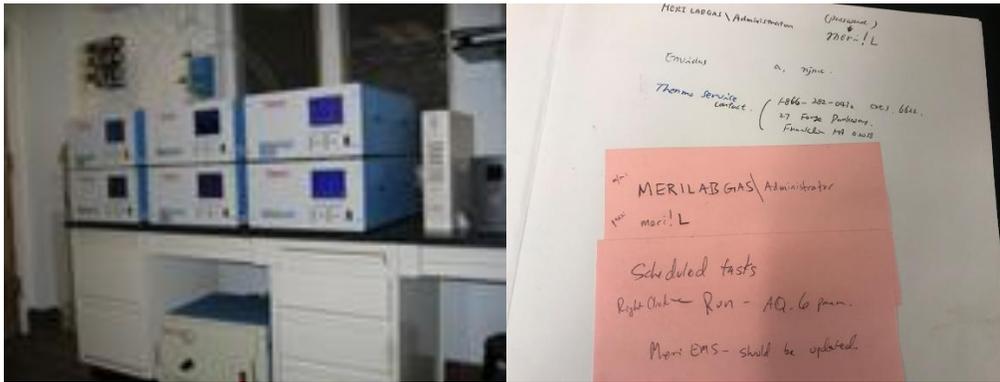


Thermo gas analyzer calibration procedure

In the Meadowlands Environmental Research institute laboratory, Envidas, the environmental data acquisition system, is used for instrument calibration and data management and sharing. ENVIDAS is an intelligent, multi-function, high-performance data acquisition system. It is designed with affordability and versatility in mind. ENVIDAS is a state-of-the-art system that uses nonproprietary desktop or industrial PC computer components to run flexible, environmental data acquisition software. ENVIDAS software features pull-down windows-based menus, and it is designed to help automate environmental data acquisition system.

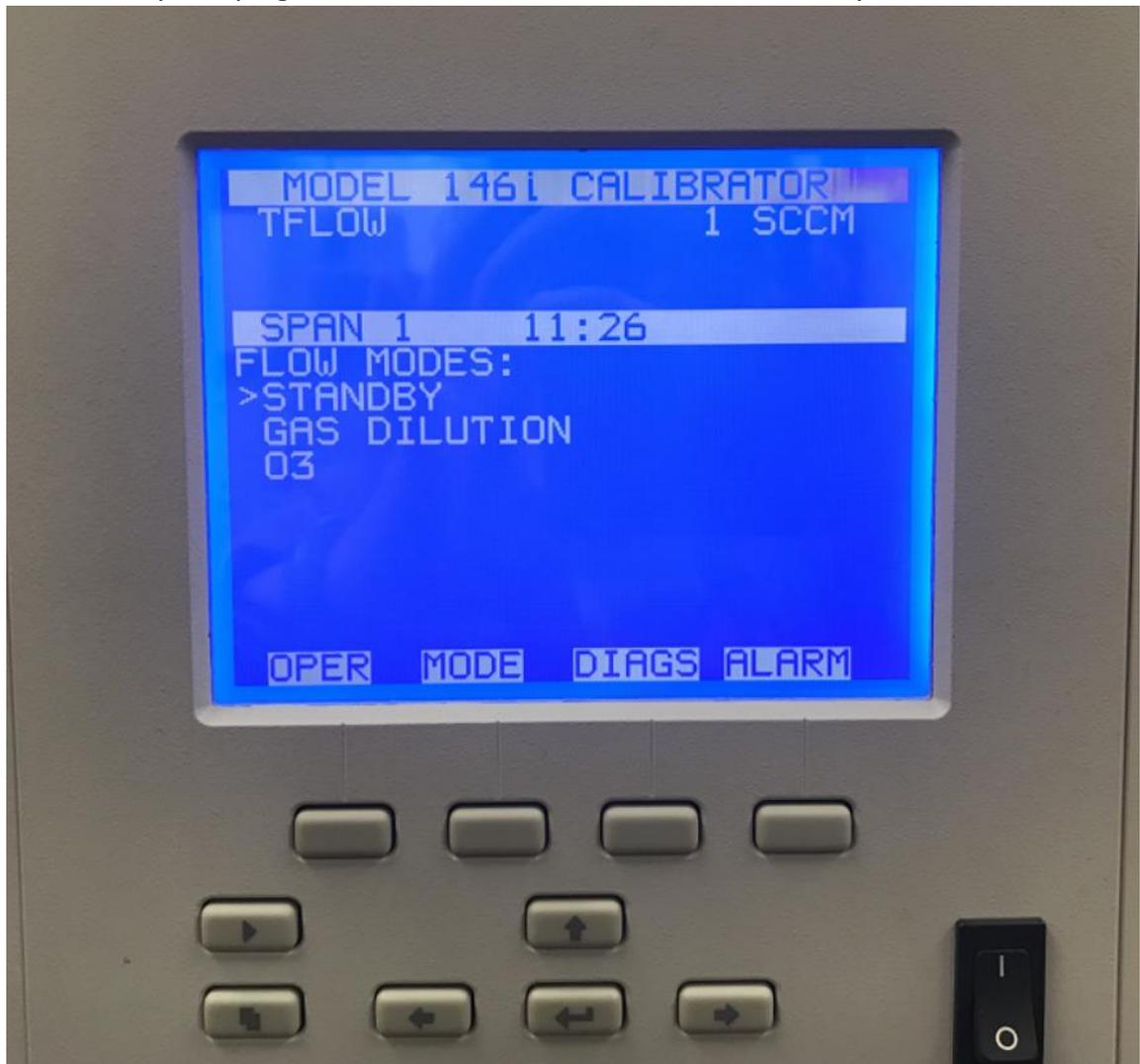


The screenshot shows the Envidas for Windows NJMC software interface. The main window displays a table titled "NJMC" with the following data:

