

www.abet-technologies.com

Manual

LS Series Light Source



M-LS Rev B
Copyright © 2006, Abet Technologies, Inc.
August 2007

Table of Contents

Introduction.....	2
Safety	3
Radiation.....	3
Lamp Explosion.....	3
Ozone	4
Electrical shock.....	4
Heat.....	4
Unpacking.....	5
Setup	6
Vibration decoupling	6
Lamp mounting.....	7
Starting up the system.....	9
Using your LS Light Source	10
Alignment and focusing.....	10
Elements of the optical system	10
Alignment	10
Mounting options.....	12
Accessories and spare parts	13
Maintenance.....	15
Troubleshooting.....	15
Warranty and returns.....	16

Introduction

Please review this manual so that you may use your LS series Light Source in a safe and productive manner.

This **high intensity** source is designed to deliver **high brightness, high UV** content light from a **high pressure** arc lamp excited by **high current**, ignited by **high voltage** and running at very **high temperatures**. All these “**high’s**” can cause unsafe conditions if basic safety considerations are not understood by the user. However, it is a perfectly safe instrument when used as intended. The built-in door and over-temperature interlocks provide an additional margin of safety.

- Please do not skip the Safety section that follows this page.

The patent pending design of this LS instrument was conceived to allow you to accomplish the hard tasks of your profession without having to worry about this tool:

- An integrated system: no additional boxes or cables to clutter your work space
- Even your toughest optical alignment needs are met without the cooling fan induced vibration
- An almost unlimited supply of opto-mechanical accessories is available from Abet Technologies and from other leading suppliers using a selection of inexpensive adapters
- The compact, integrated optical bench at the heart of the LS can be easily integrated into your own instrument as any OEM will appreciate
- The only routine maintenance function, changing the lamp, is easily accomplished without the need for any tools and without worrying about getting your fingers onto the internal optical components – lamp mount swings out for easy access

Safety

A number of hazards are present when operating any arc lamp based system, like your LS instrument. The most significant hazards are listed below together with safe usage suggestions. If in doubt, consult your company's Safety Officer or call/e-mail us.

Hazards associated with high intensity light are always present, as this is the design function of this source. The built-in interlock system was designed to protect you from other hazards. Do not defeat the interlocks.

Lamp ignition involves a low energy, high voltage discharge that does not cause any issues with most electronic instruments. However, you may choose to turn off any very sensitive electronic instruments or computers in close proximity to the LS before starting your Light Source.

Radiation

LS series Light Sources produce high intensity light output with UV, visible and infrared content.

- Hazard: Eye damage
Solution: Wear appropriate eye protection when light output is not contained. Avoid looking at the output or its reflections.
- Hazard: Skin damage
Solution: Wear protective clothing when light output is not contained.

Lamp Explosion

Arc lamps used with your LS instrument contain high pressure gas and may explode if not handled properly.

Avoid touching the glass section of the lamp. If touched, use isopropyl alcohol and a clean soft tissue to wipe off any fingerprints as they will weaken lamp envelope.

Avoid scratching the glass – do not use a lamp with scratched envelope.

Install the lamp with proper polarity of connections.

Do not stress the glass parts when tightening electrical connections.

Make sure that all plastic packaging has been removed from the lamp before installation.

Replace the lamp when it reaches its lifetime limit (a built-in Elapsed Time Meter lets you keep track of lamp operating hours). An old lamp, with a darkened glass envelope, has a high likelihood of exploding and should be replaced.

- Hazard: Eye damage
Solution: Wear appropriate eye protection when replacing a lamp.
- Hazard: Skin damage
Solution: Wear protective clothing when replacing a lamp.

Ozone

Short wavelength UV light converts oxygen into ozone. When using high UV output lamps ozone can become a major irritant to the user. Even ozone free lamps can produce enough ozone to be uncomfortable for very ozone-sensitive persons.

