AFDM412 Electric Controlled Continuous Zoom and Autofocus Digital Microscope

Contents

1   Introduction to AFDM Series

AFDM is a series of electric controlled continuous zoom and autofocus all-in-one digital microscope with a large field of view by ToupTek Photonics. It is integrated with HDMI camera, Electric Controlled Continuous Zoom Auto-focus Objective and LED Integrated Illumintaion Light. AFDM is the abbreviation of Auto-focus Digital Microscope. Different products in the AFDM series can be formed with different part to satisfy the applicatuon requirement.

AFDM can be assembled with various brackets or arms and offer a continuous zooming ratio with different lens. AFDM also supports autofocus mode and manual focus mode.

AFDM comes with a high-performance SONY CMOS sensor. It also has an embedded ARM core, allowing the camera to be connected directly to the HDMI monitor. The camera has XFCAMView software built within it, including Camera Control Panel, Auto Focus Control Panel, Measurement Toolbar, and Synthesis Camera Control Toolbar. Users can directly control the camera and perform various operations through a USB mouse. The images and videos captured by AFDM can be saved on an SD card for on-site analysis and follow-up research.

AFDM can be widely used in industrial inspection, medical observation, teaching and scientific research, automation system, and other fields.

AFDM412 supports HDMI/USB/ETH/WiFi control and video output (ToupView). The frame rate of the output is 4K/30FPS, and the zoom range is 1X~18X. It also supports electric zoom and auto focusing.

Figure 1-1 AFDM's Front and Back View

Figure 1-2 AFDM's Side and Front(with LED light) View

1.1   The Module Specifications Of AFDM412

1.1.1 AFDM Camera Module Datasheet

Order Code	Sensor & Size(mm)	Pixel(μm)	G Sensitivity/ Dark Signal	FPS/Resolution	Binning	Exposure(ms)
H4KPA	Sony IMX415LQR-C 1/2.8"(5.57x3.13)	1.45x1.45	300mv/0.13 with 1/30s	30@3840*2160(HDMI) 30@3840*2160(NETWORK) 30@3840*2160(USB)	1x1	0.04~1000

C: Color; M: Monochrome;

1.1.2 AFDM Lens Module Datasheet

Order Code	Working Distance(mm)	Zoom Range	MTF(lp/mm)	Distortion	FOV@1X(mm)	FOV@18X(mm)
EMZO-18XA-250	205~255	0.021X~0.39X	160	0.5%	255x145	14.2x8

1X and 18x are defined as the normalized magnification, which is only used to represent the relative relationship between the lowest and highest magnification. Here, the normalized equations are 1x = 0.021/0.021; 18X=0.39/0.021;

1.1.3 AFDM Light Module

Order Code	LED	Power	Inner Dia.(mm)	Out Dia.(mm)		
DRL-5076A-NPC	8 CREE xpes	3V/3A	50	76		

DRL: LED direct ring light with adjustable brightness; NPC: No power cable

AFDM412 can use AALRL-200-7650 as external light for the large FOV illumination

1.2 AFDM412 Characteristic And Specification

The AFDM412 comes with H4KPA HDMI camera, EMZO-18XA-250 lens and DRL-5076A-NPC light source(Optional);

1.2.1 The Basic Characteristic of AFDM412

- 5 groups 16 elements EMZO with 0.0218~0.392X, 18X zoom ratio, supports auto and manual focus
- 250mm standard working distance with 205~255mm depth of field
- At standard working distance, the large field of view 255mm*145mm at low magnification, helping users to quickly locate the target object, the small field of view 14.2mm*8mm at higher magnification, helping users to observe microscopically
- Sony 1/2.8" 4K Starvis CMOS with high signal-to-noise ratio
- 4K HDMI/USB/ETH/WiFi multiple video outputs
- 4K/1080P auto switching according to monitor resolution
- SD card/USB flash drive for captured image and video storage, support local preview and playback
- Built-in mouse control software XFCAMView, all functions can be realized with USB mouse
- Embedded mouse Camera Control Panel, Measurement Toolbar, Synthesis Control Toolbar, AF Control Panel
- Multi-language support
- Head suction LED ring light, the brightness can be directly controlled by XFCAMView
- With the adapter bracket of 76mm diameter, a electric controlled continuous zoom AFDM can be built

Figure 1-3 TPS-30A(bracket)+AFDM412+4K Monitor

1.2.2 Specification of AFDM412

Interface & Button Functions	
USB Mouse	USB mouse for XFCAMView control
USB2.0	Connect USB flash drive to save pictures and videos Connect 5G WLAN module to transfer video wirelessly in real time with ToupView/ToupLite
HDMI	Comply with HDMI1.4 standard. 4K/1080P format video output and supporting automatic switch between 4K and 1080P format according to the connected monitors
USB Video	Connect PC or other host device to realize video image transmission with ToupView/ToupLite
LAN	LAN port to connect router and switch to transfer video with ToupView/ToupLite
ON/OFF	Power on/off switch
LED	Power LED indicator
SD	Comply with SDIO3.0 standard and SD card could be inserted for video and images saving
DC12V3A	DC12V3A power input
XFCAMView Software Funcitons	
UI Operation	With USB mouse to operate on the embedded XFCAMView
Image Capture	8M (3840*2160) JPEG/TIFF image in SD card or USB flash drive
Video Record	Video format：8M(3840*2160) H264/H265 encoded MP4 file Video saving frame rate:30fps
Camera Control Panel	Including Exposure, Gain, White Balance, Sharpness, Denoise, Denoise, Saturation, Gamma, Contrast, Brightness, Power Frequency control
Measurement Toolbar	Including Calibration, Measurement, and measurement parameter Export functions
Synthesis Control Toolbar	Including software Zoom, Flip, Freeze, Crosshair, LED Control, Auto-focus, Comparison, Browser , Setting, Version Check function
Auto Focus Control Panel	Including Zoom, Auto Focus, One Push, Manual Focus, Reset, and other functions
Software ToupView/ToupLite Environment under LAN/WLAN/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(32 & 64 bit)/ToupView
	OSx(Mac OS X)/ToupLite
	Linux/ToupLite

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
Dimension	
Length x Width x Height	80mm x 80mm x 80mm
Shipping Weight	0.75kg

1.2.3 Dimension of AFDM412

Figure 1-4 Dimension of AFDM412

1.2.4 Packing Information of AFDM412

Figure 1-5 Packing Information of AFDM412

|	Standard Packing List	
A	Gift box: L:220cm W:220cm H:110cm (1pcs, 2.0kg/box)	
B	AFDM412	
C	Power Adapter: Input: AC 100~240V 50Hz/60Hz, Output: DC 12V 3A	American Standard: Model: HKA03612030-7K : UL/CE/FCC(With American Standard AC Power Cable)
		European Standard: Model: HKA03612030-7K : UL/CE/FCC(With European Standard AC Power Cable)
		EMI Standard: FCC Part 15 Subpart B
		EMS Standard: EN61000-4-2,3,4,5,6
D	USB Mouse	
E	HDMI Cable	
F	USB2.0 A male to A male gold-plated connectors cable /2.0m	
G	CD (Driver & utilities software, Ø12cm)	
	Optional Accessory	
H	Ethernet cable	
I	LED Ring Light(DRL-5076A-NPC)	
J	USB flash drive	
K	USB WLAN adapter	
L	SD card(16G)	
M	Calibration kit	106011/TS-M1(X=0.01mm/100Div.);
		106012/TS-M2(X,Y=0.01mm/100Div.);
		106013/TS-M7(X=0.01mm/100Div., 0.10mm/100Div.)

2   Installation and Operation of AFDM Series Product

Before use, please install the AFDM series product on an adaptive bracket.

1.Plug HDMI cable into the HDMI port to connect AFDM and HDMI monitor;

2.Plug a USB mouse into USB Mouse port, to get control of the AFDM by using built-in software XFCAMView;

3.Plug DC12V3A power adapter into DC12V3A port, to supply power for the AFDM, the LED Indicator will turn into red;

4.Insert SD card into SD card Slot for saving captured images and recorded videos;

5.Press ON/OFF button to start the AFDM, LED Indicator will turn into blue;

6.Move mouse to the left side of the video window, the Camera Control Panel will appear. It includes Manual/Automatic Exposure, White Balance, Sharpness, Denoise, and other functions, please refer to section 3.2 for details;

7.Move mouse to the upper side of the video window, the Measurement Toolbar will appear. It includes calibration, measurement of lines, angles, rectangles, circles, etc, and supports data export(*.CSV format), please refer to section 3.3 for detail;

8.Move mouse to the bottom side of the video window, the Synthesis Camera Control Toolbar will appear. Operations like Zoom In, Zoom Out, Flip, Freeze, Crossline, LED brightness control, Autofocus, SD card contents browsing, Settings, and Camera Version can be executed. See section 3.4 for details;