Channel	Input Signal	Original EU	Instantaneous	Last 1 Min AVG.	Last 5 Min AVG.	Last 60 Min AVG.
01 - Ozone [PPB]	-0.281	-0.3	-0.3	-0.5	-0.5	1.6
02 - Carbon Dioxide [PPM]	493300.000	493300	493	493	492	481
03 - NO [PPB]	0.465	0.5	0.5	0.2	0.3	0.3
04 - NOx [PPB]	0.997	1.0	1.0	1.0	1.0	1.0
05 - SO2 [PPB]	4.334	4.3	4.3	4.5	4.1	4.1
06 - CO [PPM]	462.200	0.48	0.46	0.47	0.46	0.41

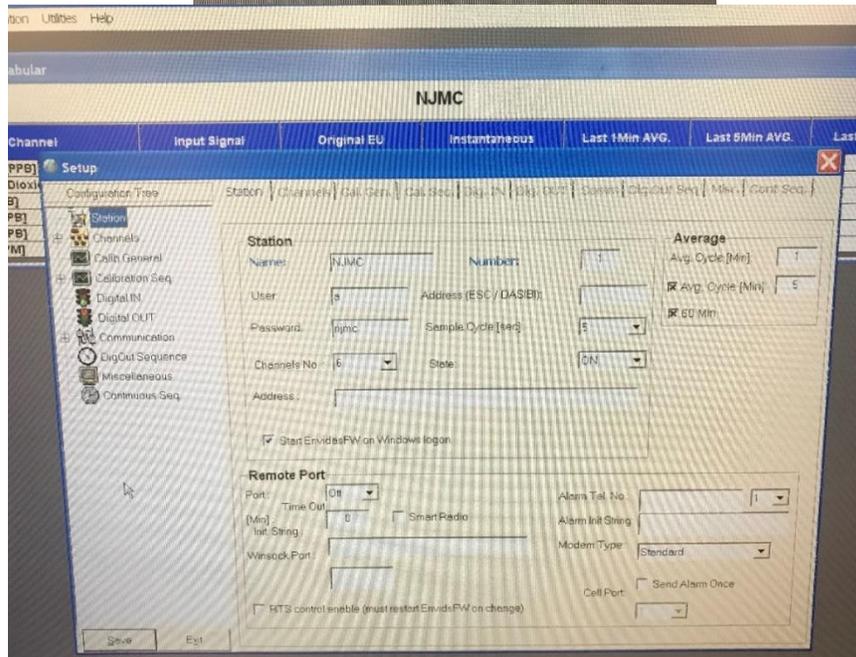
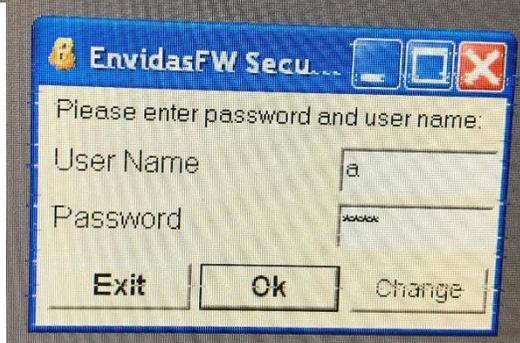
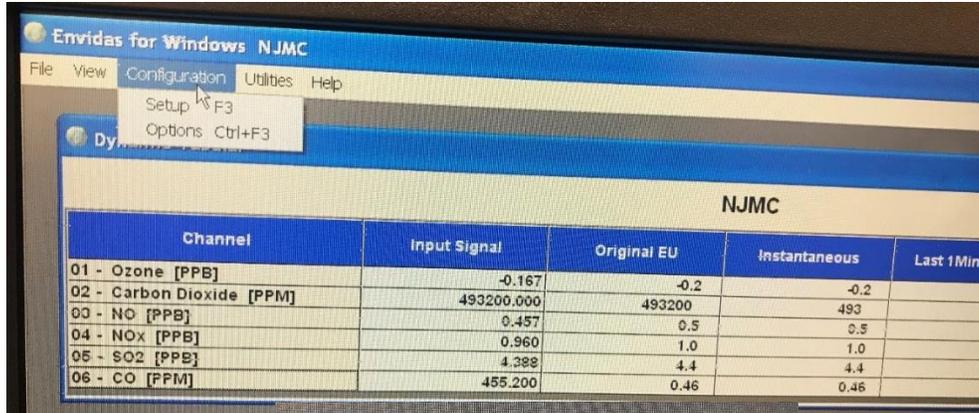
1. Calibration Setting

Gas analyzers need to be calibrated every month, and the filters (Teflon filter, 5 μm pore size, 47 mm diameter), used to clean the incoming samples, need to be replaced every month. Calibration gas cylinders, including NO, SO₂, CO₂, CO, and air are always keeping on. Put the Model 146i Calibrator at Standby mode.

