Clarity LFC

Spinning Disk Confocal Imaging Attachment

OPERATING MANUAL

Aurox Ltd
2017

Knowledge of this manual is required for the operation of the instrument. You should familiarise yourself with the contents of this manual before attempting to install the instrument and pay special attention to the notes concerning safe operation.

The specifications are subject to change. This manual is not covered by an update service.

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1 INTRODUCTION

1.1 Definitions

The following definitions will be used throughout this Manual:

Clarity LFC or instrument	Spinning Disk Confocal Imaging Attachment as supplied by the manufacturer to the distributor for system integration and onwards sale to the user
Manufacturer	Aurox Ltd
Distributor	Microscope system manufacturer or integrator who incorporates Clarity LFC into an imaging system that would typically also include a microscope, imaging sensor and light source.
User	End user of the imaging system supplied by the distributor
Software	Software package for controlling the Clarity LFC and other components of the imaging system as well as implementing image processing algorithms required for its correct functioning, supplied by the distributor
Firmware	Internal software of Clarity LFC that supports its hardware functions, supplied by the manufacturer

1.2 Important notes

The Clarity LFC is an attachment to high-end fluorescent microscopes that enables them to achieve sectioned and 3-D imaging without the recourse to the confocal laser scanning technology. As such, the Clarity LFC unit is designed to work as a part of a larger imaging system typically consisting of the following:

- Microscope stand with motorized z-stage and a selection of high-NA objective lenses
- Anti-vibration table or anti-vibration microscope support
- Cooled digital camera 12 bit dynamic range
- Clarity LFC with associated filter cubes
- Arc-lamp or LED light source
- Computer with image acquisition and hardware control software

The imaging system will be typically installed at the user facility by a service engineer working for the distributor. However, the Clarity LFC component of the system has been designed to be user-installable by following the instructions in this Operating Manual.

This Operating Manual describes the installation and use of the Clarity LFC hardware only. For notes and instructions on how to control the Clarity LFC through software please refer to the software Operating Manual supplied by the distributor. For questions related to microscope, camera or light source consult the relevant manuals.

It is essential that prior to the initial start-up of the Clarity LFC the user should familiarise himself with the notes on instrument safety as well as the chapters dealing with Instrument Description (Chapter 2), Installation (Chapter 3) and Operation (Chapter 4).

1.3 Device safety

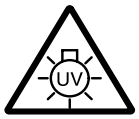
This Operating Manual includes information and warnings that must be observed by the user. The following warning and information symbols are used in this manual:

NOTE

Failure to follow this point may damage the instrument

CAUTION

This symbol is a warning that indicates a hazard to the user



CAUTION

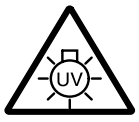
UV radiation is emitted!

The Clarity LFC may only be used for the techniques described in this manual. The manufacturer cannot assume any liability for any other application, including that of individual modules or single parts of the instrument. This also applies to all service or repair work that is not carried out by authorized service personnel. All warranty claims shall be forfeited.

The Clarity LFC is equipped with an external power supply, which permits the use of line voltages in the range between 100 to 240 V ±10 %, 50 / 60 Hz, without having to change the line voltage adjustment on the instrument. The distributor will supply the instrument with the mains lead suitable for the country of installation. Before switching on the instrument, check whether it is suitable for the line voltage present and that the correct lead has been supplied.

Never use the Clarity LFC with an external power supply other than the one shipped with the instrument! Doing so may damage the instrument and may compromise its safety.

The Clarity LFC is not equipped with any special devices for the protection from substances that are corrosive, toxic, radioactive or other substances that could be hazardous to health. When handling such substances, observe all legal regulations, particularly the relevant national regulations for the prevention of accidents.



Gas-discharge lamps or LED light sources fitted with UV emitter used in microscopy light sources emit ultraviolet radiation, which can cause burns on the eyes and skin. Therefore, never look directly into the light of these lamps or into the coupling light guide and avoid direct, unprotected incidence of their light on your skin.

When using the microscope, always use its protective devices (e.g. special attenuation filters or the fluorescence protection shield). When they are hot, gas-discharge lamps are under high internal pressure and may therefore only be changed when they have cooled down. For lamp replacement, make sure to use protective gloves and mask and consult the relevant user manual. This equipment has not been designed and manufactured for the medical diagnosis of patients.

The Clarity LFC instrument is a sealed unit, hence the internal optics will not be affected by normal level of ambient dust and dirt. However user accessible elements such as the filter cubes or illumination adapter can become exposed to dust which could impair the performance of the instrument. Therefore the filter turret door should be kept closed and illumination attached to the instrument.

The instruments may only be operated by trained personnel who must be aware of the possible dangers involved with microscopy and the relevant application. The Clarity LFC is a high-precision instrument that can be impaired in its performance or damaged when handled improperly.

1.4 Warranty

The manufacturer guarantees that the instrument has no material and production defects when delivered. The manufacturer should be informed of any discovered defects as soon as possible in order to minimize any damage. Repairs under warranty may be carried out by rectifying the fault on the user's instrument or supplying a replacement instrument free of defects at the manufacturers discretion.

The instrument manufacturer is not liable for damage caused by faulty operation, negligence or any other tampering with the instrument, particularly the removal or replacement of instrument components, or the use of accessories from other manufacturers. This forfeits all warranty claims. No guarantee is provided for defects due to natural wear (including cosmetic defects to the instrument case) or those resulting from improper use of the instrument.

With the exception of the work specified in this manual, no maintenance or repair of the Clarity LFC may be undertaken by the user. Repairs may only be performed by service staff or personnel specifically authorized by the distributor. Any queries regarding the malfunctioning instrument as well as warranty claims will be handled by your local representative of the distributor.

Warranty terms are 12 months from the purchase of the Clarity LFC unless the warranty terms offered by the distributor specify differently.

2 INSTRUMENT DESCRIPTION

2.1 Product name and intended use

Full manufacturer's product name for this system is Clarity LFC Spinning Disk Confocal Imaging Attachment. The Clarity LFC allows depth-discriminated images (i.e. optical sections) of fluorescence specimens to be obtained. Compared to the conventional epi-fluorescence images, these optical sections feature increased contrast and enhanced optical resolution in the axial direction. Because the fluorescence signals originating from planes above or below the actual focal plane are effectively suppressed, optical sections are essential for the three-dimensional reconstruction of samples under investigation.

