

Successful LIGHTING for Video
Series written and produced by Mik Parsons

FOREWORD

ViT's Successful Video Production is a series of programmes designed to help in the learning of a wide range of Video Production techniques:

CAMERA
NON LINEAR EDITING
LIGHTING
SOUND
TV NEWS
DRAMA EDITING

Although equipment is very much a part of the production process, the emphasis of the ViT series is on principles and creative techniques rather than specific hardware.

The programmes, each around 30 to 40 minutes, are full of examples shot at a wide variety of locations covering aspects of both drama and documentary. The presenter is BBC broadcaster, Sean Street and programmes are subdivided into clear sections each beginning with a Topic Heading, and ending with a list of the Key Points covered.

This study guide uses the same Topic Headings as the video and expands on issues raised in the video. There is also a series of projects set within the text. The aim is to keep things as inexpensive and accessible as possible whilst working to the highest possible standards.

How to Use the Programmes

Although the study guide is designed to be read in conjunction with the video material, each can also be used separately. The recommended approach however, is to watch the first chapter on the video up to the Key Points and then read the booklet under the same Topic Heading. Hopefully you will be keen enough to try the projects suggested but obviously this will depend on your circumstances and personal aims. Once you're ready, start viewing again, stop when you get to the next Key Points, and so on.

The series was written and produced by Mik Parsons who is Senior Lecturer in Video and Interactive Media Production at Bournemouth University.

Mik began his career with an MPhil in Electronics but has since worked extensively within the Arts and Media. In addition to his professional experience within video production, he has also worked and lectured in design, computer graphics, music, animation, and interactive media.

ViT 63 Lowther Road, Bournemouth, England. BH8 8NW
E-mail: mparsons@vitmedia.co.uk www.vitmedia.co.uk
Tel: 01202 461323

CONTENTS

Introduction

Contrast

Quality

Direction

Three Point Lighting

Location Lamps

Intensity

Colour

Safety

INTRODUCTION

Why do we need to light differently for video when our eyes can see a scene perfectly well? The answer to this is that there are fundamental differences between the way our eye sees and a camera sees. The eye is much more sensitive in low light conditions whereas a camera needs a minimum amount of light to function at all. The eye is much better than a camera at dealing with the high contrast of a bright sunny day. The fact that we have two eyes means that we see in three dimensions whereas television is two dimensional. We need to use light to create the illusion of depth. The eye has a further advantage in that it is linked to the brain and so it is selective in what it sees. We 'see' a scene by allowing our brain to filter out unimportant details. Lighting can be used to highlight and pick out important details within a scene.

As a programme maker, you will need to know how to control light to produce the best pictures - whether you're using the available light, or supplementing it, or whether you're replacing it altogether with your own lights.

The video deals with the main issues which will help you to control light and get the effect you want to achieve. But remember that lighting is a creative skill and that there are no 'correct' ways to light a scene. Six different lighting designers will come up with six different solutions.

CONTRAST

The difference between the lightest and darkest area of a picture is called 'contrast'. All TV monitors have a contrast control adjustment (on some monitors it's just called 'picture') The effect of contrast variation is more obvious to see if the picture is changed to black and white. In theory, if you reduce the contrast far enough, the range of grey tones from black to white will converge into a single mid-grey, and if you increase the contrast far enough, the result will be pure black and white.

To set up a video monitor for the correct contrast and brightness settings, you'll need to display a set of colour bars on the screen. Turn the colour down so that the colour bars appear as grey and then slowly increase the contrast until the white bar is just white enough to work with comfortably, but keep it as dull as possible to minimise other problems. The black bar should then be adjusted using the brightness control until it is just illuminated above the natural screen colour. (A problem with some small monitors is that they have a limited capacity to reproduce contrast (they have an automatic beam limiter circuit), which means that as the overall scene brightness increases, they tend to 'turn the brightness down' automatically - so pictures become more contrasty and dark areas disappear into black. Keeping the white bar dull will help to avoid this problem).

Compared to the human eye, video is very poor at resolving contrast. Sitting in a naturally lit room on a bright summer's day can illustrate the phe-

nomenon. From the shade of the interior look out of the window to the brilliantly lit exterior. Despite the enormous variation in the contrast range, your eye will quickly and easily adapt itself to focus on objects outside, and with rapid adjustment it will pick out the fine detail on the wallpaper surrounding the window frame.

