FUNDAMENTALS OF LIGHTING

Workhorse of the grid

Getting to know the ellipsoidal reflector spotlight

By Katherine Shirek Doughtie and Steve Nelson

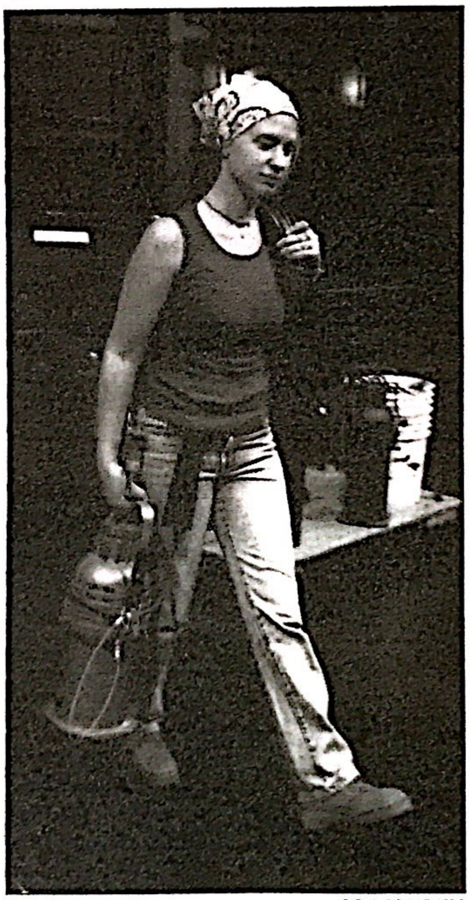
THE ELLIPSOIDAL REFLECTOR spotlight or ERS is a workhorse of theatrical lighting. It is also more complex than the other types of fixed lighting instruments in common use, and requires a considerable amount of technical knowledge of the people who are responsible for hanging, focusing, and maintaining it.

Walking onto the stage for your first lighting call can be a mystifying experience. In this working article, you'll get an electrician's understanding of the ERS, discovering how the instrument works, what its various parts are called and what they do, how to tell different types of ERSs apart, how to hang and focus an ERS and optimize and modify the beam, and how to take care of them. In future articles we'll cover Fresnels, PARs and other lighting instruments in the same way.

How ellipsoidal reflector spots work

The ERS—sometimes called the *leko,* after an early popular brand name—is capable of throwing an intense, even, sharp-edged beam of light, making it the instrument of choice for front light. They're also frequently used as side lights, as specials, and as pattern projectors.

The design of the ERS is similar to that of a slide or movie projector, upon which it was based. Light from a lamp filament is concentrated and directed forward through an aperture. A lens system in front of the aperture focuses the light, projecting a sharp image of the aperture onto the stage.



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To better understand how the ERS works and what it can do, let's follow the path of a beam of light from its source to the stage.

The filament of the bulb is positioned inside a reflector shaped as a three-dimensional ellipsoid (imagine an eggshell cut in half). The bulb pierces the reflector at the curved end.

The filament is located at one of two focal points of the ellipsoid. The light radiating from the filament is collected by the reflector and directed forward out the open end of the ellipsoid and toward a second focal point, where it passes through a round aperture called the *gate.* From there the light travels forward through a lens or pair of lenses that focus it into a sharply defined beam. This design also makes it possible to project an image of anything placed at the gate onto the stage.

