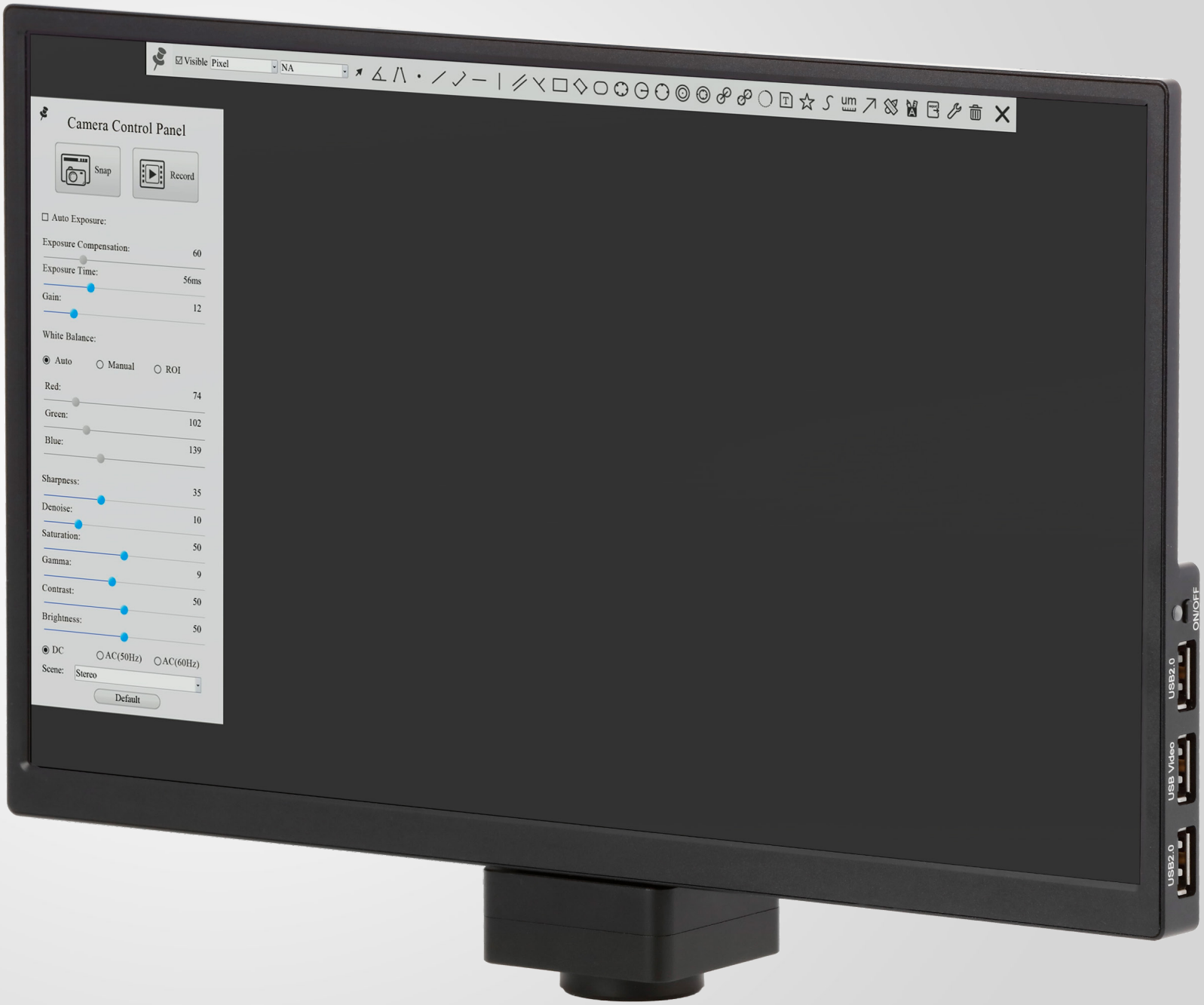


AmScope

CP480

User Guide

Safety

Before using your AmScope product, 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 sources 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

