⚠ **Please read this *User Manual* before use.**

Slide Scanning System

SQD-40P

User Manual



Manufacturer: Shenzhen Shengqiang Technology Co., Ltd.

Registered Address: Unit 302, Building 2, IOT Industrial Park, No. 4012 Wuhe Avenue, Gangtou Community, Bantian Subdistrict, Longgang District, Shenzhen, Guangdong Province, China

Tel: +86 0755-86573053

Website: www.sqray.com

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User Notice

⚠ **Before using this product, please carefully read the *User Manual* to ensure that all safety instructions and operating procedures are fully understood. The *User Manual* applies to the correct installation, operation, maintenance, and routine use of the Slide Scanning System (Model: SQD-40P).**

1. Product Registration Information

The Slide Scanning System (Model: SQD-40P) is classified as a medical device and has completed the relevant registration procedures. Detailed information is listed in Table 1.

Table 1: Product Registration Information

Product Name	Slide Scanning System
Product Model	SQD-40P
Intended Use	Intended for the viewing, screening, storage, and management of microscopic images of clinical specimens.
Registrant Name	Shenzhen Shengqiang Technology Co., Ltd.
Registrant Address	Unit 302, Building 2, IOT Industrial Park, No. 4012 Wuhe Avenue, Gangtou Community, Bantian Subdistrict, Longgang District, Shenzhen, Guangdong Province, China
Medical Device Registration Certificate No.	YXZZ 20202220365 (Guangdong)
Manufacturer Name	Shenzhen Shengqiang Technology Co., Ltd.
Manufacturer Address	Units 103, 202,203, 302, Building 2, IOT Industrial Park, No. 4012 Wuhe Avenue, Gangtou Community, Bantian Subdistrict, Longgang District, Shenzhen, Guangdong Province, China
Medical Device Manufacturing License No.	YSYJXSC 20203590 (Guangdong)
Postal Code	518116
After-sales Service Phone	+86 755-86573052

Company Fax	+86 755-86573053
Official Website	www.sqray.com
Date of Manufacture	See device nameplate
Service Life	6 years

2. Intended Use Statement

- This product is intended for browsing, screening, storing, and managing microscopic images of clinical samples.
- To ensure safe operation, it is recommended that only personnel trained on the product operate the system. Untrained personnel should not use the system independently.

3. Disclaimer

- Before using this product, please carefully read this *User Manual* to ensure correct operation.
- The information in this *User Manual* is based on the current design and configuration of the product. Shengqiang Technology is not responsible for device damage or system malfunctions caused by use inconsistent with this manual.
- In case of system failure, please contact Shengqiang Technology's after-sales service department promptly.

4. Safety Summary

Please read this *User Manual* thoroughly before using the product and follow these basic safety guidelines:

- The product contains laser components. Do not open the enclosure or perform unauthorized maintenance.
- Avoid direct laser exposure to the eyes during operation.
- If any abnormal condition occurs (e.g., unusual noise, overheating, failure to scan), contact Shengqiang Technology's after-sales service immediately.

5. Compliance Standards

This product complies with the following standards and guidelines:

- GB 4793.1-2007 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use*
- GB 4793.9-2013 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use*
- YY 0648-2008 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use*
- GB/T 14710-2009 *Medical Electrical Equipment - Environmental Requirements and Test Methods*
- GB/T 18268.1-2010 *Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements*
- GB/T 18268.26-2010 *Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 26: Particular Requirements for In Vitro Diagnostic (IVD) Medical Devices*

6. Service Support

For technical support, software updates, or maintenance services, please contact Shengqiang Technology using the following channels. Contact information may be updated on the official website.

- After-sales Service Phone: +86 755-86573052
- Company Fax: +86 755-86573053
- Official Website: www.sqray.com

7. Copyright Statement

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- This product is protected by registered patents. For patent information, please contact Shenzhen Shengqiang Technology Co., Ltd.
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1 Safety Information

1.1 Intended Use

The Slide Scanning System (Model: SQD-40P) is designed for high-resolution digital scanning of slide specimens. The acquired WSI may be used for teaching, scientific research, and image management purposes. This product is intended for the viewing, screening, storage, and management of microscopic images of clinical specimens.

1.2 General Safety Information

To ensure personnel safety and proper system operation, please read and fully understand this *User Manual* before using the product, and strictly observe the following safety principles:

① This product shall be operated and maintained only by qualified personnel who have received professional training.

② Disassembly, modification, or bypassing of any safety protection devices is strictly prohibited.

③ Use this product only under the specified environmental conditions.

④ Ensure adequate ventilation around the device and do not block any ventilation openings.

⑤ In the event of abnormal conditions (such as smoke, unusual odors, or abnormal noises), immediately disconnect the power supply and contact Shengqiang Technology after-sales service department.

1.3 Safety Warning Symbols Instructions

The following safety warning symbols are used in this *User Manual* and on the device (see Table 2) to alert users to potential hazards and important precautions. During operation and maintenance of the device, users shall strictly comply with the requirements indicated by these safety warning symbols.

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Table 2: Description of Safety Warning Symbols

Symbol Type	Description
	**Name:** Biohazard **Description:** Indicates a potential biological contamination hazard. Appropriate personal protective equipment (PPE) shall be worn during operation and maintenance, and relevant biosafety procedures shall be followed.
	**Name:** Pinch Hazard **Description:** Indicates a risk of finger or hand injury due to moving mechanical parts inside the device. Maintain a safe distance during operation or maintenance to prevent body parts or objects from being caught.
	**Name:** Warning and Caution **Description:** Identified by a triangular warning symbol, indicating potential safety risks during operation and reminding users to take necessary protective measures.

1.4 Safety and Operating Instructions

1.4.1 Pre-use Requirements

This section provides safety and operating instructions for the Slide Scanning System (Model: SQD-40P), aiming to help users avoid potential personal injury and device damage during installation, operation, maintenance, and transportation.

① **Read All Instructions:** Before operating this product, carefully read and fully understand all safety and operating instructions provided in this *User Manual*.

② **Keep This Manual:** Keep this *User Manual* properly for future reference during device operation, maintenance, or troubleshooting.

③ **Observe Warnings:** Strictly follow all safety warning labels and operating instructions marked on the device and described in this *User Manual*.

1.4.2 Operation and Environmental Safety

① Keep away from heat sources: Do not place the product near heaters, stoves, or other heat-generating resources.

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② Ensure proper ventilation: This product is equipped with ventilation openings to prevent overheating. Do not block or obstruct these openings. Clean dust, lint, hair, or debris around the ventilation openings regularly.

③ Biosafety requirements: When using this product, comply with the biosafety regulations of your institution regarding the handling of samples and potentially biohazardous materials.

④ Keep away from water: Do not use this product near water sources. If the product becomes wet or liquid enters the device, immediately disconnect the power supply.

⑤ Environmental restrictions:

- ✓ Do not use this product outdoors.
- ✓ Do not use in spray environments or in areas with flammable or explosive substances.
- ✓ Do not place any objects on top of the device.
- ✓ Prevent foreign objects or liquids from entering the device through any openings.

1.4.3 Electrical and Power Safety

① Power specifications: Ensure that the power supply used matches the specifications indicated in this *User Manual* or on the device nameplate.

② Cable management: Arrange power cords and cables properly to avoid stepping on, crushing, or pulling them, which may cause damage.

③ Overload prevention: Do not overload wall outlets or extension cords to avoid the risk of fire or electric shock.

④ Lightning protection: During thunderstorms or when the product will not be used for an extended period, disconnect the power plug to protect the device from power surges.

1.4.4 Operation, Movement, and Maintenance Safety

① Accessory restrictions: Use only accessories specified by Shengqiang Technology. Using incompatible accessories may result in safety hazards.

② Device placement: Do not place the product on unstable stands, tables, or carts. Install and position the device strictly in accordance with the manufacturer’s instructions.

③ Device movement: Exercise caution when moving the product. For transportation or

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relocation, it is recommended to contact Shengqiang Technology's after-sales service department. Unauthorized movement may result in device damage or system malfunction.

④ Maintenance requirements: All maintenance and repair operations must be performed by authorized technical personnel designated by Shengqiang Technology.

1.4.5 Abnormal Conditions and Fault Handling

Immediately disconnect the power supply and contact Shengqiang Technology's after-sales service department if any of the following occurs:

- Liquid is spilled on the product or foreign objects enter the device.
- The device is exposed to rain or immersed in water.
- The system fails to operate normally despite correct use according to this *User Manual*.
- The device is dropped or shows visible physical damage.
- System performance is significantly abnormal, indicating a potential malfunction.

Only replacement parts specified by Shengqiang Technology shall be used during maintenance. After repair, the device must be inspected by authorized technical personnel to confirm normal operation.

1.4.6 Cleaning Instructions

When cleaning the device housing, use a clean, soft, lint-free cloth. If necessary, a neutral detergent or 70% medical alcohol may be used. Do not use strong acids, strong alkalis, or organic solvents. Do not spray cleaning liquids directly onto the product surface.

1.5 Electromagnetic Compatibility Declaration

1.5.1 Declaration

The Slide Scanning System (Model: SQD-40P) has been designed, manufactured, and tested with full consideration of electromagnetic compatibility (EMC) requirements and complies with the relevant provisions of the following national standards:

① GB/T 18268.1-2010

Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement,

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Control, and Laboratory Use - Part 1: General Requirements

② GB/T 18268.26-2010

Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 26: Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment

1.5.2 EMC Information

1) Warning

① The Slide Scanning System (Model: SQD-40P) is designed and tested in accordance with GB 4824 and is classified as Class A device.

② Do not use this product in the vicinity of strong electromagnetic radiation sources, such as unshielded or high-power radio frequency (RF) transmitting equipment, as this may result in abnormal operation or degraded system performance.

2) Caution

① The Slide Scanning System (Model: SQD-40P) complies with the emission and immunity requirements specified in GB/T 18268.26. Detailed performance parameters are provided in Table 3 and Table 4.

② Users shall ensure that the operating environment meets relevant electromagnetic compatibility requirements to guarantee proper system operation.

③ It is recommended to evaluate the EMC of the intended installation environment prior to product installation and use.

Table 3: Electromagnetic Emissions

Electromagnetic Emissions	
Emission Test	**Compliance**
GB 4824 Conducted Emissions	Group 1, Class A
GB 4824 Radiated Emissions	
GB 17625.1 Harmonic Emissions	Not applicable
GB 17625.2 Voltage Fluctuations / Flicker	Not applicable

Table 4: Electromagnetic Immunity

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Electromagnetic Immunity			
Immunity Test	**Basic Standard**	**Test Level**	**Performance Criterion**
Electrostatic Discharge (ESD)	GB/T 17626.2	• Contact discharge: ±2 kV, ±4 kV • Air discharge: ±2 kV, ±4 kV, ±8 kV	B
Radiated RF Electromagnetic Field	GB/T 17626.3	3 V/m, 80 MHz - 2.0 GHz, 80% AM	A
Electrical Fast Transient / Burst	GB/T 17626.4	Power lines: ±1 kV (5/50 ns, 5 kHz)	B
Surge	GB/T 17626.5	Line-to-earth: ±2 kV; Line-to-line: ±1 kV	B
Conducted RF Disturbances	GB/T 17626.6	Power lines: 3 V/m, 150 kHz - 80 MHz, 80% AM	A
Power Frequency Magnetic Field	GB/T 17626.8	3 A/m，50 Hz / 60 Hz	A
Electrostatic Discharge (ESD)	GB/T 17626.2	• Contact discharge: ±2 kV, ±4 kV • Air discharge: ±2 kV, ±4 kV, ±8 kV	B
Performance Criteria Definitions: • A: During the test, the product maintains normal function and performance within specified limits. • B: During the test, temporary degradation or loss of function or performance may occur, but normal operation is automatically restored without operator intervention. • C: During the test, temporary degradation or loss of function or performance may occur and requires operator intervention or system reset to restore normal operation.			

1.6 Laser Safety

1.6.1 Laser Radiation Safety Information

The Slide Scanning System (Model: SQD-40P) is equipped with an HG-C1100 laser sensor. The laser classification complies with the following applicable standards:

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- Requirements for Class 2 laser products as defined in Japanese JIS, International IEC, and Chinese GB standards.
- Definitions for Class 2 laser products under U.S. FDA laser safety regulations.

1) Waring

The laser used in this product may cause eye injury if improperly used. During operation, the following safety precautions must be strictly observed:

- Do not stare directly into the laser beam.
- Do not observe the laser beam through lenses, magnifying glasses, or other optical devices (such as telescopes or binoculars).
- Operate the system in a well-lit environment and avoid use in dimly lit areas.
- Operation and maintenance shall be performed only by qualified personnel who have received appropriate professional training.

2) Caution

Failure to operate this product in accordance with this *User Manual*, or unauthorized adjustment or modification of the laser device, may result in exposure to hazardous laser radiation and pose a safety risk.

1.6.2 Laser Radiation Protective Measures

Under normal operating conditions, no additional personal laser protective device is required. During system maintenance, calibration, or abnormal operating conditions where laser exposure may occur, the following protective measures are recommended:

- Ensure that personnel's eyes are not positioned within the potential laser beam path.
- If necessary, wear laser protective eyewear that complies with relevant standards.

1.6.3 Laser Parameters

1.6.3.1 HG-C1100 Laser Sensor

- Laser wavelength: 655 nm ± 20 nm
- Beam divergence: ＜1.5 mrad
- Beam diameter: approximately φ120 μm
- Maximum output power: ≤1 mW

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- Laser class: Class 2

1.6.3.2 Locations Potentially Involving Laser Radiation

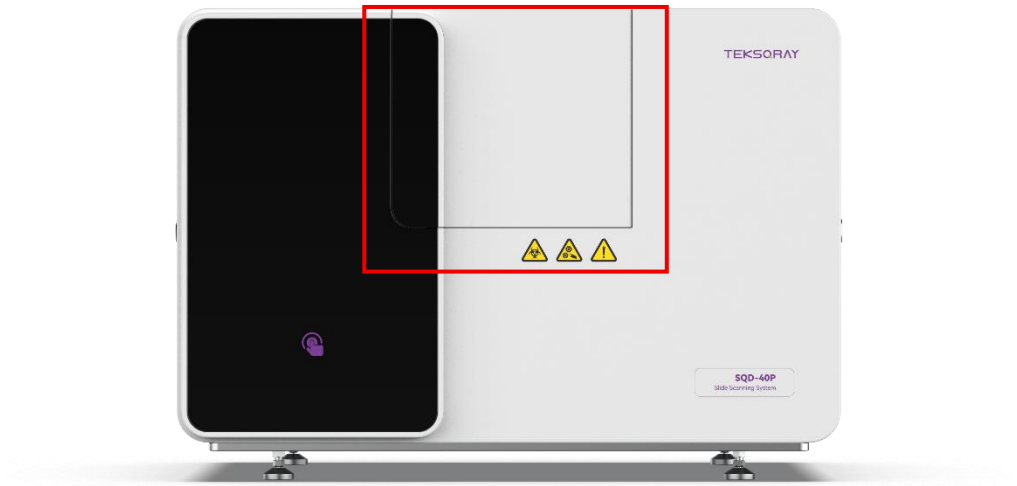

Figure 1. Potentially Involving Laser Radiation Location

Warning: Do not place eyes near the observation window or any openings of the device to inspect internal components, as laser radiation may cause eye injury.

1.6.3.3 Laser Control and Protective Design

Multiple laser safety protection measures have been implemented in the design of this product. The laser sensor and its optical path are located within a fully enclosed internal area and are equipped with appropriate laser shielding and structural isolation. Under normal operating conditions, users cannot access the laser emission area, effectively preventing exposure to laser radiation and associated safety risks.

1.6.3.4 Use and Maintenance of the Laser Sensor

- The laser sensor may only be serviced and maintained by authorized technical personnel who have received professional training.
- During maintenance involving the laser sensor, service personnel shall wear appropriate personal protective device, such as laser protective goggles, based on on-site risk assessment.
- Unauthorized personnel without proper training are strictly prohibited from disassembling, adjusting, or repairing the laser sensor.
- If abnormal operation of the laser sensor is detected, immediately stop using the equipment

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and contact Shengqiang Technology After-Sales Service for assistance.

1.7 Scanner Configuration and System Safety

1.7.1 Hardware Configuration

To ensure normal system operation and optimal scanning performance, the computer workstation should meet the following recommended hardware requirements:

- Processor: i7 or superior
- Memory: At least 64GB
- Storage: 4TB or greater
- Monitor: Resolution of 1920 x 1080

1.7.2 Software Environment

- Operating System: Windows 10 64-bit or later versions

1.7.3 Network and Information Security

- During system operation, the built-in Windows Security Center and firewall functions provide basic protection against malicious code.
- The software is designed with fundamental access control and anti-malicious behavior mechanisms to ensure secure data transmission and system operation in network-connected scenarios.
- Core scanning functions of this product do not require an external network. Users may configure the network environment according to their specific needs.

1.7.4 Data and System Interfaces

Data transmission between the scanner and the computer workstation is achieved via USB or fiber optic interfaces, enabling high-speed communication for scanning control and image data transfer.

1.7.5 User Access Mechanism

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① User Types and Permissions: This product is intended for use by trained end-users. After logging in, users can perform software functions such as scanning, parameter configuration, and data management.

② User Authentication: The system uses username and password verification to prevent unauthorized access and ensure secure system operation.

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2 Overview of the Slide Scanning System

2.1 System Introduction

The Slide Scanning System (Model: SQD-40P), developed and manufactured by Shenzhen Shengqiang Technology Co., Ltd., is a high-performance digital pathology scanner. The system utilizes advanced optical imaging technology combined with intelligent scanning algorithms to achieve high-speed, high-precision digital image acquisition of slide speciments. It is widely used in hospital pathology departments, medical research institutions, and third-party pathology diagnostic centers.

2.2 System Appearance

2.2.1 Overall Appearance

The scanner adopts a compact integrated structural design with a robust chassis. The exterior features a black-and-white color scheme with a clean and streamlined layout. A high-resolution display is provided to present image information during the scanning process as well as the software user interface in real time.

A top-opening slide door is located on the front of the scanner, allowing convenient loading and unloading of slides. The rear of the device integrates the power input interface, data communication interfaces, and other auxiliary connection ports to support system operation and peripheral connections. Ventilation openings are also provided to ensure adequate heat dissipation and stable operation during continuous use. A service door is located on the side of the device, which is intended for inspection and maintenance by authorized service personnel.

Front View **Rear View**



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Side View



Figure 2. Overall Appearance

2.3 System Components

The product primarily consists of the system host, the imaging system, and the associated software.

2.3.1 Hardware Components

① System host: The system host comprises the scanner and the computer workstation. It is used to perform high-speed slide scanning, digital image acquisition, data processing, and user operation interaction.

② Imaging system: The imaging system consists of the optical path components integrated within the scanner. It is used to perform high-resolution optical imaging of slides, ensuring image clarity and uniform illumination.

2.3.2 Software Components

① Slide Scanning Image System Software (hereinafter referred to as the “scanning software”): Responsible for comprehensive control and management of high-speed, high-precision digital image acquisition tasks. The scanning software features real-time monitoring to ensure scan quality and efficiency and supports customizable scan parameters to meet the requirements of different samples and applications.

② Digital Pathology Slide Viewing Software (hereinafter referred to as the “viewing software”): Used to browse digitally scanned images and supports operations such as image viewing and annotation.

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2.3.3 Software Information

The main software of this product, including model numbers and corresponding release versions, are detailed in Table 5.

Table 5: Software Models and Version Information

Name	Model	Release Version
Slide Scanning Image System Software	DPSCAN40	DPSCAN40 V1.1
Digital Pathology Slide Viewing Software	DPVIEW	DPVIEW V2.0

2.4 System Functions

① Batch Loading and Automated Scanning: Supports batch loading of slides and automatic execution of scanning tasks. The system can automatically complete autofocus, image stitching, and acquisition workflows based on preset parameters, enabling high-efficiency continuous scanning.

② Multi-Format Image Output: Supports mainstream digital pathology slide formats, including SDPC, DCM, DICOM, SVS, TIFF, etc., ensuring compatibility with hospitals and research platforms.

③ Magnification and Multi-Layer Scanning: Supports 20X and 40X objective magnifications and multi-layer scanning modes. Scan layers can be flexibly selected according to slide sample thickness, ensuring complete preservation of tissue structural information.

④ Intelligent Autofocus and Region Recognition: Built-in intelligent autofocus algorithm automatically identifies tissue regions and optimizes focus point distribution, balancing image clarity and scanning efficiency.

⑤ Scan Log Recording and Task Tracking: The system automatically records scan time, operational status, and task execution results, facilitating quality tracking, result verification, and after-sales maintenance.

⑥ Software Viewing and Image Management: The accompanying viewing software supports arbitrary magnification zoom, pan browsing, and related image processing operations, and provides image management and retrieval functions.

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2.5 Working Principle

The product performs high-resolution slide scanning using high-magnification optical objectives. The microscopic scanning platform moves automatically along the X/Y axes and performs autofocus along the Z axis. The scanning software processes the high-resolution images in real time and performs seamless stitching to generate a complete whole-slide digital image, which is stored in the system to build a digital pathology slide library. Users can view the digital slides with arbitrary zoom, pan, and image processing operations using the accompanying viewing software. The basic workflow is as follows:

① Slide Loading and Positioning: The slides are sequentially conveyed to the positioning camera, where the scanning area is automatically identified and positioned.

② Image Acquisition: Using the camera and objective lens, images are acquired tile by tile according to preset scan parameters.

③ Image Stitching and Processing: The acquired image tiles are seamlessly stitched to generate a high-resolution WSI.

④ Image Viewing and Management: WSI can be viewed at any magnification, panned, and processed via the viewing software.

2.6 System Specifications

2.5.1 Imaging Speed

- At 20X objective, scanning speed approximately 41 seconds, error margin of ±10%
- At 40X objective, scanning speed approximately 135 seconds, error margin of ±10%

Note: The above imaging speed is measured under a scan area of 15.00 mm × 15.00 mm, with a side length tolerance of ±1.0 mm.

2.5.2 Scan Resolution

- At 20X objective, scan resolution 0.168 μm/pixel, error margin of ±15%
- At 40X objective, scan resolution 0.085μm/pixel, error margin of ±15%

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2.5.3 Maximum Scan Area

- Maximum scan area supported: 25.00 mm × 75.00 mm, tolerance ±10%

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3 System Installation and Connection Instructions

This chapter provides guidance for correctly installing the system and connecting related interfaces, ensuring stable and efficient operation under optimal conditions. During installation and connection, please strictly follow the steps and safety requirements to avoid system malfunctions or performance degradation caused by improper operations.

3.1 Pre-Installation Preparation

3.1.1 Installation Environment Requirements

To ensure the stable operation and imaging quality of the Slide Scanning System (Model: SQD-40P), users must verify that the installation site meets the following requirements. Non-compliance may lead to reduced scanning performance, system abnormalities, or safety risks.

3.1.1.1 Temperature, Humidity, and Environmental Conditions

- Atmospheric pressure: 860 hPa to 1060 hPa
- Operating temperature: 5 ℃ - 40 ℃
- Operating relative humidity: ≤ 80%, avoid condensation
- Storage and transportation temperature: See Chapter 7, Storage and Transportation Conditions
- Pollution degree: Complies with Pollution Degree 2 per GB 4793.1-2007, Clause 3.6.6

3.1.1.2 Power Requirements

- Voltage: AC 100 - 240 V
- Frequency: 50/60 Hz
- Power: 800 VA
- Voltage fluctuation range: Within ±10% of the rated value
- Grounding: Use an independent power outlet with reliable grounding

3.1.1.3 Workbench and Installation Space

- Placement: Position the system for convenient daily operation and rapid power shutdown in emergencies.
- Workbench requirements: Stable, level, with a load-bearing capacity of ≥ 100 kg.

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- Vibration control: A vibration-damping surface is recommended to avoid imaging quality degradation.
- Cooling space: Leave at least 30 cm around the system for air circulation and heat dissipation.
- Ventilation: Do not block vents to prevent overheating.

3.1.1.4 Lighting and Environmental Conditions

- Lighting: Install in a well-ventilated indoor environment, avoiding direct sunlight or strong light exposure.
- Cleanliness: Keep the work area clean, dry, and free of corrosive gases.
- Stability: Avoid high dust, strong electromagnetic interference, or nearby radiation sources.

3.1.1.5 Network Environment

The system does not require a network connection for normal operation. If future data interaction with other systems is needed, follow relevant IT network regulations and refer to the corresponding system instructions.

3.1.1.6 Safe Operation and Usage Environment

For detailed requirements on safe operation and usage environment, refer to Chapter 1, Safety Information.

3.1.2 Unboxing Inspection

The product is factory-tested and packed with shock-proof packaging. Upon receipt, conduct a thorough unboxing inspection to ensure the device and accessories are intact and comply with the packing list. Steps are as follows:

3.1.2.1 Preparation

- Place the shipping box on a flat, stable surface.
- Ensure the work area is clean, dry, and has sufficient space for unboxing

3.1.2.2 Inspect Packaging Integrity

- Check for visible damage, moisture, or deformation of the packaging.
- If significant damage is found, take photos for documentation and contact the supplier.
- Only open the box after confirming the packaging is intact

3.1.2.3 Verify Packing List

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Open the box and compare items against the packing list (see Appendix B, Packing List). Verify the quantity and condition of each item. If any item is missing, damaged, or improperly packaged, document with photos and contact the supplier immediately.

3.1.2.4 Inspection Precautions

- Handle all items carefully to avoid impact on the device or accessories.
- Retain the packaging and foam for future transport.
- If scratches, cracks, or other abnormalities are found on the device surface, record them and report to Shengqiang Technology.

3.2 Hardware Installation

Warning: This system may only be installed and commissioned by authorized personnel who have received professional training. Installation or operation by unqualified personnel is strictly prohibited.

Caution: The system mainly consists of three components: the scanner, the computer workstation, and input devices. Before installation, please verify that all components are complete and free from damage. Strictly follow the instructions in this manual for placement and connection to avoid equipment damage or operational risks.

3.2.1 Equipment Placement and Transport Lock Release

After placing the scanner, computer workstation, and input devices in positions convenient for operation, use the dedicated maintenance triangular key to open the service door on the side of the scanner. Manually rotate and remove the internal transport lock pin (one unit) to release the transport lock.

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Figure 3. Location of the Scanner Side Service Door

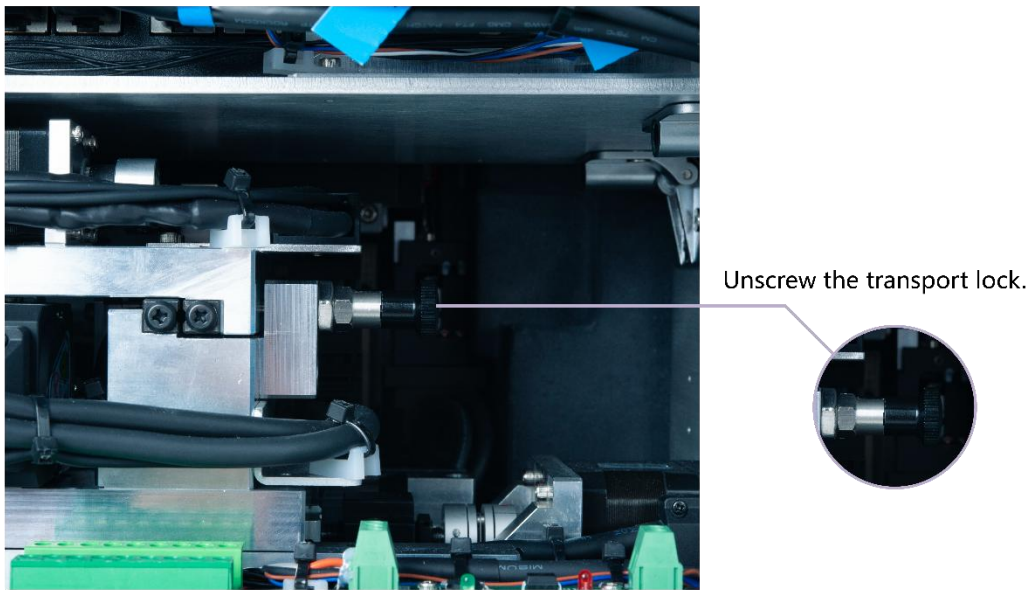

Figure 4. Illustration and Location of the Transport Lock Pin

3.2.2 Interface Connections

3.2.2.1 Power Connections

⚠ Ensure that the power supply is properly grounded to prevent damage caused by poor grounding or power instability.

⚠ Ensure that the power supply voltage matches the rated voltage of the system to avoid damage due to overvoltage or undervoltage.

⚠ Ensure that all cables are securely connected to prevent system abnormalities caused by

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loose connections.

① Scanner power: Use the power cable supplied with the system to connect the scanner power inlet to a stable AC power outlet.

② Computer workstation power: Use the power cable supplied with the system to connect the computer workstation power inlet to a stable AC power outlet.

③ Monitor power: Use the power cable supplied with the system to connect the monitor power inlet to a stable AC power outlet.

3.2.2.2 Communication Connections

① Scanner ↔ Computer workstation: Use the supplied data cable to connect the scanner to the corresponding data interface on the computer workstation.

② Monitor ↔ Computer workstation: Use an HDMI cable to connect the monitor to the video output port of the computer workstation.

③ Input devices ↔ Computer workstation: Connect the mouse and keyboard to the corresponding USB ports on the computer workstation.

Note: When routing cables, plan the cable paths properly to ensure neat and safe wiring. Avoid cable compression or creating tripping hazards for operators.

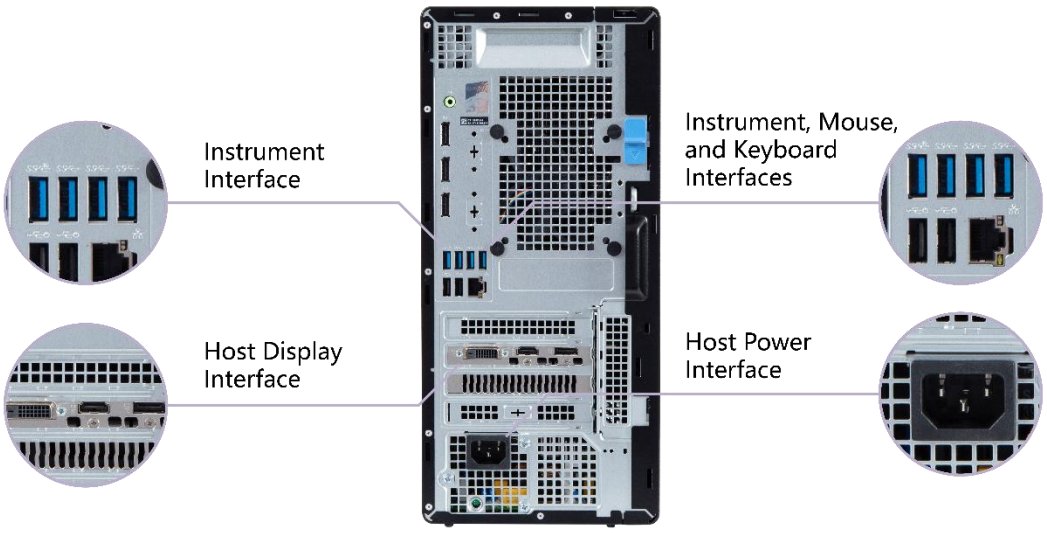

Figure 5. Communication Connection Diagram

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3.3 Software Installation

After confirming that all hardware components are correctly connected and the power supply is switched on, follow the on-screen instructions to complete the software installation. The installation procedure is as follows:

① Install the scanning software and the viewing software sequentially according to the on-screen prompts.

② Do not disconnect the power supply during the installation process to prevent installation failure or software malfunction.

③ After installation is complete, verify that the installation directory and desktop shortcuts have been created correctly.

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4 Basic Operating Instructions

This chapter provides guidance for the correct and standardized use of the Slide Scanning System (Model: SQD-40P). It includes descriptions of the basic scanning workflow, system power-on and power-off procedures, and routine operations such as slide loading and unloading.

Users shall strictly follow the operating procedures and precautions described in this chapter to ensure stable system operation under safe conditions and to obtain scanning results that meet expected performance requirements.

This system is intended for use by trained professionals only. Failure to operate the system in accordance with this *User Manual* may result in system malfunction, data loss, or potential safety hazards.

4.1 Scanning Workflow

This section describes the standard scanning workflow of the system, helping users quickly understand and master the basic operating steps.

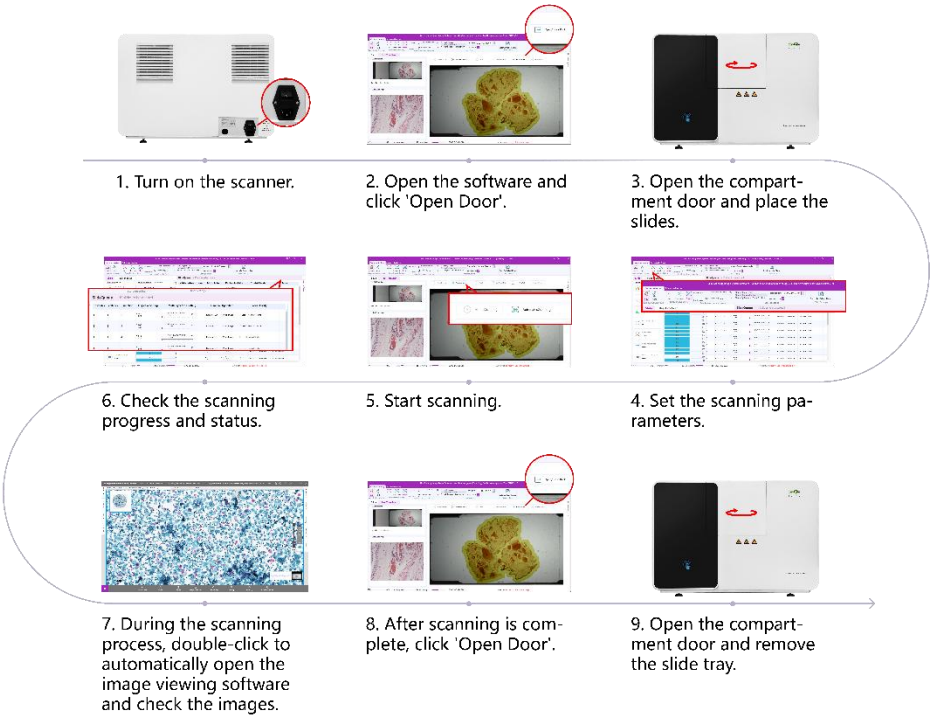

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Figure 6. Scanning Workflow Diagram

4.2 Power-On and Power-Off Procedures

4.2.1 Pre-Power-On Inspection

Before powering on the system, verify the following items:

- Confirm that internal transportation locking pin of the scanner have been released.
- Confirm that there are no slides or other foreign objects remaining inside the carousel.
- Confirm that all power cables and data cables are securely connected, with no looseness, damage, or insulation wear.
- Confirm that the operating environment meets the system requirements, including appropriate temperature, humidity, and ventilation conditions, and that there is no strong vibration or electromagnetic interference.

⚠ Before performing the power-on operation, all of the above inspections must be completed to ensure normal system operation.

⚠ If any abnormal condition is detected, immediately stop operation and contact Shengqiang Technology After-Sales Service.

4.2.2 Power-On Procedure

1) Powering on the Monitor

① Press the power button on the monitor.

② Confirm that the monitor power indicator is illuminated.

2) Powering on the Computer Workstation

① Press the power button on the computer workstation.

② Confirm that the computer workstation power indicator is illuminated.

③ Wait for the operating system to complete startup and enter the desktop interface.

3) Powering on the Scanner

① Press the power switch located on the rear panel of the scanner.

② Wait for the scanner to respond; startup takes approximately 30 seconds.

4) Launching the Scanning Software

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① Double-click the scanning software icon on the desktop.

② Enter the user login credentials.

5) System Self-Test and Initialization

① After the scanning software is launched, the scanner automatically performs a self-test.

② Wait until the software interface is fully loaded and the main interface is displayed.

⚠ Do not turn off the power or disconnect any cables during the startup process, as this may result in system damage or data loss.

⚠ If the scanner fails to complete the self-test or abnormal startup behavior occurs, refer to Appendix C, Troubleshooting or contact Shengqiang Technology After-Sales Service.

4.2.3 Power-Off Procedure

① Click the Exit (X) button in the scanning software to perform the exit operation. Ensure that all scanning tasks have been completed and saved to avoid data loss, then click the **"Confirm"** button.

② Press the power switch located on the rear panel of the scanner.

③ Shut down the computer workstation and then turn off the monitor.

⚠ Before transporting the equipment, the transportation locking pins must be secured. Failure to do so may result in device damage.

4.3 Slide Loading and Unloading

1. Slide Loading

Place the slide (standard size: 25.00 mm × 75.00 mm, thickness 0.9 – 1.2 mm) into the slide rack. Ensure that the slide label faces the "TOP END" marking. Click the **"Open/Eject Rack"** button in the scanning software. After the rack slot moves into position, open the rack door and lift the retaining latch. With the "TOP END" marking facing upward (do not change the orientation to avoid scan failure), align the slide rack with the rack slot and insert it. Push the rack inward until it is fully seated and securely fixed. After loading is complete, pull down the retaining latch and close the rack door.

2. Slide Unloading

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After confirming that the scanning task has been completed and all data has been saved, ensure that no scanning operation is in progress. Click the **"Open/Eject Rack"** button in the scanning software. When prompted to cancel the scan, click the **"Yes"** button to cancel. Once the rack slot moves into position, open the rack door, lift the retaining latch, and remove the slide rack. After unloading, close the rack door.