9.Move mouse to the bottom side of the video window, the Synthesis Camera Control Toolbar will pop up automatically. Click AF button, and Auto Focus Control Panel will show up for autofocus operation, it supports 18X optical zoom, Autofocus, Manual Focus, Reset, and One Push operation. See section 3.5 for details.
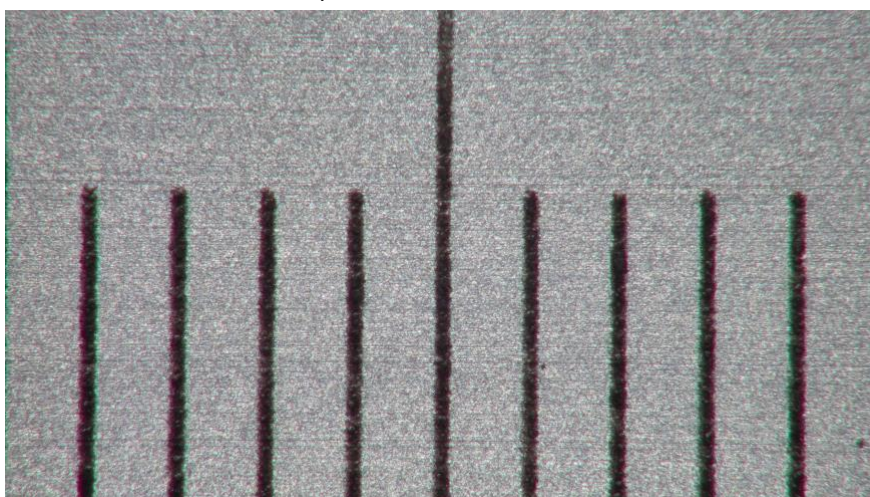
3 Images Captured with AFDM412
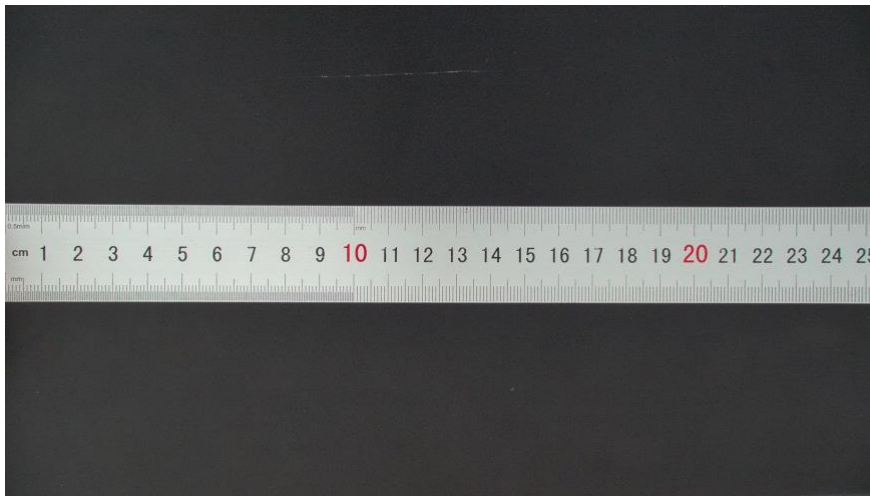
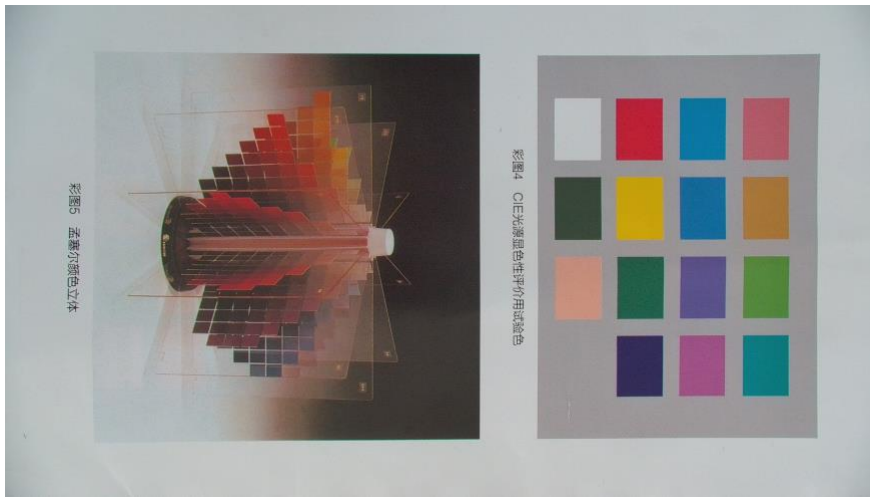Ruler Captured with AFDM412 at 1X
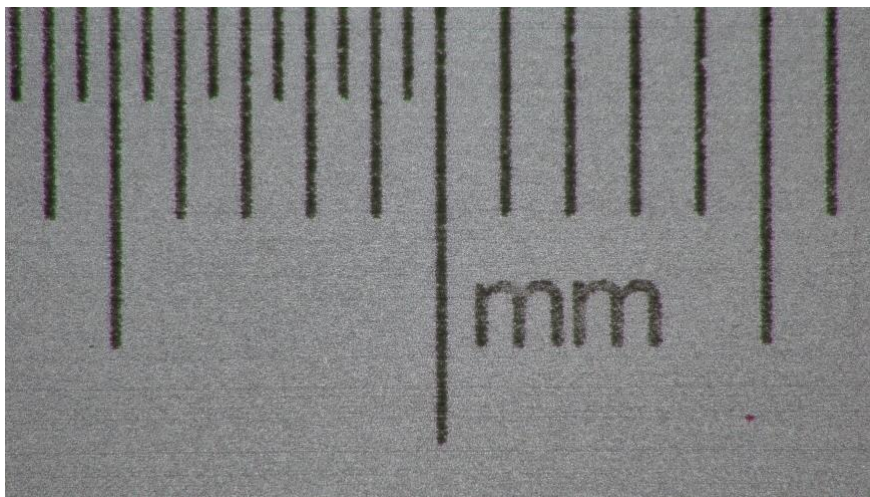
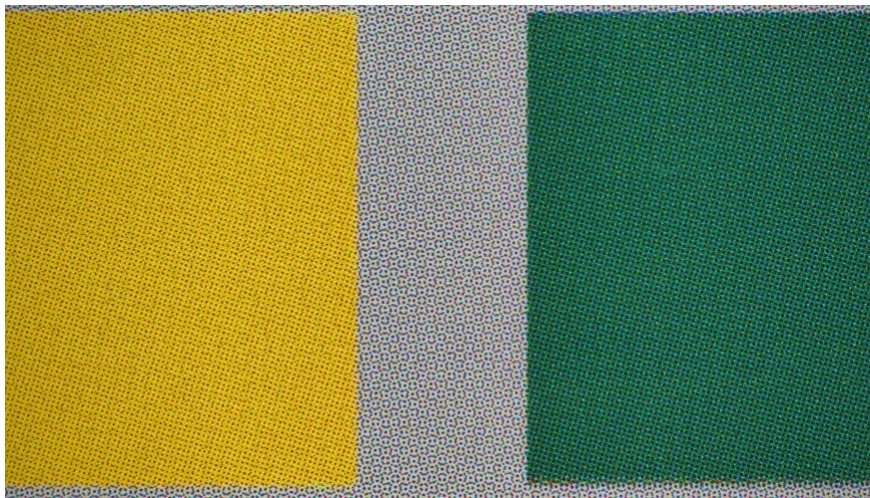Ruler Captured with AFDM412 at 10X
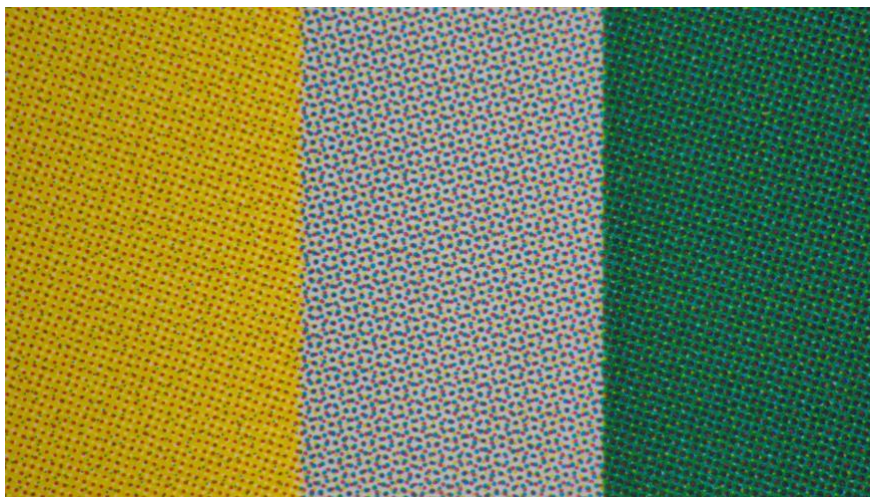

Ruler Captured with AFDM412 at 18X

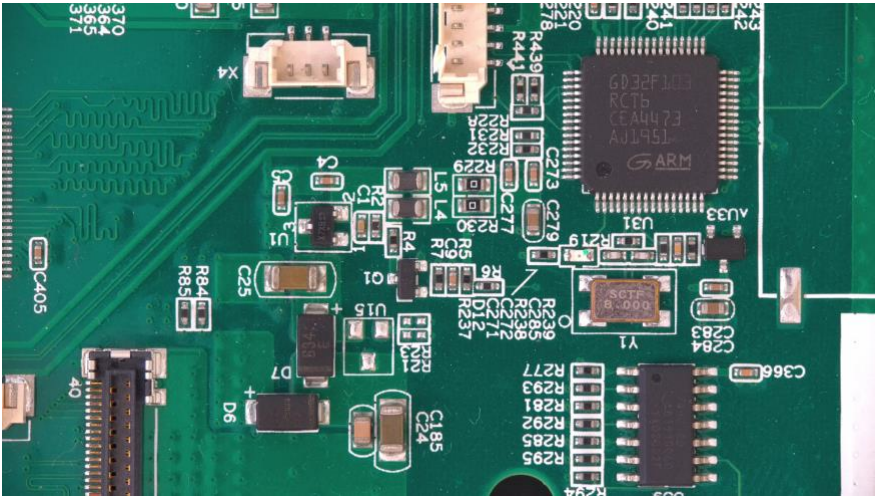Print Captured with AFDM412 at 1.0X
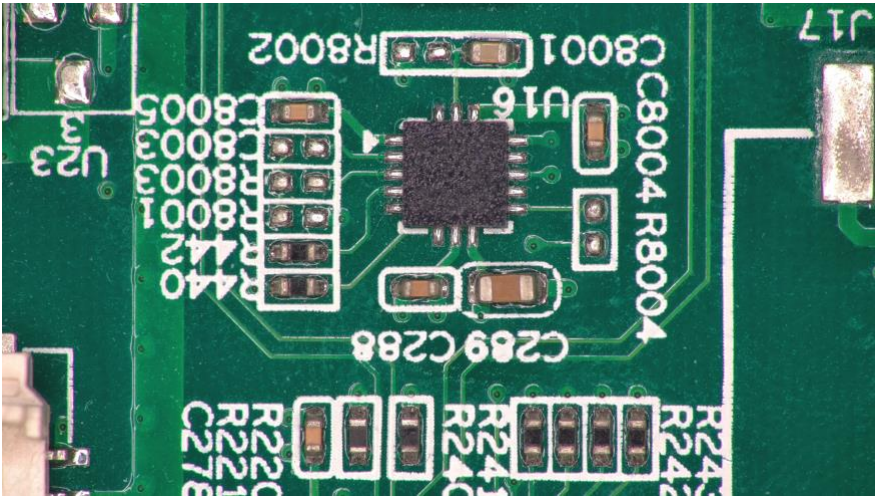

