

Welcome To

# THE USER'S GUIDE TO NATHAN SEIFER AUDITORIUM

This document was written by James Feinberg in 1997 as his Senior Honors Thesis. It began as a proposal to buy some new lighting and sound equipment for Nathan Seifer, but it quickly became apparent that something more than just equipment was needed. There needed to be instructions for the people who would use the equipment so that neither they nor the equipment would get hurt. From came the idea for a "User's Guide," which evolved into what you see here.

The guide is divided into sections, one each for Lighting Designers, Sound Designers, Stage Managers, and Technical Directors. There is also a section for things that apply to more than one group, including opening up Nathan Seifer. At the end there is a list of where to buy the supplies you need, and a section describing the equipment changes that were made and improvements that can be done in the future. Finally, there are copies of the manuals for the sound board, the MiniDisc player, and the amplifier.

I hope that you will find this useful and that it saves you some time and aggravation in working in the less-than-ideal conditions that are Nathan Seifer.

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# LIGHTING DESIGN IN NATHAN SEIFER

Lighting design is a complex process that takes years to master. I strongly recommend taking advantage of the Lighting Design classes offered by the Theater Department. This guide is just a start, covering some of the basics. This is just one approach for getting your ideas from your mind onto the stage. Each lighting designer has his or her own process for creating a design. You may find it helpful to follow this process word for word, or to abandon it completely and go your own way. Many of the concepts discussed here are not all that practical, given the working environment of Nathan Seifer, but you will do well to keep them in mind even if you don't carry them out.

Before you can even start figuring out how you are going to light the stage, you need to decide what you want to do with the light. There are four basic elements of light that you can control: intensity, directionality, color, and movement. With these, you can create the looks needed to create and sculpt the world of the play.

The first thing to do when you are beginning a design is to read the script. Once you are done, read it again, this time thinking a little about the lighting, but mostly to get a good feel for the play and what it is trying to say. At this point you should create an **emotional response**. It can be something in writing, or something visual, or both. It should express your point of view of the show. This gives you some basis for conversation with the director and the other designers.

Once the design team is thinking similarly about the overall look and feel of the show, you can continue. The next thing you will want to do is go through the script moment by moment and create a scene or moment breakdown, writing down your feelings for each point. From this, you can start creating **light sketches** for each moment or major look, showing your ideas on color and directionality. These light sketches can be very concrete or very abstract, whatever you need to get your ideas on paper.

From these light sketches, you can make magic sheets for each scene. A **magic sheet** is a quick way of showing what light is coming from where, and in what color. The kind of magic sheet you are making now is different from a production magic sheet, which is more detailed and accurate. These magic sheets are another tool for getting your ideas on paper so they are easier to work with. To create these, you will want to get or make a small copy of the ground plan and make several photocopies of it. For each scene that you described before, either in your scene breakdown or your light sketches, you need to figure out where the lights are coming from, and what gel color you want for them. Indicate the source and direction with arrows on the ground plan. You can use colored pencils to show the color, or just write in that information.

The next step is to start pulling information from the magic sheets to create a **task list**. From each cue magic sheet, write down the lighting systems you will need. Things like: blue sidelight from stage right, amber frontlight, green fresnel wash. Hopefully, you will find lots of overlap between your looks (an entire stage picture), and you can cut your task list down to just a few systems. From here, you are ready to start picking instruments and deciding where to hang them.

## IMPLEMENTING YOUR LIGHTING DESIGN IN NATHAN SEIFER

For basic purposes of illumination, you are going to need **frontlight**. Typically, the frontlight will be unnoticeable in angle and quality, as if it was the ambient light in whatever place the scene takes place. Stanley McCandless, seventy years ago, devised a system to achieve this effect. The McCandless System calls for the acting area to be split up into lighting areas, each eight to ten feet in diameter, with significant overlap. Each area should have two lights, generally Lekos of some kind, one on each side. They should be 30 to 45 degrees to each side from straight on, and elevated about 45 degrees up from horizontal.

Unfortunately, in Nathan Seifer, the existing lighting positions don't allow for correct implementation of the McCandless method. You are generally better off going for the correct vertical angle than horizontal separation, since this will greatly reduce the unnatural shadows from the actors. Stick with two lights per area, and put one light for each area on each of the front-of-house side pipes, as close to the top as possible. This won't work if you are trying to light the far side sections (that are removable for an orchestra). For those, your best bet is to put a single light on the balcony pipe, from not quite straight on; cheat a little bit towards center to try to blend the angle with the rest of your frontlights.

Frontlight alone will not allow you to do much with looks and effects. For that, and to highlight the actors, you will want to use some sidelight and backlight.

Generally, you will divide your **sidelight** into zones across the stage, parallel to the front of the stage. PARs can be good for this, since they have an elliptical beam, or Lekos, which offer you more control. Use sidelight to add some depth to your looks and some highlighting on the actors. Sidelighting positions in Nathan Seifer are basically limited to the side pipes on stage above the exit doors, but with some sidearms and a little creativity, you can achieve some nice effects.

**Backlight** can be used to highlight the actors against the scenery, a problem that often comes up when you can't get the angles you need for your frontlight. Since Nathan Seifer has only a small number of dimmers available, you will probably want to divide your backlight into large zones, either upstage and downstage zones, or stage right, center stage, and stage left running the whole depth of the stage. PARs are generally used for this purpose, since their light is distinctive and has a different quality than Lekos and fresnels, allowing you to add more effects without blurring what you already have. Again, you are pretty limited in where you can hang anything for backlight, and you need to be careful to avoid hitting the audience in the eyes, especially if you are aiming far downstage. You might want to try using sidearms off of the side pipes to go for a kind of diagonal backlight for the farther downstage areas.

One other quick and dirty way to change the look of the stage is with a **color wash**. You can achieve this with a small system of fresnels or PARs gelled with a saturated color, focused diffusely on the acting areas.