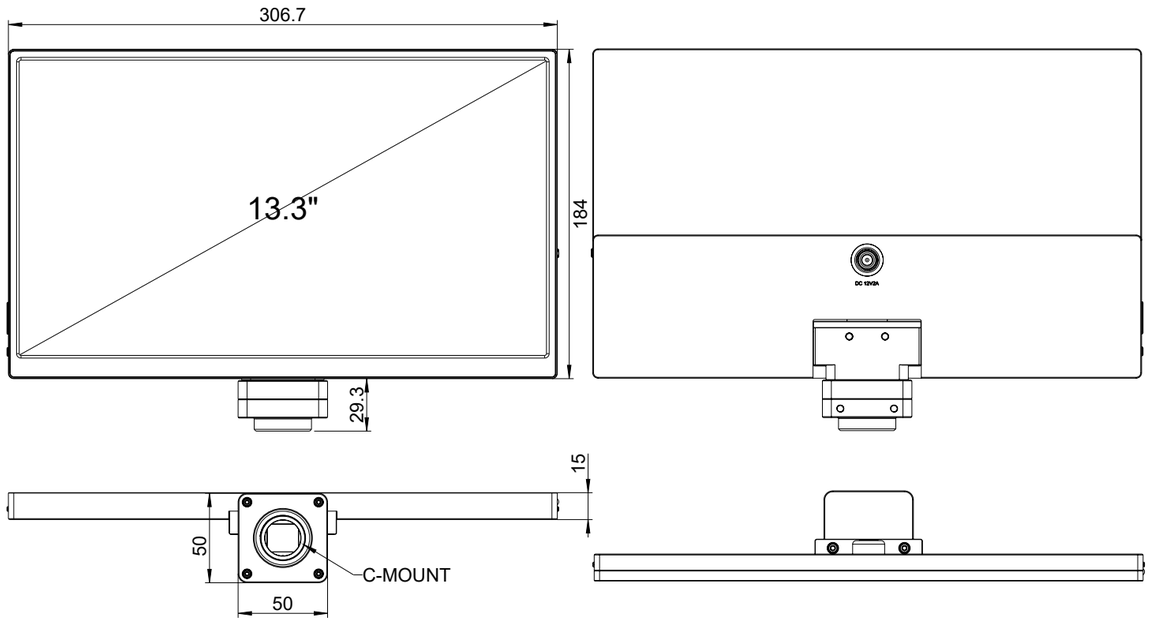
AmScope reserves the right to change specifications of the hardware and software at any time without notice. Continuous efforts are made to improve performance and reliability, which can result in changes to design and compatibility. Please contact AmScope for any concerns regarding such changes.

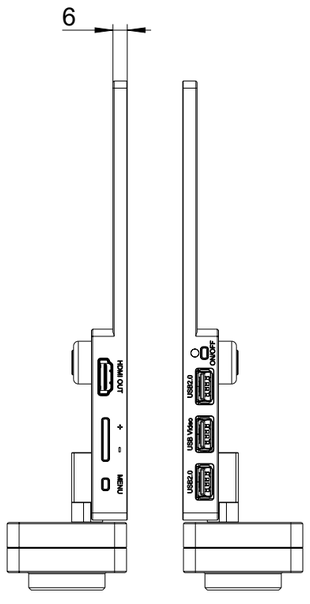
Proposition 65 Notice for California Residents

Cables included with the products described in this manual can expose you to chemicals including lead, which is known by the state of California to cause cancer, birth defects or other reproductive harm. Visit www.P65Warnings.ca.gov for more information.

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Specifications		
Sensor	IMX678 (color)	
Sensor Type	BSI CMOS	
Sensor Optical Format	1/1.8”	
Reduction Lens (Optional)	0.5X to 0.75X	
Active Recording Pixels	8.3M (3840 x 2160)	
Pixel Size	2.0µm x 2.0µm	
Active Sensor Area	7.68mm x 4.32mm	
Shutter	electronic rolling shutter	
Sensitivity	1364mV @ 1/30s (f/5.6)	
Video Resolutions	HDMI	3840x2160 30fps
	USB 2.0	3840x2160 30fps
	Wi-fi	3840x2160 30fps
File Formats	JPEG, TIFF (photo), MP4 (video)	
Recording Media	Requires external USB drive	
I/O	HDMI (video out), USB 2.0 x 2 (PC, external media, wi-fi), USB (mouse)	
Wi-Fi Standard	802.11ac 5GHz	
Lens Mount	C-Mount	
Power Requirements	DC 12V 2A	

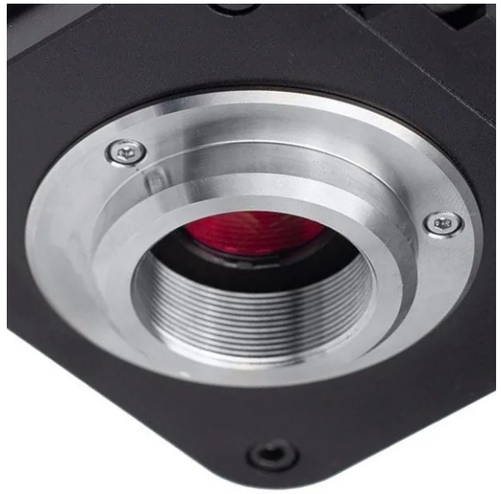
What’s In The Box

The CP480 standard outfit includes:

- One integrated imager/screen
- One USB mouse
- One HDMI cable
- One power adapter
- One USB wi-fi dongle

Setup

Attaching the Camera to a Microscope



This camera uses a C-Mount standard lens mount. The camera can be mounted directly to a microscope which provides a C-Mount photo port, or it can be mounted to an ocular or photo port by using an optional compensating lens. The C-Mount standard uses a 1” (25.4mm) diameter with 32TPI (0.794mm pitch).

