The X8CAM4K_MR Series HDMI/NETWORK/USB Multi-outputs C-mount CMOS Camera Help Manual

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1 X8CAM4K_MR Series Camera Application

Figure 1 The X8CAM4K_MR Series Camera (Image Capture Sub-device and Master Device)

The X8CAM4K_MR is a separated long-distance transmission HDMI camera developed by Touptek, the master device and the image acquisition sub-device are connected by USB3.0 cable, the connection cable is up to 10 metres long, with USB3.0 A male to MicroB interface and screw lock. Separate design can be convenient for customers to integrate the small volume of capture sub-equipment into the host of the relevant industry, the master device external, easy to connect to the monitor or computer for operation and control. The basic characteristic is listed as below:

- Sony STARVIS 2 back-illuminated CMOS sensor
- 4K HDMI/ NETWORK/ USB multiple video synchronous outputs
- 4K/1080P auto switching according to monitor resolution
- 4K 60fps low delay HDMI output mode, with an average delay of 100ms
- Supports customized development based on neural network capabilities, including object recognition, counting, and detection functions
- Supports network storage function (images captured or videos recorded by the camera are saved in real time to network storage drives)
- Support the capture and display of JEPG, TIFF, PNG and RAW format images
- Supports external USB 3.0 interface solid-state drive, and supports automatic saving of recorded videos in case of sudden power failure
- Supports USB voice control module, enabling real-time control of the camera through voice commands for taking photos, recording videos, freezing, and other operations
- Excellent ISP with local tone mapping and 3D denoising
- Provide real-time video EDF function and real-time Stitch function
- Provide two sets of default ISP parameters for biological microscope and stereo microscope
- New browsing function, providing rich file operation functions, image to image comparison, image to real-time video comparison, multi-image EDF function, multi-image Stitch function
- Embedded XCamView for the control of the camera and image processing, supporting automatic edge finding and measurement functions
- ToupView/ToupLite software for PC
- iOS/Android applications for smart phones or tablets

2 X8CAM4K_MR Series Camera Datasheet and Functions (2)

Order Code	Sensor & Size(mm)	Pixel(μm)	G Sensitivity Dark Signal	Sensor Output (FPS/Resolution)	Binning	Exposure(us)
X8CAM4K8MPC_MR	IMX678(C) 1/1.8"(7.68x4.32)	2.0x2.0	3541mv with 1/30s 0.15mv with 1/30s	60@3840*2160	1x1	23~10^6
X8CAM4K8MPB_MR	IMX585(C) 1/1.2"(11.14x6.26)	2.9x2.9	5970mv with 1/30s 0.13mv with 1/30s	60@3840*2160	1x1	58~10^6

Camera Model	Video Saving (FPS/Resolution)	HDMI2.0(FPS/Resolution)	USB3.0(FPS/Resolution)	NETWORK(FPS/Resolution)
X8CAM4K8MPC_MR	60@3840*2160 60@1920*1080 60@1280*720	60@3840*2160 60@1920*1080	30@3840*2160 45@2688*1512 60@1920*1080	30@3840*2160 60@1920*1080 60@1280*720
X8CAM4K8MPB_MR	60@3840*2160 60@1920*1080 60@1280*720	60@3840*2160 60@1920*1080	30@3840*2160 45@2688*1512 60@1920*1080	30@3840*2160 60@1920*1080 60@1280*720

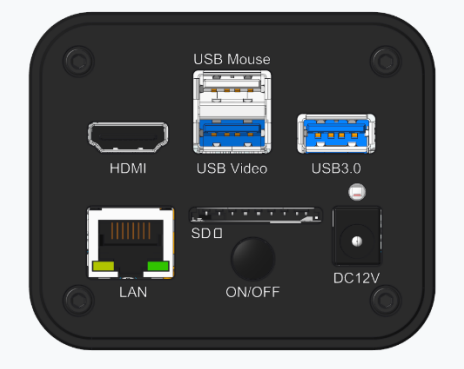


Figure 2 Available Ports on the Back Panel of the Camera Body

Interface or Button	Function Description
USB Mouse	Connect USB mouse for easy operation with embedded XCamView software Connect USB voice control for enable real-time control of camera snap, recording, freezing, and other operations
USB3.0	Connect USB flash drive to save pictures and videos Connect 5G WiFi module to transfer video wirelessly in real time Connect USB microphone to record audio and video Connect USB voice control for enable real-time control of camera snap, recording, freezing, and other operations
USB Video	Connect PC or other host device to realize video image transmission
HDMI	Comply with HDMI2.0 standard. 4K/1080P format video output and supporting automatic switch between 4K and 1080P format according to the connected monitors
LAN	LAN port to connect router and switch to transfer video
SD	SD card slot, comply with SDIO3.0 standard and SD card could be inserted for video and images saving
ON/OFF	Power switch
LED	LED status indicator
DC12V	Power adapter connection (12V/1A)
Video Output Interface	**Function Description**
HDMI Interface	Comply with HDMI2.0 standard;60fps@4K or 60fps@1080P
LAN Interface	Support real time resolution switching(4K/1080P/720P) H264 encoded video DHCP configuration or manual configuration Unicast/multicast configuration
WiFi Interface	Connecting 5G WiFi adapter (USB3.0 slot) in AP/STA mode
USB Video Interface	Connecting USB Video port of PC for video transfer MJPEG/NV12 format video
Other Function	**Function Description**
Video Saving	Video format：8M (3840*2160) H264 encoded MP4 file Video saving frame rate：60fps
Image Capture	8M (3840*2160) JPEG/TIFF/PNG/RAW image in SD card or USB flash drive (Default SD card priority, priority can be modified in settings)
Measurement Saving	Measurement information saved in different layer with image content Measurement information is saved together with image content in burn in mode
ISP	Exposure(Automatic / Manual Exposure) / Gain， White Balance(Manual / Automatic / ROI Mode), Sharpening, 3D Denoise, Saturation Adjustment, Contrast Adjustment, Brightness Adjustment, Gamma Adjustment, Hue Adjustment, 50HZ/60HZ Anti-flicker, Color to Gray, 50HZ/60HZ Anti-flicker, Dark Enhance, Clarity Enhance, Purple Reduction, Brightness Enhance Function

Image Operation	Zoom In/Zoom Out (Up to 10X), Horizontal/Vertical Flip, Freeze, EDF, Stitch, Grids, Overlay, PIP, Browser (including Picture Browsing, Video Playback, Video Compare, Picture Compare, EDF, Stitch, Image Processing), Measurement Function
Embedded RTC(Optional)	To support accurate time on board
Restore Factory Settings	Restore camera parameters to its factory status
Multiple Language Support	English / Simplified Chinese / Traditional Chinese / Korean / Thailand / French / German / Spanish / Japanese / Italian / Russian / Dutch / Portuguese
Software Environment under Network/USB Video Output	
White Balance	Auto White Balance
Color Technique	Ultra-Fine Color Engine
Capture/Control SDK	Windows/Linux/macOS/Android Multiple Platform SDK(Native C/C++, C#/VB.NET, Python, Java, DirectShow, Twain, etc)
Recording System	Still Picture or Movie
Operating System	Microsoft® Windows® XP / Vista / 7 / 8 / 8.1 / 10 / 11(32 & 64 bit) OSx(Mac OS X) Linux
PC Requirements	CPU: Equal to Intel Core2 2.8GHz or Higher
	Memory: 4GB or More
	Ethernet Port: RJ45 Ethernet Port
	Display:19” or Larger
	CD-ROM
Operating Environment	
Operating Temperature (in Centidegree)	-10°~ 50°
Storage Temperature (in Centidegree)	-20°~ 60°
Operating Humidity	30~80%RH
Storage Humidity	10~60%RH
Power Supply	DC 12V/1A or above Adapter

3 Dimension of X8CAM4K_MR Series Camera

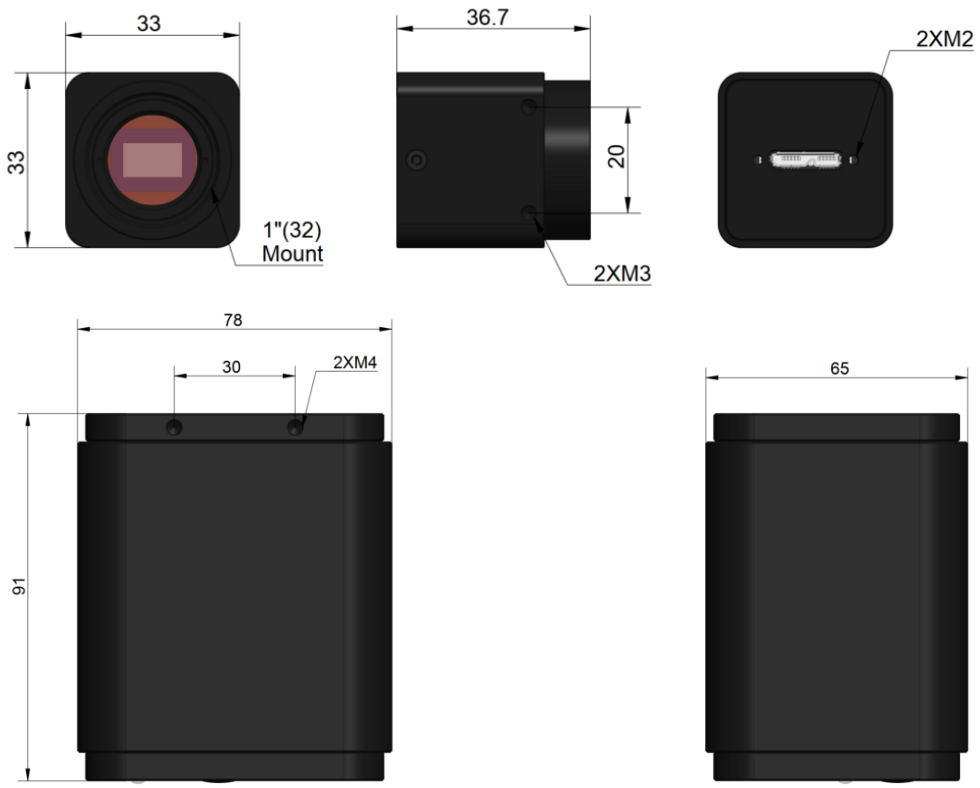


Figure 3 Dimension of X8CAM4K_MR Series Camera (Image Capture Sub-device and Master Device)

4 X8CAM4K_MR Series Camera Packing Information

Figure 4 X8CAM4K_MR Series Camera Packing Information

Standard Packing List	
A	Gift box: L:25.5cm W:17.0cm H:9.0cm (1pcs, 2Kg/ box)
B	X8CAM4K_MR Camera master device
C	X8CAM4K_MR Camera image capture sub-device
D	USB3.0 A Male to MicroB Cable (4.5m)
E	Power Adapter: Input: AC 100~240V 50Hz/60Hz, Output: DC 12V 1A American standard: Model: POWER-U-12V1A(MSA-C1000IC12.0-12W-US) European standard: Model: POWER-E-12V1A(MSA-C10001C12.0-12W-DE) British Standard: Model: POWER-UK-12V1A(NGE12I12-P1J)
F	USB Mouse
G	HDMI Cable
H	USB3.0 A male to A male gold-plated connectors cable /1.5m
Optional Accessory	
I	SD Card (16G or above; Speed: class 10)
J	USB flash drive
K	Ethernet cable
L	USB WiFi adapter
M	Voice Control Module

5 Software and App

The software or the APP can be downloaded from the following link：

Windows: https://www.touptekphotonics.com.cn/download/

macOS: https://www.touptekphotonics.com.cn/download/?category=macOS

Linux: https://www.touptekphotonics.com.cn/download/?category=Linux

Android: https://www.touptekphotonics.com.cn/download/?category=Android

iOS: https://www.touptekphotonics.com.cn/download/?category=iOS

6 X8CAM4K_MR Series Camera Configurations

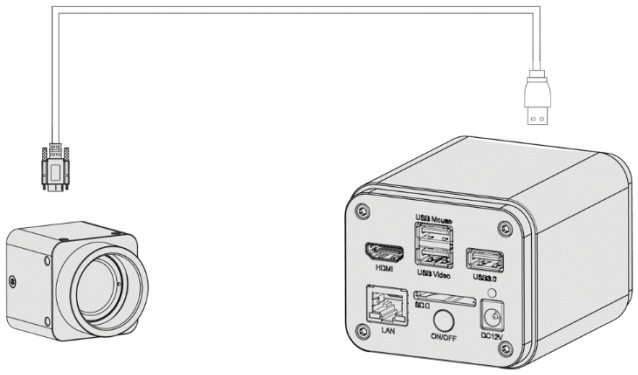
You can use the X8CAM4K_MR series camera in 5 different ways. Each application requires different hardware environment.

