Final Project Report

NASA NAG9-582

"Growing Wheat to Maturity at Reduced Gas Pressures"

Principal Investigator:
Edward J. Rykiel, Jr.

Co-Principal Investigators:
Malcolm C. Drew
Brad D. Etter

(04/01/92-06/30/93)

Texas A&M Research Foundation
Box 3578
College Station, TX 77843-3578

Project Summary

The main objective of this project was to determine assimilation of CO_2 and efficiency of water use in wheat grown to maturity in a low pressure total gas pressure environment. A functional test of the low pressure plant growth chamber system was accomplished in February and March of 1993 wherein this objective was partially achieved. Plants were grown to maturity in the chambers. Data were actively collected during the first 29 days. The plants were allowed to maintain themselves at the CO_2 compensation point until day 45 of the study at which point active atmospheric regulation was resumed. This provided data at the vegetative and reproductive stages of the life cycle of the plants. However, this information may not be representative of the performance of the plants due to the loss of low pressure on a number of days during the study, which affected the plants by changing the pressure potential of the tissues. The performance of the system will be discussed on a component by component basis. The maintenance of the plants at the CO_2 compensation point was driven by the failure of the computer program operating the system. The software problems that arose during the functional test have since been corrected. Results from the functional test also indicated that the plants were not receiving adequate light and nutrients. The growth chambers have been relocated and the growth room modified to compensate for these deficiencies.

System Description

Two 66 L chambers are used to provide separate gas pressure environments. One chamber is maintained at 101.3 kPa, the other at 70 kPa. The instrumentation configuration of each chamber is illustrated in Figure 1. The environmental conditions maintained in the chambers are presented in Table 1. The chambers are operated in a semi-closed configuration. A 150 ml. gas sample is removed from a chamber using a vacuum pump for determination of CO_2 concentration. The volume of gas removed is replaced from pressurized gas bottles.

Table 1. Chamber Environment

Variable	Set Point
Temperature	$20.0^{o}C + 0.5^{o}C$
Low Chamber Pressure	70.3 kPa + 1 kPa
Ambient Chamber Pressure	101.3 kPa + 1 kPa
Oxygen Concentration*	0.57 mole/chamber
Carbon Dioxide Concentration**	0.00285 mole/ chamber
Light Level	400 mmol m^{-2} s^{-1}

* This is equivalent to a PO_2 of 0.21 in the ambient pressure chamber and 0.3 in the sub-ambient pressure chamber.

** This is equivalent to a PCO_2 of 0.0010 in the ambient pressure chamber and 0.0013 in the sub-ambient pressure chamber. The CO_2 /O_2 mole ratio is fixed at 0.005 in both chambers. The reduction in pressure is attributable entirely to a decrease in the PN_2 in the sub-ambient pressure chamber.

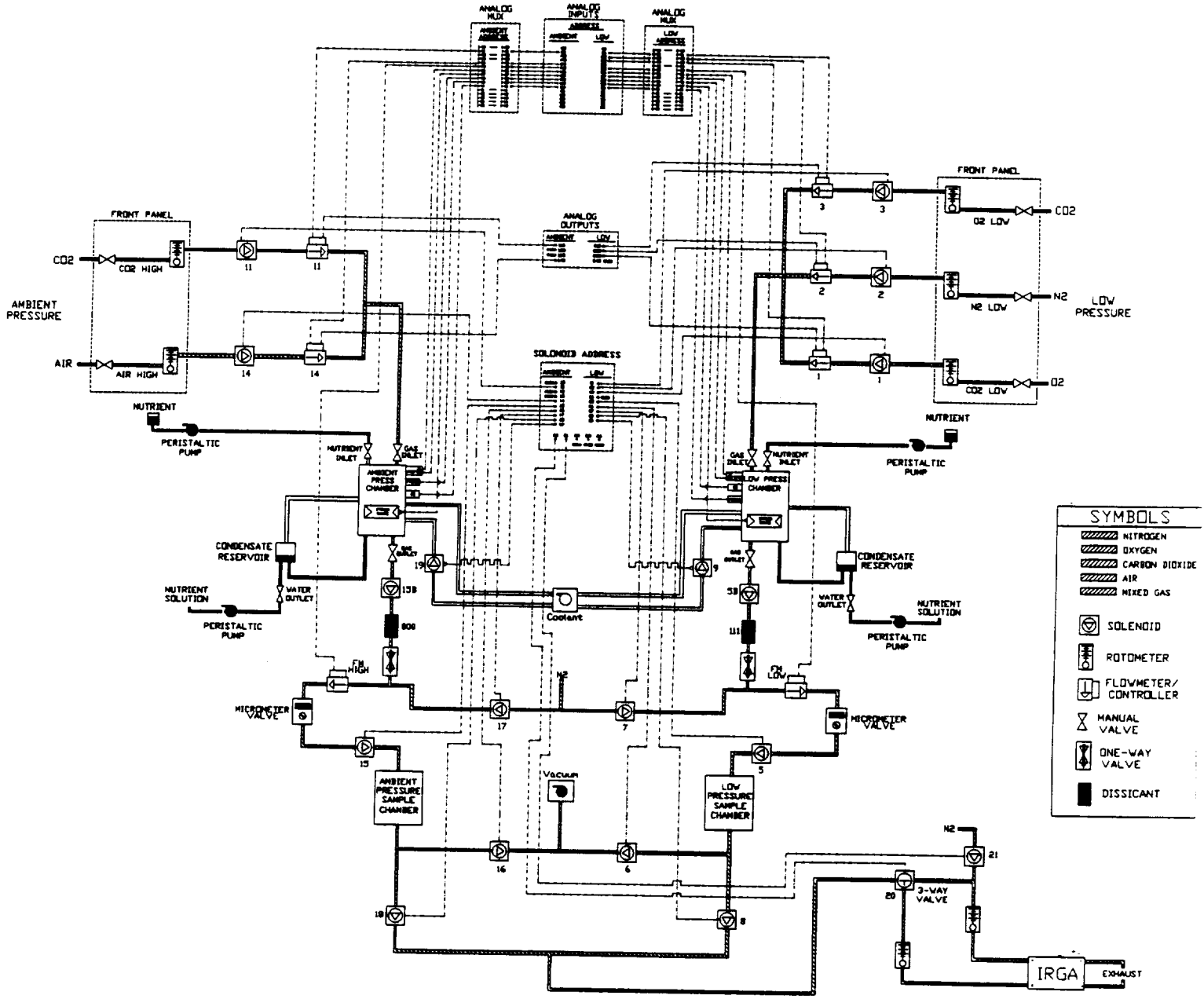
ANALOG MUX
ANALOG INPUTS
ANALOG MUX
FRONT PANEL
CO2
CO2 HIGH
AMBIENT PRESSURE
AIR
AIR HIGH
ANALOG OUTPUTS
SOLENOID ADDRESS
FRONT PANEL
CO2
O2 LOW
N2
N2 LOW
LOW PRESSURE
O2
CO2 LOW
NUTRIENT
PERISTALTIC PUMP
NUTRIENT INJECT
GAS INLET
AMBIENT PRESS CHAMBER
LOW PRESS CHAMBER
CONDENSATE RESERVOIR
WATER OUTLET
NUTRIENT SOLUTION
Coolant
GAS OUTLET
ON HIGH
ON LOW
MICROMETER VALVE
N2
Vacuum
AMBIENT PRESSURE SAMPLE CHAMBER
LOW PRESSURE SAMPLE CHAMBER
3-WAY VALVE
IRGA
EXHAUST
SYMBOLS
NITROGEN
OXYGEN
CARBON DIOXIDE
AIR
MIXED GAS
SOLENOID
ROTOMETER
FLOWMETER/ CONTROLLER
MANUAL VALVE
ONE-WAY VALVE
DISSICANT

Figure 1.

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Table 1. Chamber Environment

Variable	Set Point
Temperature	20.0°C Ý 0.5°C
Low Chamber Pressure	70.3 kPa Ý 1 kPa
Ambient Chamber Pressure	101.3 kPa Ý 1 kPa
Oxygen Concentration*	0.57 mole/chamber
Carbon Dioxide Concentration**	0.00285 mole/ chamber
Light Level	400 mmol m^{-2} s^{-1}

* This is equivalent to a PO_2 of 0.21 in the ambient pressure chamber and 0.3 in the sub-ambient pressure chamber.

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Lighting is provided by 30 VHO fluorescent lamps and ten 60W incandescent lamps. Temperature in the chambers is monitored with thermistors, and regulated by circulating a coolant through a stainless steel loop in each chamber. Air circulation in each chamber is provided by an internally mounted fan magnetically coupled to a motor mounted external to the chamber. Air velocities at the canopy are 2 m/sec. Oxygen concentration is monitored by a sensor mounted in each chamber. Nitrogen and O_2 mole ratios are maintained by injecting fixed molar ratios to offset the volume of gas removed in the measurement of CO_2 concentration. The pressure in the chambers is monitored with pressure transducers. A detailed description of each of these components is provided in Appendix A.

A major problem in this study has been to measure and regulate CO_2 concentration in the low pressure chamber. Because the infrared gas analyzer (IRGA) cannot operate properly with gas at subnormal pressure, it was necessary to bring a gas sample from the chamber and pressurize it to normal atmospheric pressure before measurement. The process selected for this has been to subsample the gas from a chamber, pressurize and entrain the sample in an N_2 gas stream while measuring the CO_2 concentration with the IRGA. The time course for the voltage output of the IRGA is presented in Figure 2. The maximum peak height of the voltage output of the IRGA is used to calculate the concentration of CO_2 in the chamber and the amount to be added to replenish CO_2 depleted by plant photosynthesis.

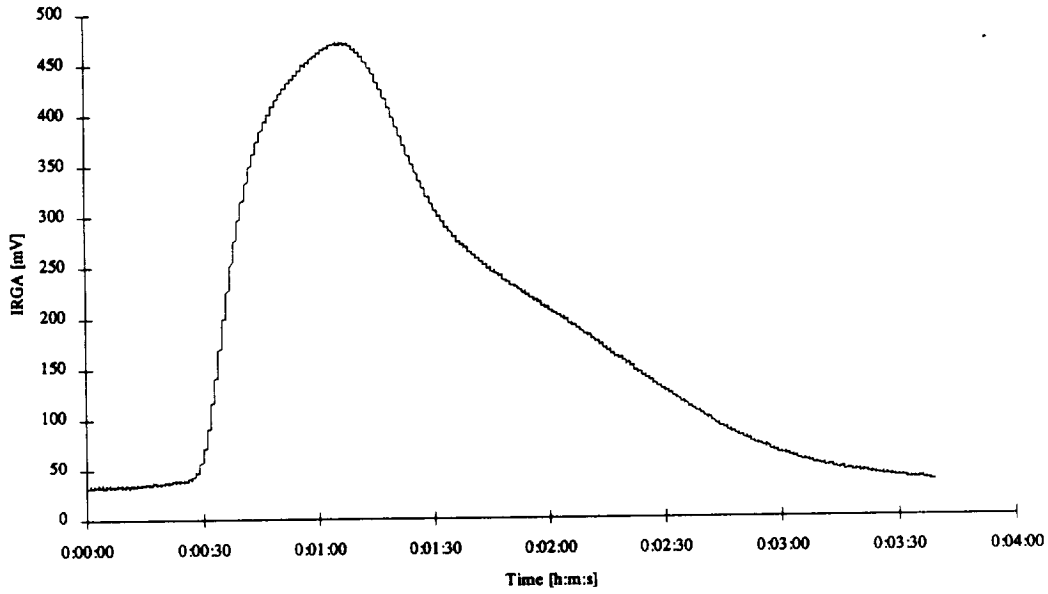

Figure 2.

Twenty seeds of *Triticum aestivum* L. cv. 'Yecora Rojo', a dwarf wheat variety, were germinated in 5 L pots containing vermiculite. The pots were placed in the chambers and the atmospheric treatments were initiated. Plants were illuminated for 24 hr/day. Plants were watered with 1/4 strength Hoagland's solution once every three days. A peristaltic pump was used to deliver the nutrient solution. Condensate was collected from the chambers with a peristaltic pump once every three days. The volume of nutrient solution added was approximately equal to the volume of condensate collected.

Results and Discussion

The study was initiated on February 4, 1993, and terminated on March 27, 1993. Various mechanical and software difficulties encountered during the study precluded the collection of a complete data set allowing for the accurate determination of the effect of low pressure on the growth and development of wheat. A summary of the systems performance is presented in Table 2.

Table 2. System Performance Log.

Date	Daily Run Time (min.)	Description of System Performance
2/10	660	Study Initiated, Leak in ambient chamber located and sealed.
2/11	1414	Nominal. Irreparable leak in ambient chamber discovered
2/12	1433	IRGA recalibrated.
2/13	1431	External strain gage circuits modified due to insensitivity.
2/14	500	Nominal
2/15	1080	System crash due to loss of N_2 during night, plants were gutating due to loss of thermal control. Software modified to prevent similar future errors.
2/16	794	System crash during addition of N_2 (software).
2/17	1404	System errors overnight due to crack of low pressure condensate collection reservoir.
2/18	691	System crash due to crack of low pressure condensate collection reservoir. Repaired and system restarted.
2/19	846	System crash due to software.
2/20	1404	Nominal.
2/21	1208	Nominal.
2/22	1307	System crash resulting in repressurization of low pressure chamber with CO_2 . System opened and vented to reduce CO_2 level.
2/23	1383	System crash resulting in repressurization of ambient pressure chamber with CO_2 . System opened and vented to reduce CO_2 level.
2/24	91	System crash while injecting CO_2 into ambient pressure chamber. (System aborted gas delivery)
2/25	1425	System performed suboptimal from previous crash.
2/26	1424	System crash resulting in repressurization of low pressure chamber.
2/27	1431	Nominal but insufficient CO_2 levels.
2/28	1409	Nominal but insufficient CO_2 levels.
3/1	1433	Nominal but insufficient CO_2 levels.
3/2	1406	Nominal but insufficient CO_2 levels.
3/3	1423	Nominal but insufficient CO_2 levels.
3/4	1430	Nominal but insufficient CO_2 levels.
3/5	1421	Nominal but insufficient CO_2 levels.
3/6	1421	Ran out of N_2 overnight. Pressure integrity maintained but no IRGA readings possible. Both chambers suffered CO_2 deficits.
3/7	1400	Nominal but recovering from previous deficit CO_2 levels.
3/8	1407	Ran out of N_2 overnight. Pressure integrity maintained. Compressed gas bottle replaced.
3/9	1423	Nominal but insufficient CO_2 levels.
3/10	825	System taken offline. Plants allowed to maintain themselves at CO_2 compensation point.

3/24	378	System successfully reconfigured. Insufficient, but improved CO_2 control levels. Study resumed.
3/25	1424	Ambient pressure chamber is leaking. Low pressure chamber is nominal.
3/26	1414	Ambient pressure chamber is leaking. Low pressure chamber is nominal.
3/27	1038	Study terminated.

The system crashes resulted from a change in the C++ operating system immediately before the initiation of the study. The code had been developed using Microsoft C++. The system was changed to Borland C++ and there were inconsistences in the implementation of header files between the two systems.

Periodic repressurization of the low pressure chamber made it impossible to access the impact of the low pressure treatment on plant growth when compared to ambient pressure. The down time occurring after 3/10 resulted from the inability to solve the system crash problem during testing. The computer system was taken off-line to correct the software errors. These errors were successfully corrected and the system reactivated with the existing plants on 3/24. Statistical summaries of the data collected are presented in Table 3. The values presented are for chamber pressure, chamber temperature, CO_2 concentration in the chamber, and volume of CO_2 added to offset chamber CO_2 deficits. Averages, standard deviations, minimum and maximum values for each data set are presented. The entire data set collected for each day is presented in Appendix C.

Table 3. Summary Statistics for Chamber Temperature, Chamber Pressure, CO2 Concentration, and Volume of CO2 added.

Date	Low Pres. [mHg]	Low Temp [°C]	Low CO_2 [ml]	Low CO_2 [ppm]	High Pressure [mHg]	High Temp [°C]	High CO_2 [ml]	High CO_2 [ppm]
2/10/93	n=30							
mean	539.7	20.95	959	2	761.41	20.95	986	2
S.D.	0.89	0.2	105	5	2.08	0.22	140	5
min.	535.2	20.65	553	0	759.5	20.41	559	0
max.	540.6	21.59	1020	25	766	21.31	1092	15
2/11/93	n=84							
mean	540.03	20.85	999	1	766.42	20.97	1004	0
S.D.	1.14	0.22	20	1	3.46	0.11	22	1
min.	536.1	20.39	940	0	759.5	20.65	941	0
max.	544.1	21.17	1046	4	770.5	21.17	1046	5
2/12/93	n=51							
mean	539.02	21.07	933	1	765.62	21.17	997	1
S.D.	1.72	0.16	220	2	4.68	0.12	33	1
min.	533.9	20.84	79	0	758.8	20.95	869	0
max.	541.9	21.64	1037	14	770.3	21.45	1037	5

Date	Low Pres. [mHg]	Low Temp [°C]	Low CO_2 [ml]	Low CO_2 [ppm]	High Pressure [mHg]	High Temp [°C]	High CO_2 [ml]	High CO_2 [ppm]
2/13/93	n=53							
mean	539.45	20.75	976	1	765.92	20.98	982	1
S.D.	2.15	0.57	21	1	3.8	0.47	128	1
min.	526	18.14	926	0	757.3	18.85	153	0
max.	541.8	21.42	1024	3	772	21.89	1106	5
2/14/93	n=21							
mean	540.14	18.91	988	1	771.19	19.53	999	1
S.D.	0.6	0.16	19	1	0.62	0.17	51	2
min.	539.7	18.62	944	0	770.6	19.19	908	0
max.	541.9	19.18	1014	3	773.2	19.78	1085	5
2/15/93	n=4							
mean	538.93	20.6	926	4	770.95	19.48	1017	0
S.D.	3.22	1.14	98	5	0.21	0.01	30	0
min.	534.1	18.89	789	0	770.8	19.47	996	0
max.	540.7	21.19	998	11	771.1	19.48	1038	0
2/16/93	n=29							
mean	417.96	17.63	560	16	773.14	18.29	789	4
S.D.	33.67	0.3	405	15	0.65	0.36	206	1
min.	363.5	17.24	108	3	772.1	17.75	376	2
max.	483.4	18.14	938	33	775.1	19.16	975	5
2/17/93	n=10							
mean	455.17	20.97	547	19	764.9	21.36	672	22
S.D.	39.65	0.18	178	6	2.73	0.25	312	20
min.	403.9	20.79	207	13	761.3	20.96	256	0
max.	541.2	21.33	711	29	768	21.69	1016	49
2/18/93	n=10							
mean	455.17	20.97	547	19	764.9	21.36	672	22
S.D.	39.65	0.18	178	6	2.73	0.25	312	20
min.	403.9	20.79	207	13	761.3	20.96	256	0
max.	541.2	21.33	711	29	768	21.69	1016	49
2/19/93	n=27							
mean	594.36	20.97	463	12	762.78	21.34	748	17
S.D.	83.92	0.17	267	11	2.26	0.33	176	12
min.	538.9	20.79	95	3	759	20.87	328	1
max.	740.6	21.65	810	40	767.5	21.85	986	44
2/20/93	n=24							
mean	537.25	21.41	637	15	761.22	21.9	777	15
S.D.	8.21	0.51	206	9	3.18	0.73	185	12
min.	506.4	20.83	154	3	757.1	20.8	372	3
max.	545.5	22.34	797	35	766.7	23.02	953	41

Date	Low Pres. [mHg]	Low Temp [°C]	Low CO_2 [ml]	Low CO_2 [ppm]	High Pressure [mHg]	High Temp [°C]	High CO_2 [ml]	High CO_2 [ppm]
2/21/93	n=20							
mean	540.12	21.21	504	19	760.99	21.94	732	18
S.D.	1.57	0.35	164	7	0.89	0.38	133	9
min.	538.9	20.82	108	3	759.5	21.13	271	10
max.	546.5	22.13	638	40	762.8	22.57	841	48
2/22/93	n=29							
mean	537.65	20.93	717	21	762.39	21.19	8687	5
S.D.	6.62	0.16	918	15	3.51	0.27	3690	12
min.	510.1	20.58	180	0	758.6	20.66	333	0
max.	544.7	21.22	5334	49	770	21.83	10289	42
2/23/93	n=39							
mean	542.92	21.13	614	23	763.52	21.6	3125	9
S.D.	23.06	0.41	194	12	2.78	0.6	3636	10
min.	473.8	20.56	83	0	760.2	20.65	398	0
max.	632.1	23.21	817	58	769.8	22.73	10289	41
2/24/93	n=5							
mean	510.04	21.1	722	20	765.56	21.05	711	20
S.D.	18.73	0.19	22	1	1.45	0.08	157	10
min.	486	20.82	702	17	764.3	20.95	457	12
max.	532.5	21.3	759	21	767.7	21.12	833	37
2/25/93	n=73							
mean	561.08	20.97	61	4	767.49	21.25	37	0
S.D.	9.31	0.23	156	8	3.08	0.29	79	0
min.	539.6	20.63	0	1	757.3	20.75	0	0
max.	573.6	22.33	570	38	771.9	22.53	361	0
2/26/93	n=37							
mean	539.72	20.95	597	22	766.54	20.96	145	3
S.D.	1.92	0.31	112	6	2.02	0.32	28	3
min.	528.6	20.44	132	0	762.7	20.43	95	0
max.	541	21.51	709	44	769.6	21.53	174	5
2/27/93	n=75							
mean	539.98	21.04	697	20	769.16	20.98	137	5
S.D.	0.23	0.33	10	1	2.28	0.35	2	0
min.	538.9	20.39	676	18	764.4	20.41	133	5
max.	540.6	21.5	719	21	771.9	21.49	141	5
2/28/93	n=67							
mean	540.03	21.04	703	18	769.39	20.9	302	10
S.D.	0.62	0.31	65	3	2.01	0.34	235	7
min.	537.2	20.4	207	14	764.5	20.41	109	5
max.	542.3	21.51	744	40	771.9	21.46	804	34

Date	Low Pres. [mHg]	Low Temp [°C]	Low CO_2 [ml]	Low CO_2 [ppm]	High Pressure [mHg]	High Temp [°C]	High CO_2 [ml]	High CO_2 [ppm]
3/1/93	n=69							
mean	539.99	20.84	765	12	768	20.9	671	14
S.D.	0.4	0.21	26	1	3.17	0.19	161	6
min.	538.6	20.42	711	10	760.3	20.56	329	5
max.	541.2	21.21	806	15	772.4	21.23	827	29
3/2/93	n=70							
mean	539.93	21.01	818	9	766.47	21.51	758	13
S.D.	0.39	0.24	16	1	3.11	0.67	106	4
min.	538	20.55	789	7	762	20.72	467	5
max.	540.7	21.49	853	11	771.2	22.63	853	24
3/3/93	n=71							
mean	539.71	20.98	813	9	766.71	21.36	807	13
S.D.	1.06	0.25	13	1	2.53	0.65	36	3
min.	532.8	20.58	750	7	762.5	20.67	621	5
max.	541.4	21.51	866	13	771.4	22.6	848	26
3/4/93	n=71							
mean	539.86	20.92	819	10	768.54	21.17	756	13
S.D.	0.6	0.17	22	1	2.3	0.49	124	5
min.	537.7	20.53	706	5	764.7	20.48	378	5
max.	541.6	21.3	856	15	773.3	22.13	859	29
3/5/93	n=73							
mean	539.95	20.87	824	11	770.54	20.9	563	11
S.D.	0.34	0.21	10	1	1.83	0.2	207	7
min.	538.6	20.51	802	9	766.8	20.54	247	5
max.	541.3	21.22	845	12	773.9	21.24	841	33
3/6/93	n=55							
mean	540.94	20.94	333	34	771.35	21.17	207	16
S.D.	0.92	0.2364	19	1.79	0.49	92	12	
min.	539.7	20.51	54	5	769.3	20.49	138	5
max.	542.6	21.26	942	57	775.7	22.19	481	40
3/7/93	n=51							
mean	541.12	20.98	671	39	770.82	21.31	783	17
S.D.	0.86	0.21	1706	18	1.34	0.61	2274	14
min.	539.5	20.49	54	0	769.8	20.54	138	0
max.	542.7	21.28	5308	57	774.4	22.5	9930	41
3/8/93	n=50							
mean	539.98	21.11	3107	4	769.96	21.33	552	13
S.D.	0.4	0.49	2104	6	2.57	0.78	222	11
min.	538.7	20.52	768	0	765.2	20.56	210	5
max.	541.5	23.63	5415	14	774.5	23.69	937	68

Date	Low Pres. [mHg]	Low Temp [°C]	Low CO_2 [ml]	Low CO_2 [ppm]	High Pressure [mHg]	High Temp [°C]	High CO_2 [ml]	High CO_2 [ppm]
3/9/93	n=65							
mean	539.78	20.98	777	13	769.74	21.39	538	12
S.D.	0.68	0.213	1 2.53	0.57	283	6		
min.	535.9	20.56	748	11	766.1	20.55	217	5
max.	540.9	21.38	826	15	774.8	22.47	848	28
3/10/93	n=38							
mean	539.79	20.98	771	14	769.62	21.1	775	14
S.D.	0.58	0.15	18	2	1.2	0.33	79	5
min.	538.1	20.71	678	5	766.9	20.59	560	5
max.	541	21.22	789	19	772	22.13	883	25
3/24/93	n=17							
mean	539.82	20.94	880	9	776.95	20.94	265	5
S.D.	0.35	0.36	10	1	1.49	0.29	19	0
min.	539	20.59	864	8	772.3	20.51	216	5
max.	540.2	21.99	897	10	778.3	21.75	289	5
3/25/93	n=63							
mean	539.93	20.9	871	9	776.54	20.88	296	5
S.D.	0.4	0.21	11	1	1.57	0.2	8	0
min.	538.7	20.47	851	8	772.9	20.49	277	5
max.	541.1	21.24	897	10	778.4	21.27	310	5
3/26/93	n=64							
mean	539.97	20.77	857	10	777.26	20.9	341	5
S.D.	0.24	0.26	10	1	3.27	0.21	67	2
min.	538.9	20.35	834	7	771.1	20.47	295	5
max.	540.4	21.25	904	11	781.8	21.24	564	20
3/27/93	n=49							
mean	540.01	20.78	853	10	773.93	20.94	430	7
S.D.	0.15	0.25	11	1	2.49	0.19	182	4
min.	539.7	20.39	825	9	770.3	20.49	305	5
max.	540.3	21.22	877	12	777.1	21.27	883	17

In spite of the system failures the plants survived and flowered (headed). By 3/24 the leaves were chlorotic and senescing. It was decided to evaluate the software corrections using the plants even though they were not "healthy". The low pressure chamber performed nominally. A crack in the ambient chamber acrylic resulted in a leak that could not be corrected mid-experiment. This leak prevented proper control of CO_2 concentration in the ambient pressure chamber. This leak was repaired after the study following chamber disassembly. A discussion of subsystem performance, emphasizing data collected between 3/24 and 3/26 follows.

Light Levels

A light intensity map for the growth room the chambers are installed in is presented in Figure 3. The light intensity was mapped at the top of the chambers, 10 cm. from the light bank. The placement of the chambers at one end of the growth room decreased the light available for the plants. Even though the photoperiod was 24 hr, the irradiance levels were observed to be too low. Comparisons of the data collected may not be consistent with values in literature (Salisbury and Bugbee, 1988).

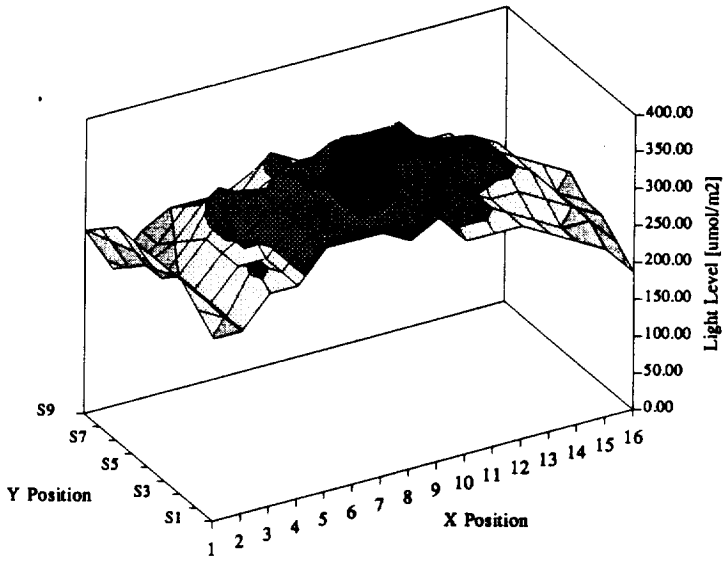

Figure 3.

Temperature

A plot of the temperatures maintained in the two chambers for March 25 is presented in Figure 4. The system operates on a 22 minute cycle. Data are updated at this frequency although temperature is controlled continuously. This data is the last temperature recorded at the end of this cycle.