Print Captured with AFDM412 at 10X
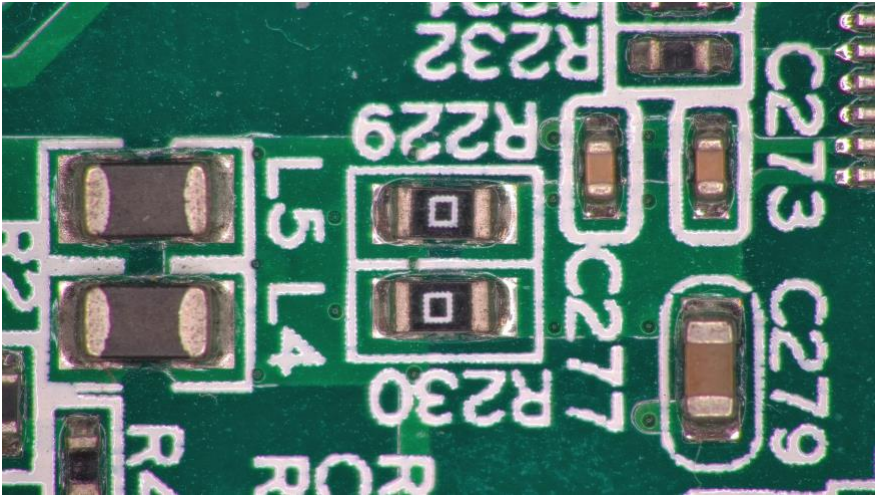

Print Captured with AFDM412 at 18X

PCB Captured with AFDM412 at 4.0X

PCB Captured with AFDM412 at 10X

PCB Captured with AFDM412 at 18X

4   Software and App

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

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

Linux & macOS: https://www.touptekphotonics.com/download/

iOS: https://itunes.apple.com/us/app/toupview/id911644970

Android: https://play.google.com/store/apps/details?id=com.touptek.tpview

For ToupLite and ToupView App, the Auto-focus and LED Brightness Control are not avaiable

5 AFDM412 Camera Configurations

You can use the AFDM412 camera in 5 different ways. Each connection requires different hardware configuration.

5.1 Camera Working Standalone with Built-in XFCAMView Software

For this application, apart from the microscope, you only need an HDMI monitor, the supplied USB mouse, and the camera embedded with XFCAMView software. The steps to start the camera are listed as below:

- Connect the camera to a HDMI monitor using the HDMI cable;
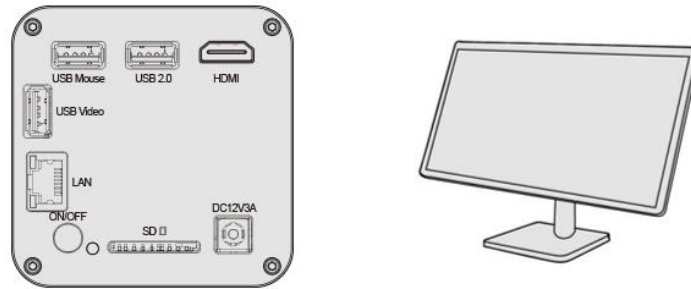
- Insert the supplied USB mouse to the camera's USB port;
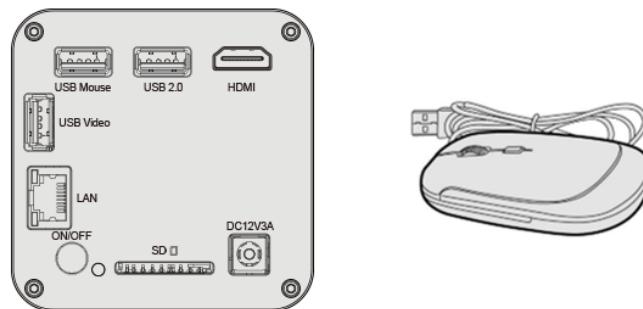
- Insert the supplied SD card/USB flash drive (USB2.0 slot) into the AFDM412 camera SD card slot/USB2.0 slot;

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

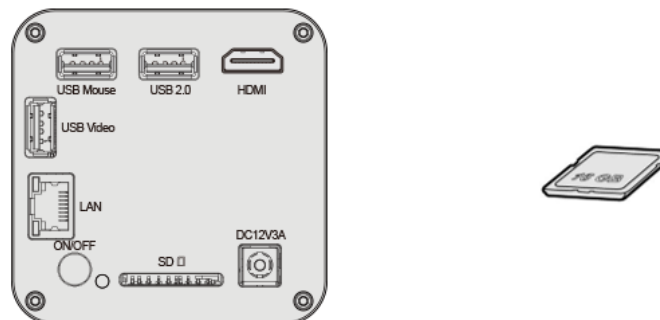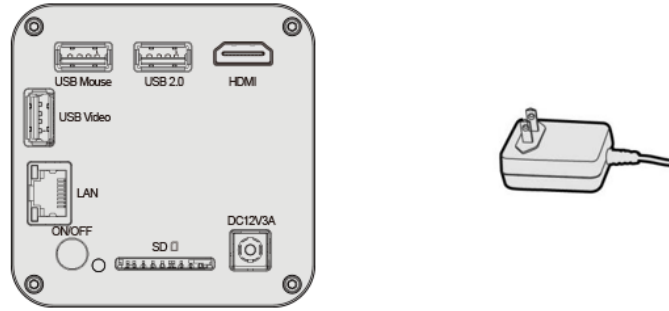- Turn on the monitor and view the video in the XFCAMView software. Move the mouse to the left, top or bottom of the XFCAMView UI, different control panel or toolbar will pop up and users could operate with the mouse at ease.
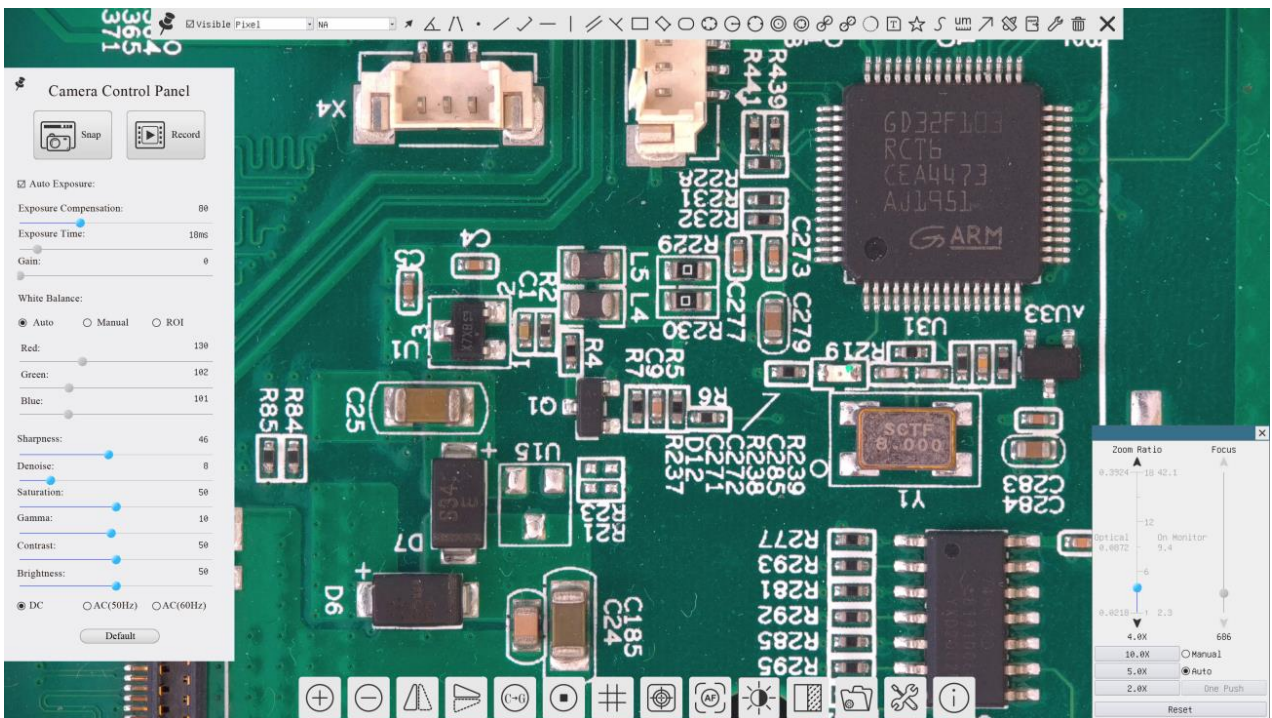
Figure 5-1 XFCAMView and AFDM412 Camera in HDMI Mode

