

Tips of the Trade

Perfect Focus and Exposure

from GTC member Robert Foster



When Nigel called to ask if I would share my experience on the subjects of focus and exposure, I was delighted to accept, as these are topics close to the heart of every cameraman and frequently debated. There are various approaches to achieving accuracy and excellence in the images we capture for the screen, and this is my personal approach rather than a complete 'A-Z of how to do it'

Focus

There are many key factors to great camerawork, and accurate focus and exposure are just two, although admittedly very important ones. 'Fixing it in post' hasn't quite got to the level of substituting the core skill of focus, although of course you can defocus a shot in post. Keeping it in focus is quite another thing, and (thankfully) editing software hasn't gone that far, otherwise craft camera operators would be redundant. Pictures that are unintentionally off-focus are incredibly distracting when watching a programme, particularly when the focus is inadvertently placed on a background or foreground item rather than the subject.

Unfortunately, Mini-DV cameras with autofocus can't always be blamed. Sometimes it's us operators at fault, whether it be because we're rushed for time, or the camera viewfinder is not properly set up, with too little peaking control, or the diopter has been knocked. Perhaps the scene is too flat and devoid of light or modelling, or maybe it's not the right type of light – just red or blue light on stage, for instance – meaning we can't find sharp focus. Has the doubler (lens extender) been left in? Or are the

grub screws on the back of the lens flange loose causing image shift and vignetting? Maybe the back focus is out, the macro has been left in... arghh, what else? There are many things that can get in the way of accurate focus control. However, by keeping on top of your pre-flight checks and not getting flustered, you'll be OK. If you can stay calm under pressure and let logic partner your creativity you'll generally be well in the control zone.

Like many of the other skills we use in our work as cameramen – lighting, composition, movement and shot development – there is not just technical excellence involved but subjective judgements to be made as well. A great part of our work is delivering with consistency and with quality control. I've been known to say that you've got to feel the music. By that, I don't mean filming a band live on stage or a pop promo, but that we often create and establish a mood and a style of shooting for a film. It may be slow and considered, glossy, fast reframed, edgy and dynamic. And even getting that 'amateur' look can take a bit of effort to resist the instincts of how we might shoot more

usually. Everything we do with the camera contributes to this overall music. And we are the first line of quality control.

Two things I'd say to any camera operator wanting to improve their skills are, first, get to know all the standard shot sizes and how to move from one to the other quickly, reframing as you go so the whole movement is smooth. Often, and particularly on documentaries or anything which involves actuality, we're working against time and need

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to be 'one-take wonders', gathering a range of shots that will cut easily into interesting and meaningful sequences. These shots must be of sufficient duration, correctly exposed and focused, and give the editor plenty of choice. To many, this is all basic



▲ Pro-35 Adapter with 35mm Ultra-Prime Lens. Lovely shallow depth of field – but challenging for the operator!

stuff but once you can deal intuitively with the composition and balance of a long shot, moving swiftly into a mid shot with correct looking room and headroom, then into a close up, BCU, 2-shot, over-shoulder 2-shot, or whatever, with perfect composition every time, you can afford to mix it up a bit and introduce a style and framing that is appropriate to your project – which may depart from the 'standard' rule book.

input and interpreting the director's visualisation. You will not have to concern yourself so much with the mechanics of how to deliver a range of perfect shots against time and other unplanned events.

In the late seventies when I was first thinking about entering the film and TV industry, I spent as much time as I possibly could at school and college practising with cameras in the studio

“a knowledge of depth-of-field tables is useful as it may allow you to make judgement calls on split-focuses or what is an acceptable focus range at any given lens size or f-stop”

Know your lenses

Secondly, I'd say it's really important to get to know thoroughly the lenses you are working with. We all have to work under pressure at times, delivering sequences of many shots that all work, often without any direction (or should that sometimes be directorial interference?). If you get to know how the lens performs precisely so that you can achieve feeling the focus intuitively, plus zooming in or out quickly and smoothly to order, it's a great start. Often, as camera operators, we work with a variety of cameras and lenses, so it's a good idea to get the feel of each lens operationally, as quickly as possible, right from the off. Prior to recording, if you've got 10 minutes to move the lens around and find a range of shots, angles and focus distances, it will help your confidence when you have to hit record and everything steps up a gear. For those just starting out in the industry or not shooting every week, it can be a good idea to 'keep your eye in' by practising the core skills and thought processes by playing around with an SLR camera with zoom lens as often as possible. Focusing, zooming and tracking with the camera, reframing and developing shots, as well as adjusting exposure, are all skills that will transfer over to the TV camera. This way, when you do land your next big gig with a director who wants their production to look like a Hollywood feature, you'll be able to concentrate on the joint thought processes, contributing useful

