APPENDIX H

MERCURY EMISSIONS DATA

Example Calculations

Emissions Input Summary

Run Data Printouts

30B Console Number Pre-Test Calibration

30B Console Number Post-Test Audit

Ambient Air Services, Inc.
Environmental Consultants
106 Ambient Airway Starke, Florida 32091 (904) 964-8440

Example Calculations, Hg Test Run 1

Facility	**Naval Station Guantanamo Bay**	**Source**	**Air Curtain Incinerator D-1**
Location	**Guantanamo Bay, Cuba**	**Date**	**April 18, 2016**

1.

Mercury Concentration, grams/DSCF, (C_s).

$$M_{Hg} \text{ X } K_1 / V_{m(std)}) \text{ X } K_2$$

Example.

M_{Hg}	=	20.3	**C_s**	=	2.25E-09	grams / SCFD
K_1	=	1.00E-09				
K_2	=	28.32				
$V_{m(std)}$	=	255.951				

2.

Mass Emission Rate, Grams / Sec, (Em).

$$C_s \text{ x } Q_{d(std)} / 60$$

Example.

C_s	=	2.25E-09				
$Q_{d(std)}$	=	120848	Em	=	4.52E-06	Grams / Sec

Constants

K_1 = **1.00E-09 grams/nanogram**

K_2 = **28.32 L/ft^3**

Variables

C_s = **Concentration Hg (grams/DSCF)**

$Q_{d(std)}$ = **Stack Gas Flow Rate, SCFMD**

Em = **Emission Rate for Hg, Grams / Second**

$V_{m(std)}$ = **Gas Volume Sampled, dry standard cubic liters**

M_{Hg} = **Mass of Hg Collected, nanograms**

Hg Emissions Data Inputs Summary

Run	Sample Volume (ft^3)	Recovery Mass (nanograms)	Volumetric Flow Rate (ft^3/min)
D1	9.04	20.3	120848
D2	9.03	18.5	98551
D3	9.12	89.7	100527
D4	8.91	37.6	137491
D5	9.13	29.1	73023
N1	8.43	3.3	104782
N2	8.45	114.5	89404
N3	8.44	0.0	72499
N4	8.47	22.9	77662
N5	8.51	5.9	91877

Configuration File: Cuba Run1 day.pro
File Exported: 4/30/2016 12:23:59 AM (PC Time).
Company Name: Cuba

04/18/16 08:02:00: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 0 ccm (Max. allowed 20 ccm)
04/18/16 08:02:00: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 9 ccm (Max. allowed 20 ccm)
Trap ID-A: OL343523
Trap ID-B: OL335385

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 24m
Averaging Period : 1 min.

Run D1

	Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES	**94.7**	**102.9**	**103.9**	**257.8**	**111**	**0.499**	**3.9**	**270.441**	**0.488**	**5.9**	**251.587**	**30.17**	**255.951**	**237.695**
4/18/2016 9:06:10 AM :	85	88	88	256	94	0	0.1	0	0	0	0	30.25	0	0
4/18/2016 9:07:09 AM :	84	88	88	253	94	0.638	2.2	0.758	0.612	2	0.656	30.25	0.738	0.639
4/18/2016 9:08:09 AM :	84	87	88	253	94	0.499	1.9	1.385	0.499	1.8	1.093	30.25	1.35	1.065
4/18/2016 9:09:09 AM :	84	87	87	256	94	0.499	1.9	1.913	0.499	1.7	1.58	30.25	1.865	1.54
4/18/2016 9:10:09 AM :	85	87	88	261	94	0.499	1.9	2.391	0.5	1.8	2.194	30.25	2.332	2.138
4/18/2016 9:11:09 AM :	85	87	88	259	94	0.5	1.9	2.917	0.5	1.8	2.79	30.25	2.845	2.719
4/18/2016 9:12:09 AM :	85	88	88	254	94	0.5	1.9	3.539	0.499	1.8	3.269	30.25	3.45	3.185
4/18/2016 9:13:09 AM :	84	88	88	253	95	0.499	1.9	4.185	0.5	1.7	3.743	30.24	4.08	3.647
4/18/2016 9:14:09 AM :	85	88	88	256	95	0.499	1.9	4.709	0.5	1.7	4.269	30.25	4.591	4.158
4/18/2016 9:15:09 AM :	85	88	88	261	95	0.5	1.9	5.2	0.5	1.7	4.79	30.24	5.069	4.666
4/18/2016 9:16:09 AM :	85	88	89	260	95	0.5	1.9	5.718	0.499	1.8	5.351	30.25	5.573	5.211
4/18/2016 9:17:09 AM :	86	88	89	255	96	0.5	1.9	6.329	0.5	1.8	5.915	30.24	6.167	5.759
4/18/2016 9:18:09 AM :	86	89	89	253	96	0.499	1.9	6.987	0.5	1.7	6.44	30.24	6.807	6.27
4/18/2016 9:19:09 AM :	86	89	89	255	96	0.5	1.9	7.499	0.5	1.7	6.902	30.24	7.305	6.718
4/18/2016 9:20:09 AM :	87	89	89	260	97	0.5	1.9	8.004	0.5	1.7	7.365	30.24	7.796	7.168
4/18/2016 9:21:09 AM :	87	89	89	260	97	0.5	1.9	8.52	0.5	1.8	7.951	30.25	8.298	7.738
4/18/2016 9:22:09 AM :	87	89	90	255	97	0.5	1.9	9.119	0.5	1.8	8.593	30.24	8.879	8.36
4/18/2016 9:23:09 AM :	86	89	90	253	97	0.5	1.9	9.772	0.5	1.7	9.08	30.25	9.514	8.833
4/18/2016 9:24:09 AM :	86	89	91	255	98	0.499	1.9	10.29	0.5	1.7	9.517	30.24	10.017	9.256
4/18/2016 9:25:09 AM :	86	90	91	260	98	0.499	1.9	10.792	0.5	1.7	10.008	30.24	10.504	9.732
4/18/2016 9:26:09 AM :	87	90	91	260	98	0.501	1.9	11.316	0.5	1.8	10.601	30.24	11.013	10.307
4/18/2016 9:27:09 AM :	87	90	91	255	99	0.499	1.9	11.917	0.5	1.8	11.203	30.25	11.596	10.89
4/18/2016 9:28:09 AM :	88	90	91	253	99	0.5	1.9	12.552	0.5	1.8	11.702	30.24	12.212	11.374
4/18/2016 9:29:09 AM :	89	90	92	255	99	0.5	1.9	13.082	0.5	1.7	12.184	30.24	12.726	11.84
4/18/2016 9:30:09 AM :	89	90	92	260	100	0.5	1.9	13.59	0.499	1.8	12.691	30.24	13.218	12.33
4/18/2016 9:31:09 AM :	89	91	92	260	100	0.499	1.9	14.112	0.5	1.8	13.205	30.24	13.724	12.827
4/18/2016 9:32:09 AM :	90	91	92	255	101	0.5	1.9	14.723	0.5	1.7	13.777	30.24	14.315	13.38
4/18/2016 9:33:09 AM :	90	91	92	253	101	0.499	1.9	15.331	0.5	1.7	14.359	30.24	14.904	13.943
4/18/2016 9:34:09 AM :	90	91	92	255	101	0.5	1.9	15.87	0.5	1.7	14.873	30.24	15.425	14.439
4/18/2016 9:35:09 AM :	90	91	93	260	101	0.5	1.9	16.38	0.5	1.8	15.336	30.24	15.919	14.887
4/18/2016 9:36:09 AM :	90	92	93	260	101	0.5	1.9	16.912	0.5	1.8	15.805	30.24	16.433	15.339
4/18/2016 9:37:09 AM :	90	92	93	255	101	0.5	1.9	17.525	0.5	1.8	16.396	30.24	17.025	15.91
4/18/2016 9:38:09 AM :	91	92	93	253	102	0.5	1.9	18.113	0.5	1.7	17.024	30.24	17.594	16.516
4/18/2016 9:39:09 AM :	91	93	93	255	102	0.499	1.9	18.666	0.5	1.7	17.518	30.24	18.128	16.993
4/18/2016 9:40:09 AM :	91	93	94	260	102	0.499	1.9	19.169	0.5	1.7	17.968	30.24	18.614	17.426
4/18/2016 9:41:09 AM :	91	93	94	260	102	0.5	1.9	19.729	0.5	1.8	18.468	30.24	19.154	17.908
4/18/2016 9:42:09 AM :	91	93	94	256	102	0.499	1.9	20.324	0.5	1.8	19.042	30.24	19.729	18.46
4/18/2016 9:43:09 AM :	91	93	94	253	103	0.5	1.9	20.896	0.5	1.8	19.646	30.24	20.281	19.043
4/18/2016 9:44:09 AM :	91	93	94	255	103	0.5	1.9	21.452	0.5	1.7	20.158	30.24	20.817	19.536
4/18/2016 9:45:09 AM :	91	94	94	260	103	0.5	1.9	21.963	0.5	1.8	20.648	30.24	21.31	20.008
4/18/2016 9:46:09 AM :	91	94	94	260	103	0.5	1.9	22.533	0.5	1.8	21.147	30.24	21.859	20.488
4/18/2016 9:47:09 AM :	92	94	95	255	103	0.5	1.9	23.124	0.5	1.8	21.656	30.24	22.429	20.978
4/18/2016 9:48:09 AM :	97	94	95	253	103	0.5	1.9	23.688	0.5	1.8	22.232	30.24	22.972	21.532
4/18/2016 9:49:09 AM :	109	94	95	256	103	0.499	1.9	24.235	0.5	1.7	22.829	30.24	23.499	22.106
4/18/2016 9:50:09 AM :	105	94	95	260	103	0.499	1.9	24.759	0.5	1.8	23.336	30.24	24.003	22.593
4/18/2016 9:51:09 AM :	99	94	95	260	103	0.501	1.9	25.333	0.5	1.8	23.798	30.24	24.556	23.038
4/18/2016 9:52:09 AM :	95	94	95	255	104	0.5	1.9	25.929	0.5	1.8	24.275	30.24	25.13	23.496
4/18/2016 9:53:09 AM :	95	95	95	253	104	0.5	1.9	26.501	0.5	1.8	24.87	30.24	25.68	24.067
4/18/2016 9:54:09 AM :	97	95	95	257	104	0.499	1.9	27.017	0.5	1.8	25.496	30.24	26.177	24.669
4/18/2016 9:55:09 AM :	102	95	96	261	104	0.501	2	27.561	0.499	1.8	25.994	30.24	26.7	25.148
4/18/2016 9:56:09 AM :	98	95	96	260	104	0.5	2	28.142	0.5	1.8	26.446	30.24	27.258	25.581
4/18/2016 9:57:09 AM :	98	95	96	255	104	0.5	2	28.744	0.5	1.8	26.944	30.23	27.837	26.059
4/18/2016 9:58:09 AM :	98	95	96	253	104	0.5	2	29.303	0.5	1.8	27.519	30.24	28.374	26.611

4/18/2016	9:59:09 AM :	97	95	96	256	104	0.499	2	29.802	0.5	1.8	28.124	30.24	28.853	27.191
4/18/2016	10:00:09 AM :	96	96	96	261	104	0.501	2	30.366	0.5	1.8	28.639	30.24	29.395	27.685
4/18/2016	10:01:09 AM :	97	96	96	260	104	0.5	2	30.944	0.5	1.8	29.13	30.24	29.949	28.156
4/18/2016	10:02:09 AM :	96	96	96	255	104	0.5	2	31.571	0.5	1.8	29.633	30.24	30.552	28.638
4/18/2016	10:03:09 AM :	96	96	96	253	104	0.5	2	32.103	0.5	1.8	30.145	30.24	31.062	29.13
4/18/2016	10:04:09 AM :	96	96	97	257	104	0.5	2	32.594	0.5	1.8	30.724	30.23	31.534	29.684
4/18/2016	10:05:09 AM :	96	96	97	261	105	0.5	2	33.157	0.5	1.8	31.312	30.23	32.074	30.248
4/18/2016	10:06:09 AM :	97	96	97	260	105	0.5	2	33.754	0.5	1.8	31.831	30.23	32.646	30.745
4/18/2016	10:07:09 AM :	98	96	97	255	104	0.499	2	34.381	0.5	1.8	32.296	30.23	33.247	31.19
4/18/2016	10:08:09 AM :	97	96	97	253	104	0.5	2	34.907	0.5	1.8	32.768	30.24	33.752	31.643
4/18/2016	10:09:09 AM :	97	96	97	257	104	0.5	2	35.402	0.5	1.8	33.359	30.24	34.227	32.209
4/18/2016	10:10:09 AM :	97	97	97	261	105	0.5	2	35.951	0.5	1.8	34.003	30.23	34.753	32.826
4/18/2016	10:11:09 AM :	96	97	97	259	105	0.5	2	36.564	0.5	1.8	34.496	30.23	35.34	33.297
4/18/2016	10:12:09 AM :	96	97	97	255	105	0.5	2	37.188	0.5	1.8	34.943	30.23	35.937	33.726
4/18/2016	10:13:09 AM :	96	97	97	253	105	0.499	2	37.718	0.5	1.8	35.442	30.23	36.445	34.202
4/18/2016	10:14:09 AM :	96	97	97	258	105	0.5	2	38.211	0.5	1.8	36.032	30.23	36.918	34.768
4/18/2016	10:15:09 AM :	97	97	97	261	105	0.499	2	38.733	0.5	1.8	36.64	30.23	37.418	35.35
4/18/2016	10:16:09 AM :	96	97	97	259	105	0.5	2	39.385	0.5	1.8	37.143	30.23	38.043	35.83
4/18/2016	10:17:09 AM :	97	97	97	254	105	0.501	2	40	0.5	1.8	37.63	30.23	38.631	36.297
4/18/2016	10:18:09 AM :	99	97	98	254	105	0.5	2	40.541	0.5	1.8	38.153	30.23	39.149	36.797
4/18/2016	10:19:09 AM :	101	97	98	259	105	0.5	2	41.021	0.5	1.9	38.675	30.23	39.608	37.296
4/18/2016	10:20:09 AM :	103	97	98	262	105	0.501	2	41.537	0.5	1.9	39.244	30.23	40.102	37.841
4/18/2016	10:21:09 AM :	106	97	98	260	105	0.499	2.1	42.191	0.5	1.9	39.822	30.23	40.728	38.393
4/18/2016	10:22:09 AM :	106	97	98	255	105	0.5	2.1	42.809	0.5	1.9	40.352	30.23	41.319	38.899
4/18/2016	10:23:09 AM :	104	97	98	254	105	0.5	2.1	43.345	0.5	1.9	40.82	30.23	41.832	39.347
4/18/2016	10:24:09 AM :	102	97	98	260	105	0.5	2.1	43.832	0.5	1.9	41.291	30.23	42.298	39.797
4/18/2016	10:25:09 AM :	99	98	98	262	105	0.5	2.1	44.356	0.5	1.9	41.876	30.23	42.799	40.356
4/18/2016	10:26:09 AM :	100	97	98	260	105	0.5	2.1	44.985	0.5	1.9	42.536	30.23	43.402	40.987
4/18/2016	10:27:09 AM :	99	98	98	255	105	0.5	2.1	45.628	0.5	1.9	43.024	30.23	44.017	41.454
4/18/2016	10:28:09 AM :	98	98	98	254	105	0.5	2.1	46.155	0.5	1.9	43.468	30.23	44.521	41.878
4/18/2016	10:29:09 AM :	96	98	98	260	105	0.501	2.1	46.651	0.5	1.9	43.958	30.22	44.994	42.346
4/18/2016	10:30:09 AM :	95	98	98	263	105	0.5	2.1	47.175	0.5	1.9	44.579	30.22	45.495	42.939
4/18/2016	10:31:09 AM :	95	98	98	261	105	0.501	2.1	47.781	0.5	1.9	45.185	30.22	46.075	43.517
4/18/2016	10:32:09 AM :	94	98	98	256	105	0.5	2.1	48.443	0.5	1.9	45.678	30.22	46.708	43.988
4/18/2016	10:33:09 AM :	94	98	98	254	105	0.5	2.1	48.959	0.5	1.9	46.153	30.23	47.201	44.442
4/18/2016	10:34:09 AM :	94	98	98	259	105	0.499	2.1	49.468	0.501	2	46.678	30.23	47.688	44.944
4/18/2016	10:35:09 AM :	94	98	98	262	105	0.5	2.1	49.99	0.499	2	47.216	30.23	48.187	45.458
4/18/2016	10:36:09 AM :	94	98	98	261	105	0.501	2.1	50.598	0.5	2	47.805	30.23	48.768	46.02
4/18/2016	10:37:09 AM :	93	98	98	256	105	0.5	2.1	51.241	0.5	1.9	48.364	30.23	49.383	46.554
4/18/2016	10:38:09 AM :	93	98	98	254	105	0.499	2.1	51.767	0.5	1.9	48.875	30.23	49.886	47.042
4/18/2016	10:39:09 AM :	93	98	98	258	105	0.499	2	52.281	0.5	1.9	49.355	30.23	50.377	47.501
4/18/2016	10:40:09 AM :	92	98	98	262	105	0.5	2	52.811	0.5	1.9	49.846	30.23	50.884	47.969
4/18/2016	10:41:09 AM :	92	98	99	260	106	0.5	2	53.429	0.5	1.9	50.44	30.23	51.474	48.537
4/18/2016	10:42:09 AM :	92	98	99	255	106	0.5	2	54.027	0.5	1.9	51.063	30.23	52.046	49.131
4/18/2016	10:43:09 AM :	92	98	99	253	106	0.5	2	54.58	0.5	1.9	51.563	30.23	52.574	49.608
4/18/2016	10:44:09 AM :	91	98	99	258	106	0.5	2	55.092	0.5	1.9	52.028	30.23	53.063	50.052
4/18/2016	10:45:09 AM :	91	98	99	261	106	0.501	2	55.651	0.5	1.9	52.509	30.23	53.597	50.511
4/18/2016	10:46:09 AM :	91	98	99	260	106	0.5	2	56.252	0.5	1.9	53.113	30.23	54.17	51.087
4/18/2016	10:47:09 AM :	92	98	99	255	106	0.5	2	56.825	0.5	1.9	53.739	30.23	54.718	51.685
4/18/2016	10:48:09 AM :	92	98	99	254	106	0.5	2	57.384	0.5	1.9	54.243	30.23	55.252	52.166
4/18/2016	10:49:09 AM :	91	98	99	258	106	0.499	2	57.896	0.5	1.9	54.699	30.23	55.741	52.601
4/18/2016	10:50:09 AM :	91	98	99	261	106	0.5	2	58.472	0.5	1.9	55.199	30.23	56.291	53.078
4/18/2016	10:51:09 AM :	91	98	99	260	106	0.501	2	59.068	0.5	1.9	55.776	30.23	56.861	53.629
4/18/2016	10:52:09 AM :	91	98	99	255	106	0.5	2	59.637	0.5	1.9	56.391	30.23	57.405	54.216
4/18/2016	10:53:09 AM :	91	98	99	254	106	0.501	2	60.176	0.5	1.9	56.906	30.24	57.92	54.708
4/18/2016	10:54:09 AM :	91	98	99	259	106	0.5	2	60.713	0.5	1.9	57.397	30.23	58.432	55.176
4/18/2016	10:55:09 AM :	90	98	99	261	106	0.5	2	61.295	0.5	1.9	57.909	30.23	58.988	55.664
4/18/2016	10:56:09 AM :	91	98	99	259	106	0.499	2.1	61.907	0.5	1.9	58.433	30.23	59.573	56.164
4/18/2016	10:57:09 AM :	95	98	99	254	106	0.5	2.1	62.46	0.5	1.9	59.008	30.23	60.101	56.712
4/18/2016	10:58:09 AM :	99	99	99	254	107	0.5	2.1	62.964	0.5	2	59.591	30.23	60.583	57.267
4/18/2016	10:59:09 AM :	99	99	99	260	107	0.5	2.1	63.531	0.5	2	60.12	30.23	61.123	57.772
4/18/2016	11:00:09 AM :	98	99	99	262	107	0.5	2.1	64.109	0.5	2	60.594	30.23	61.676	58.224
4/18/2016	11:01:09 AM :	97	99	99	260	107	0.5	2.2	64.741	0.5	2.1	61.063	30.23	62.278	58.671
4/18/2016	11:02:09 AM :	95	99	99	255	107	0.5	2.2	65.275	0.5	2.1	61.652	30.23	62.788	59.232
4/18/2016	11:03:09 AM :	95	99	99	254	107	0.501	2.2	65.768	0.5	2.1	62.315	30.23	63.259	59.865
4/18/2016	11:04:09 AM :	95	99	99	259	107	0.5	2.2	66.33	0.5	2.1	62.804	30.23	63.795	60.331
4/18/2016	11:05:09 AM :	94	99	99	262	107	0.5	2.2	66.932	0.5	2.1	63.247	30.23	64.37	60.753
4/18/2016	11:06:09 AM :	94	99	100	261	107	0.501	2.2	67.561	0.5	2.1	63.732	30.23	64.97	61.216
4/18/2016	11:07:09 AM :	93	99	100	256	107	0.5	2.2	68.09	0.5	2.1	64.363	30.23	65.474	61.817
4/18/2016	11:08:09 AM :	93	99	100	253	108	0.501	2.2	68.591	0.5	2.1	64.971	30.23	65.953	62.396
4/18/2016	11:09:09 AM :	95	99	100	258	108	0.5	2.2	69.119	0.5	2.1	65.465	30.23	66.456	62.866

4/18/2016	11:10:09 AM :	97	99	100	262	108	0.5	2.2	69.761	0.5	2.1	65.946	30.24	67.068	63.324
4/18/2016	11:11:09 AM :	101	99	100	261	108	0.499	2.2	70.378	0.5	2.1	66.463	30.23	67.656	63.817
4/18/2016	11:12:09 AM :	102	99	100	257	108	0.5	2.2	70.91	0.5	2.2	67.005	30.23	68.164	64.333
4/18/2016	11:13:09 AM :	105	99	100	254	108	0.501	2.3	71.399	0.5	2.2	67.598	30.23	68.63	64.898
4/18/2016	11:14:09 AM :	107	99	100	258	108	0.5	2.3	71.919	0.5	2.2	68.151	30.23	69.126	65.425
4/18/2016	11:15:09 AM :	107	99	101	263	108	0.499	2.3	72.573	0.499	2.3	68.661	30.23	69.749	65.911
4/18/2016	11:16:09 AM :	105	99	101	263	108	0.5	2.3	73.192	0.5	2.3	69.147	30.23	70.34	66.373
4/18/2016	11:17:09 AM :	102	99	101	259	108	0.5	2.3	73.733	0.5	2.3	69.651	30.22	70.856	66.852
4/18/2016	11:18:09 AM :	101	100	101	255	108	0.499	2.3	74.21	0.5	2.3	70.24	30.23	71.309	67.412
4/18/2016	11:19:09 AM :	101	100	101	255	108	0.5	2.3	74.736	0.5	2.3	70.856	30.23	71.81	67.999
4/18/2016	11:20:09 AM :	100	100	101	262	108	0.5	2.3	75.375	0.5	2.3	71.365	30.23	72.419	68.483
4/18/2016	11:21:09 AM :	99	100	101	264	109	0.5	2.4	76.013	0.5	2.4	71.833	30.23	73.027	68.928
4/18/2016	11:22:09 AM :	97	100	101	261	109	0.499	2.3	76.545	0.5	2.4	72.315	30.22	73.534	69.387
4/18/2016	11:23:09 AM :	96	100	101	257	109	0.499	2.3	77.032	0.5	2.3	72.91	30.22	73.998	69.953
4/18/2016	11:25:04 AM :	93	99	100	256	108	0.231	1	77.773	0.235	0.9	73.683	30.13	74.702	70.688
4/18/2016	11:26:04 AM :	93	100	101	261	109	0.5	2.2	78.374	0.499	2.1	74.19	30.2	75.273	71.169
4/18/2016	11:27:04 AM :	92	100	101	259	109	0.499	2.3	78.945	0.5	2.2	74.652	30.2	75.817	71.608
4/18/2016	11:28:04 AM :	91	100	101	255	109	0.5	2.3	79.5	0.5	2.2	75.125	30.2	76.345	72.057
4/18/2016	11:29:04 AM :	91	101	101	255	109	0.499	2.3	80.026	0.5	2.2	75.72	30.2	76.845	72.622
4/18/2016	11:29:30 AM :User Paused	91	101	101	261	109	0.501	2.3	80.218	0.502	2.2	75.971	30.2	77.028	72.861
4/18/2016	11:40:56 AM :Resumed	94	101	101	261	108	0	0.1	80.218	0	0	75.971	30.2	77.028	72.861
4/18/2016	11:41:56 AM :	92	101	101	259	108	0.49	1.9	80.857	0.495	1.8	76.53	30.2	77.636	73.392
4/18/2016	11:42:56 AM :	93	100	101	254	108	0.501	2.3	81.481	0.5	2.3	77.051	30.2	78.229	73.887
4/18/2016	11:43:56 AM :	91	100	101	254	108	0.501	2.3	82.022	0.5	2.3	77.512	30.2	78.744	74.325
4/18/2016	11:44:56 AM :	91	100	101	259	108	0.501	2.3	82.505	0.5	2.3	77.982	30.2	79.203	74.773
4/18/2016	11:45:56 AM :	91	100	101	261	108	0.5	2.3	83.039	0.5	2.3	78.571	30.2	79.711	75.332
4/18/2016	11:46:56 AM :	93	100	101	259	108	0.5	2.4	83.668	0.5	2.3	79.212	30.2	80.31	75.941
4/18/2016	11:47:56 AM :	93	100	101	254	108	0.5	2.3	84.321	0.5	2.3	79.706	30.2	80.931	76.411
4/18/2016	11:48:56 AM :	94	100	101	254	108	0.501	2.3	84.849	0.5	2.3	80.151	30.2	81.433	76.834
4/18/2016	11:49:56 AM :	93	100	101	259	108	0.5	2.3	85.354	0.5	2.3	80.645	30.2	81.914	77.304
4/18/2016	11:50:56 AM :	93	101	101	261	108	0.5	2.3	85.874	0.5	2.3	81.23	30.2	82.408	77.859
4/18/2016	11:51:56 AM :	93	101	101	258	108	0.501	2.3	86.481	0.5	2.3	81.843	30.19	82.986	78.442
4/18/2016	11:52:56 AM :	93	101	101	254	108	0.501	2.3	87.141	0.5	2.3	82.344	30.19	83.613	78.917
4/18/2016	11:53:56 AM :	93	101	101	255	108	0.5	2.3	87.663	0.5	2.3	82.83	30.19	84.109	79.378
4/18/2016	11:54:56 AM :	93	101	101	260	108	0.5	2.3	88.179	0.5	2.3	83.34	30.2	84.6	79.863
4/18/2016	11:55:56 AM :	93	101	101	261	109	0.5	2.3	88.705	0.5	2.3	83.854	30.2	85.1	80.352
4/18/2016	11:56:56 AM :	93	101	101	258	109	0.5	2.3	89.322	0.5	2.3	84.426	30.19	85.686	80.894
4/18/2016	11:57:56 AM :	94	101	101	253	109	0.5	2.3	89.941	0.5	2.3	85.013	30.19	86.275	81.452
4/18/2016	11:58:56 AM :	93	101	102	255	109	0.5	2.3	90.49	0.5	2.3	85.532	30.19	86.796	81.945
4/18/2016	11:59:56 AM :	93	101	102	260	109	0.5	2.3	91.002	0.5	2.3	85.996	30.2	87.283	82.384
4/18/2016	12:00:56 PM :	93	101	102	261	109	0.499	2.3	91.557	0.5	2.3	86.467	30.19	87.81	82.831
4/18/2016	12:01:56 PM :	93	101	102	257	109	0.5	2.3	92.164	0.5	2.3	87.053	30.19	88.386	83.388
4/18/2016	12:02:56 PM :	93	101	102	253	109	0.499	2.3	92.741	0.499	2.3	87.695	30.19	88.934	83.996
4/18/2016	12:03:56 PM :	92	101	102	256	109	0.5	2.3	93.302	0.5	2.3	88.189	30.19	89.467	84.465
4/18/2016	12:04:56 PM :	91	101	102	261	109	0.5	2.3	93.818	0.5	2.3	88.634	30.2	89.957	84.888
4/18/2016	12:05:56 PM :	91	101	102	261	109	0.501	2.3	94.396	0.5	2.4	89.126	30.2	90.506	85.354
4/18/2016	12:06:56 PM :	92	101	102	256	109	0.5	2.3	94.998	0.5	2.4	89.72	30.2	91.078	85.918
4/18/2016	12:07:56 PM :	92	101	102	253	109	0.499	2.3	95.572	0.5	2.4	90.328	30.2	91.623	86.495
4/18/2016	12:08:56 PM :	92	101	102	256	110	0.5	2.3	96.098	0.5	2.4	90.827	30.2	92.123	86.967
4/18/2016	12:09:56 PM :	92	101	102	261	110	0.5	2.3	96.641	0.499	2.4	91.31	30.2	92.638	87.425
4/18/2016	12:10:56 PM :	91	101	102	260	110	0.5	2.4	97.228	0.5	2.4	91.82	30.2	93.195	87.909
4/18/2016	12:11:56 PM :	91	102	102	256	110	0.5	2.4	97.844	0.5	2.5	92.336	30.2	93.78	88.398
4/18/2016	12:12:56 PM :	92	102	102	253	110	0.499	2.3	98.397	0.5	2.5	92.913	30.2	94.305	88.945
4/18/2016	12:13:56 PM :	92	102	102	257	110	0.5	2.4	98.896	0.499	2.5	93.492	30.2	94.778	89.494
4/18/2016	12:14:56 PM :	92	102	102	261	110	0.5	2.4	99.464	0.5	2.5	94.012	30.2	95.317	89.987
4/18/2016	12:15:56 PM :	92	102	102	259	110	0.5	2.4	100.048	0.5	2.5	94.477	30.2	95.872	90.428
4/18/2016	12:16:56 PM :	92	102	102	255	110	0.5	2.4	100.682	0.5	2.6	94.948	30.19	96.473	90.874
4/18/2016	12:17:56 PM :	92	102	102	254	110	0.501	2.4	101.214	0.5	2.6	95.532	30.19	96.978	91.428
4/18/2016	12:18:56 PM :	92	102	103	259	110	0.5	2.4	101.711	0.5	2.6	96.176	30.2	97.449	92.038
4/18/2016	12:19:56 PM :	92	102	103	262	110	0.5	2.4	102.262	0.499	2.6	96.671	30.2	97.972	92.507
4/18/2016	12:20:56 PM :	93	102	103	260	110	0.5	2.4	102.881	0.5	2.7	97.113	30.2	98.56	92.925
4/18/2016	12:21:56 PM :	93	102	103	254	110	0.5	2.4	103.509	0.5	2.7	97.603	30.2	99.155	93.389
4/18/2016	12:22:56 PM :	93	102	103	253	111	0.501	2.4	104.043	0.5	2.7	98.195	30.2	99.661	93.951
4/18/2016	12:23:56 PM :	93	102	103	258	111	0.5	2.4	104.538	0.5	2.8	98.809	30.2	100.131	94.531
4/18/2016	12:24:56 PM :	92	102	103	262	111	0.499	2.4	105.062	0.5	2.8	99.309	30.2	100.628	95.005
4/18/2016	12:25:56 PM :	92	102	103	260	111	0.499	2.4	105.718	0.5	2.8	99.79	30.2	101.25	95.461
4/18/2016	12:26:56 PM :	91	102	103	255	110	0.5	2.4	106.331	0.5	2.8	100.301	30.2	101.831	95.945
4/18/2016	12:27:56 PM :	91	102	103	253	111	0.5	2.4	106.871	0.5	2.9	100.818	30.2	102.343	96.434
4/18/2016	12:28:56 PM :	91	102	103	258	111	0.5	2.4	107.353	0.5	2.9	101.39	30.2	102.799	96.976
4/18/2016	12:29:56 PM :	91	102	103	261	111	0.499	2.4	107.877	0.5	2.9	101.974	30.2	103.296	97.528
4/18/2016	12:30:56 PM :	91	102	103	260	111	0.5	2.4	108.523	0.5	2.9	102.498	30.19	103.909	98.023

4/18/2016	12:31:56 PM :	91	102	103	255	111	0.5	2.4	109.156	0.5	3	102.958	30.19	104.509	98.459
4/18/2016	12:32:56 PM :	91	102	103	253	111	0.5	2.4	109.696	0.5	3	103.43	30.19	105.021	98.905
4/18/2016	12:33:56 PM :	91	102	103	258	111	0.5	2.4	110.181	0.5	3.1	104.015	30.19	105.481	99.459
4/18/2016	12:34:56 PM :	91	103	103	261	111	0.501	2.5	110.712	0.5	3.1	104.66	30.19	105.983	100.07
4/18/2016	12:35:56 PM :	91	103	103	260	111	0.5	2.5	111.327	0.5	3.2	105.152	30.19	106.565	100.535
4/18/2016	12:36:56 PM :	91	103	103	255	111	0.5	2.5	111.993	0.5	3.2	105.598	30.19	107.196	100.956
4/18/2016	12:37:56 PM :	91	103	103	253	111	0.5	2.4	112.507	0.5	3.2	106.089	30.19	107.683	101.421
4/18/2016	12:38:56 PM :	91	103	103	258	111	0.5	2.4	113.019	0.5	3.3	106.689	30.19	108.168	101.989
4/18/2016	12:39:56 PM :	91	103	103	261	111	0.5	2.5	113.539	0.5	3.3	107.292	30.19	108.66	102.559
4/18/2016	12:40:56 PM :	91	103	104	260	111	0.5	2.5	114.14	0.499	3.4	107.786	30.19	109.229	103.026
4/18/2016	12:41:56 PM :	91	103	104	255	111	0.5	2.5	114.791	0.5	3.4	108.269	30.19	109.845	103.482
4/18/2016	12:42:56 PM :	92	103	104	254	111	0.501	2.5	115.324	0.5	3.4	108.788	30.19	110.35	103.973
4/18/2016	12:43:56 PM :	92	103	104	259	111	0.499	2.5	115.839	0.5	3.4	109.305	30.19	110.837	104.462
4/18/2016	12:44:56 PM :	92	103	104	262	111	0.5	2.5	116.368	0.5	3.4	109.874	30.19	111.338	105
4/18/2016	12:45:56 PM :	92	103	104	259	111	0.501	2.5	116.99	0.5	3.5	110.453	30.19	111.928	105.547
4/18/2016	12:46:56 PM :	92	103	104	254	111	0.501	2.5	117.587	0.5	3.5	110.981	30.19	112.493	106.045
4/18/2016	12:47:56 PM :	93	103	104	253	111	0.5	2.5	118.147	0.5	3.5	111.448	30.19	113.023	106.487
4/18/2016	12:48:56 PM :	92	103	104	259	111	0.5	2.5	118.652	0.5	3.6	111.911	30.19	113.5	106.925
4/18/2016	12:49:56 PM :	92	103	104	261	111	0.5	2.5	119.22	0.5	3.6	112.496	30.19	114.037	107.477
4/18/2016	12:50:56 PM :	92	103	104	259	111	0.5	2.5	119.82	0.5	3.5	113.152	30.19	114.606	108.097
4/18/2016	12:51:56 PM :	92	103	104	254	111	0.501	2.5	120.394	0.5	3.6	113.644	30.19	115.148	108.562
4/18/2016	12:52:56 PM :	92	103	104	254	111	0.499	2.5	120.949	0.5	3.7	114.084	30.18	115.673	108.978
4/18/2016	12:53:56 PM :	92	103	104	259	111	0.501	2.5	121.473	0.5	3.7	114.572	30.18	116.168	109.439
4/18/2016	12:54:56 PM :	92	103	104	261	111	0.5	2.6	122.058	0.5	3.7	115.182	30.18	116.722	110.014
4/18/2016	12:55:56 PM :	92	103	104	259	112	0.5	2.6	122.657	0.5	3.6	115.783	30.18	117.288	110.582
4/18/2016	12:56:56 PM :	92	103	104	254	112	0.5	2.6	123.229	0.5	3.7	116.277	30.18	117.829	111.048
4/18/2016	12:57:56 PM :	92	103	104	254	112	0.5	2.6	123.743	0.5	3.7	116.758	30.19	118.315	111.502
4/18/2016	12:58:56 PM :	92	103	104	259	112	0.499	2.6	124.299	0.5	3.8	117.281	30.19	118.842	111.996
4/18/2016	12:59:56 PM :	92	103	104	261	112	0.501	2.6	124.881	0.5	3.8	117.8	30.19	119.392	112.486
4/18/2016	1:00:56 PM :	93	103	104	259	112	0.501	2.6	125.516	0.5	3.8	118.37	30.18	119.993	113.024
4/18/2016	1:01:56 PM :	93	103	104	254	112	0.5	2.6	126.049	0.5	3.8	118.938	30.18	120.497	113.56
4/18/2016	1:02:56 PM :	93	104	104	254	112	0.5	2.6	126.547	0.5	3.9	119.472	30.18	120.967	114.064
4/18/2016	1:03:56 PM :	93	104	105	259	112	0.5	2.6	127.112	0.5	3.9	119.942	30.18	121.501	114.507
4/18/2016	1:04:56 PM :	94	104	105	261	112	0.501	2.6	127.71	0.5	3.8	120.402	30.18	122.066	114.942
4/18/2016	1:05:56 PM :	94	104	105	259	112	0.5	2.6	128.344	0.499	3.9	120.987	30.18	122.665	115.493
4/18/2016	1:06:56 PM :	94	104	105	254	113	0.501	2.6	128.876	0.5	3.9	121.645	30.18	123.168	116.114
4/18/2016	1:07:56 PM :	94	104	105	254	113	0.501	2.6	129.379	0.5	3.9	122.137	30.18	123.643	116.578
4/18/2016	1:08:56 PM :	94	104	105	259	113	0.5	2.6	129.91	0.5	3.9	122.571	30.18	124.145	116.987
4/18/2016	1:09:56 PM :	94	104	105	261	113	0.5	2.6	130.554	0.5	4	123.059	30.18	124.753	117.448
4/18/2016	1:10:56 PM :	94	104	105	259	114	0.5	2.7	131.175	0.5	4	123.672	30.18	125.339	118.026
4/18/2016	1:11:56 PM :	94	104	105	254	114	0.5	2.7	131.714	0.5	4	124.282	30.18	125.848	118.601
4/18/2016	1:12:56 PM :	94	104	105	254	114	0.5	2.7	132.198	0.5	4	124.768	30.18	126.305	119.059
4/18/2016	1:13:56 PM :	94	104	105	259	114	0.5	2.7	132.718	0.5	4.1	125.245	30.18	126.796	119.508
4/18/2016	1:14:56 PM :	94	104	105	261	114	0.501	2.7	133.372	0.5	4.1	125.774	30.18	127.413	120.006
4/18/2016	1:15:56 PM :	94	104	105	258	114	0.499	2.7	133.996	0.5	4	126.294	30.18	128.002	120.496
4/18/2016	1:16:56 PM :	94	104	105	253	114	0.5	2.7	134.537	0.5	4.1	126.863	30.18	128.512	121.032
4/18/2016	1:17:56 PM :	94	104	105	254	114	0.5	2.7	135.017	0.5	4.1	127.426	30.18	128.966	121.563
4/18/2016	1:18:56 PM :	95	105	106	259	114	0.5	2.7	135.549	0.5	4.2	127.965	30.18	129.467	122.07
4/18/2016	1:19:56 PM :	95	105	106	261	114	0.5	2.7	136.176	0.5	4.3	128.431	30.18	130.059	122.509
4/18/2016	1:20:56 PM :	95	105	106	258	115	0.5	2.8	136.821	0.5	4.4	128.896	30.18	130.666	122.946
4/18/2016	1:21:56 PM :	96	105	106	253	115	0.5	2.8	137.353	0.5	4.3	129.48	30.18	131.168	123.496
4/18/2016	1:22:56 PM :	96	105	106	255	115	0.501	2.7	137.855	0.5	4.1	130.142	30.18	131.642	124.12
4/18/2016	1:23:56 PM :	96	105	106	260	115	0.5	2.8	138.379	0.499	4.2	130.625	30.18	132.136	124.574
4/18/2016	1:24:56 PM :	96	105	106	261	115	0.5	2.8	138.983	0.5	4.4	131.069	30.18	132.705	124.991
4/18/2016	1:25:56 PM :	96	105	106	258	115	0.5	2.8	139.641	0.5	4.3	131.547	30.18	133.325	125.442
4/18/2016	1:26:56 PM :	96	105	106	253	115	0.5	2.8	140.161	0.5	4.4	132.166	30.18	133.815	126.023
4/18/2016	1:27:56 PM :	96	105	106	254	115	0.5	2.8	140.68	0.5	4.4	132.776	30.17	134.303	126.597
4/18/2016	1:28:56 PM :	96	105	106	260	116	0.5	2.8	141.202	0.5	4.4	133.266	30.17	134.795	127.057
4/18/2016	1:29:56 PM :	96	106	107	261	116	0.501	2.8	141.822	0.5	4.4	133.736	30.18	135.379	127.499
4/18/2016	1:30:56 PM :	96	106	107	258	116	0.499	2.9	142.437	0.5	4.4	134.265	30.17	135.958	127.996
4/18/2016	1:31:56 PM :	96	106	107	253	116	0.499	2.9	142.982	0.5	4.5	134.793	30.17	136.471	128.492
4/18/2016	1:32:56 PM :	96	106	107	255	116	0.501	2.9	143.497	0.5	4.4	135.37	30.18	136.956	129.034
4/18/2016	1:33:56 PM :	96	106	107	260	116	0.5	2.9	144.048	0.5	4.4	135.926	30.17	137.474	129.556
4/18/2016	1:34:56 PM :	96	106	107	261	116	0.5	3	144.654	0.5	4.4	136.461	30.17	138.044	130.059
4/18/2016	1:35:56 PM :	96	106	107	258	116	0.5	3	145.235	0.5	4.3	136.928	30.17	138.591	130.498
4/18/2016	1:36:56 PM :	96	106	107	253	116	0.5	3	145.8	0.499	4.4	137.401	30.17	139.122	130.942
4/18/2016	1:37:56 PM :	97	106	107	255	117	0.5	3	146.308	0.5	4.6	137.98	30.17	139.599	131.485
4/18/2016	1:38:56 PM :	97	106	107	260	117	0.5	3	146.882	0.5	4.5	138.638	30.17	140.139	132.102
4/18/2016	1:39:56 PM :	97	106	107	261	117	0.5	3.1	147.479	0.5	4.5	139.126	30.17	140.699	132.56
4/18/2016	1:40:56 PM :	96	106	107	257	117	0.5	3.1	148.052	0.5	4.6	139.571	30.17	141.239	132.978
4/18/2016	1:41:56 PM :	96	107	108	253	117	0.5	3.1	148.594	0.5	4.6	140.054	30.17	141.748	133.431

4/18/2016	1:42:56 PM :	96	107	108	255	117	0.5	3.1	149.127	0.5	4.6	140.668	30.17	142.248	134.006
4/18/2016	1:43:56 PM :	97	107	108	260	117	0.501	3.2	149.713	0.5	4.6	141.279	30.17	142.798	134.579
4/18/2016	1:44:56 PM :	97	107	108	261	117	0.5	3.2	150.319	0.5	4.6	141.773	30.17	143.368	135.043
4/18/2016	1:45:56 PM :	97	107	108	257	117	0.5	3.2	150.877	0.5	4.7	142.24	30.16	143.892	135.48
4/18/2016	1:46:56 PM :	97	107	108	253	117	0.5	3.1	151.388	0.5	4.6	142.761	30.16	144.372	135.968
4/18/2016	1:47:56 PM :	97	107	108	255	117	0.5	3.1	151.954	0.5	4.4	143.302	30.16	144.903	136.475
4/18/2016	1:48:56 PM :	97	107	108	260	117	0.5	3.1	152.53	0.5	4.2	143.881	30.16	145.443	137.018
4/18/2016	1:49:56 PM :	97	107	108	261	117	0.5	3.1	153.161	0.5	4.3	144.432	30.16	146.035	137.534
4/18/2016	1:50:56 PM :	97	107	108	256	117	0.501	3.1	153.695	0.5	4.4	144.953	30.16	146.536	138.022
4/18/2016	1:51:56 PM :	96	107	108	253	117	0.5	3.1	154.192	0.5	4.3	145.43	30.16	147.002	138.468
4/18/2016	1:52:56 PM :	97	107	108	256	117	0.499	3.1	154.752	0.499	4.4	145.916	30.16	147.528	138.923
4/18/2016	1:53:56 PM :	96	108	109	261	117	0.499	3.1	155.356	0.5	4.4	146.501	30.16	148.094	139.47
4/18/2016	1:54:56 PM :	96	108	109	260	117	0.5	3.1	155.988	0.5	4.3	147.133	30.16	148.686	140.062
4/18/2016	1:55:56 PM :	96	108	109	256	118	0.499	3.1	156.518	0.5	4.2	147.631	30.16	149.183	140.528
4/18/2016	1:56:56 PM :	96	108	109	253	118	0.5	3.1	157.016	0.5	4.1	148.083	30.16	149.65	140.951
4/18/2016	1:57:56 PM :	96	108	109	256	118	0.5	3.1	157.546	0.5	4.1	148.566	30.17	150.146	141.403
4/18/2016	1:58:56 PM :	96	108	109	261	118	0.499	3.1	158.187	0.5	4.3	149.164	30.16	150.748	141.962
4/18/2016	1:59:56 PM :	97	108	109	260	118	0.5	3.1	158.807	0.5	4.6	149.788	30.16	151.328	142.546
4/18/2016	2:00:56 PM :	97	108	109	255	118	0.501	3.2	159.353	0.5	4.6	150.288	30.17	151.841	143.015
4/18/2016	2:01:56 PM :	97	108	109	253	118	0.5	3.2	159.836	0.5	5	150.75	30.17	152.293	143.446
4/18/2016	2:02:56 PM :	97	108	109	256	118	0.5	3.3	160.35	0.5	5.1	151.258	30.16	152.774	143.922
4/18/2016	2:03:56 PM :	96	108	109	261	118	0.5	3.4	161.004	0.5	5.1	151.807	30.16	153.387	144.435
4/18/2016	2:04:56 PM :	96	108	109	260	118	0.5	3.4	161.631	0.5	5.1	152.413	30.17	153.974	145.002
4/18/2016	2:05:56 PM :	96	108	109	255	118	0.499	3.4	162.169	0.5	5.1	152.945	30.17	154.478	145.499
4/18/2016	2:06:56 PM :	97	108	109	253	118	0.5	3.4	162.653	0.5	5.1	153.447	30.17	154.931	145.969
4/18/2016	2:07:56 PM :	97	108	109	256	118	0.5	3.4	163.186	0.5	5	153.94	30.16	155.43	146.43
4/18/2016	2:08:56 PM :	97	108	109	261	119	0.5	3.4	163.806	0.5	5.1	154.443	30.16	156.011	146.899
4/18/2016	2:09:56 PM :	96	109	109	260	119	0.5	3.4	164.456	0.5	5	155.023	30.17	156.619	147.442
4/18/2016	2:10:56 PM :	96	109	109	255	119	0.499	3.4	164.986	0.5	5	155.632	30.17	157.115	148.012
4/18/2016	2:11:56 PM :	96	109	110	253	119	0.501	3.4	165.485	0.5	5	156.144	30.16	157.582	148.489
4/18/2016	2:12:56 PM :	95	109	110	257	119	0.5	3.5	166.008	0.5	5	156.612	30.16	158.072	148.926
4/18/2016	2:13:56 PM :	95	109	110	261	119	0.501	3.5	166.613	0.5	5	157.086	30.16	158.637	149.37
4/18/2016	2:14:56 PM :	95	109	110	260	119	0.5	3.5	167.273	0.5	5	157.675	30.16	159.255	149.919
4/18/2016	2:15:56 PM :	95	109	110	255	119	0.5	3.4	167.797	0.5	5.1	158.317	30.16	159.745	150.519
4/18/2016	2:16:56 PM :	95	109	110	253	119	0.5	3.5	168.31	0.5	5	158.817	30.16	160.225	150.986
4/18/2016	2:17:56 PM :	96	109	110	258	119	0.5	3.5	168.831	0.5	5.1	159.269	30.16	160.713	151.408
4/18/2016	2:18:56 PM :	96	109	110	261	119	0.501	3.5	169.446	0.5	5.1	159.763	30.16	161.287	151.869
4/18/2016	2:19:56 PM :	96	109	110	259	119	0.5	3.5	170.071	0.5	5.1	160.345	30.16	161.873	152.413
4/18/2016	2:20:56 PM :	96	109	110	254	119	0.501	3.4	170.614	0.5	5.1	160.961	30.16	162.38	152.989
4/18/2016	2:21:56 PM :	96	109	110	254	119	0.5	3.4	171.131	0.5	5	161.468	30.16	162.864	153.462
4/18/2016	2:22:56 PM :	96	109	110	259	119	0.5	3.4	171.678	0.5	5.1	161.957	30.16	163.375	153.918
4/18/2016	2:23:56 PM :	96	109	110	261	119	0.501	3.5	172.287	0.5	5.1	162.473	30.15	163.944	154.4
4/18/2016	2:24:56 PM :	96	109	110	259	119	0.501	3.5	172.873	0.5	5.1	162.993	30.16	164.492	154.884
4/18/2016	2:25:56 PM :	96	109	110	254	120	0.5	3.6	173.437	0.5	5.1	163.567	30.16	165.018	155.42
4/18/2016	2:26:56 PM :	97	109	110	254	120	0.5	3.6	173.948	0.5	5.2	164.147	30.16	165.496	155.961
4/18/2016	2:27:56 PM :	97	109	110	259	120	0.5	3.6	174.524	0.5	5.2	164.683	30.15	166.034	156.461
4/18/2016	2:28:56 PM :	97	109	110	261	120	0.501	3.5	175.12	0.5	5.1	165.15	30.16	166.591	156.896
4/18/2016	2:29:56 PM :	97	109	110	258	120	0.5	3.5	175.696	0.5	5.1	165.616	30.16	167.13	157.332
4/18/2016	2:30:56 PM :	97	109	111	254	120	0.5	3.5	176.233	0.5	5.1	166.198	30.16	167.631	157.874
4/18/2016	2:31:56 PM :	97	110	111	254	120	0.5	3.5	176.773	0.5	5.1	166.863	30.15	168.135	158.494
4/18/2016	2:32:56 PM :	97	110	111	259	120	0.5	3.5	177.357	0.5	5.1	167.355	30.15	168.681	158.953
4/18/2016	2:33:56 PM :	97	110	111	261	121	0.5	3.6	177.974	0.5	5.2	167.803	30.16	169.257	159.37
4/18/2016	2:34:56 PM :	97	110	111	258	121	0.5	3.5	178.527	0.5	5.1	168.285	30.15	169.773	159.82
4/18/2016	2:35:56 PM :	97	110	111	254	121	0.5	3.5	179.031	0.499	5.2	168.91	30.15	170.243	160.402
4/18/2016	2:36:56 PM :	97	110	111	255	121	0.5	3.6	179.599	0.5	5.3	169.516	30.15	170.774	160.966
4/18/2016	2:37:56 PM :	97	110	111	260	121	0.5	3.6	180.18	0.5	5.3	170.011	30.16	171.316	161.427
4/18/2016	2:38:56 PM :	96	110	111	261	121	0.499	3.6	180.815	0.5	5.3	170.484	30.16	171.909	161.868
4/18/2016	2:39:56 PM :	96	110	111	257	121	0.5	3.7	181.349	0.5	5.3	171.014	30.15	172.407	162.361
4/18/2016	2:40:56 PM :	96	110	111	253	121	0.499	3.7	181.849	0.5	5.3	171.547	30.15	172.872	162.858
4/18/2016	2:41:56 PM :	96	110	111	256	121	0.5	3.6	182.399	0.5	5.4	172.132	30.15	173.386	163.403
4/18/2016	2:42:56 PM :	96	110	111	260	121	0.501	3.7	183.019	0.5	5.4	172.689	30.16	173.964	163.921
4/18/2016	2:43:56 PM :	96	110	111	260	121	0.5	3.7	183.646	0.5	5.3	173.213	30.16	174.549	164.409
4/18/2016	2:44:56 PM :	97	110	112	256	121	0.5	3.7	184.182	0.5	5.3	173.692	30.15	175.049	164.855
4/18/2016	2:45:56 PM :	97	111	112	253	122	0.5	3.8	184.676	0.5	5.4	174.185	30.15	175.509	165.313
4/18/2016	2:46:56 PM :	97	111	112	256	122	0.5	3.8	185.198	0.5	5.4	174.778	30.16	175.996	165.865
4/18/2016	2:47:56 PM :	96	111	112	261	122	0.5	3.8	185.852	0.5	5.4	175.398	30.15	176.605	166.442
4/18/2016	2:48:56 PM :	96	111	112	260	122	0.499	3.8	186.471	0.5	5.5	175.909	30.15	177.182	166.918
4/18/2016	2:49:56 PM :	96	111	112	255	122	0.5	3.8	187.014	0.5	5.5	176.375	30.16	177.688	167.351
4/18/2016	2:50:56 PM :	95	111	112	253	122	0.5	3.8	187.496	0.5	5.4	176.857	30.16	178.137	167.799
4/18/2016	2:51:56 PM :	96	111	112	257	122	0.5	3.9	188.02	0.5	5.6	177.454	30.16	178.626	168.354
4/18/2016	2:52:56 PM :	95	111	112	261	122	0.501	3.9	188.662	0.5	5.6	178.092	30.15	179.224	168.947

4/18/2016	2:53:56 PM :	95	111	112	260	122	0.501	3.8	189.3	0.5	5.5	178.6	30.15	179.818	169.419
4/18/2016	2:54:56 PM :	95	111	112	255	122	0.5	3.9	189.835	0.499	5.5	179.055	30.15	180.317	169.843
4/18/2016	2:55:56 PM :	96	111	112	253	122	0.499	3.9	190.332	0.5	5.6	179.552	30.15	180.779	170.304
4/18/2016	2:56:56 PM :	96	111	112	258	123	0.5	4	190.86	0.5	5.6	180.148	30.15	181.271	170.859
4/18/2016	2:57:56 PM :	96	111	113	261	123	0.5	3.9	191.47	0.5	5.6	180.771	30.15	181.839	171.437
4/18/2016	2:58:56 PM :	96	111	113	259	123	0.501	3.9	192.133	0.5	5.6	181.269	30.15	182.456	171.899
4/18/2016	2:59:56 PM :	97	111	113	254	123	0.5	3.9	192.654	0.5	5.6	181.756	30.15	182.941	172.352
4/18/2016	3:00:56 PM :	97	111	113	253	123	0.501	3.9	193.169	0.5	5.6	182.29	30.14	183.42	172.847
4/18/2016	3:01:56 PM :	97	112	113	258	122	0.501	3.9	193.691	0.5	5.6	182.811	30.14	183.906	173.331
4/18/2016	3:02:56 PM :	96	112	113	261	122	0.499	3.9	194.293	0.5	5.6	183.392	30.14	184.466	173.87
4/18/2016	3:03:56 PM :	96	112	113	259	122	0.5	3.9	194.934	0.5	5.5	183.961	30.14	185.061	174.399
4/18/2016	3:04:56 PM :	96	112	113	254	122	0.501	3.9	195.473	0.5	5.5	184.503	30.14	185.563	174.902
4/18/2016	3:05:56 PM :	95	112	113	254	122	0.5	3.9	195.989	0.5	5.6	184.976	30.14	186.043	175.34
4/18/2016	3:18:19 PM :	90	108	109	207	111	0.491	2.3	196.726	0.502	2	185.677	30.03	186.73	175.993
4/18/2016	3:19:19 PM :	92	109	111	212	112	0.498	3.9	197.364	0.497	4	186.283	30.1	187.325	176.556
4/18/2016	3:20:19 PM :	93	110	111	226	113	0.499	4.8	197.901	0.498	6.5	186.844	30.1	187.825	177.079
4/18/2016	3:22:31 PM :	93	109	110	262	113	0.488	3.4	198.839	0.496	5.2	187.749	30.03	188.699	177.92
4/18/2016	3:23:31 PM :	94	110	111	267	114	0.499	4.1	199.425	0.5	5.8	188.228	30.1	189.245	178.366
4/18/2016	3:26:08 PM :	94	109	110	253	113	0.483	3.1	200.509	0.498	4.5	189.439	30.03	190.254	179.492
4/18/2016	3:27:08 PM :	94	109	110	252	114	0.5	4.1	201.067	0.499	5.6	189.943	30.09	190.776	179.961
4/18/2016	3:28:08 PM :	94	109	110	256	114	0.501	4.1	201.592	0.5	5.6	190.404	30.1	191.265	180.39
4/18/2016	3:29:08 PM :	94	109	110	261	115	0.5	3.9	202.168	0.5	5.2	190.899	30.1	191.802	180.851
4/18/2016	3:30:08 PM :	95	109	110	261	115	0.499	3.9	202.77	0.499	5.3	191.522	30.1	192.363	181.431
4/18/2016	3:31:08 PM :	96	109	110	256	115	0.499	4.4	203.346	0.5	6	192.157	30.1	192.901	182.022
4/18/2016	3:32:08 PM :	96	109	110	253	115	0.5	4.6	203.866	0.5	6.6	192.672	30.1	193.386	182.502
4/18/2016	3:33:08 PM :	96	109	110	256	115	0.499	4.7	204.417	0.499	6.8	193.14	30.09	193.9	182.938
4/18/2016	3:34:08 PM :	97	109	110	261	115	0.501	4.6	204.999	0.5	6.6	193.652	30.09	194.443	183.414
4/18/2016	3:35:08 PM :	100	109	110	260	115	0.5	4.5	205.624	0.5	6.6	194.242	30.1	195.027	183.964
4/18/2016	3:36:08 PM :	103	109	110	256	115	0.499	4.6	206.168	0.499	6.8	194.875	30.1	195.535	184.553
4/18/2016	3:37:08 PM :	103	109	110	253	115	0.5	4.9	206.664	0.499	7.3	195.387	30.1	195.998	185.03
4/18/2016	3:38:08 PM :	104	109	110	258	115	0.5	5.2	207.231	0.499	7.9	195.877	30.09	196.527	185.487
4/18/2016	3:39:08 PM :	103	109	110	262	115	0.499	5.4	207.82	0.5	8.2	196.419	30.09	197.077	185.992
4/18/2016	3:40:08 PM :	101	109	110	262	115	0.5	5.7	208.453	0.5	8.6	196.955	30.09	197.668	186.491
4/18/2016	3:41:08 PM :	101	108	110	257	115	0.5	5.6	208.981	0.5	8.6	197.544	30.09	198.161	187.04
4/18/2016	3:42:08 PM :	101	108	110	253	115	0.5	5.9	209.486	0.499	9.1	198.116	30.09	198.633	187.573
4/18/2016	3:43:08 PM :	100	108	110	257	115	0.5	5.9	210.025	0.5	9.2	198.639	30.09	199.136	188.06
4/18/2016	3:44:08 PM :	99	108	110	262	115	0.5	5.8	210.646	0.5	9.3	199.133	30.09	199.717	188.52
4/18/2016	3:45:08 PM :	99	108	110	263	115	0.5	5.9	211.272	0.499	9.4	199.651	30.08	200.301	189.003
4/18/2016	3:46:08 PM :	98	108	110	259	115	0.5	6.1	211.81	0.5	9.7	200.246	30.08	200.804	189.557
4/18/2016	3:47:08 PM :	98	108	110	254	115	0.5	6.3	212.301	0.499	10	200.849	30.08	201.262	190.118
4/18/2016	3:48:08 PM :	97	108	109	255	115	0.499	6.4	212.819	0.5	10.1	201.384	30.08	201.747	190.618
4/18/2016	3:49:08 PM :	96	108	109	261	115	0.5	6.3	213.475	0.5	10	201.868	30.08	202.36	191.069
4/18/2016	3:50:08 PM :	96	108	109	262	115	0.5	6.3	214.09	0.5	9.9	202.345	30.08	202.934	191.514
4/18/2016	3:51:08 PM :	95	108	109	260	115	0.5	6.3	214.635	0.5	9.9	202.94	30.08	203.444	192.069
4/18/2016	3:52:08 PM :	95	108	109	255	115	0.5	6.4	215.116	0.5	10.2	203.615	30.08	203.894	192.698
4/18/2016	3:53:08 PM :	94	108	109	254	115	0.5	6.4	215.64	0.5	10.2	204.115	30.08	204.384	193.165
4/18/2016	3:54:08 PM :	94	108	109	260	115	0.499	6.5	216.277	0.5	10.5	204.577	30.08	204.979	193.595
4/18/2016	3:55:08 PM :	94	108	109	262	115	0.501	6.3	216.914	0.5	10.5	205.073	30.08	205.575	194.057
4/18/2016	3:56:08 PM :	94	107	109	259	115	0.5	6.3	217.451	0.5	10.3	205.683	30.08	206.077	194.626
4/18/2016	3:57:08 PM :	94	107	109	254	114	0.5	6.3	217.943	0.5	10.2	206.327	30.08	206.537	195.227
4/18/2016	3:58:08 PM :	94	107	109	254	114	0.499	6.3	218.471	0.5	10.2	206.844	30.08	207.031	195.709
4/18/2016	3:59:08 PM :	95	107	109	259	114	0.499	6.2	219.079	0.5	10.2	207.301	30.08	207.6	196.136
4/18/2016	4:00:08 PM :	95	107	109	262	114	0.5	6.3	219.744	0.5	10.3	207.806	30.08	208.223	196.607
4/18/2016	4:01:08 PM :	95	107	109	259	114	0.5	6.4	220.26	0.499	10.6	208.425	30.07	208.705	197.184
4/18/2016	4:02:08 PM :	96	107	109	254	114	0.501	6.4	220.771	0.5	10.7	209.043	30.08	209.183	197.761
4/18/2016	4:03:08 PM :	95	107	109	254	114	0.5	6.2	221.289	0.5	10.6	209.551	30.08	209.668	198.235
4/18/2016	4:04:08 PM :	94	107	109	259	114	0.5	6.1	221.892	0.5	10.4	210.032	30.08	210.232	198.684
4/18/2016	4:05:08 PM :	94	107	108	262	114	0.5	6.2	222.546	0.5	10.5	210.57	30.08	210.844	199.186
4/18/2016	4:06:08 PM :	95	107	108	259	114	0.5	6.2	223.078	0.5	10.5	211.121	30.07	211.342	199.701
4/18/2016	4:07:08 PM :	95	107	108	254	114	0.5	6.2	223.594	0.499	10.5	211.735	30.07	211.825	200.274
4/18/2016	4:08:08 PM :	95	107	108	254	114	0.5	6.3	224.124	0.5	10.7	212.281	30.07	212.321	200.784
4/18/2016	4:09:08 PM :	94	107	108	259	114	0.5	6.3	224.742	0.5	10.6	212.788	30.08	212.899	201.257
4/18/2016	4:10:08 PM :	95	107	108	261	114	0.499	6.3	225.342	0.5	10.6	213.303	30.08	213.462	201.739
4/18/2016	4:11:08 PM :	95	107	108	258	113	0.501	6.5	225.901	0.5	11	213.835	30.07	213.985	202.235
4/18/2016	4:12:08 PM :	95	107	108	254	113	0.5	6.6	226.409	0.499	11.2	214.419	30.07	214.46	202.78
4/18/2016	4:13:08 PM :	95	107	108	255	113	0.499	6.7	226.976	0.499	11.6	215.005	30.07	214.991	203.328
4/18/2016	4:14:08 PM :	95	107	108	260	113	0.501	6.9	227.572	0.5	11.9	215.552	30.07	215.55	203.84
4/18/2016	4:15:08 PM :	94	107	108	261	113	0.5	6.8	228.146	0.5	12	216.029	30.08	216.087	204.285
4/18/2016	4:16:08 PM :	94	106	108	258	113	0.5	6.8	228.704	0.499	12	216.516	30.08	216.609	204.741
4/18/2016	4:17:08 PM :	94	106	108	253	112	0.5	6.9	229.226	0.5	12.2	217.116	30.07	217.099	205.301
4/18/2016	4:18:08 PM :	95	106	108	255	112	0.499	7	229.806	0.499	12.5	217.764	30.07	217.642	205.907

4/18/2016	4:19:08 PM :	94	106	108	260	112	0.5	7.1	230.408	0.502	12.6	218.276	30.07	218.206	206.386
4/18/2016	4:20:08 PM :	93	106	108	261	112	0.5	6.4	230.98	0.502	11.6	218.753	30.07	218.742	206.831
4/18/2016	4:21:08 PM :	93	106	108	258	112	0.499	6.7	231.499	0.499	11.7	219.242	30.07	219.229	207.288
4/18/2016	4:22:08 PM :	97	106	107	253	112	0.499	7.2	232.051	0.497	12.6	219.838	30.08	219.746	207.846
4/18/2016	4:23:08 PM :	101	106	107	255	112	0.5	8.4	232.632	0.489	14.3	220.473	30.08	220.291	208.439
4/18/2016	4:24:08 PM :	96	106	107	261	112	0.501	7.8	233.26	0.506	14.1	220.994	30.08	220.879	208.928
4/18/2016	4:25:08 PM :	94	106	107	262	112	0.5	7.5	233.802	0.502	13.1	221.454	30.08	221.387	209.358
4/18/2016	4:26:08 PM :	93	106	107	259	112	0.501	7.4	234.3	0.501	12.5	221.956	30.08	221.855	209.827
4/18/2016	4:27:08 PM :	92	106	107	254	111	0.499	7.6	234.865	0.5	12.2	222.588	30.07	222.385	210.418
4/18/2016	4:28:08 PM :	91	106	107	254	111	0.501	7.6	235.463	0.5	12.1	223.206	30.08	222.946	210.997
4/18/2016	4:29:08 PM :	91	106	107	260	111	0.5	7.6	236.095	0.5	12.1	223.712	30.08	223.538	211.471
4/18/2016	4:30:08 PM :	90	105	107	262	111	0.5	7.1	236.625	0.5	11.9	224.195	30.08	224.036	211.923
4/18/2016	4:31:08 PM :	90	105	107	259	111	0.501	6.5	237.129	0.5	11.5	224.715	30.08	224.509	212.41
4/18/2016	4:32:08 PM :	89	105	107	254	110	0.5	6.1	237.665	0.5	11	225.286	30.08	225.013	212.945
4/18/2016	4:33:08 PM :	89	105	107	254	110	0.5	5.8	238.298	0.5	10.5	225.913	30.08	225.607	213.531
4/18/2016	4:34:08 PM :	89	105	106	259	110	0.5	5.6	238.923	0.5	10.2	226.442	30.08	226.195	214.028
4/18/2016	4:35:08 PM :	88	105	106	262	110	0.501	5.5	239.468	0.5	9.9	226.939	30.08	226.707	214.493
4/18/2016	4:36:08 PM :	88	105	106	259	110	0.5	5.5	239.951	0.5	9.8	227.472	30.08	227.161	214.993
4/18/2016	4:37:08 PM :	88	105	106	254	110	0.5	5.4	240.469	0.5	9.7	228.01	30.08	227.648	215.497
4/18/2016	4:38:08 PM :	88	104	106	254	109	0.5	5.3	241.124	0.5	9.6	228.599	30.08	228.263	216.05
4/18/2016	4:39:08 PM :	88	104	106	259	109	0.499	5.3	241.748	0.5	9.5	229.169	30.07	228.851	216.585
4/18/2016	4:40:08 PM :	88	104	106	261	109	0.5	5.3	242.291	0.499	9.4	229.709	30.08	229.362	217.091
4/18/2016	4:41:08 PM :	88	104	106	259	109	0.5	5.3	242.772	0.5	9.4	230.196	30.07	229.814	217.548
4/18/2016	4:42:08 PM :	87	104	106	254	109	0.5	5.4	243.306	0.5	9.5	230.707	30.07	230.316	218.027
4/18/2016	4:43:08 PM :	88	104	105	254	109	0.498	5.6	243.932	0.499	9.6	231.309	30.07	230.905	218.592
4/18/2016	4:44:08 PM :	92	104	105	259	109	0.492	8.2	244.577	0.479	12.1	231.906	30.07	231.512	219.152
4/18/2016	4:45:08 PM :	93	104	105	262	109	0.5	9.4	245.104	0.467	14.7	232.38	30.07	232.008	219.598
4/18/2016	4:46:08 PM :	93	104	105	259	108	0.499	9.8	245.603	0.472	16.1	232.8	30.07	232.478	219.992
4/18/2016	4:47:08 PM :	93	103	105	254	108	0.5	10.1	246.131	0.473	17	233.262	30.07	232.976	220.426
4/18/2016	4:48:08 PM :	93	103	105	254	108	0.5	10.2	246.736	0.47	17.6	233.852	30.07	233.545	220.98
4/18/2016	4:49:08 PM :	92	103	105	259	108	0.499	10.2	247.396	0.471	18	234.421	30.07	234.167	221.515
4/18/2016	4:50:08 PM :	92	103	105	262	108	0.5	10.3	247.92	0.467	18.3	234.898	30.07	234.661	221.963
4/18/2016	4:51:08 PM :	92	103	104	260	108	0.5	10.3	248.434	0.467	18.5	235.375	30.07	235.146	222.412
4/18/2016	4:52:08 PM :	92	103	104	254	108	0.5	10.2	248.958	0.46	18.8	235.82	30.07	235.64	222.831
4/18/2016	4:53:08 PM :	92	103	104	254	108	0.5	10.1	249.569	0.449	19.1	236.238	30.07	236.217	223.224
4/18/2016	4:54:08 PM :	92	103	104	259	108	0.499	10.1	250.196	0.443	19.3	236.778	30.07	236.808	223.732
4/18/2016	4:55:08 PM :	92	103	104	262	108	0.5	10.1	250.739	0.442	19.4	237.346	30.08	237.32	224.266
4/18/2016	4:56:08 PM :	91	102	104	260	108	0.5	10.1	251.257	0.443	19.5	237.774	30.08	237.809	224.669
4/18/2016	4:57:08 PM :	91	102	104	255	108	0.499	10.3	251.802	0.427	19.6	238.207	30.07	238.323	225.076
4/18/2016	4:58:08 PM :	91	102	104	254	108	0.501	10.6	252.412	0.407	19.7	238.613	30.07	238.9	225.459
4/18/2016	4:59:08 PM :	91	102	104	259	108	0.5	10.7	252.995	0.395	19.7	238.974	30.07	239.45	225.799
4/18/2016	5:00:08 PM :	91	102	104	262	108	0.5	10.6	253.557	0.401	19.7	239.475	30.07	239.981	226.27
4/18/2016	5:01:08 PM :	91	102	103	260	107	0.5	10.5	254.071	0.382	19.8	239.916	30.07	240.466	226.686
4/18/2016	5:02:08 PM :	91	102	103	255	108	0.499	10.6	254.641	0.365	19.9	240.376	30.08	241.005	227.119
4/18/2016	5:03:08 PM :	91	102	103	254	107	0.5	10.9	255.241	0.343	20	240.719	30.08	241.571	227.443
4/18/2016	5:04:08 PM :	91	102	103	259	108	0.499	11	255.814	0.326	20	241.043	30.08	242.113	227.748
4/18/2016	5:05:08 PM :	92	102	103	262	108	0.5	11	256.355	0.339	20	241.388	30.08	242.625	228.074
4/18/2016	5:06:08 PM :	93	102	103	260	107	0.499	10.9	256.888	0.323	20	241.7	30.08	243.128	228.368
4/18/2016	5:07:08 PM :	93	102	103	255	108	0.499	11.1	257.472	0.306	20.1	242.071	30.08	243.68	228.717
4/18/2016	5:08:08 PM :	93	102	103	254	108	0.5	11.5	258.088	0.319	20.3	242.446	30.08	244.262	229.07
4/18/2016	5:09:08 PM :	93	101	103	259	108	0.5	11.7	258.644	0.321	20.4	242.86	30.08	244.788	229.46
4/18/2016	5:10:08 PM :	91	101	103	262	107	0.509	11.2	259.153	0.348	20	243.241	30.07	245.27	229.82
4/18/2016	5:11:08 PM :	90	101	103	260	107	0.509	8.8	259.727	0.482	19.1	243.745	30.07	245.812	230.296
4/18/2016	5:12:08 PM :	90	101	103	255	107	0.501	7.5	260.318	0.53	18.3	244.267	30.07	246.371	230.788
4/18/2016	5:13:08 PM :	91	101	103	254	107	0.499	7	260.951	0.545	17.6	244.836	30.07	246.97	231.325
4/18/2016	5:14:08 PM :	93	101	103	259	107	0.497	8.3	261.479	0.493	18.7	245.421	30.07	247.469	231.876
4/18/2016	5:15:08 PM :	94	101	103	262	107	0.5	9.1	261.98	0.421	19.5	245.972	30.07	247.943	232.396
4/18/2016	5:16:08 PM :	95	101	103	260	107	0.5	9.2	262.525	0.381	19.7	246.324	30.07	248.459	232.728
4/18/2016	5:17:08 PM :	95	101	103	255	107	0.501	9.3	263.152	0.374	19.8	246.696	30.07	249.052	233.079
4/18/2016	5:18:08 PM :	95	101	103	254	107	0.499	9.1	263.78	0.365	19.8	247.065	30.07	249.645	233.427
4/18/2016	5:19:08 PM :	97	101	103	259	107	0.499	9.2	264.314	0.335	20	247.379	30.07	250.15	233.723
4/18/2016	5:20:08 PM :	98	101	102	263	107	0.5	9.4	264.805	0.317	20	247.789	30.07	250.615	234.11
4/18/2016	5:21:08 PM :	99	101	102	261	107	0.5	9.6	265.327	0.305	20.1	248.135	30.07	251.109	234.436
4/18/2016	5:22:08 PM :	98	101	102	256	107	0.498	10.1	265.983	0.319	20.4	248.574	30.07	251.73	234.851
4/18/2016	5:23:08 PM :	95	101	102	254	107	0.509	9.7	266.609	0.35	20.1	248.924	30.07	252.323	235.181
4/18/2016	5:24:08 PM :	93	101	102	258	107	0.503	7.4	267.152	0.488	19	249.454	30.08	252.837	235.681
4/18/2016	5:25:08 PM :	91	101	102	263	107	0.501	6.1	267.632	0.53	18.3	249.958	30.08	253.291	236.157
4/18/2016	5:26:08 PM :	95	101	102	262	107	0.48	7.3	268.136	0.457	18.9	250.397	30.08	253.769	236.572
4/18/2016	5:27:08 PM :	98	101	102	258	107	0.486	10.8	268.779	0.284	20.7	250.764	30.08	254.378	236.919
4/18/2016	5:28:08 PM :	98	101	102	254	107	0.498	11.9	269.409	0.234	21	251	30.08	254.974	237.142
4/18/2016	5:29:08 PM :	97	101	102	256	107	0.499	12.4	269.944	0.223	21.1	251.3	30.08	255.48	237.425

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     4/18/2016      5:30:08 PM  :                    96        101        102        262        107        0.501        12.5      270.428       0.225       21.1     251.583      30.08     255.938      237.692
     4/18/2016      5:30:09 PM  :                    96        101        102        262        107        0.501        12.5      270.441       0.225       21.1     251.587      30.08     255.951      237.695
'
'------------------------ LOGGED EVENTS --------------------------------
04/18/16 9:06:10 AM: Test START
04/18/16 11:24:05 AM: Return from power failure
04/18/16 11:29:30 AM: Test Paused by User
04/18/16 11:29:30 AM: PAUSE_EVENT [Manual Pause]
04/18/16 11:40:56 AM: TestResumed
04/18/16 3:17:20 PM: Return from power failure
04/18/16 3:18:45 PM: Alarm Chg     92    209     46    238    109    111    211    113  0.500    3.8   196.968  0.498    3.6   185.926    -  30.10   186.955   176.224    -    -   500   48.2   48.6   98.2   100.4 {---- ---- ---- -N--}
04/18/16 3:18:45 PM: Alarm Chg     92    209     46    238    109    111    211    113  0.500    3.8   196.970  0.498    3.6   185.926    -  30.10   186.957   176.224    -    -   500   48.2   48.6   98.2   100.4 {---- ---- ---L MN--}
04/18/16 3:19:52 PM: Alarm Chg     93    225     43    252    110    111    227    113  0.496    4.9   197.682  0.498    6.7   186.650    -  30.10   187.621   176.898    -    -   500   49.0   50.6   99.6   99.4 {---- ---- ---- MN--}
04/18/16 3:19:59 PM: Alarm Chg     93    227     43    253    110    111    230    113  0.503    4.9   197.721  0.500    6.8   186.697    -  30.10   187.657   176.941    -    -   500   49.0   50.6   99.6   99.4 {---- ---- ---- -N--}
04/18/16 3:21:32 PM: Return from power failure
04/18/16 3:22:57 PM: Alarm Chg     94    265     40    267    110    111    267    114  0.498    4.2   199.033  0.499    5.8   187.969    -  30.10   188.880   178.124    -    -   500   49.4   50.2   97.6   99.2 {---- ---- ---- -N--}
04/18/16 3:23:58 PM: Return from power failure
04/18/16 3:25:09 PM: New Test Duration:  0d   0h   0m
04/18/16 3:26:34 PM: Alarm Chg     95    251     39    275    109    111    252    114  0.502    4.2   200.773  0.499    5.6   189.619    -  30.10   190.501   179.659    -    -   500   49.8   50.6   96.6   99.6 {---- ---- ---- -N--}
04/18/16 3:27:12 PM: Alarm Clr     95    253     38    276    109    111    254    114  0.498    4.2   201.088  0.500    5.8   189.977    -  30.10   190.795   179.992    -    -   500   50.2   51.0  100.0   99.8 [-------------------]
04/18/16 4:22:44 PM: Alarm Chg    102    255     32    287    106    107    255    112  0.501    8.6   232.352  0.485   14.6   220.222    -  30.08   220.028   208.204    -    -   500   52.9   58.4   99.8   99.4 {---- ---- -J-- ----}
04/18/16 4:23:52 PM: Alarm Clr     96    261     32    287    106    107    262    112  0.499    7.6   233.057  0.509   13.8   220.826    -  30.08   220.689   208.770    -    -   500   52.2   57.6  100.0   97.8 [-------------------]
04/18/16 4:44:38 PM: Alarm Chg     93    261     32    284    104    105    262    109  0.503    9.4   244.813  0.466   14.7   232.117    -  30.07   231.734   219.351    -    -   500   52.9   57.3   98.4   95.8 {---- ---- -J-- ----}
04/18/16 5:30:09 PM: Actual Sampling Time: 0d  8h  0m  0s
04/18/16 5:30:09 PM: Test END
04/18/16 6:01:18 PM: PAUSE_EVENT -
04/19/16 8:00:25 AM: New Trap Temperature: set to = 250F
04/18/16  17:43:09: Sample A: POST-Leak Test PASSED at maximum observed vacuum at 12.6 inHg
04/18/16  17:43:09: Maximum Observed Vacuum for A was 12.6 inHg
04/18/16  17:43:09: Sample B: POST-Leak Test PASSED at maximum observed vacuum at 21.1 inHg
04/18/16  17:43:09: Maximum Observed Vacuum for B was 21.1 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'----------------------- END OF ALARM LEDGENDS ----------------------------

'--------------------------- CONSOLE INFO --------------------------------
'          Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'          DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 2 Day.pro
File Exported: 4/30/2016 12:24:11 AM (PC Time).
Company Name: Cuba

04/19/16 08:03:41: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 13 ccm (Max. allowed 20 ccm)
04/19/16 08:03:41: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 15 ccm (Max. allowed 20 ccm)
Trap ID-A: OL343528
Trap ID-B: OL335386

Run D2

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 27m
Averaging Period : 1 min.

			Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (I Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (I Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			108.9	104.2	105	257.8	112.6	0.499	3.8	271.204	0.499	2.2	261.832	30.12	255.628	246.454
4/19/2016	8:05:56 AM	:	77	81	82	260	89	0	0.2	0	0	0	0	30.17	0	0
4/19/2016	8:06:06 AM	:User Paus	77	81	82	260	89	0.566	1.8	0.171	0.546	1.4	0.147	30.16	0.168	0.145
4/19/2016	8:32:53 AM	:Resumed	80	85	84	254	93	0	0.2	0.173	0	0	0.147	30.17	0.17	0.145
4/19/2016	8:33:52 AM	:	79	84	84	256	92	0.564	1.7	0.756	0.551	1.4	0.795	30.17	0.74	0.779
4/19/2016	8:34:52 AM	:	79	84	84	260	93	0.5	2.1	1.307	0.5	1.8	1.287	30.17	1.279	1.261
4/19/2016	8:35:52 AM	:	79	84	84	260	93	0.5	2.1	1.806	0.5	1.8	1.752	30.17	1.768	1.716
4/19/2016	8:36:52 AM	:	80	84	84	256	93	0.5	2.1	2.368	0.5	1.8	2.241	30.18	2.319	2.194
4/19/2016	8:37:52 AM	:	80	85	84	253	93	0.5	2.1	2.961	0.5	1.8	2.846	30.17	2.898	2.786
4/19/2016	8:38:52 AM	:	80	85	85	256	94	0.5	2.1	3.533	0.5	1.8	3.469	30.17	3.457	3.395
4/19/2016	8:39:52 AM	:	80	85	85	261	94	0.5	2.1	4.088	0.5	1.8	3.965	30.17	4	3.879
4/19/2016	8:40:52 AM	:	80	85	85	260	94	0.5	2.1	4.598	0.5	1.8	4.415	30.17	4.498	4.319
4/19/2016	8:41:52 AM	:	80	85	85	255	95	0.5	2.1	5.175	0.499	1.8	4.918	30.17	5.062	4.811
4/19/2016	8:42:52 AM	:	80	86	86	252	95	0.501	2.1	5.774	0.5	1.8	5.509	30.17	5.646	5.387
4/19/2016	8:43:52 AM	:	81	86	86	255	95	0.5	2.1	6.335	0.5	1.8	6.117	30.17	6.194	5.98
4/19/2016	8:44:52 AM	:	81	86	86	260	96	0.501	2.1	6.876	0.5	1.8	6.619	30.17	6.721	6.47
4/19/2016	8:45:52 AM	:	82	86	86	260	96	0.5	2.1	7.406	0.5	1.8	7.111	30.17	7.238	6.949
4/19/2016	8:46:52 AM	:	82	86	87	255	96	0.5	2.1	7.996	0.499	1.8	7.62	30.17	7.814	7.444
4/19/2016	8:47:52 AM	:	82	87	87	253	97	0.499	2.1	8.594	0.5	1.8	8.146	30.17	8.396	7.956
4/19/2016	8:48:52 AM	:	82	87	87	256	97	0.501	2.1	9.158	0.5	1.8	8.729	30.17	8.945	8.524
4/19/2016	8:49:52 AM	:	83	87	87	261	97	0.5	2.1	9.666	0.5	1.8	9.314	30.17	9.44	9.092
4/19/2016	8:50:52 AM	:	84	87	88	260	98	0.501	2.1	10.222	0.499	1.8	9.829	30.17	9.981	9.593
4/19/2016	8:51:52 AM	:	86	87	88	255	98	0.5	2.1	10.808	0.5	1.8	10.299	30.17	10.551	10.05
4/19/2016	8:52:52 AM	:	86	88	88	253	98	0.501	2.1	11.443	0.5	1.8	10.778	30.17	11.169	10.515
4/19/2016	8:53:52 AM	:	87	88	88	256	99	0.5	2.1	11.966	0.499	1.8	11.378	30.17	11.677	11.098
4/19/2016	8:54:52 AM	:	88	88	88	261	99	0.5	2.1	12.459	0.5	1.8	12.03	30.17	12.155	11.73
4/19/2016	8:55:52 AM	:	89	88	89	260	100	0.5	2.1	13.024	0.5	1.8	12.518	30.17	12.705	12.204
4/19/2016	8:56:52 AM	:	90	89	89	255	101	0.499	2.1	13.623	0.5	1.8	12.964	30.17	13.285	12.637
4/19/2016	8:57:52 AM	:	90	89	89	252	101	0.5	2.1	14.25	0.5	1.8	13.472	30.17	13.894	13.128
4/19/2016	8:58:52 AM	:	90	89	89	256	101	0.499	2.1	14.774	0.5	1.8	14.092	30.17	14.402	13.729
4/19/2016	8:59:52 AM	:	90	90	90	261	102	0.499	2.1	15.267	0.5	1.8	14.704	30.17	14.879	14.322
4/19/2016	9:00:52 AM	:	89	90	91	260	102	0.501	2.1	15.814	0.5	1.8	15.197	30.17	15.409	14.799
4/19/2016	9:01:52 AM	:	88	90	91	255	103	0.5	2.1	16.438	0.5	1.8	15.68	30.17	16.012	15.266
4/19/2016	9:02:52 AM	:	87	90	91	253	103	0.5	2.1	17.067	0.5	1.8	16.196	30.17	16.621	15.764

4/19/2016	9:03:52 AM :	88	91	92	255	103	0.5	2.1	17.589	0.5	1.8	16.757	30.17	17.125	16.306
4/19/2016	9:04:52 AM :	88	91	92	260	104	0.5	2.1	18.082	0.499	1.8	17.369	30.17	17.602	16.896
4/19/2016	9:05:52 AM :	88	91	92	260	104	0.5	2.1	18.606	0.5	1.8	17.9	30.17	18.107	17.408
4/19/2016	9:06:52 AM :	88	92	92	255	105	0.499	2.1	19.259	0.499	1.8	18.4	30.17	18.737	17.891
4/19/2016	9:07:52 AM :	88	92	93	253	105	0.5	2.1	19.875	0.5	1.8	18.902	30.17	19.331	18.374
4/19/2016	9:08:52 AM :	88	93	93	256	105	0.499	2.1	20.414	0.5	1.8	19.434	30.17	19.85	18.886
4/19/2016	9:09:52 AM :	88	93	93	260	106	0.5	2.1	20.886	0.5	1.8	20.023	30.17	20.305	19.453
4/19/2016	9:10:52 AM :	86	93	94	259	106	0.5	2.1	21.404	0.5	1.8	20.605	30.17	20.804	20.013
4/19/2016	9:11:52 AM :	87	94	94	254	106	0.5	2.1	22.061	0.5	1.8	21.135	30.17	21.435	20.522
4/19/2016	9:12:52 AM :	87	94	94	253	106	0.5	2.1	22.686	0.5	1.8	21.612	30.17	22.036	20.98
4/19/2016	9:13:52 AM :	87	94	95	257	107	0.499	2.1	23.22	0.5	1.8	22.095	30.17	22.549	21.444
4/19/2016	9:14:52 AM :	88	95	95	261	107	0.5	2.1	23.696	0.5	1.8	22.701	30.17	23.006	22.026
4/19/2016	9:15:52 AM :	89	95	95	260	107	0.499	2.1	24.225	0.5	1.8	23.355	30.17	23.514	22.652
4/19/2016	9:16:52 AM :	88	95	95	255	108	0.5	2.1	24.858	0.5	1.8	23.845	30.17	24.121	23.122
4/19/2016	9:17:52 AM :	89	95	96	253	108	0.499	2.1	25.498	0.5	1.8	24.298	30.17	24.734	23.557
4/19/2016	9:18:52 AM :	90	96	96	257	108	0.5	2.1	26.026	0.5	1.8	24.807	30.17	25.24	24.043
4/19/2016	9:19:52 AM :	90	96	96	261	108	0.5	2.1	26.517	0.5	1.8	25.423	30.17	25.71	24.633
4/19/2016	9:20:52 AM :	90	96	97	259	109	0.499	2.1	27.043	0.5	1.8	26.045	30.17	26.214	25.228
4/19/2016	9:21:52 AM :	89	97	97	254	109	0.5	2.1	27.654	0.5	1.8	26.552	30.16	26.798	25.712
4/19/2016	9:22:52 AM :	89	97	97	253	109	0.499	2.1	28.313	0.5	1.8	27.011	30.17	27.428	26.151
4/19/2016	9:23:52 AM :	88	97	97	256	109	0.5	2.1	28.827	0.499	1.8	27.521	30.16	27.918	26.637
4/19/2016	9:24:52 AM :	88	97	98	261	110	0.5	2.1	29.338	0.5	1.8	28.126	30.17	28.407	27.215
4/19/2016	9:25:52 AM :	89	98	98	259	110	0.5	2.1	29.858	0.5	1.8	28.746	30.16	28.903	27.806
4/19/2016	9:26:52 AM :	89	98	98	254	110	0.499	2.1	30.464	0.5	1.8	29.252	30.17	29.482	28.289
4/19/2016	9:27:52 AM :	89	98	98	253	110	0.499	2.1	31.111	0.499	1.8	29.738	30.17	30.098	28.753
4/19/2016	9:28:52 AM :	89	98	99	257	110	0.5	2.1	31.637	0.5	1.8	30.28	30.17	30.599	29.269
4/19/2016	9:29:52 AM :	89	99	99	261	111	0.499	2.1	32.147	0.5	1.8	30.816	30.18	31.085	29.779
4/19/2016	9:30:52 AM :	89	99	99	259	111	0.5	2.1	32.681	0.499	1.8	31.407	30.17	31.594	30.341
4/19/2016	9:31:52 AM :	90	99	99	254	111	0.5	2.1	33.296	0.5	1.8	31.977	30.18	32.18	30.884
4/19/2016	9:32:52 AM :	90	99	100	253	111	0.5	2.1	33.899	0.5	1.8	32.492	30.17	32.753	31.373
4/19/2016	9:33:52 AM :	90	100	100	257	111	0.5	2.1	34.448	0.5	1.8	32.983	30.17	33.275	31.84
4/19/2016	9:34:52 AM :	90	100	101	261	111	0.499	2.1	34.957	0.5	1.8	33.494	30.17	33.759	32.326
4/19/2016	9:35:52 AM :	90	100	101	259	111	0.5	2.1	35.52	0.5	1.8	34.103	30.17	34.295	32.905
4/19/2016	9:36:52 AM :	89	101	101	254	111	0.5	2.1	36.118	0.5	1.8	34.705	30.17	34.862	33.476
4/19/2016	9:37:52 AM :	90	101	101	253	112	0.5	2.1	36.695	0.5	1.8	35.229	30.17	35.41	33.973
4/19/2016	9:38:52 AM :	90	101	102	258	112	0.499	2.1	37.251	0.5	1.8	35.704	30.17	35.939	34.423
4/19/2016	9:39:52 AM :	89	101	102	261	112	0.501	2.1	37.763	0.5	1.8	36.187	30.17	36.424	34.881
4/19/2016	9:40:52 AM :	90	102	102	259	112	0.5	2.1	38.339	0.5	1.8	36.794	30.17	36.97	35.457
4/19/2016	9:41:52 AM :	91	102	102	254	112	0.5	2.1	38.937	0.5	1.8	37.457	30.17	37.537	36.084
4/19/2016	9:42:52 AM :	91	102	102	253	112	0.5	2.1	39.503	0.5	1.8	37.951	30.17	38.073	36.552
4/19/2016	9:43:52 AM :	92	102	102	258	112	0.5	2.1	40.043	0.5	1.8	38.403	30.17	38.586	36.98
4/19/2016	9:44:52 AM :	91	102	103	261	112	0.5	2.1	40.577	0.5	1.8	38.901	30.17	39.091	37.452
4/19/2016	9:45:52 AM :	91	102	103	259	112	0.5	2.1	41.162	0.5	1.8	39.529	30.17	39.645	38.046
4/19/2016	9:46:52 AM :	91	103	103	254	112	0.499	2.1	41.764	0.5	1.8	40.151	30.17	40.214	38.635
4/19/2016	9:47:52 AM :	91	103	103	254	112	0.5	2.1	42.323	0.5	1.8	40.66	30.17	40.744	39.116
4/19/2016	9:48:52 AM :	91	103	103	258	112	0.5	2.1	42.832	0.499	1.8	41.129	30.17	41.226	39.559
4/19/2016	9:49:52 AM :	90	103	103	261	112	0.5	2.1	43.396	0.499	1.8	41.641	30.17	41.759	40.044
4/19/2016	9:50:52 AM :	90	103	103	259	112	0.5	2.1	43.978	0.5	1.8	42.232	30.17	42.309	40.602
4/19/2016	9:51:52 AM :	91	103	104	254	112	0.5	2.1	44.607	0.5	1.8	42.853	30.17	42.904	41.189
4/19/2016	9:52:52 AM :	90	103	104	254	112	0.5	2.1	45.14	0.5	1.8	43.368	30.17	43.408	41.675
4/19/2016	9:53:52 AM :	89	104	104	258	112	0.501	2.1	45.633	0.5	1.8	43.859	30.17	43.873	42.139

4/19/2016	9:54:52 AM :	89	104	104	260	112	0.5	2.1	46.2	0.5	1.8	44.396	30.17	44.409	42.646
4/19/2016	9:55:52 AM :	89	104	104	258	112	0.5	2.1	46.803	0.5	1.8	44.931	30.17	44.978	43.152
4/19/2016	9:56:52 AM :	89	104	104	253	112	0.5	2.1	47.432	0.499	1.8	45.524	30.17	45.572	43.712
4/19/2016	9:57:52 AM :	88	104	104	255	112	0.501	2.1	47.96	0.5	1.8	46.096	30.17	46.071	44.252
4/19/2016	9:58:52 AM :	89	104	104	259	112	0.501	2.1	48.46	0.5	1.8	46.623	30.17	46.543	44.75
4/19/2016	9:59:52 AM :	88	104	104	260	112	0.5	2.1	48.994	0.5	1.8	47.108	30.17	47.047	45.208
4/19/2016	10:00:52 AM :	87	104	104	256	112	0.499	2.1	49.631	0.5	1.8	47.615	30.16	47.649	45.685
4/19/2016	10:01:52 AM :	88	104	104	253	112	0.5	2.1	50.255	0.5	1.8	48.223	30.16	48.238	46.259
4/19/2016	10:02:52 AM :	88	104	104	255	112	0.5	2.1	50.798	0.5	1.8	48.831	30.16	48.75	46.832
4/19/2016	10:03:52 AM :	88	104	104	260	112	0.5	2.1	51.278	0.5	1.8	49.355	30.16	49.203	47.327
4/19/2016	10:04:52 AM :	88	104	104	260	112	0.5	2.1	51.798	0.5	1.8	49.831	30.16	49.693	47.776
4/19/2016	10:05:52 AM :	89	104	104	256	112	0.5	2.1	52.454	0.5	1.8	50.318	30.16	50.312	48.236
4/19/2016	10:06:52 AM :	88	104	104	253	112	0.5	2.1	53.078	0.499	1.8	50.921	30.16	50.901	48.805
4/19/2016	10:07:52 AM :	88	104	104	255	112	0.5	2.1	53.615	0.5	1.8	51.588	30.16	51.407	49.434
4/19/2016	10:08:52 AM :	88	104	104	260	112	0.499	2.1	54.097	0.5	1.8	52.087	30.16	51.862	49.904
4/19/2016	10:09:52 AM :	91	104	104	260	112	0.5	2.1	54.628	0.5	1.8	52.538	30.16	52.363	50.33
4/19/2016	10:10:52 AM :	92	105	104	256	112	0.501	2.1	55.257	0.5	1.8	53.042	30.16	52.956	50.806
4/19/2016	10:11:52 AM :	99	105	105	253	112	0.5	2.1	55.908	0.5	1.8	53.669	30.16	53.57	51.396
4/19/2016	10:12:52 AM :	94	105	105	255	112	0.501	2.1	56.435	0.5	1.8	54.296	30.16	54.066	51.987
4/19/2016	10:13:52 AM :	91	105	105	260	113	0.499	2.1	56.941	0.5	1.8	54.811	30.16	54.542	52.472
4/19/2016	10:14:52 AM :	92	105	105	260	113	0.501	2.1	57.463	0.5	1.8	55.273	30.16	55.034	52.908
4/19/2016	10:15:52 AM :	91	105	105	256	113	0.5	2.1	58.067	0.5	1.8	55.782	30.16	55.604	53.387
4/19/2016	10:16:52 AM :	91	105	105	253	113	0.5	2.1	58.727	0.5	1.8	56.387	30.16	56.226	53.958
4/19/2016	10:17:52 AM :	91	105	105	255	113	0.5	2.1	59.249	0.5	1.8	57.016	30.16	56.718	54.551
4/19/2016	10:18:52 AM :	90	105	105	260	113	0.501	2.1	59.765	0.5	1.8	57.52	30.16	57.204	55.026
4/19/2016	10:19:52 AM :	90	105	105	261	113	0.5	2.1	60.291	0.5	1.8	58.009	30.16	57.699	55.487
4/19/2016	10:20:52 AM :	90	105	105	256	113	0.5	2.1	60.909	0.5	1.8	58.549	30.16	58.281	55.996
4/19/2016	10:21:52 AM :	91	105	105	253	113	0.5	2.1	61.527	0.5	1.8	59.092	30.16	58.863	56.507
4/19/2016	10:22:52 AM :	93	105	105	255	113	0.5	2.1	62.074	0.5	1.8	59.699	30.16	59.378	57.079
4/19/2016	10:23:52 AM :	94	105	105	260	113	0.5	2.1	62.588	0.5	1.8	60.262	30.16	59.862	57.608
4/19/2016	10:24:52 AM :	95	105	105	261	113	0.5	2.1	63.145	0.5	1.8	60.77	30.16	60.386	58.087
4/19/2016	10:25:52 AM :	94	105	105	257	113	0.5	2.1	63.752	0.5	1.8	61.274	30.16	60.957	58.562
4/19/2016	10:26:52 AM :	93	105	105	253	113	0.5	2.1	64.33	0.499	1.8	61.802	30.16	61.502	59.059
4/19/2016	10:27:52 AM :	93	105	105	254	113	0.499	2.1	64.891	0.499	1.8	62.397	30.16	62.03	59.619
4/19/2016	10:28:52 AM :	93	105	105	259	113	0.5	2.1	65.405	0.5	1.8	62.988	30.16	62.514	60.175
4/19/2016	10:29:52 AM :	96	105	105	260	113	0.5	2.1	65.985	0.5	1.8	63.528	30.16	63.06	60.683
4/19/2016	10:30:52 AM :	96	105	105	256	113	0.499	2.1	66.587	0.5	1.8	64.009	30.16	63.627	61.136
4/19/2016	10:31:52 AM :	96	105	105	253	114	0.5	2.1	67.159	0.5	1.8	64.495	30.15	64.165	61.594
4/19/2016	10:32:52 AM :	96	106	106	255	114	0.501	2.1	67.687	0.5	1.8	65.096	30.15	64.662	62.159
4/19/2016	10:33:52 AM :	96	106	106	260	114	0.498	2.1	68.234	0.5	1.8	65.751	30.15	65.176	62.776
4/19/2016	10:34:52 AM :	97	106	106	260	114	0.5	2.1	68.819	0.5	1.8	66.258	30.15	65.727	63.252
4/19/2016	10:35:52 AM :	97	106	106	256	114	0.5	2.1	69.437	0.5	1.8	66.724	30.15	66.308	63.691
4/19/2016	10:36:52 AM :	96	106	106	253	114	0.501	2.1	69.988	0.5	1.8	67.221	30.15	66.826	64.158
4/19/2016	10:37:52 AM :	96	106	106	255	114	0.501	2.1	70.489	0.5	1.8	67.828	30.15	67.297	64.729
4/19/2016	10:38:52 AM :	96	106	106	260	114	0.5	2.1	71.057	0.5	1.8	68.476	30.15	67.831	65.339
4/19/2016	10:39:52 AM :	96	106	106	260	114	0.499	2.1	71.646	0.5	1.8	68.985	30.15	68.385	65.817
4/19/2016	10:40:52 AM :	96	106	106	256	114	0.5	2.1	72.281	0.499	1.8	69.44	30.15	68.982	66.245
4/19/2016	10:41:52 AM :	96	106	106	253	114	0.499	2.1	72.811	0.5	1.8	69.941	30.15	69.48	66.716
4/19/2016	10:42:52 AM :	96	106	106	255	114	0.5	2.1	73.31	0.5	1.8	70.569	30.15	69.95	67.307
4/19/2016	10:43:52 AM :	96	106	106	260	114	0.5	2.1	73.855	0.5	1.8	71.191	30.15	70.462	67.891
4/19/2016	10:44:52 AM :	96	106	106	261	114	0.5	2.1	74.484	0.5	1.8	71.696	30.15	71.054	68.365

4/19/2016	10:45:52 AM :	96	106	106	257	114	0.5	2.1	75.111	0.5	1.8	72.178	30.15	71.643	68.818
4/19/2016	10:46:52 AM :	96	106	106	253	114	0.5	2.1	75.647	0.5	1.8	72.7	30.15	72.147	69.309
4/19/2016	10:47:52 AM :	98	106	106	255	114	0.499	2.1	76.135	0.5	1.8	73.263	30.15	72.605	69.838
4/19/2016	10:48:52 AM :	102	106	106	260	114	0.5	2.1	76.657	0.5	1.8	73.885	30.15	73.095	70.422
4/19/2016	10:49:52 AM :	105	106	106	261	114	0.5	2.1	77.315	0.5	1.8	74.419	30.15	73.714	70.924
4/19/2016	10:50:52 AM :	147	106	106	259	114	0.5	2.2	77.936	0.5	1.8	74.92	30.15	74.298	71.395
4/19/2016	10:51:52 AM :	149	106	106	254	114	0.501	2.2	78.475	0.5	1.8	75.439	30.15	74.804	71.883
4/19/2016	10:52:52 AM :	126	106	106	254	114	0.5	2.2	78.957	0.5	1.8	75.979	30.15	75.257	72.39
4/19/2016	10:53:52 AM :	140	106	106	260	114	0.501	2.2	79.487	0.5	1.9	76.562	30.15	75.755	72.938
4/19/2016	10:54:52 AM :	129	106	106	261	114	0.5	2.2	80.122	0.5	1.9	77.141	30.15	76.351	73.481
4/19/2016	10:55:52 AM :	111	106	106	258	114	0.499	2.2	80.765	0.5	1.9	77.689	30.15	76.955	73.996
4/19/2016	10:56:52 AM :	104	106	106	253	113	0.5	2.2	81.295	0.5	1.9	78.165	30.15	77.453	74.444
4/19/2016	10:57:52 AM :	101	106	106	254	113	0.5	2.2	81.791	0.499	1.8	78.662	30.15	77.919	74.91
4/19/2016	10:58:52 AM :	103	106	106	260	113	0.5	2.2	82.321	0.5	1.8	79.27	30.15	78.417	75.482
4/19/2016	10:59:52 AM :	96	106	106	261	113	0.5	2.2	82.932	0.5	1.9	79.9	30.15	78.991	76.074
4/19/2016	11:00:52 AM :	94	106	106	258	113	0.501	2.2	83.594	0.5	1.9	80.413	30.15	79.614	76.555
4/19/2016	11:01:52 AM :	94	106	106	253	113	0.501	2.2	84.116	0.5	1.8	80.892	30.14	80.105	77.005
4/19/2016	11:02:52 AM :	95	106	106	254	112	0.5	2.2	84.63	0.5	1.8	81.38	30.14	80.588	77.464
4/19/2016	11:03:52 AM :	94	106	106	260	112	0.5	2.2	85.156	0.5	1.8	81.978	30.14	81.083	78.026
4/19/2016	11:04:52 AM :	94	106	106	261	112	0.5	2.2	85.771	0.5	1.8	82.643	30.15	81.661	78.651
4/19/2016	11:05:52 AM :	94	106	106	258	112	0.501	2.2	86.396	0.5	1.8	83.15	30.14	82.248	79.127
4/19/2016	11:06:52 AM :	93	106	106	253	112	0.501	2.2	86.939	0.5	1.8	83.599	30.14	82.759	79.549
4/19/2016	11:07:52 AM :	93	106	106	254	112	0.5	2.2	87.457	0.5	1.8	84.1	30.14	83.246	80.019
4/19/2016	11:08:52 AM :	94	106	106	259	112	0.501	2.2	88.013	0.5	1.8	84.734	30.14	83.769	80.615
4/19/2016	11:09:52 AM :	94	106	106	261	112	0.5	2.2	88.619	0.5	1.8	85.357	30.14	84.338	81.2
4/19/2016	11:10:52 AM :	94	106	106	258	112	0.5	2.2	89.199	0.5	1.8	85.866	30.14	84.883	81.678
4/19/2016	11:11:52 AM :	94	106	106	253	112	0.5	2.2	89.759	0.5	1.8	86.339	30.14	85.411	82.122
4/19/2016	11:12:52 AM :	94	106	106	254	112	0.501	2.2	90.277	0.5	1.8	86.851	30.14	85.898	82.603
4/19/2016	11:13:52 AM :	94	106	106	259	112	0.5	2.2	90.859	0.5	1.8	87.442	30.14	86.444	83.158
4/19/2016	11:14:52 AM :	93	106	106	260	112	0.5	2.2	91.46	0.5	1.8	88.068	30.14	87.009	83.747
4/19/2016	11:15:52 AM :	94	105	106	257	112	0.5	2.2	92.037	0.5	1.9	88.586	30.14	87.552	84.233
4/19/2016	11:16:52 AM :	94	105	106	253	112	0.5	2.2	92.561	0.5	1.8	89.075	30.14	88.046	84.692
4/19/2016	11:17:52 AM :	93	105	106	255	112	0.5	2.2	93.11	0.5	1.8	89.614	30.14	88.562	85.198
4/19/2016	11:18:52 AM :	93	105	106	259	112	0.499	2.2	93.695	0.5	1.8	90.154	30.14	89.112	85.705
4/19/2016	11:19:52 AM :	92	105	106	260	112	0.5	2.2	94.324	0.5	1.9	90.748	30.14	89.704	86.264
4/19/2016	11:20:52 AM :	92	105	106	256	112	0.499	2.2	94.864	0.5	1.9	91.318	30.14	90.212	86.799
4/19/2016	11:21:52 AM :	92	105	106	253	112	0.5	2.2	95.362	0.5	1.8	91.841	30.14	90.681	87.291
4/19/2016	11:22:52 AM :	93	105	106	255	112	0.5	2.2	95.931	0.499	1.8	92.338	30.14	91.216	87.758
4/19/2016	11:23:52 AM :	93	105	106	260	112	0.5	2.2	96.528	0.5	1.8	92.858	30.14	91.778	88.247
4/19/2016	11:24:52 AM :	93	105	106	260	112	0.5	2.2	97.159	0.5	1.9	93.454	30.14	92.372	88.807
4/19/2016	11:25:52 AM :	93	105	106	256	112	0.5	2.2	97.694	0.5	1.9	94.059	30.14	92.875	89.376
4/19/2016	11:26:52 AM :	93	105	106	253	112	0.5	2.2	98.197	0.5	1.8	94.595	30.14	93.348	89.88
4/19/2016	11:27:52 AM :	93	105	106	255	112	0.499	2.2	98.733	0.5	1.8	95.078	30.14	93.853	90.334
4/19/2016	11:28:52 AM :	93	105	106	260	112	0.5	2.2	99.371	0.499	1.8	95.558	30.14	94.453	90.785
4/19/2016	11:29:52 AM :	93	105	106	260	112	0.5	2.2	99.994	0.5	1.9	96.155	30.14	95.039	91.347
4/19/2016	11:30:52 AM :	92	105	106	256	112	0.5	2.2	100.541	0.5	1.9	96.826	30.14	95.554	91.978
4/19/2016	11:31:52 AM :	91	105	106	253	112	0.5	2.2	101.022	0.5	1.8	97.326	30.14	96.007	92.448
4/19/2016	11:32:52 AM :	91	105	106	255	112	0.5	2.2	101.542	0.5	1.8	97.79	30.14	96.496	92.884
4/19/2016	11:33:52 AM :	91	105	106	260	111	0.5	2.2	102.198	0.5	1.8	98.29	30.14	97.114	93.354
4/19/2016	11:34:52 AM :	91	105	106	260	111	0.5	2.2	102.826	0.499	1.9	98.9	30.14	97.705	93.928
4/19/2016	11:35:52 AM :	91	105	106	256	111	0.5	2.2	103.365	0.5	1.9	99.538	30.14	98.213	94.527

4/19/2016	11:36:52 AM :	91	105	106	253	111	0.5	2.2	103.851	0.5	1.9	100.054	30.14	98.67	95.013
4/19/2016	11:37:52 AM :	91	105	106	256	111	0.5	2.2	104.384	0.5	1.8	100.514	30.14	99.172	95.445
4/19/2016	11:38:52 AM :	91	105	106	260	111	0.5	2.2	105.006	0.5	1.9	101.016	30.14	99.758	95.917
4/19/2016	11:39:52 AM :	91	105	106	260	111	0.5	2.2	105.662	0.5	1.9	101.639	30.14	100.376	96.503
4/19/2016	11:40:52 AM :	91	105	106	255	111	0.5	2.2	106.184	0.5	1.9	102.262	30.14	100.868	97.088
4/19/2016	11:41:52 AM :	90	105	106	253	111	0.5	2.2	106.696	0.5	1.9	102.768	30.14	101.35	97.564
4/19/2016	11:42:52 AM :	90	105	106	256	111	0.5	2.2	107.218	0.5	1.8	103.249	30.14	101.842	98.016
4/19/2016	11:43:52 AM :	91	105	106	260	111	0.5	2.2	107.825	0.5	1.9	103.781	30.14	102.413	98.516
4/19/2016	11:44:52 AM :	91	105	106	260	111	0.5	2.2	108.477	0.5	1.9	104.34	30.14	103.027	99.041
4/19/2016	11:45:52 AM :	91	105	106	255	111	0.5	2.2	109.011	0.5	1.9	104.966	30.14	103.53	99.63
4/19/2016	11:46:52 AM :	92	105	105	253	111	0.499	2.2	109.525	0.5	1.9	105.502	30.14	104.014	100.134
4/19/2016	11:47:52 AM :	94	105	105	256	111	0.5	2.2	110.056	0.5	1.9	106.002	30.14	104.514	100.605
4/19/2016	11:48:52 AM :	96	105	105	260	111	0.5	2.2	110.681	0.5	1.9	106.526	30.14	105.102	101.098
4/19/2016	11:49:52 AM :	95	104	105	259	111	0.499	2.2	111.281	0.5	1.9	107.07	30.14	105.668	101.61
4/19/2016	11:50:52 AM :	95	104	105	254	111	0.5	2.2	111.837	0.5	1.9	107.651	30.14	106.192	102.156
4/19/2016	11:51:52 AM :	96	104	105	253	111	0.499	2.2	112.348	0.5	1.9	108.229	30.14	106.674	102.701
4/19/2016	11:52:52 AM :	97	104	105	258	111	0.5	2.2	112.92	0.5	1.9	108.777	30.14	107.213	103.216
4/19/2016	11:53:52 AM :	96	105	105	261	111	0.5	2.2	113.518	0.5	1.9	109.256	30.14	107.777	103.667
4/19/2016	11:54:52 AM :	97	104	105	259	111	0.5	2.2	114.092	0.5	1.9	109.763	30.14	108.317	104.144
4/19/2016	11:55:52 AM :	98	104	105	254	111	0.501	2.2	114.645	0.5	1.9	110.369	30.14	108.839	104.714
4/19/2016	11:56:52 AM :	98	104	105	254	111	0.501	2.2	115.175	0.5	1.9	110.991	30.14	109.338	105.299
4/19/2016	11:57:52 AM :	96	104	105	258	111	0.5	2.2	115.759	0.5	1.9	111.51	30.14	109.889	105.788
4/19/2016	11:58:52 AM :	96	104	105	260	111	0.501	2.2	116.368	0.5	1.9	111.991	30.14	110.463	106.241
4/19/2016	11:59:52 AM :	96	104	105	258	111	0.5	2.2	116.935	0.5	1.9	112.478	30.14	110.997	106.699
4/19/2016	12:00:52 PM :	96	104	105	253	111	0.5	2.2	117.445	0.5	1.9	113.078	30.14	111.478	107.263
4/19/2016	12:01:52 PM :	96	104	105	254	111	0.501	2.2	118.008	0.5	1.8	113.748	30.14	112.009	107.894
4/19/2016	12:02:52 PM :	97	104	105	259	111	0.5	2.2	118.59	0.5	1.9	114.249	30.14	112.557	108.365
4/19/2016	12:03:52 PM :	96	104	105	260	112	0.5	2.2	119.228	0.5	1.9	114.704	30.14	113.158	108.793
4/19/2016	12:04:52 PM :	96	104	105	257	112	0.5	2.2	119.76	0.5	1.9	115.206	30.14	113.661	109.266
4/19/2016	12:05:52 PM :	98	105	105	253	112	0.499	2.2	120.258	0.5	1.9	115.83	30.14	114.129	109.852
4/19/2016	12:06:52 PM :	97	105	105	255	112	0.5	2.2	120.816	0.5	1.9	116.46	30.14	114.655	110.445
4/19/2016	12:07:52 PM :	98	105	105	259	112	0.501	2.2	121.431	0.5	1.9	116.973	30.13	115.234	110.928
4/19/2016	12:08:52 PM :	101	105	105	260	112	0.5	2.2	122.069	0.499	1.9	117.443	30.13	115.835	111.37
4/19/2016	12:09:52 PM :	102	105	105	256	112	0.5	2.3	122.597	0.499	1.9	117.95	30.13	116.332	111.847
4/19/2016	12:10:52 PM :	101	105	105	253	112	0.5	2.3	123.094	0.5	1.9	118.552	30.14	116.8	112.413
4/19/2016	12:11:52 PM :	98	105	106	256	112	0.5	2.3	123.622	0.5	1.9	119.184	30.14	117.297	113.008
4/19/2016	12:12:52 PM :	100	105	106	260	112	0.5	2.3	124.279	0.5	1.9	119.691	30.14	117.915	113.484
4/19/2016	12:13:52 PM :	98	105	106	260	112	0.501	2.3	124.892	0.5	1.9	120.175	30.14	118.493	113.939
4/19/2016	12:14:52 PM :	100	105	106	255	112	0.501	2.3	125.437	0.5	1.9	120.719	30.14	119.006	114.45
4/19/2016	12:15:52 PM :	99	105	106	253	112	0.5	2.3	125.919	0.5	1.9	121.268	30.14	119.46	114.966
4/19/2016	12:16:52 PM :	99	105	106	257	112	0.501	2.3	126.441	0.5	1.9	121.871	30.14	119.951	115.533
4/19/2016	12:17:52 PM :	99	105	106	261	112	0.5	2.3	127.093	0.5	1.9	122.438	30.14	120.566	116.066
4/19/2016	12:18:52 PM :	99	105	106	260	112	0.5	2.3	127.731	0.5	1.9	122.944	30.13	121.166	116.542
4/19/2016	12:19:52 PM :	98	105	106	255	112	0.499	2.3	128.262	0.5	1.9	123.451	30.14	121.666	117.018
4/19/2016	12:20:52 PM :	99	105	106	253	112	0.5	2.3	128.761	0.499	1.9	123.986	30.14	122.136	117.521
4/19/2016	12:21:52 PM :	102	105	106	256	112	0.499	2.3	129.287	0.5	1.9	124.576	30.14	122.631	118.076
4/19/2016	12:22:52 PM :	101	105	106	261	113	0.501	2.3	129.899	0.5	1.9	125.167	30.14	123.208	118.632
4/19/2016	12:23:52 PM :	101	105	106	260	113	0.5	2.3	130.563	0.5	1.9	125.711	30.14	123.832	119.143
4/19/2016	12:24:52 PM :	101	105	106	255	113	0.5	2.3	131.082	0.5	1.9	126.188	30.13	124.321	119.591
4/19/2016	12:25:52 PM :	100	105	106	253	113	0.5	2.3	131.594	0.5	1.9	126.676	30.13	124.802	120.05
4/19/2016	12:26:52 PM :	99	105	106	256	113	0.5	2.3	132.12	0.5	1.9	127.287	30.13	125.297	120.624

4/19/2016	12:27:52 PM :	98	105	106	260	113	0.5	2.3	132.731	0.5	1.9	127.931	30.13	125.872	121.229
4/19/2016	12:28:52 PM :	102	105	106	259	113	0.5	2.3	133.368	0.5	1.9	128.441	30.13	126.472	121.709
4/19/2016	12:29:52 PM :	100	105	106	255	113	0.5	2.3	133.905	0.5	1.9	128.917	30.13	126.977	122.156
4/19/2016	12:30:52 PM :	99	105	106	253	113	0.5	2.3	134.422	0.5	1.9	129.412	30.13	127.463	122.621
4/19/2016	12:31:52 PM :	104	105	106	258	113	0.5	2.3	134.969	0.5	1.9	130.014	30.13	127.977	123.186
4/19/2016	12:32:52 PM :	117	105	106	261	113	0.5	2.3	135.579	0.5	1.9	130.674	30.13	128.551	123.805
4/19/2016	12:33:52 PM :	123	105	106	259	113	0.501	2.3	136.168	0.5	1.9	131.187	30.13	129.105	124.287
4/19/2016	12:34:52 PM :	127	105	106	255	113	0.501	2.3	136.73	0.5	1.9	131.637	30.13	129.634	124.709
4/19/2016	12:35:52 PM :	156	105	106	254	114	0.499	2.3	137.243	0.5	1.9	132.138	30.12	130.116	125.18
4/19/2016	12:36:52 PM :	194	105	106	259	114	0.501	2.4	137.821	0.5	1.9	132.772	30.12	130.659	125.775
4/19/2016	12:37:52 PM :	211	105	106	263	114	0.499	2.4	138.421	0.499	2	133.396	30.12	131.224	126.361
4/19/2016	12:38:52 PM :	206	106	106	262	114	0.5	2.5	138.993	0.5	2	133.907	30.12	131.761	126.841
4/19/2016	12:39:52 PM :	196	106	106	259	114	0.5	2.5	139.53	0.5	2	134.381	30.12	132.266	127.285
4/19/2016	12:40:52 PM :	190	106	106	254	114	0.501	2.5	140.068	0.5	2	134.893	30.12	132.771	127.766
4/19/2016	12:41:52 PM :	185	106	106	256	114	0.5	2.5	140.659	0.5	2	135.49	30.12	133.326	128.326
4/19/2016	12:42:52 PM :	179	106	107	262	114	0.499	2.5	141.273	0.5	2	136.118	30.12	133.903	128.915
4/19/2016	12:43:52 PM :	176	106	106	263	113	0.501	2.6	141.826	0.5	2	136.631	30.12	134.422	129.397
4/19/2016	12:44:52 PM :	166	106	107	261	114	0.5	2.6	142.328	0.5	2	137.123	30.12	134.894	129.857
4/19/2016	12:45:52 PM :	153	106	107	256	113	0.5	2.5	142.897	0.5	2	137.665	30.12	135.428	130.366
4/19/2016	12:46:52 PM :	167	106	107	254	113	0.5	2.6	143.483	0.5	2	138.208	30.12	135.979	130.875
4/19/2016	12:47:52 PM :	164	106	107	259	113	0.5	2.6	144.119	0.5	2	138.81	30.12	136.576	131.44
4/19/2016	12:48:52 PM :	164	106	107	263	114	0.501	2.7	144.651	0.5	2	139.374	30.12	137.076	131.969
4/19/2016	12:49:52 PM :	156	106	107	262	113	0.5	2.7	145.149	0.5	2	139.889	30.12	137.544	132.452
4/19/2016	12:50:52 PM :	154	106	107	258	113	0.501	2.7	145.7	0.5	2	140.39	30.12	138.061	132.921
4/19/2016	12:51:52 PM :	146	106	107	254	113	0.5	2.7	146.323	0.5	2	140.919	30.12	138.647	133.418
4/19/2016	12:52:52 PM :	144	106	107	256	113	0.5	2.7	146.954	0.5	2	141.516	30.12	139.239	133.978
4/19/2016	12:53:52 PM :	146	106	107	262	113	0.5	2.7	147.488	0.5	2	142.109	30.12	139.742	134.534
4/19/2016	12:54:52 PM :	147	106	107	262	113	0.499	2.7	147.98	0.5	2.1	142.654	30.12	140.203	135.045
4/19/2016	12:55:52 PM :	150	106	107	259	114	0.5	2.8	148.5	0.499	2.1	143.13	30.12	140.691	135.491
4/19/2016	12:56:52 PM :	149	106	107	254	113	0.5	2.8	149.162	0.5	2.1	143.622	30.12	141.314	135.952
4/19/2016	12:57:52 PM :	145	106	107	256	113	0.5	2.8	149.779	0.5	2.1	144.223	30.12	141.894	136.516
4/19/2016	12:58:52 PM :	161	106	107	261	113	0.5	2.8	150.323	0.5	2.1	144.878	30.12	142.404	137.13
4/19/2016	12:59:52 PM :	165	106	107	262	113	0.501	2.9	150.802	0.5	2.1	145.382	30.12	142.855	137.603
4/19/2016	1:00:52 PM :	160	106	107	260	113	0.5	2.9	151.338	0.5	2.1	145.857	30.12	143.358	138.048
4/19/2016	1:01:52 PM :	153	106	107	255	113	0.5	2.9	151.971	0.5	2.1	146.354	30.12	143.952	138.514
4/19/2016	1:02:52 PM :	143	106	107	255	113	0.499	2.9	152.616	0.5	2.1	146.958	30.12	144.558	139.081
4/19/2016	1:03:52 PM :	149	106	107	260	113	0.5	3	153.148	0.5	2.1	147.612	30.12	145.058	139.694
4/19/2016	1:04:52 PM :	142	106	107	262	114	0.5	3	153.646	0.5	2.2	148.123	30.11	145.526	140.173
4/19/2016	1:05:52 PM :	144	106	107	260	113	0.5	3	154.172	0.5	2.2	148.577	30.11	146.02	140.598
4/19/2016	1:06:52 PM :	148	106	107	255	114	0.499	3	154.783	0.5	2.2	149.077	30.11	146.593	141.067
4/19/2016	1:07:52 PM :	150	106	107	254	114	0.499	3.1	155.443	0.499	2.2	149.716	30.11	147.213	141.666
4/19/2016	1:08:52 PM :	145	106	107	260	114	0.5	3.1	155.963	0.5	2.2	150.336	30.11	147.701	142.247
4/19/2016	1:09:52 PM :	143	106	107	262	114	0.5	3.1	156.481	0.5	2.2	150.845	30.11	148.188	142.725
4/19/2016	1:10:52 PM :	138	106	107	260	114	0.5	3.1	157.009	0.5	2.2	151.324	30.11	148.684	143.174
4/19/2016	1:11:52 PM :	141	106	107	256	114	0.501	3.1	157.626	0.5	2.2	151.841	30.11	149.263	143.658
4/19/2016	1:12:52 PM :	137	106	107	254	114	0.501	3.1	158.245	0.499	2.2	152.423	30.11	149.844	144.205
4/19/2016	1:13:52 PM :	139	106	107	259	114	0.5	3.1	158.79	0.5	2.2	153.052	30.11	150.355	144.793
4/19/2016	1:14:52 PM :	138	106	107	262	114	0.5	3.2	159.306	0.5	2.2	153.573	30.11	150.839	145.282
4/19/2016	1:15:52 PM :	137	106	107	261	114	0.499	3.2	159.861	0.5	2.3	154.068	30.11	151.359	145.745
4/19/2016	1:16:52 PM :	130	106	107	256	114	0.499	3.2	160.463	0.5	2.3	154.605	30.11	151.925	146.249
4/19/2016	1:17:52 PM :	126	106	107	254	114	0.5	3.2	161.046	0.5	2.2	155.147	30.11	152.471	146.756

4/19/2016	1:18:52 PM :	130	106	107	258	114	0.5	3.2	161.609	0.5	2.2	155.742	30.11	152.999	147.313
4/19/2016	1:19:52 PM :	125	106	107	262	114	0.5	3.3	162.121	0.5	2.3	156.307	30.1	153.48	147.842
4/19/2016	1:20:52 PM :	132	106	107	260	114	0.5	3.3	162.704	0.499	2.3	156.837	30.1	154.027	148.339
4/19/2016	1:21:52 PM :	132	106	107	255	114	0.499	3.3	163.299	0.499	2.3	157.329	30.1	154.585	148.799
4/19/2016	1:22:52 PM :	130	106	107	253	114	0.499	3.3	163.873	0.5	2.3	157.849	30.1	155.123	149.286
4/19/2016	1:23:52 PM :	127	106	107	258	114	0.5	3.3	164.405	0.5	2.3	158.45	30.1	155.622	149.849
4/19/2016	1:24:52 PM :	123	106	107	262	114	0.5	3.3	164.951	0.5	2.3	159.054	30.1	156.135	150.414
4/19/2016	1:25:52 PM :	119	106	107	260	114	0.5	3.4	165.537	0.5	2.3	159.592	30.1	156.684	150.918
4/19/2016	1:26:52 PM :	117	106	107	255	114	0.5	3.4	166.154	0.499	2.3	160.073	30.1	157.263	151.368
4/19/2016	1:27:52 PM :	114	106	107	253	114	0.5	3.3	166.703	0.5	2.3	160.556	30.1	157.778	151.821
4/19/2016	1:28:52 PM :	111	106	107	257	114	0.5	3.3	167.202	0.5	2.3	161.153	30.1	158.247	152.379
4/19/2016	1:29:52 PM :	110	106	107	261	114	0.5	3.4	167.77	0.499	2.3	161.822	30.11	158.779	153.006
4/19/2016	1:30:52 PM :	108	106	107	259	114	0.5	3.4	168.36	0.499	2.3	162.322	30.11	159.332	153.475
4/19/2016	1:31:52 PM :	107	106	107	255	114	0.5	3.4	168.996	0.5	2.3	162.791	30.1	159.929	153.913
4/19/2016	1:32:52 PM :	106	106	107	253	114	0.5	3.4	169.526	0.499	2.3	163.289	30.1	160.426	154.38
4/19/2016	1:33:52 PM :	106	106	107	258	114	0.5	3.4	170.027	0.5	2.3	163.9	30.1	160.896	154.952
4/19/2016	1:34:52 PM :	106	106	107	261	114	0.5	3.4	170.572	0.5	2.3	164.548	30.1	161.407	155.558
4/19/2016	1:35:52 PM :	106	106	107	259	114	0.5	3.4	171.198	0.5	2.3	165.059	30.1	161.994	156.037
4/19/2016	1:36:52 PM :	106	106	107	254	113	0.5	3.4	171.825	0.5	2.3	165.519	30.1	162.582	156.468
4/19/2016	1:37:52 PM :	106	106	107	254	113	0.5	3.4	172.363	0.5	2.3	166.019	30.1	163.087	156.936
4/19/2016	1:38:52 PM :	105	106	107	258	113	0.499	3.4	172.852	0.5	2.3	166.653	30.1	163.546	157.529
4/19/2016	1:39:52 PM :	105	106	107	261	113	0.5	3.4	173.372	0.5	2.3	167.273	30.1	164.033	158.11
4/19/2016	1:40:52 PM :	105	106	107	259	113	0.5	3.5	174.03	0.499	2.4	167.777	30.09	164.65	158.582
4/19/2016	1:41:52 PM :	103	106	107	254	113	0.501	3.5	174.652	0.5	2.3	168.266	30.09	165.233	159.04
4/19/2016	1:42:52 PM :	103	106	107	253	113	0.5	3.4	175.191	0.499	2.3	168.784	30.09	165.738	159.524
4/19/2016	1:43:52 PM :	103	106	107	258	113	0.5	3.4	175.675	0.5	2.3	169.359	30.09	166.193	160.063
4/19/2016	1:44:52 PM :	102	106	107	261	113	0.499	3.5	176.203	0.5	2.4	169.988	30.09	166.688	160.651
4/19/2016	1:45:52 PM :	101	106	107	259	113	0.5	3.5	176.837	0.5	2.4	170.513	30.09	167.282	161.143
4/19/2016	1:46:52 PM :	102	106	107	254	113	0.5	3.5	177.481	0.5	2.4	171.009	30.1	167.886	161.608
4/19/2016	1:47:52 PM :	105	106	107	253	113	0.5	3.5	178.013	0.5	2.4	171.543	30.1	168.385	162.107
4/19/2016	1:48:52 PM :	108	106	107	258	113	0.501	3.5	178.513	0.5	2.4	172.085	30.1	168.855	162.615
4/19/2016	1:49:52 PM :	106	106	107	261	113	0.499	3.5	179.039	0.499	2.4	172.674	30.1	169.348	163.166
4/19/2016	1:50:52 PM :	106	106	107	259	113	0.5	3.5	179.647	0.5	2.4	173.242	30.1	169.92	163.698
4/19/2016	1:51:52 PM :	110	106	107	254	113	0.5	3.6	180.309	0.5	2.4	173.782	30.1	170.541	164.204
4/19/2016	1:52:52 PM :	114	106	107	254	113	0.5	3.6	180.831	0.5	2.4	174.273	30.1	171.031	164.664
4/19/2016	1:53:52 PM :	115	106	107	259	113	0.5	3.6	181.343	0.499	2.4	174.785	30.1	171.512	165.143
4/19/2016	1:54:52 PM :	113	106	107	261	113	0.5	3.6	181.871	0.5	2.4	175.392	30.1	172.008	165.712
4/19/2016	1:55:52 PM :	111	106	107	259	113	0.501	3.6	182.489	0.5	2.4	176	30.1	172.587	166.282
4/19/2016	1:56:52 PM :	109	106	107	254	113	0.5	3.6	183.113	0.5	2.4	176.532	30.1	173.173	166.78
4/19/2016	1:57:52 PM :	113	106	107	253	112	0.5	3.6	183.654	0.5	2.4	177.011	30.1	173.681	167.229
4/19/2016	1:58:52 PM :	118	106	107	258	112	0.5	3.6	184.17	0.5	2.4	177.494	30.09	174.165	167.681
4/19/2016	1:59:52 PM :	119	106	107	261	112	0.5	3.7	184.727	0.5	2.4	178.098	30.09	174.688	168.247
4/19/2016	2:00:52 PM :	116	106	107	259	112	0.5	3.7	185.334	0.5	2.4	178.771	30.09	175.257	168.878
4/19/2016	2:01:52 PM :	115	106	107	254	112	0.5	3.7	185.914	0.5	2.4	179.269	30.09	175.802	169.345
4/19/2016	2:02:52 PM :	116	106	107	253	112	0.5	3.7	186.475	0.5	2.4	179.729	30.09	176.329	169.775
4/19/2016	2:03:52 PM :	117	106	107	258	112	0.5	3.8	186.989	0.5	2.4	180.233	30.09	176.811	170.248
4/19/2016	2:04:52 PM :	116	106	107	261	112	0.5	3.8	187.567	0.5	2.4	180.847	30.09	177.353	170.823
4/19/2016	2:05:52 PM :	111	106	107	260	112	0.5	3.8	188.169	0.5	2.4	181.487	30.09	177.919	171.422
4/19/2016	2:06:52 PM :	111	106	107	255	112	0.5	3.8	188.741	0.5	2.4	182.001	30.09	178.455	171.904
4/19/2016	2:07:52 PM :	111	106	107	253	112	0.5	3.8	189.273	0.5	2.4	182.463	30.09	178.955	172.337
4/19/2016	2:08:52 PM :	109	106	107	257	112	0.501	3.8	189.816	0.5	2.4	182.967	30.09	179.464	172.809

4/19/2016	2:09:52 PM :	106	106	107	261	112	0.499	3.8	190.401	0.5	2.4	183.596	30.09	180.014	173.399
4/19/2016	2:10:52 PM :	105	106	107	260	112	0.5	3.9	191.021	0.499	2.4	184.217	30.09	180.595	173.98
4/19/2016	2:11:52 PM :	106	106	107	255	112	0.5	3.9	191.57	0.5	2.4	184.719	30.09	181.11	174.45
4/19/2016	2:12:52 PM :	109	106	107	253	112	0.5	3.9	192.071	0.5	2.4	185.204	30.09	181.58	174.905
4/19/2016	2:13:52 PM :	106	106	107	257	112	0.5	3.9	192.641	0.5	2.4	185.734	30.09	182.115	175.401
4/19/2016	2:14:52 PM :	106	106	107	261	112	0.5	4	193.229	0.5	2.5	186.297	30.08	182.667	175.929
4/19/2016	2:15:52 PM :	104	106	107	259	113	0.5	4	193.867	0.499	2.5	186.921	30.08	183.265	176.514
4/19/2016	2:16:52 PM :	103	106	107	255	112	0.499	4	194.395	0.499	2.5	187.454	30.08	183.761	177.013
4/19/2016	2:17:52 PM :	102	106	107	253	112	0.5	4	194.9	0.5	2.4	187.958	30.08	184.235	177.484
4/19/2016	2:18:52 PM :	101	106	107	258	112	0.501	4	195.443	0.5	2.4	188.483	30.08	184.744	177.976
4/19/2016	2:19:52 PM :	105	106	107	261	113	0.5	4	196.068	0.5	2.5	189.023	30.08	185.331	178.482
4/19/2016	2:20:52 PM :	103	106	107	259	113	0.5	4	196.697	0.5	2.5	189.61	30.08	185.921	179.032
4/19/2016	2:21:52 PM :	102	106	107	254	112	0.5	4.1	197.238	0.5	2.5	190.184	30.08	186.429	179.57
4/19/2016	2:22:52 PM :	102	106	107	254	112	0.5	4	197.726	0.5	2.5	190.73	30.08	186.886	180.081
4/19/2016	2:23:52 PM :	102	106	107	258	113	0.5	4.1	198.248	0.499	2.5	191.212	30.08	187.376	180.532
4/19/2016	2:24:52 PM :	104	106	107	261	112	0.499	4.1	198.906	0.5	2.5	191.721	30.08	187.993	181.009
4/19/2016	2:25:52 PM :	108	105	107	259	112	0.501	4.1	199.528	0.5	2.5	192.328	30.08	188.578	181.577
4/19/2016	2:26:52 PM :	105	105	107	254	112	0.5	4.2	200.069	0.5	2.5	192.946	30.08	189.086	182.156
4/19/2016	2:27:52 PM :	103	105	107	254	112	0.5	4.2	200.55	0.499	2.5	193.468	30.08	189.538	182.645
4/19/2016	2:28:52 PM :	103	105	107	259	112	0.501	4.2	201.082	0.5	2.5	193.946	30.08	190.037	183.093
4/19/2016	2:29:52 PM :	103	105	106	261	112	0.5	4.2	201.714	0.499	2.5	194.434	30.08	190.63	183.55
4/19/2016	2:30:52 PM :	102	105	106	258	112	0.501	4.2	202.362	0.5	2.5	195.033	30.08	191.239	184.112
4/19/2016	2:31:52 PM :	104	105	106	253	112	0.499	4.3	202.89	0.499	2.5	195.705	30.08	191.735	184.741
4/19/2016	2:32:52 PM :	110	105	106	254	112	0.5	4.3	203.399	0.499	2.5	196.207	30.08	192.213	185.212
4/19/2016	2:33:52 PM :	110	105	106	260	112	0.501	4.3	203.922	0.5	2.5	196.664	30.08	192.704	185.641
4/19/2016	2:34:52 PM :	107	105	106	261	112	0.5	4.4	204.527	0.5	2.5	197.165	30.08	193.271	186.11
4/19/2016	2:35:52 PM :	106	105	106	258	112	0.5	4.4	205.187	0.5	2.5	197.789	30.08	193.891	186.695
4/19/2016	2:36:52 PM :	105	105	106	253	112	0.5	4.4	205.713	0.5	2.5	198.42	30.08	194.385	187.287
4/19/2016	2:37:52 PM :	106	105	106	254	112	0.5	4.4	206.229	0.5	2.5	198.939	30.08	194.87	187.773
4/19/2016	2:38:52 PM :	106	105	106	260	112	0.5	4.4	206.763	0.5	2.5	199.404	30.08	195.371	188.209
4/19/2016	2:39:52 PM :	105	105	106	261	112	0.5	4.5	207.38	0.5	2.5	199.908	30.08	195.951	188.682
4/19/2016	2:40:52 PM :	108	105	106	258	112	0.5	4.5	207.991	0.5	2.5	200.528	30.08	196.525	189.263
4/19/2016	2:41:52 PM :	110	105	106	253	112	0.5	4.5	208.54	0.5	2.5	201.155	30.08	197.04	189.85
4/19/2016	2:42:52 PM :	113	105	106	255	112	0.5	4.6	209.052	0.5	2.5	201.655	30.08	197.521	190.319
4/19/2016	2:43:52 PM :	119	105	106	260	112	0.501	4.7	209.616	0.5	2.6	202.144	30.08	198.051	190.777
4/19/2016	2:44:52 PM :	124	105	106	261	112	0.499	4.8	210.221	0.5	2.6	202.679	30.08	198.619	191.279
4/19/2016	2:45:52 PM :	119	105	106	257	112	0.5	4.9	210.799	0.5	2.6	203.237	30.08	199.161	191.802
4/19/2016	2:46:52 PM :	112	105	106	253	112	0.5	4.9	211.354	0.5	2.6	203.854	30.08	199.683	192.381
4/19/2016	2:47:52 PM :	109	105	106	255	112	0.5	4.9	211.878	0.5	2.6	204.4	30.08	200.175	192.892
4/19/2016	2:48:52 PM :	107	105	106	261	112	0.5	4.9	212.46	0.5	2.6	204.902	30.08	200.721	193.363
4/19/2016	2:49:52 PM :	107	105	106	261	112	0.499	5	213.065	0.5	2.6	205.423	30.08	201.289	193.851
4/19/2016	2:50:52 PM :	115	105	106	257	112	0.501	5.1	213.634	0.5	2.6	205.958	30.08	201.824	194.353
4/19/2016	2:51:52 PM :	119	105	106	253	112	0.5	5.1	214.154	0.499	2.6	206.549	30.07	202.312	194.906
4/19/2016	2:52:52 PM :	120	105	106	256	112	0.5	5.2	214.711	0.5	2.6	207.13	30.07	202.835	195.451
4/19/2016	2:53:52 PM :	119	105	106	261	112	0.5	5.3	215.295	0.499	2.6	207.679	30.07	203.383	195.966
4/19/2016	2:54:52 PM :	118	105	106	261	112	0.5	5.4	215.924	0.5	2.7	208.156	30.07	203.973	196.413
4/19/2016	2:55:52 PM :	120	105	106	256	112	0.5	5.4	216.465	0.499	2.7	208.661	30.07	204.481	196.885
4/19/2016	2:56:52 PM :	117	105	106	253	112	0.5	5.4	216.96	0.5	2.7	209.271	30.07	204.946	197.457
4/19/2016	2:57:52 PM :	118	105	106	256	112	0.5	5.5	217.524	0.5	2.7	209.893	30.07	205.475	198.04
4/19/2016	2:58:52 PM :	118	105	106	261	113	0.5	5.6	218.129	0.5	2.7	210.414	30.07	206.043	198.528
4/19/2016	2:59:52 PM :	114	105	106	261	113	0.5	5.6	218.766	0.5	2.7	210.898	30.07	206.641	198.981

4/19/2016	3:00:52 PM :	113	105	106	257	113	0.5	5.7	219.294	0.5	2.7	211.387	30.07	207.137	199.44
4/19/2016	3:01:52 PM :	115	105	106	253	113	0.499	5.7	219.796	0.499	2.7	211.987	30.07	207.608	200.002
4/19/2016	3:02:52 PM :	117	105	106	256	114	0.5	5.8	220.328	0.5	2.7	212.66	30.08	208.108	200.633
4/19/2016	3:03:52 PM :	115	105	106	261	114	0.5	5.9	220.978	0.5	2.7	213.162	30.07	208.718	201.104
4/19/2016	3:04:52 PM :	112	105	107	261	114	0.5	5.9	221.595	0.5	2.7	213.62	30.08	209.297	201.532
4/19/2016	3:05:52 PM :	114	105	107	257	114	0.5	6	222.142	0.5	2.7	214.128	30.08	209.81	202.008
4/19/2016	3:06:52 PM :	116	105	107	253	114	0.5	6	222.621	0.5	2.7	214.748	30.07	210.26	202.589
4/19/2016	3:07:52 PM :	117	106	107	256	114	0.5	6.1	223.141	0.499	2.7	215.38	30.07	210.748	203.18
4/19/2016	3:08:52 PM :	113	106	107	261	115	0.499	6.1	223.796	0.5	2.7	215.9	30.07	211.363	203.668
4/19/2016	3:09:52 PM :	110	106	107	261	115	0.5	6.2	224.425	0.5	2.8	216.361	30.07	211.953	204.099
4/19/2016	3:10:52 PM :	113	106	107	257	115	0.5	6.3	224.962	0.5	2.8	216.867	30.07	212.457	204.573
4/19/2016	3:11:52 PM :	117	106	107	253	115	0.499	6.4	225.448	0.5	2.8	217.498	30.08	212.912	205.163
4/19/2016	3:12:52 PM :	116	106	107	256	115	0.5	6.5	225.984	0.5	2.8	218.116	30.07	213.414	205.742
4/19/2016	3:13:52 PM :	117	106	107	261	115	0.499	6.5	226.599	0.5	2.8	218.624	30.07	213.992	206.218
4/19/2016	3:14:52 PM :	117	106	107	261	116	0.499	6.6	227.263	0.5	2.8	219.12	30.07	214.615	206.682
4/19/2016	3:15:52 PM :	116	106	107	258	116	0.499	6.7	227.781	0.5	2.8	219.642	30.07	215.1	207.17
4/19/2016	3:16:52 PM :	115	106	107	253	116	0.5	6.7	228.29	0.5	2.8	220.201	30.07	215.577	207.693
4/19/2016	3:17:52 PM :	115	106	107	255	116	0.499	6.8	228.812	0.5	2.8	220.83	30.07	216.066	208.281
4/19/2016	3:18:52 PM :	115	106	107	261	116	0.5	6.8	229.418	0.5	2.8	221.37	30.07	216.634	208.786
4/19/2016	3:19:52 PM :	113	106	108	261	116	0.501	6.8	230.071	0.5	2.8	221.87	30.07	217.246	209.253
4/19/2016	3:20:52 PM :	113	106	108	258	116	0.499	6.8	230.6	0.499	2.8	222.398	30.07	217.742	209.747
4/19/2016	3:21:52 PM :	112	106	108	253	116	0.5	6.9	231.116	0.5	2.8	222.94	30.07	218.225	210.253
4/19/2016	3:22:52 PM :	111	107	108	255	117	0.501	6.9	231.652	0.5	2.8	223.532	30.07	218.727	210.807
4/19/2016	3:23:52 PM :	108	107	108	261	117	0.501	6.9	232.271	0.5	2.8	224.109	30.07	219.307	211.346
4/19/2016	3:24:52 PM :	110	107	108	261	117	0.5	7	232.871	0.5	2.9	224.649	30.07	219.868	211.85
4/19/2016	3:25:52 PM :	111	107	108	258	117	0.5	7.1	233.429	0.5	2.9	225.135	30.06	220.39	212.304
4/19/2016	3:26:52 PM :	112	107	108	253	117	0.5	7.1	233.936	0.5	2.9	225.651	30.06	220.865	212.786
4/19/2016	3:27:52 PM :	112	107	108	255	117	0.5	7.2	234.508	0.5	2.8	226.259	30.07	221.4	213.354
4/19/2016	3:28:52 PM :	112	107	108	261	117	0.5	7.3	235.106	0.5	2.9	226.868	30.07	221.96	213.923
4/19/2016	3:29:52 PM :	111	107	108	261	117	0.501	7.2	235.678	0.499	2.9	227.4	30.07	222.494	214.419
4/19/2016	3:30:52 PM :	111	107	108	258	117	0.5	7.3	236.231	0.5	2.9	227.884	30.06	223.011	214.871
4/19/2016	3:31:52 PM :	112	107	108	253	117	0.499	7.4	236.757	0.5	2.9	228.369	30.06	223.503	215.324
4/19/2016	3:32:52 PM :	109	107	109	255	117	0.5	7.5	237.339	0.5	2.9	228.972	30.06	224.048	215.886
4/19/2016	3:33:52 PM :	107	107	109	260	118	0.5	7.5	237.944	0.5	2.9	229.645	30.07	224.613	216.514
4/19/2016	3:34:52 PM :	110	107	109	261	118	0.5	7.6	238.513	0.5	2.9	230.148	30.07	225.145	216.982
4/19/2016	3:35:52 PM :	110	108	109	256	118	0.5	7.6	239.027	0.5	2.9	230.618	30.06	225.625	217.421
4/19/2016	3:36:52 PM :	110	108	109	253	118	0.499	7.6	239.588	0.499	2.9	231.119	30.06	226.149	217.888
4/19/2016	3:37:52 PM :	110	108	109	256	118	0.5	7.7	240.168	0.5	2.9	231.729	30.06	226.692	218.456
4/19/2016	3:38:52 PM :	109	108	109	261	118	0.5	7.7	240.796	0.5	2.9	232.378	30.06	227.278	219.062
4/19/2016	3:39:52 PM :	109	108	109	260	118	0.5	7.7	241.334	0.5	3	232.895	30.06	227.78	219.543
4/19/2016	3:40:52 PM :	110	108	109	256	118	0.5	7.8	241.829	0.5	3	233.354	30.06	228.243	219.97
4/19/2016	3:41:52 PM :	109	108	109	253	118	0.5	7.9	242.392	0.5	3	233.856	30.06	228.769	220.438
4/19/2016	3:42:52 PM :	110	108	109	257	118	0.5	8	242.997	0.5	3	234.497	30.06	229.333	221.036
4/19/2016	3:43:52 PM :	109	108	110	261	118	0.499	8.1	243.626	0.499	3	235.118	30.06	229.921	221.613
4/19/2016	3:44:52 PM :	107	108	110	260	118	0.501	8	244.156	0.5	3	235.63	30.06	230.415	222.09
4/19/2016	3:45:52 PM :	107	108	110	255	118	0.5	7.9	244.658	0.5	3	236.109	30.06	230.884	222.536
4/19/2016	3:46:52 PM :	107	108	110	253	118	0.501	8	245.192	0.5	3	236.626	30.06	231.382	223.017
4/19/2016	3:47:52 PM :	108	108	110	257	118	0.499	8.2	245.836	0.5	3	237.224	30.06	231.982	223.573
4/19/2016	3:48:52 PM :	108	108	110	261	118	0.5	8.4	246.451	0.5	3	237.852	30.06	232.557	224.158
4/19/2016	3:49:52 PM :	108	108	110	260	118	0.5	8.3	246.994	0.5	3	238.365	30.06	233.063	224.636
4/19/2016	3:50:52 PM :	106	109	110	255	118	0.5	8.2	247.478	0.5	3.1	238.859	30.06	233.515	225.095

4/19/2016	3:51:52 PM :	107	109	110	253	118	0.499	8.2	247.996	0.5	3	239.404	30.05	233.998	225.602
4/19/2016	3:52:52 PM :	106	109	110	257	118	0.5	8.4	248.651	0.5	3	239.954	30.05	234.608	226.114
4/19/2016	3:53:52 PM :	108	109	110	261	118	0.5	8.6	249.274	0.5	3.1	240.562	30.05	235.189	226.68
4/19/2016	3:54:52 PM :	107	109	110	260	118	0.501	8.6	249.813	0.5	3.1	241.119	30.05	235.691	227.198
4/19/2016	3:55:52 PM :	106	109	110	255	118	0.5	8.5	250.295	0.5	3.1	241.631	30.05	236.14	227.675
4/19/2016	3:56:52 PM :	105	109	110	253	118	0.499	8.5	250.828	0.5	3.1	242.146	30.05	236.637	228.153
4/19/2016	3:57:52 PM :	106	109	110	258	118	0.5	8.6	251.454	0.5	3.1	242.683	30.05	237.221	228.652
4/19/2016	3:58:52 PM :	105	109	110	261	118	0.5	8.7	252.107	0.5	3.1	243.28	30.05	237.829	229.207
4/19/2016	3:59:52 PM :	105	109	110	260	118	0.501	8.7	252.635	0.5	3.1	243.864	30.05	238.321	229.751
4/19/2016	4:00:52 PM :	104	109	110	255	118	0.5	8.7	253.139	0.5	3.1	244.416	30.05	238.791	230.264
4/19/2016	4:01:52 PM :	101	109	110	253	118	0.5	8.7	253.665	0.5	3.1	244.896	30.05	239.282	230.711
4/19/2016	4:02:52 PM :	99	109	110	256	117	0.5	8.6	254.265	0.5	3.1	245.4	30.05	239.841	231.179
4/19/2016	4:03:52 PM :	99	109	110	261	117	0.5	8.6	254.928	0.5	3.1	246.014	30.05	240.458	231.75
4/19/2016	4:04:52 PM :	101	109	110	260	117	0.5	8.7	255.452	0.5	3.2	246.634	30.05	240.947	232.326
4/19/2016	4:05:52 PM :	101	109	110	255	117	0.5	8.7	255.966	0.499	3.2	247.16	30.05	241.426	232.815
4/19/2016	4:06:52 PM :	99	109	110	253	117	0.501	8.4	256.5	0.5	3.2	247.644	30.04	241.923	233.265
4/19/2016	4:07:52 PM :	103	109	110	256	117	0.5	8.1	257.117	0.5	3.2	248.131	30.05	242.499	233.717
4/19/2016	4:08:52 PM :	185	109	110	261	117	0.498	8.4	257.73	0.499	3.2	248.734	30.05	243.07	234.278
4/19/2016	4:09:52 PM :	226	109	110	261	117	0.499	9.4	258.276	0.5	3.5	249.409	30.05	243.579	234.906
4/19/2016	4:10:52 PM :	213	109	110	259	117	0.5	9.9	258.788	0.5	3.6	249.909	30.05	244.057	235.371
4/19/2016	4:11:52 PM :	210	109	110	255	117	0.499	10.3	259.341	0.5	3.7	250.372	30.05	244.572	235.801
4/19/2016	4:12:52 PM :	208	109	110	256	117	0.499	10.7	259.95	0.5	3.9	250.88	30.05	245.139	236.274
4/19/2016	4:13:52 PM :	203	109	110	262	118	0.5	11.1	260.529	0.5	3.9	251.496	30.04	245.679	236.847
4/19/2016	4:14:52 PM :	194	109	110	263	118	0.5	11.3	261.089	0.5	4	252.14	30.05	246.201	237.445
4/19/2016	4:15:52 PM :	199	109	110	260	118	0.5	11.4	261.607	0.5	4	252.659	30.05	246.684	237.927
4/19/2016	4:16:52 PM :	193	109	110	256	118	0.5	11.5	262.183	0.5	4.1	253.119	30.05	247.22	238.355
4/19/2016	4:17:52 PM :	177	109	110	255	118	0.501	11.4	262.784	0.5	4	253.626	30.05	247.78	238.826
4/19/2016	4:18:52 PM :	165	109	110	261	118	0.501	11.2	263.357	0.5	3.9	254.256	30.05	248.315	239.412
4/19/2016	4:19:52 PM :	153	109	110	263	118	0.501	11	263.887	0.5	3.9	254.879	30.05	248.809	239.991
4/19/2016	4:20:52 PM :	142	109	110	262	118	0.5	10.8	264.434	0.5	3.9	255.39	30.05	249.319	240.466
4/19/2016	4:21:52 PM :	135	109	110	257	118	0.501	10.6	265.016	0.5	3.9	255.875	30.05	249.861	240.917
4/19/2016	4:22:52 PM :	131	109	110	254	118	0.5	10.4	265.643	0.5	3.9	256.396	30.05	250.446	241.402
4/19/2016	4:23:52 PM :	126	109	110	258	118	0.5	10.3	266.188	0.5	3.9	256.981	30.05	250.953	241.945
4/19/2016	4:24:52 PM :	123	109	110	263	117	0.5	10.3	266.687	0.5	3.9	257.613	30.04	251.419	242.533
4/19/2016	4:25:52 PM :	120	109	110	262	117	0.5	10.3	267.255	0.5	3.9	258.135	30.04	251.948	243.018
4/19/2016	4:26:52 PM :	119	109	110	258	117	0.5	10.3	267.843	0.5	3.9	258.63	30.04	252.495	243.478
4/19/2016	4:27:52 PM :	117	109	110	254	117	0.5	10.2	268.48	0.5	3.9	259.175	30.04	253.089	243.985
4/19/2016	4:28:52 PM :	115	109	110	256	117	0.5	10.2	269.009	0.5	3.8	259.719	30.04	253.582	244.49
4/19/2016	4:29:52 PM :	125	109	110	262	117	0.5	10.2	269.512	0.5	3.9	260.321	30.04	254.051	245.05
4/19/2016	4:30:52 PM :	149	109	110	262	117	0.498	10.6	270.055	0.5	4	260.891	30.04	254.557	245.579
4/19/2016	4:31:52 PM :	155	109	110	259	117	0.499	11.2	270.68	0.5	4.1	261.409	30.04	255.139	246.061
4/19/2016	4:32:42 PM :	155	109	110	259	117	0.499	11.2	271.204	0.5	4.1	261.832	30.04	255.628	246.454

```
'
'-------------------------- LOGGED EVENTS ----------------------------------
04/19/16 8:05:56 AM: Test START
04/19/16 8:06:06 AM: Test Paused by User
04/19/16 8:06:06 AM: PAUSE_EVENT [Manual Pause]
04/19/16 8:32:53 AM: TestResumed
04/19/16 4:32:42 PM: Actual Sampling Time: 0d  8h  0m  0s
04/19/16 4:32:42 PM: Test END
04/19/16  16:35:50: Sample A: POST-Leak Test PASSED at maximum observed vacuum at 11.7 inHg
```

```
04/19/16  16:35:50: Maximum Observed Vacuum for A was 11.7 inHg
04/19/16  16:35:50: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/19/16  16:35:50: Maximum Observed Vacuum for B was 4.1 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'           DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 3 Day.pro
File Exported: 4/30/2016 12:24:24 AM (PC Time).
Company Name: Cuba

04/20/16 07:06:28 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 0 ccm (Max. allowed 20 ccm)
04/20/16 07:06:28 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 0 ccm (Max. allowed 20 ccm)
Trap ID-A: OL343557
Trap ID-B: SPIKED OL335420

Run D3

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 40m
Averaging Period : 1 min.

			Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (I Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (I Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			97.1	99.7	99.9	257.8	108	0.499	2.4	272.093	0.498	1.7	262.349	30.09	258.292	252.232
4/20/2016	7:09:46 AM	:	70	75	open	257	82	0	0.2	0	0	0	0	30.1	0	0
4/20/2016	7:09:55 AM	:User Paus	70	75	open	258	82	0.802	2.2	0.173	0.69	1.5	0.097	30.1	0.172	0.112
4/20/2016	7:10:01 AM	:Resumed	70	75	open	259	82	0	1.4	0.173	0	0.9	0.097	30.1	0.172	0.112
4/20/2016	7:10:10 AM	:User Paus	70	75	open	259	82	0.531	2	0.25	0.529	1.4	0.163	30.1	0.248	0.188
4/20/2016	7:50:06 AM	:Resumed	74	78	open	255	85	0	0.3	0.252	0	0	0.165	30.11	0.25	0.19
4/20/2016	7:51:05 AM	:	73	77	open	257	84	0.561	1.8	0.898	0.548	1.3	0.711	30.11	0.89	0.821
4/20/2016	7:52:05 AM	:	74	77	open	260	85	0.5	2.3	1.403	0.5	1.7	1.281	30.11	1.39	1.48
4/20/2016	7:53:05 AM	:	74	77	open	259	85	0.499	2.3	1.896	0.5	1.7	1.899	30.11	1.878	2.194
4/20/2016	7:54:05 AM	:	74	77	open	254	85	0.5	2.3	2.416	0.5	1.7	2.439	30.11	2.393	2.818
4/20/2016	7:55:05 AM	:	74	77	open	253	85	0.5	2.3	3.015	0.5	1.7	2.936	30.11	2.986	3.391
4/20/2016	7:56:05 AM	:	75	77	open	258	85	0.5	2.3	3.66	0.5	1.7	3.479	30.11	3.624	4.02
4/20/2016	7:57:05 AM	:	75	77	open	261	86	0.499	2.3	4.17	0.5	1.7	4.029	30.11	4.129	4.654
4/20/2016	7:58:05 AM	:	75	77	open	259	86	0.501	2.4	4.673	0.5	1.7	4.617	30.11	4.627	5.334
4/20/2016	7:59:05 AM	:	75	78	17	254	86	0.5	2.4	5.198	0.5	1.7	5.172	30.11	5.145	5.952
4/20/2016	8:00:05 AM	:	75	78	open	253	86	0.5	2.3	5.813	0.5	1.6	5.706	30.11	5.753	6.569
4/20/2016	8:01:05 AM	:	75	78	open	258	86	0.499	2.3	6.44	0.499	1.6	6.182	30.11	6.373	7.119
4/20/2016	8:02:05 AM	:	76	78	14	261	87	0.501	2.4	6.968	0.5	1.7	6.684	30.11	6.894	7.681
4/20/2016	8:03:05 AM	:	76	78	open	259	88	0.499	2.4	7.476	0.5	1.7	7.286	30.11	7.396	8.376
4/20/2016	8:04:05 AM	:	76	78	open	254	88	0.5	2.4	8.006	0.5	1.7	7.909	30.11	7.919	9.095
4/20/2016	8:05:05 AM	:	77	79	open	253	88	0.501	2.4	8.632	0.5	1.6	8.399	30.11	8.536	9.661
4/20/2016	8:06:05 AM	:	77	79	19	257	88	0.5	2.4	9.225	0.5	1.6	8.856	30.11	9.121	10.169
4/20/2016	8:07:05 AM	:	77	79	76	261	88	0.5	2.4	9.773	0.5	1.6	9.35	30.11	9.661	10.659
4/20/2016	8:08:05 AM	:	77	79	16	260	89	0.5	2.4	10.278	0.5	1.7	9.967	30.11	10.159	11.347
4/20/2016	8:09:05 AM	:	77	79	open	255	89	0.5	2.4	10.846	0.5	1.6	10.589	30.11	10.719	12.066
4/20/2016	8:10:05 AM	:	78	79	open	253	89	0.5	2.4	11.443	0.5	1.6	11.078	30.11	11.307	12.631
4/20/2016	8:11:05 AM	:	78	80	open	256	89	0.5	2.4	12.017	0.5	1.6	11.529	30.11	11.872	13.153
4/20/2016	8:12:05 AM	:	78	80	open	261	90	0.499	2.4	12.57	0.5	1.6	12.04	30.11	12.416	13.742
4/20/2016	8:13:05 AM	:	78	80	open	260	90	0.5	2.4	13.082	0.5	1.6	12.634	30.11	12.92	14.428
4/20/2016	8:14:05 AM	:	79	80	2	255	90	0.499	2.4	13.66	0.5	1.6	13.243	30.11	13.489	15.129
4/20/2016	8:15:05 AM	:	79	80	25	253	91	0.5	2.4	14.26	0.5	1.6	13.745	30.11	14.08	15.68
4/20/2016	8:16:05 AM	:	79	80	open	256	91	0.5	2.4	14.82	0.5	1.6	14.229	30.11	14.63	16.239
4/20/2016	8:17:05 AM	:	79	81	49	260	91	0.5	2.4	15.358	0.5	1.6	14.742	30.11	15.159	16.773
4/20/2016	8:18:05 AM	:	79	81	1	259	92	0.5	2.4	15.891	0.5	1.6	15.273	30.11	15.682	17.386

4/20/2016	8:19:05 AM :	80	81	5	255	92	0.5	2.4	16.484	0.5	1.6	15.858	30.11	16.266	18.054
4/20/2016	8:20:05 AM :	80	81	open	253	92	0.5	2.4	17.085	0.5	1.6	16.431	30.11	16.855	18.716
4/20/2016	8:21:05 AM :	80	81	open	256	93	0.5	2.4	17.643	0.5	1.6	16.951	30.11	17.403	19.317
4/20/2016	8:22:05 AM :	81	82	33	261	93	0.501	2.4	18.15	0.499	1.6	17.419	30.11	17.9	19.821
4/20/2016	8:23:05 AM :	81	82	open	260	93	0.501	2.4	18.714	0.5	1.6	17.901	30.11	18.453	20.378
4/20/2016	8:24:05 AM :	81	82	3	255	94	0.501	2.4	19.299	0.5	1.6	18.496	30.11	19.027	21.061
4/20/2016	8:25:05 AM :	81	82	open	253	94	0.5	2.4	19.935	0.5	1.6	19.151	30.12	19.65	21.819
4/20/2016	8:26:05 AM :	81	82	open	256	94	0.5	2.4	20.457	0.5	1.6	19.636	30.12	20.161	22.38
4/20/2016	8:27:05 AM :	81	83	open	261	95	0.5	2.4	20.948	0.5	1.6	20.07	30.11	20.642	22.88
4/20/2016	8:28:05 AM :	81	83	open	260	95	0.5	2.4	21.512	0.5	1.6	20.566	30.12	21.194	23.454
4/20/2016	8:29:05 AM :	81	83	open	255	95	0.501	2.4	22.12	0.5	1.6	21.204	30.12	21.789	24.192
4/20/2016	8:30:05 AM :	81	83	17	253	96	0.499	2.4	22.75	0.5	1.6	21.808	30.12	22.404	24.864
4/20/2016	8:31:05 AM :	81	84	52	257	96	0.499	2.4	23.27	0.5	1.6	22.291	30.12	22.912	25.366
4/20/2016	8:32:05 AM :	81	84	48	261	96	0.5	2.4	23.767	0.5	1.6	22.756	30.12	23.398	25.852
4/20/2016	8:33:05 AM :	81	84	57	259	96	0.5	2.4	24.308	0.5	1.6	23.302	30.12	23.926	26.413
4/20/2016	8:34:05 AM :	81	85	85	254	97	0.5	2.4	24.947	0.5	1.6	23.849	30.12	24.55	26.947
4/20/2016	8:35:05 AM :	81	85	85	254	97	0.5	2.4	25.572	0.499	1.6	24.436	30.12	25.161	27.519
4/20/2016	8:36:05 AM :	81	85	86	258	97	0.5	2.4	26.1	0.5	1.6	24.982	30.11	25.675	28.05
4/20/2016	8:37:05 AM :	81	85	86	261	97	0.499	2.4	26.582	0.5	1.6	25.497	30.12	26.145	28.552
4/20/2016	8:38:05 AM :	81	86	86	259	98	0.5	2.4	27.106	0.5	1.6	25.984	30.11	26.655	29.027
4/20/2016	8:39:05 AM :	81	86	86	254	98	0.5	2.4	27.774	0.5	1.6	26.497	30.12	27.306	29.525
4/20/2016	8:40:05 AM :	81	86	86	254	98	0.5	2.4	28.386	0.5	1.6	27.096	30.11	27.902	30.108
4/20/2016	8:41:05 AM :	82	86	87	258	98	0.501	2.4	28.921	0.499	1.6	27.702	30.12	28.423	30.697
4/20/2016	8:42:05 AM :	82	86	87	261	99	0.5	2.4	29.397	0.5	1.6	28.206	30.11	28.886	31.187
4/20/2016	8:43:05 AM :	82	87	87	259	99	0.5	2.4	29.926	0.5	1.6	28.675	30.12	29.401	31.642
4/20/2016	8:44:05 AM :	82	87	87	254	99	0.5	2.4	30.576	0.5	1.6	29.166	30.11	30.032	32.119
4/20/2016	8:45:05 AM :	83	87	87	254	99	0.501	2.4	31.214	0.499	1.6	29.774	30.12	30.652	32.71
4/20/2016	8:46:05 AM :	83	87	88	259	100	0.5	2.3	31.738	0.5	1.6	30.416	30.11	31.161	33.332
4/20/2016	8:47:05 AM :	83	88	88	261	100	0.5	2.4	32.229	0.5	1.6	30.912	30.12	31.637	33.813
4/20/2016	8:48:05 AM :	85	88	88	259	101	0.499	2.4	32.761	0.5	1.6	31.357	30.11	32.153	34.245
4/20/2016	8:49:05 AM :	85	88	88	254	101	0.5	2.4	33.379	0.5	1.6	31.863	30.11	32.752	34.735
4/20/2016	8:50:05 AM :	86	88	88	254	101	0.5	2.4	34.037	0.5	1.6	32.494	30.12	33.39	35.346
4/20/2016	8:51:05 AM :	87	89	89	259	101	0.499	2.3	34.552	0.5	1.6	33.108	30.11	33.888	35.941
4/20/2016	8:52:05 AM :	88	89	89	261	102	0.498	2.4	35.06	0.5	1.6	33.599	30.12	34.38	36.416
4/20/2016	8:53:05 AM :	88	89	89	259	102	0.5	2.4	35.59	0.5	1.6	34.072	30.11	34.893	36.873
4/20/2016	8:54:05 AM :	88	89	89	254	102	0.5	2.4	36.2	0.5	1.6	34.613	30.12	35.484	37.397
4/20/2016	8:55:05 AM :	89	89	90	254	102	0.5	2.3	36.833	0.5	1.6	35.17	30.11	36.095	37.935
4/20/2016	8:56:05 AM :	90	90	90	259	103	0.501	2.4	37.367	0.5	1.6	35.769	30.12	36.611	38.514
4/20/2016	8:57:05 AM :	90	90	91	261	103	0.5	2.4	37.885	0.5	1.6	36.315	30.11	37.112	39.041
4/20/2016	8:58:05 AM :	90	90	91	259	103	0.5	2.4	38.428	0.5	1.6	36.821	30.11	37.636	39.529
4/20/2016	8:59:05 AM :	90	91	91	254	104	0.5	2.4	39.046	0.5	1.6	37.324	30.11	38.233	40.014
4/20/2016	9:00:05 AM :	91	91	91	254	104	0.501	2.3	39.635	0.5	1.6	37.86	30.11	38.8	40.53
4/20/2016	9:01:05 AM :	91	91	92	258	104	0.499	2.3	40.194	0.5	1.6	38.453	30.11	39.339	41.102
4/20/2016	9:02:05 AM :	91	91	92	261	104	0.5	2.4	40.7	0.5	1.6	39.038	30.11	39.827	41.666
4/20/2016	9:03:05 AM :	91	92	92	258	105	0.5	2.4	41.275	0.5	1.6	39.571	30.11	40.381	42.178
4/20/2016	9:04:05 AM :	91	92	92	254	105	0.501	2.4	41.875	0.5	1.6	40.048	30.11	40.958	42.637
4/20/2016	9:05:05 AM :	90	93	93	254	105	0.5	2.3	42.445	0.5	1.6	40.534	30.11	41.506	43.104
4/20/2016	9:06:05 AM :	91	93	93	259	105	0.5	2.3	42.99	0.5	1.6	41.135	30.11	42.03	43.682
4/20/2016	9:07:05 AM :	91	93	93	261	106	0.5	2.4	43.52	0.5	1.6	41.796	30.11	42.539	44.317
4/20/2016	9:08:05 AM :	92	93	93	258	106	0.499	2.4	44.11	0.5	1.6	42.289	30.11	43.106	44.791
4/20/2016	9:09:05 AM :	91	94	94	253	106	0.5	2.4	44.717	0.5	1.6	42.747	30.11	43.689	45.231

4/20/2016	9:10:05 AM :	91	94	94	255	106	0.5	2.3	45.28	0.5	1.6	43.252	30.11	44.23	45.715
4/20/2016	9:11:05 AM :	93	94	94	260	107	0.5	2.3	45.786	0.5	1.6	43.87	30.11	44.714	46.307
4/20/2016	9:12:05 AM :	92	94	94	261	107	0.501	2.4	46.349	0.5	1.6	44.498	30.11	45.255	46.91
4/20/2016	9:13:05 AM :	93	95	95	258	107	0.5	2.4	46.933	0.5	1.6	45.007	30.11	45.814	47.397
4/20/2016	9:14:05 AM :	94	95	95	253	107	0.5	2.3	47.572	0.5	1.6	45.463	30.11	46.426	47.834
4/20/2016	9:15:05 AM :	95	95	95	255	108	0.5	2.3	48.096	0.499	1.6	45.972	30.11	46.928	48.32
4/20/2016	9:16:05 AM :	95	95	95	260	108	0.5	2.3	48.589	0.5	1.6	46.592	30.11	47.4	48.914
4/20/2016	9:17:05 AM :	94	95	96	261	108	0.5	2.4	49.151	0.5	1.6	47.212	30.11	47.938	49.507
4/20/2016	9:18:05 AM :	94	96	96	258	108	0.5	2.4	49.76	0.5	1.6	47.71	30.11	48.52	49.983
4/20/2016	9:19:05 AM :	93	96	96	253	109	0.5	2.3	50.393	0.5	1.6	48.193	30.11	49.125	50.444
4/20/2016	9:20:05 AM :	93	96	96	255	109	0.5	2.3	50.919	0.5	1.6	48.737	30.11	49.628	50.964
4/20/2016	9:21:05 AM :	96	96	97	260	109	0.499	2.3	51.417	0.5	1.6	49.29	30.11	50.103	51.492
4/20/2016	9:22:05 AM :	95	97	97	261	109	0.5	2.3	51.949	0.499	1.6	49.894	30.12	50.611	52.068
4/20/2016	9:23:05 AM :	94	97	97	257	110	0.499	2.4	52.597	0.5	1.6	50.444	30.12	51.23	52.593
4/20/2016	9:24:05 AM :	94	97	97	253	110	0.5	2.3	53.216	0.5	1.6	50.953	30.12	51.82	53.078
4/20/2016	9:25:05 AM :	94	97	98	255	110	0.5	2.3	53.759	0.499	1.6	51.458	30.12	52.337	53.559
4/20/2016	9:26:05 AM :	94	98	98	260	110	0.5	2.3	54.239	0.5	1.6	51.998	30.12	52.795	54.073
4/20/2016	9:27:05 AM :	94	98	98	261	110	0.5	2.3	54.759	0.5	1.6	52.591	30.12	53.29	54.637
4/20/2016	9:28:05 AM :	94	98	98	258	111	0.5	2.3	55.42	0.5	1.6	53.178	30.12	53.92	55.196
4/20/2016	9:29:05 AM :	94	98	99	253	111	0.499	2.3	56.049	0.5	1.6	53.718	30.12	54.518	55.709
4/20/2016	9:30:05 AM :	93	99	99	255	111	0.5	2.3	56.582	0.5	1.6	54.196	30.11	55.024	56.164
4/20/2016	9:31:05 AM :	96	99	99	260	111	0.501	2.3	57.063	0.5	1.6	54.689	30.12	55.482	56.632
4/20/2016	9:32:05 AM :	99	99	99	261	111	0.501	2.3	57.603	0.5	1.6	55.298	30.12	55.995	57.21
4/20/2016	9:33:05 AM :	97	99	100	258	111	0.501	2.3	58.222	0.5	1.6	55.939	30.11	56.583	57.819
4/20/2016	9:34:05 AM :	97	100	100	253	112	0.499	2.3	58.878	0.5	1.6	56.446	30.11	57.206	58.3
4/20/2016	9:35:05 AM :	91	100	101	254	112	0.5	2.3	59.4	0.5	1.6	56.922	30.12	57.701	58.752
4/20/2016	9:36:05 AM :	92	101	101	259	112	0.5	2.3	59.912	0.5	1.6	57.419	30.12	58.186	59.222
4/20/2016	9:37:05 AM :	92	101	101	261	112	0.5	2.3	60.434	0.5	1.6	58.027	30.11	58.681	59.798
4/20/2016	9:38:05 AM :	93	101	101	258	112	0.5	2.3	61.039	0.5	1.6	58.681	30.12	59.255	60.418
4/20/2016	9:39:05 AM :	92	101	101	253	112	0.5	2.3	61.69	0.5	1.6	59.185	30.12	59.872	60.895
4/20/2016	9:40:05 AM :	91	101	102	254	112	0.5	2.3	62.219	0.499	1.6	59.64	30.12	60.373	61.326
4/20/2016	9:41:05 AM :	92	102	102	259	112	0.499	2.3	62.736	0.5	1.6	60.143	30.12	60.862	61.802
4/20/2016	9:42:05 AM :	93	102	102	261	112	0.499	2.3	63.269	0.5	1.6	60.786	30.12	61.366	62.411
4/20/2016	9:43:05 AM :	93	102	102	258	112	0.5	2.3	63.891	0.5	1.6	61.405	30.12	61.954	62.995
4/20/2016	9:44:05 AM :	93	102	102	253	112	0.499	2.3	64.492	0.5	1.6	61.915	30.12	62.523	63.478
4/20/2016	9:45:05 AM :	94	102	102	254	112	0.5	2.3	65.048	0.5	1.6	62.388	30.11	63.049	63.925
4/20/2016	9:46:05 AM :	94	102	103	259	112	0.5	2.3	65.555	0.5	1.6	62.901	30.12	63.528	64.41
4/20/2016	9:47:05 AM :	94	103	103	261	112	0.5	2.3	66.129	0.5	1.6	63.496	30.12	64.07	64.972
4/20/2016	9:48:05 AM :	94	103	103	258	112	0.5	2.3	66.727	0.5	1.6	64.124	30.12	64.635	65.566
4/20/2016	9:49:05 AM :	93	103	103	254	112	0.501	2.3	67.299	0.5	1.6	64.636	30.12	65.176	66.048
4/20/2016	9:50:05 AM :	93	103	103	254	112	0.5	2.3	67.854	0.499	1.6	65.127	30.12	65.7	66.512
4/20/2016	9:51:05 AM :	94	103	103	259	112	0.499	2.3	68.382	0.5	1.6	65.674	30.12	66.198	67.028
4/20/2016	9:52:05 AM :	94	103	103	261	112	0.5	2.3	68.967	0.5	1.6	66.216	30.12	66.75	67.54
4/20/2016	9:53:05 AM :	94	103	103	258	112	0.5	2.3	69.569	0.5	1.6	66.817	30.12	67.319	68.107
4/20/2016	9:54:05 AM :	94	103	104	254	112	0.499	2.3	70.138	0.499	1.6	67.378	30.12	67.855	68.636
4/20/2016	9:55:05 AM :	94	104	104	254	112	0.5	2.3	70.654	0.5	1.6	67.9	30.12	68.342	69.128
4/20/2016	9:56:05 AM :	95	104	104	259	112	0.5	2.3	71.212	0.5	1.6	68.398	30.12	68.868	69.598
4/20/2016	9:57:05 AM :	96	104	104	261	112	0.5	2.3	71.797	0.5	1.6	68.93	30.12	69.42	70.1
4/20/2016	9:58:05 AM :	96	104	104	258	112	0.5	2.3	72.435	0.5	1.6	69.529	30.12	70.021	70.664
4/20/2016	9:59:05 AM :	95	104	104	253	112	0.501	2.3	72.966	0.5	1.6	70.122	30.12	70.522	71.223
4/20/2016	10:00:05 AM :	95	104	104	255	112	0.501	2.3	73.465	0.5	1.6	70.665	30.12	70.993	71.735

4/20/2016	10:01:05 AM :	95	104	104	260	113	0.501	2.3	74.028	0.5	1.6	71.143	30.12	71.523	72.186
4/20/2016	10:02:05 AM :	97	104	104	261	113	0.501	2.3	74.639	0.5	1.6	71.637	30.12	72.099	72.651
4/20/2016	10:03:05 AM :	97	104	104	258	113	0.5	2.3	75.272	0.5	1.6	72.243	30.12	72.696	73.222
4/20/2016	10:04:05 AM :	96	104	104	253	113	0.501	2.3	75.806	0.5	1.6	72.896	30.12	73.199	73.838
4/20/2016	10:05:05 AM :	96	104	104	255	113	0.5	2.3	76.306	0.5	1.6	73.403	30.12	73.669	74.315
4/20/2016	10:06:05 AM :	97	105	104	260	113	0.5	2.3	76.833	0.499	1.6	73.878	30.12	74.165	74.762
4/20/2016	10:07:05 AM :	96	105	105	261	113	0.5	2.3	77.489	0.499	1.6	74.374	30.12	74.782	75.229
4/20/2016	10:08:05 AM :	95	105	105	258	113	0.5	2.3	78.107	0.5	1.6	74.982	30.12	75.365	75.801
4/20/2016	10:09:05 AM :	94	105	105	253	113	0.499	2.3	78.65	0.5	1.6	75.642	30.12	75.875	76.423
4/20/2016	10:10:05 AM :	94	105	105	255	113	0.5	2.3	79.13	0.5	1.6	76.152	30.12	76.327	76.903
4/20/2016	10:11:05 AM :	95	105	105	260	113	0.499	2.3	79.657	0.5	1.6	76.607	30.12	76.823	77.331
4/20/2016	10:12:05 AM :	95	105	105	261	113	0.5	2.3	80.305	0.5	1.6	77.108	30.12	77.433	77.803
4/20/2016	10:13:05 AM :	93	105	105	257	113	0.5	2.3	80.947	0.5	1.6	77.752	30.12	78.037	78.408
4/20/2016	10:14:05 AM :	91	105	105	253	113	0.5	2.3	81.477	0.5	1.6	78.371	30.12	78.535	78.991
4/20/2016	10:15:05 AM :	91	105	105	255	113	0.5	2.3	81.974	0.5	1.6	78.885	30.12	79.002	79.475
4/20/2016	10:16:05 AM :	91	105	105	260	113	0.5	2.3	82.509	0.5	1.6	79.356	30.12	79.505	79.918
4/20/2016	10:17:05 AM :	91	105	105	260	113	0.5	2.3	83.118	0.5	1.6	79.869	30.12	80.077	80.4
4/20/2016	10:18:05 AM :	90	105	105	256	113	0.501	2.3	83.784	0.5	1.6	80.474	30.12	80.704	80.97
4/20/2016	10:19:05 AM :	90	105	105	253	113	0.5	2.3	84.302	0.5	1.6	81.099	30.13	81.191	81.558
4/20/2016	10:20:05 AM :	90	105	105	255	113	0.5	2.3	84.818	0.5	1.6	81.607	30.12	81.676	82.036
4/20/2016	10:21:05 AM :	89	105	105	260	113	0.5	2.3	85.35	0.5	1.6	82.099	30.12	82.177	82.5
4/20/2016	10:22:05 AM :	90	105	105	261	113	0.5	2.3	85.967	0.5	1.6	82.641	30.12	82.757	83.01
4/20/2016	10:23:05 AM :	90	105	105	257	113	0.5	2.3	86.589	0.5	1.6	83.197	30.12	83.342	83.532
4/20/2016	10:24:05 AM :	90	105	105	253	113	0.5	2.3	87.139	0.5	1.6	83.81	30.12	83.859	84.108
4/20/2016	10:25:05 AM :	91	106	105	255	112	0.499	2.3	87.655	0.5	1.6	84.361	30.12	84.343	84.626
4/20/2016	10:26:05 AM :	91	106	105	260	112	0.5	2.3	88.218	0.5	1.6	84.871	30.12	84.873	85.106
4/20/2016	10:27:05 AM :	92	106	105	261	112	0.5	2.3	88.823	0.5	1.6	85.387	30.12	85.441	85.591
4/20/2016	10:28:05 AM :	92	106	105	257	112	0.5	2.3	89.399	0.5	1.6	85.927	30.12	85.982	86.099
4/20/2016	10:29:05 AM :	93	106	105	253	112	0.5	2.3	89.959	0.5	1.6	86.517	30.12	86.509	86.655
4/20/2016	10:30:05 AM :	92	106	105	255	112	0.5	2.3	90.482	0.5	1.6	87.1	30.12	87	87.202
4/20/2016	10:31:05 AM :	91	106	105	260	112	0.5	2.3	91.07	0.5	1.6	87.651	30.12	87.552	87.721
4/20/2016	10:32:05 AM :	94	106	105	261	112	0.501	2.3	91.674	0.5	1.6	88.13	30.12	88.12	88.171
4/20/2016	10:33:05 AM :	92	106	105	257	112	0.499	2.3	92.246	0.5	1.6	88.632	30.12	88.657	88.643
4/20/2016	10:34:05 AM :	91	105	105	253	112	0.5	2.3	92.76	0.5	1.6	89.248	30.12	89.14	89.222
4/20/2016	10:35:05 AM :	91	105	105	255	112	0.5	2.3	93.325	0.5	1.6	89.869	30.12	89.671	89.806
4/20/2016	10:36:05 AM :	92	105	107	260	112	0.499	2.3	93.91	0.5	1.6	90.391	30.11	90.221	90.296
4/20/2016	10:37:05 AM :	91	105	105	261	112	0.5	2.3	94.543	0.5	1.6	90.872	30.12	90.816	90.748
4/20/2016	10:38:05 AM :	91	105	105	257	112	0.5	2.3	95.081	0.5	1.6	91.363	30.12	91.322	91.209
4/20/2016	10:39:05 AM :	91	105	105	253	112	0.5	2.3	95.578	0.5	1.6	91.969	30.12	91.79	91.779
4/20/2016	10:40:05 AM :	90	105	105	255	112	0.5	2.3	96.142	0.5	1.6	92.641	30.12	92.32	92.411
4/20/2016	10:41:05 AM :	90	105	105	260	111	0.499	2.3	96.759	0.5	1.6	93.141	30.12	92.9	92.881
4/20/2016	10:42:05 AM :	91	105	105	261	111	0.5	2.3	97.393	0.5	1.6	93.602	30.12	93.496	93.314
4/20/2016	10:43:05 AM :	92	105	105	256	112	0.5	2.3	97.929	0.5	1.6	94.11	30.11	94	93.792
4/20/2016	10:44:05 AM :	93	105	105	253	111	0.5	2.3	98.424	0.5	1.6	94.728	30.11	94.465	94.374
4/20/2016	10:45:05 AM :	93	105	105	255	111	0.501	2.3	98.95	0.5	1.6	95.362	30.11	94.96	94.969
4/20/2016	10:46:05 AM :	94	105	105	261	111	0.5	2.3	99.61	0.5	1.6	95.882	30.12	95.58	95.459
4/20/2016	10:47:05 AM :	94	105	105	261	111	0.5	2.3	100.231	0.5	1.6	96.341	30.12	96.165	95.89
4/20/2016	10:48:05 AM :	94	105	105	257	111	0.5	2.3	100.774	0.5	1.6	96.847	30.12	96.675	96.366
4/20/2016	10:49:05 AM :	94	105	105	253	111	0.5	2.3	101.26	0.5	1.6	97.482	30.12	97.131	96.963
4/20/2016	10:50:05 AM :	94	105	105	255	111	0.5	2.3	101.795	0.5	1.6	98.104	30.12	97.635	97.548
4/20/2016	10:51:05 AM :	94	105	105	260	111	0.5	2.3	102.429	0.5	1.6	98.604	30.12	98.231	98.018

4/20/2016	10:52:05 AM :	94	105	105	261	111	0.5	2.3	103.077	0.5	1.6	99.09	30.12	98.841	98.475
4/20/2016	10:53:05 AM :	93	105	105	257	111	0.5	2.3	103.607	0.5	1.6	99.621	30.12	99.34	98.974
4/20/2016	10:54:05 AM :	93	105	105	253	111	0.5	2.3	104.117	0.5	1.6	100.193	30.12	99.82	99.513
4/20/2016	10:55:05 AM :	93	105	105	255	111	0.499	2.3	104.643	0.5	1.6	100.82	30.12	100.315	100.102
4/20/2016	10:56:05 AM :	93	105	105	260	111	0.501	2.3	105.25	0.5	1.6	101.348	30.12	100.886	100.598
4/20/2016	10:57:05 AM :	93	105	105	260	111	0.5	2.3	105.906	0.5	1.6	101.846	30.12	101.504	101.066
4/20/2016	10:58:05 AM :	94	105	105	256	111	0.501	2.3	106.437	0.5	1.6	102.384	30.12	102.003	101.572
4/20/2016	10:59:05 AM :	93	105	105	253	111	0.5	2.3	106.956	0.5	1.6	102.926	30.12	102.492	102.082
4/20/2016	11:00:05 AM :	94	105	105	255	111	0.5	2.3	107.495	0.5	1.6	103.521	30.12	102.999	102.642
4/20/2016	11:01:05 AM :	94	105	105	260	111	0.5	2.3	108.118	0.5	1.6	104.089	30.11	103.586	103.175
4/20/2016	11:02:05 AM :	96	105	105	261	111	0.5	2.3	108.717	0.5	1.6	104.627	30.11	104.149	103.681
4/20/2016	11:03:05 AM :	101	105	105	257	111	0.501	2.3	109.28	0.5	1.6	105.117	30.11	104.678	104.142
4/20/2016	11:04:05 AM :	107	105	105	253	111	0.5	2.3	109.788	0.5	1.6	105.637	30.11	105.156	104.631
4/20/2016	11:05:05 AM :	109	105	105	255	111	0.5	2.3	110.365	0.5	1.6	106.243	30.11	105.7	105.201
4/20/2016	11:06:05 AM :	113	105	105	260	111	0.5	2.3	110.97	0.5	1.6	106.846	30.11	106.269	105.768
4/20/2016	11:07:05 AM :	121	105	105	261	111	0.501	2.3	111.548	0.5	1.6	107.384	30.11	106.813	106.274
4/20/2016	11:08:05 AM :	123	105	105	257	111	0.5	2.4	112.086	0.5	1.6	107.868	30.12	107.32	106.729
4/20/2016	11:09:05 AM :	119	105	105	253	111	0.5	2.4	112.626	0.5	1.6	108.353	30.12	107.828	107.185
4/20/2016	11:10:05 AM :	120	105	105	256	111	0.501	2.3	113.217	0.5	1.6	108.954	30.12	108.384	107.75
4/20/2016	11:11:05 AM :	134	105	105	261	111	0.5	2.4	113.842	0.5	1.6	109.621	30.12	108.972	108.377
4/20/2016	11:12:05 AM :	144	105	105	261	111	0.5	2.4	114.393	0.5	1.7	110.124	30.12	109.491	108.849
4/20/2016	11:13:05 AM :	141	104	105	257	111	0.501	2.4	114.898	0.5	1.7	110.596	30.12	109.966	109.294
4/20/2016	11:14:05 AM :	138	105	105	253	111	0.501	2.4	115.464	0.5	1.7	111.09	30.11	110.499	109.759
4/20/2016	11:15:05 AM :	135	104	105	256	111	0.5	2.4	116.061	0.499	1.7	111.702	30.11	111.061	110.333
4/20/2016	11:16:05 AM :	131	104	105	261	111	0.5	2.4	116.702	0.5	1.7	112.352	30.11	111.665	110.945
4/20/2016	11:17:05 AM :	127	104	105	261	111	0.5	2.4	117.236	0.5	1.7	112.865	30.11	112.168	111.427
4/20/2016	11:18:05 AM :	149	104	105	258	111	0.5	2.4	117.74	0.5	1.7	113.32	30.11	112.642	111.855
4/20/2016	11:19:05 AM :	192	104	105	253	111	0.5	2.4	118.276	0.5	1.7	113.823	30.11	113.147	112.327
4/20/2016	11:20:05 AM :	200	104	105	256	111	0.499	2.4	118.918	0.499	1.7	114.464	30.11	113.752	112.931
4/20/2016	11:21:05 AM :	190	104	105	261	111	0.5	2.4	119.54	0.499	1.7	115.08	30.11	114.337	113.51
4/20/2016	11:22:05 AM :	180	104	105	262	111	0.501	2.4	120.095	0.5	1.7	115.595	30.11	114.86	113.993
4/20/2016	11:23:05 AM :	212	104	105	259	111	0.5	2.4	120.573	0.5	1.7	116.07	30.11	115.31	114.44
4/20/2016	11:24:05 AM :	204	104	105	254	111	0.501	2.4	121.099	0.5	1.7	116.589	30.11	115.806	114.928
4/20/2016	11:25:05 AM :	187	104	105	255	111	0.5	2.4	121.753	0.5	1.7	117.178	30.12	116.422	115.482
4/20/2016	11:26:05 AM :	170	104	105	261	111	0.5	2.4	122.391	0.5	1.7	117.811	30.12	117.023	116.077
4/20/2016	11:27:05 AM :	161	104	105	262	111	0.5	2.4	122.927	0.5	1.7	118.324	30.12	117.528	116.56
4/20/2016	11:28:05 AM :	155	104	105	259	111	0.5	2.4	123.418	0.5	1.7	118.819	30.12	117.991	117.026
4/20/2016	11:29:05 AM :	150	104	105	255	111	0.5	2.4	123.955	0.5	1.7	119.364	30.11	118.496	117.539
4/20/2016	11:30:05 AM :	148	104	105	255	111	0.5	2.4	124.572	0.5	1.7	119.908	30.11	119.077	118.051
4/20/2016	11:31:05 AM :	145	104	105	260	111	0.5	2.4	125.234	0.5	1.7	120.507	30.11	119.701	118.614
4/20/2016	11:32:05 AM :	140	104	105	262	111	0.5	2.4	125.754	0.5	1.7	121.073	30.11	120.19	119.147
4/20/2016	11:33:05 AM :	138	104	105	260	111	0.5	2.4	126.268	0.5	1.7	121.594	30.11	120.675	119.637
4/20/2016	11:34:05 AM :	135	104	105	255	111	0.5	2.4	126.798	0.5	1.7	122.096	30.11	121.174	120.11
4/20/2016	11:35:05 AM :	133	104	105	254	111	0.501	2.4	127.42	0.5	1.7	122.63	30.11	121.759	120.612
4/20/2016	11:36:05 AM :	130	104	105	259	111	0.5	2.4	128.041	0.5	1.7	123.226	30.11	122.344	121.173
4/20/2016	11:37:05 AM :	127	104	105	262	111	0.5	2.4	128.59	0.5	1.7	123.819	30.11	122.861	121.73
4/20/2016	11:38:05 AM :	125	104	105	260	111	0.5	2.4	129.107	0.5	1.7	124.363	30.11	123.348	122.242
4/20/2016	11:39:05 AM :	123	104	105	255	111	0.5	2.4	129.671	0.5	1.7	124.844	30.11	123.879	122.695
4/20/2016	11:40:05 AM :	117	104	105	254	110	0.5	2.4	130.277	0.5	1.7	125.338	30.11	124.45	123.16
4/20/2016	11:41:05 AM :	107	104	105	259	111	0.5	2.4	130.855	0.5	1.7	125.945	30.11	124.994	123.731
4/20/2016	11:42:05 AM :	105	104	105	262	110	0.5	2.4	131.411	0.5	1.7	126.591	30.11	125.518	124.339

4/20/2016	11:43:05 AM :	102	104	105	260	110	0.5	2.4	131.939	0.5	1.7	127.102	30.11	126.015	124.82
4/20/2016	11:44:05 AM :	100	104	105	255	110	0.5	2.4	132.526	0.5	1.7	127.579	30.11	126.569	125.269
4/20/2016	11:45:05 AM :	104	104	105	254	110	0.499	2.4	133.133	0.5	1.7	128.076	30.11	127.141	125.737
4/20/2016	11:46:05 AM :	104	104	105	258	110	0.5	2.4	133.701	0.5	1.7	128.676	30.11	127.676	126.301
4/20/2016	11:47:05 AM :	102	104	105	261	110	0.499	2.4	134.219	0.5	1.7	129.339	30.11	128.164	126.925
4/20/2016	11:48:05 AM :	102	104	105	260	110	0.5	2.5	134.779	0.5	1.7	129.849	30.11	128.693	127.405
4/20/2016	11:49:05 AM :	101	104	105	255	110	0.5	2.5	135.366	0.5	1.7	130.301	30.11	129.246	127.83
4/20/2016	11:50:05 AM :	100	104	105	253	110	0.5	2.4	136.003	0.5	1.7	130.801	30.11	129.846	128.3
4/20/2016	11:51:05 AM :	100	104	105	258	110	0.5	2.4	136.538	0.5	1.7	131.443	30.11	130.351	128.904
4/20/2016	11:52:05 AM :	101	104	105	261	110	0.5	2.5	137.033	0.5	1.7	132.065	30.11	130.817	129.489
4/20/2016	11:53:05 AM :	102	104	105	260	110	0.499	2.5	137.596	0.5	1.7	132.584	30.11	131.348	129.977
4/20/2016	11:54:05 AM :	100	104	105	255	110	0.5	2.5	138.214	0.5	1.7	133.05	30.11	131.93	130.417
4/20/2016	11:55:05 AM :	100	104	105	254	110	0.499	2.5	138.847	0.5	1.7	133.563	30.11	132.527	130.899
4/20/2016	11:56:05 AM :	99	104	105	258	110	0.5	2.5	139.385	0.5	1.7	134.173	30.11	133.034	131.473
4/20/2016	11:57:05 AM :	98	104	105	261	110	0.5	2.5	139.88	0.5	1.7	134.803	30.11	133.501	132.066
4/20/2016	11:58:05 AM :	101	104	105	260	110	0.5	2.5	140.409	0.5	1.7	135.311	30.1	133.999	132.543
4/20/2016	11:59:05 AM :	105	104	105	255	110	0.499	2.5	141.065	0.5	1.7	135.794	30.1	134.617	132.997
4/20/2016	12:00:05 PM :	104	104	104	254	110	0.5	2.5	141.686	0.5	1.7	136.34	30.1	135.202	133.511
4/20/2016	12:01:05 PM :	101	103	104	258	110	0.5	2.5	142.231	0.5	1.7	136.895	30.1	135.716	134.034
4/20/2016	12:02:05 PM :	99	103	104	262	110	0.501	2.5	142.712	0.5	1.7	137.507	30.1	136.17	134.611
4/20/2016	12:03:05 PM :	98	103	104	260	110	0.5	2.5	143.252	0.5	1.7	138.057	30.1	136.679	135.128
4/20/2016	12:04:05 PM :	98	103	104	255	110	0.499	2.5	143.881	0.5	1.7	138.564	30.1	137.273	135.606
4/20/2016	12:05:05 PM :	103	103	104	253	110	0.501	2.5	144.541	0.5	1.7	139.087	30.1	137.896	136.098
4/20/2016	12:06:05 PM :	103	103	104	258	109	0.5	2.5	145.061	0.5	1.7	139.621	30.1	138.386	136.601
4/20/2016	12:07:05 PM :	102	103	104	261	109	0.499	2.5	145.571	0.5	1.7	140.214	30.09	138.867	137.159
4/20/2016	12:08:05 PM :	102	103	104	260	109	0.5	2.5	146.097	0.5	1.7	140.796	30.09	139.363	137.707
4/20/2016	12:09:05 PM :	102	103	104	255	109	0.499	2.5	146.706	0.5	1.7	141.345	30.09	139.937	138.224
4/20/2016	12:10:05 PM :	100	103	104	253	109	0.499	2.4	147.36	0.5	1.7	141.824	30.09	140.553	138.675
4/20/2016	12:11:05 PM :	99	103	104	258	109	0.5	2.4	147.889	0.5	1.7	142.329	30.09	141.052	139.149
4/20/2016	12:12:05 PM :	96	103	104	261	109	0.5	2.5	148.409	0.5	1.7	142.941	30.09	141.542	139.725
4/20/2016	12:13:05 PM :	95	103	104	260	109	0.501	2.5	148.947	0.5	1.7	143.559	30.09	142.05	140.307
4/20/2016	12:14:05 PM :	95	103	104	255	109	0.5	2.5	149.577	0.499	1.7	144.085	30.1	142.643	140.802
4/20/2016	12:15:05 PM :	95	103	104	253	109	0.5	2.4	150.171	0.5	1.7	144.562	30.09	143.204	141.251
4/20/2016	12:16:05 PM :	95	103	104	258	109	0.501	2.4	150.732	0.5	1.7	145.055	30.09	143.734	141.716
4/20/2016	12:17:05 PM :	95	103	104	261	109	0.5	2.5	151.244	0.499	1.7	145.659	30.09	144.217	142.284
4/20/2016	12:18:05 PM :	96	103	104	260	109	0.5	2.5	151.82	0.5	1.7	146.327	30.09	144.76	142.914
4/20/2016	12:19:05 PM :	95	103	104	255	109	0.5	2.5	152.426	0.5	1.7	146.829	30.09	145.332	143.387
4/20/2016	12:20:05 PM :	96	103	104	253	109	0.499	2.5	153	0.5	1.7	147.286	30.09	145.874	143.817
4/20/2016	12:21:05 PM :	96	103	104	257	109	0.5	2.5	153.537	0.5	1.7	147.79	30.09	146.38	144.292
4/20/2016	12:22:05 PM :	97	103	104	261	109	0.5	2.5	154.082	0.5	1.7	148.416	30.09	146.895	144.882
4/20/2016	12:23:05 PM :	97	103	104	260	109	0.499	2.5	154.671	0.5	1.7	149.048	30.09	147.451	145.477
4/20/2016	12:24:05 PM :	97	103	104	255	109	0.499	2.5	155.289	0.5	1.7	149.562	30.08	148.034	145.961
4/20/2016	12:25:05 PM :	97	103	104	253	109	0.5	2.4	155.844	0.5	1.7	150.027	30.08	148.557	146.399
4/20/2016	12:26:05 PM :	98	103	104	257	109	0.5	2.4	156.349	0.5	1.7	150.532	30.08	149.034	146.875
4/20/2016	12:27:05 PM :	98	103	104	261	109	0.5	2.5	156.914	0.5	1.7	151.162	30.08	149.568	147.468
4/20/2016	12:28:05 PM :	97	103	104	260	109	0.5	2.5	157.515	0.5	1.7	151.784	30.08	150.134	148.054
4/20/2016	12:29:05 PM :	97	103	104	255	109	0.5	2.5	158.15	0.5	1.7	152.288	30.09	150.734	148.529
4/20/2016	12:30:05 PM :	96	103	104	253	109	0.499	2.4	158.684	0.5	1.7	152.773	30.09	151.238	148.986
4/20/2016	12:31:05 PM :	96	103	104	257	109	0.5	2.4	159.19	0.5	1.7	153.308	30.09	151.715	149.49
4/20/2016	12:32:05 PM :	96	103	104	261	109	0.5	2.4	159.726	0.5	1.7	153.871	30.09	152.221	150.02
4/20/2016	12:33:05 PM :	96	103	104	260	109	0.5	2.5	160.373	0.5	1.7	154.494	30.09	152.831	150.606

4/20/2016	12:34:05 PM :	96	103	104	255	109	0.5	2.5	160.992	0.5	1.7	155.029	30.09	153.416	151.111
4/20/2016	12:35:05 PM :	96	103	104	253	109	0.5	2.4	161.541	0.5	1.7	155.532	30.09	153.934	151.584
4/20/2016	12:36:05 PM :	96	103	104	258	109	0.5	2.4	162.021	0.5	1.7	156.059	30.09	154.387	152.082
4/20/2016	12:37:05 PM :	96	103	104	261	109	0.5	2.5	162.545	0.5	1.7	156.606	30.09	154.881	152.596
4/20/2016	12:38:05 PM :	95	103	104	260	109	0.499	2.5	163.199	0.499	1.7	157.19	30.08	155.499	153.147
4/20/2016	12:39:05 PM :	96	103	104	255	109	0.5	2.5	163.837	0.5	1.7	157.76	30.08	156.1	153.683
4/20/2016	12:40:05 PM :	96	103	104	253	109	0.498	2.4	164.376	0.5	1.7	158.309	30.09	156.609	154.2
4/20/2016	12:41:05 PM :	95	103	104	258	109	0.5	2.4	164.867	0.5	1.7	158.794	30.09	157.072	154.657
4/20/2016	12:42:05 PM :	95	103	104	261	109	0.501	2.4	165.399	0.5	1.7	159.306	30.09	157.574	155.14
4/20/2016	12:43:05 PM :	96	103	104	260	110	0.5	2.5	166.02	0.5	1.7	159.92	30.09	158.16	155.718
4/20/2016	12:44:05 PM :	96	103	104	255	109	0.5	2.5	166.682	0.5	1.7	160.528	30.09	158.785	156.291
4/20/2016	12:45:05 PM :	96	103	104	253	110	0.5	2.4	167.2	0.5	1.7	161.058	30.09	159.274	156.79
4/20/2016	12:46:05 PM :	96	103	104	258	110	0.5	2.4	167.717	0.5	1.7	161.541	30.1	159.761	157.245
4/20/2016	12:47:05 PM :	96	103	104	261	110	0.499	2.4	168.243	0.5	1.7	162.027	30.1	160.258	157.703
4/20/2016	12:48:05 PM :	96	103	104	260	110	0.501	2.5	168.864	0.5	1.7	162.63	30.09	160.844	158.271
4/20/2016	12:49:05 PM :	96	103	104	255	110	0.501	2.5	169.489	0.5	1.7	163.305	30.09	161.435	158.907
4/20/2016	12:50:05 PM :	96	103	104	253	110	0.5	2.5	170.04	0.5	1.7	163.805	30.09	161.955	159.378
4/20/2016	12:51:05 PM :	96	103	104	257	110	0.499	2.4	170.555	0.5	1.7	164.27	30.1	162.441	159.816
4/20/2016	12:52:05 PM :	96	103	104	261	110	0.499	2.5	171.119	0.5	1.7	164.773	30.1	162.973	160.291
4/20/2016	12:53:05 PM :	96	103	104	260	110	0.501	2.5	171.726	0.5	1.7	165.388	30.09	163.545	160.869
4/20/2016	12:54:05 PM :	96	103	104	255	110	0.5	2.5	172.305	0.5	1.7	166.036	30.09	164.092	161.48
4/20/2016	12:55:05 PM :	96	103	104	253	110	0.5	2.5	172.86	0.5	1.7	166.545	30.09	164.616	161.959
4/20/2016	12:56:05 PM :	96	103	104	258	110	0.5	2.4	173.382	0.5	1.7	167.002	30.09	165.109	162.39
4/20/2016	12:57:05 PM :	97	103	104	261	111	0.5	2.5	173.973	0.5	1.7	167.507	30.09	165.666	162.865
4/20/2016	12:58:05 PM :	97	103	104	260	111	0.499	2.5	174.577	0.5	1.7	168.15	30.09	166.236	163.471
4/20/2016	12:59:05 PM :	96	103	104	255	111	0.5	2.5	175.149	0.5	1.7	168.768	30.08	166.775	164.053
4/20/2016	1:00:05 PM :	97	103	104	253	111	0.5	2.5	175.665	0.5	1.7	169.277	30.08	167.262	164.531
4/20/2016	1:01:05 PM :	98	103	104	258	111	0.499	2.5	176.224	0.5	1.7	169.758	30.09	167.789	164.984
4/20/2016	1:02:05 PM :	97	103	104	261	111	0.5	2.5	176.807	0.499	1.7	170.277	30.09	168.339	165.473
4/20/2016	1:03:05 PM :	97	103	104	260	111	0.5	2.5	177.444	0.5	1.7	170.862	30.09	168.939	166.023
4/20/2016	1:04:05 PM :	98	103	104	255	111	0.5	2.5	177.978	0.5	1.7	171.492	30.08	169.442	166.616
4/20/2016	1:05:05 PM :	98	103	104	254	111	0.5	2.5	178.477	0.5	1.7	172.014	30.08	169.913	167.107
4/20/2016	1:06:05 PM :	98	103	104	258	111	0.5	2.5	179.039	0.5	1.7	172.511	30.08	170.442	167.575
4/20/2016	1:07:05 PM :	98	103	104	261	111	0.499	2.5	179.651	0.5	1.7	173.052	30.08	171.019	168.084
4/20/2016	1:08:05 PM :	98	103	104	260	111	0.5	2.5	180.286	0.5	1.7	173.596	30.08	171.618	168.595
4/20/2016	1:09:05 PM :	97	103	104	255	111	0.5	2.5	180.815	0.5	1.7	174.194	30.08	172.117	169.158
4/20/2016	1:10:05 PM :	97	103	105	253	112	0.5	2.5	181.315	0.5	1.7	174.761	30.08	172.587	169.691
4/20/2016	1:11:05 PM :	97	104	105	258	112	0.5	2.5	181.847	0.5	1.7	175.284	30.08	173.088	170.183
4/20/2016	1:12:05 PM :	97	104	105	261	112	0.5	2.5	182.501	0.5	1.7	175.786	30.08	173.704	170.655
4/20/2016	1:13:05 PM :	97	104	105	260	112	0.5	2.5	183.12	0.5	1.7	176.322	30.08	174.288	171.159
4/20/2016	1:14:05 PM :	97	104	105	255	112	0.5	2.5	183.662	0.5	1.7	176.918	30.08	174.798	171.719
4/20/2016	1:15:05 PM :	97	104	105	253	111	0.499	2.5	184.147	0.5	1.7	177.513	30.08	175.255	172.278
4/20/2016	1:16:05 PM :	97	104	105	258	111	0.5	2.5	184.675	0.5	1.7	178.057	30.08	175.752	172.789
4/20/2016	1:17:05 PM :	97	104	105	261	111	0.5	2.5	185.318	0.5	1.7	178.538	30.08	176.357	173.241
4/20/2016	1:18:05 PM :	97	104	105	260	111	0.5	2.5	185.961	0.499	1.7	179.03	30.08	176.963	173.704
4/20/2016	1:19:05 PM :	97	104	105	255	111	0.5	2.5	186.49	0.5	1.7	179.638	30.08	177.461	174.275
4/20/2016	1:20:05 PM :	97	104	105	253	111	0.5	2.5	186.985	0.499	1.7	180.282	30.08	177.927	174.88
4/20/2016	1:21:05 PM :	97	104	105	257	111	0.5	2.5	187.519	0.5	1.7	180.794	30.08	178.43	175.362
4/20/2016	1:22:05 PM :	97	104	105	261	111	0.5	2.5	188.136	0.5	1.7	181.275	30.08	179.011	175.814
4/20/2016	1:23:05 PM :	97	104	105	260	111	0.501	2.5	188.793	0.5	1.7	181.767	30.08	179.629	176.277
4/20/2016	1:24:05 PM :	97	104	105	256	111	0.499	2.5	189.315	0.5	1.7	182.372	30.08	180.121	176.845

4/20/2016	1:25:05 PM :	96	104	105	253	110	0.5	2.5	189.831	0.5	1.7	183.037	30.07	180.607	177.47
4/20/2016	1:26:05 PM :	96	104	104	256	110	0.5	2.5	190.361	0.5	1.7	183.544	30.08	181.106	177.947
4/20/2016	1:27:05 PM :	96	103	104	261	110	0.5	2.5	190.988	0.5	1.7	184.003	30.08	181.697	178.379
4/20/2016	1:28:05 PM :	95	103	104	261	110	0.5	2.5	191.603	0.5	1.7	184.508	30.07	182.276	178.853
4/20/2016	1:29:05 PM :	95	103	104	256	110	0.5	2.5	192.153	0.5	1.7	185.139	30.08	182.795	179.447
4/20/2016	1:30:05 PM :	94	103	104	253	110	0.501	2.5	192.666	0.5	1.7	185.767	30.08	183.278	180.038
4/20/2016	1:31:05 PM :	94	103	104	256	109	0.5	2.5	193.233	0.5	1.7	186.285	30.07	183.813	180.525
4/20/2016	1:32:05 PM :	94	103	104	261	109	0.5	2.5	193.834	0.5	1.7	186.749	30.08	184.379	180.961
4/20/2016	1:33:05 PM :	94	103	104	260	109	0.499	2.5	194.412	0.5	1.7	187.26	30.08	184.923	181.443
4/20/2016	1:34:05 PM :	94	103	104	256	109	0.5	2.5	194.968	0.5	1.7	187.873	30.07	185.448	182.02
4/20/2016	1:35:05 PM :	94	103	104	253	109	0.5	2.5	195.496	0.5	1.7	188.507	30.08	185.946	182.616
4/20/2016	1:36:05 PM :	94	103	104	257	109	0.5	2.5	196.083	0.5	1.7	189.007	30.07	186.499	183.087
4/20/2016	1:37:05 PM :	94	103	104	261	109	0.5	2.5	196.691	0.5	1.7	189.492	30.06	187.073	183.544
4/20/2016	1:38:05 PM :	94	103	104	260	108	0.5	2.5	197.263	0.5	1.7	190.035	30.07	187.612	184.055
4/20/2016	1:39:05 PM :	92	103	104	255	108	0.501	2.5	197.778	0.5	1.7	190.593	30.07	188.098	184.58
4/20/2016	1:40:05 PM :	91	103	103	253	108	0.5	2.5	198.342	0.5	1.7	191.21	30.06	188.629	185.162
4/20/2016	1:41:05 PM :	93	103	103	257	108	0.5	2.5	198.93	0.5	1.7	191.756	30.07	189.183	185.676
4/20/2016	1:42:05 PM :	93	102	103	261	108	0.5	2.5	199.566	0.5	1.7	192.263	30.07	189.784	186.153
4/20/2016	1:43:05 PM :	93	102	103	260	108	0.5	2.5	200.1	0.499	1.7	192.78	30.07	190.288	186.641
4/20/2016	1:44:05 PM :	93	102	103	255	107	0.5	2.5	200.603	0.5	1.7	193.326	30.07	190.763	187.156
4/20/2016	1:45:05 PM :	93	102	103	253	107	0.499	2.5	201.153	0.5	1.7	193.915	30.07	191.282	187.71
4/20/2016	1:46:05 PM :	93	102	103	257	107	0.501	2.5	201.779	0.5	1.7	194.491	30.06	191.873	188.254
4/20/2016	1:47:05 PM :	93	102	103	261	107	0.499	2.5	202.413	0.5	1.7	195.04	30.07	192.471	188.771
4/20/2016	1:48:05 PM :	93	102	103	260	107	0.5	2.5	202.95	0.5	1.7	195.523	30.07	192.978	189.226
4/20/2016	1:49:05 PM :	93	102	103	255	107	0.5	2.5	203.445	0.5	1.7	196.036	30.07	193.446	189.71
4/20/2016	1:50:05 PM :	93	102	103	253	107	0.5	2.5	203.971	0.5	1.7	196.645	30.07	193.943	190.285
4/20/2016	1:51:05 PM :	94	102	103	257	107	0.501	2.5	204.627	0.5	1.7	197.259	30.06	194.563	190.864
4/20/2016	1:52:05 PM :	94	102	102	261	107	0.499	2.5	205.25	0.499	1.7	197.783	30.06	195.152	191.358
4/20/2016	1:53:05 PM :	94	102	102	260	107	0.501	2.5	205.795	0.5	1.7	198.266	30.06	195.667	191.814
4/20/2016	1:54:05 PM :	94	102	102	255	107	0.5	2.5	206.28	0.5	1.7	198.754	30.07	196.125	192.275
4/20/2016	1:55:05 PM :	95	101	102	253	107	0.501	2.5	206.818	0.5	1.7	199.357	30.06	196.634	192.844
4/20/2016	1:56:05 PM :	96	101	102	257	107	0.5	2.5	207.45	0.5	1.7	200.034	30.06	197.231	193.483
4/20/2016	1:57:05 PM :	96	101	102	261	107	0.5	2.5	208.104	0.5	1.7	200.528	30.06	197.849	193.949
4/20/2016	1:58:05 PM :	96	101	102	260	108	0.501	2.5	208.628	0.5	1.7	200.992	30.07	198.345	194.387
4/20/2016	1:59:05 PM :	96	101	102	256	108	0.499	2.5	209.14	0.5	1.7	201.498	30.07	198.829	194.865
4/20/2016	2:00:05 PM :	96	101	102	253	108	0.5	2.5	209.668	0.5	1.7	202.117	30.07	199.328	195.45
4/20/2016	2:01:05 PM :	97	101	102	257	108	0.5	2.5	210.281	0.5	1.7	202.756	30.07	199.908	196.052
4/20/2016	2:02:05 PM :	97	101	102	261	108	0.5	2.5	210.927	0.5	1.7	203.27	30.07	200.519	196.537
4/20/2016	2:03:05 PM :	97	101	102	260	108	0.5	2.5	211.464	0.5	1.7	203.729	30.07	201.026	196.971
4/20/2016	2:04:05 PM :	97	101	102	255	108	0.499	2.5	211.981	0.5	1.7	204.233	30.07	201.515	197.447
4/20/2016	2:05:05 PM :	97	101	102	253	108	0.499	2.5	212.526	0.5	1.7	204.865	30.07	202.031	198.043
4/20/2016	2:06:05 PM :	97	101	102	258	108	0.5	2.5	213.145	0.5	1.7	205.491	30.07	202.617	198.634
4/20/2016	2:07:05 PM :	97	101	102	261	109	0.501	2.5	213.736	0.5	1.7	205.994	30.07	203.175	199.108
4/20/2016	2:08:05 PM :	97	101	102	260	109	0.5	2.5	214.295	0.5	1.7	206.479	30.06	203.703	199.566
4/20/2016	2:09:05 PM :	97	101	102	255	109	0.5	2.5	214.809	0.5	1.7	207.006	30.07	204.19	200.064
4/20/2016	2:10:05 PM :	97	101	102	253	109	0.501	2.5	215.39	0.5	1.7	207.582	30.07	204.74	200.607
4/20/2016	2:11:05 PM :	97	101	102	258	109	0.501	2.5	215.997	0.5	1.7	208.211	30.06	205.313	201.202
4/20/2016	2:12:05 PM :	97	101	102	261	109	0.499	2.5	216.574	0.5	1.7	208.739	30.07	205.859	201.7
4/20/2016	2:13:05 PM :	97	101	102	260	109	0.5	2.5	217.102	0.5	1.7	209.234	30.08	206.359	202.167
4/20/2016	2:14:05 PM :	97	101	102	255	110	0.5	2.5	217.649	0.5	1.7	209.771	30.07	206.876	202.674
4/20/2016	2:15:05 PM :	97	101	103	253	110	0.5	2.5	218.236	0.5	1.7	210.311	30.07	207.431	203.183

4/20/2016	2:16:05 PM :	97	102	103	258	110	0.5	2.5	218.871	0.499	1.7	210.91	30.08	208.031	203.748
4/20/2016	2:17:05 PM :	97	102	103	262	110	0.499	2.5	219.412	0.5	1.7	211.479	30.08	208.543	204.285
4/20/2016	2:18:05 PM :	97	102	103	261	110	0.5	2.5	219.909	0.5	1.7	212.011	30.08	209.012	204.787
4/20/2016	2:19:05 PM :	98	102	103	256	110	0.501	2.5	220.476	0.5	1.7	212.505	30.08	209.548	205.253
4/20/2016	2:20:05 PM :	98	102	103	253	110	0.5	2.5	221.081	0.5	1.7	213.033	30.08	210.119	205.751
4/20/2016	2:21:05 PM :	98	102	103	256	110	0.5	2.5	221.715	0.5	1.7	213.634	30.07	210.719	206.318
4/20/2016	2:22:05 PM :	98	102	103	261	110	0.5	2.5	222.247	0.5	1.7	214.234	30.07	211.221	206.884
4/20/2016	2:23:05 PM :	98	102	103	261	110	0.5	2.5	222.75	0.499	1.7	214.772	30.07	211.697	207.391
4/20/2016	2:24:05 PM :	98	102	103	256	110	0.501	2.5	223.285	0.5	1.7	215.257	30.07	212.202	207.848
4/20/2016	2:25:05 PM :	98	102	103	253	111	0.5	2.5	223.932	0.5	1.7	215.743	30.07	212.814	208.306
4/20/2016	2:26:05 PM :	98	102	103	256	111	0.5	2.5	224.552	0.5	1.7	216.348	30.07	213.399	208.876
4/20/2016	2:27:05 PM :	98	102	103	261	111	0.501	2.5	225.099	0.5	1.7	217.011	30.07	213.915	209.501
4/20/2016	2:28:05 PM :	98	102	103	261	111	0.5	2.5	225.58	0.5	1.7	217.513	30.07	214.369	209.974
4/20/2016	2:29:05 PM :	98	102	103	257	111	0.5	2.5	226.102	0.5	1.7	217.986	30.07	214.862	210.42
4/20/2016	2:30:05 PM :	98	102	103	253	111	0.499	2.5	226.755	0.5	1.7	218.485	30.07	215.478	210.89
4/20/2016	2:31:05 PM :	98	102	103	255	111	0.501	2.5	227.395	0.5	1.7	219.097	30.07	216.083	211.467
4/20/2016	2:32:05 PM :	97	102	103	261	111	0.5	2.5	227.931	0.5	1.7	219.749	30.07	216.589	212.081
4/20/2016	2:33:05 PM :	97	102	103	261	111	0.501	2.5	228.423	0.5	1.7	220.26	30.07	217.053	212.563
4/20/2016	2:34:05 PM :	97	103	104	256	111	0.5	2.5	228.955	0.5	1.7	220.716	30.07	217.555	212.992
4/20/2016	2:35:05 PM :	96	103	104	253	111	0.5	2.5	229.576	0.499	1.7	221.216	30.07	218.14	213.463
4/20/2016	2:36:05 PM :	96	103	104	256	111	0.499	2.5	230.234	0.5	1.7	221.856	30.07	218.761	214.065
4/20/2016	2:37:05 PM :	96	103	104	261	111	0.5	2.5	230.754	0.5	1.7	222.478	30.07	219.251	214.651
4/20/2016	2:38:05 PM :	95	103	104	261	110	0.501	2.5	231.272	0.5	1.7	222.994	30.06	219.74	215.137
4/20/2016	2:39:05 PM :	95	103	104	256	110	0.5	2.5	231.8	0.5	1.7	223.469	30.06	220.238	215.584
4/20/2016	2:40:05 PM :	95	103	104	253	110	0.5	2.5	232.414	0.5	1.7	223.982	30.06	220.816	216.066
4/20/2016	2:41:05 PM :	95	103	104	256	110	0.5	2.5	233.047	0.5	1.7	224.584	30.06	221.413	216.633
4/20/2016	2:42:05 PM :	95	103	104	261	110	0.5	2.5	233.588	0.5	1.7	225.212	30.06	221.923	217.224
4/20/2016	2:43:05 PM :	94	103	104	260	110	0.5	2.5	234.104	0.5	1.7	225.723	30.06	222.41	217.705
4/20/2016	2:44:05 PM :	94	103	104	256	110	0.499	2.5	234.663	0.5	1.7	226.215	30.06	222.937	218.168
4/20/2016	2:45:05 PM :	94	103	104	253	109	0.5	2.5	235.273	0.5	1.7	226.76	30.06	223.512	218.68
4/20/2016	2:46:05 PM :	94	103	104	256	109	0.5	2.5	235.855	0.5	1.7	227.31	30.06	224.06	219.198
4/20/2016	2:47:05 PM :	94	103	104	261	109	0.499	2.5	236.411	0.5	1.7	227.914	30.06	224.585	219.767
4/20/2016	2:48:05 PM :	94	103	104	260	109	0.5	2.5	236.935	0.5	1.7	228.475	30.06	225.078	220.295
4/20/2016	2:49:05 PM :	94	103	103	256	109	0.5	2.5	237.518	0.5	1.7	228.985	30.06	225.629	220.776
4/20/2016	2:50:05 PM :	95	102	103	253	109	0.5	2.5	238.127	0.5	1.7	229.5	30.05	226.203	221.26
4/20/2016	2:51:05 PM :	94	102	103	256	109	0.501	2.5	238.701	0.5	1.7	230.038	30.05	226.744	221.767
4/20/2016	2:52:05 PM :	94	102	103	261	108	0.5	2.5	239.221	0.5	1.7	230.632	30.05	227.235	222.326
4/20/2016	2:53:05 PM :	93	102	103	260	108	0.5	2.5	239.779	0.5	1.7	231.216	30.05	227.762	222.876
4/20/2016	2:54:05 PM :	93	102	103	256	108	0.501	2.5	240.366	0.5	1.7	231.764	30.05	228.315	223.392
4/20/2016	2:55:05 PM :	93	102	103	253	108	0.501	2.5	241.009	0.5	1.7	232.247	30.05	228.922	223.847
4/20/2016	2:56:05 PM :	93	102	103	256	108	0.5	2.5	241.54	0.5	1.7	232.752	30.05	229.423	224.322
4/20/2016	2:57:05 PM :	93	102	103	261	108	0.5	2.5	242.039	0.5	1.8	233.364	30.04	229.894	224.899
4/20/2016	2:58:05 PM :	93	102	103	260	108	0.5	2.5	242.602	0.5	1.8	233.99	30.04	230.425	225.489
4/20/2016	2:59:05 PM :	93	102	103	255	108	0.5	2.5	243.224	0.5	1.8	234.508	30.05	231.012	225.977
4/20/2016	3:00:05 PM :	93	102	103	253	108	0.5	2.5	243.853	0.5	1.8	234.989	30.05	231.606	226.43
4/20/2016	3:01:05 PM :	93	102	103	256	108	0.499	2.5	244.392	0.5	1.7	235.481	30.05	232.114	226.894
4/20/2016	3:02:05 PM :	93	102	103	261	107	0.499	2.5	244.889	0.5	1.8	236.09	30.04	232.584	227.468
4/20/2016	3:03:05 PM :	93	102	103	260	107	0.5	2.5	245.417	0.5	1.8	236.759	30.04	233.082	228.098
4/20/2016	3:04:05 PM :	93	102	103	255	107	0.5	2.5	246.075	0.5	1.8	237.259	30.04	233.704	228.569
4/20/2016	3:05:05 PM :	93	102	103	253	107	0.5	2.5	246.697	0.5	1.8	237.717	30.05	234.29	229.001
4/20/2016	3:06:05 PM :	92	101	102	257	107	0.5	2.5	247.244	0.5	1.8	238.228	30.05	234.807	229.483

4/20/2016	3:07:05 PM :	92	101	102	261	107	0.5	2.5	247.728	0.5	1.8	238.846	30.04	235.264	230.066
4/20/2016	3:08:05 PM :	91	101	102	259	107	0.501	2.5	248.267	0.5	1.8	239.483	30.04	235.774	230.666
4/20/2016	3:09:05 PM :	91	101	102	254	107	0.5	2.5	248.9	0.5	1.8	240.002	30.04	236.372	231.156
4/20/2016	3:10:05 PM :	91	101	102	253	107	0.5	2.5	249.558	0.5	1.7	240.464	30.04	236.994	231.592
4/20/2016	3:11:05 PM :	91	101	102	258	107	0.5	2.5	250.078	0.5	1.7	240.971	30.04	237.485	232.07
4/20/2016	3:12:05 PM :	92	101	102	261	107	0.5	2.5	250.594	0.5	1.8	241.6	30.04	237.973	232.663
4/20/2016	3:13:05 PM :	92	101	102	259	107	0.5	2.5	251.12	0.5	1.8	242.226	30.04	238.471	233.255
4/20/2016	3:14:05 PM :	92	101	102	254	107	0.5	2.5	251.734	0.5	1.8	242.73	30.04	239.051	233.731
4/20/2016	3:15:05 PM :	93	101	102	253	107	0.501	2.5	252.379	0.5	1.7	243.217	30.04	239.661	234.19
4/20/2016	3:16:05 PM :	93	101	102	258	107	0.5	2.5	252.92	0.499	1.7	243.745	30.04	240.173	234.689
4/20/2016	3:17:05 PM :	93	101	102	261	107	0.5	2.5	253.432	0.5	1.8	244.316	30.04	240.657	235.227
4/20/2016	3:18:05 PM :	93	101	102	259	107	0.5	2.5	253.985	0.5	1.8	244.944	30.04	241.18	235.82
4/20/2016	3:19:05 PM :	93	101	102	254	108	0.501	2.5	254.607	0.5	1.8	245.474	30.04	241.769	236.32
4/20/2016	3:20:05 PM :	93	101	102	253	108	0.5	2.5	255.192	0.5	1.7	245.97	30.04	242.322	236.789
4/20/2016	3:21:05 PM :	94	101	102	258	108	0.501	2.5	255.751	0.5	1.7	246.506	30.05	242.85	237.295
4/20/2016	3:22:05 PM :	94	101	102	261	108	0.5	2.5	256.273	0.5	1.8	247.052	30.04	243.344	237.81
4/20/2016	3:23:05 PM :	94	101	102	259	108	0.5	2.5	256.855	0.5	1.8	247.648	30.05	243.894	238.373
4/20/2016	3:24:05 PM :	94	101	102	254	109	0.5	2.5	257.461	0.5	1.8	248.215	30.05	244.468	238.908
4/20/2016	3:25:05 PM :	94	101	102	254	109	0.501	2.5	258.037	0.5	1.8	248.747	30.04	245.012	239.41
4/20/2016	3:26:05 PM :	94	101	102	259	109	0.5	2.5	258.558	0.5	1.8	249.242	30.05	245.505	239.878
4/20/2016	3:27:05 PM :	94	101	102	261	109	0.5	2.5	259.115	0.5	1.8	249.77	30.04	246.031	240.376
4/20/2016	3:28:05 PM :	94	101	102	259	109	0.5	2.5	259.704	0.5	1.8	250.374	30.05	246.589	240.946
4/20/2016	3:29:05 PM :	94	101	102	254	110	0.501	2.5	260.341	0.5	1.8	250.975	30.05	247.191	241.513
4/20/2016	3:30:05 PM :	94	101	102	254	110	0.499	2.5	260.873	0.5	1.8	251.513	30.05	247.694	242.021
4/20/2016	3:31:05 PM :	94	101	102	259	110	0.501	2.5	261.374	0.5	1.8	251.995	30.05	248.168	242.475
4/20/2016	3:32:05 PM :	94	101	102	261	110	0.5	2.5	261.935	0.5	1.8	252.49	30.05	248.699	242.942
4/20/2016	3:33:05 PM :	94	101	102	259	110	0.5	2.6	262.55	0.5	1.8	253.096	30.05	249.281	243.514
4/20/2016	3:34:05 PM :	94	101	102	254	110	0.5	2.5	263.185	0.5	1.8	253.75	30.05	249.881	244.131
4/20/2016	3:35:05 PM :	94	101	102	254	110	0.5	2.5	263.716	0.5	1.8	254.258	30.05	250.383	244.61
4/20/2016	3:36:05 PM :	94	101	102	259	110	0.5	2.5	264.215	0.5	1.8	254.731	30.04	250.854	245.056
4/20/2016	3:37:05 PM :	94	101	103	261	110	0.5	2.5	264.747	0.5	1.8	255.229	30.05	251.357	245.526
4/20/2016	3:38:05 PM :	94	101	103	259	110	0.499	2.6	265.404	0.5	1.8	255.839	30.05	251.977	246.101
4/20/2016	3:39:05 PM :	94	101	103	254	111	0.501	2.5	266.021	0.5	1.8	256.499	30.04	252.561	246.723
4/20/2016	3:40:05 PM :	94	101	103	254	111	0.499	2.5	266.563	0.5	1.8	257.01	30.04	253.073	247.205
4/20/2016	3:41:05 PM :	94	102	103	259	111	0.5	2.5	267.046	0.499	1.8	257.464	30.04	253.529	247.632
4/20/2016	3:42:05 PM :	94	102	103	261	111	0.498	2.5	267.574	0.5	1.8	257.966	30.05	254.027	248.105
4/20/2016	3:43:05 PM :	94	102	103	259	111	0.5	2.5	268.22	0.5	1.8	258.606	30.04	254.637	248.708
4/20/2016	3:44:05 PM :	94	102	103	254	111	0.5	2.5	268.862	0.5	1.8	259.232	30.04	255.243	249.298
4/20/2016	3:45:05 PM :	95	102	103	253	111	0.5	2.5	269.395	0.5	1.8	259.749	30.04	255.746	249.784
4/20/2016	3:46:05 PM :	95	102	103	258	111	0.5	2.5	269.892	0.5	1.8	260.215	30.04	256.215	250.224
4/20/2016	3:47:05 PM :	95	102	103	261	112	0.5	2.5	270.422	0.5	1.8	260.728	30.04	256.715	250.706
4/20/2016	3:48:05 PM :	96	102	103	259	112	0.5	2.6	271.037	0.5	1.8	261.344	30.04	257.296	251.286
4/20/2016	3:49:05 PM :	96	102	103	254	112	0.5	2.5	271.695	0.5	1.8	261.971	30.04	257.917	251.877
4/20/2016	3:49:50 PM :	96	102	103	254	112	0.5	2.5	272.093	0.5	1.8	262.349	30.04	258.292	252.232

```
'
'-------------------------- LOGGED EVENTS ----------------------------------
04/20/16 7:09:46 AM: Test START
04/20/16 7:09:55 AM: Test Paused by User
04/20/16 7:09:55 AM: PAUSE_EVENT [Manual Pause]
04/20/16 7:10:01 AM: TestResumed
04/20/16 7:10:10 AM: Test Paused by User
```

```
04/20/16 7:10:10 AM: PAUSE_EVENT [Manual Pause]
04/20/16 7:50:06 AM: TestResumed
04/20/16 3:49:50 PM: Actual Sampling Time: 0d  8h  0m  0s
04/20/16 3:49:50 PM: Test END
04/20/16 04:30:19 PM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/20/16 04:30:19 PM: Maximum Observed Vacuum for A was 2.6 inHg
04/20/16 04:30:19 PM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/20/16 04:30:19 PM: Maximum Observed Vacuum for B was 1.8 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'          DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'            RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 4 Day.pro
File Exported: 4/30/2016 12:24:37 AM (PC Time).
Company Name: Cuba

04/20/16 04:47:40 PM: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 13 ccm (Max. allowed 20 ccm)
04/20/16 04:47:40 PM: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 6 ccm (Max. allowed 20 ccm)
Trap ID-A: OL343556
Trap ID-B: spiked OL335480

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 23h 12m
Averaging Period : 1 min.