Figure 7. Location of the Scanner Rack Door

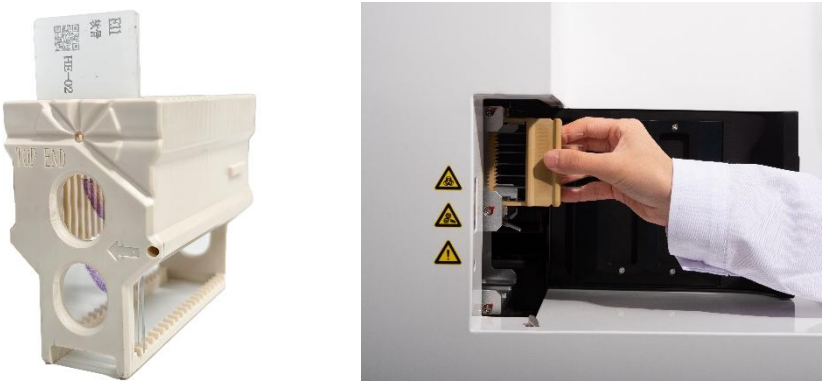

Figure 8. Illustration of Slide Loading and Unloading

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5 Slide Scanning Image System Software

5.1 Software Overview

The Slide Scanning Image System Software (hereinafter referred to as the “scanning software”) is used to control and manage the scanner for high-speed, high-precision WSI acquisition. The scanning software features an intuitive user interface and straightforward operation, and integrates multiple intelligent functions to effectively ensure scanning quality and efficiency. The scanning software also supports customizable scanning parameter settings to accommodate different sample types and application requirements, enabling a flexible and efficient digital pathology workflow.

5.2 Software Startup Procedure

5.2.1 Pre-start Checks and Preparation

Before launching the scanning software, ensure that the following conditions are met:

- The device power supply is correctly connected and operating normally.
- The scanner, computer workstation, monitor, keyboard, mouse, and all related interfaces are properly connected.
- All required maintenance or service operations have been completed, and the system is in normal operating condition.

5.2.2 Launching the Scanning Software

① Double-click the scanning software desktop icon  to launch the software.

② After successful startup, the scanning software will enter the login interface.

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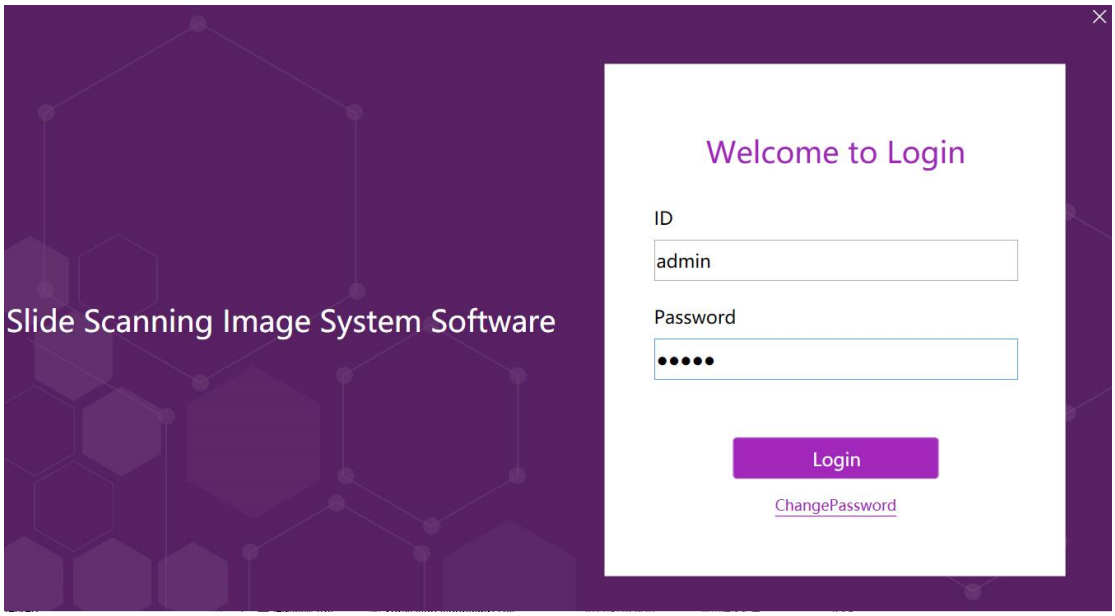

Figure 9. Login Interface

5.2.3 User Login

① On the login interface, enter the username and password (the default username and password are both **admin**), then click the **"Login"** button.

② After successful login, the scanning software will enter the startup interface. The system will automatically perform self-check and homing procedures, and the loading progress of system components will be displayed in real time via a progress bar.

③ Upon completion of the self-check and homing procedures, the scanning software will enter the main interface.

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Figure 10. Startup Interface

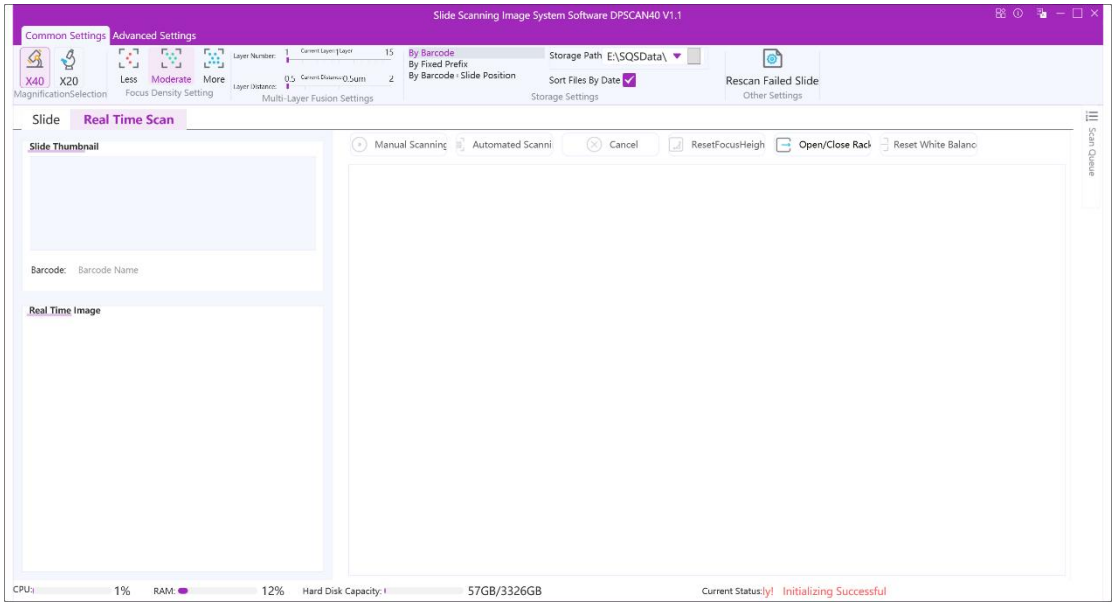

Figure 11. Main Interface

5.2.4 Change Password

① To change the password, click the **"Change Password"** link on the login interface. The scanning software will enter the password modification interface. On the password modification interface, enter the username, old password, and new password, then click the **"OK"** button to complete the change.

② To return to the login interface, click the **"Back to Login"** link.

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③ After the password has been successfully changed, follow the user login procedure (see Section 5.2.3 User Login) to enter the main interface of the scanning software.

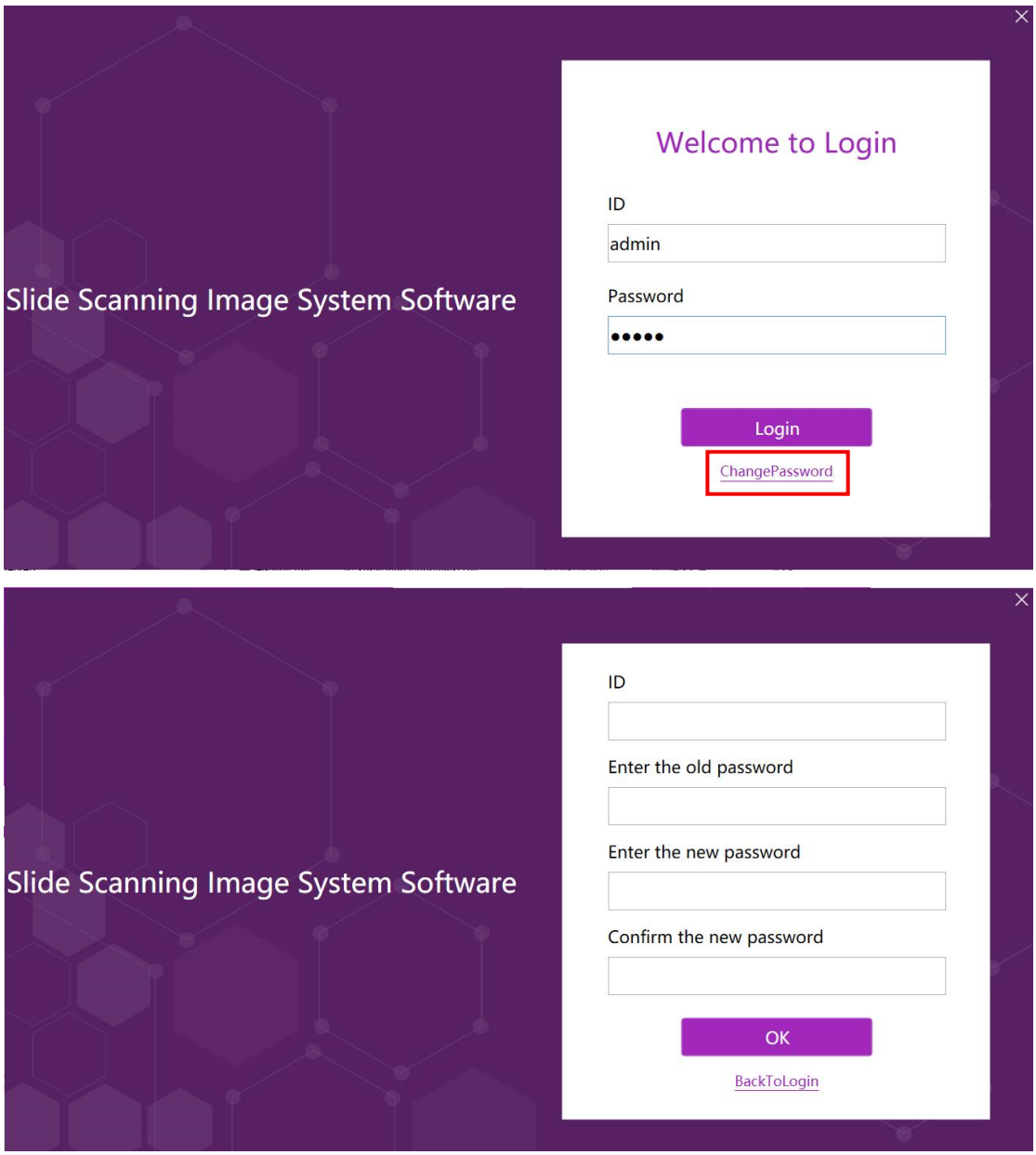

Figure 12. Change Password Interface

5.3 Software Interface Structure

This section describes the structure of the main interface of the scanning software and the primary functions of each functional module. The main interface is the core operational screen displayed after system startup, from which users can access key functional modules, perform scanning operations, and manage scanning tasks. The overall structure of the main interface

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consists of the following components:

① Information Bar: Permanently located at the top of the main interface, the information bar displays the software name and the current software version number. It also provides access to the about information, as well as buttons for interface expansion and switching between Chinese and English.

② Function Navigation Bar: Located below the information bar, it includes two functional modules: Common Settings and Advanced Settings. Users can freely switch between modules as required. Each module contains options for configuring scan parameters.

③ Central Viewing Area: Located below the information bar, this area includes three functional views: Slides, Real Time Scan, and Scan Queue. Users can switch between these views as needed. The displayed content updates dynamically to reflect the current function status.

④ Status Bar: Permanently located at the bottom of the main interface. The left side shows CPU, RAM, and hard disk capacity, while the right side displays the current system status, providing real-time feedback on system operation.

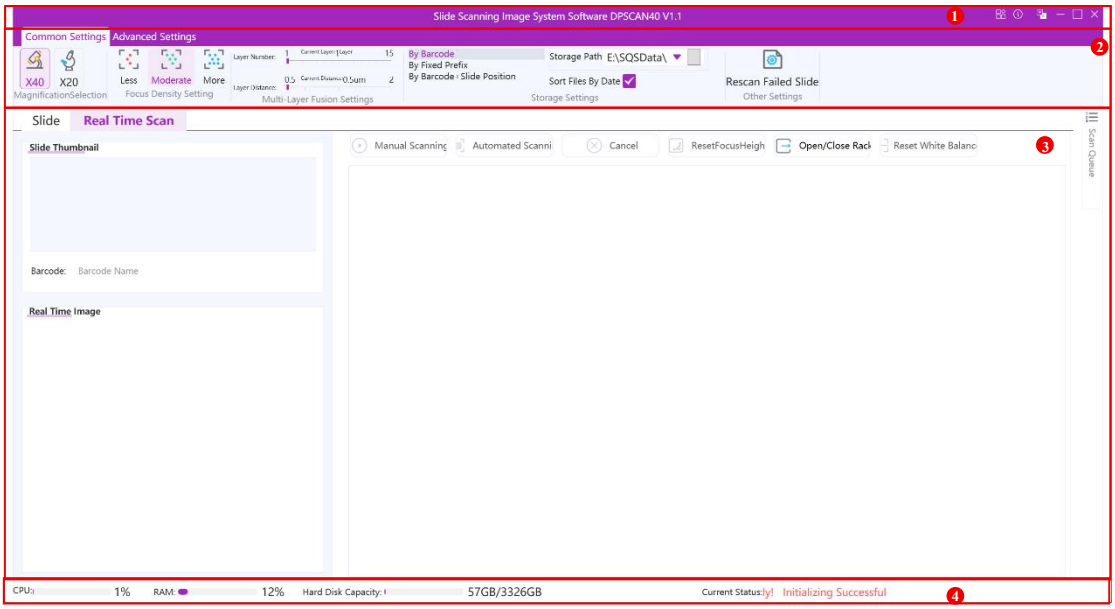

Figure 13. Main Interface

Table 6: Description of Main Interface Functional Modules

No.	Name	Function
1	Scan Parameter	Includes two functional modules: Common Settings and Advanced

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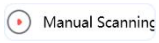
<table>
<tr><td></td><td>Configuration</td><td>Settings. Scan parameters can be configured before starting a scan.</td></tr>
<tr><td>2</td><td>Basic Information Display</td><td>Displays real-time information such as the total rack quality, total rack row, slides to be scanned, slides scanned, scanning slide, scanning progress, and overall scan progress.</td></tr>
<tr><td>3</td><td>Slide Status Color Indicators</td><td>Slide scan status is distinguished by color: Green – Completed, Orange – In Progress, Blue – Not Started, Gray – Skipped, Red – Failed.</td></tr>
<tr><td>4</td><td>Scan Control Operations</td><td>
<table>
<tr><th>Icon</th><th>Description</th></tr>
<tr><td>
</td><td>Execute the scan task after manually setting parameters</td></tr>
<tr><td>
</td><td>Automatically execute the scan task using preset system parameters</td></tr>
<tr><td>
</td><td>Cancel the current scan task</td></tr>
<tr><td>
</td><td>Reset the focus height of the current slide</td></tr>
<tr><td>
</td><td>Automatically eject the slide rack slot to the position for loading/unloading the slide rack</td></tr>
<tr><td>
</td><td>Recalibrate image white balance parameters</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Slide Thumbnail</td><td>Displays the thumbnail view of the currently scanned slide.</td></tr>
<tr><td>6</td><td>Real Time Image</td><td>Displays the focused image of the slide in real time during scanning.</td></tr>
<tr><td>7</td><td>Image Display and Operation Area</td><td>Displays the stitched slide image in real time during scanning and supports manual focus point adjustment in manual mode.</td></tr>
<tr><td>8</td><td>Scan Queue</td><td>Displays the list of slides pending scanning along with related scan information.</td></tr>
<tr><td>9</td><td>Scan Records</td><td>Allows users to view scan history records and supports traceability and inquiry of both successful and failed scan tasks.</td></tr>
</table>

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5.4 Function Modules

5.4.1 Common Settings

5.4.1.1 Magnification Selection

Switch between two scanning magnifications: X40 and X20.

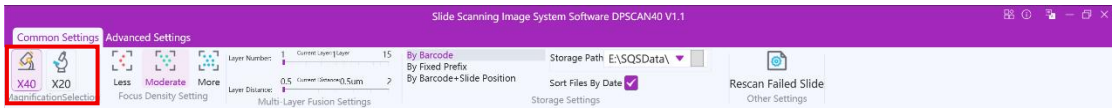

Figure 14. Magnification Selection

5.4.1.2 Focus Density Setting

Adjust the distribution density of focus points during scanning, with options including less, moderate, and more, according to actual requirements.

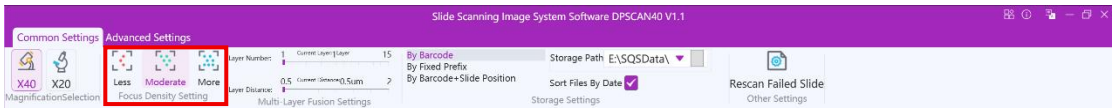

Figure 15. Focus Density Setting

5.4.1.3 Multi-layer Fusion Settings

Apply this function to thick or uneven samples to ensure image clarity and completeness of details, and adjust the following parameters as required:

① Layer Number: Defines the number of scanning layers, adjustable from 1 to a maximum of 15 layers.

② Layer Distance: Defines the distance between adjacent scanning layers, adjustable from 0.5 μm to 2 μm.

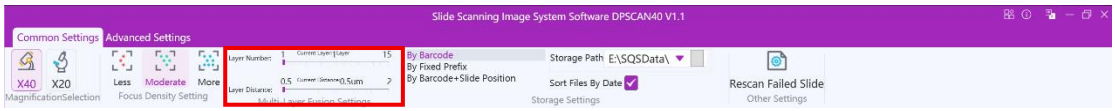

Figure 16. Multi-layer Fusion Settings

5.4.1.4 Storage Settings

Configure storage parameters for scanned images and adjust the following settings as required:

① File Naming: Select one of the following file naming rules:

- By Barcode: Use the recognized slide barcode label information as the file name.
- By Fixed Prefix: Define a fixed string as the file name, including prefix, initial

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number, and number of digits.

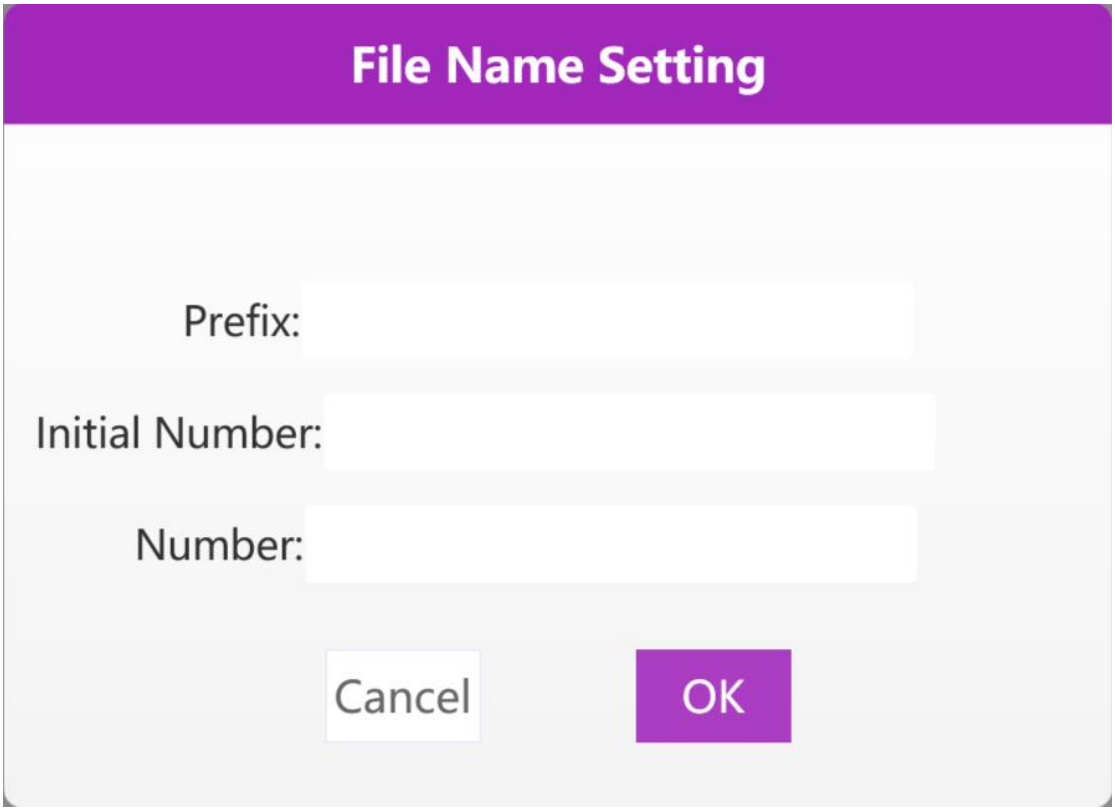

Figure 17. File Naming Setting Window

- By Barcode + Slide Position: Append the slide position number to the barcode-based file name.

② Storage Path: Select a custom storage path for scanned images.

③ Sort Files By Date: Automatically generate folders based on the scanning date.

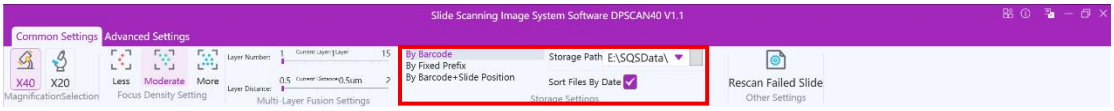

Figure 18. Storage Settings

5.4.1.5 Other Settings

- Rescan Failed Slide: Click to enter the rescan interface for failed slides. The number of focus points can be reconfigured for slides that failed during scanning. After confirmation, all failed slides in the batch can be rescanned.



Figure 19. Rescan Failed Slide Location

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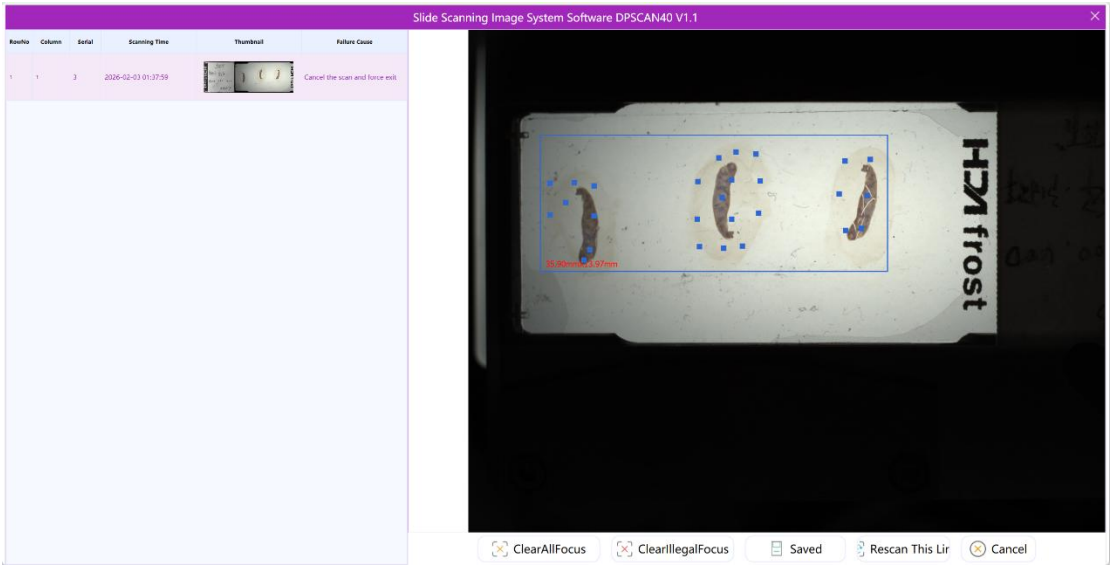

Figure 20. Rescan Failed Slide Window

5.4.2 Advanced Settings

5.4.2.1 Thumbnail Settings

Supports thumbnail display adjustment, including rotating 180° and mirror image.

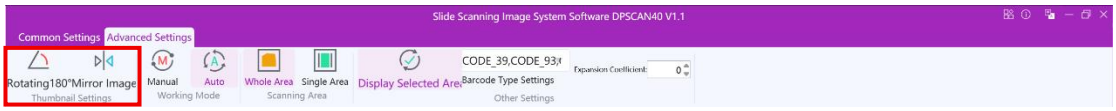

Figure 21. Thumbnail Settings

5.4.2.2 Working Mode

The following modes are available depending on workflow requirements:

① Auto: The scanner automatically completes the scanning process according to the system's preset focus parameters.

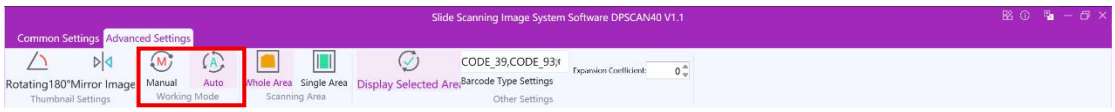

Figure 22. Auto Mode

② Manual: Click to start the scan task for the current slide.

- Reset Focus Height: Adjust the focus height of the sample. XY axes indicate the 2D position of focus points on the plane, Z axis indicates the vertical focus height. When **"Move Slightly"** is disabled, focus points move with a large step; when enabled, fine adjustment is applied. After setting the parameters, click the **"Focus"**

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button to apply.

- Reset White Balance: Corrects the sample background color. Click the **"White Balance"** button to apply the settings.

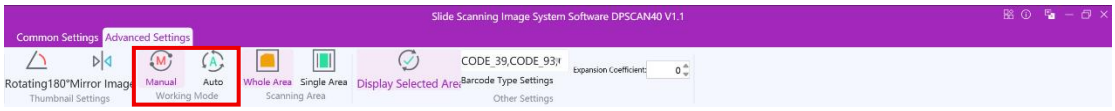

Figure 23. Manual Mode

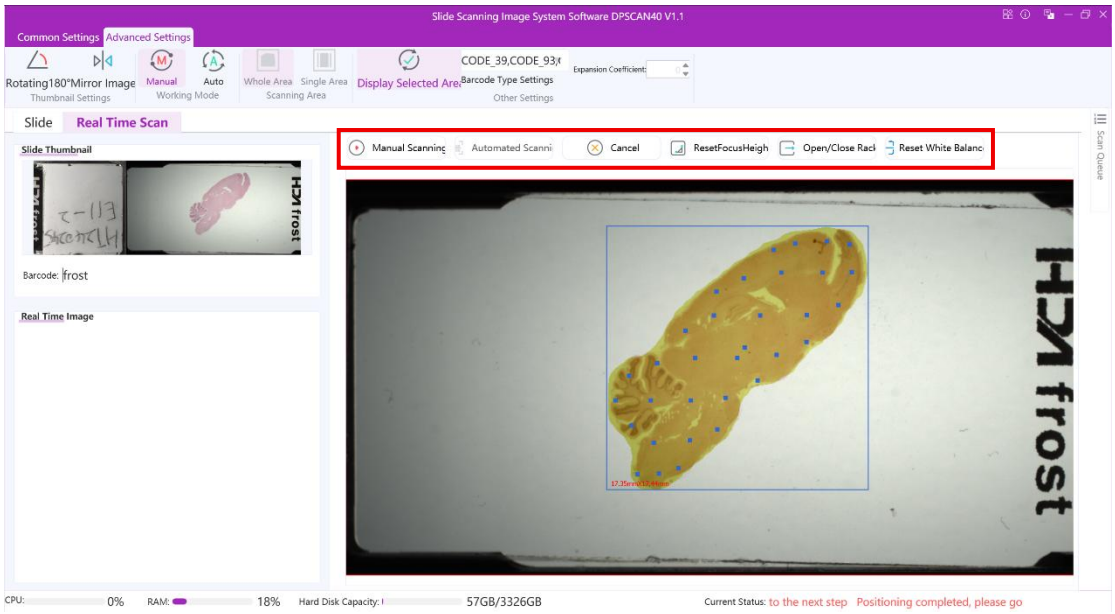

Figure 24. Manual Mode Parameters

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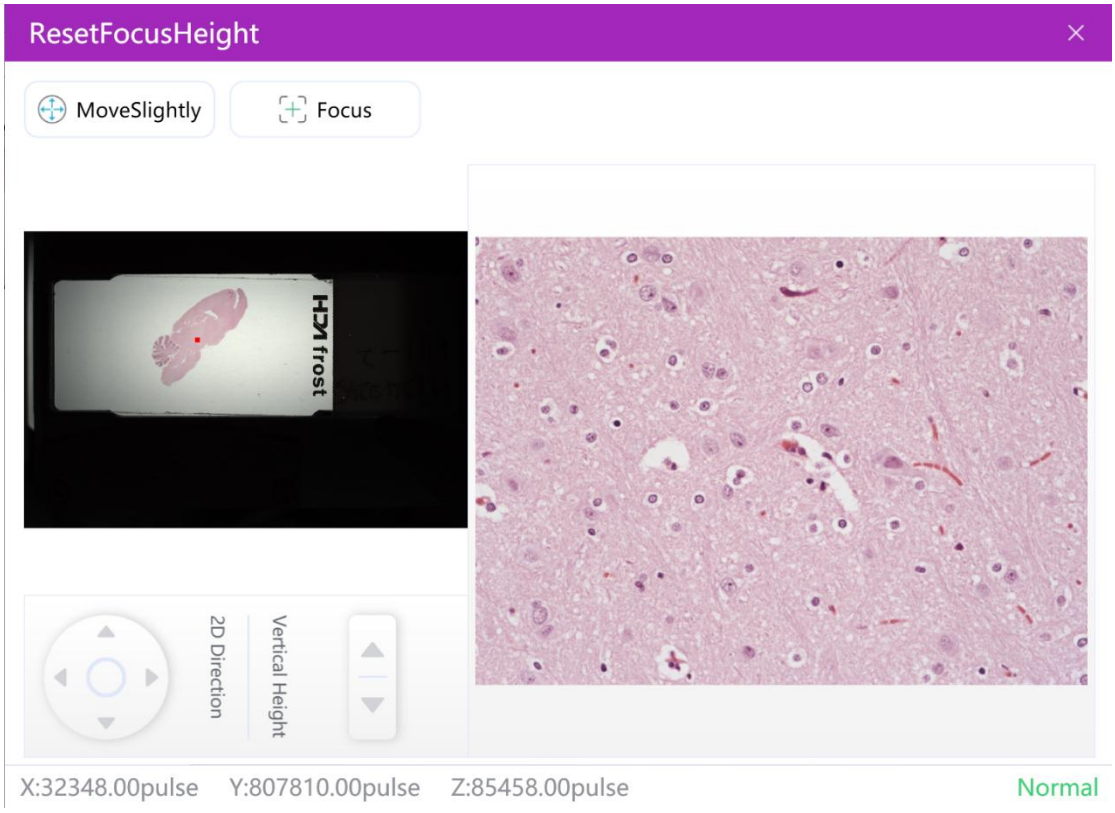

Figure 25. Reset Focus Height Window



Figure 26. Reset White Balance

5.4.2.3 Scanning Area

Supports selection of scan area types when scanning multi-sample slides. Options include:

① Single Area: Scan only the specified single sample area.

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② Whole Area: Scan all recognized sample areas.

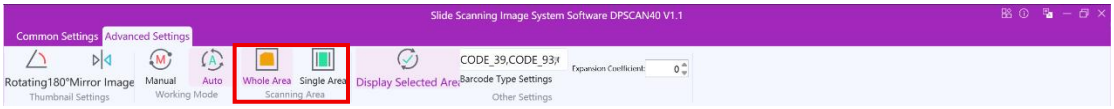

Figure 27. Scanning Area

5.4.2.4 Other Settings

The following parameters can be configured based on workflow requirements:

① Show/Display Selected Area: Controls the visibility of regions automatically detected in the sample.

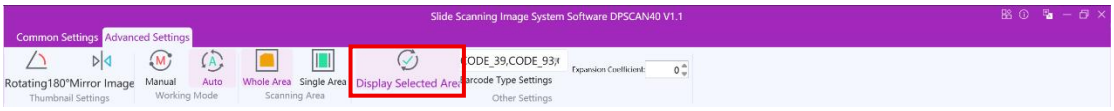

Figure 28. Show/Display Selected Area

② Barcode Type Settings: Supports selection of barcode types to be recognized, including All, CODE39, CODE93, CODE128, DATA_MATRIX, QR_CODE, OCR, etc.

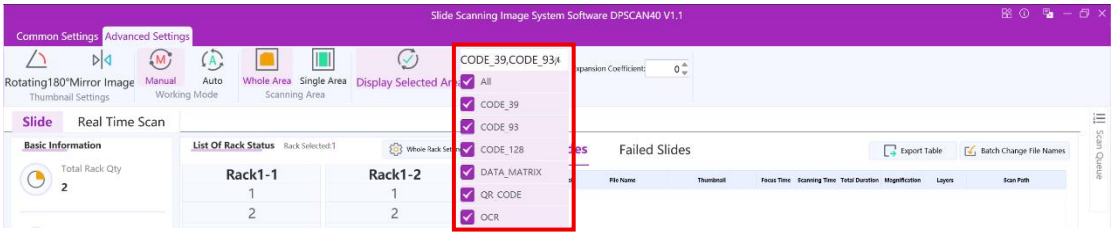

Figure 29. Barcode Type Settings

③ Expansion Coefficient: Proportionally enlarges the sample recognition area.

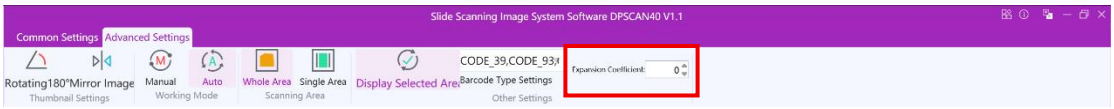

Figure 30. Expansion Coefficient

5.4.3 Slide

5.4.3.1 Basic Information

Displays real-time information including the total rack quality, total rack rows, slides to be scanned, slides scanned, scanning slide, scanning progress, and overall scan progress.

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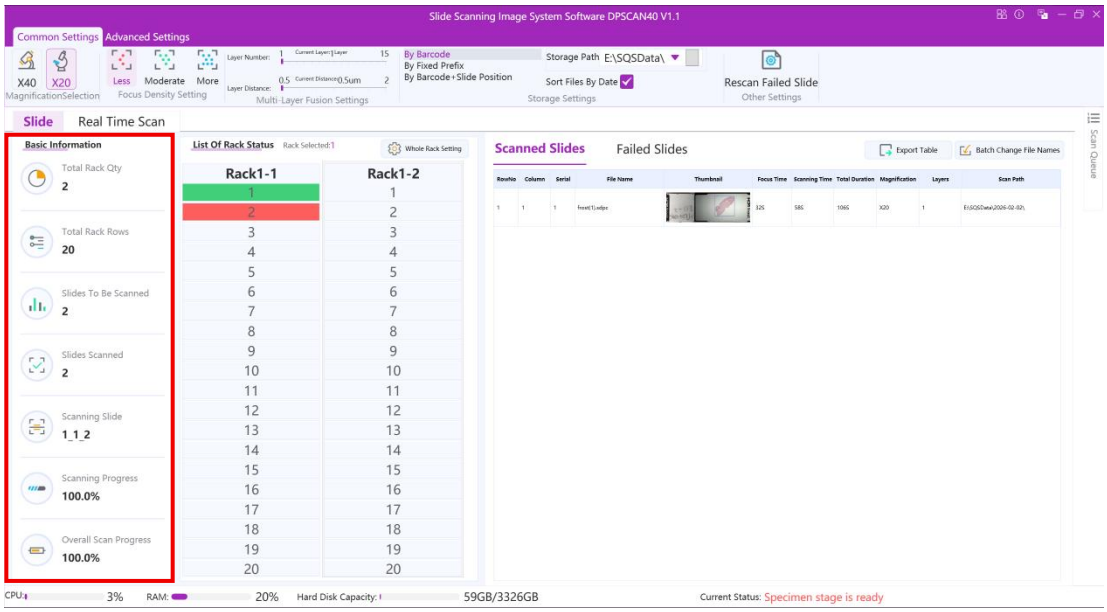

Figure 31. Basic Information

5.4.3.2 List of Rack Status

5.4.3.2.1 Visualized Rack Positions

The interface displays the slide rack positions corresponding to the scanner's physical slots, allowing real-time monitoring of the position and status of each slide.

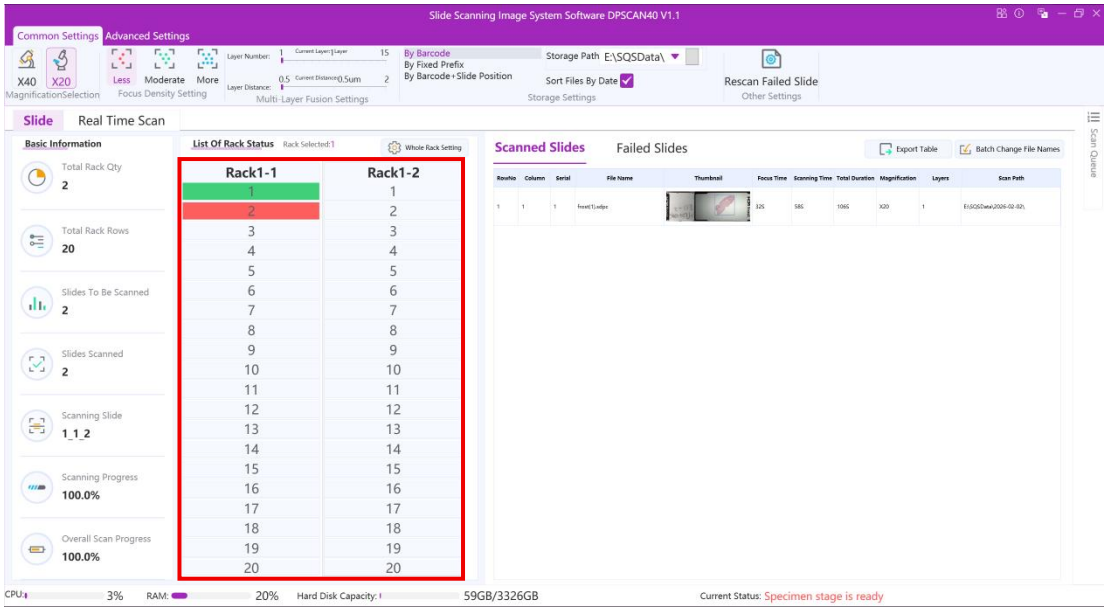

Figure 32. Visualized Rack Positions

5.4.3.2.2 Slide Status Color Guide

Slide status is indicated by color: Blue - Pending Scan; Orange – Scanning; Green - Scan Successful; Red - Scan Failed; Dark Gray - Open Slot; White - Pending Detection; Light Gray - No Slide.