5.2 Connecting Camera to Computers with USB2.0 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. 5.1. After the camera is running, connect camera to computer with USB cable. Please use "USB Video" slot, not "USB Mouse" slot as shown below.
- 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 n to start the live video as shown in Figure 5-2.
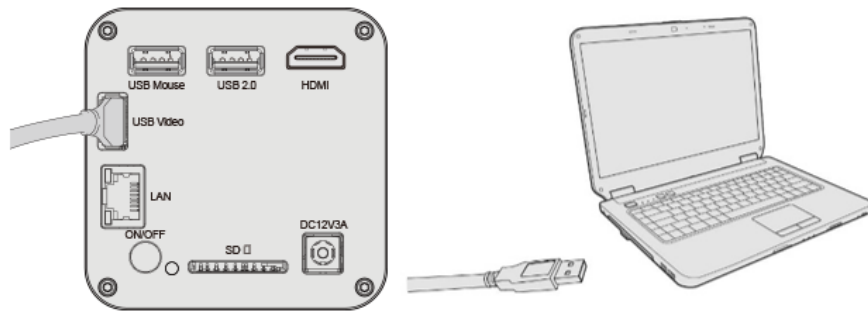
- After the USB cable is connected, the mouse will not work. If you want to use the mouse for HDMI application(XFCAMView), please unplug the USB cable and restart the camera to activate it.
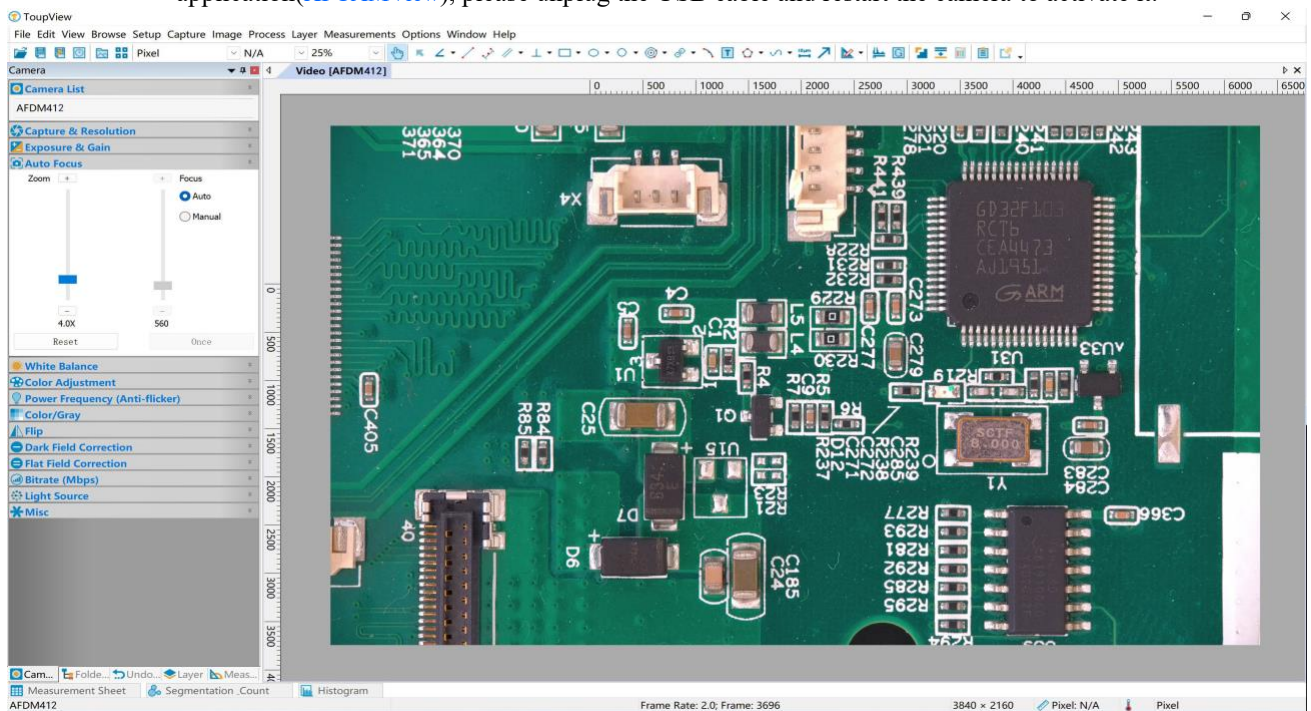
Figure 5-2 ToupView and AFDM412 Camera in USB Mode

5.3 Camera Working in WLAN Mode (AP Mode)

Please make sure your PC is WLAN enabled.

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. 5.1. 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>WLAN property page and choose the AP in the Wi-Fi Mode edit box(The factory default configuration is AP mode).
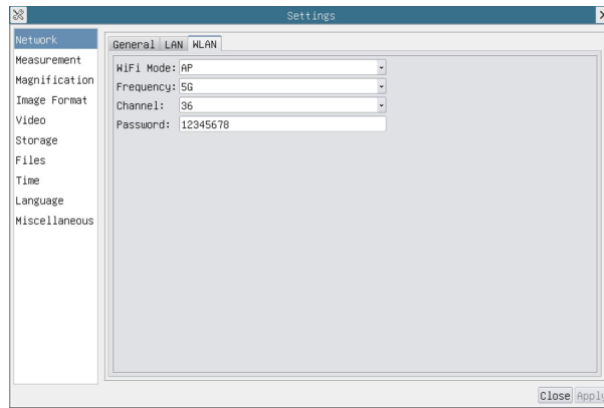
Plug the USB WLAN adapter into the camera's USB2 .0 port;
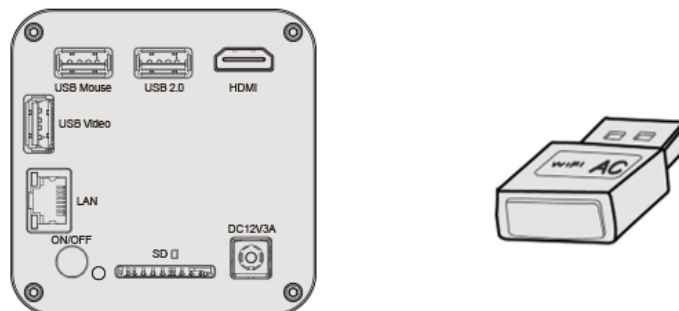
Install ToupView/ToupLite on your PC or install ToupView App on the mobile device, Connect the PC or mobile device to the camera's WLAN AP point; The network name (SSID) and the WLAN password (The default one is 12345678) can be found on the camera's Setting>Network>WLAN page in AP mode.
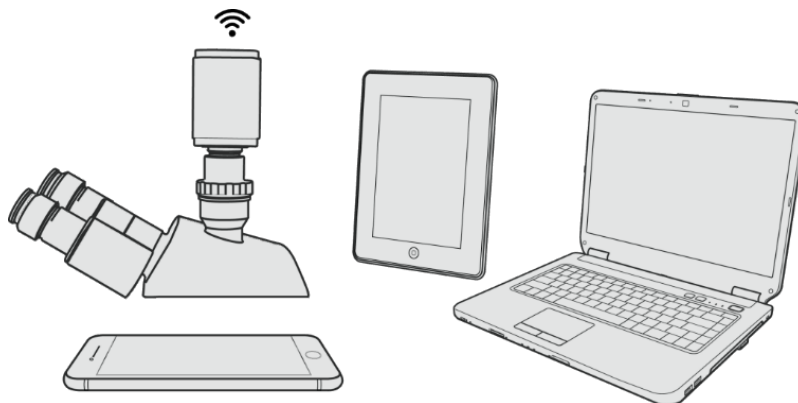
Start ToupView/ToupLite software or ToupView App and check the configuration. Normally, the active AFDM412 cameras will be automatically recognized. The live image of each camera is shown in Figure 5-3. For the display, the Camera List tool window is used in ToupView/ToupLite software, and the Camera Thumbnail is used in ToupView App.
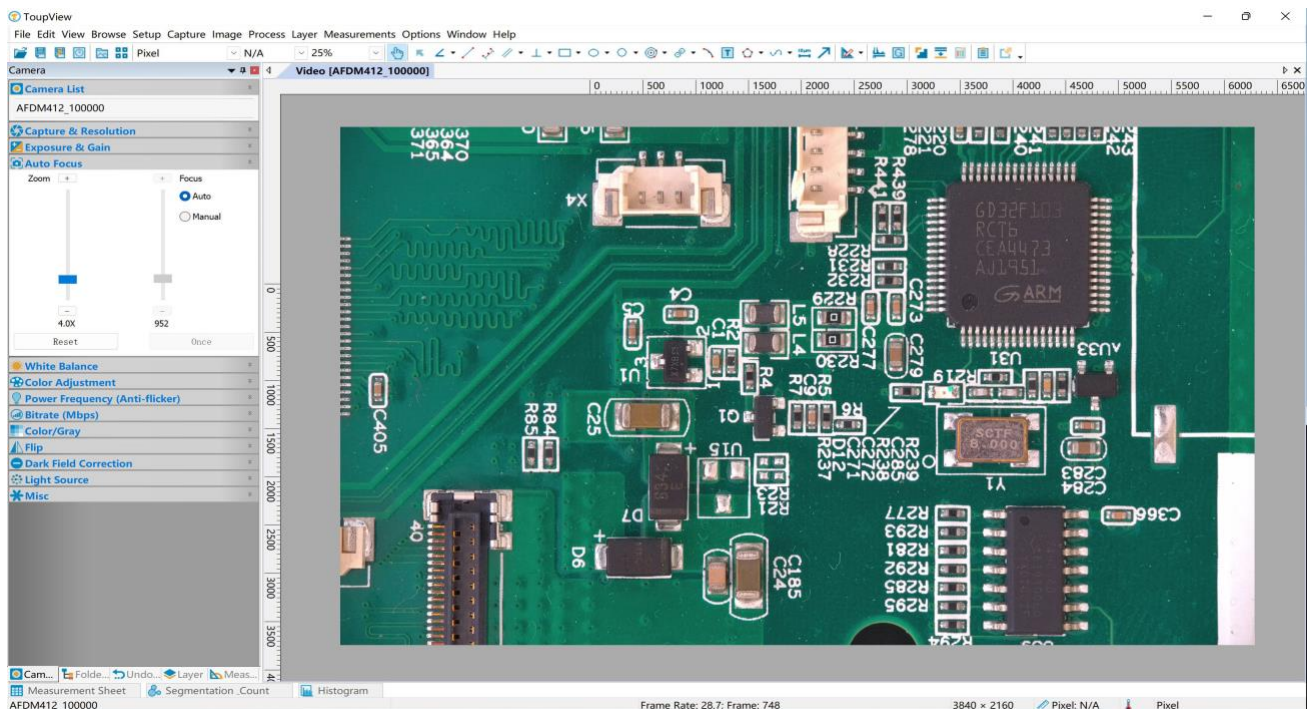
Figure 5-3 ToupView and AFDM412 Camera in WLAN AP Mode

5.4 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 are in the same net. The subnet mask and gateway of the camera and PC must be the same.

