An intro to studio lighting equipment

This is an attempt to answer (or anticipate) some of the questions that newcomers to studio lighting often ask in the forum. It isn't a technical article as such, just an introduction that I hope will be helpful to people just starting out in studio photography.

There are basically two forms of artificial lighting - continuous and flash.

Continuous lighting can be sub-divided into:
Tungsten - The term includes household lamps, security lights, theatre lighting and car headlights as well as lights designed specifically for photography.
Fluorescent
Metal discharge, e.g. HMI.
We'll come back to the different types in a moment.

Continuous lighting is often seen by beginners as being ideal, possibly because, in its most basic form it seems to be cheaper, and possibly because of its WYSIWYG (what you see is what you get) qualities. In fact, although the basic lights may be cheaper than flash the running costs are higher and the various light modifiers needed are both more expensive and less efficient than with flash.

Although there are exceptions, most tungsten light designed specifically for photography produces light of a colour around 3200 - 3400 deg K, which is much warmer in colour (less blue) than flash. Because of this the colour needs to be corrected by using filters, either in the form of gels fitted to the lamps themselves or to the camera lens. However, if the tungsten lights are the ONLY light source (i.e. all lights produce the same colour of light and there is no daylight or overhead room lighting) then filters are not needed with digital cameras, where the white balance can be adjusted instead of using filters.

I was trained on tungsten lighting and I still use it today, if only very occasionally, if I am photographing still life subjects or room interiors when it's possible to use very long exposures, or when I deliberately want to include subject blur, for example blurred people in an architectural interior.
But I would never use them for portrait or any other kind of people photography, for the following reasons, not in any particular order:

1. Although they *appear* to be very bright, tungsten lights produce a very low level of actual light compared to studio flash and so they are less than ideal if short shutter speeds are needed, or if a small aperture is needed for depth of field.

2. They are known (in The States at least) as hotlights, and there is a very good

reason for this - they produce far more heat than light and are both intimidating and very uncomfortable for the sitter. Think of them in terms of an electric heater - the function of the heater is to produce heat and it does so by passing electrical current through a thin wire - as a side effect, some light is also produced. This applies to tungsten lighting too because although the light is brighter and whiter there is still a lot more heat than light.

3. Because of the amount of heat they produce it is difficult and expensive to fit them with modifiers such as softboxes, they can melt lighting gels and scrims, polarising gels will be ruined by the heat and the lamps are liable to 'blow' if they are moved or adjusted when they are switched on or still hot.

4. They present a very real risk of fire.

5. They use a lot of electricity

6. They are not adjustable for power - dimmers can be fitted but this is for setup use only, because the use of a dimmer dramatically affects the colour of the light.

7. The colour of the light is inconsistent. With all forms of tungsten lighting, small changes of current will change the power output to some extent and will change the colour too, sometimes quite dramatically, so you'll get inconsistency between your shots. Quartz halogen lamps maintain their output power fairly well throughout their life but 'Photoflood' lamps (basically very short- life overrun domestic lamps) darken with use and change colour too.

8. Because the lights *appear* to be very bright, the pupils of live subjects are smaller than normal and look decidedly odd - very similar in effect to bright sunlight.

In theory, if you're shooting on digital then changes of colour or even output may not seem to be important **as long as all of the lights are the same** - but even though nearly all my own shots are on digital I'm old-fashioned enough to believe that it's much better to get the shot right in camera and to keep avoidable computer work down to a minimum.

Advantages
They do have a couple of advantages over studio flash.

1. They are cheaper, at least initially.

2. They may be easier than flash for beginners because arguably they show a more accurate rendition of how the actual shot will look. Budget studio flash units tend to have pretty weak modelling lamps, which don't give an accurate indication of how the final shot will look. The reason for this is that although the modelling lamps contribute little or nothing to the actual shot (and neither does the ambient light in the studio) because the light is totally overwhelmed by the power of the flash, the ambient light *does* affect the photographers' perception. The ambient light effectively lowers the contrast created by the modelling lights, so the actual contrast of the shot is much higher than it appears to be. Other than that, we can think of no advantages at all.