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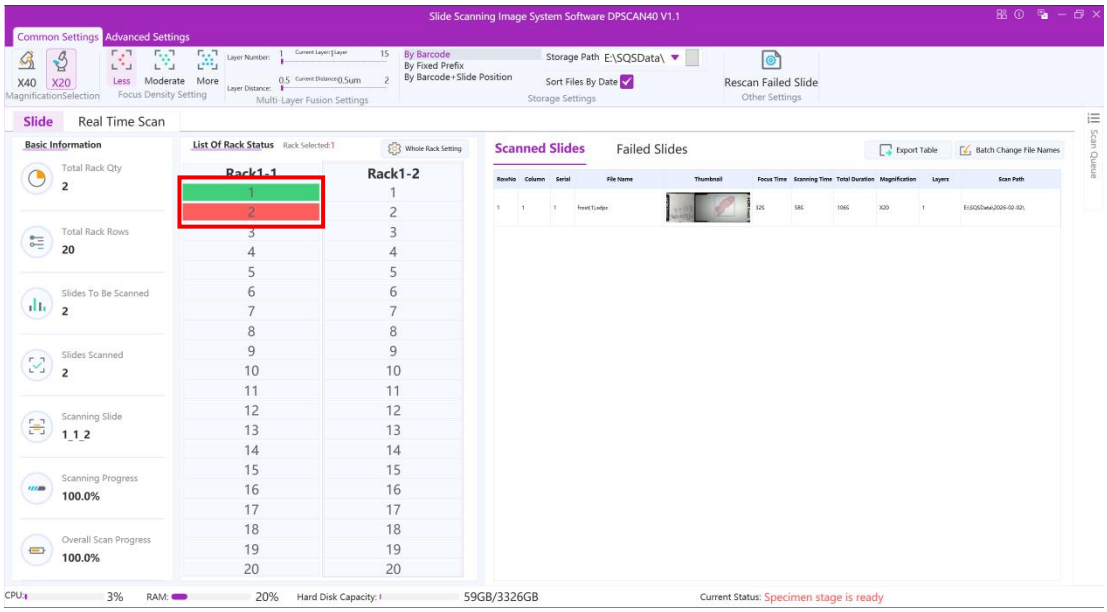

Figure 33. Slide Status Color Guide

5.4.3.2.3 Right-Click Context Menu

In the list of rack status, right-clicking any slide item opens the context menu, with the following options available depending on your workflow:

- Rescan Whole Rack: Rescan the selected slide rack; the scan status will be updated to pending scan.
- Top Whole Top: Move the selected slide rack to the top of the scan queue for priority scanning.
- Rescan This Line: Rescan the selected slide; the scan status will be updated to pending scan.
- Tope This Line: Move the selected slide to the top of the scan queue for priority scanning.
- Skip This Line: Skip scanning of the selected slide.
- Skip Whole Rack: Skip scanning of the selected slide rack.

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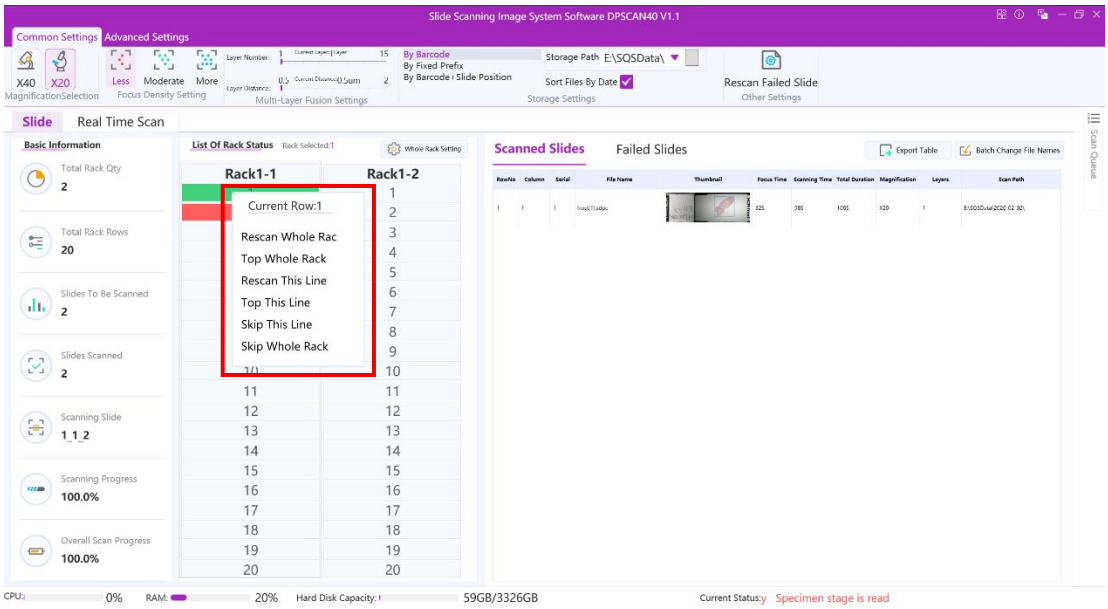

Figure 34. Right-Click Context Menu

5.4.3.2.4 Whole Rack Setting

Click the **"Whole Rack Setting"** button to open the whole rack setting window. This allows batch adjustment of scan parameters for the selected rack. Configurable options include:

① Rack Number Display: The top-left corner shows the currently selected rack number, e.g., "Rack Selected: X".

② Storage Settings: Configure parameters for storing scanned images, including naming rules, storage path, and file organization (see 5.4.1.4 Storage Settings for details).

③ Barcode Setting: Select the barcode type to be recognized, including All, CODE39, CODE93, CODE128, DATAMATRIX, QRCODE, OCR, etc.

④ Expansion Coefficient Setting: Proportionally enlarge the sample recognition area.

⑤ Thumbnail Settings: Adjust thumbnail display, with options to rotating 180° and mirror image.

⑥ Magnification Selection: Switch between X40 and X20 scanning magnifications.

⑦ Multi-Layer Setting: Suitable for thick or uneven samples to ensure image clarity and detail integrity, including number of layers and layer spacing (see 5.4.1.3 Multi-Layer Setting for details).

⑧ Focus Density: Adjust the distribution of focus points during scanning; options include less, moderate, or more.

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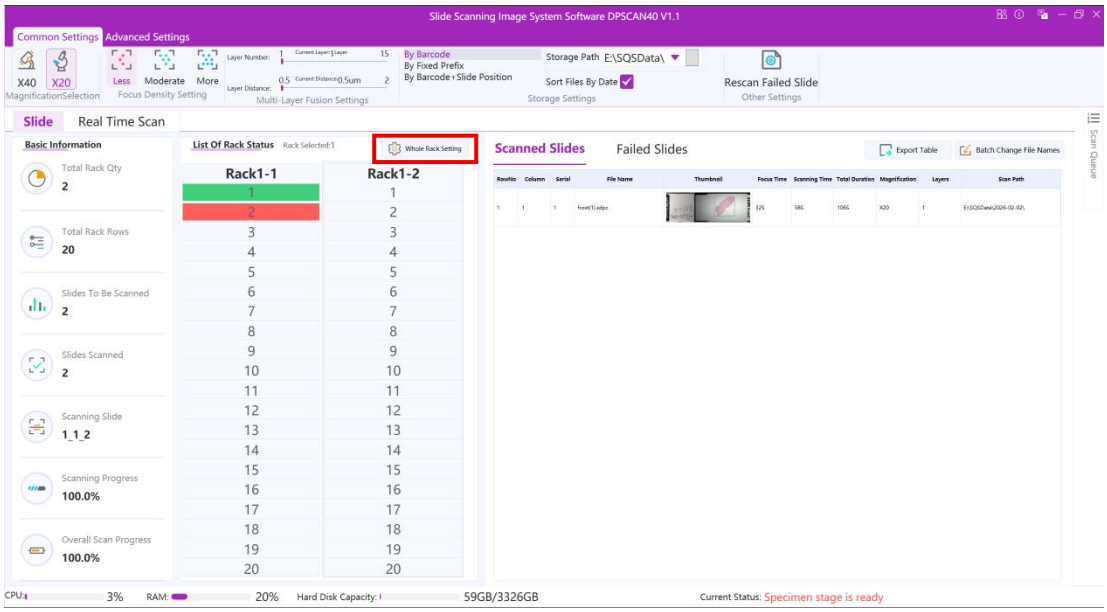

Figure 35. Whole Rack Setting Location

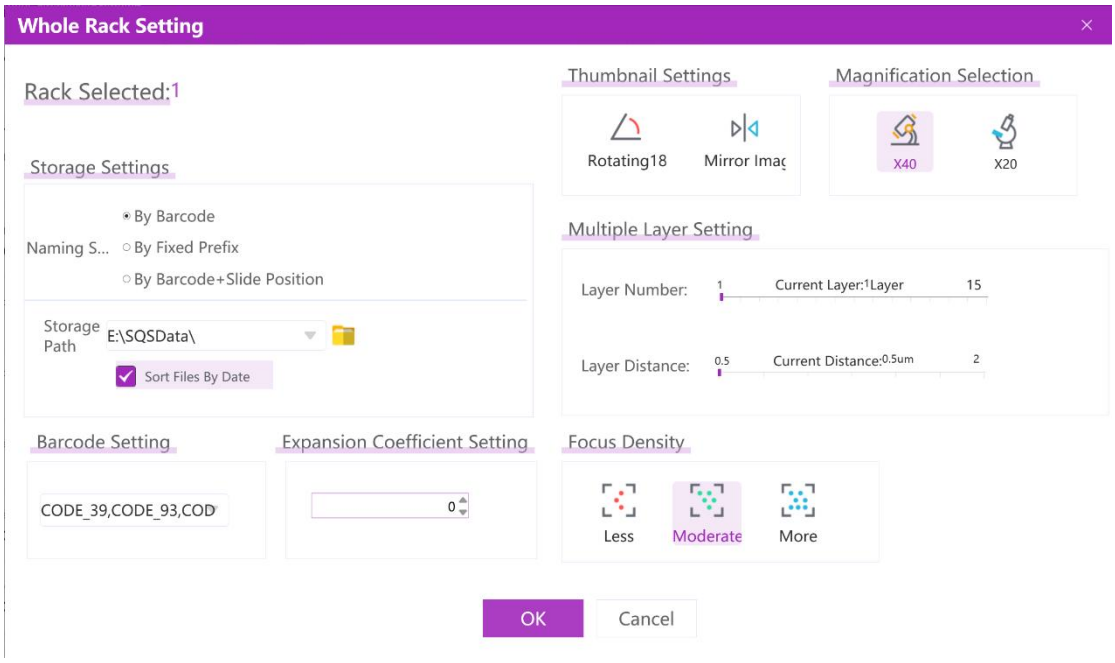

Figure 36. Whole Rack Setting Window

5.4.3.3 Scan Records

5.4.3.3.1 Scanned Slides

Displays information of slides that have been successfully scanned, including row No., column, serial, file name, thumbnail, focus time, scanning time, total duration, magnification, layers, and scan path.

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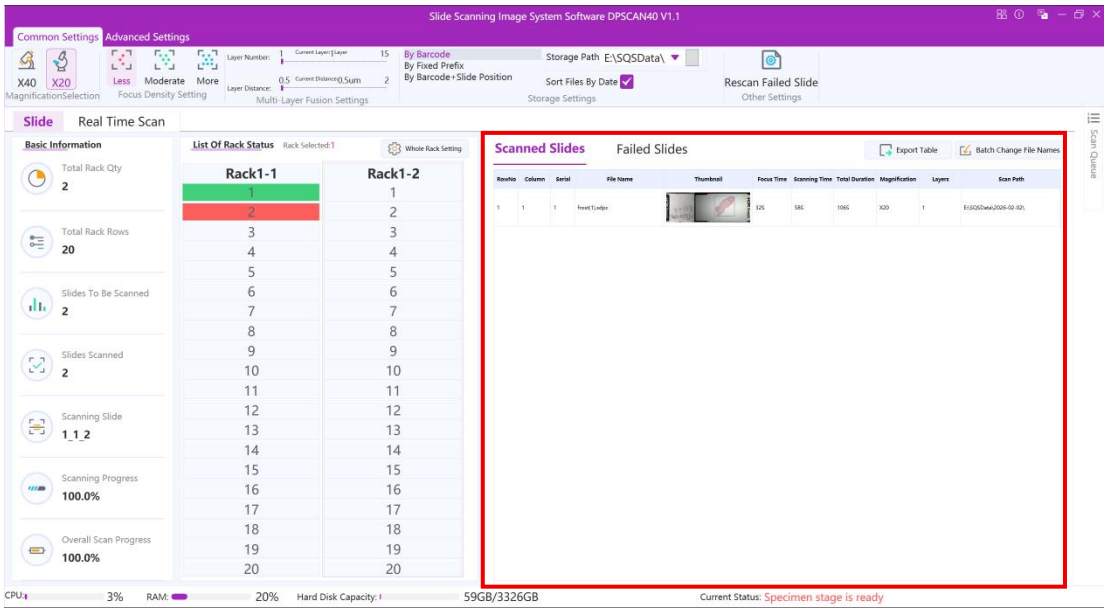

Figure 37. Scanned Slides

5.4.3.3.2 Failed Slides

Displays information of slides whose scanning failed, including row No., column, serial, scanning time, thumbnail, and failure cause.

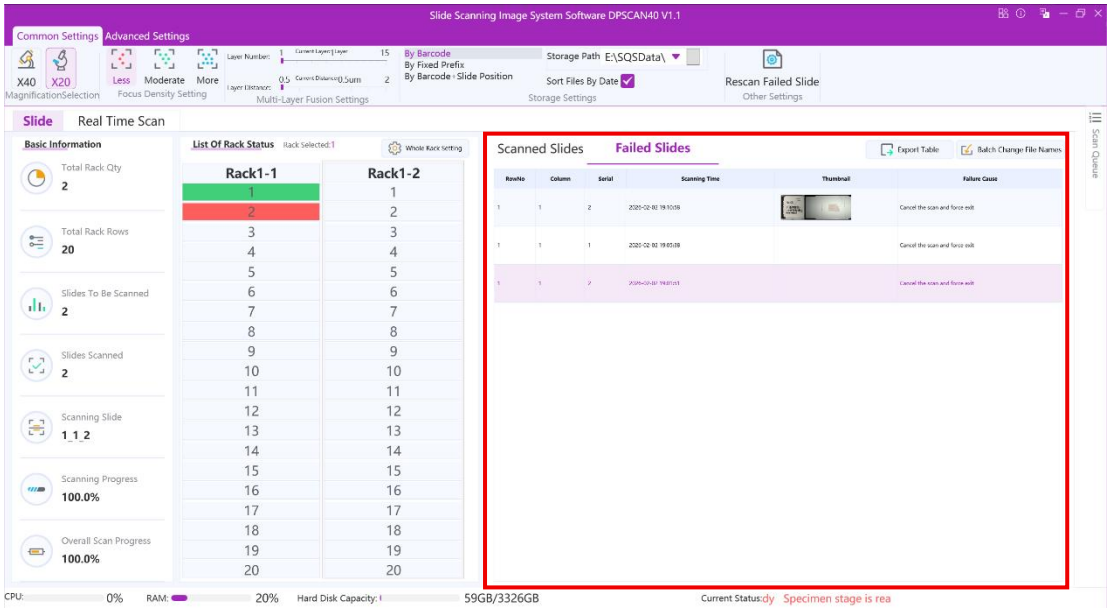

Figure 38. Failed Slides

5.4.3.3.3 Export Table

Click the **"Export Table"** button opens the export settings window. This window allows adjustment of export-related parameters. The following options can be configured according to actual requirements:

① Export Data Settings: Choose to export data for scanned slides or failed slides.

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② Select Export Date: Set the time range for the data to be exported, including start date and end date.

③ Export Information Settings:

- Scanned Slides: Select all or individually choose rack number, row No., date, file name, thumbnail, focus time, scanning time, magnification, layers, total duration.
- Failed Slides: Select all or individually choose rack number, row No., failure cause, failure time, thumbnail.

④ Save Location: Customize the storage path for the exported files.

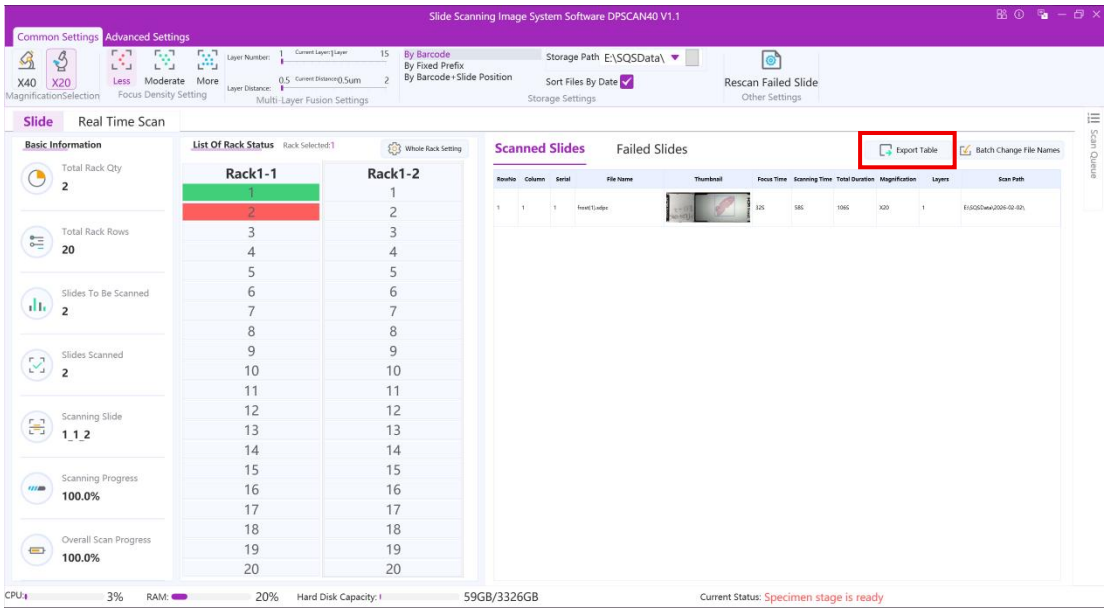

Figure 39. Export Table Location

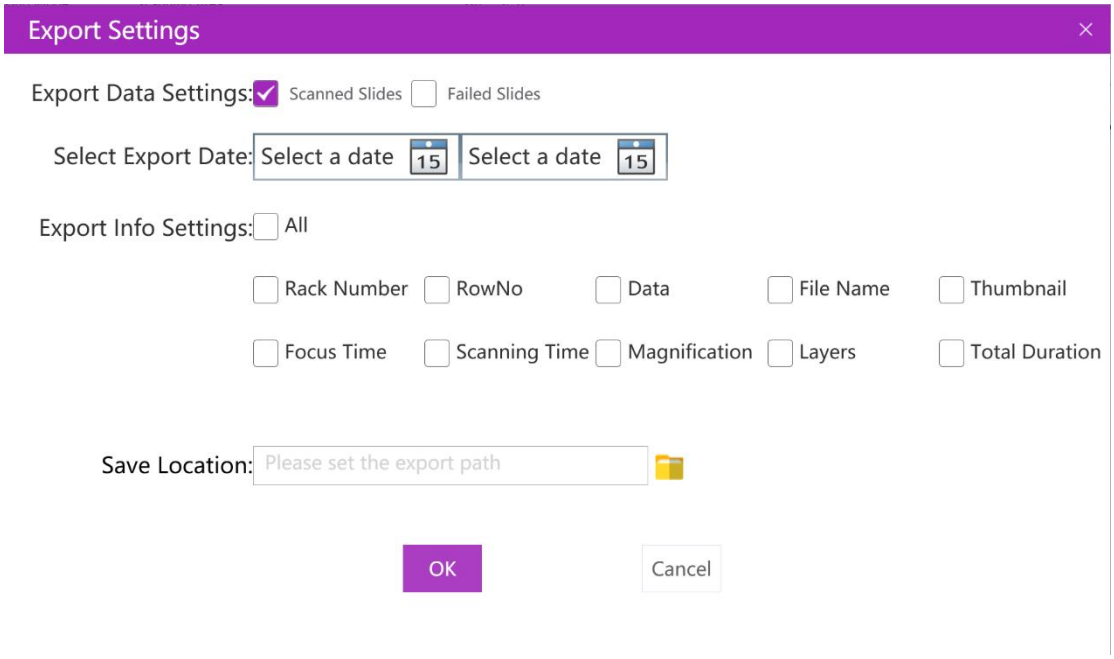

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Figure 40. Export Settings Window for Scanned Slides

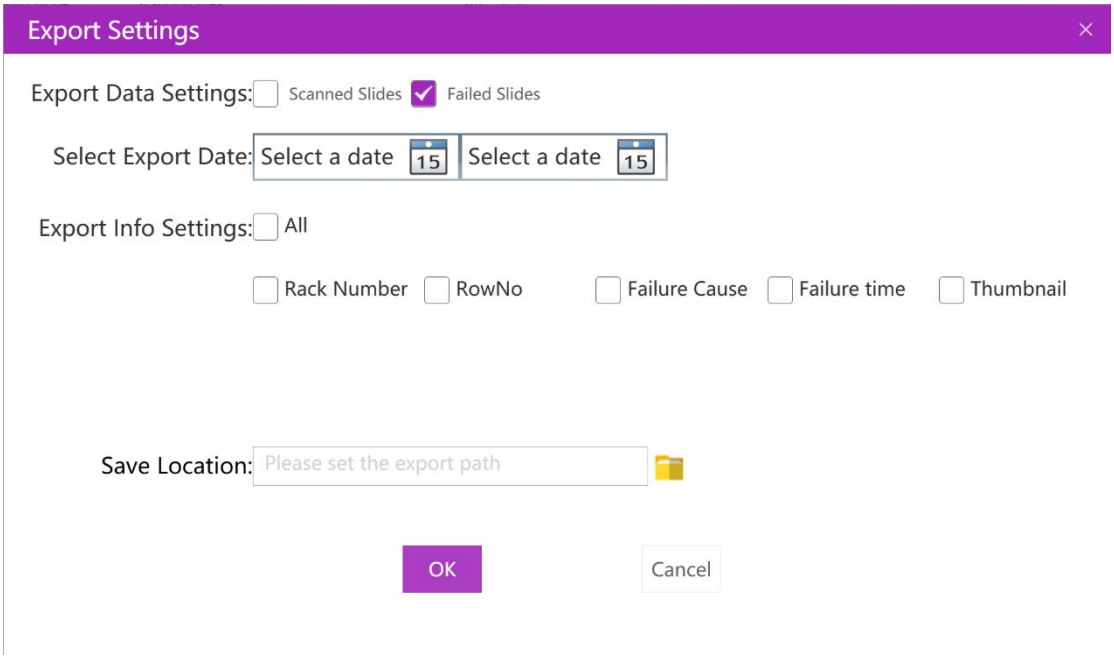

Figure 41. Export Settings Window for Failed Slides

5.4.3.3.4 Batch Change File Names

Clicking this option opens the import file name setting window, which supports batch import of slide information in CSV format, including rack number, slide position, and slide name.

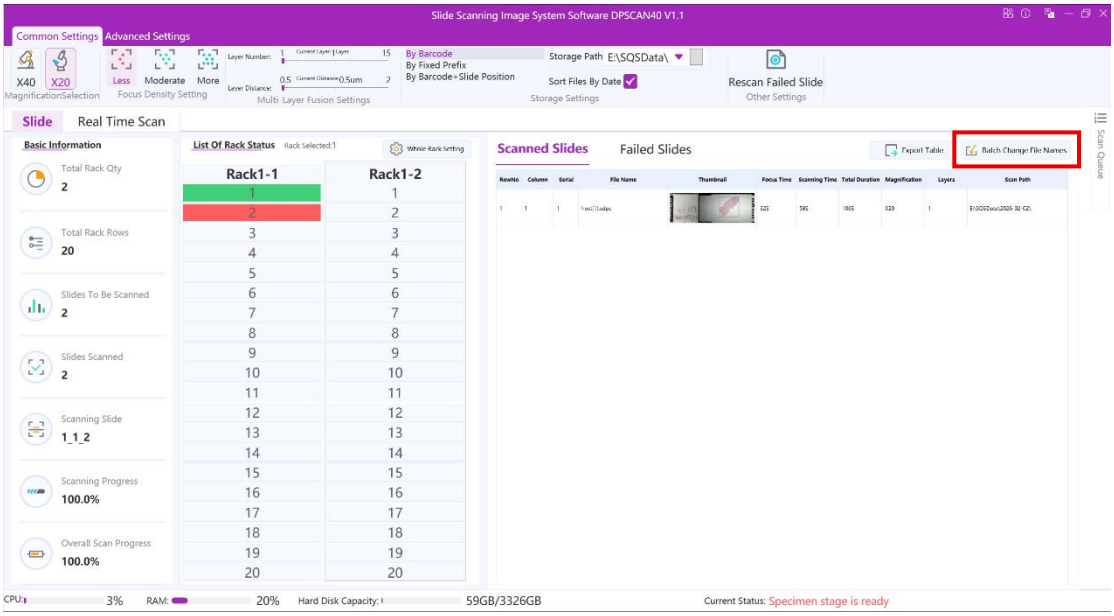

Figure 42. Batch Change File Names Location

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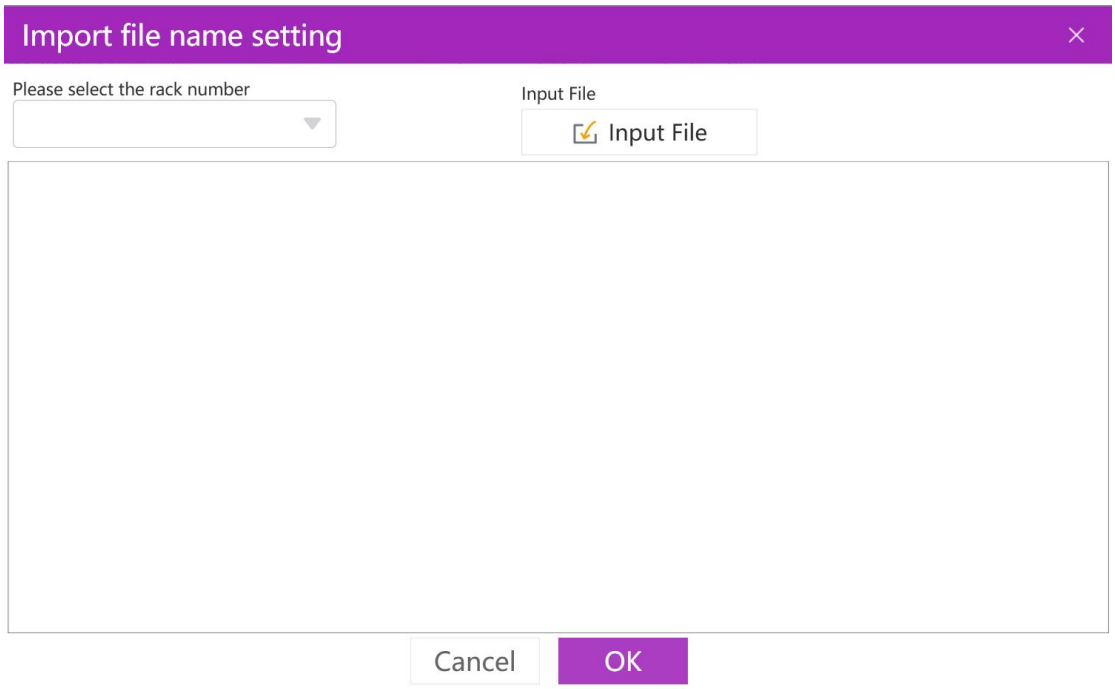

Figure 43. Import File Name Setting Window

5.4.3.4 Scan Queue

Clicking this option displays a list of all slides pending scanning, sorted by row No., column, serial, magnification, etc.

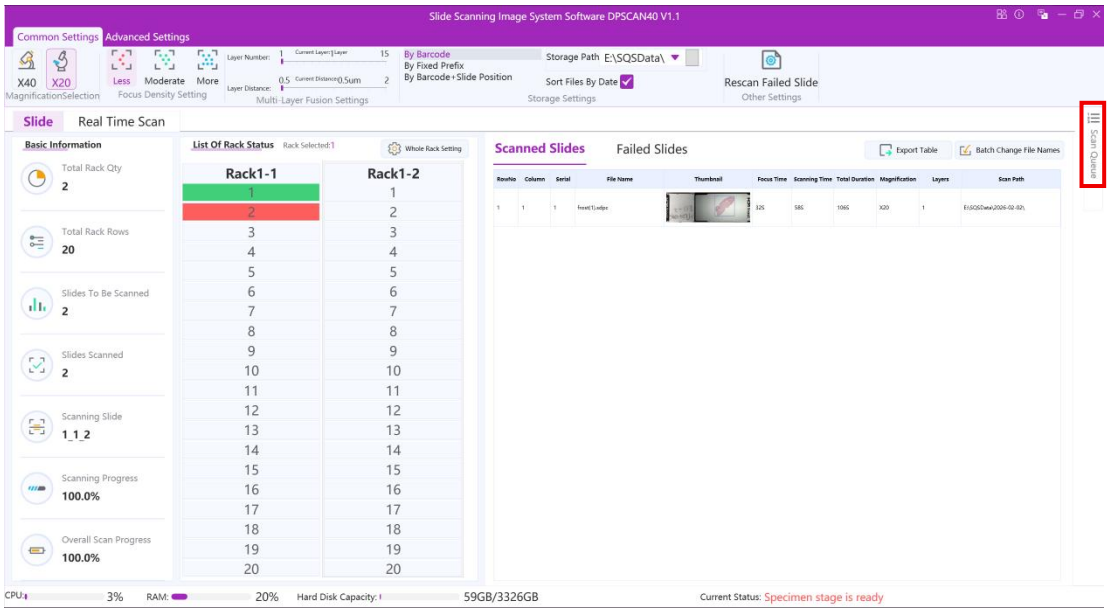

Figure 44. Scan Queue Location

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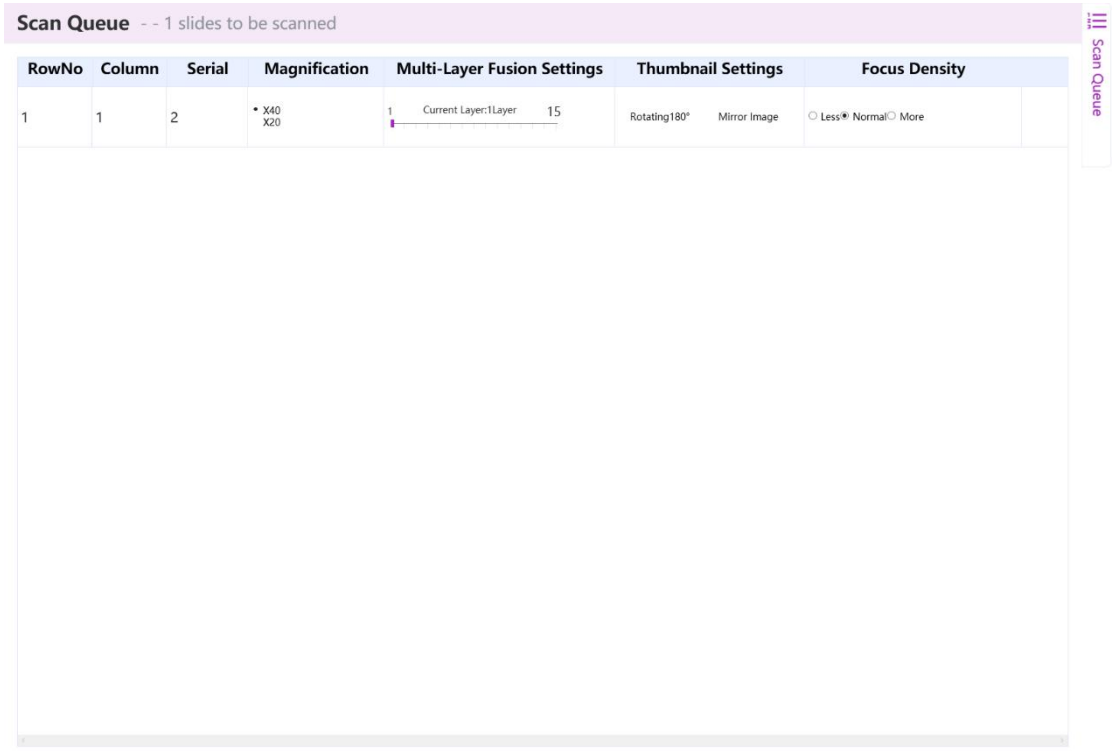

Figure 45. Scan Queue Window

5.4.4 Real Time Scan

5.4.4.1 Slide Thumbnail

Displays the overall image of the slide captured by the positioning camera, including slide label information and macroscopic features.

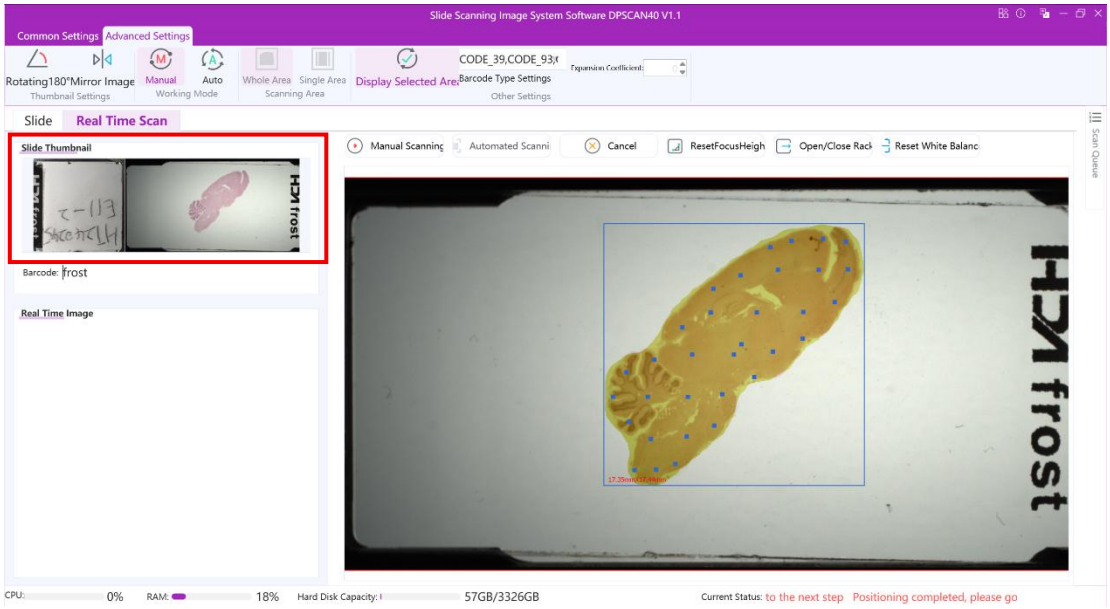

Figure 46. Slide Thumbnail

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5.4.4.2 Barcode

Displays the barcode information automatically recognized by the system.

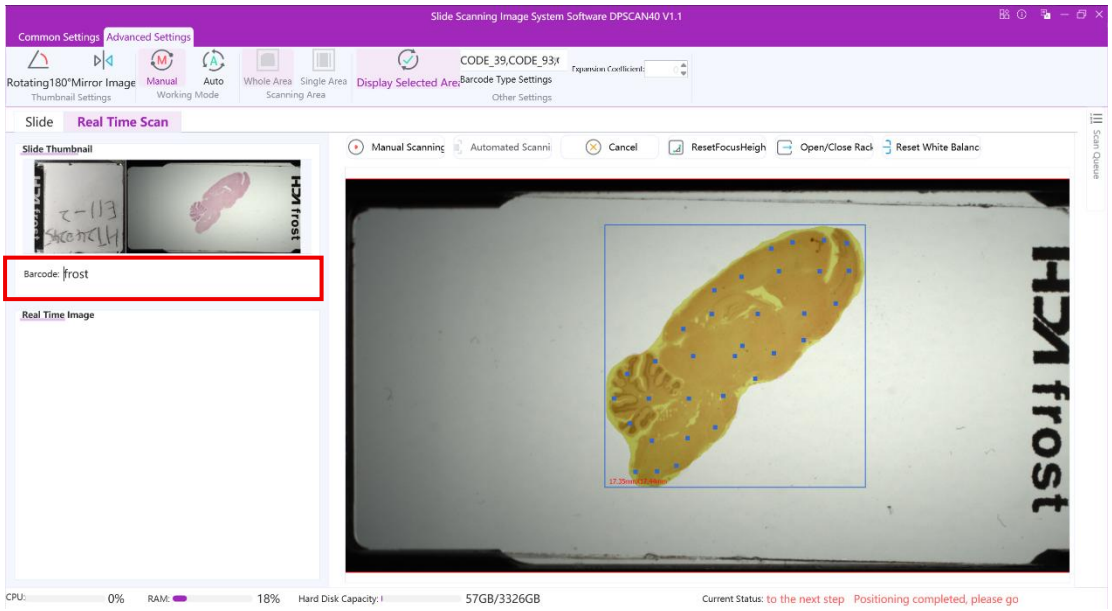

Figure 47. Barcode

5.4.4.3 Real Time Image

Displays the point-by-point imaging of the current sample in real time.

