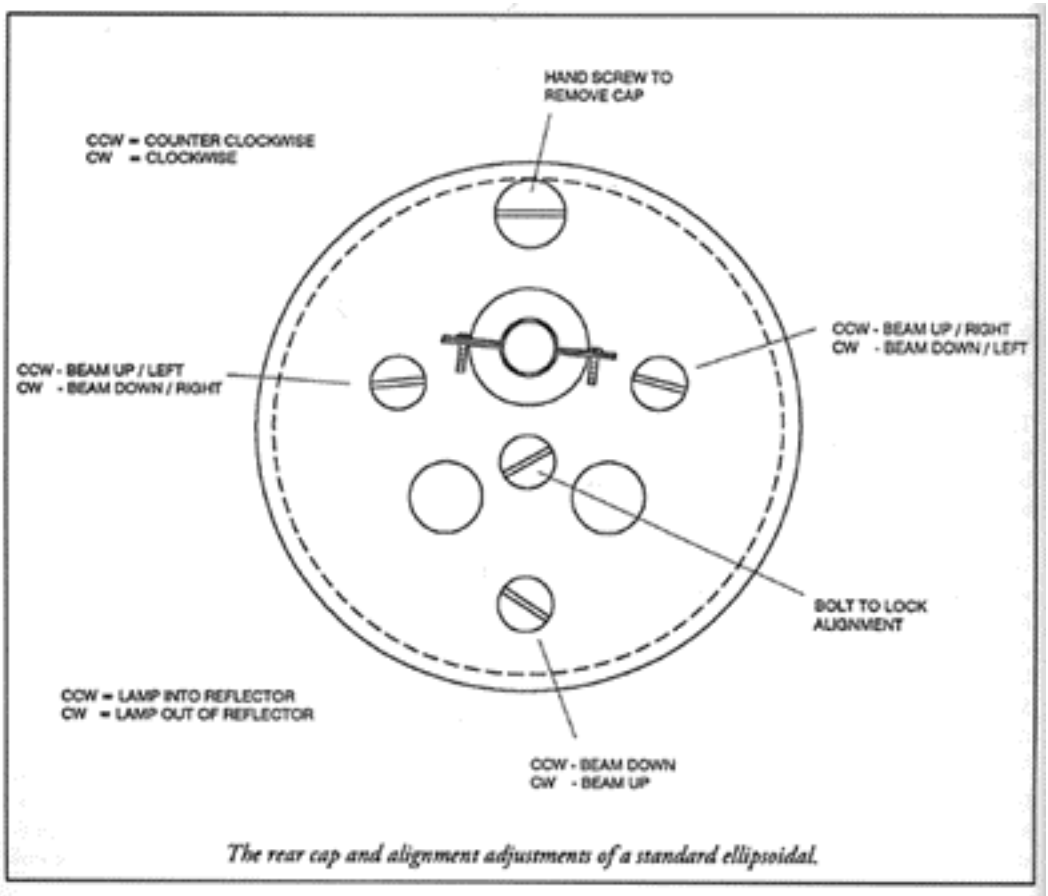
Gobos are generally used to add texture to your light, or to project a specific image like a cloud or a skyline. You can adjust the sharpness of the beam of light, and also of the pattern if you have one, by moving the lens train closer or farther from the light source. You do this by loosening the screw 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.



The rear cap and alignment adjustments of a standard ellipsoidal.

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.

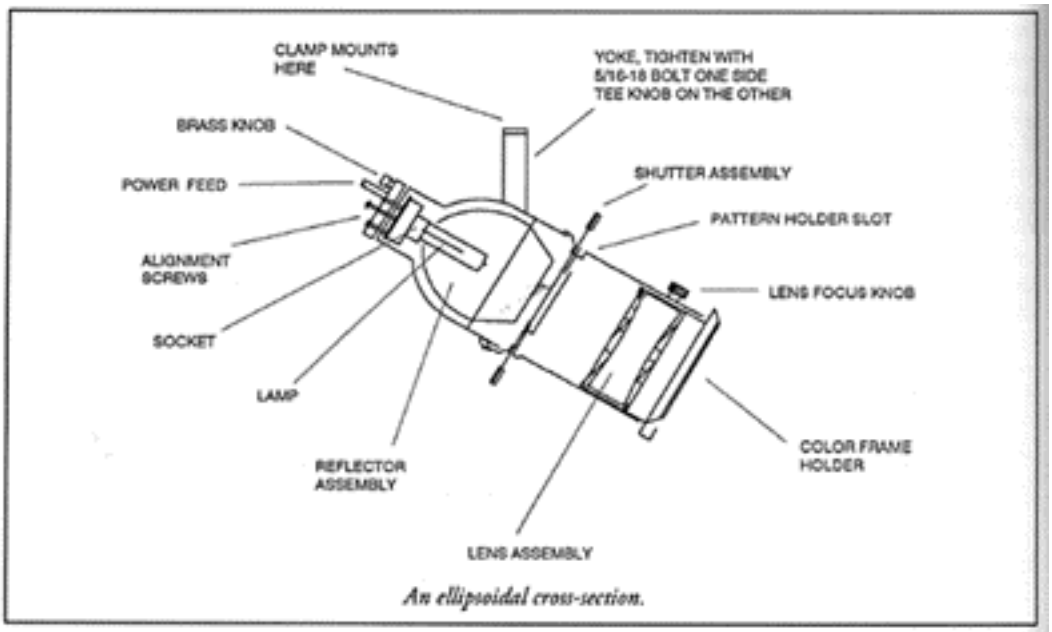
ERS's come in several varieties, mostly adjusting the degree of the angle of light that the unit emits (basically, the size of the pool of light made by the unit). In general, you pick the light based on the distance from your hanging position to the spot you are trying to light. Most of the old-style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



