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66186-M

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QUARTZ TUNGSTEN HALOGEN LAMP HOUSINGS

MODELS 66186 THROUGH 66188

Please read these instructions completely before operating this equipment. If there are any questions or problems regarding the use of this equipment, please contact: ORIEL INSTRUMENTS - or - the representative from whom this equipment was purchased.

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WARRANTY AND RETURNS

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I. INTRODUCTION

This manual covers the following 600 to 1000 W Quartz Tungsten Halogen (QTH) Lamp Housings:

66186 Lamp Housing with no condenser

66187 Lamp Housing with F/1 condenser

66188 Lamp Housing with F/0.7 condenser

The housings have the same basic design, but differ in the condensing lens assembly. With the appropriate socket adapter you can interchange between 600 and 1000 W QTH lamps. Table I lists the appropriate socket adapter for each lamp.

TABLE I Appropriate Socket Adapters for Oriel QTH Lamps

LAMP		
Type	**Model No.**	**Socket Adapter**
600 W	6336	6372
1000 W	6317	6372
1000 W	6315	6337

You can plug these housings directly into a standard 120 V outlet, or operate them with one of the following power sources described in Volume II:

6400 Variable Transformer

6405 Lamp Controller (Variable Transformer with Voltmeter and interlock)

6396 Constant Voltage Transformer

6396 with 6400

6396 with 6405

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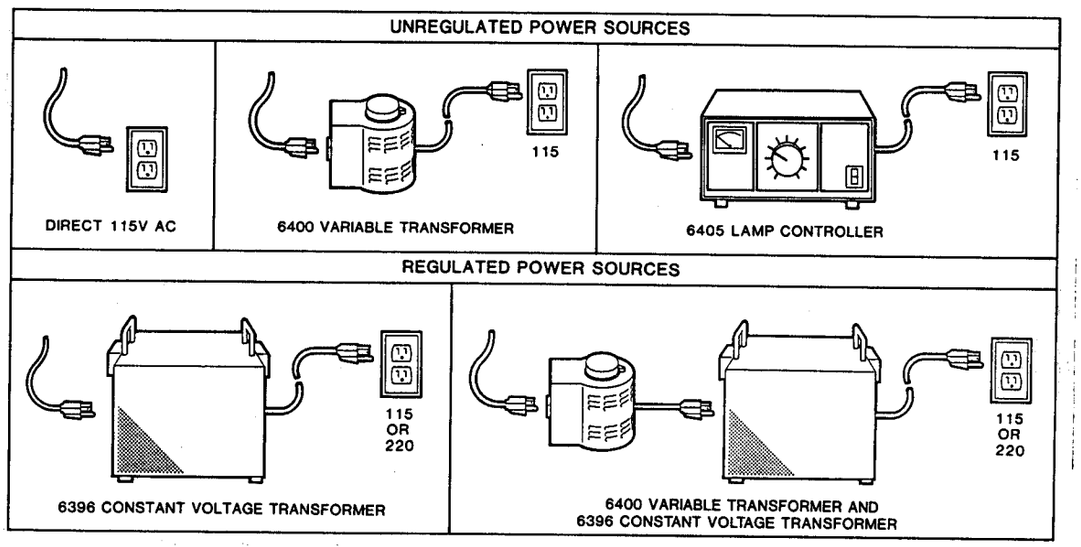


Figure 1 Power sources for Oriel QTH Lamp Housings.

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II. SUMMARY OF HAZARDS

There are three major hazards in the operation of systems employing these lamp housings:

Radiation

Electrical Shock

Heat

II.1 RADIATION

The UV radiation from these lamps can permanently damage the cornea, lens or retina of the eye, even causing blindness. Damage may not be immediately apparent. Normal blink reaction to visible light may not be adequate protection, and a beam of invisible UV or NIR (produced by spectral filtering) can be most dangerous as the blink response is not induced.

Recommendations

Never look directly into the output beam of a housing when operating a lamp.

Never look at a specular (mirror) reflection of the beam, even for short periods of time.

Use the interlock system to prevent access to a working lamp.

Always wear UV safety eyewear or facemask, and protective clothing on exposed areas of skin.

