L E I C A  B I O S Y S T E M S  I M A G I N G

# APERIO GT 450

## DIGITAL PATHOLOGY SLIDE SCANNER

**USER'S GUIDE**

(NOT for use in China)


Advancing Cancer Diagnostics
Improving Lives

Leica BIOSYSTEMS

# Aperio GT 450 User's Guide

MAN-0391, Revision G | December 2024

This manual applies to Aperio GT 450 Controller, Aperio GT 450 Console, and Aperio GT 450 SAM versions 1.4 and later.

Original Instructions.

## Copyright Notice



## Customer Resources

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

## Contact Information – Leica Biosystems Imaging, Inc.

| Headquarters | Customer Support |
|---|---|
| Leica Biosystems Imaging, Inc.<br>1360 Park Center Drive<br>Vista, CA 92081<br>USA<br>Tel: +1 (866) 478-4111 (toll free)<br>Direct International Tel:<br>+1 (760) 539-1100 | Contact your local support representative with any query or service request.<br><br>https://www.leicabiosystems.com/contact-us/ |

| Importers | |
|---|---|
| Leica Biosystems Deutschland GmbH<br>Heidelberger Straße 17-19<br>69226 Nussloch, Germany | Leica Microsystems (UK) Limited<br>Larch House, Woodlands Business Park<br>Milton Keynes, England, United Kingdom, MK14 6FG |

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CE UKCA

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REF 23GT450, 23GT450SAM, 23GT450SAMSW, 23GT450ZSTACKSW, 23GT450-R

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# Notices

## Important message

Service personnel and distributors who have access to protected patients' information must treat all such information as confidential in accordance with professional ethics, accreditation standards, and legal requirements.

# Revision Record

| Rev. | Issued | Sections Affected | Detail |
|---|---|---|---|
| G | December 2024 | Chapter 3: Slide preparation<br><br>Chapter 4: Scan slides<br><br>Chapter 5: Maintenance<br><br>Chapter 6: Troubleshooting | Chapter 3: Slide preparation: Added instructions to clarify slide preparation requirements: Slide preparation checklist (on page 33); Slide quality control (on page 36); General guidelines for slide preparation (on page 37)<br><br>Chapter 4: Scan slides Added instructions for using new features: Manual Scanning (on page 67); Extended Focus scanning (on page 52); Aperio iQC Software Module Notifications (on page 72)<br><br>Chapter 5: Maintenance: Added the following daily maintenance recommendations: Inspect the stage slide tray (on page 79); Inspect the pusher/puller (on page 81). Added a caution statement to clarify instructions: Restart the scanner after interior maintenance (on page 91). Clarified instructions for Clean the objective and Koehler (on page 82). Added Scanner Maintenance Log (on page 93)<br><br>Chapter 6: Troubleshooting: Revised troubleshooting procedures to improve clarity or include additional instructions. In Slide errors and solutions (on page 117) section, revised No barcode (on page 118); No tissue (on page 118); Image quality (on page 119)Image quality (on page 119) Added White striping appears on scanned images (on page 126) |
| F | October 2024 | Copyright page, "Notices;" Chapter 1, "Introduction;" Chapter 2, "Aperio GT 450 overview;" Chapter 4, "Scan slides;" Chapter 6, "Troubleshooting" | Added UKCA symbol and CE mark on on page 2, and the UKCA symbol to the Symbols (on page 11); Revised Symbols on page 11 to meet current compliance requirements; Chapter 1: Revised Aperio GT 450 Compliance Specifications (on page 17) to meet current compliance requirements; Chapter 2: Added Theory of operation (on page 23); revised Key features (on page 28) to include Release 1.3 features; Chapter 4: Added 20x magnification scanning (on page 47); added Z-Stack scanning (on page 49); added Check that the scanned image covers all slide tissue (on page 64); Chapter 6: Revised 1007: Internal storage full. Cannot send images to DICOM converter. (on page 108) for clarity; revised Image transfer error – pending retry (on page 120) for clarity; revised Network connection lost (on page 124) for clarity. |

| Rev. | Issued | Sections Affected | Detail |
|---|---|---|---|
| E | March 2022 | Front matter, Compliance Specifications, Chapter 4, "Scan Slides," Chapter 6, “Troubleshooting” | Added revision history, cautions and notes, updated compliance specifications; Chapter 4: Updated scan workflow diagram to include manual image quality check. Added new section “Image Quality Control for Histotechnicians and Pathologists;" Chapter 6: Added troubleshooting section for lost Internet connection. |
| D | April 2020 | All | Changed references to two monitors to “monitor(s)” to accommodate change in product configuration. |
| C | November 2019 | All | Updated graphics for patch 1.0.1. |
| B | October 2019 | All | Changes for patch 1.0.1. Updated graphics, added new section “Scan Entire Slide for Whole Rack.” |
| A | June 2019 | All | New document. |

# Cautions and Notes

- Serious Incidents Reporting – Any serious incident that has occurred in relation to the Aperio GT 450 shall be reported to the manufacturer and the competent authority of the member state in which the user is established.
- Specifications and Performance – For device specifications and performance characteristics, see the document *Aperio GT 450 Specifications*.
- Installation – Aperio GT 450 must be installed by a trained Leica Biosystems Technical Services representative.
- Repair – Repairs may be done only by a trained Leica Biosystems Technical Services representative. After repairs are done, ask the Leica Biosystems technician to perform operation checks to determine the product is in good operating condition.
- Accessories – For information on using Aperio GT 450 with third-party accessories such as a Laboratory Information System (LIS) not provided by Leica Biosystems, contact your Leica Biosystems Technical Services representative.
- Quality Control – For information on image quality checks, see Image quality control for histotechnicians and pathologists (on page 64).
- Maintenance and Troubleshooting – For information on maintenance and troubleshooting, see the *Aperio GT 450 User’s Guide*.

- Cybersecurity – Be aware that workstations are susceptible to malware, viruses, data corruption, and privacy breaches. Work with your IT administrators to protect workstations by following your institution's password and security policies.

  To protect workstations and servers from malware intrusion, use caution when inserting USB drives and other removable devices. Consider disabling USB ports that are not in use. If you plug in a USB drive or other removable device, you should scan the devices with an anti-malware utility. For Aperio recommendations on protecting your workstations and servers, see the *Aperio GT 450 IT Manager and Lab Administrator Guide*.

  If a suspected Aperio GT 450 cybersecurity vulnerability or incident is detected, contact Leica Biosystems Technical Services for assistance.

  As a system security measure, Leica Biosystems products capture and log external attempts to access system data. For more information, contact your Leica Biosystems representative.
- Training – This manual is not a substitute for the detailed operator training provided by Leica Biosystems or for other advanced instruction.
- Safety – This device is intended for indoor use only. Safety protection may be impaired if this device is used in a manner not specified by the manufacturer.

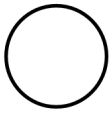
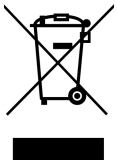
# Intended Use

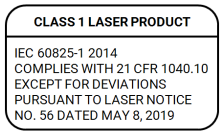
For research use only. Not for use in diagnostic procedures.

# Symbols

The following symbols appear on your product label or in this user guide:

| Symbol | Regulation/Standard | Description |
|---|---|---|
|  | ISO 15223-1 - 5.4.3 | Consult Instructions for Use |
|  | ISO 15223-1 - 5.1.1 | Manufacturer |
|  | ISO 15223-1 - 5.1.3 | Date of manufacture |
|  | ISO 15223-1 - 5.1.8 | Importer |
|  | 21 CFR 809.10(c)(2)(i) | For research use only. Not for use in diagnostic procedures. |
|  | ISO 15223-1 - 5.1.7 | Serial number |
|  | ISO 15223-1 – 5.1.6 | Catalog number |
|  | ISO 15223-1 – 5.7.10 | Unique Device Identifier |
|  | Machinery Directive 2006/42/EC | Device carries the CE (Conformitè Europëenne) Mark and fulfils the requirements of Machinery Directive 2006/42/EC and additional EU Directives, as shown Machinery and Materials. |
|  | Electromagnetic Compatibility Regulations 2016 and Low Voltage Electrical Equipment Regulations 1989 | Device is in compliance with UK Conformity Assessment requirements. |
|  | ISO 15223-1 - 5.4.4 | Caution |
|  | SO 7010 – W001 | General warning |

| Symbol | Regulation/Standard | Description |
|---|---|---|
|  | IEC 61010-1 | TÜV Product Services have certified that the listed products comply with both U.S. and Canadian safety requirements. |
|  | IEC 60417 - 5031 | This device is suitable for direct current only. |
|  | IEC 60417 - 5007 | On. To indicate connection to the mains, at least for mains switches or their positions, and those cases where safety is involved. |
|  | IEC 60417 - 5008 | Off. To indicate disconnection from the mains, at least for mains switches, and all those cases where safety is involved. |
|  | ISO 15523-1 5.7.3 | Temperature limitation |
|  | ISO 15223-1 5.3.8 | Humidity limitation |
|  | 2012/19/EU | Device is regulated under 2012/19/EU (WEEE Directive) for Electrical and Electronic Equipment Waste and must be discarded under special conditions. |
|  | People's Republic of China Electronic Industry Standard SJ/T11364 | Device contains certain toxic or hazardous elements and can be used safely during its environmental protection use period. The number in the middle of the logo indicates the environmental protection use period (in years) for the product. The outer circle indicates that this product can be recycled. |
|  | National Standard of the People's Republic of China Requirements of concentration limits for certain restricted substances in electrical and electronic products GB/T 26572-2011 | Device contains certain toxic or hazardous elements and can be used safely during its environmental protection use period. The "e" inside circle indicates product is compliant with Requirements of concentration limits for certain substances in electrical and electronic products GB/T 26572-2011. The outer circle indicates that the product can be recycled. |

| Symbol | Regulation/Standard | Description |
|---|---|---|
|  | IEC 60825-1 | Device is a Class 1 Laser Product that is in compliance with international standards and US requirements. |
|  | CA Proposition 65 | This product can expose you to chemicals known to the State of California to cause Cancer and Reproductive Harm. For more information go to https://www.P65Warnings.ca.gov. |
|  | N/A | Device is made in the USA of U.S. and foreign components. |

# 1 Introduction

In this section:

The Aperio GT 450 is a high performance, brightfield whole slide scanner that includes continuous loading with 450-slide capacity across 15 racks, priority rack scanning, automated image quality check and a scan speed of ~32 seconds at 40x scanning magnification for a 15 mm x 15 mm area.

Use of the Aperio GT 450 requires the following components.

| Component | Description |
|---|---|
| Aperio GT 450 Scanner Administration Manager (Aperio GT 450 SAM) Server | The Aperio GT 450 SAM Client Application Software resides on a server, which is referred to in this document as the Aperio GT 450 SAM server. The Aperio GT 450 SAM server connects to multiple Aperio GT 450 scanners. |
| Aperio GT 450 SAM Client Application Software | The Aperio GT 450 SAM client application software enables IT implementation, PIN configuration, and service access of multiple scanners from a single desktop client location for IT professionals. |
| Workstation, monitor, and keyboard | A workstation, monitor, and keyboard must be connected to your local area network with access to the Aperio GT 450 SAM server to administer the Aperio GT 450 scanners. |

See the *Aperio GT 450 Specifications* for more information on these components.

Ensure you follow appropriate good laboratory practices and the policies and procedures required by your institution for slide preparation, processing, storage, and disposal. Use this equipment only for this purpose and in the manner described in this guide.

# Resources

| Resource | Description |
|---|---|
| Aperio GT 450 User's Guide | Provides reference information and instructions for scanning, troubleshooting, and maintenance. |
| Aperio GT 450 Quick Reference Guide | Contains quick instructions for scanning, basic troubleshooting, and maintenance. We recommend keeping this printed guide with your scanner. An electronic version of the quick reference guide is available from the Help area on the scanner's touchscreen interface. |
| Aperio GT 450 IT Manager and Lab Administrator's Guide | Contains information and instructions regarding IT administration of the scanner, including network administration and configuration. |
| Aperio GT 450 Specifications | Provides detailed specifications for the scanner. |
| Aperio GT 450 DICOM Upgrade Guide | Provides information on setting up the optional Aperio GT 450 1.3 DICOM Feature Pack. |
| Instructional videos | Provides video instruction on performing various tasks. You can view the videos from the Help area on the scanner's touchscreen interface. |
| Customer Support | If you have an issue with the scanner you cannot resolve, contact Leica Biosystems Technical Services. |
| Training | Leica Biosystems offers classroom and virtual training courses. Contact Leica Biosystems Customer Support for information about training options. |

# Warnings

This section contains important safety and operation warnings. For more details, see also Scanner safety instructions (on page 19).

## Electromagnetic warnings

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

Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the scanner, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.

This device complies with the emissions and immunity requirements as specified in the EN/1EC 61326 series of Product Family Standards for a "basic electromagnetic environment". Such equipment is supplied directly at low voltage from public mains network. This equipment is not intended for residential use.

This device generates, uses, and can radiate unintentional radio-frequency (RF) energy. If this device is not installed and operated correctly, this RF energy can cause interference with other equipment. It is the responsibility of the end user to be sure that a compatible electromagnetic environment for the device can be maintained so that the device operates as intended.

This equipment is designed for use in a PROFESSIONAL HEALTHCARE FACILITY ENVIRONMENT. It is likely to perform incorrectly if used in a HOME HEALTHCARE ENVIRONMENT. If it is suspected that performance is affected by electromagnetic interference, correct operation may be restored by increasing the distance between the equipment and the source of the interference.

In addition, other equipment can radiate RF energy to which this device is sensitive. If one suspects interference between this device and other equipment, Leica Biosystems recommends the following actions to correct the interference:

- Evaluate the electromagnetic environment before installation and operation of this device.
- Do not operate this device close to sources of electromagnetic radiation (for example: unshielded intentional RF sources), as these can interfere with proper operation. Examples of unshielded intentional radiators are handheld radio transmitters, cordless phones, and cellular phones.
- Do not place this device near medical electrical equipment that can be susceptible to malfunctions caused by close proximity to electromagnetic fields.
- This device has been designed and tested to CISPR 11 Class A emission limits. In a domestic environment, this device can cause radio interference, in which case, you need to take measures to mitigate the interference.

## 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.

## Component and part replacement warnings

There are no user-replaceable parts or components in the Aperio GT 450 scanner. Replacement of parts or components within the Aperio GT 450 scanner must be performed by qualified Leica Biosystems Technical Services personnel using Leica Biosystems specified parts.

# Aperio GT 450 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 was evaluated against and complies to the following standards.

| Feature | Details |
|---|---|
| Safety |  <br>IEC 61010-1:2010<br>IEC 61010-1: 2010/AMD1:2016<br>IEC 61010-2-101: 2018<br>CAN/CSA C22.2 No. 61010-1:2012/A1:2018<br>CAN/CSA C22.2 No. 61010-2-101:2019<br>UL 61010-1:2012/R2019-07<br>UL 61010-2-101:2019<br>EN 61010-1:2010/A1:2019<br>EN 61010-2-101:2017 |
| Electromagnetic Compatibility (EMC) | EMC Directive (2014/30/EU)<br>EN 61326-1:2013<br>CISPR 11: 2015<br>FCC Part 15 Subpart B<br>ICES-003 Issue 6: 2016<br>CNS13438: 2006<br>KN 32: 2015-12<br>KN 35: 2015-12 |
| Machinery and Materials | IEC 60825-1:2014 (Class 1 Laser)<br>2011/65/EU - Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2)<br>2015/863 - Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 3)<br>2006/42/EC - Machinery Directive<br>2014/35/EU – Low Voltage Directive |

# Installation

**WARNING:** Two people are required for lifting the scanner.

Installation and setup of the scanner should only be performed by a trained Leica Biosystems Service representative. After installation, the Leica Biosystems Service representative will check the scanner for proper operation.

**WARNING:** Incorrect installation could result in serious injury to the operator or ergonomic strain. For work surface and operating specifications, see the *Aperio GT 450 Specifications*, MAN-0393.

When you first receive the Aperio GT 450 scanner and accessories, inspect the pallet and attached boxes for any damage. If the package has visible damage from shipment, contact Leica Biosystems Customer Service for assistance.

# Disposal of the Aperio GT 450

The service life of the Aperio GT 450 is five years. After that time, cybersecurity patches and other technical support may not be provided.

This device is regulated as Electrical and Electronic Equipment Waste (WEEE) under 2012/19/EU and must be discarded under special conditions. Contact Leica Biosystems Imaging, Inc. for assistance or questions regarding device disposal.

# Scanner safety instructions

This section contains important safety information for the Aperio GT 450 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.
- Heed All Warnings – All warnings on the scanner and those listed in the operating instructions must be adhered to.
- Follow All Instructions – All operating and scanner usage instructions must be followed.

1. Heat – The scanner must be situated away from any heat sources such as radiators, heat registers, stoves, or other products that produce heat.
2. 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.
3. 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.
4. 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.
5. Environment – This device is intended for indoor use only.
6. Attachments – Do not use any attachments not recommended by the product manufacturer as they may cause hazards.

7 **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.

8 **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.

9 **Cable Protection** – Secure all external cables to avoid operator injury.

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. The appliance coupler on the external AC/DC power supply is considered the mains disconnect device.

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 or 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.

**WARNING:** Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation.

16 **Moving** – Use care if you must slide the scanner around the workbench. If you need to pick up the scanner to move it off the workbench, contact Leica Biosystems Technical Services. Moving the scanner may void the applicable product warranty—contact Leica Biosystems 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 and may affect product compliance.

The objective in the Aperio GT 450 scanner has been specifically designed for this device. Do not replace it with another type of objective.

**WARNING:** Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation. Unauthorized substitutions may result in fire, electric shock, or other hazards and may affect product compliance.

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** – Apply the recommended cleaning solution to a clean cloth to clean the equipment. Do not apply cleaning solutions directly to the equipment.

# 2 Aperio GT 450 overview

In this section:

This chapter provides an overview of the Aperio GT 450 Scanner.

# Theory of operation

The Aperio GT 450 scanner contains an automated slide loader subsystem which is designed to process standard 1" × 3" (2.54 cm × 7.62 cm) microscope slides.

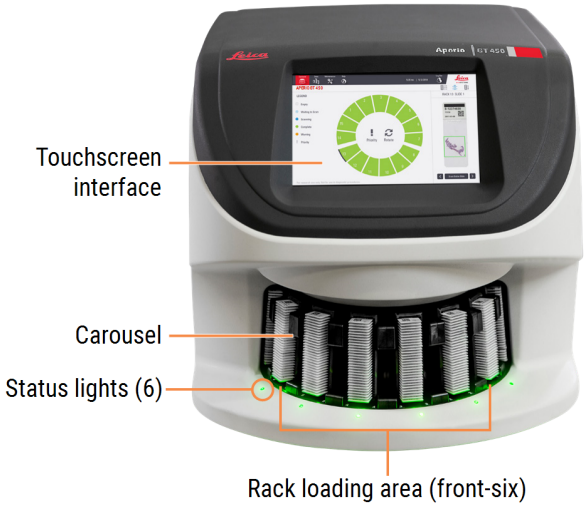
The scanner automatically loads the slides from the slide racks that the technician loaded into the scanner carousel. The slides are moved onto the scanning stage based on the automated processing and queueing of the racks.

Once the slide is on the stage, the imaging process begins with capturing the macro image, automatically detecting tissue, automatic placement of initial focus points (and reference stripe location), capturing the label image (including any barcode), and the image acquisition is initiated.

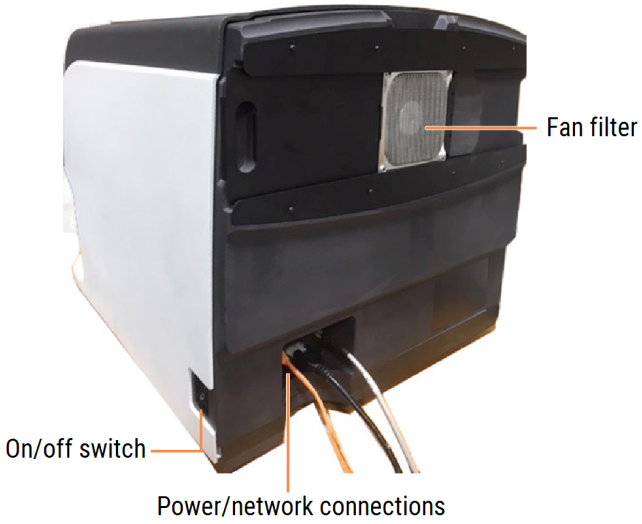
The tissue finding and scanning processes are automated without any need for the user to manipulate the slides being processed. If there is a need based on the quality review of the scanned image or tissue finder results, the device has the capability to reinitiate the scan with a different user selected mode (entire slide scan). The device images the slide using transmitted light from the Koehler Light Source through the specimen to the optical path (including the objective, tube lens, apertures, and mirrors). At this point the light travels to the line scan camera where the imaging data is captured and processed. The Aperio GT 450 scanner acquires images in stripes, as the motion subsystem moves the slide across the Koehler and optical path. These stripes of data are processed in the control VPU and sent to a database for use in later pathology workflow steps. Once the slide has finished scanning, it is automatically removed from the stage, returned to the slide rack, and the next slide is loaded.

# Scanner overview

This section describes the parts of your scanner used in daily operation.




Front




Back

The following section describes the main scanner elements:

| Element | Use | More details |
|---|---|---|
| Touchscreen Interface | View rack statuses, set rack options, and view other information. | See Touchscreen interface overview (on page 25). |
| Carousel | The carousel contains 15 rack slots. After you load racks in the carousel, the carousel rotates the racks to the scanning area and the rack loading area. | See Carousel rotation (on page 42). |
| Rack loading area | Provides access to the carousel to load and unload slide racks. This area is also referred to as the "front-six," because the rack loading area gives you access to six rack slots at a time. | See Load racks in the carousel (on page 44). |
| Safety light curtain | The infrared safety light curtain detects objects in the rack loading area. The carousel only rotates when the safety light curtain area is clear. | See Carousel rotation (on page 42). |
| Status lights | The status lights are located below the rack slots in the rack loading area. They indicate the status of the front-six racks and the scanner. The colors of the status lights match the colors of the rack status Legend on the touchscreen interface. | See Check scan status (on page 57).<br>See Red blinking lights on carousel (on page 95). |
| Fan filter | The fan filter is located on the back of the scanner. Clean the fan filter at least every six months. You can insert the fan filter from the left side, the right side, or the top (requires a different fan filter holder). | See Clean the fan filter (on page 88). |

# Turn the scanner on and off

The On/Off switch is located on the right side of the scanner near the back.

- On position = |
- Off position = ◯

When you are turning the scanner off and on, follow these procedures according to the situation:

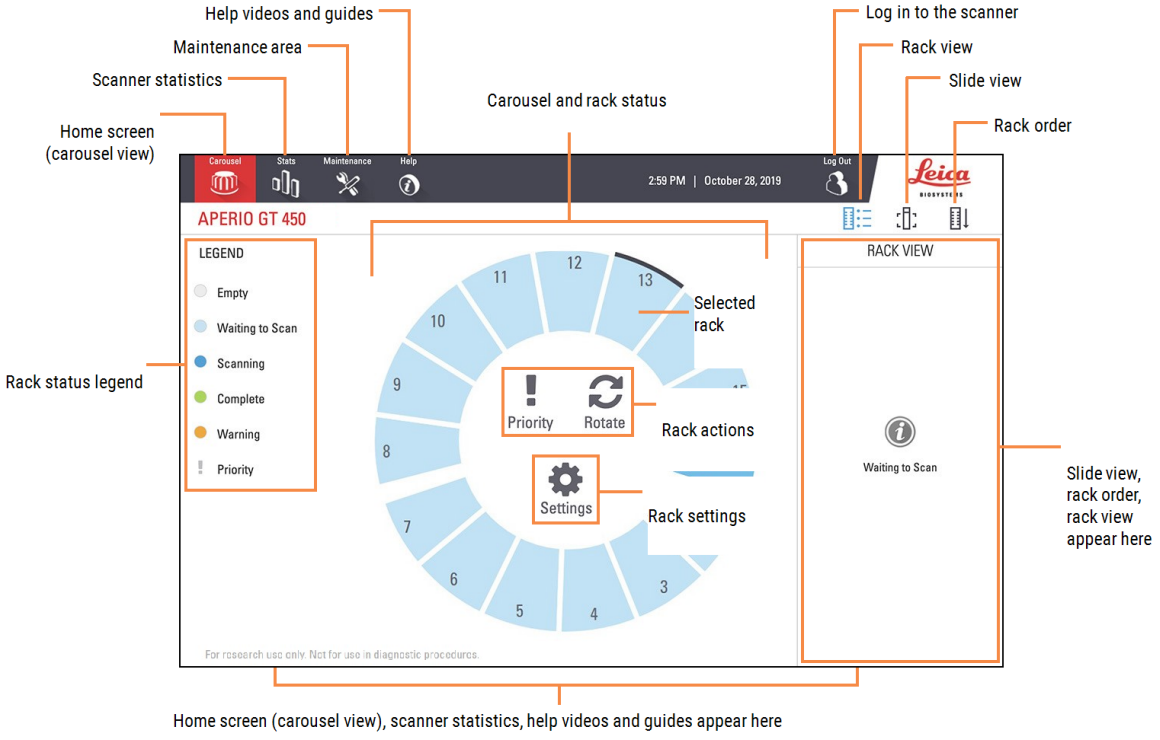
- Shut down the scanner (on page 75).
- Restart the scanner after interior maintenance (on page 91).
- Perform a safe restart after an error (on page 96).

# Touchscreen interface overview

The touchscreen interface is where you view the scan status and interact with the scanner. Tap an area on the touchscreen interface to view information or perform an action.

## Home screen

The Home screen (Carousel view) is where you view rack and slide status. The buttons along the top enable you to access other areas, such as Help and Maintenance.



