AmScope™

DM745-HDM11 Digital-Integrated Microscope

Introduction

This manual applies to the DM745-HDM11 digital-integrated microscope and accessories. The information in this manual is provided to help you familiarize yourself with the assembly and use of the products. Please read thoroughly before using the products, and keep this manual with the product for reference.

Safety

Before using your AmScope microscope, please read the following safety precautions carefully to avoid causing damage to your AmScope product, or injury to yourself or others.

Turn off power if the instrument exhibits unusual or dangerous behavior such as emitting smoke or unusual odors. These can be indications of electrical problems, in which case the instrument should be disconnected from any power source if safe to do so. Other indicators can be a loud buzzing sound or crackling. Contact AmScope to report such behavior.

Do not use around flammable liquids or gases. Electric instruments can ignite flammable substances which could result in an explosion or fire.

Do not use in a wet environment. Electrical components of the instrument can discharge when exposed to water, potentially resulting in damage to the instrument, or injury to yourself or others.

Only use the provided power adapter or authorized replacement. Incompatible power adapters can cause damage to the instrument. If you should lose the included power adapter, please contact AmScope for information about a replacement.

Do not dismantle. Dismantling can result in damage to the instrument, and potential exposure to dangerous materials or electric current.

Notices

AmScope reserves the right to change specifications of the hardware and software at any time without notice. Continuous efforts are made to improve performance and reliability, which can result in changes to design and compatibility. Please contact AmScope for any concerns regarding such changes.
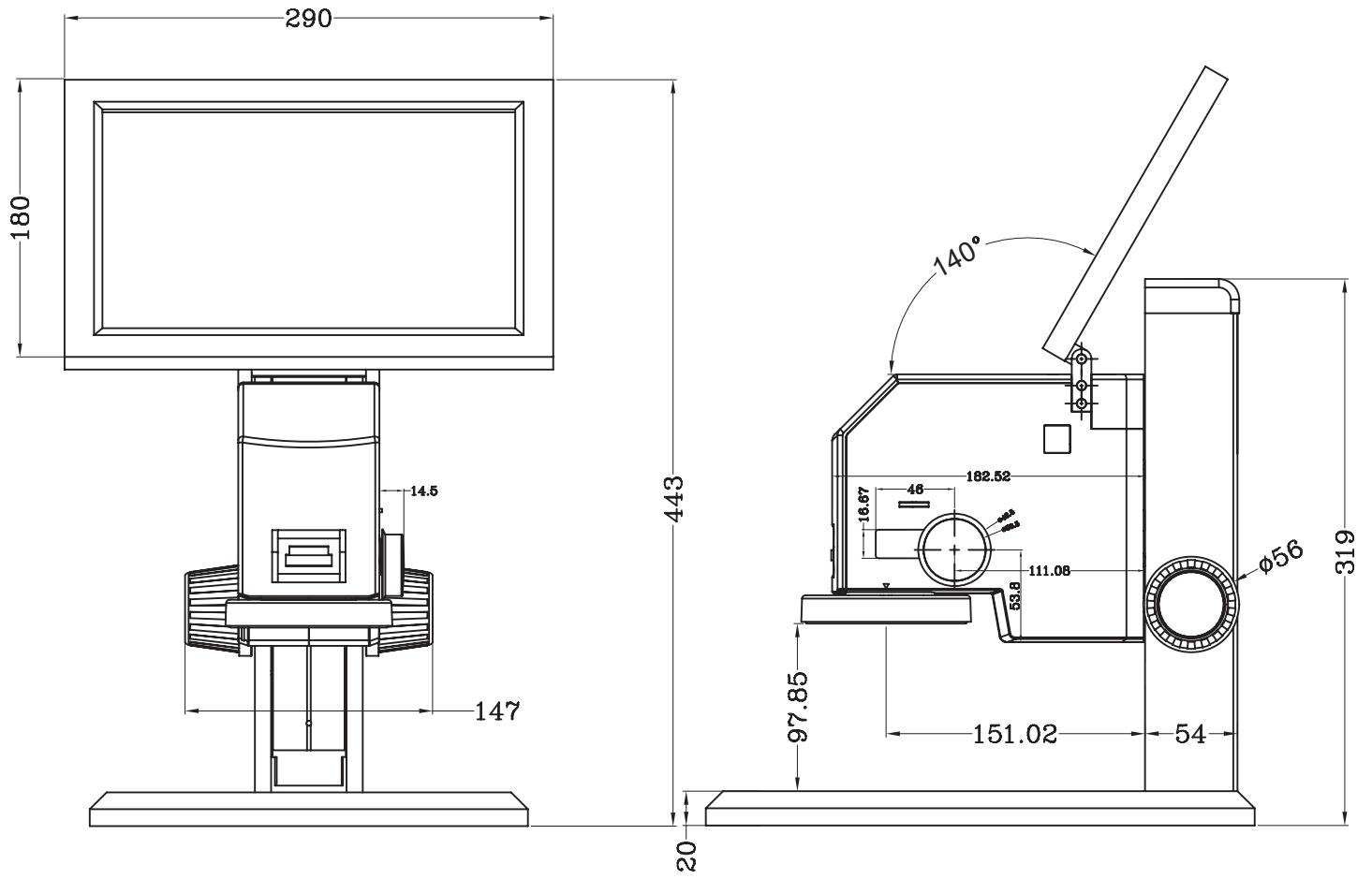
Contents

