



OptoSource

Instruction Manual

www.cairn-research.co.uk

Free Phone: 08453301267 (UK only)

Tel: +44 (0) 1795590140

Fax: +44 (0) 1795594510

Important Safety Information

Please Read Before Installation

For maximum reliability and safety we recommend using the equipment within certain guidelines. If in any doubt, then please feel free to contact our technical support department (tech@cairn-research.co.uk).

Note: Please do not adjust any controls before reading this manual.

The following points should be considered when using the OptoSource:

1. **Xenon arc lamps are pressurized and a potential hazard.** Please refer to the relevant section of the manual when changing lamps, and always wear suitable protective goggles.
2. Hold the lamp by the electrode base to avoid contact with the glass. Skin contact will leave behind a residue, which with heat will blacken and therefore reduce light intensity and the lamp's life.
3. When installing the lamp, please ensure that the nodule in the centre of the glass envelope is facing towards the window.
4. Be careful not to strain the lamp during installation, as it's easy to break off the cathode connection if significant bending or twisting forces are applied. If you have any problems installing the lamp, please phone for further advice. Neither the manufacturer's nor our own guarantee cover lamp breakage during installation, so please proceed WITH CARE!!
5. **Use suitable protective eyewear when focusing the light.** The short wavelengths generated by the arc lamp are potentially hazardous, so care should be taken to avoid direct exposure to the beam.
6. Do not operate the power supply without a lamp installed in the lamphouse as this can lead to equipment damage and failure (although you still have to try hard!).
7. The lamps we supply for use with our light source have a built in filter to cut off the short wavelengths which generate ozone, so there is little or no ozone emitted from the light source.

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1 Introduction

The Cairn OptoSource comprises of two components; namely a lamphouse and an appropriate power supply for the lamphouse. In addition, components for connecting the light source output to a fluorescence microscope via an epifluorescence port will usually be supplied.

This connection will take one of three forms:

- a) A direct coupling that relays the light from the light guide directly into the rear of the objective.
- b) An indirect coupling that relays the light via aperture and field stops to the objective.
- or c) A beam collimator that relays the light into the entry port of the microscope manufacturers epifluorescence coupling.

We originally offered just a 75W lamphouse and power supply, which we designed because our customers were fed up with having their measurement equipment fried by other manufacturers' light sources (more about this below). This is a thoroughly tried and tested design that has been on sale for the best part of a decade now, and it's been very successful. Since it remains suitable for many applications, we still supply this version and we now call it the Cairn Classic light source. However, following the introduction of our OptoScan monochromator, we began selling more systems to customers with interests in high-speed imaging, where the highest possible light intensities are required. The Classic source actually works pretty well with the OptoScan, but the OptoSource, which has been custom-designed for this application, gives typically 2-3 times more light (the exact improvement depends on the input slit width, which is variable in our design). For other applications, including flash photolysis, the OptoSource allows more efficient coupling of the light output into a smaller diameter light guide, which is likely to be translated into a higher light intensity at the experimental sample. From theoretical considerations we expect an approximately two-fold improvement. It is important to mention here that the two types of lamp that we currently support (75W xenon or mercury/xenon continuous and 150W xenon continuous) require different mountings. This prevents the wrong lamp being used with your system. However, it is quite easy to change the mountings if required.

The OptoSource uses our well-established 75W power supply with constant-power regulation for stable output and long lamp life. The greater heat dissipation capability of the OptoSource also allows it to be used with 150W lamps if required. While the greater optical output of the 150W version

may well be useful in some applications, the characteristics of 150W compared with 75W lamps are such that the focused spot is bigger rather than brighter, and our initial comparisons have shown that the 75W version is generally the better choice.