The following section describes the Home screen elements.

| Element | Icon | Use | More details |
|---|---|---|---|
| Rack status legend | not applicable | The **Legend** defines colors and icons that indicate rack status. Status colors appear on the rack slot positions on the touchscreen interface, and on the status lights in front of the carousel.<br>**Note:** the Legend is for information only and is not interactive. | Check scan status (on page 57) |
| Scanner statistics |  | Tap **Stats** to view scan statistics, such as the number of slides or racks scanned within a certain time period. | Scan statistics (on page 66) |
| Maintenance |  | Tap **Maintenance** if you need to restart the scanner, or view the serial number and the hardware and firmware versions of your scanner. | Serial number and firmware version (on page 74)<br>Shut down the scanner (on page 75)<br>Restart the scanner (on page 77) |
| Help |  | Tap **Help** to view training and maintenance videos, or access an online version of the quick reference guide. | Help videos and guides (on page 27) |
| Carousel and rack status | not applicable | Use the carousel and rack position on the touchscreen interface to:<br>• View the rack status, indicated by the color of the rack position.<br>• Tap a rack position to select the rack.<br>• Apply an action to the selected rack, such as Priority or Rotate (described next). | Carousel rotation (on page 42)<br>Check scan status (on page 57) |
| Rack actions<br>Note: Rack actions appear when you select a rack. |  | Select a rack and tap **Priority** to move the rack to the top of the scan queue. | Priority scanning (on page 46) |
| |  | Select a rack and tap **Rotate** to rotate the rack to the rack loading area. | Rotate a rack to the rack loading area (on page 55) |
| Rack settings<br>Note: Rack settings appear when you select a rack. |  | Select a rack and tap **Settings** to select and apply a rack setting. | Scan entire slide for whole rack (on page 63)<br>Change the scan magnification for a rack of slides (on page 47) |

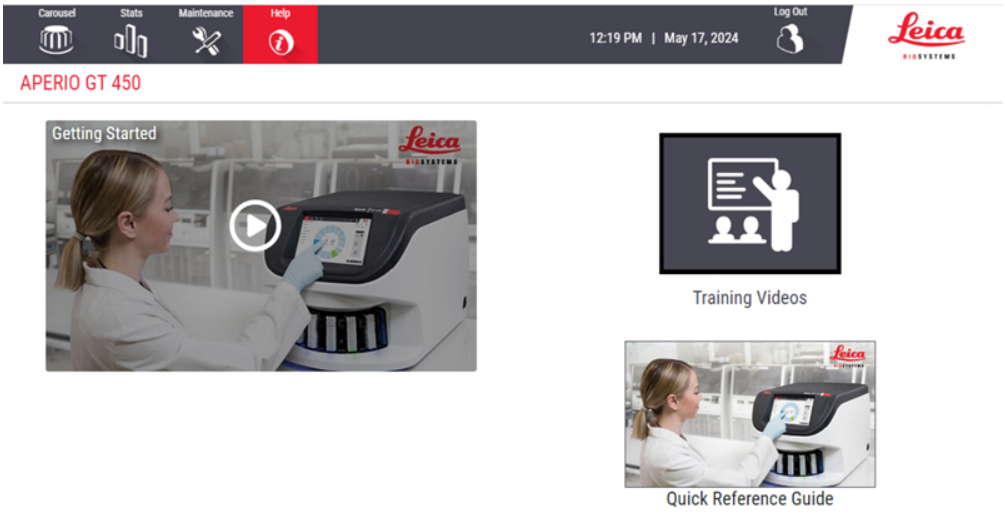
| Element | Icon | Use | More details |
|---|---|---|---|
| | | | Scan a rack of slides using z-stack scanning (on page 49)<br>Scan a rack of slides using Extended Focus (on page 52) |
| Login, Logout | | Tap **Login** to open a keypad and enter your pass code to access the scanner. | Log in and log out of the scanner (on page 42) |
| | | Tap **Logout** to lock access to the scanner touchscreen interface. | |
| Rack View | | Select a rack and tap **Rack View** to view the scan status for each slide in the rack. | View slide status for a rack (on page 59) |
| Slide View | | Select a rack and tap **Slide View** to view macro images for each slide. | View macro images of scanned slides (on page 60) |
| Rack Order | | Tap **Rack Order** to view scan order and status of the racks. | View rack scan order (on page 60) |

# Help videos and guides

You can access training videos and the *Aperio GT 450 Quick Reference Guide* directly from the touchscreen interface.

We recommend that you watch the training videos before operating the scanner for the first time.

1 From the Home screen, press **Help**, and then tap a video or guide to view.



# Key features

This section describes some key features of your Aperio GT 450.

## Continuous load workflow

You can continuously load new racks and unload completed racks without interruption.

## Scan magnification

Custom optics for native 40x scanning magnification, with the option to scan slides at 20x or 40x magnification, depending on the needs of your organization or specific project.

## Automatic image quality check

The Auto-Image QC automatically checks scan quality. If the scan status is green for “complete,” the scan and Image QC were successful. If there is a problem with the scan quality on a slide, the system alerts you.

## Manual Scanning

The optional Manual Scan feature enables you to manually adjust the scan settings using the macro image from an automatic scan and re-scan a single slide without removing the slide from the scanner.

## Z-Stack scanning

The optional Z-Stack scanning feature enables you to scan a glass slide at different focal planes along the vertical z-axis, and stack the images on top of each other to produce a 3D composite multiplane image.

## Extended Focus

The optional Extended Focus feature enables you to scan a single composite image file with optimized focus. The Extended Focus scanning process uses z-stack layers to achieve optimal focus on the entire depth of tissue. The optimally-focused areas across the z-stack layers are identified and then fused into a single image.

## Image types supported

The Aperio GT 450 creates SVS files or DICOM images. The .svs image format is the default.

For information on enabling the optional DICOM feature, see the *Aperio GT 450 DICOM Upgrade Guide*.

## Slide types supported

The scanner supports 1-inch x 3-inch (2.54-cm x 7.62-cm) glass slides (per ISO 8037/1).

## Coverslips

Fully-cured coverslips are required. The Aperio GT 450 supports common industry coverslips used for 1 x 3 inch slides.

## Slide racks supported

Optimized and recommended for use with Leica HistoCore Spectra workstation racks (stainer and coverslipper), which include the Leica Universal Rack 30-slide capacity (part number 23RACKGT450). Sakura Prisma Stainer and Coverslipper Rack 20-slide capacity racks are also accepted.

## Slide capacity

The maximum slide capacity depends on the racks used:

- 20-slide racks – load up to 300 glass slides.
- 30-slide racks – load up to 450 glass slides.

## Barcodes supported

The Aperio GT 450 supports the following barcodes:

- NW7
- QR Code
- Data Matrix
- Interleaved 2 of 5
- Code 39
- Code 128
- PDF417
- MicroPDF41
- Aztec

For more information about barcodes, see the *Aperio GT 450 Specifications*.

# Optional Aperio Viewing Station

We recommend using the Aperio Viewing Station for slide image viewing. The Aperio Viewing Station is optional and is not included in the Aperio GT 450 product. For more information, contact your Leica Biosystems representative.

If you do not purchase the viewing station, we recommend using a calibrated monitor for optimal image viewing.

For detailed viewing station and monitor specifications and requirements, see the *Aperio GT 450 Specifications*.

# Aperio Digital Slide Viewers

You can use the following viewers to view digital slides created on the Aperio GT 450 scanner:

- Aperio ImageScope (version 12.4 or higher) – this product comes pre-installed on viewing workstations (if purchased). For the latest version of Aperio ImageScope, contact your Lab Manager or download the installation file from the Leica Biosystems website. You must have administrator privileges on your viewing station to install Aperio ImageScope.
- Aperio WebViewer – this viewer is integrated with Aperio eSlide Manager. It is also available for LIS integration.

# 3 Slide preparation

In this section:

# Slide preparation overview

This section contains tips on best practices for slide preparation for your Aperio GT 450 scanner. To ensure the best possible quality and continued peak operation, it is crucial to ensure slides and scanner components are clean and free of obstructions.

The scanner is designed to safeguard the handling of slides throughout the entire scanning process. The product features numerous sensors and mechanisms to detect the proper handling of slides. Should any of these safeguards detect an unexpected outcome, the device will safely halt ensuring the slide is protected from damage throughout the process.

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**. After reading this section, if you have questions about whether your slide preparation techniques will provide good scan quality, contact Leica Biosystems Technical Services for advice.

Always 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.

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

**CAUTION:** Ensure that the slides and racks you use meet the Aperio GT 450 specifications. For details, see the *Aperio GT 450 Specifications*. Do not modify racks or attach labels to them.

# Slide preparation checklist

### Slides

- Slides stained according to manufacturer's instructions.
- Slides are clean. Wipe with clean lint-free cloth (no chemical cleaners).
- No dirt, fingerprints, markings, writing, extra mounting media, broken slides, chips, or scratches.
- Slides are fully cured (not "wet").
- No mounting media around slide edges.
- No tissue on coverslip edges or overlapping the label.
- No stain residue around slide edge.

### Coverslips

- Fully cured coverslip in place. Must use coverslip.
- Minimal mounting media used.
- No air pockets under coverslip.
- Coverslip is not hanging over the side of the slide.
- Only one coverslip per slide.

### Slide labels

- Only one label per slide
- Labels do not extend past edges of the slide.
- Labels do not cover any tissue.
- Labels are not under the coverslip.
- Labels are firmly attached.
- Labels are not applied to the bottom surface of the slide.

### Barcodes

- Barcode labels meet same application requirements as slide labels
- Barcode labels applied to the slide label region.
- Only one barcode label per slide.
- Use only supported barcode labels.
- Use only high-quality printed barcode labels.

# Tissue preparation

For optimal scanner performance, slides must be well-prepared.

# 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.
- Use appropriate morphological studies and controls as specified in the reagent manufacturer's instructions.
- Avoid excessive stain residue, as this may affect scanner performance.

# Slide preparation guidelines

Many scanning issues are avoided by checking slide quality. Ensure the following:

- **Slides are very clean and in good condition**. Wipe them with a clean cotton cloth (don't use chemical cleaners). Make sure the slides have no dirt, no fingerprints, no markings, no writing, no extra mounting media, no broken slides, no chips, no scratches, etc.
- **Slides are fully cured** (not "wet").
- **All slides have coverslips**. Coverslips are required when using the Aperio GT 450 scanner.
- **There is no mounting adhesive around the edges of a slide**. This can cause it to stick or catch in the scanner stage area.

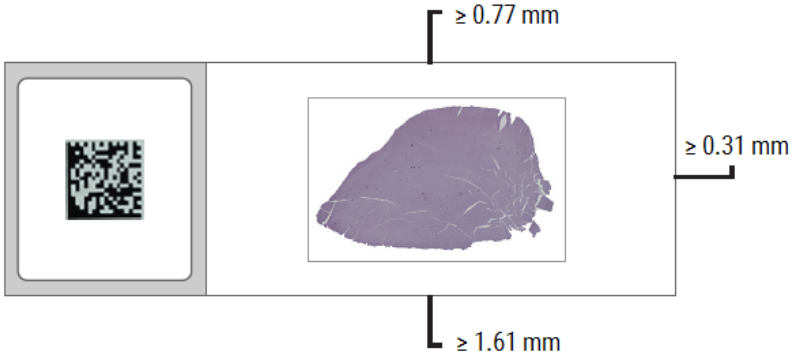
**CAUTION:** Do not attempt to scan damaged or broken slides, as doing so may damage the scanner.

## Tissue placement

Place the tissue in the middle of the slide, a distance from the edges of the slide, the label, and any other markings. Ensure the following:

- The coverslip covers all the tissue.
- The label does not cover any tissue.

The example below shows minimum distances from the side and bottom edges of a 26mm x 76mm (1" x 3") slide.




For more details on slide specifications, see Slide types supported (on page 28).

## Fixing slide preparation errors

Some physical problems of a slide can be resolved by cleaning the slide with a lint-free cloth or trimming the sides with a razor blade. Permanent problems with a slide may require the preparation of a new slide.

# Coverslips

Coverslips are required when using the Aperio GT 450. They must be fully-cured or have completed the on-board drying process for an automated coverslipper, such as the Leica Biosystems HistoCore SPECTRA Coverslipper.

The Aperio GT 450 supports common industry glass or plastic coverslips used for 1-inch x 3-inch (2.54 cm x 7.62 cm) slides. See the *Aperio GT 450 Specifications* for coverslip specifications. (Glass coverslips are recommended).

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

- Keep the mounting media that attaches the coverslip to the slide to a minimum. Excess mounting media makes it hard for the tissue finder to distinguish between actual tissue and the mounting media.
- Make sure there are no air pockets under the coverslip.
- For best results, do not mark or write on the coverslip.
- The coverslip must not hang over the side of the slide.
- Make sure there is only one coverslip attached to the slide.
- Wipe the coverslip clean of dust and fingerprints before loading the slide in the scanner.

# Labels

The Aperio GT 450 supports common industry labels used for 1 x 3 inch (2.54 cm x 7.62 cm) slides. Improperly applied slide labels can cause slides to jam.

Ensure the following:

- Do not apply multiple labels to the same slide—this can cause the slide to exceed the specification for slide thickness. See the *Aperio GT 450 Specifications* for slide specifications.
- Labels do not extend past the edges of the slide and do not cover any tissue.
- Labels are not underneath coverslips.
- Labels are firmly attached.
- Do not apply labels to the bottom surface of the slide.
- Always load slides into the rack with the label facing out and up, as shown in Load slides in the rack (on page 43).

The examples below show a slide with multiple labels that cause the slide to exceed the allowable maximum thickness, and a slide with the label peeling away:

# Barcodes

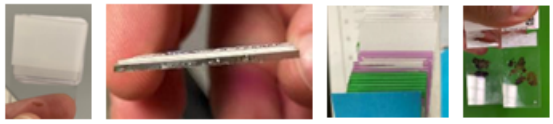
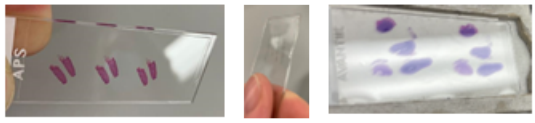
For a list of supported barcodes, see Barcodes supported (on page 29). For best performance, we recommend using barcode labels that have a white background and black ink.

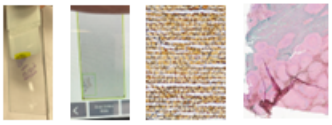
Improperly applied slide barcodes can cause slides to jam. Ensure the following:

- Barcode labels meet the same application requirements as slide labels. See Labels (on page 35).
- Apply barcode labels to the slide label region.
- Ensure a minimum of 0.5 mm between each side of the barcode and the edge of the label.
- Apply only one barcode label per slide.
- Use only supported barcode labels. See Barcodes supported (on page 29).
- Use only high-quality printed barcode labels.

# Slide quality control

Look for these issues in prepared slides.

| Issue | What to look for | Sample Issues |
|---|---|---|
| Labels | Overhanging (size of label), peeling, multiple (covering tissue, barcodes), placement (label region), print quality and supported barcode type |  |
| Coverslips | Overhanging (skewed), lifting, multiple, bubbles, excessive mounting media (edges of slide, bottom), wet |  |

| Issue | What to look for | Sample Issues |
|---|---|---|
| Cleanliness | Paraffin (slide transportation, sorting, handling), pen marks, fingerprints, dust/debris |  |
| Tissue | Thickness, size and proximity to other tissue, placement (away from edges), folds, chatter |  |
| Staining | Intensity (too dark or too light), overstaining, contamination |  |

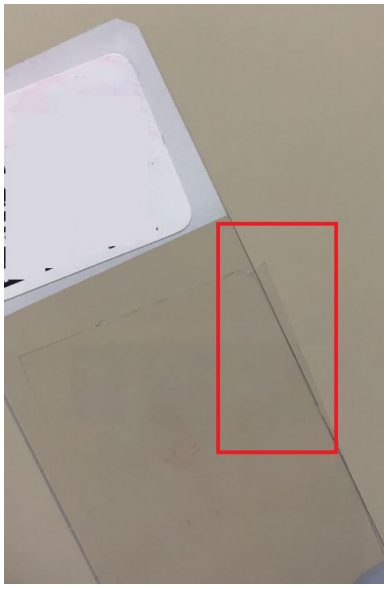
# General guidelines for slide preparation

To ensure the best possible quality and continued peak operation, it is crucial to ensure slides and scanner components are clean and free of obstructions. Examples of such obstructions are a) Debris on slides (on top and under slide), b) Overhanging labels and coverslip, c) Excessive mounting media.

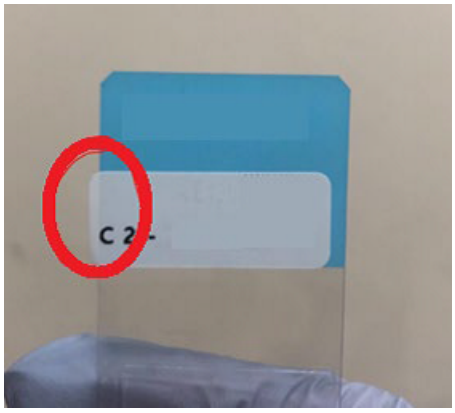
The scanner generates high magnification images with large field of view (FOV) at a high speed. To ensure good Image Quality, the slide needs to maintain its height on the stage while scanning and tissue/slide is flat within the FOV. If either of these fail, the sample will be out of focus or have uneven focus.

Here are a few examples of poor sample preparation that may cause slide handling errors in a scanner.

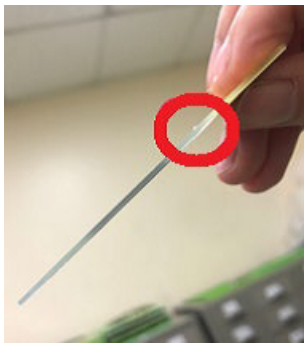
1 An overhanging or skewed coverslip may lead to slide loading and unloading errors as the slide is loaded to or from the scanning stage. It may also cause the slide to not sit firmly or flat in the slide tray and could lead to a physical shift during the scan process.



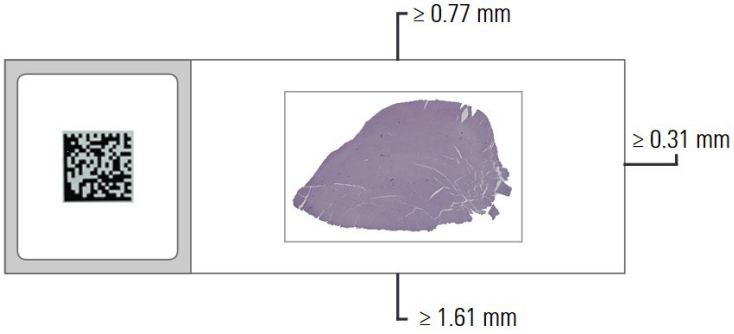
2 An overhanging label may lead to slide loading or unloading errors. Residue from the overhanging label may also transfer to the pusher assembly leading to slide loading/unloading errors for subsequent slides until the residue is cleaned.



3 Excessive mounting media around slide edges may lead to debris build up within the slide racks slots. This may cause slides to become affixed within the slide rack. Mounting media around the slide edges may also lead to slide load or unload errors.



4 When numerous slides with excessive mounting media are scanned over time, there may be mounting media buildups on the tray opening leading to a higher chance of slide loading or unloading errors. Debris on the bottom of the slide may create a catch point during the slide load or unload process leading to slide handling errors. Label on the backside of a slide may also create a catch point during the slide load or unload process leading to slide handling errors. Place the tissue in the middle of the slide, a distance from the edges of the slide, the label, and any other markings. Ensure the following: The coverslip covers all the tissue and the label does not cover any tissue. The example below shows minimum distances from the side and bottom edges of a 26 mm x 76 mm slide.



# 4 Scan slides

In this section:

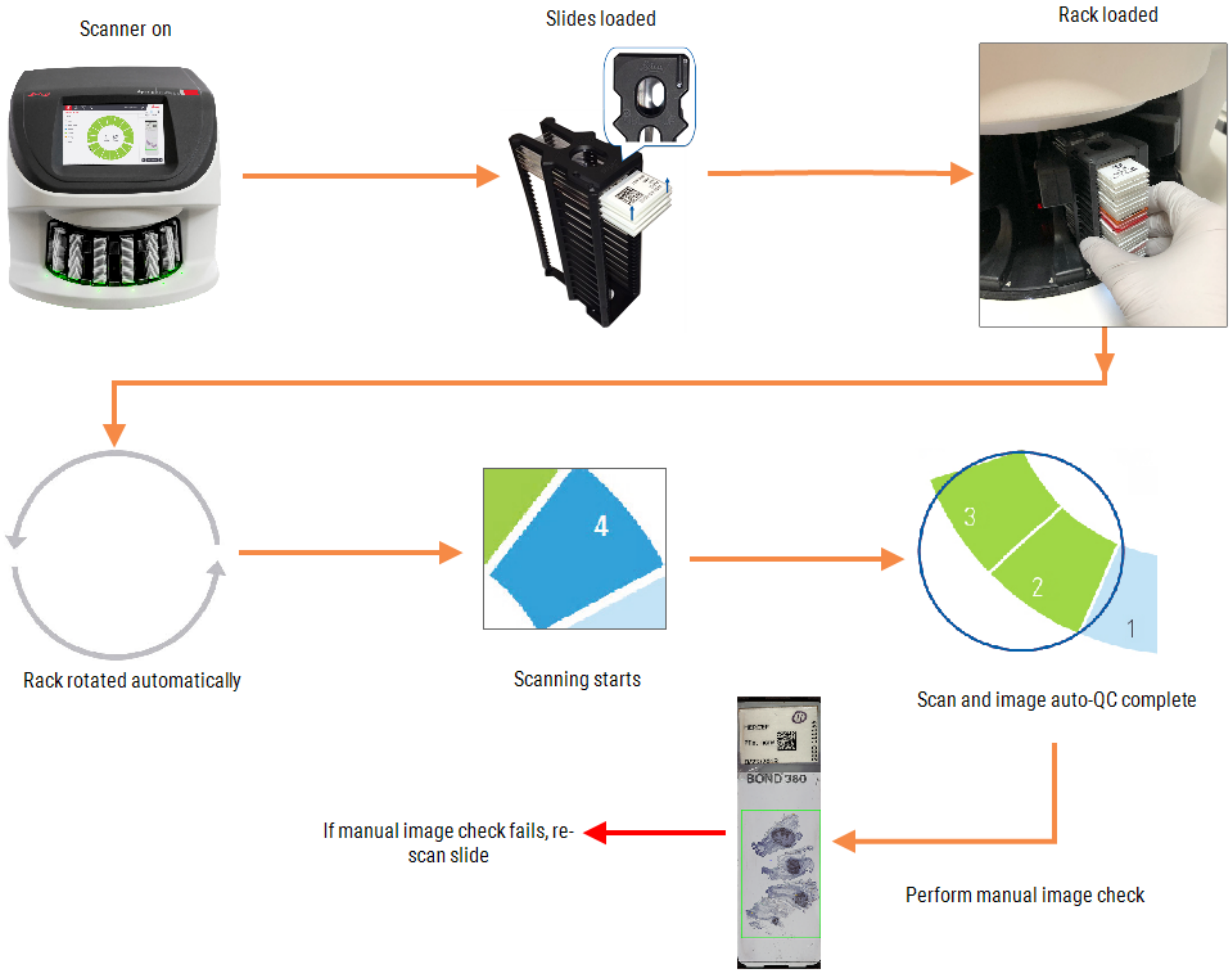
This chapter shows you how to scan slides.

# Scanning concepts

This section provides basic concepts on the scanning workflow and the carousel rotation features. We recommend reviewing this section before using the scanner.

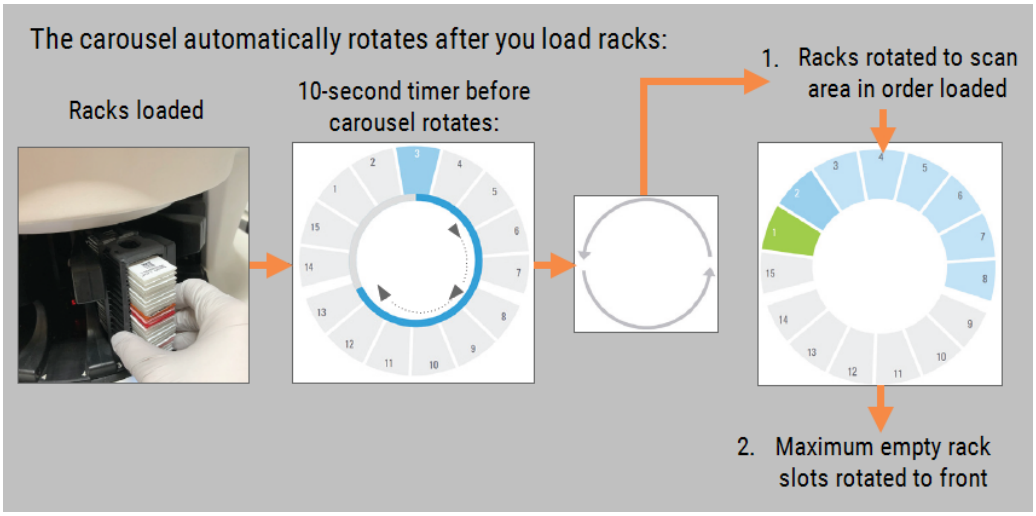
## Scan workflow

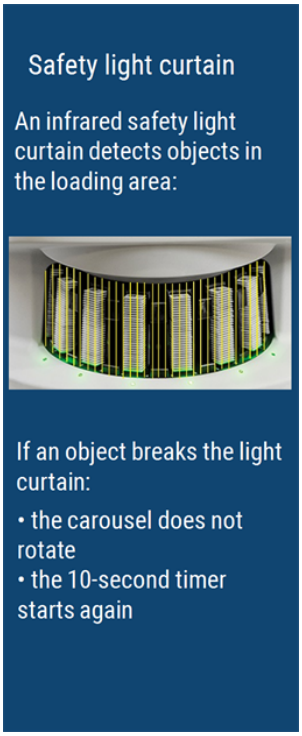
The Aperio GT 450 is a continuous load scanner. You can continually load new racks and unload completed racks, as shown below:



# Carousel rotation

Review the following information to understand the carousel rotation and safety features.




**WARNING:** Keep hands away from the carousel and pinch point areas when the carousel is rotating.

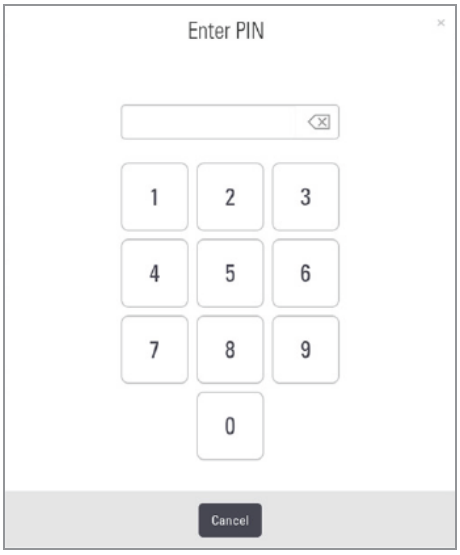
# Log in and log out of the scanner

Your Lab Administrator sets up the scanner pass codes and timeout period for your lab using the Aperio GT 450 Aperio GT 450 SAM client application software. You need to log into the scanner to interact with the touchscreen interface. You do not need to log in to load and unload racks for scanning.

As a security measure, the scanner logs you out after a period of time and requires you to enter the passcode.

1 From the touchscreen interface, tap **Login**.

2 When the keypad screen appears, enter your 5-digit passcode.




## To log out:

Logging out locks the touchscreen interface until a valid passcode is entered.

1 From the touchscreen interface, tap **Logout**.

# Load slides in the rack

For a successful scan, ensure you use the correct orientation of the slides and the rack.

To load slides in the rack:

1 Position the rack so the Leica logo and “SIDE UP” face up.

2 Insert each slide as shown with the label facing out and up.

3 Push each slide into the rack until the slide touches the back of the rack, ensuring each slide is fully inserted into the rack.

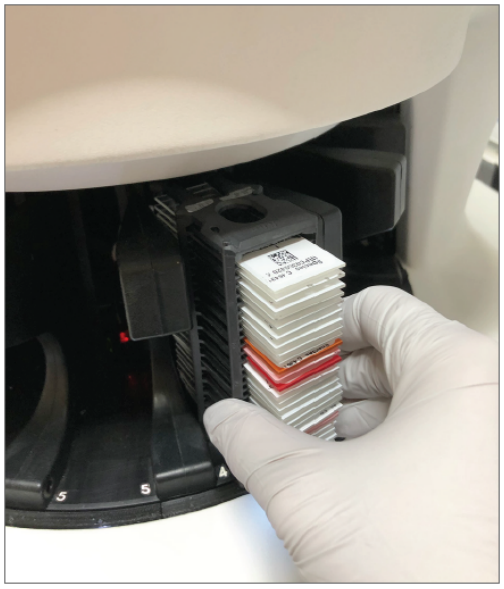

**CAUTION:** Use caution when loading slides into a rack to prevent improper slide orientation or damaged slides. Never use damaged slides in the scanner.

