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Thermo 49i Diagnostics

For all Thermo i-series instruments we recommend setting the onboard datalogger to use 70% of the memory storage to collect 1-minute LRECs for Diagnostic purposes. This will allow the collection of at least 1 week of 1-minute data. The remaining 30% of memory can be used to collect 1 hour or 1/2 hour readings of the same parameters. This will allow the collection of at least 1 month of the main parameters for long-term backup and data validation.

We recommend adding a few parameters to the default selection to obtain the following list: Time, Date, Flags, O3, Intensity A, Intensity B, Flow A, Flow B, Press, o3 bkg, o3 coef, bench temp, lamp temp, oz lamp temp, bench lamp (pwr), oz Level 5 (pwr).

For qa/qc purposes, we recommend downloading the data once a week with iPort and viewing it graphically in Excel. Normally, viewing the 1-hour or 1/2-hour SRECs is most useful for viewing long term drift, such as lamp intensity or sample flow. The 1-minute LRECs can be used to "zoom in" on any upset or anomaly. Once familiar with the procedure, downloading the data, importing it into Excel and graphing the main parameters should only take about 10 minutes. Below are some examples of useful graphs using 7 weeks of 1/2-hour readings.

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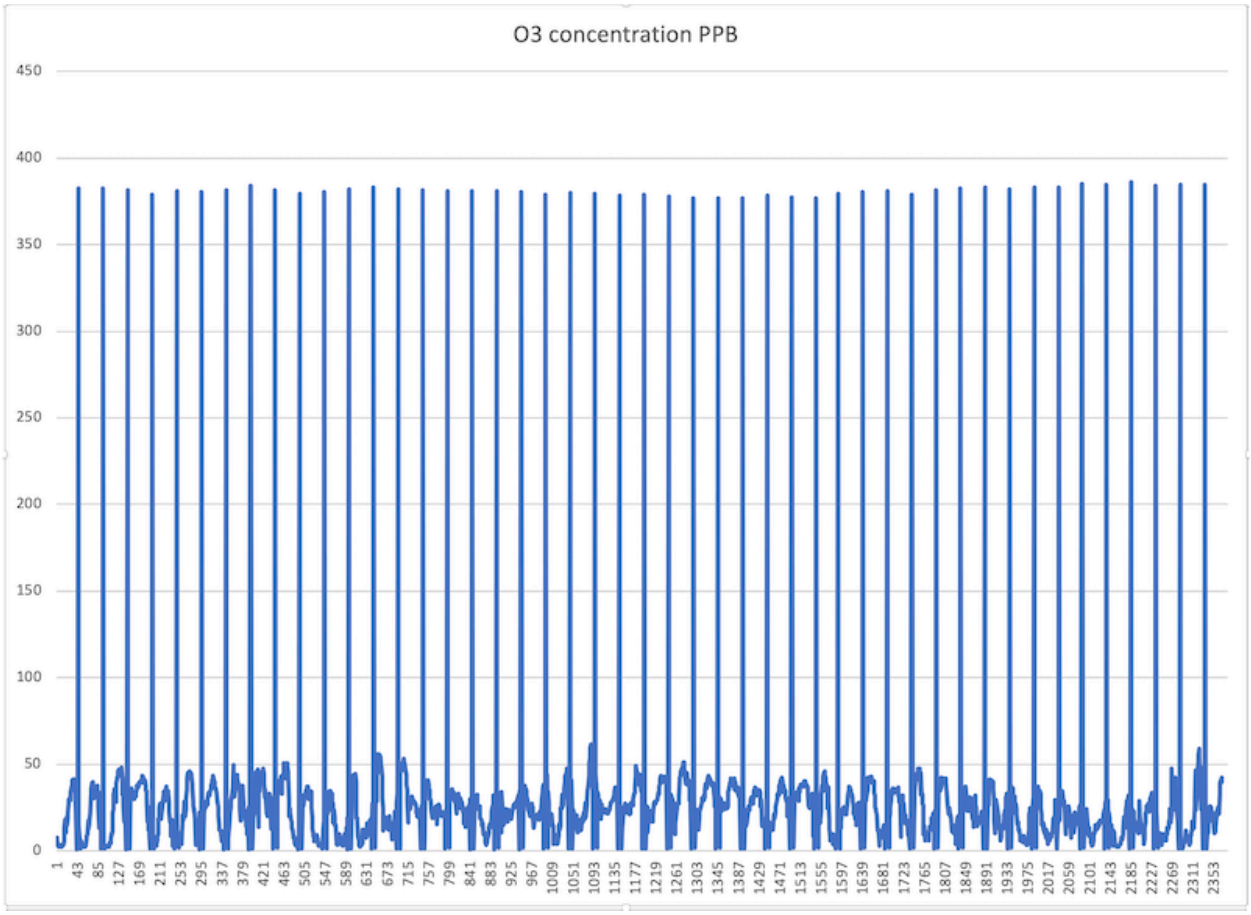
Ozone Concentration



