

# Stage Lighting, an Overview

Lighting is one of the fundamentals of the theatre. Without it, an audience can not see the performers. With it, it can suggest mood, emotion, and location. **This lighting manual will cover 5 Areas: Safety, Equipment, Procedures, Reference and Terms & Definitions.**

## Section 1: Safety

As with any aspect of operations in the Auditorium, safety comes first. Because lighting deals with electricity, safety is very important. Technicians should be familiar with the following sets of safety rules.

### General Electrician Safety Rules

1. No lighting instrument (light) will be hung without a safety chain.
2. No lighting instrument will be left with the clamps and locks “finger tight.” All instruments will be tightened down with a crescent wrench or Altman wrench.
3. Never put a Non-dimmable device on a dimmer.
4. Always unplug an instrument when changing lamps.
5. Always make sure that you are secure when on ladders or man lifts.
6. Do not use any cable or instrumentation where bare wiring visible in the cable run or the power cable.
7. Do not use a cable or instrument that appears damaged in any way.

### Safety & Light Sources

A good electrician follows several simple rules when working with the various light sources found in the theatre:

1. Always unplug a lighting instrument before replacing a bad lamp.
2. Lamps are expensive, so be sure to treat them with care.
3. Unshielded arc light is bright enough to blind anyone looking directly at its source. A warning to contact lens wearers: An unshielded arc flash has been known to weld the lens (Plastic type) to the cornea, resulting in blindness.
4. Keep your fingers off quartz bulbs. In fact, keep them off all bulbs.
5. The envelope (glass) of a burning lamp gets too hot to handle even with the best of gloves.
6. Avoid impacts or hard shocks on a light when it is on. The impact can easily break a hot filament.

## Section 2: Equipment

## Tools

When working on lights, there are several tools that will come in handy.

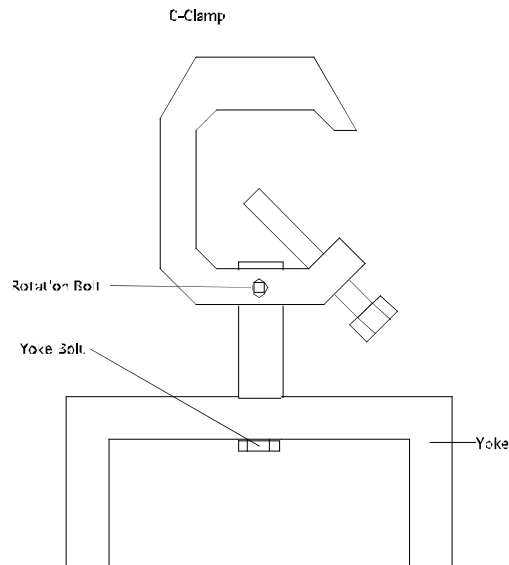
**Crescent Wrench.** An 8” Crescent wrench is easily the most useful tool in lighting. It is needed to attach lights to battens and other points, and is also needed for adjusting the light. It is a good idea to have a length of string or line tied to the end of a wrench, and then tied to your belt. Make sure that it is long enough that you can use the wrench comfortably. This line is used to prevent the wrench from falling if you are at a tall height when working.

**Altman Wrench.** An Altman Wrench is available from most theatrical supply houses. It comes pre-cut and shaped to quickly lock onto the many bolts and parts of a light.

## Hanging Equipment

Every light has hardware that is attached to it, that secures it to battens or other points.

The C-Clamp Assembly Includes:



**C-Clamp** The C-Clamp is used to tighten the light to whatever point it needs to be attached to. The bolt should never be “finger tight” when a technician leaves the light. It should be tightened down with a wrench. The **Rotation Bolt** is used to lock a light at a rotated angle from the C-Clamp. The Rotation Bolt can be snapped off VERY easily. Do not over tighten the rotation bolt. The **Yoke Bolt** connects the C-Clamp to the Yoke. This Bolt should NOT be loosened to rotate the light. The Rotation Bolt should be used for that. If the Yoke Bolt is loosened, the C-Clamp could separate from the Yoke, and the light could drop.

## Lighting Instruments

**Ellipsoidal Spotlight.** Ellipsoidal Spotlights are named for the reflector that surround the lamp. The elliptical shape reflects and focuses the light through the lens chain to shine a beam of light. They are also known as Ellipses and Lekos. The Ellipsoidals we

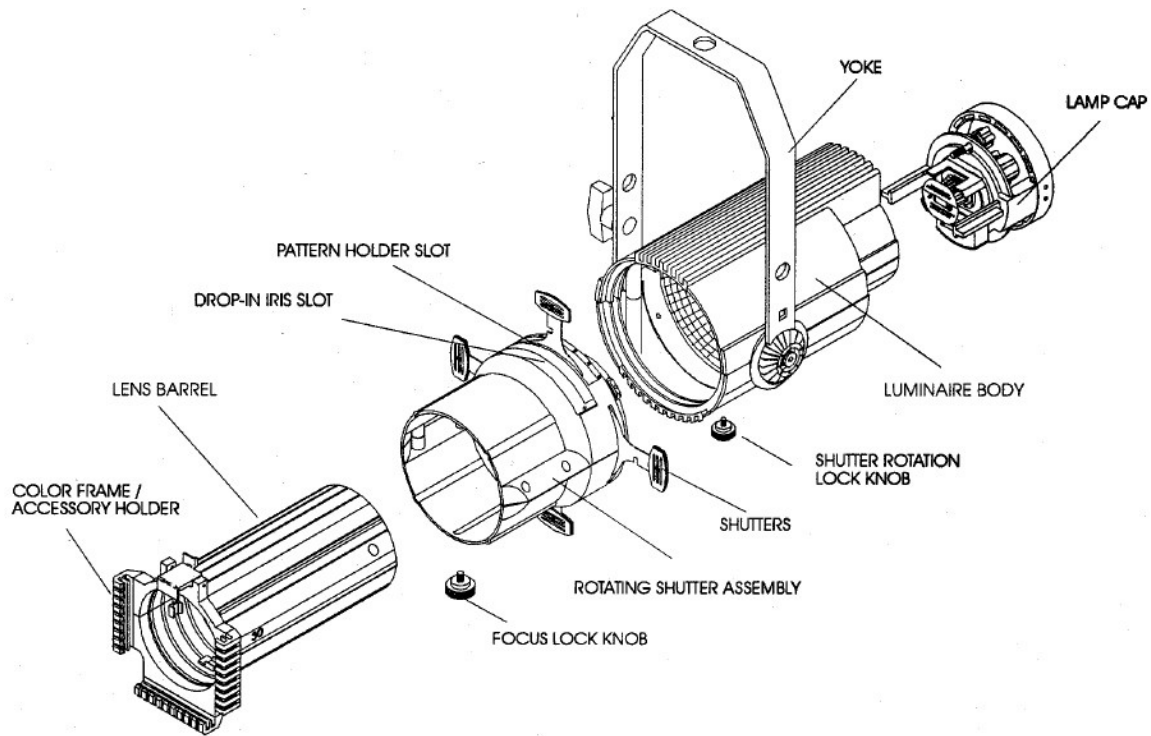
are using are manufactured by the Altman Lighting company, and are the Shakespeare 600 Series. Ellipsoidals in Auditorium come in 3 kinds.