# Load racks in the carousel

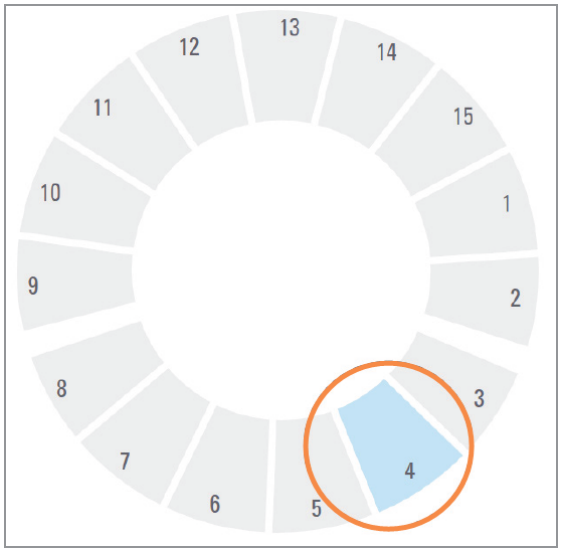
Slides are scanned in the order you load them.

1 Place the loaded rack into an open slot in the carousel.

2 Push the rack forward until it stops and you hear a click.



When the rack is fully inserted, there is a “click” sound, and the rack position on the Home screen turns light blue.



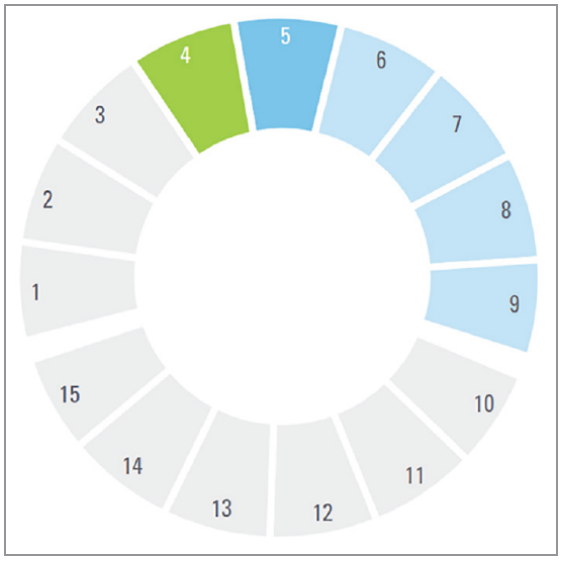

3 Continue loading racks as needed or until you fill the front six rack slots.

4 When you've finished loading the first set of racks:

- The first rack is rotated to the scan area.
- Any empty rack slots are rotated to the loading area.

> **WARNING:** To prevent injury, keep hands away from the carousel and pinch point areas when the carousel is rotating. Never manually rotate the carousel unless you are performing maintenance and power is off to the scanner as discussed in Chapter 5: Maintenance.

5 When a rack is scanned successfully, the rack status turns green.




6 You can unload any completed racks and continue loading new racks.

If the completed rack is in the back of the carousel, you can rotate it to the rack loading area. See Rotate a rack to the rack loading area (on page 55).

# Priority scanning

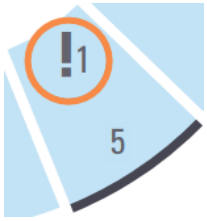
Use Priority to move a rack to the front of the scan queue. You can apply the Priority option on up to three racks at a time.

1. Tap the rack position.

   The Priority option appears when you select the rack position.


2. Tap **Priority**.


The priority icon and scan queue number appear on the rack position.



# 20x magnification scanning

You have the option to scan slides at 20x or 40x magnification, depending on the needs of your organization or specific project. This section contains instructions for performing rack-level scans at 20x or 40x magnification.

Your Aperio GT 450 scanner is initially set to scan all racks using 40x magnification. If you want this scanner to scan using 20x magnification by default, your administrator must turn on the DEFAULT TO 20X SCANNING option in SAM. For more information, see the *Aperio GT 450 IT Manager and Lab Administrator Guide*.

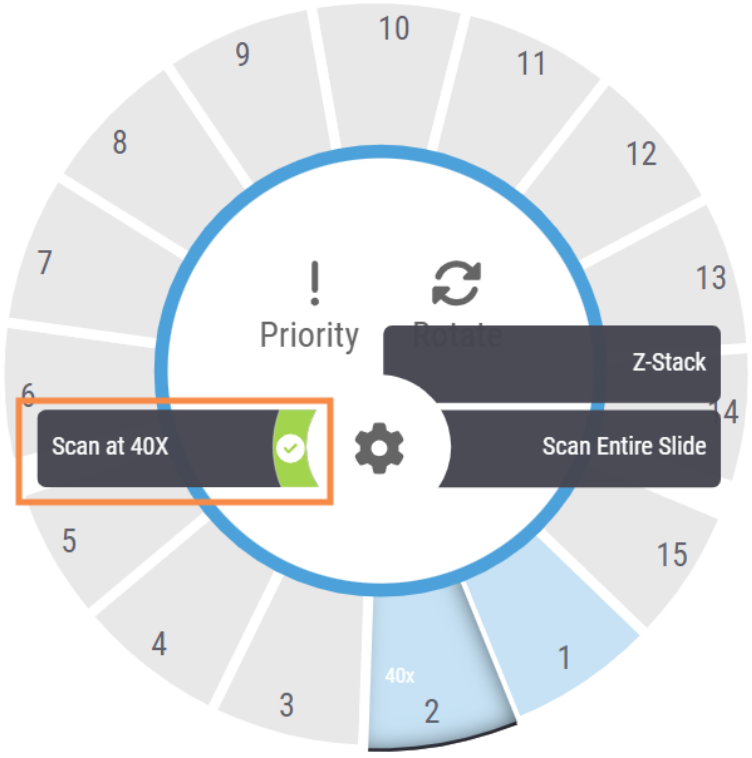
## Change the scan magnification for a rack of slides

For each Aperio GT 450 scanner, your Lab Administrator has the option of changing the default scan magnification from 40x to 20x within the SAM software. This section shows how to override the default during scanning, and manually change the scan magnification for a rack of slides.

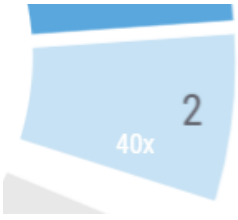
This procedure describes how to scan a rack of slides at 40x magnification, when the default scan magnification is set to 20x. (If the default scan magnification is set to 40x, use the same process to scan a rack of slides at 20x magnification.)

To scan a rack of slides at 40x when the scan magnification is set to 20x, follow these steps:

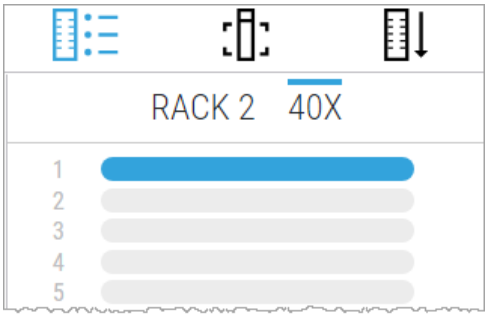
1. Load the rack with only the slides that you want to scan at 40x.
2. Tap the rack position that contains the slides you just loaded.
3. Tap **Settings**  , and then tap **Scan at 40X**.




The **Scan at 40x** option is selected, and **40x** appears on the rack position.




During scanning, the Rack View indicates the scanner is scanning this rack at 40x magnification.



# Z-Stack scanning

With the optional Z-Stack scanning feature, the scanner can create an image of multiple layers of the slide tissue scanned at different focal depths, creating a 3D composite multiplane 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.

Pathologists can review slide samples at varied “heights” using a software focus adjustment, comparable to the fine-focus knob of a conventional light microscope. The Z-Stack scanning feature is specifically useful in cytology and dermatopathology.

For all types of scanning, the 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.

## Scan a rack of slides using z-stack scanning

For each scanner in Aperio GT 450 SAM, your Lab Administrator sets the default number of layers and the distance between layers (in microns) that are used for z-stack and extended focus scanning. You can adjust these settings on the scanner console for each rack of slides you scan.

Note the following when using Z-Stack scanning:

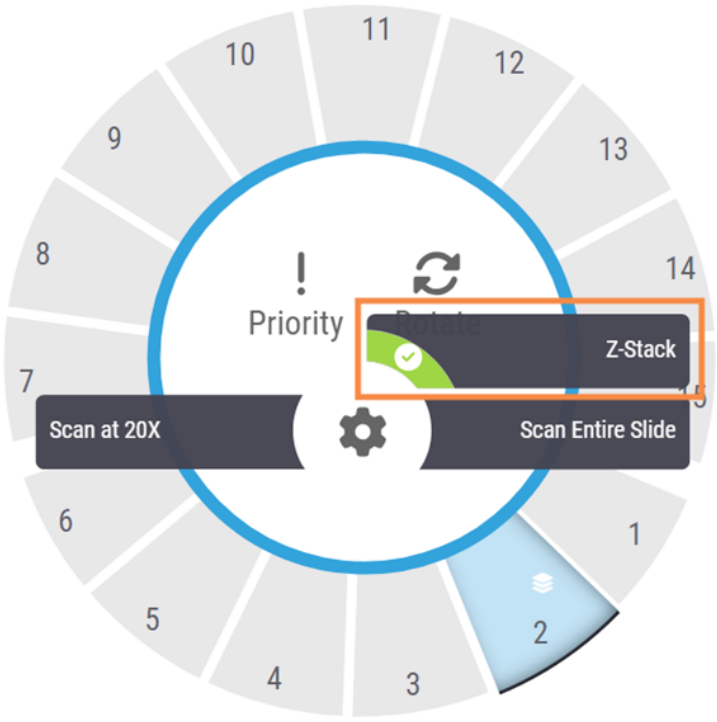
- The Auto Narrow Stripe feature is not used to scan z-stack images. If the Auto Narrow Stripe scanning feature is turned on in SAM, the system disables this feature during z-stack scanning.
- When using Z-stack scanning, the scan time and file size can increase, based on specified number of layers and the distance between layers.

To scan a rack of slides using z-stack scanning, follow these steps:

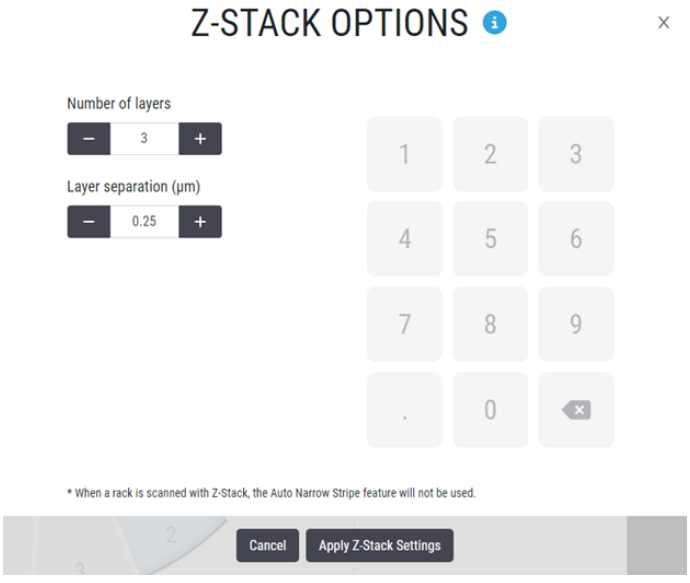
1. Load the rack with only slides that you want to scan as z-stack images. You should load slides of similar tissue types in the same rack. This is because you choose the number of layers to use depending on the type of tissue you are scanning.

   Perform steps 2 and 3 below immediately after loading the rack in step 1 to ensure the scanner does not start scanning using the standard (non-z-stack) scanning process.

2. Tap the rack position that contains the slides you just loaded.
3. Tap **Settings** , and then tap **Z-Stack**. (If your scanner has the optional Extended Focus feature installed, the setting will include "**Z-Stack and Extended Focus**."




The Z-STACK OPTIONS screen appears with the default Number of layers and Layer separation (microns) that your Lab Administrator previously set in SAM. (If your scanner has the optional Extended Focus feature installed, then the Extended Focus options also appear on this screen.)



4 Follow these steps to adjust the z-stack scan settings for the rack you are scanning:

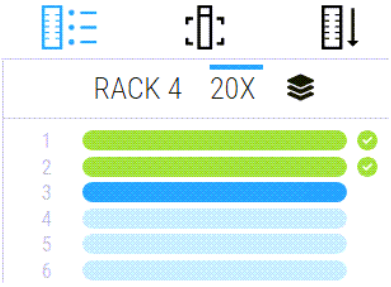
   a To adjust the **Number of layers**, tap the **Minus** and **Plus** buttons until you reach the desired number of layers. You can also use the number pad to enter the desired values directly. Tap inside the **Number of layers** field to activate the keypad. (Note that the number of layers must be an odd number.)

   b To adjust the **Layer separation**, tap the **Minus** and **Plus** buttons until you reach the desired number (in microns). As described in the step above, you can also use the number pad to enter the desired values directly.

5 Tap **Apply Z-Stack Settings** to start scanning the specified rack of slides.

After you tap **Apply Z-Stack Settings**, the Z-Stack icon appears on the rack position.


During scanning, the Z-Stack icon appears in Rack View to indicate the scanner is scanning this rack using the z-stack process.




## View z-stack images

To view the 3-dimensional z-stack images, you must use a digital slide viewer that supports z-stack viewing, such as Aperio WebViewer (versions 1.2 and later), Aperio ImageScope, or a viewer of your choice that supports z-stack viewing.

# Extended Focus scanning

The optional Extended Focus feature enables you to scan a slide to generate a single composite image with optimized focus and a greater depth of field than an image of a scanned single layer or any single layer in a set of z-stack images.

The Extended Focus process uses scanned z-stack layers to achieve optimal focus on the entire depth of the tissue. The Extended Focus process identifies the optimally focused areas across the z-stack layers and fuses those layers into a single, composite image. This feature is particularly useful in applications where it is preferable to view all cells in focus in a single-layer image.

An extended focus image has a smaller file size than the set of z-stack images from which it is generated. This smaller file size helps increase file transfer speed during collaborative activities, and also requires less storage space.

The single composite image file can be compatible in external image analysis software algorithms when a set of z-stack layers might not be.

Similar to the z-stacking feature, you set Extended Focus for an entire rack of slides.

To use the Extended Focus feature, you must have the Extended Focus option installed on your scanner.

## Scan a rack of slides using Extended Focus

For each scanner in Aperio GT 450 SAM, your Lab Administrator sets the default number of layers and the distance between layers (in microns) that are used for z-stack and extended focus scanning. You can adjust these settings on the scanner console for each rack of slides you scan using the Extended Focus feature.

To scan a rack of slides using the Extended Focus feature, follow these steps:

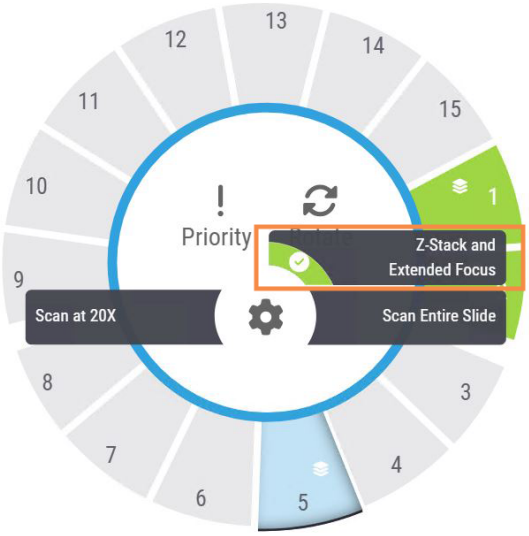
1. Load the rack with only slides that you want to scan as extended focus (EF) images. You should load slides of similar tissue types in the same rack. This is because the number of layers and the distance between the layers you choose for Extended Focus are applied to all the slides in the rack. The settings you use depend on the type of tissue you are scanning.

   > Perform steps 2 and 3 below immediately after completing loading the rack in step 1 to ensure the scanner does not start scanning using the standard (non-z-stack) scanning process.

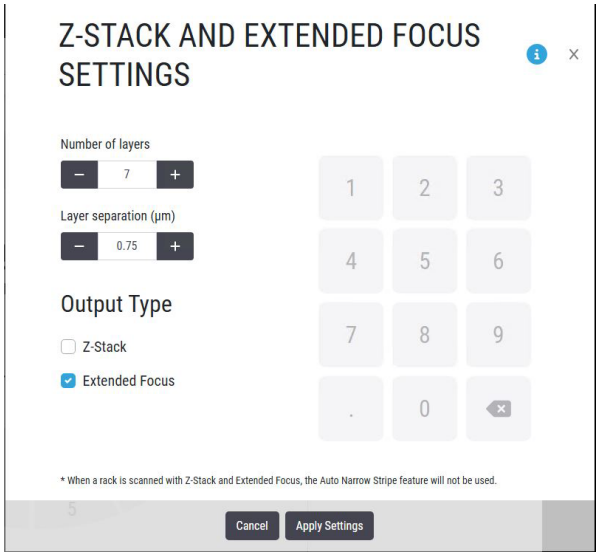
2. Tap the rack position that contains the rack of slides you just loaded.

3. Tap **Settings** , and then tap **Z-Stack and Extended Focus**.

   > **Extended Focus** appears as an option only if the Extended Focus feature is installed on your scanner.




4 The Z-STACK AND EXTENDED FOCUS SETTINGS screen appears with the default Number of layers and Layer separation (in microns) that your Lab Administrator previously set in Aperio GT 450 SAM.




5 Follow these steps to adjust the Z-STACK AND EXTENDED FOCUS SETTINGS for the rack of slides you are scanning:

a To adjust the **Number of layers**, tap the **Minus** and **Plus** buttons until you reach the desired number of layers. You can also use the number pad to enter the desired values directly. Tap inside the **Number of layers** field to activate the keypad. (Note that the number of layers must be an odd number.)

b To adjust the **Layer separation**, tap the **Minus** and **Plus** buttons until you reach the desired number (in microns). As described in the step above, you can also use the number pad to enter the desired values directly.

6 Under **Output Type**, select **Extended Focus** if it is not already selected. (Your Lab Administrator may have already set this option as a default in Aperio GT 450 SAM.) Note that Extended Focus image file names are appended with "_EF."

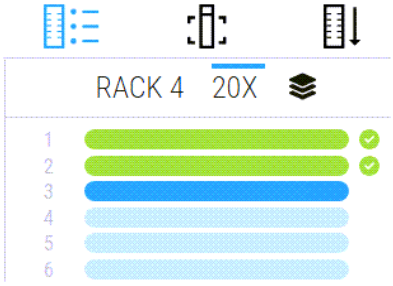
   To generate both a z-stack image and an extended focus image, you can also select **Z-Stack**.

7 Tap **Apply Settings** to start scanning the specified rack of slides.

8 After you tap **Apply Settings**, the **Z-stack** icon appears on the rack position.

.


During scanning, the Z-stack icon appears in Rack View to indicate the scanner is scanning this rack using the z-stack process.

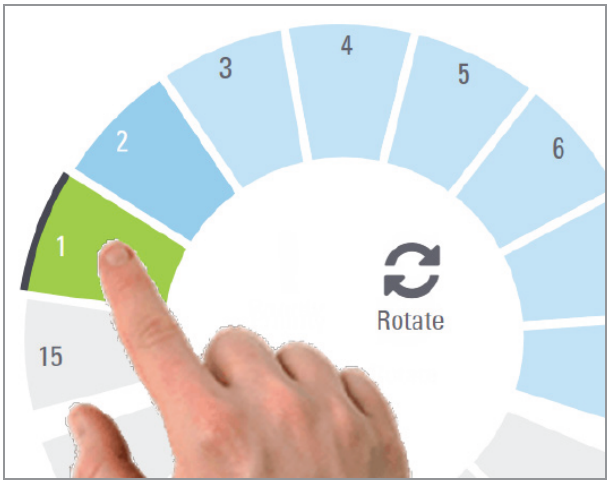


# Rotate a rack to the rack loading area

The main reason for using the rotate feature is to rotate a completed rack to the loading area. If you try to rotate the rack that is currently being scanned, the system asks you for confirmation before continuing.

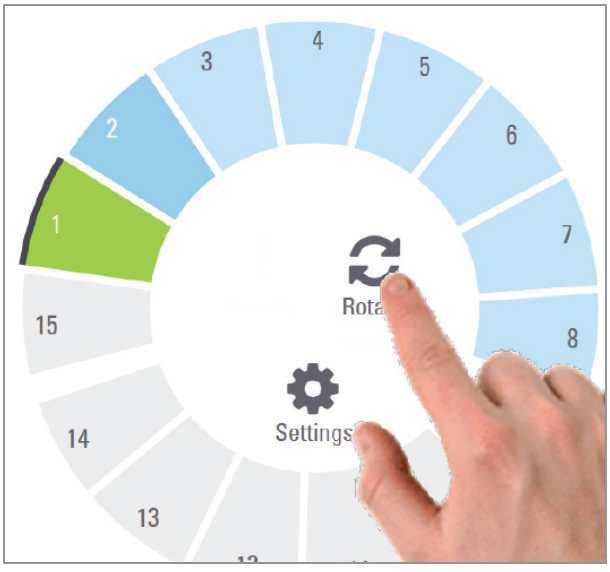
To rotate a rack to the rack loading area:

1 Tap the rack position.




The Rotate option appears when you select the rack position.

2 Tap **Rotate** to rotate the rack to the loading area.




3 After the rack is rotated to the front, you can remove the rack. (The status light in the loading area blinks to indicate the location of the rotated rack).

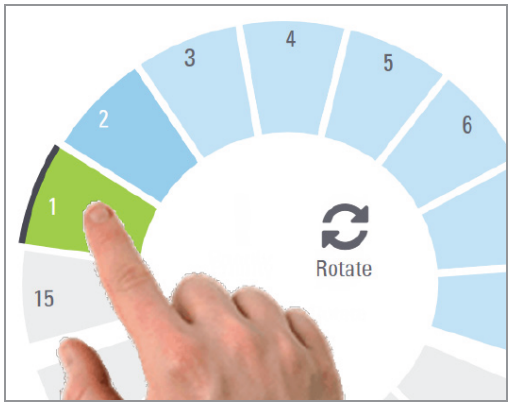
# Unload racks from the carousel

**CAUTION:** Use caution when unloading racks from the carousel and when unloading slides from a rack to prevent damaged slides or operator injury. Never use damaged slides in the scanner.

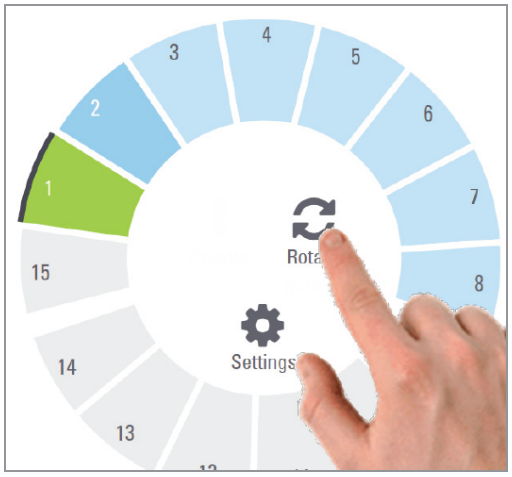
To unload racks from the carousel:

1. Make sure all the slides in the rack were successfully scanned (the rack status is green). If the rack status is orange, see Rack warnings (on page 61).
2. If the rack is in the loading area, carefully remove the rack from the rack slot.

3. If the rack is not in the loading area, you can rotate it to the front:
   a. Tap the rack position.



b Tap **Rotate**.




If you try to rotate the rack that is currently being scanned, the system asks you for confirmation.

4 After the rack is rotated to the loading area, you can remove the rack.

# Check scan status

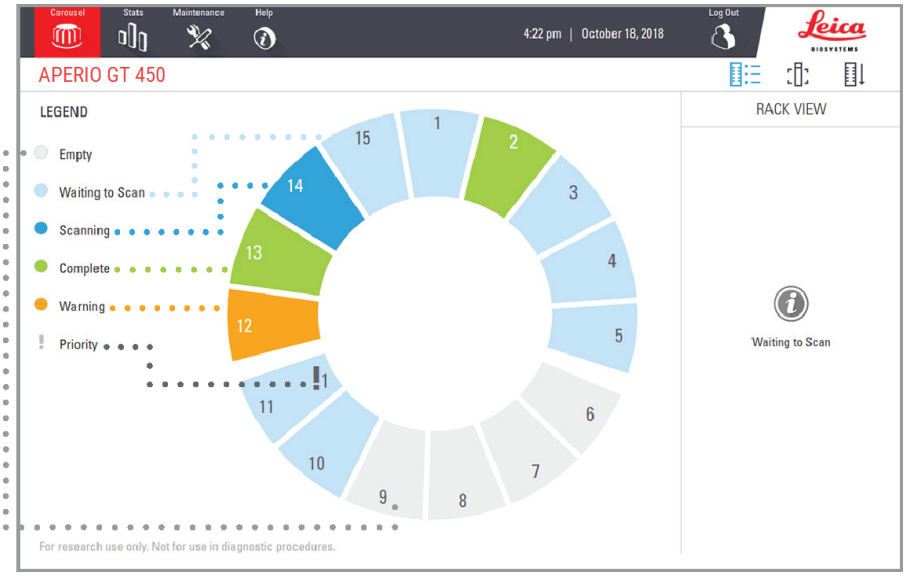
This section describes the different ways to check scan status.

**CAUTION:** If you must remove a rack before all slides in the rack are scanned, note the rack and slide status. After removal, the rack's scan status is no longer available.