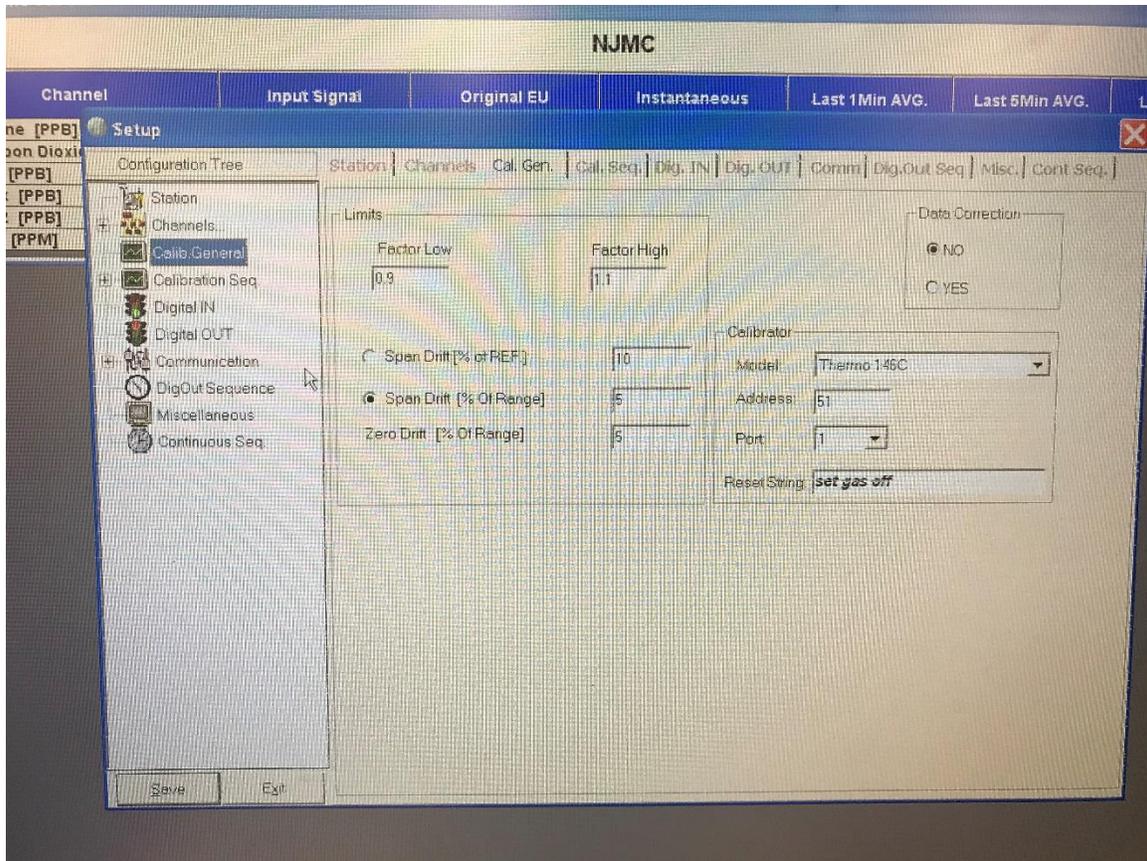


2. NOx calibration

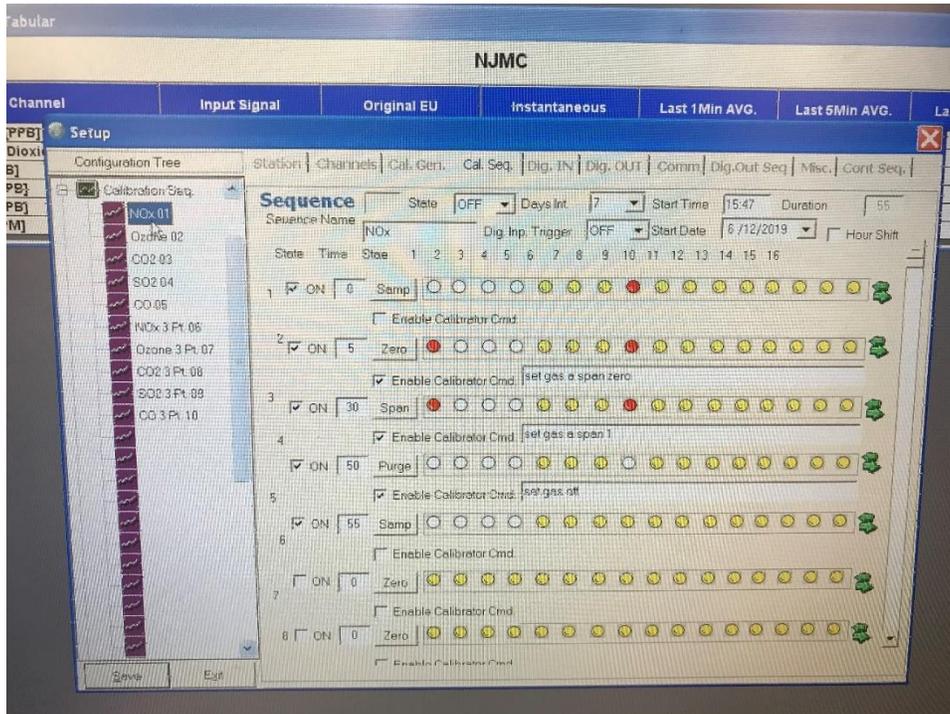
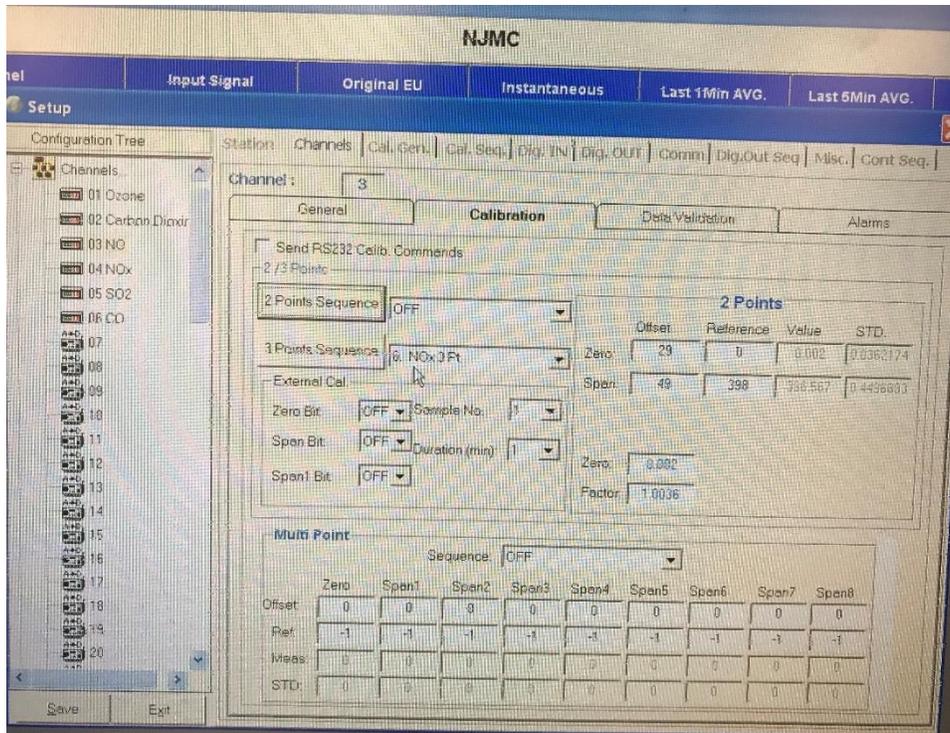
- First, open the Envidas software and go to the ‘Configuration’ and choose ‘Setup’. Input correct Username and