In the above graph the relative ozone concentrations can be seen as well as the normal diurnal effect. Because 1/2 hour SRECs were used to generate the graph, the daily span check can also be seen at the 10-minute mark (this site was using the common 20 minute zero, 20 minute span settings). This allows a quick check of the instrument operation and span stability.

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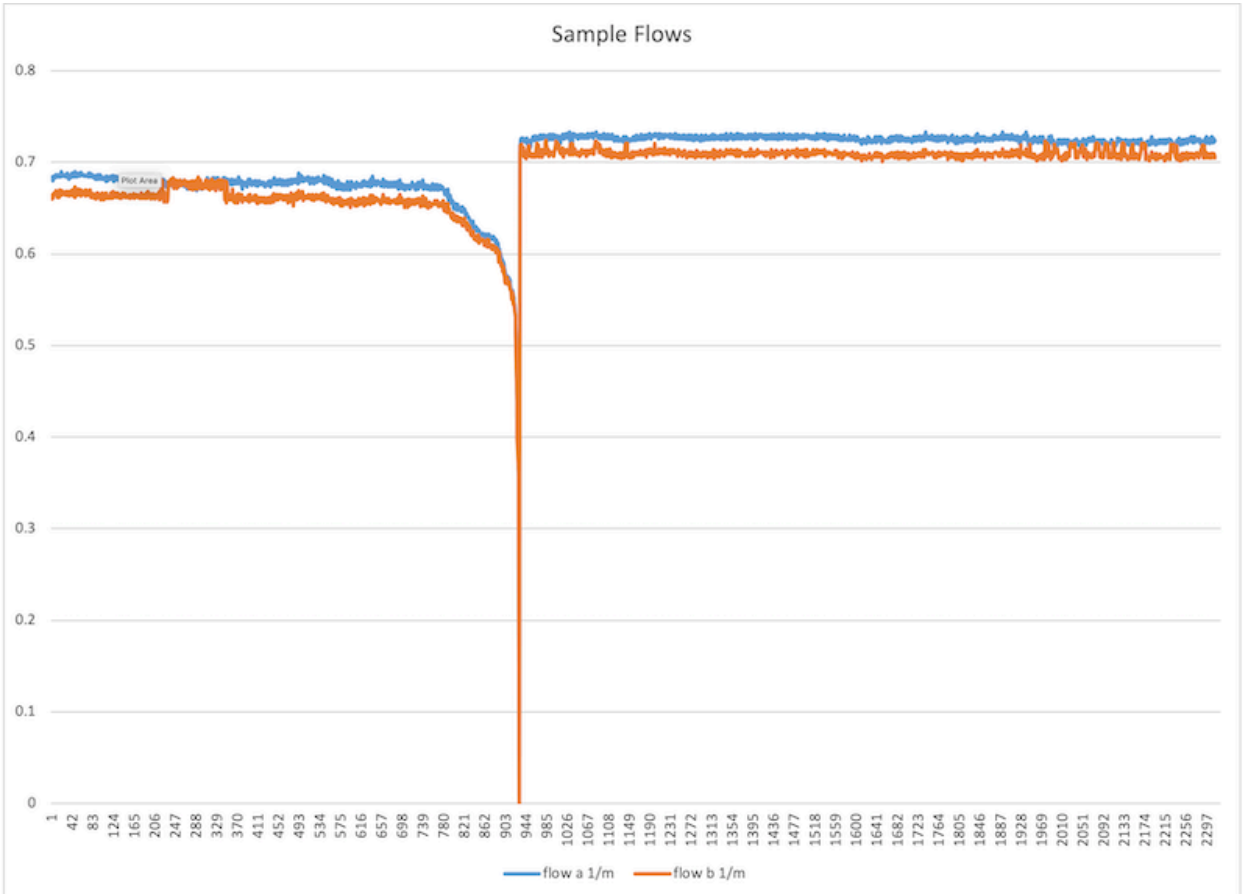
Sample Flows