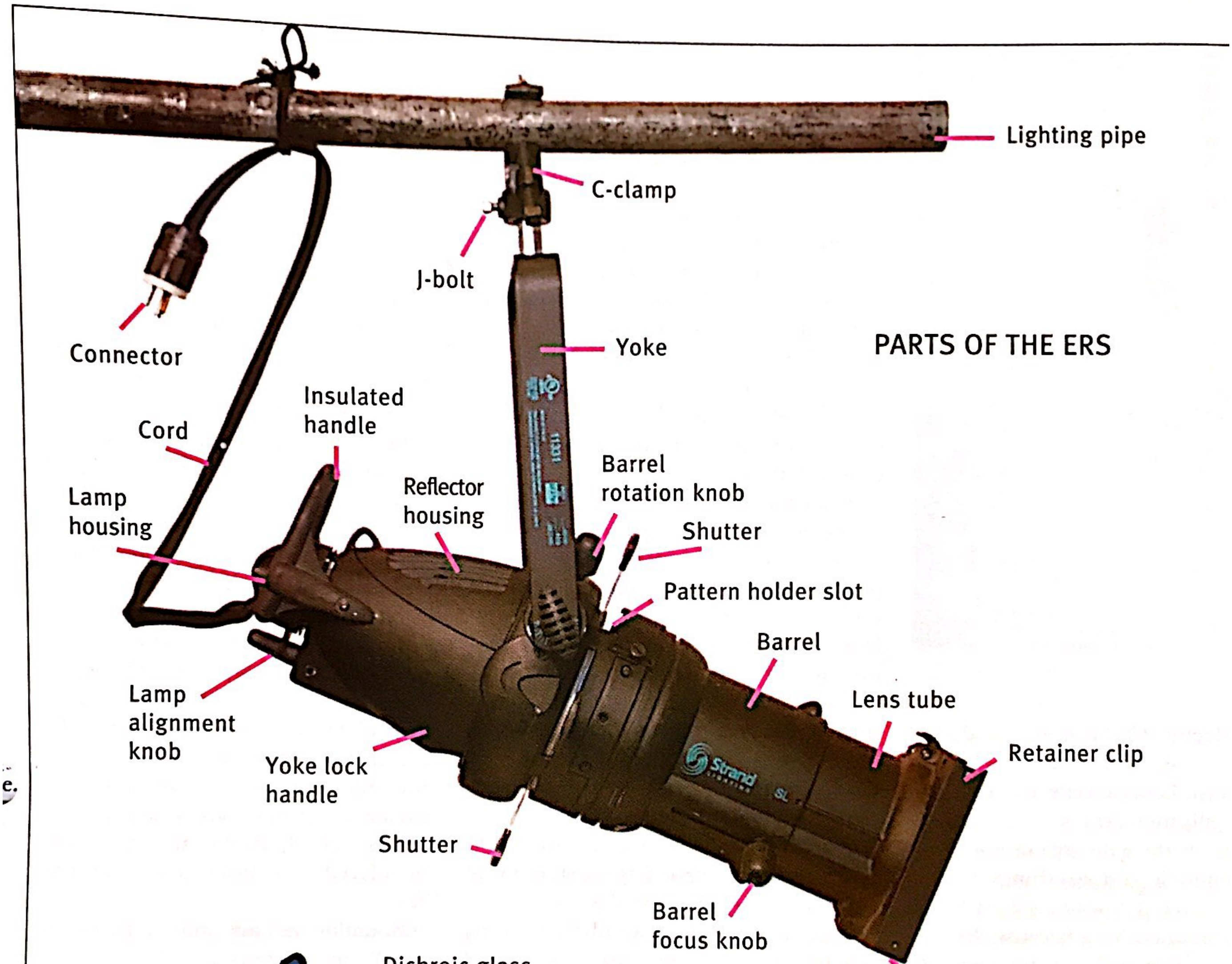
The parts of the ERS

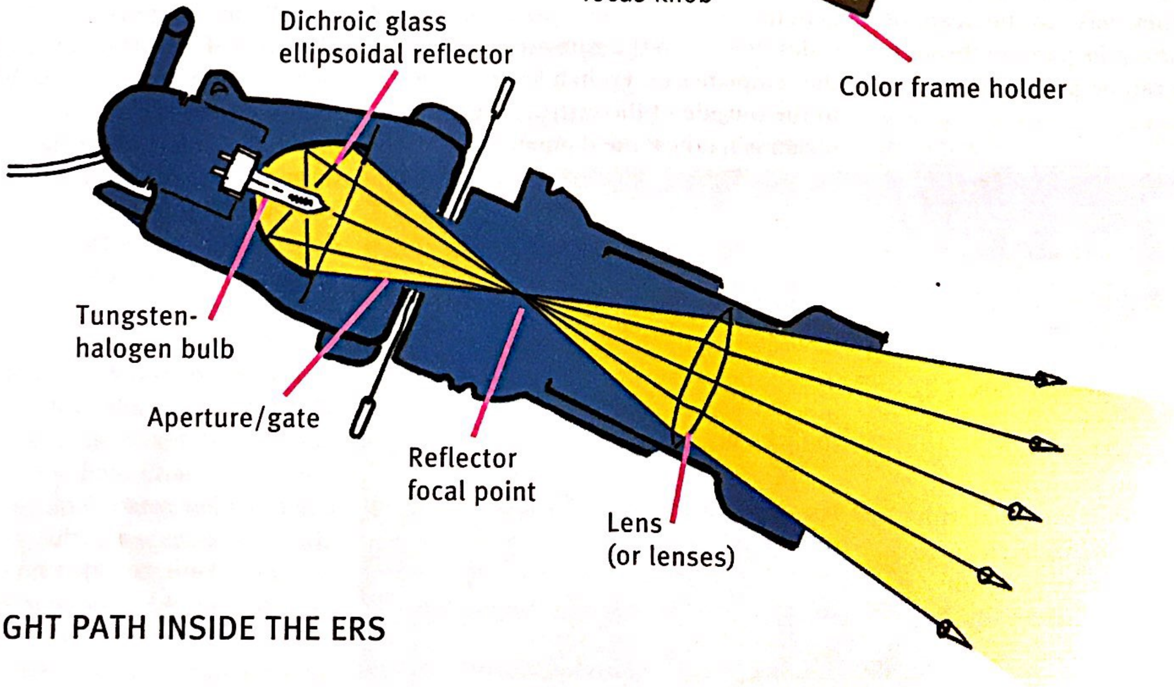
Now let's look a little more closely at the elements of the instrument.

The lamp. The lamp of an ERS is a tungsten-halogen filament bulb, typically rated at between 500 and 1000 watts. (Compare to the bulb in your reading lamp, which is probably 75 watts.)

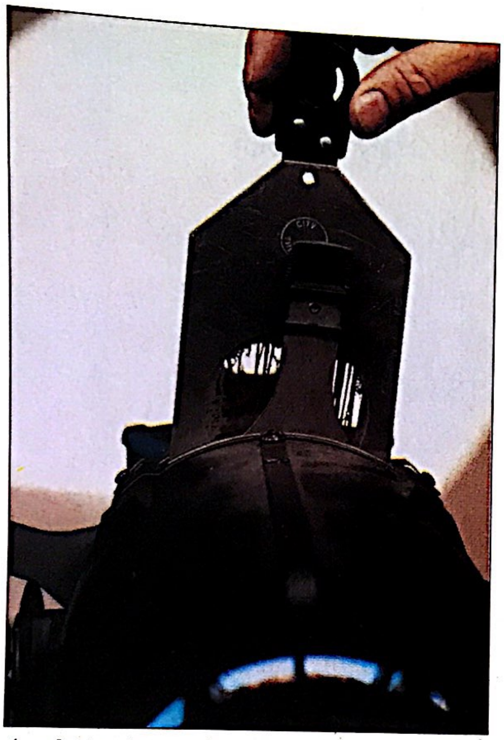
If the bulb filament was a true point source and the reflector was a perfect ellipsoidal shape, the ERS would deliver a beam of uniform brightness from edge to edge. Since the filament is bigger than a point and reflector designs are something short of perfect, the beam from an ERS is typically brighter in the center and dimmer toward the edges.

