Topic 055

Lighting Instruments

"Quartz" Lamps

Almost all incandescent lamps used in TV production are *tungsten-halogen lamps* (commonly called quartz lamps). They normally range from 500 to 2,000 watts.

This type of lamp is more efficient than the common light bulb type incandescent lamp, and it does not darken with age.

Quartz lamps get extremely hot, which makes ventilation important. Because of the great heat associated with tungsten-halogen lighting instruments, burnt fingers are a hazard.

Special care must be taken when these lamps are changed (in addition to unplugging the lights and letting them cool down) to make sure that oil from fingers is not deposited on the outer glass (quartz) envelope of the lamp.

Because of the great heat associated with these lamps, any residue of this sort will create an area of concentrated heat that will cause the lamp to fail -- and they can be rather expensive to replace.

Care must also be taken not to subject the lamp to jolts while they are turned on, or the fragile internal element can break.

Tungsten-halogen lamps are used in several common types of lighting instruments including the type that has been used for decades, the Fresnel (pronounced fra-nell).

Fresnels

Although Fresnels used to be so bulky and heavy that they were confined to studios, recent versions are small enough to be packed away in lighting kits and used on location.

The Fresnel lens, invented by French physicist Augustin-Jean Fresnel, consists of concentric circles that both concentrate and slightly diffuse the light.

Note the photo on the left below. The coherence (quality) of the resulting light represents an ideal blend between hard and soft.

In the studio these lights are typically hung from a grid in the ceiling.

A C-clamp or pipe clamp (on the right, above) is used to attach the light to the studio's ceiling grid.

Because of the safety hazard a falling Fresnel light some 5 meters (17 feet) feet overhead represents, a safety chain or cable should always be used along with the C-clamp.

These wrap around the grid pipe and will keep a heavy light from falling if the C-clamp fails or slips off of the grid.

The distance between the internal lamp and the Fresnel lens can be adjusted with this type of

light to either spread out (flood), or concentrate (spot or pin) the light's beam. This adjustment provides a convenient control over the intensity of the light, as well as the coverage area.

LED Lights

In recent years LED (Light-emitting diode) lamps have started being widely used in in TV studios. A basic studio light is shown here.

LED lights have at least ten important advantages over other types of lighting elements.

1. They produce more light per watt than incandescent bulbs, not only reducing power costs, but making them useful on locations and in battery powered devices, such as camcorder lights

2. They can emit light in a range of color temperatures without the use of color filters.

3. Unlike incandescent and fluorescent sources that often require an external reflector to collect and direct light, some LED instruments are designed to focus and direct light.

4. When dimming is required, LEDs do not change color as voltage is reduced.

5. Being solid state, they are difficult to damage. Fluorescent and incandescent bulbs are easily broken, ▲ especially if dropped.

6. They have a long life -- 35,000 to 100,000 hours. This is longer than fluorescent tubes and far longer incandescent bulbs.

7. Unlike some types of lights, they light up and stabilize almost instantly.

8. They do not generate the amount of heat that many other lighting instruments do, reducing studio cooling costs.

9. On some types the color temperature can be readily shifted to accommodate indoor and outdoor color temperature needs. (Some studios leave them at daylight settings, making it easy to match the color temperatures of window light or TV sets.)

10. The lighting instruments aren't nearly as heavy as other types of lights, so it's easier to transport and mount them.

▶ Although these are important advantages, especially in this era's need to reduce energy consumption, LED lamps have some disadvantages -- most of which can be controlled or accommodated.

1. They are currently more expensive than more conventional lighting technologies. However, the initial cost can be made up over time in reduced energy and lamp replacement costs.

2. Performance and life depends on the temperature of the operating environment. High surrounding temperatures or heat build-up (if this is allowed) will reduce both.

3. They require stable voltages and electrical current, which can involve regulated power

supplies.

4. Although not as pronounced as with fluorescent lamps, some white LED lights have a dip or a hole in the color spectrum that cannot be corrected with white balancing.

5. Finally, as with most lamps, the output of LED lamps will start to dim with age.

Scoops

Scoops produce a softer light than Fresnels. The incandescent (tungsten-halogen) lamps they normally use range from 500 to 2,000 watts.

Because there is no lens, the light is not projected any significant distance.

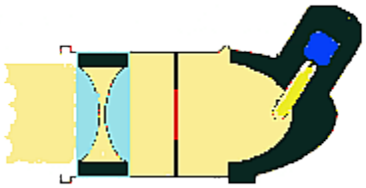
As we will see, scoops are commonly used in the studio for fill light along with ▲ LED soft lights.