2.2 Imaging system: composition and requirements

The Clarity LFC has been designed to work as a part of imaging system consisting typically of a microscope, CCD or sCMOS camera and external light source, figure 2.1.

The Clarity LFC occupies the central position in this imaging system with all critical imaging pathways routed through it. The instrument is attached to one of the available camera ports of the microscope, whereas the camera that would normally occupy this port is moved to the camera port of the Clarity LFC. The illumination light used for fluorescence excitation also needs to go via the Clarity LFC before it is directed to the microscope specimen. The Clarity LFC is designed to be used with a collimated illumination source such as a Liquid Light Guide and collimating adapter coupled with a standard arc-lamp illuminator or direct coupling with an LED light source.

The quality of the final image obtained with the Clarity LFC-based system depends crucially on the quality of the camera. Ideally this should be a high-sensitivity CCD or sCMOS device optimised for low light level fluorescence imaging. The camera chip size needs to be 2/3” or larger and at least 12 bit dynamic range is required for most practical applications. It is worth noting that Electron-Multiplying CCD do not confer any particular advantages for use with the Clarity LFC.

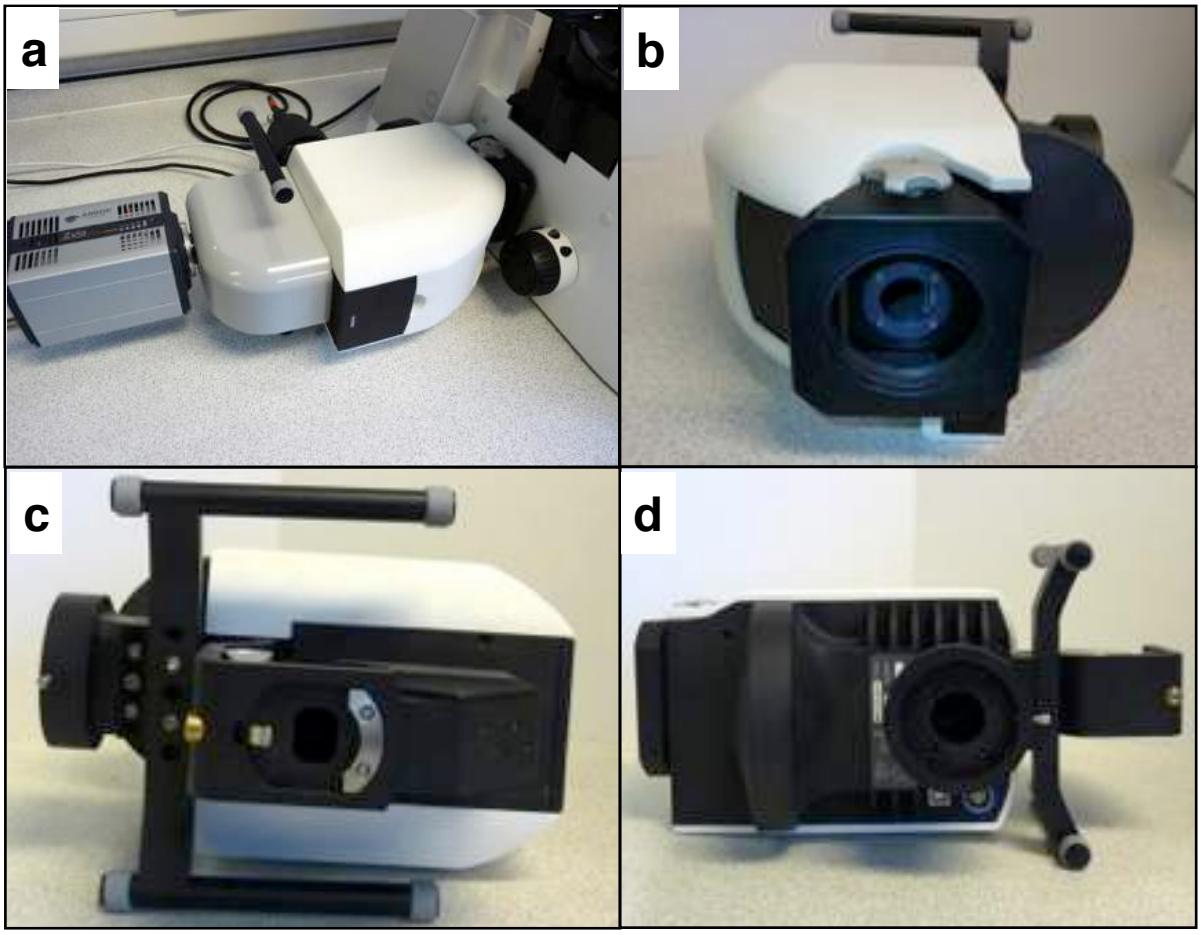


Figure 2.1: (a) General view of a Clarity LFC-based imaging system, (b) front window, microscope clamp, (c) camera port, (d) illumination port and back panel

2.3 Operating principle

The Clarity LFC is an optically-sectioning imaging system based on the principle of structured illumination: the light used to excite fluorescence in the sample is passed through a specially designed mask on its way to the microscope. The mask pattern is effectively imprinted on the excitation light beam and, consequentially, the same pattern is repeated in the fluorescence emitted by the sample. Crucially, only the parts of the sample that are positioned exactly in the focal plane of the objective lens will 'see' the high-contrast pattern. Due to the well-known properties of optical systems in the areas above and below the focal plane the contrast of the illumination pattern decays rapidly and very soon the pattern disappears altogether leaving a uniform illumination field. This effect is

the more pronounced the higher the numerical aperture of the objective lens.

The whole imaging process in the Clarity LFC can be conceptualised in three steps:

- Illumination light is projected onto the sample via an intermediate image plane containing a disk with an imprinted reflective mask pattern. This pattern may consist of line gratings of different mark/space ratios and spatial frequencies in order to accommodate different objective lenses and sectioning requirements.
- The fluorescence light collected from the sample is passed through the same disk which now acts as a reciprocal filter and partially-transmitting mirror. For the parts of the fluorescence image that emanate from the focal region the light is largely concentrated in the areas corresponding to the transparent sections of the mask. Most of the light is therefore transmitted through the disk with very little reflection (widefield + confocal, WF+C). Out-of-focus image which lacks the distinct structure correlated to the mask pattern will experience, on average, 50/50 reflection (widefield - confocal, WF-C).
- The two images split by the disk are then recombined and imaged on the two halves of the camera. By this time the original mask pattern in these images is effectively averaged out as the disk is spinning at high speed. The final step in extracting the sectioned image consists of the registration and subtraction of the image halves. This operation is performed by the imaging software.

