User Guide

High Resolution Portable Microscope Model 1 – Inverted

Firmware 1.0.12, Android app v1.1.1.483, iOS app 1.5(224)

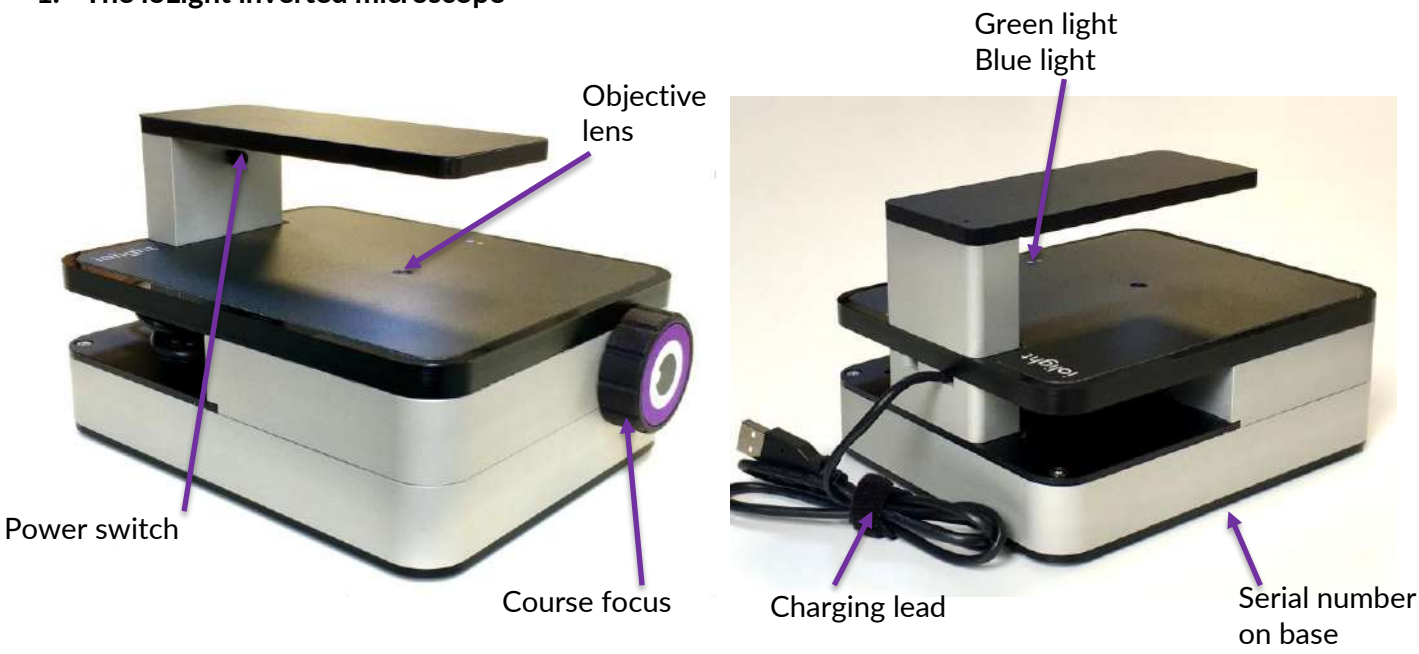
Thank you for purchasing the ioLight microscope, we very much appreciate your custom.

Please contact us on info@iolight.co.uk if you have any problems or questions.

Bold text indicates a button or icon on the screen of your computer.

Contents

1. The ioLight inverted microscope



Blue connection light	Continuously lit	Microscope is starting up or shutting down. Or microscope is streaming live images to a device
	Flashing	Microscope is on and ready to stream live images to a device
	Flashing long-short-long	Microscope battery is <20%
	Flashing fast	Microscope is in recovery mode (see trouble shooting)
Green Charging light	On	USB charger is connected and battery is charging
	Off	Battery has finished charging or no USB charger is connected
Power Switch	Switch on	A short press switches the microscope on. *Note: after pressing the power switch it takes approx. 20sec for the blue light to start flashing which signifies that the microscope is now on and ready to use.*
	Switch off	A short press switches the microscope off. *Note: switch off takes approx. 10secs then the blue light goes out* Press power switch hard and hold it for 5 seconds to reset the microscope (blue light goes out). Only do this if the microscope is not responding.

2. Before you start

The ioLight microscope displays images on Apple or Android phones and tablets and on any other devices that have WiFi and a web browser, for example laptop computers. The microscope creates its own WiFi network, to which you connect your device as described in 'Connecting to the microscope' below.

It is a good idea to charge the microscope before you start. Connect the charger and lead supplied in the box, to the micro USB socket on the back of the microscope. You can use other micro USB leads and chargers, but they may not charge the microscope as quickly as those we supplied.

3. Connecting to the microscope

Switch on the microscope by pressing and releasing the power button. The blue light will flash when the microscope is ready to use, then follow one of the procedures below:

Apple iPhone or iPad

The iPhone or iPad app works with iOS 8.1 or higher. For iOS less than 12.4 some features are not available.

1. Download the ioLight App from the App Store. If this is the first time you have used the App, you will see instructions that take you through the following connection process:
2. On your device, tap on Apple's **Settings** App, which is normally on the device's home screen (press the Home button to get to the home screen).
3. Scroll to the top of the settings menu and tap on **WiFi**.
4. Wait for the device to find a list of WiFi networks, then tap on the **iolightxxxxxx** network (xxxxxx is the serial number, which is printed on the bottom of the microscope).
5. When connection to the microscope WiFi network is complete a tick will appear against the iolightxxxxxx WiFi network.
6. Tap the Home button, to return to the home screen and open the ioLight App to use the microscope.

