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[Image]

Moving Light Programming, Part I: Parameters

July 1999--Compared to saltwater/brine dimmers, and even purely conventional lighting systems, moving light technology is still very much in its infancy. It's just under 20 years since the inception of moving lights, and probably less than 12 years since moving lights really revolutionized the lighting industry.

Within those 20 years, the demand for someone who could manipulate, control, and record all of the complexities and characteristics of moving lights grew faster than the technology itself. Lighting designers needed a person who could program these fantastic instruments at a very rapid pace, someone who could present all of the capabilities of the fixtures and the desks as well as produce the designer's vision almost telepathically. As a result, a new lighting position, the moving light programmer, was born.

Two factors--lack of equipment availability and public information about moving light programming and the various techniques programmers use--have often made it difficult to learn the basics of this craft. The quantum leap of changes to protocols, consoles, and the lights themselves have also contributed to the ever-increasing list of things you must know and learn to be a successful moving light programmer.

Within the last 10 years, a pattern has emerged in the industry of how programmers go about programming moving lights. The following is part one of a two-part article outlining this pattern and a discussion of the basic tools and skills used in this craft. Most of what is discussed here is non-specific to any one fixture or desk, just as music theory is non-specific to any one musical instrument. Learning the common thread that each of these fixtures and desks share is the key to understanding them all. Although it might take some practice developing your chops on any one desk or set of fixtures, if you have a good foundation of the theory behind them, you'll find that learning the specifics will come much more easily and naturally. My intention is to give the reader an overview of basic programming skills and knowledge as well as a good foundation that can be applied globally to the ever-growing list of consoles and moving lights.

To fully understand the organics and biology of a human being, you must first break it down to its simplest form, the single cell. The same concept applies to understanding the mechanics behind moving light programming. The simplest form of moving light programming is the parameter. A parameter consists of any function of a light that can be controlled via your console. New parameters are constantly being added to moving lights, as are different modes that add or subtract parameters or functionality to existing parameters.

When a new light comes out, there's usually a great amount of publicity on its initial release. You can easily find out what its parameters and capabilities are by accessing that particular manufacturer's website and downloading the parameter sheet. This sheet will usually outline what channel corresponds to what parameter, and what ranges govern each characteristic of that parameter.

Many lights start out with one parameter set, and within a few months an adjustment to the firmware has been made that will allow you to have 16-bit pan and tilt, separate control over the gobo wheel parameter and its rotation parameter, or a variety of other changes. Some lights already have these different parameter configurations upon their initial release. These different parameter configurations are known as modes, and are usually modified by setting the light's personality via its dipswitches or menu platform, and sometimes upgrading the firmware within the light itself. When telling the desk what kind of fixture you will be working with, you will often come across several different versions of the same light, the only difference being the mode of operation you wish to work with. If you don't know which mode is most suitable to your individual needs, you won't be able to benefit from either the extra control of the instrument or the conservation of DMX channels.

In the dawn of time (well, roughly 20 years ago) the only parameters that existed were Intensity, Focus, Color, and Beam; abbreviated as IFCB, these are the parameter groups. IFCB is a way to organize and manage all of the parameters into four unique groups. Every parameter in a light falls into one of these categories.

Intensity (parameter group I) controls the light output of the light. There are many different types of mechanisms that control the output level of a fixture; some fixtures have variable metal gates that interrupt the beam path, others have iris-type mechanisms that close or open in order to control intensity. These mechanisms open and close dynamically relative to the output level you specify. You can change the speed of the intensity fade by altering the time of the cue that it's recorded in. Intensity also includes the control over conventional dimmers.

There are many cool effects you can create by using intensity. From subtle to staccato, you can chase intensities in symmetrical or random design to create a crossfading subtle effect or an energetic stroboscopic effect. In some consoles, you can give every light's intensity levels different fade times, delay times, and cue profiles.

The decision whether or not to record intensity levels for a cue as a palette is yours. In the case of film or TV, it might be useful in adjusting a show's output level per camera angle of F-stop. I generally don't store intensity as a preset first because I like to be able to see and adjust the intensity on the fly.

Pan and tilt (parameter group F) revolutionized the lighting industry by giving lights the ability to move. Movement as an effect can draw focus or create an environment that is conducive to what's happening onstage. Movement can also reduce the number of channels and dimmers allocated for conventional lighting; you can also use the movement of the fixture to fade out, move to another position, and then fade up as if you were moving from one group of conventional lights to another. This technique is known as presetting, or marking, and is widely used in theatrical applications as well as rock and roll.

Pan and tilt can consume up to four channels (two each) for 16-bit fine resolution or two channels (one channel for each) for eight-bit resolution. The differences between 16-bit and eight-bit pan/tilt resolution can be negligible at faster movement speeds; it's when the light is moving slowly that you can see the difference.