**Altman Shakespeare S6-20 thru S6-50.** A Standard Ellipses have three sets of lens chains. These are marked with 20°, 30°, 40° and a 50° label on the lens barrel. This number related to the angle of the beam that emerges from the lens. These lights have a static lens chain. The lenses are seated in a tube that moves back and forth for focus. To change out the lens tube on an Ellipsoidal, unscrew the lens tube screw, and press the retaining clip in as the tube slides forward.

The different lens tubes give a wider beam of light at different distances. We use the following lens tubes in at these positions through the Auditorium.

- 20° - Front of House 1, focused upstage of the pit.
- 30° - Stage Left and Right Caliper Box Booms focused upstage.
- 40° - Electrics 1 – 3, focused as frontal light  
upstage. Electrics 1 – 3, focused as high side light.
- 50° - Electric 3, focused on Cyclorama for effects lighting.



These ellipses are the workhorses of Auditorium lighting. They are hung in all positions around the Auditorium. When an ellipse is needed, we usually mean a 20°, 30°, 40°, or a 50°..

**Altman Shakespeare S6-12 (Zoom)** A Zoom is an ellipse where one lens in the lens chain can be moved to change how the light is focused. There is no removable lens tube on a Zoom. Zooms are labeled with a Shakespeare 12° plate. This light will primarily be used in the catwalks at the Front of House 2 (FOH2) position. They are focused on the Apron.



**Altman Shakespeare S6-15-35 (Variable)** A Variable is an ellipse where both lenses can be moved independently. There is no removable lens tube on a Variable. This type of light offers the most flexibility in the type of beam that it can throw. Variables are labeled

with a Shakespeare 15°-35° plate Variables are hung in the catwalks and the box boom positions. They are rarely used on stage. They are a long through instrument designed to be used at far distances. It is important to remember that the rear knob in the lens chain adjust the size of beam, while the front knob adjusts focus.

All of the ellipses have **shutters** that let a technician “cut” or block off portions of light that are unwanted or are spilling in areas that should not be lit. When a shutter is being used, a Technician must remember that they are on the opposite side of a lens chain, so that the shutter on the right of the lamp, effects the left side of the beam of light. The top shutter effects the bottom of the beam.

There is also a **gobo** or **pattern holder** or **iris** slot that allows a technician can insert. These make the light shine a pattern of light, instead of a solid beam. Like the shutters, gobos are on the “other” side of the lens chain. So when a gobo is inserted, it is inserted upside down, and backwards, so it can be projected correctly. An iris is used to make the size of the beam smaller without using a shutter.

Ellipses have controls at the rear of the instrument for focusing the lamp within the focal point or “hot spot” of the reflector.

To change a lamp in an ellipsoidal, a technician unscrews the base out of the rear of the instrument.

The lens chain assemblies are slid back and forward to bring the light into focus on-stage. When the light is casting a beam that shines a hard edge on the floor, it is in focus. When it is in focus it will be evident if the lamp is seated properly in the reflector. A technician then will adjust the lamp to make sure the light is shining as brightly and evenly as possible. The final step in focusing the light is to adjust the focus to and shutters to what the designer wants.



**ETC Source 4 Ellipsodial.** Like the Shakespeares, the Source 4 (S4) ellipsodial is used for frontal lighting. S4 Ellipsodials are hung in the box boom positions and are used for frontal light for mid to upstage positions.

## Gel

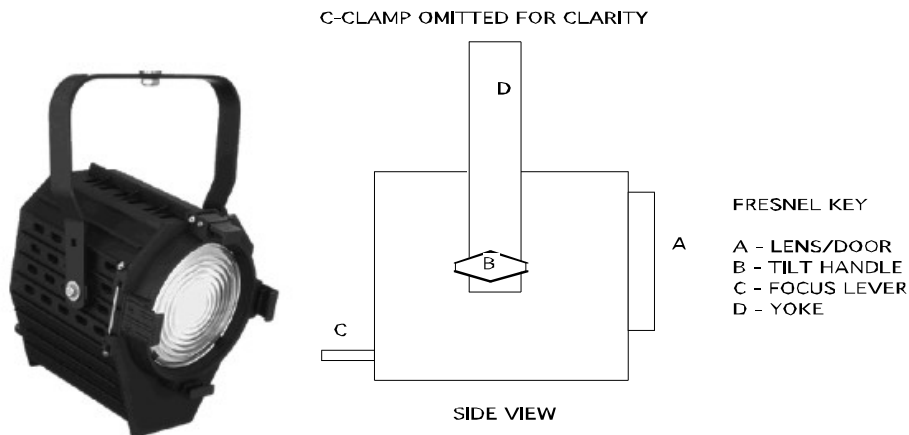
To add color to an ellipsoidal, a gel is cut to fit the gel frame. It is then loaded into the gel frame holder on the end of the light.

Gel comes from the gel storage cabinet in the light shop. BEFORE you cut a new piece, check the appropriate drawer for envelopes that have pre-cut gel in leko and fresnel sizes. If the gel has not been cut, then cut the appropriate size from a fresh sheet.

**ALWAYS** make sure that you label gel with the grease pencil with its proper color ID number: (R# for Rosco Gel, L# for Lee Gel, and G# for GAM gel. Rosco, Lee and GAM are the three major gel manufacturers.)

When pulling gel out of lights, hold it up to a light source and see if the center is faded or burned through. If it is, throw it away and get a new sheet. **Otherwise RETURN the gel to the proper drawer and storage envelope in the light shop.**

When hanging ellipsoids, be aware that there is a top and bottom of the light. The light should be hung so that the power cable that comes out the back of the light is on the bottom. If this cable is on top, it will be impossible to load gobos into the lights.



**Fresnel Floodlight.** Fresnel Floodlights are named for the man who designed the lens that shapes and disperses the light that comes out of it. Fresnel is pronounced FERNELL. Fresnel lights in Auditorium come in only one size. Fresnels only focus control beyond the c-clamp and yoke controls is a focus lever at the front of the light.

To change a lamp in a Fresnel, a Technician opens the front of the light by the lens. They then reach inside the lamp to get access to the fixture.

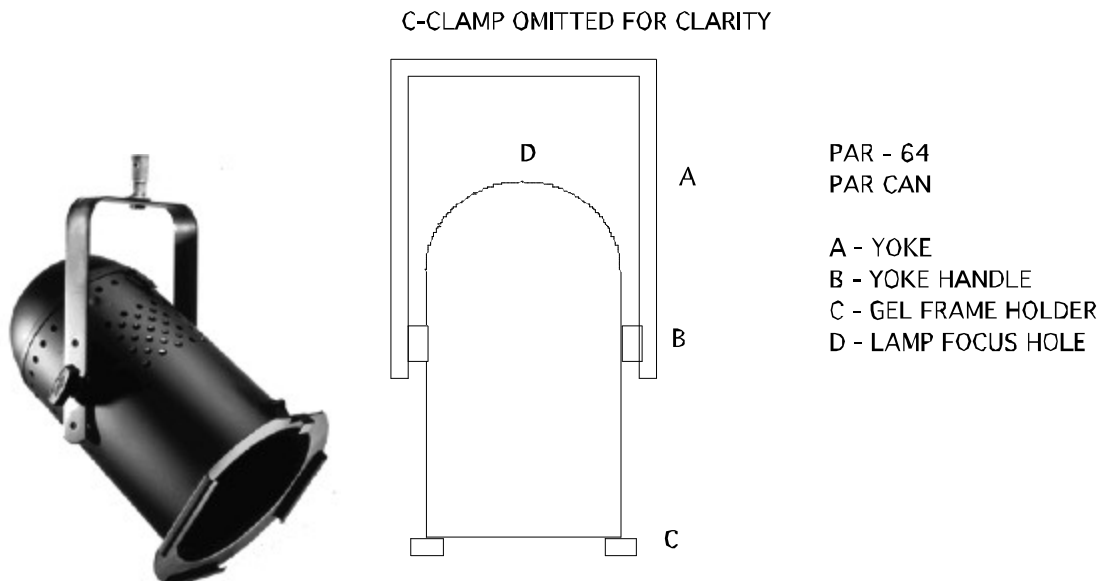
To focus a Fresnel, a technician hangs it and locks it in place. They then pull the lever right to left or left to right. This lever moved the lamp closer to the lens (flood) or to the back of the instrument (Spot).