The eye will make this transition almost immediately and at the same time adjust accurately for each extreme. When looking at the interior the exterior remains in comfortable contrast to it and vice versa. Now set up the video camera and frame up a wide shot which includes the scene through the window and plenty of the surrounding interior. What happens? On the 'auto iris' setting the camera is exposed for the average amount of light entering the lens and, since this is mostly bright sunlight, the iris will close to its smallest aperture making the room interior look completely black. Open the iris manually so that the wallpaper detail is revealed, and the exterior is bleached out, or 'over exposed'.

In the video example, we see two people in shade to the left of the frame and two people approaching in bright sunlight to the right of the frame. The video shows how the correct exposure for one will be at the expense of the other. The contrast is too high. In this situation, the only practical solution is to pick a more evenly lit environment, in other words, move away from the direct sunlight and shoot in the shade.

In the second video example as the girl drops the pencil sharpener, the solution to high contrast is to add an extra light to balance out the contrast problem.

Video's poor ability to resolve contrast is often used for stylistic effect. A darkened room or studio can be made to appear as a totally black background. Conversely a white painted room can be lit strongly so that as a background, it bleaches out.

Scenes which have a high proportion of brightly lit and colourful areas and few dark areas are said to be High Key. They suggest youth, energy and happiness and are often found in game shows and magazine style programmes. Conversely scenes which have a low proportion of brightness and colour are called Low Key. The predominating dark areas suggest a more sombre or dramatic mood. Good examples are found in action drama and Film Noir cinema where there are large areas of darkness revealing no detail, contrasted with strong highlights and splashes of light.

Key Points. Contrast

- contrast is the difference between the lightest and darkest areas
- high contrast on video means loss of detail
- high contrast can be used for dramatic effect
- sunny days give high contrast problems
- use lighting to balance contrast

High Key - bright, colourful, cheerful, energetic.

Low Key - dark, sombre, dramatic.

Projects

You will need:

Two lights

A camcorder

Arrange a scene which contains one or two people in a room which can be reasonably darkened.

Light it for high contrast and then low contrast using just two lamps. Try different relative light positions and record the results.

Arrange a scene which contains a person sitting in front of a window.

Expose the camera for the outside light conditions so that objects outside are visible but the figure is silhouetted by the window light. Experiment with a lamp to see if you can illuminate the subject sufficiently to balance the light. Use two lamps close to each other if you need more power.

What can you say about the colour of the lights?

QUALITY

The quality of light can be described as either hard or soft or simply whether it gives hard edge shadows or soft edge shadows.

The most obvious examples are provided by the sun. A bright sunny day provides everything with hard, black shadows, and reflective surfaces give off a glare that can be quite dazzling causing problems for the camera. Video cameras do not cope well in these circumstances so, contrary to popular belief, a bright sunny day is not a good day to be recording. Too much contrast means shadows become black and light colours bleach out.

When the sky is covered by a blanket of uniform cloud, the sun light is evenly diffused by the cloud which then becomes a huge soft light source. Shadows become soft and may even disappear altogether.

It's interesting to note that the worst recording situation as far as video is concerned is the chocolate box scenario of blue sky and white clouds. Small clouds will have the effect of switching the sun on and off like a lamp. An auto iris setting will be constantly shifting and a manual setting will involve constant adjustment. Keeping continuity becomes a huge problem since every shot will have a different contrast value. An overcast sky gives a much more even soft illumination which is much easier to work with. If necessary, it's possible to use large artificial lights to simulate sun highlights.

To create hard light, the light source must be small and intense

To create soft light the light source must be large and diffuse

By their very nature, portable location lights need to be quite small and so they tend to be hard lights. Although it's possible to buy soft lights, they are

usually so large that they're more suitable as permanent fixtures in a studio. On location, it's usually easier to create your own soft lights.

The video shows how a sheet of diffusion filter suspended in front of a lamp will enlarge it and soften the light. The larger the source in relation to the subject, the softer the shadows. Clipping a sheet of diffusion filter onto the barn doors is a common approach but it's more effective if the diffusion is mounted on a large frame and kept some distance away from the lamp so that it can be larger and filled more evenly.

Hardening a light is also possible, as the video demonstrates. As you move a lamp farther away it gets smaller in relation to the subject and as a result the light becomes harder. The perfect hard light would be infinitely small.