This *hot spot* was more pronounced in older ERS designs. Modern instruments have better-designed reflectors that are able to deliver more even light to the lens or lenses. They also have a way of adjusting the position of the lamp relative to the reflector, allowing the user to choose a beam with a hot spot center or one with uniformly even illumination.





LIGHT PATH INSIDE THE ERS



A gobo in the template slot creates a pattern of shadow.

The reflector. Highly polished aluminum, or in newer instruments glass with a special dichroic reflective coating, in an ellipsoidal shape.

Shutters. At the gate area of the ERS you will generally find two things: the *shutters* and a *template slot* or *gobo slot.* They're positioned here because the modifications they make to the beam of light at this point in its passage through the instrument can be projected in sharp focus.

Asbestos cords

UNTIL RECENTLY, all stage lights were wired with asbestos insulated cords because they could withstand the high heat inside the instrument. Any whitish or greyish fibrous cord covering on an old instrument is probably asbestos. For health reasons, asbestos cords are now outlawed and should be replaced with plastic or fiberglass insulated cords using the proper procedures for handling asbestos. Check with the instrument manufacturer or you local theatrical lighting dealer for advice and assistance in making the switch.

The shutters consist of four thin sheet-metal spatulas or paddles with insulated handles that protrude out the side of the ERS. When a shutter is pushed into the gate it will make a straight-edged cut into the circle of projected light. With the shutters out (the handles pulled away from the instrument body), the broad flat end inside the instrument does not encroach at all on the gate and the light is projected as a complete circle. Each shutter can be rocked or pivoted to slightly alter the angle of the cut into the beam. Push all four shutters in and you will get a rectangular or trapezoidal light beam.

Gobos or templates. A *gobo* is a sheet of stainless steel with a pattern of holes. Inserted into the template slot, it will produce sharp-edged shadow patterns in the circle of light. Gobos are available from theatrical suppliers and can be custom made to the user's specifications.

Most ERSs have rectangular, heat-insulated template holders designed to hold the gobo and fit into the instrument slot. Special glass projection patterns can also be placed in a template holder and inserted in the template slot.

Iris. An *iris* is an arrangement of movable metal leaves that produce an aperture of variable size. In an ERS the iris is generally incorporated into a holder that slides down into the gate area through the template slot. From a lever extending to the outside of the instrument, a technician can adjust the diameter of the beam of light coming out of the front of the instrument.

Lenses. The lens barrel of the instrument contains either a single lens or a pair of lenses. The lens assembly can be moved a small amount in relation to the gate to fine focus the image on stage, much as you would adjust the focus on a slide projector.

The size, shape, and position of the lenses in the barrel of the instrument will determine the instrument's field angle—how much the light spreads as it travels toward the stage. (The lens configuration is the most important variable that a lighting designer uses to choose the right instrument for a particular hanging position and lighting need. More on that subject on page 28.)

Most manufacturers offer ERSs with interchangeable lens tubes that allow a technician to change the field angle of an instrument by switching out the lens assembly. Some instruments come with lens arrangements that provide for changing the distance between two objective lenses, zooming the beam spread of the instrument from wide to narrow.

The gel holder. At the front of the instrument barrel is the color and accessory frame holder, or gel holder. This is where colored media can be placed, removing unwanted colors of the spectrum as the light passes through on its way to the stage. Other accessories such as diffusion media (to soften and fuzz the beam) and donuts (square metal frames with a hole smaller than the lens diameter) may also be attached to the end of the barrel to further modify the light.

In recent years motorized remotely controlled gel changers (called color changers or scrollers) that fit into the gel slot have become popular in productions that can afford them. With a roll of different colored gels aboard, the scroller can change colors throughout a show, effectively multiplying the different colored looks from each individual ERS.

Mounting and adjustment hardware. All ERSs are supported in the same way. The arms of a U-shaped yoke are attached to the instrument at bolt holes somewhere in the middle of the instrument, allowing it to be pivoted up and down. Thermally insulated yoke knobs allow the tech to tighten the up and down movement of the instrument in the yoke without tools.

A C-clamp with a short extension, bolted to the top of the yoke, is used to secure the instrument to a lighting pipe. The bolt on the side of the C-clamp—often called, for reasons that we need not go into here, the J-bolt—can be loosened to allow rotation of the yoke. It is also possible to rotate the yoke by loosening the large bolt that holds it to the C-clamp, but this is not a good practice. The yoke bolt is what keeps the instrument up in the sky, and should always be kept tight. All three bolts are adjusted with a wrench, usually an eight-inch crescent.

WHAT AN ERS CAN DO, AND HOW

Procedure	Effect	How to do it
Focus	Sharpens or diffuses the edge of the pool of light	Move the barrel of the instrument either in or out
Shutter	Crops the light to avoid spilling on scenery or architecture	Move the shutters in or out to create an appropriate quadrilateral shape
Color	Changes the color of the light being projected onto the stage to highlight actors or create dramatic moods	Insert colored gel media into a holder in front of the instrument
Diffuse	Blurs the light so that it is softer in intensity and focus	Insert diffusion media into a holder in front of the instrument
Project pattern	Projects silhouetted images or patterns onto the stage to enhance mood or create an effect	Insert a die-cut gobo or pattern into a slot inside the instrument so the focused light will project that image
Iris in or out	Expand or contract the size of the pool of light on the stage	Use an internal iris installed within the instrument to make the beam of light projected either larger or smaller

Cord and plug. Depending on how your theatre is wired, the plug on the end of the cord can be one of a variety of types. The cord itself is of more concern. The wires and the sheathing around them should have special thermally resistant fiberglass insulation on them. If your instruments are fairly old, they may still have cords on them with asbestos insulation. Not good. See "Asbestos cords" on the facing page.