Other types of continuous light

Fluorescent
Professionals have used fluorescent lighting for years and it has also become almost the standard in TV studios.
But let's not get confused here, because there's a world of difference between the pro fluorescent lighting and the cheaper stuff.

Flat panel fluorescent lights are available for the amateur market.... These lights are claimed to produce daylight colour, removing the need for colour correcting filters. In fact, fluorescent light is deficient in magenta and so (on the lights I've tested) the manufacturers have added a magenta grid. Clever. Because they are fluorescent and not tungsten lights, they are cool running. Personally, I do not feel that they can generate anywhere near enough power for any type of still photography of people, although it seems they're OK for video photography. I made this observation once before and a manufacturer got a little bit sniffy about it and told me that I was wrong. I responded by offering to test their products in my own studio but I heard no more from them.

Since then I've carried out a quick & dirty test on a couple of lights owned by someone I know - 2 of these flat panel lights, each measuring 17"x13" at a distance of 72" from the subject. And the result? 100 ISO, 1/30th at f1.5, or 1 sec at f6.3. An incident light measurement with the sensor actually pressed against the screen, which is useful for measurement but which is not a practical test, produced a reading of only f22.8 at 1/30th... ! The manufacturers also claim that they produce soft light. Well, they will produce soft (if uneven) light at a lamp to subject distance of up to about 21", which produces a 100 ISO reading of f6.3 at 1/30th sec - so they may be usable for some tabletop still life applications I

suppose. The tests I carried out were on one make of light only, perhaps there are other, better ones available too, I don't know.

HMI lights HMI stands for Hydrargyrum Medium-Arc Iodide. Hydrargyrum is better known as Mercury and the active ingredient of Idodide is halogen.

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HMI lights are very widely used in the motion film industry - the lights are massive and very expensive but they are ideal for the purpose because

1. They have a consistent colour temperature of around 5,600 degrees

2. They are flicker-free

3. They are cool running

4. The quantity of light produced is fairly high

Notes on these statements
The colour temperature is OK up to about 500 hours of use, after which they become progressively more green. There is usually an 'hours run' meter so that the lamps can be changed when necessary.
They are available with either magnetic or electronic ballast, electronic is much more expensive but produces flicker- free, consistent lighting.
They are not really cool running but are much cooler than their equivalents in

tungsten lighting.

They are efficient in that they produce a lot more light than their equivalents in tungsten lighting - this is not an authoritive statement (just my own finding based on limited personal experience) but a test on one of my own 70 watt HMI lights produced slightly more light than a 500 watt quartz halogen lamp, PAR (parabolic aluminized reflector) with no modifiers, 1 meter distance from a standard grey card. The result was 1/250th at f4.8, 100 ISO.

This shot shows, left to right, a 70 watt HMI, a 500 watt Quartz Halogen and a standard flash head, all positioned 2' from a cream wall. The aperture of f22 was set to suit the flash, which was dialed down to just 37J, and the shutter speed of 1/4 sec was set to suit the continuous lighting. As you can see, the level of light produced by both forms of continuous lighting were very low.

Used in a studio for people photography, HMI lights have basically the same advantages and the same disadvantages as tungsten lights, except that they don't run nearly as hot, the colour temperature approximates average daylight and the colour and output is very consistent. Because they don't run as hot as tungsten it's much easier to use modifiers such as softboxes, scrims and honeycomb grids, if they are available in the fittings needed.

HMI lights are fairly popular with still life photographers and there is at least one brand that comes complete with a very good range of light modifiers specifically designed for very precise still life photography. The light output is very low however and I can't comment on the usefulness or otherwise of this particular setup because I have no personal experience of it. Personally I only use my 2 HMI lights for the occasional architectural interior, where I need to hide lights to fill in specific areas, adjusting the effective power by means of the shutter speed.

Flash

Firstly, a statement of the obvious: Photographic flash is nothing more than a brief, intense flash of light used by photographers to illuminate a subject. It is normally synchronised so that it fires during the brief period of time that the camera shutter is open. Used in a studio environment in which there is little existing (ambient) light, the presence of other light is normally insignificant and will not affect the exposure, so it doesn't really matter whether the shutter speed is, say, 1/125th or 1/15th sec - all that really matters is that the shutter is fully open at the time the flash is fired. **The effective length of the exposure is determined by the duration of the flash, not by the shutter speed of the camera.**

However, where there are high levels of ambient light, this needs to be taken into account when choosing the shutter speed.

