SEAL AQ2 Instrument

Maintenance Book

Unique ID: Seal AQ2

Manufacture's name: SEAL Analytical

Serial #:

Software: AQ2 Version 2.4

Current Location:

Manufacturer's Instructions Location: Manual located in C315

Date Received:

Compliance: See analytical files for documentation.

Technical Support:
(262) 241-5772
techsupport@seal-us.com

Main Line and Parts:
(262) 241-7900

Logbook Serial Number:_____

Start Date:_____

End Date:_____

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HOW TO: Daily Maintenance Instructions

The following procedure should be done **before the first run of the day**. Depending on instrument use, maintenance may need to be re-performed when switching between chemistries.

All steps should be performed. However, steps designated with '*' and in bold indicates daily checklist steps for clarification.

1. **Wash container* –**
   Locate the wash container on the side of the AQ2. Remove the top and place on a clean paper towel or in a clean beaker. Empty out the old DI water, rinse the container out with DI water at least 3 times, then refill with fresh DI water till full. Replace top/probe making sure the sensor rises to the top.

2. **Empty waste –**
   Empty instrument waste container. If hazardous waste container is present, check that bottle isn't full.

3. **Checking reaction segments –**
   In the SEAL AQ2 Program, go to 'Settings' then 'Maintenance.'
   Then in the 'Initialise' tab, press 'Zero Segments.' **Do not press 'OK' yet.**
   a. Check to see if there are enough reaction segments from the day before to do maintenance. 2-3 unused is enough. Then press 'Cancel.' The probe will go to the first clean segment **instead of** Segment 1, spot 1.
   b. If there are not enough clean segments, replace the segments. Double tap clean segments on a clean portion of the bench to knock out excess manufacturing particles, then place in the instrument. Press 'OK' to reset the used segments. The probe **will go to** Segment 1, spot 1.

4. **Syringe Piston*** –
   Go to the 'Diluter' tab, set the number of primes to 10, then press 'Start Primes.'
   Watch the syringe piston to see if there are excess bubbles dragging from the top or any leaks.
   A worn syringe piston can interfere with the calibration auto-dilution and analysis. Replace if necessary.

5. **Clean the aspiration bath with a Q-tip or cleaning swap* –**
   Using a damp (with DI water) Q-tip or cleaning swab, clean the aspiration bath to remove particles from manufacturing that can get caught in the cuvette. Make sure to clean bottom and all sides of wash bath to prevent mold growth.

6. **Chemistry specific cleaning routine/extra wash* –**
   <u>NOTE:</u> If running TP, see DEP SOP NU-090 for chemistry specific daily bleach cleaning instructions.
   - In reagent wedge 1, check volume of cleaning solution. Refer to chemistry SOP for cleaning solution used. In general, for instruments running TP the same day, use the Alkaline EDTA rinse. If not running TP, use the SEAL Analytical Cuvette Cleaning solution.
   - In the 'Cuvette Functions' tab, press 'Extra Wash.'
     Observe the glass sample probe cleaner.* A water vortex should be visible when the sampler probe is being washed and liquid should not drip out.
   - After the 'Extra Wash' is done, set the number of 'Auto Wash' to 5, then press 'Auto Wash.'
     Observe the aspiration bath filling and emptying each time.*
   - Repeat 'Extra Wash' then 'Auto Wash' at least once more.

7. **Adjust the Aspiration* –**
   Remove the cover from the top of the cuvette/lamp. Press 'Test Aspiration' and observe where the water line begins. It should be around 2 inches out of the cuvette. Repeat 'Test Aspiration' 2 mores times, then check that the 4th, 5th, and 6th repetitions are in the same spot. Replace the cover once finished.
   - To make the water line come out of the cuvette further, increase the number of steps. Decrease the number of steps if it is too far out. Then repeat above to test the new location.

- If the water line is not around the same location in each repetition, random errors may occur in analysis. Replace peristaltic tubing on the pump located next to the lamp. If bubble breakage is happening between water lines, something may be stuck in the cuvette.

8. Daily Startup* –

In 'Initialise,' press 'Zero Segments,' and replace all used reaction segment.
Close the Maintenance window, then go to 'Settings' then 'Daily Startup,' then press 'Continue.'
Compare and write down the highest voltage and the corresponding filter in the maintenance book.*

9. Complete the Daily Maintenance checklist, including date and initials.

Record any additional comments on the left page of the corresponding daily checklist. Be sure to indicate any part replacements.

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HOW TO: Monthly Maintenance

The following procedure should be done **at least on a monthly basis**. Depending on instrument use, maintenance may need to be performed sooner.

1. **Clean wash container with bleach –**
   Locate the wash container on the side of the AQ2. Remove the top and place on a clean paper towel or in a clean beaker. Empty out the old DI water. Add ~100 mL of generic bleach that contains no additives (Do NOT use Clorox!) to the wash container. Fill halfway with DI water and cover with parafilm. Swish the container for around 1 minute making sure to coat all inside surfaces. Leave covered for 30 minutes, then rinse out thoroughly with DI water 7 times. Refill with fresh DI water and replace the top.

2. **Clean fan filter –**
   Locate the fan filter behind the aspiration pump. Pull out the metal frame housing the filter straight up. Wash the filter (in or out of the frame) with DI water. Place the filter between several paper towels to dry. Repeat until filter is completely dry then place back into instrument.