6.1 Camera working standalone with built-in XCamView software

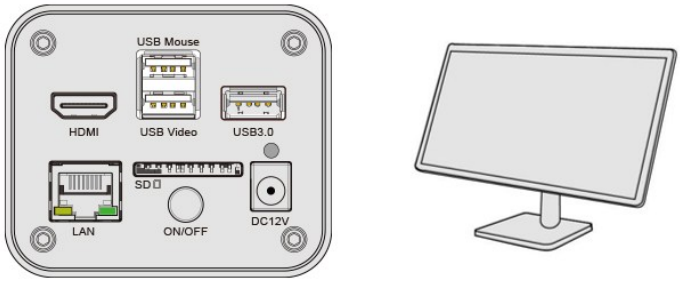
This application requires an X8CAM4K_MR series camera, a lockable USB 3.0 A to MicroB data cable, an HDMI interface display, an HDMI cable, an SD card or USB flash drive, a USB mouse included with the camera, and a power adapter. The steps to start the camera are listed as below:

Figure 5 X8CAM4K_MR Series Camera with the HDMI Monitor

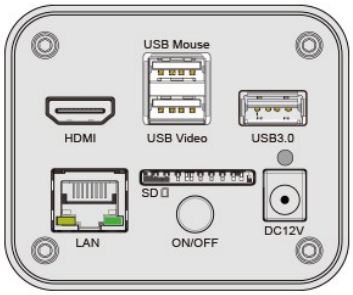
Connect the X8CAM4K_MR series camera's image capture sub-device to the master device using the supplied USB3.0 A Male to MicroB cable with locking clips;

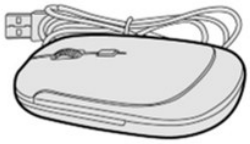


Connect the camera to a HDMI monitor using the HDMI cable;

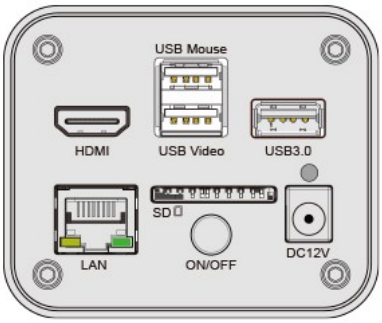


Insert the supplied USB mouse to the camera's USB Mouse port;

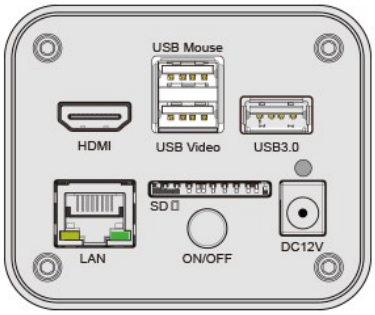


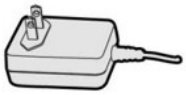


Insert the supplied SD card/USB flash drive into the X8CAM4K_MR series camera SD card slot/USB3.0 slot;



Connect the camera to the power adapter and turn it on;





Turn on the monitor and view the video in the XCamView software. Move the mouse to the left, top or bottom of the XCamView UI, different control panel or toolbar will pop up and users could operate with the mouse at ease.

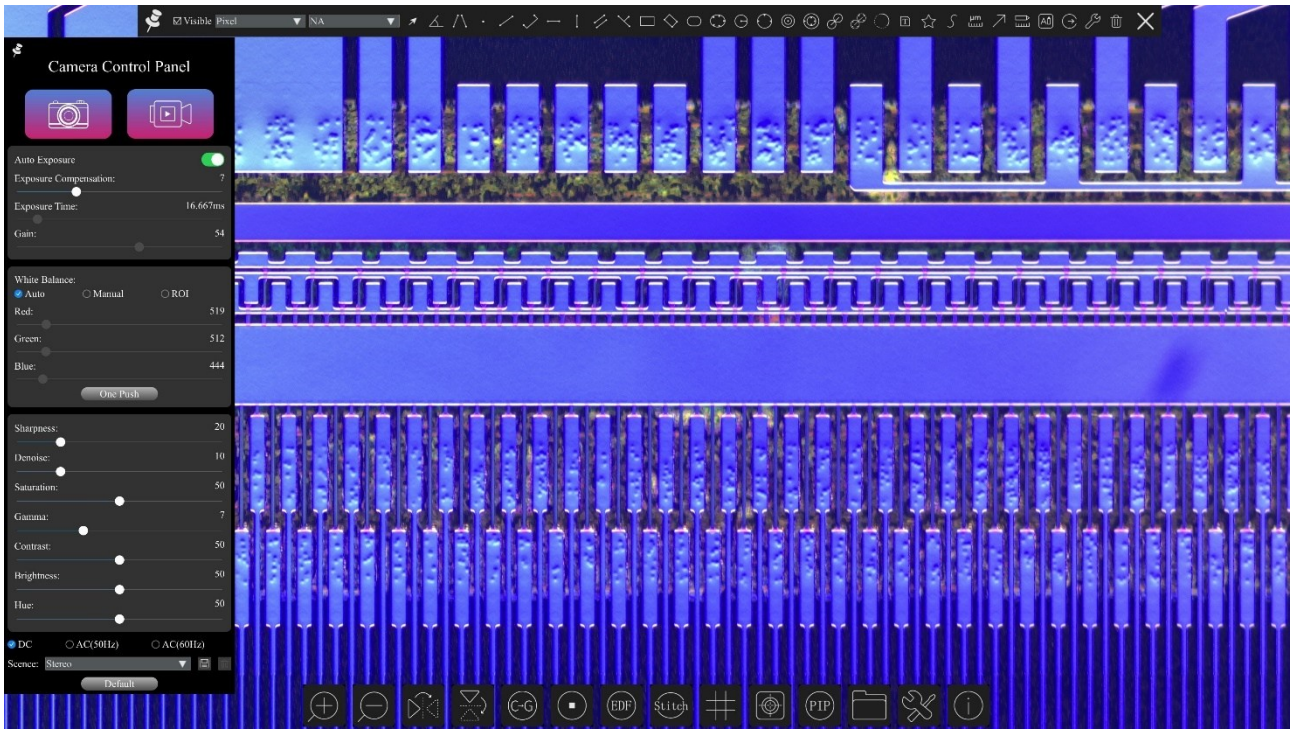


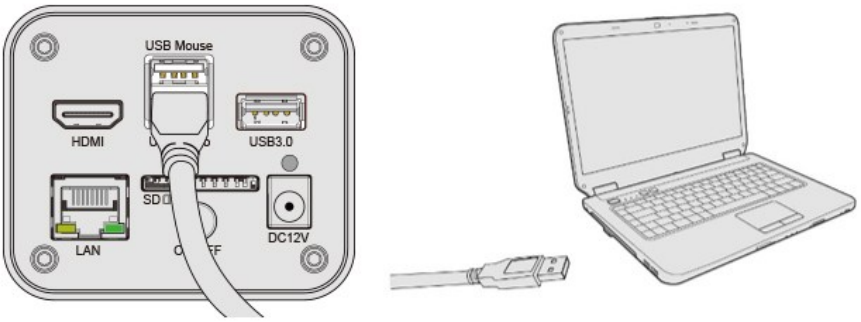
Figure 6 XCamView And X8CAM4K_MR Series Camera in HDMI Mode

6.2 Connecting camera to computers with USB3.0 port

For Windows user (Windows XP (32bit), Windows 7/8/10/11 (32/64 bit)), please use ToupView.

For macOS and Linux user (macOS 10.10 or above or Linux distributions with kernel 2.6.27 or higher), please use ToupLite. The steps to start the camera are listed below:

Start the camera according to Sec. 6.1. After the camera is running, connect camera to computer with USB cable. Please use "USB Video" slot, The upper left corner of the HDMI graphics interface displays "USB3.0 Mode" or "USB2.0 Mode", indicating that a connection has been established with the PC.



Install ToupView/ToupLite on your PC or install ToupView App on the mobile device; Run the software ToupView/ToupLite, clicking the camera name in the Camera List group to start the live video as shown in Figure 7.

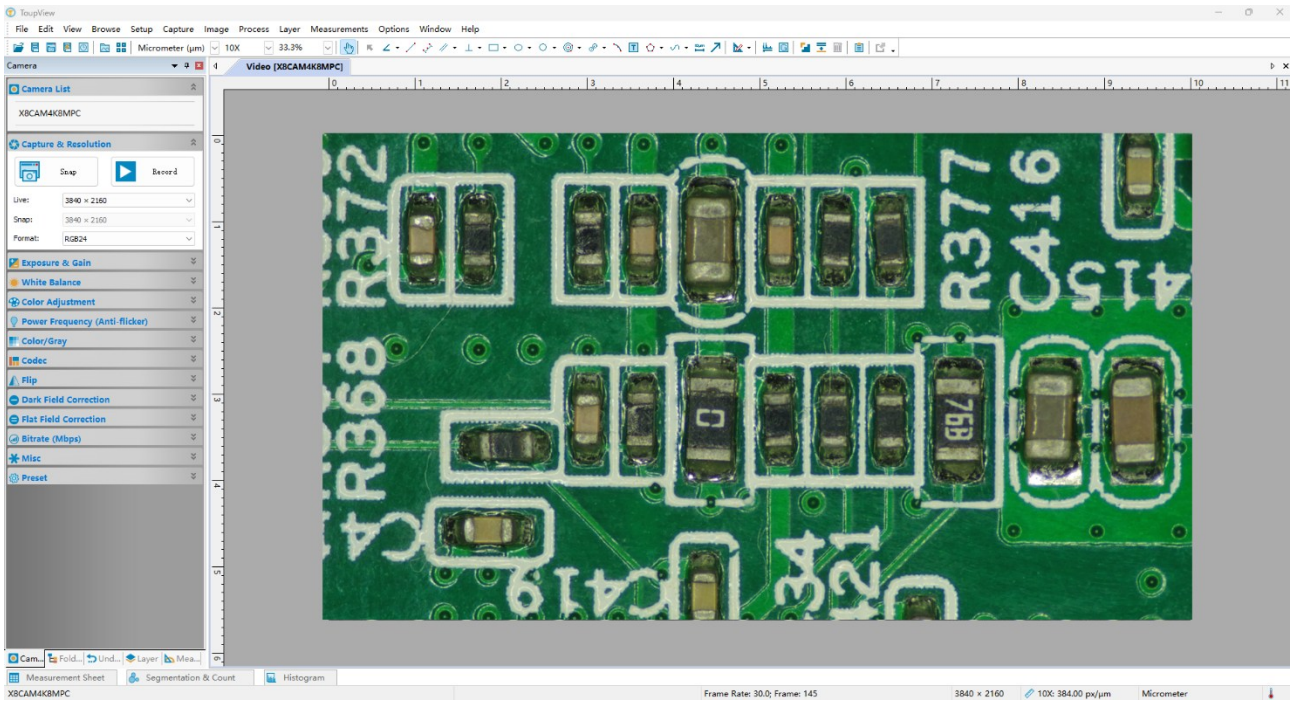


Figure 7 ToupView and X8CAM4K_MR Series Camera in USB Mode

6.3 Camera working in WiFi mode (AP mode)

Please make sure your PC is WiFi enabled.

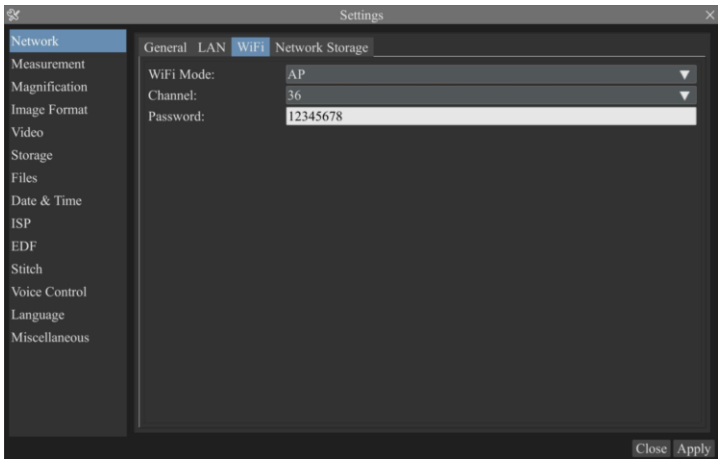
Figure 8 The PC or Mobile Device Connect to the Camera through WiFi

For Windows user (Windows XP (32bit), Windows 7/8/10/10/11 (32/64 bit)), please use ToupView.

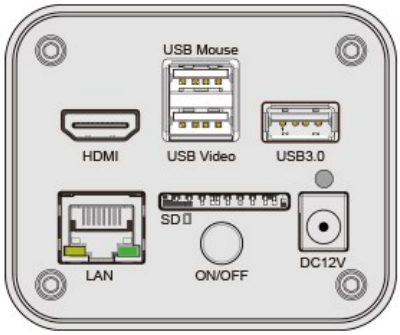
For macOS and Linux user (macOS 10.10 or above or Linux distributions with kernel 2.6.27 or higher), please use ToupLite. When connecting the camera with a mobile device, the free ToupView App is required. Just make sure that the mobile device uses iOS 11 or higher/Android 5.1 or higher operating systems.

