

# LI-7200 CO<sub>2</sub>/H<sub>2</sub>O Analyzer

## Calibration Certificate

Serial Number 72H-1044

Date: 02 Jun 2021  
Code:34873

Technician \_\_\_\_\_  
Jerry F.

### CO<sub>2</sub> Calibration Values

A = 1.03201E2

B = 1.45817E4

C = 1.00303E7

D = -1.75555E9

E = 1.66203E11

XS = -0.0002

Z = 3.01000E-5

+ SD1 = 0.0431

SD2 = -0.1003

SD3 = 2.0110

### H<sub>2</sub>O Calibration Values

A = 5.14888E3

B = 4.28555E6

C = -2.31102E8

XS = -0.0008

Z = -1.00000E-4

+ SD1 = 0.0355

SD2 = 0.8724

SD3 = 2.2650

\* Signal Strength

B = 0.053

C = 0.047

\* Ver 6.5 and above

+ Ver 7.6 and above

### Zero/Span set on 03 Jun 2021

CO2 Zero = 1.1910

CO2 Span = 0.9983 (at 752 ppm)

CO2 Span2= 0.0000

H2O Zero = 0.9935

H2O Span = 1.0107 (at 12 C)

H2O Span2= 0.0000

CX= 41245.7, WX = 47550

# LI-7550 Analyzer Interface Box

## Calibration Certificate

Serial Number AIU-2283

Date: 08 Apr 2021

Technician \_\_\_\_\_

### Pressure Sensor

A0 = 59.176

A1 = 15.506

s/n = PZ-1088

CO2 Measurements

Table with 24 columns: Type, Time, CO2(ppm), CO2(mm3), CO2Abs, CO2SD, CO2Slp, H2OAbs, TOven(C), Pa(kPa), T(C), Press, Tblk(C), APres, DPres, Fs(l/m), Cooler, ChCooler, CO2Aw, CO2Awo, H2OAw, H2OAwo, SS, Diag. Rows 1-78.

CO2(ppm) - CO2 concentration (tank value)

CO2(mm3) - Computed CO2 mole density (mmol/m3), based on mole fraction, temperature, and pressure.

CO2Abs - CO2 absorbance (unfiltered)

CO2SD - Standard deviation of CO2Abs (100 samples over 10 seconds).

H2OAbs - H2O absorbance (unfiltered)

TOven(C) - Oven temperature

T(C) - IRGA's temperature measurement from calibration tube

Press - Atmospheric pressure measured by the IRGA

Pa(kPa) - Atmospheric pressure measured by Ruska 6200

F(l/m) - Flow through calibration tube, liters/min.

Cooler - Detector cooling voltage.

AGC - Automatic gain control value (0-100%)

Diag - Diagnostics messages, plus 'C' for CO2 stability achieved, and 'H' for H2O stability achieved.