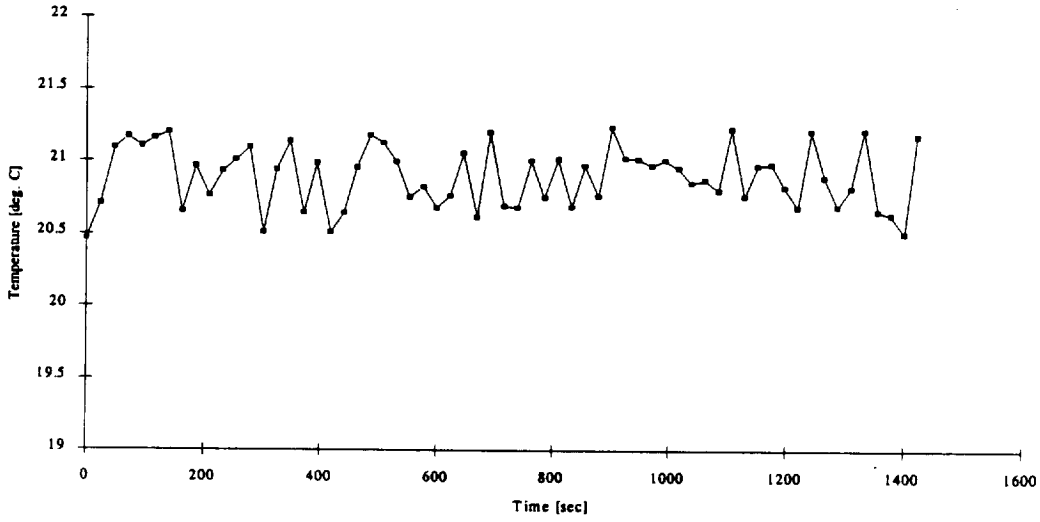

Figure 4.

Pressure

A plot of the pressure for the low pressure chamber is presented in Figure 5 for March 25. Data for the ambient pressure chamber are not presented because of the leak. Across the sampling and gas injection cycles the pressure is extremely stable. For reference, removal of 700 ml corresponds to a decrease of 0.007 atm (6mm Hg) at 21C in the low pressure chamber and 0.011 atm (8mm Hg) at 21C in the ambient pressure chamber. A 700 ml sample is removed from each chamber to purge the gas lines while obtaining the 150 ml sample for the determination of CO_2 concentration.

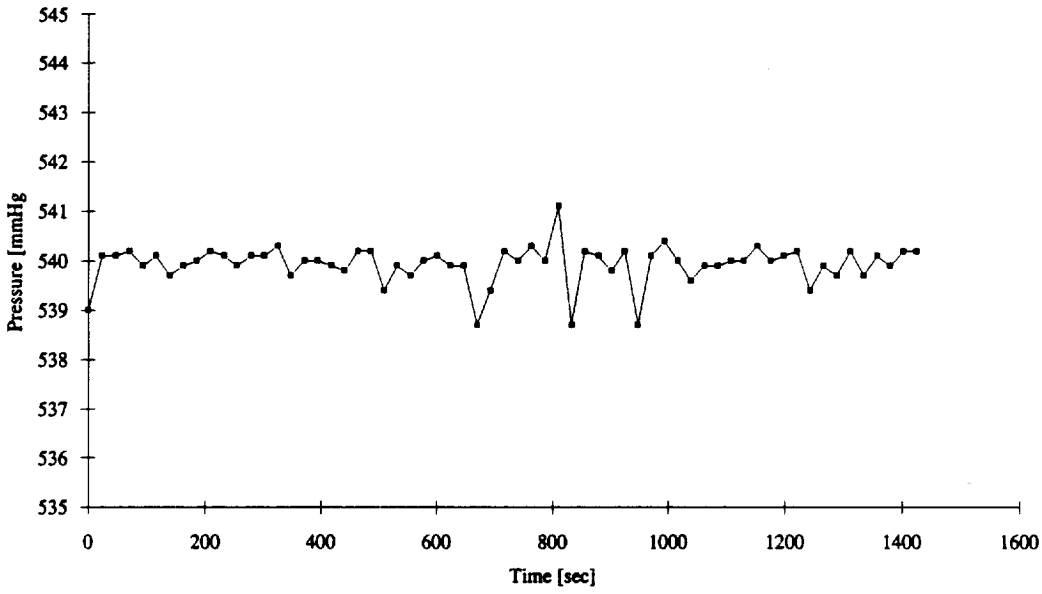

Figure 5.

CO_2 Concentration in the Chamber

The objective of this research was to discern the effect of pressure on plant growth under equal activities of CO_2 and O_2. An infrared gas analyzer (IRGA) measures CO_2 concentration on a volume of CO_2 per volume of air basis (ppm). The gas sampling system complicates CO_2 concentration determination. A calibration curve for the IRGA is required as standard procedure for accuracy. A calibration curve for each sample chamber is also required due to dilution resulting from entraining the sample with N_2. The maximum peak height of voltage output of the IRGA is used to calculate the concentration of CO_2 in the sample. Calibration curves for the IRGA and the sample system are presented in Figures 6. The CO_2 concentration determined for the low pressure chamber for March 25 is presented in Figure 7. Based on this measurement the system added CO_2 to the chamber in an attempt to bring the concentration to 1000ppm. The volume of CO_2 added is presented in Figure 8. The algorithm being used to calculate the amount of CO_2 to inject was found to be inadequate. However the system had achieved a quasi-equilibrium. The plants were taking up approximately what the system was injecting. This corresponds to a net CO_2 assimilation rate of 130 mg CO_2 per chamber per day.

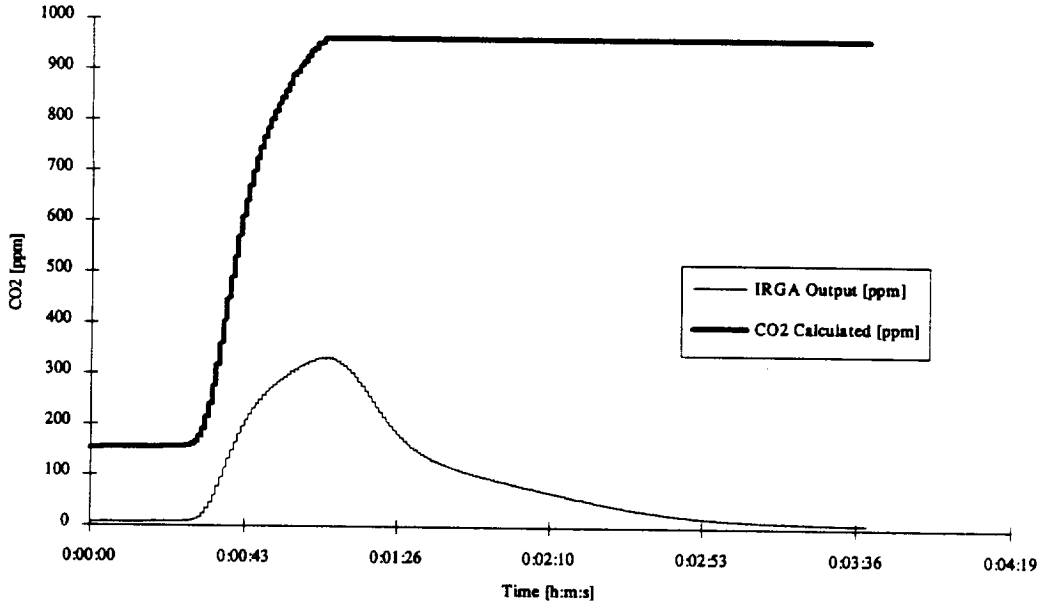

Figure 6.

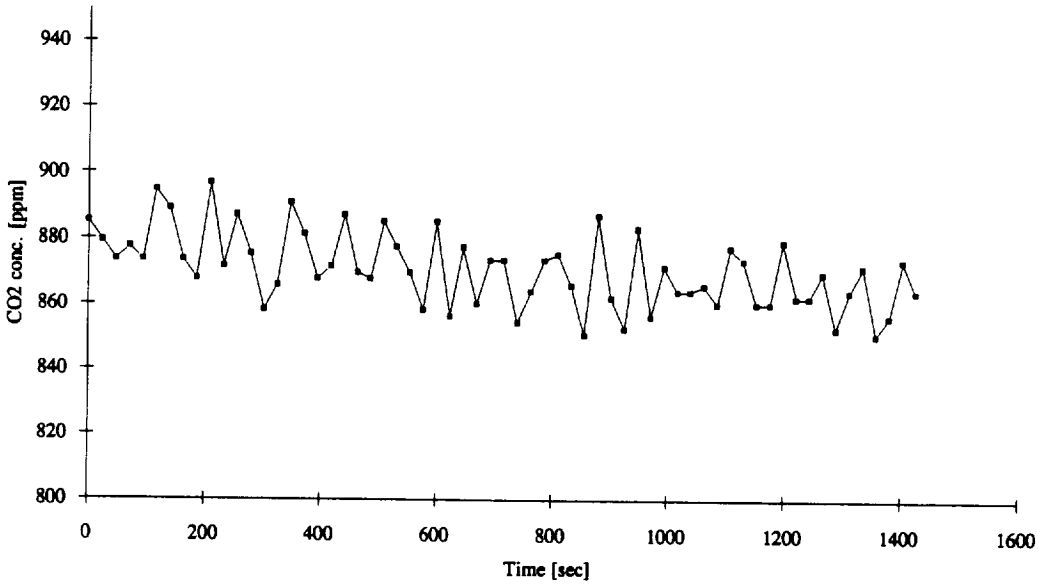

Figure 7.

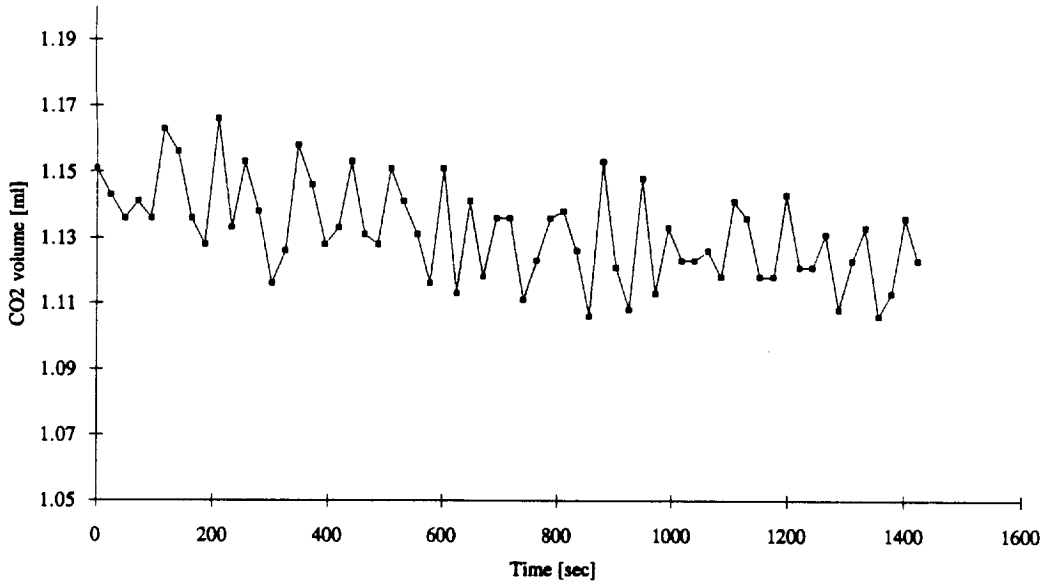

Figure 8.

Transpiration

Load cells were installed in the chamber to provide a means of monitoring water use by the plants. The pots were suspended with nylon line from the load cells. The load cell data for the ambient chambers is presented in Figure 9. The weight loss due to transpiration is evident from the steady decay periods. The sudden increases in weight correspond to nutrient addition to the pot. The load cells were prone to damage due to excessive strain imposed while attaching the pot during experiment startup. Subsequently, the hanging system has been replaced by a force plate at the bottom of the chamber.

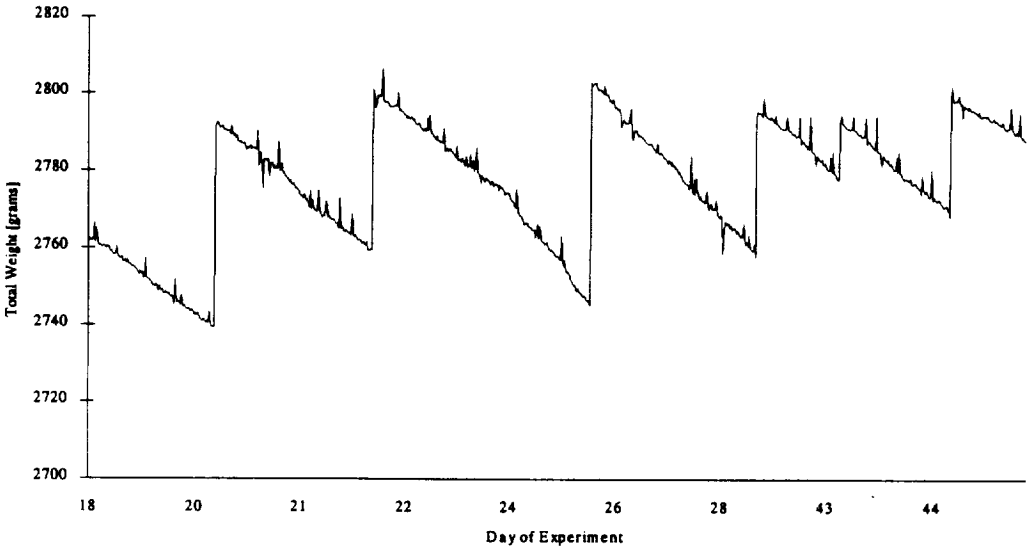

Figure 9.

Current Status of the Project

The problems of the system that arose during the functional test have resulted in numerous design revisions and modifications to the system. The chambers have been moved from the end of the growth room to the middle of the growth room. To increase robustness and to increase light levels the load cells were removed from the top of the chambers and moved to force plates in the bottom of the chambers (Figure 10).

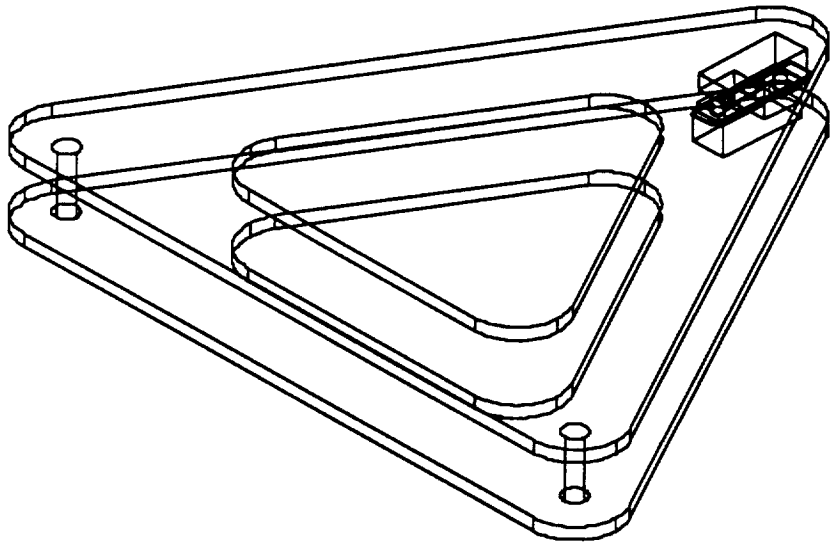

Figure 10.

Following the test, one of the motors for the fans in the chambers burned out. New motors were acquired and a stronger power supply was constructed to power all the electronic equipment in the system. All the custom electronics used to interface the sensors in the chambers have been redesigned and implemented as printed circuit boards for increased robustness. Details are provided in Appendix A. The software has been updated to improve the routines for integrating the volumes of gas added and removed from the chambers as well as to correct problems associated with calculating the amount of CO_2 to add based on the concentration measured. The software description is contained in Appendix B. System software incompatibilities have been resolved and are no longer a problem.

The system is currently undergoing calibration to test modifications made to the electronics and the control code. Another functional test is to be implemented in July.

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Appendix A.
Hardware System Description

This set of specifications describes the configuration effective 6/21/93. This configuration reflects improvements made since the functional test and is currently undergoing calibration. Several items of engineering detail are termed hardware references (HXX) to improve the readability of this document. The hardware references located at the end of this appendix provide specific part information.

Mechanical/Physical

All tubing used in this experiment was .250" stainless (H1) unless otherwise specified. Stainless Swagelok connectors (H2) were installed on all ambient system components. Stainless VCR connectors (H3) were used on all low pressure system components. Every connection was cleaned before assembly. All connectors were epoxied into place to ensure minimal gas leakage and increase mechanical robustness.

The plant growth chambers were constructed of acrylic (H4). Due to the projected growth height of the wheat, the existing chambers were stacked two high with an acrylic ring (H5) adjoining them as shown in Figure A1. The top and bottom of the chamber were joined with an acrylic plate (H5). Each mating surface of the plate contained a groove where the cylinder faces join the plate. A hollow compliant O-ring seal was constructed from neoprene rubber tubing. This O-ring was lightly lubricated with silicone vacuum grease (H6) before assembly. Meticulous cleaning and installation of this seal were vital to minimize chamber air leakage. The chamber top and bottom were pulled together with an all-thread/nut assembly at each plate corner. Overtightening of this assembly could flex the plates and promote air leakage. Chamber assemblies were located on a raised platform in the middle of a conventional growth chamber (H7). The primary purpose of this external chamber was to provide uniform, adequate lighting.

Two 9-pin gold-plated electrical connections (H8) were used to provide power, ground, and signals to/from the interior of the chamber. Air leaked around the wires of the standard connector; therefore, each connector was molded to the chamber top with a special hot melt adhesive (H9). Each of the interior wires was interrupted with a single uninsulated wire that connected to the 9-pin connector. The nine, uninsulated wires were molded to the chamber top with hot-melt adhesive.

Gas entered the chamber through a connector to a tube at the top of the growth chamber. This tube was located underneath a circulating fan (H10) which mixed the gas and provided for uniform gas and thermal distribution. The fan blade was epoxied to a standard nylon-coated laboratory stirrer magnet that was magnetically coupled to an exterior DC motor (H11) with a coupling magnet (H12). Gas was sampled via a tube protruding from the bottom of the growth chamber that connected to an external Swagelok connector.

An external Swagelok connector provided access for nutrient delivery. This connected to a nylon quick-connect which attached to the interior of the chamber top with hot-melt adhesive (H9). Norprene tubing (H13) was used to connect the chamber top to the growth pot. A simple manifold was made using a ring of Norprene tubing to distribute the nutrient media evenly to the plants. A peristaltic pump (H14) was set up to pump the desired nutrient into the pot. This technique ensured that no gases escaped during the media addition process.

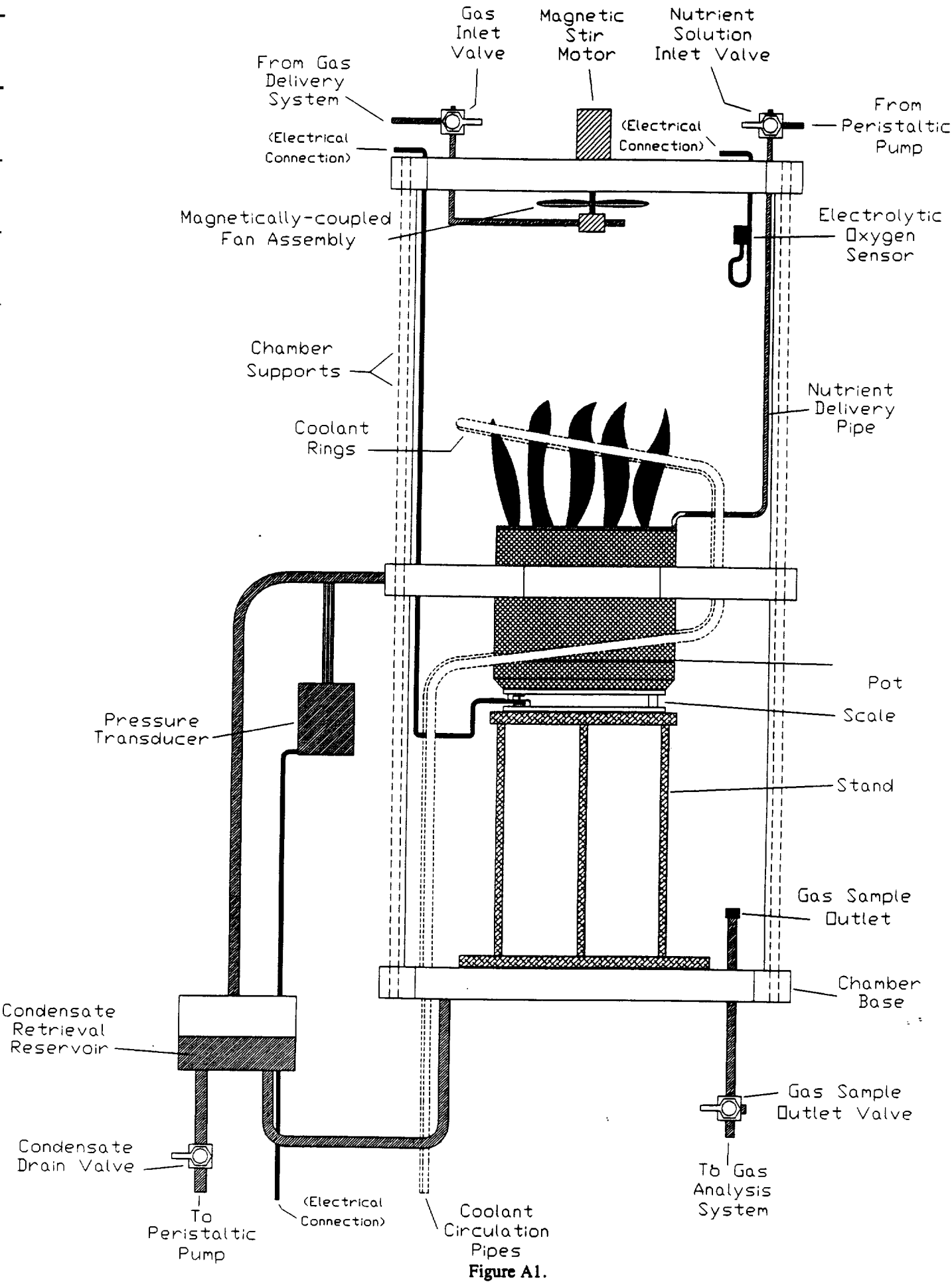
Gas Inlet Valve
Magnetic Stir Motor
Nutrient Solution Inlet Valve
From Gas Delivery System
(Electrical Connection)
(Electrical Connection)
From Peristaltic Pump
Magnetically-coupled Fan Assembly
Electrolytic Oxygen Sensor
Chamber Supports
Nutrient Delivery Pipe
Coolant Rings
Pot
Scale
Pressure Transducer
Stand
Gas Sample Outlet
Chamber Base
Condensate Retrieval Reservoir
Gas Sample Outlet Valve
Condensate Drain Valve
To Gas Analysis System
To Peristaltic Pump
(Electrical Connection)
Coolant Circulation Pipes

Figure A1.

Condensate was collected via a cooling ring which also provided temperature control. This ring was bent into an ellipsoidal shape to provide uniform cooling throughout the chamber. The coolant was provided by an external chiller (H15) which was set at 5°C. Operating the cooling ring in short cold periods encouraged condensate on the cooling ring rather than the acrylic walls and/or top of the chamber. Condensate then followed the ellipsoidal ring to a collection point on the base. An external condensate chamber connected to this collection point. The displaced volume was vented through a tube which connected to the middle joining ring. Condensate was retrieved from this condensate chamber with the peristaltic pump as was done for the media addition process.

Sensors

All sensors located inside the growth chamber were wired to the outside using shielded cable(H16). Standard instrumentation precautions were implemented to minimize the effects of ambient noise and ground loop effects. The signals from these sensors were too weak for adequate sensing; Therefore, conditioning electronics were needed. All electronics were located outside the chamber to minimize condensation risk and provide for ease of repair during experimentation.

During previous experiments the weight was measured by suspending the load from a single load cell. This assembly was removed to increase the light exposure to the plants. The collective weights of the plant, vermiculite, and media were measured with the platform shown in Figure A2. The weight was distributed upon three points, one of which was a load cell. This platform was less sensitive to motion artifacts and a sensitivity of .2 grams was obtainable during testing.

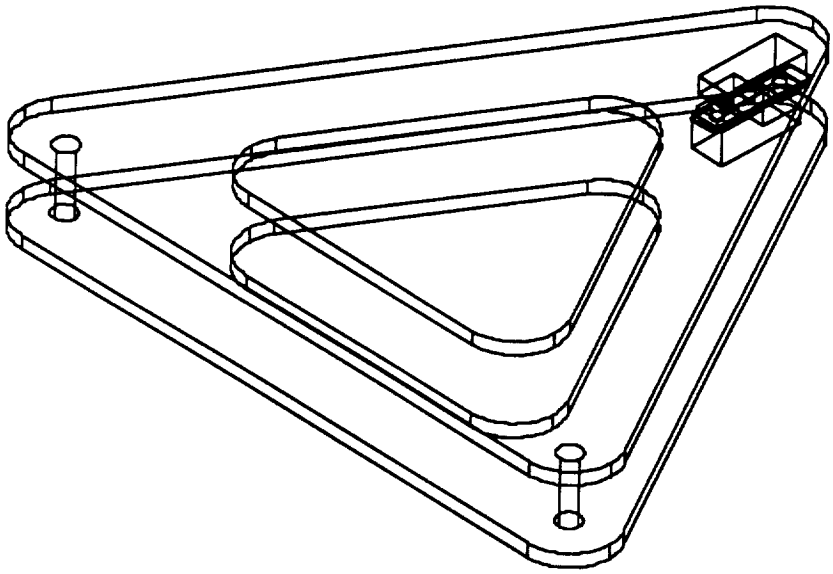

Figure A2.

External Control and Support Systems

Gas Delivery System

The schematic of the gas delivery system is illustrated in Figure A3.

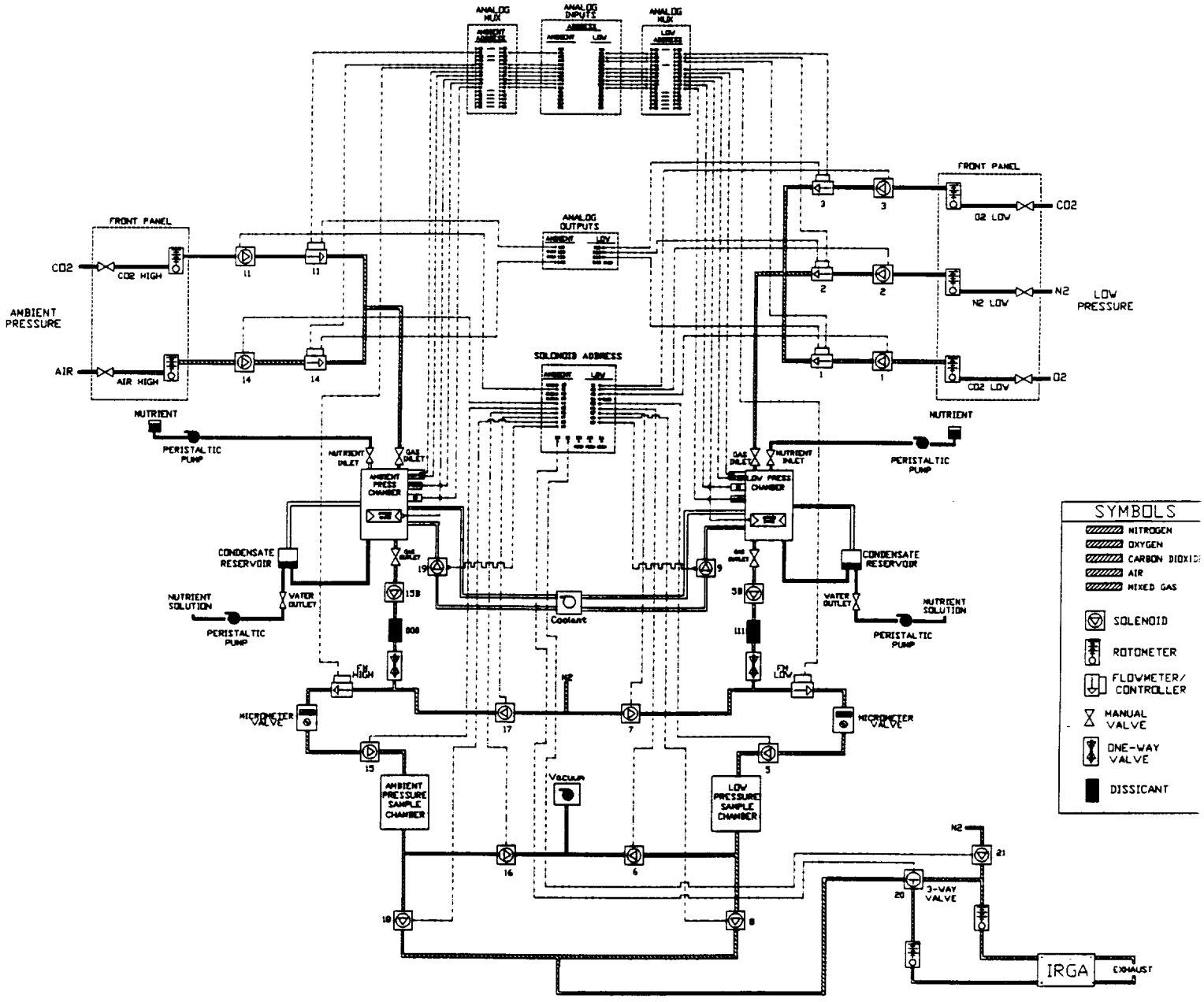
ANALOG MUX
ANALOG INPUTS
ANALOG MUX
FRONT PANEL
CO2
CO2 HIGH
AMBIENT PRESSURE
AIR
AIR HIGH
ANALOG OUTPUTS
SOLENOID ADDRESS
FRONT PANEL
CO2
O2 LOW
N2
N2 LOW
LOW PRESSURE
O2
CO2 LOW
NUTRIENT
PERISTALTIC PUMP
NUTRIENT
PERISTALTIC PUMP
CONDENSATE RESERVOIR
NUTRIENT SOLUTION
PERISTALTIC PUMP
CONDENSATE RESERVOIR
NUTRIENT SOLUTION
PERISTALTIC PUMP
Coolant
MICROMETER VALVE
MICROMETER VALVE
Vacuum
AMBIENT PRESSURE SAMPLE CHAMBER
LOW PRESSURE SAMPLE CHAMBER
3-WAY VALVE
IRGA
EXHAUST
SYMBOLS
NITROGEN
OXYGEN
CARBON DIOXIDE
AIR
MIXED GAS
SOLENOID
ROTOMETER
FLOWMETER/ CONTROLLER
MANUAL VALVE
ONE-WAY VALVE
DISSICANT

Figure A3.