Once you have decided on your systems, where you are going to hang them, and what type of instrument you are going to use, you need to determine what specific lens or lamp is appropriate, based on how far away each light is from the area you want it to hit. This distance is also known as the **beam throw distance**. While you could climb a ladder to the lighting position and toss down a tape measure to someone standing in the acting area, it's easier to do a little math. Get a copy of the existing plans for Nathan Seifer (there should be a copy in the Funky Room), and measure the distance along the ground from the light pipe to the area. Then, on the section, find the height above the stage to your

instrument. You now have the two short sides of a right triangle, and you can find the hypotenuse of the triangle using that old formula,  $a^2 + b^2 = c^2$ . For example, if you have an instrument on the top of the house left pipe focused on the center of the upper stage, it will be 21.5 feet above the stage and 28 feet away from the area along the floor. This creates a throw distance of 35 feet, so you will want to use a 6x16 or 19 degree Source Four. Or, if you are numerophobic, you can draw out the two sides of the triangle to scale (1/4 inch would probably work) and just measure the hypotenuse. In any case, once you have found the beam throw, you can refer to the handy chart at the end of this section to find the size unit you will need.

You will probably find that Nathan Seifer's inventory does not quite match up with what you need for your design. You have a couple of options at this point. First, try to substitute different kinds of lights for your systems. You could use PARs instead of Lekos for sidelight, or fresnels instead of PARs for backlight. If that doesn't work, or you are still short on instruments, you can either start cutting instruments and systems or start renting lights. Most places you will rent from will not have stage lights with edison plugs on them (as the existing lights and circuits in Nathan Seifer have), so you will also have to rent pin connector to edison adapters.

More likely, though, you will find that as you try to plan out your light plot, you will run out of dimmers (that you need to control all of the lights you are using). This is harder to fix, since you can't just rent more dimmers. You could, conceivably, rent another dimmer pack, but then you would have to get more power run into the building to wire it in, and build more control cable to connect it to the board, and it's really not all that good of an idea. What you will really need to do is start combining and cutting. If you want to have lots of side and back light, you will need to give up some of your control over your frontlight. **But be careful not to overload the dimmers.** Four Source Fours is the maximum load for any given dimmer, but if you max out all of your dimmers, you are going to run out of power. Check the section on electrical power before you start assigning dimmers.

One other option for dealing with a lack of dimmers is **repatching**. If you have two lights (or groups of lights) that are not used at the same time, you can assign them both into the same dimmer and only plug in one circuit at a time. If you are more ambitious, you can buy, rent, or build a switch box that has two female plugs (one for each light) and one male plug (to go into the dimmer) and a switch to redirect the power from one light to the other.

## THE PAPERWORK

Once you have figured out what lights are going where, you need to create some paperwork so that other people can also know what you are thinking. You will want a light plot, a magic sheet, an instrument schedule, and a channel/dimmer hookup. The Nathan Seifer Rep Plot, posted in the Funky Room and attached to this Guide, provides an excellent example of this paperwork.

The **light plot** is a graphical representation of where the lights will be hung in relation to each other, to the architecture of Nathan Seifer, and to the scenery. Generally, light plots are drafted in 1/2 inch scale, but since Nathan Seifer isn't very complex, you can probably get away with a not-to-scale drawing on a piece of notebook paper, as long as you are running the hang and focus yourself. But you should create the rest of the paperwork properly, since it will save you lots of time later.

The **magic sheet** is almost a miniature version of the light plot. It starts with a ground plan of the stage and set, on which you indicate which lights come from which direction, and what channel controls them. Typically, the magic sheet will have colored arrows indicating the direction and color of the light source, and next to each arrow the number of the channel that controls those lights. If you have a lot of instruments, you may need several copies of the ground plan to show all of your systems. You will find this is your most useful piece of paperwork when it comes time to writing cues.

The **instrument schedule** takes the information from the plot and puts it in text format. It lists the instruments in order by hanging position, and contains information like dimmer, purpose, color, and circuit. You will use this in focusing to quickly tell you which dimmer and circuit you need to turn on and where to focus the light.

The **channel hookup** has the same information as the instrument schedule, but sorted by channel. You will use this to patch your circuits to dimmers before focus, and for dimmer check to see which lights should come on when you turn on a given dimmer.

In Nathan Seifer, the **dimmer hookup** and the channel hookup are the same. In some theaters with more equipment, dimmer and channel refer to different things. The dimmer is the physical device which controls the voltage to a circuit, and the channel is how the light board refers to one or more dimmers.

## THE HANG

Once you have your paperwork in order, you are ready to begin hanging the lights. You will need a crescent wrench and at least one other person, preferably two. Depending on how much you are modifying the Rep Plot (see the Changes section), you might not have much to do. But chances are you are going to have to move at least one light somewhere, or change at least one gel.

You should gather together all of your instruments, gels, and gobos before you start, and check to make sure that everything works on the ground before you hang it. You can do this by "hot patching" the light into a regular outlet that you know is on. It is much easier to fix things before you get up in the air. Put your ladder in place beneath the hanging position. If you are working on the balcony pipe, you can put your ladder about three or four rows back from the front of the balcony, and move it along in that row. If you are working on one of the Front of House side pipes, then you will want to put your ladder in the aisle, just downstage (towards the back of the house) from the pipe. If you are working on one of the onstage side pipes, you will need to put your ladder on the stage at the top of the stairs, and lean in. And if you are using the upstage pipe, just put the ladder on stage, leaning against the back wall.

Rather than climbing the ladder with the light, and coming down for each one, it's easier to hoist them by rope once you are up. Have one person on the ground hold the base of the ladder, and another attach or detach lights from your rope, or **drop line**. If you tie a loop in the end (either using a bowline knot or by doubling the rope back on itself and tying a half-hitch) then you can just run the rope through the yoke and hook it over the c-clamp.

You should turn the square bolt on the c-clamp until it's finger tight on the pipe, then give it a good turn with your crescent wrench. It is not necessary to crank down particularly hard, just enough so it won't slip. As soon as the light is secure, attach the safety cable -- loop it over the pipe and through the yoke. Give the light a rough focus if you can, open the shutters so the light and heat has some place to go when you turn on the light, and put in

your gel and your gobo so they will be there when you are ready to focus. Plug it in to the correct circuit, noting any changes on the paperwork as needed. Then go on to the next unit.

Once you are done hanging and circuiting, go up to the Funky Room and **patch** the circuits into dimmers. There are three dimmer packs, 1-6, 7-12, and 13-18. Above the two packs on the wall are the master **disconnects** for the three packs. You should turn them off before you begin circuiting and patching. Underneath the two packs along the wall are the connectors for all the circuits in the house, in numeric order. It's a relatively simple matter of finding the end of your circuit and plugging it into the dimmer you want. If you need to use any kind of two-fer adapter or extension cord to get your circuit to reach the dimmer, make sure it's rated for 20 amps, which most home products are not. **Be sure not to overload any given dimmer, or any given pack.** Check the section on electrical power before you start patching.

