SEAL AQ400 Instrument

Maintenance Book

Unique ID: _____

Manufacture's name: SEAL Analytical

Serial #:

Software:

Current Location:

Manufacturer's Instructions Location:

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 AQ400. 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 AQ400 Software, go to 'Maintenance and Setup'
   Then in the 'Maintenance and Setup' section on the ribbon, 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. Tap clean segments on a clean portion of the bench until all excess manufacturing particles are removed, then place in the instrument. Press 'OK' to reset the used segments. The probe **will go to** Segment 1, spot 1.

   Note: This can also be reached through the 'Initialize' tab in the 'Maintenance' button on the 'Maintenance and Setup' section of the ribbon.

4. **Syringe Piston*** –
   If not done in the step prior, open the 'Maintenance' tab under 'Maintenance and Setup'. 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.

   Note: Since the cadmium reduction system is set up, the instrument will perform a total of 20 primes. This constitutes 10 primes for each system.

5. **Clean the aspiration bath with a Q-tip or cleaning swap* –**
   Using a 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 or NO_2, see DEP SOP NU-090 or DEP SOP NU-087, respectively, 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, the SEAL Analytical Cuvette Cleaning solution may be used instead.
   - 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 partially 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. Press 'Test Aspiration' and observe where the water line begins. It should be through the cuvette and past where the cover sits. Repeat 'Test Aspiration' 2 mores times, then check that the 4th, 5th, and 6th repetitions are completely through the cuvette with the water approximately 1-2 inches on each side. 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 bubble breakage is happening between water lines, something may be stuck in the cuvette.

8. Daily Startup* –

In 'Maintenance and Setup,' press 'Zero Segments,' and replace all used reaction segment.
Then go select 'Daily Startup,' then press 'Continue.'
Check that the water baselines are in between 4.0 V and 4.85 V and the dark current is ~0.027 V.
Compare and write down the gain of the filter for the chemistry being run in the maintenance book.*

Note: The gain should not change by more than 5 steps over the course of a week.

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 or PQL failures.

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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 AQ400. 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 –**
   Remove the right side cover and locate the fan filter behind the lamp. Pull out the frame housing the filter straight up. Clean the filter using compressed air then place back into the instrument.

3. **Clean and lubricate the syringe screw drive –**
   Remove the left side cover of the AQ400. Pull out the diluter assembly stage and 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. Let air dry or dry with Kimwipe. Then add 2-3 drops of oil with the lube pen. Replace the diluter assembly stage and the left side cover of the AQ400.

4. **Wash bath pump maintenance and tubing replacement (2 pump tube) –**
   a. Remove the right side cover of the AQ400 and locate the three pumps, two with blue covers and one with a red cover.
   b. Remove the two blue pump covers. Pull out the pump tubing and the white rotors and discard the tubing in the trash.
   c. Using swab soaked in isopropanol, clean each white rotor of the pump. Let air dry or dry with Kimwipe.
   d. Attach a new pump tube to the elbow connectors for each pump.
   e. Apply a light coat of Silicone Dielectric Compound to the pump tubes.
   f. Place each rotor back into place and then press the tubing into position, with the ends of the tube protruding an equal distance. The pump tubing should sit around the rotor and be positioned near the top of the assembly. If the tubing is pushed too far down, the pump may not pump water.
   g. Replace the pump covers.

5. **Aspiration pump maintenance and tubing replacement (1 pump tube) –**
   Repeat the procedure from Step #4 above, but for the pump with the red cover. When done, replace the right side cover.

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 the absorbance and corresponding wavelength for the chemistry being performed.**

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 reagent wedge 21, 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 MDYYMMDDP# format, where # represents the 1st, 2nd, etc. MD test of the day.
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 AQ400 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 maintenance performed**	**Daily startup results**	**MD test std dev (<0.0003)**	**Comments:**
Jan												
Feb												
Mar												
Apr												
May												
June												
July												
Aug												
Sept												
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Nov												
Dec												

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