In 16-bit mode, one of the pan or tilt channels controls the low, or coarse, bit of resolution while the other controls the high, or fine, bit of resolution, giving you a much smoother degree of pan-and-tilt movement. In eight-bit mode, pan and tilt are allocated only one channel apiece. This doesn't necessarily mean that you're going to have a noticeable defect in your pan-and-tilt moves; there are a few fixtures out there that actually move more smoothly at slow speeds.

Pan-and-tilt levels are almost always stored in your focus palette before using those levels in a cue. There are a wide variety of types of focuses you should keep at hand in your focus library before starting the cue-building process.

The cornerstone of design, color (parameter group C), lends us its power to express the mood of the scene or to add dimension to what we are lighting. Moving lights and color add a whole new dimension to the process. The ability of a moving light to change from one color to another over the course of a split second or several seconds facilitates the changing of the mood of a scene with the same set of lights.

The majority of color filters used in moving lights are dichroic. A dichroic filter differs greatly from that of its predecessor (gel) in that instead of absorbing unwanted wavelengths of light as heat, it reflects them back into the reflector. This gives dichroic filters an incredible lifespan and ensures that only the desired wavelengths of light required to produce a desired color will pass through the filter.

There are a wide variety of mechanics involved in how color is output from a moving light, but they can be broken down into two distinct groups: color wheels and color mixing. Some lights have both; some have one, two, or even three color wheels.

A color wheel is a wheel with many slots of color in it. The slots usually start at white when outputting a zero-color wheel percentage, and will move to the next color as the level is adjusted higher on the desk. On some lights, it's possible to fade from one color to another over the course of time, or to snap immediately to the next color.

The advantages of a color wheel are: the color it produces when the filter is fully engaged is solid and pure; and it creates a very even field within the beam of light. You won't see any discrepancy of color in the beam, or the surface it's projecting on, unless the dichroics are burned. A disadvantage of a color wheel is not being able to smoothly crossfade to any other color on the wheel except for the color on either side of the color you're in. Invariably, you will pass through a contrasting, possibly undesirable, color to get to the desired color on the wheel. In some instances, this may be a desired effect. One way of getting around this is to fade the light out first, preset the light in the color you desire, then fade the light back up.

Colors in a color wheel should always be recorded in palettes before they are used in cues. When recording a color palette using a color wheel, make sure you record each palette in the order it is on the wheel (i.e., color one, palette one; color two, palette two). Recording your palettes in such a fashion facilitates ease and speed of being able to tell the designer exactly what color is next to the current one and how many colors reside between the current color and the one requested. This is a very important palette-building technique and should be applied to color, gobo, and FX wheels alike.

Color mixing (parameter group C) uses at least three parameters, cyan, magenta, and yellow, the three subtractive color primaries. A combination of any two out of three of these parameters, fully engaged to interrupt the beam path, will yield the subtractive color mixing system's secondary colors Red (fire), Blue (congo), and Green (or pretty close to them). Varying degrees of combinations yield different hues as well as saturation levels of color. Nearly all color-mixing lights employ the subtractive color-mixing system, which I will explain in more detail in the second part of this article.

The beauty of color mixing is that it gives you the complete flexibility to create a very large color palette and crossfade from one color to another over the course of time, without a noticeable flicker that you would get from a wheel. At least, that's how it's intended to work. Not all color-mixing systems are the same; they come in a wide variety, and some are more efficient than others at producing certain colors, as well crossfading from one color to another.

There are some disadvantages to color-mixing systems--for instance, the vast majority are unable to produce a true red. Instead, a combination of the yellow and magenta color parameters will yield either a very saturated amber or a fire red, which falls more on the amber side, which means you have to revert to the color wheel for a real red. With the majority of color-mixing systems, a perfectly flat field in your beam is nearly impossible to achieve when mixing more of the pastel or less saturated colors. You usually end up with a beam with slight blotches or patches of the color you are trying to mix.

A color-mixing palette's organization is very important and will aid greatly in the speed in which it takes you to access a desired color.

Gobo wheels (parameter group B) present you with the option of adding a variety of textures to a picture. Texture can be defined either as projected surface texture or aerial texture. Surface texture is the result of the gobo pattern projected on a surface and can be razor-sharp in its definition, or very soft, to make subtle blendable textures. Using more than one gobo wheel overlapping the other and rotating it can enhance surface texture and create a wide range of looks.

Gobo wheels currently come in two varieties, standard (static) or rotating. The mechanism is nearly identical to a color wheel in shape, but differs with the rotating sort. In a gobo wheel, you have an open slot and several slots of patterns thereafter. The slots will change with the changing of value sent to the parameter, and it's possible to have split gobos. Some gobo wheels have the capability to vibrate very quickly, producing what is known as a gobo shake.