To mount the camera to a C-Mount port, simply remove the camera’s lens-port dust-cap, then align the microscope’s port with the lens port. Rotate the camera in a clockwise manner until it is firmly attached. The photo port on some microscopes will have a rotating interface which can be locked and unlocked to change the orientation of the camera. If so, you can use this to properly align the camera to produce upright images. If not, you may need to unscrew the camera slightly to achieve the proper orientation.



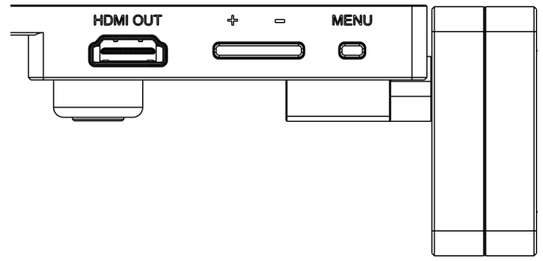
To use a compensating lens, the correct lens must be used. A compatible compensating lens would have a C-Mount thread which would allow it to screw onto the camera’s lens mount. The other end would be cylindrical, and would slide into one of the microscope’s ocular ports or photo port. The compensating lens will have a magnification such as 0.5X or 0.37X. When the lens has a magnification below 1X, it is referred to as a reduction lens since it reduces the size of the image projected onto the camera’s sensor. The magnification should roughly match the optical format of the camera’s image sensor (see Sensor Optical Format in the specification tables). For example, if the camera’s sensor format is 1/2”, then a 0.5X compensating lens would be appropriate.

Attach the lens to the camera by aligning the threads with the camera’s lens port. Gently screw the lens into the port in a clockwise manner until it is firmly attached. Next, slide the lens into an appropriate port. Because of the camera’s size and weight, it is better to use a port on the microscope intended specifically for cameras, such as a vertical trinocular port. This will avoid tipping the microscope, and can prevent the camera from rotating. Additionally, a sizing adapter may be needed if the diameter of the lens’ tube does not match the diameter of the port. Some lenses will include sizing adapters such as a 23mm to 30mm adapter.

Stand-Alone Mode

Use the included power adapter to connect the device to an AC power outlet. The power indicator light will turn red. Press the Power (ON/OFF) button once to power on the device. The power indicator light will turn blue and flash for several seconds while the internal software loads.

Screen Settings



Press the Menu button to display the menu. Use the “+/-“ buttons to move up or down through the menu options. Press the Menu button to select an option. To back out, press and hold the “-“ button.

Display Settings		
Picture	Brightness	1-10
	Contrast	0-10
	ECO	Standard, Game, Movie, Photo, Vivid
	Dynamic Contrast Ratio	On, Off
	Sharpness	0-4
Color	Color Temperature	9600K, 6500K, sRGB, User
	Hue	0-10
	Saturation	0-10
	Low Blue Light	0-10
	Freesync	On, Off
	Gamma	Off, 1.8, 2.0, 2.2, 2.4, 2.6
Audio	Volume	0-10
	Mute	On, Off
Other	Language	English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Korean, Russian, Thai
	High Dynamic Range	Off, Auto, 2084
	Reset	

Using with a PC

The camera can be used with a Windows, Mac, or Linux computer by installing AmScope imaging software which is included in the camera's packaging or can be downloaded from the AmScope website: https://amscope.com/pages/software-downloads.

Software is available for current versions of Windows, Mac OS, and Linux operating systems, but availability or compatibility is subject to change. Before connecting the camera to a computer, install the software to ensure the device will be recognized by the operating system. More information regarding the software is available in the software's help file which can be accessed from the software's menu under "Help."

The camera can be accessed from the computer using a USB connection or wi-fi. When the proper connection is made, the camera will be displayed in the software's list of available devices.

Connecting with USB

The camera can be connected to a computer using the provided USB cable. The cable has a type-A USB connector on either end. Plug one type-A connector into the camera's USB port labeled "USB Video". Plug the other type-A connector into one of the computer's available USB 2.0 or USB 3.0 ports. If the CP480 is not already powered on, press the power button and wait for the device to fully boot. If the AmScope software has been installed on the computer, the camera will be recognized as an imaging device, and can be accessed using the software.

USB Storage

A USB flash drive is required to store captured photos and videos. Attach a USB drive to one of the USB ports on the right side of the device labeled "USB". The port labelled "USB Video" is used for connecting to a PC.

Using on a Network

This imaging system can connect to a computer using wi-fi, allowing the AmScope imaging software to control the camera. The AmScope software must be installed on a compatible computer with wi-fi access.

A Note on Firewalls

When using this device with a computer, it may be necessary to create an exception for the imaging software. A firewall would prevent the software from connecting to a network device such as the camera. After the software has been installed, open your system's firewall settings and look for allowed applications.

For example, in Windows 11, Firewall & Network Protection settings include "Allow an app through firewall." This link will open a list of installed applications. Look for the AmScope application in the list, and ensure that the box next to it is checked.