Fresnels are primarily used for down light, back light, and general area illumination.

To add color to a Fresnel, a gel is cut to fit the gel frame. It is then loaded into the gel frame holder on the end of the light.

The only way to trim spill light with a Fresnel is to load a barn door onto the light. Barn doors act similar to shutters on an ellipse, but are on the “other” side of the lens, therefore the top door is the top cut, etc.

**PAR Cans.** PAR Cans are named for the light that goes inside. It is a Parabolic Reflector. The reflector and the filament are all encased within the lamp. Because of the way the lamp works it only has one focus control. That is to reach into the back of the light and twist the lamp. All this is accomplishing is rotating the hot spot of the light. To change it from a horizontal to vertical alignment.



To change a PAR lamp, the back of the light unclips and it opens up. The lamp is then pulled from the fixture.

PAR Cans are used primarily for general area lighting and color punches where fine control over focus are not required.

To add color to a PAR Can, a gel is cut to fit the gel frame. It is then loaded into the gel frame holder on the end of the light.



**ETC Source 4 PAR**

Besides the “normal” PAR 64s, there are a variety of other PARs scattered around the Auditorium. These PARs have a different design and are used principally for work lights. Occasionally Source 4 PARs will be hung on-stage as well. The Source 4’s are engineered differently than the PAR 64’s. They have an additional lens that shapes and focuses light in a more efficient way than a PAR 64.



**ETC Selador VIVID-R.** The VIVID-R’s are LED based wash lights. Different LED elements in the head create light and color without the need for Gel. Colors are mixed and created using the ION light board in the booth. Color values can be selected from a Color Wheel, or an interface that shows gel colors of major manufacturers.



**Elation EPAR QA.** The EPAR-QA is an LED light that is equivalent to a Par Can but with the flexibility of a LED. The Red LED readout on the back displays the channel assignment. The buttons below are very important and page through settings on the light. There is no lock out control, so technicians need to be careful not to accidentally press those buttons when setting these lights up. The DMX in/out uses standard 3 Pin XLR instead of 5 pin DMX. Adapters must be used to get the EPAR’s to talk to the DMX network. The blue and white plugs are the power in/out. These lights can be daisy chained for power and DMX. The yoke on the EPAR doubles as a floor stand, and the EPAR are also usually hung on lighting trees as sidelight.



## Rule of Thumb Hanging Positions:

<u>Location:</u>	<u>Instrument:</u>	<u>Purpose:</u>
FOH2	Shakespeare 12	Pit Wash
FOH1	Shakespeare 20	Frontal Areas
FOH1	PAR 64	Frontal Color Wash
Box Booms	ETC Source 4 Ellipsodial	Frontal Areas
E1-E3	Shakespeare 30	Frontal Areas
E1-E3	Shakespeare 40	Side Light
E1-E4	Altman 6" Fresnel	Downlight
E3-E4	Shakespeare 50	Gobos on Cyc
E5	ETC Vivid-R	LED Wash on Cyc
Lighti Trees	Elation EPAR-QA	Side Light

## Cables

Cables will NEVER be coiled around the arm. They will be looped over and under and to prevent twisted cables. Ends will be plugged together and the cable bundle will be tied off with trick line, Velcro, or electricians tape.

When hanging cable, it will be tied off to battens securely, but with strain relief provided for connectors. Connectors will be sanded or taped off to prevent slippage.

Cable runs from circuits to instruments. These cables have color coded ends:

BLACK – 5 ft cable.  
YELLOW - 10 ft cable  
BLUE – 15 ft cable.  
GREEN - 30 ft cable  
RED - 50 ft cable

Frequently we need to plug 2 lights into one circuit, to do this we use a **two-fer**. A two-fer is two female plugs wired to a single male receptacle.

To test a circuit to make sure it is working, use the **test light**. The test light is a 60 watt bulb in a safety cage that can be plugged into any circuit. Using the test light helps to troubleshoot problems.

## Effects Gear

The Auditorium has a large amount of effects and projection gear.

For the Ellipsodials:

**Image Multiplexers:** Glass unit that refracts light and multiplies a gobo image.

**Gobo Rotaters:** Gobo Rotaters make gobos rotate inside a light and add animation to a pattern. There are single rotaters that take one pattern, and dual rotaters that take two. **THIS IS A NON DIM DEVICE.**

**Glass Patterns:** Similar to gobos, but made out of glass, these go in special gobo holders and produce a much more realistic and color image from an ellipsoidal.

Stand Alone Effects: **ALL OF THESE ARE NON DIM DEVICES.**

**Rosco ImagePros:** The ImagePros let us create our own gobos or patterns on standard transparency film. Similar to Glass patters, these will fade over time. **THIS IS A NON DIM DEVICE.**

**Martin Fluid Projectors:** The Martin fluid projectors project an animated water or fire effect.

**Chaveaut Black Light Cannon:** The Black Light Cannon will wash the stage in UV light. This device requires about 5 minutes to warm up, and 10 minutes to cycle.

**Le Maitre G100 Foggers:** These produce a glycolfog/smoke effect.

**Halloween Foggers:** The auditorium has 2 small scale Halloween foggers for use in hidden or small applications where the G100's or Antari's won't fit.

**Le Flame:** Artificial fire units, done with fans, cloth, and light.

**Power Strobe:** High Powered Strobe unit.

## Followspots

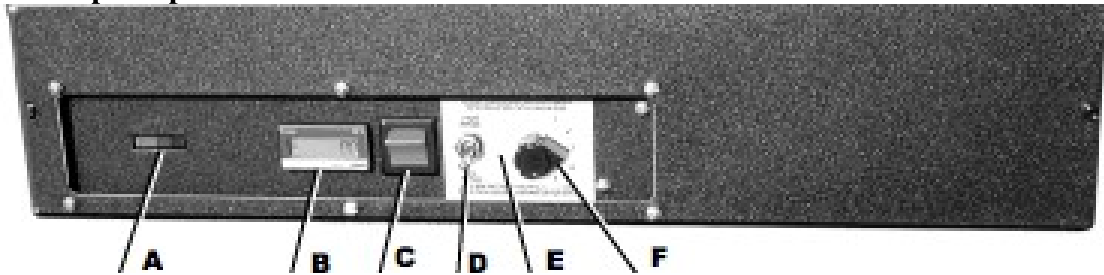
The Auditorium followspots are two Lycian Superarc 400 followspots. They use a metal halide source for their arc light. Metal halide arcs do not have the short lifespans of carbon arc, and are not under the high pressure of xenon arc lights. These are known as Short-Arc lamps.

