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1   Quick Instructions for KERN OPTICS HDMI cameras

Before starting the camera, please connect the camera to the camera adapter and then to the microscope's 3rd tube which will relay microscope object's middle image to the camera sensor.

1.1   HDMI MODE

1. Plug the HDMI cable into the HDMI port of the camera and the HDMI port of the display.
2. Plug an USB mouse into the USB port to get control of the camera by using built-in XCamView.
3. Plug the 12V/1A power supply into the camera. The LED will turn into red.
4. Insert SD card into the SD Card Slot for saving captured images and recorded videos.
5. Press the ON/OFF Button to start the camera. The LED will turn into blue.
6. Move the mouse cursor to the left side of the video window and the Camera Control Panel will appear. It includes Manual, Automatic Exposure, White Balance, Sharpness, Denoise and other functions.
7. Move the mouse cursor to the upper side of the video window, a Measurement Toolbar with calibration and other measurement tools will appear. The measurement data can be output with *.CSV format.
8. Move the mouse cursor to the bottom of the video window and a Synthesis Camera Control Toolbar will appear. Operations like Zoom In, Zoom Out, Flip, Freeze, Cross Line, WDR etc. can be realized.
9. Move the mouse cursor to bottom of the video window, the Synthesis Camera Control Toolbar will pop up automatically. Click the button and Auto Focus Control Panel will show up for conducting autofocus operation. (Not every model has an auto-focus function!)

1.2 Brief Introduction of XFCAM1080KPD UI and Functions

The Camera UI shown in Fig. 8 includes the Camera Control Panel on the left side of the video window, the Measurement Toolbar on the upper side of the video window, the Synthesis Camera Control Toolbar on the bottom of the video window and the Auto Focus Control Panel on right side of the video window.
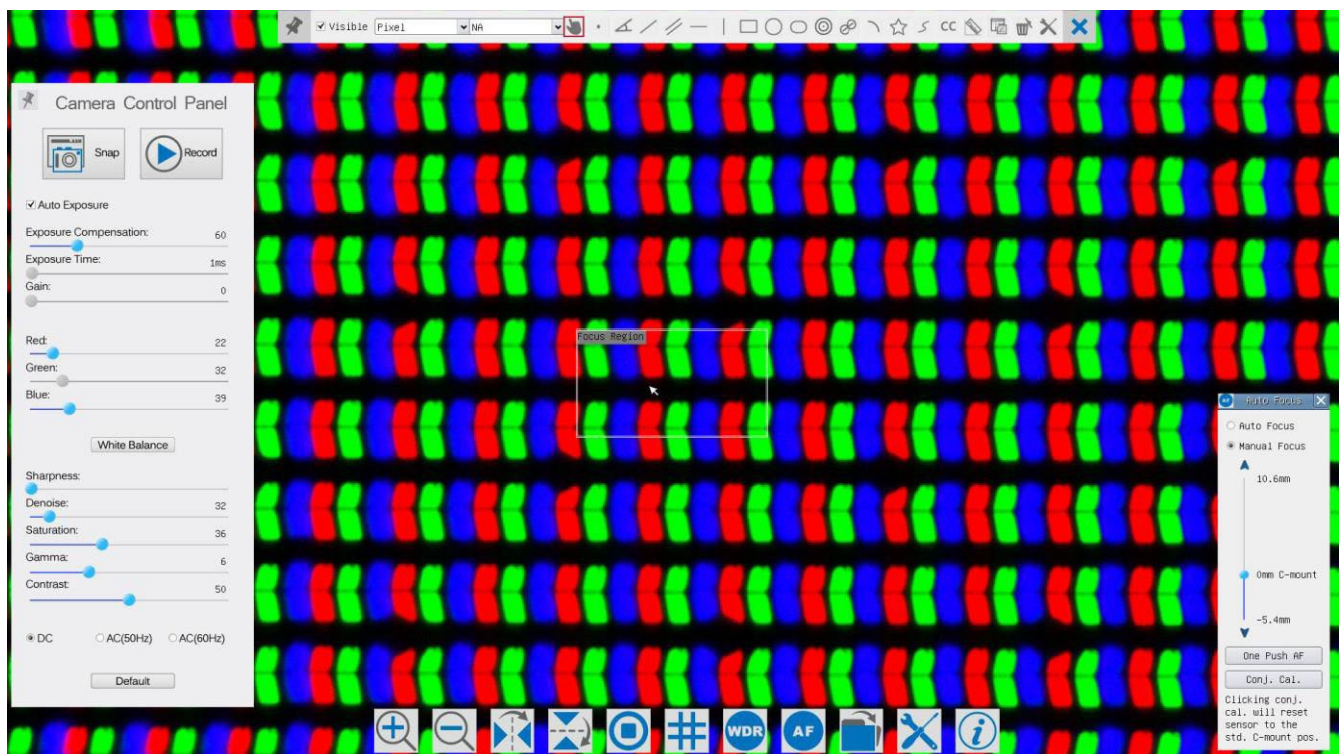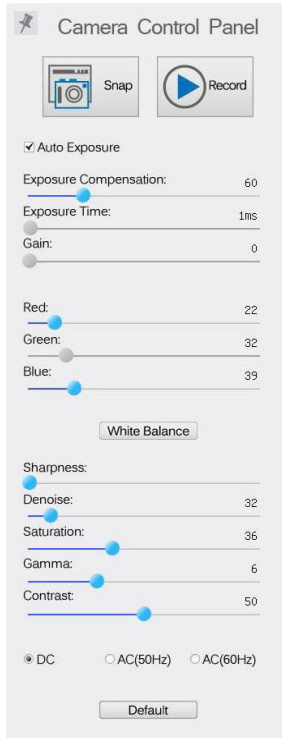

