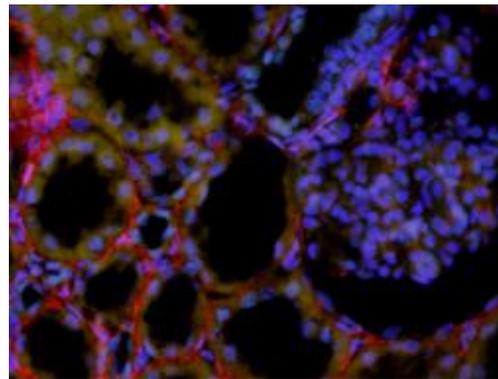
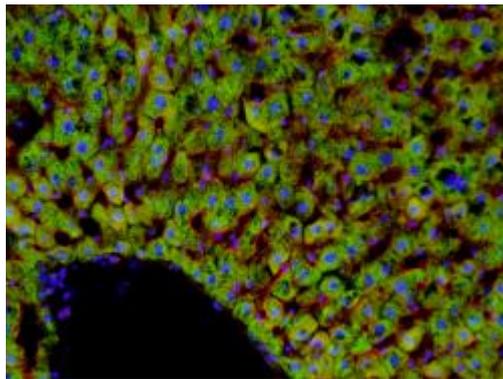
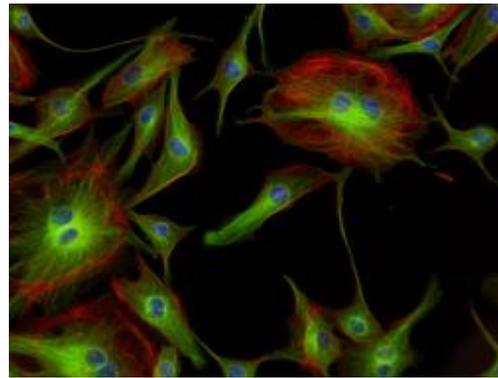
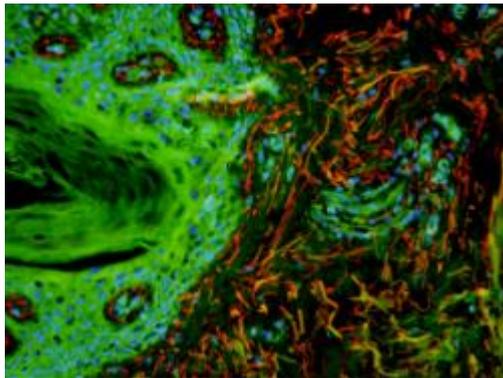


User Manual

pE-340^{fura}



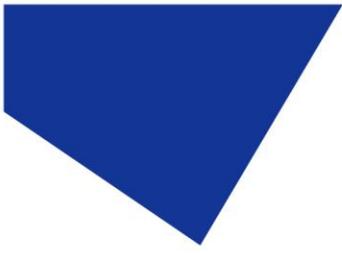
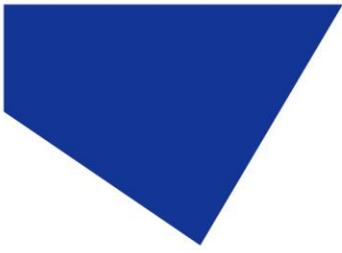


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1. Introduction

CoolLED's pE-340^{fura} Illumination System has been designed to meet the requirements of users carrying out Fura-2 AM ratiometric calcium imaging. The pE-340^{fura} offers an Illumination System that is both safer and offers a faster level of control than traditional bulb-based solutions. The three controllable channels offer 340nm, 380nm and a broad 'white' (420-700nm).

With a comprehensive range of microscope adaptors, the pE-340^{fura} can be fitted to most current and older compound research grade microscopes. The result is a safe, convenient illumination system which will last for many years without any additional operating costs.

This User Manual should give you all the information required to install and operate your new illumination system.

Additional information can be found on our website at www.coolled.com



2. Safety Precautions

While LEDs are a much safer illumination system than the mercury and metal halide lamps that they replace in microscopy applications, precautions should still be taken with this product.

When operating or maintaining this product, please observe the following safety precautions at all times. Failure to do so may result in personal injury or damage to other items.

2.1.

UV light may be emitted from this product depending on the version/wavelength selected. Avoid eye and skin exposure. Never look directly into the light output beam from the Light Source or accessories. The emissions could damage the cornea and retina of the eye if the light is observed directly.

2.2.

Always ensure that the Light Source is securely attached to the microscope (either directly or with a light guide and collimator, depending on the version) prior to turning on the power. This will minimise the risk of injury and damage.

2.3.

If for any reason the Light Source is to be operated when not attached to a microscope, all personnel should wear eye shielding and clothing to protect the exposed skin.

2.4.

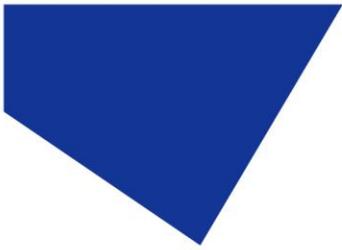
Disconnecting the mains supply is achieved by unplugging the power cord from the power supply block or the Light Source. Only plug in the power cable, once the Light Source is attached to the microscope.

2.5.

There are no serviceable parts within the Light Source. Removing any of the screws and covers will result in the safety of the Light Source being impaired. The DC power supply unit should be inspected periodically throughout the lifetime of the system.

2.6.

Any electronic equipment connected to this product must comply with the requirements of EN/IEC 60950.



2.7.

To clean the exterior of the Light Source, use a slightly dampened cloth with a simple water/detergent solution only. Avoid the optical surfaces and lenses. Cleaning of optics should only be carried out using optical wipes and fluids. Please note that the DC power supply unit should be isolated prior to cleaning.

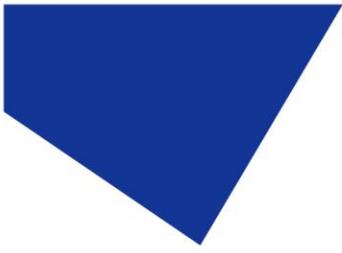
2.8.

This product conforms to the requirements of the Safety Standards as follows:

EN/IEC 61010-1:2010	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use.
EN62471:2008	Photo-biological Safety of Lamps and Lamp Systems/Guidance on manufacturing requirements relating to non-laser optical radiation safety. Risk Group 3.

RISK GROUP 3
WARNING UV emitted from this product. Avoid eye and skin exposure to unshielded product.
WARNING Possibly hazardous optical radiation emitted from this product. Do not look at operating lamp. Eye injury may result.
CAUTION IR emitted from this product. Avoid eye exposure. Use appropriate shielding or eye protection

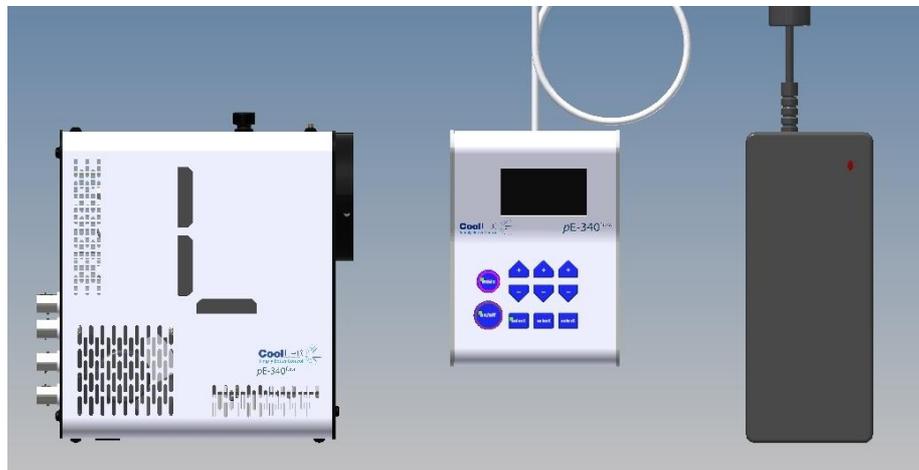
All warnings may not be applicable depending on the version/wavelength being used.



3. Getting Started – System Components

A typical CoolLED pE-340^{tura} Illumination System is supplied with the following components:

1. LED Light Source.
2. Manual Control Pod.
3. Microscope adaptor for specific microscope model (Direct fit only).
4. DC Power Supply Type GST120A12-R7B.
5. IEC Power Cable (not shown).
6. User Guide (not shown).



If any components are missing or appear damaged, please contact CoolLED immediately.



4. Installation and setup

4.1.

Carefully unpack the components from the shipping cartons.

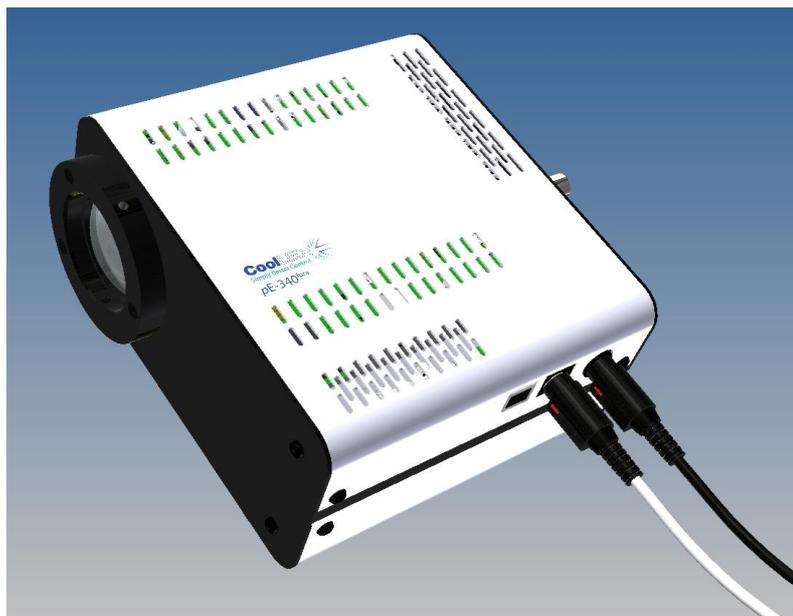
4.2.