290

180

443

14.5

147

20

140°

182.52

16.67

46

111.08

53.8

97.85

151.02

54

Φ56

319

Microscope Specifications	
Model	DM745-HDM11
Zoom Magnification	0.7X-4.5X
Working Distance	100mm
Camera Specifications	
Sensor	IMX307 (color)
Sensor Type	CMOS
Sensor Optical Format	1/2.8"
Integrated Reduction	0.35X
Active Pixels	2M (1920 x 1080)
Pixel Size	2.9μm x 2.9μm
Active Sensor Area	5.57mm x 3.13mm
Shutter	electronic rolling shutter
Monitor Specifications	
Display Size	11.6"
Monitor Magnification	46X
Displayed Magnification	11.3X-72.5X
Native Resolution	1920 x 1080
Aspect Ratio	16:9
Brightness	220 nits

What's In The Box

The DM745-HDM11 standard outfit includes:

- One microscope with track stand
- One monitor
- Three thumb screws
- One USB wireless mouse
- One USB port expander
- One AC power adapter

Assembly

Attaching the Monitor

Tilt the mounting bracket back 90 degrees so it is pointing up. Place the monitor in front of the bracket with the screen facing the front of the microscope. Align the holes in the back of the monitor with the holes in the bracket. Insert each of the three mounting screws, and rotate clockwise until they are securely fastened.

Two cables are attached to the microscope behind the bracket, including HDMI and power. Insert each cable into its respective port on the monitor.

USB Devices

The microscope has two USB ports on its right side. These can be used to attach USB devices such as the included mouse, a keyboard, and storage devices. A USB port expander is included in case more than two devices would be used simultaneously.

Wireless Mouse

The included mouse is required to navigate the microscope's software. Remove the battery cover on the underside of the mouse, remove any insulator strip if present, then replace the cover. A USB dongle will be inserted into a dummy slot on the underside of the mouse. Remove the dongle, and insert it into an available USB port on the microscope. Locate the power switch on the underside of the mouse, and move it to the "ON" position.

Storage Devices

An external storage device is required to save photos and other files. This microscope is compatible with various devices including thumb drives and card readers. Compatible storage devices will be automatically detected when attached.

Attaching the 3D Attachment

The optional 3D attachment is designed to mount to the objective lens' housing. The 3D attachment's mounting ring has female threads which will screw onto the objective housing's male threads. Guide the 3D attachment's mounting ring upward onto the objective housing, then rotate to the right using the knurled portion of the ring. Continue rotating until the ring is fully mounted. Do not applying excessive pressure, otherwise the attachment will be difficult to remove. When securely mounted, the attachment's slider should rotate freely.