After patching, turn on all three master disconnects. Then send one person to the booth and go down to the stage for **channel check**. Turn on the light board with the switches at the center of the middle vertical panel. Select a preset bank with the X/Y crossfaders near the right of the black fader panel. Then go through and bring up the channels one by one, checking against the channel hookup to ensure that everything comes on in the dimmer it's supposed to. If anything's not working, take a note and move on. Once you are done with the check, go back and fix all of your notes together. The most likely problem is are an incorrect patch. If that's not the case, try the next section, Troubleshooting.

## **TROUBLESHOOTING: WHAT TO DO WHEN A LIGHT DOESN'T WORK**

The first step in troubleshooting a light is to determine if the problem is with the light or the power supply. To do this, you will need a test light of some kind. Depending on where your lights are hung, it can be as simple as cross-plugging a light you know is good into the circuit in question. If the other light comes on, then you know that you have a bad light. In that case, check the lamp. If it is obviously dead, either cloudy gray or you can see that one of the filaments is broken, then change the lamp and check it, but chances are that you have found the problem. If it looks fine, then you may have a bad cap. Look for any loose wires inside. **Never touch exposed wires!** There should be three solid connections: black (hot), white (neutral), and green (ground). The ground may be connected just to the metal on the cap somewhere, but it should be connected to a screw, and the black and white should disappear underneath the porcelain base. You can try wiggling the power cables. **Be sure to only touch insulated cables while you are wiggling -- don't touch the instrument.** If the light comes on intermittently while you wiggle, then you have a loose connection somewhere, and you will need to take it apart, find the culprit, and put it back together again. In the mean time, the easiest solution is to swap out the cap for one that works.

If your test lamp doesn't light either, then you probably have a problem with your power supply. Work backwards through the system until you find the cause, plugging in your test lamp at each stage. You can even plug your test lamp directly into a dimmer. First, check any extension cords you might be using. If they seem good, check to make sure that the circuit you are using is patched into a dimmer, and the breaker on the dimmer is on. Check the light board. Make sure it is plugged in and turned on. Make sure that the grand master is up, and the dimmer is up in the active preset bank. If the dimmer is on at

the board, check to make sure that the master disconnect for the dimmer pack (one of those three big switches) is on, and that the dimmer has a good fuse. If all of this doesn't work, try the circuit in a different dimmer, or try a different circuit. If you have a bad dimmer (even when it's on and getting power and has a good fuse and the breaker is on, it still doesn't work) you should probably call Jim DeVer and ask him to come take a look at it, or he can tell you how to take the single dimmer out and bring it to him for repair. This will take a while, so you pretty much have to treat this dimmer as dead for your show, and move on. If the circuit is bad, check the connectors at both ends. If that is not the case, then you can call the Brandeis Electricians in to check it out, but it is probably not worth it. Just use a different circuit, running an extension cord if you need it. Make sure, though, that the extension cord is rated at 20 amps -- most are not. Anything smaller won't meet code, and you run the risk of an electrical fire.

## FOCUSING

You can either focus by system (a group of lights all doing similar things, like a system of frontlight) or by position. For the designer, it is easier to focus by system, but it's much easier for the technician to focus by position. Because time is usually the most valuable commodity at a focus, the technician generally wins this battle. For focusing, you will need one person to run the light board, one person to go up the ladder, one person to hold the ladder, and it is nice to have one more person to run errands, in addition to yourself.

The designer should stand on stage and direct the person on the ladder. You should stand where you expect the actor to be standing, or at the center of the area for area lights, and ask the focuser to hit you with the light. Then give more precise adjustments based on how the light is hitting you and the scenery. Make sure the light will hit the actor in whatever positions are appropriate, such as sitting, standing, jumping, or lying down. Once you have got the **hot spot** of the light (the center of the beam, where the light is hottest and most concentrated) where you want it, ask the focuser to "lock down" the instrument, which means to tighten all the nuts and bolts so that the unit won't slip out of focus. Then, you can use the shutters to cut the light off of places you don't want it, such as walls or the lip of the stage. If you need a very sharp shutter cut, then you will want a sharp focus, but if you are creating a wash of light (as is generally the case in a system, like frontlight), then you will want it "fuzzed" so the different lights blend evenly. This is adjusted by moving the lens train (also called the barrel) in and out until you get the look you want. It is often easier to pull the gel out of the instrument while you focus, then drop it back in when you are done, especially if you have more than one light in a dimmer.

## WRITING CUES

It is a good idea to get as many cues written during your lighting time in the space, before you go into tech. Things will go more quickly without the distractions of having other people around, and you won't be taking up other people's time. For a cueing session, you will need at least two other people: one to run the light board and one to walk the stage, so you can see how the light looks on a person. Before you start, you should have a master list of the cues you plan to write, including where in the script you want them to take place and what you want them to look like. The scene breakdown and light sketches are a good start for this list. You can later give a copy of the list to the Stage Manager and save time during paper tech, when the Stage Manager sits down with the designers and writes the cues into the prompt script

The light board operator will need a **cue sheet** to write down the channel levels set for each cue and the time of, or speed of fade into, the cue. There is a sample cue sheet at



the end of this section, but it can be anything that has space to write down the level of each channel. Some operators might prefer a cue sheet with smaller spaces and multiple cues per page, but it is probably better to have lots of pages with big print that are easier to read in the dark. It is also easier to make changes if you can just throw away one sheet and start with a blank when you need.

When writing cues, you may want to start with your primary light sources, probably your front light. Then build on this with your other systems, like sidelight and backlight. Many designers work in the opposite manner, setting backlight, downlight, and sidelight to color and sculpt the environment and then adding frontlight last to illuminate faces. Try isolating areas so you only light the parts of the stage that are in use. Try to create a contrast between the lighting in different scenes, in color, angle, or both.

## LIGHTING INSTRUMENT BEAM SPREADS AND COEFFICIENTS

To determine the diameter of the field angle of an instrument at a given distance, multiply the distance by the multiplier. Be sure you are measuring the throw distance, not the distance along the ground from the light to the stage.

