

FLAAR Reports

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Repro Stands and Copy Stands

to Photograph Paintings, Historical Maps, Drawings, Posters
So you can print this art as Giclee

Part IV

The Photo Equipment Segment of the FLAAR Series on Giclee



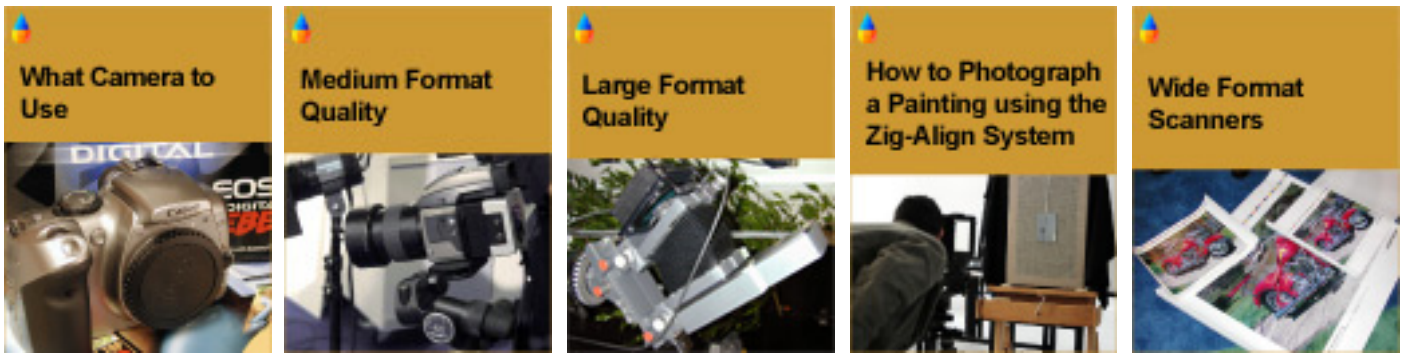


Copy Stands (Repro(graphic) Stands)	1
Vacuum Board	1
Brands of Copy Stands	
Bogen	2
Cambo	2
Colex	3
Kaiser	3
Linhof	3
Tarsia (tti)	3
Cruse	4
Summary	5
Lighting for copy stands	5
What about Vertical Copy Stands?	8
Bibliography	9
Appendix A	
How to take photographs with the Kaiser copystand	10
Equipment	10
Accessories	10
Setup	10
Procedure for taking a photo with the copystand	12
Further explanations	22
Glossary	23



The Photo Equipment Segment of the FLAAR Series on Giclee

- Part I covers basic entry level cameras to record paintings for subsequent giclee printing.
- Part II covers medium format cameras.
- Part III covers large format cameras.
- The present report is Part IV
- Part V covers the Zig-Align system for giclee photography with large format cameras.
- Part VI covers wide format scanners (which are not commonly used to produce giclee) but we added this report since full-page ads in trade magazines are showing this kind of scanner being used to produce giclee. We feel that people should be aware of the downsides).
- Part VII covers the dedicated (turnkey) Cruse reprographic camera, the professional system for a giclee atelier.



Copy Stands (Repro(graphic) Stands)

Years ago many manufacturers made copy stands. The number has dwindled considerably. The word repro or reprographic stand is more or less the same as a copy stand. The majority are made for using 35mm cameras to photograph small objects. These are too small for photographing most drawings and paintings; such stands are also too weak for holding large professional cameras.

It is absolutely essential that you have a camera with a “waist level viewer” or other viewer that you can look through while you are standing in a normal position in front of the copy stand. If you have to hang from the ceiling like a bat, or stand on a ladder and try to turn your pained neck 90-degrees just to find the viewer so you can look at the image, you will never be content. The stress alone won’t be worth it. The Mamiya 645 AFD does not have an interchangeable viewer; this would make it awkward to use on a copy stand.

At times even a good-sized stand simply is not large enough. In this case you will have to stitch several scans together. Since the camera is at a fixed distance from the painting (as long as you don’t move the camera), it is a lot easier to manually stitch since, in theory, all your individual segments should be the same proportions and thus should stitch together relatively easier. We frequently stitch manually even with the Cruse (with its copy stand of 36 x 48 inches for the model we have; often individual paintings are larger).

Vacuum Board

If the object you are photographing is a painting, it is probably relatively stiff. But if the object is a map, or anything that has been rolled, it may curl up at the edges, be warped or otherwise not be flat.

For a professional reprographic stand it is customary to have a vacuum board. Frankly I am not impressed by them; they don’t really suck most materials flat enough. And a vacuum board is seriously expensive. Yet if you

don't have one, your original will be even more rippled than without one. The option is to use non-stick tape on at least two edges and stretch the item taut. But most museums will not allow you to put any tape on their precious objects.

If your vacuum board is larger than the paper you are trying to flatten, then your vacuum will be dissipated by sucking air where there is no paper. You have to somehow cover the entire area of the vacuum board so that the suction is concentrated on the area that you want to be sucked flat.

Of course you can always explain the reality of the situation: either the item is stretched taut or the photo will be out of focus and will appear with all the ripples in the reproduction, forever. It is not as if you are going to damage the image and the idea of doing a good photograph is so you have to do it only once. If you do a shoddy job because you can't adequately flatten the original material you will have to waste more time re-doing it anyway. Might as well do a proper job to begin with, and this means do what is necessary to flatten the object in a reasonable manner.

Putting glass on top of the paper to flatten it is not recommended for a host of reasons: reflections from the glass, distortions caused by looking through non-optical glass, and so on. Despite this comment, it is surprising how well photos result that, for whatever reason, have to be taken through glass.

You might consider magnets. You can wrap them in soft material since artists may not like the sight of raw metal on their precious artwork. Since most copy stands are metal, magnets work well to hold paper flat on top of them. But magnets can't pull, or even hold, a seriously wrinkled map taut... to do this properly requires gentle persuasion, and tape.