Operation

Focusing

Each side of the microscope's focusing column is equipped with a focusing knob. Rotating either knob will raise or lower the microscope's head.

Tension can be adjusted for the knobs by securing one in place, then rotating the other. Rotating clockwise will increase tension, and counter-clockwise will decrease tension.

Magnification

Zoom Dial

The zoom dial controls the magnification of the microscope by adjusting the internal zoom mechanism. The dial can be rotated in a continuous movement from the 0.7X setting to the 4.5X setting. Key magnifications have detents (mechanical catches) which allow the dial to "click" into place. This allows you to set magnifications more precisely when performing measurements. Rotating the dial clockwise will decrease the magnification, and rotating the dial counter-clockwise will increase the magnification.

Optical Magnification

This microscope uses a combination of a fixed-magnification 1X objective lens and zoom optics to provide its 0.7X-4.5X magnification range. This is the optical magnification range which is typically listed. An additional 0.35X magnification stage is used to compensate for the format of the digital image sensor. This document refers to this stage as integrated reduction, since the purpose is to reduce the size of the image to better fit the specific image sensor. While this reduction stage modifies the overall magnification prior to being imaged, it is typically not referenced in listed magnifications due to its association with the image sensor. However, it should be used when calculating total system magnification as described in the following section about monitor magnification.

Monitor Magnification

Since the image displayed on the monitor is larger than the camera's sensor, the monitor is considered to have its own magnification referred to as monitor magnification. The magnification factor is calculated by dividing the diagonal of the on-screen image by the diagonal of the camera's sensor.

$$294mm/6.39mm = 46$$

Total system magnification includes all of these factors, and can be calculated using the formula:

$$M_{OBJ} \times M_{RED} \times M_{MON} = M_{TOT}$$

where M_{OBJ} is objective magnification, M_{RED} is integrated reduction, M_{MON} is monitor magnification, and M_{TOT} is total magnification. The low and high magnifications would be as follow:

$$0.7 \times 0.35 \times 46 = 11.27$$

$$4.5 \times 0.35 \times 46 = 72.45$$

Illumination

This microscope is equipped with an LED ring light to provide illumination. The ring light can be removed to expose the objective lens housing by simultaneously pulling downward on the left and right sides. When reattaching, be sure to align the two electrical contact on the top of the ring light with the pins on the underside of the microscope head.

 The ring light's intensity is controlled by a wheel on the right side of the microscope. Rotating the wheel counter-clockwise will increase the intensity, and rotating clockwise will decrease intensity.

3D Attachment

The 3D attachment can be used to alter the angle-of-view, allowing you to view an object from oblique angles without moving the object. The 3D attachment consists of a mounting ring and a slider. The slider can be positioned for normal viewing or 3D viewing. The open position removes the slider's mirrors from the optical path allowing you to view normally. The engaged position places a mirror directly under the microscope's objective lens, relaying an oblique image from the second mirror. When changing the position of the slider, use the metal positioning rod to avoid contaminating the mirrors. When engaged, the attachment can be rotated 270° without obstruction. Use the positioning rod or an outer edge of the slider when rotating to avoid contaminating the mirrors.

Software

The DM745-HDM11 uses internal software to manage camera and display settings, as well as to perform image-capture and measuring functions. All of these functions are accessed from the on-screen console. The console is divided into four sections including Calibration, Main Tools, Assist Tools, and a measurements log.