Instrument Type	Degree Angle	Multiplier	Diameter at Throw Distance					
			10'	20'	30'	40'	50'	60'
4.5x6.5	69	1.15	11.5'	23'				
6x9	40	.73	7.3'	14.6'	21.9'			
6x12	30	.53	5.3'	10.6'	15.9'			
6x16	20	.44	4.4'	8.8'	13.2'	17.6'	22'	
6x22	12	.20		4'	6'	8'	10'	12'
Source 4	50 deg.	.93	9.3'	18.6'	27.9'	37.2'		
Source 4	36 deg.	.65	6.5'	13'	19.5'	26'		
Source 4	26 deg.	.46	4.6'	9.2'	13.8'	18.4'	23'	
Source 4	19 deg.	.32		6.4'	9.6'	12.8'	16'	19.2'
6" Fresnel								
spot focus	16	.30	3'	6'	9'	12'		
flood focus	52	.90	9'	18'	27'	36'		
PAR-64								
WFL		.50 x .90	5x9'	10x18'	15x27'	20x36'	24x45'	
MFL		.40 x .70	4x7'	8x14'	12x21'	16x28'	20x35'	
NSP		.30 x .50	3x5'	6x10'	9x15'	12x20'	15x25'	18x30'
VNSP		.20 x .40	2x4'	4x8'	6x12'	8x16'	10x20'	12x24'

## BEAM ANGLE VS. FIELD ANGLE

The table above refers to **field angle** and the diameter of the field area. This is generally what is meant when someone is talking about the size of a pool of light, and is defined as the portion of the cone of light where the light intensity is at least 10% of the intensity at the center of the beam. The **beam angle** determines the beam area, where the intensity is at least 50% of maximum. While it depends on the type of lighting instrument, the type of lamp used, and the alignment of the lamp in the reflector, the beam area is generally around two-thirds of the field area.

# TECHNICAL INFORMATION FOR LIGHTING DESIGNERS

## USING THE LIGHT BOARD AND DIMMERS

First, you will need to turn on the system. In the Funky Room there are three main **disconnects** on your left when you walk in the door. There is one disconnect for each of the three dimmer packs; all three need to be on to use all 18 dimmers. Then head for the light board in the booth; you get there through the balcony on the third floor. In the middle of the upright section of the board is the power supply. There's a master switch and four smaller switches. To use the board, you will need to turn on the master and the smaller switch labeled power. The other three switches are for worklights, including a strip of outlets along the back of the board and two outlets on the front that you can use to plug in your running lights.

Once you are powered on, you are ready to start turning on some lights. Nathan Seifer's lightboard is a two-scene manual preset, with an added submaster matrix section. The board can control up to 30 dimmers, but only the last 18 are used, so the board has been renumbered. There are two duplicate banks of channel faders, one above the other. One bank is active, controlling the lights on stage, while you set up the next cue in the other bank. Then you fade between the two banks using the crossfader, rather than having to manually adjust 18 individual faders on the fly. Each channel fader runs from 0 to 10, which corresponds to completely off to fully on, and you can specify any percentage in between simply by adjusting the channel fader up or down.

Above each set of channel faders (one in each preset bank) there is a bump button and an activation switch. If the activation switch is on, pressing the bump button will bring that channel to full, regardless of the channel fader and master controls.

At the right of the black fader section is the grand master and blackout button, which have been disabled. More importantly, the X/Y **crossfaders** are on the right, as well. Above the fader is a switch to specify the operation of the two faders. It's generally easiest to switch the faders to alternate directions, so when both are up the top bank of channel faders is active, and when both are down the bottom bank is in use.

To the right of the main channel section is the VirgoLight MiniMatrix, which adds the useful features of submasters and a basic chase sequence.

## ASSIGNING CHANNELS TO SUBMASTERS

You assign channels to submasters using the Pin Matrix at the top of the MiniMatrix module. There are three matrices, which look like grids of holes, 10 across and 10 down on the module. The pins that go into the matrix are in the flip-up storage compartment at the bottom of the board (the leatherette wrist pad flips up towards you for access).

The individual matrices are not labeled very well in relation to our board configuration. But once you know how to interpret them, they're easy to use. The letters down the side, A-L, correspond to the nine submasters that you will find at the bottom of the MiniMatrix module. But there are only 9 submasters, so L (which is the tenth letter) is not used.

The numbers across the top of the matrices correspond to the thirty channels available on the board. The first matrix's 1-10 correspond to dimmers 1-10, the second's are 11-20, and the third are 21-30. Since we only use the last 18 dimmers, you will want to use this table to patch:

	Center Matrix										Right Matrix									
Labeled	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Actual			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

So, if you wanted to use channel 6 in submaster 4, you'd put a pin at 8,D in the center matrix. Likewise, if you wanted channels 3 and 12 in submaster 2, you'd put a pin at 5,B in the center matrix and 4,B in the right matrix.

How is this useful? Well, now you can turn on channels independently of the standard two-scene preset channel controls. You can use this to create a limited-use third preset for those times when you have got cues really close together.

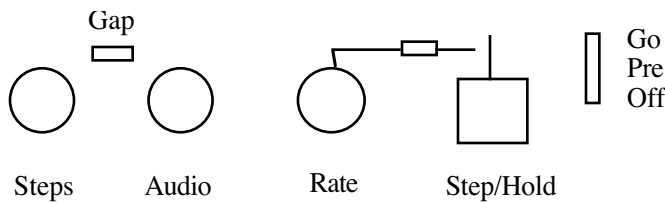
To do this, patch the channels you want into the nine submasters using the pin matrices. Then you can set levels for them using the sliders labeled 1 through 9 at the bottom of the module. You also have a Master and a blackout switch/momentary button at the top left of the module.

You can control the levels of these submasters independently of the two presets to the left. When one channel is given conflicting levels (i.e., at 20% in the active preset and 50% in the submaster, or out in the submaster and 75% in the active preset) the higher level will prevail.

### CREATING A CHASE

In order to 'chase' lights (make them come on in a sequence and speed you determine without having to manually flip faders and wear out your fingers) you need to first assign them to submasters. Figure out in what order you want the lights to go, and then put them in submasters in that order. So if you want a chase in this order: Channels 1,4,6,2,7,9, patch channel 1 into submaster 1, 4 into 2, 6 into 3, 2 into 4, 7 into 5, and 9 into 6.