II.2 ELECTRICAL SHOCK

Line voltage is supplied to the lamp housing to power the fan and elapsed time indicator. Line voltage will still be present, even when the power supply is disconnected from the housing.

Recommendations

Keep personnel clear of all exposed terminals.

Before relamping or working on the system, disconnect input power to the lamp housing.

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II.3 HEAT

The lamps become very hot during operation, and remain very hot for up to 10 minutes after being shut off.

Recommendation

- Do not touch the lamp with your bare hands for at least 10 minutes after its being shut off.

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III. GENERAL DESCRIPTION

Lamp housing hold our high power QTH lamp. The housings have a built-in fan to keep the lamps at the proper operating temperature.

III.1 LAMP AND REFLECTOR ADJUSTMENTS

The lamp housing have external adjustment knobs to independently position the lamp and rear reflector. Horizontal and vertical lamp controls position the filament of a replacement lamp. Optical components outside the housing do not have to be repositioned. Reflector controls provide tilt and focus adjustment. See Figure 2 on page 6 for location.

III.2 LAMP COOLING

The housings use forced air cooling. A side mounted fan maintains the correct operating temperature for the QTH lamps in a normal laboratory environment. Overheating, due to blocking of the cooling vents or an inoperative fan, activates a thermostat interlock.

The fan has a built in time delay of several minutes to allow the lamp to warm up.

III.3 SAFETY FEATURES

The housings come equipped with safety interlocks. [See Figure 3 on page 7 .] The lamps may be powered directly off the line, by the 6400 Variable Transformer, the 6396 Constant Voltage Transformer, or the 6405 Lamp Controller. Only the 6405 has the matching interlock circuitry to shut off lamp power if the housing door is opened, or the housing overheats. If you are using one of the other power sources, we recommend you develop your own interlock system for safety and to avoid potential damage to the lamp housing.

III.4 MOUNTING

The housings come with four leveling feet which allow 0.63 in (16 mm) height adjustment. For direct mounting to optical tables, remove the feet and use the slots in the baseplate of the housing. The optical axis is then 7.5 inches (191 mm) above the table. The slots allow 1.0 inch (25.4 mm) horizontal adjustment. See Figure 4 on page 8 for a dimensional diagram.

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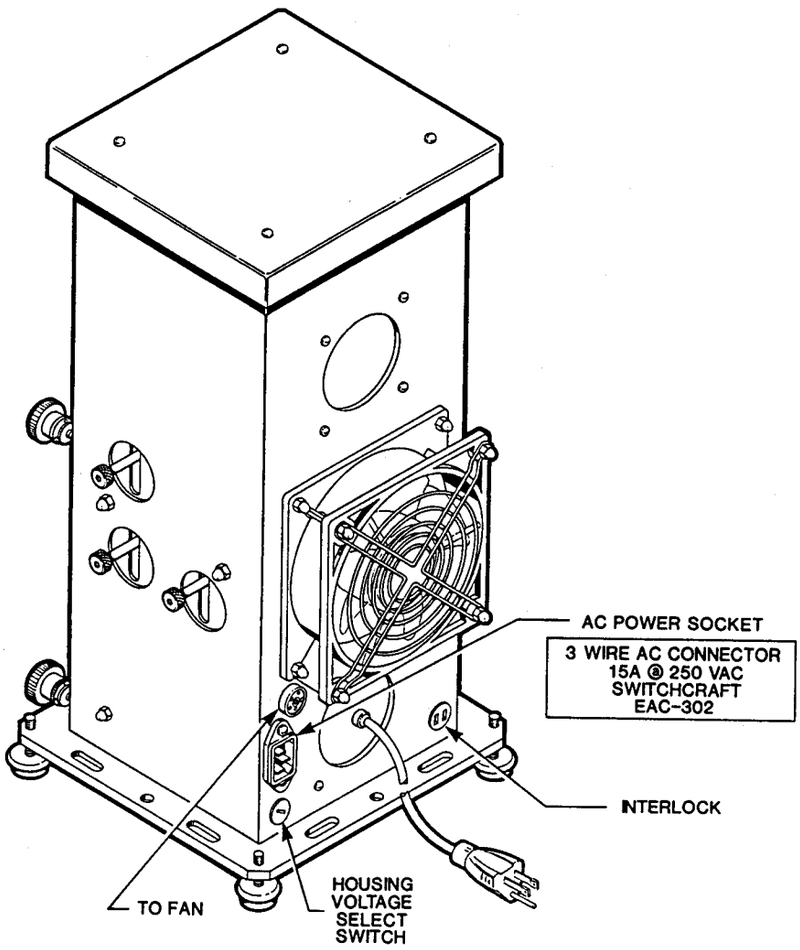


