

Close Focus Macro by Mike Tufts

Close Focus/ Macro Options

The General idea of this presentation is to explore the Various Possibilities Regarding Equipment required for Close Focus Photography, as well as accessories to further enhance the experience. For the most part we will be discussing Methods to get beyond the Minimum Focus Limits of our Standard Glass.

There are many Methods of getting Closer to our Chosen Subjects to capture minute details which can be of great interest. We shall try to explore them all noting the advantages and disadvantages of each in turn.

Generally when Close Focus or Macro is being discussed, "Reproduction Ratio" or "Magnification", are terms commonly used, often interchangeably. They are used to describe the size of the image, on film or sensor , in comparison to the size of the subject in real life. Reproduction Ratio of 1:1 means the image on the sensor would be the same size as it is in life 1:2 would mean the image on the sensor is 1/2 the size of the subject in the real world. 2:1 would translate to an image on the sensor twice the size as it is in life.

In terms of Magnification 1:1 = 1X ; 1:2 =0.5X ; 2:1 = 2X

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The categories of Equipment enabling Close Focus Photography are

- 1/ Supplementary Lenses
- 2/ Reversing Rings
- 3/ Bellows
- 4/ Extension Tubes
- 5/ Dedicated Macro Lenses

Supplementary Lenses

Among the simplest and most widely usable methods of enhancing Close focus Capabilities is the use of "Supplementary Lenses". These may be single or Dual element units that thread onto the front of your lenses Like Filters. They are also referred to as "Close Focus Filters" or "Diopters". This would be the only usable method to achieve closer Focus with Point and shoot Cameras or any camera which does not permit the user to exchange Lenses.

Single element units are much less expensive but also yield Lower image Quality. They are often found in sets of 3 and can be mounted together for greater Magnification.

I would not recommend these units.

Dual element units Yield Much improved Image Quality. Primarily they are Sharper than Single element units across your entire frame and suffer

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much less from colour fringing. Nikon Made 4 Dual element Lenses which are available on the second hand Market but are no longer in Production. The 3T and 4T fit 52mm Filter threads; the 5T and 6T are the same strength but fit 62mm Filter threads.

The 2 units can be mounted together for increased Magnification. These units are designed to work with focal lengths of 85 to 200mm though they can be used with lenses outside that range.

Canon still market the 500D Supplementary lenses in 4 filter sizes 52mm,58mm,72mm and 77mm and work best with lenses in the 70-300mm range.

Similar Supplementary lenses are available from other camera makers and third party suppliers. We have used supplementary lenses notably the Nikon 3T.

An adaption to this Method that was once popular was using a Macro Coupler to thread 2 lenses Generally of similar filter sizes together, effectively reversing one lens in front of the other. Finding Magnification is simple. Divide the Camera Mounted Focal length by the focal length of the reversed lens.

ie a 50mm lens reversed in front of a 200mm Lens yields 4X Magnification

a 35 mm lens reversed in front of a 105mm lens yields 3X

Haven't tried this but i would certainly be interested

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Advantages of Supplementary lenses

Usable with cameras Having Fixed Lenses

In Camera TTL Metering is maintained

TTL Flash Capability is maintained

There is No loss of Light when using supplementary lenses

Auto Focus and Image Stabilization are maintained though these are of limited use with Close focus

Cost is Moderate for Good Supplementary lenses

very inexpensive if you can find or make a Macro

Coupling ring and have the lenses available

Lenses from Different Manufacturers work equally well

Very easily transported

Disadvantages of supplementary lenses

You lose Infinity focus when you mount a supplementary lens [you can't shoot a bug

1 second and a Bird the next]

The range of Magnification attainable is limited and dependant on focal length used

With Coupled lenses your rear elements are exposed to Weather, Bugs, Pollen, Fungus spores, Nectar etc

[adaptors are available to mount protective or other filters in front of reversed lenses ; Nikon BR-3 for example]

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Reversing Rings

Used Normally most of our Photographic Lenses are used to create a small image of a much Larger Subject. Somewhere in the distant past an individual much into "Low Tech Solutions" thought "if i turned that lens around wouldn't it form a large image of a much smaller Subject?" and the idea of Reversing rings was born.

A Reversing Ring is nothing more than a Lens mount with threads to fit a filter mount on the other side. any ring will work with lenses from any maker of the same filter size. They are available for most makes of SLRs in the appropriate mount. Magnification Attainable is dependant on the focal length of the lens reversed with some variation due to the various optical formulas used.

