

Macro CCTV



Have you ever wanted to capture the fine details of a very small object and display it on a monitor, or to print it on paper, but found that you can not focus clearly on it when you come too close with the lens? This article will show you the tricks of macro-photography which can very easily be applied to CCTV.

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Any CCTV lens can be used with C/CS ring(s) to produce extreme close-up focusing.

For many photographers the term **Macro Photography** has a very clear meaning. This refers to taking pictures of small objects from a very close distance, so that the object's details can then be enlarged and be seen better than with the naked eye.

Why is it called "Macro"? It's probably not very clear to many photographers, but

perhaps that's because there is also the term "Micro", which refers to taking pictures of the micro cosmos, usually through a microscope.

Macro photography is usually measured and referred to by the ratio between the size of the image and the size of the real object. For example, a macro lens with 1:1 macro is a lens that projects the image of an object at

A close-up digital image produced by a DVR, taken by a CCTV camera with 12mm fixed-length lens set at the minimum focus distance of around 0.2m (without using rings).



the same size as the real object.

In other words, 1mm is reproduced as 1mm on the film. A 1:1 macro photo of a postage stamp will be reproduced as an image of the same size. A macro lens of 1:2 means the image is half the size of the real thing. The first number refers to the image and the second to the original object size.

Real macro photography is when you are working around 1:1 ratio and closer thereby giving an image on film that is equal to or larger than the subject being photographed.

The range between life size reproduction (1:1) and up to ten times enlargement (10:1) is the strict definition of macro photography. The range between 1:1 and 1:10 (1/10 of actual size) reproduction is often called **close-up** photography.

In photography, there are special macro lenses dedicated to this purpose. Macro lenses have a special optical design whereby close focusing can be achieved without removing the lens.

A cheaper method (which forms the basis of this article) would be to use any standard lens with **extension rings**. Extension rings are exactly what the name suggests – they extend the lens position relative to the imaging plane, which in photography is the film.

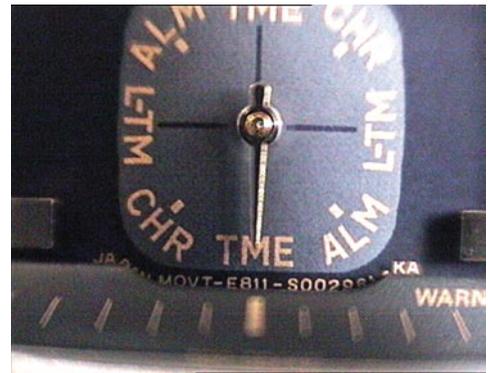
The same concept can easily be applied to CCTV.

Every lens has optical parameters which define the lens design. Here we will not discuss the optical resolution parameter, as it is beyond the scope of this article, but the focal length and the minimum focusing distance are parameters that we should consider in order to obtain “macro” images.

From general CCTV theory, it is known that there are so-called “standard” angle of view lenses for different CCD chips. Lenses that offer angles of view equivalent to human eye vision, which is around 30°, are called **standard lenses**. Such an angle of view in 35mm photography is achieved with a 50mm lens. In CCTV, this really depends on the size of the CCD chip. So for example, on a 1/2” CCD camera we need to use a 16mm lens to get a standard angle of view, a 1/3” camera will require 12mm and 1/4” CCD camera will use 8mm to obtain a standard angle of view.

For best macro effect it is recommended that lenses with a focal length equal to or longer than the standard lens be used.





The same camera, same lens and DVR have been used to produce the macro shot above. Note the C/CS ring added between the lens and the camera. The serial number on the watch that can clearly be seen on the shot above can not be seen with the naked eye.

camera employing 1/3" CCD chip was used, thus a fixed focal length manual iris lens of 12mm, as well as 8~120mm manual zoom lens were used to reproduce the images.

The 12mm fixed focal length had a minimum focusing distance of 0.2m, which is shown on the opposite page photo. The zoom lens had a minimum focusing distance of 1.2m.

Although we do not think of CCTV as being used in anything other than security (which of course is wrong), we can use CCTV cameras to take close up images of small objects by applying the same concept of extension rings. In CCTV, extension rings are very easy to find. Any C/CS conversion ring, with a thickness of 5mm, can be used to achieve the macro focusing. In actual fact more than one ring can be added for even closer focusing, as demonstrated by the photos in this article.

The images taken for this article are very provisional, a mobile phone and a watch were taken as objects of analysis, and the images were captured via a digital recorder and exported as BMP images. A CCD

Once the C/CS ring was added the respective macro images were produced.

In both cases precise focusing was adjusted with the focusing ring itself, but the camera back-focus adjusting can also be used. It is very easy to do and we encourage you to try it.

There are a few things that you may want to consider, one of which is the object illumination. As can be seen on one of the photos on the next page where two rings were used for the close up shown, the lens was so close to the object (producing a sharp image) that the actual shade of the lens itself obscured the object. With careful consideration of

the angle of the light source, this can be avoided.

How close you can come to the object really depends on the lens design itself and whether you use one or two rings. Sometimes, it is possible to get close-up focusing even without adding a ring by just unscrewing the lens from its C-mount thread. There is no better way to determine than by simple trial and error. Forget about back-focus when you are doing macro CCTV, as this concept loses its meaning. Back-focus rings or adjustors can be used however to fine-tune the macro focusing.

Applications with "macro CCTV" setup are numerous. Generally the typical requests that I have had in my dealings with various CCTV customers come from jewellery shops, stamp collectors, watch-makers and banks for counterfeit recognition purposes. The image output is usually preferred on monitor display, but it can certainly be produced as a digital image or a hard copy using a DVR.