Run D4

		Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES		**124**	**102.1**	**100.8**	**258.1**	**110.4**	**0.496**	**4.2**	**266.885**	**0.5**	**1.9**	**262.025**	**30.1**	**252.384**	**249.872**
4/20/2016	4:50:20 PM :	91	103	103	255	109	0	0.2	0	0	0	0	30.02	0	0
4/20/2016	4:50:26 PM :User Paused	91	102	103	256	109	0.909	2	0.148	0.745	1.3	0.097	30.02	0.14	0.091
4/21/2016	8:01:24 AM :Resumed	80	83	93	263	90	0	0.3	0.148	0	0	0.1	30.12	0.14	0.094
4/21/2016	8:02:23 AM :	81	84	open	261	92	0.593	2	0.666	0.565	1.5	0.635	30.11	0.646	0.713
4/21/2016	8:03:23 AM :	80	82	open	258	90	0.5	2.3	1.161	0.5	1.8	1.167	30.12	1.131	1.327
4/21/2016	8:04:23 AM :	80	82	open	253	90	0.501	2.4	1.673	0.5	1.8	1.745	30.12	1.633	1.995
4/21/2016	8:05:23 AM :	80	82	open	254	90	0.5	2.4	2.274	0.5	1.8	2.361	30.12	2.222	2.707
4/21/2016	8:06:23 AM :	81	82	51	260	91	0.5	2.4	2.924	0.501	1.8	2.926	30.12	2.86	3.295
4/21/2016	8:07:23 AM :	81	82	open	262	91	0.499	2.4	3.435	0.5	1.8	3.444	30.11	3.361	3.893
4/21/2016	8:08:23 AM :	81	82	81	259	91	0.501	2.4	3.939	0.5	1.8	3.935	30.12	3.855	4.375
4/21/2016	8:09:23 AM :	81	82	72	254	91	0.5	2.4	4.467	0.5	1.8	4.455	30.11	4.372	4.894
4/21/2016	8:10:23 AM :	81	83	83	254	91	0.501	2.4	5.076	0.5	1.7	5.049	30.12	4.968	5.476
4/21/2016	8:11:23 AM :	81	83	82	259	91	0.499	2.4	5.711	0.5	1.7	5.649	30.11	5.59	6.064
4/21/2016	8:12:23 AM :	81	83	77	261	92	0.5	2.4	6.238	0.5	1.8	6.156	30.11	6.105	6.565
4/21/2016	8:13:23 AM :	81	83	9	258	92	0.5	2.4	6.753	0.5	1.8	6.628	30.11	6.61	7.1
4/21/2016	8:14:23 AM :	81	83	84	253	92	0.5	2.4	7.286	0.5	1.7	7.114	30.11	7.131	7.575
4/21/2016	8:15:23 AM :	81	83	62	255	92	0.5	2.4	7.912	0.5	1.7	7.719	30.11	7.742	8.191
4/21/2016	8:16:23 AM :	82	83	84	260	92	0.5	2.4	8.503	0.5	1.8	8.362	30.11	8.32	8.82
4/21/2016	8:17:23 AM :	82	83	84	261	93	0.499	2.4	9.056	0.5	1.8	8.854	30.11	8.861	9.301
4/21/2016	8:18:23 AM :	82	84	63	258	93	0.499	2.4	9.562	0.5	1.8	9.3	30.11	9.355	9.754
4/21/2016	8:19:23 AM :	82	84	32	253	93	0.499	2.4	10.134	0.5	1.8	9.798	30.11	9.914	10.292
4/21/2016	8:20:23 AM :	82	84	29	255	93	0.5	2.4	10.736	0.5	1.8	10.434	30.11	10.502	10.983
4/21/2016	8:21:23 AM :	82	85	23	260	94	0.5	2.4	11.303	0.5	1.8	11.042	30.11	11.055	11.653
4/21/2016	8:22:23 AM :	82	85	85	260	94	0.499	2.4	11.857	0.5	1.8	11.529	30.11	11.596	12.128
4/21/2016	8:23:23 AM :	82	85	65	256	94	0.5	2.5	12.374	0.5	1.8	11.998	30.11	12.1	12.602
4/21/2016	8:24:23 AM :	82	85	36	253	94	0.5	2.4	12.961	0.5	1.8	12.542	30.11	12.673	13.185
4/21/2016	8:25:23 AM :	83	85	8	255	94	0.5	2.4	13.561	0.5	1.8	13.085	30.11	13.258	13.802
4/21/2016	8:26:23 AM :	83	85	18	260	95	0.5	2.4	14.13	0.5	1.8	13.668	30.11	13.813	14.451
4/21/2016	8:27:23 AM :	83	85	57	260	95	0.5	2.4	14.648	0.5	1.8	14.222	30.11	14.317	15.02
4/21/2016	8:28:23 AM :	83	86	open	256	95	0.5	2.4	15.197	0.5	1.8	14.74	30.11	14.852	15.618
4/21/2016	8:29:23 AM :	83	86	open	253	95	0.5	2.4	15.787	0.5	1.8	15.223	30.11	15.427	16.176
4/21/2016	8:30:23 AM :	84	86	54	256	96	0.499	2.4	16.415	0.5	1.8	15.727	30.11	16.038	16.697
4/21/2016	8:31:23 AM :	84	86	1	260	96	0.499	2.4	16.945	0.5	1.8	16.328	30.11	16.554	17.391
4/21/2016	8:32:23 AM :	84	86	open	260	96	0.5	2.4	17.444	0.5	1.8	16.942	30.11	17.039	18.1
4/21/2016	8:33:23 AM :	84	86	32	256	97	0.501	2.5	18.012	0.5	1.8	17.444	30.11	17.592	18.643
4/21/2016	8:34:23 AM :	84	87	open	253	97	0.5	2.4	18.604	0.5	1.8	17.907	30.11	18.168	19.177
4/21/2016	8:35:23 AM :	84	87	75	256	97	0.5	2.4	19.238	0.5	1.8	18.398	30.12	18.784	19.666
4/21/2016	8:36:23 AM :	84	87	72	260	97	0.499	2.4	19.762	0.5	1.8	19.006	30.11	19.293	20.273
4/21/2016	8:37:23 AM :	85	87	54	260	98	0.5	2.5	20.255	0.5	1.8	19.638	30.12	19.772	20.926
4/21/2016	8:38:23 AM :	85	87	60	256	98	0.5	2.5	20.806	0.5	1.8	20.139	30.12	20.307	21.438
4/21/2016	8:39:23 AM :	85	88	4	253	98	0.5	2.4	21.433	0.5	1.8	20.588	30.12	20.916	21.953
4/21/2016	8:40:23 AM :	85	88	open	256	99	0.499	2.4	22.059	0.5	1.8	21.088	30.12	21.522	22.531
4/21/2016	8:41:23 AM :	86	88	34	261	99	0.5	2.4	22.587	0.5	1.8	21.713	30.11	22.035	23.203
4/21/2016	8:42:23 AM :	86	88	27	260	100	0.5	2.5	23.076	0.5	1.8	22.323	30.12	22.509	23.868
4/21/2016	8:43:23 AM :	87	88	open	255	100	0.499	2.5	23.602	0.5	1.8	22.815	30.12	23.019	24.437
4/21/2016	8:44:23 AM :	87	89	open	253	101	0.5	2.4	24.262	0.5	1.8	23.294	30.11	23.658	24.99
4/21/2016	8:45:23 AM :	87	89	89	257	101	0.501	2.4	24.878	0.5	1.8	23.838	30.11	24.255	25.517
4/21/2016	8:46:23 AM :	88	89	27	261	102	0.5	2.4	25.409	0.5	1.8	24.379	30.11	24.768	26.107
4/21/2016	8:47:23 AM :	89	89	86	260	102	0.5	2.5	25.89	0.499	1.8	24.968	30.11	25.233	26.68
4/21/2016	8:48:23 AM :	90	90	90	255	103	0.5	2.5	26.41	0.499	1.8	25.522	30.11	25.735	27.215
4/21/2016	8:49:23 AM :	91	90	91	253	103	0.5	2.4	27.066	0.5	1.8	26.045	30.11	26.369	27.721

4/21/2016	8:50:23 AM :	92	90	91	256	103	0.5	2.4	27.701	0.499	1.8	26.534	30.11	26.982	28.193
4/21/2016	8:51:23 AM :	93	91	91	261	104	0.5	2.4	28.23	0.5	1.8	27.046	30.11	27.493	28.686
4/21/2016	8:52:23 AM :	94	91	92	260	104	0.5	2.5	28.71	0.5	1.8	27.651	30.11	27.956	29.269
4/21/2016	8:53:23 AM :	94	91	79	255	104	0.499	2.4	29.241	0.5	1.8	28.255	30.11	28.467	29.864
4/21/2016	8:54:23 AM :	95	92	92	253	105	0.5	2.4	29.868	0.5	1.8	28.767	30.11	29.07	30.358
4/21/2016	8:55:23 AM :	91	92	9	257	105	0.5	2.4	30.524	0.5	1.8	29.242	30.11	29.702	30.896
4/21/2016	8:56:23 AM :	90	93	37	261	106	0.5	2.4	31.042	0.5	1.8	29.732	30.11	30.2	31.419
4/21/2016	8:57:23 AM :	89	93	84	259	106	0.5	2.4	31.548	0.5	1.8	30.335	30.11	30.686	32.008
4/21/2016	8:58:23 AM :	90	93	93	255	106	0.5	2.4	32.068	0.5	1.8	30.994	30.11	31.186	32.641
4/21/2016	8:59:23 AM :	90	94	94	254	107	0.499	2.4	32.679	0.499	1.8	31.493	30.11	31.772	33.12
4/21/2016	9:00:23 AM :	90	94	94	258	107	0.5	2.4	33.329	0.5	1.8	31.935	30.11	32.396	33.544
4/21/2016	9:01:23 AM :	91	94	94	261	107	0.5	2.4	33.853	0.5	1.8	32.435	30.11	32.899	34.023
4/21/2016	9:02:23 AM :	91	94	94	259	107	0.499	2.4	34.365	0.5	1.8	33.079	30.11	33.389	34.64
4/21/2016	9:03:23 AM :	91	95	95	254	107	0.5	2.4	34.895	0.5	1.8	33.693	30.11	33.897	35.229
4/21/2016	9:04:23 AM :	91	95	95	253	107	0.5	2.4	35.515	0.5	1.8	34.193	30.11	34.492	35.708
4/21/2016	9:05:23 AM :	90	95	95	258	107	0.501	2.4	36.123	0.5	1.8	34.668	30.11	35.073	36.162
4/21/2016	9:06:23 AM :	90	95	95	261	107	0.5	2.4	36.67	0.5	1.8	35.186	30.11	35.597	36.658
4/21/2016	9:07:23 AM :	89	95	95	259	107	0.5	2.4	37.183	0.5	1.8	35.771	30.11	36.088	37.218
4/21/2016	9:08:23 AM :	89	95	96	254	107	0.5	2.4	37.741	0.5	1.8	36.393	30.11	36.622	37.812
4/21/2016	9:09:23 AM :	89	96	96	253	107	0.5	2.4	38.351	0.5	1.8	36.913	30.11	37.205	38.309
4/21/2016	9:10:23 AM :	89	96	96	258	108	0.5	2.4	38.925	0.5	1.8	37.402	30.11	37.754	38.776
4/21/2016	9:11:23 AM :	89	96	96	261	108	0.5	2.4	39.48	0.499	1.8	37.938	30.11	38.284	39.288
4/21/2016	9:12:23 AM :	89	96	96	260	108	0.5	2.4	39.998	0.5	1.8	38.483	30.11	38.779	39.808
4/21/2016	9:13:23 AM :	89	96	97	255	108	0.501	2.4	40.577	0.5	1.8	39.07	30.11	39.332	40.368
4/21/2016	9:14:23 AM :	89	97	97	253	108	0.5	2.4	41.178	0.5	1.8	39.631	30.11	39.905	40.904
4/21/2016	9:15:23 AM :	90	97	97	258	108	0.5	2.4	41.75	0.5	1.8	40.171	30.11	40.451	41.418
4/21/2016	9:16:23 AM :	90	97	97	261	108	0.5	2.4	42.276	0.5	1.8	40.656	30.11	40.953	41.881
4/21/2016	9:17:23 AM :	89	97	97	259	108	0.5	2.4	42.819	0.5	1.8	41.166	30.1	41.47	42.367
4/21/2016	9:18:23 AM :	90	97	97	254	108	0.5	2.4	43.406	0.5	1.8	41.772	30.11	42.03	42.945
4/21/2016	9:19:23 AM :	91	97	98	253	109	0.5	2.4	44.03	0.499	1.8	42.386	30.11	42.624	43.529
4/21/2016	9:20:23 AM :	93	98	98	258	109	0.5	2.4	44.574	0.499	1.8	42.903	30.11	43.143	44.021
4/21/2016	9:21:23 AM :	93	98	98	261	109	0.499	2.4	45.072	0.5	1.8	43.38	30.11	43.617	44.475
4/21/2016	9:22:23 AM :	95	98	98	260	109	0.5	2.4	45.641	0.5	1.8	43.872	30.11	44.159	44.943
4/21/2016	9:23:23 AM :	94	98	99	255	110	0.5	2.4	46.231	0.5	1.8	44.473	30.11	44.72	45.514
4/21/2016	9:24:23 AM :	94	98	99	253	110	0.499	2.4	46.86	0.5	1.8	45.142	30.12	45.319	46.151
4/21/2016	9:25:23 AM :	95	99	99	257	110	0.5	2.4	47.391	0.5	1.8	45.64	30.11	45.824	46.624
4/21/2016	9:26:23 AM :	94	99	99	261	110	0.5	2.4	47.892	0.5	1.8	46.094	30.12	46.3	47.055
4/21/2016	9:27:23 AM :	96	99	100	260	110	0.499	2.4	48.439	0.5	1.8	46.598	30.12	46.82	47.533
4/21/2016	9:28:23 AM :	96	99	100	255	111	0.5	2.4	49.063	0.5	1.8	47.225	30.12	47.412	48.129
4/21/2016	9:29:23 AM :	96	100	100	253	111	0.5	2.4	49.69	0.5	1.8	47.852	30.12	48.007	48.723
4/21/2016	9:30:23 AM :	97	100	101	257	111	0.499	2.4	50.22	0.5	1.8	48.364	30.12	48.51	49.209
4/21/2016	9:31:23 AM :	97	101	101	261	111	0.5	2.4	50.713	0.5	1.8	48.827	30.11	48.978	49.647
4/21/2016	9:32:23 AM :	98	101	101	260	111	0.5	2.4	51.237	0.5	1.8	49.333	30.11	49.475	50.127
4/21/2016	9:33:23 AM :	98	101	101	255	111	0.501	2.4	51.894	0.5	1.8	49.942	30.12	50.097	50.704
4/21/2016	9:34:23 AM :	96	101	101	253	111	0.5	2.4	52.513	0.5	1.8	50.576	30.12	50.683	51.304
4/21/2016	9:35:23 AM :	96	101	102	257	111	0.5	2.4	53.049	0.5	1.8	51.076	30.12	51.191	51.777
4/21/2016	9:36:23 AM :	98	101	102	261	111	0.499	2.4	53.526	0.5	1.8	51.557	30.12	51.643	52.233
4/21/2016	9:37:23 AM :	99	102	102	260	111	0.5	2.4	54.05	0.5	1.8	52.104	30.12	52.139	52.75
4/21/2016	9:38:23 AM :	101	102	102	255	111	0.5	2.4	54.699	0.5	1.8	52.656	30.12	52.754	53.272
4/21/2016	9:39:23 AM :	101	102	102	253	111	0.5	2.4	55.336	0.5	1.8	53.256	30.11	53.356	53.839
4/21/2016	9:40:23 AM :	101	102	102	257	111	0.5	2.4	55.87	0.5	1.8	53.812	30.11	53.86	54.365
4/21/2016	9:41:23 AM :	101	102	103	261	111	0.501	2.4	56.355	0.5	1.8	54.324	30.11	54.319	54.848
4/21/2016	9:42:23 AM :	101	102	103	260	111	0.5	2.4	56.891	0.5	1.8	54.83	30.11	54.826	55.326
4/21/2016	9:43:23 AM :	101	103	103	255	112	0.499	2.4	57.504	0.5	1.8	55.36	30.11	55.405	55.826
4/21/2016	9:44:23 AM :	101	103	103	253	112	0.5	2.4	58.165	0.5	1.8	55.955	30.12	56.029	56.387
4/21/2016	9:45:23 AM :	100	103	103	258	112	0.499	2.4	58.683	0.5	1.8	56.543	30.12	56.518	56.943
4/21/2016	9:46:23 AM :	100	103	103	261	112	0.501	2.4	59.194	0.5	1.8	57.087	30.11	57	57.456
4/21/2016	9:47:23 AM :	100	103	104	260	112	0.5	2.4	59.714	0.5	1.8	57.562	30.11	57.491	57.904
4/21/2016	9:48:23 AM :	98	103	104	255	112	0.5	2.4	60.324	0.5	1.8	58.054	30.11	58.067	58.368
4/21/2016	9:49:23 AM :	98	103	104	253	112	0.501	2.4	60.968	0.5	1.8	58.655	30.12	58.675	58.934
4/21/2016	9:50:23 AM :	98	104	104	258	112	0.5	2.4	61.5	0.5	1.8	59.308	30.12	59.177	59.55
4/21/2016	9:51:23 AM :	98	104	104	261	112	0.501	2.4	62.016	0.5	1.8	59.811	30.12	59.663	60.024
4/21/2016	9:52:23 AM :	97	104	104	259	112	0.5	2.4	62.547	0.5	1.8	60.278	30.11	60.164	60.464
4/21/2016	9:53:23 AM :	98	104	104	254	112	0.5	2.4	63.174	0.5	1.8	60.778	30.11	60.754	60.935
4/21/2016	9:54:23 AM :	98	104	104	254	112	0.499	2.4	63.766	0.499	1.8	61.384	30.11	61.312	61.506
4/21/2016	9:55:23 AM :	99	104	104	259	112	0.5	2.4	64.325	0.499	1.8	62.032	30.11	61.839	62.116
4/21/2016	9:56:23 AM :	99	104	105	261	112	0.5	2.4	64.831	0.5	1.8	62.54	30.11	62.315	62.594
4/21/2016	9:57:23 AM :	99	104	105	259	112	0.501	2.4	65.401	0.5	1.8	62.998	30.11	62.852	63.025
4/21/2016	9:58:23 AM :	101	104	105	254	112	0.501	2.4	66.004	0.5	1.8	63.496	30.11	63.419	63.494

4/21/2016	9:59:23 AM :	102	104	105	254	112	0.5	2.4	66.574	0.5	1.8	64.134	30.11	63.957	64.094
4/21/2016	10:00:23 AM :	102	104	105	259	112	0.5	2.4	67.126	0.5	1.8	64.752	30.12	64.477	64.675
4/21/2016	10:01:23 AM :	102	104	105	261	112	0.5	2.4	67.654	0.5	1.8	65.258	30.12	64.974	65.152
4/21/2016	10:02:23 AM :	102	104	105	258	112	0.5	2.4	68.24	0.5	1.8	65.743	30.12	65.526	65.608
4/21/2016	10:03:23 AM :	101	105	105	253	112	0.5	2.4	68.842	0.5	1.8	66.261	30.12	66.093	66.096
4/21/2016	10:04:23 AM :	101	105	105	255	112	0.5	2.4	69.41	0.5	1.8	66.838	30.12	66.627	66.639
4/21/2016	10:05:23 AM :	99	105	105	260	112	0.499	2.4	69.924	0.5	1.8	67.465	30.12	67.111	67.229
4/21/2016	10:06:23 AM :	99	105	105	261	112	0.501	2.4	70.483	0.5	1.8	67.99	30.12	67.637	67.723
4/21/2016	10:07:23 AM :	99	105	105	258	111	0.5	2.4	71.065	0.5	1.8	68.48	30.11	68.184	68.185
4/21/2016	10:08:23 AM :	99	105	105	253	111	0.499	2.4	71.7	0.5	1.8	69.022	30.11	68.782	68.695
4/21/2016	10:09:23 AM :	99	105	105	255	111	0.501	2.4	72.235	0.5	1.8	69.562	30.11	69.285	69.203
4/21/2016	10:10:23 AM :	98	105	105	260	112	0.5	2.4	72.73	0.5	1.8	70.151	30.11	69.751	69.757
4/21/2016	10:11:23 AM :	97	105	105	261	111	0.5	2.4	73.294	0.5	1.8	70.717	30.11	70.282	70.289
4/21/2016	10:12:23 AM :	98	105	105	258	111	0.5	2.4	73.898	0.5	1.8	71.257	30.11	70.85	70.797
4/21/2016	10:13:23 AM :	98	105	105	253	111	0.5	2.4	74.536	0.5	1.8	71.746	30.11	71.45	71.256
4/21/2016	10:14:23 AM :	98	105	105	255	111	0.5	2.4	75.064	0.5	1.8	72.26	30.11	71.947	71.739
4/21/2016	10:15:23 AM :	98	105	105	260	111	0.5	2.4	75.565	0.5	1.8	72.865	30.11	72.418	72.308
4/21/2016	10:16:23 AM :	98	105	105	261	111	0.499	2.4	76.098	0.5	1.8	73.475	30.11	72.92	72.882
4/21/2016	10:17:23 AM :	98	105	105	258	111	0.5	2.4	76.743	0.5	1.8	74.001	30.11	73.527	73.376
4/21/2016	10:18:23 AM :	98	105	105	253	111	0.5	2.4	77.364	0.5	1.8	74.484	30.11	74.112	73.83
4/21/2016	10:19:23 AM :	98	105	105	255	111	0.501	2.4	77.909	0.5	1.8	74.971	30.11	74.624	74.288
4/21/2016	10:20:23 AM :	98	105	105	260	111	0.499	2.4	78.391	0.5	1.8	75.573	30.11	75.077	74.854
4/21/2016	10:21:23 AM :	97	105	105	261	111	0.5	2.4	78.913	0.5	1.8	76.246	30.11	75.568	75.487
4/21/2016	10:22:23 AM :	97	105	105	257	111	0.5	2.4	79.566	0.5	1.8	76.745	30.11	76.183	75.956
4/21/2016	10:23:23 AM :	98	105	105	253	111	0.499	2.4	80.197	0.5	1.8	77.204	30.11	76.777	76.387
4/21/2016	10:24:23 AM :	97	105	105	255	111	0.5	2.4	80.738	0.5	1.8	77.71	30.11	77.286	76.863
4/21/2016	10:25:23 AM :	97	105	105	260	111	0.501	2.4	81.219	0.5	1.8	78.324	30.11	77.739	77.44
4/21/2016	10:26:23 AM :	97	105	105	261	111	0.5	2.4	81.757	0.5	1.8	78.962	30.11	78.245	78.04
4/21/2016	10:27:23 AM :	96	105	105	256	111	0.499	2.4	82.373	0.5	1.8	79.48	30.11	78.824	78.527
4/21/2016	10:28:23 AM :	96	105	105	253	111	0.5	2.4	83.033	0.5	1.8	79.94	30.12	79.445	78.96
4/21/2016	10:29:23 AM :	97	105	105	255	111	0.5	2.4	83.553	0.5	1.8	80.438	30.12	79.935	79.428
4/21/2016	10:30:23 AM :	98	105	105	260	111	0.5	2.4	84.066	0.5	1.8	81.071	30.12	80.418	80.024
4/21/2016	10:31:23 AM :	98	105	105	261	111	0.499	2.4	84.589	0.5	1.8	81.694	30.11	80.91	80.609
4/21/2016	10:32:23 AM :	98	105	105	257	111	0.5	2.4	85.196	0.5	1.8	82.196	30.11	81.48	81.081
4/21/2016	10:33:23 AM :	95	105	105	253	110	0.5	2.4	85.843	0.5	1.8	82.681	30.11	82.09	81.537
4/21/2016	10:34:23 AM :	95	105	105	255	110	0.5	2.4	86.38	0.5	1.8	83.209	30.12	82.595	82.033
4/21/2016	10:35:23 AM :	97	105	105	260	110	0.5	2.4	86.898	0.5	1.8	83.776	30.12	83.082	82.567
4/21/2016	10:36:23 AM :	98	105	105	261	110	0.5	2.4	87.436	0.5	1.8	84.398	30.12	83.589	83.152
4/21/2016	10:37:23 AM :	98	105	105	257	110	0.499	2.4	88.053	0.5	1.8	84.935	30.11	84.17	83.657
4/21/2016	10:38:23 AM :	99	105	105	253	110	0.499	2.4	88.644	0.5	1.8	85.433	30.11	84.725	84.125
4/21/2016	10:39:23 AM :	99	105	105	255	110	0.5	2.4	89.211	0.5	1.8	85.969	30.12	85.259	84.63
4/21/2016	10:40:23 AM :	98	105	105	260	110	0.499	2.4	89.719	0.5	1.8	86.511	30.12	85.737	85.14
4/21/2016	10:41:23 AM :	98	105	105	260	110	0.5	2.4	90.294	0.5	1.8	87.096	30.12	86.279	85.691
4/21/2016	10:42:23 AM :	97	105	105	256	110	0.5	2.4	90.895	0.5	1.8	87.665	30.12	86.844	86.227
4/21/2016	10:43:23 AM :	97	104	105	253	110	0.5	2.4	91.468	0.5	1.8	88.209	30.12	87.383	86.739
4/21/2016	10:44:23 AM :	97	104	105	256	110	0.499	2.4	92.011	0.5	1.8	88.693	30.11	87.895	87.194
4/21/2016	10:45:23 AM :	97	104	105	261	110	0.5	2.4	92.549	0.5	1.8	89.208	30.11	88.402	87.678
4/21/2016	10:46:23 AM :	98	104	105	261	110	0.5	2.4	93.135	0.5	1.8	89.814	30.11	88.954	88.248
4/21/2016	10:47:23 AM :	97	104	105	256	110	0.501	2.5	93.751	0.5	1.8	90.426	30.12	89.534	88.825
4/21/2016	10:48:23 AM :	97	104	105	253	110	0.5	2.4	94.307	0.5	1.8	90.951	30.12	90.058	89.318
4/21/2016	10:50:59 AM :	96	103	103	260	108	0.531	2.1	95.163	0.532	1.5	91.723	30.05	90.865	90.046
4/21/2016	10:51:59 AM :	96	104	104	259	109	0.499	2.5	95.69	0.5	1.8	92.338	30.12	91.362	90.625
4/21/2016	10:52:59 AM :	97	104	104	254	109	0.499	2.5	96.307	0.5	1.8	92.964	30.12	91.943	91.215
4/21/2016	10:53:59 AM :	97	104	104	254	109	0.499	2.5	96.913	0.5	1.8	93.47	30.12	92.515	91.692
4/21/2016	10:54:59 AM :	98	104	104	259	109	0.5	2.5	97.458	0.5	1.8	93.951	30.12	93.029	92.145
4/21/2016	10:55:59 AM :	98	104	104	261	109	0.499	2.5	97.965	0.5	1.8	94.492	30.12	93.507	92.655
4/21/2016	10:56:59 AM :	99	104	104	258	109	0.499	2.5	98.51	0.5	1.8	95.044	30.12	94.021	93.175
4/21/2016	10:57:59 AM :	99	104	104	253	109	0.5	2.5	99.118	0.5	1.8	95.65	30.12	94.594	93.746
4/21/2016	10:58:59 AM :	99	104	104	254	109	0.499	2.4	99.697	0.5	1.8	96.204	30.12	95.14	94.267
4/21/2016	10:59:59 AM :	99	104	104	259	109	0.5	2.5	100.258	0.5	1.8	96.714	30.12	95.669	94.748
4/21/2016	11:00:59 AM :	99	104	104	261	109	0.5	2.5	100.761	0.5	1.8	97.22	30.12	96.144	95.225
4/21/2016	11:01:59 AM :	99	104	104	258	109	0.5	2.5	101.329	0.5	1.8	97.75	30.13	96.679	95.724
4/21/2016	11:02:59 AM :	99	104	104	254	109	0.5	2.5	101.922	0.5	1.8	98.347	30.12	97.238	96.286
4/21/2016	11:03:59 AM :	99	104	104	254	110	0.499	2.5	102.489	0.5	1.8	98.932	30.12	97.773	96.837
4/21/2016	11:04:59 AM :	99	104	104	259	110	0.499	2.5	103.042	0.5	1.8	99.478	30.12	98.295	97.352
4/21/2016	11:05:59 AM :	99	103	104	261	110	0.5	2.5	103.557	0.5	1.8	99.954	30.12	98.781	97.801
4/21/2016	11:06:59 AM :	99	103	104	258	110	0.499	2.5	104.131	0.5	1.8	100.451	30.12	99.322	98.268
4/21/2016	11:07:59 AM :	98	103	104	253	110	0.5	2.5	104.724	0.5	1.8	101.051	30.12	99.881	98.833
4/21/2016	11:08:59 AM :	98	103	104	254	109	0.5	2.4	105.289	0.5	1.8	101.7	30.12	100.415	99.446

4/21/2016	11:09:59 AM :	98	103	104	260	110	0.499	2.4	105.825	0.5	1.8	102.207	30.12	100.921	99.923
4/21/2016	11:10:59 AM :	98	103	104	261	110	0.5	2.5	106.354	0.5	1.8	102.677	30.12	101.42	100.366
4/21/2016	11:11:59 AM :	100	103	104	258	109	0.5	2.5	106.938	0.5	1.8	103.173	30.12	101.971	100.833
4/21/2016	11:12:59 AM :	105	103	104	253	109	0.501	2.5	107.533	0.5	1.8	103.777	30.12	102.532	101.402
4/21/2016	11:13:59 AM :	112	103	104	254	109	0.499	2.5	108.099	0.5	1.8	104.432	30.12	103.067	102.019
4/21/2016	11:14:59 AM :	123	103	104	259	109	0.5	2.5	108.605	0.5	1.8	104.939	30.12	103.545	102.496
4/21/2016	11:15:59 AM :	132	103	104	261	109	0.5	2.5	109.16	0.5	1.8	105.394	30.12	104.069	102.926
4/21/2016	11:16:59 AM :	135	103	104	258	109	0.5	2.5	109.736	0.5	1.8	105.889	30.12	104.612	103.392
4/21/2016	11:17:59 AM :	180	103	104	253	109	0.5	2.5	110.352	0.5	1.8	106.532	30.12	105.194	103.999
4/21/2016	11:18:59 AM :	217	103	104	255	109	0.5	2.5	110.891	0.499	1.8	107.146	30.12	105.702	104.578
4/21/2016	11:19:59 AM :	255	103	104	260	109	0.5	2.5	111.39	0.5	1.8	107.651	30.12	106.173	105.053
4/21/2016	11:20:59 AM :	281	103	104	262	109	0.5	2.6	111.954	0.5	1.9	108.136	30.12	106.706	105.511
4/21/2016	11:21:59 AM :	260	103	104	259	109	0.501	2.7	112.532	0.5	1.9	108.649	30.12	107.251	105.995
4/21/2016	11:22:59 AM :	245	103	104	254	109	0.5	2.7	113.157	0.5	1.9	109.227	30.12	107.842	106.54
4/21/2016	11:23:59 AM :	232	103	104	255	109	0.5	2.7	113.691	0.5	1.9	109.858	30.12	108.346	107.135
4/21/2016	11:24:59 AM :	221	103	104	261	109	0.5	2.7	114.176	0.5	1.9	110.377	30.12	108.804	107.624
4/21/2016	11:25:59 AM :	209	103	104	263	109	0.5	2.7	114.741	0.5	1.9	110.873	30.12	109.337	108.092
4/21/2016	11:26:59 AM :	202	103	104	260	109	0.5	2.7	115.336	0.5	1.9	111.409	30.12	109.899	108.597
4/21/2016	11:27:59 AM :	191	103	104	255	110	0.501	2.7	115.965	0.5	1.9	111.951	30.12	110.493	109.108
4/21/2016	11:28:59 AM :	176	103	104	254	110	0.5	2.7	116.489	0.5	1.9	112.541	30.12	110.988	109.665
4/21/2016	11:29:59 AM :	162	103	104	260	110	0.499	2.7	116.978	0.5	1.9	113.105	30.12	111.45	110.197
4/21/2016	11:30:59 AM :	152	103	104	263	110	0.501	2.7	117.523	0.499	1.9	113.644	30.12	111.965	110.705
4/21/2016	11:31:59 AM :	155	103	104	261	110	0.5	2.7	118.138	0.5	1.9	114.127	30.12	112.546	111.16
4/21/2016	11:32:59 AM :	154	103	104	256	110	0.5	2.7	118.767	0.5	1.9	114.645	30.12	113.14	111.649
4/21/2016	11:33:59 AM :	151	103	104	253	110	0.499	2.7	119.287	0.5	1.9	115.249	30.12	113.631	112.219
4/21/2016	11:34:59 AM :	145	103	104	258	110	0.501	2.7	119.78	0.5	1.9	115.857	30.12	114.097	112.792
4/21/2016	11:35:59 AM :	144	103	104	262	110	0.5	2.7	120.306	0.5	1.9	116.384	30.12	114.594	113.289
4/21/2016	11:36:59 AM :	142	103	104	261	110	0.5	2.7	120.947	0.5	1.9	116.863	30.12	115.199	113.74
4/21/2016	11:37:59 AM :	139	103	104	257	110	0.501	2.7	121.563	0.5	1.9	117.351	30.12	115.78	114.201
4/21/2016	11:38:59 AM :	135	103	104	253	110	0.5	2.6	122.098	0.5	1.9	117.95	30.12	116.285	114.765
4/21/2016	11:39:59 AM :	131	103	104	256	110	0.5	2.6	122.574	0.5	1.9	118.623	30.12	116.735	115.399
4/21/2016	11:40:59 AM :	130	103	104	262	110	0.5	2.6	123.09	0.5	1.9	119.119	30.12	117.222	115.866
4/21/2016	11:41:59 AM :	127	103	104	261	110	0.5	2.6	123.743	0.5	1.9	119.573	30.11	117.837	116.293
4/21/2016	11:42:59 AM :	128	103	104	257	110	0.5	2.6	124.355	0.5	1.9	120.077	30.11	118.415	116.768
4/21/2016	11:43:59 AM :	126	103	104	253	110	0.501	2.6	124.892	0.5	1.9	120.697	30.11	118.922	117.353
4/21/2016	11:44:59 AM :	126	103	104	256	110	0.5	2.6	125.366	0.5	1.8	121.327	30.11	119.369	117.945
4/21/2016	11:45:59 AM :	125	103	104	261	110	0.5	2.6	125.876	0.5	1.9	121.841	30.12	119.851	118.43
4/21/2016	11:46:59 AM :	123	103	104	261	110	0.5	2.6	126.53	0.5	1.9	122.306	30.12	120.467	118.868
4/21/2016	11:47:59 AM :	122	103	104	257	110	0.5	2.6	127.151	0.5	1.9	122.808	30.12	121.054	119.341
4/21/2016	11:48:59 AM :	122	103	104	253	110	0.5	2.6	127.684	0.5	1.9	123.426	30.12	121.556	119.923
4/21/2016	11:49:59 AM :	122	103	104	256	110	0.5	2.6	128.158	0.5	1.8	124.051	30.12	122.004	120.512
4/21/2016	11:50:59 AM :	122	103	104	261	110	0.5	2.6	128.68	0.5	1.9	124.553	30.12	122.497	120.985
4/21/2016	11:51:59 AM :	120	103	104	261	110	0.499	2.6	129.316	0.5	1.9	125.036	30.12	123.096	121.44
4/21/2016	11:52:59 AM :	119	103	104	257	110	0.5	2.6	129.949	0.5	1.9	125.58	30.12	123.694	121.952
4/21/2016	11:53:59 AM :	118	103	104	253	110	0.5	2.6	130.48	0.5	1.9	126.131	30.11	124.195	122.471
4/21/2016	11:54:59 AM :	118	103	104	256	110	0.501	2.6	130.956	0.5	1.9	126.737	30.11	124.644	123.042
4/21/2016	11:55:59 AM :	117	103	104	261	110	0.5	2.6	131.486	0.5	1.9	127.292	30.11	125.145	123.565
4/21/2016	11:56:59 AM :	116	103	104	261	110	0.499	2.6	132.098	0.5	1.9	127.799	30.11	125.721	124.042
4/21/2016	11:57:59 AM :	115	103	104	256	110	0.499	2.7	132.753	0.499	1.9	128.311	30.11	126.34	124.524
4/21/2016	11:58:59 AM :	113	103	104	253	110	0.5	2.6	133.269	0.5	1.9	128.841	30.11	126.827	125.023
4/21/2016	11:59:59 AM :	112	103	104	256	110	0.5	2.6	133.764	0.5	1.9	129.438	30.11	127.294	125.586
4/21/2016	12:00:59 PM :	112	103	104	261	110	0.5	2.6	134.28	0.5	1.9	130.02	30.11	127.781	126.134
4/21/2016	12:01:59 PM :	112	103	104	261	110	0.499	2.7	134.885	0.499	1.9	130.568	30.11	128.351	126.65
4/21/2016	12:02:59 PM :	112	103	104	256	110	0.5	2.7	135.543	0.499	1.9	131.043	30.11	128.972	127.098
4/21/2016	12:03:59 PM :	112	103	104	253	110	0.499	2.6	136.055	0.5	1.9	131.535	30.11	129.455	127.561
4/21/2016	12:04:59 PM :	112	103	105	256	110	0.5	2.6	136.558	0.499	1.9	132.14	30.11	129.93	128.131
4/21/2016	12:05:59 PM :	111	103	105	261	110	0.5	2.7	137.074	0.5	1.9	132.787	30.11	130.417	128.739
4/21/2016	12:06:59 PM :	111	103	105	261	110	0.499	2.7	137.677	0.5	1.9	133.293	30.11	130.985	129.216
4/21/2016	12:07:59 PM :	112	103	105	256	111	0.5	2.7	138.327	0.5	1.9	133.767	30.11	131.599	129.661
4/21/2016	12:08:59 PM :	111	103	105	253	111	0.499	2.7	138.843	0.5	1.9	134.261	30.11	132.086	130.126
4/21/2016	12:09:59 PM :	110	103	105	256	111	0.5	2.7	139.35	0.5	1.9	134.863	30.11	132.564	130.693
4/21/2016	12:10:59 PM :	110	103	105	261	111	0.499	2.7	139.872	0.5	1.9	135.523	30.11	133.057	131.314
4/21/2016	12:11:59 PM :	110	103	105	261	111	0.501	2.7	140.473	0.5	1.9	136.03	30.11	133.624	131.79
4/21/2016	12:12:59 PM :	109	103	105	256	111	0.499	2.7	141.108	0.5	1.9	136.483	30.11	134.223	132.217
4/21/2016	12:13:59 PM :	109	103	105	253	111	0.5	2.7	141.639	0.5	1.9	136.983	30.11	134.724	132.688
4/21/2016	12:14:59 PM :	109	103	105	256	111	0.5	2.7	142.148	0.5	1.9	137.625	30.11	135.204	133.291
4/21/2016	12:15:59 PM :	109	104	105	261	111	0.5	2.7	142.676	0.5	1.9	138.245	30.11	135.702	133.875
4/21/2016	12:16:59 PM :	108	104	105	261	111	0.5	2.7	143.286	0.5	1.9	138.752	30.11	136.276	134.351
4/21/2016	12:17:59 PM :	107	104	105	256	111	0.499	2.7	143.89	0.5	1.9	139.228	30.11	136.846	134.8

4/21/2016	12:18:59 PM :	107	104	105	253	111	0.5	2.7	144.433	0.5	1.9	139.744	30.11	137.358	135.285
4/21/2016	12:19:59 PM :	108	104	105	256	111	0.501	2.7	144.942	0.5	1.9	140.333	30.11	137.838	135.839
4/21/2016	12:20:59 PM :	107	104	105	261	111	0.5	2.7	145.481	0.5	1.9	140.959	30.11	138.346	136.428
4/21/2016	12:21:59 PM :	107	104	105	260	111	0.501	2.7	146.088	0.5	1.9	141.477	30.11	138.917	136.915
4/21/2016	12:22:59 PM :	107	104	105	256	111	0.5	2.7	146.673	0.499	1.9	141.97	30.11	139.47	137.379
4/21/2016	12:23:59 PM :	106	104	105	253	111	0.5	2.7	147.229	0.5	1.9	142.512	30.11	139.993	137.889
4/21/2016	12:24:59 PM :	106	104	105	257	111	0.5	2.7	147.732	0.5	1.9	143.051	30.11	140.468	138.396
4/21/2016	12:25:59 PM :	106	104	105	261	111	0.5	2.7	148.297	0.5	1.9	143.647	30.11	141	138.958
4/21/2016	12:26:59 PM :	106	104	105	260	112	0.501	2.7	148.889	0.5	1.9	144.217	30.11	141.558	139.494
4/21/2016	12:27:59 PM :	105	104	105	255	112	0.5	2.7	149.461	0.5	1.9	144.742	30.11	142.097	139.988
4/21/2016	12:28:59 PM :	105	104	105	253	112	0.499	2.7	150.014	0.5	1.9	145.237	30.11	142.618	140.453
4/21/2016	12:29:59 PM :	104	104	105	257	112	0.5	2.7	150.526	0.5	1.9	145.765	30.11	143.101	140.95
4/21/2016	12:30:59 PM :	104	104	105	261	112	0.5	2.7	151.1	0.5	1.9	146.369	30.11	143.642	141.517
4/21/2016	12:31:59 PM :	103	104	105	260	112	0.5	2.7	151.689	0.5	1.9	146.964	30.11	144.197	142.077
4/21/2016	12:32:59 PM :	104	104	105	255	112	0.5	2.7	152.251	0.499	1.9	147.502	30.1	144.727	142.582
4/21/2016	12:33:59 PM :	104	104	105	253	112	0.5	2.7	152.794	0.5	1.9	147.982	30.1	145.238	143.033
4/21/2016	12:34:59 PM :	103	104	105	258	112	0.5	2.7	153.32	0.499	1.9	148.471	30.11	145.734	143.493
4/21/2016	12:35:59 PM :	102	104	105	261	112	0.501	2.7	153.898	0.5	1.9	149.072	30.11	146.278	144.058
4/21/2016	12:36:59 PM :	102	104	105	259	112	0.499	2.7	154.493	0.5	1.9	149.733	30.11	146.839	144.679
4/21/2016	12:37:59 PM :	102	104	105	254	112	0.499	2.7	155.059	0.5	1.9	150.237	30.11	147.372	145.153
4/21/2016	12:38:59 PM :	101	104	105	254	112	0.499	2.7	155.577	0.5	1.9	150.71	30.11	147.859	145.597
4/21/2016	12:39:59 PM :	100	104	105	259	112	0.5	2.7	156.118	0.5	1.9	151.206	30.11	148.369	146.064
4/21/2016	12:40:59 PM :	100	104	105	261	112	0.5	2.7	156.696	0.5	1.9	151.813	30.1	148.913	146.634
4/21/2016	12:41:59 PM :	100	104	105	259	112	0.499	2.7	157.3	0.5	1.9	152.465	30.1	149.482	147.247
4/21/2016	12:42:59 PM :	101	104	105	254	112	0.5	2.7	157.855	0.5	1.9	152.979	30.1	150.004	147.729
4/21/2016	12:43:59 PM :	100	104	105	254	112	0.5	2.7	158.356	0.5	1.9	153.432	30.1	150.476	148.155
4/21/2016	12:44:59 PM :	100	104	105	259	112	0.501	2.7	158.914	0.5	1.9	153.932	30.1	151.001	148.625
4/21/2016	12:45:59 PM :	99	104	105	261	112	0.5	2.7	159.49	0.5	1.9	154.574	30.1	151.543	149.228
4/21/2016	12:46:59 PM :	99	104	105	259	111	0.499	2.7	160.117	0.5	1.9	155.196	30.1	152.133	149.813
4/21/2016	12:47:59 PM :	99	104	105	254	111	0.5	2.7	160.647	0.5	1.9	155.703	30.1	152.632	150.289
4/21/2016	12:48:59 PM :	100	104	105	254	111	0.5	2.7	161.14	0.5	1.9	156.184	30.09	153.097	150.741
4/21/2016	12:49:59 PM :	99	104	105	259	111	0.5	2.7	161.704	0.5	1.9	156.701	30.09	153.627	151.227
4/21/2016	12:50:59 PM :	99	104	105	261	111	0.5	2.7	162.29	0.5	1.9	157.287	30.1	154.178	151.778
4/21/2016	12:51:59 PM :	100	104	105	258	111	0.499	2.7	162.917	0.5	1.9	157.914	30.1	154.769	152.367
4/21/2016	12:52:59 PM :	101	104	105	254	111	0.499	2.7	163.443	0.5	1.9	158.433	30.1	155.264	152.854
4/21/2016	12:53:59 PM :	100	104	105	255	111	0.5	2.7	163.934	0.5	1.9	158.927	30.09	155.727	153.319
4/21/2016	12:54:59 PM :	101	104	105	260	111	0.5	2.8	164.489	0.5	1.9	159.471	30.09	156.249	153.83
4/21/2016	12:55:59 PM :	100	104	105	261	111	0.5	2.8	165.094	0.5	1.9	160.012	30.1	156.818	154.338
4/21/2016	12:56:59 PM :	101	104	105	257	111	0.5	2.8	165.723	0.5	1.9	160.613	30.1	157.411	154.903
4/21/2016	12:57:59 PM :	100	104	105	253	111	0.499	2.8	166.243	0.5	1.9	161.176	30.1	157.901	155.432
4/21/2016	12:58:59 PM :	101	104	105	255	111	0.501	2.8	166.744	0.5	1.9	161.702	30.09	158.373	155.927
4/21/2016	12:59:59 PM :	102	104	105	260	110	0.5	2.8	167.273	0.5	1.9	162.2	30.09	158.872	156.395
4/21/2016	1:00:59 PM :	103	104	105	260	110	0.5	2.8	167.898	0.5	1.9	162.727	30.09	159.461	156.891
4/21/2016	1:01:59 PM :	103	104	105	256	111	0.499	2.8	168.521	0.5	1.9	163.327	30.09	160.047	157.455
4/21/2016	1:02:59 PM :	104	104	105	253	111	0.5	2.8	169.052	0.5	1.9	163.925	30.09	160.547	158.018
4/21/2016	1:03:59 PM :	104	104	105	256	111	0.5	2.8	169.538	0.5	1.9	164.466	30.09	161.005	158.527
4/21/2016	1:04:59 PM :	103	104	105	261	111	0.5	2.8	170.06	0.5	1.9	164.947	30.09	161.497	158.979
4/21/2016	1:05:59 PM :	103	104	105	260	111	0.5	2.8	170.712	0.5	1.9	165.44	30.1	162.112	159.443
4/21/2016	1:06:59 PM :	103	104	105	256	111	0.5	2.8	171.325	0.5	1.9	166.049	30.1	162.689	160.015
4/21/2016	1:07:59 PM :	104	104	105	253	111	0.5	2.8	171.862	0.5	1.9	166.696	30.1	163.195	160.624
4/21/2016	1:08:59 PM :	104	104	105	256	111	0.5	2.8	172.338	0.5	1.9	167.203	30.09	163.643	161.1
4/21/2016	1:09:59 PM :	105	104	105	261	111	0.501	2.8	172.852	0.5	1.9	167.677	30.09	164.128	161.546
4/21/2016	1:10:59 PM :	105	104	105	260	111	0.5	2.8	173.506	0.5	1.9	168.174	30.1	164.744	162.013
4/21/2016	1:11:59 PM :	104	104	105	256	111	0.5	2.8	174.122	0.5	1.9	168.779	30.1	165.324	162.582
4/21/2016	1:12:59 PM :	105	104	105	253	111	0.501	2.8	174.66	0.5	1.9	169.435	30.1	165.831	163.2
4/21/2016	1:13:59 PM :	105	104	105	256	111	0.5	2.8	175.136	0.5	1.9	169.948	30.1	166.28	163.682
4/21/2016	1:14:59 PM :	105	104	105	261	111	0.5	2.8	175.656	0.5	1.9	170.401	30.09	166.769	164.108
4/21/2016	1:15:59 PM :	106	104	105	260	112	0.499	2.8	176.292	0.5	1.9	170.9	30.1	167.369	164.577
4/21/2016	1:16:59 PM :	105	104	105	255	112	0.5	2.8	176.924	0.5	1.9	171.539	30.1	167.964	165.178
4/21/2016	1:17:59 PM :	105	104	105	253	112	0.5	2.8	177.458	0.5	1.9	172.164	30.1	168.467	165.764
4/21/2016	1:18:59 PM :	105	104	105	258	112	0.5	2.8	177.933	0.5	1.9	172.672	30.1	168.915	166.242
4/21/2016	1:19:59 PM :	105	104	105	261	112	0.499	2.8	178.465	0.499	1.9	173.149	30.09	169.416	166.69
4/21/2016	1:20:59 PM :	105	104	105	259	112	0.501	2.8	179.079	0.5	1.9	173.66	30.09	169.995	167.171
4/21/2016	1:21:59 PM :	105	104	105	254	112	0.5	2.8	179.728	0.499	1.9	174.253	30.09	170.606	167.728
4/21/2016	1:22:59 PM :	105	104	105	254	112	0.5	2.8	180.246	0.5	1.9	174.883	30.1	171.093	168.32
4/21/2016	1:23:59 PM :	105	104	105	258	112	0.5	2.8	180.743	0.5	1.9	175.399	30.1	171.561	168.804
4/21/2016	1:24:59 PM :	105	104	105	261	112	0.5	2.8	181.265	0.5	1.9	175.89	30.09	172.052	169.266
4/21/2016	1:25:59 PM :	105	104	105	259	112	0.5	2.8	181.865	0.5	1.9	176.434	30.09	172.618	169.777
4/21/2016	1:26:59 PM :	105	104	105	254	112	0.5	2.9	182.526	0.5	1.9	176.979	30.09	173.239	170.289

4/21/2016	1:27:59 PM :	105	104	105	254	112	0.5	2.8	183.042	0.5	1.9	177.584	30.09	173.725	170.857
4/21/2016	1:28:59 PM :	104	104	105	259	113	0.5	2.8	183.549	0.5	1.9	178.148	30.09	174.202	171.387
4/21/2016	1:29:59 PM :	105	104	105	261	113	0.5	2.8	184.065	0.5	1.9	178.661	30.09	174.688	171.869
4/21/2016	1:30:59 PM :	105	104	106	259	113	0.5	2.9	184.665	0.5	1.9	179.167	30.09	175.253	172.344
4/21/2016	1:31:59 PM :	105	104	106	254	113	0.5	2.9	185.316	0.5	1.9	179.703	30.09	175.865	172.847
4/21/2016	1:32:59 PM :	105	104	106	254	113	0.499	2.8	185.836	0.5	1.9	180.3	30.08	176.354	173.407
4/21/2016	1:33:59 PM :	105	104	106	259	113	0.501	2.9	186.345	0.5	1.9	180.889	30.08	176.833	173.959
4/21/2016	1:34:59 PM :	105	104	106	261	113	0.5	2.9	186.867	0.499	1.9	181.434	30.09	177.324	174.471
4/21/2016	1:35:59 PM :	105	104	106	259	113	0.501	2.9	187.48	0.5	1.9	181.913	30.09	177.901	174.92
4/21/2016	1:36:59 PM :	104	105	106	254	114	0.501	2.9	188.099	0.5	1.9	182.404	30.09	178.483	175.381
4/21/2016	1:37:59 PM :	102	105	106	253	113	0.5	2.9	188.632	0.5	1.9	183.016	30.09	178.984	175.956
4/21/2016	1:38:59 PM :	102	105	106	258	114	0.5	2.9	189.143	0.5	1.9	183.657	30.09	179.464	176.558
4/21/2016	1:39:59 PM :	121	105	106	261	114	0.501	2.9	189.68	0.5	1.9	184.17	30.09	179.969	177.039
4/21/2016	1:40:59 PM :	183	105	106	259	114	0.5	3	190.288	0.5	1.9	184.647	30.09	180.541	177.486
4/21/2016	1:41:59 PM :	237	105	106	255	114	0.5	3	190.881	0.5	2	185.141	30.09	181.098	177.95
4/21/2016	1:42:59 PM :	275	105	106	254	113	0.501	3.1	191.434	0.5	2	185.742	30.09	181.618	178.514
4/21/2016	1:43:59 PM :	389	105	106	260	113	0.5	3.1	191.939	0.5	2	186.405	30.09	182.093	179.135
4/21/2016	1:44:59 PM :	357	105	106	263	113	0.5	3.1	192.496	0.5	2	186.915	30.09	182.617	179.614
4/21/2016	1:45:59 PM :	282	105	106	261	113	0.499	3	193.093	0.5	1.9	187.369	30.08	183.178	180.039
4/21/2016	1:46:59 PM :	244	105	106	256	114	0.5	3	193.668	0.5	1.9	187.871	30.08	183.719	180.51
4/21/2016	1:47:59 PM :	221	105	106	254	113	0.499	3	194.222	0.5	1.9	188.503	30.08	184.239	181.102
4/21/2016	1:48:59 PM :	201	105	106	259	113	0.499	3	194.731	0.5	1.9	189.131	30.08	184.718	181.691
4/21/2016	1:49:59 PM :	183	105	106	263	113	0.499	3	195.298	0.5	1.9	189.644	30.08	185.251	182.172
4/21/2016	1:50:59 PM :	176	105	106	262	114	0.5	3	195.893	0.5	1.9	190.114	30.08	185.81	182.613
4/21/2016	1:51:59 PM :	174	105	106	258	114	0.501	3	196.46	0.5	1.9	190.624	30.08	186.343	183.09
4/21/2016	1:52:59 PM :	253	105	106	254	114	0.5	3	197.007	0.5	1.9	191.231	30.09	186.857	183.659
4/21/2016	1:53:59 PM :	288	105	106	256	114	0.5	3.1	197.529	0.5	2	191.858	30.08	187.348	184.248
4/21/2016	1:54:59 PM :	288	105	106	262	114	0.499	3.2	198.102	0.5	2	192.368	30.08	187.887	184.726
4/21/2016	1:55:59 PM :	279	105	106	263	114	0.5	3.3	198.697	0.5	2	192.857	30.08	188.445	185.185
4/21/2016	1:56:59 PM :	268	105	106	260	114	0.5	3.3	199.265	0.5	2	193.398	30.08	188.978	185.692
4/21/2016	1:57:59 PM :	274	105	106	256	114	0.5	3.4	199.789	0.5	2	193.951	30.08	189.47	186.209
4/21/2016	1:58:59 PM :	264	105	106	255	114	0.499	3.5	200.325	0.5	2	194.559	30.08	189.973	186.779
4/21/2016	1:59:59 PM :	245	105	107	261	114	0.499	3.5	200.905	0.5	1.9	195.116	30.08	190.519	187.301
4/21/2016	2:00:59 PM :	221	105	106	264	114	0.501	3.5	201.51	0.5	1.9	195.624	30.08	191.086	187.778
4/21/2016	2:01:59 PM :	195	105	107	262	114	0.5	3.5	202.065	0.5	1.9	196.139	30.08	191.607	188.259
4/21/2016	2:02:59 PM :	177	105	107	258	114	0.5	3.4	202.57	0.5	1.9	196.675	30.08	192.082	188.761
4/21/2016	2:03:59 PM :	165	105	107	254	114	0.501	3.4	203.13	0.5	1.9	197.268	30.08	192.607	189.317
4/21/2016	2:04:59 PM :	155	105	107	257	114	0.499	3.4	203.707	0.5	1.9	197.854	30.08	193.15	189.866
4/21/2016	2:05:59 PM :	148	105	107	262	114	0.5	3.4	204.33	0.5	1.9	198.403	30.08	193.734	190.38
4/21/2016	2:06:59 PM :	141	105	107	263	114	0.501	3.4	204.861	0.5	1.9	198.88	30.08	194.233	190.827
4/21/2016	2:07:59 PM :	137	105	107	259	114	0.501	3.4	205.354	0.5	1.9	199.378	30.08	194.696	191.293
4/21/2016	2:08:59 PM :	133	105	107	255	114	0.5	3.4	205.921	0.5	1.9	199.992	30.08	195.228	191.869
4/21/2016	2:09:59 PM :	131	105	107	255	114	0.5	3.4	206.503	0.5	1.9	200.619	30.08	195.775	192.455
4/21/2016	2:10:59 PM :	153	105	107	261	114	0.5	3.5	207.133	0.499	1.9	201.14	30.07	196.366	192.944
4/21/2016	2:11:59 PM :	164	105	107	263	114	0.5	3.6	207.657	0.5	2	201.617	30.07	196.858	193.39
4/21/2016	2:12:59 PM :	163	105	107	260	114	0.5	3.7	208.148	0.5	2	202.108	30.07	197.319	193.85
4/21/2016	2:13:59 PM :	164	105	107	255	114	0.501	3.7	208.703	0.5	2	202.71	30.07	197.84	194.413
4/21/2016	2:14:59 PM :	163	105	107	254	114	0.5	3.7	209.309	0.5	1.9	203.383	30.07	198.409	195.044
4/21/2016	2:15:59 PM :	160	105	107	260	114	0.499	3.7	209.937	0.499	1.9	203.886	30.07	198.998	195.514
4/21/2016	2:16:59 PM :	155	105	107	262	114	0.5	3.8	210.46	0.5	2	204.341	30.07	199.49	195.94
4/21/2016	2:17:59 PM :	150	105	107	260	114	0.5	3.8	210.954	0.5	2	204.844	30.07	199.953	196.41
4/21/2016	2:18:59 PM :	149	105	107	255	114	0.5	3.8	211.489	0.5	2	205.472	30.07	200.455	196.999
4/21/2016	2:19:59 PM :	147	105	107	254	114	0.5	3.9	212.117	0.5	1.9	206.105	30.07	201.045	197.592
4/21/2016	2:20:59 PM :	146	105	107	259	114	0.5	3.9	212.734	0.5	1.9	206.62	30.07	201.625	198.073
4/21/2016	2:21:59 PM :	143	105	107	262	114	0.499	3.9	213.264	0.5	2	207.089	30.07	202.122	198.512
4/21/2016	2:22:59 PM :	140	106	107	260	114	0.499	4	213.752	0.5	2	207.593	30.07	202.579	198.984
4/21/2016	2:23:59 PM :	139	106	107	255	114	0.5	4	214.274	0.5	2	208.215	30.07	203.069	199.566
4/21/2016	2:24:59 PM :	139	106	107	254	114	0.501	4.1	214.922	0.5	1.9	208.844	30.07	203.677	200.154
4/21/2016	2:25:59 PM :	140	106	107	259	114	0.499	4.2	215.53	0.5	1.9	209.348	30.07	204.247	200.626
4/21/2016	2:26:59 PM :	139	106	107	262	114	0.5	4.2	216.067	0.5	2	209.832	30.06	204.751	201.078
4/21/2016	2:27:59 PM :	139	106	107	260	114	0.5	4.2	216.544	0.5	2	210.366	30.06	205.197	201.578
4/21/2016	2:28:59 PM :	137	106	107	255	114	0.5	4.2	217.058	0.5	2	210.925	30.06	205.679	202.101
4/21/2016	2:29:59 PM :	138	106	107	254	114	0.499	4.3	217.711	0.5	2	211.547	30.06	206.292	202.683
4/21/2016	2:30:59 PM :	136	106	107	259	114	0.5	4.3	218.322	0.5	1.9	212.087	30.06	206.865	203.187
4/21/2016	2:31:59 PM :	134	106	107	262	114	0.5	4.4	218.858	0.5	2	212.589	30.06	207.368	203.657
4/21/2016	2:32:59 PM :	133	106	107	260	114	0.5	4.4	219.336	0.5	2	213.109	30.07	207.815	204.143
4/21/2016	2:33:59 PM :	133	106	107	255	114	0.5	4.5	219.854	0.5	2	213.651	30.07	208.301	204.65
4/21/2016	2:34:59 PM :	132	106	107	254	114	0.499	4.6	220.495	0.5	2	214.24	30.07	208.903	205.201
4/21/2016	2:35:59 PM :	135	106	107	259	114	0.5	4.8	221.122	0.5	2	214.816	30.07	209.491	205.74

4/21/2016	2:36:59 PM :	133	106	107	262	114	0.499	4.9	221.652	0.5	2	215.366	30.07	209.988	206.255
4/21/2016	2:37:59 PM :	131	106	107	260	114	0.5	5	222.132	0.5	2	215.845	30.07	210.438	206.703
4/21/2016	2:38:59 PM :	131	106	107	255	114	0.5	5.2	222.654	0.5	2	216.346	30.07	210.927	207.171
4/21/2016	2:39:59 PM :	129	106	107	254	114	0.5	5.4	223.281	0.5	2	216.958	30.07	211.515	207.743
4/21/2016	2:40:59 PM :	128	106	107	258	114	0.5	5.6	223.922	0.5	2	217.582	30.07	212.117	208.327
4/21/2016	2:41:59 PM :	115	106	107	262	114	0.499	5.6	224.444	0.5	2	218.1	30.07	212.606	208.811
4/21/2016	2:42:59 PM :	114	106	107	260	114	0.5	5.6	224.932	0.499	2	218.578	30.07	213.063	209.259
4/21/2016	2:43:59 PM :	113	106	107	255	114	0.5	5.8	225.458	0.5	2	219.07	30.06	213.556	209.718
4/21/2016	2:44:59 PM :	112	106	107	253	114	0.5	5.9	226.07	0.5	2	219.669	30.06	214.131	210.279
4/21/2016	2:45:59 PM :	112	106	107	258	114	0.501	6.1	226.724	0.5	2	220.341	30.06	214.744	210.907
4/21/2016	2:46:59 PM :	113	106	107	262	114	0.499	6	227.236	0.5	2	220.842	30.06	215.224	211.375
4/21/2016	2:47:59 PM :	114	106	107	260	114	0.5	6.1	227.737	0.5	2	221.292	30.06	215.694	211.797
4/21/2016	2:48:59 PM :	115	106	107	255	114	0.5	6.3	228.253	0.5	2	221.797	30.06	216.178	212.268
4/21/2016	2:49:59 PM :	115	106	107	253	114	0.5	6.3	228.858	0.5	2	222.423	30.06	216.745	212.854
4/21/2016	2:50:59 PM :	114	106	107	257	114	0.5	6.4	229.51	0.5	2	223.051	30.06	217.356	213.441
4/21/2016	2:51:59 PM :	113	106	107	262	114	0.501	6.4	230.026	0.5	2	223.569	30.06	217.84	213.925
4/21/2016	2:52:59 PM :	113	106	107	261	114	0.499	6.4	230.535	0.5	2	224.039	30.05	218.317	214.364
4/21/2016	2:53:59 PM :	112	106	107	256	114	0.5	6.5	231.053	0.5	2	224.541	30.05	218.803	214.834
4/21/2016	2:54:59 PM :	111	106	107	253	114	0.5	6.6	231.654	0.5	2	225.159	30.05	219.366	215.412
4/21/2016	2:55:59 PM :	110	106	107	257	114	0.499	6.7	232.293	0.5	2	225.78	30.05	219.965	215.993
4/21/2016	2:56:59 PM :	111	106	107	261	114	0.499	6.7	232.822	0.5	2	226.291	30.05	220.461	216.47
4/21/2016	2:57:59 PM :	110	106	107	261	114	0.5	6.7	233.331	0.5	2	226.774	30.05	220.938	216.922
4/21/2016	2:58:59 PM :	110	106	107	256	114	0.499	6.8	233.851	0.5	2	227.316	30.05	221.425	217.428
4/21/2016	2:59:59 PM :	110	106	107	253	114	0.5	7	234.469	0.5	2	227.871	30.05	222.004	217.947
4/21/2016	3:00:59 PM :	109	106	107	257	114	0.5	7.2	235.079	0.5	2	228.483	30.05	222.577	218.52
4/21/2016	3:01:59 PM :	109	106	107	261	114	0.5	7.1	235.612	0.5	2	229.03	30.05	223.076	219.031
4/21/2016	3:02:59 PM :	108	106	107	261	114	0.5	7.1	236.121	0.5	2	229.539	30.05	223.553	219.506
4/21/2016	3:03:59 PM :	107	106	107	256	114	0.5	7.1	236.66	0.5	2	230.053	30.05	224.059	219.987
4/21/2016	3:04:59 PM :	107	106	107	253	114	0.499	7.3	237.271	0.5	2	230.593	30.05	224.631	220.492
4/21/2016	3:05:59 PM :	107	106	107	256	114	0.5	7.5	237.861	0.5	2	231.184	30.05	225.185	221.044
4/21/2016	3:06:59 PM :	107	106	107	261	114	0.501	7.5	238.416	0.5	2	231.766	30.05	225.705	221.589
4/21/2016	3:07:59 PM :	106	106	107	261	114	0.499	7.4	238.915	0.5	2	232.315	30.05	226.172	222.102
4/21/2016	3:08:59 PM :	106	106	107	256	114	0.499	7.5	239.474	0.5	2	232.79	30.05	226.696	222.546
4/21/2016	3:09:59 PM :	105	106	107	253	114	0.5	7.6	240.069	0.5	2	233.291	30.05	227.254	223.014
4/21/2016	3:10:59 PM :	105	106	107	256	114	0.5	7.7	240.646	0.5	2	233.904	30.05	227.795	223.587
4/21/2016	3:11:59 PM :	105	106	107	261	114	0.5	7.5	241.201	0.5	2	234.531	30.05	228.315	224.174
4/21/2016	3:12:59 PM :	105	106	107	261	114	0.5	7.6	241.705	0.5	2	235.048	30.05	228.788	224.656
4/21/2016	3:13:59 PM :	104	106	107	256	114	0.5	7.6	242.275	0.5	2	235.529	30.05	229.321	225.106
4/21/2016	3:14:59 PM :	104	106	107	253	114	0.5	7.7	242.869	0.5	2	236.015	30.05	229.878	225.56
4/21/2016	3:15:59 PM :	104	106	107	256	114	0.5	8	243.434	0.5	2	236.615	30.05	230.408	226.122
4/21/2016	3:16:59 PM :	104	106	107	261	114	0.5	8.1	243.981	0.5	2	237.289	30.05	230.921	226.751
4/21/2016	3:17:59 PM :	104	106	107	261	114	0.5	8	244.503	0.5	2	237.791	30.05	231.41	227.221
4/21/2016	3:18:59 PM :	103	106	107	256	114	0.5	8	245.081	0.5	2	238.246	30.05	231.951	227.646
4/21/2016	3:19:59 PM :	103	106	107	253	114	0.499	8.2	245.674	0.5	2	238.747	30.05	232.506	228.114
4/21/2016	3:20:59 PM :	102	106	107	256	114	0.5	8.2	246.242	0.5	2	239.376	30.05	233.039	228.702
4/21/2016	3:21:59 PM :	102	106	107	261	114	0.5	8.2	246.766	0.5	2	240.004	30.05	233.531	229.29
4/21/2016	3:22:59 PM :	102	106	107	261	114	0.5	8.2	247.297	0.5	2	240.515	30.05	234.028	229.767
4/21/2016	3:23:59 PM :	108	106	107	256	114	0.5	8.3	247.875	0.5	2	240.986	30.05	234.57	230.207
4/21/2016	3:24:59 PM :	109	106	107	253	114	0.5	8.5	248.482	0.5	2	241.492	30.05	235.138	230.68
4/21/2016	3:25:59 PM :	108	106	107	256	114	0.501	8.6	249.04	0.5	2	242.1	30.05	235.662	231.248
4/21/2016	3:26:59 PM :	108	106	107	261	114	0.5	8.3	249.548	0.5	2	242.73	30.05	236.138	231.838
4/21/2016	3:27:59 PM :	122	106	107	260	114	0.5	8.2	250.101	0.5	2.1	243.235	30.05	236.656	232.309
4/21/2016	3:28:59 PM :	147	106	107	255	114	0.5	8.3	250.677	0.5	2.1	243.723	30.05	237.196	232.765
4/21/2016	3:29:59 PM :	209	106	107	253	114	0.498	9.2	251.302	0.5	2.1	244.265	30.05	237.782	233.272
4/21/2016	3:30:59 PM :	267	106	107	258	114	0.5	10	251.832	0.5	2.1	244.814	30.05	238.278	233.785
4/21/2016	3:31:59 PM :	308	106	107	263	114	0.498	10.7	252.331	0.5	2.2	245.423	30.05	238.746	234.354
4/21/2016	3:32:59 PM :	338	106	107	262	114	0.498	11.6	252.889	0.5	2.2	245.978	30.04	239.269	234.873
4/21/2016	3:33:59 PM :	293	106	107	259	114	0.499	12.3	253.467	0.5	2.2	246.489	30.05	239.81	235.35
4/21/2016	3:34:59 PM :	253	106	107	254	114	0.503	12	254.094	0.5	2.2	246.997	30.05	240.398	235.825
4/21/2016	3:35:59 PM :	230	106	107	256	114	0.498	10.8	254.624	0.5	2.1	247.532	30.05	240.895	236.325
4/21/2016	3:36:59 PM :	239	106	107	263	114	0.495	12	255.108	0.5	2.2	248.125	30.05	241.348	236.879
4/21/2016	3:37:59 PM :	258	106	107	264	114	0.498	13	255.668	0.5	2.2	248.713	30.05	241.873	237.43
4/21/2016	3:38:59 PM :	261	106	107	261	114	0.497	13.9	256.254	0.5	2.3	249.259	30.04	242.422	237.94
4/21/2016	3:39:59 PM :	260	106	107	257	114	0.497	14.9	256.879	0.5	2.3	249.738	30.04	243.008	238.387
4/21/2016	3:40:59 PM :	254	106	107	255	114	0.488	15.9	257.393	0.5	2.2	250.234	30.05	243.49	238.851
4/21/2016	3:41:59 PM :	253	106	107	260	114	0.475	16.9	257.868	0.5	2.3	250.851	30.05	243.934	239.427
4/21/2016	3:42:59 PM :	246	106	107	264	114	0.481	17.5	258.415	0.5	2.3	251.481	30.05	244.447	240.016
4/21/2016	3:43:59 PM :	240	106	107	264	114	0.475	18	258.963	0.5	2.3	251.993	30.04	244.961	240.494
4/21/2016	3:44:59 PM :	235	106	107	261	114	0.47	18.6	259.514	0.5	2.3	252.467	30.04	245.477	240.938

4/21/2016	3:45:59 PM :	235	106	107	257	114	0.441	19.2	260.001	0.5	2.3	252.965	30.04	245.934	241.403
4/21/2016	3:46:59 PM :	227	106	107	255	114	0.459	19.2	260.522	0.5	2.2	253.564	30.04	246.421	241.963
4/21/2016	3:47:59 PM :	210	106	107	260	114	0.496	18.8	261.013	0.5	2.2	254.233	30.04	246.881	242.588
4/21/2016	3:48:59 PM :	191	106	107	264	114	0.554	18.4	261.601	0.5	2.2	254.737	30.04	247.433	243.059
4/21/2016	3:49:59 PM :	173	106	107	263	114	0.563	18	262.245	0.5	2.2	255.195	30.04	248.035	243.487
4/21/2016	3:50:59 PM :	163	106	107	260	114	0.545	17.6	262.837	0.5	2.2	255.692	30.04	248.591	243.951
4/21/2016	3:51:59 PM :	177	106	107	256	114	0.433	19.1	263.308	0.5	2.2	256.326	30.04	249.031	244.544
4/21/2016	3:52:59 PM :	189	106	107	255	114	0.389	20.3	263.678	0.5	2.2	256.956	30.03	249.379	245.132
4/21/2016	3:53:59 PM :	189	106	107	261	113	0.371	20.5	264.017	0.5	2.2	257.47	30.03	249.696	245.613
4/21/2016	3:54:59 PM :	202	106	107	263	113	0.355	20.6	264.453	0.5	2.3	257.941	30.04	250.104	246.053
4/21/2016	3:55:59 PM :	208	105	107	261	113	0.329	20.7	264.789	0.5	2.3	258.451	30.04	250.419	246.53
4/21/2016	3:56:59 PM :	209	105	107	256	113	0.317	20.7	265.21	0.5	2.3	259.063	30.03	250.814	247.103
4/21/2016	3:57:59 PM :	207	105	107	254	113	0.308	20.8	265.495	0.5	2.3	259.694	30.03	251.081	247.692
4/21/2016	3:58:59 PM :	203	105	107	259	112	0.299	20.8	265.81	0.5	2.3	260.202	30.03	251.377	248.167
4/21/2016	3:59:59 PM :	197	105	107	263	112	0.297	20.8	266.081	0.5	2.3	260.692	30.03	251.63	248.626
4/21/2016	4:00:59 PM :	177	105	107	262	112	0.338	20.6	266.39	0.5	2.3	261.23	30.03	251.92	249.129
4/21/2016	4:01:59 PM :	167	105	107	258	112	0.38	20.4	266.76	0.5	2.2	261.785	30.03	252.267	249.648
4/21/2016	4:02:24 PM :	167	105	107	258	112	0.38	20.4	266.885	0.5	2.2	262.025	30.03	252.384	249.872

```
'
'-------------------------- LOGGED EVENTS ----------------------------------
04/20/16 4:50:20 PM: Test START
04/20/16 4:50:26 PM: Test Paused by User
04/20/16 4:50:27 PM: PAUSE_EVENT [Manual Pause]
04/21/16 8:01:24 AM: TestResumed
04/21/16 10:50:00 AM: Return from power failure
04/21/16 3:38:55 PM: Alarm Chg    260    258    32    289    106    107    260    115  0.501    14.3   256.215  0.499    2.3   249.222     -  30.05   242.386   237.905     -     -    500    57.3    51.0    99.6   100.0 {---- ---- I--- ----}
04/21/16 4:02:24 PM: Actual Sampling Time: 1d  2h  12m  16s
04/21/16 4:02:24 PM: Test END
04/21/16  16:05:  with Flow Rate of 4 ccm (Max. allowed 20 ccm)
04/21/16  16:05:43: Maximum Observed Vacuum for A was 20.9 inHg
04/21/16  16:05:  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/21/16  16:05:43: Maximum Observed Vacuum for B was 2.3 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'           DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 5 Day.pro
File Exported: 4/30/2016 12:24:50 AM (PC Time).
Company Name: Cuba

04/22/16 07:03:58: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 11 ccm (Max. allowed 20 ccm)
04/22/16 07:03:58: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 6 ccm (Max. allowed 20 ccm)
Trap ID-A: OL343607
Trap ID-B: OL335467 spiked

Run D5

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 9h 49m
Averaging Period : 1 min.

	Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES	**83.8**	**92.9**	**94**	**257.3**	**100.3**	**0.501**	**3.9**	**268.487**	**0.5**	**2.8**	**257.021**	**30.15**	**258.536**	**247.891**
4/22/2016 7:06:19 AM :	81	86	86	261	93	0	0.3	0	0	0	0	30.11	0	0
4/22/2016 7:06:25 AM :User Paused	80	86	86	260	93	1.135	2	0.13	0.892	1.3	0.145	30.11	0.127	0.141
4/22/2016 8:29:15 AM :Resumed	82	89	89	254	96	0	0.3	0.132	0	0	0.147	30.13	0.129	0.143
4/22/2016 8:30:14 AM :	82	88	88	254	95	0.597	2	0.687	0.563	1.5	0.749	30.13	0.667	0.727
4/22/2016 8:31:14 AM :	82	88	88	256	95	0.501	2.2	1.288	0.5	1.8	1.319	30.13	1.249	1.279
4/22/2016 8:32:14 AM :	82	88	88	260	95	0.5	2.2	1.938	0.5	1.8	1.855	30.13	1.88	1.798
4/22/2016 8:33:14 AM :	82	88	88	260	95	0.5	2.2	2.445	0.5	1.8	2.327	30.13	2.372	2.257
4/22/2016 8:34:14 AM :	82	88	88	255	95	0.5	2.2	2.942	0.5	1.8	2.817	30.13	2.854	2.731
4/22/2016 8:35:14 AM :	82	88	88	253	95	0.5	2.2	3.462	0.5	1.8	3.423	30.13	3.359	3.318
4/22/2016 8:36:14 AM :	82	88	89	256	96	0.5	2.2	4.063	0.5	1.7	4.058	30.13	3.941	3.934
4/22/2016 8:37:14 AM :	82	88	89	260	96	0.5	2.2	4.711	0.5	1.7	4.549	30.13	4.57	4.409
4/22/2016 8:38:14 AM :	82	88	89	260	96	0.501	2.2	5.225	0.5	1.8	5.006	30.13	5.068	4.851
4/22/2016 8:39:14 AM :	82	89	89	256	96	0.5	2.2	5.732	0.5	1.7	5.509	30.13	5.559	5.338
4/22/2016 8:40:14 AM :	83	89	89	253	96	0.5	2.2	6.248	0.5	1.7	6.119	30.13	6.059	5.929
4/22/2016 8:41:14 AM :	83	89	89	256	96	0.499	2.2	6.857	0.499	1.7	6.741	30.13	6.649	6.531
4/22/2016 8:42:14 AM :	84	89	89	260	96	0.501	2.2	7.492	0.5	1.7	7.242	30.13	7.264	7.015
4/22/2016 8:43:14 AM :	85	89	90	260	97	0.5	2.2	8.016	0.499	1.8	7.7	30.12	7.772	7.458
4/22/2016 8:44:14 AM :	85	89	90	256	97	0.5	2.2	8.522	0.5	1.8	8.203	30.13	8.261	7.943
4/22/2016 8:45:14 AM :	85	89	90	253	97	0.5	2.2	9.048	0.5	1.8	8.799	30.12	8.77	8.52
4/22/2016 8:46:14 AM :	86	89	90	256	97	0.5	2.2	9.663	0.499	1.8	9.412	30.13	9.365	9.112
4/22/2016 8:47:14 AM :	87	89	91	261	97	0.501	2.3	10.268	0.5	1.8	9.918	30.13	9.951	9.601
4/22/2016 8:48:14 AM :	87	89	91	261	98	0.5	2.3	10.802	0.499	1.8	10.413	30.12	10.468	10.079
4/22/2016 8:49:14 AM :	87	90	91	257	98	0.5	2.3	11.308	0.5	1.8	10.929	30.13	10.957	10.577
4/22/2016 8:50:14 AM :	87	90	91	253	98	0.5	2.2	11.84	0.499	1.8	11.458	30.12	11.471	11.088
4/22/2016 8:51:14 AM :	86	90	91	256	98	0.499	2.2	12.459	0.5	1.8	12.04	30.13	12.069	11.649
4/22/2016 8:52:14 AM :	86	90	91	261	98	0.499	2.2	13.043	0.5	1.8	12.61	30.13	12.634	12.2
4/22/2016 8:53:14 AM :	86	90	91	261	99	0.5	2.2	13.588	0.5	1.8	13.144	30.13	13.161	12.715
4/22/2016 8:54:14 AM :	86	90	91	256	99	0.5	2.2	14.091	0.5	1.8	13.613	30.13	13.647	13.167
4/22/2016 8:55:14 AM :	86	90	92	253	99	0.5	2.2	14.638	0.5	1.7	14.102	30.13	14.175	13.638
4/22/2016 8:56:14 AM :	86	90	92	256	99	0.5	2.2	15.241	0.5	1.7	14.699	30.13	14.757	14.214
4/22/2016 8:57:14 AM :	86	90	92	261	99	0.499	2.2	15.82	0.5	1.8	15.35	30.13	15.317	14.841
4/22/2016 8:58:14 AM :	85	91	92	261	100	0.5	2.2	16.373	0.5	1.8	15.841	30.13	15.85	15.314
4/22/2016 8:59:14 AM :	85	91	92	256	100	0.5	2.2	16.87	0.5	1.8	16.288	30.13	16.33	15.745
4/22/2016 9:00:14 AM :	85	91	92	253	100	0.5	2.2	17.428	0.5	1.7	16.788	30.13	16.868	16.227
4/22/2016 9:01:14 AM :	85	91	92	256	100	0.5	2.2	18.029	0.5	1.8	17.411	30.14	17.448	16.826
4/22/2016 9:02:14 AM :	85	91	92	261	101	0.5	2.2	18.595	0.5	1.8	18.031	30.14	17.995	17.424
4/22/2016 9:03:14 AM :	85	91	92	260	101	0.5	2.2	19.151	0.5	1.8	18.533	30.13	18.531	17.907
4/22/2016 9:04:14 AM :	85	91	93	255	101	0.499	2.2	19.652	0.5	1.8	18.998	30.14	19.014	18.354
4/22/2016 9:05:14 AM :	84	91	93	253	101	0.5	2.2	20.218	0.5	1.8	19.5	30.14	19.56	18.838

4/22/2016 9:06:14 AM :	85	91	93	257	101	0.5	2.2	20.814	0.5	1.8	20.095	30.14	20.134	19.41
4/22/2016 9:07:14 AM :	84	91	93	261	101	0.5	2.2	21.373	0.5	1.8	20.707	30.13	20.674	19.999
4/22/2016 9:08:14 AM :	84	91	93	260	101	0.5	2.3	21.922	0.5	1.8	21.22	30.13	21.203	20.492
4/22/2016 9:09:14 AM :	84	92	93	255	101	0.5	2.2	22.433	0.5	1.8	21.716	30.13	21.695	20.969
4/22/2016 9:10:14 AM :	84	92	93	253	101	0.5	2.2	22.999	0.5	1.8	22.232	30.13	22.24	21.465
4/22/2016 9:11:14 AM :	83	92	93	257	101	0.5	2.2	23.598	0.5	1.8	22.77	30.13	22.817	21.982
4/22/2016 9:12:14 AM :	83	92	93	261	101	0.5	2.2	24.157	0.5	1.8	23.349	30.14	23.355	22.539
4/22/2016 9:13:14 AM :	83	92	93	260	101	0.5	2.2	24.699	0.5	1.8	23.926	30.14	23.878	23.094
4/22/2016 9:14:14 AM :	83	92	93	255	101	0.5	2.2	25.217	0.5	1.8	24.46	30.14	24.377	23.607
4/22/2016 9:15:14 AM :	83	92	93	253	101	0.5	2.2	25.791	0.5	1.8	24.929	30.14	24.93	24.058
4/22/2016 9:16:14 AM :	83	92	93	257	101	0.5	2.2	26.387	0.5	1.8	25.419	30.14	25.503	24.529
4/22/2016 9:17:14 AM :	83	93	94	261	101	0.499	2.2	26.947	0.5	1.8	26.026	30.14	26.042	25.112
4/22/2016 9:18:14 AM :	83	93	94	259	101	0.5	2.2	27.473	0.5	1.8	26.664	30.14	26.548	25.724
4/22/2016 9:19:14 AM :	83	93	94	255	101	0.5	2.2	28	0.5	1.8	27.158	30.14	27.057	26.199
4/22/2016 9:20:14 AM :	83	93	94	253	101	0.499	2.2	28.579	0.5	1.8	27.615	30.14	27.614	26.638
4/22/2016 9:21:14 AM :	83	93	94	258	101	0.5	2.2	29.179	0.5	1.8	28.114	30.14	28.191	27.117
4/22/2016 9:22:14 AM :	83	93	94	261	101	0.5	2.2	29.739	0.5	1.8	28.73	30.14	28.73	27.709
4/22/2016 9:23:14 AM :	83	93	94	259	101	0.501	2.2	30.248	0.5	1.8	29.354	30.14	29.22	28.308
4/22/2016 9:24:14 AM :	83	93	94	254	101	0.5	2.2	30.79	0.5	1.8	29.86	30.14	29.742	28.795
4/22/2016 9:25:14 AM :	83	93	94	254	101	0.5	2.2	31.37	0.5	1.8	30.316	30.14	30.3	29.232
4/22/2016 9:26:14 AM :	83	93	94	258	101	0.5	2.2	31.975	0.5	1.8	30.82	30.14	30.882	29.716
4/22/2016 9:27:14 AM :	83	93	94	261	101	0.5	2.2	32.526	0.5	1.8	31.428	30.14	31.412	30.3
4/22/2016 9:28:14 AM :	83	93	94	258	101	0.5	2.3	33.026	0.5	1.8	32.044	30.14	31.894	30.891
4/22/2016 9:29:14 AM :	83	93	94	254	101	0.5	2.2	33.577	0.5	1.8	32.541	30.14	32.423	31.367
4/22/2016 9:30:14 AM :	83	93	94	254	101	0.5	2.2	34.158	0.499	1.8	33.026	30.15	32.983	31.833
4/22/2016 9:31:14 AM :	83	93	94	259	101	0.5	2.2	34.778	0.499	1.8	33.562	30.15	33.579	32.347
4/22/2016 9:32:14 AM :	83	93	94	261	101	0.5	2.3	35.312	0.5	1.8	34.101	30.15	34.092	32.866
4/22/2016 9:33:14 AM :	83	93	94	258	101	0.5	2.3	35.801	0.5	1.8	34.682	30.14	34.563	33.423
4/22/2016 9:34:14 AM :	83	93	94	253	101	0.5	2.2	36.366	0.5	1.8	35.257	30.14	35.106	33.974
4/22/2016 9:35:14 AM :	83	93	94	254	101	0.5	2.2	36.944	0.5	1.8	35.777	30.14	35.662	34.474
4/22/2016 9:36:14 AM :	83	93	94	259	101	0.5	2.2	37.574	0.5	1.8	36.258	30.14	36.268	34.935
4/22/2016 9:37:14 AM :	84	93	94	261	101	0.499	2.3	38.096	0.5	1.8	36.756	30.14	36.77	35.414
4/22/2016 9:38:14 AM :	84	93	94	258	101	0.5	2.3	38.584	0.5	1.8	37.36	30.14	37.239	35.993
4/22/2016 9:39:14 AM :	84	93	94	253	101	0.499	2.2	39.142	0.5	1.8	37.981	30.14	37.776	36.588
4/22/2016 9:40:14 AM :	84	93	94	255	101	0.499	2.2	39.733	0.5	1.8	38.483	30.15	38.345	37.071
4/22/2016 9:41:14 AM :	84	93	95	259	101	0.5	2.2	40.359	0.5	1.8	38.953	30.15	38.946	37.521
4/22/2016 9:42:14 AM :	84	93	95	260	102	0.5	2.3	40.883	0.5	1.8	39.445	30.15	39.45	37.993
4/22/2016 9:43:14 AM :	84	94	95	257	102	0.501	2.3	41.368	0.5	1.8	40.049	30.15	39.917	38.572
4/22/2016 9:44:14 AM :	84	94	95	253	102	0.5	2.3	41.921	0.5	1.8	40.691	30.15	40.448	39.189
4/22/2016 9:45:14 AM :	85	94	95	255	102	0.5	2.2	42.525	0.5	1.8	41.192	30.16	41.029	39.669
4/22/2016 9:46:14 AM :	84	94	95	260	102	0.5	2.3	43.151	0.5	1.8	41.641	30.15	41.63	40.1
4/22/2016 9:47:14 AM :	85	94	95	260	102	0.501	2.3	43.671	0.5	1.8	42.143	30.15	42.13	40.581
4/22/2016 9:48:14 AM :	85	94	95	256	102	0.5	2.3	44.166	0.5	1.8	42.771	30.15	42.606	41.183
4/22/2016 9:49:14 AM :	85	94	95	253	102	0.5	2.3	44.699	0.5	1.8	43.382	30.15	43.118	41.769
4/22/2016 9:50:14 AM :	85	94	95	256	102	0.501	2.2	45.319	0.5	1.8	43.874	30.15	43.714	42.241
4/22/2016 9:51:14 AM :	85	94	95	260	102	0.5	2.3	45.945	0.5	1.8	44.353	30.15	44.315	42.7
4/22/2016 9:52:14 AM :	85	94	95	260	102	0.499	2.3	46.463	0.5	1.8	44.889	30.16	44.813	43.214
4/22/2016 9:53:14 AM :	85	94	95	256	102	0.501	2.3	46.952	0.5	1.8	45.434	30.16	45.284	43.737
4/22/2016 9:54:14 AM :	85	94	95	253	102	0.5	2.3	47.48	0.5	1.8	46.026	30.16	45.791	44.305
4/22/2016 9:55:14 AM :	85	94	95	256	102	0.501	2.2	48.123	0.5	1.8	46.59	30.15	46.409	44.845
4/22/2016 9:56:14 AM :	85	94	95	260	102	0.5	2.3	48.737	0.5	1.8	47.094	30.15	46.998	45.328
4/22/2016 9:57:14 AM :	85	94	95	260	103	0.5	2.3	49.261	0.5	1.8	47.585	30.16	47.501	45.799
4/22/2016 9:58:14 AM :	85	94	95	256	103	0.501	2.3	49.743	0.5	1.8	48.101	30.16	47.964	46.293
4/22/2016 9:59:14 AM :	85	94	95	253	103	0.501	2.3	50.259	0.5	1.8	48.7	30.16	48.46	46.867
4/22/2016 10:00:14 AM :	85	94	95	256	103	0.499	2.3	50.915	0.5	1.8	49.304	30.16	49.09	47.446
4/22/2016 10:01:14 AM :	86	94	95	260	103	0.5	2.3	51.522	0.5	1.8	49.814	30.15	49.672	47.935
4/22/2016 10:02:14 AM :	86	94	95	260	103	0.499	2.3	52.055	0.499	1.8	50.289	30.15	50.184	48.39

4/22/2016 10:03:14 AM :	86	94	95	255	103	0.5	2.3	52.529	0.5	1.8	50.776	30.15	50.639	48.857
4/22/2016 10:04:14 AM :	86	94	96	253	103	0.5	2.3	53.043	0.5	1.8	51.378	30.15	51.133	49.433
4/22/2016 10:05:14 AM :	86	95	96	257	103	0.5	2.3	53.695	0.499	1.8	52.03	30.16	51.759	50.057
4/22/2016 10:06:14 AM :	86	95	96	261	103	0.501	2.3	54.312	0.5	1.8	52.528	30.16	52.35	50.534
4/22/2016 10:07:14 AM :	86	95	96	260	103	0.5	2.3	54.842	0.5	1.8	52.97	30.15	52.858	50.957
4/22/2016 10:08:14 AM :	86	95	96	255	104	0.5	2.3	55.313	0.5	1.8	53.468	30.15	53.31	51.434
4/22/2016 10:09:14 AM :	86	95	96	253	104	0.5	2.3	55.829	0.5	1.8	54.108	30.16	53.805	52.047
4/22/2016 10:10:14 AM :	86	95	96	257	104	0.5	2.3	56.48	0.5	1.8	54.718	30.16	54.43	52.631
4/22/2016 10:11:14 AM :	87	95	96	261	104	0.5	2.3	57.102	0.5	1.8	55.211	30.15	55.026	53.103
4/22/2016 10:12:14 AM :	87	95	96	259	104	0.5	2.3	57.628	0.5	1.8	55.693	30.15	55.53	53.564
4/22/2016 10:13:14 AM :	87	95	96	255	104	0.5	2.3	58.102	0.5	1.8	56.212	30.15	55.985	54.06
4/22/2016 10:14:14 AM :	87	95	96	254	104	0.5	2.3	58.626	0.5	1.8	56.775	30.15	56.487	54.598
4/22/2016 10:15:14 AM :	87	95	96	258	104	0.5	2.3	59.258	0.5	1.8	57.385	30.15	57.093	55.182
4/22/2016 10:16:14 AM :	88	95	96	261	104	0.5	2.3	59.894	0.5	1.8	57.923	30.15	57.702	55.696
4/22/2016 10:17:14 AM :	88	95	96	259	105	0.5	2.3	60.418	0.5	1.8	58.417	30.15	58.204	56.169
4/22/2016 10:18:14 AM :	87	95	97	254	105	0.5	2.3	60.892	0.5	1.8	58.926	30.15	58.658	56.654
4/22/2016 10:19:14 AM :	87	96	97	254	105	0.499	2.3	61.42	0.499	1.8	59.453	30.16	59.164	57.159
4/22/2016 10:20:14 AM :	87	96	97	258	105	0.499	2.3	62.037	0.5	1.8	60.046	30.15	59.755	57.725
4/22/2016 10:21:14 AM :	87	96	97	261	105	0.5	2.3	62.681	0.5	1.8	60.631	30.15	60.371	58.284
4/22/2016 10:22:14 AM :	87	96	97	259	105	0.499	2.3	63.199	0.5	1.8	61.163	30.15	60.867	58.792
4/22/2016 10:23:14 AM :	86	96	97	254	105	0.501	2.3	63.686	0.5	1.8	61.639	30.15	61.333	59.247
4/22/2016 10:24:14 AM :	86	96	97	253	105	0.5	2.3	64.206	0.5	1.8	62.118	30.15	61.831	59.705
4/22/2016 10:25:14 AM :	86	96	97	258	104	0.5	2.3	64.814	0.5	1.8	62.717	30.15	62.413	60.277
4/22/2016 10:26:14 AM :	86	96	97	261	104	0.5	2.3	65.469	0.5	1.8	63.382	30.15	63.04	60.912
4/22/2016 10:27:14 AM :	86	96	97	259	104	0.5	2.3	65.981	0.5	1.8	63.871	30.15	63.53	61.378
4/22/2016 10:28:14 AM :	85	96	97	254	104	0.5	2.3	66.478	0.5	1.8	64.323	30.15	64.006	61.809
4/22/2016 10:29:14 AM :	85	96	97	254	104	0.5	2.3	66.994	0.5	1.8	64.827	30.15	64.499	62.291
4/22/2016 10:30:14 AM :	85	96	97	258	104	0.5	2.3	67.598	0.5	1.8	65.447	30.15	65.077	62.883
4/22/2016 10:31:14 AM :	85	96	97	261	104	0.499	2.3	68.255	0.5	1.8	66.071	30.15	65.705	63.478
4/22/2016 10:32:14 AM :	85	96	97	258	104	0.5	2.3	68.764	0.5	1.8	66.575	30.15	66.192	63.959
4/22/2016 10:33:14 AM :	85	96	97	254	104	0.499	2.3	69.262	0.5	1.8	67.037	30.15	66.668	64.4
4/22/2016 10:34:14 AM :	85	96	97	254	104	0.5	2.3	69.781	0.5	1.8	67.545	30.15	67.165	64.885
4/22/2016 10:35:14 AM :	85	96	97	259	104	0.499	2.3	70.382	0.5	1.8	68.141	30.15	67.739	65.454
4/22/2016 10:36:14 AM :	85	96	97	261	104	0.499	2.3	71.032	0.5	1.8	68.765	30.15	68.361	66.049
4/22/2016 10:37:14 AM :	85	96	97	258	104	0.5	2.3	71.544	0.5	1.8	69.269	30.15	68.851	66.531
4/22/2016 10:38:14 AM :	84	96	97	254	103	0.5	2.3	72.049	0.5	1.8	69.757	30.15	69.334	66.996
4/22/2016 10:39:14 AM :	83	96	97	254	103	0.499	2.3	72.573	0.5	1.8	70.296	30.15	69.835	67.511
4/22/2016 10:40:14 AM :	82	96	97	260	103	0.501	2.3	73.174	0.499	1.8	70.828	30.15	70.409	68.019
4/22/2016 10:41:14 AM :	82	96	97	261	103	0.5	2.3	73.811	0.5	1.8	71.417	30.15	71.019	68.581
4/22/2016 10:42:14 AM :	82	96	97	258	103	0.5	2.3	74.334	0.5	1.8	71.978	30.15	71.519	69.116
4/22/2016 10:43:14 AM :	82	96	97	254	103	0.499	2.3	74.841	0.5	1.8	72.512	30.15	72.005	69.626
4/22/2016 10:44:14 AM :	83	96	97	254	103	0.5	2.3	75.365	0.5	1.8	72.994	30.15	72.506	70.086
4/22/2016 10:45:14 AM :	84	96	97	260	103	0.5	2.3	75.978	0.5	1.8	73.498	30.15	73.094	70.567
4/22/2016 10:46:14 AM :	83	96	97	262	103	0.5	2.3	76.587	0.5	1.9	74.103	30.15	73.676	71.145
4/22/2016 10:47:14 AM :	84	96	97	259	103	0.5	2.3	77.125	0.5	1.9	74.722	30.15	74.191	71.735
4/22/2016 10:48:14 AM :	84	96	97	254	103	0.5	2.3	77.629	0.5	1.9	75.228	30.15	74.674	72.218
4/22/2016 10:49:14 AM :	84	96	97	254	103	0.499	2.3	78.163	0.5	1.9	75.699	30.15	75.185	72.667
4/22/2016 10:50:14 AM :	85	96	97	260	102	0.5	2.3	78.776	0.5	1.9	76.189	30.15	75.772	73.135
4/22/2016 10:51:14 AM :	85	96	97	262	102	0.5	2.4	79.368	0.5	1.9	76.794	30.15	76.339	73.713
4/22/2016 10:52:14 AM :	85	96	97	259	102	0.5	2.4	79.917	0.5	1.9	77.442	30.15	76.864	74.331
4/22/2016 10:53:14 AM :	85	96	97	254	102	0.501	2.4	80.42	0.5	1.9	77.942	30.15	77.346	74.809
4/22/2016 10:54:14 AM :	85	96	97	255	102	0.5	2.3	80.968	0.5	1.9	78.389	30.15	77.87	75.236
4/22/2016 10:55:14 AM :	85	96	97	260	102	0.5	2.4	81.571	0.5	1.9	78.889	30.16	78.448	75.714
4/22/2016 10:56:14 AM :	85	96	97	262	102	0.5	2.4	82.148	0.5	1.9	79.525	30.16	79	76.322
4/22/2016 10:57:14 AM :	85	96	97	259	102	0.499	2.4	82.705	0.5	1.9	80.136	30.16	79.533	76.906
4/22/2016 10:58:14 AM :	85	95	97	254	102	0.5	2.3	83.204	0.5	1.9	80.628	30.16	80.012	77.376
4/22/2016 10:59:14 AM :	85	95	97	254	102	0.501	2.3	83.77	0.499	1.8	81.115	30.16	80.554	77.841

4/22/2016 11:00:14 AM :	86	95	97	260	102	0.501	2.3	84.367	0.5	1.8	81.637	30.16	81.127	78.34
4/22/2016 11:01:14 AM :	86	95	97	262	102	0.501	2.4	84.933	0.5	1.9	82.192	30.16	81.669	78.87
4/22/2016 11:02:14 AM :	86	95	97	259	102	0.5	2.4	85.484	0.5	1.9	82.799	30.16	82.197	79.45
4/22/2016 11:03:14 AM :	86	95	97	254	102	0.501	2.4	85.998	0.5	1.9	83.348	30.16	82.69	79.975
4/22/2016 11:04:14 AM :	86	95	97	254	102	0.499	2.3	86.57	0.5	1.9	83.846	30.16	83.238	80.451
4/22/2016 11:05:14 AM :	86	95	97	260	102	0.5	2.4	87.164	0.5	1.9	84.347	30.16	83.807	80.929
4/22/2016 11:06:14 AM :	86	95	97	262	102	0.5	2.4	87.725	0.5	1.9	84.873	30.16	84.345	81.432
4/22/2016 11:07:14 AM :	86	95	97	260	102	0.5	2.4	88.26	0.5	1.9	85.464	30.16	84.858	81.997
4/22/2016 11:08:14 AM :	87	95	97	255	102	0.5	2.4	88.784	0.501	1.9	86.054	30.16	85.36	82.561
4/22/2016 11:09:14 AM :	86	95	97	254	102	0.5	2.4	89.37	0.499	1.9	86.585	30.16	85.921	83.068
4/22/2016 11:10:14 AM :	86	95	97	259	102	0.498	2.4	89.962	0.5	1.9	87.057	30.16	86.489	83.52
4/22/2016 11:11:14 AM :	85	95	97	263	102	0.5	2.4	90.525	0.5	1.9	87.538	30.16	87.029	83.979
4/22/2016 11:12:14 AM :	85	95	96	261	102	0.501	2.4	91.041	0.5	1.9	88.14	30.16	87.523	84.555
4/22/2016 11:13:14 AM :	85	95	96	256	102	0.5	2.4	91.582	0.5	1.9	88.805	30.16	88.042	85.191
4/22/2016 11:14:14 AM :	85	95	96	253	102	0.5	2.4	92.16	0.5	1.9	89.292	30.16	88.596	85.657
4/22/2016 11:15:14 AM :	85	95	96	258	102	0.5	2.4	92.766	0.5	1.9	89.738	30.16	89.178	86.083
4/22/2016 11:16:14 AM :	85	95	96	262	102	0.499	2.4	93.319	0.5	1.9	90.242	30.16	89.708	86.566
4/22/2016 11:17:14 AM :	85	95	96	262	102	0.5	2.4	93.82	0.5	1.9	90.868	30.16	90.189	87.165
4/22/2016 11:18:14 AM :	85	95	96	258	102	0.5	2.4	94.374	0.5	1.9	91.487	30.16	90.72	87.756
4/22/2016 11:19:14 AM :	85	95	96	254	102	0.501	2.4	94.954	0.5	1.9	91.989	30.16	91.276	88.237
4/22/2016 11:20:14 AM :	85	95	96	256	102	0.501	2.3	95.58	0.5	1.8	92.458	30.16	91.877	88.685
4/22/2016 11:21:14 AM :	85	95	96	261	102	0.501	2.3	96.109	0.5	1.8	92.966	30.15	92.385	89.171
4/22/2016 11:22:14 AM :	85	95	96	261	102	0.5	2.3	96.602	0.5	1.9	93.551	30.15	92.858	89.73
4/22/2016 11:23:14 AM :	85	95	96	257	102	0.5	2.4	97.163	0.5	1.9	94.167	30.15	93.396	90.32
4/22/2016 11:24:14 AM :	85	95	96	253	102	0.5	2.3	97.748	0.5	1.8	94.685	30.15	93.957	90.816
4/22/2016 11:25:14 AM :	85	95	96	256	102	0.5	2.3	98.374	0.5	1.8	95.173	30.15	94.558	91.282
4/22/2016 11:26:14 AM :	84	95	96	261	102	0.5	2.3	98.899	0.5	1.9	95.701	30.15	95.061	91.787
4/22/2016 11:27:14 AM :	84	95	96	261	102	0.5	2.4	99.387	0.5	1.9	96.237	30.15	95.529	92.3
4/22/2016 11:28:14 AM :	84	95	96	257	102	0.5	2.4	99.943	0.5	1.9	96.818	30.15	96.063	92.855
4/22/2016 11:29:14 AM :	84	95	96	253	102	0.5	2.4	100.544	0.5	1.9	97.391	30.15	96.639	93.403
4/22/2016 11:30:14 AM :	84	95	96	256	102	0.5	2.3	101.173	0.5	1.9	97.933	30.15	97.242	93.922
4/22/2016 11:31:14 AM :	84	95	96	261	102	0.499	2.4	101.69	0.5	1.9	98.402	30.15	97.738	94.37
4/22/2016 11:32:14 AM :	84	95	96	261	102	0.5	2.4	102.177	0.5	1.9	98.889	30.15	98.206	94.836
4/22/2016 11:33:14 AM :	84	95	96	257	102	0.5	2.4	102.724	0.5	1.9	99.495	30.15	98.73	95.415
4/22/2016 11:34:14 AM :	84	95	96	253	102	0.5	2.4	103.342	0.5	1.9	100.139	30.15	99.322	96.031
4/22/2016 11:35:14 AM :	84	95	96	256	101	0.501	2.4	103.968	0.5	1.9	100.633	30.15	99.923	96.503
4/22/2016 11:36:14 AM :	84	95	96	261	102	0.5	2.4	104.482	0.5	1.9	101.094	30.15	100.416	96.945
4/22/2016 11:37:14 AM :	84	95	96	261	102	0.5	2.4	104.977	0.5	1.9	101.591	30.14	100.891	97.42
4/22/2016 11:38:14 AM :	84	95	96	257	101	0.5	2.4	105.503	0.5	1.9	102.201	30.15	101.395	98.003
4/22/2016 11:39:14 AM :	84	95	96	253	101	0.501	2.4	106.14	0.5	1.9	102.835	30.15	102.006	98.611
4/22/2016 11:40:14 AM :	84	95	96	256	101	0.5	2.4	106.756	0.5	1.9	103.337	30.15	102.597	99.091
4/22/2016 11:41:14 AM :	84	95	96	261	101	0.5	2.4	107.284	0.5	1.9	103.797	30.15	103.103	99.531
4/22/2016 11:42:14 AM :	84	94	96	261	101	0.501	2.4	107.767	0.5	1.9	104.297	30.15	103.567	100.01
4/22/2016 11:43:14 AM :	84	95	96	257	101	0.501	2.4	108.285	0.5	1.9	104.911	30.15	104.064	100.598
4/22/2016 11:44:14 AM :	84	94	96	253	101	0.5	2.4	108.941	0.499	1.9	105.53	30.15	104.694	101.19
4/22/2016 11:45:14 AM :	83	95	96	256	101	0.5	2.4	109.552	0.5	1.9	106.028	30.15	105.28	101.667
4/22/2016 11:46:14 AM :	83	94	96	261	101	0.501	2.4	110.083	0.5	1.9	106.507	30.14	105.789	102.125
4/22/2016 11:47:14 AM :	83	94	96	261	101	0.5	2.4	110.559	0.5	1.9	107.049	30.14	106.246	102.644
4/22/2016 11:48:14 AM :	83	94	96	257	101	0.5	2.4	111.069	0.499	1.9	107.586	30.14	106.736	103.157
4/22/2016 11:49:14 AM :	83	94	96	253	101	0.499	2.4	111.729	0.5	1.9	108.176	30.14	107.37	103.723
4/22/2016 11:50:14 AM :	83	94	96	256	101	0.5	2.4	112.342	0.5	1.9	108.734	30.14	107.957	104.256
4/22/2016 11:51:14 AM :	83	94	96	261	101	0.5	2.4	112.876	0.5	1.9	109.258	30.14	108.47	104.758
4/22/2016 11:52:14 AM :	83	94	96	261	101	0.5	2.4	113.347	0.5	1.9	109.742	30.14	108.922	105.221
4/22/2016 11:53:14 AM :	83	94	96	257	101	0.5	2.4	113.864	0.499	1.9	110.253	30.14	109.418	105.709
4/22/2016 11:54:14 AM :	83	94	96	253	101	0.501	2.4	114.513	0.5	1.9	110.856	30.14	110.04	106.286
4/22/2016 11:55:14 AM :	83	94	96	255	101	0.501	2.4	115.14	0.5	1.9	111.466	30.14	110.642	106.87
4/22/2016 11:56:14 AM :	83	94	96	261	101	0.5	2.4	115.668	0.5	1.9	111.976	30.14	111.149	107.358

4/22/2016 11:57:14 AM :	83	94	96	261	101	0.5	2.4	116.145	0.5	1.9	112.451	30.14	111.607	107.813
4/22/2016 11:58:14 AM :	83	94	96	258	101	0.5	2.4	116.671	0.5	1.9	112.936	30.14	112.112	108.277
4/22/2016 11:59:14 AM :	83	94	96	253	101	0.5	2.4	117.297	0.5	1.9	113.538	30.14	112.713	108.853
4/22/2016 12:00:14 PM :	83	94	96	255	101	0.499	2.4	117.934	0.5	1.9	114.19	30.14	113.324	109.477
4/22/2016 12:01:14 PM :	83	94	96	260	101	0.499	2.4	118.454	0.5	1.9	114.686	30.14	113.823	109.952
4/22/2016 12:02:14 PM :	83	94	96	261	101	0.5	2.4	118.941	0.5	1.9	115.133	30.14	114.291	110.38
4/22/2016 12:03:14 PM :	83	94	96	257	101	0.499	2.4	119.467	0.5	1.9	115.632	30.14	114.796	110.857
4/22/2016 12:04:14 PM :	83	94	95	253	101	0.5	2.4	120.082	0.5	1.9	116.272	30.15	115.386	111.47
4/22/2016 12:05:14 PM :	83	94	95	256	101	0.5	2.4	120.732	0.5	1.9	116.878	30.15	116.01	112.051
4/22/2016 12:06:14 PM :	83	94	95	261	101	0.5	2.4	121.244	0.5	1.9	117.37	30.15	116.502	112.522
4/22/2016 12:07:14 PM :	83	94	95	261	101	0.501	2.4	121.743	0.5	1.9	117.855	30.15	116.981	112.987
4/22/2016 12:08:14 PM :	83	94	95	256	101	0.5	2.4	122.261	0.5	1.9	118.377	30.15	117.478	113.487
4/22/2016 12:09:14 PM :	83	94	95	253	101	0.5	2.4	122.866	0.5	1.9	118.935	30.15	118.059	114.022
4/22/2016 12:10:14 PM :	83	94	95	256	101	0.5	2.4	123.522	0.5	1.9	119.543	30.15	118.689	114.604
4/22/2016 12:11:14 PM :	83	94	95	260	101	0.5	2.4	124.033	0.5	1.9	120.083	30.15	119.18	115.121
4/22/2016 12:12:14 PM :	83	94	95	260	101	0.5	2.4	124.537	0.5	1.9	120.583	30.15	119.665	115.601
4/22/2016 12:13:14 PM :	83	94	95	256	101	0.5	2.4	125.055	0.5	1.9	121.086	30.15	120.163	116.082
4/22/2016 12:14:14 PM :	83	94	95	253	101	0.5	2.4	125.658	0.5	1.9	121.617	30.15	120.742	116.592
4/22/2016 12:15:14 PM :	83	94	95	257	101	0.501	2.4	126.305	0.5	1.9	122.208	30.15	121.364	117.158
4/22/2016 12:16:14 PM :	83	94	95	261	101	0.5	2.4	126.821	0.5	1.9	122.793	30.15	121.86	117.718
4/22/2016 12:17:14 PM :	83	94	95	260	101	0.5	2.4	127.329	0.5	1.9	123.323	30.15	122.348	118.225
4/22/2016 12:18:14 PM :	83	94	95	255	101	0.5	2.4	127.851	0.5	1.9	123.797	30.15	122.85	118.68
4/22/2016 12:19:14 PM :	83	94	95	253	101	0.499	2.4	128.462	0.5	1.9	124.28	30.15	123.436	119.143
4/22/2016 12:20:14 PM :	83	94	95	258	101	0.5	2.4	129.085	0.5	1.9	124.88	30.15	124.035	119.718
4/22/2016 12:21:14 PM :	83	94	95	261	101	0.5	2.4	129.615	0.5	1.9	125.542	30.15	124.545	120.352
4/22/2016 12:22:14 PM :	83	94	95	260	101	0.5	2.4	130.122	0.499	1.9	126.029	30.15	125.032	120.819
4/22/2016 12:23:14 PM :	83	94	95	255	101	0.5	2.4	130.649	0.5	1.9	126.477	30.15	125.538	121.247
4/22/2016 12:24:14 PM :	83	94	95	253	101	0.5	2.4	131.267	0.5	1.9	126.979	30.15	126.133	121.728
4/22/2016 12:25:14 PM :	83	94	95	258	101	0.501	2.4	131.864	0.5	1.9	127.604	30.15	126.706	122.328
4/22/2016 12:26:14 PM :	83	94	95	261	101	0.5	2.4	132.409	0.5	1.9	128.225	30.15	127.229	122.922
4/22/2016 12:27:14 PM :	83	94	95	260	101	0.5	2.4	132.916	0.5	1.9	128.727	30.15	127.717	123.403
4/22/2016 12:28:14 PM :	83	94	95	255	101	0.5	2.4	133.459	0.5	1.9	129.195	30.15	128.238	123.851
4/22/2016 12:29:14 PM :	83	94	95	253	101	0.5	2.4	134.065	0.5	1.9	129.702	30.15	128.821	124.337
4/22/2016 12:30:14 PM :	83	94	95	258	101	0.5	2.4	134.645	0.499	1.9	130.286	30.15	129.378	124.896
4/22/2016 12:31:14 PM :	83	94	95	261	101	0.499	2.4	135.201	0.5	1.9	130.906	30.15	129.912	125.49
4/22/2016 12:32:14 PM :	83	94	95	260	101	0.499	2.4	135.7	0.5	1.9	131.421	30.15	130.392	125.984
4/22/2016 12:33:14 PM :	83	94	95	255	101	0.5	2.4	136.264	0.5	1.9	131.91	30.15	130.934	126.453
4/22/2016 12:34:14 PM :	83	94	95	253	101	0.501	2.4	136.863	0.5	1.9	132.434	30.15	131.51	126.955
4/22/2016 12:35:14 PM :	83	94	95	258	101	0.5	2.4	137.431	0.5	1.9	132.972	30.15	132.055	127.47
4/22/2016 12:36:14 PM :	83	94	95	261	101	0.499	2.4	137.984	0.5	1.9	133.555	30.15	132.586	128.028
4/22/2016 12:37:14 PM :	83	94	95	259	101	0.5	2.4	138.488	0.5	1.9	134.124	30.14	133.071	128.573
4/22/2016 12:38:14 PM :	83	94	95	254	101	0.5	2.4	139.06	0.5	1.9	134.665	30.14	133.62	129.092
4/22/2016 12:39:14 PM :	83	94	95	254	101	0.5	2.4	139.657	0.499	1.9	135.137	30.14	134.194	129.544
4/22/2016 12:40:14 PM :	83	94	95	259	101	0.501	2.4	140.219	0.5	1.9	135.627	30.14	134.734	130.013
4/22/2016 12:41:14 PM :	83	94	95	261	101	0.5	2.4	140.76	0.5	1.9	136.23	30.14	135.254	130.591
4/22/2016 12:42:14 PM :	83	94	95	259	101	0.5	2.4	141.282	0.5	1.9	136.871	30.15	135.755	131.205
4/22/2016 12:43:14 PM :	83	94	95	254	101	0.5	2.4	141.858	0.5	1.9	137.366	30.15	136.308	131.679
4/22/2016 12:44:14 PM :	83	94	95	254	101	0.5	2.4	142.455	0.5	1.9	137.825	30.15	136.883	132.119
4/22/2016 12:45:14 PM :	83	94	95	259	101	0.5	2.4	143.019	0.5	1.9	138.325	30.15	137.424	132.598
4/22/2016 12:46:14 PM :	83	94	95	261	101	0.499	2.4	143.539	0.499	1.9	138.936	30.15	137.924	133.183
4/22/2016 12:47:14 PM :	83	94	95	259	101	0.5	2.4	144.075	0.499	1.9	139.568	30.15	138.439	133.789
4/22/2016 12:48:14 PM :	83	94	95	254	101	0.5	2.4	144.656	0.5	1.9	140.07	30.15	138.997	134.27
4/22/2016 12:49:14 PM :	83	94	95	254	101	0.5	2.4	145.254	0.499	1.9	140.525	30.15	139.573	134.706
4/22/2016 12:50:14 PM :	83	94	95	259	102	0.5	2.4	145.817	0.5	1.9	141.031	30.15	140.113	135.191
4/22/2016 12:51:14 PM :	83	94	95	261	101	0.5	2.4	146.32	0.5	1.9	141.642	30.15	140.597	135.776
4/22/2016 12:52:14 PM :	84	94	95	258	101	0.5	2.4	146.872	0.5	1.9	142.258	30.15	141.127	136.367
4/22/2016 12:53:14 PM :	84	94	95	253	101	0.5	2.4	147.452	0.5	1.9	142.759	30.15	141.684	136.846

4/22/2016 12:54:14 PM :	84	94	95	254	102	0.5	2.4	148.07	0.5	1.9	143.238	30.15	142.278	137.305
4/22/2016 12:55:14 PM :	84	94	95	259	102	0.501	2.4	148.605	0.5	1.9	143.781	30.15	142.792	137.825
4/22/2016 12:56:14 PM :	84	94	95	261	102	0.5	2.4	149.098	0.5	1.9	144.321	30.15	143.265	138.343
4/22/2016 12:57:14 PM :	84	94	95	258	102	0.499	2.4	149.661	0.5	1.9	144.907	30.15	143.806	138.905
4/22/2016 12:58:14 PM :	85	94	95	254	102	0.5	2.4	150.244	0.5	1.9	145.468	30.15	144.365	139.443
4/22/2016 12:59:14 PM :	85	94	95	254	102	0.501	2.4	150.872	0.5	1.9	145.992	30.15	144.968	139.944
4/22/2016 1:00:14 PM :	85	94	95	259	102	0.5	2.4	151.395	0.5	1.9	146.477	30.15	145.47	140.409
4/22/2016 1:01:14 PM :	85	94	95	261	102	0.499	2.4	151.885	0.5	1.9	146.99	30.15	145.941	140.9
4/22/2016 1:02:14 PM :	85	94	95	258	102	0.501	2.4	152.443	0.5	1.9	147.59	30.15	146.476	141.475
4/22/2016 1:03:14 PM :	85	94	95	253	102	0.5	2.4	153.039	0.5	1.9	148.201	30.15	147.048	142.06
4/22/2016 1:04:14 PM :	85	94	95	254	102	0.5	2.4	153.664	0.5	1.9	148.71	30.15	147.649	142.548
4/22/2016 1:05:14 PM :	85	94	95	259	102	0.5	2.4	154.186	0.5	1.9	149.182	30.15	148.15	143
4/22/2016 1:06:14 PM :	85	94	95	261	102	0.5	2.4	154.677	0.5	1.9	149.672	30.15	148.621	143.47
4/22/2016 1:07:14 PM :	85	94	95	258	102	0.5	2.4	155.222	0.5	1.9	150.273	30.15	149.144	144.045
4/22/2016 1:08:14 PM :	85	94	96	253	102	0.5	2.4	155.835	0.5	1.9	150.925	30.15	149.732	144.669
4/22/2016 1:09:14 PM :	85	94	96	254	102	0.5	2.4	156.464	0.5	1.9	151.425	30.15	150.337	145.148
4/22/2016 1:10:14 PM :	85	94	96	259	102	0.5	2.4	156.98	0.5	1.9	151.87	30.15	150.832	145.574
4/22/2016 1:11:14 PM :	85	94	96	261	102	0.501	2.4	157.471	0.5	1.9	152.366	30.15	151.304	146.049
4/22/2016 1:12:14 PM :	85	94	96	258	102	0.501	2.5	158.002	0.5	1.9	153.004	30.15	151.813	146.659
4/22/2016 1:13:14 PM :	85	94	96	254	102	0.5	2.4	158.634	0.5	1.9	153.615	30.15	152.42	147.245
4/22/2016 1:14:14 PM :	85	94	96	255	102	0.499	2.4	159.252	0.499	1.9	154.105	30.16	153.013	147.714
4/22/2016 1:15:14 PM :	86	94	96	260	102	0.499	2.5	159.776	0.5	2	154.584	30.16	153.517	148.172
4/22/2016 1:16:14 PM :	87	94	96	262	102	0.501	2.5	160.261	0.5	2	155.112	30.16	153.983	148.678
4/22/2016 1:17:14 PM :	87	94	96	259	101	0.499	2.6	160.783	0.5	2.1	155.671	30.16	154.484	149.213
4/22/2016 1:18:14 PM :	87	94	96	254	101	0.5	2.6	161.432	0.5	2.1	156.279	30.15	155.106	149.795
4/22/2016 1:19:14 PM :	88	94	96	255	101	0.499	2.6	162.046	0.5	2.1	156.819	30.16	155.696	150.312
4/22/2016 1:36:29 PM :	78	90	25	189	90	0.562	2.1	162.82	0.553	1.7	157.512	30.08	156.443	151.071
4/22/2016 1:48:05 PM :	75	88	open	188	87	0.56	2.1	163.871	0.559	1.8	158.633	30.08	157.46	152.365
4/22/2016 1:49:49 PM :	77	89	open	203	88	0.563	2.3	164.757	0.557	1.8	159.467	30.14	158.319	153.329
4/22/2016 1:50:49 PM :	78	89	open	217	89	0.498	2.5	165.283	0.5	1.9	159.952	30.2	158.83	153.892
4/22/2016 1:51:49 PM :	78	89	open	235	90	0.499	2.5	165.777	0.499	2	160.393	30.2	159.308	154.403
4/22/2016 1:52:49 PM :	79	89	open	254	90	0.5	2.6	166.301	0.5	2	160.877	30.2	159.816	154.964
4/22/2016 1:53:49 PM :	79	89	open	268	91	0.499	2.7	166.961	0.5	2.1	161.497	30.2	160.457	155.683
4/22/2016 1:54:49 PM :	79	89	open	271	91	0.5	2.7	167.57	0.499	2.2	162.098	30.2	161.048	156.379
4/22/2016 1:55:49 PM :	79	89	63	268	91	0.501	2.8	168.11	0.5	2.2	162.577	30.21	161.572	156.867
4/22/2016 1:56:49 PM :	80	89	90	262	92	0.5	2.8	168.586	0.5	2.2	163.035	30.2	162.033	157.31
4/22/2016 1:57:49 PM :	80	89	90	255	92	0.499	2.8	169.103	0.5	2.2	163.564	30.2	162.534	157.824
4/22/2016 1:58:49 PM :	80	89	90	252	92	0.499	2.8	169.759	0.499	2.2	164.096	30.2	163.171	158.339
4/22/2016 1:59:49 PM :	80	89	89	256	92	0.499	2.8	170.384	0.499	2.2	164.663	30.2	163.778	158.888
4/22/2016 2:00:49 PM :	80	89	89	261	92	0.501	2.8	170.915	0.5	2.3	165.221	30.2	164.294	159.43
4/22/2016 2:01:49 PM :	80	89	89	261	92	0.501	2.9	171.393	0.499	2.3	165.734	30.2	164.758	159.928
4/22/2016 2:02:49 PM :	80	89	89	257	92	0.498	2.9	171.921	0.5	2.3	166.194	30.2	165.271	160.373
4/22/2016 2:03:49 PM :	80	89	89	253	93	0.502	2.9	172.551	0.499	2.3	166.661	30.2	165.882	160.826
4/22/2016 2:04:49 PM :	80	89	89	256	93	0.499	2.9	173.195	0.5	2.3	167.249	30.2	166.508	161.397
4/22/2016 2:05:49 PM :	80	89	89	261	93	0.5	2.9	173.717	0.499	2.3	167.891	30.2	167.015	162.019
4/22/2016 2:06:49 PM :	80	88	89	261	93	0.5	2.9	174.204	0.5	2.3	168.368	30.2	167.488	162.482
4/22/2016 2:07:49 PM :	80	88	89	256	93	0.5	2.9	174.728	0.5	2.3	168.798	30.2	167.998	162.899
4/22/2016 2:08:49 PM :	80	88	89	253	93	0.5	2.9	175.343	0.5	2.3	169.288	30.2	168.595	163.374
4/22/2016 2:09:49 PM :	80	88	89	257	94	0.5	3	176.003	0.5	2.3	169.895	30.2	169.237	163.963
4/22/2016 2:10:49 PM :	80	88	89	261	94	0.501	3	176.513	0.5	2.4	170.492	30.2	169.732	164.542
4/22/2016 2:11:49 PM :	80	88	89	260	94	0.499	3	177.018	0.5	2.4	170.984	30.19	170.223	165.019
4/22/2016 2:12:49 PM :	80	88	89	255	94	0.502	3	177.536	0.5	2.4	171.457	30.19	170.727	165.477
4/22/2016 2:13:49 PM :	80	88	89	253	94	0.5	3	178.143	0.5	2.4	171.965	30.19	171.316	165.97
4/22/2016 2:14:49 PM :	80	88	89	258	94	0.501	3	178.793	0.5	2.4	172.485	30.19	171.948	166.474
4/22/2016 2:15:49 PM :	80	88	89	261	94	0.5	3.1	179.311	0.5	2.4	173.058	30.19	172.451	167.03
4/22/2016 2:16:49 PM :	80	88	89	259	95	0.5	3.1	179.818	0.499	2.4	173.637	30.19	172.944	167.591
4/22/2016 2:17:49 PM :	80	88	89	254	95	0.5	3.1	180.342	0.5	2.4	174.137	30.18	173.453	168.076

4/22/2016	2:18:49 PM :	80	88	89	254	95	0.5	3.1	180.952	0.5	2.4	174.595	30.18	174.045	168.519
4/22/2016	2:19:49 PM :	80	88	89	259	95	0.5	3.2	181.576	0.5	2.4	175.072	30.18	174.651	168.981
4/22/2016	2:20:49 PM :	80	88	89	261	95	0.5	3.2	182.107	0.5	2.5	175.671	30.18	175.167	169.562
4/22/2016	2:21:49 PM :	80	88	89	259	95	0.501	3.3	182.62	0.5	2.5	176.289	30.18	175.665	170.161
4/22/2016	2:22:49 PM :	80	88	89	254	95	0.5	3.3	183.147	0.5	2.5	176.773	30.18	176.177	170.63
4/22/2016	2:23:49 PM :	81	88	89	254	95	0.501	3.4	183.77	0.5	2.5	177.221	30.18	176.782	171.064
4/22/2016	2:24:49 PM :	80	88	89	260	95	0.5	3.4	184.358	0.5	2.5	177.725	30.18	177.353	171.553
4/22/2016	2:25:49 PM :	80	88	89	261	95	0.498	3.5	184.907	0.5	2.5	178.288	30.17	177.886	172.098
4/22/2016	2:26:49 PM :	80	88	89	258	95	0.499	3.5	185.412	0.5	2.5	178.881	30.17	178.377	172.672
4/22/2016	2:27:49 PM :	81	88	89	253	96	0.501	3.6	185.966	0.5	2.5	179.405	30.18	178.915	173.181
4/22/2016	2:28:49 PM :	81	88	89	255	96	0.501	3.7	186.568	0.5	2.5	179.899	30.17	179.5	173.66
4/22/2016	2:29:49 PM :	81	88	89	260	96	0.5	3.8	187.143	0.5	2.6	180.378	30.17	180.058	174.124
4/22/2016	2:30:49 PM :	81	88	89	261	96	0.501	4	187.697	0.5	2.6	180.868	30.17	180.596	174.599
4/22/2016	2:31:49 PM :	81	88	89	257	96	0.5	4.1	188.204	0.5	2.6	181.459	30.17	181.088	175.171
4/22/2016	2:32:49 PM :	81	88	89	253	96	0.501	4.2	188.776	0.5	2.6	182.077	30.17	181.643	175.77
4/22/2016	2:33:49 PM :	81	89	90	255	96	0.499	4.4	189.37	0.5	2.6	182.558	30.17	182.22	176.235
4/22/2016	2:34:49 PM :	82	89	90	261	96	0.499	4.5	189.933	0.5	2.7	182.997	30.16	182.766	176.659
4/22/2016	2:35:49 PM :	82	89	90	261	96	0.501	4.6	190.48	0.5	2.8	183.483	30.16	183.296	177.13
4/22/2016	2:36:49 PM :	82	89	90	256	96	0.5	4.7	190.996	0.5	2.8	184.101	30.16	183.796	177.728
4/22/2016	2:37:49 PM :	82	89	90	253	96	0.5	4.8	191.572	0.5	2.8	184.7	30.16	184.355	178.307
4/22/2016	2:38:49 PM :	82	89	90	256	96	0.501	5	192.174	0.499	2.9	185.177	30.16	184.939	178.769
4/22/2016	2:39:49 PM :	82	89	90	261	97	0.501	5	192.74	0.5	3	185.635	30.15	185.487	179.212
4/22/2016	2:40:49 PM :	82	89	90	260	97	0.5	5.2	193.262	0.5	3.1	186.165	30.15	185.993	179.725
4/22/2016	2:41:49 PM :	82	89	90	255	97	0.499	5.3	193.796	0.5	3.2	186.697	30.15	186.511	180.239
4/22/2016	2:42:49 PM :	82	89	90	253	97	0.499	5.4	194.38	0.5	3.3	187.266	30.15	187.077	180.79
4/22/2016	2:43:49 PM :	82	89	90	256	97	0.5	5.6	194.978	0.5	3.4	187.814	30.15	187.657	181.32
4/22/2016	2:44:49 PM :	82	89	91	261	97	0.5	5.7	195.532	0.5	3.5	188.338	30.15	188.193	181.826
4/22/2016	2:45:49 PM :	82	89	91	260	97	0.5	5.8	196.041	0.5	3.6	188.8	30.14	188.686	182.273
4/22/2016	2:46:49 PM :	82	89	91	255	97	0.5	6	196.592	0.5	3.6	189.272	30.14	189.219	182.729
4/22/2016	2:47:49 PM :	82	89	91	253	97	0.5	6.1	197.17	0.499	3.6	189.857	30.14	189.779	183.293
4/22/2016	2:48:49 PM :	82	89	91	257	97	0.501	6.3	197.793	0.5	3.7	190.507	30.14	190.382	183.921
4/22/2016	2:49:49 PM :	82	89	91	261	97	0.5	6.3	198.329	0.5	3.7	190.986	30.14	190.901	184.384
4/22/2016	2:50:49 PM :	82	89	91	260	98	0.5	6.2	198.822	0.5	3.7	191.413	30.14	191.379	184.796
4/22/2016	2:51:49 PM :	82	89	91	255	98	0.5	6.3	199.384	0.5	3.7	191.902	30.13	191.922	185.269
4/22/2016	2:52:49 PM :	82	89	91	253	98	0.5	6.5	199.966	0.5	3.7	192.516	30.13	192.485	185.862
4/22/2016	2:53:49 PM :	82	89	91	257	98	0.5	6.6	200.597	0.5	3.8	193.113	30.13	193.096	186.438
4/22/2016	2:54:49 PM :	82	90	91	261	98	0.5	6.6	201.117	0.5	3.8	193.597	30.13	193.599	186.905
4/22/2016	2:55:49 PM :	82	90	91	260	98	0.5	6.6	201.606	0.5	3.9	194.072	30.13	194.072	187.363
4/22/2016	2:56:49 PM :	82	90	91	255	98	0.5	6.8	202.167	0.499	3.9	194.586	30.13	194.614	187.859
4/22/2016	2:57:49 PM :	82	90	91	253	98	0.5	6.9	202.762	0.5	4	195.103	30.13	195.189	188.357
4/22/2016	2:58:49 PM :	82	90	91	257	98	0.499	7	203.389	0.5	4	195.677	30.12	195.796	188.911
4/22/2016	2:59:49 PM :	82	90	91	261	98	0.5	7	203.911	0.5	4	196.253	30.12	196.3	189.466
4/22/2016	3:00:49 PM :	82	90	91	260	98	0.5	6.9	204.398	0.5	4	196.761	30.12	196.771	189.957
4/22/2016	3:01:49 PM :	82	90	91	255	98	0.501	7.1	204.947	0.5	4	197.218	30.12	197.302	190.397
4/22/2016	3:02:49 PM :	82	90	91	253	98	0.499	7.2	205.56	0.5	4	197.69	30.12	197.894	190.853
4/22/2016	3:03:49 PM :	82	90	92	257	98	0.501	7.2	206.185	0.5	4	198.285	30.12	198.498	191.426
4/22/2016	3:04:49 PM :	82	90	92	261	98	0.5	7.1	206.707	0.5	4	198.916	30.13	199.003	192.034
4/22/2016	3:05:49 PM :	82	90	92	260	98	0.499	7	207.198	0.5	4	199.402	30.13	199.477	192.502
4/22/2016	3:06:49 PM :	82	90	92	255	99	0.5	7.1	207.73	0.499	4	199.844	30.13	199.991	192.929
4/22/2016	3:07:49 PM :	82	90	92	253	98	0.5	7.2	208.36	0.5	4.1	200.342	30.13	200.599	193.409
4/22/2016	3:08:49 PM :	82	90	92	257	99	0.5	7.1	208.979	0.499	4	200.915	30.13	201.197	193.961
4/22/2016	3:09:49 PM :	82	90	92	261	99	0.5	7.4	209.503	0.5	4.1	201.513	30.13	201.703	194.538
4/22/2016	3:10:49 PM :	82	90	92	259	99	0.5	7.3	209.986	0.5	4.1	202.028	30.13	202.17	195.034
4/22/2016	3:11:49 PM :	82	90	92	254	99	0.5	7.5	210.508	0.5	4.2	202.516	30.13	202.674	195.504
4/22/2016	3:12:49 PM :	82	90	92	253	99	0.5	7.6	211.16	0.5	4.1	203.003	30.14	203.304	195.974
4/22/2016	3:13:49 PM :	82	90	92	258	99	0.501	7.7	211.771	0.5	4.2	203.501	30.14	203.894	196.454
4/22/2016	3:14:49 PM :	82	90	92	261	99	0.501	7.5	212.307	0.499	4.2	204.088	30.14	204.412	197.019

4/22/2016	3:15:49 PM :	82	91	92	259	99	0.499	7.6	212.778	0.5	4.2	204.693	30.14	204.867	197.601
4/22/2016	3:16:49 PM :	82	91	92	254	99	0.5	7.7	213.293	0.5	4.3	205.183	30.14	205.364	198.074
4/22/2016	3:17:49 PM :	82	91	92	253	99	0.5	7.9	213.949	0.5	4.4	205.631	30.14	205.998	198.505
4/22/2016	3:18:49 PM :	82	91	92	258	99	0.501	8	214.563	0.5	4.4	206.113	30.14	206.59	198.97
4/22/2016	3:19:49 PM :	82	91	92	261	99	0.5	7.7	215.093	0.5	4.3	206.722	30.14	207.102	199.555
4/22/2016	3:20:49 PM :	82	91	92	259	99	0.5	7.7	215.565	0.5	4.3	207.327	30.14	207.557	200.138
4/22/2016	3:21:49 PM :	82	91	92	254	99	0.5	7.8	216.075	0.5	4.3	207.805	30.14	208.05	200.6
4/22/2016	3:22:49 PM :	82	91	93	254	99	0.499	7.9	216.73	0.5	4.4	208.262	30.14	208.682	201.039
4/22/2016	3:23:49 PM :	82	91	93	259	99	0.501	7.9	217.354	0.499	4.4	208.785	30.14	209.284	201.542
4/22/2016	3:24:49 PM :	82	91	93	261	99	0.501	7.8	217.881	0.5	4.3	209.324	30.14	209.793	202.061
4/22/2016	3:25:49 PM :	82	91	93	259	100	0.499	7.8	218.355	0.5	4.3	209.897	30.14	210.251	202.613
4/22/2016	3:26:49 PM :	82	91	93	254	99	0.499	7.9	218.873	0.5	4.3	210.444	30.14	210.751	203.139
4/22/2016	3:27:49 PM :	82	91	93	253	100	0.5	8.1	219.513	0.5	4.4	210.963	30.14	211.367	203.638
4/22/2016	3:28:49 PM :	82	91	93	258	100	0.501	8.3	220.146	0.5	4.5	211.423	30.14	211.978	204.081
4/22/2016	3:29:49 PM :	82	91	93	261	100	0.501	8.2	220.673	0.5	4.4	211.902	30.14	212.486	204.542
4/22/2016	3:30:49 PM :	82	91	93	258	100	0.499	8	221.147	0.5	4.3	212.482	30.14	212.944	205.1
4/22/2016	3:31:49 PM :	82	91	93	253	100	0.5	8.2	221.673	0.5	4.3	213.131	30.14	213.451	205.726
4/22/2016	3:32:49 PM :	82	91	93	254	100	0.501	8.3	222.297	0.5	4.3	213.606	30.14	214.052	206.183
4/22/2016	3:33:49 PM :	82	91	93	259	100	0.5	8.3	222.942	0.5	4.4	214.039	30.14	214.675	206.599
4/22/2016	3:34:49 PM :	82	91	93	261	100	0.5	8.2	223.462	0.5	4.5	214.524	30.14	215.176	207.066
4/22/2016	3:35:49 PM :	82	91	93	258	100	0.5	8.2	223.947	0.5	4.5	215.139	30.14	215.644	207.657
4/22/2016	3:36:49 PM :	82	91	93	253	100	0.5	8.3	224.471	0.5	4.4	215.745	30.14	216.15	208.241
4/22/2016	3:37:49 PM :	82	91	93	254	100	0.501	8.6	225.082	0.5	4.5	216.219	30.14	216.739	208.697
4/22/2016	3:38:49 PM :	82	91	93	259	100	0.5	8.5	225.74	0.5	4.5	216.691	30.14	217.374	209.151
4/22/2016	3:39:49 PM :	82	91	93	260	100	0.501	8.4	226.25	0.5	4.5	217.217	30.14	217.866	209.656
4/22/2016	3:40:49 PM :	82	91	93	256	100	0.501	8.2	226.753	0.5	4.5	217.739	30.14	218.351	210.158
4/22/2016	3:41:49 PM :	82	91	93	253	100	0.5	8.4	227.267	0.5	4.5	218.306	30.14	218.847	210.704
4/22/2016	3:42:49 PM :	82	91	93	255	100	0.499	8.7	227.874	0.5	4.6	218.873	30.14	219.432	211.249
4/22/2016	3:43:49 PM :	82	91	93	260	100	0.5	8.7	228.524	0.5	4.6	219.389	30.14	220.059	211.745
4/22/2016	3:44:49 PM :	82	92	93	260	100	0.502	8.6	229.04	0.5	4.6	219.85	30.14	220.556	212.189
4/22/2016	3:45:49 PM :	82	92	93	256	100	0.5	8.4	229.549	0.5	4.5	220.323	30.14	221.046	212.643
4/22/2016	3:46:49 PM :	82	92	93	253	101	0.5	8.2	230.065	0.499	4.4	220.912	30.14	221.544	213.209
4/22/2016	3:47:49 PM :	82	92	93	256	100	0.5	8.3	230.668	0.5	4.4	221.542	30.14	222.124	213.815
4/22/2016	3:48:49 PM :	82	92	93	260	100	0.501	8.3	231.307	0.5	4.5	222.03	30.14	222.74	214.285
4/22/2016	3:49:49 PM :	82	92	93	260	100	0.5	8	231.832	0.5	4.4	222.47	30.14	223.246	214.707
4/22/2016	3:50:49 PM :	83	92	93	255	101	0.501	7.8	232.339	0.5	4.4	222.963	30.14	223.734	215.181
4/22/2016	3:51:49 PM :	83	92	93	253	100	0.499	7.5	232.867	0.5	4.3	223.554	30.14	224.243	215.749
4/22/2016	3:52:49 PM :	82	92	93	256	100	0.501	7.5	233.486	0.5	4.3	224.16	30.14	224.84	216.332
4/22/2016	3:53:49 PM :	82	92	93	260	100	0.5	7.4	234.085	0.5	4.4	224.658	30.13	225.416	216.81
4/22/2016	3:54:49 PM :	82	92	93	260	101	0.501	6.5	234.625	0.5	4.3	225.139	30.13	225.936	217.273
4/22/2016	3:55:49 PM :	82	92	93	255	101	0.503	4.5	235.137	0.5	4.1	225.639	30.13	226.43	217.754
4/22/2016	3:56:49 PM :	82	92	94	253	101	0.5	3	235.682	0.499	4	226.154	30.13	226.954	218.248
4/22/2016	3:57:49 PM :	82	92	94	256	100	0.499	2.8	236.288	0.5	4.1	226.73	30.13	227.539	218.801
4/22/2016	3:58:49 PM :	82	92	94	261	100	0.5	2.8	236.872	0.5	4.1	227.319	30.13	228.101	219.367
4/22/2016	3:59:49 PM :	82	92	94	260	100	0.5	2.8	237.428	0.5	4.3	227.82	30.13	228.636	219.848
4/22/2016	4:00:49 PM :	82	92	94	255	100	0.5	2.8	237.931	0.5	4.5	228.277	30.13	229.121	220.286
4/22/2016	4:01:49 PM :	82	92	94	253	100	0.501	2.8	238.497	0.5	4.7	228.752	30.13	229.666	220.742
4/22/2016	4:02:49 PM :	82	93	94	257	100	0.499	2.8	239.093	0.5	4.9	229.354	30.13	230.24	221.321
4/22/2016	4:03:49 PM :	83	93	94	261	100	0.5	2.9	239.66	0.5	5	229.973	30.13	230.785	221.915
4/22/2016	4:04:49 PM :	83	93	94	259	100	0.5	2.9	240.213	0.5	5.2	230.461	30.13	231.317	222.383
4/22/2016	4:05:49 PM :	83	92	93	254	100	0.5	2.9	240.725	0.5	5.4	230.91	30.12	231.81	222.815
4/22/2016	4:06:49 PM :	83	93	94	254	100	0.5	2.9	241.303	0.5	5.5	231.417	30.12	232.366	223.301
4/22/2016	4:07:49 PM :	83	93	94	259	100	0.5	2.9	241.899	0.5	5.6	231.978	30.12	232.94	223.84
4/22/2016	4:08:49 PM :	83	93	94	261	99	0.501	3	242.462	0.5	5.6	232.569	30.12	233.481	224.407
4/22/2016	4:09:49 PM :	83	92	93	259	99	0.5	3	242.995	0.5	5.6	233.098	30.13	233.994	224.916
4/22/2016	4:10:49 PM :	83	93	94	254	99	0.499	3	243.527	0.5	5.8	233.594	30.13	234.506	225.392
4/22/2016	4:11:49 PM :	83	92	94	254	99	0.5	3	244.111	0.5	5.8	234.072	30.13	235.068	225.852

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4/22/2016   4:12:49 PM :          83     93     94    259     99    0.499     3    244.711    0.5      5.8    234.569    30.13    235.646    226.328
4/22/2016   4:13:49 PM :          83     92     93    261     99      0.5   3.1    245.273    0.5      5.7    235.159    30.13    236.187    226.896
4/22/2016   4:14:49 PM :          83     92     93    258     99      0.5   3.1    245.782  0.499      5.7    235.772    30.13    236.677    227.484
4/22/2016   4:15:49 PM :          83     92     93    254     99    0.499   3.2    246.332    0.5      5.8    236.257    30.13    237.207     227.95
4/22/2016   4:16:49 PM :          83     92     93    254     99      0.5   3.2    246.916    0.5      5.9    236.702    30.13    237.769    228.379
4/22/2016   4:17:49 PM :          83     92     94    260     99      0.5   3.3    247.541  0.499      5.8    237.185    30.13    238.372    228.842
4/22/2016   4:18:49 PM :          83     92     93    262     99      0.5   3.4    248.069    0.5      5.8    237.797    30.13     238.88    229.431
4/22/2016   4:19:49 PM :          82     92     93    259     99    0.501   3.6    248.566    0.5      5.8    238.403    30.13    239.359    230.013
4/22/2016   4:20:49 PM :          82     92     93    254     99      0.5   3.8     249.13    0.5      5.8    238.882    30.13    239.902    230.474
4/22/2016   4:21:49 PM :          82     92     93    254     99      0.5   4.3    249.713    0.5      5.9    239.342    30.13    240.464    230.915
4/22/2016   4:22:49 PM :          82     92     93    260     99    0.498   5.3    250.343    0.5      5.8    239.865    30.13    241.071    231.419
4/22/2016   4:23:49 PM :          82     92     93    262     99    0.499   6.3    250.867    0.5      5.7    240.405    30.13    241.575    231.938
4/22/2016   4:24:49 PM :          82     92     93    259     99    0.498   7.6    251.356    0.5      5.7     240.98    30.13    242.046     232.49
4/22/2016   4:25:49 PM :          82     92     93    254     99    0.498   8.8    251.913    0.5      5.9    241.528    30.13    242.583    233.016
4/22/2016   4:26:49 PM :          82     92     93    254     99    0.499   9.7    252.513    0.5        6    242.045    30.13    243.161    233.514
4/22/2016   4:27:49 PM :          82     92     93    259     99      0.5  10.1    253.141    0.5      6.1    242.509    30.13    243.765    233.959
4/22/2016   4:28:49 PM :          82     92     93    261     99    0.501  10.3    253.661    0.5      6.2    242.984    30.13    244.266    234.416
4/22/2016   4:29:49 PM :          82     92     93    259     99    0.501  10.4    254.156    0.5      6.2    243.566    30.13    244.743    234.976
4/22/2016   4:30:49 PM :          82     92     93    254     99    0.499  10.6    254.695    0.5      6.2    244.214    30.12    245.262    235.598
4/22/2016   4:31:49 PM :          82     92     93    254     99    0.499  10.9    255.315    0.5      6.3    244.691    30.12    245.859    236.056
4/22/2016   4:32:49 PM :          82     92     93    260     99    0.501    11    255.945    0.5      6.3    245.122    30.12    246.465    236.471
4/22/2016   4:33:49 PM :          82     92     94    261     99      0.5  10.8    256.467    0.5      6.2    245.611    30.12    246.968     236.94
4/22/2016   4:34:49 PM :          82     92     93    258     99    0.499    11    256.954    0.5      6.2    246.227    30.12    247.437    237.532
4/22/2016   4:35:49 PM :          82     92     93    253     99      0.5  11.3    257.482    0.5      6.4    246.833    30.12    247.945    238.114
4/22/2016   4:36:49 PM :          82     92     94    254     99      0.5  11.4    258.124    0.5      6.5    247.308    30.11    248.564     238.57
4/22/2016   4:37:49 PM :          82     92     94    260     99    0.501  11.2    258.743    0.5      6.4    247.778    30.11    249.159    239.021
4/22/2016   4:38:49 PM :          82     92     94    261     99    0.501  10.8     259.28    0.5      6.2    248.304    30.11    249.676    239.525
4/22/2016   4:39:49 PM :          82     92     94    258     99    0.501  10.4     259.75    0.5        6    248.829    30.11    250.128     240.03
4/22/2016   4:40:49 PM :          82     92     94    253     99    0.498  10.5    260.264    0.5        6    249.393    30.11    250.623     240.57
4/22/2016   4:41:49 PM :          83     92     94    255     99      0.5  10.8    260.924    0.5      6.2    249.958    30.11    251.259    241.113
4/22/2016   4:42:49 PM :          83     92     94    260     99    0.501  10.9    261.539    0.5      6.1    250.482    30.11     251.85    241.615
4/22/2016   4:43:49 PM :          83     92     94    261     99    0.499  10.8     262.07    0.5      6.1    250.939    30.11    252.361    242.054
4/22/2016   4:44:49 PM :          83     92     94    257    100    0.498  10.9     262.54    0.5      6.2     251.41    30.11    252.814    242.506
4/22/2016   4:45:49 PM :          83     92     94    253    100      0.5  11.5    263.056    0.5      6.3    252.001    30.11     253.31    243.073
4/22/2016   4:46:49 PM :          83     92     94    256    100    0.499  11.8    263.709    0.5      6.3    252.634    30.11    253.939    243.681
4/22/2016   4:47:49 PM :          83     92     94    261    100      0.5  11.8    264.333    0.5      6.3    253.121    30.12    254.539    244.148
4/22/2016   4:48:49 PM :          83     92     94    260    100    0.499  12.1    264.863    0.5      6.5     253.56    30.12     255.05     244.57
4/22/2016   4:49:49 PM :          83     92     94    256    100    0.499  12.5    265.334    0.5      6.6    254.052    30.12    255.503    245.041
4/22/2016   4:50:49 PM :          83     93     94    253    100    0.498    13    265.854    0.5      6.6    254.642    30.12    256.004    245.608
4/22/2016   4:51:49 PM :          83     93     94    257    100    0.499  13.4    266.493    0.5      6.6    255.244    30.11    256.618    246.186
4/22/2016   4:52:49 PM :          83     93     94    261    101    0.501  13.5    267.129    0.5      6.6    255.747    30.11    257.229    246.668
4/22/2016   4:53:49 PM :          83     93     94    260    101    0.499  13.8    267.651    0.5      6.7    256.225    30.12    257.731    247.128
4/22/2016   4:54:49 PM :          83     93     94    255    101    0.498  14.3    268.123    0.5      6.8    256.725    30.12    258.186    247.607
4/22/2016   4:55:28 PM :          83     93     94    255    101    0.498  14.3    268.487    0.5      6.8    257.021    30.12    258.536    247.891
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/22/16 7:06:19 AM: Test START
04/22/16 7:06:25 AM: Test Paused by User
04/22/16 7:06:25 AM: PAUSE_EVENT [Manual Pause]
04/22/16 8:29:15 AM: TestResumed
04/22/16 1:35:30 PM: Return from power failure
04/22/16 1:36:55 PM: Alarm Chg    79   192   46   203   91   open   194   92  0.503   2.2  163.004  0.500   1.8  157.764   -  30.14   156.620   151.362   -   -   500   45.1   45.9  112.4   110.6 {---- ---- ---L MN--}
04/22/16 1:47:06 PM: Return from power failure
04/22/16 1:48:50 PM: Return from power failure
04/22/16 1:50:15 PM: Alarm Chg    78   214   49   224   89   open   216   90  0.498   2.5  164.988  0.499   1.9  159.649   -  30.20   158.543   153.540   -   -   500   45.1   45.9  112.6   111.4 {---- ---- ---L MN--}
04/22/16 1:50:56 PM: Alarm Chg    78   226   47   233   89   open   228   90  0.496   2.5  165.356  0.500   2.0  160.005   -  30.20   158.900   153.953   -   -   500   45.5   46.3   99.6   100.0 {---- ---- ---- MN--}
04/22/16 1:51:02 PM: Alarm Chg    79   228   46   234   90   open   230   90  0.506   2.5  165.414  0.499   2.0  160.062   -  30.20   158.956   154.019   -   -   500   45.5   46.3   99.6   100.0 {---- ---- ---- -N--}
```

```
04/22/16 1:53:22 PM: Alarm Clr      79     267      38     252      90    open     269      91   0.496     2.7    166.665  0.499     2.1    161.221       -   30.20    160.169    155.362      -      -     500    46.3    46.7   100.0    100.0 [-------------------]
04/22/16 4:54:03 PM: Alarm Chg      83     256      32     284      93      94     258     101   0.495    14.2    267.762  0.500     6.8    256.328       -   30.12    257.839    247.226      -      -     500    55.3    51.0    99.8    100.0 {---- ---- I--- ----}
04/22/16 4:55:28 PM: Actual Sampling Time: 0d  8h  0m  0s
04/22/16 4:55:28 PM: Test END
04/25/16 4:13:14 PM: New Trap Temperature: set to = 250F
04/22/16  17:00:24: Sample A: POST-Leak Test PASSED at maximum observed vacuum at 14.9 inHg
04/22/16  17:00:24: Maximum Observed Vacuum for A was 14.9 inHg
04/22/16  17:00:24: Sample B: POST-Leak Test PASSED at maximum observed vacuum at 6.9 inHg
04/22/16  17:00:24: Maximum Observed Vacuum for B was 6.9 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3207-Ambient Air Services
'            Console ID: XC30B-3207
'          DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
'
```

Configuration File: Cuba Mercury Run 1 Night.pro
File Exported: 4/30/2016 12:25:03 AM (PC Time).
Company Name: Cuba

04/25/16 04:18:44 PM: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 2 ccm (Max. allowed 20 ccm)
04/25/16 04:18:44 PM: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 3 ccm (Max. allowed 20 ccm)
Trap ID-A: spiked OL335424
Trap ID-B: OL343563

Run N1

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 9h 16m
Averaging Period : 1 min.

		Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES		**129.5**	**95.7**	**96.7**	**258.1**	**102**	**0.498**	**2.6**	**270.936**	**0.498**	**4**	**250.644**	**29.96**	**258.495**	**238.708**
4/25/2016	4:21:24 PM :	98	93	94	262	102	0	0.2	0	0	0	0	29.98	0	0
4/25/2016	4:21:35 PM :User Paused	98	93	94	262	102	0.585	1.9	0.151	0.554	1.5	0.196	29.98	0.145	0.187
4/25/2016	4:26:20 PM :	open	open	open	open	open	0	0	0.153	0	0	0.196	0	0.145	0.187
4/25/2016	5:37:15 PM :	132	103	102	260	109	0	0.3	0.153	0	0	0.196	29.98	0.145	0.187
4/25/2016	5:38:14 PM :	137	102	102	261	109	0.499	1.7	0.776	0.518	1.5	0.799	29.98	0.731	0.755
4/25/2016	5:39:14 PM :	145	101	102	261	109	0.5	2	1.308	0.5	1.7	1.274	29.98	1.233	1.203
4/25/2016	5:40:14 PM :	149	101	102	256	109	0.501	2	1.825	0.5	1.7	1.737	29.98	1.72	1.639
4/25/2016	5:41:14 PM :	145	101	102	253	109	0.5	2	2.362	0.5	1.7	2.258	29.98	2.227	2.13
4/25/2016	5:42:14 PM :	144	101	102	258	109	0.5	2	2.98	0.5	1.7	2.775	29.98	2.809	2.616
4/25/2016	5:43:14 PM :	159	102	102	262	109	0.5	2	3.566	0.5	1.7	3.332	29.98	3.361	3.141
4/25/2016	5:44:14 PM :	173	102	102	261	109	0.501	2	4.124	0.5	1.8	3.895	29.98	3.887	3.671
4/25/2016	5:45:14 PM :	166	102	102	256	109	0.499	2	4.628	0.5	1.8	4.404	29.97	4.362	4.15
4/25/2016	5:46:14 PM :	163	102	102	254	109	0.5	2	5.196	0.5	1.7	4.861	29.97	4.897	4.58
4/25/2016	5:47:14 PM :	168	102	103	258	109	0.5	2	5.794	0.5	1.8	5.326	29.98	5.46	5.017
4/25/2016	5:48:14 PM :	170	102	103	262	109	0.499	2	6.36	0.5	1.8	5.913	29.98	5.993	5.569
4/25/2016	5:49:14 PM :	175	102	103	261	109	0.5	2	6.916	0.5	1.8	6.533	29.97	6.516	6.152
4/25/2016	5:50:14 PM :	174	102	103	257	109	0.501	2	7.434	0.5	1.8	7.016	29.97	7.004	6.606
4/25/2016	5:51:14 PM :	165	102	103	254	110	0.501	2	8.012	0.5	1.8	7.465	29.98	7.548	7.029
4/25/2016	5:52:14 PM :	168	102	103	257	110	0.5	2	8.611	0.5	1.8	7.962	29.98	8.111	7.495
4/25/2016	5:53:14 PM :	171	102	103	262	110	0.499	2	9.178	0.5	1.8	8.503	29.99	8.645	8.004
4/25/2016	5:54:14 PM :	169	102	103	262	110	0.5	2	9.704	0.5	1.8	9.088	29.98	9.14	8.553
4/25/2016	5:55:14 PM :	174	102	103	258	110	0.5	2	10.245	0.5	1.8	9.622	29.98	9.649	9.055
4/25/2016	5:56:14 PM :	170	102	103	254	110	0.5	2	10.833	0.5	1.8	10.13	29.98	10.202	9.532
4/25/2016	5:57:14 PM :	171	102	103	256	110	0.5	2	11.445	0.5	1.8	10.589	29.98	10.779	9.963
4/25/2016	5:58:14 PM :	166	103	103	262	110	0.5	2	11.995	0.5	1.8	11.064	29.98	11.296	10.409
4/25/2016	5:59:14 PM :	159	103	104	262	110	0.5	2	12.494	0.5	1.8	11.635	29.98	11.765	10.946
4/25/2016	6:00:14 PM :	162	103	104	259	110	0.5	2	13.063	0.5	1.8	12.285	29.98	12.3	11.556
4/25/2016	6:01:14 PM :	166	103	104	254	110	0.5	2.1	13.646	0.5	1.8	12.756	29.98	12.848	11.998
4/25/2016	6:02:14 PM :	161	103	104	255	110	0.499	2	14.277	0.5	1.8	13.19	29.98	13.442	12.405
4/25/2016	6:03:14 PM :	159	103	104	260	110	0.5	2	14.803	0.5	1.8	13.67	29.98	13.936	12.856
4/25/2016	6:04:14 PM :	157	103	104	262	110	0.5	2.1	15.298	0.5	1.8	14.275	29.98	14.402	13.423
4/25/2016	6:05:14 PM :	158	103	104	260	110	0.5	2.1	15.859	0.5	1.8	14.868	29.98	14.929	13.98
4/25/2016	6:06:14 PM :	165	103	104	255	110	0.5	2.1	16.467	0.5	1.8	15.354	29.98	15.5	14.436
4/25/2016	6:07:14 PM :	161	103	104	255	110	0.501	2.1	17.096	0.5	1.8	15.829	29.97	16.092	14.881
4/25/2016	6:08:14 PM :	160	103	104	260	110	0.501	2.1	17.62	0.5	1.8	16.331	29.97	16.585	15.353
4/25/2016	6:09:14 PM :	160	103	104	262	110	0.501	2.1	18.121	0.499	1.8	16.837	29.97	17.056	15.828
4/25/2016	6:10:14 PM :	156	103	104	260	110	0.5	2.1	18.651	0.5	1.8	17.411	29.97	17.554	16.366
4/25/2016	6:11:14 PM :	167	103	104	255	110	0.5	2.1	19.295	0.5	1.8	18.005	29.97	18.16	16.924
4/25/2016	6:12:14 PM :	160	103	104	254	110	0.5	2.1	19.914	0.5	1.8	18.494	29.98	18.741	17.382
4/25/2016	6:13:14 PM :	156	103	104	259	110	0.5	2.1	20.453	0.5	1.8	18.943	29.98	19.248	17.804
4/25/2016	6:14:14 PM :	159	103	104	262	110	0.5	2.1	20.932	0.5	1.8	19.416	29.97	19.698	18.248
4/25/2016	6:15:14 PM :	160	103	104	260	110	0.499	2.1	21.452	0.5	1.8	20.015	29.97	20.187	18.81
4/25/2016	6:16:14 PM :	155	103	104	255	109	0.499	2.1	22.109	0.5	1.8	20.623	29.97	20.805	19.38
4/25/2016	6:17:14 PM :	152	103	104	254	109	0.501	2.1	22.733	0.5	1.8	21.106	29.97	21.391	19.834
4/25/2016	6:18:14 PM :	152	103	104	259	109	0.5	2.1	23.27	0.5	1.8	21.571	29.97	21.896	20.271
4/25/2016	6:19:14 PM :	155	103	104	262	109	0.499	2.1	23.75	0.5	1.8	22.074	29.96	22.347	20.742
4/25/2016	6:20:14 PM :	155	103	104	260	109	0.5	2.1	24.279	0.5	1.9	22.605	29.97	22.844	21.241
4/25/2016	6:21:14 PM :	154	103	104	256	109	0.5	2.1	24.914	0.5	1.9	23.178	29.97	23.441	21.778
4/25/2016	6:22:14 PM :	153	103	104	253	109	0.499	2.1	25.559	0.5	1.8	23.716	29.96	24.048	22.282
4/25/2016	6:23:14 PM :	158	103	104	258	108	0.501	2.1	26.084	0.499	1.8	24.244	29.97	24.541	22.777
4/25/2016	6:24:14 PM :	145	102	104	262	108	0.501	2.1	26.584	0.5	1.9	24.701	29.97	25.011	23.207

4/25/2016	6:25:14 PM :	151	102	103	261	108	0.5	2.1	27.112	0.499	1.9	25.166	29.97	25.507	23.643
4/25/2016	6:26:14 PM :	148	102	103	256	108	0.5	2.1	27.72	0.5	1.9	25.747	29.97	26.08	24.189
4/25/2016	6:27:14 PM :	149	102	103	254	108	0.501	2.1	28.376	0.5	1.9	26.389	29.97	26.697	24.792
4/25/2016	6:28:14 PM :	153	102	103	257	108	0.5	2.1	28.898	0.499	1.9	26.864	29.97	27.188	25.238
4/25/2016	6:29:14 PM :	149	102	103	262	108	0.499	2.1	29.41	0.499	1.9	27.299	29.97	27.67	25.646
4/25/2016	6:30:14 PM :	148	102	103	261	108	0.5	2.1	29.936	0.5	1.9	27.782	29.97	28.165	26.1
4/25/2016	6:31:14 PM :	148	102	103	258	108	0.5	2.1	30.556	0.5	1.9	28.375	29.97	28.748	26.657
4/25/2016	6:32:14 PM :	146	102	103	254	108	0.501	2.1	31.18	0.5	1.9	28.974	29.97	29.335	27.219
4/25/2016	6:33:14 PM :	149	102	103	256	108	0.5	2.1	31.717	0.5	1.9	29.466	29.97	29.841	27.681
4/25/2016	6:34:14 PM :	153	102	103	261	108	0.5	2.1	32.229	0.499	1.9	29.958	29.97	30.322	28.143
4/25/2016	6:35:14 PM :	151	102	103	261	108	0.5	2.1	32.782	0.5	1.9	30.441	29.97	30.843	28.597
4/25/2016	6:36:14 PM :	151	102	103	258	108	0.501	2.1	33.395	0.5	1.9	30.941	29.98	31.419	29.068
4/25/2016	6:37:14 PM :	146	102	103	254	108	0.5	2.1	33.978	0.499	1.9	31.519	29.98	31.969	29.611
4/25/2016	6:38:14 PM :	144	102	103	256	108	0.5	2.1	34.536	0.5	1.9	32.114	29.98	32.495	30.17
4/25/2016	6:39:14 PM :	148	102	103	261	108	0.5	2.1	35.049	0.5	1.9	32.608	29.97	32.978	30.634
4/25/2016	6:40:14 PM :	149	102	103	261	107	0.5	2.1	35.625	0.5	1.9	33.053	29.97	33.52	31.053
4/25/2016	6:41:14 PM :	148	102	103	258	107	0.5	2.1	36.227	0.499	1.9	33.53	29.98	34.088	31.501
4/25/2016	6:42:14 PM :	143	102	103	254	107	0.5	2.1	36.795	0.499	1.9	34.131	29.98	34.622	32.066
4/25/2016	6:43:14 PM :	154	102	103	256	107	0.5	2.1	37.334	0.5	1.9	34.733	29.98	35.13	32.632
4/25/2016	6:44:14 PM :	164	102	103	261	107	0.5	2.1	37.87	0.5	1.9	35.212	29.98	35.635	33.083
4/25/2016	6:45:14 PM :	167	102	103	262	107	0.5	2.2	38.455	0.5	1.9	35.683	29.98	36.186	33.525
4/25/2016	6:46:14 PM :	163	101	102	258	107	0.5	2.2	39.069	0.5	1.9	36.193	29.98	36.765	34.006
4/25/2016	6:47:14 PM :	164	101	102	254	107	0.5	2.2	39.627	0.5	1.9	36.717	29.98	37.291	34.499
4/25/2016	6:48:14 PM :	172	101	102	256	107	0.5	2.2	40.134	0.5	1.9	37.282	29.98	37.769	35.031
4/25/2016	6:49:14 PM :	178	101	102	261	107	0.5	2.2	40.698	0.499	1.9	37.83	29.98	38.301	35.546
4/25/2016	6:50:14 PM :	183	101	102	262	107	0.5	2.2	41.281	0.5	1.9	38.356	29.98	38.851	36.041
4/25/2016	6:51:14 PM :	183	101	102	259	107	0.501	2.2	41.913	0.5	1.9	38.811	29.98	39.446	36.47
4/25/2016	6:52:14 PM :	179	101	102	254	107	0.501	2.2	42.449	0.5	1.9	39.272	29.98	39.951	36.903
4/25/2016	6:53:14 PM :	177	101	102	255	107	0.5	2.2	42.947	0.5	1.9	39.859	29.98	40.421	37.456
4/25/2016	6:54:14 PM :	177	101	102	261	107	0.5	2.2	43.498	0.5	1.9	40.491	29.98	40.941	38.051
4/25/2016	6:55:14 PM :	169	101	102	262	107	0.5	2.2	44.122	0.5	1.9	40.975	29.98	41.529	38.506
4/25/2016	6:56:14 PM :	163	101	102	259	107	0.499	2.2	44.747	0.5	1.9	41.413	29.98	42.119	38.919
4/25/2016	6:57:14 PM :	159	101	102	254	107	0.501	2.2	45.28	0.5	1.9	41.901	29.98	42.622	39.378
4/25/2016	6:58:14 PM :	165	101	102	255	107	0.5	2.2	45.776	0.5	1.9	42.481	29.98	43.09	39.924
4/25/2016	6:59:14 PM :	168	101	102	261	107	0.501	2.2	46.304	0.5	1.9	43.077	29.98	43.588	40.485
4/25/2016	7:00:14 PM :	177	101	102	262	107	0.5	2.2	46.956	0.5	2	43.58	29.98	44.203	40.959
4/25/2016	7:01:14 PM :	187	101	102	260	106	0.5	2.2	47.574	0.5	2	44.078	29.98	44.787	41.429
4/25/2016	7:02:14 PM :	203	101	102	255	106	0.499	2.2	48.113	0.5	2	44.553	29.98	45.296	41.876
4/25/2016	7:03:14 PM :	206	101	102	255	106	0.5	2.2	48.596	0.5	2	45.049	29.98	45.752	42.344
4/25/2016	7:04:14 PM :	198	101	102	261	106	0.5	2.2	49.116	0.5	2	45.627	29.98	46.243	42.888
4/25/2016	7:05:14 PM :	195	101	102	263	106	0.5	2.3	49.764	0.5	2	46.233	29.98	46.854	43.459
4/25/2016	7:06:14 PM :	197	101	102	260	106	0.501	2.3	50.401	0.5	2	46.72	29.99	47.455	43.918
4/25/2016	7:07:14 PM :	196	101	102	256	106	0.499	2.3	50.934	0.5	2	47.159	29.99	47.958	44.331
4/25/2016	7:08:14 PM :	192	101	102	254	106	0.5	2.3	51.423	0.5	2	47.64	29.99	48.42	44.785
4/25/2016	7:09:14 PM :	189	101	102	260	106	0.501	2.3	51.957	0.5	2	48.252	29.99	48.924	45.361
4/25/2016	7:10:14 PM :	182	101	102	263	106	0.5	2.3	52.573	0.5	2	48.847	29.99	49.505	45.922
4/25/2016	7:11:14 PM :	182	101	102	261	106	0.499	2.3	53.231	0.5	2	49.326	29.99	50.127	46.373
4/25/2016	7:12:14 PM :	181	100	102	256	106	0.499	2.3	53.747	0.5	2	49.799	29.99	50.615	46.819
4/25/2016	7:13:14 PM :	183	100	102	254	106	0.5	2.3	54.258	0.5	2	50.312	29.99	51.098	47.303
4/25/2016	7:14:14 PM :	184	100	101	259	106	0.501	2.3	54.786	0.5	2	50.833	29.99	51.596	47.794
4/25/2016	7:15:14 PM :	185	100	101	263	106	0.499	2.3	55.391	0.5	2	51.396	30	52.169	48.325
4/25/2016	7:16:14 PM :	187	100	101	262	106	0.5	2.3	56.033	0.5	2	51.951	29.99	52.775	48.849
4/25/2016	7:17:14 PM :	202	100	101	258	106	0.499	2.3	56.569	0.5	2.1	52.475	29.99	53.281	49.343
4/25/2016	7:18:14 PM :	206	100	101	254	106	0.499	2.3	57.083	0.5	2.1	52.933	29.99	53.767	49.775
4/25/2016	7:19:14 PM :	206	100	101	257	106	0.5	2.3	57.618	0.5	2.1	53.393	29.99	54.273	50.209
4/25/2016	7:20:14 PM :	202	100	101	262	106	0.5	2.3	58.242	0.5	2.1	53.981	29.99	54.863	50.764
4/25/2016	7:21:14 PM :	206	100	101	263	106	0.5	2.3	58.837	0.5	2.1	54.61	30	55.425	51.357
4/25/2016	7:22:14 PM :	216	100	101	259	106	0.5	2.3	59.392	0.5	2.1	55.095	30	55.949	51.815
4/25/2016	7:23:14 PM :	217	100	101	255	106	0.5	2.3	59.896	0.499	2.1	55.533	30	56.426	52.227
4/25/2016	7:24:14 PM :	206	100	101	255	106	0.5	2.3	60.465	0.5	2.1	56.024	30	56.964	52.691
4/25/2016	7:25:14 PM :	205	100	101	261	106	0.499	2.3	61.07	0.5	2.1	56.596	30	57.535	53.231
4/25/2016	7:26:14 PM :	207	100	101	263	106	0.499	2.3	61.637	0.5	2.1	57.187	30	58.071	53.788
4/25/2016	7:27:14 PM :	205	100	101	260	106	0.5	2.4	62.192	0.5	2.1	57.701	30	58.596	54.273
4/25/2016	7:28:14 PM :	196	100	101	256	106	0.499	2.3	62.714	0.5	2.1	58.189	30	59.09	54.734
4/25/2016	7:29:14 PM :	189	99	101	255	106	0.499	2.3	63.302	0.5	2.1	58.668	30	59.646	55.186
4/25/2016	7:30:14 PM :	191	99	101	260	106	0.5	2.3	63.903	0.5	2.1	59.155	30	60.214	55.646
4/25/2016	7:31:14 PM :	187	99	101	263	106	0.499	2.3	64.472	0.5	2.1	59.74	30	60.753	56.198
4/25/2016	7:32:14 PM :	180	99	101	261	106	0.5	2.3	64.985	0.5	2.1	60.352	30	61.238	56.776
4/25/2016	7:33:14 PM :	176	99	101	257	106	0.5	2.3	65.543	0.5	2.1	60.837	30	61.766	57.234

4/25/2016	7:34:14 PM :	169	99	101	254	105	0.5	2.3	66.129	0.5	2.1	61.27	29.99	62.32	57.643
4/25/2016	7:35:14 PM :	166	99	101	258	105	0.499	2.3	66.758	0.5	2.1	61.746	29.99	62.915	58.092
4/25/2016	7:36:14 PM :	166	99	101	262	105	0.5	2.3	67.293	0.5	2.1	62.367	29.99	63.421	58.679
4/25/2016	7:37:14 PM :	169	99	101	261	105	0.5	2.4	67.786	0.5	2.1	62.958	30	63.888	59.237
4/25/2016	7:38:14 PM :	167	99	101	256	105	0.5	2.4	68.351	0.5	2.1	63.433	30	64.422	59.685
4/25/2016	7:39:14 PM :	165	99	101	254	105	0.5	2.3	68.956	0.5	2.1	63.91	30	64.995	60.136
4/25/2016	7:40:14 PM :	164	99	100	258	105	0.5	2.3	69.591	0.5	2.1	64.42	30	65.596	60.618
4/25/2016	7:41:14 PM :	159	99	100	263	105	0.5	2.4	70.12	0.5	2.1	64.942	30	66.096	61.111
4/25/2016	7:42:14 PM :	156	99	100	262	105	0.5	2.4	70.617	0.5	2.1	65.5	30	66.567	61.639
4/25/2016	7:43:14 PM :	155	99	100	258	105	0.5	2.4	71.156	0.5	2.1	66.065	30	67.077	62.172
4/25/2016	7:44:14 PM :	152	99	100	253	105	0.499	2.4	71.795	0.5	2.1	66.575	30	67.683	62.655
4/25/2016	7:45:14 PM :	152	99	100	256	105	0.5	2.4	72.414	0.5	2.1	67.031	30.01	68.269	63.086
4/25/2016	7:46:14 PM :	155	99	100	261	105	0.5	2.4	72.959	0.5	2.1	67.501	30.01	68.785	63.531
4/25/2016	7:47:14 PM :	152	99	100	262	104	0.5	2.4	73.438	0.5	2.1	68.088	30	69.239	64.085
4/25/2016	7:48:14 PM :	153	99	100	259	104	0.5	2.4	73.958	0.5	2.1	68.706	30	69.732	64.67
4/25/2016	7:49:14 PM :	155	99	99	254	104	0.5	2.4	74.616	0.5	2.1	69.197	30	70.355	65.135
4/25/2016	7:50:14 PM :	158	99	99	255	104	0.499	2.4	75.24	0.5	2.1	69.641	30.01	70.946	65.554
4/25/2016	7:51:14 PM :	168	99	99	261	104	0.5	2.4	75.778	0.5	2.2	70.139	30.01	71.455	66.026
4/25/2016	7:52:14 PM :	169	98	99	262	104	0.499	2.4	76.255	0.5	2.2	70.69	30.01	71.908	66.547
4/25/2016	7:53:14 PM :	170	98	99	259	104	0.501	2.4	76.791	0.5	2.2	71.278	30.01	72.416	67.104
4/25/2016	7:54:14 PM :	166	98	99	254	104	0.499	2.4	77.418	0.5	2.2	71.799	30	73.011	67.597
4/25/2016	7:55:14 PM :	169	98	99	255	104	0.5	2.4	78.066	0.5	2.2	72.304	30	73.625	68.074
4/25/2016	7:56:14 PM :	164	98	99	260	104	0.499	2.4	78.592	0.5	2.2	72.774	30	74.124	68.52
4/25/2016	7:57:14 PM :	155	98	99	262	104	0.5	2.4	79.1	0.5	2.2	73.253	30	74.604	68.973
4/25/2016	7:58:14 PM :	152	98	99	259	104	0.5	2.4	79.622	0.5	2.2	73.83	30	75.099	69.519
4/25/2016	7:59:14 PM :	148	98	99	254	104	0.499	2.4	80.231	0.5	2.2	74.468	30	75.677	70.123
4/25/2016	8:00:14 PM :	150	98	99	254	104	0.5	2.4	80.886	0.5	2.2	74.945	30	76.298	70.575
4/25/2016	8:01:14 PM :	148	98	99	260	104	0.5	2.4	81.404	0.5	2.2	75.371	30.01	76.79	70.979
4/25/2016	8:02:14 PM :	146	98	99	262	104	0.5	2.4	81.916	0.5	2.2	75.851	30.01	77.276	71.433
4/25/2016	8:03:14 PM :	143	98	99	260	104	0.5	2.4	82.448	0.5	2.2	76.464	30.01	77.781	72.014
4/25/2016	8:04:14 PM :	140	98	99	255	104	0.5	2.4	83.068	0.5	2.2	77.062	30.01	78.369	72.581
4/25/2016	8:05:14 PM :	139	98	99	254	103	0.501	2.4	83.683	0.5	2.2	77.537	30	78.953	73.03
4/25/2016	8:06:14 PM :	138	98	99	260	103	0.5	2.4	84.229	0.5	2.2	78.01	30	79.471	73.478
4/25/2016	8:07:14 PM :	140	98	99	262	103	0.5	2.4	84.739	0.5	2.2	78.516	30.01	79.955	73.958
4/25/2016	8:08:14 PM :	137	98	98	260	103	0.5	2.4	85.296	0.5	2.2	79.031	30.01	80.484	74.446
4/25/2016	8:09:14 PM :	131	98	98	255	103	0.5	2.4	85.904	0.5	2.2	79.596	30.01	81.06	74.982
4/25/2016	8:10:14 PM :	128	98	98	254	103	0.5	2.4	86.485	0.5	2.2	80.173	30.01	81.613	75.529
4/25/2016	8:11:14 PM :	134	97	98	259	103	0.5	2.4	87.04	0.5	2.2	80.673	30.01	82.14	76.003
4/25/2016	8:12:14 PM :	137	97	98	262	103	0.5	2.5	87.554	0.5	2.2	81.128	30.01	82.628	76.435
4/25/2016	8:13:14 PM :	122	97	98	259	103	0.5	2.5	88.134	0.5	2.2	81.599	30.01	83.179	76.881
4/25/2016	8:14:14 PM :	126	97	98	254	103	0.5	2.5	88.736	0.5	2.2	82.196	30.01	83.751	77.447
4/25/2016	8:15:14 PM :	123	97	98	254	103	0.5	2.5	89.308	0.5	2.2	82.804	30.01	84.295	78.024
4/25/2016	8:16:14 PM :	131	97	98	260	103	0.5	2.5	89.84	0.5	2.2	83.285	30	84.8	78.48
4/25/2016	8:17:14 PM :	155	97	98	262	103	0.499	2.5	90.377	0.5	2.2	83.745	30	85.31	78.916
4/25/2016	8:18:14 PM :	150	97	98	259	103	0.501	2.5	90.967	0.5	2.3	84.249	30.01	85.87	79.394
4/25/2016	8:19:14 PM :	145	97	98	254	103	0.5	2.5	91.58	0.5	2.2	84.787	30.01	86.453	79.905
4/25/2016	8:20:14 PM :	146	97	98	254	103	0.499	2.5	92.135	0.5	2.2	85.357	30.01	86.98	80.446
4/25/2016	8:21:14 PM :	141	97	98	260	103	0.5	2.5	92.638	0.499	2.2	85.901	30.01	87.459	80.962
4/25/2016	8:22:14 PM :	131	97	98	262	103	0.5	2.5	93.202	0.5	2.2	86.417	30	87.995	81.452
4/25/2016	8:23:14 PM :	123	97	98	259	102	0.501	2.5	93.791	0.5	2.2	86.876	30	88.555	81.888
4/25/2016	8:24:14 PM :	119	97	98	254	102	0.5	2.5	94.425	0.5	2.2	87.343	30	89.157	82.331
4/25/2016	8:25:14 PM :	118	97	98	254	102	0.5	2.5	94.956	0.5	2.2	87.927	30	89.662	82.885
4/25/2016	8:26:14 PM :	111	97	98	259	102	0.5	2.5	95.453	0.5	2.2	88.566	30	90.135	83.492
4/25/2016	8:27:14 PM :	107	97	97	262	102	0.5	2.5	96.004	0.5	2.3	89.045	30	90.659	83.946
4/25/2016	8:28:14 PM :	106	97	97	259	102	0.5	2.5	96.627	0.5	2.3	89.471	30.01	91.252	84.351
4/25/2016	8:29:14 PM :	107	97	97	254	102	0.501	2.5	97.252	0.5	2.3	89.959	30.01	91.846	84.815
4/25/2016	8:30:14 PM :	107	96	97	254	102	0.5	2.5	97.788	0.5	2.3	90.55	30	92.356	85.376
4/25/2016	8:31:14 PM :	115	96	97	259	102	0.5	2.5	98.282	0.5	2.3	91.149	30	92.826	85.945
4/25/2016	8:32:14 PM :	126	96	97	261	102	0.5	2.5	98.812	0.5	2.3	91.639	30	93.33	86.41
4/25/2016	8:33:14 PM :	127	96	97	259	102	0.5	2.5	99.464	0.5	2.3	92.12	30	93.951	86.867
4/25/2016	8:34:14 PM :	127	96	97	254	102	0.5	2.5	100.083	0.5	2.3	92.614	30	94.54	87.336
4/25/2016	8:35:14 PM :	130	96	97	254	102	0.5	2.5	100.623	0.5	2.3	93.118	30.01	95.054	87.815
4/25/2016	8:36:14 PM :	125	96	97	259	102	0.5	2.5	101.102	0.5	2.3	93.69	30.01	95.511	88.358
4/25/2016	8:37:14 PM :	122	96	97	261	101	0.5	2.5	101.626	0.5	2.3	94.283	30.01	96.009	88.922
4/25/2016	8:38:14 PM :	121	96	97	258	101	0.5	2.5	102.273	0.5	2.3	94.775	30	96.625	89.39
4/25/2016	8:39:14 PM :	120	96	97	254	101	0.5	2.5	102.914	0.5	2.3	95.22	30	97.236	89.813
4/25/2016	8:40:14 PM :	120	96	97	255	101	0.5	2.5	103.44	0.499	2.3	95.694	30	97.737	90.264
4/25/2016	8:41:14 PM :	118	96	97	260	101	0.5	2.5	103.935	0.499	2.3	96.304	30	98.209	90.844
4/25/2016	8:42:14 PM :	117	96	97	261	101	0.5	2.5	104.468	0.5	2.3	96.904	30	98.716	91.414

4/25/2016	8:43:14 PM :	114	96	97	257	101	0.5	2.5	105.089	0.5	2.3	97.379	30.01	99.307	91.866
4/25/2016	8:44:14 PM :	113	96	97	253	101	0.499	2.5	105.743	0.5	2.3	97.834	30.01	99.931	92.299
4/25/2016	8:45:14 PM :	113	96	96	255	101	0.5	2.5	106.261	0.5	2.3	98.36	30.01	100.424	92.799
4/25/2016	8:46:14 PM :	115	95	96	261	101	0.5	2.5	106.771	0.5	2.3	98.887	30.01	100.911	93.301
4/25/2016	8:47:14 PM :	116	95	96	261	101	0.5	2.5	107.295	0.5	2.3	99.448	30.01	101.411	93.835
4/25/2016	8:48:14 PM :	117	95	96	257	101	0.5	2.5	107.909	0.5	2.3	99.999	30.01	101.997	94.359
4/25/2016	8:49:14 PM :	121	95	96	253	101	0.499	2.5	108.545	0.5	2.3	100.521	30.01	102.603	94.856
4/25/2016	8:50:14 PM :	123	95	96	255	101	0.5	2.5	109.078	0.5	2.3	100.978	30.02	103.111	95.292
4/25/2016	8:51:14 PM :	125	95	96	260	101	0.5	2.5	109.592	0.5	2.3	101.442	30.02	103.602	95.733
4/25/2016	8:52:14 PM :	130	95	96	261	101	0.5	2.5	110.136	0.5	2.3	102.027	30.02	104.121	96.29
4/25/2016	8:53:14 PM :	130	95	96	257	101	0.5	2.5	110.755	0.5	2.3	102.656	30.02	104.712	96.889
4/25/2016	8:54:14 PM :	126	95	96	253	101	0.5	2.5	111.346	0.5	2.3	103.135	30.03	105.275	97.345
4/25/2016	8:55:14 PM :	124	95	96	256	101	0.499	2.5	111.901	0.5	2.3	103.574	30.03	105.805	97.764
4/25/2016	8:56:14 PM :	123	95	96	261	101	0.5	2.5	112.41	0.5	2.3	104.065	30.03	106.291	98.232
4/25/2016	8:57:14 PM :	121	95	96	261	101	0.499	2.5	112.981	0.5	2.3	104.642	30.03	106.837	98.782
4/25/2016	8:58:14 PM :	121	95	96	256	101	0.5	2.5	113.588	0.5	2.3	105.237	30.03	107.416	99.349
4/25/2016	8:59:14 PM :	125	95	96	253	101	0.5	2.5	114.15	0.5	2.3	105.743	30.02	107.953	99.831
4/25/2016	9:00:14 PM :	126	95	96	256	101	0.499	2.5	114.698	0.5	2.3	106.23	30.02	108.477	100.296
4/25/2016	9:01:14 PM :	128	95	96	261	101	0.499	2.5	115.23	0.5	2.3	106.713	30.02	108.985	100.756
4/25/2016	9:02:14 PM :	126	95	96	260	101	0.499	2.5	115.817	0.499	2.3	107.199	30.02	109.546	101.219
4/25/2016	9:03:14 PM :	127	95	96	256	101	0.5	2.6	116.422	0.5	2.3	107.78	30.02	110.123	101.773
4/25/2016	9:04:14 PM :	134	95	96	253	101	0.5	2.5	116.984	0.5	2.3	108.395	30.02	110.66	102.359
4/25/2016	9:05:14 PM :	132	95	96	257	101	0.499	2.5	117.496	0.5	2.3	108.877	30.02	111.15	102.818
4/25/2016	9:06:14 PM :	137	95	96	261	101	0.499	2.6	118.055	0.5	2.4	109.307	30.02	111.683	103.228
4/25/2016	9:07:14 PM :	139	95	95	260	101	0.499	2.6	118.64	0.5	2.4	109.79	30.02	112.242	103.689
4/25/2016	9:08:14 PM :	141	95	95	255	100	0.5	2.6	119.271	0.5	2.4	110.41	30.02	112.845	104.281
4/25/2016	9:09:14 PM :	138	95	95	254	100	0.5	2.6	119.801	0.5	2.4	111.001	30.02	113.351	104.844
4/25/2016	9:10:14 PM :	137	95	95	258	100	0.5	2.6	120.296	0.5	2.4	111.476	30.02	113.824	105.297
4/25/2016	9:11:14 PM :	138	94	95	261	100	0.499	2.6	120.858	0.5	2.4	111.951	30.02	114.361	105.751
4/25/2016	9:12:14 PM :	137	94	95	259	100	0.5	2.6	121.467	0.499	2.4	112.459	30.02	114.942	106.236
4/25/2016	9:13:14 PM :	139	94	95	254	100	0.5	2.6	122.1	0.5	2.4	112.977	30.02	115.548	106.729
4/25/2016	9:14:14 PM :	142	94	95	254	100	0.499	2.6	122.624	0.5	2.4	113.538	30.02	116.049	107.265
4/25/2016	9:15:14 PM :	140	94	95	259	100	0.5	2.6	123.127	0.5	2.4	114.116	30.02	116.53	107.817
4/25/2016	9:16:14 PM :	137	94	95	261	100	0.5	2.6	123.66	0.5	2.4	114.614	30.02	117.039	108.291
4/25/2016	9:17:14 PM :	135	94	95	259	100	0.501	2.6	124.305	0.5	2.4	115.067	30.02	117.656	108.724
4/25/2016	9:18:14 PM :	136	94	95	254	100	0.499	2.6	124.923	0.5	2.4	115.538	30.03	118.247	109.173
4/25/2016	9:19:14 PM :	134	94	95	254	100	0.5	2.6	125.464	0.5	2.4	116.127	30.03	118.764	109.735
4/25/2016	9:20:14 PM :	130	94	95	260	100	0.5	2.6	125.946	0.5	2.4	116.745	30.03	119.225	110.325
4/25/2016	9:21:14 PM :	125	94	95	261	99	0.5	2.6	126.464	0.5	2.4	117.227	30.02	119.72	110.785
4/25/2016	9:22:14 PM :	130	94	95	258	99	0.499	2.6	127.124	0.5	2.4	117.675	30.02	120.351	111.213
4/25/2016	9:23:14 PM :	136	94	95	254	99	0.5	2.6	127.748	0.5	2.4	118.174	30.02	120.947	111.689
4/25/2016	9:24:14 PM :	139	94	95	255	99	0.499	2.6	128.284	0.5	2.4	118.727	30.02	121.46	112.217
4/25/2016	9:25:14 PM :	137	94	95	260	99	0.5	2.6	128.765	0.5	2.4	119.307	30.02	121.921	112.772
4/25/2016	9:26:14 PM :	147	94	95	261	99	0.499	2.6	129.299	0.5	2.4	119.843	30.03	122.432	113.283
4/25/2016	9:27:14 PM :	150	94	95	258	99	0.499	2.6	129.93	0.5	2.4	120.343	30.03	123.036	113.761
4/25/2016	9:28:14 PM :	152	94	95	253	99	0.5	2.6	130.58	0.5	2.4	120.807	30.03	123.658	114.204
4/25/2016	9:29:14 PM :	149	94	95	256	99	0.499	2.6	131.098	0.5	2.4	121.28	30.03	124.154	114.656
4/25/2016	9:30:14 PM :	141	94	95	261	99	0.501	2.6	131.605	0.5	2.4	121.856	30.03	124.639	115.207
4/25/2016	9:31:14 PM :	140	94	95	261	99	0.501	2.6	132.129	0.5	2.4	122.502	30.03	125.14	115.823
4/25/2016	9:32:14 PM :	144	94	95	257	99	0.499	2.6	132.739	0.5	2.5	122.972	30.03	125.725	116.272
4/25/2016	9:33:14 PM :	138	94	94	254	99	0.499	2.6	133.391	0.5	2.4	123.399	30.03	126.349	116.68
4/25/2016	9:34:14 PM :	134	94	94	256	99	0.5	2.6	133.913	0.5	2.4	123.886	30.03	126.849	117.146
4/25/2016	9:35:14 PM :	137	94	94	261	99	0.5	2.6	134.427	0.5	2.4	124.496	30.03	127.341	117.729
4/25/2016	9:36:14 PM :	138	94	94	261	99	0.499	2.6	134.959	0.5	2.5	125.087	30.03	127.85	118.294
4/25/2016	9:37:14 PM :	140	93	94	256	99	0.501	2.6	135.577	0.5	2.5	125.566	30.03	128.442	118.752
4/25/2016	9:38:14 PM :	135	93	94	253	99	0.5	2.6	136.191	0.5	2.5	126.043	30.03	129.03	119.208
4/25/2016	9:39:14 PM :	144	93	94	257	99	0.499	2.6	136.736	0.5	2.5	126.545	30.03	129.553	119.689
4/25/2016	9:40:14 PM :	148	93	94	261	99	0.499	2.6	137.245	0.5	2.5	127.055	30.03	130.04	120.177
4/25/2016	9:41:14 PM :	146	93	94	260	99	0.499	2.6	137.801	0.5	2.5	127.625	30.03	130.573	120.721
4/25/2016	9:42:14 PM :	146	93	94	256	99	0.499	2.6	138.412	0.5	2.5	128.216	30.03	131.158	121.287
4/25/2016	9:43:14 PM :	151	93	94	254	99	0.5	2.7	138.993	0.5	2.5	128.703	30.03	131.715	121.753
4/25/2016	9:44:14 PM :	154	93	94	258	99	0.5	2.7	139.546	0.5	2.5	129.151	30.03	132.245	122.18
4/25/2016	9:45:14 PM :	151	93	94	262	99	0.5	2.7	140.062	0.5	2.5	129.634	30.03	132.739	122.642
4/25/2016	9:46:14 PM :	149	93	94	260	99	0.5	2.7	140.64	0.5	2.5	130.227	30.04	133.293	123.209
4/25/2016	9:47:14 PM :	151	93	94	255	99	0.499	2.7	141.242	0.5	2.5	130.831	30.04	133.87	123.787
4/25/2016	9:48:14 PM :	155	93	94	254	99	0.5	2.7	141.808	0.5	2.5	131.303	30.04	134.413	124.239
4/25/2016	9:49:14 PM :	155	93	94	258	99	0.499	2.7	142.34	0.5	2.5	131.767	30.04	134.922	124.682
4/25/2016	9:50:14 PM :	150	93	94	262	99	0.5	2.7	142.883	0.499	2.5	132.28	30.04	135.443	125.173
4/25/2016	9:51:14 PM :	150	93	94	260	99	0.5	2.7	143.469	0.5	2.6	132.811	30.04	136.004	125.681

4/25/2016	9:52:14 PM :	152	93	94	255	99	0.499	2.7	144.086	0.5	2.6	133.378	30.04	136.596	126.224
4/25/2016	9:53:14 PM :	151	93	94	253	99	0.5	2.7	144.635	0.5	2.6	133.918	30.04	137.122	126.74
4/25/2016	9:54:14 PM :	145	93	94	258	99	0.5	2.7	145.142	0.5	2.5	134.443	30.04	137.608	127.244
4/25/2016	9:55:14 PM :	142	93	94	261	99	0.5	2.7	145.702	0.499	2.6	134.897	30.04	138.145	127.678
4/25/2016	9:56:14 PM :	139	93	94	260	99	0.5	2.7	146.291	0.5	2.6	135.358	30.04	138.71	128.12
4/25/2016	9:57:14 PM :	134	93	94	255	99	0.499	2.7	146.925	0.5	2.6	135.945	30.04	139.318	128.682
4/25/2016	9:58:14 PM :	132	93	94	254	99	0.499	2.7	147.452	0.5	2.6	136.575	30.04	139.823	129.284
4/25/2016	9:59:14 PM :	131	93	94	259	99	0.501	2.7	147.947	0.5	2.6	137.053	30.05	140.298	129.743
4/25/2016	10:00:14 PM :	129	93	94	262	99	0.5	2.7	148.502	0.5	2.6	137.49	30.05	140.83	130.161
4/25/2016	10:01:14 PM :	129	93	94	260	99	0.499	2.7	149.12	0.5	2.6	137.98	30.05	141.424	130.63
4/25/2016	10:02:14 PM :	129	93	94	255	99	0.499	2.7	149.753	0.5	2.6	138.561	30.05	142.03	131.187
4/25/2016	10:03:14 PM :	126	93	94	254	99	0.5	2.7	150.277	0.5	2.6	139.153	30.05	142.533	131.753
4/25/2016	10:04:14 PM :	126	93	94	259	99	0.5	2.7	150.774	0.5	2.6	139.657	30.05	143.01	132.236
4/25/2016	10:05:14 PM :	124	93	94	262	99	0.5	2.7	151.302	0.5	2.6	140.142	30.05	143.517	132.701
4/25/2016	10:06:14 PM :	120	93	94	260	99	0.5	2.7	151.956	0.5	2.6	140.628	30.05	144.145	133.165
4/25/2016	10:07:14 PM :	124	93	94	255	99	0.5	2.7	152.57	0.5	2.6	141.118	30.05	144.734	133.635
4/25/2016	10:08:14 PM :	125	93	94	253	99	0.501	2.7	153.111	0.5	2.6	141.701	30.05	145.253	134.193
4/25/2016	10:09:14 PM :	125	93	94	258	99	0.5	2.7	153.589	0.5	2.6	142.309	30.05	145.711	134.776
4/25/2016	10:10:14 PM :	125	93	94	262	99	0.5	2.7	154.111	0.499	2.6	142.79	30.05	146.212	135.236
4/25/2016	10:11:14 PM :	125	93	94	260	99	0.5	2.7	154.764	0.5	2.6	143.221	30.05	146.839	135.649
4/25/2016	10:12:14 PM :	124	93	94	255	99	0.5	2.7	155.397	0.5	2.6	143.702	30.05	147.447	136.11
4/25/2016	10:13:14 PM :	124	93	94	253	99	0.499	2.7	155.928	0.5	2.6	144.323	30.05	147.957	136.704
4/25/2016	10:14:14 PM :	126	93	94	258	99	0.5	2.7	156.408	0.5	2.6	144.913	30.05	148.417	137.27
4/25/2016	10:15:14 PM :	126	93	94	262	99	0.499	2.7	156.939	0.5	2.7	145.384	30.05	148.927	137.72
4/25/2016	10:16:14 PM :	127	93	94	260	99	0.499	2.7	157.571	0.5	2.7	145.859	30.05	149.533	138.175
4/25/2016	10:17:14 PM :	128	93	94	255	99	0.5	2.7	158.218	0.5	2.7	146.367	30.05	150.154	138.662
4/25/2016	10:18:14 PM :	130	93	94	253	99	0.501	2.7	158.738	0.5	2.7	146.887	30.05	150.653	139.16
4/25/2016	10:19:14 PM :	130	93	94	258	99	0.5	2.7	159.244	0.5	2.7	147.448	30.05	151.139	139.697
4/25/2016	10:20:14 PM :	129	93	94	261	99	0.5	2.7	159.764	0.5	2.7	148.024	30.05	151.638	140.248
4/25/2016	10:21:14 PM :	130	93	94	260	99	0.499	2.8	160.377	0.5	2.7	148.522	30.05	152.226	140.726
4/25/2016	10:22:14 PM :	128	93	94	255	99	0.501	2.8	161.029	0.5	2.7	148.977	30.05	152.852	141.162
4/25/2016	10:23:14 PM :	126	93	94	254	99	0.5	2.7	161.549	0.5	2.7	149.446	30.05	153.351	141.611
4/25/2016	10:24:14 PM :	125	93	94	259	99	0.5	2.7	162.061	0.5	2.7	150.037	30.05	153.842	142.176
4/25/2016	10:25:14 PM :	127	93	94	261	99	0.501	2.8	162.593	0.5	2.7	150.653	30.05	154.353	142.766
4/25/2016	10:26:14 PM :	128	93	94	259	99	0.5	2.8	163.212	0.5	2.7	151.136	30.05	154.947	143.229
4/25/2016	10:27:14 PM :	128	93	93	254	99	0.5	2.8	163.825	0.5	2.7	151.584	30.05	155.535	143.658
4/25/2016	10:28:14 PM :	128	93	93	254	99	0.5	2.8	164.368	0.5	2.7	152.084	30.05	156.056	144.137
4/25/2016	10:29:14 PM :	127	93	93	259	99	0.499	2.8	164.879	0.5	2.7	152.635	30.05	156.546	144.666
4/25/2016	10:30:14 PM :	128	93	93	262	99	0.501	2.8	165.439	0.5	2.8	153.219	30.05	157.083	145.225
4/25/2016	10:31:14 PM :	129	93	93	259	99	0.5	2.8	166.045	0.5	2.8	153.752	30.05	157.665	145.737
4/25/2016	10:32:14 PM :	128	93	93	254	99	0.5	2.8	166.625	0.5	2.8	154.249	30.05	158.222	146.212
4/25/2016	10:33:14 PM :	128	93	93	254	99	0.5	2.8	167.182	0.5	2.8	154.717	30.05	158.756	146.662
4/25/2016	10:34:14 PM :	129	93	93	259	99	0.501	2.8	167.69	0.5	2.8	155.188	30.05	159.244	147.113
4/25/2016	10:35:14 PM :	128	93	93	261	99	0.5	2.8	168.271	0.5	2.8	155.764	30.05	159.802	147.665
4/25/2016	10:36:14 PM :	129	93	93	259	99	0.499	2.8	168.872	0.5	2.8	156.407	30.05	160.378	148.282
4/25/2016	10:37:14 PM :	125	93	93	254	99	0.5	2.8	169.442	0.5	2.8	156.878	30.05	160.925	148.733
4/25/2016	10:38:14 PM :	126	92	93	254	99	0.5	2.8	169.976	0.5	2.8	157.306	30.05	161.438	149.143
4/25/2016	10:39:14 PM :	124	92	93	259	99	0.5	2.8	170.511	0.5	2.8	157.793	30.05	161.952	149.61
4/25/2016	10:40:14 PM :	123	93	93	261	99	0.5	2.8	171.096	0.5	2.8	158.399	30.04	162.513	150.191
4/25/2016	10:41:14 PM :	121	92	93	258	98	0.5	2.8	171.718	0.5	2.8	158.99	30.04	163.11	150.757
4/25/2016	10:42:14 PM :	119	92	93	254	98	0.5	2.8	172.268	0.5	2.8	159.475	30.04	163.639	151.222
4/25/2016	10:43:14 PM :	118	92	93	254	98	0.499	2.8	172.774	0.5	2.8	159.95	30.04	164.124	151.677
4/25/2016	10:44:14 PM :	116	92	93	259	98	0.501	2.8	173.335	0.5	2.8	160.452	30.04	164.664	152.158
4/25/2016	10:45:14 PM :	113	92	93	261	99	0.5	2.8	173.925	0.5	2.8	160.961	30.04	165.23	152.646
4/25/2016	10:46:14 PM :	112	92	93	258	99	0.5	2.8	174.556	0.5	2.8	161.531	30.04	165.836	153.192
4/25/2016	10:47:14 PM :	111	92	93	254	99	0.5	2.8	175.085	0.5	2.9	162.116	30.04	166.344	153.752
4/25/2016	10:48:14 PM :	104	92	93	254	98	0.501	2.8	175.576	0.5	2.8	162.611	30.04	166.816	154.227
4/25/2016	10:49:14 PM :	105	92	93	259	99	0.5	2.8	176.135	0.5	2.9	163.058	30.04	167.353	154.656
4/25/2016	10:50:14 PM :	106	92	93	261	99	0.5	2.8	176.754	0.5	2.9	163.537	30.04	167.947	155.115
4/25/2016	10:51:14 PM :	106	92	93	258	99	0.499	2.8	177.386	0.5	2.9	164.137	30.04	168.554	155.69
4/25/2016	10:52:14 PM :	107	92	93	254	99	0.501	2.8	177.908	0.5	2.9	164.74	30.04	169.055	156.267
4/25/2016	10:53:14 PM :	109	92	93	254	99	0.5	2.8	178.403	0.5	2.9	165.213	30.04	169.531	156.721
4/25/2016	10:54:14 PM :	110	92	93	259	99	0.5	2.8	178.933	0.5	3	165.677	30.04	170.04	157.166
4/25/2016	10:55:14 PM :	111	92	93	261	99	0.5	2.8	179.587	0.499	3	166.188	30.04	170.668	157.655
4/25/2016	10:56:14 PM :	111	92	93	258	99	0.499	2.8	180.204	0.5	3	166.72	30.04	171.26	158.165
4/25/2016	10:57:14 PM :	110	92	93	253	99	0.499	2.8	180.741	0.5	3	167.287	30.04	171.776	158.708
4/25/2016	10:58:14 PM :	112	92	93	254	99	0.5	2.8	181.217	0.5	3	167.827	30.04	172.233	159.226
4/25/2016	10:59:14 PM :	111	92	93	259	99	0.5	2.8	181.739	0.5	3	168.351	30.04	172.734	159.728
4/25/2016	11:00:14 PM :	111	92	93	261	99	0.499	2.8	182.397	0.5	3	168.808	30.04	173.367	160.166

4/25/2016	11:01:14 PM :	111	92	93	258	99	0.5	2.8	183.027	0.5	3.1	169.271	30.04	173.971	160.609
4/25/2016	11:02:14 PM :	112	92	93	254	99	0.499	2.8	183.556	0.5	3.1	169.855	30.04	174.479	161.17
4/25/2016	11:03:14 PM :	111	92	93	254	99	0.499	2.8	184.038	0.5	3.1	170.49	30.04	174.942	161.778
4/25/2016	11:04:14 PM :	109	92	93	260	99	0.5	2.8	184.571	0.5	3.1	170.967	30.04	175.454	162.235
4/25/2016	11:05:14 PM :	105	92	93	261	99	0.5	2.8	185.202	0.5	3.1	171.404	30.04	176.06	162.654
4/25/2016	11:06:14 PM :	101	92	93	258	99	0.501	2.8	185.854	0.5	3.1	171.894	30.04	176.686	163.123
4/25/2016	11:07:14 PM :	105	92	93	253	99	0.5	2.8	186.372	0.5	3.1	172.478	30.04	177.183	163.683
4/25/2016	11:08:14 PM :	106	92	93	255	99	0.501	2.8	186.878	0.5	3.1	173.074	30.04	177.669	164.254
4/25/2016	11:09:14 PM :	107	92	93	260	99	0.5	2.8	187.398	0.5	3.1	173.571	30.04	178.169	164.73
4/25/2016	11:10:14 PM :	106	92	93	261	99	0.501	2.8	188.012	0.5	3.1	174.057	30.05	178.759	165.196
4/25/2016	11:11:14 PM :	103	92	93	258	99	0.5	2.9	188.662	0.5	3.1	174.54	30.05	179.383	165.659
4/25/2016	11:12:14 PM :	102	92	93	253	99	0.5	2.8	189.18	0.5	3.1	175.033	30.04	179.881	166.132
4/25/2016	11:13:14 PM :	104	92	93	255	99	0.499	2.8	189.694	0.5	3.1	175.614	30.04	180.374	166.688
4/25/2016	11:14:14 PM :	106	92	93	260	99	0.499	2.8	190.221	0.5	3.2	176.226	30.04	180.88	167.275
4/25/2016	11:15:14 PM :	107	92	93	260	99	0.5	2.9	190.848	0.5	3.2	176.707	30.04	181.482	167.736
4/25/2016	11:16:14 PM :	105	92	93	256	98	0.5	2.9	191.456	0.5	3.2	177.138	30.04	182.067	168.149
4/25/2016	11:17:14 PM :	106	92	93	253	99	0.5	2.9	192.001	0.5	3.2	177.619	30.04	182.59	168.61
4/25/2016	11:18:14 PM :	107	92	93	255	99	0.5	2.9	192.514	0.5	3.2	178.237	30.04	183.083	169.202
4/25/2016	11:19:14 PM :	107	92	93	261	99	0.501	2.9	193.07	0.5	3.3	178.832	30.04	183.616	169.772
4/25/2016	11:20:14 PM :	107	92	93	261	99	0.5	2.9	193.679	0.5	3.3	179.303	30.04	184.201	170.223
4/25/2016	11:21:14 PM :	106	92	93	256	98	0.5	2.9	194.26	0.5	3.3	179.766	30.04	184.759	170.668
4/25/2016	11:22:14 PM :	107	92	93	253	99	0.5	2.9	194.813	0.5	3.3	180.286	30.04	185.29	171.166
4/25/2016	11:23:14 PM :	107	92	93	256	98	0.5	2.9	195.325	0.5	3.4	180.809	30.04	185.782	171.668
4/25/2016	11:24:14 PM :	105	92	93	261	99	0.499	2.9	195.907	0.5	3.4	181.371	30.04	186.341	172.205
4/25/2016	11:25:14 PM :	105	92	93	261	99	0.5	2.9	196.511	0.499	3.4	181.932	30.04	186.921	172.743
4/25/2016	11:26:14 PM :	105	92	93	256	99	0.5	2.9	197.081	0.5	3.5	182.444	30.04	187.468	173.234
4/25/2016	11:27:14 PM :	104	92	93	253	98	0.501	2.9	197.611	0.5	3.5	182.898	30.04	187.977	173.669
4/25/2016	11:28:14 PM :	102	92	93	256	98	0.5	2.9	198.148	0.5	3.5	183.365	30.04	188.493	174.116
4/25/2016	11:29:14 PM :	101	92	93	260	99	0.5	2.9	198.738	0.5	3.5	183.953	30.04	189.059	174.68
4/25/2016	11:30:14 PM :	102	92	93	260	99	0.5	2.9	199.359	0.5	3.6	184.574	30.04	189.656	175.275
4/25/2016	11:31:14 PM :	101	92	93	255	99	0.5	2.9	199.908	0.5	3.6	185.059	30.04	190.183	175.74
4/25/2016	11:32:14 PM :	102	92	93	253	99	0.5	2.9	200.409	0.5	3.6	185.5	30.04	190.664	176.162
4/25/2016	11:33:14 PM :	102	92	93	256	99	0.5	2.9	200.971	0.5	3.6	185.998	30.04	191.204	176.64
4/25/2016	11:34:14 PM :	103	92	93	261	99	0.5	2.9	201.563	0.5	3.7	186.559	30.04	191.772	177.178
4/25/2016	11:35:14 PM :	93	92	93	260	98	0.5	2.9	202.197	0.5	3.8	187.145	30.04	192.381	177.739
4/25/2016	11:36:14 PM :	86	92	93	255	98	0.499	2.9	202.725	0.5	3.7	187.673	30.04	192.888	178.245
4/25/2016	11:37:14 PM :	86	92	93	253	98	0.499	2.9	203.222	0.5	3.7	188.167	30.04	193.365	178.718
4/25/2016	11:38:14 PM :	86	92	93	257	98	0.499	2.9	203.773	0.5	3.8	188.64	30.04	193.894	179.171
4/25/2016	11:39:14 PM :	86	92	93	261	98	0.5	2.9	204.392	0.5	3.8	189.117	30.04	194.489	179.628
4/25/2016	11:40:14 PM :	86	92	93	260	98	0.5	2.9	205.024	0.5	3.9	189.699	30.04	195.095	180.186
4/25/2016	11:41:14 PM :	86	92	93	255	98	0.5	2.9	205.556	0.5	3.9	190.332	30.04	195.606	180.793
4/25/2016	11:42:14 PM :	87	92	93	253	98	0.5	2.9	206.049	0.5	3.9	190.807	30.04	196.08	181.249
4/25/2016	11:43:14 PM :	87	92	93	257	98	0.5	2.9	206.575	0.5	4	191.235	30.04	196.585	181.659
4/25/2016	11:44:14 PM :	87	92	93	261	98	0.5	2.9	207.229	0.5	4	191.715	30.04	197.213	182.12
4/25/2016	11:45:14 PM :	87	92	93	260	98	0.499	2.9	207.844	0.5	4.1	192.332	30.04	197.804	182.712
4/25/2016	11:46:14 PM :	87	92	93	255	98	0.5	2.9	208.382	0.5	4.1	192.926	30.04	198.321	183.281
4/25/2016	11:47:14 PM :	86	92	93	253	98	0.5	2.9	208.86	0.5	4.1	193.398	30.04	198.779	183.735
4/25/2016	11:48:14 PM :	86	92	93	256	98	0.5	2.9	209.384	0.5	4.1	193.872	30.04	199.282	184.189
4/25/2016	11:49:14 PM :	86	92	93	261	98	0.499	2.9	210.036	0.5	4.2	194.382	30.04	199.909	184.678
4/25/2016	11:50:14 PM :	86	92	93	260	98	0.499	2.9	210.673	0.5	4.2	194.9	30.04	200.521	185.176
4/25/2016	11:51:14 PM :	85	92	93	255	98	0.5	2.9	211.205	0.5	4.2	195.466	30.04	201.032	185.718
4/25/2016	11:52:14 PM :	85	91	93	253	98	0.5	2.9	211.686	0.5	4.2	196.05	30.04	201.494	186.279
4/25/2016	11:53:14 PM :	85	91	93	256	98	0.5	2.9	212.224	0.5	4.3	196.54	30.04	202.012	186.749
4/25/2016	11:54:14 PM :	85	91	93	261	98	0.5	2.9	212.844	0.5	4.3	196.99	30.04	202.607	187.18
4/25/2016	11:55:14 PM :	86	91	93	260	98	0.501	2.9	213.504	0.5	4.4	197.467	30.04	203.242	187.637
4/25/2016	11:56:14 PM :	87	91	93	255	98	0.499	2.9	214.016	0.5	4.6	198.063	30.04	203.734	188.21
4/25/2016	11:57:14 PM :	87	91	93	253	98	0.5	2.9	214.527	0.5	4.7	198.674	30.04	204.225	188.795
4/25/2016	11:58:14 PM :	87	91	93	257	98	0.5	2.9	215.051	0.5	4.8	199.155	30.04	204.729	189.257
4/25/2016	11:59:14 PM :	87	91	93	261	98	0.501	3	215.661	0.5	5.1	199.608	30.05	205.315	189.692
4/26/2016	12:00:14 AM :	87	91	93	259	98	0.5	3	216.308	0.5	5.3	200.112	30.05	205.937	190.175
4/26/2016	12:01:14 AM :	88	91	93	255	98	0.499	3	216.837	0.5	5.5	200.658	30.05	206.446	190.699
4/26/2016	12:02:14 AM :	104	91	93	253	98	0.5	3	217.35	0.5	5.8	201.227	30.05	206.939	191.245
4/26/2016	12:03:14 AM :	112	91	93	258	98	0.5	3	217.881	0.5	6	201.775	30.05	207.45	191.771
4/26/2016	12:04:14 AM :	109	91	93	261	98	0.5	3	218.51	0.5	6.2	202.281	30.05	208.055	192.256
4/26/2016	12:05:14 AM :	107	91	93	259	98	0.5	3	219.108	0.5	6.4	202.74	30.05	208.629	192.696
4/26/2016	12:06:14 AM :	108	91	93	254	98	0.5	3	219.658	0.5	6.5	203.207	30.05	209.158	193.145
4/26/2016	12:07:14 AM :	109	91	92	253	97	0.499	3	220.167	0.5	6.8	203.79	30.05	209.648	193.705
4/26/2016	12:08:14 AM :	108	91	93	258	98	0.5	3	220.737	0.5	7	204.426	30.05	210.195	194.314
4/26/2016	12:09:14 AM :	106	91	93	261	98	0.499	3	221.343	0.5	7.1	204.905	30.05	210.778	194.774

4/26/2016	12:10:14 AM :	102	91	92	259	97	0.5	3	221.911	0.5	7.1	205.331	30.04	211.324	195.183
4/26/2016	12:11:14 AM :	99	91	92	254	97	0.501	3	222.464	0.5	7.1	205.821	30.04	211.856	195.653
4/26/2016	12:12:14 AM :	98	91	92	254	97	0.5	3	222.986	0.5	7.3	206.415	30.04	212.357	196.225
4/26/2016	12:13:14 AM :	97	91	92	258	97	0.5	3	223.575	0.5	7.5	207.012	30.04	212.924	196.798
4/26/2016	12:14:14 AM :	97	91	92	261	97	0.5	3	224.18	0.5	7.7	207.502	30.04	213.505	197.268
4/26/2016	12:15:14 AM :	97	91	92	258	98	0.499	3	224.746	0.5	7.7	207.979	30.04	214.049	197.726
4/26/2016	12:16:14 AM :	97	91	92	254	98	0.499	3	225.26	0.499	7.8	208.475	30.04	214.543	198.201
4/26/2016	12:17:14 AM :	96	91	92	255	97	0.5	3	225.816	0.5	7.9	208.983	30.04	215.078	198.69
4/26/2016	12:18:14 AM :	96	91	92	260	98	0.5	3	226.401	0.499	8	209.555	30.04	215.64	199.239
4/26/2016	12:19:14 AM :	95	91	92	261	98	0.5	3	227.04	0.5	8	210.156	30.04	216.255	199.816
4/26/2016	12:20:14 AM :	95	91	92	257	98	0.5	3	227.568	0.5	8	210.637	30.04	216.763	200.278
4/26/2016	12:21:14 AM :	95	91	92	253	97	0.501	3	228.062	0.5	8.1	211.081	30.04	217.237	200.704
4/26/2016	12:22:14 AM :	95	91	92	255	98	0.501	3	228.627	0.5	8.3	211.562	30.04	217.782	201.165
4/26/2016	12:23:14 AM :	95	91	92	260	97	0.5	3	229.234	0.5	8.4	212.17	30.04	218.365	201.749
4/26/2016	12:24:14 AM :	95	91	92	261	97	0.5	3	229.867	0.499	8.5	212.764	30.04	218.975	202.32
4/26/2016	12:25:14 AM :	94	91	92	257	97	0.5	3	230.395	0.5	8.5	213.239	30.04	219.483	202.776
4/26/2016	12:26:14 AM :	94	91	92	253	97	0.5	3	230.896	0.5	8.5	213.704	30.04	219.965	203.223
4/26/2016	12:27:14 AM :	94	91	92	255	97	0.501	3	231.429	0.5	8.5	214.22	30.04	220.478	203.718
4/26/2016	12:28:14 AM :	94	91	92	260	97	0.499	3	232.076	0.5	8.5	214.748	30.05	221.1	204.225
4/26/2016	12:29:14 AM :	93	91	92	261	97	0.501	3	232.694	0.499	8.5	215.307	30.05	221.695	204.762
4/26/2016	12:30:14 AM :	93	91	92	257	97	0.5	3	233.235	0.5	8.5	215.859	30.05	222.216	205.291
4/26/2016	12:31:14 AM :	93	91	92	253	97	0.5	3	233.713	0.5	8.5	216.377	30.05	222.676	205.789
4/26/2016	12:32:14 AM :	93	91	92	255	97	0.5	3	234.233	0.5	8.5	216.833	30.05	223.176	206.227
4/26/2016	12:33:14 AM :	93	91	92	260	97	0.5	3	234.893	0.5	8.7	217.299	30.05	223.812	206.675
4/26/2016	12:34:14 AM :	92	91	92	260	97	0.5	3	235.517	0.5	8.8	217.886	30.05	224.412	207.238
4/26/2016	12:35:14 AM :	91	91	92	256	97	0.5	3	236.054	0.5	8.8	218.514	30.05	224.928	207.842
4/26/2016	12:36:14 AM :	91	91	92	253	97	0.5	3	236.538	0.5	8.7	218.994	30.05	225.394	208.303
4/26/2016	12:37:14 AM :	93	91	92	256	97	0.5	3	237.073	0.499	8.9	219.433	30.05	225.909	208.724
4/26/2016	12:38:14 AM :	93	91	92	260	97	0.5	3	237.7	0.5	9.1	219.925	30.04	226.513	209.196
4/26/2016	12:39:14 AM :	92	91	92	260	97	0.5	3	238.352	0.5	9.2	220.498	30.04	227.139	209.747
4/26/2016	12:40:14 AM :	91	91	92	255	97	0.501	3	238.874	0.5	9.3	221.091	30.04	227.642	210.316
4/26/2016	12:41:14 AM :	92	91	92	253	97	0.5	3	239.378	0.5	9.4	221.599	30.05	228.127	210.804
4/26/2016	12:42:14 AM :	91	91	92	257	97	0.5	3	239.902	0.5	9.5	222.087	30.05	228.631	211.273
4/26/2016	12:43:14 AM :	91	91	92	261	97	0.5	3	240.514	0.5	9.6	222.566	30.05	229.22	211.733
4/26/2016	12:44:14 AM :	91	91	92	259	97	0.5	3	241.164	0.5	9.5	223.055	30.05	229.846	212.202
4/26/2016	12:45:14 AM :	91	91	92	254	97	0.5	3	241.686	0.499	9.6	223.638	30.04	230.348	212.762
4/26/2016	12:46:14 AM :	91	91	92	253	97	0.499	3	242.203	0.5	9.8	224.256	30.04	230.845	213.355
4/26/2016	12:47:14 AM :	90	91	92	258	97	0.499	3	242.731	0.499	9.8	224.733	30.04	231.353	213.813
4/26/2016	12:48:14 AM :	90	91	92	261	97	0.5	3	243.358	0.5	9.9	225.164	30.04	231.957	214.227
4/26/2016	12:49:14 AM :	90	91	92	259	97	0.5	3	243.966	0.499	10	225.649	30.04	232.542	214.693
4/26/2016	12:50:14 AM :	91	91	92	254	97	0.5	3	244.515	0.5	10.1	226.272	30.04	233.07	215.291
4/26/2016	12:51:14 AM :	93	91	92	254	97	0.5	3	245.021	0.499	10.5	226.856	30.04	233.557	215.853
4/26/2016	12:52:14 AM :	93	91	92	258	97	0.5	3	245.588	0.5	10.8	227.327	30.04	234.103	216.305
4/26/2016	12:53:14 AM :	91	91	92	260	97	0.5	3	246.196	0.5	10.6	227.796	30.04	234.687	216.756
4/26/2016	12:54:14 AM :	91	91	92	258	97	0.501	3	246.769	0.5	10.4	228.316	30.04	235.239	217.256
4/26/2016	12:55:14 AM :	91	91	92	254	97	0.499	3	247.32	0.5	10.4	228.829	30.04	235.769	217.748
4/26/2016	12:56:14 AM :	90	91	92	254	97	0.5	3	247.839	0.5	10.4	229.393	30.04	236.268	218.291
4/26/2016	12:57:14 AM :	89	91	92	259	97	0.5	3	248.42	0.5	10.4	229.971	30.04	236.827	218.846
4/26/2016	12:58:14 AM :	89	91	92	261	97	0.5	3	249.03	0.5	10.4	230.467	30.04	237.414	219.323
4/26/2016	12:59:14 AM :	89	91	92	257	97	0.499	3	249.598	0.499	10.4	230.918	30.04	237.961	219.756
4/26/2016	1:00:14 AM :	88	91	92	253	97	0.501	3	250.122	0.5	10.3	231.391	30.04	238.465	220.211
4/26/2016	1:01:14 AM :	89	91	92	254	97	0.5	3	250.671	0.499	10.4	231.984	30.04	238.993	220.78
4/26/2016	1:02:14 AM :	90	91	92	259	97	0.5	3	251.259	0.499	10.9	232.598	30.04	239.558	221.371
4/26/2016	1:03:14 AM :	90	91	92	261	97	0.5	3	251.89	0.5	11.1	233.079	30.04	240.166	221.833
4/26/2016	1:04:14 AM :	91	91	92	257	97	0.499	3	252.425	0.499	11.2	233.526	30.04	240.68	222.263
4/26/2016	1:05:14 AM :	91	91	92	253	97	0.499	3	252.924	0.5	11.4	234.031	30.04	241.161	222.747
4/26/2016	1:06:14 AM :	90	91	92	254	97	0.501	3	253.486	0.5	11.2	234.58	30.04	241.701	223.275
4/26/2016	1:07:14 AM :	90	91	92	259	97	0.501	3	254.089	0.5	11.1	235.157	30.04	242.282	223.83
4/26/2016	1:08:14 AM :	89	91	92	261	97	0.501	3	254.726	0.5	11.1	235.695	30.04	242.894	224.347
4/26/2016	1:09:14 AM :	88	91	92	257	97	0.5	3	255.248	0.5	11	236.196	30.04	243.396	224.828
4/26/2016	1:10:14 AM :	88	91	92	253	97	0.5	3	255.751	0.5	10.9	236.66	30.04	243.88	225.274
4/26/2016	1:11:14 AM :	88	91	92	255	97	0.5	3	256.292	0.5	11.1	237.135	30.04	244.401	225.731
4/26/2016	1:12:14 AM :	88	91	92	260	97	0.501	3	256.927	0.5	11.2	237.709	30.04	245.012	226.282
4/26/2016	1:13:14 AM :	88	91	92	260	97	0.5	3	257.553	0.5	11.3	238.354	30.04	245.614	226.902
4/26/2016	1:14:14 AM :	85	91	92	256	97	0.5	3	258.09	0.5	11.2	238.825	30.04	246.131	227.355
4/26/2016	1:15:14 AM :	83	91	92	253	97	0.5	3	258.572	0.5	11	239.251	30.04	246.594	227.764
4/26/2016	1:16:14 AM :	83	91	92	255	97	0.501	3	259.1	0.499	11	239.741	30.04	247.102	228.235
4/26/2016	1:17:14 AM :	82	91	92	260	97	0.5	3	259.756	0.499	11.4	240.344	30.04	247.733	228.814
4/26/2016	1:18:14 AM :	81	91	92	260	97	0.5	3	260.379	0.5	11.7	240.935	30.04	248.333	229.382

4/26/2016	1:19:14 AM :	81	90	92	256	97	0.5	3	260.916	0.5	11.8	241.421	30.03	248.85	229.849
4/26/2016	1:20:14 AM :	81	90	92	253	97	0.5	3	261.395	0.5	11.8	241.897	30.03	249.311	230.306
4/26/2016	1:21:14 AM :	81	90	92	255	97	0.499	3	261.929	0.5	11.9	242.395	30.03	249.826	230.785
4/26/2016	1:22:14 AM :	82	90	92	260	97	0.501	3	262.565	0.5	12.3	242.903	30.03	250.437	231.273
4/26/2016	1:23:14 AM :	82	90	92	260	97	0.5	3	263.214	0.499	12.8	243.476	30.03	251.063	231.823
4/26/2016	1:24:14 AM :	82	90	92	255	97	0.5	3	263.738	0.499	12.9	244.063	30.03	251.567	232.387
4/26/2016	1:25:14 AM :	82	90	92	253	97	0.501	3	264.24	0.499	13.3	244.552	30.03	252.05	232.857
4/26/2016	1:26:14 AM :	82	90	92	256	97	0.5	3	264.764	0.5	13.8	244.997	30.03	252.555	233.285
4/26/2016	1:27:14 AM :	82	90	92	261	97	0.5	3	265.379	0.499	13.8	245.474	30.03	253.146	233.743
4/26/2016	1:28:14 AM :	82	90	92	260	97	0.5	3.1	266.033	0.5	13.9	246.082	30.03	253.776	234.327
4/26/2016	1:29:14 AM :	82	90	92	255	97	0.499	3	266.553	0.5	13.7	246.683	30.02	254.277	234.904
4/26/2016	1:30:14 AM :	82	90	92	253	97	0.499	3	267.067	0.499	13.8	247.156	30.02	254.771	235.358
4/26/2016	1:31:14 AM :	82	90	92	256	97	0.5	3	267.597	0.5	14	247.615	30.02	255.281	235.799
4/26/2016	1:32:14 AM :	82	90	92	261	97	0.5	3	268.22	0.5	14	248.133	30.02	255.882	236.296
4/26/2016	1:33:14 AM :	82	90	92	259	97	0.499	3.1	268.835	0.499	14.2	248.66	30.02	256.473	236.803
4/26/2016	1:34:14 AM :	82	90	92	255	97	0.5	3.1	269.378	0.499	14.6	249.222	30.02	256.995	237.342
4/26/2016	1:35:14 AM :	82	90	92	253	97	0.499	3.1	269.89	0.5	14.8	249.772	30.02	257.488	237.87
4/26/2016	1:36:14 AM :	82	90	92	258	97	0.499	3	270.456	0.5	14.8	250.289	30.02	258.033	238.367
4/26/2016	1:37:04 AM :	82	90	92	258	97	0.499	3	270.936	0.5	14.8	250.644	30.02	258.495	238.708

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'-------------------------- LOGGED EVENTS ---------------------------------
04/25/16 4:21:24 PM: Test START
04/25/16 4:21:35 PM: Test Paused by User
04/25/16 4:21:35 PM: PAUSE_EVENT [Manual Pause]
04/25/16 4:26:14 PM: Return from power failure
04/25/16 5:37:15 PM: Alarm (D)isabled:   Flow_Tol-    |  Vacumm Hi-    | Modbus-    |  Current Loop-    |  Trap&Probe Temp.-    |  Chiller Temp-    |  Aux Temp-
04/26/16 1:31:06 AM: Alarm Chg     82    257    32    284    90    92    259    97   0.500    3.0    267.510   0.502    14.0    247.556     -   30.02    255.198    235.743     -     -    500    49.4    56.5    99.8    99.8 {---- ---- -J-- ----}
04/26/16 1:32:02 AM: Alarm Clr     82    260    32    284    90    92    261    97   0.499    3.1    268.099   0.500    14.0    248.025     -   30.02    255.765    236.193     -     -    500    49.4    56.5   100.0   100.0 [-------------------]
04/26/16 1:32:36 AM: Alarm Chg     82    259    32    284    90    92    260    97   0.502    3.1    268.489   0.499    14.2    248.268     -   30.02    256.140    236.426     -     -    500    49.4    56.9   100.0   100.0 {---- ---- -J-- ----}
04/26/16 1:37:04 AM: Actual Sampling Time: 0d  8h  0m  0s
04/26/16 1:37:04 AM: Test END
04/26/16 4:43:34 PM: PAUSE_EVENT -
04/26/16 01:39:4  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/26/16 01:39:47 AM: Maximum Observed Vacuum for A was 3.1 inHg
04/26/16 01:39:4  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/26/16 01:39:47 AM: Maximum Observed Vacuum for B was 14.9 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'          DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'           RTC ROM ID: 7334-024B-0000-005
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 2 Night.pro
File Exported: 4/30/2016 12:25:16 AM (PC Time).
Company Name: Cuba

04/26/16 04:46:55 PM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 10 ccm (Max. allowed 20 ccm)
04/26/16 04:46:55 PM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 17 ccm (Max. allowed 20 ccm)
Trap ID-A: spiked OL335417
Trap ID-B: OL343587

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 36m
Averaging Period : 1 min.

Run N2

			Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (I Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (I Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			93.5	98	99.1	257.8	104.5	0.5	2.2	272.271	0.499	1.9	252.431	30.01	258.609	239.285
4/26/2016	4:49:09 PM	:	97	109	109	256	116	0	0.3	0	0.001	0	0	29.97	0	0
4/26/2016	4:49:16 PM	:User Paus	97	109	109	255	116	0.808	2	0.178	0.698	1.4	0.1	29.97	0.165	0.093
4/26/2016	5:25:35 PM	:Resumed	116	107	107	253	112	0	0.3	0.178	0.004	0	0.1	29.96	0.165	0.093
4/26/2016	5:26:34 PM	:	112	107	107	254	112	0.569	1.9	0.762	0.548	1.4	0.561	29.96	0.71	0.523
4/26/2016	5:27:34 PM	:	113	106	106	259	112	0.5	2.1	1.335	0.5	1.8	1.042	29.96	1.246	0.972
4/26/2016	5:28:34 PM	:	114	106	106	261	112	0.5	2.1	1.88	0.5	1.8	1.631	29.97	1.755	1.522
4/26/2016	5:29:34 PM	:	113	106	106	259	112	0.5	2.1	2.42	0.5	1.8	2.266	29.97	2.259	2.116
4/26/2016	5:30:34 PM	:	113	106	106	254	112	0.5	2.1	3.007	0.5	1.8	2.753	29.96	2.808	2.57
4/26/2016	5:31:34 PM	:	113	106	106	254	111	0.5	2.1	3.621	0.5	1.8	3.195	29.96	3.382	2.982
4/26/2016	5:32:34 PM	:	113	106	106	260	112	0.501	2.1	4.178	0.5	1.8	3.695	29.96	3.902	3.449
4/26/2016	5:33:34 PM	:	113	106	106	261	112	0.501	2.1	4.682	0.5	1.8	4.298	29.96	4.373	4.012
4/26/2016	5:34:34 PM	:	111	106	106	258	112	0.5	2.1	5.252	0.499	1.8	4.9	29.96	4.906	4.574
4/26/2016	5:35:34 PM	:	110	106	106	254	112	0.5	2.1	5.842	0.5	1.8	5.385	29.96	5.456	5.027
4/26/2016	5:36:34 PM	:	110	106	106	255	112	0.5	2.1	6.469	0.5	1.8	5.868	29.96	6.043	5.478
4/26/2016	5:37:34 PM	:	110	106	106	260	112	0.5	2.1	7.006	0.5	1.8	6.379	29.96	6.544	5.955
4/26/2016	5:38:34 PM	:	111	106	106	261	112	0.5	2.1	7.505	0.5	1.8	6.91	29.96	7.011	6.451
4/26/2016	5:39:34 PM	:	111	106	106	258	112	0.501	2.1	8.056	0.5	1.8	7.489	29.96	7.525	6.991
4/26/2016	5:40:34 PM	:	110	106	106	254	112	0.5	2.1	8.681	0.5	1.8	8.05	29.96	8.11	7.515
4/26/2016	5:41:34 PM	:	109	106	106	255	112	0.5	2.1	9.311	0.5	1.8	8.562	29.96	8.698	7.994
4/26/2016	5:42:34 PM	:	109	106	107	260	112	0.5	2.1	9.851	0.5	1.8	9.033	29.96	9.202	8.433
4/26/2016	5:43:34 PM	:	108	105	107	261	112	0.499	2.1	10.34	0.5	1.8	9.51	29.96	9.66	8.878
4/26/2016	5:44:34 PM	:	109	106	107	258	112	0.5	2.1	10.866	0.5	1.8	10.097	29.97	10.151	9.425
4/26/2016	5:45:34 PM	:	108	105	106	254	112	0.499	2.1	11.52	0.5	1.8	10.738	29.97	10.764	10.024
4/26/2016	5:46:34 PM	:	108	105	107	255	112	0.5	2.1	12.139	0.5	1.8	11.221	29.97	11.343	10.475
4/26/2016	5:47:34 PM	:	112	105	107	260	112	0.499	2.1	12.68	0.5	1.8	11.661	29.96	11.849	10.884
4/26/2016	5:48:34 PM	:	113	105	107	261	112	0.501	2.1	13.167	0.5	1.8	12.161	29.96	12.304	11.351
4/26/2016	5:49:34 PM	:	117	105	107	258	112	0.5	2.1	13.699	0.5	1.8	12.771	29.96	12.802	11.92
4/26/2016	5:50:34 PM	:	120	105	107	254	112	0.5	2.1	14.329	0.5	1.8	13.368	29.96	13.391	12.477
4/26/2016	5:51:34 PM	:	123	105	107	255	112	0.5	2.1	14.976	0.5	1.8	13.853	29.96	13.996	12.93
4/26/2016	5:52:34 PM	:	123	105	107	260	112	0.5	2.1	15.507	0.5	1.8	14.338	29.96	14.493	13.382
4/26/2016	5:53:34 PM	:	124	105	107	261	112	0.5	2.1	16.006	0.5	1.8	14.851	29.97	14.96	13.861
4/26/2016	5:54:34 PM	:	121	105	107	258	112	0.501	2.1	16.532	0.499	1.8	15.377	29.97	15.452	14.352
4/26/2016	5:55:34 PM	:	119	105	107	253	112	0.501	2.1	17.147	0.5	1.8	15.957	29.96	16.027	14.892

4/26/2016	5:56:34 PM :	118	105	107	256	112	0.5	2.1	17.803	0.5	1.8	16.526	29.96	16.641	15.423
4/26/2016	5:57:34 PM :	112	105	107	261	112	0.5	2.1	18.327	0.5	1.8	17.033	29.96	17.131	15.897
4/26/2016	5:58:34 PM :	105	105	107	261	112	0.5	2.1	18.845	0.499	1.8	17.501	29.96	17.615	16.333
4/26/2016	5:59:34 PM :	104	105	106	257	112	0.5	2.1	19.376	0.5	1.8	17.982	29.96	18.112	16.782
4/26/2016	6:00:34 PM :	103	105	106	253	112	0.499	2.1	19.999	0.5	1.8	18.563	29.96	18.695	17.324
4/26/2016	6:01:34 PM :	102	105	106	256	112	0.5	2.1	20.606	0.5	1.8	19.21	29.96	19.262	17.929
4/26/2016	6:02:34 PM :	102	105	106	261	112	0.499	2.1	21.161	0.5	1.8	19.694	29.96	19.781	18.381
4/26/2016	6:03:34 PM :	101	105	106	260	112	0.5	2.1	21.673	0.5	1.8	20.137	29.96	20.261	18.794
4/26/2016	6:04:34 PM :	101	105	106	256	112	0.5	2.1	22.24	0.5	1.8	20.637	29.96	20.791	19.261
4/26/2016	6:05:34 PM :	101	105	106	253	112	0.5	2.1	22.84	0.5	1.8	21.243	29.96	21.353	19.827
4/26/2016	6:06:34 PM :	100	105	106	256	112	0.5	2.1	23.418	0.5	1.8	21.844	29.96	21.894	20.388
4/26/2016	6:07:34 PM :	100	105	106	261	112	0.5	2.1	23.974	0.5	1.8	22.33	29.96	22.415	20.841
4/26/2016	6:08:34 PM :	99	105	106	261	112	0.499	2.1	24.496	0.499	1.8	22.809	29.96	22.903	21.289
4/26/2016	6:09:34 PM :	99	105	106	256	112	0.5	2.1	25.081	0.499	1.8	23.327	29.96	23.452	21.773
4/26/2016	6:10:34 PM :	99	105	106	253	112	0.5	2.1	25.69	0.5	1.8	23.855	29.96	24.021	22.266
4/26/2016	6:11:34 PM :	98	105	106	256	112	0.501	2.1	26.259	0.5	1.8	24.431	29.96	24.555	22.803
4/26/2016	6:12:34 PM :	98	105	106	261	112	0.5	2.1	26.777	0.5	1.8	24.999	29.96	25.04	23.334
4/26/2016	6:13:34 PM :	98	105	106	261	112	0.5	2.1	27.336	0.5	1.8	25.514	29.96	25.563	23.814
4/26/2016	6:14:34 PM :	98	105	106	256	112	0.5	2.1	27.922	0.5	1.8	25.978	29.96	26.111	24.248
4/26/2016	6:15:34 PM :	98	105	106	253	112	0.501	2.1	28.552	0.5	1.8	26.455	29.96	26.701	24.693
4/26/2016	6:16:34 PM :	98	105	106	256	112	0.5	2.1	29.092	0.5	1.8	27.037	29.96	27.207	25.236
4/26/2016	6:17:34 PM :	99	105	106	261	112	0.5	2.1	29.587	0.5	1.8	27.687	29.97	27.67	25.844
4/26/2016	6:18:34 PM :	101	105	106	261	112	0.501	2.1	30.149	0.5	1.8	28.17	29.96	28.196	26.295
4/26/2016	6:19:34 PM :	103	105	106	256	112	0.499	2.1	30.762	0.5	1.8	28.609	29.96	28.77	26.704
4/26/2016	6:20:34 PM :	106	105	106	253	111	0.5	2.1	31.399	0.5	1.8	29.109	29.96	29.367	27.171
4/26/2016	6:21:34 PM :	106	105	106	256	111	0.5	2.1	31.932	0.5	1.8	29.719	29.97	29.866	27.741
4/26/2016	6:22:34 PM :	107	105	106	261	111	0.5	2.1	32.429	0.499	1.8	30.316	29.97	30.331	28.299
4/26/2016	6:23:34 PM :	108	104	106	261	111	0.5	2.2	32.961	0.5	1.8	30.804	29.97	30.83	28.754
4/26/2016	6:24:34 PM :	108	104	106	257	111	0.501	2.2	33.613	0.5	1.8	31.283	29.97	31.441	29.202
4/26/2016	6:25:34 PM :	108	104	106	253	111	0.5	2.1	34.233	0.5	1.8	31.803	29.97	32.022	29.689
4/26/2016	6:26:34 PM :	108	104	106	256	111	0.501	2.1	34.775	0.5	1.8	32.325	29.97	32.53	30.177
4/26/2016	6:27:34 PM :	109	104	106	261	111	0.499	2.1	35.26	0.5	1.8	32.904	29.97	32.985	30.717
4/26/2016	6:28:34 PM :	108	104	106	261	111	0.499	2.2	35.786	0.5	1.8	33.471	29.97	33.478	31.248
4/26/2016	6:29:34 PM :	109	104	106	257	111	0.5	2.2	36.428	0.5	1.8	33.988	29.97	34.08	31.731
4/26/2016	6:30:34 PM :	108	104	106	253	111	0.499	2.1	37.071	0.5	1.8	34.45	29.97	34.683	32.163
4/26/2016	6:31:34 PM :	108	104	106	256	111	0.5	2.1	37.604	0.5	1.8	34.927	29.97	35.183	32.609
4/26/2016	6:32:34 PM :	108	104	106	261	111	0.5	2.1	38.104	0.5	1.8	35.506	29.97	35.651	33.15
4/26/2016	6:33:34 PM :	108	104	106	261	111	0.499	2.2	38.632	0.5	1.8	36.159	29.97	36.146	33.761
4/26/2016	6:34:34 PM :	108	104	106	257	111	0.5	2.2	39.243	0.5	1.8	36.636	29.98	36.719	34.207
4/26/2016	6:35:34 PM :	108	104	106	253	111	0.5	2.1	39.907	0.5	1.8	37.08	29.97	37.342	34.622
4/26/2016	6:36:34 PM :	108	104	106	256	111	0.5	2.1	40.431	0.5	1.8	37.579	29.97	37.833	35.089
4/26/2016	6:37:34 PM :	120	104	106	261	111	0.5	2.2	40.945	0.5	1.8	38.189	29.97	38.315	35.659
4/26/2016	6:38:34 PM :	118	104	106	261	110	0.501	2.2	41.477	0.5	1.8	38.784	29.98	38.814	36.215
4/26/2016	6:39:34 PM :	104	104	106	257	110	0.499	2.2	42.099	0.5	1.8	39.268	29.97	39.397	36.668
4/26/2016	6:40:34 PM :	99	104	105	253	110	0.5	2.2	42.711	0.5	1.8	39.753	29.97	39.971	37.122
4/26/2016	6:41:34 PM :	113	104	105	256	110	0.5	2.1	43.266	0.5	1.8	40.272	29.98	40.492	37.608
4/26/2016	6:42:34 PM :	116	104	105	261	110	0.499	2.2	43.776	0.5	1.8	40.793	29.98	40.971	38.095
4/26/2016	6:43:34 PM :	105	104	105	261	110	0.5	2.2	44.341	0.5	1.8	41.365	29.97	41.501	38.631
4/26/2016	6:44:34 PM :	96	104	105	257	110	0.5	2.2	44.945	0.5	1.8	41.933	29.98	42.068	39.162
4/26/2016	6:45:34 PM :	97	104	105	253	109	0.501	2.2	45.524	0.5	1.8	42.455	29.97	42.611	39.651
4/26/2016	6:46:34 PM :	98	103	105	256	109	0.499	2.2	46.081	0.5	1.8	42.916	29.97	43.134	40.082

4/26/2016	6:47:34 PM :	98	103	105	261	109	0.501	2.2	46.607	0.5	1.8	43.389	29.97	43.628	40.525
4/26/2016	6:48:34 PM :	98	103	105	261	109	0.5	2.2	47.197	0.5	1.8	43.974	29.97	44.182	41.072
4/26/2016	6:49:34 PM :	97	103	105	256	109	0.5	2.2	47.8	0.5	1.8	44.625	29.97	44.748	41.683
4/26/2016	6:50:34 PM :	97	103	105	253	109	0.499	2.2	48.371	0.5	1.8	45.104	29.97	45.284	42.131
4/26/2016	6:51:34 PM :	97	103	105	256	109	0.5	2.2	48.887	0.5	1.8	45.54	29.97	45.769	42.54
4/26/2016	6:52:34 PM :	96	103	105	261	108	0.499	2.2	49.449	0.5	1.8	46.043	29.97	46.296	43.01
4/26/2016	6:53:34 PM :	96	103	104	261	108	0.5	2.2	50.034	0.5	1.8	46.645	29.97	46.847	43.574
4/26/2016	6:54:34 PM :	102	103	104	257	108	0.499	2.2	50.666	0.5	1.8	47.246	29.97	47.44	44.138
4/26/2016	6:55:34 PM :	105	103	104	253	108	0.501	2.2	51.206	0.5	1.8	47.729	29.97	47.949	44.591
4/26/2016	6:56:34 PM :	106	103	104	256	108	0.5	2.2	51.706	0.499	1.8	48.213	29.97	48.418	45.044
4/26/2016	6:57:34 PM :	104	103	104	261	108	0.499	2.2	52.262	0.499	1.8	48.731	29.97	48.941	45.53
4/26/2016	6:58:34 PM :	102	103	104	261	108	0.501	2.2	52.886	0.5	1.8	49.253	29.97	49.528	46.02
4/26/2016	6:59:34 PM :	105	102	104	256	108	0.499	2.2	53.517	0.5	1.8	49.818	29.97	50.122	46.55
4/26/2016	7:00:34 PM :	107	102	104	253	108	0.5	2.2	54.054	0.5	1.8	50.395	29.97	50.627	47.091
4/26/2016	7:01:34 PM :	106	102	104	257	108	0.5	2.2	54.549	0.5	1.8	50.911	29.97	51.093	47.576
4/26/2016	7:02:34 PM :	106	102	104	261	107	0.5	2.2	55.075	0.5	1.8	51.373	29.98	51.588	48.009
4/26/2016	7:03:34 PM :	110	102	103	260	107	0.5	2.2	55.733	0.5	1.8	51.842	29.98	52.207	48.45
4/26/2016	7:04:34 PM :	111	102	103	256	107	0.499	2.2	56.359	0.5	1.8	52.432	29.97	52.796	49.004
4/26/2016	7:05:34 PM :	110	102	103	253	107	0.5	2.2	56.902	0.5	1.8	53.078	29.97	53.307	49.611
4/26/2016	7:06:34 PM :	110	102	103	257	107	0.501	2.2	57.388	0.5	1.8	53.559	29.98	53.765	50.063
4/26/2016	7:07:34 PM :	110	102	103	261	107	0.501	2.2	57.929	0.5	1.8	54	29.98	54.274	50.477
4/26/2016	7:08:34 PM :	111	102	103	260	107	0.499	2.2	58.554	0.5	1.8	54.505	29.98	54.864	50.951
4/26/2016	7:09:34 PM :	110	102	103	256	107	0.5	2.2	59.213	0.5	1.8	55.101	29.97	55.483	51.512
4/26/2016	7:10:34 PM :	109	101	103	253	107	0.5	2.2	59.737	0.5	1.8	55.697	29.98	55.978	52.072
4/26/2016	7:11:34 PM :	108	101	103	257	107	0.501	2.2	60.249	0.5	1.8	56.188	29.98	56.46	52.534
4/26/2016	7:12:34 PM :	108	101	103	261	107	0.499	2.2	60.775	0.5	1.8	56.678	29.98	56.956	52.995
4/26/2016	7:13:34 PM :	107	101	103	260	106	0.5	2.2	61.383	0.5	1.8	57.185	29.98	57.53	53.471
4/26/2016	7:14:34 PM :	107	101	103	256	106	0.5	2.2	62.033	0.5	1.8	57.703	29.98	58.143	53.959
4/26/2016	7:15:34 PM :	106	101	102	253	106	0.5	2.2	62.567	0.5	1.8	58.272	29.98	58.647	54.494
4/26/2016	7:16:34 PM :	107	101	102	257	106	0.501	2.2	63.089	0.5	1.8	58.858	29.98	59.139	55.046
4/26/2016	7:17:34 PM :	106	101	102	261	106	0.5	2.2	63.634	0.5	1.8	59.365	29.98	59.653	55.523
4/26/2016	7:18:34 PM :	107	101	102	260	106	0.5	2.2	64.256	0.5	1.9	59.829	29.99	60.24	55.959
4/26/2016	7:19:34 PM :	107	101	102	255	106	0.501	2.2	64.847	0.5	1.9	60.301	29.98	60.798	56.404
4/26/2016	7:20:34 PM :	106	101	102	253	106	0.5	2.2	65.407	0.5	1.8	60.89	29.98	61.327	56.958
4/26/2016	7:21:34 PM :	105	101	102	257	106	0.499	2.2	65.923	0.5	1.8	61.526	29.98	61.814	57.557
4/26/2016	7:22:34 PM :	105	101	102	261	106	0.499	2.2	66.499	0.5	1.8	62.011	29.98	62.357	58.014
4/26/2016	7:23:34 PM :	98	101	102	260	106	0.499	2.2	67.105	0.5	1.9	62.456	29.98	62.929	58.433
4/26/2016	7:24:34 PM :	93	100	102	255	106	0.5	2.2	67.683	0.5	1.9	62.958	29.98	63.475	58.906
4/26/2016	7:25:34 PM :	92	100	102	253	105	0.501	2.2	68.213	0.5	1.8	63.54	29.98	63.976	59.454
4/26/2016	7:26:34 PM :	91	100	102	258	105	0.501	2.2	68.769	0.5	1.8	64.146	29.98	64.501	60.025
4/26/2016	7:27:34 PM :	91	100	102	261	105	0.5	2.2	69.354	0.5	1.9	64.646	29.98	65.054	60.497
4/26/2016	7:28:34 PM :	90	100	101	260	105	0.5	2.2	69.99	0.5	1.9	65.133	29.98	65.654	60.956
4/26/2016	7:29:34 PM :	90	100	101	255	105	0.501	2.2	70.529	0.5	1.9	65.633	29.98	66.163	61.428
4/26/2016	7:30:34 PM :	89	99	101	253	105	0.5	2.2	71.026	0.5	1.9	66.148	29.98	66.633	61.913
4/26/2016	7:31:34 PM :	89	99	101	258	105	0.5	2.2	71.593	0.5	1.8	66.726	29.99	67.169	62.458
4/26/2016	7:32:34 PM :	89	99	101	261	105	0.5	2.2	72.204	0.5	1.9	67.311	29.99	67.748	63.01
4/26/2016	7:33:34 PM :	89	99	101	260	105	0.501	2.2	72.843	0.5	1.9	67.815	29.99	68.352	63.485
4/26/2016	7:34:34 PM :	89	99	101	255	105	0.499	2.2	73.373	0.5	1.9	68.277	29.99	68.854	63.921
4/26/2016	7:35:34 PM :	89	99	101	253	105	0.5	2.2	73.874	0.5	1.8	68.757	29.99	69.327	64.374
4/26/2016	7:36:34 PM :	89	99	101	258	105	0.499	2.2	74.405	0.5	1.8	69.348	29.99	69.83	64.932
4/26/2016	7:37:34 PM :	89	99	101	261	105	0.5	2.2	75.062	0.5	1.9	69.97	29.99	70.45	65.519

4/26/2016	7:38:34 PM :	89	99	101	260	105	0.499	2.2	75.681	0.5	1.9	70.461	29.99	71.036	65.983
4/26/2016	7:39:34 PM :	89	99	101	255	105	0.5	2.2	76.221	0.5	1.9	70.907	29.99	71.547	66.403
4/26/2016	7:40:34 PM :	89	99	101	253	105	0.501	2.2	76.706	0.5	1.8	71.409	29.99	72.007	66.878
4/26/2016	7:41:34 PM :	89	99	101	258	105	0.5	2.2	77.236	0.499	1.8	71.972	29.99	72.508	67.409
4/26/2016	7:42:34 PM :	89	99	101	261	105	0.499	2.2	77.881	0.5	1.9	72.567	29.99	73.118	67.971
4/26/2016	7:43:34 PM :	89	99	100	260	105	0.5	2.2	78.528	0.5	1.9	73.099	29.99	73.731	68.473
4/26/2016	7:44:34 PM :	90	99	100	255	105	0.5	2.2	79.061	0.499	1.9	73.585	29.99	74.236	68.933
4/26/2016	7:45:34 PM :	90	99	100	253	105	0.5	2.2	79.558	0.5	1.9	74.068	29.99	74.706	69.389
4/26/2016	7:46:34 PM :	89	99	100	258	105	0.499	2.2	80.09	0.5	1.8	74.564	29.99	75.21	69.858
4/26/2016	7:47:34 PM :	89	99	100	261	105	0.5	2.2	80.705	0.5	1.9	75.153	29.99	75.793	70.414
4/26/2016	7:48:34 PM :	89	99	100	260	104	0.5	2.2	81.36	0.5	1.9	75.762	29.99	76.412	70.99
4/26/2016	7:49:34 PM :	89	98	100	255	104	0.5	2.2	81.886	0.5	1.9	76.25	29.99	76.91	71.451
4/26/2016	7:50:34 PM :	89	98	100	253	104	0.5	2.2	82.402	0.5	1.9	76.697	29.99	77.399	71.874
4/26/2016	7:51:34 PM :	89	98	99	258	104	0.5	2.2	82.94	0.5	1.9	77.193	29.99	77.909	72.343
4/26/2016	7:52:34 PM :	89	98	99	261	104	0.501	2.2	83.567	0.5	1.9	77.794	29.99	78.504	72.911
4/26/2016	7:53:34 PM :	89	98	99	260	104	0.501	2.2	84.171	0.5	1.9	78.4	29.99	79.076	73.484
4/26/2016	7:54:34 PM :	89	98	99	256	104	0.5	2.2	84.725	0.5	1.9	78.881	29.99	79.601	73.939
4/26/2016	7:55:34 PM :	88	98	99	253	104	0.5	2.2	85.236	0.5	1.9	79.352	29.99	80.086	74.384
4/26/2016	7:56:34 PM :	88	98	99	257	104	0.501	2.2	85.808	0.5	1.9	79.86	29.99	80.627	74.865
4/26/2016	7:57:34 PM :	88	98	99	261	104	0.5	2.2	86.415	0.5	1.9	80.402	29.99	81.202	75.378
4/26/2016	7:58:34 PM :	88	98	99	260	104	0.501	2.2	86.99	0.5	1.9	80.983	29.99	81.748	75.927
4/26/2016	7:59:34 PM :	88	98	99	255	104	0.499	2.2	87.539	0.5	1.9	81.535	29.99	82.268	76.449
4/26/2016	8:00:34 PM :	88	98	99	253	104	0.501	2.2	88.074	0.499	1.9	82.039	29.99	82.775	76.926
4/26/2016	8:01:34 PM :	88	98	99	258	104	0.5	2.2	88.664	0.5	1.9	82.51	29.98	83.334	77.371
4/26/2016	8:02:34 PM :	88	98	99	261	104	0.5	2.2	89.279	0.5	1.9	82.989	29.98	83.918	77.825
4/26/2016	8:03:34 PM :	87	98	99	259	104	0.5	2.2	89.842	0.5	1.9	83.576	29.98	84.452	78.38
4/26/2016	8:04:34 PM :	87	98	99	255	104	0.501	2.2	90.348	0.5	1.9	84.213	29.98	84.932	78.983
4/26/2016	8:05:34 PM :	87	98	99	254	104	0.499	2.2	90.911	0.5	1.8	84.692	29.98	85.465	79.437
4/26/2016	8:06:34 PM :	87	98	99	258	104	0.5	2.2	91.503	0.499	1.8	85.13	29.99	86.028	79.851
4/26/2016	8:07:34 PM :	87	98	99	261	104	0.499	2.2	92.141	0.5	1.9	85.631	29.99	86.632	80.325
4/26/2016	8:08:34 PM :	87	98	99	259	104	0.5	2.2	92.671	0.5	1.9	86.239	29.99	87.135	80.901
4/26/2016	8:09:34 PM :	86	98	99	254	103	0.5	2.2	93.173	0.5	1.9	86.834	29.99	87.611	81.464
4/26/2016	8:10:34 PM :	86	97	98	254	103	0.5	2.2	93.72	0.5	1.9	87.311	29.99	88.13	81.916
4/26/2016	8:11:34 PM :	86	97	98	259	104	0.5	2.2	94.355	0.5	1.9	87.793	29.99	88.734	82.373
4/26/2016	8:12:34 PM :	86	97	98	261	103	0.5	2.2	94.984	0.5	1.9	88.313	29.99	89.331	82.866
4/26/2016	8:13:34 PM :	86	97	98	258	104	0.5	2.2	95.524	0.5	1.9	88.829	29.99	89.844	83.355
4/26/2016	8:14:34 PM :	86	97	98	254	103	0.5	2.2	96.012	0.5	1.9	89.4	30	90.307	83.896
4/26/2016	8:15:34 PM :	86	97	98	255	103	0.5	2.2	96.534	0.5	1.9	89.965	30	90.802	84.432
4/26/2016	8:16:34 PM :	86	97	98	260	104	0.499	2.2	97.192	0.5	1.9	90.483	30	91.428	84.923
4/26/2016	8:17:34 PM :	86	97	98	261	104	0.5	2.2	97.819	0.5	1.9	90.943	30	92.023	85.358
4/26/2016	8:18:34 PM :	86	97	98	257	103	0.499	2.2	98.356	0.5	1.9	91.409	30	92.533	85.801
4/26/2016	8:19:34 PM :	87	97	98	253	103	0.501	2.2	98.842	0.5	1.9	92.014	30	92.995	86.374
4/26/2016	8:20:34 PM :	87	97	98	255	103	0.5	2.2	99.377	0.5	1.9	92.639	30	93.503	86.966
4/26/2016	8:21:34 PM :	87	97	98	260	104	0.5	2.2	100.007	0.5	1.9	93.119	30	94.101	87.421
4/26/2016	8:22:34 PM :	87	97	98	261	103	0.5	2.2	100.661	0.5	1.9	93.553	30	94.722	87.833
4/26/2016	8:23:34 PM :	87	97	98	256	103	0.501	2.2	101.187	0.5	1.9	94.061	30	95.222	88.315
4/26/2016	8:24:34 PM :	87	97	98	253	103	0.501	2.2	101.695	0.5	1.9	94.64	30	95.705	88.864
4/26/2016	8:25:34 PM :	87	97	98	256	103	0.501	2.2	102.219	0.5	1.9	95.241	30	96.203	89.434
4/26/2016	8:26:34 PM :	87	97	98	260	103	0.499	2.2	102.833	0.5	1.9	95.737	30	96.787	89.905
4/26/2016	8:27:34 PM :	87	97	98	260	103	0.499	2.2	103.482	0.5	1.9	96.22	30	97.403	90.363
4/26/2016	8:28:34 PM :	87	97	98	256	103	0.5	2.2	104.014	0.5	1.9	96.72	30	97.909	90.838

4/26/2016	8:29:34 PM :	87	97	98	253	103	0.5	2.2	104.534	0.5	1.9	97.233	30	98.403	91.324
4/26/2016	8:30:34 PM :	87	97	98	256	103	0.5	2.2	105.071	0.5	1.9	97.803	30	98.914	91.865
4/26/2016	8:31:34 PM :	87	97	98	261	103	0.5	2.2	105.698	0.5	1.9	98.394	30	99.51	92.426
4/26/2016	8:32:34 PM :	87	97	98	260	103	0.5	2.2	106.29	0.5	1.9	98.891	30	100.072	92.897
4/26/2016	8:33:34 PM :	87	97	98	255	103	0.501	2.2	106.849	0.5	1.9	99.349	29.99	100.605	93.332
4/26/2016	8:34:34 PM :	87	97	98	253	103	0.501	2.2	107.361	0.5	1.9	99.828	29.99	101.09	93.787
4/26/2016	8:35:34 PM :	87	97	98	257	103	0.5	2.2	107.936	0.5	1.9	100.423	29.99	101.638	94.351
4/26/2016	8:36:34 PM :	87	97	98	261	103	0.5	2.2	108.541	0.5	1.9	101.037	29.99	102.212	94.934
4/26/2016	8:37:34 PM :	87	97	98	260	103	0.5	2.2	109.114	0.5	1.9	101.526	29.99	102.757	95.397
4/26/2016	8:38:34 PM :	87	97	97	255	103	0.5	2.2	109.653	0.5	1.9	101.977	29.99	103.27	95.825
4/26/2016	8:39:34 PM :	87	97	97	253	103	0.501	2.2	110.196	0.5	1.9	102.483	30	103.786	96.306
4/26/2016	8:40:34 PM :	87	97	97	257	103	0.5	2.2	110.788	0.5	1.9	103.037	30	104.348	96.832
4/26/2016	8:41:34 PM :	87	97	97	261	103	0.5	2.2	111.413	0.5	1.9	103.628	30	104.943	97.393
4/26/2016	8:42:34 PM :	87	97	97	259	103	0.499	2.2	111.962	0.5	1.9	104.162	30	105.464	97.9
4/26/2016	8:43:34 PM :	88	96	97	255	103	0.501	2.2	112.467	0.5	1.9	104.656	30	105.945	98.369
4/26/2016	8:44:34 PM :	87	96	97	254	103	0.499	2.2	113.031	0.5	1.9	105.133	30	106.481	98.822
4/26/2016	8:45:34 PM :	87	96	97	258	103	0.501	2.2	113.632	0.5	1.9	105.618	30	107.053	99.283
4/26/2016	8:46:34 PM :	87	96	97	261	103	0.5	2.2	114.267	0.5	1.9	106.201	30	107.657	99.836
4/26/2016	8:47:34 PM :	87	96	97	259	103	0.501	2.2	114.802	0.5	1.9	106.83	30	108.166	100.434
4/26/2016	8:48:34 PM :	87	96	97	254	103	0.5	2.2	115.305	0.5	1.9	107.311	30	108.645	100.891
4/26/2016	8:49:34 PM :	87	96	97	254	103	0.5	2.2	115.84	0.5	1.9	107.743	30	109.154	101.301
4/26/2016	8:50:34 PM :	87	96	97	258	103	0.501	2.2	116.487	0.5	1.9	108.243	30	109.77	101.776
4/26/2016	8:51:34 PM :	87	96	97	261	103	0.5	2.2	117.109	0.5	1.9	108.851	30	110.362	102.354
4/26/2016	8:52:34 PM :	87	96	97	259	103	0.5	2.2	117.65	0.5	1.9	109.444	30.01	110.877	102.917
4/26/2016	8:53:34 PM :	87	96	97	254	103	0.501	2.2	118.136	0.5	1.9	109.923	30.01	111.34	103.372
4/26/2016	8:54:34 PM :	87	96	97	254	103	0.5	2.2	118.656	0.5	1.9	110.396	30.01	111.835	103.821
4/26/2016	8:55:34 PM :	87	96	97	258	103	0.499	2.2	119.312	0.5	1.9	110.917	30.01	112.459	104.316
4/26/2016	8:56:34 PM :	87	96	97	261	103	0.5	2.2	119.945	0.5	1.9	111.436	30.01	113.062	104.81
4/26/2016	8:57:34 PM :	87	96	97	259	103	0.5	2.2	120.486	0.5	1.9	112.004	30.01	113.577	105.349
4/26/2016	8:58:34 PM :	87	96	97	254	103	0.5	2.2	120.97	0.5	1.9	112.573	30.01	114.037	105.889
4/26/2016	8:59:34 PM :	87	96	97	254	103	0.5	2.2	121.509	0.5	1.9	113.082	30.01	114.551	106.373
4/26/2016	9:00:34 PM :	88	96	97	258	103	0.501	2.2	122.131	0.5	1.9	113.542	30.01	115.143	106.81
4/26/2016	9:01:34 PM :	90	96	97	261	103	0.5	2.2	122.789	0.5	1.9	114.007	30.01	115.769	107.252
4/26/2016	9:02:34 PM :	92	96	97	259	103	0.5	2.2	123.307	0.5	1.9	114.597	30.01	116.262	107.814
4/26/2016	9:03:34 PM :	93	96	97	254	103	0.5	2.2	123.817	0.5	1.9	115.23	30.01	116.748	108.415
4/26/2016	9:04:34 PM :	93	96	97	254	103	0.501	2.2	124.351	0.5	1.9	115.714	30.01	117.256	108.875
4/26/2016	9:05:34 PM :	95	96	97	259	103	0.5	2.2	124.966	0.5	1.9	116.152	30.01	117.841	109.292
4/26/2016	9:06:34 PM :	98	96	97	261	103	0.5	2.3	125.599	0.5	1.9	116.65	30.01	118.445	109.766
4/26/2016	9:07:34 PM :	103	96	97	259	102	0.5	2.3	126.138	0.5	1.9	117.231	30.01	118.958	110.318
4/26/2016	9:08:34 PM :	104	96	97	254	102	0.5	2.3	126.652	0.5	1.9	117.834	30.01	119.448	110.892
4/26/2016	9:09:34 PM :	104	96	97	254	102	0.501	2.2	127.205	0.5	1.9	118.336	30.01	119.975	111.369
4/26/2016	9:10:34 PM :	104	96	97	259	102	0.5	2.2	127.82	0.5	1.9	118.819	30.02	120.561	111.829
4/26/2016	9:11:34 PM :	103	96	97	261	102	0.5	2.3	128.406	0.5	1.9	119.311	30.02	121.12	112.297
4/26/2016	9:12:34 PM :	101	96	97	259	102	0.501	2.3	128.967	0.5	1.9	119.828	30.02	121.654	112.788
4/26/2016	9:13:34 PM :	101	96	97	254	102	0.499	2.2	129.479	0.5	1.9	120.402	30.02	122.142	113.335
4/26/2016	9:14:34 PM :	101	96	97	255	102	0.5	2.2	130.054	0.5	1.9	120.989	30.02	122.691	113.893
4/26/2016	9:15:34 PM :	102	96	97	260	102	0.5	2.2	130.663	0.5	1.9	121.486	30.02	123.271	114.366
4/26/2016	9:16:34 PM :	102	96	97	261	102	0.5	2.3	131.237	0.5	1.9	121.939	30.02	123.818	114.796
4/26/2016	9:17:34 PM :	102	96	97	258	102	0.5	2.3	131.767	0.5	1.9	122.422	30.02	124.323	115.255
4/26/2016	9:18:34 PM :	101	96	97	253	102	0.501	2.3	132.315	0.5	1.9	123.021	30.02	124.846	115.825
4/26/2016	9:19:34 PM :	99	96	97	255	102	0.5	2.2	132.902	0.5	1.9	123.629	30.02	125.405	116.404

4/26/2016	9:20:34 PM :	97	96	97	260	102	0.501	2.2	133.532	0.5	1.9	124.114	30.02	126.005	116.865
4/26/2016	9:21:34 PM :	96	96	97	261	103	0.5	2.3	134.074	0.5	1.9	124.578	30.02	126.523	117.307
4/26/2016	9:22:34 PM :	95	96	97	258	102	0.5	2.3	134.574	0.5	1.9	125.081	30.02	126.998	117.785
4/26/2016	9:23:34 PM :	94	96	97	254	102	0.499	2.3	135.136	0.5	1.9	125.627	30.02	127.535	118.304
4/26/2016	9:24:34 PM :	94	96	97	255	102	0.501	2.3	135.739	0.5	1.9	126.207	30.02	128.109	118.857
4/26/2016	9:25:34 PM :	93	96	97	260	103	0.5	2.3	136.373	0.5	1.9	126.753	30.02	128.714	119.376
4/26/2016	9:26:34 PM :	93	96	97	261	102	0.5	2.3	136.905	0.5	1.9	127.254	30.02	129.221	119.852
4/26/2016	9:27:34 PM :	93	96	97	257	103	0.5	2.3	137.408	0.5	1.9	127.722	30.02	129.701	120.298
4/26/2016	9:28:34 PM :	93	96	97	253	102	0.5	2.3	137.945	0.5	1.9	128.201	30.02	130.212	120.754
4/26/2016	9:29:34 PM :	92	96	97	255	102	0.5	2.2	138.591	0.5	1.9	128.804	30.02	130.828	121.327
4/26/2016	9:30:34 PM :	92	96	97	260	103	0.501	2.3	139.212	0.5	1.9	129.425	30.02	131.42	121.918
4/26/2016	9:31:34 PM :	91	96	97	261	103	0.498	2.3	139.753	0.5	1.9	129.904	30.02	131.936	122.374
4/26/2016	9:32:34 PM :	92	96	97	257	103	0.5	2.3	140.237	0.5	1.9	130.339	30.02	132.397	122.787
4/26/2016	9:33:34 PM :	94	96	97	253	103	0.499	2.3	140.755	0.5	1.9	130.833	30.02	132.891	123.257
4/26/2016	9:34:34 PM :	94	96	97	256	103	0.5	2.3	141.413	0.5	1.9	131.441	30.02	133.518	123.836
4/26/2016	9:35:34 PM :	94	96	97	260	103	0.501	2.3	142.043	0.5	1.9	132.036	30.02	134.118	124.401
4/26/2016	9:36:34 PM :	94	96	97	260	103	0.5	2.3	142.582	0.5	1.9	132.514	30.02	134.632	124.857
4/26/2016	9:37:34 PM :	94	96	97	256	103	0.5	2.3	143.063	0.5	1.9	132.991	30.02	135.091	125.311
4/26/2016	9:38:34 PM :	93	96	96	253	102	0.5	2.3	143.603	0.5	1.9	133.508	30.02	135.605	125.803
4/26/2016	9:39:34 PM :	93	96	97	256	102	0.5	2.3	144.23	0.5	1.9	134.036	30.02	136.203	126.305
4/26/2016	9:40:34 PM :	91	96	97	261	103	0.501	2.3	144.888	0.5	1.9	134.595	30.02	136.831	126.837
4/26/2016	9:41:34 PM :	91	96	97	260	103	0.5	2.3	145.406	0.5	1.9	135.168	30.02	137.325	127.382
4/26/2016	9:42:34 PM :	91	96	97	255	103	0.5	2.3	145.917	0.5	1.9	135.678	30.02	137.811	127.867
4/26/2016	9:43:34 PM :	91	96	97	253	103	0.499	2.3	146.439	0.5	1.9	136.135	30.02	138.309	128.302
4/26/2016	9:44:34 PM :	90	96	97	258	103	0.501	2.3	147.051	0.5	1.9	136.604	30.02	138.892	128.748
4/26/2016	9:45:34 PM :	90	96	96	261	103	0.5	2.3	147.695	0.5	1.9	137.195	30.02	139.507	129.311
4/26/2016	9:46:34 PM :	89	96	97	260	103	0.5	2.3	148.229	0.5	1.9	137.829	30.02	140.016	129.914
4/26/2016	9:47:34 PM :	88	96	96	255	102	0.5	2.3	148.747	0.5	1.9	138.309	30.02	140.509	130.371
4/26/2016	9:48:34 PM :	88	96	97	254	103	0.5	2.3	149.284	0.5	1.9	138.749	30.02	141.021	130.79
4/26/2016	9:49:34 PM :	88	96	97	258	103	0.5	2.3	149.911	0.5	1.9	139.25	30.03	141.618	131.266
4/26/2016	9:50:34 PM :	88	96	96	261	103	0.5	2.3	150.503	0.5	1.9	139.824	30.03	142.183	131.813
4/26/2016	9:51:34 PM :	88	96	96	259	103	0.5	2.3	151.058	0.5	1.9	140.421	30.03	142.712	132.382
4/26/2016	9:52:34 PM :	89	96	96	255	102	0.501	2.3	151.568	0.5	1.9	140.927	30.03	143.199	132.864
4/26/2016	9:53:34 PM :	89	96	96	253	102	0.5	2.3	152.142	0.5	1.9	141.417	30.03	143.746	133.33
4/26/2016	9:54:34 PM :	89	96	96	258	102	0.5	2.3	152.748	0.5	1.9	141.905	30.03	144.324	133.795
4/26/2016	9:55:34 PM :	88	96	96	261	103	0.5	2.3	153.322	0.5	1.9	142.409	30.03	144.871	134.275
4/26/2016	9:56:34 PM :	89	96	96	259	102	0.5	2.3	153.865	0.5	1.9	142.991	30.03	145.389	134.829
4/26/2016	9:57:34 PM :	89	95	96	255	102	0.501	2.3	154.401	0.5	1.9	143.588	30.03	145.9	135.398
4/26/2016	9:58:34 PM :	88	95	96	254	102	0.501	2.3	154.988	0.5	1.9	144.08	30.03	146.46	135.866
4/26/2016	9:59:34 PM :	88	95	96	258	102	0.5	2.3	155.612	0.5	1.9	144.531	30.03	147.056	136.296
4/26/2016	10:00:34 PM :	88	95	96	261	102	0.5	2.3	156.165	0.5	1.9	145.019	30.03	147.583	136.761
4/26/2016	10:01:34 PM :	88	95	96	259	102	0.501	2.3	156.671	0.5	1.9	145.616	30.02	148.066	137.329
4/26/2016	10:02:34 PM :	89	95	96	254	102	0.501	2.3	157.235	0.5	1.9	146.22	30.02	148.604	137.904
4/26/2016	10:03:34 PM :	90	95	96	254	102	0.499	2.3	157.826	0.5	1.9	146.699	30.02	149.169	138.36
4/26/2016	10:04:34 PM :	90	95	96	259	102	0.5	2.3	158.466	0.5	1.9	147.174	30.02	149.779	138.813
4/26/2016	10:05:34 PM :	90	95	96	261	102	0.5	2.3	158.995	0.5	1.9	147.678	30.02	150.283	139.293
4/26/2016	10:06:34 PM :	91	95	96	258	102	0.5	2.3	159.496	0.5	1.9	148.218	30.02	150.761	139.807
4/26/2016	10:07:34 PM :	91	95	96	254	102	0.499	2.3	160.043	0.5	1.9	148.789	30.02	151.283	140.351
4/26/2016	10:08:34 PM :	92	95	96	254	102	0.5	2.3	160.68	0.5	1.9	149.356	30.02	151.891	140.89
4/26/2016	10:09:34 PM :	91	95	96	259	102	0.499	2.3	161.307	0.5	1.9	149.855	30.02	152.49	141.366
4/26/2016	10:10:34 PM :	91	95	96	261	102	0.5	2.3	161.844	0.5	1.9	150.318	30.02	153.002	141.806

4/26/2016	10:11:34 PM :	92	95	96	258	102	0.501	2.3	162.33	0.5	1.9	150.794	30.02	153.466	142.26
4/26/2016	10:12:34 PM :	92	95	96	254	102	0.5	2.3	162.855	0.5	1.9	151.377	30.03	153.967	142.815
4/26/2016	10:13:34 PM :	91	95	96	255	102	0.5	2.3	163.513	0.5	1.9	152.023	30.03	154.594	143.43
4/26/2016	10:14:34 PM :	91	95	96	260	102	0.499	2.3	164.14	0.5	1.9	152.498	30.03	155.193	143.882
4/26/2016	10:15:34 PM :	90	95	96	261	102	0.5	2.3	164.677	0.5	1.9	152.928	30.03	155.705	144.292
4/26/2016	10:16:34 PM :	90	95	96	258	102	0.5	2.3	165.158	0.5	1.9	153.428	30.03	156.165	144.768
4/26/2016	10:17:34 PM :	90	95	96	253	102	0.5	2.3	165.694	0.5	1.9	154.031	30.03	156.676	145.343
4/26/2016	10:18:34 PM :	90	95	96	255	102	0.5	2.3	166.326	0.499	1.9	154.625	30.03	157.279	145.908
4/26/2016	10:19:34 PM :	90	95	96	260	102	0.5	2.3	166.98	0.5	1.9	155.104	30.03	157.903	146.364
4/26/2016	10:20:34 PM :	89	95	96	261	102	0.5	2.3	167.502	0.5	1.9	155.589	30.03	158.401	146.826
4/26/2016	10:21:34 PM :	89	95	96	257	102	0.501	2.3	168.014	0.5	1.9	156.099	30.03	158.89	147.313
4/26/2016	10:22:34 PM :	89	95	96	253	102	0.499	2.3	168.536	0.5	1.9	156.614	30.03	159.388	147.804
4/26/2016	10:23:34 PM :	88	95	96	255	102	0.5	2.3	169.144	0.499	1.9	157.182	30.03	159.969	148.346
4/26/2016	10:24:34 PM :	88	95	96	260	102	0.501	2.3	169.799	0.5	1.9	157.753	30.03	160.594	148.891
4/26/2016	10:25:34 PM :	88	95	96	261	102	0.5	2.3	170.327	0.5	1.9	158.262	30.04	161.098	149.375
4/26/2016	10:26:34 PM :	88	95	96	257	102	0.499	2.3	170.845	0.5	1.9	158.72	30.04	161.592	149.813
4/26/2016	10:27:34 PM :	88	95	96	253	102	0.501	2.3	171.377	0.499	1.9	159.195	30.04	162.1	150.266
4/26/2016	10:28:34 PM :	89	95	96	255	102	0.5	2.3	172.004	0.5	1.9	159.784	30.04	162.699	150.827
4/26/2016	10:29:34 PM :	89	95	96	260	102	0.5	2.3	172.603	0.5	1.9	160.404	30.03	163.27	151.418
4/26/2016	10:30:34 PM :	89	95	96	261	102	0.5	2.3	173.159	0.5	1.9	160.895	30.03	163.802	151.887
4/26/2016	10:31:34 PM :	89	95	96	256	102	0.5	2.3	173.667	0.499	1.9	161.339	30.03	164.287	152.309
4/26/2016	10:32:34 PM :	89	95	96	253	102	0.498	2.3	174.241	0.5	1.9	161.843	30.03	164.835	152.79
4/26/2016	10:33:34 PM :	90	95	96	256	102	0.5	2.3	174.844	0.5	1.9	162.406	30.04	165.411	153.328
4/26/2016	10:34:34 PM :	90	95	96	261	102	0.5	2.3	175.413	0.5	1.9	163.003	30.04	165.955	153.897
4/26/2016	10:35:34 PM :	90	95	96	260	102	0.501	2.3	175.964	0.5	1.9	163.519	30.04	166.481	154.388
4/26/2016	10:36:34 PM :	90	95	96	256	102	0.5	2.3	176.496	0.5	1.9	164.01	30.04	166.989	154.857
4/26/2016	10:37:34 PM :	91	95	96	253	102	0.501	2.3	177.089	0.5	1.9	164.493	30.04	167.556	155.317
4/26/2016	10:38:34 PM :	91	95	96	256	102	0.5	2.3	177.697	0.499	1.9	164.985	30.04	168.137	155.787
4/26/2016	10:39:34 PM :	91	95	96	261	102	0.5	2.3	178.26	0.5	1.9	165.57	30.04	168.675	156.344
4/26/2016	10:40:34 PM :	91	95	96	260	102	0.5	2.3	178.768	0.5	1.9	166.186	30.04	169.161	156.932
4/26/2016	10:41:34 PM :	91	95	96	256	102	0.499	2.3	179.332	0.5	1.9	166.667	30.04	169.699	157.39
4/26/2016	10:42:34 PM :	93	95	96	253	102	0.5	2.3	179.916	0.5	1.9	167.101	30.04	170.257	157.805
4/26/2016	10:43:34 PM :	93	95	96	256	102	0.5	2.3	180.553	0.5	1.9	167.601	30.04	170.866	158.282
4/26/2016	10:44:34 PM :	93	95	96	261	102	0.5	2.3	181.086	0.5	1.9	168.205	30.04	171.375	158.858
4/26/2016	10:45:34 PM :	93	95	96	260	102	0.5	2.3	181.583	0.5	1.9	168.802	30.04	171.851	159.427
4/26/2016	10:46:34 PM :	95	95	96	255	102	0.5	2.3	182.14	0.5	1.9	169.279	30.04	172.383	159.882
4/26/2016	10:47:34 PM :	95	95	96	253	102	0.5	2.3	182.763	0.5	1.9	169.752	30.04	172.979	160.333
4/26/2016	10:48:34 PM :	95	95	96	257	102	0.499	2.3	183.389	0.5	1.9	170.268	30.04	173.576	160.825
4/26/2016	10:49:34 PM :	95	95	96	261	102	0.5	2.3	183.927	0.5	1.9	170.794	30.04	174.09	161.327
4/26/2016	10:50:34 PM :	94	95	96	260	102	0.5	2.3	184.422	0.5	1.9	171.361	30.04	174.564	161.868
4/26/2016	10:51:34 PM :	93	95	96	255	102	0.5	2.3	184.95	0.5	1.9	171.924	30.04	175.068	162.404
4/26/2016	10:52:34 PM :	93	95	96	253	102	0.5	2.3	185.609	0.5	1.9	172.438	30.04	175.698	162.895
4/26/2016	10:53:34 PM :	93	95	96	258	102	0.501	2.3	186.227	0.5	1.9	172.896	30.04	176.289	163.331
4/26/2016	10:54:34 PM :	95	95	96	261	102	0.5	2.3	186.768	0.5	1.9	173.362	30.04	176.806	163.776
4/26/2016	10:55:34 PM :	97	95	96	260	102	0.499	2.3	187.253	0.5	1.9	173.951	30.04	177.269	164.338
4/26/2016	10:56:34 PM :	97	95	96	255	102	0.5	2.3	187.782	0.5	1.9	174.587	30.04	177.774	164.944
4/26/2016	10:57:34 PM :	96	95	96	254	102	0.499	2.3	188.423	0.5	1.9	175.068	30.04	178.387	165.402
4/26/2016	10:58:34 PM :	96	95	96	258	102	0.5	2.3	189.065	0.5	1.9	175.502	30.04	179.001	165.816
4/26/2016	10:59:34 PM :	94	95	96	261	102	0.5	2.3	189.593	0.5	1.9	175.998	30.04	179.505	166.29
4/26/2016	11:00:34 PM :	91	95	96	259	102	0.5	2.3	190.09	0.5	1.9	176.585	30.04	179.98	166.849
4/26/2016	11:01:34 PM :	90	95	96	254	102	0.5	2.3	190.62	0.5	1.9	177.184	30.04	180.487	167.42

4/26/2016	11:02:34 PM :	90	95	96	254	102	0.501	2.3	191.236	0.5	1.9	177.68	30.04	181.075	167.893
4/26/2016	11:03:34 PM :	90	95	96	258	102	0.5	2.3	191.892	0.5	1.9	178.163	30.03	181.702	168.354
4/26/2016	11:04:34 PM :	90	95	96	261	102	0.5	2.3	192.418	0.5	1.9	178.663	30.03	182.204	168.831
4/26/2016	11:05:34 PM :	91	95	96	259	102	0.5	2.3	192.928	0.5	1.9	179.171	30.03	182.692	169.316
4/26/2016	11:06:34 PM :	92	95	96	254	102	0.5	2.3	193.458	0.5	1.9	179.748	30.03	183.198	169.865
4/26/2016	11:07:34 PM :	93	95	96	254	102	0.5	2.3	194.085	0.5	1.9	180.335	30.03	183.797	170.425
4/26/2016	11:08:34 PM :	93	95	96	259	102	0.5	2.3	194.698	0.5	1.9	180.834	30.03	184.383	170.901
4/26/2016	11:09:34 PM :	92	95	96	261	102	0.5	2.3	195.247	0.5	1.9	181.285	30.03	184.907	171.331
4/26/2016	11:10:34 PM :	90	95	96	259	102	0.5	2.3	195.757	0.5	1.9	181.765	30.03	185.394	171.789
4/26/2016	11:11:34 PM :	90	95	96	254	102	0.5	2.3	196.324	0.5	1.9	182.364	30.03	185.936	172.36
4/26/2016	11:12:34 PM :	89	95	96	254	102	0.499	2.3	196.928	0.5	1.9	182.97	30.03	186.514	172.938
4/26/2016	11:13:34 PM :	89	95	96	259	102	0.5	2.3	197.507	0.5	1.9	183.455	30.03	187.066	173.4
4/26/2016	11:14:34 PM :	89	95	96	261	102	0.5	2.3	198.06	0.5	1.9	183.917	30.03	187.595	173.841
4/26/2016	11:15:34 PM :	91	95	96	259	102	0.5	2.3	198.582	0.5	1.9	184.421	30.03	188.093	174.321
4/26/2016	11:16:34 PM :	91	95	96	254	102	0.501	2.3	199.171	0.5	1.9	184.968	30.03	188.657	174.843
4/26/2016	11:17:34 PM :	92	95	96	254	102	0.499	2.3	199.778	0.5	1.9	185.544	30.03	189.236	175.392
4/26/2016	11:18:34 PM :	90	95	96	259	102	0.5	2.3	200.349	0.5	1.9	186.091	30.04	189.783	175.913
4/26/2016	11:19:34 PM :	90	95	96	261	102	0.501	2.3	200.864	0.5	1.9	186.593	30.04	190.274	176.392
4/26/2016	11:20:34 PM :	92	95	95	258	102	0.5	2.3	201.42	0.5	1.9	187.061	30.04	190.806	176.839
4/26/2016	11:21:34 PM :	90	95	95	254	101	0.499	2.3	202.009	0.5	1.9	187.538	30.04	191.368	177.294
4/26/2016	11:22:34 PM :	87	95	95	255	101	0.5	2.3	202.642	0.5	1.9	188.114	30.04	191.973	177.844
4/26/2016	11:23:34 PM :	86	95	95	260	102	0.499	2.3	203.176	0.499	1.9	188.76	30.04	192.484	178.461
4/26/2016	11:24:34 PM :	86	95	95	261	101	0.5	2.3	203.671	0.5	1.9	189.231	30.04	192.957	178.91
4/26/2016	11:25:34 PM :	86	95	95	258	101	0.5	2.3	204.235	0.5	1.9	189.663	30.04	193.496	179.323
4/26/2016	11:26:34 PM :	85	95	95	253	101	0.5	2.3	204.852	0.5	1.9	190.165	30.04	194.085	179.802
4/26/2016	11:27:34 PM :	85	94	95	255	101	0.5	2.3	205.484	0.5	1.9	190.762	30.04	194.69	180.372
4/26/2016	11:28:34 PM :	85	95	95	260	101	0.499	2.3	206.012	0.5	1.9	191.364	30.04	195.194	180.947
4/26/2016	11:29:34 PM :	85	94	95	260	101	0.5	2.3	206.511	0.5	1.9	191.839	30.04	195.672	181.4
4/26/2016	11:30:34 PM :	85	94	95	256	101	0.5	2.3	207.043	0.5	1.9	192.322	30.04	196.181	181.861
4/26/2016	11:31:34 PM :	85	94	95	253	101	0.5	2.3	207.697	0.5	1.9	192.826	30.04	196.806	182.342
4/26/2016	11:32:34 PM :	85	94	95	256	101	0.501	2.3	208.317	0.5	1.9	193.341	30.04	197.399	182.835
4/26/2016	11:33:34 PM :	85	94	95	261	101	0.5	2.3	208.855	0.499	1.9	193.907	30.04	197.913	183.374
4/26/2016	11:34:34 PM :	84	94	95	260	101	0.501	2.3	209.338	0.5	1.9	194.488	30.04	198.376	183.929
4/26/2016	11:35:34 PM :	84	94	95	255	101	0.5	2.3	209.862	0.5	1.9	194.991	30.04	198.877	184.409
4/26/2016	11:36:34 PM :	84	94	95	253	101	0.5	2.3	210.512	0.5	1.9	195.445	30.04	199.499	184.843
4/26/2016	11:37:34 PM :	85	94	95	257	101	0.5	2.3	211.152	0.5	1.9	195.919	30.04	200.11	185.295
4/26/2016	11:38:34 PM :	85	94	95	261	101	0.5	2.3	211.684	0.5	1.9	196.511	30.04	200.62	185.86
4/26/2016	11:39:34 PM :	85	94	95	260	101	0.499	2.3	212.176	0.499	1.9	197.127	30.03	201.09	186.448
4/26/2016	11:40:34 PM :	85	94	95	255	101	0.5	2.3	212.712	0.5	1.9	197.616	30.03	201.602	186.915
4/26/2016	11:41:34 PM :	85	94	95	253	101	0.501	2.3	213.331	0.5	1.9	198.061	30.03	202.195	187.34
4/26/2016	11:42:34 PM :	85	94	95	258	101	0.501	2.3	213.991	0.5	1.9	198.562	30.03	202.826	187.817
4/26/2016	11:43:34 PM :	85	94	95	261	101	0.501	2.3	214.509	0.5	1.9	199.119	30.03	203.322	188.349
4/26/2016	11:44:34 PM :	86	94	95	259	101	0.5	2.3	215.022	0.5	1.9	199.701	30.03	203.812	188.904
4/26/2016	11:45:34 PM :	86	94	95	254	101	0.5	2.3	215.549	0.5	1.9	200.234	30.03	204.316	189.414
4/26/2016	11:46:34 PM :	86	94	95	254	101	0.5	2.3	216.17	0.5	1.9	200.731	30.03	204.91	189.887
4/26/2016	11:47:34 PM :	86	94	95	259	101	0.5	2.3	216.799	0.5	1.9	201.207	30.03	205.511	190.342
4/26/2016	11:48:34 PM :	86	94	95	261	101	0.5	2.3	217.34	0.5	1.9	201.688	30.03	206.029	190.801
4/26/2016	11:49:34 PM :	86	94	95	259	101	0.5	2.3	217.854	0.499	1.9	202.267	30.03	206.52	191.353
4/26/2016	11:50:34 PM :	86	94	95	254	101	0.5	2.3	218.411	0.5	1.9	202.902	30.03	207.053	191.96
4/26/2016	11:51:34 PM :	85	94	95	254	101	0.501	2.3	219.023	0.5	1.9	203.377	30.03	207.639	192.413
4/26/2016	11:52:34 PM :	86	94	95	259	101	0.5	2.3	219.606	0.5	1.9	203.811	30.03	208.196	192.827

4/26/2016	11:53:34 PM :	86	94	95	261	101	0.5	2.3	220.163	0.5	1.9	204.31	30.03	208.728	193.303
4/26/2016	11:54:34 PM :	86	94	95	258	101	0.5	2.3	220.679	0.5	1.9	204.917	30.03	209.222	193.882
4/26/2016	11:55:34 PM :	85	94	95	254	101	0.499	2.3	221.261	0.5	1.9	205.507	30.03	209.778	194.446
4/26/2016	11:56:34 PM :	85	94	95	255	101	0.5	2.3	221.869	0.5	1.9	205.984	30.03	210.36	194.901
4/26/2016	11:57:34 PM :	85	94	95	260	101	0.5	2.3	222.439	0.5	1.9	206.459	30.03	210.905	195.354
4/26/2016	11:58:34 PM :	84	94	95	261	101	0.5	2.3	222.963	0.5	1.9	206.973	30.03	211.406	195.844
4/26/2016	11:59:34 PM :	84	94	95	258	101	0.5	2.3	223.52	0.5	1.9	207.491	30.03	211.938	196.339
4/27/2016	12:00:34 AM :	83	94	95	253	101	0.5	2.3	224.104	0.5	1.9	208.057	30.03	212.498	196.879
4/27/2016	12:01:34 AM :	83	94	95	255	101	0.5	2.3	224.734	0.5	1.9	208.631	30.03	213.1	197.428
4/27/2016	12:02:34 AM :	83	94	95	260	101	0.5	2.3	225.274	0.5	1.9	209.131	30.03	213.616	197.905
4/27/2016	12:03:34 AM :	83	94	95	261	101	0.5	2.3	225.771	0.5	1.9	209.589	30.03	214.091	198.342
4/27/2016	12:04:34 AM :	83	94	95	257	101	0.501	2.3	226.334	0.5	1.9	210.064	30.03	214.63	198.795
4/27/2016	12:05:34 AM :	83	94	95	253	101	0.5	2.3	226.941	0.5	1.9	210.655	30.03	215.211	199.36
4/27/2016	12:06:34 AM :	84	94	95	255	101	0.499	2.3	227.579	0.5	1.9	211.279	30.03	215.821	199.956
4/27/2016	12:07:34 AM :	84	94	95	260	101	0.501	2.3	228.107	0.5	1.9	211.761	30.03	216.326	200.417
4/27/2016	12:08:34 AM :	83	94	95	261	101	0.5	2.3	228.612	0.5	1.9	212.207	30.03	216.809	200.843
4/27/2016	12:09:34 AM :	83	94	95	257	101	0.5	2.3	229.142	0.5	1.9	212.705	30.03	217.316	201.319
4/27/2016	12:10:34 AM :	82	94	95	253	101	0.499	2.3	229.793	0.5	1.9	213.269	30.03	217.938	201.857
4/27/2016	12:11:34 AM :	82	94	95	255	101	0.5	2.3	230.418	0.5	1.9	213.867	30.03	218.536	202.428
4/27/2016	12:12:34 AM :	82	94	95	260	101	0.501	2.3	230.959	0.5	1.9	214.383	30.03	219.053	202.922
4/27/2016	12:13:34 AM :	83	94	95	260	101	0.5	2.3	231.437	0.5	1.9	214.871	30.03	219.51	203.388
4/27/2016	12:14:34 AM :	83	94	95	256	101	0.501	2.3	231.965	0.5	1.9	215.354	30.03	220.015	203.849
4/27/2016	12:15:34 AM :	83	94	95	253	101	0.5	2.3	232.617	0.5	1.9	215.843	30.02	220.64	204.316
4/27/2016	12:16:34 AM :	83	94	95	256	101	0.5	2.3	233.258	0.5	1.9	216.434	30.02	221.252	204.88
4/27/2016	12:17:34 AM :	83	94	95	261	101	0.5	2.3	233.79	0.5	1.9	217.048	30.02	221.761	205.467
4/27/2016	12:18:34 AM :	83	94	95	260	101	0.5	2.3	234.277	0.5	1.9	217.527	30.02	222.228	205.924
4/27/2016	12:19:34 AM :	83	94	95	256	101	0.499	2.3	234.813	0.5	1.9	217.964	30.02	222.74	206.342
4/27/2016	12:20:34 AM :	83	94	95	253	101	0.5	2.3	235.438	0.5	1.9	218.463	30.02	223.339	206.817
4/27/2016	12:21:34 AM :	83	94	95	256	101	0.501	2.3	236.097	0.5	1.9	219.068	30.02	223.969	207.395
4/27/2016	12:22:34 AM :	83	94	95	261	101	0.498	2.3	236.613	0.5	1.9	219.665	30.02	224.462	207.966
4/27/2016	12:23:34 AM :	83	94	95	260	101	0.501	2.3	237.125	0.5	1.9	220.141	30.02	224.952	208.42
4/27/2016	12:24:34 AM :	83	94	95	255	101	0.5	2.3	237.655	0.5	1.9	220.61	30.02	225.46	208.868
4/27/2016	12:25:34 AM :	83	94	95	253	101	0.5	2.3	238.274	0.5	1.9	221.132	30.02	226.052	209.366
4/27/2016	12:26:34 AM :	83	94	95	256	101	0.5	2.3	238.903	0.5	1.9	221.652	30.02	226.655	209.863
4/27/2016	12:27:34 AM :	83	94	95	261	101	0.501	2.3	239.449	0.5	1.9	222.221	30.02	227.177	210.406
4/27/2016	12:28:34 AM :	83	94	95	260	101	0.499	2.3	239.961	0.5	1.9	222.786	30.02	227.667	210.946
4/27/2016	12:29:34 AM :	83	94	95	255	100	0.5	2.3	240.518	0.5	1.9	223.292	30.02	228.2	211.429
4/27/2016	12:30:34 AM :	83	94	95	253	100	0.5	2.3	241.132	0.5	1.9	223.752	30.03	228.787	211.868
4/27/2016	12:31:34 AM :	83	94	95	258	100	0.5	2.3	241.717	0.5	1.9	224.221	30.03	229.347	212.316
4/27/2016	12:32:34 AM :	83	94	95	261	101	0.501	2.3	242.27	0.5	1.9	224.805	30.03	229.876	212.874
4/27/2016	12:33:34 AM :	83	94	95	259	100	0.499	2.3	242.79	0.5	1.9	225.438	30.03	230.374	213.479
4/27/2016	12:34:34 AM :	82	94	95	254	100	0.501	2.3	243.375	0.5	1.9	225.918	30.03	230.934	213.937
4/27/2016	12:35:34 AM :	82	94	95	254	100	0.5	2.3	243.981	0.5	1.9	226.356	30.03	231.514	214.356
4/27/2016	12:36:34 AM :	82	94	94	258	100	0.5	2.3	244.555	0.499	1.9	226.852	30.03	232.063	214.83
4/27/2016	12:37:34 AM :	82	94	94	261	100	0.5	2.3	245.073	0.5	1.9	227.43	30.03	232.559	215.382
4/27/2016	12:38:34 AM :	82	94	94	259	100	0.5	2.3	245.628	0.5	1.9	228.026	30.03	233.09	215.952
4/27/2016	12:39:34 AM :	82	94	94	254	100	0.5	2.3	246.216	0.5	1.9	228.53	30.03	233.653	216.434
4/27/2016	12:40:34 AM :	82	94	94	254	100	0.5	2.3	246.852	0.5	1.9	229.019	30.03	234.262	216.902
4/27/2016	12:41:34 AM :	82	94	94	259	100	0.5	2.3	247.386	0.5	1.9	229.502	30.03	234.773	217.363
4/27/2016	12:42:34 AM :	83	94	94	261	100	0.5	2.3	247.881	0.5	1.9	230	30.03	235.247	217.84
4/27/2016	12:43:34 AM :	83	94	94	258	100	0.5	2.3	248.445	0.5	1.9	230.581	30.03	235.786	218.395