The actual axial resolution that can be achieved with this technique depends on a number of factors: the spatial frequency of the grid pattern, magnification of the imaging system and numerical aperture of the objective lens. The Clarity LFC is equipped with a disk that features three sectors with different-sized grid patterns. This way a better match can be achieved to the requirements of a particular imaging situation and objective lenses available. There is also a “bypass” mode where the disk is moved out of the light path to allow the user to obtain epi-fluorescence images in the normal fashion, for example to quickly navigate around the sample before acquisition of sectioned images.

2.4 Requirements for objective lenses

Due to the reciprocal nature of imaging within the Clarity LFC, quality requirements for the microscope objective lenses are quite stringent. In particular, it is essential that objective lenses are well corrected for axial chromatic aberration between the excitation and emission wavelengths. This is especially relevant when using deep-blue or near-UV excitation. Many popular microscope objective lenses exhibit substantial axial chromatic aberration in this spectral region.

Generally we would recommend using the lens types with full spectral correction from Apochromat or Plan-Apochromat ranges. Fluorite-based Semi-Apochromat lenses may also be suitable for many applications although their performance is likely to be compromised in the blue end of the spectrum. If you are planning to image routinely in the deep-blue spectral range we would recommend that you use a specialised objective lens with enhanced chromatic correction for near-UV.

For more information on the objective lenses available for your microscope stand and their suitability for imaging with the Clarity LFC please contact the distributor.

2.5 Technical Specifications

Mechanical

Dimensions (Width x Depth x Height)

Base unit.....	390 x 220 x 135 mm
Power supply.....	175 x 85 x 45 mm

Mass

Base unit.....	5.8 kg
Power supply.....	1 kg

Camera mount

Load carrying capacity.....	2 kg
Moment on microscope mount (upright configuration,	

excluding camera)..... <0.5 Nm

Storage and transportation

Ambient temperature..... -10 to +50 °C

Relative humidity..... 20 to 75 % at +35 °C

Air pressure..... 800 to 1060 mBar

Operating environment

Ambient temperature..... +10 to +35 °C

Relative humidity..... 20 to 75 % non-condensing

Air pressure..... 800 to 1060 mBar

Pollution degree..... 2

Electrical

Enclosure protection..... IP20

Electrical safety..... IEC 61010-1:2010

Noise suppression..... EN 55011 Class B

Noise immunity..... EN 61000 - 4

Base unit power requirements

Voltage..... 12 V DC

Current..... 12.5 A

Mains power supply

Line voltage..... 100 to 240 V AC (±10 %), self-sensing

Line frequency..... 50 to 60 Hz

Line current..... 3 A

Power lead socket..... IEC-320/C14 (3 pins)

Short circuit protection..... continuous

Interfaces

Computer interface	USB 1.1/2.0
Camera adapters	C-mount
Microscope adapters	microscope stand specific
Light source adapter	ring dovetail
Recommended collimating adapter beam diameter	27mm

Optical

Disk rotation speed	3000 rpm
Disk grid position 0	Bypass mode
Disk grid position 1	High resolution mode
Disk grid position 2	Mid resolution mode
Disk grid position 3	Low resolution mode
Switching time between modes	< 3 s
Field of view (in the intermediate image plane)	8 x 14 mm
Filter cubes turrets	4 channels, user-replaceable cubes
Filter switching time	< 200 ms

2.6 Filter cubes

- Filter cubes are stored in clear plastic bags for cleanliness and supplied in a polyethylene case that can hold up to four filter cubes, figure 2.2 (a)
- Each filter cube has a label showing the excitation, emission and dichroic wavelengths. Each filter cube is comprised of one excitation filter and two emission filters, figure 2.2 (b)

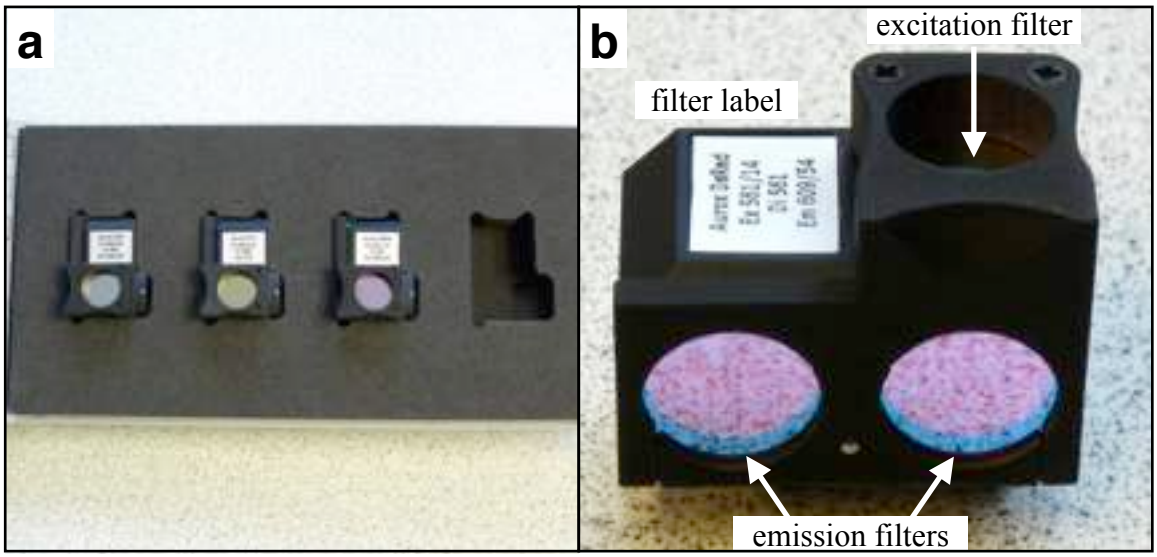


Figure 2.2: (a) Filter cube case with three filter cubes (storage plastic bags not shown), (b) Close-up photograph of a filter cube showing the filters positions and cube labeling

3 INSTALLATION

Typically the first installation of the Clarity LFC, especially if purchased as a part of complete microscopy system, would be done by the supplier's service engineer. However, the instrument has been designed so that the user can install, align and start up the Clarity LFC himself.

