Aperio AT2 DX

User's Guide

Copyright Notice

Customer Resources

‣ For the latest information on Leica Biosystems Aperio products and services, please visit www.LeicaBiosystems.com/Aperio.

Disclaimers

‣ Use normal care in maintaining and using your MDDS. Interrupting network connections or turning off the MDDS while it is writing scanned images can result in data loss.

‣ Caution: Federal (U.S.) law restricts this device to sale by or on the order of an appropriately licensed healthcare practitioner.

‣ This manual is not a substitute for the detailed operator training provided by Leica Biosystems Imaging or for other advanced instruction. Leica Biosystems Imaging Field Representatives should be contacted immediately for assistance in the event of any instrument malfunction. Installation of hardware should only be performed by a certified Leica Biosystems Imaging Service Engineer.

‣ The barcode decoding software used by Aperio scanners was provided by Honeywell International, Inc.

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REF 23AT2DX

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Contents

1 Introduction

This Aperio AT2 DX scanner has been configured for and is part of the Aperio AT2 DX System, which includes:

▸ The Aperio AT2 DX scanner, including a control/viewing workstation and calibrated monitors

▸ Console scanning software

▸ One or more Aperio AT2 DX Viewing Stations including two calibrated monitors for each station

▸ Aperio ImageScope DX viewer

For a complete description of this system and the workflow for using it, refer to the *Aperio AT2 DX System Overview.*

> ⚠️ *The monitors provided with the Aperio AT2 DX System have been calibrated at the factory and may require periodic re-calibration in the field by authorized Leica Biosystems technicians. Contact your Leica Biosystems Technical Services representative for information. Do not attempt to change the monitor display settings as doing so may interfere with the monitor calibration.*

> ⚠️ *The Aperio AT2 DX System must only be used with the Aperio AT2 DX Viewing Stations provided as part of the system.*

The Aperio AT2 DX slide scanner has been manufactured to the highest quality standards. Refer to *"Appendix C: Aperio AT2 DX Safety Instructions" on page 59* for important information on safely operating your scanner—following these safety guidelines will protect your unit and provide optimal operation.

Note that annual servicing is required to maintain scanner performance.

This equipment is intended to be used by trained, knowledgeable, licensed operators/technicians. Appropriate good laboratory practices or other policies and procedures required by your institution must be followed in support of slide preparation, processing, storage, and disposal.

Use this equipment only for this purpose and in the manner described in this guide.

Intended Use

The Aperio AT2 DX System is an automated digital slide creation and viewing system. The Aperio AT2 DX System is intended for in vitro diagnostic use as an aid to the pathologist to review and interpret digital images of surgical pathology slides prepared from formalin-fixed paraffin embedded (FFPE) tissue. The Aperio AT2 DX System is not intended for use with frozen section, cytology, or non-FFPE hematopathology specimens.

The Aperio AT2 DX System is composed of the Aperio AT2 DX scanner, the Aperio ImageScope DX review application and display. The Aperio AT2 DX System is for creation and viewing of digital images of scanned glass slides that would otherwise be appropriate for manual visualization by conventional light microscopy. It is the responsibility of a qualified pathologist to employ appropriate procedures and safeguards to assure the validity of the interpretation of images obtained using the Aperio AT2 DX System.

Image Viewing Restrictions for Primary Diagnosis

The images produced by the Aperio AT2 DX scanner are for diagnostic use within the Aperio AT2 DX System only. Images opened outside the system with non-cleared Aperio viewers will display an error alerting the user that these images cannot be used for primary diagnosis.

Non-cleared Aperio viewers include:

- ▶ Aperio ImageScope (*all* non-DX versions)
- ▶ Aperio WebViewer
- ▶ Aperio WebScope
- ▶ Aperio ePathViewer

If You Need Help

Refer to *"Appendix A: Troubleshooting" on page 50* for troubleshooting tips. For further technical support, contact your local Leica Biosystems office. Training is also available from Leica Biosystems. Refer to page 3 of this manual for contact information.

Symbols and Warnings

The following symbols are used throughout the documentation to alert you to potential danger in operating the scanner.

Symbol	Description
⚠	The exclamation point within an equilateral triangle is intended to alert you to the presence of important operating and maintenance (servicing) instructions.
⚡ High voltage	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert you to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
♨	The flat surface with waves symbol within an equilateral triangle is intended to alert you to the presence of hot surfaces which could cause burn damage.

Caution: Federal (U.S.) law restricts this device to sale by or on the order of an appropriately licensed healthcare practitioner.

IMPORTANT

If the scanner is used in any manner not specified in this documentation, the protection provided by the equipment may be impaired.

WARNING: This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions in this manual it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device (pursuant to Subpart B of Part 15 FCC Rules), which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Instrument Warnings

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THE SCANNER TO RAIN OR MOISTURE.

MISUSE OF ELECTRICAL EQUIPMENT CAN CAUSE ELECTROCUTION, BURNS, FIRES, AND OTHER HAZARDS.

Compliance Specifications

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device has been evaluated against and conforms to the following standards:

Feature	Details
Safety	
	Low Voltage Directive 2006/95/EC
	CAN/CSA-C22.2 No. 61010-1/R:2009
	CAN/CSA-C22.2 No. 61010-2-081:2004
	CAN/CSA-C22.2 No. 61010-2-101:2004
	UL 61010-1/R:2008-10
	EN 61010-1: 2001
	IEC/EN 61010-2-081/A1:2003
	IEC/EN 61010-2-101:2002
EMC	EMC Directive 2004/108/EC
	IEC/EN 61326-1: 2006; Class A
	FCC Part 15 Sub Part B

Installation

CAUTION: Two people are required for lifting the scanner.

Installation and setup of the scanner should only be performed by a trained Leica Biosystems Technical Services representative.

2 Startup and Shutdown

System Startup

To start the Aperio AT2 DX scanner:

1. Press the power button on the front panel of the Aperio AT2 DX Control Station. You see the McAfee encryption login window. (This utility protects the contents of the workstation hard disk by encrypting it.) You need to enter a password to unlock the hard disk.
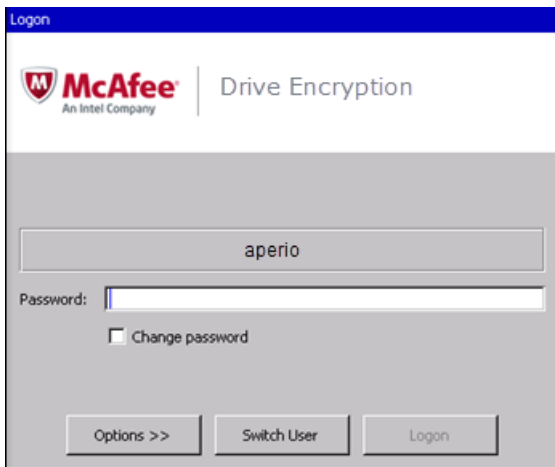
2. Enter the McAfee password for this workstation. The first time you turn on the workstation, you will use the default password shipped with the system: *scanscope*

   We recommend your administrator change the password as soon as the system is installed, so contact your administrator for the current password if it has changed.

3. When the Windows login screen appears, log in with the Windows user name and password. The first time you turn on the workstation, you will use the default user name and password:

   User Name: *aperio*

   Password: *Sc@nscope123*

   We recommend your administrator change this password as soon as the system is installed, so contact your administrator for the current password if it has changed.

4. Turn on the Aperio Image View Station monitors.

5. Press the main power switch on the back of the scanner to the On (|) position.

   The scanner takes approximately three minutes to initialize and place the stage in the home position. When the scanner completes these processes, the status screen on the front panel of the scanner reads "Scanner Ready."

Changing the McAfee Disk Encryption Password
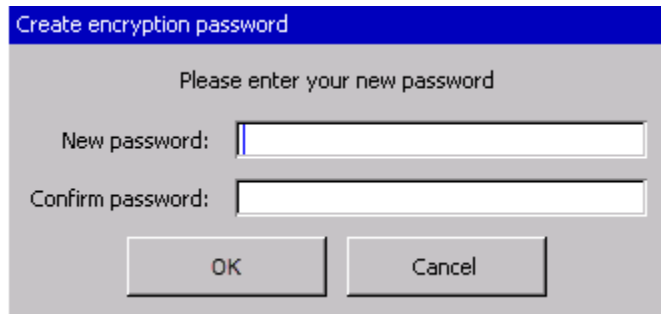
We recommend changing the disk encryption utility password every few months to protect the Aperio AT2 DX Control Station disk contents. (For more cybersecurity recommendations, see *Aperio AT2 DX System Overview*.)

1. On the main McAfee login window, select the **Change password** check box and then log in with your current password.

2. On the change password window, enter your new password in the **New password** text box and type it again in the **Confirm password** text box.

3. Click **OK**.

```
Create encryption password

          Please enter your new password

  New password:      [                    ]

  Confirm password:  [                    ]

          [   OK   ]      [  Cancel  ]
```

You cannot use a password that you've previously used.

If you forget the current password, contact Leica Biosystems Technical Services for assistance.

System Shutdown

To shut down the scanner:

1. Press the main power switch on the back of the scanner to the Off (O) position.

2. Close all scanner software applications and any additional Windows applications that are open.

3. Click the Windows **Start** button and select **Shut Down**.

4. Select **Shutdown** from the window and click **OK**.

5. Turn off the viewing monitors.

> **i** *We advise leaving the scanner instrument powered on unless it is to be idle for more than four days.*

Calibration and Verification

The Aperio AT2 DX scanner is calibrated and verified at the factory before shipment. During installation, a Leica Biosystems technician also performs calibration and operational verification.

We recommend annual preventive maintenance, performed by Leica Biosystems Technical Services, to make sure the scanner is operating correctly. For scanner maintenance you can perform yourself, see *"Chapter 7: Quality Control and Maintenance" on page 40.*

The scanner provides automatic calibration and verification every time a slide is scanned by performing calibration during the scan. For customer calibration instructions, see *"Calibration" on page 31.*

The monitors provided with the Aperio AT2 DX System have been calibrated at the factory and may require periodic re-calibration in the field by authorized Leica Biosystems technicians. Contact your Leica Biosystems Technical Services representative for information. Do not attempt to change the monitor display settings, as doing so may interfere with the monitor calibration.

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3 Preparing for Scanning

This chapter contains information on preparing for scanning slides with the Aperio AT2 DX scanner.

Training

Leica Biosystems Imaging offers on-site training courses. Contact Leica Biosystems Imaging Customer Support for information about training options.

Slide Preparation Tips

> **i** *When preparing slides for scanning, you must use the procedures required by the vendors of the stains and reagents you are using.*

Well prepared slides are crucial to a successful scan. Here are some things to keep in mind that will help make sure your scans are of the optimum quality. If after reading this section you have any questions about whether your slide preparation techniques will provide good scan quality, contact Leica Biosystems Technical Services for assistance.

Consult the material safety data sheets for the stains and re-agents you are using, as well as your institution's biosafety policies and procedures regarding safely handling biological materials.

Tissue Preparation

The tissue preparation is important for scan quality. Folds in the tissue and tissue sections that are too thick will result in out of focus images. If working with such a slide, preparation of a new slide might be required.

Staining

Reproducibility of the slide staining is important for consistent and accurate diagnosis. Make sure that the variations of the staining process are controlled and eliminated to the greatest extent possible. Employ appropriate morphological studies and controls as specified in the reagent manufacturers' instructions.

Slide Preparation

The preparation of the slide is important for its scan quality and ease of scanning. Clean the slides and make sure they are in good condition—no dirt, no fingerprints, no markings, no writing, no extra adhesive, no broken slides, no chips, no scratches, etc. Prior to loading slides, ensure that all slides are fully cured (that is, not "wet"). For best results, all slides scanned should have coverslips.

Before scanning the slide, make sure it is very clean. Wipe it with a clean cotton rag (don't use chemical cleaners).

Make sure there is no glue around the edges of a slide that would cause it to stick or catch in the scanner stage area. This is crucial for the AutoLoader.

⚠️ **DO NOT ATTEMPT TO SCAN DAMAGED SLIDES AS DOING SO MAY DAMAGE THE APERIO AT2 DX SCANNER.**

The tissue ideally should be located in the middle of the slide a distance from the edges of the slide, the label and any other markings. For more details on slide specifications, see *"Aperio AT2 DX Hardware Specifications" on page 57.*
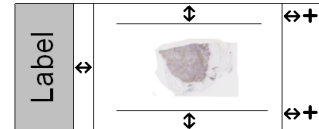
It is helpful for the tissue to be placed consistently in the same location and orientation on the slide. Some of the mechanical problems of a slide can be resolved by cleaning the slide with a cotton tissue or trimming the sides with a razor blade. Permanent problems with a slide may require the preparation of a new slide.