Figure 8 The Camera Control UI

Notes
1	When users move the mouse cursor to the left side of the video window, the Camera Control Panel will pop up automatically.
2	When users move the mouse cursor to the bottom of the video window, the Synthesis Camera Control Toolbar will pop up automatically.
3	When user moves the mouse cursor 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. (Not every model has an auto-focus function!)
4	Move the mouse cursor to the upper side of the video window, the Measurement Toolbar will pop up for the 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 side of the video windows. 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, Auto Focus 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.

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

Camera Control Panel	Function	Description
	Snap	Capture or Snap image from the current video window.
	Record	Record video from the current video window.
	Auto Exposure	When Automatic Exposure is checked, the system will automatically adjust exposure time according to the value of Exposure Compensation value.
	Exposure Compen-sation	Available when Auto Exposure is checked. Slide to left or right to adjust. Exposure Compensation according to current video brightness to achieve proper brightness value.
	Exposure Time	Available when Auto Exposure is unchecked. Slide to left or right to decrease or increase exposure time to adjust the video brightness.
	Gain	Adjust Gain 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 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 window video.
	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 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.
	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 "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 cursor is moved to the left side of the video window (in measurement status, the Camera Control Panel will not pop up. Only when measurement process is terminated will the Camera Control Panel pop up by moving mouse cursor to the left side of the video window). Left-clicking ⚲ button to achieve Display/ Auto Hide switch of the Camera Control Panel.

Icons and Functions of the 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
◉	Video Freeze	⊞	Display Cross Line
WDR	WDR	AF	Start Auto Focus Control Panel
📂	Browse Images and Videos in the SD Card	✕	Settings
ⓘ	Check Version of XCamView		

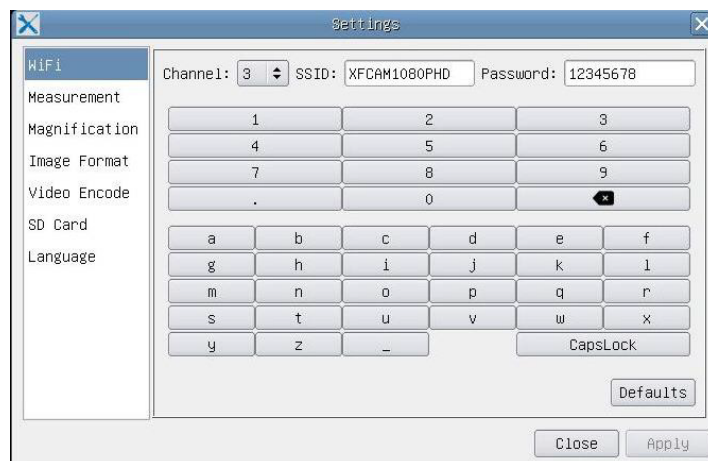The ✕ Setting function is relatively more complicated than the other functions. Here are more info about it:

Figure 9 Comprehensive Setting of WiFi Settings Page

Channel: WiFi signal Channel. Avoid interference caused by using the same channel. Suggest choosing different channels for different cameras when several WiFi cameras are running at the same time.
SSID: Name of the WiFi signal. Can be user-defined by using the soft keyboard below.
Password: Password of the WiFi signal. The Password can be user-defined by using the soft keyboard below.
Default: Set Channel, SSID, Password to the default values.

Figure 10 Comprehensive Measurement Settings Page

Global：Used for setting digits behind the decimal point for measurement results.

Calibration   Line Width: Used for defining width of the lines in measurement and calibration.

                 Color: Used for defining color of the lines in measurement and calibration.