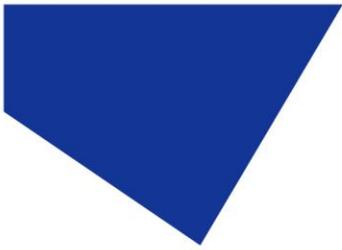
Insert the Control Pod cable into the LED Light Source using the red dots as a guide for orientation of the plug.



4.3.

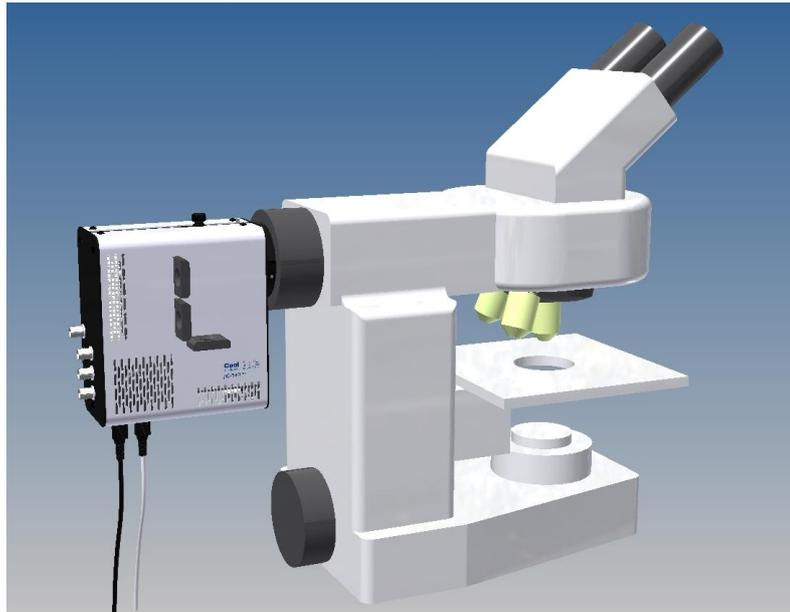
Connect the power connector from the DC power supply as shown. Ensure that the DC power supply is the one supplied with the product. Using non-CoolLED power supplies may damage the Light Source and will invalidate the warranty. At this stage do not connect the mains power lead to the DC power supply.





4.4.

Attach the LED Light Source to the epi-fluorescence port on your microscope. Your pE-340^{fura} Light Source will have been supplied with a compatible fitting for the microscope you specified at order (if direct fit version). Attach the Light Source ensuring that it is secure and true/flush with the microscope.

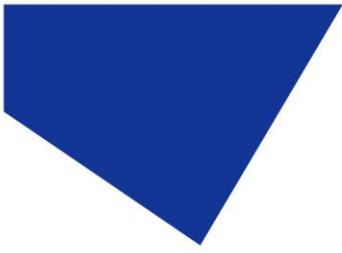


4.5.

Ensure that there is free airflow around the LED Light Source so that the cooling system is not impaired. A gap of 200mm on either side is sufficient. The diagram shows the Light Source in the preferred orientation. However it may be set with the cables at the top or at either side.

4.6.

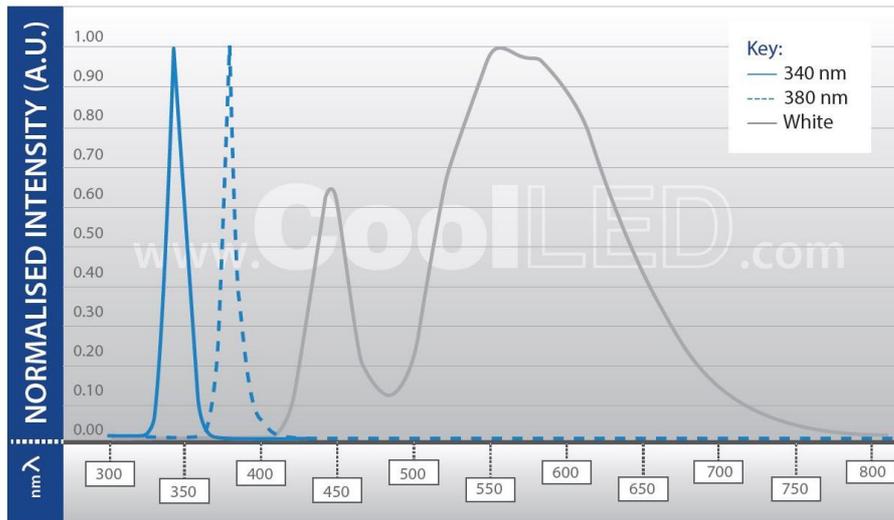
With the LED Light Source now attached to the microscope it is safe to connect the mains power. Connect the mains lead supplied to a convenient socket, plug in the IEC connector into the DC power supply and switch the power on at the socket.



5. Configuration of the Light Source

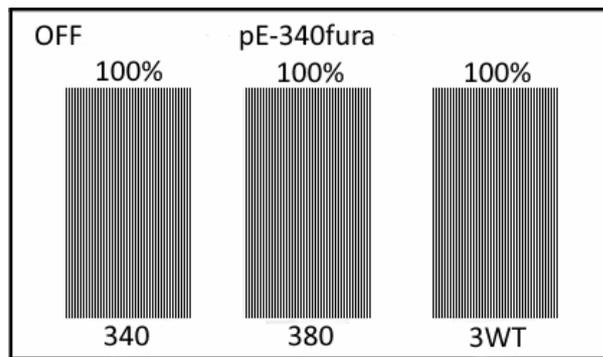
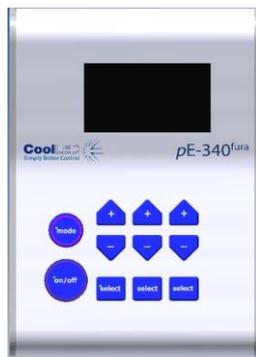
5.1.

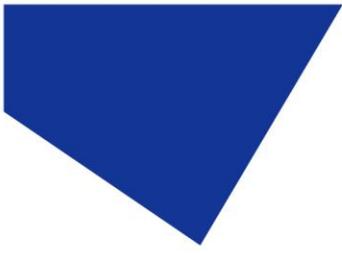
pE-340^{fura} Normalised Spectrum



5.2.

The pE-340^{fura} has independent circuits giving the user control of the three main peaks of emissions. These are referred to as 340 (nm), 380 (nm) and 3WT (white illumination).





6. Operation - Manual Control

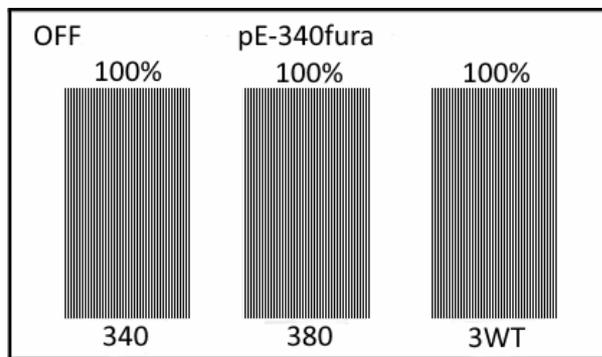
6.1.1.

Manual Control Pod Operation on/off.

The pE-340^{fura} is easily controlled from the manual Control Pod. LEDs are switched on and off by pressing the 'on/off' button.

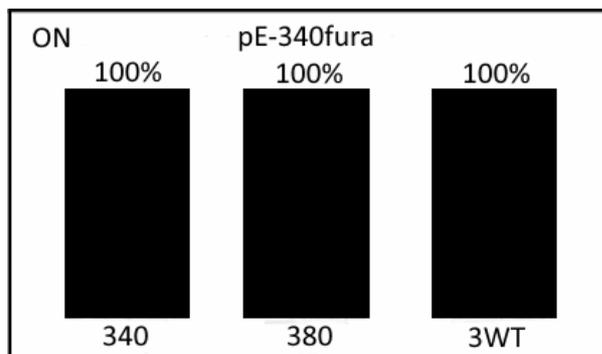
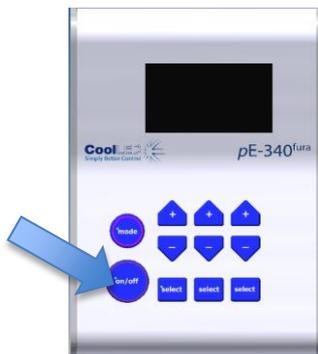
6.1.2.

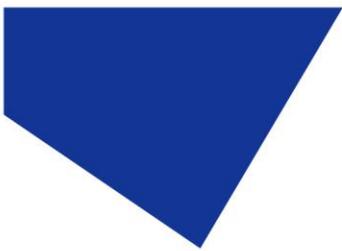
At start-up the Light Source will revert to the same settings that were set when it was last powered down. New Light Sources are supplied with the settings as shown.



6.1.3.

