



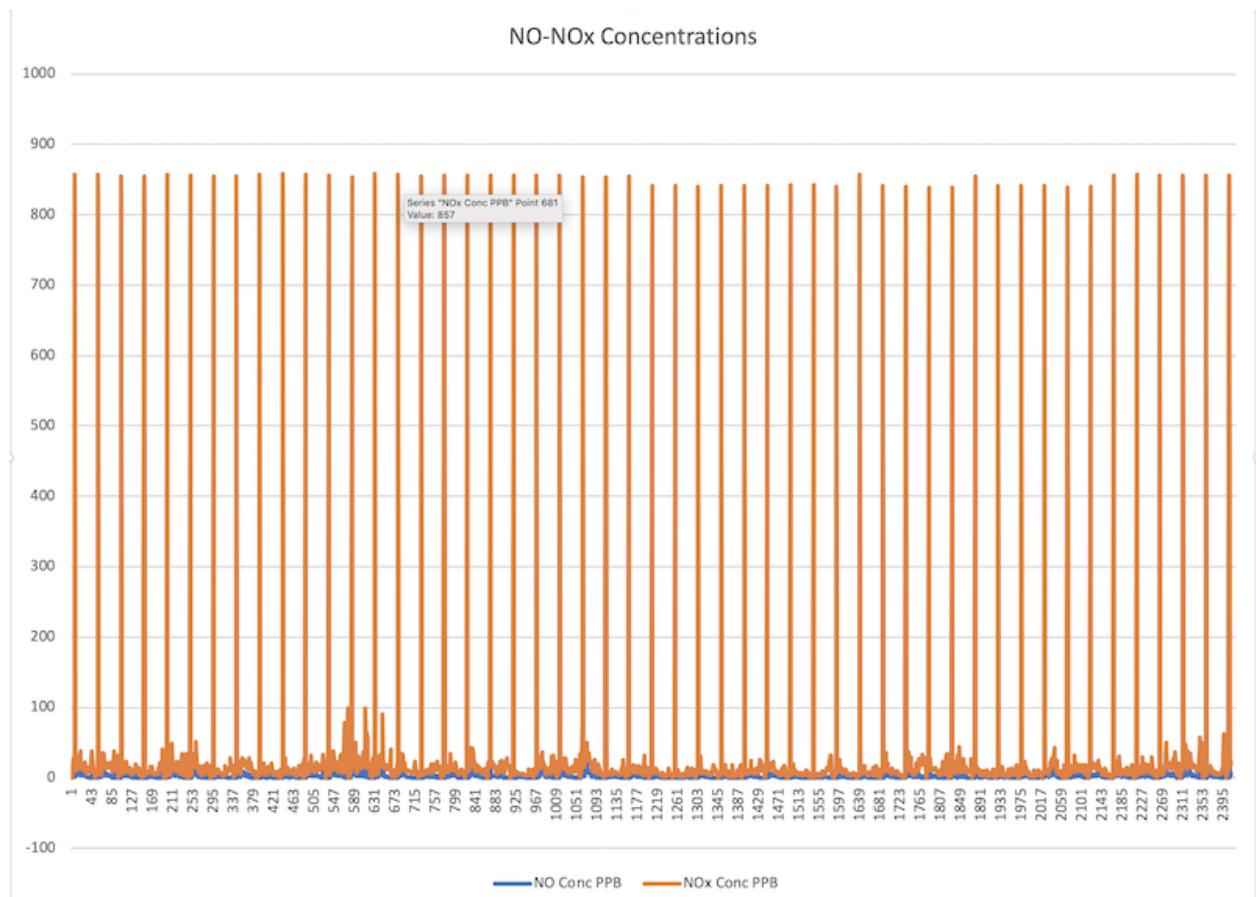
## Thermo 42i Diagnostics

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 data validation and backup.

We recommend adding a few parameters to the default selection to obtain the following list: Time, Date, Flags, NO, NO<sub>x</sub>, Int Temp, Chamber Temp, Cooler Temp, Flow, Chamber Press, PMT Volts, NO bkg, NO<sub>x</sub> bkg, NO coef, NO<sub>2</sub> coef and NO<sub>x</sub> coef.

