INFO SHEET

**TITLE:** LIGHTING TERMINOLOGY

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# Monash University Faculty of Art and Design

PHO2208 Photomedia Fabrications

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# Lighting Terminology

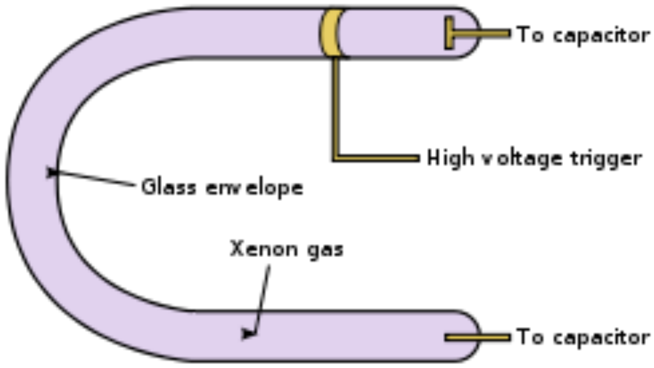
Tungsten (quartz lights): Tungsten Lights are a continuous incandescent (heat-driven) light source comprising a tungsten filament contained within a sealed high-melting point quartz glass globe. When an electrical current passes through a tungsten filament, heat is created and light is a by-product of the heat. Tungsten globes emit a light that is of a yellow/red bias in comparison to daylight. This colour difference varies depending upon the wattage and age of the globe.

Continuous light sources can produce considerable heat and generally lack the capacity to freeze motion unless very high intensity lights are used. Whilst the warm colour bias of tungsten lights can be corrected in the raw conversion stage this can lead to image degradation through the introduction of noise in the blue image channel. Full or partial correction of this colour difference prior to capture will improve overall quality of the file. This can be achieved through filtering the light source with CTB (colour temperature blue) gel or through filtering the light at the lens with an 80 series blue filter. Either method will result in a light loss equivalent to approximately 2 stops.

HMI Lights: HMI (Hydrargyrum Medium-Arc Iodide) is a type of light which uses an arc lamp instead of an incandescent bulb to produce light. HMI lamps operates by creating an electrical arc between two electrodes within the bulb. This arc excites the pressurized mercury vapour and provides very high light output with much greater efficiency than incandescent lighting units.

HMI lights produce a colour that is almost identical to daylight and does not require any filtering or correction. Per watt of light, HMI output is much higher and heat generation is considerably lower than incandescent light sources. Unfortunately these benefits come along with a significant price tag generally limiting the use of HMI’s to larger scale film productions with suitable budgets.

Strobe Lighting: Photographic strobe lights are “electric glow discharge” lamps designed to produce extremely intense, daylight-balanced light for very short durations. Flashtubes are made of a length of glass tubing with electrodes at either end and are filled with gas (usually xenon) that, when triggered, ionizes and conducts a high voltage pulse to produce the light. A power source is necessary to energize the gas and a charged capacitor is usually used for this purpose in order to allow high-speed delivery of very high electrical current when the lamp is triggered.




Structure of flash tube

## Types of Strobe Light:

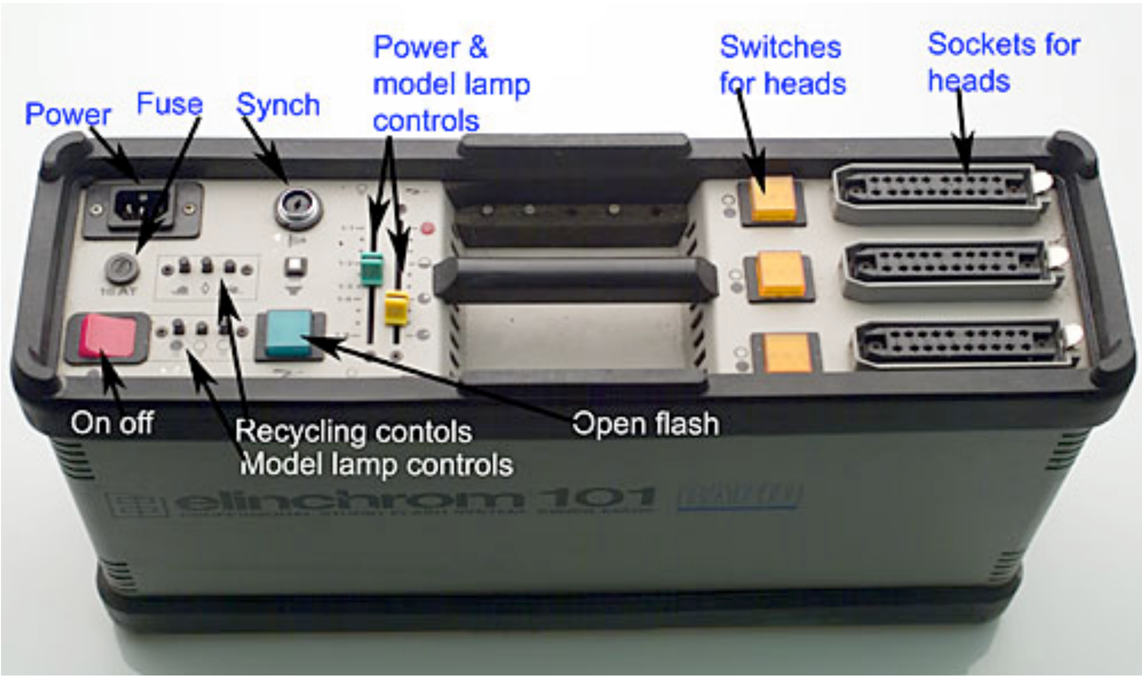
**Portable Flash:** The portable phototographic flash is a compact battery-powered strobe which is designed to be mounted either directly on a camera via the hotshoe mount or just to the side of the camera on a bracket. Most contemporary speedlights for digital cameras have very advanced system-specific functions allowing for very accurate automatic TTL (through the lens) camera controlled flash exposure