- Hazard: Ozone
Solution: Proper ventilation

Electrical shock

In normal operation the user is protected from contact with any energized electrical connections. However, electrical shock danger will occur if interlocks are defeated or power supply section opened without the unit being unplugged from the mains.

- Hazard: Electrical shock
Solution: Unplug the unit from the mains before replacing the lamp or servicing the power supply section.

Heat

Arc lamp envelope reaches very high temperatures during normal operation and can cause severe burns if touched.

- Hazard: Burn
Solution: Let the lamp cool at least 15 minutes before opening lamp compartment door.

Unpacking

Your shipment will typically consist of the LS Light Source and the lamp you selected, vibration control kit, power cord appropriate for your country, this manual and any accessories you ordered.



Allow your light source to come to room temperature if the unit was just received to avoid the danger of condensation shorting any electrical functions.

You will need to remove a few pieces of packaging, used to protect components in shipping, and install the lamp before powering the unit on.

Setup

Vibration decoupling

One of the patent pending features of the LS series light source is the ability to minimize cooling fan vibration impact on the optical performance of your system.

Your unit is shipped to you with optical assembly and external housing mounted to each other. You can choose to use it in this manner, as the cooling fan was chosen for its smooth performance and will not affect most illumination setups. However, if you will be coupling light into small pinholes, slits or fibers, performance stability will benefit from decoupling the two units as shown below.

- Turn the unit upside down and place it on a non-marring surface.
- Remove one of the four mounting screws and replace it with one of the screw-in feet that came in the vibration decoupling kit. It is enough to tighten the screw-in foot with your fingers. Too much torque can cause the screw to break off.
- Follow this procedure with each of the remaining three screws, replacing each removed screw with the next screw-in foot before moving onto the next one. Be careful when the last screw is loosened as the optical base will be free to move a limited amount within the outer housing. However, it will not fall down as the built in motion limits prevent this from happening.
- Save the removed screws and large washers in case you need to ship your source in the future.





- Turn the unit right side up and place it on a flat surface. You will notice that you can slide the external, fan holding housing a small amount in each direction without affecting the optical section. When in use, you will want to position the two parts so that they do not directly touch each other. The two sets of rubber feet and the heavy table surface will then work together to attenuate the impact of any fan induced vibration.

Lamp mounting

- Warning: Lamps will be damaged if mounted with incorrect orientation or if the connections are not securely tightened. The larger electrode end (anode), marked with a “ + “ sign, needs to be on top and the cathode end on the bottom for proper lamp operation.
- Warning: Lamps can be damaged if fingerprints are left on their glass envelopes. Handle the lamp only by the metal ends. Wipe any contamination off the glass with an isopropyl alcohol wetted soft tissue.
- Warning: Glass-to-metal seals can get damaged if, while tightening the connection on one end, you hold the lamp by the other end. When tightening the bottom connection secure the lamp by the bottom metal section. Hold the top section when attaching the high voltage wire to the top end of the lamp.

Open the optical compartment door by unscrewing its four retaining thumbscrews and gently pull on the high voltage lead to fully extend it as shown below (it is always a good idea to use powder free gloves when working inside the optical compartment) . The high voltage lead should reach approximately to the edge of the opening.



- Reach inside the lamp compartment with your finger and swing out the brass lamp mounting bracket (it is friction retained – you will need to pull a little)
- Loosen the bottom nut on the lamp and slide the screw all the way into the bracket. Orient the lamp so that the glass nipple points toward the rear of the unit (away from the condenser lens) and finger tighten the nut to provide solid mounting and good electrical contact.
- Securely attach high voltage wire to the top of the lamp.
- Check for any contamination and gently clean the glass part with isopropyl alcohol wetted wipe if needed.
- Push on the bracket or the bottom part of the lamp until the bracket hits the stop inside the unit. Do not push on the top of the lamp or it may break.
- Attach lamp compartment door with the four thumbscrews. Once closed, the electrical interlock is engaged and the system can be operated.
- Take note of the Elapsed Time Meter reading so that you can keep track of the lamp operating hours and replace it in a timely manner.