Setup

First, attach the included wi-fi dongle to one of the CP480's USB ports. There are two wi-fi modes which can be used: AP (access point) and STA (station).

AP mode allows the camera to create an ad-hoc wireless network to which other devices can connect. This mode allows devices to connect directly to the camera without the need for a router or network switch.

STA mode is used to connect the camera to an existing wireless network. The camera's accessibility on the network is managed by the network's hardware, not the camera.

To switch the mode, move the cursor over the bottom of the screen to display the Camera Control Toolbar. Click on the  icon to open the Settings menu. Select Network from the list, then click on the Wi-Fi tab. The wi-fi mode can be selected from a drop-down selector.

AP Mode

When AP mode is selected, settings specific to this mode will be available. The Channel option allows you to switch through different frequencies in the selected band. This setting is only needed in the case that interference is encountered while connecting to wireless devices such as frequent drop-outs. The Password setting allows you to change the default password to be used by devices connecting to the camera's network. The default password is 12345678. Use your own password to better secure the encrypted connection.

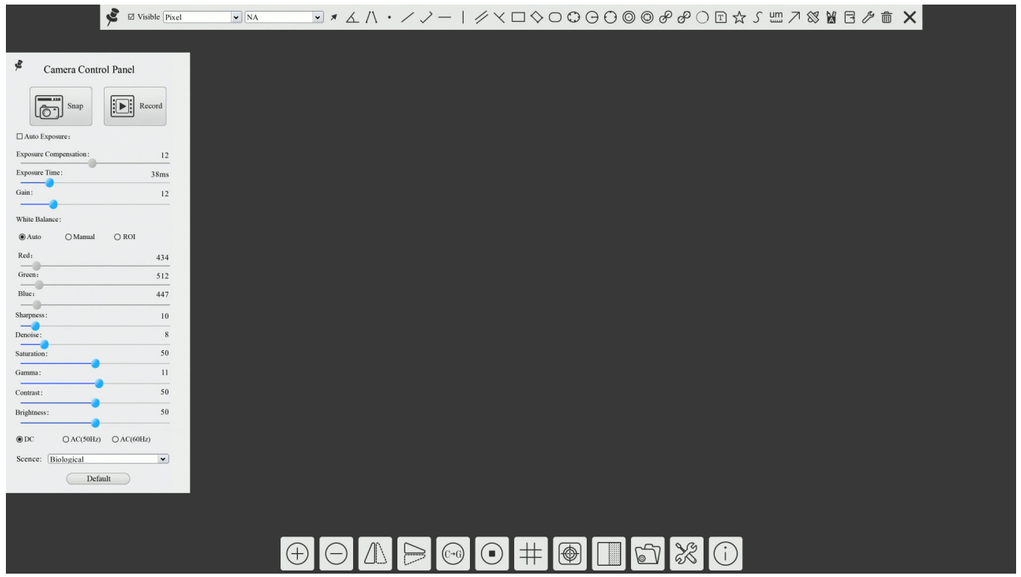
STA Mode

When STA mode is selected, you must enter the SSID and password for the wireless network to which you will connect. After the information has been entered, click the Apply button on the bottom right corner of the screen. If the camera successfully connects to the network, "STA Mode" will be displayed on the top left corner of the screen. If the connection fails, "STA Mode Failed" will be displayed. Should the connection fail, verify the SSID and password. If the SSID and password are correct, there may be a setting in the network's hardware or firewall preventing the camera from connecting.

User Interface - Stand-Alone Mode

This multi-function model uses an on-screen UI to operate. The camera controls are located in the panel on the left side of the window, the measurement toolbar on the top, and additional display controls and settings are on the bottom.

By default, the panels will only display when the mouse cursor is hovering over the appropriate area. Left-clicking on the “pin” icon will maintain the panel’s visibility, but will prevent other panels from opening.



The Camera Control Panel

The Camera Control Panel controls the camera to achieve the best video or image quality according to the specific applications. To open the panel, move the mouse cursor toward the left edge of the video window.