Before installation and start-up, make sure that you have read the Notes on instrument safety (Section 1.3 of this Manual).

3.1 Microscope stand requirements

The Clarity LFC is primarily designed to work with inverted biological microscopes. The instrument can be attached to any camera port of a microscope complying with the C-mount standard. A typical view of a fully-assembled instrument can be seen in figure 3.1

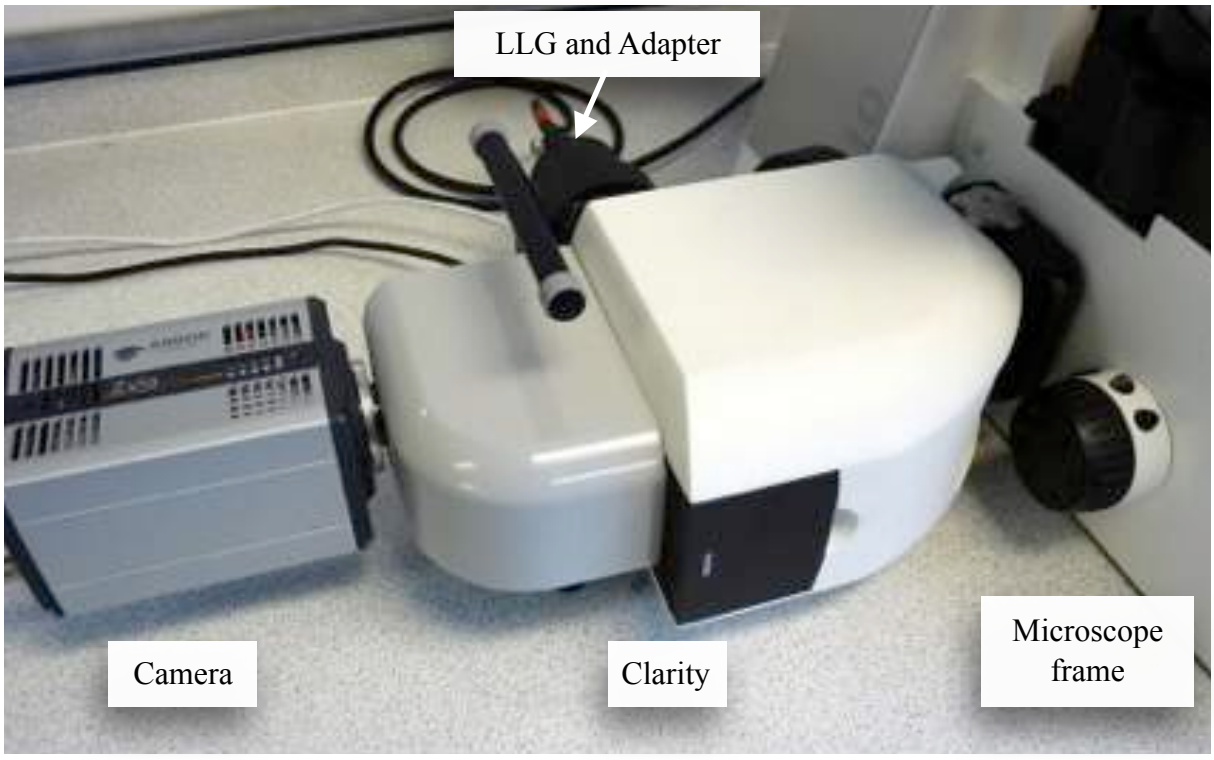


Figure 3.1: Fully assembled Clarity LFC system with Liquid Light Guide and collimating adapter, scientific camera and microscope frame.

If necessary, the instrument can be installed on a vertical camera port of an upright microscope. However, in this case the user should check with the microscope vendor whether the load-bearing properties of the camera mount are sufficient to support the weight distribution of the Clarity LFC.

If in doubt about the load-bearing capacity, never mount the Clarity LFC on a vertical port! Mechanical failure of the port adapter will result in damage to the microscope and Clarity LFC and may lead to injury to the user.

The optical sectioning imaging method used in the Clarity LFC is quite sensitive to vibrations, especially to these that affect the sample stage of the microscope. These vibrations have a potential to significantly degrade the image quality delivered by the Clarity LFC. Therefore the manufacturer recommends that the microscope together with the attached Clarity LFC should be installed on a vibration-isolation table or microscope support.

3.2 Unpacking Clarity LFC

The Clarity LFC is supplied in a commercial polyethylene shipping case with cardboard packaging. The case contains the Clarity LFC base unit together with Power Supply unit and USB cable as well a separate box for the filter cubes.

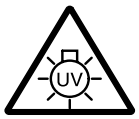
- Remove the instrument from the packaging and verify that all components listed on the delivery note are present.
- Keep the original packaging for a possible longer storage or return of the instrument to the manufacturer or dispose of it properly.

3.3 Inserting or replacing filter cubes

The instrument is equipped with filter cubes which are user-replaceable. It will be necessary to install the filter cubes before the Clarity LFC can be used. The same operation will have to be performed with any new filter cubes purchased by the user. The filter turret can hold up to four filter cubes, a full list of filters is available from the distributors

Inserting filter cubes

The instrument has an initialisation step which senses incorrect filter cube insertion and/or obstruction of the filter wheel. It is therefore recommended to power the instrument during filter cube change. After the first installation, during normal use, the software supplied by the system vendor provides a filter change option.



CAUTION

If a light source is connected to the Clarity LFC make sure that it is on standby or turned off before opening the filter turret door.

- Open the filter turret door
- Select the desired turret position, figure 3.2 (a)
- Insert the filter cube along the guiding spokes of the filter turret until the locating magnet pulls the filter cube, figure 3.2 (b). The insert of figure 3.2(b) show that the cube has not been pushed beyond the turret retaining spring and is therefore not locked in place yet.

Do not use excessive force in this step! If you are having trouble inserting the cube it is most likely due to initial misalignment of the cube with respect to the turret. Take the cube back out and try again.