or at any location where I could get the feel of all the possibilities open to me with a given camera or lens. Even if it was just an SLR camera, I would explore framing, balance and principles of great composition, learning about the importance of the Greek Golden Mean, the Intersection of Thirds, Triangulation and so on that take us back to the work of the Great Masters themselves. There are many great books available on framing and camera techniques, and these can be extremely helpful in providing benchmarks. From then on, I'd say always try to learn more, develop and evolve techniques. Read more books. Watch television! We can all learn to appreciate (or not) the techniques and particular shooting and lighting styles of others as well as the dynamics that certain styles play. Certain programmes and subjects lend themselves to particular styles, and it's always useful to think about which kind of approach best suits a specific programme, subject matter and audience.

When we're working fast and looking for a variety of shots to construct a sequence, there is not usually time to zoom in, find focus and reframe, so you'll be pulling focus continually. Occasionally I've seen instances of an experienced camera operator not holding accurate focus when performing a move or following action during actuality sequences. The wide shot may have looked OK, but then they zoom in and... ouch, where's the

focus gone? If you know each lens so well that adjusting focus at whatever distance and lens size is second nature, and all you're thinking about is developing the shot composition, I'd say you've pretty well cracked it. The keys to holding sharp focus are knowing the characteristics of the lens, assessing the focus distance accurately and being able to pull focus naturally as distances change. Personally, I continually scan the whole viewfinder frame, looking for any indication that the focus may be beginning to edge too near or too far. As long as you know whether focus needs to go forward or back, then any adjustments you make can be instant.

Get it taped

For anyone looking for extra help with focus, a method used by camera assistants is to mark pre-set focus distances on the lens. An ideal way of doing this is to prepare a strip of camera tape about 1–2mm wide and stick this around the lens barrel adjacent to the feet and inches scale, from minimum focus to infinity. It's then simply a matter of putting dot marks on the lens distance against the datum line with a pen or coloured marker. Pre-cut small 'triangles' of camera tape can also be useful to attach to the focus scale as markers for the various focus points you have to hit. Items in your shot equidistant to your subjects can be used as landmarks too and marked on the tape. This method can be useful if you've got several focus points to hit accurately and you're working quickly, especially in low light or with minimum depth of field.

From my days of media studies at school in their very basic TV studio, and then later at Manchester Poly School of Film & TV, I spent whatever

every day I'd be focus-pulling on documentaries and dramas with a variety of lenses – primes, zooms and telephoto. One of the first things an assistant learns is how critical your judgement is when following focus – especially when the operator is shooting wide open at f2.8. The basics of knowing how far to pull the lens barrel, along with the speed of the pull smoothly at different distances are key. Whether working on film or a PSC camcorder, the principles are the same, so if you can educate yourself to judge distances accurately, you should be able to pull focus by looking at the lens scale alone if necessary. A knowledge of depth-of-field tables is useful as it may allow you to make judgement calls on split-focuses or what is an acceptable focus range at any given lens size or f-stop.

My personal preference when filming interior sequences and interviews is to work fairly wide open, usually at f2.8–4.0, often on a longish lens, and I'll generally use neutral density filters to achieve the desired f-stop if the overall lighting level is higher than this. On exteriors too I will often use NDs so that I can open up the lens. A shallower depth of field and selective focus is often more interesting for the viewer – as well as being more challenging than working at f11/f16! But it's always horses for courses and depends very much on the type of programme and style you are shooting in.

My approach after first zooming in tight to find focus is to continually adjust the focus distance through a combination of constantly scanning the viewfinder and occasional quick referrals to the distance on the lens barrel (which is where the ability to accurately assess distance in feet

“continual readjustment or fiddling with the viewfinder will generally mean there is no personal reference to work to”

time I possibly could practising with cameras and lenses, following focus and throwing focus on just about anything I could in order to get 'the feel' of the lens. This gave me great confidence with lenses. Several years followed as an assistant film cameraman during which just about

or metres comes in). When pulling focus continuously, you should be able to feel the edge of focus in the viewfinder before you notice it is soft on a monitor.

Sometimes we have a decision to make on where exactly to place the

focus. For a person, this will generally be on the eyes as it is the eyes that tell the story (although I've seen many an interview with the focus on the nose!).