It can be seen from this graph that the initial flows were around 660/670 cc/min, dropped down to less than 500 cc/min, then suddenly jumped up to 710/720 cc/min when, obviously, the pump or pump diaphragm was replaced. Since the ozone analyzer is not flow dependant, these changes should not affect the readings. Normal flow readings are between 650 and 750 cc/min.

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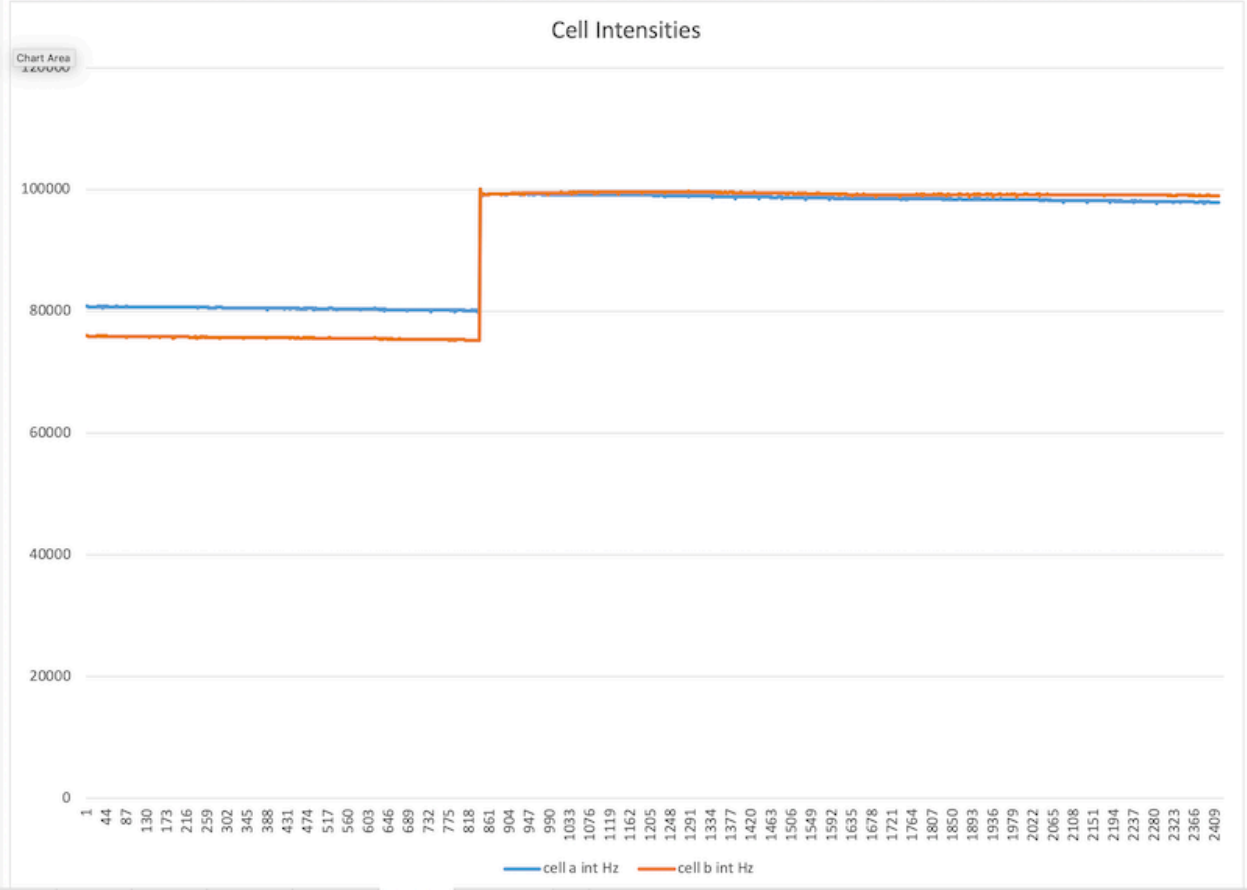
Cell Intensities



Within limits, the cell intensities do not affect the instrument readings. However, we recommend keeping them within the range of 70,000 to 110,000. Using the example above, because of normal aging of the photometer lamp, the intensities had slowly dropped to 75,000/80,000, so the lamp power was adjusted (see next graph) to bring the intensities close to 100,000, and then a Detector Calibration was performed to make both intensities equal to 100,000.