Rotating gobos will move in either direction or index to a specified angle, depending on the range you specify in the parameter (and also depending on a fixture's capabilities). When indexing all of a light's gobos, turn the gobo clockwise or counter-clockwise until you find the desired angle, then record the value, either in a palette or directly into the cue. With the ability to index gobos, you can do things like lining up all of your multibar gobos across a range of fixtures so they're all pointing up to downstage, or stage right to stage left. You can create perfectly uniform gobo washes or angle a selection of a fixture's gobos to wash an angled set piece exactly the way you want it. Bear in mind that not all fixtures with a rotating gobo are able to index.

The part of the parameter that controls the rate of rotation sometimes resides on the same parameter as the rotating gobo wheel and changes speed/direction depending on the value of output given to the parameter. There are many instances in which the rotational rate and indexing angle are stored in an entirely different parameter, which we will refer to as gobo rotation speed. Both wheels should be recorded as two separate rows of palettes in the order that they reside on the wheel, each containing values exclusive to that wheel, so you can overlap them at will.

Gobo rotation speed (parameter group B) controls the rate that a gobo will spin, and in some cases will give you control over the way a gobo is indexed. Gobo rotation speed can also affect the direction your gobo rotates. This also depends on the manufacturer of the fixture.

You will not always find a separate rotation channel for a fixture. Sometimes the gobo rotation speed resides in ranges on the rotating gobo channel. Sometimes a fixture will have the added functionality of a separate rotation channel just by changing the mode the fixture is in.

It would be wise to record many different ranges of this parameter in your beam palette. The ranges should always include a stop spin range: slow spin, medium, fast, etc. You might want to have more varying degrees of slow gobo rotation speed rather than fast. It's been my experience that designers want a larger degree of slow to medium ranges of gobo rotation speed than medium to fast.

FX wheels (parameter group B) are similar to gobo wheels, with one exception: instead of gobos in the wheel, there are several effects to use in conjunction with the gobos. Some common effects are doubling, tripling, quadrupling, and quintupling prisms, as well as hazing and tracer prisms. Other common effects employ the use of multiple color dichroics that usually split the beam into two or more colors. All of these effects have the ability to rotate and index depending on the limitations of the fixture itself.

The same principle applies to the palletizing of FX wheels as it does to gobo wheels: Record them in slot order. If a fixture has more than one effects wheel, you should palletize that wheel in different palettes than the other, again allowing for a greater flexibility when overlapping the two.

The iris (parameter group B) of a light adjusts the beam size and varies dynamically, depending on the level output. This gives you the flexibility of creating a variety of different beam sizes. Bear in mind that when you close the iris to adjust the beam of a fixture, it will truncate the edge of any other parameter in the beam path. If you want all of your beams to be smaller without affecting the edges of the gobos, you should use the zoom parameter instead of the iris (if the light is equipped with zoom) to adjust the size of the gobo.

When chasing irises in a system from open to closed, an undulating effect is created. There are many ways to create interesting looks by chasing irises in conjunction with another parameter, such as intensity. One such example is when all of the irises and intensities are closed and you randomly bump open both parameters in random groups of four or more depending on your system size. You should at least have an "iris open" and an "iris closed" at hand in your palette library.

Lens focus (parameter group B) controls the varying degrees of beam sharpness. Focus gives you the ability to control how soft or sharp you want the gobos or any other focusable parameter to be. With lens focus, you can tune gobos to razor-sharp definition or rack them out of focus for a less literal, subtler texture. In an instrument with two gobo wheels that have distinctly different focal lengths between them, you can use lens focus to morph from one gobo to the other if they share similar light-passing characteristics.

Lens focus is preferred both sharp and soft by most designers, so it would be wise to include a couple of degrees of lens focus in the beam palette. Bear in mind that if your fixtures have both zoom and lens focus, one will always affect the other and you should either include them in the same beam palette or not, depending on your circumstance.

Zoom (parameter group B) controls the overall size of your beam and every other parameter in the beam path. Zoom doesn't affect the edges of a gobo; instead, it will resize the entire gobo or whatever other parameter might be in the beam path. With zoom, you may not be able to achieve as tight a beam as with an iris, but zoom's function isn't really to resize the beam itself; its primary function is to resize what you are projecting on the surface you are projecting it on. Zoom also comes in two flavors, variable and wheel.

In most lights, it is impossible to use zoom at its extremes while keeping the lens focus crisp. In other words, you won't be able to keep your gobos or other textural parameters sharp when zooming all the way in or out. This may be a desired effect in instances where you are using gobos out of focus to add subtle texture.