Note: The app will need permission to access your location because the name of the WiFi network your device is connected to is considered as location information. The app also need access to photos.

Android phone or tablet

The Android app works with Android version 4.4 or higher running on newer high performance devices from Samsung, Sony, Google, Asus, Huawei and other leading manufacturers.

1. Download the ioLight App from the Google Play store. Don't start the app yet.
2. On your device, go to WiFi settings and connect your device to the iolightxxxxxx network (xxxxxx is the serial number, which is on the bottom of the microscope). Wait for a few seconds. Your device may tell you that there is no internet available on the iolightxxxxxx network. If it does, choose to stay connected to this network (otherwise your device will not be able to communicate with the microscope).
3. Start the ioLight app. Note: The app needs permission to access your location because the name of the WiFi network your device is connected to is considered as location information. The app also needs permission to access your photos.
4. After a few seconds you should see a live image from the microscope on the device screen
5.

Web Browser Interface (laptop, computer, smart TV, or other device with WiFi and a web browser)

1. Most computers with WiFi and a web browser will work with the microscope. We recommend using the Chrome or Opera web browsers.
2. Connect the computer to the WiFi network created by the microscope. The WiFi network will be called iolightxxxxxx (xxxxxx is the serial number, which is on the bottom of the microscope).
3. Open Chrome or another web browser. In the URL bar type the address 192.168.1.1 and press enter. Do not type http:// or www, just 192.168.1.1.
4. After a few seconds you should see a live image from the microscope.

4. Your first image

1. Place your sample on the stage above the objective lens.
    - Your sample needs to be in container that has a clear transparent base such as a Petri dish, well plate, t-flask or glass slide.
2. Connect your device (phone, tablet or computer) to the microscope and get a live image from the microscope as described above in 'Connecting to the microscope'
3. Switch on the top illuminator using the on-screen controls.
4. You can test that the image is live by waving your hand between the camera head and the sample, and watching the image change.

5. The image will be blurred at first. To focus the microscope, use the course focus knob – the microscope can focus up to 7mm above the sample stage.
6. There is a fine focus **Thumbwheel**  on the side of the screen which can be used when the image is nearly in focus. To use the fine focus, first set the fine focus to the middle of its range use the course focus to get the image approximately in focus and then use the fine focus thumbwheel to optimise the focus.
7. When the screen image is focused you can capture a high resolution copy using the **Camera Icon**  .

5. When you have finished

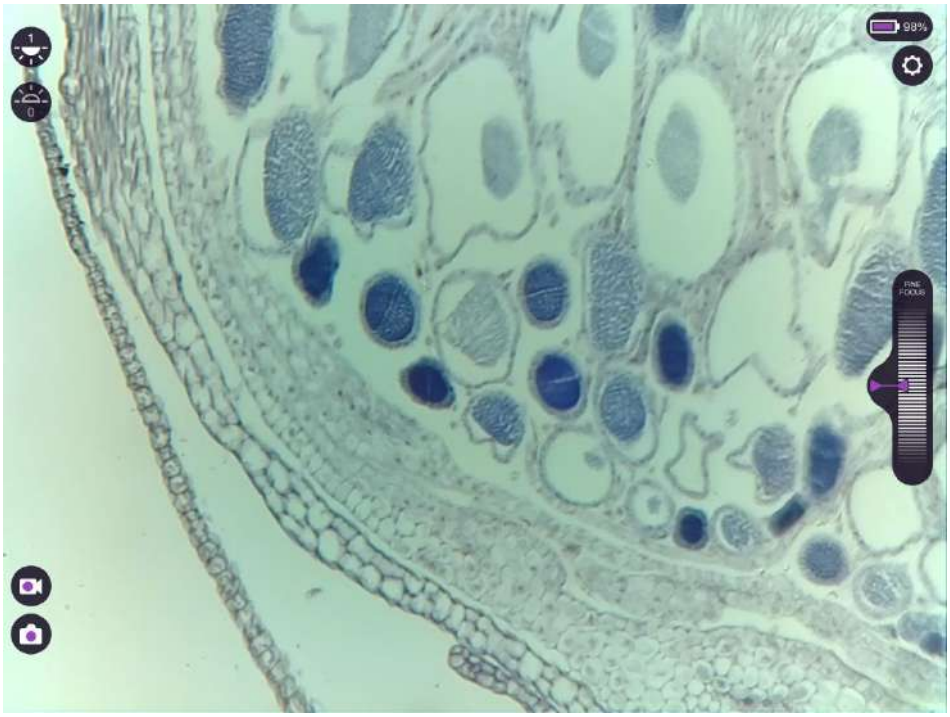
- Turn off the microscope by pressing and releasing in the on/off switch or using the on screen controls. The microscope then takes about 10 seconds to shutdown (the blue light goes out).
- Remove any dirt or liquids from the microscope body using a damp or dry cloth.
- Only clean the lens if it is obviously dirty, since cleaning risks scratching the lens. If you do need to clean the lens use a clean cotton bud dipped in alcohol. Clean gently to avoid scratching.
- Charge the battery as described below

6. Charge the microscope's battery

- The microscope is powered by a lithium ion battery which needs to be charged.
- Connect the charger and lead supplied to the micro USB socket on the back of the microscope.
- The green light indicates that the microscope is charging. It goes out when the microscope is charged.
- Other micro USB chargers (such as those used with mobile phones) may be used with the microscope. However, you may find that the microscope charges more quickly with the ioLight charger and lead.
- USB ports on computers are not usually designed to charge devices and may not charge the microscope properly, even if the green light illuminates. Some computers have special USB charging ports with a battery label. These are more likely to charge the microscope successfully.