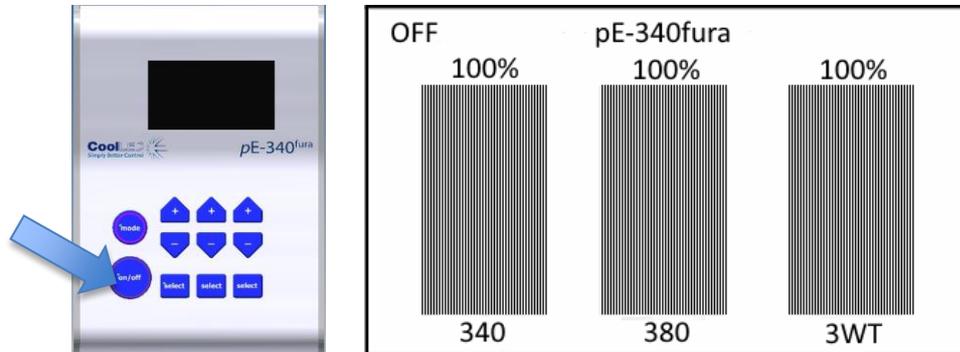
To switch on LEDs press 'on/off' once.





6.1.4.

To switch off the LEDs, press the 'on/off' once again.



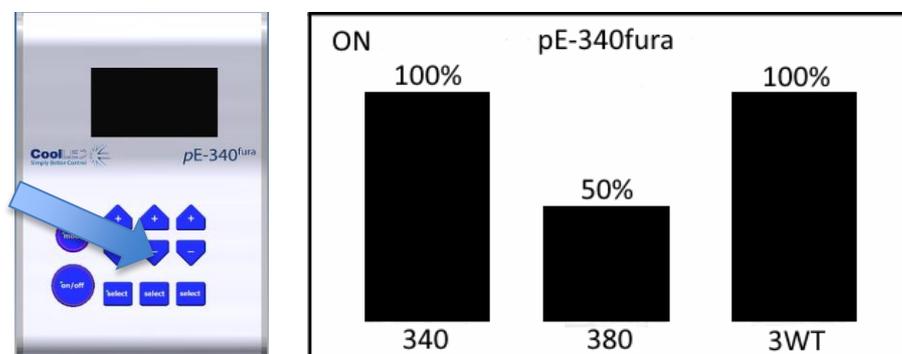
6.1.5.

Intensity Control.

The Control Pod enables the user to control the intensity of the LEDs that are exciting different stains. This helps to balance the emissions so that one stain does not dominate another.

6.1.6.

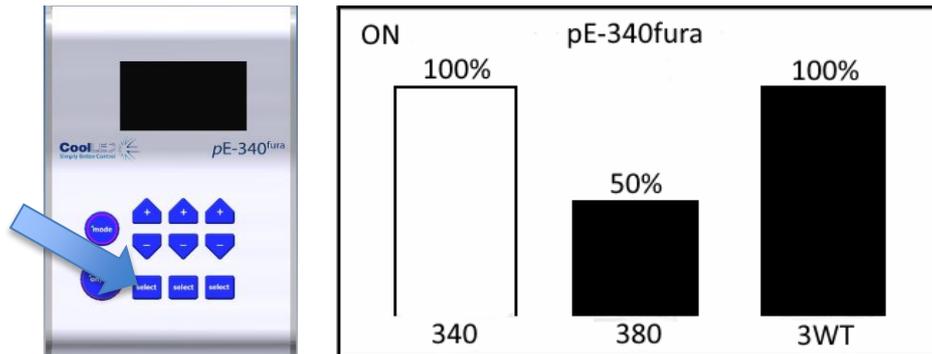
Reduce intensity of one channel by pressing the down intensity button.





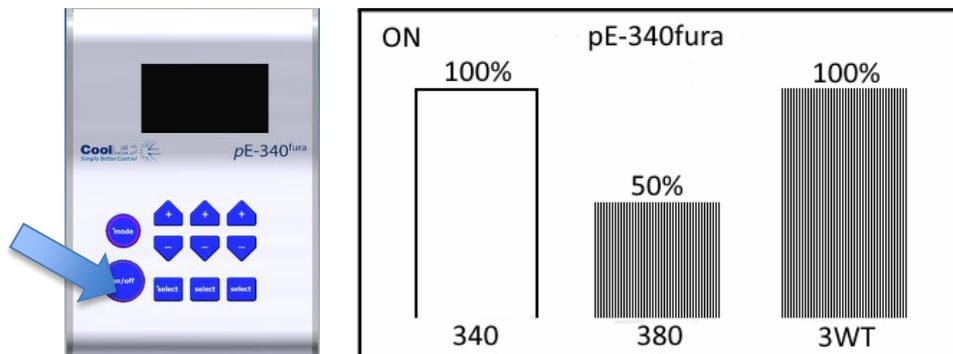
6.1.7.

Individual channels can be switched off (de-selected) by pressing the 'select' button. Light is then only generated where it is required to excite the stains in use. This has many attractive benefits with improvements in contrast, cell viability and savings in energy.



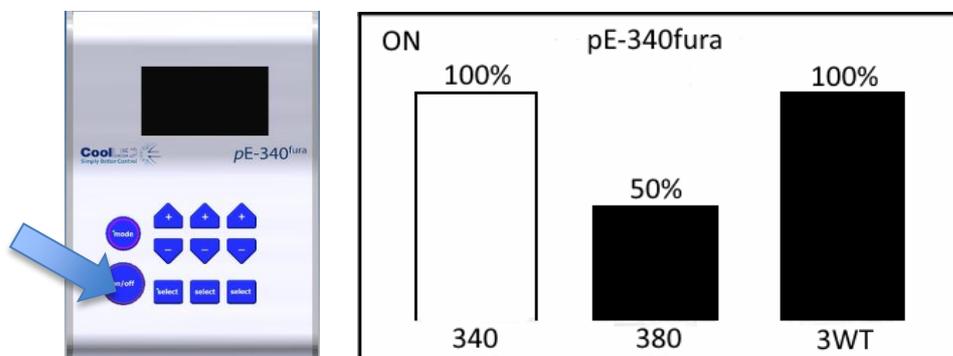
6.1.8.

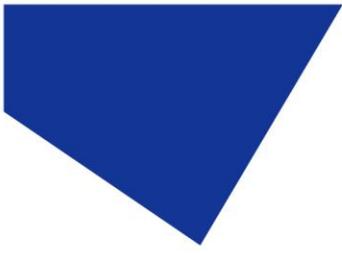
Switch off selected channels by pressing the 'on/off' button.



6.1.9.

Switch selected channels back on by pressing 'on/off' button again.



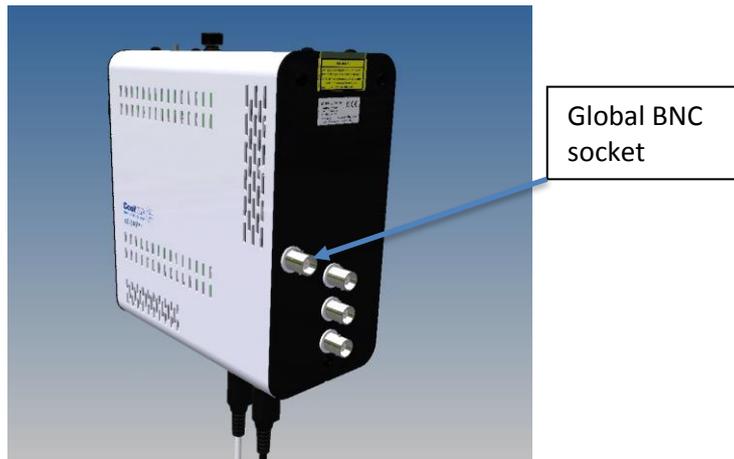


7. Remote Operation – TTL

7.1. Global triggering

7.1.1.

The pE-340^{fura} has a BNC socket on the rear of the Light Source which allows global control of the Illumination System.

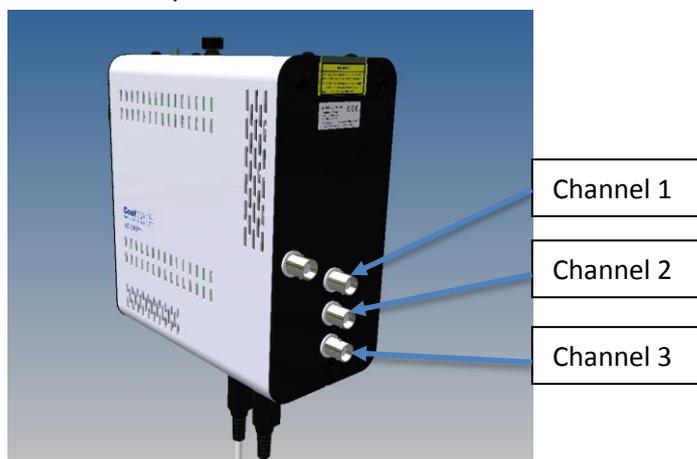


The TTL signal controls the on/off function of the Light Source. A TTL 'high' will cause the LEDs to be on, independent of the state of the on/off button. Only those bands which have been manually selected on the Control Pod (shown by a shaded intensity bar on the Control Pod display) will be switched by the TTL signal. The intensities of the selected bands are manually set on the Control Pod.

7.2. Individual channel triggering

7.2.1.

In addition to the global TTL control available, the pE-340^{fura} also has three additional BNC sockets that allow individual TTL channel control of the Illumination System.