Between the pin matrices and the submaster level controls, there is a bank of 3 knobs and some switches.



You determine the speed of the chase by pulling out the knob labeled 'rate' and turning it until you find the speed you like. Turning it clockwise will speed it up. If you are in 'pre' or 'go' mode, you will see the lights over the submasters flash at the rate your chase will be running. Use the 'steps' knob to specify how many submasters you are using. If the 'gap' switch is on, there will be a brief pause between the time that one submaster goes off and the next goes on. Otherwise, one will come on just as the one before it goes off.

If the switch between the rate knob and the step button is flipped towards step, then the chase will not advance automatically. Each press of the button will advance the chase

one step. If you flip it back towards the rate knob, then it will once again run at the determined speed.

## TYPES OF LIGHTING INSTRUMENTS, AND THEIR USES

In Nathan Seifer, there are three basic kinds of lighting instruments (a.k.a. lights): **Ellipsoidal Reflector Spotlights** (ERS, more commonly known as **Lekos**), **Fresnels** (pronounced fer-nell or fra-nell), and **PAR-64's** (also known as Par Cans). Each has different characteristics and different uses. Generally, you will want to use Lekos for frontlight and sidelight, fresnels for down and possibly backlight, and PARs for side, back, and downlight.

Nathan Seifer's inventory was updated in 1996 with the purchase of 14 **Source Four** ERS's, made by ETC. The Source Four is the next generation of Leko, with many refinements and added features. But despite the changes, the Source Four and the Leko both perform the same function.

For the curious, here's a bit of lighting history and etymology. Lekos are named for Lee and Kohen, who designed the original Lekolight for a company named Strand. Technically, Strand still owns the name Leko, and any instrument not made by them cannot be called a Leko. But most people use the term Leko to refer to any ERS. Fresnels are named for Auguste Fresnel, a Frenchman who created the original fresnel lens for use in lighthouses. PAR stands for Parabolic Aluminized Reflector, which describes the lamp. Unlike Lekos and Fresnels, where the reflector is part of the unit and you only change the lamp (aka light bulb), the PAR lamp and reflector are combined in a single lamp. This makes PAR lamps more expensive, but the instrument body is much less expensive. PAR bodies are really just a metal container for the lamp, hence the name "PAR can."

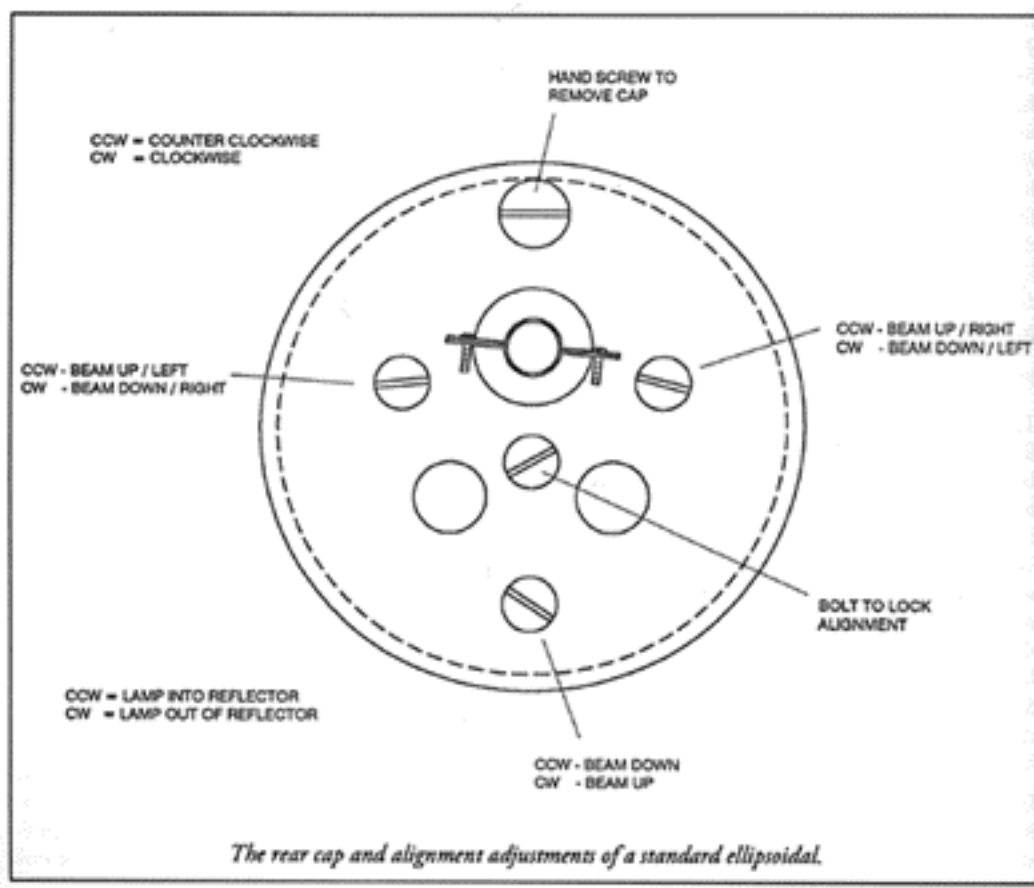
A Leko gives you the most control over the beam of light, followed by the fresnel, and then the PAR. A Leko gives a crisp, even light in a clearly-defined pool, with an easily refined shape, and the possibility of adding patterns to the light. A fresnel gives a more diffuse light, adjustable in intensity and diameter and easy to blend with other units, and can cover a larger area but with less control. A PAR gives a very distinctive light, sharp and piercing, originally designed for rock concerts, which can be used to add "punch" to a look, but with much less control.