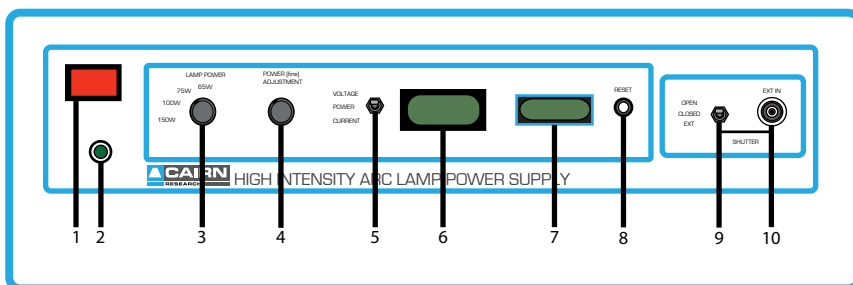
For many users, the most important feature of our light sources is that they can be used safely in close proximity to any other equipment! Although xenon lamps typically run at only about 10-20V, they require a high-voltage trigger pulse of around 30KV to initiate the arc. Some other manufacturers seem to ensure that this trigger voltage reaches the lamp by spraying it around everywhere else as well, which makes short work of any semiconductors in the vicinity, such as those in your computer, for example. Our approach is to generate the high voltage pulse INSIDE the lamphouse, which is electrically screened, and to do so in a way that is balanced with respect to ground. This is another tried-and-tested feature that has been transferred to the OptoSource, so we can confidently say that it will NOT damage your other equipment (well, not unless you drop the OptoSource on it, as it's a reassuringly substantial beast).

2 Installation Guide

Before beginning to install a Cairn system, it is advisable to have to hand an oscilloscope (any age or condition is fine provided that it's not completely dead!), screwdrivers, Allen keys, and safety glasses. We would also urge our customers to take some time to carefully check the delivery note to make sure that they can identify all the components. Having checked that all components are present and correct, the next step is to assemble and test the different sections of the system.

The subsequent sections give details of all the main controls.

2.1 Power Supply Front Panel

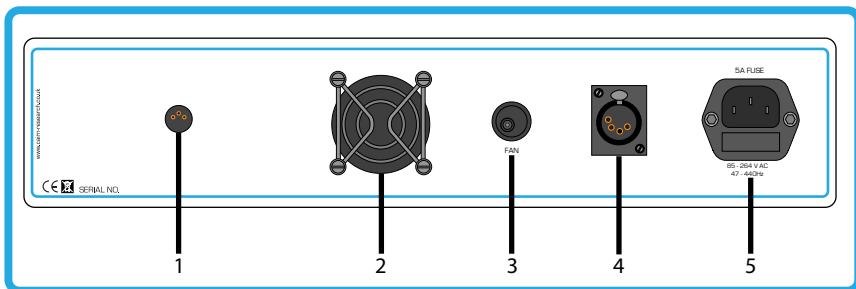


1. **Power button**
2. **Lamp on indicator**
3. **Lamp power dial** – Always ensure the correct Wattage is selected for the lamp you are using
4. **Power (fine) Adjustment dial** – Fine power adjustment for the lamp
5. **Voltage/Power/Current switch** – Changes display to Volts (Voltage), Watts (Power) or Amps (Current).
6. **Lamp power display**
7. **Lamp hours of use display**
8. **Timer reset button**

The following controls are optional and will only be present if a Cairn shutter is in use with the system.

9. **Open/Closed/Ext switch** – This switch sets the attached Cairn shutter as either open, closed, or controlled externally via the attached BNC connection.
10. **EXT IN BNC** – Allows control of the Cairn shutter externally when a positive-going logic level signal (nominally +5V) is applied.

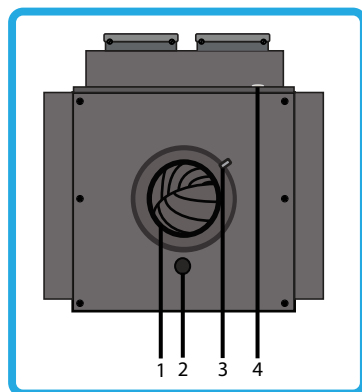
2.2 Power Supply Rear Panel



1. **Connector for Cairn Shutter** – Only present if a Cairn shutter is in use with the system
2. **Internal fan outlet**
3. **Lamphouse external fan connection**
4. **Lamphouse power cable connection**
5. **Mains power connection**