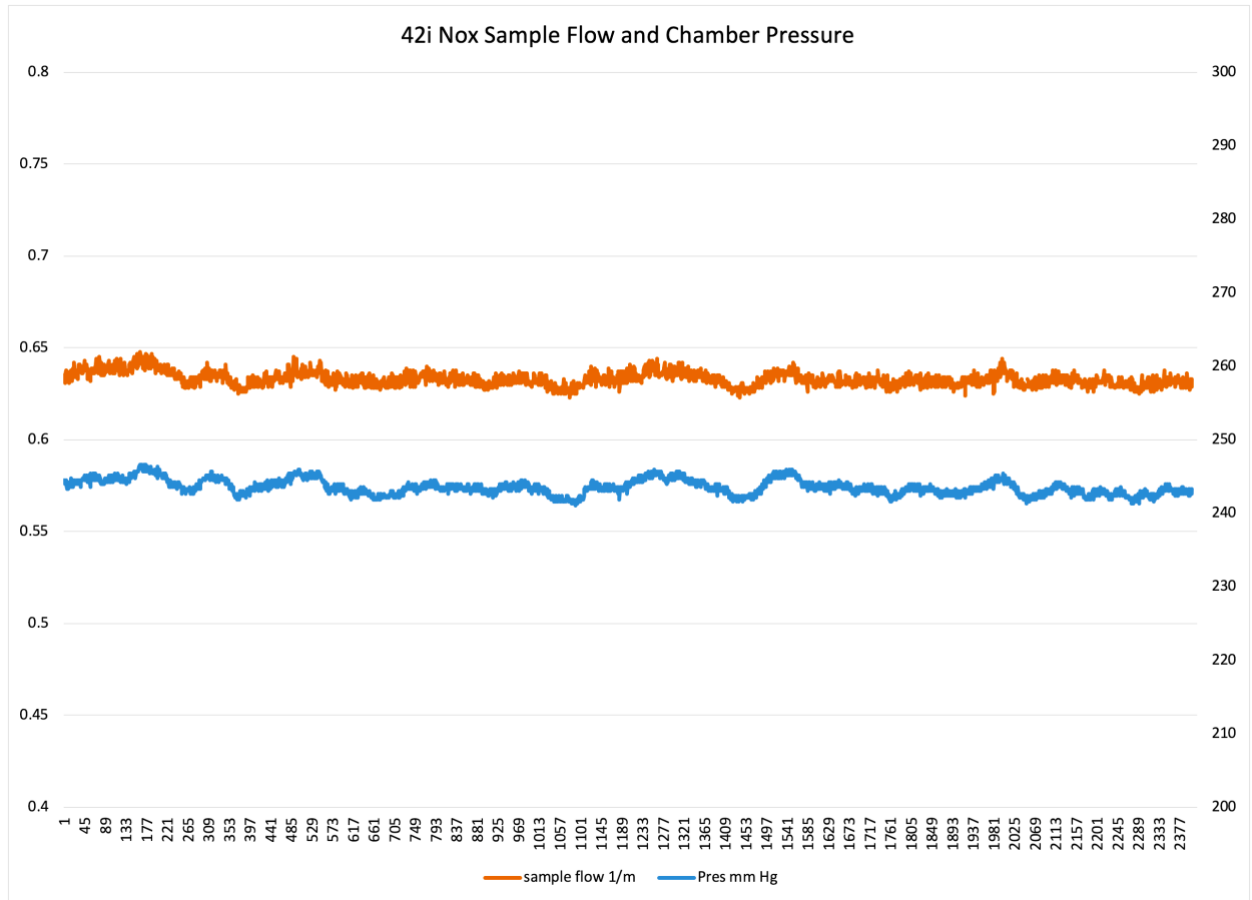
For qa/qc purposes, we recommend downloading the data once a week with iPort and viewing it graphically in Excel. Normally, viewing the 1-hour or 1/2-hour SRECs is most useful for viewing long term drift, such as chamber pressure or sample flow. The 1-minute LRECs can be used to “zoom in” on any upset 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.