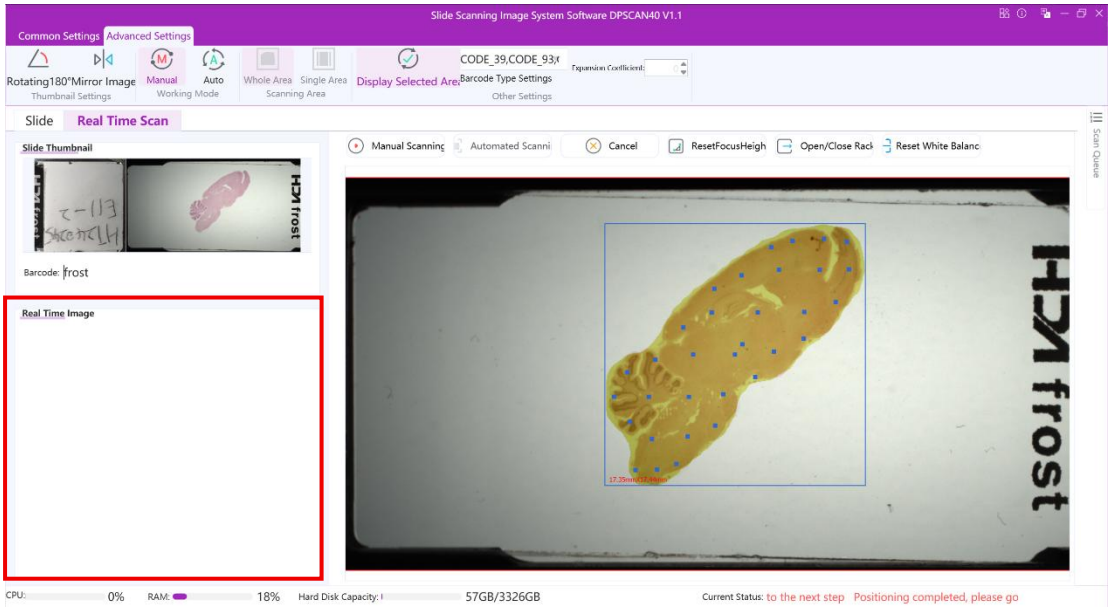

Figure 48. Real Time Image

5.4.4.4 Live Scan Image

Allows real-time viewing of the complete slide scanning process, including focus point recognition and image stitching. In manual working mode, the operation area and related buttons can be edited, to set the focus area and adjust the number of focus points.

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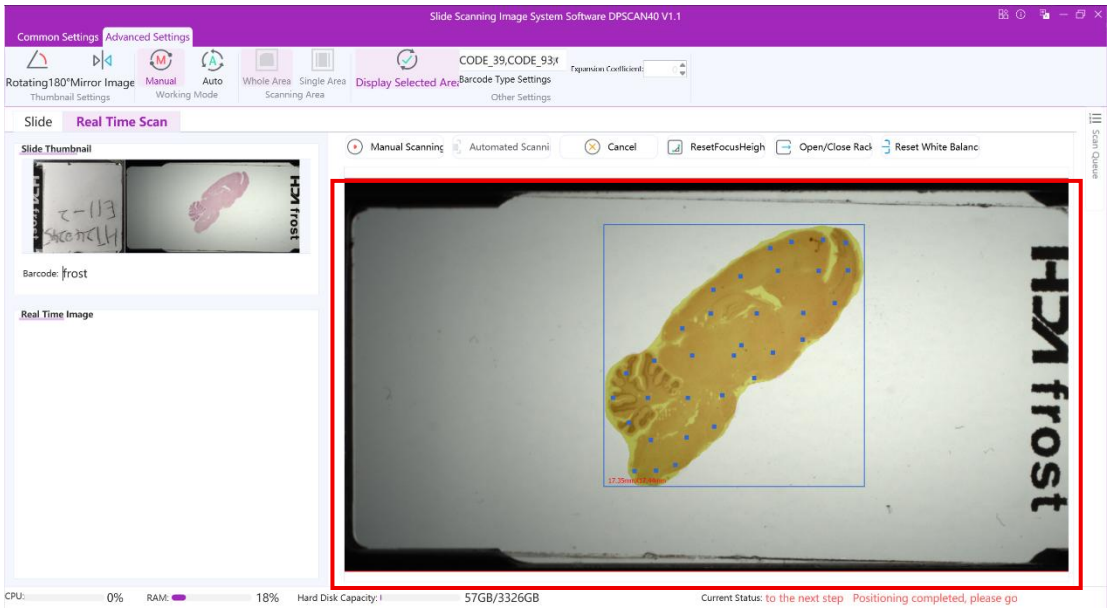

Figure 49. Live Scan Image

5.4.5 Current Status

The bottom-right corner of the interface displays the real-time operating status of the scanner.

The meanings of the status indicators are as follows:

Table 7: Current Status

Initialization successful, please load the slide	Stage ready
Slide scan completed! {0} succeeded, {1} failed	Automatic region search failed
Recognizing slide region...	Region and focus point detection failed
Closing program, please wait	Incorrect missing count, forced exit
Canceling scan, please wait	White balance automatic region search failed!
Not zeroed!	Focusing...
Focus busy!	STM count read error
Positioning busy!	Scanning and stitching...
Positioning camera error! Please restart or contact the administrator	Insufficient valid focus points
Positioning completed, please proceed to the next step	Scan error, please check the cause and resolve before proceeding
Performing light intensity calibration...	Scan completed, you may proceed to the next step

5.4.6 General Functions

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5.4.7.1 Expansion

Clicking this option opens the extended functions window, where you can select scan param setting. Once selected, the corresponding button will appear in advanced settings. Click the button to configure scan parameters. This function allows control over the scanner's scanning modes, including magnification, image layers, output mode, focus density, file naming rules, image quality, format, storage path, and file organization, to meet the requirements of different samples and applications.

1. Matching Priority Rules

① Priority Matching Rule: Parameters can be matched based on pathology ID recognition, scanner recognition, or default parameters, depending on actual requirements.

② Second Matching Rule: Parameters can be matched based on scanner recognition or default scan parameters.

③ Third Matching Rule: The default scan parameters are used directly.

2. Configuring Scan Parameters

① By Pathology Number

- Scan parameters can be set individually for each pathology ID.
- Configurable items include recognition rules, scan parameters, and operation options.
- Supports creating new entries for pathology ID-specific scan parameters.

② By Scanner

- Allows unified configuration of scan parameters for different slide types.
- Configurable items include slide type recognition rules, scan parameters, and operation options.

③ Default Scan Parameters

- When no pathology ID or slide type matches, the system uses default scan parameters to ensure proper scanner operation.
- Configurable items include scan parameters and operation options.

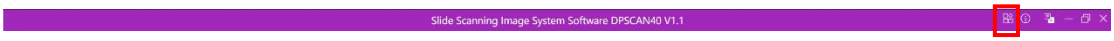

Figure 50. Expansion Button Location

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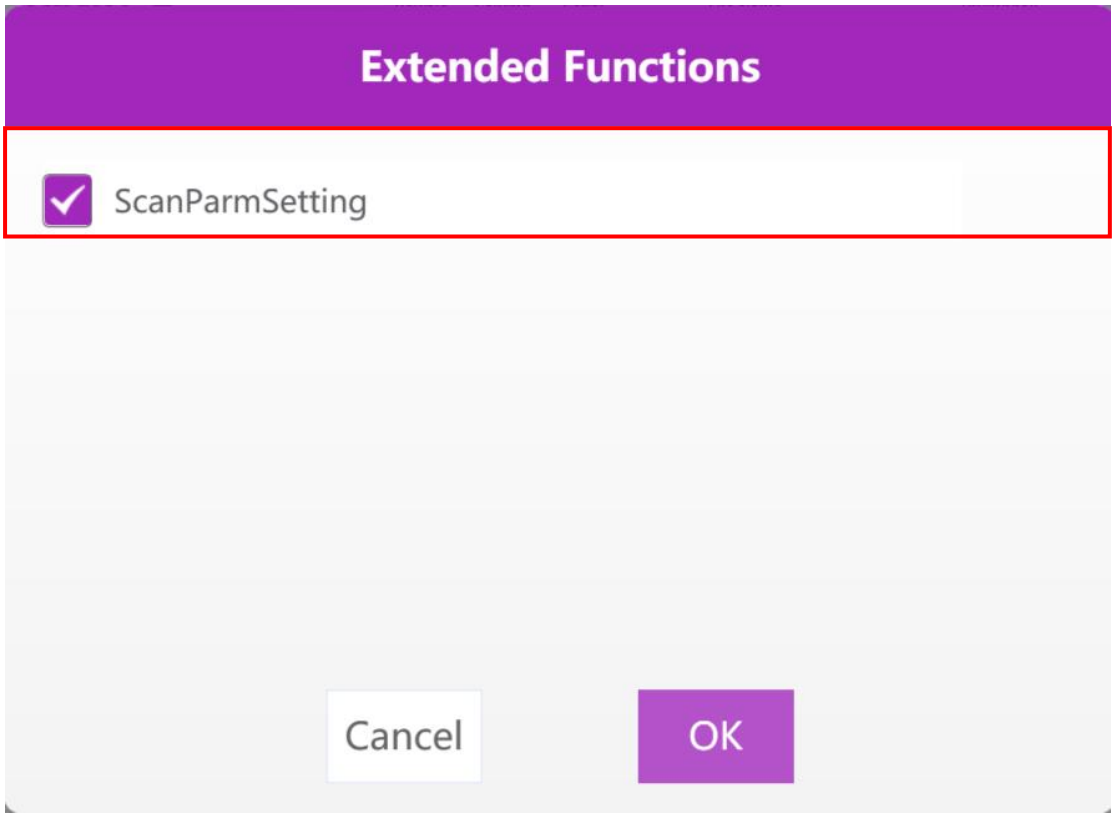

Figure 51. Extended Functions Window

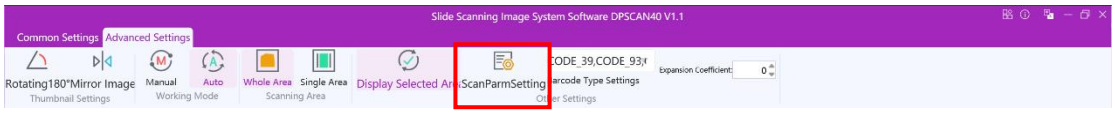

Figure 52. Scan Param Setting Location

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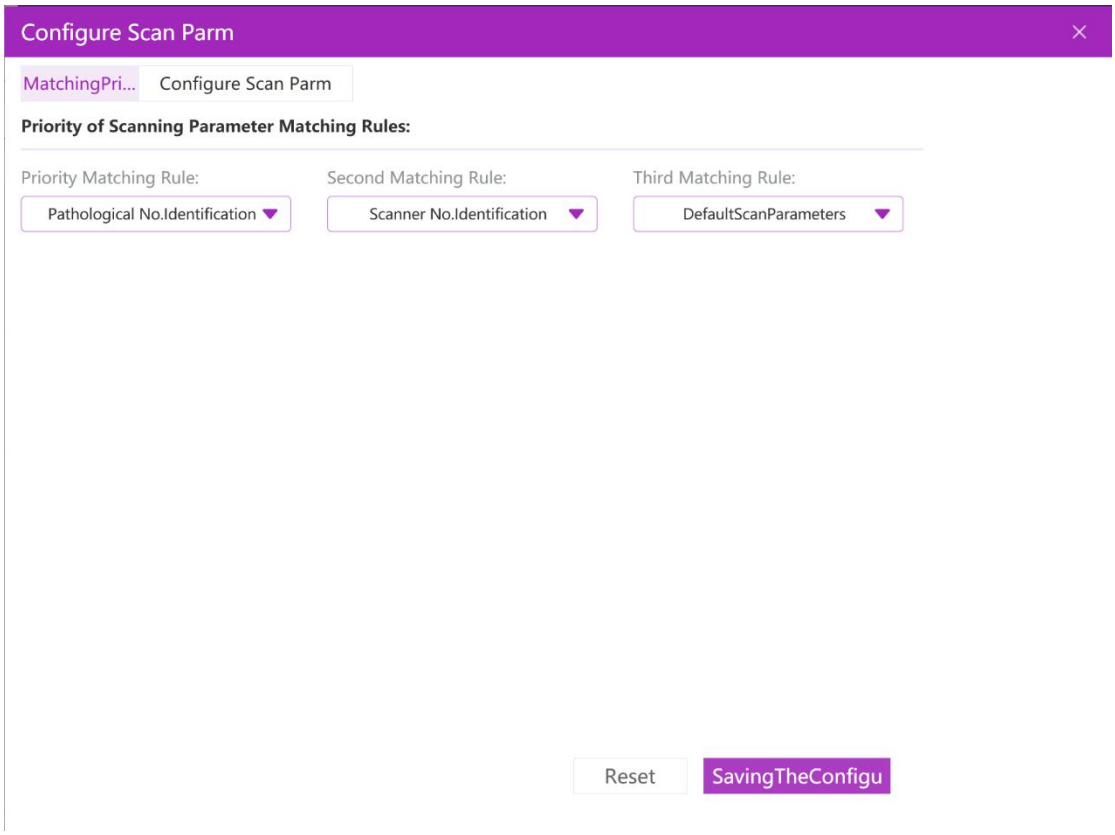

Figure 53. Configure Scan Param - Matching Priority Rules

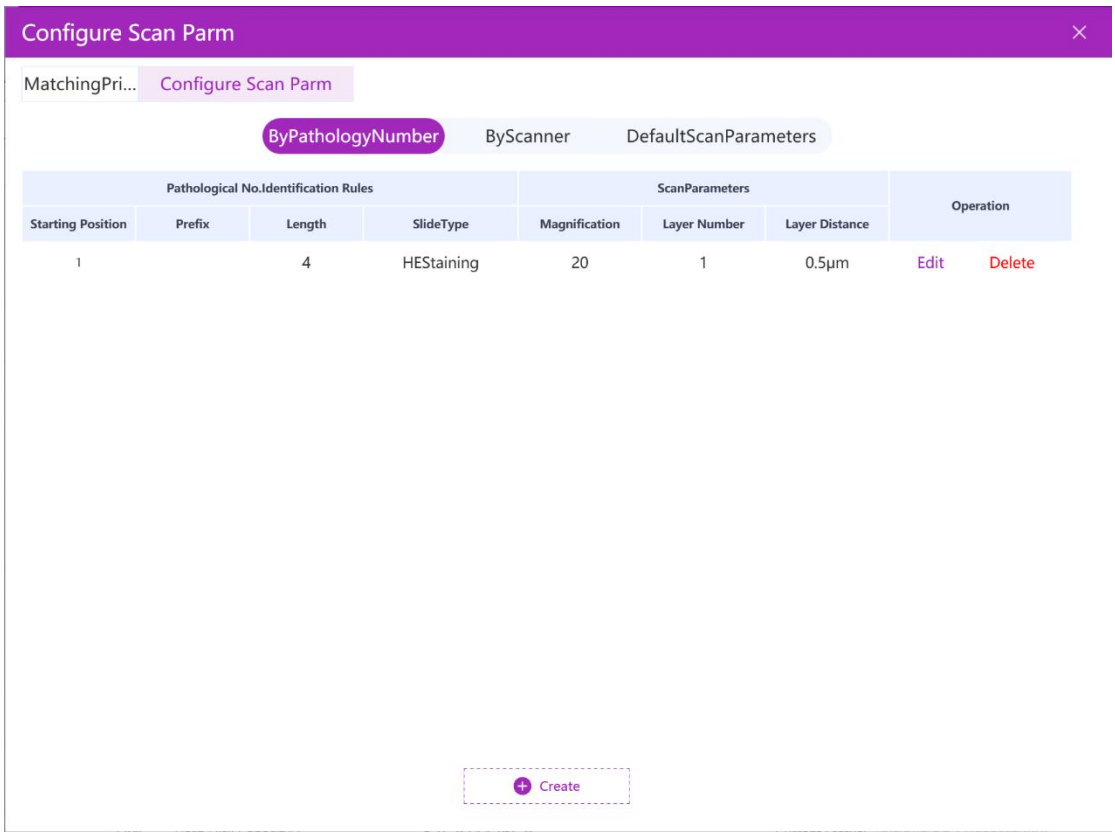

Figure 54. Configure Scan Param - by Pathology Number

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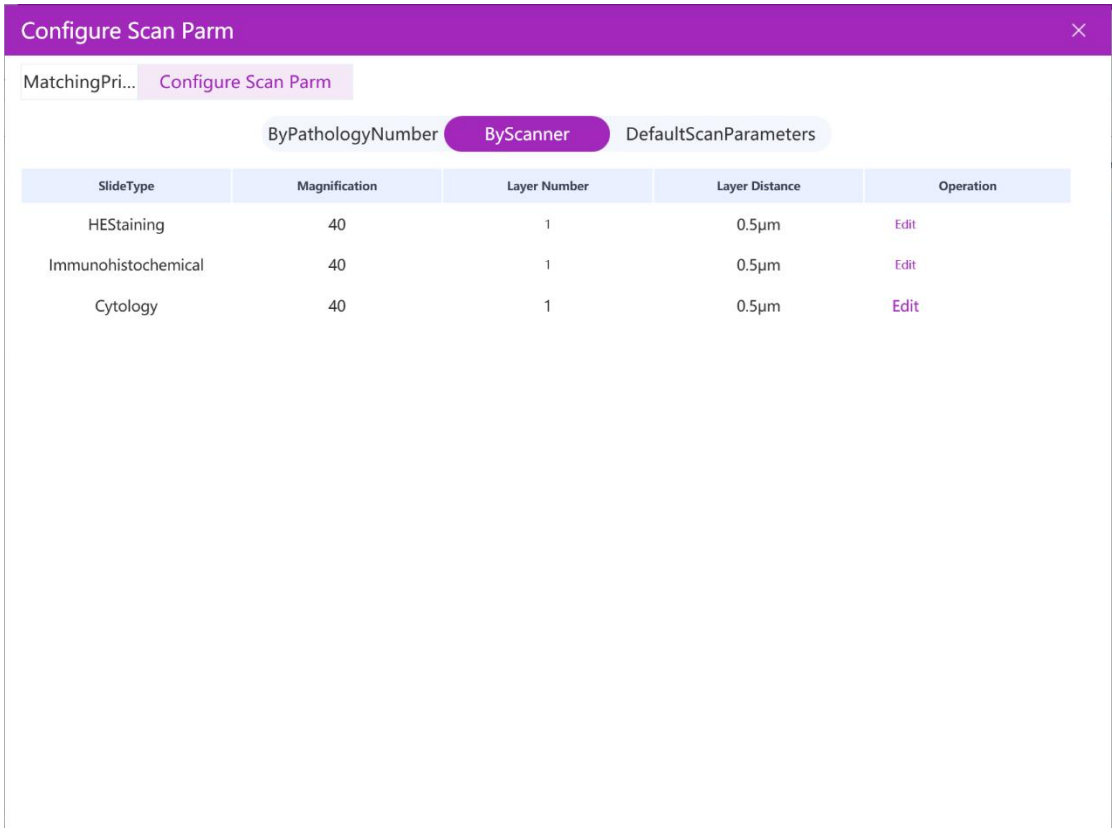

Figure 55. Configure Scan Param - by Scanner

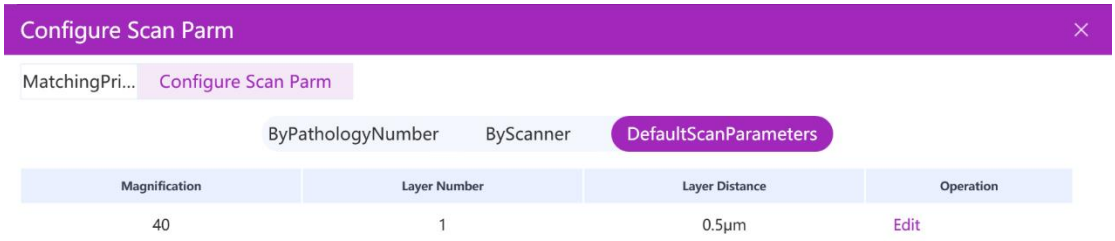

Figure 56. Configure Scan Param - Default Scan Parameters

5.4.7.2 About

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Clicking this option to view the version and related information of the scanning software.

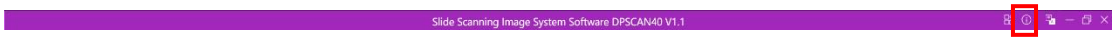

Figure 57. About Location

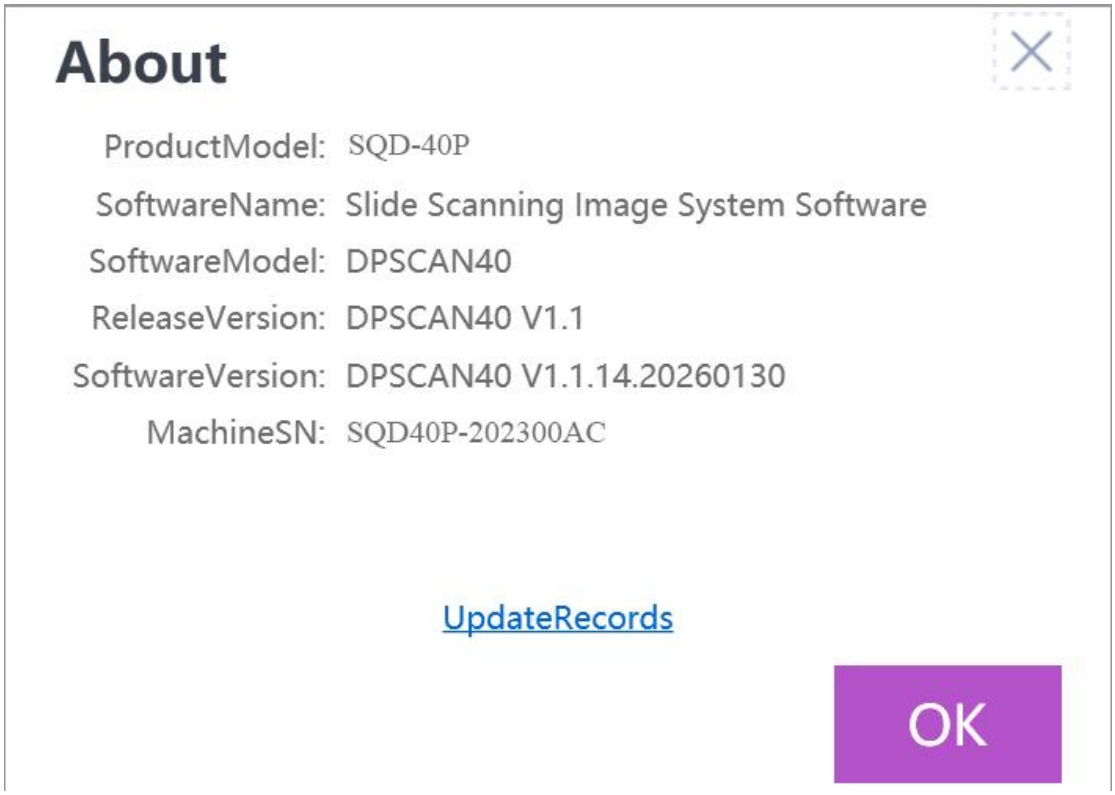

Figure 58. About Window

5.4.7.3 Language Switching

Clicking this option to switch between Chinese and English interfaces.



Figure 59. Language Switch

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6 Digital Pathology Slide Viewing Software

6.1 Software Overview

The Digital Pathology Viewing Software is a professional image viewing tool designed for use with the Slide Scanning System. The viewing software enables efficient management, rapid loading, and high-resolution visualization of WSI acquired by the scanner. It provides a precise, microscope-like zooming experience and supports a variety of auxiliary viewing functions, offering comprehensive support for pathological diagnosis and scientific research analysis.

6.2 Software Interface Structure

This section describes the overall interface structure and main functional modules of the viewing software, enabling users to quickly understand the functional layout and operational workflow of each module.

6.1.1 Interface Hierarchy

After the viewing software is launched, it first enters the main interface, which is used to display brand information. The main interface serves as the entry point for all functional modules, allowing users to select the appropriate module according to actual needs. Three global function buttons - **“Language”**, **“Settings”**, and **“About”** - are permanently displayed in the upper-right corner of the main interface, enabling users to adjust system configurations at any time.



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Figure 60. Main Interface

6.1.2 Interface Interaction Workflow

After the viewing software is launched, it first enters the main interface. Users can select the appropriate functional module according to actual needs. After completing the required operations, users may switch to other functional modules to continue related tasks. The functional modules of the main interface include:

① Image Viewing Interface: Provides a quick-access toolbar and menu operations for performing various operations on WSI.

② Local Images Interface: Used to manage and view WSI stored locally.

③ Example Images Interface: Allows access to standard or example WSI stored on the server.

④ Cloud Disk Interface: Used for the storage, sharing, and collaborative use of WSI.

⑤ Global Function Buttons:

- ✓ Language: Switches the display language of the viewing software interface.
- ✓ Settings: Configures system parameters and user preferences.
- ✓ About: Displays software version information and company details.

6.3 Functional Module Description

6.3.1 Main Interface

After the viewing software is launched, it first enters the main interface, which is used to display brand information and provide access to all functional modules. The main interface consists of the following components:

① Information Bar: Permanently displayed at the top of the interface, showing the software name, company name, company website, and software version, allowing users to easily verify software information at any time.

② Function Navigation Bar: Located below the information bar, it includes a purple computer icon and entry buttons for each functional module, such as **“Local”**, **“Example”**, **“Cloud Disk”**, and **“Platform”**. Users can select the appropriate module according to actual needs.

③ Global Function Buttons: Permanently displayed in the upper-right corner of the interface, including **“Language”**, **“Settings”**, and **“About”**. These buttons allow users to adjust the

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interface language, configure system parameters, and view software version and company information at any time.

④ Central Viewing Area: Located below the function navigation bar and global function buttons, displaying the software name and company information.

⑤ Status Bar: Permanently displayed at the bottom of the interface, showing welcome messages or operation prompts to provide real-time status feedback.

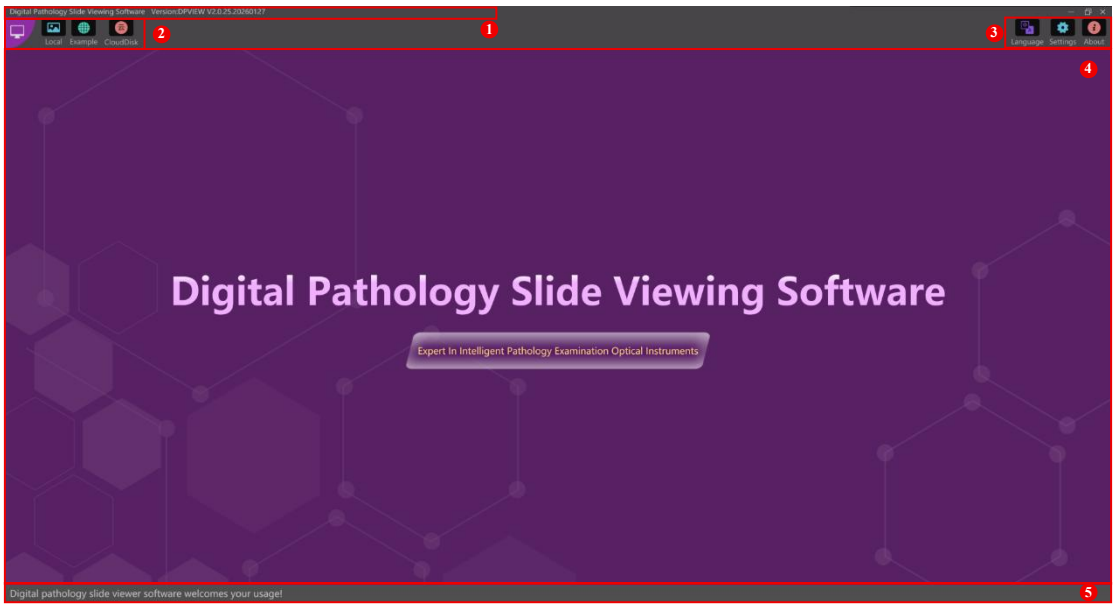

Figure 61. Main Interface

6.3.1.1 Interface Switching

By clicking the purple computer icon in the upper-left corner of the interface, users can switch between the main interface and the image viewing interface.



Figure 62. Interface Switching

6.3.1.2 Local

Displays the resource directories on the computer, facilitating the management and viewing of WSI stored locally.

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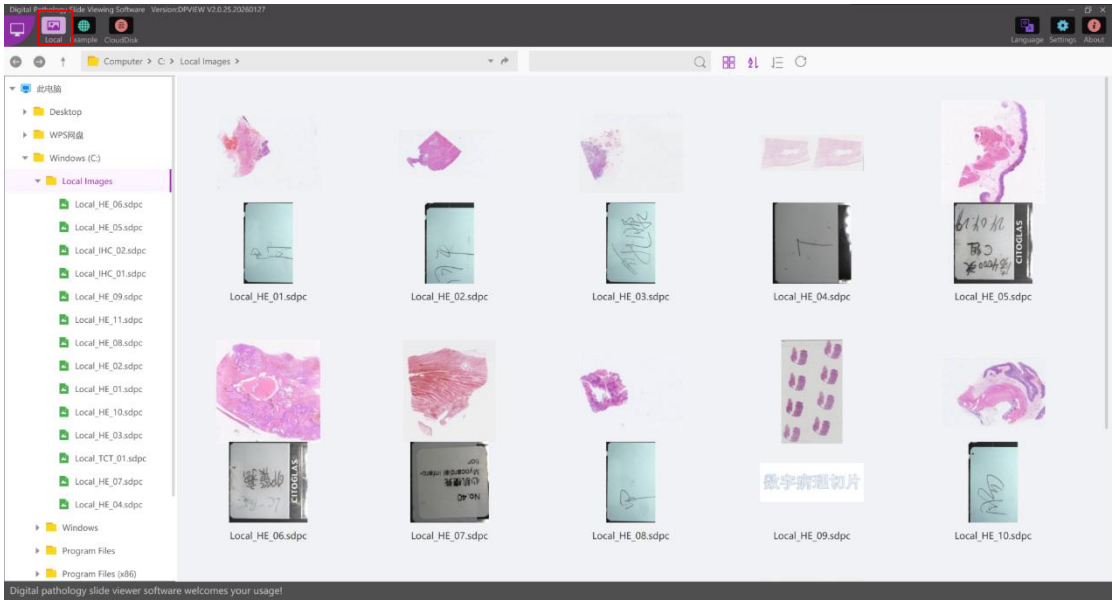

Figure 63. Local

6.3.1.3 Example

Displays a variety of typical and representative WSI, covering seven common slide types, including TCT, bone marrow, immunohistochemistry (IHC), peripheral blood, tissue sections, acid-fast bacillus (AFB) staining, and algal specimens.

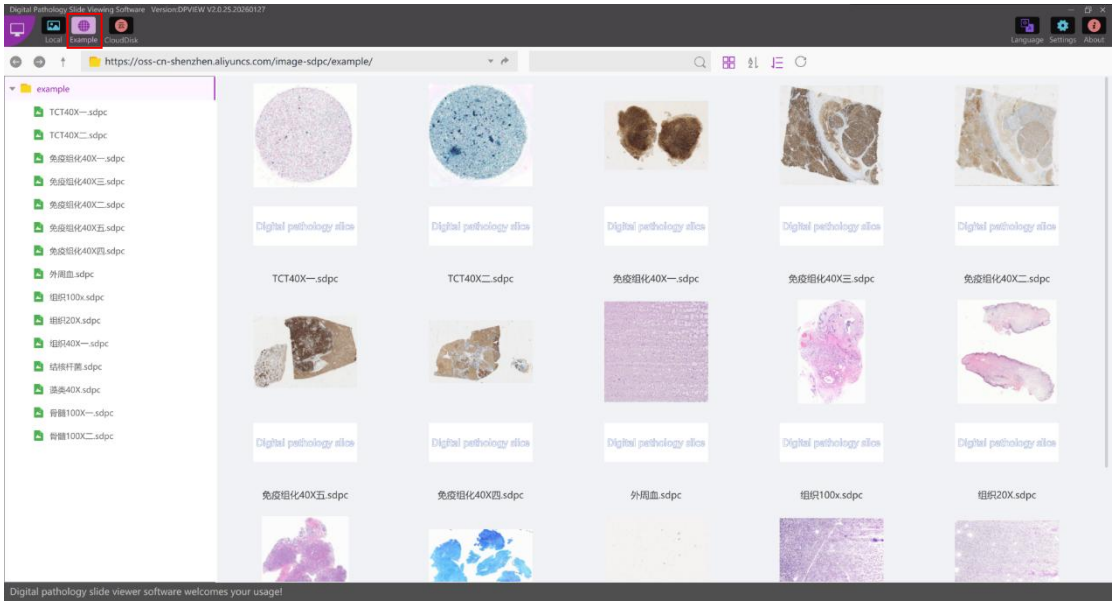

Figure 64. Example

6.3.1.4 File Resource Management

Used for the unified management of WSI stored locally or on external storage devices. The interface is generally composed of three parts: function bar, file directory area, and image preview area.

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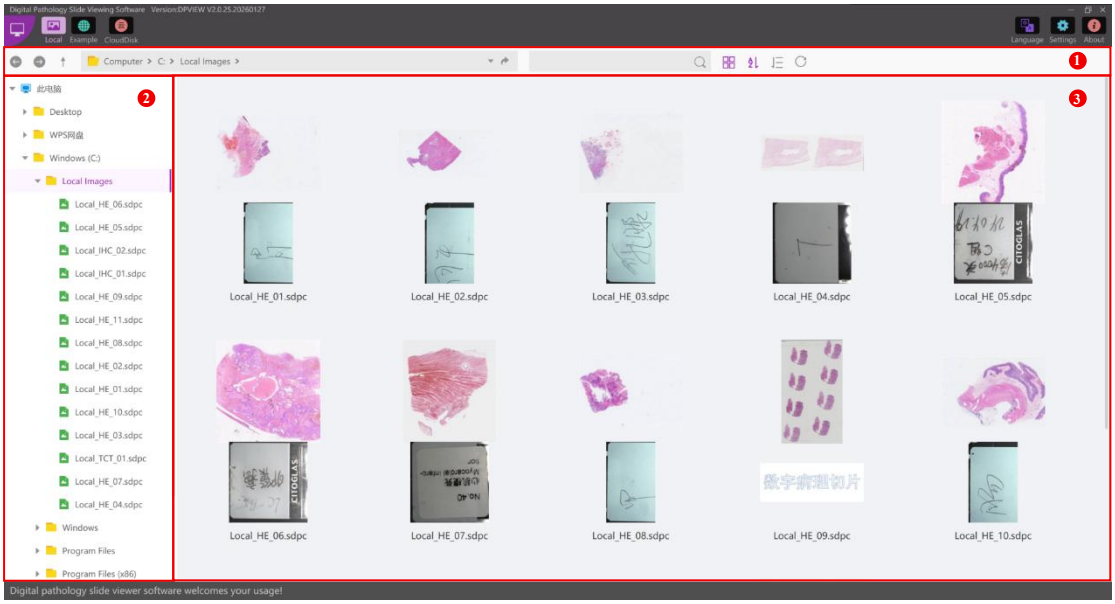

Figure 65. File Resource Management

① Function Bar

- Back: Returns to the previous browsing path.
- Next: Moves to the next browsing path.
- Up: Returns to the parent folder of the current directory.
- Directory Path: Displays the full path of the currently selected resource directory.
- Skip: Quickly navigates to and enters a specified resource directory.
- Search: Searches for target data within the currently selected resource directory, supporting keyword-based fuzzy matching.
- Image List View Toggle: Switches between extra large icon view and content view display modes.
- Sort by Name: Sorts the list by image name in increasing or decreasing order.
- Sort by Time: Sorts the list by image storage time in increasing or decreasing order.
- Refresh: Updates the list to display the latest image data when the contents of the resource directory change.

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② File Directory Area

Displays the computer's resource drives and their folder structures, including commonly used paths such as Desktop, Pictures, Downloads, Documents, and Videos, as well as resource directories on other accessible drives.

③ Image Preview Area

Displays the image contents within the currently selected resource directory. Users can double-click an image to quickly enter the image viewing interface. Images that are currently open are highlighted in the image preview area. Users can right-click an image to open a shortcut menu with the following options:

- Rename: Opens the rename dialog, allowing the selected image to be renamed. This option is not available for images that are currently open.

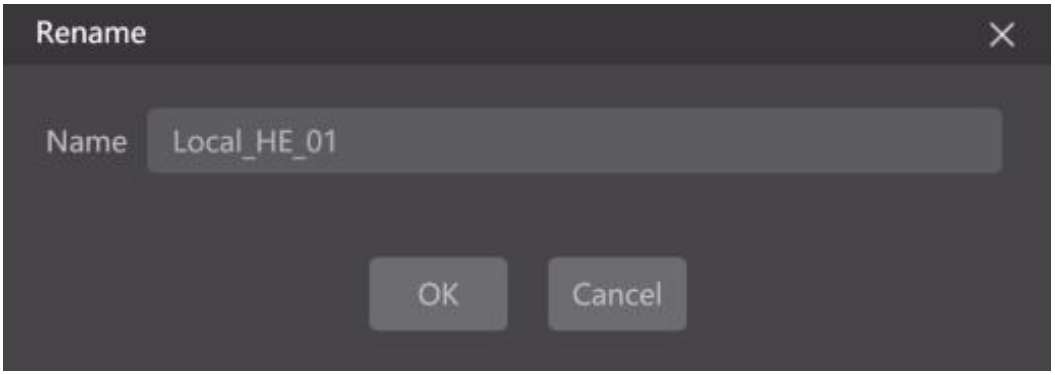

Figure 66. Rename

- Open The Section: Directly locates and opens the storage directory of the selected image.
- Copy Path: Copies the full storage path of the selected image to the system clipboard.
- Copy File: Copies the selected image file to the system clipboard.