4/27/2016	12:44:34 AM :	83	94	94	253	100	0.499	2.3	249.057	0.5	1.9	231.188	30.02	236.372	218.975
4/27/2016	12:45:34 AM :	83	94	94	255	100	0.5	2.3	249.695	0.5	1.9	231.672	30.02	236.982	219.438
4/27/2016	12:46:34 AM :	83	93	94	260	100	0.5	2.3	250.221	0.499	1.9	232.11	30.02	237.486	219.856
4/27/2016	12:47:34 AM :	83	93	94	261	100	0.5	2.3	250.723	0.5	1.9	232.604	30.02	237.967	220.329
4/27/2016	12:48:34 AM :	83	93	94	258	100	0.501	2.3	251.255	0.5	1.9	233.205	30.03	238.477	220.903
4/27/2016	12:49:34 AM :	83	93	94	253	100	0.5	2.3	251.909	0.5	1.9	233.801	30.03	239.103	221.473
4/27/2016	12:50:34 AM :	83	93	94	255	100	0.501	2.3	252.53	0.5	1.9	234.278	30.03	239.699	221.929
4/27/2016	12:51:34 AM :	83	93	94	260	100	0.5	2.3	253.068	0.5	1.9	234.746	30.03	240.214	222.376
4/27/2016	12:52:34 AM :	84	93	94	261	100	0.5	2.3	253.551	0.5	1.9	235.263	30.03	240.677	222.871
4/27/2016	12:53:34 AM :	84	93	94	257	100	0.499	2.3	254.075	0.5	1.9	235.786	30.03	241.179	223.37
4/27/2016	12:54:34 AM :	85	93	94	253	100	0.499	2.3	254.73	0.5	1.9	236.354	30.03	241.805	223.914
4/27/2016	12:55:34 AM :	85	93	94	255	100	0.5	2.3	255.367	0.5	1.9	236.915	30.02	242.416	224.45
4/27/2016	12:56:34 AM :	85	93	94	260	100	0.501	2.3	255.899	0.5	1.9	237.424	30.02	242.925	224.936
4/27/2016	12:57:34 AM :	85	93	94	261	100	0.499	2.3	256.392	0.5	1.9	237.881	30.02	243.398	225.374
4/27/2016	12:58:34 AM :	85	93	94	256	100	0.5	2.3	256.923	0.5	1.9	238.348	30.02	243.906	225.82
4/27/2016	12:59:34 AM :	85	93	94	253	100	0.501	2.3	257.547	0.5	1.9	238.937	30.02	244.504	226.382
4/27/2016	1:00:34 AM :	85	93	94	256	100	0.5	2.3	258.207	0.5	1.9	239.57	30.02	245.136	226.988
4/27/2016	1:01:34 AM :	85	93	94	261	100	0.5	2.3	258.723	0.5	1.9	240.047	30.02	245.63	227.444
4/27/2016	1:02:34 AM :	85	93	94	261	100	0.501	2.3	259.238	0.5	1.9	240.487	30.02	246.124	227.865
4/27/2016	1:03:34 AM :	85	93	94	256	99	0.5	2.3	259.765	0.5	1.9	240.982	30.02	246.628	228.337
4/27/2016	1:04:34 AM :	86	93	94	253	100	0.5	2.3	260.391	0.5	1.9	241.56	30.02	247.228	228.89
4/27/2016	1:05:34 AM :	87	93	94	256	100	0.499	2.3	261.013	0.5	1.9	242.157	30.02	247.824	229.461
4/27/2016	1:06:34 AM :	89	93	94	261	100	0.5	2.3	261.554	0.5	1.9	242.659	30.02	248.342	229.941
4/27/2016	1:07:34 AM :	90	93	94	260	99	0.5	2.3	262.068	0.5	2	243.144	30.02	248.834	230.404
4/27/2016	1:08:34 AM :	90	93	94	256	99	0.499	2.3	262.626	0.499	2	243.631	30.02	249.369	230.87
4/27/2016	1:09:34 AM :	91	93	94	253	99	0.5	2.3	263.239	0.5	1.9	244.128	30.02	249.956	231.344
4/27/2016	1:10:34 AM :	91	93	94	257	99	0.5	2.3	263.822	0.5	1.9	244.712	30.02	250.514	231.903
4/27/2016	1:11:34 AM :	91	93	94	261	99	0.501	2.3	264.376	0.5	2	245.315	30.02	251.045	232.479
4/27/2016	1:12:34 AM :	89	93	94	260	99	0.5	2.3	264.898	0.5	2	245.801	30.02	251.545	232.944
4/27/2016	1:13:34 AM :	87	93	94	255	99	0.5	2.3	265.48	0.5	1.9	246.239	30.02	252.102	233.363
4/27/2016	1:14:34 AM :	86	93	94	253	99	0.5	2.3	266.089	0.5	1.9	246.732	30.02	252.685	233.834
4/27/2016	1:15:34 AM :	85	93	94	257	99	0.5	2.3	266.662	0.5	1.9	247.336	30.02	253.234	234.411
4/27/2016	1:16:34 AM :	85	93	94	261	99	0.5	2.3	267.18	0.5	1.9	247.932	30.02	253.731	234.982
4/27/2016	1:17:34 AM :	84	93	94	260	99	0.5	2.3	267.737	0.5	1.9	248.407	30.02	254.264	235.436
4/27/2016	1:18:34 AM :	84	93	94	255	99	0.5	2.3	268.326	0.5	1.9	248.878	30.02	254.828	235.886
4/27/2016	1:19:34 AM :	83	93	94	253	99	0.5	2.3	268.957	0.5	1.9	249.397	30.02	255.433	236.382
4/27/2016	1:20:34 AM :	83	93	94	257	99	0.5	2.3	269.495	0.5	1.9	249.92	30.02	255.948	236.883
4/27/2016	1:21:34 AM :	83	93	94	261	99	0.5	2.3	269.988	0.5	1.9	250.484	30.02	256.421	237.422
4/27/2016	1:22:34 AM :	83	93	94	260	99	0.5	2.3	270.554	0.5	1.9	251.047	30.02	256.963	237.961
4/27/2016	1:23:34 AM :	83	93	94	255	99	0.5	2.3	271.166	0.5	1.9	251.555	30.02	257.55	238.447
4/27/2016	1:24:34 AM :	82	93	94	253	99	0.501	2.3	271.807	0.5	1.9	252.017	30.01	258.164	238.889
4/27/2016	1:25:28 AM :	82	93	94	253	99	0.501	2.3	272.271	0.5	1.9	252.431	30.01	258.609	239.285

```
'
'-------------------------- LOGGED EVENTS ----------------------------------
04/26/16 4:49:09 PM: Tes  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/26/16 4:49:16 PM: Test Paused by User
04/26/16 4:49:16 PM: PA  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/26/16 5:25:35 PM: TestResumed
04/27/16 1:25:28 AM: Actual Sampling Time: 0d  8h  0m  0s
04/27/16 1:25:28 AM: Test END
04/27/16 4:47:53 PM: PAUSE_EVENT -
```

```
04/27/16 01:28:12 AM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/27/16 01:28:12 AM: Maximum Observed Vacuum for A was 2.3 inHg
04/27/16 01:28:12 AM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/27/16 01:28:12 AM: Maximum Observed Vacuum for B was 2.0 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'           DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 3 Night.pro
File Exported: 4/30/2016 12:25:28 AM (PC Time).
Company Name: Cuba

04/27/16 04:54:09 PM: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 0 ccm (Max. allowed 20 ccm)
04/27/16 04:54:09 PM: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 0 ccm (Max. allowed 20 ccm)
Trap ID-A: spiked OL335414
Trap ID-B: OL343564

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 5m
Averaging Period : 1 min.

Run N3

		Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (I Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (I Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES		98.7	100.8	102.1	257.8	106.8	0.499	2.3	272.102	0.499	2	253.48	30.01	257.26	239.082
4/27/2016	4:56:56 PM :	99	114	114	253	122	0	0.3	0	0.008	0	0	29.98	0	0
4/27/2016	4:57:06 PM :User Paus	99	114	114	253	122	0.61	2	0.194	0.552	1.4	0.099	29.98	0.179	0.091
4/27/2016	5:02:29 PM :Resumed	103	115	115	253	122	0	0.3	0.194	0.002	0	0.1	29.97	0.179	0.092
4/27/2016	5:03:28 PM :	112	114	114	255	122	0.545	1.8	0.735	0.527	1.3	0.587	29.97	0.678	0.54
4/27/2016	5:04:28 PM :	132	114	114	261	122	0.501	2.1	1.236	0.5	1.8	1.211	29.97	1.14	1.115
4/27/2016	5:05:28 PM :	140	113	114	262	122	0.501	2.1	1.798	0.5	1.8	1.808	29.97	1.658	1.664
4/27/2016	5:06:28 PM :	143	113	114	260	122	0.5	2.1	2.402	0.5	1.8	2.306	29.97	2.216	2.123
4/27/2016	5:07:28 PM :	146	113	114	255	122	0.5	2.1	3.032	0.5	1.8	2.789	29.97	2.797	2.568
4/27/2016	5:08:28 PM :	148	113	114	255	122	0.501	2.1	3.562	0.5	1.8	3.311	29.97	3.286	3.048
4/27/2016	5:09:28 PM :	144	114	115	260	122	0.5	2.1	4.069	0.5	1.8	3.834	29.97	3.754	3.529
4/27/2016	5:10:28 PM :	140	114	115	262	122	0.501	2.1	4.6	0.5	1.8	4.415	29.97	4.243	4.063
4/27/2016	5:11:28 PM :	145	114	115	259	122	0.5	2.1	5.239	0.5	1.8	4.98	29.97	4.833	4.583
4/27/2016	5:12:28 PM :	144	114	115	255	122	0.5	2.1	5.86	0.5	1.8	5.505	29.97	5.406	5.066
4/27/2016	5:13:28 PM :	145	114	115	255	122	0.5	2.1	6.405	0.5	1.8	5.974	29.97	5.908	5.497
4/27/2016	5:14:28 PM :	148	114	115	260	122	0.501	2.1	6.888	0.5	1.8	6.449	29.97	6.353	5.934
4/27/2016	5:15:28 PM :	145	114	115	263	122	0.499	2.1	7.406	0.5	1.8	7.039	29.97	6.83	6.477
4/27/2016	5:16:28 PM :	144	114	115	260	122	0.5	2.1	8.058	0.5	1.8	7.685	29.97	7.432	7.071
4/27/2016	5:17:28 PM :	141	114	115	255	122	0.5	2.1	8.685	0.5	1.8	8.175	29.97	8.01	7.522
4/27/2016	5:18:28 PM :	138	114	115	254	122	0.5	2.1	9.226	0.5	1.8	8.622	29.97	8.509	7.933
4/27/2016	5:19:28 PM :	138	114	116	259	122	0.5	2.1	9.714	0.5	1.8	9.112	29.97	8.959	8.383
4/27/2016	5:20:28 PM :	138	114	116	262	122	0.5	2.1	10.245	0.5	1.8	9.724	29.97	9.449	8.945
4/27/2016	5:21:28 PM :	137	114	115	260	122	0.5	2.1	10.866	0.499	1.8	10.331	29.97	10.021	9.504
4/27/2016	5:22:28 PM :	137	114	116	255	122	0.5	2.1	11.524	0.5	1.8	10.823	29.97	10.628	9.956
4/27/2016	5:23:28 PM :	138	114	116	254	122	0.5	2.1	12.048	0.5	1.8	11.302	29.97	11.111	10.396
4/27/2016	5:24:28 PM :	137	114	116	259	122	0.499	2.1	12.556	0.5	1.8	11.81	29.97	11.58	10.863
4/27/2016	5:25:28 PM :	136	114	116	262	122	0.501	2.1	13.078	0.5	1.8	12.353	29.97	12.061	11.362
4/27/2016	5:26:28 PM :	133	114	116	260	122	0.5	2.1	13.681	0.5	1.8	12.942	29.97	12.616	11.903
4/27/2016	5:27:28 PM :	130	114	116	255	122	0.5	2.1	14.339	0.5	1.8	13.498	29.97	13.223	12.414

4/27/2016	5:28:28 PM :	128	114	116	254	122	0.499	2.1	14.869	0.5	1.8	14.002	29.97	13.712	12.877
4/27/2016	5:29:28 PM :	127	114	116	259	122	0.5	2.1	15.385	0.5	1.8	14.48	29.97	14.188	13.317
4/27/2016	5:30:28 PM :	125	114	116	262	122	0.5	2.1	15.918	0.5	1.8	14.975	29.97	14.679	13.772
4/27/2016	5:31:28 PM :	127	114	116	260	122	0.5	2.1	16.536	0.5	1.8	15.568	29.97	15.249	14.316
4/27/2016	5:32:28 PM :	128	114	116	255	122	0.499	2.1	17.137	0.5	1.8	16.182	29.97	15.803	14.881
4/27/2016	5:33:28 PM :	125	114	116	254	122	0.5	2.1	17.699	0.5	1.8	16.683	29.97	16.321	15.34
4/27/2016	5:34:28 PM :	126	114	116	259	122	0.5	2.1	18.206	0.5	1.8	17.14	29.97	16.789	15.761
4/27/2016	5:35:28 PM :	125	114	116	262	122	0.5	2.1	18.771	0.5	1.8	17.622	29.97	17.31	16.204
4/27/2016	5:36:28 PM :	124	114	116	260	122	0.5	2.1	19.37	0.5	1.8	18.225	29.97	17.862	16.758
4/27/2016	5:37:28 PM :	123	114	115	255	121	0.499	2.1	19.944	0.5	1.8	18.839	29.97	18.391	17.322
4/27/2016	5:38:28 PM :	122	114	115	254	121	0.501	2.1	20.506	0.5	1.8	19.342	29.97	18.91	17.784
4/27/2016	5:39:28 PM :	120	114	115	258	121	0.5	2.1	21.032	0.5	1.8	19.806	29.97	19.395	18.212
4/27/2016	5:40:28 PM :	119	114	115	262	121	0.499	2.1	21.616	0.5	1.8	20.31	29.96	19.933	18.674
4/27/2016	5:41:28 PM :	119	114	115	260	121	0.5	2.1	22.219	0.5	1.8	20.871	29.96	20.488	19.191
4/27/2016	5:42:28 PM :	120	114	115	255	121	0.5	2.1	22.792	0.5	1.8	21.475	29.96	21.017	19.746
4/27/2016	5:43:28 PM :	120	114	115	254	121	0.5	2.1	23.306	0.5	1.8	21.998	29.96	21.491	20.227
4/27/2016	5:44:28 PM :	122	114	115	259	121	0.5	2.1	23.868	0.5	1.8	22.501	29.96	22.009	20.689
4/27/2016	5:45:28 PM :	119	113	115	262	121	0.5	2.1	24.452	0.499	1.8	22.994	29.96	22.547	21.142
4/27/2016	5:46:28 PM :	118	113	115	260	121	0.499	2.1	25.085	0.5	1.8	23.502	29.96	23.131	21.61
4/27/2016	5:47:28 PM :	116	113	115	255	121	0.501	2.1	25.62	0.499	1.8	24.081	29.96	23.625	22.142
4/27/2016	5:48:28 PM :	117	113	115	253	121	0.5	2.1	26.121	0.5	1.8	24.689	29.96	24.087	22.701
4/27/2016	5:49:28 PM :	121	113	114	258	120	0.5	2.1	26.682	0.5	1.8	25.189	29.96	24.604	23.161
4/27/2016	5:50:28 PM :	121	113	114	262	120	0.5	2.1	27.291	0.5	1.8	25.655	29.96	25.166	23.589
4/27/2016	5:51:28 PM :	122	113	114	260	120	0.5	2.1	27.925	0.5	1.8	26.134	29.96	25.751	24.03
4/27/2016	5:52:28 PM :	123	113	114	255	120	0.5	2.1	28.461	0.499	1.8	26.727	29.96	26.245	24.576
4/27/2016	5:53:28 PM :	123	113	114	254	120	0.5	2.1	28.958	0.5	1.8	27.354	29.96	26.704	25.153
4/27/2016	5:54:28 PM :	124	113	114	258	120	0.5	2.1	29.485	0.5	1.8	27.856	29.96	27.19	25.615
4/27/2016	5:55:28 PM :	125	113	114	261	120	0.501	2.1	30.142	0.5	1.8	28.31	29.96	27.796	26.032
4/27/2016	5:56:28 PM :	123	113	114	260	120	0.499	2.1	30.758	0.5	1.8	28.806	29.96	28.365	26.489
4/27/2016	5:57:28 PM :	122	113	114	255	120	0.5	2.1	31.301	0.5	1.8	29.386	29.96	28.866	27.022
4/27/2016	5:58:28 PM :	121	113	114	254	120	0.5	2.1	31.788	0.5	1.8	29.998	29.96	29.316	27.586
4/27/2016	5:59:28 PM :	120	113	114	259	120	0.499	2.1	32.31	0.5	1.8	30.506	29.96	29.798	28.054
4/27/2016	6:00:28 PM :	122	113	114	261	120	0.501	2.1	32.953	0.5	1.8	31	29.96	30.392	28.509
4/27/2016	6:01:28 PM :	125	113	114	260	120	0.5	2.1	33.596	0.5	1.8	31.505	29.96	30.986	28.973
4/27/2016	6:02:28 PM :	128	113	114	255	119	0.5	2.1	34.131	0.5	1.8	32.021	29.96	31.48	29.449
4/27/2016	6:03:28 PM :	130	113	114	254	119	0.5	2.1	34.632	0.499	1.8	32.598	29.96	31.943	29.98
4/27/2016	6:04:28 PM :	131	113	114	259	119	0.501	2.1	35.158	0.499	1.8	33.188	29.96	32.428	30.524
4/27/2016	6:05:28 PM :	126	112	114	262	119	0.5	2.1	35.768	0.5	1.8	33.701	29.97	32.992	30.996
4/27/2016	6:06:28 PM :	127	112	114	260	119	0.5	2.1	36.43	0.5	1.8	34.165	29.97	33.604	31.424
4/27/2016	6:07:28 PM :	126	112	114	255	119	0.5	2.1	36.956	0.5	1.8	34.64	29.97	34.09	31.862
4/27/2016	6:08:28 PM :	123	112	113	254	119	0.499	2.1	37.47	0.5	1.8	35.229	29.96	34.565	32.405
4/27/2016	6:09:28 PM :	120	112	113	258	119	0.5	2.1	37.998	0.499	1.8	35.871	29.96	35.053	32.996
4/27/2016	6:10:28 PM :	118	112	113	262	119	0.5	2.1	38.618	0.499	1.8	36.366	29.97	35.626	33.453
4/27/2016	6:11:28 PM :	121	112	113	260	119	0.5	2.1	39.236	0.5	1.8	36.809	29.97	36.198	33.862
4/27/2016	6:12:28 PM :	122	112	113	255	119	0.5	2.1	39.787	0.499	1.8	37.3	29.97	36.707	34.314
4/27/2016	6:13:28 PM :	122	111	113	254	118	0.499	2.1	40.303	0.5	1.8	37.904	29.97	37.185	34.871
4/27/2016	6:14:28 PM :	124	111	113	259	118	0.5	2.1	40.867	0.5	1.8	38.508	29.97	37.706	35.428

4/27/2016	6:15:28 PM :	123	111	113	262	118	0.5	2.1	41.464	0.499	1.8	39.005	29.97	38.259	35.887
4/27/2016	6:16:28 PM :	123	111	113	260	118	0.5	2.1	42.045	0.5	1.8	39.498	29.97	38.797	36.342
4/27/2016	6:17:28 PM :	124	111	113	255	118	0.5	2.1	42.608	0.5	1.8	40.012	29.97	39.318	36.816
4/27/2016	6:18:28 PM :	124	111	113	254	118	0.5	2.1	43.13	0.5	1.8	40.532	29.97	39.801	37.296
4/27/2016	6:19:28 PM :	122	111	113	259	118	0.5	2.1	43.711	0.5	1.8	41.103	29.97	40.339	37.824
4/27/2016	6:20:28 PM :	123	111	113	262	118	0.5	2.1	44.314	0.5	1.8	41.682	29.97	40.897	38.358
4/27/2016	6:21:28 PM :	124	111	113	260	118	0.501	2.2	44.891	0.5	1.9	42.206	29.97	41.431	38.842
4/27/2016	6:22:28 PM :	123	111	113	255	118	0.499	2.1	45.41	0.5	1.9	42.673	29.98	41.912	39.273
4/27/2016	6:23:28 PM :	123	111	113	254	118	0.5	2.1	45.967	0.5	1.9	43.14	29.98	42.428	39.704
4/27/2016	6:24:28 PM :	122	111	112	259	118	0.5	2.1	46.551	0.5	1.8	43.729	29.98	42.969	40.248
4/27/2016	6:25:28 PM :	121	111	112	262	118	0.501	2.2	47.185	0.499	1.9	44.376	29.97	43.556	40.846
4/27/2016	6:26:28 PM :	122	111	112	260	117	0.5	2.2	47.721	0.5	1.9	44.869	29.97	44.053	41.302
4/27/2016	6:27:28 PM :	123	111	112	255	117	0.5	2.2	48.223	0.499	1.9	45.307	29.97	44.517	41.706
4/27/2016	6:28:28 PM :	123	110	112	254	117	0.5	2.1	48.784	0.5	1.9	45.809	29.98	45.038	42.17
4/27/2016	6:29:28 PM :	122	110	112	259	117	0.5	2.1	49.399	0.5	1.8	46.412	29.98	45.608	42.727
4/27/2016	6:30:28 PM :	121	110	112	261	117	0.5	2.2	50.034	0.5	1.9	47.018	29.97	46.197	43.287
4/27/2016	6:31:28 PM :	119	110	112	259	117	0.5	2.2	50.567	0.5	1.9	47.506	29.97	46.691	43.739
4/27/2016	6:32:28 PM :	118	110	112	255	117	0.5	2.2	51.068	0.5	1.9	47.993	29.97	47.156	44.189
4/27/2016	6:33:28 PM :	118	110	112	254	117	0.5	2.1	51.594	0.5	1.9	48.514	29.97	47.644	44.67
4/27/2016	6:34:28 PM :	119	110	112	259	117	0.499	2.2	52.248	0.5	1.9	49.035	29.98	48.25	45.153
4/27/2016	6:35:28 PM :	120	110	112	262	117	0.5	2.2	52.869	0.5	1.9	49.61	29.97	48.826	45.684
4/27/2016	6:36:28 PM :	120	110	112	260	117	0.5	2.2	53.417	0.5	1.9	50.183	29.97	49.334	46.214
4/27/2016	6:37:28 PM :	119	110	112	255	116	0.5	2.2	53.897	0.5	1.9	50.707	29.97	49.78	46.699
4/27/2016	6:38:28 PM :	118	110	111	254	116	0.5	2.2	54.429	0.5	1.9	51.172	29.98	50.274	47.13
4/27/2016	6:39:28 PM :	117	110	111	259	116	0.5	2.2	55.063	0.501	1.9	51.649	29.98	50.862	47.571
4/27/2016	6:40:28 PM :	117	110	111	262	116	0.499	2.2	55.709	0.5	1.9	52.23	29.98	51.461	48.109
4/27/2016	6:41:28 PM :	118	109	111	260	116	0.499	2.2	56.244	0.5	1.9	52.889	29.98	51.958	48.719
4/27/2016	6:42:28 PM :	118	109	111	255	116	0.5	2.2	56.757	0.5	1.9	53.374	29.98	52.435	49.168
4/27/2016	6:43:28 PM :	118	109	111	254	116	0.499	2.2	57.273	0.501	1.9	53.817	29.98	52.915	49.578
4/27/2016	6:44:28 PM :	117	109	111	259	116	0.5	2.2	57.881	0.5	1.9	54.3	29.98	53.48	50.026
4/27/2016	6:45:28 PM :	117	109	111	261	116	0.5	2.2	58.543	0.5	1.9	54.927	29.98	54.095	50.607
4/27/2016	6:46:28 PM :	117	109	111	259	115	0.5	2.2	59.07	0.5	1.9	55.526	29.98	54.585	51.163
4/27/2016	6:47:28 PM :	117	109	111	254	115	0.499	2.2	59.586	0.5	1.9	56.016	29.99	55.065	51.616
4/27/2016	6:48:28 PM :	112	109	111	254	115	0.499	2.2	60.114	0.5	1.9	56.498	29.98	55.556	52.063
4/27/2016	6:49:28 PM :	109	109	110	260	115	0.5	2.2	60.738	0.5	1.9	57.014	29.98	56.136	52.542
4/27/2016	6:50:28 PM :	108	109	110	261	115	0.499	2.2	61.348	0.5	1.9	57.548	29.99	56.703	53.037
4/27/2016	6:51:28 PM :	106	109	110	259	115	0.5	2.2	61.909	0.5	1.9	58.127	29.99	57.225	53.575
4/27/2016	6:52:28 PM :	102	109	110	254	115	0.501	2.2	62.421	0.5	1.9	58.689	29.98	57.701	54.095
4/27/2016	6:53:28 PM :	102	108	110	254	115	0.5	2.2	62.993	0.5	1.9	59.202	29.98	58.234	54.572
4/27/2016	6:54:28 PM :	106	108	110	260	115	0.499	2.2	63.593	0.5	1.9	59.675	29.99	58.793	55.01
4/27/2016	6:55:28 PM :	109	108	110	261	114	0.5	2.2	64.167	0.5	1.9	60.156	29.99	59.327	55.457
4/27/2016	6:56:28 PM :	111	108	110	258	114	0.499	2.2	64.724	0.5	1.9	60.747	29.98	59.845	56.005
4/27/2016	6:57:28 PM :	113	108	110	254	114	0.5	2.2	65.256	0.5	1.9	61.384	29.99	60.34	56.597
4/27/2016	6:58:28 PM :	115	108	110	255	114	0.5	2.2	65.843	0.5	1.9	61.871	29.99	60.887	57.05
4/27/2016	6:59:28 PM :	117	108	110	260	114	0.501	2.2	66.451	0.5	1.9	62.315	29.99	61.454	57.461
4/27/2016	7:00:28 PM :	116	108	109	261	114	0.5	2.2	67.021	0.5	1.9	62.806	29.99	61.985	57.918
4/27/2016	7:01:28 PM :	115	108	109	258	114	0.5	2.2	67.528	0.5	1.9	63.418	29.99	62.458	58.487

4/27/2016	7:02:28 PM :	110	108	109	254	113	0.501	2.2	68.098	0.499	1.9	64.024	29.99	62.989	59.05
4/27/2016	7:03:28 PM :	98	107	109	255	113	0.501	2.2	68.685	0.5	1.9	64.513	29.99	63.537	59.505
4/27/2016	7:04:28 PM :	103	107	109	260	113	0.5	2.2	69.322	0.5	1.9	64.992	29.99	64.131	59.95
4/27/2016	7:05:28 PM :	111	107	109	261	113	0.5	2.2	69.854	0.5	1.9	65.5	29.99	64.627	60.423
4/27/2016	7:06:28 PM :	110	107	109	258	112	0.5	2.2	70.357	0.5	1.9	66.039	29.99	65.096	60.924
4/27/2016	7:07:28 PM :	103	107	109	253	112	0.499	2.2	70.909	0.499	1.9	66.628	29.99	65.611	61.472
4/27/2016	7:08:28 PM :	99	107	109	255	112	0.5	2.2	71.535	0.5	1.9	67.18	29.99	66.196	61.986
4/27/2016	7:09:28 PM :	96	107	109	260	112	0.5	2.2	72.168	0.5	1.9	67.686	29.99	66.787	62.457
4/27/2016	7:10:28 PM :	95	107	108	260	112	0.5	2.2	72.707	0.5	1.9	68.159	29.99	67.29	62.897
4/27/2016	7:11:28 PM :	94	107	108	256	112	0.5	2.2	73.202	0.5	1.9	68.651	29.99	67.752	63.355
4/27/2016	7:12:28 PM :	95	106	108	253	111	0.5	2.2	73.722	0.5	1.9	69.24	29.99	68.238	63.903
4/27/2016	7:13:28 PM :	97	106	108	256	111	0.5	2.2	74.377	0.5	1.9	69.866	29.99	68.85	64.487
4/27/2016	7:14:28 PM :	105	106	108	261	111	0.501	2.2	75.01	0.5	1.9	70.354	29.99	69.442	64.942
4/27/2016	7:15:28 PM :	103	106	108	260	111	0.5	2.2	75.553	0.5	1.9	70.802	30	69.949	65.359
4/27/2016	7:16:28 PM :	98	106	108	256	111	0.501	2.2	76.04	0.5	1.9	71.291	29.99	70.405	65.815
4/27/2016	7:17:28 PM :	97	106	108	253	110	0.5	2.2	76.578	0.5	1.9	71.901	29.99	70.908	66.384
4/27/2016	7:18:28 PM :	97	106	107	257	110	0.5	2.2	77.197	0.499	1.9	72.506	30	71.487	66.948
4/27/2016	7:19:28 PM :	98	106	107	261	110	0.499	2.2	77.862	0.5	1.9	72.996	29.99	72.109	67.406
4/27/2016	7:20:28 PM :	99	106	107	260	110	0.5	2.2	78.384	0.5	1.9	73.471	29.99	72.597	67.849
4/27/2016	7:21:28 PM :	103	105	107	256	110	0.5	2.2	78.902	0.5	1.9	73.981	30	73.082	68.325
4/27/2016	7:22:28 PM :	110	105	107	253	110	0.5	2.2	79.424	0.5	1.9	74.523	29.99	73.571	68.831
4/27/2016	7:23:28 PM :	105	105	107	256	109	0.499	2.2	80.036	0.5	1.9	75.108	30	74.144	69.377
4/27/2016	7:24:28 PM :	95	105	107	261	109	0.5	2.2	80.677	0.5	1.9	75.661	29.99	74.744	69.894
4/27/2016	7:25:28 PM :	94	105	106	260	109	0.5	2.2	81.215	0.5	1.9	76.163	29.98	75.249	70.363
4/27/2016	7:26:28 PM :	93	105	106	256	109	0.5	2.2	81.735	0.5	1.9	76.64	29.99	75.736	70.809
4/27/2016	7:27:28 PM :	92	105	106	253	109	0.5	2.2	82.288	0.5	1.9	77.127	29.99	76.254	71.264
4/27/2016	7:28:28 PM :	93	105	106	256	109	0.499	2.2	82.903	0.5	1.9	77.716	29.98	76.83	71.814
4/27/2016	7:29:28 PM :	95	104	106	261	109	0.5	2.2	83.486	0.5	1.9	78.342	29.99	77.377	72.4
4/27/2016	7:30:28 PM :	95	104	106	260	108	0.499	2.2	84.048	0.5	1.9	78.828	29.99	77.904	72.854
4/27/2016	7:31:28 PM :	93	104	106	255	108	0.5	2.2	84.57	0.5	1.9	79.274	29.98	78.394	73.271
4/27/2016	7:32:28 PM :	91	104	106	253	108	0.5	2.2	85.154	0.5	1.9	79.761	29.99	78.941	73.726
4/27/2016	7:33:28 PM :	90	104	105	258	108	0.5	2.2	85.758	0.5	1.9	80.373	29.99	79.509	74.3
4/27/2016	7:34:28 PM :	90	104	105	261	108	0.501	2.2	86.338	0.5	1.9	80.979	29.99	80.053	74.867
4/27/2016	7:35:28 PM :	92	104	105	260	108	0.499	2.2	86.858	0.5	1.9	81.466	29.99	80.541	75.323
4/27/2016	7:36:28 PM :	91	104	105	255	107	0.5	2.2	87.416	0.5	1.9	81.941	29.99	81.065	75.767
4/27/2016	7:37:28 PM :	91	103	105	254	107	0.5	2.2	88.002	0.5	1.9	82.451	29.99	81.615	76.246
4/27/2016	7:38:28 PM :	91	103	105	258	107	0.5	2.2	88.641	0.5	1.9	82.991	29.99	82.216	76.752
4/27/2016	7:39:28 PM :	91	103	105	261	107	0.499	2.2	89.178	0.499	1.9	83.568	29.99	82.72	77.292
4/27/2016	7:40:28 PM :	91	103	105	259	107	0.5	2.2	89.677	0.5	1.9	84.125	29.99	83.189	77.814
4/27/2016	7:41:28 PM :	91	103	104	254	107	0.501	2.2	90.235	0.5	1.9	84.633	29.99	83.714	78.291
4/27/2016	7:42:28 PM :	91	103	104	254	107	0.5	2.2	90.855	0.5	1.9	85.104	29.99	84.297	78.733
4/27/2016	7:43:28 PM :	93	103	104	259	107	0.5	2.2	91.493	0.5	1.9	85.589	29.99	84.897	79.188
4/27/2016	7:44:28 PM :	91	103	104	261	106	0.5	2.2	92.029	0.5	1.9	86.172	29.99	85.402	79.735
4/27/2016	7:45:28 PM :	91	102	104	258	106	0.5	2.2	92.527	0.5	1.9	86.809	29.99	85.87	80.333
4/27/2016	7:46:28 PM :	89	102	104	254	106	0.5	2.2	93.053	0.5	1.9	87.294	29.99	86.365	80.789
4/27/2016	7:47:28 PM :	89	102	104	254	106	0.5	2.2	93.713	0.5	1.9	87.733	29.99	86.987	81.2
4/27/2016	7:48:28 PM :	89	102	103	259	106	0.5	2.2	94.338	0.5	1.9	88.233	29.99	87.576	81.67

4/27/2016	7:49:28 PM :	89	102	103	261	106	0.5	2.2	94.883	0.5	1.9	88.843	29.99	88.089	82.244
4/27/2016	7:50:28 PM :	89	102	103	258	106	0.501	2.2	95.366	0.5	1.9	89.44	29.99	88.544	82.804
4/27/2016	7:51:28 PM :	89	102	103	253	106	0.5	2.2	95.904	0.5	1.9	89.924	29.99	89.051	83.259
4/27/2016	7:52:28 PM :	89	102	103	255	105	0.5	2.2	96.534	0.5	1.9	90.401	29.99	89.644	83.708
4/27/2016	7:53:28 PM :	89	101	103	260	105	0.501	2.2	97.192	0.5	1.9	90.919	29.99	90.265	84.196
4/27/2016	7:54:28 PM :	89	101	103	260	105	0.499	2.2	97.716	0.5	1.9	91.445	29.99	90.76	84.69
4/27/2016	7:55:28 PM :	90	101	103	256	105	0.5	2.2	98.228	0.5	1.9	92.02	29.99	91.243	85.231
4/27/2016	7:56:28 PM :	91	101	102	253	105	0.5	2.2	98.754	0.5	1.9	92.582	30	91.739	85.76
4/27/2016	7:57:28 PM :	93	101	102	256	105	0.5	2.2	99.363	0.5	1.9	93.099	29.99	92.314	86.247
4/27/2016	7:58:28 PM :	95	101	102	261	105	0.5	2.2	100.013	0.5	1.9	93.561	29.99	92.927	86.682
4/27/2016	7:59:28 PM :	95	101	102	261	105	0.499	2.2	100.552	0.5	1.9	94.036	29.99	93.436	87.129
4/27/2016	8:00:28 PM :	94	101	102	256	105	0.5	2.3	101.072	0.5	1.9	94.618	30	93.927	87.678
4/27/2016	8:01:28 PM :	94	101	102	253	105	0.5	2.2	101.611	0.5	1.9	95.268	30	94.437	88.291
4/27/2016	8:02:28 PM :	94	100	102	256	104	0.5	2.2	102.231	0.5	1.9	95.745	30	95.022	88.74
4/27/2016	8:03:28 PM :	95	100	102	260	104	0.5	2.2	102.822	0.5	1.9	96.18	30	95.581	89.15
4/27/2016	8:04:28 PM :	95	100	102	260	104	0.5	2.3	103.386	0.5	1.9	96.678	29.99	96.114	89.62
4/27/2016	8:05:28 PM :	95	100	101	256	104	0.5	2.3	103.9	0.5	1.9	97.287	29.99	96.6	90.194
4/27/2016	8:06:28 PM :	95	100	101	253	104	0.5	2.3	104.482	0.5	1.9	97.887	30	97.15	90.76
4/27/2016	8:07:28 PM :	95	100	101	256	104	0.5	2.2	105.085	0.5	1.9	98.366	30	97.719	91.212
4/27/2016	8:08:28 PM :	96	99	101	261	104	0.499	2.3	105.664	0.5	2	98.849	30	98.268	91.668
4/27/2016	8:09:28 PM :	96	99	101	260	104	0.499	2.3	106.189	0.5	2	99.366	30	98.765	92.155
4/27/2016	8:10:28 PM :	97	99	101	255	104	0.5	2.3	106.742	0.5	2	99.893	30	99.288	92.654
4/27/2016	8:11:28 PM :	98	99	101	253	104	0.499	2.3	107.33	0.5	2	100.457	30	99.844	93.186
4/27/2016	8:12:28 PM :	98	99	101	258	104	0.501	2.3	107.963	0.5	1.9	101.031	30	100.443	93.728
4/27/2016	8:13:28 PM :	99	99	101	261	104	0.5	2.3	108.504	0.5	2	101.546	30	100.955	94.214
4/27/2016	8:14:28 PM :	99	99	101	260	104	0.5	2.3	109.003	0.5	2	102.006	30	101.428	94.649
4/27/2016	8:15:28 PM :	102	99	101	255	104	0.5	2.3	109.569	0.5	2	102.476	30	101.964	95.092
4/27/2016	8:16:28 PM :	112	99	100	253	104	0.5	2.3	110.177	0.5	2	103.065	30	102.54	95.649
4/27/2016	8:17:28 PM :	114	99	100	258	104	0.5	2.3	110.815	0.5	2	103.702	30	103.143	96.252
4/27/2016	8:18:28 PM :	111	99	100	261	104	0.5	2.3	111.344	0.5	2	104.185	30	103.644	96.708
4/27/2016	8:19:28 PM :	109	99	100	260	103	0.501	2.3	111.851	0.5	2	104.627	30	104.125	97.125
4/27/2016	8:20:28 PM :	107	98	100	255	103	0.499	2.3	112.379	0.5	2	105.131	30	104.625	97.602
4/27/2016	8:21:28 PM :	106	98	100	253	103	0.5	2.3	113.035	0.5	2	105.71	30	105.247	98.149
4/27/2016	8:22:28 PM :	105	98	99	258	103	0.5	2.3	113.654	0.5	1.9	106.313	30	105.834	98.719
4/27/2016	8:23:28 PM :	102	98	99	261	103	0.5	2.3	114.199	0.5	2	106.811	30	106.351	99.19
4/27/2016	8:24:28 PM :	100	98	99	259	103	0.499	2.3	114.682	0.5	2	107.294	30	106.808	99.647
4/27/2016	8:25:28 PM :	98	98	99	255	103	0.501	2.3	115.209	0.5	2	107.796	30	107.307	100.123
4/27/2016	8:26:28 PM :	97	98	99	254	103	0.5	2.3	115.86	0.499	1.9	108.314	30	107.925	100.612
4/27/2016	8:27:28 PM :	96	98	99	259	103	0.5	2.3	116.502	0.5	2	108.885	30	108.535	101.153
4/27/2016	8:28:28 PM :	96	98	99	261	103	0.501	2.3	117.034	0.5	2	109.47	30	109.04	101.706
4/27/2016	8:29:28 PM :	96	98	99	259	103	0.5	2.3	117.535	0.5	2	109.974	30	109.515	102.184
4/27/2016	8:30:28 PM :	96	98	99	254	103	0.5	2.3	118.06	0.5	2	110.432	30	110.014	102.617
4/27/2016	8:31:28 PM :	96	98	99	254	103	0.5	2.3	118.675	0.5	2	110.911	30	110.597	103.071
4/27/2016	8:32:28 PM :	96	98	99	259	103	0.5	2.3	119.337	0.5	2	111.503	30	111.225	103.632
4/27/2016	8:33:28 PM :	96	98	99	261	103	0.5	2.3	119.859	0.5	2	112.124	30	111.721	104.22
4/27/2016	8:34:28 PM :	97	98	99	259	103	0.501	2.3	120.377	0.5	2	112.616	30	112.212	104.686
4/27/2016	8:35:28 PM :	97	97	99	254	103	0.499	2.3	120.907	0.5	2	113.063	30	112.716	105.109

4/27/2016	8:36:28 PM :	98	97	99	254	103	0.499	2.3	121.536	0.5	2	113.567	30	113.313	105.587
4/27/2016	8:37:28 PM :	97	97	99	259	103	0.499	2.3	122.143	0.5	2	114.133	30.01	113.89	106.123
4/27/2016	8:38:28 PM :	96	97	98	261	103	0.5	2.3	122.699	0.5	2	114.721	30.01	114.418	106.681
4/27/2016	8:39:28 PM :	96	97	98	258	103	0.5	2.3	123.21	0.5	2	115.247	30.01	114.903	107.179
4/27/2016	8:40:28 PM :	96	97	98	253	103	0.499	2.3	123.779	0.5	2	115.74	30.01	115.445	107.647
4/27/2016	8:41:28 PM :	96	97	98	255	103	0.5	2.3	124.386	0.5	2	116.224	30.01	116.021	108.106
4/27/2016	8:42:28 PM :	95	97	98	260	103	0.501	2.3	124.96	0.5	2	116.719	30.01	116.566	108.576
4/27/2016	8:43:28 PM :	95	97	98	260	103	0.5	2.3	125.512	0.499	2	117.306	30.01	117.091	109.132
4/27/2016	8:44:28 PM :	95	97	98	256	102	0.5	2.3	126.041	0.5	2	117.916	30.01	117.594	109.71
4/27/2016	8:45:28 PM :	95	97	98	253	102	0.499	2.3	126.631	0.5	2	118.404	30.01	118.155	110.173
4/27/2016	8:46:28 PM :	95	97	98	256	102	0.501	2.3	127.238	0.5	2	118.849	30.01	118.731	110.595
4/27/2016	8:47:28 PM :	96	97	98	261	102	0.5	2.3	127.805	0.5	2	119.343	30.01	119.271	111.063
4/27/2016	8:48:28 PM :	96	97	98	261	102	0.501	2.3	128.315	0.5	2	119.946	30.01	119.757	111.636
4/27/2016	8:49:28 PM :	96	97	98	256	102	0.5	2.3	128.884	0.5	2	120.55	30.01	120.297	112.209
4/27/2016	8:50:28 PM :	95	97	98	253	102	0.5	2.3	129.469	0.5	2	121.029	30.01	120.854	112.664
4/27/2016	8:51:28 PM :	95	97	98	256	102	0.5	2.3	130.106	0.5	2	121.499	30.01	121.46	113.11
4/27/2016	8:52:28 PM :	96	97	98	261	102	0.5	2.3	130.64	0.5	2	122.012	30.01	121.968	113.597
4/27/2016	8:53:28 PM :	96	97	98	260	102	0.501	2.3	131.136	0.5	2	122.55	30.01	122.439	114.107
4/27/2016	8:54:28 PM :	96	97	98	256	102	0.5	2.3	131.691	0.5	2	123.12	30.01	122.967	114.649
4/27/2016	8:55:28 PM :	96	97	98	253	102	0.5	2.3	132.316	0.499	2	123.677	30.01	123.562	115.178
4/27/2016	8:56:28 PM :	95	97	98	256	102	0.499	2.3	132.948	0.5	2	124.19	30.01	124.162	115.664
4/27/2016	8:57:28 PM :	95	97	98	261	102	0.5	2.3	133.488	0.5	2	124.654	30.01	124.676	116.104
4/27/2016	8:58:28 PM :	95	97	98	261	102	0.499	2.3	133.981	0.5	2	125.13	30.01	125.145	116.557
4/27/2016	8:59:28 PM :	95	96	98	256	102	0.499	2.3	134.503	0.5	2	125.711	30.01	125.642	117.108
4/27/2016	9:00:28 PM :	95	96	98	253	102	0.5	2.3	135.165	0.5	2	126.361	30.01	126.272	117.725
4/27/2016	9:01:28 PM :	95	96	98	256	102	0.499	2.3	135.787	0.5	2	126.836	30.02	126.864	118.176
4/27/2016	9:02:28 PM :	95	96	97	261	102	0.5	2.3	136.324	0.5	2	127.265	30.02	127.375	118.583
4/27/2016	9:03:28 PM :	95	96	97	261	102	0.5	2.3	136.808	0.499	2	127.766	30.02	127.836	119.06
4/27/2016	9:04:28 PM :	95	96	97	256	102	0.499	2.3	137.341	0.5	2	128.37	30.02	128.344	119.634
4/27/2016	9:05:28 PM :	95	96	97	253	102	0.501	2.3	137.974	0.5	2	128.969	30.02	128.947	120.203
4/27/2016	9:06:28 PM :	95	96	97	256	102	0.5	2.3	138.624	0.5	2	129.448	30.02	129.566	120.658
4/27/2016	9:07:28 PM :	95	96	97	261	102	0.5	2.3	139.154	0.5	2	129.93	30.02	130.071	121.116
4/27/2016	9:08:28 PM :	95	96	97	260	102	0.5	2.3	139.662	0.499	2	130.442	30.02	130.555	121.603
4/27/2016	9:09:28 PM :	95	96	97	256	102	0.501	2.3	140.186	0.5	2	130.961	30.02	131.054	122.096
4/27/2016	9:10:28 PM :	95	96	97	253	102	0.5	2.3	140.793	0.5	2	131.527	30.02	131.631	122.634
4/27/2016	9:11:28 PM :	95	96	97	257	102	0.5	2.3	141.453	0.5	2	132.109	30.02	132.26	123.187
4/27/2016	9:12:28 PM :	94	96	97	261	102	0.501	2.3	141.981	0.5	2	132.613	30.02	132.763	123.667
4/27/2016	9:13:28 PM :	94	96	97	260	102	0.501	2.3	142.499	0.5	2	133.074	30.02	133.256	124.104
4/27/2016	9:14:28 PM :	94	96	97	255	102	0.5	2.3	143.033	0.5	2	133.544	30.02	133.765	124.552
4/27/2016	9:15:28 PM :	94	96	97	253	102	0.5	2.3	143.66	0.5	2	134.135	30.02	134.362	125.113
4/27/2016	9:16:28 PM :	95	96	97	258	102	0.5	2.3	144.257	0.5	2	134.764	30.02	134.93	125.711
4/27/2016	9:17:28 PM :	95	96	97	261	102	0.5	2.3	144.819	0.5	2	135.253	30.02	135.465	126.175
4/27/2016	9:18:28 PM :	95	96	97	260	102	0.5	2.3	145.328	0.5	2	135.694	30.02	135.951	126.595
4/27/2016	9:19:28 PM :	94	96	97	255	102	0.5	2.3	145.902	0.5	2	136.192	30.02	136.498	127.068
4/27/2016	9:20:28 PM :	94	96	97	253	102	0.5	2.3	146.504	0.5	2	136.769	30.02	137.072	127.616
4/27/2016	9:21:28 PM :	94	96	97	258	102	0.5	2.3	147.076	0.5	2	137.372	30.02	137.617	128.189
4/27/2016	9:22:28 PM :	93	96	97	261	102	0.5	2.3	147.625	0.5	2	137.876	30.02	138.14	128.669

4/27/2016	9:23:28 PM :	92	96	97	260	102	0.5	2.3	148.159	0.5	2	138.365	30.02	138.649	129.134
4/27/2016	9:24:28 PM :	91	96	97	255	102	0.501	2.3	148.747	0.5	2	138.853	30.02	139.21	129.599
4/27/2016	9:25:28 PM :	90	96	97	253	102	0.5	2.3	149.362	0.5	2	139.362	30.02	139.796	130.082
4/27/2016	9:26:28 PM :	87	96	97	258	102	0.5	2.3	149.922	0.5	2	139.942	30.02	140.33	130.635
4/27/2016	9:27:28 PM :	87	96	97	261	102	0.499	2.3	150.429	0.5	2	140.537	30.02	140.813	131.201
4/27/2016	9:28:28 PM :	87	96	97	260	102	0.5	2.3	150.996	0.5	2	141.031	30.02	141.354	131.671
4/27/2016	9:29:28 PM :	87	96	97	255	102	0.5	2.3	151.584	0.5	2	141.483	30.02	141.914	132.1
4/27/2016	9:30:28 PM :	87	96	97	254	102	0.5	2.3	152.215	0.5	2	141.966	30.02	142.516	132.56
4/27/2016	9:31:28 PM :	87	96	97	258	102	0.499	2.3	152.75	0.5	2	142.569	30.02	143.026	133.133
4/27/2016	9:32:28 PM :	87	96	97	261	102	0.5	2.3	153.253	0.5	2	143.177	30.02	143.506	133.712
4/27/2016	9:33:28 PM :	88	96	97	259	102	0.5	2.3	153.802	0.5	2	143.66	30.02	144.029	134.171
4/27/2016	9:34:28 PM :	88	96	97	254	102	0.5	2.3	154.432	0.5	2	144.12	30.03	144.629	134.61
4/27/2016	9:35:28 PM :	88	96	97	254	102	0.501	2.3	155.063	0.5	2	144.629	30.03	145.231	135.093
4/27/2016	9:36:28 PM :	88	96	97	259	102	0.5	2.3	155.598	0.5	2	145.175	30.03	145.741	135.613
4/27/2016	9:37:28 PM :	87	96	97	261	102	0.5	2.3	156.087	0.5	2	145.749	30.03	146.207	136.159
4/27/2016	9:38:28 PM :	87	96	97	258	102	0.5	2.3	156.611	0.5	2	146.3	30.03	146.707	136.684
4/27/2016	9:39:28 PM :	87	96	97	254	102	0.5	2.3	157.273	0.5	2	146.804	30.03	147.338	137.163
4/27/2016	9:40:28 PM :	87	96	97	255	102	0.5	2.3	157.895	0.5	2	147.27	30.03	147.931	137.607
4/27/2016	9:41:28 PM :	87	96	97	260	102	0.499	2.3	158.433	0.5	2	147.747	30.03	148.444	138.061
4/27/2016	9:42:28 PM :	87	96	97	261	102	0.5	2.3	158.916	0.5	2	148.328	30.03	148.904	138.613
4/27/2016	9:43:28 PM :	87	96	97	257	102	0.501	2.3	159.454	0.5	2	148.975	30.03	149.417	139.23
4/27/2016	9:44:28 PM :	87	95	97	253	102	0.5	2.3	160.085	0.5	2	149.45	30.03	150.02	139.681
4/27/2016	9:45:28 PM :	87	95	97	255	102	0.5	2.3	160.736	0.5	2	149.884	30.03	150.64	140.095
4/27/2016	9:46:28 PM :	87	95	97	260	102	0.499	2.3	161.262	0.5	2	150.383	30.03	151.143	140.569
4/27/2016	9:47:28 PM :	87	95	96	260	102	0.5	2.3	161.77	0.5	2	150.993	30.03	151.627	141.15
4/27/2016	9:48:28 PM :	87	95	96	256	101	0.5	2.3	162.294	0.5	2	151.586	30.03	152.128	141.714
4/27/2016	9:49:28 PM :	87	95	96	253	101	0.5	2.3	162.904	0.5	2	152.064	30.03	152.71	142.171
4/27/2016	9:50:28 PM :	87	95	96	256	101	0.501	2.3	163.558	0.5	2	152.543	30.03	153.335	142.627
4/27/2016	9:51:28 PM :	87	95	96	261	102	0.499	2.3	164.086	0.5	2	153.059	30.03	153.839	143.118
4/27/2016	9:52:28 PM :	87	95	96	260	101	0.5	2.4	164.602	0.5	2	153.584	30.03	154.331	143.617
4/27/2016	9:53:28 PM :	86	95	96	256	101	0.5	2.3	165.133	0.5	2	154.147	30.03	154.838	144.154
4/27/2016	9:54:28 PM :	86	95	96	253	101	0.501	2.3	165.76	0.5	2	154.719	30.03	155.436	144.699
4/27/2016	9:55:28 PM :	86	95	96	256	102	0.5	2.3	166.362	0.5	2	155.228	30.03	156.011	145.183
4/27/2016	9:56:28 PM :	86	95	96	261	101	0.5	2.3	166.92	0.5	2	155.687	30.03	156.543	145.621
4/27/2016	9:57:28 PM :	86	95	96	260	101	0.5	2.4	167.432	0.5	2	156.16	30.03	157.032	146.071
4/27/2016	9:58:28 PM :	85	95	96	255	101	0.5	2.4	168.009	0.5	2	156.747	30.03	157.582	146.63
4/27/2016	9:59:28 PM :	85	95	96	253	101	0.499	2.3	168.607	0.5	2	157.38	30.03	158.153	147.234
4/27/2016	10:00:28 PM :	85	95	96	256	101	0.499	2.3	169.175	0.5	2	157.861	30.03	158.695	147.692
4/27/2016	10:01:28 PM :	85	95	96	261	101	0.5	2.3	169.728	0.5	2	158.305	30.03	159.223	148.114
4/27/2016	10:02:28 PM :	85	95	96	260	101	0.5	2.4	170.257	0.5	2	158.803	30.03	159.727	148.588
4/27/2016	10:03:28 PM :	85	95	96	256	101	0.5	2.4	170.845	0.5	2	159.38	30.03	160.288	149.138
4/27/2016	10:04:28 PM :	85	95	96	253	101	0.499	2.3	171.451	0.5	2	159.979	30.03	160.867	149.709
4/27/2016	10:05:28 PM :	85	95	96	257	101	0.5	2.3	172.023	0.5	2	160.489	30.03	161.413	150.194
4/27/2016	10:06:28 PM :	85	95	96	261	101	0.5	2.3	172.532	0.499	2	160.972	30.03	161.898	150.654
4/27/2016	10:07:28 PM :	85	95	96	260	101	0.5	2.4	173.096	0.5	2	161.463	30.03	162.436	151.122
4/27/2016	10:08:28 PM :	85	95	96	255	101	0.5	2.4	173.681	0.5	2	161.965	30.03	162.996	151.6
4/27/2016	10:09:28 PM :	85	95	96	253	101	0.5	2.3	174.314	0.5	2	162.544	30.03	163.6	152.151

4/27/2016	10:10:28 PM :	85	95	96	258	101	0.499	2.3	174.85	0.5	2	163.143	30.03	164.112	152.722
4/27/2016	10:11:28 PM :	85	95	96	261	101	0.499	2.3	175.345	0.5	2	163.635	30.03	164.585	153.191
4/27/2016	10:12:28 PM :	84	95	96	259	101	0.501	2.4	175.902	0.5	2	164.088	30.03	165.117	153.623
4/27/2016	10:13:28 PM :	84	95	96	254	101	0.499	2.3	176.521	0.5	2	164.573	30.03	165.709	154.085
4/27/2016	10:14:28 PM :	84	95	96	253	101	0.5	2.3	177.156	0.5	2	165.175	30.04	166.316	154.659
4/27/2016	10:15:28 PM :	83	95	96	258	101	0.501	2.3	177.689	0.5	2	165.782	30.04	166.825	155.238
4/27/2016	10:16:28 PM :	84	95	96	261	101	0.5	2.3	178.183	0.5	2	166.262	30.04	167.297	155.696
4/27/2016	10:17:28 PM :	85	95	96	259	101	0.5	2.4	178.707	0.5	2	166.734	30.04	167.797	156.146
4/27/2016	10:18:28 PM :	86	95	96	254	101	0.499	2.3	179.369	0.5	2	167.236	30.04	168.43	156.625
4/27/2016	10:19:28 PM :	86	95	96	254	101	0.5	2.3	179.988	0.5	2	167.781	30.03	169.022	157.145
4/27/2016	10:20:28 PM :	86	95	96	259	101	0.5	2.3	180.526	0.5	2	168.357	30.03	169.536	157.693
4/27/2016	10:21:28 PM :	86	95	96	261	101	0.5	2.4	181.009	0.5	2	168.906	30.03	169.998	158.217
4/27/2016	10:22:28 PM :	86	95	96	258	101	0.5	2.4	181.537	0.5	2	169.41	30.03	170.502	158.698
4/27/2016	10:23:28 PM :	86	95	96	254	101	0.5	2.4	182.182	0.5	2	169.876	30.03	171.118	159.142
4/27/2016	10:24:28 PM :	86	95	96	254	101	0.5	2.3	182.827	0.5	2	170.354	30.03	171.734	159.598
4/27/2016	10:25:28 PM :	86	95	96	259	101	0.5	2.3	183.359	0.5	2	170.937	30.03	172.243	160.154
4/27/2016	10:26:28 PM :	86	95	96	261	101	0.5	2.4	183.857	0.5	2	171.583	30.03	172.718	160.77
4/27/2016	10:27:28 PM :	86	95	96	257	101	0.5	2.4	184.385	0.5	2.1	172.056	30.03	173.223	161.22
4/27/2016	10:28:28 PM :	86	95	96	253	101	0.5	2.4	184.997	0.5	2	172.487	30.03	173.808	161.632
4/27/2016	10:29:28 PM :	86	95	96	255	101	0.5	2.3	185.656	0.5	2	172.984	30.03	174.437	162.106
4/27/2016	10:30:28 PM :	86	95	96	260	101	0.5	2.3	186.176	0.5	2	173.594	30.03	174.934	162.687
4/27/2016	10:31:28 PM :	86	95	96	260	101	0.499	2.4	186.69	0.499	2.1	174.189	30.04	175.425	163.255
4/27/2016	10:32:28 PM :	86	95	96	256	101	0.5	2.4	187.224	0.5	2.1	174.668	30.04	175.935	163.711
4/27/2016	10:33:28 PM :	86	95	96	253	101	0.499	2.4	187.845	0.5	2	175.146	30.04	176.529	164.167
4/27/2016	10:34:28 PM :	86	94	96	255	101	0.501	2.3	188.46	0.5	2	175.66	30.04	177.117	164.658
4/27/2016	10:35:28 PM :	86	94	95	260	101	0.501	2.4	189.007	0.5	2	176.183	30.04	177.641	165.157
4/27/2016	10:36:28 PM :	86	94	96	260	101	0.5	2.4	189.519	0.5	2.1	176.744	30.04	178.13	165.692
4/27/2016	10:37:28 PM :	86	94	95	256	101	0.5	2.4	190.084	0.5	2.1	177.325	30.04	178.671	166.246
4/27/2016	10:38:28 PM :	86	94	95	253	101	0.5	2.4	190.687	0.5	2	177.825	30.04	179.247	166.723
4/27/2016	10:39:28 PM :	86	94	95	256	101	0.5	2.4	191.265	0.5	2	178.285	30.04	179.8	167.162
4/27/2016	10:40:28 PM :	86	94	95	260	101	0.5	2.4	191.821	0.5	2.1	178.76	30.04	180.332	167.615
4/27/2016	10:41:28 PM :	86	94	95	260	101	0.5	2.4	192.343	0.5	2.1	179.348	30.04	180.831	168.177
4/27/2016	10:42:28 PM :	86	94	95	256	101	0.5	2.4	192.925	0.5	2.1	179.976	30.04	181.388	168.776
4/27/2016	10:43:28 PM :	87	94	95	253	101	0.5	2.4	193.535	0.5	2.1	180.463	30.04	181.971	169.241
4/27/2016	10:44:28 PM :	87	94	95	256	101	0.501	2.4	194.105	0.5	2	180.904	30.04	182.517	169.662
4/27/2016	10:45:28 PM :	87	94	95	260	101	0.5	2.4	194.625	0.5	2.1	181.402	30.04	183.014	170.138
4/27/2016	10:46:28 PM :	87	94	95	260	100	0.501	2.4	195.181	0.499	2.1	181.978	30.04	183.546	170.687
4/27/2016	10:47:28 PM :	87	94	95	256	100	0.5	2.4	195.769	0.5	2.1	182.576	30.04	184.108	171.258
4/27/2016	10:48:28 PM :	86	94	95	253	101	0.5	2.4	196.406	0.5	2.1	183.084	30.04	184.718	171.744
4/27/2016	10:49:28 PM :	86	94	95	257	101	0.5	2.4	196.937	0.5	2.1	183.571	30.05	185.226	172.209
4/27/2016	10:50:28 PM :	86	94	95	261	101	0.501	2.4	197.434	0.5	2.1	184.058	30.05	185.701	172.674
4/27/2016	10:51:28 PM :	86	94	95	260	101	0.5	2.4	197.999	0.5	2.1	184.558	30.05	186.242	173.151
4/27/2016	10:52:28 PM :	86	94	95	255	100	0.5	2.4	198.608	0.5	2.1	185.143	30.05	186.825	173.71
4/27/2016	10:53:28 PM :	86	94	95	253	100	0.5	2.4	199.246	0.499	2.1	185.744	30.05	187.435	174.283
4/27/2016	10:54:28 PM :	86	94	95	257	101	0.499	2.4	199.77	0.5	2.1	186.232	30.05	187.936	174.749
4/27/2016	10:55:28 PM :	86	94	95	261	101	0.5	2.4	200.273	0.501	2.1	186.677	30.05	188.417	175.175
4/27/2016	10:56:28 PM :	87	94	95	259	101	0.5	2.4	200.802	0.5	2.1	187.171	30.05	188.924	175.646

4/27/2016	10:57:28 PM :	86	94	95	255	100	0.5	2.4	201.458	0.5	2.1	187.772	30.05	189.551	176.22
4/27/2016	10:58:28 PM :	86	94	95	253	100	0.5	2.4	202.075	0.5	2.1	188.373	30.05	190.141	176.794
4/27/2016	10:59:28 PM :	86	94	95	258	100	0.5	2.4	202.619	0.5	2.1	188.85	30.05	190.663	177.249
4/27/2016	11:00:28 PM :	85	94	95	261	100	0.5	2.4	203.099	0.5	2.1	189.323	30.04	191.121	177.701
4/27/2016	11:01:28 PM :	85	94	95	259	100	0.5	2.4	203.621	0.5	2.1	189.834	30.04	191.62	178.188
4/27/2016	11:02:28 PM :	85	94	95	254	100	0.5	2.4	204.274	0.5	2.1	190.369	30.04	192.245	178.7
4/27/2016	11:03:28 PM :	86	94	95	254	100	0.501	2.4	204.912	0.5	2.1	190.942	30.04	192.856	179.246
4/27/2016	11:04:28 PM :	86	94	95	259	100	0.5	2.4	205.444	0.5	2.1	191.495	30.04	193.365	179.774
4/27/2016	11:05:28 PM :	86	94	95	261	100	0.5	2.4	205.933	0.5	2.1	192.007	30.04	193.833	180.264
4/27/2016	11:06:28 PM :	86	94	95	258	100	0.5	2.4	206.47	0.5	2.1	192.467	30.04	194.347	180.702
4/27/2016	11:07:28 PM :	86	94	95	254	100	0.5	2.4	207.085	0.5	2.1	192.94	30.04	194.934	181.154
4/27/2016	11:08:28 PM :	86	94	95	254	100	0.501	2.4	207.749	0.5	2.1	193.54	30.04	195.57	181.726
4/27/2016	11:09:28 PM :	86	94	95	259	100	0.501	2.4	208.265	0.5	2.1	194.17	30.04	196.063	182.328
4/27/2016	11:10:28 PM :	86	94	95	261	100	0.5	2.4	208.781	0.5	2.1	194.647	30.04	196.557	182.783
4/27/2016	11:11:28 PM :	87	94	95	258	100	0.5	2.4	209.307	0.5	2.1	195.075	30.04	197.06	183.192
4/27/2016	11:12:28 PM :	87	94	95	254	100	0.5	2.4	209.918	0.5	2.1	195.575	30.04	197.644	183.67
4/27/2016	11:13:28 PM :	87	94	95	254	100	0.5	2.4	210.555	0.5	2.1	196.175	30.04	198.254	184.243
4/27/2016	11:14:28 PM :	87	94	95	259	100	0.5	2.4	211.094	0.499	2.1	196.77	30.04	198.769	184.811
4/27/2016	11:15:28 PM :	87	94	95	261	100	0.5	2.4	211.606	0.5	2.1	197.255	30.04	199.259	185.274
4/27/2016	11:16:28 PM :	86	94	95	258	100	0.499	2.4	212.157	0.5	2.1	197.74	30.04	199.786	185.737
4/27/2016	11:17:28 PM :	86	94	95	253	100	0.5	2.4	212.773	0.5	2.1	198.238	30.04	200.377	186.213
4/27/2016	11:18:28 PM :	86	94	95	254	100	0.501	2.4	213.36	0.5	2.1	198.758	30.04	200.938	186.71
4/27/2016	11:19:28 PM :	86	94	95	259	100	0.5	2.4	213.921	0.5	2.1	199.329	30.04	201.475	187.256
4/27/2016	11:20:28 PM :	86	94	95	261	100	0.499	2.4	214.431	0.5	2.1	199.906	30.04	201.964	187.807
4/27/2016	11:21:28 PM :	86	94	95	258	100	0.5	2.4	215.014	0.5	2.1	200.41	30.04	202.523	188.289
4/27/2016	11:22:28 PM :	86	94	95	253	99	0.5	2.4	215.615	0.5	2.1	200.868	30.04	203.098	188.726
4/27/2016	11:23:28 PM :	86	94	95	255	99	0.499	2.4	216.185	0.5	2.1	201.347	30.04	203.643	189.184
4/27/2016	11:24:28 PM :	86	94	95	260	100	0.499	2.4	216.719	0.5	2.1	201.935	30.05	204.155	189.746
4/27/2016	11:25:28 PM :	85	94	95	261	99	0.5	2.4	217.258	0.5	2.1	202.554	30.05	204.671	190.337
4/27/2016	11:26:28 PM :	85	94	95	257	99	0.499	2.4	217.847	0.5	2.1	203.041	30.05	205.235	190.803
4/27/2016	11:27:28 PM :	85	94	95	253	99	0.5	2.4	218.475	0.5	2.1	203.491	30.05	205.836	191.233
4/27/2016	11:28:28 PM :	85	94	95	255	99	0.5	2.4	219.021	0.5	2.1	203.992	30.05	206.36	191.712
4/27/2016	11:29:28 PM :	85	94	95	260	99	0.501	2.4	219.52	0.5	2.1	204.552	30.05	206.837	192.247
4/27/2016	11:30:28 PM :	85	94	95	260	99	0.5	2.4	220.09	0.5	2.1	205.143	30.05	207.384	192.812
4/27/2016	11:31:28 PM :	85	94	95	256	99	0.5	2.4	220.683	0.5	2.1	205.67	30.04	207.951	193.316
4/27/2016	11:32:28 PM :	85	94	95	253	99	0.5	2.4	221.318	0.5	2.1	206.162	30.04	208.56	193.786
4/27/2016	11:33:28 PM :	86	94	95	256	99	0.499	2.4	221.848	0.5	2.1	206.641	30.04	209.067	194.244
4/27/2016	11:34:28 PM :	86	94	95	260	99	0.5	2.4	222.35	0.5	2.1	207.13	30.04	209.548	194.711
4/27/2016	11:35:28 PM :	86	94	95	260	99	0.499	2.4	222.893	0.5	2.1	207.724	30.04	210.068	195.279
4/27/2016	11:36:28 PM :	86	94	94	256	99	0.5	2.4	223.527	0.5	2.1	208.335	30.04	210.674	195.863
4/27/2016	11:37:28 PM :	86	94	94	253	99	0.5	2.4	224.158	0.5	2.1	208.817	30.04	211.279	196.324
4/27/2016	11:38:28 PM :	85	94	94	256	99	0.499	2.4	224.696	0.5	2.1	209.249	30.04	211.794	196.737
4/27/2016	11:39:28 PM :	85	94	94	260	99	0.5	2.4	225.181	0.5	2.1	209.752	30.04	212.259	197.218
4/27/2016	11:40:28 PM :	85	93	94	260	99	0.499	2.4	225.701	0.5	2.1	210.358	30.05	212.757	197.798
4/27/2016	11:41:28 PM :	85	93	94	256	99	0.5	2.4	226.361	0.5	2.1	210.95	30.05	213.39	198.365
4/27/2016	11:42:28 PM :	86	93	94	253	99	0.5	2.4	226.989	0.5	2.1	211.427	30.05	213.991	198.821
4/27/2016	11:43:28 PM :	86	93	94	256	99	0.5	2.4	227.525	0.5	2.1	211.904	30.05	214.505	199.277

4/27/2016	11:44:28 PM :	86	93	94	261	99	0.5	2.4	228.008	0.5	2.1	212.421	30.05	214.968	199.771
4/27/2016	11:45:28 PM :	86	93	94	260	99	0.5	2.4	228.545	0.5	2.1	212.942	30.05	215.483	200.27
4/27/2016	11:46:28 PM :	87	93	94	256	99	0.5	2.4	229.172	0.5	2.1	213.506	30.05	216.085	200.809
4/27/2016	11:47:28 PM :	87	93	94	253	99	0.5	2.4	229.83	0.5	2.1	214.075	30.05	216.716	201.354
4/27/2016	11:48:28 PM :	87	93	94	256	99	0.5	2.4	230.352	0.5	2.1	214.588	30.05	217.216	201.844
4/27/2016	11:49:28 PM :	87	93	94	260	99	0.5	2.4	230.86	0.5	2.1	215.046	30.05	217.702	202.283
4/27/2016	11:50:28 PM :	87	93	94	259	99	0.5	2.4	231.386	0.5	2.1	215.516	30.05	218.206	202.732
4/27/2016	11:51:28 PM :	87	93	94	255	99	0.501	2.4	231.995	0.5	2.1	216.105	30.05	218.791	203.295
4/27/2016	11:52:28 PM :	87	93	94	253	99	0.5	2.4	232.648	0.5	2.1	216.738	30.04	219.417	203.901
4/27/2016	11:53:28 PM :	87	93	94	258	99	0.501	2.4	233.175	0.5	2.1	217.217	30.04	219.922	204.359
4/27/2016	11:54:28 PM :	87	93	94	261	99	0.499	2.4	233.69	0.5	2.1	217.654	30.04	220.416	204.778
4/27/2016	11:55:28 PM :	86	93	94	259	99	0.5	2.4	234.225	0.5	2.1	218.154	30.04	220.928	205.256
4/27/2016	11:56:28 PM :	87	93	94	254	99	0.5	2.4	234.851	0.5	2.1	218.738	30.04	221.528	205.815
4/27/2016	11:57:28 PM :	87	93	94	254	99	0.501	2.4	235.449	0.5	2.1	219.336	30.04	222.101	206.387
4/27/2016	11:58:28 PM :	87	93	94	258	99	0.5	2.4	236.008	0.5	2.1	219.838	30.04	222.637	206.868
4/27/2016	11:59:28 PM :	87	93	94	261	99	0.5	2.4	236.515	0.5	2.1	220.319	30.04	223.123	207.329
4/28/2016	12:00:28 AM :	86	93	94	259	99	0.499	2.4	237.091	0.5	2.1	220.815	30.04	223.675	207.804
4/28/2016	12:01:28 AM :	86	93	94	254	99	0.5	2.4	237.695	0.5	2.1	221.334	30.04	224.254	208.3
4/28/2016	12:02:28 AM :	86	93	94	254	99	0.5	2.4	238.261	0.5	2.1	221.903	30.04	224.796	208.845
4/28/2016	12:03:28 AM :	86	93	94	258	99	0.5	2.4	238.812	0.5	2.1	222.496	30.04	225.324	209.413
4/28/2016	12:04:28 AM :	86	93	94	261	99	0.5	2.4	239.341	0.5	2.1	222.988	30.04	225.831	209.884
4/28/2016	12:05:28 AM :	85	93	94	258	99	0.5	2.4	239.933	0.5	2.1	223.442	30.04	226.398	210.318
4/28/2016	12:06:28 AM :	85	93	94	254	99	0.501	2.4	240.541	0.5	2.1	223.927	30.04	226.982	210.782
4/28/2016	12:07:28 AM :	85	93	94	254	99	0.501	2.4	241.105	0.5	2.1	224.525	30.04	227.522	211.355
4/28/2016	12:08:28 AM :	85	93	94	259	99	0.5	2.4	241.614	0.5	2.1	225.135	30.04	228.01	211.939
4/28/2016	12:09:28 AM :	85	93	94	261	99	0.5	2.4	242.18	0.5	2.1	225.618	30.04	228.553	212.401
4/28/2016	12:10:28 AM :	85	93	94	258	99	0.499	2.4	242.765	0.5	2.1	226.083	30.04	229.115	212.847
4/28/2016	12:11:28 AM :	85	93	94	253	99	0.501	2.4	243.402	0.5	2.1	226.584	30.04	229.725	213.326
4/28/2016	12:12:28 AM :	85	93	94	254	99	0.499	2.4	243.934	0.5	2.1	227.133	30.04	230.236	213.852
4/28/2016	12:13:28 AM :	85	93	94	259	99	0.5	2.4	244.429	0.5	2.1	227.71	30.04	230.711	214.405
4/28/2016	12:14:28 AM :	85	93	94	260	99	0.5	2.4	244.986	0.5	2.1	228.255	30.04	231.245	214.926
4/28/2016	12:15:28 AM :	84	93	94	256	99	0.5	2.4	245.609	0.5	2.1	228.756	30.04	231.843	215.405
4/28/2016	12:16:28 AM :	84	93	94	253	99	0.499	2.4	246.24	0.5	2.1	229.226	30.04	232.449	215.856
4/28/2016	12:17:28 AM :	84	93	94	255	99	0.499	2.4	246.769	0.5	2.1	229.705	30.04	232.956	216.315
4/28/2016	12:18:28 AM :	84	93	94	260	99	0.5	2.4	247.264	0.5	2.1	230.306	30.04	233.431	216.89
4/28/2016	12:19:28 AM :	84	93	94	260	99	0.5	2.4	247.79	0.499	2.1	230.933	30.04	233.936	217.49
4/28/2016	12:20:28 AM :	84	93	94	256	99	0.5	2.4	248.449	0.5	2.1	231.403	30.04	234.568	217.941
4/28/2016	12:21:28 AM :	84	93	94	253	99	0.5	2.4	249.067	0.5	2.1	231.834	30.04	235.161	218.353
4/28/2016	12:22:28 AM :	84	93	94	256	99	0.5	2.4	249.608	0.5	2.1	232.336	30.04	235.68	218.833
4/28/2016	12:23:28 AM :	84	93	94	260	99	0.5	2.4	250.087	0.5	2.1	232.948	30.04	236.14	219.419
4/28/2016	12:24:28 AM :	84	93	94	260	99	0.499	2.4	250.617	0.499	2.1	233.543	30.04	236.648	219.989
4/28/2016	12:25:28 AM :	84	93	94	255	99	0.5	2.4	251.261	0.5	2.1	234.018	30.04	237.266	220.443
4/28/2016	12:26:28 AM :	84	93	94	253	99	0.5	2.4	251.903	0.5	2.1	234.494	30.04	237.882	220.9
4/28/2016	12:27:28 AM :	83	93	94	257	99	0.5	2.4	252.431	0.5	2.1	235.01	30.04	238.388	221.394
4/28/2016	12:28:28 AM :	83	93	94	261	99	0.5	2.4	252.928	0.5	2.1	235.536	30.04	238.865	221.897
4/28/2016	12:29:28 AM :	83	93	94	260	99	0.5	2.4	253.461	0.5	2.1	236.101	30.04	239.377	222.438
4/28/2016	12:30:28 AM :	84	93	94	255	99	0.498	2.4	254.071	0.5	2.1	236.672	30.04	239.962	222.985

4/28/2016	12:31:28 AM :	83	93	94	253	99	0.5	2.4	254.736	0.5	2.1	237.185	30.04	240.599	223.476
4/28/2016	12:32:28 AM :	83	93	94	258	99	0.501	2.4	255.254	0.5	2.1	237.641	30.04	241.096	223.913
4/28/2016	12:33:28 AM :	83	93	94	261	99	0.501	2.4	255.766	0.5	2.1	238.112	30.04	241.588	224.364
4/28/2016	12:34:28 AM :	83	93	94	259	99	0.499	2.4	256.296	0.5	2.1	238.705	30.04	242.096	224.931
4/28/2016	12:35:28 AM :	83	93	94	254	99	0.501	2.4	256.91	0.5	2.1	239.333	30.04	242.686	225.533
4/28/2016	12:36:28 AM :	82	93	94	253	99	0.5	2.4	257.54	0.5	2.1	239.816	30.04	243.29	225.995
4/28/2016	12:37:28 AM :	83	93	94	258	99	0.499	2.4	258.079	0.5	2.1	240.258	30.04	243.807	226.418
4/28/2016	12:38:28 AM :	83	93	94	261	99	0.5	2.4	258.595	0.5	2.1	240.758	30.04	244.302	226.897
4/28/2016	12:39:28 AM :	83	93	94	259	99	0.501	2.4	259.147	0.5	2.1	241.338	30.04	244.832	227.453
4/28/2016	12:40:28 AM :	83	93	94	254	99	0.5	2.4	259.76	0.5	2.1	241.937	30.04	245.42	228.026
4/28/2016	12:41:28 AM :	83	93	94	253	99	0.499	2.4	260.341	0.5	2.1	242.442	30.04	245.977	228.509
4/28/2016	12:42:28 AM :	83	93	94	258	99	0.5	2.4	260.901	0.5	2.1	242.925	30.04	246.515	228.971
4/28/2016	12:43:28 AM :	82	93	94	261	99	0.499	2.4	261.415	0.5	2.1	243.419	30.04	247.008	229.444
4/28/2016	12:44:28 AM :	82	93	94	259	99	0.5	2.4	261.993	0.5	2.1	243.929	30.04	247.562	229.933
4/28/2016	12:45:28 AM :	82	93	94	254	99	0.5	2.4	262.598	0.5	2.1	244.51	30.04	248.142	230.489
4/28/2016	12:46:28 AM :	82	93	93	253	99	0.499	2.4	263.167	0.5	2.1	245.099	30.04	248.689	231.053
4/28/2016	12:47:28 AM :	82	93	94	258	99	0.499	2.4	263.699	0.5	2.1	245.596	30.04	249.199	231.529
4/28/2016	12:48:28 AM :	82	93	94	261	99	0.5	2.4	264.242	0.5	2.1	246.048	30.04	249.72	231.962
4/28/2016	12:49:28 AM :	82	93	93	259	99	0.501	2.4	264.832	0.5	2.1	246.531	30.04	250.286	232.425
4/28/2016	12:50:28 AM :	82	93	94	254	99	0.5	2.4	265.449	0.5	2.1	247.136	30.04	250.878	233.004
4/28/2016	12:51:28 AM :	82	93	93	253	99	0.5	2.4	266	0.5	2.1	247.736	30.04	251.406	233.579
4/28/2016	12:52:28 AM :	82	93	94	258	99	0.501	2.4	266.499	0.5	2.1	248.219	30.04	251.885	234.041
4/28/2016	12:53:28 AM :	82	93	93	261	99	0.501	2.4	267.067	0.5	2.1	248.688	30.04	252.43	234.491
4/28/2016	12:54:28 AM :	82	93	93	259	99	0.499	2.4	267.664	0.5	2.1	249.188	30.04	253.002	234.97
4/28/2016	12:55:28 AM :	82	93	93	254	99	0.5	2.4	268.299	0.5	2.1	249.734	30.04	253.611	235.493
4/28/2016	12:56:28 AM :	82	93	93	254	99	0.499	2.4	268.825	0.5	2.1	250.309	30.04	254.116	236.044
4/28/2016	12:57:28 AM :	82	93	93	258	99	0.5	2.4	269.328	0.5	2.1	250.867	30.04	254.599	236.578
4/28/2016	12:58:28 AM :	82	93	93	261	99	0.5	2.4	269.871	0.5	2.1	251.365	30.04	255.119	237.056
4/28/2016	12:59:28 AM :	82	93	93	258	99	0.5	2.4	270.51	0.5	2.1	251.834	30.04	255.733	237.505
4/28/2016	1:00:28 AM :	82	93	93	254	99	0.499	2.4	271.136	0.5	2.1	252.311	30.04	256.333	237.962
4/28/2016	1:01:28 AM :	82	93	93	254	99	0.501	2.4	271.677	0.5	2.1	252.915	30.04	256.851	238.541
4/28/2016	1:02:22 AM :	82	93	93	254	99	0.501	2.4	272.102	0.5	2.1	253.48	30.04	257.26	239.082

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/27/16 4:56:5( with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/27/16 4:57:06 PM: Test Paused by User
04/27/16 4:57:0; with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/27/16 5:02:29 PM: TestResumed
04/28/16 1:02:22 AM: Actual Sampling Time: 0d  8h  0m  0s
04/28/16 1:02:22 AM: Test END
04/28/16 4:45:25 PM: PAUSE_EVENT -
04/28/16 4:58:28 PM: New Trap Temperature: set to = 250F
04/28/16 5:00:08 PM: New Trap Temperature: set to = 250F
04/28/16 5:03:19 PM: New Trap Temperature: set to = 250F
04/28/16 01:04:39 AM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/28/16 01:04:39 AM: Maximum Observed Vacuum for A was 2.4 inHg
04/28/16 01:04:39 AM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
```

```
04/28/16 01:04:39 AM: Maximum Observed Vacuum for B was 2.1 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'           DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'            RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 4 Night.pro
File Exported: 4/30/2016 12:25:41 AM (PC Time).
Company Name: Cuba

04/28/16 05:06:48 PM: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 2 ccm (Max. allowed 20 ccm)
04/28/16 05:06:48 PM: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 1 ccm (Max. allowed 20 ccm)
Trap ID-A: spiked OL335393
Trap ID-B: OL343600

Run N4

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 0m
Averaging Period : 1 min.

		Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (I Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (I Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES		**97.4**	**99.3**	**100.3**	**257.8**	**105.3**	**0.5**	**2.4**	**271.878**	**0.5**	**2**	**252.986**	**30.06**	**258.11**	**239.76**
4/28/2016	5:09:02 PM :	99	112	113	253	121	0	0.3	0	0.006	0	0	30.02	0	0
4/28/2016	5:10:01 PM :	108	111	113	254	121	0.539	1.9	0.65	0.522	1.5	0.5	30.02	0.603	0.462
4/28/2016	5:11:01 PM :	125	111	113	260	121	0.501	2.1	1.209	0.501	1.7	1.083	30.02	1.121	1
4/28/2016	5:12:01 PM :	134	111	113	262	121	0.501	2.1	1.717	0.501	1.8	1.733	30.02	1.592	1.601
4/28/2016	5:13:01 PM :	140	111	113	260	121	0.501	2.2	2.284	0.501	1.8	2.226	30.02	2.117	2.056
4/28/2016	5:14:01 PM :	140	111	113	255	121	0.501	2.1	2.862	0.501	1.8	2.665	30.02	2.653	2.462
4/28/2016	5:15:01 PM :	141	112	113	254	122	0.5	2.1	3.493	0.5	1.8	3.155	30.02	3.237	2.915
4/28/2016	5:16:01 PM :	142	112	113	259	122	0.501	2.1	4.028	0.5	1.8	3.771	30.02	3.733	3.484
4/28/2016	5:17:01 PM :	140	112	114	263	122	0.501	2.1	4.521	0.5	1.8	4.376	30.02	4.189	4.042
4/28/2016	5:18:01 PM :	140	112	114	261	122	0.501	2.1	5.078	0.5	1.8	4.864	30.03	4.705	4.493
4/28/2016	5:19:01 PM :	141	112	114	256	122	0.499	2.1	5.689	0.5	1.8	5.349	30.02	5.272	4.94
4/28/2016	5:20:01 PM :	141	113	114	254	122	0.501	2.1	6.321	0.5	1.8	5.86	30.02	5.856	5.411
4/28/2016	5:21:01 PM :	147	113	114	258	122	0.499	2.1	6.851	0.5	1.8	6.398	30.02	6.346	5.907
4/28/2016	5:22:01 PM :	147	113	114	262	122	0.501	2.1	7.346	0.5	1.8	6.98	30.03	6.804	6.445
4/28/2016	5:23:01 PM :	144	113	114	261	122	0.501	2.1	7.876	0.5	1.8	7.527	30.02	7.295	6.949
4/28/2016	5:24:01 PM :	144	113	114	256	122	0.5	2.1	8.52	0.5	1.8	8.048	30.02	7.891	7.429
4/28/2016	5:25:01 PM :	146	113	114	254	122	0.5	2.1	9.137	0.5	1.8	8.525	30.02	8.461	7.869
4/28/2016	5:26:01 PM :	145	113	114	258	122	0.5	2.1	9.681	0.5	1.8	9.01	30.02	8.965	8.316
4/28/2016	5:27:01 PM :	143	113	114	262	122	0.5	2.1	10.161	0.5	1.8	9.601	30.02	9.408	8.861
4/28/2016	5:28:01 PM :	138	113	114	261	122	0.5	2.1	10.683	0.5	1.8	10.234	30.01	9.891	9.445
4/28/2016	5:29:01 PM :	133	113	114	256	121	0.5	2.1	11.332	0.499	1.8	10.724	30.02	10.491	9.897
4/28/2016	5:30:01 PM :	132	113	114	253	121	0.5	2.1	11.965	0.5	1.8	11.178	30.02	11.077	10.315
4/28/2016	5:31:01 PM :	135	113	114	257	121	0.5	2.1	12.502	0.5	1.8	11.673	30.01	11.573	10.771
4/28/2016	5:32:01 PM :	139	113	114	262	121	0.5	2.1	12.986	0.5	1.8	12.267	30.01	12.02	11.319
4/28/2016	5:33:01 PM :	136	113	114	261	121	0.5	2.1	13.518	0.499	1.8	12.88	30.01	12.511	11.884
4/28/2016	5:34:01 PM :	134	113	114	256	121	0.5	2.1	14.137	0.5	1.8	13.374	30.01	13.084	12.339
4/28/2016	5:35:01 PM :	131	113	114	253	120	0.5	2.1	14.791	0.5	1.8	13.843	30.01	13.688	12.771
4/28/2016	5:36:01 PM :	129	113	114	256	120	0.5	2.1	15.317	0.5	1.8	14.351	30.01	14.174	13.24
4/28/2016	5:37:01 PM :	130	113	114	261	120	0.5	2.1	15.832	0.5	1.8	14.9	30.01	14.65	13.746
4/28/2016	5:38:01 PM :	129	113	114	261	120	0.499	2.1	16.352	0.5	1.8	15.499	30.01	15.131	14.298
4/28/2016	5:39:01 PM :	127	113	114	257	120	0.501	2.1	16.953	0.5	1.8	16.037	30.01	15.687	14.794
4/28/2016	5:40:01 PM :	129	113	114	253	120	0.499	2.1	17.607	0.5	1.8	16.539	30.01	16.292	15.257

4/28/2016	5:41:01 PM :	134	113	114	256	119	0.499	2.1	18.138	0.5	1.8	17.028	30.01	16.783	15.708
4/28/2016	5:42:01 PM :	136	113	114	261	119	0.5	2.1	18.656	0.5	1.8	17.529	30.01	17.262	16.169
4/28/2016	5:43:01 PM :	136	113	114	261	119	0.5	2.1	19.188	0.5	1.8	18.113	30.01	17.754	16.709
4/28/2016	5:44:01 PM :	140	113	114	257	119	0.5	2.2	19.806	0.5	1.8	18.717	30.02	18.326	17.266
4/28/2016	5:45:01 PM :	141	113	114	253	119	0.5	2.1	20.41	0.5	1.8	19.228	30.02	18.885	17.737
4/28/2016	5:46:01 PM :	144	112	114	256	118	0.501	2.1	20.971	0.5	1.8	19.689	30.02	19.404	18.163
4/28/2016	5:47:01 PM :	147	112	114	261	118	0.5	2.2	21.479	0.5	1.8	20.173	30.02	19.875	18.61
4/28/2016	5:48:01 PM :	146	112	113	261	118	0.5	2.2	22.044	0.5	1.8	20.76	30.02	20.398	19.152
4/28/2016	5:49:01 PM :	146	112	113	258	118	0.5	2.2	22.646	0.5	1.8	21.386	30.02	20.956	19.73
4/28/2016	5:50:01 PM :	144	112	113	254	118	0.501	2.2	23.222	0.5	1.8	21.891	30.02	21.489	20.196
4/28/2016	5:51:01 PM :	140	112	113	255	117	0.501	2.2	23.779	0.5	1.8	22.344	30.02	22.004	20.615
4/28/2016	5:52:01 PM :	138	112	113	261	117	0.499	2.2	24.308	0.5	1.8	22.846	30.02	22.494	21.079
4/28/2016	5:53:01 PM :	139	111	113	261	117	0.5	2.2	24.889	0.5	1.8	23.416	30.02	23.033	21.606
4/28/2016	5:54:01 PM :	139	111	113	258	117	0.501	2.2	25.496	0.5	1.8	24.02	30.02	23.596	22.164
4/28/2016	5:55:01 PM :	139	111	113	254	117	0.5	2.2	26.07	0.5	1.8	24.54	30.02	24.127	22.645
4/28/2016	5:56:01 PM :	137	111	113	255	117	0.5	2.2	26.582	0.5	1.8	25.033	30.02	24.602	23.1
4/28/2016	5:57:01 PM :	134	111	113	260	117	0.501	2.2	27.146	0.5	1.8	25.533	30.02	25.126	23.563
4/28/2016	5:58:01 PM :	133	111	112	261	117	0.499	2.2	27.728	0.5	1.8	26.043	30.03	25.665	24.035
4/28/2016	5:59:01 PM :	135	111	112	258	116	0.501	2.2	28.362	0.5	1.8	26.626	30.02	26.254	24.575
4/28/2016	6:00:01 PM :	138	111	112	254	116	0.5	2.2	28.9	0.5	1.8	27.227	30.02	26.753	25.131
4/28/2016	6:01:01 PM :	138	111	112	255	116	0.5	2.2	29.399	0.5	1.8	27.729	30.03	27.216	25.596
4/28/2016	6:02:01 PM :	136	111	112	261	116	0.5	2.2	29.955	0.5	1.8	28.198	30.03	27.732	26.029
4/28/2016	6:03:01 PM :	137	110	112	261	116	0.5	2.2	30.576	0.5	1.9	28.673	30.03	28.308	26.469
4/28/2016	6:04:01 PM :	136	110	112	258	116	0.5	2.2	31.209	0.5	1.9	29.261	30.02	28.896	27.015
4/28/2016	6:05:01 PM :	137	110	112	254	116	0.5	2.2	31.742	0.5	1.9	29.892	30.03	29.391	27.599
4/28/2016	6:06:01 PM :	137	110	112	256	116	0.5	2.2	32.241	0.5	1.8	30.394	30.03	29.855	28.064
4/28/2016	6:07:01 PM :	136	110	112	261	116	0.499	2.2	32.767	0.499	1.9	30.842	30.03	30.344	28.479
4/28/2016	6:08:01 PM :	134	110	111	262	116	0.5	2.2	33.421	0.5	1.9	31.338	30.03	30.951	28.939
4/28/2016	6:09:01 PM :	132	110	111	258	115	0.499	2.2	34.041	0.5	1.9	31.924	30.03	31.527	29.483
4/28/2016	6:10:01 PM :	131	110	111	254	115	0.5	2.2	34.586	0.5	1.9	32.531	30.03	32.034	30.046
4/28/2016	6:11:01 PM :	129	110	111	255	115	0.499	2.2	35.072	0.5	1.9	33.039	30.03	32.486	30.516
4/28/2016	6:12:01 PM :	128	110	111	260	115	0.499	2.2	35.607	0.5	1.9	33.526	30.03	32.983	30.968
4/28/2016	6:13:01 PM :	131	110	111	261	115	0.5	2.2	36.232	0.5	1.9	34.036	30.03	33.565	31.442
4/28/2016	6:14:01 PM :	134	109	111	258	115	0.5	2.2	36.884	0.5	1.9	34.553	30.03	34.171	31.921
4/28/2016	6:15:01 PM :	136	109	111	254	115	0.501	2.2	37.415	0.5	1.9	35.131	30.03	34.665	32.458
4/28/2016	6:16:01 PM :	136	109	111	255	115	0.5	2.2	37.926	0.5	1.9	35.722	30.04	35.141	33.007
4/28/2016	6:17:01 PM :	134	109	111	261	115	0.5	2.2	38.448	0.5	1.9	36.231	30.04	35.627	33.479
4/28/2016	6:18:01 PM :	133	109	111	262	115	0.499	2.2	39.055	0.5	1.9	36.693	30.03	36.192	33.908
4/28/2016	6:19:01 PM :	132	109	110	258	115	0.5	2.2	39.709	0.5	1.9	37.166	30.03	36.802	34.348
4/28/2016	6:20:01 PM :	130	109	110	254	114	0.5	2.2	40.243	0.5	1.9	37.755	30.03	37.299	34.895
4/28/2016	6:21:01 PM :	129	109	110	255	114	0.5	2.2	40.759	0.499	1.9	38.393	30.04	37.78	35.488
4/28/2016	6:22:01 PM :	128	109	110	260	114	0.5	2.2	41.295	0.5	1.9	38.888	30.04	38.279	35.947
4/28/2016	6:23:01 PM :	128	109	110	261	114	0.5	2.2	41.919	0.5	1.9	39.333	30.03	38.86	36.362
4/28/2016	6:24:01 PM :	127	109	110	258	114	0.501	2.2	42.521	0.5	1.9	39.823	30.04	39.422	36.817
4/28/2016	6:25:01 PM :	128	108	110	254	114	0.501	2.2	43.081	0.5	1.9	40.418	30.04	39.944	37.371
4/28/2016	6:26:01 PM :	128	108	110	255	114	0.501	2.2	43.59	0.5	1.9	41.021	30.04	40.418	37.932
4/28/2016	6:27:01 PM :	129	108	110	260	114	0.5	2.2	44.164	0.5	1.9	41.521	30.04	40.953	38.397
4/28/2016	6:28:01 PM :	131	108	109	261	114	0.501	2.3	44.762	0.5	1.9	42.004	30.04	41.512	38.847
4/28/2016	6:29:01 PM :	131	108	109	258	113	0.5	2.3	45.34	0.5	1.9	42.515	30.04	42.051	39.323
4/28/2016	6:30:01 PM :	132	108	109	254	113	0.5	2.2	45.889	0.5	1.9	43.032	30.04	42.563	39.804

4/28/2016	6:31:01 PM :	133	108	109	255	113	0.5	2.2	46.423	0.5	1.9	43.605	30.04	43.061	40.338
4/28/2016	6:32:01 PM :	133	108	109	260	113	0.5	2.2	47.01	0.5	1.9	44.184	30.04	43.609	40.877
4/28/2016	6:33:01 PM :	134	108	109	261	112	0.5	2.3	47.626	0.5	1.9	44.702	30.05	44.185	41.359
4/28/2016	6:34:01 PM :	135	107	109	258	112	0.499	2.3	48.186	0.5	1.9	45.165	30.04	44.708	41.791
4/28/2016	6:35:01 PM :	138	107	109	254	112	0.5	2.3	48.695	0.5	1.9	45.636	30.04	45.183	42.23
4/28/2016	6:36:01 PM :	139	107	108	255	112	0.5	2.3	49.259	0.5	1.9	46.221	30.04	45.71	42.776
4/28/2016	6:37:01 PM :	136	107	108	261	112	0.5	2.3	49.85	0.5	1.9	46.862	30.05	46.263	43.374
4/28/2016	6:38:01 PM :	135	107	108	261	112	0.5	2.3	50.484	0.5	1.9	47.353	30.04	46.855	43.832
4/28/2016	6:39:01 PM :	132	107	108	258	111	0.499	2.3	51.017	0.5	1.9	47.801	30.04	47.353	44.25
4/28/2016	6:40:01 PM :	130	107	108	253	111	0.5	2.3	51.522	0.499	1.9	48.29	30.05	47.826	44.706
4/28/2016	6:41:01 PM :	124	107	108	255	111	0.5	2.3	52.069	0.5	1.9	48.879	30.04	48.337	45.256
4/28/2016	6:42:01 PM :	116	107	108	260	111	0.5	2.3	52.698	0.5	1.9	49.485	30.04	48.926	45.822
4/28/2016	6:43:01 PM :	124	106	107	261	111	0.5	2.3	53.325	0.5	1.9	49.987	30.05	49.513	46.291
4/28/2016	6:44:01 PM :	122	106	107	258	110	0.5	2.3	53.872	0.5	1.9	50.485	30.04	50.025	46.757
4/28/2016	6:45:01 PM :	124	106	107	253	110	0.5	2.3	54.357	0.5	1.9	50.976	30.04	50.479	47.216
4/28/2016	6:46:01 PM :	126	106	107	256	110	0.5	2.3	54.879	0.5	1.9	51.486	30.05	50.968	47.692
4/28/2016	6:47:01 PM :	126	106	107	261	110	0.5	2.3	55.536	0.5	1.9	52.065	30.04	51.583	48.234
4/28/2016	6:48:01 PM :	124	106	107	261	110	0.5	2.3	56.163	0.5	1.9	52.662	30.05	52.171	48.793
4/28/2016	6:49:01 PM :	121	106	106	257	109	0.5	2.3	56.708	0.5	1.9	53.164	30.04	52.682	49.263
4/28/2016	6:50:01 PM :	121	106	106	253	109	0.5	2.3	57.196	0.5	1.9	53.625	30.04	53.139	49.694
4/28/2016	6:51:01 PM :	121	105	106	256	109	0.5	2.3	57.729	0.5	1.9	54.098	30.05	53.639	50.137
4/28/2016	6:52:01 PM :	120	105	106	261	109	0.499	2.3	58.356	0.5	1.9	54.691	30.04	54.227	50.692
4/28/2016	6:53:01 PM :	119	105	106	261	109	0.5	2.3	59.013	0.5	1.9	55.317	30.04	54.843	51.279
4/28/2016	6:54:01 PM :	119	105	106	257	109	0.5	2.3	59.535	0.5	1.9	55.811	30.04	55.332	51.742
4/28/2016	6:55:01 PM :	114	105	106	253	109	0.5	2.3	60.051	0.5	1.9	56.263	30.04	55.817	52.165
4/28/2016	6:56:01 PM :	115	105	106	256	108	0.499	2.3	60.572	0.5	1.9	56.757	30.04	56.306	52.628
4/28/2016	6:57:01 PM :	119	105	105	261	108	0.5	2.3	61.181	0.499	1.9	57.334	30.04	56.878	53.17
4/28/2016	6:58:01 PM :	119	104	105	261	108	0.5	2.3	61.833	0.5	1.9	57.938	30.04	57.49	53.736
4/28/2016	6:59:01 PM :	119	104	105	256	108	0.5	2.3	62.365	0.5	2	58.445	30.04	57.991	54.211
4/28/2016	7:00:01 PM :	119	104	105	253	108	0.5	2.3	62.885	0.5	1.9	58.94	30.04	58.479	54.676
4/28/2016	7:01:01 PM :	118	104	105	256	107	0.5	2.3	63.43	0.5	1.9	59.434	30.04	58.992	55.14
4/28/2016	7:02:01 PM :	119	104	105	260	107	0.499	2.3	64.049	0.5	1.9	59.94	30.04	59.573	55.616
4/28/2016	7:03:01 PM :	120	104	104	260	107	0.5	2.3	64.639	0.5	2	60.519	30.04	60.129	56.159
4/28/2016	7:04:01 PM :	117	104	104	256	107	0.5	2.3	65.202	0.5	2	61.126	30.04	60.658	56.73
4/28/2016	7:05:01 PM :	109	103	104	253	107	0.501	2.3	65.716	0.5	2	61.622	30.04	61.142	57.196
4/28/2016	7:06:01 PM :	105	103	104	256	107	0.499	2.3	66.292	0.5	1.9	62.076	30.05	61.684	57.622
4/28/2016	7:07:01 PM :	101	103	104	261	107	0.5	2.3	66.897	0.5	2	62.56	30.04	62.253	58.078
4/28/2016	7:08:01 PM :	97	103	104	260	107	0.5	2.3	67.474	0.5	2	63.154	30.04	62.797	58.637
4/28/2016	7:09:01 PM :	93	103	104	255	106	0.5	2.3	68.007	0.5	2	63.771	30.05	63.299	59.217
4/28/2016	7:10:01 PM :	91	103	103	253	106	0.499	2.3	68.552	0.5	2	64.264	30.04	63.812	59.681
4/28/2016	7:11:01 PM :	91	103	103	257	106	0.5	2.3	69.138	0.5	1.9	64.717	30.04	64.364	60.108
4/28/2016	7:12:01 PM :	91	102	103	261	106	0.499	2.3	69.775	0.5	2	65.225	30.04	64.965	60.586
4/28/2016	7:13:01 PM :	91	102	103	260	106	0.499	2.3	70.314	0.5	2	65.781	30.05	65.474	61.109
4/28/2016	7:14:01 PM :	91	102	103	255	106	0.5	2.3	70.817	0.5	2	66.377	30.05	65.948	61.671
4/28/2016	7:15:01 PM :	91	102	103	253	106	0.5	2.3	71.379	0.5	1.9	66.901	30.04	66.478	62.165
4/28/2016	7:16:01 PM :	90	102	103	258	106	0.5	2.3	71.981	0.5	1.9	67.404	30.05	67.047	62.638
4/28/2016	7:17:01 PM :	90	102	103	261	106	0.499	2.3	72.617	0.5	2	67.885	30.05	67.647	63.092
4/28/2016	7:18:01 PM :	90	102	102	260	105	0.5	2.3	73.153	0.5	2	68.379	30.05	68.153	63.558
4/28/2016	7:19:01 PM :	90	102	102	255	105	0.5	2.3	73.653	0.5	2	68.963	30.05	68.625	64.109
4/28/2016	7:20:01 PM :	91	101	102	253	105	0.499	2.3	74.189	0.5	2	69.578	30.04	69.131	64.689

4/28/2016	7:21:01 PM :	91	101	102	257	105	0.5	2.3	74.833	0.5	1.9	70.069	30.04	69.74	65.152
4/28/2016	7:22:01 PM :	90	101	102	261	105	0.5	2.3	75.457	0.5	2	70.518	30.05	70.33	65.576
4/28/2016	7:23:01 PM :	90	101	102	260	105	0.501	2.3	76.004	0.5	2	71.002	30.05	70.847	66.033
4/28/2016	7:24:01 PM :	90	101	102	255	105	0.5	2.3	76.486	0.5	2	71.611	30.05	71.302	66.608
4/28/2016	7:25:01 PM :	90	101	102	253	105	0.5	2.3	77.01	0.5	1.9	72.217	30.05	71.797	67.18
4/28/2016	7:26:01 PM :	90	101	102	257	105	0.499	2.3	77.664	0.5	1.9	72.702	30.04	72.416	67.638
4/28/2016	7:27:01 PM :	90	101	101	261	105	0.499	2.3	78.299	0.499	2	73.171	30.04	73.017	68.081
4/28/2016	7:28:01 PM :	90	101	101	260	105	0.5	2.3	78.834	0.5	2	73.679	30.05	73.523	68.561
4/28/2016	7:29:01 PM :	90	101	101	255	105	0.501	2.3	79.327	0.5	2	74.219	30.05	73.989	69.072
4/28/2016	7:30:01 PM :	89	100	101	253	105	0.5	2.3	79.861	0.5	2	74.794	30.05	74.495	69.615
4/28/2016	7:31:01 PM :	89	100	101	258	105	0.5	2.3	80.477	0.5	2	75.334	30.05	75.078	70.125
4/28/2016	7:32:01 PM :	89	100	101	261	105	0.5	2.3	81.141	0.499	2	75.857	30.05	75.707	70.62
4/28/2016	7:33:01 PM :	89	100	101	259	104	0.501	2.3	81.661	0.5	2	76.326	30.05	76.199	71.063
4/28/2016	7:34:01 PM :	89	100	101	255	104	0.5	2.3	82.174	0.5	2	76.801	30.05	76.685	71.512
4/28/2016	7:35:01 PM :	89	100	101	253	104	0.5	2.3	82.701	0.5	2	77.383	30.05	77.184	72.063
4/28/2016	7:36:01 PM :	89	99	101	258	104	0.499	2.3	83.317	0.5	2	78.032	30.05	77.768	72.677
4/28/2016	7:37:01 PM :	89	99	101	261	104	0.5	2.3	83.949	0.5	2	78.509	30.05	78.366	73.128
4/28/2016	7:38:01 PM :	89	99	101	259	104	0.5	2.3	84.49	0.5	2	78.944	30.05	78.879	73.54
4/28/2016	7:39:01 PM :	89	99	100	254	104	0.501	2.3	85.006	0.5	2	79.441	30.05	79.368	74.01
4/28/2016	7:40:01 PM :	89	99	100	253	104	0.5	2.3	85.564	0.5	2	80.055	30.05	79.897	74.591
4/28/2016	7:41:01 PM :	89	99	100	258	104	0.499	2.3	86.171	0.5	2	80.645	30.05	80.472	75.15
4/28/2016	7:42:01 PM :	89	99	100	261	104	0.501	2.3	86.756	0.5	2	81.126	30.05	81.027	75.606
4/28/2016	7:43:01 PM :	89	99	100	259	104	0.499	2.3	87.314	0.5	2	81.599	30.04	81.557	76.053
4/28/2016	7:44:01 PM :	88	99	100	254	104	0.501	2.3	87.83	0.5	2	82.126	30.04	82.046	76.552
4/28/2016	7:45:01 PM :	89	99	99	254	104	0.499	2.3	88.414	0.5	2	82.65	30.04	82.6	77.048
4/28/2016	7:46:01 PM :	88	99	99	258	104	0.501	2.3	89.021	0.5	2	83.215	30.04	83.175	77.584
4/28/2016	7:47:01 PM :	88	99	99	261	104	0.499	2.3	89.594	0.5	2	83.778	30.04	83.719	78.117
4/28/2016	7:48:01 PM :	88	98	99	259	104	0.5	2.4	90.12	0.5	2	84.3	30.05	84.218	78.612
4/28/2016	7:49:01 PM :	88	98	99	254	104	0.5	2.3	90.671	0.5	2	84.761	30.05	84.741	79.049
4/28/2016	7:50:01 PM :	88	98	99	254	103	0.501	2.3	91.256	0.5	2	85.228	30.05	85.297	79.492
4/28/2016	7:51:01 PM :	88	98	99	258	103	0.5	2.3	91.893	0.5	2	85.815	30.05	85.902	80.047
4/28/2016	7:52:01 PM :	88	98	99	261	103	0.5	2.4	92.427	0.5	2	86.454	30.05	86.409	80.654
4/28/2016	7:53:01 PM :	88	98	99	259	103	0.5	2.4	92.925	0.5	2	86.937	30.04	86.882	81.112
4/28/2016	7:54:01 PM :	88	98	99	254	103	0.5	2.3	93.49	0.5	2	87.375	30.04	87.418	81.527
4/28/2016	7:55:01 PM :	88	98	99	254	103	0.5	2.3	94.093	0.5	2	87.866	30.04	87.99	81.993
4/28/2016	7:56:01 PM :	88	98	99	258	103	0.5	2.3	94.731	0.5	2	88.464	30.05	88.596	82.56
4/28/2016	7:57:01 PM :	88	98	99	261	103	0.5	2.4	95.259	0.5	2	89.063	30.05	89.098	83.128
4/28/2016	7:58:01 PM :	87	98	99	258	103	0.5	2.4	95.764	0.5	2	89.561	30.05	89.578	83.6
4/28/2016	7:59:01 PM :	87	98	98	254	103	0.499	2.4	96.297	0.5	2	90.04	30.05	90.085	84.055
4/28/2016	8:00:01 PM :	87	98	98	254	103	0.5	2.3	96.948	0.5	2	90.546	30.05	90.704	84.536
4/28/2016	8:01:01 PM :	87	98	98	259	103	0.5	2.3	97.566	0.5	2	91.063	30.05	91.291	85.027
4/28/2016	8:02:01 PM :	87	98	98	261	103	0.5	2.4	98.111	0.5	2	91.633	30.05	91.809	85.568
4/28/2016	8:03:01 PM :	87	97	98	258	103	0.501	2.4	98.591	0.5	2	92.215	30.05	92.266	86.12
4/28/2016	8:04:01 PM :	87	97	98	253	103	0.5	2.4	99.111	0.499	2	92.721	30.05	92.76	86.601
4/28/2016	8:05:01 PM :	87	97	98	255	103	0.5	2.3	99.769	0.5	2	93.18	30.05	93.386	87.037
4/28/2016	8:06:01 PM :	87	97	98	260	103	0.501	2.3	100.4	0.5	2	93.654	30.05	93.987	87.487
4/28/2016	8:07:01 PM :	87	97	98	260	103	0.501	2.4	100.937	0.5	2	94.249	30.05	94.498	88.053
4/28/2016	8:08:01 PM :	87	97	98	257	103	0.501	2.4	101.425	0.5	2	94.867	30.05	94.961	88.64
4/28/2016	8:09:01 PM :	87	97	98	253	103	0.5	2.4	101.962	0.5	2	95.359	30.05	95.473	89.107
4/28/2016	8:10:01 PM :	87	97	98	255	103	0.5	2.3	102.586	0.5	2	95.813	30.05	96.066	89.539

4/28/2016	8:11:01 PM :	87	97	98	260	103	0.5	2.4	103.244	0.5	2	96.312	30.05	96.692	90.013
4/28/2016	8:12:01 PM :	87	97	98	260	103	0.501	2.4	103.762	0.5	2	96.872	30.05	97.186	90.545
4/28/2016	8:13:01 PM :	87	97	98	256	103	0.5	2.4	104.276	0.499	2	97.465	30.05	97.675	91.109
4/28/2016	8:14:01 PM :	87	97	98	253	103	0.499	2.4	104.806	0.5	2	97.997	30.05	98.18	91.615
4/28/2016	8:15:01 PM :	87	97	98	256	103	0.5	2.4	105.422	0.5	2	98.486	30.05	98.766	92.08
4/28/2016	8:16:01 PM :	87	97	97	261	103	0.498	2.4	106.052	0.499	2	98.963	30.05	99.367	92.533
4/28/2016	8:17:01 PM :	87	97	97	260	103	0.5	2.4	106.591	0.5	2	99.457	30.05	99.88	93.004
4/28/2016	8:18:01 PM :	87	97	97	255	102	0.5	2.4	107.105	0.5	2	100.042	30.05	100.369	93.56
4/28/2016	8:19:01 PM :	87	97	97	253	102	0.501	2.4	107.656	0.5	2	100.658	30.05	100.894	94.146
4/28/2016	8:20:01 PM :	87	97	97	257	102	0.5	2.4	108.275	0.5	2	101.147	30.05	101.484	94.611
4/28/2016	8:21:01 PM :	87	97	97	261	102	0.498	2.4	108.861	0.5	2	101.584	30.05	102.042	95.027
4/28/2016	8:22:01 PM :	87	96	97	259	102	0.501	2.4	109.418	0.5	2	102.071	30.05	102.572	95.491
4/28/2016	8:23:01 PM :	87	96	97	255	102	0.5	2.4	109.932	0.5	2	102.686	30.05	103.062	96.075
4/28/2016	8:24:01 PM :	87	96	97	253	102	0.5	2.4	110.513	0.5	2	103.289	30.05	103.617	96.648
4/28/2016	8:25:01 PM :	87	96	97	258	102	0.5	2.4	111.114	0.5	2	103.765	30.05	104.189	97.102
4/28/2016	8:26:01 PM :	87	96	97	261	102	0.5	2.4	111.696	0.499	2	104.236	30.05	104.744	97.55
4/28/2016	8:27:01 PM :	87	96	97	259	102	0.5	2.4	112.223	0.5	2	104.754	30.05	105.246	98.042
4/28/2016	8:28:01 PM :	87	96	97	254	102	0.499	2.4	112.772	0.5	2	105.288	30.05	105.769	98.55
4/28/2016	8:29:01 PM :	87	96	97	254	102	0.5	2.4	113.359	0.5	2	105.855	30.05	106.329	99.09
4/28/2016	8:30:01 PM :	87	96	97	258	102	0.5	2.4	113.989	0.5	2	106.397	30.05	106.929	99.606
4/28/2016	8:31:01 PM :	87	96	97	261	102	0.5	2.4	114.529	0.5	2	106.931	30.05	107.445	100.114
4/28/2016	8:32:01 PM :	87	96	97	258	102	0.5	2.4	115.031	0.5	2	107.391	30.05	107.923	100.553
4/28/2016	8:33:01 PM :	87	96	97	254	102	0.501	2.4	115.592	0.5	2	107.863	30.05	108.458	101.002
4/28/2016	8:34:01 PM :	87	96	97	254	102	0.5	2.4	116.196	0.5	2	108.442	30.05	109.034	101.553
4/28/2016	8:35:01 PM :	87	96	97	259	102	0.5	2.4	116.832	0.5	2	109.093	30.06	109.64	102.174
4/28/2016	8:36:01 PM :	87	96	97	261	102	0.5	2.4	117.364	0.5	2	109.572	30.06	110.148	102.63
4/28/2016	8:37:01 PM :	87	96	97	258	102	0.5	2.4	117.863	0.5	2	109.997	30.06	110.623	103.035
4/28/2016	8:38:01 PM :	87	96	97	254	102	0.5	2.4	118.402	0.5	2	110.489	30.06	111.137	103.503
4/28/2016	8:39:01 PM :	86	96	97	254	102	0.499	2.4	119.046	0.5	2	111.099	30.06	111.751	104.084
4/28/2016	8:40:01 PM :	87	96	97	259	102	0.5	2.4	119.667	0.5	2	111.693	30.06	112.344	104.65
4/28/2016	8:41:01 PM :	86	96	97	261	102	0.5	2.4	120.208	0.5	2	112.178	30.06	112.86	105.112
4/28/2016	8:42:01 PM :	86	96	97	258	102	0.501	2.4	120.691	0.5	2	112.657	30.06	113.322	105.569
4/28/2016	8:43:01 PM :	86	96	97	253	102	0.5	2.4	121.212	0.5	2	113.169	30.06	113.819	106.056
4/28/2016	8:44:01 PM :	86	96	97	255	102	0.5	2.4	121.871	0.5	2	113.687	30.06	114.448	106.55
4/28/2016	8:45:01 PM :	86	96	97	259	102	0.499	2.4	122.5	0.5	2	114.256	30.06	115.048	107.091
4/28/2016	8:46:01 PM :	86	96	97	260	102	0.5	2.4	123.035	0.5	2	114.831	30.06	115.558	107.639
4/28/2016	8:47:01 PM :	86	96	96	257	102	0.5	2.4	123.516	0.5	2	115.338	30.06	116.018	108.122
4/28/2016	8:48:01 PM :	87	96	96	253	102	0.5	2.4	124.058	0.5	2	115.797	30.06	116.535	108.56
4/28/2016	8:49:01 PM :	87	96	97	256	102	0.5	2.4	124.681	0.5	2	116.272	30.06	117.13	109.012
4/28/2016	8:50:01 PM :	86	96	96	260	102	0.5	2.4	125.337	0.5	2	116.864	30.06	117.756	109.576
4/28/2016	8:51:01 PM :	87	96	96	260	102	0.5	2.4	125.856	0.5	2	117.484	30.06	118.25	110.168
4/28/2016	8:52:01 PM :	86	96	96	256	102	0.5	2.4	126.367	0.5	2	117.975	30.06	118.738	110.636
4/28/2016	8:53:01 PM :	86	96	96	253	102	0.5	2.4	126.888	0.5	2	118.419	30.06	119.235	111.059
4/28/2016	8:54:01 PM :	86	96	96	256	102	0.5	2.4	127.498	0.5	2	118.921	30.06	119.818	111.538
4/28/2016	8:55:01 PM :	86	96	96	260	102	0.5	2.4	128.148	0.5	2	119.486	30.06	120.439	112.077
4/28/2016	8:56:01 PM :	86	96	96	260	102	0.5	2.4	128.68	0.5	2	120.077	30.06	120.946	112.64
4/28/2016	8:57:01 PM :	86	96	96	256	102	0.5	2.4	129.2	0.5	2	120.599	30.06	121.443	113.137
4/28/2016	8:58:01 PM :	86	96	96	253	102	0.501	2.4	129.739	0.5	2	121.094	30.06	121.957	113.609
4/28/2016	8:59:01 PM :	86	96	96	256	102	0.5	2.4	130.358	0.5	2	121.574	30.06	122.548	114.067
4/28/2016	9:00:01 PM :	86	96	96	260	102	0.499	2.4	130.954	0.5	2	122.071	30.06	123.117	114.541

4/28/2016	9:01:01 PM :	86	96	96	260	102	0.5	2.4	131.515	0.5	2	122.654	30.06	123.652	115.097
4/28/2016	9:02:01 PM :	86	96	96	256	102	0.5	2.4	132.025	0.5	2	123.268	30.06	124.139	115.682
4/28/2016	9:03:01 PM :	86	96	96	253	102	0.5	2.4	132.597	0.499	2	123.751	30.06	124.685	116.143
4/28/2016	9:04:01 PM :	87	96	96	257	102	0.5	2.4	133.201	0.5	2	124.192	30.07	125.262	116.564
4/28/2016	9:05:01 PM :	86	96	96	261	102	0.499	2.4	133.769	0.5	2	124.675	30.07	125.804	117.024
4/28/2016	9:06:01 PM :	86	96	96	260	102	0.499	2.4	134.316	0.5	2	125.293	30.07	126.326	117.614
4/28/2016	9:07:01 PM :	86	96	96	255	102	0.5	2.4	134.852	0.5	2	125.891	30.07	126.838	118.184
4/28/2016	9:08:01 PM :	86	96	96	253	102	0.5	2.4	135.44	0.5	2	126.368	30.07	127.399	118.639
4/28/2016	9:09:01 PM :	86	96	96	257	102	0.501	2.4	136.051	0.5	2	126.836	30.07	127.983	119.085
4/28/2016	9:10:01 PM :	86	96	96	261	102	0.5	2.4	136.61	0.5	2	127.357	30.07	128.516	119.583
4/28/2016	9:11:01 PM :	86	96	96	260	102	0.5	2.4	137.118	0.5	2	127.885	30.07	129.001	120.086
4/28/2016	9:12:01 PM :	86	96	96	255	102	0.5	2.4	137.681	0.5	2	128.452	30.07	129.539	120.627
4/28/2016	9:13:01 PM :	86	95	96	253	102	0.501	2.4	138.269	0.5	2	129.005	30.07	130.101	121.155
4/28/2016	9:14:01 PM :	86	95	96	258	102	0.5	2.4	138.903	0.5	2	129.53	30.07	130.707	121.655
4/28/2016	9:15:01 PM :	86	95	96	261	102	0.5	2.4	139.433	0.5	2	129.987	30.07	131.213	122.091
4/28/2016	9:16:01 PM :	86	95	96	259	102	0.5	2.4	139.932	0.5	2	130.458	30.07	131.69	122.541
4/28/2016	9:17:01 PM :	85	95	96	254	102	0.499	2.4	140.485	0.5	2	131.041	30.07	132.218	123.096
4/28/2016	9:18:01 PM :	85	95	96	253	102	0.5	2.4	141.108	0.5	2	131.689	30.07	132.814	123.714
4/28/2016	9:19:01 PM :	85	95	96	258	102	0.499	2.4	141.733	0.5	2	132.168	30.07	133.412	124.171
4/28/2016	9:20:01 PM :	85	95	96	261	102	0.499	2.4	142.266	0.5	2	132.597	30.07	133.921	124.58
4/28/2016	9:21:01 PM :	85	95	96	259	102	0.5	2.4	142.764	0.499	2	133.09	30.07	134.397	125.051
4/28/2016	9:22:01 PM :	85	95	96	254	102	0.5	2.4	143.29	0.5	2	133.69	30.07	134.899	125.623
4/28/2016	9:23:01 PM :	85	95	96	254	102	0.499	2.4	143.946	0.5	2	134.285	30.07	135.526	126.19
4/28/2016	9:24:01 PM :	85	95	96	258	102	0.5	2.4	144.566	0.5	2	134.779	30.07	136.119	126.662
4/28/2016	9:25:01 PM :	85	95	96	261	101	0.499	2.4	145.103	0.5	2	135.256	30.08	136.633	127.117
4/28/2016	9:26:01 PM :	85	95	96	259	101	0.499	2.4	145.584	0.5	2	135.76	30.08	137.093	127.599
4/28/2016	9:27:01 PM :	85	95	96	254	101	0.5	2.4	146.11	0.5	2	136.277	30.08	137.595	128.092
4/28/2016	9:28:01 PM :	85	95	96	253	101	0.501	2.4	146.758	0.5	2	136.848	30.08	138.214	128.638
4/28/2016	9:29:01 PM :	85	95	95	258	101	0.5	2.4	147.398	0.5	2	137.429	30.08	138.826	129.193
4/28/2016	9:30:01 PM :	85	95	96	261	101	0.499	2.4	147.932	0.5	2	137.935	30.08	139.337	129.676
4/28/2016	9:31:01 PM :	85	95	96	259	101	0.5	2.4	148.425	0.5	2	138.389	30.08	139.808	130.109
4/28/2016	9:32:01 PM :	85	95	96	254	101	0.499	2.4	148.96	0.5	2	138.869	30.08	140.319	130.568
4/28/2016	9:33:01 PM :	85	95	96	253	101	0.5	2.4	149.577	0.5	2	139.463	30.07	140.909	131.135
4/28/2016	9:34:01 PM :	85	95	96	258	101	0.5	2.4	150.231	0.5	2	140.077	30.07	141.534	131.722
4/28/2016	9:35:01 PM :	85	95	96	261	101	0.501	2.4	150.749	0.5	2	140.566	30.07	142.029	132.189
4/28/2016	9:36:01 PM :	85	95	96	259	101	0.5	2.4	151.265	0.5	2	141.024	30.07	142.522	132.626
4/28/2016	9:37:01 PM :	85	95	96	254	101	0.501	2.4	151.791	0.5	2	141.52	30.07	143.025	133.099
4/28/2016	9:38:01 PM :	85	95	96	253	101	0.499	2.4	152.416	0.5	2	142.077	30.07	143.624	133.631
4/28/2016	9:39:01 PM :	85	95	96	258	101	0.501	2.4	153.039	0.5	2	142.668	30.07	144.219	134.195
4/28/2016	9:40:01 PM :	85	95	96	261	101	0.501	2.4	153.582	0.5	2	143.2	30.07	144.739	134.703
4/28/2016	9:41:01 PM :	85	95	96	259	101	0.501	2.4	154.098	0.5	2	143.694	30.07	145.232	135.175
4/28/2016	9:42:01 PM :	85	95	96	254	101	0.5	2.4	154.654	0.5	2	144.168	30.08	145.765	135.627
4/28/2016	9:43:01 PM :	85	95	96	254	101	0.5	2.4	155.264	0.5	2	144.654	30.08	146.348	136.091
4/28/2016	9:44:01 PM :	85	95	96	259	101	0.5	2.4	155.842	0.5	2	145.235	30.08	146.901	136.646
4/28/2016	9:45:01 PM :	85	95	96	261	101	0.5	2.4	156.398	0.5	2	145.865	30.08	147.434	137.248
4/28/2016	9:46:01 PM :	85	95	96	258	101	0.499	2.4	156.914	0.5	2	146.344	30.08	147.927	137.705
4/28/2016	9:47:01 PM :	86	95	96	254	101	0.499	2.4	157.5	0.5	2	146.777	30.08	148.488	138.119
4/28/2016	9:48:01 PM :	86	95	96	254	101	0.5	2.4	158.103	0.5	2	147.26	30.08	149.064	138.58
4/28/2016	9:49:01 PM :	85	95	96	259	101	0.5	2.4	158.674	0.5	2	147.884	30.08	149.611	139.176
4/28/2016	9:50:01 PM :	85	95	96	260	101	0.499	2.4	159.198	0.499	2	148.477	30.08	150.113	139.742

4/28/2016	9:51:01 PM :	85	95	96	257	101	0.499	2.4	159.745	0.5	2.1	148.954	30.08	150.636	140.197
4/28/2016	9:52:01 PM :	85	95	96	253	101	0.5	2.4	160.334	0.5	2	149.425	30.08	151.199	140.647
4/28/2016	9:53:01 PM :	85	95	96	255	101	0.499	2.4	160.965	0.5	2	149.949	30.08	151.803	141.147
4/28/2016	9:54:01 PM :	85	95	96	260	101	0.5	2.4	161.503	0.5	2	150.473	30.08	152.318	141.648
4/28/2016	9:55:01 PM :	85	95	96	261	101	0.5	2.4	162.002	0.5	2.1	151.034	30.08	152.796	142.184
4/28/2016	9:56:01 PM :	85	95	96	258	101	0.5	2.4	162.564	0.5	2.1	151.594	30.08	153.333	142.718
4/28/2016	9:57:01 PM :	85	95	96	253	101	0.5	2.4	163.167	0.5	2	152.117	30.08	153.91	143.218
4/28/2016	9:58:01 PM :	85	95	96	255	101	0.5	2.4	163.8	0.5	2	152.575	30.08	154.516	143.655
4/28/2016	9:59:01 PM :	85	95	96	260	101	0.5	2.4	164.326	0.5	2	153.042	30.08	155.019	144.101
4/28/2016	10:00:01 PM :	85	95	96	261	101	0.501	2.4	164.83	0.499	2.1	153.626	30.08	155.502	144.659
4/28/2016	10:01:01 PM :	85	95	96	258	101	0.5	2.4	165.372	0.5	2.1	154.264	30.08	156.02	145.268
4/28/2016	10:02:01 PM :	85	95	96	253	101	0.5	2.4	166.01	0.5	2.1	154.745	30.08	156.631	145.727
4/28/2016	10:03:01 PM :	85	95	96	255	101	0.499	2.4	166.633	0.5	2	155.183	30.08	157.227	146.146
4/28/2016	10:04:01 PM :	85	95	95	260	101	0.5	2.4	167.176	0.5	2	155.677	30.08	157.746	146.618
4/28/2016	10:05:01 PM :	85	95	96	260	101	0.5	2.4	167.655	0.5	2.1	156.26	30.08	158.205	147.175
4/28/2016	10:06:01 PM :	85	95	95	256	101	0.501	2.4	168.179	0.5	2.1	156.859	30.08	158.706	147.747
4/28/2016	10:07:01 PM :	85	95	95	253	101	0.5	2.4	168.835	0.5	2	157.361	30.08	159.334	148.227
4/28/2016	10:08:01 PM :	85	95	95	256	101	0.5	2.4	169.462	0.5	2	157.846	30.08	159.934	148.691
4/28/2016	10:09:01 PM :	85	95	95	261	101	0.5	2.4	169.998	0.5	2	158.336	30.08	160.448	149.16
4/28/2016	10:10:01 PM :	85	95	95	260	101	0.499	2.4	170.482	0.5	2.1	158.842	30.09	160.91	149.644
4/28/2016	10:11:01 PM :	85	95	95	256	101	0.5	2.4	171.022	0.5	2.1	159.421	30.09	161.427	150.197
4/28/2016	10:12:01 PM :	85	95	95	253	101	0.5	2.4	171.649	0.5	2	160.018	30.09	162.028	150.768
4/28/2016	10:13:01 PM :	85	95	95	256	101	0.499	2.4	172.299	0.5	2	160.509	30.09	162.65	151.237
4/28/2016	10:14:01 PM :	85	95	95	261	101	0.499	2.4	172.819	0.5	2.1	160.954	30.09	163.148	151.663
4/28/2016	10:15:01 PM :	85	95	95	260	101	0.501	2.4	173.329	0.5	2.1	161.438	30.09	163.636	152.126
4/28/2016	10:16:01 PM :	85	95	95	256	101	0.501	2.4	173.853	0.5	2.1	162.043	30.09	164.138	152.704
4/28/2016	10:17:01 PM :	85	95	95	253	101	0.499	2.4	174.462	0.5	2.1	162.649	30.09	164.72	153.284
4/28/2016	10:18:01 PM :	85	95	95	256	101	0.5	2.4	175.116	0.499	2	163.128	30.09	165.346	153.742
4/28/2016	10:19:01 PM :	85	95	95	261	101	0.499	2.4	175.638	0.5	2.1	163.584	30.09	165.846	154.177
4/28/2016	10:20:01 PM :	85	95	95	260	101	0.5	2.4	176.156	0.5	2.1	164.105	30.09	166.342	154.676
4/28/2016	10:21:01 PM :	85	95	95	255	101	0.5	2.4	176.688	0.5	2.1	164.641	30.09	166.851	155.188
4/28/2016	10:22:01 PM :	85	95	95	253	101	0.5	2.4	177.312	0.5	2	165.213	30.09	167.448	155.735
4/28/2016	10:23:01 PM :	85	95	95	258	101	0.5	2.4	177.916	0.5	2	165.762	30.09	168.026	156.26
4/28/2016	10:24:01 PM :	85	95	95	261	101	0.499	2.4	178.469	0.499	2.1	166.28	30.09	168.555	156.755
4/28/2016	10:25:01 PM :	85	95	95	260	101	0.498	2.4	178.977	0.5	2.1	166.739	30.09	169.042	157.194
4/28/2016	10:26:01 PM :	85	95	95	255	101	0.501	2.4	179.548	0.5	2.1	167.214	30.09	169.588	157.648
4/28/2016	10:27:01 PM :	85	95	95	253	101	0.499	2.4	180.148	0.5	2	167.787	30.09	170.163	158.196
4/28/2016	10:28:01 PM :	85	95	95	257	101	0.5	2.4	180.726	0.5	2	168.441	30.09	170.716	158.821
4/28/2016	10:29:01 PM :	85	95	95	261	101	0.5	2.4	181.278	0.5	2.1	168.916	30.09	171.244	159.275
4/28/2016	10:30:01 PM :	85	95	95	260	101	0.5	2.4	181.8	0.5	2.1	169.343	30.09	171.744	159.684
4/28/2016	10:31:01 PM :	85	95	95	255	101	0.501	2.4	182.381	0.5	2.1	169.832	30.09	172.301	160.151
4/28/2016	10:32:01 PM :	85	95	95	253	101	0.5	2.4	182.99	0.5	2	170.446	30.09	172.883	160.739
4/28/2016	10:33:01 PM :	85	95	95	258	101	0.5	2.4	183.558	0.5	2	171.037	30.09	173.427	161.304
4/28/2016	10:34:01 PM :	85	95	95	261	101	0.5	2.4	184.076	0.5	2.1	171.522	30.09	173.922	161.767
4/28/2016	10:35:01 PM :	84	95	95	259	101	0.5	2.4	184.631	0.5	2.1	171.997	30.09	174.454	162.222
4/28/2016	10:36:01 PM :	84	94	95	255	101	0.5	2.4	185.218	0.5	2.1	172.507	30.09	175.017	162.71
4/28/2016	10:37:01 PM :	84	95	95	254	101	0.501	2.4	185.859	0.5	2.1	173.027	30.09	175.63	163.206
4/28/2016	10:38:01 PM :	84	95	95	259	101	0.5	2.4	186.387	0.5	2.1	173.596	30.09	176.135	163.751
4/28/2016	10:39:01 PM :	84	95	95	261	101	0.5	2.4	186.882	0.5	2.1	174.171	30.09	176.609	164.3
4/28/2016	10:40:01 PM :	84	95	95	259	101	0.499	2.4	187.444	0.5	2.1	174.673	30.09	177.148	164.781

4/28/2016	10:41:01 PM :	84	94	95	254	101	0.5	2.4	188.054	0.5	2.1	175.135	30.09	177.732	165.222
4/28/2016	10:42:01 PM :	84	95	95	254	101	0.5	2.4	188.685	0.5	2.1	175.609	30.09	178.336	165.676
4/28/2016	10:43:01 PM :	85	95	95	259	101	0.5	2.4	189.209	0.5	2.1	176.2	30.09	178.838	166.241
4/28/2016	10:44:01 PM :	85	95	95	261	101	0.499	2.4	189.71	0.5	2.1	176.816	30.09	179.318	166.83
4/28/2016	10:45:01 PM :	85	95	95	258	101	0.499	2.4	190.247	0.499	2.1	177.309	30.09	179.832	167.301
4/28/2016	10:46:01 PM :	85	95	95	254	101	0.5	2.4	190.893	0.5	2.1	177.76	30.09	180.449	167.733
4/28/2016	10:47:01 PM :	85	95	95	254	101	0.499	2.4	191.512	0.5	2.1	178.257	30.09	181.042	168.208
4/28/2016	10:48:01 PM :	85	95	95	260	101	0.501	2.4	192.053	0.5	2.1	178.814	30.09	181.56	168.741
4/28/2016	10:49:01 PM :	84	95	95	261	101	0.499	2.4	192.533	0.5	2.1	179.399	30.09	182.02	169.3
4/28/2016	10:50:01 PM :	84	95	95	258	101	0.499	2.4	193.053	0.5	2.1	179.927	30.09	182.518	169.805
4/28/2016	10:51:01 PM :	84	95	95	254	101	0.499	2.4	193.71	0.5	2.1	180.429	30.09	183.146	170.285
4/28/2016	10:52:01 PM :	84	95	95	254	101	0.5	2.4	194.341	0.5	2.1	180.906	30.09	183.751	170.741
4/28/2016	10:53:01 PM :	84	95	95	259	101	0.5	2.4	194.875	0.5	2.1	181.391	30.09	184.262	171.205
4/28/2016	10:54:01 PM :	84	95	95	261	101	0.501	2.4	195.356	0.5	2.1	181.972	30.09	184.722	171.76
4/28/2016	10:55:01 PM :	84	95	95	258	101	0.5	2.4	195.891	0.5	2.1	182.602	30.09	185.235	172.363
4/28/2016	10:56:01 PM :	84	95	95	254	101	0.5	2.4	196.519	0.5	2.1	183.082	30.09	185.836	172.822
4/28/2016	10:57:01 PM :	84	94	95	254	101	0.5	2.4	197.174	0.5	2.1	183.516	30.09	186.463	173.237
4/28/2016	10:58:01 PM :	84	94	95	259	101	0.499	2.4	197.694	0.5	2.1	183.997	30.09	186.961	173.697
4/28/2016	10:59:01 PM :	84	95	95	261	101	0.499	2.4	198.202	0.5	2.1	184.624	30.09	187.448	174.297
4/28/2016	11:00:01 PM :	84	94	95	258	101	0.5	2.4	198.724	0.5	2.1	185.219	30.09	187.948	174.866
4/28/2016	11:01:01 PM :	84	94	95	253	101	0.5	2.4	199.334	0.5	2.1	185.696	30.09	188.533	175.322
4/28/2016	11:02:01 PM :	84	94	95	255	101	0.5	2.4	199.987	0.5	2.1	186.164	30.09	189.158	175.769
4/28/2016	11:03:01 PM :	84	94	95	260	101	0.5	2.4	200.513	0.5	2.1	186.692	30.09	189.662	176.274
4/28/2016	11:04:01 PM :	84	94	95	261	101	0.5	2.4	201.025	0.5	2.1	187.211	30.09	190.152	176.771
4/28/2016	11:05:01 PM :	84	94	95	258	101	0.5	2.4	201.559	0.5	2.1	187.774	30.09	190.664	177.309
4/28/2016	11:06:01 PM :	84	94	95	253	101	0.5	2.4	202.182	0.5	2.1	188.332	30.09	191.261	177.842
4/28/2016	11:07:01 PM :	84	94	95	254	101	0.5	2.4	202.786	0.5	2.1	188.854	30.09	191.84	178.342
4/28/2016	11:08:01 PM :	84	94	95	259	101	0.5	2.4	203.339	0.5	2.1	189.315	30.09	192.37	178.782
4/28/2016	11:09:01 PM :	84	94	95	261	101	0.499	2.4	203.847	0.5	2.1	189.784	30.09	192.857	179.23
4/28/2016	11:10:01 PM :	84	94	95	258	101	0.5	2.4	204.415	0.5	2.1	190.367	30.09	193.401	179.788
4/28/2016	11:11:01 PM :	84	94	95	254	101	0.5	2.4	205.018	0.5	2.1	191.003	30.09	193.978	180.396
4/28/2016	11:12:01 PM :	85	94	95	255	101	0.501	2.4	205.595	0.5	2.1	191.486	30.09	194.532	180.858
4/28/2016	11:13:01 PM :	85	94	95	260	101	0.5	2.4	206.148	0.5	2.1	191.923	30.09	195.061	181.276
4/28/2016	11:14:01 PM :	85	94	95	261	101	0.499	2.5	206.67	0.5	2.1	192.417	30.09	195.561	181.748
4/28/2016	11:15:01 PM :	85	94	95	258	101	0.5	2.5	207.258	0.5	2.1	193.005	30.09	196.124	182.31
4/28/2016	11:16:01 PM :	85	94	95	253	101	0.5	2.4	207.862	0.5	2.1	193.603	30.09	196.703	182.882
4/28/2016	11:17:01 PM :	85	94	95	255	101	0.5	2.4	208.43	0.5	2.1	194.105	30.08	197.247	183.362
4/28/2016	11:18:01 PM :	85	94	95	260	101	0.499	2.4	208.948	0.5	2.1	194.586	30.08	197.744	183.822
4/28/2016	11:19:01 PM :	85	94	95	261	101	0.499	2.4	209.503	0.5	2.1	195.082	30.08	198.275	184.296
4/28/2016	11:20:01 PM :	85	94	95	257	101	0.501	2.5	210.09	0.5	2.1	195.595	30.08	198.837	184.786
4/28/2016	11:21:01 PM :	85	94	95	253	101	0.499	2.4	210.723	0.5	2.1	196.168	30.08	199.444	185.334
4/28/2016	11:22:01 PM :	84	94	95	255	101	0.5	2.4	211.255	0.5	2.1	196.761	30.08	199.953	185.901
4/28/2016	11:23:01 PM :	84	94	95	260	101	0.5	2.4	211.75	0.5	2.1	197.255	30.08	200.428	186.374
4/28/2016	11:24:01 PM :	84	94	95	260	101	0.499	2.5	212.316	0.5	2.1	197.707	30.08	200.97	186.805
4/28/2016	11:25:01 PM :	84	94	95	256	101	0.5	2.5	212.926	0.5	2.1	198.191	30.08	201.555	187.268
4/28/2016	11:26:01 PM :	84	94	95	253	101	0.5	2.4	213.562	0.5	2.1	198.789	30.08	202.163	187.84
4/28/2016	11:27:01 PM :	84	94	95	256	101	0.5	2.4	214.086	0.5	2.1	199.398	30.08	202.665	188.422
4/28/2016	11:28:01 PM :	84	94	95	260	101	0.5	2.4	214.588	0.5	2.1	199.883	30.08	203.146	188.885
4/28/2016	11:29:01 PM :	84	94	95	260	101	0.5	2.5	215.12	0.5	2.1	200.338	30.08	203.656	189.321
4/28/2016	11:30:01 PM :	84	94	95	256	101	0.499	2.5	215.77	0.5	2.1	200.851	30.08	204.279	189.811

4/28/2016	11:31:01 PM :	84	94	95	253	101	0.5	2.4	216.391	0.5	2.1	201.396	30.09	204.873	190.332
4/28/2016	11:32:01 PM :	85	94	95	256	101	0.501	2.4	216.935	0.5	2.1	201.971	30.09	205.395	190.882
4/28/2016	11:33:01 PM :	85	94	95	261	101	0.5	2.4	217.411	0.5	2.1	202.507	30.09	205.851	191.395
4/28/2016	11:34:01 PM :	85	94	95	260	101	0.5	2.5	217.931	0.5	2.1	203.022	30.09	206.349	191.887
4/28/2016	11:35:01 PM :	85	94	95	256	101	0.501	2.5	218.589	0.5	2.1	203.489	30.08	206.979	192.334
4/28/2016	11:36:01 PM :	85	94	95	253	101	0.501	2.4	219.224	0.5	2.1	203.968	30.08	207.588	192.792
4/28/2016	11:37:01 PM :	85	94	95	256	101	0.501	2.4	219.76	0.5	2.1	204.548	30.08	208.102	193.346
4/28/2016	11:38:01 PM :	85	94	95	261	101	0.5	2.4	220.245	0.5	2.1	205.195	30.08	208.566	193.965
4/28/2016	11:39:01 PM :	85	94	95	260	101	0.5	2.5	220.777	0.5	2.1	205.666	30.08	209.076	194.415
4/28/2016	11:40:01 PM :	85	94	95	255	101	0.501	2.5	221.405	0.5	2.1	206.099	30.08	209.677	194.829
4/28/2016	11:41:01 PM :	85	94	95	253	101	0.5	2.4	222.063	0.5	2.1	206.58	30.08	210.308	195.289
4/28/2016	11:42:01 PM :	85	94	95	257	101	0.5	2.4	222.579	0.5	2.1	207.2	30.08	210.802	195.882
4/28/2016	11:43:01 PM :	84	94	95	261	101	0.501	2.4	223.089	0.5	2.1	207.799	30.08	211.291	196.455
4/28/2016	11:44:01 PM :	84	94	95	260	101	0.5	2.5	223.611	0.5	2.1	208.274	30.08	211.791	196.909
4/28/2016	11:45:01 PM :	84	94	95	255	101	0.501	2.5	224.224	0.5	2.1	208.747	30.08	212.377	197.362
4/28/2016	11:46:01 PM :	84	94	95	253	101	0.499	2.4	224.87	0.5	2.1	209.267	30.08	212.997	197.859
4/28/2016	11:47:01 PM :	83	94	95	257	101	0.5	2.4	225.402	0.5	2.1	209.783	30.08	213.506	198.353
4/28/2016	11:48:01 PM :	83	94	95	261	101	0.5	2.4	225.918	0.5	2.1	210.35	30.08	214	198.896
4/28/2016	11:49:01 PM :	83	94	95	259	101	0.501	2.5	226.457	0.5	2.1	210.919	30.08	214.517	199.44
4/28/2016	11:50:01 PM :	83	94	95	255	101	0.5	2.5	227.077	0.5	2.1	211.427	30.08	215.111	199.926
4/28/2016	11:51:01 PM :	83	94	95	254	101	0.499	2.4	227.672	0.5	2.1	211.889	30.08	215.68	200.368
4/28/2016	11:52:01 PM :	83	94	95	258	101	0.501	2.4	228.229	0.5	2.1	212.362	30.08	216.214	200.82
4/28/2016	11:53:01 PM :	83	94	95	261	101	0.5	2.4	228.739	0.5	2.1	212.95	30.08	216.702	201.384
4/28/2016	11:54:01 PM :	83	94	95	259	100	0.5	2.5	229.312	0.5	2.1	213.575	30.08	217.252	201.981
4/28/2016	11:55:01 PM :	83	94	95	254	100	0.501	2.5	229.919	0.5	2.1	214.061	30.08	217.833	202.446
4/28/2016	11:56:01 PM :	83	94	95	253	100	0.499	2.4	230.491	0.5	2.1	214.505	30.08	218.38	202.871
4/28/2016	11:57:01 PM :	85	94	95	258	100	0.5	2.4	231.034	0.5	2.1	215.007	30.08	218.9	203.352
4/28/2016	11:58:01 PM :	86	94	95	261	100	0.5	2.5	231.567	0.5	2.1	215.574	30.08	219.412	203.894
4/28/2016	11:59:01 PM :	86	94	95	259	100	0.499	2.5	232.155	0.5	2.1	216.167	30.08	219.976	204.461
4/29/2016	12:00:01 AM :	87	94	95	254	100	0.501	2.5	232.777	0.5	2.1	216.685	30.08	220.572	204.957
4/29/2016	12:01:01 AM :	88	94	95	254	100	0.501	2.4	233.331	0.5	2.1	217.177	30.08	221.104	205.428
4/29/2016	12:02:01 AM :	88	94	95	259	100	0.5	2.4	233.835	0.5	2.1	217.658	30.08	221.587	205.888
4/29/2016	12:03:01 AM :	88	94	95	261	100	0.5	2.5	234.402	0.5	2.1	218.154	30.08	222.13	206.363
4/29/2016	12:04:01 AM :	87	94	95	258	100	0.5	2.5	234.991	0.5	2.1	218.74	30.08	222.695	206.923
4/29/2016	12:05:01 AM :	87	94	94	254	99	0.5	2.4	235.626	0.5	2.1	219.352	30.08	223.304	207.51
4/29/2016	12:06:01 AM :	87	94	94	255	100	0.501	2.4	236.156	0.5	2.1	219.834	30.08	223.812	207.971
4/29/2016	12:07:01 AM :	87	94	94	260	99	0.501	2.4	236.656	0.5	2.1	220.277	30.08	224.292	208.395
4/29/2016	12:08:01 AM :	86	94	94	261	99	0.5	2.5	237.205	0.5	2.1	220.758	30.08	224.818	208.856
4/29/2016	12:09:01 AM :	86	94	94	258	99	0.499	2.5	237.837	0.5	2.1	221.377	30.08	225.423	209.449
4/29/2016	12:10:01 AM :	86	94	94	253	99	0.5	2.4	238.468	0.499	2.1	221.976	30.08	226.029	210.022
4/29/2016	12:11:01 AM :	86	94	94	255	99	0.5	2.4	239.002	0.5	2.1	222.452	30.09	226.541	210.479
4/29/2016	12:12:01 AM :	86	94	94	260	99	0.5	2.4	239.491	0.5	2.1	222.919	30.09	227.01	210.926
4/29/2016	12:13:01 AM :	86	94	94	261	99	0.5	2.5	240.017	0.5	2.1	223.44	30.09	227.514	211.425
4/29/2016	12:14:01 AM :	86	94	94	257	99	0.5	2.5	240.673	0.5	2.1	223.963	30.08	228.144	211.927
4/29/2016	12:15:01 AM :	85	94	94	253	99	0.5	2.4	241.299	0.5	2.1	224.537	30.08	228.743	212.477
4/29/2016	12:16:01 AM :	85	94	94	255	99	0.5	2.4	241.836	0.499	2.1	225.08	30.08	229.258	212.997
4/29/2016	12:17:01 AM :	86	93	94	260	99	0.5	2.4	242.314	0.5	2.1	225.605	30.08	229.717	213.499
4/29/2016	12:18:01 AM :	86	93	94	260	99	0.5	2.5	242.853	0.5	2.1	226.065	30.08	230.234	213.94
4/29/2016	12:19:01 AM :	86	93	94	256	99	0.5	2.5	243.49	0.5	2.1	226.538	30.08	230.846	214.393
4/29/2016	12:20:01 AM :	86	93	94	253	99	0.5	2.4	244.137	0.5	2.1	227.123	30.08	231.467	214.953

4/29/2016	12:21:01 AM :	86	93	94	256	99	0.5	2.4	244.658	0.5	2.1	227.763	30.08	231.967	215.567
4/29/2016	12:22:01 AM :	85	93	94	260	99	0.499	2.4	245.164	0.5	2.1	228.242	30.08	232.452	216.025
4/29/2016	12:23:01 AM :	85	93	94	260	99	0.501	2.5	245.69	0.5	2.1	228.673	30.08	232.957	216.439
4/29/2016	12:24:01 AM :	85	93	94	256	99	0.501	2.5	246.302	0.5	2.1	229.162	30.08	233.545	216.908
4/29/2016	12:25:01 AM :	84	93	94	253	99	0.5	2.4	246.958	0.5	2.1	229.764	30.08	234.175	217.485
4/29/2016	12:26:01 AM :	84	93	94	256	99	0.499	2.4	247.48	0.5	2.1	230.361	30.09	234.676	218.057
4/29/2016	12:27:01 AM :	84	93	94	261	99	0.501	2.5	247.994	0.5	2.1	230.851	30.09	235.169	218.527
4/29/2016	12:28:01 AM :	83	93	94	260	99	0.5	2.5	248.522	0.5	2.1	231.33	30.09	235.676	218.986
4/29/2016	12:29:01 AM :	83	93	94	255	99	0.5	2.5	249.152	0.5	2.1	231.837	30.09	236.28	219.472
4/29/2016	12:30:01 AM :	83	93	94	253	99	0.499	2.4	249.761	0.5	2.1	232.355	30.09	236.865	219.969
4/29/2016	12:31:01 AM :	83	93	94	257	99	0.5	2.4	250.308	0.5	2.1	232.924	30.09	237.39	220.515
4/29/2016	12:32:01 AM :	83	93	94	261	99	0.5	2.5	250.821	0.5	2.1	233.509	30.09	237.883	221.076
4/29/2016	12:33:01 AM :	83	93	94	259	99	0.501	2.5	251.389	0.5	2.1	234.007	30.09	238.428	221.553
4/29/2016	12:34:01 AM :	83	93	94	254	99	0.501	2.5	251.995	0.5	2.1	234.465	30.09	239.01	221.992
4/29/2016	12:35:01 AM :	83	93	94	253	99	0.5	2.4	252.571	0.5	2.1	234.944	30.09	239.563	222.451
4/29/2016	12:36:01 AM :	83	93	94	258	99	0.5	2.4	253.122	0.5	2.1	235.538	30.09	240.092	223.021
4/29/2016	12:37:01 AM :	83	93	94	261	99	0.5	2.5	253.646	0.5	2.1	236.152	30.09	240.595	223.61
4/29/2016	12:38:01 AM :	83	93	94	259	99	0.501	2.5	254.231	0.5	2.1	236.637	30.09	241.156	224.075
4/29/2016	12:39:01 AM :	83	93	94	254	99	0.501	2.5	254.841	0.5	2.1	237.098	30.09	241.743	224.517
4/29/2016	12:40:01 AM :	83	93	94	253	99	0.501	2.5	255.407	0.5	2.1	237.597	30.09	242.286	224.995
4/29/2016	12:41:01 AM :	83	93	94	258	99	0.501	2.5	255.926	0.5	2.1	238.15	30.09	242.785	225.526
4/29/2016	12:42:01 AM :	83	93	94	261	99	0.5	2.5	256.482	0.5	2.1	238.73	30.09	243.319	226.082
4/29/2016	12:43:01 AM :	83	93	94	259	99	0.501	2.5	257.071	0.5	2.1	239.261	30.08	243.885	226.591
4/29/2016	12:44:01 AM :	83	93	94	254	99	0.501	2.5	257.705	0.5	2.1	239.767	30.08	244.494	227.076
4/29/2016	12:45:01 AM :	83	93	94	254	99	0.5	2.4	258.238	0.5	2.1	240.24	30.08	245.006	227.53
4/29/2016	12:46:01 AM :	83	93	93	259	99	0.501	2.5	258.733	0.5	2.1	240.72	30.08	245.482	227.991
4/29/2016	12:47:01 AM :	83	93	93	261	99	0.501	2.5	259.298	0.5	2.1	241.306	30.08	246.024	228.553
4/29/2016	12:48:01 AM :	83	93	93	258	99	0.499	2.5	259.911	0.5	2.1	241.939	30.08	246.614	229.161
4/29/2016	12:49:01 AM :	83	93	93	253	99	0.5	2.5	260.542	0.499	2.1	242.414	30.08	247.22	229.616
4/29/2016	12:50:01 AM :	83	93	93	254	99	0.5	2.4	261.072	0.5	2.1	242.848	30.08	247.729	230.033
4/29/2016	12:51:01 AM :	83	93	93	259	99	0.5	2.5	261.57	0.5	2.1	243.326	30.08	248.207	230.492
4/29/2016	12:52:01 AM :	83	93	93	260	99	0.501	2.5	262.1	0.5	2.1	243.953	30.08	248.717	231.093
4/29/2016	12:53:01 AM :	83	93	93	257	99	0.5	2.5	262.759	0.5	2.1	244.55	30.08	249.349	231.665
4/29/2016	12:54:01 AM :	83	93	93	253	99	0.5	2.5	263.375	0.5	2.1	245.024	30.08	249.942	232.121
4/29/2016	12:55:01 AM :	83	93	93	255	99	0.499	2.4	263.916	0.5	2.1	245.493	30.08	250.461	232.571
4/29/2016	12:56:01 AM :	82	93	93	260	99	0.5	2.5	264.396	0.5	2.1	246.019	30.08	250.923	233.075
4/29/2016	12:57:01 AM :	82	93	93	261	99	0.499	2.5	264.916	0.5	2.1	246.541	30.08	251.422	233.577
4/29/2016	12:58:01 AM :	82	93	93	257	99	0.5	2.5	265.571	0.5	2.1	247.103	30.08	252.051	234.115
4/29/2016	12:59:01 AM :	82	93	93	253	99	0.5	2.5	266.207	0.5	2.1	247.668	30.08	252.662	234.658
4/29/2016	1:00:01 AM :	82	93	93	255	99	0.5	2.4	266.741	0.5	2.1	248.184	30.08	253.175	235.152
4/29/2016	1:01:01 AM :	82	93	93	260	99	0.5	2.5	267.232	0.5	2.1	248.643	30.08	253.647	235.593
4/29/2016	1:02:01 AM :	82	93	93	261	99	0.5	2.5	267.762	0.5	2.1	249.114	30.08	254.156	236.045
4/29/2016	1:03:01 AM :	82	93	93	257	99	0.5	2.5	268.381	0.5	2.1	249.703	30.08	254.751	236.61
4/29/2016	1:04:01 AM :	83	93	93	253	99	0.499	2.5	269.046	0.5	2.1	250.333	30.08	255.389	237.215
4/29/2016	1:05:01 AM :	83	93	93	255	99	0.501	2.4	269.558	0.5	2.1	250.813	30.08	255.881	237.675
4/29/2016	1:06:01 AM :	83	93	93	260	99	0.499	2.5	270.072	0.5	2.1	251.259	30.08	256.374	238.103
4/29/2016	1:07:01 AM :	83	93	93	260	99	0.5	2.5	270.596	0.5	2.1	251.752	30.08	256.878	238.576
4/29/2016	1:08:01 AM :	83	93	93	256	99	0.5	2.5	271.206	0.5	2.1	252.328	30.08	257.464	239.129
4/29/2016	1:09:01 AM :	83	93	93	253	98	0.501	2.5	271.852	0.5	2.1	252.931	30.08	258.084	239.707
4/29/2016	1:09:06 AM :	83	93	93	253	98	0.501	2.5	271.878	0.5	2.1	252.986	30.08	258.11	239.76

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/28/16 5:09:0 with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/29/16 1:09:06 AM: Actual Sampling Time: 0d  8h  0m  0s
04/29/16 1:09:0 with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/29/16 3:39:16 PM: PAUSE_EVENT -
04/29/16 01:11:33 AM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/29/16 01:11:33 AM: Maximum Observed Vacuum for A was 2.5 inHg
04/29/16 01:11:33 AM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/29/16 01:11:33 AM: Maximum Observed Vacuum for B was 2.1 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO --------------------------------
'           Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'           DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: Cuba Mercury Run 5 Night.pro
File Exported: 4/30/2016 12:25:53 AM (PC Time).
Company Name: Cuba

04/29/16 03:43:43 PM: Sample A: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 2 ccm (Max. allowed 20 ccm)
04/29/16 03:43:43 PM: Sample B: PRE-Leak Test PASSED at Maximum vacuum
with Flow Rate 0 ccm (Max. allowed 20 ccm)
Trap ID-A: spiked OL335435
Trap ID-B: OL343565

Run N5

Test Duration (Planned): 0d 8h 0m
Test Duration (Actual) : 0d 8h 31m
Averaging Period : 1 min.

		Stack F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (I Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (I Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES		90.3	97.5	98.2	257.9	103.2	0.5	2.2	272.03	0.5	1.9	252.902	30.02	258.858	240.951
4/29/2016	3:46:05 PM :	100	116	117	253	123	0	0.3	0	0.004	0	0	30	0	0
4/29/2016	3:46:11 PM :User Paus	100	116	117	253	123	1.07	1.6	0.105	0.788	1	0.063	30	0.097	0.058
4/29/2016	4:17:27 PM :Resumed	99	115	115	254	121	0	0.3	0.107	0.004	0	0.065	29.99	0.099	0.06
4/29/2016	4:18:26 PM :	102	114	114	256	120	0.572	1.9	0.722	0.542	1.5	0.738	29.99	0.665	0.68
4/29/2016	4:19:26 PM :	105	114	114	261	120	0.5	2.1	1.257	0.5	1.8	1.224	29.99	1.159	1.127
4/29/2016	4:20:26 PM :	107	114	114	261	120	0.5	2.1	1.808	0.5	1.8	1.672	29.99	1.667	1.54
4/29/2016	4:21:26 PM :	109	113	114	257	120	0.501	2.1	2.389	0.5	1.8	2.155	29.99	2.204	1.985
4/29/2016	4:22:26 PM :	111	113	114	253	120	0.5	2.1	3.025	0.5	1.8	2.785	29.99	2.791	2.567
4/29/2016	4:23:26 PM :	113	113	114	256	120	0.5	2.1	3.566	0.5	1.8	3.387	29.99	3.29	3.122
4/29/2016	4:24:26 PM :	113	114	114	261	120	0.501	2.1	4.071	0.5	1.8	3.878	29.99	3.756	3.574
4/29/2016	4:25:26 PM :	113	114	114	261	120	0.5	2.1	4.632	0.5	1.8	4.351	29.99	4.275	4.009
4/29/2016	4:26:26 PM :	113	114	114	257	120	0.5	2.1	5.235	0.5	1.8	4.881	29.99	4.831	4.497
4/29/2016	4:27:26 PM :	113	114	114	253	120	0.5	2.1	5.862	0.5	1.8	5.414	29.98	5.409	4.989
4/29/2016	4:28:26 PM :	112	113	114	256	120	0.5	2.1	6.4	0.5	1.8	6.003	29.98	5.906	5.531
4/29/2016	4:29:26 PM :	112	114	114	261	120	0.5	2.1	6.904	0.5	1.8	6.562	29.98	6.371	6.046
4/29/2016	4:30:26 PM :	112	114	114	261	120	0.5	2.1	7.438	0.5	1.8	7.071	29.98	6.863	6.514
4/29/2016	4:31:26 PM :	112	113	114	256	120	0.5	2.1	8.075	0.5	1.8	7.55	29.99	7.451	6.955
4/29/2016	4:32:26 PM :	113	113	114	254	120	0.501	2.1	8.695	0.5	1.8	8.038	29.98	8.024	7.405
4/29/2016	4:33:26 PM :	115	113	114	258	120	0.5	2.1	9.244	0.5	1.8	8.637	29.98	8.531	7.956
4/29/2016	4:34:26 PM :	114	113	114	261	120	0.5	2.1	9.727	0.5	1.8	9.253	29.98	8.977	8.524
4/29/2016	4:35:26 PM :	113	113	114	260	120	0.499	2.1	10.247	0.5	1.8	9.755	29.98	9.457	8.986
4/29/2016	4:36:26 PM :	113	113	114	256	120	0.501	2.1	10.898	0.499	1.8	10.211	29.98	10.057	9.406
4/29/2016	4:37:26 PM :	112	113	114	253	120	0.499	2.1	11.529	0.5	1.8	10.699	29.98	10.64	9.855
4/29/2016	4:38:26 PM :	112	113	114	257	120	0.499	2.1	12.069	0.499	1.8	11.296	29.98	11.138	10.405
4/29/2016	4:39:26 PM :	112	113	114	261	120	0.499	2.1	12.556	0.5	1.8	11.916	29.98	11.588	10.976
4/29/2016	4:40:26 PM :	113	113	114	261	120	0.501	2.1	13.09	0.5	1.8	12.416	29.98	12.081	11.436
4/29/2016	4:41:26 PM :	113	113	114	256	120	0.5	2.1	13.707	0.5	1.8	12.878	29.97	12.651	11.861
4/29/2016	4:42:26 PM :	114	113	114	253	119	0.499	2.1	14.368	0.5	1.8	13.386	29.97	13.261	12.33

4/29/2016	4:43:26 PM :	115	113	114	257	119	0.5	2.1	14.89	0.5	1.8	13.947	29.98	13.743	12.847
4/29/2016	4:44:26 PM :	114	113	114	261	119	0.5	2.1	15.404	0.5	1.8	14.551	29.97	14.218	13.404
4/29/2016	4:45:26 PM :	116	113	114	261	119	0.5	2.1	15.924	0.5	1.8	15.075	29.98	14.698	13.886
4/29/2016	4:46:26 PM :	116	113	114	257	118	0.501	2.1	16.53	0.5	1.8	15.573	29.97	15.259	14.345
4/29/2016	4:47:26 PM :	116	113	113	253	118	0.5	2.1	17.182	0.5	1.8	16.073	29.98	15.861	14.806
4/29/2016	4:48:26 PM :	114	112	113	256	118	0.5	2.1	17.72	0.5	1.8	16.584	29.98	16.359	15.278
4/29/2016	4:49:26 PM :	113	112	113	261	118	0.5	2.1	18.242	0.5	1.8	17.168	29.98	16.841	15.816
4/29/2016	4:50:26 PM :	114	112	113	261	118	0.5	2.1	18.775	0.5	1.8	17.758	29.98	17.334	16.361
4/29/2016	4:51:26 PM :	114	112	113	257	118	0.501	2.1	19.394	0.5	1.8	18.274	29.97	17.906	16.836
4/29/2016	4:52:26 PM :	112	112	113	254	117	0.5	2.1	19.992	0.5	1.8	18.742	29.97	18.46	17.268
4/29/2016	4:53:26 PM :	111	112	113	256	117	0.5	2.1	20.554	0.5	1.8	19.218	29.97	18.979	17.707
4/29/2016	4:54:26 PM :	112	111	113	261	117	0.5	2.1	21.065	0.5	1.8	19.805	29.97	19.452	18.25
4/29/2016	4:55:26 PM :	112	111	113	261	117	0.5	2.1	21.641	0.5	1.8	20.443	29.97	19.985	18.838
4/29/2016	4:56:26 PM :	110	111	113	257	117	0.499	2.1	22.24	0.5	1.8	20.941	29.97	20.539	19.298
4/29/2016	4:57:26 PM :	110	111	112	253	117	0.5	2.1	22.819	0.5	1.8	21.392	29.97	21.075	19.715
4/29/2016	4:58:26 PM :	110	111	112	256	116	0.501	2.1	23.36	0.5	1.8	21.889	29.98	21.576	20.174
4/29/2016	4:59:26 PM :	110	111	112	261	116	0.5	2.1	23.903	0.5	1.8	22.479	29.97	22.079	20.72
4/29/2016	5:00:26 PM :	109	111	112	261	116	0.501	2.1	24.495	0.5	1.8	23.089	29.98	22.627	21.284
4/29/2016	5:01:26 PM :	110	111	112	256	116	0.499	2.1	25.108	0.5	1.8	23.591	29.98	23.195	21.747
4/29/2016	5:02:26 PM :	111	111	112	253	116	0.499	2.1	25.661	0.5	1.8	24.075	29.98	23.707	22.195
4/29/2016	5:03:26 PM :	111	111	112	257	116	0.5	2.1	26.169	0.5	1.8	24.591	29.98	24.178	22.673
4/29/2016	5:04:26 PM :	112	110	112	261	116	0.499	2.1	26.738	0.5	1.8	25.113	29.98	24.706	23.155
4/29/2016	5:05:26 PM :	112	110	112	261	116	0.5	2.1	27.33	0.5	1.8	25.686	29.98	25.255	23.686
4/29/2016	5:06:26 PM :	111	110	111	256	115	0.499	2.1	27.964	0.499	1.8	26.261	29.98	25.842	24.218
4/29/2016	5:07:26 PM :	109	110	111	253	115	0.5	2.1	28.498	0.499	1.8	26.788	29.98	26.338	24.705
4/29/2016	5:08:26 PM :	106	110	111	257	115	0.5	2.1	29.008	0.499	1.8	27.254	29.99	26.811	25.137
4/29/2016	5:09:26 PM :	105	110	111	261	115	0.501	2.1	29.547	0.5	1.8	27.725	29.98	27.312	25.573
4/29/2016	5:10:26 PM :	106	110	111	261	115	0.5	2.1	30.19	0.5	1.8	28.312	29.98	27.909	26.117
4/29/2016	5:11:26 PM :	105	110	111	256	115	0.5	2.1	30.809	0.5	1.8	28.962	29.98	28.484	26.719
4/29/2016	5:12:26 PM :	106	109	111	253	114	0.5	2.1	31.356	0.5	1.8	29.451	29.98	28.992	27.172
4/29/2016	5:13:26 PM :	107	109	111	256	114	0.501	2.1	31.841	0.5	1.8	29.892	29.98	29.443	27.581
4/29/2016	5:14:26 PM :	108	109	110	261	114	0.5	2.1	32.365	0.5	1.8	30.382	29.98	29.929	28.036
4/29/2016	5:15:26 PM :	109	109	110	261	114	0.501	2.1	33.017	0.5	1.8	30.996	29.98	30.534	28.605
4/29/2016	5:16:26 PM :	109	109	110	256	114	0.5	2.1	33.651	0.5	1.8	31.597	29.98	31.124	29.163
4/29/2016	5:17:26 PM :	108	109	110	253	114	0.501	2.1	34.195	0.5	1.8	32.087	29.98	31.63	29.618
4/29/2016	5:18:26 PM :	107	109	110	257	113	0.5	2.1	34.69	0.5	1.8	32.568	29.99	32.091	30.064
4/29/2016	5:19:26 PM :	106	109	110	261	113	0.501	2.1	35.223	0.5	1.8	33.096	29.99	32.587	30.555
4/29/2016	5:20:26 PM :	105	108	110	260	113	0.5	2.1	35.838	0.5	1.8	33.62	29.99	33.159	31.042
4/29/2016	5:21:26 PM :	105	108	109	256	112	0.501	2.1	36.502	0.5	1.8	34.188	29.99	33.777	31.569
4/29/2016	5:22:26 PM :	105	108	109	253	112	0.499	2.1	37.023	0.5	1.8	34.764	29.99	34.262	32.105
4/29/2016	5:23:26 PM :	104	108	109	258	112	0.5	2.1	37.542	0.5	1.8	35.288	29.99	34.746	32.592
4/29/2016	5:24:26 PM :	104	108	109	261	112	0.501	2.1	38.067	0.5	1.8	35.754	29.99	35.235	33.025
4/29/2016	5:25:26 PM :	104	108	109	260	112	0.5	2.1	38.689	0.5	1.9	36.225	30	35.815	33.463
4/29/2016	5:26:26 PM :	104	108	109	255	112	0.5	2.1	39.311	0.5	1.8	36.807	30	36.395	34.006
4/29/2016	5:27:26 PM :	103	108	109	253	112	0.501	2.1	39.863	0.5	1.8	37.467	30	36.91	34.62
4/29/2016	5:28:26 PM :	101	107	109	258	112	0.501	2.1	40.378	0.499	1.8	37.947	30	37.39	35.066
4/29/2016	5:29:26 PM :	99	107	108	261	112	0.5	2.1	40.947	0.5	1.8	38.389	30	37.921	35.478

4/29/2016	5:30:26 PM :	100	107	108	260	111	0.501	2.1	41.546	0.5	1.9	38.873	30	38.48	35.929
4/29/2016	5:31:26 PM :	98	107	108	255	111	0.5	2.1	42.126	0.5	1.9	39.496	30	39.021	36.509
4/29/2016	5:32:26 PM :	96	107	108	254	111	0.5	2.1	42.684	0.5	1.8	40.094	30	39.542	37.067
4/29/2016	5:33:26 PM :	96	107	108	258	111	0.5	2.1	43.212	0.5	1.8	40.583	30	40.036	37.522
4/29/2016	5:34:26 PM :	97	107	108	262	111	0.5	2.1	43.799	0.5	1.9	41.054	30.01	40.584	37.962
4/29/2016	5:35:26 PM :	95	107	108	260	111	0.5	2.2	44.399	0.5	1.9	41.591	30.01	41.145	38.463
4/29/2016	5:36:26 PM :	95	107	108	255	111	0.499	2.1	44.975	0.5	1.9	42.114	30.01	41.682	38.95
4/29/2016	5:37:26 PM :	95	106	107	254	111	0.5	2.1	45.49	0.5	1.9	42.684	30.01	42.164	39.483
4/29/2016	5:38:26 PM :	96	106	107	259	111	0.501	2.1	46.054	0.5	1.9	43.243	30.01	42.691	40.005
4/29/2016	5:39:26 PM :	97	106	107	262	111	0.5	2.2	46.638	0.5	1.9	43.779	30.02	43.237	40.505
4/29/2016	5:40:26 PM :	97	106	107	260	111	0.5	2.2	47.273	0.5	1.9	44.245	30.02	43.832	40.94
4/29/2016	5:41:26 PM :	96	106	107	255	110	0.499	2.2	47.804	0.5	1.9	44.716	30.02	44.329	41.38
4/29/2016	5:42:26 PM :	96	106	107	254	110	0.501	2.1	48.307	0.5	1.8	45.296	30.02	44.8	41.922
4/29/2016	5:43:26 PM :	94	106	107	258	110	0.5	2.1	48.867	0.5	1.8	45.954	30.02	45.324	42.537
4/29/2016	5:44:26 PM :	100	106	107	262	110	0.5	2.1	49.485	0.5	1.9	46.439	30.03	45.903	42.991
4/29/2016	5:45:26 PM :	96	105	106	260	110	0.5	2.2	50.113	0.5	1.9	46.877	30.02	46.491	43.4
4/29/2016	5:46:26 PM :	95	105	106	255	109	0.5	2.2	50.654	0.5	1.9	47.362	30.02	46.998	43.854
4/29/2016	5:47:26 PM :	95	105	106	254	109	0.5	2.1	51.151	0.5	1.9	47.983	30.03	47.464	44.435
4/29/2016	5:48:26 PM :	93	105	106	258	109	0.5	2.1	51.679	0.5	1.8	48.584	30.02	47.959	44.997
4/29/2016	5:49:26 PM :	94	105	106	262	109	0.5	2.2	52.333	0.5	1.9	49.071	30.02	48.572	45.453
4/29/2016	5:50:26 PM :	90	105	106	260	109	0.5	2.2	52.954	0.5	1.9	49.546	30.02	49.155	45.898
4/29/2016	5:51:26 PM :	89	105	105	255	109	0.499	2.2	53.498	0.5	1.9	50.075	30.01	49.665	46.394
4/29/2016	5:52:26 PM :	88	104	105	253	108	0.499	2.1	53.984	0.5	1.8	50.599	30.01	50.121	46.885
4/29/2016	5:53:26 PM :	88	104	105	258	108	0.499	2.1	54.52	0.5	1.8	51.172	30.01	50.625	47.422
4/29/2016	5:54:26 PM :	89	104	105	262	108	0.5	2.2	55.152	0.5	1.9	51.724	30.01	51.217	47.939
4/29/2016	5:55:26 PM :	89	104	105	260	108	0.5	2.2	55.806	0.5	1.9	52.264	30.01	51.832	48.446
4/29/2016	5:56:26 PM :	89	104	105	256	107	0.5	2.2	56.332	0.5	1.9	52.726	30.01	52.326	48.879
4/29/2016	5:57:26 PM :	89	104	104	253	107	0.499	2.2	56.848	0.5	1.9	53.205	30.01	52.81	49.329
4/29/2016	5:58:26 PM :	88	104	104	258	107	0.5	2.2	57.368	0.5	1.9	53.783	30.01	53.299	49.871
4/29/2016	5:59:26 PM :	88	103	104	262	107	0.5	2.2	57.977	0.5	1.9	54.435	30	53.871	50.484
4/29/2016	6:00:26 PM :	88	103	104	260	107	0.499	2.2	58.631	0.5	1.9	54.916	30.01	54.486	50.935
4/29/2016	6:01:26 PM :	88	103	104	255	107	0.501	2.2	59.167	0.5	1.9	55.356	30	54.99	51.348
4/29/2016	6:02:26 PM :	89	103	104	254	107	0.499	2.2	59.685	0.5	1.9	55.855	30.01	55.478	51.817
4/29/2016	6:03:26 PM :	89	103	103	258	106	0.499	2.2	60.222	0.5	1.9	56.467	30.01	55.983	52.393
4/29/2016	6:04:26 PM :	89	103	103	262	106	0.5	2.2	60.842	0.5	1.9	57.06	30.01	56.567	52.95
4/29/2016	6:05:26 PM :	89	102	103	260	106	0.5	2.2	61.443	0.5	1.9	57.548	30.01	57.133	53.409
4/29/2016	6:06:26 PM :	89	102	103	255	106	0.5	2.2	62.005	0.5	1.9	58.011	30.01	57.662	53.845
4/29/2016	6:07:26 PM :	89	102	103	253	106	0.5	2.2	62.514	0.5	1.9	58.549	30.01	58.142	54.352
4/29/2016	6:08:26 PM :	89	102	103	258	106	0.5	2.2	63.093	0.5	1.9	59.075	30.01	58.688	54.847
4/29/2016	6:09:26 PM :	88	102	103	261	106	0.501	2.2	63.696	0.5	1.9	59.642	30.01	59.256	55.381
4/29/2016	6:10:26 PM :	88	102	103	260	106	0.499	2.2	64.273	0.5	1.9	60.2	30.01	59.8	55.905
4/29/2016	6:11:26 PM :	88	102	102	255	106	0.501	2.2	64.812	0.499	1.9	60.731	30.01	60.309	56.406
4/29/2016	6:12:26 PM :	88	102	102	254	106	0.5	2.2	65.355	0.5	1.9	61.192	30.01	60.821	56.84
4/29/2016	6:13:26 PM :	87	102	102	258	106	0.499	2.2	65.945	0.5	1.9	61.663	30.01	61.377	57.284
4/29/2016	6:14:26 PM :	87	101	102	261	106	0.5	2.2	66.574	0.5	1.9	62.246	30.02	61.971	57.834
4/29/2016	6:15:26 PM :	87	101	102	259	106	0.499	2.2	67.119	0.5	1.9	62.897	30.02	62.485	58.447
4/29/2016	6:16:26 PM :	86	101	102	254	105	0.5	2.2	67.623	0.5	1.9	63.38	30.01	62.961	58.903

4/29/2016	6:17:26 PM :	85	101	102	254	105	0.501	2.2	68.19	0.5	1.9	63.814	30.01	63.496	59.312
4/29/2016	6:18:26 PM :	85	101	101	259	105	0.5	2.2	68.795	0.5	1.9	64.302	30.01	64.067	59.773
4/29/2016	6:19:26 PM :	85	101	101	261	105	0.5	2.2	69.429	0.5	1.9	64.917	30.01	64.666	60.352
4/29/2016	6:20:26 PM :	85	101	101	259	105	0.5	2.2	69.963	0.5	1.9	65.52	30.01	65.171	60.921
4/29/2016	6:21:26 PM :	85	101	101	254	105	0.499	2.2	70.469	0.5	1.9	66	30.01	65.649	61.375
4/29/2016	6:22:26 PM :	85	100	101	254	105	0.499	2.2	71.003	0.5	1.9	66.477	30.01	66.154	61.826
4/29/2016	6:23:26 PM :	85	100	101	259	105	0.5	2.2	71.659	0.5	1.9	67.003	30.01	66.774	62.322
4/29/2016	6:24:26 PM :	85	100	101	261	105	0.5	2.2	72.278	0.5	1.9	67.525	30.01	67.359	62.815
4/29/2016	6:25:26 PM :	85	100	101	258	105	0.5	2.2	72.819	0.5	1.9	68.09	30.01	67.87	63.349
4/29/2016	6:26:26 PM :	85	100	101	254	105	0.5	2.2	73.304	0.5	1.9	68.657	30	68.329	63.885
4/29/2016	6:27:26 PM :	85	99	101	255	105	0.5	2.2	73.83	0.5	1.9	69.179	30	68.827	64.378
4/29/2016	6:28:26 PM :	85	99	100	259	105	0.5	2.2	74.482	0.5	1.9	69.643	30	69.444	64.816
4/29/2016	6:29:26 PM :	85	99	100	260	105	0.5	2.2	75.121	0.5	1.9	70.113	30	70.049	65.261
4/29/2016	6:30:26 PM :	85	99	100	257	105	0.499	2.2	75.656	0.5	1.9	70.702	30	70.555	65.818
4/29/2016	6:31:26 PM :	85	99	100	253	105	0.5	2.2	76.157	0.5	1.9	71.342	30	71.029	66.422
4/29/2016	6:32:26 PM :	85	99	100	256	105	0.5	2.2	76.685	0.5	1.9	71.829	30	71.529	66.883
4/29/2016	6:33:26 PM :	85	99	100	260	105	0.5	2.2	77.303	0.5	1.9	72.268	30	72.114	67.298
4/29/2016	6:34:26 PM :	86	99	100	260	105	0.5	2.2	77.959	0.499	1.9	72.764	30	72.735	67.767
4/29/2016	6:35:26 PM :	86	99	100	256	105	0.5	2.2	78.483	0.5	1.9	73.355	30	73.232	68.325
4/29/2016	6:36:26 PM :	86	99	99	253	105	0.5	2.2	79.001	0.5	1.9	73.958	30	73.723	68.896
4/29/2016	6:37:26 PM :	86	99	99	257	105	0.5	2.2	79.535	0.5	1.9	74.454	30	74.228	69.366
4/29/2016	6:38:26 PM :	86	99	99	261	105	0.499	2.2	80.16	0.5	1.9	74.935	30	74.821	69.821
4/29/2016	6:39:26 PM :	86	99	99	260	105	0.5	2.2	80.765	0.5	1.9	75.441	30	75.393	70.3
4/29/2016	6:40:26 PM :	86	99	99	255	105	0.5	2.2	81.324	0.5	1.9	75.961	30	75.922	70.792
4/29/2016	6:41:26 PM :	86	99	99	254	105	0.5	2.2	81.834	0.5	1.9	76.53	30	76.405	71.331
4/29/2016	6:42:26 PM :	86	99	99	258	105	0.501	2.2	82.406	0.5	1.9	77.113	30	76.947	71.882
4/29/2016	6:43:26 PM :	86	99	99	261	105	0.499	2.2	83.008	0.5	1.9	77.624	30	77.518	72.365
4/29/2016	6:44:26 PM :	86	99	99	259	105	0.5	2.2	83.586	0.5	1.9	78.087	30	78.065	72.804
4/29/2016	6:45:26 PM :	86	98	99	254	105	0.5	2.2	84.139	0.5	1.9	78.562	30	78.589	73.254
4/29/2016	6:46:26 PM :	85	98	99	254	105	0.5	2.2	84.667	0.5	1.9	79.153	30	79.09	73.813
4/29/2016	6:47:26 PM :	85	98	99	259	105	0.5	2.2	85.251	0.5	1.9	79.774	30	79.644	74.4
4/29/2016	6:48:26 PM :	85	98	99	261	105	0.5	2.2	85.856	0.5	1.9	80.267	30	80.217	74.867
4/29/2016	6:49:26 PM :	85	98	99	259	105	0.501	2.2	86.43	0.5	1.9	80.713	30	80.761	75.289
4/29/2016	6:50:26 PM :	85	98	99	254	105	0.501	2.2	86.941	0.5	1.9	81.215	30	81.246	75.764
4/29/2016	6:51:26 PM :	85	98	99	254	105	0.501	2.2	87.506	0.5	1.9	81.788	30	81.782	76.307
4/29/2016	6:52:26 PM :	85	98	99	259	105	0.5	2.2	88.094	0.5	1.9	82.388	30	82.339	76.874
4/29/2016	6:53:26 PM :	86	98	99	261	105	0.5	2.2	88.726	0.5	1.9	82.907	30	82.939	77.365
4/29/2016	6:54:26 PM :	86	98	99	258	105	0.501	2.2	89.262	0.5	1.9	83.391	30	83.447	77.824
4/29/2016	6:55:26 PM :	86	98	99	254	105	0.501	2.2	89.763	0.5	1.9	83.886	30	83.922	78.292
4/29/2016	6:56:26 PM :	86	98	99	255	105	0.5	2.2	90.316	0.5	1.9	84.39	30	84.446	78.77
4/29/2016	6:57:26 PM :	85	98	99	260	105	0.5	2.2	90.938	0.5	1.9	84.973	30	85.035	79.322
4/29/2016	6:58:26 PM :	85	98	99	261	105	0.499	2.2	91.565	0.5	1.9	85.57	30	85.63	79.887
4/29/2016	6:59:26 PM :	85	98	99	257	105	0.5	2.2	92.102	0.5	1.9	86.068	30	86.139	80.359
4/29/2016	7:00:26 PM :	85	98	99	253	105	0.501	2.2	92.601	0.5	1.9	86.526	30	86.612	80.792
4/29/2016	7:01:26 PM :	85	98	99	256	105	0.5	2.2	93.121	0.5	1.9	87.006	30	87.105	81.247
4/29/2016	7:02:26 PM :	85	98	99	260	105	0.501	2.2	93.785	0.5	1.9	87.609	30	87.735	81.818
4/29/2016	7:03:26 PM :	85	98	99	260	105	0.5	2.2	94.403	0.5	1.9	88.219	30	88.32	82.396

4/29/2016	7:04:26 PM :	85	98	99	256	105	0.5	2.2	94.945	0.5	1.9	88.71	30.01	88.835	82.861
4/29/2016	7:05:26 PM :	85	98	99	253	105	0.5	2.2	95.428	0.5	1.9	89.17	30.01	89.293	83.297
4/29/2016	7:06:26 PM :	85	98	99	256	105	0.5	2.2	95.965	0.5	1.9	89.675	30.01	89.803	83.775
4/29/2016	7:07:26 PM :	85	98	99	261	104	0.5	2.2	96.598	0.5	1.9	90.229	30	90.404	84.3
4/29/2016	7:08:26 PM :	85	98	99	260	104	0.5	2.2	97.246	0.5	1.9	90.813	30	91.018	84.854
4/29/2016	7:09:26 PM :	85	98	99	256	104	0.5	2.2	97.776	0.5	1.9	91.354	30	91.522	85.366
4/29/2016	7:10:26 PM :	85	98	99	253	104	0.5	2.2	98.284	0.5	1.9	91.852	30	92.003	85.837
4/29/2016	7:11:26 PM :	85	98	99	257	104	0.499	2.2	98.806	0.5	1.9	92.331	30	92.499	86.291
4/29/2016	7:12:26 PM :	85	98	99	261	104	0.499	2.2	99.414	0.5	1.9	92.823	30	93.076	86.757
4/29/2016	7:13:26 PM :	85	98	98	260	104	0.501	2.2	100.07	0.5	1.9	93.403	30	93.699	87.307
4/29/2016	7:14:26 PM :	86	98	98	255	104	0.5	2.2	100.596	0.5	1.9	94.026	30	94.198	87.897
4/29/2016	7:15:26 PM :	86	98	98	253	104	0.501	2.2	101.114	0.499	1.9	94.515	30	94.689	88.361
4/29/2016	7:16:26 PM :	85	98	98	258	104	0.5	2.2	101.643	0.5	1.9	94.954	30	95.191	88.777
4/29/2016	7:17:26 PM :	85	98	98	261	104	0.5	2.2	102.269	0.5	1.9	95.443	30	95.785	89.241
4/29/2016	7:18:26 PM :	86	98	98	259	104	0.499	2.2	102.875	0.5	1.9	96.057	30	96.36	89.823
4/29/2016	7:19:26 PM :	86	98	98	254	104	0.501	2.2	103.432	0.5	1.9	96.659	30	96.889	90.394
4/29/2016	7:20:26 PM :	85	97	98	254	104	0.5	2.2	103.942	0.5	1.9	97.14	30.01	97.373	90.85
4/29/2016	7:21:26 PM :	85	97	98	259	104	0.5	2.2	104.511	0.5	1.9	97.603	30.01	97.914	91.289
4/29/2016	7:22:26 PM :	85	97	98	261	104	0.5	2.2	105.115	0.5	1.9	98.127	30	98.488	91.787
4/29/2016	7:23:26 PM :	85	97	98	259	103	0.5	2.2	105.691	0.5	1.9	98.667	30	99.035	92.299
4/29/2016	7:24:26 PM :	84	97	98	254	103	0.5	2.2	106.244	0.5	1.9	99.236	30	99.56	92.838
4/29/2016	7:25:26 PM :	84	97	98	254	103	0.501	2.2	106.773	0.5	1.9	99.782	30.01	100.062	93.356
4/29/2016	7:26:26 PM :	84	97	97	259	103	0.5	2.2	107.363	0.5	1.9	100.307	30.01	100.623	93.856
4/29/2016	7:27:26 PM :	84	97	98	261	103	0.5	2.2	107.967	0.5	1.9	100.771	30.01	101.197	94.296
4/29/2016	7:28:26 PM :	84	97	97	258	103	0.501	2.2	108.539	0.5	1.9	101.249	30.01	101.74	94.75
4/29/2016	7:29:26 PM :	84	97	97	253	103	0.5	2.2	109.047	0.5	1.9	101.826	30.01	102.223	95.299
4/29/2016	7:30:26 PM :	85	97	98	255	103	0.5	2.2	109.614	0.499	1.9	102.476	30	102.762	95.915
4/29/2016	7:31:26 PM :	85	97	98	260	103	0.5	2.2	110.196	0.499	1.9	102.949	30.01	103.316	96.364
4/29/2016	7:32:26 PM :	85	97	98	261	103	0.501	2.2	110.832	0.499	1.9	103.382	30.01	103.92	96.775
4/29/2016	7:33:26 PM :	85	97	97	257	103	0.5	2.2	111.366	0.5	1.9	103.867	30.01	104.428	97.236
4/29/2016	7:34:26 PM :	85	97	97	253	103	0.5	2.2	111.859	0.5	1.9	104.481	30.02	104.897	97.82
4/29/2016	7:35:26 PM :	85	97	97	255	103	0.501	2.2	112.417	0.5	1.9	105.078	30.01	105.428	98.387
4/29/2016	7:36:26 PM :	85	97	97	260	103	0.5	2.2	113.035	0.5	1.9	105.559	30.01	106.016	98.844
4/29/2016	7:37:26 PM :	85	97	97	261	103	0.499	2.2	113.668	0.5	1.9	106.032	30.01	106.618	99.294
4/29/2016	7:38:26 PM :	85	97	97	256	102	0.5	2.2	114.195	0.5	1.9	106.551	30.01	107.119	99.788
4/29/2016	7:39:26 PM :	85	97	97	253	103	0.5	2.2	114.694	0.5	1.9	107.066	30.01	107.594	100.276
4/29/2016	7:40:26 PM :	85	97	97	256	102	0.501	2.2	115.222	0.5	1.9	107.631	30.01	108.096	100.813
4/29/2016	7:41:26 PM :	85	97	97	261	103	0.5	2.2	115.883	0.5	1.9	108.206	30.01	108.724	101.359
4/29/2016	7:42:26 PM :	85	96	97	261	102	0.5	2.2	116.498	0.5	1.9	108.714	30.01	109.31	101.842
4/29/2016	7:43:26 PM :	85	96	97	256	102	0.5	2.2	117.036	0.5	1.9	109.172	30.02	109.822	102.277
4/29/2016	7:44:26 PM :	86	96	97	253	102	0.499	2.2	117.519	0.5	1.9	109.647	30.02	110.282	102.728
4/29/2016	7:45:26 PM :	86	96	97	256	102	0.5	2.2	118.041	0.5	1.9	110.235	30.02	110.779	103.288
4/29/2016	7:46:26 PM :	86	96	97	261	102	0.499	2.2	118.691	0.5	1.9	110.862	30.02	111.398	103.883
4/29/2016	7:47:26 PM :	86	96	97	260	102	0.501	2.2	119.333	0.5	1.9	111.35	30.02	112.009	104.347
4/29/2016	7:48:26 PM :	86	96	97	256	102	0.501	2.2	119.863	0.5	1.9	111.793	30.02	112.514	104.768
4/29/2016	7:49:26 PM :	86	96	97	253	102	0.5	2.2	120.36	0.5	1.9	112.297	30.02	112.987	105.248
4/29/2016	7:50:26 PM :	86	96	97	257	102	0.5	2.2	120.891	0.499	1.9	112.863	30.02	113.493	105.785

4/29/2016	7:51:26 PM :	86	96	97	261	102	0.5	2.2	121.511	0.5	1.9	113.46	30.02	114.083	106.353
4/29/2016	7:52:26 PM :	87	96	97	260	102	0.5	2.2	122.168	0.5	1.9	113.974	30.02	114.708	106.842
4/29/2016	7:53:26 PM :	87	96	97	255	102	0.5	2.2	122.686	0.5	1.9	114.466	30.02	115.202	107.311
4/29/2016	7:54:26 PM :	87	96	96	253	102	0.501	2.2	123.204	0.5	1.9	114.955	30.02	115.696	107.776
4/29/2016	7:55:26 PM :	87	96	96	257	102	0.5	2.2	123.728	0.5	1.9	115.45	30.02	116.195	108.247
4/29/2016	7:56:26 PM :	86	96	96	261	102	0.501	2.2	124.347	0.5	1.9	116.034	30.02	116.786	108.804
4/29/2016	7:57:26 PM :	86	96	89	260	101	0.5	2.2	124.971	0.5	1.9	116.642	30.02	117.38	109.39
4/29/2016	7:58:26 PM :	86	96	96	255	101	0.501	2.2	125.516	0.5	1.9	117.131	30.01	117.9	109.856
4/29/2016	7:59:26 PM :	86	96	96	253	101	0.499	2.2	126.031	0.5	1.9	117.575	30.02	118.39	110.278
4/29/2016	8:00:26 PM :	86	96	96	257	101	0.499	2.2	126.585	0.5	1.9	118.069	30.02	118.919	110.749
4/29/2016	8:01:26 PM :	86	96	96	261	101	0.5	2.2	127.197	0.5	1.9	118.672	30.02	119.502	111.323
4/29/2016	8:02:26 PM :	86	96	96	260	101	0.5	2.2	127.776	0.5	1.9	119.271	30.02	120.054	111.893
4/29/2016	8:03:26 PM :	85	96	96	255	101	0.501	2.2	128.337	0.5	1.9	119.753	30.02	120.589	112.352
4/29/2016	8:04:26 PM :	85	96	96	253	101	0.5	2.2	128.857	0.5	1.9	120.224	30.02	121.084	112.801
4/29/2016	8:05:26 PM :	85	95	96	257	101	0.5	2.2	129.44	0.5	1.9	120.738	30.01	121.64	113.29
4/29/2016	8:06:26 PM :	85	95	96	261	101	0.5	2.2	130.044	0.5	1.9	121.276	30.01	122.217	113.803
4/29/2016	8:07:26 PM :	85	95	96	259	101	0.5	2.2	130.618	0.5	1.9	121.845	30.02	122.764	114.346
4/29/2016	8:08:26 PM :	85	95	96	255	101	0.499	2.2	131.138	0.5	1.9	122.396	30.02	123.26	114.871
4/29/2016	8:09:26 PM :	85	95	96	253	101	0.5	2.2	131.693	0.5	1.9	122.913	30.02	123.79	115.363
4/29/2016	8:10:26 PM :	84	95	96	258	101	0.499	2.2	132.281	0.5	1.9	123.375	30.02	124.351	115.804
4/29/2016	8:11:26 PM :	84	95	96	261	101	0.5	2.2	132.91	0.5	1.9	123.85	30.02	124.951	116.257
4/29/2016	8:12:26 PM :	84	95	96	259	100	0.5	2.2	133.447	0.5	1.9	124.428	30.02	125.463	116.807
4/29/2016	8:13:26 PM :	85	95	96	254	100	0.5	2.2	133.944	0.5	1.9	125.079	30.02	125.938	117.427
4/29/2016	8:14:26 PM :	84	95	96	254	100	0.5	2.2	134.512	0.5	1.9	125.552	30.02	126.48	117.879
4/29/2016	8:15:26 PM :	84	95	96	258	100	0.5	2.2	135.114	0.5	1.9	125.984	30.03	127.055	118.29
4/29/2016	8:16:26 PM :	84	95	96	261	100	0.5	2.2	135.754	0.5	1.9	126.479	30.03	127.666	118.762
4/29/2016	8:17:26 PM :	85	95	96	258	100	0.5	2.2	136.282	0.5	1.9	127.091	30.03	128.17	119.346
4/29/2016	8:18:26 PM :	85	95	96	254	100	0.499	2.2	136.784	0.5	1.9	127.687	30.02	128.65	119.913
4/29/2016	8:19:26 PM :	84	95	95	254	100	0.5	2.2	137.32	0.5	1.9	128.166	30.02	129.162	120.37
4/29/2016	8:20:26 PM :	84	95	95	259	100	0.499	2.2	137.97	0.5	1.9	128.642	30.02	129.783	120.825
4/29/2016	8:21:26 PM :	84	95	95	261	100	0.501	2.2	138.592	0.5	1.9	129.163	30.02	130.377	121.322
4/29/2016	8:22:26 PM :	84	95	95	258	100	0.5	2.2	139.137	0.5	1.9	129.679	30.02	130.898	121.814
4/29/2016	8:23:26 PM :	83	95	95	253	99	0.501	2.2	139.615	0.5	1.9	130.248	30.02	131.354	122.357
4/29/2016	8:24:26 PM :	83	94	95	255	99	0.5	2.2	140.139	0.5	1.9	130.817	30.03	131.855	122.9
4/29/2016	8:25:26 PM :	83	94	95	260	99	0.501	2.2	140.795	0.5	1.9	131.331	30.03	132.482	123.39
4/29/2016	8:26:26 PM :	83	94	95	260	99	0.5	2.2	141.43	0.499	1.9	131.788	30.03	133.09	123.827
4/29/2016	8:27:26 PM :	84	94	95	256	99	0.5	2.2	141.965	0.5	1.9	132.263	30.03	133.601	124.28
4/29/2016	8:28:26 PM :	84	94	95	253	99	0.5	2.2	142.458	0.5	1.9	132.856	30.03	134.073	124.846
4/29/2016	8:29:26 PM :	84	94	95	256	99	0.501	2.2	142.99	0.5	1.9	133.478	30.03	134.581	125.441
4/29/2016	8:30:26 PM :	84	94	95	260	99	0.5	2.2	143.61	0.5	1.9	133.966	30.03	135.174	125.907
4/29/2016	8:31:26 PM :	84	94	95	260	99	0.5	2.2	144.27	0.5	1.9	134.411	30.03	135.805	126.331
4/29/2016	8:32:26 PM :	84	94	95	256	99	0.5	2.2	144.788	0.5	1.9	134.909	30.03	136.3	126.807
4/29/2016	8:33:26 PM :	85	94	95	253	99	0.499	2.2	145.301	0.5	1.9	135.481	30.03	136.791	127.354
4/29/2016	8:34:26 PM :	85	94	95	257	99	0.5	2.2	145.827	0.5	1.9	136.074	30.03	137.294	127.92
4/29/2016	8:35:26 PM :	85	94	95	261	99	0.5	2.2	146.448	0.5	1.9	136.589	30.03	137.889	128.412
4/29/2016	8:36:26 PM :	84	94	95	260	99	0.5	2.2	147.074	0.5	1.9	137.077	30.03	138.487	128.878
4/29/2016	8:37:26 PM :	84	94	95	255	99	0.501	2.2	147.617	0.5	1.9	137.566	30.03	139.007	129.345

4/29/2016	8:38:26 PM :	84	94	94	253	99	0.499	2.2	148.133	0.5	1.9	138.064	30.03	139.501	129.822
4/29/2016	8:39:26 PM :	84	94	95	257	99	0.5	2.2	148.688	0.5	1.9	138.651	30.04	140.032	130.382
4/29/2016	8:40:26 PM :	84	94	94	261	99	0.499	2.2	149.304	0.5	1.9	139.254	30.04	140.623	130.959
4/29/2016	8:41:26 PM :	86	94	94	259	99	0.5	2.2	149.884	0.5	1.9	139.744	30.04	141.178	131.428
4/29/2016	8:42:26 PM :	89	94	94	255	99	0.5	2.2	150.444	0.5	1.9	140.193	30.04	141.714	131.858
4/29/2016	8:43:26 PM :	87	94	94	254	99	0.5	2.2	150.962	0.5	1.9	140.686	30.04	142.21	132.329
4/29/2016	8:44:26 PM :	85	94	94	258	99	0.5	2.2	151.549	0.5	1.9	141.288	30.04	142.772	132.905
4/29/2016	8:45:26 PM :	84	93	94	261	99	0.5	2.2	152.148	0.5	1.9	141.889	30.04	143.346	133.48
4/29/2016	8:46:26 PM :	84	93	94	259	98	0.5	2.2	152.72	0.5	1.9	142.368	30.04	143.894	133.938
4/29/2016	8:47:26 PM :	85	93	94	254	98	0.5	2.2	153.242	0.5	1.9	142.823	30.03	144.394	134.372
4/29/2016	8:48:26 PM :	86	93	94	254	98	0.5	2.2	153.796	0.5	1.9	143.345	30.04	144.926	134.872
4/29/2016	8:49:26 PM :	86	93	94	259	98	0.5	2.2	154.382	0.5	1.9	143.883	30.04	145.487	135.387
4/29/2016	8:50:26 PM :	87	93	94	261	98	0.5	2.2	155.013	0.5	1.9	144.452	30.04	146.092	135.93
4/29/2016	8:51:26 PM :	87	93	94	258	98	0.5	2.2	155.548	0.5	1.9	144.988	30.04	146.605	136.443
4/29/2016	8:52:26 PM :	86	93	94	254	98	0.5	2.2	156.045	0.5	1.9	145.515	30.04	147.081	136.948
4/29/2016	8:53:26 PM :	87	93	94	254	98	0.5	2.2	156.611	0.5	1.9	145.973	30.04	147.624	137.386
4/29/2016	8:54:26 PM :	88	93	94	259	98	0.5	2.2	157.212	0.5	1.9	146.446	30.04	148.199	137.839
4/29/2016	8:55:26 PM :	88	93	94	261	98	0.5	2.2	157.847	0.5	1.9	147.025	30.04	148.808	138.394
4/29/2016	8:56:26 PM :	87	93	94	258	98	0.5	2.2	158.377	0.5	1.9	147.672	30.04	149.317	139.013
4/29/2016	8:57:26 PM :	87	93	94	253	98	0.5	2.2	158.878	0.5	1.9	148.149	30.04	149.797	139.47
4/29/2016	8:58:26 PM :	87	93	94	255	98	0.5	2.2	159.411	0.499	1.9	148.577	30.04	150.309	139.88
4/29/2016	8:59:26 PM :	87	93	94	259	98	0.501	2.2	160.058	0.5	1.9	149.07	30.04	150.93	140.352
4/29/2016	9:00:26 PM :	87	93	94	261	98	0.5	2.2	160.678	0.5	1.9	149.668	30.04	151.524	140.924
4/29/2016	9:01:26 PM :	88	93	93	257	98	0.5	2.2	161.223	0.5	1.9	150.267	30.04	152.047	141.498
4/29/2016	9:02:26 PM :	88	93	93	253	98	0.5	2.2	161.703	0.499	1.9	150.756	30.04	152.507	141.967
4/29/2016	9:03:26 PM :	88	93	93	255	98	0.501	2.2	162.221	0.5	1.9	151.231	30.04	153.004	142.422
4/29/2016	9:04:26 PM :	89	93	93	260	98	0.499	2.2	162.881	0.5	1.9	151.733	30.04	153.638	142.903
4/29/2016	9:05:26 PM :	90	93	93	261	98	0.5	2.2	163.509	0.5	1.9	152.246	30.04	154.24	143.395
4/29/2016	9:06:26 PM :	92	93	93	257	98	0.5	2.2	164.044	0.5	1.9	152.82	30.04	154.753	143.945
4/29/2016	9:07:26 PM :	93	92	93	253	98	0.5	2.2	164.529	0.5	1.9	153.405	30.04	155.219	144.505
4/29/2016	9:08:26 PM :	94	92	93	256	98	0.5	2.2	165.063	0.5	1.9	153.901	30.04	155.732	144.981
4/29/2016	9:09:26 PM :	94	92	93	260	98	0.5	2.2	165.688	0.5	1.9	154.35	30.04	156.332	145.411
4/29/2016	9:10:26 PM :	93	92	93	260	98	0.499	2.2	166.344	0.5	1.9	154.831	30.04	156.963	145.872
4/29/2016	9:11:26 PM :	93	92	93	256	98	0.5	2.2	166.864	0.5	1.9	155.43	30.04	157.462	146.446
4/29/2016	9:12:26 PM :	92	92	93	253	98	0.5	2.2	167.372	0.5	1.9	156.038	30.04	157.949	147.029
4/29/2016	9:13:26 PM :	91	92	93	256	98	0.5	2.2	167.897	0.5	1.9	156.527	30.04	158.454	147.498
4/29/2016	9:14:26 PM :	89	92	93	261	98	0.499	2.2	168.503	0.5	1.9	156.98	30.04	159.036	147.932
4/29/2016	9:15:26 PM :	88	92	93	260	98	0.5	2.2	169.158	0.5	1.9	157.486	30.04	159.665	148.418
4/29/2016	9:16:26 PM :	87	92	93	255	98	0.501	2.2	169.681	0.5	1.9	158.03	30.04	160.167	148.94
4/29/2016	9:17:26 PM :	87	92	93	253	98	0.5	2.2	170.196	0.5	1.9	158.604	30.04	160.662	149.49
4/29/2016	9:18:26 PM :	87	92	93	257	98	0.499	2.2	170.731	0.5	1.9	159.142	30.04	161.175	150.006
4/29/2016	9:19:26 PM :	87	92	93	261	97	0.5	2.2	171.355	0.5	1.9	159.655	30.04	161.774	150.498
4/29/2016	9:20:26 PM :	86	92	93	259	98	0.501	2.3	171.957	0.5	1.9	160.12	30.04	162.352	150.944
4/29/2016	9:21:26 PM :	85	92	93	255	97	0.5	2.2	172.512	0.5	1.9	160.598	30.04	162.885	151.403
4/29/2016	9:22:26 PM :	84	91	93	254	97	0.5	2.2	173.021	0.5	1.9	161.172	30.04	163.375	151.953
4/29/2016	9:23:26 PM :	84	91	93	258	97	0.5	2.2	173.595	0.5	1.9	161.824	30.04	163.926	152.578
4/29/2016	9:24:26 PM :	84	91	93	261	97	0.5	2.2	174.191	0.5	1.9	162.29	30.04	164.5	153.026

4/29/2016	9:25:26 PM :	83	91	93	259	97	0.5	2.2	174.767	0.5	1.9	162.725	30.04	165.053	153.443
4/29/2016	9:26:26 PM :	83	91	93	254	97	0.5	2.2	175.32	0.5	1.9	163.209	30.05	165.585	153.907
4/29/2016	9:27:26 PM :	83	91	93	254	97	0.501	2.2	175.844	0.5	1.9	163.825	30.05	166.088	154.498
4/29/2016	9:28:26 PM :	82	91	93	259	97	0.5	2.2	176.427	0.5	1.9	164.414	30.05	166.648	155.063
4/29/2016	9:29:26 PM :	82	91	92	261	97	0.5	2.2	177.037	0.5	1.9	164.896	30.05	167.235	155.527
4/29/2016	9:30:26 PM :	83	91	93	259	97	0.5	2.3	177.605	0.5	1.9	165.371	30.05	167.781	155.982
4/29/2016	9:31:26 PM :	83	91	92	254	97	0.5	2.2	178.12	0.5	1.9	165.884	30.05	168.277	156.474
4/29/2016	9:32:26 PM :	83	91	92	254	97	0.5	2.2	178.678	0.5	1.9	166.399	30.05	168.813	156.969
4/29/2016	9:33:26 PM :	83	91	92	259	97	0.5	2.2	179.263	0.5	1.9	166.967	30.05	169.376	157.514
4/29/2016	9:34:26 PM :	84	91	92	261	97	0.5	2.3	179.907	0.5	1.9	167.544	30.05	169.994	158.069
4/29/2016	9:35:26 PM :	84	91	92	258	97	0.5	2.3	180.432	0.5	1.9	168.045	30.05	170.499	158.549
4/29/2016	9:36:26 PM :	84	91	92	254	97	0.5	2.2	180.929	0.5	1.9	168.503	30.05	170.977	158.99
4/29/2016	9:37:26 PM :	85	91	92	255	97	0.5	2.2	181.492	0.5	1.9	168.98	30.05	171.518	159.448
4/29/2016	9:38:26 PM :	85	91	92	259	97	0.5	2.2	182.101	0.5	1.9	169.569	30.05	172.104	160.013
4/29/2016	9:39:26 PM :	85	91	92	260	97	0.5	2.3	182.742	0.5	1.9	170.187	30.05	172.721	160.607
4/29/2016	9:40:26 PM :	84	91	92	257	97	0.501	2.3	183.268	0.5	1.9	170.672	30.05	173.227	161.073
4/29/2016	9:41:26 PM :	83	91	92	253	97	0.5	2.2	183.768	0.5	1.9	171.123	30.05	173.708	161.506
4/29/2016	9:42:26 PM :	83	91	92	256	97	0.5	2.2	184.294	0.5	1.9	171.624	30.05	174.215	161.987
4/29/2016	9:43:26 PM :	83	91	92	260	97	0.5	2.2	184.95	0.5	1.9	172.175	30.05	174.845	162.516
4/29/2016	9:44:26 PM :	83	91	92	260	97	0.5	2.2	185.569	0.5	1.9	172.758	30.05	175.441	163.076
4/29/2016	9:45:26 PM :	83	91	92	255	97	0.5	2.2	186.106	0.5	1.9	173.284	30.05	175.958	163.581
4/29/2016	9:46:26 PM :	83	91	92	253	97	0.5	2.2	186.586	0.5	1.9	173.79	30.04	176.42	164.067
4/29/2016	9:47:26 PM :	85	91	92	256	97	0.5	2.2	187.106	0.5	1.9	174.261	30.04	176.921	164.519
4/29/2016	9:48:26 PM :	86	91	92	260	97	0.499	2.2	187.763	0.5	1.9	174.74	30.04	177.552	164.979
4/29/2016	9:49:26 PM :	86	91	92	259	97	0.5	2.3	188.398	0.5	1.9	175.321	30.04	178.163	165.537
4/29/2016	9:50:26 PM :	86	91	92	255	97	0.5	2.3	188.931	0.5	1.9	175.96	30.04	178.676	166.151
4/29/2016	9:51:26 PM :	86	91	92	253	97	0.5	2.2	189.415	0.5	1.9	176.436	30.04	179.142	166.608
4/29/2016	9:52:26 PM :	86	91	92	258	97	0.5	2.2	189.952	0.5	1.9	176.865	30.05	179.659	167.02
4/29/2016	9:53:26 PM :	86	91	92	261	97	0.501	2.3	190.574	0.5	1.9	177.35	30.05	180.257	167.486
4/29/2016	9:54:26 PM :	86	91	92	259	97	0.5	2.3	191.234	0.5	1.9	177.968	30.05	180.892	168.079
4/29/2016	9:55:26 PM :	86	91	92	255	97	0.501	2.3	191.752	0.499	1.9	178.565	30.05	181.391	168.653
4/29/2016	9:56:26 PM :	86	91	92	253	97	0.5	2.2	192.261	0.5	1.9	179.036	30.05	181.881	169.105
4/29/2016	9:57:26 PM :	86	91	92	258	97	0.499	2.2	192.787	0.5	1.9	179.509	30.05	182.387	169.56
4/29/2016	9:58:26 PM :	87	91	92	261	97	0.5	2.3	193.398	0.5	1.9	180.026	30.05	182.975	170.057
4/29/2016	9:59:26 PM :	87	91	92	259	97	0.5	2.3	194.044	0.5	1.9	180.541	30.05	183.596	170.552
4/29/2016	10:00:26 PM :	88	91	92	254	97	0.5	2.3	194.573	0.5	1.9	181.108	30.05	184.105	171.097
4/29/2016	10:01:26 PM :	88	91	92	254	97	0.5	2.3	195.09	0.5	1.9	181.678	30.05	184.603	171.645
4/29/2016	10:02:26 PM :	88	91	92	259	97	0.501	2.3	195.634	0.5	1.9	182.185	30.05	185.127	172.132
4/29/2016	10:03:26 PM :	89	91	92	261	97	0.5	2.3	196.252	0.499	1.9	182.643	30.05	185.721	172.572
4/29/2016	10:04:26 PM :	88	91	92	259	97	0.501	2.3	196.844	0.5	1.9	183.12	30.05	186.291	173.031
4/29/2016	10:05:26 PM :	88	91	92	254	97	0.499	2.3	197.403	0.5	1.9	183.71	30.05	186.83	173.598
4/29/2016	10:06:26 PM :	89	91	92	254	97	0.5	2.3	197.912	0.5	1.9	184.327	30.05	187.319	174.191
4/29/2016	10:07:26 PM :	89	90	92	259	97	0.499	2.3	198.488	0.5	1.9	184.814	30.05	187.874	174.659
4/29/2016	10:08:26 PM :	89	90	92	261	97	0.5	2.3	199.093	0.5	2	185.263	30.05	188.457	175.091
4/29/2016	10:09:26 PM :	89	90	92	258	97	0.5	2.3	199.66	0.5	2	185.761	30.05	189.003	175.57
4/29/2016	10:10:26 PM :	89	90	92	254	97	0.5	2.3	200.205	0.5	2	186.322	30.05	189.528	176.11
4/29/2016	10:11:26 PM :	90	90	92	254	97	0.499	2.3	200.741	0.5	1.9	186.905	30.05	190.045	176.67

4/29/2016	10:12:26 PM :	92	90	92	259	97	0.501	2.3	201.332	0.5	1.9	187.437	30.05	190.614	177.181
4/29/2016	10:13:26 PM :	85	90	92	261	97	0.499	2.3	201.94	0.499	2	187.928	30.05	191.2	177.653
4/29/2016	10:14:26 PM :	86	90	92	259	97	0.5	2.3	202.5	0.5	2	188.403	30.05	191.74	178.11
4/29/2016	10:15:26 PM :	86	90	92	254	97	0.501	2.3	203.007	0.5	2	188.891	30.05	192.228	178.579
4/29/2016	10:16:26 PM :	86	90	92	254	97	0.5	2.3	203.573	0.5	1.9	189.468	30.06	192.773	179.134
4/29/2016	10:17:26 PM :	86	90	92	260	97	0.501	2.3	204.163	0.5	2	190.096	30.06	193.341	179.738
4/29/2016	10:18:26 PM :	86	90	92	261	97	0.501	2.3	204.799	0.5	2	190.575	30.06	193.955	180.198
4/29/2016	10:19:26 PM :	86	90	92	258	97	0.5	2.3	205.329	0.5	2	191.009	30.06	194.465	180.616
4/29/2016	10:20:26 PM :	88	90	92	254	97	0.501	2.3	205.826	0.5	2	191.499	30.06	194.944	181.087
4/29/2016	10:21:26 PM :	89	90	92	255	97	0.5	2.3	206.379	0.499	2	192.115	30.06	195.477	181.679
4/29/2016	10:22:26 PM :	89	90	92	260	97	0.5	2.3	207	0.5	2	192.7	30.06	196.076	182.242
4/29/2016	10:23:26 PM :	90	90	92	261	97	0.5	2.3	207.632	0.5	2	193.179	30.06	196.684	182.702
4/29/2016	10:24:26 PM :	90	90	92	258	97	0.499	2.3	208.164	0.5	2	193.647	30.06	197.197	183.152
4/29/2016	10:25:26 PM :	90	90	92	254	97	0.5	2.3	208.655	0.5	2	194.166	30.06	197.67	183.651
4/29/2016	10:26:26 PM :	90	90	92	255	97	0.5	2.3	209.183	0.5	2	194.688	30.06	198.179	184.153
4/29/2016	10:27:26 PM :	90	90	92	260	96	0.499	2.3	209.843	0.5	2	195.251	30.05	198.815	184.695
4/29/2016	10:28:26 PM :	91	90	92	261	96	0.5	2.3	210.462	0.5	2	195.818	30.06	199.412	185.24
4/29/2016	10:29:26 PM :	95	90	92	257	96	0.499	2.3	210.995	0.5	2	196.327	30.06	199.926	185.729
4/29/2016	10:30:26 PM :	97	90	91	253	96	0.5	2.3	211.478	0.5	2	196.784	30.05	200.39	186.169
4/29/2016	10:31:26 PM :	96	90	91	256	96	0.499	2.3	212.006	0.5	2	197.257	30.05	200.899	186.624
4/29/2016	10:32:26 PM :	94	90	91	261	96	0.5	2.3	212.652	0.5	2	197.85	30.05	201.522	187.195
4/29/2016	10:33:26 PM :	91	90	91	261	96	0.5	2.3	213.297	0.5	2	198.471	30.05	202.144	187.793
4/29/2016	10:34:26 PM :	90	90	91	256	96	0.501	2.3	213.826	0.5	2	198.956	30.06	202.653	188.26
4/29/2016	10:35:26 PM :	91	90	91	253	96	0.5	2.3	214.323	0.5	2	199.402	30.06	203.133	188.688
4/29/2016	10:36:26 PM :	91	90	91	256	96	0.499	2.3	214.853	0.5	2	199.899	30.06	203.644	189.167
4/29/2016	10:37:26 PM :	90	90	91	261	96	0.5	2.3	215.462	0.5	2	200.463	30.06	204.231	189.71
4/29/2016	10:38:26 PM :	89	90	91	261	96	0.5	2.3	216.123	0.5	2	201.052	30.06	204.869	190.277
4/29/2016	10:39:26 PM :	89	90	91	256	96	0.499	2.3	216.64	0.5	2	201.583	30.06	205.368	190.788
4/29/2016	10:40:26 PM :	89	90	91	253	96	0.5	2.3	217.156	0.5	2	202.065	30.06	205.865	191.252
4/29/2016	10:41:26 PM :	90	90	91	256	96	0.5	2.3	217.68	0.5	2	202.544	30.06	206.371	191.713
4/29/2016	10:42:26 PM :	89	90	91	261	96	0.499	2.3	218.3	0.5	2	203.039	30.06	206.968	192.189
4/29/2016	10:43:26 PM :	87	90	91	260	96	0.5	2.3	218.923	0.5	2	203.621	30.06	207.57	192.75
4/29/2016	10:44:26 PM :	86	90	91	256	96	0.501	2.3	219.465	0.5	2	204.237	30.05	208.092	193.343
4/29/2016	10:45:26 PM :	85	90	91	253	96	0.5	2.3	219.981	0.5	2	204.718	30.05	208.59	193.806
4/29/2016	10:46:26 PM :	85	90	91	256	96	0.501	2.3	220.541	0.5	2	205.154	30.05	209.13	194.225
4/29/2016	10:47:26 PM :	86	90	91	261	96	0.5	2.3	221.149	0.5	2	205.647	30.05	209.717	194.699
4/29/2016	10:48:26 PM :	87	90	91	260	96	0.501	2.3	221.729	0.5	2	206.261	30.05	210.276	195.29
4/29/2016	10:49:26 PM :	87	90	91	256	96	0.5	2.3	222.288	0.5	2	206.852	30.05	210.815	195.859
4/29/2016	10:50:26 PM :	88	90	91	253	96	0.501	2.3	222.804	0.5	2	207.327	30.05	211.313	196.317
4/29/2016	10:51:26 PM :	89	90	91	257	96	0.5	2.3	223.383	0.5	2	207.791	30.05	211.872	196.764
4/29/2016	10:52:26 PM :	89	90	91	261	96	0.5	2.3	223.988	0.5	2	208.321	30.05	212.455	197.275
4/29/2016	10:53:26 PM :	89	90	91	260	96	0.501	2.3	224.56	0.5	2	208.842	30.05	213.006	197.776
4/29/2016	10:54:26 PM :	89	90	91	255	96	0.5	2.3	225.085	0.5	2	209.405	30.05	213.512	198.319
4/29/2016	10:55:26 PM :	89	90	91	253	96	0.499	2.3	225.636	0.5	2	209.964	30.05	214.044	198.857
4/29/2016	10:56:26 PM :	89	90	91	258	96	0.5	2.3	226.227	0.5	2	210.482	30.05	214.614	199.356
4/29/2016	10:57:26 PM :	89	90	91	261	96	0.499	2.3	226.855	0.5	2	210.939	30.05	215.219	199.797
4/29/2016	10:58:26 PM :	89	90	91	260	96	0.5	2.3	227.395	0.5	2	211.41	30.05	215.741	200.25

4/29/2016	10:59:26 PM :	88	90	91	255	96	0.501	2.3	227.891	0.5	2	211.997	30.05	216.218	200.815
4/29/2016	11:00:26 PM :	88	90	91	254	96	0.499	2.3	228.458	0.5	2	212.627	30.05	216.766	201.423
4/29/2016	11:01:26 PM :	88	90	91	259	96	0.501	2.3	229.061	0.5	2	213.107	30.05	217.347	201.885
4/29/2016	11:02:26 PM :	87	90	91	261	96	0.5	2.3	229.694	0.5	2	213.547	30.05	217.958	202.309
4/29/2016	11:03:26 PM :	87	89	91	260	96	0.5	2.3	230.224	0.5	2	214.044	30.05	218.47	202.787
4/29/2016	11:04:26 PM :	86	89	91	255	96	0.5	2.3	230.725	0.5	2	214.624	30.05	218.953	203.346
4/29/2016	11:05:26 PM :	86	89	91	254	96	0.501	2.3	231.262	0.5	2	215.221	30.06	219.472	203.921
4/29/2016	11:06:26 PM :	90	89	90	259	96	0.5	2.3	231.906	0.5	2	215.727	30.06	220.093	204.41
4/29/2016	11:07:26 PM :	90	89	90	261	96	0.501	2.3	232.531	0.5	2	216.208	30.06	220.697	204.873
4/29/2016	11:08:26 PM :	87	89	91	259	95	0.5	2.3	233.074	0.5	2	216.7	30.06	221.221	205.348
4/29/2016	11:09:26 PM :	85	89	90	254	96	0.5	2.3	233.55	0.5	2	217.201	30.06	221.681	205.83
4/29/2016	11:10:26 PM :	83	89	91	254	95	0.5	2.3	234.074	0.5	2	217.786	30.06	222.187	206.394
4/29/2016	11:11:26 PM :	83	89	91	259	95	0.499	2.3	234.734	0.5	2	218.38	30.06	222.824	206.966
4/29/2016	11:12:26 PM :	83	89	91	261	95	0.5	2.3	235.36	0.5	2	218.871	30.05	223.428	207.44
4/29/2016	11:13:26 PM :	82	89	90	259	95	0.5	2.3	235.895	0.5	2	219.317	30.05	223.944	207.869
4/29/2016	11:14:26 PM :	81	89	90	254	95	0.5	2.3	236.377	0.5	2	219.807	30.05	224.41	208.341
4/29/2016	11:15:26 PM :	81	89	89	254	95	0.5	2.3	236.912	0.5	2	220.41	30.05	224.926	208.923
4/29/2016	11:16:26 PM :	81	89	89	259	95	0.5	2.3	237.539	0.5	2	221.012	30.05	225.532	209.504
4/29/2016	11:17:26 PM :	81	89	89	261	95	0.5	2.3	238.196	0.5	2	221.489	30.05	226.165	209.965
4/29/2016	11:18:26 PM :	81	89	89	258	95	0.501	2.3	238.716	0.5	2	221.954	30.05	226.667	210.414
4/29/2016	11:19:26 PM :	81	89	89	254	95	0.499	2.3	239.225	0.5	2	222.469	30.05	227.159	210.911
4/29/2016	11:20:26 PM :	81	89	89	255	95	0.5	2.3	239.751	0.5	2	223.006	30.05	227.666	211.429
4/29/2016	11:21:26 PM :	81	89	89	260	95	0.5	2.3	240.358	0.5	2	223.575	30.05	228.253	211.979
4/29/2016	11:22:26 PM :	81	89	88	261	95	0.499	2.3	241.011	0.499	2	224.119	30.05	228.883	212.506
4/29/2016	11:23:26 PM :	81	89	88	257	95	0.501	2.3	241.536	0.5	2	224.641	30.05	229.39	213.011
4/29/2016	11:24:26 PM :	81	89	open	253	95	0.5	2.3	242.053	0.499	2	225.096	30.05	229.889	213.536
4/29/2016	11:25:26 PM :	82	89	open	256	95	0.5	2.3	242.586	0.5	2	225.569	30.05	230.404	214.081
4/29/2016	11:26:26 PM :	82	89	open	261	95	0.5	2.3	243.21	0.5	2	226.152	30.05	231.006	214.753
4/29/2016	11:27:26 PM :	82	89	open	261	95	0.499	2.3	243.809	0.5	2	226.795	30.05	231.586	215.495
4/29/2016	11:28:26 PM :	82	89	open	256	95	0.499	2.3	244.363	0.5	2	227.27	30.05	232.121	216.043
4/29/2016	11:29:26 PM :	82	89	open	253	95	0.5	2.3	244.874	0.5	2	227.698	30.05	232.615	216.536
4/29/2016	11:30:26 PM :	82	89	1	256	95	0.5	2.3	245.446	0.499	2	228.194	30.05	233.167	217.108
4/29/2016	11:31:26 PM :	83	89	86	261	95	0.5	2.3	246.05	0.5	2	228.793	30.06	233.751	217.69
4/29/2016	11:32:26 PM :	83	89	89	260	95	0.5	2.3	246.618	0.5	2	229.386	30.06	234.3	218.262
4/29/2016	11:33:26 PM :	83	89	89	256	95	0.5	2.3	247.173	0.5	2	229.88	30.06	234.836	218.739
4/29/2016	11:34:26 PM :	83	89	89	253	95	0.5	2.3	247.701	0.5	2	230.353	30.06	235.346	219.195
4/29/2016	11:35:26 PM :	83	89	89	257	95	0.501	2.3	248.292	0.5	2	230.859	30.06	235.917	219.684
4/29/2016	11:36:26 PM :	83	89	89	261	95	0.5	2.3	248.896	0.5	2	231.376	30.06	236.501	220.183
4/29/2016	11:37:26 PM :	83	89	89	260	95	0.5	2.3	249.464	0.5	2	231.944	30.06	237.05	220.731
4/29/2016	11:38:26 PM :	83	89	89	255	95	0.5	2.3	249.971	0.5	2	232.528	30.06	237.54	221.295
4/29/2016	11:39:26 PM :	83	89	89	253	95	0.499	2.3	250.533	0.5	2	233.026	30.06	238.083	221.776
4/29/2016	11:40:26 PM :	83	89	89	257	95	0.501	2.3	251.124	0.499	2	233.478	30.06	238.655	222.211
4/29/2016	11:41:26 PM :	83	89	90	261	95	0.5	2.3	251.759	0.5	2	233.964	30.05	239.268	222.68
4/29/2016	11:42:26 PM :	83	89	90	260	95	0.5	2.3	252.291	0.5	2	234.561	30.05	239.782	223.256
4/29/2016	11:43:26 PM :	83	89	90	255	95	0.5	2.3	252.78	0.5	2	235.163	30.05	240.255	223.837
4/29/2016	11:44:26 PM :	82	89	90	254	95	0.5	2.3	253.347	0.5	2	235.647	30.05	240.802	224.304
4/29/2016	11:45:26 PM :	82	89	90	258	95	0.501	2.3	253.96	0.5	2	236.105	30.05	241.395	224.745

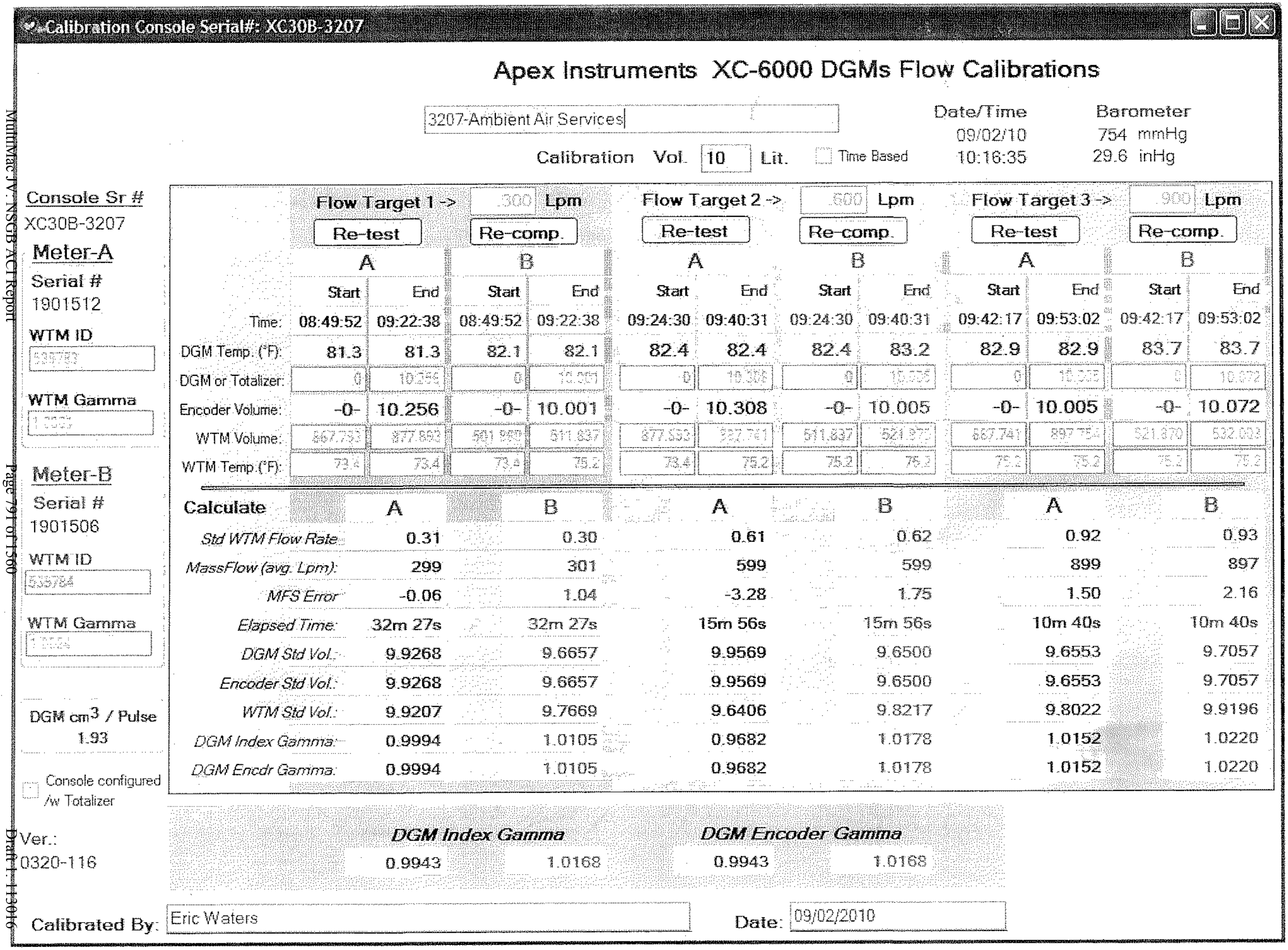
4/29/2016	11:46:26 PM :	82	89	90	261	95	0.5	2.3	254.599	0.5	2	236.611	30.05	242.013	225.233
4/29/2016	11:47:26 PM :	81	89	90	259	95	0.5	2.3	255.123	0.499	2	237.159	30.05	242.519	225.762
4/29/2016	11:48:26 PM :	81	89	89	254	95	0.5	2.3	255.621	0.499	2	237.73	30.05	243	226.312
4/29/2016	11:49:26 PM :	81	89	89	254	95	0.5	2.3	256.148	0.5	2	238.274	30.05	243.509	226.837
4/29/2016	11:50:26 PM :	81	89	89	259	95	0.5	2.3	256.804	0.5	2	238.78	30.05	244.143	227.326
4/29/2016	11:51:26 PM :	81	89	89	261	95	0.5	2.3	257.422	0.5	2	239.247	30.05	244.74	227.776
4/29/2016	11:52:26 PM :	81	89	89	259	95	0.501	2.4	257.961	0.499	2	239.726	30.05	245.261	228.238
4/29/2016	11:53:26 PM :	81	89	89	254	95	0.5	2.3	258.445	0.5	2	240.304	30.05	245.729	228.796
4/29/2016	11:54:26 PM :	82	89	89	254	95	0.499	2.3	258.961	0.5	2	240.948	30.05	246.228	229.418
4/29/2016	11:55:26 PM :	82	89	89	259	95	0.5	2.3	259.622	0.5	2	241.42	30.05	246.865	229.873
4/29/2016	11:56:26 PM :	82	89	89	261	95	0.5	2.4	260.257	0.5	2	241.851	30.05	247.479	230.289
4/29/2016	11:57:26 PM :	82	89	89	259	95	0.499	2.4	260.788	0.5	2	242.342	30.05	247.992	230.763
4/29/2016	11:58:26 PM :	82	89	89	254	95	0.5	2.3	261.272	0.5	2	242.954	30.05	248.46	231.353
4/29/2016	11:59:26 PM :	82	89	89	254	95	0.5	2.3	261.807	0.499	2	243.547	30.05	248.977	231.925
4/30/2016	12:00:26 AM :	83	89	89	259	95	0.5	2.4	262.429	0.5	2	244.026	30.05	249.577	232.388
4/30/2016	12:01:26 AM :	83	89	89	261	95	0.501	2.4	263.093	0.5	2	244.501	30.05	250.219	232.846
4/30/2016	12:02:26 AM :	83	89	89	259	95	0.501	2.4	263.605	0.5	2	245.012	30.05	250.714	233.339
4/30/2016	12:03:26 AM :	83	88	89	254	95	0.501	2.4	264.116	0.5	2	245.527	30.05	251.208	233.836
4/30/2016	12:04:26 AM :	83	89	89	254	95	0.5	2.4	264.647	0.5	2	246.1	30.04	251.721	234.389
4/30/2016	12:05:26 AM :	83	89	89	260	95	0.501	2.4	265.261	0.5	2	246.673	30.04	252.314	234.941
4/30/2016	12:06:26 AM :	83	89	89	261	95	0.5	2.4	265.897	0.5	2	247.179	30.04	252.928	235.43
4/30/2016	12:07:26 AM :	83	88	89	259	95	0.499	2.4	266.43	0.5	2	247.637	30.04	253.443	235.871
4/30/2016	12:08:26 AM :	83	88	89	254	95	0.501	2.4	266.945	0.5	2	248.113	30.04	253.941	236.331
4/30/2016	12:09:26 AM :	83	88	89	254	95	0.5	2.4	267.494	0.5	2	248.708	30.04	254.472	236.905
4/30/2016	12:10:26 AM :	83	88	89	260	95	0.5	2.3	268.109	0.5	2	249.32	30.04	255.067	237.496
4/30/2016	12:11:26 AM :	82	88	89	261	95	0.501	2.4	268.697	0.5	2	249.808	30.04	255.635	237.967
4/30/2016	12:12:26 AM :	82	88	89	258	95	0.5	2.4	269.256	0.5	2	250.258	30.04	256.177	238.4
4/30/2016	12:13:26 AM :	82	88	89	254	95	0.499	2.4	269.766	0.499	2	250.756	30.04	256.669	238.881
4/30/2016	12:14:26 AM :	82	88	89	255	95	0.499	2.3	270.343	0.5	2	251.317	30.04	257.228	239.422
4/30/2016	12:15:26 AM :	82	88	89	260	95	0.499	2.3	270.948	0.5	2	251.903	30.04	257.812	239.987
4/30/2016	12:16:26 AM :	82	88	89	261	95	0.5	2.4	271.519	0.5	2	252.437	30.04	258.365	240.502
4/30/2016	12:17:21 AM :	82	88	89	261	95	0.5	2.4	272.03	0.5	2	252.902	30.04	258.858	240.951

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/29/16 3:46:0  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/29/16 3:46:11 PM: Test Paused by User
04/29/16 3:46:1  with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/29/16 4:17:27 PM: TestResumed
04/30/16 12:17:21 AM: Actual Sampling Time: 0d  8h  0m  0s
04/30/16 12:17:21 AM: Test END
04/30/16 00:19:23 AM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/30/16 00:19:23 AM: Maximum Observed Vacuum for A was 2.4 inHg
04/30/16 00:19:23 AM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
04/30/16 00:19:23 AM: Maximum Observed Vacuum for B was 2.0 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
```

```
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3207-Ambient Air Services
'             Console ID: XC30B-3207
'           DAC Board ID: 3332-3037-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901512 / 0.9943
'Dry Gas Meter-B ID/Gamma: 1901506 / 1.0168
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7334-024B-0000-0052
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```



Apex Instruments XC-6000 DGMs Flow Calibrations

3207-Ambient Air Services

Calibration Vol. 10 Lit. ☐ Time Based

Date/Time
09/02/10
10:16:35

Barometer
754 mmHg
29.6 inHg

Console Sr #
XC30B-3207

Meter-A
Serial # 1901512
WTM ID: 535783
WTM Gamma: [illegible]

Meter-B
Serial # 1901506
WTM ID: 535784
WTM Gamma: [illegible]

DGM cm^3 / Pulse
1.93

☐ Console configured /w Totalizer

Ver.:
0320-116

	Flow Target 1 -> 300 Lpm				Flow Target 2 -> 600 Lpm				Flow Target 3 -> 900 Lpm			
	A		B		A		B		A		B	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
Time:	08:49:52	09:22:38	08:49:52	09:22:38	09:24:30	09:40:31	09:24:30	09:40:31	09:42:17	09:53:02	09:42:17	09:53:02
DGM Temp. (°F):	81.3	81.3	82.1	82.1	82.4	82.4	82.4	83.2	82.9	82.9	83.7	83.7
DGM or Totalizer:	0	10.256	0	10.001	0	10.308	0	10.005	0	10.005	0	10.072
Encoder Volume:	-0-	10.256	-0-	10.001	-0-	10.308	-0-	10.005	-0-	10.005	-0-	10.072
WTM Volume:	867.753	877.893	501.980	511.837	877.553	887.741	511.837	521.977	887.741	897.754	521.870	532.003
WTM Temp. (°F):	73.4	73.4	73.4	75.2	73.4	75.2	75.2	75.2	75.2	75.2	75.2	75.2

Calculate	A	B	A	B	A	B
Std WTM Flow Rate	0.31	0.30	0.61	0.62	0.92	0.93
MassFlow (avg. Lpm):	299	301	599	599	899	897
MFS Error	-0.06	1.04	-3.28	1.75	1.50	2.16
Elapsed Time:	32m 27s	32m 27s	15m 56s	15m 56s	10m 40s	10m 40s
DGM Std Vol.:	9.9268	9.6657	9.9569	9.6500	9.6553	9.7057
Encoder Std Vol.:	9.9268	9.6657	9.9569	9.6500	9.6553	9.7057
WTM Std Vol.:	9.9207	9.7669	9.6406	9.8217	9.8022	9.9196
DGM Index Gamma:	0.9994	1.0105	0.9682	1.0178	1.0152	1.0220
DGM Encdr Gamma:	0.9994	1.0105	0.9682	1.0178	1.0152	1.0220

DGM Index Gamma		*DGM Encoder Gamma*	
0.9943	1.0168	0.9943	1.0168

Calibrated By: Eric Waters

Date: 09/02/2010

APEX INSTRUMENTS XC-6000 SENSOR AUDIT
PRESSURE TRANSDUCER
ENGLISH UNITS

Meter Console Information	
Console Model Number	XC-6000EPC
Console Serial Number	XC30B-3207
DGM Model Number	AP25
DGM A Serial Number	1901512
DGM B Serial Number	1901506

Calibration Conditions	
Date	2-Sep-10
Time	8:15
Calibration Technician	EW
Ambient Temperature (°F)	75

XC6000 Configuration	
Firmware / Software Rev.	0320-116
Modbus installed?	NO
Pitot installed?	NO
2.5L/min Rotameters?	NO

Transducer Info		
Pressure Type		Delta P
Model Number		5IN-D-4V
Range		5in H_2O
Reference Manometer Info		
Model Number		1223-36-D
Range		36in H_2O
Accuracy (% F.S.)		0.5
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(P_{ref})	(ΔP)	
in H_2O	in H2O	% Full Scale
0.00	0.00	0.0
4.50	4.50	0.0
	average	0.0
		N/A

Transducer Info		
Pressure Type		Barometer
Model Number		BARO-A-4V
Range		600-1100mBar
Reference Barometer Info		
Absolute Pressure Location		RDU Airport
Absolute Pressure (in Hg)		29.00
Elevation @ Apex Inst (ft)		410
Calibration Data		
Reference Pressure	Displayed Pressure	Absolute Error
(P_{ref})	(P_{bar})	(<=0.39inHg)
in Hg	in Hg	in Hg
Current Barometric Pressure		
29.70	29.68	0.02
		Pass

Transducer Info		
Pressure Type		Vacuum Ch. A
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Reference Vacuum Gauge Info		
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Accuracy (% F.S.)		1.0
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(Vac_{ref})	(Vac)	
in Hg	in Hg	% Full Scale
0.00	0.00	0.0
23.00	21.89	3.7
		0.0
		0.0
		0.0
		0.0
		0.0
	average	0.5
		Pass

Transducer Info		
Pressure Type		Vacuum Ch. B
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Reference Vacuum Gauge Info		
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Accuracy (% F.S.)		1.0
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(Vac_{ref})	(Vac)	
in Hg	in Hg	% Full Scale
0.00	0.00	0.0
22.50	21.47	3.4
		0.0
		0.0
		0.0
		0.0
		0.0
	average	0.5
		Pass

I certify that the above were calibrated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems Vol III" and/or USEPA Methods, Title 40 CFR Parts 60 & 75.

Signature ________________ Date 9/2/10

3207-Ambient Air Services Sensor Audit.xls

APEX INSTRUMENTS XC-6000 SENSOR AUDIT
TYPE K THERMOCOUPLE TEMPERATURE SENSORS
ENGLISH UNITS

Meter Console Information	
Console Model Number	XC-6000EPC
Console Serial Number	XC30B-3207
DGM Model Number	AP25
DGM A Serial Number	1901512
DGM B Serial Number	1901506

Calibration Conditions	
Date	2-Sep-10
Time	8:15
Calibration Technician	EW
Ambient Temperature (°F)	75

XC6000 Configuration	
Current Firmware / Software Rev.	0320-116
Modbus installed?	NO
Pitot installed?	NO
2.5L/min Rotameters Installed?	NO

Thermocouple Info		
Source		Stack
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.6	0.4
30.0	29.5	0.5
60.0	60.0	0.0
100.0	100.0	0.0
300.0	300.0	0.0
500.0	499.5	0.1
	average	0.2
		Pass

Thermocouple Info		
Source		Trap
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	2.2	0.2
30.0	30.0	0.0
60.0	60.0	0.0
100.0	100.5	0.5
300.0	300.0	0.0
500.0	500.0	0.0
	average	0.1
		Pass

Thermocouple Info		
Source		Probe
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.4	0.6
60.0	59.5	0.5
100.0	99.5	0.5
300.0	299.5	0.2
500.0	499.5	0.1
	average	0.5
		Pass

Thermocouple Info		
Source		Chiller
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.0	1.0
60.0	59.5	0.5
100.0	99.0	1.0
300.0	299.5	0.2
500.0	499.5	0.1
	average	0.6
		Pass

Thermocouple Info		
Source		Aux
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	2.2	0.2
30.0	31.0	1.0
60.0	60.5	0.5
100.0	100.5	0.5
300.0	300.0	0.0
500.0	500.0	0.0
	average	0.4
		Pass

Thermocouple Info		
Source		DGM A
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	2.2	0.2
30.0	30.0	0.0
60.0	60.0	0.0
100.0	100.0	0.0
300.0	300.0	0.0
500.0	500.0	0.0
	average	0.0
		Pass

Thermocouple Info		
Source		DGM B
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	2.1	0.1
30.0	30.0	0.0
60.0	60.0	0.0
100.0	100.0	0.0
300.0	300.0	0.0
500.0	500.0	0.0
	average	0.0
		Pass

I certify that the above were calibrated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems Vol III" and/or USEPA Methods, Title 40 CFR Parts 60 & 75.

Signature

Date 9/2/10

Ambient Air Services, Inc.

106 Ambient Airway

Starke, Florida 32091

Method 30B Post-test Console Audit

Console ID	XB30B-3207
Technician	MEH
Project	NSGB Mercury
Date:	6/23/2016
Barometric Pressure Audit	
Reference Barometric Pressure Sensor ID	Kollsman 433
Calibration Date	10/20/2015
Reference Barometric Pressure Reading (in. Hg)	30.11
Console Barometric Pressure Reading (in. Hg)	30.21
Difference (+ / - 10 mm Hg or 0.33 in. Hg)	0.10
Vacuum Audit	
Reference Vacuum Gauge ID	CP 125602
Calibration Date	2/4/2016
Reference Vacuum Gauge Reading (A-Side) (in. Hg)	21.40
Console Vacuum Reading (A-Side) (in. Hg)	22.08
Difference (+ / - 1 in. Hg)	0.68
Reference Vacuum Gauge Reading (B-Side) (in. Hg)	21.70
Console Vacuum Reading (B-Side) (in. Hg)	21.65
Difference (+ / - 1 in. Hg)	0.05
Temperature Audit	
Reference Thermometer ID	Atkins 36036-C
Calibration Date	10/26/2015
Reference Temperature Reading (^{0}F)	76.0
All Temperatures +/- 1.5% of Absolute Reference Temperature Reading	
Console DGM A Temperature Reading (^{o}F)	76.5
Percent Difference	0.7
Console DGM B Temperature Reading (^{o}F)	76.2
Percent Difference	0.3
Console Stack Temperature Reading (^{o}F)	76.5
Percent Difference	0.7
Console Chiller Temperature Reading (^{o}F)	75.8
Percent Difference	0.3

Ambient Air Services, Inc.

106 Ambient Airway

Starke, Florida 32091

Method 30B Post-test Console Audit

Console ID	XB30B-3207
Technician	MEH
Project	NSGB Mercury
Date:	6/23/2016

Dry Gas Meter Audit

Reference Flow Meter ID	Bios DC Lite 700
Calibration Date	6/20/2016
Reference DGM A Target Flow Rate (LPM)	0.500
Reference DGM A Target Volume (L)	5
Console DGM A Audit	
Console DGM A ID	1901512
Console DGM A Gamma	0.9943
Reference DGM Start Temperature (^{o}F)	76.8
Reference DGM End Temperature (^{o}F)	78.4
Reference DGM A Volume Sampled (L)	5.08
Reference DGM A Volume Sampled (Standard L)	5.021
Console DGM A Temperature (^{o}F)	79.2
Console DGM A Volume Sampled (L)	5.012
Console DGM A Volume Sampled (Standard L)	4.955
Calculated Audit Gamma	1.0132
Difference (+/- 5% of Console Gamma Value)	1.9
Console DGM B Audit	
Console DGM B ID	1901506
Console DGM B Gamma	1.0168
Reference DGM Start Temperature (^{o}F)	78.9
Reference DGM End Temperature (^{o}F)	79.5
Reference DGM B Volume Sampled (L)	4.98
Reference DGM B Volume Sampled (Standard L)	4.908
Console DGM B Temperature (^{o}F)	82.3
Console DGM B Volume Sampled (L)	5.016
Console DGM B Volume Sampled (Standard L)	4.931
Calculated Audit Gamma	0.9952
Difference (+/- 5% of Console Gamma Value)	2.2

Technician Signature and Date Michael Hinkel 6/23/16

QA Signature and Date Daniel Ockenhouse 6/27/16

APPENDIX I

VOLATILE ORGANIC COMPOUNDS EMISSIONS DATA

Example Calculations

Emissions Input Summary

VOC Lab Summary Results

Run Data Printouts

30B Console Number Pre-Test Calibration

30B Console Number Post-Test Audit

Ambient Air Services, Inc.
Environmental Consultants
106 Ambient Airway Starke, Florida 32091 (904) 964-8440

Example Calculations, VOC Test Run 1

Facility	**Naval Station Guantanamo Bay**	**Source**	**Air Curtain Incinerator D-1**
Location	**Guantanamo Bay, Cuba**	**Date**	**April 18, 2016**

1.

VOC Concentration, g/scmd, (C_s).

$$M_{VOC} \text{ x } K_1 / V_{m(std)}) \text{ x } K_2$$

Example, using Run 1 Benzene Result	M_{VOC}	=	16.7	**C_s**	=	1.62E-05	grams / SCFD
	K_1	=	1.00E-06				
	K_2	=	28.32				
	$V_{m(std)}$	=	29.120				

2.

Mass Emission Rate, Grams / Sec, (Em).

$$C_s \text{ x } Q_{d(std)} / 60$$

	C_s	=	1.62E-05				
Example.	$Q_{d(std)}$	=	120848	Em	=	3.27E-02	Grams / Sec

Constants

K_1 = **1.00E-06 micrograms/gram**

K_2 = **28.32 L/ft^3**

Variables

C_s	=	**Concentration VOC (grams/scfd)**	**$Q_{d(std)}$**	=	**Stack Gas Flow Rate, SCFMD**
Em	=	**Emission Rate for VOC, Grams / Second**	**$V_{m(std)}$**	=	**Gas Volume Sampled, dry standard cubic liters**
M_{VOC}	=	**Mass of VOC Collected, ug**			

VOCs Emissions Data Inputs Summary

Run	Sample Set	Cumulative Sample Volume (Liters)	Sample Volume per Set (Liters)	Adjusted Sample Volume (Liters)	Volumetric Flow Rate (ft^3/min)
D1	1	8.95	8.95	29.12	120848
	2	29.12	20.17		
	3(1)	51.23	22.11		
	4(1)	69.75	18.52		
D2	1	19.64	19.64	81.27	98551
	2	41.17	21.53		
	3	61.43	20.26		
	4	81.27	19.84		
D3	1	20.28	20.28	82.17	100527
	2	42.08	21.80		
	3	61.57	19.49		
	4	82.17	20.60		
D4	1	21.88	21.88	45.99	137491
	2	40.92	19.03		
	3	45.82	4.90		
	4	45.99	0.18		
D5	1	21.37	21.37	83.02	73023
	2	42.11	20.74		
	3	62.36	20.25		
	4	83.02	20.65		
D6	1	22.56	22.56	39.36	106088
	2(2)	43.94	21.37		
	3	60.73	16.80		
	4(2)	81.95	21.21		
N1	1	20.95	20.95	61.75	104782
	2	40.84	19.89		
	3	61.75	20.91		
	4(3)	82.57	20.82		
N2	1	21.61	21.61	61.51	89404
	2	41.39	19.78		
	3	61.51	20.12		
	4(3)	82.79	21.28		
N3	1	22.19	22.19	62.45	72499
	2	43.21	21.02		
	3	62.45	19.24		
	4(3)	82.63	20.18		
N4	1	19.80	19.80	41.66	77662
	2(2)	40.31	20.51		
	3	62.17	21.86		
	4(2)	82.38	20.22		
N5	1	19.69	19.69	62.06	91877
	2	41.01	21.32		
	3	62.06	21.05		
	4(3)	82.14	20.08		

Note (1): Sample set results were not reportable due to being over the range of the instrument. Sample volume has been adjusted to exclude this set.
(2): Sample set was broken in transport or at the lab and was not suitable for analysis. The actual sample volume has been adjusted to exclude this set.
(3): Sample set was collected as a backup set. It was not needed and therefore not analyzed. The actual sample volume has been adjusted to exclude this set.

VOCs Laboratory Results Summary

Sum of Result		Units	Run												
		ug	ug	ug	ug	ug	ug	ug	ug	ug	ug	ug	ug	ug	ug Total
Analyte	Set	D1	D2	D3	D4	D5	D6	N1	N2	N3	N4	N5	Q-FBD	Q-FBN	
1,1,1,2-Tetrachloroethane		**0**	**0**	**0**	**0**	**0.028**	**0.028**	**0**	**0**	**0**	**0**	**0.023**	**0**	**0**	**0.079**
1,1,1,2-Tetrachloroethane	SET 1	0	0	0	0	0	0.028	0	0	0	0	0	0	0	0.028
1,1,1,2-Tetrachloroethane	SET 2	0	0	0	0	0.028		0	0	0		0			0.028
1,1,1,2-Tetrachloroethane	SET 3	0	0	0	0	0	0	0	0	0	0	0.023			0.023
1,1,1,2-Tetrachloroethane	SET 4	0	0	0	0	0									0
1,1,1-Trichloroethane		**0**	**0**	**0.0077**	**0**	**0.021**	**0.027**	**0**	**0**	**0**	**0**	**0.028**	**0**	**0**	**0.0837**
1,1,1-Trichloroethane	SET 1	0	0	0	0	0	0.027	0	0	0	0	0	0	0	0.027
1,1,1-Trichloroethane	SET 2	0	0	0	0	0.021		0	0	0		0			0.021
1,1,1-Trichloroethane	SET 3	0	0	0.0077	0	0	0	0	0	0	0	0.028			0.0357
1,1,1-Trichloroethane	SET 4	0	0	0	0	0									0
1,1,2,2-Tetrachloroethane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,1,2,2-Tetrachloroethane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	SET 2	0	0	0	0	0		0	0	0		0			0
1,1,2,2-Tetrachloroethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,1,2,2-Tetrachloroethane	SET 4	0	0	0	0	0									0
1,1,2-Trichloroethane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,1,2-Trichloroethane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,1,2-Trichloroethane	SET 2	0	0	0	0	0		0	0	0		0			0
1,1,2-Trichloroethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,1,2-Trichloroethane	SET 4	0	0	0	0	0									0
1,1-Dichloroethane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,1-Dichloroethane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,1-Dichloroethane	SET 2	0	0	0	0	0		0	0	0		0			0
1,1-Dichloroethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,1-Dichloroethane	SET 4	0	0	0	0	0									0
1,1-Dichloroethene		**0.0194**	**0.0052**	**0.0016**	**0.0057**	**0.0065**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0384**
1,1-Dichloroethene	SET 1	0.0038	0	0	0.0057	0.0065	0	0	0	0	0	0	0	0	0.016
1,1-Dichloroethene	SET 2	0.0156	0	0.0016	0	0		0	0	0		0			0.0172
1,1-Dichloroethene	SET 3	0	0.002	0	0	0	0	0	0	0	0	0			0.002
1,1-Dichloroethene	SET 4	0	0.0032	0	0	0									0.0032
1,1-Dichloropropene		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,1-Dichloropropene	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,1-Dichloropropene	SET 2	0	0	0	0	0		0	0	0		0			0
1,1-Dichloropropene	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,1-Dichloropropene	SET 4	0	0	0	0	0									0
1,2,3-Trichlorobenzene		**0.003**	**0.2941**	**0.0088**	**0.0069**	**0.449**	**0.025**	**0**	**0**	**0.073**	**0**	**0.162**	**0**	**0.056**	**1.0778**
1,2,3-Trichlorobenzene	SET 1	0.003	0.149	0	0.0069	0.013	0.025	0	0	0.073	0	0	0	0.056	0.3259
1,2,3-Trichlorobenzene	SET 2	0	0.131	0.004	0	0.412		0	0	0		0			0.547

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1,2,3-Trichlorobenzene	SET 3	0	0.0141	0	0	0.024	0	0	0	0	0	0.162			0.2001
1,2,3-Trichlorobenzene	SET 4	0	0	0.0048	0	0									0.0048
1,2,3-Trichloropropane		**0**	**0.075**	**0.078**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.153**
1,2,3-Trichloropropane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,2,3-Trichloropropane	SET 2	0	0	0	0	0		0	0	0		0			0
1,2,3-Trichloropropane	SET 3	0	0.075	0.078	0	0	0	0	0	0	0	0			0.153
1,2,3-Trichloropropane	SET 4	0	0	0	0	0									0
1,2,4-Trichlorobenzene		**0.0058**	**0.1472**	**0.0126**	**0.011**	**0.364**	**0**	**0**	**0**	**0**	**0**	**0.041**	**0**	**0**	**0.5816**
1,2,4-Trichlorobenzene	SET 1	0.0058	0.137	0	0.011	0.011	0	0	0	0	0	0	0	0	0.1648
1,2,4-Trichlorobenzene	SET 2	0	0	0.0054	0	0.353		0	0	0		0			0.3584
1,2,4-Trichlorobenzene	SET 3	0	0.0085	0.0026	0	0	0	0	0	0	0	0.041			0.0521
1,2,4-Trichlorobenzene	SET 4	0	0.0017	0.0046	0	0									0.0063
1,2,4-Trimethylbenzene		**0.8735**	**1.9198**	**2.88**	**1.3494**	**1.7909**	**0.42**	**2.45**	**0.2**	**0.46**	**0.28**	**0.9**	**0**	**0**	**13.5236**
1,2,4-Trimethylbenzene	SET 1	0.86	0.621	0.82	0.6694	0.4569	0	1.7	0	0	0	0.9	0	0	6.0273
1,2,4-Trimethylbenzene	SET 2	0.0135	0.68	0.9234	0.68	1.334		0.75	0.2	0		0			4.5809
1,2,4-Trimethylbenzene	SET 3	0	0.5132	0.5337	0	0	0.42	0	0	0.46	0.28	0			2.2069
1,2,4-Trimethylbenzene	SET 4	0	0.1056	0.6029	0	0									0.7085
1,2-Dibromo-3-chloropropane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,2-Dibromo-3-chloropropane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,2-Dibromo-3-chloropropane	SET 2	0	0	0	0	0		0	0	0		0			0
1,2-Dibromo-3-chloropropane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,2-Dibromo-3-chloropropane	SET 4	0	0	0	0	0									0
1,2-Dibromoethane		**0**	**0**	**0**	**0**	**0.028**	**0.035**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.063**
1,2-Dibromoethane	SET 1	0	0	0	0	0	0.035	0	0	0	0	0	0	0	0.035
1,2-Dibromoethane	SET 2	0	0	0	0	0.028		0	0	0		0			0.028
1,2-Dibromoethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,2-Dibromoethane	SET 4	0	0	0	0	0									0
1,2-Dichlorobenzene		**0.024**	**0.0325**	**0.081**	**0.062**	**0.051**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.2505**
1,2-Dichlorobenzene	SET 1	0.024	0	0	0.062	0.051	0	0	0	0	0	0	0	0	0.137
1,2-Dichlorobenzene	SET 2	0	0	0.04	0	0		0	0	0		0			0.04
1,2-Dichlorobenzene	SET 3	0	0.027	0.016	0	0	0	0	0	0	0	0			0.043
1,2-Dichlorobenzene	SET 4	0	0.0055	0.025	0	0									0.0305
1,2-Dichloroethane		**0.0019**	**0.4013**	**0.7424**	**0.4532**	**0.753**	**0.264**	**1.21**	**0.335**	**0.37**	**0.188**	**0.7**	**0**	**0**	**5.4188**
1,2-Dichloroethane	SET 1	0.0019	0.12	0.26	0.2432	0.095	0.084	0.76	0.079	0.08	0.11	0.27	0	0	2.1031
1,2-Dichloroethane	SET 2	0	0.17	0.1943	0.21	0.288		0.34	0.066	0.12		0.21			1.5983
1,2-Dichloroethane	SET 3	0	0.0826	0.1418	0	0.18	0.18	0.11	0.19	0.17	0.078	0.22			1.3524
1,2-Dichloroethane	SET 4	0	0.0287	0.1463	0	0.19									0.365
1,2-Dichloropropane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,2-Dichloropropane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1,2-Dichloropropane	SET 2	0	0	0	0	0		0	0	0		0			0
1,2-Dichloropropane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0

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1,2-Dichloropropane	SET 4	0	0	0	0	0									0
1,3,5-Trimethylbenzene		**0.662**	**2.0706**	**4.2739**	**1.6335**	**1.6026**	**0.28**	**1.93**	**0.17**	**0.34**	**0.17**	**0.85**	**0**	**0**	**13.9826**
1,3,5-Trimethylbenzene	SET 1	0.64	0.59	1	0.9235	0.5026	0	1.4	0	0	0	0.85	0	0	5.9061
1,3,5-Trimethylbenzene	SET 2	0.022	0.67	1.4047	0.71	1.1		0.53	0.17	0		0			4.6067
1,3,5-Trimethylbenzene	SET 3	0	0.6437	0.9651	0	0	0.28	0	0	0.34	0.17	0			2.3988
1,3,5-Trimethylbenzene	SET 4	0	0.1669	0.9041	0	0									1.071
1,3-Dichlorobenzene		**0.016**	**0.0198**	**0.049**	**0.03**	**0.063**	**0**	**0**	**0**	**0**	**0**	**0.028**	**0**	**0**	**0.2058**
1,3-Dichlorobenzene	SET 1	0.016	0	0	0.03	0.026	0	0	0	0	0	0	0	0	0.072
1,3-Dichlorobenzene	SET 2	0	0	0.024	0	0.037		0	0	0		0			0.061
1,3-Dichlorobenzene	SET 3	0	0.015	0.011	0	0	0	0	0	0	0	0.028			0.054
1,3-Dichlorobenzene	SET 4	0	0.0048	0.014	0	0									0.0188
1,3-Dichloropropane		**0**	**0**	**0**	**0**	**0.03**	**0.033**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.063**
1,3-Dichloropropane	SET 1	0	0	0	0	0	0.033	0	0	0	0	0	0	0	0.033
1,3-Dichloropropane	SET 2	0	0	0	0	0.03		0	0	0		0			0.03
1,3-Dichloropropane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
1,3-Dichloropropane	SET 4	0	0	0	0	0									0
1,4-Dichlorobenzene		**0.02**	**0.0299**	**0.0264**	**0.025**	**0.055**	**0**	**0.38**	**0**	**0**	**0**	**0**	**0**	**0**	**0.5363**
1,4-Dichlorobenzene	SET 1	0.02	0	0	0.025	0.013	0	0.38	0	0	0	0	0	0	0.438
1,4-Dichlorobenzene	SET 2	0	0	0.013	0	0.042		0	0	0		0			0.055
1,4-Dichlorobenzene	SET 3	0	0.023	0.0058	0	0	0	0	0	0	0	0			0.0288
1,4-Dichlorobenzene	SET 4	0	0.0069	0.0076	0	0									0.0145
2,2-Dichloropropane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2,2-Dichloropropane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,2-Dichloropropane	SET 2	0	0	0	0	0		0	0	0		0			0
2,2-Dichloropropane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
2,2-Dichloropropane	SET 4	0	0	0	0	0									0
2-Butanone		**3.3**	**1.8**	**6**	**1.7**	**2.2**	**3**	**0**	**2.9**	**0**	**9.6**	**8.1**	**0**	**0**	**38.6**
2-Butanone	SET 1	1.7	0	0	1.7	2.2	3	0	2.9	0	5	0	0	0	16.5
2-Butanone	SET 2	1.6	0	2.56	0	0		0	0	0		0			4.16
2-Butanone	SET 3	0	1.38	1.57	0	0	0	0	0	0	4.6	8.1			15.65
2-Butanone	SET 4	0	0.42	1.87	0	0									2.29
2-Chlorotoluene		**0**	**0.127**	**0**	**0.12**	**0.329**	**0.025**	**0.32**	**0**	**0**	**0**	**0**	**0**	**0**	**0.921**
2-Chlorotoluene	SET 1	0	0	0	0	0	0.025	0.32	0	0	0	0	0	0	0.345
2-Chlorotoluene	SET 2	0	0.1	0	0.12	0.329		0	0	0		0			0.549
2-Chlorotoluene	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
2-Chlorotoluene	SET 4	0	0.027	0	0	0									0.027
2-Hexanone		**0.76**	**0**	**0**	**0.55**	**1.3**	**0**	**3.15**	**1.01**	**0.23**	**0.44**	**0**	**0**	**0**	**7.44**
2-Hexanone	SET 1	0.32	0	0	0	0	0	2.1	0.23	0.23	0	0	0	0	2.88
2-Hexanone	SET 2	0.44	0	0	0.55	1.3		0.77	0.22	0		0			3.28
2-Hexanone	SET 3	0	0	0	0	0	0	0.28	0.56	0	0.44	0			1.28
2-Hexanone	SET 4	0	0	0	0	0									0

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4-Chlorotoluene		**0**	**0.11**	**0**	**0.15**	**0.253**	**0**	**0**	**0**	**0**	**0.028**	**0.11**	**0**	**0**	**0.651**
4-Chlorotoluene	SET 1	0	0	0	0.15	0	0	0	0	0	0	0.11	0	0	0.26
4-Chlorotoluene	SET 2	0	0.11	0	0	0.253		0	0	0		0			0.363
4-Chlorotoluene	SET 3	0	0	0	0	0	0	0	0	0	0.028	0			0.028
4-Chlorotoluene	SET 4	0	0	0	0	0									0
4-Methyl-2-pentanone		**0**	**0**	**0.11**	**0.16**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.27**
4-Methyl-2-pentanone	SET 1	0	0	0	0.16	0	0	0	0	0	0	0	0	0	0.16
4-Methyl-2-pentanone	SET 2	0	0	0.11	0	0		0	0	0		0			0.11
4-Methyl-2-pentanone	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
4-Methyl-2-pentanone	SET 4	0	0	0	0	0									0
Acetone		**19.29**	**44.31**	**32.8**	**25.48**	**83.84**	**18.5**	**67.57**	**25.4**	**30.7**	**26.2**	**50.6**	**0.043**	**0**	**424.733**
Acetone	SET 1	5.54	25	18.1	4.18	6.84	9.6	39.3	9	8.6	15.1	12.4	0.043	0	153.703
Acetone	SET 2	13.75	15.5	5.9	13.8	34.1		19.2	4.1	12.2		19.1			137.65
Acetone	SET 3	0	2.48	4.7	5.4	23.5	8.9	9.07	12.3	9.9	11.1	19.1			106.45
Acetone	SET 4	0	1.33	4.1	2.1	19.4									26.93
Benzene		**16.684**	**144.61**	**130.69**	**92.21**	**314.7**	**93.34**	**361.75**	**103.13**	**163.88**	**54.14**	**275.85**	**0.0058**	**0**	**1750.9898**
Benzene	SET 1	8.95	55.56	100.67	9.29	7.67	37.38	201.9	29	39.32	30	90.6	0.0058	0	610.3458
Benzene	SET 2	7.734	72.95	10.75	68.1	150.23		110.44	18	60.24		99.41			597.854
Benzene	SET 3	0	9.8	8.77	14.46	82.42	55.96	49.41	56.13	64.32	24.14	85.84			451.25
Benzene	SET 4	0	6.3	10.5	0.36	74.38									91.54
Bromobenzene		**0.014**	**0.061**	**0.0333**	**0.015**	**0.013**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.1363**
Bromobenzene	SET 1	0.014	0	0	0.015	0.013	0	0	0	0	0	0	0	0	0.042
Bromobenzene	SET 2	0	0	0.014	0	0		0	0	0		0			0.014
Bromobenzene	SET 3	0	0.011	0.0073	0	0	0	0	0	0	0	0			0.0183
Bromobenzene	SET 4	0	0.05	0.012	0	0									0.062
Bromochloromethane		**0.028**	**0.112**	**0**	**0**	**0.012**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.152**
Bromochloromethane	SET 1	0.014	0	0	0	0.012	0	0	0	0	0	0	0	0	0.026
Bromochloromethane	SET 2	0.014	0	0	0	0		0	0	0		0			0.014
Bromochloromethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
Bromochloromethane	SET 4	0	0.112	0	0	0									0.112
Bromodichloromethane		**0**	**0**	**0**	**0.033**	**0.063**	**0.034**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.13**
Bromodichloromethane	SET 1	0	0	0	0.033	0.025	0.034	0	0	0	0	0	0	0	0.092
Bromodichloromethane	SET 2	0	0	0	0	0.038		0	0	0		0			0.038
Bromodichloromethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
Bromodichloromethane	SET 4	0	0	0	0	0									0
Bromoform		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Bromoform	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromoform	SET 2	0	0	0	0	0		0	0	0		0			0
Bromoform	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
Bromoform	SET 4	0	0	0	0	0									0
Bromomethane		**0.376**	**0.836**	**0.397**	**0.351**	**3.644**	**0.9**	**0.47**	**0.46**	**0.74**	**0.17**	**0.7**	**0**	**0.17**	**9.214**

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Bromomethane	SET 1	0.14	0.47	0.15	0.081	0.204	0.33	0.18	0.14	0.39	0.17	0	0	0.17	2.425
Bromomethane	SET 2	0.236	0.17	0.112	0.12	2.17		0.29	0	0.21		0			3.308
Bromomethane	SET 3	0	0.119	0.073	0.15	1.03	0.57	0	0.32	0.14	0	0.7			3.102
Bromomethane	SET 4	0	0.077	0.062	0	0.24									0.379
Carbon disulfide		**1.769**	**0.24**	**0.628**	**0.266**	**1.271**	**0.059**	**0**	**0**	**0.223**	**0.077**	**0.953**	**0**	**0**	**5.486**
Carbon disulfide	SET 1	0.098	0	0.055	0.159	0.443	0.059	0	0	0.073	0.077	0.251	0	0	1.215
Carbon disulfide	SET 2	1.671	0	0.253	0.038	0.454		0	0	0.15		0.373			2.939
Carbon disulfide	SET 3	0	0.186	0.194	0.069	0.33	0	0	0	0	0	0.329			1.108
Carbon disulfide	SET 4	0	0.054	0.126	0	0.044									0.224
Carbon tetrachloride		**0.0173**	**0.0255**	**0.0411**	**0.0175**	**0.0163**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.1177**
Carbon tetrachloride	SET 1	0.0111	0	0	0.0175	0.0163	0	0	0	0	0	0	0	0	0.0449
Carbon tetrachloride	SET 2	0.0062	0	0.0164	0	0		0	0	0		0			0.0226
Carbon tetrachloride	SET 3	0	0.0136	0.011	0	0	0	0	0	0	0	0			0.0246
Carbon tetrachloride	SET 4	0	0.0119	0.0137	0	0									0.0256
Chlorobenzene		**0.383**	**1.214**	**1.6648**	**1.23**	**1.685**	**0.293**	**2.24**	**0.326**	**0.473**	**0.11**	**1.185**	**0**	**0**	**10.8038**
Chlorobenzene	SET 1	0.31	0.38	0.46	0.79	0.49	0.063	1.5	0.058	0.053	0	0.75	0	0	4.854
Chlorobenzene	SET 2	0.073	0.46	0.5216	0.44	0.955		0.62	0.088	0.1		0.21			3.4676
Chlorobenzene	SET 3	0	0.2715	0.3316	0	0.11	0.23	0.12	0.18	0.32	0.11	0.225			1.8981
Chlorobenzene	SET 4	0	0.1025	0.3516	0	0.13									0.5841
Chlorodibromomethane		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Chlorodibromomethane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorodibromomethane	SET 2	0	0	0	0	0		0	0	0		0			0
Chlorodibromomethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
Chlorodibromomethane	SET 4	0	0	0	0	0									0
Chloroethane		**1.42**	**1.48**	**3.81**	**1.69**	**2.28**	**0.33**	**2.38**	**1.63**	**2.1**	**0.59**	**1.53**	**0**	**0**	**19.24**
Chloroethane	SET 1	0.66	0.3	0.54	1.13	0.7	0.15	1.1	0.5	0.44	0.46	0.41	0	0	6.39
Chloroethane	SET 2	0.76	0.46	1.34	0.56	0.55		1.28	0.13	0.84		0.44			6.36
Chloroethane	SET 3	0	0.54	1.01	0	0.5	0.18	0	1	0.82	0.13	0.68			4.86
Chloroethane	SET 4	0	0.18	0.92	0	0.53									1.63
Chloroform		**0**	**0**	**0.036**	**0**	**0.027**	**0.031**	**0**	**0**	**0**	**0**	**0.034**	**0**	**0**	**0.128**
Chloroform	SET 1	0	0	0	0	0	0.031	0	0	0	0	0	0	0	0.031
Chloroform	SET 2	0	0	0	0	0.027		0	0	0		0			0.027
Chloroform	SET 3	0	0	0.036	0	0	0	0	0	0	0	0.034			0.07
Chloroform	SET 4	0	0	0	0	0									0
Chloromethane		**10.27**	**5.595**	**8.31**	**6.03**	**20.52**	**1.37**	**5.735**	**4.13**	**4.18**	**2.93**	**2.91**	**0.0096**	**0.12**	**72.1096**
Chloromethane	SET 1	2.72	1.54	2.1	2.55	5.3	0.75	1.25	1.22	0.48	2.33	0.51	0.0096	0.12	20.8796
Chloromethane	SET 2	7.55	1.5	2.89	2.2	7.1		4.22	0.67	1.94		1.2			29.27
Chloromethane	SET 3	0	2.14	1.9	1.1	5.32	0.62	0.265	2.24	1.76	0.6	1.2			17.145
Chloromethane	SET 4	0	0.415	1.42	0.18	2.8									4.815
cis-1,2-Dichloroethene		**0**	**0**	**0**	**0**	**0.024**	**0.021**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.045**
cis-1,2-Dichloroethene	SET 1	0	0	0	0	0	0.021	0	0	0	0	0	0	0	0.021

VOCs Laboratory Results Summary

cis-1,2-Dichloroethene	SET 2	0	0	0	0	0.024		0	0	0		0			0.024
cis-1,2-Dichloroethene	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
cis-1,2-Dichloroethene	SET 4	0	0	0	0	0									0
cis-1,3-Dichloropropene		**0**	**0**	**0**	**0.004**	**0.034**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.038**
cis-1,3-Dichloropropene	SET 1	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0.004
cis-1,3-Dichloropropene	SET 2	0	0	0	0	0.034		0	0	0		0			0.034
cis-1,3-Dichloropropene	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
cis-1,3-Dichloropropene	SET 4	0	0	0	0	0									0
Dibromomethane		**0**	**0.1444**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.1444**
Dibromomethane	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dibromomethane	SET 2	0	0	0	0	0		0	0	0		0			0
Dibromomethane	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
Dibromomethane	SET 4	0	0.1444	0	0	0									0.1444
Dichlorodifluoromethane		**0.117**	**0.122**	**0.143**	**0.0567**	**0.0599**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.4986**
Dichlorodifluoromethane	SET 1	0.069	0	0	0.0567	0.0599	0	0	0	0	0	0	0	0	0.1856
Dichlorodifluoromethane	SET 2	0.048	0	0.047	0	0		0	0	0		0			0.095
Dichlorodifluoromethane	SET 3	0	0.056	0.045	0	0	0	0	0	0	0	0			0.101
Dichlorodifluoromethane	SET 4	0	0.066	0.051	0	0									0.117
Ethylbenzene		**16.5402**	**40.156**	**62.314**	**32.573**	**38.6279**	**15.939**	**88.837**	**19.235**	**25.258**	**9.809**	**55.226**	**0.0019**	**0**	**404.517**
Ethylbenzene	SET 1	11.035	12.085	27.13	11.012	8.4089	0.908	59.053	2.8	2.433	0.78	38.091	0.0019	0	173.7378
Ethylbenzene	SET 2	5.5052	16.068	13.059	21.25	25.055		24.054	6.435	4.8		9.2			125.4262
Ethylbenzene	SET 3	0	9.563	11.071	0.213	2.136	15.031	5.73	10	18.025	9.029	7.935			88.733
Ethylbenzene	SET 4	0	2.44	11.054	0.098	3.028									16.62
Hexachlorobutadiene		**0**	**0**	**0**	**0**	**0.05**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.05**
Hexachlorobutadiene	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hexachlorobutadiene	SET 2	0	0	0	0	0.05		0	0	0		0			0.05
Hexachlorobutadiene	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
Hexachlorobutadiene	SET 4	0	0	0	0	0									0
Isopropylbenzene		**0.944**	**4.2039**	**9.521**	**4.4256**	**4.1285**	**0.908**	**6**	**0.877**	**1.689**	**0.63**	**3.901**	**0**	**0**	**37.228**
Isopropylbenzene	SET 1	0.784	1.1	1.9	2.5016	1.6025	0.058	4.2	0.037	0.049	0	3.3	0	0	15.5321
Isopropylbenzene	SET 2	0.16	1.2	2.8063	1.924	2.526		1.7	0.59	0.14		0.23			11.2763
Isopropylbenzene	SET 3	0	1.6079	2.4073	0	0	0.85	0.1	0.25	1.5	0.63	0.371			7.7162
Isopropylbenzene	SET 4	0	0.296	2.4074	0	0									2.7034
Methylene chloride		**0.153**	**1.55**	**5.066**	**2.007**	**2.67**	**2.92**	**4.75**	**1.92**	**2.16**	**4.11**	**4.01**	**0.0201**	**0.44**	**31.7761**
Methylene chloride	SET 1	0.108	0.33	0.55	1.087	0.75	0.91	2.66	0.56	0.56	3.68	1.02	0.0201	0.44	12.6751
Methylene chloride	SET 2	0.045	0.42	1.94	0.53	0.82		1.35	0.48	0.76		0.74			7.085
Methylene chloride	SET 3	0	0.624	1.466	0.202	0.49	2.01	0.74	0.88	0.84	0.43	2.25			9.932
Methylene chloride	SET 4	0	0.176	1.11	0.188	0.61									2.084
m-Xylene & p-Xylene		**5.8632**	**10.408**	**18.48**	**7.51**	**10.0632**	**2.48**	**15.43**	**3.07**	**3.06**	**1.71**	**5.78**	**0**	**0**	**83.8544**
m-Xylene & p-Xylene	SET 1	4.16	2.8	5.24	4.014	2.8092	0.18	9.8	0.47	0.23	0.11	4.2	0	0	34.0132
m-Xylene & p-Xylene	SET 2	1.7032	3.6	5.314	3.452	6.244		4.7	1.1	0.53		0.86			27.5032

VOCs Laboratory Results Summary

m-Xylene & p-Xylene	SET 3	0	3.415	3.915	0.044	0.48	2.3	0.93	1.5	2.3	1.6	0.72			17.204
m-Xylene & p-Xylene	SET 4	0	0.593	4.011	0	0.53									5.134
Naphthalene		**1.584**	**9.948**	**8.18**	**5**	**14.916**	**2.3**	**9.8**	**0.53**	**2.2**	**1**	**4.6**	**0**	**0**	**60.058**
Naphthalene	SET 1	1.584	3	3.1	1.8	2.916	0	6.6	0	0	0	4.6	0	0	23.6
Naphthalene	SET 2	0	3.7	2.38	3.2	12		3.2	0.53	0		0			25.01
Naphthalene	SET 3	0	3.11	0.54	0	0	2.3	0	0	2.2	1	0			9.15
Naphthalene	SET 4	0	0.138	2.16	0	0									2.298
n-Butylbenzene		**0.6243**	**1.8876**	**3.6538**	**1.8113**	**1.8133**	**0.451**	**2.27**	**0.21**	**0.66**	**0.31**	**1.22**	**0**	**0**	**14.9113**
n-Butylbenzene	SET 1	0.621	0.51	0.76	1.0013	0.5813	0.021	1.6	0	0	0	1.2	0	0	6.2946
n-Butylbenzene	SET 2	0.0033	0.61	1.2044	0.81	1.232		0.67	0.21	0		0			4.7397
n-Butylbenzene	SET 3	0	0.663	0.8057	0	0	0.43	0	0	0.66	0.31	0.02			2.8887
n-Butylbenzene	SET 4	0	0.1046	0.8837	0	0									0.9883
n-Propylbenzene		**0.885**	**2.9005**	**5.5128**	**2.3024**	**2.358**	**0.713**	**3.7**	**0.386**	**0.87**	**0.46**	**1.6**	**0**	**0**	**21.6877**
n-Propylbenzene	SET 1	0.816	0.8	1.4	1.2024	0.732	0.023	2.6	0	0	0	1.6	0	0	9.1734
n-Propylbenzene	SET 2	0.069	1	1.7041	1.1	1.626		1.1	0.32	0		0			6.9191
n-Propylbenzene	SET 3	0	0.9139	1.205	0	0	0.69	0	0.066	0.87	0.46	0			4.2049
n-Propylbenzene	SET 4	0	0.1866	1.2037	0	0									1.3903
o-Xylene		**3.4835**	**6.1021**	**9.4469**	**5.2359**	**5.5262**	**1.606**	**9.28**	**1.53**	**2.009**	**1.242**	**3.56**	**0**	**0**	**49.0216**
o-Xylene	SET 1	3.152	1.722	2.821	2.5049	1.6032	0.106	6.3	0.15	0.089	0.042	2.8	0	0	21.2901
o-Xylene	SET 2	0.3315	2.2	2.6086	2.731	3.633		2.7	0.82	0.22		0.4			15.6441
o-Xylene	SET 3	0	1.9091	1.9091	0	0.13	1.5	0.28	0.56	1.7	1.2	0.36			9.5482
o-Xylene	SET 4	0	0.271	2.1082	0	0.16									2.5392
p-Isopropyltoluene		**0.1351**	**0.5719**	**1.3956**	**0.61**	**0.647**	**0.111**	**0.65**	**0.045**	**0.099**	**0.05**	**0.321**	**0**	**0**	**4.6356**
p-Isopropyltoluene	SET 1	0.133	0.13	0.2	0.38	0.23	0.021	0.47	0	0	0	0.3	0	0	1.864
p-Isopropyltoluene	SET 2	0.0021	0.15	0.512	0.23	0.417		0.18	0.045	0		0			1.5361
p-Isopropyltoluene	SET 3	0	0.2514	0.3619	0	0	0.09	0	0	0.099	0.05	0.021			0.8733
p-Isopropyltoluene	SET 4	0	0.0405	0.3217	0	0									0.3622
sec-Butylbenzene		**0.0871**	**0.3102**	**0.7513**	**0.218**	**0.335**	**0**	**0**	**0**	**0**	**0**	**0.19**	**0**	**0**	**1.8916**
sec-Butylbenzene	SET 1	0.0854	0.085	0.14	0.13	0.089	0	0	0	0	0	0.19	0	0	0.7194
sec-Butylbenzene	SET 2	0.0017	0.096	0.26	0.088	0.246		0	0	0		0			0.6917
sec-Butylbenzene	SET 3	0	0.11	0.1813	0	0	0	0	0	0	0	0			0.2913
sec-Butylbenzene	SET 4	0	0.0192	0.17	0	0									0.1892
Styrene		**24.408**	**97.17**	**128.37**	**93.821**	**190.614**	**79.461**	**226.77**	**21.845**	**59.809**	**22.946**	**150.882**	**0.0036**	**0**	**1096.0996**
Styrene	SET 1	18.17	35.24	85.43	13.035	12.034	2.281	150.15	1.4	2.671	0.826	130.44	0.0036	0	451.6806
Styrene	SET 2	6.238	47.24	16.35	79.96	170.3		71.25	13.1	5.028		14.086			423.552
Styrene	SET 3	0	10.16	12.32	0.42	3.76	77.18	5.37	7.345	52.11	22.12	6.356			197.141
Styrene	SET 4	0	4.53	14.27	0.406	4.52									23.726
tert-Butylbenzene		**0**	**0.0123**	**0.035**	**0.014**	**0.044**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.1053**
tert-Butylbenzene	SET 1	0	0	0	0.014	0.013	0	0	0	0	0	0	0	0	0.027
tert-Butylbenzene	SET 2	0	0	0.015	0	0.031		0	0	0		0			0.046
tert-Butylbenzene	SET 3	0	0.01	0.01	0	0	0	0	0	0	0	0			0.02

VOCs Laboratory Results Summary

tert-Butylbenzene	SET 4	0	0.0023	0.01	0	0									0.0123
Tetrachloroethene		**0.0092**	**0.0532**	**0.0199**	**0.0067**	**0.044**	**0**	**0**	**0**	**0**	**0**	**0.022**	**0**	**0**	**0.155**
Tetrachloroethene	SET 1	0.0051	0	0	0.0067	0.019	0	0	0	0	0	0	0	0	0.0308
Tetrachloroethene	SET 2	0.0041	0	0.0087	0	0.025		0	0	0		0			0.0378
Tetrachloroethene	SET 3	0	0.0092	0.0059	0	0	0	0	0	0	0	0.022			0.0371
Tetrachloroethene	SET 4	0	0.044	0.0053	0	0									0.0493
Toluene		**10.6947**	**59.44**	**59.4**	**37.902**	**93.103**	**27.738**	**135.63**	**46.13**	**53.167**	**18.863**	**94.232**	**0.007**	**0.162**	**636.4687**
Toluene	SET 1	5.886	21.12	39.23	6.322	5.713	6.653	80.2	11.11	12.093	5.833	40.14	0.007	0.162	234.469
Toluene	SET 2	4.8087	29.13	7.39	29.37	49.1		38.17	8.91	18.028		28.031			212.9377
Toluene	SET 3	0	6.33	6.284	2.02	18.13	21.085	17.26	26.11	23.046	13.03	26.061			159.356
Toluene	SET 4	0	2.86	6.496	0.19	20.16									29.706
trans-1,2-Dichloroethene		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
trans-1,2-Dichloroethene	SET 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
trans-1,2-Dichloroethene	SET 2	0	0	0	0	0		0	0	0		0			0
trans-1,2-Dichloroethene	SET 3	0	0	0	0	0	0	0	0	0	0	0			0
trans-1,2-Dichloroethene	SET 4	0	0	0	0	0									0
trans-1,3-Dichloropropene		**0.0044**	**0**	**0.0025**	**0.0078**	**0.0353**	**0.027**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.077**
trans-1,3-Dichloropropene	SET 1	0.0044	0	0	0.0078	0.0053	0.027	0	0	0	0	0	0	0	0.0445
trans-1,3-Dichloropropene	SET 2	0	0	0	0	0.03		0	0	0		0			0.03
trans-1,3-Dichloropropene	SET 3	0	0	0.0025	0	0	0	0	0	0	0	0			0.0025
trans-1,3-Dichloropropene	SET 4	0	0	0	0	0									0
Trichloroethene		**0**	**0.0078**	**0.0068**	**0.0027**	**0.005**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0223**
Trichloroethene	SET 1	0	0	0	0.0027	0.005	0	0	0	0	0	0	0	0	0.0077
Trichloroethene	SET 2	0	0	0.0042	0	0		0	0	0		0			0.0042
Trichloroethene	SET 3	0	0.0045	0.0026	0	0	0	0	0	0	0	0			0.0071
Trichloroethene	SET 4	0	0.0033	0	0	0									0.0033
Trichlorofluoromethane		**0.0376**	**0.055**	**0.0785**	**0.028**	**0.069**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.2681**
Trichlorofluoromethane	SET 1	0.024	0	0	0.028	0.034	0	0	0	0	0	0	0	0	0.086
Trichlorofluoromethane	SET 2	0.0136	0	0.028	0	0		0	0	0		0			0.0416
Trichlorofluoromethane	SET 3	0	0.028	0.0246	0	0	0	0	0	0	0	0			0.0526
Trichlorofluoromethane	SET 4	0	0.027	0.0259	0	0.035									0.0879
Vinyl chloride		**2.96**	**1.1695**	**1.191**	**0.859**	**2.94**	**0.27**	**0.53**	**0.179**	**0.251**	**0.194**	**0.48**	**0**	**0**	**11.0235**
Vinyl chloride	SET 1	1.37	0.18	0.24	0.55	0.75	0.16	0.28	0.049	0.053	0.15	0.13	0	0	3.912
Vinyl chloride	SET 2	1.59	0.22	0.392	0.25	1.1		0.25	0	0.078		0.17			4.05
Vinyl chloride	SET 3	0	0.24	0.303	0.059	0.65	0.11	0	0.13	0.12	0.044	0.18			1.836
Vinyl chloride	SET 4	0	0.5295	0.256	0	0.44									1.2255

Configuration File: CUBA VOCS.pro
File Exported: 4/20/2016 4:09:21 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run D1

Trap ID-A: 5870 71
Trap ID-B: na

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 2h 9m
Averaging Period : 5 min.

			Stack **F**	**DGM-A** **F**	**Console** **F**	**MAS-A** **LPM**	**VAC-A** **in-Hg**	**DGM-A (L)** **Corr-Vol**	**Baro** **in-Hg**	**STD** **Vol_A**
AVERAGES AND TEST SUMMARIES			**84.5**	**98.1**	**104.9**	**0.839**	**5**	**73.27**	**30.04**	**69.749**
4/18/2016	4:12:33 PM	:	81	105	112	0.005	0	0	30.03	0
4/18/2016	4:17:32 PM	:	87	104	112	0.409	2.2	2.112	30.03	1.985
4/18/2016	4:53:57 PM	:	87	102	108	0.359	1.9	4.126	30.01	3.883
4/18/2016	4:58:57 PM	:	85	98	99	0.399	2.1	6.154	30.04	5.81
4/18/2016	5:03:57 PM	:	85	97	102	0.613	3.7	9.457	30.04	8.951
4/18/2016	5:08:57 PM	:	86	97	103	1.01	5.3	14.887	30.04	14.12
4/18/2016	5:13:57 PM	:	86	97	104	0.979	4.7	20.119	30.04	19.101
4/18/2016	5:18:57 PM	:	85	97	104	1.003	8.9	25.466	30.04	24.19
4/18/2016	5:23:48 PM	:User Paused	85	97	104	1.003	8.9	30.645	30.04	29.12
4/18/2016	5:34:23 PM	:Resumed	85	97	104	1.003	8.9	30.645	30.04	29.12
4/18/2016	5:35:23 PM	:	84	97	104	1	7.2	31.762	30.04	30.183
4/18/2016	5:40:23 PM	:	83	96	104	0.999	5.8	37.064	30.04	35.235
4/18/2016	5:45:23 PM	:	83	96	104	0.999	5.6	42.374	30.04	40.294
4/18/2016	5:50:23 PM	:	83	96	104	0.999	5.6	47.703	30.04	45.372
4/18/2016	5:55:23 PM	:	83	96	104	0.999	5.5	53.05	30.04	50.465
4/18/2016	5:56:07 PM	:User Paused	84	96	104	1.002	5.6	53.849	30.04	51.227
4/18/2016	6:02:52 PM	:Resumed	83	97	104	0.004	0	53.851	30.04	51.229
4/18/2016	6:07:51 PM	:	83	96	104	0.997	5.7	59.154	30.04	56.286
4/18/2016	6:12:51 PM	:	83	96	104	0.999	5.8	64.501	30.04	61.386
4/18/2016	6:17:51 PM	:	82	96	103	0.999	5.8	69.826	30.04	66.464
4/18/2016	6:21:06 PM	:	82	96	103	0.999	5.8	73.27	30.04	69.749

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/18/16 4:12:33 PM: Test START
04/18/16 4:13:53 PM: Alarm Chg    88   open   open   open   104   105   open   112  0.402   2.1   0.657  0.403   0.0   0.520   -  30.03   0.617   0.487   -   -   400   51.8   53.3   1.3   0.5 {---- ---- ---L MN--
04/18/16 4:52:58 PM: Return from power failure
04/18/16 4:54:25 PM: Alarm Chg    85   open   open   open    98    99   open    97  0.400   2.2   4.324  0.398   0.1   4.334   -  30.04   4.071   4.072   -   -   400   46.3   46.7   89.7   89.0 {---- ---- ---L MN--}
04/18/16 5:01:57 PM: Flow Adjust: value added to the flow rate = 600
04/18/16 5:02:00 PM: Flow Adjust: value added to the flow rate = 600
04/18/16 5:23:48 PM: Test Paused by User
04/18/16 5:23:49 PM: PAUSE_EVENT [Manual Pause]
04/18/16 5:34:23 PM: TestResumed
04/18/16 5:56:07 PM: Test Paused by User
04/18/16 5:56:07 PM: PAUSE_EVENT [Manual Pause]
04/18/16 6:02:52 PM: TestResumed
04/18/16 6:21:06 PM: Actual Sampling Time: 0d  1h  20m  1s
04/18/16 6:21:06 PM: Test END
04/19/16 2:49:00 PM: PAUSE_EVENT -
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.9 inHg
' NOTE: Post_Leak Test Side B Not tested
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'            Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS run 2.pro
File Exported: 4/20/2016 4:09:26 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run D2

Trap ID-A: na
Trap ID-B: nab

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 33m
Averaging Period : 5 min.

			Stack **F**	**DGM-A** **F**	**Console** **F**	**MAS-A** **LPM**	**VAC-A** **in-Hg**	**DGM-A (L)** **Corr-Vol**	**Baro** **in-Hg**	**STD** **Vol_A**
AVERAGES AND TEST SUMMARIES			**94.2**	**108.4**	**118.1**	**0.947**	**5.7**	**87.104**	**30.03**	**81.272**
4/19/2016	2:51:33 PM	:	95	107	112	0.005	0	0	30.03	0
4/19/2016	2:56:32 PM	:	95	106	112	0.996	5.4	5.446	30.03	5.1
4/19/2016	3:01:32 PM	:	96	106	113	1	5.5	10.926	30.03	10.234
4/19/2016	3:06:32 PM	:	95	106	114	0.999	5.5	16.325	30.03	15.292
4/19/2016	3:10:51 PM	:User Paused	95	106	114	0.999	5.5	20.967	30.03	19.641
4/19/2016	3:17:06 PM	:Resumed	95	106	114	0.999	5.5	20.969	30.03	19.642
4/19/2016	3:18:06 PM	:	98	107	117	0.974	5.5	22.105	30.03	20.703
4/19/2016	3:23:06 PM	:	94	107	118	0.999	5.9	27.499	30.03	25.743
4/19/2016	3:28:06 PM	:	96	107	119	1	5.9	32.96	30.03	30.845
4/19/2016	3:33:06 PM	:	96	108	119	0.999	5.9	38.4	30.03	35.922
4/19/2016	3:38:06 PM	:	96	108	120	0.999	5.9	43.82	30.03	40.976
4/19/2016	3:38:15 PM	:User Paused	94	109	121	0.999	5.9	44.029	30.03	41.17
4/19/2016	3:44:55 PM	:Resumed	92	110	121	0.003	0	44.031	30.03	41.172
4/19/2016	3:49:54 PM	:	94	109	120	0.984	8.5	49.394	30.03	46.164
4/19/2016	3:54:54 PM	:	93	109	120	0.999	8.8	54.886	30.03	51.277
4/19/2016	3:59:54 PM	:	92	109	120	0.999	8.8	60.322	30.03	56.336
4/19/2016	4:04:54 PM	:	90	109	120	1.002	8.8	65.793	30.03	61.428
4/19/2016	4:09:54 PM	:	92	109	120	0.993	3	71.264	30.03	66.52
4/19/2016	4:14:54 PM	:	90	109	119	0.993	6.1	76.694	30.03	71.574
4/19/2016	4:19:54 PM	:	91	109	119	0.999	6.2	82.153	30.03	76.659
4/19/2016	4:24:27 PM	:	91	109	119	0.999	6.2	87.104	30.03	81.272

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/19/16 2:51:33 PM: Test START
04/19/16 2:51:36 PM: Flow Adjust: value added to the flow rate = 600
04/19/16 2:51:37 PM: Flow Adjust: value added to the flow rate = 600
04/19/16 2:52:52 PM: Alarm Chg    94    94    94   open    106    107    open    112  0.999    5.4    1.416  1.004    0.2    1.438     -  30.03    1.326    1.343     -     -   1000   59.6   60.8    1.3    0.5 {---- ---- ---L MN--}
04/19/16 3:10:51 PM: Test Paused by User
04/19/16 3:10:51 PM: PAUSE_EVENT [Manual Pause]
04/19/16 3:17:06 PM: TestResumed
04/19/16 3:38:15 PM: Test Paused by User
04/19/16 3:38:15 PM: PAUSE_EVENT [Manual Pause]
04/19/16 3:44:55 PM: TestResumed
04/19/16 4:24:27 PM: Actual Sampling Time: 0d  1h  20m  0s
04/19/16 4:24:27 PM: Test END
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.8 inHg
' NOTE: Post_Leak Test Side B Not tested
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'            Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS run 3.pro
File Exported: 4/20/2016 4:09:31 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run D3

Trap ID-A: na
Trap ID-B: na3

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 42m
Averaging Period : 5 min.

			Stack	**DGM-A**	**Console**	**MAS-A**	**VAC-A**	**DGM-A (L)**	**Baro**	**STD**
			F	**F**	**F**	**LPM**	**in-Hg**	**Corr-Vol**	**in-Hg**	**Vol_A**
AVERAGES AND TEST SUMMARIES			**90**	**99.4**	**109**	**0.951**	**7.4**	**86.682**	**30.02**	**82.17**
4/20/2016	2:23:03 PM	:	92	97	105	0.002	0	0	29.93	0
4/20/2016	2:28:02 PM	:	93	97	106	0.956	7.7	5.198	30.02	4.946
4/20/2016	2:33:02 PM	:	91	97	107	0.999	8	10.65	30.03	10.129
4/20/2016	2:38:02 PM	:	89	98	108	1	7.9	16.02	30.03	15.229
4/20/2016	2:42:58 PM	:User Paused	89	98	108	1	7.9	21.342	30.03	20.283
4/20/2016	2:49:34 PM	:Resumed	89	98	108	1	7.9	21.345	30.03	20.286
4/20/2016	2:50:34 PM	:	87	99	108	0.98	7.9	22.437	30.03	21.321
4/20/2016	2:55:34 PM	:	87	99	108	0.999	8.6	27.852	30.03	26.454
4/20/2016	3:00:34 PM	:	86	99	107	0.998	8.5	33.306	30.03	31.624
4/20/2016	3:05:34 PM	:	86	99	107	0.999	8.5	38.698	30.03	36.735
4/20/2016	3:10:34 PM	:	86	98	107	1.001	8.5	44.126	30.03	41.885
4/20/2016	3:10:45 PM	:User Paused	88	99	107	1	8.5	44.333	30.03	42.082
4/20/2016	3:19:53 PM	:Resumed	91	100	107	0.005	0	44.334	30.03	42.083
4/20/2016	3:24:52 PM	:	90	98	107	0.992	8.9	49.723	30.03	47.195
4/20/2016	3:29:52 PM	:	90	98	108	1	8.7	55.143	30.03	52.338
4/20/2016	3:34:52 PM	:	89	99	109	0.999	8.3	60.538	30.03	57.453
4/20/2016	3:38:48 PM	:User Paused	89	99	109	0.999	8.3	64.883	30.03	61.572
4/20/2016	3:45:18 PM	:Resumed	89	99	109	0.999	8.3	64.886	30.03	61.574
4/20/2016	3:47:17 PM	:	93	100	110	0.996	8	67.038	30.03	63.61
4/20/2016	3:52:17 PM	:	92	101	111	1	7.6	72.484	30.03	68.759
4/20/2016	3:57:17 PM	:	89	101	112	0.999	7.4	77.952	30.03	73.926
4/20/2016	4:02:17 PM	:	91	101	112	0.999	7.3	83.37	30.03	79.043
4/20/2016	4:05:17 PM	:	91	101	112	0.999	7.3	86.682	30.03	82.17

'
'-------------------------- LOGGED EVENTS ---------------------------------
04/20/16 2:23:03 PM: Test START
04/20/16 2:23:16 PM: Flow Adjust: value added to the flow rate = 600
04/20/16 2:23:17 PM: Flow Adjust: value added to the flow rate = 600
04/20/16 2:24:22 PM: Alarm Chg 93 93 93 open 97 98 open 106 0.989 8.1 1.221 1.023 0.2 1.175 - 30.03 1.162 1.115 - - 1000 66.3 63.9 0.5 - {---- ---- ---L MN--}
04/20/16 2:42:58 PM: Test Paused by User
04/20/16 2:42:59 PM: PAUSE_EVENT [Manual Pause]
04/20/16 2:49:34 PM: TestResumed
04/20/16 3:10:45 PM: Test Paused by User
04/20/16 3:10:45 PM: PAUSE_EVENT [Manual Pause]
04/20/16 3:19:53 PM: TestResumed
04/20/16 3:38:48 PM: Test Paused by User
04/20/16 3:38:48 PM: PAUSE_EVENT [Manual Pause]
04/20/16 3:45:18 PM: TestResumed
04/20/16 4:05:17 PM: Actual Sampling Time: 0d 1h 20m 1s
04/20/16 4:05:17 PM: Test END
Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.9 inHg
' *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
' Console Name: 3212 - Ambient Air Services
' Console ID: XC30B-3212
' DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
' DGM cm3/Pulse: 1.93

' RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
' Software-Firmware Ver: 0320L-116

Configuration File: CUBA VOCS run 4.pro
File Exported: 4/21/2016 3:41:00 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run D4

Trap ID-A: na
Trap ID-B: nab

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 43m
Averaging Period : 5 min.

			Stack F	DGM-A F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	Baro in-Hg	STD Vol_A
AVERAGES AND TEST SUMMARIES			**94.6**	**105.7**	**115**	**0.557**	**12.8**	**0**	**28.78**	**45.992**
4/21/2016	12:48:01 PM	:	91	105	111	0.004	0	0	30.03	0
4/21/2016	12:53:00 PM	:	91	104	111	0.973	7.9	5.37	30.03	5.043
4/21/2016	12:58:00 PM	:	91	104	111	0.999	8.5	10.835	30.03	10.176
4/21/2016	1:03:00 PM	:	93	104	112	1.001	8.1	16.334	30.03	15.341
4/21/2016	1:08:00 PM	:	95	104	112	1	7.7	21.792	30.03	20.468
4/21/2016	1:09:25 PM	:User Paused	95	104	112	1	7.7	23.296	30.03	21.881
4/21/2016	1:16:47 PM	:Resumed	95	104	112	1	7.7	23.296	30.03	21.881
4/21/2016	1:20:46 PM	:	92	105	114	0.978	9.3	27.596	30.03	25.916
4/21/2016	1:25:46 PM	:	94	105	114	1	9.4	33.034	30.03	31.019
4/21/2016	1:30:46 PM	:	94	105	114	1	8.9	38.465	30.03	36.115
4/21/2016	1:35:29 PM	:User Paused	94	105	114	1	8.9	43.581	30.03	40.915
4/21/2016	1:41:31 PM	:Resumed	94	105	114	1	8.9	43.583	30.03	40.917
4/21/2016	1:42:30 PM	:	94	105	114	0.98	8.8	44.741	30.03	42.003
4/21/2016	1:47:30 PM	:	94	105	114	0.677	12.2	48.694	30.03	45.708
4/21/2016	1:52:30 PM	:	97	105	116	0.017	21.6	48.732	30.03	45.745
4/21/2016	1:57:30 PM	:	96	106	116	0.018	21.5	48.768	30.03	45.778
4/21/2016	2:02:04 PM	:User Paused	96	106	116	0.018	21.5	48.808	30.03	45.816
4/21/2016	2:07:12 PM	:Resumed	96	106	116	0.018	21.5	48.808	30.03	45.816
4/21/2016	2:08:11 PM	:	95	107	117	0.043	21	48.867	30.03	45.871
4/21/2016	2:13:11 PM	:	94	107	117	0.02	21.4	48.916	30.03	45.917
4/21/2016	2:18:11 PM	:	94	107	116	0.02	21.5	48.946	30.03	45.945
4/21/2016	2:23:11 PM	:	94	107	116	0.02	21.5	48.976	30.03	45.972
4/21/2016	2:26:33 PM	:	94	107	116	0.02	21.5	48.997	30.03	45.992
4/21/2016	2:31:18 PM	:End	open	open	open	0	0	0	0	45.992

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/21/16 12:48:01 PM: Test START
04/21/16 12:48:06 PM: Flow Adjust: value added to the flow rate = 600
04/21/16 12:49:21 PM: Alarm Chg    90   open    89   open   105   106   open   111  0.982   7.5   1.372  0.980   0.1   1.371    -  30.03   1.288   1.283    -    -  1000  67.8  65.1   1.0   0.8 {---- ---- ---L MN--}
04/21/16 1:09:25 PM: Test Paused by User
04/21/16 1:09:25 PM: PAUSE_EVENT [Manual Pause]
04/21/16 1:16:47 PM: TestResumed
04/21/16 1:35:29 PM: Test Paused by User
04/21/16 1:35:30 PM: PAUSE_EVENT [Manual Pause]
04/21/16 1:41:31 PM: TestResumed
04/21/16 2:02:04 PM: Test Paused by User
04/21/16 2:02:04 PM: PAUSE_EVENT [Manual Pause]
04/21/16 2:07:12 PM: TestResumed
04/21/16 2:26:33 PM: Actual Sampling Time: 0d  1h  20m  0s
04/21/16 2:26:33 PM: Test END
04/21/16 2:31:18 PM: Actual Sampling Time: 0d  1h  20m  0s
04/21/16 2:31:18 PM: Test END
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 21.6 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'            Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'           RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'  Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS run 5.pro
File Exported: 4/22/2016 5:38:51 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run D5

Trap ID-A: na
Trap ID-B: nb

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 34m
Averaging Period : 5 min.

			Stack F	**DGM-A F**	**MAS-A LPM**	**VAC-A in-Hg**	**DGM-A (L) Corr-Vol**	**Baro in-Hg**	**STD Vol_A**
AVERAGES AND TEST SUMMARIES			**77.6**	**83.7**	**0.903**	**5.5**	**0.002**	**28.66**	**83.017**
4/22/2016	3:47:51 PM	:	76	78	0	0	0	30.03	0
4/22/2016	3:52:50 PM	:	75	78	0.981	5.7	5.185	30.03	5.107
4/22/2016	3:57:50 PM	:	75	78	1.001	6	10.493	30.03	10.331
4/22/2016	4:02:50 PM	:	75	79	0.999	5.9	15.721	30.03	15.466
4/22/2016	4:07:50 PM	:	75	80	0.999	6	21.058	30.03	20.703
4/22/2016	4:08:28 PM	:User Paused	77	81	1.004	6	21.738	30.03	21.369
4/22/2016	4:14:56 PM	:Resumed	77	83	0	0	21.742	30.03	21.373
4/22/2016	4:19:55 PM	:	77	82	0.997	6.4	26.969	30.03	26.487
4/22/2016	4:24:55 PM	:	76	82	0.999	6.5	32.292	30.03	31.69
4/22/2016	4:29:55 PM	:	76	83	0.998	6.5	37.607	30.03	36.88
4/22/2016	4:34:55 PM	:	76	83	0.999	6.5	42.972	30.03	42.113
4/22/2016	4:39:55 PM	:	77	84	1.005	4.3	48.327	30.03	47.332
4/22/2016	4:44:55 PM	:	78	84	0.984	7.8	53.614	30.03	52.479
4/22/2016	4:49:55 PM	:	78	85	1.001	7.6	58.926	30.03	57.641
4/22/2016	4:54:30 PM	:User Paused	78	85	1.001	7.6	63.787	30.03	62.364
4/22/2016	5:01:05 PM	:Resumed	78	85	1.001	7.6	63.789	30.03	62.366
4/22/2016	5:02:04 PM	:	78	87	0.996	6.3	64.937	30.03	63.478
4/22/2016	5:07:04 PM	:	78	87	0.999	6	70.258	30.03	68.629
4/22/2016	5:12:04 PM	:	79	87	0.998	6.1	75.608	30.03	73.808
4/22/2016	5:17:04 PM	:	79	88	0.999	6.2	80.954	30.03	78.977
4/22/2016	5:20:53 PM	:	79	88	0.999	6.2	85.132	30.03	83.017
4/22/2016	5:22:20 PM	:End	open	open	0	0	0.002	0	83.017

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/22/16 3:47:51 PM: Test START
04/22/16 3:47:55 PM: Flow Adjust: value added to the flow rate = 600
04/22/16 3:47:55 PM: Flow Adjust: value added to the flow rate = 600
04/22/16 3:49:10 PM: Alarm Chg    76    78  open  open    78    79  open    87  1.001    5.8    1.258  0.994   0.0    1.299    -  30.03    1.238    1.277    -    -  1000   65.5   66.3    -    - {---- ---- ---L MN--}
04/22/16 4:08:28 PM: Test Paused by User
04/22/16 4:08:28 PM: PAUSE_EVENT [Manual Pause]
04/22/16 4:14:56 PM: TestResumed
04/22/16 4:54:30 PM: Test Paused by User
04/22/16 4:54:30 PM: PAUSE_EVENT [Manual Pause]
04/22/16 5:01:05 PM: TestResumed
04/22/16 5:20:53 PM: Actual Sampling Time: 0d  1h  20m  0s
04/22/16 5:20:53 PM: Test END
04/22/16 5:22:20 PM: Actual Sampling Time: 0d  1h  20m  0s
04/22/16 5:22:20 PM: Test END
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 7.8 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'----------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3212 - Ambient Air Services
'             Console ID: XC30B-3212
'           DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS Day Run 6.pro
File Exported: 4/29/2016 6:25:45 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run D6

Trap ID-A: n
Trap ID-B: nn

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 37m
Averaging Period : 5 min.

			Stack F	DGM-A F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	Baro in-Hg	STD Vol_A
AVERAGES AND TEST SUMMARIES			**98.5**	**109.4**	**120.1**	**0.996**	**7.2**	**88.042**	**30.02**	**81.946**
4/29/2016	2:03:45 PM	:	97	104	113	0.002	0	0	30.03	0
4/29/2016	2:08:44 PM	:	98	104	114	0.967	7.9	5.313	30.02	4.989
4/29/2016	2:13:44 PM	:	97	105	115	1.001	7.7	10.759	30.02	10.098
4/29/2016	2:18:44 PM	:	101	106	117	0.999	7.5	16.232	30.02	15.223
4/29/2016	2:23:44 PM	:	99	106	118	0.996	8.2	21.733	30.02	20.37
4/29/2016	2:25:52 PM	:User Paused	99	106	118	0.996	8.2	24.076	30.02	22.562
4/29/2016	2:31:09 PM	:Resumed	99	106	118	0.996	8.2	24.076	30.02	22.562
4/29/2016	2:34:08 PM	:	97	108	120	1.014	6.2	27.436	30.02	25.694
4/29/2016	2:39:08 PM	:	101	108	120	0.997	6.6	32.979	30.02	30.861
4/29/2016	2:44:08 PM	:	97	109	121	1.001	6.7	38.491	30.02	35.994
4/29/2016	2:49:08 PM	:	96	110	121	0.999	6.4	43.988	30.02	41.103
4/29/2016	2:51:54 PM	:User Paused	96	110	121	0.999	6.4	47.035	30.02	43.936
4/29/2016	2:58:06 PM	:Resumed	96	110	121	0.999	6.4	47.037	30.02	43.938
4/29/2016	3:01:06 PM	:	99	111	121	0.971	6.9	50.267	30.02	46.935
4/29/2016	3:06:06 PM	:	98	111	121	0.999	7.9	55.809	30.02	52.077
4/29/2016	3:11:06 PM	:	98	111	121	0.999	7.9	61.353	30.02	57.221
4/29/2016	3:14:31 PM	:User Paused	98	111	121	0.999	7.9	65.138	30.02	60.733
4/29/2016	3:20:31 PM	:Resumed	98	111	121	0.999	7.9	65.142	30.02	60.737
4/29/2016	3:22:30 PM	:	98	112	121	0.995	7.5	67.318	30.02	62.752
4/29/2016	3:27:30 PM	:	98	112	121	0.998	7.7	72.857	30.02	67.882
4/29/2016	3:32:30 PM	:	97	112	122	0.999	8.1	78.424	30.02	73.038
4/29/2016	3:37:30 PM	:	97	112	122	0.997	8.4	83.938	30.02	78.145
4/29/2016	3:41:13 PM	:	97	112	122	0.997	8.4	88.042	30.02	81.946

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/29/16 2:03:45 PM: Test START
04/29/16 2:03:48 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 2:03:49 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 2:03:50 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 2:03:50 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 2:03:59 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 2:05:04 PM: Alarm Chg    98   open   open   open   104   105   open   114  0.979   8.3   1.288  0.988   0.0   1.371    -  30.02   1.209   1.286    -    -  1000   78.4   72.2   0.5   0.5 {---- ---- ---L MN--}
04/29/16 2:25:52 PM: Test Paused by User
04/29/16 2:25:52 PM: PAUSE_EVENT [Manual Pause]
04/29/16 2:31:09 PM: TestResumed
04/29/16 2:51:54 PM: Test Paused by User
04/29/16 2:51:54 PM: PAUSE_EVENT [Manual Pause]
04/29/16 2:58:06 PM: TestResumed
04/29/16 3:14:31 PM: Test Paused by User
04/29/16 3:14:31 PM: PAUSE_EVENT [Manual Pause]
04/29/16 3:20:31 PM: TestResumed
04/29/16 3:41:13 PM: Actual Sampling Time: 0d  1h  20m  0s
04/29/16 3:41:13 PM: Test END
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.4 inHg
' NOTE: Post_Leak Test Side B Not tested
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'             Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'           RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA VOCS NIght Run 1.pro
File Exported: 4/28/2016 12:19:12 AM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run N1

Trap ID-A: n
Trap ID-B: b

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 39m
Averaging Period : 5 min.

			Stack **F**	**DGM-A** **F**	**Console** **F**	**MAS-A** **LPM**	**VAC-A** **in-Hg**	**DGM-A (L)** **Corr-Vol**	**Baro** **in-Hg**	**STD** **Vol_A**
AVERAGES AND TEST SUMMARIES			**76.3**	**84.4**	**94.3**	**0.951**	**7.5**	**84.752**	**30.03**	**82.572**
4/25/2016	11:08:50 PM	:	78	81	92	1.146	9.3	0.004	30.03	0.004
4/25/2016	11:13:49 PM	:	77	81	91	0.965	7.4	5.126	30.03	5.024
4/25/2016	11:18:49 PM	:	76	81	91	1	7.5	10.36	30.03	10.151
4/25/2016	11:23:49 PM	:	77	82	92	1.001	7.4	15.636	30.03	15.313
4/25/2016	11:28:49 PM	:	76	82	93	1	7.2	20.932	30.03	20.489
4/25/2016	11:29:15 PM	:User Paused	77	83	94	1.003	7.1	21.407	30.03	20.953
4/25/2016	11:35:19 PM	:Resumed	77	85	93	0.002	0	21.411	30.03	20.957
4/25/2016	11:40:18 PM	:	76	84	94	0.996	7.8	26.643	30.03	26.057
4/25/2016	11:45:18 PM	:	76	84	94	1.001	7.3	31.961	30.03	31.24
4/25/2016	11:50:18 PM	:	75	84	94	1	7	37.297	30.03	36.436
4/25/2016	11:54:34 PM	:User Paused	75	84	94	1	7	41.82	30.03	40.84
4/26/2016	12:00:12 AM	:Resumed	75	84	94	1	7	41.822	30.03	40.842
4/26/2016	12:01:11 AM	:	75	85	94	0.94	7.3	42.851	30.03	41.842
4/26/2016	12:06:11 AM	:	75	85	94	0.988	8.3	48.115	30.03	46.963
4/26/2016	12:11:11 AM	:	76	85	94	0.998	8.5	53.434	30.03	52.137
4/26/2016	12:16:11 AM	:	76	85	95	0.998	9	58.701	30.03	57.26
4/26/2016	12:20:33 AM	:User Paused	76	85	95	0.998	9	63.32	30.03	61.753
4/26/2016	12:28:05 AM	:Resumed	76	85	95	0.998	9	63.32	30.03	61.753
4/26/2016	12:29:04 AM	:	76	86	95	1.042	7.6	64.44	30.03	62.841
4/26/2016	12:34:04 AM	:	75	85	95	1.001	7.7	69.757	30.03	68.008
4/26/2016	12:39:04 AM	:	75	85	95	0.999	7.7	75.052	30.03	73.154
4/26/2016	12:44:04 AM	:	74	86	95	1	7.7	80.407	30.03	78.353
4/26/2016	12:48:05 AM	:	74	86	95	1	7.7	84.752	30.03	82.572

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/25/16 11:08:50 PM: Test START
04/25/16 11:08:56 PM: Flow Adjust: value added to the flow rate = 600
04/25/16 11:08:57 PM: Flow Adjust: value added to the flow rate = 600
04/25/16 11:10:10 PM: Alarm Chg    77   open   open   open    81    81   open    91  0.986    7.5    1.196  1.003    0.1    1.336    -  30.03    1.171    1.308    -    -   1000   83.5   69.8  286.5    1.0 {---- ---- ---L MN--
04/25/16 11:29:15 PM: Test Paused by User
04/25/16 11:29:15 PM: PAUSE_EVENT [Manual Pause]
04/25/16 11:35:19 PM: TestResumed
04/25/16 11:54:34 PM: Test Paused by User
04/25/16 11:54:34 PM: PAUSE_EVENT [Manual Pause]
04/26/16 12:00:12 AM: TestResumed
04/26/16 12:20:32 AM: Test Paused by User
04/26/16 12:20:33 AM: PAUSE_EVENT [Manual Pause]
04/26/16 12:28:05 AM: TestResumed
04/26/16 12:48:05 AM: Actual Sampling Time: 0d  1h  20m  0s
04/26/16 12:48:05 AM: Test END
04/26/16 8:50:06 PM: New Trap Temperature: set to = 300F
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 9 inHg
' NOTE: Post_Leak Test Side B Not tested
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'             Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'             RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS NIght Run 2.pro
File Exported: 4/28/2016 12:19:23 AM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run N2

Trap ID-A: nNMn
Trap ID-B: nn

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 36m
Averaging Period : 5 min.

			Stack	**DGM-A**	**Console**	**MAS-A**	**VAC-A**	**DGM-A (L)**	**Baro**	**STD**
			F	**F**	**F**	**LPM**	**in-Hg**	**Corr-Vol**	**in-Hg**	**Vol_A**
AVERAGES AND TEST SUMMARIES			**79.4**	**91.7**	**100.2**	**0.95**	**6.2**	**86.116**	**30.03**	**82.788**
4/26/2016	9:43:59 PM	:	79	91	98	0.001	0	0	30.03	0
4/26/2016	9:48:58 PM	:	78	90	98	0.971	6.8	5.268	30.03	5.074
4/26/2016	9:53:58 PM	:	79	90	99	1.002	7.2	10.68	30.03	10.287
4/26/2016	9:58:58 PM	:	79	91	99	0.993	7.3	15.993	30.03	15.401
4/26/2016	10:03:58 PM	:	79	91	99	1	7.9	21.387	30.03	20.593
4/26/2016	10:04:55 PM	:User Paused	81	91	100	1.002	7.6	22.441	30.03	21.606
4/26/2016	10:09:59 PM	:Resumed	80	92	99	0.007	0	22.442	30.03	21.607
4/26/2016	10:14:59 PM	:	80	91	99	1.002	6.5	27.896	30.03	26.851
4/26/2016	10:19:59 PM	:	79	91	100	0.996	6	33.221	30.03	31.971
4/26/2016	10:24:59 PM	:	79	91	100	0.999	6.5	38.605	30.03	37.148
4/26/2016	10:29:05 PM	:User Paused	79	91	100	0.999	6.5	43.015	30.03	41.388
4/26/2016	10:34:04 PM	:Resumed	79	91	100	0.999	6.5	43.015	30.03	41.388
4/26/2016	10:35:04 PM	:	78	92	100	0.95	7.3	44.068	30.03	42.399
4/26/2016	10:40:04 PM	:	78	92	100	0.996	8.1	49.398	30.03	47.519
4/26/2016	10:45:04 PM	:	78	92	100	1.001	7.6	54.833	30.03	52.74
4/26/2016	10:50:04 PM	:	78	92	100	0.999	7.4	60.213	30.03	57.909
4/26/2016	10:53:31 PM	:User Paused	78	92	100	0.999	7.4	63.965	30.03	61.512
4/26/2016	10:59:25 PM	:Resumed	78	92	100	0.999	7.4	63.967	30.03	61.514
4/26/2016	11:01:24 PM	:	78	92	100	1.004	5.6	66.15	30.03	63.609
4/26/2016	11:06:24 PM	:	79	92	100	0.999	5.4	71.521	30.03	68.768
4/26/2016	11:11:24 PM	:	79	92	100	0.995	5.7	76.934	30.03	73.968
4/26/2016	11:16:24 PM	:	78	92	100	0.999	6.4	82.358	30.03	79.179
4/26/2016	11:19:55 PM	:	78	92	100	0.999	6.4	86.116	30.03	82.788

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/26/16 9:43:59 PM: Test START
04/26/16 9:44:02 PM: Flow Adjust: value added to the flow rate = 600
04/26/16 9:44:02 PM: Flow Adjust: value added to the flow rate = 600
04/26/16 9:45:18 PM: Alarm Chg    79   open   open   open    91    91   open    98  0.966    6.2    1.300  1.000    0.0    1.289     -  30.03    1.251    1.239    -     -   1000   66.3   68.2    0.3    0.8 {---- ---- ---L MN--}
04/26/16 10:04:55 PM: Test Paused by User
04/26/16 10:04:56 PM: PAUSE_EVENT [Manual Pause]
04/26/16 10:09:59 PM: TestResumed
04/26/16 10:29:05 PM: Test Paused by User
04/26/16 10:29:05 PM: PAUSE_EVENT [Manual Pause]
04/26/16 10:34:04 PM: TestResumed
04/26/16 10:53:31 PM: Test Paused by User
04/26/16 10:53:32 PM: PAUSE_EVENT [Manual Pause]
04/26/16 10:59:25 PM: TestResumed
04/26/16 11:19:55 PM: Actual Sampling Time: 0d  1h  20m  0s
04/26/16 11:19:55 PM: Test END
04/27/16 10:01:14 PM: New Trap Temperature: set to = 300F
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.1 inHg
' NOTE: Post_Leak Test Side B Not tested
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'            Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS NIght Run 3.pro
File Exported: 4/28/2016 12:19:30 AM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run N3

Trap ID-A: n
Trap ID-B: nn

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 36m
Averaging Period : 5 min.

			Stack	**DGM-A**	**Console**	**MAS-A**	**VAC-A**	**DGM-A (L)**	**Baro**	**STD**
			F	**F**	**F**	**LPM**	**in-Hg**	**Corr-Vol**	**in-Hg**	**Vol_A**
AVERAGES AND TEST SUMMARIES			**77.7**	**89.2**	**97.9**	**0.996**	**6.6**	**85.584**	**30.02**	**82.626**
4/27/2016	10:21:55 PM	:	78	88	95	0.003	0	0	30.02	0
4/27/2016	10:26:54 PM	:	77	87	95	0.966	8.5	5.197	30.02	5.029
4/27/2016	10:31:54 PM	:	78	87	96	1.001	8.6	10.631	30.02	10.288
4/27/2016	10:36:54 PM	:	77	88	97	1	8.5	15.973	30.02	15.454
4/27/2016	10:41:54 PM	:	77	88	97	1	8.4	21.37	30.02	20.672
4/27/2016	10:43:26 PM	:User Paused	77	88	97	1	8.4	22.94	30.02	22.19
4/27/2016	10:49:24 PM	:Resumed	77	88	97	1	8.4	22.942	30.02	22.192
4/27/2016	10:53:24 PM	:	76	88	97	1.006	5.9	27.345	30.02	26.445
4/27/2016	10:58:24 PM	:	76	88	97	0.999	5.7	32.742	30.02	31.658
4/27/2016	11:03:24 PM	:	77	89	98	0.999	5.7	38.116	30.02	36.845
4/27/2016	11:08:24 PM	:	77	89	98	0.999	5.7	43.459	30.02	42.002
4/27/2016	11:09:32 PM	:User Paused	77	89	98	0.999	5.7	44.711	30.02	43.21
4/27/2016	11:14:19 PM	:Resumed	77	89	98	0.999	5.7	44.713	30.02	43.212
4/27/2016	11:18:18 PM	:	77	89	98	0.991	6.5	48.94	30.02	47.291
4/27/2016	11:23:18 PM	:	77	89	98	0.999	6.3	54.225	30.02	52.391
4/27/2016	11:28:18 PM	:	77	89	98	0.999	6.2	59.607	30.02	57.581
4/27/2016	11:33:00 PM	:User Paused	77	89	98	0.999	6.2	64.657	30.02	62.449
4/27/2016	11:38:21 PM	:Resumed	77	89	98	0.999	6.2	64.659	30.02	62.451
4/27/2016	11:39:20 PM	:	78	89	98	0.981	6	65.679	30.02	63.434
4/27/2016	11:44:20 PM	:	77	89	98	0.993	6.5	71.006	30.02	68.57
4/27/2016	11:49:20 PM	:	77	89	98	0.99	7.9	76.293	30.02	73.668
4/27/2016	11:54:20 PM	:	77	89	98	0.998	8	81.677	30.02	78.86
4/27/2016	11:58:01 PM	:	77	89	98	0.998	8	85.584	30.02	82.626