## NO and NO<sub>x</sub> Concentrations:



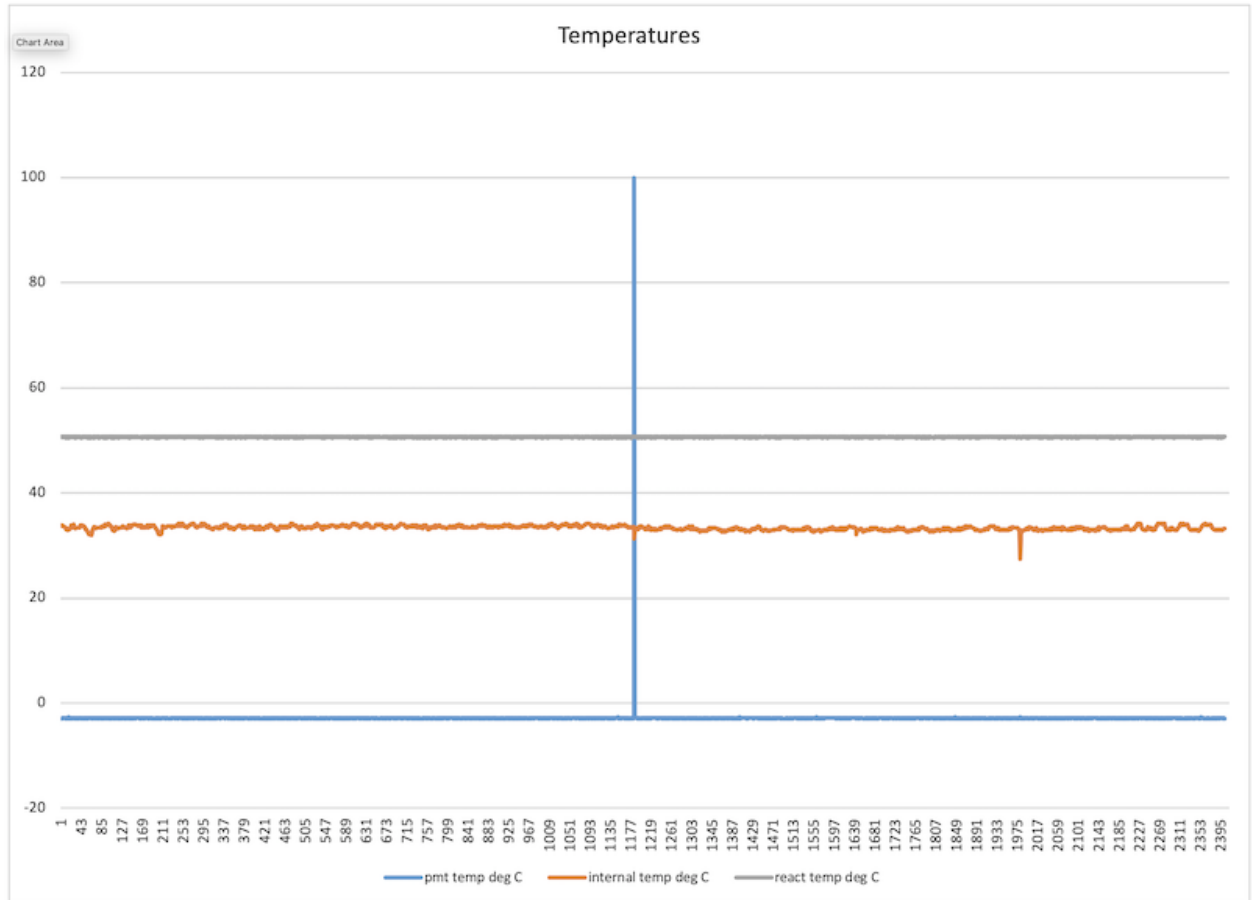
In the above graph the relative NO and NO<sub>x</sub> concentrations can be seen. Because 1/2 hour SRECs were used to generate the graph, the daily span check can also be seen at the 10-minute mark (this site was using the common 20 minute zero, 20 minute span settings). This allows a quick check of the instrument operation and span stability.