Portable flash

**Monobloc:** A monobloc is a strobe in which the electronics, power supply, tube and output controls are all integrated into the flash head. They are the most portable and affordable variety of studio strobe and go from about 250joules up to a maximum power of 1200 joules. The higher-powered monoblocs tend to get quite heavy and often require rigid stands and shot bags to ensure optimum stability. Most monoblocs will vary in colour temperature as the flash output power is changed

A Monobloc strobe head with integral power supply and slider controls.

Generator and Flash Head: The generator and head configuration removes all but the flash tube and cooling fan from the flash head and contains the electronics, power supply and output controls in a pack which sits on the floor. Generators can have output provision in some cases for up to 4 separate heads running from the same pack. Generators tend to have much more power, going from 1200 joules in the smaller packs up to 4800 joules in the larger, more expensive packs. This is very desirable for large format cameras though overkill for most digital cameras. Generators come in both symmetrical and the more expensive asymmetrical designs. Asymmetrical packs allow for the power of each connected head to be adjusted independently allowing a greater degree of control. The more expensive asymmetrical generators have the added benefit of maintaining a constant colour temperature across all heads regardless of the power setting.




A Floor/Generator Pack with built in power supply and multiple outlets for separate flash heads.

The Key Light: The Key light is the dominant light source in any scene. It may come from any direction but its primary role is to define the overall form and shape of the subject. Key lights can be hard and directional, soft and enveloping or anywhere in-between depending on the desired feel. In portraiture the key light is generally the first light that is set and is particularly important in that it will define the critical lighting pattern on the subjects face.

**The Fill Light:** The fill-light is the secondary light in a picture and is used to lighten areas in the image that would otherwise fall away completely to shadow without overpowering the effect of the key-light. Usually the fill-light is a softer, relatively shadowless light source that wraps-around the subject, filling-in the areas of shadow and creating a more even contrast in the picture. The fill-light can come from either the same or opposing sides of the camera to the key-light but must always add further illumination to the shadows to some degree. Fill lighting effects can be achieved through the use of reflectors, soft-boxes, brollies or bounce light to achieve the desired effect.

**The Standard Reflector:** This is a reflective attachment on the front of the strobe head which aids to focus the direction of the light and increases its overall efficiency.

**Barn-Doors:** These are adjustable attachments that mount on front of a standard reflector allowing control of where the light falls, preventing the light from spilling in unwanted areas.

A light with a set of barn-doors attached

**Umbrella:** A brolly is a photographic umbrella that attaches to the flash head. They can be used to either bounce the light from the flash head (silver or white) or shoot directly through in the case of the translucent varieties

Lights with Umbrellas.

**Softbox:** A softbox is a fully enclosed light modifier that comes in various sizes. It produces light that is similar to that of a translucent umbrella however it is more even and does not produce the same amount of spill.

Light with softbox attached

**Spill:** Light which falls in unwanted areas away from the main direction of the light

**Feathering:** Using the soft edge of the light source to illuminate the subject, often in conjunction with barn doors. This can result in increased contrast and highlight detail whilst effectively directing the light source away from the background. Feathering techniques can be used with soft light sources such as softboxes and brollys with similar benefits as well as an added increase in shadow detail.