Figure 3 Safety Interlock and Electrical Sockets

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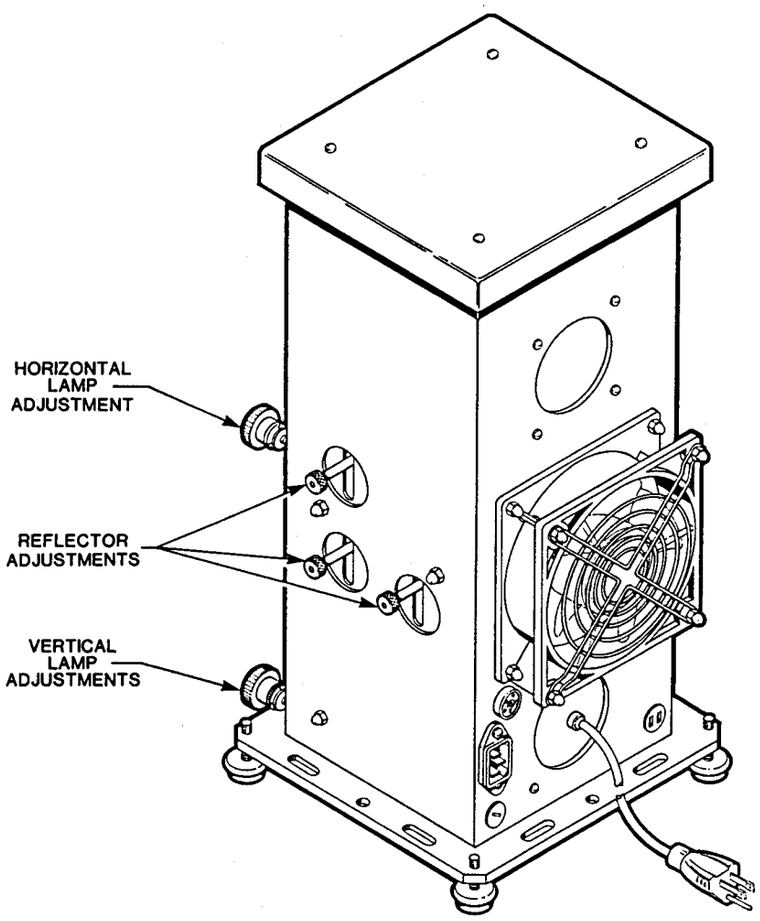