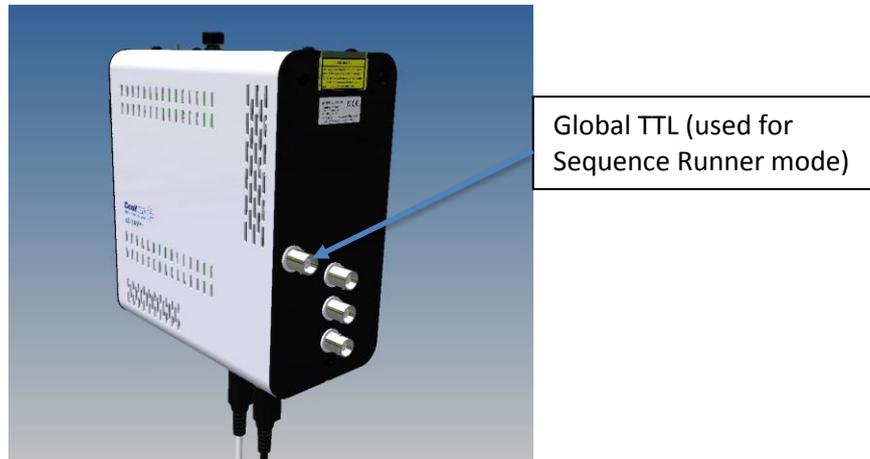
7.2.2.

The TTL signal controls the on/off function of the Light Source. A TTL 'high' will cause the LEDs to be on. The channel controls shall trigger the corresponding channel regardless of its on/off state or whether it has been selected using the Control Pod. The intensities of the selected bands are manually set on the Control Pod.

7.3. Sequence Runner

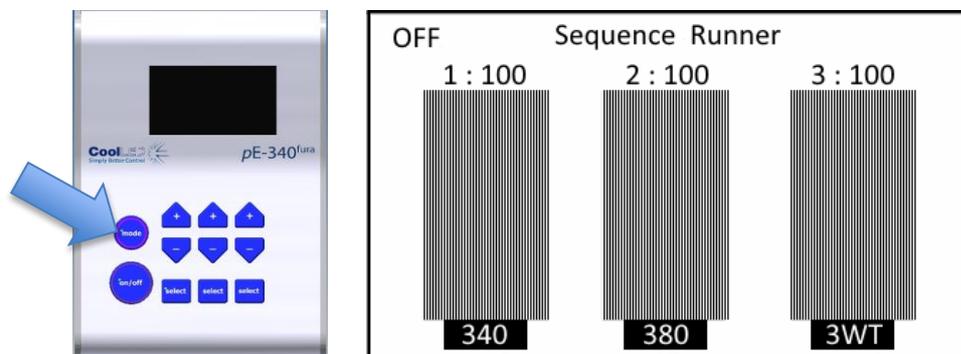
7.3.1.

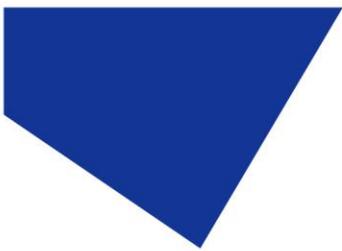
The pE-340^{fura} allows the Illumination System to be controlled using the Sequence Runner mode. The Sequence Runner allows sequential triggering of multiple channels using a single TTL signal attached to the global BNC socket.



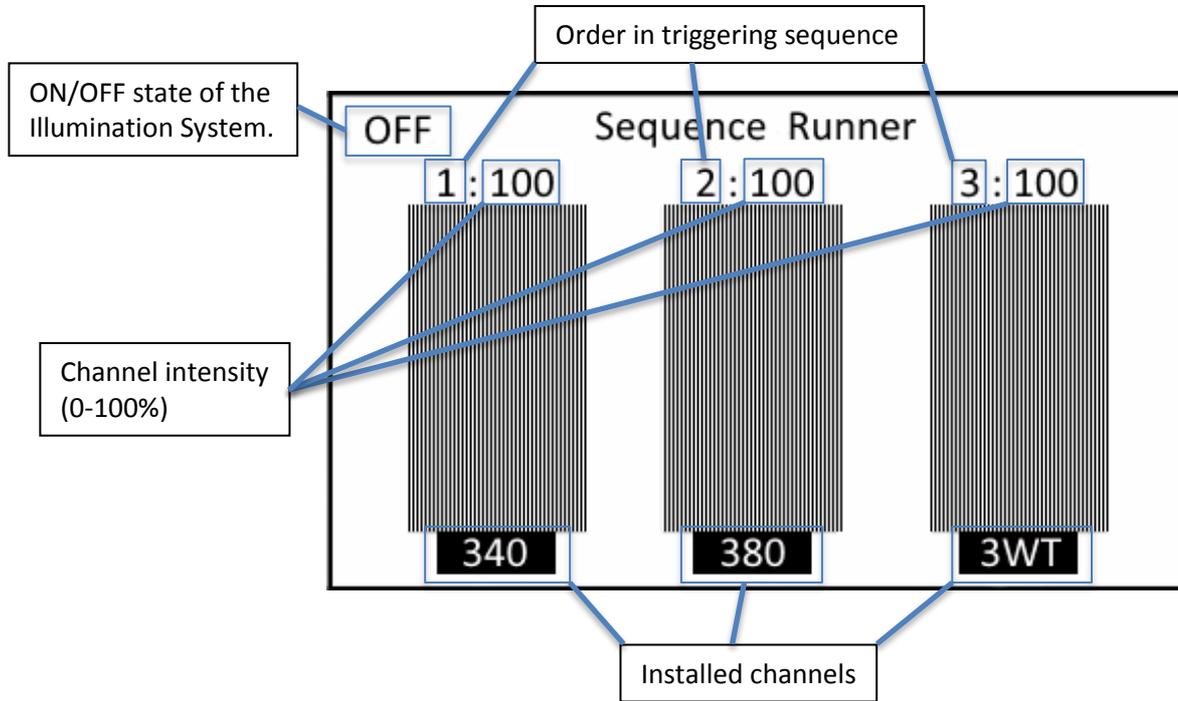
7.3.2.

The Sequence Runner mode is accessed by a short duration press of the mode button on the Control Pod.



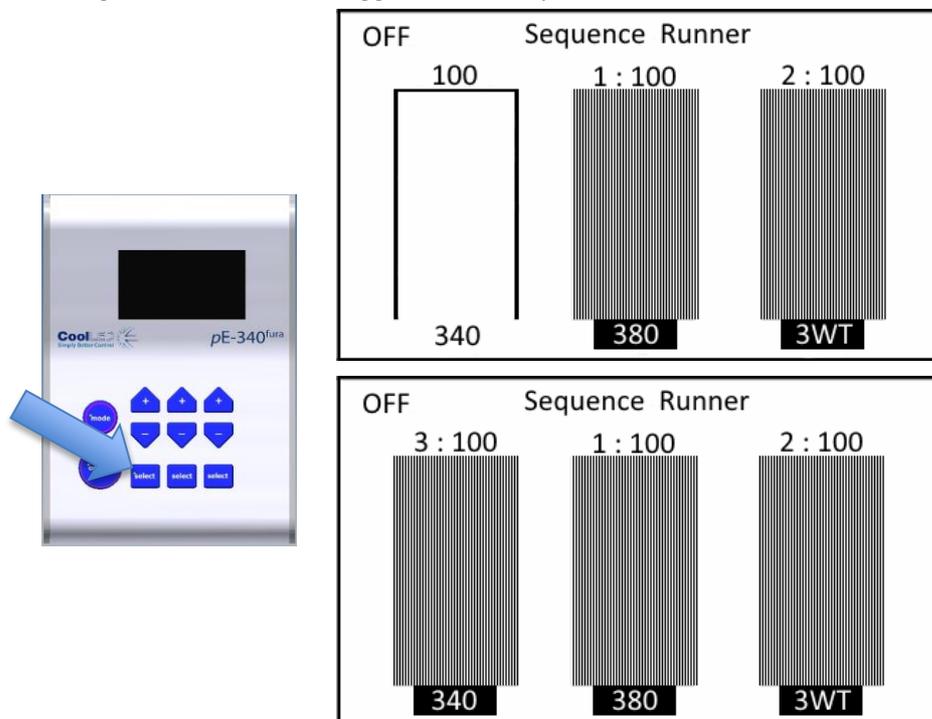


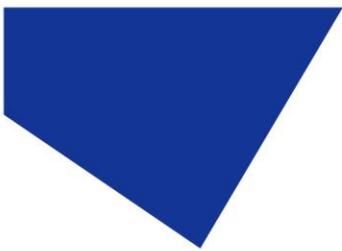
7.3.3.



7.3.4.

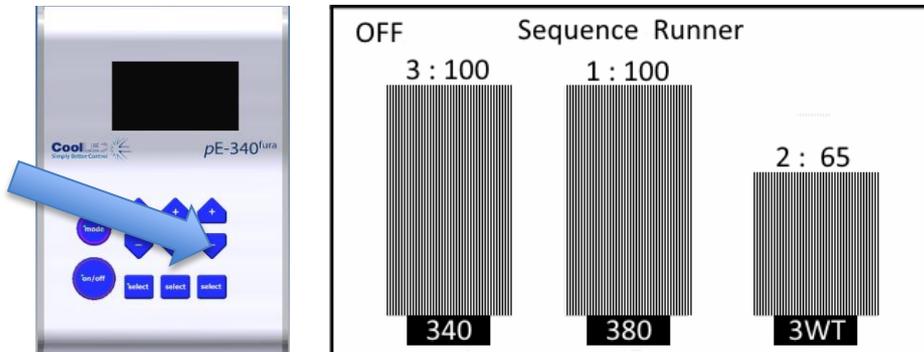
Pressing the channel select button allows you to either deselect a channel or change the order that it triggers in the sequence.