Good lighting will always help with focus. Flat lighting may make focusing difficult, and the subject will generally appear flat and lifeless. When a subject is nicely modelled with light and good contrast ratio, the overall effect helps maintain an interesting 3-dimensional feel, and the lighting contrast brings the subject to life. It's always a great idea to use lighting to get a sparkle into the eyes.

Perhaps one of the best aids to maintaining accurate focusing with TV/video cameras is the peaking

most of us will agree, when correctly set up, or set up for colour, contrast and brightness to your own liking, then it is best to leave it alone. The monitor can be used as a constant reference for picture colour, contrast, focus and exposure. And, with the adjustment pots covered or taped over, we will prevent that pesky producer from fiddling with the knobs!

Putting it into practice

As a camera assistant in the early 1980s, I worked on a BBC docudrama series about the Celts. The set-up one day was to see a tribe of Celts, complete with animals and children, leaving their village in the distance and walking towards camera along a muddy track through rain and the smoke from camp fires. We were to

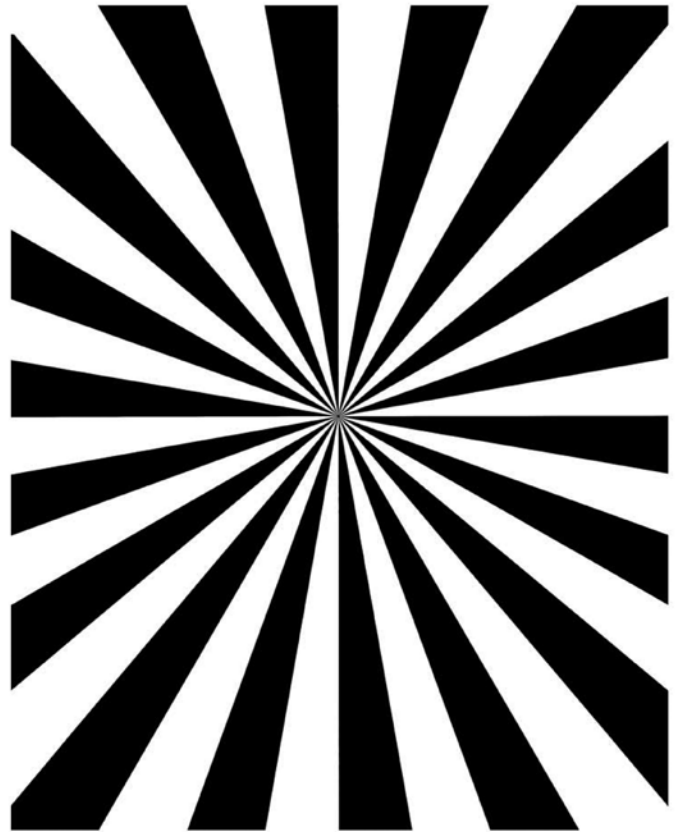
“the keys to holding sharp focus are knowing the characteristics of the lens, assessing the focus distance accurately and being able to pull focus naturally as distances change”

control in the viewfinder. Peaking adds an artificial edge to the viewfinder picture only. However, I never over-use it, and my personal preference is to set up just enough peaking to add only a little extra sharpness to horizontals and verticals that will be adequate for general assessment of focus. I prefer to feel the picture and the mood rather than subject my eye to a hard electronic image that zings out at me.

Many of us hire in a variety of cameras. One of the first things to do if using a hired camera, or any that is not your usual camera, is set up the viewfinder correctly, both on colour bars and picture. This is relevant to focus and how we perceive everything through the viewfinder. I always try to work with the same relative setting. Continual readjustment or fiddling with the viewfinder will generally mean there is no personal reference to work to.

Another of the reference tools for focus and exposure decisions is the colour monitor. Using a high quality reference monitor to creatively assess colour, focus and exposure is great. As

shoot this on a Canon 300mm/600mm telephoto lens, so not much leeway in the focus. Because there were no real landmarks on the road to use as focus marks, I had rehearsed the shot with a stand-in for marks, and eight available people were stationed just out of shot to the side of the road ready to raise an arm when the front actors hit that position. All good, and we were ready to go. More smoke was put in, the eight rain machines just out of shot were turned on, action was called and the tribe ambled slowly towards us. It was surreal and atmospheric ... but the really surreal moment came when the Celtic chief and his elders emerged beyond the final rain machine and past where we had ever planned to end the shot. The director loved the effect, so we just continued to run the shot, pulling focus by feel and judgement. Called upon to wing it like this I did wonder if I had lost focus but the cameraman soon assured me it was spot on throughout. The moral of this little tale is to know your lenses, plan for what you can plan, and when you can't, be prepared to busk it!