Brands of Copy Stands

Bogen

Bogen Imaging (www.BogenImaging.com) is the US importer for Manfrotto studio equipment.¹ Manfrotto (in Italy) makes good studio equipment; their tripods are as good as Gitzo, for example (Gitzo does not make a copy stand that we know of).

A "geared side arm," #FF1227 is an accessory to better and more easily situate the camera in precisely the position you need. I would estimate the Bogen/Manfrotto system is good for 35mm and obviously also for a point-and-shoot camera.

We have not tried the Bogen/Manfrotto Maxi-Repro Copy Stand. It has a 30 x 36 inch base. But we use a wide variety of other Manfrotto products, especially tripods and tripod heads.

Cambo

Everything we have from Cambo is well made (we have two different 4x5 Cambo cameras). Thus we assume their copy stand is better than average. The copy area is 60 x 70 cm, 23 1/2 by 27 1/2 inches. This would be our bare minimum in size, for small sketches; or for art to create greeting cards as an example.

The Cambo system would be expected to be sturdy enough to hold a medium format and probably a large format camera (since it is 4x5 cameras that Cambo makes).

¹ What is now called Bogen Imaging is known to most photographers by its earlier name, Bogen Photo. It is the same company.

Colex

Five years ago Colex offered copy stands but they dropped out of this market. When we found the remnants of Colex at trade shows around 2000-2002, they either did not exhibit or sometimes did not even talk about their copy stands. By 2003 I gave up even looking for them. At Photokina 2006 many of these traditional companies will barely be recognizable since they did not adapt quickly enough to the reality of digital photography. Photokina is held only every two years.

Kaiser

The Kaiser rePRO copy stand is the brand we used, for one reason: it cost less than the larger one from tti. Kaiser is a sturdy stand; the model we obtained has an electric motor to raise and lower the camera. If I remember correctly, it can handle art up to 28.4 x 33.5 inches. The main disadvantage of the Kaiser is that it is not big enough for large paintings. If you are a commercial company you should be able to afford the more versatile Tarsia (tti).



Kaiser copy stand

Linhof

Linhof, a German company, makes good equipment. Although best known for their large format cameras, Linhof also makes tripods, studio stands, and copy stands. Models include the Linhof Technopro II (circa \$3,200). There is also a Technopro I (65 x 70 cm). The Technopro II goes to 80 x 90 cm (100 cm is roughly a yard).

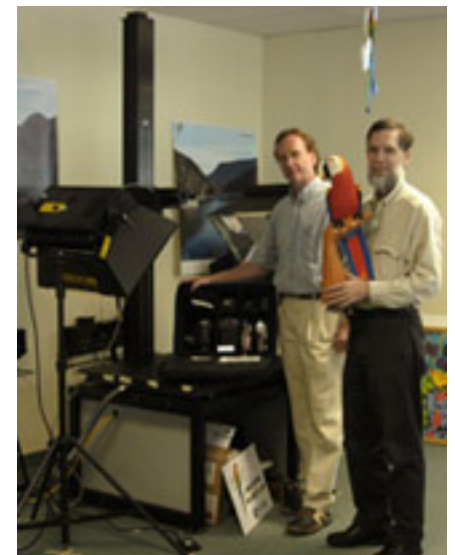


Linhof reprographic stand

The Linhof Master Digi Repro-System is a well thought out system. I especially like two features: the support for the lensboard and the table so you can put your digital camera processor here. Overall I would rate this as excellent. Everything about it is what you expect from a German designer. However I would want to be sitting down when I heard the price tag.

Tarsia (tti)

Joe Tarsia designs and builds solid equipment. Nonetheless we do not have a Tarsia system (FLAAR is non-profit so we do not generate enough income from the use of our equipment. Thus we could not afford a tti). If you are a commercial company then the price should be acceptable. The place we recommend that you obtain more information about the tti copy stand is from Parrot Digigraphic, imaging@parrotcolor.com.



Here is the tti copy stand at Parrot Digigraphic. Parrot sells to museums, universities, libraries, artists, giclee studios, sign shops, photo labs, individuals, and pro-sumers.

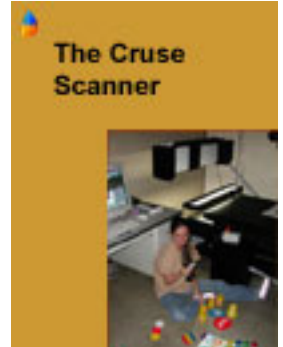
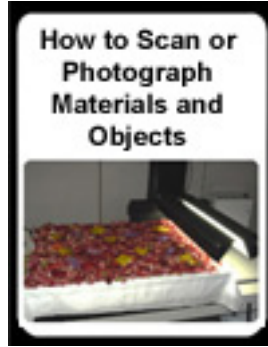


Here is the tti copy stand at a trade show with a BetterLight camera. We recommend the BetterLight for digitizing paintings, drawings, posters, maps, and other art work.



Cruse

A Cruse copy stand is a turnkey reprographic system. It includes everything: lights, camera, and action. If you wish further information you can consult our Lab Manager, Brent Cavanaugh, brentc@bgnnet.bgsu.edu; he uses the Cruse every week. We scan for artists all across the US (they send their paintings by FedEx or drive them here). BGSU (where FLAAR equipment is evaluated) also scans wood, photographs, maps, and other materials. We are south of both the Toledo airport and the Detroit airport.



We have many separate reports on the Cruse copy stand system because we have their scanning camera and also see their other models at Photokina and other trade shows.



Here is the Cruse in the FLAAR facilities at Bowling Green State University.



Here is the Cruse at Photokina trade show 2004.

Summary

- Bogen/Manfrotto, good entry level for 35mm and zoom-lens cameras. We would have to test ourselves to see if it will hold a medium format camera system.
- Cambo, heavy-duty but small copy area.
- Kaiser, a choice if you don't need large copy area; can hold cameras up to 4x5. However avoid their Scando camera.
- tti is a good choice; better than the Kaiser if you can afford the tti (we use the Cruse).
- Cruse is top of the line, the best system if you can afford absolute top quality.

The Linhof would surely be good but we have not used one.