It's hot in there

A tremendous amount of heat is generated by an ERS at work. Because the reflector focuses the light, and thus the heat, through the gate area, anything positioned there must be made to withstand high temperatures without melting or deforming. Slides must be made of heat resistant glass, and gobos and shutters are generally stainless steel.

These insertions into the gate area affect the beam by blocking some of the light. Much of that light hitting the pattern or shutter is transformed into more heat. Modern instruments are able to eliminate a lot of that heat energy by using dichroic reflectors that focus only the visible light and allow the infrared and other non-visible parts of the spectrum to escape out the back of the instrument—saving the shutters, gobos, lenses, and anything else in the light path from much of the heat that would ordinarily be directed their way.

Upside down and backwards

An interesting thing happens when the light passes through the lens system: the light rays cross to the other side of the beam from where they started. What that means for the technician is that if the beam is modified before passing through the lenses (as with shutters or gobos), when the light strikes the stage or set surface, the beam and any gobo image will be flipped upside down and backwards from how it was at the gate.

With gobos, this is an easy principle

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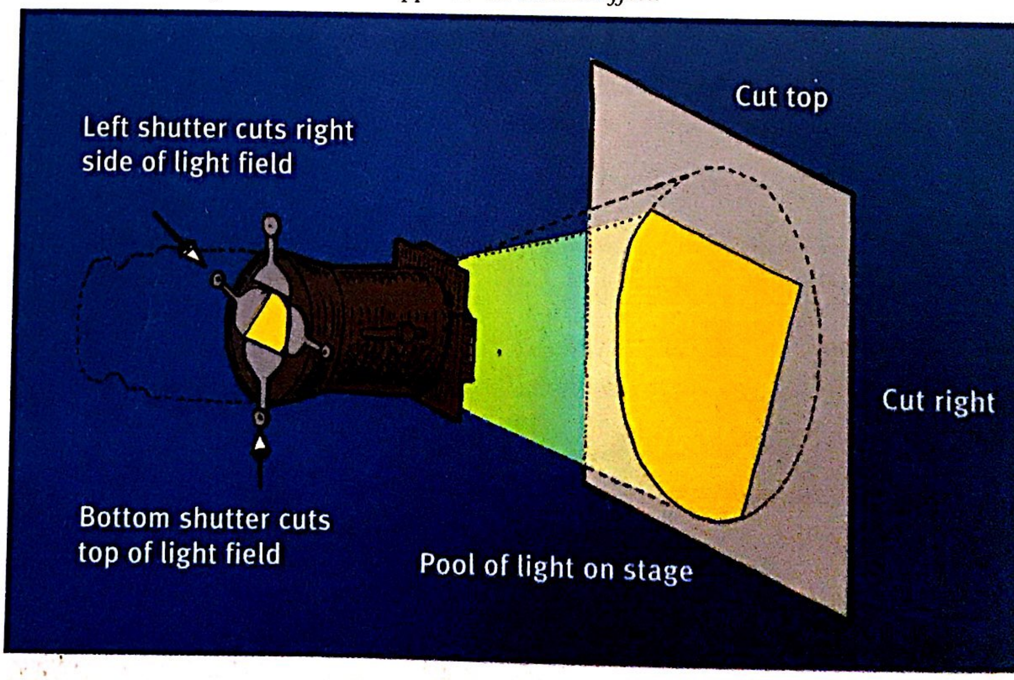
Upside down and backwards: because the light beam flops inside the ERS, shutter cuts are made on the side of the instrument opposite the desired effect.



ERS maintenance

IT'S IMPORTANT to take good care of your lighting instruments when they're not in use, too. Here are some guidelines for striking, maintaining, and storing ERSs.

Storage

Here's the drill for taking an instrument down for storage.

Unplug the instrument.

Push the shutters in (this will prevent shutter damage while removing the instrument and while it is stored).

Loosen the yoke handle nuts and align the instrument parallel to the yoke.

Loosen the C-clamp just enough to allow the yoke to hang straight down.

Loosen the barrel securing knob and run the barrel all the way in.

Undo the safety cable (and reattach it to itself through the yoke).

Remove the gel frame and any accessories from the gel frame holder.

Set the instrument on the deck, barrel down.

Wrap the power cord around the instrument and secure the plug end between the yoke and instrument.

Store the unit on a lighting cart or hanging from a pipe.

Maintenance

Good maintenance of equipment is critical to a well-run theatre. As with other lighting instruments, ERSs periodically—in a school theatre setting, a minimum of once a year—need cleaning and adjustment. This is most easily done on the ground and requires a little bit of setup.

A thorough maintenance procedure includes several tasks: cleaning, fixing poorly-functioning parts, marking, and adjusting the light socket, a procedure called *bench focusing*. The first time a lighting tech performs maintenance on an ERS, it should be under the supervision of someone who has done the work before.

Getting set up. A good setup will make the maintenance process go much more quickly. The exact way you set up will depend on your working area, but you can either rig a waist-high pipe to hang the instrument you're working on, or you can rest it on a milk crate sitting on top of a table. Either way, you'll need to have enough space to shine the instrument's beam onto a flat white surface about ten feet away.