CO2 Computations

Num	ppm	abs/kPa	mmol/m3/kPa	Coeffs	Predicted	Error	%Error	Temp	Drift at 370 ppm	%/C
1	0	0E0	0	1.03201E2	0	0	0.000	45C	0.939	-0.004
2	97.7	3.36555E-4	0.0369	1.45817E4	0.03744	0.00055	1.482	33C	0.661	
3	194.2	6.27686E-4	0.07333	1.00303E7	0.07412	0.0008	1.089	18C	0.657	
4	308.8	9.30013E-4	0.11659	-1.75555E9	0.11762	0.00103	0.885	3C	0.764	
5	407.1	1.15906E-3	0.15372	1.66203E11	0.1548	0.00108	0.701	-8C	0.907	
6	504.8	1.36657E-3	0.19056		0.19192	0.00136	0.714	-22C	1.149	
7	605.7	1.56375E-3	0.22872	0.0431	0.2304	0.00168	0.735			
8	752.1	1.82354E-3	0.2839	-0.1003	0.28611	0.00221	0.778			
9	1003	2.21647E-3	0.37867	2.0108	0.38172	0.00305	0.805			
10	1481	2.83937E-3	0.55902		0.56316	0.00414	0.740			
11	1986	3.38391E-3	0.74962		0.75439	0.00477	0.637			
12	2471	3.83189E-3	0.93277		0.93719	0.00442	0.474			
13	2951	4.22517E-3	1.11372		1.11914	0.00542	0.487			
14	0	0E0	0		0	0	0.000			
15	97.7	3.51146E-4	0.0384		0.03885	0.00045	1.172			
16	194.2	6.53376E-4	0.07634		0.07695	0.00061	0.805			
17	308.8	9.65042E-4	0.12132		0.12206	0.00074	0.608			
18	407.1	1.20077E-3	0.15997		0.1607	0.00073	0.458			
19	504.8	1.41376E-3	0.19845		0.19927	0.00083	0.417			
20	605.7	1.61529E-3	0.23813		0.23917	0.00103	0.434			
21	752.1	1.88099E-3	0.29553		0.29707	0.00154	0.520			
22	1003	2.28023E-3	0.39408		0.39601	0.00193	0.490			
23	1481	2.91232E-3	0.58219		0.58406	0.00188	0.322			
24	1986	3.46295E-3	0.78091		0.78227	0.00136	0.175			
25	2471	3.91562E-3	0.97111		0.97232	0.00121	0.125			
26	2951	4.31125E-3	1.15952		1.16137	0.00184	0.159			
27	0	0E0	0		0	0	0.000			
28	97.7	3.69913E-4	0.04027		0.04074	0.00048	1.180			
29	194.2	6.85675E-4	0.08003		0.08068	0.00065	0.807			
30	308.8	1.00966E-3	0.12727		0.12804	0.00077	0.601			
31	407.1	1.25318E-3	0.16778		0.16854	0.00076	0.450			
32	504.8	1.47256E-3	0.20804		0.20898	0.00093	0.449			
33	605.7	1.6793E-3	0.24963		0.25072	0.00109	0.438			
34	752.1	1.9517E-3	0.30998		0.31139	0.00141	0.455			
35	1003	2.35963E-3	0.41339		0.41495	0.00156	0.378			
36	1481	3.00328E-3	0.61042		0.61175	0.00133	0.219			
37	1986	3.56134E-3	0.81857		0.81903	0.00046	0.057			
38	2471	4.01818E-3	1.01847		1.01771	-0.00076	-0.074			
39	2951	4.41728E-3	1.21631		1.21605	-0.00027	-0.022			
40	0	0E0	0		0	0	0.000			
41	97.7	3.91751E-4	0.04249		0.04301	0.00051	1.207			
42	194.2	7.23474E-4	0.08447		0.08521	0.00074	0.879			
43	308.8	1.06129E-3	0.13431		0.13526	0.00094	0.702			
44	407.1	1.31419E-3	0.17708		0.17812	0.00104	0.588			
45	504.8	1.54076E-3	0.21956		0.22082	0.00126	0.572			
46	605.7	1.75431E-3	0.26346		0.26501	0.00155	0.588			
47	752.1	2.03399E-3	0.32714		0.32898	0.00185	0.564			
48	1003	2.4525E-3	0.43628		0.43838	0.0021	0.481			
49	1481	3.10862E-3	0.64415		0.64564	0.00149	0.232			
50	1986	3.6752E-3	0.8638		0.86394	0.00015	0.017			
51	2471	4.13676E-3	1.07483		1.07307	-0.00175	-0.163			
52	2951	4.53968E-3	1.28361		1.28261	-0.00101	-0.078			
53	0	0E0	0		0	0	0.000			
54	97.7	4.10947E-4	0.0445		0.04504	0.00054	1.203			
55	194.2	7.56565E-4	0.08845		0.08929	0.00084	0.948			
56	308.8	1.1068E-3	0.14066		0.14186	0.0012	0.853			
57	407.1	1.36767E-3	0.18543		0.18686	0.00143	0.769			
58	504.8	1.60086E-3	0.22994		0.23171	0.00177	0.768			
59	605.7	1.82008E-3	0.2759		0.27811	0.00221	0.800			
60	752.1	2.10652E-3	0.34258		0.34523	0.00265	0.774			
61	1003	2.53352E-3	0.4569		0.45981	0.00291	0.638			
62	1481	3.20151E-3	0.67465		0.67703	0.00238	0.353			

Num	ppm	abs/kPa	mmol/m3/kPa	Coeffs	Predicted	Error	%Error	Temp	Drift at 370 ppm	%/C
63	1986	3.77485E-3	0.90473		0.90524	0.00052	0.057			
64	2471	4.24039E-3	1.12571		1.12393	-0.00178	-0.158			
65	2951	4.64547E-3	1.34438		1.34312	-0.00125	-0.093			
66	0	0E0	0		0	0	0.000			
67	97.7	4.33691E-4	0.04689		0.04748	0.00059	1.248			
68	194.2	7.95578E-4	0.09323		0.0942	0.00097	1.044			
69	308.8	1.16056E-3	0.14823		0.14988	0.00165	1.112			
70	407.1	1.4311E-3	0.19543		0.19756	0.00213	1.089			
71	504.8	1.67194E-3	0.24234		0.24504	0.0027	1.115			
72	605.7	1.89732E-3	0.29077		0.29404	0.00326	1.122			
73	752.1	2.19193E-3	0.36104		0.3651	0.00406	1.124			
74	1003	2.62915E-3	0.48146		0.48614	0.00467	0.971			
75	1481	3.30997E-3	0.71099		0.71527	0.00427	0.601			
76	1986	3.89133E-3	0.95347		0.95575	0.00228	0.239			
77	2471	4.36163E-3	1.18642		1.18636	-0.00006	-0.005			
78	2951	4.76792E-3	1.41677		1.41678	0.00001	0.001			