Password, then login to the setting of system.

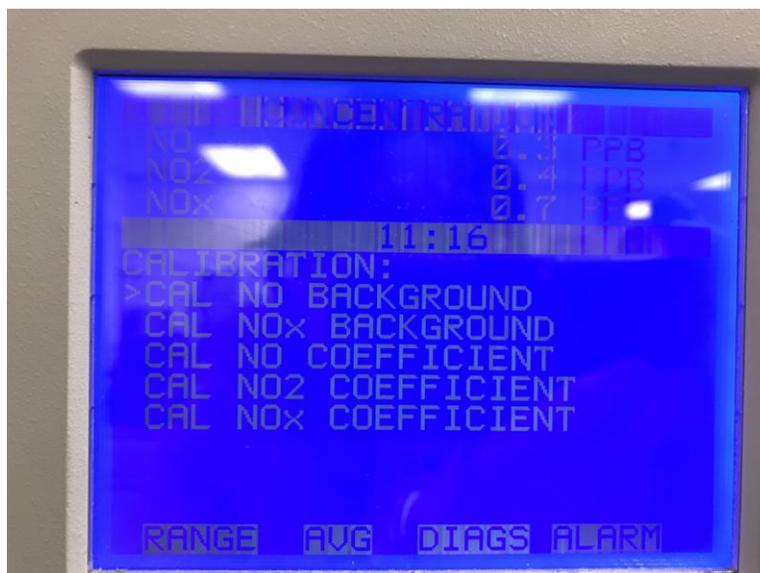


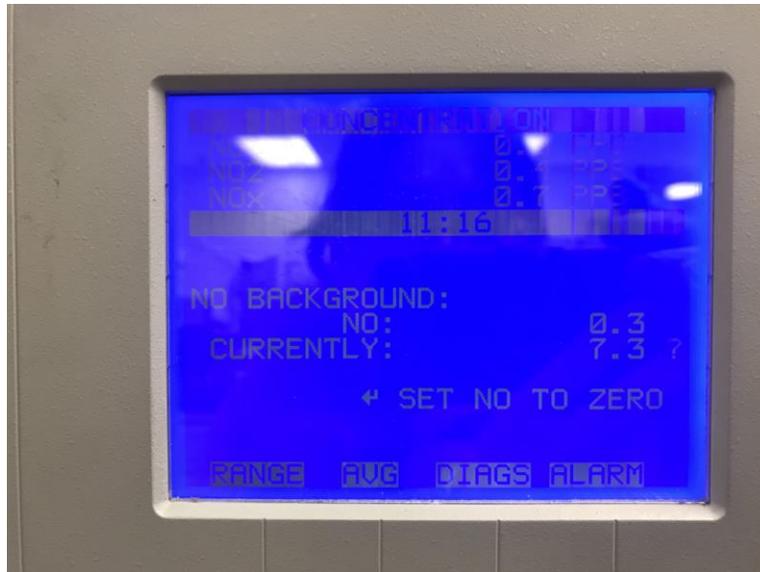
- Choose the ‘Calibration general’ for ‘Configuration type”, then the general options of calibration could be set up over here.