Index	Item	Value
1	L0	4.8986mm
2	L1	5.0092mm
3	L2	4.8554mm
4	L3	5.3320mm
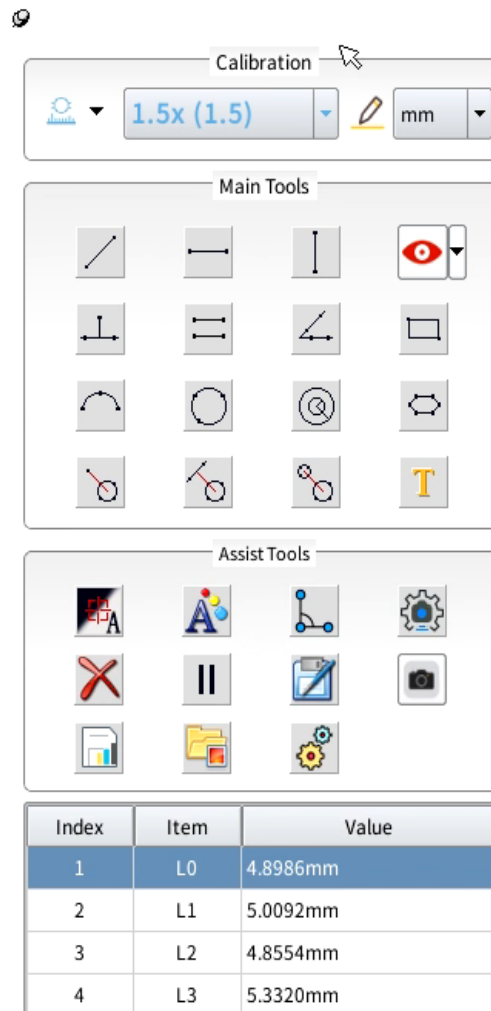
Calibration

The calibration section is used to select precalibrated magnification profiles or to define custom profiles. A magnification profile defines the relationship between camera pixels and real units of measure such as millimeters. Once this relationship is defined, any shape drawn on the screen will provide accurate measurements by translating the number of pixels into the desired unit of measure.

Calibration Tool

The calibration tool has two options: "Line Calibration" and "Calibration by Circle". To select the desired tool, click on the down arrow next to the icon.

Profiles

Profiles are predefined for key magnifications, and can be selected for use with the corresponding magnifications to perform accurate measurement functions. When using any magnification which is not already have a profile, the calibration process must be performed to produce accurate results.

Units

Units defines the measurement unit to be displayed when performing measuring functions.

Line Calibration

To perform the calibration process, a ruler will be needed for reference. For low magnifications, a ruler with millimeter graduations is usually adequate. For high magnifications, a ruler with finer graduations may be needed, such as a micrometer slide. Place the ruler under the microscope's lens so it can be viewed on the screen. The ruler needs to be in clear focus with multiple, clearly-distinguishable graduations visible on the screen.

Click on the ruler icon in the main panel's calibration section. Using this tool, a line will be drawn over the image of the ruler. Click the left mouse button to create the first anchor point. As the cursor is moved, a line will be displayed. The line should span as many readable graduations as possible, and should be parallel to the ruler's edge to improve the precision. Move the cursor along the image of the ruler until it has spanned an adequate number of graduations, then click the left mouse button again to create the second anchor point. A popup window will be displayed. Enter a name for the profile, the length of the measurement, and the current magnification. If you are not using a keyboard, double-click on each appropriate field to enable the on-screen keyboard. Once finished with the calibration, click on any measurement tool to use the profile.

Once saved, the profile will be listed in the main panel's drop-down selector. With the profile selected, you can select the desired unit of measure to display on-screen measurements in that unit.
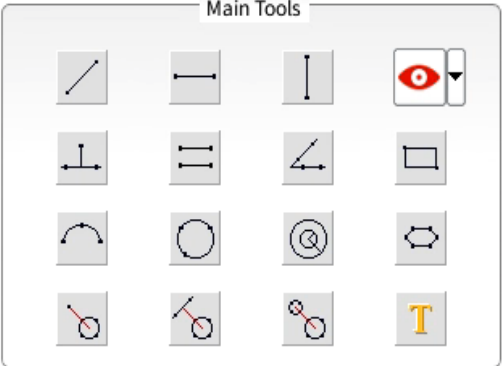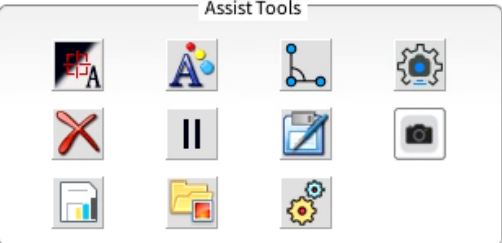
Calibration by Circle