- Lock the filter cube in place by pushing it against the filter turret, figure 3.2 (c), insert show that the cube has been pushed beyond the turret retaining spring and is therefore locked.
- Check that the filter cube is flush with the turret

Failure to insert the filter cube properly could result in damage to the instrument and/or filter cube, as well as compromising the optical performance of the instrument.

- Repeat from step ii. to insert the next filter cube

- When all filter cubes have been inserted close the filter turret door. The instrument will undergo its initialisation procedure during which the wheel spins slowly to detect any misplaced filter cube or obstruction. If the initialisation procedure fails the filter turret door indicator will remain dark. If the initialisation procedure pass then the door indicator will light up.

Removing filter cubes

- Pull the filter cube outward by holding the side grip as shown in figure 3.2 (d)

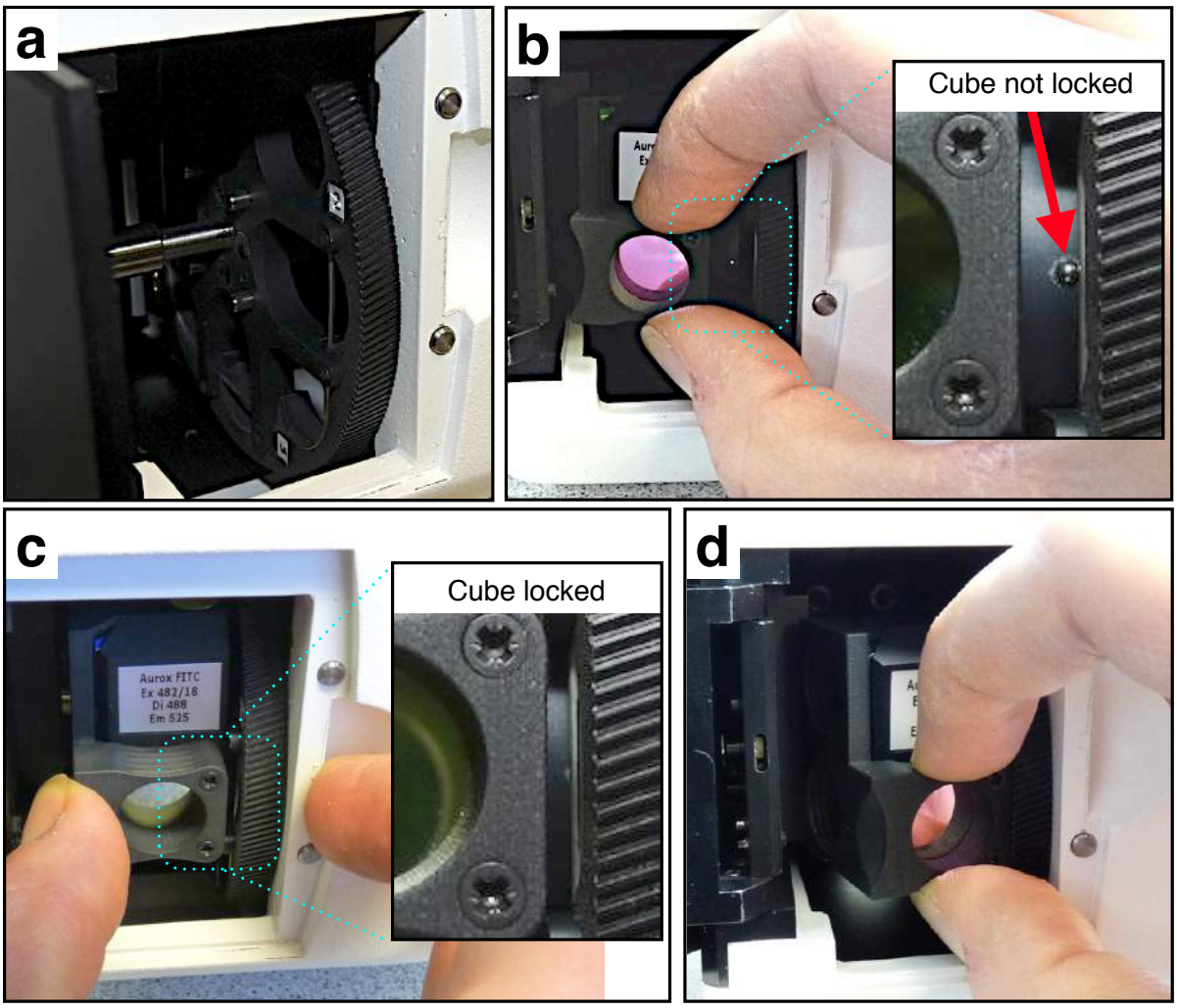


Fig 3.2 Inserting and removing filter cubes: (a) filter turret, (b) filter cube insertion, (c) filter cube locking, (d) removing a filter cube

3.4 Connecting Clarity LFC to the microscope

The Clarity LFC attaches to the microscope using a microscope specific adapter, the distributor will provide an adapter suitable for the user's system. An example configuration is shown in figure 3.3, in this case the adapter is first screwed onto the sideport of the microscope and the Clarity LFC unit clamps on the adapter. Other configurations may require the adapter to be fitted to the Clarity LFC first and then the whole assembly can be fitted into the sideport of the microscope.

Fig 3.3: a) microscope adapter fitted to the side port of an inverted microscope, b) Clarity LFC engaged onto the microscope adapter, c) locking the microscope clamp.

- Fit the adapter to the microscope sideport, figure 3.3 (a)
- Remove the protective cover from the Clarity LFC microscope port.
- Slide the Clarity LFC onto the microscope adapter, figure 3.3 (b)
- Clamp using the provided M6 allen key, figure 3.3 (c).

The result of this procedure should be a solid connection between the Clarity LFC and microscope.

3.5 Attaching the camera

The camera is attached to the Clarity LFC via the camera adapter

- Wind in the camera adapter into the camera C-mount
- Remove the plastic cover from the Clarity LFC. The cover is held in place by magnets and should slide off easily

- Release the camera lock screw and remove the blanking plate from the Clarity LFC camera port by pulling on the release lever.
- Insert the dovetail part of the camera adapter and lock it in place with the lock screw using the 3 mm hex screwdriver, figure 3.4. Check that the camera is aligned approximately vertically and is positively locked in place and try to avoid tightening the lock screw with excessive force.