ppm - CO2 tank value (umol/mol)

abs/kPa - zero corrected CO2 absorptance divided by pressure

umolCO2/m3/kPa - CO2 mole density divided by pressure

Coeffs - computed calibration coeffs (fit 5th order poly to previous 2 columns)

Predicted - predicted CO2 (umol/m3/kPa)

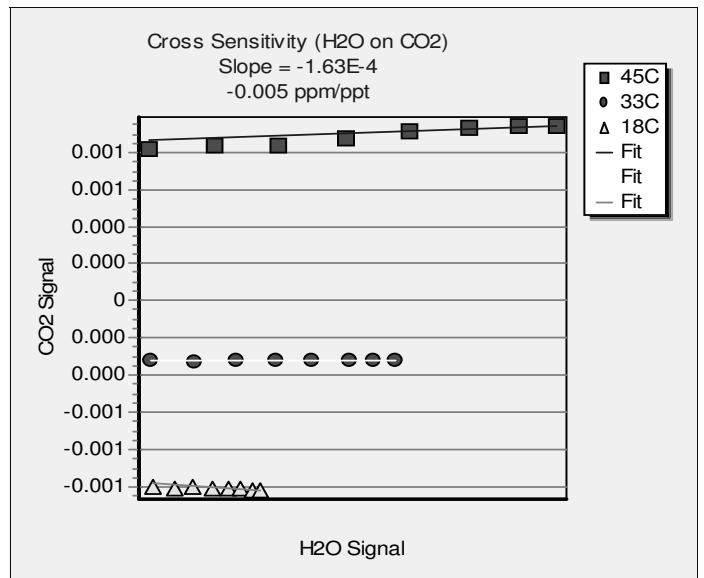
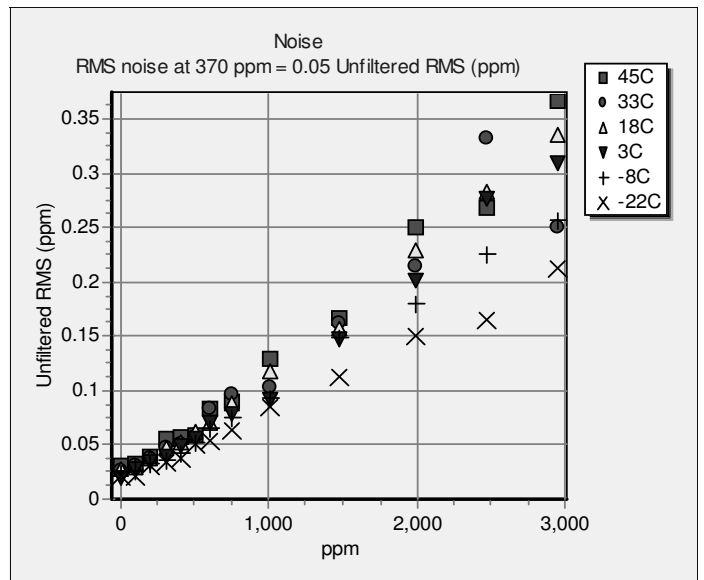
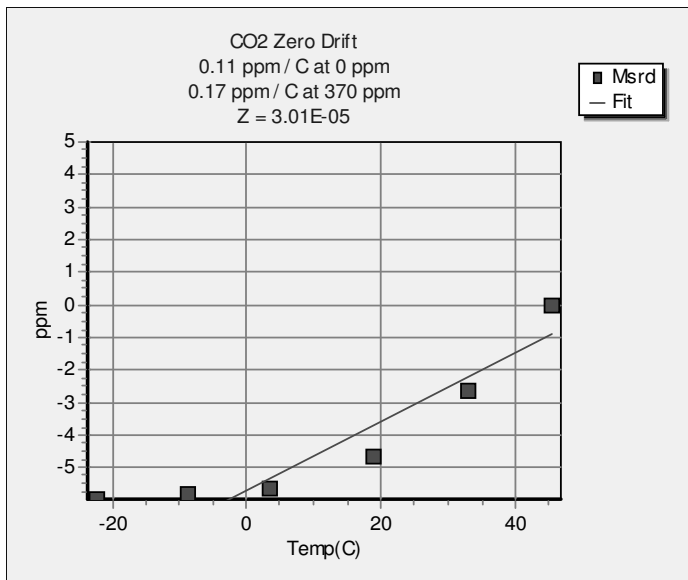
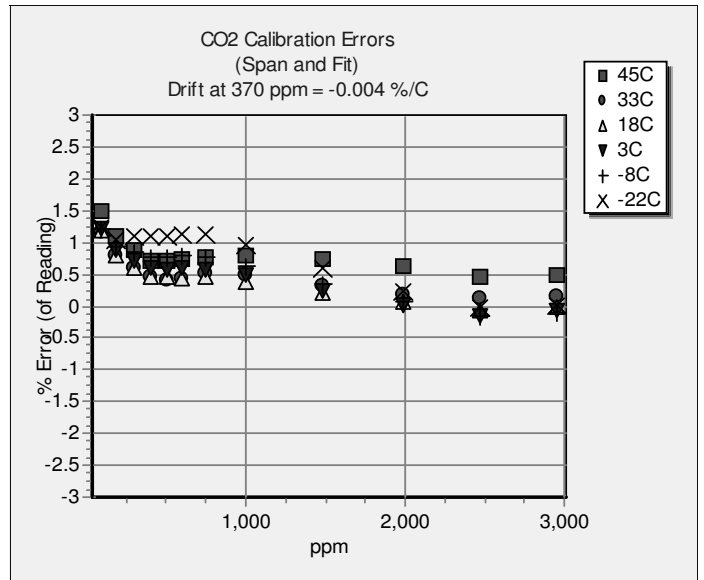
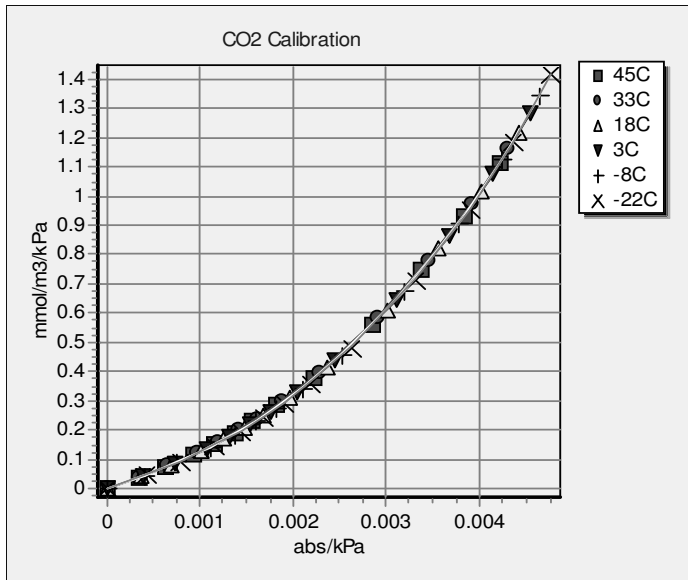
% Error - (Predicted - actual)/actual \* 100