See *"Coverslips"* and *"Label Issues"* below for more information on slide preparation.

Coverslips

The quality of the scan is affected by the condition of the coverslip.

▸ Keep the glue that attaches the coverslip to the slide to a minimum. Excess glue makes it hard for the tissue finder to distinguish between actual tissue and the glue. If a focus point lands on the glue, slide focus will not be accurate.

▸ Make sure there are no air pockets under the coverslip.

▸ For best results, there should not be markings or writing on the coverslip.

▸ The coverslip must not hang over the side of the slide.

Label Issues

Improperly applied slide labels can cause slides to jam in the AutoLoader. Do not apply multiple labels to the same slide—this can cause the slide to exceed the specification for slide thickness (see *"AutoLoader Specifications" on page 57* for slide specifications). Make sure that labels do not extend beyond the edges of the slide and that they do not cover any tissue. Make sure that labels are firmly attached.

Do not apply labels to the bottom surface of the slide.

Below are examples of a slide on which multiple labels cause the slide to exceed the allowable maximum thickness and a slide in which the label is peeling away from the slide:
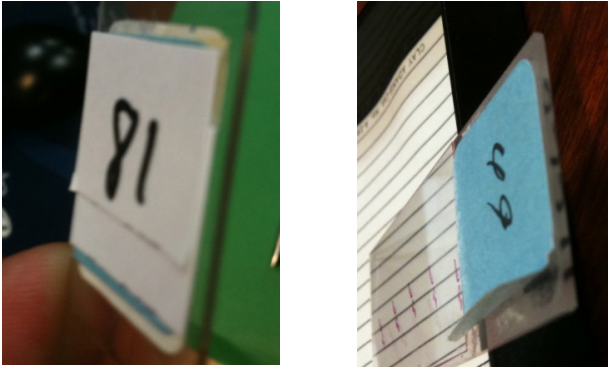
Glass Slide Quality Control

It is the responsibility of the lab to verify the quality of the tissue preparation, the mechanics of a slide and the staining.

4 Scanning Slides

This chapter contains information on scanning slides with the Aperio AT2 DX scanner.

![Caution icon] **CAUTION:** Keep hands clear of the mechanical stage assemblies when the scanner is operating.

Scanner Controls

Several of the controls on this scanner not labeled below are used in other configurations of this scanner, but are not used as part of an Aperio AT2 DX System.

LCD status

Slide tray access

Scanning Parameters

> Note that certain scanning parameters (such as image compression type) have been preselected and cannot be changed. This ensures that your results are consistent with the Aperio clinical studies on which the FDA clearances for the Aperio AT2 DX System were based.

Starting the Console

Start the Console by double-clicking the **Console** icon on the Windows Desktop or from the Windows Start menu by clicking **Start**, pointing to **All Programs > ScanScope**, and then selecting **ScanScope Console**.

You can only use the Console on a workstation directly connected to the scanner.

When you first start the Console you see a connection screen that asks you to log in. Enter the user name and password required by your MDDS. If you are not sure what user name and password to use, contact your system administrator for help.

Barcode Requirement

For quality control, the Aperio AT2 DX System requires the use of barcodes on your slide labels to provide slide identification information. The Aperio AT2 DX will mark as a failed scan any slide on which it was not able to read the barcode.

Barcode formats supported by this system are:

- Code 128
- Interleaved 2 of 5
- PDF 417
- 2D Datamatrix
- QR Code

If the Aperio AT2 DX scanner is unable to interpret the barcode on the label of your slide, the slide will appear on the Console window in red to indicate the scan failed.

In this case, inspect the slide to see if that area of the slide needs to be cleaned.

If you are unable to make the barcode area of the label readable to the scanner, you can manually enter barcode data. (The text you enter depends on your institution's policy for what information should be in the barcode.)

Manually Entering a Barcode

To manually enter a barcode:

1. While using the Console, click on the slide in the rack or batch view and select the **View Slide** icon ⬚.

2. In the slide view window, click the down-arrow at the top of the label window to expand it.

3. Type the barcode data into the **Enter Barcode Id** text box and press Return.

4. Rescan the slide.

Multiple Slide Scanning Using the AutoLoader

The AutoLoader allows you to automatically scan up to 400 1-inch x 3-inch (2.54 cm by 7.62 cm) tissue slides unattended. For information on loading slides into the AutoLoader, see *"Loading Slides into the AutoLoader" on page 37*. For specifications for slides used in the AutoLoader, see *"AutoLoader Specifications" on page 57*.

Replacing a Rack

To replace an AutoLoader rack, eject the rack—this tells the scanner to move the rack to the access position. Then remove the rack from the scanner, re-load it or replace it with another loaded rack, and place it back in the scanner. (See *"Chapter 6: Using the AutoLoader" on page 36* for details on placing slides in racks and using the AutoLoader.) To eject the rack, place your cursor at the bottom of the graphic of the rack you want to eject—the ⬆ **Eject** button appears; click it to eject the rack.

Loading a Slide into the Slide Tray

You can scan a single slide by using the slide tray.

To load a slide in the slide tray:

1. First, make sure the slide tray is in load position by clicking the **Eject** button at the bottom of the Console window.
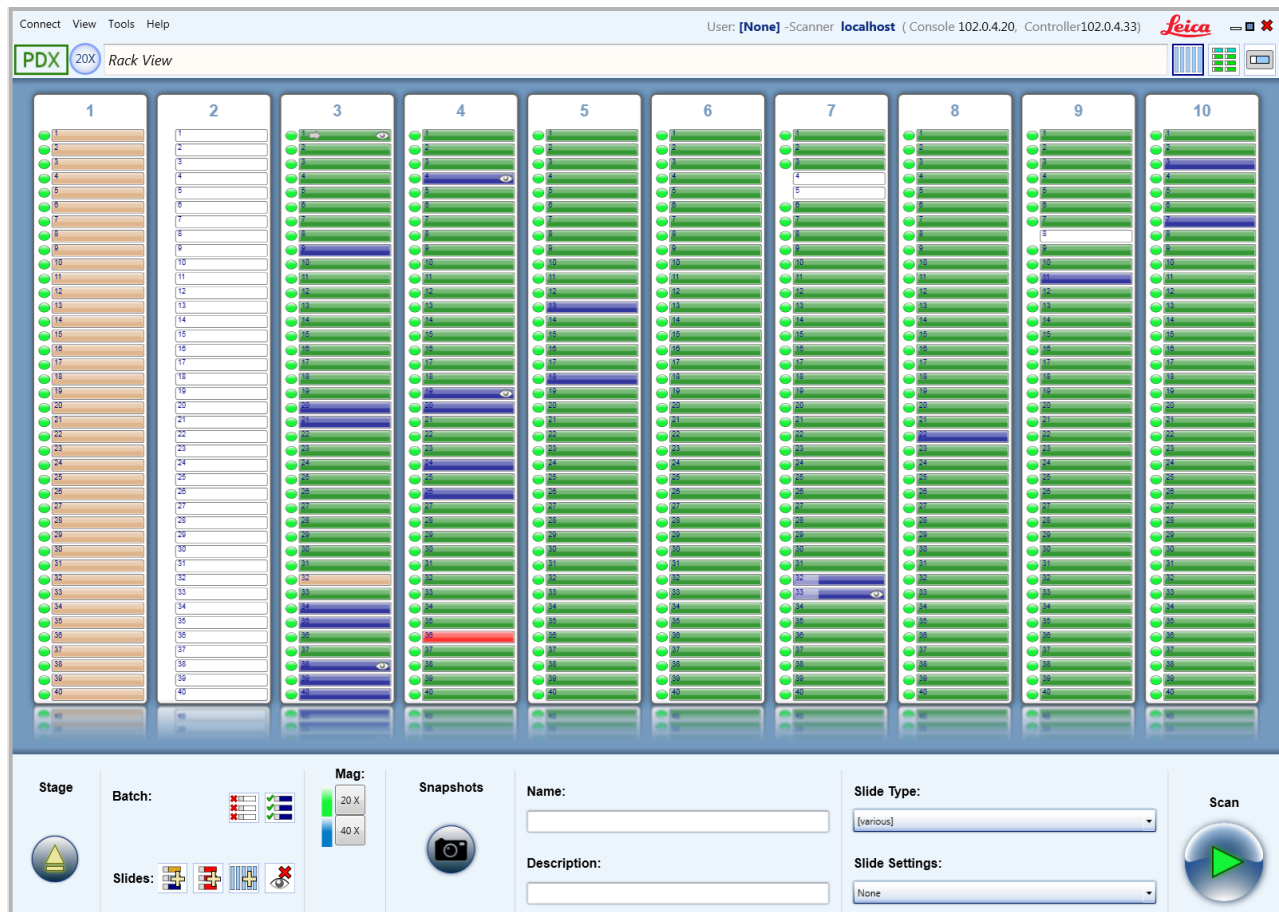

2. Place a slide into the slide tray with coverslip up and label oriented to the front.

For more information on scanning from the slide tray, see *"Manually Scanning a Slide" on page 28*.

Basic Concepts

When you first start the Console, you see the rack view, which gives information on the status of the contents of the AutoLoader racks.


You will select slides and racks on this window.

The most important concept to understand when using the rack view is the difference between including slides in the current scan batch and selecting slides.

Any slides in the slide positions shown in the slide tray display that have a white color are not included in the current scan batch nor are they selected, whether or not there is a slide in that position.

Any slides in the slide positions shown in the rack view that have a status color other than white *are* included in the current scan batch.

If the slide position has a status color and shows a lighter bar on the left, the slide is selected:
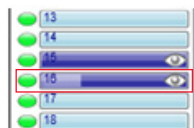

The dot to the left of each slide indicates the scan magnification selected for that slide. (The colors match the magnification levels shown on the **Magnification** icon.)

A selected slide means that the slide is both included in the current scan batch and certain Console buttons and icons (such as the **Name** field or the **Snapshot** button) will apply to that slide. In addition, if a macro image exists for a selected slide or slides, those slides can be viewed in the detailed slide view.

For information on selecting slides, and including or excluding slides in a scan batch, see *"Scan Batch Tasks" on page 26.*

Batch View

Click the **Batch View** icon at the top of the rack view to review all slides included in the scan batch in batch view. For any slides for which snapshots have been taken or that have been scanned, you see the macro image of the slide.
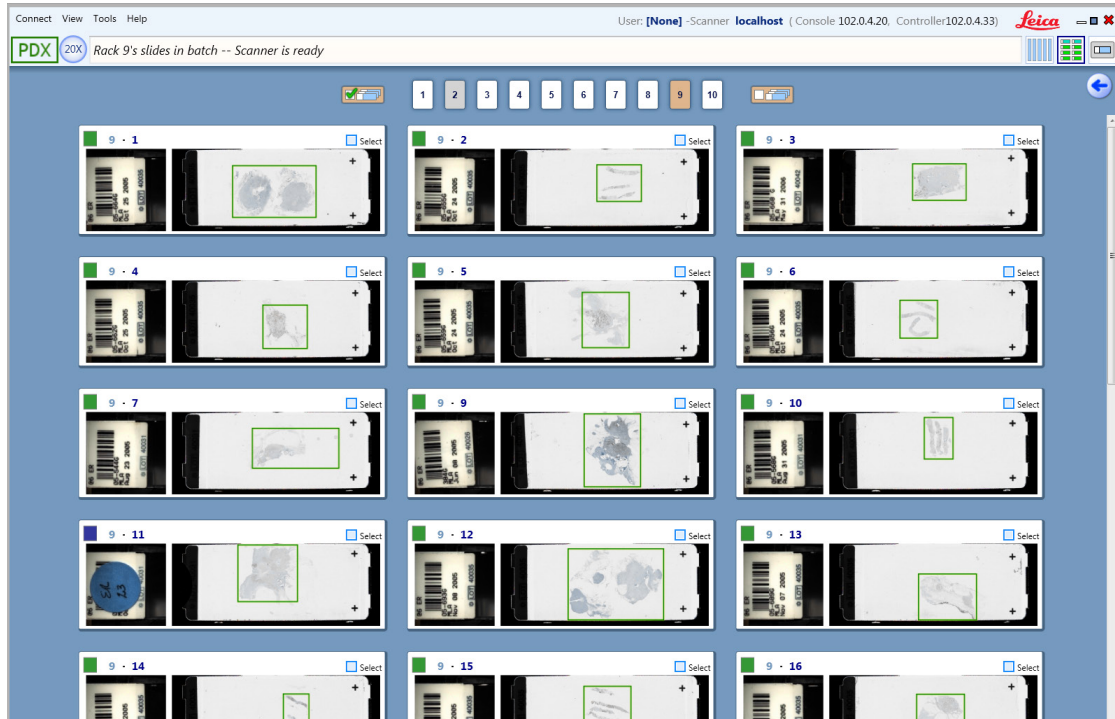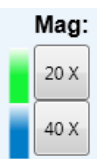
Features on this window include:

▶ Status colors give the status of the slides. For example, green means the slide was scanned and the scanner could focus on the tissue.