### Arc light Rules

Because of the way Arc Light works, electricity jumping the gam between two electrodes, a few different rules apply to theses light.

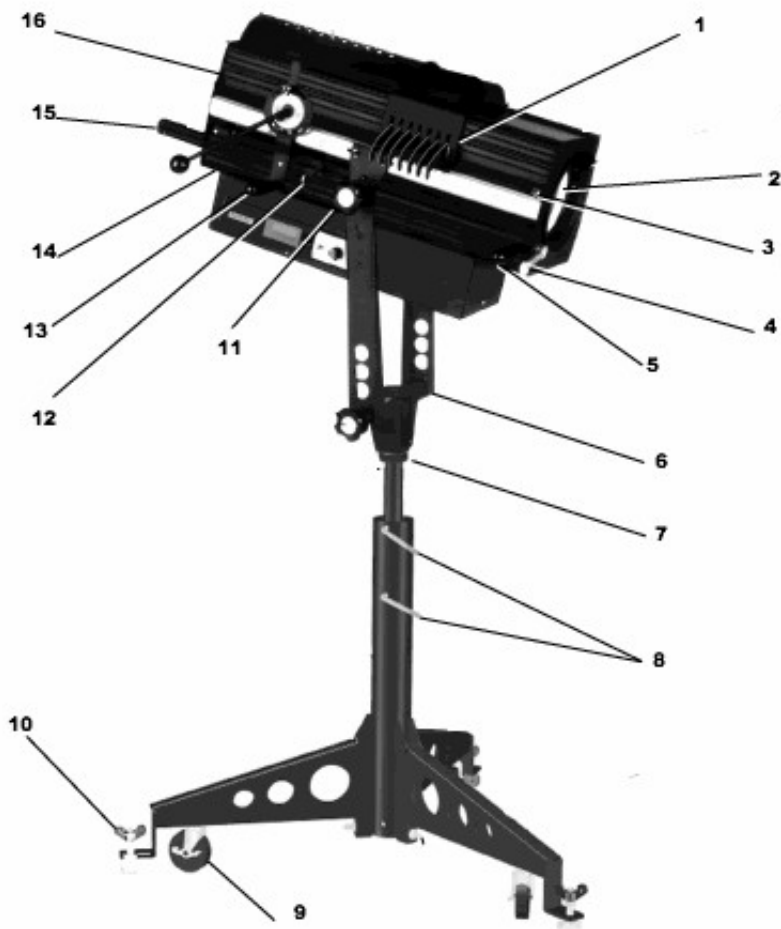
1. Do not turn them on and off and on and off. Each time the arc is struck, (lit) it gets incrementally harder to relight. During a production, turn them on, and keep them faded out until the last cue.
2. Never open the back of the spot and stare at the light. The light is so brilliant it can cause permanent eye damage. If you are wearing contact lenses, they may be welded to your corneas.
3. Don't close their all the way, close the guillotine, and fade the light down all at the way at the same time.
4. NEVER plug an Arc Light into a dimmable circuit. They are non-dim instruments and are dimmed by the mechanical shutters and levers built into the light. Arc lights can not be electrically dimmed.

## Follow Spot Operation



### Power Controls

Start operation of the follow spot by turning on the red power switch on the right hand side of the spot (C). During show settings, this happens a 10-15 MINUTES before the first spot cue happens. Next to the red power switch are a series of LED lights (A). These lights display how much voltage is being drawn at the time. The spot should be kept in the green/yellow colors. If the Spot is displaying red LED's contact Mr. Chapman as soon as possible. There is a LCD display (B) that shows how long the lamp has been burning. Let Mr. Chapman know when the display shows a number that is a multiple of 240. The metal halide lamp in the follow spot has a burn life of about 240 hours. When the lamp is reaching the end of the lifespan, we need to know about it so replacement lamps can be prepared or ordered. Next to the LCD display is a toggle switch (D). This shifts the light between low and high range. Unless directed, the light should be operated in low range. **Do not throw this switch when the spot is on.** If this switch is thrown, the light will reset itself and turn off momentarily. This would be bad in the middle of a cue. Next to the toggle is a dial (F) that selects the specific power of the power range selected (E).



### **Fader Controls**

There are two controls to fade the light in and out. After the light has been powered up, one of these two controls should be used so that the light is not casting a beam. The knob at the rear of the spot light (15), and the metal bar at the front (4) are the fader controls. Rotating the rear knob fades the light in and out. Pulling the front bar down and pulling it up also fade the light in and out. The two controls function the same and are for the preference of the operator. If it is easier to twist the rear knob, use it. If it is easier to pull the bar, use it instead.

Besides the fader, there is a guillotine switch (12). (The lever in the middle of the follow spot.) When this switch is pulled, two panels close in the light, cutting it off. Every audience member can clearly see this happen.

The decision to use which fader control will depend on the show.

### **Iris Control**

The round knob assembly on the right hand side of the spot is the iris control (15). This dictates how large of a beam the spot shoots. Pulling the bar up and down makes the spot bigger and smaller.

### **Focus Control**

The knob at the rear of the spot is focus control (14). Moving the knob forward and back dictates how sharp or fuzzy the spot will be.

### **Color Control**

Gels are selected by pulling down one of the arms (1) in the Boomerang. As one color is pulled down, the previous inserted color is automatically removed. If no color is in, it will simply lock. If no new color is desired, simply press the release lever, which is the furthest away along the boomerang assembly.

### **Pan & Tilt Control**

The most comfortable way to pan and tilt the spot is to have your left hand on the rear fader knob, and your right hand on the front control knob (13). You use both hand to steer the spot around. Looking down the top of the spot is the easiest way to aim it. When you are spotting a single performer, the nest way to aim, is to put the center of the spot just above the chest.

The tilt control of the spot can be tweaked by tightening the bolts on the side, (11\_ in the yoke. At the top of the yoke, where it meets the base, is the control for tightening the pan adjustments (6)

When operating the spot, an operator wants to make smooth movements. Small movements are the best as well. You have to remember that every little movement you make is magnified by the thrown of the instrument. Moving the light an inch can make the spot move 10 feet. Smooth movements are your friend.

The three wheels on the base (9) have locks to keep the spot from moving. Three leveling feet (10) are also available to secure the spot.

### **Control Equipment**

#### **UNISON System**

The UNISON System is the lighting system then usually controls house lights, lobby lights and worklights. It is designed to be easy to use. UNISON Touchscreen stations are mounted in the Stage Managers panel, two are mounted on the walls in the booth, and there is one remote unit that can be setup in multiple locations.

When not in use, the touchscreens go “to sleep.” When they are in sleep mode, the screens are dimmed. They must be touched once to “awaken.”

Multiple looks are stored on multiple pages. The pages are sorted like notecards. To bring up a new page, tap the appropriate tab. Too bring up the appropriate look, press the appropriate button on the touchscreen.