## HOW THE DIFFERENT LIGHTS WORK: LEKOS

All ERS units (both original Lekos and newer Source Fours) have the same basic components. A lamp, that sits near the back of the unit, an ellipsoidal reflector surrounding the back and sides of the lamp which gathers the light and redirects it forward, and a dual lens assembly which focuses all of the light into a clearly-defined beam. Most units (including all those in Nathan Seifer) allow you to adjust the beam in several ways. There are four **shutters**, which come between the lamp and the lenses, which can cut into the beam of light to adjust it to fit your scenery. Because the shutters come before the lenses, which reverse the beam of light, the left shutter will control the right cut, the top shutter will control the bottom cut, and so on. You can also insert a pattern, or **gobo**, just before the shutters. To use a gobo, you will need a gobo (or pattern or template) holder. There are no pattern holders in Nathan Seifer, so you will need to rent them or convince the UTC to buy them (which is not a bad idea). Like the shutters that work backwards, gobos go in upside down and backwards of the intended image projection. There are a wide variety of gobos available from manufacturers like Rosco, GAM, and Theater Magic, or you can make your own.

Gobos are generally used to add texture to your light, or to project a specific image like a cloud or a skyline. You can adjust the sharpness of the beam of light, and also of the pattern if you have one, by moving the lens train closer or farther from the light source. You do this by loosening the screw on the top of the barrel (on the bottom of the barrel on a Source Four) near the lens end of the unit, and sliding the lens train in or out. At the front of the lens train is a position for framed **gels**, also known as color.

If the light from the unit is not even or of poor quality, you may need to **bench focus** the unit. Old-style Lekos bench focus differently from Source Fours, but the concept is still the same. You adjust the position of the lamp in the reflector by tweaking the angle of the plate in the cap to which the lamp is attached. On a Source Four, there are two knobs on the back of the cap, one inset in the other, which adjust the angle of the plate. On an older Leko, there are three screws on the back of the cap which thread through the plate. There is a fourth screw in the center which pushes against the back of the plate, keeping it tight. You will need to loosen this screw a little before you can use the three outer screw to adjust the position in the lamp.



If you are getting lots of random light outside of the intended pool of light, you can put a **top hat** in the gel-frame holder. This will cut down on the spurious beams of light that are not focused through the lens into the desired area.

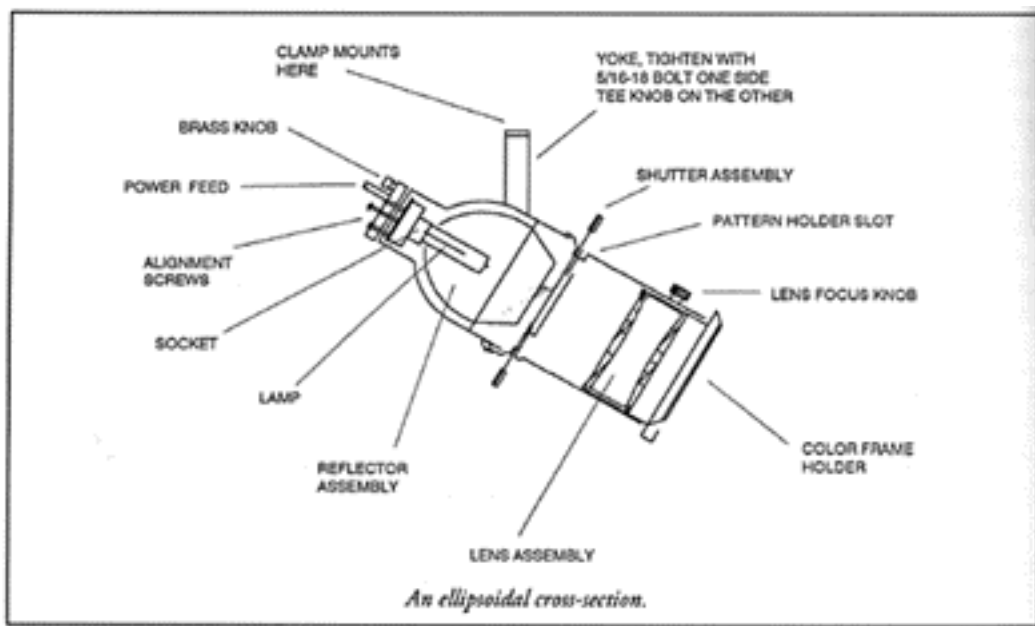
ERS's come in several varieties, mostly adjusting the degree of the angle of light that the unit emits (basically, the size of the pool of light made by the unit). In general, you pick the light based on the distance from your hanging position to the spot you are trying to light. Most of the old-style Lekos in Nathan Seifer are 6x9's, with a couple of 6x12's

thrown in. The Source Fours are 19 and 26 degree units. You can use the chart at the end of this section for easy reference when you are choosing instruments for your plot.

Source Fours offer several advances over traditional Lekos. For one, they use a 575 watt lamp, but give off as much light as an older unit with a 1 kW lamp. This, along with a design that directs most of the heat out the back of the unit instead of through the shutter gate, means that the lights run much cooler. This is especially useful during focusing, and also means that gobos and gels last much longer. Source Fours also feature a rotating barrel, including the shutters and gobos. This comes in handy when you are trying to match a shutter cut to a piece of scenery or if you are using a gobo and your light isn't hung perfectly straight. And one of the greatest features of the Source Four is that the lens trains are interchangeable between instrument sizes. So if you have a 26 degree unit hung where you need a 19 degree, you can just swap the lenses instead of the entire unit. Be sure that the lens train is properly seated and securely screwed in after you swap.

**Lamp Replacement in Lekos** is fairly straightforward. **First, unplug the light.** Then remove the cap on the back of the unit by unscrewing the brass thumb-screw. Once it's loose, gently pull the cap straight out the back. Then you can remove the lamp from the cap either by pulling straight out (if it's a rectangular porcelain base and the cap was straight out the back) or by pushing in and turning like a child-proof bottle cap (if it's a round porcelain base and the cap came off the unit on an angle). Once the lamp is out, you can replace it with one of the same kind, being careful not to touch the glass (it's actually quartz) with your bare hands. If oil from your fingers gets on the lamp, it can burn and cause the lamp to burst.

The ERS's in Nathan Seifer can take several types of lamp. If the cap comes straight out the back, it's known as an axial unit, and will take either an EHG (750 W) or FEL (1kW) lamp. If the cap comes out at an angle, it takes an EGG (750 W) lamp. The Source Fours all take HPL (575 W) lamps. Like household light bulbs, theatrical lamps are marked with their code and wattage, either on the top of the quartz lamp or on the porcelain base.