                 EndPoint   Type: Used for defining shape of the endpoints of lines in measurement and calibration: Null means no endpoints; rectangle means rectangle type of endpoints. It makes it easier to calibrate.

Point, Angle, Line, Horizontal Line, Vertical Line, Rectangle, Circle, Ellipse, Annulus, Two Circles, Polygon, Curve:

     Left-click the ⊞ besides the measuring patterns mentioned above will unfold the corresponding attribute settings to set the individual property of the measuring objects.
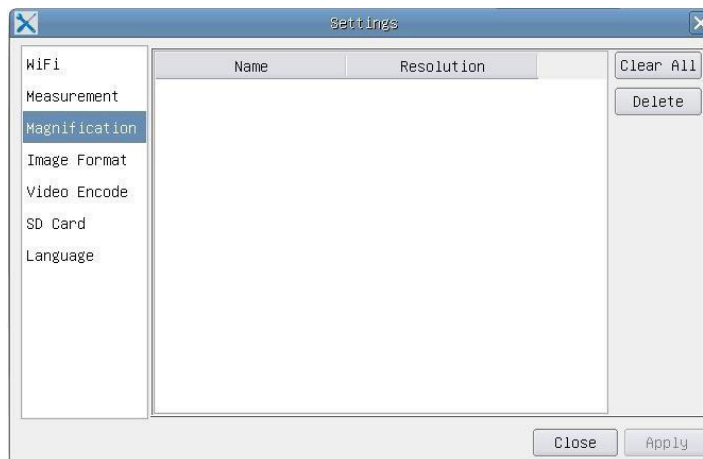

Figure 11 Comprehensive Measuring Units, Calibration, Magnification Management Settings Page

Name: Names such as 4X, 10X, 20X ,40X, 100X are based on magnification of microscopes. For continuous zoom microscopes, ensure that the selected magnification coincides with the scale alignment line.

Resolution: Pixels per meter. Devices like microscopes have high resolution value.

Clear All: Clear All the calibrated magnifications and resolutions.

Delete: Click Delete to delete the selected item for specific resolution.
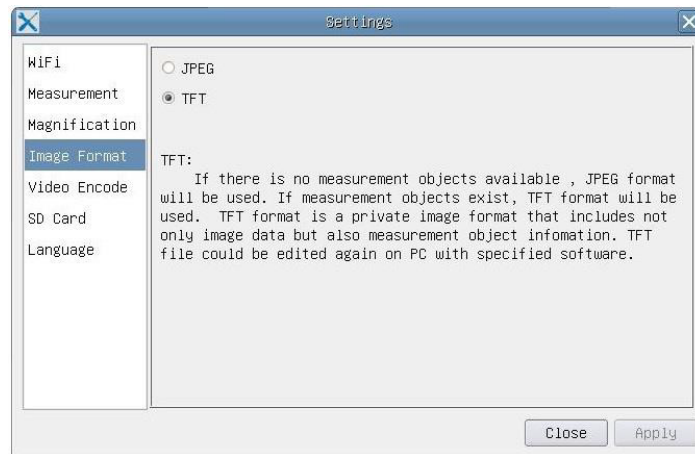

Figure 12 Image Format Setting Page

JPEG: Save captured image in JPEG format into SD card.

TFT: Save captured image in TFT format into SD card. The TFT format saves not only image data but also the measurement data over the image. The camera control & imaging processing software ToupView is capable of opening TFT file.
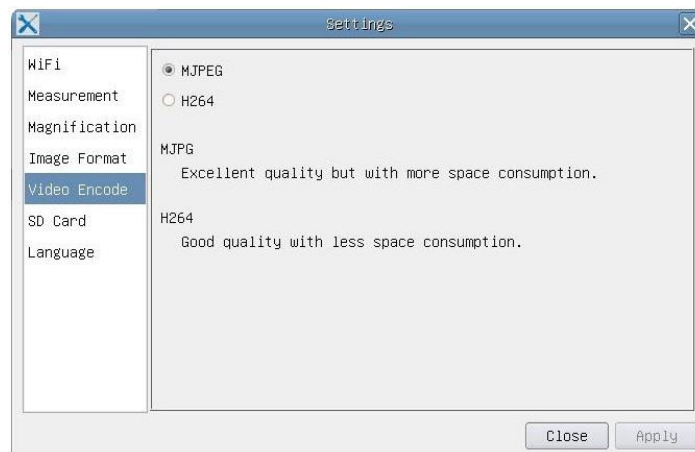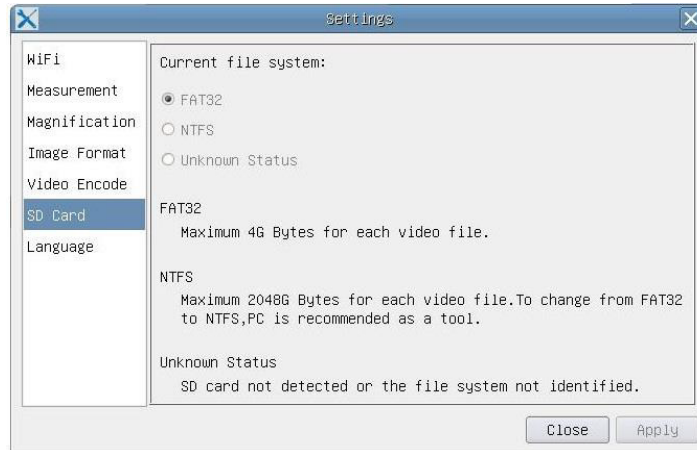