Another common way to soften light is to bounce it from a large surface. Ceilings and walls make good bounce surfaces provided they are out of shot but remember they need to be white unless you intentionally wish to colour the light. Their size and distance from the subject also means that you waste a lot of the light. You'll get more control by using large sheets of polystyrene board which can be cut into convenient sizes and taped or clamped into position. Take care when using polystyrene though, it's highly inflammable and will give off toxic fumes if overheated.

Key Points. Quality

The quality of light can be hard or soft.

Bright sunlight gives hard light and hard shadows.

A cloudy sky gives soft light and soft shadows.

Use small, intense lamps for hard light

Enlarge and diffuse the light source to create soft light

Projects

You will need:

- A hard light source (This could be either a professional film light such as an 800Watt Redhead or a 60Watt Anglepoise will do).

- A diffusion filter (professional grade 'spun' or diffusion filter for the Redhead since it needs to be flame proof, or ordinary tracing paper will do if you are using an angle poise).

1) Arrange the light source to shine towards a plain neutral coloured surface and position an object (your hand will do!) in between (Fig 1A). Vary the position of the object and make a note of what happens to the shadow.

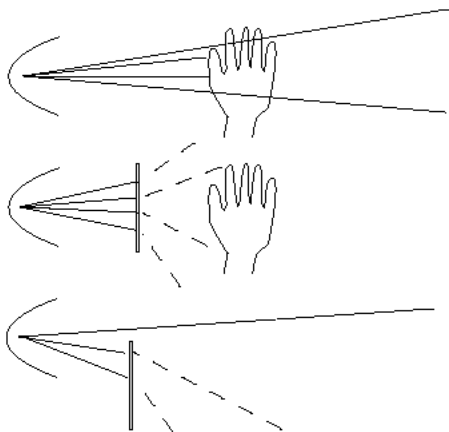
When the object is placed quite close to the light source what do you notice about the edge of the shadow? Can you explain what you see?

2) Introduce a diffusion filter between the light and the object (Fig 1B).

Observe the shadow. What happens when you move the filter further from the light? Can you explain what you see?

3) Use the edge of the filter to roughly divide the light into two types (hard and soft) (Fig 1C). Now move the filter away from the light source. What

can you say about the the way the brightness of the light is affected? Can you explain what you see?



DIRECTION

The direction of light can often tell us a lot about a scene - even when the light source itself cannot be seen. We can tell where light is coming from by looking at the shadows.

Sunny exteriors may initially suggest summer warmth but if the shadows are long then the sun is low in the sky which may suggest winter. In addition, the light has a slight orange cast, this may suggest sunset or sunrise. If the scene is an interior, soft light coming predominantly from one side may suggest the presence of a window, even if it is out of shot. If the shadows are harder and the light slightly more orange, this is likely to suggest an artificial light - a table lamp perhaps.

If the shadows are very soft or non-existent, then the light is coming from all around. Natural occurrences of this can be found inside a tent or marquee, or in a large evenly lit space like a department store or a museum, or outside on a cloudy day.

Light direction also affects the mood of a scene. We normally expect light to come obliquely from above - like natural sunlight. If the light comes from below, it seems highly unnatural. Faces lit from below look quite ghoulish.

The horizontal angle of the light direction in relation to the camera also has an effect on the mood of a scene. If a single light source is placed right

next to the camera, then the scene will appear to have no shadows. This is rather unattractive in most situations because everything looks rather flat and lacks three-dimensionality. It's often used in news reportage though for when recording a night interview, the most convenient place to mount a small portable light is on top of the camera itself.

Move the lamp off to one side slightly and the shadows begin to appear. The subject immediately take on more shape and depth.

Hard light from the side looks quite dramatic. Unnatural but striking. If the light is moved beyond the profile and around to the back, then the subject become 'back-lit' and is defined by outline only. When used on its own, hard back-light can be used to suggest 'presence' (because we can see the outline) and 'mystery' (because we cannot see any detail). Good for mysterious nocturnal visitors and awesome rock formations with supernatural powers! Ironically perhaps, back-light can also be used to sweeten and glamorise pictures as we will see in the next section.

Key Points. Direction

Use light direction to suggest:

- season
- time of day
- location
- dramatic mood

Hard light is more directional than soft light

Projects

1. Take a selection of scenes from different TV programmes or films recorded 'off air'. Freeze a frame at random and see if you can work out how many lights are being used in the scene and where they are coming from. Use the shadow positions to help you. Try to draw an overhead diagram of the scene and mark in where you think the light sources are.