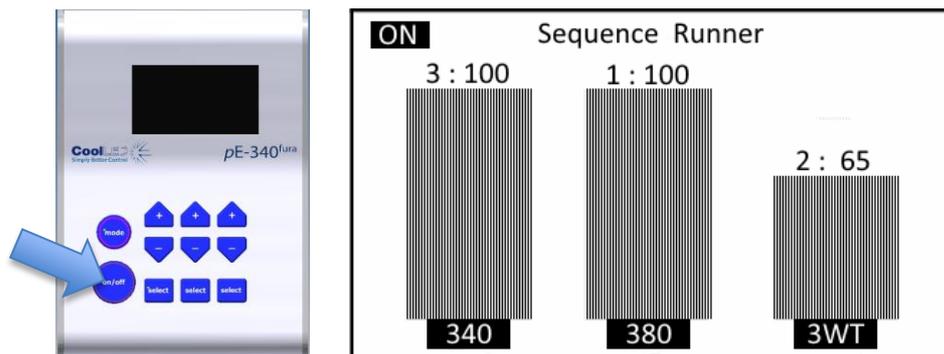
7.3.5.

Pressing the + & - buttons on the Control Pod will allow the light intensity of the corresponding channel to be increased or decreased.



7.3.6.

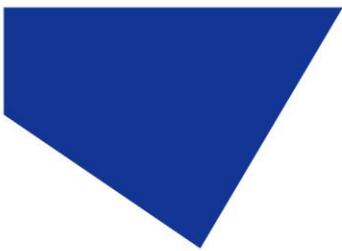
The sequence will not begin until the ON/OFF button on the Control Pod is pressed.



In this example channel 2 will pulse at 100% intensity, channel 3 will pulse at 65% and then channel 1 will pulse at 100%. This Sequence will continue until the ON/OFF button is pressed again to stop the sequence.

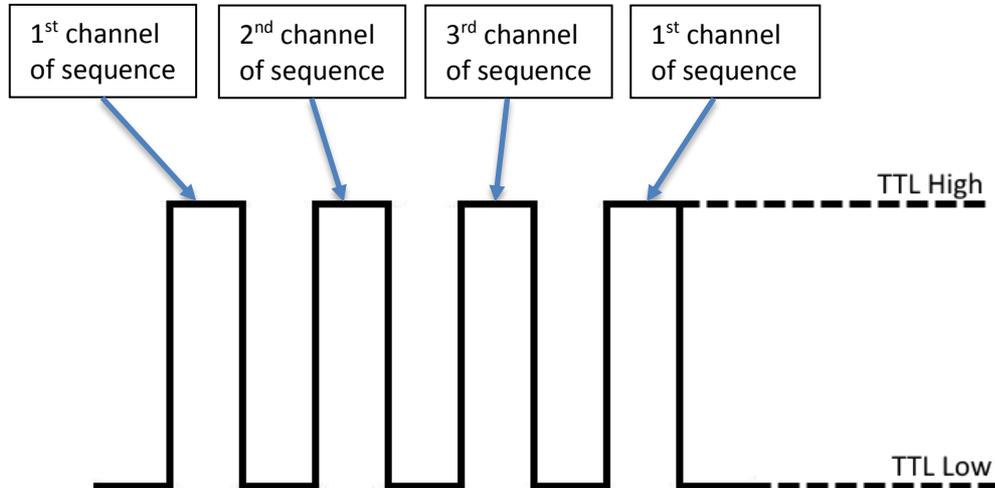
7.3.7.

Whilst a sequence is running the ability to change the triggering order, select or deselect a channel and the mode button are disabled. The BNC sockets responsible for Individual channel triggering are also disabled whilst in Sequence Runner mode to avoid any conflicts.



7.3.8.

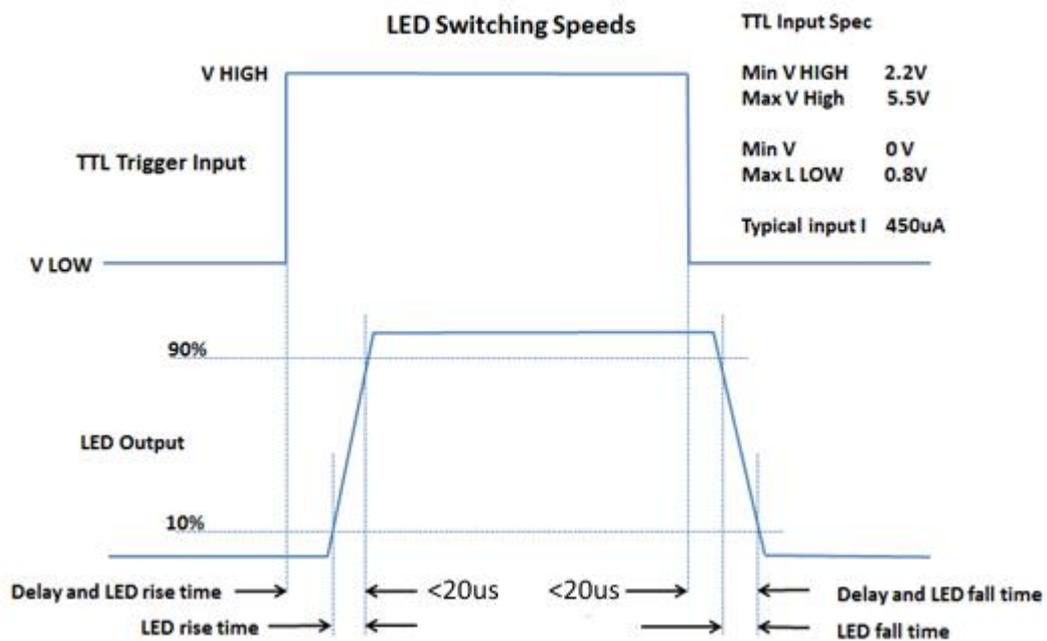
An example of the TTL signal is shown below with labels showing the effect on the light output during the sequence.



7.4. TTL triggering information

7.4.1.

The TTL input circuit has been designed to maximise the switching speed of the LEDs to give the user precise control of the excitation light reaching the sample.



This diagram shows the worst case triggering speeds when triggered at 100% intensity. There will be slight differences in speed between channels and at different intensities.



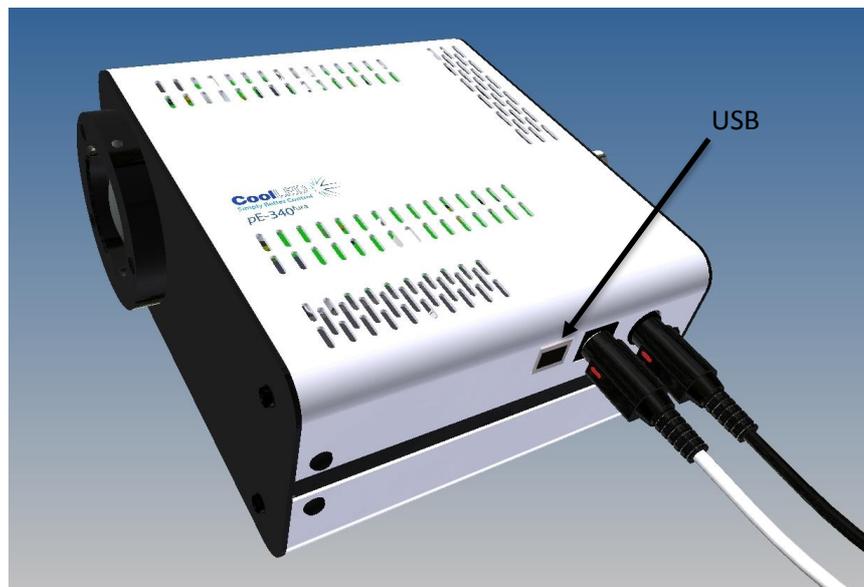
7.4.2.

With fast repetitive switching, the Control Pod display will not be able to respond at the same speed. This can occasionally result in the Control Pod displaying the incorrect ON/OFF state. If this happens, simply press the ON/OFF button to reset the state on the display.

8. Remote Operation – USB

8.1.

For a remote control using software connection between the host computer and the Illumination system, a USB interface is used. The Light Source has a Type 'B' connector socket located adjacent to the Control Pod socket.



8.2.

Connect the Light Source to your computer using a USB cable. As with all USB remotely controlled devices, it will be necessary to set up the driver files on your system to allow the pE-340^{fura} to be recognised.

8.3.

When you first plug your CoolLED system into your PC with the USB cable, Windows will ask for a driver file unless one has already been installed. You should point Windows to the file available from CoolLED.



8.4.

If you do not have the driver file you can download this from the following page on the CoolLED website:

<http://www.cooled.com/product-detail/imaging-software/>

8.5.

Click on the link at the bottom of the Overview section titled 'CoolLED pE_Driver'. Download then unzip before pointing Windows to this file.

8.6.

Once the CoolLED device has been successfully installed into Windows you should look at the Virtual COM ports assigned by going into Device Manager. Look within Ports (COM & LPT).



In this example the Illumination System has been assigned two COM ports, COM3 and COM4. You may need this information to connect to the Light Source from your software control package. Either COM port may be used for control. Two COM ports have been assigned to allow for diagnostics to take place in parallel with communication and also allow for dual communication should it ever be desired.