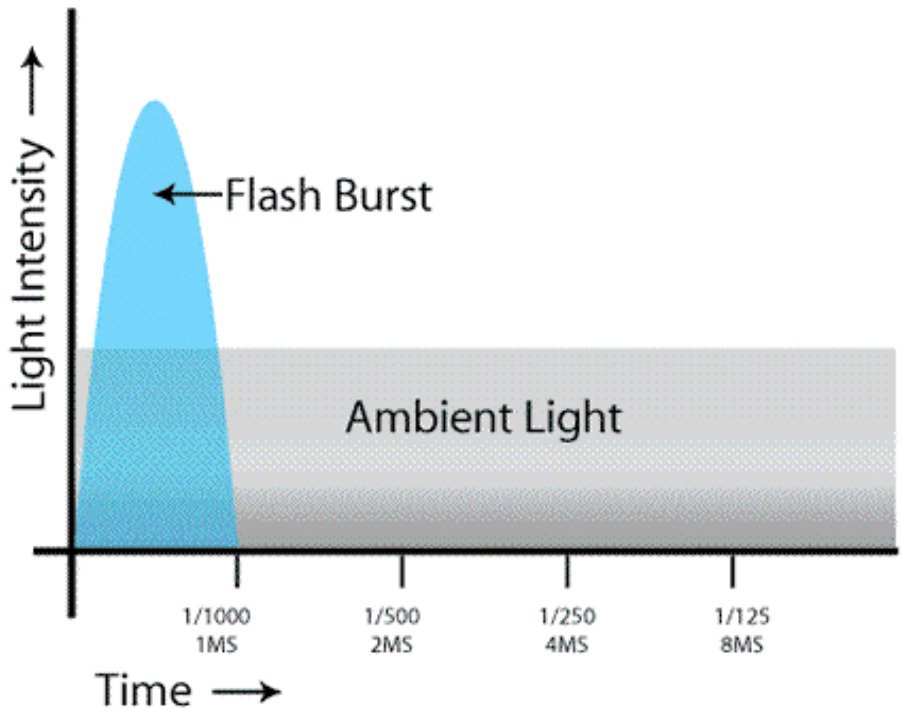
**Flag:** A flag is a rectangular piece of black plastic, metal or foam attached to an adjustable stand that is used to block light from unwanted areas of the image. It can be used to control spill as well as control the transition of light across the subject. Flags are also particularly useful for controlling lens-flare in a studio environment.

**Reflector:** A reflector is a reflective panel used to direct light from the main source back into the shadow areas of the image. By adjusting its position and angle in relation to the subject a broad range of results can be achieved. Reflectors come in white, silver and gold surfaces depending on the desired reflective intensity and colour. Reflectors can be purchased in collapsible form or made out of white polyboard.

**Incident Light Meter:** An Incident light meter measures the intensity of the light falling on the subject through the use of a white hemispherical dome. Incident meters can often measure both continuous ambient light as well as short duration photographic strobes. The benefit of ambient light meters is that they are not affected by the tone of the subject and produce more consistent exposure across a wide range of subject tones. When in continuous light mode the meter will suggest a range of appropriate f-stop/Shutter speed combinations to produce correct exposure. In Flash mode the meter will suggest an f-stop only which will produce correct exposure.

An incident light meter which measures both strobe and ambient light.

Synchronization Speed: The maximum shutter speed that the camera can be set whilst using flash before a part of the image is lost due to the shutter curtain blocking part of the frame. Typically 1/250th of a second on most of today's digital slr's.

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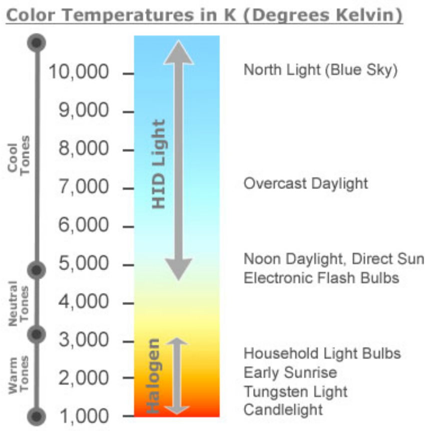
Colour temperature: Colour temperature refers to the quantity of yellow/red in opposition to cyan/blue transmitted from a light source and is measured in degrees Kelvin. Standard neutral flash colour is equivalent to direct midday sunlight and is rated at 5500 degrees Kelvin. An incandescent globe is much warmer in colour and is rated at approximately 2900 degrees Kelvin. Indirect shadow light from a blue sky is rated at approximately 7500 degrees Kelvin. Most studio flashes drop in colour temperature as their power is reduced leading to a warmer colour balance. This can be readily corrected in raw conversion with use of a colour chart or with your digital cameras presets. Key and fill lights set at different power levels may however produce a colour shift from highlight to shadow that can be difficult to correct.