The steps to start the camera are listed below:

Start the camera according to Sec. 6.1. After the camera is running, move the mouse to the bottom of the GUI and clicking the button on the Synthesis Camera Control Toolbar at the bottom of the video window, a small window called Settings will pop up as shown below. Click Network> WiFi property page and choose the AP in the WiFi Mode edit box (The factory default configuration is AP mode).



Plug the USB WiFi adapter into the camera's USB3.0 port, the upper left corner of the HDMI graphics interface will display "AP mode";



Install ToupView/ToupLite on your PC or install ToupView App on the mobile device, connect the PC or mobile device to the camera's WiFi AP point; The network name (SSID) and the WiFi password (The default one is 12345678) can be found on the camera's Setting>Network> WiFi page in AP mode.

Start ToupView/ToupLite software or ToupView App and check the configuration. Normally, the active X8CAM4K_MR series cameras will be automatically recognized. The live image of each camera is shown in Figure 9. For the display, the Camera List group is used in ToupView/ToupLite software, and the Camera Thumbnail is used in ToupView App.

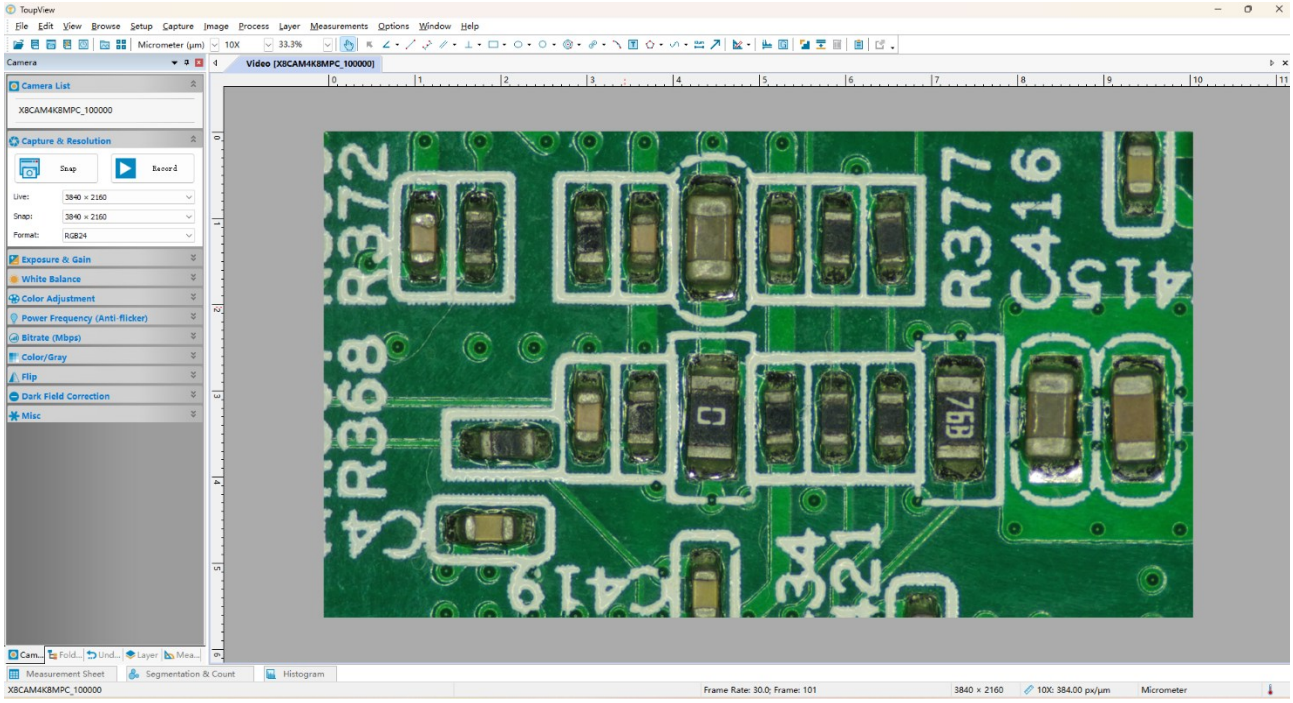


Figure 9 ToupView and X8CAM4K_MR Series Camera in WiFi AP Mode

6.4 Connecting camera to the PC with LAN port

This application uses the camera as the network camera. User must configure the IP of the camera and PC manually

and ensure their IP addresses in the same net. The subnet mask and gateway of the camera and PC must be the same.

Figure 10 Connecting theX8CAM4K_MR Series Camera with Ethernet Cable to the PC

Start the camera according to Sec. 6.1 after the camera is running, clicking button on the Synthesis Camera Control Toolbar at the bottom of the video window(See Figure 6), a small window called Settings will pop up as shown below on the left side, clicking LAN property page, uncheck the DHCP item. Input IP Address, Subnet Mask and Default Gateway for the camera. Designate Internet Protocol Version 4 (TCP/IPv4) Settings page's IP address on the PC with similar configuration as shown below on the right side but with different IP address.

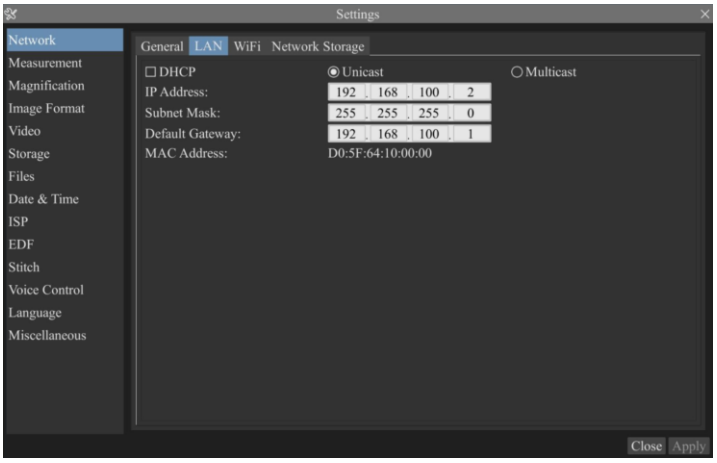


Figure 11 Configure theX8CAM4K_MR Series Camera IP

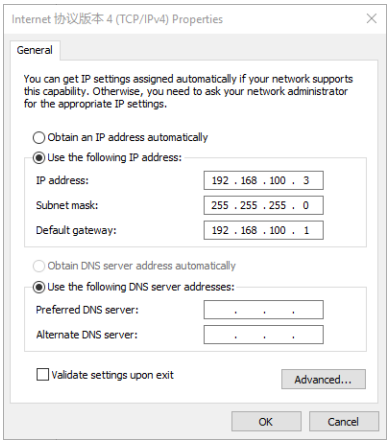
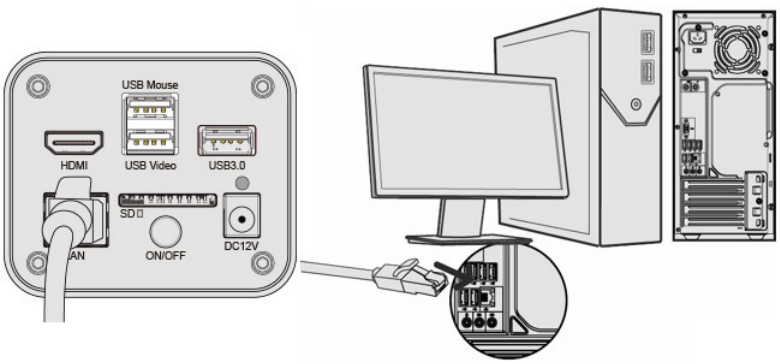


Figure 12 Configure the PC's IP

After the above configurations are finished, user can connect the X8CAM4K_MR series camera to the computer through the Ethernet cable as shown below:

Connect the LAN port with the Ethernet cable to the PC's network port, the upper left corner of the HDMI graphics interface will display IP address;



Install ToupView/ToupLite on your PC or install ToupView App on the mobile device; Run the software ToupView/ToupLite, clicking the camera name in the camera list starts the live video as shown in Figure 9.

6.5 Connecting multi-cameras to the router through the LAN port/ WiFi STA mode for the network application

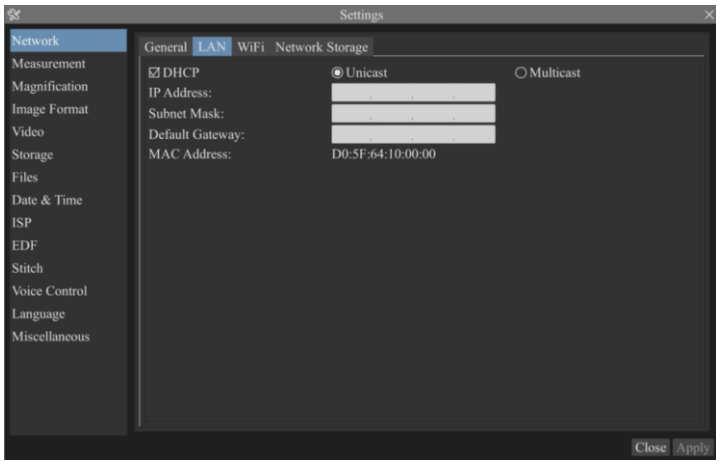
In LAN/ WiFi STA mode, the camera connects to the router by LAN port/ WiFi STA mode. If a router with LAN/

WiFi capability is used, users could connect the router with Ethernet cable/ WiFi to control the camera.

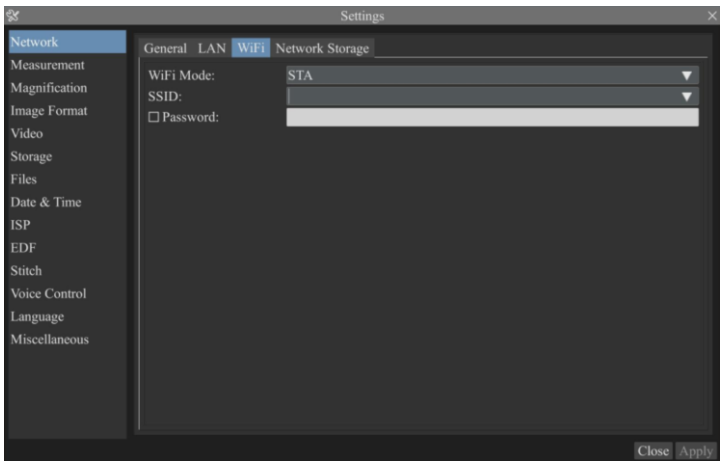
Figure 13 Multi X8CAM4K_MR Series Cameras Connecting to the Router through the LAN Port/ WiFi Style

The connection and configuration are just the same as in Sec.6.1 or Sec. 6.4. But here, users need to check DHCP. If Multicast is disabled or is not supported, users should only select Unicast. If Multicast is supported by the network, users could select Multicast to achieve a better performance, especially in the case that multi-users connecting to the same camera. In addition, please guarantee that the broadcasting function is enabled in the network.

Active X8CAM4K_MR series camera is recognized by ToupView/ToupLite software or ToupView App and they are displayed as a camera list or thumbnail in the software or app as shown in Figure 9.