At 370 - %Error at 370 ppm (based on curve fit of errors) for each temperature data set

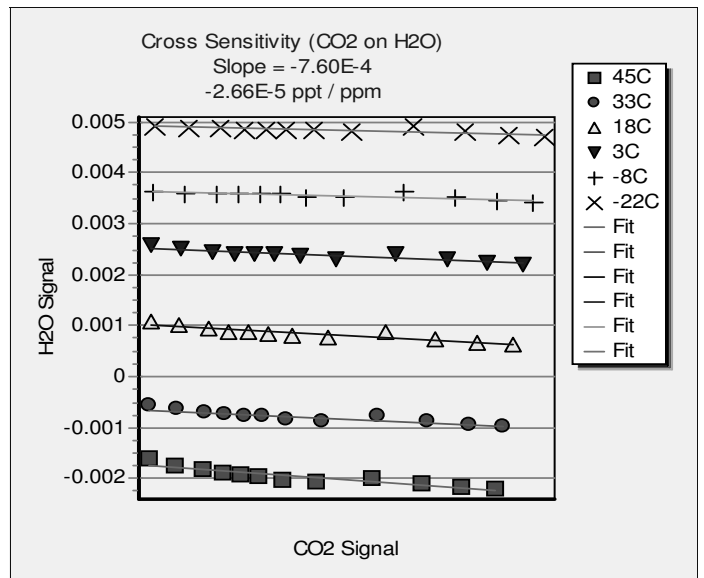
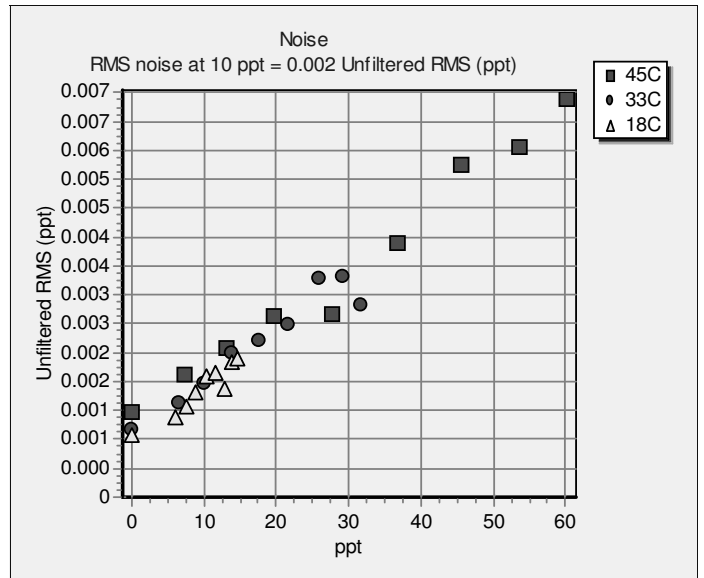
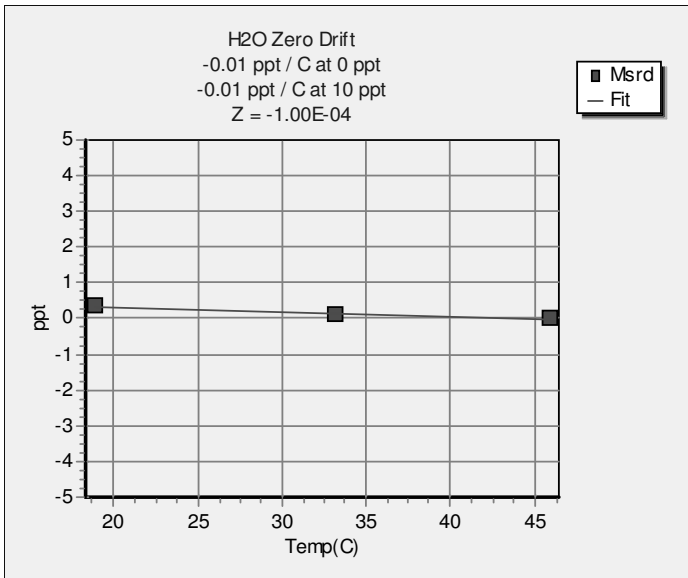
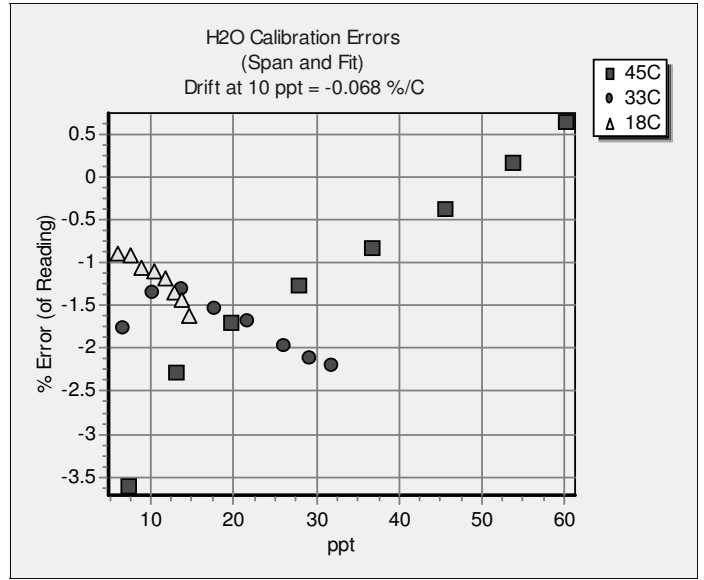
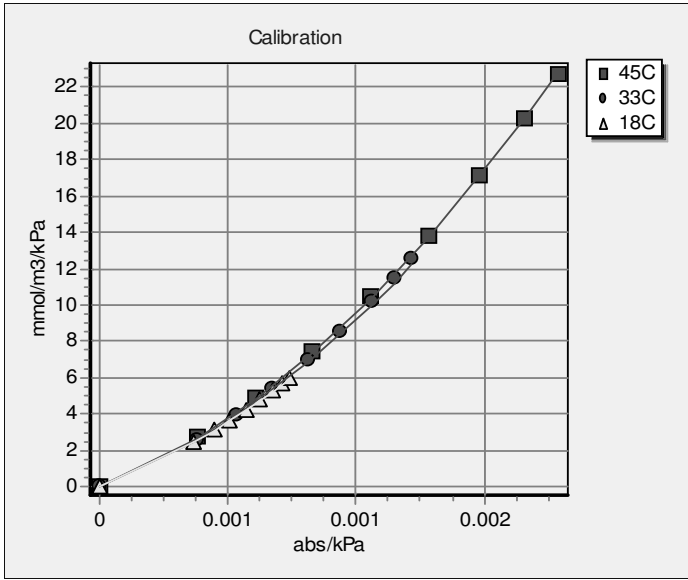
%/C - Estimated span drift with temperature at 370 ppm.