## Sample Flow and Chamber Pressure



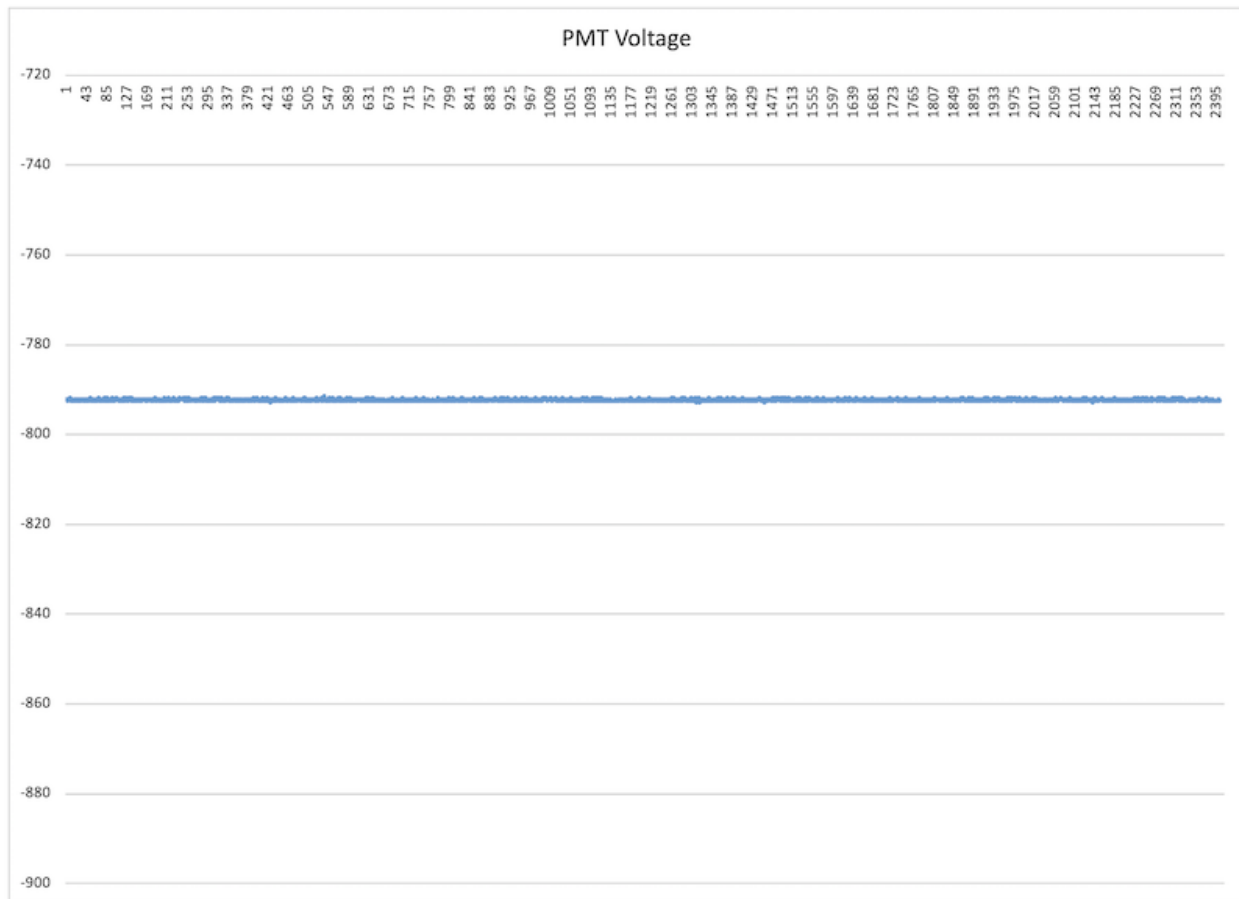
The sample flow is usually between 0.6 and 0.8 lpm and the chamber pressure is usually between 200 and 300 mmHg. A change in one parameter will usually be reflected in a change to the other parameter. A torn pump diaphragm will cause the pressure to increase (decrease in vacuum) and the flow to decrease. A heavily loaded sample filter will cause both the flow and pressure to decrease.