Start the camera according to Sec. 5.1 after the camera is running, clicking ✂ button on the Synthesis Camera Control Toolbar at the bottom of the video window(See Figure 5-1), 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.
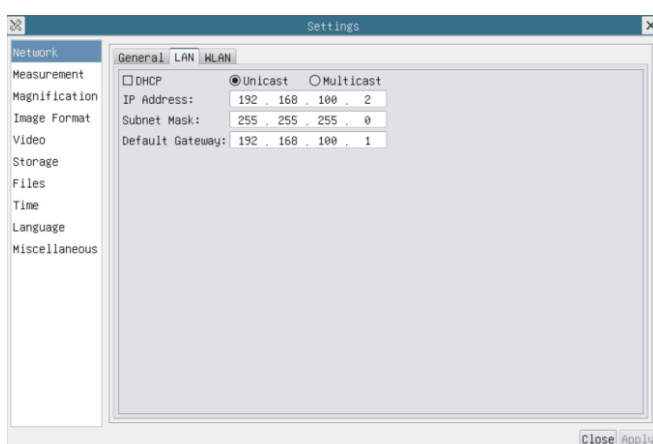
Figure 5-4 Configure theAFDM412 Camera IP
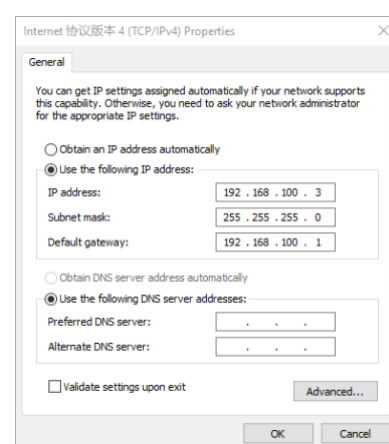
Figure 5-5 Configure the PC's IP

After the above configurations are finished, user can connect the AFDM412 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;
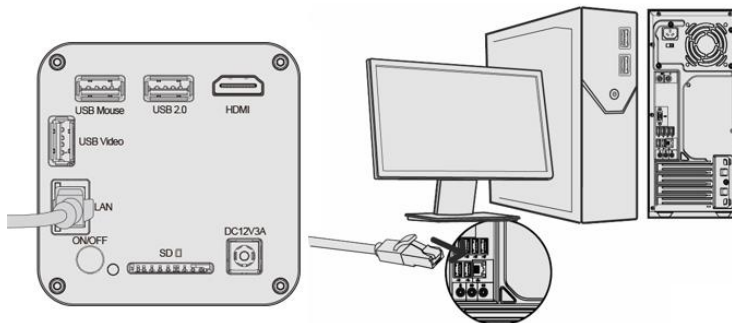
Insert the supplied SD card/USB flash drive (USB2.0 slot) into the AFDM412 camera's SD card slot/USB2.0 slot;
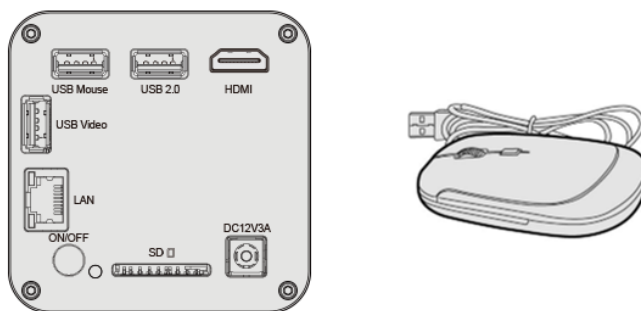
Install ToupView/ToupLite on your PC or install ToupView App on the mobile device; Run the software ToupView/ToupLite, clicking the camera name in the camera list starts the live video as shown in Figure 5-3.

5.5 Connecting Multi-Cameras to the Router Through the LAN Port/WLAN STA Mode for Network Application

In LAN/WLAN STA mode, the camera connects to the router by LAN port/WLAN STA mode. If a router with LAN/WLAN capability is used, users could connect the router with Ethernet cable/WLAN to control the camera.
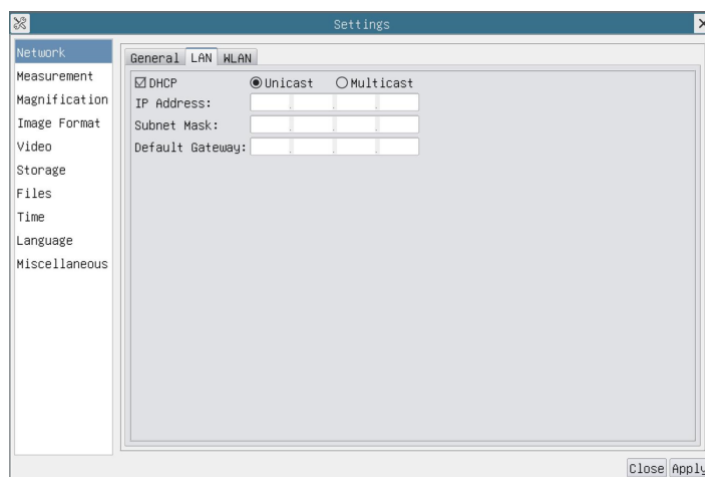
The connection and configuration are just the same as in Sec.5.1 or Sec. 5.4. But here, users need to check DHCP. If Multicast is disabled or is not supported, users should only select Unicast. If Multicast is supported by the network, users could select Multicast to achieve a better performance, especially 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 AFDM412 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 5-2.

Or start the camera according to Sec. 5.1. 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>WLAN property page and choosing the STA in the Wi-Fi Mode edit box(The factory default configuration is AP mode). Input the to be connected router's SSID and Password as shown below:
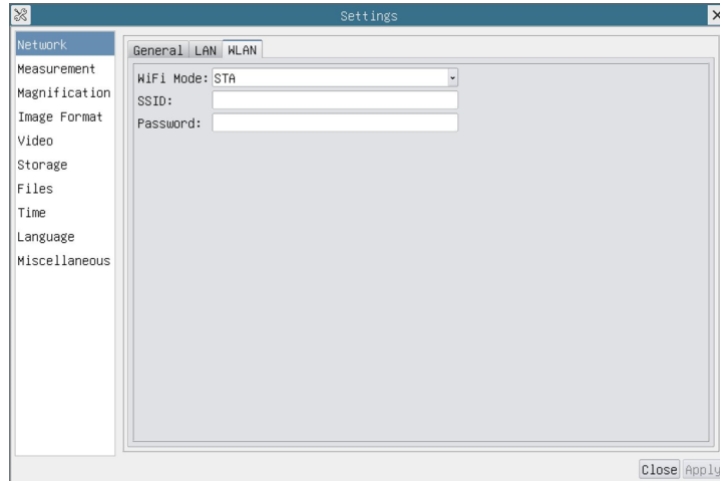
Install ToupView /ToupLite software on your PC. Alternatively, install the free ToupView App on the mobile device;

Plug the Ethernet cable into the camera's LAN port and the other end to the PC (for those connected to router with WLAN STA mode);
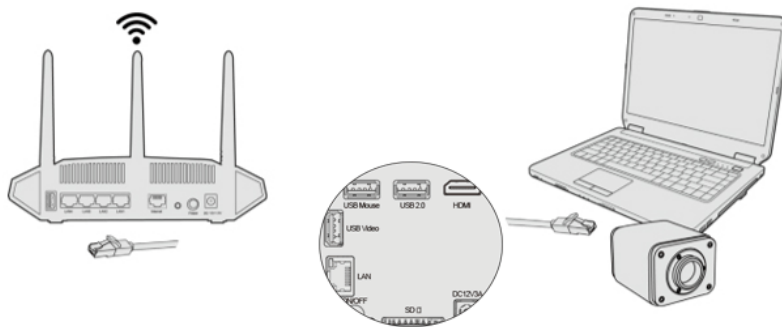
Or plug the USB WLAN adapter into the camera's USB2.0 port(for those connected to router with WLAN STA mode);
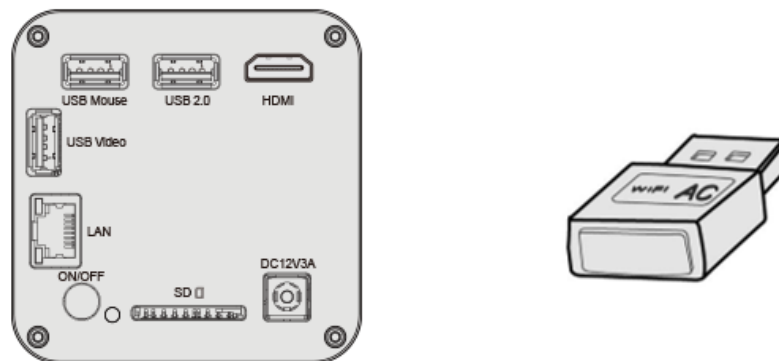
Finally, as shown below, 2 AFDM412 cameras are connected to the router with LAN cable and 2 AFDM412 cameras are connected to the same router with WLAN STA mode(The number of the cameras, the connection mode(LAN or WLAN STA)) connected to the router are determined by the router performance)
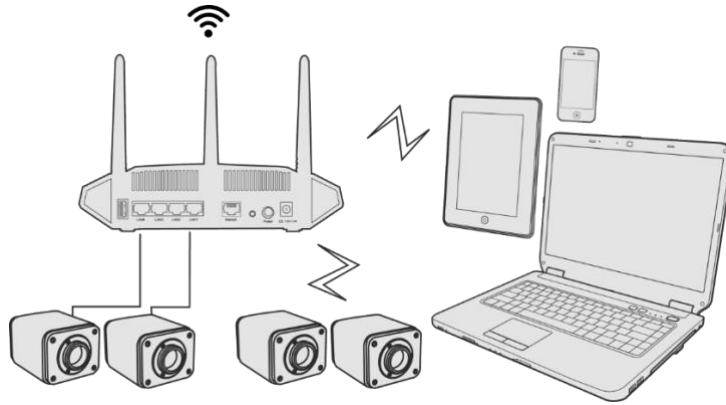
Make sure that your PC or your mobile device is connected to the LAN or WLAN of the router; Start ToupView/ToupLite software or ToupView App and check the configuration. Normally, active AFDM412 cameras are automatically recognized. The live image of each camera is displayed. For the display, Camera List control panel window is used in ToupView/ToupLite software, and Camera Thumbnail is used in ToupView App; Select the AFDM412 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 5-6)