▲ Back focus star chart

Back focus

Another key contributor to critical focus is correct back focus set-up. While I'm working, I'm always on the lookout for anything odd optically. Back focus must be properly set on

any lens. If it's only slightly out, you could be happily into the shoot and filming before the penny drops and you realise the back focus needs some attention. Usually, I don't need to specifically check the back focus on

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▲ Robert Foster in action, shooting HD

my cameras and lenses because I'm personally using them all the time, and I know where they've been. But if I'm using hired-in kit, I always thoroughly check the back focus of all the lenses against their cameras before the shoot. To many of us, accurately adjusting back focus might be straightforward, but I'm afraid recently I've encountered a couple of cameramen who haven't known how to do this correctly. Worrying stuff!

Let's say you're working on a wide lens, with plenty of light and consequently a big f-stop with loads of depth-of-field, you might be forgiven for thinking the camera and lens combo you've just picked

up is OK. So what happens when the light becomes low and flat, and you're shooting with the iris nearly wide open? Any back focus issues will become obvious; the focus will be unmanageable when you widen the shot and a lot of what goes back to the edit suite will be NG!

The way I adjust back focus on a lens is first to have the camera switched on for, say, half-an-hour so the electronics and CCDs are sufficiently warmed up (particularly important on HD cameras as this is the period of time when operational temperature of the camera will affect the lens set-up). I find a couple of things that are really important to finely

Focus tips

- Get to know all the standard shot sizes and how to move from one to the other quickly
- Get to know thoroughly the lenses you are working with
- Prior to recording, move the lens around and find a range of shots, angles and focus distances
- Play around with an SLR camera with zoom lens as often as possible
- Read more books. Watch television
- Educate yourself to judge distances accurately
- Learn how to accurately check and set back focus

adjusting back focus are the peaking control and the f-stop settings. The viewfinder peaking control introduces an artificial hard edge enhancement to the viewfinder picture, so first dial this out to get the real picture without any artificial sharpness in the viewfinder. Secondly, as I want as little depth of field as possible for this operation, I control the light level relative to the exposure in order to open the lens wide to f1.8. To achieve this, I'll employ a combination of either closing window blinds, changing the colour temperature filter, or adding ND filters on the camera filter wheel as necessary. This will give the ideal conditions for accurately adjusting back focus. Then, point the camera at a back focus star chart (otherwise known as a flange focal length adjustment chart) at about three feet distance. Zoom in and focus, then

zoom out to the wide end of the lens, and if the chart does not remain in sharp focus throughout the zoom, loosen the back focus adjustment screw and carefully rock it several times through focus until finding the most accurate setting. Then carefully lock off the adjustment screw without altering the setting. Finally check the tight shot again and pull out to the wide to ensure that everything remains OK. Only after I'm confident that the back focus is correctly adjusted will I redial the peaking control level into the viewfinder.

If you're on location and don't have a star chart available, you can still check and perform back focus adjustments using any verticals and horizontals to hand – brick walls, stair cases, filing trays, etc!

Exposure

Exposure and lighting go hand in hand. In combination they control the quality, mood, atmosphere and 'realness' of the picture. Where you choose to set the exposure – most generally for accurate highlights, although sometimes for areas of low light or shadow – is another of those decisions that is both artistic and technical. So how do you best achieve a method of exposure control that will work in most circumstances?

First up, using auto exposure is always to be avoided. OK, I may turn the lens to instant auto iris first thing in the day to get to the right part of the iris scale, and to perform white balance adjustments, but then it definitely goes on to manual. The means of reference I personally always use is the viewfinder zebra set to 70% so that it will kick in on highlights to the

skin of most faces. I work with the zebra all day every day, either setting a base f-stop for a scene, or pulling stop if, for example, I'm whipping around for reverse shots in slightly different light. I find manual control and good judgement allow me to keep the exposure and the scene constant. I'm always prepared to nudge the iris ring slightly closed or open according to changing conditions. Most lenses lose about 1 stop of light at the tight end of the lens, so I will open up the lens to compensate accordingly for light loss on a tighter shot, or to stop down when widening out to compensate for light transmission gain.

