

Lachat Quick Chem 8000 (QC 8000) Operation Protocol

(Rev F. 4Dec2020)

Note: Basic troubleshooting is underlined throughout SOP.

Start Up

!! - Because of the age of computer/software, the computer needs to be restarted before running. If you open the Omnion software and receive any errors – try restarting computer first.

Turn on power to pump and manifolds for spec warm up.

Once all the instrument modules are on follow the steps listed below.

- Open *Omnion* by clicking on *Omnion* icon on the desktop.
- Install the manifold on the channel you want to run the analysis.
- Make all the injection valve fluidic connections.
- Make the flow cell connections.
- Set all pump tubes on the pump. The number of pump tubes for each analysis are: *NH₄* – 4 reagent tubes & 1 carrier, *NO₃/NO₂* – 2 reagent tubes & 1 carrier, *PO₄* – 2 reagent lines & 1 carrier, *Cl* – 1 reagent line & 1 carrier. All methods will have a sample line (green-green tabs) and a wash line (purple-purple tabs for the auto-sampler). Fit the tubing lines into holders. The tension adjustment tab goes to left side of pump. The tension tab is set to the second stop position for correct flow rate. Check the pump tubes for wear prior to placing them on the pump. If upon twisting of the tubes the inner portion of the tube collapses on itself, the tube needs replacement. Check that all of the tension tabs are in line for all of the manifold tubes.
 - All methods will include a carrier line for Nanopure or salt matrix; and various reagent lines depending on the method. Carrier line tubing will always connect into valve port #2 for Nanopure or matrix for manifold.
 - Sample loop sizes will vary with method but will always connect between positions valve port #1 and #4.
 - Valve port #6 is the sample inlet line and valve port #5 is the waste line for the manifold.
 - Valve port #3 will always be a connection to the manifold.
- Run Nanopure water initially through all the lines to make sure there are no leaks. If you are running Nitrate make sure that the column is **OFF** line at this time. **ALWAYS** check to be sure that the waste lines are in the proper waste containers before beginning to flow reagents. If no leaks are present, put the actual reagents in line. For *NO₃/NO₂* & *NH₄*, always start pumping the buffer solution first. The pump can be placed on low flow while samples are prepped by pressing **MIN** button on top of pump to slow usage of reagents.
- If you are running a heated chemistry like ammonia or phosphate set the heater controller on

the manifold.

- Only the heater underneath channel 1 is working. The heater in channel 1 will always connect the manifold on channel 2 for PO4 or NH4.
- Set the heater to temp by clicking the circular arrow button then adjusting to temp with the up/down arrows. Then click enter. The light in the top left corner of the control panel should be ON and the display should alternate between the set temp and “SP”. If the display is blinking letters like “OPEN” and “INP”, turn the instrument off and back on again.
- PO4 temp = 37 and NH4 temp = 60. The heater should only be set to temperature if liquid is pumping thru the manifold. Heating the unit without water or reagents in place can cause coils to stretch. This also applies to pumping the manifold dry after analysis. Cool the heater prior to pumping the manifold dry as leaving the tubing warm on shutdown could cause the tubes to stretch.
- Diluter is commonly used only for PO4/Cl analysis. If running mainly high range NO3/NH4, diluter should be fine, but will need a custom method made.
- If you will be using the diluter, prime at least 2-3 times prior to instrument start to remove any air bubbles. The “Prime” button is located in the “Auto-samplers” window under the “Configuration” pull down menu. If you suspect auto-dilution of samples may be necessary be sure to place a rack of tubes in location #4 to the far right of autosampler tray. Start adding tubes beginning at position **ONE (front left)** in the rack.
- Pour the calibration standards into standard vials. Standards go in decreasing concentration for all analysis starting with cup #1. A blank cup of appropriate matrix goes in the last standard location. Place QCs and Dilution Checks (for PO4/Cl only) into appropriate vials and position according to run worksheet.
- Rinse each sample tube with small amount of sample prior to pouring sample to volume. Minimum of 5 mls is needed for analysis. Sample trays are located with tray one on the far left hand side of the auto-sampler. Racks need to be securely placed into the grooves on the auto-sampler tray.
- Click on the “Open” folder on the menu bar. The default screen will be “My Computer” so double click on “DATASTORE (F:)", then “Omnion Methods & Data”, then for each run template:
 - “Nitrate-Nitrite & Ammonia” folder for Ammonia or Nitrate
 - For High Range NO3/NH4: Select “NO3 High and NH4 High Template (USE ME)”
 - For Low Range: Select “NO3 Low and NH4 Low Template use me”
 - “Chloride & Phosphate DRD” folder for Phosphate and Chloride (using diluter)
 - Select method “Cl 200 ppm and PO4 400 ppb DRD USE THIS ONE”
 - “Nitrate-Nitrite” folder for Nitrite
 - Select method “Low NO2 Template”