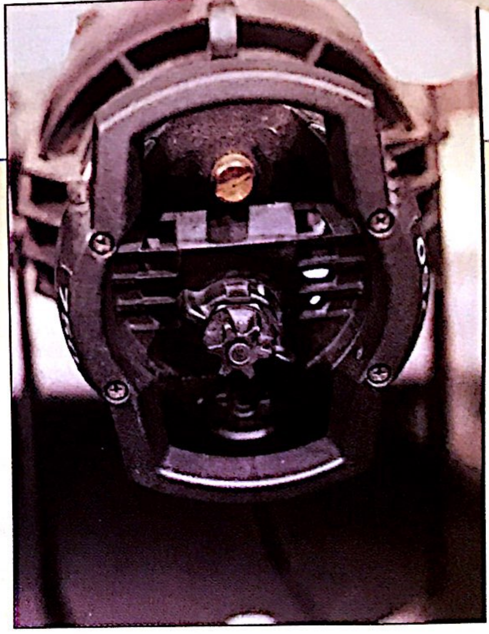
To do the maintenance you'll need the following things:

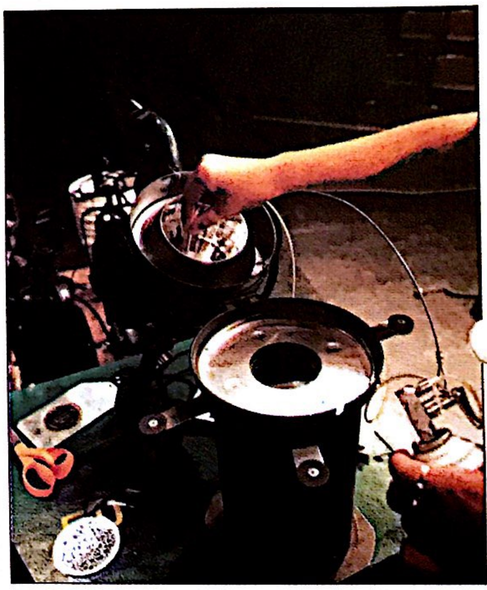
- An AC cable for connecting the instrument to a live power source.
- Compressed air for cleaning.
- A flathead screwdriver for alignment screws (if necessary).
- A crescent wrench.
- Tape or some other marking system.
- An indelible marking pen.
- A grease pencil.
- A pencil and notepad.

Cleaning. Cleaning the inside of an ER instrument is relatively simple. Position the instrument on a crate. Pull all four shutters out and open up the body of the instrument. Use compressed air to blow out the dust, being sure to move carefully around the lamp itself.

Fingerprints or smudges on the reflector or lenses can be removed with alcohol and a lint-free cloth.

Repairing. While you're cleaning the instrument, you may notice elements that you need to repair, replace, or adjust. It's always helpful to have a few instruments around to pirate parts from. If you can't make every instrument perfect, keep notes of what instruments have cracked lenses or sticky shutters, so you don't keep hanging flawed instruments in critical positions.

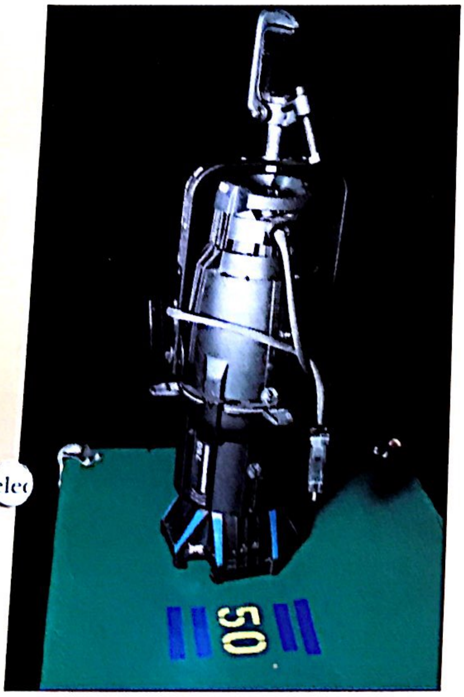




Marking. With all the variations possible with ERS instruments, sometimes it's hard to tell from the outside how an instrument is configured. It is extremely helpful to devise a system for coding the instruments for easy visual reference. While you're inside the instrument, make a note of its focal length, whether it has an iris or not, and any idiosyncrasies you find. After you've closed it back up, mark it clearly on the yoke.

You can use colored stickers or tape to mark the various types of instruments—this is a quick and easy solution but requires that everyone involved remembers what each color means. Another way to label instruments is by attaching Velcro to the yoke. Stick the soft (felt) side to the instrument and

Counter-clockwise from top left: beam adjustment knobs on the rear lamp housing of an ETC Source Four; cleaning an instrument with compressed air; an ERS prepared for storage; adjusting the filament position during bench focusing.



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put the hook side on top. Mark the specific configuration of that instrument on the back of the hook side and change it later if you modify the instrument.

Bench focusing. Very often the filament of the lamp within an ERS gets bumped out of position. If the lamp is not aligned properly in the focal point of the reflector, the light output from the instrument will be diminished. The lamp position is adjusted using either adjustment screws or a joystick control at the back of the instrument.

Follow these steps to align the lamp correctly.

Set up the instrument on a milk carton or hung from a pipe, aimed at a white surface about ten feet away.

After cleaning the instrument and performing any necessary repairs, close the instrument and mark it.

Make sure the shutters are pulled out.

Connect the instrument to the AC power source.

Adjust the instrument barrel (or cannon) so that the edge of the light beam is as sharp as possible.

If you are focusing an adjustment screw type ERS, loosen the center locking screw with a screwdriver, and then adjust the three outer screws until you have the brightest, most even field.

Tighten the center locking screw when done.

If you are bench focusing a joystick control type ERS, loosen the joystick locking ring at the back of the lamp housing. Move the joystick to center the hot spot in the beam projected on the wall and then lock it in place. Modern instruments generally have a second separate lamp alignment knob that runs the lamp in and out of the instrument to even out the light distribution across the beam. Twist that knob back and forth until the light on the edges of the beam looks as bright as the light in the center.

Unplug the ERS and push the shutters back in all the way to prevent damage from bending or shearing off.

Changing a lamp

The most important thing to remember when changing out a tungsten-halogen lamp is to *never* touch the glass itself. Here are the basic steps for changing a lamp. Since lamps typically go bad during the run of a show, this task is usually performed while the instrument is hanging in the grid.

First make sure that the lamp you are changing is really dead, by checking all the cabling and circuitry.