8.7.

The majority of microscopy imaging software systems have integrated the pE-340^{fura} into their packages. If you are developing your own software, a Software Development Kit (SDK) is available giving the full instruction sets necessary. Contact support@cooled.com and request access to this information.

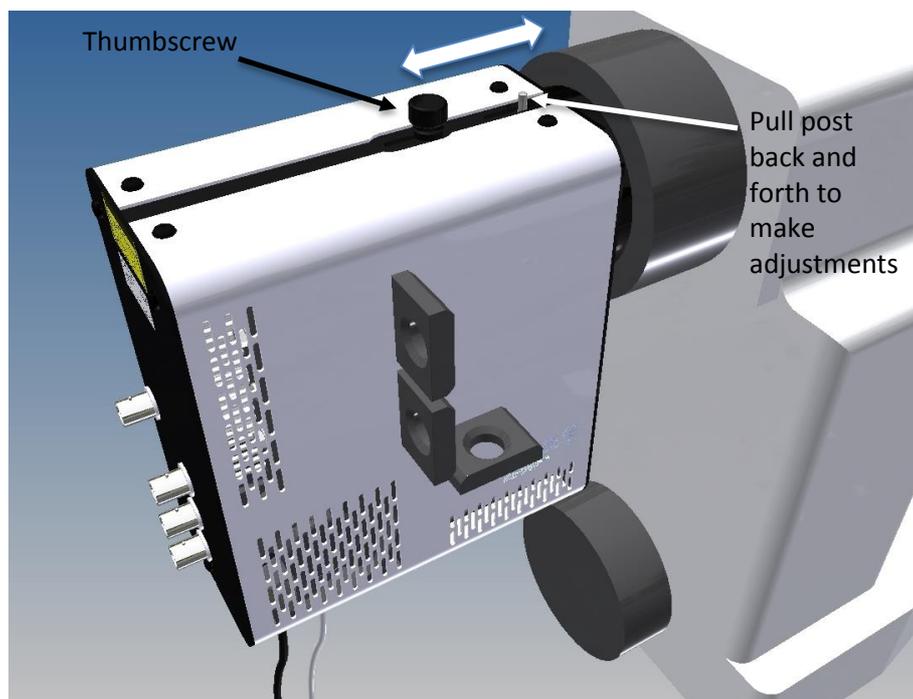


9. Optical setup

9.1. Direct fit version

9.1.1.

The pE-340^{fura} has been designed to work on the majority of fluorescence microscopes, both new and old. As would be expected, there is some variation in the optical path and elements within every microscope. In order to accommodate these variations, the pE-340^{fura} is supplied with a small adjustment which allows the user to optimise the performance of the illumination system when it is first fitted. This is a one-time adjustment. No further adjustment will be required during the life of the product unless changes are made to the microscope or the illumination system is fitted to a different microscope.



9.1.2.

To make the adjustment, set up a typical sample on the microscope that gives an image over the whole field of view. Loosen the thumbscrew and slide the post back and forth until you achieve the maximum brightness with an even field of view. Tighten the thumbscrew to prevent the setting from changing.

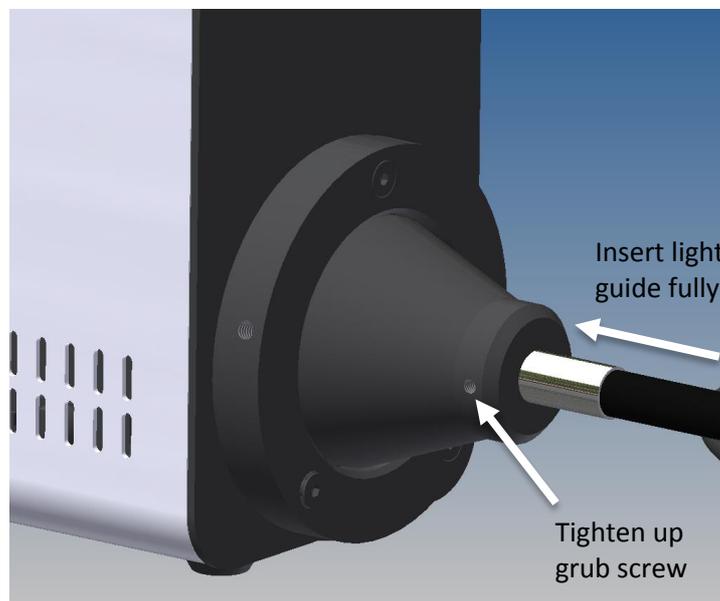


9.2. Liquid light guide version

The pE-340^{fura} Illumination System is also available with a liquid light guide output. The Illumination System is designed to accept a 3mm core light guide. CoolLED offer a liquid light guide that has been selected to offer maximal transmission of the 340nm channel. It should be noted that if an alternative light guide is used you may note a reduction in optical power when using the 340nm channel.

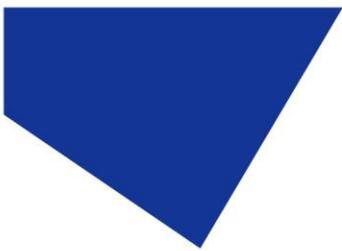
9.2.1.

Fully insert light guide as shown and tighten up grub screw to ensure end of light guide is prevented from sliding out.



9.2.2.

Do not bend the liquid light guides through sharp corners. It is recommended to ensure a minimum bend radius of 75mm. Ensure that the Light Source sits upright on a flat surface and keep the clearance of 200mm on both sides to ensure adequate airflow for the cooling system.



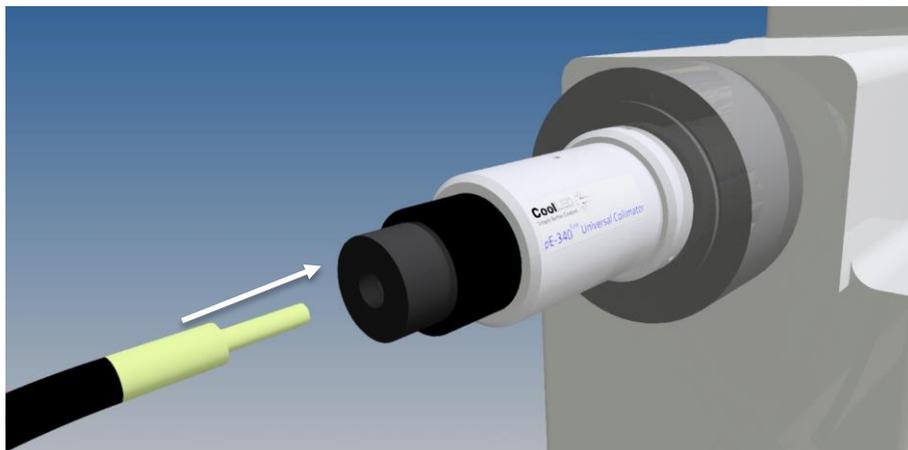
9.2.3.

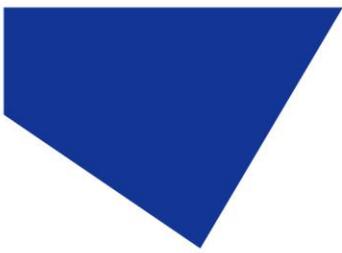
The pE-340^{fura} Illumination Systems with liquid light guide output are provided with a 'cradle' to ensure that they remain in a stable position during operation, as shown in the image below.



9.2.4.

The use of a liquid light guide will be attractive, as this allows the light source to be placed outside the Faraday cage to reduce vibration and electrical noise close up to the samples. The pE-340^{fura} Universal Collimator is available for these applications. See [Product options and order codes](#) for details.





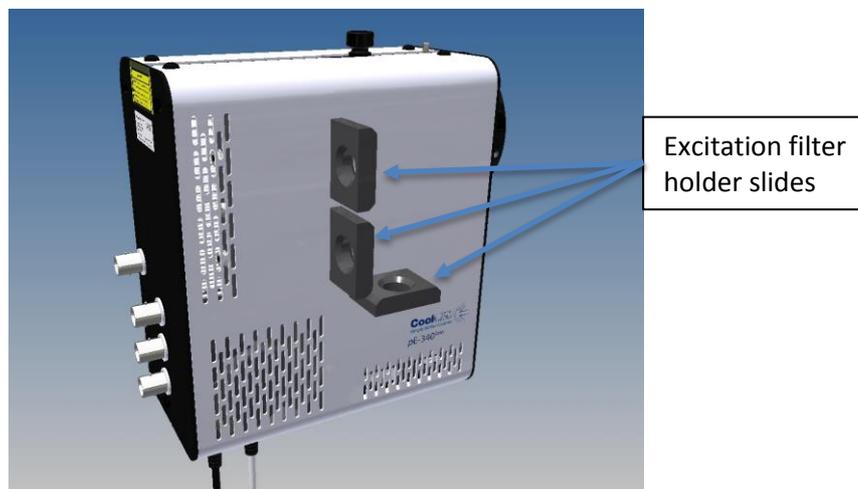
9.2.5.

The pE-340^{fura} Universal Collimator has been designed with optics to allow maximal transmission of the 340nm channel. When using this collimator, it is important to set up the optics correctly to optimise the performance of the Illumination System. Full setup instructions are given in the separate User Manual for the pE-340^{fura} Universal Collimator.