About the routers/switches

It is suggested that routers/switches supporting 802.11ac 5G segment should be selected to achieve better wireless connection experience.
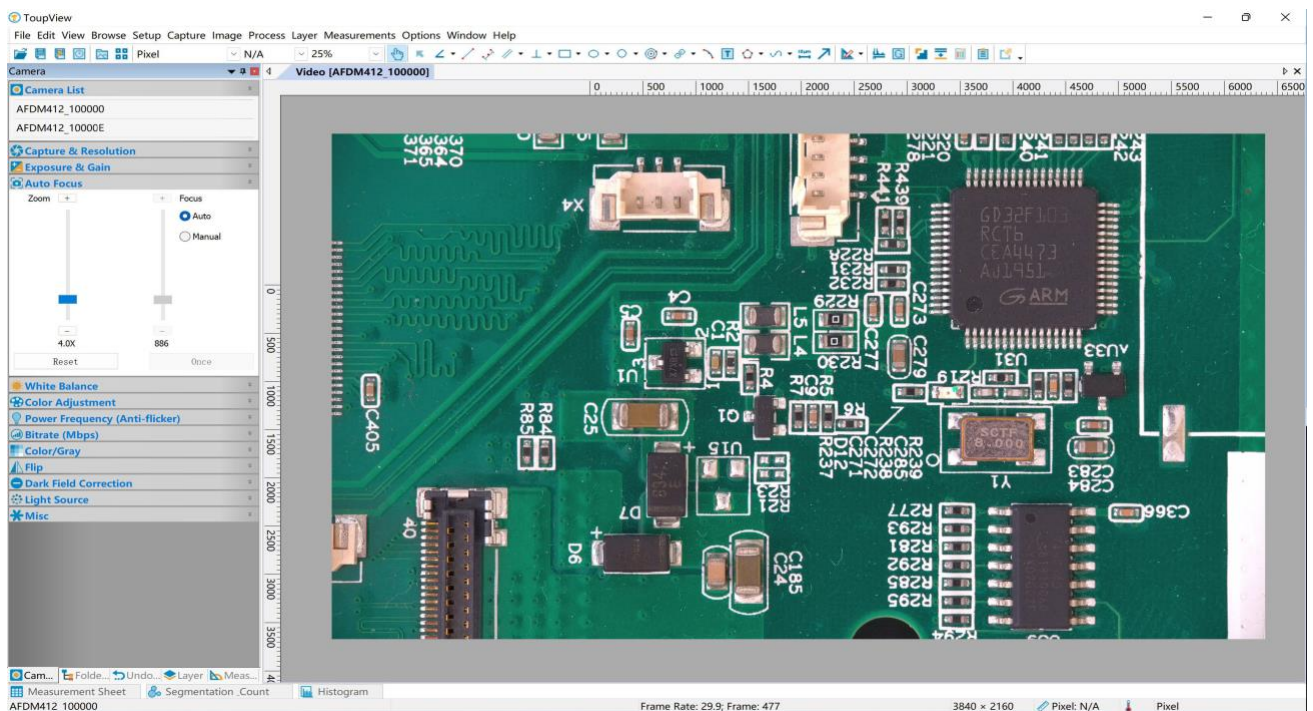
Figure 5-6 ToupView and AFDM412 camera in LAN port/WLAN STA mode

6   Introduction of XFCAMView UI and Functions

6.1   Control UI
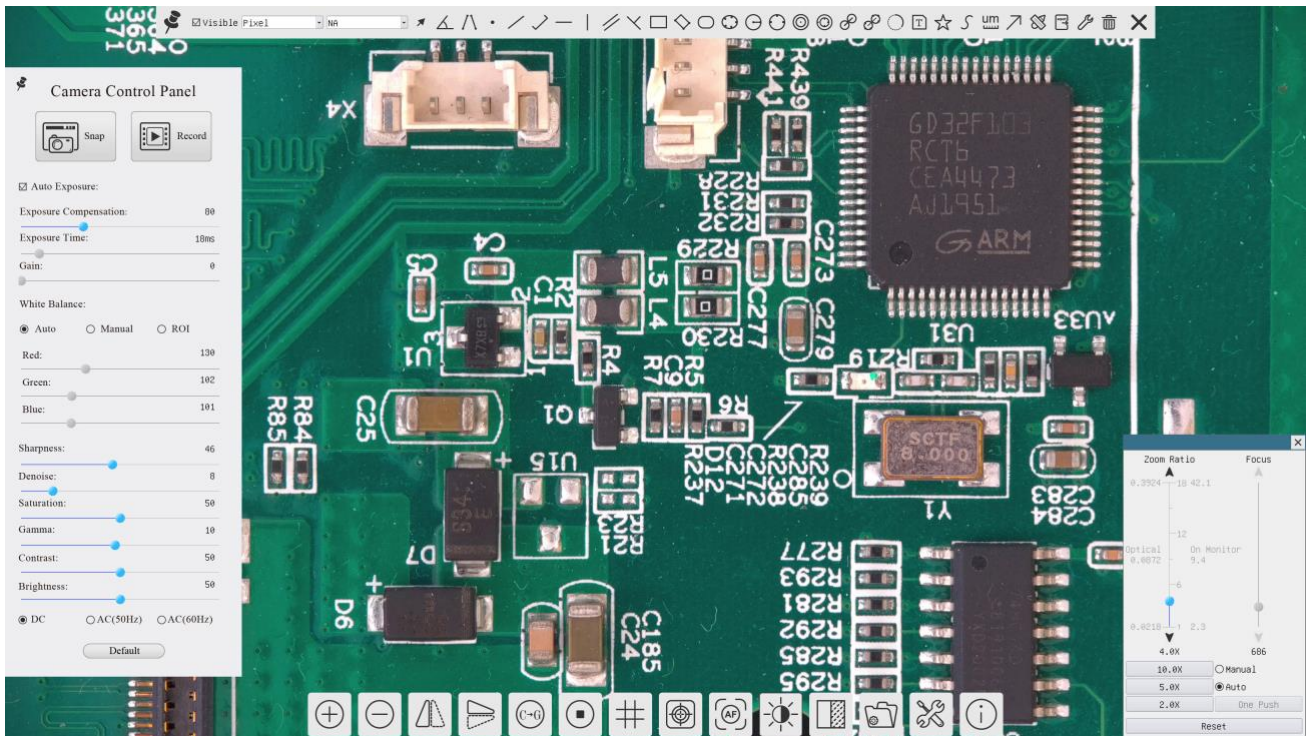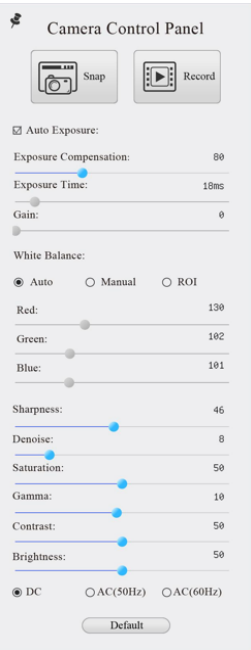
Figure 6-1 XFCAMView and Its Control UI

AFDM 's XFCAMView software operation UI is shown in Figure 6-1. It includes Camera Control Panel on the left side of the video window, Measurement Toolbar on the top of the video window, Synthesis Camera Control Toolbar, and Autofocus Control Panel on the right side of the video window.

Software Toolbar / Control Bar / Control Panel

1	Move the mouse to the left side of the video window, the **Camera Control Panel** will pop up automatically;
2	Move the mouse to the bottom of the video window, the **Synthesis Camera Control Toolbar** will pop up automatically;
3	Move the mouse to the bottom of the video window, the **Synthesis Camera Control Toolbar** will pop up automatically. Click the ⊚ button and the **Auto Focus Control Panel** will appear for autofocus operation;
4	Move the mouse to the upper side of the video window, the **Measurement Toolbar** will pop up for the calibration and measurement operations. When the 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 user moves mouse to the left side of the video windows. Only when the user left-clicks the ✖ button on the **Measurement Toolbar** to exit from the measuring procedure will he be able to do other operations on **Camera Control Panel**, **Autofocus Control Panel,** or **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 objects.

6.2 The Camera Control Panel on the Left Side of the Video Window

Camera Control Panel	Function	Function Description
	Snap	**Capture** or **Snap** image from the current video window
	Record	**Record** video from the current video window
	Auto Exposure	Checking **Automatic Exposure** box will automatically adjust exposure time according to the **Exposure Compensation** value
	Exposure Compensation	Available when **Auto Exposure** is checked. Slide to left or right to adjust **Exposure Compensation** according to current video brightness to achieve proper video brightness
	Exposure Time	Available when **Auto Exposure** is unchecked. Slide to left or right to decrease or increase the exposure time to adjust the video brightness
	Gain	Adjust the **Gain** value to decrease or increase the video brightness. The noise will be reduced or increased accordingly
	Red	Slide to left or right to decrease or increase the proportion of **Red** in the video window
	Green	**Green** is a base for reference and cannot be adjusted
	Blue	Slide to left or right to decrease or increase the proportion of **Blue** for the video
	White Balance	**Auto White Balance** adjustment according to the video window
	Sharpness	Adjust **Sharpness** level of the video window
	Denoise	Adjust **Denoise** level of the video window

Saturation	Adjust **Saturation** level of the video window
Gamma	Adjust **Gamma** level of the video. Slide to the right to increase the gamma value and to the left to decrease the gamma value.
Contrast	Adjust **Contrast** level of the video. Slide to the right side to increase and to the left to decrease video contrast
DC	For **DC** illumination, there will be no fluctuation under the light source so no need for compensating light flickering
AC(50HZ)	Check **AC(50HZ)** to eliminate flickering "strap" caused by 50Hz illumination
AC(60HZ)	Check **AC(60HZ)** to eliminate flickering "strap" caused by 60Hz illumination
Default	Set all the settings in the **Camera Control Panel** to the default values.
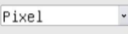
The Camera Control Panel controls the camera to achieve the best image quality according to the specific applications; It will pop up automatically when the mouse is moved to the left side of the video window (in measurement status, the Camera Control Panel will not pop up. Only when the measurement process is terminated will the Camera Control Panel pop up by moving mouse to the left side of the video window). Left-clicking 📌 button to achieve Display/ Auto Hide switch of the Camera Control Panel;

6.3 The Measurement Toolbar On The Upper Side Of The Video Window

6.3.1 Introduction to Measurement Toolbar

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

Icon	Function	Icon	Function
	Float/ Fix switch of the Measurement Toolbar	✓ Visible	Define measuring object in **Show** up/ **Hide** mode
Pixel	Select the desired **Measurement Unit**		
NA	Choose the same **Magnification** as the digital microscope current **Zoom Ratio** to ensure accuracy of measurement result when measurement unit is not in **Pixel** unit		

	Object Select		**Point**
	Angle		**Four-point** method to measure the angle
	Arbitrary Line		**Three-Point** method to measure the spacing
	Three-Point method to measure vertical line		**Parallel Line**
	Horizontal Line		**Vertical Line**
	Rectangle		**Center + Radius Circle**
	Three-points Circle		**Ellipse**
	Annulus		**Two Circles**
	Three-points Two Circles		**Arc**
	Polygon		**Curve**
	Arrow		**Scale Bar**

Make Calibration to determine the corresponding relation between magnification and resolution, this will establish the corresponding relationship between the measurement unit and the sensor pixel size. The monitor's size can be input to achieve the accurate value of the digital magnification. The Calibration needs to be done with the aid of a ruler with an accuracy of more than 1mm. The detailed Calibration process is described in Sec. 6.3.2

Export the measurement information to CSV file(*.csv)

Delete all the Measurement Objects

Setting　　　　　　　　　　　　　　　　　　　　　　**Exit** from **Current Measurement Mode**

When the measurement ends, left-click on a single measuring object and the **Object Location & Properties Control Bar** will show up. The icons on the control bar mean **Move Left**, **Move Right**, **Move Up**, **Move Down**, **Color Adjustment**, and Delete**.**

Note:1) When the user left-clicks Display/Hide 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 moving the mouse cursor to the left side of the video window. Only when users left-click the ✖ button on the Measurement Toolbar to exit from the measurement mode will they be able to perform other operations in the Camera Control Panel, the Autofocus Control Panel, or the Synthesis Camera Control Toolbar.