Carry the lamp up in its box. Each instrument will have a specific lamp that is designed for it, so make sure to bring up the right one.

Unplug the instrument. Remove the circular lamp housing. Different instruments have different ways of securing the lamp housing, but the most common is a brass knurled machine screw. Loosening that knurled knob will usually release the housing so it can be removed. If you don't find a knurled knob at the back, check with the other lighting techs or consult the instrument manual.

The lamp socket inside the housing will usually be rectangular in modern instruments, round in older ones. To remove a bulb from a rectangular sockets, press down on the two metal clips that hold the lamp in and pull it out. If the socket is round, twist the lamp about a third of a turn counter-clockwise until you feel it stop and then pull it out.

Open the box and remove the new lamp, making sure to keep the paper or plastic sleeve covering the glass of the bulb as you hold it. (This is very important, because any oils from your hand that get on the glass will severely shorten the bulb life.)

Insert the new lamp in the socket. For rectangular bases, just push the lamp base into the socket. Make sure to push hard until it seats solidly—a partially seated bulb will result in arcing in the socket and reduce bulb life. For round bases, push the bulb down into the socket and turn it clockwise until you feel it stop.

Once the bulb is in place, remove the protective sleeve and replace the lamp housing.

— K.S.D.

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integrate because you just have to tell yourself that you need to put the gobo in the form upside down and backwards.

It's always a more confusing thing with shutters. There you are behind the instrument when the lighting designer asks you to shutter off the proscenium. It happens that the proscenium to be dealt with is on the right side of this instrument's field, so you instinctively want to grab the shutter tab on the right side of the instrument. Wrong. The correct shutter would be on the opposite, or left side. So as a focusing tech, you must drill into your head, always opposite. Left is right, right is left, top is bottom, and bottom is top.

The right tool for the job

ERSs are generally classified in one of two ways. Both methods give an indication of the kind of beam that the instrument will produce.

The traditional way is to describe the instrument by lens diameter and focal length, in inches, expressed as two numbers separated by the "by" symbol: 6 x 9, 8 x 22 ("six by nine," "eight by twenty-two").

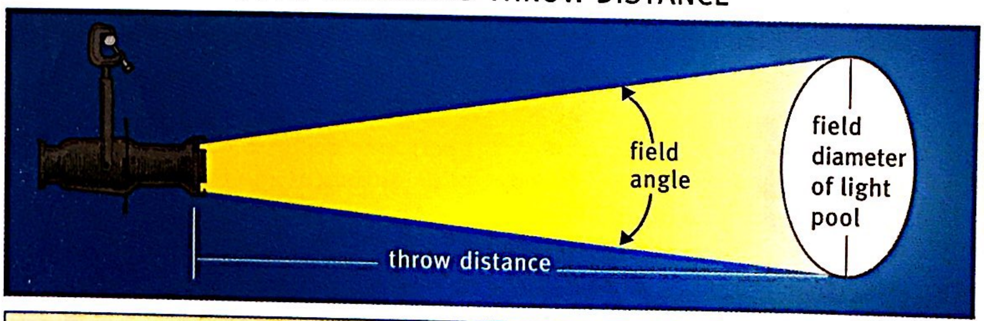
The lens size is easily determined by looking in the front of the lens barrel. Elliposidals usually have 4½, 6, 8, or 10 inch diameter lenses.

The second number, the focal lengt[h] is the distance from the center of the o[b]jective lens to the point where a beam [o]f light passing through it will converge. This is not something you'll have to me[a]sure—instruments are usually designate[d] as to their type, or at least the techs in a specific theatre know which style is whic[h].

Newer instruments are classified by manufacturers and technicians by their nominal field angle, the angle that the beam of light spreads out from the front of the instrument. Common instruments are 19-degree, 26-degree, 36-degree, and 50-degree. These instruments will be called by the degree number, for example, a "19-degree Source Four" if the model is important, or just a "19."

These two ways of classifying instruments are different routes to the same destination. One describes the key characteristic of an instrument (the field angle in degrees); the other describes th[e] optical configuration that produces that characteristic. The important thing that the lighting tech needs to remember about the relationship between them is:

FIELD ANGLE AND THROW DISTANCE



Nominal lens size and focal length	Approximate field angle	Throw distance to 12-foot field*
4½ x 6½	50°	13 ft.
6 x 9	37°	18 ft.
6 x 12	27°	25 ft.
6 x 16	17°	40 ft.
6 x 22, 8 x 14	10°	68 ft.

*Use as a rule of thumb. Calculated from information in Paul Carter's *Backstage Handbook* (Broadway Press, 1995).

the shorter the focal length, the larger the field angle. A 6 x 9, a relatively short focal length ERS, has a field angle of about 36 degrees. A 6 x 22 spreads about 10 degrees. There's a table showing the correspondence between lens diameter, focal length, and field angle on page 28.

Beyond just identifying different instruments, these designations give the lighting tech a relative idea of the instrument's beam throw and where it should be hung. An instrument with a large beam spread—a 6 x 9 or a 36 degree, for example—is most useful for short throws to the stage, say eighteen feet away for a twelve-foot diameter acting area. A 6 x 22 or a 10-degree instrument's relatively narrow beam spread is better suited to a hanging position with a long throw to the stage.

Usually the lighting technician won't be making the decisions on which instrument hangs where and lights what. That's the lighting designer's responsibility. But understanding the characteristics of the different ERS configurations and knowing something about why the designer draws the light plot the way she does will make the technician better at his job.

How far?

The designer's concerns are throw distance, size of light pool when it hits the stage, and intensity of light on the surface. Usually the throw distance will be the starting point. Then the designer can make selections based on the manufacturer's spec sheet data for the available instruments. It's simply a matter of matching the data for the available instruments with the throw distances in the light plot. When you find an instrument with the approximately correct size pool of light (field or beam diameter) at the right intensity (generally 100 foot-candles or more at that distance) you're home. Most facilities have a limited number and types of ERSs and the designers and technicians get to know intuitively what beam spread or focal length instrument is right for each position or throw distance.