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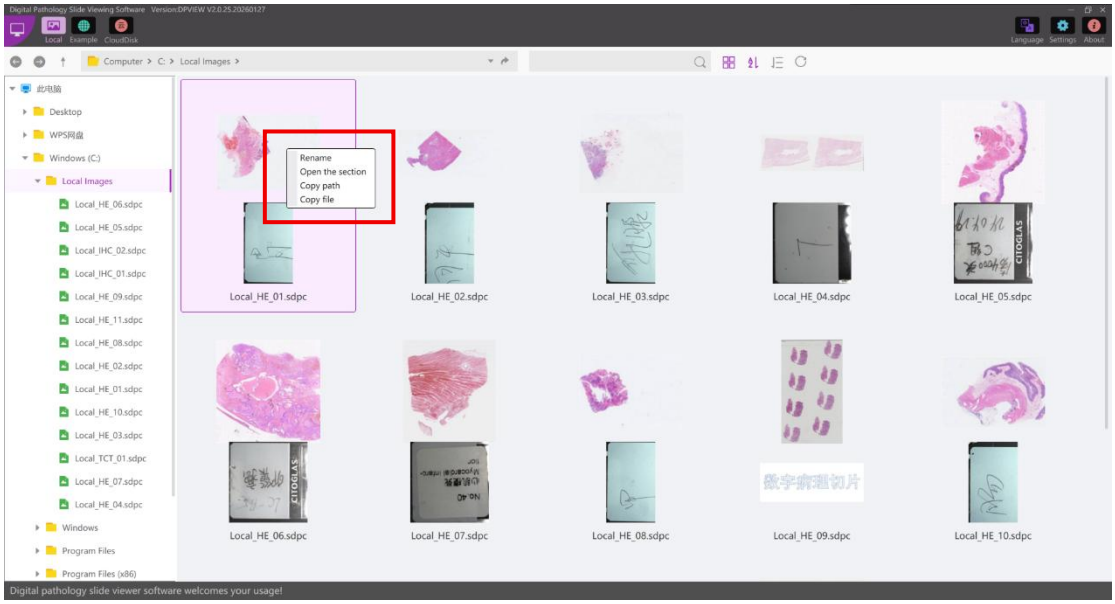

Figure 67. Shortcut Menu

6.3.2 Image Viewing Interface

This is the core interface for viewing and operating WSI. The interface is mainly composed of the following components:

① Information Bar: Permanently displayed at the top of the interface, showing the software name, company name, company website, and software version, allowing users to easily verify software information at any time.

② Function Navigation Bar: Located below the information bar, it includes a purple computer icon and entry buttons for each functional module, such as **"Local"**, **"Example"**, and **"Cloud Disk"**. Users can select the appropriate module according to actual needs.

③ List: Located on the left side of the interface, consisting of **"All List"** and **"Current Preview"** sections. Expand » and collapse « icons are provided, allowing the list panel to be expanded or collapsed according to actual needs.

④ Central Viewing Area: Located below the function navigation bar, serving as the primary area for viewing and operating WSI.

⑤ Information: Located on the right side of the interface. Clicking the **"Information"** panel opens the information window, which displays the annotations associated with the current image. A collapse » icon is provided, allowing the window to be expanded or collapsed as required.

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⑥ Previous / Next: Allows sequential viewing of the previous or next image within the currently selected resource directory.

⑦ Status Bar: Located at the bottom of the interface, displaying information such as image pixel, coordinate, current layer size, and save path.

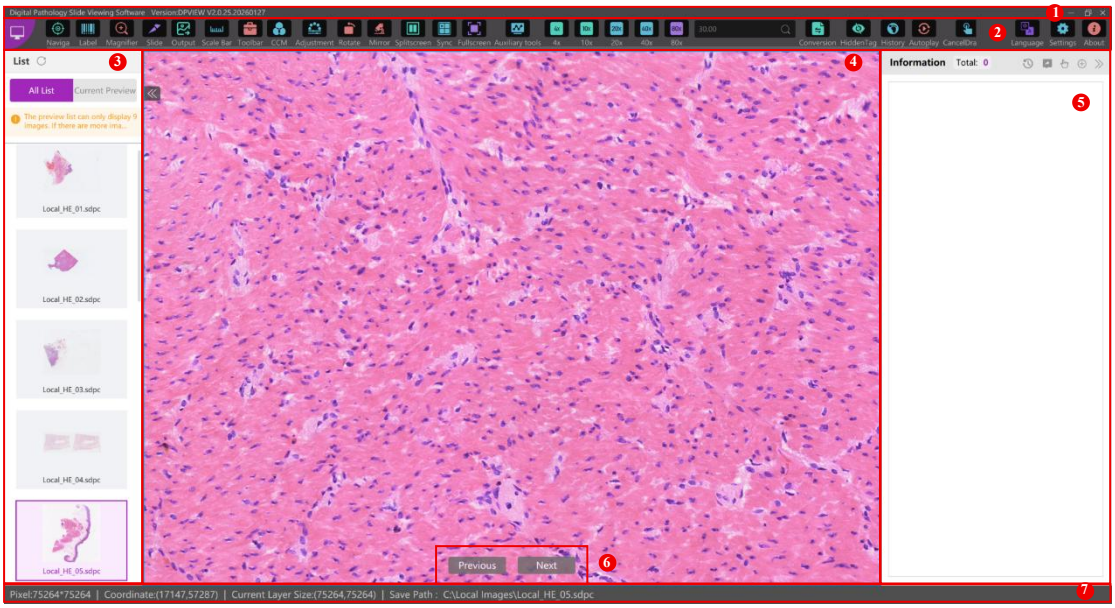

Figure 68. Image Viewing Interface

6.3.2.1 Navigation

Click the **"Navigation"** button to open the navigation panel. This panel displays the overall morphology of the tissue. Clicking any area within the panel allows quick navigation to the corresponding field of view. Click the **"Navigation"** button again to close the panel.

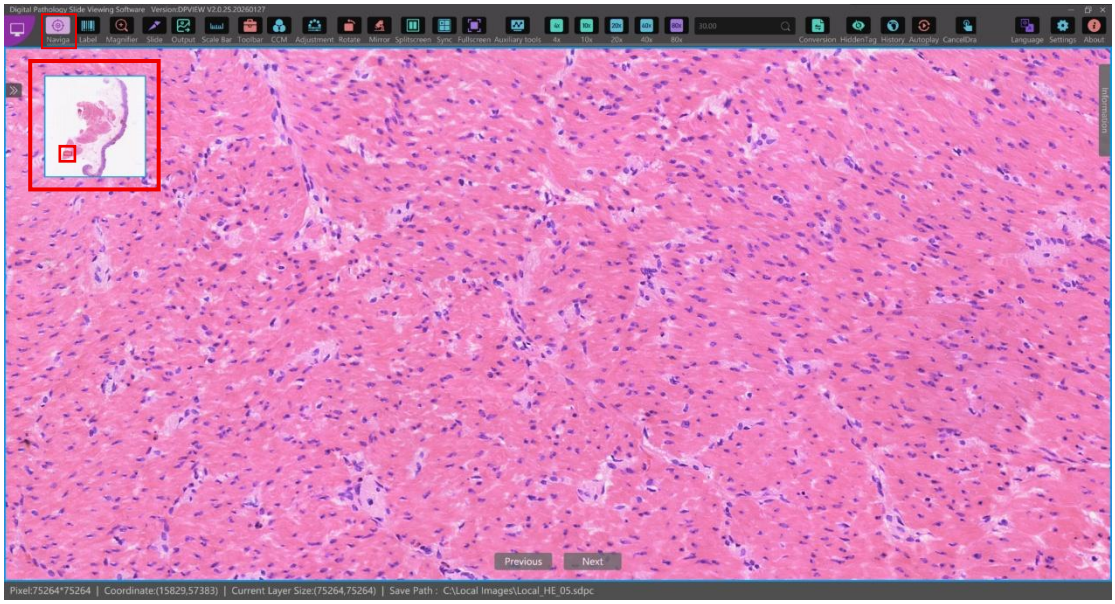

Figure 69. Navigation

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6.3.2.2 Label

Click the **"Label"** button to open the preview panel. This panel displays the label image of the slide. Click the **"Label"** button again to close the panel.

Clicking the preview panel opens the label window. In this window, the label image and the macro image can be rotated independently. The supported rotation angles are 0°, 90°, 180°, and 270°. Click the close button (X) in the upper-right corner of the window to close it.

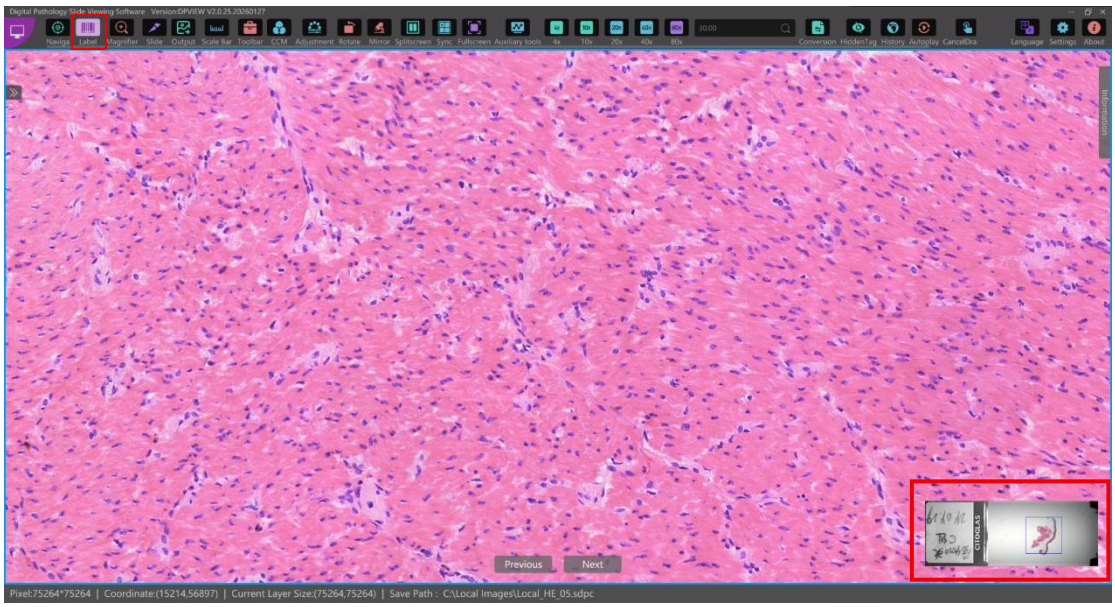

Figure 70. Label

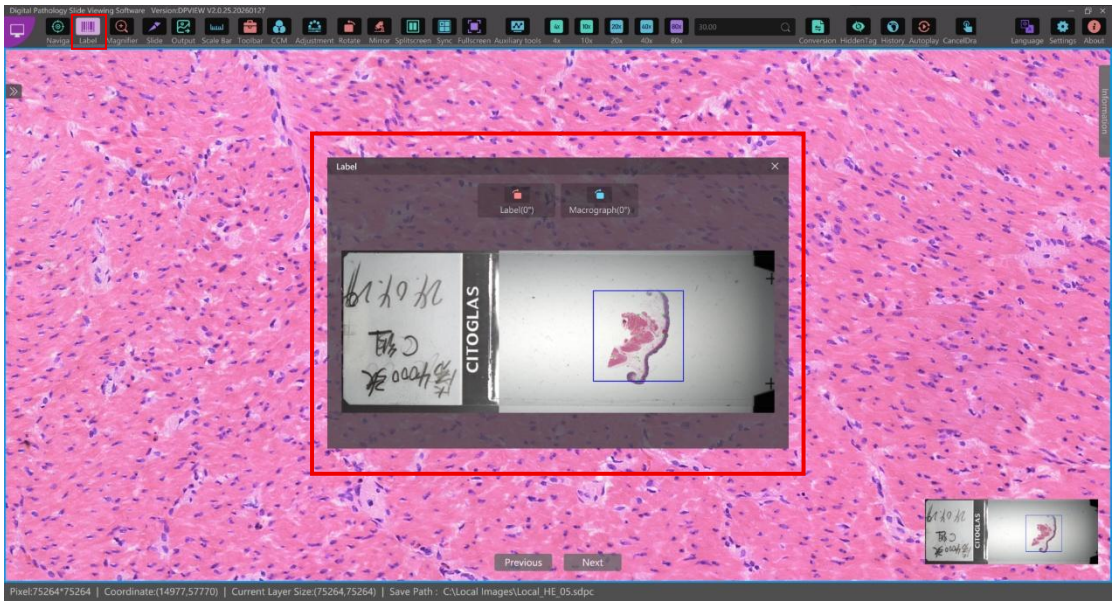

Figure 71. Label Window

6.3.2.3 Magnifier

Click the **"Magnifier"** button to open the magnifier panel. This panel displays a magnified

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view that dynamically follows the mouse position, providing localized enlargement of the image at the current cursor location. Click the **"Magnifier"** button again to close the panel.

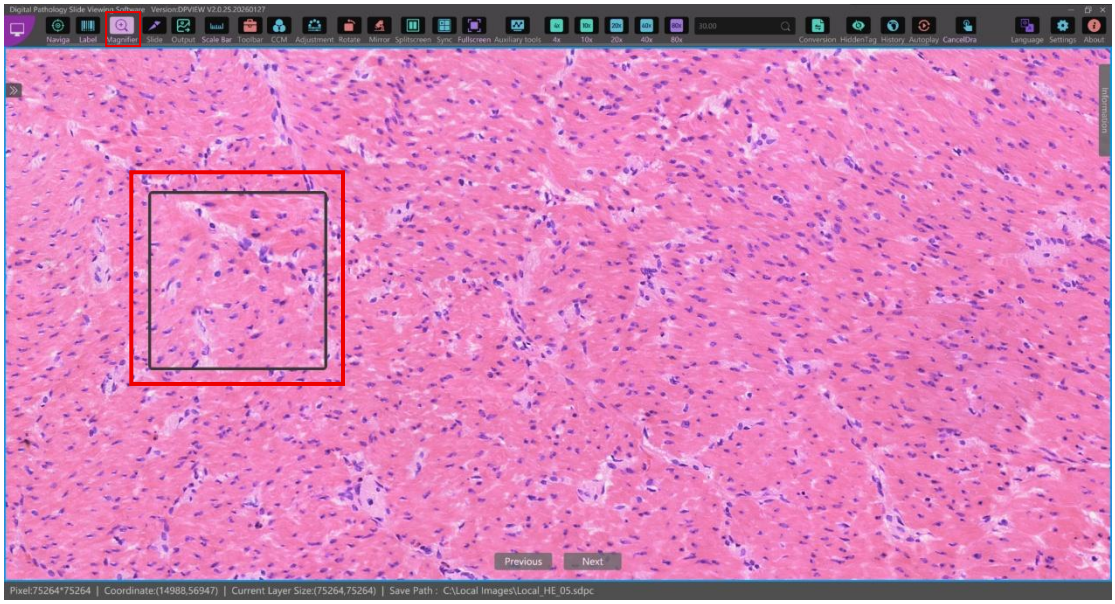

Figure 72. Magnifier

6.3.2.4 Slide

Click the **"Slide"** button to open the slide window. This window displays detailed information about the current image, including the file path, file size, image size, fusion layers, step distance, scan resolution, description, scan magnification, scan time, scan duration, barcode information, objective lens model, instrument number, and a preview image. Click the close button (**X**) in the upper-right corner of the window to close it.



Figure 73. Slide

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6.3.2.5 Output

Click the **"Output"** button to open the output window. This window is used to configure image output parameters and supports saving the image of the current field of view. Click the close button (**X**) in the upper-right corner of the window to close it. The output parameters include:

① Display Information: Allows selection of whether to display information, scalebar (position selectable as top-left, top-right, bottom-left, or bottom-right), navigation, and the label.

② Export Settings: Allows selection of the output resolution, including 96 ppi, 300 ppi, and 600 ppi.

③ Output Format: Allows selection of the output file format, including .jpg, .jpeg, .png, .bmp, and .tif.



Figure 74. Output Window

6.3.2.6 Scalebar

Click the **"Scalebar"** button to display the scalebar indicator. This indicator shows the unit length of the image in the current field of view. The available scale values include 20 μm, 50 μm, 100 μm, 200 μm, 500 μm, and 1 mm. Click the **"Scalebar"** button again to hide the indicator.

Right-click the scalebar indicator to open the settings options. After clicking **"Settings"**, the style of the scalebar indicator can be configured, including the following:

① Scalebar Wireframe: Click the input box and select the wireframe from the drop-down

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menu. Four options are available: 1, 2, 3, and 5.

② Set Font: Click the input box and select the font size from the drop-down menu. A range from 10 to 25 is available.

③ Current Color: The default color is blue. Click the color palette icon to open the set color window, where custom colors can be defined by entering R, G, and B values.

④ Display Position: Select the display position of the scalebar, including top-left, top-right, bottom-left, or bottom-right.

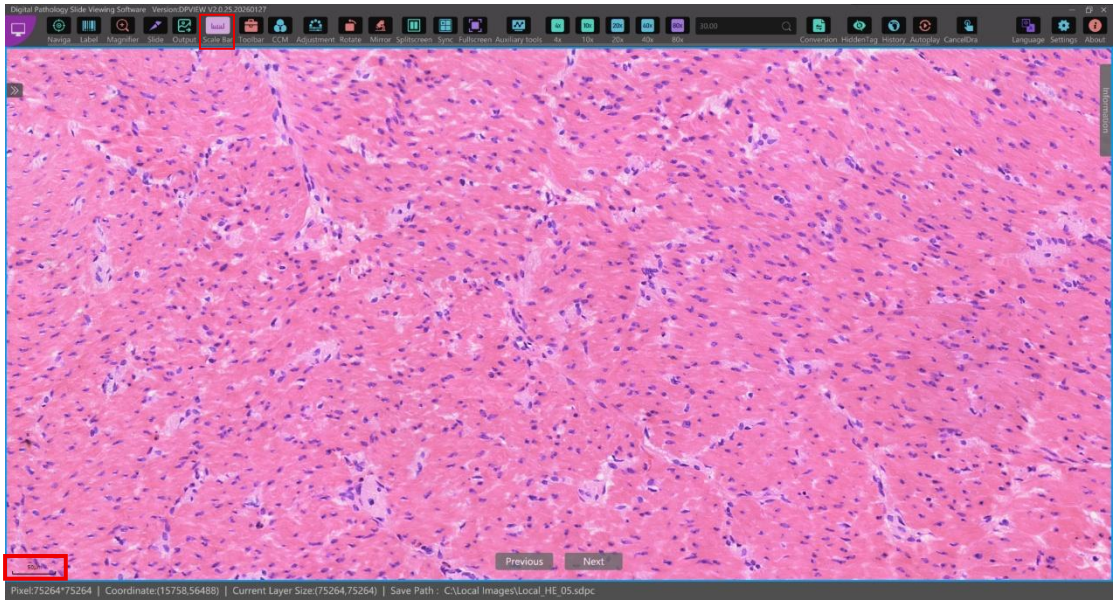

Figure 75. Scalebar Indicator

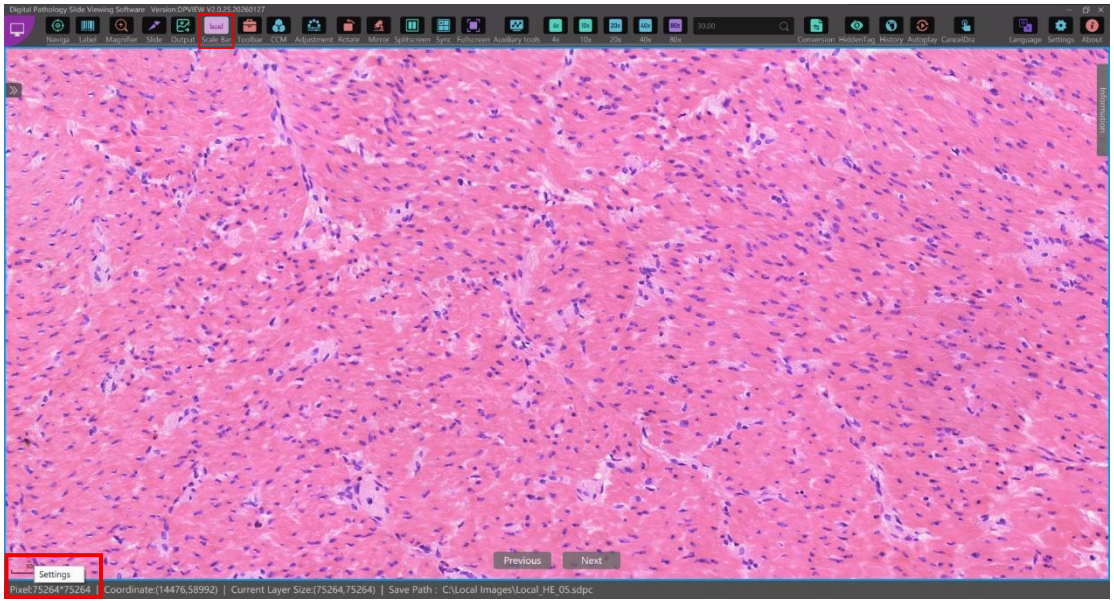

Figure 76. Scalebar Settings

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Figure 77. Scalebar Settings Window

6.3.2.7 Toolbar

Click the **"Toolbar"** button to open the toolbar panel. This panel contains commonly used operation options. Click the **"Toolbar"** button again to close the panel.

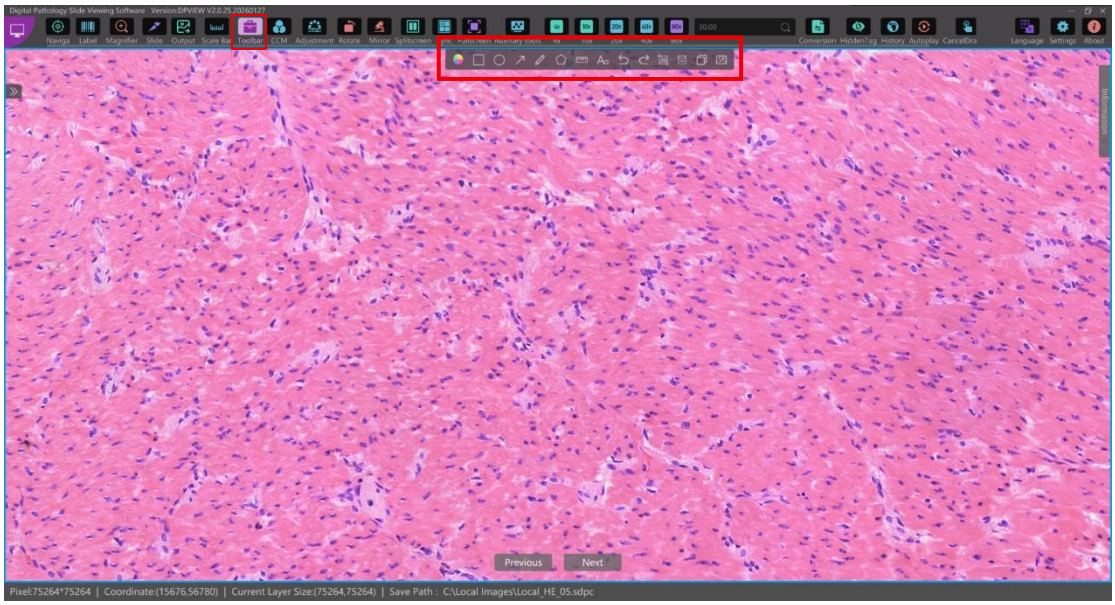

Figure 78. Toolbar

The commonly used operation options include:

① Set Frame Size and Color: Click the color palette icon to open the operation panel. This panel is used to adjust the style of annotation frame, including the following:

- Width: Four frame width options are available: 1 pt, 2 pt, 3 pt, and 5 pt.

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- Color: The default color is red. Click the color palette icon to open the color settings window, where custom colors can be defined by entering R, G, and B values.
- Font: Click the font name to open the font settings window. In this window, users can select the font type, style, weight, and size. After configuration, the preview area below displays the changes in real time.
- Annotate Fixed Display Content: When enabled, the content entered in the input box can be displayed permanently above the annotation as a note for that annotation.

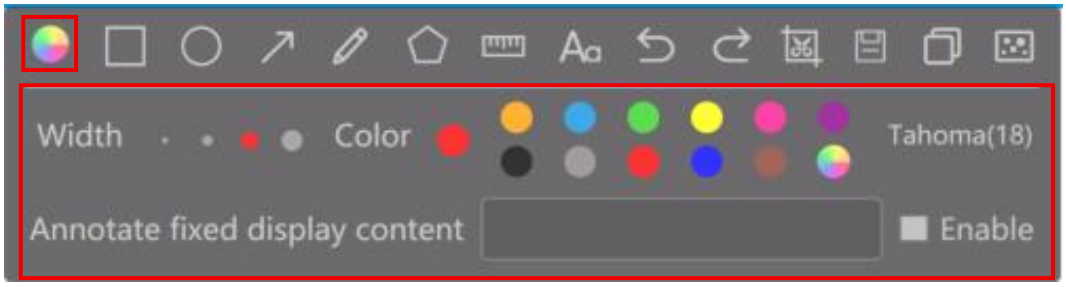

Figure 79. Set Frame Size and Color

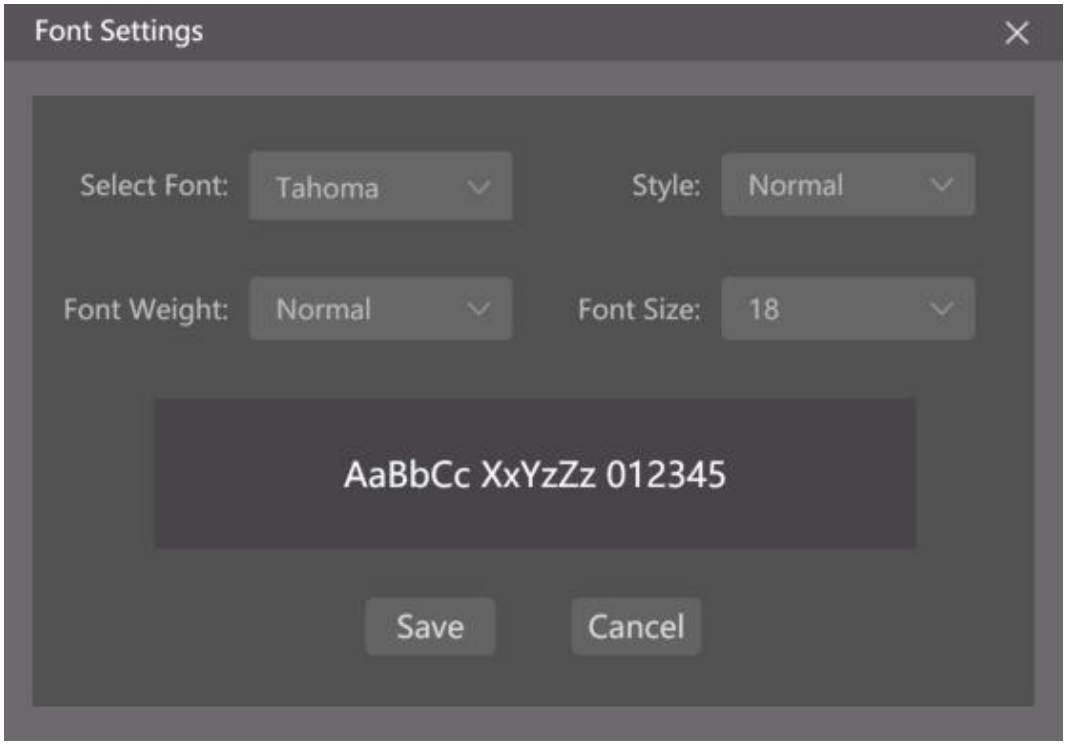

Figure 80. Font Settings Window

② Rectangle: Draw a rectangular annotation.

③ Circle: Draw a circular annotation.

④ Arrow: Draw an arrow annotation.

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⑤ Brush: Draw a freehand closed-shape annotation.

⑥ Polygon: Draw a polygon annotation.

⑦ Ruler: Draw a scale annotation.

⑧ Text: Add a custom text annotation.

⑨ Back: Undo the currently drawn annotation.

⑩ Next: Redo an annotation that was previously undone.

⑪ Screen Capture: Capture an image of the current field of view.

⑫ Save: Save the updated annotations.

⑬ Copy Annotation: Copy annotations from the current image to another image, supporting automatic alignment.

⑭ Cell Category: Classify and annotate cells. Click the **"Cell Category"** icon to open the cell category window. In this window, users can add and configure cell categories, including:

- Set Color: Assign colors to different categories for distinction.
- Rename Category: Modify the name of an existing category.
- Delete Category: Remove unwanted categories.

Click the close button (X) in the upper-right corner of the window to close it.

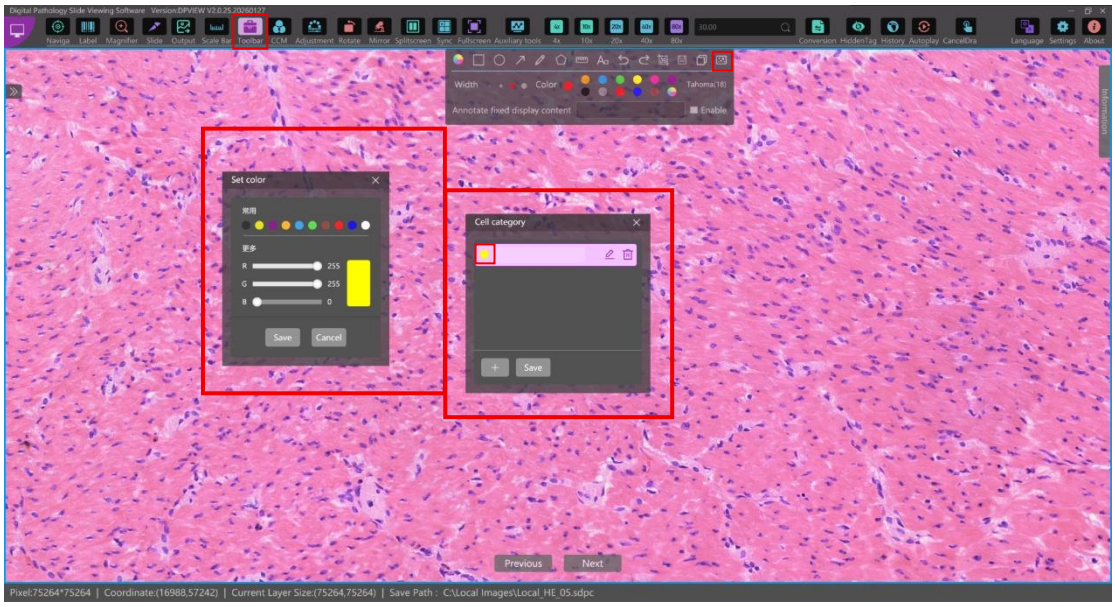

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Figure 81. Cell Category Window

When in annotation drawing mode, right-clicking any area opens the operation options menu, which includes the following options:

- Close: Complete the drawing, connecting the start and end points to form a closed annotation area.
- Redraw: Restart drawing the current annotation, discarding the previous drawing.
- Close Drawing: Close the current drawing mode and stop drawing operations.
- Delete: Delete the selected annotation.
- Edit: Edit and modify the selected annotation.
- Hide: Hide the selected annotation so it is not displayed in the current field of view.
- Continue Drawing: Continue drawing the current annotation.
- Export Annotations: Export the annotation content as a file.
- Rotate: Rotate the annotation.
- Cell Counter: Count the cells within the annotated area.

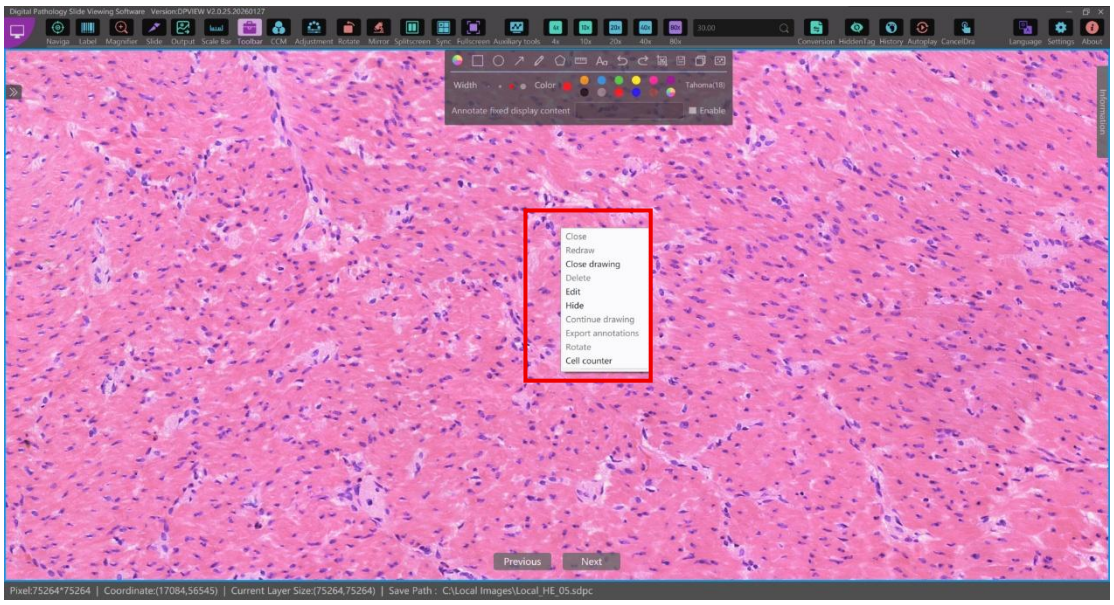

Figure 82. Operation Options Menu

6.3.2.8 CCM

Click the **"CCM"** button to open the CCM panel. This panel allows users to select the color display mode. Available modes include:

- Real Color: Optimizes color reproduction based on human visual perception, presenting colors close to the actual sample.

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- Original Color: Preserves the original color information of the image without additional color processing.
- Vivid Color: Enhances color saturation and contrast to highlight tissue details.

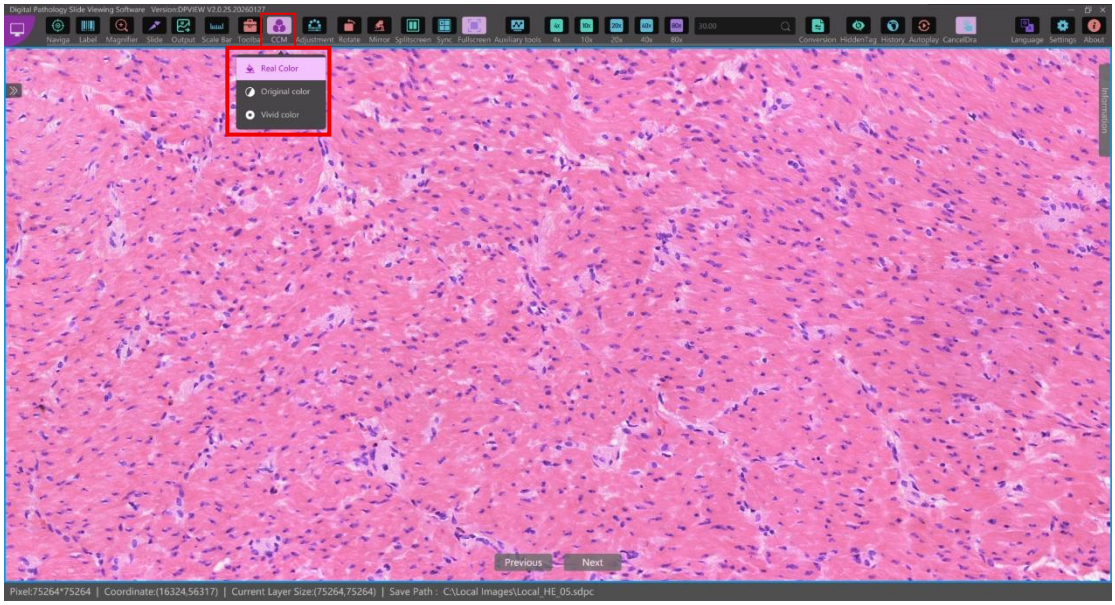

Figure 83. CCM

6.3.2.9 Adjustment

Click the **"Adjustment"** button to open the adjustment window. This window allows configuration and optimization of the image's color performance, including:

- Three-Channel Adjustment: Adjust the gain of the red, green, and blue channels separately, for color balance and specific tone optimization.
- Gamma Adjustment: Adjust the mid-tone brightness of the image to improve overall light and dark gradation.
- Brightness Adjustment: Increase or decrease the overall brightness level of the image.
- Contrast Adjustment: Enhance or reduce the difference between light and dark areas of the image.

Click the close button (X) in the upper-right corner of the window to close it.

Tip: When adjusting color parameters, it is recommended to make gradual fine-tuning while observing the preview to avoid information loss or color distortion caused by excessive adjustment.

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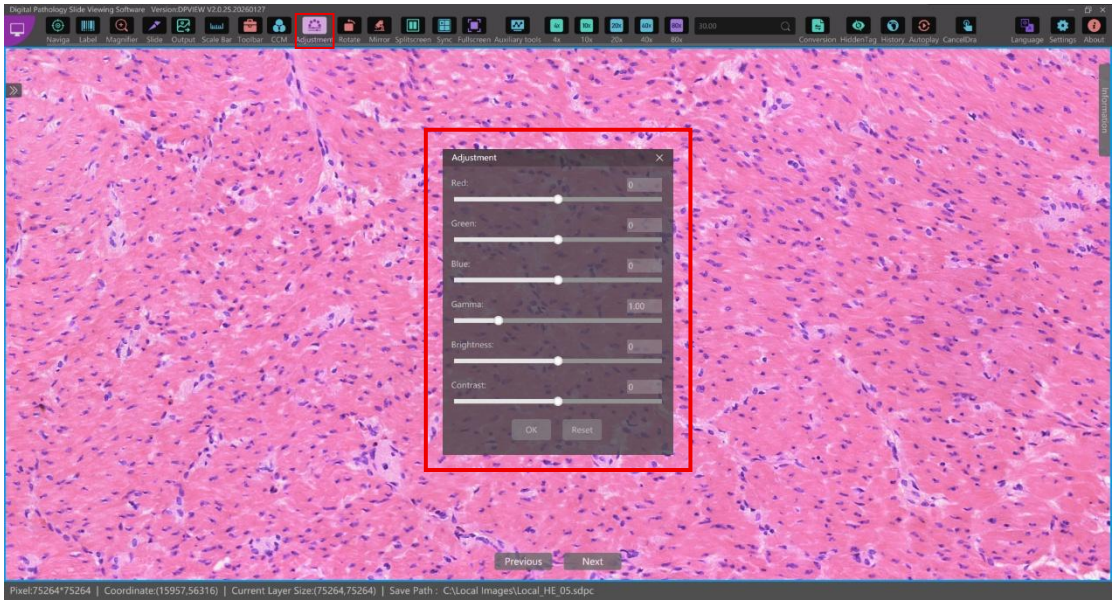

Figure 84. Adjustment Window

6.3.2.10 Rotate

Click the **"Rotate"** button to open the operation panel. This panel includes the following options:

-  Arbitrary Angle Rotation: Users can input a custom rotation angle or adjust the angle using the slider.
-  Fixed Angle Rotation: Provides four preset rotation angles: 45°, 90°, 180°, and 270°.
-  Reset: Restores the image to its original rotation angle.
-  Flip Horizontal: Flips the image along the horizontal axis.
-  Flip Vertical: Flips the image along the vertical axis.