CO2 Calibration Plots



H2O Calibration Plots

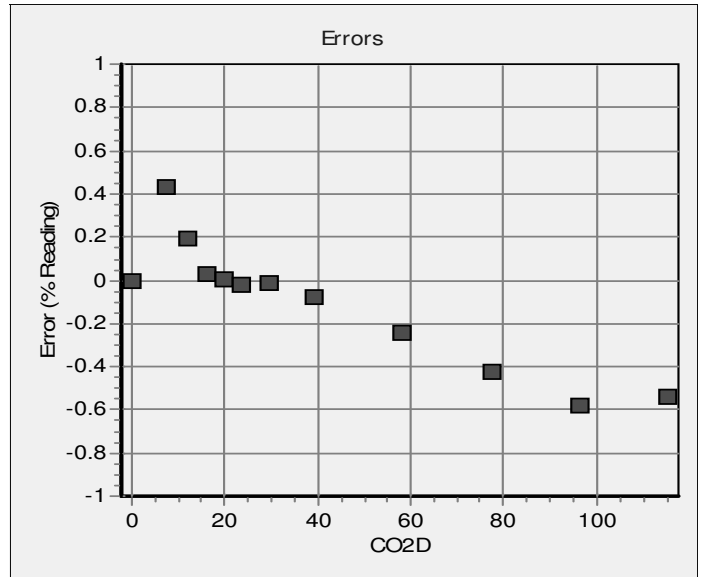
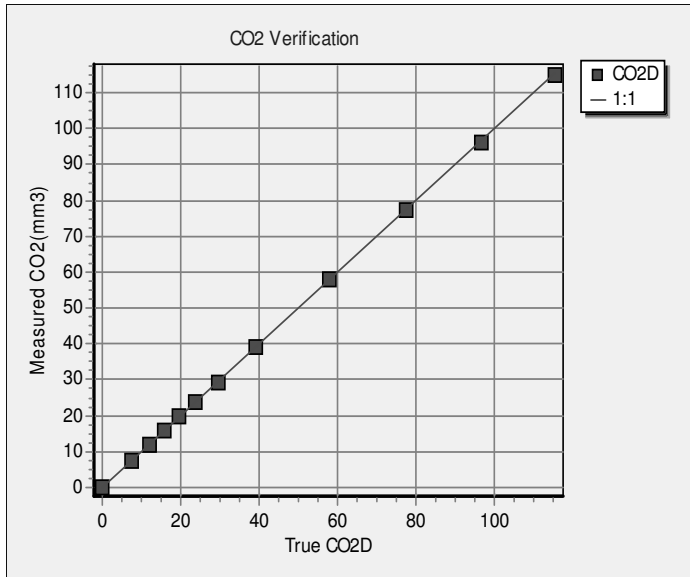