- Choose 'Channels' and NO_x, there are 2 points or 3 points calibration sequence. We use 2 points calibration sequence, which has zero and 398 ppb as the reference concentration.
- Choose the 'Calibration sequence' for 'Configuration type', then choose the 'NO_x'. Change the state to 'On' and choose the start date and start time and then save the setting.
- Once the calibration sequence start, set the span zero at 5min. On the NO_x gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL NO BACKGROUND' and then set the NO to zero. Also choose 'CAL NO_x BACKGROUND' and then set the NO_x to zero.





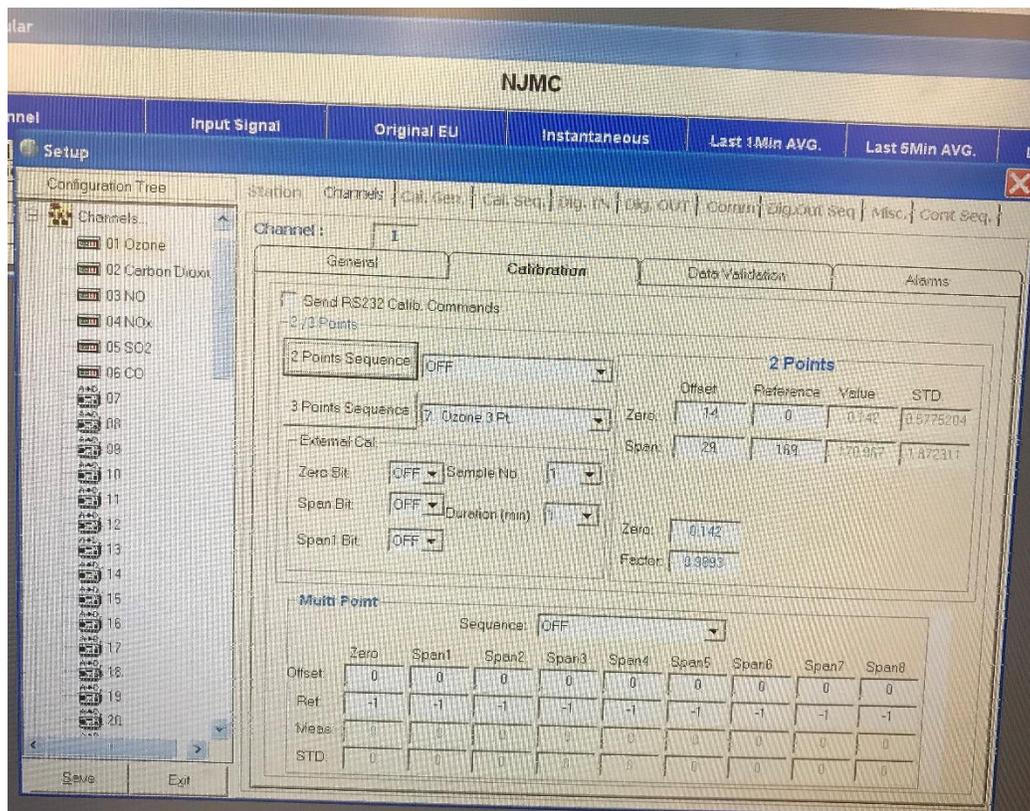


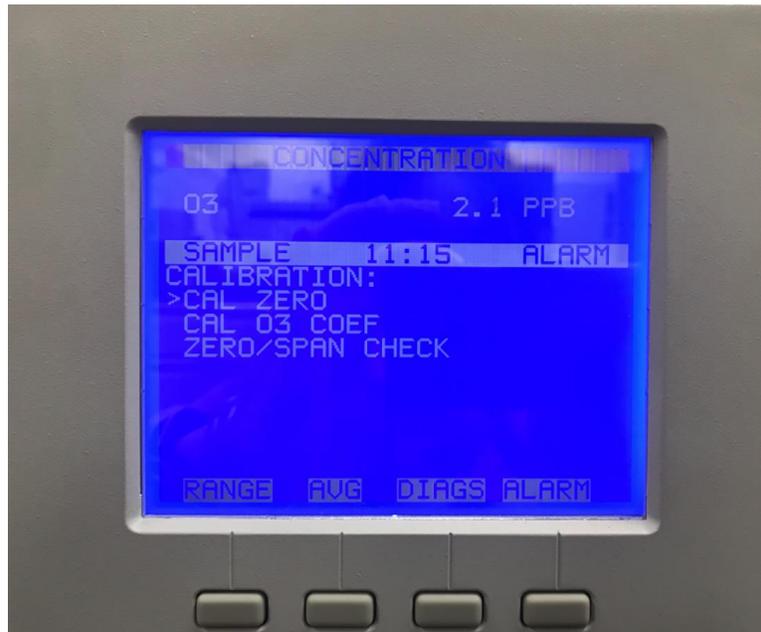
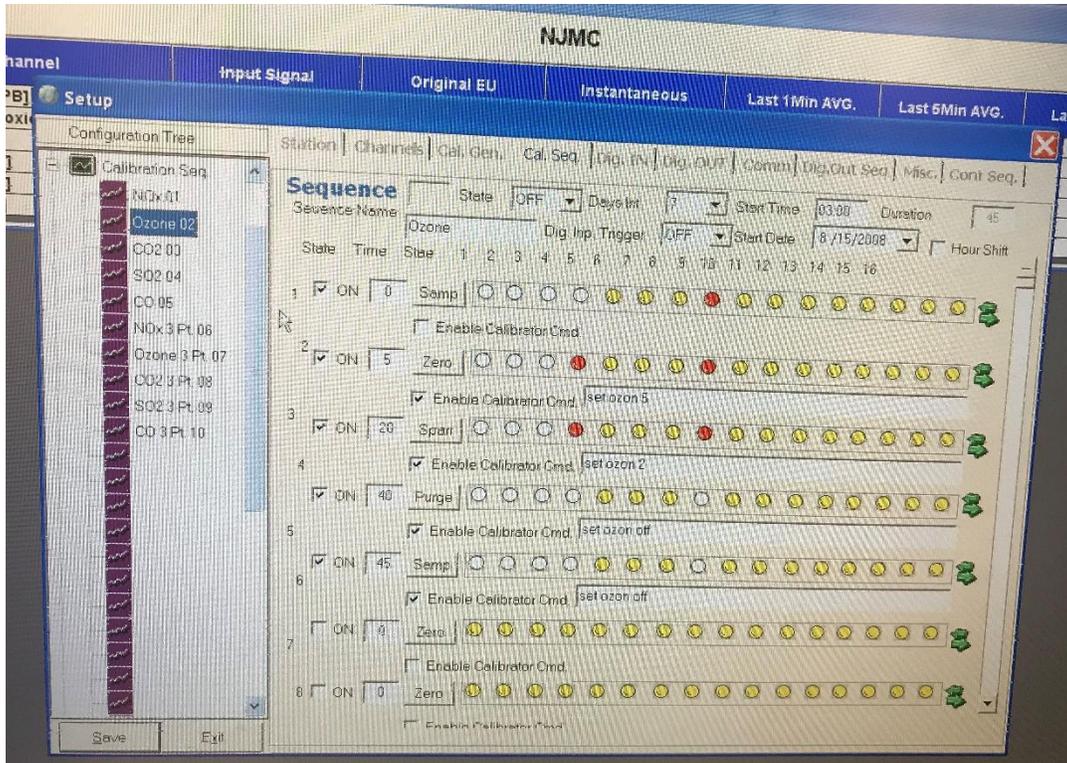
- After the calibration sequence start 30 min, set the span 1. On the NOx gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL NO COEFFICIENT' and then calibrate NOx concentration and set the span concentration at 400 ppb. Also choose 'CAL NOx COEFFICIENT' and then calibrate the NOx.