This calibration is similar to line calibration, except it uses a circle which can be useful when referencing premeasured diameters. Click the left mouse button to create the first anchor point on the edge of the reference circle. As the cursor is moved, a line will be displayed. Move the cursor to the opposite side of the circle, then click the left mouse button again to create the second anchor point. A circle will now be displayed. Move the cursor to enlarge or reduce the size of the circle. Once the circle is properly sized, click the left mouse button. A popup window will be displayed. Enter a name for the profile, the length of the measurement, and the current magnification. If you are not using a keyboard, double-click on each appropriate field to enable the on-screen keyboard. Once finished with the calibration, click on any measurement tool to use the profile.

Once saved, the profile will be listed in the main panel's drop-down selector. With the profile selected, you can select the desired unit of measure to display on-screen measurements in that unit.

Main Tools

The Main Tools section contains measuring tools, reticles, and a text tool. These tools allow you to draw shapes to measure distances or areas.

Panel	Function	Description
Main Tools		Arbitrary Line: draw a line with an arbitrary angle
		Horizontal Line: draw a horizontal line
		Vertical Line: draw a vertical line
		Perpendicular Lines: draw perpendicular lines
		Parallel Lines: draw a pair of lines, and the second will be parallel to the first
		Angle: measure an angle
		Rectangle: draw a rectangle
		3-Point Arc: draw an arc
		3-Point Circle: draw a circle
		Concentric Circles: draw concentric circles
		Polygon: draw a polygon
		Circle to Point: measure the distance from the center of a circle to an arbitrary point
		Circle to Line: measure the distance from the center of a circle to a line
		Circle to Circle: measure the distance between the centers of two circles
		Text: add text
		Overlays: select from basic and graduated reticles, or set a background image

Assist Tools

The Assist Tools section provides the tools necessary for managing system settings, capturing images, and exporting files.

Panel	Function	Description
		Edge Detect Mode: select from automatic and manual
		Graphics Settings: change characteristics of shapes including color
		Output Settings
		Camera Settings: controls for manipulating camera settings
		Delete: remove graphics currently on screen
		Freeze Image: freezes the live video feed to display a static image
		Export
		Capture: captures photos
		Save Graphics: saves the graphics data
		Browse Folder: view saved images
		System Settings: manage system settings including file naming, saved data, etc.

The Camera Settings Panel

The Camera Settings panel provides controls for manipulating camera settings which can optimize image quality for specific subjects.
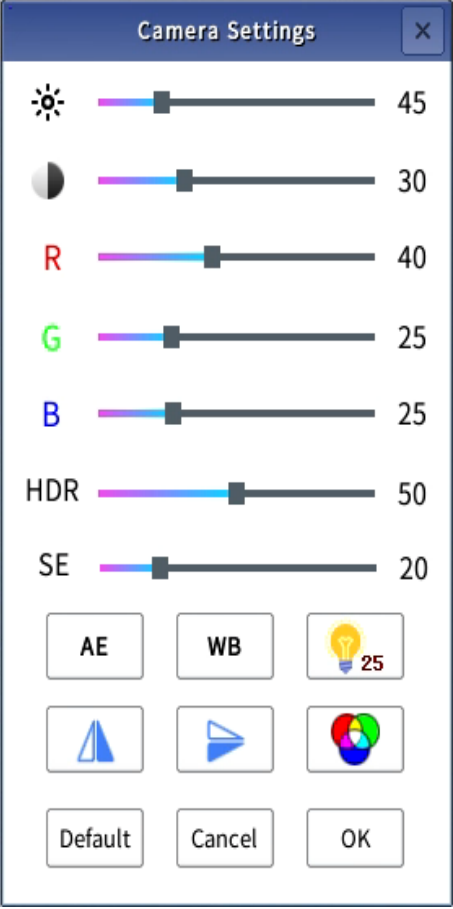
Panel	Function	Description
	☀	Adjust the brightness of the image.
	◗	Adjust the contrast of the image.
	R	Manually adjust the proportional Red level of the RGB image.
	G	Manually adjust the proportional Green level of the RGB image.
	B	Manually adjust the proportional Blue level of the RGB image.
	HDR	High Dynamic Range: adjust the compression level of colors to improve detail in overexposed or underexposed areas.
	SE	Sharpen Edges
	AE	Auto Exposure: automatically adjusts exposure settings
	WB	White Balance: adjusts color balance based on a neutral grey reference
	💡25	Frame Rate: select the video frame-rate to match the electrical frequency and eliminate flicker. Options include 25, 30, 50, 60.
	◁	Flip image horizontally
	▷	Flip image vertically
	🎨	Color Mode: choose color or monochrome
	Default	Resets the values to factory defaults