Table A1. Solenoid Switching Address and Associated Function.

Address	Chamber	Function
00	Low	unused
01	Low	CO_2 Into Growth Chamber
02	Low	N_2 Into Growth Chamber
03	Low	O_2 Into Growth Chamber
04	Low	not connected
05	Low	Sample out of the growth chamber
06	Low	Vacuum
07	Low	N_2 Purge
08	Low	Sample out of the Sample chamber
09	low	Coolant
10	High	unused
11	High	CO_2 into growth chamber
12	High	not connected
13	High	not connected
14	High	Air into growth chamber
15	High	Sample out of chamber
16	High	Vacuum
17	High	N_2 purge
18	High	Sample out of Sample Chamber
19	High	Coolant

The low pressure delivery system injects CO_2 , N_2 or O_2 at the request of the control program. The solenoids (address: 01,02, or 03) perform the primary closure of gas while the flowcontrollers (also addressed as: 01,02, or 03) regulate the flow once the solenoids are opened. The flowcontrollers only performed properly when operated individually . If two or more flowcontrollers were operated in parallel, the gas flow rate was unreliable; therefore each gas was added singularly. The manual valves next to the chamber are only engaged for maintenance operation during midexperiment. The high chamber delivers either air or CO_2 . The operation is identical to the low, except the solenoids and flow controllers are addressed 11 and 14 for CO_2 and air respectively.

Gas is sampled from the growth chamber by opening solenoids C5, C5A and C6 where C denotes the chamber (0--low,1--high). Solenoid C5 serves as the primary closure for gas flow between the system and the chamber. This allows replacement of the desiccant without manual intervention. The control program instructs the technician when it is safe to perform this service. Solenoid C5A functions to shut off the flow to the flowmeter, since it has no regulatory capability of its own. Solenoid C6 is opened to apply the vacuum necessary to draw the sample from the growth chamber, through the desiccant, and into the sample chamber. The desiccant bed was added to remove water vapor from the sample which would interfere with the IRGA readings. Although the size of the sample chamber is 150 ml an additional 550 ml ample was needed to obtain a true representation of the growth chamber sample. This was attributed to the dilution effects in the desiccant bed and in the sample chamber.

All solenoids are then closed before discharging the gas in the sample chamber through the IRGA. Solenoid C7 is first opened to pressurize the gas to approximately 5 psi above atmospheric pressure in order to force it through the IRGA. Solenoids C8 and C21 are then opened to send the sample through the IRGA. The flowmeter allows the precise measurement of all gas which is sent through the IRGA. During IRGA measurements, solenoid #20 is engaged to provide an N_2 reference.

Electronic Control of Gas Delivery System

The electrical flow diagram for the gas delivery system is shown in Figure A3. All the solenoids required 115 VAC which mandated the use of high current relays(H18) for reliable switching. These relays were engaged with a 12 VDC signal which was provided by solid state relays (H19). These relays were mounted in a rack and were controlled by the digital output board (H20) mounted in the computer. These relays not only provided the DC current required by the AC relays, but also provided 4000 V isolation to protect the digital output board and the computer. This is a standard industry practice for switching high current, high voltage sources.

The flowcontrollers utilized an analog input voltage to vary the flow through the controller. This analog control signal was provided by the analog output (D/A) board (H21) mounted in the computer. The flowcontrollers also provide an analog measurement of the flow which actually passes through the controller. This analog voltage, along with all other analog signals, was routed to the analog multiplexer (MUX) which will be described in the Electronics section. The output of this MUX directed the appropriate analog signal to the analog input board (A/D) mounted in the computer. The control program used the analog voltage from the flowmeter component of the controller to calculate the actual volume of gas delivered. This process is described in the control software section. This technique allowed accurate measurement and compensation of any errors which occurred during the gas delivery process.

Electronics

All electronics were custom constructed by wire-wrapping for research and development purposes. The prototype boards were located in a sealed external box which was connected to the chamber sensors via a shielded cable(H16). All resistors were 1% metal film type(H22) and each circuit was decoupled from the power supply with .1çF capacitors. All operational amplifiers are TL054 quad opamps (H23). Each of the following circuits was simulated in PSpice for functionality and performance over a wide range of operating conditions. Maximum cumulative error for any circuit was found to be .8 % over a broad temperature range. These custom circuits provided for remote placement of discrete sensors, and provided greater robustness and sensitivity than similar prepackaged products. The sensitivity and digitized accuracy are itemized for each sensor/circuit system in the following paragraphs.

Two 16 channel analog multiplexers (MUX) (H24) were implemented to allow for expandability and structured addressability for multiple chamber systems. Each output of these MUXs was buffered with a voltage follower before input to the data acquisition board. The combined speed of the system was a maximum of .05 msec switching time per channel.

A 16-channel, 12 bit A/D board (H25) was used for digitization of the voltages into discrete numbers for the computer. The digital outputs of this board were also used to control the switching operation of the MUXs. The current configuration provides for 32 multiplexed analog inputs and 14 straight analog inputs. This system can be expanded to 256 multiplexed analog inputs or even up to 2048 inputs with minimal logic circuitry. In operation, the data transfer rate was approximately 2800 samples per second. The 12 bit A/D was configured for a 0.000 to 10.000 volt scale which provided a resolution of 409 bit combination (numbers) per volt.

The temperature circuit is shown in Figure A4. This bridge circuit provides linear operation at 25^{o} C with great sensitivity for the 100K thermistor used in the chamber. A non-inverting amplifier amplified the output of the bridge circuit with a gain of 44. The final output was buffered from the

computer with a voltage follower. Sensitivity of this circuit was 2.7°C/volt which corresponded to a sensitivity of 0.006°C when digitized.

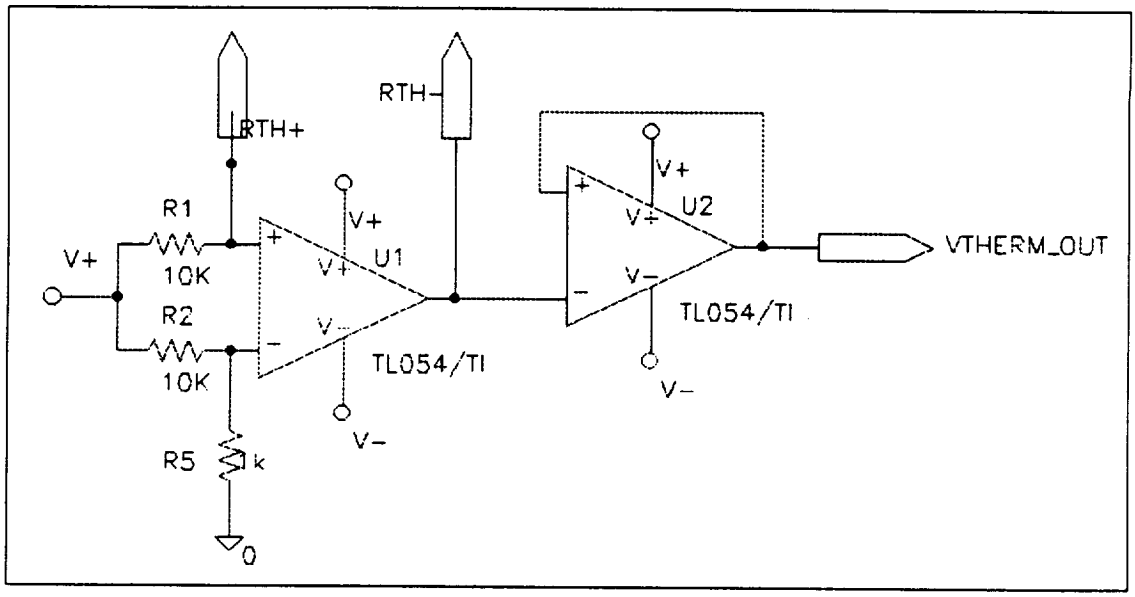

Figure A4.

The output of the O_2 sensor is amplified by a differential amplifier as shown in Figure A5 with a gain of 14. This is amplified again with a noninverting amplifier with a gain of 2.5. A summing amp is used to offset the baseline reading of O_2 concentration in ambient air. The final output was buffered from the computer with a voltage follower.

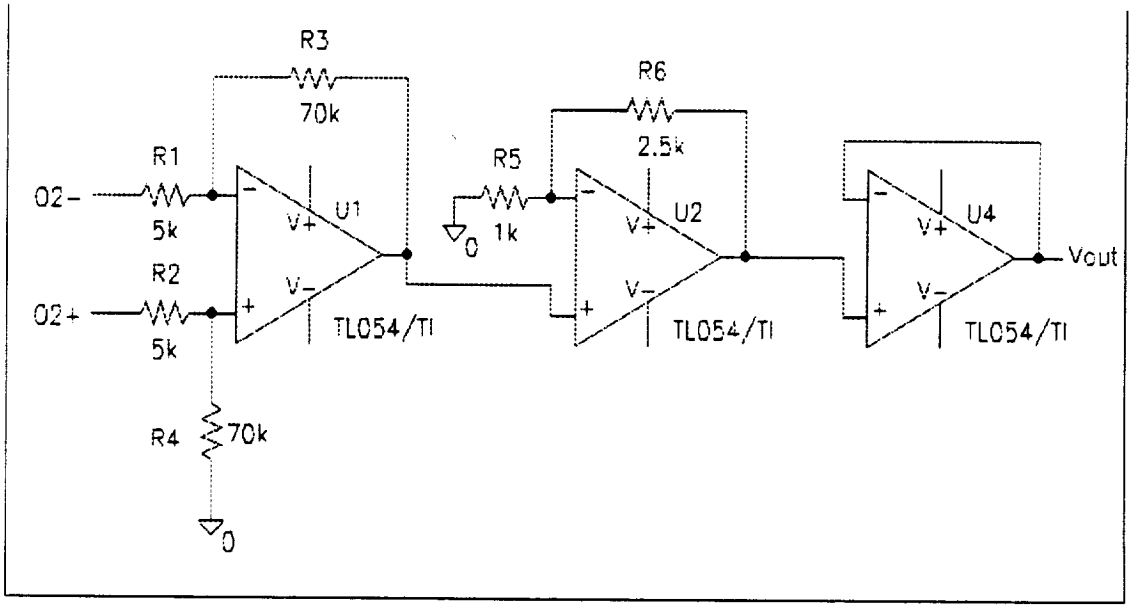

Figure A5.

The load cell sensor forms part of a bridge circuit as show in Figure A6. This is amplified again with a noninverting amplifier with a gain of 2.5. A summing amp is used to offset(tare) the startup weight of 2500 grams. Range of this system was from 2300 to 2900 grams. The final output was buffered from the computer with a voltage follower. Sensitivity of this circuit was 0.15 grams which corresponded to a sensitivity of 0.2 grams when digitized.

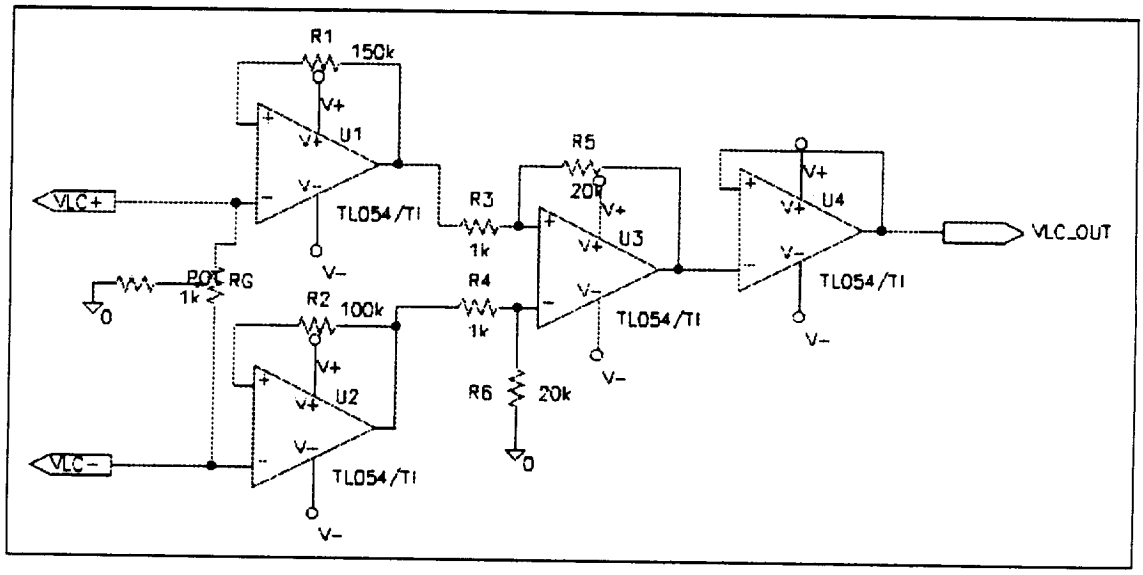

Figure A6.

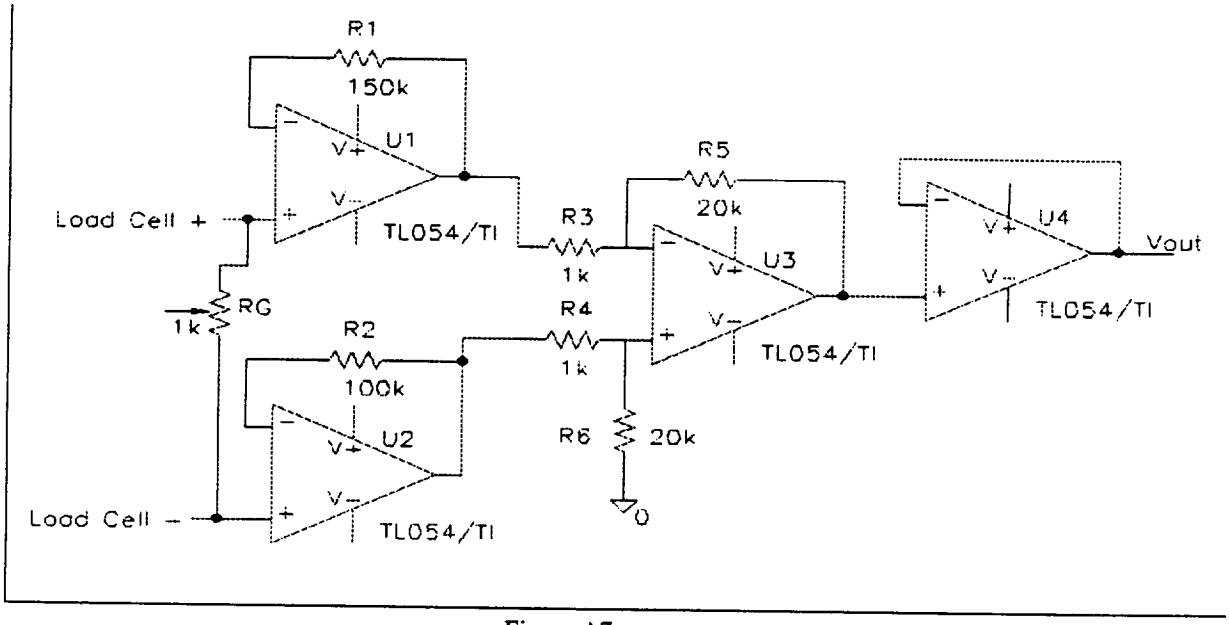

Figure A7.

The output of the infrared gas analyzer (IRGA) was directly connected to the A/D board. This system was calibrated to yield 2000 ppm full scale at 1.0 volts. This corresponded to a sensitivity of 4.9 ppm when digitized.

Hardware References

H1. Stainless Steel Tubing .25" O.D. ;Swagelok T304
H2. Stainless Swagelok Connectors SS-XXX
H3. Stainless VCR Connectors: Cajon SS-XXX
H4. Acrylic tubing .250" thick wall: Cadillac Plastics
H5. Acrylic plate stock 1.000" thick: Cadillac Plastics
H6. Dow Corning Silicone High Vacuum Grease
H7. Environmental Growth Chambers
H8. 9-pin gold-plated connectors Amphenol
H9. Bostick hot-melt adhesive
H10. Tec-Air 6" nylon fan blade
H11. Globe 12V DC motor Model 403A159
H12. Alnico 5 Coupling magnet #2225: The Magnet Store
H13. Norprene tubing /25" I.D.: Cole Parmer
H14. Peristaltic Pump: Cole Parmer model E690MC
H15. Koolant Koolers Cold Water Chiller Model HCC330PR-L
H16. 6 conductor Shielded Cable; Alpha Wire-H E9332: P/N 1299/15C
H17. Fenwal 100k Thermistor #197-104QAG-A01
H18. Idec Relays #RH2B-U; rated 7.5A@120V
H19. Grayhill Solid State Relays #70-ODC5; rated 3.5A@60V
H20. Computerboards Model CIO-DIO48 Digital Output Board
H21. Computerboards Model CIO-DDA06 Digital to Analog Board
H22. Panasonic 1% Tolerance 1/8 watt Metal-film Resistors
H23. Texas Instruments Model TL054BCN
H24. Maxim Model #DG406
H25. Computerboards Model CIO-AD16JR-AT Analog to Digital Board

Appendix B.

Software System Description

All computer code was generated and operated on an IBM compatible '386 machine. The hardware boards described previously utilize the ISA bus of this machine. All computer code was written in Borland C++ Ver. 3.1. All code was written such that the program can be easily ported to another software compiler.

Most of the operations performed for this research would be best carried out with dedicated inexpensive microcontrollers. The main supervisory program would then simply initiate system-level commands to the distributed components. This scenario is also the most robust, and would probably be implemented in final development. Since this project involves fundamental research, one computer program controls all aspects of the system. It was recognized however that a distributed system would be desirable. Therefore effort was made to keep the 'C' code structured such that any subroutine/ function could be implemented with different hardware. This structuring was also implemented so that the code could be easily ported into a non-IBM machine. This research can be ported to VMEbus, S-Bus, etc., types of hardware. A basic flowchart of the control program is shown in Figure B1. An alphabetical list of the subroutines is given in Table B1. An alphabetical list of program constants (including fixed setpoints) is in Table B2, and a list of the variables is in Table B3. Where possible, the titles in the flowchart represent the names of the subroutine/function called. The values in parentheses indicate the parameters sent to the subroutine/function.

The program accepts command-line parameters which select normal, engineering test, or simulation modes of operation. The initialization includes any experiment information as well as the date and time of startup. All hardware is initialized (*BoardInit)*and checked for problems. All software variables: date, time, round, etc., are initialized. Different error checks are performed throughout the program. Unrecoverable errors are processed by the errorsub subroutine which returns control to the beginning of the program for complete reinitialization. The **initAndClearWindow** initializes various sections of the display which represent content-specific information.

The sample chamber is evacuated for 30 seconds before sampling. The program then executes the **integoutflow** function which suctions a 700 ml sample from the growth chamber. The flowmeters used in this study give a voltage which represents the flow rate of gas through the meter. In order to get volume, this rate must be integrated. **Integoutflow** is one of three integrating functions which performs the conversion from rate to volume. The output of the flowmeter is sampled with subroutine calls to **AllDataIn** during the entire integration process to detect any small changes in flow rate. The function begins the integrating process and inserts a 2 second delay before opening the solenoids leading from the chamber (described in the gas delivery section). This delay allows for minor pressure equilibration in the gas lines while before sampling. The solenoids are then opened and the gas is drawn from the chamber, through the desiccant bed, flowmeter, and into the sample chamber. The excess sample gas described previously is suctioned through the vacuum pump and vented to room atmosphere. This integration process continues until 99% of the sample has been obtained. The solenoids then close; however the function does not return to the main program until all gas flow has ceased. This ensures that no gas flow goes undetected or unaccounted.

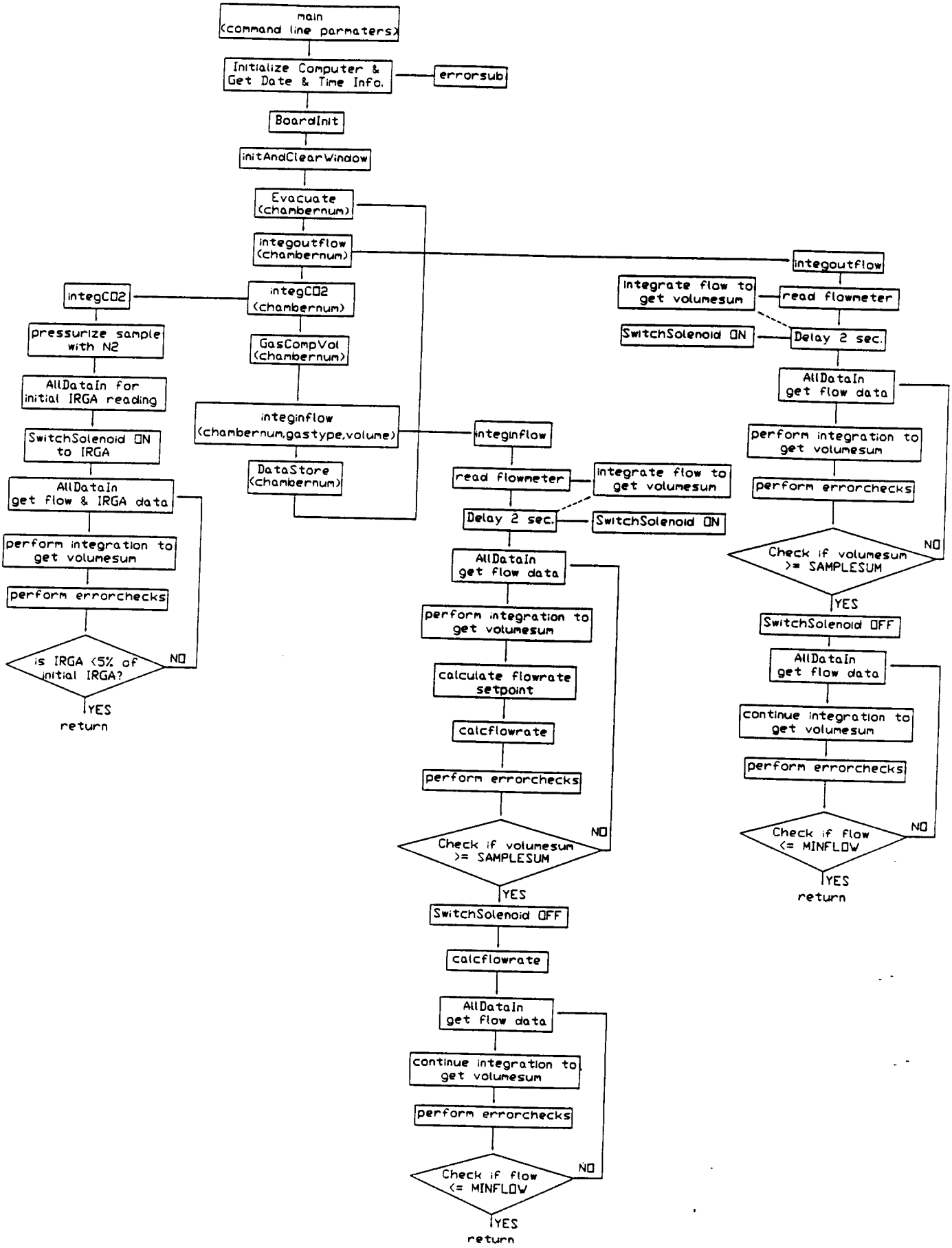
main
(command line parmaters)
Initialize Computer & Get Date & Time Info.
errorsub
BoardInit
initAndClearWindow
Evacuate (chambernum)
integoutflow (chambernum)
integoutflow
integCO2
integCO2 (chambernum)
integrate flow to get volumesum
read flowmeter
SwitchSolenoid ON
Delay 2 sec.
pressurize sample with N2
GasCompVol (chambernum)
AllDataIn for initial IRGA reading
AllDataIn get flow data
SwitchSolenoid ON to IRGA
integinflow (chambernum,gastype,volume)
integinflow
perform integration to get volumesum
AllDataIn get flow & IRGA data
DataStore (chambernum)
read flowmeter
integrate flow to get volumesum
perform errorchecks
perform integration to get volumesum
Delay 2 sec.
SwitchSolenoid ON
Check if volumesum >= SAMPLESUM
NO
perform errorchecks
AllDataIn get flow data
YES
is IRGA <5% of initial IRGA?
NO
perform integration to get volumesum
SwitchSolenoid OFF
YES
return
calculate flowrate setpoint
AllDataIn get flow data
calcflowrate
continue integration to get volumesum
perform errorchecks
perform errorchecks
Check if volumesum >= SAMPLESUM
NO
Check if flow <= MINFLOW
NO
SwitchSolenoid OFF
YES
return
calcflowrate
AllDataIn get flow data
continue integration to get volumesum
perform errorchecks
Check if flow <= MINFLOW
NO
YES
return

Figure B1.

The main program then executes the function **integCO2**. This function first pressurizes the sample with N_2 in order to force it through the IRGA. This pressurization was found require a constant time of 60 seconds. The solenoids leading to the IRGA (described in the gas delivery section) are opened and the **AllDataIn** subroutine is called to read the IRGA reading and the flow through the sample chamber (and through the IRGA). This IRGA reading was integrated in time to obtain an integrated CO_2 reading. Another parameter which was extracted during this process was the maximum, or peak IRGA reading. The analysis of these readings is given in the results section. The integration process continues until the IRGA reading is less than 5% of the initial value. This would indicate that the sample being injected could be assumed to be 95% N2. The solenoids were then turned off and the function returned to the main program.

Once a CO_2 value for the chamber had been determined, the **GasCompVol** subroutine was executed which calculated the volumetric ratio of gas to add to the growth chamber: CO2, N2, and O_2 for low; CO_2 and Air for high. The gas ratio was then multiplied by the volume sampled from the chamber during **integoutflow** to obtain the volume for each specific gas. As noted previously in the gas delivery section, each gas was added individually.

The main program executes **integinflow** to add the calculated volume of gas to the growth chamber. The steps of this process are identical to **integoutflow**; except the flowcontrollers are also used to provide more precise gas delivery than using solenoids alone. The flowcontrollers have separate flowmeters which are used for flowcontrol; but also provide a separate output voltage which represents the actual flow rate of gas through the meter. In order to get volume, this rate must be integrated. The output of the flowmeter is sampled with subroutine calls to **AllDataIn** during the entire integration process to detect any small changes in flow rate. The function begins the integrating process and inserts a 2 second delay before opening the solenoids leading from the chamber (described in the gas delivery section). The function then calculates a desired flowrate for accurate volume integration and gas delivery. This flowrate setpoint is then sent to the subroutine **calcflowrate**. **calcflowrate** performs the necessary conversions and calculates the analog output voltage (D/A) to send to the flow controller. This integration process continues until 99% of the sample has been obtained. The solenoids then close and the flowcontrollers are set to zero flow. However, the function does not return to the main program until all gas flow has ceased.

Table B1.