# Check rack status

To check the scan status of a rack:

1 Check the rack position status color against the Legend.




The rack statuses are:

| | | |
|---|---|---|
| | **Empty** | Rack is empty and available for use. |
| | **Complete** | All slides in the rack scanned successfully and passed image QC. Scanned images are saved to the specific location. |
| | **Scanning** | The rack is currently being scanned. |
| | **Waiting to Scan** | The rack is loaded successfully and is waiting to scan. |
| | **Warning** | There is an issue with the rack, or one or more slides in the rack. If you get a rack warning, see Rack warnings (on page 61). |
| | **Priority** | The rack is set for priority scanning. See Priority scanning (on page 46). |

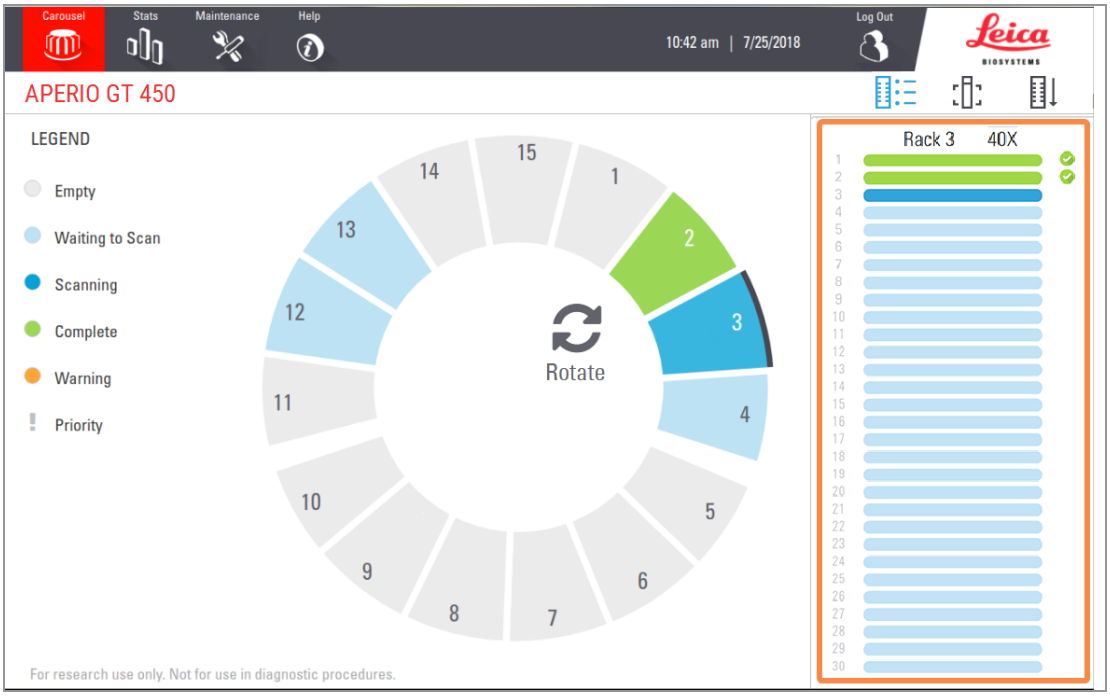
# Rack error on current scan

If there is an error on at least one slide in the rack that is currently scanning, the rack position pulses blue and orange. See Rack warnings (on page 61).

# View slide status for a rack

To view the status for slides in a rack:

1. Tap the rack position on the touchscreen interface.
2. Tap the **Rack View** icon.




Slide status colors correspond to the Legend:

| | |
|---|---|
| | The slide is scanning. |
| | The slide is waiting to scan. |
| | The slide slot is empty. |
| | The scanned image was successfully transferred to the specific image location. |
| | No scanned image created. See Rack warnings (on page 61). |
| | The slide scanned successfully, passed image QC, and was transferred to the specific image location. |
| | The slide has a scan warning. See Rack warnings (on page 61). |

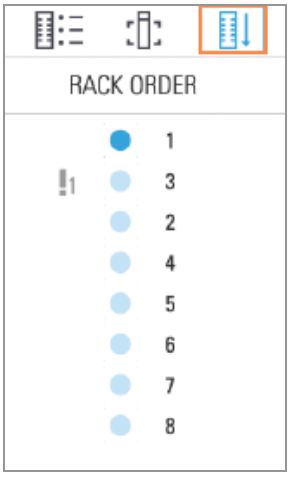
# View macro images of scanned slides

To view a macro image of a scanned slide:

1. Tap the rack position on the touchscreen interface.
2. Tap the **Slide View** icon to view individual images for the selected rack.
   - Tap < and > to view other slides in the rack.
   - If any tissue is outside the scan area, you can tap **Scan Entire Slide** to rescan the whole slide.
   - If there is an error scanning the slide, a message appears in the box. See Slide errors and solutions (on page 117).


# View rack scan order

1. Tap the **Rack Order** icon to show the scan order of the racks.
   - Racks in the list appear in the scan order.
   - The scan status is indicated for each rack.
   - In the example, rack 3 is set as priority.



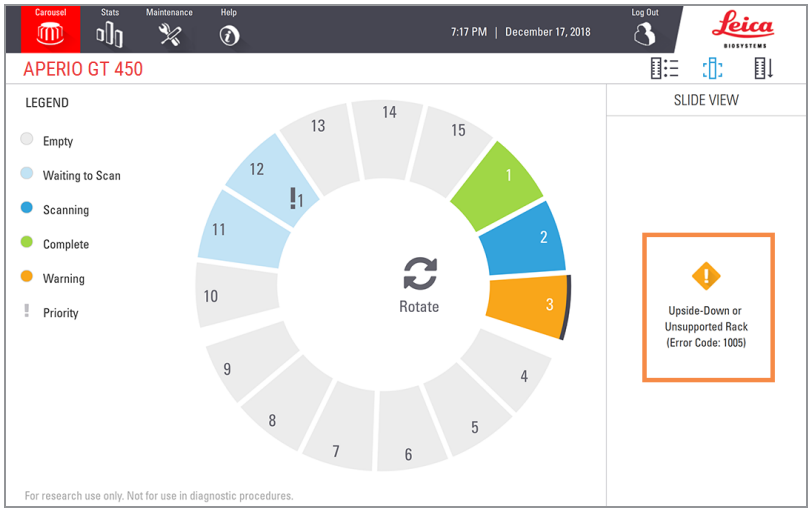
# Rack warnings

A rack has a warning if the status color is orange or if the rack position is pulsating blue and orange.

To check the rack for errors:

1 Tap the rack position you want to check.

2 If there is a problem with the rack, a message appears similar to the example below.




3 Take note of the error code and message. For information and steps to resolve the rack error, go to Rack warnings and solutions (on page 115).

4 If there is a problem with one or more slides in the rack, a warning icon appears next to the slide in Rack View:

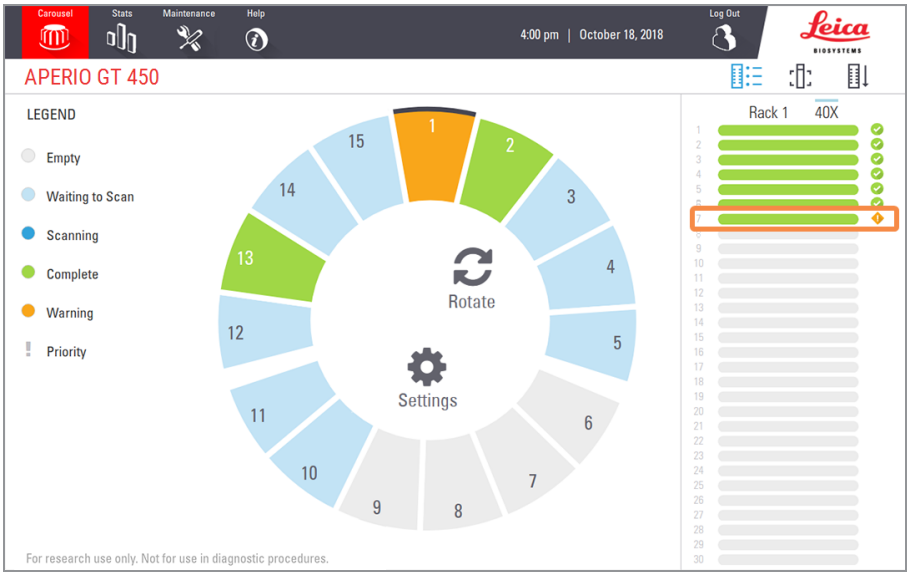
The scanner created an image, but there is an error.

An error prevented the scanner from creating an image.

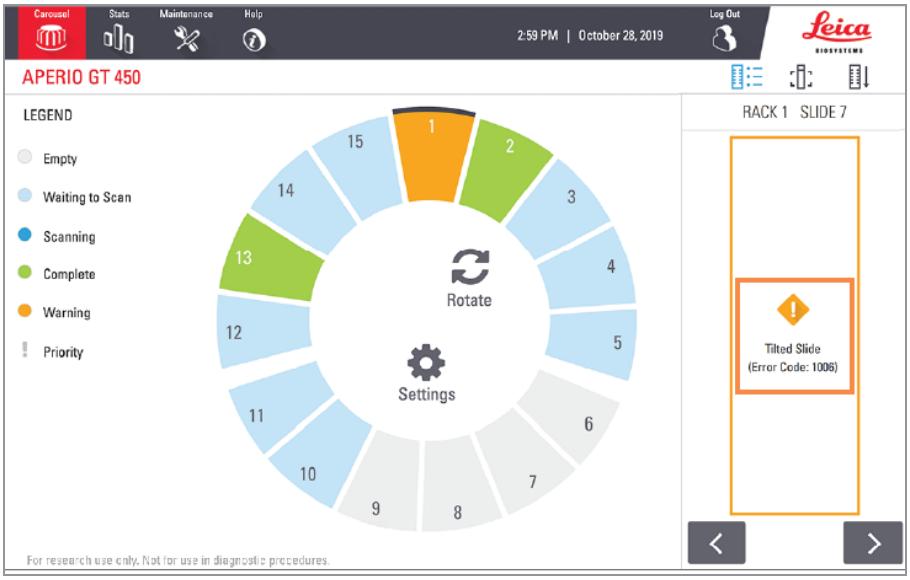
An error occurred when transferring an image to the designated storage location

A barcode is missing or invalid. (This issue only occurs if the Aperio GT 450 SAM is configured to require barcodes.)

In the example below, slide 7 in the selected rack has a warning.




5 Tap the **Slide View** icon to view the macro image for the slide that has a warning.

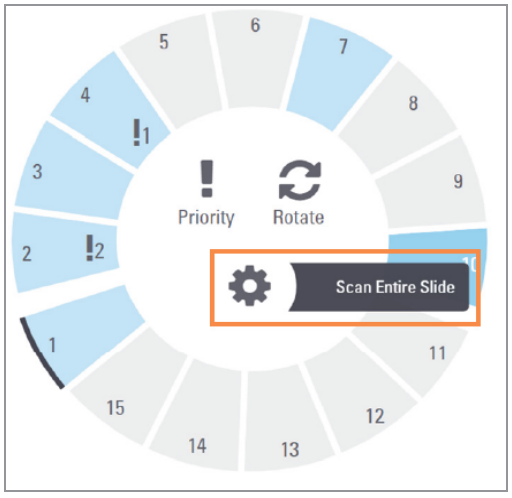



6 Take note of the error code and message. For information and steps to resolve the error, go to Slide errors and solutions (on page 117).

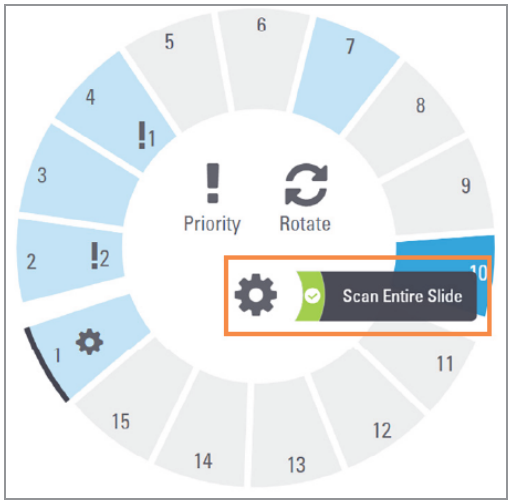
# Scan entire slide for whole rack

This feature enables you to scan the full slide area for an entire rack of slides.

1. Load only the slides that require a full slide area scan in the rack.
2. Load the rack in the carousel.
3. Tap to select the rack position.
4. Tap **Settings** , and then tap **Scan Entire Slide**.




The Scan Entire Slide option is selected, and the Settings icon appears on the rack position:



# Image quality control for histotechnicians and pathologists

After scanning slides, it is important to review the digital slides to make sure the images are of good quality. Ultimately, it is up to the pathologist to look at digital slides to verify they are of sufficient quality to perform their task. In addition, scanner operators should verify digital slide quality after scanning.

The quality criteria that should be verified by scanner operators are:

- that the entire tissue sample has been scanned, and;
- 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. Check that image for the quality criteria mentioned above. (For more details, see the next section, Check that the scanned image covers all slide tissue.)

Re-scan any slides that failed to scan or failed the image quality review.

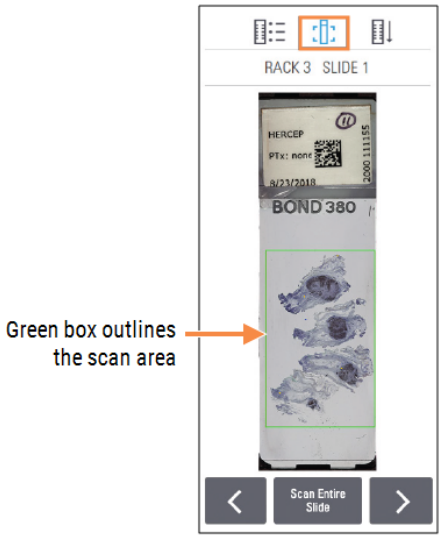
For additional image quality assessment instructions, refer to the user guide for your viewer.


## Check that the scanned image covers all slide tissue

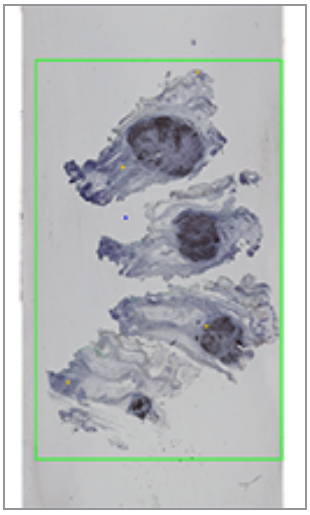
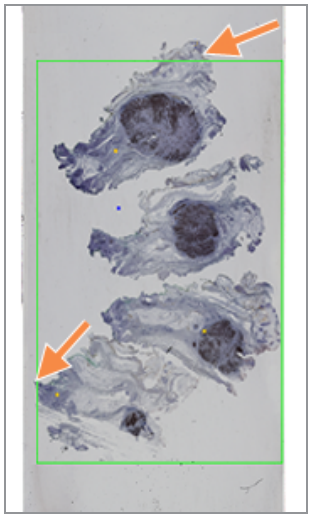
The steps below describe how to check that the scanned image covers all of the slide tissue.

1. Tap the rack position on the touchscreen interface that contains the slide images you want to review.
2. In the right pane of the touchscreen interface, tap the **Slide View** icon to view the individual scanned images for the selected rack. (Tap < and > to navigate through the slides in the rack. You can view slide images only after the scanner has completed scanning the slide.)

3 The green box on the macro image indicates the scan area, as shown below.




4 Visually check the macro image to ensure all of the tissue is inside the scan area. Tissue that extends outside of the scan area is not included in the scanned image.

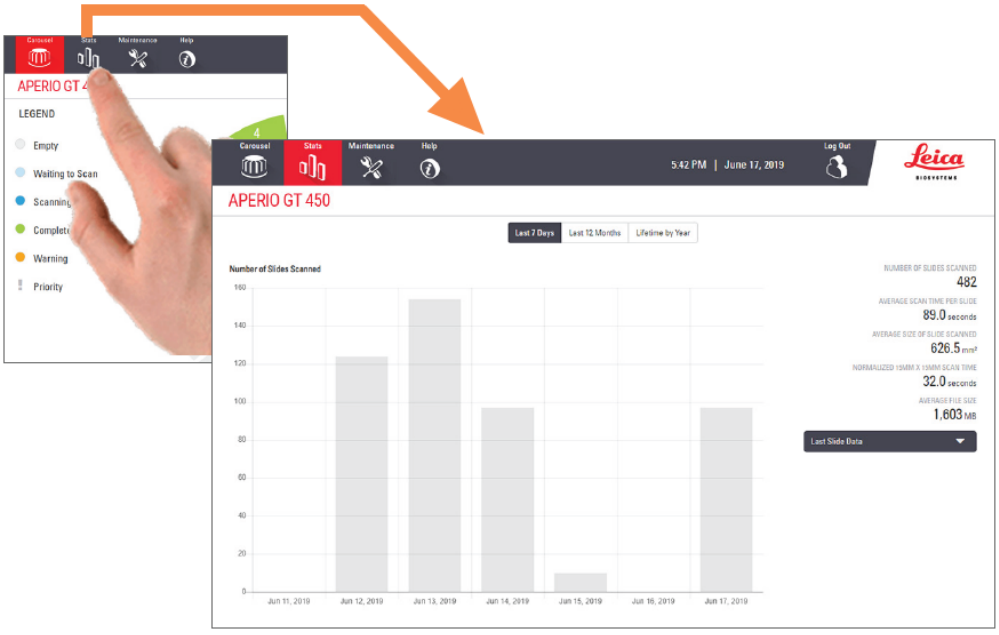
| Tissue is within the scan area | Tissue is outside the scan area |
|---|---|
| In the example below, all of the tissue is inside the scan area. This means all of the tissue is included in the scanned image. | In the example below, tissue extends outside the scan area. This means some tissue is not included in the scanned image. |
|  |  |

5 If any tissue is outside the scan area, you can tap **Scan Entire Slide** to rescan the whole slide.

If your scanner has the optional Manual Scan feature, tap **Manual Scan** to adjust the scan area. For more details, see Manual Scanning (on page 67)

# Scan statistics

The Aperio GT 450 provides scan statistics, such as the number of slides or racks scanned per day, per week, etc. Tap **Stats** to view statistics for the **Last 7 Days**, **Last 12 Months**, or **Lifetime by Year**.



# Manual Scanning

If a scanned image has certain image quality issues, sometimes the best resolution is to re-scan the slide using a manual process. The optional Manual Scan feature enables you to manually adjust the scan settings using the macro image from the automated scan, and then re-scan a single slide without removing the slide from the scanner.

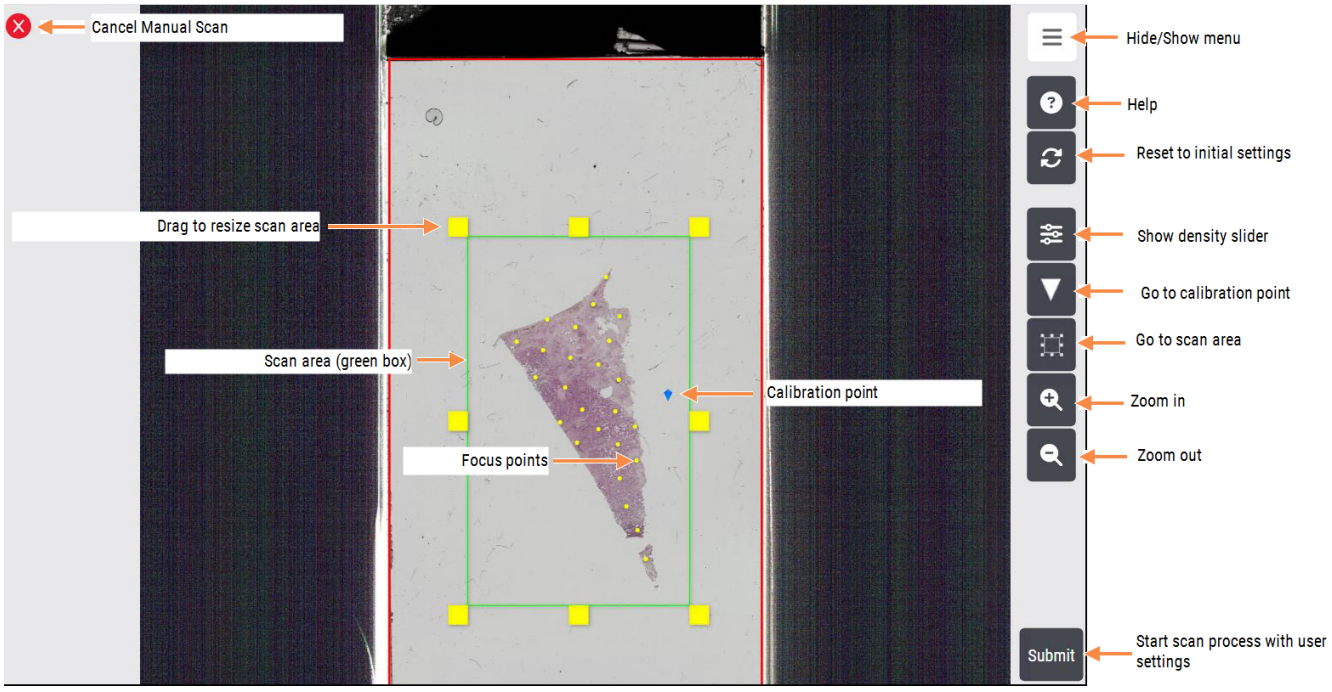
## Manual Scan overview

You access the Manual Scan settings from the Slide View, which shows the macro image from the automated scan. The Manual Scan feature enables you to:

- Adjust the bounding box that defines the scan area.
- Add or remove focus points.
- Verify that the calibration point is positioned correctly, and re-position it if needed.
- Zoom into the macro image of the slide to access potential problem areas.

## Manual Scan user interface

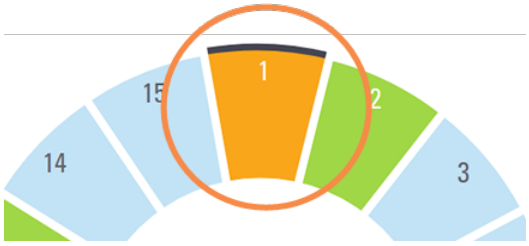
The example below shows the features of the Manual Scan user interface.




## Use Manual Scan to resolve an image quality issue

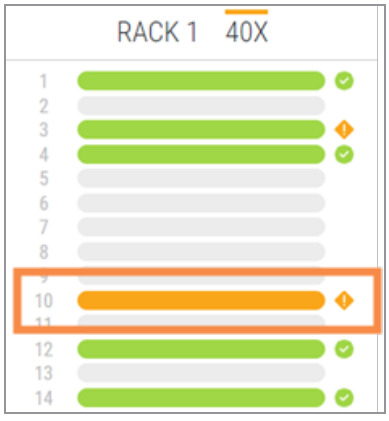
If the scanner indicates a slide image has a quality issue, follow these steps to manually re-scan the slide:

1 On the touchscreen, tap the rack position that has the error.



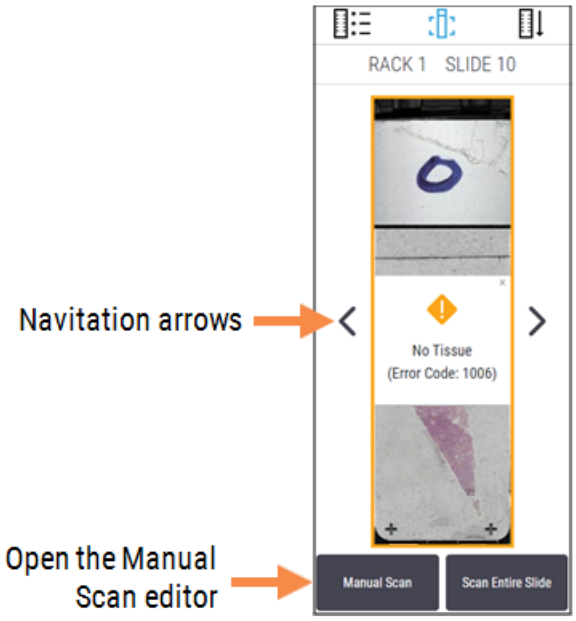

2 Tap the **Rack View** icon to view the list of slides in the rack.

Any slides with scan issues are colored orange, as shown below.



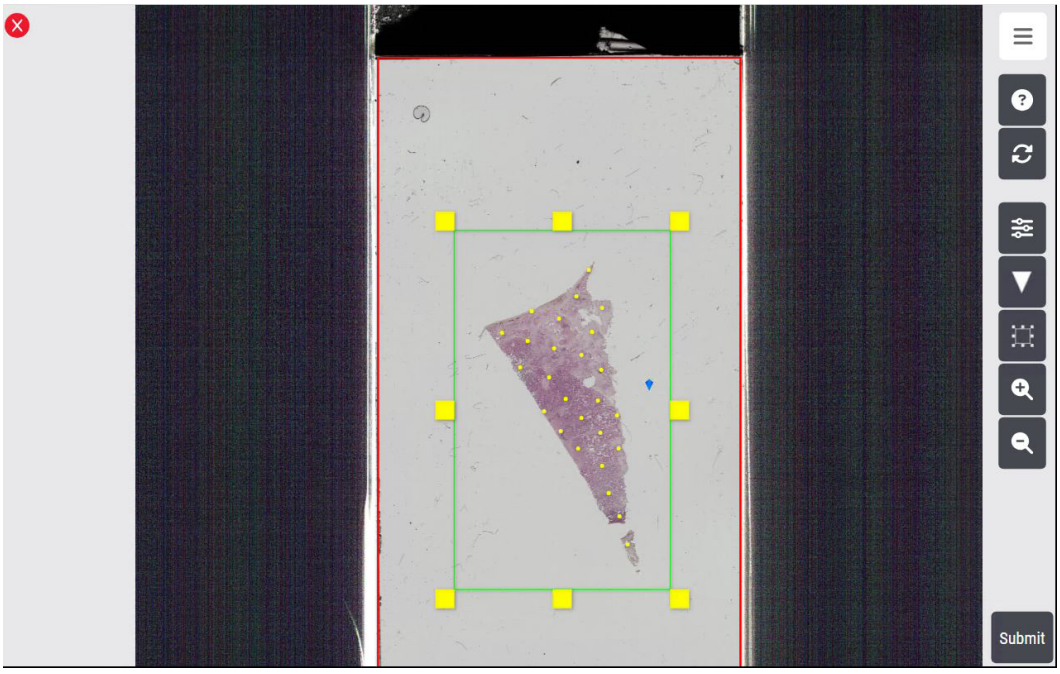

3 Tap the **Slide View** icon.

The macro image for the first slide in the rack appears.




4 Tap the left or right navigation arrow (shown above) to display the problem slide, and then tap **Manual Scan**.

The Manual Scan settings for the image open in the scanner console.



5 Adjust the Manual Scan settings as needed, using the instructions in the following table. Refer to Manual Scan user interface (on page 67) as needed.

| To do this: | Follow these steps: |
|---|---|
| Adjust the scan area | Drag any corner of the green bounding box to move or re-size the box to the desired position. Only the tissue inside the scan area is included in the scanned image.<br>When you adjust the scan area, the system recalculates the number of focus points. |
| Add or remove focus points | The yellow dots in the scan area are focus points. The scanner calculates the number of focus points to present for use depending on the specified scan area.<br>Add or remove focus points in the following ways:<br>• Tap to open the **Focus Point Density** slider. Drag the **Focus Point Density** slider left for fewer focus points, and right for more focus points.<br>  <br>• Tap a focus point to delete it. (There must a minimum of three focus points for a slide.)<br>• Double-tap an area to add a focus point.<br>• Drag to move a focus point to a new position. |
| Locate and verify the placement of the calibration point | To verify the calibration point:<br>1 Click the **Focus View on Calibration Point** button to bring the calibration point (the blue diamond) into view.<br>2 Ensure the calibration point is on a clear area of the slide that does not contain tissue and that is under the coverslip. (Note that the calibration point can be located outside the bounding box of the scan area.)<br>3 If necessary, drag it to a new position. |
| Zoom in or out for a different view of the macro image | Pinch-to-zoom or tap the **Zoom In** and **Zoom Out** buttons to adjust the view of the image. |
| Zoom to the scan area | Tap the **Focus View on Scan Area** button to bring the scan area into view. Tap the button again to return to thefull view. |

| To do this: | Follow these steps: |
|---|---|
| Reset to the default scan settings | Tap the **Reset to Default Settings** button to erase your changes and return to the default settings, as determined by the scanner's tissue finder. |

6 When you are satisfied with your settings, tap **Submit**. The rack is added to the scan queue, with the manual scan settings applied to designated slide.