Given that the process itself is so simple, it can be confusing for people when they find that there are so many different brands, models and types of flash available - hopefully this article will help to address some of this confusion.

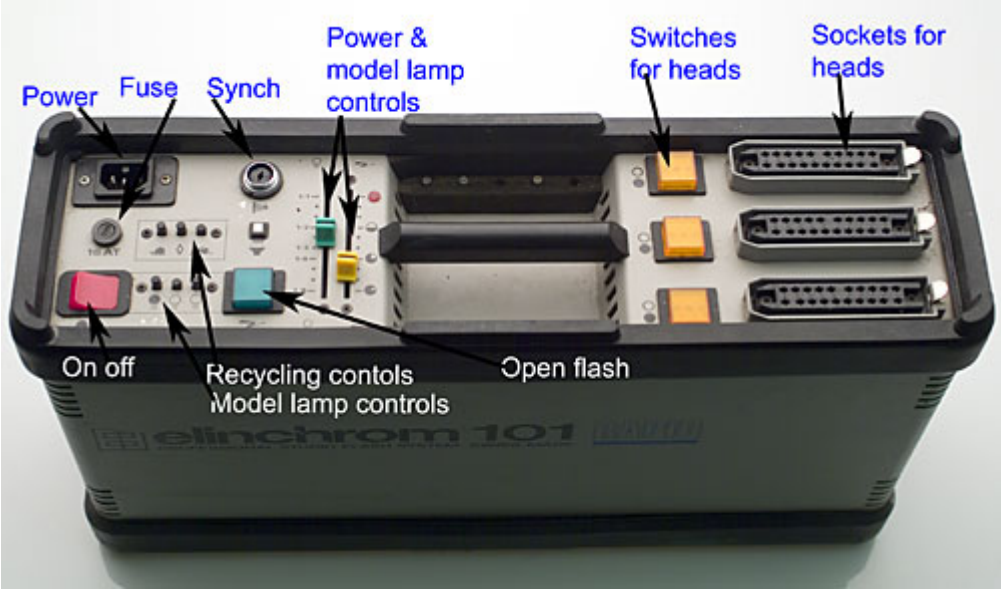
There are 2 very different types of flash, the type that fits onto a camera and the type that's used for studio lighting.

On-camera flash units are clever, and if they're dedicated to the camera they can communicate with it, focusing the camera even in the dark, setting themselves to the camera ISO setting, setting the zoom to suit the camera lens, calculating the exposure adjusting the power output accordingly.

Studio flash units are dumb, and don't have any of these features - but they're far easier to use in the studio, generally have far more power and can be used with modifiers.

The terms **flash** and **strobe** are interchangeable and don't refer to any specific type of unit.

There are 2 basic types of studio flash - **Generator** (England) also known as **Pack & Head** (USA) flash basically consists of a box that sits on the floor (or, with professional units too heavy to lift, sits on wheels) and **Monoblock** (England) or **Monolight** (USA). **Generator/Pack and head lights** contain all their 'works' in the box, and a high-voltage cable connects the box to the actual flash head. .



Typically, the flash head contains just a flash tube, a modeling lamp and (usually) a cooling fan. Because the head itself is so simple it is light in weight and fairly small, so it's less unstable when perched at the top of a flimsy light stand or on a boom arm. And because the head doesn't include any complex electronics there is less risk of damage caused by overheating when using accessories such as honeycomb grids, which restrict ventilation and trap heat.
I once had a mono head, fitted with a honeycomb grid, blow up - I had forgotten to switch off the modeling lamp! It was both dramatic and expensive, with a loud bang, a cloud of black acrid smoke and a terrified fashion model....