```
'
'-------------------------- LOGGED EVENTS --------------------------------
04/27/16 10:21:55 PM: Test START
04/27/16 10:21:55 PM: Flow Adjust: value added to the flow rate = 600
04/27/16 10:21:55 PM: Flow Adjust: value added to the flow rate = 600
04/27/16 10:23:15 PM: Alarm Chg     78    open    open    open     88     88    open     95   0.961    8.5     1.383  1.005     0.0     1.226      -   30.02     1.337     1.186      -      -    1000    79.6    70.6     0.3     0.3 {---- ---- ---L MN--}
04/27/16 10:43:26 PM: Test Paused by User
04/27/16 10:43:26 PM: PAUSE_EVENT [Manual Pause]
04/27/16 10:49:24 PM: TestResumed
04/27/16 11:09:32 PM: Test Paused by User
04/27/16 11:09:32 PM: PAUSE_EVENT [Manual Pause]
04/27/16 11:14:19 PM: TestResumed
04/27/16 11:33:00 PM: Test Paused by User
04/27/16 11:33:01 PM: PAUSE_EVENT [Manual Pause]
04/27/16 11:38:21 PM: TestResumed
04/27/16 11:58:01 PM: Actual Sampling Time: 0d  1h  20m  0s
04/27/16 11:58:01 PM: Test END
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.6 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3212 - Ambient Air Services
'             Console ID: XC30B-3212
'           DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320L-116
```

Configuration File: CUBA VOCS NIght Run 4.pro
File Exported: 4/29/2016 6:25:40 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run N4

Trap ID-A: n
Trap ID-B: m

Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 37m
Averaging Period : 5 min.

			Stack F	DGM-A F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	Baro in-Hg	STD Vol_A
AVERAGES AND TEST SUMMARIES			**79.9**	**91.2**	**99.5**	**0.998**	**6.7**	**85.636**	**30.02**	**82.381**
4/28/2016	8:15:06 PM	:	81	90	96	0.004	0	0	30.02	0
4/28/2016	8:20:05 PM	:	80	89	96	0.981	6.5	5.266	30.02	5.08
4/28/2016	8:25:05 PM	:	80	89	96	1	6.2	10.585	30.02	10.213
4/28/2016	8:30:05 PM	:	78	89	97	0.998	5.9	15.889	30.02	15.326
4/28/2016	8:34:24 PM	:User Paused	78	89	97	0.998	5.9	20.529	30.02	19.8
4/28/2016	8:40:42 PM	:Resumed	78	89	97	0.998	5.9	20.529	30.02	19.8
4/28/2016	8:41:41 PM	:	80	90	98	0.988	6	21.572	30.02	20.805
4/28/2016	8:46:41 PM	:	79	90	98	1	6.2	26.92	30.02	25.956
4/28/2016	8:51:41 PM	:	78	90	98	0.999	6.2	32.296	30.02	31.134
4/28/2016	8:56:41 PM	:	79	91	99	1	6.3	37.656	30.02	36.291
4/28/2016	9:00:34 PM	:User Paused	79	91	99	1	6.3	41.829	30.02	40.307
4/28/2016	9:05:44 PM	:Resumed	79	91	99	1	6.3	41.831	30.02	40.309
4/28/2016	9:07:43 PM	:	80	91	100	0.979	7	43.911	30.02	42.308
4/28/2016	9:12:43 PM	:	78	91	100	0.997	8.2	49.26	30.02	47.45
4/28/2016	9:17:43 PM	:	79	91	100	0.994	8.5	54.617	30.02	52.6
4/28/2016	9:22:43 PM	:	79	92	101	0.996	8.6	59.991	30.02	57.761
4/28/2016	9:27:02 PM	:User Paused	79	92	101	0.996	8.6	64.578	30.02	62.166
4/28/2016	9:32:15 PM	:Resumed	79	92	101	0.996	8.6	64.58	30.02	62.168
4/28/2016	9:33:14 PM	:	80	92	101	1.031	7.5	65.744	30.02	63.285
4/28/2016	9:38:14 PM	:	79	92	100	1.001	7.2	71.108	30.02	68.436
4/28/2016	9:43:14 PM	:	79	92	100	0.999	7.5	76.494	30.02	73.609
4/28/2016	9:48:14 PM	:	79	92	101	1	7.6	81.809	30.02	78.709
4/28/2016	9:51:46 PM	:	79	92	101	1	7.6	85.636	30.02	82.381

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/28/16 8:15:06 PM: Test START
04/28/16 8:15:12 PM: Flow Adjust: value added to the flow rate = 600
04/28/16 8:15:12 PM: Flow Adjust: value added to the flow rate = 600
04/28/16 8:16:25 PM: Alarm Chg    80   open   open   open    89    90   open    96  0.996   6.5    1.311  0.998   0.0    1.266    -  30.02    1.264    1.219    -    -   1000   65.1   64.7   1.0    0.8 {---- ---- ---L MN--}
04/28/16 8:34:24 PM: Test Paused by User
04/28/16 8:34:25 PM: PAUSE_EVENT [Manual Pause]
04/28/16 8:40:42 PM: TestResumed
04/28/16 9:00:34 PM: Test Paused by User
04/28/16 9:00:34 PM: PAUSE_EVENT [Manual Pause]
04/28/16 9:05:44 PM: TestResumed
04/28/16 9:27:02 PM: Test Paused by User
04/28/16 9:27:02 PM: PAUSE_EVENT [Manual Pause]
04/28/16 9:32:15 PM: TestResumed
04/28/16 9:51:46 PM: Actual Sampling Time: 0d  1h  20m  0s
04/28/16 9:51:46 PM: Test END
04/29/16 1:49:42 PM: New Trap Temperature: set to = 300F
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 8.6 inHg
' NOTE: Post_Leak Test Side B Not tested
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'            Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA VOCS Night Run 5.pro
File Exported: 4/29/2016 6:26:42 PM (PC Time).
Company Name: NSGB
Sample A: PRE-Leak Test PASSED at Maximum vacuum

Run N5

Trap ID-A: n
Trap ID-B: nn

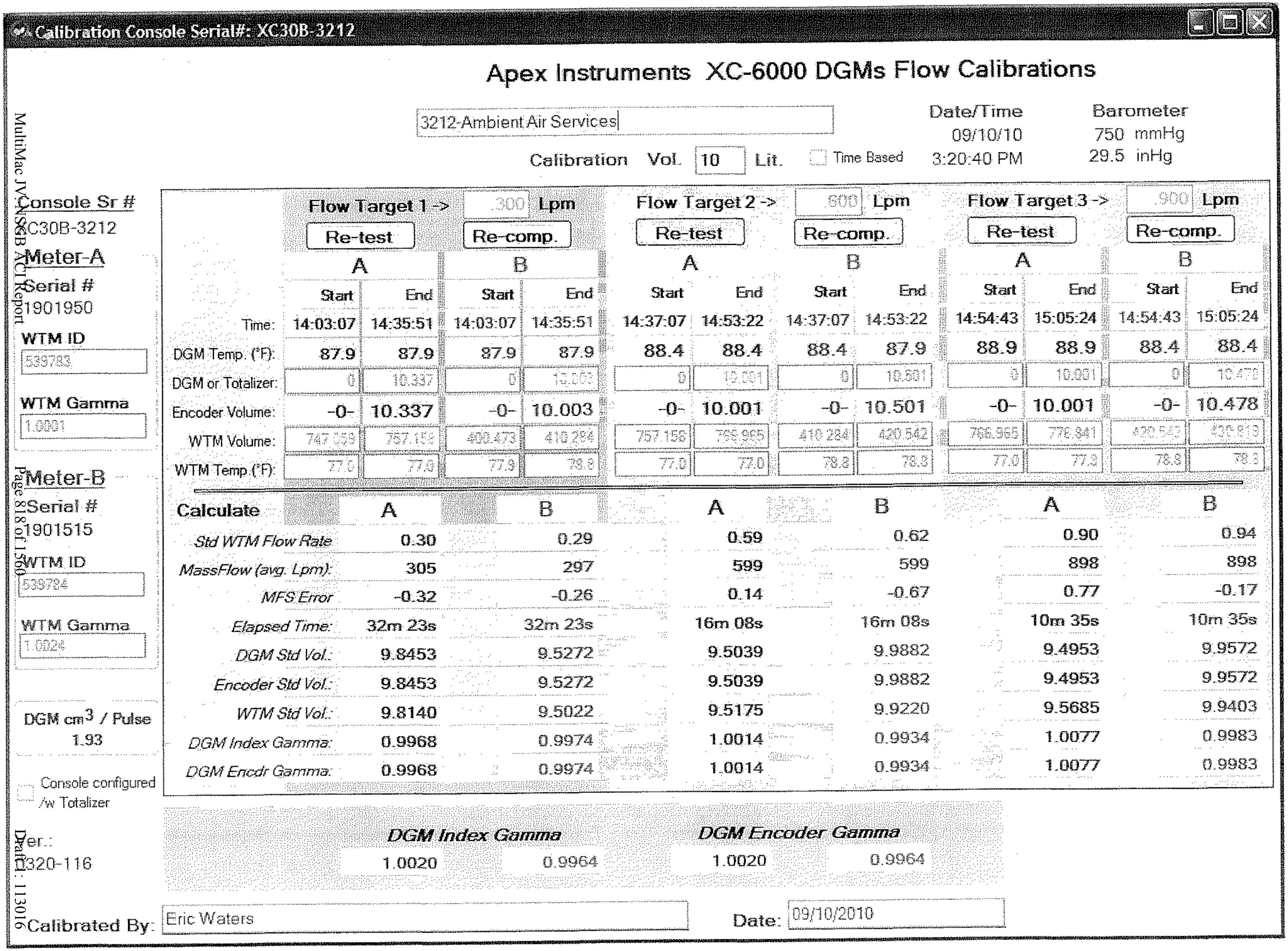
Test Duration (Planned): 0d 1h 20m
Test Duration (Actual) : 0d 1h 33m
Averaging Period : 5 min.

			Stack **F**	**DGM-A** **F**	**Console** **F**	**MAS-A** **LPM**	**VAC-A** **in-Hg**	**DGM-A (L)** **Corr-Vol**	**Baro** **in-Hg**	**STD** **Vol_A**
AVERAGES AND TEST SUMMARIES			**87.6**	**107.1**	**113.9**	**0.997**	**7.7**	**87.8**	**30.02**	**82.136**
4/29/2016	4:29:57 PM	:	91	111	118	0.004	0	0	30.02	0
4/29/2016	4:34:56 PM	:	94	110	118	0.968	7.5	5.378	30.02	4.998
4/29/2016	4:39:56 PM	:	93	110	118	0.998	7.7	10.879	30.02	10.112
4/29/2016	4:44:56 PM	:	91	110	118	0.999	8	16.372	30.02	15.217
4/29/2016	4:49:15 PM	:User Paused	91	110	118	0.999	8	21.186	30.02	19.692
4/29/2016	4:53:58 PM	:Resumed	91	110	118	0.999	8	21.186	30.02	19.692
4/29/2016	4:54:57 PM	:	88	109	115	1.005	6.9	22.278	30.02	20.709
4/29/2016	4:59:57 PM	:	89	108	115	0.998	7.5	27.758	30.02	25.816
4/29/2016	5:04:57 PM	:	89	108	114	0.994	8.1	33.255	30.02	30.944
4/29/2016	5:09:57 PM	:	88	107	114	1.001	8	38.805	30.02	36.127
4/29/2016	5:14:44 PM	:User Paused	88	107	114	1.001	8	44.031	30.02	41.007
4/29/2016	5:19:02 PM	:Resumed	88	107	114	1.001	8	44.031	30.02	41.007
4/29/2016	5:20:01 PM	:	86	107	113	1.027	8	45.201	30.02	42.1
4/29/2016	5:25:01 PM	:	86	106	112	0.999	7.6	50.679	30.02	47.23
4/29/2016	5:30:01 PM	:	85	105	111	0.999	7.6	56.15	30.02	52.358
4/29/2016	5:35:01 PM	:	85	105	111	0.999	7.8	61.647	30.02	57.515
4/29/2016	5:39:22 PM	:User Paused	85	105	111	0.999	7.8	66.487	30.02	62.055
4/29/2016	5:43:38 PM	:Resumed	85	105	111	0.999	7.8	66.487	30.02	62.055
4/29/2016	5:44:38 PM	:	85	104	110	0.963	7.3	67.481	30.02	62.989
4/29/2016	5:49:38 PM	:	84	103	110	0.991	8.5	72.95	30.02	68.134
4/29/2016	5:54:38 PM	:	81	102	109	0.991	9.3	78.384	30.02	73.254
4/29/2016	5:59:38 PM	:	81	102	109	0.999	9.6	83.843	30.02	78.404
4/29/2016	6:03:14 PM	:	81	102	109	0.999	9.6	87.8	30.02	82.136

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/29/16 4:29:57 PM: Test START
04/29/16 4:30:02 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 4:30:02 PM: Flow Adjust: value added to the flow rate = 600
04/29/16 4:31:17 PM: Alarm Chg    94   open   open   open   110   111   open   118  0.974   7.6   1.347  0.999   0.1   1.467   -  30.02   1.251   1.360   -   -  1000  72.9  68.6  1.0  0.5 {---- ---- ---L MN--
04/29/16 4:49:15 PM: Test Paused by User
04/29/16 4:49:16 PM: PAUSE_EVENT [Manual Pause]
04/29/16 4:53:58 PM: TestResumed
04/29/16 5:14:44 PM: Test Paused by User
04/29/16 5:14:44 PM: PAUSE_EVENT [Manual Pause]
04/29/16 5:19:02 PM: TestResumed
04/29/16 5:39:22 PM: Test Paused by User
04/29/16 5:39:22 PM: PAUSE_EVENT [Manual Pause]
04/29/16 5:43:38 PM: TestResumed
04/29/16 6:03:14 PM: Actual Sampling Time: 0d  1h  20m  0s
04/29/16 6:03:14 PM: Test END
 Sample A: POST-Leak Test PASSED at maximum observed vacuum at 9.6 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3212 - Ambient Air Services
'             Console ID: XC30B-3212
'          DAC Board ID: 3332-3132-202D-2041
'Dry Gas Meter-A ID/Gamma: 1901950 / 1.0219
'Dry Gas Meter-B ID/Gamma: 1901515 / 1.0133
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 738E-014B-0000-00D4
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```



Calibration Console Serial#: XC30B-3212

Apex Instruments XC-6000 DGMs Flow Calibrations

3212-Ambient Air Services

Calibration Vol. 10 Lit. ☐ Time Based

Date/Time 09/10/10 3:20:40 PM

Barometer 750 mmHg 29.5 inHg

Console Sr #
XC30B-3212

Meter-A
Serial # 1901950
WTM ID 539783
WTM Gamma 1.0001

Meter-B
Serial # 1901515
WTM ID 539794
WTM Gamma 1.0024

DGM cm^3 / Pulse 1.93

☐ Console configured /w Totalizer

Ver.: 320-116

	Flow Target 1 -> .300 Lpm				Flow Target 2 -> .600 Lpm				Flow Target 3 -> .900 Lpm			
	A		B		A		B		A		B	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
Time:	14:03:07	14:35:51	14:03:07	14:35:51	14:37:07	14:53:22	14:37:07	14:53:22	14:54:43	15:05:24	14:54:43	15:05:24
DGM Temp. (°F):	87.9	87.9	87.9	87.9	88.4	88.4	88.4	87.9	88.9	88.9	88.4	88.4
DGM or Totalizer:	0	10.337	0	10.003	0	10.001	0	10.501	0	10.001	0	10.478
Encoder Volume:	-0-	10.337	-0-	10.003	-0-	10.001	-0-	10.501	-0-	10.001	-0-	10.478
WTM Volume:	747.359	757.158	400.473	410.284	757.158	766.965	410.284	420.542	766.965	776.841	420.542	430.919
WTM Temp (°F):	77.0	77.0	77.9	78.8	77.0	77.0	78.2	78.3	77.0	77.3	78.8	78.3

Calculate	A	B	A	B	A	B
Std WTM Flow Rate	0.30	0.29	0.59	0.62	0.90	0.94
MassFlow (avg. Lpm):	305	297	599	599	898	898
MFS Error	-0.32	-0.26	0.14	-0.67	0.77	-0.17
Elapsed Time:	32m 23s	32m 23s	16m 08s	16m 08s	10m 35s	10m 35s
DGM Std Vol.:	9.8453	9.5272	9.5039	9.9882	9.4953	9.9572
Encoder Std Vol.:	9.8453	9.5272	9.5039	9.9882	9.4953	9.9572
WTM Std Vol.:	9.8140	9.5022	9.5175	9.9220	9.5685	9.9403
DGM Index Gamma:	0.9968	0.9974	1.0014	0.9934	1.0077	0.9983
DGM Encdr Gamma:	0.9968	0.9974	1.0014	0.9934	1.0077	0.9983

DGM Index Gamma		***DGM Encoder Gamma***	
1.0020	0.9964	1.0020	0.9964

Calibrated By: Eric Waters

Date: 09/10/2010

APEX INSTRUMENTS XC-6000 SENSOR AUDIT
PRESSURE TRANSDUCER
ENGLISH UNITS

Meter Console Information	
Console Model Number	XC-6000EPC
Console Serial Number	XC30B-3212
DGM Model Number	AP25
DGM A Serial Number	1901950
DGM B Serial Number	1901515

Calibration Conditions	
Date	10-Sep-10
Time	13:45
Calibration Technician	EW
Ambient Temperature (°F)	78

XC6000 Configuration	
Firmware / Software Rev.	0320-116
Modbus installed?	NO
Pitot installed?	NO
2.5L/min Rotameters?	NO

Transducer Info		
Pressure Type		Delta P
Model Number		5IN-D-4V
Range		5in H_2O
Reference Manometer Info		
Model Number		1223-36-D
Range		36in H_2O
Accuracy (% F.S.)		0.5
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(P_{ref})	(ΔP)	
in H_2O	in H2O	% Full Scale
0.00	0.00	0.0
4.50	4.50	0.0
	average	0.0
		N/A

Transducer Info		
Pressure Type		Barometer
Model Number		BARO-A-4V
Range		600-1100mBar
Reference Barometer Info		
Absolute Pressure Location		RDU Airport
Absolute Pressure (in Hg)		29.00
Elevation @ Apex Inst (ft)		410
Calibration Data		
Reference Pressure	Displayed Pressure	Absolute Error
(P_{ref})	(P_{bar})	(<=0.39inHg)
in Hg	in Hg	in Hg
Current Barometric Pressure		
29.60	29.56	0.04
		Pass

Transducer Info		
Pressure Type		Vacuum Ch. A
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Reference Vacuum Gauge Info		
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Accuracy (% F.S.)		1.0
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(Vac_{ref})	(Vac)	
in Hg	in Hg	% Full Scale
0.00	0.00	0.0
21.50	20.79	2.4
		0.0
		0.0
		0.0
		0.0
		0.0
	average	0.3
		Pass

Transducer Info		
Pressure Type		Vacuum Ch. B
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Reference Vacuum Gauge Info		
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Accuracy (% F.S.)		1.0
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(Vac_{ref})	(Vac)	
in Hg	in Hg	% Full Scale
0.00	0.00	0.0
21.00	20.20	2.7
		0.0
		0.0
		0.0
		0.0
		0.0
	average	0.4
		Pass

I certify that the above were calibrated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems Vol III" and/or USEPA Methods, Title 40 CFR Parts 60 & 75.

Signature

Date 9/10/10

3212-Ambient Air Services Sensor Audit.xls

APEX INSTRUMENTS XC-6000 SENSOR AUDIT
TYPE K THERMOCOUPLE TEMPERATURE SENSORS
ENGLISH UNITS

Meter Console Information	
Console Model Number	XC-6000EPC
Console Serial Number	XC30B-3212
DGM Model Number	AP25
DGM A Serial Number	1901950
DGM B Serial Number	1901515

Calibration Conditions	
Date	10-Sep-10
Time	13:45
Calibration Technician	EW
Ambient Temperature (°F)	78

XC6000 Configuration	
Current Firmware / Software Rev.	0320-116
Modbus installed?	NO
Pitot installed?	NO
2.5L/min Rotameters Installed?	NO

Thermocouple Info		
Source		Stack
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.6	0.4
30.0	30.0	0.0
60.0	60.0	0.0
100.0	100.0	0.0
300.0	300.0	0.0
500.0	499.5	0.1
	average	0.1
		Pass

Thermocouple Info		
Source		Trap
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.1	0.9
30.0	29.0	1.0
60.0	59.0	1.0
100.0	99.0	1.0
300.0	299.0	0.3
500.0	499.0	0.2
	average	0.7
		Pass

Thermocouple Info		
Source		Probe
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.6	0.4
30.0	29.5	0.5
60.0	60.0	0.0
100.0	99.5	0.5
300.0	299.5	0.2
500.0	499.5	0.1
	average	0.3
		Pass

Thermocouple Info		
Source		Chiller
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.6	0.4
30.0	29.0	1.0
60.0	59.0	1.0
100.0	99.5	0.5
300.0	299.5	0.2
500.0	499.5	0.1
	average	0.5
		Pass

Thermocouple Info		
Source		Aux
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.6	0.4
30.0	29.5	0.5
60.0	59.5	0.5
100.0	99.5	0.5
300.0	299.0	0.3
500.0	499.5	0.1
	average	0.4
		Pass

Thermocouple Info		
Source		DGM A
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.6	0.4
30.0	29.5	0.5
60.0	59.5	0.5
100.0	99.5	0.5
300.0	299.5	0.2
500.0	499.5	0.1
	average	0.4
		Pass

Thermocouple Info		
Source		DGM B
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature (T_{ref}) °F	Displayed Temperature (T_{stack}) °F	Percent Error % Temp
2.0	1.0	1.0
30.0	29.0	1.0
60.0	59.0	1.0
100.0	99.0	1.0
300.0	299.0	0.3
500.0	499.0	0.2
	average	0.8
		Pass

I certify that the above were calibrated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems Vol III" and/or USEPA Methods, Title 40 CFR Parts 60 & 75.

Signature

Date 9/10/10

Ambient Air Services, Inc.

106 Ambient Airway
Starke, Florida 32091

Method 30B Post-test Console Audit

Console ID	XC30B-3212
Technician	MEH
Project	NSGB VOST
Date:	6/23/2016

Barometric Pressure Audit

Reference Barometric Pressure Sensor ID	Kollsman 433
Calibration Date	10/20/2015
Reference Barometric Pressure Reading (in. Hg)	30.11
Console Barometric Pressure Reading (in. Hg)	30.04
Difference (+ / - 10 mm Hg or 0.33 in. Hg)	0.07

Vacuum Audit

Reference Vacuum Gauge ID	CP 125602
Calibration Date	2/4/2016
Reference Vacuum Gauge Reading (A-Side) (in. Hg)	21.50
Console Vacuum Reading (A-Side) (in. Hg)	21.24
Difference (+ / - 1 in. Hg)	0.26
Reference Vacuum Gauge Reading (B-Side) (in. Hg)	21.40
Console Vacuum Reading (B-Side) (in. Hg)	20.99
Difference (+ / - 1 in. Hg)	0.41

Temperature Audit

Reference Thermometer ID	Atkins 36036-C
Calibration Date	10/26/2015
Reference Temperature Reading (^{0}F)	79.0

All Temperatures +/- 1.5% of Absolute Reference Temperature Reading

Console DGM A Temperature Reading (^{o}F)	77.9
Percent Difference	1.4
Console DGM B Temperature Reading (^{o}F)	78.9
Percent Difference	0.1
Console Stack Temperature Reading (^{o}F)	78.8
Percent Difference	0.3
Console Chiller Temperature Reading (^{o}F)	79.5
Percent Difference	0.6

Ambient Air Services, Inc.

106 Ambient Airway

Starke, Florida 32091

Method 30B Post-test Console Audit

Console ID	XC30B-3212
Technician	MEH
Project	NSGB VOST
Date:	6/23/2016

Dry Gas Meter Audit

Reference Flow Meter ID	Bios DC Lite 700
Calibration Date	6/20/2016
Reference DGM A Target Flow Rate (LPM)	1.000
Reference DGM A Target Volume (L)	5

Console DGM A Audit

Console DGM A ID	1901950
Console DGM A Gamma	1.0219
Reference DGM Start Temperature (^{o}F)	83.2
Reference DGM End Temperature (^{o}F)	83.2
Reference DGM A Volume Sampled (L)	5.03
Reference DGM A Volume Sampled (Standard L)	4.920
Console DGM A Temperature (^{o}F)	83.7
Console DGM A Volume Sampled (L)	5.029
Console DGM A Volume Sampled (Standard L)	4.903
Calculated Audit Gamma	1.0035
Difference (+/- 5% of Console Gamma Value)	1.8

Console DGM B Audit

Console DGM B ID	1901515
Console DGM B Gamma	1.0133
Reference DGM Start Temperature (^{o}F)	83.7
Reference DGM End Temperature (^{o}F)	83.7
Reference DGM B Volume Sampled (L)	4.95
Reference DGM B Volume Sampled (Standard L)	4.838
Console DGM B Temperature (^{o}F)	86.8
Console DGM B Volume Sampled (L)	5.043
Console DGM B Volume Sampled (Standard L)	4.889
Calculated Audit Gamma	0.9895
Difference (+/- 5% of Console Gamma Value)	2.4

Technician Signature and Date Michael Hinkel 6/23/16

QA Signature and Date Daniel Ockenhouse 6/27/16

30B Audit Template
Rev 1
07/10/15

APPENDIX J

ALDEHYDES EMISSIONS DATA

Example Calculations

Emissions Input Summary

Run Data Printouts

30B Console Number Pre-Test Calibration

30B Console Number Post-Test Audit

Ambient Air Services, Inc.
Environmental Consultants
106 Ambient Airway Starke, Florida 32091 (904) 964-8440

Example Calculations, Aldehydes Test Run 1

Facility	**Naval Station Guantanamo Bay**	**Source**	**Air Curtain Incinerator D-1**
Location	**Guantanamo Bay, Cuba**	**Date**	**April 18, 2016**

1.

Acetaldehyde Concentration Train 1, grams/SCFD, (C_s).

$$M_{ace} \text{ x } K_1 / V_{m(std)}) \text{ x } K_2$$

Example.

M_{ace} = 252
K_1 = 1.00E-06
K_2 = 28.3
$V_{m(std)}$ = 29.23 C_{train1} = 2.44E-04 grams / SCFD

2.

Mass Emission Rate, Grams / Sec, (Em).

MAc x K1 / Vm(std) x K2

Example.

C_{train1} = 2.44E-04
$Q_{d(std)}$ = 120848 Em = 0.49 grams / second

3.

Acetaldehyde Concentration, ppmvd, C_{ppmace}

$$M_{ace} \text{ x } K_3 / V_{m(std)}) / MW_{ace}$$

Example.

M_{ace} = 252
K_3 = 24.04
$V_{m(std)}$ = 29.2
MW_{ace} = 44.0 C_{ppmace} = 4.71 ppmvd

4.

Percent Difference of Duplicate Samples, Percent, RPD

$$\text{ABS}[(C_{train1} - C_{train2}) / (\text{Average}(C_{train1},C_{train2}))]$$

Example.

C_{train1} = 2.44E-04
C_{train2} = 2.61E-04 RPD = 6.84%

Aldehydes Emissions Data Inputs Summary

Run	Sample	Sample Volume (ft^3)	Acetaldehyde Recovery Mass (micrograms)	Formaldehyde Recovery Mass (micrograms)	Propionaldehyde Recovery Mass (micrograms)	Volumetric Flow Rate (ft^3/min)
D1	A	1.03	252	130	27	120848
	B	1.12	292	173	32	
D2	A	1.07	35	20	4	98551
	B	1.11	29	17	3	
D3	A	1.03	80	50	9	100527
	B	1.09	72	48	6	
D4	A	1.06	133	63	14	137491
	B(1)	1.11	207	138	80	
D5	A	1.05	79	45	8	73023
	B	1.12	88	48	10	
N1	A	1.04	240	87	24	104782
	B	1.11	262	94	26	
N2	A	1.03	234	86	27	89404
	B	1.13	266	101	31	
N3	A(1)	1.02	144	108	89	72499
	B	1.13	59	20	6	
N4	A	1.02	55	24	10	77662
	B	1.14	50	22	8	
N5	A	1.04	105	25	12	91877
	B	1.14	17	6	3	

Note (1): A spiking solution containing 100 ug of each target compound was injected into the impinger solution of this sample prior to the run.

Configuration File: Cuba - NCASI.pro
File Exported: 4/29/2016 10:07:42 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: NCASI A day1
Trap ID-B: NCASI B day 1

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 0h 43m
Averaging Period : 1 min.

Run D1

			Stack F	DGM-A F	DGM-B F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			**84.92308**	**102**	**100.9905**	**108.2095**	**0.370**	**4.5**	**31.097**	**0.391**	**0.8**	**33.615**	**29.8698095**	**29.233**	**31.633**
4/18/2016	16:33:38	:	87	105	105	111	0.001	0	0	0.001	0	0	29.86	0	0
4/18/2016	16:34:37	:	87	105	105	111	0.38	16.9	0.31	0.541	0.9	0.562	29.87	0.289	0.524
4/18/2016	16:34:38	:	86	105	105	111	0.325	20.1	0.315	0.506	0.9	0.567	29.87	0.294	0.529
4/18/2016	16:35:02	:Resumed	86	105	105	111	0.005	0.6	0.317	0	0.7	0.569	29.86	0.296	0.531
4/18/2016	16:36:01	:	86	105	104	110	0.365	19.5	0.72	0.507	0.9	1.185	29.86	0.672	1.107
4/18/2016	16:36:03	:	86	105	104	110	0.326	20.1	0.725	0.504	0.9	1.203	29.86	0.677	1.123
4/18/2016	16:37:13	:Resumed	87	105	104	110	0.005	0.4	0.727	0	0.6	1.204	29.87	0.679	1.124
4/18/2016	16:38:12	:	86	105	104	110	0.37	19.5	1.129	0.504	0.9	1.747	29.86	1.054	1.631
4/18/2016	16:38:14	:	86	105	104	110	0.327	20.1	1.138	0.5	0.9	1.762	29.86	1.062	1.645
4/18/2016	16:38:20	:Resumed	86	105	104	110	0.016	13.1	1.14	0	0.7	1.764	29.86	1.064	1.647
4/18/2016	16:39:19	:	86	104	104	110	0.343	19.8	1.462	0.496	0.9	2.249	29.86	1.365	2.1
4/18/2016	16:39:21	:	86	104	104	110	0.325	20	1.476	0.505	0.9	2.28	29.86	1.378	2.13
4/18/2016	16:39:29	:Resumed	86	105	104	110	0.015	11.2	1.478	0	0.7	2.28	29.86	1.38	2.13
4/18/2016	16:40:28	:	86	104	104	110	0.348	19.8	1.914	0.492	0.9	2.776	29.86	1.786	2.593
4/18/2016	16:40:30	:	86	104	104	110	0.327	20.1	1.925	0.492	0.9	2.789	29.87	1.797	2.605
4/18/2016	16:42:22	:Resumed	86	104	104	110	0.003	0.3	1.925	0	0.5	2.789	29.86	1.797	2.605
4/18/2016	16:43:21	:	85	104	104	109	0.373	19.5	2.326	0.502	0.9	3.337	29.86	2.172	3.117
4/18/2016	16:43:23	:	85	104	104	110	0.327	20.1	2.335	0.496	0.9	3.351	29.86	2.18	3.131
4/18/2016	16:46:01	:Resumed	86	104	104	109	0.003	0.3	2.335	0	0.4	3.351	29.86	2.18	3.131
4/18/2016	16:47:00	:	85	104	103	109	0.373	19.5	2.779	0.507	0.9	3.967	29.86	2.595	3.707
4/18/2016	16:47:02	:	85	104	103	109	0.329	20.1	2.786	0.502	0.9	3.984	29.86	2.602	3.723
4/18/2016	16:49:43	:Resumed	86	104	103	109	0.004	0	2.786	0	0.4	3.986	29.87	2.602	3.725
4/18/2016	16:50:42	:	85	103	103	109	0.374	19.4	3.146	0.502	0.9	4.528	29.86	2.938	4.232
4/18/2016	16:50:44	:	86	103	103	109	0.328	20.1	3.155	0.494	0.9	4.542	29.87	2.946	4.246
4/18/2016	16:51:41	:Resumed	86	103	103	109	0.005	0.4	3.157	0	0.6	4.544	29.87	2.948	4.248
4/18/2016	16:52:40	:	86	103	103	109	0.369	19.5	3.532	0.493	0.9	5.021	29.87	3.299	4.694
4/18/2016	16:52:42	:	86	103	103	109	0.322	20.1	3.54	0.502	0.9	5.036	29.87	3.308	4.708
4/18/2016	16:52:59	:Resumed	86	103	103	109	0	0	3.542	0	0.7	5.038	29.87	3.309	4.71
4/18/2016	16:53:58	:	86	103	102	109	0.859	2.7	4.597	0.494	0.9	5.552	29.87	4.298	5.193
4/18/2016	16:54:00	:	86	103	102	109	0.435	13.7	4.608	0.498	0.9	5.568	29.87	4.308	5.208
4/18/2016	16:54:49	:Resumed	86	103	102	109	0.003	0	4.61	0	0.6	5.568	29.87	4.31	5.208
4/18/2016	16:55:48	:	86	103	102	109	0.395	17.2	5.027	0.497	0.9	6.118	29.87	4.7	5.723
4/18/2016	16:55:50	:	86	103	102	109	0.333	20.2	5.034	0.501	0.9	6.128	29.87	4.706	5.733
4/18/2016	16:59:08	:Resumed	86	103	102	109	0.002	0	5.034	0	0.4	6.129	29.88	4.706	5.734
4/18/2016	17:00:07	:	86	102	102	108	0.888	1.2	6.021	0.497	0.9	6.716	29.87	5.633	6.285
4/18/2016	17:00:09	:	86	103	102	109	0.5	0.5	6.039	0.502	0.9	6.742	29.87	5.649	6.308
4/18/2016	17:06:02	:Resumed	87	102	102	108	0.004	0.2	6.041	0	0.3	6.744	29.87	5.651	6.31

4/18/2016	17:07:01	:	87	102	101	108	0.51	0.5	6.522	0.491	0.9	7.268	29.87	6.102	6.803
4/18/2016	17:07:03	:	87	102	101	108	0.5	0.5	6.541	0.5	0.9	7.293	29.87	6.12	6.827
4/18/2016	17:07:06	:Resumed	87	102	102	108	0.005	0.4	6.543	0	0.7	7.295	29.87	6.122	6.829
4/18/2016	17:08:05	:	87	102	101	108	0.49	0.5	7.037	0.497	0.9	7.774	29.87	6.586	7.278
4/18/2016	17:08:07	:	88	102	101	108	0.502	0.5	7.052	0.499	0.9	7.791	29.87	6.6	7.294
4/18/2016	17:08:11	:Resumed	88	102	101	108	0.004	0.4	7.054	0	0.7	7.793	29.87	6.602	7.296
4/18/2016	17:09:10	:	35	102	101	108	0.494	0.5	7.637	0.489	0.9	8.311	29.87	7.149	7.783
4/18/2016	17:09:12	:	open	102	101	108	0.501	0.5	7.647	0.501	0.9	8.324	29.87	7.158	7.795
4/18/2016	17:10:26	:Resumed	87	102	101	108	0.004	0.3	7.649	0	0.6	8.326	29.87	7.16	7.797
4/18/2016	17:11:25	:	85	102	101	108	0.492	0.5	8.195	0.494	0.9	8.878	29.87	7.673	8.315
4/18/2016	17:11:27	:	87	102	101	108	0.498	0.5	8.212	0.5	0.9	8.888	29.87	7.689	8.325
4/18/2016	17:11:30	:Resumed	87	102	101	108	0.005	0.4	8.212	0	0.7	8.89	29.87	7.689	8.327
4/18/2016	17:12:29	:	86	102	101	108	0.5	0.5	8.662	0.494	0.9	9.467	29.87	8.111	8.869
4/18/2016	17:12:31	:	87	102	101	108	0.502	0.5	8.682	0.5	0.9	9.488	29.87	8.13	8.889
4/18/2016	17:12:39	:Resumed	86	102	101	108	0.004	0.4	8.682	0	0.7	9.488	29.87	8.13	8.889
4/18/2016	17:13:38	:	86	101	101	108	0.489	0.5	9.159	0.493	0.9	10.048	29.87	8.578	9.416
4/18/2016	17:13:40	:	87	102	101	108	0.493	0.5	9.169	0.499	0.9	10.063	29.87	8.587	9.43
4/18/2016	17:13:43	:Resumed	86	102	101	108	0.005	0.4	9.171	0	0.7	10.065	29.87	8.589	9.432
4/18/2016	17:14:42	:	86	101	101	108	0.502	0.5	9.678	0.496	0.9	10.561	29.87	9.066	9.898
4/18/2016	17:14:44	:	87	102	101	108	0.498	0.5	9.69	0.499	0.9	10.577	29.87	9.077	9.913
4/18/2016	17:14:55	:Resumed	87	101	101	108	0.004	0.4	9.69	0	0.7	10.579	29.87	9.077	9.915
4/18/2016	17:15:52	:User Paus	87	101	101	108	0.494	0.5	10.298	0.5	0.9	11.086	29.87	9.648	10.391
4/18/2016	17:16:18	:Resumed	87	102	101	108	0.004	0.4	10.298	0	0.7	11.086	29.87	9.648	10.391
4/18/2016	17:16:23	:	87	101	101	108	0.517	0.5	10.339	0.523	0.9	11.133	29.87	9.687	10.436
4/18/2016	17:16:44	:Resumed	87	102	101	108	0.004	0.3	10.339	0	0.7	11.133	29.87	9.687	10.436
4/18/2016	17:17:05	:	87	102	101	108	0.516	0.5	10.508	0.494	0.9	11.332	29.87	9.845	10.623
4/18/2016	17:22:23	:	87	102	101	107	0.005	0	0	0	0.4	0	29.88	0	0
4/18/2016	17:23:22	:	86	101	101	107	0.562	0.5	0.581	0.567	0.9	0.674	29.87	0.546	0.634
4/18/2016	17:24:22	:	86	101	100	107	0.501	0.5	1.081	0.5	0.9	1.251	29.87	1.016	1.177
4/18/2016	17:25:22	:	85	101	100	107	0.501	0.5	1.556	0.5	0.9	1.812	29.87	1.463	1.705
4/18/2016	17:26:22	:	85	101	100	107	0.5	0.5	2.057	0.499	0.9	2.351	29.87	1.934	2.213
4/18/2016	17:27:22	:	85	101	100	107	0.5	0.5	2.635	0.5	0.9	2.872	29.87	2.478	2.703
4/18/2016	17:28:22	:	85	101	99	107	0.496	0.5	3.168	0.494	0.9	3.399	29.87	2.979	3.199
4/18/2016	17:29:22	:	85	101	99	107	0.5	0.5	3.63	0.502	0.9	4.007	29.87	3.414	3.772
4/18/2016	17:30:22	:	85	101	99	107	0.5	0.5	4.102	0.5	0.9	4.579	29.87	3.857	4.311
4/18/2016	17:31:22	:	85	100	99	108	0.501	0.5	4.622	0.501	0.9	5.105	29.87	4.346	4.806
4/18/2016	17:32:22	:	84	100	99	108	0.5	0.5	5.212	0.501	0.9	5.629	29.87	4.901	5.3
4/18/2016	17:33:22	:	84	100	99	108	0.502	0.5	5.729	0.503	0.9	6.173	29.87	5.389	5.812
4/18/2016	17:34:22	:	84	100	99	108	0.5	0.5	6.197	0.5	0.9	6.781	29.87	5.829	6.385
4/18/2016	17:35:22	:	84	100	99	108	0.5	0.5	6.701	0.5	0.9	7.36	29.88	6.303	6.931
4/18/2016	17:36:22	:	84	100	99	108	0.499	0.5	7.22	0.499	0.9	7.88	29.88	6.792	7.422
4/18/2016	17:37:22	:	84	100	99	108	0.5	0.5	7.742	0.501	0.9	8.394	29.88	7.283	7.906
4/18/2016	17:38:22	:	84	100	99	108	0.503	0.5	8.288	0.506	0.9	8.94	29.88	7.797	8.42
4/18/2016	17:39:22	:	84	100	99	107	0.502	0.5	8.81	0.504	0.9	9.559	29.87	8.288	9.003
4/18/2016	17:40:22	:	84	100	99	107	0.498	0.5	9.306	0.499	0.9	10.137	29.87	8.756	9.548
4/18/2016	17:41:22	:	84	100	99	107	0.501	0.5	9.785	0.502	0.9	10.654	29.87	9.207	10.035
4/18/2016	17:42:22	:	84	100	99	107	0.501	0.5	10.298	0.501	0.9	11.167	29.87	9.689	10.519
4/18/2016	17:43:22	:	83	100	99	107	0.5	0.5	10.882	0.501	0.9	11.716	29.87	10.238	11.036
4/18/2016	17:44:22	:	83	100	99	107	0.501	0.5	11.418	0.5	0.9	12.327	29.88	10.743	11.613
4/18/2016	17:45:22	:	83	99	99	107	0.501	0.5	11.882	0.502	0.9	12.918	29.88	11.181	12.17
4/18/2016	17:46:22	:	83	99	99	107	0.501	0.5	12.35	0.5	0.9	13.432	29.87	11.622	12.655
4/18/2016	17:47:22	:	83	99	99	107	0.498	0.5	12.885	0.501	0.9	13.947	29.87	12.126	13.14
4/18/2016	17:48:22	:	83	99	99	107	0.499	0.5	13.456	0.497	0.9	14.485	29.87	12.664	13.647

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4/18/2016   17:49:22   :   83   99   99   107   0.5     0.5   13.974   0.5     0.9   15.097   29.87   13.151   14.225
4/18/2016   17:50:22   :   84   99   98   107   0.5     0.5   14.447   0.501   0.9   15.696   29.88   13.597   14.79
4/18/2016   17:51:22   :   84   99   98   107   0.502   0.5   14.949   0.504   0.9   16.209   29.87   14.071   15.274
4/18/2016   17:52:22   :   84   99   98   107   0.501   0.5   15.471   0.503   0.9   16.724   29.87   14.562   15.761
4/18/2016   17:53:22   :   84   99   98   107   0.501   0.5   15.998   0.501   0.9   17.27    29.87   15.059   16.276
4/18/2016   17:54:22   :   84   99   98   107   0.501   0.5   16.533   0.501   0.9   17.874   29.87   15.563   16.846
4/18/2016   17:55:22   :   84   99   98   107   0.5     0.5   17.056   0.5     0.9   18.478   29.87   16.056   17.417
4/18/2016   17:56:22   :   84   99   98   107   0.5     0.5   17.549   0.501   0.9   18.986   29.87   16.521   17.896
4/18/2016   17:57:22   :   84   99   98   107   0.5     0.5   18.026   0.5     0.9   19.501   29.88   16.971   18.382
4/18/2016   17:58:22   :   84   99   98   107   0.5     0.5   18.534   0.501   0.9   20.046   29.88   17.451   18.896
4/18/2016   17:59:22   :   84   99   98   107   0.501   0.5   19.118   0.502   0.9   20.652   29.88   18.001   19.469
4/18/2016   18:00:22   :   84   99   98   107   0.5     0.5   19.648   0.5     0.9   21.252   29.88   18.5     20.036
4/18/2016   18:01:22   :   84   99   98   107   0.502   0.5   20.11    0.504   0.9   21.761   29.88   18.936   20.517
4/18/2016   18:02:22   :   83   99   98   107   0.497   0.5   20.578   0.496   0.9   22.267   29.88   19.378   20.995
4/18/2016   18:02:24   :   83   99   98   107   0.497   0.5   20.589   0.496   0.9   22.283   29.88   19.388   21.01
'-------------------------- LOGGED EVENTS ---------------------------------
04/18/16  16:33:38: Test START
04/18/16  16:34:38: PAUSE_EVENT [Auto Pause]
04/18/16  16:35:02: TestResumed
04/18/16  16:36:03: PAUSE_EVENT [Auto Pause]
04/18/16  16:37:13: TestResumed
04/18/16  16:38:14: PAUSE_EVENT [Auto Pause]
04/18/16  16:38:20: TestResumed
04/18/16  16:39:21: PAUSE_EVENT [Auto Pause]
04/18/16  16:39:29: TestResumed
04/18/16  16:40:30: PAUSE_EVENT [Auto Pause]
04/18/16  16:42:22: TestResumed
04/18/16  16:43:23: PAUSE_EVENT [Auto Pause]
04/18/16  16:46:01: TestResumed
04/18/16  16:47:02: PAUSE_EVENT [Auto Pause]
04/18/16  16:49:43: TestResumed
04/18/16  16:50:44: PAUSE_EVENT [Auto Pause]
04/18/16  16:51:41: TestResumed
04/18/16  16:52:42: PAUSE_EVENT [Auto Pause]
04/18/16  16:52:59: TestResumed
04/18/16  16:54:00: PAUSE_EVENT [Auto Pause]
04/18/16  16:54:49: TestResumed
04/18/16  16:55:50: PAUSE_EVENT [Auto Pause]
04/18/16  16:59:08: TestResumed
04/18/16  17:00:09: PAUSE_EVENT [Auto Pause]
04/18/16  17:06:02: TestResumed
04/18/16  17:07:03: PAUSE_EVENT [Auto Pause]
04/18/16  17:07:06: TestResumed
04/18/16  17:08:07: PAUSE_EVENT [Auto Pause]
04/18/16  17:08:11: TestResumed
04/18/16  17:09:12: PAUSE_EVENT [Auto Pause]
04/18/16  17:10:23: New Trap Temperature: set to = 100F
04/18/16  17:10:26: TestResumed
04/18/16  17:11:27: PAUSE_EVENT [Auto Pause]
04/18/16  17:11:30: TestResumed
04/18/16  17:12:31: PAUSE_EVENT [Auto Pause]
04/18/16  17:12:39: TestResumed
04/18/16  17:13:40: PAUSE_EVENT [Auto Pause]
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04/18/16  17:13:43: TestResumed
04/18/16  17:14:44: PAUSE_EVENT [Auto Pause]
04/18/16  17:14:55: TestResumed
04/18/16  17:15:52: Test Paused by User
04/18/16  17:15:53: PAUSE_EVENT [Manual Pause]
04/18/16  17:16:18: TestResumed
04/18/16  17:16:23: PAUSE_EVENT [Auto Pause]
04/18/16  17:16:44: TestResumed
04/18/16  17:17:05: Actual Sampling Time: 0d  0h  20m  20s
04/18/16  17:17:05: Test END
04/18/16  17:17:05: Test was manually ended
' NOTE: Post_Leak Test Side A Not tested
' NOTE: Post_Leak Test Side B Not tested
' Pre_Leak Test Side A Not tested
' Pre_Leak Test Side B Not tested
04/18/16  17:22:23: Test START
04/18/16  17:39:23: Alarm Chg     84    open    open    open    100     99    open    108   0.504     0.5     8.815   0.508     0.9     9.569      -   29.87     8.294     9.013      -      -    500    51.4    49.0   100.4   100.8 {---- ---- ---L MN--}
04/18/16  18:02:24: Actual Sampling Time: 0d  0h  40m  0s
04/18/16  18:02:24: Test END
04/18/16  18:52:04: New Trap Temperature: set to = 250F
04/19/16  07:18:29: New Trap Temperature: set to = 250F
04/19/16  07:34:03: New Trap Temperature: set to = 250F
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
```

Configuration File: CUBA NCASI DAY2 41916.pro
File Exported: 4/29/2016 10:06:41 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: NCASI A2 41916
Trap ID-B: NCASI B2 41916

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 0m
Averaging Period : 1 min.

Run D2

			Stack	DGM-A	DGM-B	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B	DGM-B (L)	Baro	STD	STD
			F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg	Corr-Vol	in-Hg	Vol_A	Vol_B
AVERAGES AND TEST SUMMARIES			**88**	**104.8**	**103.9**	**115.1**	**0.501**	**0.5**	**32.301**	**0.502**	**0.8**	**33.533**	**29.96**	**30.257**	**31.465**
4/19/2016	8:48:20	:	85	99	98	108	0.002	0	0	0	0	0	29.96	0	0
4/19/2016	8:49:19	:	84	99	98	107	0.522	0.5	0.476	0.541	0.8	0.452	29.96	0.45	0.428
4/19/2016	8:50:19	:	85	99	98	108	0.501	0.5	0.986	0.5	0.8	1.058	29.96	0.932	1.001
4/19/2016	8:51:19	:	84	99	98	108	0.501	0.5	1.564	0.5	0.8	1.633	29.96	1.479	1.546
4/19/2016	8:52:19	:	84	99	98	108	0.486	0.5	2.105	0.487	0.8	2.128	29.96	1.99	2.015
4/19/2016	8:53:19	:	84	99	98	108	0.509	0.5	2.58	0.51	0.8	2.642	29.96	2.438	2.501
4/19/2016	8:54:19	:	85	99	98	108	0.501	0.5	3.046	0.501	0.8	3.184	29.96	2.879	3.014
4/19/2016	8:55:19	:	85	100	99	109	0.494	0.5	3.59	0.498	0.8	3.792	29.96	3.392	3.589
4/19/2016	8:56:19	:	86	100	99	109	0.502	0.5	4.213	0.504	0.8	4.398	29.96	3.981	4.163
4/19/2016	8:57:19	:	85	101	99	109	0.499	0.5	4.75	0.501	0.8	4.904	29.96	4.487	4.641
4/19/2016	8:58:19	:	85	101	99	110	0.502	0.5	5.234	0.501	0.8	5.413	29.96	4.944	5.122
4/19/2016	8:59:19	:	86	101	99	110	0.5	0.5	5.739	0.502	0.8	5.965	29.96	5.42	5.643
4/19/2016	9:00:19	:	85	101	100	110	0.503	0.5	6.292	0.506	0.8	6.577	29.96	5.941	6.221
4/19/2016	9:01:19	:	85	101	100	111	0.501	0.5	6.902	0.502	0.8	7.183	29.96	6.516	6.793
4/19/2016	9:02:19	:	85	102	100	111	0.499	0.5	7.442	0.499	0.8	7.689	29.96	7.024	7.271
4/19/2016	9:03:19	:	86	102	101	111	0.5	0.5	7.918	0.502	0.8	8.203	29.96	7.472	7.755
4/19/2016	9:04:19	:	87	102	101	111	0.499	0.5	8.441	0.499	0.8	8.751	29.96	7.965	8.272
4/19/2016	9:05:19	:	86	102	101	112	0.503	0.5	8.999	0.503	0.8	9.361	29.96	8.489	8.847
4/19/2016	9:06:19	:	86	102	101	112	0.504	0.5	9.575	0.506	0.8	9.969	29.96	9.032	9.42
4/19/2016	9:07:19	:	88	103	101	112	0.5	0.5	10.126	0.502	0.8	10.48	29.96	9.549	9.901
4/19/2016	9:08:19	:	87	103	102	113	0.501	0.5	10.62	0.499	0.8	10.991	29.96	10.014	10.383
4/19/2016	9:09:19	:	86	103	102	113	0.5	0.5	11.136	0.502	0.8	11.543	29.96	10.498	10.903
4/19/2016	9:10:19	:	86	103	102	113	0.5	0.5	11.699	0.502	0.8	12.155	29.96	11.026	11.478
4/19/2016	9:11:19	:	86	103	102	113	0.501	0.5	12.264	0.503	0.8	12.766	29.96	11.557	12.052
4/19/2016	9:12:19	:	87	104	102	114	0.498	0.5	12.801	0.496	0.8	13.27	29.96	12.061	12.527
4/19/2016	9:13:19	:	88	104	103	114	0.503	0.5	13.334	0.507	0.8	13.793	29.96	12.56	13.018
4/19/2016	9:14:19	:	89	104	103	114	0.502	0.5	13.847	0.502	0.8	14.344	29.96	13.042	13.536
4/19/2016	9:15:19	:	88	104	103	114	0.5	0.5	14.393	0.499	0.8	14.957	29.97	13.554	14.111
4/19/2016	9:16:19	:	87	104	103	115	0.499	0.5	14.941	0.498	0.8	15.562	29.96	14.067	14.68
4/19/2016	9:17:19	:	88	104	103	115	0.501	0.5	15.494	0.5	0.8	16.075	29.97	14.585	15.161
4/19/2016	9:18:19	:	88	105	104	115	0.501	0.5	16.034	0.502	0.8	16.596	29.96	15.091	15.65
4/19/2016	9:19:19	:	88	105	104	115	0.499	0.5	16.553	0.499	0.8	17.142	29.96	15.577	16.162
4/19/2016	9:20:19	:	87	105	104	115	0.499	0.5	17.069	0.498	0.8	17.756	29.96	16.06	16.738
4/19/2016	9:21:19	:	87	105	104	116	0.501	0.5	17.615	0.5	0.8	18.36	29.96	16.571	17.304
4/19/2016	9:22:19	:	88	105	104	116	0.503	0.5	18.194	0.505	0.8	18.884	29.96	17.112	17.795
4/19/2016	9:23:19	:	88	105	104	116	0.502	0.5	18.734	0.501	0.8	19.405	29.96	17.618	18.283

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4/19/2016    9:24:19    :    88    106    105    116    0.5      0.5    19.266    0.501    0.8    19.955    29.96    18.114    18.798
4/19/2016    9:25:19    :    89    106    105    116    0.499    0.5    19.771    0.5      0.8    20.578    29.96    18.587    19.381
4/19/2016    9:26:19    :    89    106    105    117    0.503    0.5    20.305    0.503    0.8    21.171    29.96    19.085    19.936
4/19/2016    9:27:19    :    88    106    105    117    0.499    0.5    20.902    0.498    0.8    21.7      29.96    19.644    20.431
4/19/2016    9:28:19    :    91    106    105    117    0.501    0.5    21.446    0.503    0.8    22.225    29.96    20.152    20.922
4/19/2016    9:29:19    :    88    106    106    118    0.499    0.5    21.962    0.498    0.8    22.772    29.96    20.633    21.434
4/19/2016    9:30:19    :    87    107    106    118    0.502    0.5    22.465    0.503    0.8    23.398    29.96    21.102    22.018
4/19/2016    9:31:19    :    88    107    106    118    0.504    0.5    22.997    0.506    0.8    23.979    29.96    21.599    22.561
4/19/2016    9:32:19    :    88    107    106    118    0.499    0.5    23.595    0.499    0.8    24.518    29.96    22.156    23.064
4/19/2016    9:33:19    :    88    107    106    118    0.504    0.5    24.164    0.505    0.8    25.052    29.96    22.686    23.563
4/19/2016    9:34:19    :    89    107    106    118    0.502    0.5    24.662    0.502    0.8    25.606    29.96    23.151    24.081
4/19/2016    9:35:19    :    91    107    106    118    0.498    0.5    25.165    0.498    0.8    26.217    29.96    23.62     24.651
4/19/2016    9:36:19    :    89    107    107    119    0.504    0.5    25.699    0.507    0.8    26.789    29.96    24.118    25.185
4/19/2016    9:37:19    :    90    108    107    119    0.5      0.5    26.307    0.498    0.8    27.343    29.96    24.683    25.702
4/19/2016    9:38:19    :    90    108    107    119    0.501    0.5    26.874    0.5      0.8    27.866    29.96    25.211    26.189
4/19/2016    9:39:19    :    89    108    107    119    0.51     0.5    27.373    0.506    0.8    28.445    29.96    25.675    26.728
4/19/2016    9:40:19    :    88    108    107    119    0.5      0.5    27.865    0.499    0.8    29.034    29.96    26.134    27.277
4/19/2016    9:41:19    :    90    108    107    119    0.499    0.5    28.408    0.498    0.8    29.597    29.96    26.638    27.802
4/19/2016    9:42:19    :    91    108    108    119    0.501    0.5    29.026    0.5      0.8    30.157    29.96    27.214    28.323
4/19/2016    9:43:19    :    92    108    108    120    0.5      0.5    29.591    0.499    0.8    30.694    29.96    27.739    28.823
4/19/2016    9:44:19    :    91    109    108    120    0.499    0.5    30.08     0.5      0.8    31.269    29.96    28.193    29.359
4/19/2016    9:45:19    :    89    109    108    120    0.501    0.5    30.568    0.502    0.8    31.848    29.96    28.647    29.898
4/19/2016    9:46:19    :    89    109    108    120    0.5      0.5    31.102    0.501    0.8    32.421    29.96    29.143    30.431
4/19/2016    9:47:19    :    89    109    108    120    0.5      0.5    31.736    0.5      0.8    32.966    29.96    29.733    30.938
4/19/2016    9:48:19    :    89    109    108    120    0.5      0.5    32.28     0.5      0.8    33.512    29.96    30.238    31.446
4/19/2016    9:48:21    :    89    109    108    120    0.5      0.5    32.301    0.5      0.8    33.533    29.96    30.257    31.465
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/19/16  08:48:20: Test START
04/19/16  09:05:21: Alarm Chg     86    open    open    open    102    101    open    112   0.499    0.5    9.012   0.500    0.8    9.376    -   29.96    8.502    8.861    -    -    500    55.3    52.2   100.6    100.6 {---- ---- ---L MN--}
04/19/16  09:48:21: Actual Sampling Time: 0d  1h  0m  0s
04/19/16  09:48:21: Test END
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------
```

```
'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
'
```

Zip

Zip

Configuration File: CUBA NCASI DAY3 42016.pro
File Exported: 4/29/2016 10:06:47 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: SIDE A
Trap ID-B: SIDE B

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 0m
Averaging Period : 1 min.

Run D3

			Stack F	DGM-A F	DGM-B F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			**95.7**	**110.1**	**109.3**	**119**	**0.5**	**0.5**	**31.476**	**0.501**	**0.9**	**33.335**	**29.88**	**29.135**	**30.897**
4/20/2016	12:29:47	:	99	109	108	114	0.005	0	0	0	0.1	0	29.9	0	0
4/20/2016	12:30:46	:	97	108	107	114	0.512	0.5	0.585	0.535	0.9	0.537	29.89	0.543	0.499
4/20/2016	12:31:46	:	93	108	107	114	0.501	0.5	1.123	0.501	0.9	1.042	29.9	1.043	0.969
4/20/2016	12:32:46	:	93	108	107	114	0.501	0.5	1.598	0.501	0.9	1.574	29.9	1.484	1.464
4/20/2016	12:33:46	:	93	108	107	114	0.5	0.5	2.068	0.5	0.9	2.173	29.9	1.921	2.021
4/20/2016	12:34:46	:	93	108	107	114	0.501	0.5	2.592	0.501	0.9	2.768	29.89	2.407	2.574
4/20/2016	12:35:46	:	93	108	107	115	0.5	0.5	3.206	0.5	0.9	3.263	29.9	2.978	3.035
4/20/2016	12:36:46	:	94	108	107	115	0.501	0.5	3.727	0.5	0.9	3.751	29.9	3.462	3.489
4/20/2016	12:37:46	:	97	108	107	115	0.5	0.5	4.197	0.5	0.9	4.313	29.89	3.899	4.011
4/20/2016	12:38:46	:	98	108	107	115	0.5	0.5	4.68	0.501	0.9	4.917	29.89	4.347	4.573
4/20/2016	12:39:46	:	99	108	107	115	0.5	0.5	5.224	0.5	0.9	5.498	29.89	4.851	5.113
4/20/2016	12:40:46	:	100	108	107	115	0.5	0.5	5.801	0.5	0.9	6.01	29.89	5.388	5.589
4/20/2016	12:41:46	:	100	108	107	116	0.5	0.5	6.331	0.5	0.9	6.492	29.89	5.879	6.037
4/20/2016	12:42:46	:	102	108	107	116	0.499	0.5	6.812	0.5	0.9	7.062	29.89	6.325	6.567
4/20/2016	12:43:46	:	101	108	107	116	0.5	0.5	7.32	0.5	0.9	7.679	29.89	6.797	7.141
4/20/2016	12:44:46	:	101	108	108	116	0.5	0.5	7.851	0.5	0.9	8.251	29.89	7.29	7.672
4/20/2016	12:45:46	:	102	108	108	116	0.5	0.5	8.388	0.5	0.9	8.755	29.89	7.788	8.14
4/20/2016	12:46:46	:	101	108	108	117	0.5	0.5	8.928	0.5	0.9	9.248	29.89	8.29	8.599
4/20/2016	12:47:46	:	102	109	108	117	0.5	0.5	9.45	0.5	0.9	9.811	29.89	8.773	9.122
4/20/2016	12:48:46	:	99	109	108	118	0.5	0.5	9.967	0.5	0.9	10.446	29.89	9.253	9.712
4/20/2016	12:49:46	:	96	109	108	118	0.5	0.5	10.458	0.5	0.9	11.008	29.89	9.708	10.234
4/20/2016	12:50:46	:	94	109	108	118	0.5	0.5	10.972	0.5	0.9	11.522	29.89	10.184	10.711
4/20/2016	12:51:46	:	97	109	108	118	0.5	0.5	11.552	0.5	0.9	12.018	29.89	10.723	11.171
4/20/2016	12:52:46	:	100	109	108	119	0.5	0.5	12.106	0.5	0.9	12.577	29.89	11.236	11.69
4/20/2016	12:53:46	:	101	109	108	119	0.501	0.5	12.587	0.499	0.9	13.22	29.89	11.682	12.287
4/20/2016	12:54:46	:	103	109	108	119	0.5	0.5	13.056	0.5	0.9	13.782	29.89	12.117	12.808
4/20/2016	12:55:46	:	103	109	108	119	0.5	0.5	13.584	0.5	0.9	14.297	29.88	12.605	13.286
4/20/2016	12:56:46	:	102	109	109	120	0.5	0.5	14.204	0.5	0.9	14.799	29.88	13.18	13.751
4/20/2016	12:57:46	:	102	109	109	120	0.5	0.5	14.734	0.5	0.9	15.359	29.89	13.67	14.27
4/20/2016	12:58:46	:	98	110	109	120	0.5	0.5	15.204	0.499	0.9	15.998	29.88	14.105	14.863
4/20/2016	12:59:46	:	98	110	109	120	0.5	0.5	15.687	0.5	0.9	16.565	29.88	14.552	15.388
4/20/2016	13:00:46	:	101	110	109	120	0.5	0.5	16.227	0.5	0.9	17.077	29.88	15.052	15.863
4/20/2016	13:01:46	:	102	110	109	120	0.5	0.5	16.82	0.499	0.9	17.583	29.88	15.6	16.332
4/20/2016	13:02:46	:	99	110	109	121	0.5	0.5	17.348	0.5	0.9	18.143	29.87	16.089	16.851
4/20/2016	13:03:46	:	99	110	109	121	0.5	0.5	17.824	0.5	0.9	18.785	29.88	16.529	17.444
4/20/2016	13:04:46	:	94	110	109	121	0.5	0.5	18.333	0.501	0.9	19.352	29.87	17	17.97

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4/20/2016   13:05:46   :   93   110   109   121   0.5     0.5   18.872   0.499   0.9   19.865   29.88   17.497   18.445
4/20/2016   13:06:46   :   91   110   110   121   0.5     0.5   19.414   0.5     0.9   20.369   29.87   17.998   18.911
4/20/2016   13:07:46   :   92   111   110   121   0.499   0.5   19.949   0.5     0.9   20.932   29.88   18.493   19.432
4/20/2016   13:08:46   :   91   111   110   122   0.5     0.5   20.467   0.5     0.9   21.575   29.88   18.971   20.027
4/20/2016   13:09:46   :   91   111   110   122   0.5     0.5   20.988   0.5     0.9   22.139   29.88   19.452   20.549
4/20/2016   13:10:46   :   90   111   110   122   0.5     0.5   21.484   0.5     0.9   22.654   29.88   19.91    21.025
4/20/2016   13:11:46   :   93   111   110   122   0.5     0.5   22.005   0.499   0.9   23.162   29.87   20.392   21.494
4/20/2016   13:12:46   :   94   111   110   122   0.5     0.5   22.584   0.5     0.9   23.722   29.87   20.926   22.012
4/20/2016   13:13:46   :   93   111   110   122   0.5     0.5   23.127   0.5     0.9   24.364   29.87   21.427   22.605
4/20/2016   13:14:46   :   91   111   110   122   0.499   0.5   23.608   0.5     0.9   24.93    29.87   21.871   23.128
4/20/2016   13:15:46   :   93   111   110   121   0.5     0.5   24.079   0.5     0.9   25.445   29.87   22.306   23.604
4/20/2016   13:16:46   :   94   111   110   121   0.5     0.5   24.607   0.5     0.9   25.953   29.87   22.793   24.073
4/20/2016   13:17:46   :   93   111   110   121   0.499   0.5   25.22    0.5     0.9   26.514   29.87   23.36    24.592
4/20/2016   13:18:46   :   93   111   110   121   0.5     0.5   25.751   0.5     0.9   27.157   29.86   23.849   25.186
4/20/2016   13:19:46   :   94   111   110   121   0.5     0.5   26.221   0.5     0.9   27.725   29.86   24.283   25.711
4/20/2016   13:20:46   :   92   111   110   120   0.499   0.5   26.7     0.5     0.9   28.237   29.86   24.725   26.184
4/20/2016   13:21:46   :   89   111   110   120   0.5     0.5   27.235   0.499   0.9   28.741   29.87   25.219   26.65
4/20/2016   13:22:46   :   88   111   110   120   0.499   0.5   27.829   0.5     0.9   29.305   29.86   25.767   27.171
4/20/2016   13:23:46   :   88   111   110   120   0.499   0.5   28.356   0.5     0.9   29.95    29.86   26.254   27.767
4/20/2016   13:24:46   :   89   111   110   120   0.5     0.5   28.829   0.5     0.9   30.517   29.86   26.69    28.291
4/20/2016   13:25:46   :   88   111   110   119   0.5     0.5   29.336   0.499   0.9   31.032   29.86   27.158   28.767
4/20/2016   13:26:46   :   88   111   110   119   0.499   0.5   29.874   0.5     0.9   31.538   29.86   27.655   29.235
4/20/2016   13:27:46   :   87   110   110   119   0.5     0.5   30.416   0.5     0.9   32.102   29.86   28.156   29.756
4/20/2016   13:28:46   :   88   110   110   119   0.501   0.5   30.948   0.5     0.9   32.746   29.86   28.647   30.352
4/20/2016   13:29:46   :   88   110   109   118   0.5     0.5   31.459   0.5     0.9   33.316   29.86   29.119   30.88
4/20/2016   13:29:48   :   88   110   109   118   0.5     0.5   31.476   0.5     0.9   33.335   29.86   29.135   30.897
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/20/16  12:29:47: Test START
04/20/16  12:46:47: Alarm Chg    102    open    open    open    109    108    open    118   0.498    0.5    8.934   0.501    0.9    9.254    -   29.89    8.295    8.605    -    -    500    56.1    50.6   100.0   100.0 {---- ---- ---L MN--
04/20/16  13:29:48: Actual Sampling Time: 0d  1h  0m  0s
04/20/16  13:29:48: Test END
04/20/16  13:32:43: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg                    with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/20/16  13:32:43: Maximum Observed Vacuum for A was 0.6 inHg
04/20/16  13:32:43: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg                    with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/20/16  13:32:43: Maximum Observed Vacuum for B was 1.5 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
```

```
'------------------------ END OF ALARM LEDGENDS ----------------------------



'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI DAY4 42116 spikeb.pro
File Exported: 4/29/2016 10:06:53 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: side a
Trap ID-B: spiked 100ul

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 42m
Averaging Period : 1 min.

Run D4

			Stack F	**DGM-A F**	**DGM-B F**	**Console F**	**MAS-A LPM**	**VAC-A in-Hg**	**DGM-A (L) Corr-Vol**	**MAS-B LPM**	**VAC-B in-Hg**	**DGM-B (L) Corr-Vol**	**Baro in-Hg**	**STD Vol_A**	**STD Vol_B**
AVERAGES AND TEST SUMMARIES			**95.4**	**108.3**	**107.7**	**116.3**	**0.493**	**0.7**	**32.404**	**0.494**	**0.9**	**33.881**	**29.88**	**30.094**	**31.5**
4/21/2016	11:59:11	:	97	108	108	117	0.002	0	0	0	0.1	0	29.9	0	0
4/21/2016	11:59:21	:User Paus	98	108	108	117	0.56	0.1	0.067	0.599	0.3	0.165	29.9	0.063	0.153
4/21/2016	12:41:34	:Resumed	92	109	108	114	0.007	0	0.067	0	0.1	0.165	29.89	0.063	0.153
4/21/2016	12:42:33	:	93	108	108	114	0.524	0.6	0.643	0.547	0.8	0.733	29.89	0.597	0.681
4/21/2016	12:43:33	:	93	108	108	114	0.5	0.7	1.125	0.5	0.9	1.239	29.89	1.044	1.151
4/21/2016	12:44:33	:	92	108	108	114	0.5	0.7	1.595	0.5	0.9	1.735	29.89	1.48	1.612
4/21/2016	12:45:33	:	93	108	107	114	0.5	0.7	2.113	0.5	0.9	2.295	29.89	1.961	2.132
4/21/2016	12:46:33	:	93	108	107	114	0.499	0.7	2.735	0.5	0.9	2.94	29.89	2.539	2.732
4/21/2016	12:47:33	:	93	108	107	114	0.5	0.7	3.267	0.5	0.9	3.509	29.89	3.034	3.261
4/21/2016	12:48:33	:	92	108	107	114	0.501	0.7	3.76	0.5	0.9	4.026	29.88	3.491	3.742
4/21/2016	12:49:33	:	93	108	107	114	0.5	0.7	4.269	0.5	0.9	4.534	29.89	3.963	4.214
4/21/2016	12:50:33	:	93	108	107	114	0.501	0.7	4.811	0.499	0.9	5.104	29.89	4.467	4.744
4/21/2016	12:51:33	:	94	108	107	114	0.499	0.7	5.439	0.5	0.9	5.746	29.89	5.051	5.341
4/21/2016	12:52:33	:	93	108	107	114	0.5	0.7	5.985	0.5	0.9	6.322	29.88	5.558	5.876
4/21/2016	12:53:33	:	93	108	107	114	0.499	0.7	6.464	0.5	0.9	6.839	29.88	6.003	6.357
4/21/2016	12:54:33	:	93	108	107	114	0.5	0.7	6.986	0.5	0.9	7.345	29.89	6.487	6.827
4/21/2016	12:55:33	:	94	108	107	114	0.5	0.7	7.538	0.5	0.9	7.926	29.89	7	7.367
4/21/2016	12:56:33	:	94	108	107	114	0.501	0.7	8.147	0.5	0.9	8.557	29.88	7.565	7.954
4/21/2016	12:57:33	:	96	108	107	114	0.501	0.7	8.695	0.5	0.9	9.142	29.88	8.074	8.498
4/21/2016	12:58:33	:	95	108	107	114	0.499	0.7	9.182	0.5	0.9	9.663	29.88	8.526	8.982
4/21/2016	12:59:33	:	95	108	107	114	0.5	0.7	9.701	0.5	0.9	10.171	29.88	9.009	9.455
4/21/2016	13:00:33	:	95	108	107	114	0.499	0.7	10.267	0.5	0.9	10.747	29.88	9.534	9.991
4/21/2016	13:01:33	:	96	108	107	115	0.499	0.7	10.844	0.499	0.9	11.367	29.89	10.07	10.567
4/21/2016	13:02:33	:	96	108	107	115	0.5	0.7	11.403	0.5	0.9	11.966	29.89	10.59	11.125
4/21/2016	13:03:33	:	97	108	107	115	0.499	0.7	11.902	0.5	0.9	12.487	29.89	11.053	11.61
4/21/2016	13:04:33	:	97	108	107	115	0.5	0.7	12.419	0.5	0.9	12.993	29.89	11.533	12.081
4/21/2016	13:05:33	:	99	108	107	115	0.501	0.7	12.99	0.5	0.9	13.565	29.89	12.064	12.613
4/21/2016	13:06:33	:	97	108	107	115	0.499	0.7	13.553	0.5	0.9	14.179	29.89	12.587	13.185
4/21/2016	13:07:33	:	95	108	107	115	0.5	0.7	14.113	0.5	0.9	14.788	29.89	13.107	13.75
4/21/2016	13:08:33	:	95	108	107	116	0.5	0.7	14.625	0.5	0.9	15.302	29.89	13.582	14.229
4/21/2016	13:09:33	:	95	108	107	116	0.501	0.7	15.144	0.5	0.9	15.819	29.89	14.065	14.71
4/21/2016	13:10:33	:	96	108	107	116	0.5	0.7	15.703	0.5	0.9	16.377	29.89	14.584	15.228
4/21/2016	13:11:33	:	95	108	107	116	0.5	0.7	16.269	0.5	0.9	16.993	29.89	15.11	15.801
4/21/2016	13:12:33	:	95	108	107	116	0.5	0.7	16.812	0.5	0.9	17.603	29.89	15.614	16.369
4/21/2016	13:13:33	:	97	108	107	116	0.5	0.7	17.348	0.499	0.9	18.12	29.89	16.112	16.849
4/21/2016	13:14:33	:	96	108	107	116	0.5	0.7	17.867	0.5	0.9	18.641	29.89	16.594	17.333

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4/21/2016   13:15:33   :   96   108   107   116   0.499   0.7   18.414   0.5     0.9   19.201   29.89   17.102   17.854
4/21/2016   13:16:33   :   95   108   107   117   0.498   0.7   18.968   0.501   0.9   19.823   29.89   17.616   18.432
4/21/2016   13:17:33   :   94   108   107   116   0.5     0.7   19.518   0.5     0.9   20.417   29.89   18.127   18.985
4/21/2016   13:18:33   :   94   108   107   117   0.5     0.7   20.064   0.499   0.9   20.946   29.89   18.635   19.477
4/21/2016   13:19:33   :   94   108   107   117   0.5     0.7   20.589   0.5     0.9   21.475   29.89   19.122   19.968
4/21/2016   13:20:33   :   96   108   107   117   0.499   0.7   21.112   0.5     0.9   22.042   29.89   19.608   20.495
4/21/2016   13:21:33   :   98   108   107   117   0.499   0.7   21.668   0.5     0.9   22.656   29.88   20.125   21.066
4/21/2016   13:22:33   :   99   108   107   117   0.5     0.7   22.235   0.5     0.9   23.235   29.88   20.651   21.605
4/21/2016   13:23:33   :   97   108   107   117   0.5     0.7   22.771   0.5     0.9   23.778   29.88   21.149   22.109
4/21/2016   13:24:33   :   96   108   107   117   0.5     0.7   23.311   0.5     0.9   24.314   29.88   21.65    22.607
4/21/2016   13:25:33   :   96   108   107   117   0.501   0.7   23.826   0.5     0.9   24.884   29.88   22.129   23.137
4/21/2016   13:26:33   :   95   108   107   117   0.501   0.7   24.368   0.5     0.9   25.484   29.88   22.632   23.695
4/21/2016   13:27:33   :   96   108   107   117   0.501   0.7   24.954   0.5     0.9   26.051   29.88   23.176   24.222
4/21/2016   13:28:33   :   96   108   107   117   0.5     0.7   25.496   0.5     0.9   26.611   29.88   23.68    24.743
4/21/2016   13:29:33   :   96   108   107   118   0.499   0.7   26.03    0.5     0.9   27.15    29.88   24.175   25.244
4/21/2016   13:30:33   :   95   108   107   118   0.499   0.7   26.539   0.5     0.9   27.729   29.88   24.649   25.782
4/21/2016   13:31:33   :   95   108   107   118   0.499   0.7   27.073   0.5     0.9   28.316   29.88   25.144   26.327
4/21/2016   13:32:33   :   95   108   107   118   0.5     0.7   27.66    0.501   0.9   28.881   29.88   25.69    26.853
4/21/2016   13:33:33   :   94   108   107   117   0.5     0.7   28.219   0.5     0.9   29.427   29.88   26.208   27.36
4/21/2016   13:34:33   :   94   108   107   117   0.499   0.7   28.738   0.5     0.9   29.979   29.87   26.69    27.873
4/21/2016   13:35:33   :   94   108   107   118   0.499   0.7   29.246   0.5     0.9   30.564   29.87   27.161   28.416
4/21/2016   13:36:33   :   95   108   107   117   0.5     0.7   29.777   0.5     0.9   31.155   29.87   27.655   28.966
4/21/2016   13:37:33   :   95   108   107   117   0.5     0.7   30.384   0.5     0.9   31.711   29.87   28.218   29.482
4/21/2016   13:38:33   :   94   108   107   117   0.5     0.7   30.948   0.5     0.9   32.243   29.87   28.742   29.978
4/21/2016   13:39:33   :   93   108   107   117   0.5     0.7   31.447   0.5     0.9   32.808   29.88   29.206   30.503
4/21/2016   13:40:33   :   93   108   107   117   0.5     0.7   31.954   0.5     0.9   33.395   29.87   29.676   31.048
4/21/2016   13:41:25   :   93   108   107   117   0.5     0.7   32.404   0.5     0.9   33.881   29.87   30.094   31.5
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/21/16  11:59:11: Test START
04/21/16  11:59:21: Test Paused by User
04/21/16  11:59:21: PAUSE_EVENT [Manual Pause]
04/21/16  12:41:34: TestResumed
04/21/16  12:58:34: Alarm Chg     96    open    open    open    108    107    open    114   0.500    0.7    9.188   0.501    0.9    9.672     -   29.88    8.532    8.990     -     -    500    56.9    50.2    99.8   100.0 {---- ---- ---L MN--
04/21/16  13:41:25: Actual Sampling Time: 0d  1h  0m  0s
04/21/16  13:41:25: Test END
04/21/16  13:46:06: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg                with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/21/16  13:46:06: Maximum Observed Vacuum for A was 1.2 inHg
04/21/16  13:46:06: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg                with Flow Rate of 0 ccm (Max. allowed 20 ccm)
04/21/16  13:46:06: Maximum Observed Vacuum for B was 1.1 inHg
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
```

```
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ----------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI DAY5 42216.pro
File Exported: 4/29/2016 10:07:05 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: side A
Trap ID-B: side B

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 0m
Averaging Period : 1 min.

Run D5

			Stack F	DGM-A F	DGM-B F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			**84.5**	**97.1**	**96.3**	**106.8**	**0.5**	**0.7**	**31.412**	**0.501**	**0.9**	**33.356**	**29.95**	**29.826**	**31.715**
4/22/2016	9:39:52	:	83	95	94	103	0.006	0	0	0	0.1	0	29.95	0	0
4/22/2016	9:40:51	:	83	95	94	103	0.518	0.7	0.518	0.553	0.9	0.558	29.95	0.493	0.532
4/22/2016	9:41:51	:	83	94	94	103	0.502	0.7	1.09	0.501	0.9	1.037	29.95	1.039	0.989
4/22/2016	9:42:51	:	83	94	94	103	0.501	0.7	1.641	0.501	0.9	1.6	29.95	1.564	1.526
4/22/2016	9:43:51	:	83	94	94	103	0.501	0.7	2.118	0.5	0.9	2.22	29.95	2.019	2.118
4/22/2016	9:44:51	:	83	94	94	103	0.501	0.7	2.592	0.5	0.9	2.781	29.95	2.471	2.653
4/22/2016	9:45:51	:	83	94	94	103	0.5	0.7	3.111	0.5	0.9	3.286	29.95	2.966	3.136
4/22/2016	9:46:51	:	83	95	94	103	0.5	0.7	3.709	0.5	0.9	3.78	29.95	3.536	3.607
4/22/2016	9:47:51	:	83	95	94	103	0.5	0.7	4.218	0.5	0.9	4.338	29.96	4.021	4.14
4/22/2016	9:48:51	:	84	95	94	103	0.5	0.7	4.669	0.5	0.9	4.981	29.95	4.451	4.753
4/22/2016	9:49:51	:	84	95	94	103	0.5	0.7	5.158	0.5	0.9	5.543	29.95	4.917	5.289
4/22/2016	9:50:51	:	85	95	94	103	0.5	0.7	5.701	0.5	0.9	6.054	29.95	5.433	5.776
4/22/2016	9:51:51	:	85	95	94	104	0.5	0.7	6.245	0.5	0.9	6.55	29.95	5.951	6.249
4/22/2016	9:52:51	:	85	95	94	104	0.5	0.7	6.76	0.499	0.9	7.112	29.96	6.442	6.785
4/22/2016	9:53:51	:	84	95	94	104	0.5	0.7	7.265	0.5	0.9	7.745	29.96	6.923	7.389
4/22/2016	9:54:51	:	84	95	94	104	0.5	0.7	7.767	0.5	0.9	8.311	29.95	7.4	7.928
4/22/2016	9:55:51	:	84	95	95	104	0.499	0.7	8.259	0.5	0.9	8.801	29.96	7.869	8.395
4/22/2016	9:56:51	:	84	95	95	105	0.5	0.7	8.77	0.5	0.9	9.326	29.96	8.355	8.895
4/22/2016	9:57:51	:	84	95	95	105	0.5	0.7	9.343	0.5	0.9	9.885	29.95	8.901	9.428
4/22/2016	9:58:51	:	84	96	95	105	0.5	0.7	9.875	0.5	0.9	10.507	29.96	9.407	10.02
4/22/2016	9:59:51	:	84	96	95	105	0.499	0.7	10.347	0.5	0.9	11.082	29.96	9.856	10.568
4/22/2016	10:00:51	:	83	96	95	105	0.5	0.7	10.811	0.5	0.9	11.574	29.95	10.297	11.037
4/22/2016	10:01:51	:	84	96	95	106	0.5	0.7	11.338	0.499	0.9	12.101	29.96	10.798	11.539
4/22/2016	10:02:51	:	85	96	95	106	0.499	0.7	11.941	0.5	0.9	12.664	29.96	11.372	12.075
4/22/2016	10:03:51	:	85	96	95	106	0.5	0.7	12.459	0.5	0.9	13.278	29.95	11.864	12.659
4/22/2016	10:04:51	:	86	96	95	106	0.5	0.7	12.914	0.5	0.9	13.857	29.96	12.297	13.21
4/22/2016	10:05:51	:	86	96	95	106	0.5	0.7	13.407	0.5	0.9	14.353	29.96	12.765	13.682
4/22/2016	10:06:51	:	85	96	95	107	0.5	0.7	13.955	0.5	0.9	14.882	29.95	13.286	14.186
4/22/2016	10:07:51	:	86	96	96	107	0.5	0.7	14.506	0.5	0.9	15.446	29.96	13.809	14.722
4/22/2016	10:08:51	:	85	96	96	107	0.499	0.7	15.045	0.5	0.9	16.06	29.95	14.322	15.306
4/22/2016	10:09:51	:	85	96	96	107	0.5	0.7	15.561	0.5	0.9	16.639	29.95	14.812	15.857
4/22/2016	10:10:51	:	85	97	96	107	0.5	0.7	16.074	0.5	0.9	17.137	29.96	15.299	16.33
4/22/2016	10:11:51	:	85	97	96	108	0.5	0.7	16.629	0.5	0.9	17.669	29.95	15.825	16.836
4/22/2016	10:12:51	:	85	97	96	108	0.5	0.7	17.186	0.5	0.9	18.233	29.95	16.354	17.372
4/22/2016	10:13:51	:	86	97	96	108	0.5	0.7	17.728	0.5	0.9	18.843	29.95	16.868	17.951
4/22/2016	10:14:51	:	86	97	96	108	0.5	0.7	18.266	0.5	0.9	19.42	29.95	17.379	18.5

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4/22/2016    10:15:51    :    86    97    96    108    0.5      0.7    18.786    0.5      0.9    19.919    29.95    17.872    18.974
4/22/2016    10:16:51    :    86    97    96    109    0.501    0.7    19.309    0.5      0.9    20.45     29.95    18.368    19.479
4/22/2016    10:17:51    :    86    97    97    109    0.5      0.7    19.867    0.5      0.9    21.019    29.95    18.897    20.019
4/22/2016    10:18:51    :    86    97    97    109    0.5      0.7    20.43     0.5      0.9    21.629    29.95    19.431    20.598
4/22/2016    10:19:51    :    85    97    97    109    0.5      0.7    20.964    0.5      0.9    22.203    29.95    19.937    21.142
4/22/2016    10:20:51    :    85    98    97    109    0.5      0.7    21.496    0.5      0.9    22.704    29.95    20.441    21.617
4/22/2016    10:21:51    :    85    98    97    109    0.5      0.7    22.005    0.5      0.9    23.235    29.95    20.924    22.121
4/22/2016    10:22:51    :    84    98    97    109    0.501    0.7    22.541    0.5      0.9    23.805    29.95    21.431    22.662
4/22/2016    10:23:51    :    85    98    97    109    0.499    0.7    23.135    0.5      0.9    24.413    29.95    21.993    23.238
4/22/2016    10:24:51    :    84    98    97    109    0.5      0.7    23.675    0.499    0.9    24.99     29.95    22.505    23.785
4/22/2016    10:25:51    :    84    98    97    109    0.499    0.7    24.19     0.499    0.9    25.492    29.94    22.993    24.261
4/22/2016    10:26:51    :    84    98    97    109    0.5      0.7    24.691    0.5      0.9    26.022    29.94    23.467    24.763
4/22/2016    10:27:51    :    83    98    97    109    0.5      0.7    25.222    0.5      0.9    26.594    29.95    23.971    25.305
4/22/2016    10:28:51    :    84    98    97    109    0.503    0.7    25.798    0.5      0.9    27.202    29.95    24.516    25.882
4/22/2016    10:29:51    :    84    98    97    109    0.5      0.7    26.34     0.5      0.9    27.779    29.94    25.029    26.429
4/22/2016    10:30:51    :    83    98    97    108    0.5      0.7    26.786    0.5      0.9    28.279    29.94    25.45     26.902
4/22/2016    10:31:51    :    83    98    97    108    0.5      0.7    27.244    0.5      0.9    28.811    29.94    25.883    27.407
4/22/2016    10:32:51    :    83    98    97    108    0.5      0.7    27.781    0.5      0.9    29.38     29.94    26.392    27.947
4/22/2016    10:33:51    :    83    98    97    108    0.5      0.7    28.375    0.5      0.9    29.991    29.94    26.953    28.525
4/22/2016    10:34:51    :    83    98    97    108    0.499    0.7    28.874    0.499    0.9    30.56     29.94    27.425    29.064
4/22/2016    10:35:51    :    83    98    97    108    0.501    0.7    29.33     0.5      0.9    31.067    29.94    27.857    29.545
4/22/2016    10:36:51    :    83    98    97    108    0.5      0.7    29.823    0.499    0.9    31.598    29.94    28.323    30.048
4/22/2016    10:37:51    :    82    98    97    108    0.501    0.7    30.35     0.5      0.9    32.167    29.94    28.822    30.588
4/22/2016    10:38:51    :    80    98    97    108    0.499    0.7    30.872    0.5      0.9    32.772    29.94    29.316    31.161
4/22/2016    10:39:51    :    79    98    97    108    0.5      0.7    31.406    0.5      0.9    33.347    29.94    29.821    31.706
4/22/2016    10:39:52    :    79    98    97    108    0.5      0.7    31.412    0.5      0.9    33.356    29.94    29.826    31.715
'
'-------------------------- LOGGED EVENTS ----------------------------------
04/22/16  09:39:52: Test START
04/22/16  09:56:51: Alarm Chg     85    open    open    open    95    95    open    105   0.499    0.7    8.766   0.500    0.9    9.322    -   29.96    8.352    8.891    -    -    500    54.1    48.6    99.8    100.0 {---- ---- ---- MN--}
04/22/16  09:56:51: Alarm Chg     85    open    open    open    95    95    open    105   0.499    0.7    8.768   0.500    0.9    9.324    -   29.96    8.353    8.893    -    -    500    54.1    48.6    99.8    100.0 {---- ---- ---L MN--}
04/22/16  10:39:52: Actual Sampling Time: 0d  1h  0m  0s
04/22/16  10:39:52: Test END
04/25/16  17:33:40: New Trap Temperature: set to = 250F
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
```

```
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI DAY5 train spike.pro
File Exported: 4/29/2016 10:06:59 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: train spike
Trap ID-B: na

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 6m
Averaging Period : 1 min.

Run TB

			Stack F	DGM-A F	DGM-B F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			**82**	**89.5**	**88.9**	**99.8**	**0.493**	**0.7**	**31.24**	**0.493**	**0.2**	**32.733**	**29.92**	**30.042**	**31.511**
4/22/2016	7:56:24	:	80	86	85	94	0.005	0	0	0	0.1	0	29.92	0	0
4/22/2016	7:56:39	:User Paus	80	86	85	94	0.512	0.7	0.132	0.511	0.2	0.135	29.92	0.127	0.131
4/22/2016	8:02:48	:Resumed	79	87	86	94	0.004	0.4	0.132	0	0.1	0.137	29.92	0.127	0.133
4/22/2016	8:03:47	:	79	86	85	94	0.53	0.7	0.616	0.553	0.3	0.695	29.92	0.596	0.673
4/22/2016	8:04:47	:	80	86	85	94	0.5	0.7	1.15	0.501	0.1	1.243	29.92	1.112	1.204
4/22/2016	8:05:47	:	80	86	85	94	0.5	0.7	1.682	0.5	0.1	1.772	29.92	1.627	1.715
4/22/2016	8:06:47	:	80	86	85	94	0.5	0.7	2.2	0.5	0.2	2.297	29.92	2.127	2.223
4/22/2016	8:07:47	:	80	86	85	94	0.502	0.7	2.708	0.501	0.2	2.822	29.92	2.619	2.732
4/22/2016	8:08:47	:	80	86	85	95	0.501	0.7	3.222	0.499	0.2	3.322	29.93	3.116	3.215
4/22/2016	8:09:47	:	80	86	86	95	0.499	0.7	3.715	0.5	0.2	3.846	29.93	3.592	3.723
4/22/2016	8:10:47	:	79	86	86	95	0.499	0.7	4.234	0.5	0.2	4.449	29.92	4.094	4.305
4/22/2016	8:11:47	:	79	87	86	95	0.5	0.7	4.82	0.5	0.2	5.006	29.92	4.66	4.845
4/22/2016	8:12:47	:	80	87	86	96	0.5	0.7	5.372	0.5	0.2	5.506	29.93	5.193	5.328
4/22/2016	8:13:47	:	80	87	86	96	0.5	0.7	5.853	0.5	0.2	6.006	29.92	5.657	5.811
4/22/2016	8:14:47	:	81	87	86	96	0.5	0.7	6.343	0.5	0.2	6.544	29.93	6.13	6.331
4/22/2016	8:15:47	:	81	87	86	96	0.501	0.7	6.877	0.5	0.2	7.147	29.93	6.646	6.914
4/22/2016	8:16:47	:	81	87	86	96	0.501	0.7	7.489	0.5	0.2	7.737	29.92	7.236	7.484
4/22/2016	8:17:47	:	81	87	86	97	0.5	0.7	8.031	0.5	0.2	8.228	29.93	7.759	7.958
4/22/2016	8:18:47	:	81	87	87	97	0.499	0.7	8.506	0.5	0.2	8.703	29.93	8.218	8.417
4/22/2016	8:19:47	:	81	87	87	97	0.501	0.7	8.986	0.501	0.2	9.269	29.92	8.681	8.964
4/22/2016	8:20:47	:	81	88	87	97	0.5	0.7	9.539	0.5	0.2	9.885	29.93	9.214	9.558
4/22/2016	8:21:47	:	81	88	87	98	0.5	0.7	10.156	0.499	0.2	10.443	29.92	9.809	10.097
4/22/2016	8:22:47	:	81	88	88	98	0.499	0.7	10.687	0.5	0.2	10.941	29.93	10.32	10.577
4/22/2016	8:23:47	:	81	88	88	98	0.499	0.7	11.151	0.5	0.2	11.421	29.93	10.767	11.04
4/22/2016	8:24:47	:	81	88	88	98	0.501	0.7	11.661	0.5	0.2	11.977	29.92	11.26	11.576
4/22/2016	8:25:47	:	80	88	88	98	0.5	0.7	12.22	0.5	0.2	12.612	29.93	11.798	12.189
4/22/2016	8:26:47	:	81	88	88	99	0.501	0.7	12.801	0.5	0.2	13.166	29.92	12.357	12.723
4/22/2016	8:27:47	:	81	88	88	99	0.5	0.7	13.345	0.5	0.2	13.649	29.92	12.881	13.188
4/22/2016	8:28:47	:	81	88	88	99	0.5	0.7	13.83	0.5	0.2	14.161	29.93	13.348	13.682
4/22/2016	8:29:47	:	81	89	88	99	0.5	0.7	14.342	0.5	0.2	14.719	29.92	13.84	14.22
4/22/2016	8:30:47	:	81	89	88	99	0.5	0.7	14.902	0.5	0.2	15.323	29.92	14.379	14.801
4/22/2016	8:31:47	:	81	89	89	99	0.5	0.7	15.467	0.499	0.2	15.883	29.92	14.922	15.34
4/22/2016	8:32:47	:	81	89	89	99	0.5	0.7	16.003	0.5	0.2	16.377	29.92	15.438	15.816
4/22/2016	8:33:47	:	81	89	89	100	0.499	0.7	16.527	0.5	0.2	16.891	29.92	15.941	16.31
4/22/2016	8:34:47	:	81	89	89	100	0.5	0.7	17.038	0.5	0.2	17.464	29.92	16.433	16.862
4/22/2016	8:35:47	:	81	89	89	100	0.5	0.7	17.566	0.5	0.2	18.041	29.92	16.94	17.417

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4/22/2016   8:36:47   :   81   89   89   100   0.5     0.7   18.12    0.499   0.2   18.61    29.92   17.473   17.965
4/22/2016   8:37:47   :   81   89   89   100   0.499   0.7   18.677   0.499   0.2   19.12    29.92   18.008   18.455
4/22/2016   8:38:47   :   82   89   89   101   0.504   0.7   19.181   0.5     0.2   19.632   29.92   18.493   18.948
4/22/2016   8:39:47   :   82   90   89   101   0.499   0.7   19.664   0.5     0.2   20.192   29.92   18.957   19.486
4/22/2016   8:40:47   :   83   90   89   101   0.5     0.7   20.134   0.5     0.2   20.765   29.92   19.408   20.037
4/22/2016   8:41:47   :   83   90   89   101   0.5     0.7   20.646   0.501   0.2   21.318   29.92   19.899   20.569
4/22/2016   8:42:47   :   84   90   90   101   0.5     0.7   21.231   0.5     0.2   21.86    29.92   20.46    21.09
4/22/2016   8:43:47   :   84   90   90   102   0.499   0.7   21.75    0.499   0.2   22.383   29.92   20.959   21.592
4/22/2016   8:44:47   :   84   91   90   102   0.499   0.7   22.2     0.5     0.2   22.916   29.92   21.391   22.104
4/22/2016   8:45:47   :   84   91   90   102   0.5     0.7   22.672   0.5     0.2   23.479   29.92   21.843   22.645
4/22/2016   8:46:47   :   84   91   90   102   0.5     0.7   23.213   0.5     0.2   24.043   29.92   22.362   23.186
4/22/2016   8:47:47   :   84   91   90   102   0.5     0.7   23.767   0.499   0.2   24.591   29.92   22.893   23.712
4/22/2016   8:48:47   :   84   91   90   103   0.499   0.7   24.272   0.5     0.2   25.132   29.92   23.377   24.231
4/22/2016   8:49:47   :   83   91   90   103   0.501   0.7   24.759   0.5     0.2   25.646   29.92   23.844   24.725
4/22/2016   8:50:47   :   83   91   91   103   0.499   0.7   25.256   0.5     0.2   26.187   29.92   24.32    25.244
4/22/2016   8:51:47   :   83   92   91   103   0.5     0.7   25.745   0.5     0.2   26.787   29.92   24.788   25.819
4/22/2016   8:52:47   :   84   92   91   104   0.5     0.7   26.253   0.5     0.2   27.345   29.93   25.275   26.354
4/22/2016   8:53:47   :   84   92   91   104   0.5     0.7   26.824   0.5     0.2   27.866   29.92   25.821   26.853
4/22/2016   8:54:47   :   84   92   91   104   0.5     0.7   27.353   0.5     0.2   28.374   29.93   26.327   27.339
4/22/2016   8:55:47   :   84   92   91   104   0.5     0.7   27.808   0.499   0.2   28.908   29.93   26.762   27.851
4/22/2016   8:56:47   :   83   92   92   104   0.5     0.7   28.256   0.5     0.2   29.522   29.93   27.191   28.439
4/22/2016   8:57:47   :   83   92   92   105   0.5     0.7   28.788   0.5     0.2   30.099   29.93   27.699   28.991
4/22/2016   8:58:47   :   83   93   92   105   0.5     0.7   29.391   0.5     0.2   30.603   29.93   28.276   29.473
4/22/2016   8:59:47   :   83   93   92   105   0.5     0.7   29.888   0.5     0.2   31.111   29.93   28.751   29.96
4/22/2016   9:00:47   :   83   93   92   105   0.5     0.7   30.334   0.499   0.2   31.65    29.93   29.177   30.476
4/22/2016   9:01:47   :   83   93   92   105   0.5     0.7   30.827   0.5     0.2   32.257   29.93   29.648   31.056
4/22/2016   9:02:35   :   83   93   92   105   0.5     0.7   31.24    0.5     0.2   32.733   29.93   30.042   31.511
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/22/16  07:56:24: Test START
04/22/16  07:56:39: Test Paused by User
04/22/16  07:56:39: PAUSE_EVENT [Manual Pause]
04/22/16  08:02:48: TestResumed
04/22/16  08:19:48: Alarm Chg     81    open    open    open     88     87    open     97  0.505     0.7     8.993  0.499     0.2     9.279      -   29.93     8.687     8.973      -      -     500    52.5    47.1   100.2    100.2 {---- ---- ---L MN--}
04/22/16  09:02:35: Actual Sampling Time: 0d  1h  0m  0s
04/22/16  09:02:35: Test END
04/22/16  09:36:45: PAUSE_EVENT -
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
```

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'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI Night 1 42516.pro
File Exported: 4/29/2016 10:07:11 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: side a
Trap ID-B: side b

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 5h 36m
Averaging Period : 1 min.

Run N1

			Stack	DGM-A	DGM-B	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B	DGM-B (L)	Baro	STD	STD
			F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg	Corr-Vol	in-Hg	Vol_A	Vol_B
AVERAGES AND TEST SUMMARIES			**78.5**	**89.5**	**88.7**	**98.1**	**0.494**	**1.8**	**30.619**	**0.499**	**2**	**32.685**	**29.85**	**29.401**	**31.429**
4/25/2016	17:56:36	:	88	102	101	109	0.006	0	0	0	0.1	0	29.78	0	0
4/25/2016	17:56:43	:User Paus	88	102	101	109	0.597	0.1	0.057	0.864	0.6	0.135	29.78	0.054	0.127
4/25/2016	22:32:32	:Resumed	78	88	88	95	0.006	0	0.059	0	0.2	0.137	29.86	0.056	0.129
4/25/2016	22:33:32	:	79	89	89	96	0.528	0.7	0.596	0.553	1	0.668	29.85	0.57	0.639
4/25/2016	22:34:32	:	77	87	87	95	0.501	0.8	1.111	0.5	1	1.189	29.86	1.066	1.14
4/25/2016	22:35:32	:	77	87	87	95	0.501	0.8	1.627	0.5	1	1.782	29.86	1.562	1.711
4/25/2016	22:36:32	:	77	87	87	95	0.501	0.8	2.137	0.499	1	2.363	29.86	2.054	2.271
4/25/2016	22:37:32	:	77	87	87	95	0.501	0.8	2.633	0.5	1.1	2.849	29.86	2.531	2.739
4/25/2016	22:38:32	:	77	88	87	95	0.5	0.8	3.113	0.5	1.1	3.32	29.86	2.992	3.192
4/25/2016	22:39:32	:	77	88	87	95	0.501	0.8	3.625	0.499	1.1	3.876	29.86	3.484	3.728
4/25/2016	22:40:32	:	77	88	87	95	0.501	0.8	4.211	0.5	1.1	4.496	29.86	4.049	4.325
4/25/2016	22:41:32	:	77	88	87	95	0.499	0.8	4.762	0.5	1.1	5.053	29.86	4.579	4.862
4/25/2016	22:42:32	:	77	88	87	95	0.5	0.8	5.234	0.5	1.1	5.547	29.86	5.033	5.338
4/25/2016	22:43:32	:	78	88	87	95	0.5	0.9	5.708	0.5	1.1	6.035	29.86	5.488	5.808
4/25/2016	22:44:32	:	78	88	87	96	0.501	0.9	6.251	0.5	1.1	6.585	29.86	6.01	6.338
4/25/2016	22:45:32	:	78	88	87	96	0.501	0.9	6.865	0.5	1.1	7.207	29.85	6.601	6.937
4/25/2016	22:46:32	:	78	88	88	96	0.5	0.9	7.387	0.5	1.2	7.762	29.85	7.102	7.471
4/25/2016	22:47:32	:	77	88	88	96	0.5	0.9	7.844	0.5	1.2	8.241	29.86	7.541	7.931
4/25/2016	22:48:32	:	78	88	88	96	0.5	1	8.341	0.5	1.2	8.751	29.86	8.019	8.422
4/25/2016	22:49:32	:	77	88	88	96	0.5	1	8.884	0.5	1.2	9.313	29.86	8.54	8.963
4/25/2016	22:50:32	:	77	88	88	96	0.499	1	9.421	0.5	1.3	9.889	29.86	9.056	9.518
4/25/2016	22:51:32	:	77	88	88	96	0.5	1.1	9.927	0.5	1.3	10.458	29.85	9.542	10.065
4/25/2016	22:52:32	:	77	88	88	97	0.499	1.1	10.425	0.5	1.4	10.958	29.85	10.021	10.546
4/25/2016	22:53:32	:	77	88	88	97	0.5	1.2	10.929	0.5	1.4	11.468	29.85	10.504	11.036
4/25/2016	22:54:32	:	77	88	88	97	0.499	1.3	11.407	0.5	1.5	12.02	29.85	10.963	11.567
4/25/2016	22:55:32	:	77	88	88	97	0.5	1.4	11.902	0.5	1.6	12.587	29.86	11.439	12.113
4/25/2016	22:56:32	:	77	88	88	97	0.5	1.5	12.473	0.5	1.7	13.133	29.86	11.987	12.638
4/25/2016	22:57:32	:	78	88	88	97	0.499	1.5	13.011	0.5	1.7	13.683	29.86	12.504	13.167
4/25/2016	22:58:32	:	78	88	88	97	0.5	1.5	13.456	0.5	1.7	14.208	29.85	12.932	13.672
4/25/2016	22:59:32	:	78	88	88	97	0.5	1.5	13.916	0.5	1.8	14.727	29.85	13.374	14.172
4/25/2016	23:00:32	:	78	88	88	97	0.5	1.7	14.447	0.5	1.9	15.286	29.86	13.883	14.71
4/25/2016	23:01:32	:	78	88	88	97	0.5	1.7	15.015	0.5	2	15.86	29.86	14.429	15.262
4/25/2016	23:02:32	:	77	88	88	97	0.499	1.8	15.52	0.5	2	16.41	29.86	14.915	15.792
4/25/2016	23:03:32	:	77	88	88	98	0.5	1.9	15.998	0.5	2.1	16.941	29.86	15.374	16.303
4/25/2016	23:04:32	:	78	88	88	98	0.5	1.9	16.487	0.5	2.1	17.446	29.86	15.844	16.788
4/25/2016	23:05:32	:	78	88	88	98	0.5	1.9	16.983	0.5	2.2	17.971	29.85	16.32	17.292

4/25/2016	23:06:32	:	78	88	88	98	0.499	2	17.491	0.5	2.3	18.583	29.85	16.808	17.88
4/25/2016	23:07:32	:	78	89	88	98	0.5	2.1	18.052	0.5	2.4	19.153	29.85	17.347	18.428
4/25/2016	23:08:32	:	78	89	88	98	0.499	2.2	18.572	0.5	2.4	19.655	29.86	17.845	18.911
4/25/2016	23:09:32	:	79	89	88	98	0.5	2.3	19.034	0.5	2.5	20.156	29.86	18.289	19.393
4/25/2016	23:10:32	:	79	89	88	98	0.5	2.3	19.487	0.5	2.6	20.692	29.86	18.724	19.908
4/25/2016	23:11:32	:	78	89	88	98	0.5	2.4	20.009	0.5	2.6	21.298	29.85	19.224	20.491
4/25/2016	23:12:32	:	78	89	88	98	0.5	2.4	20.604	0.5	2.7	21.887	29.85	19.796	21.057
4/25/2016	23:13:32	:	78	89	88	98	0.5	2.5	21.11	0.5	2.7	22.381	29.85	20.281	21.531
4/25/2016	23:14:32	:	78	89	88	98	0.5	2.5	21.551	0.5	2.8	22.858	29.85	20.704	21.99
4/25/2016	23:15:32	:	78	89	88	98	0.499	2.6	22.042	0.5	2.8	23.425	29.85	21.175	22.534
4/25/2016	23:16:32	:	78	89	88	98	0.5	2.6	22.573	0.5	2.9	24.035	29.85	21.685	23.121
4/25/2016	23:17:32	:	77	89	88	98	0.5	2.7	23.093	0.5	2.9	24.603	29.85	22.184	23.667
4/25/2016	23:18:32	:	77	89	88	98	0.5	2.8	23.613	0.5	3	25.097	29.85	22.683	24.141
4/25/2016	23:19:32	:	77	89	88	98	0.5	2.8	24.126	0.5	3	25.579	29.85	23.175	24.605
4/25/2016	23:20:32	:	78	89	88	98	0.5	2.8	24.615	0.5	3.1	26.134	29.85	23.644	25.139
4/25/2016	23:21:32	:	78	89	89	98	0.5	2.9	25.079	0.5	3.1	26.771	29.85	24.089	25.75
4/25/2016	23:22:32	:	78	89	89	98	0.5	2.9	25.585	0.5	3.1	27.327	29.85	24.574	26.284
4/25/2016	23:23:32	:	78	89	89	99	0.5	2.9	26.173	0.5	3.2	27.812	29.85	25.139	26.75
4/25/2016	23:24:32	:	77	89	89	99	0.501	2.9	26.685	0.5	3.2	28.319	29.85	25.629	27.236
4/25/2016	23:25:32	:	77	89	89	99	0.5	3	27.141	0.5	3.2	28.875	29.85	26.066	27.77
4/25/2016	23:26:32	:	77	89	89	99	0.5	3	27.617	0.5	3.2	29.483	29.85	26.523	28.354
4/25/2016	23:27:32	:	77	89	89	99	0.5	3.1	28.149	0.5	3.3	30.043	29.85	27.033	28.892
4/25/2016	23:28:32	:	77	89	89	99	0.501	3	28.694	0.5	3.3	30.531	29.85	27.555	29.361
4/25/2016	23:29:32	:	77	89	89	99	0.5	3	29.198	0.5	3.3	31.046	29.85	28.038	29.855
4/25/2016	23:30:32	:	77	89	89	99	0.501	3.1	29.697	0.5	3.3	31.615	29.85	28.517	30.402
4/25/2016	23:31:32	:	77	89	89	99	0.5	3.1	30.197	0.5	3.3	32.196	29.85	28.996	30.959
4/25/2016	23:32:26	:	77	89	89	99	0.5	3.1	30.619	0.5	3.3	32.685	29.85	29.401	31.429

'

'-------------------------- LOGGED EVENTS ---------------------------------

04/25/16 17:56:36: Test START
04/25/16 17:56:43: Test Paused by User
04/25/16 17:56:44: PAUSE_EVENT [Manual Pause]
04/25/16 22:32:32: TestResumed
04/25/16 22:49:32: Alarm Chg 78 open open open 88 88 open 97 0.501 1.0 8.882 0.499 1.3 9.311 - 29.86 8.538 8.962 - - 500 52.9 47.8 100.0 100.0 {---- ---- ---L MN--}
04/25/16 23:32:26: Actual Sampling Time: 0d 1h 0m 0s
04/25/16 23:32:26: Test END
04/26/16 17:23:00: New Trap Temperature: set to = 250F

NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum

NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum

' *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range

```
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI Night 2 42616.pro
File Exported: 4/29/2016 10:07:17 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: sidea
Trap ID-B: sideb

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 3m
Averaging Period : 1 min.

Run N2

			Stack	DGM-A	DGM-B	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B	DGM-B (L)	Baro	STD	STD
			F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg	Corr-Vol	in-Hg	Vol_A	Vol_B
AVERAGES AND TEST SUMMARIES			**87.3**	**102.3**	**101.2**	**110.4**	**0.5**	**3.4**	**31.161**	**0.505**	**3.6**	**34.22**	**29.72**	**29.093**	**32.009**
4/26/2016	17:25:07	:	88	104	102	109	0.004	0	0	0	0	0	29.72	0	0
4/26/2016	17:25:14	:User Paus	88	103	102	109	0.973	4.2	0.103	1.267	4.9	0.18	29.72	0.096	0.168
4/26/2016	17:27:47	:Resumed	89	103	102	109	0.004	0	0.105	0	0.3	0.182	29.72	0.098	0.169
4/26/2016	17:28:47	:	88	103	102	108	0.544	2.6	0.663	0.572	2.9	0.74	29.72	0.618	0.69
4/26/2016	17:29:47	:	88	102	102	108	0.499	2.6	1.22	0.5	2.8	1.235	29.72	1.138	1.153
4/26/2016	17:30:47	:	88	102	101	108	0.499	2.7	1.757	0.5	2.9	1.799	29.72	1.639	1.681
4/26/2016	17:31:47	:	87	102	101	108	0.499	2.8	2.278	0.5	3	2.441	29.72	2.124	2.28
4/26/2016	17:32:47	:	88	102	101	109	0.499	2.9	2.792	0.5	3.1	3.007	29.72	2.604	2.81
4/26/2016	17:33:47	:	88	102	101	109	0.499	2.9	3.321	0.501	3.1	3.53	29.72	3.097	3.298
4/26/2016	17:34:47	:	87	102	101	109	0.501	3	3.932	0.5	3.2	4.036	29.71	3.668	3.771
4/26/2016	17:35:47	:	87	102	101	109	0.501	3	4.46	0.5	3.2	4.606	29.71	4.16	4.304
4/26/2016	17:36:47	:	87	102	101	109	0.5	3	4.935	0.499	3.2	5.258	29.71	4.603	4.913
4/26/2016	17:37:47	:	87	102	101	109	0.499	3	5.407	0.5	3.3	5.839	29.71	5.043	5.456
4/26/2016	17:38:47	:	88	102	101	109	0.5	3.1	5.922	0.5	3.3	6.36	29.71	5.524	5.943
4/26/2016	17:39:47	:	88	102	101	109	0.5	3.1	6.535	0.5	3.3	6.866	29.71	6.095	6.416
4/26/2016	17:40:47	:	88	102	101	109	0.499	3.1	7.056	0.5	3.3	7.455	29.71	6.582	6.966
4/26/2016	17:41:47	:	88	102	101	109	0.499	3.1	7.518	0.5	3.4	8.09	29.71	7.013	7.56
4/26/2016	17:42:47	:	87	102	101	110	0.501	3.2	8	0.499	3.4	8.682	29.72	7.462	8.113
4/26/2016	17:43:47	:	87	102	101	110	0.5	3.2	8.536	0.5	3.4	9.211	29.72	7.963	8.607
4/26/2016	17:44:47	:	87	102	101	110	0.5	3.2	9.103	0.5	3.4	9.719	29.72	8.492	9.082
4/26/2016	17:45:47	:	87	102	101	110	0.499	3.2	9.629	0.499	3.4	10.3	29.73	8.982	9.626
4/26/2016	17:46:47	:	87	102	101	110	0.499	3.2	10.108	0.5	3.5	10.919	29.73	9.429	10.205
4/26/2016	17:47:47	:	87	102	101	110	0.499	3.3	10.606	0.5	3.5	11.533	29.73	9.894	10.78
4/26/2016	17:48:47	:	87	102	101	110	0.499	3.3	11.113	0.5	3.5	12.056	29.72	10.368	11.269
4/26/2016	17:49:47	:	87	102	101	110	0.5	3.3	11.639	0.5	3.6	12.581	29.72	10.859	11.76
4/26/2016	17:50:47	:	86	102	101	110	0.5	3.4	12.2	0.5	3.6	13.137	29.72	11.382	12.28
4/26/2016	17:51:47	:	87	102	101	110	0.5	3.4	12.717	0.5	3.7	13.774	29.72	11.865	12.876
4/26/2016	17:52:47	:	86	102	101	110	0.501	3.5	13.194	0.5	3.7	14.363	29.72	12.311	13.427
4/26/2016	17:53:47	:	86	102	101	110	0.501	3.5	13.674	0.5	3.7	14.901	29.72	12.759	13.931
4/26/2016	17:54:47	:	86	102	101	110	0.501	3.5	14.191	0.5	3.7	15.442	29.72	13.242	14.437
4/26/2016	17:55:47	:	86	102	101	110	0.5	3.5	14.797	0.5	3.7	15.996	29.71	13.807	14.955
4/26/2016	17:56:47	:	86	102	101	110	0.501	3.5	15.327	0.5	3.8	16.623	29.71	14.303	15.541
4/26/2016	17:57:47	:	86	102	101	110	0.5	3.5	15.783	0.5	3.8	17.195	29.71	14.728	16.076
4/26/2016	17:58:47	:	86	102	101	110	0.501	3.5	16.265	0.5	3.8	17.754	29.71	15.178	16.599
4/26/2016	17:59:47	:	86	102	101	110	0.5	3.6	16.796	0.501	3.8	18.295	29.71	15.674	17.105
4/26/2016	18:00:47	:	86	102	101	110	0.5	3.6	17.377	0.5	3.8	18.878	29.71	16.216	17.651

4/26/2016	18:01:47	:	86	102	101	110	0.5	3.6	17.9	0.5	3.8	19.463	29.72	16.705	18.198
4/26/2016	18:02:47	:	87	102	101	110	0.499	3.6	18.372	0.5	3.8	20.038	29.72	17.145	18.736
4/26/2016	18:03:47	:	87	102	101	110	0.499	3.6	18.866	0.5	3.9	20.586	29.72	17.606	19.248
4/26/2016	18:04:47	:	87	102	101	110	0.499	3.6	19.37	0.5	3.9	21.146	29.72	18.078	19.772
4/26/2016	18:05:47	:	87	102	101	110	0.5	3.6	19.902	0.5	3.9	21.744	29.72	18.574	20.332
4/26/2016	18:06:47	:	87	102	101	111	0.5	3.7	20.457	0.5	3.9	22.317	29.72	19.092	20.868
4/26/2016	18:07:47	:	87	102	101	111	0.499	3.7	20.97	0.5	3.9	22.881	29.72	19.572	21.395
4/26/2016	18:08:47	:	87	102	101	111	0.5	3.7	21.45	0.5	3.9	23.416	29.72	20.02	21.896
4/26/2016	18:09:47	:	86	102	101	111	0.5	3.7	21.925	0.5	3.9	24.008	29.72	20.464	22.45
4/26/2016	18:10:47	:	86	102	101	111	0.5	3.7	22.443	0.501	3.9	24.605	29.72	20.947	23.009
4/26/2016	18:11:47	:	85	102	101	111	0.5	3.7	23.042	0.5	3.9	25.197	29.72	21.507	23.563
4/26/2016	18:12:47	:	86	102	101	111	0.5	3.7	23.566	0.5	4	25.718	29.72	21.996	24.05
4/26/2016	18:13:47	:	85	102	101	111	0.5	3.7	24.021	0.5	4	26.259	29.72	22.421	24.556
4/26/2016	18:14:47	:	85	102	101	111	0.5	3.7	24.498	0.5	4	26.844	29.72	22.866	25.103
4/26/2016	18:15:47	:	85	102	101	111	0.5	3.8	25.036	0.5	4	27.467	29.72	23.369	25.686
4/26/2016	18:16:47	:	86	102	101	110	0.5	3.8	25.594	0.5	4	28.062	29.72	23.89	26.243
4/26/2016	18:17:47	:	86	102	101	110	0.5	3.8	26.102	0.499	4	28.566	29.72	24.364	26.714
4/26/2016	18:18:47	:	85	102	101	110	0.5	3.8	26.591	0.501	4.1	29.108	29.72	24.821	27.221
4/26/2016	18:19:47	:	86	102	101	110	0.5	3.9	27.086	0.5	4.1	29.679	29.72	25.283	27.755
4/26/2016	18:20:47	:	87	102	101	110	0.5	3.9	27.582	0.5	4.2	30.332	29.72	25.747	28.367
4/26/2016	18:21:47	:	86	102	100	110	0.5	3.9	28.094	0.5	4.2	30.909	29.72	26.224	28.907
4/26/2016	18:22:47	:	86	101	100	110	0.5	4	28.654	0.5	4.2	31.432	29.73	26.748	29.397
4/26/2016	18:23:47	:	86	101	100	110	0.5	4	29.186	0.5	4.2	31.939	29.73	27.246	29.872
4/26/2016	18:24:47	:	86	101	100	110	0.499	4	29.639	0.499	4.3	32.52	29.73	27.67	30.417
4/26/2016	18:25:47	:	87	101	100	110	0.5	4.1	30.098	0.5	4.3	33.169	29.73	28.098	31.024
4/26/2016	18:26:47	:	86	101	100	110	0.501	4.1	30.619	0.5	4.4	33.754	29.73	28.586	31.572
4/26/2016	18:27:41	:	86	101	100	110	0.501	4.1	31.161	0.5	4.4	34.22	29.73	29.093	32.009

```
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/26/16  17:25:07: Test START
04/26/16  17:25:14: Test Paused by User
04/26/16  17:25:14: PAUSE_EVENT [Manual Pause]
04/26/16  17:27:47: TestResumed
04/26/16  17:44:47: Alarm Chg     87    open    open    open    102    101    open    110   0.499    3.2    9.101   0.502    3.4    9.715    -   29.72    8.490    9.078    -    -    500   55.3   48.2   100.0   100.0 {---- ---- ---- -N--}
04/26/16  17:44:47: Alarm Chg     87    open    open    open    102    101    open    110   0.499    3.2    9.101   0.502    3.4    9.717    -   29.72    8.490    9.080    -    -    500   55.3   48.2   100.0   100.0 {---- ---- ---L MN--}
04/26/16  18:27:41: Actual Sampling Time: 0d  1h  0m  0s
04/26/16  18:27:41: Test END
04/27/16  19:57:50: PAUSE_EVENT -
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
```

```
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI Night 3 42716.pro
File Exported: 4/29/2016 10:07:24 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: side a run spike
Trap ID-B: side b

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 0m
Averaging Period : 1 min.

Run N3

			Stack F	DGM-A F	DGM-B F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			**79.2**	**93.6**	**92.6**	**101.9**	**0.5**	**0.7**	**30.324**	**0.501**	**0.9**	**33.694**	**29.81**	**28.837**	**32.096**
4/27/2016	21:43:52	:	81	93	92	100	0.004	0	0	0	0	0	29.8	0	0
4/27/2016	21:44:51	:	80	93	92	99	0.514	0.7	0.489	0.537	0.9	0.643	29.8	0.465	0.613
4/27/2016	21:45:51	:	80	93	92	99	0.501	0.6	1.002	0.501	0.8	1.201	29.8	0.954	1.144
4/27/2016	21:46:51	:	80	93	92	99	0.494	0.6	1.528	0.501	0.8	1.677	29.8	1.454	1.598
4/27/2016	21:47:51	:	80	93	92	99	0.502	0.7	2.089	0.501	0.8	2.197	29.8	1.988	2.093
4/27/2016	21:48:51	:	80	93	92	99	0.499	0.7	2.618	0.5	0.9	2.76	29.8	2.491	2.63
4/27/2016	21:49:51	:	79	93	92	99	0.5	0.7	3.13	0.5	0.9	3.353	29.8	2.978	3.195
4/27/2016	21:50:51	:	80	93	92	99	0.501	0.7	3.627	0.5	0.9	3.924	29.8	3.451	3.739
4/27/2016	21:51:51	:	79	93	92	99	0.5	0.7	4.15	0.5	0.9	4.425	29.8	3.949	4.217
4/27/2016	21:52:51	:	79	93	92	100	0.503	0.7	4.746	0.5	0.9	4.942	29.8	4.516	4.71
4/27/2016	21:53:51	:	79	93	92	100	0.503	0.7	5.306	0.5	0.9	5.525	29.8	5.048	5.266
4/27/2016	21:54:51	:	79	93	92	100	0.5	0.7	5.743	0.5	0.9	6.112	29.81	5.464	5.825
4/27/2016	21:55:51	:	79	93	92	101	0.503	0.7	6.191	0.5	0.9	6.697	29.81	5.891	6.382
4/27/2016	21:56:51	:	79	93	92	101	0.5	0.7	6.728	0.5	0.9	7.21	29.81	6.4	6.871
4/27/2016	21:57:51	:	79	93	92	101	0.501	0.7	7.314	0.5	0.9	7.728	29.81	6.958	7.364
4/27/2016	21:58:51	:	79	93	92	101	0.501	0.7	7.805	0.5	0.9	8.316	29.81	7.425	7.924
4/27/2016	21:59:51	:	79	93	92	101	0.5	0.7	8.255	0.499	0.9	8.907	29.8	7.853	8.487
4/27/2016	22:00:51	:	79	93	92	101	0.5	0.7	8.741	0.5	0.9	9.496	29.8	8.315	9.048
4/27/2016	22:01:51	:	79	93	92	101	0.5	0.7	9.245	0.5	0.9	10.005	29.8	8.794	9.532
4/27/2016	22:02:51	:	78	93	92	102	0.501	0.7	9.756	0.5	0.9	10.53	29.8	9.28	10.032
4/27/2016	22:03:51	:	78	93	92	102	0.5	0.7	10.307	0.5	0.9	11.119	29.81	9.803	10.593
4/27/2016	22:04:51	:	78	93	92	102	0.5	0.7	10.822	0.499	0.9	11.721	29.81	10.293	11.167
4/27/2016	22:05:51	:	78	93	92	102	0.5	0.7	11.269	0.5	0.9	12.302	29.81	10.719	11.72
4/27/2016	22:06:51	:	78	93	92	102	0.501	0.7	11.717	0.5	0.9	12.814	29.81	11.144	12.208
4/27/2016	22:07:51	:	78	93	92	102	0.499	0.7	12.243	0.501	0.9	13.349	29.81	11.645	12.717
4/27/2016	22:08:51	:	78	93	92	102	0.5	0.7	12.845	0.5	0.9	13.926	29.81	12.217	13.267
4/27/2016	22:09:51	:	78	93	92	102	0.501	0.7	13.334	0.5	0.9	14.543	29.81	12.681	13.854
4/27/2016	22:10:51	:	78	93	92	102	0.5	0.7	13.775	0.5	0.9	15.128	29.8	13.101	14.412
4/27/2016	22:11:51	:	78	93	92	102	0.499	0.7	14.258	0.5	0.9	15.632	29.8	13.56	14.891
4/27/2016	22:12:51	:	78	93	92	102	0.5	0.7	14.775	0.5	0.9	16.168	29.8	14.052	15.403
4/27/2016	22:13:51	:	78	93	92	102	0.501	0.7	15.293	0.5	0.9	16.737	29.81	14.544	15.944
4/27/2016	22:14:51	:	78	93	92	102	0.498	0.7	15.83	0.5	0.9	17.373	29.81	15.055	16.549
4/27/2016	22:15:51	:	78	93	92	102	0.499	0.7	16.338	0.5	0.9	17.956	29.81	15.537	17.105
4/27/2016	22:16:51	:	78	93	92	102	0.501	0.7	16.794	0.5	0.9	18.457	29.81	15.971	17.583
4/27/2016	22:17:51	:	78	93	92	102	0.5	0.7	17.247	0.5	0.9	18.984	29.81	16.402	18.084
4/27/2016	22:18:51	:	78	93	92	102	0.5	0.7	17.764	0.5	0.9	19.551	29.81	16.894	18.625

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4/27/2016   22:19:51   :   78   93   92   102   0.499   0.7   18.362   0.5     0.9   20.202   29.81   17.463   19.245
4/27/2016   22:20:51   :   78   93   92   102   0.499   0.7   18.855   0.5     0.9   20.777   29.81   17.931   19.793
4/27/2016   22:21:51   :   78   93   92   102   0.499   0.7   19.286   0.5     0.9   21.294   29.81   18.341   20.285
4/27/2016   22:22:51   :   78   93   92   102   0.501   0.7   19.769   0.501   0.9   21.8     29.81   18.801   20.767
4/27/2016   22:23:51   :   78   93   92   102   0.5     0.7   20.295   0.5     0.9   22.371   29.81   19.3     21.311
4/27/2016   22:24:51   :   78   93   92   102   0.5     0.7   20.812   0.5     0.9   23.022   29.81   19.792   21.931
4/27/2016   22:25:51   :   78   93   92   102   0.5     0.7   21.345   0.5     0.9   23.603   29.81   20.3     22.485
4/27/2016   22:26:51   :   78   93   92   102   0.502   0.7   21.849   0.5     0.9   24.116   29.81   20.779   22.973
4/27/2016   22:27:51   :   78   93   92   102   0.501   0.7   22.315   0.5     0.9   24.62    29.81   21.222   23.453
4/27/2016   22:28:51   :   79   93   92   102   0.5     0.7   22.76    0.5     0.9   25.209   29.81   21.645   24.014
4/27/2016   22:29:51   :   79   93   92   102   0.5     0.7   23.28    0.5     0.9   25.84    29.81   22.139   24.615
4/27/2016   22:30:51   :   78   93   92   102   0.5     0.7   23.884   0.5     0.9   26.431   29.81   22.713   25.178
4/27/2016   22:31:51   :   79   93   92   102   0.499   0.7   24.376   0.501   0.9   26.954   29.81   23.181   25.676
4/27/2016   22:32:51   :   78   93   92   102   0.5     0.7   24.802   0.5     0.9   27.448   29.81   23.586   26.146
4/27/2016   22:33:51   :   78   93   92   102   0.5     0.7   25.274   0.5     0.9   28.035   29.81   24.035   26.705
4/27/2016   22:34:51   :   78   93   92   102   0.499   0.7   25.806   0.5     0.9   28.662   29.81   24.541   27.303
4/27/2016   22:35:51   :   78   93   92   103   0.501   0.7   26.33    0.5     0.9   29.264   29.81   25.039   27.876
4/27/2016   22:36:51   :   78   93   92   102   0.499   0.7   26.849   0.499   0.9   29.778   29.81   25.532   28.366
4/27/2016   22:37:51   :   78   93   92   102   0.499   0.7   27.35    0.5     0.9   30.297   29.81   26.009   28.86
4/27/2016   22:38:51   :   78   93   92   103   0.501   0.7   27.815   0.499   0.9   30.857   29.81   26.451   29.393
4/27/2016   22:39:51   :   78   93   92   103   0.499   0.7   28.264   0.5     0.9   31.476   29.81   26.878   29.983
4/27/2016   22:40:51   :   78   93   92   103   0.499   0.7   28.784   0.5     0.9   32.09    29.81   27.372   30.568
4/27/2016   22:41:51   :   78   93   92   103   0.501   0.7   29.385   0.5     0.9   32.6     29.81   27.944   31.054
4/27/2016   22:42:51   :   78   93   92   103   0.499   0.7   29.882   0.5     0.9   33.123   29.81   28.417   31.552
4/27/2016   22:43:51   :   78   93   92   103   0.501   0.7   30.309   0.5     0.9   33.676   29.81   28.823   32.079
4/27/2016   22:43:53   :   78   93   92   103   0.501   0.7   30.324   0.5     0.9   33.694   29.81   28.837   32.096
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/27/16  21:43:52: Test START
04/27/16  22:00:52: Alarm Chg     79    open    open    open     93     92    open     101   0.503    0.7     8.744   0.500    0.9    9.504     -   29.80     8.318     9.055     -     -    500    57.6    49.0   100.0    100.0 {---- ---- ---L MN--}
04/27/16  22:43:53: Actual Sampling Time: 0d  1h  0m  0s
04/27/16  22:43:53: Test END
04/28/16  19:22:44: PAUSE_EVENT -
04/28/16  20:10:28: New Trap Temperature: set to = 250F
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
```

```
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI Night 4 42816.pro
File Exported: 4/29/2016 10:07:30 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: side a
Trap ID-B: side b

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 2h 19m
Averaging Period : 1 min.

Run N4

			Stack F	DGM-A F	DGM-B F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	Baro in-Hg	STD Vol_A	STD Vol_B
AVERAGES AND TEST SUMMARIES			**80.4**	**92.4**	**91.6**	**101**	**0.498**	**0.5**	**30.203**	**0.502**	**0.7**	**33.706**	**29.86**	**28.837**	**32.231**
4/28/2016	20:17:25	:	79	93	92	99	0.005	0	0	0	0	0	29.83	0	0
4/28/2016	20:17:29	:User Paus	79	93	92	100	0.805	0.1	0.031	1.092	0.7	0.075	29.83	0.029	0.072
4/28/2016	21:36:47	:Resumed	81	92	91	98	0.004	0	0.033	0	0	0.077	29.86	0.031	0.074
4/28/2016	21:37:46	:	81	92	91	98	0.54	0.5	0.643	0.568	0.8	0.662	29.85	0.614	0.633
4/28/2016	21:38:46	:	79	91	91	98	0.501	0.5	1.173	0.5	0.8	1.187	29.86	1.12	1.135
4/28/2016	21:39:46	:	79	91	90	98	0.499	0.5	1.667	0.5	0.8	1.803	29.86	1.593	1.726
4/28/2016	21:40:46	:	79	91	90	98	0.5	0.5	2.154	0.5	0.8	2.374	29.86	2.059	2.272
4/28/2016	21:41:46	:	79	91	90	98	0.501	0.5	2.682	0.5	0.8	2.882	29.86	2.563	2.759
4/28/2016	21:42:46	:	80	91	90	98	0.5	0.5	3.281	0.5	0.8	3.39	29.86	3.136	3.245
4/28/2016	21:43:46	:	81	91	90	98	0.5	0.5	3.836	0.499	0.8	3.932	29.86	3.667	3.764
4/28/2016	21:44:46	:	81	91	90	98	0.5	0.5	4.314	0.5	0.8	4.548	29.86	4.124	4.354
4/28/2016	21:45:46	:	81	91	91	98	0.5	0.5	4.788	0.5	0.8	5.146	29.86	4.577	4.926
4/28/2016	21:46:46	:	81	91	91	98	0.499	0.5	5.309	0.5	0.8	5.652	29.86	5.075	5.41
4/28/2016	21:47:46	:	81	92	91	99	0.5	0.5	5.949	0.5	0.8	6.167	29.86	5.686	5.903
4/28/2016	21:48:46	:	81	92	91	99	0.501	0.5	6.479	0.5	0.8	6.71	29.86	6.193	6.423
4/28/2016	21:49:46	:	80	92	91	99	0.501	0.5	6.904	0.5	0.8	7.331	29.86	6.598	7.017
4/28/2016	21:50:46	:	81	92	91	99	0.5	0.5	7.366	0.5	0.8	7.933	29.86	7.04	7.593
4/28/2016	21:51:46	:	80	92	91	99	0.5	0.5	7.902	0.5	0.8	8.444	29.86	7.552	8.082
4/28/2016	21:52:46	:	81	92	91	99	0.5	0.5	8.422	0.5	0.8	8.959	29.86	8.048	8.575
4/28/2016	21:53:46	:	81	92	91	99	0.5	0.5	8.932	0.5	0.8	9.509	29.86	8.536	9.101
4/28/2016	21:54:46	:	81	92	91	99	0.5	0.5	9.426	0.5	0.8	10.133	29.87	9.008	9.699
4/28/2016	21:55:46	:	81	92	91	100	0.5	0.5	9.892	0.5	0.8	10.729	29.87	9.453	10.269
4/28/2016	21:56:46	:	81	92	91	100	0.5	0.5	10.335	0.5	0.8	11.243	29.86	9.877	10.761
4/28/2016	21:57:46	:	81	92	91	100	0.5	0.5	10.865	0.5	0.8	11.762	29.86	10.382	11.257
4/28/2016	21:58:46	:	81	92	91	101	0.5	0.5	11.447	0.499	0.8	12.308	29.86	10.938	11.779
4/28/2016	21:59:46	:	81	92	91	101	0.5	0.5	11.939	0.5	0.8	12.939	29.87	11.409	12.384
4/28/2016	22:00:46	:	81	92	91	101	0.501	0.5	12.36	0.5	0.8	13.528	29.87	11.811	12.947
4/28/2016	22:01:46	:	81	92	91	101	0.5	0.5	12.837	0.5	0.8	14.047	29.87	12.266	13.443
4/28/2016	22:02:46	:	81	92	91	101	0.5	0.5	13.356	0.5	0.8	14.567	29.86	12.763	13.941
4/28/2016	22:03:46	:	81	92	91	101	0.5	0.5	13.867	0.501	0.8	15.119	29.86	13.25	14.469
4/28/2016	22:04:46	:	80	92	91	101	0.5	0.5	14.401	0.5	0.8	15.752	29.86	13.76	15.074
4/28/2016	22:05:46	:	79	92	91	101	0.501	0.5	14.906	0.5	0.8	16.331	29.87	14.242	15.627
4/28/2016	22:06:46	:	79	92	91	101	0.5	0.5	15.35	0.499	0.8	16.856	29.87	14.666	16.129
4/28/2016	22:07:46	:	79	92	91	101	0.499	0.5	15.783	0.5	0.8	17.383	29.87	15.079	16.633
4/28/2016	22:08:46	:	79	92	91	101	0.499	0.5	16.303	0.5	0.8	17.931	29.86	15.576	17.157
4/28/2016	22:09:46	:	79	92	91	101	0.501	0.5	16.9	0.5	0.8	18.562	29.86	16.145	17.76

4/28/2016	22:10:46	:	79	92	91	101	0.5	0.5	17.379	0.5	0.8	19.133	29.86	16.602	18.306
4/28/2016	22:11:46	:	79	92	91	102	0.501	0.5	17.824	0.5	0.8	19.668	29.86	17.027	18.818
4/28/2016	22:12:46	:	79	92	91	102	0.5	0.5	18.303	0.499	0.8	20.2	29.87	17.484	19.327
4/28/2016	22:13:46	:	79	92	91	102	0.5	0.5	18.794	0.5	0.8	20.746	29.87	17.953	19.849
4/28/2016	22:14:46	:	80	92	91	102	0.499	0.5	19.292	0.5	0.8	21.373	29.87	18.429	20.448
4/28/2016	22:15:46	:	80	92	91	102	0.499	0.5	19.844	0.499	0.8	21.938	29.87	18.956	20.988
4/28/2016	22:16:46	:	80	92	91	102	0.499	0.5	20.367	0.5	0.8	22.483	29.87	19.455	21.51
4/28/2016	22:17:46	:	80	92	91	102	0.501	0.5	20.795	0.5	0.8	23.01	29.87	19.864	22.014
4/28/2016	22:18:46	:	80	92	91	102	0.499	0.5	21.242	0.5	0.8	23.593	29.86	20.29	22.571
4/28/2016	22:19:46	:	80	92	91	102	0.5	0.5	21.754	0.499	0.8	24.182	29.86	20.779	23.134
4/28/2016	22:20:46	:	80	92	92	102	0.501	0.5	22.34	0.5	0.8	24.746	29.86	21.338	23.673
4/28/2016	22:21:46	:	80	92	92	102	0.5	0.5	22.839	0.5	0.8	25.298	29.87	21.814	24.2
4/28/2016	22:22:46	:	80	92	92	102	0.499	0.5	23.289	0.5	0.8	25.827	29.87	22.244	24.705
4/28/2016	22:23:46	:	79	92	92	102	0.5	0.5	23.773	0.501	0.8	26.408	29.87	22.706	25.26
4/28/2016	22:24:46	:	79	93	92	102	0.499	0.5	24.25	0.5	0.8	26.99	29.87	23.16	25.816
4/28/2016	22:25:46	:	79	93	92	102	0.499	0.5	24.746	0.5	0.8	27.554	29.87	23.634	26.355
4/28/2016	22:26:46	:	79	93	92	102	0.499	0.5	25.304	0.499	0.8	28.104	29.87	24.166	26.881
4/28/2016	22:27:46	:	79	93	92	102	0.5	0.5	25.835	0.5	0.8	28.647	29.87	24.672	27.399
4/28/2016	22:28:46	:	79	93	92	102	0.5	0.5	26.259	0.5	0.8	29.224	29.87	25.077	27.95
4/28/2016	22:29:46	:	79	93	92	102	0.499	0.5	26.71	0.5	0.8	29.807	29.87	25.506	28.507
4/28/2016	22:30:46	:	79	93	92	102	0.501	0.5	27.235	0.5	0.8	30.372	29.87	26.007	29.047
4/28/2016	22:31:46	:	79	93	92	102	0.501	0.5	27.804	0.5	0.8	30.913	29.86	26.55	29.564
4/28/2016	22:32:46	:	79	93	92	102	0.5	0.5	28.303	0.5	0.8	31.463	29.86	27.025	30.089
4/28/2016	22:33:46	:	79	93	92	102	0.501	0.5	28.763	0.5	0.8	32.055	29.86	27.464	30.654
4/28/2016	22:34:46	:	80	93	92	102	0.5	0.5	29.256	0.5	0.8	32.627	29.87	27.934	31.201
4/28/2016	22:35:46	:	80	93	92	102	0.5	0.5	29.729	0.5	0.8	33.192	29.87	28.385	31.74
4/28/2016	22:36:44	:	80	93	92	102	0.5	0.5	30.203	0.5	0.8	33.706	29.87	28.837	32.231

'

'-------------------------- LOGGED EVENTS ---------------------------------

04/28/16 20:17:25: Test START

04/28/16 20:17:29: Test Paused by User

04/28/16 20:17:30: PAUSE_EVENT [Manual Pause]

04/28/16 21:36:47: TestResumed

04/28/16 21:53:47: Alarm Chg 81 open open open 92 91 open 100 0.499 0.5 8.937 0.502 0.8 9.517 - 29.87 8.541 9.109 - - 500 53.7 48.6 100.0 100.0 {---- ---- ---L MN--}

04/28/16 22:36:44: Actual Sampling Time: 0d 1h 0m 0s

04/28/16 22:36:44: Test END

04/29/16 13:53:03: PAUSE_EVENT -

04/29/16 20:36:25: New Trap Temperature: set to = 250F

04/29/16 20:41:17: New Trap Temperature: set to = 250F

NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum

NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum

' *ALARMS LEGEND

'A - Not Used

'B - Not Used

'C - Not Used

'D - Current Loop failure for External FLOW Input

'E - Current Loop failure for External MOISTURE Input

'F - Modbus inactivity timeout

'G - Unable to maintain proportional flow for A

'H - Unable to maintain proportional flow for B

'I - High Vac-A

'J - High Vac-B

'K - Not Used

```
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------

'---------------------------- CONSOLE INFO ---------------------------------
'          Console Name: 3211-Ambient Air Services
'            Console ID: XC30B-3211
'          DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'         DGM cm3/Pulse: 1.93

'            RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```

Configuration File: CUBA NCASI Night 5 42916.pro
File Exported: 4/29/2016 10:07:36 PM (PC Time).
Company Name: Cuba NCASI

Sample A: PRE-Leak Test PASSED at Maximum vacuum
Sample B: PRE-Leak Test PASSED at Maximum vacuum

Trap ID-A: side a
Trap ID-B: side b

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 0m
Averaging Period : 1 min.

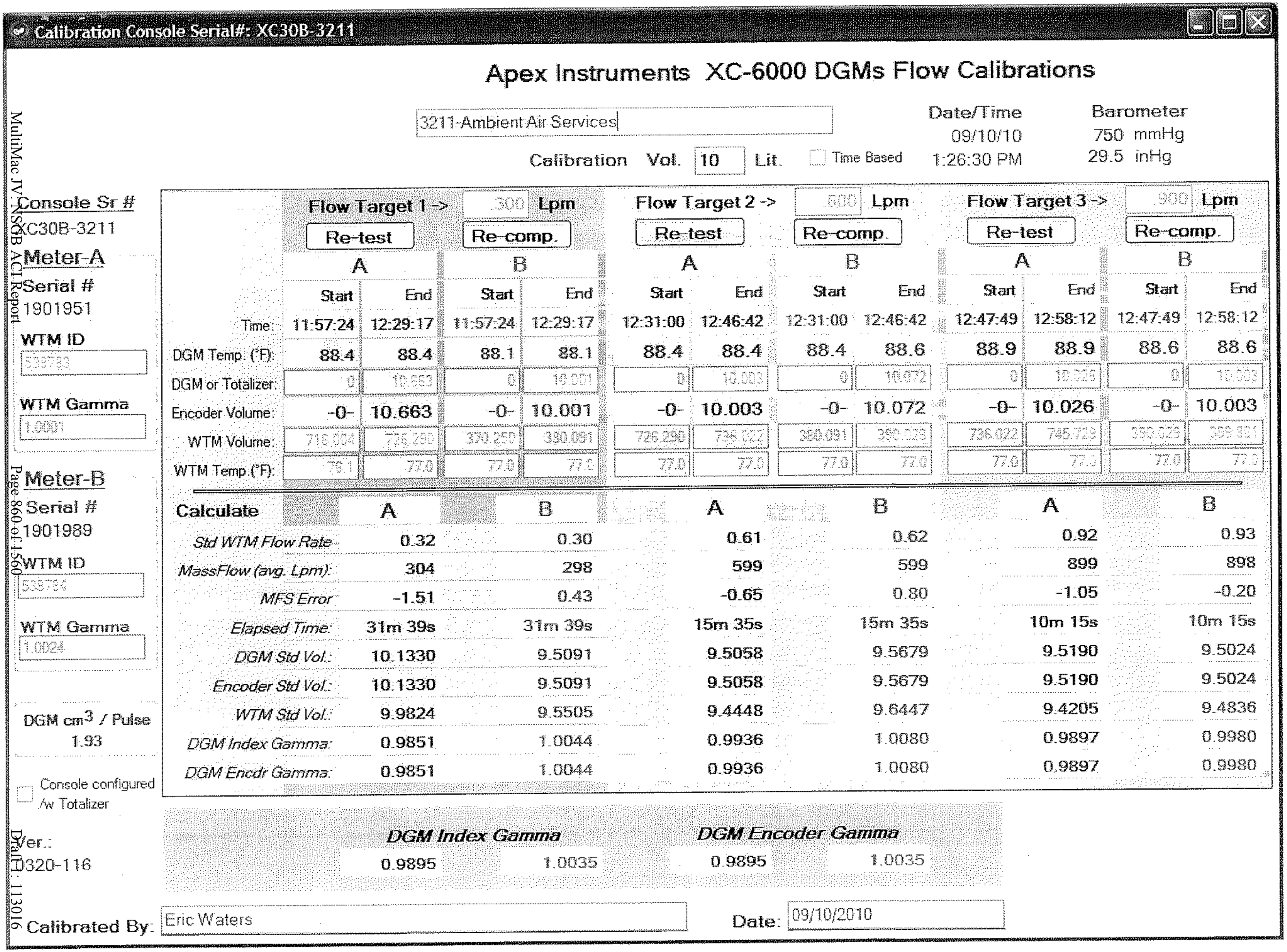
Run N5

			Stack	DGM-A	DGM-B	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B	DGM-B (L)	Baro	STD	STD
			F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg	Corr-Vol	in-Hg	Vol_A	Vol_B
AVERAGES AND TEST SUMMARIES			**78.6**	**91.5**	**90.7**	**99.7**	**0.501**	**0.6**	**30.716**	**0.501**	**0.7**	**33.754**	**29.82**	**29.33**	**32.28**
4/29/2016	21:01:17	:	80	92	91	98	0.004	0	0	0	0	0	29.82	0	0
4/29/2016	21:02:16	:	79	91	91	97	0.525	0.6	0.495	0.551	0.7	0.618	29.82	0.472	0.591
4/29/2016	21:03:16	:	79	91	90	97	0.501	0.6	1.008	0.501	0.7	1.11	29.82	0.963	1.061
4/29/2016	21:04:16	:	78	91	90	97	0.501	0.6	1.604	0.501	0.7	1.618	29.82	1.532	1.547
4/29/2016	21:05:16	:	78	91	90	97	0.502	0.6	2.129	0.501	0.7	2.187	29.82	2.034	2.091
4/29/2016	21:06:16	:	77	91	90	97	0.501	0.6	2.561	0.501	0.7	2.774	29.82	2.447	2.652
4/29/2016	21:07:16	:	77	91	90	97	0.5	0.6	3.01	0.501	0.7	3.345	29.82	2.876	3.199
4/29/2016	21:08:16	:	77	91	90	98	0.5	0.6	3.544	0.5	0.7	3.852	29.82	3.386	3.684
4/29/2016	21:09:16	:	78	91	90	98	0.501	0.6	4.054	0.5	0.7	4.363	29.82	3.872	4.173
4/29/2016	21:10:16	:	78	91	90	98	0.5	0.6	4.557	0.5	0.7	4.952	29.82	4.352	4.736
4/29/2016	21:11:16	:	78	91	90	98	0.5	0.6	5.031	0.5	0.7	5.531	29.82	4.805	5.29
4/29/2016	21:12:16	:	78	91	90	98	0.501	0.6	5.502	0.5	0.7	6.116	29.82	5.255	5.85
4/29/2016	21:13:16	:	78	91	90	98	0.5	0.6	5.97	0.5	0.7	6.627	29.82	5.702	6.338
4/29/2016	21:14:16	:	78	91	90	98	0.5	0.6	6.481	0.5	0.7	7.147	29.82	6.19	6.835
4/29/2016	21:15:16	:	78	91	90	98	0.5	0.6	7.085	0.499	0.7	7.733	29.81	6.766	7.396
4/29/2016	21:16:16	:	78	91	90	98	0.5	0.6	7.602	0.5	0.7	8.326	29.81	7.26	7.963
4/29/2016	21:17:16	:	77	91	90	98	0.5	0.6	8.062	0.5	0.7	8.909	29.81	7.7	8.52
4/29/2016	21:18:16	:	77	91	90	98	0.5	0.6	8.552	0.5	0.7	9.426	29.82	8.167	9.015
4/29/2016	21:19:16	:	77	91	90	98	0.5	0.6	9.083	0.499	0.7	9.946	29.82	8.674	9.512
4/29/2016	21:20:16	:	77	91	90	99	0.5	0.6	9.639	0.5	0.7	10.538	29.82	9.205	10.078
4/29/2016	21:21:16	:	77	91	90	99	0.5	0.6	10.163	0.5	0.7	11.137	29.82	9.706	10.651
4/29/2016	21:22:16	:	77	91	90	99	0.5	0.6	10.656	0.5	0.7	11.725	29.82	10.176	11.214
4/29/2016	21:23:16	:	78	91	90	99	0.5	0.6	11.153	0.5	0.7	12.243	29.82	10.651	11.709
4/29/2016	21:24:16	:	78	91	90	99	0.5	0.6	11.653	0.5	0.7	12.768	29.82	11.129	12.211
4/29/2016	21:25:16	:	78	91	90	99	0.501	0.6	12.167	0.5	0.7	13.35	29.81	11.619	12.768
4/29/2016	21:26:16	:	78	91	90	99	0.5	0.6	12.736	0.5	0.7	13.964	29.81	12.162	13.355
4/29/2016	21:27:16	:	78	91	90	99	0.5	0.6	13.261	0.5	0.7	14.547	29.82	12.664	13.913
4/29/2016	21:28:16	:	78	91	90	99	0.5	0.6	13.731	0.5	0.7	15.068	29.82	13.113	14.411
4/29/2016	21:29:16	:	78	91	90	99	0.5	0.6	14.197	0.5	0.7	15.592	29.82	13.558	14.913
4/29/2016	21:30:16	:	78	91	90	99	0.5	0.6	14.713	0.501	0.7	16.162	29.82	14.05	15.458
4/29/2016	21:31:16	:	78	91	90	99	0.5	0.6	15.323	0.5	0.7	16.802	29.82	14.633	16.069
4/29/2016	21:32:16	:	78	91	90	99	0.501	0.6	15.841	0.5	0.7	17.385	29.82	15.127	16.627
4/29/2016	21:33:16	:	78	91	90	99	0.501	0.6	16.298	0.5	0.7	17.893	29.82	15.564	17.114
4/29/2016	21:34:16	:	78	91	90	99	0.5	0.6	16.789	0.5	0.7	18.411	29.82	16.032	17.609
4/29/2016	21:35:16	:	78	91	90	99	0.5	0.6	17.325	0.5	0.7	18.98	29.82	16.544	18.153
4/29/2016	21:36:16	:	78	91	90	99	0.5	0.6	17.875	0.5	0.7	19.634	29.82	17.07	18.779

```
4/29/2016   21:37:16   :   79   91   90   99    0.5     0.6   18.395   0.5   0.7   20.206   29.82   17.566   19.326
4/29/2016   21:38:16   :   79   91   90   99    0.5     0.6   18.89    0.5   0.7   20.723   29.82   18.038   19.82
4/29/2016   21:39:16   :   79   91   90   100   0.5     0.6   19.391   0.5   0.7   21.231   29.82   18.517   20.306
4/29/2016   21:40:16   :   79   91   90   99    0.5     0.6   19.888   0.5   0.7   21.798   29.82   18.991   20.848
4/29/2016   21:41:16   :   78   91   90   100   0.5     0.6   20.396   0.5   0.7   22.451   29.82   19.476   21.473
4/29/2016   21:42:16   :   78   91   90   100   0.5     0.6   20.97    0.5   0.7   23.03    29.82   20.025   22.027
4/29/2016   21:43:16   :   79   91   90   100   0.501   0.6   21.502   0.5   0.7   23.547   29.82   20.532   22.521
4/29/2016   21:44:16   :   79   91   90   100   0.5     0.6   21.972   0.5   0.7   24.058   29.82   20.981   23.01
4/29/2016   21:45:16   :   79   91   90   100   0.5     0.6   22.434   0.5   0.7   24.634   29.82   21.423   23.561
4/29/2016   21:46:16   :   79   91   90   100   0.5     0.6   22.972   0.5   0.7   25.269   29.82   21.936   24.168
4/29/2016   21:47:16   :   78   91   90   100   0.499   0.6   23.562   0.5   0.7   25.857   29.82   22.5     24.731
4/29/2016   21:48:16   :   78   91   90   100   0.5     0.6   24.081   0.5   0.7   26.379   29.82   22.996   25.23
4/29/2016   21:49:16   :   78   91   90   100   0.5     0.6   24.541   0.5   0.7   26.888   29.82   23.434   25.716
4/29/2016   21:50:16   :   78   91   90   100   0.501   0.6   25.031   0.5   0.7   27.46    29.82   23.903   26.263
4/29/2016   21:51:16   :   78   91   91   100   0.5     0.6   25.572   0.5   0.7   28.087   29.82   24.418   26.863
4/29/2016   21:52:16   :   78   91   90   100   0.5     0.6   26.123   0.5   0.7   28.693   29.82   24.945   27.442
4/29/2016   21:53:16   :   78   91   91   100   0.5     0.6   26.646   0.5   0.7   29.204   29.82   25.445   27.93
4/29/2016   21:54:16   :   78   91   90   100   0.5     0.6   27.143   0.5   0.7   29.722   29.82   25.919   28.426
4/29/2016   21:55:16   :   77   91   91   100   0.5     0.6   27.644   0.5   0.7   30.282   29.82   26.397   28.961
4/29/2016   21:56:16   :   77   91   91   100   0.5     0.6   28.141   0.5   0.7   30.905   29.82   26.872   29.556
4/29/2016   21:57:16   :   77   91   91   100   0.501   0.6   28.652   0.5   0.7   31.515   29.82   27.36    30.139
4/29/2016   21:58:16   :   77   91   90   100   0.5     0.6   29.231   0.5   0.7   32.028   29.82   27.912   30.63
4/29/2016   21:59:16   :   77   91   90   100   0.5     0.6   29.757   0.5   0.7   32.548   29.82   28.415   31.127
4/29/2016   22:00:16   :   77   91   90   100   0.5     0.6   30.229   0.5   0.7   33.108   29.82   28.865   31.663
4/29/2016   22:01:16   :   77   91   90   100   0.5     0.6   30.695   0.5   0.7   33.731   29.81   29.31    32.258
4/29/2016   22:01:18   :   77   91   90   100   0.5     0.6   30.716   0.5   0.7   33.754   29.81   29.33    32.28
'
'-------------------------- LOGGED EVENTS ---------------------------------
04/29/16  21:01:17: Test START
04/29/16  21:18:17: Alarm Chg     77   open   open   open    91    91   open    99  0.503    0.6    8.557  0.500    0.7    9.432    -  29.82    8.172    9.020     -     -    500   54.5    48.6   100.0    100.0 {---- ---- ---L MN--}
04/29/16  22:01:18: Actual Sampling Time: 0d  1h  0m  0s
04/29/16  22:01:18: Test END
 NOTE: Post_Leak Test Side A, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
 NOTE: Post_Leak Test Side B, Tested Manually, with a flow rate of 0 CCM at 5 inHg vacuum
'    *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'------------------------ END OF ALARM LEDGENDS ----------------------------
```

```
'---------------------------- CONSOLE INFO ---------------------------------
'           Console Name: 3211-Ambient Air Services
'             Console ID: XC30B-3211
'           DAC Board ID: 3332-3131-2D41-6D62
'Dry Gas Meter-A ID/Gamma: 1901951 / 0.9895
'Dry Gas Meter-B ID/Gamma: 1901989 / 1.0035
'          DGM cm3/Pulse: 1.93