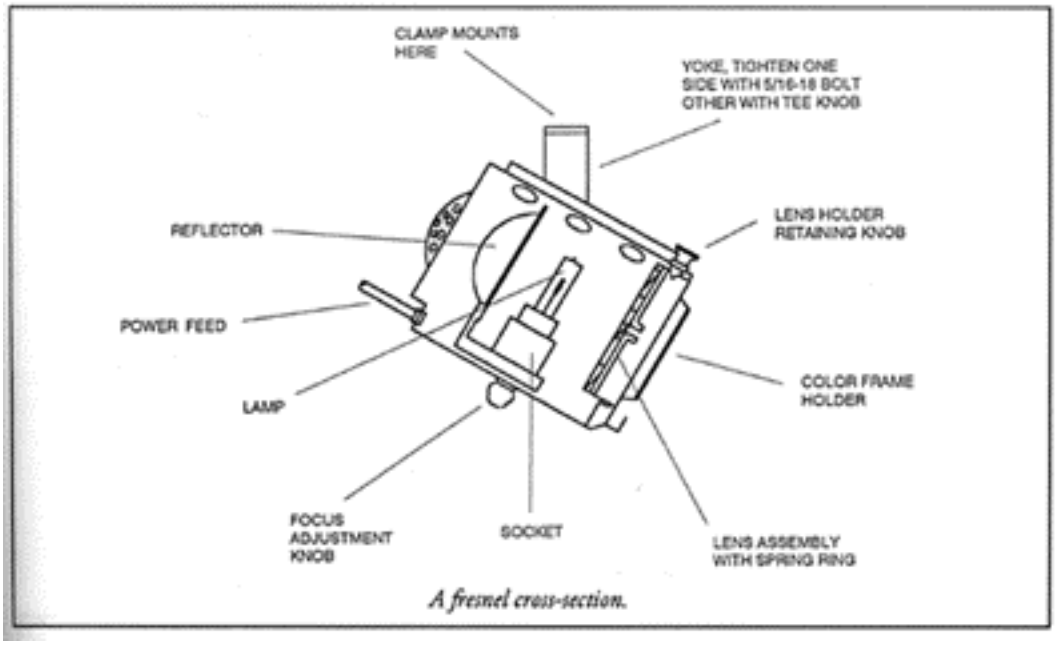
An ellipsoidal cross-section.

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.



A fresnel cross-section.