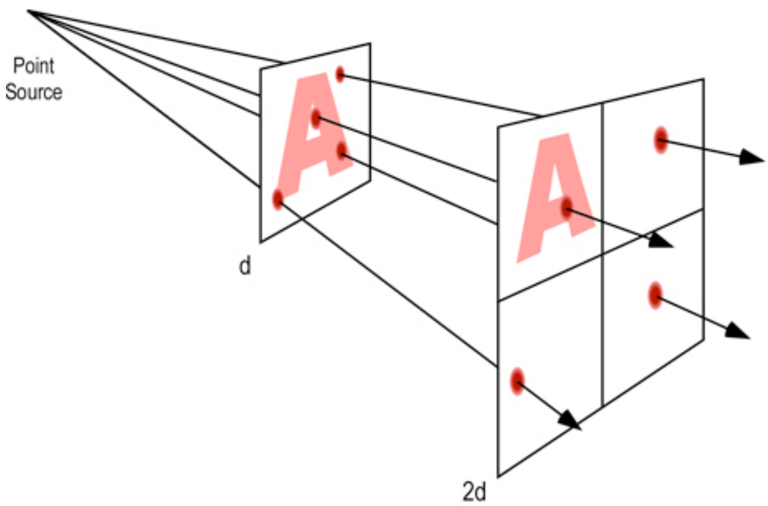

Quartz Tungsten Lights = 3400K light source

1100K 3400K 5500K

Flash is daylight colour temperature = 5500K

3200K 5500K 9000K

The inverse Square law: This law dictates that light falls off at a rate equivalent to the inverse square of the distance travelled from one point to another. In other words if the distance of light from a particular subject is increased by a factor of x 2 the intensity of the light on the subject will be one quarter as bright.



$$\text{Light fall off} = \frac{\qquad}{\text{Distance squared}}$$

$$\text{Light intensity} = \frac{1}{\text{2 squared}} = \frac{1}{4} = .25$$

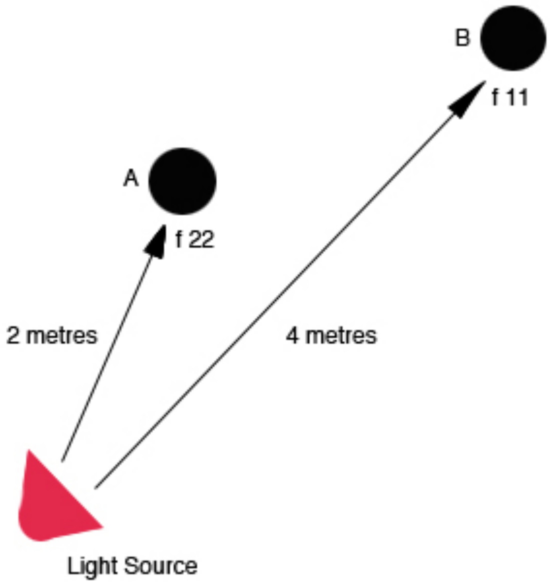
For example if a light that is positioned one metre from the subject produces a direct incident flash reading of f16 then when the distance of the light is doubled, my exposure is quartered giving me an adjusted reading of f8. This means that Light falls off in an exponentially decreasing amount as it travels from it source. This is a very useful principle to harness when I need to evenly light a space or multiple subjects at different distances from a singular light source.

The best example of this principle is offered by our sun which is such a great distance away that it will produce even illumination regardless the distance from one subject to the next.

### Example:

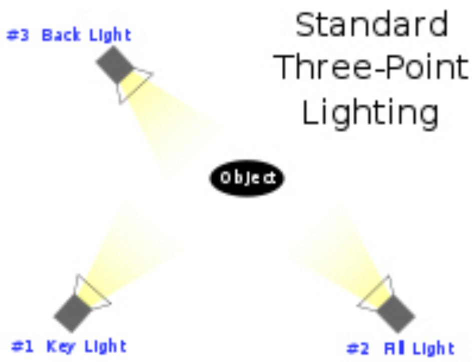
Subjects A and B are both lit by a single light source. Subject-A is 2 metres from the light source and subject-B 4 metres from the same source. If the direct incident flash reading from subject A measured f22 then subject-B, being double the distance from the light source would be a quarter the brightness of subject-A producing a reading of f11 ie. 2 stops darker. This would make for very uneven lighting of multiple subjects.