The Process of Reversing lenses is Most effective with shorter Focal Lengths, 60mm and under, with greater magnification at the shorter lengths.

Examples of Magnification 50mm .72 X,
35 mm 1.43 X, 28mm 2.14 X, 24mm 2.62 X

Nikon Suggest for Images Greater than 1X

Magnification reversing a lens will yield Superior Image Quality and maintain a greater working distance from the subject.

Working distance from the reversed rear element to the subject is effectively the same as the distance

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from a normal rear element to the sensor. with simple lens formulas the Focus adjustment has little effect on sharpness of the image; with other Formulas, notably short zooms, it will have a bearing.

A tripod or other solid rest is almost a must as you have to set the aperture ring on the lens wide open to frame and focus then reset to required aperture to record the shot.

Lenses without Aperture rings [IE Nikon G series] can be used though the lens aperture lever must be jammed to record a shot and getting the Aperture you want is strictly guesswork. Not Recommended.

We have and Use a Nikon Reversing Ring BR-2A [and the BR-3] and find them suitable

Advantages of Reversing Rings

Higher Magnifications are easily attainable if you have a variety of lenses or a short Zoom

No light is lost when lenses are reversed

one of the least expensive methods for close up photography

Lenses from Different Manufacturers work equally well

Very easily transported

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Disadvantages of Reversing Rings

You lose Infinity focus when you reverse mount a lens
With Reversed lenses your rear elements are exposed [adaptors are available to mount protective or other filters in front of reversed lenses; Nikon BR-3 for example]

Auto Focus, Image Stabilization, and in camera Metering, are not available

TTL Flash control is not available

No Automatic control of aperture so it is slower to frame, focus, and record an image

With most cameras you will have to use Manual Exposure mode and guess at exposure settings or use an external Exposure Meter

Bellows

Essentially an adaptation of the Bellows from View camera days for Close Focus work; they are extremely well suited for use in a controlled workspace and permit Greater Magnification than most other systems. They are Bulky and Awkward to use. They are available mostly on the second hand market as they are not that popular today and most makers have stopped marketing them. Some models allow a limited range of Tilt and Shift and even couplings to permit control of aperture from the camera. I have no personal experience with Bellows

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Advantages of Bellows

- Precise focusing and framing
- Highest available range of Magnification
- Superior Image Quality in a controlled environment
- with adaptors lenses from Many sources can be used
- Some Units may permit Movements [tilt/shift]

Disadvantages of Bellows

- Not easily transported
- Loss of light will be moderate to severe
- No Autofocus available
- Most allow no in camera Metering
- Most allow no Lens Aperture Control

Extension Tubes

Extension tubes are like a bellows of fixed length permitting handheld photos. Essentially they are a Camera mount on 1 end and a Lens mount on the other with a tube in between painted a matte black inside to absorb light and reduce reflections. Tubes are available for most SLR cameras in various lengths, some as sets of 3 lengths allowing seven different Magnification ranges. Tubes can be used with most lenses of the same manufacturer though many combinations might not be practical or possible with a given focal length.

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Dumb tubes are very simple and inexpensive but do not permit metering or aperture control.

Smart tubes, like the Kenko DG series, maintain metering and aperture control from the camera as well as IS/VR and Auto Focus [limited use]

Extension tubes work by moving the rear element of your lens further from the Sensor/Film plane thereby shifting the entire Focus range closer to the camera.

Extension tubes seem to work best with lenses of about 35mm focal length and longer with the most magnification at the lower end.

While they do boost Magnification with longer lenses like 200 and 300 mm; the real advantage with this Glass is a moderate level of Magnification in conjunction with a working distance that does not disturb your intended subject.

For example 68 mm of extension with our 300mm F4 yields .23 to .36X and working distances from 1.68 M to .99 M

Magnification for extension tubes is calculated by dividing the length of the tube or tubes used by the focal length of the lens used set to infinity focus.