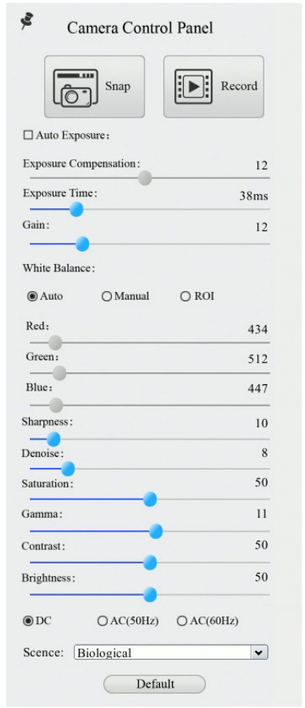
Control Panel	Function	Description
	Snap	Capture image and save it to the SD card.
	Record	Record video and save it to the SD card.
	Auto Exposure	When Auto Exposure is checked, the system will automatically adjust exposure time and gain according to the value of exposure compensation.
	Exposure Compensation	Available when Auto Exposure is checked. Slide to increase or decrease the overall brightness to compensate for varying subjects.
	Exposure Time	Available when Auto Exposure is not checked. Slide to increase or decrease exposure time for achieving appropriate brightness.
	Gain	Available when Auto Exposure is not checked. Slide to increase or decrease signal amplification. Increasing the amplification will increase brightness without adjusting exposure time, but will result in increased noise levels.
	Red	Manually adjust the proportional Red level of the RGB video.
	Green	Manually adjust the proportional Green level of the RGB video.
	Blue	Manually adjust the proportional Blue level of the RGB video.
	Auto (White Balance)	Continuously adjusts RGB levels automatically based on the overall video content.
	Manual (White Balance)	Enables the manual RGB controls to adjust the color balance.
	ROI (White Balance)	Use the on-screen Region-of-Interest selector (rectangle will appear) to define a region which should be used as reference when performing white balance.
	Sharpness	Slide to adjust the sharpness level of the video.
	Denoise	Slide to adjust the amount of noise-reduction to apply to the video.
	Saturation	Slide to adjust the color saturation of the video.
	Gamma	Slide to increase or decrease the Gamma level of the video.
	Contrast	Slide to adjust the contrast of the video.
	Brightness	Slide to adjust the image brightness
	DC	Select when using DC powered illumination. No flicker compensation.
	AC (50Hz)	Select when using AC powered illumination with 50Hz to remove flickering.
	AC (60Hz)	Select when using AC powered illumination with 60Hz to remove flickering.
	Preset	Preset common configurations
	Default	Restore all values in the Camera Control Panel to their default settings.

Image Exposure

Manual Exposure

Image exposure controls the amount of light captured by the imaging device. Exposure time is used to set the amount of time over which light is collected. More time will result in a brighter image. For most static subjects, increasing exposure time to achieve the appropriate brightness is the preferred method. For moving subjects, too much time will result in blurring as the subject's location changes over time. Exposure time must be limited in these cases to prevent excess movement. Use of the gain setting would therefore be the preferred method to achieve optimal brightness. Gain controls the amount of amplification applied to the signal generated by the imaging sensor. While the signal strength would be increased, noise generated during the imaging process would also be increased.

Auto Exposure

Auto exposure relies on software to set the exposure time and gain. This simplifies the workflow, especially when capturing images in changing lighting conditions. As a microscope's magnification changes, or the distance from the microscope to the subject changes, the amount of light collected will also change. Auto exposure can continuously compensate for these changes. This method assumes that the optimal amount of light would create an image with levels which would average to a middle tone. Because of this, images of light subjects may appear too dark, and images of dark subjects may appear too bright. For this reason, adjustment can be done using the exposure compensation control, sometimes called exposure target. This allows you to increase or decrease the target level of brightness.

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.

The Measurement Toolbar

The Measurement Toolbar will pop up when moving the mouse cursor toward the upper edge of the video window. This panel contains tools and settings for performing measurements.



Icon	Function
	Pin the Measurement Toolbar
	Show / Hide Measurement Objects
	Select Measurement Unit Select Magnification (requires calibration process)
	Object Selector
	Angle
	4-Point Angle
	Point
	Arbitrary-Angle Line
	3-Point Lines
	Horizontal Line
	Vertical Line
	Parallel
	3 Points Vertical Line
	Rectangle
	Ellipse
	5-Point Ellipse
	Circle
	3-Point Circle
	Annulus (Concentric Circles)

Icon	Function
	Two Circles with Distance from Centers
	Two 3-Point Circles with Distance from Centers
	Arc
	Text
	Polygon
	Curve
	Scale Bar
	Arrow
	Perform magnification calibration. Defines relationship between the measurement unit and pixel size. Requires the use of a micrometer slide.
	Auto Measurement: detect circle, detect annulus, detect rectangle
	Export measurement information to CSV file
	Access the camera's settings
	Delete measurement object
	Exit measurement mode
	Left-clicking on a measurement object will open the Object Location & Properties Control Bar. The icons on the control bar: • Move Up • Move Down • Move Left • Move Right • Adjust Color • Delete

When the Pin icon is clicked to lock the Measurement Toolbar, the Camera Control Panel will not be displayed until the Measurement Toolbar is unpinned by clicking the Exit icon .

The Camera Control Toolbar

The Camera Control Toolbar provides a subset of tools for controlling the camera's video, as well as general settings and the file viewer.



Icon	Function	Icon	Function
	Zoom In		Zoom Out
	Horizontal Flip		Vertical Flip
	Color/Grayscale		Freeze Video
	Display Crosshair/Grid		Overlay
	Compare Images		Browse Images and Videos on USB Drive
	Settings		Software Version Information

The **Zoom** tools allow you to use digital zoom to enlarge the on-screen image up to 10X in 0.2X increments.

Horizontal and **Vertical Flip** are used to reorient the on-screen image due to image-inversion caused by a microscope's optics or the camera's physical orientation.

