Standard Operating Procedure

Title: Siemens Advia 120 Routine Maintenance

Department: Hematology
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The Siemens ADVIA 120 Hematology System is a fully automated diagnostic instrument with a throughput of 120 samples per hour (CBC/diff). The analyzer uses whole blood samples to provide Complete Blood Count, differential count, reticulocyte count and body fluid count.

Performance of routine maintenance is required to keep the instrument fully operational and to comply with manufacturer recommendations. Routine maintenance must be performed daily, weekly, monthly, and quarterly. The following table details the maintenance schedule and the maintenance actions that are required. An Advia 120 Maintenance Log with required maintenance procedures can be found on Antech University.

Table 1. Advia 120 Maintenance Schedule

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly (or after 2000 samples)</th>
<th>Monthly (or after 8000 samples)</th>
<th>Every 2 Months (or after 16,000 samples)</th>
<th>Every 6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty Waste Container</td>
<td>Wash Flowcells</td>
<td>Inspect and Clean Syringes and Plungers</td>
<td>Replace 50ul Syringe Plunger</td>
<td>Replace the 1000ul Syringe Plungers</td>
</tr>
<tr>
<td>Check/Empty Overflow Bottle</td>
<td>Clean Aspiration Pathways</td>
<td>Replace Auto-sampler Needle</td>
<td>Clean the Air Filter</td>
<td></td>
</tr>
<tr>
<td>Check Reagents</td>
<td>Clean Shear Valve</td>
<td>Replace Manual Closed Tube Needle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Background Counts</td>
<td>Inspect and Clean Perox-cap Vent Hole</td>
<td>Replace Sheath Filters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean the Perox Chamber</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform a System Wash</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform End of Day Procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Off</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.1 Daily startup

- Assure that instrument, computer, and printer are all on.
- Perform START UP by following “Starting each Shift” procedure:
- Go to Help. Click Quick Guide then Starting each Shift. Follow the procedures for Emptying the waste container, Emptying the overflow bottle, Checking reagents, and Obtaining the background count.

Emptying the waste container

1. Make sure that the analyzer is not sampling.
2. Cancel all the Auto Cycles, Auto Wash, Auto Rinse, Auto Standby, and Auto Startup.
3. Disconnect the level-sensor switch (Fig. 1).
4. On the waste removal assembly, turn the mode selector knob (Fig. 1) from NORMAL to EMPTY.
5. The waste in the container should start to empty. It will take between two and five minutes to completely empty the container. When you see air bubbles in the discharge line (Fig. 1), the container is empty.
6. Once the container is empty, reconnect the level-sensor switch and turn the mode selector knob back to the NORMAL setting.
7. Reset any auto cycles that you cancelled.
Section 2. Daily Maintenance

Emptying the overflow bottle

1. Visually check the fluid level in the overflow bottle located to the right of the RBC sample and sheath pumps (Fig.2).

2. If it has any liquid in it, empty the bottle, and then clean the vent lines and chambers.

Cleaning the vent lines and chambers

MATERIALS LIST
- Beaker
- Deionized water
- EZ KLEEN for cleaning perox-related pathways and chambers
- Household bleach for all pathways and chambers other than perox
- Tubing, .090, PN 116-0536-16

1. Clean one vent line or chamber at a time. The analyzer mode should be “Ready to Run”.

   IMPORTANT!
   Do not use bleach for any maintenance on the perox (left) side of the instrument UFC.

2. Remove the tubing from the overflow bottle that leads to the vent of the Pathway or chamber that you want to clean (Fig.2). See Figure 3 for location of chambers. If there is no overflow tube installed, attach a 12 inch piece of tubing to the vent.

3. Put the free end of the tube into a beaker filled with a 25% solution of household bleach—or EZ Kleen—and deionized water.

Figure 2. Overflow bottle and vent lines at 1, 2 and 3.

Figure 3. Location of Reaction Chambers in the UFC.

1. HGB Reaction Chamber
2. Baso Reaction Chamber
3. RBC Reaction Chamber
4. Retic Reaction Chamber
5. Perox Reaction Chamber
4. Open the valve that will create a vacuum to aspirate the bleach solution from the beaker through the vent line and chamber to the main waste line at the bottom of the UFC block (Fig.4). To open a valve, on the Utilities menu, click the Exerciser tab. Click Valves from the list on the left side of the screen. Click the appropriate valves (Table 2).

<table>
<thead>
<tr>
<th>Chamber</th>
<th>Open Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baso</td>
<td>V13</td>
</tr>
<tr>
<td>Perox Vacuum Shuttle</td>
<td>V17 &amp; V18 (EZ Kleen Only)</td>
</tr>
<tr>
<td>Retic</td>
<td>V65</td>
</tr>
<tr>
<td>RBC</td>
<td>V10</td>
</tr>
<tr>
<td>RBC/Baso/Retic Vacuum Shuttle</td>
<td>V21 &amp; V22</td>
</tr>
</tbody>
</table>

5. Allow alternate segments of household bleach solution—or EZ Kleen—and air to run through the line and the chamber until they are clean.