As with focus, knowing your lens is key. Whenever I'm moving the camera and need to adjust the exposure either during a pan, tilt or track to compensate for lighting variables, my fingers are always close to the iris

“to achieve accurate exposure one has to standardise working practices and exposure reference methods, but be prepared to employ a little bit of gut feeling alongside knowledge and experience”

ring, and I'll pull the exposure as I go in order to achieve smooth and natural adjustments, always referring to the zebra levels I want to maintain. It's as simple as pulling focus really, although being heavy-handed will have more drastic results.

Exposure is your other element of quality control and as lighting

camera operators and professional craft people we're all responsible for maintaining the correct light level on the canvas – from shot to shot and scene to scene. Personally preferring to work towards the open end of the lens with a narrower depth of field, everything I do – appropriate light control, ND filtration or even camera gain – is heading towards that goal.

These days I mostly shoot without any camera effect filters, delivering clean pictures that can have effects applied in post if required. However, if you are using camera filters, there are often exposure compensations to manage and factor in as the filter may soak up from two-thirds to one full stop of light. With Pro-Mist, diffusion and contrast filters the exposure may need to be pushed a bit more to help highlights flare out a little and to enhance what these filters are designed for. My lighting style when using filters will also be a bit different, with harder edges and more contrast to really bring out the effects.

Light meters

Occasionally it is useful to use a light meter, and this is particularly effective when doing a recce of several locations, to get a good idea of the available light levels and what lamps you might need to bring in. An effective reference too, which will help with all future lighting decisions, is to run a sensitivity ISO/ASA test on your camera with



▲ Minolta Auto III incident light meter

a light meter and to rate it as a film speed on the various camera filters. (Set your light meter to 1/50 second shutter speed). All camera models are subject to variables in sensitivity, so an accurate test should be performed for each camera. I rate my DVW-790 Digibeta camera at 500ASA on Filter B, 320ASA on Filter C, and 200ASA on Filter D.

From my early 'film days' I use a Minolta Auto III incident meter, and a Pentax digital spot meter. I tend to use light meters on studio days,

commercials and dramas. Meters can also be really useful in establishing even light coverage in blue screen and green screen shoots. They save time and help achieve consistent results. For everything else, essentially I set lighting control and lighting ratios by eye, backed up with the zebra for exposure setting and the occasional quick look at my reference monitor if it's there.

I always exercise very careful control over exposure. I would emphasise that to achieve accurate exposure one has to standardise working practices and exposure reference methods, but be prepared to employ a little bit of gut feeling alongside knowledge and experience. I never use auto exposure, as it cannot be relied upon to accurately and smoothly compensate for all the lighting variables.

Not so long ago, a cameraman recounted a story to me of a producer director he had worked with for a couple of days when finishing off the filming of a networked prime time documentary. The producer director had shot the majority of the programme as a self-shooter, which is not so unusual nowadays in cost-saving exercises. The cameraman queried why the hired-in camera was defaced with strange scribbled abbreviations. On the side of the camera, scrawled in bold permanent marker were the words 'white' and 'focus'. The director replied that these were to remind him to perform white balances and to focus. As if this wasn't enough, the cameraman noticed that on the lens barrel, he had etched 'N' and 'F'. When asked about this, the director responded that this was to remind him which way to turn the lens

to make the picture clear for Near and Far. Finally, on the camera jacket near the iris ring were two other letters – 'L' and 'D'. These were a reminder to turn the iris ring towards 'L' to make the picture lighter and towards 'D' to make it darker! Perhaps the cameraman should have added another note to remind the director: 'Breathe in, Breathe out...'

Hopefully, as professional camera operators, we don't need reminders about what should be informed and instinctive applications of our finely tuned craft skills! I hope this article

Exposure tips

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has been of value to those who may need a few more tips, and to others a reminder about the journey we've been through. The sheer range of kit available to us proliferates, and technologies continue to evolve at pace. I'd like to think that as professional operators and artists we continue to maintain high standards and improve the technical excellence

of our craft. HD is an everyday acquisition format, making it more important to the viewers than ever that we keep it always focused-up, close and personal. New technologies, cameras, recording and editing formats that increase the standards of acquisition are great and should be embraced, though – as always – the art is in the execution!

Fact File

Robert Foster has worked as a professional lighting cameraman and DoP for 22 years. He runs Manchester-based crewing company, Broadcast Television Facilities. Robert began his career in the BBC film unit, spending 6 years as an assistant cameraman working across a diverse range of network programmes on film.
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"Get me a 0.6 ND for a 2k on the doors"

"Get me a Half CTO on a 4x4 for the 20k"

"Can I have a 4x4 Soft Silver bounce"

"I need some 216 on a 3x2"

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