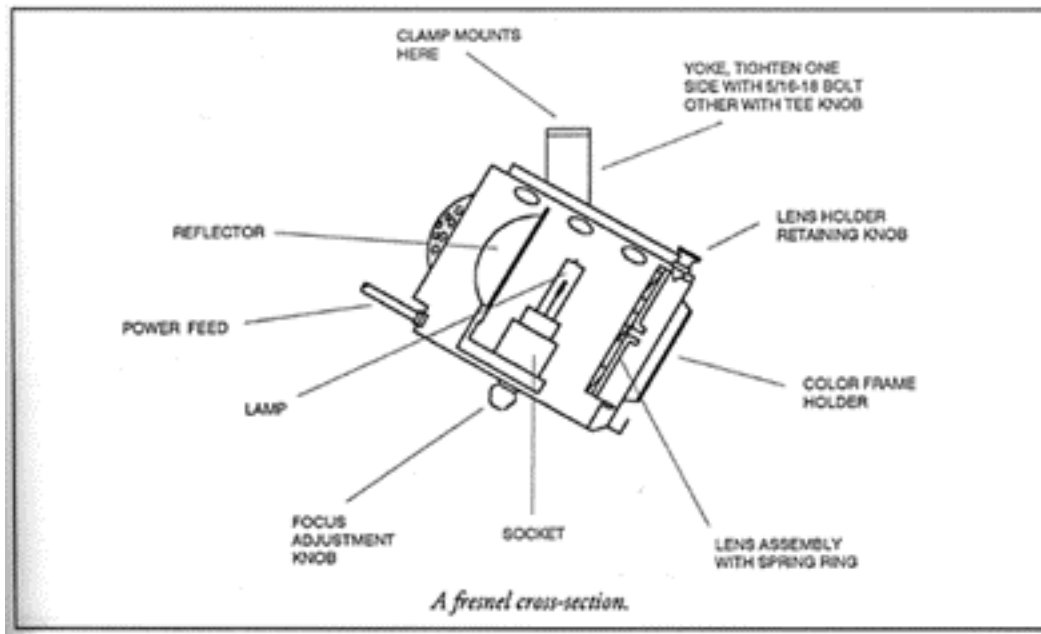


## HOW THE DIFFERENT LIGHTS WORK: FRESNELS

Fresnels are much simpler than Lekos. They have a lamp in a reflector and a single lens with a gel-frame holder mounted on the front. You can adjust the position of the lamp/reflector assembly forward or backwards in the unit to control the size of the field of light output by the unit. This is known as changing the focus from "spot" to "flood".

If you need more control over where the light from a fresnel is hitting, you can mount **barndoors** in the gel-frame holder. Barndoors can block some of the light coming out of the unit, but they are not as effective nor as precise as shutters in a Leko.

**Lamp Replacement in Fresnels** is a simple matter of opening the front of the unit and reaching in. **Always unplug the unit before changing the lamp.** On the top of the unit at the front there is generally a screw or spring-loaded knob that, when released, allows the lens to swing down on a bottom hinge. Most fresnel lamps have the push-and-twist style of bases described in the Leko section.



## HOW THE DIFFERENT LIGHTS WORK: PARS

PARs are the simplest of the lights in Nathan Seifer, with just a lamp in a housing. The housing itself is trivial, basically just a can that holds the lamp and projects only the properly focused beams of light, much in the same way that a top hat works on a Leko. The PAR lamp contains the reflector in a sealed assembly, and in the same way that Lekos come in different sizes, PAR lamps are available in Wide Flood, Medium Flood, Narrow Spot, and Very Narrow Spot.

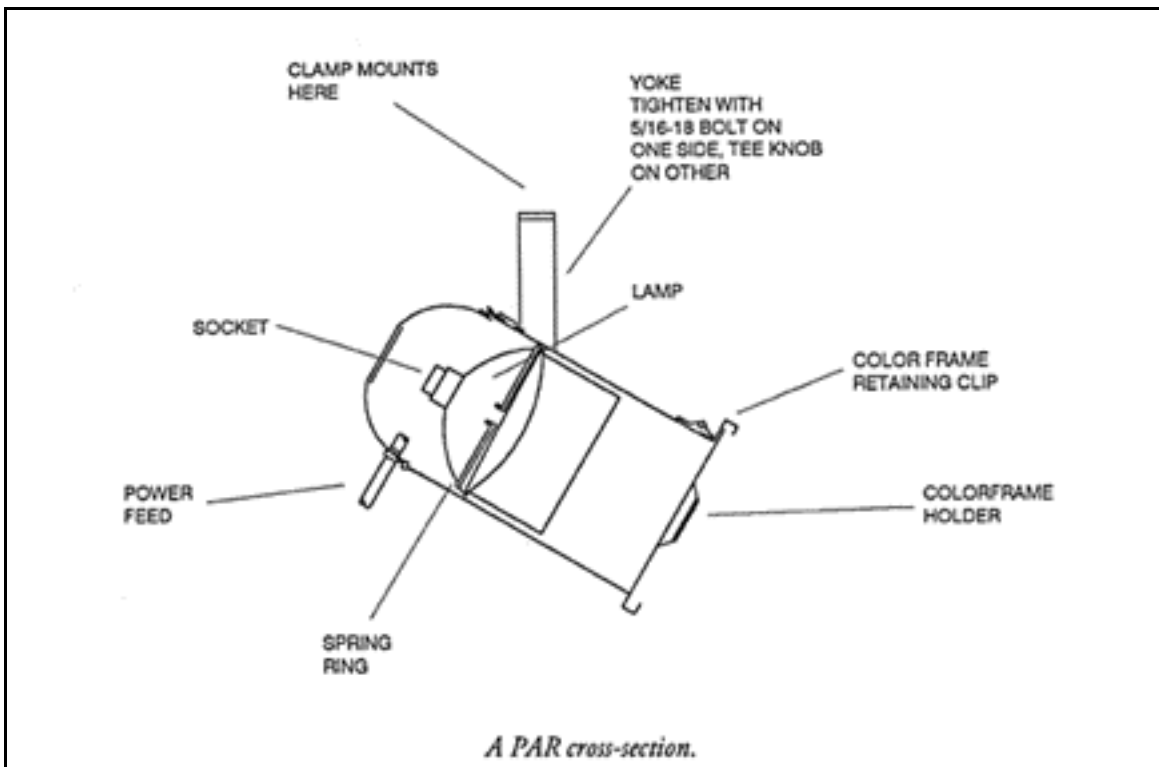
Unlike Lekos and fresnels, where the lamp is in a single point in the reflector (at least in the plane of the lens), the PAR lamp has a filament that extends lengthwise in the reflector. This gives the PAR an elliptical instead of circular beam of light. Thus, where Lekos and fresnels can be described in terms of a beam angle and a diameter of the light field, PAR fields are dimensioned along two axis. The long dimension of the pool of light



is in the same orientation as the "**bottle**", the rectangular bulge on the back of the PAR lamp where it connects with the power cords.