It's a good idea to record a couple of palettes with different zoom sizes, so you will be able to quickly change the aspect ratio of the light's projected beam size. You may also want to store zoom along with the gobo wheel to ensure it will always come back to the base size, if that's what you desire. Keep in mind that changing the zoom will also affect the lens focus, and both should be adjusted proportionally.

Frost, or diffusion (parameter group B), will turn your hard-edge fixture into a wash fixture by softening the beam, or will give a wash fixture a wider beam angle, enhancing the widest possible area coverage.

Frost is similar to zoom in that it too comes in variable or wheel form. With wheel frost, depending on the fixture, you can make slow changes from one slot to another without a noticeable flicker caused by the area in between the two slots.

Strobe (parameter group B) is one of the more erratic beam parameters. The strobe parameter of a light is controlled by a swiftly moving gate that interrupts the beam path to allow light to escape the fixture in either an on or off state.

Unlike intensity, strobe is only variable in the speed and style (simultaneous or random) at which you want the light to turn on and off. There are strobe wheels with one slot that continuously spins to achieve this effect, and in some cases the strobe channel uses the same gates allocated for intensity to create the stroboscopic effect. Strobe's default is open, and from there you will go through many stages of strobing rates, simultaneously or randomly strobing on and off.

Blade (parameter group B) employs the use of the same technology used to shutter a leko off to a given area. Blade uses up to nine parameters: two are for each end of one of the four blades, and one is used to rotate the entire blade mechanism. Currently, there are only two major fixtures which employ this technology, the Martin Pal 1200 and the Vari*Lite(R) VL7B(TM).

There are several different strategies you can use when recording shape into the palettes. The first is to record the shutter shape into the beam palette and label it in correspondence to the position focus you shaped it to. The second, provided your console supports it, is to record the beam information right into your position focus palette along with the pan-and-tilt values used; after all, when you're focusing a leko, part of that focus is the shutter or blade mechanism of the light itself.

Speed (parameter group B) is a peculiar parameter, in that it usually determines the time at which a gobo or color wheel will traverse to the chosen gobo or color. Speed also determines the speed at which the mirror travels. The speed you specify is usually cumulative to the time already specified in the cue fade time, which can become quite confusing. In some fixtures, this is the only way to roll a gobo or color to another on the wheel, so you must use speed in order to achieve the desired effect.

I've found that if you need to use speed to roll a gobo, it's best to put a zero-second time on those parameters that speed governs. This will allow you to make all of your parameters that are moving from cue to move with one time.

The control parameter (parameter group B) allows you to remotely reset or home the light as well as douse or turn on the lamp, depending on what range the parameter is set to. Some lights don't have a separate channel for this and these functions either are unavailable or reside on the strobe channel.

Operators and technicians often ask to have these different states of the control channel prerecorded into the palette library for quick access. It's highly recommended that you do this if the console allows, in case a fixture starts acting up in the middle of a show and you don't want to take the time to manually access this parameter and adjust or reset it.

In this point, we've discussed moving light parameters and their functionality, as well as what parameter groups they fall into, and a couple of basic palette-building strategies as well. These parameters are the building blocks for palettes, just as palettes are the building blocks for cues. It's imperative that you move with technology and keep an eye out for new parameters and new lights, as this will greatly improve not only your knowledge of the lights themselves, but also your power to create new and beautiful looks.

--Christian Choi

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Christian has also been recently appointed AC Lighting's programming and software specialist for their Agoura Hills office and handles software support for WYSIWYG as well as Flyingpig's and Jands' Hog lines of consoles. You can find out more about Christian at his web site at www.ChristianChoi.com, or contact him at Christian@ChristianChoi.com.

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# Moving Light Programming, Part II: Building Palettes

October 1999--The fundamentals of moving light programming start with understanding the individual parameters of the lights themselves, as discussed in the July issue of Entertainment Design. Learning how each parameter works, as well as making them respond the way you want, is the first step in broadening your moving light programming knowledge. From there, aspiring programmers need to understand how to set up their desk with the types of lights they'll be using, patch the lights, and create a window interface in order to navigate through all the views of their desk. After that, you'll be ready to learn about building palettes, also known as presets or libraries.

In this article, we'll get your console set up for programming, expose some of the techniques used in building palettes, and then dissect a few show looks to give you a first-hand peek at how groups and palettes are used. For the purposes of demonstration we'll be using the Wholehog II, but most of these same concepts can be applied to a wide array of moving light consoles.

## Basic Console Setup

Before any programming can begin, users need to get the console talking to the fixtures. This procedure is known as patching, which can be broken down into four sections:

1. Add fixtures to the console's schedule. The very first step to patching is to tell your console what type of and how many fixtures you will be working with. Most consoles will provide you with a large menu of fixture types to choose from, and some even include onboard editors that allow you to create or alter your own fixtures. The fixture library includes all the information on each of the fixture's parameters and parameter ranges. This library will also contain information about what parameter group the fixture's parameters will fall into by default when recording your palettes.