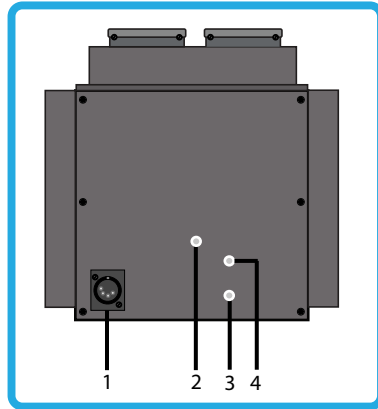
2.3 Lamphouse front

1. **Output Window**
2. **Lamp lower mount securing aperture**
3. **Iris diaphragm adjustment**
4. **Fan cable connection**



2.4 Lamphouse rear

1. **Power Supply connection**
- 2 & 3. **Arc horizontal and vertical adjustment**
4. **Arc focussing adjustment**



2.5 Lamp Installation

As delivery companies are inclined to treat packaged equipment with less respect than perhaps they should, we have found it prudent to remove lamps from the lamphouses after testing. This saves the inconvenience of finding a sharps bin to empty the lamphouse contents into, and ensures you receive both a lamp and lamphouse that are functional on arrival.

After removing the equipment from the packaging, first check the components for any obvious signs of damage. If all is well, the first stage in the installation is to fit the supplied lamp into the lamphouse. Be careful not to strain the lamp during installation, as it is easy to break off the cathode connection if significant bending or twisting forces are applied. If you have any problems in installing the lamp, please phone for further advice. Neither the manufacturer's nor our own guarantee, cover lamp breakage during installation, so please **proceed with CARE!!**

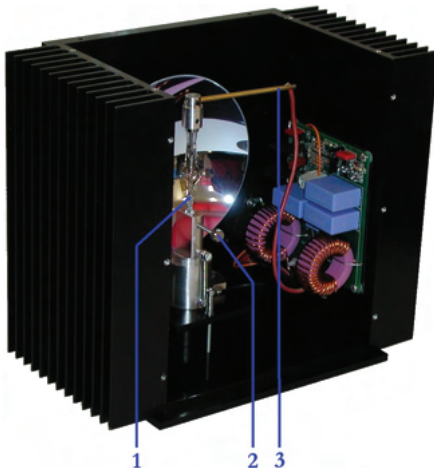
**** Disconnect the power supply before continuing.**

**** Arc lamps are pressurised and fragile. Ensure suitable protective eyewear is worn at all times while handling.**

1. To gain access to the lamp mount, the top plate of the lamphouse needs to be removed. This is secured by means of four hexagonal retaining screws on the top cover. After removing these screws, the top plate will lift off and allow access to the lamp assembly.

2. The upper lamp fitting will be clipped to one side for shipping; this should be released, and fixed to the upper end (anode) of the lamp. The lamp should be orientated so the nodule in the glass envelope is facing forward, towards the output window, and perpendicular to the side arm.

Hold the lamp by the electrode base to avoid contact with the glass. Skin contact will leave behind a residue, which with heat will blacken and therefore reduce light intensity and the lamp's life.



1. Arc lamp
2. Lower fitting thumbscrew
3. Upper fitting arm

3. Holding the lamp by the upper fitting, carefully drop into place in the lamphouse with the lamp nodule facing forwards. Secure the lamp by tightening the lower mount socket screw using the allen key provided.

4. Replace the top cover and secure.

**** If you inadvertently touch the envelope it is important to clean the lamp with the wipe provided to prevent grease residues burning on to the lamp and thus reducing its operating efficiency.**

n.b. It is not possible to connect the lamp in the incorrect orientation, or fit the incorrect lamp, as the anode and cathode fittings are different for each.

2.6 Lamp Removal

**** Ensure the lamp is fully cooled & protective eyewear is worn before handling.**

To change the lamp after it has reached the end of its useful life, remove the top cover then release the thumbscrew at the lower lamp fitting. The lamp can then be lifted out of the housing using the upper mount. Free the lamp from the upper fitting, then fit a new lamp as described above in section 2.5. The lamphouse enclosure reaches extremely high temperatures when in use and could cause severe burns, so please exercise extreme caution when exchanging lamps.

2.7 Lamp Disposal

Xenon arc lamps are pressurised and we recommend returning old lamps to us for safe disposal. Please package the lamp securely (ideally within its original box) and send to the address found at the back of this manual (Technical Support section) with a short note indicating the lamp is for disposal. We would also be happy to provide a quotation for a new lamp; please get in touch if this would be of interest.