▶ Check boxes allow you to select or unselect slides.

▶ Numbered boxes at the top of the window allow you to select the rack to view.

▶ To select all slides in the batch view, click at the top of the window.

▶ To unselect all slides in the batch view, click at the top of the window.

Quick Reference

Here is a quick look at the most frequently used icons and buttons you see on Console windows.

Selects rack view	Selects batch view	Selects single slide view for selected slides	Ejects the stage or the rack	Captures calibration image
Starts the scan	Takes a snapshot	Selects all slides in all racks	Selects all slides that are in scan batch	Sets starting slide
Selects all slides that failed to scan	Excludes all selected slides from scan batch	Marks all selected slides for rescanning	Removes viewed indicator	Automatically sets focus points
Selects magnification of scan	Selects z-stack scanning.			

Viewing Scan Status

The scanning status colors displayed on the slide tray view indicate how well the scanner was able to focus the tissue on the slide. Although a well-focused slide is likely to result in a better image than a poorly-focused slide, status colors should not be interpreted as an absolute indicator of image quality. Instead, they should be used as a diagnostic tool alerting you to possible problems with a scan. Regardless of the scan status color displayed by the Console, all slides should be reviewed for acceptable image quality. Refer to *"Chapter 5: Image Quality Review" on page 35.*

To see this complete list of status colors and their meaning, go to the Help menu and select **Slide Status Legend**.

Batch Scanning

To perform the fastest scan possible without fine-tuning the scans:

1. Eject each rack on the Console window as discussed in *"Viewing Scan Status" on page 24* and replace the racks with loaded racks.

2. Click the **Scan** button:

As the scan proceeds, you see a green progress indicator on each slide position as the slide is being scanned.

When the scan is finished, review the scanned slide images, giving special attention to slides that show a status color other than green.

To review scanned slides:

1. Put your cursor over the scanned slide in rack view or batch view. You see the **View Slide** icon:
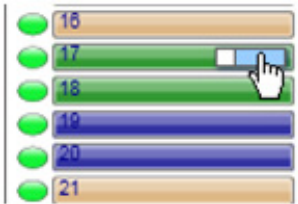
2. Click this icon to see the slide in the slide view window.
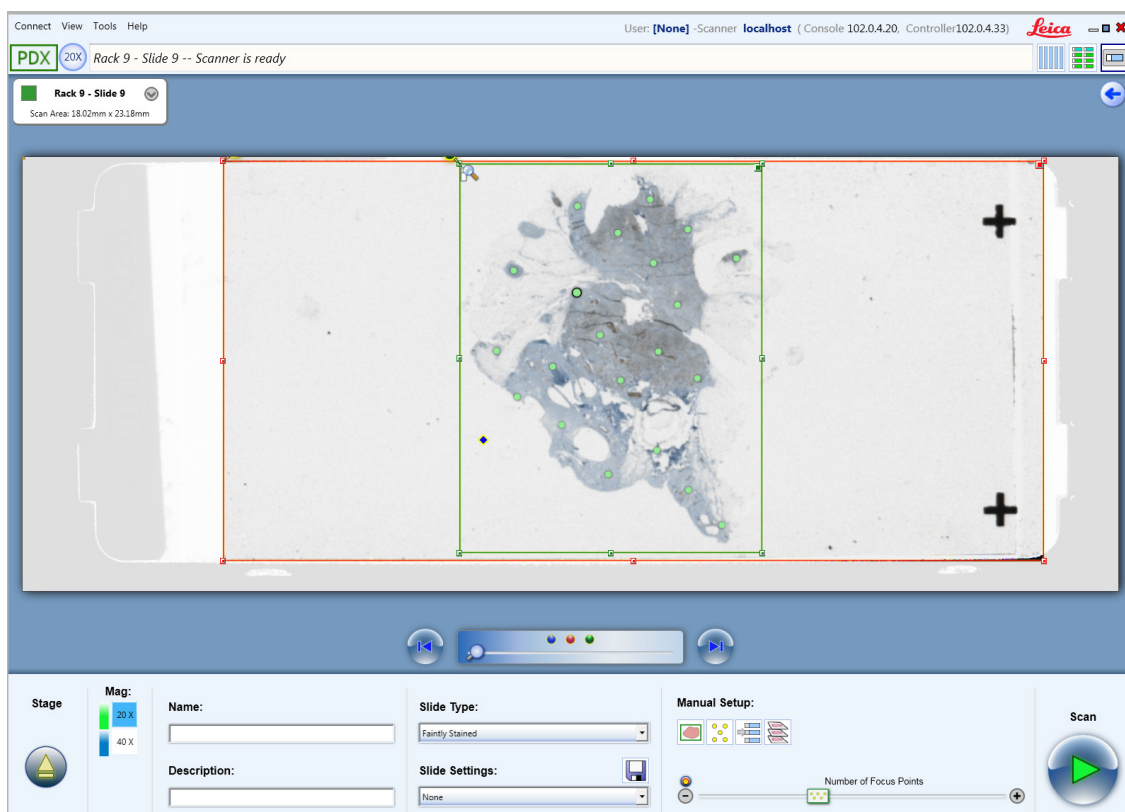
On the slide view window, you can use the tools at the bottom of the window to prepare this slide for rescanning if necessary. (See *"Using Snapshots" on page 29* for more information on using this window.)

To see the slide in even more detail, click the magnifying glass at the top corner of the green box (which indicates the scanned area) to open the image in Aperio ImageScope DX.

To return to the previous view, click the back arrow at the top of the page.

Fine-Tuning Batch Scanning

A more hands-on approach to scanning than the simple batch scanning discussed above involves taking snapshots of the slides before scanning them so that you can view them to fine-tune their scanning parameters to achieve optimal scanning.

An efficient method of doing this would be to:

1. Select all of the slides in the rack view or batch view graphic that you want to scan.

2. Take snapshots of the selected slides by clicking the **Snapshot** button:

3. Select the slides for which you took snapshots and click the **View Slide** icon on one of the slides to view the slides in the slide view window.

4. You can fine-tune scanning parameters in the slide view window. When finished with snapshot review, click the **Scan** button to start scanning the slides.
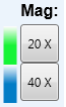
See *"Manually Scanning a Slide" on page 28* for more information on using snapshots and the slide view window.

Scan Batch Tasks

Here are some tasks you can perform during batch scanning. For more ways to include/exclude slides from a scanning batch, see *"Quick Reference" on page 23.*

If you want to	Do this
Replace rack	To place the rack in loading position, move the cursor to the bottom of the rack in rack view and click the **Eject** button: Then remove the rack, re-load it or replace it with another loaded slide rack, and place it back in the scanner.

If you want to	Do this
Include racks in a scan batch	Remember that any slide positions that show a color other than white are included in the current scan batch. Only selected slides will be affected by most of the buttons and commands in the Console window. To include all the slides in a slide rack in the current scan batch, do one of the following: • Insert a new rack (slides are automatically placed in the scan batch) • Click the top of a rack to select all of the slides in it, then click it again to unselect the slides but leave them in the scan batch. To add specific racks to a scan batch, hold down the Control key while you click the tops of racks. If you want to unselect those slides but leave them in the scan batch, click the tops of the racks again. To add all slides in all racks to a scan batch, click the **Select all racks** icon:
Include slides in a scan batch	• To include a single slide in a scan batch, click a white slide position in a rack. To unselect it, but leave it in the scan batch, click it again. • To add a group of slides to a scan batch, click the first slide in the group, hold down the Shift key, and click the last slide in the group. If you want to unselect them but leave them in the scan batch, hold down the Control key and click each slide.
Exclude slides from a scan batch	• To exclude all slides in a rack from the scan batch, click the top of the rack to select all slides in the rack, then right-click and select **Exclude selected slides**. • To remove a group of selected slides from the current batch, place the cursor on a group of selected slides, then right-click and select **Exclude selected slides**.
Select/unselect slides	• To select a single slide to mark it for further action and to include it in the scan batch, click it in the rack graphic. • To select a group of slides, click the first slide in the group, hold down the Shift key, and click the last slide in the group. Or, hold down the Control key while you click specific slides to select them. • To unselect a slide or group of slides, use the tips above on selected slides.
Set scan order	When you begin the scan, the scan will start with the start slide, then move to the next slide position in that rack that is included in the current scan batch. To set which slide the scan will start with, right-click on a slide position in the rack view and select **Set start slide**. However, note that the scanner will skip scanning slides that show a green status color (because they have already been successfully scanned) and slides that show orange or red status colors (because they need to be reviewed and adjusted before they can be rescanned).
Select magnification	Set the scan magnification for the selected slides by choosing 20x or 40x on the **Magnification** icon.
Add name or description	Optionally, you can name one or more selected slides and give them a description by using the **Name** and **Description** fields.

If you want to	Do this
Add slide setting	If you have previously saved scan parameters as a slide setting, you can select it from the **Slide Settings** drop-down list to apply the settings to selected slides.
Select slide type	To assist you with scanning certain types of slides (such as faintly stained slides), scan parameters have been preset for those types of slides. You can apply a slide type to the selected slides by selecting one from the **Slide Type** drop-down list.

Manually Scanning a Slide

Certain features of the Console are only available when manually scanning the slide in the slide tray rather scanning slides in a rack. This is because the slide is physically under the scanner objective while you are reviewing it.

Features only available when manually scanning a slide include:

▸ Creating a calibration image (see *"Calibration" on page 31*).

▸ Auto focusing focus points before the scan (see *"Working with Focus Points" on page 30*).

To place the slide on the scanner stage:

1. First, eject the slide tray by clicking the **Eject Stage** button 🔼 at the bottom of the window. Do this to initiate a manual scan even if the stage is already ejected (for example, after homing the stage).

2. Place the slide on the slide tray with coverslip up and the label to the front. The Manual Scan window appears where you can set name and description for the slide, select a slide type, and a magnification.

Although you could just click the **Scan** button on the Manual Scan window to start scanning the slide, you will probably want to take a snapshot to get a macro image of the slide by clicking the **Take Snapshot** button to see the slide view window, shown below.
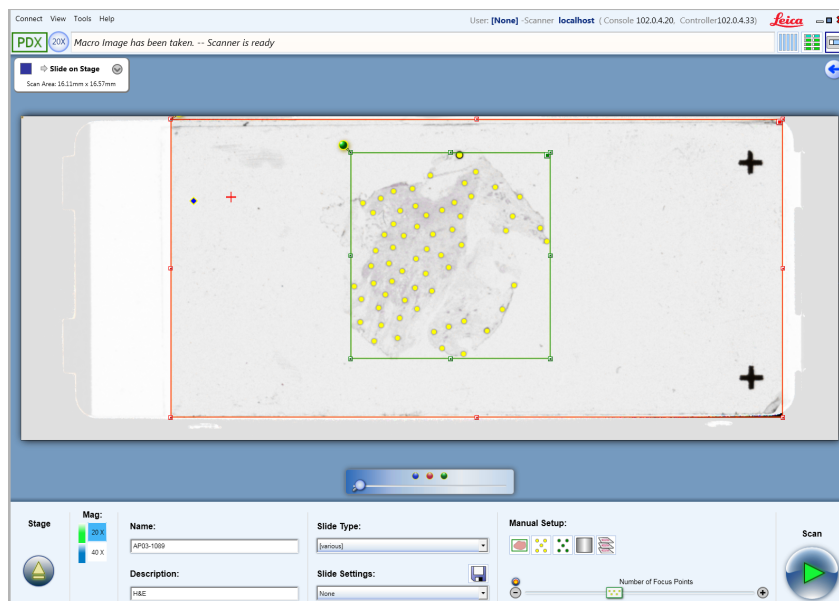
For details on the icons in the Manual Setup section shown on the slide view window above, see the following sections of this chapter.

Using Snapshots

The scanner provides an automated workflow that is optimized to provide the best scanning experience in most cases. Many operators find it easiest to load the slides into the racks and click the Console **Scan** button, letting the scanner automatically find the tissue on the slide, set focus points, and scan. In most cases, this default operation provides excellent results. In some cases, however, workflow is improved if the operator first views a quick snapshot of the slides, manually sets the scan areas, sets focus points, chooses slide type, and so on, before scanning.