2. Assign control channel numbers to the fixtures. Once

you've finished adding fixtures to the fixture schedule, you might wish to change the default control numbers of the fixtures to different starting addresses. The reason for this is mainly to aid in the timely recall of your fixtures when selecting them. If your system were to include 57 High End Systems Cyberlights®and 62 Vari*Lite VL5A™s, you might want to separate these two types of fixtures into two separate numerical areas. Rather than numbering them in one block from 1 to 119, you might be able to recall the fixtures easier if the Cyberlights were numbered 1 through 57 and the VL5As were numbered 101 through 162. This technique is especially helpful when you have several different types of fixtures because you can separate your fixture types by blocks of hundreds. This way you always know that your Martin Mac500s start at 1, your High End Studio Colors® are in the 201 range, your Clay Paky Stage Scans are in your 301 range, and your conventionals are in the 401 range.

Feel free to use whatever numbering technique works best for you, but make sure you keep a consistent pattern of numbering throughout your rig. For instance, don't start one type of light from upstage right to downstage left and another type from downstage left to upstage right. This can make things very confusing.

3. Assign DMX addresses to the control channels. Each fixture in your rig should have its own starting DMX address. This is the address you can set at the fixture itself. Each fixture's unique starting address must not overlap with another fixture's address. Most of the problems encountered when firing up your system for the first time are due to a mis-addressed fixture. Changing the address to the correct one easily rectifies this problem.

To make this process easier, you may want to think of each fixture having two numbers. The control channel is the number that you will type in your console to select the fixture, and the DMX address is a hard number that you set at your fixture. You can call your fixture whatever number you want, but that number must correspond and be patched to the actual DMX number on the fixture itself.

4. Align the fixtures' pans and tilts so they all move in a uniform fashion. This procedure is known as

fixture alignment. If your fixtures don't all move in the same direction, you will have to spend time thinking about which way to move the encoders or joystick on your desk every time you want to focus a fixture. You'll find yourself moving your encoder right to focus your fixture left or up to focus it down. Your focusing speed will become much quicker if your fixtures are properly aligned. The object of aligning your fixtures is to match your fixture's pan and tilt with your encoders, trackball, or other input devices on your console so that when you do turn your encoder right the fixture will follow.

To align your fixtures, you are presented with three options that can be used alone or together to give you every possible direction in fixture orientation. The choices are pan invert, tilt invert, and swap axis. Pan and tilt invert will change the direction a head will pan or tilt when moved on your encoder. Swap axis will swap pan for tilt so that when you pan a fixture it will actually tilt it and vice versa. These options can be used on individual fixtures or whole trusses.

One way to approach fixture alignment is to look at your system and find all commonly oriented fixtures and select them. You first want to check the tilt of those fixtures, so tilt them using your encoder wheel. Do all of the fixtures move upstage when tilted upstage? Check to make sure that your wheel movement matches the fixtures' movement. If it doesn't, then invert the tilt; if the fixtures are panning when your intent is to tilt them, swap the axis first, then check the fixtures' tilt.

Next you'll want to check the pan of the fixture. When you align the pan of each fixture you should tilt them first. A simple rule I follow when aligning pan is to tilt all onstage overhead fixtures downstage and all front-of-house fixtures upstage to the stage before checking and aligning their pan. I do this because yoke fixtures (fixtures with an actual moving head) pan in opposite directions when tilted upstage or downstage of the fixture itself, so you must decide on an area either upstage or downstage of the fixture before aligning the pan of the fixture. Since I will mostly be focusing my onstage fixtures either overhead or downstage, I tilt the fixtures downstage of their enclosures to align their pan. For front-of-house fixtures, I tilt them upstage before aligning the pan because I know that in most instances, I will be focusing those units upstage of their enclosures and onto the stage.

After patching is completed, you should learn how your console navigates through its views. If the console provides user-definable views, this would be the point where you could set those up before you proceed. Once all of this is completed, you're ready to begin working with palettes.

## Palettes

What are palettes? Think of them as you would an artist's palette. When an artist paints, he or she uses a palette from which to choose colors. These colors can be straight out of the tube or mixed with other colors in order to provide the perfect blend; however, they're all organized on a palette for quick access. Without this palette, every time the artist wanted a new color, she would have to stop painting, pick another tube of paint, and mix a new color. This would become very time-consuming, not to mention frustrating, especially when trying to match the exact hue of color.

A programming palette is much the same concept, but with colors, gobos/beams, and positions replacing paints. A palette is an area where you can store frequently used parameter values for quick recall while programming your cues. These areas not only accommodate individual parameter settings but can also store combinations of parameters over some or all of your fixtures. The different types of palettes can vary on a per-console basis, but generally they consist of groups, positions, colors, and beams.