Lighting for copy stands

Here is where you separate the sheep from the goats. Some copy stands have awkward lighting.

Avoid any copy stand with normal bulbs. These lamps don't last long and are the cheapest kind of lighting. Even as a beginner you can do better (Lowel Tota-lites at least).

Most lights that come with copy stands don't have facilities for light modifiers (umbrellas, lightboxes, etc).

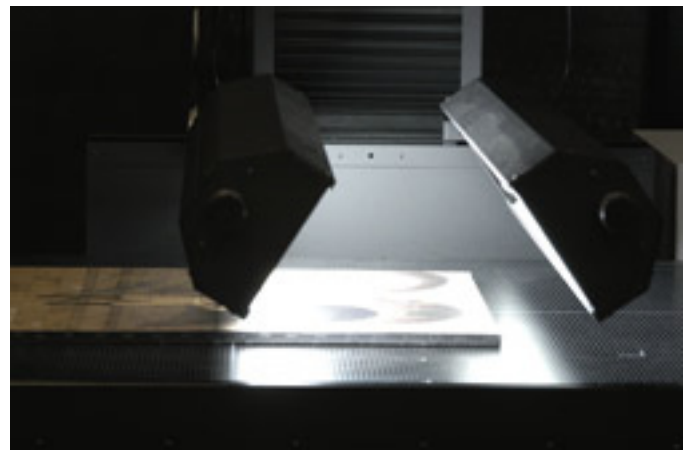
Studio lighting comes in the following technologies:

- Basic bulbs
- Tungsten/halogen
- Digital fluorescent
- Ceramic discharge
- HMI

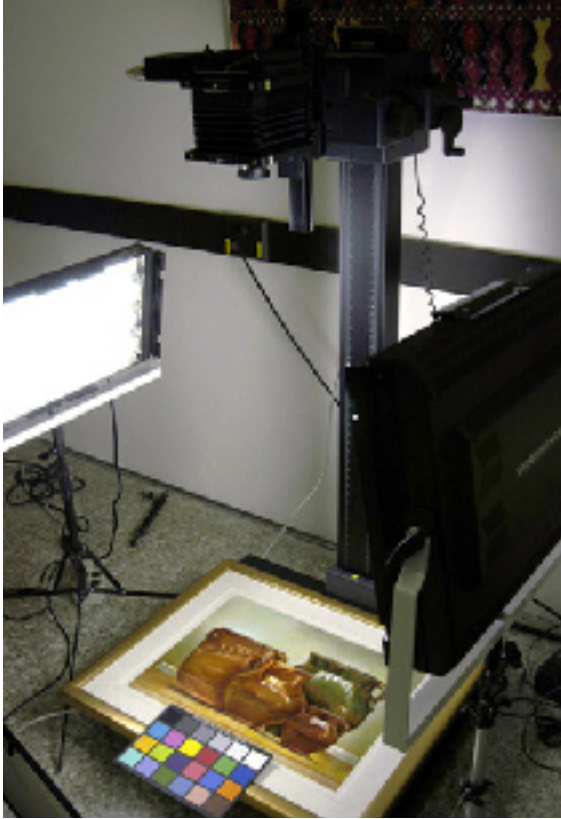
Basic bulbs are the light bulbs, in traditional light bulb shape. These are the bulbs that go into cheap fixtures (the aluminum reflectors you buy at hardware stores or camera stores). They are not unusable, but you can do better, so we do not recommend these.

Tungsten are hot lights. Many companies make tungsten lighting for photography: we have used Lowel lights for decades. Their Rifa-lites are good because they come with a softbox. Downside is the softbox takes lots of space so you can get only one at each side of the copy stand.

Lowel Tota-lites would be the most economical. They are indestructible and great for transporting. We have used them for decades all over Latin America, the US, Mexico, and Japan: never had one break or even damaged.



The Cruse system has its own special lights. This is so that everything is gray balanced automatically. I am guessing these are tungsten lights



Notice that we are using a GretagMacbeth ColorChecker in the photo. You should use a Macbeth ColorChecker in every professional digital photo you take, especially of a painting to reproduce as a giclee, fine art photo, or decor. If you are using a Kodak color chart, or Kodak gray card (Q 13), they are okay, but are glossy and have fallen out of favor with digital photographers, who prefer the matte surface of the Macbeth ColorChecker



Here I am using Balcar fluorescent lighting while photographing in Malta.



Here is the set of Balcar lights that FLAAR has available at BGSU.



BetterLight uses ceramic discharge lights in its booth at trade shows.



If you need more light, the Lowel DP is good; the Lowel Omni is similar. We use them both.

Fluorescent lighting is the new fad. These lights are cool, but therefore don't pack the wallop, as do tungsten lights. Lowel makes transportable fluorescent lighting. Balcar makes the most sophisticated ones that we use. You can easily balance these professional lights for gray balance: these are NOT the same fluorescent lights as in your ceiling. Lowel and Balcar are made for digital photography.

Ceramic discharge lights are sold under many different designations. The most sophisticated are from North-Light Products. Other kinds are available from DeSisti, Altman, and Buhl. You can obtain information from www.NorthLightProducts.com.

HMI are very expensive; a replacement lamp (the bulb) can cost up to \$3,000. These are not the kind of lights you need for a copy stand anyway.



HMI lights are for illuminating building interiors; I have used them in photographing inside the cathedral in Malta and the national palace in Valletta, Malta.



The disadvantage of having the copy stand on the floor is that the lights are too high. The lighting is enough illumination, and the results we achieved were quite nice, but you get better three-dimensional effect from the brushstrokes if the lights are at the same level as the painting. This is called "raking light." But here the painting is watercolor, and you don't get the brush strokes and gobs of paint as you would with an oil painting



What about Vertical Copy Stands?

A “vertical copy stand” is a contradiction in terms. What this really means is photographing the painting on a wall, or a special tablet, frame, or dedicated work area.

Advantages of photographing on the wall is that it takes less space; you can photograph materials of almost any reasonable size (much larger than will fit on most regular-sized copy stands).