Computer System Subroutines and Functions

Note: Names in **Bold** are hardware independent, Names in *Italic* are hardware dependent.
Names in ALL CAPS are program constants.
All other names in normal type are program variables listed.

void **addnutrient**

Simple subroutine which may be accessed at certain times by the technician to perform gas tank changes, add nutrients, and other growth chamber maintenance. This subroutine can only be accessed during certain noncritical times of operation. Otherwise the technician's keyboard entries will be ignored.

void **AllDataIn**

Main routine which performs calls to all sensory inputs. This includes flow controllers, flow meters, IRGA and any growth chamber sensors.

void **AllOff**

Turns off all solenoids and flow controllers to render the system in a fail-safe mode. This subroutine is called after any error detection or upon system reset.

void **AllOn**

The opposite of AllOff, this subroutine is an engineering test program only. It can only be issued from the engineering program **plantest**.

float **AnalogIn**(*channel*)

Support intermediate-level subroutine call to sample analog data from a specific channel of the A/D board selected.

void *AnalogOut*(*channel*,value)

Support intermediate-level subroutine call to send analog data from a specific channel of the D/A board selected.

void **Beep**

Support subroutine which sends a sound to the speaker. This is only called when an error is detected to alert the user. This sound can be detected when system is controlled remotely over the ethernet.

void *BoardInit*

Hardware specific routine which initializes all system hardware and checks for initialization errors (makes sure all systems are on line).

void **calcflowrate**(chambernum,gastype,flowset)

Subroutine which selects the proper D/A channel and calculates the analog voltage to send to the flowcontroller to achieve the desired flowrate.

void **CalcWindow**(passbuff)

One of the display windows which is dedicated to rapidly changing information contained in "passbuff". Normally used during integration processes.

void **convertDataVoltages**

Subroutine which converts the raw data voltages into meaningful units based on regression equations determined during testing. This routine is usually called immediately after **AllDataIn**.

void **Coolant**

Simple support subroutine which determines if the coolant solenoids should be engaged. Setpoint and tolerance are determined at program initiation.

float **DataIn**(chambernum,channel)

System-level call for data input from chambernum (system) and channel or component of that system.

void **DataScreen**(row,col,color,value,precision)

One of the display windows which only displays data to the desired location. This routine is normally called after AllDataIn and data has been converted with convertDataVoltages.

void **DataStore**(storemode)

All normal calls to store data are served with this routine. The data values and format are selected by storemode. Each data file ends with a .DAT extension and has a matching .PAT file. This ensures that there remains a one-one match for the variables stored on disk. Each data file has the date encoded in the name. The program creates one data file for each day.

void **Delay**(delaytime)

Simple time delay which freezes all system activity. Normally called for short (<5.0 sec) delays.

unsigned *DigIn*(*conn*,*port*)

Hardware specific routine which determines the current status of the digital output board which controls the relays. This permits feedback to the program about which solenoids are engaged. The Primary utility is for confirmation of hardware performance and feedback for remote control over the ethernet. This routine is only called by **Mon_Solenoid**.

void *DigOut*(*conn*,*port*,*byte*)

Hardware specific routine which sends the desired digital code to the digital output board which controls the relays. This routine is a service routine which is called only by **SwitchSolenoid**.

void **DispTime**

Support routine which displays time in the date & time window.

void **endRawDataRead**

Read previously stored raw simulation data from disk.

void **endRawDataStorage**

Store raw simulation data to disk.

void **error**(buf)

void **errorexit**(subname)

Support subroutine which handles all errors detected in any portion of the program. The system is rendered fail-passive and any critical data is stored. This function is recursive and makes every attempt to restart the entire system to ensure plant integrity is not compromised.

void **errortest**(stream,msg)

Support subroutine which does basic error checking before writing data to disk (stream).

void **Evacuate**(chambernum)

Routine which evacuates the sample chamber of interest before sampling. Delay is created by a call to **Mon_Delay**.

float **flowin**(chambernum,gastype)

Support routine which returns the flowmeter reading of the flowcontroller of interest. This is a support routine for **integinflow**.

float **flowout**(chambernum)

Support routine which returns the reading of the flowmeter of interest. This is a support routine for **integoutflow**.

void **GasCompVol**(gasmode)

Routine which calculates the volume(s) of gas to add based on the most recent IRGA and sensor data.

void **GasesWindow**(chambernum,gastype,volume)

clock_t **getGoodRealClock**

Support subroutine which obtains current CPU clock reading. This technique is used to perform time measurements with msec precision.

void **initializeDataStore**

int **inkey**(out_char)

Keyboard handler subroutine.

float **integCO2**(chambernum,flag)

Main subroutine which performs the process of pressurizing the sample, and sending it through the IRGA to obtain CO2 measurements. This subroutine also contains the regression equations which compensates for the diluting effects of the N2 purge procedure.

float **integinflow**(chambernum,gastype,vol,flag)

Main subroutine which adds the desired amount of gas to the selected growth chamber. The volume to be added is determined previously by **GasCompVol**.

float **integoutflow**(chambernum)

Main subroutine which samples gas from the growth chamber, through the desiccant bed, and into the sample chamber.

void **keycheck**

void **keyexit**(subname)

Subroutine which is called with any keyboard entry. Any unacceptable keyboard entries are rejected, and the calling process is resumed. Program interruption can only be generated with a special series of keystrokes. (<shift-KEY>)

void **main**(argc,argv)

Main program, commonly referred to as plantrun. This program accepts command-line arguments which determine the operating mode: NORMAL_MODE, TEST_MODE, SIMULATION_MODE.

void **Message**(passbuff)

One of the display windows which is primarily used to display system status information sent through "passbuff".

void **mon**(voltdisp)

Support subroutine for the engineering program plantest. This program permits bypassing the subroutine **convertDataVoltages** to display raw voltages. Only used during testing.

void **Mon_Delay**(delaytime)

Support delay routine for delays longer than a few seconds. This permits screen update while the system is waiting for another procedure.

void **Mon_Solenoid**

Support display routine which displays current solenoid information in the solenoid display window. This routine calls *DigIn*.

void **Monitor**(clear)

Main display routine which gets most recent data (**AllDataIn**) and displays either the data, or data and titles depending upon the clear variable.

void **plantest**

Main engineering test program which selectively exercises any of the subroutines during testing. This program is frequently modified for brief custom tests to test specific system integrity or aid in debugging software or hardware problems. It remains an integral part of the final software to allow for occasional system diagnostics.

void **prepareRawDataRead**

Prepare program to read previously stored raw simulation data from disk.

void **prepareRawDataStorage**

Prepare program to store raw simulation data to disk.

int **processCommandLine**(argc,argv)

Support subroutine which processes command-line arguments upon experiment startup. These commands can alter which mode the program will operate in. (NORMAL_MODE, TEST_MODE, SIMULATION_MODE)

void **readDataFromMux**

Support subroutine for **AllDataIn** which makes direct calls to **DataIn**

void **readNextDataFromFile**

Read next previously stored raw simulation data set from disk.
(Simulation equivalent of **readDataFromMux**)

void **readRawDataFromFile**

Read first previously stored raw simulation data set from disk.
(Simulation equivalent of **readDataFromMux**)

void **Screen**(row,col,color,passbuff,unassigned)

Lowest-level display routine which displays contents in "passbuff" to the location specified by row,col in the current display window. The parameter unassigned remains to allow for portability to other software platforms.

void **showCommandLineHelp**

Support subroutine called to display valid user entries at the command line when the program is first executed.

void **sol**

Support subroutine used by the engineering program **plantest**. Used to selectively switch solenoids manually during testing.

int **string_in**(stra,no_char,first_char)

Support routine for keyboard entry and edit.

int **string_over**(stra,no_char)

Support routine for keyboard entry and edit.

void **SwitchSolenoid**(chambernum,channel,status)

System level support subroutine used to switch solenoids on or off.

void **syncRawData**

void **terminateDueToEndOfRawData**

void **test_flowcntrol**

Support subroutine used by the engineering program **plantest**. Used to selectively command the flowcontrollers manually during testing.

void **Warning**(passbuff)

One of the display windows which is primarily used to critical system status information sent through "passbuff". This is very similar to the **Message** subroutine; however it is reserved for critical messages. All error messages are displayed through this routine.

void **Window**(winnumber,clear)

Main display routine which determines the physical layout windows of the user screen. Windows may be selectively cleared with the clear variable.

void **writeRawDataToFile**

Table B2.

Control Program Constants

Note: Names in *Italic* are hardware dependent.

```
#define A_TO_D_WIN 11 /*Define window number */
#define AD16JR_AT_BASE 0x380 /*Logical Address of AD16-Jr-AT A/D Board */
#define AD16JR_AT_BOARDNUM 1  /*Logical Boardnumber of AD16-Jr-AT A/D Board */
#define AD16JR_AT_DMA 3  /*DMA Channel of AD16-Jr-AT A/D Board (not currently used)*/
#define AD16JR_AT_INT 5  /*Interrupt Levell of AD16-Jr-AT A/D Board (not currently used)*/
#define AIR 4 /* System Gas Reference Constant for bottled breathing air*/
#define AMBIENT_PRESS_WIN 6 /*Define window number */
#define ATOD_COL_BEGIN 3 /* Define atod window limits*/
#define ATOD_COL_END 78 /* Define atod window limits*/
#define ATOD_ROW_BEGIN 37 /* Define atod window limits*/
#define ATOD_ROW_END 42 /* Define atod window limits*/
#define AVGCOUNT 10 /* Number of Samples To Average When Inputing Analog Data */
#define BUFLENGTH 78 /* Standard buffer length of character strings in code */
#define CALC_COL_BEGIN 3 /* Define fast display window limits*/
#define CALC_COL_END 79 /* Define fast display window limits*/
#define CALC_ROW_BEGIN 25 /* Define fast display window limits*/
#define CALC_ROW_END 25 /* Define fast display window limits*/
#define clearWindow(x) Window((x), 1) /* Macro to clear desired window*/
#define closeToZero(x) withinEpsiolon(x) /*Check to see if value is withinEpsilon distance from zero
*/
#define CO2 1 /* System Gas Reference Constant for bottled CO2*/
#define CO2LEVEL 1000 /* Desired CO2 level in chambers (ppm) */
#define CONT_CALC_WIN 9 /*Define window number for fast display window*/
#define COOLANT 9 /* System Component Constant for cooling*/
#define DATE_COL_BEGIN 71 /* Define date window limits*/
#define DATE_COL_END 79 /* Define date window limits*/
#define DATE_ROW_BEGIN 1 /* Define date window limits*/
#define DATE_ROW_END 2 /* Define date window limits*/
```

```
#define DDA06_BASE 0x320 /*Logical Address of DDA-06 D/A Board */
#define DDA06_BOARDNUM 2  /*Logical Boardnumber of DDA-06 D/A  Board */
#define DIO48_BASE 0x300  /*Logical Address of DIO48 Digital Output Board */
#define DRAW_TITLES 0 /* Constant for displaying titles in display subroutines */
#define EPSILON 1.00E 06 /* Minimal value for evaluating floating point expressions close to 0 */
#define EVACUATETIME 20 /* Time to evacuate sample chamber to near absolute vacuum before
sample is          drawn */
#define SETTLETIME 60 /* Time to allow N2 equilibration to pressurize sample chamber */
#define GAS_CALC_WIN 10 /*Define window number for gases*/
#define GAS_COL_BEGIN 3/* Define window limits for gases*/
#define GAS_COL_END 78 /* Define window limits for gases*/
#define GAS_ROW_BEGIN 26 /* Define window limits for gases*/
#define GAS_ROW_END 36 /* Define window limits for gases*/
#define GetInterruptVector(i) getvect(i) /* Internal use by A/D subroutines*/
#define GetPortB(p) ((unsigned int) inportb(p))  /* Internal use by A/D subroutines*/
#define GROWTHCHAMBERVOL 66000 /* Total Volume of the growth chamber, without lines */
#define HiByte(p) ((unsigned int) (((unsigned int) p) > > 8))  /* Internal use by A/D subroutines*/
#define HIGH_CHAMBER 1 /* System Level Constant value for High System References*/
#define HIGH_COL_BEGIN 55 /* Define window limits*/
#define HIGH_COL_END 80 /* Define window limits*/
#define HIGH_ROW_BEGIN 9 /* Define window limits*/
#define HIGH_ROW_END 20 /* Define window limits*/
#define HORIZ 0xC4 /* Define special ASCII characters for screen display*/
#define HPRESSURE 770 /* Pressure to maintain in Ambient Pressure Chamber (mmHg) */
#define HTEMP 21 /* Desired Temperature in Ambient Chamber (C) */
#define initAndClearWindow() Window(1, 1)
#define initWindow() Window(1, 0)
#define InterruptsOff disable  /* Internal use by A/D subroutines*/
#define InterruptsOn enable  /* Internal use by A/D subroutines*/
#define IRGA 2 /* System Level Constant value for IRGA System References*/
#define IRGA_COL_BEGIN 3 /* Define window limits*/
#define IRGA_COL_END 27 /* Define window limits*/
#define IRGA_ROW_BEGIN 18 /* Define window limits*/
#define IRGA_ROW_END 20 /* Define window limits*/
#define IRGA_WIN 4 /*Define window number */
#define LEFT_BOT 0xC0 /* Define special ASCII characters for screen display*/
#define LEFT_TOP 0xDA /* Define special ASCII characters for screen display*/
#define LoByte(p) ((unsigned int) (p & 0xff))
#define LOW_CHAMBER 0 /* System Level Constant value for Low System References*/
#define LOW_COL_BEGIN 29 /* Define window limits*/
#define LOW_COL_END 54 /* Define window limits*/
#define LOW_PRESS_WIN 5 /*Define window number */
#define LOW_ROW_BEGIN 9 /* Define window limits*/
#define LOW_ROW_END 20 /* Define window limits*/
#define LPRESSURE 540 /* Pressure to maintain in Low Pressure Chamber (mmHg) */
#define LPT1Port 0 /*Constant define for system printer #1 */
#define LPT2Port 1  /*Constant define for system printer #2 */
#define LTEMP 21 /* Desired Temperature in Low Chamber (C) */
#define MAXINTEGTIME 400 /* Max time allowed for integration during any in/out
        gas procedure */
#define MESSAGE_COL_BEGIN 3 /* Define window limits*/
```

```
#define MESSAGE_COL_END 79 /* Define window limits*/
#define MESSAGE_ROW_BEGIN 4 /* Define window limits*/
#define MESSAGE_ROW_END 7 /* Define window limits*/
#define MESSAGE_WIN 2 /*Define window number */
#define MINIRGAPURGE 8 /* Min allowable initial irga reading before gas calculation routines */
#define N2 2 /* Gas Reference Constant */
#define N2PURGE 7 /* System Component Constant*/
#define NO_DRAW_TITLES 1  /*Constant define to not display titles when displaying data*/
#define noallocmemerr 1  /* Internal use by A/D subroutines*/
#define NORMAL_MODE 1 /*System level constant for normal operation */
#define O2 3 /* Gas Reference Constant */
#define O2LEVEL 0.204 /* Desired O2 level in chamber (%O2) */
#define OFF 0 /* System Component Constant*/
#define ON 1 /* System Component Constant*/
#define PLUSVOLUME 550 /* Volume (ml) to pull through Sample Chamber After Flow is Zero */
#define PRINTER_DEVICE_ERROR (0x08) /*Constant define for system printer
#define PRINTER_NOT_BUSY (0x80)
#define PutPortB(p, val) (outportb(p, (char) val))  /* Internal use by A/D subroutines*/
#define RIGHT_BOT 0xD9 /* Define special ASCII characters for screen display*/
#define RIGHT_TOP 0xBF /* Define special ASCII characters for screen display*/
#define SAMPLE_IN 5 /* System Component Constant for obtaining samples*/
#define SAMPLE_OUT 8 /* System Component Constant for processing samples*/
#define SAMPLECHAMBERVOL 150 /* Total Volume of the Sample chamber & associated gas
        lines */
#define SetInterruptVector(i, v) setvect(i, v)  /* Internal use by A/D subroutines*/
#define SIMULATION_MODE 2  /*System level constant for simulated operation */
#define SOLENOID_COL_BEGIN 3 /* Define window limits for solenoid info.*/
#define SOLENOID_COL_END 27 /* Define window limits for solenoid info.*/
#define SOLENOID_INFO_WIN 3 /*Define window number for solenoid info.*/
#define SOLENOID_ROW_BEGIN 9 /* Define window limits for solenoid info.*/
#define SOLENOID_ROW_END 16 /* Define window limits for solenoid info.*/
#define TEMP_TOLERANCE 0.2 /* Sensitivity of system for temperature correction */
#define TEST_MODE 3  /*System level constant for testing (manual) operation */
#define TIME_DATE_WIN 8 /*Define window number for dat and time*/
#define useWindow(x) Window((x), 0) /*Macro for selecting "x" window*/
#define VACUUM 6 /* System Component Constant for vacuum*/
#define VERT 0xB3 /* Define special ASCII characters for screen display*/
#define WARN_COL_BEGIN 3 /* Define warning window limits*/
#define WARN_COL_END 79 /* Define warning window limits*/
#define WARN_ROW_BEGIN 22 /* Define warning window limits*/
#define WARN_ROW_END 23 /* Define warning window limits*/
#define WARNINGS_WIN 7 /*Define warning window number */
#define FALSE 0 /*System Boolean constant */
#define TRUE 1 /*System Boolean constant */
```

Table B3
Global System Variables

```
getProjectDescription;     /*Flag to check if Experiment has been restarted*/
LCO2          Low Chamber CO2 Flowmeter Reading
LN2           Low Chamber N2 Flowmeter Reading
LO2           Low Chamber O2 /N2 Flowmeter Reading
```

Lflow	Low Chamber Sample Flowmeter Reading
Ldrytemp	Low Chamber Dry Bulb Temp.
Lwettemp	Low Chamber Wet Bulb Temp.
Lstrain	Low Chamber Dry Bulb Temp.
Lpressure	Low Chamber Pressure
LO2sensor	Low Chamber O_2 sensor.
HCO2	High Chamber CO_2 Flowmeter Reading
HAir	High Chamber N_2 Flowmeter Reading
Hflow	High Chamber Sample Flowmeter Reading
Hdrytemp	High Chamber Dry Bulb Temp.
Hwettemp	High Chamber Wet Bulb Temp.
Hstrain	High Chamber Dry Bulb Temp.
Hpressure	High Chamber Pressure
HO2sensor	High Chamber O_2 sensor.
gas_volume[2][4]	Static Array which contains the latest calculated volume of gas to add Note: gas_volume[0][X] is for low chamber;gas_volume[1][X] is for high chamber
irga	Direct reading from the IRGA
irgacalcmax	Calculated Sample CO_2 [ppm] based on regression fit
LCO2out	Calculated Low Volume of CO_2 [ml] removed based on regression fit
LCO2vol	Low Volume of CO_2 [ml] added
LN2vol	Low Volume of N_2 [ml] added
LO2vol	Low Volume of O_2 [ml] added
Loutvol	Total Low Volume removed
Ltotalinvol	Total Low Volume added
Llastirga	Last calculated IRGA reading (irgacalcmax)
Lnutrient	Nutrient Added to high chamber during cycle
HCO2out	Calculated High Volume of CO_2 [ml] removed based on regression fit
HCO2vol	Low Volume of CO_2 [ml] added
HN2vol	Low Volume of N_2 [ml] added
Houtvol	Total Low Volume removed
Htotalinvol	Total Low Volume added
Hlastirga	Last calculated IRGA reading (irgacalcmax)
Hnutrient	Nutrient Added to high chamber during cycle
roomtemp	Temperature of room (IRGA)
Lcoolant	Boolean Flag when coolant solenoid is on
Hcoolant	Boolean Flag when coolant solenoid is on
mode	Operating mode: 0-normal, 1-manual testing, 2-simulation
voltdisp	Boolean flag to display raw voltages (Only accessed during manual testing)
round	Variable which counts the cycle (round) for the day. Note: Data stored in daily data sets; and round reinitialized.

Appendix C.

Functional Test Experiment Data

DATE2/10

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.4	21.589	552.578	24.706	764.9	20.853	729.265	5.414
22.90	535.2	20.833	686.986	4.946	759.9	20.922	559.153	13.581
47.72	540	20.986	774.135	10.334	760	21.078	619.027	15.367
73.05	539.8	20.937	880.775	5.455	759.8	20.991	799.061	12.947
98.40	540	20.908	964.508	2.154	759.5	21.305	965.909	2.805
123.88	539	20.979	972.959	1.646	760	21.154	1018.249	0
147.33	540	20.893	1010.76	0	760.1	21.009	1092.074	0
169.62	539.6	20.823	1007.784	0	760.1	21.009	1092.074	0
190.95	540.1	21.181	993.075	0.437	760.1	20.9	1087.177	0
213.92	539.9	21.088	985.827	0.874	761.1	21.142	1066.248	0
236.75	539.9	20.921	988.718	0.699	760.1	20.927	1083.926	0
258.92	539.9	20.763	1009.27	0	760.1	21.026	1067.841	0
280.13	539.9	21.228	985.827	0.873	760.1	20.934	1058.324	0
302.38	539.8	21.075	998.925	0	760.1	20.816	1053.602	0
325.20	540.1	20.914	980.079	1.218	762.2	21.206	1059.903	0
347.57	540	20.763	995.994	0.263	760.1	20.739	1048.907	0
368.38	539.8	20.862	997.458	0.179	760.2	20.843	1047.347	0
390.42	539.8	21.179	990.167	0.612	761.7	20.954	1034.971	0
412.75	539.9	20.721	1007.784	0	764.1	21.063	1036.509	0
433.55	540.6	21.179	985.827	0.873	764.6	21.107	1028.851	0
455.57	539.8	20.654	1004.82	0	761.1	20.411	1025.807	0
476.65	539.9	20.711	995.994	0.263	760.5	20.626	1009.271	0
496.93	540	20.937	995.994	0.263	765.1	21.167	1013.747	0
518.00	539.8	20.96	1003.342	0	760.1	20.448	1016.745	0
539.03	539.8	21.189	1006.3	0	761.1	20.712	1012.252	0
560.38	539.9	20.929	1000.394	0	765.5	21.115	1012.252	0
582.07	539.9	21.002	984.386	0.96	766	21.075	995.994	0
603.25	539.7	20.906	997.458	0.176				
638.23	539.8	20.771	987.271	0.788				
659.72	539.7	20.765	1019.754	0				

DATE2/11

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540	20.638	1012.252	0	763.5	20.648	991.62	0.599
21.40	540.3	20.617	1012.252	0	765.4	20.939	1003.342	0
43.17	540.1	20.643	991.62	0.525	765.1	20.969	1001.866	0
64.70	539.9	20.633	1018.248	0	765.3	21.058	1013.747	0
86.12	539.7	20.63	1009.271	0	765.1	21.102	1003.342	0
107.60	539.9	20.589	1001.866	0	765.1	21.1	1004.819	0
129.73	539.8	20.661	985.827	0.873	765	21.038	1009.271	0

151.22	539.9	20.698	1016.745	0	765.1	21.107	1009.271	0
172.75	540.1	20.698	1009.271	0	764.9	20.947	1009.27	0
194.27	539.8	20.713	1012.252	0	765.2	21.068	1012.252	0
216.18	539.9	20.7	990.167	0.612	765.1	21.107	1012.252	0
238.72	540	20.654	977.223	1.389	765	21.134	1007.784	0
260.47	539.8	20.612	995.994	0.263	765.4	20.895	997.458	0
281.90	540	20.591	1027.328	0	765.3	20.969	994.533	0
303.32	540.1	20.571	1024.29	0	765	21.004	1007.784	0
324.68	540	20.513	1013.747	0	765.1	21.006	998.925	0
346.17	540.1	20.386	1013.747	0	765.7	20.865	1000.394	0
367.43	539.9	20.425	998.925	0	765.3	20.843	1010.76	0
389.32	540.2	20.417	988.718	0.699	765.4	20.851	1004.82	0
410.67	539.9	20.456	1006.3	0	765.3	20.888	994.533	0
431.95	539.9	20.524	1003.342	0	765.1	20.934	1003.342	0
453.53	539.7	20.532	993.075	0.437	765	20.996	1004.82	0
474.95	540	20.516	1006.3	0	765	20.944	993.075	0
496.60	539.8	20.511	991.62	0.525	765.1	20.947	995.994	0
518.08	540.1	20.532	1004.819	0	765.2	20.974	995.994	0
539.37	539.9	20.552	1000.394	0	765.3	20.969	994.533	0
745.42	538.6	20.971	939.771	3.638	759.5	20.91	968.721	2.564
756.93	541.3	20.895	968.721	3.638	759.7	20.902	968.721	2.564
768.87	540	21.106	978.649	1.303	761.5	21.021	941.121	4.933
780.75	541.6	21.166	941.121	1.303	761.9	21.036	941.121	4.933
792.67	540	20.911	1013.747	0	762.7	20.989	984.386	1.22
802.92	544.1	21.132	984.386	0	762.9	21.043	984.386	1.22
813.58	540	21.101	1000.394	0	770.1	20.934	998.925	0
827.75	538.6	20.999	998.925	0	770.5	20.969	998.925	0
840.33	539.8	21.093	982.948	1.046	770.1	20.752	1025.807	0
851.20	537.4	20.674	1025.807	1.046	770.4	20.764	1025.807	0
863.18	538.4	20.711	1007.784	0	770	20.806	1042.685	0
874.90	541.6	21.111	1042.685	0	770.3	20.814	1042.685	0
886.90	540	20.986	993.075	0.437	770.1	21.167	1034.971	0
897.78	538.8	20.921	1034.971	0.437	769.5	21.171	1034.971	0
910.77	539.5	20.916	987.271	0.787	770.1	20.809	1045.791	0
922.38	542.1	20.984	1045.791	0.787	770.2	20.784	1045.791	0
933.65	540.2	20.778	990.167	0.612	770.1	20.806	1031.905	0
944.07	542.9	21.137	1031.905	0.612	770.1	20.831	1031.905	0
956.67	539.9	20.713	993.075	0.438	770.1	20.799	1025.807	0
968.42	541.6	20.862	1025.807	0.438	770.1	20.816	1025.807	0
980.37	540	20.721	1009.27	0	770.1	20.843	1007.784	0
991.52	541.3	20.656	1007.784	0	770.3	20.865	1007.784	0
1004.73	539.8	20.888	972.959	1.645	770.2	20.873	1015.244	0
1015.57	543.2	20.953	1015.244	1.645	770.3	20.883	1015.244	0
1027.20	540.1	20.953	990.167	0.612	766.4	21.068	990.167	0.725
1037.30	540.2	21.01	990.167	0.612	766.7	21.08	990.167	0.725
1048.85	540	20.89	1004.82	0	760.5	20.967	985.827	1.097
1059.37	536.1	20.786	985.827	0	760.9	20.999	985.827	1.097
1072.50	539.9	21.161	980.079	1.218	767	20.986	997.458	0
1084.85	538.2	20.981	997.458	1.218	767	20.979	997.458	0
1097.97	539.4	20.989	982.947	1.046	763.5	21.105	982.948	1.344
1108.52	540.4	20.992	982.948	1.046	763.5	20.932	982.948	1.344

1119.45	540.2	20.992	995.994	0.263	760.8	20.964	988.718	0.848
1129.60	538.8	20.981	988.718	0.263	761.5	20.972	988.718	0.848
1142.02	540	21.025	990.167	0.612	761	21.041	975.798	1.957
1153.08	540.8	21.111	975.798	0.612	761.4	21.073	975.798	1.957
1165.27	539.5	20.966	995.994	0.263	763.7	21.088	974.377	2.079
1176.48	542.3	21.158	974.377	0.263	764.1	21.115	974.377	2.079
1188.33	540	20.947	998.925	0	762.3	21.021	980.079	1.59
1199.17	541	21.057	980.079	0	762.6	21.05	980.079	1.59
1211.37	539.4	20.919	988.718	0.699	770.1	21.046	1004.82	0
1222.98	539.5	20.869	1004.82	0.699	770.3	21.068	1004.82	0
1235.05	540	21.153	977.223	1.389	770.1	20.9	1036.509	0
1246.97	538.4	21.114	1036.509	1.389	770.2	20.9	1036.509	0
1260.35	539.9	20.898	990.167	0.613	769.8	21.154	1027.328	0
1270.72	539.8	20.815	1027.328	0.613	769.8	21.125	1027.328	0
1284.57	539.6	20.752	987.271	0.786	769.9	20.865	1045.791	0
1296.38	538.8	20.828	1045.791	0.786	770.4	20.851	1045.791	0
1308.27	540.1	21.111	994.533	0.35	770.2	21.048	1022.775	0
1319.60	538.6	21.077	1022.775	0.35	770	21.023	1022.775	0
1332.33	539.7	21.041	998.924	0	770.1	21.134	1016.745	0
1343.68	540.8	21.161	1016.745	0	770.2	21.144	1016.745	0
1356.37	539.4	21.132	971.543	1.731	770.4	21.018	997.458	0
1366.17	540.8	20.984	997.458	1.731	770.5	21.004	997.458	0
1378.92	540.2	20.687	997.458	0.178	769.9	20.848	993.075	0
1390.78	542.1	20.937	993.075	0.178	770.1	20.92	993.075	0
1403.67	540	20.999	974.377	1.56	760.5	21.169	985.827	1.097
1413.88	539.3	21.116	985.827	1.56	760.3	21.125	985.827	1.097

DATE2/12

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.6	20.932	985.827	0.873	758.8	21.1	970.13	2.444
11.13	541.6	21.145	970.13	0.873	758.9	21.048	970.13	2.444
24.55	539.5	21.085	975.798	1.475	765	21.157	968.721	2.565
35.68	540.2	20.981	968.721	1.475	765.1	21.174	968.721	2.565
47.68	539.4	21.075	997.458	0.176	760.6	20.947	968.72	2.565
58.77	538.8	20.924	968.72	0.176	761	20.974	968.72	2.565
72.77	540.1	21.02	980.079	1.218	761.5	21.036	975.798	1.957
83.63	540.2	20.911	975.798	1.218	761.4	20.999	975.798	1.957
96.13	539.7	21.067	982.948	1.046	770.1	21.075	1010.76	0
107.65	540.6	21.158	1010.76	1.046	770.3	21.12	1010.76	0
121.23	539.8	20.947	984.386	0.959	770	21.043	1036.509	0
133.32	540.5	21.002	1036.509	0.959	770	21.046	1036.509	0
146.07	539.4	21.057	987.271	0.787	770.1	21.216	1034.971	0
157.45	540.1	21.015	1034.971	0.787	770.1	21.228	1034.971	0
170.82	540	20.929	971.543	1.731	770.2	21.043	1025.807	0
182.17	541.3	20.994	1025.807	1.731	770	21.021	1025.807	0
194.48	540	21.179	987.271	0.787	770	21.278	1016.745	0
206.07	538.1	21.038	1016.745	0.787	770	21.26	1016.745	0
218.78	539.9	21.163	998.925	0	770.1	21.448	1016.745	0
230.17	540	21.174	1016.745	0	770	21.44	1016.745	0