7. The on-screen controls

7.1. iPad or iPhone app



Illumination from above sample

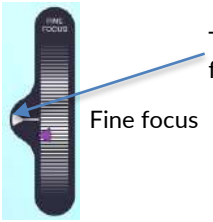
Illumination from below sample

Save image

Record video

Settings menu

Microscope battery charge level
(not available on iOS less than 12.4)



Tap here to centre fine focus

Fine focus

Illumination **:**

Tapping the top illuminator icon, , shows the 5 settings for the top illuminator as follow:

Top illuminator setting	Function
0	Off
1	Brightfield illumination
2	Low NA brightfield illumination
3	Darkfield illumination
4	All on

Setting 1 – brightfield illumination is for samples that have a reasonable amount of contrast, for instance stained tissue or cell samples.
Setting 2 – low NA (Numerical Aperture) brightfield illumination is for samples with low contrast, for instance unstained tissue or cell samples.
Setting 3 – dark field illumination illuminates the sample at an angle giving a black background to the image. This works well with samples that have sharp (well defined) edges.
Setting 4 – this setting switches on all the lights, thus providing maximum illumination for samples which are thick and absorb much of the light from the top illuminator before it can get through the sample to the objective lens.

Tapping the base illuminator icon, , you can set the illuminator to one of 5 brightness levels – 0 (off) to 4 (maximum).

Save image **:**

You can capture an image by tapping the **Camera Icon** on the screen. The images will be saved to the Photo Apps (Camera Roll) on your phone or tablet.

Record video **:**

The apps can also record video by pressing the **Video Icon** on the screen. The video will be recorded at high resolution when High resolution mode or HD mode is switched on (see Settings menu)

Note on saved image and live video resolution

Saved images are always full resolution (5MP = 2592 x 1944 pixels).

The *live* video resolution is lower. To see the best quality image and to zoom in, save an image, then look at the saved image in the Photos App.

The resolution of both the live video and the saved video is the same. For high resolution, go to the Apple settings app on your iPhone/iPad, scroll down to apps and tap on the ioLight – you will then see the switch to turn on HD mode.

When should I use HD mode?

- HD mode is good when you want to record high quality videos, or to see fine detail in the live video. Remember, you can always see more detail on the saved still image.
- For general use, it is best to turn HD mode off because the live video is smoother (higher frame rate). HD mode transmits a lot of data and so the video is more susceptible to WiFi interference when HD mode is on.

The Settings menu **:**

The Settings menu allows you to:

- Go directly to the Photos App to view saved images
- Switch on the Scale Grid
- Switch off the microscope

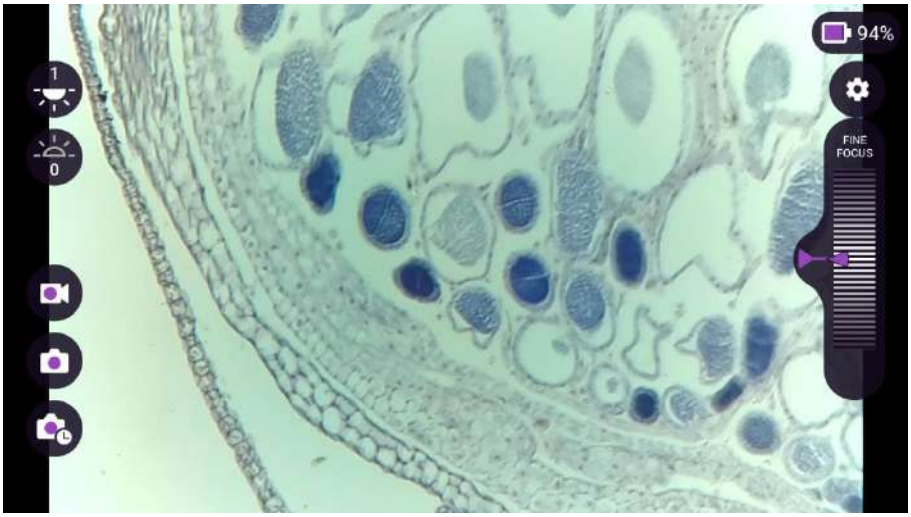
You can zoom in on the live image by pinching two fingers together on the screen then moving them apart. Use HD mode to give fine detail when you are zooming in, see below *(not available on iOS less than 12.4)*.

Settings menu - Scale Grid:

The Scale Grid helps you to estimate the size of objects in the image – the grid lines are spaced by approximately 0.1mm.

NOTE: It is possible to use the Web Browser interface to change various settings, for example white balance, contrast, brightness etc. Any settings changes made using the Web Browser interface continue to be in effect when you subsequently use the iOS app.

7.2. Android app



Illumination from above sample

Illumination from below sample

Save image

Record video

Time-lapse images

Settings menu

Tap here to centre fine focus

Fine focus

Microscope battery charge level

Illumination :

Tapping the top illuminator icon, , shows the 5 settings for the top illuminator as follow:

Top illuminator setting	Function
0	Off
1	Brightfield illumination
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Setting 2 – low NA (Numerical Aperture) brightfield illumination is for samples with low contrast, for instance unstained tissue or cell samples.
Setting 3 – dark field illumination illuminates the sample at an angle giving a black background to the image. This works well with samples that have sharp (well defined) edges.
Setting 4 – this setting switches on all the lights, thus providing maximum illumination for samples which are thick and absorb much of the light from the top illuminator before it can get through the sample to the objective lens.

Tapping the base illuminator icon, , you can set the illuminator to one of 5 brightness levels – 0 (off) to 4 (maximum).

Save image :

You can capture an image by tapping the **Camera Icon** on the screen. The images will be saved to the Photo App on your phone or tablet. On a separate 'ioLight' folder will be created for the images.