IE a 24 mm Lens Extended by 12 mm yields .5X

Magnification

a 24 mm lens extended by 48 mm yields 2X

at closest focus setting the magnification would be 10-20% greater

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We have used an improvised Dumb tube with satisfactory results [Nikon BR-2A threaded to a BR-3 = a 21mm Extension tube]
we have also use a set of Kenko DG Extension tubes which are very satisfying

Advantages of Extension Tubes

a set of 3 yields a wide variety of available

Magnification

works with most if not all your glass

Smart Tubes may maintain In Camera Metering and TTL Flash

Smart Tubes may permit use of AF and image stabilization/VR

Easily transported

inexpensive for dumb units

moderate price for smarter units

Some combinations of extension+ focal length can yield much greater working distance which is very useful for Butterflies etc which may flee if you get too close

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Disadvantages of Extension tubes

Loss of Infinity Focus

dumb tubes won't allow metering, TTL Flash, AF or IS/VR

Tubes will lose light the longer the tube the greater the loss

Dumb tubes will require more math to factor in exposure corrections

smart tubes will allow for this through ttl metering but light loss does mean slower shutter speeds possibly forcing the use of a tripod

Dedicated Macro Lenses

These lenses are highly corrected and generally yield a flat plane of focus and with few exceptions will focus from infinity to closest focus which generally yields 1X Magnification or 1:1 reproduction ratio

Less expensive 3rd party Glass is still very good there are 4 generally recognized categories for 35mm SLR and derivatives

Standard or Normal Macros of 50 to 60 mm focal length

Portrait Macros of about 90 to 105mm focal length

Telephoto Macros of say 150 to 200mm focal length

Zoom Macros which yield 1:1 reproduction ratio at various Focal lengths

Disadvantages of Extension tubes

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all work well, the shorter lengths are lighter but suffer reduced working distance from your subject to front of the lens which will scare some subjects and may interfere with lighting on others.

Portrait Macros involve more working distance but are also bulkier and heavier.

Telephotos even heavier but greater Working Distance still; telephotos may/should have a Tripod collar.

The latest and Greatest may include Image Stabilization or Vibration Reduction. This is very effective when used as a normal or telephoto lens ; Much less effective to not at all effective when shooting Macro

Manual focus Macro lenses are still available second hand from time to time

Many of these go to .5X /1:2 at minimum focus distance and the manufacturer also made an extension ring to boost them to 1:1

sometimes they were sold as a package together Nothing wrong with MF and the price is much more affordable Some of the finest Macros i have seen were taken by a guy who only uses an MF lens given to him by a retired Dentist[they were commonly used in the Dental industry]

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There are some lenses available, mostly third party, that claim to be Zooms with a Macro Capability; check the fine print as they seldom get past 1:4 or 1:3

Reproduction ratio, suitable for shots of large flowers etc but not really close focus ;

our 35mm F2 lens used normally will go to 1:4.2 at minimum focus distance and the 18-55 mm Kit lens goes to 1:3.2 the 55-200 reaches 1:3.5 reproduction ratio.

There are at least 2 companies that build a few lenses that are macro only.

These lenses are highly specialized for use at very close focus distances only [no infinity focus] and of course very expensive. Canon for example markets a lens which is 1X to 5X magnification. The few users i have interacted with who have them are very satisfied.

We have and use a Standard Macro 60mm F 2.8,
a Portrait Macro 105mm f 2.8,
and a Standard Macro 40mm F 2.8

We are quite happy with all 3 units

Advantages of Dedicated Macro lenses

with 1 or 2 exceptions they are capable of infinity focus to 1X / 1:1 as is
no loss of metering
TTL Flash capable

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AF and VR maintained though of limited use for Macro

Overall much more convenient to use

Disadvantages of Dedicated Macro Glass

Much more expensive than other options

Heavier and Bulkier than other options not as easily transported

Manual Focus units don't enjoy metering, or TTL Flash Capability

MF units suffer light loss so Some compensation to exposure must be factored in

Higher Magnification is easier to attain with other methods

In many situations it is possible to increase magnification by mixing the various categories. We have added supplemental lenses to dedicated Macro Glass. We have put Macro lenses on extension tubes. we have reversed short focal length lenses on extension tubes. All options can be used together effectively.

Accessories for Macro/ Close Focus

Support

Many Gadgets will enhance Image Quality or

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make Macro Photography easier. at the top of the list has to be a tripod or other Stable support. With Macro, Depth of field can be as little as 1 mm so any movement is critical to image Quality.

Image Stabilization is not much use because it does nothing to counter movement towards/away from our subject. Even on a tripod AF is not much use as the AF areas seldom fall on the parts of the screen we choose for critical focus. Factor in a bit of wind and the lens will Auto Focus with the slightest movement of the subject which is very frustrating.

Manual Focusing is probably going to yield better images with less frustration. Focus manually, either with the Focus ring or by setting the focus ring to a given magnification then moving the camera body until focus is perfect.

In many situations a tripod's Vertical column reconfigured to a Horizontal mode is much easier to use for critical focusing than repositioning the pod.

Focusing Aids

For many cameras, more suitable Manual focus screens are available from the maker or third party suppliers like Katz eye.

