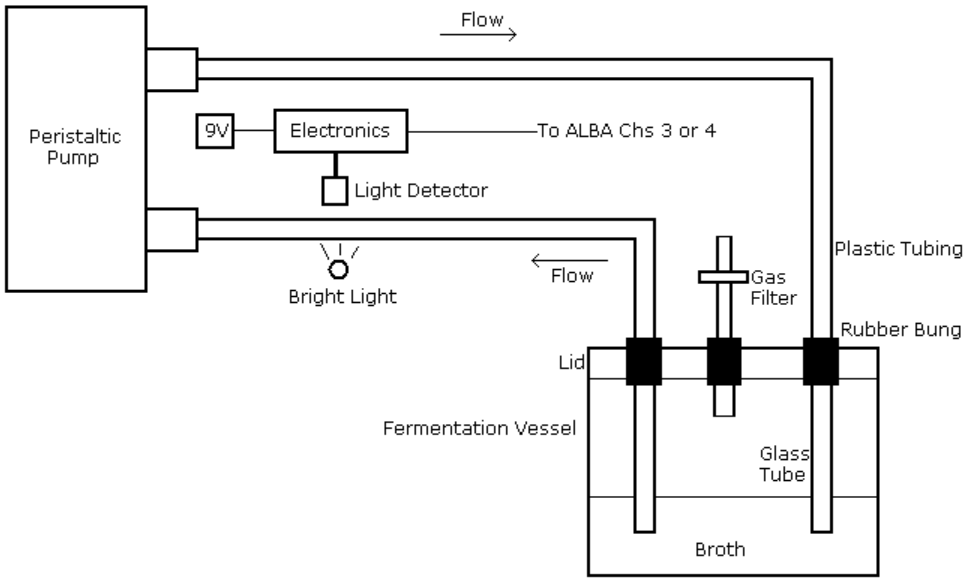
djb microtech
Transmission and Absorbance Monitor

The Transmission and Absorbance Monitor is intended for use with our Fermentation vessel.
Transmission and Absorbance Monitor consists of three main components:

- a peristaltic pump
- a very bright light
- some electronics

A schematic of the Transmission and Absorbance Monitor setup is shown below.



How it Works

When the peristaltic pump is working it removes broth from the fermentation vessel. This broth then passes between the bright light and detector. The detector produces a voltage depending how bright the light is. The liquid is pumped round and back into the fermentation vessel. It is a closed system. As the opacity of the broth changes so does the voltage produced by the detector. Note that any gas produced in the fermentation vessel must be allowed to escape.

The software

Connect the Transmission and Absorbance Monitor to either channel 3 or 4 of the ALBA Interface and Logger. Use the Investigator software and set it up to log at suitable intervals. Table 1 shows results for a glucose/yeast solution.

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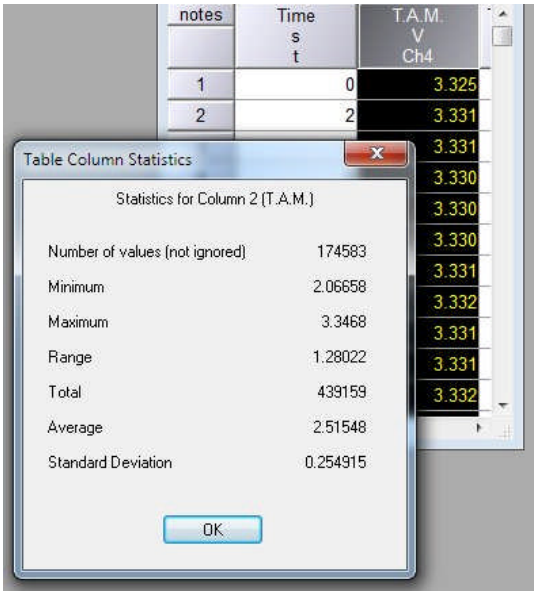
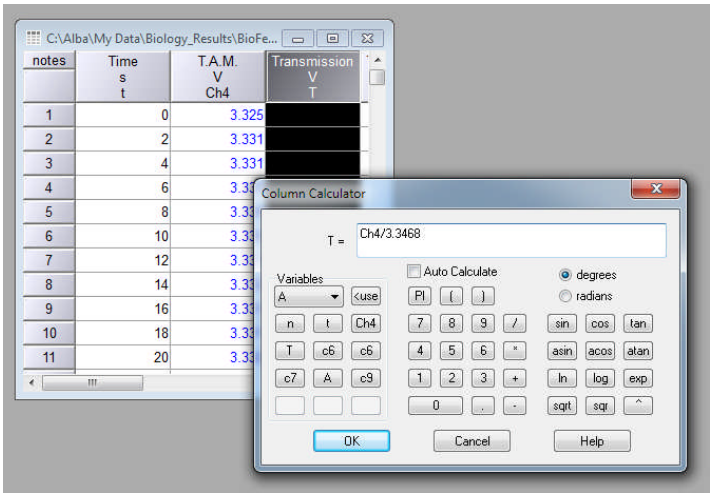
notes	Time s t	T.A.M. V Ch4
1	0	3.325
2	2	3.331
3	4	3.331
4	6	3.330
5	8	3.330
6	10	3.330
7	12	3.331
8	14	3.332
9	16	3.331
10	18	3.331
11	20	3.332

The next step is to normalize the results. Firstly create an empty column. Identify the largest voltage produced by the Transmission and Absorbance Monitor - you can use the statistics icon if it helps you. Use the column calculator and fill this new column with the Ch4 values divided by the maximum value - see the Table below.