'             RTC ROM ID: 7397-014B-0000-0019
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT -----------
'   Software-Firmware Ver: 0320e-116
```



Calibration Console Serial#: XC30B-3211

Apex Instruments XC-6000 DGMs Flow Calibrations

3211-Ambient Air Services

Calibration Vol. 10 Lit. ☐ Time Based

Date/Time 09/10/10 1:26:30 PM

Barometer 750 mmHg 29.5 inHg

Console Sr # XC30B-3211

Meter-A

Serial # 1901951

WTM ID 538783

WTM Gamma 1.0001

Meter-B

Serial # 1901989

WTM ID 538784

WTM Gamma 1.0024

DGM cm^3 / Pulse 1.93

☐ Console configured /w Totalizer

Ver.: 0320-116

	Flow Target 1 -> 300 Lpm				Flow Target 2 -> 600 Lpm				Flow Target 3 -> 900 Lpm			
	A		B		A		B		A		B	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
Time:	11:57:24	12:29:17	11:57:24	12:29:17	12:31:00	12:46:42	12:31:00	12:46:42	12:47:49	12:58:12	12:47:49	12:58:12
DGM Temp. (°F):	88.4	88.4	88.1	88.1	88.4	88.4	88.4	88.6	88.9	88.9	88.6	88.6
DGM or Totalizer:	0	10.663	0	10.001	0	10.003	0	10.072	0	10.026	0	10.003
Encoder Volume:	-0-	10.663	-0-	10.001	-0-	10.003	-0-	10.072	-0-	10.026	-0-	10.003
WTM Volume:	716.004	726.290	370.250	380.091	726.290	736.022	380.091	390.025	736.022	745.729	390.025	399.891
WTM Temp (°F):	76.1	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0

Calculate	A	B	A	B	A	B
Std WTM Flow Rate	0.32	0.30	0.61	0.62	0.92	0.93
MassFlow (avg. Lpm):	304	298	599	599	899	898
MFS Error	-1.51	0.43	-0.65	0.80	-1.05	-0.20
Elapsed Time:	31m 39s	31m 39s	15m 35s	15m 35s	10m 15s	10m 15s
DGM Std Vol.:	10.1330	9.5091	9.5058	9.5679	9.5190	9.5024
Encoder Std Vol.:	10.1330	9.5091	9.5058	9.5679	9.5190	9.5024
WTM Std Vol.:	9.9824	9.5505	9.4448	9.6447	9.4205	9.4836
DGM Index Gamma:	0.9851	1.0044	0.9936	1.0080	0.9897	0.9980
DGM Encdr Gamma:	0.9851	1.0044	0.9936	1.0080	0.9897	0.9980

DGM Index Gamma		DGM Encoder Gamma	
0.9895	1.0035	0.9895	1.0035

Calibrated By: Eric Waters

Date: 09/10/2010

APEX INSTRUMENTS XC-6000 SENSOR AUDIT
PRESSURE TRANSDUCER
ENGLISH UNITS

Meter Console Information	
Console Model Number	XC-6000EPC
Console Serial Number	XC308-3211
DGM Model Number	AP25
DGM A Serial Number	1901951
DGM B Serial Number	1901989

Calibration Conditions	
Date	10-Sep-10
Time	11:15
Calibration Technician	EW
Ambient Temperature (°F)	78

XC6000 Configuration	
Firmware / Software Rev.	0320-116
Modbus installed?	NO
Pitot installed?	NO
2.5L/min Rotameters?	NO

Transducer Info		
Pressure Type		Delta P
Model Number		5IN-D-4V
Range		5in H_2O
Reference Manometer Info		
Model Number		1223-36-D
Range		36in H_2O
Accuracy (% F.S.)		0.5
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(P_{ref})	(ΔP)	
in H_2O	in H2O	% Full Scale
0.00	0.00	0.0
4.50	4.50	0.0
	average	0.0
		N/A

Transducer Info		
Pressure Type		Barometer
Model Number		BARO-A-4V
Range		600-1100mBar
Reference Barometer Info		
Absolute Pressure Location		RDU Airport
Absolute Pressure (in Hg)		29.00
Elevation @ Apex Inst (ft)		410
Calibration Data		
Reference Pressure	Displayed Pressure	Absolute Error
(P_{ref})	(P_{bar})	(<=0.39inHg)
in Hg	in Hg	in Hg
Current Barometric Pressure		
29.60	29.56	0.04
		Pass

Transducer Info		
Pressure Type		Vacuum Ch. A
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Reference Vacuum Gauge Info		
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Accuracy (% F.S.)		1.0
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(Vac_{ref})	(Vac)	
in Hg	in Hg	% Full Scale
0.00	0.00	0.0
22.00	21.02	3.3
		0.0
		0.0
		0.0
		0.0
		0.0
	average	0.5
		Pass

Transducer Info		
Pressure Type		Vacuum Ch. B
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Reference Vacuum Gauge Info		
Model Number		MPS-V8U-AGE
Range		0-30 in Hg
Accuracy (% F.S.)		1.0
Calibration Data		
Reference Pressure	Displayed Pressure	Percent Error
(Vac_{ref})	(Vac)	
in Hg	in Hg	% Full Scale
0.00	0.00	0.0
22.00	20.77	4.1
		0.0
		0.0
		0.0
		0.0
		0.0
	average	0.6
		Pass

I certify that the above were calibrated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems Vol III" and/or USEPA Methods, Title 40 CFR Parts 60 & 75.

Signature

Date 9/10/10

3211-Ambient Air Services Sensor Audit.xls

APEX INSTRUMENTS XC-6000 SENSOR AUDIT
TYPE K THERMOCOUPLE TEMPERATURE SENSORS
ENGLISH UNITS

Meter Console Information	
Console Model Number	XC-6000EPC
Console Serial Number	XC308-3211
DGM Model Number	AP25
DGM A Serial Number	1901951
DGM B Serial Number	1901989

Calibration Conditions	
Date	10-Sep-10
Time	11:15
Calibration Technician	EW
Ambient Temperature (°F)	78

XC6000 Configuration	
Current Firmware / Software Rev.	0320-116
Modbus installed?	NO
Pitot installed?	NO
2.5L/min Rotameters Installed?	NO

Thermocouple Info		
Source		Stack
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.6	0.4
30.0	29.5	0.5
60.0	60.0	0.0
100.0	99.5	0.5
300.0	299.5	0.2
500.0	499.5	0.1
	average	**0.3**
		Pass

Thermocouple Info		
Source		Trap
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	30.0	0.0
60.0	59.5	0.5
100.0	99.0	1.0
300.0	299.0	0.3
500.0	499.0	0.2
	average	**0.5**
		Pass

Thermocouple Info		
Source		Probe
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.0	1.0
60.0	59.0	1.0
100.0	99.5	0.5
300.0	299.0	0.3
500.0	499.0	0.2
	average	**0.7**
		Pass

Thermocouple Info		
Source		Chiller
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.0	1.0
60.0	59.5	0.5
100.0	99.0	1.0
300.0	299.0	0.3
500.0	499.0	0.2
	average	**0.7**
		Pass

Thermocouple Info		
Source		Aux
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.0	1.0
60.0	59.0	1.0
100.0	99.0	1.0
300.0	299.0	0.3
500.0	499.0	0.2
	average	**0.7**
		Pass

Thermocouple Info		
Source		DGM A
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.0	1.0
60.0	59.5	0.5
100.0	99.5	0.5
300.0	299.0	0.3
500.0	499.0	0.2
	average	**0.6**
		Pass

Thermocouple Info		
Source		DGM B
Range		
Accuracy Requirement		±1%
Reference Temperature Info		
Model Number		PIE Model 520
Type		Voltage Source
Serial Number		105978
Range		0-1000°C & 0-2000°F
Calibration Data		
Reference Temperature	Displayed Temperature	Percent Error
(T_{ref})	(T_{stack})	
°F	°F	% Temp
2.0	1.1	0.9
30.0	29.5	0.5
60.0	59.5	0.5
100.0	99.0	1.0
300.0	299.0	0.3
500.0	499.0	0.2
	average	**0.6**
		Pass

I certify that the above were calibrated in accordance with "Quality Assurance Handbook for Air Pollution Measurement Systems Vol III" and/or USEPA Methods, Title 40 CFR Parts 60 & 75.

Signature

Date 9/10/10

Ambient Air Services, Inc.

106 Ambient Airway
Starke, Florida 32091

Method 30B Post-test Console Audit

Console ID	XB30B-3211
Technician	MEH
Project	NSGB NCASI
Date:	6/23/2016

Barometric Pressure Audit

Reference Barometric Pressure Sensor ID	Kollsman 433
Calibration Date	10/20/2015
Reference Barometric Pressure Reading (in. Hg)	30.11
Console Barometric Pressure Reading (in. Hg)	30.03
Difference (+ / - 10 mm Hg or 0.33 in. Hg)	0.08

Vacuum Audit

Reference Vacuum Gauge ID	CP 125602
Calibration Date	2/4/2016
Reference Vacuum Gauge Reading (A-Side) (in. Hg)	21.70
Console Vacuum Reading (A-Side) (in. Hg)	21.60
Difference (+ / - 1 in. Hg)	0.10
Reference Vacuum Gauge Reading (B-Side) (in. Hg)	21.70
Console Vacuum Reading (B-Side) (in. Hg)	21.43
Difference (+ / - 1 in. Hg)	0.27

Temperature Audit

Reference Thermometer ID	Atkins 36036-C
Calibration Date	10/26/2015
Reference Temperature Reading (^{0}F)	81.0

All Temperatures +/- 1.5% of Absolute Reference Temperature Reading

Console DGM A Temperature Reading (^{o}F)	80.5
Percent Difference	0.6
Console DGM B Temperature Reading (^{o}F)	81.1
Percent Difference	0.1
Console Stack Temperature Reading (^{o}F)	80.5
Percent Difference	0.6
Console Chiller Temperature Reading (^{o}F)	80.5
Percent Difference	0.6

30B Audit Template
Rev 1
07/10/15

Ambient Air Services, Inc.

106 Ambient Airway

Starke, Florida 32091

Method 30B Post-test Console Audit

Console ID	XB30B-3211
Technician	MEH
Project	NSGB NCASI
Date:	6/23/2016

Dry Gas Meter Audit

Reference Flow Meter ID	Bios DC Lite 700
Calibration Date	6/20/2016
Reference DGM A Target Flow Rate (LPM)	0.500
Reference DGM A Target Volume (L)	5
Console DGM A Audit	
Console DGM A ID	1901990
Console DGM A Gamma	1.0018
Reference DGM Start Temperature (^{o}F)	84.7
Reference DGM End Temperature (^{o}F)	87.4
Reference DGM A Volume Sampled (L)	5.11
Reference DGM A Volume Sampled (Standard L)	4.972
Console DGM A Temperature (^{o}F)	84.7
Console DGM A Volume Sampled (L)	5.01
Console DGM A Volume Sampled (Standard L)	4.874
Calculated Audit Gamma	1.0201
Difference (+/- 5% of Console Gamma Value)	1.8
Console DGM B Audit	
Console DGM B ID	1902001
Console DGM B Gamma	0.9959
Reference DGM Start Temperature (^{o}F)	85.7
Reference DGM End Temperature (^{o}F)	87.6
Reference DGM B Volume Sampled (L)	5.01
Reference DGM B Volume Sampled (Standard L)	4.870
Console DGM B Temperature (^{o}F)	85.6
Console DGM B Volume Sampled (L)	5.017
Console DGM B Volume Sampled (Standard L)	4.873
Calculated Audit Gamma	0.9993
Difference (+/- 5% of Console Gamma Value)	0.3

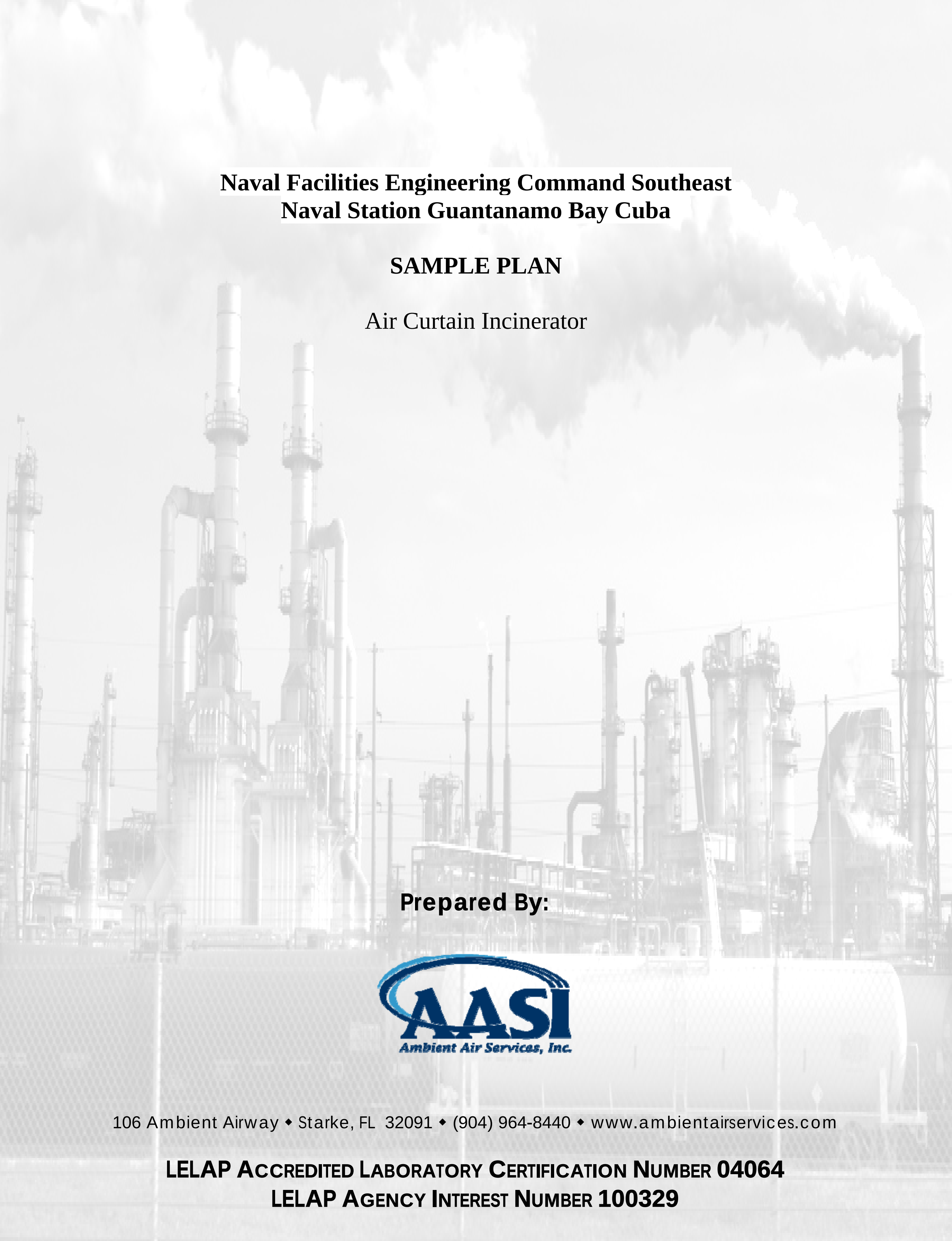
Technician Signature and Date Michael Hinkel 6/23/16

QA Signature and Date Daniel Ockenhouse 6/27/16

30B Audit Template
Rev 1
07/10/15

APPENDIX K

TEST PROTOCOL



Naval Facilities Engineering Command Southeast
Naval Station Guantanamo Bay Cuba

SAMPLE PLAN

Air Curtain Incinerator

Prepared By:

Ambient Air Services, Inc.

106 Ambient Airway ◆ Starke, FL 32091 ◆ (904) 964-8440 ◆ www.ambientairservices.com

LELAP ACCREDITED LABORATORY CERTIFICATION NUMBER 04064
LELAP AGENCY INTEREST NUMBER 100329

Ambient Air Services, Inc.

106 Ambient Airway Starke, FL 32091 * (904) 964-8440 * FAX (904) 964-6675

Naval Facilities Engineering Command Southeast
Naval Station Guantanamo Bay Cuba

SAMPLE PLAN

April 8, 2016

1.0 INTRODUCTION

MultiMAC JV has retained Ambient Air Services, Inc. (AASI) of Starke, Florida to perform emission testing on behalf of the Naval Facilities Engineering Command Southeast (NAVFAC SE). The objective of the testing is to obtain representative emission data for contaminants that are being emitted from one of Naval Station Guantanamo Bay (NSGB)'s air curtain incinerators. The information from the test will be used by the Government, under a separate project, for air dispersion modeling. Testing is scheduled for April 15-29, 2016.

The testing will include separate day and night sampling to capture data from different burning stages of the facility's incinerator and will include the following parameters:

- Particulate Matter (PM)
- Condensable Particulate Matter (CPM)
- Particle Size Distribution
- Carbon Dioxide (CO_2)
- Sulfur Dioxide (SO_2)
- Total Reduced Sulfur (TRS)
- Oxides of Nitrogen (NO_x)
- Carbon Monoxide (CO)
- Total Organic Compounds (TOC)
- Dioxins/Furans (D/F)
- Polychlorinated Biphenyls (PCB's)
- Polycyclic Aromatic Hydrocarbons (PAH's)
- Semi-Volatile Organic Compounds (SVOC)
- Hydrogen Chloride (HCl)
- Hydrogen Cyanide (HCN)
- Metals
- Mercury (Hg)
- Volatile Organic Compounds (VOC)
- Aldehydes

The proposed sampling and methodology described in this plan are based on pre-test knowledge and assumptions. Schedules, the order of testing, and if necessary, the test methodology and equipment may change. The changes will be based on the actual conditions encountered while on site. Conditions such as weather, process changes, equipment problems or other unforeseen issues may necessitate changes in this sample plan.

1.1 Project Contacts

MultiMAC JV

Mr. Rafael de Paz
404 SW 140th Terrace
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1.2 Project Responsibilities

AASI's Responsibilities

- Preparation of this sample plan.
- Design and fabricate the sampling device.
- Conduct the emission testing.
- Aerial lifts for sampling access.
- Laboratory analysis and sample shipment: All samples will be delivered to AASI and/or contracted third party laboratory for analysis. Dedicated charter flights will be used to delivery samples back to the U.S. Note: Due to the nature of this project, AASI does not accept responsibility of any samples exceeding hold times.
- Reports: Preliminary summary results (summary table spreadsheet format) will be provided to MultiMac JV ~3-5 business after AASI receives each lab report. The results/summary report will be reviewed but not fully QA'd. This assumes internet service is sufficient enough to send/receive large data files between AASI's field personnel at NSGB and AASI's office. AASI will submit a draft report to MultiMAC JV within 60 days following the completion of the test. MultiMAC JV will forward to the client or other parties as required.
- Logistics: personnel travel, equipment shipment (barge), moving equipment to and from site.
- Purchase ice through NEX and provide refrigerator for sample preservation.

MultiMAC JV's Responsibilities

- All submittals to NAVFAC SE.
- Collection of process information and data for inclusion in the reports including, but not limited to, documenting waste characterization and on-site conditions.
- Notifications of any changes in schedules.
- Assist with logistics to complete the testing.
- 3rd party data validation.

NAVFAC SE's Responsibilities

- Provide (1) 240VAC 50 Amp, single phase service for the trailer and (5) 120 VAC 15 Amp circuits. If the 240VAC 50 Amp is powered via a generator it will need to be fueled for 24 hour operation. NAVFAC is responsible for providing all fuel and generators used.
- Provide access and clearance to testing locations.
- Provide lighting for night time testing.
- Provide power and a secure location for full size refrigerator (approximately 26" X 24" X 60" and one 120 VAC three prong outlet)
- Assist with logistics as needed.

1.3 Testing Schedule

The following schedule is anticipated:

April 15-18, 2016:	Arrive on site, evaluate site conditions, and set-up sampling apparatus(s) and equipment.
April 19-23, 2016	Conduct 5 days of day time sampling, 1 sample for each parameter will be taken per day.
April 24, 2016	Sunday, off day.
April 25-29, 2016	Conduct 5 days of night time sampling, 1 sample for each parameter will be taken per day.
April 29-May 6, 2016	Breakdown all sampling equipment and prepare for shipment back to the U.S.

AASI will not be responsible for delays, outside of our direct control, including, but not limited to, equipment delivery and/or Customs delays.

1.4 Summary of Proposed Testing

Summary of Proposed Testing **Guantanamo Bay Naval Base** **Guantanamo Bay, Cuba**			
Source	**Parameters**	**Reference Methods**[(A)]	**Duration of Tests**[(B)]
Air Curtain Incinerator (ACI)	Volumetric Flow Rate	USEPA Methods 1, 2, 5D	~1 hour
	Particulate Matter, Condensable Particulate Matter, and Metals	USEPA Methods 1A, 4, 5, 5G, 29, 202	2 hours
	Particle Size Distribution	CARB Method 501	2 hours
	Carbon Dioxide (CO_2),	USEPA Methods 3A	8 hours(C)
	Sulfur Dioxide (SO_2)	USEPA Method 6C	8 hours(C)
	Total Reduced Sulfur (TRS)	USEPA Method 16C	8 hours(C)
	Oxides of Nitrogen (NO_x)	USEPA Method 7E	8 hours(C)
	Carbon Monoxide (CO)	USEPA Method 10	8 hours(C)
	Total Organic Compounds (TOC)	USEPA Method 25A	8 hours(C)
	Dioxins/Furans (D/F)	USEPA Method 23	4 hours
	Polychlorinated Biphenyls (PCB's), Polycyclic Aromatic Hydrocarbons (PAH's), Semi-Volatile Organic Compounds (SVOC)	USEPA SW846-0010	4 hours
	Hydrogen Chloride (HCl)	USEPA Method 26	4 hours
	Hydrogen Cyanide (HCN)	USEPA OTM 29	1 hour
	Mercury (Hg)	USEPA Method 30B	8 hours(D)
	Volatile Organic Compounds (VOC)	USEPA SW846-0031	2 hours
	Aldehydes	NCASI 105.01	1 hour

Table 1.4 Notes:

(A) The methods referenced will be followed, as described in Table 1.4 and Section 4.0, as closely as possible. Due to the nature of the source and on-site conditions, deviations from Table 1.4 and Section 4.0 may become necessary. When possible, deviations will be reviewed with NAVFAC SE and/or MultiMAC JV on-site personnel. Any deviations will be listed in the final report.

(B) 5 day time samples and 5 night time samples (1 sample per day, per parameter) will be taken (10 total samples per parameter).

(C)The proposed schedule is for an eight hour operating shift. If operating conditions are not suitable for testing for eight hours, actual testing time may be less. The minimum run time for instrumental analyzer methods is 1 hour. Run times less than eight hours will not impact detection limits.

(D) The proposed schedule is for an eight hour operating shift. If operating conditions are not suitable for testing for eight hours, actual testing time may be less. Reduced sample time will result in a lower total mass of mercury recovered and potentially impact minimum detection limits. Additionally, analytical spike levels are based on expected recovery. Changes to sampling time may cause spike levels to fall outside the defined limits of 50 to 150 percent of the expected mass.

2.0 PROCESS AND CONTROL EQUIPMENT OPERATING CONDITIONS

2.1 Process Data and Operating Conditions

MultiMAC JV will be responsible for collecting all data on waste burning during the testing events. MultiMAC JV will provide this information to AASI for inclusion in the test report.

2.2 Treatment of Delays or Abnormal Conditions

Delays of varying length are normal to the operation. NAVFAC SE will use its discretion to determine when a delay is not normal and is, therefore, considered down time. Testing will be suspended as soon as practical after NAVFAC SE and/or MultiMAC JV notifies the test team of such down time. The testing will resume as soon as practical after AASI is notified of normal operations being restarted. Delay time, while both the sampling train and process are down, will be subtracted for purposes of calculating production.

3.0 SAMPLING STRATEGY

The design and operation of an air curtain incinerator (ACI) does not allow for strict adherence to USEPA reference methods for source emissions testing.

No suitable measurement site, as described in USEPA method 1, exists for the source as it is currently constructed and operated. Modifications to the source that would allow it to satisfy method 1 criteria would be disruptive to operations and not accurately represent the source's typical operation.

The goal of USEPA Method 1 is to select a measurement site that is representative of pollutant emissions and/or total volumetric flow rate from a source. Representative volumetric flow rate measurements must consider the entire area of potential exhaust of the source. Measurement points are located according to method 1, by treating the entire open area of the incinerator as a large rectangular stack. The height of the sampling point will be determined by field measurements, at the point of highest differential pressure. This height may vary per point, according to the operation of the air curtain. An explanation to this approach is provided in the following technical memorandum: "*Comparison of Test Methods and Results Between US EPA Evaluation Emissions from the Open Burning of Land-Clearing Debris Final Report and the Final Emissions Report for the Whitton (Air Burners) S-127 Air Curtain Destructor*"[1]. A small, moveable, stack will be constructed to allow this measurement point to satisfy upstream and downstream criteria of USEPA Method 5D. The area will be accessed and traversed with an aerial lift. Figure 3.0.1 is a diagram of the flow measurement system. The entire area can be measured for flow rate, as measurements can be coordinated with loading. Figure 3.0.2 shows the sampling points for flow measurements.

Locating a representative sample location for pollutants is more complex because sampling time is strictly dictated by the testing methods and accommodations for loading the unit would be significantly disruptive. Sampling time varies for the required parameters, and would therefore require sampling trains to be located at several locations simultaneously, further complicating the incinerator operations.

Due to these challenges, a single point sampling system will be used for pollutant measurement. In order to withdraw an appropriate amount of sample, a small duct will withdraw sample at a controlled rate, such that induced draft from dilution air is minimized. A collection hood will be sized to withdraw the sample at near isokinetic rates. Construction of the sample tunnel will be similar to the dilution tunnel specified in USEPA Method 5G. The sample duct will be insulated to prevent condensation. Location of the sample hood will be determined based on field measurements of flow and carbon dioxide. Figure 3.0.3 is a diagram of the pollutant sampling system. Velocity, temperature, Oxygen, and Carbon Dioxide will be measured at the sample hood location and near the pollutant measurement sites in order to evaluate isokinetics of the system. All pollutant measurements will be made from the sample tunnel. Measurement points will be located based on USEPA Method 1A if applicable.

[1] *Bawkon, Bruce, P.E., and Milan Kluko. Air Burners, LLC 14 Feb 2002. Web 1 Jan 2016.*

Figure 3.0.1

Flow Sampling System

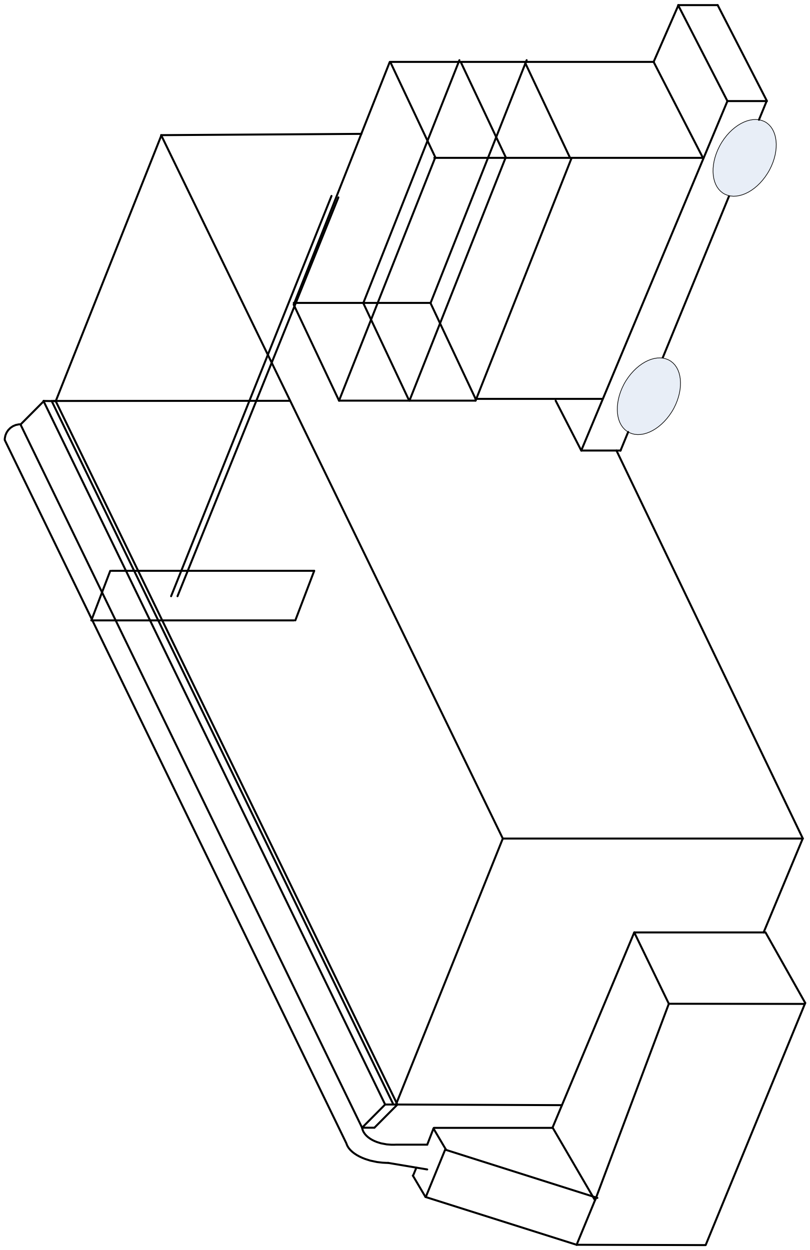
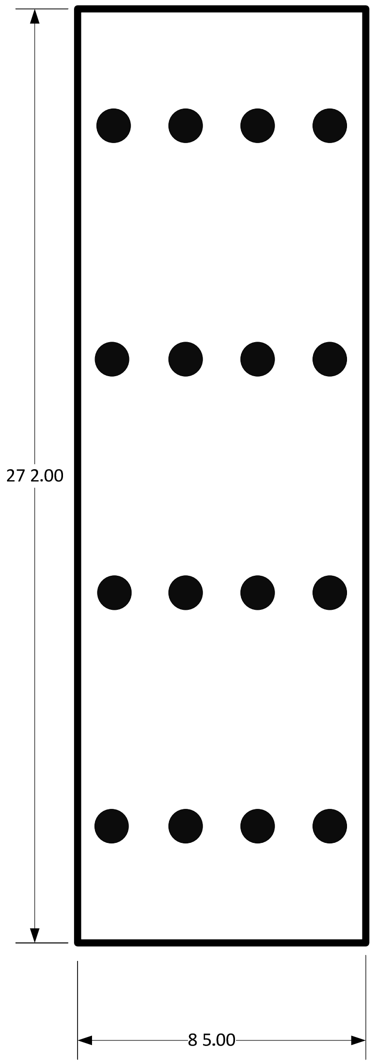


Figure 3.0.2

Guantanamo Bay Naval Base
Guantanamo Bay, Cuba
Air Curtain Incinerator
Velocity Sampling Points

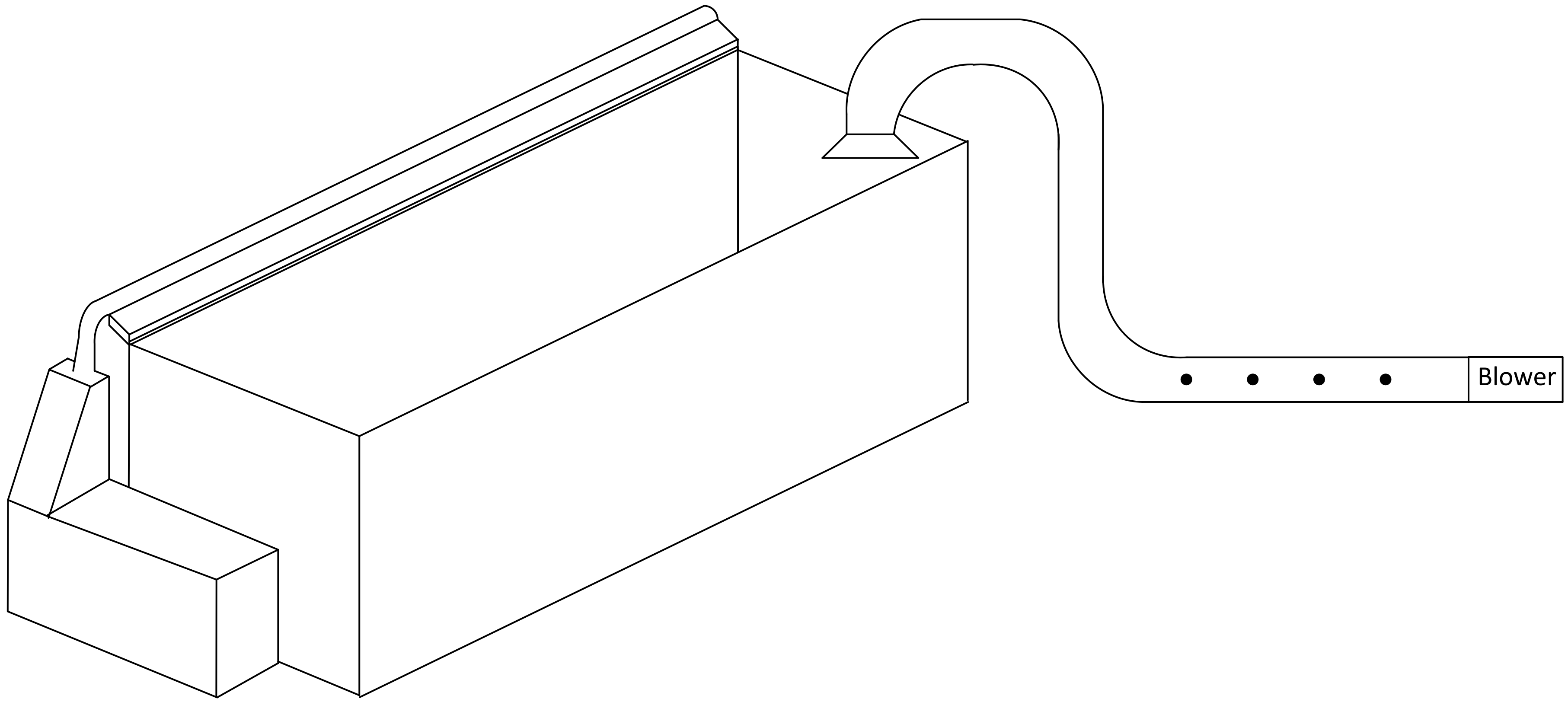
Diameters Upstream	N/A	Stack Width	101”
Diameters Downstream	N/A	Stack Depth	326”
Matrix	4 X 4		



Sampling Points (Inches)			
Distance from Top End		**Distance from Right Side**	
1	40.75”	**1**	12.63”
2	122.25”	**2**	37.88”
3	203.75”	**3**	63.13”
4	285.25”	**4**	88.38”

Note: 4 by 4 point matrix for 16 total points. Actual dimensions to be verified on site.

Figure 3.0.3
Pollutant Sampling System



4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Sampling Points

USEPA Method 1, as published in 40 CFR, Part 60, Appendix A, will be used as a guideline to determine the location of the traverse points for velocity measurements. The source does not meet method 1 criteria. This test will still use a sampling matrix as described in method 1 for velocity measurements. Velocity, moisture, temperature, and all pollutants will be measured from a sample duct that is constructed and operated according to section 3.0. Velocity, temperature, and measurements for molecular weight will also be made at the location of the sample hood for the purpose of evaluating isokinetics of the sample duct.

4.2 Velocity and Volumetric Flow Rate

USEPA Method 2, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method to determine average gas velocity. A type "S" pitot tube and inclined manometer will be used for velocity determination. Gas temperature will be measured with a type K thermocouple. Calibration checks will be performed on the pitot tube to verify the face opening alignments, external tubing diameter, and base-to-opening plane distances. A base-line coefficient of 0.84 will be assigned to the pitot tube.

4.3 Oxygen and Carbon Dioxide

USEPA Method 3A, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method for determining oxygen (O_2) and carbon dioxide (CO_2) concentrations in the effluent gas stream. A Thermo Environmental Instruments Model 410i gas filter correlation non-dispersive infrared analyzer (GFC-NDIR) with paramagnetic Oxygen sensor (or equivalent) will be used. Calibration gasses are selected so that measured emissions are between 20 and 100 percent of the high level gas, to the extent practicable. Limited information is available for expected emissions at this source, and gasses will be selected based on information from similar sources.

4.4 Moisture

USEPA Method 4, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method to determine the moisture content of the gas stream by extracting the gas sample at a known and regulated rate through a glass condenser train. The condenser train will consist of the impinger portion of the sampling train. The gas sample will be extracted through the impinger train (maintained at below 68° F in an ice bath) with a vacuum pump. The amount of gas sampled will be measured with a calibrated dry gas meter. The amount of moisture collected during the test will be gravimetrically determined and the amount of gas drawn, corrected to dry standard conditions, will be determined. At least three moisture measurements will be made per sampling day.

4.5 Filterable and Condensable Particulate and Metals (PM, CPM)

USEPA Method 5, as published in 40 CFR, Part 60, and USEPA Method 202 as published in Appendix A, 40 CFR, Part 51, respectively, will be used as the reference methods to determine PM and CPM and Metal emissions from the source. The sample will be withdrawn isokinetically from the source. PM is collected on a filter and pre-filter wash. CPM is collected in a series of dry impingers and on a filter maintained between 65° F and 85° F. Metals are collected in an aqueous acidic solution. (5% HNO_3 / 10% H_2O_2) and with 0.1 HNO_3 rinses. The collected PM and CPM samples will be returned to the lab where they will be processed and then weighed. After weighing, PM and CPM samples will be extracted and combined with the metal sample and sent to a laboratory for metals analysis by inductively coupled argon plasma spectroscopy or other approved methods The following is a description of the sampling apparatus. Figure 4.5.1 is a diagram of the sampling train.

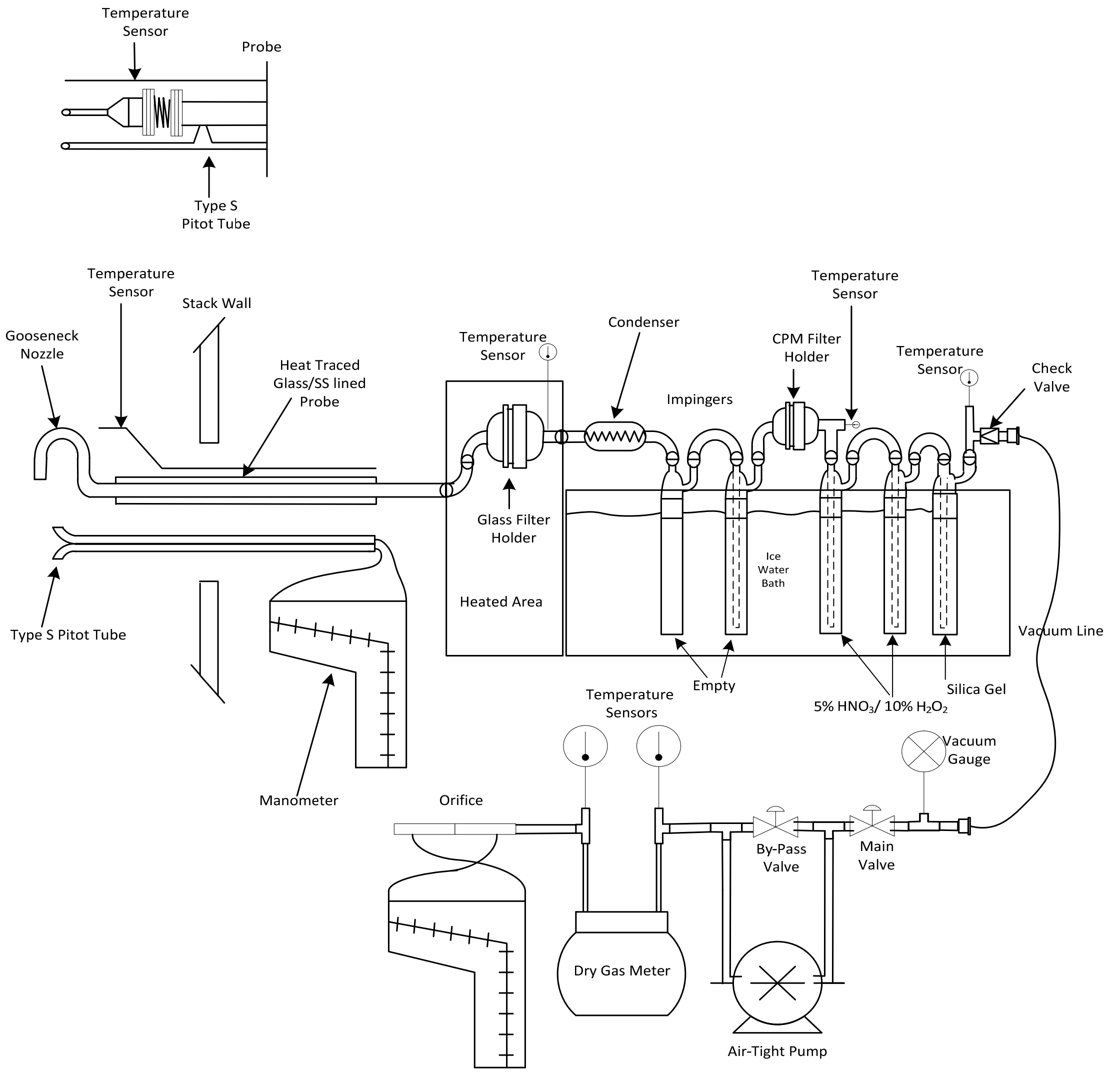
Sampling Apparatus:

1)	Probe Nozzle	Stainless steel with sharp tapered leading edge.
2)	Probe	Stainless steel 5/8” OD.
3)	Pitot Tube	Standard “type S”, attached to the probe.
4)	Filter Holder (PM)	The filter holder will be constructed of glass. The gasket will be made of Teflon. The filter holder will be designed to provide a positive seal against leakage from the outside or around the filter.
5)	Filter Holder (CPM)	The filter holder will be constructed of glass. The gasket will be made of Teflon. The filter holder will be designed to provide a positive seal against leakage from the outside or around the filter.
6)	Condenser	Glass Method 23 type.
7)	Impingers	Five (5) glass impingers connected in series with glass ball joint fittings. The first will be a dropout impinger with no bubbler tube. The second, third, fourth, fifth will be of the Greenburg-Smith design modified by replacing the tip with a 1.3 cm (1/2 inch) Id glass tube extending to about ½ inch from the bottom of the flask. All will be submerged in an ice bath during the sample runs. The first two impingers will be empty. The third and fourth impingers will contain 100 ml of 5%H_2O_2/10%HNO_3 and the fifth impinger will contain approximately 400g of silica gel. A filter will be inserted between the second and third impingers.
8)	Meter Box	Module containing a vacuum gauge, leak free pump, dry gas meter with a minimum of one percent accuracy, valves, and related

		equipment to maintain isokinetic sampling rate and determine sample volume.
9)	Barometer	Measured atmospheric pressure on-site to ±0.05 inches of mercury.
10)	Thermocouples	Type K thermocouples will be utilized to monitor temperatures for stack gas, filter, last impinger, and dry gas meter.
11)	Filters	PM-Glass fiber filter CPM- Teflon fiber filter

Figure 4.5.1

Method 5/202/29 Sampling



Impinger Contents:

1. Knockout Impinger, Empty
2. Modified Greenburg-Smith, Empty
3. Modified Greenburg-Smith, 100 ml 5%HNO/ 10%H_2O_2
4. Modified Greenburg-Smith, 100 ml 5%HNO/ 10%H_2O_2
5. Modified Greenburg-Smith, nominally 400g of Silica Gel

4.6 Sulfur Dioxide

USEPA Method 6C, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method for determining the SO_2 concentration in the effluent gas stream. A Thermo Environmental Instruments (TEI) Model 43C analyzer (or equivalent) will be used. Calibration gasses are selected so that measured emissions are between 20 and 100 percent of the high level gas, to the extent practicable. Limited information is available for expected emissions at this source, and gasses will be selected based on information from similar sources.

4.7 Total Reduced Sulfur

USEPA Method 16C, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method for determining the total reduced sulfur (TRS) concentration in the effluent gas stream. Prior to the analyzer, sample will be passed through an SO_2 scrubber to remove SO_2, and then passed through a thermal oxidizer to converter H_2S and other TRS compounds to SO_2. An H_2S gas will be used to evaluate the system performance and determine a system recovery factor. A TEI Model 43C chemiluminescence analyzer (or equivalent) will be used. Calibration gasses are selected so that measured emissions are between 20 and 100 percent of the high level gas, to the extent practicable. Limited information is available for expected emissions at this source, and gasses will be selected based on information from similar sources.

4.8 Oxides of Nitrogen

USEPA Method 7E, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method for determining the oxides of nitrogen (NO_x) concentration in the effluent gas stream. A TEI Model 42i chemiluminescence analyzer (or equivalent) will be used. Calibration gasses are selected so that measured emissions are between 20 and 100 percent of the high level gas, to the extent practicable. Limited information is available for expected emissions at this source, and gasses will be selected based on information from similar sources.

4.9 Carbon Monoxide

USEPA Method 10, as published in 40 CFR, Part 60, Appendix A, will be used as the reference method for determining carbon monoxide levels in the effluent gas stream. A Thermo Environmental Instruments Model 48 gas filter correlation non-dispersive infrared analyzer (GFC-NDIR) (or equivalent) will be used. Calibration gasses are selected so that measured emissions are between 20 and 100 percent of the high level gas, to the extent practicable. Limited information is available for expected emissions at this source, and gasses will be selected based on information from similar sources.

4.10 Total Organic Compounds

USEPA Method 25A as published in 40 CFR, Part 60, Appendix A, will be used as the reference method for determining volatile organic compounds (VOC) emission. A continuous gas sample will be extracted from the source through a heated sample line and filtered to a flame ionization analyzer (FIA). Results will be reported as volume concentration equivalents of carbon. A Thermo Environmental Instruments (TEI) Model 51 (or equivalent) analyzer will be used. USEPA Method 25A specifies drift determinations will be performed hourly. To minimize data loss, scheduled drift determinations will be performed before and after each 8 hour sample run. Calibration gasses are selected so that measured emissions are between 150 and 250 percent of the instrument span, to the extent practicable. Limited information is available for expected emissions at this source, and gasses will be selected based on information from similar sources.

4.11 Dioxin and Furans, PCB, PAH, SVOC's

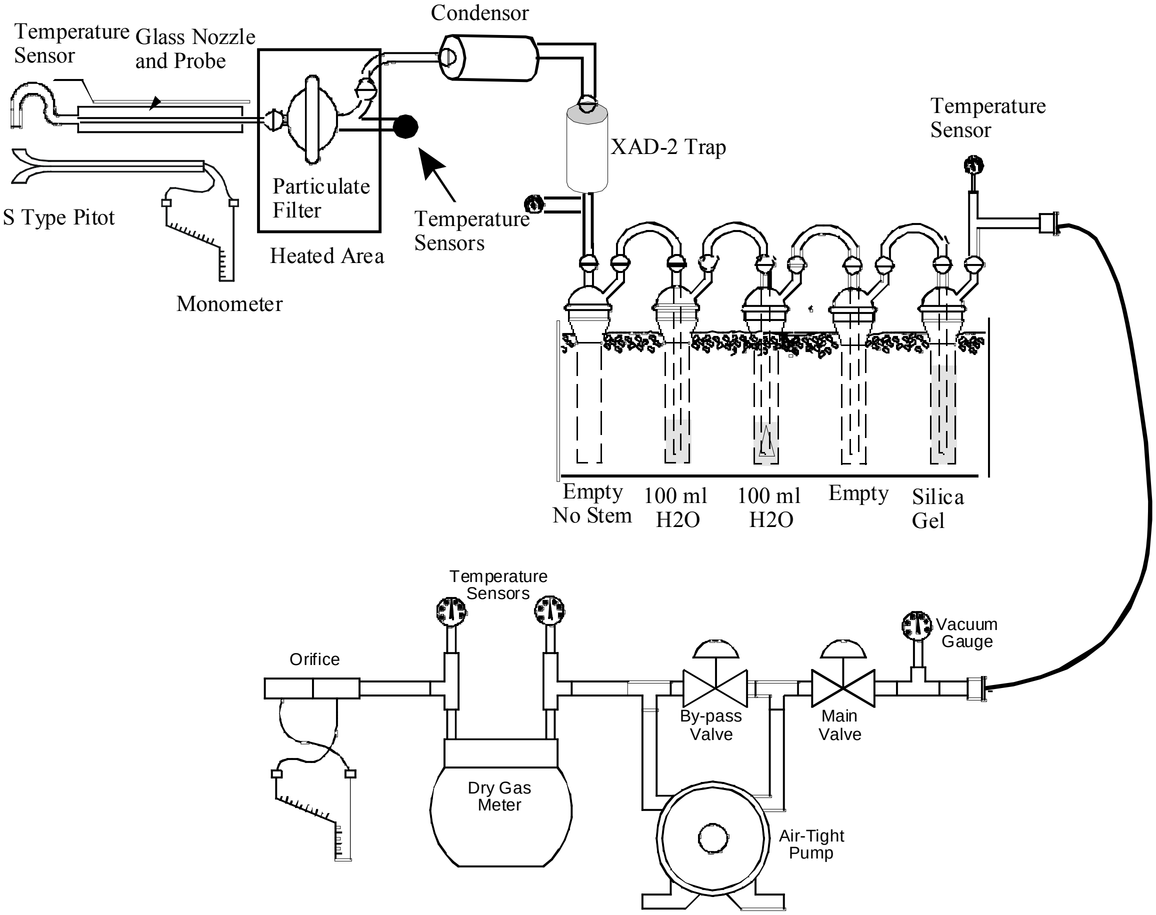
USEPA Method 23, as published in 40 CFR, Part 60, Appendix A, will be used to measure dioxin and furan concentrations. This sampling train will also measure PCB's, PAH's, and SVOC's utilizing USEPA SW846. The front and back half fractions will be combined into one analysis for D/Fs, PAHs, PCBs and, SVOC's. A separate rinse is required to ensure complete collection of D/F and will also combine front and back half fractions for a single analysis. The sampling system is shown in Figure 4.10.1 and is described below:

Sampling Apparatus:	
Probe Nozzle	Glass with sharp tapered leading edge.
Probe	Stainless steel sheath with a 5/8" OD glass insert.
Pitot Tube	Standard "type S", attached to the probe.
Filter Holder	The filter holder will be constructed of glass. The gasket will be made of silicone rubber. The filter holder will be designed to provide a positive seal against leakage from the outside or around the filter
Condenser	A glass coil-type condenser will be placed between the filter and the dioxin trap. Ice water will be the cooling fluid used in the condenser.
Absorbent Module	A preloaded container with the proper fittings to connect to the condenser. The trap will be filled with XAD-2 that will be cleaned according to methods specified in Section 3.1.2.1 of Method 23. The traps will be spiked with 100µl of surrogate standard solution as specified in Section 4.1.1.2

Impingers	Five impingers connected by leak-free ground glass fittings. The first impinger will be a knockout impinger. The second, fourth, and fifth impingers will be of the Greenburg-Smith design modified by replacing the tip with a 1.3 cm (1/2 inch) ID glass tube extending to about ½ inch from the bottom of the flask. The third impinger will be a Greenburg-Smith design with a standard tip. The first impinger will be empty. The second impinger and third impinger will contain 100 ml of water. The fourth will be empty. The fifth impinger will contain ~400g silica gel.
Meter Box	Module containing a vacuum gauge, leak free pump, dry gas meter with a minimum of one percent accuracy, valves, and related equipment to maintain isokinetic sampling rate and to determine sample volume.
Barometer	Aneroid type to measure atmospheric pressure on-site to ±0.05 inches of mercury.
Thermocouples	Type K thermocouples will be utilized to monitor temperatures for stack gas, last impinger, and dry gas meter.

Figure 4.11.1

Method 23/SW846-0010 Sampling System

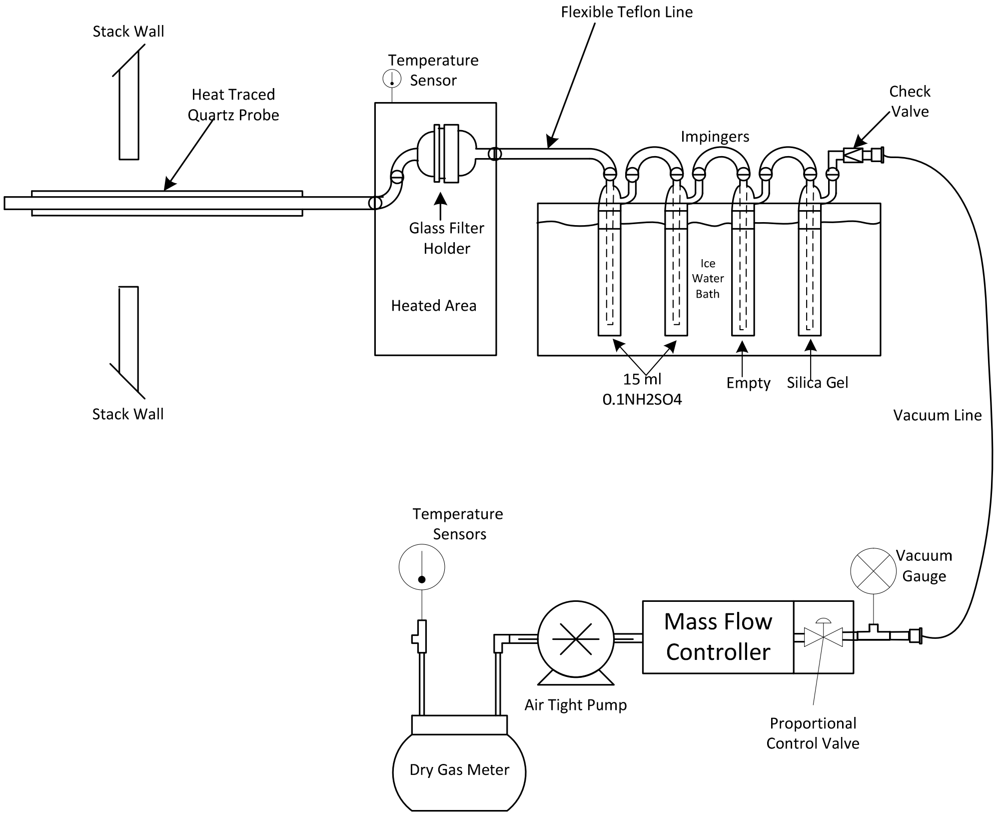


4.12 Hydrogen Chloride

USEPA Method 26 will be used to determine the hydrogen chloride concentration. An integrated sample will be extracted from the source and collected in a dilute sulfuric acid solution (0.1N H_2SO_4). The impinger train will not collect chlorine, and therefore will not contain 0.1 NaOH as described in Method 26. The samples will be collected and sent to a lab where they are analyzed for HCl by ion chromatography. The sampling system is shown in Figure 4.11.1

Figure 4.12.1

Method 26 Sampling System



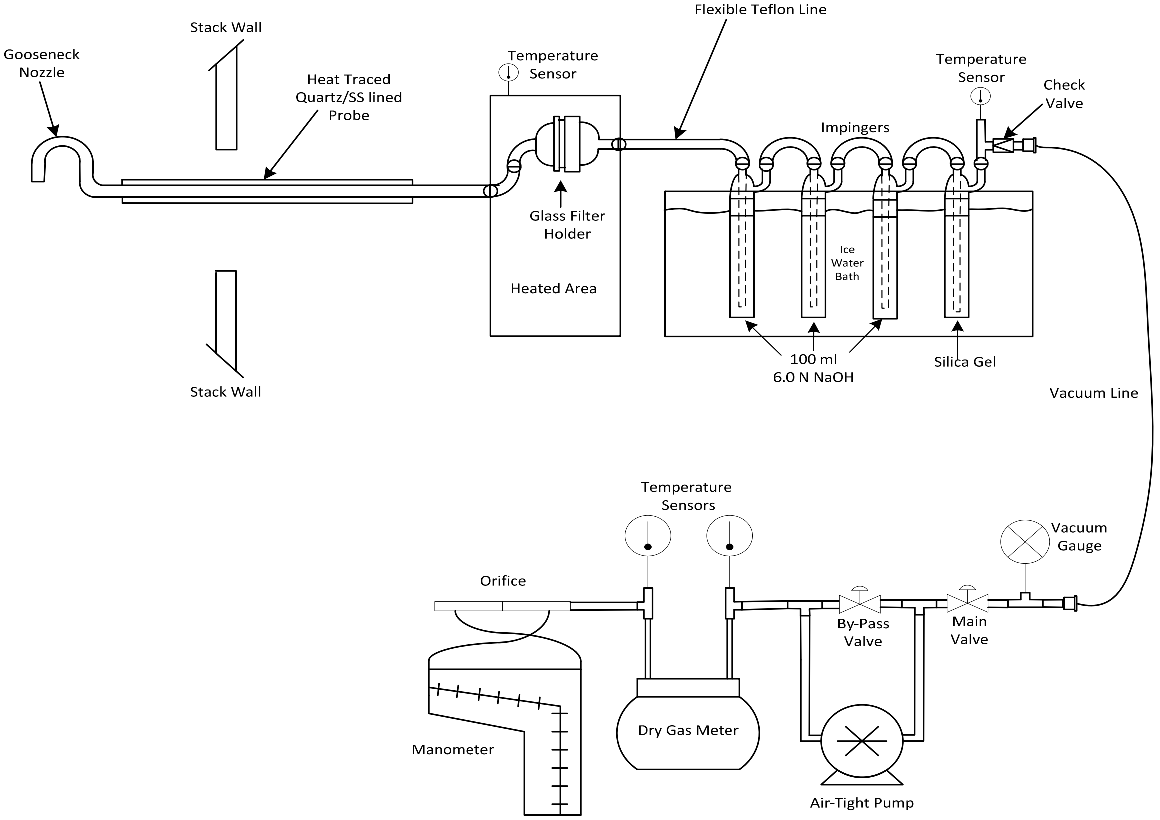
Impinger Contents:

1. Midget Impinger, 15 ml of 0.1N H2SO4
2. Midget Impinger, 15 ml of 0.1N H2SO4
3. Midget Impinger, Empty
4. Midget Impinger, Silica Gel

4.13 Hydrogen Cyanide

USEPA Other Test Method 29 will be used to determine hydrogen cyanide concentration. A sample will be withdrawn isokinetically from the source, particulate emissions will be filtered and cyanide emissions will be collected in 6.0 N NaOH solution. The samples will be collected and sent to a lab where they are analyzed for HCN by ion chromatography. Field matrix spike levels are selected near the range of expected emissions, to the extent practicable. Limited information is available for expected emissions at this source, and matrix spike levels will be selected based on information from similar sources. The sampling system is shown in Figure 4.13.1.

Figure 4.13.1
OTM 29 Sampling System



Impinger Contents:
1. Modified Greenburg-Smith, 100 ml of 6.0 N NaOH
2. Modified Greenburg-Smith, 100 ml of 6.0 N NaOH
3. Modified Greenburg-Smith, 100 ml of 6.0 N NaOH
4. Modified Greenburg-Smith, 200-300g of Silica Gel

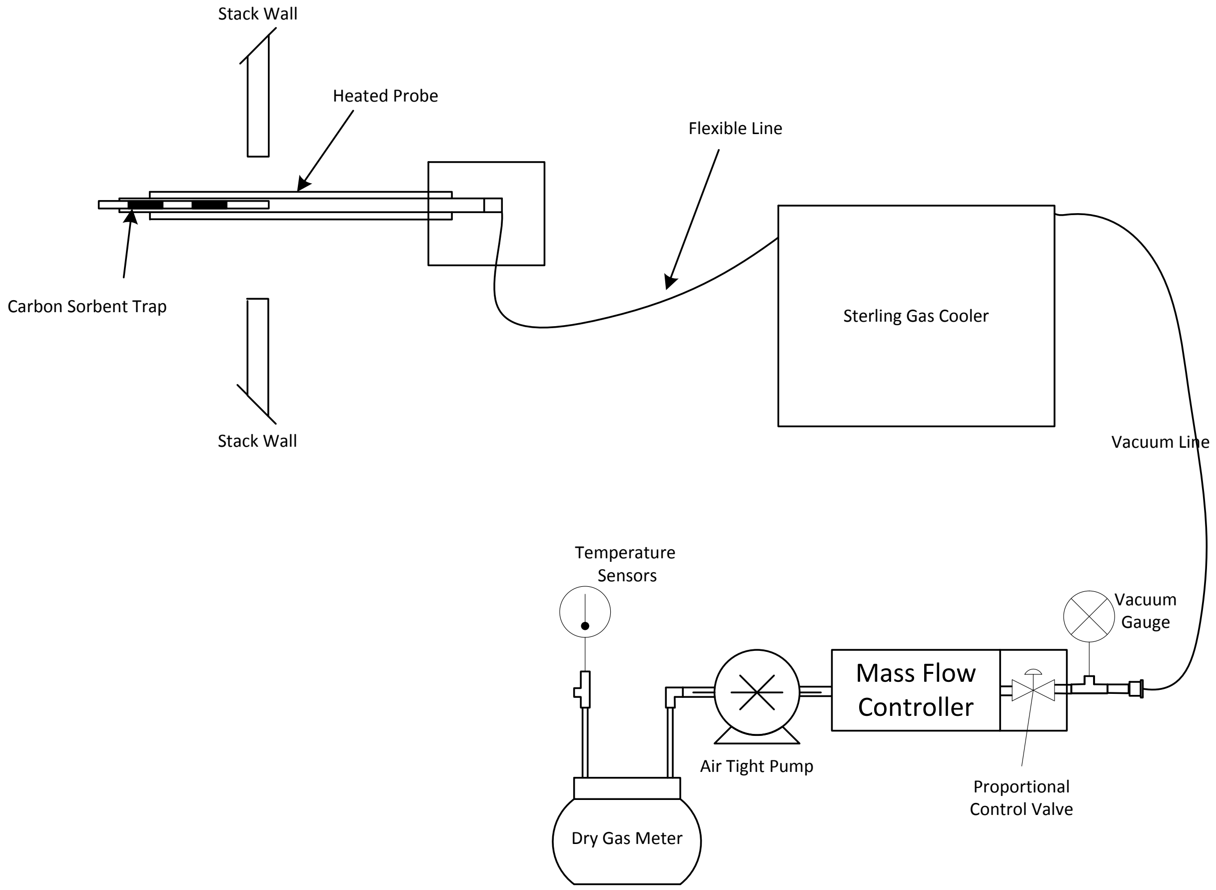
4.14 Mercury

USEPA Method 30B will be used as the reference method for measuring total vapor phase mercury (Hg) emissions from the source using sorbent trap sampling and an extractive or thermal analytical technique. This method measures the mass concentration of total vapor phase Hg in the flue gas. Total vapor phase Hg includes elemental Hg (Hg^0) and oxidized Hg (Hg^{+2}). Measurements are recorded in milligrams per dry standard cubic meters (mg/dsm^3). A schematic of the sampling system is provided in Figure 4.14.1.

A predetermined sample volume of flue gas will be extracted from the exhaust through paired, in-stack sorbent traps at a set flow rate. The collection of mercury onto the in-stack sorbent traps avoids potential loss of mercury, which could occur during transport through a probe/sampling line set-up. The probe assembly will contain paired sorbent traps mounted at the entrance to the probe ensuring direct sample gas entry. The recovered sorbent traps will be collected and sent to a contract laboratory for analysis.

Spiked samples will be prepared and analyzed with the samples to verify data acceptability. No existing data for mercury levels at this source exists and spike levels will be based on best available information. Spike levels may fall outside the defined limits of 50 to 150 percent of the expected mass.

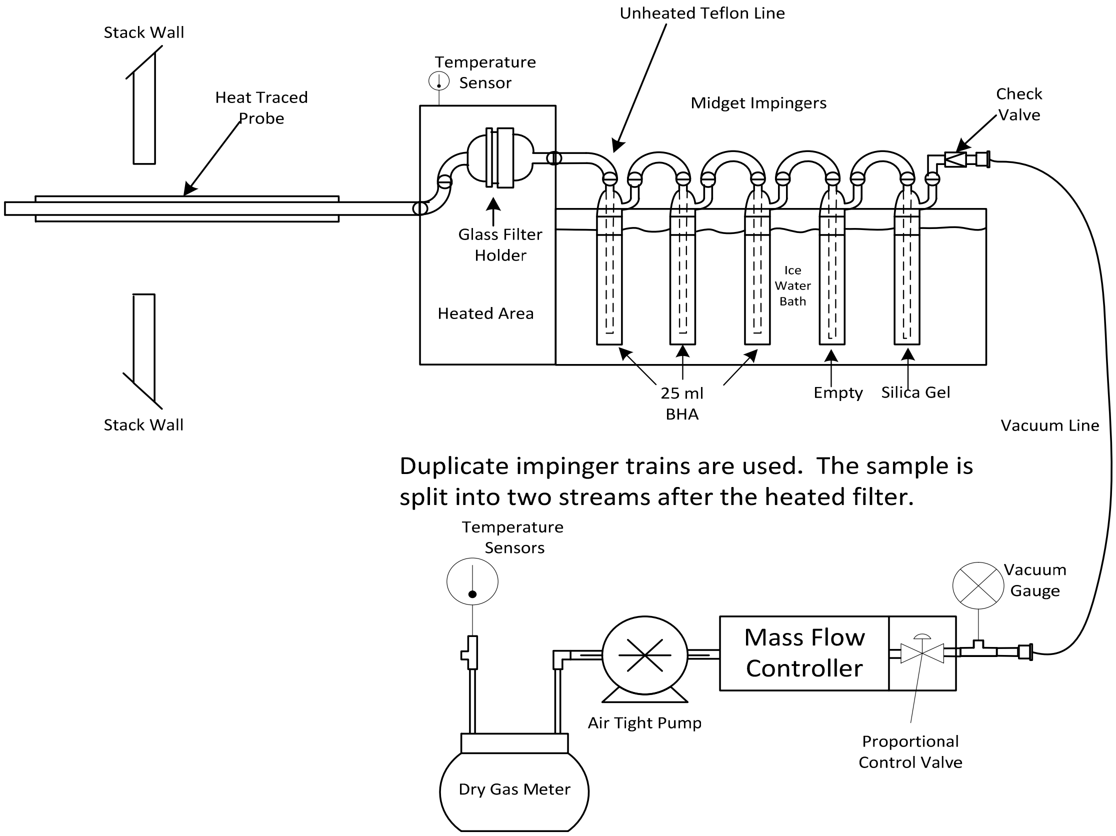
Figure 4.14.1
30B Sampling System



4.15 Aldehydes

NCASI Method 105.01 will be used to determine emissions of aldehydes. An integrated sample will be extracted from the source and collected in an o-benzylhydroxylamine (BHA) solution. The samples will be collected and sent to a lab where they are analyzed for formaldehyde, acetaldehyde, and propionaldehyde by gas chromatography. Field matrix spike levels are selected near the range of expected emissions, to the extent practicable. Limited information is available for expected emissions at this source, and matrix spike levels will be selected based on information from similar sources. The sampling system is shown in Figure 4.15.1

Figure 4.15.1
NCASI Method 105.01 Sampling System



Duplicate impinger trains are used. The sample is split into two streams after the heated filter.

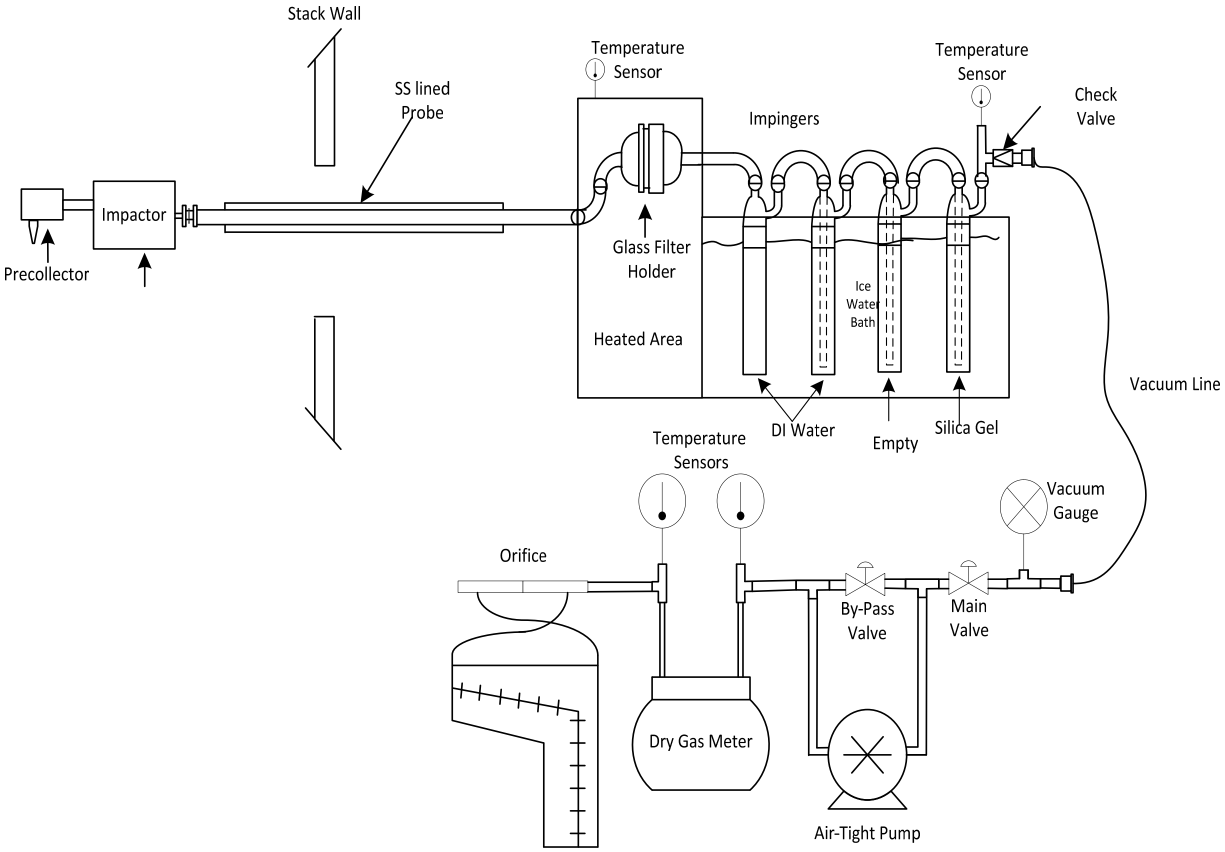
Impinger Contents:

1. Midget Impinger, 25 ml of BHA
2. Midget Impinger, 25 ml of BHA
3. Midget Impinger, 25 ml of BHA
4. Midget Impinger, Empty
5. Midget Impinger, Silica Gel

4.16 Particle Size Distribution

CARB Method 501 will be used as a guideline to determine particle size distribution. A sample will be withdrawn at a constant rate and collected in a multi stage impactor device. Particulate will be collected from each stage in an acetone rinse. Samples for each stage will be analyzed gravimetrically and a particle size distribution for the entire sample will be determined. The sampling system is shown in Figure 4.16.1.

Figure 4.16.1
CARB Method 501 Sampling System

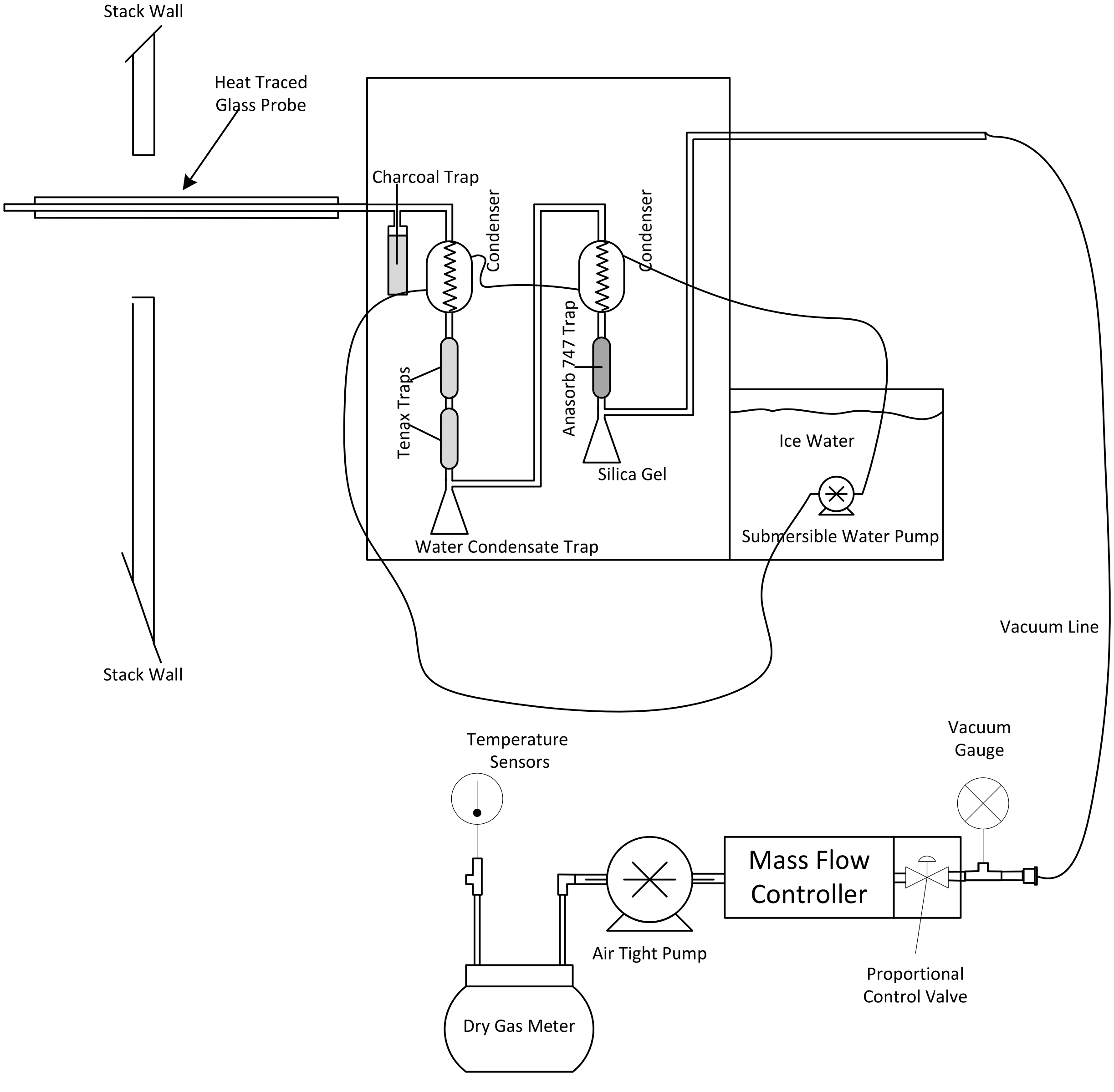


Impinger Contents:
1. Modified Greenburg-Smith, 100 ml of DI Water
2. Standard Greenburg-Smith, 100 ml of DI Water
3. Modified Greenburg-Smith, Empty
4. Modified Greenburg-Smith, 200-300g of Silica Gel

4.17 Volatile Organic Compounds

USEPA SW846 Method 0031 will be used to determine the emissions of various volatile organic compounds. An integrated sample will be extracted from the source and collected on sorbent traps. Any liquid condensate will also be recovered and analyzed. The samples will be collected and sent to a lab where they will be analyzed using gas chromatography-mass spectrometry. The sampling system is shown in Figure 4.17.1.

Figure 4.17.1
SW846-0031 Sampling System



5.0 DATA QUALITY INDICATORS

5.1 Quality Objectives

The objectives of AASI's test program is to produce data that are complete, representative, and of known precision and accuracy. Data Quality Objectives are established throughout this sample plan. Unless otherwise noted, AASI data quality objectives are summarized below:

- Complete the test program under the planned process operating conditions.
- Complete the planned number of test runs, and complete each run for the planned duration.
- Complete the test program within the range of the test method.
- Complete the test program in accordance with the published (or otherwise established) method performance criteria.
- Complete the test program by collecting all required quality control data.
- Obtain quality control data that are within acceptable limits.

Failure to achieve data quality objectives does not automatically mean that the test program was unsuccessful or that the test program data are not valid. Instead, it often means that additional effort is required to qualify and explain the data. In these cases, AASI's Quality Assurance Manager and Technical Director will review the data relative to data quality objectives and present test program results accordingly.

5.2 Completeness

Completeness is the percentage of the required field testing, laboratory measurements, and all necessary documentation that was achieved. It is our policy to promote a systematic, detailed and documented approach to completeness. Completeness is calculated as follows:

$\%C = 100 (n_v / n)$

Where: $\%C$ = percent completeness
n_v = number of valid measurements
n = total number of planned measurements

The goal for completeness for this project is 100% for all parameters. AASI will make every effort to collect 5 day and 5 night time samples that result in valid measurements. However, events out of the direct control of AASI, could result in less samples being collected and/or sample loss. In the event this is recognizable while on-site, AASI will discuss with NAVFAC SE to determine if additional or replacement samples should be taken during this sampling event. In the event an invalid sample is discovered after the testing event (i.e. shipping, laboratory sample loss, etc.) AASI will provide detailed information of the situation and determine whether the data should be included or removed in the calculations for the final test results.

5.3 Precision and Accuracy

Internal Quality Assurance activities assure that proper procedures are implemented to assure the precision and accuracy of the data. Precision and Accuracy are measures of data quality. These measures are included in the reference test methods and procedures in the form of equipment, reagent, and performance specifications, e.g., calibration accuracy, precision of triplicate analyses, percent recoveries, and trace abilities to primary standards. AASI has a stated company policy that all staff members are to be dedicated to highest standards of precision and accuracy. Team Leaders and the Project Manager are considered to be precision and accuracy inspectors for the projects they oversee.

5.3.1 Precision

Precision is a measure of agreement among two or more determinations of the same parameter under similar conditions. Although multiple field measurements will be made for all parameters, the conditions cannot assumed to be similar enough to calculate precision for the replicate sample runs.

Specific parameters will collect duplicate samples, and precision will be calculated for these measurements. Relative percent difference (RPD) will be calculated for duplicate measurements as,
$RPD = 100 * (X_1-X_2) / ((X_1+X_2)/2)$

Where

RPD = Relative percent difference

X_1 = larger of the two values

X_2 = smaller of the two values

Target precision criteria are given below.

Parameters	**Reference Methods**	**Relative Percent Difference**
Mercury (Hg)	USEPA Method 30B	≤10% for Hg concentrations > 1 µg/dscm
		≤20% for Hg concentrations ≤1 µg/dscm (alternatively, agreement within 0.2µg/dscm are acceptable)
Aldehydes	NCASI 105.01	≤50% for concentrations < 0.5ppmvd
		≤40% for concentrations between 0.5 and 1.5 ppmvd
		≤530% for concentrations > 1.5ppmvd

5.3.2 Accuracy

Accuracy is the degree of agreement between a measure value and the true, expected, or accepted value. It is frequently expressed in terms of percent recovery (%R) whether standard reference materials (SRM) or spiked samples are used.

When standard reference materials are used, accuracy is expressed as follows:

$\%R = 100(C_{M}/C_{SRM})$

Where

$\%R$ = percent recovery

C_{M} = measured concentration of SRM

C_{SRM} = actual concentration of SRM

When spikes are added to samples, accuracy is expressed as follows:

$\%R = 100(C_{S}-Cu) /C_{SS}$

Where

$\%R$ = percent recovery

C_{S} = measured concentration in spiked aliquot

C_{U} = measured concentration of in unspiked aliquot

C_{SA} = actual concentration of spike

Target recovery criteria for accuracy are given below.

Parameters	**Reference Methods**	**Recovery Limits**
Mercury (Hg)	USEPA Method 30B	Average recovery between 85% and 115%
Aldehydes	NCASI 105.01	50% - 150% for concentrations < 0.5ppmvd
		60% - 140% for concentrations between 0.5 and 1.5 ppmvd
		70% - 130% % for concentrations > 1.5ppmvd
TRS	USEPA 16C	80% - 120%
NOx	USEPA 7E	95% - 105%
SO_2	USEPA 6C	95% - 105%
CO_2	USEPA 3A	95% - 105%
O_2	USEPA 3A	95% - 105%
CO	USEPA 10	95% - 105%
TOC	USEPA 25A	95% - 105%
HCN	USEPA OTM 29	80% - 120%
D/F(1)	USEPA 23	70% - 130%
PCB's, PAH's, and SVOC's(1)	SW846-0010	70% - 130%

Note (1): recovery percentages outside of the specified range do not necessarily invalidate a test, USEPA method 23 allows results to be adjusted according to the recovery. Poor recoveries for isolated surrogate compounds are not ground for rejecting an entire set of samples.

5.4 Data Validation

Approximately twenty percent of all laboratory samples collected will be validated in accordance with US EPA guidelines and analytical method requirements. The remaining eighty percent of the samples will go through a verification review step to check for agreement between hardcopy results and the electronic data provided by the laboratory. Data validation is an objective systematic process in which analytical data are reviewed to ascertain the validity of the reported results and to alert the data user to the possible limitation of these results. The process of data validation is designed to ensure compliance with analytical methodologies and procedures and to provide data that is technically defensible to the end user.

Data validation procedures will be conducted in accordance with one or more of the following:

- U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA-540/R-99-008, & EPA-540/R-04-004)
- Analytical method procedures (Test Methods for Evaluating Solid Waste
- Physical/Chemical Methods SW-846, Third Edition)
- Department of Defense Quality Systems Manual (QSM) for Environmental Laboratories, Final Version 3, January 2006.

5.5 Out of Control and/or Unacceptable Data

All of the test methods addressed in this sample plan will contain some form of allowable data limits, whether it will be in the form of calibration limits or perhaps repeatability limits on a liquid titration. In all cases where these limits are not met, the technician shall document these facts and contact his supervisor for further guidance.

If for some reason, such as sample exhaustion, satisfactory results cannot be achieved, the results of the sample run in question will be declared void with proper notations in the project file and/or report as appropriate. All data, whether acceptable or not, will be retained in project files.

5.6 Representativeness

Representativeness is defined by the “when”, “how”, and “how many” of measurements taken. All interested parties must agree upon the desired “representative” conditions before any measurement are taken. Special care will be taken to ensure a detailed record of test specifics or other special data testing and processing matrices.

The USEPA standard for source testing is triplicate test runs for a complete test. Five runs each will be performed in this program during two distinct operating conditions. Coordination with the source operators will be required to ensure that operations are representative of typical operations.

5.7 Organization

AASI has a designated QA Manager who is responsible to the President of the company. The QA Manager's responsibilities include, but are not limited to:

- Adherence to SOP plan, including stipulated calibration scheduled therein.
- Organization and conduct of internal training programs.
- Reviews of reports or other work product prior to release.

5.8 Sample Identification and Custody

The Team Leader/Project Manager will be responsible for the custody control of the samples taken. A custody control form will be filled out and utilized for the samples until the samples can be properly disposed of.

Sample containers, sample reagents, and samples will be transported under chain-of-custody. Chain-of-custody data provide information about the identity, origin, transfers, and depositions of sample containers, sample train reagents, and samples. Chain-of-custody requirements can apply when:

- Transferring samples from the field location to the AASI base laboratory or another NELAC approved laboratory.
- Transferring sample containers, sample reagents, and samples between AASI and another organization.
- When uniquely specified in this sample plan.

AASI will observe the following chain-of-custody procedures unless other procedures are specified in this sample plan. These procedures cover sample containers and sample media. Thus, when applicable, each time the sample container, sample reagent, or sample changes hands or control areas, the disposition of the sample should be noted on the Chain-of-Custody form.

- Sample containers and sample reagents must be stored such that they are not compromised.
- Samples must be collected and preserved in accordance with the requirements of the test method.
- Samples must be stored in accordance with method requirements from the time samples are collected through completion of the analysis.
- Each sample must bear a unique identification that includes the sample location, sample collection date, and sample fraction identification. Data sheets summarize detailed sample location information, who collected the sample, sample collection time, and physical data relevant to sample collection and data reduction (for example, gas or condensate volumes).
- When AASI personnel transport samples from the field to the laboratory, the samples must be packaged to protect them from breakage, maintain integrity, and ensure that

preservation requirements are achieved. Preservation requirements are detailed in method-specific SOPs and in the methods on which the SOPs are based.

- AASI may deliver samples to its own lab and/or to an external laboratory. When delivered to AASI's lab, samples are recorded in the sample log and given a laboratory identification number. Chain-of-custody documentation is completed upon receipt. Samples are inspected to determine if they have been compromised. If there is evidence that the sample has been compromised (e.g., container breakage, container leakage, obliterated or loosened labels, or conflicting label and chain-of-custody information), the Quality Assurance Manager will work to resolve the problem. Resolution of the problem, the rationale for its correction, and when appropriate, the effect on reported data, must be documented and presented in the laboratory report and final project report.
- AASI retains samples and sample derivatives in a secure area based on the requirements of the project.
- Note the chain-of-custody for reagents and sample containers prepared by AASI for AASI use is typically not documented unless specifically required by the assignment.

6.0 QUALITY CONTROL REQUIREMENTS

6.1 Glassware Preparation

All sample train glassware and sample recovery jars will be cleaned by soaking in hot soapy water followed by three rinses with deionized water, and one rinse with acetone to dry the glassware. Glassware will subsequently be cleaned and prepared following the procedures of the respective sampling method. Glassware will then be sealed with caps, aluminum foil, or another suitable method. The table below details additional glassware cleaning where applicable:

Parameters	**Reference Methods**	**Soak**	**Rinse**
Particulate Matter, Condensable Particulate Matter, and Metals	USEPA 5, 29, 202	All glassware will be soaked for a minimum of 4 hours in 10% HNO_3	All glassware between PM and CPM filter will be rinsed 3 times each with acetone and hexane. All recovery glassware will be rinsed 3 times with 0.1 N HNO_3, acetone, and hexane.
Dioxins/Furans (D/F)	USEPA Method 23	N/A	All glassware will be rinsed 3 times each with acetone, methylene chloride, and toluene
Polychlorinated Biphenyls (PCB's), Polycyclic Aromatic Hydrocarbons (PAH's), Semi-Volatile Organic Compounds (SVOC)	USEPA SW846-0010	N/A	All glassware will be rinsed 3 times each with acetone, methylene chloride, and toluene
Aldehydes	NCASI 105.01	N/A	The impingers will be rinsed 3 times with isopropanol followed by three rinses with methylene chloride
Volatile Organic Compounds (VOC)	USEPA SW846-0010	N/A	All glassware will be rinsed with ultrapure grade methanol and baked at 100°C for at least one hour to dry.

6.2 Calibration of Equipment

All equipment will be prepared and calibrated in accordance with USEPA stack testing methods. Equipment used will have sensitivity as listed in the USEPA methods and described below. Brief descriptions of the calibration procedures are below. A table of calibration criteria is shown below. The accuracy of equipment is determined through calibration against reference standards and is equal to the acceptable calibration limits listed below.

6.2.1 Barometric Pressure

Barometric pressure devices are calibrated annually against a NIST certified barometric pressure device. Barometric pressure devices will be capable of reading atmospheric within 0.01” Hg.

6.2.2 Temperature Sensors

Type K thermocouples will be checked at a single point according to USEPA alternative method 11. After each test run series thermocouples will be checked against a reference thermometer. The temperatures will agree within ±2°F. Temperature devices will be capable of reading temperature at 0.1° for temperatures of 0-100°, and at 1° for temperatures greater than 100°.

6.2.3 Pitot Tubes

AASI uses type-S pitot tubes which are constructed according to USEPA Method 2 specifications. Pitot tubes are checked against the method design criteria and assigned a coefficient of 0.84. Pitot tubes that do not satisfy the method 2 criteria will not be used. Pitots are inspected before, during, and after each use.

6.2.4 Differential Pressure Gauges

AASI uses inclined manometers and/or magnehelic gauges to measure differential pressure. Inclined manometers are a primary standard and are not calibrated. Magnehelic gauges are calibrated against a primary standard. Pressure devices will be capable of reading pressure at 0.1” H_2O for measurements ranging from 0-10” H_2O, 0.01” H_2O for measurements ranging from 0-1” H_2O, and 0.005” H_2O for measurements ranging from 0-0.25” H_2O.

6.2.5 Dry Gas Meter

Dry gas meters are calibrated periodically and after each test series. Dry gas meters are calibrated using an orifice or against a secondary volumetric flow reference device. Dry gas meters will be capable of reading volume measurments at 0.001 cubic feet.

Table 6.2 Calibration of Equipment

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Barometers	Calibrated against a NIST traceable or mercury barometer	Annually	±10mm Hg of standard	Adjust and recheck.
Temperature Sensors	Check accuracy against an ASTM reference thermometer	Before and after each test series	±2°F of standard	Discard test series, adjust device and recheck.
	Check the continuity of the thermocouple	Before and after each test series	Responds to temperature increase	Discard test series, adjust device and recheck.
Magnehelic Pressure Gauges	Checked at a minimum of three points against a primary standard	Before and after each test series	±5% difference from the primary	Discard test series, adjust device and recheck.
Pitot Tubes	Inspect pitot for chips, scars, bends, and other deformities. Leak check each pitot line	Before and after each test series	Described in USEPA Method 2	If possible determine a new pitot coefficient. Otherwise discard test series, repair and replace pitot
Dry Gas Meter	Calibrate against a set of 5 calibration orifices.	Before initial use in the field, and at least annually	All calibration factors must not differ by more than ±2 percent from the average	Adjust meter and recalibrate.
	Calculate an average value of the calibration factor based on three calibrations at a single orifice setting.	After each test series	Must not vary by more than 5% from the calibration factor	Adjust meter and recalibrate.

6.3 On-Site Sampling

6.3.1 Measurement Sites

This testing site does not meet Method 1 criteria. This deviation is noted in Sections 3.0 and 4.0. The measurement locations will be measured on site to verify actual conditions and the sampling points may be adjusted according to actual measurements.

6.3.2 Barometric Pressure

Barometric pressure will be recorded at least once during each test run. Any required elevation adjustments will be made.

6.3.3 Velocity Measurements

All velocity measurement equipment will be assembled, leveled, zeroed, and leak-checked prior to use and at the end of each test run. The static pressure will be determined at a single point near the center of the measurement area.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Manometer	Leveled and zeroed	Before and after each test run	Manometer must read zero.	Check level and adjust zero as required.
Pitot	Inspect pitot for chips, scars, bends, and other deformities. Leak check each pitot line	Before and after each test run	Pitot lines must indicated no leak over 15 seconds at a pressure of 3-7” H_2O	Replace pitot, check lines, and/or retest.

6.3.4 Moisture Measurements

Moisture measurements will be made from the USEPA 5/29/202 sampling train. The exit of the last impinger must maintain 68°F. Silica gel will be weighed pre and post run with an electronic balance of at least 0.1 gram sensitivity.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Impinger Train	Monitor Exit Temperature	Every 10 minutes during sampling.	Exit temperature will be less than 68°F	Add more ice to the impinger container
Electronic Balance	Reference Weight	Before each measurement	Reading within 0.1 grams of standard	Check level, recalibrate, and reweigh standard.

6.3.5 Instrumental Gas Methods

All instruments will be initially calibrated with a minimum of a zero, mid, and high level calibration gas. Calibrations will occur before and after each run, and during a run if any changes are made to the sampling system.

Process or Element	QC Check	Frequency	Criteria	Corrective Action
Sample Extraction	Probe and wetted part material	Initially and whenever a component change occurs	Stainless Steel, Teflon, or other inert material	Replace
Sample Extraction	Sample line temperature	Initially and at least once an hour	Above dew point prior to drying or at all times for wet basis analyzers	Replace sample line if it cannot maintain temperature
NOx, SO_2, CO_2, O_2, and CO Analyzers	Analyzer Calibration	Before the first run and after a failed bias or drift test	±2% of Calibration Span	Recalibrate
NOx, SO_2, CO_2, O_2, and CO Analyzers	System Bias Check	Before and after each run	±5% of Calibration Span	Discard test run and recalibrate analyzer(s)
NOx, SO_2, CO_2, O_2, and CO Analyzers	System Drift	After each test run	≤3% of Calibration Span	Discard test run and recalibrate analyzer(s)
VOC Analyzers	Calibration Error Test	Before the first test run	±5% of Calibration Gas Value	Recalibrate analyzer(s)
VOC Analyzer	System Bias Check	Before and after each run	±3% of Calibration Span	Discard test run and recalibrate analyzer(s)
TRS Analyzer	Calibration Error Test	Before the first test run	±5% of Calibration Span	Recalibrate
TRS Analyzer	System Performance Check	Before and after each run	±20% of Calibration Gas Value	Discard test run, inspect system and recalibrate analyzer(s)
TRS Analyzer	Calibration Drift	After a run or series of runs, at no more than 24 hour intervals	≤3% of Calibration Span	Perform a new calibration error test. Results for the intervening runs are still valid.

6.3.6 Filterable and Condensable Particulate and Metals (PM, CPM)

The USEPA 5/29/202 sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Sample Extraction	Probe and wetted part material	Initially and whenever a component change occurs	Glass or Teflon	Replace
Probe Heater	Monitor Temperature	Every 10 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Particulate Filter	Monitor Temperature	Every 10 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Condensable Particulate Filter	Monitor Temperature	Every 10 minutes during sampling.	Maintain Temperature at 75±10°F	Add ice, insulation, or adjust circulatory water bath temperature as required
Isokinetic Sampling Train	Leak Check	After each test run	Leak Rate of less than 0.02 CFM	Adjust sample volume or retest

6.3.7 Dioxin and Furans, PCB, PAH, SVOC's

The USEPA 23/SW846-0010 sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Probe Heater	Monitor Temperature	Every 10 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Particulate Filter	Monitor Temperature	Every 10 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
XAD Trap	Monitor Temperature	Every 10 minutes during sampling.	Maintain Temperature at less than 68°F	Add ice, insulation, or adjust circulatory water bath temperature as required
Isokinetic Sampling Train	Leak Check	After each test run	Leak Rate of less than 0.02 CFM	Adjust sample volume or retest

6.3.8 Hydrogen Chloride

The USEPA Method 26 sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Probe Heater	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Particulate Filter	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Sampling Train	Leak Check	After each test run	Leak Rate of less than 2% of the average sampling rate	Adjust sample volume or retest

6.3.9 Hydrogen Cyanide

The USEPA OTM 29 sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train. USEPA OTM 29 also specifies that the pH of the final impinger must remain greater than 12.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Probe Heater	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Particulate Filter	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Isokinetic Sampling Train	Leak Check	After each test run	Leak Rate of less than 0.02 CFM	Adjust sample volume or retest
Impinger Train	Check pH	After each test run	Post Test pH greater than 12 in the 3rd impinger	Void run and retest. Add additional caustic solution and/or an additional caustic solution impinger.

6.3.10 Mercury

The USEPA 30B sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Sampling Train	Leak Check	After each test run	Leak Rate of less than 4% of average sampling rate	Adjust sample volume or retest

6.3.11 Aldehydes

The NCASI 105.01 sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Probe Heater	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Particulate Filter	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Sampling Train	Leak Check	After each test run	Leak Rate of less than 2% of the average sampling rate	Adjust sample volume or retest

6.3.12 Particle Size Distribution

The CARB 501 sampling train will be leak checked, and operated at a constant sampling rate.

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Sampling Train	Leak Check	After each test run	Leak Rate of less than 0.02 CFM	Adjust sample volume or retest

6.3.13 Volatile Organic Compounds

SW846-0031 sampling train will be leak checked, and temperatures will be monitored and regulated at several points in the train..

Apparatus	QC Check	Frequency	Criteria	Corrective Action
Probe Heater	Monitor Temperature	Every 5 minutes during sampling.	Maintain Temperature at 248±25°F	Adjust heater setting
Tenax Trap	Monitor Temperature	Every 5 minutes during sampling.	Maintain Exit Temperature of the first condenser at less than 68°F	Add ice, insulation, or adjust circulatory water bath temperature as required
Sampling Train	Leak Check	After each test run	Leak Rate of less than 2% of the average sampling rate	Adjust sample volume or retest

6.4 Sample Recovery and Handling

6.4.1 Sample Recovery

Sample recovery will be performed on site in a clean area. Samples are labelled as they are recovered. Sample recovery jars will be made of the following material(s):

Parameters	Containers	Size
Particulate Matter	Polyethylene sample bottles	250 milliliter
Condensable Particulate Matter	Inorganic Fraction - Polyethylene bottles with Teflon lids	500 milliliter
	Organic Fraction - Glass Amber bottles with Teflon lids	500 milliliter
Metals	Polyethylene bottles with Teflon lids	500 milliliter
Particle Size Distribution	Polyethylene sample bottles	500 milliliter
Dioxins/Furans (D/F)	Glass Amber bottles with Teflon lids	250 milliliter
Polychlorinated Biphenyls (PCB's), Polycyclic Aromatic Hydrocarbons (PAH's), Semi-Volatile Organic Compounds (SVOC)	Aqueous Fraction - Polyethylene bottles with Teflon lids	500 milliliter
	Solvent Fraction - Glass Amber bottles with Teflon lids	250 milliliter
Hydrogen Chloride (HCl)	Polyethylene bottles with Teflon lids	500 milliliter
Hydrogen Cyanide (HCN)	Polyethylene bottles with Teflon lids	500 milliliter
Aldehydes	Glass VOA vials with Teflon lids	40 milliliter
Volatile Organic Compounds (VOC)	Glass VOA vials with Teflon lids	40 milliliter

6.4.2 Sample Preservation

Samples will be stored in controlled environments until they are shipped to the laboratory. Samples will be transported to the lab at set intervals during the project to adhere with specified hold times. The storage conditions and sample hold times are noted below.

Parameters	Hold Times	Storage Conditions
Particulate Matter	Samples will be analyzed within 60 days	Samples will be stored at ambient temperatures in a controlled environment
Condensable Particulate Matter	Samples will be analyzed within 28 days	Samples will be stored at temperatures of less than 85°F in a controlled environment
Metals	Samples will be analyzed within 6 months	Samples will be stored at ambient temperatures in a controlled environment
Particle Size Distribution	Samples will be analyzed within 60 days	Samples will be stored at ambient temperatures in a controlled environment
Dioxins/Furans (D/F)	Samples will be extracted within 28 days. Sample will be analyzed within 40 days	Samples will be preserved on ice at approximately 4°C in a controlled environment
Polychlorinated Biphenyls (PCB's), Polycyclic Aromatic Hydrocarbons (PAH's), Semi-Volatile Organic Compounds (SVOC)	Samples will be extracted within 14 days. Sample will be analyzed within 40 days.	Samples will be preserved on ice at approximately 4°C in a controlled environment
Hydrogen Chloride (HCl)	Samples will be analyzed within 28 days	Samples will be stored at ambient temperatures in a controlled environment
Hydrogen Cyanide (HCN)	Samples will be analyzed within 30 days	Samples will be preserved on ice in a controlled environment.
Aldehydes	Samples will be analyzed within 21 days	Samples will be preserved on ice at approximately 4°C in a controlled environment
Volatile Organic Compounds (VOC)	Samples will be analyzed within 14 days	Trap samples will be preserved on ice at approximately 10°C in a controlled environment. Condensate samples will be preserved with sodium thiosulfate and on ice at approximately 4°C

6.5 Documentation

Data sheets and other pertinent data will be collected and recorded. Data sheets should clearly identify the process tested, the date, time, location, and the sampling personnel involved. Other information should be recorded as required to document that the testing conformed to the prescribed testing procedures.

Records should be in indelible ink. Record should never be erased or overwritten. Mistakes should be lined out in a manner that maintains the legibility of the original entry. Corrections should be initialed and dated.

6.6 QA/QC Samples

Field blanks, reagent blanks, trip blanks, duplicate samples, spiked samples, and any other QA/QC sample as dictated by the sampling methods will be recovered and analyzed. A "test" means a series of sample runs. Specifically, for each parameter in this program, a test encompasses the 10 sample runs that will be performed for this project. A summary of the expected QA/QC samples that will be recovered is below.

Parameters	**Reagent Blanks**	**Field Blanks**	**Spiked Samples**	**Duplicate Samples**
Particulate Matter	An acetone blank will be recovered	N/A	N/A	N/A
Condensable Particulate Matter	N/A	One complete field train blank per test	N/A	N/A
Metals	N/A	One complete field train blank per test	N/A	N/A
Particle Size Distribution	An acetone blank will be recovered	N/A	N/A	N/A
Dioxins/Furans (D/F)	One XAD trap blank per sample shipment	One complete field train blank per test	XAD traps will be spiked with surrogate compounds	N/A

Table Continued

Polychlorinated Biphenyls (PCB's),	One XAD trap blank per sample shipment	One complete field train blank per test	XAD traps will be spiked with surrogate compounds	N/A
Polycyclic Aromatic Hydrocarbons (PAH's),				
Semi-Volatile Organic Compounds (SVOC)				
Hydrogen Chloride (HCl)	One 0.1 N H_2SO_4 blank, diluted with DI water	N/A	N/A	N/A
Hydrogen Cyanide (HCN)	One 6.0 N NaOH blank will be recovered per test	One complete field train blank per test	A single impinger will be spiked and recovered	N/A
Aldehydes	N/A	One complete field train blank per test	One train spike per facility. One field spike per condition. One run spike per condition.	Two duplicate samples will be recovered during the test (one each during day and night condition)
Mercury (Hg)	N/A	N/A	At a minimum, one run spike will be per condition.	Duplicate samples for every run
Volatile Organic Compounds (VOC)	One DI water blank will be recovered for each shipment to the lab	One set of field blanks will be recovered for every run.	N/A	N/A

7.0 SAFETY

The AASI Team Leader/Project Manager and MultiMAC JV will be responsible for the safety of all AASI personnel. It is the responsibility of NAVFAC SE to inform and train AASI personnel in their specific safety requirements for their facility including, but not limited to, site-specific safety procedures and guidelines, evacuation procedures, and emergency personnel locations. All emergency contacts should be provided to the project manager or team leader upon arrival. In addition, NAVFAC SE will notify AASI of any areas that have been identified as potential hazards, including confined spaces, which are relevant to or in the vicinity of AASI's operations.

APPENDIX A

TEST METHODS

Note: Test methods were printed from following websites:

- https://www.epa.gov/hw-sw846
- www.**ncasi**.org
- https://www3.epa.gov/ttn/emc/methods
- http://www.arb.ca.gov/testmeth/vol1/meth_501.pdf.

It is assumed that the information provided by these sites are accurate.

Test methods listed may not be strictly followed and are listed here for reference only. Please see the sample plan for method/sampling deviations.

- USEPA Method 1
- USEPA Method 1A
- USEPA Method 2
- USEPA Method 3A
- USEPA Method 5
- USEPA Method 5D
- USEPA Method 5G
- USEPA Method 6C
- USEPA Method 7E
- USEPA Method 10
- USEPA Method 16C
- USEPA Method 23
- USEPA Method 25A
- USEPA Method 26
- USEPA Method 30B
- USEPA Method 202
- USEPA SW846-0010
- USEPA SW846-0031
- USEPA OTM 29
- NCASI 105.01
- CARB Method 501

Method 1— Sample and Velocity Traverses for Stationary Sources

NOTE: This method does not include all of the specifications (e.g., equipment and supplies) and procedures (e.g., sampling) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test method: Method 2.

1.0 Scope and Application

1.1 Measured Parameters. The purpose of the method is to provide guidance for the selection of sampling ports and traverse points at which sampling for air pollutants will be performed pursuant to regulations set forth in this part. Two procedures are presented: a simplified procedure, and an alternative procedure (see section 11.5). The magnitude of cyclonic flow of effluent gas in a stack or duct is the only parameter quantitatively measured in the simplified procedure.

1.2 Applicability. This method is applicable to gas streams flowing in ducts, stacks, and flues. This method cannot be used when: (1) the flow is cyclonic or swirling; or (2) a stack is smaller than 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) in cross-sectional area. The simplified procedure cannot be used when the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

NOTE: The requirements of this method must be considered before construction of a new facility from which emissions are to be measured; failure to do so may require subsequent alterations to the stack or deviation from the standard procedure. Cases involving variants are subject to approval by the Administrator.

2.0 Summary of Method

2.1 This method is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source. A measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. Traverse points are then located within each of these equal areas.

3.0 Definitions [Reserved]

4.0 Interferences [Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies.

6.1 Apparatus. The apparatus described below is required only when utilizing the alternative site selection procedure described in section 11.5 of this method.

6.1.1 Directional Probe. Any directional probe, such as United Sensor Type DA Three-Dimensional Directional Probe, capable of measuring both the pitch and yaw angles of gas flows is acceptable. Before using the probe, assign an identification number to the directional probe, and permanently mark or engrave the number on the body of the probe. The pressure holes of directional probes are susceptible to plugging when used in particulate-laden gas streams. Therefore, a procedure for cleaning the pressure holes by "back-purging" with pressurized air is required.

6.1.2 Differential Pressure Gauges. Inclined manometers, U-tube manometers, or other differential pressure gauges (*e.g.,* magnehelic gauges) that meet the specifications described in Method 2, section 6.2.

NOTE: If the differential pressure gauge produces both negative and positive readings, then both negative and positive pressure readings shall be calibrated at a minimum of three points as specified in Method 2, section 6.2.

7.0 Reagents and Standards [Reserved]

8.0 Sample Collection, Preservation, Storage, and Transport [Reserved]

9.0 Quality Control [Reserved]

10.0 Calibration and Standardization [Reserved]

11.0 Procedure

11.1 Selection of Measurement Site.

11.1.1 Sampling and/or velocity measurements are performed at a site located at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, or contraction in the stack, or from a visible flame. If necessary, an alternative location may be selected, at a position at least two stack or duct diameters downstream and a half diameter upstream from any flow disturbance.

11.1.2 An alternative procedure is available for determining the acceptability of a measurement location not meeting the criteria above. This procedure described in section 11.5 allows for the determination of gas flow angles at the sampling points and comparison of the measured results with acceptability criteria.

11.2 Determining the Number of Traverse Points.

11.2.1 Particulate Traverses.

11.2.1.1 When the eight- and two-diameter criterion can be met, the minimum number of traverse points shall be: (1) twelve, for circular or rectangular stacks with diameters (or equivalent diameters) greater than 0.61 meter (24 in.); (2) eight, for circular stacks with diameters between 0.30 and 0.61 meter (12 and 24 in.); and (3) nine, for rectangular stacks with equivalent diameters between 0.30 and 0.61 meter (12 and 24 in.).

11.2.1.2 When the eight- and two-diameter criterion cannot be met, the minimum number of traverse points is determined from Figure 1-1. Before referring to the figure, however, determine the istances from the measurement site to the nearest upstream and downstream disturbances, and divide each distance by the stack diameter or equivalent diameter, to determine the distance in terms of the number of duct diameters. Then, determine from Figure 1-1 the minimum number of traverse points that corresponds: (1) to the number of duct diameters upstream; and (2) to the number of diameters downstream. Select the higher of the two minimum numbers of traverse points, or a greater value, so that for circular stacks the number is a multiple of 4, and for rectangular stacks, the number is one of those shown in Table 1-1.

11.2.2 Velocity (Non-Particulate) Traverses. When velocity or volumetric flow rate is to be determined (but not particulate matter), the same procedure as that used for particulate traverses (Section 11.2.1) is followed, except that Figure 1-2 may be used instead of Figure 1-1.

11.3 Cross-Sectional Layout and Location of Traverse Points.

11.3.1 Circular Stacks.

11.3.1.1 Locate the traverse points on two perpendicular diameters according to Table 1-2 and the example shown in Figure 1-3. Any equation (see examples in References 2 and 3 in section 16.0) that gives the same values as those in Table 1-2 may be used in lieu of Table 1-2.

11.3.1.2 For particulate traverses, one of the diameters must coincide with the plane containing the greatest expected concentration variation (*e.g.,* after bends); one diameter shall be congruent to the direction of the bend. This requirement becomes less critical as the distance from the disturbance increases; therefore, other diameter locations may be used, subject to the approval of the Administrator.

11.3.1.3 In addition, for elliptical stacks having unequal perpendicular diameters, separate traverse points shall be calculated and located along each diameter. To determine the cross-sectional area of the elliptical stack, use the following equation:

Square Area = $D_1 \times D_2 \times 0.7854$

Where: D_1= Stack diameter 1

D_2= Stack diameter 2

11.3.1.4 In addition, for stacks having diameters greater than 0.61 m (24 in.), no traverse points shall be within 2.5 centimeters (1.00 in.) of the stack walls; and for stack diameters equal to or less than 0.61 m (24 in.), no traverse points shall be located within 1.3 cm (0.50 in.) of the stack walls. To meet these criteria, observe the procedures given below.

11.3.2 Stacks With Diameters Greater Than 0.61 m (24 in.).

11.3.2.1 When any of the traverse points as located in section 11.3.1 fall within 2.5 cm (1.0 in.) of the stack walls, relocate them away from the stack walls to: (1) a distance of 2.5 cm (1.0 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger. These relocated traverse points (on each end of a diameter) shall be the "adjusted" traverse points.

11.3.2.2 Whenever two successive traverse points are combined to form a single adjusted traverse point, treat the adjusted point as two separate traverse points, both in the sampling and/or velocity measurement procedure, and in recording of the data.

11.3.3 Stacks With Diameters Equal To or Less Than 0.61 m (24 in.). Follow the procedure in section 11.3.1.1, noting only that any "adjusted" points should be relocated away from the stack walls to: (1) a distance of 1.3 cm (0.50 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger.

11.3.4 Rectangular Stacks.

11.3.4.1 Determine the number of traverse points as explained in sections 11.1 and 11.2 of this method. From Table 1-1, determine the grid configuration. Divide the stack cross-section into as many equal rectangular elemental areas as traverse points, and then locate a traverse point at the centroid of each equal area according to the example in Figure 1-4.

11.3.4.2 To use more than the minimum number of traverse points, expand the "minimum number of traverse points" matrix (see Table 1-1) by adding the extra traverse points along one or the other or both legs of the matrix; the final matrix need not be balanced. For example, if a 4 × 3 "minimum number of points" matrix were expanded to 36 points, the final matrix could be 9 × 4 or 12 × 3, and would not necessarily have to be 6 × 6. After constructing the final matrix, divide the stack cross-section into as many equal rectangular, elemental areas as traverse points, and locate a traverse point at the centroid of each equal area.

11.3.4.3 The situation of traverse points being too close to the stack walls is not expected to arise with rectangular stacks. If this problem should ever arise, the Administrator must be contacted for resolution of the matter.

11.4 Verification of Absence of Cyclonic Flow.

11.4.1 In most stationary sources, the direction of stack gas flow is essentially parallel to the stack walls. However, cyclonic flow may exist (1) after such devices as cyclones and inertial demisters following venturi scrubbers, or (2) in stacks having tangential inlets or other duct configurations which tend to induce swirling; in these instances, the presence or absence of cyclonic flow at the sampling location must be determined. The following techniques are acceptable for this determination.

11.4.2 Level and zero the manometer. Connect a Type S pitot tube to the manometer and leak-check system. Position the Type S pitot tube at each traverse point, in succession, so that the planes of the face openings of the pitot tube are perpendicular to the stack cross-sectional plane; when the Type S pitot tube is in this position, it is at "0° reference." Note the differential pressure (Δp) reading at each traverse point. If a null (zero) pitot reading is obtained at 0° reference at a given traverse point, an acceptable flow condition exists at that point. If the pitot reading is not zero at 0° reference, rotate the pitot tube (up to ±90° yaw angle), until a null reading is obtained. Carefully determine and record the value of the rotation angle (α) to the nearest degree. After the null technique has been applied at each traverse point, calculate the average of the absolute values of α; assign α values of 0° to those points for which no rotation was required, and include these in the overall average. If the average value of α is greater than 20°, the overall flow condition in the stack is unacceptable, and alternative methodology, subject to the approval of the Administrator, must be used to perform accurate sample and velocity traverses.

11.5 The alternative site selection procedure may be used to determine the rotation angles in lieu of the procedure outlined in section 11.4.

11.5.1 Alternative Measurement Site Selection Procedure. This alternative applies to sources where measurement locations are less than 2 equivalent or duct diameters downstream or less than one-half duct diameter upstream from a flow disturbance. The alternative should be limited to ducts larger than 24 in. in diameter where blockage and wall effects are minimal. A directional flow-sensing probe is used to measure pitch and yaw angles of the gas flow at 40 or more traverse points; the resultant angle is calculated and compared with acceptable criteria for mean and standard deviation.

NOTE: Both the pitch and yaw angles are measured from a line passing through the traverse point and parallel to the stack axis. The pitch angle is the angle of the gas flow component in the plane that INCLUDES the traverse line and is parallel to the stack axis. The yaw angle is the angle of the gas flow component in the plane PERPENDICULAR to the traverse line at the traverse point and is measured from the line passing through the traverse point and parallel to the stack axis.

11.5.2 Traverse Points. Use a minimum of 40 traverse points for circular ducts and 42 points for rectangular ducts for the gas flow angle determinations. Follow the procedure outlined in section 11.3 and Table 1-1 or 1-2 for the location and layout of the traverse points. If the measurement location is determined to be acceptable according to the criteria in this alternative procedure, use the same traverse point number and locations for sampling and velocity measurements.

11.5.3 Measurement Procedure.

11.5.3.1 Prepare the directional probe and differential pressure gauges as recommended by the manufacturer. Capillary tubing or surge tanks may be used to dampen pressure fluctuations. It is recommended, but not required, that a pretest leak check be conducted. To perform a leak check, pressurize or use suction on the impact opening until a reading of at least 7.6 cm (3 in.) H_2O registers on the differential pressure gauge, then plug the impact opening. The pressure of a leak-free system will remain stable for at least 15 seconds.

11.5.3.2 Level and zero the manometers. Since the manometer level and zero may drift because of vibrations and temperature changes, periodically check the level and zero during the traverse.

11.5.3.3 Position the probe at the appropriate locations in the gas stream, and rotate until zero deflection is indicated for the yaw angle pressure gauge. Determine and record the yaw angle. Record the pressure gauge readings for the pitch angle, and determine the pitch angle from the calibration curve. Repeat this procedure for each traverse point. Complete a “back-purge” of the pressure lines and the impact openings prior to measurements of each traverse point.

11.5.3.4 A post-test check as described in section 11.5.3.1 is required. If the criteria for a leak-free system are not met, repair the equipment, and repeat the flow angle measurements.

11.5.4 Calibration. Use a flow system as described in sections 10.1.2.1 and 10.1.2.2 of Method 2. In addition, the flow system shall have the capacity to generate two test-section velocities: one between 365 and 730 m/min (1,200 and 2,400 ft/min) and one between 730 and 1,100 m/min (2,400 and 3,600 ft/min).

11.5.4.1 Cut two entry ports in the test section. The axes through the entry ports shall be perpendicular to each other and intersect in the centroid of the test section. The ports should be elongated slots parallel to the axis of the test section and of sufficient length to allow measurement of pitch angles while maintaining the pitot head position at the test-section centroid. To facilitate alignment of the directional probe during calibration, the test section should be constructed of plexiglass or some other transparent material. All calibration measurements should be made at the same point in the test section, preferably at the centroid of the test section.

11.5.4.2 To ensure that the gas flow is parallel to the central axis of the test section, follow the procedure outlined in section 11.4 for cyclonic flow determination to measure the gas flow angles at the centroid of the test section from two test ports located 90° apart. The gas flow angle measured in each port must be ±2° of 0°. Straightening vanes should be installed, if necessary, to meet this criterion.

11.5.4.3 Pitch Angle Calibration. Perform a calibration traverse according to the manufacturer's recommended protocol in 5° increments for angles from −60° to +60° at one velocity in each of the two ranges specified above. Average the pressure ratio values obtained for each angle in the two flow ranges, and plot a calibration curve with the average values of the pressure ratio (or other suitable measurement factor as recommended by the manufacturer) versus the pitch angle. Draw a smooth line through the data points. Plot also the data values for each traverse point. Determine the differences between the measured data values and the angle from the calibration curve at the same pressure ratio. The difference at each comparison must be within 2° for angles between 0° and 40° and within 3° for angles between 40° and 60°.

11.5.4.4 Yaw Angle Calibration. Mark the three-dimensional probe to allow the determination of the yaw position of the probe. This is usually a line extending the length of the probe and aligned with the impact opening. To determine the accuracy of measurements of the yaw angle, only the zero or null position need be calibrated as follows: Place the directional probe in the test section, and rotate the probe until the zero position is found. With a protractor or other angle measuring device, measure the angle indicated by the yaw angle indicator on the three-dimensional probe. This should be within 2° of 0°. Repeat this measurement for any other points along the length of the pitot where yaw angle measurements could be read in order to account for variations in the pitot markings used to indicate pitot head positions.

12.0 Data Analysis and Calculations

12.1 Nomenclature.

L = length.

n = total number of traverse points.

P_i = pitch angle at traverse point i, degree.

R_{avg} = average resultant angle, degree.

R_i = resultant angle at traverse point i, degree.

S_d = standard deviation, degree.

W = width.

Y_i = yaw angle at traverse point i, degree.

12.2 For a rectangular cross section, an equivalent diameter (D_e) shall be calculated using the following equation, to determine the upstream and downstream distances:

$$D_e = \frac{2(L)(W)}{L+W} \qquad Eq.\ 1\text{-}1$$

12.3 If use of the alternative site selection procedure (Section 11.5 of this method) is required, perform the following calculations using the equations below: the resultant angle at each traverse point, the average resultant angle, and the standard deviation. Complete the calculations retaining at least one extra significant figure beyond that of the acquired data. Round the values after the final calculations.

12.3.1 Calculate the resultant angle at each traverse point:

$$R_i = \text{arc cosine}\left[(\text{cosine } Y_i)(\text{cosine } P_i)\right] \qquad \text{Eq. 1-2}$$

12.3.2 Calculate the average resultant for the measurements:

$$R_{avg} = \sum R_i / n \qquad \text{Eq. 1-3}$$

12.3.3 Calculate the standard deviations:

$$S_d = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{avg})^2}{(n-1)}} \qquad \text{Eq. 1-4}$$

12.3.4 Acceptability Criteria. The measurement location is acceptable if $R_{avg} \leq 20°$ and $S_d \leq 10°$.

13.0 Method Performance [Reserved]

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 References

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17.0 Tables, Diagrams, Flowcharts, and Validation Data

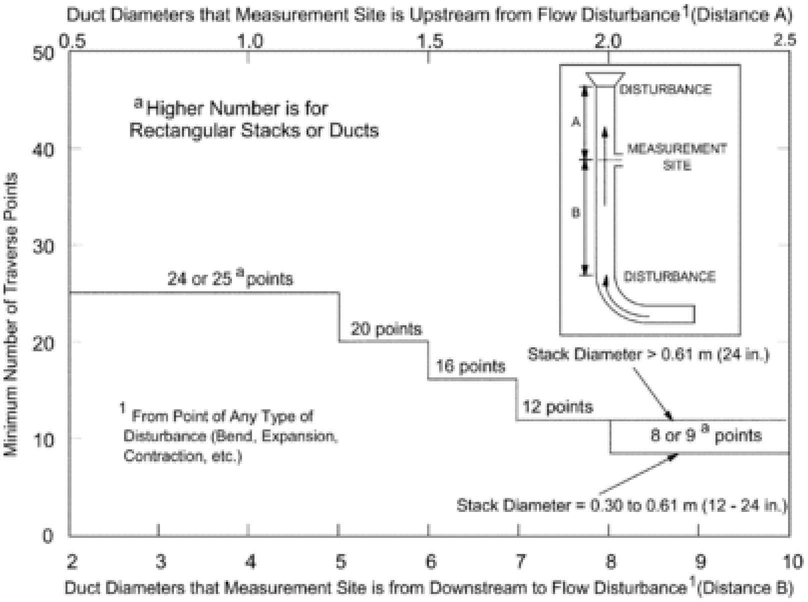

Figure 1-1. Minimum number of traverse points for particulate traverses

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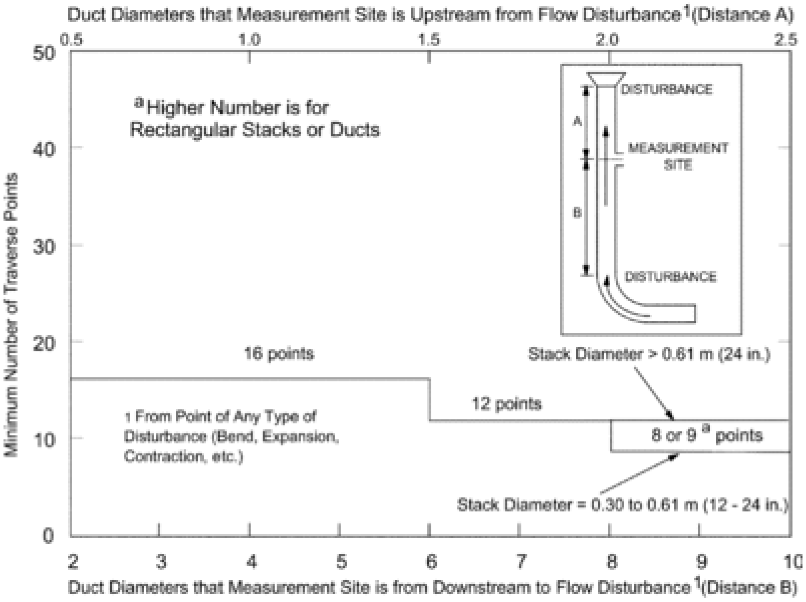

Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses

TABLE 1-1 CROSS-SECTION LAYOUT FOR RECTANGULAR STACKS

Number of tranverse points layout	**Matrix**
9	3×3
12	4×3
16	4×4
20	5×4
25	5×5
30	6×5
36	6×6
42	7×6
49	7×7

TABLE 1-2—LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

[Percent of stack diameter from inside wall to tranverse point]

Traverse point number on a diameter	**Number of traverse points on a diameter**											
	2	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												99.9

Traverse Point	% of diameter Distance
1	4.4
2	14.7
3	29.5
4	70.5
5	85.3
6	95.6

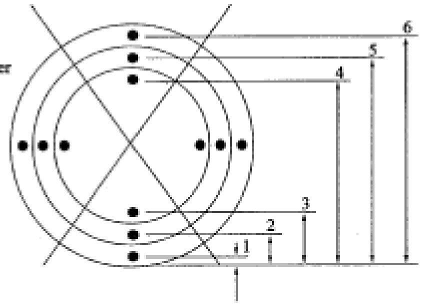

Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points.

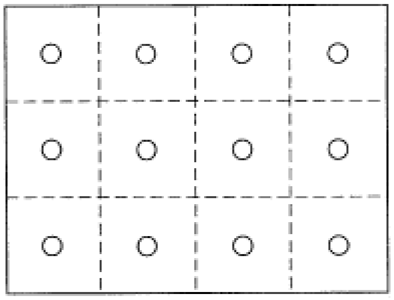

Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with traverse points at centroid of each area.

Method 1A—Sample and Velocity Traverses for Stationary Sources With Small Stacks or Ducts

Note: This method does not include all of the specifications (*e.g.,* equipment and supplies) and procedures (*e.g.,* sampling) essential to its performance. Some material is incorporated by reference from other methods this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test method: Method 1.

1.0 Scope and Application

1.1 Measured Parameters. The purpose of the method is to provide guidance for the selection of sampling ports and traverse points at which sampling for air pollutants will be performed pursuant to regulations set forth in this part.

1.2 Applicability. The applicability and principle of this method are identical to Method 1, except its applicability is limited to stacks or ducts. This method is applicable to flowing gas streams in ducts, stacks, and flues of less than about 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) in cross-sectional area, but equal to or greater than about 0.10 meter (4 in.) in diameter, or 0.0081 m^2 (12.57 $in.^2$) in cross-sectional area. This method cannot be used when the flow is cyclonic or swirling.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 The method is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source. A measurement site or a pair of measurement sites where the effluent stream is flowing in a known direction is (are) selected. The cross-section of the stack is divided into a number of equal areas. Traverse points are then located within each of these equal areas.

2.2 In these small diameter stacks or ducts, the conventional Method 5 stack assembly (consisting of a Type S pitot tube attached to a sampling probe, equipped with a nozzle and thermocouple) blocks a significant portion of the cross-section of the duct and causes inaccurate measurements. Therefore, for particulate matter (PM) sampling in small stacks or ducts, the gas velocity is measured using a standard pitot tube downstream of the actual emission sampling site. The straight run of duct between the PM sampling and velocity measurement sites allows the flow profile, temporarily disturbed by the presence of the sampling probe, to redevelop and stabilize.

3.0 Definitions[Reserved]

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies[Reserved]

7.0 Reagents and Standards[Reserved]

8.0 Sample Collection, Preservation, Storage, and Transport[Reserved]

9.0 Quality Control[Reserved]

10.0 Calibration and Standardization[Reserved]

11.0 Procedure

11.1 Selection of Measurement Site.

11.1.1 Particulate Measurements—Steady or Unsteady Flow. Select a particulate measurement site located preferably at least eight equivalent stack or duct diameters downstream and 10 equivalent diameters upstream from any flow disturbances such as bends, expansions, or contractions in the stack, or from a visible flame. Next, locate the velocity measurement site eight equivalent diameters downstream of the particulate measurement site (see Figure 1A–1). If such locations are not available, select an alternative particulate measurement location at least two equivalent stack or duct diameters downstream and two and one-half diameters upstream from any flow disturbance. Then, locate the velocity measurement site two equivalent diameters downstream from the particulate measurement site. (See Section 12.2 of Method 1 for calculating equivalent diameters for a rectangular cross-section.)

11.1.2 PM Sampling (Steady Flow) or Velocity (Steady or Unsteady Flow) Measurements. For PM sampling when the volumetric flow rate in a duct is constant with respect to time, Section 11.1.1 of Method 1 may be followed, with the PM sampling and velocity measurement performed at one location. To demonstrate that the flow rate is constant (within 10 percent) when PM measurements are made, perform complete velocity traverses before and after the PM sampling run, and calculate the deviation of the flow rate derived after the PM sampling run from the one derived before the PM sampling run. The PM sampling run is acceptable if the deviation does not exceed 10 percent.

11.2 Determining the Number of Traverse Points.

11.2.1 Particulate Measurements (Steady or Unsteady Flow). Use Figure 1–1 of Method 1 to determine the number of traverse points to use at both the velocity measurement and PM sampling locations. Before referring to the figure, however, determine the distances between both the velocity measurement and PM sampling sites to the nearest upstream and downstream disturbances. Then divide each distance by the stack diameter or equivalent diameter to express the distances in terms of the number of duct diameters. Then, determine the number of traverse points from Figure 1–1 of Method 1 corresponding to each of these four distances. Choose the highest of the four numbers of traverse points (or a greater number) so that, for circular ducts the number is a multiple of four; and for rectangular ducts, the number is one of those shown in Table 1–1 of Method 1. When the optimum duct diameter location criteria can be satisfied, the minimum number of traverse points required is eight for circular ducts and nine for rectangular ducts.

11.2.2 PM Sampling (Steady Flow) or only Velocity (Non-Particulate) Measurements. Use Figure 1–2 of Method 1 to determine number of traverse points, following the same procedure used for PM sampling as described in Section 11.2.1 of Method 1. When the optimum duct diameter location criteria can be satisfied, the minimum number of traverse points required is eight for circular ducts and nine for rectangular ducts.

11.3 Cross-sectional Layout, Location of Traverse Points, and Verification of the Absence of Cyclonic Flow. Same as Method 1, Sections 11.3 and 11.4, respectively.

12.0 Data Analysis and Calculations[Reserved]

13.0 Method Performance[Reserved]

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

Same as Method 1, Section 16.0, References 1 through 6, with the addition of the following:

1. Vollaro, Robert F. Recommended Procedure for Sample Traverses in Ducts Smaller Than 12 Inches in Diameter. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, North Carolina. January 1977.

17.0 Tables, Diagrams, Flowcharts, and Validation Data

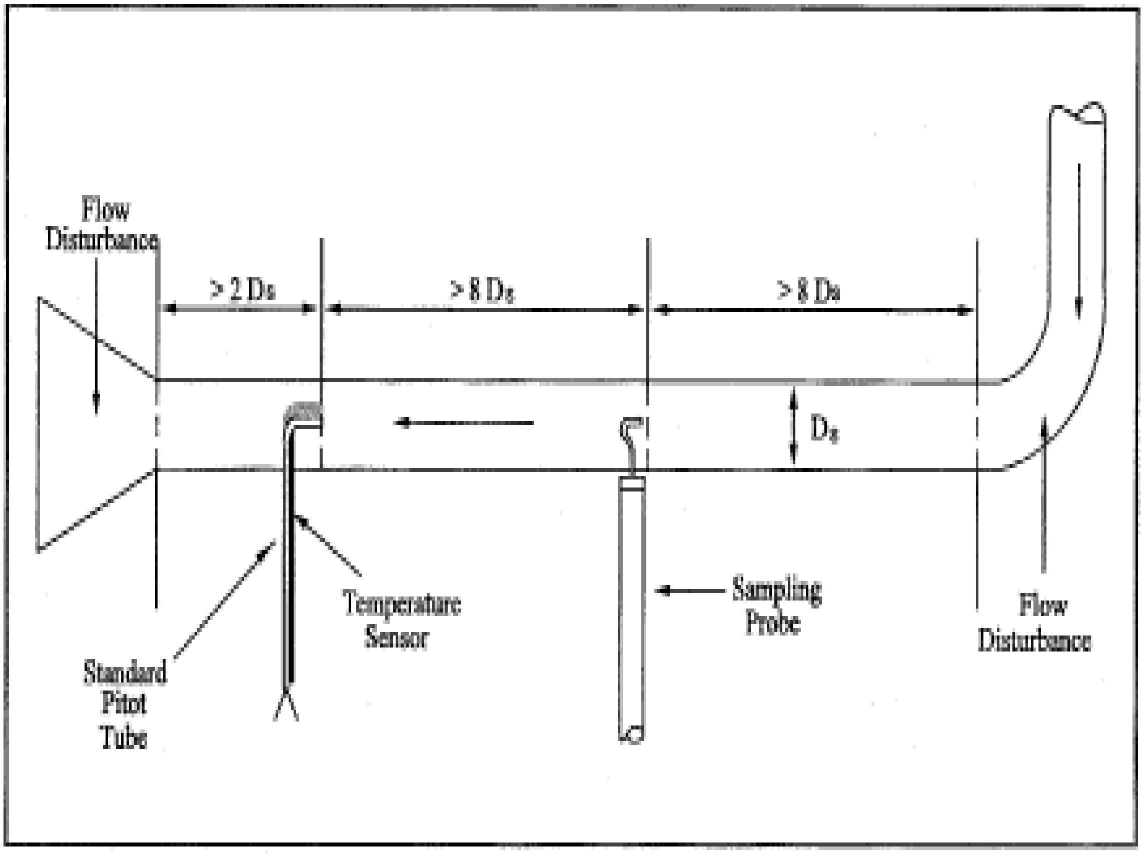

Figure 1A-1. Recommended sampling arrangement for small ducts

Method 2—Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

NOTE: This method does not include all of the specifications (*e.g*., equipment and supplies) and procedures (*e.g*., sampling) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test method: Method 1.

1.0 Scope and Application.

1.1 This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

1.2 This method is not applicable at measurement sites that fail to meet the criteria of Method 1, section 11.1. Also, the method cannot be used for direct measurement in cyclonic or swirling gas streams; section 11.4 of Method 1 shows how to determine cyclonic or swirling flow conditions. When unacceptable conditions exist, alternative procedures, subject to the approval of the Administrator, must be employed to produce accurate flow rate determinations. Examples of such alternative procedures are: (1) to install straightening vanes; (2) to calculate the total volumetric flow rate stoichiometrically, or (3) to move to another measurement site at which the flow is acceptable.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method.

2.1 The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

3.0 Definitions [Reserved]

4.0 Interferences [Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable.

6.1 Type S Pitot Tube.

6.1.1 Pitot tube made of metal tubing (*e.g*., stainless steel) as shown in Figure 2-1. It is recommended that the external tubing diameter (dimension D_t, Figure 2-2b) be between 0.48 and 0.95 cm ($^3/_{16}$ and $^3/_8$ inch). There shall be an equal distance from the base of each leg of the pitot tube to its face-opening plane (dimensions P_A and P_B, Figure 2-2b); it is recommended that this distance be between 1.05 and 1.50 times the external tubing diameter. The face openings of the pitot tube shall, preferably, be aligned as shown in Figure 2-2; however, slight misalignments of the openings are permissible (see Figure 2-3).

6.1.2 The Type S pitot tube shall have a known coefficient, determined as outlined in section 10.0. An identification number shall be assigned to the pitot tube; this number shall be permanently marked or engraved on the body of the tube. A standard pitot tube may be used instead of a Type S, provided that it meets the specifications of sections 6.7 and 10.2. Note, however, that the static and impact pressure holes of standard pitot tubes are susceptible to plugging in particulate-laden gas streams. Therefore, whenever a standard pitot tube is used to perform a traverse, adequate proof must be furnished that the openings of the pitot tube have not plugged up during the traverse period. This can be accomplished by comparing the velocity head (Δp) measurement recorded at a selected traverse point (readable Δp value) with a second Δp measurement recorded after "back purging" with pressurized air to clean the impact and static holes of the standard pitot tube. If the before and after Δp measurements are within 5 percent, then the traverse data are acceptable. Otherwise, the data should be rejected and the traverse measurements redone. Note that the selected traverse point should be one that demonstrates a readable Δp value. If "back purging" at regular intervals is part of a routine procedure, then comparative Δp measurements shall be conducted as above for the last two traverse points that exhibit suitable Δp measurements.

6.2 Differential Pressure Gauge. An inclined manometer or equivalent device. Most sampling trains are equipped with a 10 in. (water column) inclined-vertical manometer, having 0.01 in. H_20 divisions on the 0 to 1 in. inclined scale, and 0.1 in. H_20 divisions on the 1 to 10 in. vertical scale. This type of manometer (or other gauge of equivalent sensitivity) is satisfactory for the measurement of Δp values as low as 1.27 mm (0.05 in.) H_20. However, a differential pressure gauge of greater sensitivity shall be used (subject to the approval of the Administrator), if any of the following is found to be true: (1) the arithmetic average of all Δp readings at the traverse points in the stack is less than 1.27 mm (0.05 in.) H_20; (2) for traverses of 12 or more points, more than 10 percent of the individual Δp readings are below 1.27 mm (0.05 in.) H_20; or (3) for traverses of fewer than 12 points, more than one Δp reading is below 1.27 mm (0.05 in.) H_20. Reference 18 (see section 17.0) describes commercially available instrumentation for the measurement of low-range gas velocities.

6.2.1 As an alternative to criteria (1) through (3) above, Equation 2-1 (Section 12.2) may be used to determine the necessity of using a more sensitive differential pressure gauge. If T is greater than 1.05, the velocity head data are unacceptable and a more sensitive differential pressure gauge must be used.

NOTE: If differential pressure gauges other than inclined manometers are used (*e.g.*, magnehelic gauges), their calibration must be checked after each test series. To check the calibration of a differential pressure gauge, compare Δp readings of the gauge with those of a gauge-oil manometer at a minimum of three points, approximately representing the range of Δp values in the stack. If, at each point, the values of Δp as read by the differential pressure gauge and gauge-oil manometer agree to within 5 percent, the differential pressure gauge shall be considered to be in proper calibration. Otherwise, the test series shall either be voided, or procedures to adjust the measured Δp values and final results shall be used, subject to the approval of the Administrator.

6.3 Temperature Sensor. A thermocouple, liquid-filled bulb thermometer, bimetallic thermometer, mercury-in-glass thermometer, or other gauge capable of measuring temperatures to within 1.5 percent of the minimum absolute stack temperature. The temperature sensor shall be attached to the pitot tube such that the sensor tip does not touch any metal; the gauge shall be in an interference-free arrangement with respect to the pitot tube face openings (see Figure 2-1 and Figure 2-4). Alternative positions may be used if the pitot tube-temperature gauge system is calibrated according to the procedure of section 10.0. Provided that a difference of not more than 1 percent in the average velocity measurement is introduced, the temperature gauge need not be attached to the pitot tube. This alternative is subject to the approval of the Administrator.

6.4 Pressure Probe and Gauge. A piezometer tube and mercury- or water-filled U-tube manometer capable of measuring stack pressure to within 2.5 mm (0.1 in.) Hg. The static tap of a standard type pitot tube or one leg of a Type S pitot tube with the face opening planes positioned parallel to the gas flow may also be used as the pressure probe.

6.5 Barometer. A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.54 mm (0.1 in.) Hg.

NOTE: The barometric pressure reading may be obtained from a nearby National Weather Service station. In this case, the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be made at a rate of minus 2.5 mm (0.1 in.) Hg per 30 m (100 ft) elevation increase or plus 2.5 mm (0.1 in.) Hg per 30 m (100 ft.) for elevation decrease.

6.6 Gas Density Determination Equipment. Method 3 equipment, if needed (see section 8.6), to determine the stack gas dry molecular weight, and Method 4 (reference method) or Method 5 equipment for moisture content determination. Other methods may be used subject to approval of the Administrator.

6.7 Calibration Pitot Tube. When calibration of the Type S pitot tube is necessary (see section 10.1), a standard pitot tube shall be used for a reference. The standard pitot tube shall, preferably, have a known coefficient, obtained either (1) directly from the National Institute of Standards and Technology (NIST), Gaithersburg MD 20899, (301) 975-2002, or (2) by calibration against another standard pitot tube with an NIST-traceable coefficient. Alternatively, a standard pitot tube designed according to the criteria given in sections 6.7.1 through 6.7.5 below and illustrated in Figure 2-5 (see also References 7, 8, and 17 in section 17.0) may be used. Pitot tubes designed according to these specifications will have baseline coefficients of 0.99 ±0.01.

6.7.1 Standard Pitot Design.

6.7.1.1 Hemispherical (shown in Figure 2-5), ellipsoidal, or conical tip.

6.7.1.2 A minimum of six diameters straight run (based upon D, the external diameter of the tube) between the tip and the static pressure holes.

6.7.1.3 A minimum of eight diameters straight run between the static pressure holes and the centerline of the external tube, following the 90° bend.

6.7.1.4 Static pressure holes of equal size (approximately 0.1 D), equally spaced in a piezometer ring configuration.

6.7.1.5 90° bend, with curved or mitered junction.

6.8 Differential Pressure Gauge for Type S Pitot Tube Calibration. An inclined manometer or equivalent. If the single-velocity calibration technique is employed (see section 10.1.2.3), the calibration differential pressure gauge shall be readable to the nearest 0.127 mm (0.005 in.) H_20. For multivelocity calibrations, the gauge shall be readable to the nearest 0.127 mm (0.005 in.) H_20 for Δp values between 1.27 and 25.4 mm (0.05 and 1.00 in.) H_20, and to the nearest 1.27 mm (0.05 in.) H_20 for Δp values above 25.4 mm (1.00 in.) H_20. A special, more sensitive gauge will be required to read Δp values below 1.27 mm (0.05 in.) H_20 (see Reference 18 in section 16.0).

7.0 Reagents and Standards [Reserved]

8.0 Sample Collection and Analysis

8.1 Set up the apparatus as shown in Figure 2-1. Capillary tubing or surge tanks installed between the manometer and pitot tube may be used to dampen ΔP fluctuations. It is recommended, but not required, that a pretest leak-check be conducted as follows: (1) blow through the pitot impact opening until at least 7.6 cm (3.0 in.) H_2O velocity head registers on the manometer; then, close off the impact opening. The pressure shall remain stable (±2.5 mm H_2O, ±0.10 in. H_2O) for at least 15 seconds; (2) do the same for the static pressure side, except using suction to obtain the minimum of 7.6 cm (3.0 in.) H_2O. Other leak-check procedures, subject to the approval of the Administrator, may be used.

8.2 Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse (at least once per hour). Record all necessary data on a form similar to that shown in Figure 2-6.

8.3 Measure the velocity head and temperature at the traverse points specified by Method 1. Ensure that the proper differential pressure gauge is being used for the range of Δp values encountered (see section 6.2). If it is necessary to change to a more sensitive gauge, do so, and remeasure the Δp and temperature readings at each traverse point. Conduct a post-test leak-check (mandatory), as described in section 8.1 above, to validate the traverse run.

8.4 Measure the static pressure in the stack. One reading is usually adequate.

8.5 Determine the atmospheric pressure.

8.6 Determine the stack gas dry molecular weight. For combustion processes or processes that emit essentially CO_2, O_2, CO, and N_2, use Method 3. For processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0. For other processes, other methods, subject to the approval of the Administrator, must be used.

8.7 Obtain the moisture content from Method 4 (reference method, or equivalent) or from Method 5.

8.8 Determine the cross-sectional area of the stack or duct at the sampling location. Whenever possible, physically measure the stack dimensions rather than using blueprints. Do not assume that stack diameters are equal. Measure each diameter distance to verify its dimensions.

9.0 Quality Control

Section	**Quality control measure**	**Effect**
10.1-10.4	Sampling equipment calibration	Ensure accurate measurement of stack gas flow rate, sample volume.

10.0 Calibration and Standardization

10.1 Type S Pitot Tube. Before its initial use, carefully examine the Type S pitot tube top, side, and end views to verify that the face openings of the tube are aligned within the specifications illustrated in Figures 2-2 and 2-3. The pitot tube shall not be used if it fails to meet these alignment specifications. After verifying the face opening alignment, measure and record the following dimensions of the pitot tube: (a) the external tubing diameter (dimension D_t, Figure 2-2b); and (b) the base-to-opening plane distances (dimensions P_A and P_B, Figure 2-2b). If D_t is between 0.48 and 0.95 cm $^{3}/_{16}$ and $^{3}/_{8}$ in.), and if P_A and P_B are equal and between 1.05 and 1.50 D_t, there are two possible options: (1) the pitot tube may be calibrated according to the procedure outlined in sections 10.1.2 through 10.1.5, or (2) a baseline (isolated tube) coefficient value of 0.84 may be assigned to the pitot tube. Note, however, that if the pitot tube is part of an assembly, calibration may still be required, despite knowledge of the baseline coefficient value (see section 10.1.1). If D_t, P_A, and P_B are outside the specified limits, the pitot tube must be calibrated as outlined in sections 10.1.2 through 10.1.5.

10.1.1 Type S Pitot Tube Assemblies. During sample and velocity traverses, the isolated Type S pitot tube is not always used; in many instances, the pitot tube is used in combination with other source-sampling components (e.g., thermocouple, sampling probe, nozzle) as part of an "assembly." The presence of other sampling components can sometimes affect the baseline value of the Type S pitot tube coefficient (Reference 9 in section 17.0); therefore, an assigned (or otherwise known) baseline coefficient value may or may not be valid for a given assembly. The baseline and assembly coefficient values will be identical only when the relative placement of the components in the assembly is such that aerodynamic interference effects are eliminated. Figures 2-4, 2-7, and 2-8 illustrate interference-free component arrangements for Type S pitot tubes having external tubing diameters between 0.48 and 0.95 cm ($^3\!/_{16}$ and $^3\!/_8$ in.). Type S pitot tube assemblies that fail to meet any or all of the specifications of Figures 2-4, 2-7, and 2-8 shall be calibrated according to the procedure outlined in sections 10.1.2 through 10.1.5, and prior to calibration, the values of the intercomponent spacings (pitot-nozzle, pitot-thermocouple, pitot-probe sheath) shall be measured and recorded.

NOTE: Do not use a Type S pitot tube assembly that is constructed such that the impact pressure opening plane of the pitot tube is below the entry plane of the nozzle (see Figure 2-7B).

10.1.2 Calibration Setup. If the Type S pitot tube is to be calibrated, one leg of the tube shall be permanently marked A, and the other, B. Calibration shall be performed in a flow system having the following essential design features:

10.1.2.1 The flowing gas stream must be confined to a duct of definite cross-sectional area, either circular or rectangular. For circular cross sections, the minimum duct diameter shall be 30.48 cm (12 in.); for rectangular cross sections, the width (shorter side) shall be at least 25.4 cm (10 in.).

10.1.2.2 The cross-sectional area of the calibration duct must be constant over a distance of 10 or more duct diameters. For a rectangular cross section, use an equivalent diameter, calculated according to Equation 2-2 (see section 12.3), to determine the number of duct diameters. To ensure the presence of stable, fully developed flow patterns at the calibration site, or "test section," the site must be located at least eight diameters downstream and two diameters upstream from the nearest disturbances.

NOTE: The eight- and two-diameter criteria are not absolute; other test section locations may be used (subject to approval of the Administrator), provided that the flow at the test site has been demonstrated to be or found stable and parallel to the duct axis.

10.1.2.3 The flow system shall have the capacity to generate a test-section velocity around 910 m/min (3,000 ft/min). This velocity must be constant with time to guarantee steady flow during calibration. Note that Type S pitot tube coefficients obtained by single-velocity calibration at 910 m/min (3,000 ft/min) will generally be valid to ±3 percent for the measurement of velocities above 300 m/min (1,000 ft/min) and to ±6 percent for the measurement of velocities between 180 and 300 m/min (600 and 1,000 ft/min). If a more precise correlation between the pitot tube coefficient, (C_p), and velocity is desired, the flow system should have the capacity to generate at least four distinct, time-invariant test-section velocities covering the velocity range from 180 to

1,500 m/min (600 to 5,000 ft/min), and calibration data shall be taken at regular velocity intervals over this range (see References 9 and 14 in section 17.0 for details).

10.1.2.4 Two entry ports, one for each of the standard and Type S pitot tubes, shall be cut in the test section. The standard pitot entry port shall be located slightly downstream of the Type S port, so that the standard and Type S impact openings will lie in the same cross-sectional plane during calibration. To facilitate alignment of the pitot tubes during calibration, it is advisable that the test section be constructed of Plexiglas^{TM} or some other transparent material.

10.1.3 Calibration Procedure. Note that this procedure is a general one and must not be used without first referring to the special considerations presented in section 10.1.5. Note also that this procedure applies only to single-velocity calibration. To obtain calibration data for the A and B sides of the Type S pitot tube, proceed as follows:

10.1.3.1 Make sure that the manometer is properly filled and that the oil is free from contamination and is of the proper density. Inspect and leak-check all pitot lines; repair or replace if necessary.

10.1.3.2 Level and zero the manometer. Switch on the fan, and allow the flow to stabilize. Seal the Type S pitot tube entry port.

10.1.3.3 Ensure that the manometer is level and zeroed. Position the standard pitot tube at the calibration point (determined as outlined in section 10.1.5.1), and align the tube so that its tip is pointed directly into the flow. Particular care should be taken in aligning the tube to avoid yaw and pitch angles. Make sure that the entry port surrounding the tube is properly sealed.

10.1.3.4 Read Δp_{std}, and record its value in a data table similar to the one shown in Figure 2-9. Remove the standard pitot tube from the duct, and disconnect it from the manometer. Seal the standard entry port.

10.1.3.5 Connect the Type S pitot tube to the manometer and leak-check. Open the Type S tube entry port. Check the manometer level and zero. Insert and align the Type S pitot tube so that its A side impact opening is at the same point as was the standard pitot tube and is pointed directly into the flow. Make sure that the entry port surrounding the tube is properly sealed.

10.1.3.6 Read Δp_s, and enter its value in the data table. Remove the Type S pitot tube from the duct, and disconnect it from the manometer.

10.1.3.7 Repeat Steps 10.1.3.3 through 10.1.3.6 until three pairs of Δp readings have been obtained for the A side of the Type S pitot tube.

10.1.3.8 Repeat Steps 10.1.3.3 through 10.1.3.7 for the B side of the Type S pitot tube.

10.1.3.9 Perform calculations as described in section 12.4. Use the Type S pitot tube only if the values of σ_A and σ_B are less than or equal to 0.01 and if the absolute value of the difference between $C_{p(A)}$ and $C_{p(B)}$ is 0.01 or less.

10.1.4 Special Considerations.

10.1.4.1 Selection of Calibration Point.

10.1.4.1.1 When an isolated Type S pitot tube is calibrated, select a calibration point at or near the center of the duct, and follow the procedures outlined in section 10.1.3. The Type S pitot coefficients measured or calculated, (*i.e.,* $C_{p(A)}$ and $C_{p(B)}$) will be valid, so long as either: (1) the isolated pitot tube is used; or (2) the pitot tube is used with other components (nozzle, thermocouple, sample probe) in an arrangement that is free from aerodynamic interference effects (see Figures 2-4, 2-7, and 2-8).

10.1.4.1.2 For Type S pitot tube-thermocouple combinations (without probe assembly), select a calibration point at or near the center of the duct, and follow the procedures outlined in section 10.1.3. The coefficients so obtained will be valid so long as the pitot tube-thermocouple combination is used by itself or with other components in an interference-free arrangement (Figures 2-4, 2-7, and 2-8).

10.1.4.1.3 For Type S pitot tube combinations with complete probe assemblies, the calibration point should be located at or near the center of the duct; however, insertion of a probe sheath into a small duct may cause significant cross-sectional area interference and blockage and yield incorrect coefficient values (Reference 9 in section 17.0). Therefore, to minimize the blockage effect, the calibration point may be a few inches off-center if necessary. The actual blockage effect will be negligible when the theoretical blockage, as determined by a projected-area model of the probe sheath, is 2 percent or less of the duct cross-sectional area for assemblies without external sheaths (Figure 2-10a), and 3 percent or less for assemblies with external sheaths (Figure 2-10b).

10.1.4.2 For those probe assemblies in which pitot tube-nozzle interference is a factor (i.e., those in which the pitot-nozzle separation distance fails to meet the specifications illustrated in Figure 2-7A), the value of $C_{p(s)}$ depends upon the amount of free space between the tube and nozzle and, therefore, is a function of nozzle size. In these instances, separate calibrations shall be performed with each of the commonly used nozzle sizes in place. Note that the single-velocity calibration technique is acceptable for this purpose, even though the larger nozzle sizes (>0.635 cm or $\frac{1}{4}$ in.) are not ordinarily used for isokinetic sampling at velocities around 910 m/min (3,000 ft/min), which is the calibration velocity. Note also that it is not necessary to draw an isokinetic sample during calibration (see Reference 19 in section 17.0).

10.1.4.3 For a probe assembly constructed such that its pitot tube is always used in the same orientation, only one side of the pitot tube need be calibrated (the side which will face the flow). The pitot tube must still meet the alignment specifications of Figure 2-2 or 2-3, however, and must have an average deviation (σ) value of 0.01 or less (see section 10.1.4.4).

10.1.5 Field Use and Recalibration.

10.1.5.1 Field Use.

10.1.5.1.1 When a Type S pitot tube (isolated or in an assembly) is used in the field, the appropriate coefficient value (whether assigned or obtained by calibration) shall be used to perform velocity calculations. For calibrated Type S pitot tubes, the A side coefficient shall be used when the A side of the tube faces the flow, and the B side coefficient shall be used when the B side faces the flow. Alternatively, the arithmetic average of the A and B side coefficient values may be used, irrespective of which side faces the flow.

10.1.5.1.2 When a probe assembly is used to sample a small duct, 30.5 to 91.4 cm (12 to 36 in.) in diameter, the probe sheath sometimes blocks a significant part of the duct cross-section, causing a reduction in the effective value of $C_{p(s)}$. Consult Reference 9 (see section 17.0) for details. Conventional pitot-sampling probe assemblies are not recommended for use in ducts having inside diameters smaller than 30.5 cm (12 in.) (see Reference 16 in section 17.0).

10.1.5.2 Recalibration.

10.1.5.2.1 Isolated Pitot Tubes. After each field use, the pitot tube shall be carefully reexamined in top, side, and end views. If the pitot face openings are still aligned within the specifications illustrated in Figure 2-2 and Figure 2-3, it can be assumed that the baseline coefficient of the pitot tube has not changed. If, however, the tube has been damaged to the extent that it no longer meets the specifications of Figure 2-2 and Figure 2-3, the damage shall either be repaired to restore proper alignment of the face openings, or the tube shall be discarded.

10.1.5.2.2 Pitot Tube Assemblies. After each field use, check the face opening alignment of the pitot tube, as in section 10.1.5.2.1. Also, remeasure the intercomponent spacings of the assembly. If the intercomponent spacings have not changed and the face opening alignment is acceptable, it can be assumed that the coefficient of the assembly has not changed. If the face opening alignment is no longer within the specifications of Figure 2-2 and Figure 2-3, either repair the damage or replace the pitot tube (calibrating the new assembly, if necessary). If the intercomponent spacings have changed, restore the original spacings, or recalibrate the assembly.

10.2 Standard Pitot Tube (if applicable). If a standard pitot tube is used for the velocity traverse, the tube shall be constructed according to the criteria of section 6.7 and shall be assigned a baseline coefficient value of 0.99. If the standard pitot tube is used as part of an assembly, the tube shall be in an interference-free arrangement (subject to the approval of the Administrator).

10.3 Temperature Sensors.

10.3.1 After each field use, calibrate dial thermometers, liquid-filled bulb thermometers, thermocouple-potentiometer systems, and other sensors at a temperature within 10 percent of the average absolute stack temperature. For temperatures up to 405 °C (761 °F), use an ASTM mercury-in-glass reference thermometer, or equivalent, as a reference. Alternatively, either a reference thermocouple and potentiometer (calibrated against NIST standards) or thermometric fixed points (*e.g.,* ice bath and boiling water, corrected for barometric pressure) may be used. For temperatures above 405 °C (761 °F), use a reference thermocouple-potentiometer system calibrated against NIST standards or an alternative reference, subject to the approval of the Administrator.

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor agree within 1.5 percent, the temperature data taken in the field shall be considered valid. Otherwise, the pollutant emission test shall either be considered invalid or adjustments (if appropriate) of the test results shall be made, subject to the approval of the Administrator.

10.4 Barometer. Calibrate the barometer used against a mercury barometer or NIST-traceable barometer prior to each field test.

11.0 Analytical Procedure

Sample collection and analysis are concurrent for this method (see section 8.0).

12.0 Data Analysis and Calculations

Carry out calculations, retaining at least one extra significant figure beyond that of the acquired data. Round off figures after final calculation.

12.1 Nomenclature.

A = Cross-sectional area of stack, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream (from Method 4 (reference method) or Method 5), proportion by volume.

C_p = Pitot tube coefficient, dimensionless.

$C_{p(s)}$=Type S pitot tube coefficient, dimensionless.

$C_{p(std)}$ = Standard pitot tube coefficient; use 0.99 if the coefficient is unknown and the tube is designed according to the criteria of sections 6.7.1 to 6.7.5 of this method.

D_e = Equivalent diameter.

K = 0.127 mm H_2O (metric units). 0.005 in. H_2O (English units).

K_p = Velocity equation constant.

L = Length.

M_d = Molecular weight of stack gas, dry basis (see section 8.6), g/g-mole (lb/lb-mole).

M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

n = Total number of traverse points.

P_{bar} = Barometric pressure at measurement site, mm Hg (in. Hg).

P_g = Stack static pressure, mm Hg (in. Hg).

P_s = Absolute stack pressure ($P_{bar} + P_g$), mm Hg (in. Hg),

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscm/hr (dscf/hr).

T = Sensitivity factor for differential pressure gauges.

$T_{s(abavg)}$ = Average absolute stack temperature, °K (°R).

= 273 + T_s for metric units,

= 460 + T_s for English units.

T_s = Stack temperature, °C ((°deg;F).

= 273 + T_s for metric units,

= 460 + T_s for English units.

T_{std} = Standard absolute temperature, 293 °K (528 °R).

V_s = Average stack gas velocity, m/sec (ft/sec).

W = Width.

Δp = Velocity head of stack gas, mm H_2O (in. H_{20}).

Δp_i = Individual velocity head reading at traverse point "i", mm (in.) H_2O.

Δp_{std} = Velocity head measured by the standard pitot tube, cm (in.) H_2O.

Δp_s = Velocity head measured by the Type S pitot tube, cm (in.) H_2O.

3600 = Conversion Factor, sec/hr.

18.0 = Molecular weight of water, g/g-mole (lb/lb-mole).

12.2 Calculate T as follows:

$$T = \frac{\sum_{i=1}^{n} \sqrt{\Delta p_i + K}}{\sum_{i=1}^{n} \sqrt{\Delta p_i}} \qquad \text{Eq. 2-1}$$

12.3 Calculate D_e as follows:

$$D_e = \frac{2LW}{L+W} \qquad \text{Eq. 2-2}$$

12.4 Calibration of Type S Pitot Tube.

12.4.1 For each of the six pairs of Δp readings (i.e., three from side A and three from side B) obtained in section 10.1.3, calculate the value of the Type S pitot tube coefficient according to Equation 2-3:

$$C_{p(s)} = C_{p(std)}\sqrt{\frac{\Delta p_{std}}{\Delta p}} \qquad \text{Eq. 2-3}$$

12.4.2 Calculate $C_{p(A)}$, the mean A-side coefficient, and $C_{p(B)}$, the mean B-side coefficient. Calculate the difference between these two average values.

12.4.3 Calculate the deviation of each of the three A-side values of $C_{p(s)}$ from $C_{p(A)}$, and the deviation of each of the three B-side values of $C_{p(s)}$ from $C_{p(B)}$, using Equation 2-4:

$$\text{Deviation} = C_{p(s)} - \overline{C}_{p(\text{A or B})} \qquad \text{Eq. 2-4}$$

12.4.4 Calculate σ the average deviation from the mean, for both the A and B sides of the pitot tube. Use Equation 2-5:

$$\sigma_{(\text{A or B})} = \frac{\sum_{i=1}^{3}\left|C_{p(s)} - \overline{C}_{p(\text{A or B})}\right|}{3} \qquad \text{Eq. 2-5}$$

12.5 Molecular Weight of Stack Gas.

$$M_s = M_d\,(1 - B_{ws}) + 18.0B_{ws} \qquad \text{Eq. 2-6}$$

12.6 Average Stack Gas Velocity.

$$V_s = K_p\,C_p\left[\frac{\sum_{i=1}^{n}\sqrt{\Delta p_i}}{n}\right]\sqrt{\frac{T_{s(abavg)}}{P_s\,M_s}} \qquad \text{Eq. 2-7}$$

Where:

$$K_p = 34.97\frac{m}{\sec}\left[\frac{(g/g-mole)(mm\ Hg)}{(^{o}K)(mm\ H_2O)}\right]^{1/2} \qquad \textit{Metric}$$

$$= 85.49\frac{ft}{\sec}\left[\frac{(lb/lb-mole)(in.\ Hg)}{(^{o}R)(in.\ H_2O)}\right]^{1/2} \qquad \textit{English}$$

12.7 Average Stack Gas Dry Volumetric Flow Rate.

$$Q = 3600(1 - \mathrm{B_{ws}})v_s A \left[\frac{T_{std}P_s}{T_{s(abavg)}P_{std}}\right] \quad Eq. 2-8$$

13.0 Method Performance [Reserved]

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 References

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16. Vollaro, R.F. Recommended Procedure for Sample Traverses in Ducts Smaller than 12 Inches in Diameter. U.S. Environmental Protection Agency, Emission Measurement Branch, Research Triangle Park, NC. November 1976.

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17.0 Tables, Diagrams, Flowcharts, and Validation Data

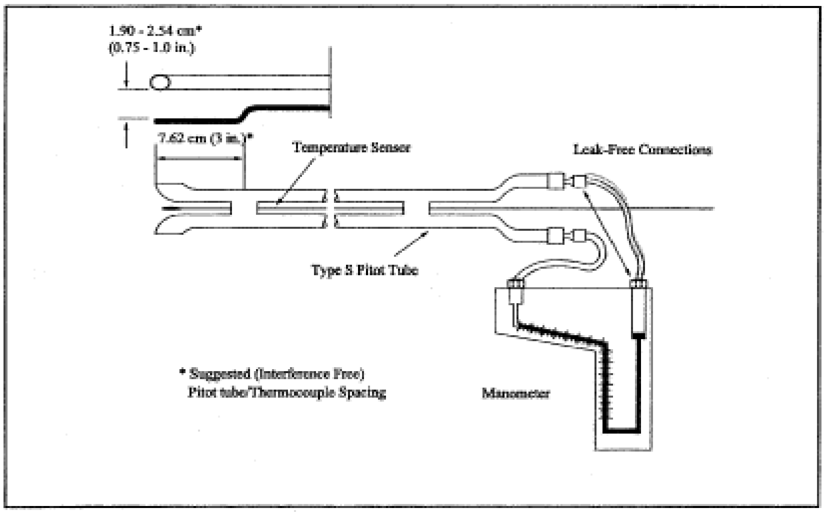
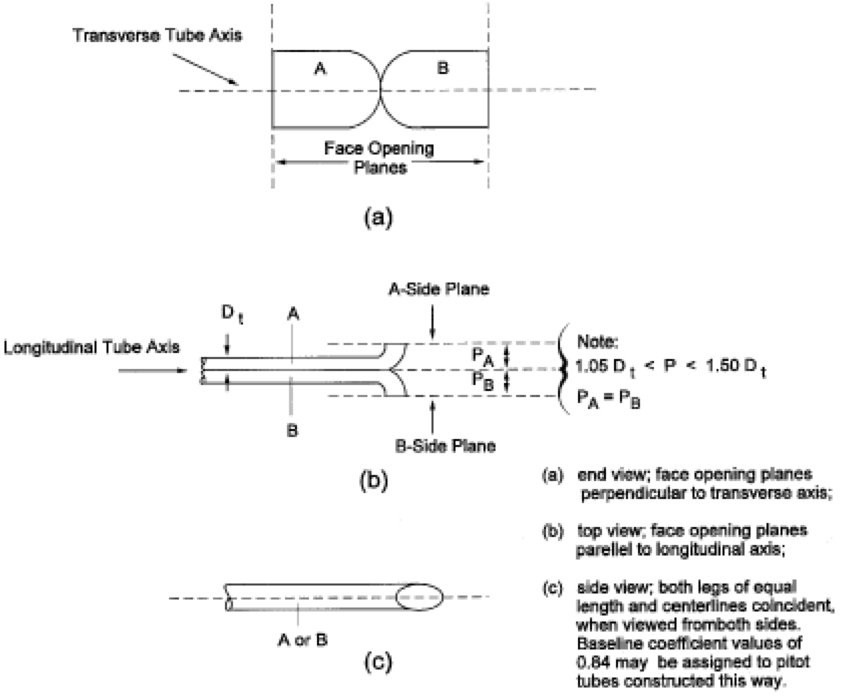


Figure 2-1. Type S Pitot Tube Manometer Assembly.



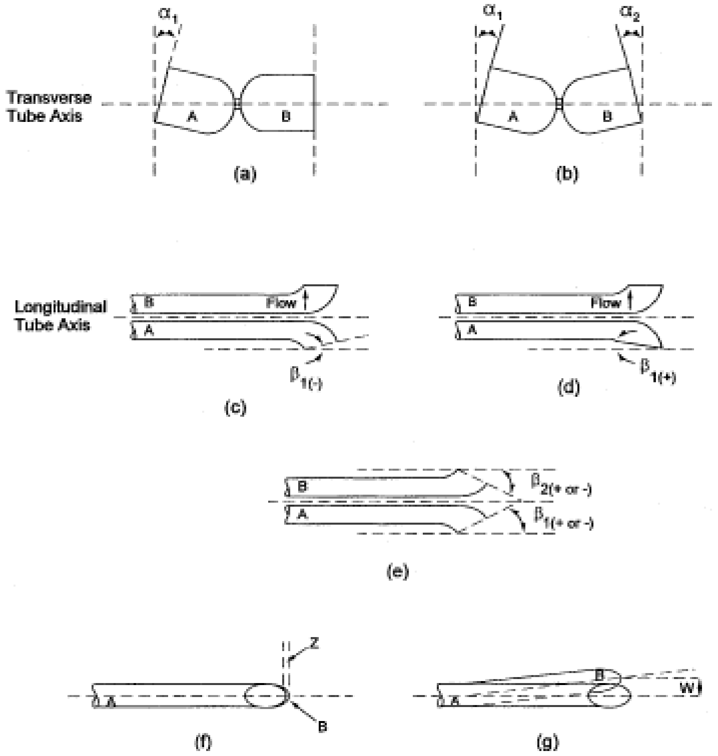
Note:
$1.05\ D_t < P < 1.50\ D_t$
$P_A = P_B$

(a) end view; face opening planes perpendicular to transverse axis;

(b) top view; face opening planes parellel to longitudinal axis;

(c) side view; both legs of equal length and centerlines coincident, when viewed fromboth sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

Figure 2-2. Properly Constructed Type S Pitot Tube.



The types of face-opening misalignment shown above will not affect the baseline value of $C_{p(s)}$ so long as α_1 and $\alpha_2 \leq 10°$, β_1 and $\beta_2 \leq 5°$, $z \leq 0.32$ cm (1/8 in.), and $w \leq 0.08$ cm (1/32 in.) (Reference 11.0 in Section 16.0)

Figure 2-3. Types of face-opening misalignments that can result from field use or improper construction of type S pitot tubes.

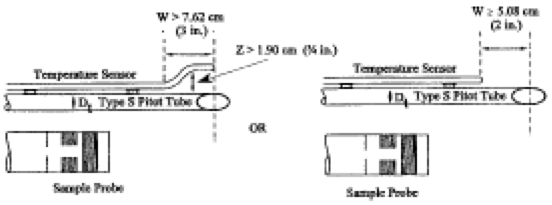


Figure 2-4. Proper temperature sensor placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in).

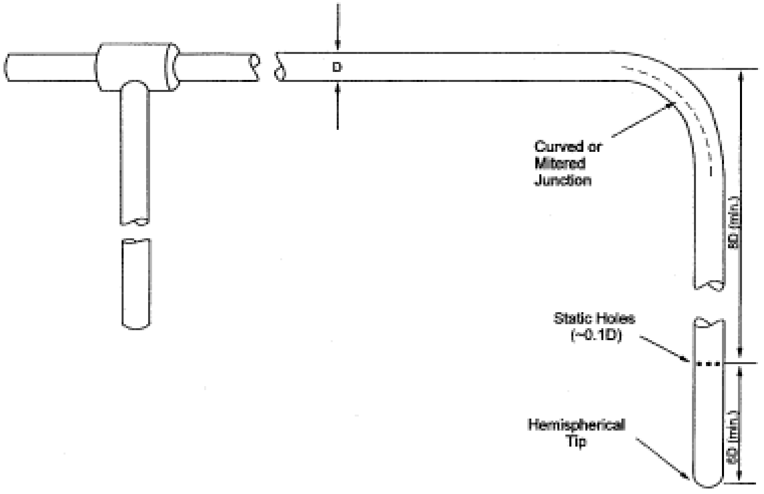


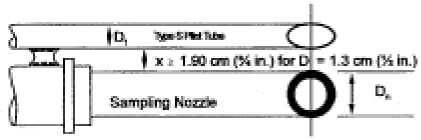
Figure 2-5. Standard pitot tube design specifications.

PLANT____________________
DATE____________________
RUN NO.____________________
STACK DIA. OR DIMENSIONS, m (in.)____________________
BAROMETRIC PRESS., mm Hg (in. Hg)____________________
CROSS SECTIONAL AREA, m^2 (ft^2)____________________
OPERATORS____________________
PITOT TUBE I.D. NO.____________________
AVG. COEFFICIENT, Cp =____________________
LAST DATE CALIBRATED____________________

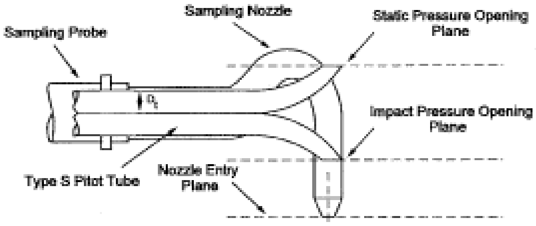
SCHEMATIC OF STACK CROSS SECTION

Traverse Pt. No.	**Vel. Hd., Δp mm (in.) H_2O**	**Stack temperature**		**P_g mm Hg (in. Hg)**	**(Δp)1/2**
		T_s, °C ((°deg;F)	**T_s, °K (°R)**		
	Average(1)				

Figure 2-6. Velocity Traverse Data



A. Bottom View; showing minimum pitot tube-nozzle separation.



B. Side View; to prevent pitot tube from interfering with gas flow streamlines approaching the nozzle. The impact pressure opening plane of the pitot tube shall be even with or above the nozzle entry plane.

Figure 2-7. Proper pitot tube-sampling nozzle configuration.

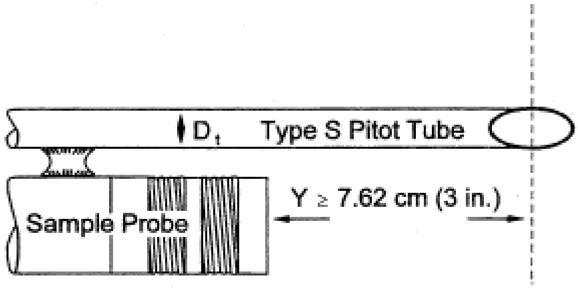


Figure 2-8. Minimum pitot-sample probe separation needed to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in).

PITOT TUBE IDENTIFICATION NUMBER:
DATE:
CALIBRATED BY:

“A” SIDE CALIBRATION

Run No.	**ΔP_{std}** **cm H_2O** **(in H_2O)**	**$\Delta P(_{s})$** **cm H_2O** **(in H_2O)**	**$C_{p(s)}$**	**Deviation** **$C_{p(s)}$—$C_p(A)$**
1				
2				
3				
		$C_{p,\ avg}$ (SIDE A)		

“B” SIDE CALIBRATION

Run No.	**ΔP_{std}** **cm H_2O** **(in H_2O)**	**$\Delta P_{(s)}$** **cm H_2O** **(in H_2O)**	**$C_{p(s)}$**	**Deviation** **$C_{p(s)}$—$C_p(B)$**
1				
2				
3				
		$C_{p,\ avg}$ (SIDE B)		

$$\sigma_{A \text{ or } B} = \frac{\sum_{i=1}^{3}\left|C_{p(s)} - \bar{C}_{p(A \text{ or } B)}\right|}{3} \qquad Eq.\ 2\text{-}5$$

[Cp, avg (side A)—Cp, avg (side B)]*

*Must be less than or equal to 0.01

Figure 2-9. Pitot Tube Calibration Data

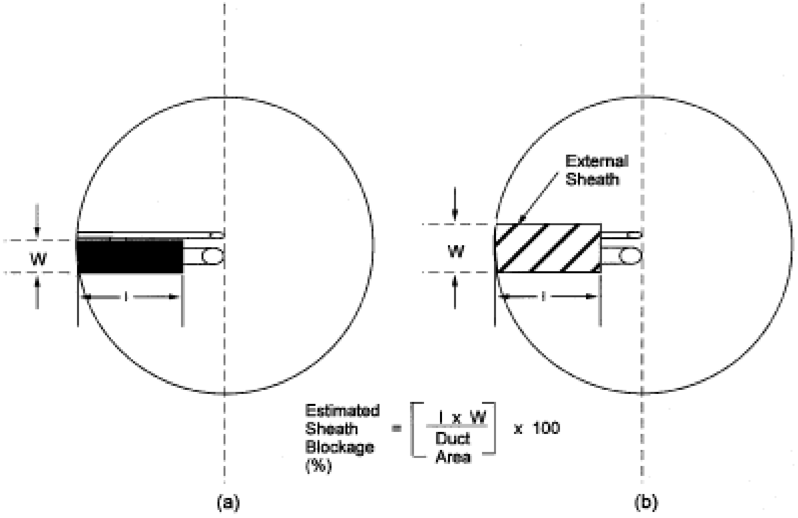


Figure 2-10. Projected-area models for typical pitot tube assemblies.

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http://www.ecfr.gov/cgi-bin/text-idx?SID=d5e070facf01b589cd2c172172bd4594&node=40:8.0.1.1.1&rgn=div5#40:8.0.1.1.1.0.1.1.2

METHOD 3A—DETERMINATION OF OXYGEN AND CARBON DIOXIDE CONCENTRATIONS IN EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

1.0 Scope and Application

What is Method 3A?

Method 3A is a procedure for measuring oxygen (O_2) and carbon dioxide (CO_2) in stationary source emissions using a continuous instrumental analyzer. Quality assurance and quality control requirements are included to assure that you, the tester, collect data of known quality. You must document your adherence to these specific requirements for equipment, supplies, sample collection and analysis, calculations, and data analysis.

This method does not completely describe all equipment, supplies, and sampling and analytical procedures you will need but refers to other methods for some of the details. Therefore, to obtain reliable results, you should also have a thorough knowledge of these additional test methods which are found in appendix A to this part:

(a) Method 1—Sample and Velocity Traverses for Stationary Sources.

(b) Method 3—Gas Analysis for the Determination of Molecular Weight.

(c) Method 4—Determination of Moisture Content in Stack Gases.

(d) Method 7E—Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure).

1.1 *Analytes. What does this method determine?* This method measures the concentration of oxygen and carbon dioxide.

Analyte	**CAS No.**	**Sensitivity**
Oxygen (O_2)	7782-44-7	Typically <2% of Calibration Span.
Carbon dioxide (CO_2)	124-38-9	Typically <2% of Calibration Span.

1.2 *Applicability. When is this method required?* The use of Method 3A may be required by specific New Source Performance Standards, Clean Air Marketing rules, State Implementation Plans and permits, where measurements of O_2 and CO_2 concentrations in stationary source emissions must be made, either to determine compliance with an applicable emission standard or to conduct performance testing of a continuous emission monitoring system (CEMS). Other regulations may also require the use of Method 3A.

1.3 *Data Quality Objectives. How good must my collected data be?* Refer to section 1.3 of Method 7E.

2.0 Summary of Method

In this method, you continuously or intermittently sample the effluent gas and convey the sample to an analyzer that measures the concentration of O_2 or CO_2. You must meet the performance requirements of this method to validate your data.

3.0 Definitions

Refer to section 3.0 of Method 7E for the applicable definitions.

4.0 Interferences [Reserved]

5.0 Safety

Refer to section 5.0 of Method 7E.

6.0 Equipment and Supplies

Figure 7E-1 in Method 7E is a schematic diagram of an acceptable measurement system.

6.1 What do I need for the measurement system? The components of the measurement system are described (as applicable) in sections 6.1 and 6.2 of Method 7E, except that the analyzer described in section 6.2 of this method must be used instead of the analyzer described in Method 7E. You must follow the noted specifications in section 6.1 of Method 7E except that the requirements to use stainless steel, Teflon, or non-reactive glass filters do not apply. Also, a heated sample line is not required to transport dry gases or for systems that measure the O_2 or CO_2 concentration on a dry basis, provided that the system is not also being used to concurrently measure SO_2 and/or NO_X.

6.2 What analyzer must I use? You must use an analyzer that continuously measures O_2 or CO_2 in the gas stream and meets the specifications in section 13.0.

7.0 Reagents and Standards

7.1 Calibration Gas. *What calibration gases do I need?* Refer to Section 7.1 of Method 7E for the calibration gas requirements. Example calibration gas mixtures are listed below. Pre-cleaned or scrubbed air may be used for the O_2 high-calibration gas provided it does not contain other gases that interfere with the O_2 measurement.

(a) CO_2 in Nitrogen (N_2).

(b) CO_2/SO_2 gas mixture in N_2.

(c) O_2/SO_2 gas mixture in N_2.

(d) $O_2/CO_2/SO_2$ gas mixture in N_2.

(e) CO_2/NO_X gas mixture in N_2.

(f) $CO_2/SO_2/NO_X$ gas mixture in N_2.

The tests for analyzer calibration error and system bias require high-, mid-, and low-level gases.

7.2 Interference Check. What reagents do I need for the interference check? Potential interferences may vary among available analyzers. Table 7E-3 of Method 7E lists a number of gases that should be considered in conducting the interference test.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Sampling Site and Sampling Points. You must follow the procedures of section 8.1 of Method 7E to determine the appropriate sampling points, unless you are using Method 3A only to determine the stack gas molecular weight and for no other purpose. In that case, you may use single-point integrated sampling as described in section 8.2.1 of Method 3. If the stratification test provisions in section 8.1.2 of Method 7E are used to reduce the number of required sampling points, the alternative acceptance criterion for 3-point sampling will be ±0.5 percent CO_2 or O_2, and the alternative acceptance criterion for single-point sampling will be ±0.3 percent CO_2 or O_2. In that case, you may use single-point integrated sampling as described in section 8.2.1 of Method 3.

8.2 Initial Measurement System Performance Tests. You must follow the procedures in section 8.2 of Method 7E. If a dilution-type measurement system is used, the special considerations in section 8.3 of Method 7E apply.

8.3 Interference Check. The O_2 or CO_2 analyzer must be documented to show that interference effects to not exceed 2.5 percent of the calibration span. The interference test in section 8.2.7 of Method 7E is a procedure that may be used to show this. The effects of all potential interferences at the concentrations encountered during testing must be addressed and documented. This testing and documentation may be done by the instrument manufacturer.

8.4 Sample Collection. You must follow the procedures in section 8.4 of Method 7E.

8.5 Post-Run System Bias Check and Drift Assessment. You must follow the procedures in section 8.5 of Method 7E.

9.0 Quality Control

Follow quality control procedures in section 9.0 of Method 7E.

10.0 Calibration and Standardization

Follow the procedures for calibration and standardization in section 10.0 of Method 7E.

11.0 Analytical Procedures

Because sample collection and analysis are performed together (see section 8), additional discussion of the analytical procedure is not necessary.

12.0 Calculations and Data Analysis

You must follow the applicable procedures for calculations and data analysis in section 12.0 of Method 7E, substituting percent O_2 and percent CO_2 for ppmv of NO_X as appropriate.

13.0 Method Performance

The specifications for the applicable performance checks are the same as in section 13.0 of Method 7E except for the alternative specifications for system bias, drift, and calibration error. In these alternative specifications, replace the term "0.5 ppmv" with the term "0.5 percent O_2" or "0.5 percent CO_2" (as applicable).

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures [Reserved]

17.0 References

1. "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards" September 1997 as amended, EPA-600/R-97/121.

18.0 Tables, Diagrams, Flowcharts, and Validation Data

Refer to section 18.0 of Method 7E.

METHOD 5—DETERMINATION OF PARTICULATE MATTER EMISSIONS FROM STATIONARY SOURCES

NOTE: This method does not include all of the specifications (*e.g.,* equipment and supplies) and procedures (*e.g.,* sampling and analytical) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test methods: Method 1, Method 2, Method 3.

1.0 Scope and Application

1.1 Analyte. Particulate matter (PM). No CAS number assigned.

1.2 Applicability. This method is applicable for the determination of PM emissions from stationary sources.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature of 120 ±14 °C (248 ±25 °F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after the removal of uncombined water.

3.0 Definitions [Reserved]

4.0 Interferences [Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies

6.1 Sample Collection. The following items are required for sample collection:

6.1.1 Sampling Train. A schematic of the sampling train used in this method is shown in Figure 5-1 in section 18.0. Complete construction details are given in APTD-0581 (Reference 2 in section 17.0); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, see the following subsections.

NOTE: The operating and maintenance procedures for the sampling train are described in APTD-0576 (Reference 3 in section 17.0). Since correct usage is important in obtaining valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein.

6.1.1.1 Probe Nozzle. Stainless steel (316) or glass with a sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. If made of stainless steel, the nozzle shall be constructed from seamless tubing. Other materials of construction may be used, subject to the approval of the Administrator. A range of nozzle sizes suitable for isokinetic sampling should be available. Typical nozzle sizes range from 0.32 to 1.27 cm ($^1/_8$ to $^1/_2$in) inside diameter (ID) in increments of 0.16 cm ($^1/_{16}$ in). Larger nozzles sizes are also available if higher volume sampling trains are used. Each nozzle shall be calibrated, according to the procedures outlined in section 10.1.

6.1.1.2 Probe Liner. Borosilicate or quartz glass tubing with a heating system capable of maintaining a probe gas temperature during sampling of 120 ±14 °C (248 ±25 °F), or such other temperature as specified by an applicable subpart of the standards or as approved by the Administrator for a particular application. Since the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and utilizing the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) will be considered acceptable. Either borosilicate or quartz glass probe liners may be used for stack temperatures up to about 480 °C (900 °F); quartz glass liners shall be used for temperatures between 480 and 900 °C (900 and 1,650 °F). Both types of liners may be used at higher temperatures than specified for short periods of time, subject to the approval of the Administrator. The softening temperature for borosilicate glass is 820 °C (1500 °F), and for quartz glass it is 1500 °C (2700 °F). Whenever practical, every effort should be made to use borosilicate or quartz glass probe liners. Alternatively, metal liners (e.g., 316 stainless steel, Incoloy 825 or other corrosion resistant metals) made of seamless tubing may be used, subject to the approval of the Administrator.

6.1.1.3 Pitot Tube. Type S, as described in section 6.1 of Method 2, or other device approved by the Administrator. The pitot tube shall be attached to the probe (as shown in Figure 5-1) to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see Method 2, Figure 2-7) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in section 10.0 of Method 2.

6.1.1.4 Differential Pressure Gauge. Inclined manometer or equivalent device (two), as described in section 6.2 of Method 2. One manometer shall be used for velocity head (Δp) readings, and the other, for orifice differential pressure readings.

6.1.1.5 Filter Holder. Borosilicate glass, with a glass or Teflon frit filter support and a silicone rubber gasket. Other materials of construction (e.g., stainless steel or Viton) may be used, subject to the approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The holder shall be attached immediately at the outlet of the probe (or cyclone, if used).

6.1.1.6 Filter Heating System. Any heating system capable of monitoring and maintaining temperature around the filter shall be used to ensure the sample gas temperature exiting the filter of 120 ± 14 °C (248 ± 25 °F) during sampling or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The monitoring and regulation of the temperature around the filter may be done with the filter temperature sensor or another temperature sensor.

6.1.1.7 Filter Temperature Sensor. A temperature sensor capable of measuring temperature to within ±3 °C (5.4 °F) shall be installed so that the sensing tip of the temperature sensor is in direct contact with the sample gas exiting the filter. The sensing tip of the sensor may be encased in glass, Teflon, or metal and must protrude at least ½ in. into the sample gas exiting the filter. The filter temperature sensor must be monitored and recorded during sampling to ensure a sample gas temperature exiting the filter of 120 ± 14 °C (248 ± 25 °F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application.

6.1.1.8 Condenser. The following system shall be used to determine the stack gas moisture content: Four impingers connected in series with leak-free ground glass fittings or any similar leak-free noncontaminating fittings. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with a 1.3 cm (½ in.) ID glass tube extending to about 1.3 cm (½ in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. Modifications (e.g., using flexible connections between the impingers, using materials other than glass, or using flexible vacuum lines to connect the filter holder to the condenser) may be used, subject to the approval of the Administrator. The first and second impingers shall contain known quantities of water (Section 8.3.1), the third shall be empty, and the fourth shall contain a known weight of silica gel, or equivalent desiccant. A temperature sensor, capable of measuring temperature to within 1 °C (2 °F) shall be placed at the outlet of the fourth impinger for monitoring purposes. Alternatively, any system that cools the sample gas stream and allows measurement of the water condensed and moisture leaving the condenser, each to within 1 ml or 1 g may be used, subject to the approval of the Administrator. An acceptable technique involves the measurement of condensed water either gravimetrically or volumetrically and the determination of the moisture leaving the condenser by: (1) monitoring the temperature and pressure at the exit of the condenser and using Dalton's law of partial pressures; or (2) passing the sample gas stream through a tared silica gel (or equivalent desiccant) trap with exit gases kept below 20 °C (68 °F) and determining the weight gain. If means other than silica gel are used to determine the amount of moisture leaving the condenser, it is recommended that silica gel (or equivalent) still be used between the condenser system and pump to prevent moisture condensation in the pump and metering devices and to avoid the need to make corrections for moisture in the metered volume.

NOTE: If a determination of the PM collected in the impingers is desired in addition to moisture content, the impinger system described above shall be used, without modification. Individual States or control agencies requiring this information shall be contacted as to the sample recovery and analysis of the impinger contents.

6.1.1.9 Metering System. Vacuum gauge, leak-free pump, calibrated temperature sensors (rechecked at at least one point after each test), dry gas meter (DGM) capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 5-1. Alternatively, an Isostack metering system may be used if all Method 5 calibrations are performed, with the exception of those related to ΔH@ in Section 9.2.1, wherein the sample flow rate system shall be calibrated in lieu of ΔH@ and shall not deviate by more than 5 percent. Other metering systems capable of maintaining sampling rates within 10 percent of isokinetic and of determining sample volumes to within 2 percent may be used, subject to the approval of the Administrator. When the metering system is used in conjunction with a pitot tube, the system shall allow periodic checks of isokinetic rates.

6.1.1.10 Sampling trains utilizing metering systems designed for higher flow rates than that described in APTD-0581 or APTD-0576 may be used provided that the specifications of this method are met.

6.1.2 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in.).

NOTE: The barometric pressure reading may be obtained from a nearby National Weather Service station. In this case, the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be made at a rate of minus 2.5 mm Hg (0.1 in.) per 30 m (100 ft) elevation increase or plus 2.5 mm Hg (0.1 in) per 30 m (100 ft) elevation decrease.

6.1.3 Gas Density Determination Equipment. Temperature sensor and pressure gauge, as described in sections 6.3 and 6.4 of Method 2, and gas analyzer, if necessary, as described in Method 3. The temperature sensor shall, preferably, be permanently attached to the pitot tube or sampling probe in a fixed configuration, such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see Method 2, Figure 2-4). As a second alternative, if a difference of not more than 1 percent in the average velocity measurement is to be introduced, the temperature sensor need not be attached to the probe or pitot tube. (This alternative is subject to the approval of the Administrator.)

6.2 Sample Recovery. The following items are required for sample recovery:

6.2.1 Probe-Liner and Probe-Nozzle Brushes. Nylon bristle brushes with stainless steel wire handles. The probe brush shall have extensions (at least as long as the probe) constructed of stainless steel, Nylon, Teflon, or similarly inert material. The brushes shall be properly sized and shaped to brush out the probe liner and nozzle.

6.2.2 Wash Bottles. Two Glass wash bottles are recommended. Alternatively, polyethylene wash bottles may be used. It is recommended that acetone not be stored in polyethylene bottles for longer than a month.

6.2.3 Glass Sample Storage Containers. Chemically resistant, borosilicate glass bottles, for acetone washes, 500 ml or 1000 ml. Screw cap liners shall either be rubber-backed Teflon or shall be constructed so as to be leak-free and resistant to chemical attack by acetone. (Narrow mouth glass bottles have been found to be less prone to leakage.) Alternatively, polyethylene bottles may be used.

6.2.4 Petri Dishes. For filter samples; glass or polyethylene, unless otherwise specified by the Administrator.

6.2.5 Graduated Cylinder and/or Balance. To measure condensed water to within 1 ml or 0.5 g. Graduated cylinders shall have subdivisions no greater than 2 ml.

6.2.6 Plastic Storage Containers. Air-tight containers to store silica gel.

6.2.7 Funnel and Rubber Policeman. To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

6.2.8 Funnel. Glass or polyethylene, to aid in sample recovery.

6.3 Sample Analysis. The following equipment is required for sample analysis:

6.3.1 Glass Weighing Dishes.

6.3.2 Desiccator.

6.3.3 Analytical Balance. To measure to within 0.1 mg.

6.3.4 Balance. To measure to within 0.5 g.

6.3.5 Beakers. 250 ml.

6.3.6 Hygrometer. To measure the relative humidity of the laboratory environment.

6.3.7 Temperature Sensor. To measure the temperature of the laboratory environment.

7.0 Reagents and Standards

7.1 Sample Collection. The following reagents are required for sample collection:

7.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3 micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM Method D 2986-71, 78, or 95a (incorporated by reference—see §60.17). Test data from the supplier's quality control program are sufficient for this purpose. In sources containing SO_2 or SO_3, the filter material must be of a type that is unreactive to SO_2 or SO_3. Reference 10 in section 17.0 may be used to select the appropriate filter.

7.1.2 Silica Gel. Indicating type, 6 to 16 mesh. If previously used, dry at 175 °C (350 °F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

7.1.3 Water. When analysis of the material caught in the impingers is required, deionized distilled water [to conform to ASTM D1193-77 or 91 Type 3 (incorporated by reference—see §60.17)] with at least <0.001 percent residue shall be used or as specified in the applicable method requiring analysis of the water. Run reagent blanks prior to field use to eliminate a high blank on test samples.

7.1.4 Crushed Ice.

7.2 Sample Recovery. Acetone, reagent grade, ≤0.001 percent residue, in glass bottles, is required. Acetone from metal containers generally has a high residue blank and should not be used. Sometimes, suppliers transfer acetone to glass bottles from metal containers; thus, acetone blanks shall be run prior to field use and only acetone with low blank values (≤0.001 percent) shall be used. In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight.

7.3 Sample Analysis. The following reagents are required for sample analysis:

7.3.1 Acetone. Same as in section 7.2.

7.3.2 Desiccant. Anhydrous calcium sulfate, indicating type. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Pretest Preparation. It is suggested that sampling equipment be maintained according to the procedures described in APTD-0576. Alternative mercury-free thermometers may be used if the thermometers are at a minimum equivalent in terms of performance or suitably effective for the specific temperature measurement application.

8.1.1 Place 200 to 300 g of silica gel in each of several air-tight containers. Weigh each container, including silica gel, to the nearest 0.5 g, and record this weight. As an alternative, the silica gel need not be preweighed, but may be weighed directly in its impinger or sampling holder just prior to train assembly.

8.1.2 Check filters visually against light for irregularities, flaws, or pinhole leaks. Label filters of the proper diameter on the back side near the edge using numbering machine ink. As an alternative, label the shipping containers (glass or polyethylene petri dishes), and keep each filter in its identified container at all times except during sampling.

8.1.3 Desiccate the filters at 20 ±5.6 °C (68 ±10 °F) and ambient pressure for at least 24 hours. Weigh each filter (or filter and shipping container) at intervals of at least 6 hours to a constant weight (*i.e.,* ≤0.5 mg change from previous weighing). Record results to the nearest 0.1 mg. During each weighing, the period for which the filter is exposed to the laboratory atmosphere shall be less than 2 minutes. Alternatively (unless otherwise specified by the Administrator), the filters may be oven dried at 105 °C (220 °F) for 2 to 3 hours, desiccated for 2 hours, and weighed. Procedures other than those described, which account for relative humidity effects, may be used, subject to the approval of the Administrator.

8.2 Preliminary Determinations.

8.2.1 Select the sampling site and the minimum number of sampling points according to Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and the range of velocity heads using Method 2; it is recommended that a leak check of the pitot lines (see Method 2, section 8.1) be performed. Determine the moisture content using Approximation Method 4 or its alternatives for the purpose of making isokinetic sampling rate settings. Determine the stack gas dry molecular weight, as described in Method 2, section 8.6; if integrated Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the particulate sample run.

8.2.2 Select a nozzle size based on the range of velocity heads, such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see section 8.3 of Method 2).

8.2.3 Select a suitable probe liner and probe length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the required probe length.

8.2.4 Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that (l) the sampling time per point is not less than 2 minutes (or some greater time interval as specified by the Administrator), and (2) the sample volume taken (corrected to standard conditions) will exceed the required minimum total gas sample volume. The latter is based on an approximate average sampling rate.

8.2.5 The sampling time at each point shall be the same. It is recommended that the number of minutes sampled at each point be an integer or an integer plus one-half minute, in order to avoid timekeeping errors.

8.2.6 In some circumstances (*e.g.,* batch cycles) it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

8.3 Preparation of Sampling Train.

8.3.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin. Place 100 ml of water in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

8.3.2 Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

8.3.3 When glass probe liners are used, install the selected nozzle using a Viton A O-ring when stack temperatures are less than 260 °C (500 °F) or a heat-resistant string gasket when temperatures are higher. See APTD-0576 for details. Other connecting systems using either 316 stainless steel or Teflon ferrules may be used. When metal liners are used, install the nozzle as discussed above or by a leak-free direct mechanical connection. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

8.3.4 Set up the train as shown in Figure 5-1 ensuring that the connections are leak-tight. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack gas.

8.3.5 Place crushed ice around the impingers.

8.4 Leak-Check Procedures.

8.4.1 Leak Check of Metering System Shown in Figure 5-1. That portion of the sampling train from the pump to the orifice meter should be leak-checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 5-2): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 to 18 cm (5 to 7 in.) water column by blowing into the rubber tubing. Pinch off the tubing, and observe the manometer for one minute. A loss of pressure on the manometer indicates a leak in the meter box; leaks, if present, must be corrected.

8.4.2 Pretest Leak Check. A pretest leak check of the sampling train is recommended, but not required. If the pretest leak check is conducted, the following procedure should be used.

8.4.2.1 After the sampling train has been assembled, turn on and set the filter and probe heating systems to the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 380 mm (15 in.) Hg vacuum.

NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.

8.4.2.2 If a heat-resistant string is used, do not connect the probe to the train during the leak check. Instead, leak-check the train by first plugging the inlet to the filter holder (cyclone, if applicable) and pulling a 380 mm (15 in.) Hg vacuum (see note in section 8.4.2.1). Then connect the probe to the train, and leak-check at approximately 25 mm (1 in.) Hg vacuum; alternatively, the probe may be leak-checked with the rest of the sampling train, in one step, at 380 mm (15 in.) Hg vacuum. Leakage rates in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.020 cfm), whichever is less, are unacceptable.

8.4.2.3 The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with the bypass valve fully open and the coarse adjust valve completely closed. Partially open the coarse adjust valve, and slowly close the bypass valve until the desired vacuum is reached. Do not reverse the direction of the bypass valve, as this will cause water to back up into the filter holder. If the desired vacuum is exceeded, either leak-check at this higher vacuum, or end the leak check and start over.

8.4.2.4 When the leak check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable), and immediately turn off the vacuum pump. This prevents the water in the impingers from being forced backward into the filter holder and the silica gel from being entrained backward into the third impinger.

8.4.3 Leak Checks During Sample Run. If, during the sampling run, a component (*e.g.,* filter assembly or impinger) change becomes necessary, a leak check shall be conducted immediately before the change is made. The leak check shall be done according to the procedure outlined in section 8.4.2 above, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.020 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered; if, however, a higher leakage rate is obtained, either record the leakage rate and plan to correct the sample volume as shown in section 12.3 of this method, or void the sample run.

NOTE: Immediately after component changes, leak checks are optional. If such leak checks are done, the procedure outlined in section 8.4.2 above should be used.

8.4.4 Post-Test Leak Check. A leak check of the sampling train is mandatory at the conclusion of each sampling run. The leak check shall be performed in accordance with the procedures outlined in section 8.4.2, except that it shall be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3 min (0.020 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, either record the leakage rate and correct the sample volume as shown in section 12.3 of this method, or void the sampling run.

8.5 Sampling Train Operation. During the sampling run, maintain an isokinetic sampling rate (within 10 percent of true isokinetic unless otherwise specified by the Administrator) and a sample gas temperature through the filter of 120 ± 14 °C (248 ± 25 °F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator.

8.5.1 For each run, record the data required on a data sheet such as the one shown in Figure 5-3. Be sure to record the initial DGM reading. Record the DGM readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak check, and when sampling is halted. Take other readings indicated by Figure 5-3 at least once at each sample point during each time increment and additional readings when significant changes (20 percent variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

8.5.2 Clean the portholes prior to the test run to minimize the chance of collecting deposited material. To begin sampling, verify that the filter and probe heating systems are up to temperature, remove the nozzle cap, verify that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump, and adjust the flow to isokinetic conditions. Nomographs are available which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations. These nomographs are designed for use when the Type S pitot tube coefficient (C_p) is 0.85 ±0.02, and the stack gas equivalent density [dry molecular weight (M_d)] is equal to 29 ±4. APTD-0576 details the procedure for using the nomographs. If C_p and M_d are outside the above stated ranges, do not use the nomographs unless appropriate steps (see Reference 7 in section 17.0) are taken to compensate for the deviations.

8.5.3 When the stack is under significant negative pressure (*i.e.,* height of impinger stem), take care to close the coarse adjust valve before inserting the probe into the stack to prevent water from backing into the filter holder. If necessary, the pump may be turned on with the coarse adjust valve closed.

8.5.4 When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

8.5.5 Traverse the stack cross-section, as required by Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the portholes; this minimizes the chance of extracting deposited material.

8.5.6 During the test run, make periodic adjustments to keep the temperature around the filter holder at the proper level to maintain the sample gas temperature exiting the filter; add more ice and, if necessary, salt to maintain a temperature of less than 20 °C (68 °F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

8.5.7 If the pressure drop across the filter becomes too high, making isokinetic sampling difficult to maintain, the filter may be replaced in the midst of the sample run. It is recommended that another complete filter assembly be used rather than attempting to change the filter itself. Before a new filter assembly is installed, conduct a leak check (see section 8.4.3). The total PM weight shall include the summation of the filter assembly catches.

8.5.8 A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator.

NOTE: When two or more trains are used, separate analyses of the front-half and (if applicable) impinger catches from each train shall be performed, unless identical nozzle sizes were used on all trains, in which case, the front-half catches from the individual trains may be combined (as may the impinger catches) and one analysis of front-half catch and one analysis of impinger catch may be performed. Consult with the Administrator for details concerning the calculation of results when two or more trains are used.

8.5.9 At the end of the sample run, close the coarse adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final DGM meter reading, and conduct a post-test leak check, as outlined in section 8.4.4. Also, leak-check the pitot lines as described in Method 2, section 8.1. The lines must pass this leak check, in order to validate the velocity head data.

8.6 Calculation of Percent Isokinetic. Calculate percent isokinetic (see Calculations, section 12.11) to determine whether the run was valid or another test run should be made. If there was difficulty in maintaining isokinetic rates because of source conditions, consult with the Administrator for possible variance on the isokinetic rates.

8.7 Sample Recovery.

8.7.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool.

8.7.2 When the probe can be safely handled, wipe off all external PM near the tip of the probe nozzle, and place a cap over it to prevent losing or gaining PM. Do not cap off the probe tip tightly while the sampling train is cooling down. This would create a vacuum in the filter holder, thereby drawing water from the impingers into the filter holder.

8.7.3 Before moving the sample train to the cleanup site, remove the probe from the sample train and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Cap the filter inlet where the probe was fastened. Remove the umbilical cord from the last impinger, and cap the impinger. If a flexible line is used between the first impinger or condenser and the filter holder, disconnect the line at the filter holder, and let any condensed water or liquid drain into the impingers or condenser. Cap off the filter holder outlet and impinger inlet. Either ground-glass stoppers, plastic caps, or serum caps may be used to close these openings.

8.7.4 Transfer the probe and filter-impinger assembly to the cleanup area. This area should be clean and protected from the wind so that the chances of contaminating or losing the sample will be minimized.

8.7.5 Save a portion of the acetone used for cleanup as a blank. From each storage container of acetone used for cleanup, save 200 ml and place in a glass sample container labeled "acetone blank." To minimize any particulate contamination, rinse the wash bottle prior to filling from the tested container.

8.7.6 Inspect the train prior to and during disassembly, and note any abnormal conditions. Treat the samples as follows:

8.7.6.1 Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Using a dry Nylon bristle brush and/or a sharp-edged blade, carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket. Seal the container.

8.7.6.2 Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Deionized distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator. In these cases, save a water blank, and follow the Administrator's directions on analysis. Perform the acetone rinse as follows:

8.7.6.2.1 Carefully remove the probe nozzle. Clean the inside surface by rinsing with acetone from a wash bottle and brushing with a Nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

8.7.6.2.2 Brush and rinse the inside parts of the fitting with acetone in a similar way until no visible particles remain.

8.7.6.2.3 Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since metal probes have small crevices in which particulate matter can be entrapped. Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe.

8.7.6.2.4 It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

8.7.6.2.5 After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a Nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone, also (if applicable). After all acetone washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that acetone will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to allow determination of whether leakage occurred during transport. Label the container to identify clearly its contents.

8.7.6.3 Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container, and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in section 11.2.3.

8.7.6.4 Impinger Water. Treat the impingers as follows: Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within 1 ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance. Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas. Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see NOTE, section 6.1.1.8). If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

8.8 Sample Transport. Whenever possible, containers should be shipped in such a way that they remain upright at all times.

9.0 Quality Control

9.1 Miscellaneous Quality Control Measures.

Section	**Quality control measure**	**Effect**
8.4, 10.1-10.6	Sampling equipment leak check and calibration	Ensures accurate measurement of stack gas flow rate, sample volume.

9.2 Volume Metering System Checks. The following procedures are suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional.

9.2.1 Meter Orifice Check. Using the calibration data obtained during the calibration procedure described in section 10.3, determine the ΔH@ for the metering system orifice. The ΔH@ is the orifice pressure differential in units of in. H_2O that correlates to 0.75 cfm of air at 528 °R and 29.92 in. Hg. The ΔH@ is calculated as follows:

$$\Delta H@ = 0.0319\ \Delta \mathrm{H} \frac{\mathrm{T_M}\theta^2}{P_{bar} Y^2 V_m^2}$$

Where:

ΔH = Average pressure differential across the orifice meter, in. H_2O.

T_m = Absolute average DGM temperature, °R.

P_{bar} = Barometric pressure, in. Hg.

Θ = Total sampling time, min.

Y = DGM calibration factor, dimensionless.

V_m = Volume of gas sample as measured by DGM, dcf.

$0.0319 = (0.0567 \text{ in. Hg/°R}) (0.75 \text{ cfm})^2$

9.2.1.1 Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (*i.e.,* pump, volume meter, and orifice) at the ΔH@ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10}{V_m}\left[\frac{0.0319\ \mathrm{T_m}}{\mathrm{P_{bar}}}\right]^{\frac{1}{2}}$$

where:

Y_c = DGM calibration check value, dimensionless.

10 = Run time, min.

9.2.1.2 Compare the Y_c value with the dry gas meter calibration factor Y to determine that: $0.97Y < Y_c < 1.03Y$. If the Y_c value is not within this range, the volume metering system should be investigated before beginning the test.

9.2.2 Calibrated Critical Orifice. A critical orifice, calibrated against a wet test meter or spirometer and designed to be inserted at the inlet of the sampling meter box, may be used as a check by following the procedure of section 16.2.

10.0 Calibration and Standardization

NOTE: Maintain a laboratory log of all calibrations.

10.1 Probe Nozzle. Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the ID of the nozzle to the nearest 0.025 mm (0.001 in.). Make three separate measurements using different diameters each time, and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

10.2 Pitot Tube Assembly. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in section 10.1 of Method 2.

10.3 Metering System.

10.3.1 Calibration Prior to Use. Before its initial use in the field, the metering system shall be calibrated as follows: Connect the metering system inlet to the outlet of a wet test meter that is accurate to within 1 percent. Refer to Figure 5-4. The wet test meter should have a capacity of 30 liters/rev (1 ft^3/rev). A spirometer of 400 liters (14 ft^3) or more capacity, or equivalent, may be used for this calibration, although a wet test meter is usually more practical. The wet test meter should be periodically calibrated with a spirometer or a liquid displacement meter to ensure the accuracy of the wet test meter. Spirometers or wet test meters of other sizes may be used, provided that the specified accuracies of the procedure are maintained. Run the metering system pump for about 15 minutes with the orifice manometer indicating a median reading as expected in field use to allow the pump to warm up and to permit the interior surface of the wet test meter to be thoroughly wetted. Then, at each of a minimum of three orifice manometer settings, pass an exact quantity of gas through the wet test meter and note the gas volume indicated by the DGM. Also note the barometric pressure and the temperatures of the wet test meter, the inlet of the DGM, and the outlet of the DGM. Select the highest and lowest orifice settings to bracket the expected field operating range of the orifice. Use a minimum volume of 0.14 m^3 (5 ft^3) at all orifice settings. Record all the data on a form similar to Figure 5-5 and calculate Y, the DGM calibration factor, and ΔH , the orifice calibration factor, at each orifice setting as shown on Figure 5-5. Allowable tolerances for individual Y and ΔH values are given in Figure 5-5. Use the average of the Y values in the calculations in section 12.0.

10.3.1.1 Before calibrating the metering system, it is suggested that a leak check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. For these cases the following leak-check procedure is suggested: make a 10-minute calibration run at 0.00057 m^3/min (0.020 cfm). At the end of the run, take the difference of the measured wet test meter and DGM volumes. Divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.020 cfm).

10.3.2 Calibration After Use. After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test), with the vacuum set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet test meter and the inlet of the metering system. Calculate the average value of the DGM calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as detailed in section 10.3.1.

NOTE: Alternative procedures (*e.g.,* rechecking the orifice meter coefficient) may be used, subject to the approval of the Administrator.

10.3.3 Acceptable Variation in Calibration Check. If the DGM coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (*i.e.*, before or after) gives the lower value of total sample volume.

10.4 Probe Heater Calibration. Use a heat source to generate air heated to selected temperatures that approximate those expected to occur in the sources to be sampled. Pass this air through the probe at a typical sample flow rate while measuring the probe inlet and outlet temperatures at various probe heater settings. For each air temperature generated, construct a graph of probe heating system setting versus probe outlet temperature. The procedure outlined in APTD-0576 can also be used. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used. Also, probes with outlet temperature monitoring capabilities do not require calibration.

NOTE: The probe heating system shall be calibrated before its initial use in the field.

10.5 Temperature Sensors. Use the procedure in Section 10.3 of Method 2 to calibrate in-stack temperature sensors. Dial thermometers, such as are used for the DGM and condenser outlet, shall be calibrated against mercury-in-glass thermometers. An alternative mercury-free NIST-traceable thermometer may be used if the thermometer is, at a minimum, equivalent in terms of performance or suitably effective for the specific temperature measurement application. As an alternative, the following single-point calibration procedure may be used. After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F.

10.6 Barometer. Calibrate against a mercury barometer or NIST-traceable barometer prior to the field test. Alternatively, barometric pressure may be obtained from a weather report that has been adjusted for the test point (on the stack) elevation.

11.0 Analytical Procedure

11.1 Record the data required on a sheet such as the one shown in Figure 5-6.

11.2 Handle each sample container as follows:

11.2.1 Container No. 1. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight, and report the results to the nearest 0.1 mg. For the purposes of this section, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings. Alternatively, the sample may be oven dried at 104 °C (220 °F) for 2 to 3 hours, cooled in the desiccator, and weighed to a constant weight, unless otherwise specified by the Administrator. The sample may be oven dried at 104 °C (220 °F) for 2 to 3 hours. Once the sample has cooled, weigh the sample, and use this weight as a final weight.

11.2.2 Container No. 2. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±1 ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250 ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

11.2.3 Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

11.2.4 Acetone Blank Container. Measure the acetone in this container either volumetrically or gravimetrically. Transfer the acetone to a tared 250 ml beaker, and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.1 mg.

NOTE: The contents of Container No. 2 as well as the acetone blank container may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone is highly flammable and has a low flash point.

12.0 Data Analysis and Calculations

Carry out calculations, retaining at least one extra significant figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used, provided that they give equivalent results.

12.1 Nomenclature.

A_n = Cross-sectional area of nozzle, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream, proportion by volume.

C_a = Acetone blank residue concentration, mg/mg.

c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (gr/dscf).

I = Percent of isokinetic sampling.

L_1 = Individual leakage rate observed during the leak-check conducted prior to the first component change, m^3/min (ft^3/min)

L_a = Maximum acceptable leakage rate for either a pretest leak-check or for a leak-check following a component change; equal to 0.00057 m^3/min (0.020 cfm) or 4 percent of the average sampling rate, whichever is less.

L_i = Individual leakage rate observed during the leak-check conducted prior to the “i^{th}” component change (i=1, 2, 3 . . . n), m^3/min (cfm).

L_p = Leakage rate observed during the post-test leak-check, m^3/min (cfm).

m_a = Mass of residue of acetone after evaporation, mg.

m_n = Total amount of particulate matter collected, mg.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

P_s = Absolute stack gas pressure, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 ((mm Hg)(m^3))/((K)(g-mole)) {21.85 ((in. Hg) (ft^3))/((°R) (lb-mole))}.

T_m = Absolute average DGM temperature (see Figure 5-3), K (°R).

T_s = Absolute average stack gas temperature (see Figure 5-3), K (°R).

T_{std} = Standard absolute temperature, 293 K (528 °R).

V_a = Volume of acetone blank, ml.

V_{aw} = Volume of acetone used in wash, ml.

V_{1c} = Total volume of liquid collected in impingers and silica gel (see Figure 5-6), ml.

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).

V_s = Stack gas velocity, calculated by Method 2, Equation 2-7, using data obtained from Method 5, m/sec (ft/sec).

W_a = Weight of residue in acetone wash, mg.

Y = Dry gas meter calibration factor.

ΔH = Average pressure differential across the orifice meter (see Figure 5-4), mm H_2O (in. H_2O).

ρ_a = Density of acetone, mg/ml (see label on bottle).

ρ_w = Density of water, 0.9982 g/ml. (0.002201 lb/ml).

θ = Total sampling time, min.

θ_1 =Sampling time interval, from the beginning of a run until the first component change, min.

θ_i= Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.

θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.

13.6 = Specific gravity of mercury.

60 = Sec/min.

100 = Conversion to percent.

12.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop. See data sheet (Figure 5-3).

12.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20 °C, 760 mm Hg or 68 °F, 29.92 in. Hg) by using Equation 5-1.

$$V_{m(std)} = V_m Y \frac{T_{std}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m P_{std}} \qquad Eq.\ 5\text{-}1$$

$$= K_1 V_m Y \frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{T_m}$$

Where:

K_1 = 0.3858 °K/mm Hg for metric units, = 17.64 °R/in. Hg for English units.

NOTE: Equation 5-1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (*i.e.,* the post-test leak check or leak checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 5-1 must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 5-1 with the expression:

$$\left(V_m - \left(L_p - L_a\right)\theta\right)$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation 5-1 by the expression:

$$\left[V_m - \left(L_1 - L_a\right)\theta_1 - \sum_{i=2}^{n}\left(L_1 - L_a\right)\theta_i - \left(L_p - L_a\right)\theta_p\right]$$

and substitute only for those leakage rates (L_i or L_p) which exceed L_a.

12.4 Volume of Water Vapor Condensed.

$$V_{w(std)} = V_{1c}\frac{\rho_w R T_{std}}{M_w P_{std}} \qquad \text{Eq. 5-2}$$
$$= K_2 V_{1c}$$

Where:

$K_2 = 0.001333$ m^3/ml for metric units, $= 0.04706$ ft^3/ml for English units.

12.5 Moisture Content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad \text{Eq. 5-3}$$

NOTE: In saturated or water droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 5-3), and a second from the assumption of saturated conditions. The lower of the two values of B_{ws} shall be considered correct. The procedure for determining the moisture content based upon the assumption of saturated conditions is given in section 4.0 of Method 4. For the purposes of this method, the average stack gas temperature from Figure 5-3 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±1 °C (2 °F).

12.6 Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a} \qquad \text{Eq. 5-4}$$

12.7 Acetone Wash Blank.

$$W_a = C_a V_{aw} \rho_a \qquad \text{Eq. 5-5}$$

12.8 Total Particulate Weight. Determine the total particulate matter catch from the sum of the weights obtained from Containers 1 and 2 less the acetone blank (see Figure 5-6).

NOTE: In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight. Refer to section 8.5.8 to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

12.9 Particulate Concentration.

$$C_s = \frac{K_3 m_n}{V_{m(std)}} \qquad \text{Eq. 5-6}$$

Where:

K_3 = 0.001 g/mg for metric units.

= 0.0154 gr/mg for English units.

12.10 Conversion Factors:

From	To	Multiply by
ft^3	m^3	0.02832
gr	mg	64.80004
gr/ft^3	mg/m^3	2288.4
mg	g	0.001
gr	lb	1.429×10^{-4}

12.11 Isokinetic Variation.

12.11.1 Calculation from Raw Data.

$$I = \frac{100 T_s \left[K_4 V_{1c} + \frac{(V_m Y)}{T_m} \left(P_{bar} + \frac{\Delta H}{13.6} \right) \right]}{60 \theta v_s P_s A_n} \qquad \text{Eq. 5-7}$$

Where:

$K_4 = 0.003454$ ((mm Hg)(m^3))/((ml)(°K)) for metric units,

= 0.002669 ((in. Hg)(ft^3))/((ml)(°R)) for English units.

12.11.2 Calculation from Intermediate Values.

$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} v_s \theta A_n P_s 60 (1 - B_{ws})} \qquad \text{Eq. 5-8}$$

$$= K_5 \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1 - B_{ws})}$$

Where:

$K_5 = 4.320$ for metric units,

= 0.09450 for English units.

12.11.3 Acceptable Results. If 90 percent $\leq I \leq 110$ percent, the results are acceptable. If the PM results are low in comparison to the standard, and "I" is over 110 percent or less than 90 percent, the Administrator may opt to accept the results. Reference 4 in section 17.0 may be used to make acceptability judgments. If "I" is judged to be unacceptable, reject the results, and repeat the sampling run.

12.12 Stack Gas Velocity and Volumetric Flow Rate. Calculate the average stack gas velocity and volumetric flow rate, if needed, using data obtained in this method and the equations in sections 12.3 and 12.4 of Method 2.

13.0 Method Performance [Reserved]

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures

16.1 Dry Gas Meter as a Calibration Standard. A DGM may be used as a calibration standard for volume measurements in place of the wet test meter specified in section 10.3, provided that it is calibrated initially and recalibrated periodically as follows:

16.1.1 Standard Dry Gas Meter Calibration.

16.1.1.1. The DGM to be calibrated and used as a secondary reference meter should be of high quality and have an appropriately sized capacity (*e.g.,* 3 liters/rev (0.1 ft^3/rev)). A spirometer (400 liters (14 ft^3) or more capacity), or equivalent, may be used for this calibration, although a wet test meter is usually more practical. The wet test meter should have a capacity of 30 liters/rev (1 ft^3/rev) and capable of measuring volume to within 1.0 percent. Wet test meters should be checked against a spirometer or a liquid displacement meter to ensure the accuracy of the wet test meter. Spirometers or wet test meters of other sizes may be used, provided that the specified accuracies of the procedure are maintained.

16.1.1.2 Set up the components as shown in Figure 5-7. A spirometer, or equivalent, may be used in place of the wet test meter in the system. Run the pump for at least 5 minutes at a flow rate of about 10 liters/min (0.35 cfm) to condition the interior surface of the wet test meter. The pressure drop indicated by the manometer at the inlet side of the DGM should be minimized (no greater than 100 mm H_2O (4 in. H_2O) at a flow rate of 30 liters/min (1 cfm)). This can be accomplished by using large diameter tubing connections and straight pipe fittings.

16.1.1.3 Collect the data as shown in the example data sheet (see Figure 5-8). Make triplicate runs at each of the flow rates and at no less than five different flow rates. The range of flow rates should be between 10 and 34 liters/min (0.35 and 1.2 cfm) or over the expected operating range.

16.1.1.4 Calculate flow rate, Q, for each run using the wet test meter volume, V_W, and the run time, θ. Calculate the DGM coefficient, Y_{ds}, for each run. These calculations are as follows:

$$Q = K_1 \frac{P_{bar} V_w}{\left(T_w + T_{std}\right)\theta} \qquad \text{Eq. 5-9}$$

$$Y_{ds} = \frac{V_w\left(T_{ds} + T_{std}\right) P_{bar}}{V_{ds}\left(T_w + T_{std}\right)\left(P_{bar} + \dfrac{\Delta p}{13.6}\right)} \qquad \text{Eq. 5-10}$$

Where:

K_1 = 0.3858 °C/mm Hg for metric units=17.64 °F/in. Hg for English units.

V_W = Wet test meter volume, liter (ft^3).

V_{ds} = Dry gas meter volume, liter (ft^3).

T_{ds} = Average dry gas meter temperature, °C ((°deg;F).

T_{adj} = 273 °C for metric units, = 460 °F for English units.

T_W = Average wet test meter temperature, °C ((°deg;F)

P_{bar} = Barometric pressure, mm Hg (in. Hg).

Δp = Dry gas meter inlet differential pressure, mm H_2O (in. H_2O).

Θ = Run time, min.

16.1.1.5 Compare the three Y_{ds} values at each of the flow rates and determine the maximum and minimum values. The difference between the maximum and minimum values at each flow rate should be no greater than 0.030. Extra sets of triplicate runs may be made in order to complete this requirement. In addition, the meter coefficients should be between 0.95 and 1.05. If these specifications cannot be met in three sets of successive triplicate runs, the meter is not suitable as a calibration standard and should not be used as such. If these specifications are met, average the three Y_{ds} values at each flow rate resulting in no less than five average meter coefficients, Y_{ds}.

16.1.1.6 Prepare a curve of meter coefficient, Y_{ds}, versus flow rate, Q, for the DGM. This curve shall be used as a reference when the meter is used to calibrate other DGMs and to determine whether recalibration is required.

16.1.2 Standard Dry Gas Meter Recalibration.

16.1.2.1 Recalibrate the standard DGM against a wet test meter or spirometer annually or after every 200 hours of operation, whichever comes first. This requirement is valid provided the standard DGM is kept in a laboratory and, if transported, cared for as any other laboratory instrument. Abuse to the standard meter may cause a change in the calibration and will require more frequent recalibrations.

16.1.2.2 As an alternative to full recalibration, a two-point calibration check may be made. Follow the same procedure and equipment arrangement as for a full recalibration, but run the meter at only two flow rates [suggested rates are 14 and 30 liters/min (0.5 and 1.0 cfm)]. Calculate the meter coefficients for these two points, and compare the values with the meter calibration curve. If the two coefficients are within 1.5 percent of the calibration curve values at the same flow rates, the meter need not be recalibrated until the next date for a recalibration check.