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

3) To ensure accuracy of the measurement, after the calibration is turned on, the camera will automatically reset, and then sets the normalization magnification to 18X, and adjusts the focus to the required standard object distance. If the "Calibration Object" on the stage is not clear on the monitor, you need to manually adjust the height of the bracket to the clearest position, which is the standard object distance. After the Calibration is completed, use the Measurement Toolbar to measure the 1mm physical distance on the ruler, which should display 1mm on the monitor.

4) Even if the Calibration has been completed, once the user needs to measure, but is not sure whether the camera is at the standard object distance position, it is always better to reset it first, adjust the stand height in the reset state to make the observation object clear, and ensure that the camera is at the standard object distance position before measurment.

6.3.2 Calibration Method

User needs to prepare an Calibration Object such as ruler before Calibration;

Move the mouse to the upper side of the video window, the Measurement Toolbar will appear. Clicking 🖉 Calibration on the Measurement ToolBar to start the calibration.

1)The XFCAMView will pop up a message box: "1. Camera resetting for calibration..."

2)After the reset is finished, a message box: "2. Please put the calibration object on the stage(if not), adjust the height of the stand until the calibration object is in focus, then click OK button;" will pop up.

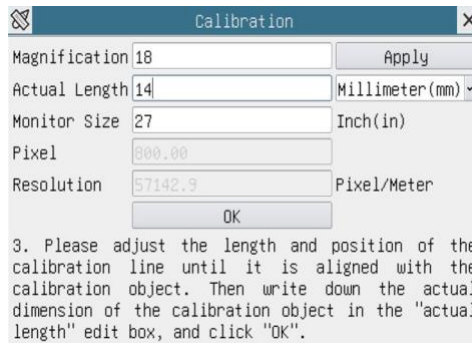3)After clicking the OK Button, XFCAMView will pop up a Calibration dialog shown below:

Figure 6-2 A Dialog for Calibration

Magnification: the Magnification edit box, can be set from 1 to 18 as user want, Click **Apply** button to confirm;

Actual Length: the **Actual Length** of the **Calibration** object on the stage, the unit can be selected with the right drop-down list box. Read the hint on the **Calbration** dialog to get the correct **Calibration** result;

Monitor Size: the **Monitor Size** in Inch for the magnification calculation of the object displayed on the monitor;

Pixel: the length in **Pixel** of the **Calibration Line** on the monitor;

Resolution: the resolution in **Pixel/Meter** unit which is arrived by **Pixel/Actual Length**;

OK: Click **OK** button to end the Calibration;

Users can refer to the message: **"3. Please adjust the length and position of the calibration line until it is aligned with the calibration object. Then write down the actual dimension of the calibration object in the actual length edit box, and click OK."** to get the correct calibration result.

The default monitor size is 27.0 inches. Users can enter the practical Monitor Size.

6.4 Synthesis Camera Control Toolbar At 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/gray**	⊙	**Video Freeze**
#	**Display Cross Line**	⊚	**Image Overlay**
AF	**Auto Focus Control Panel**	☼	**LED Brightness Control**
▦	**Compare** Image with the Current Video	🗁	**Browse Images Videos**
✄	**Settings**	ⓘ	**Check the Version of XFCAMView**

The ✄ Setting function is relatively more complicated than the other functions. Here is more info about it:

6.4.1 Setting>Network
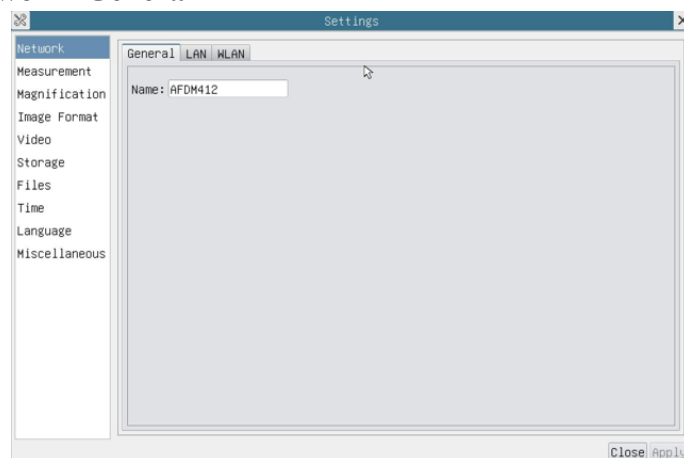
6.4.1.1 Setting>Network>General

Figure 6-3 Comprehensive Network General Settings Page

Name   The current camera name recognized as the network name
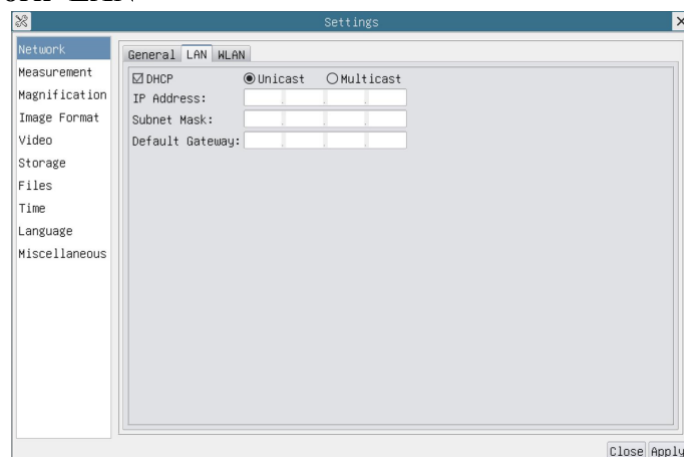
6.4.1.2 Setting>Network>LAN

Figure 6-4 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 6-. 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**;

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 **Default Gateway** 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**.

Uncheck the DHCP and select the Unicast item, user still need to set the IP address, Subnet mask and Default Gateway as shown below:
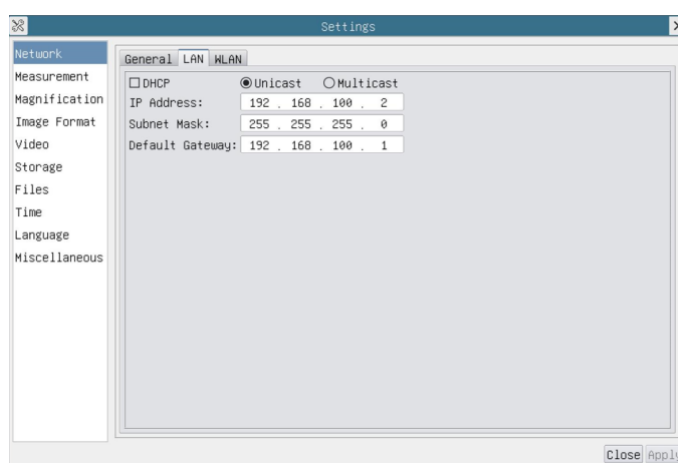
Figure 6-5 Manual DHCP and Unicast

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

6.4.1.3 Setting>Network>WLAN

Wi-Fi Mode **AP/STA mode** to select;

Channel/SSID **Channel** for the **AP mode** and **SSID** for the **STA mode**. Here, the **SSID** is the router's **SSID**;

Password **Camera Password** for the **AP mode**. **Router Password** for the **STA mode**

Figure 6-6   Network Setup

6.4.2 Setting>Measurement

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

Figure 6-7　The Measurement Setup

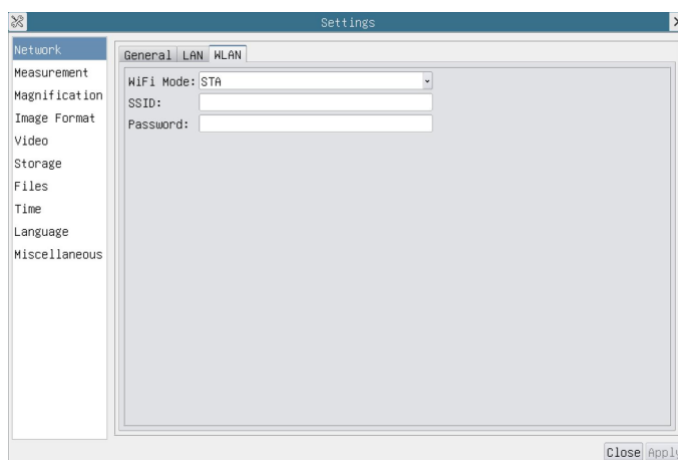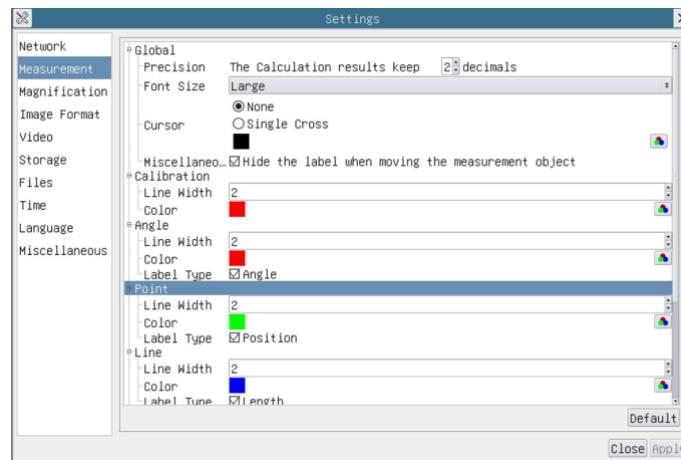| Global		Used for setting digits behind the decimal point for measurement results;
	Line Width	Used for defining width of the lines for calibration;
Calibration	Color	Used for defining color of the lines for calibration;
	EndPoint	Type: Used for defining shape of the endpoints of lines for calibration: 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**.