Lamp bracket in the mounting position



Lamp bracket in the operating position

Starting up the system

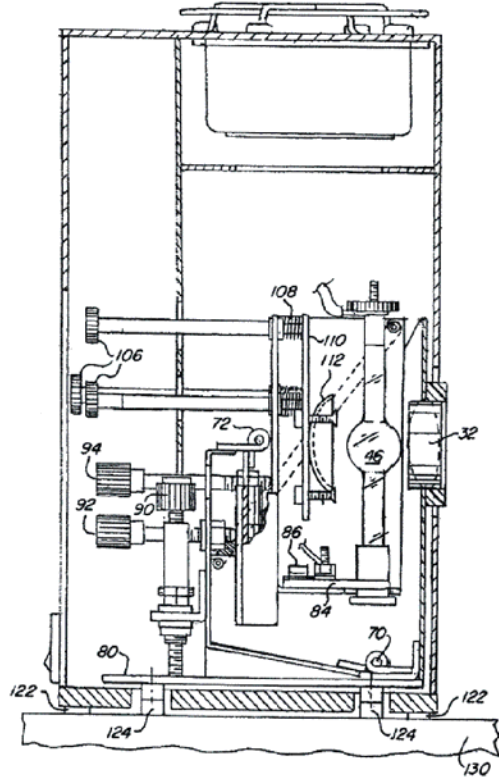
- **Warning:** High intensity light with high UV content is emitted by your LS Light Source. Avoid exposure to the light by using appropriate eye and skin protection.
- Check that the switch is in the OFF (0) position and plug the power cord into the unit.
- Position the unit so that light exiting the condenser lens will point toward some safe surface (a wall, a screen or similar) and not at any person.
- Plug the cord into the mains and turn the switch ON (1). Lamp will ignite. After a few minutes of lamp warm-up time your LS output will be stable and dependable.
- **Warning:** If lamp fails to ignite a few seconds, turn the unit off and review the Troubleshooting section below.
- You may now proceed to the alignment and focusing section below or turn the system off if you plan to do the optical alignment later.

Using your LS Light Source

Alignment and focusing

Elements of the optical system

- Arc lamp 46 produces the light
- Condenser lens 32 collects light output and produces an approximately collimated beam
- Reflector 112 collects the rear going lamp output and refocuses it right next to the arc. Condenser lens 32 collects this light, too. System output is thus almost doubled.
- Actuator 90 is used for focusing
- Actuator 92 provides vertical control
- Actuator 94 provides horizontal control
- Actuators 106 align reflector 112 to lamp 46



Alignment

Your LS Light Source has been designed to arrive to your facility being very close to its optimal alignment. Therefore it should take only a short time to optimize the lamp and reflector positions for your application.

- Remove the magnetically attached louvered door to gain access to the optical adjusters



- Select a safe surface to shine the light on (a wall or some non-flammable surface that could be closer). You will typically see two illuminated spots. One is the unfocused direct image of the arc and the other comes from arc image created by the rear reflector.



- Adjust focus knob 90 to produce a reasonably sharp image of lamp electrodes (inverted image will place the red glowing anode on the bottom and the sharp needle like cathode on top)

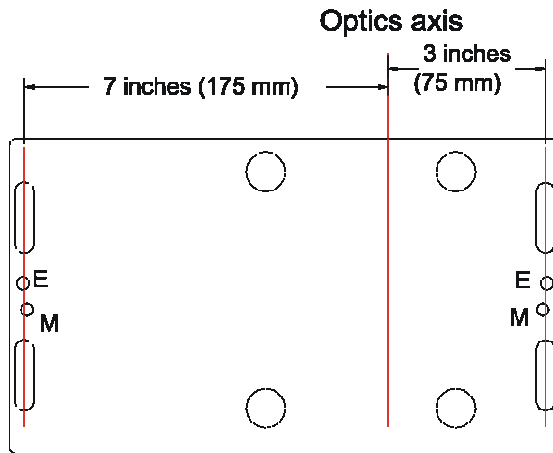


- Adjust reflector position to produce a similar sized secondary image of the electrodes, now with anode on top and cathode on the bottom, and bring the secondary image close to but not overlapping the primary lamp image



The final focus and horizontal/vertical alignment optimization can be done when your LS Light Source is coupled to the optical setup that needs its illumination capacity.