## dmxPhone

For focusing lights, we use the dmxPhone, which we also call “The Focus Phone.” This is a standard wireless phone that interfaces over DMX into our lighting system. Since it is wireless, a technician can take it anywhere in the auditorium and quickly turn lights on and off. The Focus Phone has some unique issues:

1. You MUST be in talk mode for the phone to work. Alternatelively you can enter a command string, and hit dial, and the command will come up momentarily.
2. When running a dimmer check, you have to count which dimmer you are on in your head, the focus phone will not display dimmer numbers on a dimmer check.
3. The Focus Phone will NOT play or record cues.
4. The command list is printed on the back of the handset if you forget commands.

### Focus Phone Commands:

<u>Example:</u>	<u>Command</u>
<b>1 thru 6 and 9 at 50%:</b> <small>Dimmer 1 thru 6 and Dimmer 9 at 50% Intensity</small>	<b>1*6**9#50</b>
<b>Start Dimmer Check Mode:</b> <small>Dimmer Check pages through Dimmers On/Off Sequentially</small>	<b>(Dimmer #)#100 555#</b> <small>22 # 100 555</small>
<b>Dimmer Check Next Dimmer</b>	<b>2</b>
<b>Dimmer Check Previous Dimmer</b>	<b>1</b>
<b>Clear a Mistake</b>	<b>***</b>
<b>Release all Dimmers</b>	<b>000#*</b>
<b>Upstage Cove Lighting Up</b>	<b>213*216#50</b>



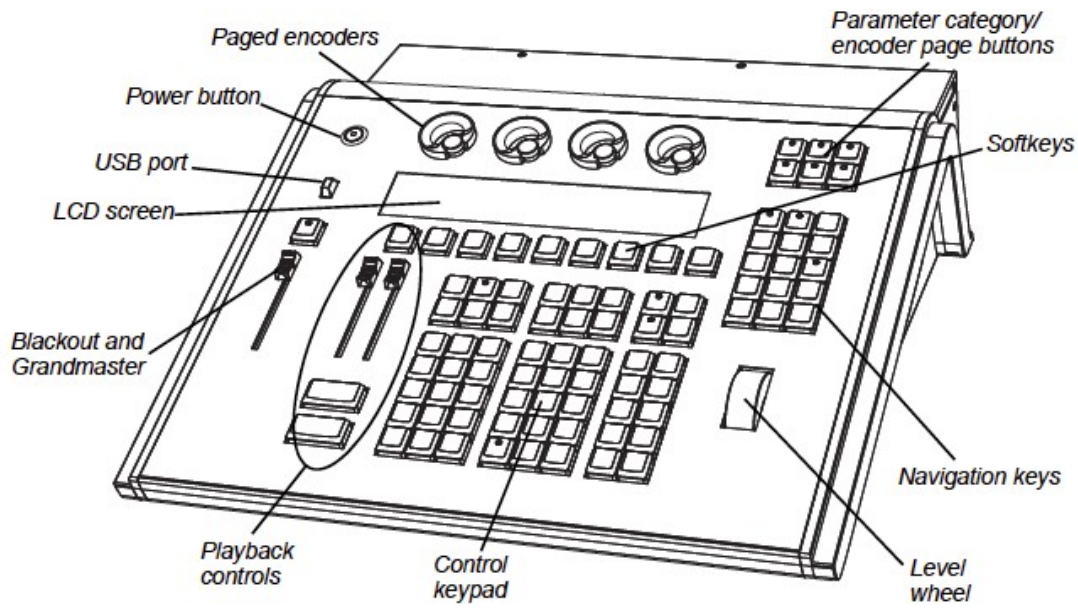
## **The Ion Light Board**

The computer that controls the lights in the Auditorium is an ETC ION light board. It can control all of the intensities of different lights, built into separate cues for playback. Cue and controls can be configured multiple ways on the board (direct input, fader wing control, cue playback, and touch screen). Learning how to operate the ION to the fullest can take years to learn, but we will cover the basic concepts of the board and it's use.

Besides controlling conventional, incandescent lighting, the ION can easily program and manipulate intelligent lighting gear as well. "Intelligent" gear generally has other controls beside on/off. For moving lights, this includes: pan, tilt, zoom, edge, focus, color, and pattern. For LED lights it the color spectrum that the light can generate.

ETC ION Light Boards are used through out the entertainment industry, and can be found in venues ranging from Theatres, Stadiums, to Clubs and Theme Parks.

The Ion has a main interface panel, a fader wing, a keyboard & mouse, a standard monitor and a touchscreen monitor.



### Power Button

This button powers up the Ion. Press it once to boot the system up. DO NOT push it in to shut down.

### USB Port

Standard USB 2.0 port for importing/exporting data or attaching external devices such as keyboards, mice, etc.

### LCD Screen

This screen features a command line for data entry into the board, as well as context sensitive buttons for the Encoders (see below) and the Soft Keys (see Below). In this example the command line shows that Channel 100 is active.



(Example of LCD Display with LED Color Encoders Active, with Cue 1 playing.)

### Blackout Button

Pressing this button takes all lights to zero intensity. Do not press this button.

### Grandmaster

This fader controls overall lighting intensity. If it is at 50%, all lights will run at 50% of their recorded intensity. (A light at 100% would be at 50%, a light at 50% would be at 25%). This fader should be UP to see any cues or lights.



### **Playback Controls: A/B Faders**

The A/B Faders let an operator manually override time for fades on the board. To operate automated cues, they both need to be UP.

### **Playback Controls Stop/Back Button**

When this button is pressed, an automated cue will STOP executing. Pressed again, and an automated cue will go BACK to the previous cue in the cue list.

### **Playback Controls Go Button**

This button will play this next cue in the Cue List.

### **Control Keypad**

The Keypad is broken up into several groups of keys;

The Top Left contains Macro, Delete, Help, Learn, Label/Note & Effect. These keys are target oriented to cues and macros.

The Bottom Left contains keys that are focused on how we group lights and cues, and create cues and groups with the RECORD button.

The Top Center contains special keys for grouping data and modifying groups and cues. Important keys include GO TO CUE, COPY TO, and UNDO.

The Bottom Center is the numeric keypad that is used for most data entry.

The Top Right contains the important NEXT and LAST for quickly paging through and creating cues and groups.

The Bottom Right is primarily concerned with values for intensities such as FULL, OUT and important keys such as SNEAK, Q ONLY, and ENTER.

### **Level Wheel**

The Level wheel is used to dial values up and down to achieve intensity or numeric value without guessing numbers.

### **Navigation Keys**

This group of Keys is used to Navigate ION displays.

### **Softkeys**

Softkeys are context sensitive buttons below the LCD display. The keys change based on what display you are in, and what commands are entered.

### **Parameter category/encoder page buttons**

The top right buttons select the functionality for the encoder dials to the left.