6.4.3 Setting>Magnification

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

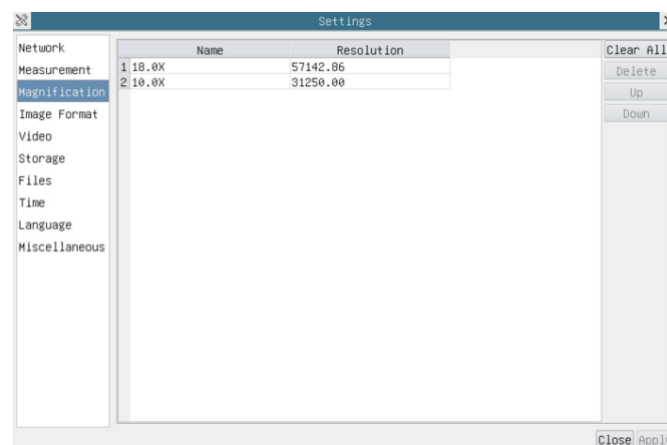Figure 6-8　Comprehensive Magnification Settings Page

Name	Names such as 4X,10X, 18X， are based on magnification of the digital microscopes.
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 ratio and click **Up** to move up the currently selected magnification ratio;
Down	Select a row in the magnification ratio and click **Down** to move down the currently selected magnification ratio;

6.4.4 Settings>Image Format

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.
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.
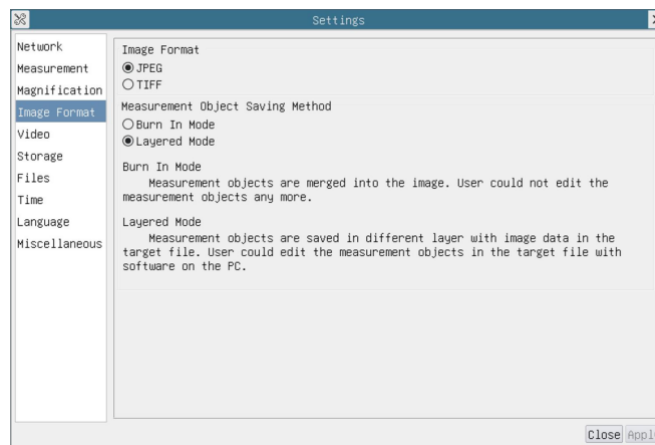
Figure 6-9   Comprehensive Image Format Settings Page

6.4.5 Setting>Video

Video Playback	Fast Forward/Reverse internal in second unite for Video Playback
Video Encode	Select the Video Encode format. Can be H264 or H265. Compared with H264, H265 has a higher H265 compression ratio which is primarily used to further reduce the design flow rate, in order to lower the cost of storage and transmission

Figure 6-10   Comprehensive Setting of Video page

6.4.6 Setting>Storage

List the file system format of the current storage device

File System Format of the Storage Device
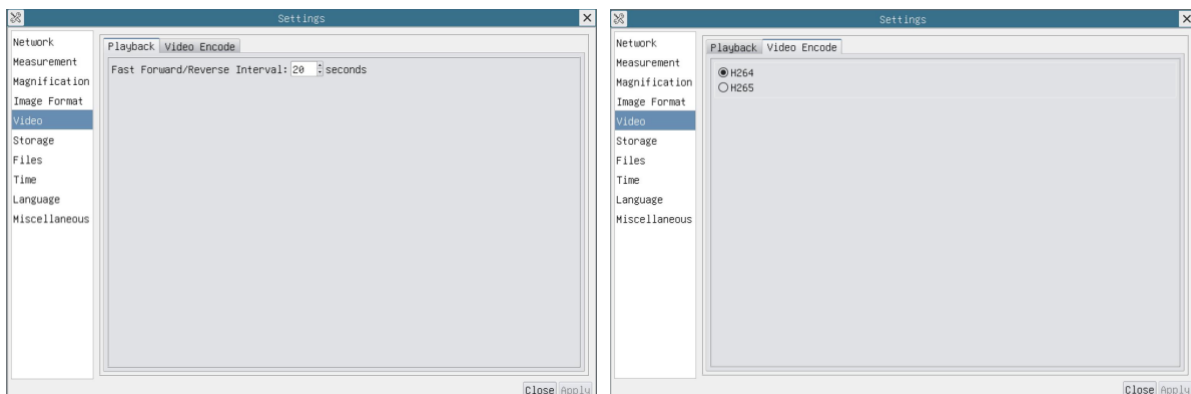FAT32: The file system of SD Card is FAT32. The maximum video file size of single file in FAT32 file system is 4G Bytes;

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.

Figure 6-11　Comprehensive Setting of Storage Page
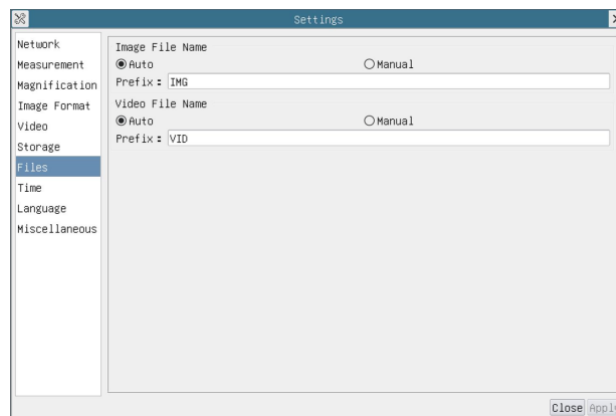
6.4.7 Setting>Files

Figure 6-12　Comprehensive Setting of Files Name

Image/Video File Name　Provide Auto or Manual naming paradigm for Image or Video file;

Auto　With specified name as the Prefix and XFCAMView 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.
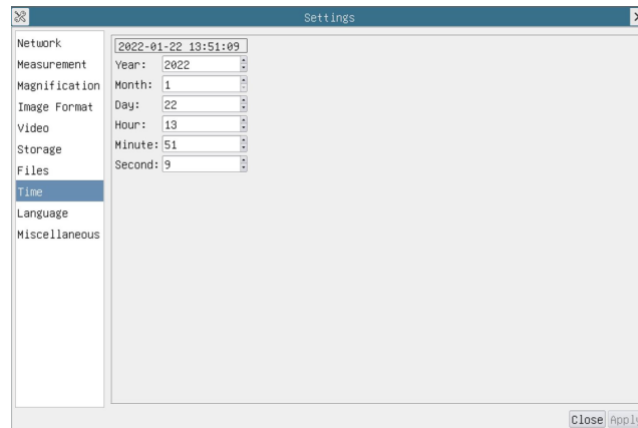
6.4.8 Setting>Time

Figure 6-13 Time Setting

Time   User can set Year, Month, Day, Hour, Minute and Second ital.in this page.

6.4.9 Setting>Language

Figure 6-14   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**;

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**;

6.4.10 Setting>Miscellaneous

Figure 6-15 Comprehensive Miscellaneous Settings Page

Clarity Factor	Check this will show the **Clarity Factor** on the video window screen to tell if the camera is focused correctly or not;
Ruler	Select to display the **Ruler** in the video window, otherwise not to display the **Ruler**;
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;
USB video output switch back to mouse operation	Select automatic restart or manual restart to switch from USB video output to mouse operation;
ROI Color	Choosing the **ROI** rectangle line color
Cursor	Choosing the **Cursor** size according to the screen resolution or personal preference
Auto Exposure	Define the maximum automatic exposure time;
Auto Exposure Region	Select the **AE** reference area;
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;

6.4.11 Auto Focus Control Panel on the Right Side of Video Window
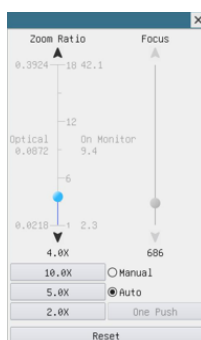
Zoom Slider	Move the **Zoom Slider** to change the **Zoom Ratio**, the value will be displayed below the slider. It can be edited to set the desired **Zoom Ratio**
Zoom Button	There are 3 **Zoom Buttons**, users can set specific zoom ratio for the quick control
Optical Magnification	**Optical Magnification** is the designed lens magnification
Digital Magnification	**Digital Magnification** is the object length on the monitor divided by the actual object length
Focus Slider	Move the **Focus Slider** to change the focus lens position; The focus lens position value will be displayed below the slider. It can be edited to set the desired focus lens position;
Manual Focus	With **Manual Focus** radio button is checked, users can move the **Focus Slider** to change

the focus lens position to get a clear image. The position value of the focus lens below the slider can be set by the user

|	
Autofocus	With Autofocus radio button is checked, the system will automatically focus the object on the stage, the focus lens position value under the **Focus Slider** will be refreshed in real-time; When the **ROI** or **Object** state is changed, the camera will perform the **Auto Focus** operation automatically
One Push	Clicking **One Push** button will perform a **Autofocus** operation at a time
Reset	Click Reset button to reset the **Zoom** and **Focus** modules. After the process is finished, the **Zoom** is set to 18X normalized magnification, and the **Focus** is fixed at the standard object distance(195mm in this model), if the object(such as a ruler for **Calibration**) is not clear, adjust the stand bracket to move the object to the standard object distance. Note: (see **Measurement Toolbar>Calibration** items for details).

6.4.12 Focus Region On the Video Window
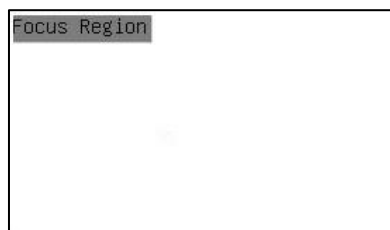
Figure 6-16 Focus region

The Focus Region is used for selecting the region of interest for Auto Focus operation. When user clicks the [⊚] button on the Synthesis Camera Control Toolbar, the Focus Region will pop up as well with the Autfoocus Control Panel. Users can click any part of the video window to select the focus region for Auto Focus operation.

When users close the Autofocus Control Panel, the Focus Region will be closed automatically.