Mounting options



The slots on the base of your LS Light Source allow you to secure it to 25 mm or 1 inch based optical tables with output beam centered on the table's hole pattern. Additionally, there are two sets of two M6 (M) and ¼-20 (E) tapped holes for mounting the system at elevated locations.

The vibration isolated mode of mounting will require additional support means to preserve the separation of the fan holding housing and the optical section when elevating the LS Light Source.

Accessories and spare parts

PLEASE NOTE: Care needs to be taken when using absorbing filters with this high intensity light source, as they will most likely suffer thermal failure unless protected. It is suggested that the M101 series 45° mount with an appropriate dichroic be used in the optical path before the filter.

Your LS Light Source can adapt easily to your needs. Its output face plate can accept 1.035-40 thread lens cells directly and the four, 30 mm spaced 4-40 tapped holes allow for mounting of a host of accessories and adapters. Appropriate hex keys are included with all accessories that require attachment to the 30 mm spaced tapped holes.

PLEASE NOTE: Some of the accessories are equipped with four flat washers, attached to one of the surfaces. Those should be in contact with the LS Light Source face plate when mounted to assure comfortable operating temperature of that accessory.



LS Light Source with the A103 female adapter to Newport-Oriel 1.5 inch series flanging system

The A104 C-mount adapter simply screws into the output face plate of the LS Light Source.

The M101 series 45° mounts attach to the output face plate of the LS Light Source with 4-40 screws (provided) to allow beam direction changes and/or spectral

control with the dichroic reflector options available from Abet Technologies and other suppliers (accepts flat optics sized from 25x38x1 mm to 45x60x6.35 mm – contact Abet Technologies for mounting instructions).



LS Light Source with the FW-LS filter wheel. L101 and L102 focusing condensers are mounted to the wheel allowing microscope turret type ease of focusing power changes.



An almost unlimited number of combinations of components can be mounted to the LS Light Source using the 30 mm caging system, shown here with a cube mount. Possible setups include fiber illumination, spatial filtering, beam expanding and more.

Maintenance

The LS series Light Sources should provide maintenance-free service (other than lamp replacement). Please use the Elapsed Time Meter indications to avoid using lamps beyond their rated lifetime as that will ultimately lead to lamp explosion.

The Lamp Mounting section above will safely lead you through the lamp replacement steps.

Troubleshooting

There are very few user-serviceable items in the LS Light Source. They are basically limited to lamp replacement and fuse replacement.

Symptom: Cooling fan not turning when unit is powered up

- Check if the little hour-glass symbol in the elapsed time meter is blinking, indicating applied power. Contact Abet Technologies' service department if it is.
- If the symbol is not blinking, check if the power cord is fully engaged and plugged into mains and check if the lamp door is fully closed or door interlock may not be engaged. If the door is fully closed and still there is no power – check fuses and replace with same rating fuses if needed. Otherwise, contact Abet Technologies' service department.

Symptom: Lamp not lit within few seconds after the unit is turned on, fan is running

- **PLEASE NOTE:** Do not leave power on for more than a few seconds if lamp does not turn on or ignition circuit life will be significantly shortened.
- Unplug the unit, open the lamp compartment and check if lamp connections are tight and that lamp is properly oriented (anode on top). If all is as it should be, try another lamp. If still no light, then contact Abet Technologies' service department.

Symptom: System repeatedly turns itself off after it runs for some time

- Check if fan is running when operating. Contact Abet Technologies' service department if it is not.
- Check if air input or fan output ports are being blocked and one of the thermal interlocks is shutting power down. Contact Abet Technologies' service department if the system continues to shut down with an unimpeded cooling air flow.