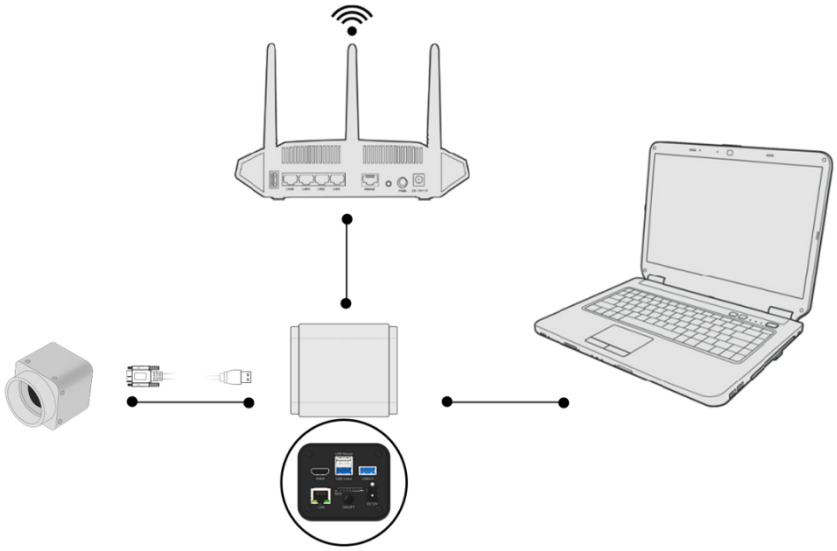
Or start the camera according to Sec. 6.1. After the camera is running, move the mouse to the bottom of the video window and clicking the button on the Synthesis Camera Control Toolbar at the bottom of the video window, a small window called Settings will pop up as shown below. Clicking Network> WiFi property page and choosing the STA in the WiFi Mode edit box (The factory default configuration is AP mode). Choice or input the to be connected router's SSID and Password as shown below:



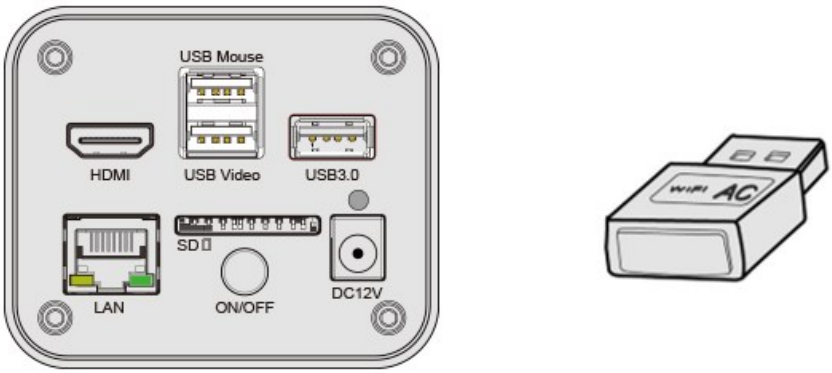
Install ToupView /ToupLite software on your PC. Alternatively, install the free ToupView App on the mobile device;

Plug the Ethernet cable into the camera's LAN port and the other end to the PC (for those connected to router with

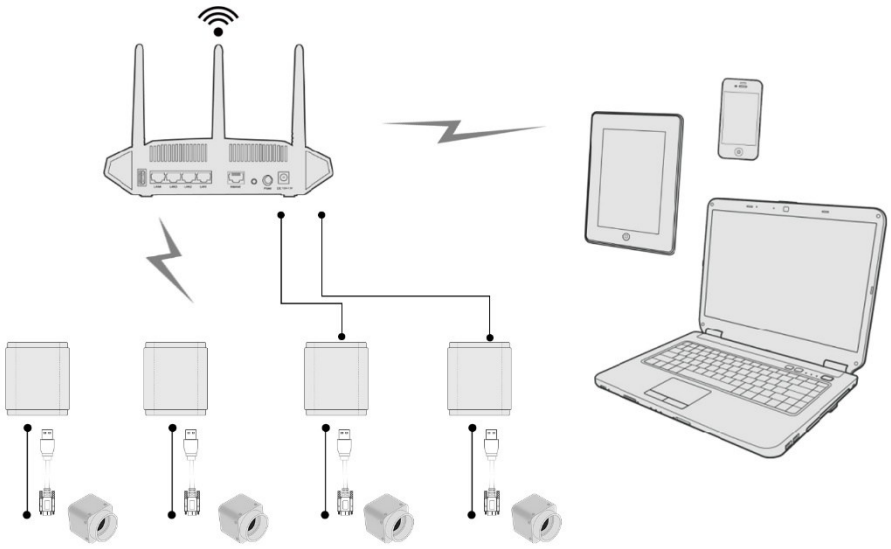
LAN Port), the upper left corner of the HDMI graphics interface will display IP address;



Or plug the USB WiFi adapter into the camera's USB3.0 port(for those connected to router with WiFi STA mode), the upper left corner of the HDMI graphics interface will display "STA Mode";



Finally, as shown below, 2 X8CAM4K_MR series cameras are connected to the router with LAN cable and 2 X8CAM4K_MR series cameras are connected to the same router with WiFi STA mode (The number of the cameras, the connection mode (LAN or WiFi STA) connected to the router are determined by the router performance).



Make sure that your PC or your mobile device is connected to the LAN or WiFi of the router; Start ToupView/ToupLite software or ToupView App and check the configuration. Normally, active X8CAM4K_MR series cameras are automatically recognized. The live image of each camera is displayed. For the display, Camera List group is

used in ToupView/ToupLite software, and Camera Thumbnail is used in ToupView App; Select theX8CAM4K_MR series camera you are interested in. To do so, double click the camera's name in Camera List tool window if you use ToupView /ToupLite software; If you use ToupView App, tap the camera's thumbnail in Camera List page (See Figure 14)

About the routers/switches

It is suggested that routers/switches supporting WiFi 5G should be selected to achieve better wireless connection experience.

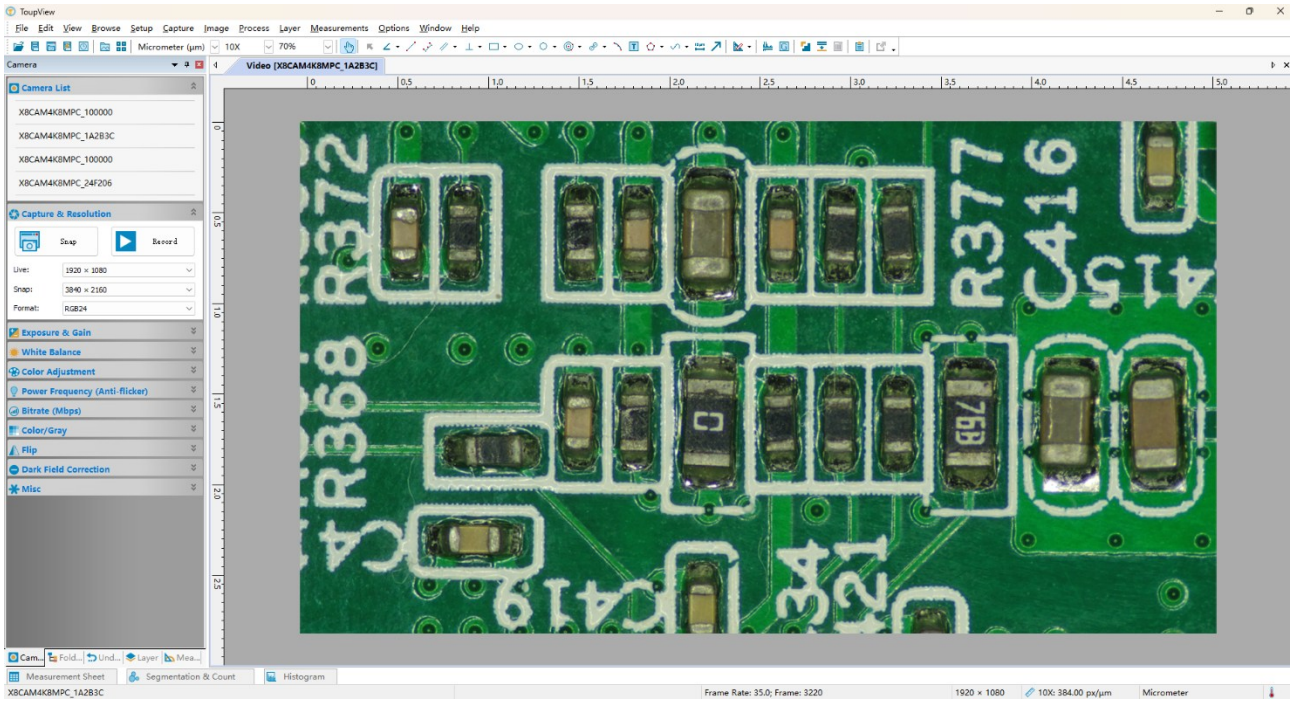


Figure 14 ToupView and X8CAM4K_MR Series Camera in LAN port/ WiFi STA mode

7 Brief Introduction of X8CAM4K_MR UI and Its Functions

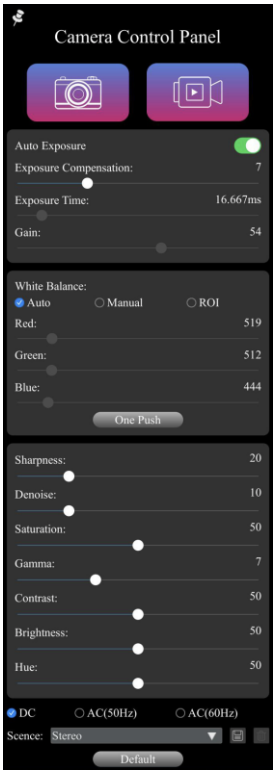
7.1 XCamView UI

The X8CAM4K_MR UI shown in Figure 6 includes a Camera Control Panel on the left of the video window, a Measurement Toolbar on the top of the video window and a Synthesis Camera Control Toolbar on the bottom of the video window.

Notes	
1	To show the Camera Control Panel, move your mouse to the left or right of the video window. See Sec.7.2 for details
2	Move the mouse cursor to the top of the video window, a Measurement Toolbar will pop up for calibration and measurement operations. When user left-clicks the Float/Fixed button on the Measurement Toolbar, the Measurement Toolbar will be fixed. In this case the Camera Control Panel will not pop up automatically even if users move mouse cursor to left or right side of the video window. Only when user left-clicks the ✕ button on the Measurement Toolbar to exit from measuring procedure will they be able to do other operations on the Camera Control Panel, or the Synthesis Camera Control Toolbar. During the measuring process, when a specific measuring object is selected, an Object Location & Attributes Control Bar will appear for changing location and properties of the selected object. See Sec.7.3 for details.
3	When users move mouse cursor to the bottom of the video window, the Synthesis Camera Control Toolbar will pop up automatically. See Sec.7.4 for details.

7.2 The camera control panel on the left or right side of the video window

The Camera Control Panel controls the camera to achieve the best video or image quality according to the specific applications; It will pop up automatically when the mouse cursor is moved to the left or right side of the video window (in measurement status, the Camera Control Panel will not pop up. The Camera Control Panel will only pop up when the measurement process is finished or terminated while user's cursor on the left edge of the video window). Left-clicking button to achieve Display/Auto Hide switch of the Camera Control Panel.

Camera Control Panel	Function	Function Description
	Snap	Capture image and save it to the SD card or USB flash drive
	Record	Record video and save it to the SD card or USB flash drive
	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 left or right to adjust Exposure Compensation according to the current video brightness to achieve proper brightness value
	Exposure Time	Available when Auto Exposure is unchecked. Slide to left or right to reduce or increase exposure time, adjusting brightness of the video
	Gain	Adjust Gain to reduce or increase brightness of video. The Noise will be reduced or increased accordingly
	Red	Slide to left or right to decrease or increase the proportion of Red in RGB on video
	Green	Slide to left or right to decrease or increase the proportion of Green in RGB on video
	Blue	Slide to left or right to decrease or increase the proportion of Blue in RGB on the video
	Auto	White Balance adjustment according to the window video every time the button is clicked
	Manual	Adjust the Red、Green or Blue item to set the video White Balance
	ROI	Check the ROI item will display a red ROI rectangle on the video window, drag it to the interested area will perform the White Balance according to the area video data
	One Push	Perform a global White Balance based on image conditions
	Sharpness	Adjust Sharpness level of the video
	Denoise	Slide left or right to denoise the video
	Saturation	Adjust Saturation level of the video
	Gamma	Adjust Gamma level of the video. Slide to the right side to increase Gamma and to the left to decrease Gamma.
	Contrast	Adjust Contrast level of the video. Slide to the right side to increase Contrast and to the left to decrease Contrast.
	Brightness	Adjust Brightness level of the video. Slide to the right side to increase Brightness and to the left to decrease Brightness.
	Hue	Adjust Hue level of the video. Slide to the right side to increase Hue and to the left to decrease Hue.
	DC	For DC illumination, there will be no fluctuation in light source so no need for compensating light flickering
	AC(50HZ)	Check AC(50HZ) to eliminate flickering caused by 50Hz illumination
	AC(60HZ)	Check AC(60HZ) to eliminate flickering caused by 60Hz illumination
	Scence	Select different default parameters according to the type of microscope
	Default	Restore all the settings in the Camera Control Panel to default values

7.3 The Measurement Toolbar on top of the video window

The Measurement Toolbar will pop up when moving mouse cursor to any place near the upper edge of the video window. Here is the introduction of the various functions on the Measurement Toolbar:

Figure 15 The Measurement Toolbar on the Upper Side of the Video Window

Icon	Function
	Float/ Fix switch of the Measurement Toolbar
Visible	Show / Hide Measurement Objects
Pixel	Select the desired Measurement Unit
NA	Select Magnification for Measurement after Calibration
	Object Select
	Angle
	4 Points Angle
	Point (Point Counter)
	Arbitrary Line
	3 Points Line
	Horizontal Line
	Vertical Line
	3 Points Vertical Line
	Parallel
	Rectangle
	3 Points Rectangle
	Ellipse
	5 Points Ellipse
	Circle
	3 Points Circle
	Annulus
	3 Points Annulus
	Two Circles and its Center Distance
	3 Points Two Circles and its Center Distance
	Arc
	Text
	Polygon
	Curve
	Scale Bar
	Arrow
	Execute Calibration to determine the corresponding relation between magnification and resolution, which will establish the corresponding relationship between measurement unit and the sensor pixel size. Calibration needs to be done with the help of a micrometer. For detailed steps of carrying out Calibration please refer to ToupView help manual.
	Auto Measurement: Two Points Parallel, Circle Detect, Annulus Detect, Rectangle Detect, Polygon Detect
	Export the Measurement information to CSV file(*.csv)
	Measurement Setup
	Delete all the measurement objects
	Exit from Measurement mode
	When the measurement ends, left-click on a single measuring object and the Object Location & Properties Control Bar will show up. User could move the object by dragging the object with the mouse. But more accurate movement could be done with the control bar. The icons on the control bar mean Move Left, Move Right, Move Up, Move Down, Color Adjustment and Delete.