2. Write down examples of situations where the light direction will give information about the scene or mood.

3. You will need:

Two hard lights

A camcorder and monitor

Set up a still scene in a room which can be reasonably darkened. Using a single hard light try aiming the light from different directions to light the scene. Record the results.

Introduce a second light but keep it hard so that it acts as another key source. Find a position for the two key sources so that they complement each other and don't conflict

THREE POINT LIGHTING

One of the commonest images on television is of a person talking to, or slightly off, camera. It could be a news presenter, a chat show host, or an interviewee. Invariably you will find that they are lit using a variation of the three-point lighting set up shown in the video. Let's look at this in a little more detail.

Key Light

The key light is the primary light source. You could say it is the key to the scene's appearance. It defines the main shadows to be seen on the face, in particular the shadow cast from the nose and across the eye sockets. Also look for the cheek shadow on the opposite side to the light and the shadow cast under the chin. The best position for a naturalistic light effect is frontally from above and slightly off to one side. Shadows are formed but not too prominently, and the lamp is low enough for the eyes to be illuminated.

Look at portraits by Rembrandt and you will see that his apparent key light often casts a particular set of shadows known as the Rembrandt triangle. An area of light defined by the nose shadow, the eye sockets and the cheek bone. Fig (2)

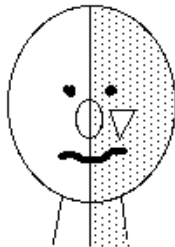
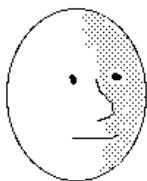


Fig (2) The Rembrandt Triangle

If the subject looks off camera slightly, in an interview situation for example, you'll have a choice of which side of the face to place the key light. If you illuminate the exposed cheek, the lit area of the face will be larger than the shaded area Fig (3). This is called 'broad' lighting. Lighting from the other side of the face will present a narrow lit area with a larger shaded area facing the camera. This is called 'narrow' lighting.

If in doubt, a common choice is to put the key light between the camera and the interviewer. This leaves the light slightly 'broad' on the subject's face.

The key light is usually hard because it needs to define the main shadows. Some people prefer a softer key light to give a softer appearance to the skin. Glamour photographers will often use exclusively soft light.



Broad lighting



Narrow lighting

Fig (3)

Fill Light

Once you've got the key light right everything else will follow. You should now take steps to reduce the contrast imposed by the key. Shadows will be harsh and the skin tones will not look right. To counter this we need to introduce a soft light known as the fill. In the video the fill light was provided by an 800 watt Redhead softened by a large diffusion filter which also had the effect of reducing the power of the lamp so that the contrast ratio between key and fill was about 2:1. The lamp was positioned slightly below the eyeline so that light could reach under the chin.

In a TV studio where the lights are high up and suspended from a ceiling grid, this isn't always possible with the result that a dark triangle often remains unlit beneath the chin. Fig (4).

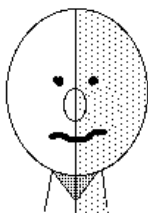


Fig (4) High studio lights will often leave an unlit area beneath the chin

Back Light

Because all of the light directed at the subject so far comes from the front, the outline of the subject is not well defined. If the hair is dark it may appear to lack definition and merge into the darkness of the background. The addition of a hard, steeply angled backlight will provide a rimmed high-light effect to the hair and to the shoulders. This effectively separates the subject from the background. On location, circumstances will often dictate where the back light can be placed since, if it's on a stand, the stand must not appear in shot. Sometimes a special fitting can be used to suspend the light from above. If possible, try positioning the back light diagonally opposite the key. This gives a pleasing balance to the shape of the face. Two back lights, one from either side, can be used to make a feature of the hair. Another variation is to allow the backlight to strike the shaded side of the

face. This is useful if you only have two lights since the backlight will replace the need for a fill light.

Some people will argue that back light makes everything look artificial and contrived. Some people say it looks stylish. Certainly it can be overdone but there's no doubt that it helps to give depth to pictures and makes them more pleasing to the eye.

Three Point

An arrangement of the three lights discussed results in the classic three point portrait lighting set up shown in the video. The key light defines the main illumination and shadows, the fill light reduces the contrast by filling out the shadows and the back light provides separation from the background and attractive highlighting.