Warranty and returns

Abet Technologies warrants that all goods described in this manual (except consumables such as lamps, filters, etc.) shall be free from defects in material and workmanship. Such defects become apparent within the following period:

All products described here, except spare parts: one (1) year after delivery of the goods to the buyer.

Spare parts: ninety (90) days after delivery of goods to the buyer.

Abet Technologies' liability under this warranty is limited to the adjustment, repair and/or replacement of the defective part(s). During the above listed warranty period, Abet Technologies shall provide all materials to accomplish the repaired adjustment, repair or replacement. Abet Technologies shall provide the labor required during the above listed warranty period to adjust, repair and/or replace the defective goods at no cost to the buyer ONLY IF the defective goods are returned, freight prepaid, to a Abet Technologies designated facility. If goods are not returned to Abet Technologies, and the user chooses to have repairs made at their premises, Abet Technologies shall provide labor for field adjustment, repair and/or replacement at prevailing rates for field service, on a portal-to-portal basis.

Abet Technologies shall be relieved of all obligations and liability under this warranty of:

The user operates the device with any accessory, equipment or part not specifically approved or manufactured or specified by Abet Technologies unless buyer furnishes reasonable evidence that such installations were not the cause of the defect. This provision shall not apply to any accessory, equipment or part which does not affect the safe operation of the device.

The goods are not operated or maintained in accordance with Abet Technologies' instructions and specifications.

The goods have been repaired, altered or modified by other than authorized Abet Technologies personnel.

Buyer does not return the defective goods, freight prepaid, to an Abet Technologies facility within the applicable warranty period.

IT IS EXPRESSLY AGREED THAT THIS WARRANTY SHALL REPLACE ALL WARRANTIES OF FITNESS AND MERCHANTABILITY. BUYER HEREBY WAIVES ALL OTHER WARRANTIES, GUARANTEES, CONDITIONS OR LIABILITIES, EXPRESSED OR IMPLIED, ARISING BY LAW OR OTHERWISE, WHETHER OR NOT OCCASIONED BY ABET TECHNOLOGIES' NEGLIGENCE.

This warranty shall not be extended, altered or varied except by a written document signed by both parties. If any portion of this agreement is invalidated, the remainder of the agreement shall remain in full force and effect.

CONSEQUENTIAL DAMAGES

Abet Technologies shall not be responsible for consequential damages resulting from misfunctions or malfunctions of the goods described in this manual. Abet Technologies' total responsibility is limited to repairing or replacing the malfunctioning or malfunctioning goods under the terms and conditions of the above described warranty.

INSURANCE

Persons receiving goods for demonstrations, demo loan, temporary use or in any manner in which title is not transferred from Abet Technologies, shall assume full responsibility for any and all damage while in their care, custody and control. If damage occurs, unrelated to the proper and warranted use and performance of the goods, recipient of the goods accepts full responsibility for restoring the goods to their condition upon original delivery, and for assuming all costs and charges.

RETURNS

Before returning equipment to Abet Technologies for repair, please call the Customer Service Department at (203) 540-9990. Have your purchase order number available before calling Abet Technologies. The Customer Service Representative will give you a Return Material Authorization number (RMA). Having an RMA will shorten the time required for repair, because it ensures that your equipment will be properly processed. Write the RMA on the returned equipment's box. Equipment returned without a RMA may be rejected by the Abet Technologies Receiving Department. Equipment returned under warranty will be returned with no charge for the repair or shipping. Abet Technologies will notify you of any repairs not covered by the warranty, with the cost of the repair, before starting the work.

Please return equipment in the original (or equivalent) packaging. You will be responsible for damage incurred from inadequate packaging, if the original packaging is not used.

Include the cables, connector caps and antistatic materials sent and/or used with the equipment, so that Abet Technologies can verify correct operation of these accessories.