Record video :

The app can also record video by pressing the **Video Icon** on the screen. The video will be recorded at high resolution when High resolution mode or HD mode is switched on.

Note on saved image and live video resolution

Saved images are always full resolution (5MP = 2592 x 1944 pixels).

The *live* video resolution is lower. To see the best quality image and to zoom in, save an image, then look at the saved image in the Photos App.

The resolution of both the live video and the saved video is the same. For high resolution, tap the **Gear icon** on screen to open the settings menu and switch on HD mode.

When should I use HD mode?

- HD mode is good when you want to record high quality videos, or to see fine detail in the live video. Remember, you can always see more detail on the saved still image.
- For general use, it is best to turn HD mode off because the live video is smoother (higher frame rate). HD mode transmits a lot of data and so the video is more susceptible to WiFi interference when HD mode is on.

***Time-lapse* :**

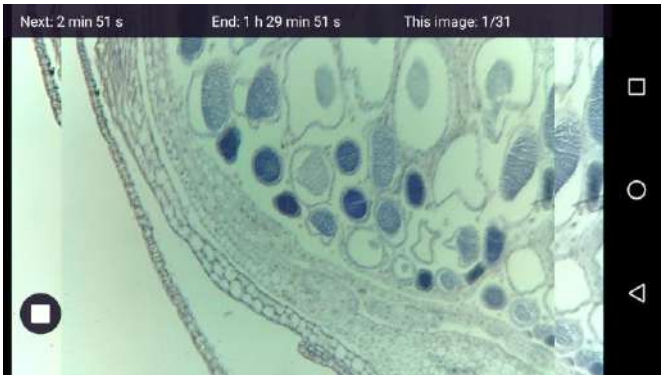
Tap the Time-lapse icon on screen to setup a sequence of time-lapse images. Set the interval between images (range: 20seconds to 23hrs 59min 59 seconds), then set the duration (range: 20seconds to 99 days, 23hrs 59min 59 seconds) – the number of images that will be saved is calculated and shown at the bottom of the dialogue box. Press **Start** to begin the time-lapse sequence.

Please ensure that the Android device has sufficient storage space to store the number of images in the time-lapse sequence – as a rule of thumb, each JPEG image is approx. 1Mb.

The ioLight app should remain running and displayed on screen for the duration of the time-lapse. This means that the Android device needs to have sufficient battery charge or be plugged into a charger. It also means that you should ensure that the device doesn't automatically sleep or lock.

You should not switch to using a different app while the time-lapse is running. (On some Android devices the time-lapse function may work in the background, but this is not guaranteed to work, and it is more likely to be to be reliable if you leave the ioLight app on screen for the entire time-lapse).

When the time-lapse is running you see the following display:



The image shown is NOT A LIVE IMAGE, but is the last image saved in the time-lapse sequence. The microscope illuminators switch off in-between saving images. At the top of the screen you see the time to the next image, the time to the end of the time-lapse sequence and the number of images.

The stop button in the bottom left of the screen stops the time-lapse.

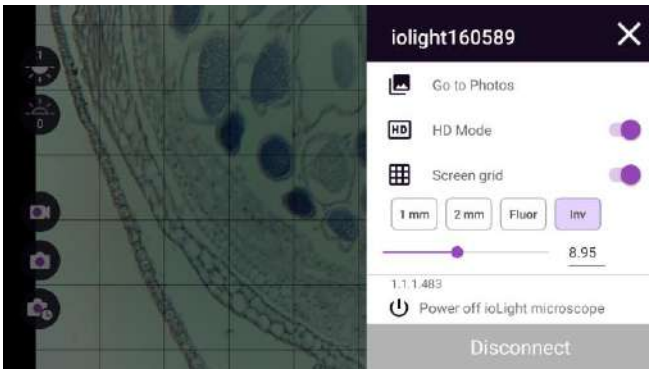
TIP – often you won't know how long you need the time-lapse to run for, so you can simply set a longer duration than will be required and then press the stop button when you want to end the time-lapse sequence.

The Settings menu:

The Settings menu to allows you to:

- See microscope battery charge level.
- Go directly to your Photos App to view saved images.
- Switch on the Scale Grid.
- Switch on HD mode (live video High Resolution Mode).
- Switch off the microscope.
- You can zoom in on the live image by pinching two fingers together on the screen then moving them apart. Use HD mode to give fine detail when you are zooming in.

Settings Menu - Scale Grid:



- Tap the **Gear icon** on screen to open the settings menu
- Switch on a scale grid using the purple switch next to 'Screen grid'
- When the Screen grid is switched on, you will see a choice of different sizes for the grid – choose '1mm' for the 1mm microscope, '2mm' for the 2mm microscope, 'Fluor' for the florescence microscope and 'Inv' for the inverted microscope. The lines on the grid are separated by approximately 0.1mm.
- You can set a custom grid size using the slider.
- When you save an image the grid is superimposed on the saved image.

NOTE: It is possible to use the Web Browser interface to change various settings, for example white balance, contrast, brightness etc. Any settings changes made using the Web Browser interface continue to be in effect when you subsequently use the iOS or Android apps.