Most generator packs can power more than one lamp head at a time. If, for example, the pack generates 2,400 Joules and can power 2 heads, if only 1 head is fitted then the output is adjustable up to the full 2,400, with 2 heads fitted the output per head will be divided between them. Some generator packs are symmetrical, that is the distribution of power between however many heads are plugged in is equal, other (better) units are asymmetrical, allowing different heads to be set to different power levels.

The adjustment may be infinitely variable, or the allocation of power may be fixed, or variable to only a limited degree - you need to check the spec. One of the many advantages of generator packs is that all the adjustments are carried out on the magic box, so there is no need to climb a stepladder to switch off a modeling lamp or alter the power. Some professional generator packs can also be adjusted from the computer. As with mono lights, some generator packs have infinitely variable (step less) power adjustment, allowing literally any level of power to be set, others have simple 'click stop' dials, which are less versatile. In an attempt to make mono heads easier to adjust, some manufacturers have remote controls available, either wireless or hard-wired.

Personally, I'm a great believer in redundancy, so I normally have one generator pack for each light head, which means that I have extra packs available in case of breakdown - although breakdown is very rare.
As you would expect, generator packs are more expensive than mono heads.

Mono heads contain all their 'works' in the actual head, making them heavy and delicate. Because of their low(er) cost they are usually the tool of choice for occasional users, but cost saving is the only real advantage I can think of.

The power hype
Flash power is expressed as watt seconds (w/s) or Joules (effectively the same thing) or as effective watt seconds (IMO meaningless marketing hype) and about the only indication you can usefully glean from this kind of 'information' is that a higher figure should indicate the probability of higher power, the actual figure and the terminology used is less informative and can be downright misleading. To indicate the scale of the differences, I tested two makes with identical theoretical ratings, one produced almost twice the actual power of the other.

If you *really* want to know how much power a given flash will produce you need to look through all the manufacturers data and find the **guide number,** sometimes hidden away almost out of sight amongst the hype - the guide number is an indication of actual measured power, not of consumed energy, and so this information is actually useful.

Suppose, for example, that the guide number is stated to be 110 (feet). In Europe we measure in metres not feet, so the figures are different but the results are the same.

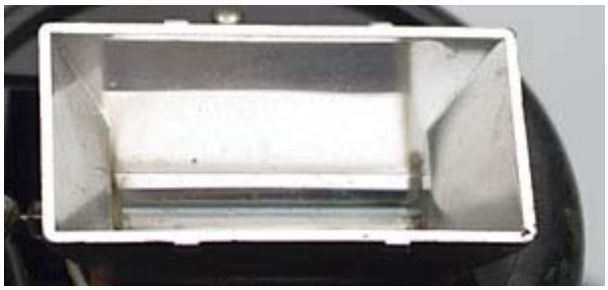
What the guide number actually means is that if you divide the distance from flash to subject into the guide number the answer is the aperture you will use, assuming the use of 100 ISO film.

So a flash with a guide number of 110 (ft) means an aperture of f11 when used at 10 feet.

Simple? Well... actually, no!
First of all you need to know the conditions under which the guide number was measured - which reflector was fitted to the head at the time?
The choice of reflector makes an enormous difference - IMO manufacturers should conduct their tests using a standard reflector, but some reflectors can be up to 400% more efficient than standard reflectors, producing very misleading figures.

'Guide Number Inflation' seems to be especially common with the type of flashguns that fit into camera hotshoes, where manufacturers often quote guide numbers tested on the narrowest possible zoom.
Going off at a bit of a tangent, a few years ago I tested a few hotshoe flashguns and in each case the actual guide number, tested in my own studio, was inflated by at least 30%. In one case it was inflated by 400%!

Here are 3 different flash heads - this one is one is one of the cheapest available, what you see here isn't normally visible because the reflector is fixed and built in to the flash and is normally hidden by a translucent cover..



The flash tube itself if tiny, probably about the same size as fitted to the average accessory flashgun and the mirror-like qualities of the reflector exaggerate its performance, producing extremely harsh and barely usable lighting.

Next we have an Elinchrom head in a standard reflector, this produces directional but useful light of good quality.

And finally we have a Stobex flash head, massive by comparison, this head operates on very high voltage and is housed in a white-painted reflector that produces directional yet soft light. .