Click the **"Rotate"** button again to close the panel.

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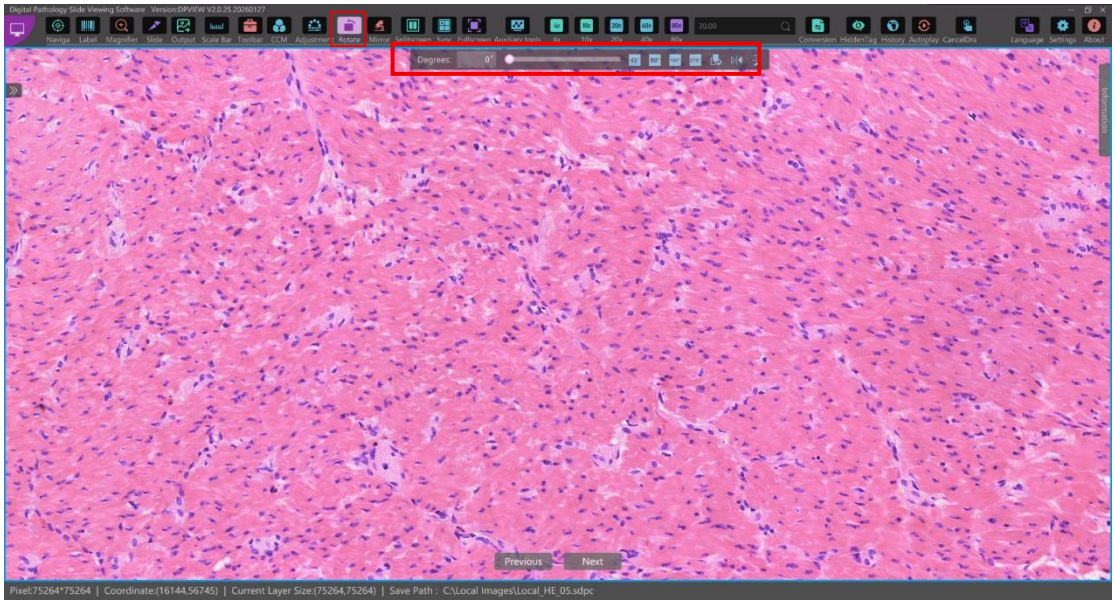

Figure 85. Rotate

6.3.2.11 Mirror

Click the **"Mirror"** button to open the mirror panel. This panel allows users to select the field of view shape (circular or rectangular) and manually input the field diameter to customize the observation area. This feature simulates the microscope viewing experience, accurately reproducing the observation effect under a traditional microscope. Click the **"Mirror"** button again to close the panel.

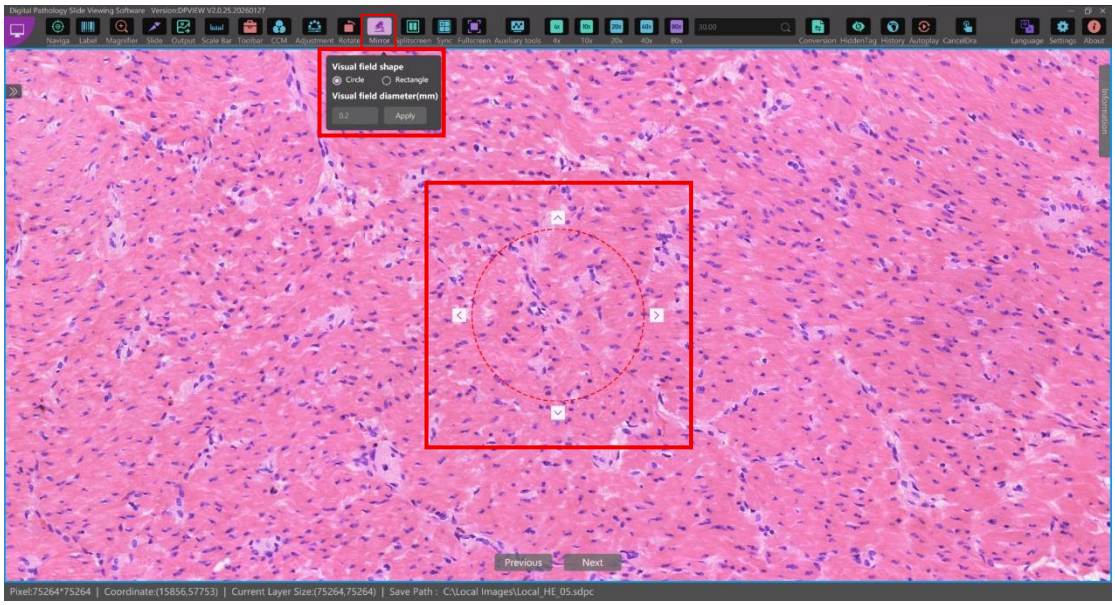

Figure 86. Circular Field of View

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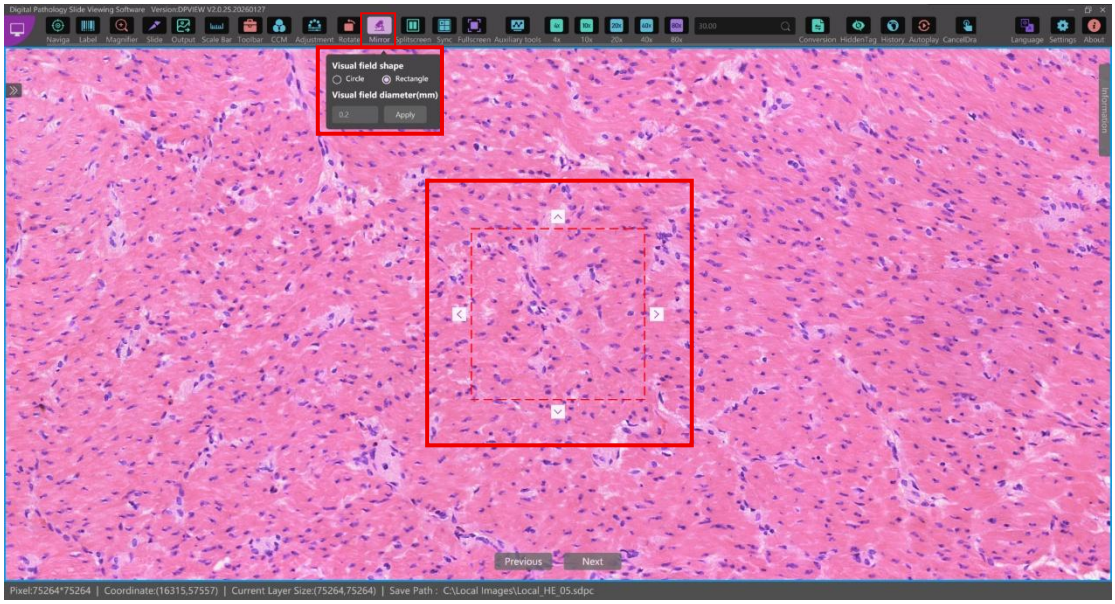

Figure 87. Rectangle Field of View

6.3.2.12 Split Screen

Click the **"Split Screen"** button to open the split screen panel. This panel provides four split-screen mode options: single screen, dual screen, quad screen, and nine screen. While in split screen mode, users can return to a single view by selecting the **"Single Screen"** option or by double-clicking any of the images.

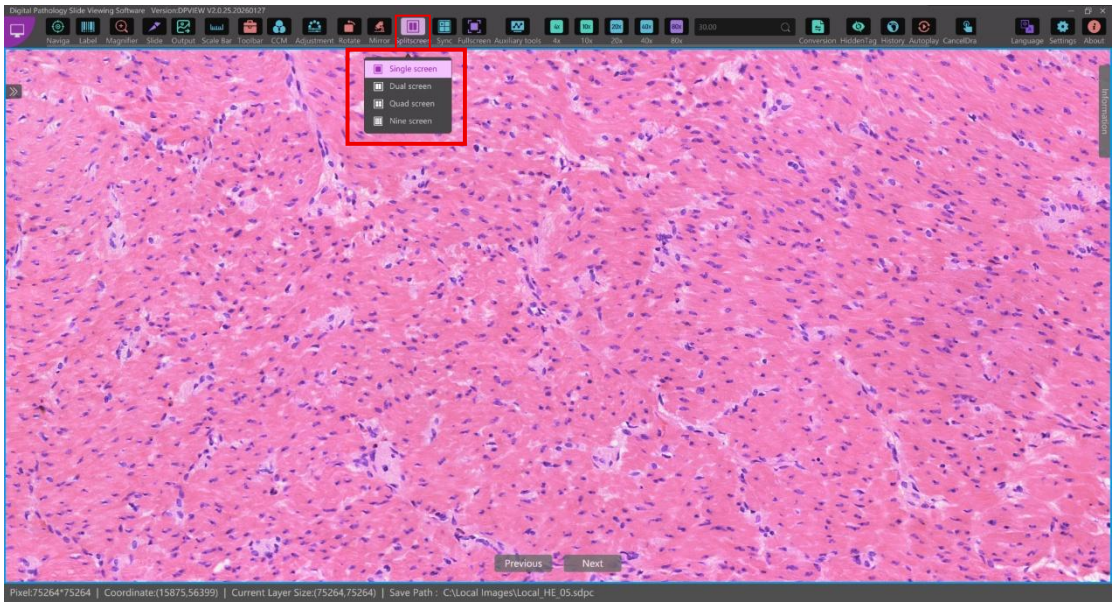

Figure 88. Split Screen

6.3.2.13 Multi-Image Synchronization

After enabling the **"Split Screen"** function and using a dual screen or higher mode, click the **"Sync"** button to simultaneously view multiple images in split screen mode. This function

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allows synchronized operations such as dragging and zooming across all displayed images. Click the **"Sync"** button again to disable this feature.

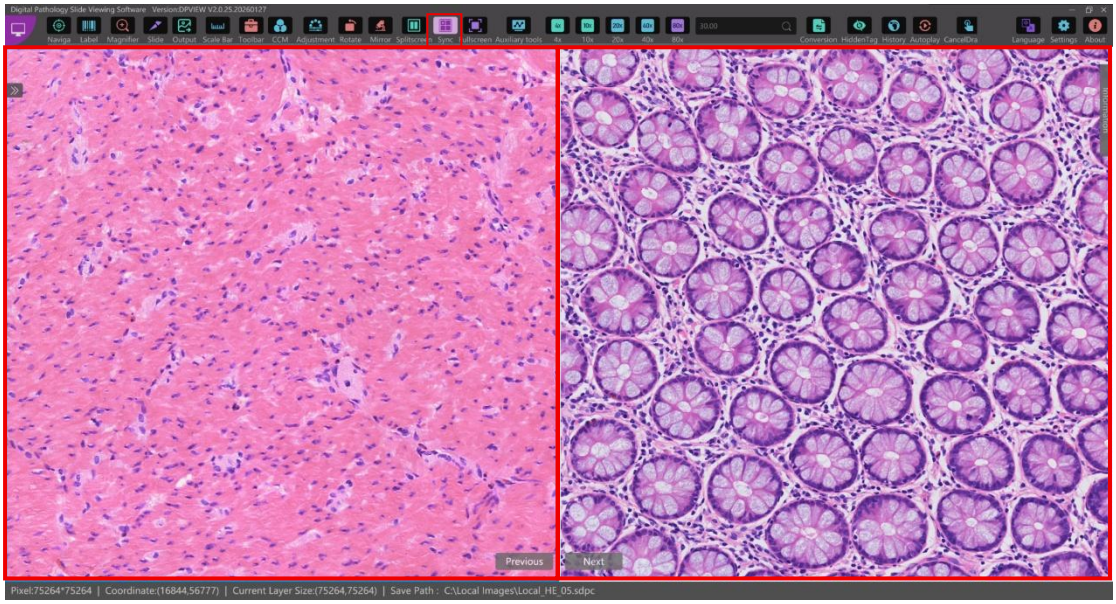

Figure 89. Multi-Image Synchronization

6.3.2.14 Full Screen

Click the **"Full Screen"** button to switch the image area to full screen mode. In split screen mode, the selected image window can also be switched to full screen display. To exit full screen mode, press the ESC key on the keyboard or double-click the image.



Figure 90. Full Screen Location

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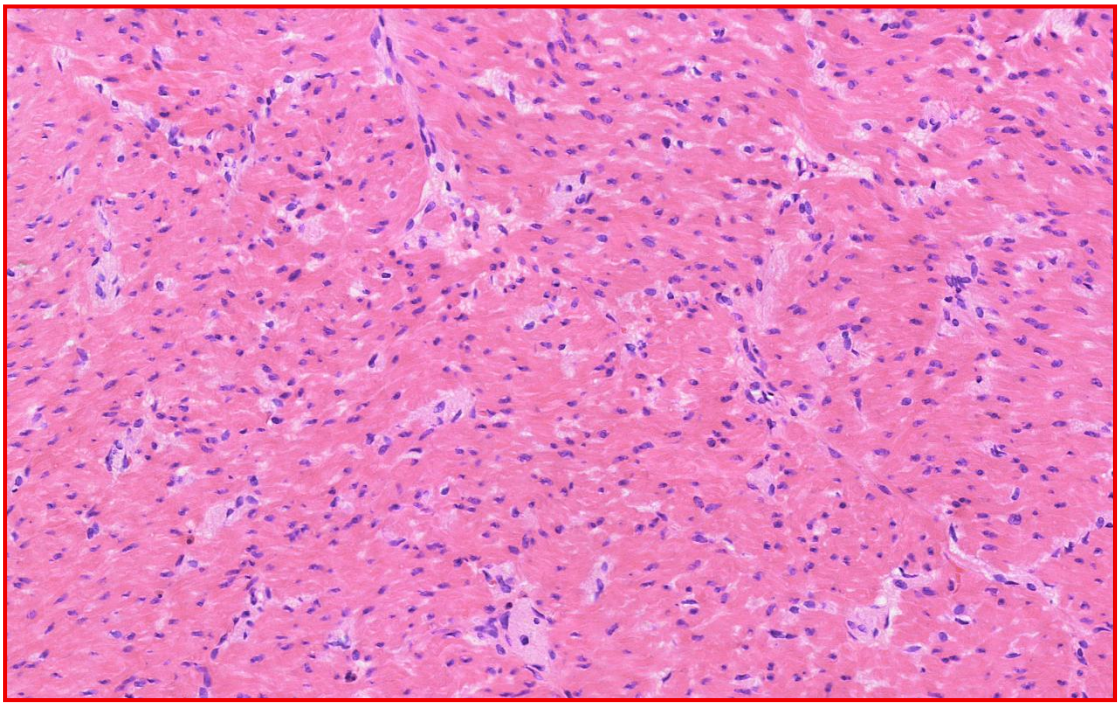

Figure 91. Full Screen Mode

6.3.2.15 Auxiliary Tools

Click the **"Auxiliary Tools"** button to open the auxiliary tools panel. This panel includes the following features:

① Topology Map: Simulates the differential interference contrast effect of an optical microscope, enhancing the three-dimensional appearance and layering of tissue structures, making it easier to observe subtle morphological changes.

② Heat Map: Uses a color gradient to display signal intensity or density distribution across different regions, highlighting areas of interest. It is suitable for quantitative analysis and comparative observation.

③ 3D Image Browsing: Reconstructs scanned images in three dimensions, supporting multi-angle rotation, zooming, and layered observation, facilitating three-dimensional analysis of tissue structure relationships.

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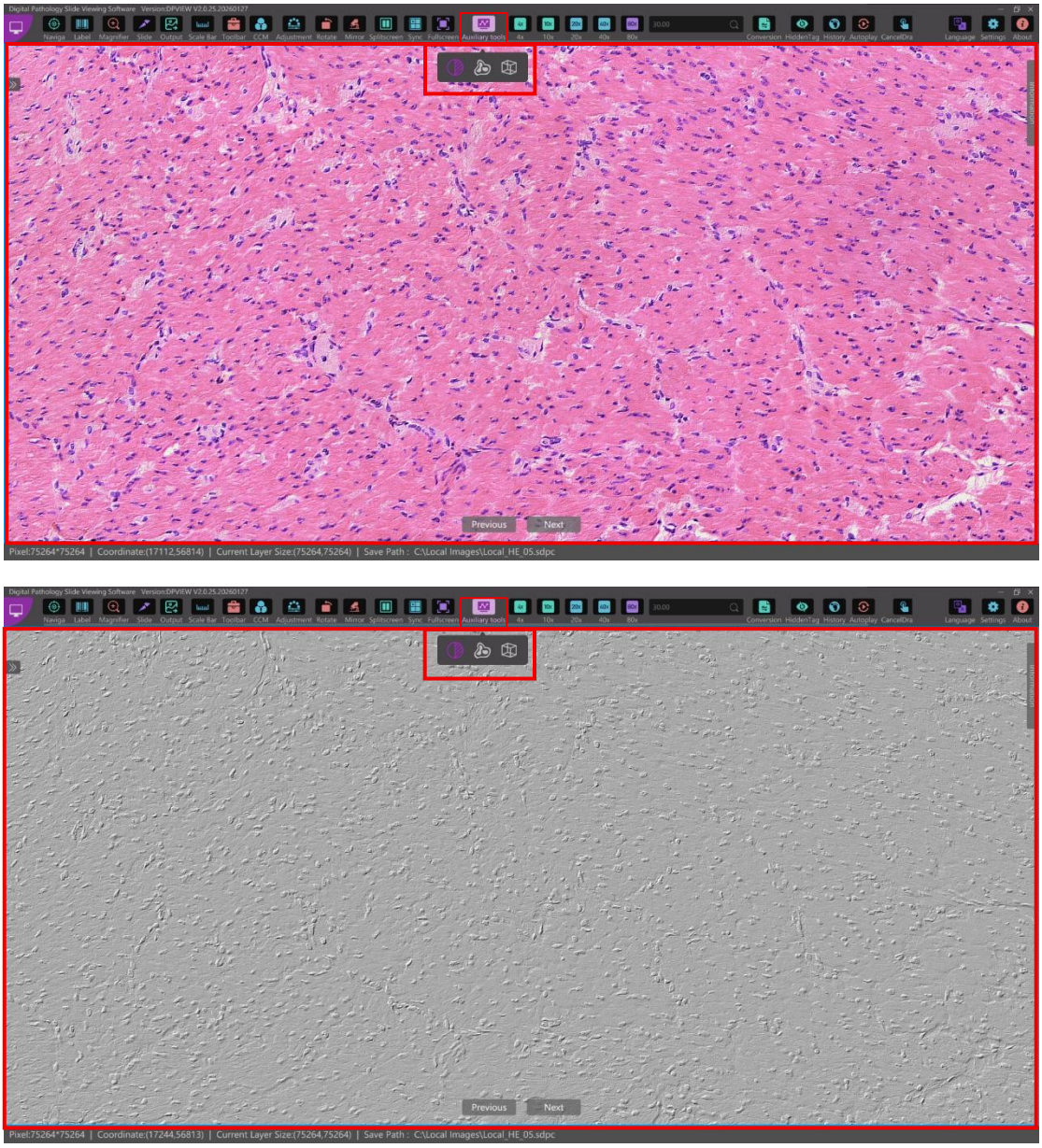

Figure 92. Topology Map

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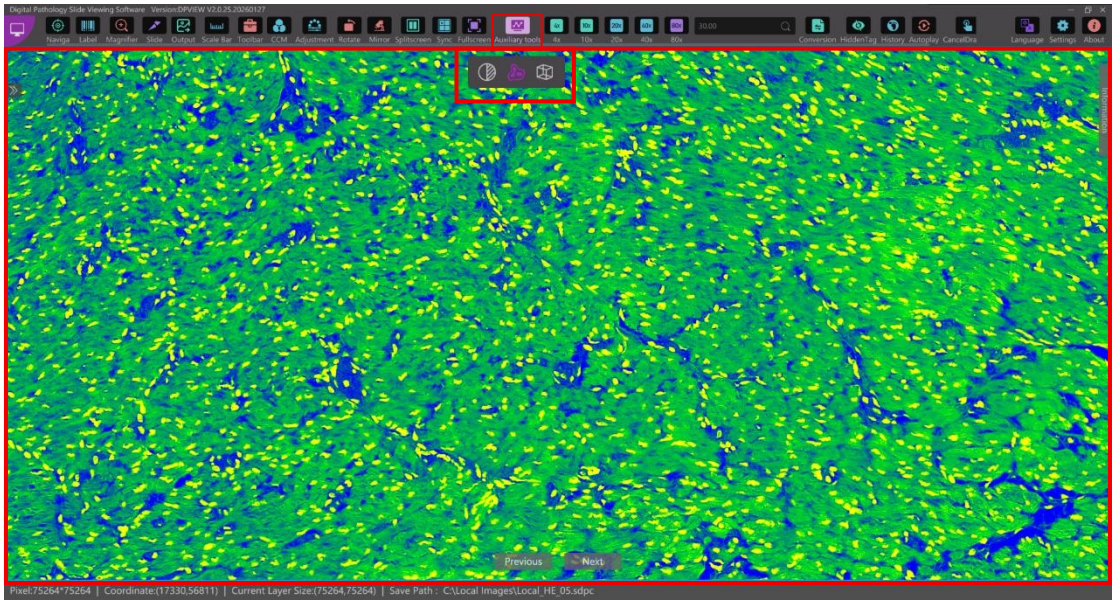
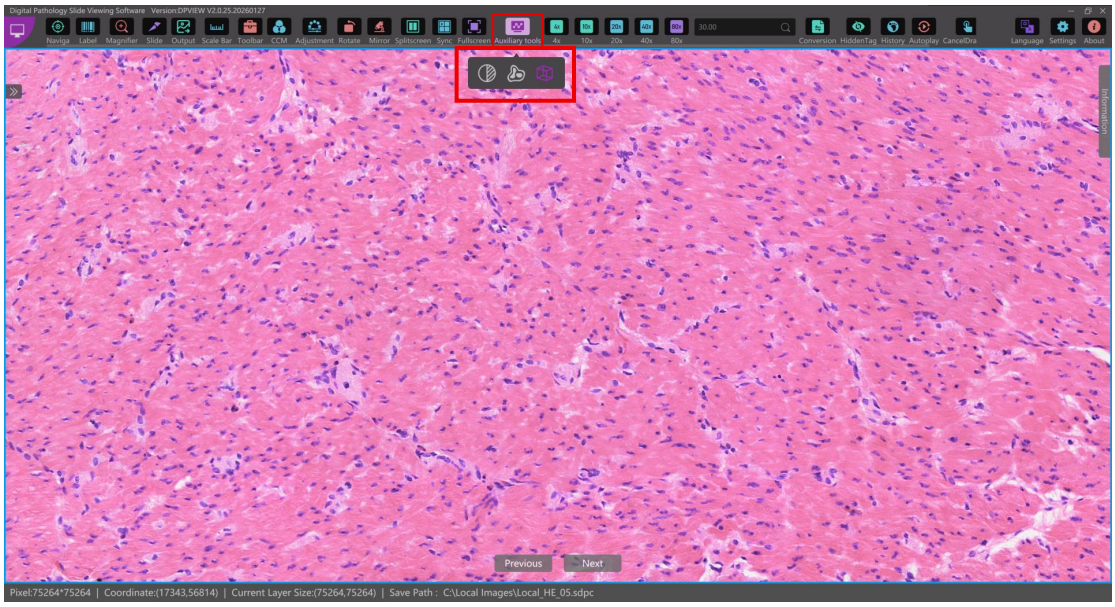


Figure 93. Heat Map



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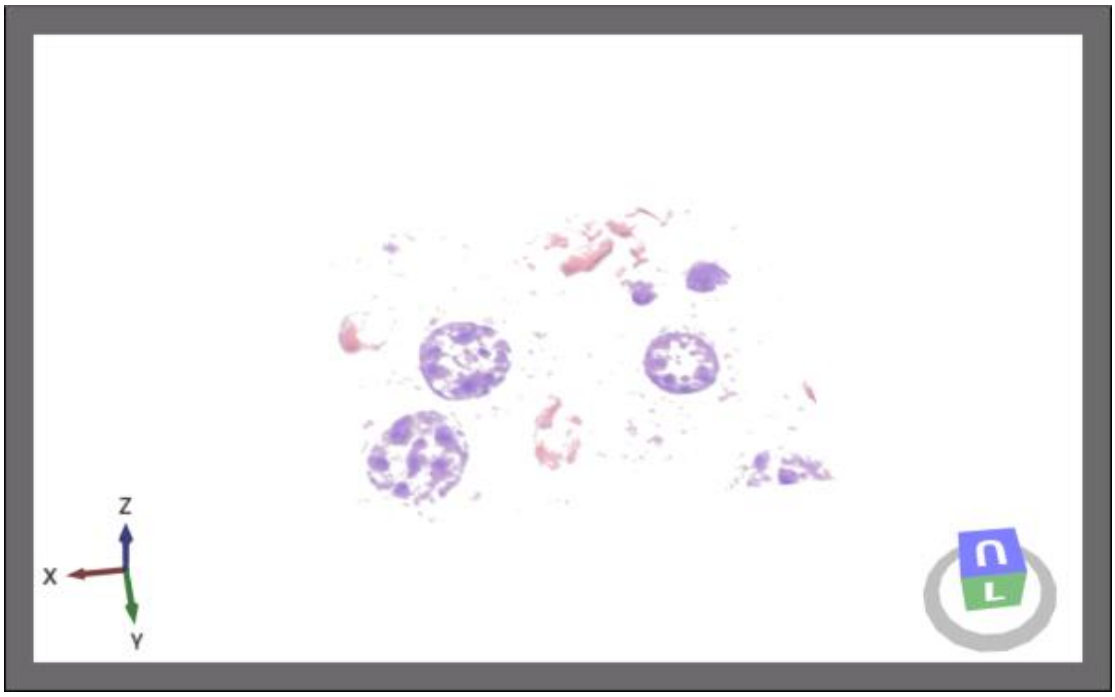

Figure 94. 3D Image Browsing

6.3.2.16 Magnification

The image can be zoomed according to preset magnification levels, with five options available: 4×, 10×, 20×, 40×, and 80×. To the right of the magnification buttons, a search box displays the current magnification level and allows users to input a custom magnification value, up to a maximum of 80×.



Figure 95. Magnification

6.3.2.17 Conversion

Click the **"Conversion"** button to open the conversion window. This window includes the following components:

① Directory: Right-click an image record to convert files from **.sdpc** format to **.svs** /**.csp** format.

② Conversion List: Displays detailed information for current image conversion tasks, including file name, path, format, quality, CCM, whether to save slide information, progress, result, and time.

③ Bottom Settings Area: Displays and allows configuration of the following parameters:

- Save Path: Specifies the save location for converted files.

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- Compression Quality (%): Sets the compression ratio via the input box.
- Output Color-Corrected Images: Check this box to output images with CCM applied.
- Save Slide Information: Check this box to preserve the original slide information in the output image.

Click the close button (X) in the upper-right corner of the window to close it.

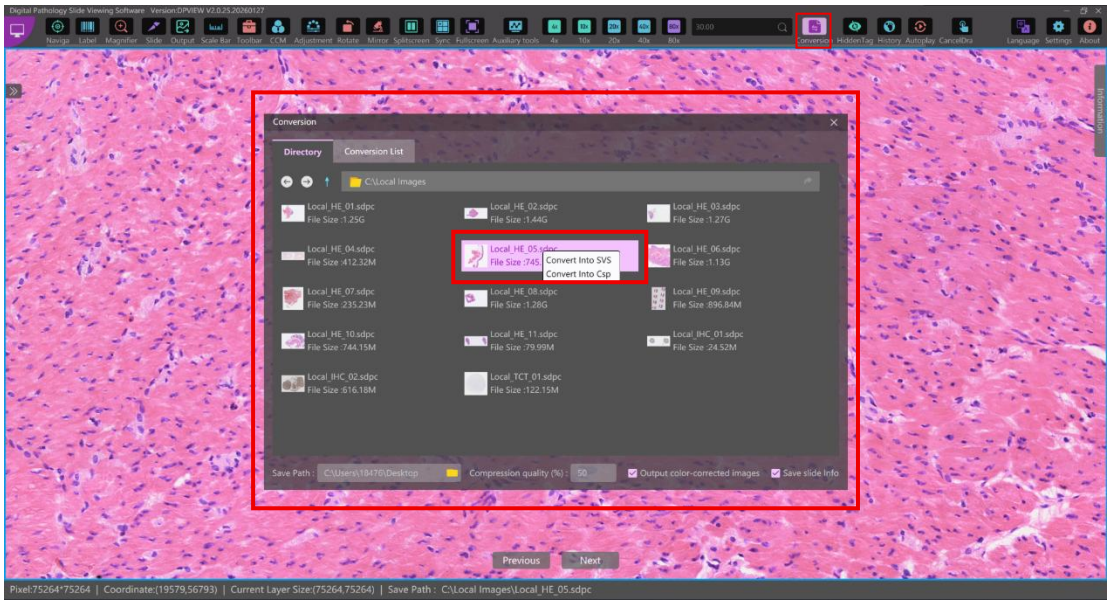

Figure 96. Directory

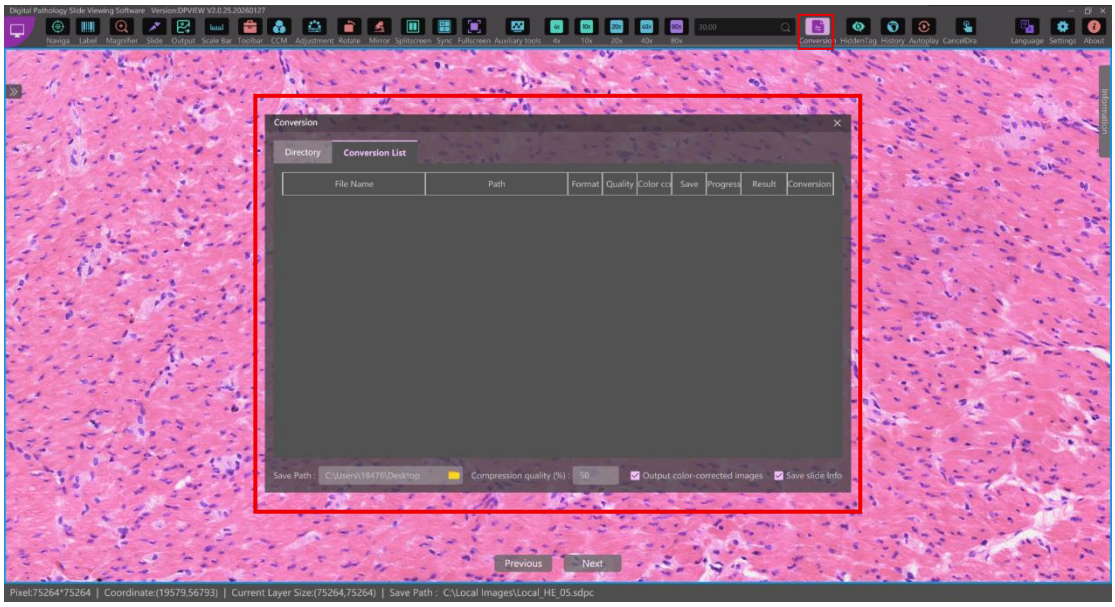

Figure 97. Conversion List

6.3.2.18 Hidden Tag

After enabling the **"Toolbar"** function, the viewing software enters continuous annotation mode, allowing users to perform consecutive annotation operations. Click the **"Hidden Tag"**

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button to hide all currently displayed annotations in the image with a single action. If the **"Hidden Tag"** function is enabled, the **"Toolbar"** cannot be used to perform annotation operations in this mode.

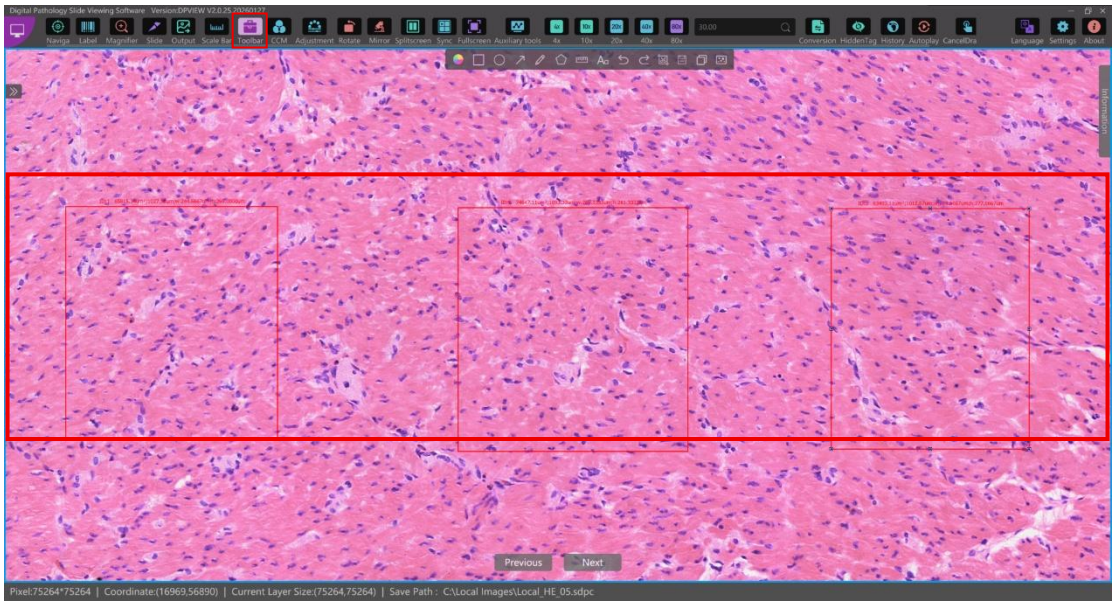

Figure 98. Continuous Annotation Mode

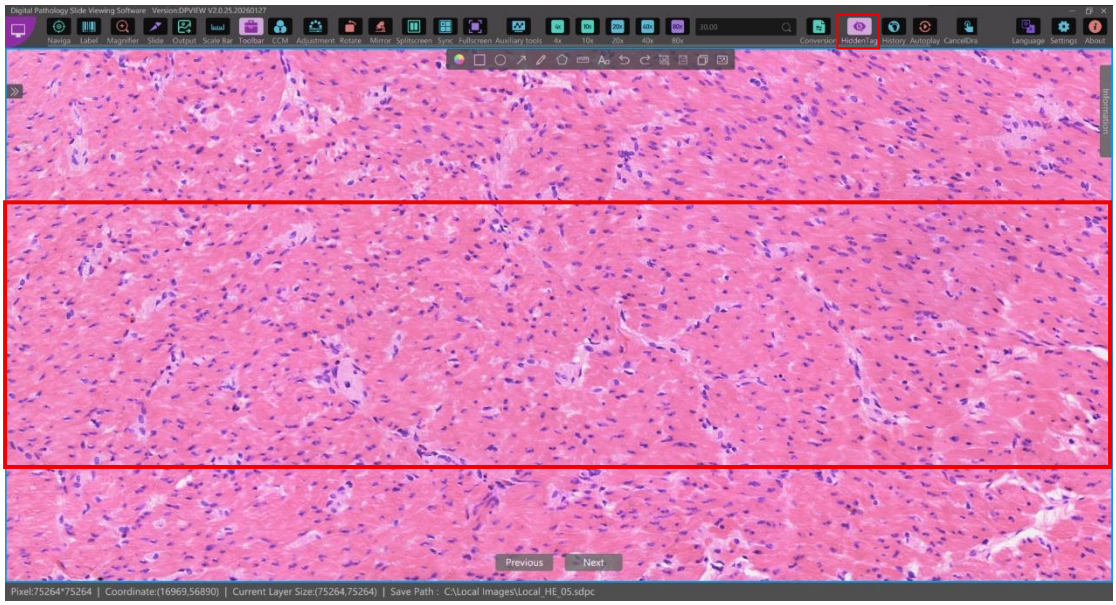

Figure 99. Hidden Tag

6.3.2.19 History

After enabling the **"Navigation"** function and opening the navigation panel, click the **"History"** button to open the history panel. This panel includes the following features:

① Display History: Displays the historical viewing trajectory in the navigation panel.

② Clear History: Clears the historical viewing trajectory from the navigation panel.