To take snapshots, select one or more slides in rack view or batch view and click the **Snapshot** button:

After snapshots have been made, select slides in rack view or batch view that display the light blue status color. While your cursor is over one of the selected slides, click the **View Slide** icon.
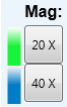
You see the slide view window (shown above).

In the slide view window, click the forward arrow or back arrow to move between snapshots. Use the zoom slider to zoom into the image—click the blue dot to zoom into the entire macro image, the red dot to zoom into the maximum scan area (the red box), and the green dot to zoom into the scan area (the green box).

If you want to	Do this
Set the scan area	The area of the slide that will be scanned is marked by a green box (this is limited by the red box, the maximum scan area).
	To reset the scan area by letting the scanner detect the tissue area on the slide, click the **Auto select tissue** icon:
	Or, click the green pin at the top left of the scan area box to redraw the scan area. Or, click a handle on the scan area box to drag the edges or corners of the box to a new position.
Verify the calibration point position	Make sure the calibration point (the blue diamond) is on a clear area of the slide that does not contain tissue and that is under the coverslip. Click on it and drag it to a new position if necessary.
Set focus points	You can add, delete, or move focus points. See *"Working with Focus Points"* below.
Scan the slide	Click the **Scan** button to scan this slide and all slides that are ready for scanning.
View the scanned image	If the image has already been scanned, a small magnifying glass appears at the top left of the image. Click it to open the scanned image in Aperio ImageScope DX.

If you want to	Do this
View the slide label	To view the slide label, click the **View slide** icon from the rack or batch view to open the slide in the slide view window. Click on the down arrow on the slide information box to see the label.
Rotate the slide label	To view the slide label, click the **View slide** icon to open the scanned slide in the slide view window. Click on the down arrow on the slide information box to see the label. Double-click the label image if you want to rotate it (clicking on the right side of the label rotates it clockwise; clicking on the left side rotates it counter clockwise).
Manually enter a barcode	Click the **View slide** icon on the rack or batch view to open the scanned slide in the slide view window. Click on the down arrow on the slide information box to see the label. Type the barcode information in the **Enter Barcode Id** text box and press Return.
Set scan magnification	To select scanning magnification, select 20x or 40x on the **Magnification** icon.
Set start slide	To set the slide as the starting slide for the scan, click in the slide view window.
Save slide settings	If you have changed scanning parameters on this slide, you can save the parameters as a slide setting. Type a name in the **Slide Settings** box and click the **Save** icon. You will then be able to apply these settings to selected slides by selecting them from the **Slide Settings** drop-down list.
Scan z-stacks	For information on z-stack scanning, see *"Z-Stack Scanning" on page 32.*

Once you have viewed a snapshot and if you have changed scanning parameters, the status color of the slide changes from light blue to dark blue. If you have viewed a slide it appears in the rack view with a Viewed symbol: 👁.

Working with Focus Points

The most important factor in determining whether the scanned image will be of excellent quality is whether the scanner can successfully focus the tissue on the slide. In most cases, you can let the scanner automatically place and focus the focus points. However, in some cases where the slide contains tissue of uneven thickness or staining is faint, or there is not much tissue on the slide, you may get best results by placing focus points yourself.

Automatically Adding Focus Points

You can automatically place focus points in two ways on the slide view window.

Use the **Number of Focus Points** slider to place a small number or large number of focus points.
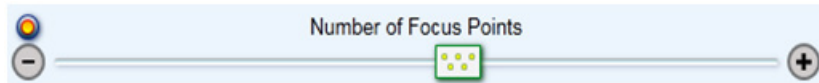
Or click the **Auto Select Focus Points** icon to tell the scanner to automatically place focus points at the default density.

After the focus points are automatically placed, you may decide to manually add more, move focus points, or delete focus points. For example, if a focus point has been placed in a clear area of the slide without tissue, you will want to delete it or move it to an area that contains tissue.

After opening a slide in the slide view window, you can work with focus points.

If you want to	Do this
Add focus points	To add a focus point, double-click on the macro image at the position at which you want to add a focus point. Or, right-click on that position and select **Add Focus Point Here** from the context menu.
Move focus points	Click a focus point to select it and drag it to a new position.
Delete focus points	Click the focus point to select it and press the Delete key on your keyboard. Or, click the focus point select it and right-click. Select **Delete This Point** from the context menu. (You can also hold down the Control key and select multiple focus points before doing these procedures.)
Automatically focus all focus points	If you are manually scanning a slide on the stage, you can tell the scanner to automatically focus the focus points before scanning. This allows you to test that all focus points can be focused. Click the **Auto Focus All Focus Points** icon .

Calibration

The scanner is calibrated and verified at the factory before shipment. No further manual calibration or verification is required by the customer. However, we recommend annual preventive maintenance, performed by Leica Biosystems Technical Services, to make sure the scanner is operating correctly.

Every time you scan, the scanner calculates adjustments for minor illumination differences to ensure that the scanner performs consistently to scan high-quality images.

The scanner makes a calibration image of the white background at the location of the blue diamond (which must be positioned at a location that does not appear to have tissue) and then uses the image to obtain a shading correction that will be applied during the scanning process. Calibration then performs white-balancing. The final step of calibration is to measure intensity across the entire calibration image, and then normalize the calibration image to a predefined value. Not only does this provide uniformity for images made by a single scanner, but calibration also ensures images are similar in intensity across multiple scanners.

To manually make a calibration image, you must be manually scanning a slide in the slide tray.

1. First, place the slide tray into load position by clicking the **Eject** button at the bottom of the Console window.

2. Place the slide on the stage with the coverslip up and the label oriented to the front.

3. Take a snapshot to get a macro image of the slide by clicking the **Snapshot** button.

   After the snapshot is taken, you see the macro image of the slide in the window.

4. Set at least four focus points, preferably more. You can click the **Auto Select Focus Points** icon to tell the scanner to automatically set focus points.

5. Click the **Capture a calibration image** icon.

   The focus points turn green as they are focused.

A calibration image is taken. When the calibration operation is complete, the calibration image appears.
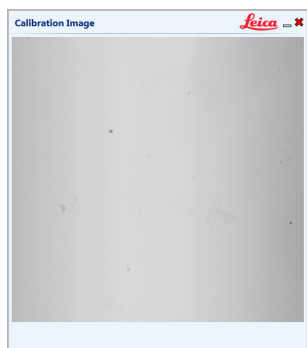
The calibration image should be consistent with non-tissue areas of a slide, typically light gray. (The illustration above shows a good calibration image.)

If the calibration image is too dark or displays shadowing, the light may need replacing. If the calibration image shows tissue, move the blue diamond calibration point out of the tissue area and make a new calibration image.

Z-Stack Scanning

The Aperio AT2 DX can create multiple digital images of slide tissue scanned at different focal depths, creating a 3D image that you can visually navigate through much as a microscope user can navigate through different tissue focal depths by using the microscope objective fine and coarse adjustments. This ability to create a 3D image is called "z-stack scanning."

Use z-stack settings to scan a single slide as a z-stack, or save those settings as a permanent slide setting that can be used to scan groups of slides as z-stacks in the future. You can create z-stack scan settings for a manually scanned slide that is under the objective or for a slide in a scan batch.

For all types of scanning, the Aperio scanner determines the layer within the tissue that provides the optimal focus—this is called the *best focus layer*. For z-stack scanning, by default the best focus layer is placed in the middle of the z-stack, with an equal number of layers above and below it.

To configure a z-stack scan:

1. First, take a snapshot of a slide (see *"Using Snapshots" on page 29).*

2. Open the slide in the slide view window.

3. Click the ⬛ icon in the Manual Setup section of the slide view window.

You see the Z-Stack Scanning window.
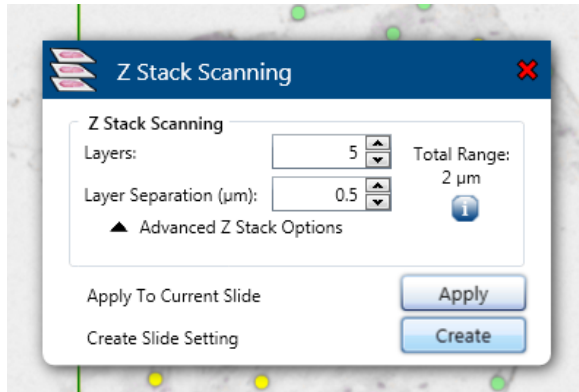
About the Z-Stack Scanning Window

The Z-Stack Scanning Window allows you to do several different things:

1. Make simple settings for z-stack scanning using the controls on the window. After making those settings, you will click the **Apply** button, click the red **X** at the top of the window to close it, then click the **Scan** button on the slide view window to scan the slide with these settings. See *"Basic Z-Stack Settings"* below for more.

2. Refine z-stack scanning settings by using the **Advanced Z-Stack Options** control. This allows you to set layer offsets. See *"Advanced Z-Stack Settings"* below for more.

3. Save the z-stack settings you have made as a slide setting to use in the future on other slides by clicking the **Create** button. See *"Saving Z-Stack Settings as a Slide Setting" on page 34.*

For a visual reminder of how the z-stack layers are arranged and for tips on using the controls, hover over the **Info** icon in either the basic or the advanced configuration sections.

Basic Z-Stack Settings

Configure the basic z-stack scan settings by telling the scanner how many focal layers you want to scan and the distance between the layers in microns. For example, if you configure the z-stack to use 5 layers separated by .5 microns, there are two layers above the best focus layer and two layers below it.

1. Select the number of layers by clicking up and down arrows in the **Layers** box. Select the number of layers based on the thickness of the sample.

2. Adjust the separation between the layers by clicking the up and down arrows in the **Layer Separation** box. This controls the focus offset between layers.

3. When satisfied with the settings, click **Apply** to apply the settings to the current slide and click the red **X** at the top of the window to close it.

4. Click **Scan** on the slide view window to scan the slide.

Advanced Z-Stack Settings

To see the Layer Offset controls, click **Advanced Z-Stack Options** on the Z-Stack Scanning window.

Use the advanced settings to change where the best focus layer is positioned in the stack. For example, the settings below show that the best focus layer is at the bottom of the stack with four layers above it:
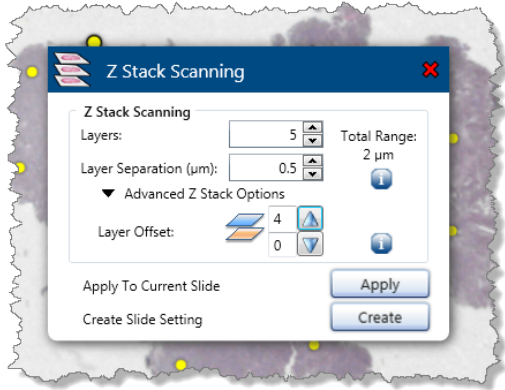
Use the arrow controls in the Advanced Z-Stack Options section to set the number of layers above and below the best focus layer.

> *The advanced z-stack settings require a thorough understanding of the tissue or type of tissue you want to create a z-stack for.*
>
> *For example, if you know that the best detail in the tissue occurs above the best focus layer and if you are not interested in the tissue below the best focus layer, place the best focus layer at the bottom of the stack and scan layers above the best focus layer.*

Saving Z-Stack Settings as a Slide Setting

To save the settings as a slide setting to apply to scans in the future:

1. Click **Create** on the Z-Stack Scanning window.

2. On the Save Slide Settings window, select the **Z-Stack Scanning** check box.

3. Type a name for the slide setting.

4. Click **Save**.
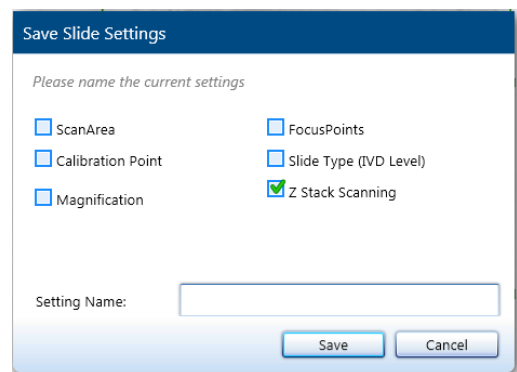
Viewing Z-Stacks

For information on viewing the 3-dimensional z-stack image, refer to the *Aperio ImageScope DX User's Guide*.

5 Image Quality Review

This chapter discusses the importance of reviewing image quality for the scanned slides.

Image Quality Review

After scanning slides, it is important to review the eSlides to make sure the image is of good quality. Ultimately, it is up to the pathologist to look at eSlides to verify they are of sufficient quality to perform his/her task. In addition, scanner operators should verify eSlide quality after scanning.

The quality criteria that are important for primary diagnosis that should be verified by scanner operators are: 1) that the entire tissue sample has been scanned, and 2) that the tissue is in focus.