Providing the subject is positioned well away from the background wall or screen, the background should still be in relative shadow even when the three main lights are switched on. This is good news because it means you are in control of it and can light it separately. A good distance between subject and background also means you are far less likely to have to deal with unwanted shadows falling onto it. There are various ways of illuminating a background either by 'spilling' light from one of the main light sources, introducing a 'practical' lamp (i.e. one that becomes part of the overall scene such as a table lamp) or using a fourth lamp specifically to light the background. In the video we have shown how raw light can be broken up into interesting patterns by using a polystyrene sheet which has had holes punched into it.

It's important to notice that even with three lights, there's only one main shadow - the key light shadow. The more lights you introduce the more potential there is to create unwanted multiple shadows. This can become a real problem in wider shots and particularly in multi-camera studio set-ups where, although a single set of clean shadows may be ideal, it may be virtually impossible to achieve.

Key Points. Three Point Lighting

A subject can be lit from three points.

The key light is hard, It sets mood and exposure.

The fill light is soft . It reduces contrast

The backlight is hard. It provides highlight and background separation.

Keep the subject away from the background wall

Light the background separately

Project

You will need:

- a camcorder and monitor

- a suitable key light source

- a suitable fill light source

- a suitable back light source

- a suitable background and a light for it

coloured filters (blue and orange)

a model (Try inanimate objects, teddy bears, flower displays, still-life arrangements as well as people. If you have access to lots of people, try different nationalities, hair colours, facial shapes, spectacles, headgear etc.)

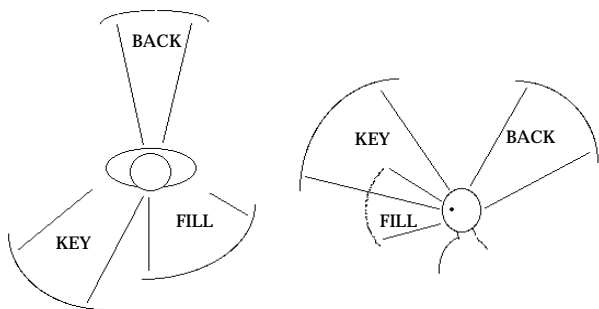


Fig (5) Three point lamp positions

Arrange a three point lighting set up and adjust it to suit each of your different subjects. Try and work out how to highlight their most attractive characteristics. Record your pictures onto video tape and discuss the results.

Here are some ideas:

- how can you best illuminate someone with deep set eyes?
- what effect does coloured clothing have on your image?
- does your subject have a good side and a bad side depending on which side you key from? What causes it?
- which is more effective, broad or narrow lighting?
- try an orange filter on the key light and a blue filter on the back light - then the other way round. Comment on what you see.
- what happens if you increase the intensity of the back light and reduce the intensity of the key light? (lamp dimmers can help here or alternatively just move the lights)

LOCATION LAMPS

Modern video cameras use CCD (Charge Coupled Device) integrated circuits to translate the image into electronic signals. They are much more sensitive to light than the older tube cameras. In many indoor situations you won't need to build up the light levels from scratch, it will be enough merely to supplement the existing available light. The number and size of

the lamps you will need to carry can be quite small.

It is a different matter if you are working outdoors in daylight. Here you are at the mercy of the sun. It is too powerful to compete against so the most you can hope to do is supplement it. If it is bright sunlight then use the sun as a key and use large reflector sheets or polystyrene boards to bounce it back in from the other side as fill. If it is cloudy or shady, the ambient light level will still be quite high so any additional balancing lights you put in will probably need to be quite powerful.

If it is windy or raining, then stay indoors or undercover. It is possible to use outdoor lights in bad weather conditions but you should seek specialist help before doing so.

HMI lights are much more efficient than their tungsten counterparts. An HMI is generally three or four times brighter than a tungsten light of the same power. In addition, whereas a tungsten light will need a blue filter to correct its colour for daylight use, an HMI doesn't require a filter and so avoids a further power loss equivalent to two f-stops. On the more negative side however, HMI lamps are relatively expensive and they require a separate and rather bulky electronic ballast unit to regulate the mains power supply. Some types of ballast can cause audible or electrical noise problems.