HOW THE DIFFERENT LIGHTS WORK: PARS

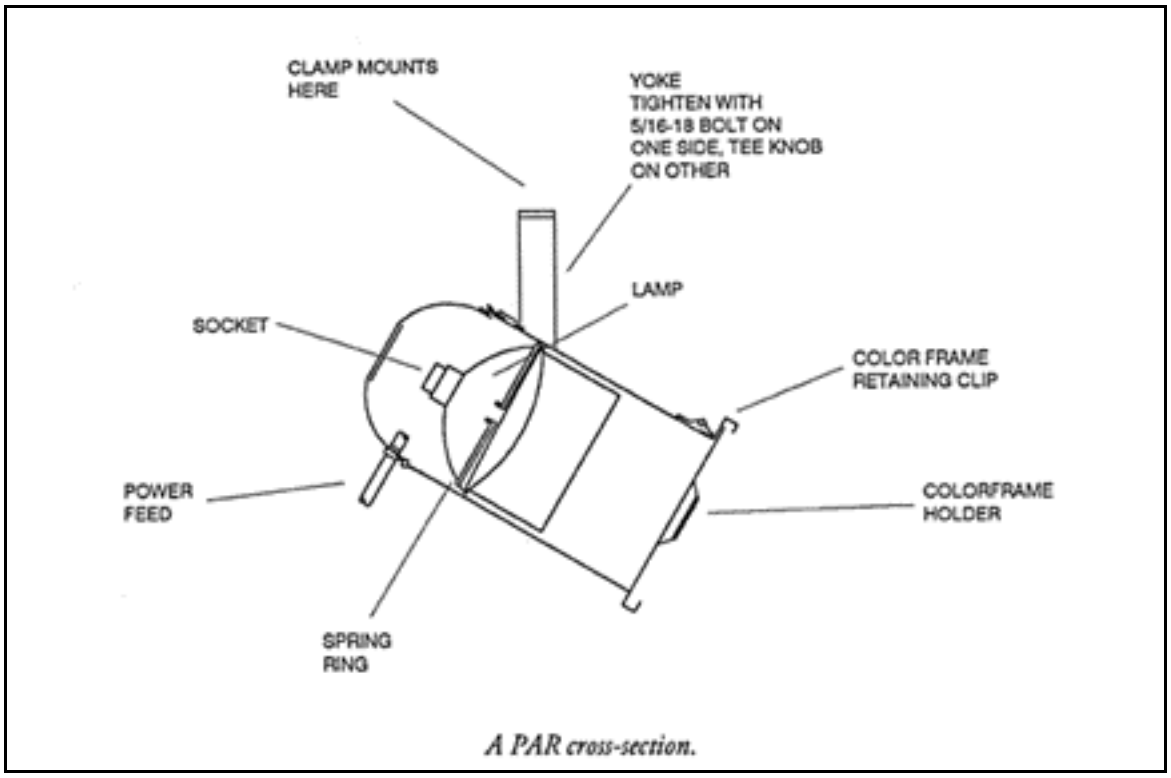
PARs are the simplest of the lights in Nathan Seifer, with just a lamp in a housing. The housing itself is trivial, basically just a can that holds the lamp and projects only the properly focused beams of light, much in the same way that a top hat works on a Leko. The PAR lamp contains the reflector 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.



A PAR cross-section.

(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.

(Insert Gel Lists Here)

(Insert Gel Lists Here)

(Insert Gel Lists Here)

(Insert Gel Lists Here)

NATHAN SEIFER'S POWER SYSTEM

As a designer or electrician working in Nathan Seifer, you need to be aware of quite a few things, mostly relating to the fact that there is not enough electrical power coming into the theater for all of the equipment we have. As you're planning your dimmer hookup, you need to be careful how you divide your electrical load across the dimmers.

Nathan Seifer has 18 dimmers, each rated at 25 amps. (If you don't understand about amps, please read the section below on basic electricity.) They are divided up into 3 dimmer-packs, and further divided into groups of three in each pack for the purposes of power distribution. So we have six legs of power coming into these dimmer packs, effectively dividing the dimmers into six groups of three (Dimmers 1-3, 4-6, 7-9, 10-12, 13-15, and 16-18).

Each of these groups should be getting 75 amps, which would then be divided into 25 amps for each dimmer in the group. Unfortunately, since there is not enough power drawn into the Funky Room, each dimmer group is only receiving 50 amps.

What does this mean? It means that just because the dimmers are rated at 25 amps, you can't put 25 amps worth of lighting on every dimmer. You need to weigh your electrical usage against the power supply to the dimmer groups. If you were to fully load all three dimmers in any one group, you would be drawing more power than the building power supply could handle, and you'd start blowing circuits, some of which you could reset, others which would require a Brandeis Electrician to come fix.

That's not the only thing you need to worry about. Even though the dimmers are rated at 25 amps, the edison plugs (the standard plugs that are used just about everywhere, including Seifer but not most theaters) are only rated for 20 amps.

Those are your limits on dimmers -- 20 amps per dimmer, 50 amps per group of three dimmers. To be truly safe, you shouldn't put more than 16 amps (1900 watts) on any dimmer. But if you plan out your dimmer usage carefully, you can load more than 50 amps into the group, up to 20 amps per dimmer, as long as you don't draw more than 50 amps at any one time.

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.

Sound Design in Nathan Seifer

Sound is a field that is just now beginning to come into acceptance as a serious design element in the theater. Few directors fully understand its potential to influence the audience's perception of a production. But a carefully crafted sound design can offer a show elements that no other design medium can approach. In some productions, the silences can be just as powerful as the sound.

This guide will focus more on the technical aspects of producing a sound design than on the artistic. If you are taking on the daunting task of creating a complete sound design, I highly recommend seeking out Professor David Wilson in Spingold. He has been working in Sound Design at Brandeis since 1984, and is very talented. He offers an undergraduate class in Sound Design, and if you have the chance to work with him on a show in Spingold, you shouldn't pass it up. Professor Wilson can also recommend some good reading on the subject, including one of the books used in his class, *Sound and Music for the Theater* by Deena Kaye and James LeBrecht.