7.3. Web Browser

Live image:

Illumination from above sample

Illumination from below sample

Save image

Save Digital Phase Contrast image (takes several seconds)

Record 12 images for Z-Stacking

Settings menu

Fine focus

Microscope battery charge level

Switch off microscope

Illumination :

Tapping the top illuminator icon, , shows the 5 settings for the top illuminator as follow:

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0	Off
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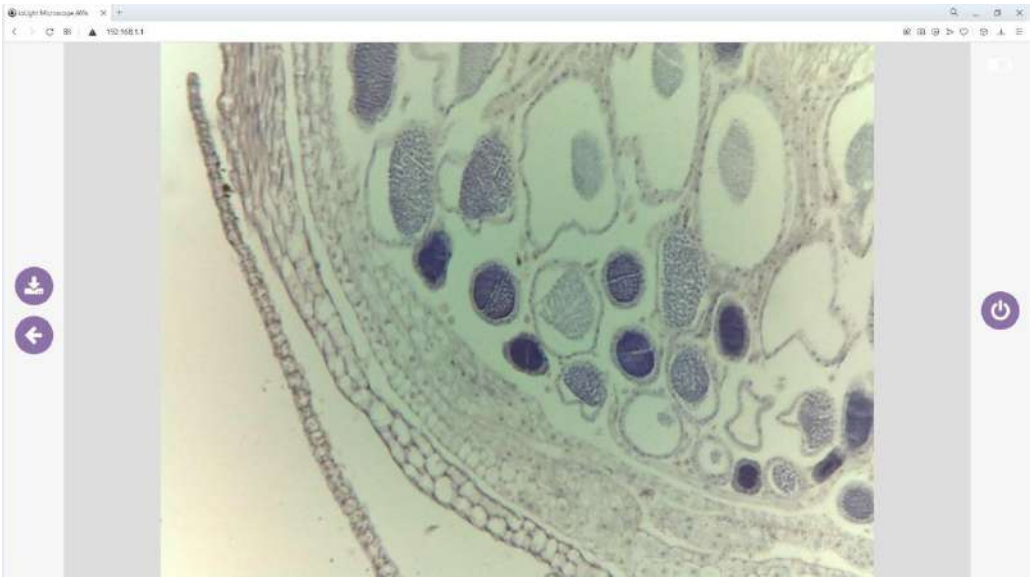
Setting 4 – this setting switches on all the lights, thus providing maximum illumination for samples which are thick and absorb much of the light from the top illuminator before it can get through the sample to the objective lens.

Tapping the base illuminator icon, , you can set the illuminator to one of 5 brightness levels – 0 (off) to 4 (maximum).

Save Image :

When you click the **Save Image Icon** the microscope takes a full resolution still image (5MP = 2592 x 1944 pixels) and you see the image in the screen below:



Download image to downloads folder

Back to live image

Switch off microscope

To save the still image to your computer, click the **Download Image Icon**

The image will be saved to the downloads directory that your web browser uses, and will be called 'iolight_image.jpg'

Save Digital Phase Image :

When you click the **Digital Phase Contrast Icon** the microscope takes a digital phase contrast image (resolution of this image = 1,296 x 972 pixels). The process to save the image is the same as that described above in 'Save image'.

Digital phase contrast helps to increase contrast with subjects that are low contrast – for instance transparent cells.

The Digital Phase Contrast image is created by the microscope taking 2 images at different focus positions then subtracting the images. This process results in an image that is proportional to the optical phase (rather than intensity) of the object. The 2 images are taken such that the first image has the focus set at a value above the current focus position and the second with the focus below the current focus position. You can set the focus offset (focus range) for the images above and below the current focus value in the settings menu.

The digital phase contrast images are monochrome.

To use digital phase contrast to increase contrast when imaging transparent cells, set the base illuminator to off and set the top illuminator to setting 2. Focus the microscope on the sample. Press the **Digital Phase Contrast Icon** , it then takes approximately 15sec to record the phase contrast image. You can optimise the digital phase contrast image for your sample by varying the focus offsets (focus range) in the settings menu – remember to press 'Apply Changes' in the settings menu after changing the focus offsets.

Images for Z-Stacking :

A Z-Stack is a sequence of images taken different fine focus positions. When the object is not flat, different parts of the image will be in focus at different focus positions. Widely available software packages can be used to combine the in-focus sections of each image. The ioLight microscope can record images for Z-Stacking using external software. This feature is only available when you connect to the microscope using a web browser.

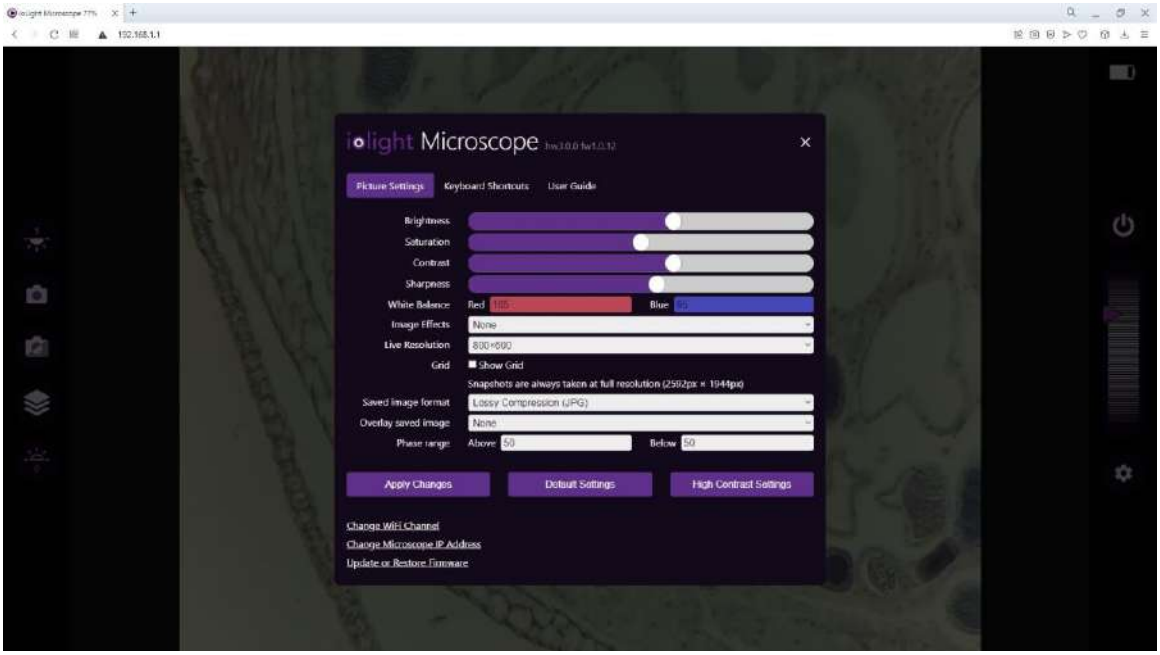
To record a Z Stack, set the course focus so that the chosen parts of the object can be brought into focus by adjusting the fine focus on the screen. Click the **Z-Stack Icon** and the microscope will automatically save 12 images at different focus positions covering the entire fine focus range. There are a number of different software packages that can be used to combine the 12 images into a single image. These software packages include Photoshop, Helicon Focus and ImageJ.