Lighting design computer programs they come loaded with all the photometric data about lighting instruments, ancient to modern, and are able to display specific data on any instrument the designer wants to plug into any position on her plot. The software shows you the exact light pool size and intensity of any instrument at any specific distance, eliminating a lot of calculations and rifling through specification data sheets.

How bright?

What theatrical lighting designers are most concerned with is the amount of light falling on a surface (an actor or scenery), which is sometimes called *illuminance.* Illuminance or intensity of light is measured in foot-candles, abbreviated FC. Foot-candles are defined as a unit of measure of the intensity of light falling on a surface, equal to one lumen per square foot.

Average illuminance levels during a typical production may range from 10-200 FC. In general, however, acting areas with 50-100 FC are usually suitable for most dramatic plays, comedies, and musicals, providing that surrounding and back-

Manufacturers' websites

Strand Lighting:
www.strandlight.com
Electronic Theatre Controls:
www.etcconnect.com
Altman Stage Lighting Co.:
www.altmanltg.com
NSI/Colortran Division of Leviton:
www.colortran.com or
www.nsicorp.com
Lighting & Electronics:
www.le-us.com

Books

Designing with Light: An Introduction to Stage Lighting, by J. Michael Gillette (third edition), Mayfield Publishing Co., 1998

Scene Design and Stage Lighting, by W. Oren Parker and R. Craig Wolf (seventh edition), Holt, Rinehart and Winston, 1996

Lighting the Stage: Art and Practice, by Willard Bellman, Broadway Press, 2001

Video

Conducting Light with David Cuthbert, Theatre Arts Video Library, 1998 ground lighting levels are lower, for contrast.

Basic physics tells us that the farther away the light source is from the surface it is illuminating, the less bright it will be. Actually, the intensity drops off very quickly as distance increases. Specifically, the intensity of the light is inversely proportional to the square of the distance from the source. Also keep in mind that light intensity drops off more rapidly over a given distance for a wide field angle ERS than a narrow beam ERS, because the wider beam instrument spreads the same amount of light over a larger surface area.

If more intensity is needed, there are a number of things that can be done:

- Add one or more instruments aimed at the same acting area.
- Change the instrument to one with a narrower beam angle.
- Find a closer hanging position.
- Change the color of the gel installed in the instrument to a lighter color.

For intensity and field angle data on specific instruments, check out the manufacturers' websites listed on page 30.

Hanging the instruments

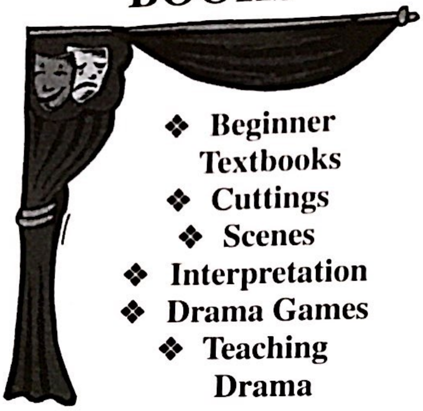
Before you start hanging lights, do a thorough maintenance and bench focus of your instruments (see "ERS Maintenance," page 26). If that's not possible, at a minimum you should do a quick inspection to be certain the lights are ready to hang. Make sure:

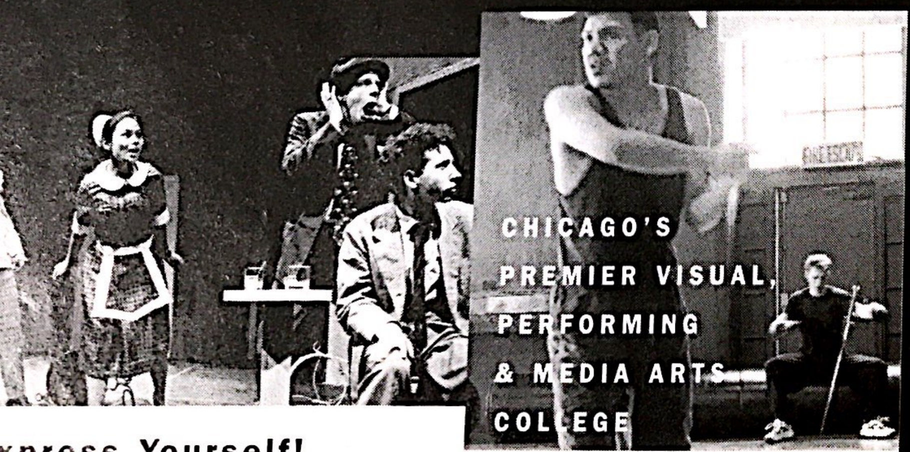
- The shutters function. Push them fully in for hanging.
- The iris, if one is installed, is opened to full aperture.
- The C-clamps and yoke are in good working order (i.e., the pin is straight, the threads are not stripped, etc.).
- A lamp is installed.
- The power cable is looped neatly around the yoke for safe and easy carrying.
- A safety cable is attached.

To hang an instrument, you will need:

- A crescent wrench, preferably attached to your belt or pants with a tie line or telephone cable.
- A ladder or other kind of lift.
- Sturdy shoes.

There are two things you should be thinking about when hanging lighting





instruments. The first one is safety. The other is how to position the instrument as accurately as possible and make sure it's ready to be focused.

Let's begin. Using the light plot for direction, take the ladder, the specified instruments, pre-cut gel, and appropriately sized gel frames to the hanging position.

Before climbing the ladder, plug in and test each instrument, and loosen the bolt that runs diagonally through the C-clamp so that the clamp will fit over the pipe.