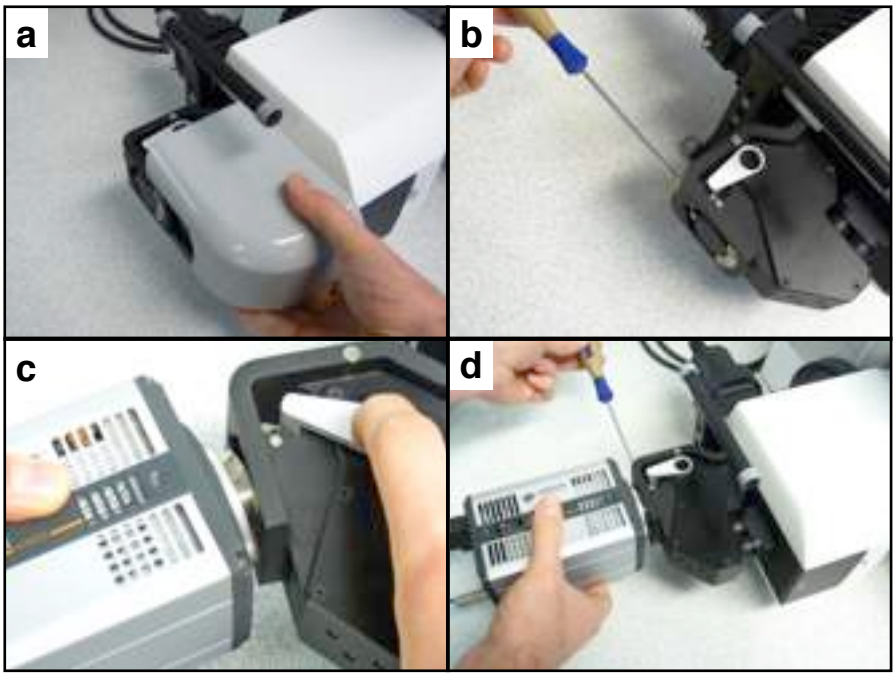


Figure 3.4: Attaching camera, (a) slide cover off, (b) unlock and remove blanking plate, (c) attach camera, (d) lock camera

To achieve the correct operation of the Clarity LFC it may be necessary to align the camera more accurately at a later stage. This will be typically done with the aid of software tools that are a part of the microscopy imaging system as a procedure of the initial calibration of the system. Please refer to the Software Manual for further information.

3.6 Making electrical and optical connections

All electrical and optical connection of the Clarity LFC are to be found on the connector panel at the back of the instrument, Fig 3.5.

External light sources may produce intense visible and UV radiation. Never attempt to insert or remove the illumination into the Clarity LFC with the light source switched on!

- Release the illumination adapter locking screw using the 3 mm hex screwdriver. Insert the illumination collimating adapter or the external light source in the ring dove tail and tighten the locking screw.

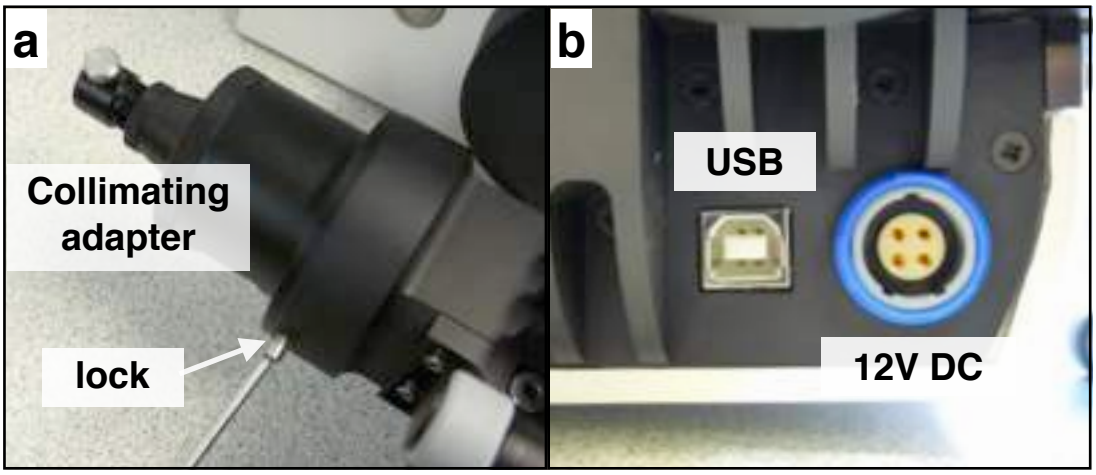


Fig 3.5 Clarity LFC connections: (a) collimating adapter attachment, (b) connector panel

- Insert the supplied USB cable into the USB socket and connect the other end to the computer running the imaging software.
- Insert the DC supply plug from the Power Supply Unit into the 12V socket of the Clarity LFC. The socket is keyed to avoid inserting the plug in the wrong orientation

Do not force the plug into the socket, check the orientation of the plug relative to the socket. The plug should easily connect to the socket without requiring excessive force.

4 OPERATION

All functions of the Clarity LFC will be controlled from the host computer via the USB link.

4.1 Switching Clarity LFC on/off

The Clarity LFC is activated by plugging in the mains lead of the Power Supply Unit. The instrument will undergo an initialisation step during which the filter turret will slowly spin and the disk will go to a preset position. At this point the instrument is in the Standby mode and USB communication is active. The host computer should now register the presence of the Clarity LFC.

The power cord should be only removed when the instrument is in the Standby mode. This will ensure that the disk is in the correct position.

We recommend that you switch on the instrument and the light source at least 30 minutes before taking the images to allow them to warm up to the stable operating temperatures.

4.2 Initial setup - pupil alignment

Every time the instrument is attached to the microscope it will be necessary to align the corresponding pupils to ensure that the light from the Clarity LFC is coupled into the objective lens properly. Do do this:

Inverted microscope configuration:

- Move the microscope objective turret to a position not occupied by an objective lens. Insert a ground-glass alignment tool.
- Make sure the external light source is switched on. Open the instrument shutter by pressing the Shutter button and observe an image of the instrument pupil in the objective socket. You may have to adjust the brightness of the light source and/or change the filter position to achieve the optimal visibility
- Make sure that the “pitch” locking screw is loosen before starting adjustment.