## Temperatures



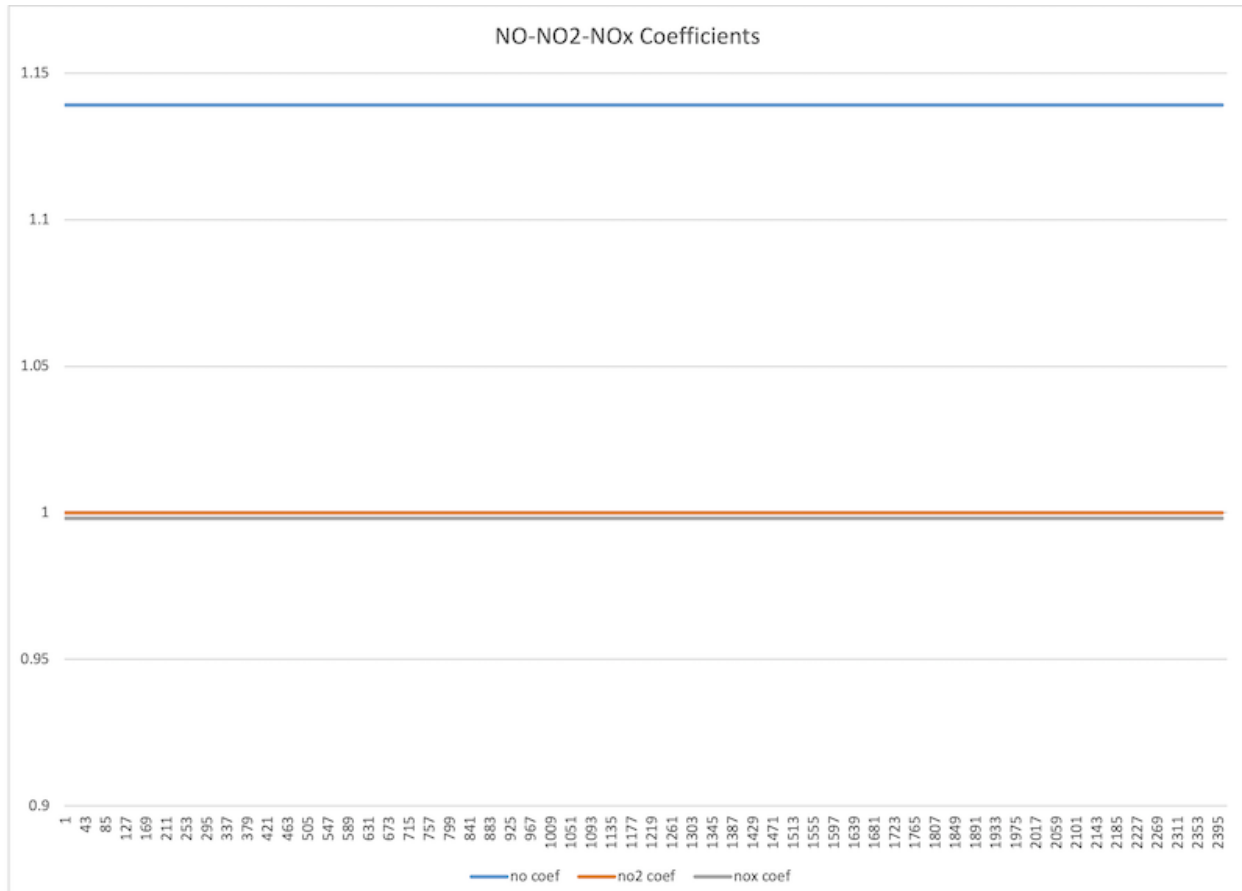
The reaction chamber temperature should be very steady and is usually within 1 degree of the 50°C set point. The internal temperature is usually 8 to 12 degrees above the enclosure temperature. Variations are usually due to an instrument fan failure or changes to the enclosure temperature. The PMT cooler temperature should be steady near -3°C. Increases to this temperature usually indicate that the cooler fan is plugged, has quit working or the enclosure temperature is above 30°C.