A Magnifying Eye Piece for your viewfinder can enhance focusing. Some right angle viewfinder adaptors have a choice of magnification settings and certainly make it easier to focus than getting one eye down near ground level. Some provide viewing

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capabilities from top bottom or either side which is very handy [For Nikon bodies the DR-6 is superb] Bodies with Live View capabilities [frame your shot via the LCD] can enhance Manual focusing in some situations as you can magnify the image on the LCD to concentrate on parts requiring critical focus. For really precise Focusing, particularly with High magnification, a focusing Rail permits you to reposition the body to exactly where you need it.

Vibration Reduction

When we get to higher magnifications involved in Close focus very slight vibrations will have a negative impact on Image Quality. Two critical areas here are Human Induced Vibration and Mirror Slap.

The first originates when we push the shutter release to trigger the shot and is the worst of the 2. Technique helps; instead of pushing the shutter release try laying the side of your trigger finger on the switch in front of the release and roll your finger across the release to trigger the shot. Whenever reasonable consider using the self timer to release the shutter. A cable release or the electronic equivalent, whether wired or IR remote, is very useful for this.

Mirror Slap can be a real problem with some high Magnification images but you will not notice this until you have conquered Human Induced Vibration.

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Higher end Bodies have a function that permits one to raise the mirror then release the shutter with 2 separate actions to prevent mirror slap from becoming a problem. Don't bother using this function without a remote release as HIV will cancel out any advantage of using it. If you don't have a Mirror Up function, try to avoid using shutter speeds of 1 sec to 1/60 sec as in this range the effects of Mirror Slap will peak. The mirror Slap sets up a vibration in the camera Body/Lens combination which due to Mass and dimensions will vibrate naturally in that Range of Shutter speeds [Resonant Frequency or Frequency of Natural Vibration]. Outside that range the shutter speed is either too short or too long to be affected as much.

Subject Motion

Any movement is a pain when we are dealing with tiny subjects close up. The wind is a real problem any time we are trying to photograph Flowers or anything else susceptible to being moved by the Wind. If possible Relocate your Subject to a Controlled Environment [inside /wind free] If not you can set up a wind screen on the windward side of your Subject [easy near home; not so easy on a long hike] or with patience you can get good results waiting for periods of little or no movement .

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Supplemental lighting

Because Macro subjects are so small they only reflect a tiny portion of the ambient light to be recorded by our cameras. Many subjects which are typically found in shaded areas can benefit a great deal from supplemental lighting. It can also be used in bright light to reduce the contrast in shadowed areas of the subject. Often a tinfoil reflector works very well for this [light and very portable].

Flash would be a good source of supplemental lighting but it is not that easily transported and off camera flash which yields much better modeling is cumbersome to set up. Built in Flash and shoe mounted units tend to yield Flat Harsh light not flattering to the subject though some diffusion can help considerably.

Primary Lighting

Generally this will be Flash though as already mentioned this can be cumbersome.

The Exception would be a Macro Flash kit which mounts a light source near the front end of the lens either clamped around the lens barrel or via the filter threads.

Ring lights are flat and don't yield pleasing effects but placing a strip or two of tape to block some areas can improve the results.

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The Ultimate Macro Flash kit most of us have seen on CSI. Nikon's R1C1 kit mounts 2 or more small flash units [SBR200] to the front of the lens and triggers them Via an IR controller [SU800] mounted on the shoe. The commander can run 3 separate groups of lights either TTL or Manual mode independently. The lights can be independently aimed for desirable results.

Nice but expensive. Actors get to Play with all the nice toys. Presumably other makers offer something similar.

One very big advantage of Using Flash as a primary Light source is Flash tends to freeze action which often overcomes either subject or camera movement or both yielding sharp photos. This often makes the transport and setup problems well worth it. I have never had the opportunity to play with a Macro flash, but those i have been in contact with who have had the pleasure, seem to be very Satisfied.

Image Comment

Many Close Focus/Macro solutions will leave us with incomplete Exif. Dumb Tubes and Reversing rings will result in no Lens or Aperture information While Smart tubes will provide the lens /Aperture info but nothing on the tubes themselves. If your Camera provides an area where you can input comments for inclusion with the Exif use it to provide info you probably won't remember later.

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IE R 35mm F16 for reversed 35mm Lens at F16
Kenko DG 48mm when using 48mm of
Kenko Extension tubes. Nikon 3T or Canon 500G
when using a supplemental lens
it makes things a lot easier when reviewing shots
months or years later