- Adjust the angle between the microscope frame and Clarity LFC by moving the entire unit as shown in figure 4.1 (a), yaw adjustment
- Adjust the pitch of the Clarity LFC unit using the adjustment screw of the leg support, figure 4.1 (b). Make sure that the pitch locking screws are unlocked.
- As well as the fine pitch adjustment screw, the leg support has three coarse height settings, unscrew the two M4 screws to set to the required height.
- The pupil is correctly aligned when centered at the microscope objective, figure 4.1 (c).
- Lock the pitch adjustment with the side screw of the leg support, figure 4.1 (e)
- Lock the yaw adjustment with the locking knob, figure 4.1 (d)

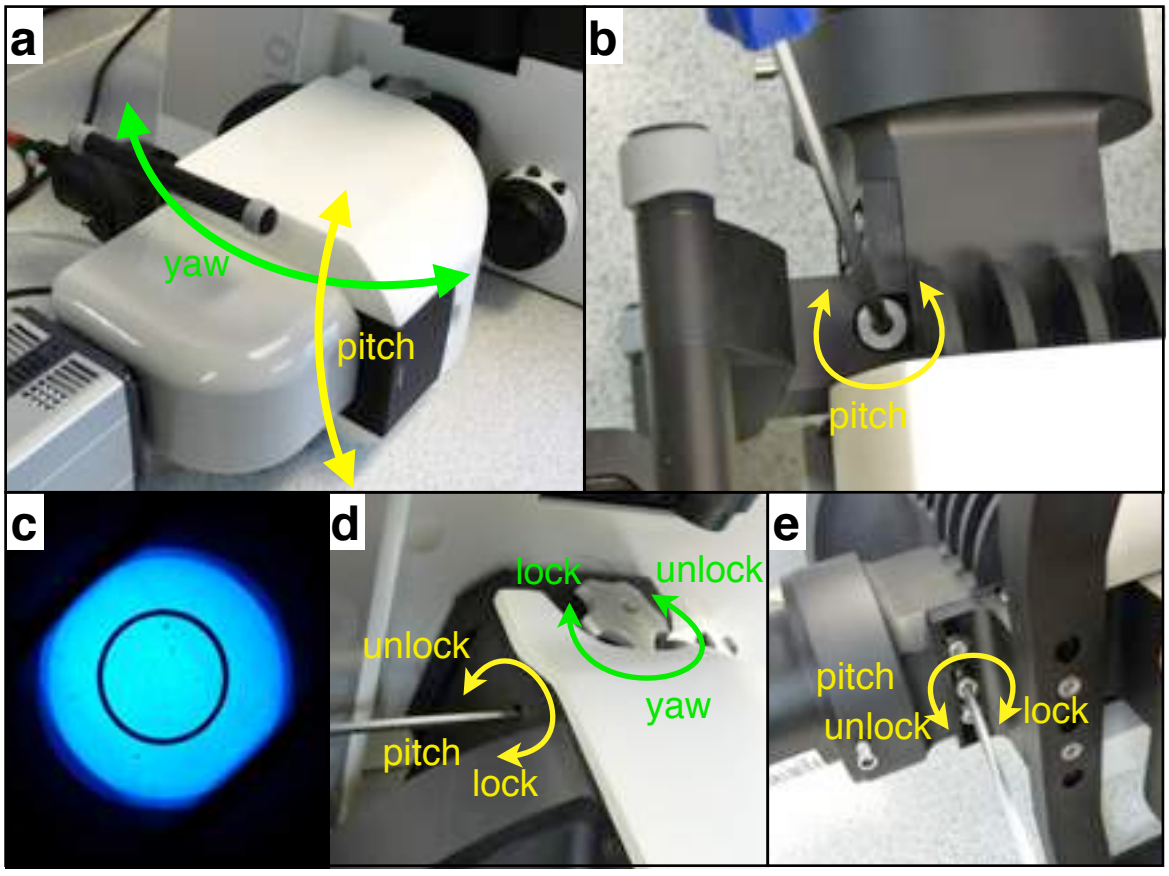


Figure 4.1: Pupil alignment. (a) yaw and pitch definitions, (b) pitch support leg adjustment, (c) correctly aligned pupil on ground-glass alignment tool, (d) microscope clamp pitch and yaw lock, (e) leg support pitch lock

Upright microscope configuration:

- In upright configuration the pitch adjustment on the support leg is not used or not present depending on the Clarity LFC configuration.
- If the Clarity LFC is mounted in an upright configuration the yaw and pitch are locked at the microscope clamp with the yaw and pitch locking screw as labelled in figure 4.1 (d)

4.3 Calibration

The performance of the Clarity LFC critically depends on the registration of the two sub-images detected by the camera. To aid this registration the Clarity LFC is equipped with a calibration target which is projected to both imaging channels of the instrument. The alignment of the two sub-images is done with adjusters located on the camera adapter, figure 4.2.

◎ Alignment screws. These are used for the image field alignment
◎ between the Clarity LFC and camera during the calibration setup.

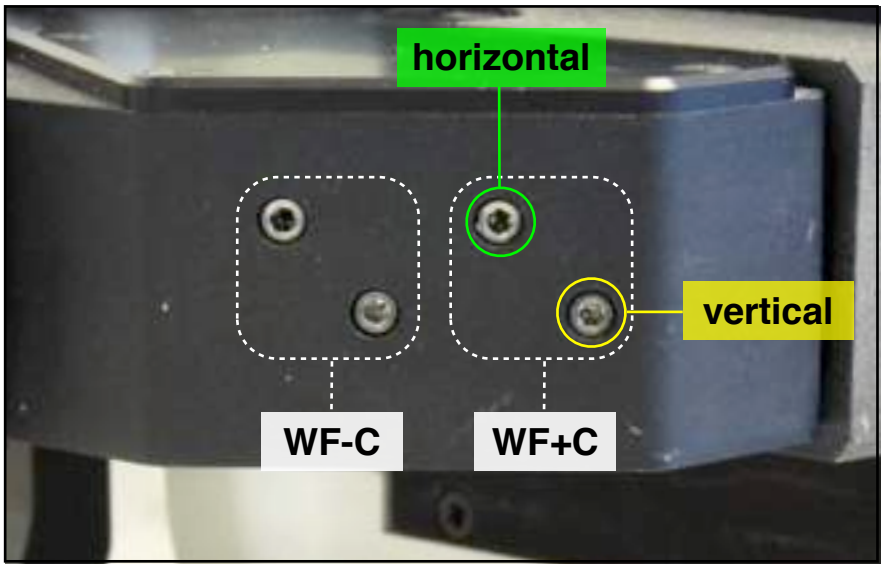


Figure 4.2: image field alignment adjustment

The calibration process is software driven and a more detailed description of it can be found in the Software Manual.