Take the instrument up the ladder and hook the clamp onto the pipe, oriented so the instrument will be right side up when it is aimed in the direction of the stage. Make sure the instrument has enough room to move without hitting adjacent ones. Finger-tighten the bolt until it meets the pipe.

Secure the instrument with a safety cable.

Use your wrench to tighten the bolt until it's secure. (It doesn't have to make a dent in the pipe!)

Adjust the instrument so that it's pointing in generally the right direction (upstage, downstage, stage right, stage left).

Finger tighten the yoke lock handle.

Make sure the shutters are pulled out, the iris is opened and the power cable is hanging free.

If you are hanging on an on-stage batten, add weights to the fly line as needed (typically every four to six instruments) and for any cable added to the pipe.

Plug the instrument into the designated circuit.

Power each instrument to make sure that it turns on. If it doesn't, troubleshoot the problem.

Focusing

When all the instruments are hung, the lighting technicians and the lighting designer work together to aim and focus them. The designer stands on the stage with a lighting plot and a cheat sheet with dimmer hookups, circuiting, and board channel assignments. One technician runs the lighting board, either from the stage or from the booth. One or two technicians work in the catwalks or on ladders or lifts at the side box boom positions and over the stage and house, doing the hands-on work of positioning and adjusting each instrument.

What you will need to focus:

- A crescent wrench, preferably attached to your belt or pants with a tie line or telephone cable.
- A ladder or other kind of lift.
- Sturdy shoes.
- Gel for every instrument, already cut and framed (if not already installed in the instrument).
- Leather gloves.
- Gobos in the correct gobo holders for the instruments in which they will be installed. (Don't ever touch the cut-out part of a gobo with your fingers! The oil on your hands will cause the thin metal to warp when it's exposed to heat and ruin the pattern.)

The typical focusing sequence goes something like this.

The designer calls for a specific grouping of instruments (a *dimmer* or a *channel*) to be brought up. Based on how the instruments were cabled and patched into the dimmers, that group of instruments light up.

The designer stands on the stage in the place she wants the first instrument aimed. Generally she will specify which instrument she intends to focus.

If the instrument is already gelled (or "colored"), remove the gel frame unless the designer specifically asks you to keep it in. It's a lot easier to focus an instrument without the color media installed.

It's good etiquette to periodically *flag* the instrument by waving your hand in front of it so that the designer can tell where your particular instrument is aimed. The first time you should flag the instrument is at the beginning of the process, when the designer may be trying to assess what she'll want you to do to this instrument.

The designer tells you how to position the instrument (up, down, right, left). You, as the lighting technician doing the focusing, aim the light so that the hot spot is on the designer. The designer can actually feel or see this spot and you should strive to get it on her as quickly as possible.

Once you have the position set, *lock down* the instrument with your wrench on the yoke bolts. If you need a moment, tell the designer you are locking it down. If you have old or very large instruments, this could take a few seconds but is extremely important. The few seconds you spend locking down now will save lots of time later if the position of the instrument shifts.

The designer will tell you how to focus the edge of the light so that it's sharp or blurry.

Fuzz it out or *soften it up* means to move the barrel of the instrument out or in so that the edges of the pool of light get less sharp.

Sharpen it up means to gradually move the barrel towards the middle of its range until the edge of the pool of light is in crisp focus, or until the designer says she's happy.

Run the barrel means that the designer wants to see the range of focus that particular instrument is capable of projecting. She will (you hope) tell you to stop when she's found a look she's happy with.

If you are working with gobos, they should already be mounted in their appropriate holders. Slide the gobo into the slot. Remember that the lenses flip the image around. If the gobo pattern is directional, insert it "backwards" so that left will be right and up will be down when it's projected.

The designer will tell you whether she wants the gobo crisply focused or soft. In general, most gobos will be focused with a sharp edge.

When projecting gobos onto the cyclorama, sometimes the angle of projection creates a bad *keystoning* effect, which makes the light look like it's smearing diagonally away from you. You can correct this effect by adjusting the angle at which the gobo is inserted into the gobo holder. Tilting it 45 degrees or so can make a lot of difference, but be prepared to fine tune several times before it's exactly right.

If you are getting a lot of *halation* or *flare* around the edges of the pattern, you may want to use a donut, a solid metal square the size of a gel frame with a circle cut out of it. The donut sits in the gel frame holder and does a good job of reducing halation.

Scanned by CamScanner

If necessary, the designer will tell you how to shutter the instrument to make cuts off of scenery or architectural structures (such as the proscenium), or to create a smaller pool of light.

Remember that the image reverses inside the instrument. When making shutter cuts, left is right and up is down. Don't worry, you'll get used to it.

When all the adjustments have been done, reinstall the gel frame. When you're finished, flag the instrument again. It's a nice courtesy and a good final check.

Tell the designer when you're ready to move on.

Focusing etiquette

Focusing instruments can be tedious, hard work. Sometimes it seems like an eternity between one instrument and the next as you sit in the catwalks waiting for the donut break to finally arrive. Be patient. The designer you are working with has a lot of details to attend to and sometimes things don't go as smoothly as everyone would like.

Remember that you're on a team. Sometimes it may seem the designer can't make up her mind. Sometimes she may ask you to run the barrel a dozen times in a row, and your arms will feel like they're about to fall off. Stay with it. You are there to support her in making the show look great.

Good focusing etiquette also includes keeping your eyes open. If you see light spilling on the proscenium, or if you think there's a dark spot on the stage, bring it to the designer's attention. If the designer looks like she's not sure where an instrument is aimed, flag it for her. All these things go a very long way to making the day go smoothly and keeping a good sense of camaraderie.

Katherine Shirek Doughtie is a veteran of more lighting calls than she can count. Steve Nelson is our technical theatre editor.

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