3. Ozone calibration

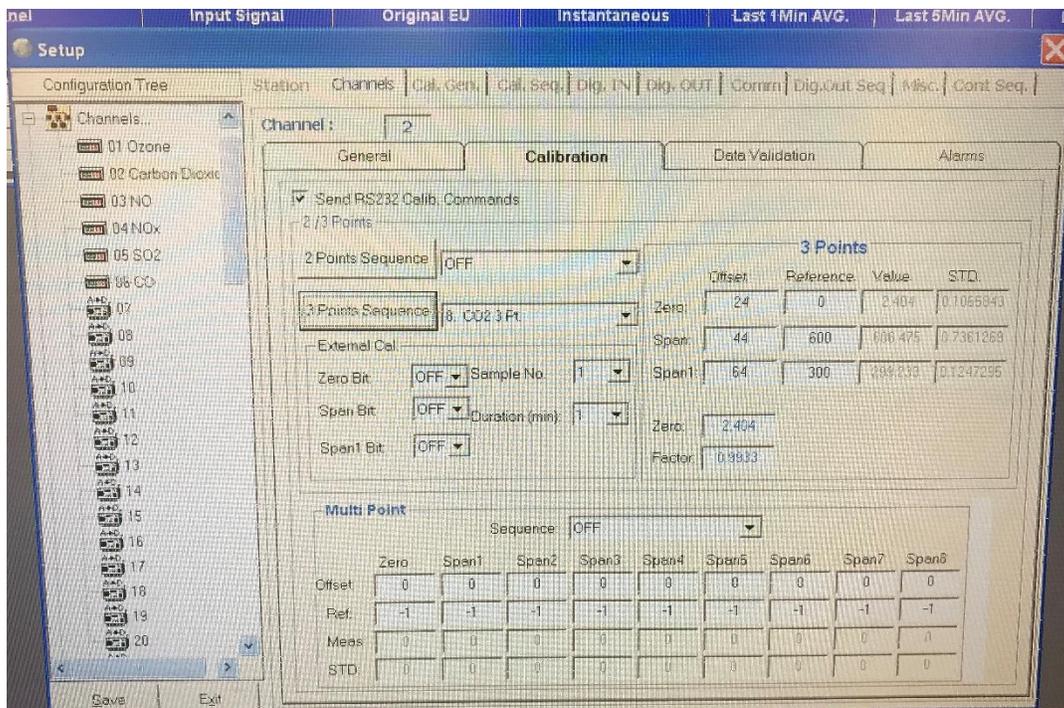
- First, open the Envidas software and go to the 'Configuration' and choose 'Setup'. Input correct Username and Password, then login to the setting of system.
- Choose 'Channels' and ozone, there are 2 points or 3 points calibration sequence. We use 2 points calibration sequence, which has zero and 169 ppb as the reference concentration.
- Choose the 'Calibration sequence' for 'Configuration type", then choose the 'Ozone'. Change the state to 'On' and choose the start date and start time and then save the setting.
- Once the calibration sequence start, set the span zero at 5min. On the Ozone gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL ZERO' and then set the ozone to zero.
- After the calibration sequence start 20 min, set the span 1. On the ozone gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL O3 COEF' and then calibrate ozone concentration and set the span concentration at 170 ppb.