## Paged Encoders

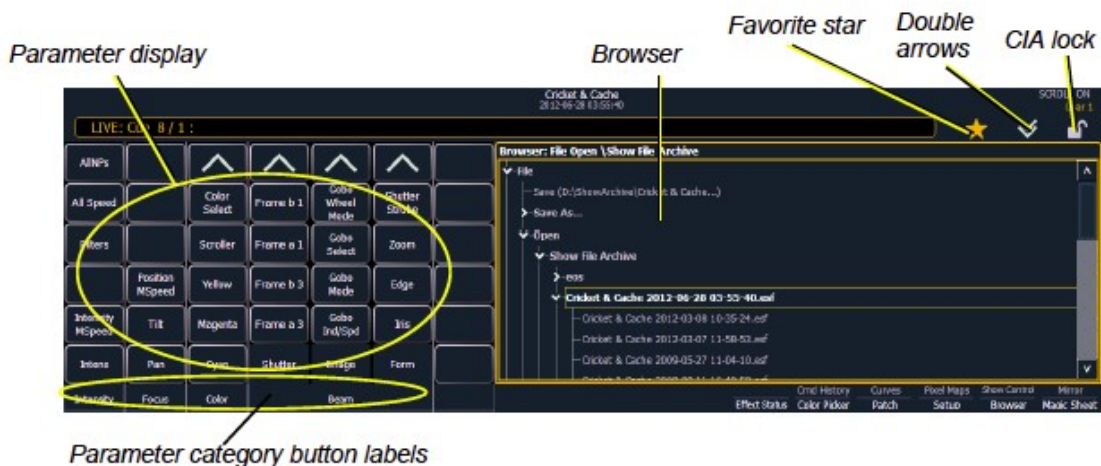
The Large Wheels are encoder buttons that are used primarily with LED and moving lights to deal with all of their sundry values including; hue, saturation, pan, tilt, edge, zoom, gobo among others.



## Fader Wing

To the left of the Ion interface panel is the 2x10 Fader Wing. Twenty faders are available here that can be assigned in multiple ways. The computer can track and manage up to 10 pages of 20 faders. Cue lists can be loaded into the fader wings as well, and the buttons then act as STOP BACK/GO buttons. When channel or group control is loaded into a fader is called a SUBMASTER. When in Submaster mode, the buttons will act as FLASH buttons causing whatever is recorded in the submaster to flash to the recorded intensity as long as the button is held in.

The LCD display in the center of the Fader Wing displays what has been loaded into the Wing. Faders 1-10 (top) are shown in the top row of the LCD screen, below the actual fader. Faders 11-20 (bottom) are shown in the bottom row of the LCD screen, above the actual Fader.



## CIA interface

The CIA Interface is usually on the Right Hand Monitor. CIA stands for Central Information Area. The CIA is context based, and changes based on what display and command set you are in. The Parameter Display area are touchscreen or mouse selectable buttons. The Browser area lets the operator click on displays, save shows, and shut down the system. If the Favorite Star is gold, that display will come up if you press the DISPLAY button twice. The Double Arrows minimize the CIA within the screen, and the CIA Lock, locks the display view.



### Live Channel Display

The Live Channel Display is usually found on the left screen. It shows what the current value of different control channels the board is running. This can be an easy place to see what level a light is set at. The color of the level indicates:

GOLD: Channel is selected

PURPLE: Level is tracked, unchanged from previous cue.

BLUE: Level is tracked, higher than previous cue.

GREEN: Level is tracked, lower than previous cue.

RED: Manual data, over ridden from a submaster.

WHITE: Value is blocked.

GRAY: Default value of channel.

### Live vs. Blind

Live cues or moves can be seen by the operator and the audience. If you put the ION into BLIND mode, changes to cue lists, channels, groups, and effects can be made without the audience seeing them.

**Channel Number** → 27

**Straight line under channel heading** →

**Intensity data (I)** → 68

**Effect data** → E 1

**No other parameter categories** →

**Conventionals**

Most of the channels in the above image are conventional channels (intensity is the only available parameter).

Conventionals have a straight line beneath the channel number. They also display only the top field, intensity, as no other parameters are available on a conventional channel.

**Wavy line under channel heading** → 64

**Intensity data (I)** → IP 2 M

**Focus data (F)** → FP 3 M

**Color data (C)** → CP 2 M

**Beam data (B)** → +

**F, C, B icons when collapsed** → F C B

**Moving Lights or Multi-parameter Devices**

Several channels in the image are moving lights (possessing more parameters than just intensity).

Moving light channels have a wavy line beneath the channel number as well as parameter category indicators at the bottom of the channel.

This view also has additional data fields beneath intensity (F, C, B). This information can be suppressed by pressing and holding **[Data]** and any of the encoder paging keys (Focus, Color, Image, Shutter, or Form). Doing so will leave only the intensity field and FCB indicators at the bottom of the channel.

Individual Channel Tab Information. Note the wavy line in the bottom tab that indicates that it is an intelligent or multi-parameter device.

*Indicates the timing for a category.*

*If blank, default time is used and there is no move instruction*

*Indicates that timing has been applied but there is no move instruction.*

Cue	Int Up	Int Down	Focus	Color	Beam	Mr	MB	A	P	A	M	F	V	Fw/Hg	Link	Loop	Curve	Rate	Label	Ext Links
1	1	2				1	m							F5						S1
2	5					5	B	A						H3						E 1*
2.5	5					12														
3	5			5		5	A	P	L						1	3				M1 E 1
4	5			5		5	a	*												E 1
5	5	5		5	5	5	b	a	L										Test 1 2 3 I	E 1
6	1	2		3	4	5	M							H4				901		Q2 / 1 E 1
7	Man					0														E 1

**Sneak Counter**

Master: List 11 v 4.0 100% 0.0 1 2

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10

Playback Display

### Playback Display (cont.)

This display shows the current cue list, with timing and labels. This display lets the operator see where they are in a show, and what is coming up, along with timing/execution of the current cue.

### Power up/shutdown

To power the Ion up, simply press the power button on the face of the board. To shut down, you have to go into the CIA Browser, and select, Power Down Board.

### Channel on/off

To turn a light on using the board, the channel number is entered, then given a value.

The following examples use brackets to indicate keystrokes:

[1] [At] [50] [Enter]

Channel 1 comes up at 50%.

[1] [+] [3] [At] [50] [Enter]

Channels 1 and 3 come up together at 50%.

[1] [thru] [15] [At] [Full] [Enter]

Channels 1 through 15 come up together at full intensity (100%).

[21] [+] [22] [Enter]

Channels 21 & 22 intensities are controlled by the wheel now. Rolling the wheel up and down will change intensities.

### Channel check

Frequently we will want to page through all of the lights to check that they are all working, or to find a light. To do a channel check:

[3] [at] [Full] {Channel Check} [Enter]

Channel 3 is at Full. The Channel Check Button is a Softkey that has to be depressed. Find it by looking at the LCD Display. Using the NEXT and LAST button the operator can now page up and down the channels that are currently patched into the ION.

### Recording a cue

When levels onstage are set (called "A Look") the operator needs to save the setting to a cue.

To Record a cue:

[Record] <Cue> [5] [Enter]

Current Levels are recorded as Cue 5. When the operator hits the Record button, the ION automatically assumes a Cue is being created so pressing the Cue button is not required. Other targets such as Groups, Parts, Palettes, and Submasters can be recorded by inserting that command where <Cue> is.

## iRFR

Sometimes the iRFR App will be used for focus, notes, and running cues. This App runs on the Auditorium iPad. During a technical rehearsal, Mr. Chapman will be using it for notes and to see what the ION is doing.



The interface for the iRFR app is the same as the ION. So commands entered here are the same as entering on the ION keyboard. Sometimes this is used instead of the Focus Phone for ease of entry, and if changes to LED's or other multi-parameter lights are needed.





The Playback interface is slightly different. The Button in the center is the GO button. Stop/Back is on the left, and GOTO CUE is on the right. Cues that are executing are shown with a red progress bar filling them as they execute. Notes can be taken on specific cues by tapping on the specific cue.