Note:

1) When user left-clicks Display/Hide button on Measurement Toolbar, Measurement Toolbar will be fixed. In this case Camera Control Panel will not pop up automatically even if moving the mouse cursor to the left edge of the video window. Only when user left-click the button on Measurement Toolbar to exit from the measurement mode will they be able to doing other operations on Camera Control Panel or Synthesis Camera Control Toolbar.

2) When a specific Measurement Object is selected during the measurement process, Object Location & Attributes Control Bar will appear for changing the object location and properties of the selected objects.

7.4 Icons and functions of the Synthesis Camera Control Toolbar at the bottom of the video window

Figure 16 The Synthesis Camera Control Toolbar on the Bottom of the Video Window

Icon	Function	Icon	Function
	Zoom In the Video Window		Zoom Out the Video Window
	Horizontal Flip		Vertical Flip
	Color to Gray		Video Freeze
	EDF		Stitch
	Display Cross Line		Image Overlay
	PIP		Browse images and videos in the SD Card
	Settings		Check the Version of XCamView

The Browsing function, for detailed introduction, please refer to Section 7.4.1.

The Setting function, for detailed introduction, please refer to Sections 7.4.2 to7.4.15.

7.4.1 Browse

Clicking the to browse the dxf, images, videos, and other files saved on the SD card or USB flash drive, as shown in the following figure.

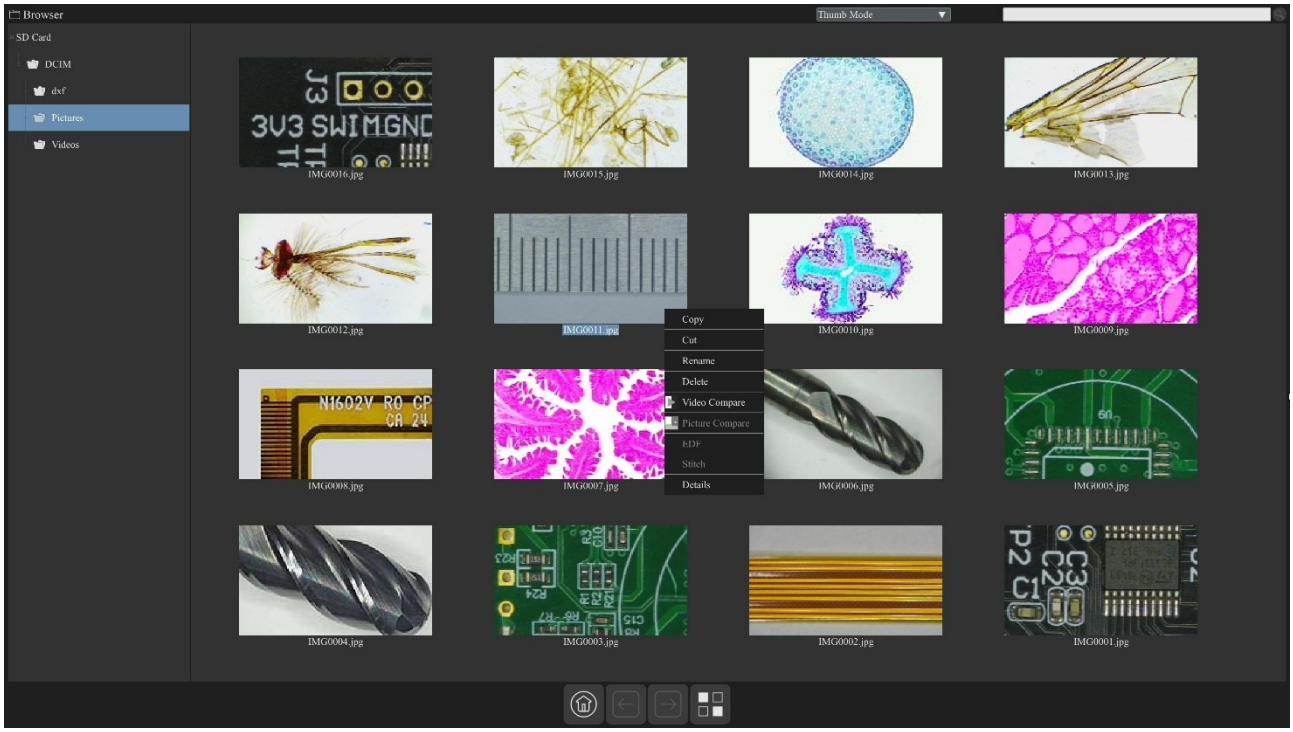


Figure 17 Browsing UI

There are two browsing modes: List mode and Thumb mode. The default is Thumb mode.

Right click on an empty area to create a new folder.

Right click on an image file to Copy, Cut, Rename, Delete, Video Compare, Picture Compare (2/4) and view detailed information (Details). Clicking on a thumb to select the 1st image, and clicking on another thumb to select the 2nd image

(or selecting 2/4 images with frame), then clicking the right mouse button to bring up the context menu and select Picture Compare to analyze and compare the two images (Four images can also be compared). Clicking on a thumb to select 3 (or box select 3) pictures focusing on different targets in the same scene, you can perform depth of field compositing on the selected pictures. Clicking on a thumb to select 2~32 (or box select 2~32) pictures, The selected images can be stitch in ascending order of the numerical numbers in the file name.

Right click on a video file to Copy, Cut, Rename, Delete, and view detailed information (Details).

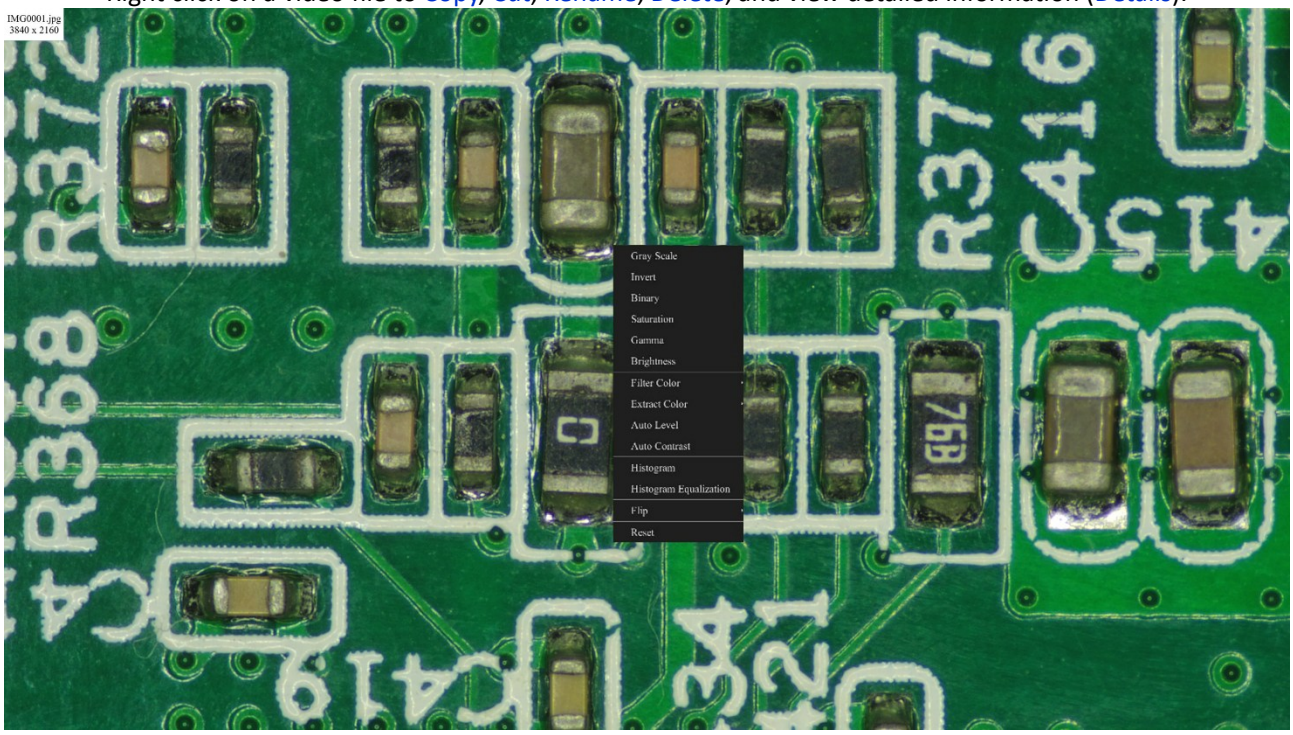


Figure 18 Image Processing

Double-click the thumbnail of the picture with the left mouse button to open the picture, and then right-click the picture to Gray Scale, Invert , Highlights , Binary , Sharpness , Saturation , Gamma , Brightness , Filter Color, Extract Color , Auto Level, Auto Contrast , Histogram, Histogram Equalization, Flip, and other image processing functions, and then after the processing is completed, you can choose reset to revert back to the original picture, and also you can choose save or save as in the lower sidebar of the picture. The description of each function is as follows:

Gray Scale	Choose Gray Scale command to convert a color image to a Gray Scale image
Invert	Choose Invert command to reverse the pixel values of the active image
Highlights	Choose Highlights command to adjust the Highlight parts of the images
Binary	Binary is a kind of gray level process. If the gray of the pixel is greater than the given threshold, the pixel's color will be changed into white. Otherwise, the pixel's color will be changed into black
Sharpness	Adjust the Sharpness of the image
Saturation	Adjust the Saturation of the image
Gamma	Adjust the Gamma of the image
Brightness	Adjust the Brightness of the image
Filter Color	Choose Filter Color command to filter a special color channel from a color image. Select either Red, or Green, or Blue color to filter. For every pixel, if select Red color to filter, only information about the Red channel will be discarded, the Green and Blue information will remain there.
Extract Color	Choose Extract Color command to extract a special color channel from a color image. Select either Red or Green, or Blue color to extract. For every pixel, if selecting Red color to extract, only information about the Red channel will be kept, the Green and Blue information will be discarded.
Auto Level	The Auto Level command moves the level's sliders automatically to set highlight and shadow. It defines the lightest and darkest pixels in each color channel as white and black and then redistributes the pixels' color values proportionately
Auto Contrast	The Auto Contrast command automatically adjusts the overall contrast an RGB image
Histogram	Used to show the distribution of brightness, R, G, B of an image over an image
Histogram Equalization	Used to improved image contrast
Flip	Flip image Horizontally/Vertically

7.4.2 Settings>Network

7.4.2.1 Settings>Network>General

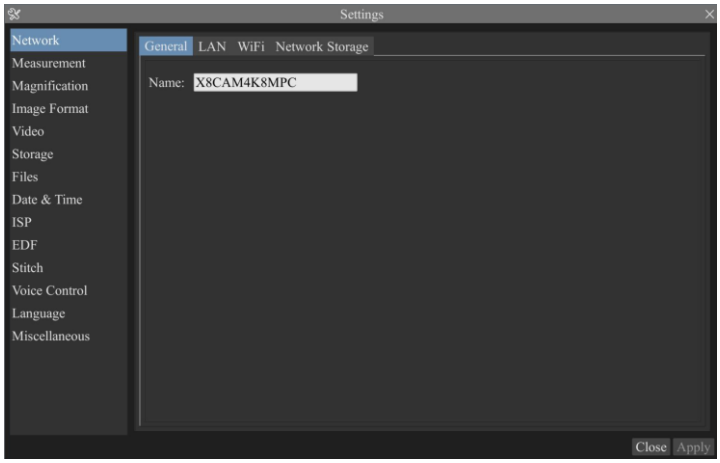


Figure 19 Comprehensive Network General Settings Page

Name	The current camera name recognized as the network name

7.4.2.2 Settings>Network>LAN

Figure 20 Comprehensive Network LAN Settings Page

DHCP	Dynamic host control protocol allows DHCP server to automatically assign IP information to the camera. Only in Sec 6.4 LAN networking this item should be checked, so that cameras can automatically get IP information from routers/switches to facilitate networking operation;
Unicast/Multicast	By default, unicast function is used. Only in Sec 6.4 networking environment, when the router/switch has multicast function, camera can switch to multicast mode, which can save the network bandwidth consumed by the camera and facilitate the connection of more cameras in the same network;
IP Address	Every machine on a network has a unique identifier. Just as you would address a letter to send in the mail, computers use the unique identifier to send data to specific computers on a network. Most networks today, including all computers on the Internet, use the TCP/IP protocol as the standard for how to communicate on the network. In the TCP/IP protocol, the unique identifier for a computer is called IP address. There are two standards for IP address: IP Version 4 (IPv4) and IP Version 6 (IPv6). All computers with IP addresses have an IPv4 address, and many are starting to use the new IPv6 address system as well. Users must manually configure their IP addresses on the camera side and computer side. The IP addresses set on the camera side and computer side should be in the same network segment. The specific settings are shown Figure 21. It's usually a private address. Private address is a non-registered address used exclusively within an organization. The internal private addresses retained are listed below: Class A 10.0.0-10.255.255; Class B 172.16.0-172.31.255.255; Class C 192.168.0-192.168.255.255. The suggested IP address is Class C.
Subnet Mask	Subnet Mask is used to distinguish network domain from host domain in 32-bit IP address;
Default Gateway	A default gateway allows computers on a network to communicate with computers on another network. Without it, the network is isolated from the outside. Basically, computers send data that is bound for other networks (one that does not belong to its local IP range) through the default gateway; Network administrators configure the computer's routing capability with an IP range's starting address as the default gateway and point all clients to that IP address.
MAC Address	Camera-independent physical address that identifies the network device.