The basic rule is the bigger the space, the more light you will need. The principles remain the same but bringing in large quantities of light will require more specialist equipment. It will make greater demands on the electricity supply and requires specialist knowledge beyond the scope of this introduction. Wherever possible, make use of prevailing light conditions and use your own lights to supplement it. In this way, you should be able to keep your power needs to a minimum.

The simplest form of portable video light is the one which mounts onto the camera. Battery driven and low powered, it points wherever the camera points and gives flat shadowless light. Convenient for the single operator and acceptable in news reportage but the light quality is rather unattractive. A better variation, which requires an assistant, is to hand hold the light high up and to one side so that more naturalistic key light shadows are created.

An assistant will certainly be valuable in larger set ups. The video shows an example of an 800 Watt open faced or lens less spot lamp commonly called a Redhead (some manufacturers may use different terms) and its bigger sister the Blonde rated at 2000 Watts (or 2 KiloWatts). These are useful, general purpose tungsten filament lamps which have spot/flood controls to vary the spread and intensity of the light. They can be mounted on lightweight aluminium extendible stands and should come fitted with a safety glass and a set of barn doors. The barn doors, as well as being useful to prevent light spillage are also useful places to attach colour gels and other filter materials

If you need to get very crisp shadows, you will need a spotlight. This has a focusing lens on it which will concentrate the light into a tighter and more

intense beam. The example in the video is a very small one rated at 300 Watts. 500 W, 1 kW, and 2 kW versions are popular, but once again anything larger will need specialist attention.

You need to remember that the maximum load on a 13 Amp domestic plug is approximately 3 kW. This will limit you to the equivalent of three Redheads, or one Blonde and one Redhead. In some situations, when you know that the electrical supply is on a 30 Amp ring main for example, you may be able to spread a greater load using more than one wall socket, but you should gain electrical knowledge beyond the scope of this booklet before attempting this.

Tungsten lights are usually the best choice for indoor situations although you may need to colour balance them with correction filters to match the prevailing light colour.

As well as the lamps themselves, you will need to think about where to attach them. The larger lamps will almost certainly need to be mounted on lamp stands, but smaller ones can often be clipped to doors, furniture fittings, posts, ceilings etc. There are a variety of special clip devices available and also some very small lightweight lamp kits ideally suited for this type of work. Make sure that the lamps are well ventilated and that your clamps are not damaging someone's antique furniture. Gaffer tape can have a nasty habit of turning into paint and wallpaper stripper so be cautious about where you stick it.

You will also need to have some ways of manipulating the light, reflecting it, bouncing it, filtering it etc. Sheets of polystyrene are useful, if rather bulky accessories. Keep one side white for reflecting light and the other side black for blocking it. Punch holes in it to break the light into interesting patterns.

A range of filter gels will also become an essential part of your kit. These you can suspend in front of the lamps to diffuse or colour the light. Manufacturers produce a wide range to choose from and we will look at some of the more important ones in the next sections.

Key Points. Lamps on Location

Modern CCD cameras need less light than the older tube cameras

Don't take too much, use lamps which are small, portable and low powered

Supplement the available light if you can

In bright sunlight, use reflector boards to control contrast

HMI lamps give more power and are colour balanced for daylight conditions

Use bounce techniques to convert hard lights to soft lights

Carry an adequate range of reflectors, gels, mounting clips, lamp stands and relevant accessories

INTENSITY

Having selected a particular lamp you will often find that it is too bright or not bright enough. How can you control its brightness or intensity? There are several ways but most of them have side effects so you will have to choose which is the most appropriate.

1. Flood or spot the lamp

The light will spread out more if it is flooded but can usually be contained by closing the barn doors. A 'spotted' Redhead will not give light as even as a true spotlight and it will also produce double edged shadows which may be unacceptable. (The main hard shadow is produced by the glowing bulb filament and a softer secondary shadow is produced by the metal reflector behind the bulb.)

2. Move the lamp (or move the subject)

Moving the lamp back will reduce intensity. It's interesting to note that this will also have an effect on the light's rate of fall-off which also varies according to the distance between lamp and subject. If the lamp is distant the light intensity remains relatively constant as the subject moves farther away. If the lamp is close, a small movement of the subject away from the lamp will cause the light intensity to fall off sharply. If conditions aren't too cramped it's usually better to try and work with the lights as far back as practicable to prevent this from happening.