- A previous run can also be selected if preferred.
- Note: if only running one of the two analyses in a template, one channel can be shut off by going to the “Analytes” tab in the method, clicking on the channel, then checking the box next to “Channel Off”.
- Edit the run worksheet according to your analysis needs (# of samples, dilutions, spike, etc) but **DO NOT OVER WRITE** the template file. It is not necessary to save your modifications to the run worksheet since the changes **are automatically saved when you start your run** under a date time stamp file name. If you need to save changes, save them under a different file name.
- Once template file is completed and reagents have been pumping through the manifolds for a short time, click on the Preview (eye button). This will allow viewing of the baseline before starting the analysis. Stop preview mode before starting analysis or making changes to method.
- ACTUATE THE VALVES by toggling to the timing tab and clicking the two green L shaped buttons. Switch on and off 3-4 times and listen for the valve opening and closing.
- For nitrate, check that the column is in line. For all analyses, check that all standard, blank, QC’s and samples are in place. Click the Start icon at top of the menu bar to begin the analysis.
- Analysis calibration can be monitored, and software views changed by using the icons on the left hand side of the screen.
- Most settings for analysis have been set with a 10% error window. If a test such as CCV or dilution check fails a grey response window will appear asking to stop or continue. If a choice has not been made within a 5-minute window the software will time out and analysis will stop.
- Peak integration changes can be made after a run is complete or stopped.
 - For **GLOBAL** peak integration window adjustment, right click on any peak and select “Adjust Peak Expectation Window”. Move boxes forward or back to align peaks in center, then right click again and select “Rerun Peak Detection”
 - NOTE: This is suitable if the timing on the entire run is off. Once adjusted, the changes will hold for the next run start.
 - For manual integration of a single peak, right-click on peak, then select “Adjust Baseline Window for Manual Detection”. Hover over one side of the box (left or right) until you get this ↔ arrow. Move the edge of the box until the peak is properly aligned, then right-click again and select “Run Manual Integration”.
 - NOTE: This is suitable if the program accidentally integrates the wrong area or integrates a bubble peak.
 - NOTE: **Integration changes to singular peaks will not save in the regular time-stamped file.** Choose “save as” and either overwrite the time-stamped file or choose a new file name. Click “Export Data to File” under the “Run” Tab.
 - If this doesn’t export the file to the data folder, you may need to close it and re-open it in Omnion.

Start Up Reminders

- ❑ Does the manifold match the manifold diagram in the QuikChem[®] method?
- ❑ Do you have the correct interference filter in the detector head?
- ❑ Do you have the correct sample loop connected to ports 1 and 4 of the valve?
- ❑ Are all tubing lengths correct?
- ❑ If using a manifold with a column, has it been put in-line, by turning the switching valve after reagents have been pumping through the manifold?
- ❑ Is the heater set to the correct temperature? Is the heater at the specified temperature?
- ❑ Did you have all of the modules turned on upon system boot-up?
- ❑ Did you place test tubes in rack #4 for possible dilutions?
- ❑ Do you have a fresh container of diluent for the dilutor?
- ❑ Did you pour enough volume in the standard vials?
- ❑ Are all the waste lines hooked up? Are they placed into the proper container?
- ❑ Is the waste container full? For others, is it going to drain?
- ❑ Did you check for any leaks?
- ❑ Are the reagent lines in their proper reagent containers?
- ❑ Do the reagents match the QuikChem[®] method reagent recipes?
- ❑ Do you have the correct standards in the standard vials?
- ❑ Did you open the correct template file for the run
- ❑ Check configuration, rack type, and probe installation.

System Shutdown Procedure

- If you are running nitrate, take the column off-line by rotating the switching valve to the bypass position.
- Remove the reagent lines from each reagent and rinse off the lines and glass weights before putting them into the rinse solutions.
- If after a PO₄ or NH₄ run the lines look stained, place all reagent transmission lines into appropriate manifold rinse solution and pump for a minimum of 5 minutes at standard speed. Then rinse briefly and follow with Nanopure water.
- Place transmission lines into Nanopure water and allow the system to rinse for 5 to 10 minutes at standard speed or until heater unit has cooled.
- Remove the transmission lines from the water and allow all liquid to drain from the manifold.
- Turn off the pump and release the pump tube cartridges tension by pressing the on the tube cartridge levers on the side of the pump.
- Export data to data folder by going to the “Run” tab and clicking “Export Data to File”.
 - NOTE: See note about singular peak integration changes on pg 3.
- To find excel file, go to “My Computer” then click “DATASTORE (F:)” then, “CSV Data”, then “CSV-Excel Default”. Your timestamped or saved file should be in this folder. It is recommended to put it into list view and sorting by “Date Modified”.
- Copy and paste into excel file and save data to a flash drive.
- Close all files and exit the Omnion program. The PC may remain on.

Manifold Removal Procedure

- Confirm proper manifold rinse according to the procedure given under System Shutdown Procedure and is dry before removal.
- Detach manifold tubing from port 3 of the injection valve.
- Disconnect carrier pump tube from port 2 of the injection valve
- Detach output of the manifold from union on flow cell tubing, leaving the union connected to the manifold.
- Remove the backpressure loop, if present, and store in bag.
- Detach heating unit tubing from manifold, if necessary.
- Remove all manifold pump tubes from cartridges.
- Remove the interference filter from the detector module and store in bag.
- Remove sample loop from ports 1 and 4 of valve and store in bag.
- Remove manifold from the Sample Processing Module (channel).
- Carefully place transmission lines in bag and carefully fold under manifold into appropriate chemistry box.
- Store box in cabinet with method label facing out.