You can prioritize the rack in the scan queue by following the instructions in Priority scanning (on page 46)

# Aperio iQC Software Module Notifications

The Aperio iQC Software Module is a standalone software application intended to assist in identifying artifacts in whole slide images (WSIs) produced by the Aperio iQC Software Module scanner. If the Aperio iQC Software Module software identifies any specified artifacts on the scanned image, the rack status indicates an error and a message appears within the Slide View on the scanner's console, as shown in the example below.


Your IT Administrator sets up the communication between your Aperio GT 450 scanner and the Aperio iQC Software Module. For more details, see the *Aperio GT 450 IT Manager and Lab Administrator Guide* and your *Aperio iQC Software Module IT Administrator's Guide*.

For instructions on using the Aperio iQC Software Module, see your *Aperio iQC Software Module User's Guide*.

# 5 Maintenance

This chapter contains a maintenance schedule and procedures for maintaining your Aperio GT 450 scanner.

Call Leica Biosystems Technical Services if you cannot perform a maintenance routine or if you discover a problem with your scanner.

Before performing maintenance, we recommend you watch the maintenance videos available on the touchscreen. See Help videos and guides (on page 27).

**CAUTION:** It is important that you perform the maintenance procedures listed below on a regular schedule. Not doing so could result in scanner misalignment which could impair image quality.

In this section:

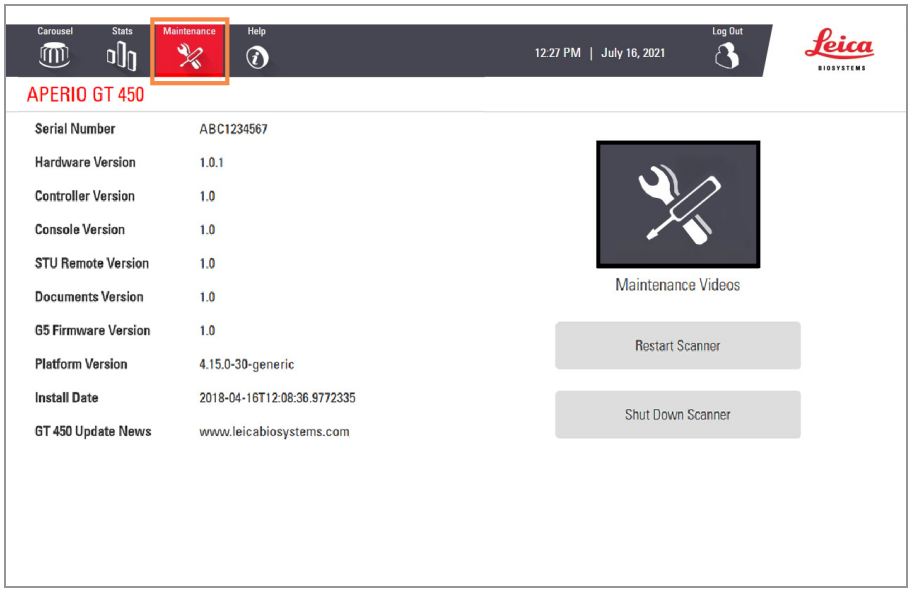
# Maintenance schedule

To keep your Aperio GT 450 scanner in optimal working condition, follow these maintenance routines.

| Frequency | Maintenance Task | Procedure |
|---|---|---|
| Daily (Recommended) | Restart the scanner. | Restart the scanner (on page 77) |
| | Inspect the Stage Slide Tray | Inspect the stage slide tray |
| | Inspect the Pusher/Puller | Inspect the pusher/puller |
| Every Six Months | 1 Clean the objective and Koehler | Clean the objective and Koehler (on page 82) |
| | 2 Clean the stage slide tray | Clean the stage slide tray (on page 85) |
| | 3 Clean the carousel | Clean the carousel (on page 87) |
| | 4 Clean the slide racks | Clean the slide racks (on page 90) |
| | 5 Clean the fan filter | Clean the fan filter (on page 88) |
| | 6 Clean the touchscreen | Clean the touchscreen (on page 91) |
| | 7 Clean the scanner cover | Clean the scanner cover (on page 90) |
| Once a year | Schedule annual maintenance visit by Leica Biosystems Technical Services. | Call Leica Biosystems Technical Services. |

# Serial number and firmware version

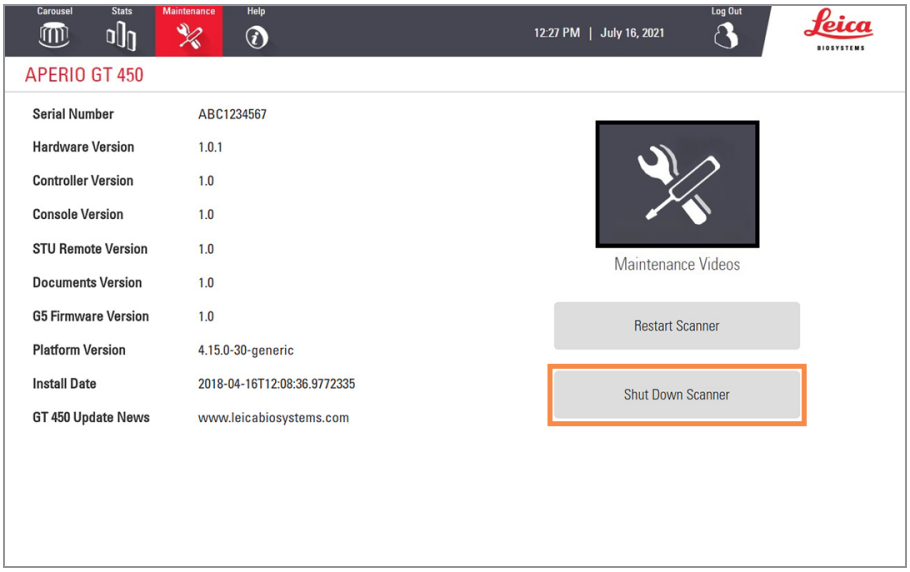
You need the serial number and current software version if you call Leica Biosystems Technical Support. Tap **Maintenance** on the touchscreen interface to view the serial number, firmware version, and other system information.



# Shut down the scanner

Use this procedure when you need to turn off the scanner.

1 From the touchscreen interface, tap **Maintenance**.




2 Tap **Shut Down Scanner**.

3 After the touchscreen goes dark, turn the scanner off using the On/Off switch.

# Open the scanner cover and access the interior components

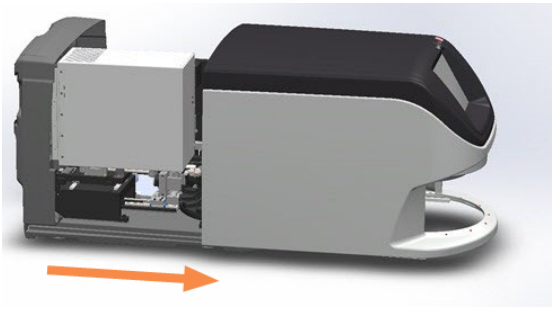
Complete these steps to access the inside of the scanner for maintenance or troubleshooting.

If you are performing maintenance on the scanner, you should first remove any racks from the carousel.

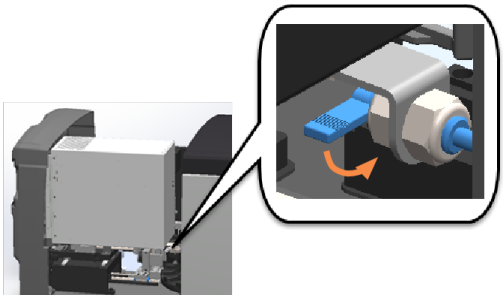
1 Shut down the scanner using the steps in Shut down the scanner (on page 75).

2 Grasp the cover using the handhold indentations:

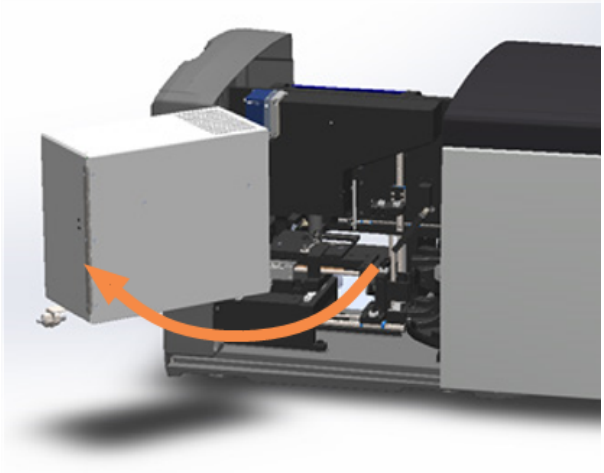
3 Slide the cover out until it reaches the point shown below.



4 Rotate the VPU latch 180 degrees, as shown below.



5 Carefully pivot the VPU outward as shown.



6 You can now access the interior components of the scanner for maintenance or troubleshooting purposes.

7 When you are ready to close the VPU and slide the cover back into place, following the instructions in Restart the scanner after interior maintenance (on page 91).

# Recommended daily maintenance

This section provides the recommended daily maintenance procedures.

## Restart the scanner

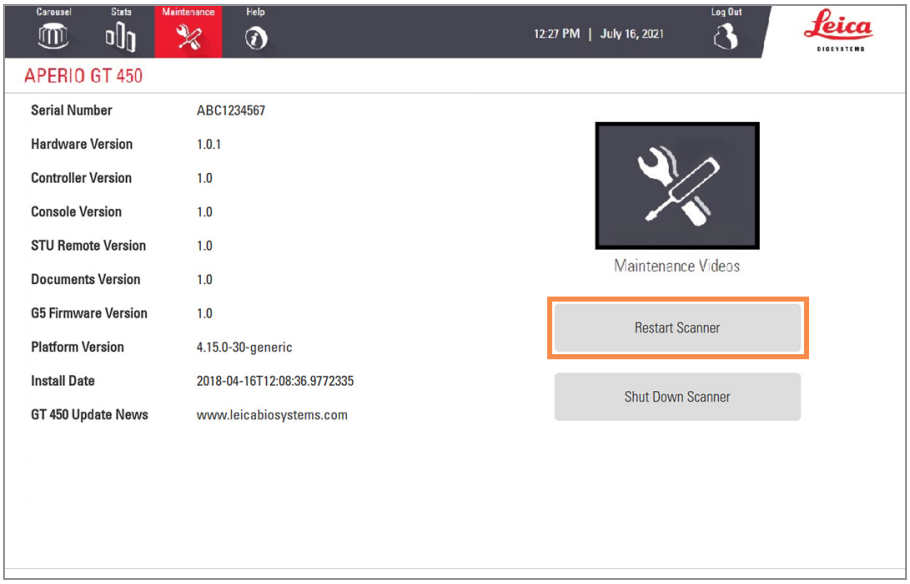
- **Frequency: daily**, and as needed to resolve a scanner issue.

Restarting the scanner initializes the controller and puts the camera, stage, and autoloader in their home positions.

> **CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

1 Before restarting the scanner, ensure the following:
   - All racks are unloaded from the carousel.
   - There are no slides scanning.
   - The system does not have any errors displayed.

2 From the touchscreen interface, tap **Maintenance** and tap **Restart Scanner**.




You can use the scanner again after initialization is complete and the Home screen appears.

# Restart the scanner

- **Frequency: daily**, and as needed to resolve a scanner issue.

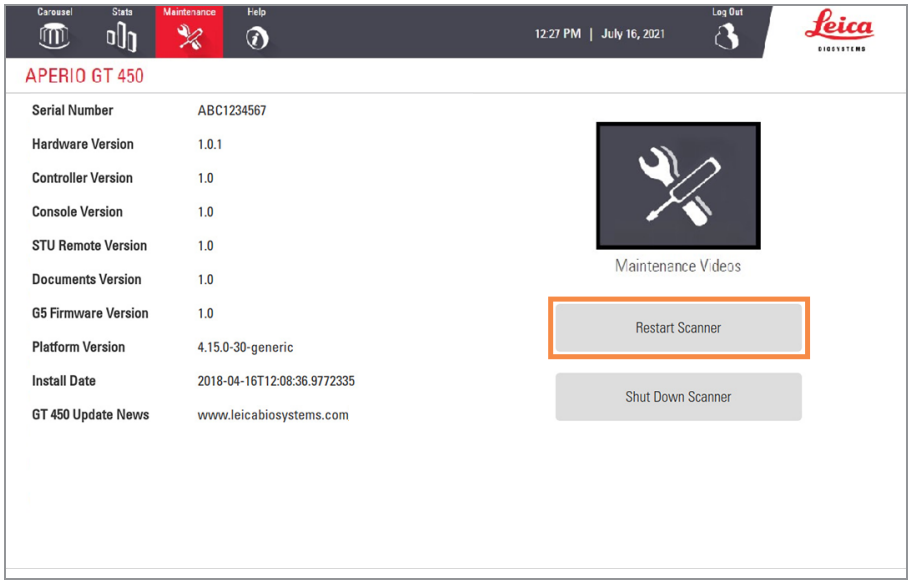
Restarting the scanner initializes the controller and puts the camera, stage, and autoloader in their home positions.

**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

1 Before restarting the scanner, ensure the following:

- All racks are unloaded from the carousel.
- There are no slides scanning.
- The system does not have any errors displayed.

2 From the touchscreen interface, tap **Maintenance** and tap **Restart Scanner**.




You can use the scanner again after initialization is complete and the Home screen appears.

# Inspect the stage slide tray

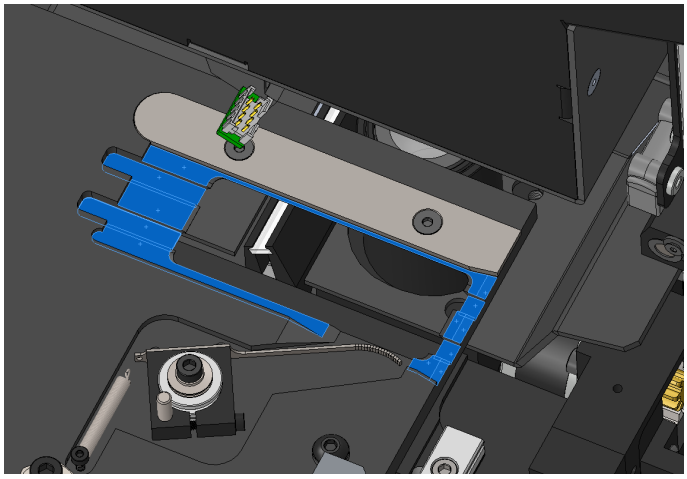
- **Frequency: daily**, and as needed to resolve a scanner issue.

Perform a visual inspection daily. Clean the slide tray if you observe debris.

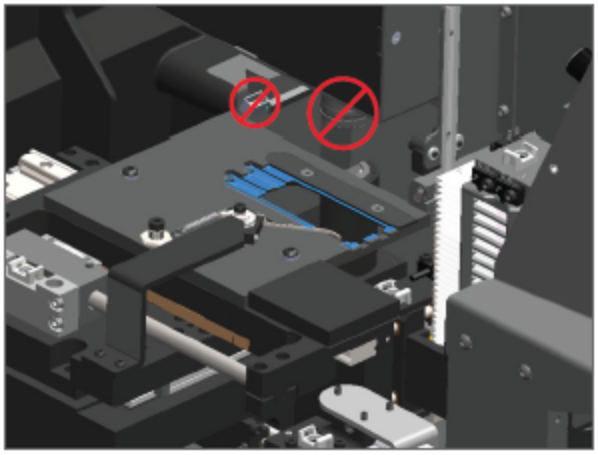
1 Ensure there are no slides scanning and the touchscreen interface does not display any errors.

2 Open the scanner interior. For instructions, see Open the scanner cover and access the interior components (on page 75).

3 Visually inspect the stage slide tray (shown in blue). If you see debris on the slide tray, clean it using a plastic scraper or edge of a blank glass slide, removing any mounting, debris, or high points.



The stage slide tray is not removable. When cleaning it in place, do not bump the LED or objective (highlighted in red):



4 Gently wipe the slide tray from back to front with a lint-free cloth.

> Do not use solvents such as xylene and toluene to clean the stage slide tray, as these solvents can damage the stage, lens coatings, wiring, and other internal components. Using such chemical solvents may also cause issues with the stage coating, resulting in loading or focusing errors during the scanning process.

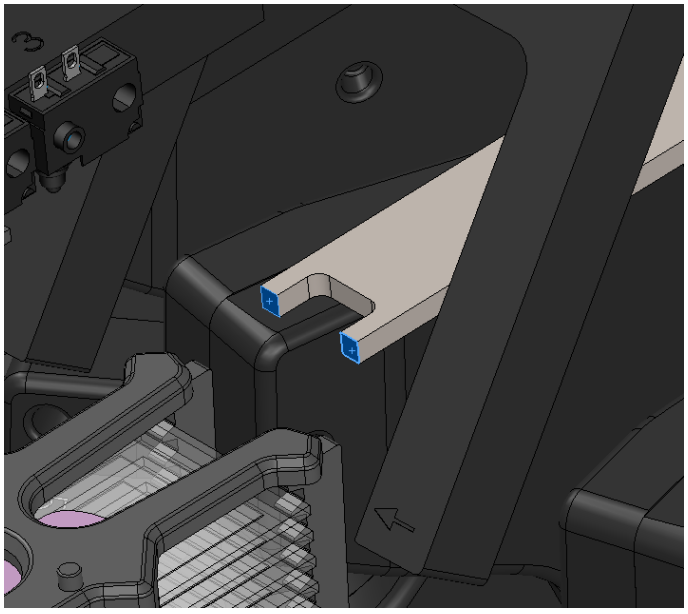
5 Wipe the slide tray again from back to front using a microfiber cloth. If necessary, use a gentle solvent such as denatured alcohol to remove any remaining residue. (To order a cleaning kit for this purpose, contact your Leica Biosystems representative.

# Inspect the pusher/puller

- **Frequency: daily**, and as needed to resolve a scanner issue.

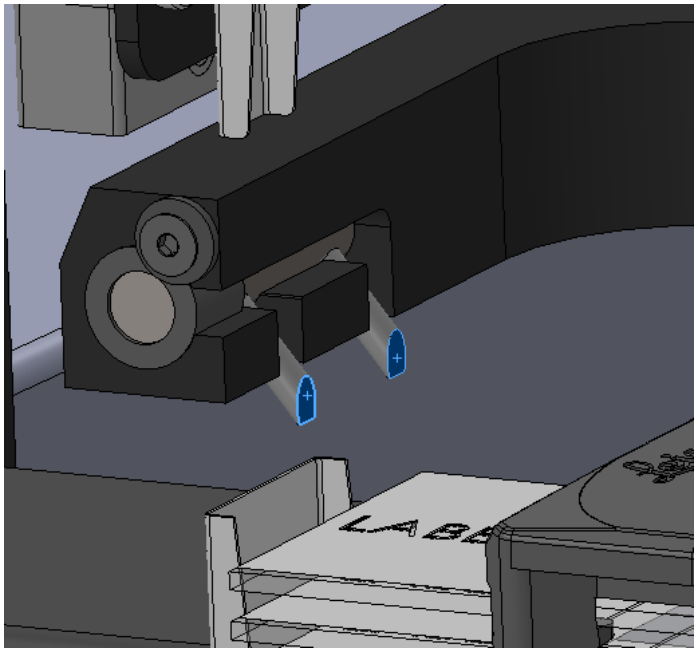
Visually inspect the pusher and puller assemblies. If you see debris on surfaces that contact the slide, clean the pusher and puller.

1. Ensure there are no slides scanning and the touchscreen interface does not display any errors.
2. Open the scanner interior. For instructions, see Open the scanner cover and access the interior components (on page 75).
3. Inspect the pusher contact surfaces (shown in blue):



4. If the pusher contact points contain debris, wipe them using a plastic scraper or edge of a blank glass slide, removing any mounting, debris, or high points.
5. Use a lint-free cloth or alcohol wipes to clean the surfaces.

6 Inspect the puller contact surfaces (shown in blue):



7 If the puller contact surfaces contain debris, wipe them using a plastic scraper or edge of a blank glass slide, removing any mounting, debris, or high points.

8 Use a lint-free cloth or alcohol wipes to clean surfaces.

# Six month maintenance

This section provides the six-month maintenance procedures. The purpose of the six month maintenance is to clean the scanner components.

## Clean the objective and Koehler

- **Frequency: at least every six months.**

**CAUTION:** When cleaning the scanner's objective:

- **Do not remove the objective.**
- **Only use the recommended cleaning cloth and solution on the objective**. Otherwise, this may damage the objective and impact image quality.
- **Do not drag anything (including lens paper) across the lens surface using a lot of pressure**. This may damage the lens.

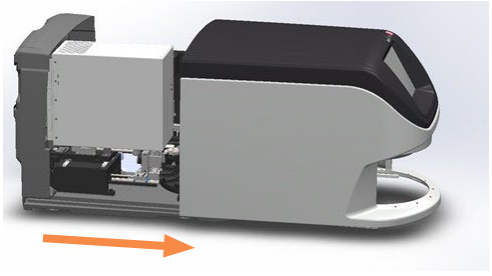
# Materials needed

As stated in the previous "CAUTION," use only the cleaning product specified below to clean the objective and Koehler. Using other products, including fiber-reinforced paper towels or other paper products, may leave debris deposits that can affect image quality.

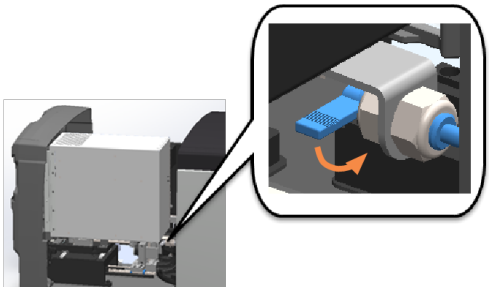
- Texwipe TX404 Absorbond Synthetic Wipers (lens cleaning wipes made of lint-free microfiber)
- Laboratory gloves

**To clean the objective and Koehler:**

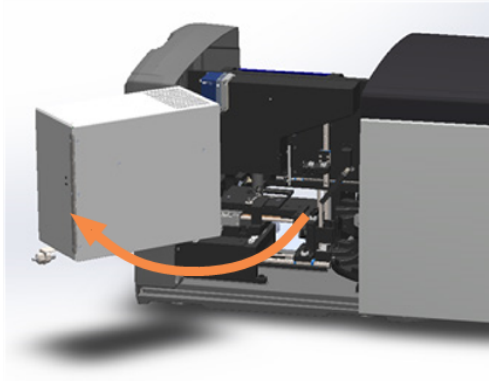
1. Ensure the scanner is turned off. (For instructions, see Turn the scanner on and off (on page 24)).
2. Open the cover and access the interior:
   a. Open the scanner cover.



   b. Rotate the VPU latch.

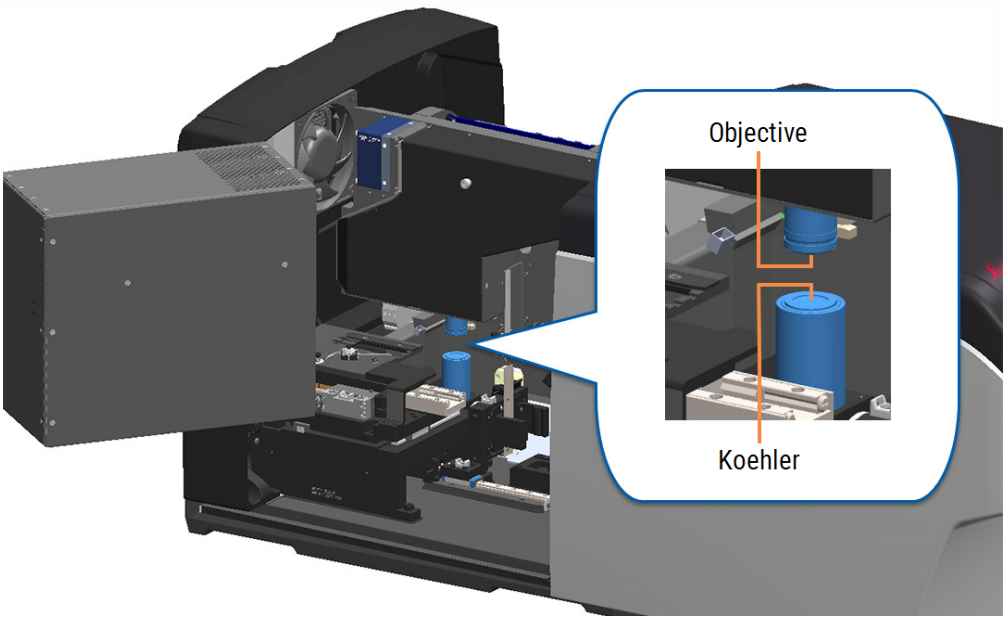


   c. Pivot out the VPU.



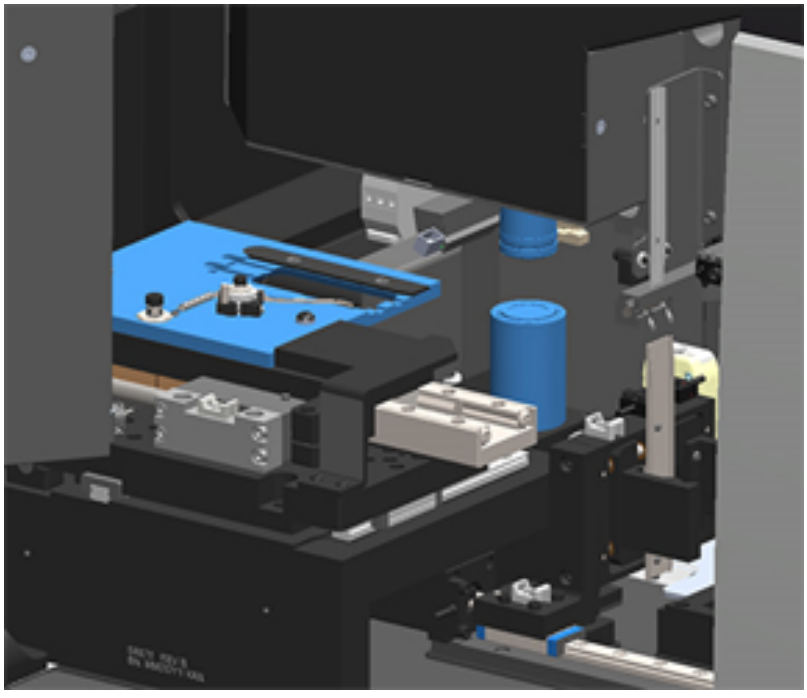
For detailed steps, see Open the scanner cover and access the interior components (on page 75).