## Section 3: Procedures

### The Design

A light design is mapped out with a **Light Plot**. The Plot is drafted over the scene design. Acting areas are specified by letter A-Z. These are the focus points of lights. The lights are then drawn on the plot to make sure that lighting angles are correct. They are then numbered, and their gel color written in.

All of the instruments, the hang number, and color are then copied onto a **hookup sheet**. The hookup lists all of the lights, what circuit they are plugged into by electricians, and what dimmers they will be assigned to. This information is helpful during programming.

Finally, another sheet that lists the focus areas, and shorthand notations of channel numbers for lights are written on it. This is known as **The Magic Sheet**. The magic sheet quickly tells a designer at a glance which channel is providing which light for quick programming purposes.

## Bench Focusing

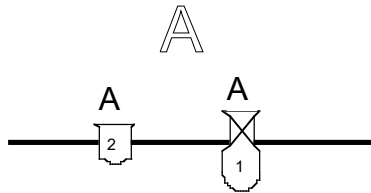
Periodically all lights will be Bench focused. This means they will be removed from their set positions, brought down to the stage floor, and locked off from a wall at the same distance. In these controlled circumstances, the lamps will be adjusted for fine focus and brightness before they are returned to their positions.

## Floor Check

When lights are being hung for a show, and are being prepped for hanging, technicians will make sure that all shutters have been pulled open. Lights will be matched to their hang position from the light plot and have their gels in them before they go up in the air. The speeds the focus process. As gels are cut and put into holders, their make and color number will be notated with a white grease pencil on the gel. Gels and gobos are noted on the hook-up sheet.

## Reading the Light Plot

The Light Plot is a road map that tells technicians where to hang lights and what they are focused on. The Light Plot also shows the floor plan of the set to reference where lights and focus points are. A portion of a light plot is shown here:



The outline capital A is a focus area. They are lettered A-Z skipping I and O because they look like a 1 and a 0. The solid black line is the pipe that the lights are hung on. Each type of light has a different outline. Shown is a 20° ellipsoidal and a Fresnel. The instruments are numbered from right to left. The instrument number is inside the light. The letter in front of the light is the focus point of the light. Both of these lights are focused on area A. The Light Plot is a very active document, light techs should make what ever notes they need to on the plot.

## Hanging

Instruments will be hung so that the backside (full) of the C-Clamp is facing upstage. The C-Clamp bolt will have its nut facing downstage. All ellipses will be hung so that their power cable is at the bottom of the lamp housing when focused. All lamps hung over the house or over the stage will have a safety chain attached. No instrument will be left finger tight. Once the light is hung, it is then plugged into a circuit. A tech turns it on using the Focus Phone, the iRFR, or the ION.

## Updating Show Paperwork

As each light is hung and plugged into a circuit, a light tech needs to write down on the hook-up sheet what circuit each light is plugged into. This is vital so that when its time to program the Light Board, we will know what circuit controls which light. It is VERY



important that the hook-up is easy to read. If mistakes are made and there are multiple corrections on a hook-up, ask for a new copy and write in the circuit numbers cleanly.

Sample Hookup Sheet from GHS “Hunchback of Notre Dame”

POSITION	INSTRUMENT	GOBO	COLOR	FOCUS	CIRCUIT	CHANNEL
FOH1 - 1	ERS - 30		RX -06	P		
FOH1 - 2	ERS - ZOOM		RX -06	F		
FOH1 - 3	ERS - 30		RX -06	L		
FOH1 - 4	ERS - 30		RX -06	O		
FOH1 - 5	ERS - ZOOM		RX -06	E		
FOH1 - 6	ERS - 30		RX -06	K		
FOH1 - 7	ERS - 30		RX -06	N		
FOH1 - 8	ERS - 30		RX -06	D		
FOH1 - 9	ERS - 30		RX -06	J		
FOH1 - 10	ERS - 30		RX -06	H		
FOH1 - 11	ERS - ZOOM		RX -06	C		
FOH1 - 12	ERS - ZOOM		RX -06	B		
FOH1 - 13	ERS - 30		RX -06	A		
FOH1 - 14	ERS - 20	376 ROSE WINDOW2	COLORIZER	O		
FOH1 - 15	ERS - 30		RX -06	G		
FOH1 - 16	ERS - ZOOM		RX -06	F		
FOH1 - 17	ERS - ZOOM		RX -06	E		
FOH1 - 18	ERS - 30		RX -06	M		
FOH1 - 19	ERS - 30		RX -06	L		
FOH1 - 20	ERS - 30		RX -06	D		
FOH1 - 21	ERS - 30		RX -06	P		
FOH1 - 22	ERS - 30		RX -06	K		
FOH1 - 23	ERS - ZOOM		RX -06	C		
FOH1 - 24	ERS - 30		RX -06	O		
FOH1 - 25	ERS - 30		RX -06	J		
FOH1 - 26	ERS - ZOOM		RX -06	B		
FOH1 - 27	ERS - 30		RX -06	N		
SR BOOM - 1	ERS - 30		RX -06	A		
SR BOOM - 2	ERS - 30		RX -06	H		
SR BOOM - 3	ERS - 40	7350 TUDOR WINDOW	NO COLOR	M		
SL BOOM - 1	ERS - 40	7350 TUDOR WINDOW	NO COLOR	H		
SL BOOM - 2	ERS - 30		RX -06	M		
SL BOOM - 3	ERS - 30		RX -06	G		
E1 - 1	ERS - 50		RX -06	U		
E1 - 2	FRES.		RX -04	M		
E1 - 3	FRES.		RX -64	M		
E1 - 4	FRES.		RX -04	P		
E1 - 5	ERS -50		RX -06	T		

**Programming**

Once the hang and focus is complete, techs go to the Light Board to program the show. Usually the Auditorium runs a on a Dimmer per Circuit per Channel setup. What this means is that the Channel number will be the same as the Circuit number that lights are

plugged into. Channels are then brought up on the computer, and are recorded on a Submaster or as a Cue. Playback is done by pressing the GO button, or fading submasters up and down. The Magic Sheet provides a short cut during programming, displaying the circuit information in a more graphic format.

### **Running**

When we are running a show, light techs must perform a Dimmer Check before a show to make sure all the lights are working. Once Dimmer Check is done, lights techs make sure that the light board is in the proper configuration for the show to run. They execute cues when the Stage Manager says “GO”.

### **Striking**

When instruments are being struck, gels will be pulled from their gel frames and returned to the proper drawer in gel storage. All gel frames will be returned to their instrument. All shutters will be closed. Any gobos will be pulled and returned to gel storage. Gobo slots will be closed. Power cables will be fed back through the yoke making a neat loop.

## **Section 4: Reference**

### **Electrical Analogies & Explanations**

#### **Lighting Design**

##### **The Concept**

Lighting design can be simplified down to a few concepts. There is inherently more to learn about lighting design, but these basic concepts will start a technician on their way. Stage lighting is different than studio lighting, so the concepts of key and fill lights do not necessarily apply the same way. In a studio situation the key light is usually an ellipse, the fill is a Fresnel, and back light is provided by scoops or Fresnels. Because of distances involved, this frequently is not the way in the theater.

#### **Motivating Light**

Motivating lights that are lights that are from suggesting sources such as a fire, candles, chandeliers, moon light, or lightning. Motivated Light is light that usually has a visible source on-stage and will provide motivation to actors concerning their acting space.