PARs can also take barndoors in the same way that fresnels can, for the same types of uses.

**Lamp Replacement in PARs** is as simple undoing a little clip on the top of the back of the unit. **Always unplug the unit before changing the lamp.** Once it's open, unplug the lamp from the ceramic base where the power cords connect. It is probably a little stiff, so be firm but gentle. There is a spring ring holding in the lamp. Squeeze the open ends together, and pull it out. Then the lamp should just slide out. It is also possible to swap lamps among PAR cans if you need a different beam spread, just as you can change lens assemblies in Source Fours.



*(All images in this section are from Stage Lighting Revealed by Glen Cunningham.)*

## GELS

Gels are a very subjective issue. You should discuss your choices with the Director and the other designers to make sure that your colors will work with their colors. But even once you have picked a range of colors, you still have a very wide selection of shades to choose from.

There is a limited supply of poorly sorted gel in the Funky Room. If you are on a tight budget, you may want to consider basing your color choices on what is available in the pile. If you can't find what you want, or not enough of what you want, you can buy new gel from any of the supply houses listed in the appendix. You should use a **gel book** (a little book with small pieces of every color of gel made by a particular manufacturer) to make your selection. Rosco and GAM are the two major gel makers. If even then you cannot find the color you want, you can experiment with mixing two gels to create a new color. At the end of this section I have included a chart from Glen Cunningham's *Stage Lighting Revealed* that lists most of the gel colors available and their equivalents from other manufacturers as well as suggestions for how the colors might be used.

The gel will come in 24" by 36" sheets, which you will then need to cut into pieces to fit your instruments. There are three sizes of gels used in Nathan Seifer. Source Fours take gels 6" on a side, PARs take gels 12" on a side, and Lekos and fresnels take gel 7.5" on a side. You can get 6 7.5" cuts, 4 12" cuts, or 12 6" cuts from a sheet of gel. The easiest way to cut a sheet of gel is with a paper cutter. If you ask nicely, you may be able to use the paper cutter in Electrics in Spingold. If not, or if your schedule doesn't allow this option, you can use scissors or a gel cutter (basically a razor in a cardboard holder), available at your lighting supply house. You should mark cutting lines your gel sheet, and mark each cut piece with the color number. A white grease pencil or china marker works very well for this.

Once your gel is cut, you will need to frame it. Gel goes in metal **color frames** to give it the rigidity it needs to stay in place in the slots on the front of each lighting unit. In that place, though, it is very close to the heat of the light, and has the potential to burn out or fade. When a gel burns out, you will need to replace it with a fresh piece.

## BASIC ELECTRICAL CONCEPTS

There are three basic terms you need to understand to converse about electricity: **amps**, **watts**, and **volts**.

**Amp** is the measure of amperage, also known as current. Specifically, amperage refers to the rate that electricity (electrons) is moving through the cable. Generally, the thicker the cable, the higher the amp rating. On a related note, the higher the amp rating of a cable, the lower the **gauge** of the cable. Any cable used to circuit a light in Nathan Seifer should be rated at 12 gauge or lower, giving it a capacity of at least 25 amps. Most household extension cords and power strips and cube taps (outlet "splitters") are rated at only 15 amps, which is too small to safely use in theatrical lighting.

**Watt** is the measure of total power used. It is generally easiest to think about electrical usage in terms of wattage, since that's a term familiar to anyone who's ever changed a light bulb.

**Volt** is the measure of voltage, which has to do with electrical charge. Basically, it's the difference in electrical potential between the most positive point of a circuit (the hot) and the most negative point (the ground or neutral). In Nathan Seifer, as in most places in the United States, the standard voltage is between 115 and 120 volts.

So what? Well, if you know the amperage of a circuit, and you know the voltage (which you do -- it works fine if you just treat the voltage as always being 120), then you can figure out the maximum wattage you can run on a circuit. Remember the West Virginia formula: **W=VxA**. Watts equals Volts times Amps. So if you've got a 20 amp circuit running at 120 volts, you can put 2400 watts on it.

Note that if you're running a dimmer at less than 100%, the wattage (and thus amperage) drawn will be lower.

A Source Four uses a 575 watt lamp (light bulb).

A 6" Fresnel generally uses a 500 watt lamp, an 8" uses either a 750 W or 1000 W (sometimes abbreviated 1 kW, for kilowatt) lamp.

A standard ellipsoidal (Leko) can have anything from 500 W to 1000 W, but we generally use 750 watt lamps in them in Nathan Seifer.

A PAR 64 can also run from 500 W to 1 kW, but we generally use 1kW in Seifer.

# APPENDIX B: SUGGESTED READING

*Backstage Handbook* (Third Edition) by Paul Carter. © 1994. Broadway Press:  
Shelter Island, NY. 800-869-6372

*Theatrical Design and Production* (Second Edition) by J. Michael Gillette.  
©1992. Mayfield Publishing Company: Mountain View, California.

*Stage Lighting Revealed: A Design and Execution Handbook.* by Glen  
Cunningham. ©1993. Betterway Books: Cincinnati, Ohio. 800-289-0963

*Sound and Music for the Theatre: The Art and Technique of Design* by Deena  
Kaye and James LeBrecht. ©1992. Back Stage Books: New York, NY.

*Sound Design in the Theatre* by John L. Bracewell. ©1993. Prentice-Hall:  
Englewood Cliffs, NJ.

*Sound for the Stage: A Technical Handbook* by Patrick M. Finelli. ©1989. Drama  
Book Publishers: NY, NY.

*The Stage Management Handbook* by Daniel A. Ionazzi. ©1992. Betterway  
Publications: White Hall, VA. 804-823-5561

*Stagecraft: A Handbook for Organization, Construction, and Management* by  
David Welker. ©1987. Allyn and Bacon, Inc. Newton, MA.