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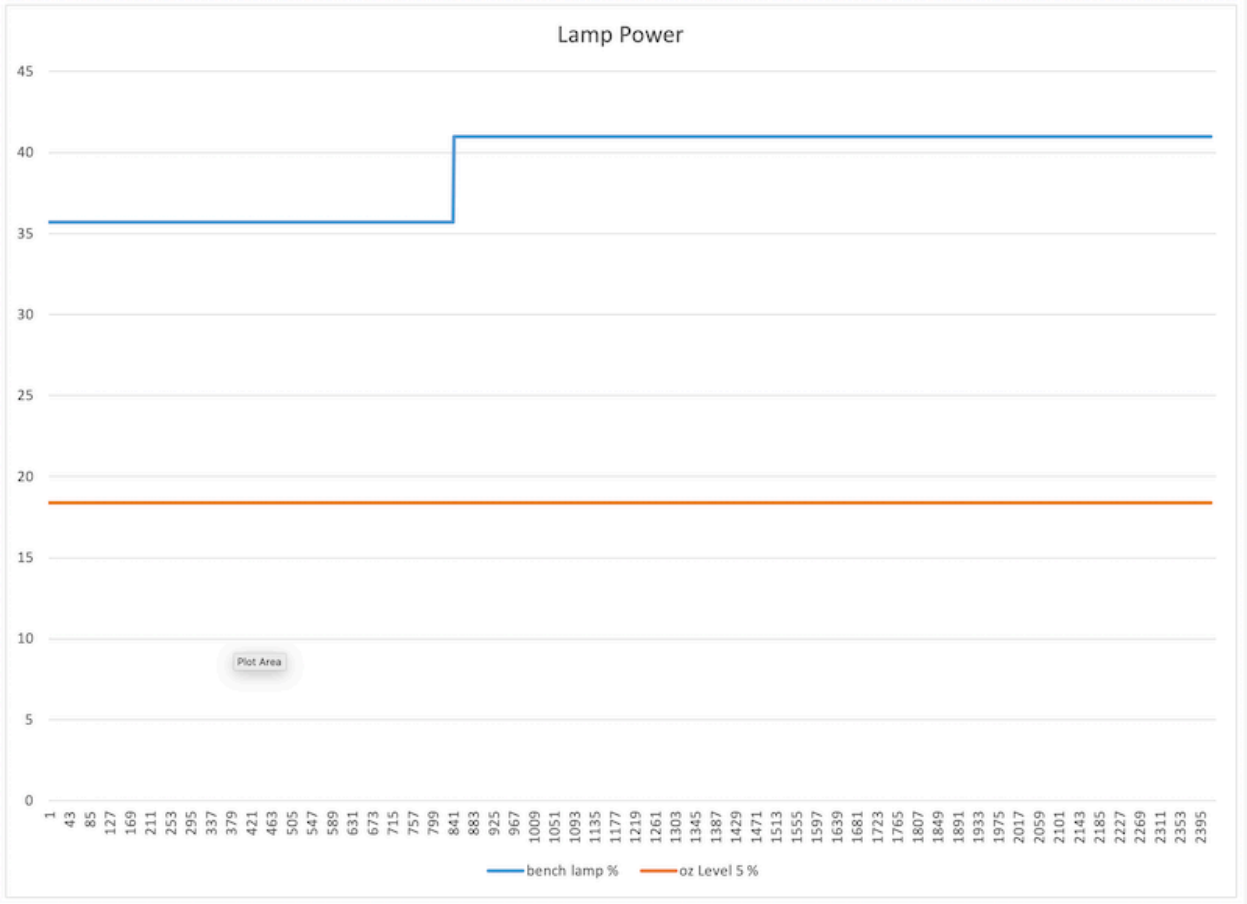
Lamp Power



The graph above shows the power to the photometer lamp (bench) and the power to the Ozonator lamp on Level 5 setting (used for daily span check). These values should be constant until someone manually changes them. It is normal for the photometer lamp output to decrease over time, and when it approaches 70,000 or so, we recommend increasing the power to bring it back up close to 100,000, as was done above. The Ozonator lamp will also slowly change over time. After the analyzer has been certified as reading correctly (after an audit or calibration), we recommend adjusting the span check value to a nice round number, say 300 ppb or 400 ppb. This will allow staff to know if the instrument is responding well, as the "Expected" span value will always be the same.