Figure 2 Lamp and Reflector Adjustments

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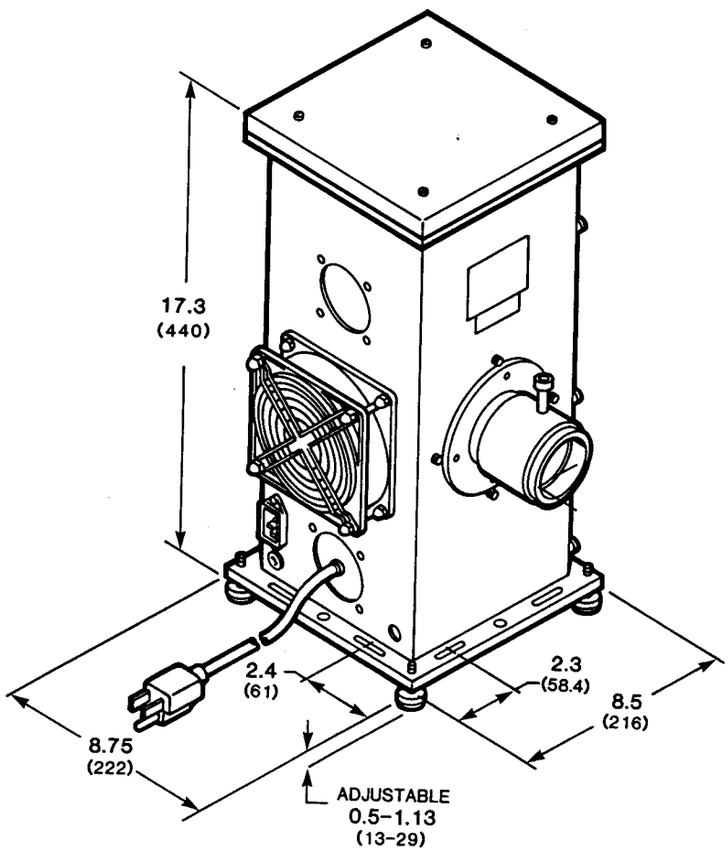


Figure 4 Dimensional Diagram

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IV. OPERATING INSTRUCTIONS

IV.1 LAMP INSTALLATION AND INITIAL OPERATION

Unscrew the four knurled thumb screws on the side of the housing to remove the access door.

Install the lamp in the appropriate socket adapter. See Table I on page 1 for model numbers and Figure 5 for installation.

The lamps are delicate; take care when installing them in the socket adapters.

Clean the lamp envelope with alcohol and line-free tissue after it is installed. **Fingerprints left on the lamp may cause it to break when lit.**

Replace the access door on the lamp housing.

Connect the blower line cord to a source of 110 V, 50/60 Hz (220V on export units). Make sure the line select switch is in the appropriate 110/220 V position before plugging in the fan. The fan has an built in time delay of several minutes to allow lamp warmup.

Connect the lamp line cord to a standard 120 V outlet or one of the power sources listed on Page1.

If using the 6405 Lamp Controller to power the lamp, connect the safety interlock cable to the Controller.

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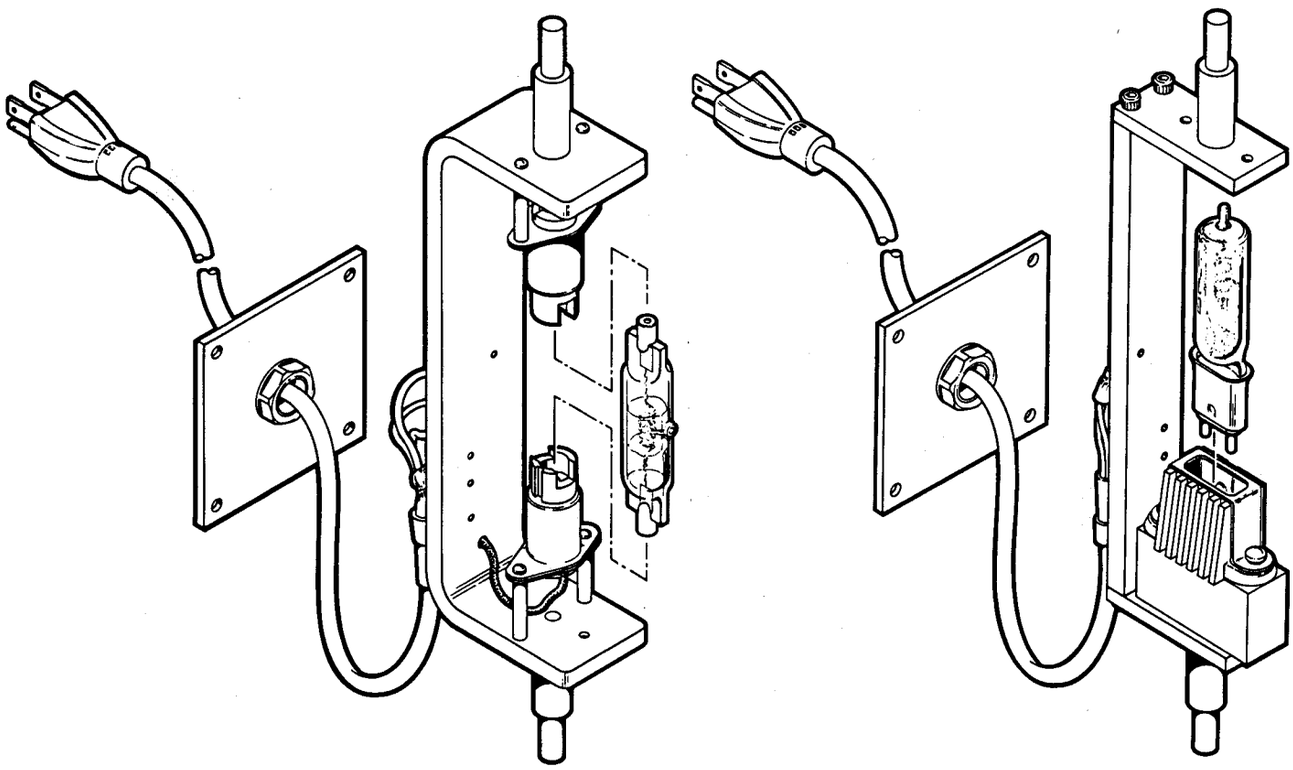