10. Additional Filtering Capability

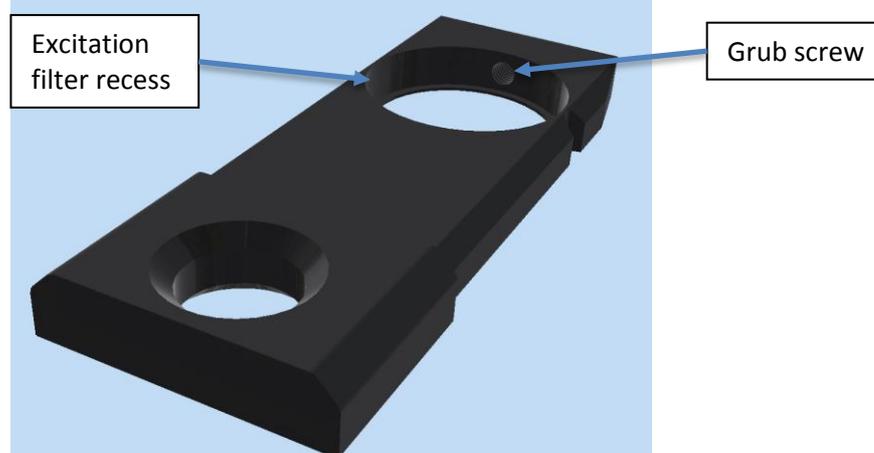
10.1.

The pE-340^{fura} allows additional filtering of excitation light through the use of three excitation filter holder slides (one in the optical path of each of the three channels).



10.2.

The excitation filter holder slides accept a standard 25mm diameter filter and is secured in place with a ball ended grub screw.



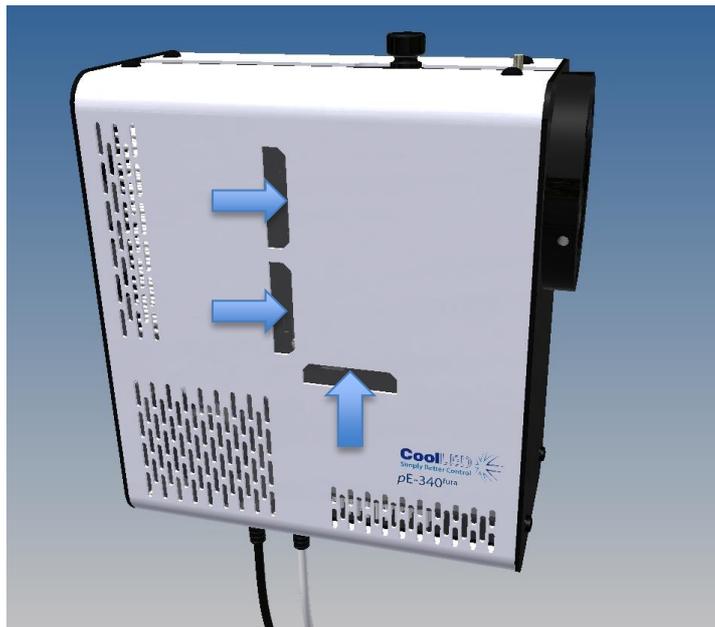


10.3.

Due to the shape of the excitation filter holder slide, it can only be fitted into the corresponding channel in one orientation.

10.4.

To install excitation filters in the optimal orientation, the direction of light through the Light Source should be observed. This is shown in the image below with arrows.



11. Excitation Filter Specifications

pE-340^{fura} Illumination Systems are provided with two excitation filters to be used with the 340nm & 380nm channels for Fura-2 ratiometric calcium imaging.

11.1. Specification

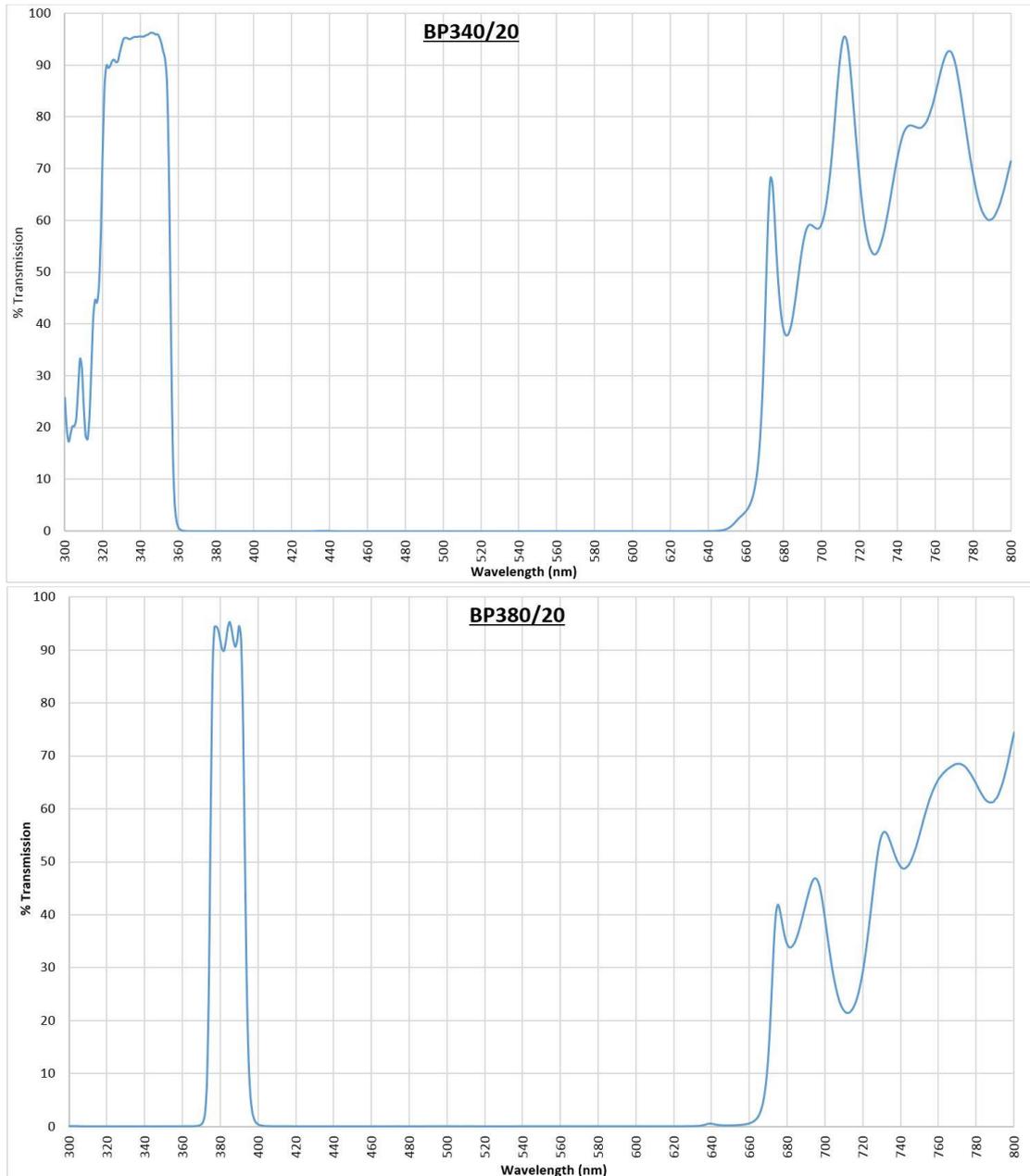
The 340nm excitation filter is marked as 'BP340/20'. The transmission is centred around 340nm. This filter is for use in the 'Ch 1' position of the Light Source.

The 380nm excitation filter is marked as 'BP380/20'. The transmission is centred around 380nm. This filter is for use in the 'Ch 2' position of the Light Source.

Further information for fitting the excitation filters can be found in the [Additional Filtering Capability](#) section of this User Manual.