Aperio scanners provide a macro image, a low resolution image of the entire slide, that also provides a green outline of the scanned image.

1. From your MDDS, open the scanned images in Aperio ImageScope DX.

2. Look at the entire image to see if the entire tissue sample was scanned.

3. Adjust the zoom level by using the Zoom tool. Click in the thumbnail in the Aperio ImageScope DX window and pan the image. All eSlide images should be in focus and free of visible image stripes.

4. Rescan any eSlides that failed to scan or failed the image quality review.

Data Entry

Data entry is automated using barcodes. When a glass microscope slide is scanned by the Aperio AT2 DX scanner, a barcode on the slide label is decoded to populate data fields in your MDDS. For information on barcode formats supported and on what to do if the scanner cannot read a barcode, see *"Barcode Requirement" on page 19.*

6   Using the AutoLoader

The Aperio AT2 DX AutoLoader is a high precision robotic device which automates the tedious and time consuming task of manually loading glass microscope slides into a scanner. As the AutoLoader involves transportation of fragile and often precious glass slides, it is critical that you read and follow these operational guidelines carefully.

Failure to follow these simple guidelines may result in unsatisfactory operation of the AutoLoader, the creation of sub-optimal virtual slide images, or on rare occasions the breakage of slides.

Please follow these simple and important procedures for continued successful operation of your AutoLoader. Should you have any further question regarding use and operation of your AutoLoader please contact a Leica Biosystems Technical Services representative.

Microscope Slide Types

The AutoLoader has been designed to work with many commonly available glass microscope slides. The dimensions of a slide must be such that each slide fits easily into one of the racks of the AutoLoader and can be securely loaded onto and unloaded from the stage by the AutoLoader.

> The AutoLoader for your scanner can be used with 1-inch x 3-inch (2.54 cm x 7.62 cm) slides.
>
> Under no circumstances should you attempt to modify the slide AutoLoader, slide tray insert or system software configuration to enable scanning of a different slide format, as this may result in damage to your scanner and/or slides.
>
> For detailed specifications on the exact size of slides that can be used with your model of scanner, see *"AutoLoader Specifications" on page 57.* **Please ensure that your slides meet these specifications prior to use of the AutoLoader.**

If you have any questions about the suitability of your glass slides please consult a Leica Biosystems Technical Services representative.

Slide Preparation

The creation of high quality virtual slide images begins with good slide preparation. In addition to these AutoLoader-specific notes on slide preparation, also see *"Chapter 3: Preparing for Scanning" on page 15* for general information on making sure your slides are ready for scanning.

Inspect all slides before loading the AutoLoader racks:

▸ Ensure that all slides are fully cured (that is, not "wet"), and free from exposed (sticky) mounting media that may have accumulated near the edge of a slide. Clean the surface of all slides to remove any dirt or dust that may impair the auto-focus functions of the scanner. Slides with pen-marks may require manual scanning.

▸ Inspect the coverslips and ensure they do not protrude beyond the edge of the slide. Do not use the AutoLoader for slides in which the coverslip extends past the edges of a slide. These types of slides should be set aside for manual scanning.

▸ Inspect the slide label and ensure that the label:

- Is fully adhered to the slide (that is, does not curl back on itself) and;

- Does not extend beyond the margins of the glass slide. Do not use the AutoLoader for slides in which the slide label protrudes beyond the edges of a slide. These types of slides should be set aside for manual scanning.

- Does not cover any tissue.

▸ The slide should be inserted into a rack with the label facing the back of the scanner (that is, away from you when you insert the rack into the AutoLoader) and the coverslip up.

> ⚠️ **DO NOT ATTEMPT TO SCAN DAMAGED SLIDES AS DOING SO MAY DAMAGE THE APERIO AT2 DX SCANNER.**

Loading Slides into the AutoLoader

1. In the Console, select the rack position you want to use and click the **Eject** button on that rack—this moves that rack position to the front of the carousel where you can remove or load a rack.

2. Open the scanner front access door. When you open the scanner access door, you see the AutoLoader carousel. Note the status light behind the carousel door at the top of the carousel. This light will be green when the scanner is ready for you to remove or load racks.
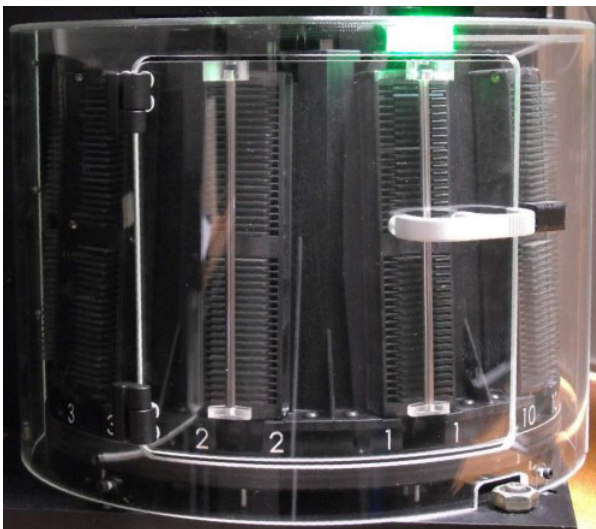
3. If the status light inside the carousel cover is green, open the carousel door by pulling on the handle.

   ▸ If the status light is red, the carousel is moving or racks are not in load position. Do not try to open the carousel—use the Console to select the rack you want to use and click the **Eject** button in the Console to move that rack into load position. The status light should turn green.

▶ If the status light is blinking red, do not try to open the carousel. An AutoLoader error has occurred—refer to *"AutoLoader Troubleshooting" on page 51* for instructions.

4. Remove a rack by slightly lifting up on the rack and pulling it out.
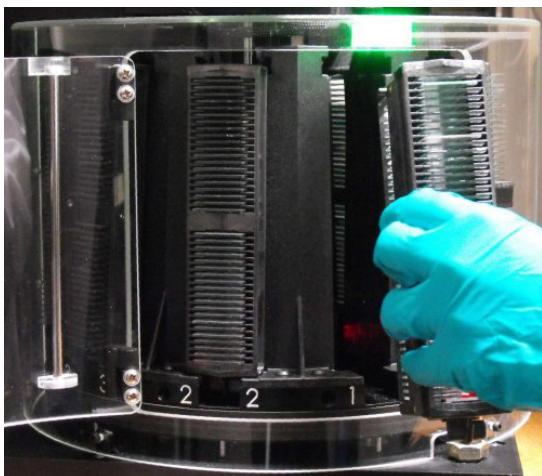
5. Place slides into the rack with the slide labels facing towards the rear of the rack and the coverslips up.

Note *– The slide racks can be loaded into any position on the AutoLoader. This is possible because the scanner automatically senses which AutoLoader positions contain a slide rack. However you must use the Console to move the rack position you want to use to load position before removing or replacing a rack. Do not try to manually rotate the carousel.*

Note that the rack has been designed to load slides from a Sakura Tissue-Tek automatic slide stainer and coverslipper slide basket.

Simply hold the scanner rack over the coverslipper slide basket so that the slides in the coverslipper slide basket line up with the rack slots and turn the basket and the rack upside down so the slides fall into the rack.

6. Push the slide rack back into the scanner until it contacts the "Stop" position.
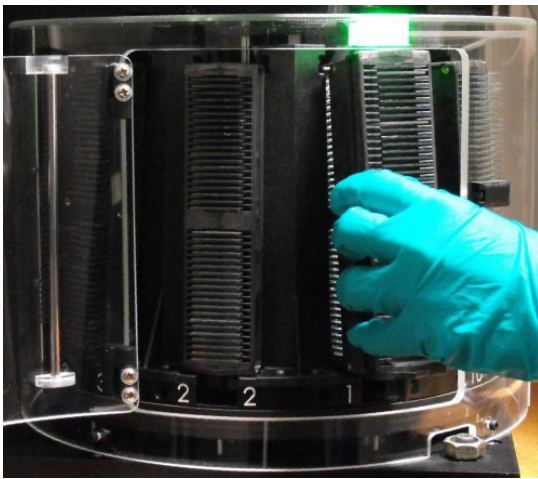
7. Close the carousel door by pushing the carousel door handle. The carousel rotates to move the next two racks into the access position. The carousel status light will be red during this operation. When the light is green, you can open and close the carousel door to move another two racks into load position.

8. Close the front scanner access door.

   The slide rack positions are indicated on the Console display and the scanner LCD display. The scanner LCD displays "Scanner Ready."

Inspecting the AutoLoader and Racks

It is important to keep the AutoLoader rack, the AutoLoader compartment, and the scanning stage slot (the area on the scanning stage onto which the AutoLoader places the slide) clean at all times. Prior to each AutoLoader run please inspect the condition of these parts and if required, clean them. See *"Cleaning the AutoLoader" on page 43* for instructions.

Carefully inspect each rack before use and ensure that it is seated correctly in the AutoLoader's rack holder. Inspect racks for damage and for accumulated glass dust or accumulated mounting media. All grooves within the rack (sides and bottom) must be clean and smooth. Clean the racks as required with compressed air and/or cleaning solvent. Damaged racks should be replaced immediately. Clean racks frequently.

7 Quality Control and Maintenance

This chapter contains information on maximizing the performance of the scanner and the quality of its images by following a regular maintenance schedule.

⚠️ **CAUTION:** When cleaning and servicing a scanner with the access door open, to prevent injury to the operator that can occur when a scan is initiated, first press the main power switch on the back of the scanner to the Off (0) position and disconnect the power cord to the scanner.

Maintenance Schedule

Call Leica Biosystems Technical Services for assistance if any maintenance task cannot be performed or indicates problems.

How Often	Task	How To
Daily	Restart scanner controller service to initialize the scanner and put the stage in the home position.	See *"Restart the Scanner Controller Service" on page 41.*
Daily	Perform Presnap to optimize tissue finder for the macro image.	See *"Perform a Presnap" on page 41.*
Daily	Verify display function	Open a slide image in Aperio ImageScope DX to verify that the monitors are working properly. Verify that there are no flickering or artifacts on the display and no damage to the display.
Monthly	Clean objective	See *"Clean the Objective" on page 42.*
Monthly	Set line camera gains	See *"Set Line Camera Gains" on page 41.*
Monthly	Clean slide tray on stage	See *"Cleaning the Slide Tray on the Stage" on page 43.*
Monthly	Verify the scanner control/viewing station hard disk space and integrity	Ensure there is at least 100GB or 20% of the total capacity free on the hard disk.
Monthly	Clean scanner cover, internal system, slide tray, AutoLoader and AutoLoader racks.	See *"Clean the Scanner" on page 43.*
Monthly	Verify display function/monitor check	See the viewing station maintenance chapter in the *Aperio AT2 DX System Overview.*
Every six-months	Recalibrate AutoLoader slide-in-rack sensor	See *"Recalibrate the AutoLoader Slide-in-Rack Sensor" on page 44.*
Once a year	Schedule annual maintenance visit by Leica Biosystems Technical Services.	

Restart the Scanner Controller Service

Restarting the scanner Controller service initializes the scanner and puts the stage in the home position. We recommend doing this every day before the first scan.

Before performing this procedure, verify that your Windows logon credentials have administrative permission to restart Windows services. If you do not have this permission, contact your IT department for assistance.

---

1. Click the Service Manager icon ![icon] in the Windows task bar, select **Restart Services**, and then select **Restart Controller Service**. This restarts the Controller and also homes the AutoLoader and stage.

2. Wait for the Controller Service to restart (about 30 seconds) until the scanner status screen on the front panel reads "Scanner Ready." Then start up the Console and re-connect to the scanner.

Perform a Presnap

Making a presnap allows the scanner to correct for light reflection from the slide surface. This may improve the accuracy and sensitivity of the Tissue Finder.

1. Go to the Console **Tools** menu and select **Capture New Presnap**. The New Presnap window appears and the scanner stage moves to the access position.

2. Clean an unused, blank slide with no markings.

3. Load the blank slide into the slide tray with the coverslip up and label to the front. Make sure the slide is inserted so that the front edge is even with the edge of the slide tray.

4. In the New Presnap window, click **OK**.

5. When the scanner status screen reads "Scanner Ready" and the stage ejects, remove the slide.

We recommend performing a presnap each day the scanner is in use before the first scan. Always perform a presnap before setting line camera gains.

Set Line Camera Gains

You need to set line camera gains when prompted to do so when the scanner cannot create a calibration image or if there is a problem with the calibration image. However, it is a good idea to do this every month even if not prompted to do so.

To set the line camera gains:

1. Eject the stage and place a clean slide containing tissue (no scratches or markings) on the stage.

2. In the Console Manual Scan window, click **Take Snapshot**. The macro image (snapshot) of the slide opens in Slide View and the stage ejects.