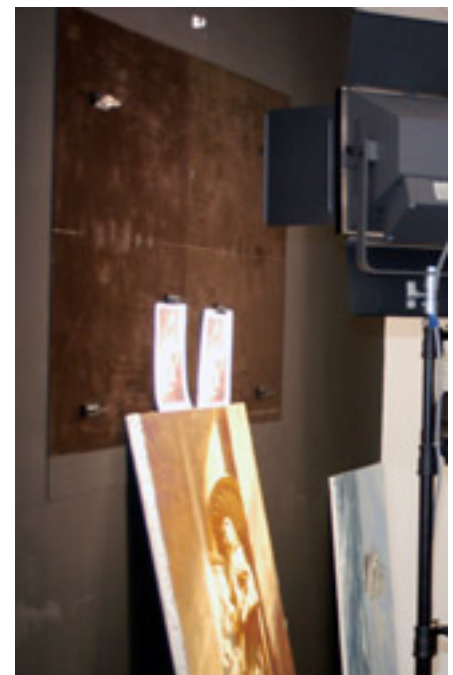
The main advantage of photographing on the wall is that it is so much easier to set-up, aim, and modify your lighting.

Another key advantage is that museum curators and artists are more accustomed to seeing their precious babies on the wall than they are seeing their charges flat on a table. Some nervous nellys are afraid that something will fall off the repro camera onto their painting. Well of course this could happen. As I write this 144,800 people died from a Tsunami wave hitting the beach resorts of the Indian Ocean. They were not expecting that either, so bad luck hits. But you can't stop going to the beaches just because a Tsunami, or shark, might get you. I was in Honduras last weekend; in the next town 28 people were massacred by gangs who opened fire on a public city bus in the main city. But people get murdered on the subway in New York, and over 300 people probably died agonizing deaths in traffic accidents over New Year's drunken holidays, so I feel it safe to put paintings on a copy stand. You can't be afraid of your own shadow and expect to be successful and productive. Unless you are Howard Hughes of course, who made billions while cowering in unlit rooms in a hotel in Nicaragua.

Downsides of photographing against a vertically positioned painting or map are the alignment problems. It is easier to align a camera on a professional copy stand than to jerry rig a camera on a tripod in front of a painting on the wall.



The lights are Videssence fluorescent fixtures, normally used in TV studios, to light video. The advantage of fluorescent lighting is that it is cool. But we recommend Balcar brand if you need a stronger light; we recommend Lowel brand if you need portability. The Videssence are okay, but are neither very portable nor strong



You do not have to spend a thousand dollars in order to have a flawless scan of your painting. If your wall is plumb; if the painting is mounted on an even frame (not warped); and if you use a Zig-align system, you can use the wall as a copy stand. I have visited the giclee studio of Gary Kerr both in Boston and in his new location in Charlotte. His attention to detail results in a giclee print that is better than most of the prints at million-dollar trade shows such as Atlanta Art Expo and the Art Expo International in New York.

In other studios I have seen exceedingly complex set-ups that tried to achieve alignment, but failed. So complexity is not the solution. The answer is to understand that parallel alignment (the painting has to be parallel to the CCD sensor) is more than plumb bobs and line levels. This situation is why we have produced a special FLAAR Report on the Zig-align system.



Whatever, be sure your wall or upright copy stand has markings so you can square-up your painting, poster, historical map, or whatever.

Bibliography

Most copy stands are cheap and only for entry-level cameras for home use. We do not include these nor a bibliography on them. Not too many people write about professional copy stands good enough for professional use, but here is one gem that we did find.

www.marietta.edu/~mcshaffd/macro/copy.html

Useful generic info (does not hawk one brand or another). Nicely illustrated. Entry level (basic 35mm camera only).

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Appendix A

How to take photographs with the Kaiser copystand

I. Equipment

- Kaiser Copystand
- 4x5 camera, viewer
- 180 mm apochromatic macro lens
- Digital infrared filter (indoors)
- 2 lights (fluorescent lights, Tota lights, or equivalent)
- 2 tripods for lights
- BetterLight 6000 tri-linear scanning back
- ViewFinder 5.2.2
- Sola Hevi-Duti line conditioner
- Laptop computer with SCSI
- SCSI connection
- Adobe Photoshop version 6 or later

II. Accessories

- Bubble levels
- Gaffer tape (special photography tape)
- Rubber band
- Focusing card
- Reflectors: two layers of drafting paper
- Kaiser Copystand with Cambo Ultima camera.
- Lens shade
- Extra battery for laptop computer

III. Setup

The Kaiser copystand is quite heavy and therefore easiest to set up on the floor. If you wish to elevate it, make sure that you put it on a solid and stable base. You can check if the platform is level with the two bubble levels integrated in the copystand.

Before attaching the camera to the extension arm, insert the lens, since the front of the camera might be a bit awkward to reach once the system is set up, especially if the copystand is standing on the floor. We recommend a 180 mm apochromatic macro lens for taking photographs with the Kaiser copystand.

Attach the square infrared filter to the back of the lens with a rubber band or Gaffer tape. They filter any infrared light emitted by the light source that can cause the photo to be overexposed. It is absolutely necessary to use the infrared filter with tungsten lights.

There are special digital infrared filters for indoor and outdoor photography. The ones for indoor photography are thinner. They filter any infrared light emitted by the lights that can cause the photo to be overexposed.