6. Immerse the free end of the tube into a beaker of deionized water to rinse the line and chamber.

7. Remove the tube from the beaker and close the valve.

8. Exit the Exerciser.

9. Replace the tube into the overflow bottle, or if it was not an overflow tube, remove it from the vent opening.

**Checking reagents**

- Use the Startup tab or the Reagent Log tab to check the supply of all reagents.

- Note: Advia Defoamer Reagent will not show up in the Reagent Log. You must visually check the supply of ADVIA 120 Defoamer.

- If you need to replace reagents, use the Reagent Log tab.
**Obtaining the background counts**

1. Run a background count cycle to obtain a BASO WBC background count, a platelet background count, and an HGB Trans (Hemoglobin baseline Transmission).

2. On the Routine Operations menu, click Startup.

3. Click Refresh.

4. The background results are color coded:
   - **Green** - Within range
   - **Red** - Out of range

5. If any result is out of range, click Refresh on the Startup tab to run another background count cycle. If any result is still unacceptable, perform a system wash.
2.2 Daily maintenance/End of Shift

- Go to the Help menu then click on Quick Guide then Ending Each Shift.
- Follow procedures for Cleaning the perox chamber, Washing the RBC/Baso/Retic flowcell, Washing the system, Performing End of Day procedure and Logging Off.

Clean the perox chamber

**MATERIALS LIST**
- Cotton swab
- EZ Kleen
- Dental mirror
- Flashlight
- Pipettes, 2mm disposable

1. Remove the perox chamber cap (Fig.5).
2. Dip a clean, cotton-tipped swab into EZ Kleen and wipe clean the inside of the perox chamber (Fig.5).

**IMPORTANT!**

Avoid pushing any dirt into the drain and reagent ports at the base and back wall of the chamber. Always wipe the chamber by starting at the bottom of the back wall, using a circular up and outward motion.

3. Using a 2mm disposable pipette, fill the chamber 1/3 full with EZ Kleen.
4. Using the pipette, agitate the liquid in the chamber, then let it soak for one minute.
5. Agitate the liquid again. Using the pipette, remove all of the liquid from the chamber.
6. Check if there are any black particles in the liquid. If there are, repeat steps 3–5 until the EZ Kleen is clear when you remove it from the chamber.
7. Replace the perox chamber cap and perform a system wash.

**Washing the system**

1. On the Utilities menu, click Hydraulic Functions.

2. Click System Wash, select 3 or 5 for the number of cycles, and then click start.

**Performing the End of Day:**

1. On Customize menu, click System Setup, and then click Tools Modify.

2. When the tools list appears, double-click End of Day.

3. Select the SID Reset check box to perform a SID RESET.

**Logging off**


2. Click Log Off.
Washing the RBC/baso/retic flowcell

<table>
<thead>
<tr>
<th>MATERIALS LIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Household bleach</td>
</tr>
<tr>
<td>✓ 15ml disposable tube</td>
</tr>
</tbody>
</table>

1. Prepare 25% solution of household bleach and deionized water.

2. On the Utilities menu, click the Hydraulics tab. Click Flowcell Wash and select RBC/baso/retic flowcell.

3. Hold the 25% bleach solution under the open-tube sample probe and click Start in the window. Do not push the aspiration paddle. The vacuum will aspirate the solution.

4. Hold the beaker until the wash block starts to move down, approximately 80 seconds.

5. The flowcell cleaning will continue approximately 2.5 minutes longer.
**Washing the perox flowcell**

**MATERIALS LIST**
- ✔ EZ Kleen
- ✔ 15ml disposable tube

1. Prepare a beaker with EZ Kleen.

   **IMPORTANT!**
   Do not use bleach to wash the Perox flowcell.

2. On the Utilities menu, click the Hydraulics tab. Click Flowcell Wash and select Perox flowcell.

3. Hold the beaker of EZ Kleen under the open-tube sample probe and click Start in the window.

4. Do not push the aspiration paddle. The vacuum will aspirate the solution.

5. Hold the beaker until the wash block starts to move down, approximately 80 seconds.

6. The flowcell cleaning will continue approximately 2.5 minutes longer.
Cleaning aspiration pathways

MATERIALS LIST

- Beaker
- Household bleach
- Deionized water

1. Analyzer mode should be “Ready to Run”.
2. Prepare a beaker of bleach and another beaker with water.
3. On the Utilities menu, click the Exerciser tab. Click Syringe Pumps on the left hand side. Click on the image of the valve under Selector valve to Automated Closed then to Manual Closed then to Opened.
4. Click the valves button on the left. Click valve V72 to close.
5. Open valves V1, V47, and V74.
6. Hold a beaker of household bleach under the open-tube sample probe until 5 ml is aspirated.
7. Repeat step e using 5ml of water.
8. Close valve V74 and click V72 to open and make sure that V73 is closed.
9. Repeat steps e and f.
10. Close V74 and V72, and open V73.
11. Repeat steps e and f.
12. Close valves V1, V47, and V73.
13. Click on the Analyzer Status tab to exit.