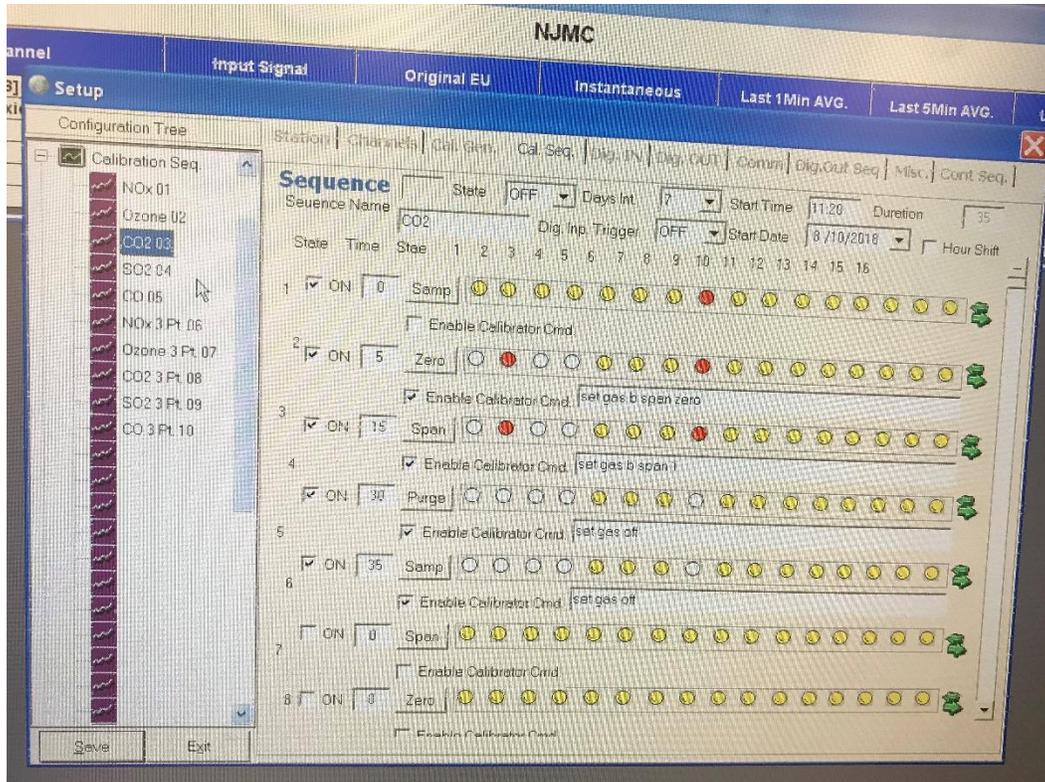




4. CO2 calibration

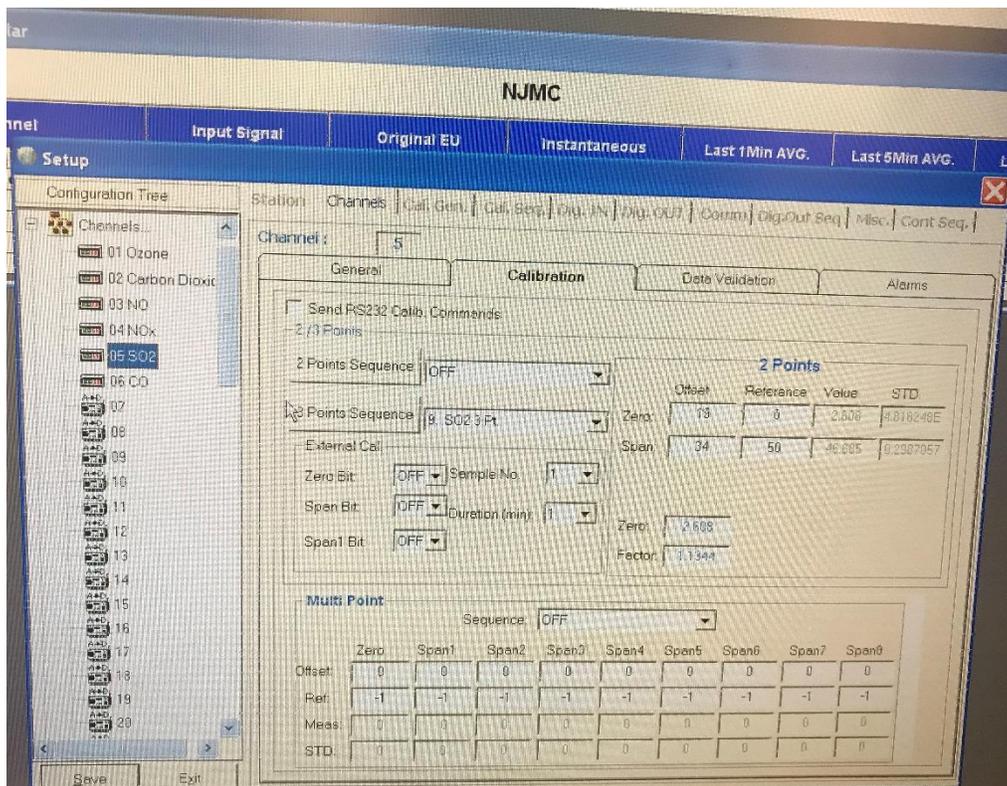
- First, open the Envidas software and go to the 'Configuration' and choose 'Setup'. Input correct Username and Password, then login to the setting of system.
- Choose 'Channels' and CO2, there are 2 points or 3 points calibration sequence. We use 2 points calibration sequence, which has zero and 600 ppm as the reference concentration.
- Choose the 'Calibration sequence' for 'Configuration type", then choose the 'CO2'. Change the state to 'On' and choose the start date and start time and then save the setting.
- Once the calibration sequence start, set the span zero at 5min. On the CO2 gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL BACKGROUND' and then set the CO2 to zero.
- After the calibration sequence start 15 min, set the span 1. On the CO2 gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL COEF' and then calibrate CO2 concentration and set the span concentration at 600 PPM.