Some web browsers cannot save the Z-stack images. For instance Google Chrome running on Windows works, but Safari running on an iPad does not.

Power switch :

You can switch off the microscope by clicking the **Power Icon** . The microscope takes about 10 seconds to shut down and for the blue light to go out.

Settings menu

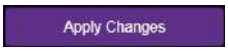


Tap the **Gear Icon** to display the settings menu to:

- Change camera settings (white balance, brightness, contrast, saturation, sharpness).
- Use image effects.
- Change the live image resolution. Higher resolution enables you to see more detail when zooming in.
- Switch the Scale Grid on and off.
- Set the image file (or snapshot) format.
- Overlay saved images - save scale grid or scale bar on saved images
- Change the WiFi channel.
- Change the microscope IP address
- Enter recovery mode to fix problems or update the microscope's firmware (see Troubleshooting).
- See list of keyboard shortcuts.
- See this user guide.

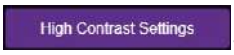
There are three tabs at the top of the settings menu, Picture Settings, Keyboard Short Cuts and User Guide. The settings under the Picture Settings tab are described below, followed by the Keyboard Short Cuts. The User Guide tab displays a PDF version of the Quick Start Guide that was included in the box with your microscope.

Picture Settings tab:



– Press this button after making any changes to save apply the changes

– Press this button to restore the default settings, suitable for many samples which have high contrast eg stained cells.



– Press this button to set 'preset' settings suitable for many samples which have low contrast (eg unstained cells)

Saved image file format:

You can set the saved image format to jpg, png or bmp.

- jpg is a compressed file format, which gives the smallest file size and fastest performance. jpg is best for general use.
- png files are also compressed, but in a way that doesn't lose any image data. This file type will result in slightly better quality images but the file sizes are larger and performance slower.
- bmp files are uncompressed, although the image quality should be the same as the lossless compression used in png files. bmp files are very large and microscope performance will be very much slower if you use bmp files.

Image resolution:

- Saved images are always full resolution (5MP = 2592 x 1944 pixels).
- The **live** image resolution is set in the Settings Menu.
- Which live image resolution should I use?
    - The lower resolution settings result in faster, smoother, live images (higher frame rate). This makes it easier to see what is going on when moving the sample under the microscope.
    - Higher resolution settings allow you to see more detail in the image. You will need to zoom in to see the full detail on the highest 2 resolution settings
    - It is possible to have the live images at full resolution (2592 x 1944 pixels). However this will make the frame rate very slow (approx. 1 frame per second) which will make it difficult to use the microscope if you move the sample
    - A good way to use the microscope is to set a lower resolution, say 640 x 480, and focus the microscope on the region of the sample that you want to look at. Then increase the resolution and zoom in to see the full detail
    - If there is interference on the WiFi signal then the live images may deteriorate. In this situation it may be better to use a lower resolution, since this needs less information to be transmitted over the WiFi link to the microscope.

Change WiFi channel:

If you are experiencing difficulties connecting to the microscope's WiFi, or there is interference on the live video, then using a different WiFi channel may help. To change the WiFi channel click on **Change WiFi channel** then select the WiFi channel you want to change to. The microscope will then reset the WiFi signal to the new channel.

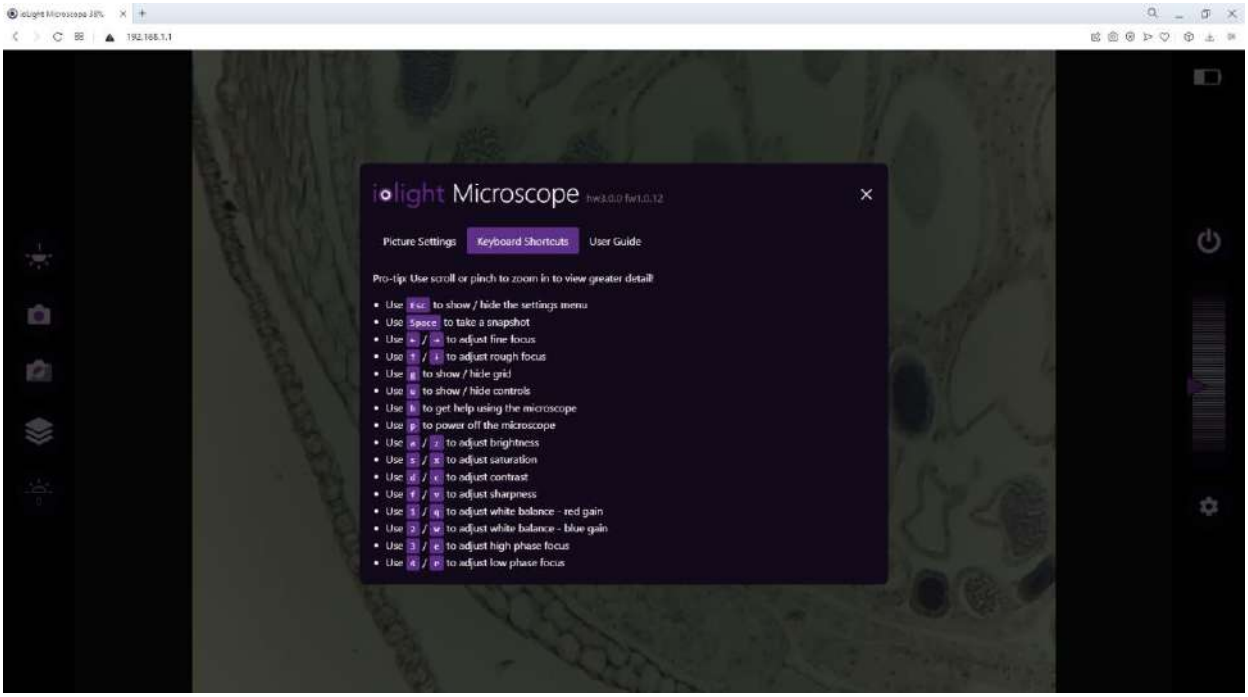
Your computer and web browser may not follow the change of WiFi channel. If you don't see a live image after changing the WiFi channel, first make sure that your computer is connected to the microscope's WiFi, then close the browser, open it again and go to web address (IP address) 192.168.1.1.