Uncheck the DHCP and select the Unicast item, user still need to set the IP address, Subnet mask and Default Gateway as shown below:

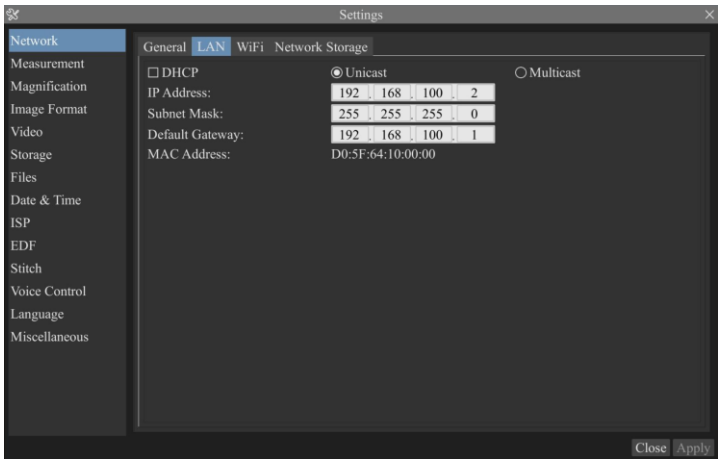


Figure 21 Manual DHCP and Unicast

Uncheck the DHCP and select the Multicast item, user still need to set the IP address, Subnet Mask and Default Gateway as shown below:

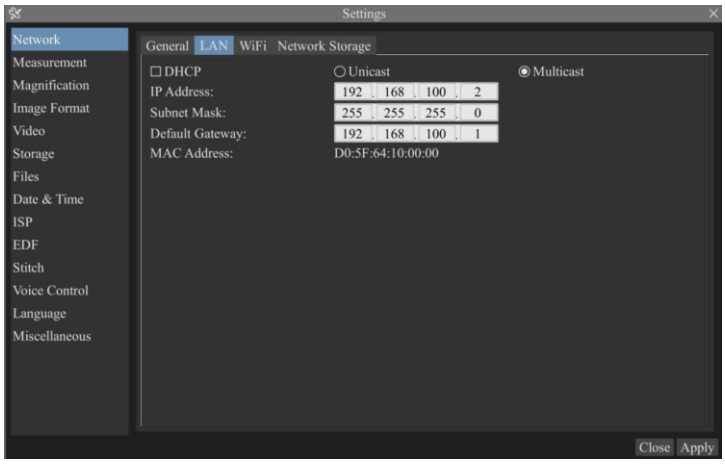


Figure 22 Manual DHCP and Multicast

7.4.2.3 Settings>Network> WiFi

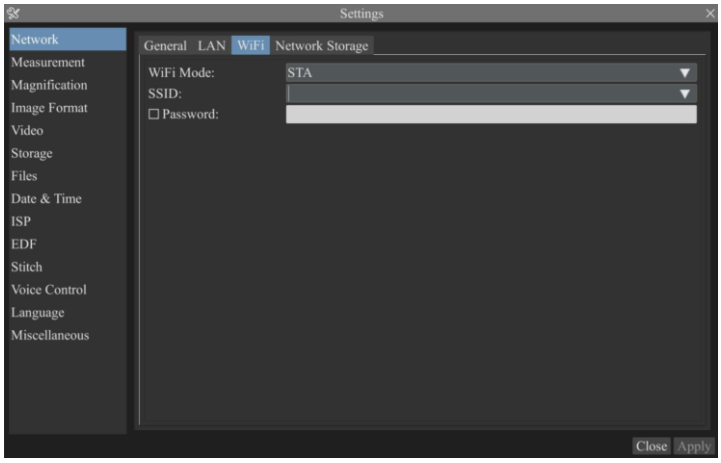


Figure 23 Network Setup

Wi-Fi Mode	AP/STA mode to select;
Channel/SSID	Channel for the AP mode and SSID for the STA mode. Choice or input the to be connected router's SSID. Here, the SSID is the router's SSID;
Password	Camera Password for the AP mode. Router Password for the STA mode

7.4.2.4 Settings>Network> Network Storage

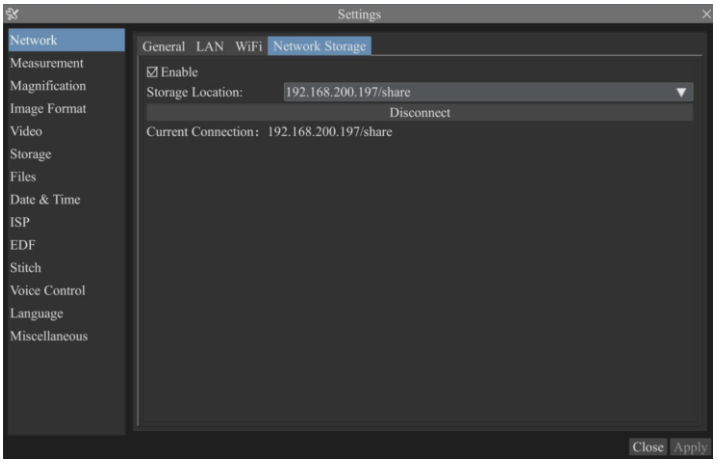


Figure 24 Comprehensive Network Storage Settings Page

Network Storage	Select whether to enable Network Storage;
Storage Location	When the WiFi mode is in AP mode, ensure that the PC is connected to the camera's AP, open the Server, Select Network Storage Function, click Update, and the IP address assigned by the camera to the PC will be displayed. Ensure that the Server has enabled; The camera will automatically detect available storage location. Select the desired storage location and click Connect. The left corner of the interface will display "Connected to Server", indicating successful connection. Click the snap button/click the left mouse button/use an external device to snap/ Click the record button / click the right mouse button / use an external device to record, shared images or videos will appear in the save path set on the PC, indicating successful network storage.
	When the WiFi mode is in STA mode, ensure that both the PC and camera are connected to the router's WiFi; When connected via LAN, ensure that the PC and camera are on the same LAN, open the Server, Select Network Storage Function, click Update, and the IP address assigned by the camera to the PC will be displayed. Ensure that the Server has enabled; The camera will automatically detect available storage location. Select the desired storage location and click Connect. The left corner of the interface will display "Connected to Server", indicating successful connection. Click the snap button/click the left mouse button/use an external device to snap/ Click the record button / click the right mouse button / use an external device to record, shared images or videos will appear in the save path set on the PC, indicating successful network storage.
Current Connection	Display the storage location of the current connection;
Note: The Network Storage function requires the installation of Server software on the computer. Enable Network Storage function, unable to save pictures to SD card or USB drive; If you need to save pictures to an SD card or USB drive, you need to first turn off the Network Storage function. For detailed instructions on the Network Storage function and the Server on the upper computer, please consult our company for more information.	

7.4.3 Settings>Measurement

This page is used for the define of the Measurement Object properties.

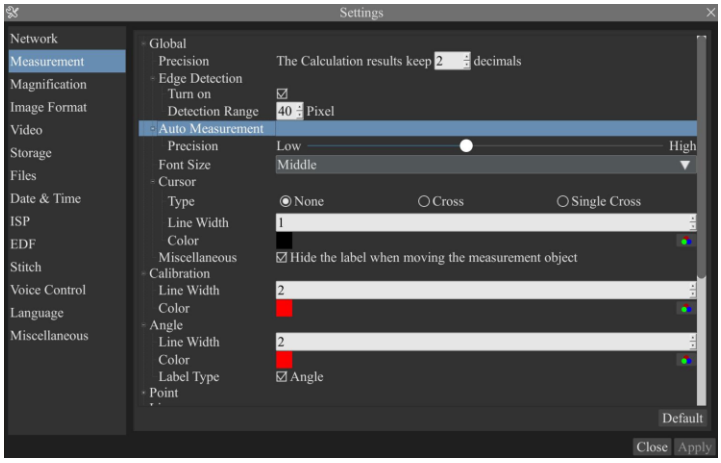


Figure 25 The Measurement Setup

Global	Precision	Used for setting digits behind the decimal point for measurement results;
	Edge Detection	Select whether to enable the automatic edge search function and set the detection range;
	Auto Measurement	Used for define the level of accuracy used for auto measurement;
	Font Size	The font size of measurement data can be divided into three types: large, Middle, and Small;
	Cursor	Select whether the cursor is a single crosshair and set the color of the single cross;
	Miscellaneous	Whether to hide the label when moving the measurement objects;

Calibration	Line Width	Used for defining width of the lines for calibration;
	Color	Used for defining color of the lines for calibration;
	EndPoint	Type: Used for defining shape of the endpoints of lines for calibration: Null means no EndPoint, rectangle means rectangle type of endpoints. It makes alignment more easily;
Point, Angle, Line, Horizontal Line, Vertical Line, Rectangle, Circle, Ellipse, Annulus, Two Circles, Polygon, Curve		
	Left-click the ⊞ along with the Measurement command mentioned above will unfold the corresponding attribute settings to set the individual property of the Measurement Objects.	

7.4.4 Settings>Magnification

This page's items are formed by the Measurement Toolbar's Calibration command.

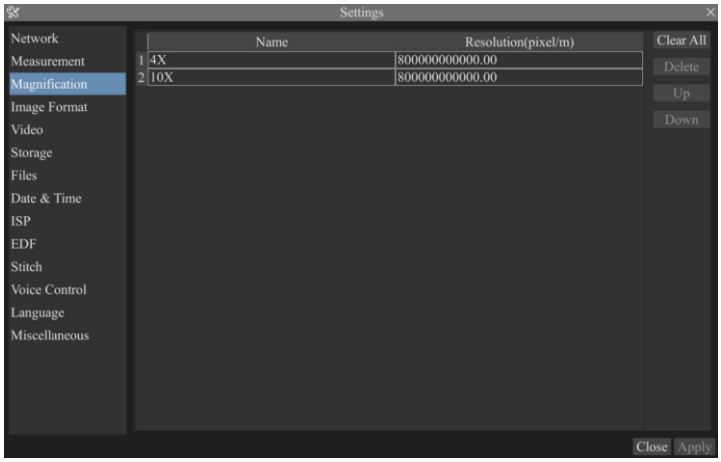


Figure 26 Comprehensive Magnification Settings Page

Name	Names such as 10X, 40X, 100X are based on magnification of the microscopes. For continuous zoom microscopes, ensure that the selected magnification coincides with the scale alignment line on the microscope zoom knob; Users could also edit the name of the magnification with other information, for example, microscope mode, users name, etc.
Resolution	Pixels per meter. Image device like microscopes have high Resolution value;
Clear All	Click the Clear All button will clear the calibrated magnifications;
Delete	Click Delete to delete the selected magnification;
Up	Select a row in the magnification and click Move Up to move up the currently selected magnification;
Down	Select a row in the magnification and click Move Down to move up the currently selected magnification;

7.4.5 Settings>Image Format

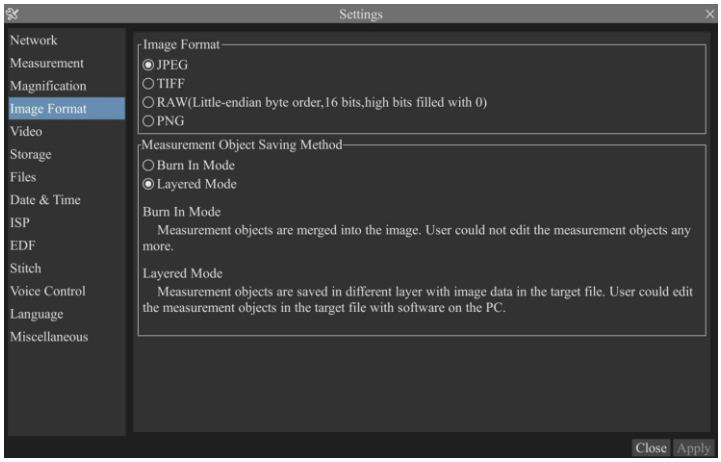


Figure 27 Comprehensive Image Format Settings Page

Image Format	JPEG: The extension of JPEG file can get very high compression rate and display very rich and vivid images by removing redundant images and color data. In other words, it can get better image quality with the least disk space. If measurement objects are available, the measurement objects will be burned into the image and the measurement cannot be edited. TIFF: TIFF is a flexible bitmap format mainly used to store images including photos and artistic images. RAW (Little-ending byte order,16bits, high bits filled with 0): RAW is an uncompressed and unprocessed image format that preserves all raw data directly obtained from the sensor of a digital camera. PNG: PNG is a lossless compression image format that supports transparency and high color depth, making it ideal for graphics, logos, and web images where sharp details and transparent backgrounds are required.
Measurement Object Saving Method	Burn in Mode: The measurement objects are merged into the current image. User could not edit the measurement objects any more. This mode is not reversable. Layered Mode: The measurement objects are saved in different layer with current image data in the target file. User could edit the measurement objects in the target file with some software on the PC. This mode is reversable.