Color/Grayscale can be used to switch between the camera's normal color image and a desaturated image.

Freeze Video will pause the live video.

A **Crosshair** or **Grid** can be displayed to assist with segmenting and counting, image alignment, and other operations.

Overlay allows you to load a DXF file which can be superimposed over the main image.

Compare Images allows you to compare two images side-by-side

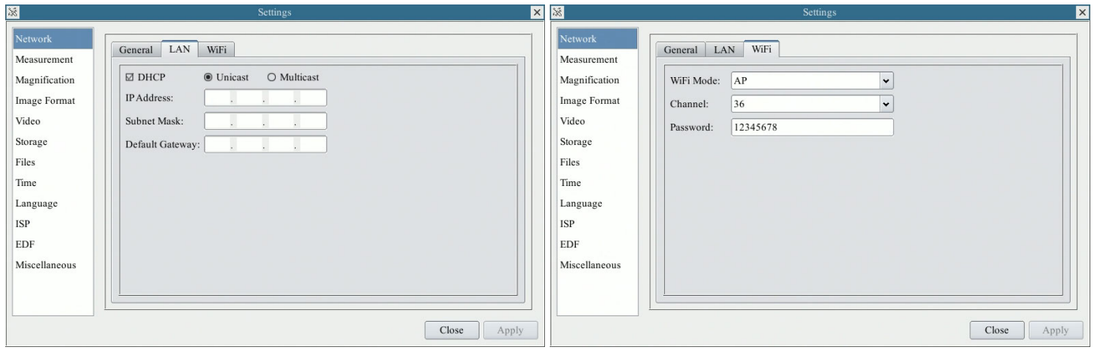
The **Browse** tool allows you to view media files recorded by the camera on attached USB media.

The **Settings** panel can be used to customize certain display options, manage saved magnification calibrations, choose image formats, and configure the camera for network operation.

Settings

Network

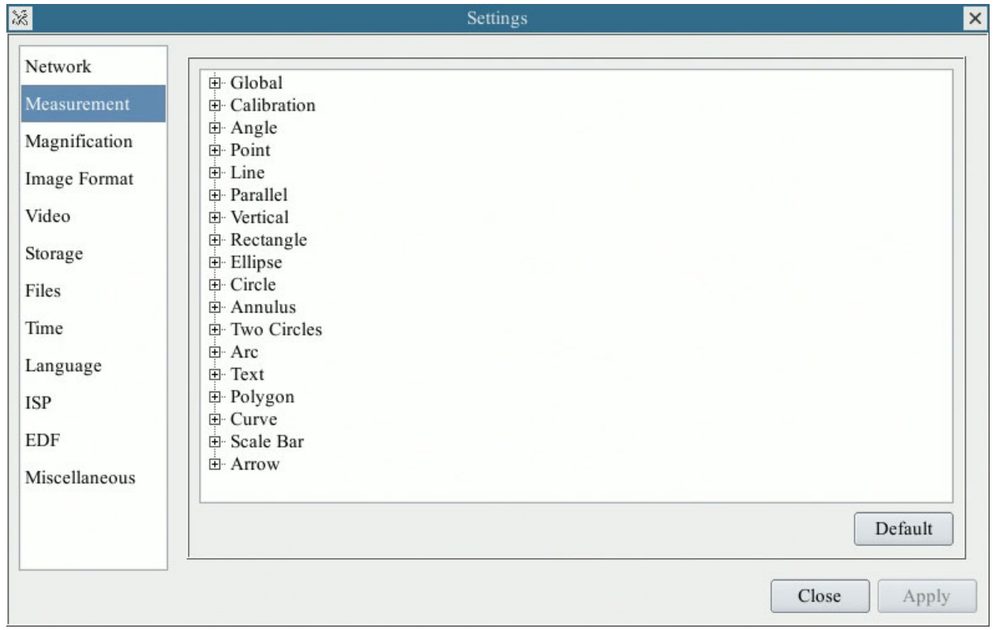
Network settings are used to configure the camera's LAN and WLAN settings. Camera models equipped with an Ethernet port can connect to a local-area network (LAN). Camera models which include a wi-fi dongle can be used with compatible computers and mobile devices using a wireless local-area network (WLAN).