3. Verify the scan area and the calibration point are placed correctly.

4. Go to the Console Tools menu and click **Set Line Camera Gains**. The scanner will automatically place focus points on the slide, check the calibration, then adjust the line camera gains as required.

Do this procedure for each magnification level, setting the magnification level each time.

If the scanner cannot create a calibration image after setting the line camera gains, the LED light source may need to be replaced or adjusted—contact your Leica Biosystems Technical Services representative for assistance.

Clean the Objective

We recommend cleaning the objective every month. To protect the objective, use gloves when handling it. If you are removing the objective to clean it, store the objective in the objective case supplied by Leica Biosystems when it is outside of the scanner.

Because the tip of the objective is more scratch resistant than the interior lens, first try cleaning the objective without removing it from the scanner.

- ▶ To avoid the possibility of introducing very fine scratches onto the surface, never drag anything across the lens surface with a high degree of pressure, including lens paper.

- ▶ Clean the lens with a solvent designed for optical surfaces or, in an emergency, absolute ethanol. Avoid other solvents because they might react with optical coatings on the glass.

- ▶ Slightly moisten a Q-tip with lens cleaner or ethanol and very gently wipe it over the lens several times, turning the cotton tip before each pass. Blot excess solvent with lens tissue and allow the lens to dry thoroughly. Repeat this procedure if necessary.

Removing the Objective

If cleaning the objective in the scanner does not fully remove artifacts, you will need to remove the objective and clean it more thoroughly outside of the scanner.

To remove the objective, place two fingers of one hand under the objective to protect it and using your other hand carefully unthread the objective rotating to the left (or counterclockwise if viewing from below) without touching the glass lens as you rotate it. When the objective is free of the mount, remove the objective and place it in an objective case to protect it.

After you remove the objective, you may see a Console error message that a motion error has occurred—ignore that message for now and continue cleaning the lens.

Dust the lens surface with compressed air prior to cleaning to remove loose particles. Only use compressed air if the objective has been removed from the scanner—never use compressed air inside the scanner.

Now follow the cleaning steps in the section above.

Installing the Objective

To install the objective into the scanner after cleaning it, while keeping two fingers under it without touching the glass lens, use your other hand to carefully hold the objective by its sides, seat it in the objective mount, and rotate it to the right (or clockwise if viewing from below) to secure it. Do not cross-thread or over tighten.

After you install the objective, the scanner Console may display a message that a motion error has occurred. While changing the objective, you may have moved the stage which causes a motion error. Power down the scanner and restart the Controller to rehome the stage and return it to a known position. See *"Recovering from a Motion Fault" on page 55* for more information. For more information on cleaning objectives, please see:

http://www.olympusmicro.com/primer/techniques/fluorescence/troubleshoot.html

Clean the Scanner

This section contains instructions on cleaning both external and internal scanner components. We recommend doing these procedures every month.

Cleaning the Scanner Casing

Clean the outer casing of the scanner as needed by wiping it with a damp cloth and immediately drying it with a dry cloth. Be sure to clean only the outside of the instrument.

Cleaning the Scanner Interior

In the unlikely event that slides have broken in the scanner, use the utmost care in removing glass shards and biological material. Turn off power to the scanner and unplug the power cord before placing your hands inside the scanner. Using proper safety protection and procedures, pick up and wipe up the visible pieces of any broken slides. Please contact Leica Biosystems Technical Services for advice before operating the scanner.

Cleaning the Slide Tray on the Stage

Gently wipe the slide tray from the top to the bottom with a lint-free tissue. After initial wipe down, final polishing can be done using a micro fiber cloth. Only if necessary, use a gentle solvent such as denatured alcohol to remove any remaining residue.

Cleaning the AutoLoader

It is important to keep the AutoLoader rack, the AutoLoader compartment, and the scanning stage slot (the area on the scanning stage onto which the AutoLoader places the slide) clean at all times. Prior to each AutoLoader run please inspect the condition of these parts and if required, clean them with a cotton swab that has been soaked in a cleaning solvent such as denatured alcohol. To clean the AutoLoader carousel cover and access door, use water and a mild detergent.

Cleaning the AutoLoader Racks

Inspect racks for damage and for accumulated glass dust or accumulated mounting media. All grooves within the rack (sides and bottom) must be clean and smooth. Clean the racks as required with compressed air and/or cleaning solvent. Damaged racks should be replaced immediately.

Clean racks frequently.

Recalibrate the AutoLoader Slide-in-Rack Sensor

Recalibrating the AutoLoader slide-in-rack sensor prevents scanning problems by ensuring that the slide moving from the AutoLoader to the scanning stage is precisely positioned. This procedure should be done every six months. (This will be done as part of your annual maintenance visit by Leica Biosystems Technical Services.)

First you will restart the scanner Controller service. This initializes the scanner and puts the stage and AutoLoader in the home position.

1. Turn the scanner off and back on: Press the main power switch on the back of the scanner to the Off position then press it to the On position.

2. Click the Service Manager icon ![icon] in the Windows task bar, select **Restart Services**, and then select **Restart Controller Service**.

Now you will recalibrate the AutoLoader slide-in-rack sensor:

1. Open the AT2 DX covers to gain access to the inside of the scanner.

2. Locate the slide-in-rack sensor amplifier which is to the right of the AutoLoader cover.

3. Flip the plastic slide-in-rack sensor amplifier cover up to uncover the amplifier. As you stand in front of the scanner opening, the amplifier cover latch is at the top of the amplifier. Pull it toward you to open the cover. In this illustration, the cover is open.

Be very careful not to press any buttons on the amplifier other than the **Set** button. PRESSING OTHER BUTTONS ON THE AMPLIFIER COULD PUT THE SCANNER INTO A STATE THAT CAN ONLY BE REMEDIED BY A SERVICE TECHNICIAN VISIT.

4. Locate the **Set** button on the amplifier (marked in the illustration). The button is labeled "Set."

5. Press the **Set** button on the amplifier.

6. Close the amplifier cover.
7. Close the scanner covers.

Change the Aperio Service Account Password and Update ApService

The Aperio service account is used by the Aperio scanner to manage the scanner service ApService. The account and service are necessary for the scanner to operate.

While there is no Aperio requirement to change the Aperio service account password, your institution's password policy may require you to periodically change the account password. If you change the password, you must also update the credentials of the ApService service that runs under the Aperio service account or the scanner will not operate.

Perform the procedures below on the Aperio AT2 DX control station.

Changing the Aperio Service Account Password

To change the password for the Aperio service account:

1. Log in as the Aperio service account user. (The default Aperio service account user name is *AperioSvc* and the initial password is *Sc@nscope123*. Contact your administrator for assistance if the user name and password have changed.)

2. Press CTRL + ALT + DELETE.

3. Select **Change a password** on the Windows screen.

4. Enter the old password.

5. Enter the new password and repeat it in the next text box.

6. Click the arrow to proceed.

Now you must go to the next section to update the service credentials.

Updating the Aperio Service Credentials

After changing the Aperio service account password, you must also update the credentials for the ApService service that runs under that account.

Follow these steps to update the services credentials:

1. Click the **Start** button on the Windows task bar.

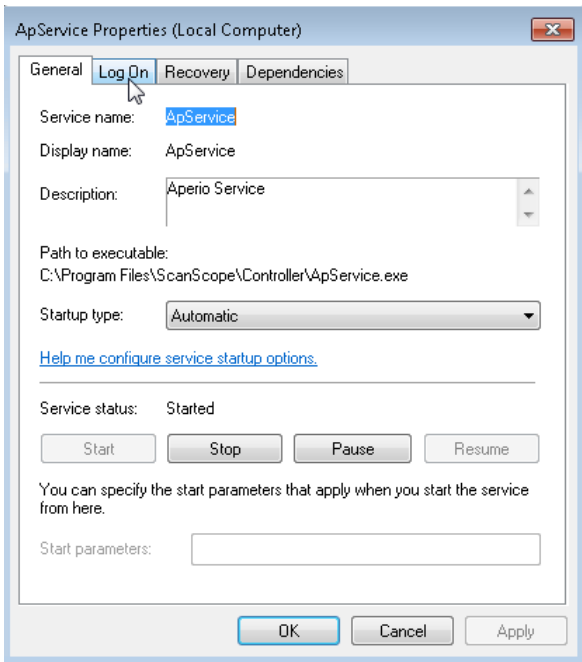2. In the search box at the bottom of the pane, type **services.msc**.
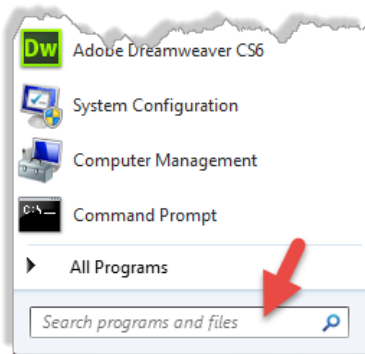
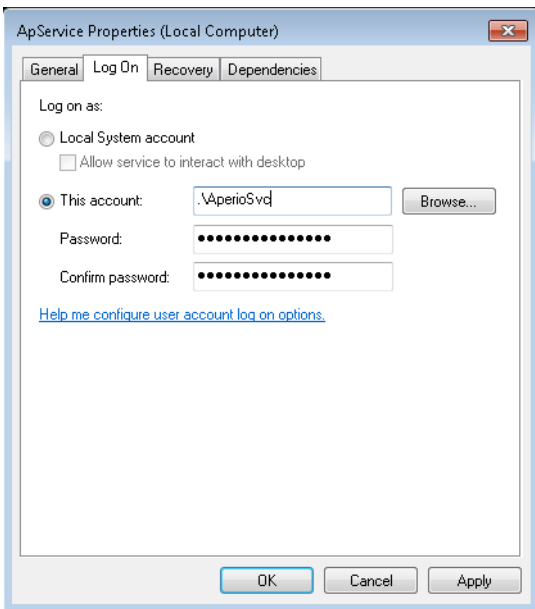3. On the Services window, locate ApService:
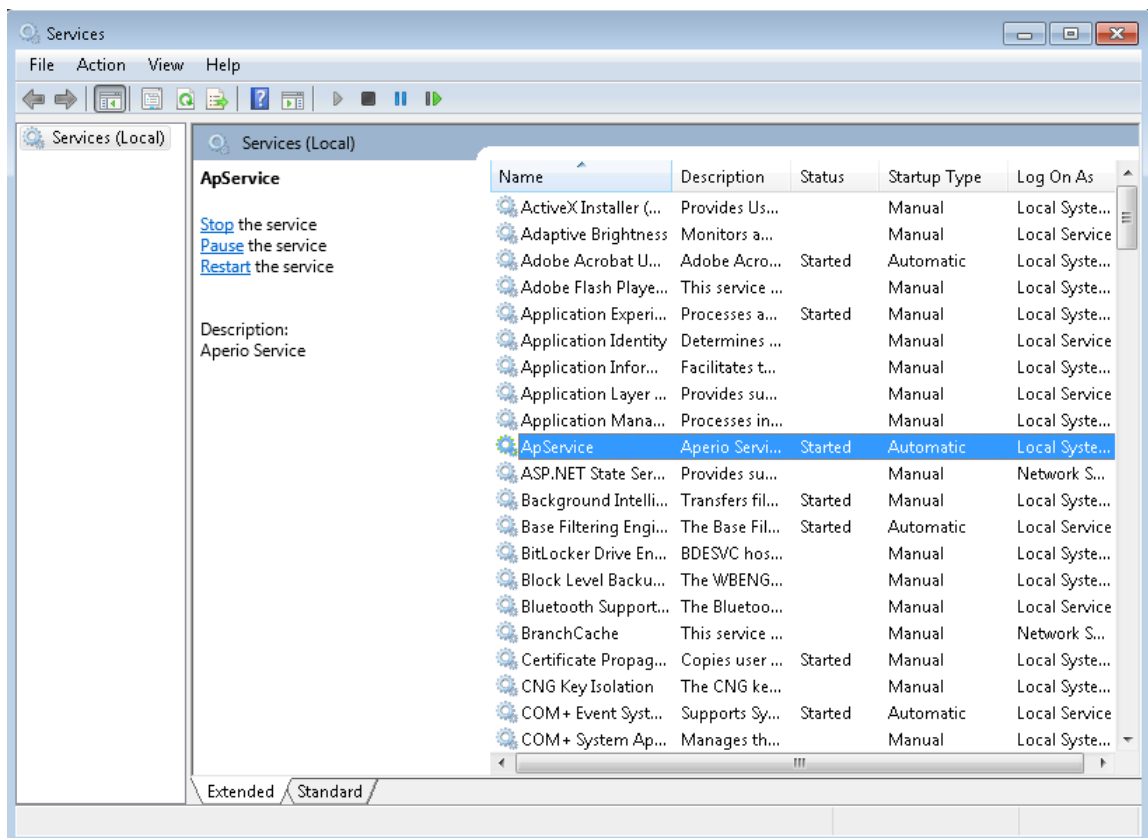
4. Right click on it and select **Properties** from the context menu.