3 The objective and Koehler are shown below in blue:




4 Manually position the slide stage so that you have clear access to the objective, as shown below.

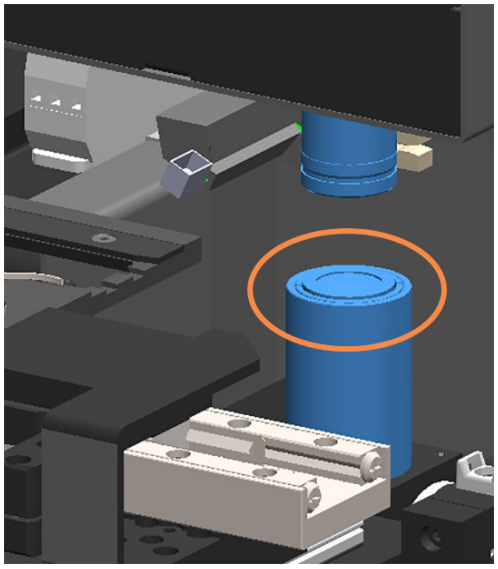
> **CAUTION:** The objective may move when you're cleaning it.



5 Wear gloves when cleaning the objective.

6 Clean the objective using small circular motions with the recommended lint-free microfiber cloth.

7 With a clean lint-free microfiber cloth, use the same technique described in step 6 to clean the Koehler. The Koehler is located below the objective, as shown circled in orange below.



8 If you are performing the entire six-month maintenance routine, continue to the next procedure.

9 If you are ready to close the scanner cover and restart the scanner, follow the steps in Restart the scanner after interior maintenance (on page 91).

# Clean the stage slide tray

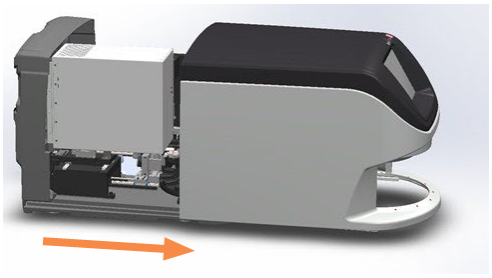
- Frequency: at least every six months.

To clean the stage slide tray:

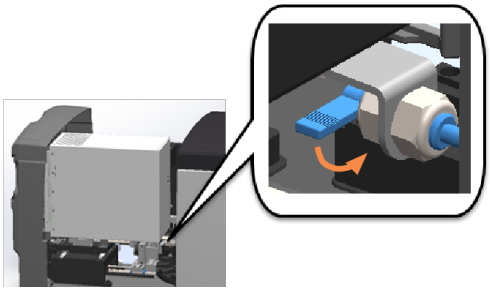
1 If the scanner is on, shut down the scanner by following the steps in Shut down the scanner (on page 75).

2 Open the cover and access the interior.

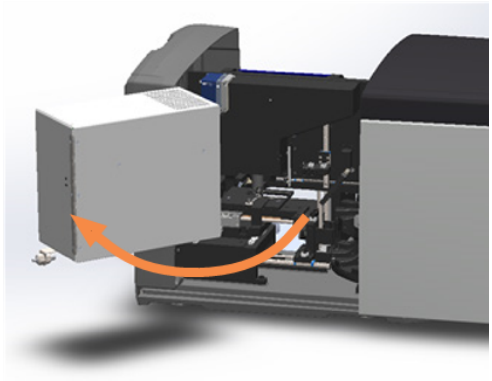
a Open the scanner cover.



b Rotate the VPU latch.



c Pivot out the VPU.

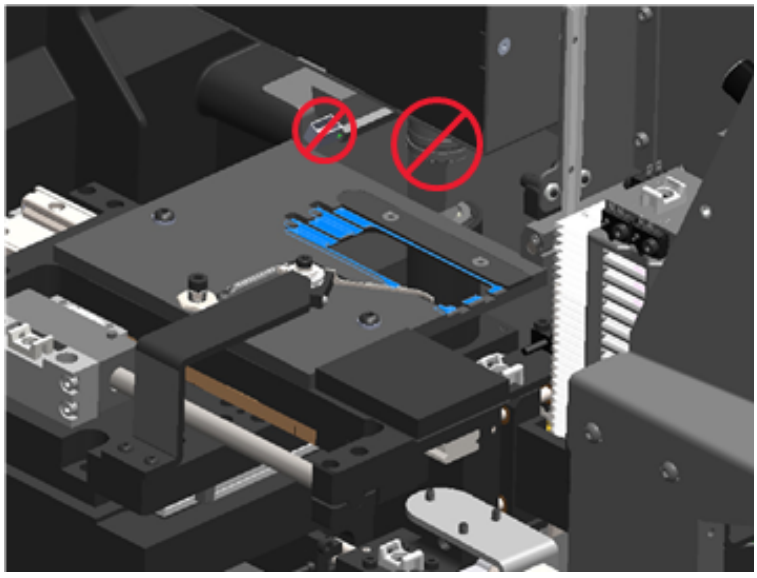


For detailed steps, see Open the scanner cover and access the interior components (on page 75).

**CAUTION:** The stage slide tray is not removable. Do not attempt to remove it.

3 Gently wipe the slide tray (shown in blue) from back to front with a lint-free cloth.

> **CAUTION:** Be careful not to bump the LED or the objective (highlighted in red).



4 Wipe the slide tray again from back to front using a microfiber cloth.

5 If necessary, use a gentle solvent such as denatured alcohol to remove any remaining residue.

6 If you are performing the entire six-month maintenance routine, continue to the next procedure.

7 If you are ready to close the scanner cover and restart the scanner, follow the steps in Restart the scanner after interior maintenance (on page 91).

# Clean the carousel

- Frequency: at least every six months.

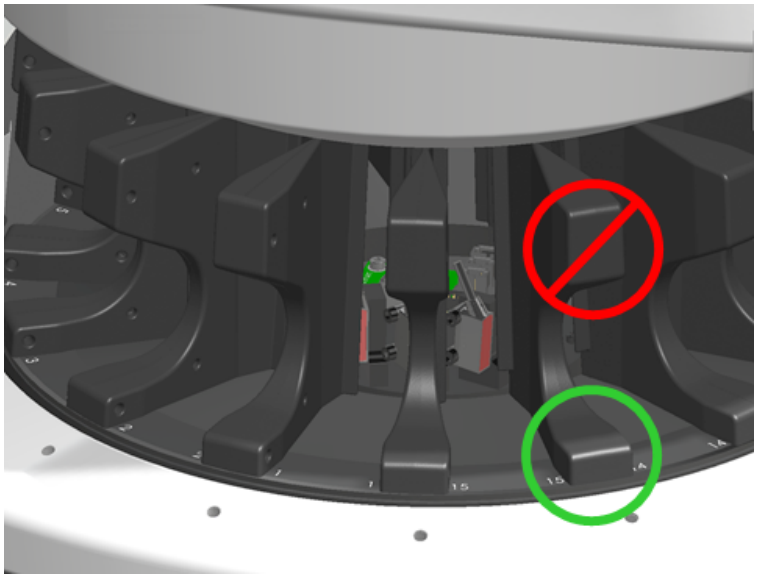
To clean the carousel:

1 If the scanner is on, shut down the scanner by following the steps in Shut down the scanner (on page 75).

2 Remove all slide racks from the carousel.

3 Use a cotton swab soaked in a cleaning solvent, such as denatured alcohol, to thoroughly clean the carousel. Be sure to clean inside the slide rack slots.

> **CAUTION:** When manually rotating the carousel to access the rack slots, grasp the area circled in green. Do not grasp the area circled in red.



4 Manually rotate the carousel to access the rear slide rack slots.

5 Repeat the cleaning steps until you have cleaned every slide rack slot.

6 If you are performing the entire six-month maintenance routine, continue to the next procedure.

7 If you are ready to close the scanner cover and restart the scanner, follow the steps in Restart the scanner after interior maintenance (on page 91).

# Clean the fan filter

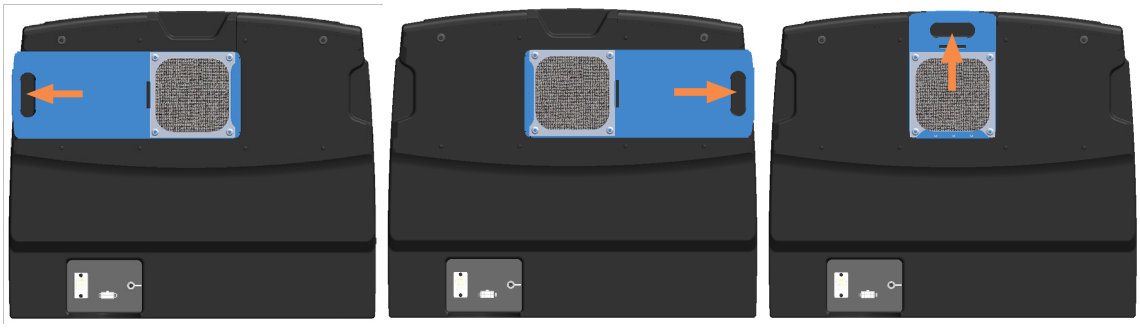
The fan filter is located on the back of the scanner. You may need to pivot the scanner to access the fan filter.

- Frequency: at least every six months.

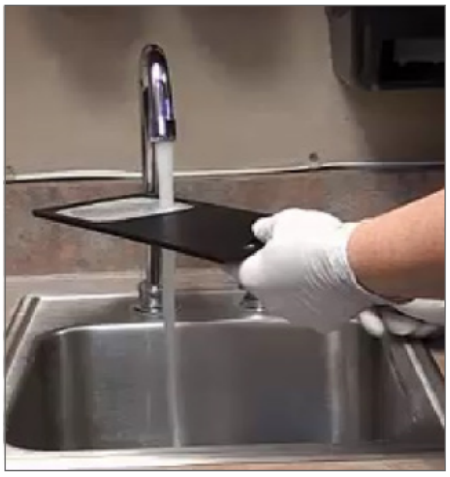
To clean the fan filter:

1 If the scanner is on, shut down the scanner by following the steps in Shut down the scanner (on page 75).

2 Remove the fan filter by gripping the handle (shown in blue), and sliding it left, right, or up depending on your scanner's configuration.



3 With the front of the filter up toward the faucet (as shown below), rinse the filter under warm water.



4 Shake off any excess water.

5 Dry the filter thoroughly with a clean cloth or a dryer.

> **CAUTION:** Ensure the fan filter is completely dry before inserting it in the scanner.

6 When the filter is completely dry, slide it back into position.

7 If you are performing the entire six-month maintenance routine, continue to the next procedure.

8 If you are ready to close the scanner cover and restart the scanner, follow the steps in Restart the scanner after interior maintenance (on page 91).

# Clean the slide racks

- Frequency: at least every six months.

To clean the slide racks:

1 Check the racks for any damage or accumulated glass dust and mounting media.

2 If a rack is damaged, replace it immediately.

3 Use compressed air or a cleaning solvent to clean all grooves in the rack, ensuring the racks are clean and smooth. (We recommend Xylene cleaning solvent).

4 If you are performing the entire six-month maintenance routine, continue to the next procedure.

5 If you are ready to close the scanner cover and restart the scanner, follow the steps in Restart the scanner after interior maintenance (on page 91).

# Clean the scanner cover

- Frequency: at least every six months.

To clean the scanner cover:

1 Wipe the outer cover of the scanner with a damp cloth.

2 Immediately dry the cover using a dry cloth.

# Clean the touchscreen

- Frequency: at least every six months.

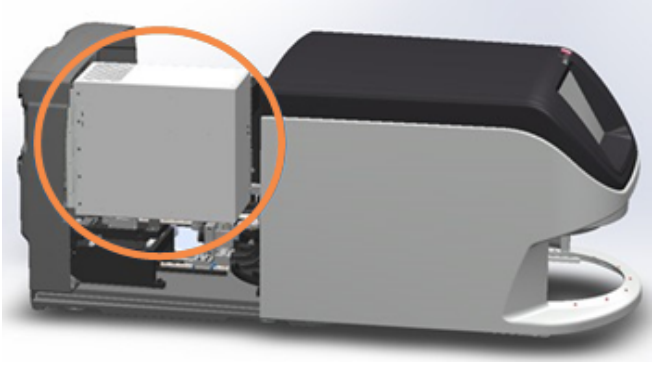
To clean the touchscreen:

1. Spray standard monitor cleaner directly on a clean non-scratch cloth. (Avoid spraying the touchscreen directly to ensure that no liquid gets inside the scanner).
2. Thoroughly wipe down the touchscreen with the cloth.
3. If you are ready to close the scanner cover and restart the scanner, follow the steps in Restart the scanner after interior maintenance (on page 91).

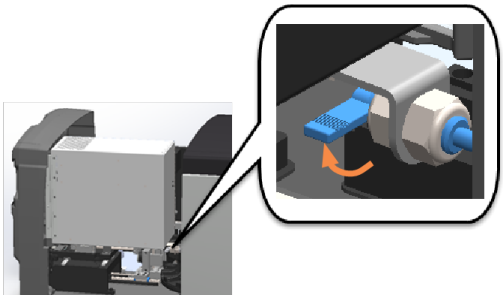
# Restart the scanner after interior maintenance

Follow these steps to restart the scanner after you have accessed the scanner interior.

1. Pivot the VPU into the closed position.

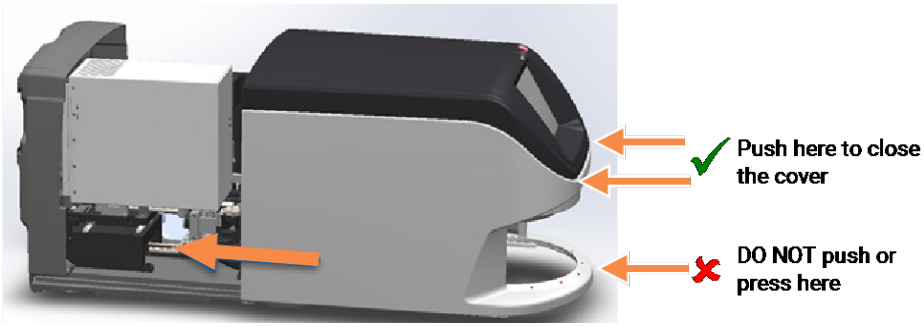


2. Secure the VPU in place by rotating the VPU latch 180 degrees.



3 Slide the scanner cover back into position so that it is aligned with the rear latches and clicks closed.

> **CAUTION:** Take care when installing the cover. Do not press or push the lower-front area, as shown below with the red "X." This can damage the scanner's assembly. Place your hand flat against the areas shown with the green check mark, and then gently push to slide the cover back into place.




4 Turn on the scanner.

# Transporting or moving the Aperio GT 450

If you need to relocate the scanner, contact Leica Biosystems Technical Services. Be aware that moving the scanner yourself may void the hardware warranty.

# Long term storage

If you are not going to use the scanner for a considerable amount of time, shut it down and unplug it. To shut down the scanner, follow the steps in Shut down the scanner (on page 75).

If you want to store the scanner, contact Leica Biosystems Technical Services for assistance.

For information on disposing of the scanner, see Disposal of the Aperio GT 450 (on page 19).

# Scanner Maintenance Log

Scanner Model Number: Scanner Serial Number: Year Installed: Year of Log:

| Activity | Technician | Date | Date | Date | Date | Date | Date | Date | Date | Date | Date | Date | Date | Date | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Daily Maintenance | | | | | | | | | | | | | | | |
| Restart scanner | | | | | | | | | | | | | | | |
| *Clean pusher/puller | | | | | | | | | | | | | | | |
| *Clean slide tray | | | | | | | | | | | | | | | |
| Monthly Maintenance | | | | | | | | | | | | | | | |
| Clean objective and Koehler | | | | | | | | | | | | | | | |
| Clean carousel | | | | | | | | | | | | | | | |
| Clean slide racks | | | | | | | | | | | | | | | |
| Clean fan filter | | | | | | | | | | | | | | | |
| Clean touchscreen | | | | | | | | | | | | | | | |
| Clean scanner cover | | | | | | | | | | | | | | | |
| Yearly Maintenance | | | | | | | | | | | | | | | |
| Schedule annual maintenance visit | | | | | | | | | | | | | | | |

*Perform visual inspection daily; clean if you observe debris.

# 6 Troubleshooting

This chapter contains information and instructions to help you resolve troubleshooting issues with your scanner. For issues with the Aperio GT 450 Scanner Administration Manager, see the *Aperio GT 450 IT Manager and Lab Administrator's Guide*.

**WARNING:** Do not attempt to perform troubleshooting procedures not shown in this chapter. For additional troubleshooting assistance, contact Leica Biosystems Technical Services.

In this section:

# Personal protective equipment

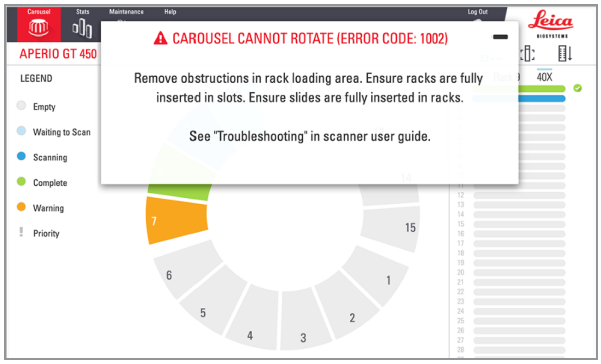
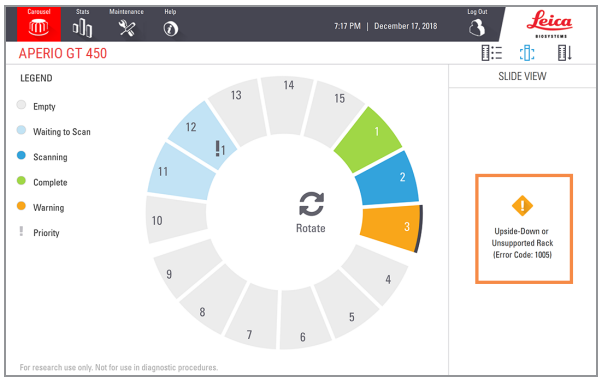
If you need to access the interior of the scanner while troubleshooting an issue, follow the policies and procedures of your institution, including the use of personal protective equipment (PPE).

# Red blinking lights on carousel

If the lights in front of the carousel are blinking red, the scanner needs attention. If there is an issue with a rack in the rack loading area, the light below that rack position blinks red. See the next section for more details on resolving scanner issues.

# How to use the troubleshooting steps

The following table describes how to find the appropriate troubleshooting section:

| Type of issue | Scanner status | Steps to resolve the issue |
|---|---|---|
| An error message box similar to this example appears on the touchscreen interface:<br>  | Until the error is resolved:<br>• You cannot interact with the carousel.<br>• The scanner cannot continue scanning. | 1 You can tap the ▬ to minimize the message box.<br>This enables you to view the rack status and access the Help resources.<br>2 See Error codes and solutions (on page 99) for steps to resolve the specific error. |
| A rack warning and error message similar to this example appears on the touchscreen interface:<br>  | There is a problem with the rack or one or more slides in the rack.<br>The scanner can continue scanning other racks or slides. | See Rack warnings and solutions (on page 115) for steps to resolve the specific error. |

| Type of issue | Scanner status | Steps to resolve the issue |
|---|---|---|
| No message or warning appears on the touchscreen interface, but there is a problem with the scanner. For example, the scanner does not power up when you turn it on. | Varies with the situation. | See Symptoms and solutions (on page 123). |

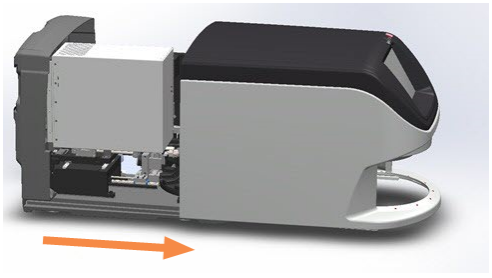
# Perform a safe restart after an error

Some procedures in this chapter ask you to restart the scanner. Restarting the scanner initializes the controller and puts the stage and autoloader in their home positions. Before restarting the scanner, you need to ensure there is no slide on the stage.

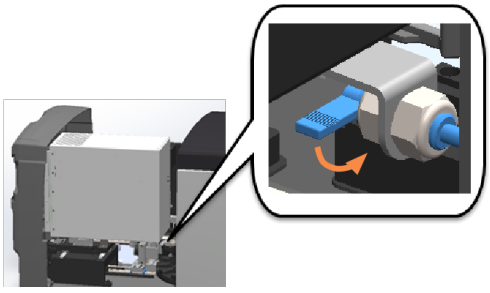
Follow these steps to safely restart the scanner after an error:

1 Open the cover and access the interior:

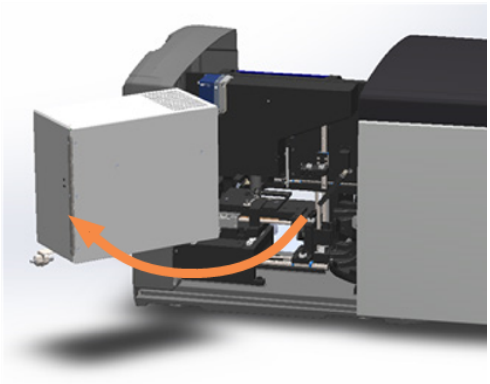
a Open the scanner cover.



b Rotate the VPU latch.



c Pivot out the VPU.



For detailed steps, see Open the scanner cover and access the interior components (on page 75).

2 Check if there is a slide on the stage or partially on the stage.

**Figure 6-1:** Slide on the stage

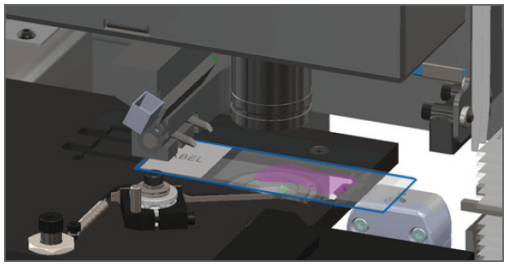
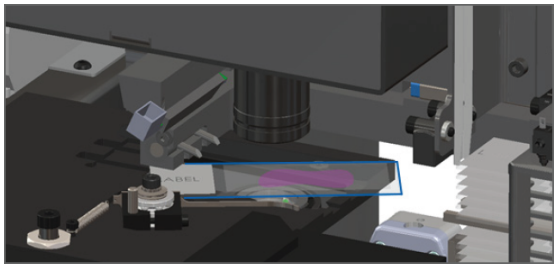


**Figure 6-2:** Slide partially on the stage

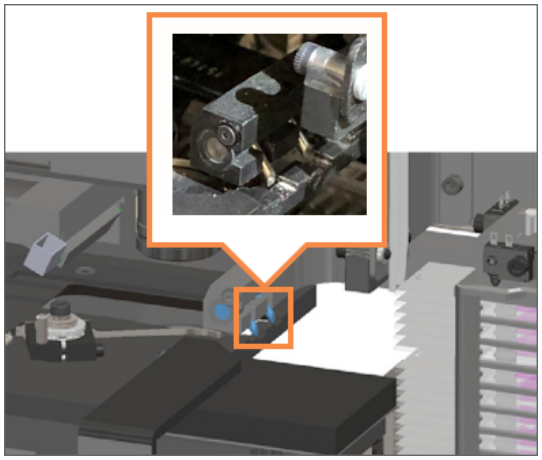


**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

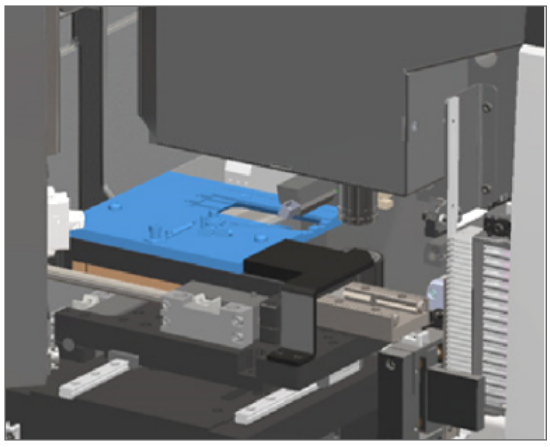
3 If there is a slide on the stage, carefully remove it from the stage without touching the surrounding components.

4 If the pusher is extended, return the pusher to the safe (retracted) position.

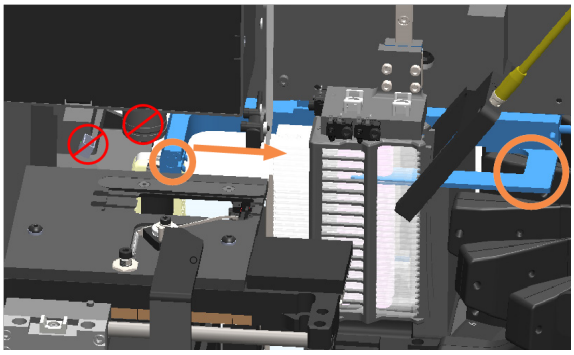
a Align the pusher teeth with the slide stage grooves.

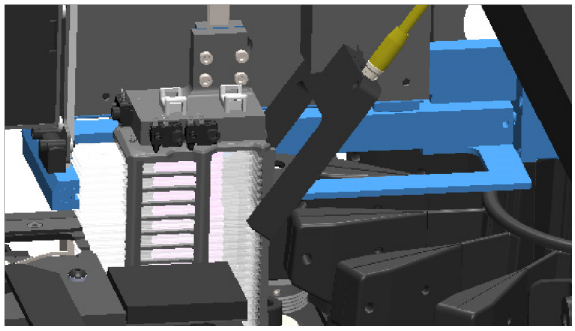


b Slide the stage to the rear of the scanner, as shown.



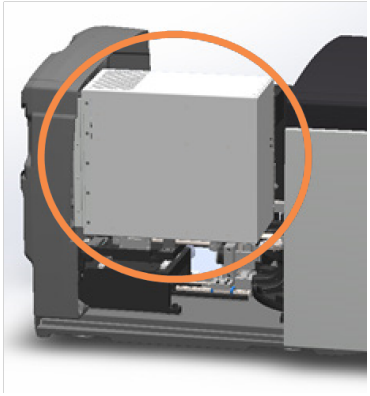
c Slide the pusher to the front of the scanner, as shown in the rightmost image below. Hold the pusher in one of the areas circled below. Avoid touching the LED and objective.



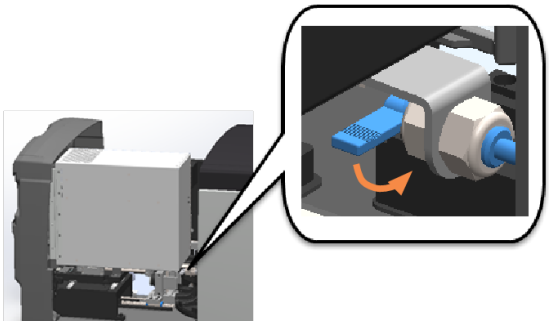


5 Close the scanner cover.

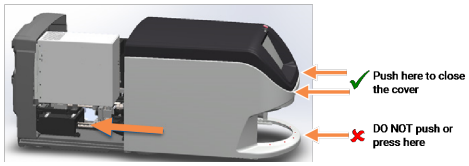
a Pivot the VPU into place.



b Rotate the VPU latch.



c Slide the cover until it clicks closed.




For detailed steps, see Restart the scanner after interior maintenance (on page 91).

6 Tap **Maintenance** on the touchscreen interface, then tap **Restart Scanner**. Wait for the scanner to complete the restart process.