If you set up your palettes efficiently and keep a consistent method of organization, you'll find programming your cues to be much faster and easier. A large percentage of programming speed will be dictated by how efficient and organized your palettes are. It's very important to lay out your palettes in a logical order as well as descriptively label them so that when the time comes to select a palette, you'll be able to quickly recall where you put it.

## Groups

Preset groups are stored selections of your fixtures. They enable quick access to many fixtures with the push of one button. They can be used to select all of a fixture type, a range of fixtures, odd/even fixtures, random selections of your fixtures, even single fixtures. Groups help to increase your speed and they should be used as much as possible to select the different parts of your system. To create a group, you simply select the fixtures you want in that group and record them in the groups window.

There are many strategies used when approaching the building of your groups. The importance of organization can't be stressed enough. As with most programming techniques, developing a consistent system that you can use to approach the building of your groups will help you to develop more speed.

Look at Figure 1. This is my main groups screen from the Cher tour, which I programmed for Patrick Woodroffe, and it is where I keep all of my most widely used groups. I usually start off by creating some groups that will select all of a certain type of light. As you can see, I'll reserve sections of the screen for groupings of similar types. The All-Groups were created on the top row starting with the first button on the left. Next, I'll cordon off areas of the screen for groups of a certain fixture type. If you look at my main Studio Spot groups, you'll notice that all groups pertaining to Studio Spots were organized into their own area, and likewise with Studio Colors. This helps me to find my groups when I need them without having to go searching.

Some of the selections I'll make for my main groups screen are All of a Truss (for each fixture type), and widely used groups such as Band Lights and Set Lights. I usually approach this groups screen with whole sections of fixtures in mind. I also reserve some space on this section for later on in the programming session, when the designer starts finding interesting combinations of fixtures to use on specific areas.

Note: It's vital that you keep your perception very sharp when it comes to the designer's frequent use of certain selections of fixtures. If the designer finds an interesting combination of fixtures, record that as a group on your main group screen. This way you are able to keep up when frequently asked to make changes to this new selection.

The next type I use is one that further breaks down a specific type of light into more detailed, less used groups. In Figure 2, I still retain some All-Groups so I can quickly select them while in my more specific groups screen. I also make single fixture groups and lay them out in a manner that will topographically resemble the rig. This helps me to pick out individual fixtures quickly when the designer requests them.

One very useful group I create is four random selections of the rig, each with different fixtures in them. These groups are used together to create random color, strobe, movement, and iris chases. I'll also use them to offset timing from each other in cues and FX. This enables me to create very complex, randomly displaced fly-ins/outs with ease.

When you first look at the plot, it's important that you understand what the designer's intent is for each lighting position. This will greatly aid in how you approach building your groups for that system. It's easy to go a little overboard when building your groups, which can cause clutter and consequently inhibit your speed. It's not the end of the world if you need to create a more specific group in the future; you can build it right there on the fly if needed. Just try to spend a good amount of time building some of the more sensible and widely used groups. Eventually, you'll get more of a grasp of how many and what types of groups you should start off with.

If you have access to a console beforehand, building groups is one of the many things you can program without having the system on hand. Jump on any opportunity to build things beforehand so you can spend more time on focusing and building cues and effects.

Positions

The position palette is a place to store pan-and-tilt information for quick access while programming looks. Position palettes, also known as preset focuses, are one of the more delicate operations of palette building; a fair amount of strategy and consideration should be used during their construction. Though often used for quick access, remember that a change made to a focus will also change all of the cues using that focus. This is a valuable tool because it allows you to update your whole show's focus from venue to venue just by changing the preset focuses. It is especially useful for touring shows, where the venue and the hang are usually different from day to day. The trick is to build preset focuses that can be used in many contexts so they can be re-used without making your show look too static.

In Figure 3, you can see some of the focuses I built on Cher. Notice the way they are organized into their own rows. I start with some point focuses such as down center, stage right, and stage left. Each row will encompass a different class of focuses such as washes, scenic elements, and aerial fly-out focuses. Eventually I'll use combinations of these focuses to quickly produce the overall focus of a look.

There are a few basic focuses you should always have: a down-center focus; a mid-center focus; an up-center focus; a center-wide tight wash; a full-stage wash; an apron wash; cycs and set washes, and several aerial focuses. From there, it would be wise to focus some fixtures on obvious acting areas such as lifts, platforms, and any auxiliary stages. If there is a band, build some band specials, then build a full band wash using those specials.

One focus that's good to have up your sleeve is a random focus. Whenever you've been building a lot of symmetrical looks, random is a nice departure from the norm, and you'll find that in the wee hours of the morning after programming all night, this focus can spark a new creative perspective on behalf of the designer. Pop it in every once in a while for maximum effect.