Image Exposure

Manual Exposure

The brightness setting is used to manually control the amount of light captured by the imaging device. Manual control is preferable when imaging light or dark specimens which do not appear properly exposed when using auto exposure.

Auto Exposure

Auto exposure automatically adjusts the brightness of the image by calculating an average of light levels in the viewable area. The process attempts to adjust the brightness level until the average is approximately middle grey.

Color

White Balance

The color of an object is influenced by the color of light reflecting off of it or passing through it. Different light sources produce light with different color-biases. Common examples are incandescent lamps which typically produce warm colors compared to fluorescent or LED lamps which produce cooler colors. This sort of bias is referred to as color temperature. Due to this phenomenon, a white object may appear slightly yellow in morning sunlight, and slightly blue in afternoon shade. To compensate for these variations, digital imaging devices can process images using what is called "white balance." The white balance process shifts colors based on the color of the light source, with the goal of producing a more neutral white or grey.

System Settings

The System Settings panel allows you to customize general software settings.

General Settings

Cursor Type

You can select either of two options for the type of cursor to display, including the arrow and the crosshair.

Menu Position

The main menu console can be docked on the left or right side.

System Time

Set the appropriate time to use for timestamps or file naming.

Language

Set the displayed language to English, Simplified Chinese, or Traditional Chinese.

Switch User

Use the administrator account or create a separate user account to maintain individual preferences. Functions such as Application Upgrade can only be accessed by the administrator account.

Restore Factory

Restore all system settings to factory-defaults.

Application Upgrade

This is used to upgrade the software in the case that a revision is released.

Image Tab

Image Data Source

This selects what will be included in saved images. Video includes the image generated by the camera. Scene includes any reticle, graphics or text overlaying the image. Window includes the menu console.

Image Naming Method

Select manual to be prompted for a file name when saving an image, or auto to generate a name automatically.

Image Saving Format

Select the file type to use. Options include JPG, BMP, and PNG.
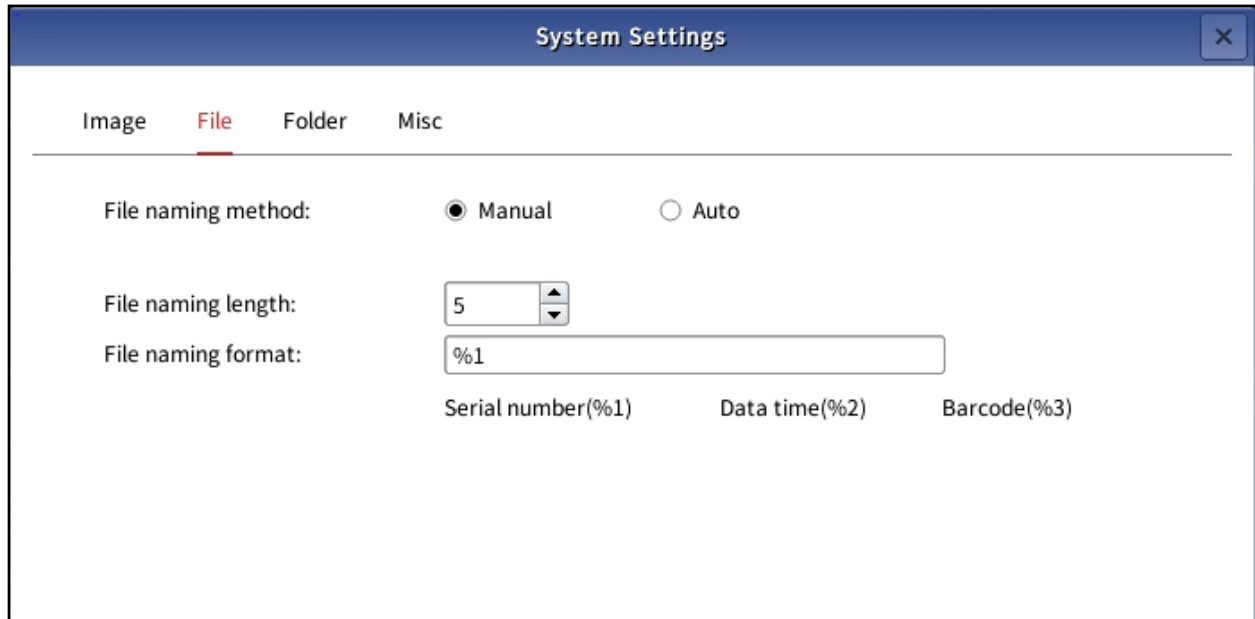
Image Saving Quality