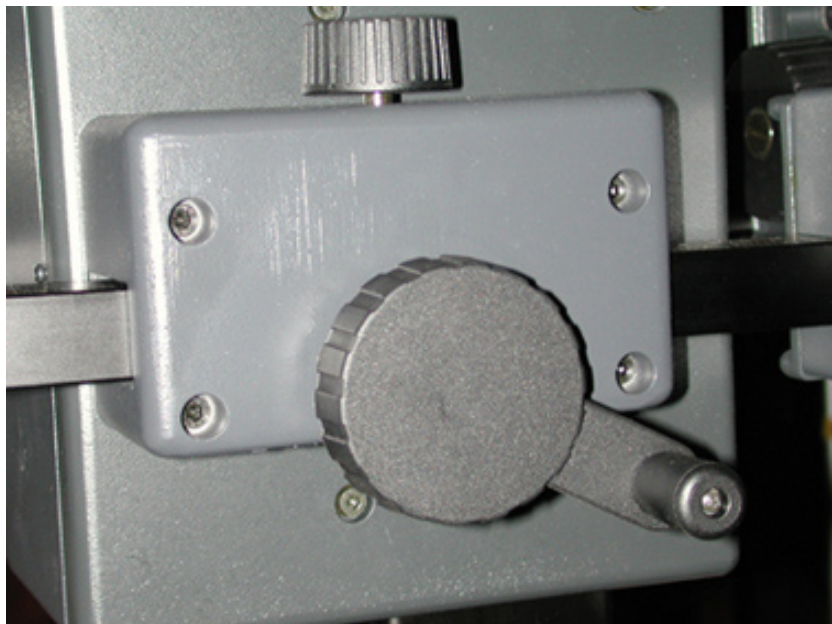


Connect the up/down mechanism and remote control to the power box. The arrows on the remote control indicate the direction of the movement; the button in the middle activates fast movement.



KaiserPro power box and remote control.

There are two rotating handles on either side of the up/down mechanism with which it is possible to move the camera backwards and forwards.



Rotating handle.

Set up the lights. Depending on the height of the copystand you will have to use normal tripods, or flat tripods for set up on the floor. It will be easier to adjust the lights if the Kaiser reprostand is set up slightly elevated from the floor, so that you can use tripods that are adjustable in height.



Flat tripod good for light set-up on the floor.

To prevent banding effects¹ on the image, use a Sola Hevi-Duti line conditioner to produce clean electricity. This power conditioner comes in portable 1000 watt units, or non-portable 3000 watt 15 amps units, and keeps the lighting from flickering due to the normal fluctuation of any electrical current. Every time an electrical appliance is turned on elsewhere in the building, the lights dim slightly, and cause vertical gray bands on the image.

It might be a good idea to prepare a cover in a neutral color for the base of the copystand to make retouching in Adobe Photoshop easier.

IV. Procedure for taking a photo with the copystand

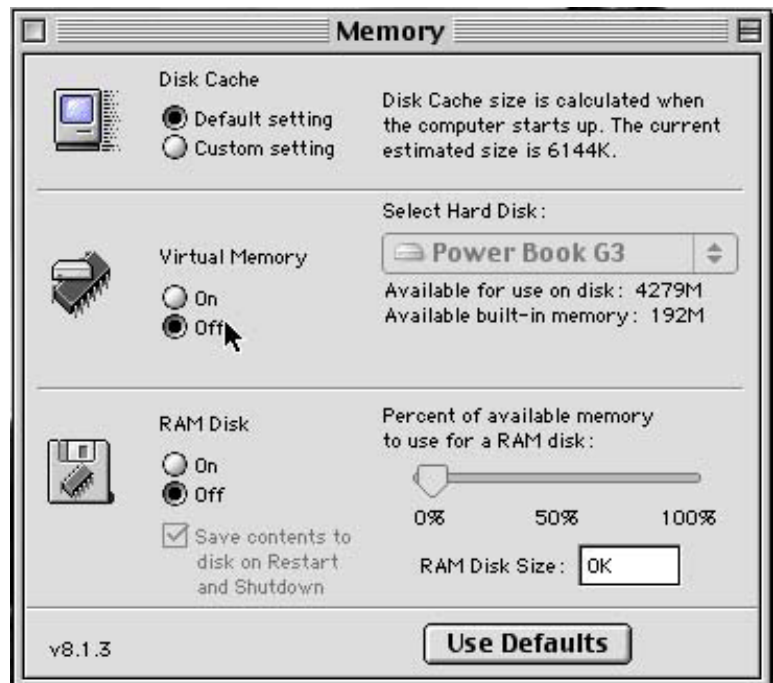
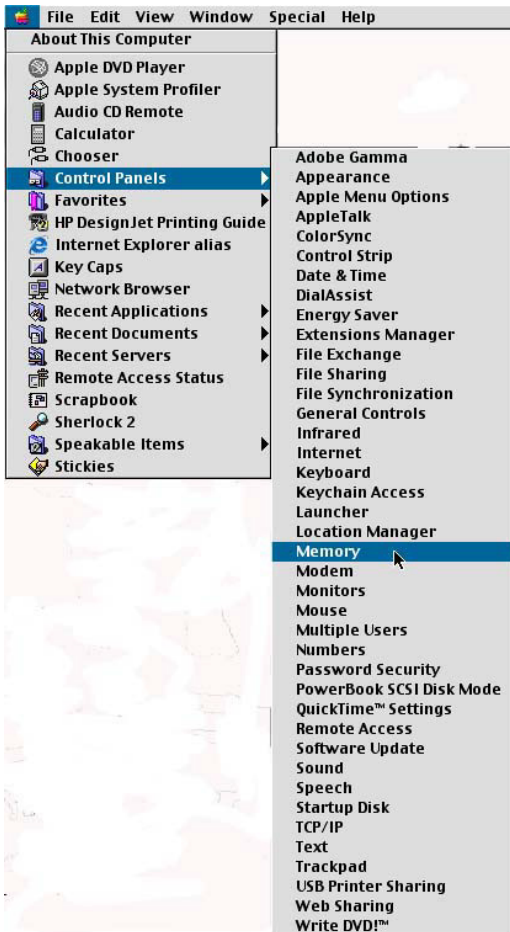
1. Place the object on the base of the copystand
2. Select the camera position by moving the motor to get the wanted image size.
You might want to take notes of the camera position in case you wish to reproduce the image size in the future.
3. Manually focus on the object.
You will first have to set the camera dials to zero. Then start moving them while looking through the viewfinder of the camera until the image is focused. Remember to focus on an area 1/3 into the object when it is not flat.
4. Connect the BetterLight digital system with a SCSI cable to the computer.
5. Insert the scan back
Any BetterLight scan back can be used with the BetterLight pano adapter, but you will have to make sure that the Firmware inside the scan back has been updated to the most recent version (currently 4.06).
6. Turn the BetterLight system on

¹ Banding due to electrical disturbance is totally different to banding in a laser printer or inkjet printer. Electrical disturbances can be caused by anyone turning on a laser printer, a copy machine, or any motor. This could be enough to cause the electricity to drop and then surge, even if it happens elsewhere in the building. The milliseconds during the drop results in less light for a fraction of a second, which causes a thin gray band on the photo. The longer the drop, the wider the band (those are the pixel columns being scanned at precisely the time the electricity was down).