Again, it's imperative that you understand the intent the designer had when he or she specified each lighting position. Are there any special lighting positions that would merit the creation of a special focus? Are there any frequently used acting areas that you may be unaware of? These are the kinds of questions that you should be asking your lighting designer.

Colors

Before building your color palette, quickly review the color capabilities of your fixtures. Which ones have color wheels, and how many do they have? Do any of your fixtures have color mixing? What kinds of color modes can you put your fixtures in (snap, split, crossfade, m-speed)? These are factors that you should be aware of before building your color palette. Once you've figured out all of the color capabilities of your fixtures, you can start building your color palette based on your discoveries.

Figure 4 illustrates my standard color palette for color-mixing units as well as color wheel units. The top six rows consist of 60 color-mixing colors and the two bottom rows encompass the color wheels. I organize my color-mixing palette in chromatic shades, creating about five shades of each color of the spectrum. I then organize my color wheel colors below them in their own rows.

When building a color palette with color wheels, pay close attention to the order of the wheel. For every wheel, you should build a white or open in the first slot of that row. The next color on that row should increment one color up on that wheel. For instance, in Figure 4, palette 81 white is the Studio Spot's first color in that row. If the very next color on the wheel would be yellow, you should record palette 82 as yellow. Repeat this process until you get to the end of the wheel. If you keep all of your wheels organized like this, you will easily be able to tell the designer which color is closest to the one you are currently in. This also helps you determine what colors you would go through if you had to crossfade to a color on the other side of the wheel. The smoothest crossfade to a color on a color wheel is usually to the one right next door to the current color you are in.

If your fixture has two or three color wheels, you should palletize each wheel into its own row, making sure that you record only the values for that particular color wheel; do not include other color parameters in your designated wheel's palettes. Doing so yields two or three rows of color wheel palettes that you can freely overlap and mix other colors from. When you do have more than one color wheel, you might want to consider mixing some other colors from both wheels combined and recording those colors in either a different row or into your color-mixing palette. This will make accessing those mixed colors much faster when trying to recall them.

Another variable to consider when building a color wheel palette is making sure that you are in the correct mode of the color wheel you are trying to palletize. Some color wheels have modes that only allow you to quick snap from one color to another or one to gracefully roll from one color to another. Other modes include the enabling of the speed or m-speed functions of that color. These modes will exist in different ranges on that color wheel channel. When I go about building my color palette, I usually record all of my colors on the wheels in a mode that allows me to be able to roll from one color to another with the fade time of the cue. If I want to snap from one color to another, I can still do so; I just have to decrease the fade time or speed for that individual cue.

So far we've talked about color wheel palettes; let's take a closer look at the color-mixing palette. The color-mixing palette uses subtractive color mixing to yield a large range of colors. Most color-mixing systems use three dichroic sets of variable leaves or disks in order to produce a color. These leaves are colored cyan, magenta, and yellow, the three primaries of the subtractive color-mixing system. A combination of two of these leaves engaged to completely interrupt the beam path will yield fire red, congo blue, and green (very close to the subtractive color-mixing system's secondary colors). To create any other colors in the spectrum, you can vary the degrees of level given to each leaf, which will consequently vary the amount of dichroic filter interrupting the beam path. Most useable colors reside within ranges of one leaf on its own or two leaves combined. Any more than two leaves at once yield strange and dirty colors.

The first color-mixing colors that I record in my color palette are the ones easiest to mix, the full primaries and secondary colors. To do this, I select my color-mixing fixtures, and the first color I record is magenta, which I place in the top right button of my screen. From there, I'll roll in the cyan leaf in addition to the magenta. Any guesses which color this might mix? If you said congo, you were correct. I'll record the congo just under the magenta. Next I'll completely roll out the magenta leaf and leave only the cyan leaf to be recorded. I'll record cyan under the congo. Now I'll add the yellow on top of the cyan, which will mix a green. I'll record the green just under the cyan. If I take out the cyan leaf, I'll leave only the yellow to be recorded under the green. This leaves me with just one more combination to record, which would be yellow plus magenta. This mixes a fire red.

If you look at Figure 5, you can see how the colors line up on the right side. From top to bottom we have magenta, congo, cyan, green, yellow, and fire. To the left of these colors I'll create about five lighter shades of each hue. When you combine two leaves such as cyan and yellow to mix a green, if you take the cyan out about 40% you will yield more of a yellow-green or chartreuse. Instead, if you take out the yellow leaf 40%, you will yield a blue-green or turquoise. With every combination you can have two possible hues of that color.