A distant light will also appear physically smaller and so the shadows will harden. Light spread may also increase, but it can usually be contained by closing the barn doors slightly. An alternative way of increasing the lamp to subject distance is to bounce it from a reflective surface. A mirror surface will give the purest result but a roll of cooking foil taped to a polystyrene sheet will provide a good practical alternative.

3. Diffusion Filter

A diffusion filter will certainly reduce a lamp's intensity but it will also make the light softer. You can reduce the softening effect by keeping the filter fairly close to the lamp head, (make sure it is heat-proof filter) so that the size of the lamp source does not appear to be enlarged. (When used over a Redhead on 'spotlight' setting, a fine diffusion filter will eliminate the filament 'double' shadow and improve the light quality).

4. Neutral Density Filter

The most effective method of reducing intensity is to use grey neutral density filter gels, which reduce light transmission without affecting either the colour or the shadow quality of the light. They come in different grades equivalent to aperture stop closures on the camera lens. Camera lenses are often fitted with internal ND filters for use in bright sunlight or snow conditions.

5. Dimmer Controls

Lamp dimmers are essential in TV studio use, partly because individual lights need to be lit and dimmed as recording proceeds, but also because

the lamps are high up and difficult to get at once the production is under way. Dimming is a convenient way to reduce a lamp's intensity. On location a multichannel lamp dimmer is unsuitable but something smaller like the single channel in-line dimmer shown in the video can be very useful. The main disadvantage is that the colour temperature will drop considerably as the lamp is dimmed so that it becomes orange. Some dimmers will also create an electronic or audible buzz if they are poorly suppressed or laid near audio cables.

Key Points. Intensity

Control intensity by:

- spotting or flooding the lamp
- moving the lamp (or subject)
- blocking with trace or ND filter
- attaching a dimmer

Project

You will need:

A suitable hard light with flood and spot control

Diffusion filter, ND filter, a dimmer

A camcorder

Arrange a scene which has a definite foreground and background and can be lit by a single lamp.

Try each of the methods described to see if you can reduce the light intensity of the scene by three camera f-stops.

Observe the depth of field changes. How else could you control the depth of field? (Look at the ViT programme 'Successful Camerawork' if you're not sure of this).

COLOUR

The temperature of a light source affects its colour. Seen through a video camera, a candle will appear orange, daylight will appear blue and fluorescent light usually appears green. Our eyes and brains tend to correct for these differences so we don't notice the changes.

Colour temperature is related to the colour spectrum of the rainbow - red, orange yellow, green, blue, indigo, violet (ROYGBIV) where red/orange is cool, low energy (think of a candle flame) and blue/violet is hot, high energy (think of a welder's torch or gas flame).

The average colour temperature of daylight is 5600 degrees Kelvin (although it can vary enormously according to weather and sky conditions). Fluorescent lights approximate to an equivalent colour temperature of 4800 degrees Kelvin but again there are many variations around this figure. The colour temperature of a tungsten video light is 3200 degrees Kelvin.

(This figure reduces slightly as the filament ages, and significantly if the lamp is electronically dimmed).

A video camera needs to be set so that its colour response matches the colour quality of the prevailing light. You can do this by switching in a colour correction filter inside the lens system and then adjusting the camera's white balance to get a more accurate setting. This is fine if the scene is lit by only one type of light source.

If the scene is lit by different sources, for example, blue daylight through a window and orange light from a tungsten light, you will need to use colour correction filters either on the daylight or the tungsten source. The choice in this situation is to either:

i) white balance to tungsten and put orange correction filter over the daylight source.

ii) white balance to daylight and put blue correction filters over the tungsten lights.

Situations can get more complex, for example there may be a table lamp and a window in shot and also a fluorescent ceiling light to contend with in addition to your video lights. They will all appear to have different colours. The rule of thumb here is to decide which is the dominant source and set the white balance to that colour temperature. All the other sources will need to be colour filtered to match that temperature. Alternatively you could decide, for example, to turn the fluorescent lights off or leave the table lamp looking slightly orange, or leave the daylight looking slightly blue.

Colour correction filters will absorb a lot of light and will reduce the intensity of your lamps. A full Colour Temperature Blue correction filter (CTB) for example can reduce the brightness by 75%. Because this is so inefficient, many operators will compromise and use half-blue filters (half CTB). This will shift the temperature from 3200 to 4300, in other words about half way towards a daylight temperature of 5600.

On many professional cameras it's possible to set the white balance temperature to any value and so it's possible to choose a point somewhere in between to give the most pleasing result.