Recovery Mode:

You should not normally need to use Recovery Mode, except when ioLight issue an update to the firmware on the microscope. When this happens, ioLight will provide instructions.

Keyboard shortcuts:

Many of the controls can be used via keyboard shortcuts during live image view



Use the keys show above to increase/decrease the desired parameter

8. Expert Techniques

Illumination and image settings

Illumination is key to getting the best images. Try the different settings for the top illuminator, and also try adjusting brightness, contrast, saturation and sharpness in the settings menu on the Web Browser interface.

The 'High Contrast' preset in the Web Browser settings menu is good for low contrast samples such as unstained cells – normally it is best to use the High Contrast preset with the top illuminator set to 2. You may find that the High contrast setting is too extreme for your samples ie contrast is too high and areas of the image are either back or white – you can reduce the contrast using the contrast control in the wb browser settings menu.

Colours may look odd on some samples – this is often due to the whit balance not being correct for your sample. You can adjust the colour balance from the settings menu in the web browser.

Dark field illumination works best when the sample is closer to the sample stage (1-3mm above the sample stage)

With some samples, side illumination is effective – you can illuminate the sample from the side simply by directing the light from a touch (flashlight) at the side of the sample.

Sharing images over the internet

If your phone or tablet normally connects to the internet using WiFi, you will need to disconnect it from the microscope and reconnect it to your normal WiFi internet Access Point to share images and videos. The microscope has no direct connection to the internet.

ioLight can supply the ioLight Internet Module, iIM, which allows your device to connect to the microscope and internet simultaneously. The iIM is a small box that plugs into an Ethernet (wired) network and the microscope WiFi. The iIM then provides the microscope WiFi network with internet, so that your device (phone or tablet) can access the internet whilst connected to the microscope WiFi.

If you are using a computer, you may be able to use a second wired or WiFi connection to connect to the internet and the microscope at the same time. You can add a second WiFi connection to your computer simply and inexpensively by adding a USB WiFi dongle.

You can set your device (phone or tablet) to automatically upload images that appear in the Photos / Camera Roll / Gallery app to the cloud. Various cloud services do this including iCloud and Google Photos. If you set up this service you can then remotely access images saved by the microscope by accessing you iCloud/Google Photos account.

9. Troubleshooting

Problem	Try This
The app or web browser can't connect to the microscope with the message "The ioLight is not currently available. Someone else may be using it"	The microscope can only connect to one device at a time, so close the ioLight app and any web browser tabs connected to the microscope on other devices before starting the app. Note: several devices can connect to the microscope WiFi SSID at the same time, but only 1 app or web browser session can connect to the microscope at any one time.
The iOS or Android apps don't connect to the microscope with the message "Not connected to ioLight device"	Make sure that the iOS or Android device is connected to the ioLight microscope WiFi. You can get this error if you have connected to the microscope via a web browser on your iOS/Android device and then immediately opened the app to connect to the microscope – on some devices the web browser doesn't drop the connection to the microscope immediately, so you may need to force quit the web browser so as to get it to drop the connection to the microscope and so make the microscope available to connect to the app. Some devices have a feature that disconnects from a WiFi network that doesn't have internet access – clearly the microscope WiFi doesn't have internet access, so make sure that you turn off the feature that disconnects from WiFi if there is no internet.
Web Browser says that "Your ioLight Miroscope can't be found"	Make sure that your device is connected to the microscope WiFi. Make sure there are no other devices, or instances of web browsers connected to the microscope.
Image freezes, is jumpy or pixilated and difficult to focus	This can happen in high resolution mode where several other Wi-Fi networks are present. Try moving away from Wi-Fi networks (perhaps to a pond or jungle for some interesting samples….!) Switch to standard resolution mode in the iPhone, iPad or Android apps, or reduce the image resolution in the Web Browser. This transmits less data and is less susceptible to interference - see Expert Techniques. Also see 'Can't connect to WiFi, or poor WiFi connection' below.
Blue connection light is flashing slowly	This means that the microscope is on, but not sending video to your device. Start the ioLight app or connect a web browser