General	Name	The camera's name which will appear on the network.	
Wi-Fi	AP	Channel	Select the wi-fi channel to use
		Password	Edit the password other devices will use to connect to the camera
	STA	SSID	Enter the network's SSID
		Password	Enter the network's password
LAN	DHCP	Select to allow the network's DHCP server to manage this device's network address	
	Transfer	Unicast	Sends data to one network device
		Mulicast	Sends data to multiple network devices
	IP Address	Manually define the network IP address	
	Subnet Mask	Manually define the network subnet mask	
	Default Gateway	Manually define the network default gateway	

Measurement

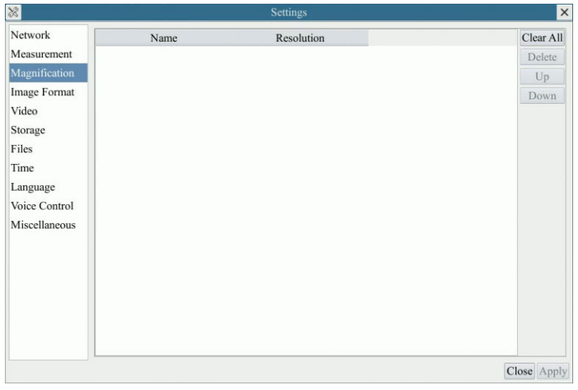
Measurement settings allow you to customize shapes, and define the precision of measurements.



Global	Precision	Sets the decimal scale: number of digits after a decimal point
Calibration	Line Width	Sets the width of lines used for calibration
	Color	Sets the color of lines used for calibration
	Endpoint	Sets the shape used at each endpoint of a line. Includes null or rectangle
Angle, Point, Line, Parallel Line, Vertical Line, Rectangle, Ellipse, Circle, Annulus, Two Circles, Arc, Text, Polygon, Curve, Scale Bar, Arrow		
	Each shape or element can be customized using attributes such as Line Width and Color	

Magnification

Magnification settings allow you to edit stored magnification calibrations. Each time the calibration process is completed, you can save the results as a magnification preset. These presets can be selected from the Measurement Toolbar to use the appropriate, calibrated settings.



Name	This is the user-defined name of magnification setting. Names typically incorporate the magnification of the objective lens used, and additional information pertaining to the microscope or camera used.
Resolution	The number of pixels per meter.
Clear All	Clears all saved calibration data
Delete	Clears the selected calibration data

Image Format

Image Format settings allow you to determine whether measurement objects will be merged into saved images, or embedded as a separate layer.

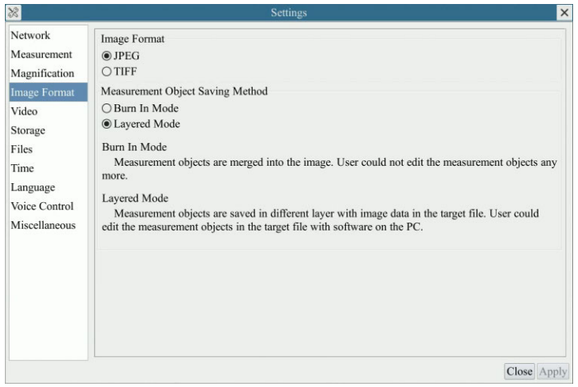
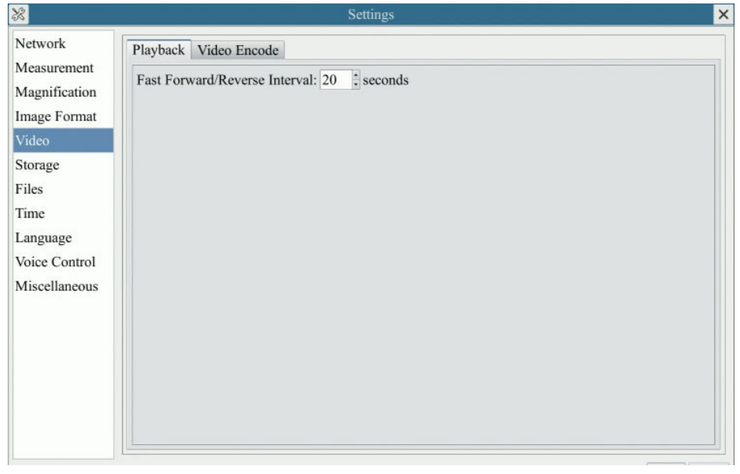


Image Format	Choose the file type to be used: JPEG or TIFF	
Measurement Object Saving Method	Burn In Mode	Measurement objects are merged with the image before saving the file. Objects can neither be edited nor removed.
	Layered Mode	Measurement objects are saved in a separate layer, and can be edited.

Video

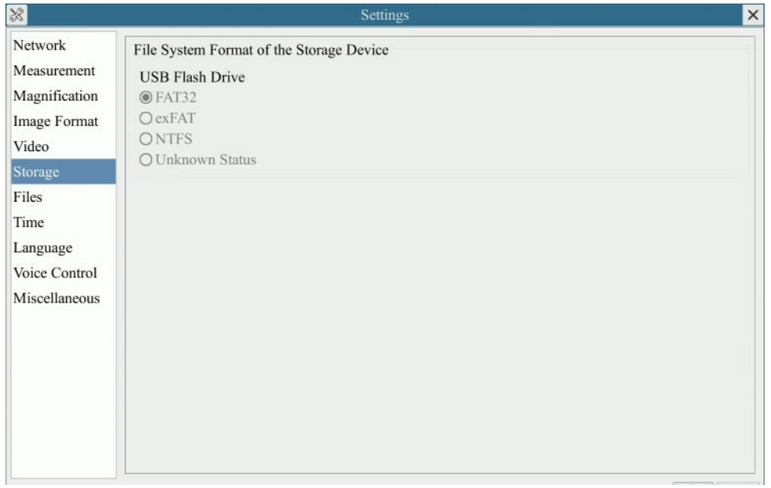
Video settings allow you to change the fast-forward and reverse intervals, and to choose the video codec.