Figure 6. Valve positions for Opened and Closed.
Cleaning the shear valve

**MATERIALS LIST**

- Beaker
- Household bleach
- Paper towels
- Squirt bottle

1. Analyzer mode should be in “Standby”.
2. Prepare beaker with bleach and fill a wash bottle with DI water.
3. Place paper towels directly under the shear valve to prevent any fluid from dripping down into the analyzer.
4. Remove the knurled nut by turning counterclockwise (Fig.7).
5. Remove the compression spring (Fig.7).
6. Remove the rotor by holding the shear valve with one hand and with the other hand rotate the rotor until it can be pulled forward and off the shaft (Fig.7).
7. Remove the front shear face by gently rotating the front face until loose, then pull forward and remove. DO NOT use sharp objects or excessive force to remove the shear face (Fig.7).
8. Place the front shear face in the beaker of bleach for 10 minutes, and then rinse thoroughly with DI water.
9. Rinse the rear shear face by using the DI water bottle. Be sure to use paper towels to catch the dripping water. DO NOT wipe either of the shear faces with paper towels.
10. Put the shear valve back together. Be sure to align the front shear valve with the smaller loops at 9 and 11 o’clock positions and the large loop at 5 o’clock.
Inspect and clean the centering collars

- Inspect the Autosampler and Manual tube sampler centering collars for salt build-up and blood build-up.
- Clean as necessary.

Cleaning the autosampler centering collar

1. Turn off the analyzer.
2. Tilt the front cover down.
3. Remove the sample line from the bottom of the needle base (Fig.8).
4. Loosen the two thumb screws and tilt the autosampler assembly forward (Fig.8).
5. Pull the spring-loaded knob and turn a ¼.
6. Remove the centering collar by pulling it up and out.
7. Place the red needle cover over the needle.
8. Remove the three lines from the collar (Fig.8 & Fig.9).
9. Place the collar in a beaker filled with 25% bleach and soak for 5 minutes.
10. Remove any remaining residue using a cotton swab then rinse with DI water.
11. Use a stylet or heavy fishing line to clean the three ports and the center bore of the collar (Fig.9).
12. Attach a piece of tubing to a syringe, and then flush each port with DI water.

13. Reconnect the three tubes to the collar.

14. Remove the needle cover and replace the collar. Be careful not to bend the needle. Turn the spring loaded knob back to its original position. Carefully pull on the collar to check the collar is put in correctly. If the collar can be removed check the spring loaded knob.

15. Reposition the autosampler assembly and that it is seated correctly over the guide pins, tighten the thumb screws.

16. Reconnect the sample line to the base of the collar.

17. Close the analyzer cover and turn the power on.
Cleaning the manual closed-tube centering collar

**MATERIALS LIST**
- Beakers (2)
- Cotton swab
- Household bleach
- Paper towels
- Stylet or thin wire
- Syringe
- Tubing, .02-inch ID

1. Turn off the analyzer
2. Open the front cover.
3. Pull the centering collar up (Fig.10).
4. Remove the tubing from the collar
5. Place the red needle cover over the needle.
6. Place the centering collar in a beaker filled with 25% bleach solution for 5 minutes.
7. Remove any remaining residue with a cotton swab and rinse with DI water.
8. Use a stylet or heavy fishing line to clean the port and center bore of the collar (Fig.11).
9. Attach a piece of tubing with a syringe to the port and flush with DI water.
10. Reconnect the tubing to the collar.
11. Remove the red needle cover and replace the collar, being careful not to touch the needle.
12. Close the analyzer cover and turn the power on.

![Figure 10. Location of Manual Closed Tube centering collar at 1.](image)

![Figure 11. Manual closed tube centering collar. Port location at V46.](image)
Inspect and clean the perox-cap vent hole

1. Remove the perox cap from the top of the perox chamber (Fig.12).
2. Inspect the vent hole for buildup and remove if necessary using the drill bit provided in the Advia 120 maintenance kit (Fig.13).