3. **Clean and lubricate the syringe screw drive –**
   Remove the top of the AQ2. Locate the syringe screw drive behind the glass body of the syringe. Using a clean swab with isopropanol, clean around the screw to remove the dirt. Then add 2-3 drops of oil with the lube pen. Replace the top of the AQ2.

4. **Wash bath pump maintenance and tubing replacement (2 pump tube) –**
   a. Remove the platen and clean with isopropanol and a swab. Remove and dispose old peristaltic pump tubing.
   b. Using swab soaked in isopropanol, clean each roller and outer part of the pump. Let air dry or dry with kimwipe.
   c. Using the lube pen, place 1 **small** drop of oil on the middle of the roller. Repeat for each roller. Use finger to manually rotate and coat each roller evenly.
   d. Check each steel nipple is clear of debris inside. If debris is present, clean **carefully** so that debris doesn't go into the system. Debris pushed further in may cause issues with wash bath filling/emptying.
   e. Replace peristaltic pump tubing ensuring tubes are on straight. Thread tube #2 on bottom of platen and tube #1 on top (threading through from back of instrument to the front). Connect tube #2 to the #2 steel nipple and #1 tube to the #1 steel nipple and ensure tubes are on straight.
   f. While holding the platen tightly to the rollers with one finger, use the nut to tighten the platen in place.

Note: If too much oil is applied, the pump may slip and not properly fill. If not enough oil is applied, the pump may make a louder noise and fill irregularly. The same may happen if the platen is tightened too loosely or tightly. Add more/less oil and loosen/tighten platen as needed after testing (Step #8). The new tubing may need to be replaced as well if too much oil was used or if the platen was too tight. This also applies to the aspiration pump/tubing (Step #5 below).

5. **Aspiration pump maintenance and tubing replacement (1 pump tube) –**
   Repeat the procedure from Step #4 above, but with only 1 tubing. Make sure to connect peristaltic tubing to the cuvette outlet tubing/nipple. Thread tubing from back of instrument to the front.

6. **Clean (C) or replace (R) reagent containers/wedges –**
   Replace all reagent wedges/caps if older than 3 months. If re-using reagent wedge, clean with 1:1 HCl (if applicable) and rinse 7 times with DI water.

7. **Wipe down instrument with wet paper towels to remove dust, spilled liquid, and other debris**.

8. **Daily maintenance/check –**
   Perform regular instrument daily maintenance (see page #3) to check operation of all components, especially wash bath and aspiration. Adjust as needed for proper operation.

9. Perform daily start up in Settings and record highest absorbance and corresponding wavelength.

10. Run and record Measuring Diagnostic (MD) test results –

The Measuring Diagnostic (MD) test checks for proper fluidic movement, proper hardware movement, the cleanliness of the cuvette, and electronic stability. This is especially important to do after performing maintenance and can be useful for troubleshooting instrument issues.

a. Place clean DI water in the appropriate reagent wedge (usually #15), make sure the wash container is full of DI water (if top is removed, system will need to be re-primed), and waste container is empty. Place clean reaction segments in the reaction carousel.
b. In Scheduling, choose **Reagent Set 5**. Select a free tray and name the run. The file name follows the MDYYMMDDX# format, where # represents the 1st, 2nd, etc MD test of the day, and X indicates which AQ2 instrument (for example, AQ2-1 is "K").
c. Schedule 30 unknowns (U1-30) and set the test to "MD_Test." Save the schedule.
d. With **NO** sample tray, double click run, select "Run Water Baselines," and submit the schedule for analysis.
e. After analysis complete, go to Data Review, click Accept All, and save to AQ2 folder in the Nutrients drive in your regular analysis folder.
f. In Reporting, select regular report, check "Include Statistics," select file, choose absorbance data, and then OK.
g. Record the "Std. Dev" number. **Number should be <0.0003.**

Note: For MD test std dev failures, go to the Run screen and at the top window, look at the "T" and "W" absorbance values for irregularities or deviations from the trend. The "T" absorbance readings are from DI water aspirated from the reaction wells. The "W" absorbance values are from the rinse water left in the cuvette following the final cuvette wash.

If there are just a few irregularities, this usually indicates an issue with the aspiration:

- If in the "T" column, check the cuvette aspiration and that the reagent wedge is clean and filled with fresh DI water.
- If in the "W" column, check the wash bath is clean and properly filling and emptying.
- If in both columns, check all the pump tubes and make sure the water container and reagent container are both clean/filled with fresh DI water.

If the values are all low but inconsistent, the cuvette may need to be soaked or there may be a problem with the electronics.

Record Annual Preventative Maintenance (PM) and staple PM or other service reports to this book.

Step:		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	
INITIAL and DATE		**Water container bleached**	**Fan filter cleaned**	**Syringe screw drive maintenance**	**Wash bath pump/tubing maintenance**	**Aspiration pump/tubing maintenance**	**Reagent wedges (C or R)**	**Instr. cleaned**	**Daily maint performed**	**Daily startup results**	**MD test std dev (<0.0003)**	**Comments:**
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Feb												
Mar												
Apr												
May												
June												
July												
Aug												
Sept												
Oct												
Nov												
Dec												

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