We recommend that you use the calibration image from time to time to check the alignment of the instrument. This is especially advisable before the acquisition of large and important image data sets.

5 MAINTENANCE, TROUBLESHOOTING AND SERVICE

5.1 Instrument care

The care of the Clarity LFC is limited to actions described below:

- After each use, power down the instrument via software or disconnect from power supply and cover it with the protective cover, if available, to protect from dust and moisture. If not used for prolonged periods store the Clarity LFC in the shipping case.
- Do not install the instrument in a damp room; the maximum permissible humidity is 75 %.
- Remove dust and loose contamination from visible optical surfaces with compressed air, rubber blower, or optics-cleaning tissue without exerting pressure.
- Wipe off stronger oily or fatty contamination (immersion oil, fingerprints) with a cotton bud or a dust-free cotton cloth using optics cleaning agent supplied with your microscope. If not available, use Ethyl Alcohol or Isopropanol.

Clean optical surfaces using a spiral motion starting in the centre of the element and moving towards the edge, while exerting a slight pressure onto the surface.

The following conditions increase the likelihood of fungal growth:

- Relative humidity of > 75% over more than three days at temperatures of +15 °C to +35 °C.
- Installation in dark rooms without movement of air.
- Dust deposits and fingerprints on optical surfaces.

5.2 Instrument maintenance and firmware upgrades

The Clarity LFC has been designed to be maintenance free apart from the preventive measures described above.

From time to time check the power supply leads for excessive wear.

Never use the mains lead if it shows excessive wear or obvious signs of damage. Discard the damaged lead and seek a replacement from the supplier

The Clarity LFC is shipped with fully functioning and certified firmware that should not require upgrades under normal circumstances. Nevertheless the instrument has a built-in capability for field-upgrading the firmware, should such need arise. One possible use for firmware upgrade could be expansion of the functional capabilities of the instrument.

Firmware upgrade is potentially disruptive operation and should not be undertaken by non-qualified personnel. If such upgrade becomes necessary the user will be contacted by the distributor with appropriate arrangements.

5.3 Troubleshooting

Various instrument states, including some fault conditions, are indicated by the indicator light on the filter turret panel. Some of these states that indicate untypical behavior, as well as possible corrective actions, are listed in Table 5.1.

Device states:	Indicator LED
Standby	OFF
Runmode	Orange
Door open	OFF
Initialisation	Purple
Initialisation fault	Red

5.4 Spares, consumables and tools

For full list of spares please contact Aurox or visit out website http://www.aurox.co.uk

5.5 Requesting service

All repairs to mechanical, optical and electronic components inside the Clarity LFC may only be performed by the distributor staff or service personnel specifically authorized by the distributor.

To keep the Clarity LFC and your entire microscope imaging system optimally adjusted and perfectly working over a longer period, we recommend you to conclude a service/maintenance agreement with the distributor.

For more information about our distributors and available options please contact us via info@aurox.co.uk or visit our website http://www.aurox.co.uk

AUROX
PERSONAL CONFOCAL

Aurox Ltd • Culham Science Centre • Abingdon • Oxfordshire • OX14 3DB • UK • tel/fax +44 (0)1865 407814

RoHS Statement of Compliance

Manufacturer: **Aurox Ltd**

Address: 30 Upper High Street
Thame, Oxfordshire
OX14 4SH, United Kingdom

Device name: **CC88 Spinning Disk Imaging System and accessories**

Part numbers: **CC0x882, CC0x20x, CC0x30x, CC0x31x, CC0x32x, CC0x35x**

We hereby declare that to full extent of our knowledge of these parts are in compliance with the requirements of the EU Directive **2011/65/EU** (RoHS Directive) with respect to the following substances:

Mercury (Hg)
Cadmium (Cd)
Lead (Pb)
Hexavalent Chromium (Cr(VI))
Deca Brominated Diphenyl Ether (decaBDE)
Polybrominated Biphenyls and Ethers (PBB and PBDE)

This statement is based on Aurox Ltd understanding of RoHS and our knowledge of the materials that go into these products as disclosed by our suppliers. Any modification of the products not authorized by Aurox Ltd will invalidate this declaration.

Abingdon, 12.03.2014

Dr Rimas Juškaitis
MANAGING DIRECTOR

AUROX
PERSONAL CONFOCAL

Aurox Ltd • Culham Science Centre • Abingdon • Oxfordshire • OX14 3DB • UK • tel/fax +44 (0)1865 407814

EC Declaration of Conformity

Manufacturer: **Aurox Ltd**

Address: 30 Upper High Street
Thame, Oxfordshire
OX14 4SH, United Kingdom

Device name: **CC88 Spinning Disk Imaging System**

Part numbers: **CC01882, CC02882, CC03882**

We declare full compliance of this device with the requirements of the Council Directive **2004/108/EC** (EMC Directive) and the Council Directive **2006/42/EC** (Machinery Directive). Any modification of the product not authorized by Aurox Ltd will invalidate this declaration.

Testing standards:

EN 61326	EMC requirements
EN 55011	Radiated emissions
EN 61000-3-2	Harmonic current emissions
EN 61000-3-3	Voltage fluctuations and flicker
EN 61000-4-2	Electrostatic discharge immunity
EN 61000-4-3	RF electromagnetic field immunity
EN 61000-4-4	Electrical fast transient/burst immunity
EN 61000-4-5	Surge immunity
EN 61000-4-6	Immunity to conducted disturbances induced by RF field
EN 61000-4-11	Voltage dips, interruptions and voltage variations immunity
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use

Test certificates:

3C13/10435/1	3C Test Ltd, Silverstone Technology Park, Northants NN12 8GX, UK
TR/13/743-2	BSI, Kitemark Court, Davy Avenue, Milton Keynes MK5 8PP, UK

Based on the above the device is marked with CE

Abingdon, 1.04.2014

Dr Rimas Juškaitis
MANAGING DIRECTOR

R&D 100 IOP Institute of Physics Innovation Award 2012