I organize my color-mixing colors from darkest to lightest going left. It's important that whatever organizational technique you come up with, you group similar shades of color together from darkest to lightest. When designers ask for a color, they rarely ask for it by the number of your palette; instead they'll say something like, "Give me a blue-green." It's then up to you to supply them with a blue-green. If they want a different blue-green, they'll usually give you some indication as to whether they want a more or less saturated one, or they'll simply say "lighter" or "darker" and sometimes "bluer" or "greener". If your colors are organized chromatically and from darkest to lightest, it will be easy for you to keep up and finally produce the exact color the designer is looking for.

Beams

The beam palette is where you keep all gobos, irises, frost levels, strobe levels, zoom, and any other parameter that may fall into the beam parameter group. Like the color palette, you should know the capabilities of your fixtures' beam characteristics inside and out before you determine to how to best create and organize your beam palette. Gobo, prism, frost, and lens wheels can each have different modes residing within the ranges of their parameters. It's up to you to find out what these modes are and to decide which modes of that parameter you are going to palletize. Figure 5 illustrates the technique I use to lay out my beam palette. As you can see, all gobo wheel opens, strobes, irises, frost stops, and clears line up in a column on the left side of the screen. Each wheel and parameter type has its own dedicated row of palettes, starting with the first slot on those wheels.

Starting with beam 1, I record an "open all" beam palette. This enables me to quickly open all the parameters within the beam group of whatever fixtures I'm working with. Next to the open all, I'll build an iris open and closed as well as a couple of beam sizes. If the instruments I'm working with have a lens focus or zoom parameter, I'll include that information into my iris palette so that my iris looks will always have a crisp edge to them. On that same row, I've recorded a strobe open and closed as well as some preset strobe levels. Notice how I separated the strobe palettes from the iris palettes. If you have the space to play with, separating two palette types on the same row will help you to distinguish them from one another.

The next row down is where I'll palletize my first gobo wheel. Like color wheels, I'll build my gobo wheel palettes in slot order starting with open. With gobo wheels, you might want to include lens focus, and if your fixtures possess it, zoom. If you do include lens focus and zoom, your gobos will always be recalled sharp. If you want more subtle textures, you can then throw them into a racked lens focus preset. Often your fixture's lens focus and zoom parameters will be slightly off from fixture to fixture. Tuning each fixtures lens focus and zoom to every gobo and recording those values in with the gobo palette will insure that all your gobos will be the same sharpness when their palettes are accessed. If your fixtures possess more than one gobo wheel, you should build separate rows of gobo palettes for each wheel, as illustrated in Figure 5.

If your fixtures possess rotating gobo wheels, it's important that you palletize different rotation speeds.

Be sure you only record the rotational rate parameter into your palette; this way you'll be able to freely combine the palettes for your gobo wheel or wheels with your rotational rate to yield different speeds of rotation.

Other palettes to build include a row for frost levels, prism wheels, different zoom sizes, and lens focuses. Once you understand the logic behind building wheel-type palettes such as gobo or color wheels, you can apply that logic to many palette types.

Putting It All Together

Once you've taken the time to build and organize your palettes, building looks becomes so much easier and quicker to accomplish. It's now only a matter of assembling these pre-built elements together and recording your picture as a look. The better your organization, the quicker you'll be at accessing these elements. Let's take a glance at a few lighting looks to better understand how these palettes relate to a show. All of these looks were created with the palettes previously discussed.

In Figure 6, I started upstage with the Studio Colors washing the set. I added the circle Studio Colors to the stage in a center wide focus and colored them congo. Added to this were the floor and set Studio Colors in the floor fans position. They were colored with the loving amber color-mixing color on the color palette. Finally, I selected the B rear, E FOH truss, and pod Studio Spot groups and put them in the shatter gobo on the beam palette. I put the B and E trusses in the house positions and the pods into the blitz positions and was finished. It took about two minutes to create this look.

In Figure 7, the first thing I did was select the B rear truss Studio Spots and put them into the set wash position, lava gobo, light blue color wheel. Next I added color to the circular trusses by selecting the All Circle Colors groups and putting them in the toners position, then coloring them congo. I then selected the All Circle Spots group and put them into a spiral position. Once I've added the pod spots group and put them into the high out position, I'll reselect the circles along with the pods and color and gobo them at the same time.

In Figure 8, the Side Studio Colors group was selected and put into the shin wash position. Added to this was the Set Studio Colors group in the down-center position. Both of these groups were colored green. The Floor Spots group was then put into the floor crosses position and colored yellow then put in the Blocks gobo. To add some top light, I selected the All Circle Colors group and put them in the three points position. To finish the look, I colored them lavender.

As you can see, even the most complex looks are comprised of these simple elements known as palettes, presets, and libraries. If you understand how to create palettes and organize them into a sensible interface, you will be able to assemble even the most complex looks. Add timing, effects, and a cue structure to your knowledge, and you'll be on your way to programming a show.

--Christian Choi