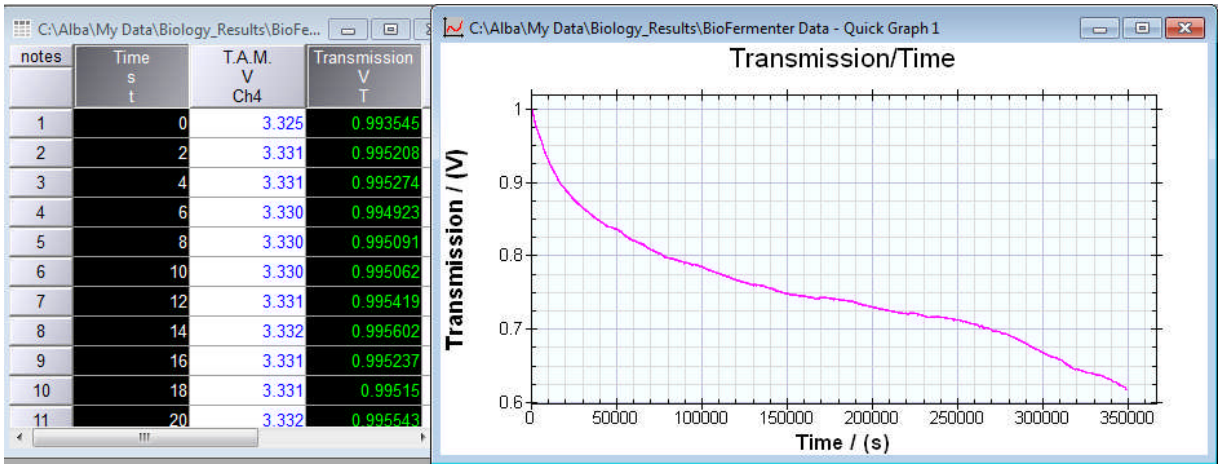


Using the Stats button to find the maximum value in a row



Using the Column Calculator to normalize the values

The normalized values give the Transmission data for the broth.

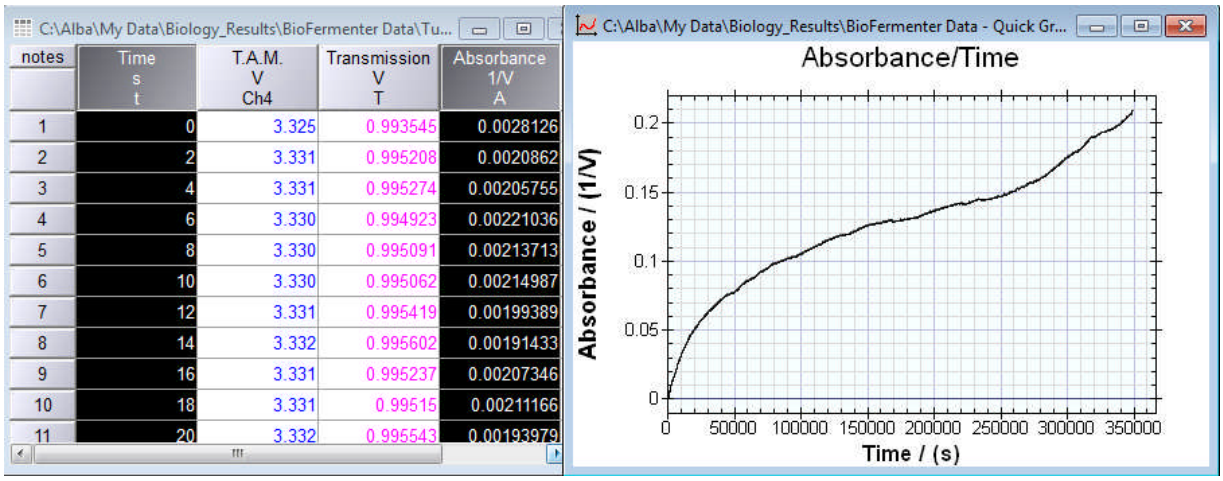


C:\Alba\My Data\Biology_Results\BioFe...

notes	Time s t	T.A.M. V Ch4	Transmission V T
1	0	3.325	0.993545
2	2	3.331	0.995208
3	4	3.331	0.995274
4	6	3.330	0.994923
5	8	3.330	0.995091
6	10	3.330	0.995062
7	12	3.331	0.995419
8	14	3.332	0.995602
9	16	3.331	0.995237
10	18	3.331	0.99515
11	20	3.332	0.995543

Normalized Transmission Data and Transmission/Time Graph

To calculate the absorbance you must use the relationship A = log(1/T).
Add a new column to your Table and using the Column Calculator fill this column with log(1/T) values.



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notes	Time s t	T.A.M. V Ch4	Transmission V T	Absorbance 1/V A
1	0	3.325	0.993545	0.0028126
2	2	3.331	0.995208	0.0020862
3	4	3.331	0.995274	0.00205755
4	6	3.330	0.994923	0.00221036
5	8	3.330	0.995091	0.00213713
6	10	3.330	0.995062	0.00214987
7	12	3.331	0.995419	0.00199389
8	14	3.332	0.995602	0.00191433
9	16	3.331	0.995237	0.00207346
10	18	3.331	0.99515	0.00211166
11	20	3.332	0.995543	0.00193979

Calculation of Absorbance and Absorbance/Time Graph

Ideas to Explore

1) Using djb microtech's oxygen and carbon dioxide gas sensors investigate how the percentage of these gases changes as the absorbance changes. This will require holes to be made in the lid of the biofermenter to accommodate the gas sensors. Take care not to get the sensors wet.

2) Using our air pump the broth can be aerated. How does the flow rate of air affect the absorbance?

3) Using our Biofermenter Control Unit the temperature of the broth can be maintained at a set temperature. How does this set temperature affect the Absorbance. A photograph of this setup is shown on our website.

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