16.2 Critical Orifices As Calibration Standards. Critical orifices may be used as calibration standards in place of the wet test meter specified in section 16.1, provided that they are selected, calibrated, and used as follows:

16.2.1 Selection of Critical Orifices.

16.2.1.1 The procedure that follows describes the use of hypodermic needles or stainless steel needle tubings which have been found suitable for use as critical orifices. Other materials and critical orifice designs may be used provided the orifices act as true critical orifices (*i.e.,* a critical vacuum can be obtained, as described in section 16.2.2.2.3). Select five critical orifices that are appropriately sized to cover the range of flow rates between 10 and 34 liters/min (0.35 and 1.2 cfm) or the expected operating range. Two of the critical orifices should bracket the expected operating range. A minimum of three critical orifices will be needed to calibrate a

Method 5 DGM; the other two critical orifices can serve as spares and provide better selection for bracketing the range of operating flow rates. The needle sizes and tubing lengths shown in Table 5-1 in section 18.0 give the approximate flow rates.

16.2.1.2 These needles can be adapted to a Method 5 type sampling train as follows: Insert a serum bottle stopper, 13 by 20 mm sleeve type, into a ½ -inch Swagelok (or equivalent) quick connect. Insert the needle into the stopper as shown in Figure 5-9.

16.2.2 Critical Orifice Calibration. The procedure described in this section uses the Method 5 meter box configuration with a DGM as described in section 6.1.1.9 to calibrate the critical orifices. Other schemes may be used, subject to the approval of the Administrator.

16.2.2.1 Calibration of Meter Box. The critical orifices must be calibrated in the same configuration as they will be used (*i.e.,* there should be no connections to the inlet of the orifice).

16.2.2.1.1 Before calibrating the meter box, leak check the system as follows: Fully open the coarse adjust valve, and completely close the by-pass valve. Plug the inlet. Then turn on the pump, and determine whether there is any leakage. The leakage rate shall be zero (*i.e.,* no detectable movement of the DGM dial shall be seen for 1 minute).

16.2.2.1.2 Check also for leakages in that portion of the sampling train between the pump and the orifice meter. See section 8.4.1 for the procedure; make any corrections, if necessary. If leakage is detected, check for cracked gaskets, loose fittings, worn O-rings, etc., and make the necessary repairs.

16.2.2.1.3 After determining that the meter box is leakless, calibrate the meter box according to the procedure given in section 10.3. Make sure that the wet test meter meets the requirements stated in section 16.1.1.1. Check the water level in the wet test meter. Record the DGM calibration factor, Y.

16.2.2.2 Calibration of Critical Orifices. Set up the apparatus as shown in Figure 5-10.

16.2.2.2.1 Allow a warm-up time of 15 minutes. This step is important to equilibrate the temperature conditions through the DGM.

16.2.2.2.2 Leak check the system as in section 16.2.2.1.1. The leakage rate shall be zero.

16.2.2.2.3 Before calibrating the critical orifice, determine its suitability and the appropriate operating vacuum as follows: Turn on the pump, fully open the coarse adjust valve, and adjust the by-pass valve to give a vacuum reading corresponding to about half of atmospheric pressure. Observe the meter box orifice manometer reading, ΔH. Slowly increase the vacuum reading until a stable reading is obtained on the meter box orifice manometer. Record the critical vacuum for each orifice. Orifices that do not reach a critical value shall not be used.

16.2.2.2.4 Obtain the barometric pressure using a barometer as described in section 6.1.2. Record the barometric pressure, P_{bar}, in mm Hg (in. Hg).

16.2.2.2.5 Conduct duplicate runs at a vacuum of 25 to 50 mm Hg (1 to 2 in. Hg) above the critical vacuum. The runs shall be at least 5 minutes each. The DGM volume readings shall be in increments of complete revolutions of the DGM. As a guideline, the times should not differ by more than 3.0 seconds (this includes allowance for changes in the DGM temperatures) to achieve ±0.5 percent in K′ (see Eq. 5-11). Record the information listed in Figure 5-11.

16.2.2.2.6 Calculate K′ using Equation 5-11.

$$K' = \frac{K_1 V_m Y \left(P_{bar} + \frac{\Delta H}{13.6} \right) T_{amb}^{1/2}}{P_{bar} T_m \theta} \qquad \text{Eq. 5-11}$$

Where:

K′ = Critical orifice coefficient,

[m^3)(°K)$^{1/2}$]/

[(mm Hg)(min)] {[(ft^3)(°R)$^{1/2}$)] [(in. Hg)(min)].

T_{amb} = Absolute ambient temperature, °K (°R).

Calculate the arithmetic mean of the K′ values. The individual K' values should not differ by more than ±0.5 percent from the mean value.

16.2.3 Using the Critical Orifices as Calibration Standards.

16.2.3.1 Record the barometric pressure.

16.2.3.2 Calibrate the metering system according to the procedure outlined in section 16.2.2. Record the information listed in Figure 5-12.

16.2.3.3 Calculate the standard volumes of air passed through the DGM and the critical orifices, and calculate the DGM calibration factor, Y, using the equations below:

$$V_{m(std)} = \frac{K_1 V_m \left[P_{bar} + \left(\frac{\Delta H}{13.6} \right) \right]}{T_m} \qquad \text{Eq. 5-12}$$

$$V_{cr(std)} = K' \frac{P_{bar} \theta}{\sqrt{T_{amb}}} \qquad \text{Eq. 5-13}$$

$$Y = \frac{V_{cr(std)}}{V_{m(std)}} \qquad \text{Eq. 5-14}$$

Where:

$V_{cr(std)}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions, dscm (dscf).

K_1 = 0.3858 K/mm Hg for metric units

= 17.64 °R/in. Hg for English units.

16.2.3.4 Average the DGM calibration values for each of the flow rates. The calibration factor, Y, at each of the flow rates should not differ by more than ±2 percent from the average.

16.2.3.5 To determine the need for recalibrating the critical orifices, compare the DGM Y factors obtained from two adjacent orifices each time a DGM is calibrated; for example, when checking orifice 13/2.5, use orifices 12/10.2 and 13/5.1. If any critical orifice yields a DGM Y factor differing by more than 2 percent from the others, recalibrate the critical orifice according to section 16.2.2.

16.3 Alternative Post-Test Metering System Calibration. The following procedure may be used as an alternative to the post-test calibration described in Section 10.3.2. This alternative procedure does not detect leakages between the inlet of the metering system and the dry gas meter. Therefore, two steps must be included to make it an equivalent alternative:

(1) The metering system must pass the post-test leak-check from either the inlet of the sampling train or the inlet of the metering system. Therefore, if the train fails the former leak-check, another leak-check from the inlet of the metering system must be conducted;

(2) The metering system must pass the leak-check of that portion of the train from the pump to the orifice meter as described in Section 8.4.1.

16.3.1 After each test run, do the following:

16.3.1.1 Ensure that the metering system has passed the post-test leak-check. If not, conduct a leak-check of the metering system from its inlet.

16.3.1.2 Conduct the leak-check of that portion of the train from the pump to the orifice meter as described in Section 10.3.1.1.

16.3.1.3 Calculate Y_{qa} for each test run using the following equation:

$$Y_{qa} = \frac{\theta}{V_m}\sqrt{\frac{0.0319T_m}{\Delta H@\left(P_{bar} + \frac{\Delta H_{avg}}{13.6}\right)}\left(\frac{29}{M_d}\right)}\left(\sqrt{\Delta H}\right)_{avg} \qquad \text{Eq. 5-15}$$

Where:

Y_{qa} = Dry gas meter calibration check value, dimensionless.

$0.0319 = (29.92/528)\ (0.75)^2$ (in. Hg/°R) cfm^2.

$\Delta H@$ = Orifice meter calibration coefficient, in. H_2O.

M_d = Dry molecular weight of stack gas, lb/lb-mole.

29 = Dry molecular weight of air, lb/lb-mole.

16.3.2 After each test run series, do the following:

16.3.2.1 Average the three or more Y_{qa}'s obtained from the test run series and compare this average Y_{qa} with the dry gas meter calibration factor Y. The average Y_{qa} must be within 5 percent of Y.

16.3.2.2 If the average Y_{qa} does not meet the 5 percent criterion, recalibrate the meter over the full range of orifice settings as detailed in Section 10.3.1. Then follow the procedure in Section 10.3.3.

17.0 References.

1. Addendum to Specifications for Incinerator Testing at Federal Facilities. PHS, NCAPC. December 6, 1967.

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18.0 Tables, Diagrams, Flowcharts, and Validation Data

TABLE 5-1 FLOR RATES FOR VARIOUS NEEDLE SIZES AND TUBE LENGTHS

Gauge/cm	**Flow rate liters/min.**	**Gauge/cm**	**Flow rate liters/min.**
12/7.6	32.56	14/2.5	19.54
12/10.2	30.02	14/5.1	17.27
13/2.5	25.77	14/7.6	16.14
13/5.1	23.50	15/3.2	14.16
13/7.6	22.37	15/7.6	11.61
13/10.2	20.67	15/10.2	10.48

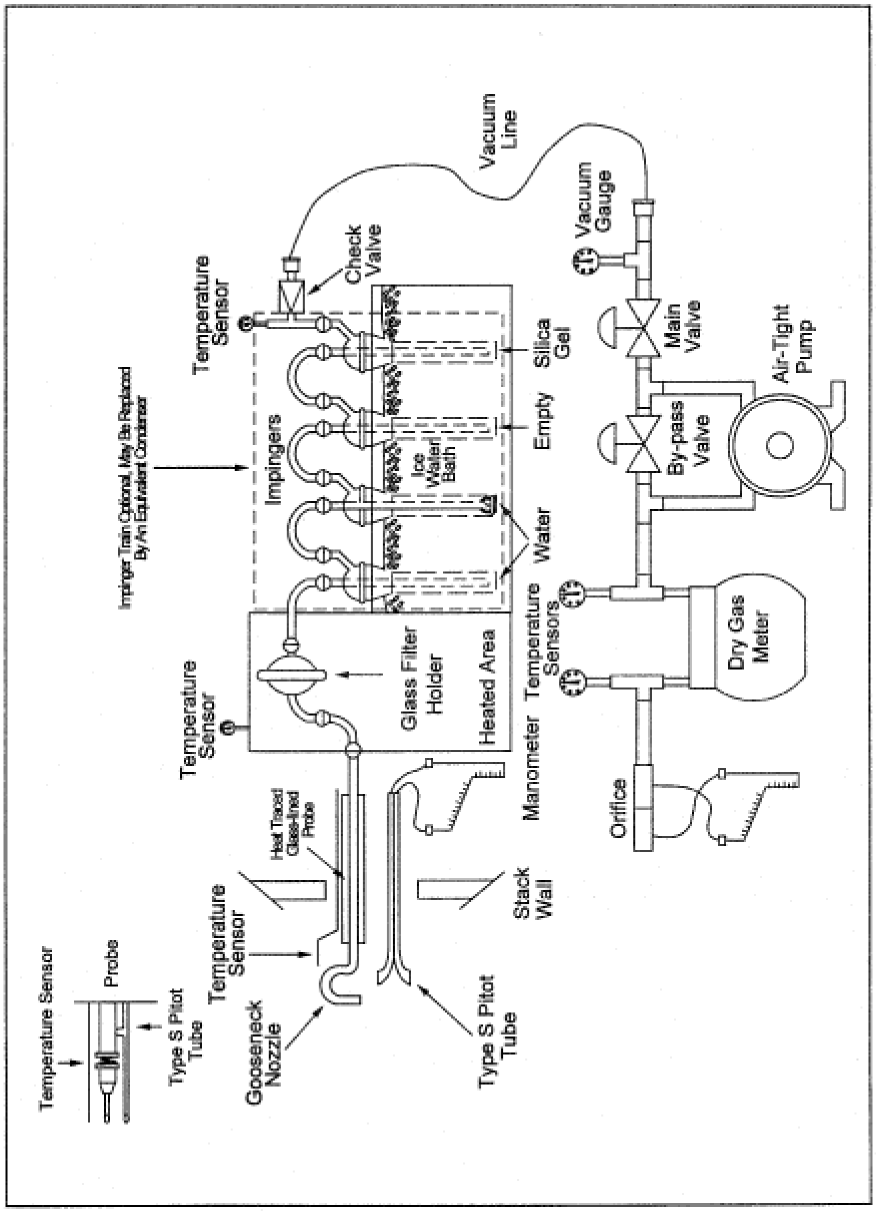
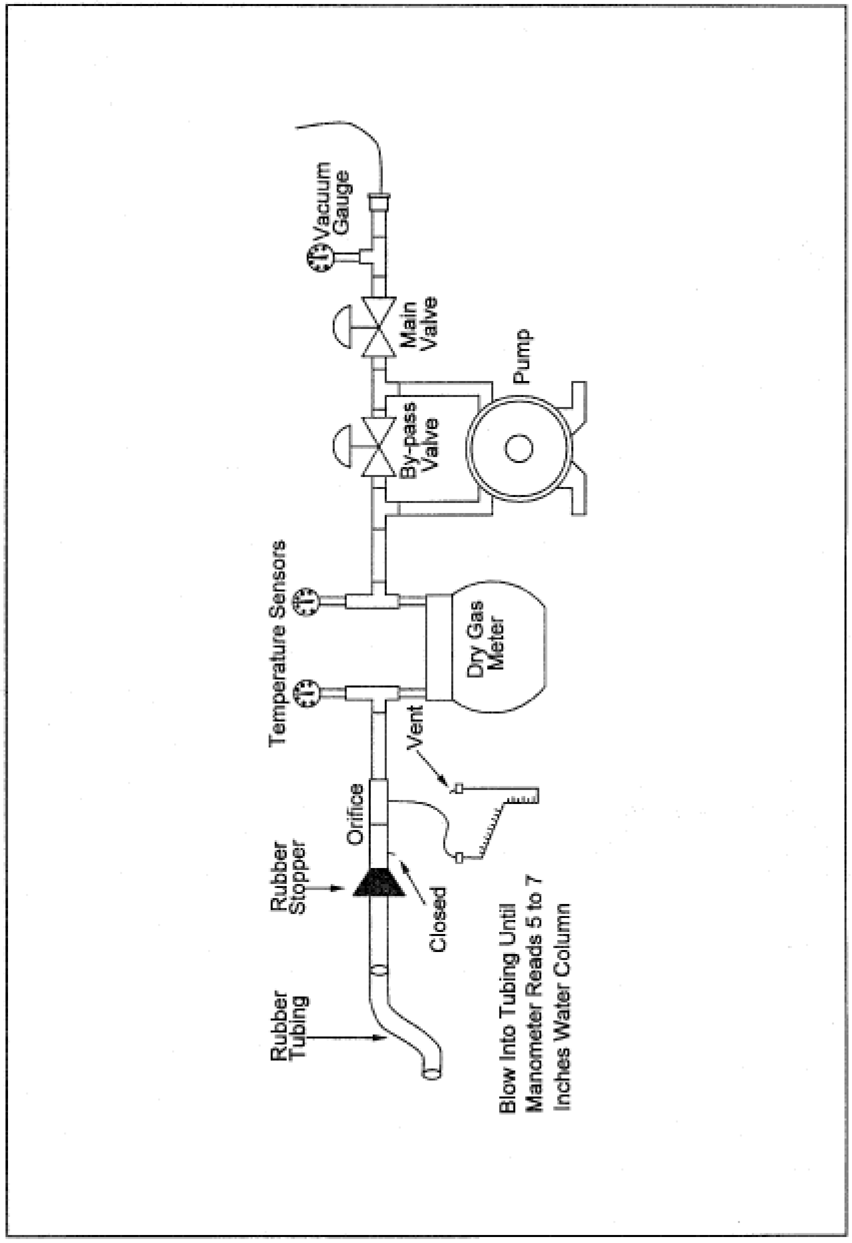
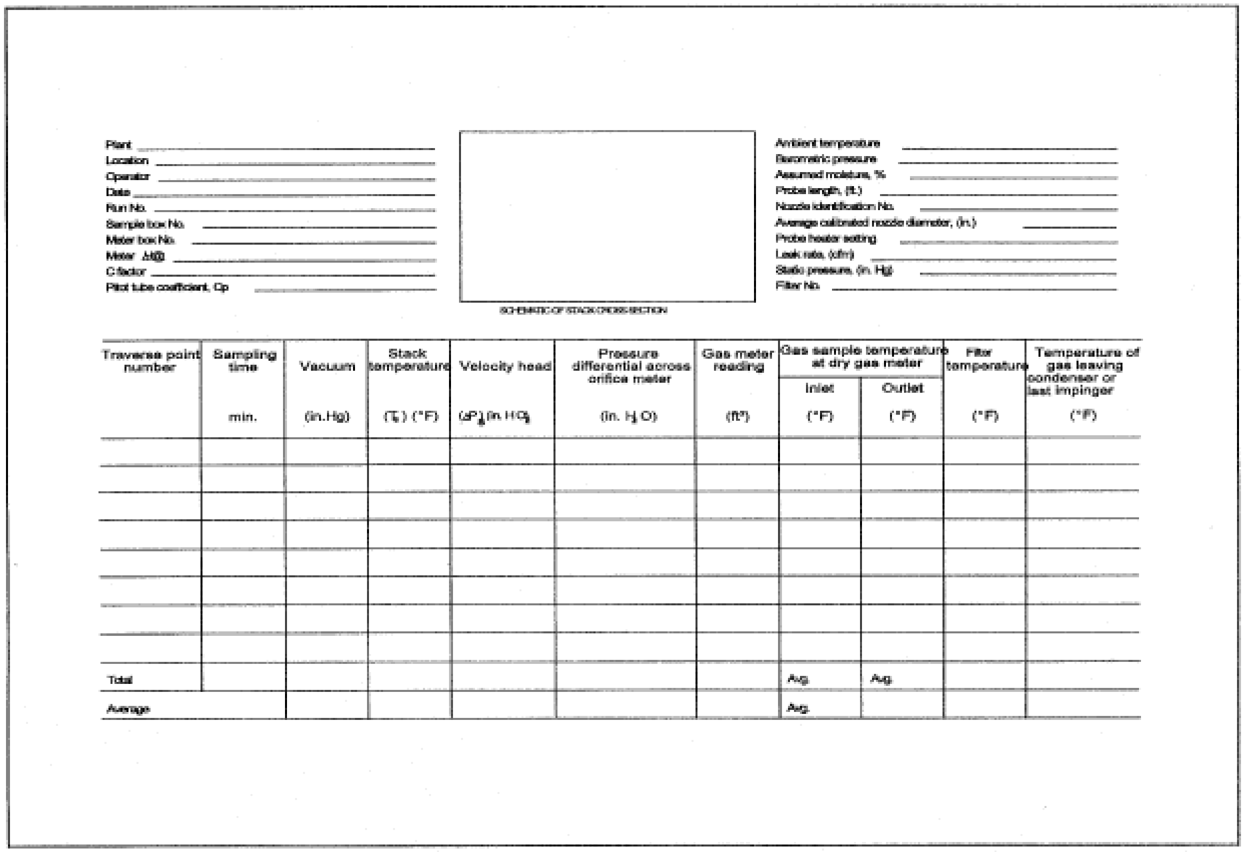


Figure 5-1. Particulate Sampling Train.



Blow Into Tubing Until Manometer Reads 5 to 7 Inches Water Column

Figure 5-2. Leak Check of Meter Box.



Plant ____________________
Location ____________________
Operator ____________________
Date ____________________
Run No. ____________________
Sample box No. ____________________
Meter box No. ____________________
Meter ΔH@ ____________________
C factor ____________________
Pitot tube coefficient, Cp ____________________

SCHEMATIC OF STACK CROSS SECTION

Ambient temperature ____________________
Barometric pressure ____________________
Assumed moisture, % ____________________
Probe length, (ft.) ____________________
Nozzle identification No. ____________________
Average calibrated nozzle diameter, (in.) ____________________
Probe heater setting ____________________
Leak rate, (cfm) ____________________
Static pressure, (in. Hg) ____________________
Filter No. ____________________

Traverse point number	Sampling time	Vacuum	Stack temperature	Velocity head	Pressure differential across orifice meter	Gas meter reading	Gas sample temperature at dry gas meter		Filter temperature	Temperature of gas leaving condenser or last impinger
							Inlet	Outlet		
	min.	(in.Hg)	(T_s) (°F)	(ΔP_s) (in. H_2O)	(in. H_2O)	(ft³)	(°F)	(°F)	(°F)	(°F)
Total							Avg.	Avg.		
Average							Avg.			

Figure 5-3. Particulate Field Data.

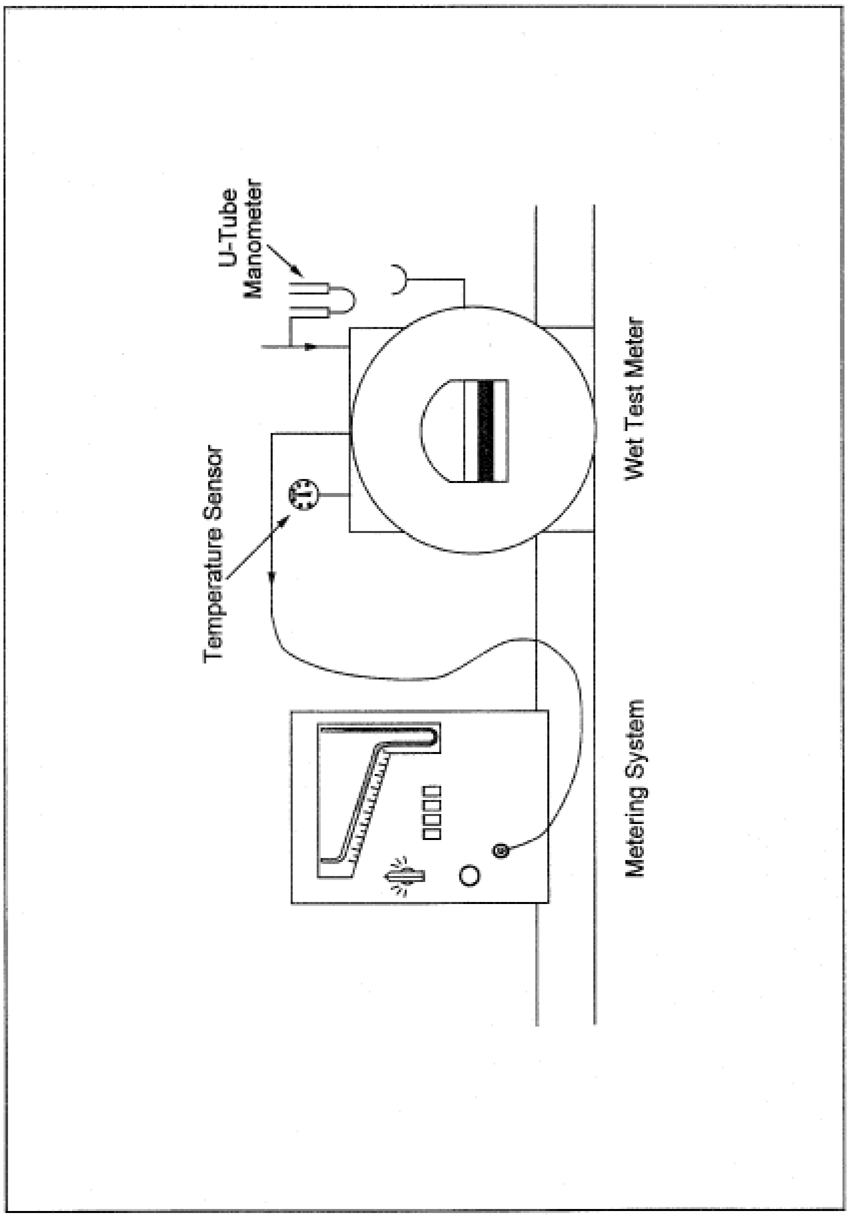


Figure 5-4. Equipment arrangement for metering system calibration.

Date: ____________________ Metering System Identification: __________

Barometric pressure, P_b = __________ in. Hg

Orifice manometer setting ΔH in. H_2O	Spirometer (wet meter) gas volume, V_w ft³	Dry gas meter volume, V_m, ft³	Temperatures				Time θ min
			Spirometer (wet meter) T_w °F	Dry Gas Meter			
				Inlet T_i °F	Outlet T_o °F	Average T_m °F	

Calculations

ΔH in H_2O	Y				$\Delta H_@$		
Average							

Y = Ratio of reading of wet test meter to dry test meter; tolerance for individual values ± 0.02 from average.

$\Delta H_@$ = Orifice pressure differential that equates to 0.75 cfm of air @ 68°F and 29.92 inches of mercury, in. H_2O; tolerance for individual values ± 0.20 from average.

Figure 5-5. Example Data Sheet for Calibration of Metering System (English Units).

Plant___________________________________
Date ___________________________________
Run No. ________________________________
Filter No. ______________________________
Amount liquid lost during transport __________________________________
Acetone blank volume, m1____
Acetone blank concentration, mg/mg (Equation 5-4) ____________________
Acetone wash blank, mg (Equation 5-5) ______________________________

<table>
<tr><th rowspan="2">Container number</th><th colspan="3">Weight of particulate collected, mg</th></tr>
<tr><th>Final weight</th><th>Tare weight</th><th>Weight gain</th></tr>
<tr><td>1.</td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td></tr>
<tr><td>Total:</td><td></td><td></td><td></td></tr>
<tr><td>Less acetone blank</td><td></td><td></td><td></td></tr>
<tr><td>Weight of particulate matter</td><td></td><td></td><td></td></tr>
<tr><th rowspan="2"></th><th colspan="3">Volume of liquid water collected</th></tr>
<tr><th>Impinger volume, ml</th><th colspan="2">Silica gel weight, g</th></tr>
<tr><td>Final</td><td></td><td colspan="2"></td></tr>
<tr><td>Initial</td><td></td><td colspan="2"></td></tr>
<tr><td>Liquid collected</td><td></td><td colspan="2"></td></tr>
<tr><td>Total volume collected</td><td></td><td colspan="2">g* ml</td></tr>
</table>

*Convert weight of water to volume by dividing total weight increase by density of water (1 g/ml).

Figure 5-6. Analytical Data Sheet

$$\frac{Increase,\ g}{\left(1g\,/\,ml\right)} = \text{Volume water, ml}$$

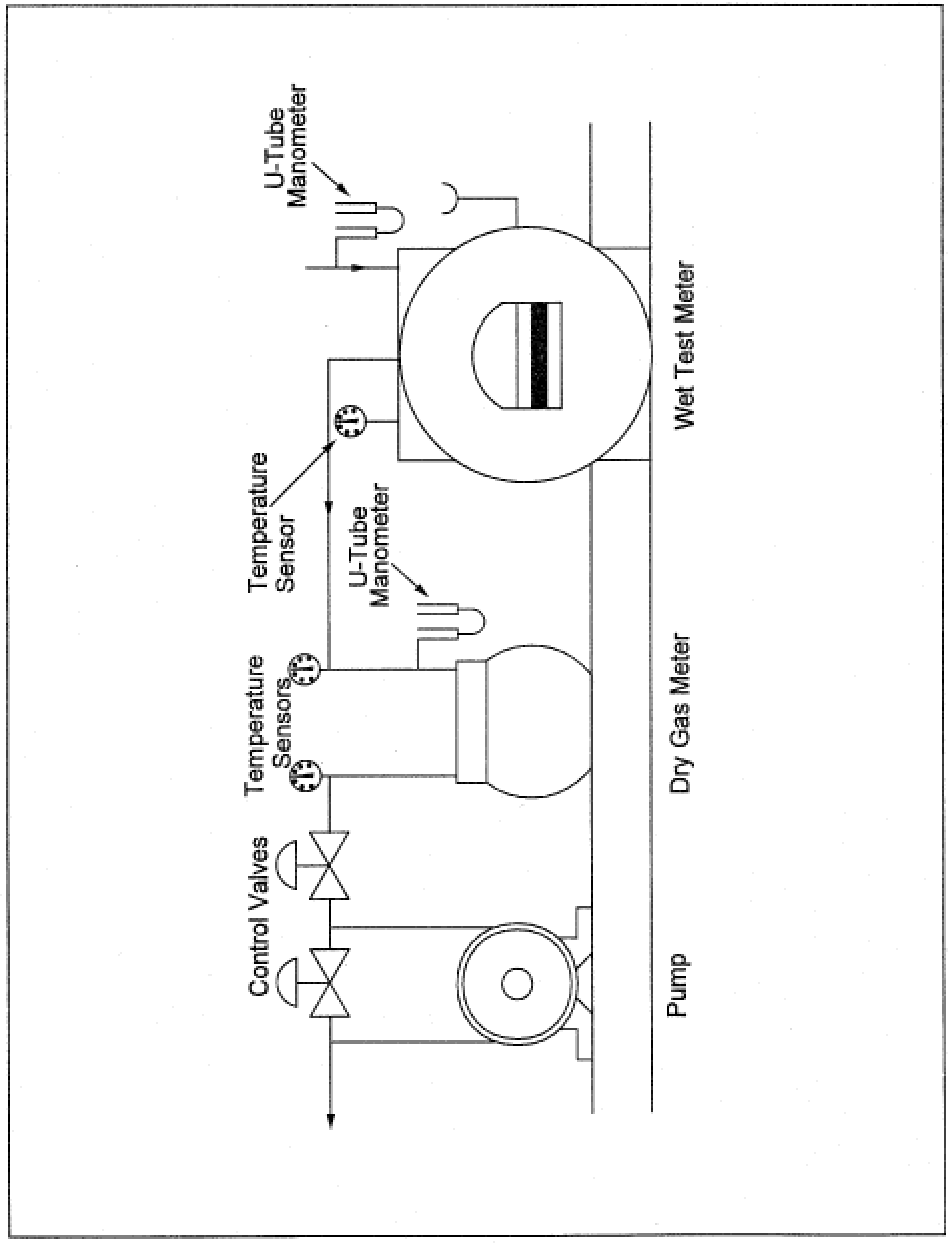
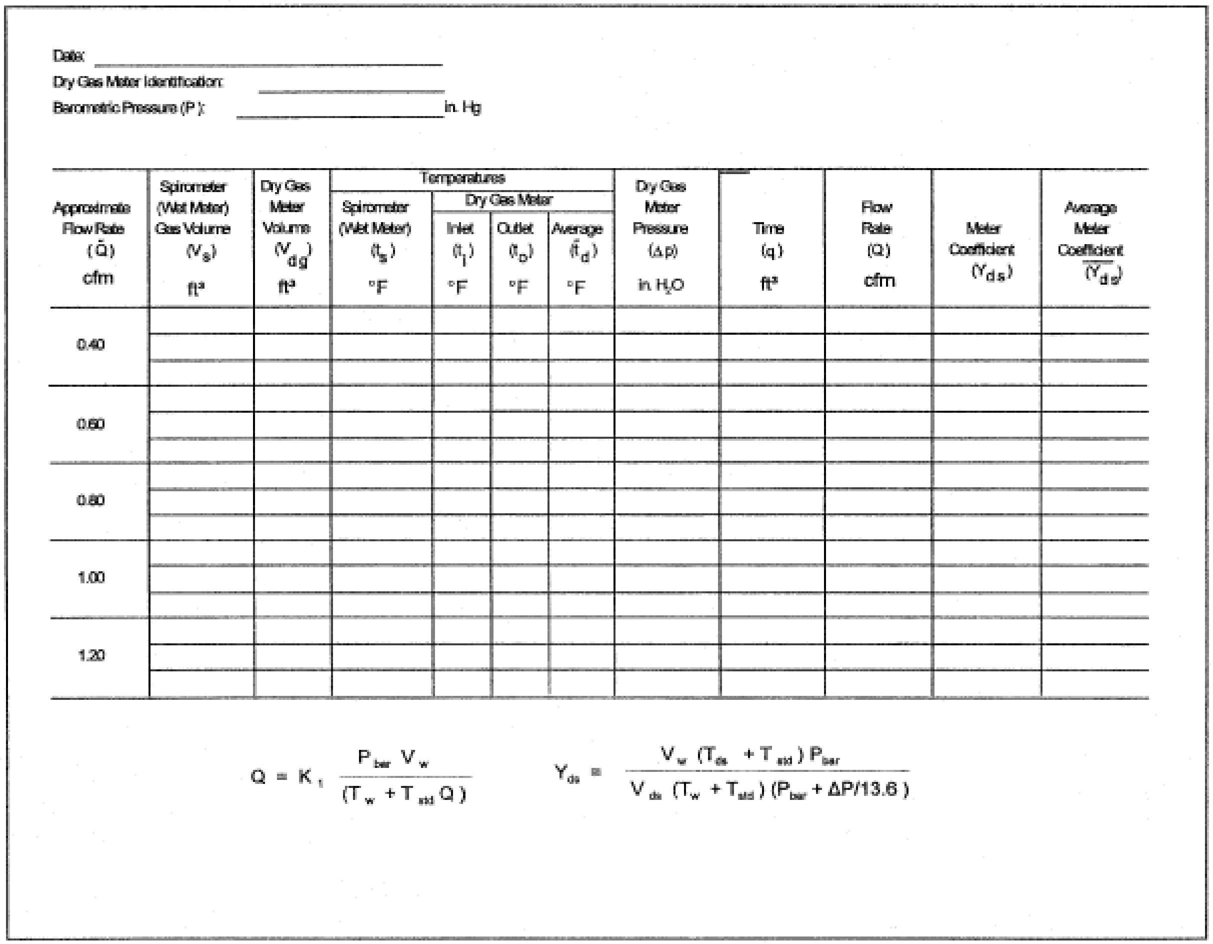


Figure 5-7. Equipment Arrangement for Dry Gas Meter Calibration.



Date: ____________________

Dry Gas Meter Identification: ____________

Barometric Pressure (P): ____________ in. Hg

			Temperatures								
				Dry Gas Meter							
Approximate Flow Rate $(\bar{Q})$ cfm	Spirometer (Wet Meter) Gas Volume (V_s) ft³	Dry Gas Meter Volume (V_{dg}) ft³	Spirometer (Wet Meter) (t_s) °F	Inlet (t_i) °F	Outlet (t_o) °F	Average $(\bar{t}_d)$ °F	Dry Gas Meter Pressure (Δp) in. H_2O	Time (q) ft³	Flow Rate (Q) cfm	Meter Coefficient (Y_{ds})	Average Meter Coefficient $(\overline{Y_{ds}})$
0.40											
0.60											
0.80											
1.00											
1.20											

$$Q = K_1 \frac{P_{bar} V_w}{(T_w + T_{std} Q)} \qquad Y_{ds} = \frac{V_w (T_{ds} + T_{std}) P_{bar}}{V_{ds} (T_w + T_{std}) (P_{bar} + \Delta P/13.6)}$$

Figure 5-8. Example Data Sheet for Calibration of a Standard Dry Gas Meter for Method 5 Sampling Equipment (English units).

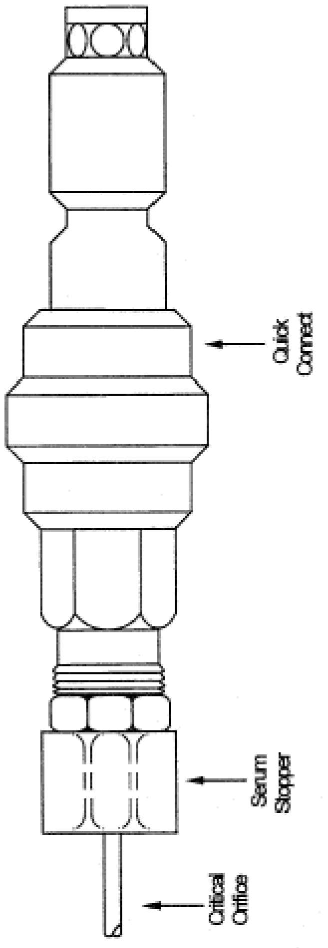


Figure 5-9. Critical Orifice Adaptation to Method 5 Metering System.

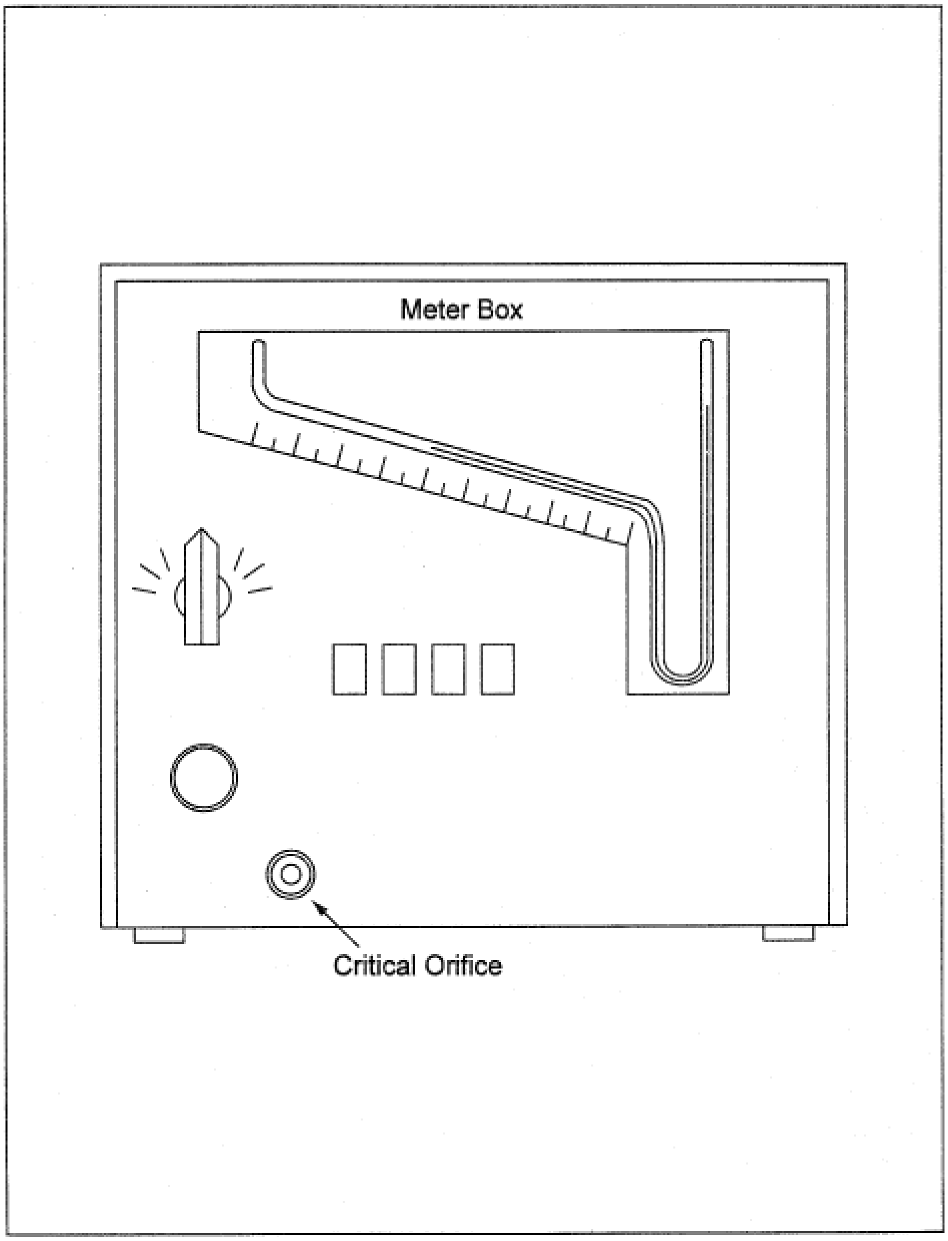


Figure 5-10. Apparatus Setup.

Date ____________________
Train ID _________________
DGM cal. Factor ___________
Critical orifice ID__________

		Run No.	
Dry gas meter		**1**	**2**
Final reading	m^3 (ft^3)		
Initial reading	m^3 (ft^3)		
Difference, V^m	m^3 (ft^3)		
Inlet/Outlet			
Temperatures:	°C ((°deg;F)	/	/
Initial	°C ((°deg;F)	/	/
Final	min/sec	/	/
Av. Temeperature, t_m	min		
Time, θ			
Orifice man. rdg., ΔH	mm (in.) H_2		
Bar. pressure, P^{bar}	mm (in.) Hg		
Ambient temperature, t_{amb}	mm (in.) Hg		
Pump vacuum			
K′ factor			
Average			

Figure 5-11. Data sheet of determining K′ factor.

Date ___________________________
Train ID _______________________
Critical orifice ID ________________
Critical orifice K' factor ___________

		Run No.	
Dry gas meter		**1**	**2**
Final reading	m^3 (ft^3)		
Initial reading	m^3 (ft^3)		
Difference, V_m	m^3 (ft^3)		
Inlet/outlet temperatures	°C ((°deg;F)	/	/
Initial	°C ((°deg;F)	/	/
Final	°C ((°deg;F)		
Avg. Temperature, t_m	min/sec	/	/
Time, θ	min		
Orifice man. rdg., ΔH	min		
Bar. pressure, P_{bar}	mm (in.) H_2O		
Ambient temperature, t_{amb}	mm (in.) Hg		
Pump vacuum	°C ((°deg;F)		
$V_{m(std)}$	mm (in.) Hg		
$V_{cr(std)}$	m^3 (ft^3)		
DGM cal. factor, Y	m^3 (ft^3)		

Figure 5-12. Data Sheet for Determining DGM Y Factor

Method 5D - Determination of Particulate Matter Emissions from Positive Pressure Fabric Filters

Note: This method does not include all of the specifications (*e.g.,* equipment and supplies) and procedures (*e.g.,* sampling and analytical) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test methods: Method 1, Method 2, Method 3, Method 5, Method 17.

1.0 Scope and Application

1.1 Analyte. Particulate matter (PM). No CAS number assigned.

1.2 Applicability.

1.2.1 This method is applicable for the determination of PM emissions from positive pressure fabric filters. Emissions are determined in terms of concentration (mg/m^3 or gr/ft^3) and emission rate (kg/hr or lb/hr).

1.2.2 The General Provisions of 40 CFR part 60, §60.8(e), require that the owner or operator of an affected facility shall provide performance testing facilities. Such performance testing facilities include sampling ports, safe sampling platforms, safe access to sampling sites, and utilities for testing. It is intended that affected facilities also provide sampling locations that meet the specification for adequate stack length and minimal flow disturbances as described in Method 1. Provisions for testing are often overlooked factors in designing fabric filters or are extremely costly. The purpose of this procedure is to identify appropriate alternative locations and procedures for sampling the emissions from positive pressure fabric filters. The requirements that the affected facility owner or operator provide adequate access to performance testing facilities remain in effect.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature at or above the exhaust gas temperature up to a nominal 120°C (248 ±25°F). The particulate mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after the removal of uncombined water.

3.0 Definitions[Reserved]

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies

Same as Section 6.0 of either Method 5 or Method 17.

7.0 Reagents and Standards

Same as Section 7.0 of either Method 5 or Method 17.

8.0 Sample Collection, Preservation, Storage, and Transport

Same Section 8.0 of either Method 5 or Method 17, except replace Section 8.2.1 of Method 5 with the following:

8.1 Determination of Measurement Site. The configuration of positive pressure fabric filter structures frequently are not amenable to emission testing according to the requirements of Method 1. Following are several alternatives for determining measurement sites for positive pressure fabric filters.

8.1.1 Stacks Meeting Method 1 Criteria. Use a measurement site as specified in Method 1, Section 11.1.

8.1.2 Short Stacks Not Meeting Method 1 Criteria. Use stack extensions and the procedures in Method 1. Alternatively, use flow straightening vanes of the “egg-crate” type (see Figure 5D–1). Locate the measurement site downstream of the straightening vanes at a distance equal to or greater than two times the average equivalent diameter of the vane openings and at least one-half of the overall stack diameter upstream of the stack outlet.

8.1.3 Roof Monitor or Monovent. (See Figure 5D–2). For a positive pressure fabric filter equipped with a peaked roof monitor, ridge vent, or other type of monovent, use a measurement site at the base of the monovent. Examples of such locations are shown in Figure 5D–2. The measurement site must be upstream of any exhaust point (*e.g.,* louvered vent).

8.1.4 Compartment Housing. Sample immediately downstream of the filter bags directly above the tops of the bags as shown in the examples in Figure 5D–2. Depending on the housing design, use sampling ports in the housing walls or locate the sampling equipment within the compartment housing.

8.2 Determination of Number and Location of Traverse Points. Locate the traverse points according to Method 1, Section 11.3. Because a performance test consists of at least three test runs and because of the varied configurations of positive pressure fabric filters, there are several schemes by which the number of traverse points can be determined and the three test runs can be conducted.

8.2.1 Single Stacks Meeting Method 1 Criteria. Select the number of traverse points according to Method 1. Sample all traverse points for each test run.

8.2.2 Other Single Measurement Sites. For a roof monitor or monovent, single compartment housing, or other stack not meeting Method 1 criteria, use at least 24 traverse points. For example, for a rectangular measurement site, such as a monovent, use a balanced 5×5 traverse point matrix. Sample all traverse points for each test run.

8.2.3 Multiple Measurement Sites. Sampling from two or more stacks or measurement sites may be combined for a test run, provided the following guidelines are met.

8.2.3.1 All measurement sites up to 12 must be sampled. For more than 12 measurement sites, conduct sampling on at least 12 sites or 50 percent of the sites, whichever is greater. The measurement sites sampled should be evenly, or nearly evenly, distributed among the available sites; if not, all sites are to be sampled.

8.2.3.2 The same number of measurement sites must be sampled for each test run.

8.2.3.3 The minimum number of traverse points per test run is 24. An exception to the 24-point minimum would be a test combining the sampling from two stacks meeting Method 1 criteria for acceptable stack length, and Method 1 specifies fewer than 12 points per site.

8.2.3.4 As long as the 24 traverse points per test run criterion is met, the number of traverse points per measurement site may be reduced to eight.

8.2.3.5 Alternatively, conduct a test run for each measurement site individually using the criteria in Section 8.2.1 or 8.2.2 to determine the number of traverse points. Each test run shall count toward the total of three required for a performance test. If more than three measurement sites are sampled, the number of traverse points per measurement site may be reduced to eight as long as at least 72 traverse points are sampled for all the tests.

8.2.3.6 The following examples demonstrate the procedures for sampling multiple measurement sites.

8.2.3.6.1 Example 1: A source with nine circular measurement sites of equal areas may be tested as follows: For each test run, traverse three measurement sites using four points per diameter (eight points per measurement site). In this manner, test run number 1 will include sampling from sites 1,2, and 3; run 2 will include samples from sites 4, 5, and 6; and run 3 will include sites 7, 8, and 9. Each test area may consist of a separate test of each measurement site using eight points. Use the results from all nine tests in determining the emission average.

8.2.3.6.2 Example 2: A source with 30 rectangular measurement sites of equal areas may be tested as follows: For each of the three test runs, traverse five measurement sites using a 3×3 matrix of traverse points for each site. In order to distribute the sampling evenly over all the available measurement sites while sampling only 50 percent of the sites, number the sites consecutively from 1 to 30 and sample all the even numbered (or odd numbered) sites. Alternatively, conduct a separate test of each of 15 measurement sites using Section 8.2.1 or 8.2.2 to determine the number and location of traverse points, as appropriate.

8.2.3.6.3 Example 3: A source with two measurement sites of equal areas may be tested as follows: For each test of three test runs, traverse both measurement sites, using Section 8.2.3 in determining the number of traverse points. Alternatively, conduct two full emission test runs for each measurement site using the criteria in Section 8.2.1 or 8.2.2 to determine the number of traverse points.

8.2.3.7 Other test schemes, such as random determination of traverse points for a large number of measurement sites, may be used with prior approval from the Administrator.

8.3 Velocity Determination.

8.3.1 The velocities of exhaust gases from positive pressure baghouses are often too low to measure accurately with the type S pitot tube specified in Method 2 (*i.e.,* velocity head <1.3 mm H_2O (0.05 in. H_2O)). For these conditions, measure the gas flow rate at the fabric filter inlet following the procedures outlined in Method 2. Calculate the average gas velocity at the measurement site as shown in Section 12.2 and use this average velocity in determining and maintaining isokinetic sampling rates.

8.3.2 Velocity determinations to determine and maintain isokinetic rates at measurement sites with gas velocities within the range measurable with the type S pitot tube (*i.e.,* velocity head greater than 1.3 mm H_2O (0.05 in. H_2O)) shall be conducted according to the procedures outlined in Method 2.

8.4 Sampling. Follow the procedures specified in Sections 8.1 through 8.6 of Method 5 or Sections 8.1 through 8.25 in Method 17 with the exceptions as noted above.

8.5 Sample Recovery. Follow the procedures specified in Section 8.7 of Method 5 or Section 8.2 of Method 17.

9.0 Quality Control

9.1 Miscellaneous Quality Control Measures.

Section	Quality control measure	Effect
8.0, 10.0	Sampling equipment leak check and calibration	Ensures accurate measurement of stack gas flow rate, sample volume.

9.2 Volume Metering System Checks. Same as Method 5, Section 9.2.

10.0 Calibration and Standardization

Same as Section 10.0 of either Method 5 or Method 17.

11.0 Analytical Procedure

Same as Section 11.0 of either Method 5 or Method 17.

12.0 Data Analysis and Calculations

Same as Section 12.0 of either Method 5 or Method 17 with the following exceptions:

12.1 Nomenclature.

A_o = Measurement site(s) total cross-sectional area, m^2 (ft^2).

Cor C_{avg} = Average concentration of PM for all n runs, mg/scm (gr/scf).

Q_i = Inlet gas volume flow rate, m^3/sec (ft^3/sec).

m_i = Mass collected for run i of n, mg (gr).

T_o = Average temperature of gas at measurement site, °K (°R).

T_i = Average temperature of gas at inlet, °K (°R).

Vol_i = Sample volume collected for run i of n, scm (scf).

v = Average gas velocity at the measurement site(s), m/s (ft/s)

Q_o = Total baghouse exhaust volumetric flow rate, m^3/sec (ft^3/sec).

Q_d = Dilution air flow rate, m^3/sec (ft^3/sec).

Ta_{mb} = Ambient Temperature, (°K).

12.2 Average Gas Velocity. When following Section 8.3.1, calculate the average gas velocity at the measurement site as follows:

$$\bar{v} = \frac{Q_o}{A_o} \qquad \text{Eq. 5D-1}$$

12.3 Volumetric Flow Rate. Total volumetric flow rate may be determined as follows:

$$Q_o = Q_i + Q_d \qquad \text{Eq. 5D-2}$$

12.4 Dilution Air Flow Rate.

$$Q_d = \frac{Q_i\,(T_i - T_o)}{T_o - T_{amb}} \qquad \text{Eq. 5D-3}$$

12.5 Average PM Concentration. For multiple measurement sites, calculate the average PM concentration as follows:

$$C_{avg}\ or\ \bar{C} = \frac{\sum_{i=1}^{n} m_i}{\sum_{i=1}^{n} \mathrm{Vol}_i} \qquad \text{Eq. 5D-4}$$

13.0 Method Performance[Reserved]

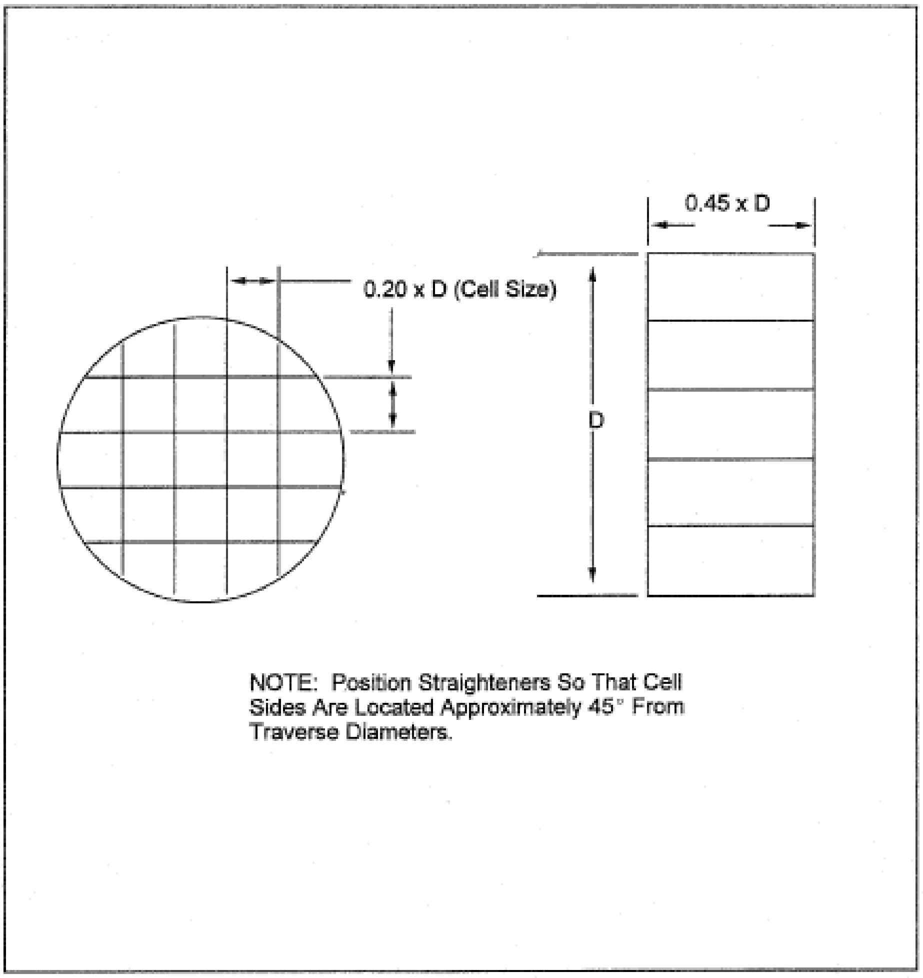
14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

Same as Method 5, Section 17.0.

17.0 Tables, Diagrams, Flowcharts, and Validation Data



NOTE: Position Straighteners So That Cell Sides Are Located Approximately 45° From Traverse Diameters.

Figure 5D-1. Example of Flow Straightening Vanes.

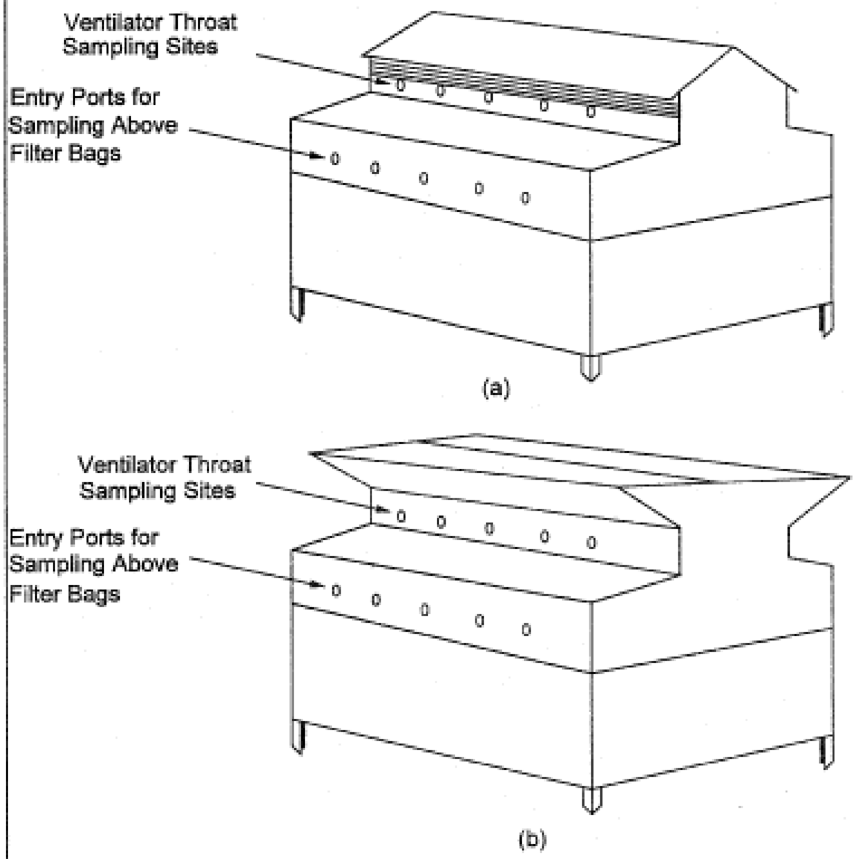


Figure 5D-2. Acceptable Sampling Site Locations for: (a) Peaked Roof; and (b) Ridge Vent Type Fabric Filters

Method 5G - Determination of Particulate Matter Emissions From Wood Heaters (Dilution Tunnel Sampling Location)

Note: This method does not include all of the specifications (*e.g.,* equipment and supplies) and procedures (*e.g.,* sampling and analytical) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test methods: Method 1, Method 2, Method 3, Method 4, Method 5, Method 5H, and Method 28.

1.0 Scope and Application

1.1 Analyte. Particulate matter (PM). No CAS number assigned.

1.2 Applicability. This method is applicable for the determination of PM emissions from wood heaters.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 The exhaust from a wood heater is collected with a total collection hood, and is combined with ambient dilution air. Particulate matter is withdrawn proportionally from a single point in a sampling tunnel, and is collected on two glass fiber filters in series. The filters are maintained at a temperature of no greater than 32°C (90°F). The particulate mass is determined gravimetrically after the removal of uncombined water.

2.2 There are three sampling train approaches described in this method: (1) One dual-filter dry sampling train operated at about 0.015 m^3/min (0.5 cfm), (2) One dual-filter plus impingers sampling train operated at about 0.015 m^3/min (0.5 cfm), and (3) two dual-filter dry sampling trains operated simultaneously at any flow rate. Options (2) and (3) are referenced in Section 16.0 of this method. The dual-filter dry sampling train equipment and operation, option (1), are described in detail in this method.

3.0 Definitions[Reserved]

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies

6.1 Sample Collection. The following items are required for sample collection:

6.1.1 Sampling Train. The sampling train configuration is shown in Figure 5G–1 and consists of the following components:

6.1.1.1 Probe. Stainless steel (*e.g.,* 316 or grade more corrosion resistant) or glass about 9.5 mm (3/8in.) I.D., 0.6 m (24 in.) in length. If made of stainless steel, the probe shall be constructed from seamless tubing.

6.1.1.2 Pitot Tube. Type S, as described in Section 6.1 of Method 2. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Method 2, Section 10. Alternatively, a standard pitot may be used as described in Method 2, Section 6.1.2.

6.1.1.3 Differential Pressure Gauge. Inclined manometer or equivalent device, as described in Method 2, Section 6.2. One manometer shall be used for velocity head (Δp) readings and another (optional) for orifice differential pressure readings (ΔH).

6.1.1.4 Filter Holders. Two each made of borosilicate glass, stainless steel, or Teflon, with a glass frit or stainless steel filter support and a silicone rubber, Teflon, or Viton gasket. The holder design shall provide a positive seal against leakage from the outside or around the filters. The filter holders shall be placed in series with the backup filter holder located 25 to 100 mm (1 to 4 in.) downstream from the primary filter holder. The filter holder shall be capable of holding a filter with a 100 mm (4 in.) diameter, except as noted in Section 16.

6.1.1.5 Filter Temperature Monitoring System. A temperature sensor capable of measuring temperature to within ±3°C (±5°F). The sensor shall be installed at the exit side of the front filter holder so that the sensing tip of the temperature sensor is in direct contact with the sample gas or in a thermowell as shown in Figure 5G–1. The temperature sensor shall comply with the calibration specifications in Method 2, Section 10.3. Alternatively, the sensing tip of the temperature sensor may be installed at the inlet side of the front filter holder.

6.1.1.6 Dryer. Any system capable of removing water from the sample gas to less than 1.5 percent moisture (volume percent) prior to the metering system. The system shall include a temperature sensor for demonstrating that sample gas temperature exiting the dryer is less than 20°C (68°F).

6.1.1.7 Metering System. Same as Method 5, Section 6.1.1.9.

6.1.2 Barometer. Same as Method 5, Section 6.1.2.

6.1.3 Dilution Tunnel Gas Temperature Measurement. A temperature sensor capable of measuring temperature to within ±3°C (±5°F).

6.1.4 Dilution Tunnel. The dilution tunnel apparatus is shown in Figure 5G–2 and consists of the following components:

6.1.4.1 Hood. Constructed of steel with a minimum diameter of 0.3 m (1 ft) on the large end and a standard 0.15 to 0.3 m (0.5 to 1 ft) coupling capable of connecting to standard 0.15 to 0.3 m (0.5 to 1 ft) stove pipe on the small end.

6.1.4.2 90° Elbows. Steel 90° elbows, 0.15 to 0.3 m (0.5 to 1 ft) in diameter for connecting mixing duct, straight duct and optional damper assembly. There shall be at least two 90° elbows upstream of the sampling section (see Figure 5G–2).

6.1.4.3 Straight Duct. Steel, 0.15 to 0.3 m (0.5 to 1 ft) in diameter to provide the ducting for the dilution apparatus upstream of the sampling section. Steel duct, 0.15 m (0.5 ft) in diameter shall be used for the sampling section. In the sampling section, at least 1.2 m (4 ft) downstream of the elbow, shall be two holes (velocity traverse ports) at 90° to each other of sufficient size to allow entry of the pitot for traverse measurements. At least 1.2 m (4 ft) downstream of the velocity traverse ports, shall be one hole (sampling port) of sufficient size to allow entry of the sampling probe. Ducts of larger diameter may be used for the sampling section, provided the specifications for minimum gas velocity and the dilution rate range shown in Section 8 are maintained. The length of duct from the hood inlet to the sampling ports shall not exceed 9.1 m (30 ft).

6.1.4.4 Mixing Baffles. Steel semicircles (two) attached at 90° to the duct axis on opposite sides of the duct midway between the two elbows upstream of sampling section. The space between the baffles shall be about 0.3 m (1 ft).

6.1.4.5 Blower. Squirrel cage or other fan capable of extracting gas from the dilution tunnel of sufficient flow to maintain the velocity and dilution rate specifications in Section 8 and exhausting the gas to the atmosphere.

6.2 Sample Recovery. The following items are required for sample recovery: probe brushes, wash bottles, sample storage containers, petri dishes, and funnel. Same as Method 5, Sections 6.2.1 through 6.2.4, and 6.2.8, respectively.

6.3 Sample Analysis. The following items are required for sample analysis: glass weighing dishes, desiccator, analytical balance, beakers (250-ml or smaller), hygrometer, and temperature sensor. Same as Method 5, Sections 6.3.1 through 6.3.3 and 6.3.5 through 6.3.7, respectively.

7.0 Reagents and Standards

7.1 Sample Collection. The following reagents are required for sample collection:

7.1.1 Filters. Glass fiber filters with a minimum diameter of 100 mm (4 in.), without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3-micron dioctyl phthalate smoke particles. Gelman A/E 61631 has been found acceptable for this purpose.

7.1.2 Stopcock Grease. Same as Method 5, Section 7.1.5. 7.2 Sample Recovery. Acetone-reagent grade, same as Method 5, Section 7.2.

7.3 Sample Analysis. Two reagents are required for the sample analysis:

7.3.1 Acetone. Same as in Section 7.2.

7.3.2 Desiccant. Anhydrous calcium sulfate, calcium chloride, or silica gel, indicating type.

8.0 Sample Collection, Preservation, Transport, and Storage

8.1 Dilution Tunnel Assembly and Cleaning. A schematic of a dilution tunnel is shown in Figure 5G–2. The dilution tunnel dimensions and other features are described in Section 6.1.4. Assemble the dilution tunnel, sealing joints and seams to prevent air leakage. Clean the dilution tunnel with an appropriately sized wire chimney brush before each certification test.

8.2 Draft Determination. Prepare the wood heater as in Method 28, Section 6.2.1. Locate the dilution tunnel hood centrally over the wood heater stack exhaust. Operate the dilution tunnel blower at the flow rate to be used during the test run. Measure the draft imposed on the wood heater by the dilution tunnel (*i.e.,* the difference in draft measured with and without the dilution tunnel operating) as described in Method 28, Section 6.2.3. Adjust the distance between the top of the wood heater stack exhaust and the dilution tunnel hood so that the dilution tunnel induced draft is less than 1.25 Pa (0.005 in. H_2O). Have no fire in the wood heater, close the wood heater doors, and open fully the air supply controls during this check and adjustment.

8.3 Pretest Ignition. Same as Method 28, Section 8.7.

8.4 Smoke Capture. During the pretest ignition period, operate the dilution tunnel and visually monitor the wood heater stack exhaust. Operate the wood heater with the doors closed and determine that 100 percent of the exhaust gas is collected by the dilution tunnel hood. If less than 100 percent of the wood heater exhaust gas is collected, adjust the distance between the wood heater stack and the dilution tunnel hood until no visible exhaust gas is escaping. Stop the pretest ignition period, and repeat the draft determination procedure described in Section 8.2.

8.5 Velocity Measurements. During the pretest ignition period, conduct a velocity traverse to identify the point of average velocity. This single point shall be used for measuring velocity during the test run.

8.5.1 Velocity Traverse. Measure the diameter of the duct at the velocity traverse port location through both ports. Calculate the duct area using the average of the two diameters. A pretest leak-check of pitot lines as in Method 2, Section 8.1, is recommended. Place the calibrated pitot tube at the centroid of the stack in either of the velocity traverse ports. Adjust the damper or similar device on the blower inlet until the velocity indicated by the pitot is approximately 220 m/min (720 ft/min). Continue to read the Δp and temperature until the velocity has remained constant (less than 5 percent change) for 1 minute. Once a constant velocity is obtained at the centroid of the duct, perform a velocity traverse as outlined in Method 2, Section 8.3 using four points per traverse as outlined in Method 1. Measure the Δp and tunnel temperature at each traverse point and record the readings. Calculate the total gas flow rate using calculations contained in Method 2, Section 12. Verify that the flow rate is 4 ±0.40 dscm/min (140 ±14 dscf/min); if not, readjust the damper, and repeat the velocity traverse. The moisture may be assumed to be 4 percent (100 percent relative humidity at 85°F). Direct moisture measurements (*e.g.,* according to Method 4) are also permissible.

Note: If burn rates exceed 3 kg/hr (6.6 lb/hr), dilution tunnel duct flow rates greater than 4 dscm/min (140 dscfm) and sampling section duct diameters larger than 150 mm (6 in.) are allowed. If larger ducts or flow rates are used, the sampling section velocity shall be at least 220 m/min (720 fpm). In order to ensure measurable particulate mass catch, it is recommended that the ratio of the average mass flow rate in the dilution tunnel to the average fuel burn rate be less than 150:1 if larger duct sizes or flow rates are used.

8.5.2 Testing Velocity Measurements. After obtaining velocity traverse results that meet the flow rate requirements, choose a point of average velocity and place the pitot and temperature sensor at that location in the duct. Alternatively, locate the pitot and the temperature sensor at the duct centroid and calculate a velocity correction factor for the centroidal position. Mount the pitot to ensure no movement during the test run and seal the port holes to prevent any air leakage. Align the pitot opening to be parallel with the duct axis at the measurement point. Check that this condition is maintained during the test run (about 30-minute intervals). Monitor the temperature and velocity during the pretest ignition period to ensure that the proper flow rate is maintained. Make adjustments to the dilution tunnel flow rate as necessary.

8.6 Pretest Preparation. Same as Method 5, Section 8.1.

8.7 Preparation of Sampling Train. During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

Using a tweezer or clean disposable surgical gloves, place one labeled (identified) and weighed filter in each of the filter holders. Be sure that each filter is properly centered and that the gasket is properly placed so as to prevent the sample gas stream from circumventing the filter. Check each filter for tears after assembly is completed.

Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct. Set up the train as shown in Figure 5G–1.

8.8 Leak-Check Procedures.

8.8.1 Leak-Check of Metering System Shown in Figure 5G–1. That portion of the sampling train from the pump to the orifice meter shall be leak-checked prior to initial use and after each certification or audit test. Leakage after the pump will result in less volume being recorded than is actually sampled. Use the procedure described in Method 5, Section 8.4.1. Similar leak-checks shall be conducted for other types of metering systems (i.*e.,* without orifice meters).

8.8.2 Pretest Leak-Check. A pretest leak-check of the sampling train is recommended, but not required. If the pretest leak check is conducted, the procedures outlined in Method 5, Section 8.4.2 should be used. A vacuum of 130 mm Hg (5 in. Hg) may be used instead of 380 mm Hg (15 in. Hg).

8.8.3 Post-Test Leak-Check. A leak-check of the sampling train is mandatory at the conclusion of each test run. The leak-check shall be performed in accordance with the procedures outlined in Method 5, Section 8.4.2. A vacuum of 130 mm Hg (5 in. Hg) or the highest vacuum measured during the test run, whichever is greater, may be used instead of 380 mm Hg (15 in. Hg).

8.9 Preliminary Determinations. Determine the pressure, temperature and the average velocity of the tunnel gases as in Section 8.5. Moisture content of diluted tunnel gases is assumed to be 4 percent for making flow rate calculations; the moisture content may be measured directly as in Method 4.

8.10 Sampling Train Operation. Position the probe inlet at the stack centroid, and block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream. Be careful not to bump the probe into the stack wall when removing or inserting the probe through the porthole; this minimizes the chance of extracting deposited material.

8.10.1 Begin sampling at the start of the test run as defined in Method 28, Section 8.8.1. During the test run, maintain a sample flow rate proportional to the dilution tunnel flow rate (within 10 percent of the initial proportionality ratio) and a filter holder temperature of no greater than 32°C (90°F). The initial sample flow rate shall be approximately 0.015 m^3/min (0.5 cfm).

8.10.2 For each test run, record the data required on a data sheet such as the one shown in Figure 5G–3. Be sure to record the initial dry gas meter reading. Record the dry gas meter readings at the beginning and end of each sampling time increment and when sampling is halted. Take other readings as indicated on Figure 5G–3 at least once each 10 minutes during the test run. Since the manometer level and zero may drift because of vibrations and temperature changes, make periodic checks during the test run.

8.10.3 For the purposes of proportional sampling rate determinations, data from calibrated flow rate devices, such as glass rotameters, may be used in lieu of incremental dry gas meter readings. Proportional rate calculation procedures must be revised, but acceptability limits remain the same.

8.10.4 During the test run, make periodic adjustments to keep the temperature between (or upstream of) the filters at the proper level. Do not change sampling trains during the test run.

8.10.5 At the end of the test run (see Method 28, Section 6.4.6), turn off the coarse adjust valve, remove the probe from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak-check, as outlined in Section 8.8.2. Also, leak-check the pitot lines as described in Method 2, Section 8.1; the lines must pass this leak-check in order to validate the velocity head data.

8.11 Calculation of Proportional Sampling Rate. Calculate percent proportionality (see Section 12.7) to determine whether the run was valid or another test run should be made.

8.12 Sample Recovery. Same as Method 5, Section 8.7, with the exception of the following:

8.12.1 An acetone blank volume of about 50-ml or more may be used.

8.12.2 Treat the samples as follows:

8.12.2.1 Container Nos. 1 and 1A. Treat the two filters according to the procedures outlined in Method 5, Section 8.7.6.1. The filters may be stored either in a single container or in separate containers. Use the sum of the filter tare weights to determine the sample mass collected.

8.12.2.3 Container No. 2.

8.12.2.3.1 Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe and filter holders by washing and brushing these components with acetone and placing the wash in a labeled glass container. At least three cycles of brushing and rinsing are required.

8.12.2.3.2 Between sampling runs, keep brushes clean and protected from contamination.

8.12.2.3.3 After all acetone washings and particulate matter have been collected in the sample containers, tighten the lids on the sample containers so that the acetone will not leak out when transferred to the laboratory weighing area. Mark the height of the fluid levels to determine whether leakage occurs during transport. Label the containers clearly to identify contents.

8.13 Sample Transport. Whenever possible, containers should be shipped in such a way that they remain upright at all times.

Note: Requirements for capping and transport of sample containers are not applicable if sample recovery and analysis occur in the same room.

9.0 Quality Control

9.1 Miscellaneous Quality Control Measures.

Section	Quality control measure	Effect
8.8, 10.1–10.4	Sampling equipment leak check and calibration	Ensures accurate measurement of stack gas flow rate, sample volume.
10.5	Analytical balance calibration	Ensure accurate and precise measurement of collected particulate.
16.2.5	Simultaneous, dual-train sample collection	Ensure precision of measured particulate concentration.

9.2 Volume Metering System Checks. Same as Method 5, Section 9.2.

10.0 Calibration and Standardization

Note: Maintain a laboratory record of all calibrations.

10.1 Pitot Tube. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Method 2, Section 10.1, prior to the first certification test and checked semiannually, thereafter. A standard pitot need not be calibrated but shall be inspected and cleaned, if necessary, prior to each certification test.

10.2 Volume Metering System.

10.2.1 Initial and Periodic Calibration. Before its initial use and at least semiannually thereafter, calibrate the volume metering system as described in Method 5, Section 10.3.1, except that the wet test meter with a capacity of 3.0 liters/rev (0.1 ft^3/rev) may be used. Other liquid displacement systems accurate to within ±1 percent, may be used as calibration standards.

Note: Procedures and equipment specified in Method 5, Section 16.0, for alternative calibration standards, including calibrated dry gas meters and critical orifices, are allowed for calibrating the dry gas meter in the sampling train. A dry gas meter used as a calibration standard shall be recalibrated at least once annually.

10.2.2 Calibration After Use. After each certification or audit test (four or more test runs conducted on a wood heater at the four burn rates specified in Method 28), check calibration of the metering system by performing three calibration runs at a single, intermediate flow rate as described in Method 5, Section 10.3.2.

Note: Procedures and equipment specified in Method 5, Section 16.0, for alternative calibration standards are allowed for the post-test dry gas meter calibration check.

10.2.3 Acceptable Variation in Calibration. If the dry gas meter coefficient values obtained before and after a certification test differ by more than 5 percent, the certification test shall either be voided and repeated, or calculations for the certification test shall be performed using whichever meter coefficient value (*i.e.,* before or after) gives the lower value of total sample volume.

10.3 Temperature Sensors. Use the procedure in Method 2, Section 10.3, to calibrate temperature sensors before the first certification or audit test and at least semiannually, thereafter.

10.4 Barometer. Calibrate against a mercury barometer before the first certification test and at least semiannually, thereafter. If a mercury barometer is used, no calibration is necessary. Follow the manufacturer's instructions for operation.

10.5 Analytical Balance. Perform a multipoint calibration (at least five points spanning the operational range) of the analytical balance before the first certification test and semiannually, thereafter. Before each certification test, audit the balance by weighing at least one calibration weight (class F) that corresponds to 50 to 150 percent of the weight of one filter. If the scale cannot reproduce the value of the calibration weight to within 0.1 mg, conduct the multipoint calibration before use.

11.0 Analytical Procedure

11.1 Record the data required on a sheet such as the one shown in Figure 5G–4. Use the same analytical balance for determining tare weights and final sample weights.

11.2 Handle each sample container as follows:

11.2.1 Container Nos. 1 and 1A. Treat the two filters according to the procedures outlined in Method 5, Section 11.2.1.

11.2.2 Container No. 2. Same as Method 5, Section 11.2.2, except that the beaker may be smaller than 250 ml.

11.2.3 Acetone Blank Container. Same as Method 5, Section 11.2.4, except that the beaker may be smaller than 250 ml.

12.0 Data Analysis and Calculations

Carry out calculations, retaining at least one extra significant figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

12.1 Nomenclature.

B_{ws} = Water vapor in the gas stream, proportion by volume (assumed to be 0.04).

c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (gr/dscf).

E = Particulate emission rate, g/hr (lb/hr).

E_{adj} = Adjusted particulate emission rate, g/hr (lb/hr).

L_a = Maximum acceptable leakage rate for either a pretest or post-test leak-check, equal to 0.00057 m^3/min (0.020 cfm) or 4 percent of the average sampling rate, whichever is less.

L_p = Leakage rate observed during the post-test leak-check, m^3/min (cfm).

m_a=Mass of residue of acetone blank after evaporation, mg.

m_{aw} = Mass of residue from acetone wash after evaporation, mg.

m_n = Total amount of particulate matter collected, mg.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

PR = Percent of proportional sampling rate.

P_s = Absolute gas pressure in dilution tunnel, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

Q_{sd} = Average gas flow rate in dilution tunnel, calculated as in Method 2, Equation 2–8, dscm/hr (dscf/hr).

T_m = Absolute average dry gas meter temperature (see Figure 5G–3), °K (°R).

T_{mi} = Absolute average dry gas meter temperature during each 10-minute interval, i, of the test run, °K (°R).

T_s = Absolute average gas temperature in the dilution tunnel (see Figure 5G–3), °K (°R).

T_{si} = Absolute average gas temperature in the dilution tunnel during each 10 minute interval, i, of the test run, °K (°R).

T_{std} = Standard absolute temperature, 293°K (528°R).

V_a = Volume of acetone blank, ml.

V_{aw} = Volume of acetone used in wash, ml.

V_m=Volume of gas sample as measured by dry gas meter, dcm (dcf).

V_{mi} = Volume of gas sample as measured by dry gas meter during each 10-minute interval, i, of the test run, dcm.

Vm(std) = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

V_s = Average gas velocity in the dilution tunnel, calculated by Method 2, Equation 2–7, m/sec (ft/sec). The dilution tunnel dry gas molecular weight may be assumed to be 29 g/g mole (lb/lb mole).

V_{si} = Average gas velocity in dilution tunnel during each 10-minute interval, i, of the test run, calculated by Method 2, Equation 2–7, m/sec (ft/sec).

Y = Dry gas meter calibration factor.

ΔH = Average pressure differential across the orifice meter, if used (see Figure 5G–2), mm H_2O (in. H_2O).

U = Total sampling time, min.

10 = 10 minutes, length of first sampling period.

13.6 = Specific gravity of mercury.

100 = Conversion to percent.

12.2 Dry Gas Volume. Same as Method 5, Section 12.2, except that component changes are not allowable.

12.3 Solvent Wash Blank.

$$m_{aw} = \frac{m_a V_{aw}}{V_a} \qquad Eq.\ 5G\text{-}1$$

12.4 Total Particulate Weight. Determine the total particulate catch, mn, from the sum of the weights obtained from Container Nos. 1, 1A, and 2, less the acetone blank (see Figure 5G–4).

12.5 Particulate Concentration.

$$c_s = K_2 \frac{m_n}{V_{m(std)}} \qquad \text{Eq. 5G-2}$$

Where:

K_2 = 0.001 g/mg for metric units.

= 0.0154 gr/mg for English units.

12.6 Particulate Emission Rate.

$$E = C_s Q_{sd} \qquad \text{Eq. 5G-3}$$

Note: Particulate emission rate results produced using the sampling train described in Section 6 and shown in Figure 5G–1 shall be adjusted for reporting purposes by the following method adjustment factor:

$$E_{adj} = K_3 E^{0.83} \qquad \text{Eq. 5G-4}$$

Where:

K_3 = constant, 1.82 for metric units.

= constant, 0.643 for English units.

12.7 Proportional Rate Variation. Calculate PR for each 10-minute interval, i, of the test run.

$$PR = \left(\frac{\theta \left(V_{mi} V_s \, T_m T_{si} \right)}{10 \left(V_m V_{si} T_s T_{mi} \right)} \right) \times 100 \qquad Eq.\ \text{5G-5}$$

Alternate calculation procedures for proportional rate variation may be used if other sample flow rate data (e.g., orifice flow meters or rotameters) are monitored to maintain proportional sampling rates. The proportional rate variations shall be calculated for each 10-minute interval by comparing the stack to nozzle velocity ratio for each 10-minute interval to the average stack to nozzle velocity ratio for the test run. Proportional rate variation may be calculated for intervals shorter than 10 minutes with appropriate revisions to Equation 5G–5. If no more than 10 percent of the PR values for all the intervals exceed 90 percent ≤ PR ≤ 110 percent, and if no PR value for any interval exceeds 80 percent ≤ PR ≤ 120 percent, the results are acceptable. If the PR values for the test run are judged to be unacceptable, report the test run emission results, but do not include the results in calculating the weighted average emission rate, and repeat the test run.

13.0 Method Performance[Reserved]

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 Alternative Procedures

16.1 Method 5H Sampling Train. The sampling train and sample collection, recovery, and analysis procedures described in Method 5H, Sections 6.1.1, 7.1, 7.2, 8.1, 8.10, 8.11, and 11.0, respectively, may be used in lieu of similar sections in Method 5G. Operation of the Method 5H sampling train in the dilution tunnel is as described in Section 8.10 of this method. Filter temperatures and condenser conditions are as described in Method 5H. No adjustment to the measured particulate matter emission rate (Equation 5G–4, Section 12.6) is to be applied to the particulate emission rate measured by this alternative method.

16.2 Dual Sampling Trains. Two sampling trains may be operated simultaneously at sample flow rates other than that specified in Section 8.10, provided that the following specifications are met.

16.2.1 Sampling Train. The sampling train configuration shall be the same as specified in Section 6.1.1, except the probe, filter, and filter holder need not be the same sizes as specified in the applicable sections. Filter holders of plastic materials such as Nalgene or polycarbonate materials may be used (the Gelman 1119 filter holder has been found suitable for this purpose). With such materials, it is recommended that solvents not be used in sample recovery. The filter face velocity shall not exceed 150 mm/sec (30 ft/min) during the test run. The dry gas meter shall be calibrated for the same flow rate range as encountered during the test runs. Two separate, complete sampling trains are required for each test run.

16.2.2 Probe Location. Locate the two probes in the dilution tunnel at the same level (see Section 6.1.4.3). Two sample ports are necessary. Locate the probe inlets within the 50 mm (2 in.) diameter centroidal area of the dilution tunnel no closer than 25 mm (1 in.) apart.

16.2.3 Sampling Train Operation. Operate the sampling trains as specified in Section 8.10, maintaining proportional sampling rates and starting and stopping the two sampling trains simultaneously. The pitot values as described in Section 8.5.2 shall be used to adjust sampling rates in both sampling trains.

16.2.4 Recovery and Analysis of Sample. Recover and analyze the samples from the two sampling trains separately, as specified in Sections 8.12 and 11.0, respectively.

16.2.4.1 For this alternative procedure, the probe and filter holder assembly may be weighed without sample recovery (use no solvents) described above in order to determine the sample weight gains. For this approach, weigh the clean, dry probe and filter holder assembly upstream of the front filter (without filters) to the nearest 0.1 mg to establish the tare weights. The filter holder section between the front and second filter need not be weighed. At the end of the test run, carefully clean the outside of the probe, cap the ends, and identify the sample (label). Remove the filters from the filter holder assemblies as described for container Nos. 1 and 1A in Section 8.12.2.1. Reassemble the filter holder assembly, cap the ends, identify the sample (label), and transfer all the samples to the laboratory weighing area for final weighing. Requirements for capping and transport of sample containers are not applicable if sample recovery and analysis occur in the same room.

16.2.4.2 For this alternative procedure, filters may be weighed directly without a petri dish. If the probe and filter holder assembly are to be weighed to determine the sample weight, rinse the probe with acetone to remove moisture before desiccating prior to the test run. Following the test run, transport the probe and filter holder to the desiccator, and uncap the openings of the probe and the filter holder assembly. Desiccate for 24 hours and weigh to a constant weight. Report the results to the nearest 0.1 mg.

16.2.5 Calculations. Calculate an emission rate (Section 12.6) for the sample from each sampling train separately and determine the average emission rate for the two values. The two emission rates shall not differ by more than 7.5 percent from the average emission rate, or 7.5 percent of the weighted average emission rate limit in the applicable subpart of the regulations, whichever is greater. If this specification is not met, the results are unacceptable. Report the results, but do not include the results in calculating the weighted average emission rate. Repeat the test run until acceptable results are achieved, report the average emission rate for the acceptable test run, and use the average in calculating the weighted average emission rate.

17.0 References

Same as Method 5, Section 17.0, References 1 through 11, with the addition of the following:

1. Oregon Department of Environmental Quality. Standard Method for Measuring the Emissions and Efficiencies of Woodstoves. June 8, 1984. Pursuant to Oregon Administrative Rules Chapter 340, Division 21.

2. American Society for Testing and Materials. Proposed Test Methods for Heating Performance and Emissions of Residential Wood-fired Closed Combustion-Chamber Heating Appliances. E–6 Proposal P 180. August 1986.

18.0 Tables, Diagrams, Flowcharts, and Validation Data

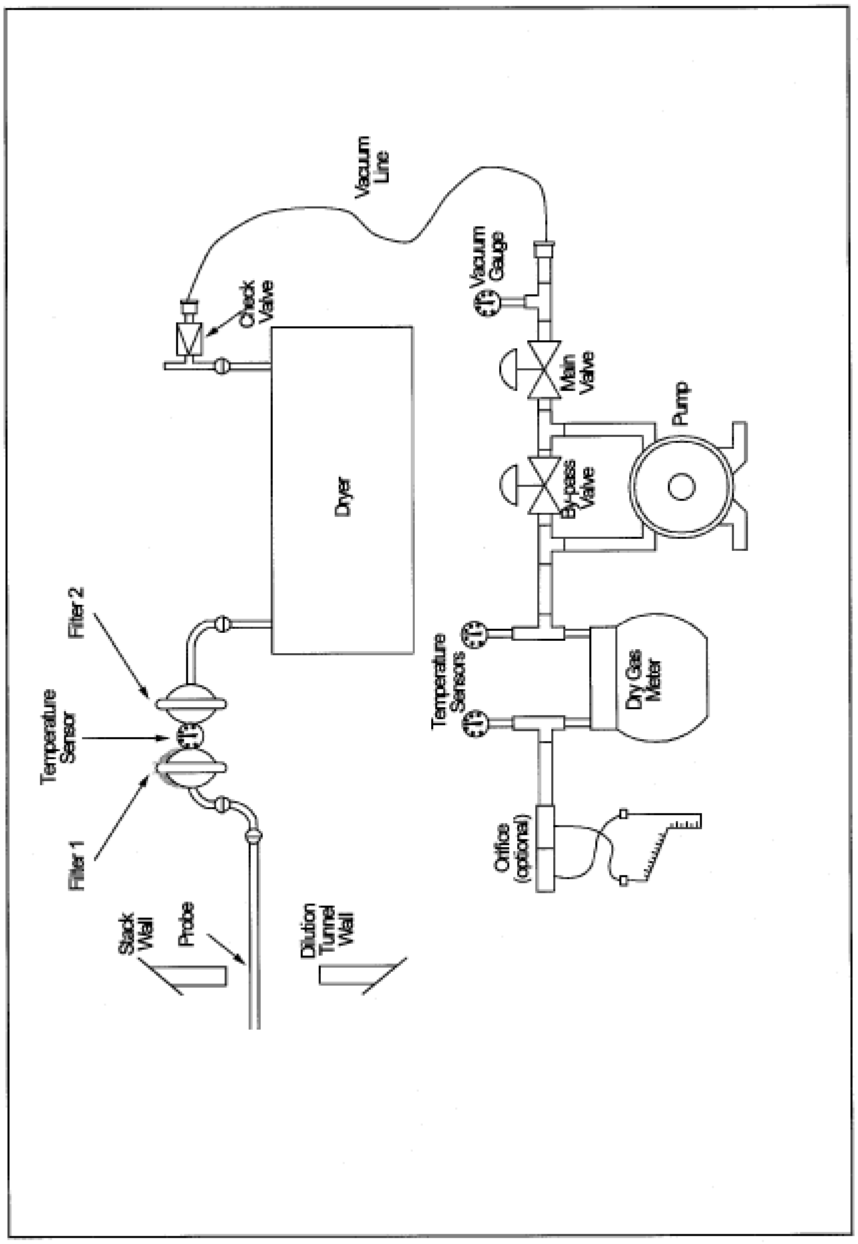


Figure 5G-1. Method 5G Sampling Train.

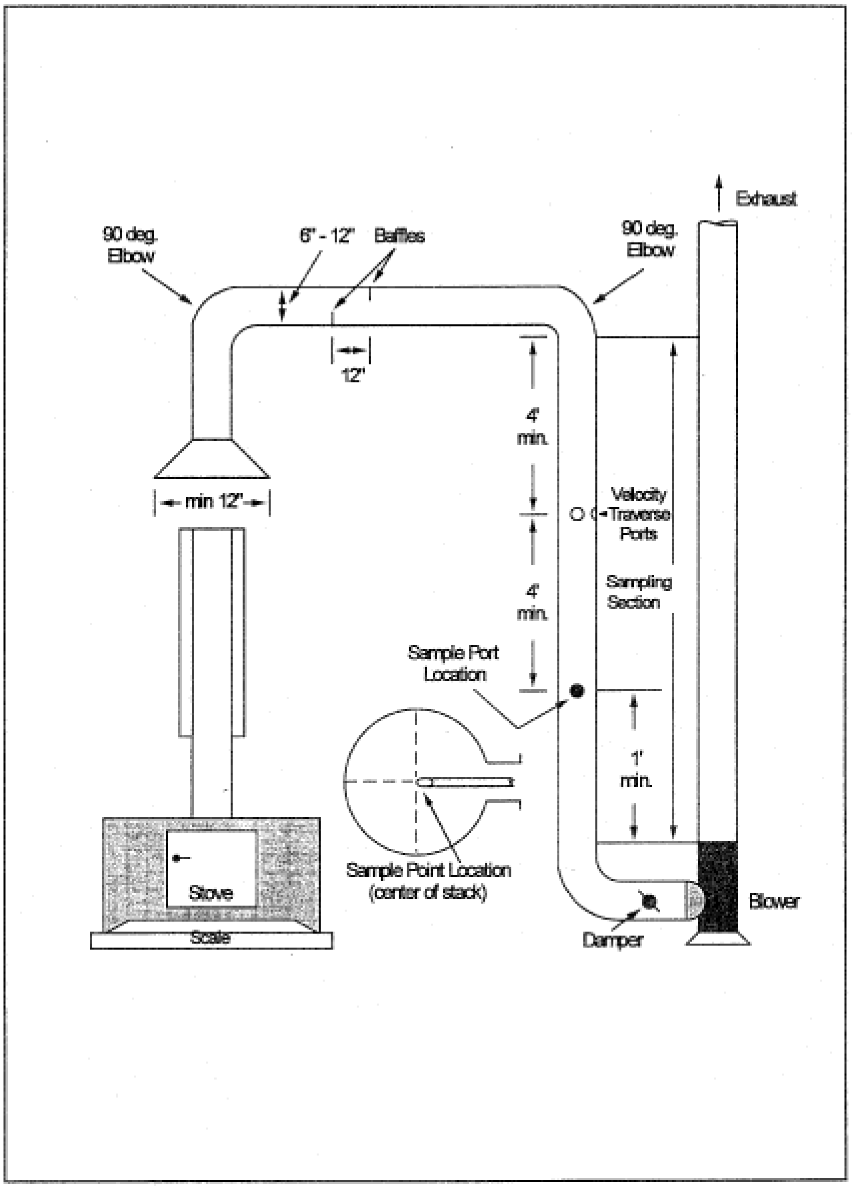
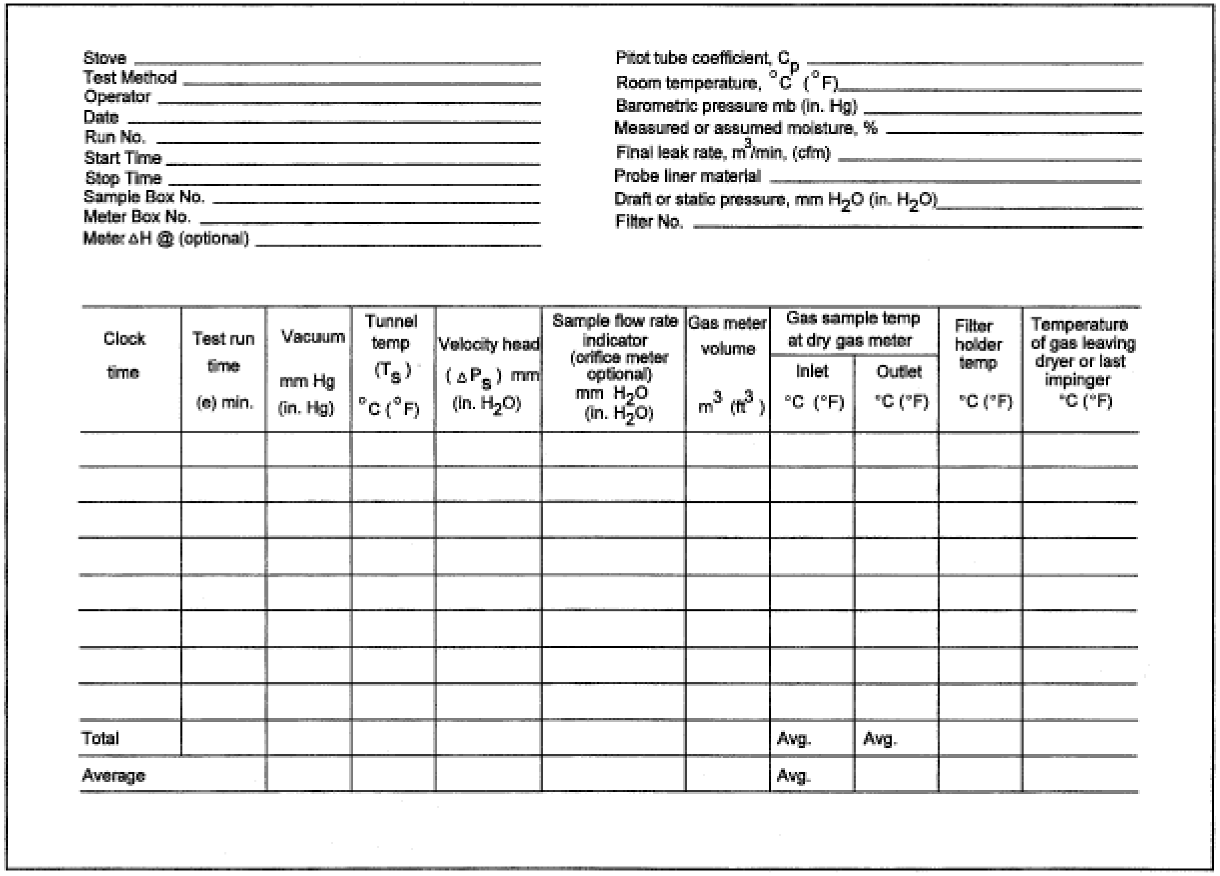


Figure 5G-2. Suggested Construction Details of the Dilution Tunnel.

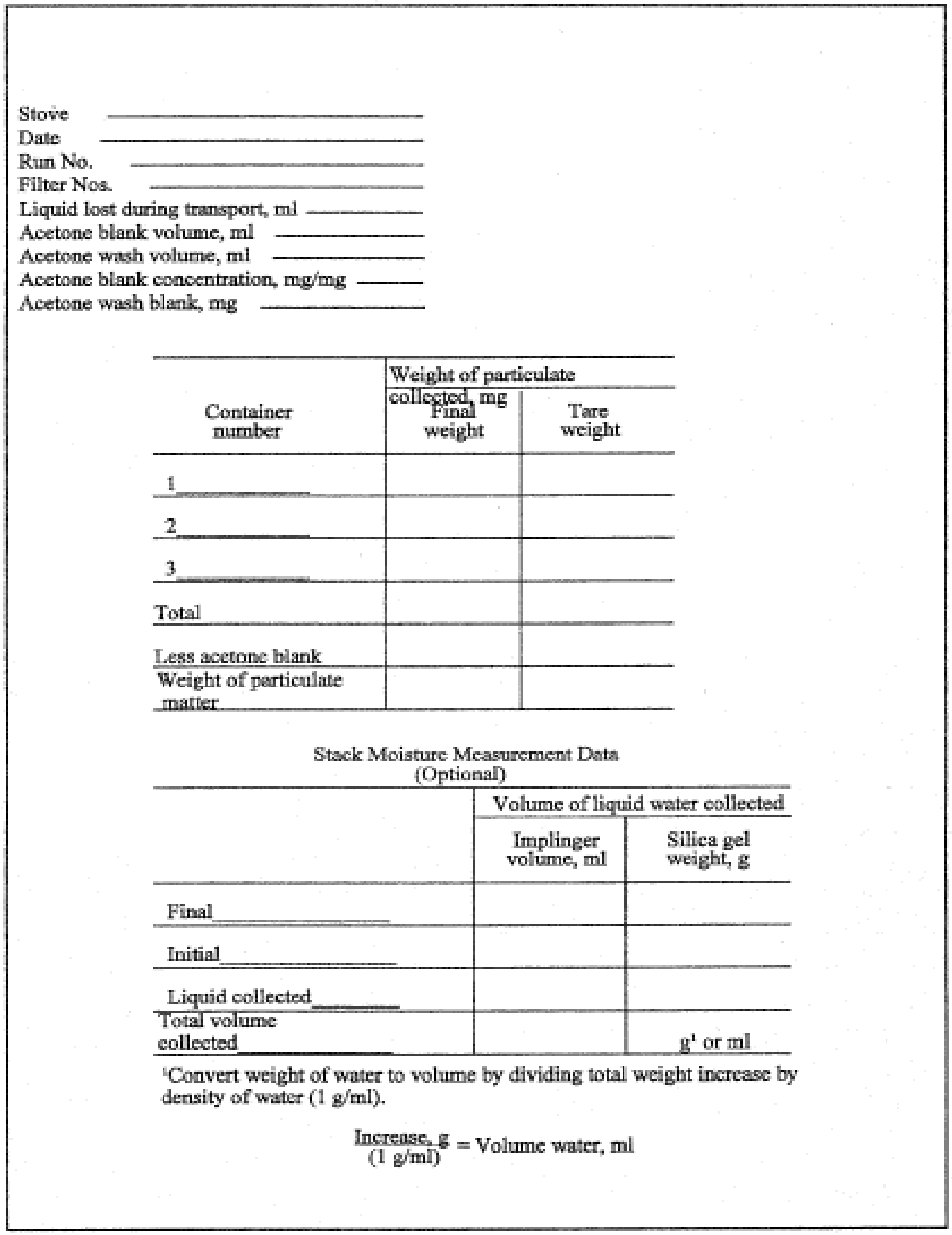


Stove __________
Test Method __________
Operator __________
Date __________
Run No. __________
Start Time __________
Stop Time __________
Sample Box No. __________
Meter Box No. __________
Meter ΔH @ (optional) __________

Pitot tube coefficient, C_p __________
Room temperature, °C (°F) __________
Barometric pressure mb (in. Hg) __________
Measured or assumed moisture, % __________
Final leak rate, m^3/min, (cfm) __________
Probe liner material __________
Draft or static pressure, mm H_2O (in. H_2O) __________
Filter No. __________

Clock time	Test run time (e) min.	Vacuum mm Hg (in. Hg)	Tunnel temp (T_s) °C (°F)	Velocity head (ΔP_s) mm (in. H_2O)	Sample flow rate indicator (orifice meter optional) mm H_2O (in. H_2O)	Gas meter volume m^3 (ft^3)	Gas sample temp at dry gas meter		Filter holder temp °C (°F)	Temperature of gas leaving dryer or last impinger °C (°F)
							Inlet °C (°F)	Outlet °C (°F)		
Total							Avg.	Avg.		
Average							Avg.			

Figure 5G-3. Sampling Data Sheet.



Stove ____________________

Date ____________________

Run No. ____________________

Filter Nos. ____________________

Liquid lost during transport, ml ________

Acetone blank volume, ml ________

Acetone wash volume, ml ________

Acetone blank concentration, mg/mg ______

Acetone wash blank, mg ________

Container number	Weight of particulate collected, mg	
	Final weight	Tare weight
1________		
2________		
3________		
Total		
Less acetone blank		
Weight of particulate matter		

Stack Moisture Measurement Data (Optional)

	Volume of liquid water collected	
	Implinger volume, ml	Silica gel weight, g
Final________		
Initial________		
Liquid collected________		
Total volume collected________		g[1] or ml

[1] Convert weight of water to volume by dividing total weight increase by density of water (1 g/ml).

$$\frac{\text{Increase, g}}{(1\ \text{g/ml})} = \text{Volume water, ml}$$

Figure 5G-4. Analysis Data Sheet.

METHOD 6C—DETERMINATION OF SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

1.0 Scope and Application

What is Method 6C?

Method 6C is a procedure for measuring sulfur dioxide (SO_2) in stationary source emissions using a continuous instrumental analyzer. Quality assurance and quality control requirements are included to assure that you, the tester, collect data of known quality. You must document your adherence to these specific requirements for equipment, supplies, sample collection and analysis, calculations, and data analysis.

This method does not completely describe all equipment, supplies, and sampling and analytical procedures you will need but refers to other methods for some of the details. Therefore, to obtain reliable results, you should also have a thorough knowledge of these additional test methods which are found in appendix A to this part:

(a) Method 1—Sample and Velocity Traverses for Stationary Sources.

(b) Method 4—Determination of Moisture Content in Stack Gases.

(c) Method 6—Determination of Sulfur Dioxide Emissions from Stationary Sources.

(d) Method 7E—Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure).

1.1 Analytes. What does this method determine? This method measures the concentration of sulfur dioxide.

Analyte	**CAS No.**	**Sensitivity**
SO_2	7446-09-5	Typically <2% of Calibration Span.

1.2 Applicability. When is this method required? The use of Method 6C may be required by specific New Source Performance Standards, Clean Air Marketing rules, State Implementation Plans, and permits where SO_2 concentrations in stationary source emissions must be measured, either to determine compliance with an applicable emission standard or to conduct performance testing of a continuous emission monitoring system (CEMS). Other regulations may also require the use of Method 6C.

1.3 Data Quality Objectives. How good must my collected data be? Refer to section 1.3 of Method 7E.

2.0 Summary of Method

In this method, you continuously sample the effluent gas and convey the sample to an analyzer that measures the concentration of SO_2. You must meet the performance requirements of this method to validate your data.

3.0 Definitions

Refer to section 3.0 of Method 7E for the applicable definitions.

4.0 Interferences

Refer to Section 4.0 of Method 7E.

5.0 Safety

Refer to section 5.0 of Method 7E.

6.0 Equipment and Supplies

Figure 7E-1 of Method 7E is a schematic diagram of an acceptable measurement system.

6.1 What do I need for the measurement system? The essential components of the measurement system are the same as those in sections 6.1 and 6.2 of Method 7E, except that the SO_2 analyzer described in section 6.2 of this method must be used instead of the analyzer described in section 6.2 of Method 7E. You must follow the noted specifications in section 6.1 of Method 7E.

6.2 What analyzer must I use? You may use an instrument that uses an ultraviolet, non-dispersive infrared, fluorescence, or other detection principle to continuously measure SO_2 in the gas stream and meets the performance specifications in section 13.0. The low-range and dual-range analyzer provisions in sections 6.2.8.1 and 6.2.8.2 of Method 7E apply.

7.0 Reagents and Standards

7.1 Calibration Gas. What calibration gases do I need? Refer to section 7.1 of Method 7E for the calibration gas requirements. Example calibration gas mixtures are listed below.

(a) SO_2 in nitrogen (N_2).

(b) SO_2 in air.

(c) SO_2 and CO_2 in N_2.

(d) SO_2 andO_2 in N_2.

(e) $SO_2/CO_2/O_2$ gas mixture in N_2.

(f) CO_2/NO_X gas mixture in N_2.

(g) $CO_2/SO_2/NO_X$ gas mixture in N_2.

7.2 Interference Check. What additional reagents do I need for the interference check? The test gases for the interference check are listed in Table 7E-3 of Method 7E. For the alternative interference check, you must use the reagents described in section 7.0 of Method 6.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Sampling Site and Sampling Points. You must follow the procedures of section 8.1 of Method 7E.

8.2 Initial Measurement System Performance Tests. You must follow the procedures in section 8.2 of Method 7E. If a dilution-type measurement system is used, the special considerations in section 8.3 of Method 7E also apply.

8.3 *Interference Check.* You must follow the procedures of Section 8.2.7 of Method 7E to conduct an interference check, substituting SO_2 for NO_X as the method pollutant. For dilution-type measurement systems, you must use the alternative interference check procedure in Section 16 and a co-located, unmodified Method 6 sampling train. Quenching in fluorescence analyzers must be evaluated and remedied unless a dilution system and ambient-level analyzer is used. This may be done by preparing the calibration gas to contain within 1 percent of the absolute oxygen and carbon dioxide content of the measured gas, preparing the calibration gas in air and using vendor nomographs, or by other acceptable means.

8.4 Sample Collection. You must follow the procedures of section 8.4 of Method 7E.

8.5 Post-Run System Bias Check and Drift Assessment. You must follow the procedures of section 8.5 of Method 7E.

9.0 Quality Control

Follow quality control procedures in section 9.0 of Method 7E.

10.0 Calibration and Standardization

Follow the procedures for calibration and standardization in section 10.0 of Method 7E.

11.0 Analytical Procedures

Because sample collection and analysis are performed together (see section 8), additional discussion of the analytical procedure is not necessary.

12.0 Calculations and Data Analysis

You must follow the applicable procedures for calculations and data analysis in section 12.0 of Method 7E as applicable, substituting SO_2 for NO_X as appropriate.

13.0 Method Performance

13.1 The specifications for the applicable performance checks are the same as in section 13.0 of Method 7E.

13.2 Alternative Interference Check. The results are acceptable if the difference between the Method 6C result and the modified Method 6 result is less than 7.0 percent of the Method 6 result for each of the three test runs. For the purposes of comparison, the Method 6 and 6C results must be expressed in the same units of measure.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures

16.1 Alternative Interference Check. You may perform an alternative interference check consisting of at least three comparison runs between Method 6C and Method 6. This check validates the Method 6C results at each particular source category (type of facility) where the check is performed. When testing under conditions of low concentrations (<15 ppm), this alternative interference check is not allowed.

NOTE: The procedure described below applies to non-dilution sampling systems only. If this alternative interference check is used for a dilution sampling system, use a standard Method 6 sampling train and extract the sample directly from the exhaust stream at points collocated with the Method 6C sample probe.

a. Build the modified Method 6 sampling train (flow control valve, two midget impingers containing 3 percent hydrogen peroxide, and dry gas meter) shown in Figure 6C-1. Connect the sampling train to the sample bypass discharge vent. Record the dry gas meter reading before you begin sampling. Simultaneously collect modified Method 6 and Method 6C samples. Open the flow control valve in the modified Method 6 train as you begin to sample with Method 6C. Adjust the Method 6 sampling rate to 1 liter per minute (.10 percent). The sampling time per run must be the same as for Method 6 plus twice the average measurement system response time. If your modified Method 6 train does not include a pump, you risk biasing the results high if you over-pressurize the midget impingers and cause a leak. You can reduce this risk by cautiously increasing the flow rate as sampling begins.

b. After completing a run, record the final dry gas meter reading, meter temperature, and barometric pressure. Recover and analyze the contents of the midget impingers using the procedures in Method 6. Determine the average gas concentration reported by Method 6C for the run.

17.0 References

1. “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards” September 1997 as amended, EPA-600/R-97/121

18.0 Tables, Diagrams, Flowcharts, and Validation Data

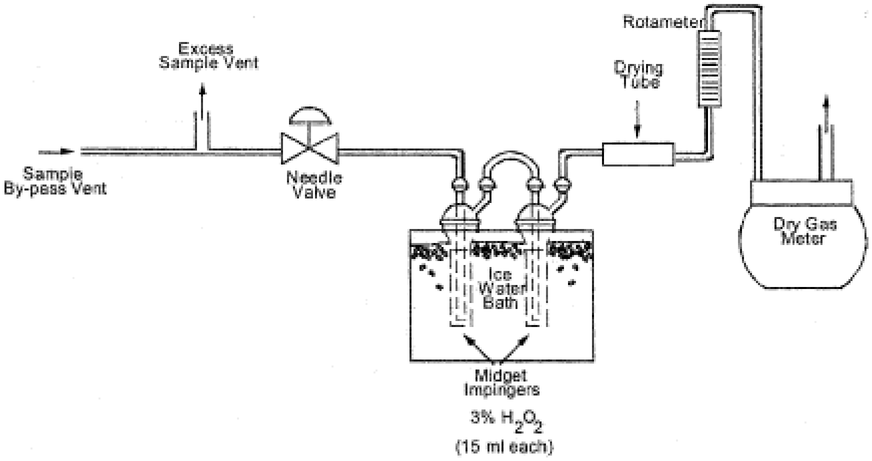


Figure 6C-1. Modified Method 6 Alternative Interference Check Sampling Train

While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. Please refer to the official version in the FR publication, which appears on the Government Printing Office's eCFR website:
http://www.ecfr.gov/cgi-bin/text-idx?SID=c7836e6ff67e5ad001bcb19ccfd99c1a&node=40:8.0.1.1.1&rgn=div5#40:8.0.1.1.1.0.1.1.4

METHOD 7E—DETERMINATION OF NITROGEN OXIDES EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

1.0 Scope and Application

What is Method 7E?

Method 7E is a procedure for measuring nitrogen oxides (NO_X) in stationary source emissions using a continuous instrumental analyzer. Quality assurance and quality control requirements are included to assure that you, the tester, collect data of known quality. You must document your adherence to these specific requirements for equipment, supplies, sample collection and analysis, calculations, and data analysis. This method does not completely describe all equipment, supplies, and sampling and analytical procedures you will need but refers to other methods for some of the details. Therefore, to obtain reliable results, you should also have a thorough knowledge of these additional test methods which are found in appendix A to this part:

(a) Method 1—Sample and Velocity Traverses for Stationary Sources.

(b) Method 4—Determination of Moisture Content in Stack Gases.

1.1 Analytes. What does this method determine? This method measures the concentration of nitrogen oxides as NO_2.

Analyte	**CAS No.**	**Sensitivity**
Nitric oxide (NO)	10102-43-9	Typically <2% of
Nitrogen dioxide (NO_2)	10102-44-0	Calibration Span.

1.2 Applicability. When is this method required? The use of Method 7E may be required by specific New Source Performance Standards, Clean Air Marketing rules, State Implementation Plans, and permits where measurement of NO_Xconcentrations in stationary source emissions is required, either to determine compliance with an applicable emissions standard or to conduct performance testing of a continuous monitoring system (CEMS). Other regulations may also require the use of Method 7E.

1.3 Data Quality Objectives (DQO). How good must my collected data be? Method 7E is designed to provide high-quality data for determining compliance with Federal and State emission standards and for relative accuracy testing of CEMS. In these and other applications, the principal objective is to ensure the accuracy of the data at the actual emission levels encountered. To meet this objective, the use of EPA traceability protocol calibration gases and measurement system performance tests are required.

1.4 Data Quality Assessment for Low Emitters. Is performance relief granted when testing low-emission units? Yes. For low-emitting sources, there are alternative performance specifications for analyzer calibration error, system bias, drift, and response time. Also, the alternative dynamic spiking procedure in section 16 may provide performance relief for certain low-emitting units.

2.0 Summary of Method

In this method, a sample of the effluent gas is continuously sampled and conveyed to the analyzer for measuring the concentration of NO_X. You may measure NO and NO_2 separately or simultaneously together but, for the purposes of this method, NO_X is the sum of NO and NO_2. You must meet the performance requirements of this method to validate your data.

3.0 Definitions

3.1 Analyzer Calibration Error, for non-dilution systems, means the difference between the manufacturer certified concentration of a calibration gas and the measured concentration of the same gas when it is introduced into the analyzer in direct calibration mode.

3.2 Calibration Curve means the relationship between an analyzer's response to the injection of a series of calibration gases and the actual concentrations of those gases.

3.3 Calibration Gas means the gas mixture containing NO_X at a known concentration and produced and certified in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards,” September 1997, as amended August 25, 1999, EPA-600/R-97/121 or more recent updates. The tests for analyzer calibration error, drift, and system bias require the use of calibration gas prepared according to this protocol. If a zero gas is used for the low-level gas, it must meet the requirements under the definition for “zero air material” in 40 CFR 72.2 in place of being prepared by the traceability protocol.

3.3.1 Low-Level Gas means a calibration gas with a concentration that is less than 20 percent of the calibration span and may be a zero gas.

3.3.2 Mid-Level Gas means a calibration gas with a concentration that is 40 to 60 percent of the calibration span.

3.3.3 High-Level Gas means a calibration gas with a concentration that is equal to the calibration span.

3.4 Calibration Span means the upper limit of the analyzer's calibration that is set by the choice of high-level calibration gas. No valid run average concentration may exceed the calibration span. To the extent practicable, the measured emissions should be between 20 to 100 percent of the selected calibration span. This may not be practicable in some cases of low-concentration measurements or testing for compliance with an emission limit when emissions are substantially less than the limit. In such cases, calibration spans that are practicable to achieving the data quality objectives without being excessively high should be chosen.

3.5 Centroidal Area means the central area of the stack or duct that is no greater than 1 percent of the stack or duct cross section. This area has the same geometric shape as the stack or duct.

3.6 Converter Efficiency Gas means a calibration gas with a known NO or NO_2 concentration and of Traceability Protocol quality.

3.7 Data Recorder means the equipment that permanently records the concentrations reported by the analyzer.

3.8 Direct Calibration Mode means introducing the calibration gases directly into the analyzer (or into the assembled measurement system at a point downstream of all sample conditioning equipment) according to manufacturer's recommended calibration procedure. This mode of calibration applies to non-dilution-type measurement systems.

3.9 Drift means the difference between the pre- and post-run system bias (or system calibration error) checks at a specific calibration gas concentration level (*i.e.* low-, mid- or high-).

3.10 Gas Analyzer means the equipment that senses the gas being measured and generates an output proportional to its concentration.

3.11 Interference Check means the test to detect analyzer responses to compounds other than the compound of interest, usually a gas present in the measured gas stream, that is not adequately accounted for in the calibration procedure and may cause measurement bias.

3.12 Low-Concentration Analyzer means any analyzer that operates with a calibration span of 20 ppm NO_X or lower. Each analyzer model used routinely to measure low NO_X concentrations must pass a manufacturer's stability test (MST). An MST subjects the analyzer to a range of line voltages and temperatures that reflect potential field conditions to demonstrate its stability following procedures similar to those provided in 40 CFR 53.23. Ambient-level analyzers are exempt from the MST requirements of section 16.3. A copy of this information must be included in each test report. Table 7E-5 lists the criteria to be met.

3.13 Measurement System means all of the equipment used to determine the NO_X concentration. The measurement system comprises six major subsystems: Sample acquisition, sample transport, sample conditioning, calibration gas manifold, gas analyzer, and data recorder.

3.14 Response Time means the time it takes the measurement system to respond to a change in gas concentration occurring at the sampling point when the system is operating normally at its target sample flow rate or dilution ratio.

3.15 Run means a series of gas samples taken successively from the stack or duct. A test normally consists of a specific number of runs.

3.16 System Bias means the difference between a calibration gas measured in direct calibration mode and in system calibration mode. System bias is determined before and after each run at the low- and mid- or high-concentration levels. For dilution-type systems, pre- and post-run system calibration error is measured rather than system bias.

3.17 System Calibration Error applies to dilution-type systems and means the difference between the measured concentration of low-, mid-, or high-level calibration gas and the certified concentration for each gas when introduced in system calibration mode. For dilution-type systems, a 3-point system calibration error test is conducted in lieu of the analyzer calibration error test, and 2-point system calibration error tests are conducted in lieu of system bias tests.

3.18 System Calibration Mode means introducing the calibration gases into the measurement system at the probe, upstream of the filter and all sample conditioning components.

3.19 Test refers to the series of runs required by the applicable regulation.

4.0 Interferences

Note that interferences may vary among instruments and that instrument-specific interferences must be evaluated through the interference test.

5.0 Safety

What safety measures should I consider when using this method? This method may require you to work with hazardous materials and in hazardous conditions. We encourage you to establish safety procedures before using the method. Among other precautions, you should become familiar with the safety recommendations in the gas analyzer user's manual. Occupational Safety and Health Administration (OSHA) regulations concerning cylinder and noxious gases may apply. Nitric oxide and NO_2 are toxic and dangerous gases. Nitric oxide is immediately converted to NO_2 upon reaction with air. Nitrogen dioxide is a highly poisonous and insidious gas. Inflammation of the lungs from exposure may cause only slight pain or pass unnoticed, but the resulting edema several days later may cause death. A concentration of 100 ppm is dangerous for even a short exposure, and 200 ppm may be fatal. Calibration gases must be handled with utmost care and with adequate ventilation. Emission-level exposure to these gases should be avoided.

6.0 Equipment and Supplies

The performance criteria in this method will be met or exceeded if you are properly using equipment designed for this application.

6.1 What do I need for the measurement system? You may use any equipment and supplies meeting the following specifications:

(1) Sampling system components that are not evaluated in the system bias or system calibration error test must be glass, Teflon, or stainless steel. Other materials are potentially acceptable, subject to approval by the Administrator.

(2) The interference, calibration error, and system bias criteria must be met.

(3) Sample flow rate must be maintained within 10 percent of the flow rate at which the system response time was measured.

(4) All system components (excluding sample conditioning components, if used) must maintain the sample temperature above the moisture dew point. Ensure minimal contact between any condensate and the sample gas. Section 6.2 provides example equipment specifications for a NO_X measurement system. Figure 7E-1 is a diagram of an example dry-basis measurement system that is likely to meet the method requirements and is provided as guidance. For wet-basis systems, you may use alternative equipment and supplies as needed (some of which are described in Section 6.2), provided that the measurement system meets the applicable performance specifications of this method.

Section 6.2 provides example equipment specifications for a NO_X measurement system. Figure 7E-1 is a diagram of an example dry basis measurement system that is likely to meet the method requirements and is provided as guidance. For wet-basis systems, you may use alternative equipment and supplies as needed (some of which are described in section 6.2), provided that the measurement system meets the applicable performance specifications of this method.

6.2 Measurement System Components

6.2.1 Sample Probe. Glass, stainless steel, or other approved material, of sufficient length to traverse the sample points.

6.2.2 Particulate Filter. An in-stack or out-of-stack filter. The filter must be made of material that is non-reactive to the gas being sampled. The filter media for out-of-stack filters must be included in the system bias test. The particulate filter requirement may be waived in applications where no significant particulate matter is expected (*e.g.*, for emission testing of a combustion turbine firing natural gas).

6.2.3 Sample Line. The sample line from the probe to the conditioning system/sample pump should be made of Teflon or other material that does not absorb or otherwise alter the sample gas. For a dry-basis measurement system (as shown in Figure 7E-1), the temperature of the sample line must be maintained at a sufficiently high level to prevent condensation before the sample conditioning components. For wet-basis measurement systems, the temperature of the sample line must be maintained at a sufficiently high level to prevent condensation before the analyzer.

6.2.4 Conditioning Equipment. For dry basis measurements, a condenser, dryer or other suitable device is required to remove moisture continuously from the sample gas. Any equipment needed to heat the probe or sample line to avoid condensation prior to the sample conditioning component is also required.

For wet basis systems, you must keep the sample above its dew point either by: (1) Heating the sample line and all sample transport components up to the inlet of the analyzer (and, for hot-wet extractive systems, also heating the analyzer) or (2) by diluting the sample prior to analysis using a dilution probe system. The components required to do either of the above are considered to be conditioning equipment.

6.2.5 Sampling Pump. For systems similar to the one shown in Figure 7E-1, a leak-free pump is needed to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is non-reactive to the gas being sampled. For dilution-type measurement systems, an ejector pump (eductor) is used to create a vacuum that draws the sample through a critical orifice at a constant rate.

6.2.6 Calibration Gas Manifold. Prepare a system to allow the introduction of calibration gases either directly to the gas analyzer in direct calibration mode or into the measurement system, at the probe, in system calibration mode, or both, depending upon the type of system used. In system calibration mode, the system should be able to flood the sampling probe and vent excess gas. Alternatively, calibration gases may be introduced at the calibration valve following the probe. Maintain a constant pressure in the gas manifold. For in-stack dilution-type systems, a gas dilution subsystem is required to transport large volumes of purified air to the sample probe and a probe controller is needed to maintain the proper dilution ratio.

6.2.7 Sample Gas Manifold. For the type of system shown in Figure 7E-1, the sample gas manifold diverts a portion of the sample to the analyzer, delivering the remainder to the by-pass discharge vent. The manifold should also be able to introduce calibration gases directly to the analyzer (except for dilution-type systems). The manifold must be made of material that is non-reactive to the gas sampled or the calibration gas and be configured to safely discharge the bypass gas.

6.2.8 NO_X Analyzer. An instrument that continuously measures NO_X in the gas stream and meets the applicable specifications in section 13.0. An analyzer that operates on the principle of chemiluminescence with an NO_2 to NO converter is one example of an analyzer that has been used successfully in the past. Analyzers operating on other principles may also be used provided the performance criteria in section 13.0 are met.

6.2.8.1 Dual Range Analyzers. For certain applications, a wide range of gas concentrations may be encountered, necessitating the use of two measurement ranges. Dual-range analyzers are readily available for these applications. These analyzers are often equipped with automated range-switching capability, so that when readings exceed the full-scale of the low measurement range, they are recorded on the high range. As an alternative to using a dual-range analyzer, you may use two segments of a single, large measurement scale to serve as the low and high ranges. In all cases, when two ranges are used, you must quality-assure both ranges using the proper sets of calibration gases. You must also meet the interference, calibration error, system bias, and drift checks. However, we caution that when you use two segments of a large measurement scale for dual range purposes, it may be difficult to meet the performance specifications on the low range due to signal-to-noise ratio considerations.

6.2.8.2 Low Concentration Analyzer. When an analyzer is routinely calibrated with a calibration span of 20 ppmv or less, the manufacturer's stability test (MST) is required. See Table 7E-5 for test parameters.

6.2.9 Data Recording. A strip chart recorder, computerized data acquisition system, digital recorder, or data logger for recording measurement data may be used.

7.0 Reagents and Standards

7.1 Calibration Gas. What calibration gases do I need? Your calibration gas must be NO in N_2 and certified (or recertified) within an uncertainty of 2.0 percent in accordance with “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards” September 1997, as amended August 25, 1999, EPA-600/R-97/121. Blended gases meeting the Traceability Protocol are allowed if the additional gas components are shown not to interfere with the analysis. If a zero gas is used for the low-level gas, it must meet the requirements under the definition for “zero air material” in 40 CFR 72.2. The calibration gas must not be used after its expiration date. Except for applications under part 75 of this chapter, it is acceptable to prepare calibration gas mixtures from EPA Traceability Protocol gases in accordance with Method 205 in appendix M to part 51 of this chapter. For part 75 applications, the use of Method 205 is subject to the approval of the Administrator. The goal and recommendation for selecting calibration gases is to bracket the sample concentrations. The following calibration gas concentrations are required:

7.1.1 High-Level Gas. This concentration is chosen to set the calibration span as defined in Section 3.4.

7.1.2 Mid-Level Gas. 40 to 60 percent of the calibration span.

7.1.3 Low-Level Gas. Less than 20 percent of the calibration span.

7.1.4 Converter Efficiency Gas. What reagents do I need for the converter efficiency test? The converter efficiency gas is a manufacturer-certified gas with a concentration sufficient to show NO_2 conversion at the concentrations encountered in the source. A test gas concentration in the 40 to 60 ppm range is suggested, but other concentrations may be more appropriate to specific sources. For the test described in section 8.2.4.1, NO_2 is required. For the alternative converter efficiency tests in section 16.2, NO is required.

7.2 Interference Check. What reagents do I need for the interference check? Use the appropriate test gases listed in Table 7E-3 or others not listed that can potentially interfere (as indicated by the test facility type, instrument manufacturer, etc.) to conduct the interference check. These gases should be manufacturer certified but do not have to be prepared by the EPA traceability protocol.

8.0 Sample Collection, Preservation, Storage, and Transport

Emission Test Procedure

Since you are allowed to choose different options to comply with some of the performance criteria, it is your responsibility to identify the specific options you have chosen, to document that the performance criteria for that option have been met, and to identify any deviations from the method.

8.1 What sampling site and sampling points do I select?

8.1.1 Unless otherwise specified in an applicable regulation or by the Administrator, when this method is used to determine compliance with an emission standard, conduct a stratification test as described in section 8.1.2 to determine the sampling traverse points to be used. For performance testing of continuous emission monitoring systems, follow the sampling site selection and traverse point layout procedures described in the appropriate performance specification or applicable regulation (e.g., Performance Specification 2 in appendix B to this part).

8.1.2 Determination of Stratification. Perform a stratification test at each test site to determine the appropriate number of sample traverse points. If testing for multiple pollutants or diluents at the same site, a stratification test using only one pollutant or diluent satisfies this requirement. A stratification test is not required for small stacks that are less than 4 inches in diameter. To test for stratification, use a probe of appropriate length to measure the NO_X (or pollutant of interest) concentration at twelve traverse points located according to Table 1-1 or Table 1-2 of Method 1. Alternatively, you may measure at three points on a line passing through the centroidal area. Space the three points at 16.7, 50.0, and 83.3 percent of the measurement line. Sample for a minimum of twice the system response time (see section 8.2.6) at each traverse point. Calculate the individual point and mean NO_X concentrations. If the concentration at each traverse point differs from the mean concentration for all traverse points by no more than: (a) ±5.0 percent of the mean concentration; or (b) ±0.5 ppm (whichever is less restrictive), the gas stream is considered unstratified and you may collect samples from a single point that most closely matches the mean. If the 5.0 percent or 0.5 ppm criterion is not met, but the concentration at each traverse point differs from the mean concentration for all traverse points by no more than: (a) ±10.0 percent of the mean; or (b) ±1.0 ppm (whichever is less restrictive), the gas stream is considered to be minimally stratified, and you may take samples from three points. Space the three points at 16.7, 50.0, and 83.3 percent of the measurement line. Alternatively, if a twelve-point stratification test was performed and the emissions were shown to be minimally stratified (all points within ±10.0 percent of their mean or within ±1.0 ppm), and if the stack diameter (or equivalent diameter, for a rectangular stack or duct) is greater than 2.4 meters (7.8 ft), then you may use 3-point sampling and locate the three points along the measurement line exhibiting the highest average concentration during the stratification test, at 0.4, 1.0 and 2.0 meters from the stack or duct wall. If the gas stream is found to be stratified because the 10.0 percent or 1.0 ppm criterion for a 3-point test is not met, locate twelve traverse points for the test in accordance with Table 1-1 or Table 1-2 of Method 1.

8.2 Initial Measurement System Performance Tests. What initial performance criteria must my system meet before I begin collecting samples? Before measuring emissions, perform the following procedures:

(a) Calibration gas verification,

(b) Measurement system preparation,

(c) Calibration error test,

(d) NO_2 to NO conversion efficiency test, if applicable,

(e) System bias check,

(f) System response time test, and

(g) Interference check

8.2.1 Calibration Gas Verification. How must I verify the concentrations of my calibration gases? Obtain a certificate from the gas manufacturer documenting the quality of the gas. Confirm that the manufacturer certification is complete and current. Ensure that your calibration gas certifications have not expired. This documentation should be available on-site for inspection. To the extent practicable, select a high-level gas concentration that will result in the measured emissions being between 20 and 100 percent of the calibration span.

8.2.2 Measurement System Preparation. How do I prepare my measurement system? Assemble, prepare, and precondition the measurement system according to your standard operating procedure. Adjust the system to achieve the correct sampling rate or dilution ratio (as applicable).

8.2.3 Calibration Error Test. How do I confirm my analyzer calibration is correct? After you have assembled, prepared and calibrated your sampling system and analyzer, you must conduct a 3-point analyzer calibration error test (or a 3-point system calibration error test for dilution systems) before the first run and again after any failed system bias test (or 2-point system calibration error test for dilution systems) or failed drift test. Introduce the low-, mid-, and high-level calibration gases sequentially. For non-dilution-type measurement systems, introduce the gases in direct calibration mode. For dilution-type measurement systems, introduce the gases in system calibration mode.

(1) For non-dilution systems, you may adjust the system to maintain the correct flow rate at the analyzer during the test, but you may not make adjustments for any other purpose. For dilution systems, you must operate the measurement system at the appropriate dilution ratio during all system calibration error checks, and may make only the adjustments necessary to maintain the proper ratio.

(2) Record the analyzer's response to each calibration gas on a form similar to Table 7E-1. For each calibration gas, calculate the analyzer calibration error using Equation 7E-1 in section 12.2 or the system calibration error using Equation 7E-3 in section 12.4 (as applicable). The calibration error specification in section 13.1 must be met for the low-, mid-, and high-level

gases. If the calibration error specification is not met, take corrective action and repeat the test until an acceptable 3-point calibration is achieved.

8.2.4 NO_2 to NO Conversion Efficiency Test. Before or after each field test, you must conduct an NO_2 to NO conversion efficiency test if your system converts NO_2 to NO before analyzing for NO_X. You may risk testing multiple facilities before performing this test provided you pass this test at the conclusion of the final facility test. A failed final conversion efficiency test in this case will invalidate all tests performed subsequent to the test in which the converter efficiency test was passed. Follow the procedures in section 8.2.4.1, or 8.2.4.2. If desired, the converter efficiency factor derived from this test may be used to correct the test results for converter efficiency if the NO_2 fraction in the measured test gas is known. Use Equation 7E-8 in section 12.8 for this correction.

8.2.4.1. Introduce NO_2 converter efficiency gas to the analyzer in direct calibration mode and record the NO_Xconcentration displayed by the analyzer. Calculate the converter efficiency using Equation 7E-7 in section 12.7. The specification for converter efficiency in section 13.5 must be met. The user is cautioned that state-of-the-art NO_2 calibration gases may have limited shelf lives, and this could affect the ability to pass the 90-percent conversion efficiency requirement.

8.2.4.2 Alternatively, either of the procedures for determining conversion efficiency using NO in section 16.2 may be used.

8.2.5 Initial System Bias and System Calibration Error Checks. Before sampling begins, determine whether the high-level or mid-level calibration gas best approximates the emissions and use it as the upscale gas. Introduce the upscale gas at the probe upstream of all sample conditioning components in system calibration mode. Record the time it takes for the measured concentration to increase to a value that is at least 95 percent or within 0.5 ppm (whichever is less restrictive) of a stable response for both the low-level and upscale gases. Continue to observe the gas concentration reading until it has reached a final, stable value. Record this value on a form similar to Table 7E-2.

(1) Next, introduce the low-level gas in system calibration mode and record the time required for the concentration response to decrease to a value that is within 5.0 percent or 0.5 ppm (whichever is less restrictive) of the certified low-range gas concentration. If the low-level gas is a zero gas, use the procedures described above and observe the change in concentration until the response is 0.5 ppm or 5.0 percent of the upscale gas concentration (whichever is less restrictive).

(2) Continue to observe the low-level gas reading until it has reached a final, stable value and record the result on a form similar to Table 7E-2. Operate the measurement system at the normal sampling rate during all system bias checks. Make only the adjustments necessary to achieve proper calibration gas flow rates at the analyzer.

(3) From these data, calculate the measurement system response time (see section 8.2.6) and then calculate the initial system bias using Equation 7E-2 in section 12.3. For dilution systems, calculate the system calibration error in lieu of system bias using equation 7E-3 in section 12.4.

See section 13.2 for acceptable performance criteria for system bias and system calibration error. If the initial system bias (or system calibration error) specification is not met, take corrective action. Then, you must repeat the applicable calibration error test from section 8.2.3 and the initial system bias (or 2-point system calibration error) check until acceptable results are achieved, after which you may begin sampling.

(NOTE: For dilution-type systems, data from the 3-point system calibration error test described in section 8.2.3 may be used to meet the initial 2-point system calibration error test requirement of this section, if the calibration gases were injected as described in this section, and if response time data were recorded).

8.2.6 Measurement System Response Time. As described in section 8.2.5, you must determine the measurement system response time during the initial system bias (or 2-point system calibration error) check. Observe the times required to achieve 95 percent of a stable response for both the low-level and upscale gases. The longer interval is the response time.

8.2.7 Interference Check. Conduct an interference response test of the gas analyzer prior to its initial use in the field. If you have multiple analyzers of the same make and model, you need only perform this alternative interference check on one analyzer. You may also meet the interference check requirement if the instrument manufacturer performs this or a similar check on an analyzer of the same make and model of analyzer that you use and provides you with documented results. Analytical quenching must be evaluated and remedied unless a dilution system and ambient-level analyzer are used. The analyzer must be checked for quenching at concentrations of approximately 4 and 12 percent CO_2 at a mid-range concentration for each analyzer range which is commonly used. The analyzer must be rechecked after it has been repaired or modified or on another periodic basis. * * *

(1) You may introduce the appropriate interference test gases (that are potentially encountered during a test, see examples in Table 7E-3) into the analyzer separately or as mixtures. Test the analyzer with the interference gas alone at the highest concentration expected at a test source and again with the interference gas and NO_X at a representative NO_X test concentration. For analyzers measuring NO_X greater than 20 ppm, use a calibration gas with an NO_X concentration of 80 to 100 ppm and set this concentration equal to the calibration span. For analyzers measuring less than 20 ppm NO_X, select an NO concentration for the calibration span that reflects the emission levels at the sources to be tested, and perform the interference check at that level. Measure the total interference response of the analyzer to these gases in ppmv. Record the responses and determine the interference using Table 7E-4. The specification in section 13.4 must be met.

(2) A copy of this data, including the date completed and signed certification, must be available for inspection at the test site and included with each test report. This interference test is valid for the life of the instrument unless major analytical components (*e.g.*, the detector) are replaced with different model parts. If major components are replaced with different model parts, the interference gas check must be repeated before returning the analyzer to service. If major components are replaced, the interference gas check must be repeated before returning the

analyzer to service. The tester must ensure that any specific technology, equipment, or procedures that are intended to remove interference effects are operating properly during testing.

8.3 Dilution-Type Systems—Special Considerations. When a dilution-type measurement system is used, there are three important considerations that must be taken into account to ensure the quality of the emissions data. First, the critical orifice size and dilution ratio must be selected properly so that the sample dew point will be below the sample line and analyzer temperatures. Second, a high-quality, accurate probe controller must be used to maintain the dilution ratio during the test. The probe controller should be capable of monitoring the dilution air pressure, eductor vacuum, and sample flow rates. Third, differences between the molecular weight of calibration gas mixtures and the stack gas molecular weight must be addressed because these can affect the dilution ratio and introduce measurement bias.

8.4 Sample Collection.

(1) Position the probe at the first sampling point. Purge the system for at least two times the response time before recording any data. Then, traverse all required sampling points, sampling at each point for an equal length of time and maintaining the appropriate sample flow rate or dilution ratio (as applicable). You must record at least one valid data point per minute during the test run.

(2) Each time the probe is removed from the stack and replaced, you must recondition the sampling system for at least two times the system response time prior to your next recording. If the average of any run exceeds the calibration span value, that run is invalid.

(3) You may satisfy the multipoint traverse requirement by sampling sequentially using a single-hole probe or a multi-hole probe designed to sample at the prescribed points with a flow within 10 percent of mean flow rate. Notwithstanding, for applications under part 75 of this chapter, the use of multi-hole probes is subject to the approval of the Administrator.

8.5 Post-Run System Bias Check and Drift Assessment.

How do I confirm that each sample I collect is valid? After each run, repeat the system bias check or 2-point system calibration error check (for dilution systems) to validate the run. Do not make adjustments to the measurement system (other than to maintain the target sampling rate or dilution ratio) between the end of the run and the completion of the post-run system bias or system calibration error check. Note that for all post-run system bias or 2-point system calibration error checks, you may inject the low-level gas first and the upscale gas last, or vice-versa. You may risk sampling for multiple runs before performing the post-run bias or system calibration error check provided you pass this test at the conclusion of the group of runs. A failed final test in this case will invalidate all runs subsequent to the last passed test.

(1) If you do not pass the diagnose and fix the problem and pass another calibration error test (Section 8.2.3) and system bias (or 2-point system calibration error) check (Section 8.2.5) before repeating the run. Record the system bias (or system calibration error) results on a form similar to Table 7E-2.

(2) After each run, calculate the low-level and upscale drift, using Equation 7E-4 in section 12.5. If the post-run low- and upscale bias (or 2-point system calibration error) checks are passed, but the low-or upscale drift exceeds the specification in section 13.3, the run data are valid, but a 3-point calibration error test and a system bias (or 2-point system calibration error) check must be performed and passed before any more test runs are done.

(3) For dilution systems, data from a 3-point system calibration error test may be used to met the pre-run 2-point system calibration error requirement for the first run in a test sequence. Also, the post-run bias (or 2-point calibration error) check data may be used as the pre-run data for the next run in the test sequence at the discretion of the tester.

8.6 Alternative Interference and System Bias Checks (Dynamic Spike Procedure). If I want to use the dynamic spike procedure to validate my data, what procedure should I follow? Except for applications under part 75 of this chapter, you may use the dynamic spiking procedure and requirements provided in section 16.1 during each test as an alternative to the interference check and the pre- and post-run system bias checks. The calibration error test is still required under this option. Use of the dynamic spiking procedure for Part 75 applications is subject to the approval of the Administrator.

8.7 Moisture correction. You must determine the moisture content of the flue gas and correct the measured gas concentrations to a dry basis using Method 4 or other appropriate methods, subject to the approval of the Administrator, when the moisture basis (wet or dry) of the measurements made with this method is different from the moisture basis of either: (1) The applicable emissions limit; or (2) the CEMS being evaluated for relative accuracy. Moisture correction is also required if the applicable limit is in lb/mmBtu and the moisture basis of the Method 7E NO_X analyzer is different from the moisture basis of the Method 3A diluent gas (CO_2 or O_2) analyzer.

9.0 Quality Control

What quality control measures must I take?

The following table is a summary of the mandatory, suggested, and alternative quality assurance and quality control measures and the associated frequency and acceptance criteria. All of the QC data, along with the sample run data, must be documented and included in the test report.

SUMMARY TABLE OF AQ/QC

Status	Process or element	QA/QC specification	Acceptance criteria	Checking frequency
S	Identify Data User		Regulatory Agency or other primary end user of data	Before designing test.
S	Analyzer Design	Analyzer resolution or sensitivity	<2.0% of full-scale range	Manufacturer design.

M		Interference gas check	Sum of responses ≤2.5% of calibration span Alternatively, sum of responses:	
			≤0.5 ppmv for calibration spans of 5 to 10 ppmv	
			≤0.2 ppmv for calibration spans <5 ppmv	
			See Table 7E-3	
M	Calibration Gases	Traceability protocol (G1, G2)	Valid certificate required Uncertainty ≤2.0% of tag value	
M		High-level gas	Equal to the calibration span	Each test.
M		Mid-level gas	40 to 60% of calibration span	Each test.
M		Low-level gas	<20% of calibration span	Each test.
S	Data Recorder Design	Data resolution	≤0.5% of full-scale range	Manufacturer design.
S	Sample Extraction	Probe material	SS or quartz if stack >500 °F	East test.
M	Sample Extraction	Probe, filter and sample line temperature	For dry-basis analyzers, keep sample above the dew point by heating, prior to sample conditioning	Each run.
			For wet-basis analyzers, keep sample above dew point at all times, by heating or dilution	
S	Sample Extraction	Calibration valve material	SS	Each test.
S	Sample Extraction	Sample pump material	Inert to sample constituents	Each test.
S	Sample Extraction	Manifolding material	Inert to sample constituents	Each test.
S	Moisture Removal	Equipment efficiency	<5% target compound removal	Verified through system bias check.

S	Particulate Removal	Filter inertness	Pass system bias check	Each bias check.
M	Analyzer & Calibration Gas Performance	Analyzer calibration error (of 3-point system calibration error for dilution systems)	Within ±2.0 percent of the calibration span of the analyzer for the low-, mid-, and high-level calibration gases	Before initial run and after a failed system bias test or drift test.
			Alternative specification: ≤0.5 ppmv absolute difference	
M	System Performance	System bias (or pre- and post-run 2-point system calibration error for dilution (Systems)	Within ±5.0% of the analyzer calibration span for low-sacle and upscale calibration gases	Before and after each run.
			Alternative specification: ≤0.5 ppmv absolute difference	
M	System Performance	System response time	Determines minimum sampling time per point	During initial sampling system bias test.
M	System Performance	Drift	≤3.0% of calibration span for low-level and mid- or high-level gases	After each test run.
			Alternative specification: ≤0.5 ppmv absolute difference	
M	System Performance	NO_2-NO conversion efficiency	≥90% of certified test gas concentration	Before or after each test.
M	System Performance	Purge time	≥2 times system response time	Before starting the first run and when probe is removed from and re-inserted into the stack.
M	System Performance	Minimum sample time at each point	Two times the system response time	Each sample point.
M	System Performance	Stable sample flow rate (surrogate for maintaining system response time)	Within 10% of flow rate established during system response time check	Each run.

M	Sample Point Selection	Stratification test	All points within:	Prior to first run.
			±5% of mean for 1-point sampling	
			±10% of mean for 3-point	
			Alternatively, all points within:	
			±0.5 ppm of mean for 1-point sampling	
			±1.0 ppm of mean for 3-point sampling	
A	Multiple sample points simultaneously	No. of openings in probe	Multi-hole probe with verifiable constant flow through all holes within 10% of mean flow rate (requires Administrative approval for Part 75)	Each run.
M	Data Recording	Frequency	≤1 minute average	During run.
S	Data Parameters	Sample concentration range	All 1-minute averages within calibration span	Each run.
M	Date Parameters	Average concentration for the run	Run average ≤calibration span	Each run.

S = Suggest.

M = Mandatory.

A = Alternative.

Agency.

10.0 Calibration and Standardization

What measurement system calibrations are required?

(1) The initial 3-point calibration error test as described in section 8.2.3 and the system bias (or system calibration error) checks described in section 8.2.5 are required and must meet the specifications in section 13 before you start the test. Make all necessary adjustments to calibrate the gas analyzer and data recorder. Then, after the test commences, the system bias or system calibration error checks described in section 8.5 are required before and after each run. Your

analyzer must be calibrated for all species of NO_X that it detects. Analyzers that measure NO and NO_2 separately without using a converter must be calibrated with both NO and NO_2.

(2) You must include a copy of the manufacturer's certification of the calibration gases used in the testing as part of the test report. This certification must include the 13 documentation requirements in the EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards, September 1997, as amended August 25, 1999. When Method 205 is used to produce diluted calibration gases, you must document that the specifications for the gas dilution system are met for the test. You must also include the date of the most recent dilution system calibration against flow standards and the name of the person or manufacturer who carried out the calibration in the test report.

11.0 Analytical Procedures

Because sample collection and analysis are performed together (see section 8), additional discussion of the analytical procedure is not necessary.

12.0 Calculations and Data Analysis

You must follow the procedures for calculations and data analysis listed in this section.

12.1 *Nomenclature.* The terms used in the equations are defined as follows:

ACE = Analyzer calibration error, percent of calibration span.

B_{WS} = Moisture content of sample gas as measured by Method 4 or other approved method, percent/100.

C_{Avg} = Average unadjusted gas concentration indicated by data recorder for the test run, ppmv.

C_D = Pollutant concentration adjusted to dry conditions, ppmv.

C_{Dir} = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode, ppmv.

C_{Gas} = Average effluent gas concentration adjusted for bias, ppmv.

C_M = Average of initial and final system calibration bias (or 2-point system calibration error) check responses for the upscale calibration gas, ppmv.

C_{MA} = Actual concentration of the upscale calibration gas, ppmv.

C_{Native} = NO_X concentration in the stack gas as calculated in section 12.6, ppmv.

C_O = Average of the initial and final system calibration bias (or 2-point system calibration error) check responses from the low-level (or zero) calibration gas, ppmv.

C_{OA} = Actual concentration of the low-level calibration gas, ppmv.

C_S = Measured concentration of a calibration gas (low, mid, or high) when introduced in system calibration mode, ppmv.

C_{SS} = Concentration of NO_X measured in the spiked sample, ppmv.

C_{Spike} = Concentration of NO_X in the undiluted spike gas, ppmv.

C_{Calc} = Calculated concentration of NO_X in the spike gas diluted in the sample, ppmv.

C_V = Manufacturer certified concentration of a calibration gas (low, mid, or high), ppmv.

C_W = Pollutant concentration measured under moist sample conditions, wet basis, ppmv.

CS = Calibration span, ppmv.

D = Drift assessment, percent of calibration span.

DF = Dilution system dilution factor or spike gas dilution factor, dimensionless.

Eff_{NO2} = NO_2 to NO converter efficiency, percent.

NO_{XCorr} = The NO_X concentration corrected for the converter efficiency, ppmv.

NOX_{Final} = The final NO_X concentration observed during the converter efficiency test in section 16.2.2, ppmv.

NO_{XPeak} = The highest NO_X concentration observed during the converter efficiency test in section 16.2.2, ppmv.

Q_{Spike} = Flow rate of spike gas introduced in system calibration mode, L/min.

Q_{Total} = Total sample flow rate during the spike test, L/min.

R = Spike recovery, percent.

SB = System bias, percent of calibration span.

SB_i = Pre-run system bias, percent of calibration span.

SB_{final} = Post-run system bias, percent of calibration span.

SCE = System calibration error, percent of calibration span.

SCE_i = Pre-run system calibration error, percent of calibration span.

SCE_{Final} = Post-run system calibration error, percent of calibration span.

12.2 Analyzer Calibration Error. For non-dilution systems, use Equation 7E-1 to calculate the analyzer calibration error for the low-, mid-, and high-level calibration gases.

$$ACE = \frac{C_{Dir} - C_V}{CS} \, x \, 100 \quad \text{Eq. 7E-1}$$

12.3 System Bias. For non-dilution systems, use Equation 7E-2 to calculate the system bias separately for the low-level and upscale calibration gases.

$$SB = \frac{C_S - C_{Dir}}{CS} \, x \, 100 \quad \text{Eq. 7E-2}$$

12.4 System Calibration Error. Use Equation 7E-3 to calculate the system calibration error for dilution systems. Equation 7E-3 applies to both the initial 3-point system calibration error test and the subsequent 2-point calibration error checks between test runs. In this equation, the term "C_s" refers to the diluted calibration gas concentration measured by the analyzer.

$$SCE = \frac{(C_S - DF) - C_V}{CS} \, x \, 100 \quad \text{Eq. 7E -3}$$

12.5 Drift Assessment. Use Equation 7E-4 to separately calculate the low-level and upscale drift over each test run. For dilution systems, replace "SB_{final}" and "SB_i" with "SCE_{final}" and "SCE_i", respectively, to calculate and evaluate drift.

$$D = |SB_{Final} - SB_i| \quad \text{Eq. 7E-4}$$

12.6 Effluent Gas Concentration. For each test run, calculate C_{avg}, the arithmetic average of all valid NO_X concentration values (*e.g.*, 1-minute averages). Then adjust the value of C_{avg} for bias using Equation 7E-5a if you use a non-zero gas as your low-level calibration gas, or Equation 7E-5b if you use a zero gas as your low-level calibration gas.

$$C_{Gas} = \left(C_{Avg} - C_M\right) \frac{C_{MA} - C_{OA}}{C_M - C_O} + C_{MA} \quad \text{Eq. 7E-5a}$$

$$C_{Gas} = \left(C_{Avg} - C_O\right) \frac{C_{MA}}{C_M - C_O} \quad \text{Eq. 7E-5b}$$

12.7 NO_2—NO Conversion Efficiency. If the NO_X converter efficiency test described in section 8.2.4.1 is performed, calculate the efficiency using Equation 7E-7.

$$Eff_{NO2} = \frac{C_{Dir}}{C_V} \, x \, 100 \quad \text{Eq. 7E-7}$$

12.8 NO_2—NO Conversion Efficiency Correction. If desired, calculate the total NO_X concentration with a correction for converter efficiency using Equations 7E-8.

$$NO_{XCorr} = NO + \frac{NO_X - NO}{Eff_{NO2}} \, x \, 100 \quad \text{Eq. 7E-8}$$

12.9 Alternative NO_2 Converter Efficiency. If the alternative procedure of section 16.2.2 is used, determine the NO_X concentration decrease from NO_{XPeak} after the minimum 30-minute test interval using Equation 7E-9. This decrease from NO_{XPeak} must meet the requirement in section 13.5 for the converter to be acceptable.

$$\%Decrease = \frac{NO_{XPeak} - NO_{XFinal}}{NO_{XPeak}} x\ 100 \qquad \text{Eq. 7E-9}$$

12.10 Moisture Correction. Use Equation 7E-10 if your measurements need to be corrected to a dry basis.

$$C_D = \frac{C_W}{1 - B_{WS}} \qquad \text{Eq. 7E-10}$$

2.11 Calculated Spike Gas Concentration and Spike Recovery for the Example Alternative Dynamic Spiking Procedure in section 16.1.3. Use Equation 7E-11 to determine the calculated spike gas concentration. Use Equation 7E-12 to calculate the spike recovery.

$$C_{Calc} = \frac{(C_{Spike})(Q_{Spike})}{Q_{Total}} \qquad \text{Eq. 7E-11}$$

$$R = \frac{DF(C_{SS} - C_{native}) + C_{native}}{C_{spike}} x\ 100 \qquad \text{Eq. 7E-12}$$

13.0 Method Performance

13.1 Calibration Error. This specification is applicable to both the analyzer calibration error and the 3-point system calibration error tests described in section 8.2.3. At each calibration gas level (low, mid, and high) the calibration error must either be within ±2.0 percent of the calibration span. Alternatively, the results are acceptable if $|C_{dir} - C_V|$ or $|C_s - C_V|$ (as applicable) is ≤ 0.5 ppmv.

13.2 System Bias. This specification is applicable to both the system bias and 2-point system calibration error tests described in section 8.2.5 and 8.5. The pre- and post-run system bias (or system calibration error) must be within ±5.0 percent of the calibration span for the low-level and upscale calibration gases. Alternatively, the results are acceptable if $| C_s - C_{dir} |$ is ≤ 0.5 ppmv or if $| C_s - C_v |$ is ≤ 0.5 ppmv (as applicable).

13.3 Drift. For each run, the low-level and upscale drift must be less than or equal to 3.0 percent of the calibration span. The drift is also acceptable if the pre- and post-run bias (or the pre- and post-run system calibration error) responses do not differ by more than 0.5 ppmv at each gas concentration (i.e. $| C_{s\ post\text{-}run} - C_{s\ pre\text{-}run} | \leq 0.5$ ppmv).

13.4 Interference Check. The total interference response (i.e., the sum of the interference responses of all tested gaseous components) must not be greater than 2.50 percent of the calibration span for the analyzer tested. In summing the interferences, use the larger of the absolute values obtained for the interferent tested with and without the pollutant present. The results are also acceptable if the sum of the responses does not exceed 0.5 ppmv for a calibration span of 5 to 10 ppmv, or 0.2 ppmv for a calibration span <5 ppmv.

13.5 NO_2 to *NO Conversion Efficiency Test (as applicable).* The NO_2 to NO conversion efficiency, calculated according to Equation 7E-7, must be greater than or equal to 90 percent.

The alternative conversion efficiency check, described in section 16.2.2 and calculated according to Equation 7E-9, must not result in a decrease from NO_{XPeak} by more than 2.0 percent.

13.6 Alternative Dynamic Spike Procedure. Recoveries of both pre-test spikes and post-test spikes must be within 100 ±10 percent. If the absolute difference between the calculated spike value and measured spike value is equal to or less than 0.20 ppmv, then the requirements of the ADSC are met.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures

16.1 Dynamic Spike Procedure. Except for applications under part 75 of this chapter, you may use a dynamic spiking procedure to validate your test data for a specific test matrix in place of the interference check and pre- and post-run system bias checks. For part 75 applications, use of this procedure is subject to the approval of the Administrator. Best results are obtained for this procedure when source emissions are steady and not varying. Fluctuating emissions may render this alternative procedure difficult to pass. To use this alternative, you must meet the following requirements.

16.1.1 Procedure Documentation. You must detail the procedure you followed in the test report, including how the spike was measured, added, verified during the run, and calculated after the test.

16.1.2 Spiking Procedure Requirements. The spikes must be prepared from EPA Traceability Protocol gases. Your procedure must be designed to spike field samples at two target levels both before and after the test. Your target spike levels should bracket the average sample NO_X concentrations. The higher target concentration must be less than the calibration span. You must collect at least 5 data points for each target concentration. The spiking procedure must be performed before the first run and repeated after the last run of the test program.

16.1.3 Example Spiking Procedure. Determine the NO concentration needed to generate concentrations that are 50 and 150 percent of the anticipated NO_X concentration in the stack at the total sampling flow rate while keeping the spike flow rate at or below 10 percent of this total. Use a mass flow meter (accurate within 2.0 percent) to generate these NO spike gas concentrations at a constant flow rate. Use Equation 7E-11 in section 12.11 to determine the calculated spike concentration in the collected sample.

(1) Prepare the measurement system and conduct the analyzer calibration error test as described in sections 8.2.2 and 8.2.3. Following the sampling procedures in section 8.1, determine the stack NO_X concentration and use this concentration as the average stack concentration (C_{avg}) for the first spike level, or if desired, for both pre-test spike levels. Introduce the first level spike gas into the system in system calibration mode and begin sample collection. Wait for at least two times the system response time before measuring the spiked sample concentration. Then record at least five successive 1-minute averages of the spiked sample gas. Monitor the spike gas flow rate and

maintain at the determined addition rate. Average the five 1-minute averages and determine the spike recovery using Equation 7E-12. Repeat this procedure for the other pre-test spike level. The recovery at each level must be within the limits in section 13.6 before proceeding with the test.

(2) Conduct the number of runs required for the test. Then repeat the above procedure for the post-test spike evaluation. The last run of the test may serve as the average stack concentration for the post-test spike test calculations. The results of the post-test spikes must meet the limits in section 13.6.

16.2 Alternative NO_2 to NO Conversion Efficiency Procedures. You may use either of the following procedures to determine converter efficiency in place of the procedure in section 8.2.4.1.

16.2.1 The procedure for determining conversion efficiency using NO in 40 CFR 86.123-78.

16.2.2 Bag Procedure. Perform the analyzer calibration error test to document the calibration (both NO and NO_X modes, as applicable). Fill a Tedlar or equivalent bag approximately half full with either ambient air, pure oxygen, or an oxygen standard gas with at least 19.5 percent by volume oxygen content. Fill the remainder of the bag with mid- to high-level NO in N_2 (or other appropriate concentration) calibration gas. (Note that the concentration of the NO standard should be sufficiently high enough for the diluted concentration to be easily and accurately measured on the scale used. The size of the bag should be large enough to accommodate the procedure and time required. Verify through the manufacturer that the Tedlar alternative is suitable for NO and make this verifed information available for inspection.)

(1) Immediately attach the bag to the inlet of the NO_X analyzer (or external converter if used). In the case of a dilution-system, introduce the gas at a point upstream of the dilution assembly. Measure the NO_X concentration for a period of 30 minutes. If the NO_X concentration drops more than 2 percent absolute from the peak value observed, then the NO_2 converter has failed to meet the criteria of this test. Take corrective action. The highest NO_X value observed is considered to be NO_{XPeak}. The final NO_X value observed is considered to be NO_{Xfinal}.

(2) [Reserved]

16.3 Manufacturer's Stability Test. A manufacturer's stability test is required for all analyzers that routinely measure emissions below 20 ppmv and is optional but recommended for other analyzers. This test evaluates each analyzer model by subjecting it to the tests listed in Table 7E-5 following procedures similar to those in 40 CFR 53.23 for thermal stability and insensitivity to supply voltage variations. If the analyzer will be used under temperature conditions that are outside the test conditions in Table B-4 of Part 53.23, alternative test temperatures that better reflect the analyzer field environment should be used. Alternative procedures or documentation that establish the analyzer's stability over the appropriate line voltages and temperatures are acceptable.

17.0 References

1. “ERA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards” September 1997 as amended, ERA-600/R-97/121.

18.0 Tables, Diagrams, Flowcharts, and Validation Data

Figure 7E-1. Measurement System

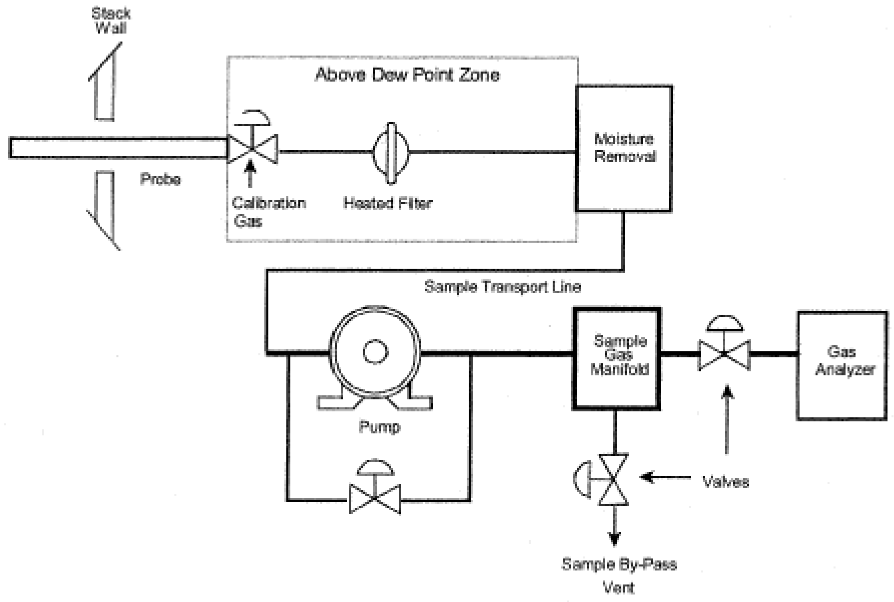
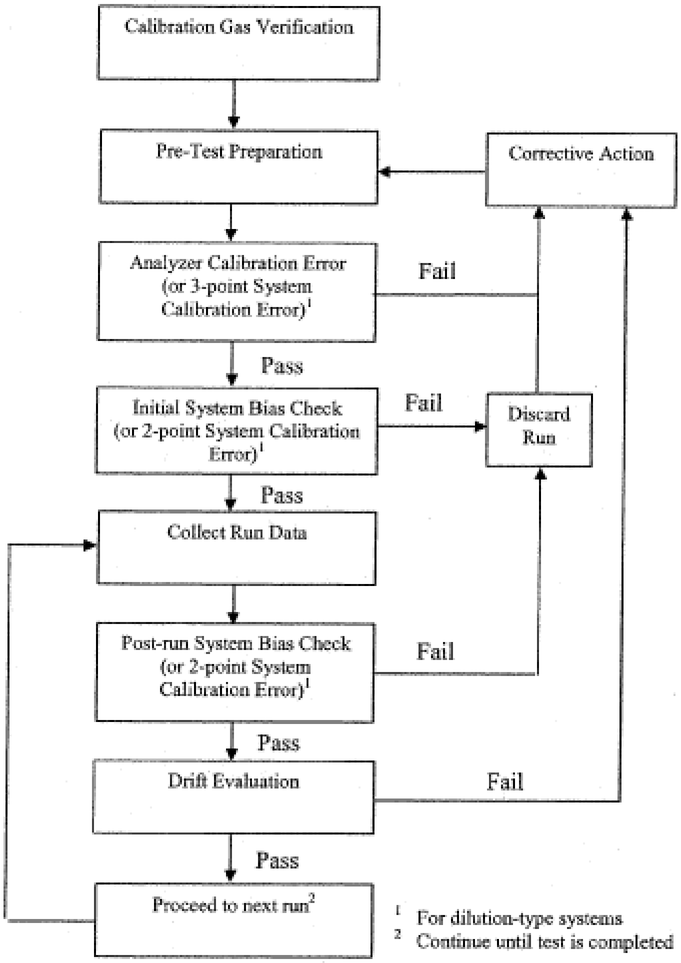


Figure 7E-2. Testing Flow Chart



[1] For dilution-type systems

[2] Continue until test is completed

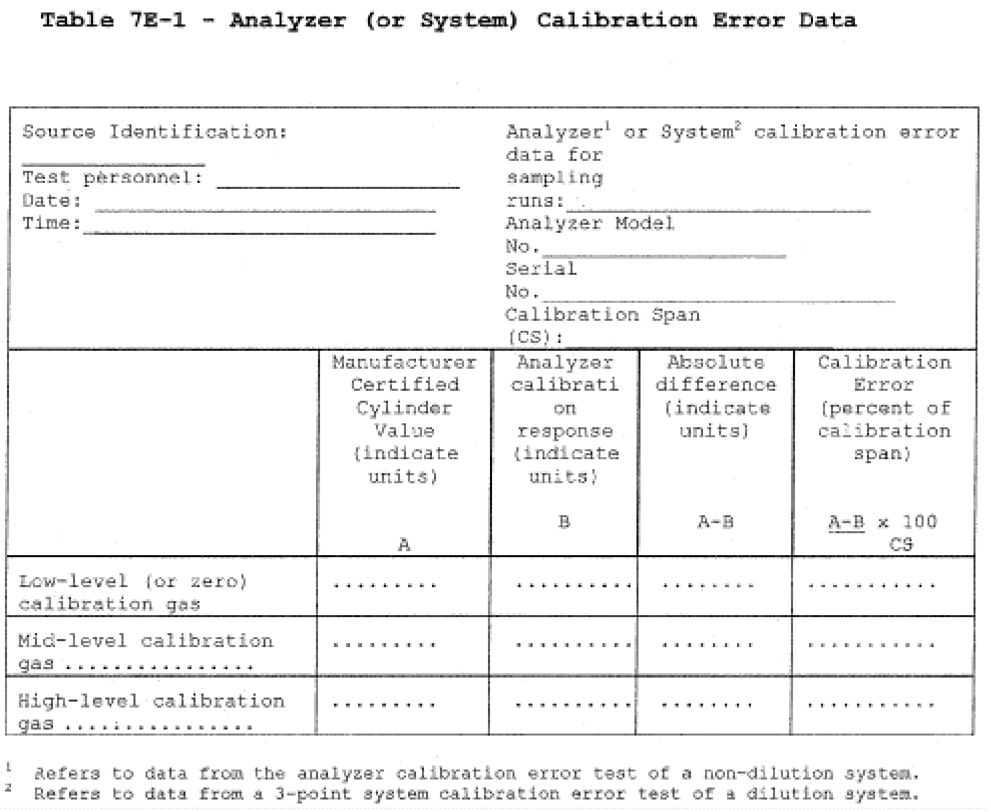


Table 7E-1 - Analyzer (or System) Calibration Error Data

Source Identification: ______________ Test personnel: ____________________ Date: ____________________________ Time: ____________________________	Analyzer[1] or System[2] calibration error data for sampling runs: ______________________ Analyzer Model No. ____________________ Serial No. _____________________________ Calibration Span (CS):

	Manufacturer Certified Cylinder Value (indicate units) A	Analyzer calibration response (indicate units) B	Absolute difference (indicate units) A-B	Calibration Error (percent of calibration span) A-B x 100 / CS
Low-level (or zero) calibration gas	....	....	....	....
Mid-level calibration gas	....	....	....	....
High-level calibration gas	....	....	....	....

[1] Refers to data from the analyzer calibration error test of a non-dilution system.
[2] Refers to data from a 3-point system calibration error test of a dilution system.

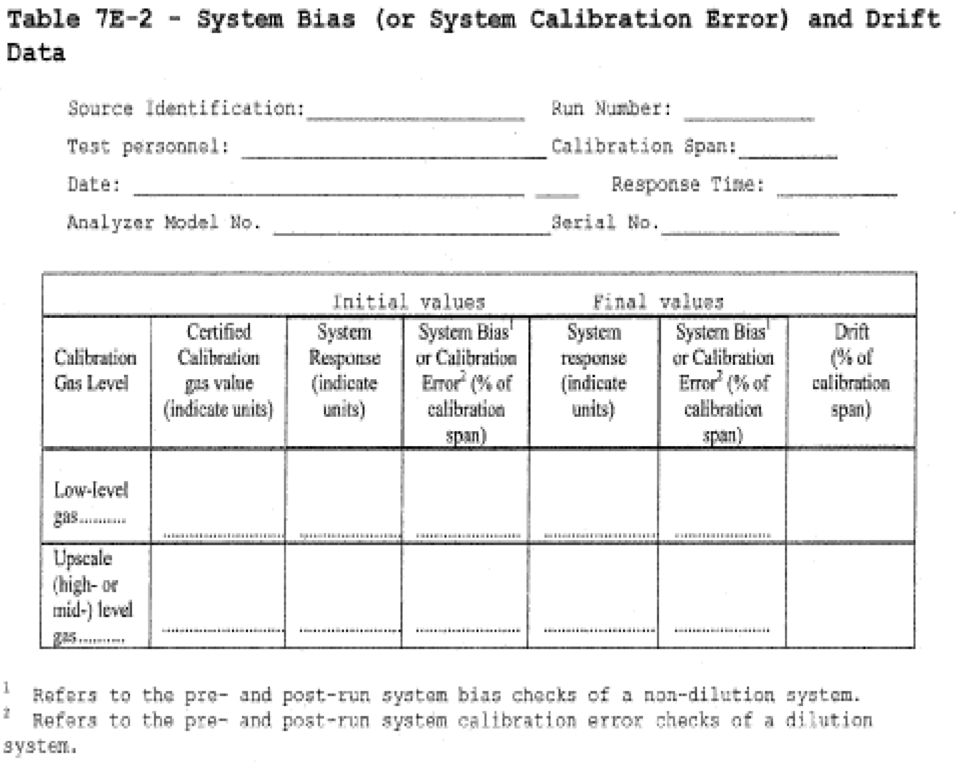


Table 7E-2 - System Bias (or System Calibration Error) and Drift Data

Source Identification: __________________ Run Number: __________

Test personnel: __________________________ Calibration Span: ________

Date: _________________________________ ____ Response Time: __________

Analyzer Model No. _______________________ Serial No. _______________

		Initial values		Final values		
Calibration Gas Level	Certified Calibration gas value (indicate units)	System Response (indicate units)	System Bias[1] or Calibration Error[2] (% of calibration span)	System response (indicate units)	System Bias[1] or Calibration Error[2] (% of calibration span)	Drift (% of calibration span)
Low-level gas..........	....	....	....	....	....	
Upscale (high- or mid-) level gas..........	....	....	....	....	....	

[1] Refers to the pre- and post-run system bias checks of a non-dilution system.
[2] Refers to the pre- and post-run system calibration error checks of a dilution system.

TABLE 7E-3—EXAMPLE INTERFERENCE CHECK GAS CONCENTRATIONS

Potential interferent gas[1]	**Concentrations**[2] **sample conditioning type**	
	Hot wet	**Dried**
CO_2	5 and 15%	5 and 15%
H_2O	25%	1%
NO	15 ppmv	15 ppmv
NO_2	15 ppmv	15 ppmv
N_2O	10 ppmv	10 ppmv
CO	50 ppmv	50 ppmv
NH_3	10 ppmv	10 ppmv
CH_4	50 ppmv	50 ppmv
SO_2	20 ppmv	20 ppmv
H_2	50 ppmv	50 ppmv
HCl	10 ppmv	10 ppmv

[1] Any applicable gas may be eliminated or tested at a reduced level if the manufacturer has provided reliable means for limiting or scrubbing that gas to a specified level.

[2] As practicable, gas concentrations should be the highest expected at test sites.

TABLE 7E-4—INTERFERENCE RESPONSE

Date of Test: ________________________
Analyzer Type: ______________________
Model No.: __________________________
Serial No: ___________________________
Calibration Span: ____________________

Test gas type	**Concentration (ppm)**	**Analyzer response**
Sum of Responses		
% of Calibration Span		

TABLE 7E-5—MANUFACTURER STABILITY TEST

Test description	**Acceptance criteria (note 1)**
Thermal Stability	Temperature range when drift does not exceed 3.0% of analyzer range over a 12-hour run when measured with NO_X present @ 80% of calibration span.
Fault Conditions	Identify conditions which, when they occur, result in performance which is not in compliance with the Manufacturer's Stability Test criteria. These are to be indicated visually or electrically to alert the operator of the problem.
Insensitivity to Supply Voltage Variations	±10.0% (or manufacturers alternative) variation from nominal voltage must produce a drift of ≤2.0% of calibration span for either zero or concentration ≥80% NO_X present.
Analyzer Calibration Error	For a low-, medium-, and high-calibration gas, the difference between the manufacturer certified value and the analyzer response in direct calibration mode, no more than 2.0% of calibration span.

Note 1: If the instrument is to be used as a Low Range analyzer, all tests must be performed at a calibration span of 20 ppm or less.

METHOD 10—DETERMINATION OF CARBON MONOXIDE EMISSIONS FROM STATIONARY SOURCES (INSTRUMENTAL ANALYZER PROCEDURE)

1.0 Scope and Application

What is Method 10?

Method 10 is a procedure for measuring carbon monoxide (CO) in stationary source emissions using a continuous instrumental analyzer. Quality assurance and quality control requirements are included to assure that you, the tester, collect data of known quality. You must document your adherence to these specific requirements for equipment, supplies, sample collection and analysis, calculations, and data analysis. This method does not completely describe all equipment, supplies, and sampling and analytical procedures you will need but refers to other methods for some of the details. Therefore, to obtain reliable results, you should also have a thorough knowledge of these additional test methods which are found in appendix A to this part:

(a) Method 1—Sample and Velocity Traverses for Stationary Sources.

(b) Method 4—Determination of Moisture Content in Stack Gases.

(c) Method 7E—Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure).

1.1 Analytes. What does this method determine? This method measures the concentration of carbon monoxide.

Analyte	**CAS No.**	**Sensitivity**
CO	630-08-0	Typically <2% of Calibration Span.

1.2 Applicability. When is this method required? The use of Method 10 may be required by specific New Source Performance Standards, State Implementation Plans, and permits where CO concentrations in stationary source emissions must be measured, either to determine compliance with an applicable emission standard or to conduct performance testing of a continuous emission monitoring system (CEMS). Other regulations may also require the use of Method 10.

1.3 Data Quality Objectives. Refer to section 1.3 of Method 7E.

2.0 Summary of Method

In this method, you continuously or intermittently sample the effluent gas and convey the sample to an analyzer that measures the concentration of CO. You must meet the performance requirements of this method to validate your data.

3.0 Definitions

Refer to section 3.0 of Method 7E for the applicable definitions.

4.0 Interferences

Substances having a strong absorption of infrared energy may interfere to some extent in some analyzers. Instrumental correction may be used to compensate for the interference. You may also use silica gel and ascarite traps to eliminate the interferences. If this option is used, correct the measured gas volume for the carbon dioxide (CO_2) removed in the trap.

5.0 Safety

Refer to section 5.0 of Method 7E.

6.0 Equipment and Supplies

What do I need for the measurement system?

6.1 Continuous Sampling. Figure 7E-1 of Method 7E is a schematic diagram of an acceptable measurement system. The components are the same as those in sections 6.1 and 6.2 of Method 7E, except that the CO analyzer described in section 6.2 of this method must be used instead of the analyzer described in section 6.2 of Method 7E. You must follow the noted specifications in section 6.1 of Method 7E except that the requirements to use stainless steel, Teflon, or non-reactive glass filters do not apply. Also, a heated sample line is not required to transport dry gases or for systems that measure the CO concentration on a dry basis.

6.2 Integrated Sampling.

6.2.1 Air-Cooled Condenser or Equivalent. To remove any excess moisture.

6.2.2 Valve. Needle valve, or equivalent, to adjust flow rate.

6.2.3 Pump. Leak-free diaphragm type, or equivalent, to transport gas.

6.2.4 Rate Meter. Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per minute (0.035 cfm).

6.2.5 Flexible Bag. Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft^3). (Verify through the manufacturer that the Tedlar alternative is suitable for CO and make this verified information available for inspection.) Leak-test the bag in the laboratory before using by evacuating with a pump followed by a dry gas meter. When the evacuation is complete, there should be no flow through the meter. Gas tanks may be used in place of bags if the samples are analyzed within one week.

6.3 What analyzer must I use? You must use an instrument that continuously measures CO in the gas stream and meets the specifications in section 13.0. The dual-range analyzer provisions in section 6.2.8.1 of Method 7E apply.

7.0 Reagents and Standards

7.1 Calibration Gas. What calibration gases do I need? Refer to section 7.1 of Method 7E for the calibration gas requirements.

7.2 Interference Check. What additional reagents do I need for the interference check? Use the appropriate test gases listed in Table 7E-3 of Method 7E (i.e., potential interferents, as identified by the instrument manufacturer) to conduct the interference check.

8.0 Sample Collection, Preservation, Storage, and Transport

Emission Test Procedure

8.1 Sampling Site and Sampling Points. You must follow section 8.1 of Method 7E.

8.2 Initial Measurement System Performance Tests. You must follow the procedures in section 8.2 of Method 7E. If a dilution-type measurement system is used, the special considerations in section 8.3 of Method 7E also apply.

8.3 Interference Check. You must follow the procedures of section 8.2.7 of Method 7E.

8.4 Sample Collection.

8.4.1 Continuous Sampling. You must follow the procedures of section 8.4 of Method 7E.

8.4.2 Integrated Sampling. Evacuate the flexible bag. Set up the equipment as shown in Figure 10-1 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak-free. Sample at a rate proportional to the stack velocity. If needed, the CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing an ascarite CO_2 removal tube used and computing CO_2concentration from the gas volume sampled and the weight gain of the tube. Data may be recorded on a form similar to Table 10-1. If a tank is used for sample collection, follow procedures similar to those in Sections 8.1.2, 8.2.3, 8.3, and 12.4 of Method 25 as appropriate to prepare the tank, conduct the sampling, and correct the measured sample concentration.

8.5 Post-Run System Bias Check, Drift Assessment, and Alternative Dynamic Spike Procedure. You must follow the procedures in sections 8.5 and 8.6 of Method 7E.

9.0 Quality Control

Follow the quality control procedures in section 9.0 of Method 7E.

10.0 Calibration and Standardization

Follow the procedures for calibration and standardization in section 10.0 of Method 7E.

11.0 Analytical Procedures

Because sample collection and analysis are performed together (see section 8), additional discussion of the analytical procedure is not necessary.

12.0 Calculations and Data Analysis

You must follow the procedures for calculations and data analysis in section 12.0 of Method 7E, as applicable, substituting CO for NO_X as applicable.

12.1 Concentration Correction for CO_2 Removal. Correct the CO concentration for CO_2 removal (if applicable) using Eq. 10-1.

$$C_{Avg} = C_{CO_{stack}}(1 - F_{CO2})$$

Where:

C_{Avg} = Average gas concentration for the test run, ppm.

$C_{CO\ stack}$ = Average unadjusted stack gas CO concentration indicated by the data recorder for the test run, ppmv.

F_{CO2} = Volume fraction of CO_2 in the sample, i.e., percent CO_2 from Orsat analysis divided by 100.

13.0 Method Performance

The specifications for analyzer calibration error, system bias, drift, interference check, and alternative dynamic spike procedure are the same as in section 13.0 of Method 7E.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures

The dynamic spike procedure and the manufacturer stability test are the same as in sections 16.1 and 16.3 of Method 7E

17.0 References

1. “EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards—September 1997 as amended, EPA-600/R-97/121

18.0 Tables, Diagrams, Flowcharts, and Validation Data

Figure 10-1. Integrated Gas Sampling Train.

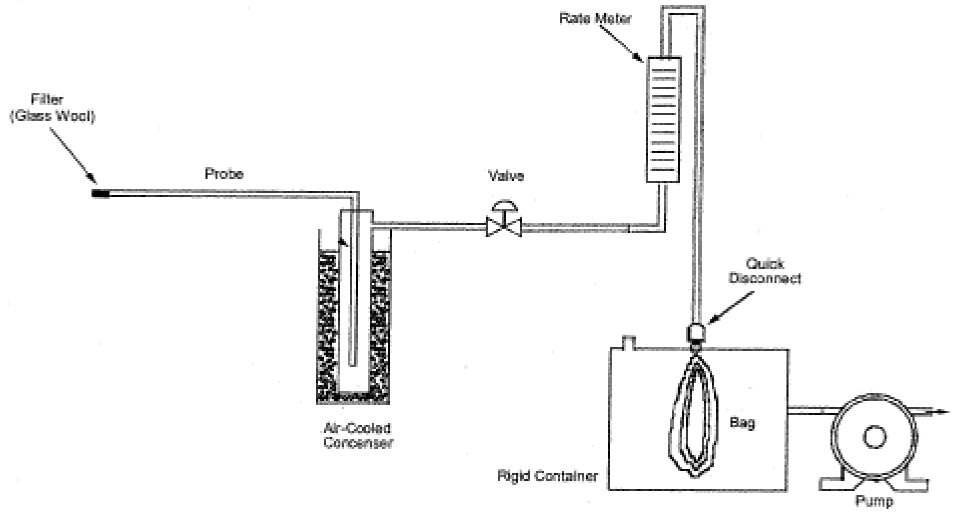


TABLE 10-1—FIELD DATA

[Integrated sampling]

Location:	Date:	
Test:	Operator:	
Clock Time	Rotameter Reading liters/min (cfm)	Comments

METHOD 16C—DETERMINATION OF TOTAL REDUCED SULFUR EMISSIONS FROM STATIONARY SOURCES

1.0 Scope and Application

What is Method 16C?

Method 16C is a procedure for measuring total reduced sulfur (TRS) in stationary source emissions using a continuous instrumental analyzer. Quality assurance and quality control requirements are included to assure that you, the tester, collect data of known quality. You must document your adherence to these specific requirements for equipment, supplies, sample collection and analysis, calculations, and data analysis. This method does not completely describe all equipment, supplies, and sampling and analytical procedures you will need but refers to other methods for some of the details. Therefore, to obtain reliable results, you should also have a thorough knowledge of these additional test methods which are found in appendix A to this part:

(a) Method 6C—Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)

(b) Method 7E—Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

(c) Method 16A—Determination of Total Reduced Sulfur Emissions from Stationary Sources (Impinger Technique)

1.1 Analytes. What does Method 16C determine?

Analyte	**CAS No.**
Total reduced sulfur including:	N/A
Dimethyl disulfide (DMDS), [$(CH_3)_2S_2$]	62-49-20
Dimethyl sulfide (DMS), [$(CH_3)_2S$]	75-18-3
Hydrogen sulfide (H_2S)	7783-06-4
Methyl mercaptan (MeSH), (CH_4S)	74-93-1
Reported as: Sulfur dioxide (SO_2)	7449-09-5

1.2 Applicability. This method is applicable for determining TRS emissions from recovery furnaces (boilers), lime kilns, and smelt dissolving tanks at kraft pulp mills, and from other sources when specified in an applicable subpart of the regulations.

1.3 Data Quality Objectives. Adherence to the requirements described in Method 16C will enhance the quality of the data obtained.

2.0 Summary of Method

2.1 An integrated gas sample is extracted from the stack. The SO_2 is removed selectively from the sample using a citrate buffer solution. The TRS compounds are then thermally oxidized to SO_2 and determined as SO_2 by an instrumental analyzer. This method is a combination of the sampling procedures of Method 16A and the analytical procedures of Method 6C (referenced in Method 7E), with minor modifications to facilitate their use together.

3.0 Definitions

Analyzer calibration error, Calibration curve, Calibration gas, Low-level gas, Mid-level gas, High-level gas, Calibration drift, Calibration span, Data recorder, Direct calibration mode, Gas analyzer, Interference check, Measurement system, Response time, Run, System calibration mode, System performance check, and *Test* are the same as used in Methods 16A and 6C.

4.0 Interferences

4.1 Reduced sulfur compounds other than those defined as TRS, if present, may be measured by this method. Compounds like carbonyl sulfide, which is partially oxidized to SO_2 and may be present in a lime kiln exit stack, would be a positive interferent. Interferences may vary among instruments, and instrument-specific interferences must be evaluated through the interference check.

4.2 Particulate matter from the lime kiln stack gas (primarily calcium carbonate) can cause a negative bias if it is allowed to enter the citrate scrubber; the particulate matter will cause the pH to rise and H_2S to be absorbed before oxidation. Proper use of the particulate filter, described in section 6.1.3 of Method 16A, will eliminate this interference.

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices before performing this test method.

5.2 Hydrogen Sulfide. Hydrogen sulfide is a flammable, poisonous gas with the odor of rotten eggs. Hydrogen sulfide is extremely hazardous and can cause collapse, coma, and death within a few seconds of one or two inhalations at sufficient concentrations. Low concentrations irritate the mucous membranes and may cause nausea, dizziness, and headache after exposure. It is the responsibility of the user of this test method to establish appropriate safety and health practices.

6.0 Equipment and Supplies

What do I need for the measurement system?

The measurement system is similar to those applicable components in Methods 16A and 6C. Modifications to the apparatus are accepted provided the performance criteria in section 13.0 are met.

6.1 Probe. Teflon tubing, 6.4-mm (¼ in.) diameter, sequentially wrapped with heat-resistant fiber strips, a rubberized heat tape (plug at one end), and heat-resistant adhesive tape. A flexible thermocouple or other suitable temperature measuring device must be placed between the Teflon tubing and the fiber strips so that the temperature can be monitored to prevent softening of the probe. The probe must be sheathed in stainless steel to provide in-stack rigidity. A series of bored-out stainless steel fittings placed at the front of the sheath will prevent moisture and particulate from entering between the probe and sheath. A 6.4-mm (¼ in.) Teflon elbow (bored out) must be attached to the inlet of the probe, and a 2.54 cm (1 in.) piece of Teflon tubing must be attached at the open end of the elbow to permit the opening of the probe to be turned away from the particulate stream; this will reduce the amount of particulate drawn into the sampling train. The probe is depicted in Figure 16A-2 of Method 16A.

6.2 Probe Brush. Nylon bristle brush with handle inserted into a 3.2-mm (⅛ in.) Teflon tubing. The Teflon tubing should be long enough to pass the brush through the length of the probe.

6.3 Particulate Filter. 50-mm Teflon filter holder and a 1- to 2-µm porosity, Teflon filter (may be available through Savillex Corporation, 5325 Highway 101, Minnetonka, Minnesota 55343, or other suppliers of filters). The filter holder must be maintained in a hot box at a temperature sufficient to prevent moisture condensation. A temperature of 121 °C (250 °F) was found to be sufficient when testing a lime kiln under sub-freezing ambient conditions.

6.4 SO_2 Scrubber. Three 300-ml Teflon segmented impingers connected in series with flexible, thick-walled, Teflon tubing. (Impinger parts and tubing may be available through Savillex or other suppliers.) The first two impingers contain 100 ml of citrate buffer, and the third impinger is initially dry. The tip of the tube inserted into the solution should be constricted to less than 3 mm (⅛ in.) ID and should be immersed to a depth of at least 5 cm (2 in.).

6.5 Combustion Tube. Quartz glass tubing with an expanded combustion chamber 2.54 cm (1 in.) in diameter and at least 30.5 cm (12 in.) long. The tube ends should have an outside diameter of 0.6 cm (¼ in.) and be at least 15.3 cm (6 in.) long. This length is necessary to maintain the quartz-glass connector near ambient temperature and thereby avoid leaks. Alternative combustion tubes are acceptable provided they are shown to combust TRS at concentrations encountered during tests.

6.6 Furnace. A furnace of sufficient size to enclose the combustion chamber of the combustion tube with a temperature regulator capable of maintaining the temperature at 800 ±100 °C (1472

±180 °F). The furnace operating temperature should be checked with a thermocouple to ensure accuracy.

6.7 Sampling Pump. A leak-free pump is required to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system and must be constructed of material that is non-reactive to the gas it contacts. For dilution-type measurement systems, an eductor pump may be used to create a vacuum that draws the sample through a critical orifice at a constant rate.

6.8 Calibration Gas Manifold. The calibration gas manifold must allow the introduction of calibration gases either directly to the gas analyzer in direct calibration mode or into the measurement system, at the probe, in system calibration mode, or both, depending upon the type of system used. In system calibration mode, the system must be able to flood the sampling probe and vent excess gas. Alternatively, calibration gases may be introduced at the calibration valve following the probe. Maintain a constant pressure in the gas manifold. For in-stack dilution-type systems, a gas dilution subsystem is required to transport large volumes of purified air to the sample probe, and a probe controller is needed to maintain the proper dilution ratio.

6.9 Sample Gas Manifold. The sample gas manifold diverts a portion of the sample to the analyzer, delivering the remainder to the by-pass discharge vent. The manifold should also be able to introduce calibration gases directly to the analyzer. The manifold must be made of material that is non-reactive to SO_2 and be configured to safely discharge the bypass gas.

6.10 SO_2 Analyzer. You must use an instrument that uses an ultraviolet, non-dispersive infrared, fluorescence, or other detection principle to continuously measure SO_2 in the gas stream provided it meets the performance specifications in section 13.0.

6.11 Data Recording. A strip chart recorder, computerized data acquisition system, digital recorder, or data logger for recording measurement data must be used.

7.0 Reagents and Standards

NOTE: Unless otherwise indicated, all reagents must conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society. When such specifications are not available, the best available grade must be used.

7.1 Water. Deionized distilled water must conform to ASTM Specification D 1193-77 or 91 Type 3 (incorporated by reference—see §60.17). The $KMnO_4$ test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

7.2 Citrate Buffer. Dissolve 300 g of potassium citrate (or 284 g of sodium citrate) and 41 g of anhydrous citric acid in 1 liter of water (200 ml is needed per test). Adjust the pH to between 5.4 and 5.6 with potassium citrate or citric acid, as required.

7.3 Calibration Gas. Refer to section 7.1 of Method 7E (as applicable) for the calibration gas requirements. Example calibration gas mixtures are listed below.

(a) SO_2 in nitrogen (N_2).

(b) SO_2 in air.

(c) SO_2 and carbon dioxide (CO_2) in N_2.

(d) SO_2 and oxygen (O_2) in N_2.

(e) $SO_2/CO_2/O_2$ gas mixture in N_2.

(f) CO_2/NO_X gas mixture in N_2.

(g) $CO_2/SO_2/NO_X$ gas mixture in N_2.

For fluorescence-based analyzers, the O_2 and CO_2 concentrations of the calibration gases as introduced to the analyzer must be within 1.0 percent (absolute) O_2 and 1.0 percent (absolute) CO_2 of the O_2 and CO_2 concentrations of the effluent samples as introduced to the analyzer. Alternatively, for fluorescence-based analyzers, use calibration blends of SO_2 in air and the nomographs provided by the vendor to determine the quenching correction factor (the effluent O_2 and CO_2concentrations must be known). This requirement does not apply to ambient-level fluorescence analyzers that are used in conjunction with sample dilution systems. Alternatively, H_2S in O_2 or air may be used to calibrate the analyzer through the tube furnace.

7.4 System Performance Check Gas. You must use H_2S (100 ppmv or less) stored in aluminum cylinders with the concentration certified by the manufacturer. Hydrogen sulfide in nitrogen is more stable than H_2S in air, but air may be used as the balance gas.

NOTE: Alternatively, H_2S recovery gas generated from a permeation device gravimetrically calibrated and certified at some convenient operating temperature may be used. The permeation rate of the device must be such that at the appropriate dilution gas flow rate, an H_2S concentration can be generated in the range of the stack gas or within 20 percent of the emission standard.

7.5 Interference Check. Examples of test gases for the interference check are listed in Table 7E-3 of Method 7E.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Pre-sampling Tests. Before measuring emissions, perform the following procedures:

(a) Calibration gas verification,

(b) Calibration error test,

(c) System performance check,

(d) Verification that the interference check has been satisfied.

8.1.1 Calibration Gas Verification. Obtain a certificate from the gas manufacturer documenting the quality of the gas. Confirm that the manufacturer certification is complete and current. Ensure that your calibration gas certifications have not expired. This documentation should be available on-site for inspection. To the extent practicable, select a high-level gas concentration that will result in the measured emissions being between 20 and 100 percent of the calibration span.

8.1.2 Analyzer Calibration Error Test. After you have assembled, prepared, and calibrated your sampling system and analyzer, you must conduct a 3-point analyzer calibration error test before the first run and again after any failed system performance check or failed drift test to ensure the calibration is acceptable. Introduce the low-, mid-, and high-level calibration gases sequentially to the analyzer in direct calibration mode. For each calibration gas, calculate the analyzer calibration error using Equation 16C-1 in section 12.2. The calibration error for the low-, mid-, and high-level gases must not exceed 5.0 percent or 0.5 ppmv. If the calibration error specification is not met, take corrective action and repeat the test until an acceptable 3-point calibration is achieved.

8.1.3 System Performance Check. A system performance check is done (1) to validate the sampling train components and procedure (prior to testing), and (2) to validate a test run (after a run). You must conduct a performance check in the field prior to testing, and after each 3-hour run or after three 1-hour runs. A performance check consists of sampling and analyzing a known concentration of H_2S (system performance check gas) and comparing the analyzed concentration to the known concentration. To conduct the system performance check, mix the system performance check gas (Section 7.4) and ambient air, that has been conditioned to remove moisture and sulfur-containing gases, in a dilution system such as that shown in Figure 16A-3 of Method 16A. Alternatively, ultra-high purity (UHP) grade air may be used. Adjust the gas flow rates to generate an H_2S concentration in the range of the stack gas or within 20 percent of the applicable standard and an oxygen concentration greater than 1 percent at a total flow rate of at least 2.5 liters/min (5.3 ft3/hr). Use Equation 16A-3 from Method 16A to calculate the concentration of system performance check gas generated. Calibrate the flow rate from both gas sources with a soap bubble flow meter so that the diluted concentration of H_2S can be accurately calculated. Alternatively, mass flow controllers with documented calibrations may be used if UHP grade air is being used. Sample duration should be sufficiently long to ensure a stable response from the analyzer. Analyze in the same manner as the emission samples. Collect the sample through the probe of the sampling train using a manifold or other suitable device that will ensure extraction of a representative sample. The TRS sample concentration measured between system performance checks is corrected by the average of the pre- and post-system performance checks.

8.1.4 Interference Check. Same as in Method 7E, section 8.2.7.

8.2 Measurement System Preparation.

8.2.1 For the SO_2 scrubber, measure 100 ml of citrate buffer into the first and second impingers; leave the third impinger empty. Immerse the impingers in an ice bath, and locate them as close as possible to the filter heat box. The connecting tubing should be free of loops. Maintain the probe and filter temperatures sufficiently high to prevent moisture condensation, and monitor with a suitable temperature sensor. Prepare the oxidation furnace and maintain at 800 ±100 °C (1472 ±180 °F).

8.2.2 Citrate Scrubber Conditioning Procedure. Condition the citrate buffer scrubbing solution by pulling stack gas through the Teflon impingers as described in section 8.4.1.

8.3 Pretest Procedures. After the complete measurement system has been set up at the site and deemed to be operational, the following procedures must be completed before sampling is initiated.

8.3.1 Leak-Check. Appropriate leak-check procedures must be employed to verify the integrity of all components, sample lines, and connections. For components upstream of the sample pump, attach the probe end of the sample line to a manometer or vacuum gauge, start the pump and pull a vacuum greater than 50 mm (2 in.) Hg, close off the pump outlet, and then stop the pump and ascertain that there is no leak for 1 minute. For components after the pump, apply a slight positive pressure and check for leaks by applying a liquid (detergent in water, for example) at each joint. Bubbling indicates the presence of a leak.

8.3.2 Initial System Performance Check. A system performance check using the test gas (Section 7.4) is performed prior to testing to validate the sampling train components and procedure.

8.4 Sample Collection and Analysis.

8.4.1 After performing the required pretest procedures described in section 8.1, insert the sampling probe into the test port ensuring that no dilution air enters the stack through the port. Condition the sampling system and citrate buffer solution for a minimum of 15 minutes before beginning analysis. Begin sampling and analysis. A source test consists of three test runs. A test run shall consist of a single sample collected over a 3-hour period or three separate 1-hour samples collected over a period not to exceed six hours.

8.5 Post-Run Evaluations.

8.5.1 System Performance Check. Perform a post-run system performance check before replacing the citrate buffer solution and particulate filter and before the probe is cleaned. The check results must not exceed the 100 ±20 percent limit set forth in section 13.2. If this limit is exceeded, the intervening run is considered invalid. However, if the recovery efficiency is not in the 100 ±20 percent range, but the results do not affect the compliance or noncompliance status of the affected facility, the Administrator may decide to accept the results of the compliance test.

8.5.2 Calibration Drift. After a run or series of runs, not to exceed a 24-hour period after initial calibration, perform a calibration drift test using a calibration gas (preferably the level that best approximates the sample concentration) in direct calibration mode. This drift must not differ from the initial calibration error percent by more than 3.0 percent or 0.5 ppm. If the drift exceeds this limit, the intervening run or runs are considered valid, but a new analyzer calibration error test must be performed and passed before continuing sampling.

9.0 Quality Control

Section	Quality control measure	Effect
8.1.2	Analyzer calibration error test	Establishes initial calibration accuracy within 5.0%.
8.1.3, 8.5.1	System performance check	Ensures accuracy of sampling/analytical procedure to 100 ±20%.
8.5.2	Calibration drift test	Ensures calibration drift is within 3.0%.
8.1.4	Interference check	Checks for analytical interferences.
8.3	Sampling equipment leak-check	Ensures accurate measurement of sample gas flow rate, sample volume.

10.0 Calibration

10.1 Calibrate the system using the gases described in section 7.3. Perform the initial 3-point calibration error test as described in section 8.1.2 before you start the test. The specification in section 13 must be met. Conduct an initial system performance test described in section 8.1.3 as well before the test to validate the sampling components and procedures before sampling. After the test commences, a system performance check is required after each run. You must include a copy of the manufacturer's certification of the calibration gases used in the testing as part of the test report. This certification must include the 13 documentation requirements in the EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards, September 1997, as amended August 25, 1999.

11.0 Analytical Procedure

Because sample collection and analysis are performed together (see section 8.0), additional discussion of the analytical procedure is not necessary.

12.0 Calculations and Data Analysis

12.1 Nomenclature.

ACE = Analyzer calibration error, percent of calibration span.

CD = Calibration drift, percent.

C_{Dir} = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode, ppmv.

C_{H2S} = Concentration of the system performance check gas, ppmv H_2S.

C_S = Measured concentration of the system performance gas when introduced in system calibration mode, ppmv H_2S.

C_V = Manufacturer certified concentration of a calibration gas (low, mid, or high), ppmv SO_2.

C_{SO2} = Unadjusted sample SO_2 concentration, ppmv.

C_{TRS} = Total reduced sulfur concentration corrected for system performance, ppmv.

DF = Dilution system (if used) dilution factor, dimensionless.

SP = System performance, percent.

12.2 Analyzer Calibration Error. Use Equation 16C-1 to calculate the analyzer calibration error for the low-, mid-, and high-level calibration gases.

$$ACE = \frac{C_{Dir} - C_V}{C_V} \; x \; 100 \qquad \text{Eq. 16C-1}$$

12.3 System Performance Check. Use Equation 16C-2 to calculate the system performance.

$$SP = \frac{C_S - C_{H2S}}{C_{H2S}} \; x \; 100 \qquad \text{Eq. 16C-2}$$

12.4 Calibration Drift. Use Equation 16C-3 to calculate the calibration drift at a single concentration level after a run or series of runs (not to exceed a 24-hr period) from initial calibration. Compare the single-level calibration gas error (ACE_n) to the original error obtained for that gas in the initial analyzer calibration error test (ACE_i).

$$CD = |ACE_i - ACE_n| \qquad \text{Eq. 16C-3}$$

12.5 TRS Concentration as SO_2. For each sample or test run, calculate the arithmetic average of SO_2 concentration values (e.g., 1-minute averages). Then calculate the sample TRS concentration by adjusting the average value of C_{SO2} for system performance using Equation 16C-4.

$$C_{TRS} = \frac{\overline{C_{SO2}}}{1 - \overline{|SP|}} \qquad \text{Eq. 16C-4}$$

13.0 Method Performance

13.1 Analyzer Calibration Error. At each calibration gas level (low, mid, and high), the calibration error must either not exceed 5.0 percent of the calibration gas concentration or $|C_{Dir} - C_v|$ must be ≤ 0.5 ppmv.

13.2 System Performance. Each system performance check must not deviate from the system performance gas concentration by more than 20 percent. Alternatively, the results are acceptable if $|C_s - C_{H2S}|$ is ≤ 0.5 ppmv.

13.3 Calibration Drift. The calibration drift at the end of any run or series of runs within a 24-hour period must not differ by more than 3.0 percent from the original ACE at the test concentration level or $|ACEi - ACE_n|$ must not exceed 0.5 ppmv.

13.4 Interference Check. For the analyzer, the total interference response (i.e., the sum of the interference responses of all tested gaseous components) must not be greater than 2.5 percent of the calibration span. Any interference is also acceptable if the sum of the responses does not exceed 0.5 ppmv for a calibration span of 5 to 10 ppmv, or 0.2 ppmv for a calibration span <5 ppmv.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 References

1. The references are the same as in section 16.0 of Method 16, section 17.0 of Method 16A, and section 17.0 of Method 6C.

2. National Council of the Paper Industry for Air and Stream Improvement, Inc,. A Study of TRS Measurement Methods. Technical Bulletin No. 434. New York, NY. May 1984. 12p.

3. Margeson, J.H., J.E. Knoll, and M.R. Midgett. A Manual Method for TRS Determination. Draft available from the authors. Source Branch, Quality Assurance Division, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

17.0 Tables, Diagrams, Flowcharts, and Validation Data [Reserved]

While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. Please refer to the official version in the FR publication, which appears on the Government Printing Office's eCFR website

HTTP://WWW.ECFR.GOV/CGI-BIN/TEXT-IDX?SID=C7836E6FF67E5AD001BCB19CCFD99C1A&NODE=40:8.0.1.1.1&RGN=DIV5#40:8.0.1.1.1.0.1.1.7

METHOD 23—DETERMINATION OF POLYCHLORINATED DIBENZO-P-DIOXINS AND POLYCHLORINATED DIBENZOFURANS FROM STATIONARY SOURCES

1. Applicability and Principle

1.1 Applicability. This method is applicable to the determination of polychlorinated dibenzo-p-dioxins (PCDD's) and polychlorinated dibenzofurans (PCDF's) from stationary sources.

1.2 Principle. A sample is withdrawn from the gas stream isokinetically and collected in the sample probe, on a glass fiber filter, and on a packed column of adsorbent material. The sample cannot be separated into a particle vapor fraction. The PCDD's and PCDF's are extracted from the sample, separated by high resolution gas chromatography, and measured by high resolution mass spectrometry.

2. Apparatus

2.1 Sampling. A schematic of the sampling train used in this method is shown in Figure 23-1. Sealing greases may not be used in assembling the train. The train is identical to that described in section 2.1 of Method 5 of this appendix with the following additions:

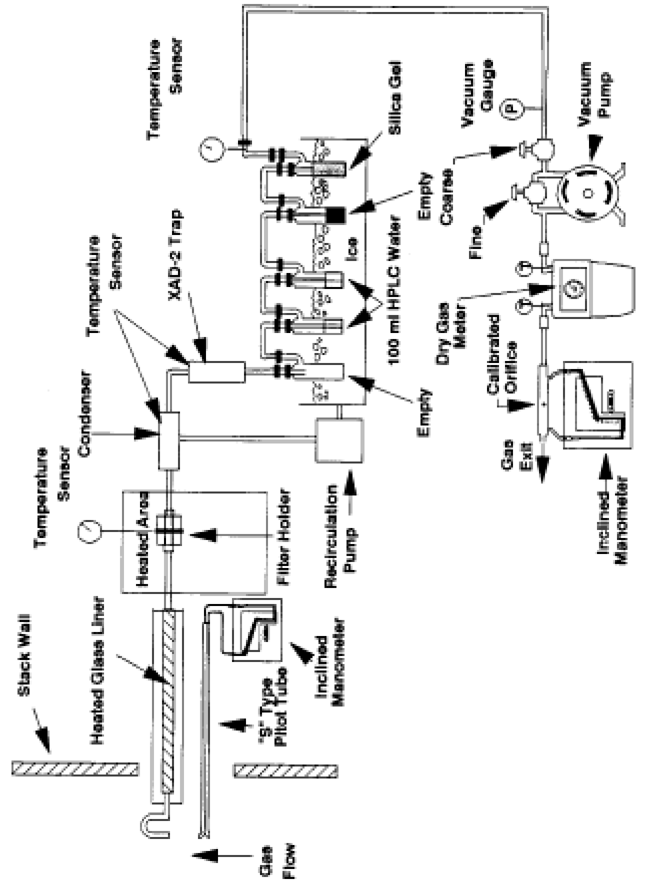


Figure 23.1 Sampling train

2.1.1 Nozzle. The nozzle shall be made of nickel, nickel-plated stainless steel, quartz, or borosilicate glass.

2.1.2 Sample Transfer Lines. The sample transfer lines, if needed, shall be heat traced, heavy walled TFE (½ in. OD with⅛ in. wall) with connecting fittings that are capable of forming leak-free, vacuum-tight connections without using sealing greases. The line shall be as short as possible and must be maintained at 120 °C.

2.1.1 Filter Support. Teflon or Teflon-coated wire.

2.1.2 Condenser. Glass, coil type with compatible fittings. A schematic diagram is shown in Figure 23-2.

2.1.3 Water Bath. Thermostatically controlled to maintain the gas temperature exiting the condenser at <20 °C (68 °F).

2.1.4 Adsorbent Module. Glass container to hold the solid adsorbent. A shematic diagram is shown in Figure 23-2. Other physical configurations of the resin trap/condenser assembly are acceptable. The connecting fittings shall form leak-free, vacuum tight seals. No sealant greases shall be used in the sampling train. A coarse glass frit is included to retain the adsorbent.

2.2 Sample Recovery.

2.2.1 Fitting Caps. Ground glass, Teflon tape, or aluminum foil (Section 2.2.6) to cap off the sample exposed sections of the train.

2.2.2 Wash Bottles. Teflon, 500-ml.

2.2.3 Probe-Liner Probe-Nozzle, and Filter-Holder Brushes. Inert bristle brushes with precleaned stainless steel or Teflon handles. The probe brush shall have extensions of stainless steel or Teflon, at least as long as the probe. The brushes shall be properly sized and shaped to brush out the nozzle, probe liner, and transfer line, if used.

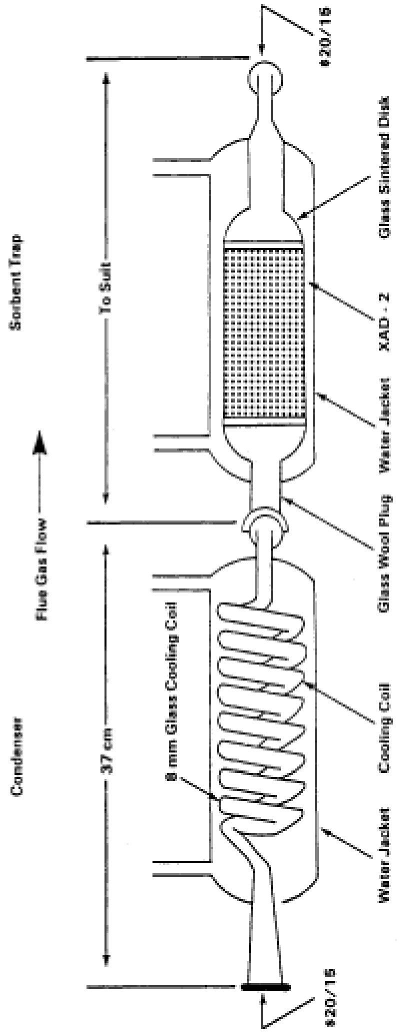


Figure 23.2. Condenser and adsorbent trap

2.2.4 Filter Storage Container. Sealed filter holder, wide-mouth amber glass jar with Teflon-lined cap, or glass petri dish.

2.2.5 Balance. Triple beam.

2.2.6 Aluminum Foil. Heavy duty, hexane-rinsed.

2.2.7 Storage Container. Air-tight container to store silica gel.

2.2.8 Graduated Cylinder. Glass, 250-ml with 2-ml graduation.

2.2.9 Glass Sample Storage Container. Amber glass bottle for sample glassware washes, 500- or 1000-ml, with leak free Teflon-lined caps.

2.3 Analysis.

2.3.1 Sample Container. 125- and 250-ml flint glass bottles with Teflon-lined caps.

2.3.2 Test Tube. Glass.

2.3.3 Soxhlet Extraction Apparatus. Capable of holding 43×123 mm extraction thimbles.

2.3.4 Extraction Thimble. Glass, precleaned cellulosic, or glass fiber.

2.3.5 Pasteur Pipettes. For preparing liquid chromatographic columns.

2.3.6 Reacti-vials. Amber glass, 2-ml, silanized prior to use.

2.3.7 Rotary Evaporator. Buchi/Brinkman RF-121 or equivalent.

2.3.8 Nitrogen Evaporative Concentrator. N-Evap Analytical Evaporator Model III or equivalent.

2.3.9 Separatory Funnels. Glass, 2-liter.

2.3.10 Gas Chromatograph. Consisting of the following components:

2.3.10.1 Oven. Capable of maintaining the separation column at the proper operating temperature ±°C and performing programmed increases in temperature at rates of at least 40 °C/min.

2.3.10.2 Temperature Gauge. To monitor column oven, detector, and exhaust temperatures ±1 °C.

2.3.10.3 Flow System. Gas metering system to measure sample, fuel, combustion gas, and carrier gas flows.

2.3.10.4 Capillary Columns. A fused silica column, 60 × 0.25 mm inside diameter (ID), coated with DB-5 and a fused silica column, 30 m × 0.25 mm ID coated with DB-225. Other column systems may be used provided that the user is able to demonstrate using calibration and performance checks that the column system is able to meet the specifications of section 6.1.2.2.

2.3.11 Mass Spectrometer. Capable of routine operation at a resolution of 1:10000 with a stability of ±5 ppm.

2.3.12 Data System. Compatible with the mass spectrometer and capable of monitoring at least five groups of 25 ions.

2.3.13 Analytical Balance. To measure within 0.1 mg.

3. Reagents

3.1 Sampling.

3.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3-micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM Standard Method D 2986-71 (Reapproved 1978) (incorporated by reference—see §60.17).

3.1.1.1 Precleaning. All filters shall be cleaned before their initial use. Place a glass extraction thimble and 1 g of silica gel and a plug of glass wool into a Soxhlet apparatus, charge the apparatus with toluene, and reflux for a minimum of 3 hours. Remove the toluene and discard it, but retain the silica gel. Place no more than 50 filters in the thimble onto the silica gel bed and top with the cleaned glass wool. Charge the Soxhlet with toluene and reflux for 16 hours. After extraction, allow the Soxhlet to cool, remove the filters, and dry them under a clean N_2 stream. Store the filters in a glass petri dish sealed with Teflon tape.

3.1.2 Adsorbent Resin. Amberlite XAD-2 resin. Thoroughly cleaned before initial use.

3.1.2.1 Cleaning Procedure. This procedure may be carried out in a giant Soxhlet extractor. An all-glass filter thimble containing an extra-course frit is used for extraction of XAD-2. The frit is recessed 10-15 mm above a crenelated ring at the bottom of the thimble to facilitate drainage. The resin must be carefully retained in the extractor cup with a glass wool plug and a stainless steel ring because it floats on methylene chloride. This process involves sequential extraction in the following order.

Solvent	**Procedure**
Water	Initial rinse: Place resin in a beaker, rinse once with water, and discard. Fill with water a second time, let stand overnight, and discard.
Water	Extract with water for 8 hours.
Methanol	Extract for 22 hours.
Methylene Chloride	Extract for 22 hours.
Toluene	Extract for 22 hours.

3.1.2.2 Drying.

3.1.2.2.1 Drying Column. Pyrex pipe, 10.2 cm ID by 0.6 m long, with suitable retainers.

3.1.2.2.2 Procedure. The adsorbent must be dried with clean inert gas. Liquid nitrogen from a standard commercial liquid nitrogen cylinder has proven to be a reliable source of large volumes of gas free from organic contaminants. Connect the liquid nitrogen cylinder to the column by a length of cleaned copper tubing, 0.95 cm ID, coiled to pass through a heat source. A convenient heat source is a water-bath heated from a steam line. The final nitrogen temperature should only be warm to the touch and not over 40 °C. Continue flowing nitrogen through the adsorbent until all the residual solvent is removed. The flow rate should be sufficient to gently agitate the particles but not so excessive as the cause the particles to fracture.

3.1.2.3 Quality Control Check. The adsorbent must be checked for residual toluene.

3.1.2.3.1 Extraction. Weigh 1.0 g sample of dried resin into a small vial, add 3 ml of toluene, cap the vial, and shake it well.

3.1.2.3.2 Analysis. Inject a 2 µl sample of the extract into a gas chromatograph operated under the following conditions:

Column: 6 ft × ⅛ in stainless steel containing 10 percent OV-101 on 100/120 Supelcoport.

Carrier Gas: Helium at a rate of 30 ml/min.

Detector: Flame ionization detector operated at a sensitivity of 4×10^{-11} A/mV.

Injection Port Temperature: 250 °C.

Detector Temperature: 305 °C.

Oven Temperature: 30 °C for 4 min; programmed to rise at 40 °C/min until it reaches 250 °C; return to 30 °C after 17 minutes.

Compare the results of the analysis to the results from the reference solution. Prepare the reference solution by injection 2.5 µl of methylene chloride into 100 ml of toluene. This corresponds to 100 µg of methylene chloride per g of adsorbent. The maximum acceptable concentration is 1000 µg/g of adsorbent. If the adsorbent exceeds this level, drying must be continued until the excess methylene chloride is removed.

3.1.2.4 Storage. The adsorbent must be used within 4 weeks of cleaning. After cleaning, it may be stored in a wide mouth amber glass container with a Teflon-lined cap or placed in one of the glass adsorbent modules tightly sealed with glass stoppers. If precleaned adsorbent is purchased in sealed containers, it must be used within 4 weeks after the seal is broken.

3.1.3 Glass Wool. Cleaned by sequential immersion in three aliquots of methylene chloride, dried in a 110 °C oven, and stored in a methylene chloride-washed glass jar with a Teflon-lined screw cap.

3.1.4 Water. Deionized distilled and stored in a methylene chloride-rinsed glass container with a Teflon-lined screw cap.

3.1.5 Silica Gel. Indicating type, 6 to 16 mesh. If previously used, dry at 175 °C (350 °F) for two hours. New silica gel may be used as received. Alternately other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

3.1.6 Chromic Acid Cleaning Solution. Dissolve 20 g of sodium dichromate in 15 ml of water, and then carefully add 400 ml of concentrated sulfuric acid.

3.2 Sample Recovery.

3.2.2 Acetone. Pesticide quality.

3.2.2 Methylene Chloride. Pesticide qualtity.

3.2.3 Toluene. Pesticide quality.

3.3 Analysis.

3.3.1 Potassium Hydroxide. ACS grade, 2-percent (weight/volume) in water.

3.3.2 Sodium Sulfate. Granulated, reagent grade. Purify prior to use by rinsing with methylene chloride and oven drying. Store the cleaned material in a glass container with a Teflon-lined screw cap.

3.3.3 Sulfuric Acid. Reagent grade.

3.3.4 Sodium Hydroxide. 1.0 N. Weigh 40 g of sodium hydroxide into a 1-liter volumetric flask. Dilute to 1 liter with water.

3.3.5 Hexane. Pesticide grade.

3.3.6 Methylene Chloride. Pesticide grade.

3.3.7 Benzene. Pesticide Grade.

3.3.8 Ethyl Acetate.

3.3.9 Methanol. Pesticide Grade.

3.3.10 Toluene. Pesticide Grade.

3.3.11 Nonane. Pesticide Grade.

3.3.12 Cyclohexane. Pesticide Grade.

3.3.13 Basic Alumina. Activity grade 1, 100-200 mesh. Prior to use, activate the alumina by heating for 16 hours at 130 °C before use. Store in a desiccator. Pre-activated alumina may be purchased from a supplier and may be used as received.

3.3.14 Silica Gel. Bio-Sil A, 100-200 mesh. Prior to use, activate the silica gel by heating for at least 30 minutes at 180 °C. After cooling, rinse the silica gel sequentially with methanol and methylene chloride. Heat the rinsed silica gel at 50 °C for 10 minutes, then increase the temperature gradually to 180 °C over 25 minutes and maintain it at this temperature for 90 minutes. Cool at room temperature and store in a glass container with a Teflon-lined screw cap.

3.3.15 Silica Gel Impregnated with Sulfuric Acid. Combine 100 g of silica gel with 44 g of concentrated sulfuric acid in a screw capped glass bottle and agitate thoroughly. Disperse the solids with a stirring rod until a uniform mixture is obtained. Store the mixture in a glass container with a Teflon-lined screw cap.

3.3.16 Silica Gel Impregnated with Sodium Hydroxide. Combine 39 g of 1 N sodium hydroxide with 100 g of silica gel in a screw capped glass bottle and agitate thoroughly. Disperse solids with a stirring rod until a uniform mixture is obtained. Store the mixture in glass container with a Teflon-lined screw cap.

3.3.17 Carbon/Celite. Combine 10.7 g of AX-21 carbon with 124 g of Celite 545 in a 250-ml glass bottle with a Teflon-lined screw cap. Agitate the mixture thoroughly until a uniform mixture is obtained. Store in the glass container.

3.3.18 Nitrogen. Ultra high purity.

3.3.19 Hydrogen. Ultra high purity.

3.3.20 Internal Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDD's and PCDF's at the concentrations shown in Table 1 under the heading “Internal Standards” in 10 ml of nonane.

3.3.21 Surrogate Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDD's and PCDF's at the concentrations shown in Table 1 under the heading “Surrogate Standards” in 10 ml of nonane.

3.3.22 Recovery Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDD's and PCDF's at the concentrations shown in Table 1 under the heading “Recovery Standards” in 10 ml of nonane.

4. Procedure

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation.

4.1.1.1 Cleaning Glassware. All glass components of the train upstream of and including the adsorbent module, shall be cleaned as described in section 3A of the "Manual of Analytical Methods for the Analysis of Pesticides in Human and Environmental Samples." Special care shall be devoted to the removal of residual silicone grease sealants on ground glass connections of used glassware. Any residue shall be removed by soaking the glassware for several hours in a chromic acid cleaning solution prior to cleaning as described above.

4.1.1.2 Adsorbent Trap. The traps must be loaded in a clean area to avoid contamination. They may not be loaded in the field. Fill a trap with 20 to 40 g of XAD-2. Follow the XAD-2 with glass wool and tightly cap both ends of the trap. Add 100 µl of the surrogate standard solution (section 3.3.21) to each trap.

4.1.1.3 Sample Train. It is suggested that all components be maintained according to the procedure described in APTD-0576. Alternative mercury-free thermometers may be used if the thermometers are, at a minimum, equivalent in terms of performance or suitably effective for the specific temperature measurement application.

4.1.1.4 Silica Gel. Weigh several 200 to 300 g portions of silica gel in an air tight container to the nearest 0.5 g. Record the total weight of the silica gel plus container, on each container. As an alternative, the silica gel may be weighed directly in its impinger or sampling holder just prior to sampling.

4.1.1.5 Filter. Check each filter against light for irregularities and flaws or pinhole leaks. Pack the filters flat in a clean glass container.

4.1.2 Preliminary Determinations. Same as section 4.1.2 of Method 5.

4.1.3 Preparation of Collection Train.

4.1.3.1 During preparation and assembly of the sampling train, keep all train openings where contamination can enter, sealed until just prior to assembly or until sampling is about to begin.

NOTE: Do not use sealant grease in assembling the train.

4.1.3.2 Place approximately 100 ml of water in the second and third impingers, leave the first and fourth impingers empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fifth impinger.

4.1.3.3 Place the silica gel container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

4.1.3.4 Assemble the train as shown in Figure 23-1.

4.1.3.5 Turn on the adsorbent module and condenser coil recirculating pump and begin monitoring the adsorbent module gas entry temperature. Ensure proper sorbent temperature gas entry temperature before proceeding and before sampling is initiated. It is extremely important that the XAD-2 adsorbent resin temperature never exceed 50 °C because thermal decomposition will occur. During testing, the XAD-2 temperature must not exceed 20 °C for efficient capture of the PCDD's and PCDF's.

4.1.4 Leak-Check Procedure. Same as Method 5, section 4.1.4.

4.1.5 Sample Train Operation. Same as Method 5, section 4.1.5.

4.2 Sample Recovery. Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Seal the nozzle end of the sampling probe with Teflon tape or aluminum foil.

When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe. Remove the probe from the train and close off both ends with aluminum foil. Seal off the inlet to the train with Teflon tape, a ground glass cap, or aluminum foil.

Transfer the probe and impinger assembly to the cleanup area. This area shall be clean and enclosed so that the chances of losing or contaminating the sample are minimized. Smoking, which could contaminate the sample, shall not be allowed in the cleanup area.

Inspect the train prior to and during disassembly and note any abnormal conditions, e.g., broken filters, colored impinger liquid, etc. Treat the samples as follows:

4.2.1 Container No. 1. Either seal the filter holder or carefully remove the filter from the filter holder and place it in its identified container. Use a pair of cleaned tweezers to handle the filter. If it is necessary to fold the filter, do so such that the particulate cake is inside the fold. Carefully transfer to the container any particulate matter and filter fibers which adhere to the filter holder gasket, by using a dry inert bristle brush and a sharp-edged blade. Seal the container.

4.2.2 Adsorbent Module. Remove the module from the train, tightly cap both ends, label it, cover with aluminum foil, and store it on ice for transport to the laboratory.

4.2.3 Container No. 2. Quantitatively recover material deposited in the nozzle, probe transfer lines, the front half of the filter holder, and the cyclone, if used, first, by brushing while rinsing three times each with acetone and then, by rinsing the probe three times with methylene chloride. Collect all the rinses in Container No. 2.

Rinse the back half of the filter holder three times with acetone. Rinse the connecting line between the filter and the condenser three times with acetone. Soak the connecting line with three separate portions of methylene chloride for 5 minutes each. If using a separate condenser and adsorbent trap, rinse the condenser in the same manner as the connecting line. Collect all the rinses in Container No. 2 and mark the level of the liquid on the container.

4.2.4 Container No. 3. Repeat the methylene chloride-rinsing described in section 4.2.3 using toluene as the rinse solvent. Collect the rinses in Container No. 3 and mark the level of the liquid on the container.

4.2.5 Impinger Water. Measure the liquid in the first three impingers to within ±1 ml by using a graduated cylinder or by weighing it to within ±0.5 g by using a balance. Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight.

4.2.7 Silica Gel. Note the color of the indicating silica gel to determine if it has been completely spent and make a mention of its condition. Transfer the silica gel from the fifth impinger to its original container and seal. If a moisture determination is made, follow the applicable procedures in sections 8.7.6.3 and 11.2.3 of Method 5 to handle and weigh the silica gel. If moisture is not measured, the silica gel may be disposed.

5. Analysis

All glassware shall be cleaned as described in section 3A of the "Manual of Analytical Methods for the Analysis of Pesticides in Human and Environmental Samples." All samples must be extracted within 30 days of collection and analyzed within 45 days of extraction.

5.1 Sample Extraction.

5.1.1 Extraction System. Place an extraction thimble (section 2.3.4), 1 g of silica gel, and a plug of glass wool into the Soxhlet apparatus, charge the apparatus with toluene, and reflux for a minimum of 3 hours. Remove the toluene and discard it, but retain the silica gel. Remove the extraction thimble from the extraction system and place it in a glass beaker to catch the solvent rinses.

5.1.2 Container No. 1 (Filter). Transfer the contents directly to the glass thimble of the extraction system and extract them simultaneously with the XAD-2 resin.

5.1.3 Adsorbent Cartridge. Suspend the adsorbent module directly over the extraction thimble in the beaker (See section 5.1.1). The glass frit of the module should be in the up position. Using a Teflon squeeze bottle containing toluene, flush the XAD-2 into the thimble onto the bed of cleaned silica gel. Thoroughly rinse the glass module catching the rinsings in the beaker containing the thimble. If the resin is wet, effective extraction can be accomplished by loosely packing the resin in the thimble. Add the XAD-2 glass wool plug into the thimble.

5.1.4 Container No. 2 (Acetone and Methylene Chloride). Concentrate the sample to a volume of about 1-5 ml using the rotary evaporator apparatus, at a temperature of less than 37 °C. Rinse the sample container three times with small portions of methylene chloride and add these to the concentrated solution and concentrate further to near dryness. This residue contains particulate matter removed in the rinse of the train probe and nozzle. Add the concentrate to the filter and the XAD-2 resin in the Soxhlet apparatus described in section 5.1.1.

5.1.5 Extraction. Add 100 µl of the internal standard solution (Section 3.3.20) to the extraction thimble containing the contents of the adsorbent cartridge, the contents of Container No. 1, and the concentrate from section 5.1.4. Cover the contents of the extraction thimble with the cleaned glass wool plug to prevent the XAD-2 resin from floating into the solvent reservoir of the extractor. Place the thimble in the extractor, and add the toluene contained in the beaker to the solvent reservoir. Pour additional toluene to fill the reservoir approximately ⅔ full. Add Teflon boiling chips and assemble the apparatus. Adjust the heat source to cause the extractor to cycle three times per hour. Extract the sample for 16 hours. After extraction, allow the Soxhlet to cool. Transfer the toluene extract and three 10-ml rinses to the rotary evaporator. Concentrate the extract to approximately 10 ml. At this point the analyst may choose to split the sample in half. If so, split the sample, store one half for future use, and analyze the other according to the procedures in sections 5.2 and 5.3. In either case, use a nitrogen evaporative concentrator to reduce the volume of the sample being analyzed to near dryness. Dissolve the residue in 5 ml of hexane.

5.1.6 Container No. 3 (Toluene Rinse). Add 100 µl of the Internal Standard solution (section 3.3.2) to the contents of the container. Concentrate the sample to a volume of about 1-5 ml using the rotary evaporator apparatus at a temperature of less than 37 °C. Rinse the sample container apparatus at a temperature of less than 37 °C. Rinse the sample container three times with small portions of toluene and add these to the concentrated solution and concentrate further to near dryness. Analyze the extract separately according to the procedures in sections 5.2 and 5.3, but concentrate the solution in a rotary evaporator apparatus rather than a nitrogen evaporative concentrator.

5.2 Sample Cleanup and Fractionation.

5.2.1 Silica Gel Column. Pack one end of a glass column, 20 mm×230 mm, with glass wool. Add in sequence, 1 g silica gel, 2 g of sodium hydroxide impregnated silica gel, 1 g silica gel, 4 g of acid-modified silica gel, and 1 g of silica gel. Wash the column with 30 ml of hexane and discard it. Add the sample extract, dissolved in 5 ml of hexane to the column with two additional 5-ml rinses. Elute the column with an additional 90 ml of hexane and retain the entire eluate. Concentrate this solution to a volume of about 1 ml using the nitrogen evaporative concentrator (section 2.3.7).

5.2.2 Basic Alumina Column. Shorten a 25-ml disposable Pasteur pipette to about 16 ml. Pack the lower section with glass wool and 12 g of basic alumina. Transfer the concentrated extract from the silica gel column to the top of the basic alumina column and elute the column sequentially with 120 ml of 0.5 percent methylene chloride in hexane followed by 120 ml of 35 percent methylene chloride in hexane. Discard the first 120 ml of eluate. Collect the second 120 ml of eluate and concentrate it to about 0.5 ml using the nitrogen evaporative concentrator.