#### **Motivated Light**

Motivated lights usually give the illusion of light coming from a source. The sun is usually motivated light in the way that it is portrayed coming through windows or filtered through gobos to suggest trees or blinds.

#### **“The Method”**

The modern form of lighting is usually referred to as “The Method” and was originally popularized by Stanley McCandless. To generate even stage lighting that approximates nature, and in turn can be modified to be dramatic, lights are usually hung at 45° angles from their focus point. Some designers go to the length of having one of the two principle key lights be a warm color, and the second being a cool color to increase contrast. If this is done with too varied a color selection, it can look pretty ugly though.

So we light a focus point with two **frontal lights** hung at opposing 45° angles. These will create a good frontal fill light. These are usually Ellipsoidals.

**Backlights** or **downlights** are hung directly over the focus point. The light falls on an actors shoulders and back, and separates them from the background. These are usually Fresnels.

**Sidelights** are hung in the wings and shoot across stage. They pick up the line of an actors body and emphasize line and movement. They are primarily used for dance. These are usually Ellipsoidals.

So for each focus point, you could have up to 5 lights focused on it. This is called **5-point** lighting. Dropping sidelight, it is referred to as **3-point** lighting.

Besides where the lights are hung, the next important step is the addition of color. Color suggests mood, time of day, and other ideas as well. Color is added by putting a gel in front of a light. Gels are identified by number from the manufacturer. A Roscolux gel is generally referred to as RX####. Gam gels are G####, Lee gels are L####.

### **The Lighting Chain of Control**

**Instrument > Circuit > Dimmer > Channel>Group>Palette**

The key to remembering how the system works is to remember the chain of control.

A light (Instrument) is plugged into a **circuit**. Every plug in the Auditorium has a number above it. This is the Circuit number.

Each circuit is connected to a **dimmer**. The dimmer supplies power to each circuit. Each dimmer is rated at 2400 Watts. Most of the lights in Auditorium are 600 Watt lamps. So in essence, 4 lamps can be put on any one dimmer. The dimmer racks hold the dimmers, and information is given to electricians by the Sensor packs in the middle of each dimmer rack.

The dimmer racks are phased balanced. This is to prevent heavy electrical loading on one bank over another. That is why the dimmers skip the numbers the way they do. In a perfect world the Auditorium would have one dimmer per circuit, but we don't. There are roughly 280 circuits available for the stage, and we have dimmers for roughly 2/3 of them. If we hang lights in specific areas, we may need to repatch the dimmers to the new circuits.

The Light Board controls the dimmers. Dimmers are assigned to control **channels**. A channel is used to control dimmers. A channel can hold an unlimited number of dimmers. Sometimes we go channel per dimmer so the numbers all match, but sometimes we assign more dimmers to one channel for ease of use. The decision is made based on the complexity of the show and the amount of lighting that is being used. At the Light Board, Channels can be further assigned into Groups and Palettes for more levels of control.

**For Example:** Frontal light for a lighting area is coming from two ellipses. They are plugged into circuits 25 and 36. Circuits 25 and 36 go to dimmer 25 and 36. There are 5 more areas using similar set ups. (A total of 12 dimmers being controlled for 12 lights for 6 areas.) To ease up programming the light board. Dimmer 25 and 36 are patched into channel 10. The other Frontal lights are also patched similarly. To aide in ease of programming, the designer now only has to input 5 channels instead of 10, speeding the process along. On larger shows this may be important as the number of dimmers may be limited, or in the case of a Broadway show or a roadshow, the number of channels may be limited.

The way the light board talks to the dimmers is via a protocol called **DMX**. More accurately DMX512(1990). This is a universal standard in theater controls. DMX can controls lights, or motorized lights, or pretty much any piece of stage equipment that has a digital interface. DMX512 can control 512 channels at a time. This is called a DMX universe. A second universe can control an additional 512 channels. Our light board has access to two DMX universes, for a total of 1024 channels.

## Section 5: Terms & Definitions

Term	Definition
Barn Doors	Device mounted on a Fresnel that control spill similar to shutters on an ellipse.
Blackout	When all light on stage goes to black. Blackouts actually usually have some light in them for safety of actors.
Blind	Mode of the lightboard where changes can be made without being seen.
Bump	Buttons on the light board that instantly bring a Submaster to full.
Clamp	Claw that connects the yoke of a light to the point it is hanging from.
Crossfade	When one channel of light fades out, another channel of light fades up at the same time.
DMX512(1990)	Communications protocol that computerized lighting systems.
Edison Plug	A standard plug used in the home.
Ellipsoidal	A type of spotlight. Ellipsoidals have ellipse shaped reflector that surround the lamp. Thus multiplying the brightness of the lamp. Light is then shown through two parabolic lenses. Also know as Lekos, Ellipses.
Flag	The act of waving your hand or an object in front of a light to find out where it is focused.
Focal Length	Number with which a lens is identified by, I.E. 6X9. The first number is the diameter Of the lens (6”) while the second gives the Focal length (distance from focal point to the lens) (9”). Ellipsoidals are sometimes referred to by their Focal Length alone.
Focal Point	If parallel light rays strike a lens, they will converge at the focal point. Conversely, is a source of light is placed at the focal point of

	a lens, all the rays that emerge from the lens will be parallel with each other.
Fresnel	Specific type of lens that bends light. Used primarily in a Fresnel Light. (Pronounced Fernell) Primrily used as a flood or wash light. Also known as a Fres.
Gobo	A pattern that is added to a light to cast shadows on stage. Also referred to as a cookie or pattern.
Hook Up Sheet	Generated by lighting designer, completed by electricians, it details light, hang position, focus, gel, lamp type, channel number. Used for programming and record keeping.
Lamp	The “light bulb” in a lighting instrument.
LED	Light Emitting Diode. “New” style of lighting equipment that doesn’t rely on a lamp for intensity or a gel for color.
Light	An entire instrument used for lighting. Includes bulb, lens, case, yoke, clamp, etc.
Live	Mode of the light board where cues and changes to lights can be seen by the audience.
Look	A scene of lights that are focused and set at an intensity. A look is usually a lighting cue.
Magic Sheet	The “cheat sheet” that a lighting designer uses to quickly tell which channels control which light. Used for programming.
Motivated Light	Light that is the illusion of coming from a light source offstage.
Motivating Light	Light that comes from a visible light source on stage.
Multi-Parameter Device	A device that has more parameters than just intensity. LED color fixtures, moving lights, gel scrollers, and fog machines are

examples.

PAR	Parabolic Reflector lamp. This is the type of lamp in a PAR can. The reflector and the filament are within the lamp.
Plot	The map that shows where all lights in a show hang.
Safety	Chain that is connected to every light to make sure it doesn't fall on the audience, cast, or crew.
Shift Light	Dim light that is used during scene changes. Usually a dim blue light.
Shutter	The arms that extend into a light to add "cuts" to trim light off of unwanted areas on-stage.
Stage Pin	Three pin plug used on-stage.
Two-fer	Y-Cable that lets two lights be plugged into one circuit.
Variable	A type of ellipsoidal where both lens move. This changes the focal length totally. These are the most flexible Ellipsoidals.
Yoke	Metal "harness" that holds a light.
Zoom	A type of ellipsoidal where one lens in the lens chain is movable. This changes the focal length slightly.