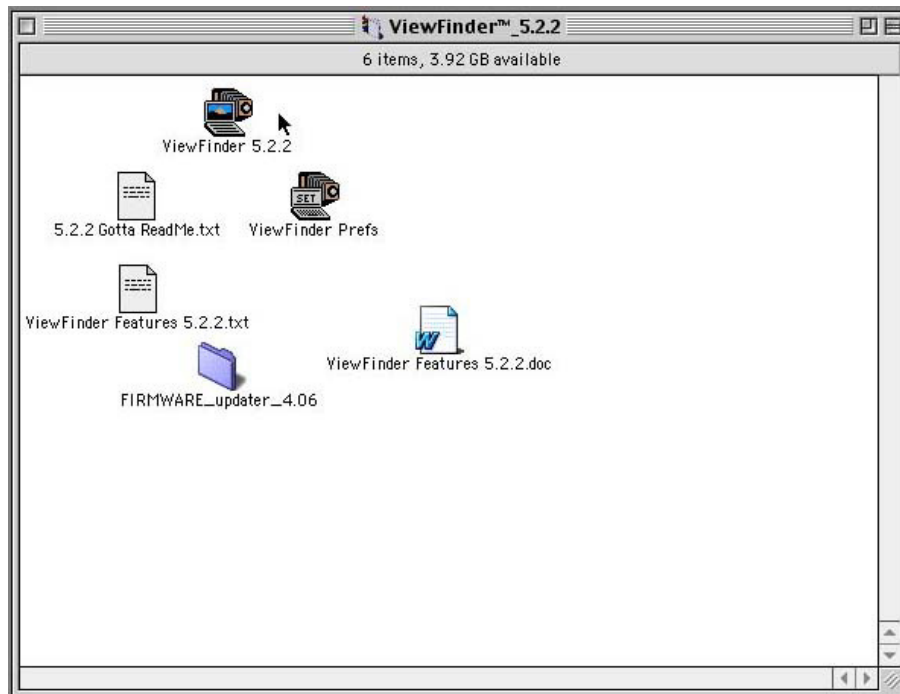


The green light indicates, that you are connected to the main external power. The yellow light means that your battery is still charging, but you can use the system. The system is turned on fully when the red light is on.

7. Turn on the computer
8. Turn off the memory of the computer, and restart
To turn off the memory open the *Control panels* and select *Memory*