7.4.6 Settings>Video

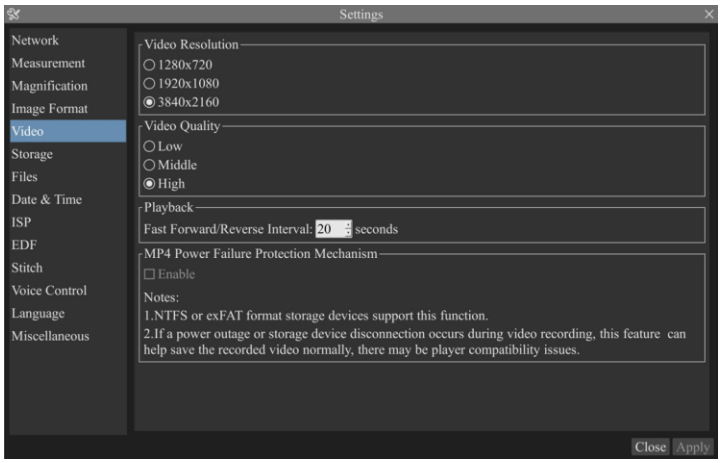


Figure 28 Comprehensive Setting of Video page

Video Resolution	Select a Video Resolution of 1280 x 720, 1920x1080 or 3840x2160;
Video Quality	Select Video Quality as low, medium, or high;
Video Playback	Fast Forward/Reverse internal in second unite for Video Playback;
MP4 Power Failure Protection Mechanism	1.NTFS or exFAT format storage devices support this function. 2. If a power outage or storage device disconnection occurs during video recording, this feature can help save the recorded video normally, there may be player compatibility issues;

7.4.7 Settings>Storage

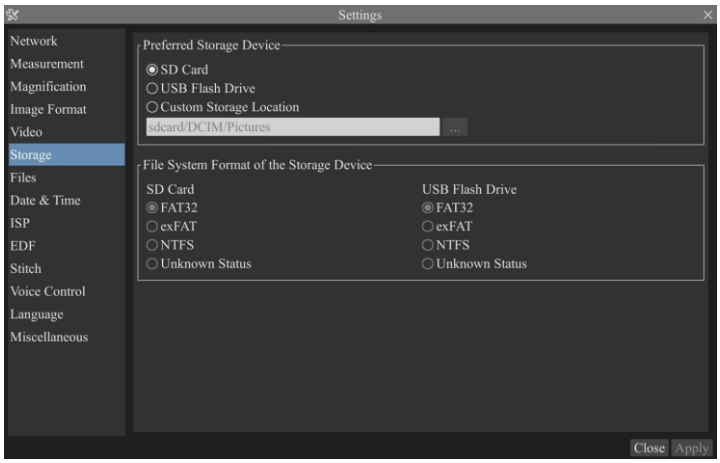


Figure 29 Comprehensive Setting of Storage Page

Preferred Storage Page	SD Card: Select it to save the video and image to the SD Card. USB Flash Drive: Select it to save the video and image to the USB Flash Drive. Custom Storage Location: Select it to save the video and image to the Custom Storage Location.
File System Format of the Storage Device	List the file system format of the current storage device FAT32: The file system of SD Card is FAT32. The maximum video file size of single file in FAT32 file system is 4G Bytes; exFAT: The file system of SD Card is exFAT. The maximum video file size of single file in FAT32 file system is 16E Bytes; NTFS: The file system of SD Card is NTFS. The maximum video file size of single file is 2T Bytes. Unknown Status: SD Card not detected or the file system is not identified;
Note: For USB Flash Drive, USB 3.0 interface is preferred.	

7.4.8 Settings>Files

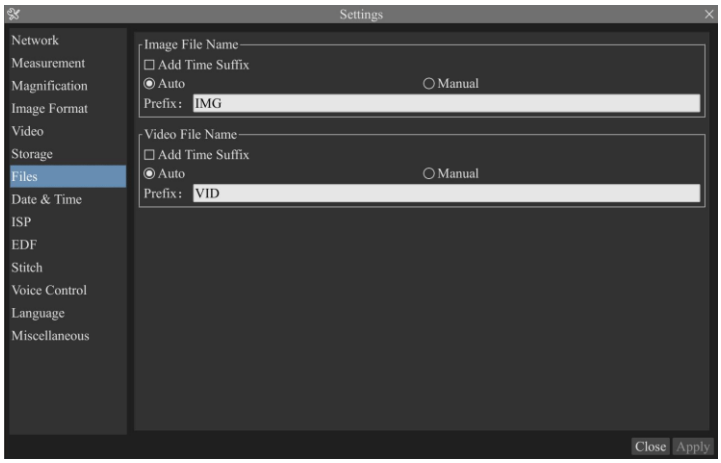


Figure 30 Comprehensive Setting of Files Name

Image or Video File Name Paradigm	Provide Auto or Manual naming paradigm for Image or Video file;
Auto	With specified name as the Prefix and XCamView will add digital after the Prefix for the Image or Video file;
Manual	A file dialog will pop up to enter the Image or Video file name for the captured Image or Video.

7.4.9 Settings>Date &Time

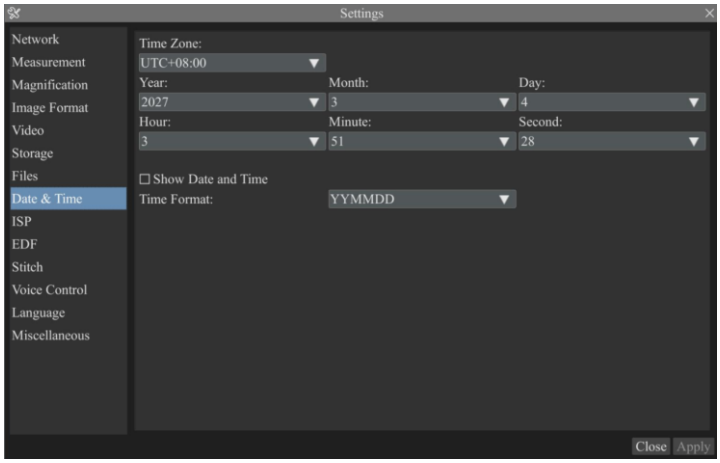


Figure 31 Time Setting

Date& Time	Users can enter precise clock parameters in the respective input fields for Year: Month: Day: Hour: Minute: Second. They may also choose whether to display the date and time in the lower-right corner of the HDMI interface.

7.4.10 Settings>ISP

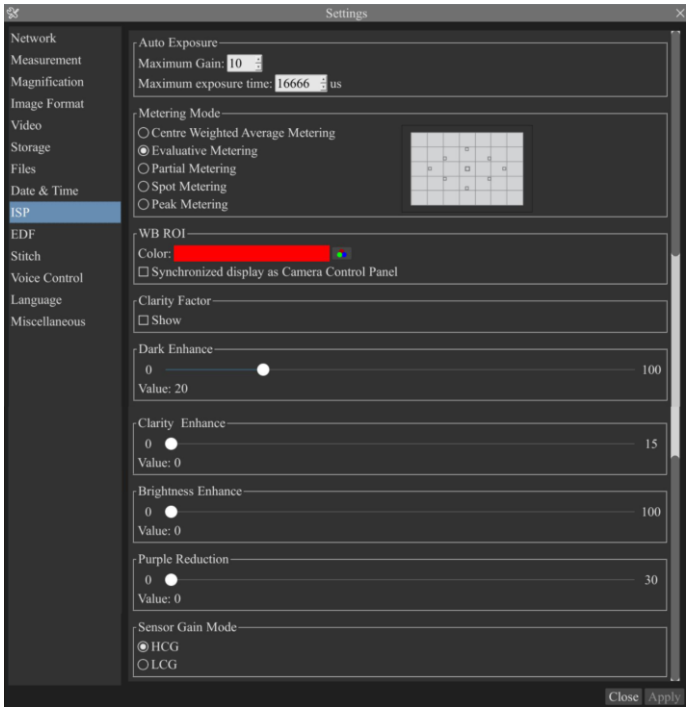


Figure 32 Comprehensive Setting of ISP Page

Maximum Gain	Define the maximum gain;
Auto Exposure	Define the maximum automatic exposure time;
Metering Mode	Select the Metering mode as the Central Weighted Average Metering, Evaluative Metering, Partial Metering, Spot Metering or Peak Metering; Peak Metering Mode: Provides metering intensity configuration, default is 8; The larger the value, the stronger the overexposure inhibition
WB ROI Color	Choosing the ROI rectangle line color and whether it is synchronized display as Camera Control Panel;
Clarity Factor	Select to display the clarity factor in the video window, otherwise the clarity factor will not be displayed;
Dark Enhance	Define the intensity value of dark enhancement;
Clarity Enhance	Define the intensity value of Clarity Enhance;
Brightness Enhance	Define the intensity value of Brightness Enhance;
Purple Reduction	Define the intensity value for purple reduction edges;
Sensor Gain Mode	Select to HCG (High Conversion Gain) or LCG (Low Conversion Gain) mode;

7.4.11 Settings>EDF

Figure 33 Comprehensive Setting of EDF

Automatic Alignment	Optionally turn on auto-alignment when there is significant displacement or scaling between images;
Sensitivity	Select the sensitivity of EDF;
Window size	Select the window size for displaying real-time images during EDF;
Description	Automatic alignment: Solves offset issues of fused images, but slows down the fusion process. Sensitivity: Improves the detection accuracy of depth of field, perhaps reduce the quality of fused image.

7.4.12 Settings>Stitch

Figure 34 Comprehensive Setting of Stitch

Detection Precision	Define the level of detection precision;
Stitching Stride	Select the stitching stride;
Background Color	Select the background color of stitch;
Description	Detection Precision: The higher the detection precision, the more precision the stitching and the longer it takes Stitching Stride: The larger the stitching stride, the lower the precision and the faster the speed.

