



Richard Fitzpatrick, Camera Operator, Digital Dimensions.

High definition TV has five times more information, so you have to be five times more accurate in your focus. The high definition cameras all have black and white viewfinders for clarity of focus, but they recommend you use 9-inch field monitors to be sure of your focus.

3. Turn the focus ring until the image is as clear as possible.
4. Zoom out.

You're now ready to shoot. You'll find that the image is correctly focused for every type of shot of that subject.

As long as both you and your subject stay at the same distance from each other, you won't have to focus again.

### Fixing a Back Focus Problem

If you've zoomed in and focused clearly, but you find that as you zoom out the image goes out of focus, then you have a back focus problem. This is a hazard exclusive to zoom lenses.



The white line should usually be aligned with the triangle.

The back focus adjustment is located at the back of the lens barrel, near the camera body. Because most of the time the back focus lens is meant to stay in one place, you have to untighten a little lever in order to move this ring.

To adjust the back focus, zoom in on your subject again and make certain that it's in clear focus. Then zoom out all the way and turn the back focus ring until you get as sharp a picture as possible.

There's a little marking on the back focus ring which is normally aligned with another mark on the lens barrel when the back focus adjustment is correct.

Once you're happy with the adjustment, carefully twist the lever back in tight so the back focus doesn't get accidentally disturbed.

### Macro

Macro is a close-up lens which allows you to get a clear focus on things which are within 1 m of the camera—which is too close for good focus using the standard camera lens.

The macro adjustment ring is sometimes located right next to the back focus ring, and people do mistakenly untighten the little back focus lever and turn both rings around together. Needless to say, that creates more focus problems.

To use macro, the zoom needs to be in the wide angle position (zoomed out all the way).

Then all you do is turn the macro ring until you get a clear focus on your subject, or that part of your subject which you want to show clearly.

Having macro is a great advantage because it allows you to get good close-ups of very tiny things.



You adjust focus in macro by turning the macro ring.

The small print on graduation and wedding invitations, the text of newspaper articles, illustrations from books, small photographs, even details within photos—these can all be captured using macro.

You can place your subject almost against the camera lens and have its image fill the screen in clear detail, using macro.

The one thing you have to watch is that putting the object so close to the lens tends to block out the light needed to illuminate it. Careful positioning of a side light, or working near a window, can help.

Don't be tempted to move an artificial light in too close to the camera, though. First the lens hood will melt and then the harder plastic of the camera body will be affected.



A fullscreen view of the diamond.

### The Connection Between Zoom and Focus

Once you've had some practice operating the zoom and the focus, you'll probably notice there's a connection between the two.

In the wide angle view (zoomed out all the way) you can turn the focus ring all the way around in either direction and see very little change in the clarity of the image in the viewfinder. You'll probably find the picture looks pretty good no matter what the focus setting.

But in telephoto (zoomed in all the way) you'll see that a very slight rotation of the focus ring makes a dramatic change to the image and that it will vary from being sharp and clear to being entirely blurry. In fact, there will be only one position where the focus looks right.

In practice, this difference means that focusing is far more critical in telephoto than in wide angle.

When you have only one subject and it's staying still—and so are you—you can set the focus by zooming in and focusing on your subject at the beginning of your shot (or your shoot) and know that it will be right for any zoom position you later choose.

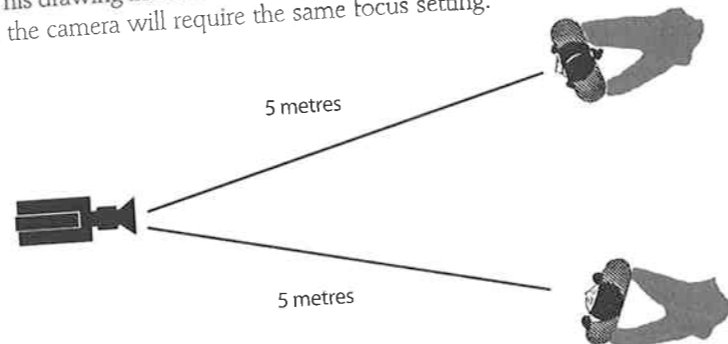


When doing shots at a very great distance, you may need a zoom lens with a higher zoom range. Kimberley Brown, Camera Operator, Pangnirtung, Nunavut, Canada. (Photo by Sylvia Cloutier)