# Error codes and solutions

If an error box appears on the touchscreen, you must resolve the issue before the scanner can continue scanning. This section contains error codes and messages with troubleshooting steps.

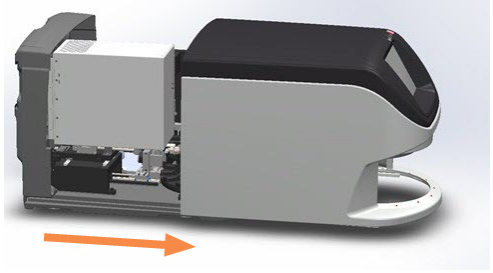
## 1000: Internal error

- **Cause:** An unexpected event occurred in the system that prevents it from continuing operation.

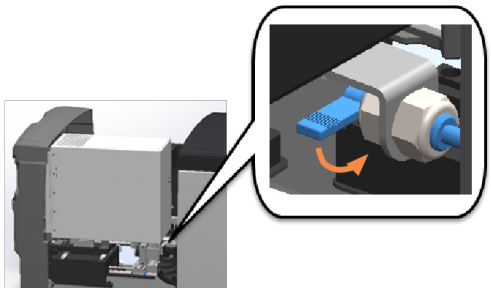
Follow these steps:

1 Open the cover and access the interior:

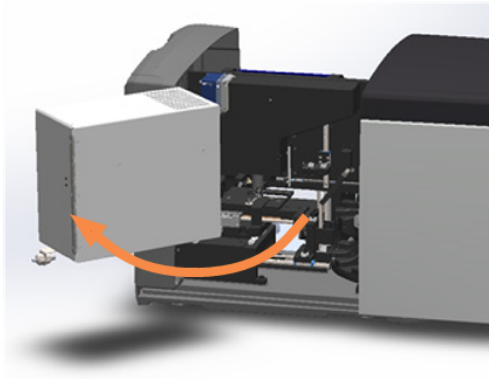
a Open the scanner cover.



b Rotate the VPU latch.



c Pivot out the VPU.



For detailed steps, see Open the scanner cover and access the interior components (on page 75).

2 Take photos of any obstructions. Leica Biosystems Technical Services may request the photos if you need additional assistance after completing the steps below.

3 Check if there is a slide on the stage or partially on the stage.

**Figure 6-3:** Slide on the stage

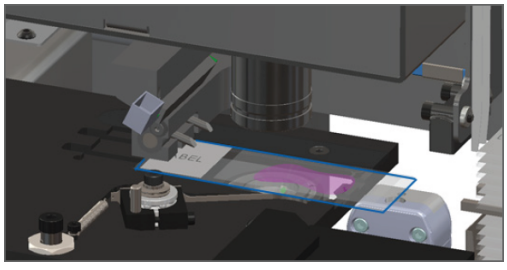
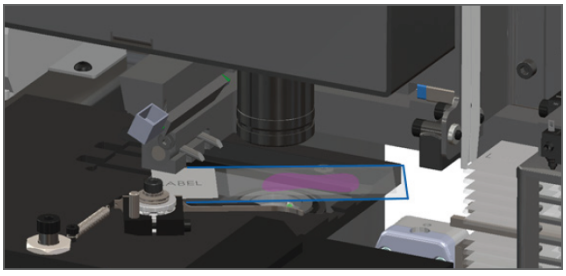


**Figure 6-4:** Slide partially on the stage

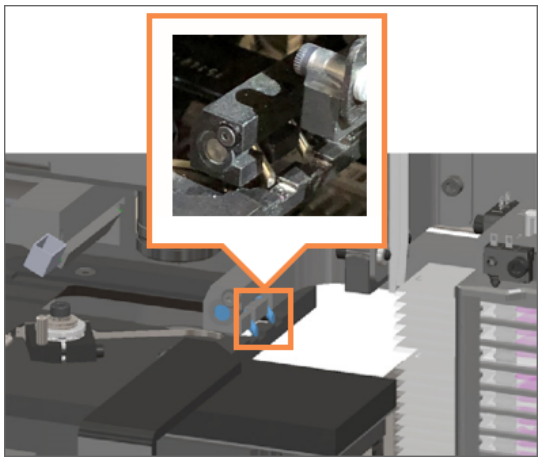


**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

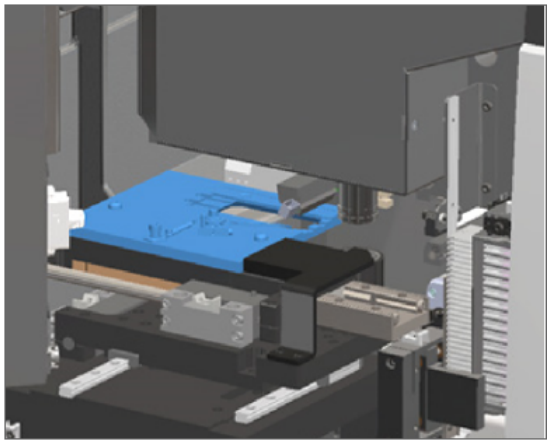
4 If there is a slide on the stage, carefully remove it from the stage without touching the surrounding components.

5 If the pusher is extended, return the pusher to the safe (retracted) position.

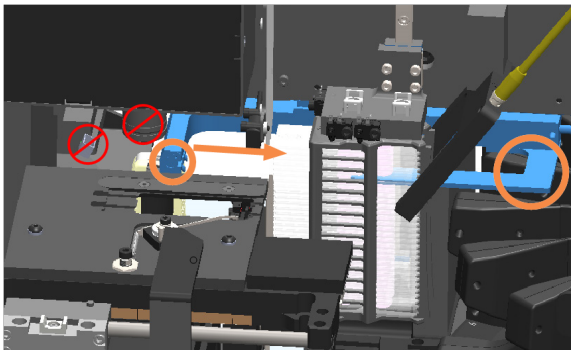
a Align the pusher teeth with the slide stage grooves.

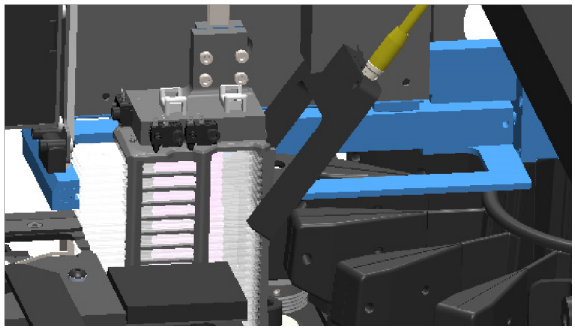


b Slide the stage to the rear of the scanner, as shown.



c Slide the pusher to the front of the scanner, as shown in the rightmost image below. Hold the pusher in one of the areas circled below. Avoid touching the LED and objective.

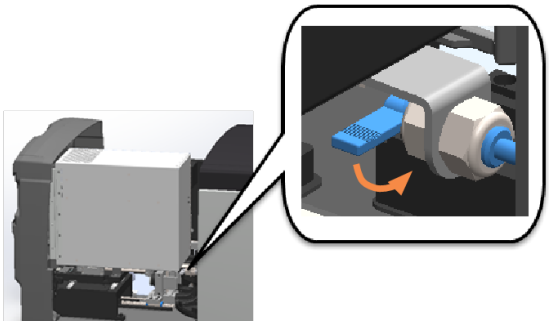




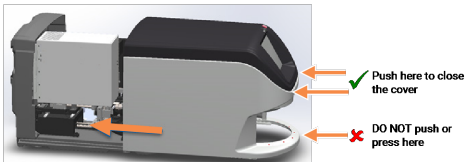
6 Close the scanner cover:

a Pivot the VPU into place.

b Rotate the VPU latch.



c Slide the cover until it clicks closed.




For detailed steps, see Restart the scanner after interior maintenance (on page 91).

7 Tap **Restart Scanner** on the touchscreen interface, and wait for the scanner to complete the restart process.

8 If the issue persists, call Leica Biosystems Technical Services.

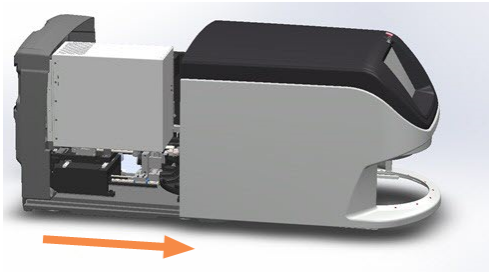
# 1001: Scanner cannot initialize

- **Cause:** The scanner cannot complete the initialization process.

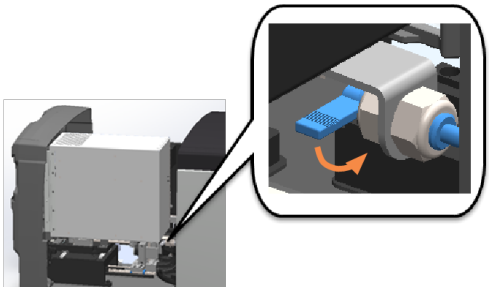
Follow these steps:

1 Open the cover and access the interior:

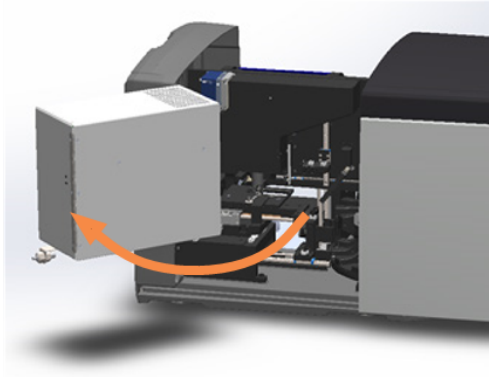
a Open the scanner cover.



b Rotate the VPU latch.



c Pivot out the VPU.



For step details, see Open the scanner cover and access the interior components (on page 75).

2 Check if there is a slide on the stage or partially on the stage.

**Figure 6-5:** Slide on the stage

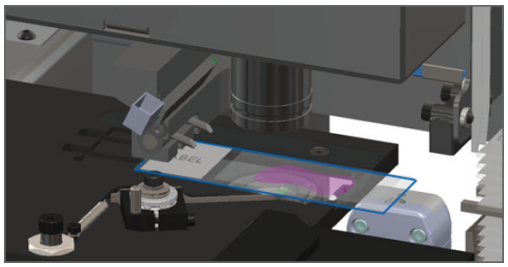
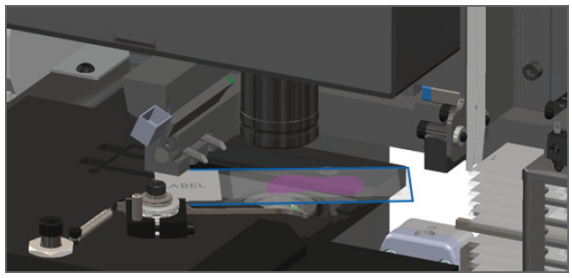


**Figure 6-6:** Slide partially on the stage

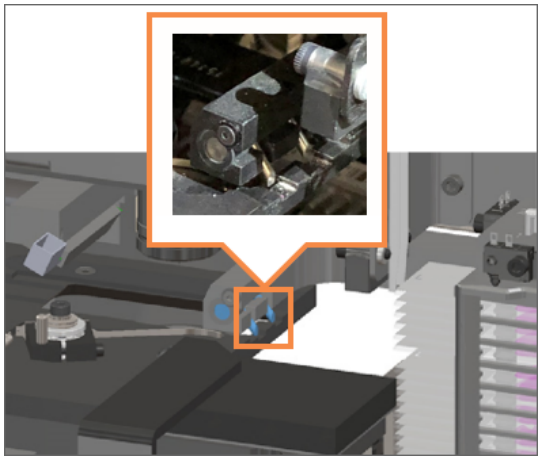


**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

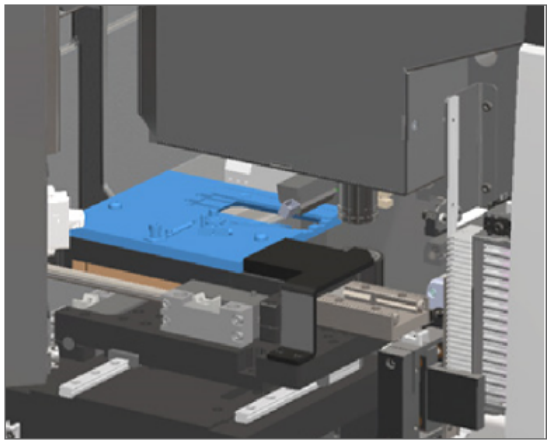
3 If there is a slide on the stage, carefully remove it from the stage without touching the surrounding components.

4 If the pusher is extended, return the pusher to the safe (retracted) position.

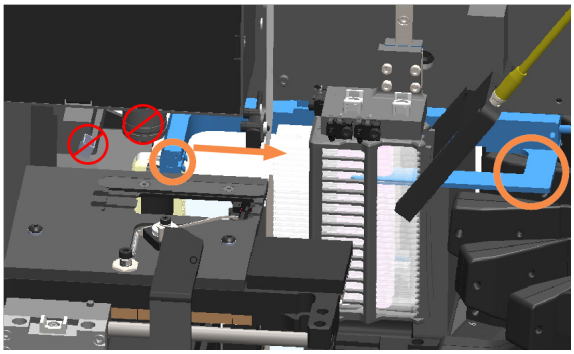
a Align the pusher teeth with the slide stage grooves.

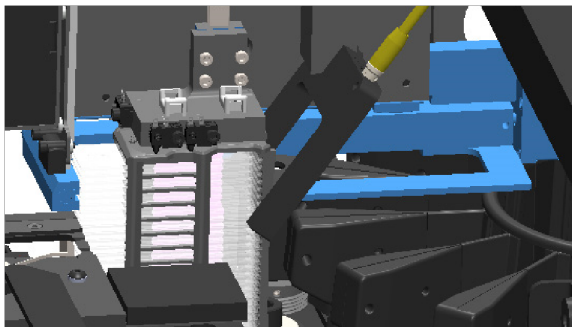


b Slide the stage to the rear of the scanner, as shown.



c Slide the pusher to the front of the scanner, as shown in the rightmost image below. Hold the pusher in one of the areas circled below. Avoid touching the LED and objective.

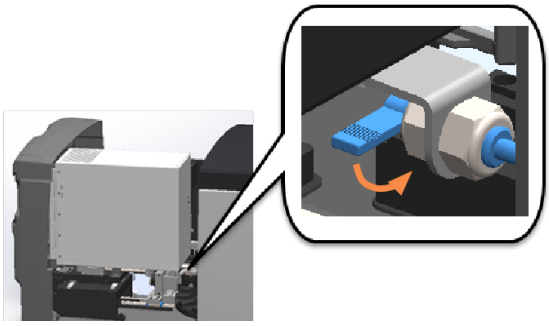




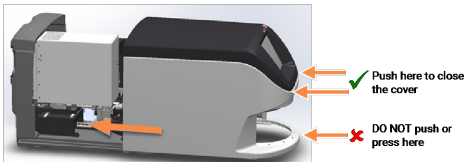
5 Close the scanner cover:

a Pivot the VPU into place.

b Rotate the VPU latch.



c Slide the cover until it clicks closed.




For step details, see Restart the scanner after interior maintenance (on page 91).

6 Shut down the scanner using the steps in Shut down the scanner (on page 75).

7 Turn on the scanner and wait for the initialization process to complete.

8 If the issue persists, call Leica Biosystems Technical Services.

# 1002: Carousel cannot rotate

- **Cause:** Something is blocking the light curtain.

Follow these steps in order until the issue is resolved and the error message closes:

1 Check the rack loading area and pinch points for any unexpected object.

**Figure 6-7:** Rack loading area with light curtain highlighted

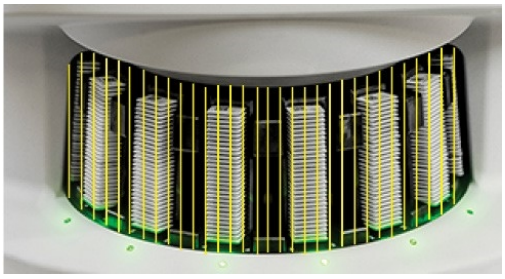


**Figure 6-8:** Pinch points on either edge of rack loading area

2 Ensure the racks in the rack loading area are inserted correctly:

**Figure 6-9:** Leica logo facing out and up

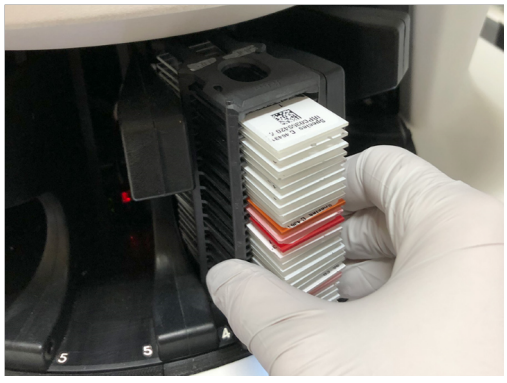


**Figure 6-10:** Rack inserted fully into the rack slot

3 When you insert the rack, ensure the rack position and the rack status light turns light blue (waiting to scan):

**Figure 6-11:** Empty rack slot

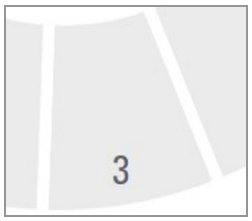
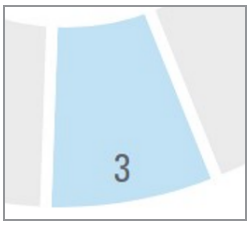



**Figure 6-12:** Rack inserted and waiting to scan




4 Ensure all the slides are fully inserted so that they touch the back of the rack.

5 If there are no obstructions and the carousel still does not rotate, restart the scanner. See Perform a safe restart after an error (on page 96).

6 If the issue persists, contact Leica Biosystems Technical Services.

# 1003: Carousel cannot rotate. Carousel pinch point obstructed.

- **Cause:** There is an obstruction at a pinch point.

Follow these steps in order until the issue is resolved and the error message closes:

1 Check the rack loading area and pinch points for any unexpected object that may break the light curtain.

**Figure 6-13:** Rack loading area with light curtain highlighted

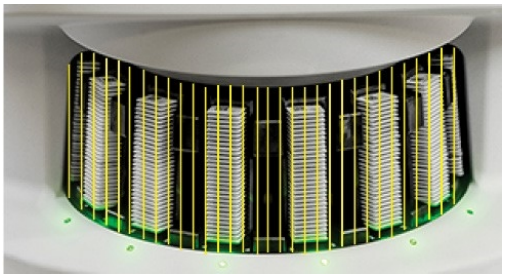


**Figure 6-14:** Pinch points on either edge of rack loading area

2 If there are no obstructions and the carousel still does not rotate, restart the scanner by following the steps in Perform a safe restart after an error (on page 96).

3 If the issue persists, contact Leica Biosystems Technical Services.

# 1007: Internal storage full. Cannot send images to DICOM converter.

- **Cause:** If the internal storage is full, the system cannot send the images to the DICOM converter.

The Lab Administrator should perform these steps:

1 Ensure the LAN cables are connected at the scanner LAN port and at the Aperio GT 450 SAM server.

2 Do not restart the scanner. If you restart the scanner, the scanned data is lost, and users have to rescan their slides.

3 Check the connectivity from the scanner to the DICOM server, and from the DICOM server to your site's image storage location.

4 Ensure the DICOM server is running. Restart the DICOM server if necessary.

5 Check if your site's image storage location is full.

6 Check if there is a permissions or account problem with the account running the DICOM server.

7 If the issue persists, consult with your organization's IT professionals prior to calling Leica Biosystems Technical Services.

When the issue is resolved, if you have not restarted the scanner, the scanner starts transferring the slide images to the DICOM server.

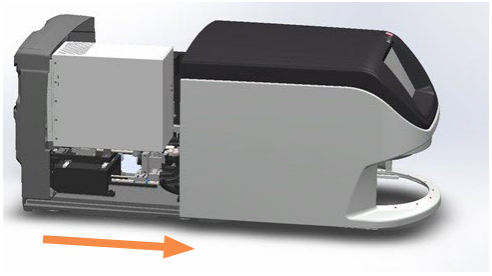
# 2000: Slide handling error at slide stage, rack, or pusher.

- **Cause:** There is an obstruction at the slide stage, rack, or pusher.

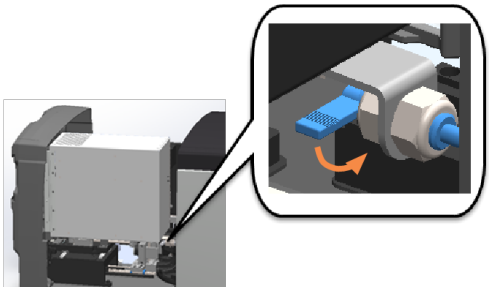
Follow these steps in order until the issue is resolved:

1 Open the cover and access the interior:

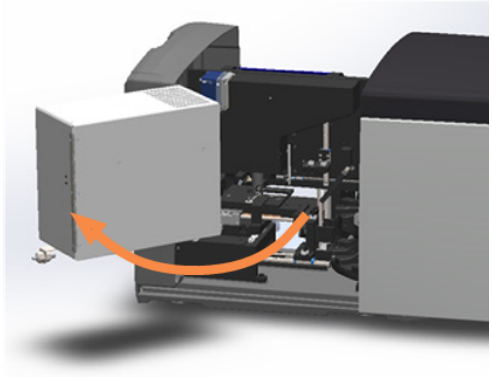
a Open the scanner cover.



b Rotate the VPU latch.



c Pivot out the VPU.



For detailed steps, see Open the scanner cover and access the interior components (on page 75).

2 Take photos of the obstruction. Leica Biosystems Technical Services may request the photos if you need additional assistance after completing the steps below.

3 Check if there is a slide on the stage or partially on the stage.

**Figure 6-15:** Slide on the stage

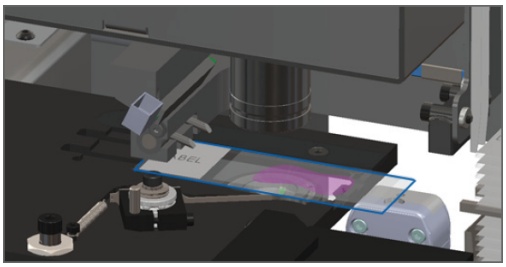
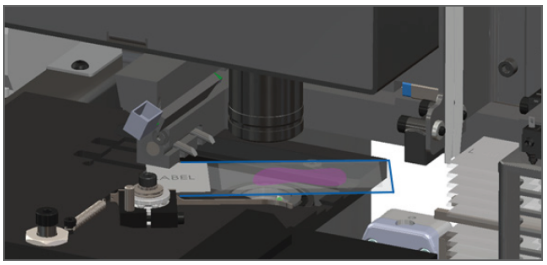


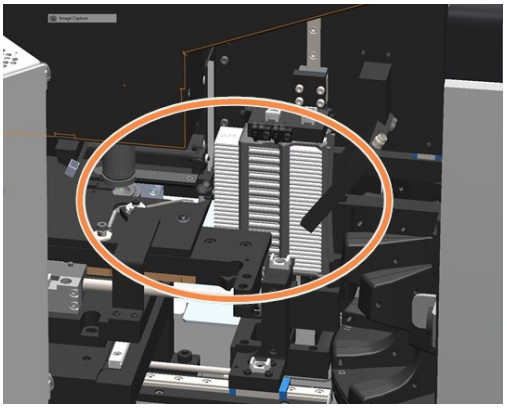
**Figure 6-16:** Slide partially on the stage



**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

4 If there is a slide on the stage, carefully remove it from the stage without touching the surrounding components.

5 Check the slide stage, rack, and pusher area for an obstruction.



6 If possible, carefully remove the slide that is causing the obstruction.

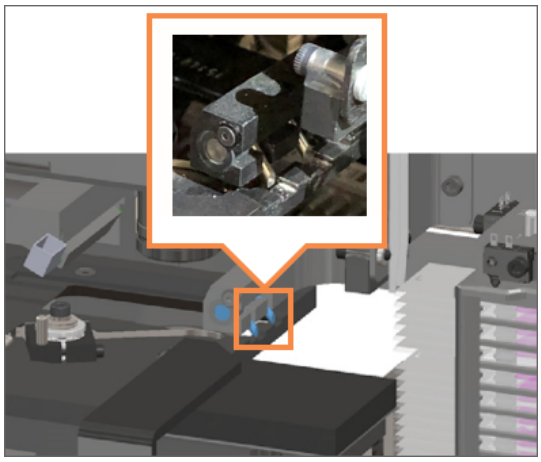
**WARNING:** Do not attempt to recover broken slides. Call Leica Biosystems Technical Services.

7 Check the slide for preparation issues, such as over-hanging coverslips and label issues.

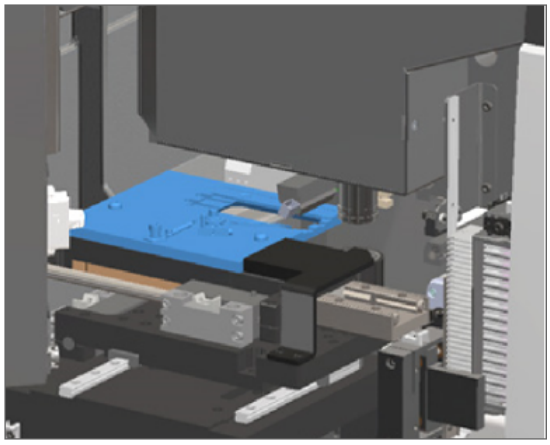
- If there are no obvious preparation issues, re-insert the slide in an available rack after you restart the scanner.
- If there are slide preparation issues, correct the slide issues before rescanning.

8 If the pusher is extended, return the pusher to the safe (retracted) position.

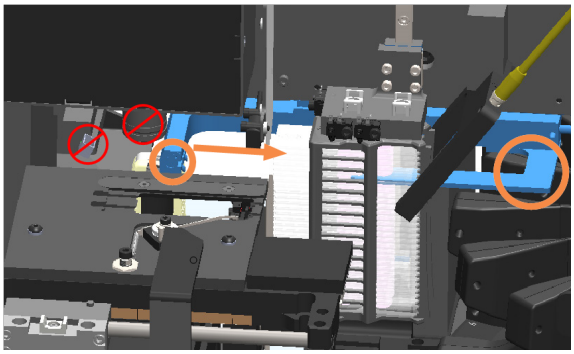
a Align the pusher teeth with the slide stage grooves.

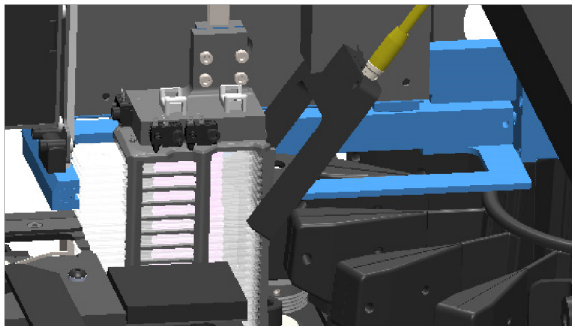


b Slide the stage to the rear of the scanner, as shown.



c Slide the pusher to the front of the scanner, as shown in the rightmost image below. Hold the pusher in one of the areas circled below. Avoid touching the LED and objective.