Figure 5 Installing QTH Lamps in 6372 (left) and 6377 (right) Socket Adapters.

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IV.2 ADJUSTMENTS PRIOR TO OPERATION

Before turning the lamp on, roughly adjust its position with the horizontal and vertical adjustment screws. [See Figure 2 on page 6 for the location of these screws.] Adjust the lamp so the filament lies approximately in the center of the condensing lens. This can be seen through the lens if the focusing lever on the lens is full back.

Adjust the mirror image so it lies alongside the lamp as viewed from the front.

IV.3 CAUTION WITH AN F/0.7 LENS

This lens is a close fitting wrap around lens. It is possible to touch the lamp with the lens assembly. Therefore:

During initial lamp adjustment, be sure the bulb is centered on the lens vertically and horizontally so that as the lens is moved back toward the lamp, the metal edge of the lens holder does not hit the bulb.

During operation, do not force the lens back toward the lamp. Do not operate with the lens in contact with the lamp.

IV.4 ADJUSTMENTS DURING OPERATION

With the condensing lens, focus so an image of the filament appears on a wall or screen.

Rotate the mirror thumb nuts until an image is in focus. Focus the mirror by rotating all three screws in the same direction concurrently (this translates the mirror back or forth).

Place the mirror image over the lamp image.

Adjust the lamp position to place images in the center of the illuminated field.

Focus the condensing lens as desired.

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For additional Range of Adjustment:

Remove the condensing lens assembly handle (take care to record the order of assembly of the parts).

By hand, slide the inner lens barrel forward or backward until another tapped hole appears in the spiral slot.

Re-assemble the handle into this new hole.

C A U T I O N

AFTER RE-ASSEMBLING THE HANDLE, TURN POWER OFF, OPEN THE LAMP HOUSING DOOR AND CHECK THAT THE LENS BARREL CANNOT HIT THE LAMP THROUGHOUT ITS RANGE OF TRAVEL.

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V. LAMP HOUSING OPTICS

Two types of condenser lenses are available on these lamp housings. You can check the lens type for your housing from the listing:

66186 No condenser

66187 F/1 condenser

66168 F/0.7 condenser

The lenses were designed for efficient collection of light from the filament. In order to get the best performance from your Lamp Housings, we first review some aspects of light collection and then describe how to set the lens position.

By moving the focusing lever you can move the position of the condenser lenses to produce a diverging beam, "collimated beam" or to re-image the filament. The lenses in these housings are designed for collimation rather than imaging. The lens shape and orientation are selected to minimize lens induced distortions (aberration) when the lenses are close to the position which produces a collimated beam (the collimating position). When using them for imaging, there are two penalties; lens aberrations increase[1] and light collection is reduced. For imaging, the lens is moved further from the filament, and so gathers less of the light emitted by the filament within its aperture. The lens operates at a higher F/#.