CO2 Final Checkout. File = L:\MICHAEL\CALS\72H\1044\20210603.fc

Type	Time	CO2(ppm)	CO2(mm3)	CO2Abs	CO2SD	CO2Stp	H2OAbs	CO2D	CO2DSD	H2OD	H2ODSD	CO2MF	H2OMF	TOvent(C)	Pat(kPa)	T(C)	Press	Tbtk(C)	APres	DPres	Fs(l/m)	Cooler	CltCooler	CO2Aw	CO2Awo	H2OAw	H2OAwo	SS	Diag	
1	CO2/75	09:20:21	0	0.000	-0.00001	8.49E-6	-4.37E-3	-0.00017	-0.001	8.74E-4	-0.9	4.04E-2	-0.04	-0.023	24.50	97.36	25.87	97.32	26.06	97.4317	-0.110711	1.013	2.1570	1.6315	32522.1	38758.9	45201.1	44786.4	100.2	0x1fff
2	CO2/75	09:21:34	194.2	7.605	0.06540	9.33E-6	1.82E-3	-0.00019	7.638	1.25E-3	-1.0	4.46E-2	195.13	-0.025	24.50	97.36	25.91	97.32	26.12	97.427	-0.109493	1.014	2.1580	1.6339	30395.8	38745.7	45193.2	44755.5	100.2	0x1fff
3	CO2/75	09:22:47	308.8	12.092	0.09640	8.31E-6	2.41E-3	-0.00020	12.115	1.30E-3	-1.0	4.70E-2	309.53	-0.026	24.50	97.36	25.94	97.32	26.18	97.4222	-0.10462	1.014	2.1587	1.6347	29385.2	38737.1	45185.8	44766.7	100.2	0x1fff
4	CO2/75	09:23:59	407.1	15.939	0.11975	1.10E-5	1.25E-3	-0.00020	15.944	1.90E-3	-1.0	3.97E-2	407.41	-0.026	24.50	97.37	25.97	97.32	26.24	97.4222	-0.105229	1.014	2.1597	1.6366	28621.0	38726.9	45175.9	44755.8	100.2	0x1fff
5	CO2/75	09:25:12	504.8	19.762	0.14079	9.36E-6	-3.67E-6	-0.00019	19.763	1.79E-3	-1.0	4.10E-2	505.04	-0.025	24.50	97.37	26.01	97.32	26.30	97.4222	-0.10462	1.014	2.1605	1.6389	27935.5	38719.2	45168.2	44747.4	100.2	0x1fff
6	CO2/75	09:26:25	605.7	23.710	0.16664	9.90E-6	7.69E-6	-0.00020	23.705	2.04E-3	-1.0	4.01E-2	605.84	-0.026	24.50	97.37	26.03	97.32	26.36	97.427	-0.105229	1.014	2.1611	1.6398	27283.8	38710.2	45159.3	44737.6	100.2	0x1fff
7	CO2/75	09:27:38	752.1	29.435	0.18678	9.23E-6	-5.61E-7	-0.00022	29.432	2.18E-3	-1.1	3.94E-2	752.28	-0.029	24.50	97.37	26.06	97.31	26.42	97.4222	-0.107666	1.015	2.1621	1.6417	26430.0	38701.9	45152.9	44729.2	100.2	0x1fff
8	CO2/75	09:28:51	1003	39.255	0.22602	8.05E-6	1.32E-3	-0.00023	39.223	2.14E-3	-1.2	3.94E-2	1002.65	-0.030	24.50	97.37	26.09	97.32	26.47	97.427	-0.10462	1.015	2.1630	1.6427	25149.6	38691.9	45145.5	44720.1	100.1	0x1fff
9	CO2/75	09:30:04	1481	57.953	0.28790	8.93E-6	4.83E-6	-0.00010	57.812	3.14E-3	-0.5	4.19E-2	1478.06	-0.013	24.50	97.37	26.14	97.32	26.54	97.4222	-0.103402	1.015	2.1635	1.6439	23130.0	38677.8	45129.3	44707.8	100.1	0x1fff
10	CO2/75	09:31:20	1986	77.706	0.34155	9.73E-6	1.05E-3	-0.00015	77.376	3.98E-3	-0.8	4.00E-2	1978.47	-0.020	24.40	97.37	26.17	97.32	26.60	97.4175	-0.101574	1.015	2.1645	1.6460	21377.0	38666.3	45124.0	44698.3	100.1	0x1fff
11	CO2/75	09:32:33	2471	96.666	0.38546	9.18E-6	-1.72E-6	-0.00020	96.105	4.30E-3	-1.0	4.50E-2	2457.62	-0.027	24.50	97.37	26.22	97.32	26.66	97.4222	-0.102184	1.015	2.1652	1.6471	19940.8	38656.5	45118.6	44688.9	100.1	0x1fff
12	CO2/75	09:33:46	2951	113.432	0.42389	8.08E-6	2.73E-3	-0.00021	114.807	4.66E-3	-1.1	4.35E-2	2936.21	-0.028	24.40	97.37	26.25	97.32	26.72	97.4222	-0.100965	1.015	2.1660	1.6494	18682.1	38646.3	45110.7	44679.4	100.1	0x1fff

CO2(ppm) - CO2 concentration (tank value)  
 CO2(mm3) - Actual value of CO2 mole density (mmol/m3)  
 CO2Abs - CO2 absorbance (unfiltered)  
 CO2D - Measured value of CO2 mole density (mmol/m3)  
 CO2DSD - Standard deviation of CO2D (100 samples over 10 seconds)  
 CErv - (CO2D - CO2(mm3))  
 H2OD - Measured value of H2O mole density (mmol/m3)  
 H2ODSD - Standard deviation of H2OD (100 samples over 10 seconds)  
 TIC) - IRGA's temperature measurement  
 Press - IRGA's pressure measurement  
 Pat(kPa) - Atmospheric pressure (measured by Ruska 6200)  
 Press - IRGA's pressure measurement (kPa)  
 F(l/m) - Flow through calibration tube, liters/min.  
 AGC - Automatic gain control value (0-100%)  
 Cooler - Detector cooler voltage  
 Diag - IRGA's diagnostic codes, plus 'C' indicates CO2 stability achieved, and 'H' indicates H2O stability achieved.