243.80	540	21.275	965.909	2.07	765.2	21.194	988.718	0.848
253.62	539.8	20.94	988.718	2.07	765.2	21.199	988.718	0.848
266.00	540.1	21.15	984.386	0.96	759.5	21.149	990.167	0.726
275.75	538.4	20.953	990.167	0.96	759.5	21.149	990.167	0.726
289.15	539.7	21.083	988.718	0.699	759.6	21.162	981.512	1.467
299.55	539.7	20.984	981.512	0.699	759.7	21.164	981.512	1.467
312.25	540.2	20.994	990.167	0.612	760.3	21.167	960.321	3.285
323.42	541.9	21.085	960.321	0.612	760.4	21.179	960.321	3.285
336.65	539.8	20.999	975.798	1.476	760.3	21.184	977.223	1.835
347.28	539.9	21.015	977.223	1.476	760.4	21.186	977.223	1.835
359.08	539.5	21.062	998.925	0	759.7	21.287	978.649	1.712
369.63	540.1	21.067	978.649	0	759.6	21.176	978.649	1.712
383.02	538.5	21.171	980.079	1.218	768.7	21.204	1007.784	0
395.00	538.6	21.02	1007.784	1.218	768.4	21.191	1007.784	0
408.08	537.8	21.038	978.649	1.304	769.6	21.107	1034.971	0
419.72	540.3	21.08	1034.971	1.304	770.2	21.236	1034.971	0
432.78	537.8	21.116	980.079	1.218	769.6	21.196	1030.377	0
444.22	538.9	21.132	1030.377	1.218	769.9	21.028	1030.377	0
456.70	538	21.21	991.62	0.525	770	21.043	1036.509	0
468.02	538.2	20.976	1036.509	0.525	769.7	21.263	1036.509	0
481.85	536.8	21.054	970.13	1.816	769.9	21.411	1015.244	0
493.42	538.6	21.062	1015.244	1.816	769.8	21.268	1015.244	0
506.08	537.7	21.111	988.718	0.699	769.7	21.149	1001.866	0
517.28	538.6	21.033	1001.866	0.699	769.6	21.312	1001.866	0
530.35	538.1	21.15	980.079	1.218	759.8	21.1	869.131	0
1368.77	535.5	20.911	931.868	0	761.1	21.347	937.437	4.884
1378.83	535.6	20.838	84.613	0				
1397.58	540	20.836	703.948	13.541				
1429.73	533.9	21.433	1036.705	0				
1432.33	535	21.639	82.148	-0.068				
1432.70	534.4	21.61	78.799	-0.07				

DATE2/13

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	526	21.415	1024.363	0	757.3	21.796	152.571	0.4
26.70	533.4	21.374	997.839	0.102	760.6	21.408	943.82	3.68
45.00	538.3	21.309	999.868	0	761.4	21.287	943.82	3.678
71.73	539.4	20.966	951.651	2.216	770.1	21.292	995.936	0
98.30	540	20.908	977.64	1.026	770.1	21.204	1074.048	0
125.27	539.6	20.927	991.761	0.381	770	21.223	1064.906	0
153.48	540	20.906	975.63	1.118	770.1	21.253	1036.265	0
182.95	538.8	21.135	981.666	0.842	769.9	21.213	1036.265	0
210.20	539.6	21.098	975.63	1.118	770.1	21.213	1007.588	0
240.15	539.8	20.895	969.611	1.393	764	21.253	972.904	1.778
269.00	539.9	21.163	959.615	1.851	763.1	21.191	947.022	3.47
297.97	539.7	20.823	983.681	0.75	763.1	21.157	931.083	4.511
327.60	539.3	20.929	971.616	1.304	762.8	21.075	955.06	2.945
355.18	539.7	21.137	969.611	1.393	762.6	21.201	979.447	1.352
384.55	539.5	20.862	973.622	1.211	761.6	21.184	982.73	1.136
412.67	538.1	21.109	965.608	1.577	762.3	21.206	987.669	0.815
441.55	539.9	20.843	967.609	1.485	762.6	21.26	977.809	1.458

468.93	539.9	21.054	953.64	2.123	762.1	21.334	976.172	1.565
497.92	539.9	20.914	971.616	1.302	762.6	21.524	969.643	1.993
526.42	539.9	21.002	973.622	1.21	761.3	21.603	986.021	0.921
555.35	540	21.054	943.716	2.577	760.8	21.885	976.172	1.565
583.08	539.9	21.275	969.611	1.394	766.8	20.811	972.904	1.778
611.53	539.9	21.044	967.609	1.485	763.8	20.981	971.273	1.886
638.45	541.1	20.906	959.615	1.851	763.6	20.794	971.273	1.886
666.97	540.1	20.89	975.63	1.118	763.6	20.821	982.73	1.138
695.07	539.6	20.885	957.622	1.942	766.2	20.972	955.06	2.945
721.45	539.9	21.155	957.622	1.943	762.5	21.06	971.273	1.886
749.10	539.8	20.893	969.611	1.394	766.7	21.073	990.97	0.616
775.17	540	21.218	945.697	2.488	762.4	20.858	968.015	2.097
801.37	540.1	20.807	985.698	0.658	762.2	20.831	964.766	2.31
827.13	539.9	21.119	959.615	1.851	763	20.828	979.447	1.352
853.93	539.9	20.882	969.611	1.393	763.5	20.93	977.809	1.46
880.25	539.9	20.869	967.609	1.485	767	21.117	958.288	2.733
906.78	540.1	20.82	959.615	1.852	770	20.981	994.279	0
932.00	540	20.992	953.64	2.123	770.1	21.115	1032.863	0
961.27	539.7	20.875	963.608	1.669	769.8	21.041	1029.469	0
984.80	540.7	21.09	963.608	1.667	764.5	20.828	974.537	1.672
1012.50	540.1	21.08	973.622	1.21	765.8	21.068	966.389	2.205
1038.47	538.6	20.888	951.651	2.215	762.9	20.873	927.917	4.717
1065.52	539.7	20.877	963.608	1.668	766.4	20.981	927.917	4.718
1092.98	540.1	20.765	959.615	1.85	772	18.849	939.03	3.992
1176.77	541.8	18.135	925.969	3.39	770	19.804	992.623	0
1199.85	540.1	19.258	995.811	0.246	770.1	20.194	1083.335	0
1222.18	539.7	19.773	1014.126	0	770.1	20.421	1105.575	0
1245.45	539.8	19.817	1018.215	0	770.1	20.707	1103.959	0
1269.10	539.9	20.123	995.811	0.195	770.1	20.71	1094.355	0
1292.28	540.1	20.318	1018.215	0	770.1	20.752	1089.608	0
1315.17	539.9	20.225	1014.126	0	770.1	20.752	1083.335	0
1339.10	539.8	20.287	989.738	0.473	770.1	20.836	1070.984	0
1361.98	540.1	20.251	1003.933	0	770	20.631	1043.091	0
1385.20	539.8	20.269	1001.9	0	770.1	20.685	1051.666	0
1408.42	540	20.126	993.785	0.288				
1431.37	539.9	20.001	999.868	0				

DATE2/14

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	541.9	18.988	987.717	0.567	773.2	19.668	963.143	2.416
56.27	539.9	19.076	943.716	2.577	771.9	19.728	907.515	5.403
80.25	540	19.151	965.608	1.578	771.4	19.779	913.76	5.404
103.75	540	19.175	1005.968	0	770.6	19.782	976.172	1.565
127.25	540.1	19.032	981.666	0.842	770.7	19.614	1012.609	0
149.32	540.1	19.001	1005.968	0	770.8	19.567	1064.906	0
171.97	540	19.014	979.652	0.935	771	19.621	1080.224	0
194.20	539.7	19.024	1008.005	0	770.7	19.624	1084.897	0
216.65	539.8	18.998	987.717	0.566	770.9	19.621	1058.892	0
238.75	540.1	18.993	993.785	0.288	770.8	19.592	1046.516	0
260.72	539.9	18.977	1010.043	0	770.9	19.572	1024.391	0

282.95	539.9	18.959	991.761	0.383	771.9	19.397	1019.331	0
305.07	539.9	18.681	995.811	0.22	771.2	19.189	995.936	0
328.23	540	18.704	965.608	1.577	770.8	19.377	987.669	0.816
350.22	539.8	18.769	1008.005	0	771	19.362	974.537	1.673
373.22	539.8	18.782	995.811	0.22	770.9	19.456	966.389	2.204
396.98	539.9	18.868	975.63	1.118	771.3	19.417	963.143	2.415
419.85	540.1	18.722	1005.968	0	771.1	19.249	984.375	1.032
444.27	540.2	18.621	961.611	1.762	771.6	19.461	964.766	2.313
478.13	541.9	18.795	965.608	1.579				
500.38	540	18.873	1014.126	0				

DATE2/15

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.3	18.891	995.811	0.249	771.1	19.471	995.936	0
1013.82	534.1	21.174	789.429	10.95	770.8	19.483	1037.969	0
1042.93	540.7	21.187	922.045	3.235				
1080.43	540.6	21.155	997.839	0.083				

DATE2/16

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	445	18.049	214.578	32.262	775.1	19.155	449.882	4.883
30.90	436.8	17.48	132.336	32.719	773.5	18.375	375.89	4.664
60.45	429.9	17.262	115.755	32.719	773.6	18.185	395.369	4.701
90.58	421.7	17.254	115.123	32.724	773.2	18.136	456.594	4.666
120.35	414.7	17.324	111.383	31.008	773.8	18.177	504.637	4.661
150.20	407.5	17.55	108.938	32.717	773.1	18.469	554.026	4.649
180.23	400.2	17.797	107.73	32.708	772.6	18.575	589.191	4.664
210.48	392.6	17.904	107.73	32.713	772.4	18.688	640.523	4.666
240.90	385.5	18.052	108.333	32.717	772.1	18.671	670.484	4.662
271.62	378.3	18.135	109.546	32.709	772.6	18.822	721.207	4.658
302.55	371.4	18.07	108.938	32.704	772.3	18.804	764.737	4.666
333.65	363.5	18.13	112	32.722	772.5	18.758	799.963	4.673
373.82	371.2	18.106	110.156	32.514	773.5	18.646	808.578	4.749
402.58	378.5	17.956	818.922	7.523	773.2	18.474	842.183	4.654
430.33	385.7	17.789	906.424	3.885	773.6	18.321	872.161	4.654
457.85	393.1	17.737	890.921	4.529	773.8	18.313	901.298	4.648
485.17	400.1	17.693	906.424	3.885	773.6	18.136	935.846	3.851
511.63	406.5	17.519	925.969	3.071	774	17.958	971.273	1.747
537.90	414.3	17.394	912.268	3.641	773	18.049	974.537	1.554
564.40	421.2	17.483	927.933	2.99	772.6	18.103	964.766	2.134
590.38	428.3	17.516	922.045	3.236	772.3	18.15	959.904	2.423
616.18	435.2	17.485	937.784	2.58	772.9	18.071	971.273	1.747
641.83	442.2	17.519	935.81	2.664	773.1	18.094	972.904	1.65
667.53	449.1	17.428	931.868	2.827	772.5	18.074	964.766	2.134
693.08	456	17.446	927.933	2.99	772.6	18.037	961.523	2.327
718.53	462.9	17.384	933.838	2.745	773.8	17.758	966.389	2.037
743.80	469.5	17.236	937.784	2.581	773.2	17.891	971.273	1.746
768.83	476.4	17.285	937.784	2.58	773.1	17.812	968.015	1.94

794.00	483.4	17.282	929.9	2.909	773.4	17.75	956.673	2.615

DATE2/17

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	482.1	17.012	929.9	2.908	774.3	17.664	955.06	2.71
26.62	489.4	17.08	898.658	4.207	774.3	17.716	947.022	3.187
51.83	495.9	17.007	933.838	2.745	773.6	17.657	959.904	2.422
76.72	502.8	17.025	941.737	2.417	774	17.8	968.015	1.94
101.42	509.5	17.02	945.697	2.252	774.3	17.694	986.021	0.872
125.52	516.2	17.051	949.665	2.088	773.8	17.686	971.273	1.747
150.07	522.7	16.95	935.81	2.663	773.8	17.457	969.643	1.843
174.53	529.4	16.815	947.68	2.169	773.9	17.474	969.643	1.844
199.10	536	16.815	927.933	2.99	774.2	17.395	977.809	1.36
224.10	540.8	16.713	961.611	1.59	773.7	17.427	964.766	2.135
247.62	540.6	16.768	943.716	2.335	773.5	17.514	961.523	2.327
629.40	501.6	20.971	361.834	10.767	762.9	21.579	562.954	26.002
664.35	510.7	20.838	436.429	23.433	763.2	21.803	623.482	22.407
696.30	517.7	21.257	683.293	13.162	764.2	21.233	709.276	17.311
752.07	527.5	21.103	634.578	15.19	766.1	21.058	738.681	15.567
784.50	535.8	20.976	758.637	10.029	763.7	21.009	879.766	7.183
817.53	540.9	20.854	751.473	10.329	762.2	21.374	606.758	0.4
942.77	777.4	21.431	211.786	3.803	760.4	21.322	517.202	0.4
959.48	777.2	20.903	154.222	-0.07	759.3	21.226	436.68	0.4
985.85	777.4	21.257	117.665	3.8	766.6	21.134	655.385	22.586
1001.03	777.6	21.067	120.897	-0.07	763.6	21.073	904.403	6.317
1353.60	540	20.68	747.904	11.552				
1378.62	539.9	20.786	789.429	9.652				
1404.08	538.7	21.163	776.682	10.235				

DATE2/18

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	541.2	20.791	207.18	16.527	767.9	20.957	350.077	42.548
408.27	403.9	21.327	356.872	29.437	767.4	21.685	256.147	48.67
442.77	416.2	21.031	374.397	28.637	768	21.537	358.782	41.961
475.90	426.8	21.023	627.993	17.036	765.9	21.601	635.622	23.873
507.97	435.8	20.843	710.898	13.243	763.6	21.366	899.749	6.613
538.70	446	20.872	698.757	13.799	761.3	21.384	1015.966	0
569.12	455.9	20.869	676.472	14.818	762	21.243	977.809	1.51
600.73	469.2	21.2	679.878	14.663	763.1	21.11	878.242	8.018
632.93	472.8	20.877	646.18	16.203				
691.47	483.9	20.849	494.505	23.14				

DATE2/19

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	556.2	21.116	94.538	3.131	765	21.06	506.716	32.288

21.10	546.5	20.786	108.938	3.109	767.5	20.991	327.967	43.966
41.37	540.8	20.955	124.189	3.111	764.4	21.386	570.85	28.096
66.23	541.1	21.197	117.665	39.565	765.4	21.283	523.569	31.185
156.73	538.9	21.148	522.65	21.852	765.3	21.47	603.216	25.98
181.00	540	20.932	793.089	9.484	763.1	21.598	741.395	16.951
241.02	740.6	21.067	659.562	3.107	760.6	21.685	898.201	6.705
259.88	732.9	20.833	472.834	3.109	759.5	21.714	986.021	0.964
278.17	728	20.882	373.131	3.112	759	21.737	976.172	1.609
295.85	722.7	20.82	292.317	3.103	759.7	21.712	926.337	4.867
313.32	718	20.966	239.659	3.101	759.9	21.769	861.588	9.095
330.92	713.6	20.908	195.481	3.126	760.3	21.811	845.149	10.169
348.32	708	20.862	163.581	3.124	760.5	21.853	683.248	20.748
365.18	702.3	20.916	143.74	3.126	763.9	21.448	596.174	26.438
485.68	539.8	21.652	149.672	38.913	764.1	21.305	675.57	21.25
510.05	539.9	21.054	365.579	29.037	763.2	21.174	818.708	11.897
533.53	539.6	20.799	661.243	15.513	762.1	21.097	926.337	4.865
555.72	540	20.89	809.652	8.726	761.7	20.885	950.232	3.303
577.47	539.9	20.947	796.756	9.315	762.4	20.875	909.073	5.993
599.37	540.1	20.997	778.497	10.15	762.2	20.996	869.131	8.602
621.47	539.8	21.012	746.122	11.632	763.3	21.258	689.693	20.326
643.33	540.5	20.934	751.473	11.386	764.9	21.115	589.191	26.894
743.15	539.7	20.984	488.679	23.407	764.8	20.962	664.164	21.995
778.70	539.9	20.862	485.779	23.541	763.8	20.87	810.02	12.464
802.02	539.7	20.846	624.713	17.185				
824.18	539	20.999	746.122	11.631				
846.00	540.1	20.945	800.431	9.147				

DATE2/20

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.9	20.901	796.756	9.314	762.4	20.831	924.759	4.967
21.87	540.1	20.984	765.831	10.73	763.6	21.016	950.232	3.304
43.50	540.2	20.992	771.248	10.481	761.7	20.89	910.634	5.891
634.20	545.5	22.341	396.268	3.13	762.5	20.801	870.645	8.503
656.78	540.9	21.122	154.222	35.105	766.7	21.196	532.145	30.621
681.65	538.7	20.867	384.609	28.167	766.2	21.199	417.429	38.115
705.15	539.8	20.994	671.378	15.051	765.3	21.369	554.026	29.19
727.28	539.6	21.02	783.954	9.901	762.8	21.51	774.492	14.785
749.40	539.8	21.109	771.248	10.482	760.2	21.749	939.03	4.032
771.32	539.4	21.254	753.261	11.305	759.1	22.025	953.449	3.091
793.27	539.7	21.374	749.688	11.469	759.4	22.117	920.034	5.275
815.10	540	21.602	730.173	12.361	759.5	22.218	858.583	9.288
836.90	539.4	21.696	747.904	11.549	759.5	22.398	833.327	10.939
858.60	538.9	21.779	753.261	11.305	758.7	22.556	849.611	9.875
880.47	540	21.896	758.637	11.058	758.5	22.608	864.6	8.895
902.02	539.9	21.974	767.635	10.647	757.9	22.657	872.161	8.401
923.67	539.2	22	758.637	11.059	758	22.763	882.821	7.705
945.22	540	22.024	767.635	10.647	757.8	22.754	887.416	7.403
966.58	538.5	22.078	769.44	10.563	757.2	22.835	882.821	7.703
988.28	539.9	22.198	791.258	9.566	757.1	22.946	872.161	8.4
1315.67	506.4	21.064	223.08	35.378	757.5	23.02	869.131	8.597
1346.40	518.6	20.841	306.953	31.717	764.7	21.655	490.259	33.354

1376.57	529.7	20.833	422.821	26.418	765.1	21.517	371.758	41.096
1403.60	539.8	20.916	482.887	23.671	765.3	21.406	484.19	33.751
					763.9	21.428	667.951	21.744

DATE2/21

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.6	20.88	527.165	21.646	762	21.581	804.262	12.837
23.07	539.7	20.994	559.302	20.176	761.2	21.635	840.703	10.455
45.83	539.3	20.955	578.084	19.317	760.8	21.818	812.909	12.272
845.02	546.5	22.13	199.933	3.102	760.9	22.573	270.69	47.699
865.10	541.1	21.745	122.206	5.615	761.8	22.386	470.242	34.661
890.43	540.2	21.488	107.73	40.357	761.2	22.272	690.986	20.237
914.32	539.5	21.41	380.763	28.341	759.7	22.225	807.138	12.647
936.80	540	21.426	584.411	19.026	759.5	22.235	831.857	11.032
958.73	539.3	21.394	637.882	16.58	759.5	22.26	802.828	12.928
981.12	539.7	21.428	611.676	17.78	760.1	22.294	750.947	16.319
1003.87	540.1	21.41	573.36	19.532	760	22.183	756.442	15.96
1026.52	539.7	21.319	578.084	19.315	760.4	22.102	756.442	15.96
1049.22	539.6	21.205	576.507	19.388	761.1	21.976	752.318	16.23
1072.05	539.5	21.064	576.507	19.387	761	21.87	731.926	17.561
1094.85	539.9	20.999	563.969	19.961	761.4	21.863	748.209	16.498
1117.67	539.8	20.94	565.529	19.891	761.3	21.747	763.35	15.509
1140.25	539.9	20.843	582.826	19.099	761.7	21.621	756.442	15.961
1162.78	540	20.872	584.411	19.026	761.3	21.581	763.35	15.51
1185.20	538.9	20.815	587.588	18.881	762	21.344	770.301	15.055
1207.65	540	20.95	579.662	19.244	762.8	21.134	756.442	15.959

DATE2/22

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	532.3	20.643	179.942	37.526	768.8	20.89	399.706	39.27
26.88	540	20.716	296.779	32.181	768.4	20.786	361.187	41.785
51.42	540	20.825	440.554	25.606	770	21.181	520.379	31.591
563.37	510.1	21.044	258.986	45.785	767.4	21.095	333.193	10.886
601.12	524.3	20.986	396.268	39.467	761.8	21.833	10264.728	0.4
624.82	533.4	20.869	693.584	20.039	761.4	21.48	10264.728	0.4
740.80	538.6	20.895	222.126	47.611	761.4	21.344	10264.728	0.4
761.00	539.8	20.911	764.03	15.436	760.3	21.287	10264.728	0.4
780.40	538.7	20.849	912.268	5.75	761.4	21.283	10192.056	0.4
798.58	539.8	20.981	5333.557	0.021	760.4	21.265	10289.059	0.4
819.22	539.7	20.981	592.368	26.653	759.7	21.31	10240.445	0.4
848.07	544.7	20.791	185.036	3.103	759.6	21.364	10240.445	0.4
864.30	541.6	20.942	471.407	11.641	759.4	21.396	10216.223	0.4
884.90	540.7	21.106	510.706	31.988	759.6	21.25	10264.722	0.4
916.80	540.6	20.851	435.058	17.224	759.9	21.263	10264.722	0.4
936.03	538.6	20.872	824.506	11.484	758.6	21.275	10240.445	0.4
955.55	539.6	21.031	762.23	15.552	759.2	21.332	10289.059	0.4
985.35	542.7	20.901	420.126	3.095	758.6	21.339	10289.059	0.4
998.68	536.9	20.997	647.845	0.136	758.7	21.361	10264.728	0.4

1018.70	540.1	20.888	222.126	47.552	762.7	20.799	10289.059	0.4
1038.42	539.9	20.841	824.506	11.484	764.9	20.986	10289.059	0.4
1058.67	539.7	21.028	835.727	10.751	765.2	20.969	10289.059	0.4
1174.67	530.3	21.155	197.255	48.725	764.1	20.757	10289.059	0.4
1197.07	539.9	21.207	807.804	12.576	766.3	21.167	10264.728	0.4
1218.78	539.8	21.215	778.497	14.49	762	20.656	10289.059	0.4
1241.27	540.2	20.797	662.927	22.042				
1263.28	539.9	21.072	676.472	21.157				
1284.70	540	21.135	742.564	16.838				
1306.75	540	20.581	709.157	19.021				

DATE2/23

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	541.7	21.028	136.54	48.703	767.8	21.1	10289.059	0.4
23.75	539.9	20.833	686.715	21.877	768.3	21.142	10289.059	0.4
47.33	540	20.558	771.248	16.356	768.6	20.917	10289.059	0.4
70.73	540.2	20.7	707.419	20.518	764.9	20.71	10289.059	0.4
94.22	539.9	20.95	681.585	22.203	768.1	20.804	10289.059	0.4
117.78	540.1	21.22	676.472	22.537	764.2	20.651	10289.059	0.4
141.70	540.2	20.932	667.991	23.097	769.8	21.176	10289.059	0.4
525.97	532.9	20.739	242.654	50.919	767.5	21.125	7036.273	0.4
550.22	540.1	21.181	688.43	21.771	767.6	21.12	4687.41	0.4
573.48	539.9	21.116	771.248	16.362	766.5	21.199	3723.078	0.4
597.13	539.9	21.08	705.683	20.648	765.8	20.88	3317.245	0.4
620.73	540.1	21.184	637.882	25.078	764.6	20.705	2925.948	0.4
644.50	539.1	20.833	639.538	24.972	765.8	21.176	2647.361	0.4
667.92	539.7	21.062	652.854	24.092	766	21.125	2384.569	0.4
691.88	540.2	20.784	651.183	24.199	761.3	20.843	2061.906	0.4
715.22	539.7	20.833	646.18	24.51	761.6	20.967	1811.022	0.4
737.62	540.1	21.124	679.878	22.31	762.2	21.107	1541.897	0.4
759.53	539.9	20.859	688.43	21.756	760.3	21.361	1312.906	0.4
781.07	540.1	20.903	697.031	21.191	760.2	21.537	1103.96	0.4
823.58	632.1	20.973	601.984	4.192	762.1	21.882	845.149	11.57
841.20	626.9	21.025	413.427	4.209	762.6	21.961	696.179	21.307
874.55	539.6	21.441	135.834	57.874	762.7	22.346	624.688	25.96
898.60	539.8	21.563	646.18	24.514	761.8	22.499	704.017	20.808
919.28	540.4	21.472	817.064	13.356	761.1	22.174	795.679	14.815
940.12	539.7	21.491	744.342	18.107	760.7	22.393	831.857	12.411
961.22	540	21.389	688.43	21.753	761.7	22.215	849.611	11.28
982.43	539.9	21.21	719.629	19.72	760.7	22.159	815.805	13.47
1003.67	540	21.218	714.384	20.05	761.7	22.08	795.679	14.777
1024.77	539.8	21.135	705.683	20.629	762.2	22.129	798.533	14.622
1045.80	540.1	21.132	716.131	19.94	761.6	22.087	798.533	14.621
1066.78	539.7	21.023	728.411	19.135	761.7	21.966	811.463	13.76
1087.72	540	21.101	730.173	19.018	762.3	22.021	801.394	14.41
1108.88	539.9	20.901	712.64	20.164	761.8	21.954	794.254	14.888
1129.83	539.7	21.038	728.411	19.132	761.1	22.104	805.699	14.144
1150.88	539.7	21.124	723.136	19.48	761.4	22.092	804.262	14.223
1171.73	539.8	20.932	730.173	19.021	762.2	21.882	811.463	13.755
1198.27	548.5	23.209	82.636	-0.07	760.7	22.729	763.35	16.895
1220.22	540.7	21.394	366.832	42.751	761.4	22.24	768.907	16.537

1383.18	473.8	21.249	203.538	53.542	764.7	21.65	397.967	40.791

DATE2/24

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	486	20.815	710.898	20.386	767.7	21.11	456.594	36.935
23.20	498.1	21.018	758.637	17.241	766.4	21.09	661.648	23.546
46.18	510.2	21.189	721.382	19.662	764.8	21.115	802.828	14.311
68.92	523.4	21.298	702.216	20.898	764.3	20.969	833.327	12.338
91.32	532.5	21.184	716.131	19.981	764.6	20.947	801.394	14.416

DATE2/25

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	557.4	20.89	0	0.939	768.4	21.31	0	0.4
11.63	557.9	20.895	0	0.938	768.2	21.376	0	0.4
23.27	557.7	20.885	0	0.935	768.4	21.357	0	0.4
34.88	558.5	20.984	0	0.936	768.1	21.376	0	0.4
46.52	559.1	21.012	0	0.933	768.5	21.352	0	0.4
58.15	560	21.106	0	0.946	768.5	21.32	0	0.4
69.77	560.5	21.22	0	0.932	768.2	21.359	0	0.4
81.40	559.6	21.2	0	0.928	768	21.352	0	0.4
93.02	558.5	20.999	0	0.935	768.7	21.347	0	0.4
104.65	558.1	20.911	0	0.933	768.7	21.334	0	0.4
116.28	558.2	20.828	0	0.933	768.9	21.315	0	0.4
127.90	558.6	20.789	0	0.93	769.1	21.263	0	0.4
139.53	559.9	20.859	0	0.929	767.9	21.302	0	0.4
151.15	561	21.002	0	0.923	768.2	21.381	0	0.4
162.78	562.4	21.231	0	0.934	768.2	21.371	0	0.4
174.42	562.7	21.21	0	0.917	768	21.324	0	0.4
186.03	561.6	21.163	0	0.915	768.6	21.278	0	0.4
197.67	560.3	20.947	0	0.934	767.8	21.305	0	0.4
209.30	560.2	20.919	0	0.916	768.1	21.302	0	0.4
220.92	560	20.802	0	0.914	768.4	21.26	0	0.4
232.55	560.3	20.807	0	0.913	768.9	21.258	0	0.4
244.17	563.2	20.973	0	0.909	768.5	21.253	0	0.4
255.80	564.4	21.137	0	0.905	768.4	21.208	0	0.4
267.43	563.2	21.142	0	0.927	768.7	21.152	0	0.4
279.05	563.9	20.989	0	0.905	769	21.221	0	0.4
290.68	564.7	21.08	0	0.903	768.6	21.218	0	0.4
302.32	564.8	21.205	0	0.925	768.5	21.213	0	0.4
313.93	563	20.906	0	0.904	768.7	21.144	0	0.4
325.57	562.7	20.773	0	0.905	768.8	21.147	0	0.4
337.20	564	20.82	0	0.924	767.9	21.134	0	0.4
348.82	566.4	21.179	0	0.901	768.4	21.147	0	0.4
360.43	564.6	21.044	0	0.903	768.9	21.117	0	0.4
372.07	563.6	20.823	0	0.924	768.5	21.169	0	0.4
383.70	563.9	20.786	0	0.907	768.5	21.258	0	0.4
395.32	565.3	20.849	0	0.901	768.3	21.241	0	0.4
406.93	566.7	21.002	0	0.9	768.2	21.218	0	0.4