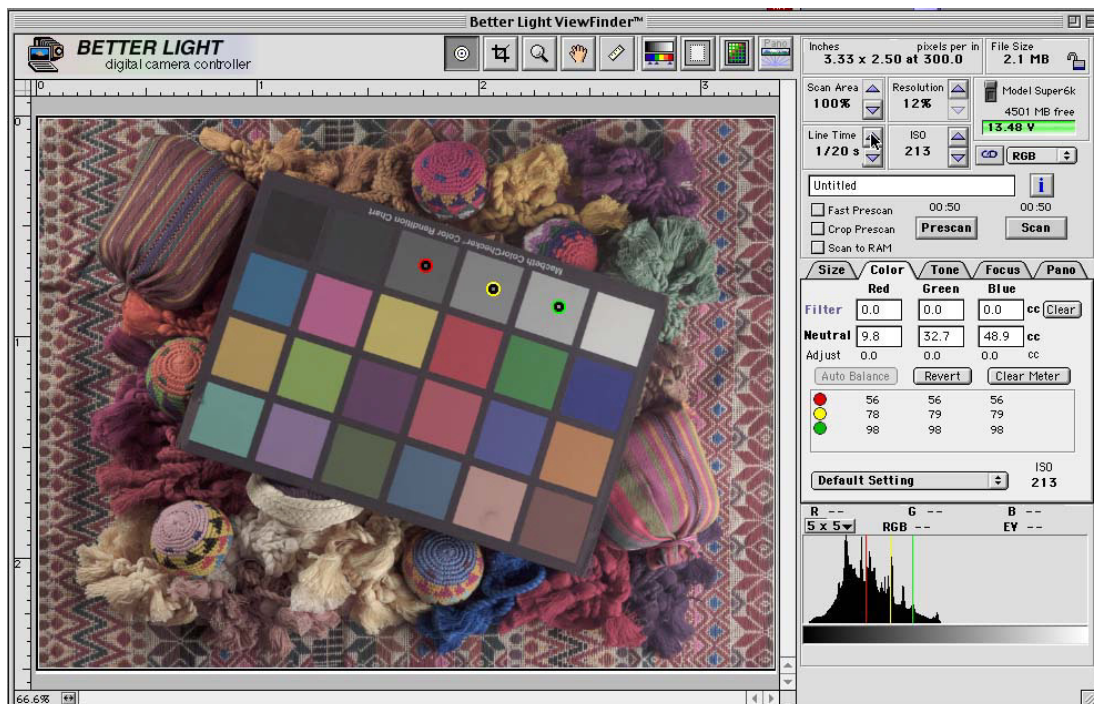


9. Open the ViewFinder software by clicking on the icon.
We are using the ViewFinder 5.2.2 software.

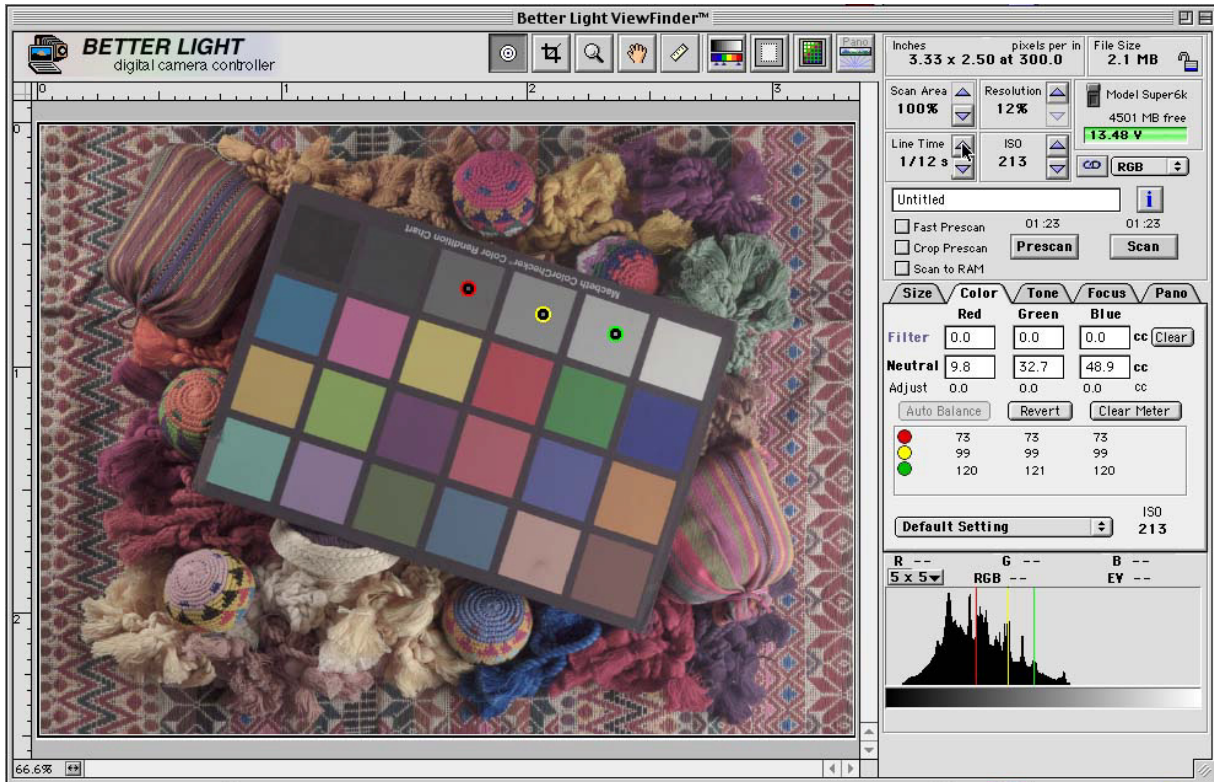


10. Choose a low resolution for the Prescan (12%)
11. Choose a Line time and ISO

The line time is the digital equivalent of the shutter time. The line time and aperture of the lens determine the exposure. Under *Preferences* you can choose how it operates (exact, 60Hz, 50Hz²).

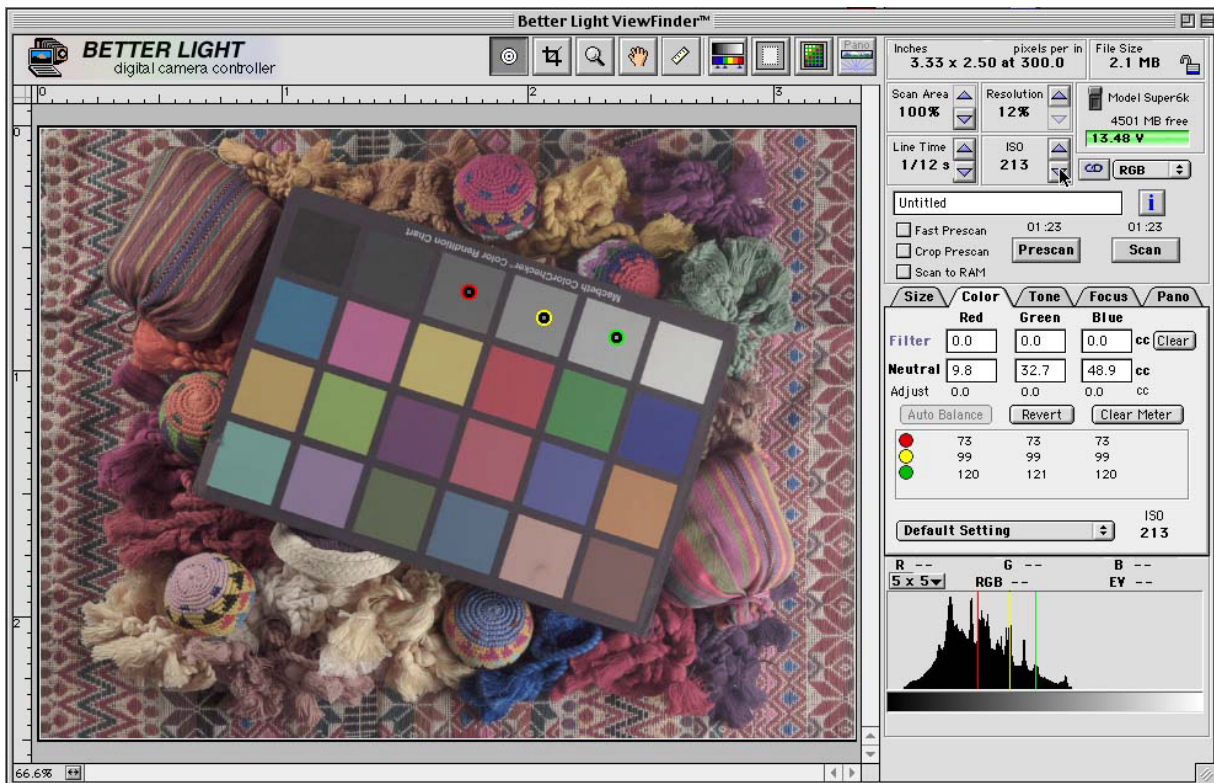


² 50 vs. 60 Hz have to do with the electrical line frequency. Comments will follow ones we have gained some experience with this.