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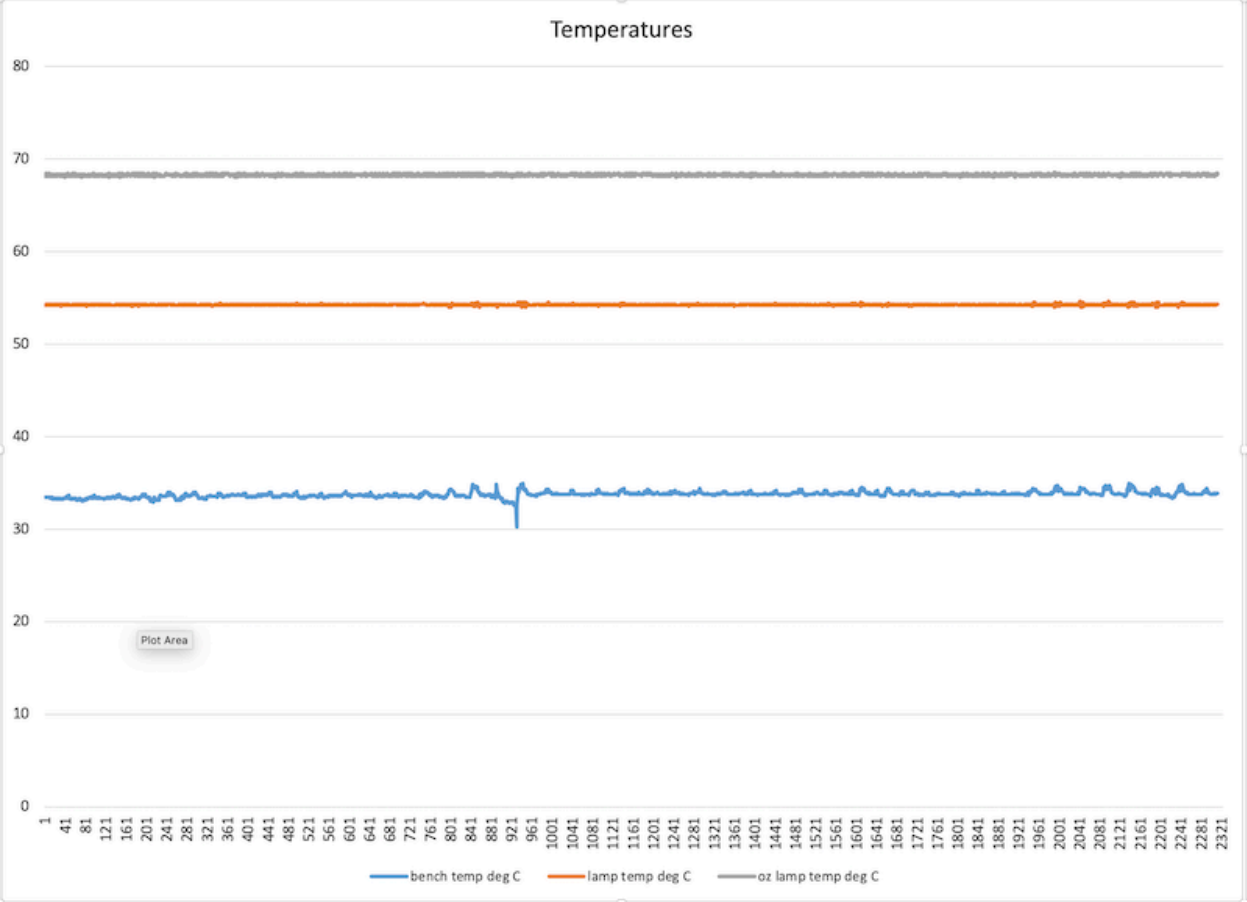
Temperatures



We always recommend graphing the lamp, o3 lamp and bench temperatures together, as the automatic scaling works well. The lamp (photometer) temperature should be very steady, and between 52 and 56 degrees C. The O3 lamp temperature should be very steady and between 65 and 70 degrees C. The bench temperature is usually between 8 to 12 degrees above the enclosure temperature and will vary depending on enclosure conditions. If the instrument fan fails, or the fan filter plugs up, the bench temperature will climb. It should never get above 40 C.