418.57	567.5	21.038	0	0.92	767.9	21.139	0	0.4
430.18	567.5	20.994	0	0.9	768.1	21.211	0	0.4
441.82	568.1	21.075	0	0.898	769.1	21.181	0	0.4
453.43	569.1	21.194	0	0.917	768.8	21.142	0	0.4
465.07	566.5	20.984	0	0.898	768.7	21.189	0	0.4
476.68	565.8	20.791	0	0.921	768.8	21.231	0	0.4
488.32	566.8	20.791	0	0.921	768.2	21.258	0	0.4
499.93	569.1	21.033	0	0.897	768.2	21.201	0	0.4
511.57	569.9	21.187	0	0.894	767.4	21.226	0	0.4
523.18	568.4	21.122	0	0.92	768	21.255	0	0.4
534.82	568.7	20.973	0	0.899	767.9	21.241	0	0.4
546.43	567.2	20.776	0	0.901	768.3	21.32	0	0.4
558.05	567.9	20.786	0	0.92	768.5	21.327	0	0.4
569.68	569.2	20.846	0	0.921	767.7	21.339	0	0.4
581.30	570.2	20.908	0	0.899	768.4	21.199	0	0.4
592.93	571.1	20.898	0	0.918	770.5	20.833	0	0.4
604.55	570.8	20.742	0	0.898	771.9	20.991	0	0.4
616.18	569.7	20.654	0	0.898	771.6	21.065	0	0.4
627.80	571.9	21.103	0	0.896	771.4	21.031	0	0.4
639.43	573.6	21.067	0	0.916	771.5	20.964	0	0.4
651.05	572.3	20.823	0	0.916	770.4	20.846	0	0.4
662.68	571	20.628	0	0.898	769.6	20.828	0	0.4
674.30	570.5	20.641	0	0.898	769.5	20.823	0	0.4
974.82	570.5	22.333	224.996	3.216	757.3	22.534	361.187	0.4
990.37	563.2	21.332	113.867	3.219	758	22.235	203.189	0.4
1004.73	556.3	20.862	97.297	3.223	758.3	22.025	187.473	0.4
1019.12	551.2	21.072	93.452	3.228	759.1	21.776	183.155	0.4
1033.85	545.7	20.841	90.779	3.237	759.5	21.724	180.492	0.4
1049.15	540.5	21.054	87.14	3.334	759.2	21.719	178.261	0.4
1293.18	541	20.927	166.777	27.336	765.5	20.976	185.884	0.4
1312.95	541.5	21.044	234.713	38.391	763.5	20.749	174.65	0.4
1332.00	540	21.054	487.228	26.007	766.3	21.179	173.944	0.4
1350.95	539.8	21.005	568.655	21.916	763	20.749	173.944	0.4
1369.73	540.1	20.734	568.655	21.924	765.6	21.028	173.593	0.4
1388.25	539.7	20.747	570.221	21.838	766.7	21.179	174.296	0.4
1406.30	540.2	20.765	556.201	22.56	763.5	20.93	172.202	0.4
1424.53	539.6	20.908	559.302	22.392	767.3	21.213	171.857	0.4

DATE2/26

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.4	21.093	576.507	21.53	764.5	21.068	171.857	0.4
18.57	539.1	20.934	560.856	22.31	768.5	21.196	171.514	0.4
36.57	539.3	21.176	563.969	22.154	767	21.06	171.857	0.4
54.87	539.9	21.038	567.091	22.001	764.2	20.599	171.514	0.4
73.57	540	20.628	560.856	22.316	768.1	21.167	171.857	0.4
91.58	540.1	21.184	560.856	22.308	765	20.54	171.857	0.4
110.55	540	20.568	565.529	22.088	767.2	20.846	172.547	0.4
128.68	540	21.059	557.75	22.472	765.7	21.033	171.857	0.4
147.45	540.2	20.537	559.302	22.397	765	20.567	173.944	0.4
165.57	540	20.997	550.025	22.855	767.7	20.774	172.202	0.4
184.10	539.9	21.01	560.856	22.309	767.1	20.801	172.202	0.4

202.87	539.5	20.83	559.302	22.387	768.7	21.129	172.894	0.4
221.35	540.1	20.62	553.109	22.701	768.9	21.167	172.894	0.4
239.75	539.6	20.664	563.969	22.161	765.2	20.451	172.894	0.4
258.57	540	20.555	557.75	22.477	769.4	21.132	173.243	0.4
277.05	540.4	21.207	557.75	22.468	768.3	21.016	174.296	0.4
649.75	528.6	20.82	132.102	-0.07	765.7	21.391	108.267	0.597
693.58	540.2	21.215	329.759	43.818	762.7	20.495	98.672	0.4
732.58	540	21.498	563.56	28.538	762.8	20.537	98.024	0.4
771.60	540	21.348	565.77	28.387	767	21.413	95.17	0.4
810.10	540.8	21.343	559.153	22.297	767.7	21.505	96.11	0.4
849.63	540.2	20.506	562.457	28.611	763.5	21.001	97.062	5.449
886.38	540.9	21.296	656.727	18.687	763.7	20.545	108.267	5.446
924.87	539.9	20.474	676.012	21.192	766.7	21.31	126.978	5.446
962.83	540.1	20.984	671.163	21.499	769.5	21.228	135.174	5.46
1001.52	541	21.511	684.539	20.625	767.2	20.922	135.174	5.428
1040.35	540.2	21.057	694.353	19.989	764	20.702	135.617	5.447
1079.30	540.1	20.771	705.479	19.271	764	20.737	137.404	5.44
1117.73	540	20.726	709.208	19.011	766.1	21.263	137.854	5.447
1156.23	539.7	20.474	699.287	19.658	769.6	21.532	136.062	5.46
1194.18	540	20.776	690.664	20.231	769.4	21.125	138.305	5.467
1231.97	540	21.179	695.585	19.927	765.9	20.981	138.758	5.446
1270.77	540	20.438	709.208	19.011	769.6	21.1	139.211	5.445
1308.30	539.9	21.262	699.287	19.662	767.6	21.184	139.211	5.462
1346.82	540.2	21.223	700.523	19.593	766.8	20.999	138.758	5.466
1385.35	540	21.062	699.287	19.659	766.3	20.473	139.666	5.466
1424.10	540.2	20.937	694.353	20	765.6	20.431	138.758	5.455

DATE2/27

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540	20.391	691.893	20.148	771.3	21.167	137.404	5.467
18.77	540.2	21.444	693.122	20.071	767.4	21.189	137.854	5.447
38.15	540.1	21.306	696.818	19.832	768	20.665	138.758	5.423
57.32	539.7	21.054	690.664	20.229	771.2	21.167	139.666	5.445
77.18	540	20.726	689.437	20.319	771.3	21.445	137.854	5.467
96.12	540.2	21.259	678.442	21.034	765	20.453	139.211	5.449
115.52	540	20.635	702.999	19.421	767.9	20.5	140.122	5.451
135.25	540	21.376	694.353	19.986	770.5	20.994	139.211	5.438
154.73	540.1	21.213	686.986	20.462	771.2	21.213	138.758	5.465
174.15	540	21.491	690.664	20.234	770.9	21.332	138.758	5.446
193.75	540.1	21.21	684.539	20.638	771.4	21.475	139.666	5.448
213.72	539.9	21.452	688.211	20.398	766.1	20.433	138.758	5.426
233.83	540.2	21.158	676.012	21.184	767.7	20.512	137.854	5.449
253.20	540	21.244	685.762	20.559	771.4	21.485	138.758	5.438
273.13	540.2	21.478	699.287	19.659	766.2	20.631	137.854	5.423
292.85	539.9	21.085	689.437	20.312	767.5	20.478	139.666	5.451
312.90	540	21.426	690.664	20.231	770.4	20.735	139.666	5.458
333.28	540.1	21.007	683.318	20.709	771.4	21.036	139.211	5.435
353.38	540	21.353	679.66	20.946	771.9	21.078	137.854	5.424
373.47	540.3	21.462	678.442	21.038	771.5	21.05	139.666	5.437
393.72	539.8	20.947	684.539	20.63	771.7	21.08	138.305	5.451
413.60	540	21.259	690.664	20.232	771.7	21.065	140.579	5.454

433.63	539.6	21.244	691.893	20.157	767	20.411	139.666	5.453
453.63	539.9	21.288	685.762	20.548	771.3	21.428	139.211	5.454
473.72	540.1	21.249	683.318	20.713	771.3	21.27	138.758	5.449
493.42	539.9	21.337	700.523	19.587	771.9	21.018	139.666	5.451
513.77	540.1	21.498	691.893	20.144	771.3	21.29	138.758	5.438
533.88	540	21.14	691.893	20.155	771.5	21.384	137.854	5.455
553.87	540	21.35	685.762	20.561	771.5	21.463	137.404	5.437
573.77	540.1	21.363	689.437	20.315	771	21.359	138.758	5.423
593.80	540	20.836	699.287	19.67	765.3	20.589	136.508	5.448
613.45	540	21.493	688.211	20.384	769.8	20.809	136.956	5.451
633.35	540	21.384	694.353	19.981	771.3	21.445	136.062	5.423
653.22	539.9	21.132	694.353	19.983	767.8	20.564	136.508	5.439
673.10	539.9	20.898	690.664	20.232	771.4	21.411	136.508	5.435
692.73	539.9	20.916	691.893	20.154	770.3	20.939	136.956	5.447
712.60	540.3	20.513	690.664	20.23	765	20.739	134.29	5.424
731.73	540.6	20.623	702.999	19.415	771.2	21.312	136.508	5.454
751.52	539.4	20.493	698.051	19.752	768.1	20.633	134.731	5.448
771.08	540	20.516	693.122	20.069	764.8	20.483	135.617	5.445
790.63	540	20.742	684.539	20.638	771.5	21.394	134.731	5.464
809.83	540.1	20.68	701.76	19.512	770	20.991	133.85	5.448
829.20	540.1	20.474	705.479	19.265	768.1	20.799	134.731	5.465
848.42	540	20.454	690.664	20.238	765.6	20.552	134.29	5.463
867.17	539.9	21.491	696.818	19.822	770	21.088	135.617	5.446
886.50	540	20.669	712.947	18.778	765.4	20.485	136.062	5.461
905.40	539.8	20.48	700.523	19.593	766.1	21.009	134.29	5.461
923.85	540	20.781	709.208	19.02	770.3	21.292	135.617	5.463
942.62	539.9	21.09	698.051	19.74	770.2	21.009	136.956	5.465
961.85	540.1	21.288	699.287	19.673	765.9	20.478	133.85	5.454
980.45	540	21.491	711.699	18.858	769.5	21.386	135.174	5.445
999.43	539.9	21.207	701.76	19.5	770.8	21.199	136.508	5.434
1018.97	539.8	20.48	700.523	19.592	767.2	20.621	133.411	5.466
1037.28	540.1	20.591	707.964	19.115	765.2	20.836	135.174	5.467
1055.58	538.9	20.947	702.999	19.435	770.6	21.26	135.617	5.448
1074.50	540.1	21.275	700.523	19.578	769.2	20.9	135.617	5.465
1093.72	540	21.358	702.999	19.435	767.2	20.675	133.85	5.447
1112.07	539.1	21.353	717.948	18.453	770.8	21.445	134.731	5.45
1130.92	539.9	21.379	705.479	19.272	770	21.011	135.617	5.462
1150.12	539.9	21.231	702.999	19.434	765.9	20.725	132.974	5.451
1169.10	540.2	20.908	706.721	19.176	769.4	20.981	136.062	5.445
1187.62	540.1	20.986	702.999	19.42	767.6	20.51	135.174	5.465
1207.08	539.9	20.869	694.353	20	770.9	21.379	132.974	5.451
1225.57	539.9	21.077	717.948	18.449	768.5	20.794	135.174	5.464
1244.23	540.1	20.898	705.479	19.271	767.5	21.233	134.731	5.464
1262.80	539.9	20.797	710.453	18.941	769.9	21.09	134.731	5.447
1281.42	539.9	20.804	711.699	18.848	764.4	20.47	135.174	5.462
1300.18	540.1	20.586	705.479	19.264	770.4	21.164	134.29	5.434
1318.53	540.1	20.687	710.453	18.931	765.6	20.446	134.731	5.465
1337.17	540	20.706	704.238	19.339	770.4	21.317	135.174	5.433
1355.72	540	20.83	719.201	18.365	767.2	20.619	134.731	5.448
1374.22	540.1	21.059	699.287	19.674	770.9	21.445	135.617	5.449
1393.22	539.9	20.966	711.699	18.856	768.9	20.831	134.731	5.45
1412.18	539.8	21.072	700.523	19.592	771.4	21.477	134.29	5.453
1431.30	540.2	20.823	706.721	19.186				

DATE2/28

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.1	20.454	724.224	18.045	767.7	20.557	134.731	5.466
19.07	539.8	20.604	711.699	18.861	771	21.408	135.617	5.446
37.47	540.6	21.459	705.479	19.27	765.4	20.436	135.617	5.448
56.25	540	21.457	717.948	18.446	771.4	21.352	136.508	5.462
75.35	540.1	21.42	714.195	18.69	766.5	20.473	136.956	5.466
94.43	539	21.309	699.287	19.666	771.7	21.27	136.508	5.451
113.65	540	21.262	711.699	18.863	765.7	20.421	136.508	5.456
132.20	540	21.485	719.201	18.376	771.4	20.927	135.617	5.437
151.30	540	21.304	717.948	18.453	771.5	21.241	137.854	5.446
170.35	539.9	21.057	704.238	19.349	771.2	21.448	138.758	5.453
189.28	540.2	21.446	721.71	18.21	765.9	20.419	137.404	5.466
208.42	540.1	21.413	714.195	18.698	767.9	20.67	138.305	5.466
227.47	540.1	21.22	701.76	19.497	770.9	21.241	139.666	5.453
246.42	540.1	21.14	719.201	18.375	768.7	21.28	136.956	5.452
265.28	540.2	21.506	717.948	18.453	766.6	20.426	138.305	5.442
284.47	540	21.283	712.947	18.775	770.8	20.976	138.305	5.435
303.50	540	21.049	722.967	18.118	771.3	21.248	137.854	5.446
323.08	540	20.43	709.208	19.026	770.6	21.44	138.305	5.466
341.68	540.4	21.394	704.238	19.35	766	20.451	137.404	5.452
360.62	540.3	21.2	717.948	18.445	771.1	21.016	139.211	5.436
379.65	540.1	20.82	726.742	17.882	771.1	21.369	138.305	5.449
398.32	540.3	21.405	722.967	18.13	771.2	21.46	139.211	5.45
417.50	539.9	21.288	715.445	18.62	766.7	20.458	142.421	5.424
436.58	540	21.054	724.224	18.035	771	21.154	141.038	5.446
455.58	540.2	20.812	725.483	17.959	771.8	21.448	138.305	5.434
474.95	539.9	20.399	710.453	18.93	765.7	20.443	139.211	5.433
493.32	540.6	21.363	717.948	18.446	769.5	20.858	138.758	5.466
512.17	539.9	21.252	735.592	17.304	770.8	21.216	139.211	5.446
531.43	539.9	20.695	725.483	17.96	768.2	21.26	138.758	5.434
549.88	540	21.371	717.948	18.444	771.1	21.048	138.305	5.451
568.77	540.3	21.343	725.483	17.96	770.5	21.438	139.666	5.436
587.58	540	21.343	725.483	17.96	766.9	20.545	138.758	5.463
606.47	540.2	21.236	729.265	17.708	771.4	21.228	139.666	5.446
625.23	539.9	21.335	731.793	17.551	764.8	20.406	140.122	5.465
657.93	537.2	21.278	651.951	22.767	770.3	20.873	118.441	5.423
677.15	539.8	21.283	660.321	22.204	765.7	20.424	121.629	5.428
695.92	540.2	21.272	698.051	19.755	770.5	21.184	129.946	5.429
714.73	539.9	21.356	717.948	18.452	765.7	20.52	134.29	5.465
734.00	539.9	21.018	730.528	17.632	764.5	20.517	136.508	5.429
752.72	540.3	20.636	729.265	17.718	770.8	21.455	138.305	5.426
771.17	539.6	21.033	731.793	17.536	769.3	21.206	139.666	5.423
790.33	540.1	20.768	744.496	16.705	767.6	20.969	109.353	5.444
916.97	542.3	20.846	207.18	39.501	770.5	21.001	201.846	34.256
936.35	541	20.981	593.965	20.451	770.1	21.092	349.295	12.119
956.00	540	20.877	712.64	14.485	770.1	20.944	377.553	24.239
976.20	538.4	20.693	716.131	14.308	770.3	21.159	474.197	5.439
995.35	539.5	21.135	717.879	14.218	770.1	20.665	429.268	25.025
1015.45	540.1	21.176	712.64	14.477	770.1	20.705	527.845	20.003
1036.90	539.7	20.604	685.003	15.875	769.8	20.7	579.97	19.467

1057.17	541.6	20.612	690.146	15.604	770.1	20.619	633.181	18.443
1077.32	540.1	20.625	703.948	14.923	770	20.552	689.693	20.936
1099.03	540.1	20.56	695.307	15.341	769.3	20.663	721.207	20.103
1119.48	540	20.63	688.43	15.7	768.8	20.638	789.991	15.136
1140.77	540.1	20.786	697.031	15.27	771.2	21.191	777.294	5.423
1160.55	540.3	20.862	716.131	14.301	770.8	20.994	681.964	5.459
1180.57	540.2	21.09	709.157	14.66	770.1	20.764	573.12	5.461
1201.15	540	20.882	709.157	14.654	770.2	20.656	479.174	24.034
1221.73	539.9	21.049	709.157	14.647	770.1	20.596	558.477	27.264
1242.92	539.7	21.187	702.216	15.005	768.1	20.633	681.964	22.919
1264.03	540	21.207	703.948	14.908	768.9	20.816	791.41	15.019
1285.58	539.9	20.594	691.864	15.523	771.9	21.107	804.262	5.439
1305.95	541.2	21.205	705.683	14.827	770.1	20.964	697.481	7.858
1327.60	540	20.545	721.382	14.046	770.1	21.021	596.174	6.255
1347.72	539.9	20.758	698.757	15.17	770.1	20.809	504.637	9.422
1367.45	539	20.687	723.136	13.955	770	20.695	462.407	19.454
1388.12	540.1	20.916	728.411	13.687	770.1	20.651	500.498	25.573
1408.60	540	21.129	714.384	14.393	770.1	20.688	624.688	20.467

DATE3/1

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.1	20.545	721.382	14.031	770.1	20.668	680.682	11.255
21.42	540.1	20.464	714.384	14.384	770.1	20.705	654.138	20.446
41.98	540.3	20.42	712.64	14.468	770.2	20.675	719.874	16.367
62.88	540.9	21.187	712.64	14.473	772.4	21.149	734.623	5.423
84.35	539.9	21.129	735.471	13.33	770.2	20.905	640.523	5.443
105.15	539.9	20.958	723.136	13.955	770.1	20.574	535.387	25.119
126.58	540	20.919	710.898	14.561	770.3	21.107	612.694	5.458
147.45	539.8	21.057	730.173	13.594	771.3	20.897	536.471	5.456
168.08	539.8	20.773	739.014	13.158	770.1	20.623	451.792	21.741
189.13	540.1	20.571	723.136	13.946	771.2	20.981	506.716	5.431
208.68	540.2	21.059	740.788	13.051	771.4	21.211	458.526	5.456
228.97	538.6	20.781	753.261	12.427	770.1	20.92	390.212	6.093
249.37	540.1	20.784	740.788	13.063	770.1	20.68	329.453	20.333
270.13	540	20.763	744.342	12.885	770.1	20.569	400.578	24.549
291.52	539.9	20.828	735.471	13.324	770.1	20.683	516.147	7.789
311.48	540	20.984	746.122	12.795	771.6	21.218	488.23	5.465
332.32	539.9	20.615	747.904	12.702	770.1	20.794	415.63	6.255
353.07	539	20.529	744.342	12.886	770.1	20.559	350.861	23.706
374.08	540.2	20.526	749.688	12.605	771.3	21.191	447.978	5.43
394.87	541.2	21.148	740.788	13.064	770.1	20.843	397.967	6.511
415.57	539.9	20.869	758.637	12.163	770.1	20.567	346.179	28.375
436.87	539.8	20.641	746.122	12.794	771.1	21.006	484.19	5.464
458.00	540.1	20.547	756.843	12.26	770.1	20.989	435.748	10.592
478.55	539.8	20.854	755.051	12.337	770.1	21.046	417.429	7.995
500.30	539.9	20.737	765.831	11.801	770.1	20.599	366.035	29.065
521.45	540	20.521	728.411	13.688	770.1	20.621	512.989	26.53
542.33	539.9	20.643	758.637	12.16	770.1	20.71	670.484	21.723
563.90	540	21.168	762.23	11.986	770.1	21.115	752.318	5.619
585.33	540	20.921	771.248	11.519	770.1	20.821	669.217	19.199
606.90	538.6	20.628	751.473	12.526	769.4	20.814	701.397	21.491

628.03	540.7	21.176	751.473	12.516	770.1	20.954	763.35	14.153
650.12	540	21.012	774.868	11.347	768.1	20.722	748.209	18.16
671.27	540.1	20.882	758.637	12.165	767.7	20.772	785.743	15.431
693.18	539.9	20.815	755.051	12.348	767.4	20.794	788.573	15.223
715.32	540.1	21.054	776.682	11.252	767.3	20.843	768.907	16.662
736.00	539.8	21.179	760.432	12.064	766.7	20.774	798.533	14.543
758.42	539.8	20.752	785.777	10.805	767.9	20.873	780.104	15.866
778.72	540.2	20.817	760.432	12.071	768.5	21.023	799.963	14.43
799.97	539.8	21.213	765.831	11.793	769.5	21.159	794.254	14.848
821.15	539.9	20.698	774.868	11.34	767.1	20.994	794.254	14.85
841.98	540	20.976	778.497	11.17	768.3	21.142	801.394	14.311
864.05	540.1	20.747	780.314	11.08	767.9	21.068	777.294	16.078
884.00	540	20.752	778.497	11.154	766.2	20.856	801.394	14.308
905.08	540	21.122	787.602	10.715	768.2	21.174	814.356	13.374
926.43	540	20.752	785.777	10.8	766.2	20.809	789.991	15.129
947.02	539.8	21.101	789.429	10.604	767.1	21.08	807.138	13.925
968.55	540.1	20.732	778.497	11.16	760.3	20.809	780.104	15.864
988.98	540	20.908	791.258	10.526	763.5	21.07	791.41	15.023
1009.52	540	21.062	791.258	10.527	761.2	20.833	798.533	14.527
1029.60	540	21.166	798.593	10.156	761.5	21.036	827.458	12.454
1051.27	540.1	20.737	782.133	10.973	762.6	21.211	787.157	15.352
1071.73	539.8	20.914	783.954	10.884	762.2	20.947	805.699	13.996
1093.73	541.2	20.828	794.921	10.336	764	21.226	782.92	15.665
1114.72	540	20.76	791.258	10.512	762.6	21.065	794.254	14.835
1135.00	539.7	20.981	778.497	11.162	762	20.902	820.162	12.992
1156.57	540.1	20.776	805.958	9.773	762.2	20.833	801.394	14.33
1177.62	539.2	20.778	791.258	10.525	762.6	20.925	791.41	15.047
1198.63	540.1	20.687	782.133	10.973	761.5	20.707	814.356	13.411
1219.47	540	20.95	782.133	10.983	762.2	21.068	784.331	15.531
1240.40	539.9	21.207	800.431	10.051	767.5	20.816	802.828	14.249
1262.25	540.2	20.693	805.958	9.775	767.6	20.821	802.828	14.262
1282.77	540.2	20.669	780.314	11.082	767.9	20.781	805.699	14.02
1303.78	540.1	20.698	796.756	10.248	768	20.794	805.699	14
1325.50	540.3	20.927	793.089	10.425	767.5	20.934	787.157	15.342
1346.73	539.9	21.046	780.314	11.064	770.1	21.115	805.699	13.205
1368.90	540	20.63	798.593	10.149	770	21.07	787.157	9.487
1389.92	540	20.672	785.777	10.802	770.1	21.07	731.926	11.505
1411.02	540	20.773	791.258	10.527	770.1	20.974	698.785	15.943
1432.55	540.1	20.817	802.271	9.963				

DATE3/2

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.4	20.875	802.271	9.964	770.1	20.934	710.595	12.039
20.80	540.2	20.623	800.431	10.051	771	21.162	697.481	5.444
41.70	539.9	20.641	796.756	10.241	770.1	21.196	611.504	5.728
61.70	540.7	21.228	802.271	9.963	770.1	21.063	528.917	6.238
83.28	540	21.054	804.114	9.884	770.1	20.848	467.293	20.701
104.80	540	20.973	796.756	10.253	770	20.781	551.809	22.323
126.57	539.9	20.682	796.756	10.251	770.1	20.9	650.405	14.033
148.90	540	20.552	789.429	10.62	770	20.715	664.164	24.198
169.98	539.4	20.716	796.756	10.249	770.8	20.87	784.331	5.463

191.70	539.9	20.841	811.502	9.504	771.2	21.095	698.785	5.429
213.10	539.8	20.784	794.921	10.344	770.1	20.717	604.395	19.331
234.15	539.9	20.742	805.958	9.774	770.1	20.967	650.405	6.339
255.52	540.4	21.005	791.258	10.514	770.2	20.742	588.033	21.712
277.82	539.9	20.789	794.921	10.341	769.7	20.769	676.845	23.101
299.97	540.1	20.602	809.652	9.589	768.8	20.838	778.698	15.965
321.80	539.1	21.155	793.089	10.43	768.6	20.799	807.138	13.929
343.85	539.9	20.843	793.089	10.421	770.2	20.86	798.533	8.544
366.42	539.9	20.555	794.921	10.343	769.1	20.717	740.037	18.723
387.75	540	20.76	811.502	9.513	770.1	20.781	778.698	7.025
409.35	539.8	20.955	789.429	10.618	770.5	20.865	697.481	5.445
430.02	539.5	21.28	813.354	9.428	770.3	20.91	610.315	5.448
451.17	540	20.693	813.354	9.428	770	20.91	536.471	7.812
472.70	539.9	20.573	800.431	10.062	770.1	20.759	491.276	20.184
493.07	540.6	21.161	824.506	8.856	770.5	21.132	574.258	5.458
513.75	540.2	21.038	805.958	9.784	770.1	20.947	523.569	20.011
534.87	540.1	21.031	811.502	9.496	770.1	20.925	605.576	20.832
556.72	540	20.958	826.372	8.755	770.1	20.994	702.706	15.964
575.53	540.7	20.75	794.921	10.343	769.2	20.984	702.706	21.437
595.45	540	21.226	845.13	7.81	765.8	20.964	839.224	11.598
615.73	540.1	21.005	831.979	8.478	765	21.107	843.665	11.305
636.07	540.1	21.08	809.652	9.605	765.1	21.332	814.356	13.404
655.70	540.1	20.867	813.354	9.416	765	21.574	814.356	13.369
675.67	540	20.955	831.979	8.478	764.6	21.791	817.255	13.188
695.40	540.2	20.932	813.354	9.415	764.4	21.865	834.799	11.912
715.27	539.8	20.885	847.016	7.722	764	21.907	825.996	12.552
735.35	539.9	20.999	835.727	8.29	764	22.016	817.255	13.174
755.55	538.7	21.106	815.208	9.309	763.5	22.134	814.356	13.386
774.90	540	21.114	835.727	8.289	763.6	22.186	827.458	12.453
794.77	539.9	21.132	828.239	8.668	763.3	22.206	846.635	11.077
814.42	540	21.246	831.979	8.474	763.1	22.302	827.458	12.459
834.43	540.2	21.254	830.108	8.584	763.2	22.364	827.458	12.465
854.75	539.8	21.244	835.727	8.285	763.4	22.393	825.996	12.561
874.28	540	21.314	833.852	8.388	763.3	22.425	827.458	12.431
894.35	539.9	21.337	830.108	8.578	763.1	22.443	837.747	11.699
914.02	540	21.283	818.922	9.133	762.9	22.467	823.075	12.748
933.38	539.9	21.353	845.13	7.802	762.6	22.415	836.272	11.831
952.83	540	21.452	841.363	8.009	762.8	22.509	817.255	13.188
972.25	540	21.488	826.372	8.753	762	22.623	843.665	11.295
992.28	539.9	21.483	822.643	8.949	762.6	22.625	845.149	11.184
1012.23	540	21.42	830.108	8.578	762.7	22.586	818.708	13.071
1031.47	540	21.358	852.687	7.427	762.5	22.514	828.923	12.344
1051.15	538.9	21.265	820.781	9.038	762.6	22.462	839.224	11.619
1071.22	539.9	21.244	822.643	8.943	762.8	22.413	842.183	11.409
1091.07	539.8	21.179	839.483	8.101	763.1	22.324	828.923	12.331
1110.83	540.2	21.093	820.781	9.044	763.2	22.257	825.996	12.569
1130.90	539.9	21.036	839.483	8.096	763.5	22.174	812.909	13.482
1150.63	540	20.95	822.643	8.944	763.9	22.127	814.356	13.387
1170.10	539.8	20.864	824.506	8.846	763.6	22.033	839.224	11.589
1190.17	539.8	20.903	824.506	8.858	763.9	21.919	837.747	11.703
1209.75	540	20.994	824.506	8.854	764.3	21.87	815.805	13.281
1229.15	540	20.911	826.372	8.746	764.7	21.798	830.389	12.247
1248.05	540	21.012	830.108	8.578	764.7	21.776	817.255	13.18
1267.82	540	20.916	835.727	8.281	764.9	21.631	852.595	10.623