Sound in the theater can take many forms for many tasks. It may be as simple as pre- and post-show music for the audience's entertainment and to set the mood for the show. Or it may be as complex as an original composition to underscore the entire performance. It can also include live and recorded effects to motivate action and to set the scene. And it may include using microphones and voice processors to affect the sound of an actor's voice.

Just like a Lighting Designer, a Sound Designer must start by reading the script several times and developing an emotional response and a design concept. This concept, along with your meetings and discussions with the Director and other designers, will form the framework on which you will build your sound design.

In reading the script, you should look for textual clues indicating what sound effects are called for in the show. You are in no way bound to these cues, but they can provide an excellent starting point. Look not only for cues in the stage directions, but also in the actors' lines. For example, if an actor enters from the garage, it would be logical to consider including a recording of a car parking in a garage.

You may also want to include music to underscore a scene, or to mask a scene change. Most shows will also call for preshow music and sometimes curtain call and exit music.

Assemble this list of cues into a preliminary **sound plot**, including the page number, the effect you are considering, and any notes you might want about the action on stage or other motivation for the cue. Eventually, this plot will grow to include cue letter, page number, cue name, description, playback source and track, duration, speaker used, level, and fade time. Most of this information will not be available until much closer to the production, so just start with the essential information that you will need to begin assembling your music and effects sources.

BUILDING A SHOW DISC

Once you have a list of what cues you will need in the show, you are ready to start putting together a show disc. Put simply, a show disc (or discs) is a MiniDisc containing all of the cues used in a production. The first step in assembling a show disc is picking out sources. If you are including music, either preshow or in scene changes or even underscoring, you should spend time in the various libraries in the area, especially the Waltham Library, listening to recorded music. Bring a portable CD player to the library and just pick out discs at random. You can also use the Brandeis library computer system (LOUIS) to connect to the Boston Library System and Minuteman (suburban Boston-area libraries) to search for different kinds of music. If you are using recorded effects, look in the BBC sound effects library in the Brandeis library. You might also want to contact the Special Productions Director at WBRS and ask to use their collection.

As you are picking out recorded effects, try to create the story behind each cue. If you need a recording of a car horn, decide what kind of car is honking. Is it in traffic? Are there several horns? Is it honking to get the attention of a pedestrian, or because another car just swerved into its lane? If you need a bird chirping, what kind of bird is it? Answering these kinds of questions can make the difference between just some sound effects and an integrated sound score for the show.

Using the preliminary sound plot, you will need to make choices about which playback deck (MiniDisc or cassette) each cue will be recorded on. Generally, it is better to use the MiniDisc whenever possible. There may be times, however, when two cues are very close together or you want to crossfade from one cue to another, and the operator needs to be able to set up one cue while the previous cue is still playing. In that case, one cue will need to be on the cassette deck (or another MiniDisc, if you have one available). You may also want to put long cues, such as preshow music, on cassette to conserve space on your MiniDisc. This will allow you to avoid changing discs in the middle of the show, eliminating one potential problem and making the job of the sound operator much easier.

It is a very good idea to make backup copies of all MiniDiscs and cassettes that are used in the production, in case something happens to the originals. Especially with MiniDiscs, if the playback machine overheats or otherwise malfunctions, it is not uncommon for the disc in the machine to be damaged and become unreadable.

WRITING CUES AT TECH

Unlike the Lighting Designer, who must wait until the lights are focused onstage before he or she can write cues, most of the Sound Designer's work is done long before the show enters tech. Decisions like which speakers to use for what cue have already been made, and all that remains to do is to set the level at which the cue will run through the sound system.

Before tech, you should give your sound board Operator a list of cues including the cue letter, the source deck, the track number, the speaker assignment (remember, you can assign a cue to only one speaker, or both), and a brief description of the cue. Sound cues are generally referred to by cue letter instead of number to differentiate them from lighting cues and avoid confusion. If you need more than 26 cues, use double and then triple letters. You may also wish to skip some letters, such as I (which can easily look like a 1) or N (which often sounds like M).

During dry tech you will set the levels at which the cue will play during the show, as well as the speed of the fade into or out of the cue, if needed. Make sure that the ventilation system is off while you are setting levels, unless it will be on for performances, in which case you should have it on while setting cues. The operator will combine this information with the paperwork you gave him before to create a sound cue sheet for the production.

You will find at the end of this section a sample cue sheet. I recommend using colored pens or highlighters to mark the different input devices. For example, all cues that run on the MiniDisc could be marked in red, while all cues on cassette are marked in green and all cues with the backstage mic are marked in blue.

You will probably find that the levels you set during tech are too low once the show begins performing for an audience. This is due to the acoustical properties of human beings -- they absorb sound. It is a good idea to try to compensate for this by setting levels just a little bit higher during tech.