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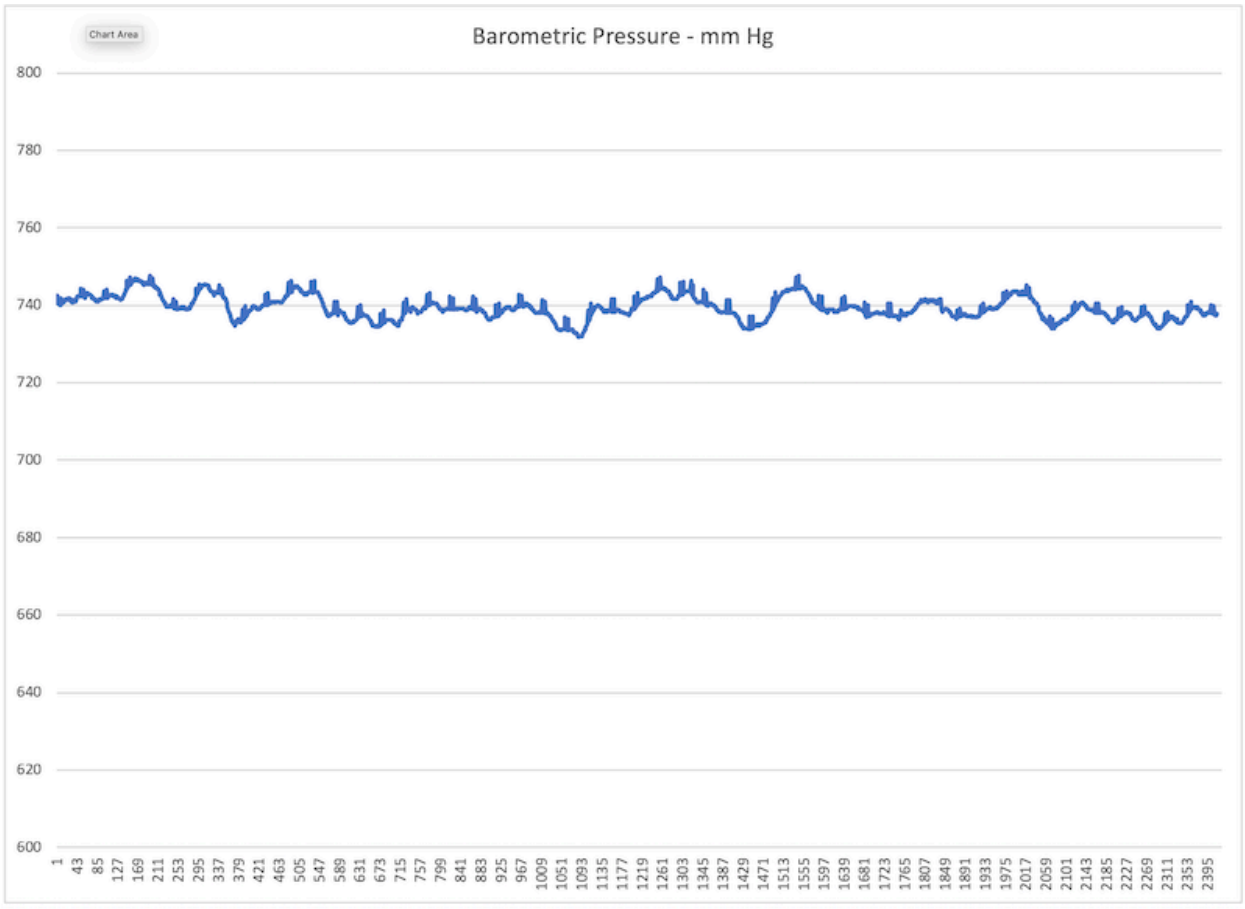
Barometric Pressure



The pressure reading is generally 20 to 60 mm Hg below the local barometric pressure. The pressure reading will decline slightly over time due to loading on the inline sample filter. This is sometimes a good indication that the filter needs to be changed. Fluctuations in the readings are generally due to normal variations of the barometric pressure.