In addition to the colour correction filters, it's possible to select any colour from a whole range of filters. These are designed to be used purely for effect. Any filter will reduce the light intensity to some extent but dark saturated colours will reduce a lamp's final output quite considerably. If your intention is to colour cast the entire picture, it may be easier to use a coloured lens filter or tint the picture in post production rather than colouring all the lights. Colouring the lights is more effective if the colour affects only part of the picture - the background for example.

Key Points. Colour

The average colour temperature of daylight is 5600 degrees K

The colour temperature of normal fluorescent lighting is around 4800 degrees K

The colour temperature of a tungsten video light is 3200 degrees K

An orange filter (CTO) converts daylight to tungsten

A blue filter (CTB) converts tungsten to daylight

Filters will drastically reduce light efficiency

A video camera needs to be 'white balanced'

White balance to the prevailing light temperature

Use other colours for effect and atmosphere

Projects

You will need:

A camcorder and monitor

A tungsten light source

temperature correction filters

A room with a window

(other sources eg. fluorescent strip light, table lamp, torch etc.)

1. Arrange a scene lit by tungsten light with a window in the background

White balance for the window light and use filters to adjust the tungsten light colour

Now remove the filters and white balance to the tungsten light. Experiment with the filters you have to adjust the colour of the window light.

2. Introduce other light sources and experiment with different white balance settings and different filters over the lights. Record the pictures and discuss the results

SAFETY

Lighting a scene takes time and will often cause impatience on the set.

There is always the pressure to get it set up as quickly as possible.

Remember though that lamps treated poorly can be dangerous. Each Redhead that you use is the equivalent of a small electric fire on top of a pole. It is important that you take the necessary time to ensure that your set up is as safe as possible.

Check electrical safety:

Don't overload the supply. Calculate the power that you will be using. The simple formula $\text{Amps} = \text{Watts} \div \text{Volts}$ will help you to convert lamp wattage figures into fuse current ratings (amps).

Example:

$13 \text{ Amps} \times 240 \text{ Volts} = 3120 \text{ Watts}$

In the UK, this is the maximum load a single 13A fused plug can carry.

eg. $4 \times \text{Redheads} (800) = 3200 \text{ Watts}$. This will overload the supply and may cause the fuse to blow.

Remember that the maximum load on a 13A domestic plug is approximately 3 kW. This will limit you to the equivalent of three Redheads, or one Blonde and one Redhead. In some situations, when you know that the electrical supply is on a 30 Amp ring main for example, you may be able to spread a greater load using more than one wall socket, but you should gain electrical knowledge beyond the scope of this booklet before attempting

this.

Make sure that the cabling you use is adequately current-rated (preferably 30A) and never leave the cable coiled up when it's in use (it's best to avoid cable drums altogether). Coiled cable will 'hot up' like an electric heater element, and eventually melt the plastic sheath.

Check your equipment is in good condition, that clamp nuts are not missing, that cables are not pulled or frayed etc.

Use RCD fitted mains plugs (Residual Current Devices) wherever possible. If there is an electrical fault, such as a short circuit in your equipment or in the supply you are drawing from, an RCD will detect the leakage current and immediately trip the circuit to prevent electric shock.

Keep lights well away from water and damp environments. Water conducts electricity and can cause short circuits. Raindrops can also cause hot bulbs to explode.

Check floor area safety.

Extended lamp stands should be weighted down or held by an assistant. Video sets are busy places. People trip over cables very easily so keep them tidy and clear of walkways. Hang them or tuck them under the carpet. Tape them down if necessary. In walkways and doorways, use mats to cover the cables.

Check fire safety

Tungsten lights operate at high temperatures and so the lamp casings will get very hot. Use gloves while you're working and make sure lights are kept well away from drapes, wallpaper, wood fittings etc. Remember too that heat rises so watch out in particular for damage to ceilings - particularly polystyrene tiles. (The 1993 fire at Windsor castle was started by a spotlight too close to a curtain and caused forty million pounds worth of damage!)

Let the lights cool down for a while after switching off. Hot barn doors can easily slice through a cable.

Tungsten bulbs can sometimes explode quite spectacularly into tiny fragments of glass, so make sure open faced lamps are fitted with a safety glass.

Key Points. Safety

Check electrical safety

Check floor area for clear movement

Check for potential fire hazard