### Focusing for More Than One Subject

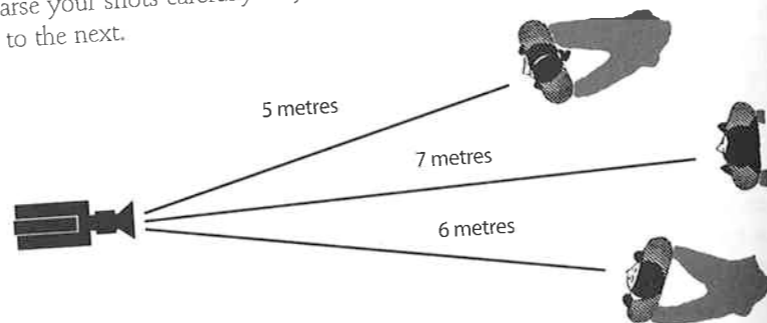
Often, however, there'll be more than one subject which you're expected to cover. Have a look at the next drawing, shown in the 'plan' convention—which means it's shown as if you're viewing the scene from above.

This drawing indicates that each person or object which is the same distance away from the camera will require the same focus setting.



Same distance to subjects = same focus setting

However, if you have more than one subject and they're at different distances to the camera, the correct focus adjustment for each close-up will be different, and you'll have to rehearse your shots carefully so you can smoothly refocus as you change from one person to the next.



Different distances to subjects = refocus for each subject

At the most basic level, you need to know for sure which way to turn the focus ring so the shot of the new person comes rapidly into focus rather than going further out.

### Focus Emergencies

If your subject makes a sudden, unrehearsed movement, and you're zoomed in for a close-up, most likely your shot will go blurry. Zoom out immediately and stay on wide angle until the person settles down into a new position. Only then will it be prudent to attempt another close-up requiring careful focus.



If your subject keeps moving, stay on wide angle.

### Push-Auto Focus

Some cameras have a *push-auto focus* button. If you need to find focus very quickly, you can engage the camera's auto focus function briefly by holding in this button. The camera will do its best to find the right focus. When you release the button, the camera's focus stays where it is, and the focus mode goes back to manual.



NAIDOC Day performance at Long Bay Gaol, Sydney, NSW, Australia. (Photo by Michelle Blakeney)

### Difficult Focus Situations

In a pre-rehearsed action with a moving subject, reference to the focus ring markings might help you guarantee a clear focus when the subject reaches its final pre-determined position. However, you may still find that following by eye and synchronising the movement of the focus ring with the changing image in the viewfinder is the most practical and effective method of operation. Remember, in video what you see is what you get.

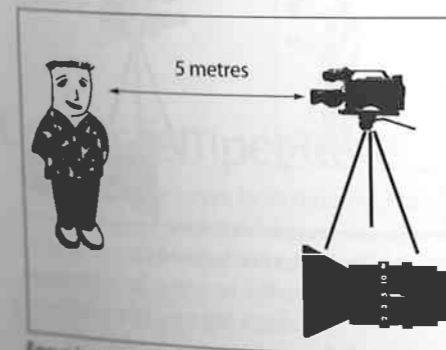
With subjects that constantly move, such as dancers, close-ups in good focus are nearly impossible. Only with very careful rehearsals could you expect to do well-focused close-ups.

This is due to depth of field.

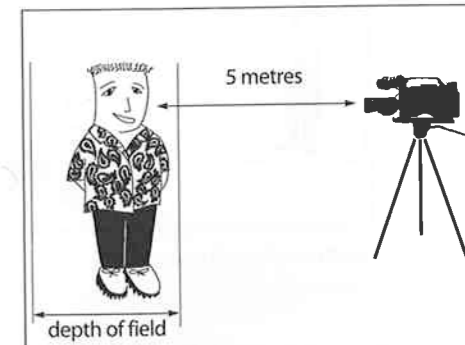
### Depth of Field

You now know that focus is related to the distance between the subject and the lens. There will be one focus setting which is the best for a subject at any particular distance.

But it's also true that on either side of this point (both closer and farther away) there's a certain range of distance within which focus is still acceptable. This range, from front to back, is known as the *depth of field*.



Focus is set correctly for a distance of 5 m from the camera.

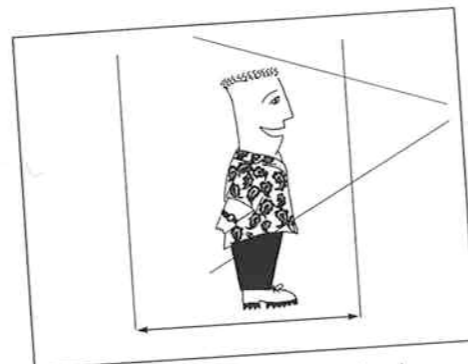


Depth of field is the range of distance within which focus is acceptable.