This type of flash produces very long flash duration which can be useful sometimes (more of this later)

And what about the size and decoration of the studio used? If the test was carried out in a small room with white walls and a low white ceiling then the figure will be much higher than in a large studio with distant walls and a high ceiling, which won't bounce light back from their surfaces.
It's probably reasonable to assume that reputable manufacturers will measure their lights sensibly and fairly and may publish their testing conditions, but it may not be a good idea to assume that all lights are tested in the same way, especially those sold on auction sites?

How much power is enough?
This is a question without an answer!
Visit any commercial studio and you'll find a wide range of very powerful lighting. This is often only normally needed for large sets (usually furniture) shot at small apertures on large cameras.

And because image quality is paramount in commercial work, just about everything is shot at 100 ISO or less. If you shoot still life at f32 to get maximum depth of field, or use a 5" x 4" camera at f45 or a 10" x 8" at f90 you will need a LOT more power than if you use a 35mm at f16 or a cropped-sensor DSLR at f11.

But if you want to shoot portrait heads in a small studio using a small camera and you want to shoot at f4 to get part of your subject out of focus then very little power will be needed and too much can be a problem.

And if your studio photography is carried out on an occasional basis then you may find that the quality loss involved in using, say, 200 or even 400 ISO instead of 100 could be acceptable to you - a very cheap way of getting more effective power!

I don't really want to feature specific makes of lights but, just as an example, let's take a look at the power output of Alien Bees, which seem to be very popular... Take their 'entry level' model, the B400, which they claim to be 160 WS. They say that, using their standard reflector, tested in what seems to me to be a perfectly reasonable test environment, the guide No. is 118.

Now, this is a very low-powered unit, but 118 means an ISO 100 aperture of f11.8 at 10 feet, which seems to me to be very usable for most portrait use.

Of course, guide numbers are just that, guides, and will be affected by light modifiers as well as by reflectors and the environment.

All modifiers will 'reduce' light to some extent (although, in theory, the light is not so much reduced as spread around by most modifiers) And a medium softbox might 'eat' perhaps 2 stops of light but, typically, the softbox would be used very close to the subject, say 2' away, so there will be plenty of power for most situations, most of the time.

Don't get the idea that low-powered flash will be fine for every type of studio, with every type of camera and every type of subject - it won't - we just feel that we need to point out that high power is not always needed and that there are other, equally important things to consider.

One important feature is **the range of adjustment** and the way in which the adjustment is made.

Now, there are some very basic flash heads that don't have any power adjustment at all, and the only ways in which the power can (effectively) be adjusted is to move the head closer or further from the subject, or to fit one or more neutral density gels in front of the light.

Moving the flash closer or further away is no answer at all, because by doing so you will affect the quality and softness of the light and the size and softness of the shadows.

Next up in terms of sophistication are lamps with 'click stop' adjustment, e.g. full, half, quarter power etc. These often have a limited range of adjustment, and a 100% incremental 'click' doesn't allow for fine adjustment, so it's better if possible to go for infinite, or stepless adjustment, usually carried out by means of a slider.

Typically, flash units with stepless adjustment will adjust by about 5 stops, a ratio of 32:1, with an even wider adjustment range possible on some units.

At least as important as the range of adjustment, is the **range of accessories** available.

Some of the very cheapest flash units (AKA auction site wonders) have built-in reflectors and may not take any accessories at all, but the better makes have a range of different reflectors available, from wideangle to almost parabolic, from highly reflective to matt surface, and in a range of different sizes.

The reflectors can be used with umbrellas, or they can have a honeycomb grid fitted into the front of the reflector, or they can be removed to allow the lights to be used with softboxes, spotlight attachments etc.

Softboxes are usually available from the lamp manufacturers, and come complete with the same fitting as their reflectors - or you can buy an independent make, together with a speedring that fits your lamp. This is often the better option.

I've noticed a range of small softboxes sold on American Ebay that have a 'universal' fitting, simply a ring fitted with thumbscrews. These will fit onto many lights that cannot otherwise be fitted with softboxes - and at very low prices too! They are also offered for sale on British Ebay, but at several times the USA price.