5. On the Properties window, click on the **Log On** tab.

6. In the This account section of the window, click the **Browse** button.

7. On the Select User window, go to the **Enter the object name to select** text box. If the Aperio service account user name is not already filled in, type it: *AperioSvc*. Next, click the **Check Names** button and the full Aperio service account specification is filled in.

8. Click **OK**.

9. On the Log On tab, enter and confirm the password you used for the Aperio service account in *"Changing the Aperio Service Account Password" on page 46*.
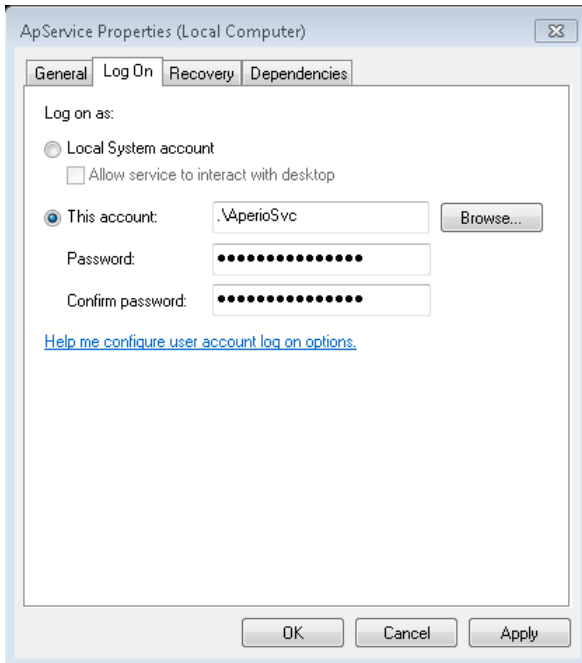
10. Click **Apply**. You see a warning that the changes won't take effect until you stop and restart the service.

11. Click **OK** on the message box to exit.

12. Click the Aperio Service Manager icon and select **Restart All** from the context menu to restart all services.
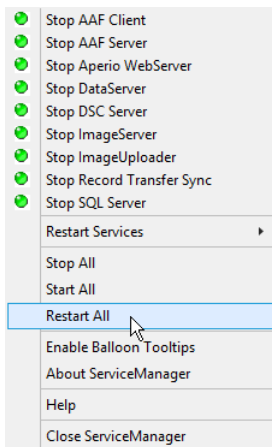
A Troubleshooting

This appendix contains tips for troubleshooting the most common problems you may encounter with your scanner.

General Troubleshooting

If the information below does not help you find or fix the problem you are having, for further scanner technical support contact your local Leica Biosystems office. Refer to page 3 of this manual for contact information.

| Symptom	Solution
Scanner fails to start up or initialize.	1. Verify that the power switch at the back of the unit is on.
	2. Make sure all scanner doors are closed, including the AutoLoader carousel door, as the scanner cannot start unless all doors are shut.
	3. Click the Aperio Service Manager icon in the Windows task bar and check that the entry for the Controller has a green dot and says "Stop Controller Service." If it has a red dot and says "Start Controller Service," click the entry to restart it.
Console or LCD displays "Failed to move stage" or "Check stage locks."	If the stage is locked, you cannot scan. Contact Leica Biosystems Technical Services for assistance.
Trouble scanning a particular slide.	1. Is the slide tissue extremely thick or thin?
	2. Is the slide extremely dark or faint? Use a parameter set such as **faint**.
	3. Is the label large or located inside the area of interest? Remove the label or adjust the area of interest.
	4. Are there pen marks on the coverslip? Remove the marks or perform a manual scan.
	5. Is there dust or debris on the coverslip or bottom surface? Clean the slide.
	6. Are there bubbles under the coverslip? Perform a manual scan.
	7. Is there excess adhesive around edges of the coverslip? Clean or perform manual scan.
During the scan, the Tissue Finder included a non-tissue area in the scan area of interest.	Perform a new presnap with a very clean, blank slide and repeat the manual load. (For instructions, see *"Restart the Scanner Controller Service" on page 41*.)

Symptom	Solution
Entire image is out of focus.	1. Verify that the slide is being held flat and not moving in the tray during scanning (tape down the slide if necessary).
	2. Optic surfaces (such as the objective) may contain finger prints. See *"Clean the Objective" on page 42* for information on cleaning the objective.
Individual stripes of the image are poorly focused but a neighboring stripe is perfect.	This may indicate that the slide is moving during scanning. 1. Verify that the slide tray is clean. 2. Verify that the slide is sitting flat and not rocking.
Autofocus did not detect at least four focus points.	1. The tissue may be too faint to scan; use the **faint** parameter set. 2. Try performing a new presnap. (For instructions, see *"Restart the Scanner Controller Service" on page 41*.)
Calibration image is displayed but error message "bulb may be unusable" is displayed.	1. If the calibration image is clear but too dark or too bright, set the line camera gains. (For instructions, see *"Restart the Scanner Controller Service" on page 41*.)
	2. If the calibration image contains considerable tissue, while looking at the video monitor display, click on a clear glass area without tissue and verify that location is clear. Then move the blue diamond (calibration point) to that clear area.
	3. If the calibration image contains coverslip or other defects, try the parameter set **coverslip** to help the scanner ignore edges or defects. If the problem persists, either select the scan area manually or adjust the area of interest for all slides to avoid defects.
	4. If the calibration image is very uneven, verify the slide is sitting flat. Repeat with another slide. An uneven calibration may also indicate optical misalignment due to mishandling which requires a service visit or factory repair.
An error message tells you that the scanner cannot create a calibration image.	Set the line camera gains. (For instructions, see *"Restart the Scanner Controller Service" on page 41*.)
Scan quality is not good.	It may be that a motion fault occurred and was not recovered from. See *"Recovering from a Motion Fault" on page 55* for assistance.

AutoLoader Troubleshooting

This section contains information on recovering from several AutoLoader error conditions.

Carousel Status Light Red or Blinking Red

When you open the scanner access door, you see the AutoLoader carousel. Note the status light behind the carousel door at the top of the carousel. This light will be green when the scanner is ready for you to remove or load racks (that is, when the racks are in load position).
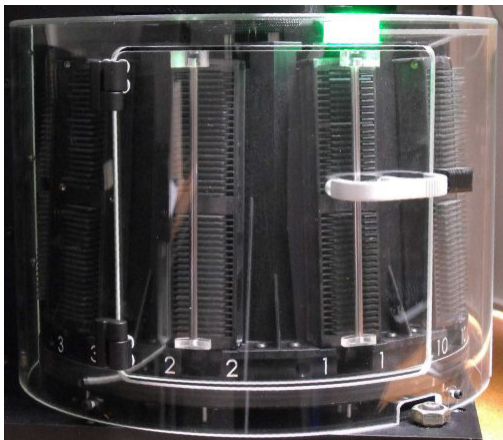
If the status light inside the carousel cover is red or blinking red instead of green, do not open the carousel door.

▶ **Red status light -** A red status light means that the carousel is moving or that the racks are not in load position (for example, the scanner may be loading a slide in or out of a rack). Wait until the status light turns green before opening the carousel.

Try using the Console to tell the scanner to move a rack into load position by selecting the rack position on the Console display and clicking the **Eject** button for that rack in the display.

If the light does not turn green, contact Leica Biosystems Technical Services for assistance.

▶ **Blinking red status light -** A blinking red status light means that an AutoLoader error occurred. One common error is that someone opened the carousel door while the carousel was moving—in this case, use the Console to rehome the stage. If this does not correct the error, contact Leica Biosystems Technical Services for assistance.

Slide on Stage

If you see a "slide on stage" error message, it means that the scanner tried to load a slide from the AutoLoader but a slide is already on the stage.

In most cases, this is the result of an operator leaving a slide on the stage after performing a manual scan, performing a presnap, or setting the camera gains. If you are sure that the slide was left on the stage by an operator, you can simply click the **Eject Stage** button on the Console window to move the stage to the access position and you can remove the slide.

Rarely, a slide can be left on the stage by the AutoLoader because of a sticky label or adhesive on the edge of the slide. In this case, follow these instructions:

1. Open the front and side access doors of the scanner and check the status of the slide.

2. If the slide appears to be secure on the stage, click the **Eject Stage** button in the Console and remove the slide.

3. If the slide was left on the stage while the AutoLoader pusher was moving between the rack and the stage, retract the AutoLoader pusher by pulling it towards the front of the scanner until it comes to a mechanical stop; this returns the slide to the rack. Note that the AutoLoader will not operate or move to its home position unless the pusher is pulled all the way forward, as shown in the following image.
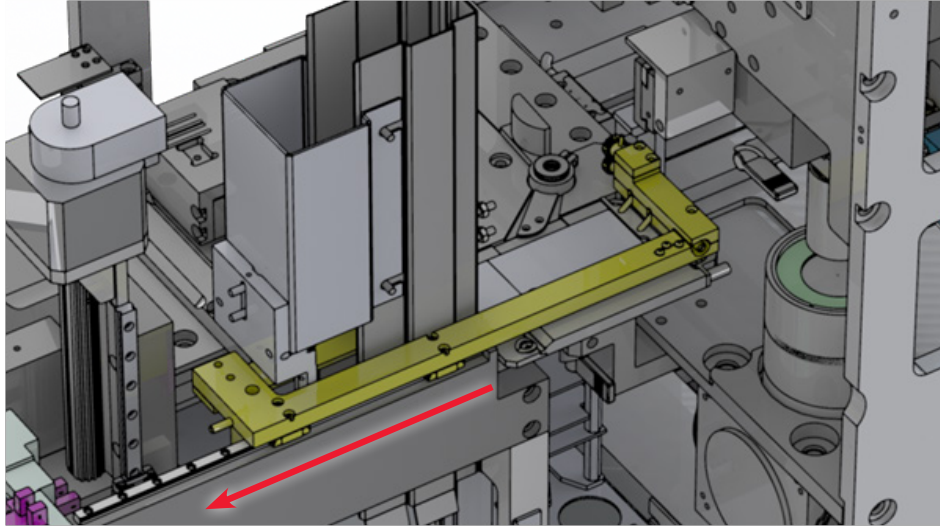
Note the label on the pusher assembly:

Make sure that the dotted lines (indicated by the red arrows in the illustration above) line up with each other; this ensures the pusher is fully retracted.

Stalled AutoLoader Carousel or Rack Lift

If the AutoLoader carousel or rack lift stall during use, first look for any obstructions, including the rack or slides preventing the axis from moving, and clear the obstructions if necessary. Then restart the Controller; don't power the scanner off and on. If that does not work, then power the scanner off and then back on again.

To restart the Controller, click the Aperio Service Manager icon in the Windows task bar select **Restart Services** and then select **Restart Controller Service**.

Unable to Load AutoLoader Carousel

If you have opened the scanner to add or remove racks, and the carousel has stalled (you might hear a rattling sound and the carousel does not rotate):

1. Open the carousel cover.

2. Manually rotate the carousel, and look for obstructions such as a rack not fully seated in the carousel or slides that have shifted outside of the rack.

3. If you see an obstruction, remove it.

4. Close the carousel cover and the scanner access door.

Then restart the Controller to home the carousel. To restart the Controller, click the Aperio Service Manager icon ![icon] in the Windows task bar select **Restart Services** and then select **Restart Controller Service**.

Motion Control

The Console Motion Control options allow you to move the scanner stage: extend it to the stage access position, retract it to move the stage back inside the scanner, and home the stage (move the stage back to its normal position under the objective).