Figure 13 Comprehensive Setting of Video Encode Setting Page

MJPEG: Save recorded videos in MJPEG coded format.

H264: Save recorded videos in H264 coded format.

Figure 14 Comprehensive Setting of SD Card Setting Page

Current File System: The maximum file FAT32 can store is of 4G Bytes; for NTFS it's 2048G Bytes. Suggest converting FAT32 file into NTFS format on a PC; Unknown Status: SD card not detected, or the file system is not identified.

Figure 15 XFCAM Comprehensive Setting of Language Selection Setting Page

English: Set language of the whole software into English.

1.2.2 The Measurement Toolbar on the Upper Side of the Video Window

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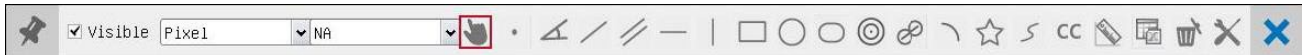

Figure 16 The Measurement Toolbar Button on the Upper Side of the Video window

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 microscope to ensure accuracy of measurement result when measurement unit is not in Pixel unite
	Object Select
	Point
	Angle
	Arbitrary Line
	Parallel
	Horizontal Line
	Vertical Line
	Rectangle

	Circle
	Ellipse
	Annulus
	Two Circles and Center Distance
	Arc

	Polygon
	Curve
	Make Calibration to determine the corresponding relation between magnification and resolution, this 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.
CC	Conjugate Correction: Click CC to do the Conjugate Correction before doing any calibration. Then manually adjust the coarse and fine focus knob of microscope to make sure the video is clear. Make sure the magnification in the software stays in accordance with microscope magnification, and then select the corresponding Measurement Unit for doing the measurement.
	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 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 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 doing other operations in the Camera Control Panel, the Auto Focus 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, please click the Conjugate Correction button ᶜᶜ to reset the camera

sensor to the standard C-mount position before calibration. The measurements can be started after calibration is completed and the video is focused.

4) In case calibration is completed but camera sensor is not on the C-mount position, The Conjugate Correction should be done to reset sensor to the standard C-mount position and the video is focused before measurement is started.

1.2.3

	Auto Focus	With Auto Focus button checked, the system will start autofocus according to status of the specimen till it stays in focus;
	Manual Focus	With Manual Focus checked, users should reset position of the camera sensor by using the mouse to scroll up and down till the specimen stays in focus;
	One Push AF	Click One Push button can carry out autofocus operation for just once;
	Conjugate Correction	Left-click the Conjugate Correction button can reset the camera sensor to standard C-mount position. Conjugate Correction allows users to get sensor position calibrated while ensuring that the camera video window is clear as well as image seen from eyepiece is clear. Suggest users do Conjugate Correction when using the camera for the first time to ensure the camera sensor at the standard C-mount position. This ensures the object plane, eyepiece image plane and camera adapter image plane at the standard position; Note: 1) When height of the specimen changes, users must make sure the sensor at the standard C-mount position while adjusting the coarse and fine focus knob of microscope to focus; 2) Before doing measurement please do Conjugate Correction to make sure accuracy of the measurement results (please refer to Measurement Toolbar> Conjugate Correction... for details).

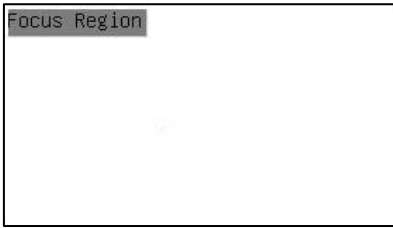### 1.2.4   Focus Region on the Video Window

Figure 17 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 show up as well with the Auto Focus Control Panel. Users can click any part of the video window to reset the focus region for Auto Focus operation.

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

Note: When Auto Focus is working, moving mouse cursor to upper side of the video window does not make the Measurement Toolbar pop up.