5.2.3 AX-21 Carbon/Celite 545 Column. Remove the botton 0.5 in. from the tip of a 9-ml disposable Pasteur pipette. Insert a glass fiber filter disk in the top of the pipette 2.5 cm from the constriction. Add sufficient carbon/celite mixture to form a 2 cm column. Top with a glass wool plug. In some cases AX-21 carbon fines may wash through the glass wool plug and enter the sample. This may be prevented by adding a celite plug to the exit end of the column. Rinse the column in sequence with 2 ml of 50 percent benzene in ethyl acetate, 1 ml of 50 percent methylene chloride in cyclohexane, and 2 ml of hexane. Discard these rinses. Transfer the concentrate in 1 ml of hexane from the basic alumina column to the carbon/celite column along with 1 ml of hexane rinse. Elute the column sequentially with 2 ml of 50 percent methylene chloride in hexane and 2 ml of 50 percent benzene in ethyl acetate and discard these eluates. Invert the column and elute in the reverse direction with 13 ml of toluene. Collect this eluate. Concentrate the eluate in a rotary evaporator at 50 °C to about 1 ml. Transfer the concentrate to a Reacti-vial using a toluene rinse and concentrate to a volume of 200 µl using a stream of N_2. Store extracts at room temperature, shielded from light, until the analysis is performed.

5.3 Analysis. Analyze the sample with a gas chromatograph coupled to a mass spectrometer (GC/MS) using the instrumental parameters in sections 5.3.1 and 5.3.2. Immediately prior to analysis, add a 20 µl aliquot of the Recovery Standard solution from Table 1 to each sample. A 2 µl aliquot of the extract is injected into the GC. Sample extracts are first analyzed using the DB-5 capillary column to determine the concentration of each isomer of PCDD's and PCDF's (tetra- through octa-). If tetra-chlorinated dibenzofurans are detected in this analysis, then analyze another aliquot of the sample in a separate run, using the DB-225 column to measure the 2,3,7,8 tetra-chloro dibenzofuran isomer. Other column systems may be used, provided that the user is able to demonstrate using calibration and performance checks that the column system is able to meet the specifications of section 6.1.2.2.

5.3.1 Gas Chromatograph Operating Conditions.

5.3.1.1 Injector. Configured for capillary column, splitless, 250 °C.

5.3.1.2 Carrier Gas. Helium, 1-2 ml/min.

5.3.1.3 Oven. Initially at 150 °C. Raise by at least 40 °C/min to 190 °C and then at 3 °C/min up to 300 °C.

5.3.2 High Resolution Mass Spectrometer.

5.3.2.1 Resolution. 10000 m/e.

5.3.2.2 Ionization Mode. Electron impact.

5.3.2.3 Source Temperature 250 °C.

5.3.2.4 Monitoring Mode. Selected ion monitoring. A list of the various ions to be monitored is summarized in Table 3.

5.3.2.5 Identification Criteria. The following identification criteria shall be used for the characterization of polychlorinated dibenzodioxins and dibenzofurans.

1. The integrated ion-abundance ratio (M/M+2 or M+2/M+4) shall be within 15 percent of the theoretical value. The acceptable ion-abundance ratio ranges for the identification of chlorine-containing compounds are given in Table 4.

2. The retention time for the analytes must be within 3 seconds of the corresponding ^{13}C-labeled internal standard, surrogate or alternate standard.

3. The monitored ions, shown in Table 3 for a given analyte, shall reach their maximum within 2 seconds of each other.

4. The identification of specific isomers that do not have corresponding ^{13}C-labeled standards is done by comparison of the relative retention time (RRT) of the analyte to the nearest internal standard retention time with reference (i.e., within 0.005 RRT units) to the comparable RRT's found in the continuing calibration.

5. The signal to noise ratio for all monitored ions must be greater than 2.5.

6. The confirmation of 2, 3, 7, 8-TCDD and 2, 3, 7, 8-TCDF shall satisfy all of the above identification criteria.

7. For the identification of PCDF's, no signal may be found in the corresponding PCDPE channels.

5.3.2.6 Quantification. The peak areas for the two ions monitored for each analyte are summed to yield the total response for each analyte. Each internal standard is used to quantify the indigenous PCDD's or PCDF's in its homologous series. For example, the $^{13}C_{12}$-2,3,7,8-tetra chlorinated dibenzodioxin is used to calculate the concentrations of all other tetra chlorinated isomers. Recoveries of the tetra- and penta- internal standards are calculated using the $^{13}C_{12}$-1,2,3,4-TCDD. Recoveries of the hexa- through octa- internal standards are calculated using $^{13}C_{12}$-1,2,3,7,8,9-HxCDD. Recoveries of the surrogate standards are calculated using the corresponding homolog from the internal standard.

6. Calibration

Same as Method 5 with the following additions.

6.1 GC/MS System.

6.1.1 Initial Calibration. Calibrate the GC/MS system using the set of five standards shown in Table 2. The relative standard deviation for the mean response factor from each of the unlabeled analytes (Table 2) and of the internal, surrogate, and alternate standards shall be less than or equal to the values in Table 5. The signal to noise ratio for the GC signal present in every selected ion current profile shall be greater than or equal to 2.5. The ion abundance ratios shall be within the control limits in Table 4.

6.1.2 Daily Performance Check.

6.1.2.1 Calibration Check. Inject on µl of solution Number 3 from Table 2. Calculate the relative response factor (RRF) for each compound and compare each RRF to the corresponding mean RRF obtained during the initial calibration. The analyzer performance is acceptable if the measured RRF's for the labeled and unlabeled compounds for the daily run are within the limits of the mean values shown in Table 5. In addition, the ion-abundance ratios shall be within the allowable control limits shown in Table 4.

6.1.2.2 Column Separation Check. Inject a solution of a mixture of PCDD's and PCDF's that documents resolution between 2,3,7,8-TCDD and other TCDD isomers. Resolution is defined as a valley between peaks that is less than 25 percent of the lower of the two peaks. Identify and record the retention time windows for each homologous series.

Perform a similar resolution check on the confirmation column to document the resolution between 2,3,7,8 TCDF and other TCDF isomers.

6.2 Lock Channels. Set mass spectrometer lock channels as specified in Table 3. Monitor the quality control check channels specified in Table 3 to verify instrument stability during the analysis.

7. Quality Control

7.1 Sampling Train Collection Efficiency Check. Add 100 µl of the surrogate standards in Table 1 to the absorbent cartridge of each train before collecting the field samples.

7.2 Internal Standard Percent Recoveries. A group of nine carbon labeled PCDD's and PCDF's representing, the tetra-through octachlorinated homologues, is added to every sample prior to extraction. The role of the internal standards is to quantify the native PCDD's and PCDF's present in the sample as well as to determine the overall method efficiency. Recoveries of the internal standards must be between 40 to 130 percent for the tetra-through hexachlorinated compounds while the range is 25 to 130 percent for the higher hepta- and octachlorinated homologues.

7.3 Surrogate Recoveries. The five surrogate compounds in Table 2 are added to the resin in the adsorbent sampling cartridge before the sample is collected. The surrogate recoveries are measured relative to the internal standards and are a measure of collection efficiency. They are not used to measure native PCDD's and PCDF's. All recoveries shall be between 70 and 130 percent. Poor recoveries for all the surrogates may be an indication of breakthrough in the sampling train. If the recovery of all standards is below 70 percent, the sampling runs must be repeated. As an alternative, the sampling runs do not have to be repeated if the final results are divided by the fraction of surrogate recovery. Poor recoveries of isolated surrogate compounds should not be grounds for rejecting an entire set of the samples.

7.4 Toluene QA Rinse. Report the results of the toluene QA rinse separately from the total sample catch. Do not add it to the total sample.

8.0 [Reserved]

9. Calculations

Same as Method 5, section 6 with the following additions.

9.1 Nomenclature.

A_{ai} = Integrated ion current of the noise at the retention time of the analyte.

A^*_{ci} = Integrated ion current of the two ions characteristic of the internal standard i in the calibration standard.

A_{cij} = Integrated ion current of the two ions characteristic of compound i in the jth calibration standard.

A^*_{cij} = Integrated ion current of the two ions characteristic of the internal standard i in the jth calibration standard.

A_{csi} = Integrated ion current of the two ions characteristic of surrogate compound i in the calibration standard.

A_i = Integrated ion current of the two ions characteristic of compound i in the sample.

A^*_I = Integrated ion current of the two ions characteristic of internal standard i in the sample.

A_{rs} = Integrated ion current of the two ions characteristic of the recovery standard.

A_{si} = Integrated ion current of the two ions characteristic of surrogate compound i in the sample.

C_i = Concentration of PCDD or PCDF i in the sample, pg/M^3.

C_T = Total concentration of PCDD's or PCDF's in the sample, pg/M^3.

m_{ci} = Mass of compound i in the calibration standard injected into the analyzer, pg.

m_{rs} = Mass of recovery standard in the calibration standard injected into the analyzer, pg.

m_{si} = Mass of surrogate compound in the calibration standard, pg.

RRF_i = Relative response factor.

RRF_{rs} = Recovery standard response factor.

RRF_s = Surrogate compound response factor.

9.2 Average Relative Response Factor.

$$RRF_i = \frac{1}{n}\sum_{j=1}^{n}\frac{A_{cij}\, m^*_{ci}}{A^*_{cij}\, m_{ci}} \qquad Eq.\ 23\text{-}1$$

9.3 Concentration of the PCDD's and PCDF's.

$$C_i = \frac{m_i^{*} A_i}{A_i^{*} RRF_i V_{mstd}} \qquad Eq.\ 23\text{-}2$$

9.4 Recovery Standard Response Factor.

$$RRF_{rs} = \frac{A_{ci}^{*} m_{rs}}{A_{rs} m_{ci}^{*}} \qquad Eq.\ 23\text{-}3$$

9.5 Recovery of Internal Standards (R*).

$$R^{*} = \frac{A_i^{*} m_{rs}}{A_{rs} RF_{rs} m_i^{*}} \times 100\% \qquad Eq.\ 23\text{-}4$$

9.6 Surrogate Compound Response Factor.

$$RRF_s = \frac{A_{ci}^{*} m_s}{A_{cis} m_{ci}^{*}} \qquad Eq.\ 23\text{-}5$$

9.7 Recovery of Surrogate Compounds (R_s).

$$R_s = \frac{A_s m_i^{*}}{A_i^{*} RRF_s m_s} \times 100\% \qquad Eq.\ 23\text{-}6$$

9.8 Minimum Detectable Limit (MDL).

$$MDL = \frac{2.5\ A_{ai} m_i^{*}}{A_{ci}^{*} RRF_i} \qquad Eq.\ 23\text{-}7$$

9.9 Total Concentration of PCDD's and PCDF's in the Sample.

$$C_{Tr} = \sum_{i=1}^{n} C_i \qquad Eq.\ 23\text{-}8$$

Any PCDD's or PCDF's that are reported as nondetected (below the MDL) shall be counted as zero for the purpose of calculating the total concentration of PCDD's and PCDF's in the sample.

10. Bibliography

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TABLE 1—COMPOSITION OF THE SAMPLE FORTIFICATION AND RECOVERY STANDARDS SOLUTIONS

Analyte	**Concentration (pg/µl)**
Internal Standards:	
$^{13}C_{12}$-2,3,7,8-TCDD	100
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100
$^{13}C_{12}$-OCDD	100
$^{13}C_{12}$-2,3,7,8-TCDF	100
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100
Surrogate Standards:	
$^{37}Cl_4$-2,3,7,8-TCDD	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	100
$^{13}C_{12}$-2,3,4,7,8-PeCDF	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	100
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	100
Recovery Standards:	

$^{13}C_{12}$-1,2,3,4-TCDD	500
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	500

TABLE 2—COMPOSITION OF THE INITIAL CALIBRATION SOLUTIONS

Compound	**Concentrations (pg/µL)**				
	Solution No.				
	1	**2**	**3**	**4**	**5**
Alternate Standard:					
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	2.5	5	25	250	500
Recovery Standards:					
$^{13}C_{12}$-1,2,3,4-TCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	100	100	100	100	100

TABLE 3—ELEMENTAL COMPOSITIONS AND EXACT MASSES OF THE IONS MONITORED BY HIGH RESOLUTION MASS SPECTROMETRY FOR PCDD'S AND PCDF'S

Descriptor No.	**Accurate mass**	**Ion type**	**Elemental composition**	**Analyte**
2	292.9825	LOCK	C_7F_{11}	PFK
	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl^{37}O$	TCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)
	319.8965	M	$C_{12}H_4{}^{35}ClO_2$	TCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD
	327.8847	M	$C_{12}H_4{}^{37}Cl_4O_2$	TCDD (S)
	330.9792	QC	C_7F_{13}	PFK
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)
	333.9339	M+2	$^{13}C_{12}H_4{}^{35}Cl^{37}ClO_2$	TCDD (S)
	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PECDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF (S)
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl^{3537}Cl_2O$	PeCDF (S)

	355.8546	M+2	$C_{12}H_3{}^{35}Cl_3 37ClO_2$	PeCDD
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}\ Cl_2O_2$	PeCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCPDE
3	373.8208	M+2	$C_{12}H_2 35Cl_5{}^{37}ClO$	HxCDF
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)
	389.8157	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD
	392.9760	LOCK	C_9F_{15}	PFK
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDD (S)
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE
	430.9729	QC	C_9F_{17}	PFK
4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	409.7789	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	417.8253	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF (S)
	423.7766	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCPDE
	430.9729	LOCK	C_9F_{17}	PFK
	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD

	459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	469.7779	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O_2$	DCDPE
	442.9728	QC	$C_{10}F_{17}$	PFK

(a) The following nuclidic masses were used:

H=1.007825

C=12.000000

^{13}C=13.003355

F=18.9984

O=15.994915

^{35}Cl=34.968853

^{37}Cl=36.965903

S=Labeled Standard

QC=Ion selected for monitoring instrument stability during the GC/MS analysis.

TABLE 4—ACCEPTABLE RANGES FOR ION-ABUNDANCE RATIOS OF PCDD'S AND PCDF'S

No. of chlorine atoms	Ion type	Theoretical ratio	Control limits	
			Lower	Upper
4	M/M+2	0.77	0.65	0.89
5	M+2/M+4	1.55	1.32	1.78
6	M+2/M+4	1.24	1.05	1.43
6[a]	M/M+2	0.51	0.43	0.59
7[b]	M/M+2	0.44	0.37	0.51
7	M+2/M+4	1.04	0.88	1.20
8	M+2/M+4	0.89	0.76	1.02

[a] Used only for ^{13}C-HxCDF.

[b]Used only for ^{13}C-HpCDF.

TABLE 5—MINIMUM REQUIREMENTS FOR INITIAL AND DAILY CALIBRATION RESPONSE FACTORS

Compound	Relative response factors	
	Initial calibration RSD	Daily calibration % difference
Unlabeled Analytes:		
2,3,7,8-TCDD	25	25
2,3,7,8-TCDF	25	25
1,2,3,7,8-PeCDD	25	25
1,2,3,7,8-PeCDF	25	25
2,3,4,7,8-PeCDF	25	25
1,2,4,5,7,8-HxCDD	25	25
1,2,3,6,7,8-HxCDD	25	25
1,2,3,7,8,9-HxCDD	25	25
1,2,3,4,7,8-HxCDF	25	25
1,2,3,6,7,8-HxCDF	25	25
1,2,3,7,8,9-HxCDF	25	25
2,3,4,6,7,8-HxCDF	25	25
1,2,3,4,6,7,8-HpCDD	25	25
1,2,3,4,6,7,8-HpCDF	25	25
OCDD	25	25
OCDF	30	30
Internal Standards:		
$^{13}C_{12}$-2,3,7,8-TCDD	25	25
$^{13}C_{12}$-1,2,3,7,8-PeCDD	30	30
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	25	25
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	30	30
$^{13}C_{12}$-OCDD	30	30
$^{13}C_{12}$-2,3,7,8-TCDF	30	30

$^{13}C_{12}$-1,2,3,7,8-PeCDF	30	30
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	30	30
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	30	30
Surrogate Standards:		
$^{37}Cl_4$-2,3,7,8-TCDD	25	25
$^{13}C_{12}$-2,3,4,7,8-PeCDF	25	25
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	25	25
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	25	25
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	25	25
Alternate Standard:		
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	25	25

Method 25A - Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

1.0 Scope and Application

1.1 Analytes.

Analyte	CAS No.	Sensitivity
Total Organic Compounds	N/A	< 2% of span.

1.2 Applicability. This method is applicable for the determination of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 A gas sample is extracted from the source through a heated sample line and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

3.0 Definitions

3.1 *Calibration drift* means the difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.2 *Calibration error* means the difference between the gas concentration indicated by the measurement system and the know concentration of the calibration gas.

3.3 *Calibration gas* means a known concentration of a gas in an appropriate diluent gas.

3.4 *Measurement system* means the total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

3.4.1 *Sample interface* means that portion of a system used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer(s) from the effects of the stack effluent.

3.4.2 *Organic analyzer* means that portion of the measurement system that senses the gas to be measured and generates an output proportional to its concentration.

3.5 *Response time* means the time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

3.6 *Span Value* means the upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

3.7 *Zero drift* means the difference in the measurement system response to a zero level calibration gas before or after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method. The analyzer user's manual should be consulted for specific precautions to be taken with regard to the analytical procedure.

5.2 Explosive Atmosphere. This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

6.0 Equipment and Supplies

6.1 Measurement System. Any measurement system for total organic concentration that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 25A–1. All sampling components leading to the analyzer shall be heated ≥ 110°C (220°F) throughout the sampling period, unless safety reasons are cited (Section 5.2) The essential components of the measurement system are described below:

6.1.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications of this method. The flame ionization detector block shall be heated >120°C (250°F).

6.1.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm (0.16-in.) in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

6.1.3 Heated Sample Line. Stainless steel or Teflon” tubing to transport the sample gas to the analyzer. The sample line should be heated (≥ 110°C) to prevent any condensation.

6.1.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

6.1.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

6.1.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute.

7.0 Reagents and Standards

7.1 Calibration Gases. The calibration gases for the gas analyzer shall be propane in air or propane in nitrogen. Alternatively, organic compounds other than propane can be used; the appropriate corrections for response factor must be made. Calibration gases shall be prepared in accordance with the procedure listed in Citation 2 of Section 16. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value. For calibration gas values not generally available (*i.e.,* organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems (Test Method 205, 40 CFR Part 51, Appendix M), may be used with prior approval of the Administrator.

7.1.1 Fuel. A 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

7.1.2 Zero Gas. High purity air with less than 0.1 part per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

7.1.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

7.1.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

7.1.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test (*i.e.,* exhaust stack, inlet line, etc.). The sample port shall be located to meet the testing requirements of Method 1.

8.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

8.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system by following the manufacturer's written instructions for preparing sample interface and the organic analyzer. Make the system operable (Section 10.1).

8.4 Calibration Error Test. Immediately prior to the test series (within 2 hours of the start of the test), introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 8.6.2). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

8.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

8.6 Emission Measurement Test Procedure.

8.6.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particulate, note on the recording chart, periods of process interruption or cyclic operation.

8.6.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 8.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

Note: Note on the recording chart periods of process interruption or cyclic operation.

9.0 Quality Control

Method section	**Quality control measure**	**Effect**
8.4	Zero and calibration drift tests	Ensures that bias introduced by drift in the measurement system output during the run is no greater than 3 percent of span.

10.0 Calibration and Standardization

10.1 FIA equipment can be calibrated for almost any range of total organic concentrations. For high concentrations of organics (> 1.0 percent by volume as propane), modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

11.0 Analytical Procedure

The sample collection and analysis are concurrent for this method (see Section 8.0).

12.0 Calculations and Data Analysis

12.1 Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by integration of the output recording over the period specified in the applicable regulation. If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A–1.

$$C_c = K C_{meas} \qquad Eq.\ 25A\text{-}1$$

Where:

C_c = Organic concentration as carbon, ppmv.

C_{meas} = Organic concentration as measured, ppmv.

K = Carbon equivalent correction factor.

= 2 for ethane.

= 3 for propane.

= 4 for butane.

= Appropriate response factor for other organic calibration gases.

13.0 Method Performance

13.1 Measurement System Performance Specifications.

13.1.1 Zero Drift. Less than ±3 percent of the span value.

13.1.2 Calibration Drift. Less than ±3 percent of span value.

13.1.3 Calibration Error. Less than ±5 percent of the calibration gas value.

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

1. Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA–450/2–78–041. June 1978. p. 46–54.

2. EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards. U.S. Environmental Protection Agency, Quality Assurance and Technical Support Division. Research Triangle Park, N.C. September 1993.

3. Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EMB Report No. 75–GAS–6. August 1975.

17.0 Tables, Diagrams, Flowcharts, and Validation Data

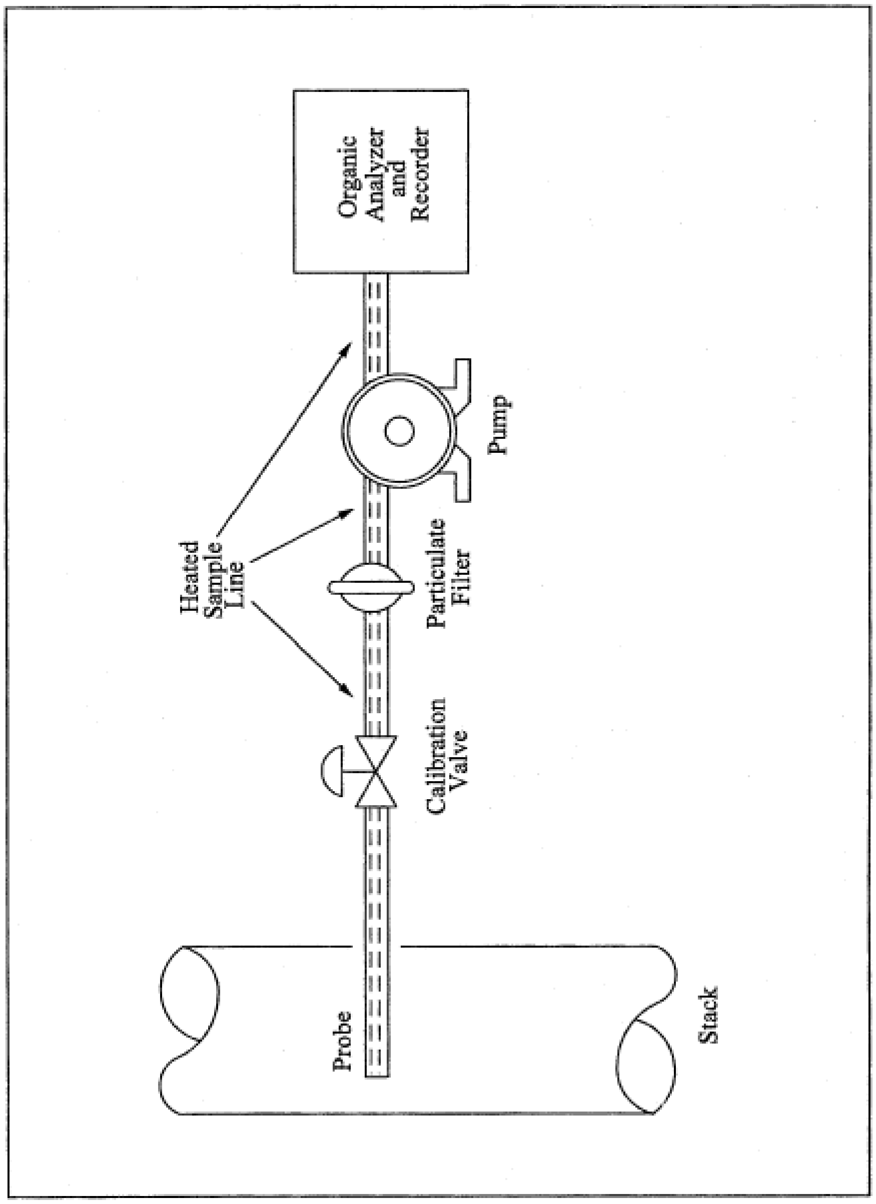


Figure 25A-1. Organic Concentration Measurement System.

METHOD 26—DETERMINATION OF HYDROGEN HALIDE AND HALOGEN EMISSIONS FROM STATIONARY SOURCES NON-ISOKINETIC METHOD

1.0 Scope and Application

1.1 Analytes.

Analytes	**CAS No.**
Hydrogen Chloride (HCl)	7647-01-0
Hydrogen Bromide (HBr)	10035-10-6
Hydrogen Fluoride (HF)	7664-39-3
Chlorine (Cl_2)	7882-50-5
Bromine (Br_2)	7726-95-6

1.2 Applicability. This method is applicable for determining emissions of hydrogen halides (HX) (HCl, HBr, and HF) and halogens (X_2) (Cl_2 and Br_2) from stationary sources when specified by the applicable subpart. Sources, such as those controlled by wet scrubbers, that emit acid particulate matter must be sampled using Method 26A.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 An integrated sample is extracted from the source and passed through a prepurged heated probe and filter into dilute sulfuric acid and dilute sodium hydroxide solutions which collect the gaseous hydrogen halides and halogens, respectively. The filter collects particulate matter including halide salts but is not routinely recovered and analyzed. The hydrogen halides are solubilized in the acidic solution and form chloride (Cl^-), bromide (Br^-), and fluoride (F^-) ions. The halogens have a very low solubility in the acidic solution and pass through to the alkaline solution where they are hydrolyzed to form a proton (H^+), the halide ion, and the hypohalous acid (HClO or HBrO). Sodium thiosulfate is added in excess to the alkaline solution to assure reaction with the hypohalous acid to form a second halide ion such that 2 halide ions are formed for each molecule of halogen gas. The halide ions in the separate solutions are measured by ion chromatography (IC).

3.0 Definitions [Reserved]

4.0 Interferences

4.1 Volatile materials, such as chlorine dioxide (ClO_2) and ammonium chloride (NH_4Cl), which produce halide ions upon dissolution during sampling are potential interferents. Interferents for the halide measurements are the halogen gases which disproportionate to a hydrogen halide and a hydrohalous acid upon dissolution in water. However, the use of acidic rather than neutral or basic solutions for collection of the hydrogen halides greatly reduces the dissolution of any halogens passing through this solution.

4.2 The simultaneous presence of HBr and CL_2 may cause a positive bias in the HCL result with a corresponding negative bias in the Cl_2 result as well as affecting the HBr/Br_2 split.

4.3 High concentrations of nitrogen oxides (NO_X) may produce sufficient nitrate (NO_3^- to interfere with measurements of very low Br^- levels.

4.4 A glass wool plug should *not* be used to remove particulate matter since a negative bias in the data could result.

4.5 There is anecdotal evidence that HF may be outgassed from new teflon components. If HF is a target analyte, then preconditioning of new teflon components, by heating should be considered.

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory limitations before performing this test method.

5.2 Corrosive Reagents. The following reagents are hazardous. Personal protective equipment and safe procedures are useful in preventing chemical splashes. If contact occurs, immediately flush with copious amounts of water for at least 15 minutes. Remove clothing under shower and decontaminate. Treat residual chemical burns as thermal burns.

5.2.1 Sodium Hydroxide (NaOH). Causes severe damage to eyes and skin. Inhalation causes irritation to nose, throat, and lungs. Reacts exothermically with limited amounts of water.

5.2.2 Sulfuric Acid (H_2SO_4). Rapidly destructive to body tissue. Will cause third degree burns. Eye damage may result in blindness. Inhalation may be fatal from spasm of the larynx, usually within 30 minutes. May cause lung tissue damage with edema. 1 mg/m^3 for 8 hours will cause lung damage or, in higher concentrations, death. Provide ventilation to limit inhalation. Reacts violently with metals and organics.

6.0 Equipment and Supplies

NOTE: Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

6.1 Sampling. The sampling train is shown in Figure 26-1, and component parts are discussed below.

6.1.1 Probe. Borosilicate glass, approximately 3/8-in. (9-mm) I.D. with a heating system capable of maintaining a probe gas temperature during sampling between 120 and 134 °C (248 and 273 °F) to prevent moisture condensation; or Teflon where stack probes are below 210 °C. If HF is a target analyte, then preconditioning of new teflon components by heating should be considered to prevent potential HF outgassing. A Teflon-glass filter in a mat configuration should be installed to remove particulate matter from the gas stream.

6.1.2 Three-way Stopcock. A borosilicate-glass three-way stopcock with a heating system to prevent moisture condensation. The heated stopcock should connect to the outlet of the heated filter and the inlet of the first impinger. The heating system should be capable of preventing condensation up to the inlet of the first impinger. Silicone grease may be used, if necessary, to prevent leakage.

6.1.3 Impingers. Four 30-ml midget impingers with leak-free glass connectors. Silicone grease may be used, if necessary, to prevent leakage. For sampling at high moisture sources or for sampling times greater than one hour, a midget impinger with a shortened stem (such that the gas sample does not bubble through the collected condensate) should be used in front of the first impinger.

6.1.4 Drying Tube or Impinger. Tube or impinger, of Mae West design, filled with 6- to 16-mesh indicating type silica gel, or equivalent, to dry the gas sample and to protect the dry gas meter and pump. If the silica gel has been used previously, dry at 175 °C (350 °F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used.

6.1.5 Heating System. Any heating system capable of maintaining a temperature around the probe and filter holder between 120 and 134 °C (248 and 273 °F) during sampling, or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application.

6.1.6 Filter Holder and Support. The filter holder shall be made of Teflon or quartz. The filter support shall be made of Teflon. All Teflon filter holders and supports are available from Savillex Corp., 5325 Hwy 101, Minnetonka, MN 55345.

6.1.7 Sample Line. Leak-free, with compatible fittings to connect the last impinger to the needle valve.

6.1.8 Rate Meter. Rotameter, or equivalent, capable of measuring flow rate to within 2 percent of the selected flow rate of 2 liters/min (0.07 ft^3/min).

6.1.9 Purge Pump, Purge Line, Drying Tube, Needle Valve, and Rate Meter. Pump capable of purging the sampling probe at 2 liters/min, with drying tube, filled with silica gel or equivalent, to protect pump, and a rate meter capable of measuring 0 to 5 liters/min (0.2 ft^3/min).

6.1.10 Stopcock Grease, Valve, Pump, Volume Meter, Barometer, and Vacuum Gauge. Same as in Method 6, sections 6.1.1.4, 6.1.1.7, 6.1.1.8, 6.1.1.10, 6.1.2, and 6.1.3.

6.1.11 Temperature Measuring Devices. Temperature sensors to monitor the temperature of the probe and to monitor the temperature of the sampling system from the outlet of the probe to the inlet of the first impinger.

6.1.12 Ice Water Bath. To minimize loss of absorbing solution.

6.2 Sample Recovery.

6.2.1 Wash Bottles. Polyethylene or glass, 500-ml or larger, two.

6.2.2 Storage Bottles. 100- or 250-ml, high-density polyethylene bottles with Teflon screw cap liners to store impinger samples.

6.3 Sample Preparation and Analysis. The materials required for volumetric dilution and chromatographic analysis of samples are described below.

6.3.1 Volumetric Flasks. Class A, 100-ml size.

6.3.2 Volumetric Pipets. Class A, assortment. To dilute samples to the calibration range of the ion chromatograph.

6.3.3 Ion Chromatograph (IC). Suppressed or non-suppressed, with a conductivity detector and electronic integrator operating in the peak area mode. Other detectors, strip chart recorders, and peak height measurements may be used.

7.0 Reagents and Standards

NOTE: Unless otherwise indicated, all reagents must conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society (ACS reagent grade). When such specifications are not available, the best available grade shall be used.

7.1 Sampling.

7.1.1 Filter. A 25-mm (1 in) (or other size) Teflon glass mat, Pallflex TX40HI75 (Pallflex Inc., 125 Kennedy Drive, Putnam, CT 06260). This filter is in a mat configuration to prevent fine particulate matter from entering the sampling train. Its composition is 75% Teflon/25% borosilicate glass. Other filters may be used, but they must be in a mat (as opposed to a laminate) configuration and contain at least 75% Teflon. For practical rather than scientific reasons, when the stack gas temperature exceeds 210 °C (410 °F) and the HCl concentration is greater than 20 ppm, a quartz-fiber filter may be used since Teflon becomes unstable above this temperature.

7.1.2 Water. Deionized, distilled water that conforms to American Society of Testing and Materials (ASTM) Specification D 1193-77 or 91, Type 3 (incorporated by reference—see §60.17).

7.1.3 Acidic Absorbing Solution, 0.1 N Sulfuric Acid (H_2SO_4). To prepare 100 ml of the absorbing solution for the front impinger pair, slowly add 0.28 ml of concentrated H_2SO_4 to about 90 ml of water while stirring, and adjust the final volume to 100 ml using additional water. Shake well to mix the solution.

7.1.4 Silica Gel. Indicating type, 6 to 16 mesh. If previously used, dry at 180 °C (350 °F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

7.1.5 Alkaline Adsorbing Solution, 0.1 N Sodium Hydroxide (NaOH). To prepare 100 ml of the scrubber solution for the third and fourth impinger, dissolve 0.40 g of solid NaOH in about 90 ml of water, and adjust the final solution volume to 100 ml using additional water. Shake well to mix the solution.

7.1.6 Sodium Thiosulfate ($Na_2S_2O_3$ 5 H_2O)

7.2 Sample Preparation and Analysis.

7.2.1 Water. Same as in section 7.1.2.

7.2.2 Absorbing Solution Blanks. A separate blank solution of each absorbing reagent should be prepared for analysis with the field samples. Dilute 30 ml of each absorbing solution to approximately the same final volume as the field samples using the blank sample of rinse water.

7.2.3 Halide Salt Stock Standard Solutions. Prepare concentrated stock solutions from reagent grade sodium chloride (NaCl), sodium bromide (NaBr), and sodium fluoride (NaF). Each must be dried at 110 °C (230 °F) for two or more hours and then cooled to room temperature in a desiccator immediately before weighing. Accurately weigh 1.6 to 1.7 g of the dried NaCl to within 0.1 mg, dissolve in water, and dilute to 1 liter. Calculate the exact Cl^- concentration using Equation 26-1 in section 12.2. In a similar manner, accurately weigh and solubilize 1.2 to 1.3 g of dried NaBr and 2.2 to 2.3 g of NaF to make 1-liter solutions. Use Equations 26-2 and 26-3 in section 12.2, to calculate the Br^- and F^- concentrations. Alternately, solutions containing a nominal certified concentration of 1000 mg/l NaCl are commercially available as convenient stock solutions from which standards can be made by appropriate volumetric dilution. Refrigerate the stock standard solutions and store no longer than one month.

7.2.4 Chromatographic Eluent. Effective eluents for nonsuppressed IC using a resin-or silica-based weak ion exchange column are a 4 mM potassium hydrogen phthalate solution, adjusted to pH 4.0 using a saturated sodium borate solution, and a 4 mM 4-hydroxy benzoate solution, adjusted to pH 8.6 using 1 N NaOH. An effective eluent for suppressed ion chromatography is a solution containing 3 mM sodium bicarbonate and 2.4 mM sodium carbonate. Other dilute solutions buffered to a similar pH and containing no interfering ions may be used. When using suppressed ion chromatography, if the “water dip” resulting from sample injection interferes with the chloride peak, use a 2 mM NaOH/2.4 mM sodium bicarbonate eluent.

8.0 Sample Collection, Preservation, Storage, and Transport

NOTE: Because of the complexity of this method, testers and analyst should be trained and experienced with the procedure to ensure reliable results.

8.1 Sampling.

8.1.1 Preparation of Collection Train. Prepare the sampling train as follows: Pour 15 ml of the acidic absorbing solution into each one of the first pair of impingers, and 15 ml of the alkaline absorbing solution into each one of the second pair of impingers. Connect the impingers in series with the knockout impinger first, if used, followed by the two impingers containing the acidic absorbing solution and the two impingers containing the alkaline absorbing solution. Place a fresh charge of silica gel, or equivalent, in the drying tube or impinger at the end of the impinger train.

8.1.2 Adjust the probe temperature and the temperature of the filter and the stopcock (*i.e.*, the heated area in Figure 26-1) to a temperature sufficient to prevent water condensation. This temperature must be maintained between 120 and 134 °C (248 and 273 °F). The temperature should be monitored throughout a sampling run to ensure that the desired temperature is maintained. It is important to maintain a temperature around the probe and filter in this range since it is extremely difficult to purge acid gases off these components. (These components are not quantitatively recovered and, hence, any collection of acid gases on these components would result in potential underreporting of these emissions. The applicable subparts may specify alternative higher temperatures.)

8.1.3 Leak-Check Procedure.

8.1.3.1 Sampling Train. A leak-check prior to the sampling run is optional; however, a leak-check after the sampling run is mandatory. The leak-check procedure is as follows: Temporarily attach a suitable [*e.g.,* 0-40 cc/min (0-2.4 in^3/min)] rotameter to the outlet of the dry gas meter and place a vacuum gauge at or near the probe inlet. Plug the probe inlet, pull a vacuum of at least 250 mm Hg (10 in. Hg), and note the flow rate as indicated by the rotameter. A leakage rate not in excess of 2 percent of the average sampling rate is acceptable.

NOTE: Carefully release the probe inlet plug before turning off the pump.

8.1.3.2 Pump. It is suggested (not mandatory) that the pump be leak-checked separately, either prior to or after the sampling run. If done prior to the sampling run, the pump leak-check shall precede the leak-check of the sampling train described immediately above; if done after the sampling run, the pump leak-check shall follow the train leak-check. To leak-check the pump, proceed as follows: Disconnect the drying tube from the probe-impinger assembly. Place a vacuum gauge at the inlet to either the drying tube or pump, pull a vacuum of 250 mm (10 in) Hg, plug or pinch off the outlet of the flow meter, and then turn off the pump. The vacuum should remain stable for at least 30 sec. Other leak-check procedures may be used, subject to the approval of the Administrator, U.S. Environmental Protection Agency.

8.1.4 Purge Procedure. Immediately before sampling, connect the purge line to the stopcock, and turn the stopcock to permit the purge pump to purge the probe (see Figure 1A of Figure 26-1).

Turn on the purge pump, and adjust the purge rate to 2 liters/min (0.07 ft^3/min). Purge for at least 5 minutes before sampling.

8.1.5 Sample Collection. Turn on the sampling pump, pull a slight vacuum of approximately 25 mm Hg (1 in Hg) on the impinger train, and turn the stopcock to permit stack gas to be pulled through the impinger train (see Figure 1C of Figure 26-1). Adjust the sampling rate to 2 liters/min, as indicated by the rate meter, and maintain this rate to within 10 percent during the entire sampling run. Take readings of the dry gas meter volume and temperature, rate meter, and vacuum gauge at least once every five minutes during the run. A sampling time of one hour is recommended. Shorter sampling times may introduce a significant negative bias in the HCl concentration. At the conclusion of the sampling run, remove the train from the stack, cool, and perform a leak-check as described in section 8.1.3.1.

8.2 Sample Recovery.

8.2.1 Disconnect the impingers after sampling. Quantitatively transfer the contents of the acid impingers and the knockout impinger, if used, to a leak-free storage bottle. Add the water rinses of each of these impingers and connecting glassware to the storage bottle.

8.2.2 Repeat this procedure for the alkaline impingers and connecting glassware using a separate storage bottle. Add 25 mg of sodium thiosulfate per the product of ppm of halogen anticipated to be in the stack gas times the volume (dscm) of stack gas sampled (0.7 mg per ppm-dscf).

NOTE: This amount of sodium thiosulfate includes a safety factor of approximately 5 to assure complete reaction with the hypohalous acid to form a second Cl^- ion in the alkaline solution.

8.2.3 Save portions of the absorbing reagents (0.1 N H_2SO_4 and 0.1 N NaOH) equivalent to the amount used in the sampling train (these are the absorbing solution blanks described in section 7.2.2); dilute to the approximate volume of the corresponding samples using rinse water directly from the wash bottle being used. Add the same amount of sodium thiosulfate solution to the 0.1 N NaOH absorbing solution blank. Also, save a portion of the rinse water used to rinse the sampling train. Place each in a separate, prelabeled storage bottle. The sample storage bottles should be sealed, shaken to mix, and labeled. Mark the fluid level.

8.3 Sample Preparation for Analysis. Note the liquid levels in the storage bottles and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Quantitatively transfer the sample solutions to 100-ml volumetric flasks, and dilute to 100 ml with water.

9.0 Quality Control [Reserved]

10.0 Calibration and Standardization

NOTE: Maintain a laboratory log of all calibrations.

10.1 Volume Metering System, Temperature Sensors, Rate Meter, and Barometer. Same as in Method 6, sections 10.1, 10.2, 10.3, and 10.4.

10.2 Ion Chromatograph.

10.2.1 To prepare the calibration standards, dilute given amounts (1.0 ml or greater) of the stock standard solutions to convenient volumes, using 0.1 N H_2SO_4 or 0.1 N NaOH, as appropriate. Prepare at least four calibration standards for each absorbing reagent containing the appropriate stock solutions such that they are within the linear range of the field samples.

10.2.2 Using one of the standards in each series, ensure adequate baseline separation for the peaks of interest.

10.2.3 Inject the appropriate series of calibration standards, starting with the lowest concentration standard first both before and after injection of the quality control check sample, reagent blanks, and field samples. This allows compensation for any instrument drift occurring during sample analysis. The values from duplicate injections of these calibration samples should agree within 5 percent of their mean for the analysis to be valid.

10.2.4 Determine the peak areas, or heights, for the standards and plot individual values versus halide ion concentrations in µg/ml.

10.2.5 Draw a smooth curve through the points. Use linear regression to calculate a formula describing the resulting linear curve.

11.0 Analytical Procedures

11.1 Sample Analysis.

11.1.1 The IC conditions will depend upon analytical column type and whether suppressed or non-suppressed IC is used. An example chromatogram from a non-suppressed system using a 150-mm Hamilton PRP-X100 anion column, a 2 ml/min flow rate of a 4 mM 4-hydroxy benzoate solution adjusted to a pH of 8.6 using 1 N NaOH, a 50 µl sample loop, and a conductivity detector set on 1.0 µS full scale is shown in Figure 26-2.

11.1.2 Before sample analysis, establish a stable baseline. Next, inject a sample of water, and determine if any Cl^-, Br^-, or F^- appears in the chromatogram. If any of these ions are present, repeat the load/injection procedure until they are no longer present. Analysis of the acid and alkaline absorbing solution samples requires separate standard calibration curves; prepare each according to section 10.2. Ensure adequate baseline separation of the analyses.

11.1.3 Between injections of the appropriate series of calibration standards, inject in duplicate the reagent blanks, quality control sample, and the field samples. Measure the areas or heights of the Cl^-, Br^-, and F^- peaks. Use the mean response of the duplicate injections to determine the concentrations of the field samples and reagent blanks using the linear calibration curve. The values from duplicate injections should agree within 5 percent of their mean for the analysis to be valid. If the values of duplicate injections are not within 5 percent of the mean, the duplicate injections shall be repeated and all four values used to determine the average response. Dilute any sample and the blank with equal volumes of water if the concentration exceeds that of the highest standard.

12.0 Data Analysis and Calculations

NOTE: Retain at least one extra decimal figure beyond those contained in the available data in intermediate calculations, and round off only the final answer appropriately.

12.1 Nomenclature.

B_{X^-} = Mass concentration of applicable absorbing solution blank, µg halide ion (Cl^-, Br^-, F^-) /ml, not to exceed 1 µg/ml which is 10 times the published analytical detection limit of 0.1 µg/ml.

C = Concentration of hydrogen halide (HX) or halogen (X_2), dry basis, mg/dscm.

K = 10^{-3} mg/µg.

K_{HCl} = 1.028 (µg HCl/µg-mole)/(µg Cl^-/µg-mole).

K_{HBr} = 1.013 (µg HBr/µg-mole)/(µg Br^-/µg-mole).

K_{HF} = 1.053 (µg HF/µg-mole)/(µg F^-/µg-mole).

m_{HX} = Mass of HCl, HBr, or HF in sample, µg.

m_{X2} = Mass of Cl_2 or Br_2 in sample, µg.

S_{X^-} = Analysis of sample, µg halide ion (Cl^-, Br^-, F^-)/ml.

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to standard conditions, dscm.

V_s = Volume of filtered and diluted sample, ml.

12.2 Calculate the exact Cl^-, Br^-, and F^- concentration in the halide salt stock standard solutions using the following equations.

$$\mu g\ Cl^-/ml = \text{g of NaCl} \times 10^3 \times 35.453/58.44 \qquad \text{Eq. 26-1}$$

$$\mu g\ Br^-/ml = \text{g of NaBr} \times 10^3 \times 79.904/102.90 \qquad \text{Eq. 26-2}$$

$$\mu g\ F^-/ml = \text{g of NaF} \times 10^3 \times 18.998/41.99 \qquad \text{Eq. 26-3}$$

12.3 Sample Volume, Dry Basis, Corrected to Standard Conditions. Calculate the sample volume using Eq. 6-1 of Method 6.

12.4 Total µg HCl, HBr, or HF Per Sample.

$m_{HX} = K_{HCl,Hbr,HF} V_s (S_X^- - B_X^-)$ Eq. 26-4

12.5 Total μg Cl_2 or Br_2 Per Sample.

$M_{x2} = V_s \left(S_X^- - B_X^- \right)$ Eq. 26-5

12.6 Concentration of Hydrogen Halide or Halogen in Flue Gas.

$C = K m_{XH,X2} / V_{m(std)}$ Eq. 26-6

13.0 Method Performance

13.1 Precision and Bias. The within-laboratory relative standard deviations are 6.2 and 3.2 percent at HCl concentrations of 3.9 and 15.3 ppm, respectively. The method does not exhibit a bias to Cl_2 when sampling at concentrations less than 50 ppm.

13.2 Sample Stability. The collected Cl^-samples can be stored for up to 4 weeks.

13.3 Detection Limit. A typical IC instrumental detection limit for Cl^- is 0.2 μg/ml. Detection limits for the other analyses should be similar. Assuming 50 ml liquid recovered from both the acidified impingers, and the basic impingers, and 0.06 dscm of stack gas sampled, then the analytical detection limit in the stack gas would be about 0.1 ppm for HCl and Cl_2, respectively.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures

Method 26A. Method 26A, which uses isokinetic sampling equipment, is an acceptable alternative to Method 26.

17.0 References

1. Steinsberger, S. C. and J. H. Margeson, “Laboratory and Field Evaluation of a Methodology for Determination of Hydrogen Chloride Emissions from Municipal and Hazardous Waste Incinerators,” U.S. Environmental Protection Agency, Office of Research and Development, Report No. 600/3-89/064, April 1989. Available from the National Technical Information Service, Springfield, VA 22161 as PB89220586/AS.

2. State of California, Air Resources Board, Method 421, “Determination of Hydrochloric Acid Emissions from Stationary Sources,” March 18, 1987.

3. Cheney, J.L. and C.R. Fortune. Improvements in the Methodology for Measuring Hydrochloric Acid in Combustion Source Emissions. J. Environ. Sci. Health. *A19*(3): 337-350. 1984.

4. Stern, D. A., B. M. Myatt, J. F. Lachowski, and K. T. McGregor. Speciation of Halogen and Hydrogen Halide Compounds in Gaseous Emissions. In: Incineration and Treatment of Hazardous Waste: Proceedings of the 9th Annual Research Symposium, Cincinnati, Ohio, May 2-4, 1983. Publication No. 600/9-84-015. July 1984. Available from National Technical Information Service, Springfield, VA 22161 as PB84-234525.

5. Holm, R. D. and S. A. Barksdale. Analysis of Anions in Combustion Products. In: Ion Chromatographic Analysis of Environmental Pollutants. E. Sawicki, J. D. Mulik, and E. Wittgenstein (eds.). Ann Arbor, Michigan, Ann Arbor Science Publishers. 1978. pp. 99-110.

18.0 Tables, Diagrams, Flowcharts, and Validation Data

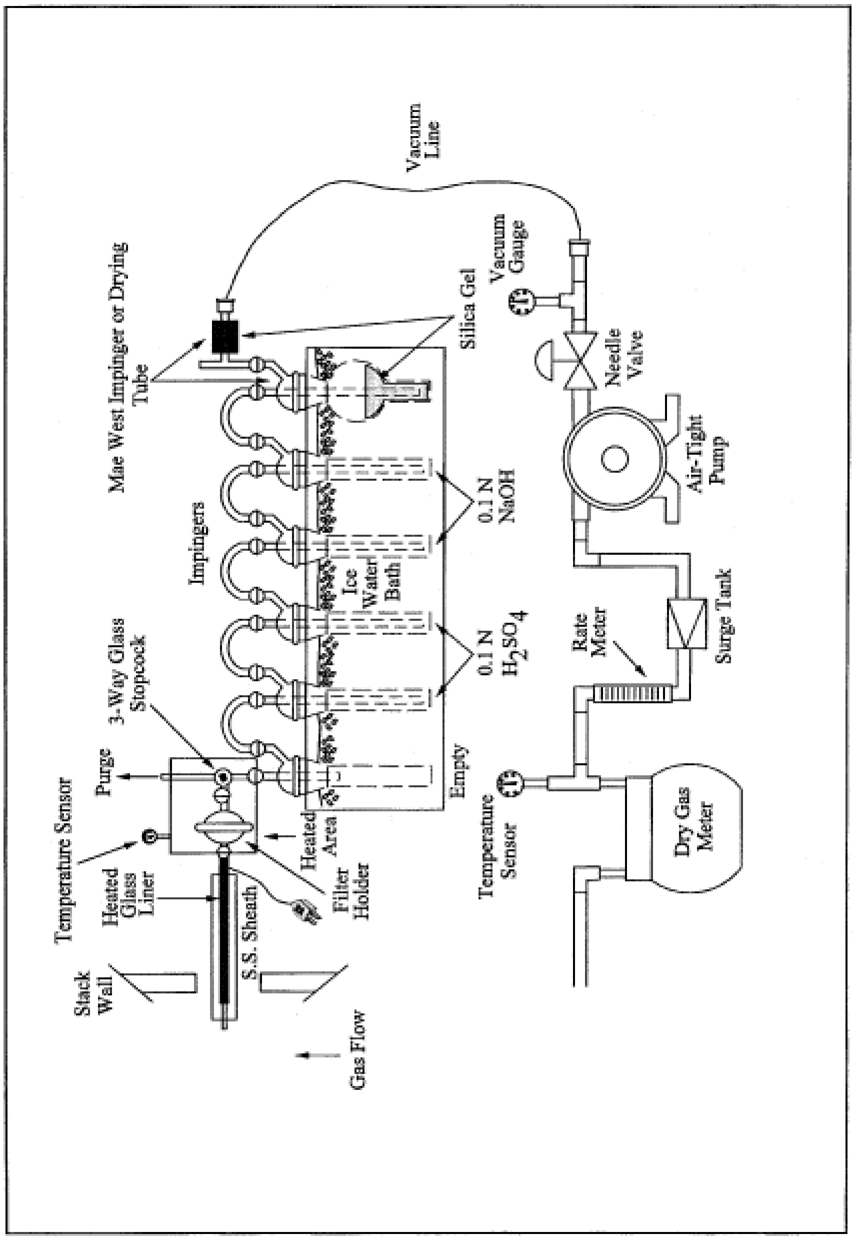


Figure 26-1. Sampling Train.

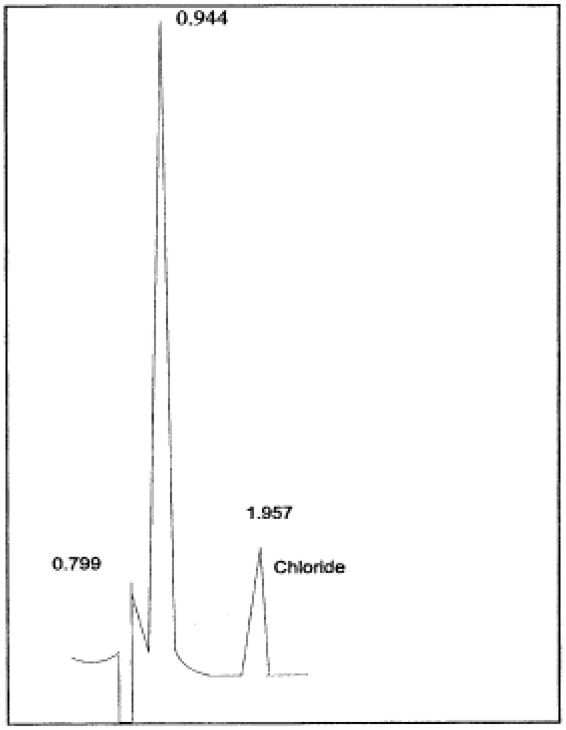


Figure 26-2. Example Chromatogram.

METHOD 29—DETERMINATION OF METALS EMISSIONS FROM STATIONARY SOURCES

NOTE: This method does not include all of the specifications (*e.g.,* equipment and supplies) and procedures (*e.g.,* sampling and analytical) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test methods: Method 5 and Method 12.

1.0 Scope and Application

1.1 Analytes.

Analyte	**CAS No.**
Antimony (Sb)	7440-36-0
Arsenic (As)	7440-38-2
Barium (Ba)	7440-39-3
Beryllium (Be)	7440-41-7
Cadmium (Cd)	7440-43-9
Chromium (Cr)	7440-47-3
Cobalt (Co)	7440-48-4
Copper (Cu)	7440-50-8
Lead (Pb)	7439-92-1
Manganese (Mn)	7439-96-5
Mercury (Hg)	7439-97-6
Nickel (Ni)	7440-02-0
Phosphorus (P)	7723-14-0
Selenium (Se)	7782-49-2
Silver (Ag)	7440-22-4
Thallium (Tl)	7440-28-0
Zinc (Zn)	7440-66-6

1.2 Applicability. This method is applicable to the determination of metals emissions from stationary sources. This method may be used to determine particulate emissions in addition to the metals emissions if the prescribed procedures and precautions are followed.

1.2.1 Hg emissions can be measured, alternatively, using EPA Method 101A of Appendix B, 40 CFR Part 61. Method 101-A measures only Hg but it can be of special interest to sources which need to measure both Hg and Mn emissions.

2.0 Summary of Method

2.1 Principle. A stack sample is withdrawn isokinetically from the source, particulate emissions are collected in the probe and on a heated filter, and gaseous emissions are then collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all metals including Hg) and an aqueous acidic solution of potassium permanganate (analyzed only for Hg). The recovered samples are digested, and appropriate fractions are analyzed for Hg by cold vapor atomic absorption spectroscopy (CVAAS) and for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, and Zn by inductively coupled argon plasma emission spectroscopy (ICAP) or atomic absorption spectroscopy (AAS). Graphite furnace atomic absorption spectroscopy (GFAAS) is used for analysis of Sb, As, Cd, Co, Pb, Se, and Tl if these elements require greater analytical sensitivity than can be obtained by ICAP. If one so chooses, AAS may be used for analysis of all listed metals if the resulting in-stack method detection limits meet the goal of the testing program. Similarly, inductively coupled plasma-mass spectroscopy (ICP-MS) may be used for analysis of Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Ag, Tl and Zn.

3.0 Definitions [Reserved]

4.0 Interferences

4.1 Iron (Fe) can be a spectral interference during the analysis of As, Cr, and Cd by ICAP. Aluminum (Al) can be a spectral interference during the analysis of As and Pb by ICAP. Generally, these interferences can be reduced by diluting the analytical sample, but such dilution raises the in-stack detection limits. Background and overlap corrections may be used to adjust for spectral interferences. Refer to Method 6010 of Reference 2 in section 16.0 or the other analytical methods used for details on potential interferences to this method. For all GFAAS analyses, use matrix modifiers to limit interferences, and matrix match all standards.

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.

5.2 Corrosive Reagents. The following reagents are hazardous. Personal protective equipment and safe procedures are useful in preventing chemical splashes. If contact occurs, immediately flush with copious amounts of water at least 15 minutes. Remove clothing under shower and decontaminate. Treat residual chemical burn as thermal burn.

5.2.1 Nitric Acid (HNO_3). Highly corrosive to eyes, skin, nose, and lungs. Vapors cause bronchitis, pneumonia, or edema of lungs. Reaction to inhalation may be delayed as long as 30 hours and still be fatal. Provide ventilation to limit exposure. Strong oxidizer. Hazardous reaction may occur with organic materials such as solvents.

5.2.2 Sulfuric Acid (H_2SO_4). Rapidly destructive to body tissue. Will cause third degree burns. Eye damage may result in blindness. Inhalation may be fatal from spasm of the larynx, usually within 30 minutes. May cause lung tissue damage with edema. 1 mg/m^3 for 8 hours will cause lung damage or, in higher concentrations, death. Provide ventilation to limit inhalation. Reacts violently with metals and organics.

5.2.3 Hydrochloric Acid (HC1). Highly corrosive liquid with toxic vapors. Vapors are highly irritating to eyes, skin, nose, and lungs, causing severe damage. May cause bronchitis, pneumonia, or edema of lungs. Exposure to concentrations of 0.13 to 0.2 percent can be lethal to humans in a few minutes. Provide ventilation to limit exposure. Reacts with metals, producing hydrogen gas.

5.2.4 Hydrofluoric Acid (HF). Highly corrosive to eyes, skin, nose, throat, and lungs. Reaction to exposure may be delayed by 24 hours or more. Provide ventilation to limit exposure.

5.2.5 Hydrogen Peroxide (H_2O_2). Irritating to eyes, skin, nose, and lungs. 30% H_2O_2 is a strong oxidizing agent. Avoid contact with skin, eyes, and combustible material. Wear gloves when handling.

5.2.6 Potassium Permanganate ($KMnO_4$). Caustic, strong oxidizer. Avoid bodily contact with.

5.2.7 Potassium Persulfate. Strong oxidizer. Avoid bodily contact with. Keep containers well closed and in a cool place.

5.3 Reaction Pressure. Due to the potential reaction of the potassium permanganate with the acid, there could be pressure buildup in the acidic $KMnO_4$ absorbing solution storage bottle. Therefore these bottles shall not be fully filled and shall be vented to relieve excess pressure and prevent explosion potentials. Venting is required, but not in a manner that will allow contamination of the solution. A No. 70-72 hole drilled in the container cap and Teflon liner has been used.

6.0 Equipment and Supplies

6.1 Sampling. A schematic of the sampling train is shown in Figure 29-1. It has general similarities to the Method 5 train.

6.1.1 Probe Nozzle (Probe Tip) and Borosilicate or Quartz Glass Probe Liner. Same as Method 5, sections 6.1.1.1 and 6.1.1.2, except that glass nozzles are required unless alternate tips are constructed of materials that are free from contamination and will not interfere with the sample. If a probe tip other than glass is used, no correction to the sample test results to compensate for the nozzle's effect on the sample is allowed. Probe fittings of plastic such as Teflon, polypropylene, etc. are recommended instead of metal fittings to prevent contamination. If one chooses to do so, a single glass piece consisting of a combined probe tip and probe liner may be used.

6.1.2 Pitot Tube and Differential Pressure Gauge. Same as Method 2, sections 6.1 and 6.2, respectively.

6.1.3 Filter Holder. Glass, same as Method 5, section 6.1.1.5, except use a Teflon filter support or other non-metallic, non-contaminating support in place of the glass frit.

6.1.4 Filter Heating System. Same as Method 5, section 6.1.1.6.

6.1.5 Condenser. Use the following system for condensing and collecting gaseous metals and determining the moisture content of the stack gas. The condensing system shall consist of four to seven impingers connected in series with leak-free ground glass fittings or other leak-free, non-contaminating fittings. Use the first impinger as a moisture trap. The second impinger (which is the first HNO_3/H_2O_2 impinger) shall be identical to the first impinger in Method 5. The third impinger (which is the second HNO_3/H_2O_2 impinger) shall be a Greenburg Smith impinger with the standard tip as described for the second impinger in Method 5, section 6.1.1.8. The fourth (empty) impinger and the fifth and sixth (both acidified $KMnO_4$) impingers are the same as the first impinger in Method 5. Place a temperature sensor capable of measuring to within 1 °C (2 °F) at the outlet of the last impinger. If no Hg analysis is planned, then the fourth, fifth, and sixth impingers are not used.

6.1.6 Metering System, Barometer, and Gas Density Determination Equipment. Same as Method 5, sections 6.1.1.9, 6.1.2, and 6.1.3, respectively.

6.1.7 Teflon Tape. For capping openings and sealing connections, if necessary, on the sampling train.

6.2 Sample Recovery. Same as Method 5, sections 6.2.1 through 6.2.8 (Probe-Liner and Probe-Nozzle Brushes or Swabs, Wash Bottles, Sample Storage Containers, Petri Dishes, Glass Graduated Cylinder, Plastic Storage Containers, Funnel and Rubber Policeman, and Glass Funnel), respectively, with the following exceptions and additions:

6.2.1 Non-metallic Probe-Liner and Probe-Nozzle Brushes or Swabs. Use non-metallic probe-liner and probe-nozzle brushes or swabs for quantitative recovery of materials collected in the front-half of the sampling train.

6.2.2 Sample Storage Containers. Use glass bottles (see section 8.1 of this Method) with Teflon-lined caps that are non-reactive to the oxidizing solutions, with capacities of 1000- and 500-ml, for storage of acidified $KMnO_4$—containing samples and blanks. Glass or polyethylene bottles may be used for other sample types.

6.2.3 Graduated Cylinder. Glass or equivalent.

6.2.4 Funnel. Glass or equivalent.

6.2.5 Labels. For identifying samples.

6.2.6 Polypropylene Tweezers and/or Plastic Gloves. For recovery of the filter from the sampling train filter holder.

6.3 Sample Preparation and Analysis.

6.3.1 Volumetric Flasks, 100-ml, 250-ml, and 1000-ml. For preparation of standards and sample dilutions.

6.3.2 Graduated Cylinders. For preparation of reagents.

6.3.3 Parr Bombs or Microwave Pressure Relief Vessels with Capping Station (CEM Corporation model or equivalent). For sample digestion.

6.3.4 Beakers and Watch Glasses. 250-ml beakers, with watch glass covers, for sample digestion.

6.3.5 Ring Stands and Clamps. For securing equipment such as filtration apparatus.

6.3.6 Filter Funnels. For holding filter paper.

6.3.7 Disposable Pasteur Pipets and Bulbs.

6.3.8 Volumetric Pipets.

6.3.9 Analytical Balance. Accurate to within 0.1 mg.

6.3.10 Microwave or Conventional Oven. For heating samples at fixed power levels or temperatures, respectively.

6.3.11 Hot Plates.

6.3.12 Atomic Absorption Spectrometer (AAS). Equipped with a background corrector.

6.3.12.1 Graphite Furnace Attachment. With Sb, As, Cd, Co, Pb, Se, and Tl hollow cathode lamps (HCLs) or electrodeless discharge lamps (EDLs). Same as Reference 2 in section 16.0. Methods 7041 (Sb), 7060 (As), 7131 (Cd), 7201 (Co), 7421 (Pb), 7740 (Se), and 7841 (Tl).

6.3.12.2 Cold Vapor Mercury Attachment. With a mercury HCL or EDL, an air recirculation pump, a quartz cell, an aerator apparatus, and a heat lamp or desiccator tube. The heat lamp shall be capable of raising the temperature at the quartz cell by 10 °C above ambient, so that no condensation forms on the wall of the quartz cell. Same as Method 7470 in Reference 2 in section 16.0. See note 2: section 11.1.3 for other acceptable approaches for analysis of Hg in which analytical detection limits of 0.002 ng/ml were obtained.

6.3.13 Inductively Coupled Argon Plasma Spectrometer. With either a direct or sequential reader and an alumina torch. Same as EPA Method 6010 in Reference 2 in section 16.0.

6.3.14 Inductively Coupled Plasma-Mass Spectrometer.

Same as EPA Method 6020 in Reference 2 in section 16.0.

7.0 Reagents and Standards

7.1 Unless otherwise indicated, it is intended that all reagents conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Otherwise, use the best available grade.

7.2 Sampling Reagents.

7.2.1 Sample Filters. Without organic binders. The filters shall contain less than 1.3 μg/in.^{2} of each of the metals to be measured. Analytical results provided by filter manufacturers stating metals content of the filters are acceptable. However, if no such results are available, analyze filter blanks for each target metal prior to emission testing. Quartz fiber filters meeting these requirements are recommended. However, if glass fiber filters become available which meet these requirements, they may be used. Filter efficiencies and unreactiveness to sulfur dioxide (SO_2) or sulfur trioxide (SO_3) shall be as described in section 7.1.1 of Method 5.

7.2.2 Water. To conform to ASTM Specification D1193-77 or 91, Type II (incorporated by reference—see §60.17). If necessary, analyze the water for all target metals prior to field use. All target metals should be less than 1 ng/ml.

7.2.3 HNO_3, Concentrated. Baker Instra-analyzed or equivalent.

7.2.4 HCl, Concentrated. Baker Instra-analyzed or equivalent.

7.2.5 H_2O_2, 30 Percent (V/V).

7.2.6 $KMnO_4$.

7.2.7 H_2SO_4, Concentrated.

7.2.8 Silica Gel and Crushed Ice. Same as Method 5, sections 7.1.2 and 7.1.4, respectively.

7.3 Pretest Preparation of Sampling Reagents.

7.3.1 HNO_3/H_2O_2 Absorbing Solution, 5 Percent HNO_3/10 Percent H_2O_2. Add carefully with stirring 50 ml of concentrated HNO_3 to a 1000-ml volumetric flask containing approximately 500 ml of water, and then add carefully with stirring 333 ml of 30 percent H_2O_2. Dilute to volume with water. Mix well. This reagent shall contain less than 2 ng/ml of each target metal.

7.3.2 Acidic $KMnO_4$ Absorbing Solution, 4 Percent $KMnO_4$ (W/V), 10 Percent H_2SO_4 (V/V). Prepare fresh daily. Mix carefully, with stirring, 100 ml of concentrated H_2SO_4 into approximately 800 ml of water, and add water with stirring to make a volume of 1 liter: this solution is 10 percent H_2SO_4 (V/V). Dissolve, with stirring, 40 g of $KMnO_4$ into 10 percent H_2SO_4(V/V) and add 10 percent H_2SO_4 (V/V) with stirring to make a volume of 1 liter. Prepare and store in glass bottles to prevent degradation. This reagent shall contain less than 2 ng/ml of Hg.

Precaution: To prevent autocatalytic decomposition of the permanganate solution, filter the solution through Whatman 541 filter paper.

7.3.3 HNO_3, 0.1 N. Add with stirring 6.3 ml of concentrated HNO_3 (70 percent) to a flask containing approximately 900 ml of water. Dilute to 1000 ml with water. Mix well. This reagent shall contain less than 2 ng/ml of each target metal.

7.3.4 HCl, 8 N. Carefully add with stirring 690 ml of concentrated HCl to a flask containing 250 ml of water. Dilute to 1000 ml with water. Mix well. This reagent shall contain less than 2 ng/ml of Hg.

7.4 Glassware Cleaning Reagents.

7.4.1 HNO_3, Concentrated. Fisher ACS grade or equivalent.

7.4.2 Water. To conform to ASTM Specifications D1193, Type II.

7.4.3 HNO_3, 10 Percent (V/V). Add with stirring 500 ml of concentrated HNO_3 to a flask containing approximately 4000 ml of water. Dilute to 5000 ml with water. Mix well. This reagent shall contain less than 2 ng/ml of each target metal.

7.5 Sample Digestion and Analysis Reagents. The metals standards, except Hg, may also be made from solid chemicals as described in Reference 3 in section 16.0. Refer to References 1, 2, or 5 in section 16.0 for additional information on Hg standards. The 1000 μg/ml Hg stock solution standard may be made according to section 7.2.7 of Method 101A.

7.5.1 HCl, Concentrated.

7.5.2 HF, Concentrated.

7.5.3 HNO_3, Concentrated. Baker Instra-analyzed or equivalent.

7.5.4 HNO_3, 50 Percent (V/V). Add with stirring 125 ml of concentrated HNO_3 to 100 ml of water. Dilute to 250 ml with water. Mix well. This reagent shall contain less than 2 ng/ml of each target metal.

7.5.5 HNO_3, 5 Percent (V/V). Add with stirring 50 ml of concentrated HNO_3 to 800 ml of water. Dilute to 1000 ml with water. Mix well. This reagent shall contain less than 2 ng/ml of each target metal.

7.5.6 Water. To conform to ASTM Specifications D1193, Type II.

7.5.7 Hydroxylamine Hydrochloride and Sodium Chloride Solution. See Reference 2 In section 16.0 for preparation.

7.5.8 Stannous Chloride. See Reference 2 in section 16.0 for preparation.

7.5.9 $KMnO_4$, 5 Percent (W/V). See Reference 2 in section 16.0 for preparation.

7.5.10 H_2SO_4, Concentrated.

7.5.11 Potassium Persulfate, 5 Percent (W/V). See Reference 2 in section 16.0 for preparation.

7.5.12 Nickel Nitrate, $Ni(N0_3)_2 6H_20$.

7.5.13 Lanthanum Oxide, La_20_3.

7.5.14 Hg Standard (AAS Grade), 1000 µg/ml.

7.5.15 Pb Standard (AAS Grade), 1000 µg/ml.

7.5.16 As Standard (AAS Grade), 1000 µg/ml.

7.5.17 Cd Standard (AAS Grade), 1000 µg/ml.

7.5.18 Cr Standard (AAS Grade), 1000 µg/ml.

7.5.19 Sb Standard (AAS Grade), 1000 µg/ml.

7.5.20 Ba Standard (AAS Grade), 1000 µg/ml.

7.5.21 Be Standard (AAS Grade), 1000 µg/ml.

7.5.22 Co Standard (AAS Grade), 1000 µg/ml.

7.5.23 Cu Standard (AAS Grade), 1000 µg/ml.

7.5.24 Mn Standard (AAS Grade), 1000 µg/ml.

7.5.25 Ni Standard (AAS Grade), 1000 µg/ml.

7.5.26 P Standard (AAS Grade), 1000 µg/ml.

7.5.27 Se Standard (AAS Grade), 1000 µg/ml.

7.5.28 Ag Standard (AAS Grade), 1000 µg/ml.

7.5.29 Tl Standard (AAS Grade), 1000 µg/ml.

7.5.30 Zn Standard (AAS Grade), 1000 µg/ml.

7.5.31 Al Standard (AAS Grade), 1000 µg/ml.

7.5.32 Fe Standard (AAS Grade), 1000 µg/ml.

7.5.33 Hg Standards and Quality Control Samples. Prepare fresh weekly a 10 µg/ml intermediate Hg standard by adding 5 ml of 1000 µg/ml Hg stock solution prepared according to Method 101A to a 500-ml volumetric flask; dilute with stirring to 500 ml by first carefully adding 20 ml of 15 percent HNO_3 and then adding water to the 500-ml volume. Mix well. Prepare a 200 ng/ml working Hg standard solution fresh daily: add 5 ml of the 10 µg/ml intermediate standard to a 250-ml volumetric flask, and dilute to 250 ml with 5 ml of 4 percent $KMnO_4$, 5 ml of 15 percent HNO_3, and then water. Mix well. Use at least five separate aliquots of the working Hg standard solution and a blank to prepare the standard curve. These aliquots and blank shall contain 0.0, 1.0, 2.0, 3.0, 4.0, and 5.0 ml of the working standard solution containing 0, 200, 400, 600, 800, and 1000 ng Hg, respectively. Prepare quality control samples by making a separate 10 µg/ml standard and diluting until in the calibration range.

7.5.34 ICAP Standards and Quality Control Samples. Calibration standards for ICAP analysis can be combined into four different mixed standard solutions as follows:

MIXED STANDARD SOLUTIONS FOR ICAP ANALYSIS

Solution	Elements
I	As, Be, Cd, Mn, Pb, Se, Zn.
II	Ba, Co, Cu, Fe.
III	Al, Cr, Ni.
IV	Ag, P, Sb, Tl.

Prepare these standards by combining and diluting the appropriate volumes of the 1000 µg/ml solutions with 5 percent HNO_3. A minimum of one standard and a blank can be used to form each calibration curve. However, prepare a separate quality control sample spiked with known amounts of the target metals in quantities in the mid-range of the calibration curve. Suggested standard levels are 25 µg/ml for Al, Cr and Pb, 15 µg/ml for Fe, and 10 µg/ml for the remaining elements. Prepare any standards containing less than 1 µg/ml of metal on a daily basis. Standards containing greater than 1 µg/ml of metal should be stable for a minimum of 1 to 2 weeks. For ICP-MS, follow Method 6020 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i).

7.5.35 GFAAS Standards. Sb, As, Cd, Co, Pb, Se, and Tl. Prepare a 10 µg/ml standard by adding 1 ml of 1000 µg/ml standard to a 100-ml volumetric flask. Dilute with stirring to 100 ml with 10 percent HNO_3. For GFAAS, matrix match the standards. Prepare a 100 ng/ml standard by adding 1 ml of the 10 µg/ml standard to a 100-ml volumetric flask, and dilute to 100 ml with the appropriate matrix solution. Prepare other standards by diluting the 100 ng/ml standards. Use at least five standards to make up the standard curve. Suggested levels are 0, 10, 50, 75, and 100 ng/ml. Prepare quality control samples by making a separate 10 µg/ml standard and diluting until it is in the range of the samples. Prepare any standards containing less than 1 µg/ml of metal on a daily basis. Standards containing greater than 1 µg/ml of metal should be stable for a minimum of 1 to 2 weeks.

7.5.36 Matrix Modifiers.

7.5.36.1 Nickel Nitrate, 1 Percent (V/V). Dissolve 4.956 g of $Ni(N0_3)_2 \cdot 6H_20$ or other nickel compound suitable for preparation of this matrix modifier in approximately 50 ml of water in a 100-ml volumetric flask. Dilute to 100 ml with water.

7.5.36.2 Nickel Nitrate, 0.1 Percent (V/V). Dilute 10 ml of 1 percent nickel nitrate solution to 100 ml with water. Inject an equal amount of sample and this modifier into the graphite furnace during GFAAS analysis for As.

7.5.36.3 Lanthanum. Carefully dissolve 0.5864 g of La_20_3 in 10 ml of concentrated $HN0_3$, and dilute the solution by adding it with stirring to approximately 50 ml of water. Dilute to 100 ml with water, and mix well. Inject an equal amount of sample and this modifier into the graphite furnace during GFAAS analysis for Pb.

7.5.37 Whatman 40 and 541 Filter Papers (or equivalent). For filtration of digested samples.

8.0 Sample Collection, Preservation, Transport, and Storage

8.1 Sampling. The complexity of this method is such that, to obtain reliable results, both testers and analysts must be trained and experienced with the test procedures, including source sampling; reagent preparation and handling; sample handling; safety equipment and procedures; analytical calculations; reporting; and the specific procedural descriptions throughout this method.

8.1.1 Pretest Preparation. Follow the same general procedure given in Method 5, section 8.1, except that, unless particulate emissions are to be determined, the filter need not be desiccated or weighed. First, rinse all sampling train glassware with hot tap water and then wash in hot soapy water. Next, rinse glassware three times with tap water, followed by three additional rinses with water. Then soak all glassware in a 10 percent (V/V) nitric acid solution for a minimum of 4 hours, rinse three times with water, rinse a final time with acetone, and allow to air dry. Cover all glassware openings where contamination can occur until the sampling train is assembled for sampling.

8.1.2 Preliminary Determinations. Same as Method 5, section 8.1.2.

8.1.3 Preparation of Sampling Train.

8.1.3.1 Set up the sampling train as shown in Figure 29-1. Follow the same general procedures given in Method 5, section 8.3, except place 100 ml of the HNO_3/H_2O_2 solution (Section 7.3.1 of this method) in each of the second and third impingers as shown in Figure 29-1. Place 100 ml of the acidic $KMnO_4$ absorbing solution (Section 7.3.2 of this method) in each of the fifth and sixth impingers as shown in Figure 29-1, and transfer approximately 200 to 300 g of pre-weighed silica gel from its container to the last impinger. Alternatively, the silica gel may be weighed directly in the impinger just prior to final train assembly.

8.1.3.2 Based on the specific source sampling conditions, the use of an empty first impinger can be eliminated if the moisture to be collected in the impingers will be less than approximately 100 ml.

8.1.3.3 If Hg analysis will not be performed, the fourth, fifth, and sixth impingers as shown in Figure 29-1 are not required.

8.1.3.4 To insure leak-free sampling train connections and to prevent possible sample contamination problems, use Teflon tape or other non-contaminating material instead of silicone grease.

Precaution: Exercise extreme care to prevent contamination within the train. Prevent the acidic $KMnO_4$ from contacting any glassware that contains sample material to be analyzed for Mn. Prevent acidic H_2O_2 from mixing with the acidic $KMnO_4$.

8.1.4 Leak-Check Procedures. Follow the leak-check procedures given in Method 5, section 8.4.2 (Pretest Leak-Check), section 8.4.3 (Leak-Checks During the Sample Run), and section 8.4.4 (Post-Test Leak-Checks).

8.1.5 Sampling Train Operation. Follow the procedures given in Method 5, section 8.5. When sampling for Hg, use a procedure analogous to that described in section 8.1 of Method 101A, 40 CFR Part 61, Appendix B, if necessary to maintain the desired color in the last acidified permanganate impinger. For each run, record the data required on a data sheet such as the one shown in Figure 5-3 of Method 5.

8.1.6 Calculation of Percent Isokinetic. Same as Method 5, section 12.11.

8.2 Sample Recovery.

8.2.1 Begin cleanup procedures as soon as the probe is removed from the stack at the end of a sampling period. The probe should be allowed to cool prior to sample recovery. When it can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a rinsed, non-contaminating cap over the probe nozzle to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling; a vacuum can form in the filter holder with the undesired result of drawing liquid from the impingers onto the filter.

8.2.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train and cap the open outlet. Be careful not to lose any condensate that might be present. Cap the filter inlet where the probe was fastened. Remove the umbilical cord from the last impinger and cap the impinger. Cap the filter holder outlet and impinger inlet. Use non-contaminating caps, whether ground-glass stoppers, plastic caps, serum caps, or Teflon® tape to close these openings.

8.2.3 Alternatively, the following procedure may be used to disassemble the train before the probe and filter holder/oven are completely cooled: Initially disconnect the filter holder outlet/impinger inlet and loosely cap the open ends. Then disconnect the probe from the filter holder or cyclone inlet and loosely cap the open ends. Cap the probe tip and remove the umbilical cord as previously described.

8.2.4 Transfer the probe and filter-impinger assembly to a cleanup area that is clean and protected from the wind and other potential causes of contamination or loss of sample. Inspect the train before and during disassembly and note any abnormal conditions. Take special precautions to assure that all the items necessary for recovery do not contaminate the samples. The sample is recovered and treated as follows (see schematic in Figures 29-2a and 29-2b):

8.2.5 Container No. 1 (Sample Filter). Carefully remove the filter from the filter holder and place it in its labeled petri dish container. To handle the filter, use either acid-washed polypropylene or Teflon coated tweezers or clean, disposable surgical gloves rinsed with water and dried. If it is necessary to fold the filter, make certain the particulate cake is inside the fold. Carefully transfer the filter and any particulate matter or filter fibers that adhere to the filter holder gasket to the petri dish by using a dry (acid-cleaned) nylon bristle brush. Do not use any metal-containing materials when recovering this train. Seal the labeled petri dish.

8.2.6 Container No. 2 (Acetone Rinse). Perform this procedure only if a determination of particulate emissions is to be made. Quantitatively recover particulate matter and any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with a total of 100 ml of acetone, while simultaneously taking great care to see that no dust on the outside of the probe or other surfaces gets in the sample. The use of exactly 100 ml is necessary for the subsequent blank correction procedures. Distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank and follow the Administrator's directions on analysis.

8.2.6.1 Carefully remove the probe nozzle, and clean the inside surface by rinsing with acetone from a wash bottle while brushing with a non-metallic brush. Brush until the acetone rinse shows no visible particles, then make a final rinse of the inside surface with acetone.

8.2.6.2 Brush and rinse the sample exposed inside parts of the probe fitting with acetone in a similar way until no visible particles remain. Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Allow the acetone to drain from the lower end into the sample container. A funnel may be used to aid in transferring liquid washings to the container. Follow the acetone rinse with a non-metallic probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action three times through the probe. Hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter which is brushed through the probe until no visible particulate matter is carried out with the acetone or until none remains in the probe liner on visual inspection. Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

8.2.6.3 It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination. Clean the inside of the front-half of the filter holder by rubbing the surfaces with a non-metallic brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. After all acetone washings and particulate matter have been collected in the sample container, tighten the lid so that acetone will not leak out when shipped to the laboratory. Mark the height of the fluid level to determine whether or not leakage occurred during transport. Clearly label the container to identify its contents.

8.2.7 Container No. 3 (Probe Rinse). Keep the probe assembly clean and free from contamination during the probe rinse. Rinse the probe nozzle and fitting, probe liner, and front-half of the filter holder thoroughly with a total of 100 ml of 0.1 N HNO_3, and place the wash into a sample storage container. Perform the rinses as applicable and generally as described in Method 12, section 8.7.1. Record the volume of the rinses. Mark the height of the fluid level on the outside of the storage container and use this mark to determine if leakage occurs during transport. Seal the container, and clearly label the contents. Finally, rinse the nozzle, probe liner, and front-half of the filter holder with water followed by acetone, and discard these rinses.

NOTE: The use of a total of exactly 100 ml is necessary for the subsequent blank correction procedures.

8.2.8 Container No. 4 (Impingers 1 through 3, Moisture Knockout Impinger, when used, HNO_3/H_2O_2 Impingers Contents and Rinses). Due to the potentially large quantity of liquid involved, the tester may place the impinger solutions from impingers 1 through 3 in more than one container, if necessary. Measure the liquid in the first three impingers to within 0.5 ml using a graduated cylinder. Record the volume. This information is required to calculate the moisture content of the sampled flue gas. Clean each of the first three impingers, the filter support, the back half of the filter housing, and connecting glassware by thoroughly rinsing with 100 ml of 0.1 N HNO_3 using the procedure as applicable in Method 12, section 8.7.3.

NOTE: The use of exactly 100 ml of 0.1 N HNO_3 rinse is necessary for the subsequent blank correction procedures. Combine the rinses and impinger solutions, measure and record the final total volume. Mark the height of the fluid level, seal the container, and clearly label the contents.

8.2.9 Container Nos. 5A (0.1 N HNO_3), 5B ($KMnO_4/H_2SO_4$ absorbing solution), and 5C (8 N HCl rinse and dilution).

8.2.9.1 When sampling for Hg, pour all the liquid from the impinger (normally impinger No. 4) that immediately preceded the two permanganate impingers into a graduated cylinder and measure the volume to within 0.5 ml. This information is required to calculate the moisture content of the sampled flue gas. Place the liquid in Container No. 5A. Rinse the impinger with exactly 100 ml of 0.1 N HNO_3 and place this rinse in Container No. 5A.

8.2.9.2 Pour all the liquid from the two permanganate impingers into a graduated cylinder and measure the volume to within 0.5 ml. This information is required to calculate the moisture content of the sampled flue gas. Place this acidic $KMnO_4$solution into Container No. 5B. Using a total of exactly 100 ml of fresh acidified $KMnO_4$ solution for all rinses (approximately 33 ml per rinse), rinse the two permanganate impingers and connecting glassware a minimum of three times. Pour the rinses into Container No. 5B, carefully assuring transfer of all loose precipitated materials from the two impingers. Similarly, using 100 ml total of water, rinse the permanganate impingers and connecting glass a minimum of three times, and pour the rinses into Container 5B, carefully assuring transfer of any loose precipitated material. Mark the height of the fluid level, and clearly label the contents. Read the *Precaution:* in section 7.3.2.

NOTE: Due to the potential reaction of $KMnO_4$ with acid, pressure buildup can occur in the sample storage bottles. Do not fill these bottles completely and take precautions to relieve excess pressure. A No. 70-72 hole drilled in the container cap and Teflon liner has been used successfully.

8.2.9.3 If no visible deposits remain after the water rinse, no further rinse is necessary. However, if deposits remain on the impinger surfaces, wash them with 25 ml of 8 N HCl, and place the wash in a separate sample container labeled No. 5C containing 200 ml of water. First, place 200 ml of water in the container. Then wash the impinger walls and stem with the HCl by turning the impinger on its side and rotating it so that the HCl contacts all inside surfaces. Use a total of only 25 ml of 8 N HCl for rinsing *both permanganate impingers combined.* Rinse the first impinger, then pour the actual rinse used for the first impinger into the second impinger for its rinse. Finally, pour the 25 ml of 8 N HCl rinse carefully into the container. Mark the height of the fluid level on the outside of the container to determine if leakage occurs during transport.

8.2.10 Container No. 6 (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. Transfer the silica gel from its impinger to its original container and seal it. The tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. The small amount of particles that might adhere to the impinger wall need not be removed. Do not use water or other liquids to transfer the silica gel since weight gained in the silica gel impinger is used for moisture calculations. Alternatively, if a balance is available in the field, record the weight of the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g.

8.2.11 Container No. 7 (Acetone Blank). If particulate emissions are to be determined, at least once during each field test, place a 100-ml portion of the acetone used in the sample recovery process into a container labeled No. 7. Seal the container.

8.2.12 Container No. 8A (0.1 N HNO_3 Blank). At least once during each field test, place 300 ml of the 0.1 N HNO_3solution used in the sample recovery process into a container labeled No. 8A. Seal the container.

8.2.13 Container No. 8B (Water Blank). At least once during each field test, place 100 ml of the water used in the sample recovery process into a container labeled No. 8B. Seal the container.

8.2.14 Container No. 9 (5 Percent HNO_3/10 Percent H_2O_2 Blank). At least once during each field test, place 200 ml of the 5 Percent HNO_3/10 Percent H_2O_2 solution used as the nitric acid impinger reagent into a container labeled No. 9. Seal the container.

8.2.15 Container No. 10 (Acidified $KMnO_4$ Blank). At least once during each field test, place 100 ml of the acidified $KMnO_4$ solution used as the impinger solution and in the sample recovery process into a container labeled No. 10. Prepare the container as described in section 8.2.9.2. Read the *Precaution*: in section 7.3.2 and read the note in section 8.2.9.2.

8.2.16 Container No. 11 (8 N HCl Blank). At least once during each field test, place 200 ml of water into a sample container labeled No. 11. Then carefully add with stirring 25 ml of 8 N HCl. Mix well and seal the container.

8.2.17 Container No. 12 (Sample Filter Blank). Once during each field test, place into a petri dish labeled No. 12 three unused blank filters from the same lot as the sampling filters. Seal the petri dish.

8.3 Sample Preparation. Note the level of the liquid in each of the containers and determine if any sample was lost during shipment. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. A diagram illustrating sample preparation and analysis procedures for each of the sample train components is shown in Figure 29-3.

8.3.1 Container No. 1 (Sample Filter).

8.3.1.1 If particulate emissions are being determined, first desiccate the filter and filter catch without added heat (do not heat the filters to speed the drying) and weigh to a constant weight as described in section 11.2.1 of Method 5.

8.3.1.2 Following this procedure, or initially, if particulate emissions are not being determined in addition to metals analysis, divide the filter with its filter catch into portions containing approximately 0.5 g each. Place the pieces in the analyst's choice of either individual microwave pressure relief vessels or Parr Bombs. Add 6 ml of concentrated HNO_3 and 4 ml of concentrated HF to each vessel. For microwave heating, microwave the samples for approximately 12 to 15 minutes total heating time as follows: heat for 2 to 3 minutes, then turn off the microwave for 2 to 3 minutes, then heat for 2 to 3 minutes, etc., continue this alternation until the 12 to 15 minutes total heating time are completed (this procedure should comprise approximately 24 to 30 minutes at 600 watts). Microwave heating times are approximate and are dependent upon the number of samples being digested simultaneously. Sufficient heating is evidenced by sorbent reflux within the vessel. For conventional heating, heat the Parr Bombs at 140 °C (285 °F) for 6 hours. Then cool the samples to room temperature, and combine with the acid digested probe rinse as required in section 8.3.3.

8.3.1.3 If the sampling train includes an optional glass cyclone in front of the filter, prepare and digest the cyclone catch by the procedures described in section 8.3.1.2 and then combine the digestate with the digested filter sample.

8.3.2 Container No. 2 (Acetone Rinse). Note the level of liquid in the container and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically within 1 ml or gravimetrically within 0.5 g. Transfer the contents to an acid-cleaned, tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. If particulate emissions are being determined, desiccate for 24 hours without added heat, weigh to a constant weight according to the procedures described in section 11.2.1 of Method 5, and report the results to the nearest 0.1 mg. Redissolve the residue with 10 ml of concentrated HNO_3. Quantitatively combine the resultant sample, including all liquid and any particulate matter, with Container No. 3 before beginning section 8.3.3.

8.3.3 Container No. 3 (Probe Rinse). Verify that the pH of this sample is 2 or lower. If it is not, acidify the sample by careful addition with stirring of concentrated HNO_3 to pH 2. Use water to rinse the sample into a beaker, and cover the beaker with a ribbed watch glass. Reduce the sample volume to approximately 20 ml by heating on a hot plate at a temperature just below boiling. Digest the sample in microwave vessels or Parr Bombs by quantitatively transferring the sample to the vessel or bomb, carefully adding the 6 ml of concentrated HNO_3, 4 ml of concentrated HF, and then continuing to follow the procedures described in section 8.3.1.2. Then combine the resultant sample directly with the acid digested portions of the filter prepared previously in section 8.3.1.2. The resultant combined sample is referred to as *"Sample Fraction 1"*. Filter the combined sample using Whatman 541 filter paper. Dilute to 300 ml (or the appropriate volume for the expected metals concentration) with water. This diluted sample is *"Analytical Fraction 1"*. Measure and record the volume of Analytical Fraction 1 to within 0.1 ml. Quantitatively remove a 50-ml aliquot and label as *"Analytical Fraction 1B"*. Label the remaining 250-ml portion as *"Analytical Fraction 1A"*. Analytical Fraction 1A is used for ICAP or AAS analysis for all desired metals except Hg. Analytical Fraction 1B is used for the determination of front-half Hg.

8.3.4 Container No. 4 (Impingers 1-3). Measure and record the total volume of this sample to within 0.5 ml and label it *"Sample Fraction 2"*. Remove a 75- to 100-ml aliquot for Hg analysis and label the aliquot *"Analytical Fraction 2B"*. Label the remaining portion of Container No. 4 as *"Sample Fraction 2A"*. Sample Fraction 2A defines the volume of Analytical Fraction 2A *prior* to digestion. All of Sample Fraction 2A is digested to produce *"Analytical Fraction 2A"*. Analytical Fraction 2A defines the volume of Sample Fraction 2A *after* its digestion and the volume of Analytical Fraction 2A is normally 150 ml. Analytical Fraction 2A is analyzed for all metals except Hg. Verify that the pH of Sample Fraction 2A is 2 or lower. If necessary, use concentrated HNO_3 by careful addition and stirring to lower Sample Fraction 2A to pH 2. Use water to rinse Sample Fraction 2A into a beaker and then cover the beaker with a ribbed watchglass. Reduce Sample Fraction 2A to approximately 20 ml by heating on a hot plate at a temperature just below boiling. Then follow either of the digestion procedures described in sections 8.3.4.1 or 8.3.4.2.

8.3.4.1 Conventional Digestion Procedure. Add 30 ml of 50 percent HNO_3, and heat for 30 minutes on a hot plate to just below boiling. Add 10 ml of 3 percent H_2O_2 and heat for 10 more minutes. Add 50 ml of hot water, and heat the sample for an additional 20 minutes. Cool, filter the sample, and dilute to 150 ml (or the appropriate volume for the expected metals concentrations) with water. This dilution produces Analytical Fraction 2A. Measure and record the volume to within 0.1 ml.

8.3.4.2 Microwave Digestion Procedure. Add 10 ml of 50 percent HNO_3 and heat for 6 minutes total *heating* time in alternations of 1 to 2 minutes at 600 Watts followed by 1 to 2 minutes with no power, etc., similar to the procedure described in section 8.3.1. Allow the sample to cool. Add 10 ml of 3 percent H_2O_2 and heat for 2 more minutes. Add 50 ml of hot water, and heat for an additional 5 minutes. Cool, filter the sample, and dilute to 150 ml (or the appropriate volume for the expected metals concentrations) with water. This dilution produces Analytical Fraction 2A. Measure and record the volume to within 0.1 ml.

NOTE: All microwave heating times given are approximate and are dependent upon the number of samples being digested at a time. Heating times as given above have been found acceptable for simultaneous digestion of up to 12 individual samples. Sufficient heating is evidenced by solvent reflux within the vessel.

8.3.5 Container No. 5A (Impinger 4), Container Nos. 5B and 5C (Impingers 5 and 6). Keep the samples in Containers Nos. 5A, 5B, and 5C separate from each other. Measure and record the volume of 5A to within 0.5 ml. Label the contents of Container No. 5A to be Analytical Fraction 3A. To remove any brown MnO_2 precipitate from the contents of Container No. 5B, filter its contents through Whatman 40 filter paper into a 500 ml volumetric flask and dilute to volume with water. Save the filter for digestion of the brown MnO_2 precipitate. Label the 500 ml filtrate from Container No. 5B to be Analytical Fraction 3B. Analyze Analytical Fraction 3B for Hg within 48 hours of the filtration step. Place the saved filter, which was used to remove the brown MnO_2 precipitate, into an appropriately sized *vented* container, which will allow release of any gases including chlorine formed when the filter is digested. In a laboratory hood which will remove any gas produced by the digestion of the MnO_2, add 25 ml of 8 N HCl to the filter and allow to digest for a minimum of 24 hours at room temperature. Filter the contents of Container No. 5C through a Whatman 40 filter into a 500-ml volumetric flask. Then filter the result of the digestion of the brown MnO_2 from Container No. 5B through a Whatman 40 filter into the same 500-ml volumetric flask, and dilute and mix well to volume with water. Discard the Whatman 40 filter. Mark this combined 500-ml dilute HCl solution as Analytical Fraction 3C.

8.3.6 Container No. 6 (Silica Gel). Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance.

9.0 Quality Control

9.1 Field Reagent Blanks, if analyzed. Perform the digestion and analysis of the blanks in Container Nos. 7 through 12 that were produced in sections 8.2.11 through 8.2.17, respectively. For Hg field reagent blanks, use a 10 ml aliquot for digestion and analysis.

9.1.1 Digest and analyze one of the filters from Container No. 12 per section 8.3.1, 100 ml from Container No. 7 per section 8.3.2, and 100 ml from Container No. 8A per section 8.3.3. This step produces blanks for Analytical Fractions 1A and 1B.

9.1.2 Combine 100 ml of Container No. 8A with 200 ml from Container No. 9, and digest and analyze the resultant volume per section 8.3.4. This step produces blanks for Analytical Fractions 2A and 2B.

9.1.3 Digest and analyze a 100-ml portion of Container No. 8A to produce a blank for Analytical Fraction 3A.

9.1.4 Combine 100 ml from Container No. 10 with 33 ml from Container No. 8B to produce a blank for Analytical Fraction 3B. Filter the resultant 133 ml as described for Container No. 5B in section 8.3.5, except do not dilute the 133 ml. Analyze this blank for Hg within 48 hr of the filtration step, and use 400 ml as the blank volume when calculating the blank mass value. Use the actual volumes of the other analytical blanks when calculating their mass values.

9.1.5 Digest the filter that was used to remove any brown MnO_2 precipitate from the blank for Analytical Fraction 3B by the same procedure as described in section 8.3.5 for the similar sample filter. Filter the digestate and the contents of Container No. 11 through Whatman 40 paper into a 500-ml volumetric flask, and dilute to volume with water. These steps produce a blank for Analytical Fraction 3C.

9.1.6 Analyze the blanks for Analytical Fraction Blanks 1A and 2A per section 11.1.1 and/or section 11.1.2. Analyze the blanks for Analytical Fractions 1B, 2B, 3A, 3B, and 3C per section 11.1.3. Analysis of the blank for Analytical Fraction 1A produces the front-half reagent blank correction values for the desired metals except for Hg; Analysis of the blank for Analytical Fraction 1B produces the front-half reagent blank correction value for Hg. Analysis of the blank for Analytical Fraction 2A produces the back-half reagent blank correction values for all of the desired metals except for Hg, while separate analyses of the blanks for Analytical Fractions 2B, 3A, 3B, and 3C produce the back-half reagent blank correction value for Hg.

9.2 Quality Control Samples. Analyze the following quality control samples.

9.2.1 ICAP and ICP-MS Analysis. Follow the respective quality control descriptions in section 8 of Methods 6010 and 6020 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i). For the purposes of a source test that consists of three sample runs, modify those requirements to include the following: two instrument check standard runs, two calibration blank runs, one interference check sample at the beginning of the analysis (analyze by Method of Standard Additions unless within 25 percent), one quality control sample to check the accuracy of the calibration standards (required to be within 25 percent of calibration), and one duplicate analysis (required to be within 20 percent of average or repeat all analyses).

9.2.2 Direct Aspiration AAS and/or GFAAS Analysis for Sb, As, Ba, Be, Cd, Cu, Cr, Co, Pb, Ni, Mn, Hg, P, Se, Ag, Tl, and Zn. Analyze all samples in duplicate. Perform a matrix spike on at least one front-half sample and one back-half sample, or one combined sample. If recoveries of less than 75 percent or greater than 125 percent are obtained for the matrix spike, analyze each sample by the Method of Standard Additions. Analyze a quality control sample to check the accuracy of the calibration standards. If the results are not within 20 percent, repeat the calibration.

9.2.3 CVAAS Analysis for Hg. Analyze all samples in duplicate. Analyze a quality control sample to check the accuracy of the calibration standards (if not within 15 percent, repeat calibration). Perform a matrix spike on one sample (if not within 25 percent, analyze all samples by the Method of Standard Additions). Additional information on quality control can be obtained from Method 7470 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i), or in *Standard Methods for Water and Wastewater* Method 303F.

10.0 Calibration and Standardization

NOTE: Maintain a laboratory log of all calibrations.

10.1 Sampling Train Calibration. Calibrate the sampling train components according to the indicated sections of Method 5: Probe Nozzle (Section 10.1); Pitot Tube (Section 10.2); Metering System (Section 10.3); Probe Heater (Section 10.4); Temperature Sensors (Section 10.5); Leak-Check of the Metering System (Section 8.4.1); and Barometer (Section 10.6).

10.2 Inductively Coupled Argon Plasma Spectrometer Calibration. Prepare standards as outlined in section 7.5. Profile and calibrate the instrument according to the manufacturer's recommended procedures using those standards. Check the calibration once per hour. If the instrument does not reproduce the standard concentrations within 10 percent, perform the complete calibration procedures. Perform ICP-MS analysis by following Method 6020 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i).

10.3 Atomic Absorption Spectrometer—Direct Aspiration AAS, GFAAS, and CVAAS analyses. Prepare the standards as outlined in section 7.5 and use them to calibrate the spectrometer. Calibration procedures are also outlined in the EPA methods referred to in Table 29-2 and in Method 7470 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i), or in *Standard Methods for Water and Wastewater*Method 303F (for Hg). Run each standard curve in duplicate and use the mean values to calculate the calibration line. Recalibrate the instrument approximately once every 10 to 12 samples.

11.0 Analytical Procedure

11.1 Sample Analysis. For each sampling train sample run, seven individual analytical samples are generated; two for all desired metals except Hg, and five for Hg. A schematic identifying each sample container and the prescribed analytical preparation and analysis scheme is shown in Figure 29-3. The first two analytical samples, labeled Analytical Fractions 1A and 1B, consist of the digested samples from the front-half of the train. Analytical Fraction 1A is for ICAP, ICP-MS or AAS analysis as described in sections 11.1.1 and 11.1.2, respectively. Analytical Fraction 1B is for front-half Hg analysis as described in section 11.1.3. The contents of the back-half of the train are used to prepare the third through seventh analytical samples. The third and fourth analytical samples, labeled Analytical Fractions 2A and 2B, contain the samples from the moisture removal impinger No. 1, if used, and HNO_3/H_2O_2 impingers Nos. 2 and 3. Analytical Fraction 2A is for ICAP, ICP-MS or AAS analysis for target metals, except Hg. Analytical Fraction 2B is for analysis for Hg. The fifth through seventh analytical samples, labeled Analytical Fractions 3A, 3B, and 3C, consist of the impinger contents and rinses from the empty impinger No. 4 and the $H_2SO_4/KMnO_4$ Impingers Nos. 5 and 6. These analytical samples are for analysis for Hg as described in section 11.1.3. The total back-half Hg catch is determined from the sum of Analytical Fractions 2B, 3A, 3B, and 3C. Analytical Fractions 1A and 2A can be combined proportionally prior to analysis.

11.1.1 ICAP and ICP-MS Analysis. Analyze Analytical Fractions 1A and 2A by ICAP using Method 6010 or Method 200.7 (40 CFR 136, Appendix C). Calibrate the ICAP, and set up an analysis program as described in Method 6010 or Method 200.7. Follow the quality control procedures described in section 9.2.1. Recommended wavelengths for analysis are as shown in Table 29-2. These wavelengths represent the best combination of specificity and potential detection limit. Other wavelengths may be substituted if they can provide the needed specificity and detection limit, and are treated with the same corrective techniques for spectral interference. Initially, analyze all samples for the target metals (except Hg) plus Fe and Al. If Fe and Al are present, the sample might have to be diluted so that each of these elements is at a concentration of less than 50 ppm so as to reduce their spectral interferences on As, Cd, Cr, and Pb. Perform ICP-MS analysis by following Method 6020 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i).

NOTE: When analyzing samples in a HF matrix, an alumina torch should be used; since all front-half samples will contain HF, use an alumina torch.

11.1.2 AAS by Direct Aspiration and/or GFAAS. If analysis of metals in Analytical Fractions 1A and 2A by using GFAAS or direct aspiration AAS is needed, use Table 29-3 to determine which techniques and procedures to apply for each target metal. Use Table 29-3, if necessary, to determine techniques for minimization of interferences. Calibrate the instrument according to section 10.3 and follow the quality control procedures specified in section 9.2.2.

11.1.3 CVAAS Hg analysis. Analyze Analytical Fractions 1B, 2B, 3A, 3B, and 3C separately for Hg using CVAAS following the method outlined in Method 7470 in EPA Publication SW-846 Third Edition (November 1986) including updates I, II, IIA, IIB and III, as incorporated by reference in §60.17(i), or in *Standard Methods for Water and Wastewater Analysis,* 15th Edition, Method 303F, or, optionally using note no. 2 at the end of this section. Set up the calibration curve (zero to 1000 ng) as described in Method 7470 or similar to Method 303F using 300-ml BOD bottles instead of Erlenmeyers. Perform the following for each Hg analysis. From each original sample, select and record an aliquot in the size range from 1 ml to 10 ml. If no prior knowledge of the expected amount of Hg in the sample exists, a 5 ml aliquot is suggested for the first dilution to 100 ml (see note no. 1 at end of this section). The total amount of Hg in the aliquot shall be less than 1 µg and within the range (zero to 1000 ng) of the calibration curve. Place the sample aliquot into a separate 300-ml BOD bottle, and add enough water to make a total volume of 100 ml. Next add to it sequentially the sample digestion solutions and perform the sample preparation described in the procedures of Method 7470 or Method 303F. (See note no. 2 at the end of this section). If the maximum readings are off-scale (because Hg in the aliquot exceeded the calibration range; including the situation where only a 1-ml aliquot of the original sample was digested), then dilute the original sample (or a portion of it) with 0.15 percent HNO_3(1.5 ml concentrated HNO_3 per liter aqueous solution) so that when a 1- to 10-ml aliquot of the "0.15 HNO_3 percent dilution of the original sample" is digested and analyzed by the procedures described above, it will yield an analysis within the range of the calibration curve.

NOTE NO. 1: When Hg levels in the sample fractions are below the in-stack detection limit given in Table 29-1, select a 10 ml aliquot for digestion and analysis as described.

NOTE NO. 2: Optionally, Hg can be analyzed by using the CVAAS analytical procedures given by some instrument manufacturer's directions. These include calibration and quality control procedures for the Leeman Model PS200, the Perkin Elmer FIAS systems, and similar models, if available, of other instrument manufacturers. For digestion and analyses by these instruments, perform the following two steps: (1), Digest the sample aliquot through the addition of the aqueous hydroxylamine hydrochloride/sodium chloride solution the same as described in this section: (*The Leeman, Perkin Elmer, and similar instruments described in this note add automatically the necessary stannous chloride solution during the automated analysis of Hg.)*; (2), Upon completion of the digestion described in (1), analyze the sample according to the instrument manufacturer's directions. This approach allows multiple (including duplicate) automated analyses of a digested sample aliquot.

12.0 Data Analysis and Calculations

12.1 Nomenclature.

A = Analytical detection limit, µg/ml.

B = Liquid volume of digested sample prior to aliquotting for analysis, ml.

C = Stack sample gas volume, dsm^3.

C_{a1} = Concentration of metal in Analytical Fraction 1A as read from the standard curve, µg/ml.

C_{a2} =Concentration of metal in Analytical Fraction 2A as read from the standard curve, (µg/ml).

C_s = Concentration of a metal in the stack gas, mg/dscm.

D = In-stack detection limit, $\mu g/m^3$.

F_a = Aliquot factor, volume of Sample Fraction 2 divided by volume of Sample Fraction 2A (see section 8.3.4.)

F_d = Dilution factor (F_d=the inverse of the fractional portion of the concentrated sample in the solution actually used in the instrument to produce the reading C_{a1}. For example, if a 2 ml aliquot of Analytical Fraction 1A is diluted to 10 ml to place it in the calibration range, F_d=5).

Hg_{bh} = Total mass of Hg collected in the back-half of the sampling train, µg.

Hg_{bh2} = Total mass of Hg collected in Sample Fraction 2, µg.

$Hg_{bh3(A,B,C)}$ = Total mass of Hg collected separately in Fraction 3A, 3B, or 3C, µg.

Hg_{bhb} = Blank correction value for mass of Hg detected in back-half field reagent blanks, µg.

Hg_{fh} = Total mass of Hg collected in the front-half of the sampling train (Sample Fraction 1), µg.

Hg_{fhb} = Blank correction value for mass of Hg detected in front-half field reagent blank, µg.

Hg_t = Total mass of Hg collected in the sampling train, µg.

M_{bh} = Total mass of each metal (except Hg) collected in the back-half of the sampling train (Sample Fraction 2), µg.

M_{bhb} = Blank correction value for mass of metal detected in back-half field reagent blank, µg.

M_{fh} = Total mass of each metal (except Hg) collected in the front half of the sampling train (Sample Fraction 1), µg.

M_{fhb} = Blank correction value for mass of metal detected in front-half field reagent blank, µg.

M_t = Total mass of each metal (separately stated for each metal) collected in the sampling train, µg.

M_t = Total mass of that metal collected in the sampling train, µg; (substitute Hg_t for M_t for the H_g calculation).

Q_{bh2} = Quantity of Hg, µg, TOTAL in the ALIQUOT of Analytical Fraction 2B selected for digestion and analysis .

NOTE: For example, if a 10 ml aliquot of Analytical Fraction 2B is taken and digested and analyzed (according to section 11.1.3 and its notes nos. 1 and 2), then calculate and use the total amount of Hg in the 10 ml aliquot for Q_{bh2}.

$Q_{bh3(A,B,C)}$ = Quantity of Hg, µg, *TOTAL,* separately, in the ALIQUOT of Analytical Fraction 3A, 3B, or 3C selected for digestion and analysis (see notes in sections 12.7.1 and 12.7.2 describing the quantity “Q” and calculate similarly).

Q_{fh} = Quantity of Hg, µg, TOTAL in the ALIQUOT of Analytical Fraction 1B selected for digestion and analysis.

NOTE: For example, if a 10 ml aliquot of Analytical Fraction 1B is taken and digested and analyzed (according to section 11.1.3 and its notes nos. 1 and 2), then calculate and use the total amount of Hg in the 10 ml aliquot for Q_{fh}.

V_a = Total volume of digested sample solution (Analytical Fraction 2A), ml (see section 8.3.4.1 or 8.3.4.2, as applicable).

V_{f1B} = Volume of aliquot of Analytical Fraction 1B analyzed, ml.

NOTE: For example, if a 1 ml aliquot of Analytical Fraction 1B was diluted to 50 ml with 0.15 percent HNO_3 as described in section 11.1.3 to bring it into the proper analytical range, and then 1 ml of that 50-ml was digested according to section 11.1.3 and analyzed, V_{f1B} would be 0.02 ml.

V_{f2B} = Volume of Analytical Fraction 2B analyzed, ml.

NOTE: For example, if 1 ml of Analytical Fraction 2B was diluted to 10 ml with 0.15 percent HNO_3 as described in section 11.1.3 to bring it into the proper analytical range, and then 5 ml of that 10 ml was analyzed, V_{f2B} would be 0.5 ml.

$V_{f3(A,B,C)}$ = Volume, separately, of Analytical Fraction 3A, 3B, or 3C analyzed, ml (see previous notes in sections 12.7.1 and 12.7.2, describing the quantity "V" and calculate similarly).

$V_{m(std)}$ = Volume of gas sample as measured by the dry gas meter, corrected to dry standard conditions, dscm.

$V_{soln,1}$ = Total volume of digested sample solution (Analytical Fraction 1), ml.

$V_{soln,1}$ = Total volume of Analytical Fraction 1, ml.

$V_{soln,2}$ = Total volume of Sample Fraction 2, ml.

$V_{soln,3(A,B,C)}$ = Total volume, separately, of Analytical Fraction 3A, 3B, or 3C, ml.

$K_4 = 10^{-3}$ mg/µg.

12.2 Dry Gas Volume. Using the data from this test, calculate $V_{m(std)}$, the dry gas sample volume at standard conditions as outlined in section 12.3 of Method 5.

12.3 Volume of Water Vapor and Moisture Content. Using the total volume of condensate collected during the source sampling, calculate the volume of water vapor $V_{w(std)}$ and the moisture content B_{ws} of the stack gas. Use Equations 5-2 and 5-3 of Method 5.

12.4 Stack Gas Velocity. Using the data from this test and Equation 2-9 of Method 2, calculate the average stack gas velocity.

12.5 In-Stack Detection Limits. Calculate the in-stack method detection limits shown in Table 29-4 using the conditions described in section 13.3.1 as follows:

$$A \times \frac{B}{C} = D \qquad \text{Eq. 29-1}$$

12.6 Metals (Except Hg) in Source Sample.

12.6.1 Analytical Fraction 1A, Front-Half, Metals (except Hg). Calculate separately the amount of each metal collected in Sample Fraction 1 of the sampling train using the following equation:

$$M_{fh} = C_{a1} F_d V_{soln,1} \qquad \text{Eq. 29-2}$$

NOTE: If Analytical Fractions 1A and 2A are combined, use proportional aliquots. Then make appropriate changes in Equations 29-2 through 29-4 to reflect this approach.

12.6.2 Analytical Fraction 2A, Back-Half, Metals (except Hg). Calculate separately the amount of each metal collected in Fraction 2 of the sampling train using the following equation:

$$M_{bh} = C_{a2} F_a V_a \qquad \text{Eq. 29-3}$$

12.6.3 Total Train, Metals (except Hg). Calculate the total amount of each of the quantified metals collected in the sampling train as follows:

$$M_t = \left(M_{fh} - M_{fhb}\right) + \left(M_{bh} - M_{bhb}\right) \qquad \text{Eq. 29-4}$$

NOTE: If the measured blank value for the front half (M_{fhb}) is in the range 0.0 to “A” µg (where “A” µg equals the value determined by multiplying 1.4 µg/in.^{2} times the actual area in in.^{2} of the sample filter), use M_{fhb} to correct the emission sample value (M_{fh}); if M_{fhb}exceeds “A” µg, use the greater of I or II:

I. “A” µg.

II. The lesser of (a) M_{fhb}, or (b) 5 percent of M_{fh}. If the measured blank value for the back-half (M_{bhb}) is in the range 0.0 to 1 µg, use M_{bhb} to correct the emission sample value (M_{bh}); if M_{bhb} exceeds 1 µg, use the greater of I or II:

I. 1 µg.

II. The lesser of (a) M_{bhb}, or (b) 5 percent of M_{bh}.

12.7 Hg in Source Sample.

12.7.1 Analytical Fraction 1B; Front-Half Hg. Calculate the amount ofHg collected in the front-half, Sample Fraction 1, of the sampling train by using Equation 29-5:

$$Hg_{fh} = \frac{Q_{fh}}{V_{f1B}}\left(V_{soln,1}\right) \qquad \text{Eq. 29-5}$$

12.7.2 Analytical Fractions 2B, 3A, 3B, and 3C; Back Half Hg.

12.7.2.1 Calculate the amount of Hg collected in Sample Fraction 2 by using Equation 29-6:

$$Hg_{bh2} = \frac{Q_{bh2}}{V_{f2B}}\left(V_{soln,2}\right) \qquad \text{Eq. 29-6}$$

12.7.2.2 Calculate each of the back-half Hg values for Analytical Fractions 3A, 3B, and 3C by using Equation 29-7:

$$Hg_{bh3(A,B,C)} = \frac{Q_{bh3(A,B,C)}}{V_{f3(A,B,C)}}\left(V_{soln,3(A,B,C)}\right) \qquad \text{Eq. 29-7}$$

12.7.2.3 Calculate the total amount of Hg collected in the back-half of the sampling train by using Equation 29-8:

$$Hg_{bh} = Hg_{bh2} + Hg_{bh3A} + Hg_{bh3B} + Hg_{bh3C} \qquad \text{Eq. 29-8}$$

12.7.3 Total Train Hg Catch. Calculate the total amount of Hg collected in the sampling train by using Equation 29-9:

$$Hg_{t} = \left(Hg_{fh} - Hg_{fhb}\right) + \left(Hg_{bh} - Hg_{bhb}\right) \qquad \text{Eq. 29-9}$$

NOTE: If the total of the measured blank values (Hg_{fhb} + Hg_{bhb}) is in the range of 0.0 to 0.6 µg, then use the total to correct the sample value (Hg_{fh} + Hg_{bh}); if it exceeds 0.6 µg, use the greater of I. or II:

I. 0.6 µg.

II. The lesser of (a) (Hg_{fhb} + Hg_{bhb}), or (b) 5 percent of the sample value (Hg_{fh} + Hg_{bh}).

12.8 Individual Metal Concentrations in Stack Gas. Calculate the concentration of each metal in the stack gas (dry basis, adjusted to standard conditions) by using Equation 29-10:

$$C_{s} = \frac{K_{4}M_{t}}{V_{m(std)}} \qquad \text{Eq. 29-10}$$

12.9 Isokinetic Variation and Acceptable Results. Same as Method 5, sections 12.11 and 12.12, respectively.

13.0 Method Performance

13.1 Range. For the analysis described and for similar analyses, the ICAP response is linear over several orders of magnitude. Samples containing metal concentrations in the nanograms per ml (ng/ml) to micrograms per ml (µg/ml) range in the final analytical solution can be analyzed using this method. Samples containing greater than approximately 50 µg/ml As, Cr, or Pb should be diluted to that level or lower for final analysis. Samples containing greater than approximately 20 µg/ml of Cd should be diluted to that level before analysis.

13.2 Analytical Detection Limits.

NOTE: See section 13.3 for the description of in-stack detection limits.

13.2.1 ICAP analytical detection limits for the sample solutions (based on *SW-846,* Method 6010) are approximately as follows: Sb (32 ng/ml), As (53 ng/ml), Ba (2 ng/ml), Be (0.3 ng/ml), Cd (4 ng/ml), Cr (7 ng/ml), Co (7 ng/ml), Cu (6 ng/ml), Pb (42 ng/ml), Mn (2 ng/ml), Ni (15 ng/ml), P (75 ng/ml), Se (75 ng/ml), Ag (7 ng/ml), Tl (40 ng/ml), and Zn (2 ng/ml). ICP-MS analytical detection limits (based on *SW-846,* Method 6020) are lower generally by a factor of ten or more. Be is lower by a factor of three. The actual sample analytical detection limits are sample dependent and may vary due to the sample matrix.

13.2.2 The analytical detection limits for analysis by direct aspiration AAS (based on *SW-846*, Method 7000 series) are approximately as follows: Sb (200 ng/ml), As (2 ng/ml), Ba (100 ng/ml), Be (5 ng/ml), Cd (5 ng/ml), Cr (50 ng/ml), Co (50 ng/ml), Cu (20 ng/ml), Pb (100 ng/ml), Mn (10 ng/ml), Ni (40 ng/ml), Se (2 ng/ml), Ag (10 ng/ml), Tl (100 ng/ml), and Zn (5 ng/ml).

13.2.3 The detection limit for Hg by CVAAS (on the resultant volume of the *digestion* of the aliquots taken for Hg analyses) can be approximately 0.02 to 0.2 ng/ml, depending upon the type of CVAAS analytical instrument used. 13.2.4 The use of GFAAS can enhance the detection limits compared to direct aspiration AAS as follows: Sb (3 ng/ml), As (1 ng/ml), Be (0.2 ng/ml), Cd (0.1 ng/ml), Cr (1 ng/ml), Co (1 ng/ml), Pb (1 ng/ml), Se (2 ng/ml), and Tl (1 ng/ml).

13.3 In-stack Detection Limits.

13.3.1 For test planning purposes in-stack detection limits can be developed by using the following information: (1) The procedures described in this method, (2) the analytical detection limits described in section 13.2 and in *SW-846,*(3) the normal volumes of 300 ml (Analytical Fraction 1) for the front-half and 150 ml (Analytical Fraction 2A) for the back-half samples, and (4) a stack gas sample volume of 1.25 m^3. The resultant in-stack method detection limits for the above set of conditions are presented in Table 29-1 and were calculated by using Eq. 29-1 shown in section 12.5.

13.3.2 To ensure optimum precision/resolution in the analyses, the target concentrations of metals in the analytical solutions should be at least ten times their respective analytical detection limits. Under certain conditions, and with greater care in the analytical procedure, these concentrations can be as low as approximately three times the respective analytical detection limits without seriously impairing the precision of the analyses. On at least one sample run in the source test, and for each metal analyzed, perform either repetitive analyses, Method of Standard Additions, serial dilution, or matrix spike addition, etc., to document the quality of the data.

13.3.3 Actual in-stack method detection limits are based on actual source sampling parameters and analytical results as described above. If required, the method in-stack detection limits can be improved over those shown in Table 29-1 for a specific test by either increasing the sampled stack gas volume, reducing the total volume of the digested samples, improving the analytical detection limits, or any combination of the three. For extremely low levels of *Hg only,* the aliquot size selected for digestion and analysis can be increased to as much as 10 ml, thus improving the in-stack detection limit by a factor of ten compared to a 1 ml aliquot size.

13.3.3.1 A nominal one hour sampling run will collect a stack gas sampling volume of about 1.25 m^3. If the sampling time is increased to four hours and 5 m^3 are collected, the in-stack method detection limits would be improved by a factor of four compared to the values shown in Table 29-1.

13.3.3.2 The in-stack detection limits assume that all of the sample is digested and the final liquid volumes for analysis are the normal values of 300 ml for Analytical Fraction 1, and 150 ml for Analytical Fraction 2A. If the volume of Analytical Fraction 1 is reduced from 300 to 30 ml, the in-stack detection limits for that fraction of the sample would be improved by a factor of ten. If the volume of Analytical Fraction 2A is reduced from 150 to 25 ml, the in-stack detection limits for that fraction of the sample would be improved by a factor of six. Matrix effect checks are necessary on sample analyses and typically are of much greater significance for samples that have been concentrated to less than the normal original sample volume. Reduction of Analytical Fractions 1 and 2A to volumes of less than 30 and 25 ml, respectively, could interfere with the redissolving of the residue and could increase interference by other compounds to an intolerable level.

13.3.3.3 When both of the modifications described in sections 13.3.3.1 and 13.3.3.2 are used simultaneously on one sample, the resultant improvements are multiplicative. For example, an increase in stack gas volume by a factor of four and a reduction in the total liquid sample digested volume of both Analytical Fractions 1 and 2A by a factor of six would result in an improvement by a factor of twenty-four of the in-stack method detection limit.

13.4 Precision. The precision (relative standard deviation) for each metal detected in a method development test performed at a sewage sludge incinerator were found to be as follows:

Sb (12.7 percent), As (13.5 percent), Ba (20.6 percent), Cd (11.5 percent), Cr (11.2 percent), Cu (11.5 percent), Pb (11.6 percent), P (14.6 percent), Se (15.3 percent), Tl (12.3 percent), and Zn (11.8 percent). The precision for Ni was 7.7 percent for another test conducted at a source simulator. Be, Mn, and Ag were not detected in the tests. However, based on the analytical detection limits of the ICAP for these metals, their precisions could be similar to those for the other metals when detected at similar levels.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 Alternative Procedures

16.1 Alternative Analyzer. Samples may also be analyzed by cold vapor atomic fluorescence spectrometry.

16.2 [Reserved]

17.0 References

1. Method 303F in *Standard Methods for the Examination of Water Wastewater,* 15th Edition, 1980. Available from the American Public Health Association, 1015 18th Street N.W., Washington, D.C. 20036.

2. EPA Methods 6010, 6020, 7000, 7041, 7060, 7131, 7421, 7470, 7740, and 7841, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846, Third Edition, November 1986, with updates I, II, IIA, IIB and III. Office of Solid Waste and Emergency Response, U. S. Environmental Protection Agency, Washington, DC 20460.

3. EPA Method 200.7, Code of Federal Regulations, Title 40, Part 136, Appendix C. July 1, 1987.

4. EPA Methods 1 through 5, Code of Federal Regulations, Title 40, Part 60, Appendix A, July 1, 1991.

5. EPA Method 101A, Code of Federal Regulations, Title 40, Part 61, Appendix B, July 1, 1991.

18.0 Tables, Diagrams, Flowcharts, and Validation Data

TABLE 29-1—IN STACK METHOD DETECTION LIMITS (UG/M^3) FOR THE FRONT-HALF, THE BACK HALF, AND THE TOTAL SAMPLING TRAIN USING ICAP, GFAAS, AND CVAAS

Metal	Front-half: probe and filter	Back-half: impinters 1-3	Back-half: impringers 4-6[a]	Total train
Antimony	[1]7.7 (0.7)	[1]3.8 (0.4)		[1]11.5 (1.1)
Arsenic	[1]12.7 (0.3)	[1]6.4 (0.1)		[1]19.1 (0.4)
Barium	0.5	0.3		0.8
Beryllium	[1]0.07 (0.05)	[1]0.04 (0.03)		[1]0.11 (0.08)
Cadmium	[1]1.0 (0.02)	[1]0.5 (0.01)		[1]1.5 (0.03)
Chromium	[1]1.7 (0.2)	[1]0.8 (0.1)		[1]2.5 (0.3)
Cobalt	[1]1.7 (0.2)	[1]0.8 (0.1)		[1]2.5 (0.3)
Copper	1.4	0.7		2.1
Lead	[1]10.1 (0.2)	[1]5.0 (0.1)		[1]15.1 (0.3)
Manganese	[1]0.5 (0.2)	[1]0.2 (0.1)		[1]0.7 (0.3)
Mercury	[2]0.06	[2]0.3	[2]0.2	[2]0.56
Nickel	3.6	1.8		5.4
Phosphorus	18	9		27
Selenium	[1]18 (0.5)	[1]9 (0.3)		[1]27 (0.8)
Silver	1.7	0.9 (0.7)		2.6
Thallium	[1]9.6 (0.2)	[1]4.8 (0.1)		[1]14.4 (0.3)
Zinc	0.5	0.3		0.8

[a] Mercury analysis only.

[1] Detection limit when analyzed by ICAP or GFAAS as shown in parentheses (see section 11.1.2).

[2] Detection limit when anaylzed by CVAAS, estimated for Back-half and Total Train. See sections 13.2 and 11.1.3.

Note: Actual method in-stack detection limits may vary from these values, as described in section 13.3.3.

TABLE 29-2—RECOMMENDED WAVELENGTHS FOR ICAP ANALYSIS

Analyte	Wavelength (nm)
Aluminum (Al)	308.215
Antimony (Sb)	206.833
Arsenic (As)	193.696
Barium (Ba)	455.403
Beryllium (Be)	313.042
Cadmium (Cd)	226.502
Chromium (Cr)	267.716
Cobalt (Co)	228.616
Copper (Cu)	328.754
Iron (Fe)	259.940
Lead (Pb)	220.353
Manganese (Mn)	257.610
Nickel (Ni)	231.604
Phosphorus (P)	214.914
Selenium (Se)	196.026
Silver (Ag)	328.068
Thallium (T_1)	190,864
Zinc (Zn)	213,856

TABLE 29-3—APPLICABLE TECHNIQUES, METHODS AND MINIMIZATION OF INTERFERENCES FOR AAS ANALYSIS

Metal	Technique	SW-846[1] Methods No.	Wavelength (nm)	Interferences	
				Cause	Minimization
Fe	Aspiration	7380	248.3	Contamination	Great care taken to avoid contamination.
Pb	Aspiration	7420	283.3	217.0 nm alternate	Background correction required.
Pb	Furnace	7421	283.3	Poor recoveries	Matrix modifier, add 10 µl of phosphorus acid to 1 ml of prepared sample in sampler cup.
Mn	Aspiration	7460	279.5	403.1 nm alternate	Background correction required.
Ni	Aspiration	7520	232.0	352.4 nm alternate Fe, Co, and Cr Nonlinear response	Background correction required. Matrix matching or nitrous-oxide/acetylene flame Sample dilution or use 352.3 nm line
Se	Furnace	7740	196.0	Volatility	Spike samples and reference materials and add nickel nitrate to minimize volatilization.
				Adsorption & scatter	Background correction is required and Zeeman background correction can be useful.
Ag	Aspiration	7760	328.1	Adsorption & scatter AgCl insoluble	Background correction is required. Avoid hydrochloric acid unless silver is in solution as a chloride complex. Sample and standards monitored for aspiration rate.
Tl	Aspiration	7840	276.8		Background correction is required. Hydrochloric acid should not be used.
Tl	Furnace	7841	276.8	Hydrochloric acid or chloride	Background correction is required. Verify that losses are not occurring for volatilization by spiked samples or standard addition; Palladium is a suitable matrix modifier.
Zn	Aspiration	7950	213.9	High Si, Cu, & P	Strontium removes Cu and

				Contamination	phosphate. Great care taken to avoid contamination.
Sb	Aspiration	7040	217.6	1000 mg/ml Pb, Ni, Cu, or acid	Use secondary wavelength of 231.1 nm; match sample & standards acid concentration or use nitrous oxide/acetylene flame.
Sb	Furnace	7041	217.6	High Pb	Secondary wavelength or Zeeman correction.
As	Furnace	7060	193.7	Arsenic Volatilization Aluminum	Spike samples and add nickel nitrate solution to digestates prior to analysis. Use Zeeman background correction.
Ba	Aspiration	7080	553.6		
				Calcium	
				Barium Ionization	High hollow cathode current and narrow band set. 2 ml of KCl per 100 m1 of sample.
Be	Aspiration	7090	234.9	500 ppm Al. High Mg and Si	Add 0.1% fluoride.
Be	Furnace	7091	234.9	Be in optical path	Optimize parameters to minimize effects.
Cd	Aspiration	7130	228.8	Absorption and light scattering	Background correction is required.
Cd	Furnace	7131	228.8	As above Excess Chloride Pipet Tips	As above. Ammonium phosphate used as a matrix modifier. Use cadmium-free tips.
Cr	Aspiration	7190	357.9	Alkali metal	KCl ionization suppressant in samples and standards—Consult mfgs' literature.
Co	Furnace	7201	240.7	Excess chloride	Use Method of Standard Additions.
Cr	Furnace	7191	357.9	200 mg/L Ca and P	All calcium nitrate for a know constant effect and to eliminate effect of phosphate.
Cu	Aspiration	7210	324.7	Absorption and Scatter	Consult manufacturer's manual.

[1] Refer to EPA publication SW-846 (Reference 2 in section 16.0).

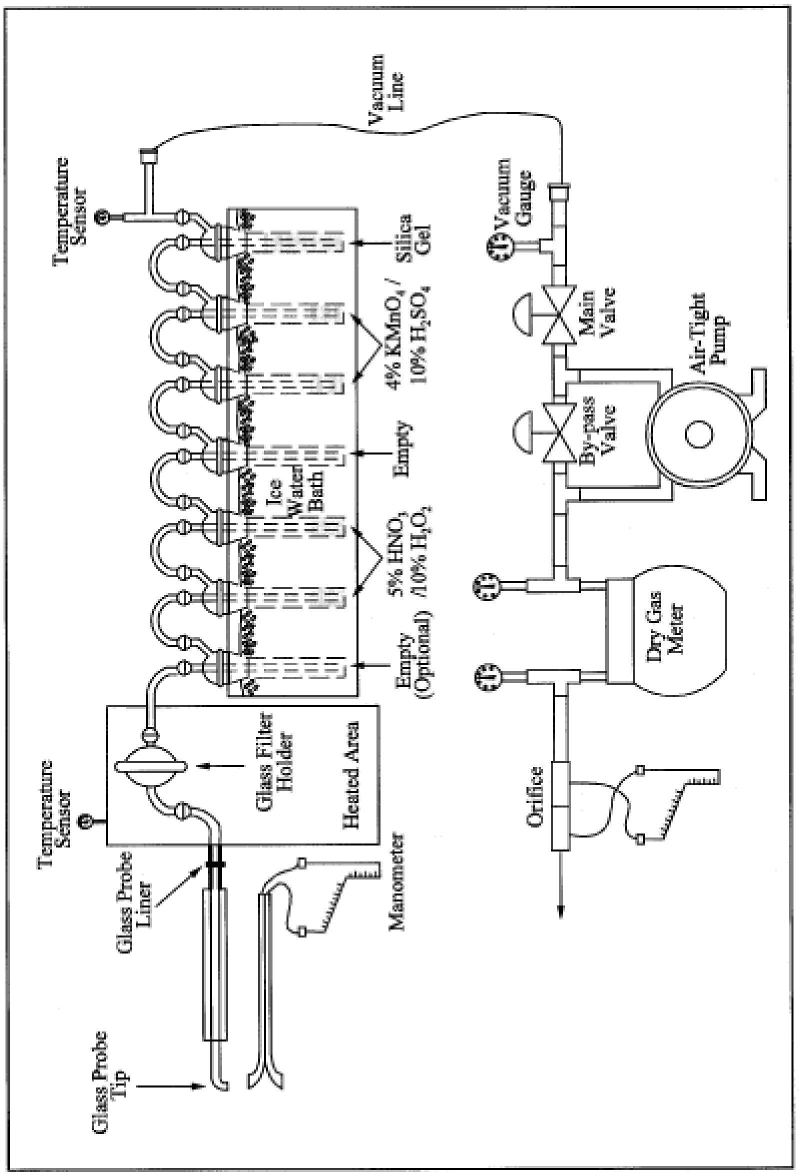
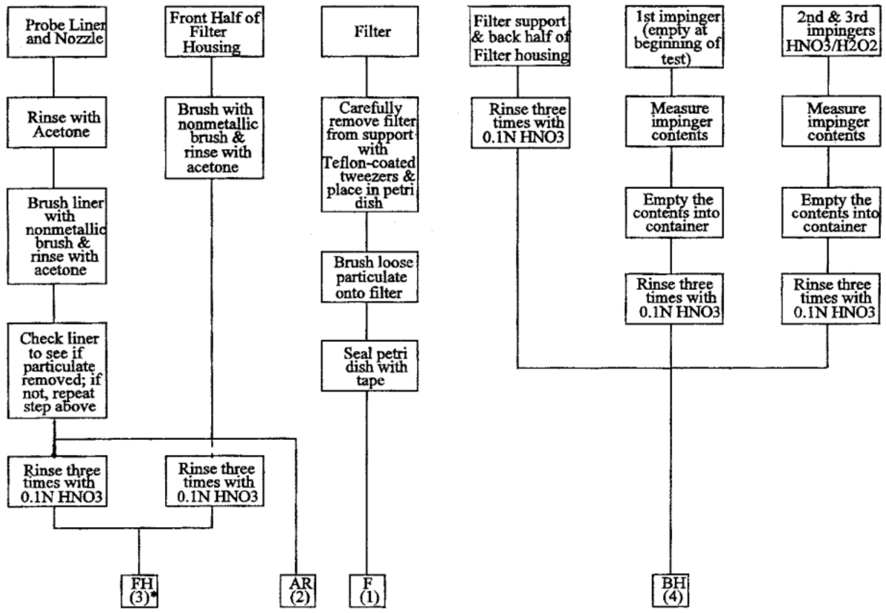


Figure 29-1. Sampling Train.



* Number in parentheses indicated container number

Figure 29-2a. Sample Recovery Scheme.

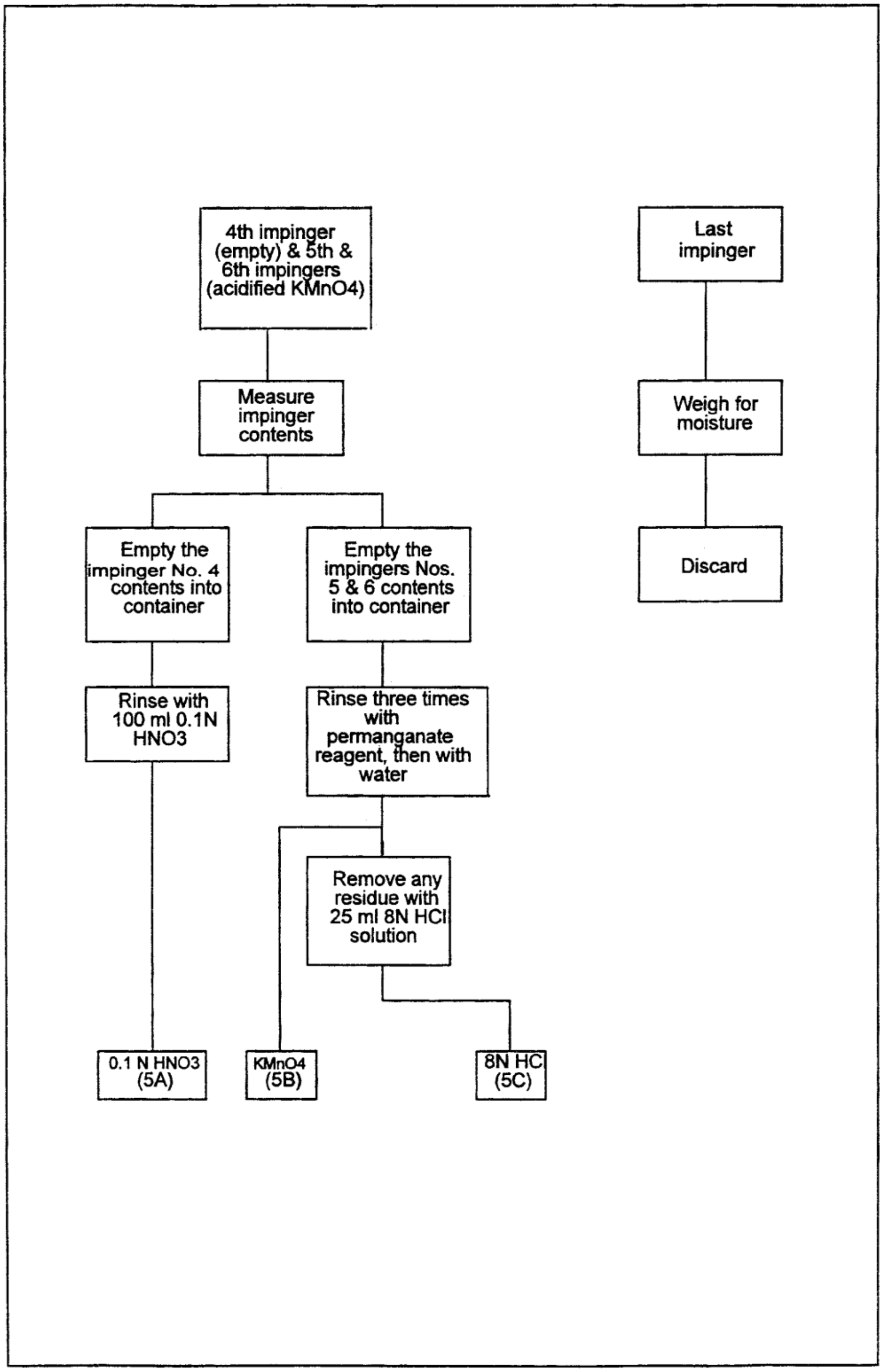
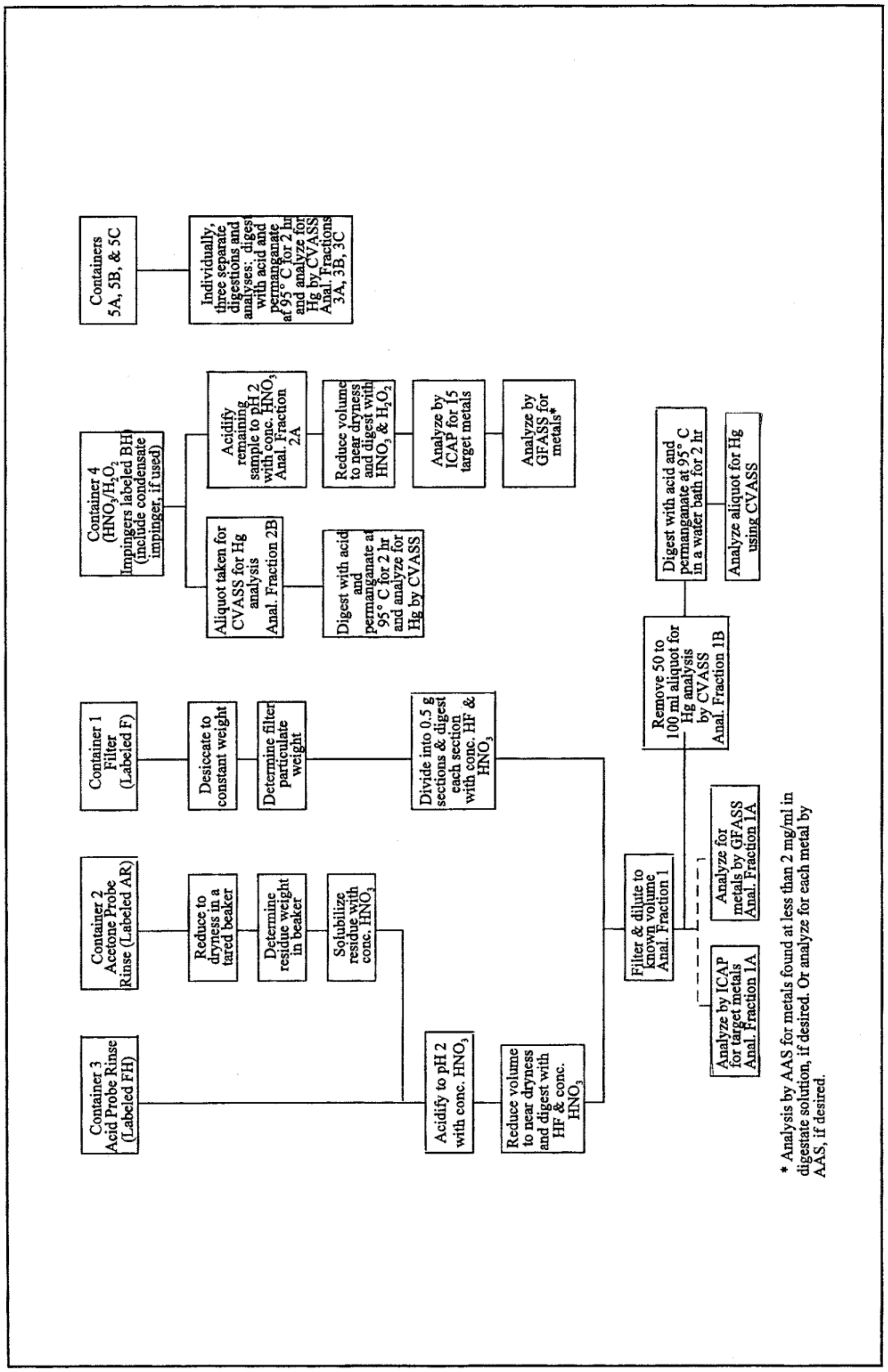


Figure 29-2b. Sample Recovery Scheme.



* Analysis by AAS for metals found at less than 2 mg/ml in digestate solution, if desired. Or analyze for each metal by AAS, if desired.

Figure 29-3. Sample Preparation and Analysis Scheme.

While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. Please refer to the official version in the FR publication, which appears on the Government Printing Office's eCFR website
HTTP://WWW.ECFR.GOV/CGI-BIN/TEXT-IDX?SID=C7836E6FF67E5AD001BCB19CCFD99C1A&NODE=40:8.0.1.1.1&RGN=DIV5#40:8.0.1.1.1.0.1.1.8

METHOD 30B—DETERMINATION OF TOTAL VAPOR PHASE MERCURY EMISSIONS FROM COAL-FIRED COMBUSTION SOURCES USING CARBON SORBENT TRAPS

1.0 Scope and Application

What is Method 30B?

Method 30B is a procedure for measuring total vapor phase mercury (Hg) emissions from coal-fired combustion sources using sorbent trap sampling and an extractive or thermal analytical technique. This method is only intended for use only under relatively low particulate conditions (e.g., sampling after all pollution control devices). Quality assurance and quality control requirements are included to assure that you, the tester, collect data of known and acceptable quality for each testing program. This method does not completely describe all equipment, supplies, and sampling and analytical procedures you will need, but instead refers to other test methods for some of the details. Therefore, to obtain reliable results, you should also have a thorough knowledge of these additional methods which are found in Appendices A-1 and A-3 to this part:

(a) Method 1—Sample and Velocity Traverses for Stationary Sources.

(b) Method 4—Determination of Moisture Content in Stack Gases.

(c) Method 5—Determination of Particulate Matter Emissions from Stationary Sources

1.1 Analytes. What does this method determine? This method is designed to measure the mass concentration of total vapor phase Hg in flue gas, including elemental Hg (Hg^0) and oxidized forms of Hg (Hg^{+2}), in micrograms per dry standard cubic meter (µg/dscm).

Analyte	**CAS No.**	**Analytical range and sensitivity**
Elemental Hg (Hg^0)	7439-97-6	Typically 0.1 µg/dscm to >50 µg/dscm.
Oxidized Hg (Hg^{+2})		(Same)

1.2 Applicability. When is this method required? Method 30B is a reference method for relative accuracy test audits (RATAs) of vapor phase Hg CEMS and sorbent trap monitoring systems installed at coal-fired boilers and is also appropriate for Hg emissions testing at such boilers. It is intended for use only under relatively low particulate conditions (i.e., sampling after all pollution control devices); in cases where significant amounts of particle-bound Hg may be present, an isokinetic sampling method for Hg should be used. Method 30B may also be specified by New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), emissions trading programs, State Implementation Plans (SIPs), and operating permits that require measurement of Hg concentrations in stationary source emissions, either to determine compliance with an applicable emission standard or limit, or to conduct RATAs of Hg CEMS and sorbent trap monitoring systems.

1.3 Data Quality Objectives (DQO). How good must my collected data be? Method 30B has been designed to provide data of high and known quality for Hg emissions testing and for RATA testing of Hg monitoring systems, including CEMS and sorbent trap monitors. In these and other applications, the principal objective is to ensure the accuracy of the data at the actual emissions levels and in the actual emissions matrix encountered. To meet this objective, NIST-traceable calibration standards must be used and method performance tests are required.

2.0 Summary of Method

Known volumes of flue gas are extracted from a stack or duct through paired, in-stack sorbent media traps at an appropriate flow rate. Collection of mercury on the sorbent media in the stack mitigates potential loss of mercury during transport through a probe/sample line. For each test run, paired train sampling is required to determine measurement precision and verify acceptability of the measured emissions data. A field recovery test which assesses recovery of an elemental Hg spike to determine measurement bias is also used to verify data acceptability. The sorbent traps are recovered from the sampling system, prepared for analysis as needed, and analyzed by any suitable determinative technique that can meet the performance criteria.

3.0 Definitions

3.1 *Analytical System* is the combined equipment and apparatus used to perform sample analyses. This includes any associated sample preparation apparatus e.g., digestion equipment, spiking systems, reduction devices, etc., as well as analytical instrumentation such as UV AA and UV AF cold vapor analyzers.

3.2 *Calibration Standards* are the Hg containing solutions prepared from NIST traceable standards and are used to directly calibrate analytical systems.

3.3 *Independent Calibration Standard* is a NIST traceable standard obtained from a source or supplier independent of that for the calibration standards and is used to confirm the integrity of the calibration standards used.

3.4 *Method Detection Limit (MDL)* is the lowest mass of Hg greater than zero that can be estimated and reported by your candidate analytical technique. The MDL is statistically derived from replicate low level measurements near your analytical instrument's detection level.

3.5 *NIST* means the National Institute of Standards and Technology, located in Gaithersburg, Maryland.

3.6 *Run* means a series of gas samples taken successively from the stack or duct. A test normally consists of a specific number of runs.

3.7 *Sorbent Trap* means a cartridge or sleeve containing a sorbent media (typically activated carbon treated with iodine or some other halogen) with multiple sections separated by an inert material such as glass wool. These sorbent traps are optimized for the quantitative capture of elemental and oxidized forms of Hg and can be analyzed by multiple techniques.

3.8 *Test* refers to the series of runs required by the applicable regulation.

3.9 *Thermal Analysis* means an analytical technique where the contents of the sorbent traps are analyzed using a thermal technique (desorption or combustion) to release the captured Hg in a detectable form for quantification.

3.10 *Wet Analysis* means an analytical technique where the contents of the sorbent tube are first leached or digested to quantitatively transfer the captured Hg to liquid solution for subsequent analysis.

4.0 Interferences

Interferences may result from the sorbent trap material used as well as from the measurement environment itself. The iodine present on some sorbent traps may impart a negative measurement bias. High levels of sulfur trioxide (SO_3) are also suspected to compromise the performance of sorbent trap Hg capture. These, and other, potential interferences are assessed by performing the analytical matrix interference, Hg^0 and $HgCl_2$ analytical bias and field recovery tests.

5.0 Safety

What safety measures should I consider when using this method? This method may require you to work with hazardous materials and in hazardous conditions. You are encouraged to establish safety procedures before using the method. Among other precautions, you should become familiar with the safety recommendations in the gas analyzer user's manual. Occupational Safety and Health Administration (OSHA) regulations concerning use of compressed gas cylinders and noxious gases may apply.

5.1 Site Hazards. Prior to applying these procedures/specifications in the field, the potential hazards at the test site should be considered; advance coordination with the site is critical to understand the conditions and applicable safety policies. At a minimum, portions of the sampling system will be hot, requiring appropriate gloves, long sleeves, and caution in handling this equipment.

5.2 Laboratory Safety. Policies should be in place to minimize risk of chemical exposure and to properly handle waste disposal in the laboratory. Personnel shall wear appropriate laboratory attire according to a Chemical Hygiene Plan established by the laboratory.

5.3 Reagent Toxicity/Carcinogenicity. The toxicity and carcinogenicity of any reagents used must be considered. Depending upon the sampling and analytical technologies selected, this measurement may involve hazardous materials, operations, and equipment and this method does not address all of the safety problems associated with implementing this approach. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicable regulatory limitations prior to performance. Any chemical should be regarded as a potential health hazard and exposure to these compounds should be minimized. Chemists should refer to the Material Safety Data Sheet (MSDS) for each chemical used.

5.4 Waste Disposal. Any waste generated by this procedure must be disposed of according to a hazardous materials management plan that details and tracks various waste streams and disposal procedures.

6.0 Equipment and Supplies

The following list is presented as an example of key equipment and supplies likely required to measure vapor-phase Hg using a sorbent trap sampling system. It is recognized that additional equipment and supplies may be needed. Collection of paired samples is required.

6.1 Sorbent Trap Sampling System. A typical sorbent trap sampling system is shown in Figure 30B-1 in section 17.0. The sorbent trap sampling system shall include the following components:

6.1.1 Sorbent Traps. The sorbent media used to collect Hg must be configured in a trap with at least two distinct segments or sections, connected in series, that are amenable to separate analyses. section 1 is designated for primary capture of gaseous Hg. section 2 is designated as a backup section for determination of vapor phase Hg breakthrough. Each sorbent trap must be inscribed or otherwise permanently marked with a unique identification number, for tracking purposes. The sorbent media may be any collection material (e.g., carbon, chemically-treated filter, etc.) capable of quantitatively capturing and recovering for subsequent analysis, all gaseous forms of Hg in the emissions from the intended application. Selection of the sorbent media shall be based on the material's ability to achieve the performance criteria contained in this method as well as the sorbent's vapor phase Hg capture efficiency for the emissions matrix and the expected sampling duration at the test site. The sorbent media must be obtained from a source that can demonstrate their quality assurance and quality control (see section 7.2). The paired sorbent traps are supported on a probe (or probes) and inserted directly into the flue gas stream.

6.1.2 Sampling Probe Assembly. Each probe assembly shall have a leak-free attachment to the sorbent trap(s). Each sorbent trap must be mounted at the entrance of or within the probe such that the gas sampled enters the trap directly. Each probe/sorbent trap assembly must be heated to a temperature sufficient to prevent liquid condensation in the sorbent trap(s). Auxiliary heating is required only where the stack temperature is too low to prevent condensation. Use a calibrated thermocouple to monitor the stack temperature. A single probe capable of operating the paired sorbent traps may be used. Alternatively, individual probe/sorbent trap assemblies may be used, provided that the individual sorbent traps are co-located to ensure representative Hg monitoring.

6.1.3 Moisture Removal Device. A moisture removal device or system shall be used to remove water vapor from the gas stream prior to entering dry gas flow metering devices.

6.1.4 Vacuum Pump. Use a leak-tight, vacuum pump capable of operating within the system's flow range.

6.1.5 Gas Flow Meter. A gas flow meter (such as a dry gas meter, thermal mass flow meter, or other suitable measurement device) shall be used to determine the total sample volume on a dry basis, in units of standard cubic meters. The meter must be sufficiently accurate to measure the total sample volume to within 2 percent and must be calibrated at selected flow rates across the range of sample flow rates at which the sampling train will be operated. The gas flow meter shall be equipped with any necessary auxiliary measurement devices (e.g., temperature sensors, pressure measurement devices) needed to correct the sample volume to standard conditions.

6.1.6 Sample Flow Rate Meter and Controller. Use a flow rate indicator and controller for maintaining necessary sampling flow rates.

6.1.7 Temperature Sensor. Same as section 6.1.1.7 of Method 5 in Appendix A-3 to this part.

6.1.8 Barometer. Same as section 6.1.2 of Method 5 in Appendix A-3 to this part.

6.1.9 Data Logger (optional). Device for recording associated and necessary ancillary information (e.g., temperatures, pressures, flow, time, etc.).

6.2 Gaseous Hg^0 Sorbent Trap Spiking System. A known mass of gaseous Hg^0 must be either present on or spiked onto the first section of sorbent traps in order to perform the Hg^0 and $HgCl_2$ analytical bias test and the field recovery study. Any approach capable of quantitatively delivering known masses of Hg^0 onto sorbent traps is acceptable. Several spiking technologies or devices are available to meet this objective. Their practicality is a function of Hg mass spike levels. For low levels, NIST-certified or NIST-traceable gas generators or tanks may be suitable. An alternative system, capable of delivering almost any mass required, makes use of NIST-certified or NIST-traceable Hg salt solutions (e.g., $HgCl_2$, $Hg(NO_3)_2$). With this system, an aliquot of known volume and concentration is added to a reaction vessel containing a reducing agent (e.g., stannous chloride); the Hg salt solution is reduced to Hg^0 and purged onto the sorbent trap using an impinger sparging system. When available, information on example spiking systems will be posted at *http://www.epa.gov/ttn/emc.*

6.3 Sample Analysis Equipment. Any analytical system capable of quantitatively recovering and quantifying total Hg from the sorbent media selected is acceptable provided that the analysis can meet the performance criteria described in this method. Example recovery techniques include acid leaching, digestion, and thermal desorption/direct combustion. Example analytical techniques include, but are not limited to, ultraviolet atomic fluorescence (UV AF), ultraviolet atomic absorption (UV AA) with and without gold trapping, and X-ray fluorescence (XRF) analysis.

6.3 Moisture Measurement System. If correction of the measured Hg emissions for moisture is required (see section 8.3.3.7), either Method 4 in Appendix A-3 to this part or other moisture measurement methods approved by the Administrator will be needed to measure stack gas moisture content.

7.0 Reagents and Standards

7.1 Reagents and Standards. Only NIST-certified or NIST-traceable calibration standards, standard reference materials, and reagents shall be used for the tests and procedures required by this method.

7.2 Sorbent Trap Media. The sorbent trap media shall be prepared such that the material used for testing is of known and acceptable quality. Sorbent supplier quality assurance/quality control measures to ensure appropriate and consistent performance such as sorptive capacity, uniformity of preparation treatments, and background levels shall be considered.

8.0 Sample Collection and Handling

This section presents the sample collection and handling procedures along with the pretest and on-site performance tests required by this method. Since you may choose different options to comply with certain performance criteria, each test report must identify the specific options selected and document the results with respect to the performance criteria of this method.

8.1 Sample Point Selection. What sampling site and sampling points do I select? Same as section 8.1 of Method 30A of this appendix.

8.2 Measurement System Performance Tests. What performance criteria must my measurement system meet? The following laboratory and field procedures and associated criteria of this section are designed to ensure (1) selection of a sorbent and analytical technique combination capable of quantitative collection and analysis of gaseous Hg, (2) collection of an adequate amount of Hg on each sorbent trap during field tests, and (3) adequate performance of the method for each test program: The primary objectives of these performance tests are to characterize and verify the performance of your intended analytical system and associated sampling and analytical procedures, and to define the minimum amount of Hg (as the sample collection target) that can be quantified reliably.

(a) Analytical Matrix Interference Test;

(b) Determination of Minimum Sample Mass;

(c) Hg^0 and $HgCl_2$ Analytical Bias Test;

(d) Determination of Nominal Sample Volume;

(e) Field Recovery Test.

8.2.1 Analytical Matrix Interference Test and Minimum Sample Dilution.

(a) The analytical matrix interference test is a laboratory procedure. It is required only if you elect to use a liquid digestion analytical approach and needs to be performed only once for each sorbent material used. The purpose of the test is to verify the presence or absence of known and potential analytical matrix interferences, including the potential negative bias associated with iodine common to many sorbent trap materials. The analytical matrix interference test determines the minimum dilution (if any) necessary to mitigate matrix effects on the sample digestate solutions.

(b) The result of the analytical matrix interference test, i.e., the minimum sample dilution required (if any) for all sample analyses, is used to establish the minimum sample mass needed for the Hg^0 and $HgCl_2$ analytical bias test and to determine the nominal sample volume for a test run. The analytical matrix interference test is sorbent material-specific and shall be performed for each sorbent material you intend to use for field sampling and analysis. The test shall be performed using a mass of sorbent material comparable to the sorbent mass typically used in the first section of the trap for sampling. Similar sorbent materials from different sources of supply are considered to be different materials and must be tested individually. You must conduct the analytical matrix interference test for each sorbent material prior to the analysis of field samples.

8.2.1.1 Analytical Matrix Interference Test Procedures. Digest and prepare for analysis a representative mass of sorbent material (unsampled) according to your intended laboratory techniques for field samples. Analyze the digestate according to your intended analytical conditions at the least diluted level you intend to use for sample analysis (e.g., undiluted, 1 in 10 dilution, etc.). Determine the Hg concentration of the undiluted digestate solution. Prepare a series of solutions with a fixed final volume containing graduated aliquots of the sample digestate and, a fixed aliquot of a calibration standard (with the balance being Hg-free reagent or H_20) to establish solutions of varied digestate dilution ratio (e.g., 1:2, 1:5, 1:10, 1:100, etc.—see example in section 8.2.1.3, below). One of these solutions should contain only the aliquot of the calibration standard in Hg-free reagent or H_2O. This will result in a series of solutions where the amount of Hg is held relatively constant and only the volume of digestate diluted is varied. Analyze each of these solutions following intended sample analytical procedures and conditions, determining the concentration for each solution.

8.2.1.2 Analytical Matrix Interference Test Acceptance Criteria. Compare the measured concentration of each solution containing digestate to the measured concentration of the digestate-free solution. The lowest dilution ratio of any solution having a Hg concentration within ±5 percent of the digestate-free solution is the minimum dilution ratio required for analysis of all samples. If you desire to measure the digestate without dilution, the ±5 percent criterion must be met at a dilution ratio of at least 9:10 (i.e., ≥90% digestate).

8.2.1.3 Example Analytical Matrix Interference Test. An example analytical matrix interference test is presented below. Additional information on the conduct of the analytical matrix interference test will be posted at *http://www.epa.gov/ttn/emc.*Determine the most sensitive working range for the analyzer to be used. This will be a narrow range of concentrations. Digest and prepare for analysis a representative mass of sorbent material (unsampled) according to your intended laboratory techniques for sample preparation and analysis. Prepare a calibration curve for the most sensitive analytical region, e.g., 0.0, 0.5, 1.0, 3.0, 5.0, 10 ppb. Using the highest calibration standard, e.g., 10.0 ppb, prepare a series of solutions by adding successively smaller increments of the digestate to a fixed volume of the calibration standard and bringing each solution to a final fixed volume with mercury-free deionized water (diH_2O). To 2.0 ml of the calibration standard add 18.0, 10.0, 4.0, 2.0, 1.0, 0.2, and 0.0 ml of the digestate. Bring the final volume of each solution to a total volume of 20 ml by adding 0.0, 8.0, 14.0, 16.0, 17.0, 17.8, and 18.0 ml of diH_2O. This will yield solutions with dilution ratios of 9:10, 1:2, 1:5, 1:10, 1:20, 1:100, and 0:10, respectively. Determine the Hg concentration of each solution. The dilution ratio of any solution having a concentration that is within ±5 percent of the concentration of the solution containing 0.0 ml of digestate is an acceptable dilution ratio for analyzing field samples. If more than one solution meets this criterion, the one with the lowest dilution ratio is the minimum dilution required for analysis of field samples. If the 9:10 dilution meets this criterion, then no sample dilution is required.

8.2.2 Determination of Minimum Sample Mass. The minimum mass of Hg that must be collected per sample must be determined. This information is necessary in order to effectively perform the Hg^0 and $HgCl_2$ Analytical Bias Test, to estimate target sample volumes/sample times for test runs, and to ensure the quality of the measurements. The determination of minimum sample mass is a direct function of analytical technique, measurement sensitivity, dilutions, etc. This determination is required for all analytical techniques. Based on the analytical approach you employ, you should determine the most sensitive calibration range. Based on a calibration point within that range, you must consider all sample treatments (e.g., dilutions) to determine the mass of sample that needs to be collected to ensure that all sample analyses fall within your calibration curve.

8.2.2.1 Determination of Minimum Calibration Concentration or Mass. Based on your instrument's sensitivity and linearity, determine the calibration concentrations or masses that make up a representative low level calibration range. Verify that you are able to meet the multipoint calibration performance criteria in section 11.0 of this method. Select a calibration concentration or mass that is no less than 2 times the lowest concentration or mass in your calibration curve. The lowest point in your calibration curve must be at least 5, and preferably 10, times the Method Detection Limit (MDL), which is the minimum amount of the analyte that can be detected and reported. The MDL must be determined at least once for the analytical system using an MDL study such as that found in section 15.0 to Method 301 of appendix A to part 63 of this chapter.

NOTE TO SECTION 8.2.2.1: While it might be desirable to base the minimum calibration concentration or mass on the lowest point in the calibration curve, selecting a higher concentration or mass is necessary to ensure that all analyses of the field samples will fall within the calibration curve. Therefore, it is strongly recommended that you select a minimum calibration concentration or mass that is sufficiently above the lowest point of the calibration curve (see examples in sections 8.2.2.2.1 and 8.2.2.2.2 below).

8.2.2.2 Determination of Minimum Sample Mass. Based on your minimum calibration concentration or mass and other sample treatments including, but not limited to, final digestate volume and minimum sample dilution, determine the minimum sample mass. Consideration should also be given to the Hg levels expected to be measured in section 2 of the sorbent traps and to the breakthrough criteria presented in Table 9-1.

8.2.2.2.1 Example Determination of Minimum Sample Mass for Thermal Desorption Analysis. A thermal analysis system has been calibrated at five Hg mass levels: 10 ng, 20 ng, 50 ng, 100 ng, 200 ng, and shown to meet the calibration performance criteria in this method. Based on 2 times the lowest point in the calibration curve, 20 ng is selected as the minimum calibration mass. Because the entire sample is analyzed and there are no dilutions involved, the minimum sample mass is also 20 ng.

NOTE: In this example, if the typical background (blank) Hg levels in section 2 were relatively high (e.g., 3 to 5 ng), a sample mass of 20 ng might not have been sufficient to ensure that the breakthrough criteria in Table 9-1 would be met, thereby necessitating the use of a higher point on the calibration curve (e.g., 50 ng) as the minimum calibration and sample mass.

8.2.2.2.2 Example Determination of Minimum Sample Mass for Acid Leachate/Digestate Analysis. A cold vapor analysis system has been calibrated at four Hg concentration levels: 2 ng/L, 5 ng, 10 ng/L, 20 ng/L, and shown to meet the calibration performance criteria in this method. Based on 2 times the lowest point in the calibration curve, 4 ng/L was selected as the minimum calibration concentration. The final sample volume of a digestate is nominally 50 ml (0.05 L) and the minimum dilution necessary was determined to be 1:100 by the Analytical Matrix Interference Test of section 8.2.1. The following calculation would be used to determine the minimum sample mass.

Minimum sample mass = (4 ng/L) × (0.05 L) × (100) = 20 ng

NOTE: In this example, if the typical background (blank) Hg levels in section 2 were relatively high (e.g., 3 to 5 ng), a sample mass of 20 ng might not have been sufficient to ensure that the breakthrough criterion in Table 9-1 would be met, thereby necessitating the use of a higher point on the calibration curve (e.g., 10 ng/L) as the minimum calibration concentration.

8.2.3 Hg^0 and $HgCl_2$ Analytical Bias Test. Before analyzing any field samples, the laboratory must demonstrate the ability to recover and accurately quantify Hg^0 and $HgCl_2$ from the chosen sorbent media by performing the following analytical bias test for sorbent traps spiked with Hg^0 and $HgCl_2$. The analytical bias test is performed at a minimum of two distinct sorbent trap Hg loadings that will: (1) Represent the lower and upper bound of sample Hg loadings for application of the analytical technique to the field samples, and (2) be used for data validation.

8.2.3.1 Hg^0 and $HgCl_2$ Analytical Bias Test Procedures. Determine the lower and upper bound mass loadings. The minimum sample mass established in section 8.2.2.2 can be used for the lower bound Hg mass loading although lower Hg loading levels are acceptable. The upper bound Hg loading level should be an estimate of the greatest mass loading that may result as a function of stack concentration and volume sampled. As previously noted, this test defines the bounds that actual field samples must be within in order to be valid.

8.2.3.1.1 Hg^0 Analytical Bias Test. Analyze the front section of three sorbent traps containing Hg^0 at the lower bound mass loading level and the front section of three sorbent traps containing Hg^0 at the upper bound mass loading level. In other words, analyze each mass loading level in triplicate. You may refer to section 6.2 for spiking guidance. Prepare and analyze each spiked trap, using the same techniques that will be used to prepare and analyze the field samples. The average recovery for the three traps at each mass loading level must be between 90 and 110 percent. If multiple types of sorbent media are to be analyzed, a separate analytical bias test is required for each sorbent material.

8.2.3.1.2 $HgCl_2$ Analytical Bias Test. Analyze the front section of three sorbent traps containing $HgCl_2$ at the lower bound mass loading level and the front section of three traps containing $HgCl_2$ at the upper bound mass loading level. $HgCl_2$can be spiked as a gas, or as a liquid solution containing $HgCl_2$. However the liquid volume spiked must be <100 µL. Prepare and analyze each spiked trap, using the techniques that will be used to prepare and analyze the field samples. The average recovery for three traps at each spike concentration must be between 90 and 110 percent. Again, if multiple types of sorbent media are to be analyzed, a separate analytical bias test is required for each sorbent material.

8.2.4 Determination of Target Sample Volume. The target sample volume is an estimate of the sample volume needed to ensure that valid emissions data are collected (i.e., that sample mass Hg loadings fall within the analytical calibration curve and are within the upper and lower bounds set by the analytical bias tests). The target sample volume and minimum sample mass can also be determined by performing a diagnostic test run prior to initiation of formal testing.

Example: If the minimum sample mass is 50 ng and the concentration of mercury in the stack gas is estimated to be 2 $\mu g/m^3$ (ng/L) then the following calculation would be used to determine the target sample volume:

Target Sample Volume = (50 ng) / (2 ng/L) = 25 L

NOTE TO SECTION 8.2.4: For the purposes of relative accuracy testing of Hg monitoring systems under subpart UUUUU of part 63 of this chapter and Performance Specifications 12A and 12B in appendix B to this part, when the stack gas Hg concentration is expected to be very low (<0.5 µg/dscm), you may estimate the Hg concentration at 0.5 µg/dscm.

8.2.5 Determination of Sample Run Time. Sample run time will be a function of minimum sample mass (see section 8.2.2), target sample volume and nominal equipment sample flow rate. The minimum sample run time for conducting relative accuracy test audits of Hg monitoring systems is 30 minutes and for emissions testing to characterize an emission source is 1 hour. The target sample run time can be calculated using the following example.

Example: If the target sample volume has been determined to be 25 L, then the following formula would be used to determine the sampling time necessary to acquire 25 L of gas when sampling at a rate of 0.4 L/min.

Sampling time (min) = 25 L / 0.4 L/min = 63 minutes

8.2.6 Field Recovery Test. The field recovery test provides a test program-specific verification of the performance of the combined sampling and analytical approach. Three sets of paired samples, one of each pair which is spiked with a known level of Hg, are collected and analyzed and the average recovery of the spiked samples is used to verify performance of the measurement system under field conditions during that test program. The conduct of this test requires an estimate or confirmation of the stack Hg concentrations at the time of testing.

8.2.6.1 Calculation of Pre-sampling Spiking Level. Determine the sorbent trap spiking level for the field recovery test using estimates of the stack Hg concentration, the target sample flow rate, and the planned sample duration. First, determine the Hg mass expected to be collected in section 1 of the sorbent trap. The pre-sampling spike must be within 50 to 150 percent of this expected mass.

Example calculation: For an expected stack Hg concentration of 5 ug/m^3 (ng/L) a target sample rate of 0.40 liters/min, and a sample duration of 1 hour:

$$(0.40 \text{ L/min}) * (60 \text{ min}) * (5\text{ng/L}) = 120 \text{ ng}$$

A Hg spike of 60 to 180 ng (50-150% of 120 ng) would be appropriate.

8.2.6.2 Procedures. Set up two identical sampling trains. One of the sampling trains shall be designated the spiked train and the other the unspiked train. Spike Hg^0 onto the front section of the sorbent trap in the spiked train before sampling. The mass of Hg spiked shall be 50 to 150 percent of the mass expected to be collected with the unspiked train. Sample the stack gas with the two trains simultaneously using the same procedures as for the field samples (see section 8.3). The total sample volume must be within ±20 percent of the target sample volume for the field sample test runs. Analyze the sorbent traps from the two trains utilizing the same analytical procedures and instrumentation as for the field samples (see section 11.0). Determine the fraction of spiked Hg recovered (R) using the equations in section 12.7. Repeat this procedure for a total of three runs. Report the individual R values in the test report; the average of the three R values must be between 85 and 115 percent.

NOTE TO SECTION 8.2.6.2: It is acceptable to perform the field recovery test concurrent with actual test runs (e.g., through the use of a quad probe). It is also acceptable to use the field recovery test runs as test runs for emissions testing or for the RATA of a Hg monitoring system under subpart UUUUU of part 63 of this chapter and Performance Specifications 12A and 12B in appendix B to this part, if certain conditions are met. To determine whether a particular field recovery test run may be used as a RATA run, subtract the mass of the Hg^0 spike from the total Hg mass collected in sections 1 and 2 of the spiked trap. The difference represents the mass of Hg in the stack gas sample. Divide this mass by the sample volume to obtain the Hg concentration in the effluent gas stream, as measured with the spiked trap. Compare this concentration to the corresponding Hg concentration measured with the unspiked trap. If the paired trains meet the relative deviation and other applicable data validation criteria in Table 9-1, then the average of the two Hg concentrations may be used as an emissions test run value or as the reference method value for a RATA run.

8.3 Sampling. This section describes the procedures and criteria for collecting the field samples for analysis. As noted in section 8.2.6, the field recovery test samples are also collected using these procedures.

8.3.1 Pre-test leak check. Perform a leak check of the sampling system with the sorbent traps in place. For each of the paired sampling trains, draw a vacuum in the train, and adjust the vacuum to ~15″ Hg; and, using the gas flow meter, determine leak rate. The leak rate for an individual train must not exceed 4 percent of the target sampling rate. Once the leak check passes this criterion, carefully release the vacuum in the sample train, then seal the sorbent trap inlet until the probe is ready for insertion into the stack or duct.

8.3.2 Determination of Flue Gas Characteristics. Determine or measure the flue gas measurement environment characteristics (gas temperature, static pressure, gas velocity, stack moisture, etc.) in order to determine ancillary requirements such as probe heating requirements (if any), initial sampling rate, moisture management, etc.

8.3.3 Sample Collection

8.3.3.1 Remove the plug from the end of each sorbent trap and store each plug in a clean sorbent trap storage container. Remove the stack or duct port cap and insert the probe(s). Secure the probe(s) and ensure that no leakage occurs between the duct and environment.

8.3.3.2 Record initial data including the sorbent trap ID, date, and the run start time.

8.3.3.3 Record the initial gas flow meter reading, stack temperature, meter temperatures (if needed), and any other appropriate information, before beginning sampling. Begin sampling and target a sampling flow rate similar to that for the field recovery test. Then, at regular intervals (≤5 minutes) during the sampling period, record the date and time, the sample flow rate, the gas meter reading, the stack temperature, the flow meter temperatures (if using a dry gas meter), temperatures of heated equipment such as the vacuum lines and the probes (if heated), and the sampling system vacuum readings. Adjust the sampling flow rate as necessary to maintain the initial sample flow rate. Ensure that the total volume sampled for each run is within 20 percent of the total volume sampled for the field recovery test.

8.3.3.4 Data Recording. Obtain and record any essential operating data for the facility during the test period, e.g., the barometric pressure must be obtained for correcting sample volume to standard conditions when using a dry gas meter. At the end of the data collection period, record the final gas flow meter reading and the final values of all other essential parameters.

8.3.3.5 Post-Test Leak Check. When sampling is completed, turn off the sample pump, remove the probe(s) with sorbent traps from the port, and carefully seal the end of each sorbent trap. Perform another leak check of each sampling train with the sorbent trap in place, at the maximum vacuum reached during the sampling period. Record the leakage rates and vacuums. The leakage rate for each train must not exceed 4 percent of the average sampling rate for the data collection period. Following each leak check, carefully release the vacuum in the sample train.

8.3.3.6 Sample Recovery. Recover each sampled sorbent trap by removing it from the probe and sealing both ends. Wipe any deposited material from the outside of the sorbent trap. Place the sorbent trap into an appropriate sample storage container and store/preserve in appropriate manner (see section 8.3.3.8).

8.3.3.7 Stack Gas Moisture Determination. If the moisture basis of the measurements made with this method (dry) is different from the moisture basis of either: (1) the applicable emission limit; or (2) a Hg CEMS being evaluated for relative accuracy, you must determine the moisture content of the flue gas and correct for moisture using Method 4 in appendix A-3 to this part. If correction of the measured Hg concentrations for moisture is required, at least one Method 4 moisture determination shall be made during each test run.

8.3.3.8 Sample Handling, Preservation, Storage, and Transport. While the performance criteria of this approach provide for verification of appropriate sample handling, it is still important that the user consider, determine, and plan for suitable sample preservation, storage, transport, and holding times for these measurements. Therefore, procedures in ASTM WK223 “Guide for Packaging and Shipping Environmental Samples for Laboratory Analysis” shall be followed for all samples, where appropriate. To avoid Hg contamination of the samples, special attention should be paid to cleanliness during transport, field handling, sampling, recovery, and laboratory analysis, as well as during preparation of the sorbent cartridges. Collection and analysis of blank samples (e.g., reagent, sorbent, field, etc.,) is useful in verifying the absence or source of contaminant Hg.

8.3.3.9 Sample Custody. Proper procedures and documentation for sample chain of custody are critical to ensuring data integrity. The chain of custody procedures in ASTM D4840-99 “Standard Guide for Sampling Chain-of-Custody Procedures” shall be followed for all samples (including field samples and blanks).

9.0 Quality Assurance and Quality Control

Table 9-1 summarizes the QA/QC performance criteria that are used to validate the Hg emissions data from Method 30B sorbent trap measurement systems.

TABLE 9-1—QUALITY ASSURANCE/QUALITY CONTROL CRITERIA FOR METHOD 30B

QA/QC test or specification	Acceptance criteria	Frequency	Consequences if not met
Gas flow meter calibration (At 3 settings or points)	Calibration factor (Y_i) at each flow rate must be within ±2% of the average value (Y)	Prior to initial use and when post-test check is not within ±5% of Y	Recalibrate at 3 points until the acceptance criteria are met.
Gas flow meter post-test calibration check (Single-point)	Calibration factor (Y_i) must be within ±5% of the Y value from the most recent 3-point calibration	After each field test. For mass flow meters, must be done on-site, using stack gas	Recalibrate gas flow meter at 3 points to determine a new value of Y. For mass flow meters, must be done on-site, using stack gas. Apply the new Y value to the field test data.
Temperature sensor calibration	Absolute temperature measures by sensor within ±1.5% of a reference sensor	Prior to initial use and before each test thereafter	Recalibrate; sensor may not be used until specification is met.
Barometer calibration	Absolute pressure measured by instrument within ±10 mm Hg of reading with a mercury barometer or NIST traceable barometer	Prior to initial use and before each test thereafter	Recalibrate; instrument may not be used until specification is met.
Pre-test leak check	≤4% of target sampling rate	Prior to sampling	Sampling shall not commence until the leak check is passed.
Post-test leak check	≤4% of average sampling rate	After sampling	Sample invalidated.*
Analytical matrix interference test (wet chemical analysis, only)	Establish minimum dilution (if any) needed to eliminate sorbent matrix interferences	Prior to analyzing any field samples; repeat for each type of sorbent used	Field sample results not validated.
Analytical bias test	Average recovery between 90% and 110% for Hg^0 and $HgCl_2$ at each of the 2 spike concentration levels	Prior to analyzing field samples and prior to use of new sorbent media	Field samples shall not be analyzed until the percent recovery criteria has been met.
Multipoint analyzer calibration	Each analyzer reading within ±10% of true value *and* $r^2 \geq 0.99$	On the day of analysis, before analyzing any samples	Recalibrate until successful.
Analysis of	Within ±10% of true value	Following daily	Recalibrate and repeat

independent calibration standard		calibration, prior to analyzing field samples	independent standard analysis until successful.
Analysis of continuing calibration verification standard (CCVS)	Within ±10% of true value	Following daily calibration, after analyzing ≤10 field samples, and at end of each set of analyses	Recalibrate and repeat independent standard analysis, reanalyze samples until successful, if possible; for destructive techniques, samples invalidated.
Test run total sample volume	Within ±20% of total volume sampled during field recovery test	Each individual sample	Sample invalidated.
Sorbent trap section 2 breakthrough	For compliance/emissions testing:	Every sample	Sample invalidated.*
	≤10% of section 1 Hg mass for Hg concentrations >1 µg/dscm;		
	≤20% of section 1 Hg mass for Hg concentrations ≤1 µg/dscm		
	≤50% of section 1 Hg mass if the stack Hg concentration is ≤30% of the Hg concentration that is equivalent to the applicable emission limit		
	For relative accuracy testing:		
	≤10% of section 1 Hg mass for Hg concentrations >1 µg/dscm;		
	≤20% of section 1 Hg mass for Hg concentrations ≤1 µg/dscm and >0.5 µg/dscm;		
	≤50% of section 1 Hg mass for Hg concentrations ≤0.5 µg/dscm >0.1 µg/dscm;		
	no criterion for Hg concentrations ≤0.1 µg/dscm		

	(must meet all other QA/QC specifications)		
Paired sorbent trap agreement	≤10% Relative Deviation (RD) mass for Hg concentrations >1 µg/dscm;	Every run	Run invalidated.*
	≤20% RD or ≤0.2 µg/dscm absolute difference for Hg concentrations ≤1 µg/dscm		
Sample analysis	Within valid calibration range (within calibration curve)	All Section 1 samples where stack Hg concentration is ≥0.02 µg/dscm except in case where stack Hg concentration is ≤30% of the applicable emission limit	Reanalyze at more concentrated level if possible, samples invalidated if not within calibrated range.
Sample analysis	Within bounds of Hg^0 and $HgCl_2$ Analytical Bias Test	All Section 1 samples where stack Hg concentration is ≥0.5 µg/dscm	Expand bounds of Hg^0 and $HgCl_2$Analytical Bias Test; if not successful, samples invalidated.
Field recovery test	Average recovery between 85% and 115% for Hg^0	Once per field test	Field sample runs not validated without successful field recovery test.

*And data from the pair of sorbent traps are also invalidated.

10.0 Calibration and Standardization

10.1 Only NIST-certified and NIST-traceable calibration standards (i.e., calibration gases, solutions, etc.) shall be used for the spiking and analytical procedures in this method.

10.2 Gas Flow Meter Calibration.

10.2.1 Preliminaries. The manufacturer or equipment supplier of the gas flow meter should perform all necessary set-up, testing, programming, etc., and should provide the end user with any necessary instructions, to ensure that the meter will give an accurate readout of dry gas volume in standard cubic meters for this method.

10.2.2 Initial Calibration. Prior to its initial use, a calibration of the gas flow meter shall be performed. The initial calibration may be done by the manufacturer, by the equipment supplier, or by the end user. If the flow meter is volumetric in nature (*e.g.*, a dry gas meter), the manufacturer or end user may perform a direct volumetric calibration using any gas. For a mass flow meter, the manufacturer, equipment supplier, or end user may calibrate the meter using either: (1) A bottled gas mixture containing 12 ±0.5% CO_2, 7 ±0.5% O_2, and balance N_2 (when this method is applied to coal-fired boilers); (2) a bottled gas mixture containing CO_2, O_2, and N_2 in proportions representative of the expected stack gas composition; or (3) the actual stack gas.

10.2.2.1 Initial Calibration Procedures. Determine an average calibration factor (Y) for the gas flow meter by calibrating it at three sample flow rate settings covering the range of sample flow rates at which the sampling system will be operated. You may either follow the procedures in section 10.3.1 of Method 5 in appendix A-3 to this part or in section 16 of Method 5 in appendix A-3 to this part. If a dry gas meter is being calibrated, use at least five revolutions of the meter at each flow rate.

10.2.2.2 Alternative Initial Calibration Procedures. Alternatively, you may perform the initial calibration of the gas flow meter using a reference gas flow meter (RGFM). The RGFM may be: (1) A wet test meter calibrated according to section 10.3.1 of Method 5 in appendix A-3 to this part; (2) a gas flow metering device calibrated at multiple flow rates using the procedures in section 16 of Method 5 in appendix A-3 to this part; or (3) a NIST-traceable calibration device capable of measuring volumetric flow to an accuracy of 1 percent. To calibrate the gas flow meter using the RGFM, proceed as follows: While the Method 30B sampling system is sampling the actual stack gas or a compressed gas mixture that simulates the stack gas composition (as applicable), connect the RGFM to the discharge of the system. Care should be taken to minimize the dead volume between the gas flow meter being tested and the RGFM. Concurrently measure dry stack gas volume with the RGFM and the flow meter being calibrated for at least 10 minutes at each of three flow rates covering the typical range of operation of the sampling system. For each set of concurrent measurements, record the total sample volume, in units of dry standard cubic meters (dscm), measured by the RGFM and the gas flow meter being tested.

10.2.2.3 Initial Calibration Factor. Calculate an individual calibration factor Y_i at each tested flow rate from section 10.2.2.1 or 10.2.2.2 of this method (as applicable) by taking the ratio of the reference sample volume to the sample volume recorded by the gas flow meter. Average the three Y_i values, to determine Y, the calibration factor for the flow meter. Each of the three individual values of Y_i must be within ±0.02 of Y. Except as otherwise provided in sections 10.2.2.4 and 10.2.2.5 of this method, use the average Y value from the initial 3-point calibration to adjust subsequent gas volume measurements made with the gas flow meter.

10.2.2.4 Pretest On-Site Calibration Check (Optional). For a mass flow meter, if the most recent 3-point calibration of the flow meter was performed using a compressed gas mixture, you may want to conduct the following on-site calibration check prior to testing, to ensure that the flow meter will accurately measure the volume of the stack gas: While sampling stack gas, check the calibration of the flow meter at one intermediate flow rate setting representative of normal operation of the sampling system. If the pretest calibration check shows that the value of Y_i, the calibration factor at the tested flow rate, differs from the current value of Y by more than 5 percent, perform a full 3-point recalibration of the meter using stack gas to determine a new value of Y, and (except as otherwise provided in section 10.2.2.5 of this method) apply the new Y value to the data recorded during the field test.

10.2.2.5 Post-Test Calibration Check. Check the calibration of the gas flow meter following each field test at one intermediate flow rate setting, either at, or in close proximity to, the average sample flow rate during the field test. For dry gas meters, ensure at least three revolutions of the meter during the calibration check. For mass flow meters, this check must be performed before leaving the test site, while sampling stack gas. If a one-point calibration check shows that the value of Y_i at the tested flow rate differs by more than 5 percent from the current value of Y, repeat the full 3-point calibration procedure to determine a new value of Y, and apply the new Y value to the gas volume measurements made with the gas flow meter during the field test that was just completed. For mass flow meters, perform the 3-point recalibration while sampling stack gas.

10.3 Thermocouples and Other Temperature Sensors. Use the procedures and criteria in Section 10.3 of Method 2 in appendix A-1 to this part to calibrate in-stack temperature sensors and thermocouples. Dial thermometers shall be calibrated against mercury-in-glass thermometers or equivalent. Calibrations must be performed prior to initial use and before each field test thereafter. At each calibration point, the absolute temperature measured by the temperature sensor must agree to within ±1.5 percent of the temperature measured with the reference sensor, otherwise the sensor may not continue to be used.

10.4 Barometer. Calibrate against a mercury barometer or other NIST-traceable barometer as per Section 10.6 of Method 5 in appendix A-3 to this part. Calibration must be performed prior to initial use and before each test program, and the absolute pressure measured by the barometer must agree to within ±10 mm Hg of the pressure measured by the mercury or other NIST-traceable barometer, otherwise the barometer may not continue to be used.

10.5 Other Sensors and Gauges. Calibrate all other sensors and gauges according to the procedures specified by the instrument manufacturer(s).

10.6 Analytical System Calibration. See section 11.1 of this method.

11.0 Analytical Procedures

The analysis of Hg in the field and quality control samples may be conducted using any instrument or technology capable of quantifying total Hg from the sorbent media and meeting the performance criteria in this method. Because multiple analytical approaches, equipment and techniques are appropriate for the analysis of sorbent traps, it is not possible to provide detailed, technique-specific analytical procedures. As they become available, detailed procedures for a variety of candidate analytical approaches will be posted at *http://www.epa.gov/ttn/emc.*

11.1 Analytical System Calibration. Perform a multipoint calibration of the analyzer at three or more upscale points over the desired quantitative range (multiple calibration ranges shall be calibrated, if necessary). The field samples analyzed must fall within a calibrated, quantitative range and meet the performance criteria specified below. For samples suitable for aliquotting, a series of dilutions may be needed to ensure that the samples fall within a calibrated range. However, for sorbent media samples consumed during analysis (e.g., when using thermal desorption techniques), extra care must be taken to ensure that the analytical system is appropriately calibrated prior to sample analysis. The calibration curve range(s) should be determined such that the levels of Hg mass expected to be collected and measured will fall within the calibrated range. The calibration curve may be generated by directly introducing standard solutions into the analyzer or by spiking the standards onto the sorbent media and then introducing into the analyzer after preparing the sorbent/standard according to the particular analytical technique. For each calibration curve, the value of the square of the linear correlation coefficient, i.e., r^2, must be ≥ 0.99, and the analyzer response must be within ±10 percent of the reference value at each upscale calibration point. Calibrations must be performed on the day of the analysis, before analyzing any of the samples. Following calibration, an independent standard shall be analyzed. The measured value of the independently prepared standard must be within ±10 percent of the expected value.

11.2 Sample Preparation. Carefully separate the sections of each sorbent trap. Combine for analysis all materials associated with each section; any supporting substrate that the sample gas passes through prior to entering a media section (e.g., glass wool separators, acid gas traps, etc.) must be analyzed with that segment.

11.3 Field Sample Analyses. Analyze the sorbent trap samples following the same procedures that were used for conducting the Hg^0 and $HgCl_2$ analytical bias tests. The individual sections of the sorbent trap and their respective components must be analyzed separately (*i.e.*, section 1 and its components, then section 2 and its components). All sorbent trap section 1 sample analyses must be within the calibrated range of the analytical system as specified in Table 9-1. For wet analyses, the sample can simply be diluted to fall within the calibrated range. However, for the destructive thermal analyses, samples that are not within the calibrated range cannot be re-analyzed. As a result, the sample cannot be validated, and another sample must be collected. It is strongly suggested that the analytical system be calibrated over multiple ranges so that thermally analyzed samples fall within the calibrated range. The total mass of Hg measured in each sorbent trap section 1 must also fall within the lower and upper mass limits established during the initial Hg^0 and $HgCl_2$analytical bias test. If a sample is analyzed and found to fall outside of these limits, it is acceptable for an additional Hg^0 and $HgCl_2$ analytical bias test to be performed that now includes this level. However, some samples (e.g., the mass collected in trap section 2), may have Hg levels so low that it may not be possible to quantify them in the analytical system's calibrated range. Because a reliable estimate of these low-level Hg measurements is necessary to fully validate the emissions data, the MDL (see section 8.2.2.1 of this method) is used to establish the minimum amount that can be detected and reported. If the measured mass or concentration is below the lowest point in the calibration curve and above the MDL, the analyst must estimate the mass or concentration of the sample based on the analytical instrument response relative to an additional calibration standard at a concentration or mass between the MDL and the lowest point in the calibration curve. This is accomplished by establishing a response factor (e.g., area counts per Hg mass or concentration) and estimating the amount of Hg present in the sample based on the analytical response and this response factor.

Example: The analysis of a particular sample results in a measured mass above the MDL, but below the lowest point in the calibration curve which is 10 ng. An MDL of 1.3 ng Hg has been established by the MDL study. A calibration standard containing 5 ng of Hg is analyzed and gives an analytical response of 6,170 area counts, which equates to a response factor of 1,234 area counts/ng Hg. The analytical response for the sample is 4,840 area counts. Dividing the analytical response for the sample (4,840 area counts) by the response factor gives 3.9 ng Hg, which is the estimated mass of Hg in the sample.

11.4 Analysis of Continuing Calibration Verification Standard (CCVS). After no more than 10 samples and at the end of each set of analyses, a continuing calibration verification standard must be analyzed. The measured value of the continuing calibration standard must be within ±10 percent of the expected value.

11.5 Blanks. The analysis of blanks is optional. The analysis of blanks is useful to verify the absence of, or an acceptable level of, Hg contamination. Blank levels should be considered when quantifying low Hg levels and their potential contribution to meeting the sorbent trap section 2 breakthrough requirements; however, correcting sorbent trap results for blank levels is prohibited.

12.0 Calculations and Data Analysis

You must follow the procedures for calculation and data analysis listed in this section.

12.1 Nomenclature. The terms used in the equations are defined as follows:

B = Breakthrough (%).

B_{ws} = Moisture content of sample gas as measured by Method 4, percent/100.

C_a = Concentration of Hg for the sample collection period, for sorbent trap “a” (μg/dscm).

C_b = Concentration of Hg for the sample collection period, for sorbent trap “b” (μg/dscm).

C_d = Hg concentration, dry basis (μg/dscm).

C_{rec} = Concentration of spiked compound measured ($\mu g/m^3$).

C_w = Hg concentration, wet basis ($\mu g/m^3$).

m_1 = Mass of Hg measured on sorbent trap section 1 (μg).

m_2 = Mass of Hg measured on sorbent trap section 2 (μg).

$m_{recovered}$ = Mass of spiked Hg recovered in Analytical Bias or Field Recovery Test (μg).

m_s = Total mass of Hg measured on spiked trap in Field Recovery Test (μg).

m_{spiked} = Mass of Hg spiked in Analytical Bias or Field Recovery Test (μg).

m_u = Total mass of Hg measured on unspiked trap in Field Recovery Test (μg).

R = Percentage of spiked mass recovered (%).

RD = Relative deviation between the Hg concentrations from traps “a” and “b” (%).

v_s = Volume of gas sampled, spiked trap in Field Recovery Test (dscm).

V_t = Total volume of dry gas metered during the collection period (dscm); for the purposes of this method, standard temperature and pressure are defined as 20 °C and 760 mm Hg, respectively.

v_u = Volume of gas sampled, unspiked trap in Field Recovery Test (dscm).

12.2 Calculation of Spike Recovery (Analytical Bias Test). Calculate the percent recovery of Hg^0 and $HgCl_2$ using Equation 30B-1.

$$R = \frac{m_{recovered}}{m_{spiked}} x100 \quad \text{Eq. 30B-1}$$

12.3 Calculation of Breakthrough. Use Equation 30B-2 to calculate the percent breakthrough to the second section of the sorbent trap.

$$B = \frac{m_2}{m_1} \times 100 \quad \text{Eq. 30B-2}$$

12.4 Calculation of Hg Concentration. Calculate the Hg concentration measured with sorbent trap “a”, using Equation 30B-3.

$$C_a = \frac{(m_1 + m_2)}{V_t} \quad \text{Eq. 30B-3}$$

For sorbent trap “b”, replace “C_a ” with “C_b ” in Equation 30B-3. Report the average concentration, i.e., ½ ($C_a + C_b$).

12.5 Moisture Correction. Use Equation 30B-4 if your measurements need to be corrected to a wet basis.

$$C_w = C_d \times (1 - B_{ws}) \quad \text{Eq. 30B-4}$$

12.6 Calculation of Paired Trap Agreement. Calculate the relative deviation (RD) between the Hg concentrations measured with the paired sorbent traps using Equation 30B-5.

$$RD = \frac{|C_a - C_b|}{C_a + C_b} \times 100 \quad \text{Eq. 30B-5}$$

12.7 Calculation of Measured Spike Hg Concentration (Field Recovery Test). Calculate the measured spike concentration using Equation 30B-6.

$$C_{rec} = \frac{m_s}{v_s} - \frac{m_u}{v_u} \quad \text{Eq. 30B-6}$$

Then calculate the spiked Hg recovery, R, using Equation 30B-7.

$$R = \frac{C_{rec} \times v_s}{m_{spiked}} \times 100 \qquad \text{Eq. 30B-7}$$

13.0 Method Performance

How do I validate my data? Measurement data are validated using initial, one-time laboratory tests coupled with test program-specific tests and procedures. The analytical matrix interference test and the Hg^0 and $HgCl_2$ analytical bias test described in section 8.2 are used to verify the appropriateness of the selected analytical approach(es) as well as define the valid working ranges for sample analysis. The field recovery test serves to verify the performance of the combined sampling and analysis as applied for each test program. Field test samples are validated by meeting the above requirements as well as meeting specific sampling requirements (i.e., leak checks, paired train agreement, total sample volume agreement with field recovery test samples) and analytical requirements (i.e., valid calibration curve, continuing calibration performance, sample results within calibration curve and bounds of Hg^0 and $HgCl_2$ analytical bias test). Complete data validation requirements are summarized in Table 9-1.

14.0 Pollution Prevention [Reserved]

15.0 Waste Management [Reserved]

16.0 References

1. EPA Traceability Protocol for Qualification and Certification of Elemental Mercury Gas Generators, expected publication date December 2008, see *www.epa.gov/ttn/emc*.

2. EPA Traceability Protocol for Qualification and Certification of Oxidized Mercury Gas Generators, expected publication date December 2008, see *www.epa.gov/ttn/emc*.

3. EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards, expected revision publication date December 2008, see *www.epa.gov/ttn/emc*.

17.0 Figures and Tables

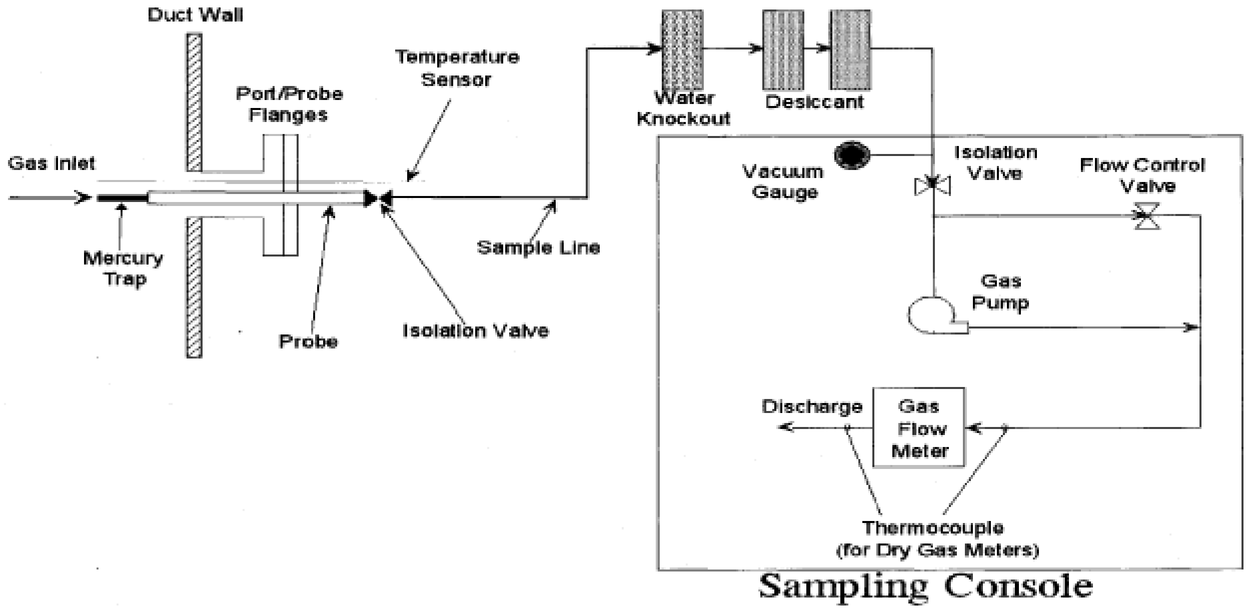


Figure 30B-1. Typical Sorbent Trap Sampling System