Now lets take the same two subjects but place subject-A 8 metres from the light source and subject-B 10 metres from the light source. Subject A and B are still both just 2 metres apart but subject-B is now only x1.25 the distance from the light source as subject-A instead of twice the distance. This results in a difference in light intensity between A and B equivalent to approximately 2 thirds of a stop, significantly reducing the difference in brightness from one subject to the next. If I were to continue moving the light further away from along the same axis without the subjects changing position the relative difference in brightness between my two subjects will progressively decrease whilst the overall level of light Is continually reduced.



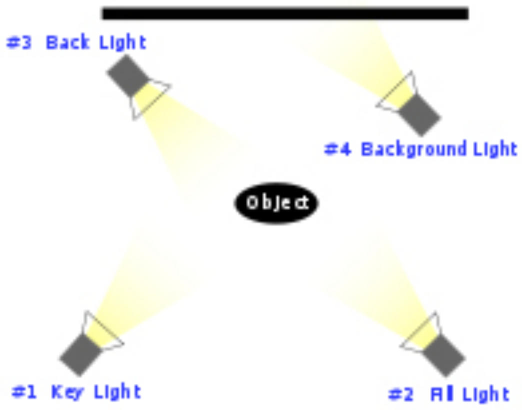

## Three Point Lighting:

A lighting set up that consists of a Key light, a Fill light and a ¾ back or edge light. The Key light defines the overall shape of the light, the Fill light controls the brightness of the shadows and the Edge light helps to separate the subject from their environment creating depth and dimension.




## Four Point Lighting:

Is the same as three point lighting with the addition of a background light.




## Lighting Ratio:

A lighting ratio is the total difference in illuminance at subject position between the fill-light on one side and the key-light plus fill on the other.

To give an example we will look at the method of establishing a 3:1 Lighting ratio with flash using an incident light meter:

I position a key light 45 degrees to the left of the subject. Using a flat-disc or retractable diffuser I direct the flash meter directly back towards the light source from the subject position and take a reading. Lets say in this instance I have a key light reading of f11. Turning off the key-light, now I position a fill-light or reflector slightly to camera-right and adjust its distance from the subject or it's intensity whilst taking meter readings in the manner previously described. I adjust the fill source back and forth this way until I have an incident reading of f8. Now the key-light at f11 is one stop brighter (twice as bright) than the fill source at f8.

Although we have established the relative intensities of each light at subject-position this alone does not give us our lighting ratio. The reason being that when we turn on both lights together the key side of the subject will have the combined effect of illumination from both the key light and the fill light whilst on the shadow side the illumination will come almost exclusively from the fill-light. Thus the formula for establishing a ratio is as follows:

Lighting Ratio = Key light + Fill : Fill

At this point it is useful to assign a relative numerical value to the illumination from each light to help arrive at the final ratio. In this case we will assign a value of 100 to the key-light and 50 to the fill-light which is half the power of the key. Using the formula above we can now begin to calculate the final ratio.

Key f11 (100) + Fill f8 (50) : Fill f8 (50) = 150 : 50 = 3 : 1

Our final ratio is now 3:1 suggesting that the key lit side of the subject is now 3 times brighter than the shadow side. This is equivalent to a difference in brightness of 1.5 stops.

The higher the lighting ratio we choose the darker the shadows in the image will appear relative to the highlights.

## Some common lighting ratios are as follows:

3:1

Fill light is set one stop below the key to provide a full range of tonal information from shadow to the highlight

5:1

Fill Light is set two stops below the key light providing a stronger shadow effect on the face. Some darker shadow texture is lost

9:1

Fill Light is set three stops below the key light providing a hint of texture in the shadows though the image has a pronounced contrast between shadows and highlights

17:1

Fill light is set four stops below the key light providing only the slightest hint of shadow tone in some tone in some instances. Vey dramatic contrast.

Setting Lighting Ratios for soft key sources: Due to the wrap-around effect of soft key light sources such as softboxes and brollys there is always greater level of scattered light in the shadows compared to hard-light sources. This leads to a softer contrast with brighter than usual shadows. In this instance it is advisable to set the lighting ratio higher than one usually would. Usually setting the fill light one stop darker than normal will help maintain desired levels of contrast between highlights and shadows. This would equate to the difference between a 3:1 and a 5:1 ratio.