Shutting down the system

1. On the Routine Operations menu, Log OFF.
2. Click Shut down NT. Wait 1-2 minutes while the software shuts down.
3. When the message appears “It is now safe to turn off your computer”, turn the analyzer off then switch the computer off.
4. Leave the system shut down for 10 minutes
5. Turn the computer on.
6. When the computer displays the Begin Logon message, press Ctrl, Alt, and Delete at the same time to log on to Windows NT.
7. Enter the operator name and password in the Logon Information and click OK.
8. Click on Advia 120
9. Turn on analyzer.
Inspect and clean syringes and plungers

**MATERIALS LIST**

- Lint-free tissue (Kim-wipe)
- Small Hex wrench

1. Turn the analyzer off.

2. Turn the thumb wheel counterclockwise until the plunger is lowered about ½ inch (Fig.14).

3. Disconnect the tubing from the fittings, then disconnect the fittings from the syringe head.

4. Remove the nut and washer at the top of the syringe and slide the syringe down and remove.

5. If inspecting and cleaning the 50 ul syringe, remove the small plastic bushing inside the syringe by using a paper clip to pop the bushing out.

6. Remove the plunger from the syringe.

7. Inspect the syringe. Clean with 25% bleach solution and rinse with water if dirty.

8. Inspect the plunger. Clean with a kim-wipe and 25% bleach solution and rinse with water if dirty.

9. If the plunger appears to be worn or seems to be loose when replacing in the syringe, replace the plunger.

10. Wet the plunger with saline and insert into the barrel of the syringe.

11. Replace the bushing into the syringe (50ul only). Insert the bottom end of the syringe into the slot at the bottom of the carriage.

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Figure 14.
1. 1000 ul syringe
2. 50 ul syringe
12. Slide the syringe up and into the mounting hole in the frame with the input port facing left on the RBC/baso/retic channel and facing right on the perox channel.

13. Install the washer and the nut.

14. Reconnect the tubing to the syringe fittings.

Replace the autosampler and manual sampler needles

1. Turn off the analyzer

2. Remove the centering collar.

3. Place the needle cover over the needle firmly and turn counterclockwise to loosen.

4. Discard the needle along with its cover.

5. Clean the needle base using a cotton swab soaked in DI water.

6. Remove the clear plastic end from the cover of a new needle.

7. Screw the needle clockwise into the needle base.

8. Remove the red cover from the needle and save for next installation.
Replace the sheath filters

1. Analyzer mode should be in “Ready to Run"

**IMPORTANT!**
The filters are not interchangeable. The perox sheath filter is green and the RBC/baso filter is clear.

2. Pull the perox sheath filter located on the left side toward you to remove it from its mounting (Fig.15).

3. Disconnect the reagent line attached to the barbed fitting located at the top of the filter (Fig.16).

4. Disconnect the luer fitting from the connector at the output port located at the bottom of the filter. DO NOT disconnect the reagent line leading from the luer fitting (Fig.16).

5. Replace the filter.

6. Attach the luer fitting to the connector located at the bottom of the filter first, then connect the reagent line to the barbed fitting at the top of the filter (Fig.16).

7. Insert the filter back into the mounting clip.

8. Repeat the procedure for the RBC/baso sheath filter on the right side of the instrument (Fig.15).

9. Prime reagent lines 5 times.
Replace the 50ul syringe plunger

**MATERIALS LIST**
- Hex wrench, small
- Household bleach
- Sample syringe repair kit, PN 067-B506-01 (50mL)
- Sheath syringe repair kit, PN 067-B506-02 (1000mL)

1. Follow procedure steps 1–6 in section 4, page 16, to remove the plunger.
2. Loosen the set screws on the metal bushing on the plunger stem using a hex wrench (Fig.17).
3. Remove the plunger and discard. Keep the metal bushing.
4. Insert the pin gauge into the top side of the syringe.
5. Wet the plunger with saline and insert into the syringe barrel until it touches the pin gauge.
6. Replace the small plastic bushing into the syringe.
7. Replace the metal bushing onto the plunger stem with the narrow collar of the bushing toward the plunger.
8. Push the metal bushing up against the syringe and tighten the set screws.
9. Remove the pin gauge from the syringe.
10. Reinstall the sample syringe.

![Diagram](image-url)

**Figure 17.**
- 4. Set screws
- 5. Metal bushing
- 6. Plunger
- 7. Pin gauge
Every Six Months Maintenance Procedure

Replace the 1000ul syringe plungers

1. Follow the procedure for changing the 50ul syringe plunger in Section 5, page 19.
2. The 1000ul syringe plungers do not have plastic bushings.

Clean the air-circulation filter

1. Facing the back of the instrument the air filter is located on the bottom right side (Fig.18).
2. Slide the filter out of its frame.
3. Use canned air to remove excess dust from the filter.
4. Flush the filter with DI water.
5. Allow it to air dry.
6. Replace the filter

Figure 18. Air filter located at 1.
References

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