What else?

Well, **recycling speed** may be important to you if you shoot fashion or any other kind of people photography or if, like me, nearly all your work is commercial, it will be unimportant.

The recycling speed is usually quoted in the spec, but it can be a good idea to take the figure with a small pinch of salt, allowing perhaps double the quoted time for the flash to reach its full charge.

Going off at a slight tangent, some flash units can be set to beep when ready to use, with others the modelling lamp switches off when fired, coming back on when recharging is (claimed to be) complete.

Modellng lamps don't normally contribute to the actual exposure, their function is simply to indicate the effect of the light. Even the best modelling lamps fall short of the ideal however, simply because the light isn't bright enough to show

the true contrast that the flashhead produces. As a result, shadows are always much harsher than the modeling lamp indicates them to be.

In general terms, the brighter the better as far as modeling lamps go; bright lamps provide more information to the photographer and make focusing easier. Turn the room lights out and block out any natural daylight to get the most accurate indication from the modeling lights, especially if you have budget-range lights with dim modeling lamps.

Some flash heads are fitted with **proportional modeling lamps** - what this means is that if the power of the flash is turned down then the brightness of the modeling lamp is reduced in proportion.

(Nearly) all flash heads have a **built-in sensor,** allowing the flash to 'see' the flash from another head and fire in perfect synch. On some models this can be switched off if required.

All flash units need to be synchronised to fire when the shutter is open. The manufacturers supply PC cords that run between the flash and the camera, most flash units have a standard jack socket, which is simple and reliable, but some have their own, very special fitting, for example Bron, Elinchrom and Strobex each have their own unique fitting. The Bron and Strobex ones are generally reliable. But whatever the fitting, I strongly advise you to get a radio transmitter set to trigger your flashes - much more reliable and no danger of damaging your camera if the trigger voltage of the flash is too high! The leading brands are Pocket Wizard and Pulsar, but cheapo ones are now available at far lower prices and most people seem to find them perfectly O.K. for normal home use.

Another factor is colour shift. Basically, flash heads are supposed to produce 'photographic daylight' colour, usually at around 5,500 deg.K The better makes hold this colour accuracy regardless of the power setting, but some of the cheaper makes don't, and the colour can change (usually to a warmer colour) as the power is reduced.

Another factor that may or may not be important to you is **flash duration** - the length of time that the flash actually fires for, and which determines the length of the exposure. Now, with on-camera flashguns the duration largely depends on the power setting (because on-camera flashguns produce a full-power flash but switch it off early when less power is needed) but studio flash works in a different way. Many studio flash lights have a longer flash duration when less than full power is used. With some makes of generator/pack flashes you can have a choice of slow or fast heads. Whether flash duration matters or not depends on the type of shots you want to produce? With still life photography it doesn't usually matter, although it *can* be important for shots involving steam, pouring liquids or splashes.

For portrait photography just about any flash duration will be fine, for fashion photography or for the type of shot below, where fast movement can be involved, a long duration can cause subject blur, which may or may not be what you want..

Which make and why?
No, I'm not going to recommend any particular manufacturer, instead let's just recap on the things that **should** be important to you.
1. A wide range of adjustment

2. Stepless adjustment

3. The ability to change reflectors

4. The availability of a wide range of well-designed light modifiers (e.g. softboxes, honeycomb grills, spotlight accessories) (check the fitting - some cheap makes

take the same fitting as expensive pro equipment so they can use top quality accessories)

5. Easy to adjust

6. Build quality

7.Adequate power

Right, that's ruled out all of the 'auction specials' that I've personally seen. Now the things that *might* be important to you

8. High power

9. Consistent colour, especially at lower power settings

10. Fast recycling

11. Short flash duration

12. The ability to control the flash units from your computer

13. Weight and portability

14. Will it stand up to 'all day every day' use?

15. Will you be able to hire in extra units if needed?

Generally, with lights as with everything else you get what you pay for - but although it's a false economy to get something that is less than suitable there's little point in spending hard earned money on top quality pro equipment if you don't need it.

And, as you can see from the list above, different people have different needs anyway.

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