(see below if blue light is flashing quickly)	window to 192.168.1.1 to view the live image from the microscope. If this happens unexpectedly, close the ioLight app or web browser window and then open it to start again. If this doesn't work, follow the reset procedure in 'The microscope is not working as expected' below
Blue light is flashing quickly and my phone or tablet will not connect to the microscope The microscope is in recovery mode.	If there is a problem starting or shutting down the microscope, the next time it is switched on it will enter recovery mode. If the microscope has previously been working, simply switch off the microscope, wait 1min and switch it on again and it should start normally. If are having problems or want to update the microscope firmware and you have entered recovery mode deliberately, then connect to the microscope with a web browser and follow the on screen instructions.
Reset procedure The microscope is not working as expected.	Use this procedure to reset the microscope. Begin by closing the ioLight app or web browser window. • To close the app on iPhone or iPad, double tap the home button to show the open apps. Scroll to the ioLight app, then close it by swiping the app upwards off the screen. • To close the app on Android, launch the recent applications menu by tapping one of the 3 navigation buttons at the bottom of the screen. On some devices this is the square button, on others it looks like two 90 degree angles. Find the ioLight app by scrolling through the list and close it by swiping it to the right. • Once you have closed the app or browser, hold the power button on the microscope down hard for 4-5 seconds until the microscope switches off. The blue light switches off. • Wait 1min and switch the microscope back on again. • Reconnect your device to the microscope WiFi • Start the app or if using a web browser go to 192.168.1.1. If the above doesn't work, connect the microscope to power using the USB charger and lead supplied with the microscope, check the green charging light lights, then try the above procedure again
Image completely black (black cat in a coal cellar!)	Check that one or both of the illuminators are switched on. The bottom illuminator will not help with opaque samples. The 2mm microscope gives much better images of opaque shiny surfaces, like polished rocks or metals than the 1mm microscope. If the surfaces are rough or textured, you should see a really good image with the top illuminator on either microscope.
The microscope switches off when you try to connect to it. Problems charging.	Use the supplied charger and lead to charge the microscope battery. Some other leads and chargers may work but some will charge slowly or even not charge at all. Most USB ports on computers will not charge the microscope properly since they only supply a very small amount of power. The exception to this is if the USB port has a battery symbol next to it. This indicates that the port is designed for battery charging.
Can't connect to WiFi, or poor WiFi connection	If there is a lot of interference on the WiFi signal then your device may not be able to connect to the microscope. If this happens, you may find that changing WiFi channel helps.

	You can change the WiFi channel using the web browser interface as follows: 1. Connect to the microscope using a web browser (see 'Connecting to the microscope' above) 2. Go to settings by clicking on the [gear] icon 3. Click on [change WiFi channel] 4. Select the [WiFi channel] to want to use 5. Wait for the microscope to change to the new WiFi channel. 6. Your device may disconnect from the microscope WiFi network. Check that it is still connected to the iolightxxxxxx WiFi network using the WiFi settings on your device. You can use a WiFi network analyser app on a laptop or Android device to scan the WiFi environment for a WiFi channel with less interference. After changing the WiFi channel with a web browser, the new WiFi channel will work with the web browser, iPhone, iPad and Android apps.
Can I use the web browser interface on an iPad, iPhone or Android device?	Yes, but for normal use the app will be much better. Z Stack images will not work on many phones or tablets. Using the web browser interface on a phone or tablet does allow you to use features that are not available on the apps. For example changing the WiFi channel.
I can't see the high resolution setting in the Settings app on iPhone or iPad	Close the Apple Settings app by double tapping the home button to show the open apps, then scroll to the Settings app and close it by swiping the app upwards off the screen. Open the Apple Settings app again from the home screen of the device.
On some Android devices the app runs but the controls don't work and there is no live image (image is black)	This can happen for several reasons: • the Android app doesn't have the required permissions • the app did not install correctly • the Android device has disconnected from the microscope WiFi because it can't access the internet via the microscope WiFi. • a secondary Android user account is being used. To correct these faults, try the following procedure: 1. Switch on the microscope. 2. Go to your Android Settings/Network and Internet/WiFi tap on the ioLight microscope. Tap [Forget]. Come out of settings. 3. Switch off the microscope - short press and wait. 4. Uninstall the ioLight App: press and hold, then drag onto uninstall. (Or use the apps menu) 5. If you have multiple accounts on your Android device, check that you have uninstalled the ioLight app from all accounts on your device, the switch to the primary (owner) user account 6. Switch off your Android device and wait a few minutes

	7. Switch on your Android device 8. Install the ioLight app from Google Play 9. Switch on the microscope and wait while it boots to flashing blue light. 10. Go to your Android Settings/Network and Internet/WiFi tap on the ioLight microscope. WAIT! 11. After a minute or two, you should see an error message that says words to the effect of 'there is no internet available on this connection, do you want to connect anyway?' 12. Select the option where you always connect to ioLight WiFi even if there is no internet. If you accidentally select the wrong action then you need to go back to 1). 13. Open the app again. You may get the 'Not connected to ioLight device screen'. If so just tap on [NEXT] Notes to help diagnose problems : • **Android / device user accounts** – the app will only work in the primary (owner) user account • **Permissions –** The app need permission to Location & Photos/Storage. The app needs location permission since Android considered the WiFi network name as location identifying information. Be sure to give the app the permissions it needs • **WiFi -** On some Android devices the message to the effect of 'there is no internet available on this connection, do you want to connect anyway?' is hidden – you may see it only when you quit the ioLight app (square Android button and swipe ioLight app off the screen) • **Automatic network optimisation –** if your device has features or apps to automatically select the best network (WiFi) it is likely that this feature will automatically disconnect from the microscope WiFi network since there is no internet on the microscope WiFi. Please disable this feature

10. Contact

If you have any questions, please contact ioLight at info@iolight.co.uk