Note that this scoop shown here has a square filter frame attached to the front. Colored gels, diffusers, and scrims can be slid into this frame to change the light in various ways.

Ellipsoidal Spots

The ellipsoidal spot produces a hard, focused beam of light. Used with gels, these lights can project colored pools of light on a background.

Some ellipsoidal have slots at their optical midpoint that accept a "cookie" (cucalorus), a small metal pattern (shown in red in the middle of the drawing below) that can be used to project a wide variety of patterns on a background.



In some cases, a background pattern (see samples on the left) may be all you need in a medium shot or close-up to suggest a complete setting.

For example, a colored stained glass pattern behind a person suggests that person is in a church.

Abstract patterns, or patterns suggesting the theme of a program, can also be used to break up what might otherwise be a blank background.

These can either be in the form of a cookie inside the light as indicated in the drawing above, or a large pattern mounted on a stand.

When a coherent light source such as an ellipsoidal spot is directed at the pattern, a shadow of the pattern is projected on the background.

These large patterns are referred to as gobos, a term which stands for "go between."

Backgrounds, sets, and settings are discussed in this section.

Although Fresnels, scoops, and ellipsoidal spots are the most used types of studio lights, there are also several other types of lighting instruments including HMI lights. These are

covered here.

Camera Lights

In ENG (electronic newsgathering) where quality is often secondary to getting a story, camera-mounted, LED, tungsten-halogen, or HMI lights (often called sun-guns) are sometimes used as a sole source of illumination.

These lights can be mounted on the top of the camera as shown here or held by an assistant.

Camera lights are typically powered by batteries -- often, the same batteries that power the camcorder.

The camera light shown here is a 24-watt HMI, a fixed output Frezzi fill light, with a full spectrum output sufficient to compete with sunlight for many applications.

As we've noted, both tungsten-halogen (quartz) and HMI lamps are being replaced by LED units, which provide a softer light and consume much less power. Plus, the color temperature of some LED camera lights can be varied, which is important when they are used as a fill under different lighting conditions.

When used as the only source of light they provide the same (questionable) quality as the familiar single-flash-on-the-camera does in still photography. As a result of the straight-on angle involved, picture detail and depth are sacrificed.

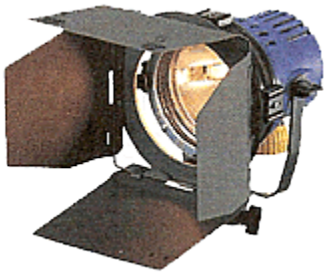
Because of the relationship between distance and light intensity, the detail and color of foreground objects often becomes washed out, and objects in the distance typically go

completely dark. Consequently, camera lights are best used as a fill for a more dominant source of light.

Attachments to Lighting Instruments

Barn doors

From lighting instruments themselves we now turn to attachments that are used with these lights.



Adjustable black metal flaps called barn doors can be attached to some lights to mask off unwanted light and to keep it from spilling into areas where it's not needed.

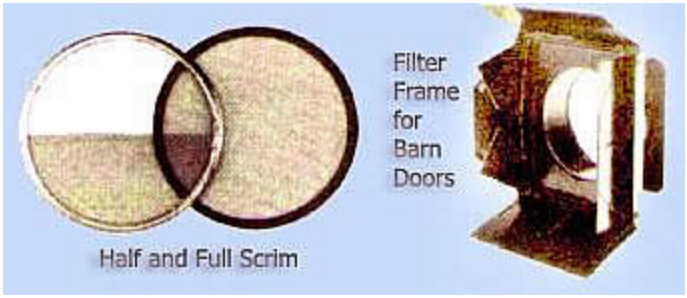
While barn doors provide a soft cutoff (edge) to the perimeters of the light, flags provide a sharper, more defined cutoff point.

Flags

Flags consist of any type of opaque material that can block and sharply define the edges of the light source. They are often created and shaped, as needed, from double or triple layers of aluminum foil.

Flags are generally either clipped to stands or attached to the outer edges of barn doors. The further away they are from the light source, the more sharply defined the light cutoff will be.

Filter Frames



Filter frames are typically a part of the barn door attachment that slides over the front of lighting instruments. They can hold:

- one or more scrims to reduce light intensity
- one or more diffusers to soften the light, or
- a colored gel to alter the color of the light

Each of these simply slides into the filter frame, which attaches to the front of the lighting instrument.

Now that we know the basics of lamps and lighting instruments, we're ready to put them into use. In the next Module we'll start with the most important light, the key light.