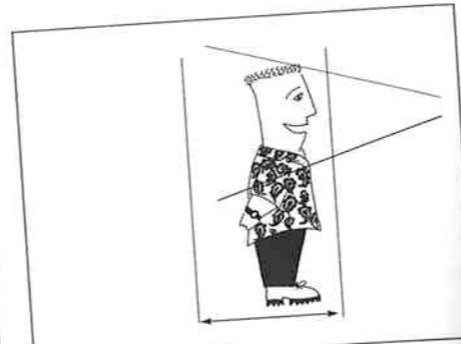
### Lens Angle Affects Depth of Field

Wider lens angles give a greater depth of field. This means that when the camera is zoomed out all the way, your subject will be able to move forward and backward across a considerable range and still be in focus.

Narrower lens angles (especially telephoto) give a smaller depth of field. As you zoom in, the acceptable focus range for your subject will decrease. When you're zoomed in all the way on a close-up shot, the depth of field will be smallest.



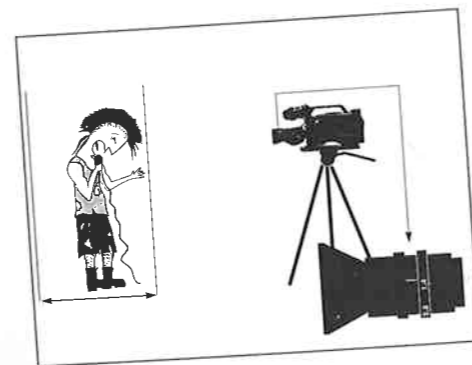
Depth of field on wide angle (zoomed out).



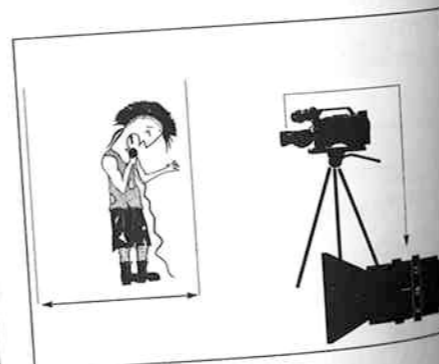
Depth of field on telephoto (zoomed in).

### Iris Setting Also Affects Depth of Field

The wider the aperture (the more open the iris) the smaller the depth of field. This means focus will be more problematic in low light conditions where the iris will need to be opened wide. You'll find that your subject won't be able to move forward or backward very far without going out of focus.



Depth of field with a wide open iris.



Depth of field with a nearly closed iris.

### Telephoto Lens and Wide Iris Combined

The combination of telephoto lens (zoomed in all the way) and a wide aperture (big iris opening) gives you the smallest depth of field of all.

This is the hardest situation for shooting action over which you have no directorial control, because very small movements forward or backward will cause focus difficulties.

For example, if you're taping a singer in low light at a night-time outdoor concert, and you have the lens in telephoto to give you a close-up of her face on the screen, you'll find that if she sways only slightly forward or back with the feel of the music, she'll go in and out of focus.

There's not much you can do. Your work will look awful and people won't be able to understand why you didn't just focus the camera.

To retrieve the situation, you can stay on a wider angle shot, and then move your camera in closer to the stage when that song ends. But it's times like this that make you wonder how you got into video in the first place.

For better depth of field in lowlight conditions, you should try to either get in close to your subject so you can stay on the wide angle lens, or add lights, so you can use a smaller aperture.

### Aperture Priority/ Shutter Priority

Some cameras are automated to the extent that you can decide what function you want most and set that one, and the camera will adjust all the other function settings accordingly.

For example, if your main concern is to freeze the motion in the image because you're a physio-therapist or sports teacher and you're doing motion analysis, you can tell the camera to prioritise the high speed shutter setting. The camera will then adjust the iris and other functions to suit the high speed shutter setting you've selected.

On the other hand, if you're mainly concerned with getting the greatest depth of field because you're videoing dancers who will be coming forward and backward in the frame and you need them to always be in focus, you can tell the camera to prioritise the aperture setting, and the camera will make all the adjustments needed to the other functions.

Another solution to improve depth of field under low light levels is to increase the camera's video gain from 0 dB (normal operation) to +6 dB or +12 dB. In the +6 dB setting you can increase the iris setting by a factor of 2, for instance from  $f$  2.8 to  $f$  4.0, without lowering your camera's video signal.



Ernst Hadenfeld, former Chief Engineer, AFTS.

### Colour Temperature

Different light sources have different colour temperatures.

We don't notice this because our eyes automatically adjust to the light source we're in and they represent colours correctly most of the time. (Still, you may have had the experience of going to a shopping mall wearing a red shirt and having it appear to turn purplish once you get inside.)

The colour temperature of light is measured in degrees Kelvin, which is written °K.