1287.55	540	21.2	817.064	9.231	765.7	21.445	833.327	12.035
1307.62	540.1	20.903	833.852	8.387	765.9	21.226	808.578	13.821
1327.15	539.9	20.96	807.804	9.69	766.3	21.142	823.075	12.755
1347.00	539.8	21.072	824.506	8.853	765.5	21.095	828.923	12.345
1366.50	538	20.914	830.108	8.585	766.4	20.858	821.618	12.848
1387.35	540	20.737	826.372	8.747	766.7	20.939	818.708	13.097
1406.33	540.1	20.862	824.506	8.848	766.9	20.823	807.138	13.926
					766.7	20.826	848.122	10.964

DATE3/3

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	532.8	21.163	815.208	9.309	767	20.944	833.327	12.014
21.97	539.8	21.067	749.688	12.609	767.2	20.757	795.679	14.734
41.88	537.7	21.111	865.983	6.755	766.3	20.841	804.262	14.13
62.35	540	20.737	831.979	8.469	767	20.858	827.458	12.437
82.65	540	20.916	813.354	9.415	768.6	21.107	815.805	13.268
102.67	536.9	21.098	804.114	9.867	768	20.804	815.805	13.303
123.65	540.1	21.127	815.208	9.32	767.7	20.784	818.708	13.079
144.35	539.8	20.708	824.506	8.841	768.5	20.826	802.828	14.263
164.78	540	20.768	796.756	10.248	769.1	20.907	820.162	12.958
185.13	540.1	20.841	818.922	9.137	768.8	20.925	811.463	13.583
205.53	540.1	20.88	809.652	9.589	768.7	20.809	814.356	13.375
226.13	539.4	20.773	815.208	9.318	769	20.833	801.394	14.334
246.70	540	20.734	805.958	9.783	768.1	20.754	818.708	13.08
267.43	540	20.62	804.114	9.871	767.6	20.767	798.533	14.531
288.28	539.9	20.599	811.502	9.506	767.5	20.801	804.262	14.133
308.53	541.4	21.213	805.958	9.782	770.1	20.979	820.162	12.965
329.82	539.8	21.02	813.354	9.416	769.8	20.781	810.02	11.537
351.02	540	20.711	811.502	9.504	768.1	20.737	775.892	16.136
372.23	540	20.594	802.271	9.973	771	21.236	802.828	5.451
393.25	540.2	20.651	798.593	10.161	770.6	21.115	713.238	5.465
413.30	540.6	20.828	804.114	9.869	770.1	20.688	621.073	26.073
434.77	539.9	20.578	794.921	10.331	771.4	21.208	761.965	5.46
454.52	540.3	21.129	818.922	9.129	770.1	20.811	687.11	19.919
475.95	540	21.064	805.958	9.782	768.4	20.712	749.577	18.033
496.75	540.1	20.791	805.958	9.789	770.4	21.092	801.394	5.461
517.82	539.8	20.615	800.431	10.05	769.5	20.846	719.874	20.171
538.92	540.1	20.797	817.064	9.222	768.3	20.87	788.573	15.261
559.73	539.1	20.711	798.593	10.15	768.6	20.91	814.356	13.402
580.03	539.9	20.706	811.502	9.495	766	20.789	804.262	14.135
600.67	540	21.132	804.114	9.869	765.8	20.88	802.828	14.247
621.30	539.8	20.838	802.271	9.969	766.1	20.9	820.162	12.98
641.48	539.1	21.135	822.643	8.936	765.5	21.132	812.909	13.502
662.18	540	20.88	822.643	8.938	765.2	21.263	818.708	13.084
682.00	540.2	21.093	805.958	9.774	765	21.48	812.909	13.509
702.52	540.9	20.864	833.852	8.371	764.4	21.702	820.162	12.996
722.40	540	20.976	826.372	8.75	764.1	21.892	815.805	13.275
742.45	539.4	20.955	818.922	9.13	764	21.993	811.463	13.62
761.93	540.1	21.031	818.922	9.135	763.3	22.134	837.747	11.717
781.90	538.9	21.15	815.208	9.312	763	22.265	811.463	13.615
801.60	539.1	21.202	815.208	9.322	762.9	22.364	848.122	10.956

821.27	538.9	21.285	811.502	9.509	762.9	22.317	834.799	11.92
842.00	539.9	21.311	824.506	8.851	763.4	22.443	818.708	13.093
862.22	538	21.413	800.431	10.055	762.8	22.492	815.805	13.292
882.65	539.3	21.506	830.108	8.577	762.5	22.531	817.255	13.195
903.03	540	21.475	817.064	9.232	762.8	22.596	825.996	12.538
923.05	540.6	21.48	813.354	9.41	763.1	22.603	820.162	12.99
943.23	539.9	21.431	817.064	9.232	763.5	22.564	824.534	12.647
963.58	539.9	21.327	811.502	9.498	763	22.462	837.747	11.704
983.82	539.9	21.343	818.922	9.12	763.2	22.465	815.805	13.282
1003.55	538.8	21.301	815.208	9.31	763.7	22.406	827.458	12.46
1024.00	539.7	21.226	815.208	9.321	763.9	22.354	820.162	12.968
1044.25	540.7	21.197	820.781	9.043	764.1	22.255	825.996	12.569
1064.12	540.2	21.08	824.506	8.846	764.6	22.127	820.162	12.993
1084.13	540.1	20.963	809.652	9.6	765	22.038	828.923	12.383
1103.95	540	20.841	817.064	9.231	764.9	21.961	818.708	13.077
1123.72	540.1	21.01	818.922	9.133	765.3	21.806	824.534	12.648
1143.62	538.9	21.01	818.922	9.133	765.6	21.611	825.996	12.554
1163.42	540	20.986	811.502	9.51	765.9	21.436	839.224	11.608
1183.03	540	20.893	822.643	8.95	766.1	21.263	821.618	12.875
1202.97	539.9	20.825	805.958	9.779	766.4	21.152	808.578	13.809
1222.17	539.7	21.202	828.239	8.657	766.6	21.041	840.703	11.477
1242.27	540.1	20.843	818.922	9.123	767.5	20.92	827.458	12.43
1261.75	540	20.924	828.239	8.666	767	20.665	812.909	13.482
1281.57	540	21.226	815.208	9.319	767.2	20.838	825.996	12.545
1302.03	540	20.737	817.064	9.214	768.4	20.905	821.618	12.85
1322.12	540	20.711	798.593	10.158	767.3	20.912	828.923	12.345
1342.03	540.2	20.898	804.114	9.879	770.1	21.164	823.075	8.944
1361.93	539.7	20.789	817.064	9.225	770	20.996	766.125	16.878
1382.42	540.1	20.862	809.652	9.588	770.1	21.033	817.255	10.223
1402.85	539.9	20.698	804.114	9.881	769.7	20.974	787.157	15.337
1422.92	539.9	20.651	815.208	9.316	769	20.831	805.699	13.995

DATE3/4

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.8	20.955	813.354	4.947	770.1	21.122	858.583	8.5
20.28	539.9	20.677	705.683	14.833	769.7	20.875	802.828	14.199
40.35	538.5	20.607	856.476	7.247	768.3	20.764	817.255	13.198
60.32	541.1	21.012	822.643	8.938	770.7	20.937	820.162	5.441
80.88	540.1	20.545	822.643	8.948	769.3	20.762	731.926	19.317
100.97	539.9	20.924	798.593	10.148	770.1	20.786	797.105	12.451
121.78	540.2	20.529	811.502	9.505	771.4	21.092	785.743	5.424
141.95	540.2	20.745	807.804	9.694	769.8	20.705	705.329	21.226
162.60	540	21.142	800.431	10.063	770.1	20.715	787.157	13.921
183.07	539.9	21.028	822.643	8.935	769.5	20.744	808.578	13.81
204.87	540	20.545	793.089	10.424	769.8	20.661	802.828	14.262
225.22	540	20.568	804.114	9.88	770.1	20.838	815.805	7.25
245.95	540.1	20.872	802.271	9.966	771.4	20.937	745.478	5.431
266.75	540	21.012	804.114	9.872	771.1	20.858	656.634	5.461
287.23	540	21.054	798.593	10.154	770.1	20.7	575.397	9.003
307.45	540.1	20.88	817.064	9.23	770.6	20.586	547.395	17.532
328.40	540	20.83	800.431	10.054	770.1	20.599	611.504	18.075

349.53	540.1	20.981	798.593	10.153	773.3	21.201	673.024	5.451
369.80	539.8	20.875	818.922	9.139	772	20.932	598.515	5.445
390.17	539	20.937	811.502	9.5	771.7	21.031	528.917	5.451
410.58	540	20.888	802.271	9.966	771.9	21.004	464.357	5.46
430.78	540.2	20.882	809.652	9.596	770.1	20.725	415.63	5.429
450.77	539.9	20.758	807.804	9.689	770.1	20.636	377.553	16.14
471.35	540.2	20.843	798.593	10.153	769.9	20.478	442.301	21.981
492.07	540	20.846	815.208	9.308	770.1	20.658	565.202	18.488
512.42	540	20.992	811.502	9.512	770.1	20.653	646.687	14.391
532.90	539.9	21.218	805.958	9.786	770.4	20.905	664.164	5.446
553.53	540.1	20.571	811.502	9.51	770.1	20.722	584.568	27.286
574.35	540.4	21.103	796.756	10.239	771.5	21.221	745.478	5.425
595.23	539.9	20.859	811.502	9.504	769.7	20.93	664.164	9.572
615.80	538.9	20.851	809.652	9.591	770.1	20.878	622.276	23.797
636.85	539.9	20.901	783.954	10.894	769.8	21.023	749.577	16.798
657.35	539.9	21.2	805.958	9.778	767.5	20.912	794.254	14.853
678.67	540	20.763	818.922	9.13	766.8	20.838	805.699	14.032
698.68	540.2	21.135	800.431	10.068	766.7	20.996	814.356	13.383
719.68	539.8	20.804	800.431	10.068	767.7	21.875	666.687	28.813
746.52	537.7	21.304	780.314	13.279	766.6	21.791	777.294	19.242
768.38	539.8	21.038	815.208	11.181	766	21.714	851.102	12.891
788.57	540	20.81	831.979	10.175	765.9	21.843	855.586	12.499
809.48	540.2	20.981	845.13	9.385	765.7	21.769	840.703	13.794
829.90	539.8	20.947	839.483	9.702	765.2	21.853	842.183	13.638
850.77	540	20.914	839.483	9.708	765.3	21.9	833.327	14.419
870.93	540	20.963	826.372	10.501	765	21.946	855.586	12.5
891.18	538.5	20.825	835.727	9.929	764.7	22.072	849.611	13.001
911.80	539.9	20.984	843.246	9.483	764.7	21.875	846.635	13.291
931.87	539.9	21.046	830.108	10.283	764.9	22.077	846.635	13.277
951.80	540.1	20.992	841.363	9.602	765	22.035	842.183	13.682
972.05	539.9	20.968	845.13	9.371	764.7	22.075	855.586	12.523
992.07	539.9	20.934	837.604	9.827	764.8	22.132	845.149	13.411
1011.73	539.2	20.934	841.363	9.602	765.4	22.008	848.122	13.157
1031.67	538.7	20.898	839.483	9.719	765	21.974	852.595	12.746
1051.78	539.8	20.95	835.727	9.941	765.6	21.867	852.595	12.75
1071.15	540	21.106	852.687	8.916	765.8	21.756	846.635	13.277
1090.97	540	21.14	837.604	9.819	766.2	21.66	846.635	13.278
1111.18	540.2	20.867	839.483	9.71	766.7	21.552	852.595	12.774
1131.13	540.9	20.958	822.643	10.723	767.5	21.352	840.703	13.773
1151.20	539.6	21.124	848.905	9.134	767.7	21.1	834.799	14.275
1171.13	540.1	21.07	831.979	10.182	767.7	20.967	851.102	12.905
1190.83	539.3	20.908	841.363	9.592	768.4	21.016	842.183	13.644
1210.75	539.9	21.163	833.852	10.047	768.4	20.895	852.595	12.749
1230.82	540.1	20.945	839.483	9.71	767.5	20.846	830.389	14.671
1250.98	539.3	20.721	822.643	10.724	770.1	20.999	854.089	11.077
1270.88	539.1	20.75	837.604	9.831	770.1	21.07	825.996	12.218
1290.33	540.6	21.213	830.108	10.277	768.8	20.905	808.578	16.57
1310.10	539.1	21.111	837.604	9.832	770.1	20.89	848.122	12.883
1330.32	539.9	20.966	828.239	10.386	768.6	20.816	830.389	14.69
1350.65	539.9	20.682	833.852	10.04	768.6	20.781	839.224	13.936
1370.60	538.3	20.794	826.372	10.499	771	21.009	840.703	5.466
1390.70	540	20.95	826.372	10.508	770.1	20.865	745.478	10.719
1410.97	539.9	20.61	828.239	10.38				
1430.90	541.6	21.077	826.372	10.498				

DATE3/5

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.2	20.576	826.372	10.498	771.2	21.036	715.887	5.446
19.40	540.1	20.547	820.781	10.836	772.3	21.221	618.671	5.459
39.35	540	20.771	837.604	9.824	770.1	20.784	538.643	23.521
59.78	539.8	20.953	826.372	10.496	770.1	20.668	661.648	11.399
80.12	539.9	21.038	811.502	11.402	770.1	20.735	650.405	7.295
100.13	540.1	21.075	837.604	9.815	770.1	20.739	581.117	9.115
119.87	539.9	21.036	811.502	11.391	770.2	20.735	544.102	8.32
140.33	539.9	20.914	839.483	9.702	770.1	20.633	506.716	15.374
160.83	540.1	20.677	826.372	10.508	770.1	20.594	536.471	14.133
181.10	539.9	20.589	811.502	11.393	773.1	21.186	557.362	5.438
200.82	539.9	21.114	831.979	10.157	772	20.932	481.176	5.441
221.08	540.1	20.919	828.239	10.38	770.1	20.636	421.952	17.779
241.20	540	21.088	822.643	10.732	771.5	20.732	487.217	5.441
261.90	540.1	20.589	817.064	11.059	773.7	21.176	426.513	5.441
281.88	539.9	21.137	813.354	11.294	771.4	20.762	367.663	5.436
301.62	539.9	20.83	843.246	9.488	773.4	21.078	325.749	5.438
320.90	539.8	20.526	826.372	10.51	773.9	21.216	300.819	5.422
340.67	540.2	20.955	820.781	10.847	770.1	20.574	285.383	16.72
360.07	540	21.215	831.979	10.166	770.9	20.611	366.035	5.444
380.70	540	20.641	833.852	10.052	772.2	20.853	330.945	5.45
399.95	539.8	20.602	815.208	11.177	772.7	20.917	297.4	5.44
419.60	539.9	20.851	835.727	9.936	773.5	21.144	278.263	5.444
439.35	540	20.703	828.239	10.383	773.7	21.169	265.753	5.453
459.45	540.1	20.578	817.064	11.056	773.1	20.93	259.111	5.425
479.23	540.1	20.711	818.922	10.95	772.9	20.937	250.899	5.451
498.88	540.1	21.072	841.363	9.6	772.9	21.026	249.175	5.442
519.28	540.4	20.901	807.804	11.614	770.1	20.564	246.895	20.306
538.85	540	21.093	833.852	10.052	772.8	20.932	354.012	5.44
559.18	539.8	20.739	817.064	11.069	773.1	21.149	318.448	5.444
579.35	540.3	20.659	818.922	10.949	771.1	20.836	284.076	5.425
599.48	540	20.513	833.852	10.046	770.1	20.611	263.925	15.944
619.23	541.3	21.171	804.114	11.862	770.1	20.633	326.487	18.765
639.12	540	21.205	824.506	10.62	772.8	21.208	406.724	5.443
659.00	540	20.571	828.239	10.392	771.4	21.186	359.582	5.424
678.30	540.3	21.01	826.372	10.87	770.1	20.665	311.289	23.29
697.63	539.4	20.586	802.271	11.96	770.1	20.967	430.189	6.477
716.70	540.3	21.129	845.13	9.387	770.2	20.947	390.212	14.42
736.50	539.9	21.064	833.852	10.043	770.1	20.833	425.598	24.152
756.63	539.9	21.137	811.502	11.393	770.1	20.804	551.809	33.134
776.37	538.6	21.041	831.979	10.16	770.2	21.236	773.093	5.443
796.45	540	21.158	828.239	10.396	770.1	21.149	675.57	15.219
816.90	539.9	20.781	813.354	11.282	769.1	20.912	676.845	27.935
836.12	540	20.963	831.979	10.169	767.7	20.848	821.618	15.45
855.65	540	21.21	824.506	10.62	766.8	20.954	840.703	13.802
876.18	539.8	20.859	830.108	10.268	767.2	20.959	821.618	15.426
895.87	540	20.846	805.958	11.735	767.4	21.001	834.799	14.279
915.38	539.9	20.992	839.483	9.717	766.8	20.885	821.618	15.448
935.58	538.8	20.888	817.064	11.072	767.2	21.048	834.799	14.317

955.22	540.1	20.893	831.979	10.179	767.5	20.991	828.923	14.799
974.98	539.9	21.098	811.502	11.4	768.5	20.986	823.075	15.29
994.87	540	21.08	828.239	10.392	767.6	20.962	833.327	14.403
1014.37	540	20.768	830.108	10.283	767.5	20.947	834.799	14.293
1034.12	539.6	20.862	805.958	11.738	767.8	20.818	820.162	15.579
1053.33	540.1	20.895	835.727	9.937	770.1	21.159	840.703	8.57
1072.95	540.1	20.992	813.354	11.278	768.3	20.873	773.093	19.609
1092.32	539.7	20.833	830.108	10.277	769.8	20.858	836.272	11.172
1112.22	539.1	20.651	830.108	10.285	768.7	20.781	815.805	15.951
1131.25	540	20.906	826.372	10.492	771.2	21.102	812.909	5.456
1151.27	539.3	20.638	813.354	11.292	769.8	20.752	726.553	23.626
1170.45	540	20.843	826.372	10.495	771.8	21.011	830.389	5.458
1189.93	539.3	21.137	818.922	10.955	770.1	20.715	735.974	19.184
1210.00	540	20.558	830.108	10.268	770.1	20.784	795.679	14.024
1229.18	539.8	20.623	804.114	11.858	771.4	21.016	794.254	5.455
1248.07	539.9	20.726	830.108	10.286	771.9	21.241	694.878	5.433
1267.65	539.9	21.111	826.372	10.5	770.1	20.537	605.576	23.824
1286.88	540.1	21.098	809.652	11.521	770	20.628	723.876	7.084
1306.20	540	20.992	835.727	9.934	770.1	20.769	652.892	6.898
1325.57	540	20.877	822.643	10.732	770.1	20.646	585.721	12.657
1345.27	540.1	20.648	813.354	11.279	770.2	20.623	582.265	17.824
1364.93	540	20.555	813.354	11.284	773	21.11	630.746	5.446
1383.48	540.4	20.807	818.922	10.946	770.8	20.717	550.703	5.464
1402.93	540	20.545	826.372	10.495	771.9	21.11	484.19	5.451
1421.45	540.3	21.207	813.354	11.295	771.4	20.942	418.33	5.436

DATE3/6

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.6	20.75	837.604	9.822	770.1	20.594	370.116	20.406
19.07	540	21.031	822.643	10.727	771	20.7	463.381	5.433
38.23	540	21.192	813.354	11.288	772.7	20.984	414.732	5.439
57.30	540	20.524	835.727	9.944	773.7	21.102	361.187	5.439
75.83	539.9	20.778	817.064	11.066	773.1	21.218	322.811	5.449
94.62	539.8	21.02	826.372	10.498	770.1	20.92	299.447	5.424
113.37	540	21.161	822.643	10.72	771.3	20.71	279.545	5.441
132.25	540.2	20.778	830.108	10.286	770.1	20.49	268.211	8.933
150.95	540.1	20.534	822.643	10.732	773.9	21.167	282.774	5.436
170.22	539.9	20.589	830.108	10.274	773.5	21.001	268.211	5.426
188.83	539.8	21.116	826.372	10.512	773.3	20.801	259.708	5.442
207.82	540	21.028	833.852	10.044	772	20.732	254.385	5.454
226.40	539.9	20.958	824.506	10.614	770.1	20.53	249.748	8.186
245.42	540.2	20.511	852.687	8.92	773.7	21.171	264.533	5.442
265.83	540	21.189	881.292	7.187	773.2	20.91	260.306	5.443
291.27	539.9	20.524	941.737	4.645	775.1	21.179	259.111	5.444
317.45	540	20.695	902.537	5.907	771.7	20.552	250.899	5.432
345.92	540	20.815	789.429	12.729	774.3	20.907	238.543	5.443
377.48	541.3	21.028	157.303	50.905	771.4	20.503	234.215	5.457
407.73	541	21.051	477.13	31.59	772.3	20.498	481.176	5.439
438.88	540.8	20.942	285.693	43.143	775.7	21.181	327.226	5.464
470.00	541.1	21.093	244.663	45.625	774.5	20.831	246.329	5.455
501.60	540.8	20.755	238.665	45.991	775.6	20.959	236.91	5.425

532.63	541.6	21.145	138.675	44.667	774.9	21.105	234.215	5.443
562.05	540.7	20.516	54.384	57.109	770.1	20.589	137.656	9.093
588.77	539.8	21.098	54.384	31.683	770.1	20.646	137.656	11.48
617.43	541.8	21.098	54.384	55.272	771.6	21.041	137.656	5.436
645.58	542	21.044	54.384	49.685	772	21.243	137.656	5.447
674.62	541.6	20.898	54.384	57.111	770.1	21.1	137.656	10.067
703.25	542.4	21.236	54.384	47.554	769.6	20.957	137.656	21.827
732.23	541.3	21.259	54.384	48.612	769.3	20.967	137.656	27.98
762.08	541.7	21.018	54.384	57.111	770.1	21.201	137.656	29.595
790.88	541.8	21.244	54.384	45.027	770.1	21.391	137.656	31.536
821.08	540.5	20.88	54.384	57.102	770.1	21.695	137.656	32.353
849.88	540.1	20.875	54.384	41.728	770.1	21.919	137.656	34.172
879.32	541.5	21.096	54.384	49.479	770.1	21.983	137.656	36.347
908.42	541.6	21.111	54.384	44.533	770.1	22.137	137.656	39.668
936.75	540.3	20.979	54.384	36.604	770.1	22.191	137.656	34.121
966.55	541.5	20.945	54.384	54.351	770.1	22.092	137.656	34.291
995.53	541.5	20.921	54.384	45.447	769.6	22.102	137.656	34.157
1024.68	539.7	20.81	54.384	47.232	770.1	22.008	137.656	34.413
1052.43	542.1	20.986	54.384	32.893	770.1	21.87	137.656	32.321
1082.38	541.5	20.898	54.384	57.104	770.1	21.821	137.656	31.632
1109.62	539.9	21.085	54.384	21.087	770.1	21.87	137.656	35.265
1139.47	540.6	20.815	54.384	57.114	770.1	21.811	137.656	28.245
1167.62	542.5	21.059	54.384	38.938	770	21.606	137.656	28.535
1197.10	542.5	20.789	54.384	56.403	770	21.352	137.656	21.734
1223.27	541.9	21.22	54.384	19.97	770.1	21.095	137.656	22.994
1252.55	541.4	20.885	54.384	55.435	770.1	20.843	137.656	18.808
1279.52	542.6	20.997	54.384	36.583	770.5	21.201	137.656	5.427
1307.65	541.9	20.934	54.384	45.774	770	20.942	137.656	13.701
1335.45	542	21.041	54.384	45.774	771	21.12	137.656	5.466
1363.85	541.9	21.005	54.384	45.399	770.2	20.811	137.656	20.623
1392.10	541.9	20.888	54.384	50.344	770.1	20.959	137.656	6.442
1420.58	542.4	20.706	54.384	53.337	771.2	21.186	137.656	5.458

DATE3/7

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	541.9	21.101	54.384	26.494	770.1	20.727	137.656	13.857
28.85	541.4	20.755	54.384	57.103	772.1	21.199	137.656	5.466
55.95	541.9	21.049	54.384	35.111	770.1	20.831	137.656	12.005
82.77	540.8	21.158	54.384	34.974	772.5	21.159	137.656	5.433
112.07	539.5	20.493	54.384	57.118	770.1	20.851	137.656	5.454
138.72	541.8	21.122	54.384	33.729	770.6	20.717	137.656	5.436
167.82	541.1	20.532	54.384	57.109	770.7	20.707	137.656	5.432
193.62	541.7	21.194	54.384	24.424	773	20.863	137.656	5.448
221.55	541.7	21.145	54.384	47.476	773.6	20.996	137.656	5.437
248.75	540.9	21.155	54.384	38.512	770.1	20.567	137.656	6.17
277.47	541.4	20.96	54.384	56.142	774	21.055	137.656	5.424
306.32	541.8	20.648	54.384	57.118	770.1	20.584	137.656	6.515
334.08	541.8	20.745	54.384	45.87	773.3	20.991	137.656	5.434
360.37	541.1	21.278	54.384	29.908	771.2	20.661	137.656	5.449
388.67	540.8	20.94	54.384	51.757	771.8	20.725	137.656	5.453
416.72	540.1	20.581	54.384	39.409	774.4	20.949	137.656	5.423

443.32	541.2	21.202	54.384	33.591	774.1	21.127	137.656	5.464
471.08	541.7	21.184	54.384	46.138	770.3	20.535	137.656	5.438
498.98	541.7	21.085	54.384	47.528	774	21.058	137.656	5.433
527.63	541.9	21.015	54.384	54.44	770.1	20.658	137.656	8.156
557.10	541	20.597	54.384	57.112	770.1	20.838	137.656	14.855
585.77	542.3	20.81	54.384	53.064	770	20.853	137.656	11.373
612.65	540.3	21.187	54.384	28.152	770.1	20.981	137.656	24.121
643.05	539.9	20.752	54.384	57.112	770.1	20.915	137.656	28.501
670.88	539.8	20.947	54.384	29.659	770.1	21.105	137.656	24.56
699.35	542.5	21.218	54.384	42.238	770.1	21.329	137.656	30.463
729.28	540.7	20.825	54.384	57.119	770.1	21.534	137.656	29.356
758.57	541.5	20.82	54.384	50.439	770.1	21.806	137.656	31.991
785.65	540	21.2	54.384	24.739	770.1	21.934	137.656	36.438
815.72	540.4	20.999	54.384	57.102	769.8	22.198	137.656	33.837
845.77	541.4	21.028	54.384	55.411	770.1	22.312	137.656	39.154
874.55	541.6	21.093	54.384	40.89	770.1	22.425	137.656	41.331
903.55	541.5	21.168	54.384	44.791	770.1	22.504	137.656	38.32
932.42	541.7	21.08	54.384	45.464	770.1	22.408	137.656	32.953
961.45	542.3	21.163	54.384	45.483	770.4	22.499	137.656	36.894
990.52	541	21.096	54.384	45.242	770.1	22.492	137.656	38.377
1019.52	541.6	21.015	54.384	46.135	770.1	22.322	137.656	34.574
1048.12	542.7	20.966	54.384	41.384	770.1	22.265	137.656	35.609
1077.52	541.4	20.83	54.384	49.547	770.1	22.169	137.656	36.652
1104.20	540.1	21.158	54.384	21.661	770.1	21.991	137.656	33.153
1134.22	541.3	20.807	54.384	57.11	770	21.823	137.656	29.33
1161.37	539.8	20.828	54.384	15.401	770.1	21.438	137.656	24.52
1188.97	541.8	21.244	54.384	34.081	770.1	21.347	137.656	27.687
1217.65	542.2	21.166	54.384	47.234	770.1	21.231	137.656	24.164
1246.43	542.4	21.08	54.384	48.848	770.1	21.021	137.656	23.318
1284.45	540	21.184	5298.139	0	770	20.964	137.656	19.246
1305.93	539.9	20.947	5307.586	0	770.1	21.527	9929.799	0
1326.63	540	20.963	5301.337	0	770.1	21.1	9743.14	0
1348.07	540	20.75	5294.893	0	770.1	20.93	9582.596	0
1371.87	539.9	21.124	5294.893	0	770.2	21.149	2247.309	0
1398.98	540.1	20.617	5294.893	0	772.7	21.028	1644.591	0
					770.9	20.897	1248.228	0

DATE3/8

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.1	21.036	5294.893	0	770.3	20.989	937.437	5.458
25.80	540	20.643	5294.893	0	770.2	20.794	688.4	10.258
50.60	539.9	20.602	5294.893	0	771.8	21.08	600.862	5.429
76.05	539.9	20.526	5294.893	0	770.1	20.67	492.295	5.533
100.60	540.1	21.174	5294.893	0	770.1	20.675	421.045	12.577
124.92	539.9	20.888	5294.893	0	770.1	20.693	452.75	7.912
149.13	539.9	20.752	5294.893	0	774.2	21.174	414.732	5.458
172.70	540	21.202	5294.893	0	771	20.564	379.222	5.462
197.65	540.1	20.695	5294.893	0	770.6	20.678	344.629	5.459
221.63	540	21.051	5294.893	0	772.3	20.846	344.629	5.475
245.65	540	21.077	5294.894	0	774.1	21.223	330.945	5.455
270.07	540	21.122	5294.893	0	770.6	20.663	318.448	5.465