If you need to image the filament close to the Lamp Housing, or equivalently, produce a small image of the filament, then it is more efficient to use the condenser in the collimating position and use a secondary focusing lens to create the image.

To simplify the discussion, we first describe the operation of an ideal lens and then some of the major results of aberrations.

V.1 COLLIMATED BEAMS

The usual concept of a collimated beam is a parallel cylinder of light. If the intensity is the same anywhere across a section of the cylinder, the beam is uniform. Unfortunately there is no source of a uniform, perfectly collimated beam.

Even expensive laser sources have some residual divergence, in the limit governed by the laws of diffraction, and they usually have non uniform, though sometimes known intensity distributions.

[1] See Volume III for a comprehensive discussion on aberrations.

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QTH Sources with an ideal condenser lens in the collimating position produce beams which depend on the filament size and intensity distribution.

A pinhole source at the focus of an ideal lens produces a beam which is close to the ideal collimated beam. In Figure 6 we show a second pinhole source a distance "d" from the first.

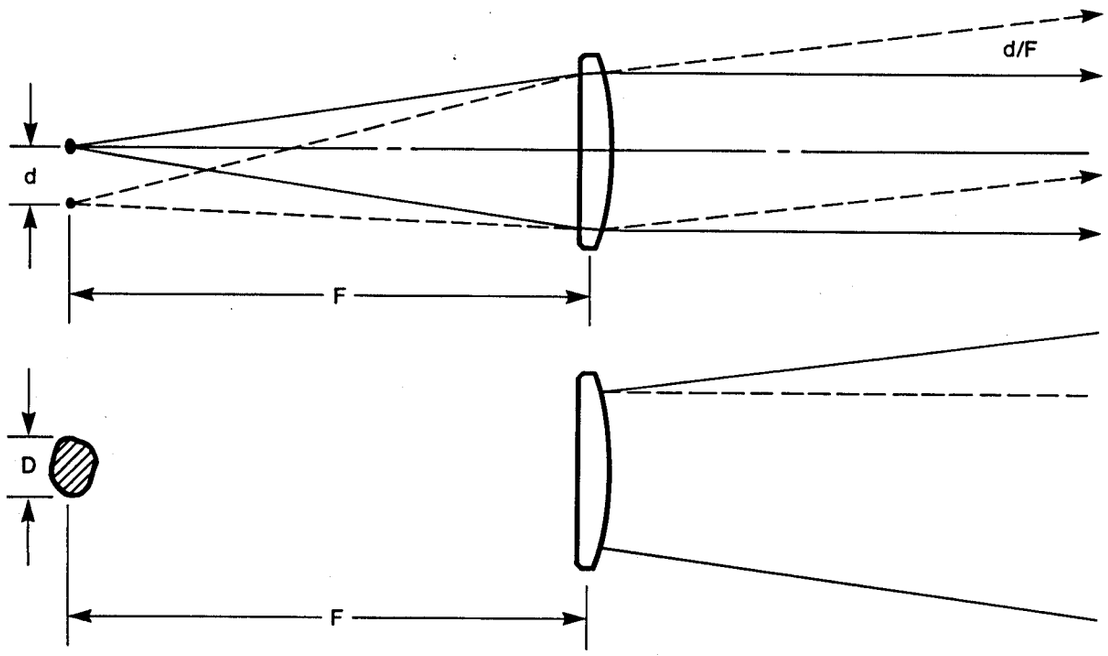


Figure 6 For many sources, the divergence in one plane is not the same as the divergence in the orthogonal plane.

The beam from the second pinhole will also be collimated but at an angle arctan (d/F) with the first. Any extended source can be thought of as a whole set of touching pinholes. The beam after the lens is the sum of all the beams from all the pinholes. It will contain rays with angles up to D/F where D is the largest dimension of the source. The beam will have a divergence which depends on the sum of the light from all the points on the source. Obviously this divergence will depend on the size of the source and the intensity of the various "pinholes" or points on the source.