H2O Final Checkout. File = L:\MICHAEL\CALS\72H\1044\20210603.fc

Type	Time	H2O(C)	610kPa	610kPaSD	H2O(ppm)	H2O(mm3)	CO2Abs	H2OAbs	H2OStd	H2OStdp	CO2D	CO2DSD	H2OD	H2ODSD	CO2MF	H2OMF	T(ventC)	Pat(kPa)	T(C)	Press	Tblk(C)	APres	DPres	Fs(l/m)	Cooler	ChC.cooler	CO2Aw	CO2Awo	H2OAw	H2OAwo	SS	Diag	
1	H2O/75	09:45:01	-99.00	0.01	7.4E-4	0.00	0.0000	0.00007	1.33E-5	-1.42E-6	0.002	1.66E-3	0.4	6.87E-2	0.05	0.009	24.40	97.37	26.88	97.32	27.22	97.4175	-0.0954832	0.510	2.1726	1.6619	32425.3	38646.0	45051.5	44634.8	100.2	0x1ff	
2	H2O/75	10:01:44	11.99	13.26	2.9E-3	12.71	494.936	0.00009	0.06251	1.28E-5	6.02E-7	0.010	1.34E-3	495.0	1.35E-1	0.25	12.715	25.00	97.38	27.60	97.32	27.94	97.4222	-0.0979197	0.512	2.1827	1.6825	32358.9	38569.9	44983.3	44384.2	100.0	0x1ff
3	H2O/75	10:06:53	20.00	13.48	4.7E-3	21.16	823.710	0.00014	0.09025	1.01E-5	1.39E-5	0.014	1.12E-3	817.5	1.29E-1	0.36	21.009	25.00	97.38	27.70	97.32	28.08	97.4175	-0.0979197	0.512	2.1843	1.6836	32345.5	38555.4	44622.1	44272.6	99.9	0x1ff
4	H2O/75	10:08:30	14.99	13.40	2.8E-3	15.44	600.884	0.00009	0.07212	7.73E-6	-4.24E-5	0.009	1.24E-3	599.9	8.79E-2	0.24	15.420	25.10	97.38	27.78	97.32	28.20	97.4175	-0.0985288	0.512	2.1862	1.6886	32337.3	38544.0	44488.1	44318.5	100.0	0x1ff
5	H2O/75	10:12:35	10.01	13.25	4.5E-3	11.15	433.683	0.00005	0.05668	7.59E-6	2.74E-5	0.005	9.94E-4	434.8	7.68E-2	0.13	11.185	25.20	97.38	27.95	97.32	28.37	97.4175	-0.0979197	0.512	2.1885	1.6927	32324.8	38528.0	44213.4	44344.6	100.0	0x1ff
6	H2O/75	10:17:21	5.00	13.13	2.1E-3	7.93	308.204	0.00001	0.04349	7.63E-6	2.04E-5	0.001	8.97E-4	309.3	6.85E-2	0.02	7.961	25.40	97.38	28.15	97.31	28.55	97.4128	-0.099138	0.512	2.1909	1.6982	32311.9	38511.2	42823.4	44357.9	100.1	0x1ff

H2O(C) - LI-610 Dewpoint generator set point  
 610kPa - Overpressure (kPa) in the LI-610  
 H2O(ppm) - True water concentration (mmol/mol)  
 H2O(mm3) - True water mole density (mmol/m3)  
 H2OAbs - H2O absorbance (unfiltered)  
 H2OD - Measured value of H2O mole density (mmol/m3)  
 H2ODSD - Standard deviation of H2OD (100 samples over 10 seconds)  
 H2r - (H2OD - H2O(mm3))  
 CO2D - Measured value of CO2 mole density (mmol/m3)  
 T(C) - IRGA's temperature measurement  
 Press - IRGA's pressure measurement  
 Pat(kPa) - Atmospheric pressure (measured by Ruska 6200)  
 Press - IRGA's pressure measurement (kPa)  
 F(l/m) - Flow through calibration tube, liter/min.  
 AGC - Automatic gain control value (0-100%)  
 Cooler - Detector cooler voltage  
 Diag - IRGA's diagnostic codes