Go to the Console Tools menu and select **Motion Control.** Then select the action you want to perform:

Magnification Changer Troubleshooting

You will use the Console program to select the magnification to use for scanning. Under rare circumstances, it may be necessary to manually release or engage the magnification changer inside the scanner. The scanner cannot home the stage if the magnification changer is not pulled all the way out. Normally, the Console program will take care of this for you, but if the scanner will not scan, verify that the magnification changer is pulled all of the way out. If you cannot scan:

1. Open the scanner doors.

2. Pull the magnification changer all the way out.
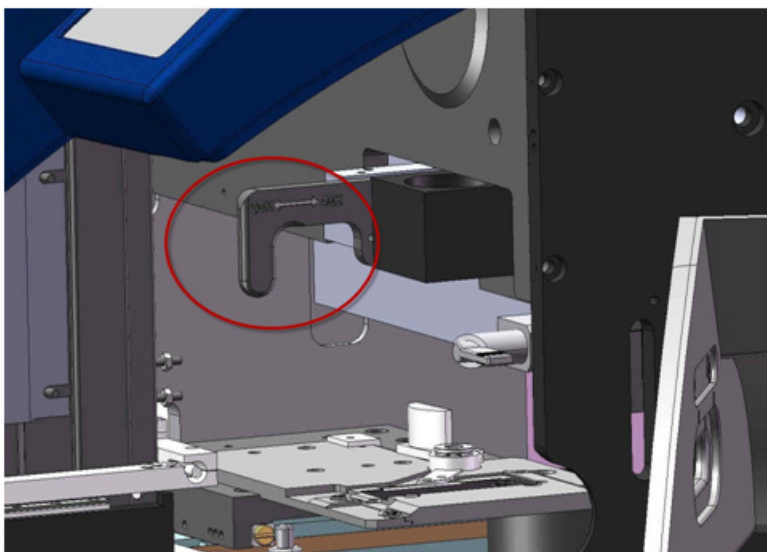
Recovering from a Motion Fault

If you move the stage by hand or it is otherwise moved in some way other than by the scanner motor, a motion fault may occur and the Console displays the message: "Critical Notice—A motion error has occurred. Power down the scanner and rehome the stage."

This error does not indicate damage to the stage, but simply that the scanner may have lost track of the exact position of the stage.

If the AutoLoader shuts down because of improperly prepared slides or improper use, you also may need to home the stage.

To recover from this error:

1. Verify the magnification changer is completely pulled out. The scanner cannot start with the magnification changer in. (See *"Magnification Changer Troubleshooting" on page 54.)*

2. Turn the scanner off and back on: Press the main power switch on the back of the scanner to the Off position then press it to the On position.

3. Click the Service Manager icon in the Windows task bar, select **Restart Services**, and then select **Restart Controller Service**. This restarts the Controller and also homes the AutoLoader and stage.

If you do not recover from this error, the quality of your scans may suffer.

B Specifications

This appendix contains specifications for the Aperio AT2 DX scanner.

Recommended Operating Environment

Typically, the scanner work area should have good lighting and the air should be clean and cool. See *"Environment Specifications" on page 58* for details.

AC Power

The scanner is operated at 24V DC and is supplied with a 220W external AC/DC adapter.

⚠️ **CAUTION:** If the power cord supplied with this product does not match the wall plug configuration, do not use. Contact a qualified electrician to obtain the proper cord

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The AC/DC adapter must be connected to an AC wall socket through its power cord. At least one grounded dual AC wall socket (3 conductor) is recommended for a power source. Connected to that is a surge protected 4-6 outlet power strip to be provided in close proximity to the work surface and easily accessible.

To protect the scanner, Leica Biosystems recommends using a UPS (uninterruptible power supply) rated at 2200VA with power conditioning that protects connected loads from electrical surges and spikes, lightning and other power disturbances. The UPS allows the scanner to run for an additional 30 minutes, giving you time to safely shut it down.

Transporting or Moving the Aperio AT2 DX

If you need to transport the scanner, either to move it to a new location or to return it to your distributor for repair, you must contact Leica Biosystems Technical Services for assistance because the scanner's stage must be locked before it is moved and unlocked before it is used again. If moving or shipping the scanner yourself, you may void your Leica Biosystems hardware service agreement.

Decommissioning and Disposal

The instrument and/or its parts must be disposed of in accordance with the existing applicable, local regulations for class A (non-hazardous) waste.

Long Term Storage

If you plan on not using the scanner for a considerable amount of time, turn it off and unplug it. (This is not necessary for normal day to day use.) If you want to store it, contact Leica Biosystems Technical Services for assistance (See pages 3-4 for contact information.)

Aperio AT2 DX Hardware Specifications

Feature	Details
Input format	1-inch x 3-inch (2.54 cm x 7.62 cm) microscope slides with 0.17 mm coverslip
Slide loading	Manual: One 1-inch x 3-inch (2.54 cm x 7.62 cm) slide when using the slide tray
	Automatic: Up to 400 1-inch x 3-inch (2.54 cm x 7.62 cm) slides when using the AutoLoader
Scanning region	1-inch x 3-inch (2.54 cm x 7.62 cm) slide: 22.9 mm (top to bottom edges) x 54.9 mm (measured from the right edge of the slide)
Objective lens	20x/0.75 NA Plan Apo
Scanning resolution	50,000 pixels per inch (0.5 µm per pixel) with 20x objective
Scanning method	Line scanning (U.S. Patent 6,711,283)
Tissue finding	Automatic
Focus	Automatic
Scan output	24-bit color contiguous pyramid TIFF, immediately viewable
eSlide file format	Standard pyramid tiled TIFF with JPEG2000 image compression
Network interface	1 gigabit per second Ethernet
Dimensions	Approximately 23.5 inches (H) x 16 inches (W) x 25.5 inches (D)
	59.7 cm (H) x 40.6 cm (W) x 64.7 cm (D)
Weight	Approx. 129 lbs (58.5 kg)
Power	Universal AC input, power factor corrected. 100vAC – 240VAC, 50Hz/60Hz, 2 amp. See *"AC Power" on page 56* for UPS recommendations.
Monitor	Calibrated LCD monitor

AutoLoader Specifications

The AutoLoader can contain up to 400 1-inch x 3-inch (2.54 cm x 7.62 cm) slides and has been designed to work with many commonly available glass microscope slides. The dimensions of a slide must be such that each slide fits easily into an AutoLoader rack slot and can be securely loaded onto and unloaded from the stage by the AutoLoader.

Please ensure that your slides meet these specifications prior to use of the AutoLoader:[1]

Slide width	0.968 inches (24.6 mm) to 1.043 inches (26.5 mm)
Slide length	2.898 inches (73.6 mm) to 3.016 inches (76.6 mm)
Maximum thickness including coverslip and label	0.058 inches (1.48 mm)
Scanning region	22.9 mm (top to bottom edges) x 54.9 mm (measured from the right edge of the slide)

Successful scans require well prepared slides. See *"Slide Preparation Tips" on page 15* for slide preparation guidelines.

1. Slide dimensions are approximate, and are affected by the presence of excessive mounting media, overhanging coverslips, and label thickness. In all cases, it is up to the user to load slides which fit easily and smoothly into the AutoLoader rack. Failure to follow this advice may result in damage to specimens and/or the AutoLoader mechanism.

If you have any questions about the suitability of your glass slides, please consult a Leica Biosystems Technical Services representative. For instructions on using the AutoLoader, see *"Chapter 6: Using the AutoLoader" on page 36*.

Scanner Control Workstation Software Specifications

Feature	Details
Operating system	Windows 7 64-bit
Scanning software	Console / Controller
Viewing software	Aperio ImageScope DX

System Requirements

You must use the workstation provided with the scanner and its calibrated monitor to scan. eSlide viewing also requires using a workstation and two calibrated monitors provided by Leica Biosystems.

Environment Specifications

The Aperio AT2 DX is designed to be operated under the following environmental conditions: indoor use only, MAINS supply voltage fluctuations of up to ± 10% of 100 - 120 V and 220 - 240 V, and transient overvoltages (category II of IEC 60364-4-443) typically present on the MAINS supply. Also refer to the table below:

Feature	Details
Transportation/storage temperature	-22 degrees Fahrenheit to 113 degrees Fahrenheit
	-30 degrees Celsius to 45 degrees Celsius
Operating temperature	65 – 81 degrees Fahrenheit
	18 – 27 degrees Celsius
System heat dissipation	Typical BTU/hour: 1968
Power use	Typical watts/hour: 580
Transportation/storage humidity	30% – 90%, non-condensed
Operating humidity	30% – 90%, non-condensed, for a standard working pathology laboratory environment.
Maximum elevation	Up to 2000 Meters (6561.7 feet)

Routine setup and alignment may be required by a Leica Biosystems Technical Services representative after shipping.

C Aperio AT2 DX Safety Instructions

This appendix contains important safety information for the Aperio AT2 DX scanner.

When using your scanner, always take basic safety precautions, including all of those listed below.

Read All Instructions – All safety and operating instructions must be read before operating the product.

Retain All Instructions – All safety and operating instructions must be retained for future reference.

1. **Heed All Warnings** – All warnings on the scanner and those listed in the operating instructions must be adhered to.

2. **Follow All Instructions** – All operating and scanner usage instructions must be followed.

3. **Heat** – The scanner must be situated away from any heat sources such as radiators, heat registers, stoves, or other products that produce heat.

4. **Ventilation** – Slots and openings in the scanner are provided for ventilation. They ensure reliable operation of the product, keeping it from overheating. These openings must not be blocked nor covered during operation. Keep air openings free of lint, hair, fluff, etc. This product should not be placed into a rack unless proper ventilation is provided through following the manufacturer's recommended installation procedures.

   The external light source should be placed in an area where air circulation is not impeded.

5. **Biosafety Procedures** – Please refer to your institution's biosafety policies and procedures regarding the proper handling of tissue and other potentially hazardous materials in connection with the use of this device.

6. **Water and Moisture** – Do not use the scanner near water—for example, near a water bath, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near an open pool of water or the like. If the scanner becomes wet, unplug it before touching it.

7. **Attachments** – Do not use any attachments not recommended by the product manufacturer as they may cause hazards.

8. **Power Sources** – The scanner must be operated from the type of power source indicated on the marking label and in the installation instructions. If you are not sure of the type of power supplied to your facility, consult your local power company. Check that the voltage setting matches the electrical supply voltage.

9. **Grounding and Polarization** – The scanner AC/DC adapter is equipped with a polarized AC plug with integral safety ground pin. Do not defeat the safety ground in any manner.

10. **Power Cord Protection** – Power supply cords must be routed so that they are not likely to be walked on nor pinched by items placed upon or against them. Pay particular attention to the cords at AC wall plugs and convenience receptacles and at the point where the cord enters the AC/DC adapter.

11. **Lightning** – For added protection for this scanner during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the AC wall outlet. This will prevent damage to the product due to lightning and power line surges.

12. **Power Overloading** – Do not overload AC wall outlets, extension cords, or integral convenience outlets as this can result in a fire or electric shock hazard.

13. **Operating Environment** – Observe these basic safety requirements:

    ‣ Do not operate the scanner out of doors.

    ‣ Do not use where aerosol sprays are being used or where oxygen is being administered.

    ‣ Do not let the scanner or its cables or accessories come into contact with surfaces which are too hot to touch.

    ‣ Do not place anything on top of the scanner.

14. **Object and Liquid Entry** – Never push objects of any kind into the scanner through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the scanner.

15. **Accessories** – Do not place the scanner on an unstable cart, stand, tripod, bracket, or table. The scanner may fall, causing serious injury and damage to the product. Any mounting of the scanner needs to follow manufacturer's installation instructions. Do not place anything on top of the scanner.

16. **Moving** – The scanner should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product to overturn. Removal of the scanner may void the applicable product warranty—contact Leica Biosystems Imaging for advice.

17. **Servicing** – Refer all servicing to qualified service personnel.

18. **Damage Requiring Service** – Unplug the scanner from the wall AC outlet and refer servicing to qualified service personnel under the following conditions:

    ‣ When the AC cord or AC/DC adapter is damaged.

    ‣ If liquid has been spilled or objects have fallen into the scanner.

    ‣ If the scanner has been exposed to rain or water.

    ‣ If the scanner does not operate normally (when you are following operating instructions).

    ‣ If the scanner has been dropped or damaged in any way.

    ‣ When the scanner exhibits a distinct change in performance. This indicates a need for service.

19. **Replacement Parts** – When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer. Unauthorized substitutions may result in fire, electric shock, or other hazards.

20. **Operational Check** – Upon completion of any repairs to this scanner, ask the service technician to perform operation checks to determine that the product is in proper operating condition.

21. **Cleaning** – Do not use liquid cleaners or aerosol cleaners. Use only a damp cloth for cleaning.

Index

Symbols

▸ The following symbols may appear on your product label or in this user's guide:

	Consult instructions for use	
	Manufacturer	
	Date of manufacture	
EC REP	Authorized representative in the European Community	
IVD	In vitro medical diagnostic device	
SN	Serial number	
REF	Catalog number	
RH	Relative humidity range	
	Biological risks	
	Temperature limit	
	Electronic and electrical equipment waste disposal	
	Caution	
	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert you to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.	
	The flat surface with waves symbol within an equilateral triangle is intended to alert you to the presence of hot surfaces which could cause burn damage.	
	The UV lamp within an equilateral triangle is intended to alert you to the presence of UV light within the product's enclosure that may be of sufficient magnitude to constitute a risk to the operator.	