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V.2 IMAGING THE FILAMENT

Using the focusing lever, you can reimage the filament by positioning the condenser further from the lamp. Volume III describes imaging and provides the formulae. As the condenser lens is moved out, the image moves in and becomes smaller. As already indicated, the lens collects less light as it is moved away from the filament. Additionally, the convergence angle of the beam goes up as the image becomes smaller. This is not usually important for irradiance of a surface, but can be significant if the image is on the slit of a monochromator, optical fiber, or other optical system with limited acceptance angle. We normally use a secondary focusing lens to maximize the light through a slit or into a fiber optic.

V.3 REAL LENSES

The condenser lenses are intended for efficient light collection. They operate at low F/#s. As a result, the single element F/1 lens suffers from severe aberrations while the F/0.7 Aspherab™ is almost free from spherical aberration. Note that all lenses perform best while collimating the light from the source.

V.3a Spherical Aberration

This aberration results from the fact that the ideal lens, the aberration free lens, is not spherical in shape. These condenser lenses, like most lenses, have spherical surface shapes for economic manufacturing. In general, spherical aberration is decreased by dividing the refraction (light bending), as equally as possible between as many surfaces as possible. The lens shapes of our condensers and orientations minimize spherical aberration for the type of condenser and at the collimation position. The F/0.7 Aspherab™ multi-element lens assembly practically eliminates this aberration by balancing the effects between lenses.

Consider the simple plano convex lens collimating light from an ideal point source. With the plano surface towards the point source and the point source at the (paraxial) focus, the marginal rays converge while the paraxial rays are collimated (Figure 7). This is due to spherical aberration. For the ideal, non spherical lens shape, the paraxial and marginal rays are all collimated. If the source is located about 1/4 f inside the focus, the paraxial rays diverge slightly and the marginal rays are almost collimated. This is often the optimum compromise for a single element collimating lens (and has the added advantage of collecting more light form the source).

The lens adjustment on the lamp housings allows the lens to be moved closer to the source than the paraxial focus. You can empirically find the best position for your system.

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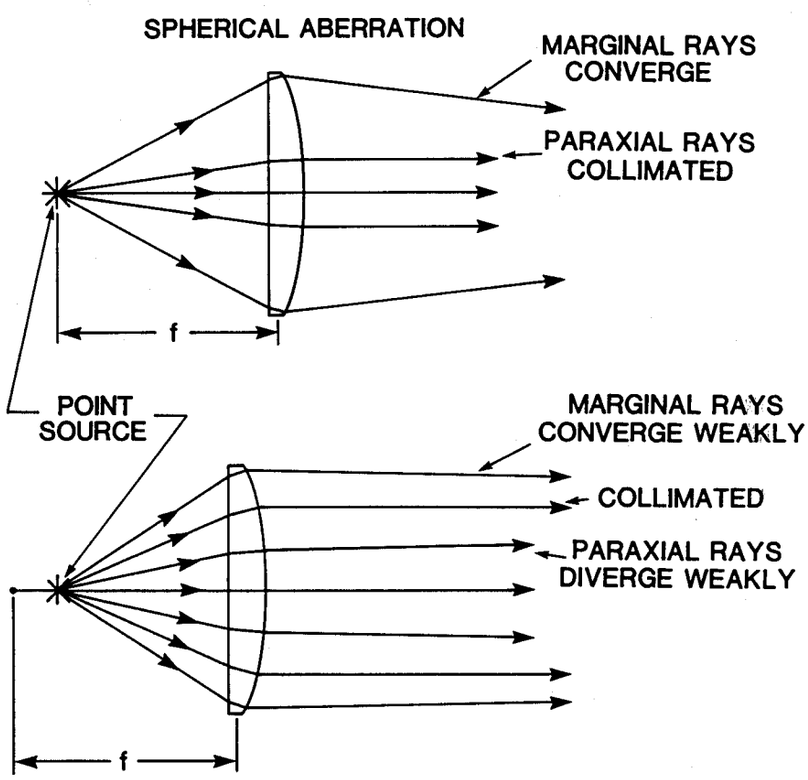


Figure 7 The marginal rays and the paraxial rays are collimated when the point source is at the paraxial focus, and the plano surface of the lens faces the point source.