## PMT Voltage



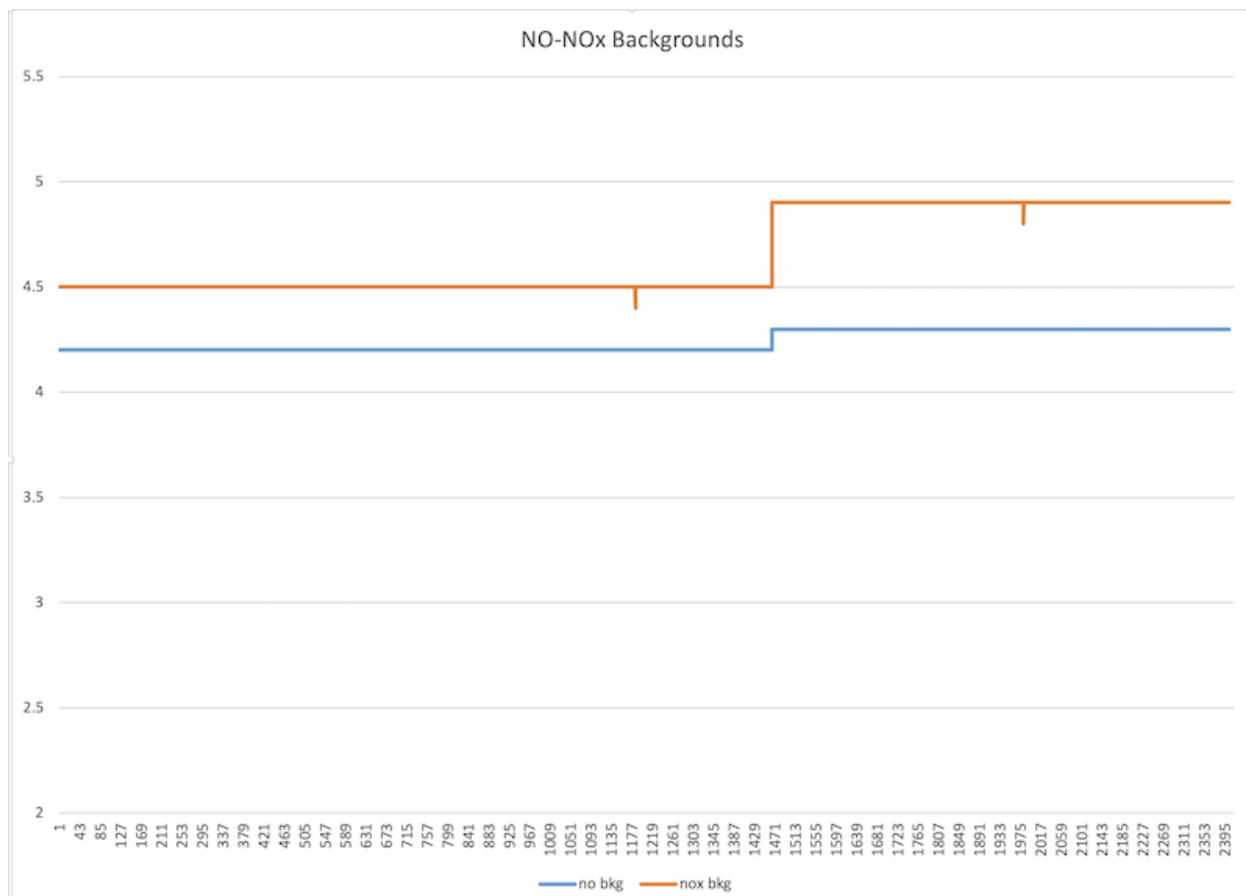
The PMT Voltage should be very steady and be between -700 and -900 volts on an ambient level analyzer. This is normally only changed during a calibration following a major service where the reaction chamber has been cleaned. A sudden increase in the noise level could be caused by a failing PMT Power Supply.

## NO-NO<sub>2</sub>-NO<sub>x</sub> Coefficients



The NO coefficient is usually set to 1.00 after a major service and will normally increase during subsequent calibrations as the reaction chamber gets dirty and the pump weakens. Normal values are between 0.9 and 1.5. Although the NO coefficient affects the span of both the NO and NO<sub>x</sub> channels, the NO<sub>x</sub> coefficient provides a correction to the NO<sub>x</sub> channel because of its different flow path (slightly affecting flow, pressure and timing). Normal values are between 0.95 and 1.05. On a new instrument the NO<sub>2</sub> coefficient should be close to 1.00. Over time, GPT calibrations will cause this coefficient to decrease to compensate for the failing NO<sub>2</sub> converter efficiency. Normal values are between 1.00 and 0.95. However, we recommend replacing the converter once the coefficient gets below 0.97 (less than 97% efficient).

## NO-NOx Backgrounds



The NO and NO<sub>2</sub> backgrounds will slowly change over time due to the reaction chamber getting dirty or changes to the sample flow/chamber pressure. Larger changes will occur after a major service if the chamber is cleaned and/or the PMT voltage is changed. Normal values are between 0 and 10 ppb.