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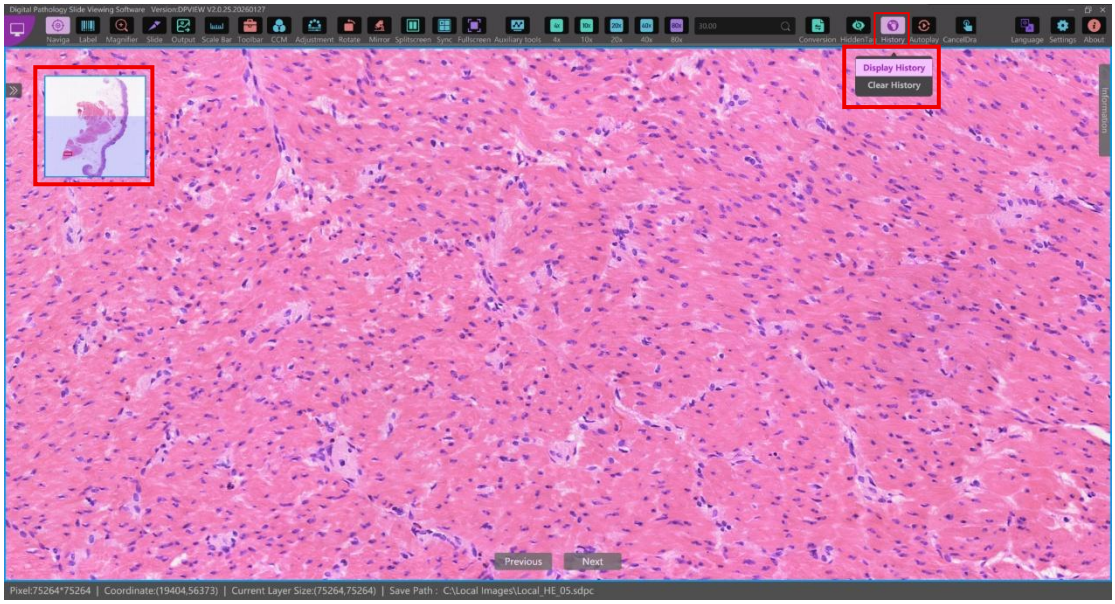

Figure 100. Display History

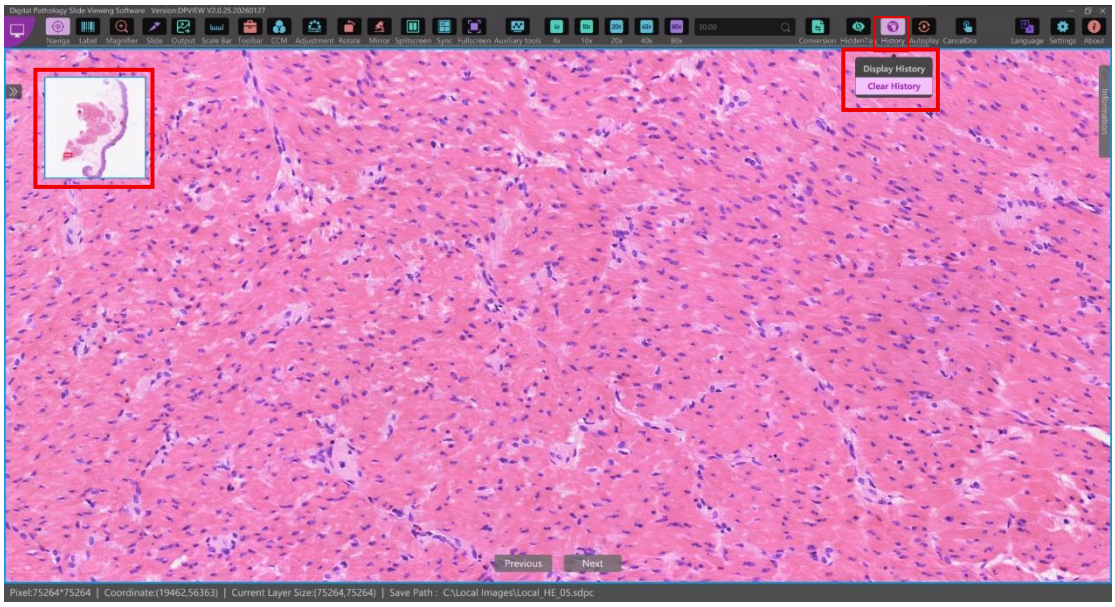

Figure 101. Clear History

6.3.2.20 Autoplay

Click the **"Autoplay"** button to open the play mode window. This window allows configuration of the play mode, including:

① Mode: Supports switching between horizontal and vertical playback modes.

② Playback Interval: Sets the interval between frames, with a range of 1-10 seconds.

The viewing software will automatically play the scanned image frames sequentially according to the configured settings. Click the close button (X) in the upper-right corner of the window to close it.

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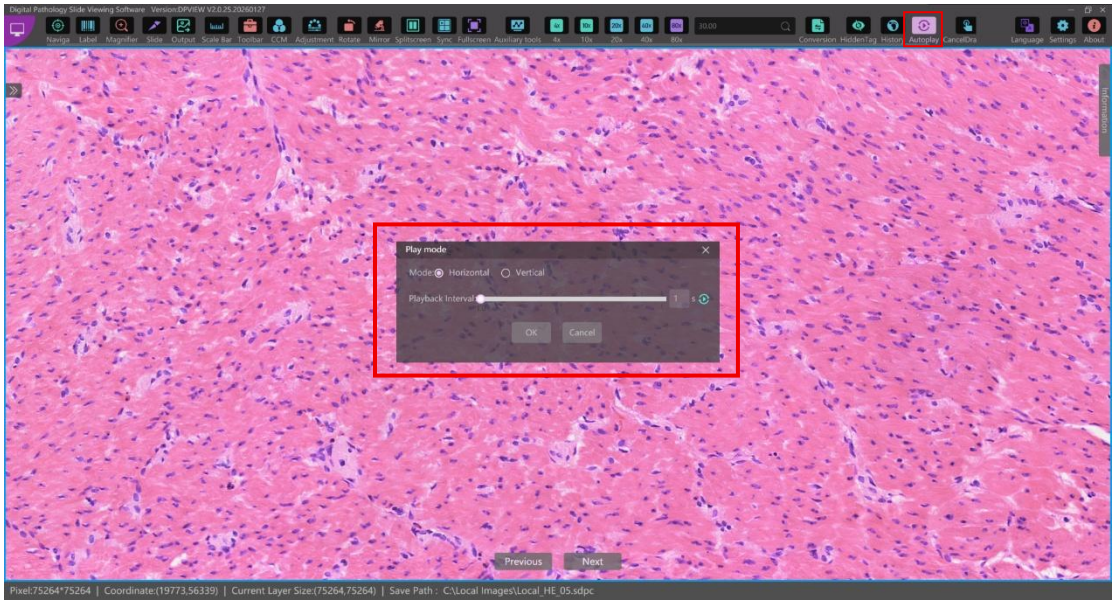

Figure 102. Play Mode Window

6.3.2.21 Cancel Drawing

After enabling the **"Toolbar"** function, the software enters continuous annotation mode, allowing consecutive annotation operations. Clicking the **"Cancel Drawing"** button again will immediately terminate the current continuous annotation mode and stop all annotation operations.

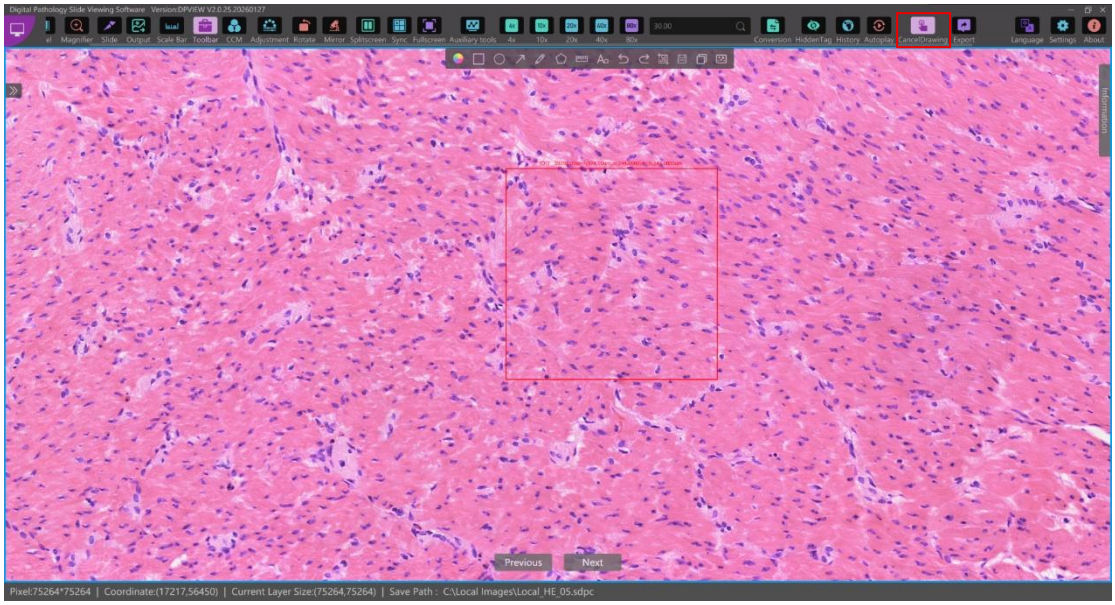

Figure 103. Cancel Drawing

6.3.2.22 Export

Click the **"Export"** button to open the annotation image export record window. This window displays the export record information for the current annotation images, including:

① File Name: Shows the names of images that have been exported or are currently being

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exported.

② Progress: Displays the completion status of export tasks in a percentage progress bar.

③ Status: Indicates the current status of the task (e.g., in progress, download completed, or download failed).

④ Operation: Provides action options related to the export tasks, including:

- Clear: Clears the currently exported image files.
- Open Folder: Opens and locates the folder containing the locally stored image files.

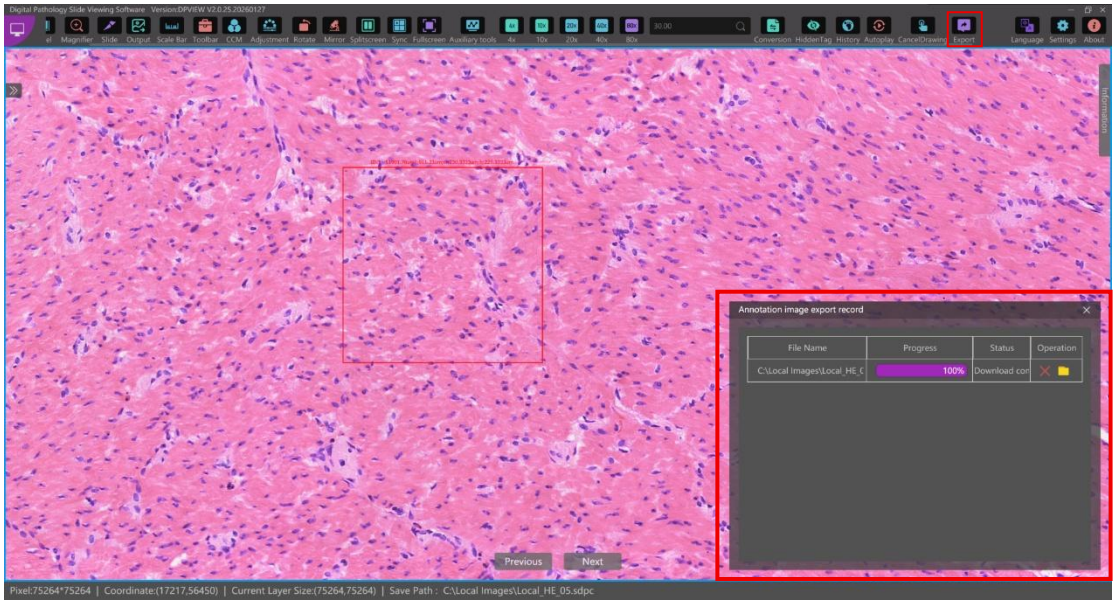

Figure 104. Annotation Image Export Record Window

6.3.2.23 List

The list panel displays the macro images of the resources in the directory, facilitating quick browsing, switching, and locating of the desired images.

① All List: Displays all macro images within the currently selected resource directory. Double-clicking any image will directly open it in the image viewing interface. The image currently being viewed is highlighted in the list.

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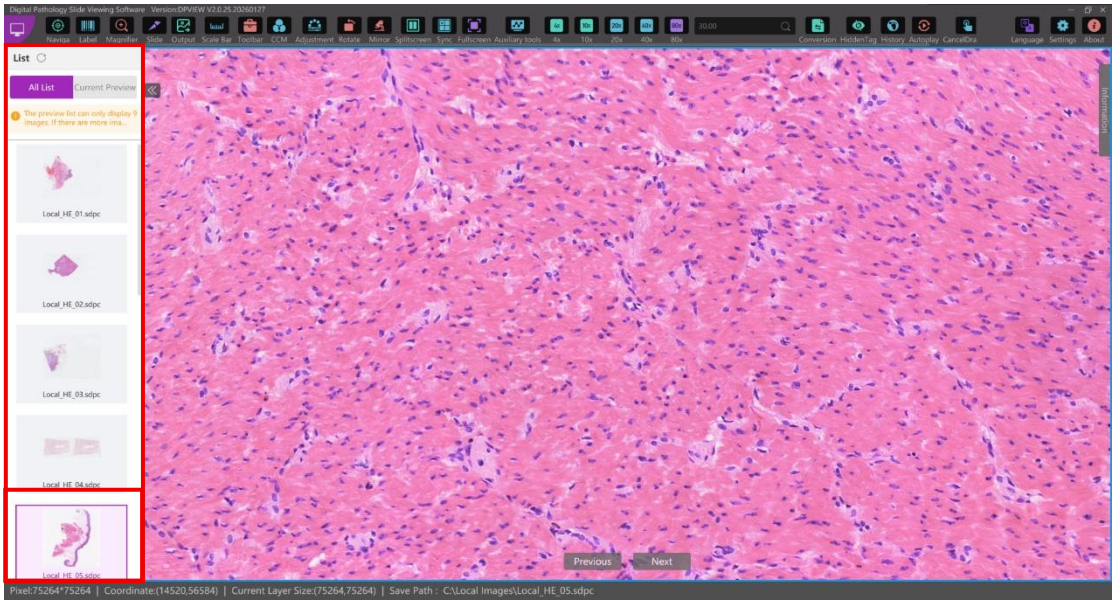

Figure 105. All List

② Current Preview: Displays the image currently being viewed in the image viewing interface, as well as all images that have been viewed since the software was last opened.

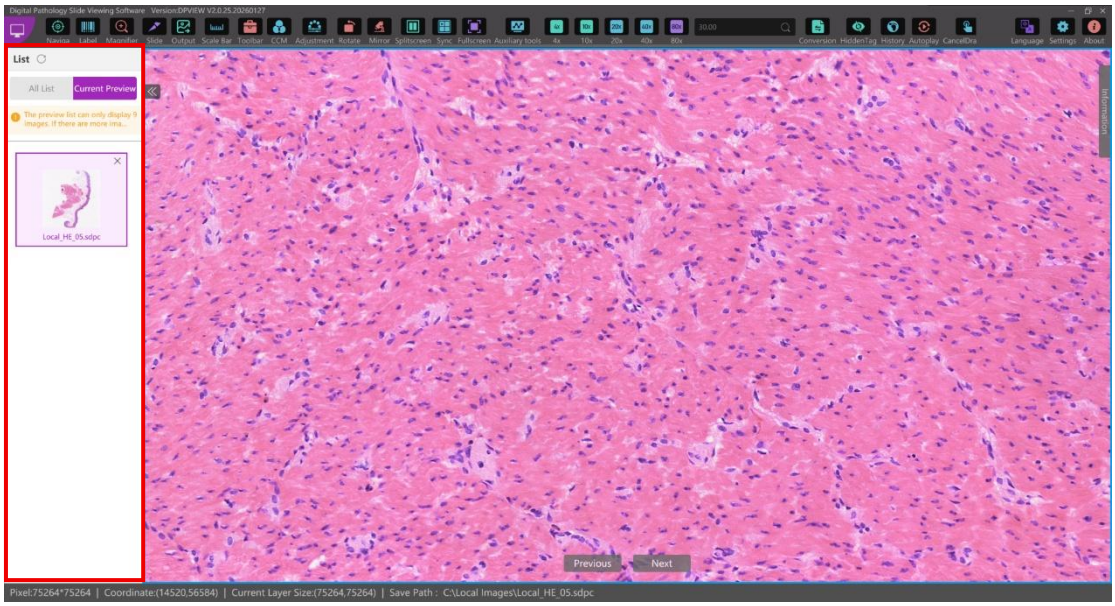

Figure 106. Current Preview

③ Right-Click Menu: Right-clicking any image opens the context menu, which includes:

✓ Rename: Allows modification of the selected image's name.

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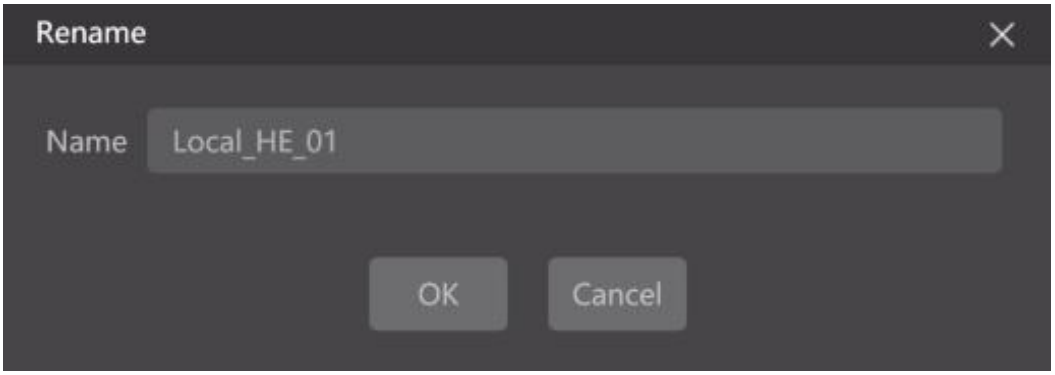

Figure 107. Rename Window

✓ Open The Section: Directly locates and opens the folder where the selected image is stored within the resource directory.

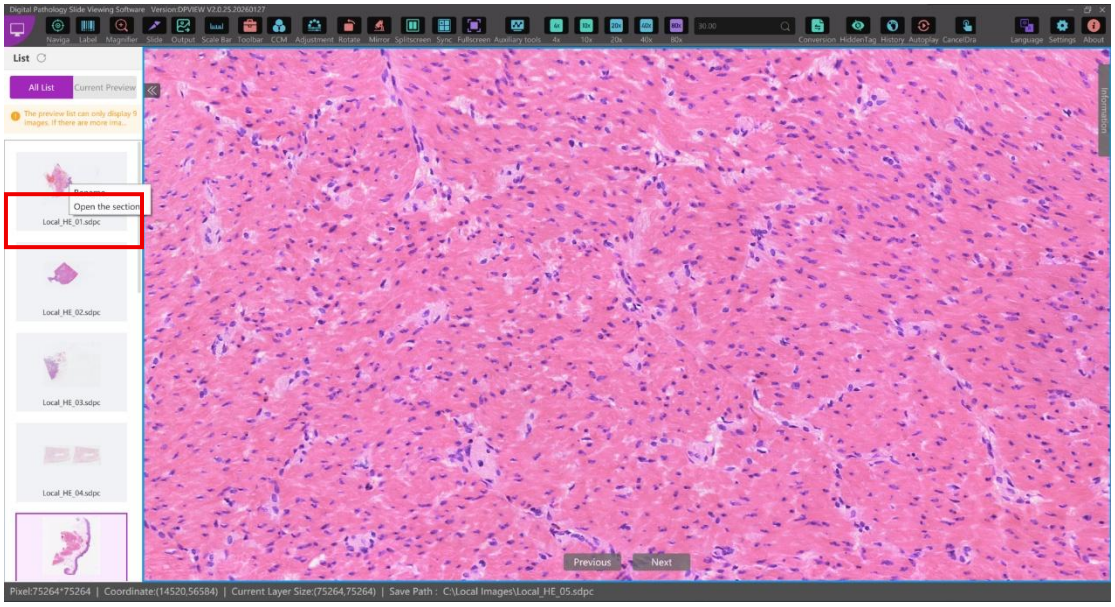

Figure 108. Right-Click Menu

6.3.2.24 Information

Click the **"Information"** box to open the information window. This window is used to manage the annotations of the current image, including annotation shapes, ID numbers, area, and color, and includes the following features:

① Total: 1 Total: Displays the total number of annotations in the current image.

② Mark The Historical List: Shows all historical annotation records, including mark time and user. Restoration operations are available to revert the state of selected annotations.

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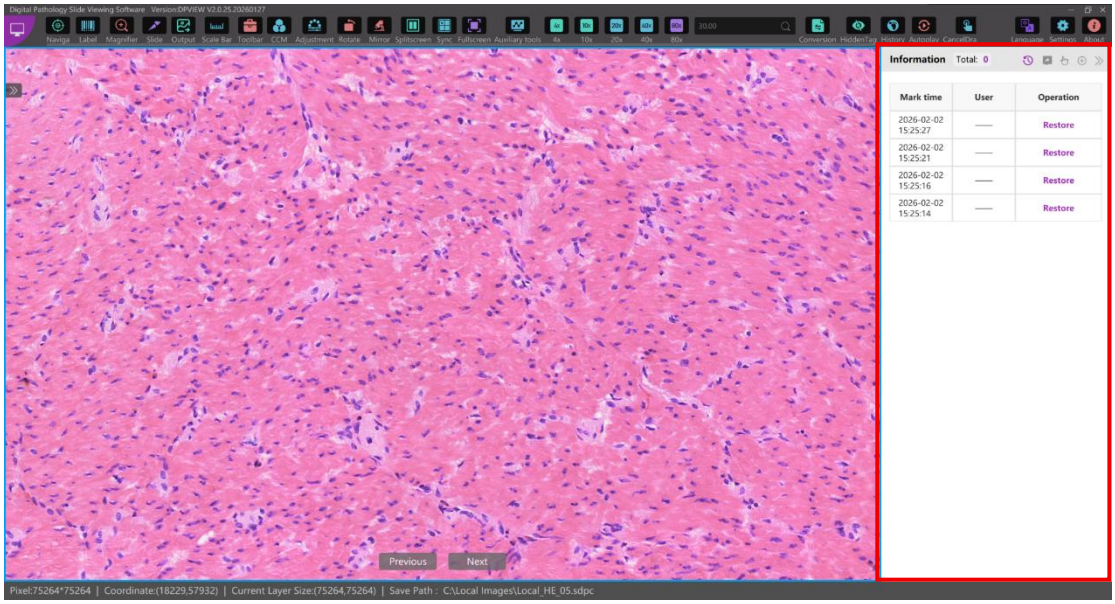

Figure 109. Mark The Historical List

③ Export Excel: Exports the annotation data to an Excel file.

④ Draw Annotations in Root Directory: Allows new annotations to be exported directly to the resource directory where the image is stored.

⑤ Add Group: Creates annotation groups for categorized management of related annotations.

Right-clicking the group number column opens a context menu, including:

- Add Group: Create a new annotation group.
- Modify Group: Modify the name of an existing group.
- Delete Group: Remove the selected group while retaining the annotations within it.

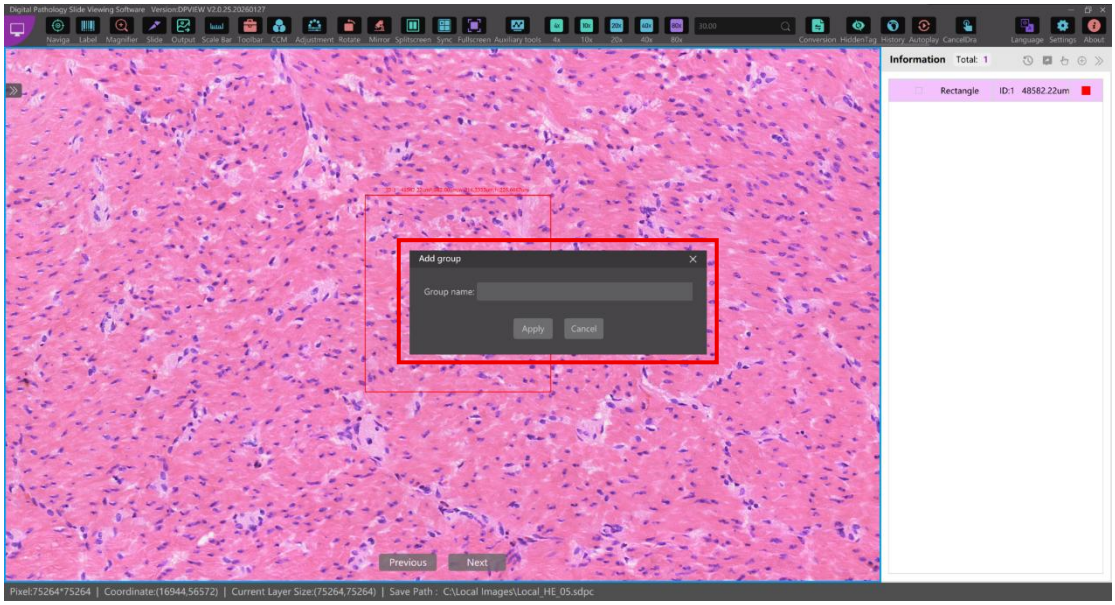

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Figure 110. Add Group Window

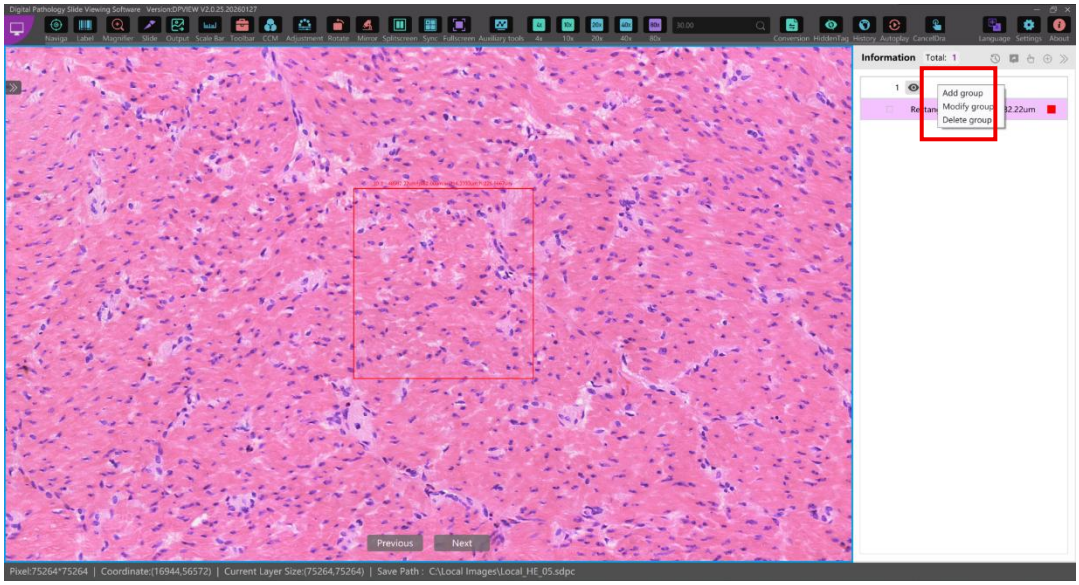

Figure 111. Add Group - Context Menu

⑥ Right-Click Menu: Right-clicking any annotation opens a context menu, including:

- Delete Annotation: Remove the selected annotation.
- Hide: Temporarily hide the annotation from the image while retaining its information.
- Display: Restore a hidden annotation to display it again on the image.

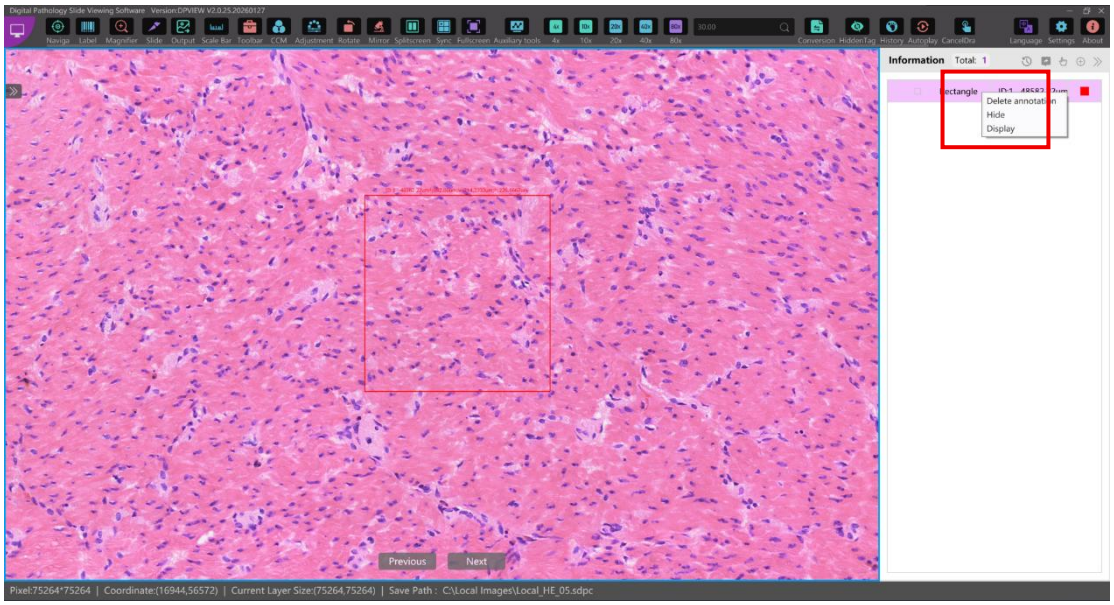

Figure 112. Right-Click Menu

⑦ Annotation Positioning: Click an annotation to quickly locate its position in the image viewing interface.

6.3.3 Cloud Disk

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Displays image resources stored in the cloud, supporting viewing and management of cloud-based data.

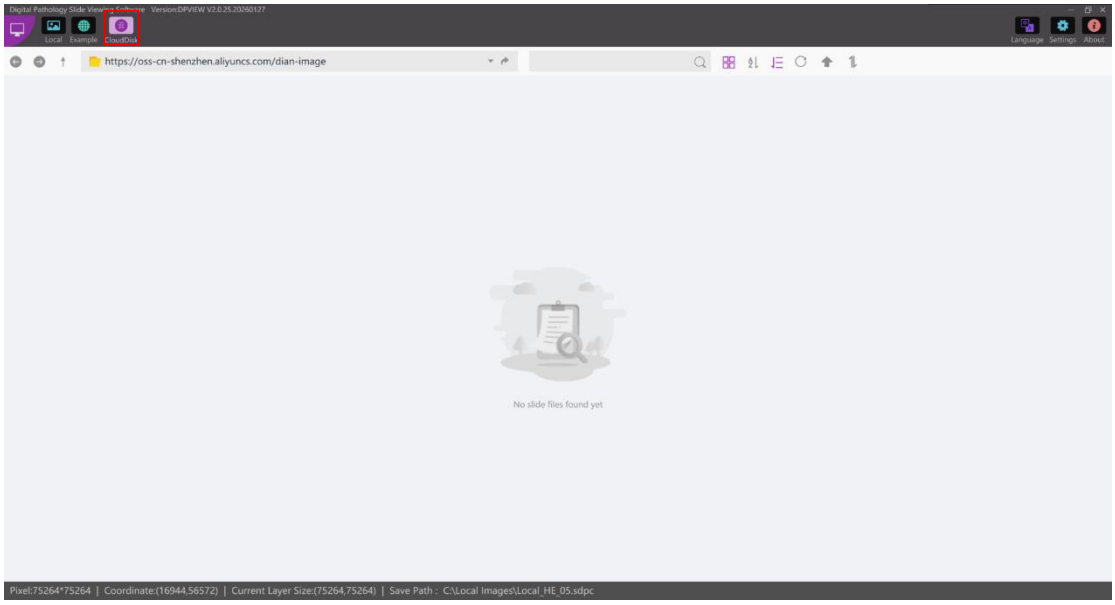

Figure 113. Cloud Disk

6.3.5 Global Function Buttons

6.3.5.1 Language

Supports switching the interface between Chinese and English.

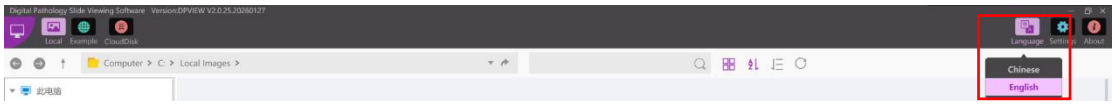

Figure 114. Language

6.3.5.2 Settings

Primarily used to configure cache and general record-related parameters.



Figure 115. Settings Location

① System: Includes cache management and functions configuration.

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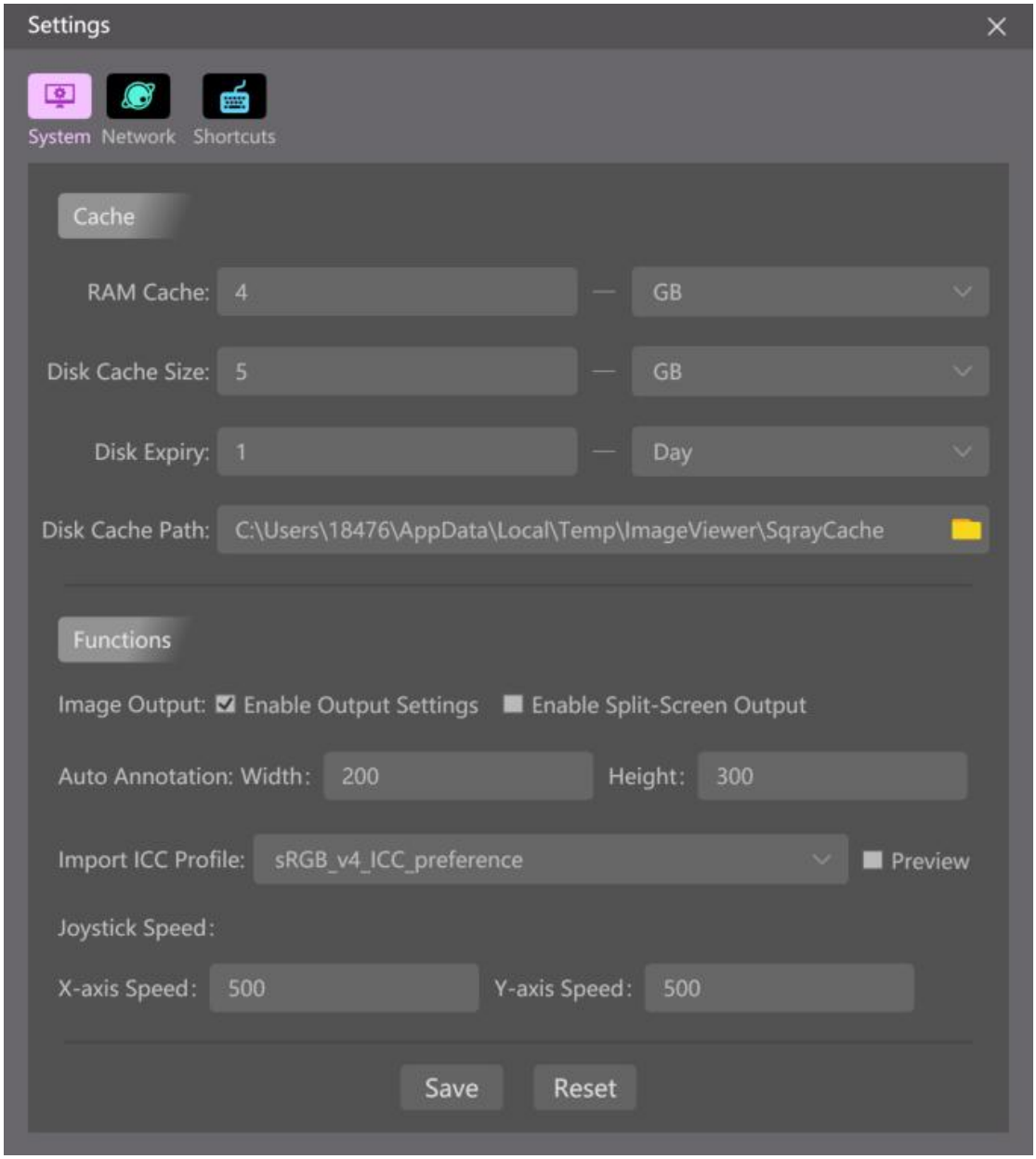

Figure 116. System Setting

② Network: Includes configuration of platform selection, endpoint, access key ID, access key secret, and bucket.

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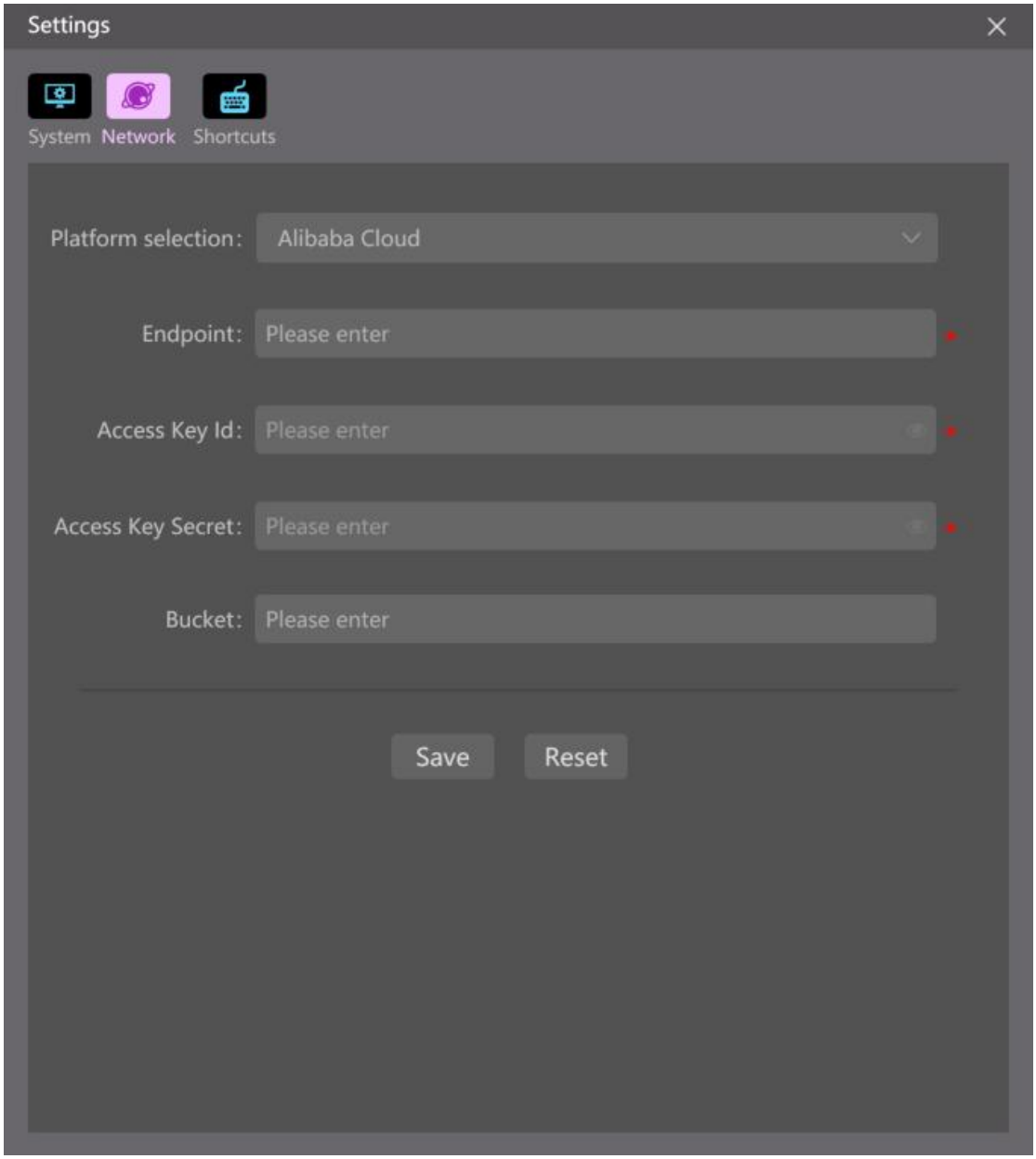

Figure 117. Network Settings

③ Shortcuts: Supports customization of shortcut operations.