The F/0.7 Aspherab™ condensing lenses combine negligible spherical aberration and low F/#, and should be used at focus for critica collimating applications.

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V.3b Chromatic Aberration

The term "chromatic aberration" describes the variation of lens focal length with color (Figure 8). This variation is due to the change in lens index of refraction (n) with wavelength. As the wavelength goes up, n goes down and the focal length increases.

This causes problems in producing multi-wavelength collimated beams, but is usually a second order effect compared with source and spherical aberration limitations. Chromatic aberration usually becomes more important when UV wavelengths are to be collimated. The reduction in focal length (f) for a fused silica lens from the visible value of f to 0.91 f at 250 nm may require a change of lens for optimum performance. Contact Oriel for details.

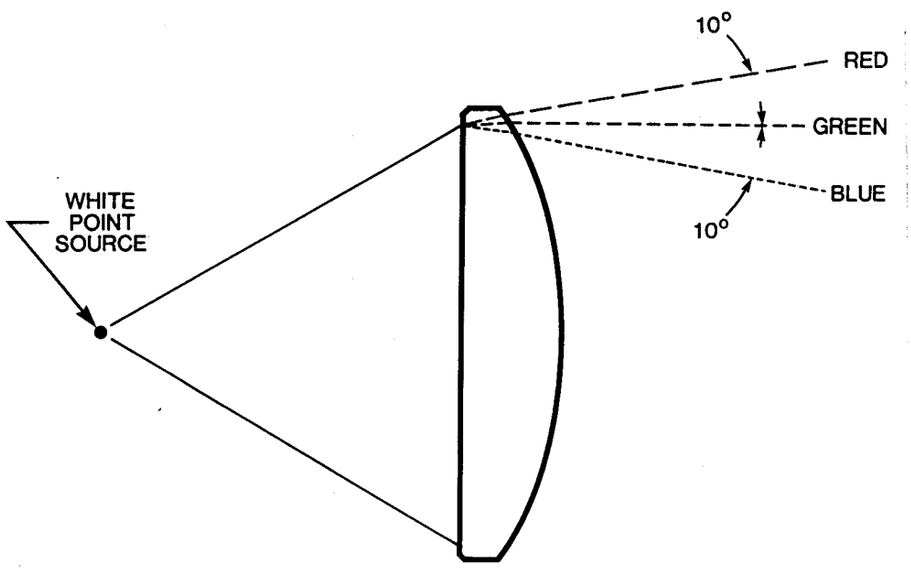


Figure 8 Chromatic aberration: different wavelengths are focused at different points.

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V.4 HOW TO POSITION THE CONDENSER TO GET A COLLIMATED BEAM

Image the filament on the most distant wall in your laboratory (remembering appropriate safety measures) to get close to the collimating position. You can then move the lens barrel a small amount for best collimation. If your wall is two meters away, a 1.3 mm adjustment is required. For 3 m and 4 m, the corresponding numbers are 0.8 and 0.6 mm.

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WARRANTY AND RETURNS

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

3. Repaired items: ninety (90) days after delivery of goods to buyer.

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Oriel Instruments shall be relieved of all obligations and liability under this warranty if:

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2. The goods are not operated or maintained in accordance with Oriel's instructions and specifications.

3. The goods have been repaired, altered or modified by other than Oriel authorized personnel.

4. Buyer does not return the defective goods, freight prepaid, to an Oriel repair facility within the applicable warranty period.

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INSURANCE -

Persons receiving goods for demonstrations, demo loan, temporary use or in any manner in which title is not transferred from Oriel, shall assume full responsibility for any and all damage to the goods while they are in their care, custody and control. If damage occurs which is unrelated to the proper and warranted use and performance of the goods, then the 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 Oriel for repair, please call the Customer Service Department at (203) 377-8282. Have your purchase order number available before calling Oriel. The Customer Service Representative will give you a Return Material Authorization number (RMA). Having an RMA will shorten the time required for the 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 Oriel Receiving Department. Equipment returned under warranty will be returned with no charge for the repair or shipping. Oriel will notify you of the cost of repairs not covered by warranty before starting out of warranty repairs.

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 Oriel can verify correct operation of these accessories.

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