This is used to set the level of quality for images being saved. A lower percentage will result in a smaller file, but image quality will be degraded. A higher percentage will result in a larger file with improved quality.

Image Naming Length

This sets the number of digits to be used when using the "serial number" option with automatically generated file names.

Image Naming Format

This defines what will be included in an automatically generated file name. You can enter custom text and use predefined placeholders. *%1* adds a numeric sequence to the file name, but only when the rest of the name is unique. *%2* adds a timestamp to the file name.

File Tab

File Naming Method

Select manual to be prompted for a file name when saving an image, or auto to generate a name automatically.
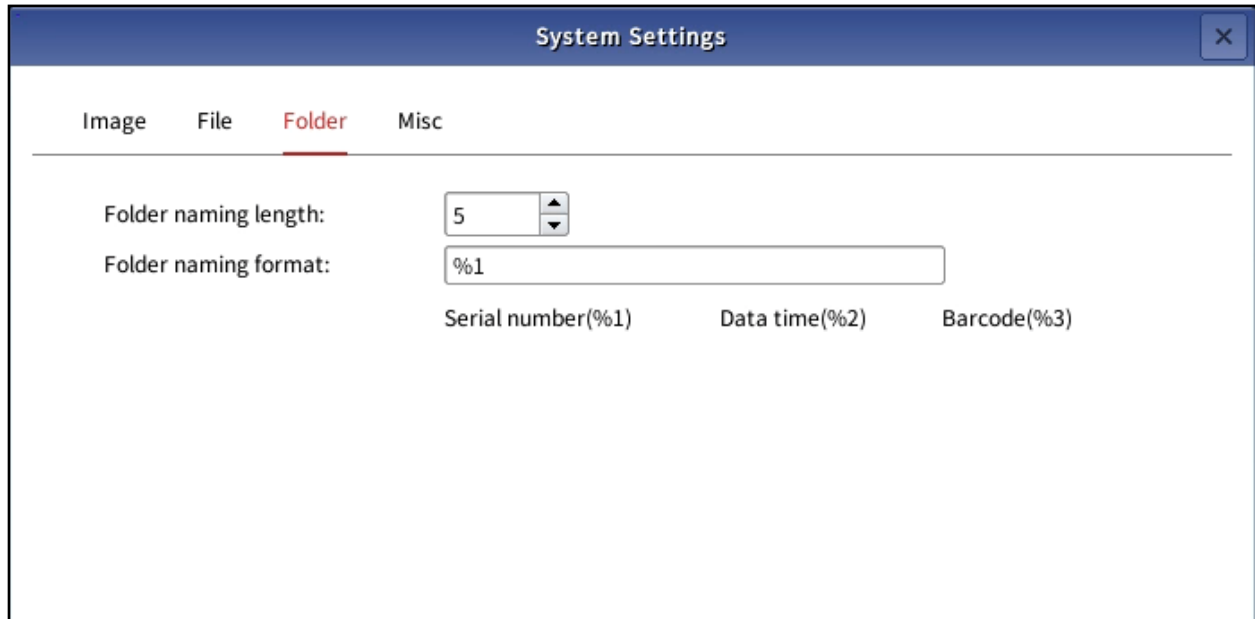
File Naming Length

This sets the number of digits to be used when using the "serial number" option with automatically generated file names.