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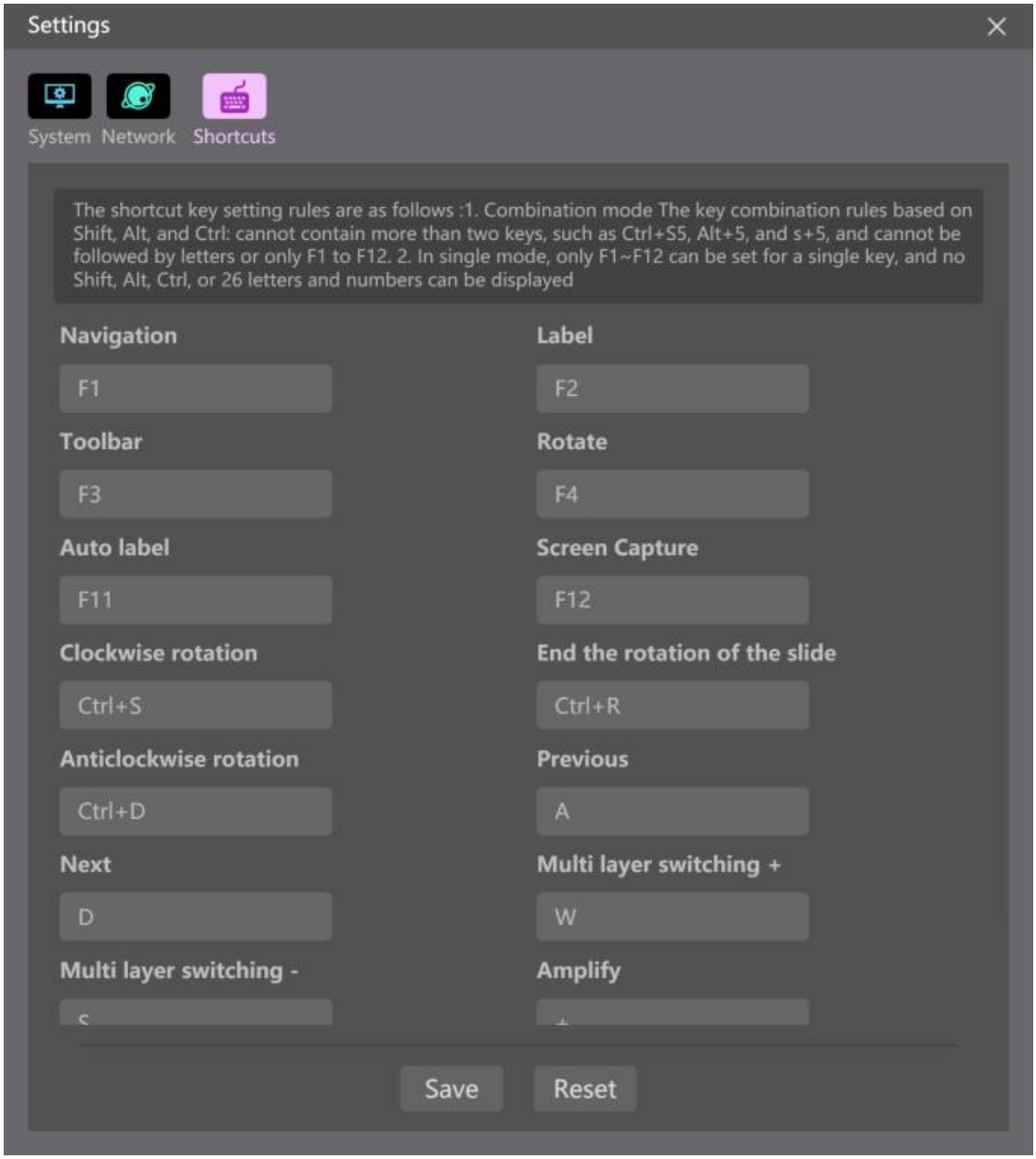

Figure 118. Shortcuts Settings

6.2.7 About

Click the **"About"** button to open the about window. This window displays basic software information, including the software name, software model, release version, complete version, company name, and company website.



Figure 119. About Location

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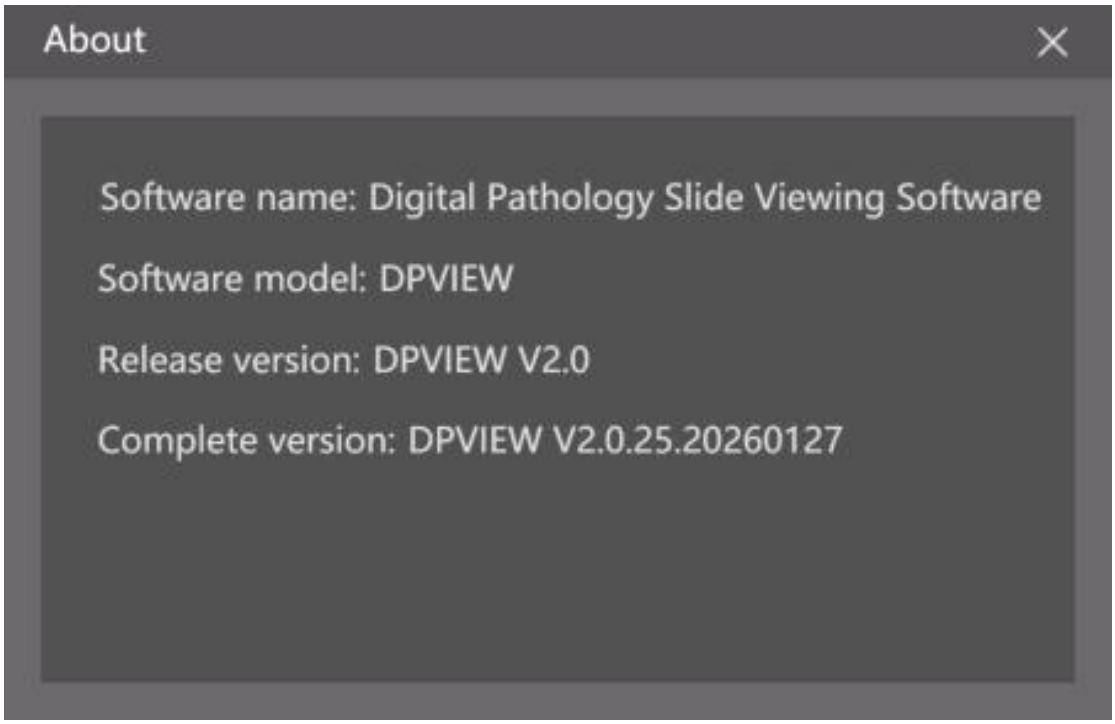

Figure 120. About Window

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7 Storage and Transportation Conditions

This chapter describes the packaging, storage, and transportation requirements for the Slide Scanning System (Model: SQD-40P), in order to ensure the safety of the device and the stability of its performance during transportation, handling, and storage.

7.1 Packaging Description

Prior to shipment, the product has undergone appearance inspection and functional testing. Professional packaging structures suitable for medical device transportation are adopted. The scanner and the computer workstation are packaged separately to ensure device safety and performance stability during transportation, handling, and storage.

7.1.1 Packaging Configuration

The product adopts a separated packaging configuration, including:

① Scanner package: The scanner is packaged independently.

② Computer workstation package: The computer host, monitor, keyboard, mouse, and other input devices are packaged together as one unit.

7.1.2 Packaging Materials

1. Scanner Package

① Inner packaging: Molded shock-absorbing EPE (expanded polyethylene) foam is used to enclose and secure the scanner, reducing impact and vibration during transportation.

② Outer packaging: A reinforced aviation-grade transport case with a metal latch locking structure, providing high-strength compression and shock resistance. It is suitable for long-distance transportation and multiple handling scenarios.

2. Computer Workstation Package

① Inner packaging: Molded shock-absorbing EPE (expanded polyethylene) foam is used to enclose and secure the computer host, monitor, and accessories, reducing impact and vibration during transportation.

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② Outer packaging: A reinforced aviation-grade transport case with a metal latch locking structure, providing high-strength compression and shock resistance. It is suitable for long-distance transportation and multiple handling scenarios.

7.1.3 Accessory Packaging

The product does not have separate accessory packaging. All accessories are placed together with the corresponding equipment within the packaging structure.

7.1.4 Packaging Labels and Markings

1. Scanner Packaging Labels

Necessary transportation and storage handling symbols are affixed to the exterior of the transport case. No additional labels or markings are applied to the inner shock-absorbing EPE packaging.

Table 8: Scanner Packaging Labels

Warning Symbol	Name	Description
	Do not stack	No items should be placed on top of the package.
	Fragile; Handle with Care	Fragile item. Handle with care during transportation and handling.
	Keep Away From Rain	Protect from rain and moisture.
	This Way Up	Keep in an upright position. Do not invert.

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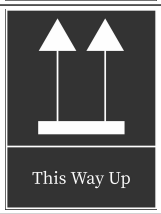
	No stepping on The Surface	Standing or stepping on the surface of the package is prohibited.
	Do Not Roll	The package must not be rolled during handling or transportation.

2. Computer Workstation Packaging Labels

Necessary transportation and storage handling symbols, as well as basic company information markings, are printed on the exterior of the transport case. No additional labels or markings are applied to the inner shock-absorbing EPE packaging.

Table 9: Computer Workstation Packaging Labels

Warning Symbol	Name	Description
	Do not stack	No items should be placed on top of the package.
	Fragile; Handle with Care	Fragile item. Handle with care during transportation and handling.
	Keep Away From Rain	Protect from rain and moisture.
	This Way Up	Keep in an upright position. Do not invert.
	No stepping on The Surface	Standing or stepping on the surface of the package is prohibited.

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	Do Not Roll	The package must not be rolled during handling or transportation.

7.1.5 Packaging Requirements

Packaging operations shall comply with the following requirements to ensure equipment safety during transportation and handling:

- Pre-packaging inspection: Prior to packaging, the equipment shall undergo visual inspection and functional self-checks.
- Cleaning: Dust, debris, and other contaminants shall be removed from the surfaces of the equipment and accessories before packaging.
- Placement: The equipment shall be stably secured within the inner packaging to prevent tilting or significant displacement.
- Sealing requirements: After packing, the equipment shall not protrude beyond the edges of the packaging container. The sealed package shall be flat and free of bulging or deformation.
- Stacking requirements: Plywood crates and corrugated cartons are not recommended to be stacked more than one layer, in order to prevent structural deformation or equipment damage due to excessive load.

7.1.6 Requirements for the Use of Packaging Materials

To ensure transportation safety, the scanner must be transported using the dedicated transport case provided by Shengqiang Technology. The computer workstation must be transported using the corresponding original manufacturer’s packaging materials. Shengqiang Technology shall not be responsible for any equipment damage caused by transportation without the use of the specified packaging materials.

Users are advised to properly retain all original packaging materials for equipment relocation, return-to-factory servicing, or long-term storage.

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7.2 Storage Conditions

1. Atmospheric pressure: 860 hPa to 1060 hPa
2. Ambient temperature: 0°C to 40°C
3. Relative humidity: ≤80%, non-condensing
4. The equipment shall be stored in a dry, well-ventilated indoor environment free of corrosive gases, and protected from direct sunlight and strong magnetic field interference.
5. Storage in environments with high dust levels, acidic or alkaline gases, or flammable and explosive atmospheres is prohibited.

7.3 Transportation Conditions

1. During transportation, adverse conditions such as severe vibration, impact, jolting, high temperature, high humidity, and direct sunlight shall be avoided.
2. Transportation vehicles shall be equipped with adequate moisture-proof and shock-proof measures, and the packaging shall remain intact and undamaged.
3. The transportation ambient temperature shall be controlled within the range of 0°C to 40°C to prevent damage caused by excessively low or high temperatures.
4. Inversion, heavy loading, or compression of the packaging structure is strictly prohibited during transportation.
5. Manual handling shall be used for loading and unloading. When handling the scanner, it shall be lifted steadily from the four bottom corners to avoid collision, tilting, or dropping.
6. All transportation operations shall strictly comply with the labels and markings indicated on the exterior of the packaging.

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7.4 Precautions

1. Unpacking shall be performed with care to avoid equipment damage caused by external force or impact.
2. If packaging damage, moisture ingress, or system abnormalities are detected, immediately contact the distributor or Shengqiang Technology for assistance.
3. Failure to comply with the storage or transportation conditions specified in this section may affect equipment performance or operational safety.
4. For domestic logistics, logistics service providers with experience in medical device transportation, such as SF Express or Deppon, are recommended. For international logistics, internationally recognized carriers such as UPS are recommended.

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8 Maintenance Plan and Warranty Policy

This chapter describes the routine maintenance plan and warranty policy for the Slide Scanning System (Model: SQD-40P). If routine maintenance cannot resolve an issue, or if abnormalities occur during system operation, please contact the Shengqiang Technology after-sales service department for professional technical support.

8.1 Maintenance Plan

To ensure stable system operation and optimal imaging performance, routine maintenance is recommended in accordance with the following items:

① Exterior and Component Cleaning

- Regularly clean the device housing and key components to prevent dust and dirt accumulation that may affect heat dissipation and system operation.
- Key components such as the stage shall be gently cleaned using a lint-free cloth and an appropriate amount of alcohol.
- The use of strongly corrosive solvents (such as acetone or strong acidic/alkaline cleaners) is strictly prohibited to avoid damage to device surfaces or components.

② System Connection Inspection

- Check power cords, data cables, and all interfaces to ensure secure and reliable connections, free from looseness, wear, breakage, or plug deformation, thereby ensuring safe and stable system operation.

③ Operational Status Inspection

- After power-on, confirm that system self-checks are completed normally, stage movement is smooth, and the light source operates stably, with no abnormal noise or alarms.
- If slow operation, jamming, abnormal prompts, or abnormal scanning results occur, immediately stop using the system and contact the Shengqiang Technology After-Sales Service Department for professional technical support.

④ System Calibration

- Perform system calibration regularly according to usage intensity and imaging quality

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requirements to ensure long-term consistency and stability of image quality.

⑤ Optical and Mechanical Maintenance

- Inspect and perform lubrication maintenance on optical components and mechanical transmission mechanisms as appropriate based on usage intensity.

Table 10: Maintenance Plan

Maintenance Frequency	Maintenance Task
Daily (recommended)	Restart the system; observe system operating status.
Annually	Request annual maintenance and performance inspection from the Shengqiang Technology after-sales service department.

8.2 Warranty Policy

8.2.1 After-Sales Service Support

Shengqiang Technology is committed to providing professional, timely, and comprehensive after-sales service support. If users encounter any questions or abnormalities during product use, professional technical support can be obtained through the following channels:

- After-Sales Service Hotline: +86-755-8657-3052
- Fax: +86-755-8657-3053
- Official Website: www.sqray.com

After-sales service support includes technical consultation, remote assistance, software maintenance, fault diagnosis, and repair services. Software-related issues are supported by regular updates and maintenance to ensure continuous system optimization. To improve troubleshooting efficiency, users are advised to provide the product model, serial number, operating environment, and fault description when contacting the After-Sales Service Department.

8.2.2 Standard Warranty Commitment

The product is covered by a 12-month warranty from the date of purchase (or the period specified in the contract/invoice). The warranty covers hardware or software failures caused by product quality issues.

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The following situations are not covered by the free warranty:

- Damage to the housing, accessories, or packaging caused by improper storage;
- Failure caused by operation not in accordance with the *User Manual* or prohibited operations;
- Failures resulting from unauthorized disassembly, repair, or modification;
- Issues caused by the use of non-original Shengqiang Technology parts or consumables;
- Damage caused by human factors such as handling, dropping, or impact;
- Damage caused by force majeure events such as fire, earthquake, or flooding;
- Software abnormalities caused by user modification of system configurations or installation of unauthorized software;
- Product documentation inconsistent with the physical product, altered information, or unidentifiable labels.

8.2.3 Warranty Period Description

The warranty period starts from the date confirmed by Shengqiang Technology based on the delivery documentation, with a standard warranty period of 12 months. If valid documentation cannot be provided, the warranty start date shall be calculated as 7 days after the product factory release date.

8.2.4 Service Providers

1. Product warranty and joint warranty services are provided by the Shengqiang Technology after-sales service department or authorized service centers.
2. Product return and replacement services are coordinated by the corresponding sales representative.

8.2.5 Warranty Service Policy

1. Prior to sending the product for repair, please contact the Shengqiang Technology After-Sales Service Department for remote fault diagnosis. In cases of severe human-induced damage (such as device breakage or burning) where repair is not possible, Shengqiang Technology shall not assume repair responsibility.

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2. Please back up important data before sending the product for repair to avoid potential data loss during maintenance. Shengqiang Technology shall not be responsible for such data loss.
3. Repairs within the warranty scope are provided free of charge. A “After-Sales Service Work Order” must be completed and signed by the user. Repaired products and documentation shall be sent to the Shengqiang Technology After-Sales Service Department. Repair cycle and costs will be communicated within 10 working days.
4. For repairs outside the warranty scope, the After-Sales Service Department will provide a repair quotation and estimated timeline, and proceed upon user confirmation.

8.2.6 Return-to-Factory Transportation Costs

For repairs required during the warranty period due to product failure, transportation costs shall be borne by Shengqiang Technology. For repairs outside the warranty period, transportation costs shall be borne by the user.

8.2.7 Warranty Cost Settlement

1. Whether a repair falls within the free warranty scope shall be determined according to the warranty terms. Out-of-warranty repair fees shall be charged in accordance with the “Out-of-Warranty Repair Fee Schedule,” including material and labor costs.
2. If the same fault recurs within one month after repair, Shengqiang Technology will provide free repair service.

8.3 Warranty Service Process

1. Fault Reporting: Upon detecting abnormalities, users shall promptly contact the Shengqiang Technology After-Sales Service Department and provide the product model, serial number, operating environment, and fault description.
2. Problem Diagnosis: Technical support engineers will assist with preliminary troubleshooting via telephone or remote methods. If the issue cannot be resolved remotely, on-site service or return-to-factory repair will be arranged as appropriate.

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3. Repair Request: If return-to-factory repair is required, users shall complete a “Repair Request Form” and send the product together with relevant documentation (such as invoice, work order, and warranty card) to the designated service location. The product shall be properly packaged to avoid transportation damage.
4. Inspection and Repair: Upon receipt of the product, the After-Sales Service Department will conduct a detailed inspection, confirm the root cause, and perform repair operations. Repair progress, handling solutions, and estimated completion time will be communicated in a timely manner.
5. Repair Confirmation and Return: After repair, functional verification will be performed by technical support engineers. Upon receiving the equipment, the user shall confirm the repair results and sign the *Repair Confirmation Form*.

8.4 User Responsibilities and Precautions

1. The product shall be used strictly in accordance with the operating requirements specified in this user manual. Operations beyond the specified scope shall be avoided to prevent system damage or performance abnormalities.
2. Users shall perform cleaning and maintenance regularly in accordance with the maintenance plan in this manual, keep the system in good operating condition, and address abnormalities in a timely manner.
3. Purchase invoices, warranty cards, repair records, and other related documents shall be properly retained as important evidence for warranty service.
4. When relocation, disassembly, or reinstallation is required, operations shall be performed by qualified professionals to avoid damage or safety risks caused by improper handling.
5. Without authorization from Shengqiang Technology, users shall not disassemble, repair, or modify the equipment. Any resulting damage or malfunction shall not be covered by the warranty.

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Appendix

Appendix A Product Specifications

A.1 Basic Information

- Product Name: Slide Scanning System
- Model: SQD-40P
- Medical Device Classification: Class II
- Manufacturer: Shenzhen Shengqiang Technology Co., Ltd.
- Scanner Dimensions: 640 mm × 550 mm × 430 mm (tolerance ±10%)
- Scanner Weight: 78.00 kg (tolerance ±10%)

A.2 Fuse

The scanner is equipped with internal fuses to provide circuit protection in the event of abnormal current conditions. If a fuse is damaged or blown, it must be replaced with a fuse of the specified type and rating listed in Table 11 to ensure the safety and stable operation of the scanner. The use of fuses that do not meet the specified model or rated parameters is strictly prohibited, as this may result in equipment damage or pose safety hazards. Fuse replacement shall be performed only by trained professional personnel or service personnel authorized by the manufacturer.

Table 11 Fuse Specifications

Fuse Type	Rated Voltage	Rated Current
Fast-acting fuse	250 V	10 A

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Appendix B Packing List

No.	Item Name	Model / Specification	Quantity	Unit	Remarks
1	Slide Scanning System	SQD-40P	1	unit	
2	Computer Host	HP	1	unit	
3	Monitor	HP	1	unit	
4	Keyboard and Mouse Set	HP	1	set	
5	Mouse Pad	General	1	pc	
6	Power Cables	Chinese Standard	3	pcs	
7	DP Cable	General	1	pc	
8	HDMI Cable	General	1	pc	
9	Slide Rack	General	2	pcs	
10	Sample Slides	General	1	box	
11	Slide Calibration Block	General	1	block	
12	Maintenance Triangle Key	General	1	pc	
13	User Manual	English	1	copy	
14	Quick Operation Guide	English	1	sheet	
15	Safety and Precautions Card	English	1	sheet	
16	Product Warranty Card	English	1	sheet	
17	Product Inspection Certificate	English	1	sheet	
18	Equipment Usage Record Form	English	1	sheet	

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Appendix C Troubleshooting

C.1 Abnormal Conditions and Corrective Actions

Table 12 Abnormal Conditions and Corrective Actions

Error Code	Error Message	Cause	Remarks / Corrective Action
100	Scan cancelled, forced exit	The "Cancel" button was clicked.	None.
101	Grabbing failed!	Failed to grip and load the slide onto the stage.	Close the scanning software and power off the scanner. Open the maintenance door and check the system. Remove any slide on the stage or gripper. If a slide protrudes excessively from the slide cassette, push it back to the bottom of the cassette.
102	STM focus read error!	Abnormal microcontroller (STM) connection.	Close the scanning software and power off the scanner. Open the maintenance door, check the system, remove any slide on the stage or gripper, and restart the system.
103	STM count read error!	Abnormal microcontroller (STM) connection.	Close the scanning software and power off the scanner. Open the maintenance door, check the system, remove any slide on the stage or gripper, and restart the system.
104	Z-axis position out of range, forced exit	Z-axis position exceeds the preset limit.	Service personnel shall check whether the parameters **BigFocusRangeZLimit** and **ZLimit** are set appropriately. Modification by unauthorized personnel is prohibited.
105	Image lost, forced exit	The scanning camera cannot acquire images or the number of acquired images is insufficient.	• Loose camera cable connection; • Scanning camera failure; • Scanning speed too high. Service personnel shall troubleshoot according to actual conditions.

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106	Region and focus point detection failed!	Positioning failed; the algorithm did not detect the sample region.	• Positioning light not on; • Slide sample too sparse or severely faded; • No slide on the stage. Service personnel shall troubleshoot according to actual conditions.
107	Positioning camera abnormal!	Abnormal positioning camera connection.	• Loose positioning camera cable; • Positioning camera failure. Service personnel shall troubleshoot according to actual conditions.
108	Focus data count error!	The number of images collected for focusing does not meet the minimum requirement.	• Dropped frames from the scanning camera. • Scanning camera failure. Open the camera manufacturer's software and click "Display Image" to check for image loss: • If images cannot be displayed, the camera may be faulty—try restarting the system; • If dropped or erroneous frames occur, the optical fiber connection may be loose—reconnect both ends of the fiber. If the issue persists, consider replacing the fiber. Service personnel shall troubleshoot according to actual conditions.
109	Insufficient focus points!	Too few focus points.	In manual mode, manually add focus points.
110	Insufficient valid focus	Focus failed.	In manual mode, reset the focus height.

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	points!		
112	Automatic region search failed!	During positioning, the algorithm did not detect the sample region.	• Positioning light not on; • Slide sample too sparse or severely faded; • No slide on the stage. Service personnel shall troubleshoot according to actual conditions.
113	Failed to create storage file	Storage file creation failed; scan data cannot be saved.	Check whether the storage path exists and confirm that sufficient disk space is available.
114	Barcode recognition failed	When the parameter **BarcodeSuccessScan** is set to 1, a barcode must be successfully recognized for the slide scan to be considered successful.	Select the corresponding barcode type in **Barcode Settings** for recognition.
118	Rule configuration failed	Scan parameter configuration is enabled, but the corresponding slide configuration failed to load.	Service personnel shall retrieve the relevant logs and troubleshoot together with R&D personnel based on actual conditions.
119	Piezoelectric actuator detection abnormal	Abnormal piezoelectric actuator movement.	1. Insufficient piezoelectric actuator response; 2. Piezoelectric actuator failure resulting in no movement. Service personnel shall troubleshoot according to actual conditions.
120	Piezoelectric actuator detection	Abnormal piezoelectric actuator movement.	1. Oscillation threshold set improperly; 2. Uneven work surface causing excessive vibration of the device. Service

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	abnormal, restart required (oscillation exceeds preset threshold)		personnel shall troubleshoot according to actual conditions.
121	Failed to create compression thread. Please check whether the GPU encoder is occupied by background programs!	GPU encoder is occupied.	1. Remote-control software running (e.g., Sunlogin); 2. Screen-recording software running. Solution: Close remote-control or screen-recording software. If they cannot be closed, change the SDPC compression method to **JPEG**. Please contact service personnel for assistance.
122	File storage failed. Please check whether sufficient disk space is available!	Scan data cannot be written to temporary files.	Insufficient disk space on the selected storage path. Delete unnecessary files, move files to another storage location, or change the storage path to another disk.
123	Computing thread initialization abnormal. Please check whether sufficient memory is available!	Insufficient system memory.	Close unnecessary applications to free system memory.

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124	Computing thread processing abnormal. Please check whether sufficient memory is available!	Insufficient system memory.	Close unnecessary applications to free system memory.
125	Cassette detection abnormal	Slide cassette is not fully pushed into position.	Push the slide cassette fully to the bottom.
126	Score too low	Image quality is evaluated by the algorithm and determined to be poor.	A score threshold can be set. When the scan score is below the threshold, the system will automatically rescan. If the score remains below the threshold after rescanning, the slide will be judged as

C.2 Operational Troubleshooting

Table 13 Common Fault Phenomena and Corrective Actions

Fault Phenomenon	Possible Cause	Corrective Action
After power-on, the system produces no normal operating sound.	1. No voltage supply or loose power outlet. 2. Failure of the system power interface.	1. Check whether the power supply has voltage; confirm that the power outlet is secure and that the plug is firmly connected. Reinsert the power plug if necessary. 2. If the problem persists, contact the manufacturer or an authorized distributor.

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The scanner and computer workstation are powered on, but an error occurs when launching the scanning software.	The scanner and computer workstation are not fully ready; the scanning software is started too quickly.	After power-on, wait approximately 30 seconds to ensure that the scanner and computer workstation have completed startup, then launch the scanning software.
An error occurs during system operation.	1. System operating abnormality.	1. Follow the error prompt to perform corrective actions, or restart the scanner and computer workstation to allow the system to recover automatically. 2. If the problem persists, contact the manufacturer or an authorized distributor.
	2. Improper operation by the operator.	2. 1. Follow the error prompt to perform corrective actions, or restart the scanner and computer workstation to allow the system to recover automatically. 3. If the problem persists, contact the manufacturer or an authorized distributor.
	4. Abnormal slide return to cassette.	1. During slide return, a detection abnormality may occur, preventing the slide from returning properly and causing the scanner to stop. In this case, the scanner will transfer the abnormal slide to the exception handling bin. Open the maintenance door on the right side of the scanner and remove the scanned slide from the exception handling bin, or contact the manufacturer or an

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		authorized distributor for assistance.

C.3 Fault Codes and Corrective Actions

Fault Code 1: MessageBoxCheckSlideError3

Error Message: A slide is detected at scanner position {num}. Do you want to continue?

Possible Causes:

1. A slide is present at the stage position.
2. If no slide is present, contamination on the stage position or diffuser plate may cause false detection.

Corrective Actions:

1. Remove the slide from the stage position.
2. Clean the stage position and diffuser plate with alcohol, or appropriately reduce the stage similarity check value (SimilarityMin) from 0.9. The value must not be set lower than 0.75.

Fault Code 2: MessageBoxLoaderImcControlError

Error Message: Failed to open the control card. Please check the device.

Possible Causes:

1. Device power is not turned on.
2. The scanning software is started too quickly.
3. USB cable is not properly connected.
4. The control card driver is disabled.

Corrective Actions:

1. Turn on the device power switch.
2. After powering on the device, wait approximately 30 seconds before starting the scanning software.
3. Reconnect the USB cable and restart the device and computer workstation.
4. Re-enable the disabled control card driver.

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Fault Code 3: MessageBoxLocateCameraError1

Error Message: Locate camera not found. Please check whether the camera cable is properly connected.

Possible Causes:

1. Loose USB cable connection.
2. Antivirus or system management software has disabled the locate camera driver.

Corrective Actions:

1. Reconnect the USB cable and restart the device and computer workstation.
2. Check antivirus or management software logs and re-enable the locate camera driver if disabled.

Fault Code 4: MessageBoxLocateCameraError2

Error Message: Locate camera device ID mismatch.

Possible Cause: A non-matching computer workstation is used, or the workstation does not correspond to the device.

Corrective Action: Confirm that the original computer workstation supplied with the device is used. Use of other computers is strictly prohibited.

Fault Code 5: MessageBoxMachineError

Error Message: Device abnormal. The program will exit. Please check the control card connection.

Possible Causes: Loose USB connection, sudden power failure, or software crash.

Corrective Actions:

1. If a slide is present on the stage, remove it first.
2. Reconnect the USB cable and restart the device and computer workstation.

Fault Code 6: MessageBoxComputerSnError

Error Message: Computer device ID mismatch. Do not replace the computer.

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Possible Causes:

1. A non-matching computer workstation is used.
2. The motherboard of the computer workstation has been replaced.

Corrective Actions:

1. Confirm use of the original computer workstation supplied with the device.
2. If replacement has occurred, contact after-sales service engineers.

Fault Code 7: MessageBoxDiskWarn2

Error Message: Insufficient remaining disk space.

Possible Cause: Disk storage is nearly full.

Corrective Action: Free disk space and ensure that at least 10% of disk capacity remains available.

Fault Code 8: MessageBoxPawInitError

Error Message: A slide may be present in the gripper. Please open the cover for inspection.

Possible Cause: Abnormal system shutdown causing the slide to remain in the gripper.

Corrective Action: Shut down the system, manually and gently open the gripper to remove the slide, then restart the system.

Fault Code 9: StatusTextFocusError

Error Message: Insufficient valid focus points.

Possible Causes:

1. Incorrect slide orientation, reversed slide, or adhesive contamination on the objective.
2. Missing coverslip or multiple coverslips.
3. Large slide thickness variation exceeding focus range.
4. Insufficient sample material.
5. Contamination on the stage position causing uneven slide placement.
6. Weak staining or improper variance parameter settings.
7. Piezo actuator malfunction.
8. Label overflow adhering to spring pins, causing slide lifting.

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9. Dropped frames from the scanning camera.

Corrective Actions:

1. Eject the slide and confirm correct orientation.
2. Verify coverslip quantity.
3. In manual mode, reset focus height and lower the objective to search for a clear focal point; if unsuccessful, remount the slide.
4. In manual mode, manually select the sample region and place focus points on the sample.
5. Clean the stage position with anhydrous ethanol or alcohol.
6. Remove any excess label material from the slide.

Fault Code 10: StatusTextPinchError

Error Message: Failed to pick up the slide.

Possible Causes:

1. Coverslip or adhesive overflow pulling the cassette during pickup.
2. Label overflow or adhesive buildup on the gripper preventing secure gripping.
3. Abnormal photoelectric sensor position (too high or too low).
4. Gripper deformation due to software bugs or improper debugging operations.

Corrective Action: Clean excess adhesive, coverslip, and label material. If the issue persists, contact after-sales service engineers.

Fault Code 11: MessageBoxSTMError

Error Message: STM connection error. Please check the USB connection.

Possible Causes:

1. Loose USB connection.
2. Missing microcontroller driver.
3. Microcontroller circuit fault or damage.

Corrective Actions:

1. Reconnect the USB cable and restart the device and computer workstation.
2. Reinstall the 5750 driver.

   Installation steps:

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Start Menu → “LibUsbDotNet” folder → run “FilterWizard” → select “Install a device filter” → click “Next” → check “vid:0483 pid:5750 rev:0200” → click “Install” → installation is successful when “successfully” is displayed.

3. Avoid arbitrary system updates.
4. Check the indicator status of the microcontroller inside the right-side maintenance door to confirm power supply and connection.

Fault Code 12: StatusTextScanError

Error Message: Scan error. Please check and resolve the issue before proceeding.

Possible Causes:

1. Sample focus failure.
2. Only blank areas were detected.

Corrective Action: Refer to the corrective actions for Fault Code 9: **StatusTextFocusError** – Insufficient valid focus points.

Fault Code 13: MessageBoxPutOnRackError

Error Message: The slide may collide with an object when returning to the rack. Please check.

Possible Causes:

1. Coverslip overflow.
2. Abnormal slide position preventing accurate gripping.
3. Severe wear or deformation of the gripper.

Corrective Action: Shut down the system, gently open the gripper manually to remove the slide, then restart the system.

Fault Code 14: MessageBoxMachineError2

Error Message: Axis abnormality detected. Please check the cause.

Possible Cause: Axis exceeds the limit position.

Corrective Action: Shut down the system, manually move the axis to a normal position, then restart the system.

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Fault Code 15: ResetFocusHeightOver

Error Message: Focus height reset exceeds limit. Please raise the objective and retry.

Possible Cause: Slide preparation is too thin or too thick.

Corrective Action: Remount the slide.

Fault Code 16: switchMirrorError

Error Message: Objective switching failed. Camera setup failed.

Possible Cause: Camera switching axis alarm triggered the hard limit sensor.

Corrective Action: Shut down the system, manually move the camera switching axis to a normal position, then restart the system.

Fault Code 17: RackCheckError

Error Message: The rack is positioned too far outward. Please push it inward firmly.

Possible Cause: The slide rack is not fully inserted.

Corrective Action: Cancel the scan, open the rack door, and push the rack fully into position.

Fault Code 18: SaveError

Error Message: Failed to create storage file. Exiting.

Possible Causes:

1. Direct storage to a removable hard drive during scanning; the drive is unstable or disconnected.
2. The storage folder path has been deleted.

Corrective Action: Change the storage path to the default local drive (Drive E, 3 TB). After scanning, copy the data from the local hard drive to the removable drive.

Fault Code 19: ChangeStateInfo

Error Message: The program was not closed properly last time. Please check whether slides remain in the gripper or stage and ensure proper handling. Carefully inspect machine positions. Then send the encoded information to after-sales service to obtain a password, enter the password, and click OK to start the program.

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Possible Cause: Incorrect shutdown sequence: device power was turned off before closing the scanning software and computer workstation.

Corrective Action: Reconnect device power, wait approximately 30 seconds after startup to ensure the device and computer workstation are ready, then launch the scanning software.

Fault Code 20: ErrorMsg_123

Error Message: Computation thread initialization error. Please check whether sufficient memory is available.

Possible Cause: Other software running during scanning consumes excessive system resources, causing the scanning software to crash.

Corrective Actions:

1. Close background applications and restart the device and scanning software.
2. Avoid running other software during scanning.

Fault Code 21: SavePathError

Error Message: Scan storage path error. Please restart the software and select a path.

Possible Causes:

1. Direct storage to a removable hard drive during scanning; the drive is unstable or disconnected.
2. The storage folder path has been deleted.

Corrective Action: Change the storage path to the default local drive (Drive E, 3 TB). After scanning, copy the data from the local hard drive to the removable drive.

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Appendix D Referenced Standards

- GB 4793.1-2007 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements*
- GB 4793.9-2013 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 9: Particular Requirements for Automatic and Semi-automatic Laboratory Equipment for Analysis and Other Purposes*
- YY 0648-2008 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-101: Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment*
- GB/T 14710-2009 *Environmental Requirements and Test Methods for Medical Electrical Equipment* (Applicable to Climatic Environment Group II and Mechanical Environment Group I)
- GB/T 18268.1-2010 *Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements*
- GB/T 18268.26-2010 *Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 26: Particular Requirements for In Vitro Diagnostic (IVD) Medical Equipment*

Please retain this User Manual for future reference.

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