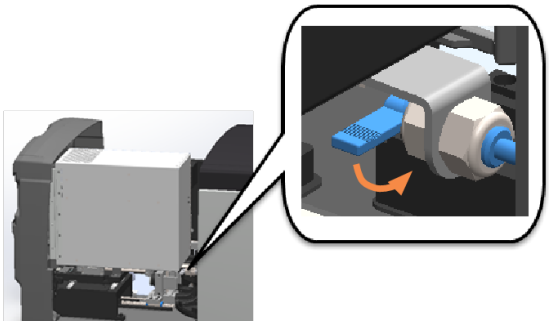




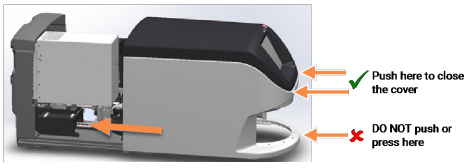
9 Close the scanner cover:

a Pivot the VPU into place.

b Rotate the VPU latch.



c Slide the cover until it clicks closed.




For detailed steps, see Restart the scanner after interior maintenance (on page 91).

10 Tap **Restart Scanner** on the touchscreen interface, and wait for the scanner to complete the restart process.

11 If the issue persists, contact Leica Biosystems Technical Services.

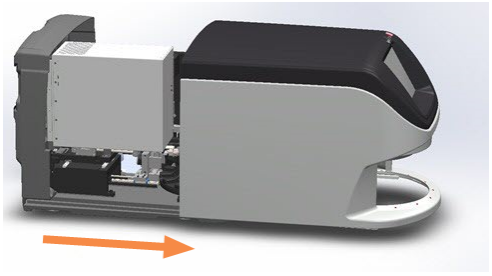
# 2001: Slide handling error at rack gripper, lift, or carousel.

- **Cause:** There is an obstruction near the rack gripper, lift, or carousel.

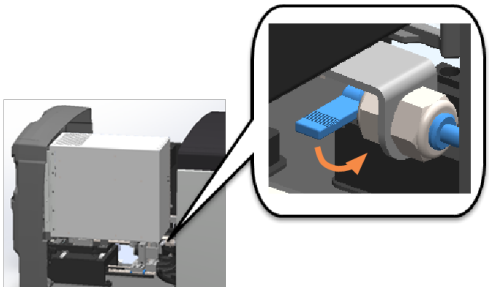
Follow these steps until the issue is resolved:

1 Open the cover and access the interior:

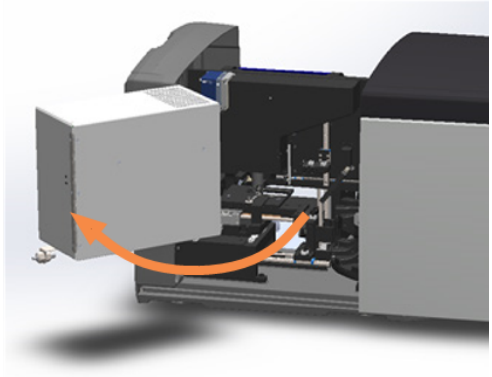
a Open the scanner cover.



b Rotate the VPU latch.



c Pivot out the VPU.



For detailed steps, see Open the scanner cover and access the interior components (on page 75).

2 Take photos of the obstruction.

**WARNING:** Do not attempt to recover broken slides. Call Leica Biosystems Technical Services.

3 Check if there is a slide on the stage or partially on the stage.

**Figure 6-17:** Slide on the stage

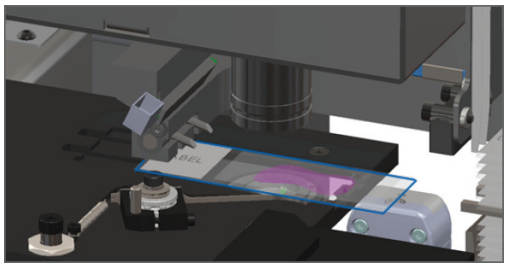
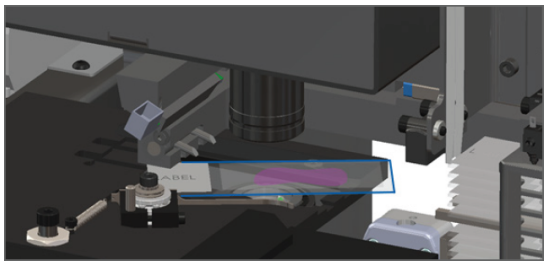


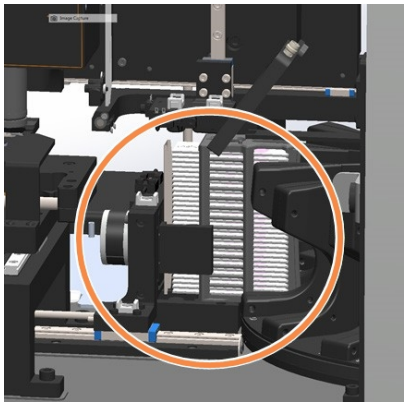
**Figure 6-18:** Slide partially on the stage



**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

4 If there is a slide on the stage, carefully remove it from the stage without touching the surrounding components.

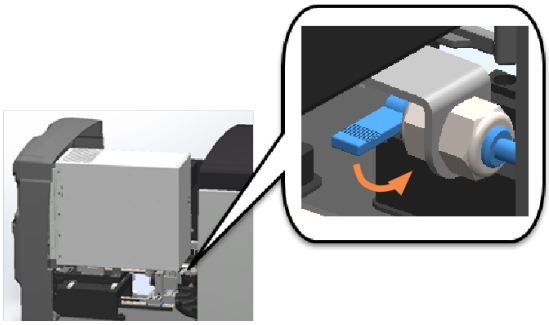
5 Check the rack gripper, lift, and carousel area for an obstruction.



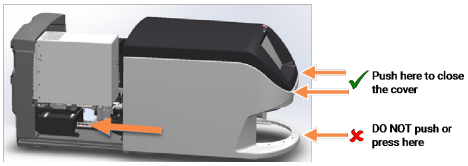
6 Close the scanner cover:

a Pivot the VPU into place.

b Rotate the VPU latch.



c Slide the cover until it clicks closed.




For detailed steps, see Restart the scanner after interior maintenance (on page 91).

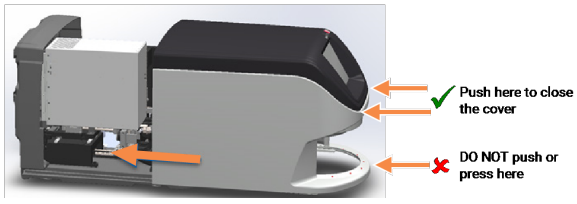
7 Contact Leica Biosystems Technical Services.

## 9000: Scanner cover is open

- The scanner cover is not closed completely.

Follow these steps until the issue is resolved:

1 Slide the cover to the closed position, making sure the cover aligns with rear latches and clicks closed:




# Rack warnings and solutions

Rack warnings indicate a problem with the rack or one or more slides in the rack. The scanner can continue scanning when there is a rack warning.

**CAUTION:** If you need to remove a rack before all slides in the rack are scanned, first take note of the rack and slide status. After you remove a rack, the rack's scan status is no longer available on the Home screen.

# 1005: Cannot process rack

- **Cause:** There is an issue with a rack that prevents scanning.

Follow these steps in order until the issue is resolved:

1. Rotate the rack to the rack loading area. See Rotate a rack to the rack loading area (on page 55).
2. Ensure the rack is inserted correctly:

**Figure 6-19:** Leica logo facing out and up

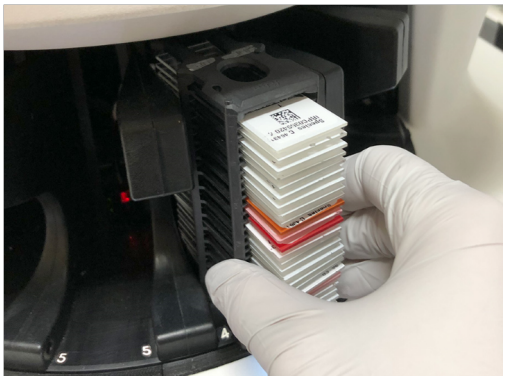
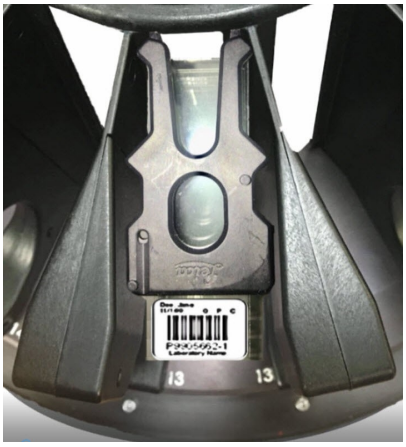


**Figure 6-20:** Rack inserted fully into the carousel



3. Remove the rack and check the following:
   - You are using a supported rack. See Slide racks supported (on page 29).
   - The rack is not damaged or modified.
4. Verify the error only occurs on one rack.
   - If the error only occurs on one rack, go to step 5.
   - If the error occurs on multiple racks, contact Leica Biosystems Technical Services.
5. If you verified the rack is a supported and undamaged rack, reinsert it into the carousel for scanning.
6. If the scanner still cannot process the rack, attempt to restart the scanner by following the steps in Perform a safe restart after an error (on page 96).
7. If the issue persists, remove the rack and contact Leica Biosystems Technical Services.

# 1006: Cannot process one or more slides in rack

- **Cause:** There is an issue with one or more slides in the rack.

Follow these steps in order until the issue is resolved:

1. On the touchscreen, tap the rack position that has the error, and tap **Rack View** to identify which slides have the error.
2. Tap **Slide View** to view the macro image of the slide and check for an error message.

3 Go to the section that matches the slide error:
   - Tilted slide(s) (on page 117)
   - No barcode (on page 118)
   - No tissue (on page 118)
   - No macro focus (on page 119)
   - Image quality (on page 119)
   - Image transfer error – pending retry (on page 120)
   - Aborted (on page 121)
4 If the issue persists after following the relevant procedure, keep the slide available for inspection and contact Leica Biosystems Technical Services.

# Slide errors and solutions

If there is an issue scanning a slide, one of the following error messages appears in Slide View. Follow the steps in order until the issue is resolved. If you follow the steps and the issue persists, contact Leica Biosystems Technical Services.

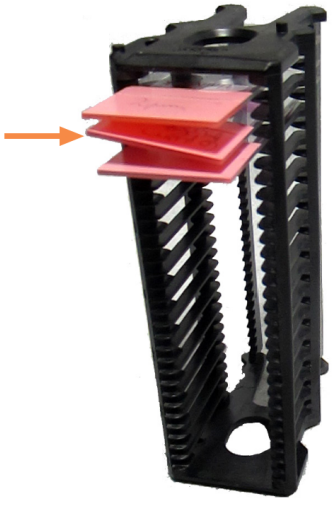
You can temporarily hide some error messages by tapping the x in the top-right corner. This enables you to view the macro image.

## Tilted slide(s)

- **Cause:** The slide is tilted between two or more slots in the rack and cannot be scanned.

Follow these steps in order:

1 Remove the rack from the carousel, and locate the tilted slide:



2 Insert the slide in a new rack for scanning, ensuring it sits level horizontally in one slot.
3 Insert the rack into an empty rack slot for scanning.

# No barcode

- **Cause:** The scanner does not detect a barcode on the slide.

The scanner produces an image even if there are no barcodes detected. If your site does not require the use of barcodes, you can ignore this error.

> Your Lab Administrator determines whether the scanner requires the presence of a barcode to complete a scan. Your Lab Administrator or Leica Biosystems representative sets this configuration in Aperio GT 450 SAM.

If your site requires the use of barcodes, follow these steps in order until the issue is resolved:

1. Check the slides and rack are inserted correctly:
   - Slide label facing out and up.
   - Leica logo facing out and up.
   - See Load slides in the rack (on page 43).
2. Ensure barcodes meet specifications. See Barcodes supported (on page 29).
3. Ensure barcodes meet minimum quality requirements. See Barcodes (on page 36).
4. If the issue persists, call Leica Biosystems Technical Services.

# No tissue

- **Cause:** The scanner does not detect tissue on the slide.

Follow these steps in order until the issue is resolved:

1. On the touchscreen interface, tap the rack position that has the error.
2. Tap the **Slide View** icon to view the macro image of the slide.

3. Tap the error message to temporarily hide it.
4. If available on your scanner, scan the slide again using the optional Manual Scan process. (For details, see Use Manual Scan to resolve an image quality issue (on page 67).) If you do not have the Manual Scan feature available, skip to the next step.
   a. Consider placing additional focus points on the tissue area using the Manual Scan feature.
   b. When the scan is finished, do not remove the rack from the scanner.
5. If the issue persists, continue with the following steps.
6. Verify there is tissue on the slide.
7. Take note of the slide number.

8 Rotate and remove the rack to access the slide.

9 Remove the slide from the rack, and then clean the slide.

10 Re-insert the slide into a new rack and scan it again.

11 If the issue persists, check for slide preparation errors. See Chapter 3: Slide preparation.

12 If the issue persists after completing the previous steps, call Leica Biosystems Technical Services.

## No macro focus

- **Cause:** The scanner's camera cannot focus on the tissue.

Follow these steps in order until the issue is resolved:

1 Check for slide loading issues:
   - Slide orientation is correct with the specimen-side facing up. See Load slides in the rack (on page 43).
   - Slide tray is clean.

2 Check the stain quality.

3 Check that the slide and coverslip thickness meet the requirements. See the *Aperio GT 450 Specifications*.

4 Check for common slide preparation issues and verify:
   - Coverslip is not missing or overhanging.
   - Labels are not overhanging or on wrong side.
   - There is only one label applied to the slide.
   - Slide is clean.

5 If every slide has the same error, or if the issue persists after following the previous steps, call Leica Biosystems Technical Services.

## Image quality

- **Cause:** The scanner's Auto-Image QC feature detected an image quality issue.

Follow these steps in order until the issue is resolved:

1 Review the scanned slide image in your viewing software.

2 Check for common slide preparation issues and verify:
   - Coverslip is not missing or overhanging.
   - Labels are not overhanging or on wrong side.
   - There is only one label applied to the slide.
   - Slide is clean.

3 Display the slide in Slide View, and do one of the following depending on the configuration of your scanner:
   - If the optional Manual Scan feature is available on your scanner, tap **Manual Scan**. For detailed instructions, see Use Manual Scan to resolve an image quality issue (on page 67). When the scan is finished, do not remove the rack from the scanner.
   - If your scanner does not have the Manual Scan feature available, tap **Scan Entire Slide** to re-scan the entire slide. (To scan the whole area for a rack of slides, see Scan entire slide for whole rack (on page 63).)
4 When the scan is finished, do not remove the rack from the scanner.
5 Review the newly scanned slide image in your viewing software. If the issue persists, continue with the following steps.
6 Check if other slides are in focus.
7 If all slides are out of focus, clean the objective. See Clean the objective and Koehler (on page 82).
8 If the issue persists after following the previous steps, call Leica Biosystems Technical Services.

## Image transfer error – pending retry

- **Cause:** The scanner cannot transfer the scanned image to the image storage location.

Follow the appropriate steps below:

| Error appears on some slides | Error appears on all slides |
|---|---|
| The system often resolves the issue without intervention.<br>1 If all slides in the rack are finished scanning, remove the rack.<br>2 Check for the image in Aperio eSlide Manager.<br>3 If necessary, rescan only the slides that are missing from Aperio eSlide Manager. | The Lab Administrator should:<br>1 Ensure the LAN cables are connected to the scanner LAN port and to the Aperio GT 450 SAM server.<br>2 Do not restart the scanner. If you restart the scanner, the scanned data is lost, and users have to rescan their slides.<br>3 Check the connectivity from the scanner to the DICOM server, and from the DICOM server to your site's image storage location<br>4 Ensure the DICOM server is running. Restart the DICOM server if necessary.<br>5 Check if your site's image storage location is full.<br>6 Check if there is a permissions or account problem with the account running the DICOM server.<br>7 If the issue persists, consult with your organization's IT professionals prior to calling Leica Biosystems Technical Services.<br><br>When the issue is resolved, if you have not restarted the scanner, the scanner starts transferring the slide images to the DICOM server. |

# Aborted

- **Cause:** The scanner cannot scan the slide.

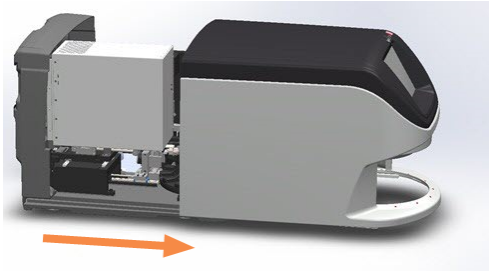
Follow these steps in order until the issue is resolved.

1. If the "Aborted" message appears on all slides, go to Aborted message appears on all slides (on page 121). If the message appears on one or some slides, continue to the next step.
2. Check for damage or common slide preparation issues and verify:
   - Coverslip is not missing or overhanging.
   - Labels are not overhanging or on wrong side.
   - There is only one label applied to the slide.
   - There is only one coverslip applied to the slide.
   - Slide is clean.
3. Clean the slide.
4. Insert the slide into a different rack and scan it again.
5. If the issue persists after following the previous steps, call Leica Biosystems Technical Services.

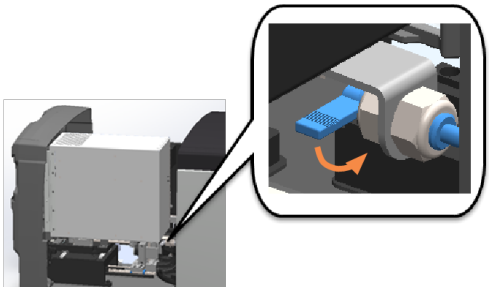
# Aborted message appears on all slides

Follow these steps in order until the issue is resolved:

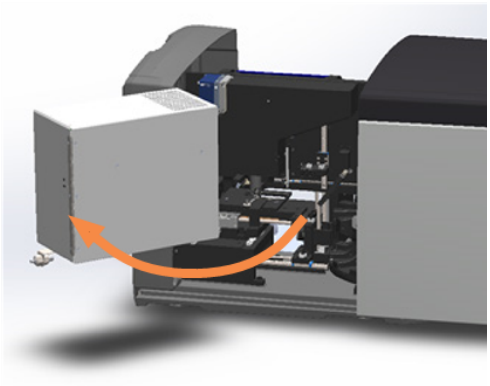
1. Remove any completed slide racks from the carousel.
2. Open the cover and access the interior:
   a. Open the scanner cover.



   b. Rotate the VPU latch.



c Pivot out the VPU.



For step details, see Open the scanner cover and access the interior components (on page 75).

3 Check if there is a slide on the stage or partially on the stage.

**Figure 6-21:** Slide on the stage

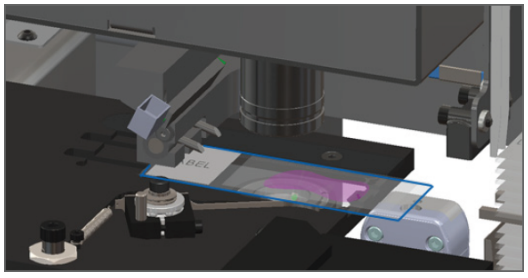
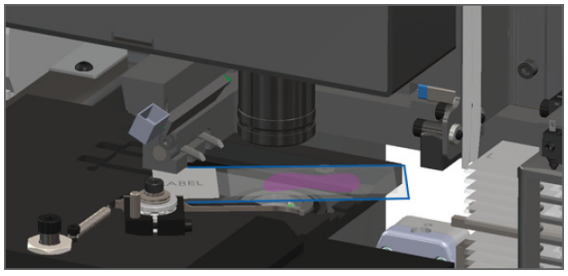


**Figure 6-22:** Slide partially on the stage



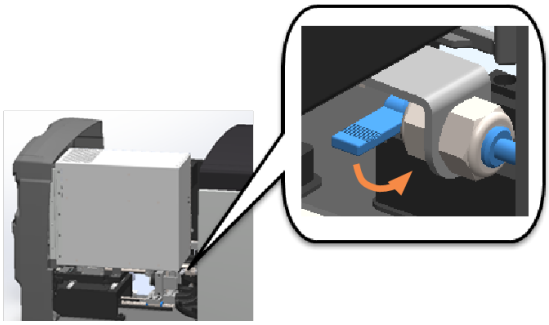
**CAUTION:** Restarting the scanner with a slide on the stage may damage the slide.

4 If there is a slide on the stage, carefully remove it from the stage without touching the surrounding components.

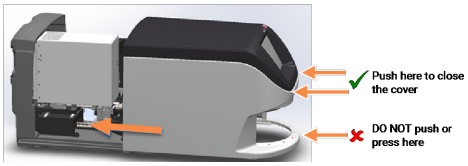
5 Close the scanner cover:

a Pivot the VPU into place.

b Rotate the VPU latch.



c Slide the cover until it clicks closed.




For detailed steps, see Restart the scanner after interior maintenance (on page 91).

6 Shut down the scanner by tapping **Maintenance**, then tapping **Shut Down Scanner**.

7 When touchscreen is dark, turn the scanner off using the On/Off switch.

8 Turn the scanner back on using the On/Off switch.

9 Allow the scanner to scan any remaining racks.

10 If the issue persists, call Leica Biosystems Technical Services.

## Artifact detection messages from the optional Aperio iQC Software Module

If you are using the optional Aperio iQC Software Module, messages preceeded by "iQC" appear in the scanner console's Slide View if the Aperio iQC Software Module detects one or more artifacts on the scanned image. Some examples of messages include "iQC: Missing Tissue," "iQC: Air Bubbles," etc.

See your *Aperio iQC Software Module User's Guide* for full details.

# Symptoms and solutions

This section contains troubleshooting information organized by symptom for scanner issues that do not have an error message or code.

## Scanner does not power on

1 Ensure the scanner is turned on.

2 If you are using an optional uninterruptible power supply (UPS), ensure it is turned on.

3 Check the connections to wall outlet, and the Ethernet cable that attaches to the back of the scanner.

4 Ensure there is power available where the scanner is plugged in.

5 Verify there is a network connection to the device.

6 Ensure the main scanner cover is fully closed.

7 If the issue persists, call Leica Biosystems Technical Services.

## Touchscreen does not respond to touch

1 Shut down the scanner by following the steps in Shut down the scanner (on page 75).

2 Turn the scanner on.

3 If the issue persists, contact Leica Biosystems Technical Services with details.

## Touchscreen is black

1 Shut down the scanner by following the steps in Shut down the scanner (on page 75).

2 Turn the scanner on.

3 If the issue persists, contact Leica Biosystems Technical Services with details.

## Slides are broken inside the scanner

**WARNING:** Do not attempt to recover broken slides. Call Leica Biosystems Technical Services.

1 Leica Biosystems Technical Services may request photos when providing assistance.

## Network connection lost

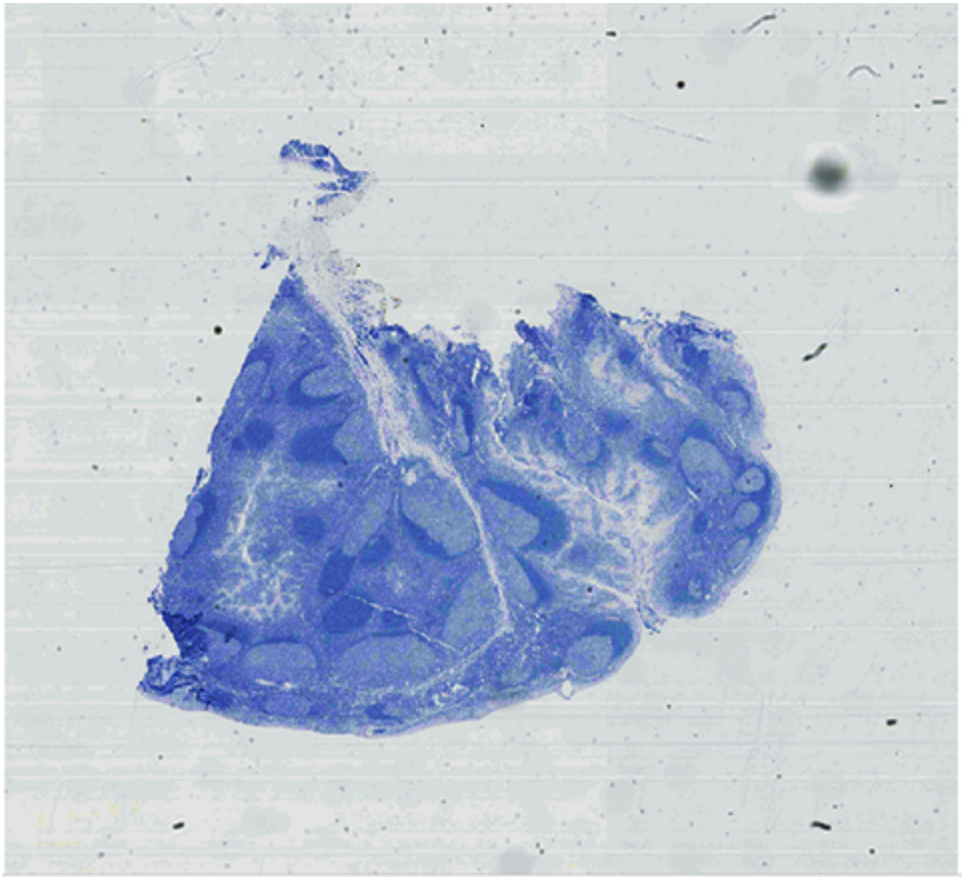
The Aperio GT 450 must be connected to the Aperio GT 450 Scanner Administration Manager (Aperio GT 450 SAM) through your Local Area Network to function. If that connection is lost, you see:


Contact your IT Administrator for assistance. The IT Administrator should do the following:

1. Ensure the LAN cables are connected to the scanner LAN port and to theAperio GT 450 SAM server.
2. In the area provided on the scanner's touchscreen interface, enter the IP address of the Aperio GT 450 SAM server.
3. Verify the network connections are up and working for the Scanner and Aperio GT 450 SAM server. (Consult your organization's IT professionals if needed.)
4. On the server, go to the Services Manager and restart all services. It may take a few minutes for all the services to restart.
5. Try to connect from the scanner again by manually entering the IP address again.
6. If the issue persists, consult with your organization’s IT professionals prior to calling Leica Biosystems Technical Services.

# White striping appears on scanned images

If your scanned images frequently appear with white striping, this may be caused by certain artifacts introduced by improper tissue processing, such as microscopic contamination, micro water droplets, micro air bubbles, preventing the scanner from obtaining a clear calibration pre-scan. The example below shows an image with thewhite striping effect:



The optional Default Calibration Point feature addesses this issue.

When the Default Calibration Point is enabled, the scanner checks the quality of the pre-scan during the scan workflow, and if necessary, replaces it with a higher quality default pre-scan that was created specifically for your particular scanner.

Your Lab Administrator configures the Default Calibration Point feature in the Aperio GT 450 SAM. See the *Aperio GT 450 IT Manager and Lab Administrator's Guide* for details.

If your scanner is configured with the Default Calibration Point feature, and your scanned images still have the white striping effect, contact Leica Biosystems Technical Services. The Default Calibration Point settings may need adjustments.

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