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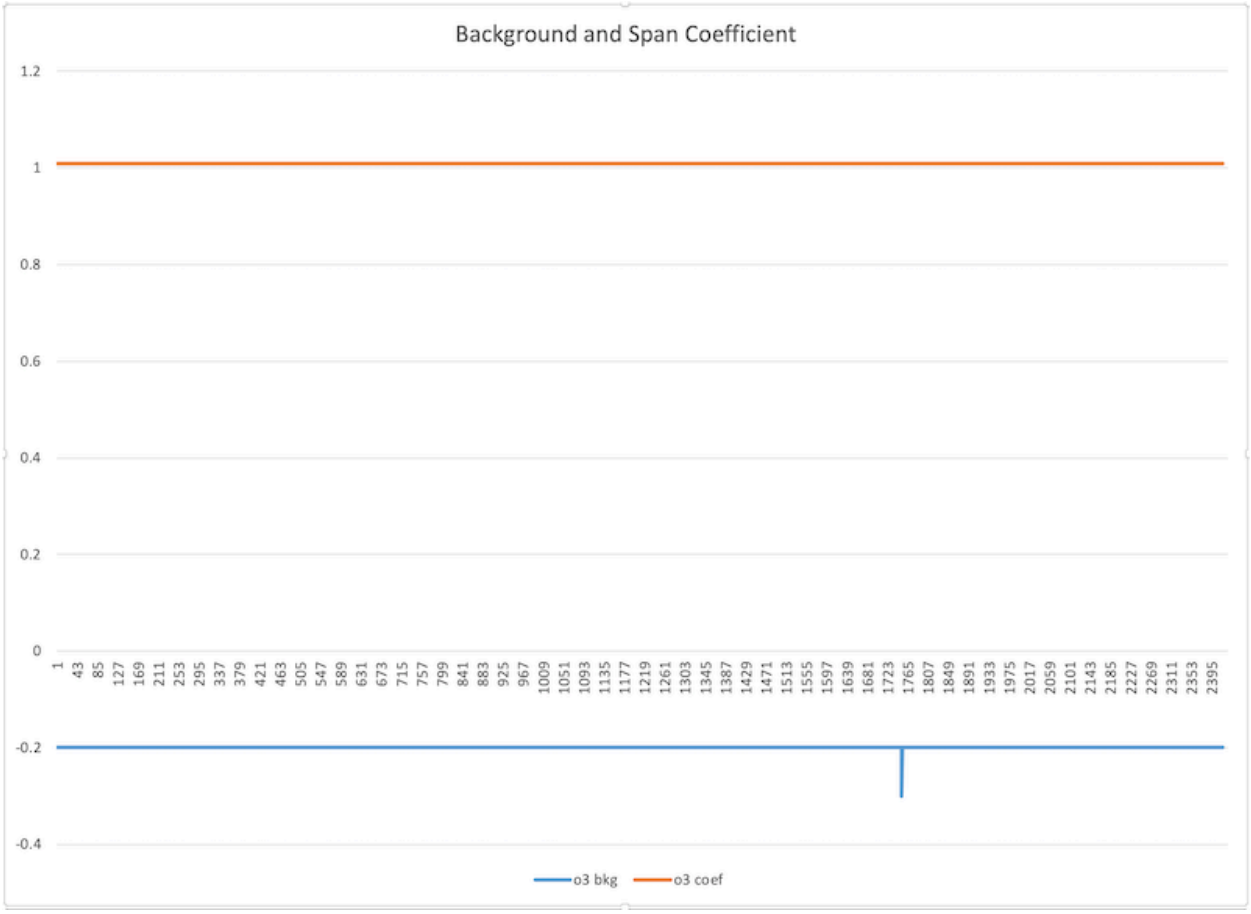
Background and Span Coefficients



For qa/qc purposes, graphing the background and span coefficient is very useful. The span coefficient should always be close to 1.00 and should rarely, if ever, change. From the factory, the coefficient is usually between 0.98 and 1.02. The background is also quite stable and usually close to zero. From the factory the background is usually between 2 ppb and -2 ppb, but can vary from 5 ppb to -5 ppb.