Playback	Fast Forward/Reverse Interval	The number of seconds to be skipped when fast-forwarding or reversing playback of videos
Video Encode	H264	Older AVC video codec with better compatibility across multimedia devices, but less efficient compression compared to H265.
	H265	Newer HEVC video codec with improved compression while retaining high quality

Storage

Storage displays the format of any recognized USB flash drive. If compatible media is recognized, the media's file system will be shown, such as FAT32, exFAT, and NTFS. Unformatted cards must be formatted on a computer or other device prior to being used with the camera.



Language

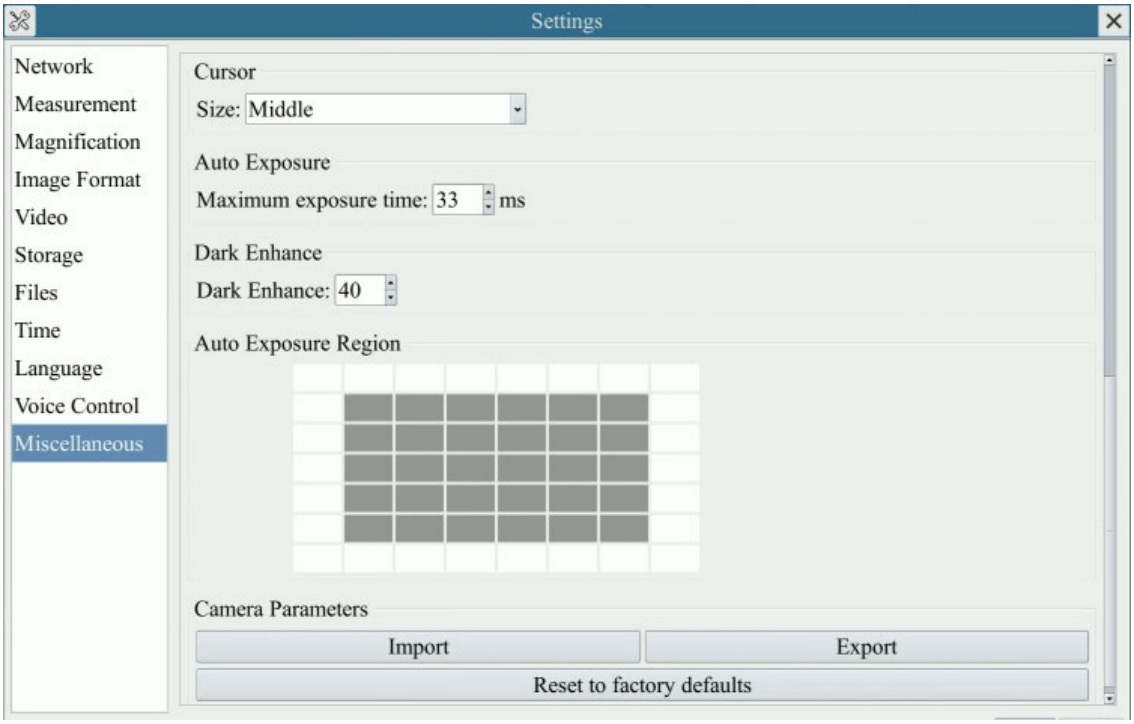
Language setting selects which language will be displayed. Options include English, Simplified Chinese, Traditional Chinese, Korean, Thai, French, German, Japanese, Italian, Russian.



Miscellaneous

Miscellaneous settings include additional helpful settings.

Clarity Factor	Select whether to display the clarity factor or not. The clarity factor is a numeric value which measures the clarity of the image based on detail and contrast. This can provide guidance when focusing.
Ruler	Select whether to display the on-screen rulers or not, and choose the color.
Measurement	
Overlay	Enable or disable Burn In Mode which rasterizes and saves overlays as part of the image.
Grids	Enable or disable Burn In Mode which rasterizes and saves grids as part of the image.
USB video output switch back to mouse operation	When switching from USB (PC control) mode back to stand-alone mode, should the device restart automatically or manually.
ROI	Set the color for the Region of Interest rectangle



Cursor	Select the cursor size.	
Auto Exposure	Set the maximum exposure time for Auto Exposure mode	
Dark Enhance	Set the intensity of dark enhancement using a value from 0 to 100.	
Auto Exposure Region	Define the regions of the image used for Auto Exposure	
Camera Parameters	Import	Import previously-saved parameters from the SD card
	Export	Export current parameters to the SD card
	Reset to Factory defaults	Restore all parameters to the factory-default values