11.2. Transmission spectrum

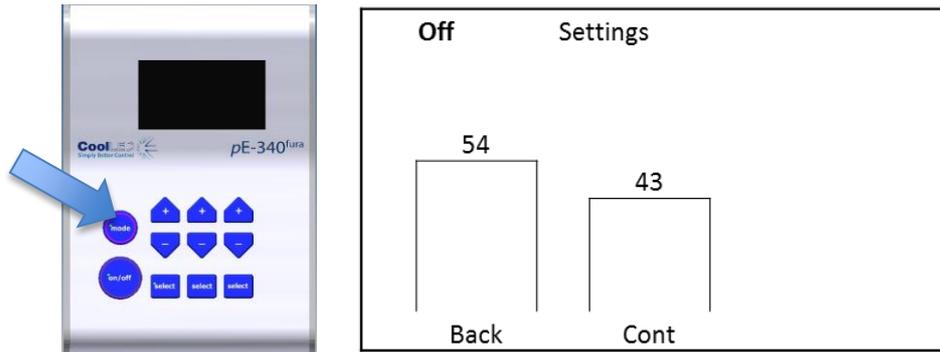




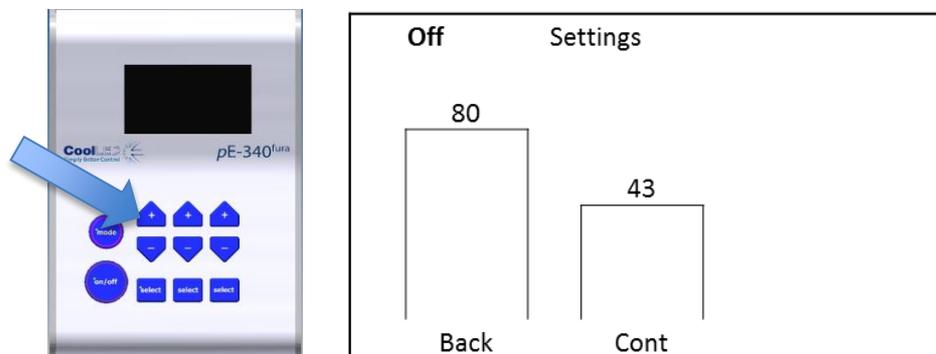
12. Settings / Additional Information

12.1. Display Backlight and Contrast settings

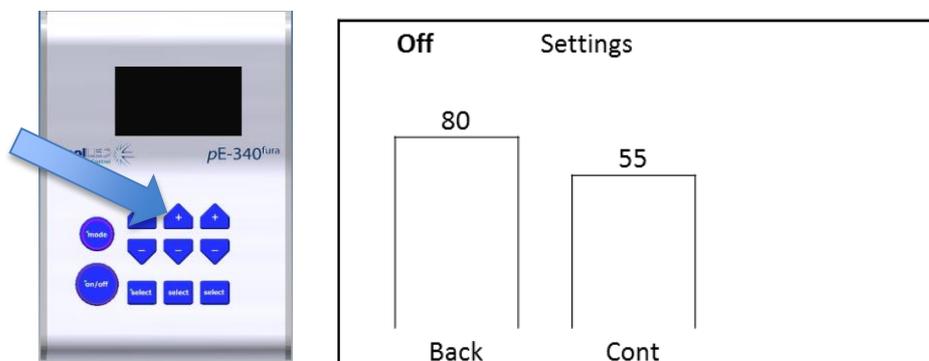
The Control Pod display settings can be adjusted to suit the lighting environment that the instrument is being operated in. To make adjustments, press and hold the 'mode' button for 3 seconds.



Use the first column up/down buttons to adjust the backlight to the desired level.



Use the second column up/down buttons to adjust the display contrast as required.



To return to the main screen, either press and hold the mode button for 3 seconds again or wait 10 seconds for the screen to automatically return.

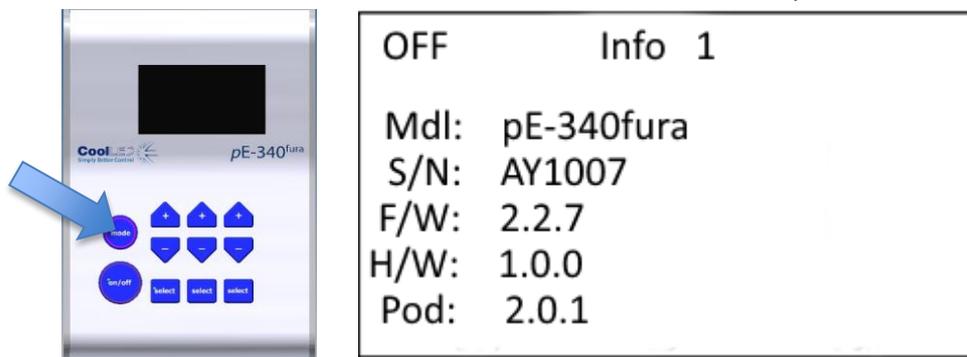


12.2.

System Information

To interrogate the product on its hardware and firmware revisions, press and hold the 'mode' button for 3 seconds. Once the display settings screen appears as in 11.1, release the 'mode' button and then give it a second short duration press. The following display will appear.

To return to the main screen, either press and hold the Mode button for 3 seconds or wait for 10 seconds for the screen to automatically return.



12.3.

LED usage.

The system automatically records the total time that the LEDs are actually on. To retrieve this information, repeat the process in 9.2 above except give two short duration presses of the 'mode' button rather than a single one. The following screen will appear:



To return to the main screen, either press and hold the 'mode' button for 3 seconds or wait for 10 seconds for the screen to automatically return.



13. Routine Care and Maintenance

13.1.

The pE-340^{fura} Illumination System requires little or no maintenance throughout its life. There are no field serviceable parts so there is no need to remove the covers.

13.2.

Cleaning of the external surfaces can be carried out with a mild soap and water solution used to lightly dampen a lint-free cloth. Ensure that no liquid is allowed to enter the product through vents and panel edges. Avoid optical surfaces.

13.3.

Cleaning of optical surfaces maybe necessary if debris or finger prints accidentally come into contact with the lens during installation. In the first instance remove any loose debris with an air duster (aerosol or rubber blower).

13.4.

Finger prints or other liquid type contaminants should be removed using standard lens cleaning procedures. Do not flood the lens surfaces with fluid as liquid could enter the product and cause damage.

14. Fitting the pE-340^{fura} Illumination System to a different microscope

14.1.

The pE-340^{fura} can be easily fitted to most compound research microscopes, both new and old. Every microscope manufacturer has one or a number of methods of attaching the fluorescence light source. CoolLED has designed a comprehensive range of adaptors to match these microscopes.

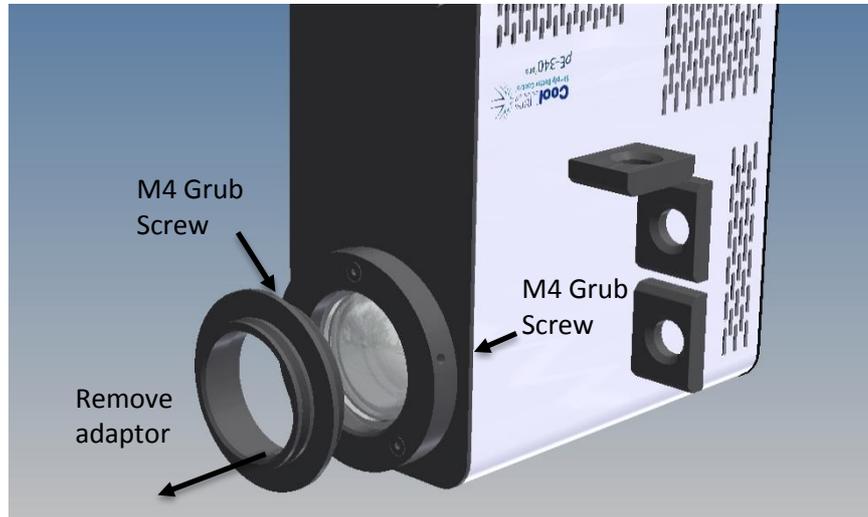
14.2.

There are a small number of microscopes which require additional optics or special settings internal to the pE-340^{fura} Light Source. Light Sources for these microscopes will be supplied with a label on the back panel, next to the serial number. These light sources cannot be transferred on to other microscopes without first returning them to CoolLED for internal modifications. Contact info@cooled.com if a light source needs this modification and ensure that the complete Illumination System is returned.



14.3.

The adaptor can be removed and replaced by simply unscrewing a pair of M4 grub screws as shown.



14.4.

Fit the new adaptor and tighten grub screws.

14.5.

A complete list of adaptors can be found on the CoolLED website using the link: www.coolled.com/product-detail/adaptors-2/

14.6.

The simple optical setup procedure will need to be followed when fitting the pE-340^{fura} to a different microscope. See the [Optical setup](#) section.



15. Product specifications

15.1.

Power requirements
110-240Va.c 50/60Hz 1.4A

15.2.

Power consumption

Standby mode	max 2W
Three bands at 100%	max 36W
Two bands at 100% (340nm + 3WT)	max 30W
Single band at 100% (3WT)	max 24W

15.3.

Dimensions

Light Source	77mm (w) x 186mm (d) x 162mm (h)
-weight	1.40kg
Control Pod	88mm (w) x 125mm (d) x 37mm (h)
-weight	0.32kg
Power Supply	167mm (w) x 67mm (d) x 35mm (h)
-weight	0.62kg

15.4.

Environmental Operating Conditions
Operating 5 – 35°C

16. Product options and order codes

See website ([Microscope Illuminators](#) | [LED Illumination Systems](#) | [CoolLED](#))
for full details of product options and order codes.



17. Warranty and Repairs

Please refer to CoolLED's current Warranty Policy available on our website [CoolLED Warranty - CoolLED](#). Although warranty terms are fixed at the time of ordering according to the terms and conditions of sale in place, the Warranty Policy may be subject to periodic change so please check to avoid confusion.

For any warranty queries or in the event of the product developing a fault, make contact with support@cooled.com for further assistance. You shall be asked to provide your microscope make and model, the product serial number and a brief description of the issue. You shall then be issued with a Support Case to manage your issue.

18. Compliance

18.1. WEEE

All qualifying products that are subject to the WEEE Directive and supplied by CoolLED are compliant with the WEEE marking requirements. Such products are marked with the "crossed out wheelie bin" WEEE symbol and in accordance with European Standard EN 50419.

CoolLED Certificate No: WEEE/GB4236XX

18.2. RoHS

Based on information obtained from our component suppliers, this statement certifies that ALL products manufactured and supplied by CoolLED Ltd are in compliance with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (also known as "RoHS").

This declaration is correct to the best of CoolLED Ltd knowledge, information and belief at the date of its release.



18.3. CoolLED's Recycling Program

At CoolLED, we recognize the importance of preserving the global environment. We are proud to provide a Recycling Program that enables CoolLED customers and end-users to send back used CoolLED Light Sources for recycling, free of charge.

Together we can reduce the burden on our environment through responsible disposal and recycling of End-of-Life Light Sources. You can help us by filling in our online contact form and providing us with your contact details and the serial number of the CoolLED Light Source that you wish to return and we will collect it free of charge.

If you are taking delivery of a replacement CoolLED Light Source, why not send the old one back in the packing box of the new one?

19. Contact Details

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