File Naming Format

This defines what will be included in an automatically generated file name. You can enter custom text and use predefined placeholders. *%1* adds a numeric sequence to the file name, but only when the rest of the name is unique. *%2* adds a timestamp to the file name.

Folder Tab

Folder Naming Length

This sets the number of digits to be used when using the "serial number" option with automatically generated file names.

Folder Naming Format

This defines what will be included in an automatically generated folder name. You can enter custom text and use pre-defined placeholders. **%1** adds a numeric sequence to the folder name, but only when the rest of the name is unique. **%2** adds a timestamp to the folder name.

Misc Tab
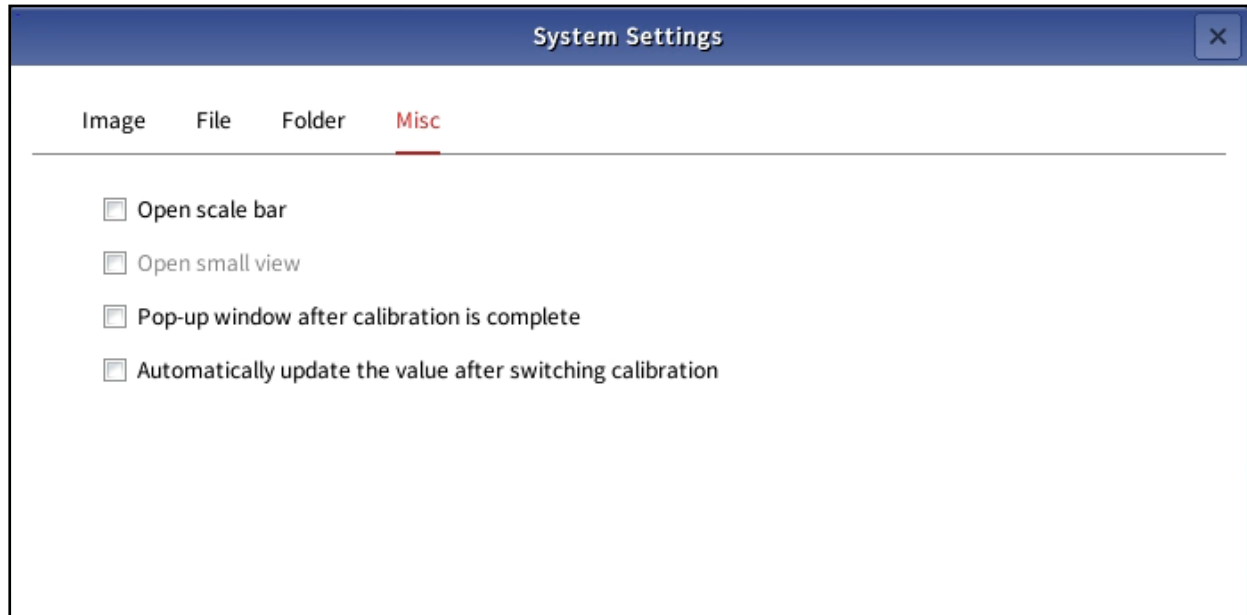
Open scale bar

This will display a scale bar on the bottom of the screen.

Open small view

Not currently used.

Pop-up window after calibration is complete

By default, you would need to right-click on the screen after drawing a reference line during the calibration process to display the calibration pop-up window. When this box is checked, the pop-up window will automatically display after the line is drawn.

Automatically update the value after switching calibration

When this box is checked, on-screen measurements will be recalculated when the calibration profile is changed.