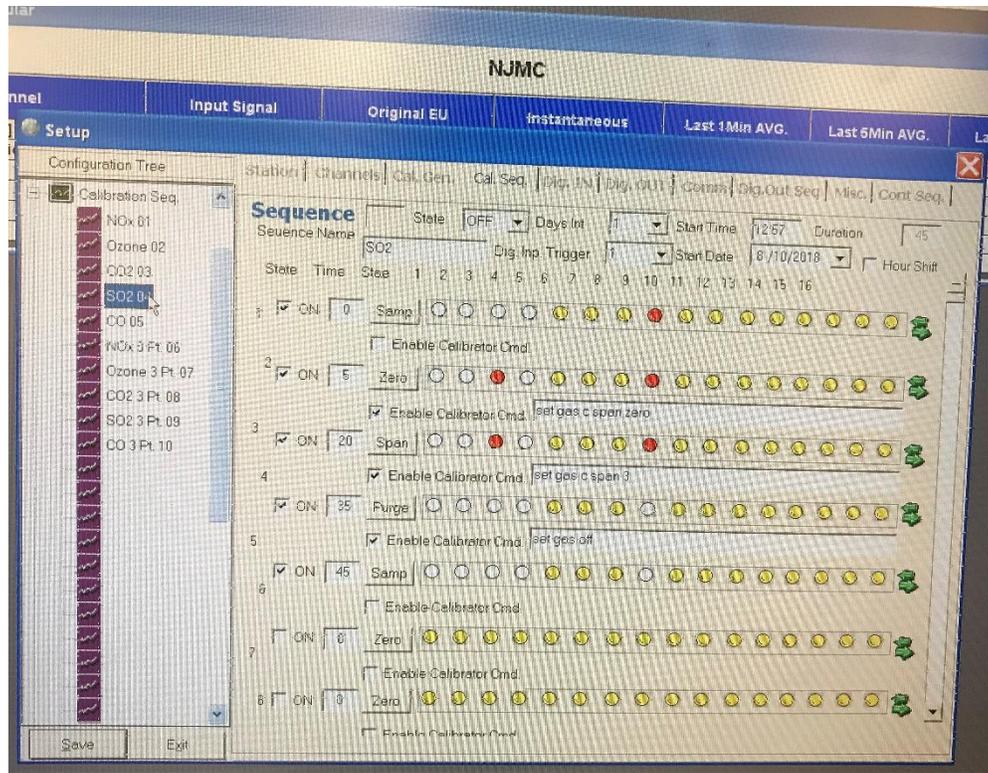




5. SO2 calibration

- First, open the Envidas software and go to the 'Configuration' and choose 'Setup'. Input correct Username and Password, then login to the setting of system.
- Choose 'Channels' and SO2, there are 2 points or 3 points calibration sequence. We use 2 points calibration sequence, which has zero and 50 ppb as the reference concentration.
- Choose the 'Calibration sequence' for 'Configuration type", then choose the 'SO2'. Change the state to 'On' and choose the start date and start time and then save the setting.
- Once the calibration sequence start, set the span zero at 5min. On the SO2 gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL SO2 BACKGROUND' and then set the SO2 to zero.
- After the calibration sequence start 20 min, set the span 1. On the SO2 gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL SO2 COEFFICIENT' and then calibrate SO2 concentration and set the span concentration at 50 ppb.





6. CO calibration

- First, open the Envidas software and go to the 'Configuration' and choose 'Setup'. Input correct Username and Password, then login to the setting of system.
- Choose 'Channels' and CO, there are 2 points or 3 points calibration sequence. We use 2 points calibration sequence, which has zero and 2.6 ppb as the reference concentration.
- Choose the 'Calibration sequence' for 'Configuration type", then choose the 'CO'. Change the state to 'On' and choose the start date and start time and then save the setting.
- Once the calibration sequence start, set the span zero at 5min. On the CO gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL BACKGROUND' and then set the CO to zero.
- After the calibration sequence start 20 min, set the span 1. On the CO gas analyzer, go to the main menu and choose 'Calibration'. Then choose 'CAL COEF' and then calibrate CO concentration and set the span concentration at 2.6 ppb.