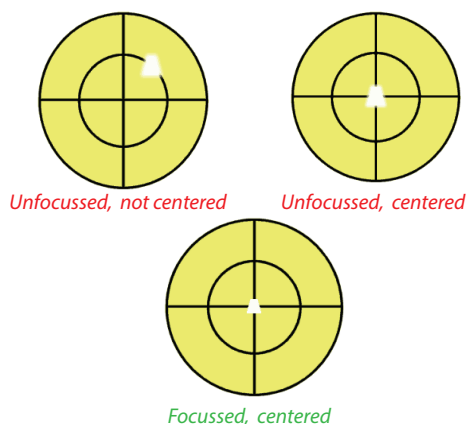
2.8 Illumination setup

a) Focussing the lamp onto the light guide input

With the lamp installed in the lamphouse, the next stage is to focus the Optosource.

Note: Often, the Cairn OptoSource lamphouse is used in conjunction with the Cairn OptoScan monochromator. Please refer to the OptoScan manual for focussing instructions when your OptoSource is coupled to the OptoScan as opposed to a light guide.

1. Connect the cabling to the Optosource. There is a four-pin lamphouse power lead, which needs to be connected from the lamphouse to the power supply unit, and the power supply should be connected to the mains.
2. If not already in place, attach the coupling tube to the light source, with the focussing assembly in place and the diaphragm fully open.
n.b. If the focussing assembly is unavailable, the lamp should be focussed 55mm in front of the coupling tube, using a piece of black card as a target. This should be carried out only using suitable protective eyewear to ensure the adjustment can be made again at a future date!
3. Turn on the lamp and leave the unit to warm up for at least ten minutes and then adjust the lamp focus and position to give the sharpest image of the lamp arc at the centre of the focussing assembly, illustrated below. This ensures the maximum amount of light is focussed onto the entrance of the light guide.



4. Turn off the lamp and remove the focussing assembly from the light source coupling. The lamphouse output tube is then either coupled directly to the Optoscan monochromator or to the light guide input coupling, together with any filter sliders or the filter wheel.

5. Fit one end of the light guide into the lamphouse mount, sliding it up to the stop. Secure in place using the small hex screw.

6. To adjust the fine focus of the lamp, a photodiode sensor connected to a multimeter can be used to maximise the signal. Alternatively, your acquisition software and camera can be used by making small adjustments to each of the lamp controls until the maximum signal is detected.

7. The fine focus adjustment should be repeated after the lamp has been switched on and allowed to stabilise for at least an hour.

b) Coupling the light guide output to your microscope



1. **Microscope epifluorescence coupling** - (Example shown is an Olympus epifluorescence coupling)
- 2 & 3. **X & Y offset adjustment**
4. **Light guide coupling retaining screw**
5. **Light guide mount**

1. If supplied, fit the epifluorescence coupling assembly to the microscope. With the light guide mount detached from the microscope epifluorescence

coupling, feed the free end of the light guide into the light guide mount until it reaches the end stop. A hex screw can then be tightened to hold the light guide in place.

2. Replace the mount, with the light guide fitted, onto the end of the microscope epifluorescence coupling using the locator groove. Secure in place by tightening the light guide coupling retaining screw.

3. To focus the light beam, remove one of the microscope objectives and position the appropriate filter cube in the light path. Using a piece of fluorescent paper or card at the microscope stage as a target, adjust the position of the light guide mount until a sharp image of the end of the light guide is seen at the stage. Centre the image using the X & Y offset adjustments on the light guide mount.

4. Replace the microscope objective and check for uniform illumination at the image plane. The illumination path is now fully aligned and the system ready for use.

5. To ensure optimum performance from your lamp housing, it is recommended that this fine calibration procedure is repeated periodically during the lifetime of the lamp.

3 Technical Support

E-mail: tech@cairn-research.co.uk

Web: <http://www.cairn-research.co.uk>

Address: Cairn Research
Graveney Road
Faversham
Kent
ME13 8UP

Telephone: +44 (0) 1795590140

Fax: +44 (0) 1795594510

In addition to designing and manufacturing our own products, we are also proud distributors for the following companies



HAMAMATSU

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