7.4.13 Settings>Voice Control

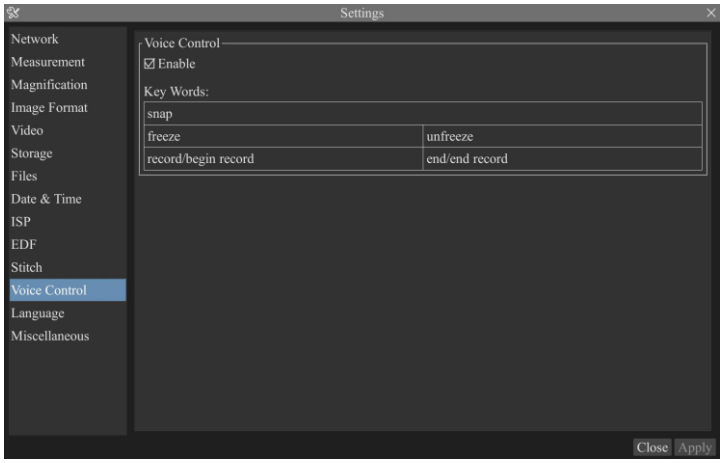


Figure 35 Comprehensive Setting of Voice Control

Voice Control	Select whether to enable or not;
Key Words	Provide Key Words for “snap”;
	Provide Key Words for “freeze”, “unfreeze”;
	Provide Key Words for “record/begin record”, “end/end record”;
Note: After the camera is turned on, if the voice control module is not plugged in, the Key Words information will not be displayed by default;	

7.4.14 Settings>Language

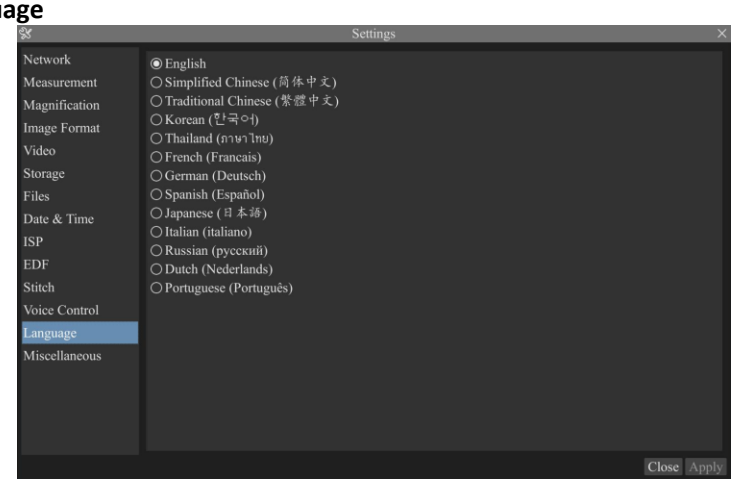


Figure 36 Comprehensive Setting of Language Selection Setting Page

English	Set language of the whole software into English;
Simplified Chinese	Set language of the whole software into Simplified Chinese;
Traditional Chinese	Set language of the whole software into Traditional Chinese;
Korean	Set language of the whole software into Korean;
Thailand	Set language of the whole software into Thailand;
French	Set language of the whole software into French;
German	Set language of the whole software into German;
Spanish	Set language of the whole software into Spanish;
Japanese	Set language of the whole software into Japanese;
Italian	Set language of the whole software into Italian;
Russian	Set language of the whole software into Russian;
Dutch	Set language of the whole software into Dutch;
Portuguese	Set language of the whole software into Portuguese;

7.4.15 Settings>Miscellaneous

Figure 37 Comprehensive Miscellaneous Settings Page

Ruler	Select to display the ruler in the video window, otherwise not to display the ruler. You can choose the ruler color;
Measurement	Select to display the measurement toolbar in the video window, otherwise not to display the measurement toolbar;
Overlay	Select to support saving graphics overlay information in fusion mode, otherwise it will not support;
Grids	Select to support saving mesh information in fusion mode, otherwise not to support;
Monitor Working Mode	Select to display the Monitor Working Mode in the video window, otherwise the Monitor Working Mode will not be displayed;
Mouse	Select the mouse size and hide time; Select to capture the video with the left button and the right button. If not selected, the video will not be captured with the left button or the right button;
Camera Control Panel Display Location	Select the camera control panel to display on the left, right, or both sides of the HDMI interface;
Camera Parameters Import	Import the Camera Parameters from the SD Card or USB flash drive to use the previously exported Camera Parameters;
Camera Parameters Export	Export the Camera Parameters to the SD Card or USB flash drive to use the previously exported Camera Parameters;
Reset to factory defaults	Restore camera parameters to its factory status;

8 Sample Photos Captured with X8CAM4K_MR Series Camera

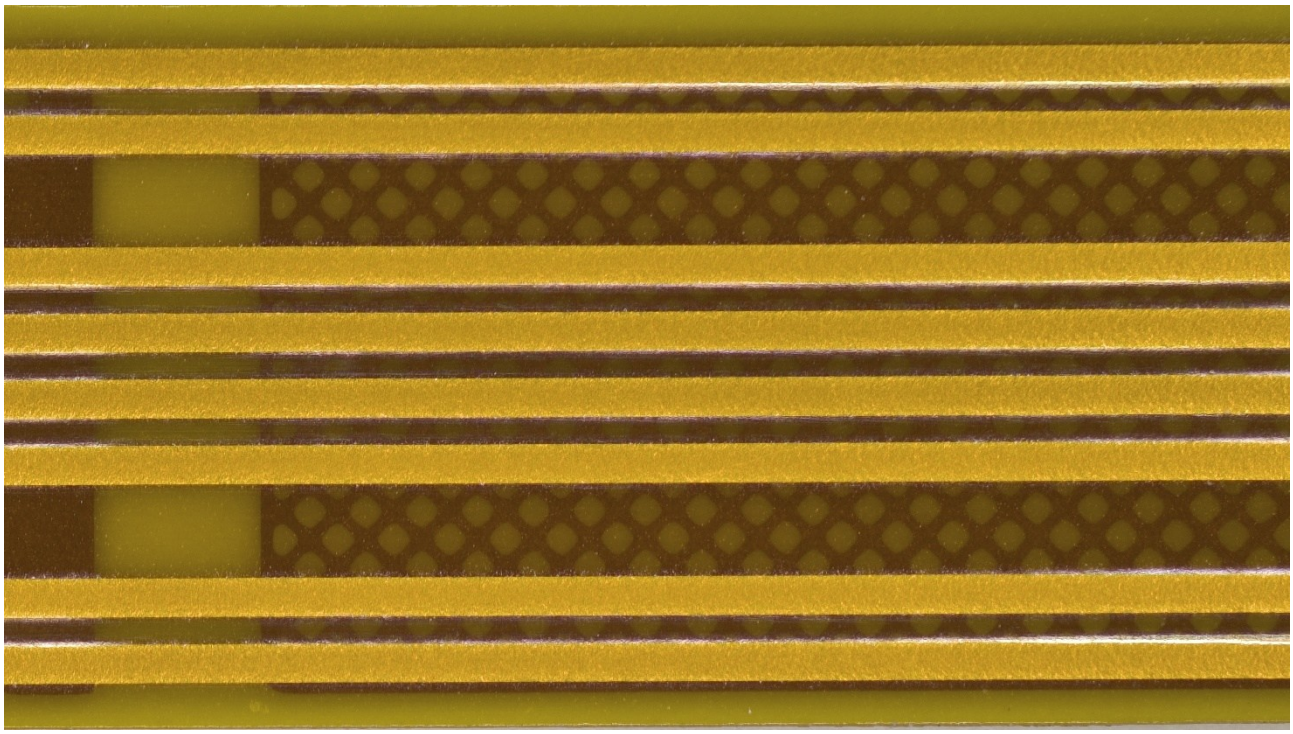


Figure 38 FPC PCB Captured with X8CAM4K8MPC_MR

Figure 39 Teeth Captured with X8CAM4K8MPC_MR

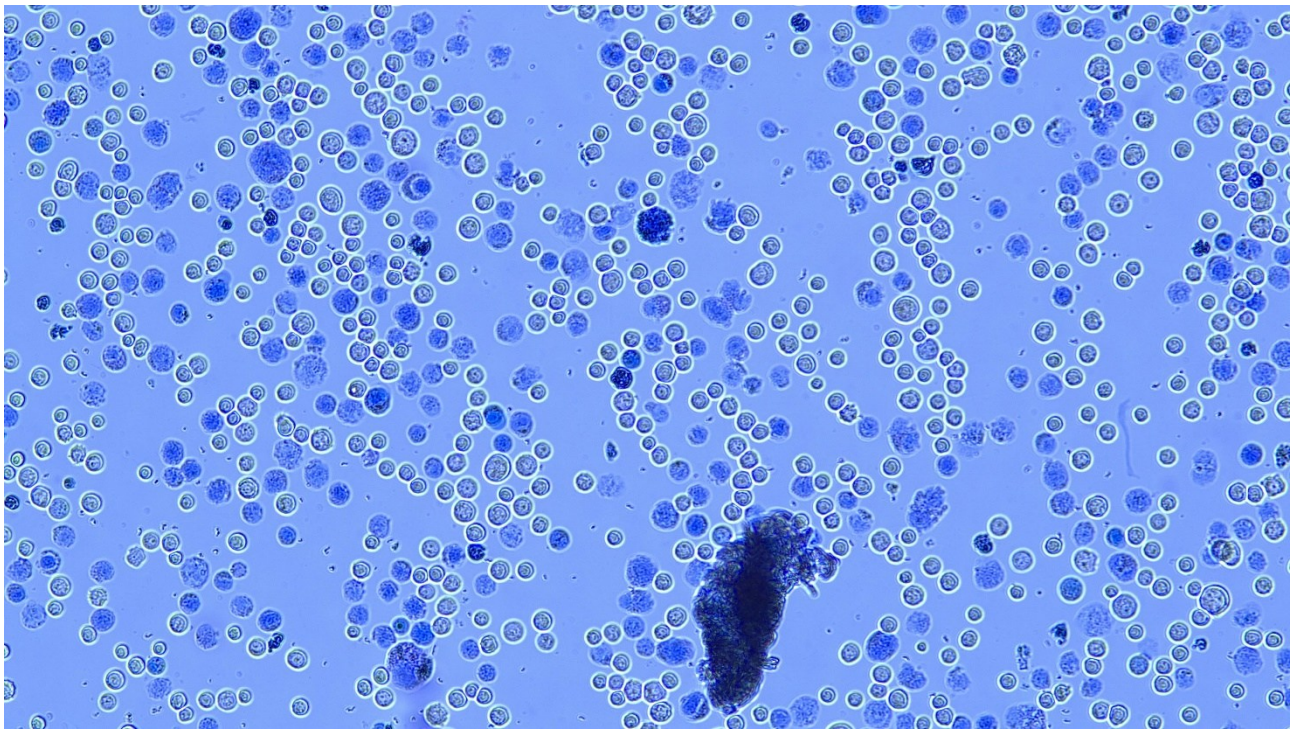


Figure 40 Cell Captured with X8CAM4K8MPC_MR

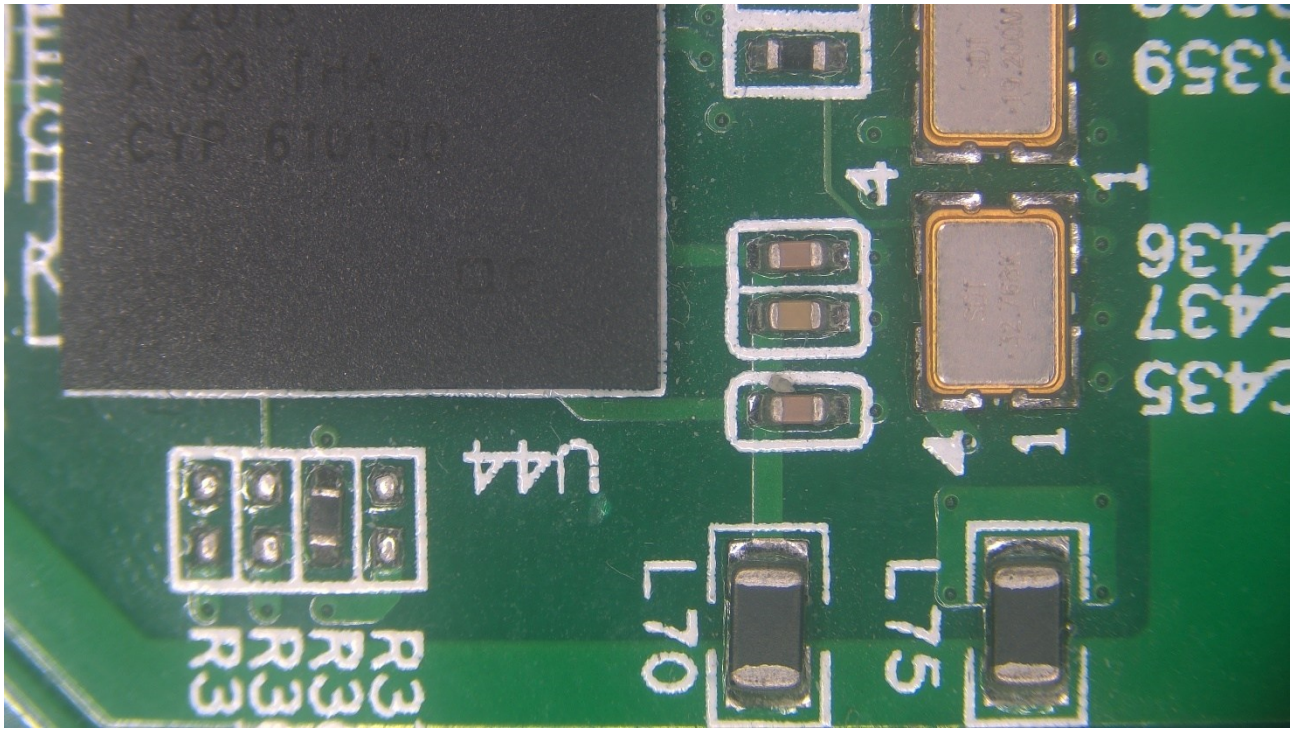


Figure 41 Circuit Board Captured with X8CAM4K8MPC_MR

9 Contacting Customer Service

Please contact your local distributor if you have any questions about the product.