294.35	540	21.189	5294.893	0	773.7	21.078	311.999	5.447
318.58	539.8	21.075	5294.893	0	774.4	21.092	308.466	5.454
342.80	539.9	20.521	5294.893	0	773	20.93	307.063	5.456
366.53	540	21.08	5294.893	0	772.7	20.823	302.197	5.457
390.82	539.4	20.849	5388.749	0	773.7	20.962	301.507	5.457
416.12	539.9	20.789	5405.299	0	774.5	21.004	290.002	5.464
440.10	539.9	21.01	5414.568	0	773	20.777	289.337	5.444
464.47	540.1	20.62	5386.645	0	771.6	20.762	282.774	5.46
487.92	539.8	21.15	5269.318	0	771.1	20.764	282.774	5.459
512.35	540.4	20.825	5170.747	0	770.1	20.695	235.828	15.489
541.15	540.1	20.786	4677.12	0	770.1	20.823	289.337	18.362
807.45	539.9	23.627	3433.119	0	768.5	23.689	210.086	68.198
832.07	540.1	22.169	2855.29	0	765.2	22.936	814.356	16.076
856.23	539.9	21.693	2599.084	0	766	22.613	774.492	19.504
880.13	540	21.558	2349.045	0	766.2	22.541	774.492	19.502
904.02	539.9	21.543	2085.9	0	766	22.564	768.907	20
927.78	540.1	21.532	1858.865	0	766.2	22.546	788.573	18.28
951.28	539.9	21.501	1662.858	0	766.2	22.489	795.679	17.661
974.95	540	21.478	1441.72	0	766.6	22.452	784.331	18.657
998.15	538.9	21.327	1196.186	0	767.2	22.455	646.687	30.542
1020.80	540.1	21.587	975.63	1.957	767.2	22.174	698.785	26.015
1044.02	540	21.304	780.314	13.285	765.8	22.26	818.708	15.688
1065.23	540.2	21.194	778.497	13.394	765.3	22.371	854.089	12.611
1085.63	540.1	21.174	822.643	10.725	767.4	21.909	854.089	12.629
1107.35	539.9	21.036	873.623	7.656	769.2	21.463	753.691	21.304
1131.97	539.3	20.794	800.431	12.074	769.6	21.144	802.828	17.066
1155.28	539.9	20.994	791.258	12.641	770.1	20.969	791.41	17.885
1178.80	538.7	20.921	783.954	13.064	769.9	20.917	782.92	18.784
1202.58	541.5	20.914	787.602	12.849	770	20.831	828.923	14.816
1225.07	540.3	21.075	778.497	13.396	770.3	21.189	785.743	5.427
1248.82	539.9	20.807	785.777	12.948	770.1	21.026	631.962	5.533
1272.03	540.1	21.22	780.314	13.291	770.1	20.784	518.26	20.011
1294.00	540.2	20.69	785.777	12.956	770.1	20.843	567.457	19.947
1316.92	539.8	20.807	767.635	14.05	770.1	20.796	639.295	12.267
1339.03	540	21.041	791.258	12.621	770.5	20.91	576.538	5.447
1362.70	540	20.815	771.248	13.834	770.1	20.816	478.175	6.272
1384.15	541.1	21.153	793.089	12.509	770.6	20.905	385.109	5.433
1406.80	539.9	21.044	769.44	13.948				

DATE3/9

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.1	20.781	791.258	12.612	770.1	20.767	313.422	7.633
20.63	540	21.093	771.248	13.824	772.6	21.021	300.819	5.464
42.18	538.7	20.651	798.593	12.172	770.1	20.7	263.925	12.092
63.32	539	20.612	769.44	13.931	772.2	20.967	294.69	5.433
84.33	539.8	20.921	791.258	12.624	773.1	21.115	265.753	5.439
105.85	540	21.072	780.314	13.288	771.3	21.016	244.077	5.466
127.17	539.9	21.096	793.089	12.506	770	20.601	234.751	6.784
148.78	540	20.963	780.314	13.276	770.1	20.586	234.751	7.805
170.00	540.1	20.636	778.497	13.389	774	21.201	242.402	5.445
190.65	540.1	21.161	773.057	13.715	773	20.868	233.147	5.448

212.53	539.7	20.698	802.271	11.948	774.7	21.174	226.853	5.432
233.77	540	20.576	771.248	13.827	770.1	20.552	221.758	6.963
254.62	540	20.869	780.314	13.29	773.8	20.865	230.5	5.438
275.95	539.9	20.838	776.682	13.498	774.8	21.038	226.853	5.451
297.28	540.2	20.558	791.258	12.615	773.7	21.199	222.766	5.449
318.50	540	20.602	773.057	13.714	770.1	20.569	220.755	6.59
339.77	539.8	20.882	780.314	13.289	772.7	20.897	226.853	5.456
361.35	540	20.924	785.777	12.96	774.2	21.026	224.288	5.438
382.68	540	20.823	776.682	13.499	770.1	20.651	221.758	5.569
405.05	539.8	21.109	764.03	14.282	774.3	20.853	217.78	5.441
426.47	540.2	21.049	782.133	13.18	774.4	21.001	219.758	5.45
447.95	540.8	21.114	776.682	13.509	773.2	21.184	222.261	5.453
470.02	539.9	20.667	787.602	12.843	772.6	20.863	218.767	5.439
491.80	540.2	21.062	794.921	12.408	770.1	20.614	216.8	12.46
512.48	539.9	20.867	747.904	15.243	770.4	20.606	264.533	5.452
535.00	540.2	20.971	793.089	12.504	770.2	20.722	229.451	20.824
550.82	540	20.791	826.372	10.506	770.1	20.925	318.448	6.083
572.83	539.9	21.057	778.497	13.391	770.4	21.149	276.987	5.449
595.23	538.2	20.953	762.23	14.382	769.7	21.023	249.748	13.585
616.62	539.5	21.145	778.497	13.398	770.1	20.922	287.354	28.059
638.90	540.3	20.817	793.089	12.504	770.1	21.152	467.293	26.226
661.63	539.8	20.942	755.051	14.814	770.1	21.248	603.216	22.584
684.62	540	20.947	783.954	13.059	769.8	21.601	676.845	27.303
708.10	540	21.122	774.868	13.604	768.3	21.719	807.138	16.684
731.92	539.8	20.945	760.432	14.486	767.5	21.902	804.262	16.913
755.48	540.1	21.075	771.248	13.823	767.3	21.991	802.828	17.065
779.32	540	21.057	764.03	14.28	766.8	22.053	798.533	17.416
802.18	540.2	21.132	771.248	13.832	766.8	22.099	805.699	16.809
825.73	539	21.109	767.635	14.045	766.1	22.243	820.162	15.571
849.25	540	21.239	773.057	13.724	766.3	22.238	780.104	19.008
872.62	539.1	21.088	760.432	14.484	766.4	22.47	834.799	14.283
895.50	539.7	21.306	785.777	12.948	766.4	22.282	811.463	16.327
918.60	539	21.376	774.868	13.603	766.7	22.346	820.162	15.579
941.63	539	21.376	778.497	13.39	766.8	22.344	810.02	16.418
964.78	539.9	21.374	765.831	14.165	766.8	22.275	821.618	15.416
987.72	540.3	21.304	780.314	13.29	767.1	22.243	824.534	15.164
1010.65	535.9	21.324	767.635	14.048	767.4	22.124	811.463	16.316
1033.75	540.1	21.231	785.777	12.948	767.1	22.122	817.255	15.791
1057.53	539.9	21.14	764.03	14.285	766.9	22.08	798.533	17.444
1080.98	539	21.096	774.868	13.615	767.1	22.001	833.327	14.423
1103.35	539.9	21.007	796.756	12.283	767.1	21.9	839.224	13.91
1125.90	538.5	21.127	778.497	13.401	767.7	21.907	814.356	16.061
1148.72	540	20.908	783.954	13.056	767.7	21.786	810.02	16.447
1171.48	540.1	21.046	762.23	14.365	767.6	21.816	833.327	14.424
1194.50	540.9	20.921	765.831	14.163	767.6	21.781	833.327	14.403
1217.45	539.9	20.911	774.868	13.609	768.4	21.858	797.105	17.565
1240.28	540.1	20.893	769.44	13.939	768	21.598	848.122	13.146
1262.65	539.9	20.877	776.682	13.511	768.8	21.411	824.534	15.194
1284.57	540.1	21.15	776.682	13.5	769.2	21.381	817.255	15.82
1308.20	539.8	20.96	769.44	13.948	768.8	21.438	821.618	15.416
1331.17	539.9	20.794	773.057	13.722	769.2	21.344	833.327	14.406
1353.65	539.9	21.002	764.03	14.257	769.7	21.287	827.458	14.909
1376.57	539.3	20.971	793.089	12.502	769.4	21.186	817.255	15.822
1400.02	540	21.075	765.831	14.147	770	21.095	814.356	16.052

1423.45	540.2	20.776	762.23	14.365

DATE3/10

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540.6	21.163	767.635	14.039	769.7	21.033	825.996	15.043
22.82	539.7	20.994	785.777	12.948	769.6	21.105	830.389	14.69
44.58	539.7	20.893	760.432	14.492	769.7	20.93	834.799	10.776
67.78	539.5	20.758	776.682	13.492	770.1	20.974	757.82	19.607
90.12	541	21.135	778.497	13.397	769.8	20.912	827.458	14.911
111.93	539.7	20.768	771.248	13.838	769.7	20.915	840.703	13.801
134.12	540.5	21.161	771.248	13.832	769.8	20.979	843.665	13.532
156.38	538.9	20.986	771.248	13.823	770.5	20.589	833.327	14.428
179.48	538.1	21.033	773.057	13.713	769.9	20.843	817.255	15.826
202.88	539.9	20.955	780.314	13.276	770.6	21.142	812.909	5.434
224.30	540	21.077	758.637	14.586	770.1	20.846	722.541	15.407
246.93	539.8	20.786	780.314	13.276	770.1	20.905	730.58	14.648
269.40	539.8	20.773	756.843	14.694	770.1	20.806	738.681	15.524
292.33	539.9	21.155	765.831	14.159	770.1	20.858	756.442	15.522
315.25	539.9	20.742	773.057	13.714	770.1	20.878	774.492	14.513
337.42	539.8	20.875	762.23	14.366	770.9	21.122	780.104	5.448
359.38	540.1	20.88	785.777	12.963	770.1	20.823	678.123	20.537
382.47	539.9	21.2	765.831	14.151	770.5	20.937	753.691	5.466
405.55	539.9	20.771	773.057	13.72	770.1	20.809	625.896	22.605
427.02	540.2	20.706	764.03	14.28	771.2	21.152	753.691	5.446
448.88	540.3	20.885	774.868	13.612	770.6	20.71	660.392	17.049
470.83	539.9	21.096	773.057	13.713	772	21.238	714.561	5.448
493.13	538.5	21.184	778.497	13.383	770.1	20.833	610.315	16.225
515.55	538.9	20.799	778.497	13.396	771.3	21.231	650.405	5.449
537.93	539.3	21.023	780.314	13.292	770.1	20.932	559.594	24.563
559.92	538.9	20.981	756.843	14.696	770.1	20.868	707.958	17.413
582.85	540.4	20.888	782.133	13.176	769.9	21.105	753.691	21.311
605.13	540	21.036	765.831	14.161	768.9	21.199	851.102	12.872
624.90	539.9	21.116	778.497	4.979	768.9	21.191	864.6	11.72
648.58	540.1	20.83	678.174	19.457	769.1	21.213	815.805	15.945
670.85	540.5	21.171	764.03	14.279	768.9	21.236	831.857	14.538
693.73	540	20.914	774.868	13.619	768.7	21.243	811.463	16.326
714.93	539.9	21.194	774.868	13.613	767.5	21.542	882.821	10.158
737.67	540.2	21.031	787.602	12.847	768	21.403	811.463	16.324
759.00	540	20.914	767.635	14.039	767.4	21.672	864.6	11.712
780.68	539.1	20.953	783.954	13.068	767.5	21.774	836.272	14.202
803.28	539.9	21.023	776.682	13.501	766.9	21.905	833.327	14.425
824.47	539.4	21.223	789.429	12.727	766.9	22.129	863.093	11.852

DATE3/24

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.9	21.987	896.721	7.594	772.3	21.747	288.675	4.775
24.87	539.8	20.791	877.454	8.745	774.9	20.796	215.824	4.774
47.37	539	21.166	867.89	9.319	775.6	20.87	231.555	4.79

71.75	539.9	20.83	892.852	7.824	776.4	21.058	244.638	4.771
96.30	540	20.617	864.078	9.557	777.1	20.764	252.636	4.769
120.43	540.2	20.615	883.214	8.404	776.9	21.12	257.328	4.769
143.92	539.9	20.713	867.89	9.322	777.3	20.836	262.713	4.768
166.67	540	20.591	890.921	7.94	777.3	20.957	267.594	4.785
189.63	539.1	21.161	881.292	8.514	777.5	21.181	273.192	4.785
213.13	540.1	21.051	890.921	7.951	777.6	21.117	274.452	4.787
236.83	540	20.643	879.372	8.648	777.7	20.838	275.083	4.769
260.07	540	21.109	875.537	8.878	777.6	20.628	276.351	4.769
284.27	540.1	21.163	879.372	8.638	778.3	20.952	272.565	4.767
307.35	539.6	20.641	888.992	8.06	777.8	20.515	280.188	4.785
330.77	540	20.68	871.71	9.102	777.7	21.016	280.188	4.769
354.62	539.9	21.012	879.372	8.639	777.8	20.512	274.452	4.766
377.78	539.4	21.197	869.799	9.211	778.3	21.041	278.263	4.766

DATE3/25

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539	20.467	885.138	8.285	777.8	20.54	280.188	4.767
23.85	540.1	20.708	879.372	8.629	778.2	20.989	278.263	4.786
47.75	540.1	21.093	873.623	8.983	777.9	20.532	280.832	4.77
70.97	540.2	21.168	877.454	8.746	778.4	20.493	276.987	4.771
93.90	539.9	21.103	873.623	8.988	778.3	20.878	282.125	4.77
115.97	540.1	21.158	894.786	7.714	778.3	21.134	286.695	4.769
139.85	539.7	21.2	888.992	8.058	777.9	20.646	286.038	4.787
163.17	539.9	20.659	873.623	8.991	778.1	21.171	285.383	4.787
185.87	540	20.968	867.89	9.333	778.4	20.559	286.038	4.788
209.22	540.2	20.768	896.721	7.593	777.9	20.927	287.354	4.789
231.88	540.1	20.934	871.71	9.092	778	20.784	289.337	4.786
254.62	539.9	21.01	887.064	8.171	778.2	20.799	290.002	4.767
278.38	540.1	21.096	875.537	8.866	777.8	20.801	290.667	4.768
301.97	540.1	20.513	858.374	9.901	777.8	21.028	286.038	4.768
325.00	540.3	20.942	865.983	9.443	777.9	20.611	288.014	4.769
347.73	539.7	21.14	890.921	7.933	777.6	21.196	292.002	4.769
371.22	540	20.646	881.292	8.525	777.9	20.868	290.667	4.769
394.43	540	20.989	867.89	9.324	777.7	20.596	289.337	4.768
417.85	539.9	20.513	871.71	9.102	777.9	21.211	291.334	4.772
440.78	539.8	20.646	887.064	8.173	777.9	20.841	292.672	4.773
463.27	540.2	20.958	869.799	9.214	778	20.616	292.672	4.769
485.92	540.2	21.179	867.89	9.329	778	20.979	295.365	4.793
508.35	539.4	21.129	885.138	8.29	778	20.663	296.042	4.771
530.83	539.9	20.997	877.454	8.763	778	20.959	297.4	4.777
554.37	539.7	20.755	869.799	9.226	777.9	20.633	297.4	4.778
577.23	540	20.828	858.374	9.91	777.4	20.702	295.365	4.774
600.55	540.1	20.682	885.138	8.293	776.9	20.868	297.4	4.757
624.08	539.9	20.768	856.476	10.026	776.9	20.69	294.016	4.792
646.75	539.9	21.057	877.454	8.76	776.6	20.749	296.042	4.772
670.30	538.7	20.62	860.273	9.796	776.1	20.73	293.343	4.775
692.93	539.4	21.202	873.623	8.985	775.4	20.838	296.72	4.773
717.02	540.2	20.695	873.623	8.987	775.8	21.139	293.343	4.773
740.38	540	20.685	854.581	10.131	775	21.115	295.365	4.773
763.47	540.3	21.007	864.078	9.563	774.9	20.93	298.081	4.773

786.92	540	20.758	873.623	8.989	775.1	20.784	298.081	4.789
810.08	541.1	21.02	875.537	8.889	775.1	21.179	298.763	4.767
833.37	538.7	20.69	865.983	9.449	774.5	20.92	298.763	4.766
855.70	540.2	20.973	850.795	10.358	774.6	20.92	301.507	4.769
879.22	540.1	20.763	887.064	8.171	774.9	20.87	299.447	4.785
902.02	539.8	21.239	862.175	9.662	774.5	21.063	300.819	4.765
925.05	540.2	21.025	852.687	10.245	774.1	21.026	301.507	4.785
947.78	538.7	21.02	883.214	8.405	774	20.875	304.274	4.786
970.80	540.1	20.973	856.476	10.019	773.6	20.905	303.58	4.766
993.60	540.4	21.01	871.71	9.098	772.9	20.959	302.197	4.767
1016.78	540	20.958	864.078	9.561	772.9	21.018	300.819	4.786
1039.02	539.6	20.856	864.078	9.554	773.7	20.917	304.969	4.782
1062.52	539.9	20.877	865.983	9.439	774.3	20.897	301.507	4.765
1085.50	539.9	20.802	860.273	9.786	774.8	20.816	302.887	4.78
1107.73	540	21.228	877.454	8.753	775.3	21.127	304.274	4.766
1129.90	540	20.763	873.623	8.98	775.6	20.897	307.764	4.765
1152.92	540.3	20.973	860.273	9.79	776	20.754	308.466	4.785
1176.13	540	20.984	860.273	9.783	776	20.821	309.875	4.763
1198.38	540.1	20.828	879.372	8.646	776.1	21.208	305.665	4.785
1221.30	540.2	20.687	862.175	9.674	776.6	21.073	304.969	4.763
1243.53	539.4	21.213	862.175	9.662	776.5	20.796	309.875	4.765
1265.97	539.9	20.893	869.799	9.219	776.5	21.265	307.063	4.762
1288.80	539.7	20.693	852.687	10.247	776.9	20.72	308.466	4.764
1311.78	540.2	20.823	864.078	9.562	776.8	21.125	305.665	4.783
1334.15	539.7	21.218	871.71	9.099	776.8	20.893	304.274	4.767
1357.13	540.1	20.661	850.795	10.364	777.1	20.673	300.132	4.785
1379.37	539.9	20.635	856.476	10.027	777.6	20.611	305.665	4.788
1402.05	540.2	20.506	873.623	8.991	777.7	21.028	308.466	4.767
1424.17	540.2	21.181	864.078	9.561				

DATE3/26

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	539.9	20.89	858.374	9.914	777.7	21.157	303.58	4.79
22.27	539.9	21.179	864.078	9.57	778.4	20.665	303.58	4.791
45.37	540	20.586	862.175	9.691	778	21.105	304.274	4.773
68.15	539.9	20.88	850.795	10.378	778.3	20.579	303.58	4.774
91.58	539.9	20.773	858.374	9.919	778.4	20.979	304.274	4.778
114.42	540.1	20.513	856.476	10.038	778.7	20.564	300.132	4.779
137.03	539.9	21.002	856.476	10.034	779.4	20.554	301.507	4.779
159.53	539.9	20.984	852.687	10.262	779.6	21.055	300.819	4.783
182.53	539.8	20.88	865.983	9.46	779.9	20.473	302.887	4.788
205.43	540.1	20.794	852.687	10.265	780.1	20.631	302.887	4.784
227.88	539.9	20.7	865.983	9.469	780.8	20.828	302.887	4.785
251.07	539.9	20.623	848.905	10.497	780.8	20.715	304.274	4.765
273.82	540.2	20.581	858.374	9.92	781.5	21.152	298.763	4.784
296.65	540.3	20.412	850.795	10.383	781.4	21.013	298.763	4.804
319.00	539.9	20.399	856.476	10.032	781.7	21.134	300.819	4.787
341.58	540	20.373	850.795	10.379	781.8	20.796	301.507	4.786
364.30	540.1	20.435	865.983	9.462	781.3	21.129	302.197	4.788
386.93	540	20.352	858.374	9.93	781.6	20.994	300.819	4.788
409.73	539.9	20.357	845.13	10.729	781.5	21.115	300.132	4.787

432.78	539.9	20.391	860.273	9.806	781.4	20.466	300.819	4.789
455.60	540.1	20.396	860.273	9.81	781.6	21.068	299.447	4.789
478.20	539.8	20.383	856.476	10.047	781.4	21.157	296.72	4.785
501.08	539.9	20.451	852.687	10.272	781.2	20.991	300.132	4.787
523.65	539.9	20.519	862.175	9.693	781.3	20.794	298.081	4.787
546.47	539.9	20.43	858.374	9.93	781.3	20.71	298.081	4.785
569.62	540.1	20.623	845.13	10.727	781.1	21.171	299.447	4.785
592.13	540.2	20.94	848.905	10.494	780.4	20.589	295.365	4.782
615.02	540.1	20.654	839.483	11.064	779.3	20.562	296.72	4.781
637.53	540.1	21.036	860.273	9.818	778.8	20.868	296.72	4.782
660.27	540.2	20.765	843.246	10.832	778.2	20.981	298.763	4.779
682.58	540.1	20.791	856.476	10.041	778	20.92	298.763	4.78
705.25	539.9	21.046	858.374	9.918	777.6	21.075	300.132	4.781
728.32	540	20.758	833.852	11.402	777.5	20.769	300.819	4.78
751.20	540.1	20.654	864.078	9.569	777.2	20.865	300.132	4.798
773.55	539.9	21.254	839.483	11.061	777.1	21.1	300.819	4.778
796.38	540	20.664	854.581	10.147	776.5	20.784	304.969	4.781
818.85	540.1	20.75	856.476	10.035	776.5	20.725	304.274	4.78
841.22	540.2	20.979	841.363	10.941	776.4	21.021	303.58	4.779
863.55	539.4	21.218	854.581	10.147	776.2	21.036	303.58	4.777
886.75	539.9	20.682	847.016	10.607	776.4	21.05	309.17	4.774
909.35	540.3	20.724	845.13	10.715	776.7	21.105	306.363	4.781
929.22	540.3	20.924	858.374	9.917	774.1	20.727	304.274	4.771
950.08	540.4	20.804	904.48	7.127	771.3	20.752	357.186	20.063
972.08	540.2	21.046	854.581	10.141	772.5	20.976	564.078	4.781
994.43	540	20.682	869.799	9.231	771.8	21.05	545.198	4.784
1016.78	540.1	21.174	856.476	10.028	774.1	21.162	522.504	4.8
1039.82	538.9	20.747	854.581	10.143	771.1	20.71	496.384	5.033
1061.63	540	20.994	860.273	9.803	772.8	20.927	476.183	4.786
1084.00	539.7	20.739	871.71	9.111	774	21.238	458.526	4.783
1106.17	540.2	20.69	847.016	10.598	771.2	20.586	440.421	4.807
1128.45	539.1	20.903	867.89	9.336	774.1	21.041	429.268	4.782
1150.98	539.9	21.054	856.476	10.032	774.7	21.085	417.429	4.788
1173.57	540	20.971	858.374	9.91	775.6	21.181	402.327	4.783
1195.65	540.1	20.651	862.175	9.685	774.3	21.004	392.784	4.783
1217.43	540	21.168	850.795	10.367	772.5	20.705	388.505	4.788
1239.37	540.1	20.55	864.078	9.572	774	21.078	379.222	4.785
1260.85	539.9	21.031	858.374	9.916	773.2	20.72	376.721	4.788
1282.60	540	21.145	869.799	9.225	775.7	21.1	370.116	4.784
1304.37	540	21.184	854.581	10.144	771.3	20.606	366.848	4.808
1327.18	539.7	20.636	869.799	9.228	774.2	20.727	361.991	4.782
1348.47	540	21.114	862.175	9.677	775.3	20.962	354.012	4.779
1370.10	540	21.046	867.89	9.34	775.4	20.915	354.804	4.78
1392.18	540.2	20.469	858.374	9.913	775.4	20.806	354.804	4.783
1413.58	539.8	20.979	841.363	10.936	773.7	20.577	348.514	4.783
					776.6	21.167	343.857	4.781

DATE3/27

Time minutes	Pressure mmHg	Low Temp. deg.C	CO2conc. ppm	CO2vol. ml	Pressure mmHg	Ambient Temp. deg.C	CO2conc. ppm	CO2vol. ml
0.00	540	21.075	858.374	9.911	775.6	20.796	340.016	4.782
21.58	539.9	21.072	862.175	9.69	776.6	21.154	336.211	4.798

43.57	539.7	21.028	854.581	10.138	775.3	20.683	334.699	4.78
65.60	539.9	21.005	858.374	9.912	777.1	21.006	333.193	4.779
87.70	540	20.89	856.476	10.03	776.5	21.058	328.709	4.786
109.32	540.1	20.854	864.078	9.57	776.8	21.068	329.453	4.783
130.97	539.8	20.765	847.016	10.598	776.4	21.021	327.967	4.788
152.23	540	20.693	867.89	9.335	776.4	20.939	326.487	4.806
174.30	540.2	20.703	843.246	10.823	776.5	20.865	324.277	4.785
195.88	540	20.765	862.175	9.683	776.6	20.868	323.543	4.785
217.57	540.2	20.5	858.374	9.914	776.8	21.073	317.725	4.801
239.57	540.2	20.521	843.246	10.822	775.3	20.69	319.171	4.794
261.05	539.9	20.477	862.175	9.683	776.5	21.102	316.285	4.788
282.35	540.1	20.506	858.374	9.911	774.5	20.589	319.171	4.774
304.12	539.8	20.48	856.476	10.036	776.3	21.11	316.285	4.795
325.48	539.8	20.428	845.13	10.718	776	21.201	314.136	4.789
346.77	539.9	20.513	862.175	9.692	776.1	21.038	312.71	4.771
368.15	539.9	20.482	860.273	9.795	773.9	20.532	315.567	4.792
389.38	540.2	20.498	841.363	10.946	775.9	21.127	315.567	4.792
411.00	540	20.386	865.983	9.461	776.2	21.147	314.136	4.791
432.78	540.1	20.428	843.246	10.827	776.3	20.801	311.999	4.792
454.45	540	20.443	856.476	10.03	776.5	21.144	311.289	4.792
476.03	540.2	20.467	848.905	10.482	776.5	20.902	313.422	4.788
497.22	540.1	20.428	850.795	10.379	776.6	21.147	311.289	4.786
519.15	539.9	20.524	852.687	10.265	776.1	20.981	309.17	4.789
540.20	540.2	20.656	856.476	10.03	776.1	20.967	311.999	4.789
561.95	539.9	20.802	854.581	10.148	772	20.846	304.969	4.79
582.73	540.1	21.075	862.175	9.694	771.5	20.902	306.363	4.791
603.98	540.2	20.594	856.476	10.029	773.7	21.085	306.363	4.791
624.43	539.9	21.15	839.483	11.057	771.4	20.976	311.999	4.79
645.98	539.7	20.755	877.454	8.762	771.2	20.801	309.17	8.928
666.97	540.1	20.823	841.363	10.939	772.9	21.176	350.077	4.788
688.23	539.9	21.046	835.727	11.288	771.2	20.836	344.629	9.102
709.23	540.3	21.002	873.623	8.998	771.1	20.905	387.654	15.218
730.95	540	21.018	847.016	10.602	770.6	20.767	492.295	14.678
753.18	539.9	21.122	843.246	10.831	772	21.213	582.265	4.768
774.35	540.1	21.223	843.246	10.826	772.4	21.149	555.136	4.783
795.98	539.9	20.69	862.175	9.685	771.7	21.083	526.773	4.786
817.65	539.9	20.859	837.604	11.161	771.2	20.863	497.41	6.258
839.28	540.1	20.88	845.13	10.712	771	20.735	492.295	16.821
861.07	540.1	20.989	841.363	10.935	771	20.747	611.504	16.166
883.72	539.8	20.771	856.476	10.025	771.3	20.651	723.876	15.065
906.02	540.2	20.828	824.506	11.952	770.3	20.878	812.909	8.359
927.78	540	21.168	865.983	9.442	772.7	21.265	828.923	4.774
949.80	539.9	20.734	854.581	10.127	770.5	21.063	771.696	4.78
972.02	540.2	20.992	830.108	11.606	771.2	20.816	726.553	12.799
993.83	540.1	21.15	848.905	10.476	770.8	20.749	787.157	15.414
1016.87	540.2	20.685	860.273	9.789	770.4	20.897	882.821	4.777
1038.52	540.1	21.192	835.727	11.274	771.1	20.493	837.747	13.995