The longer the line time (e.g. 1/8s, 1/15s), the more light can be absorbed by the CCD. But a longer line time also increases the scan time and the dark current noise.

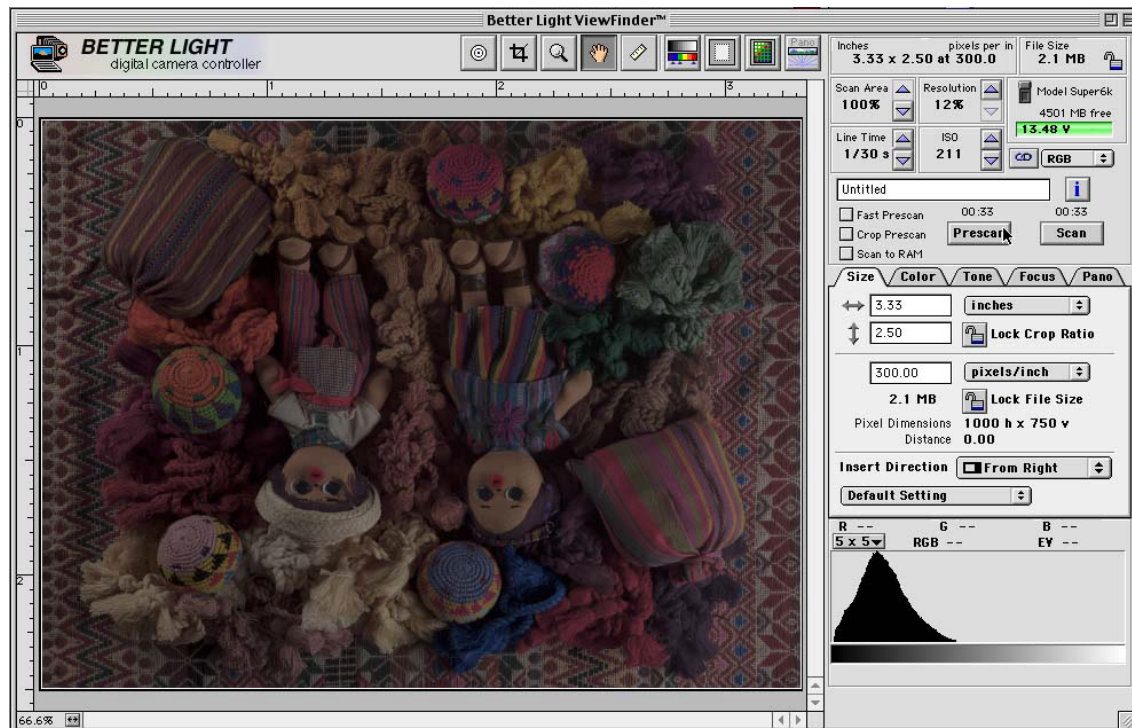
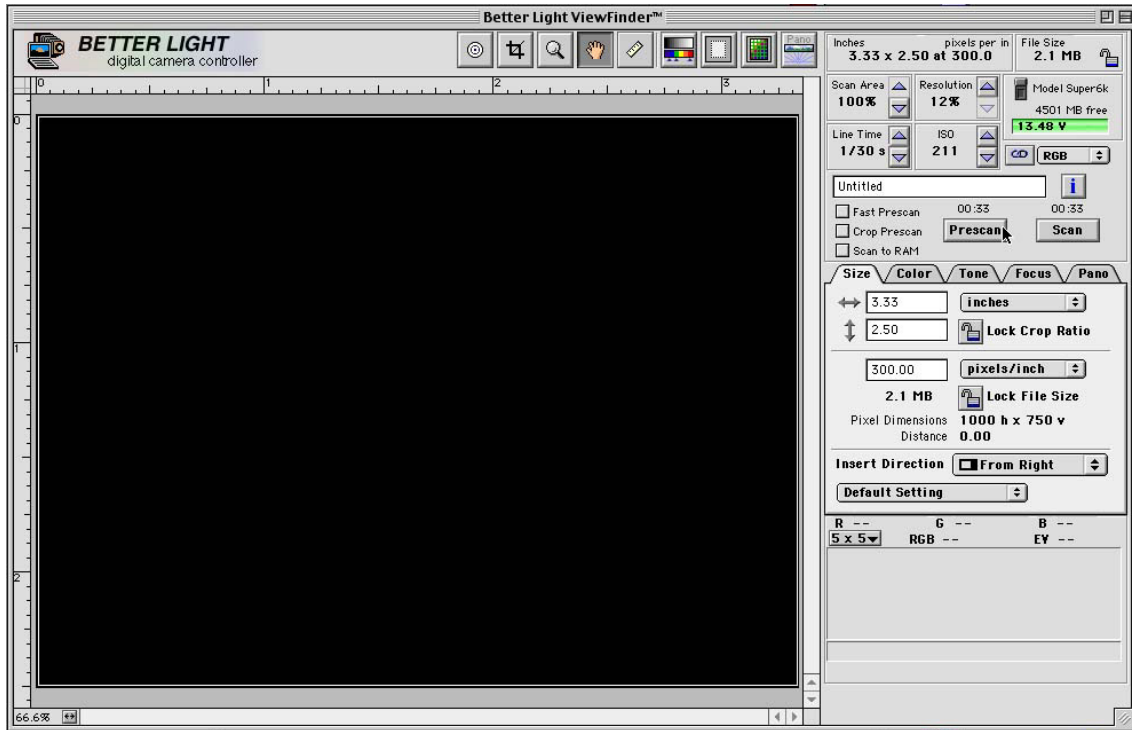
ISO determines the sensitivity of the camera. With a higher ISO the shadow noise increases.



A faster Line time needs a higher ISO. You can synchronize the two settings by clicking on the small button next to the ISO field.

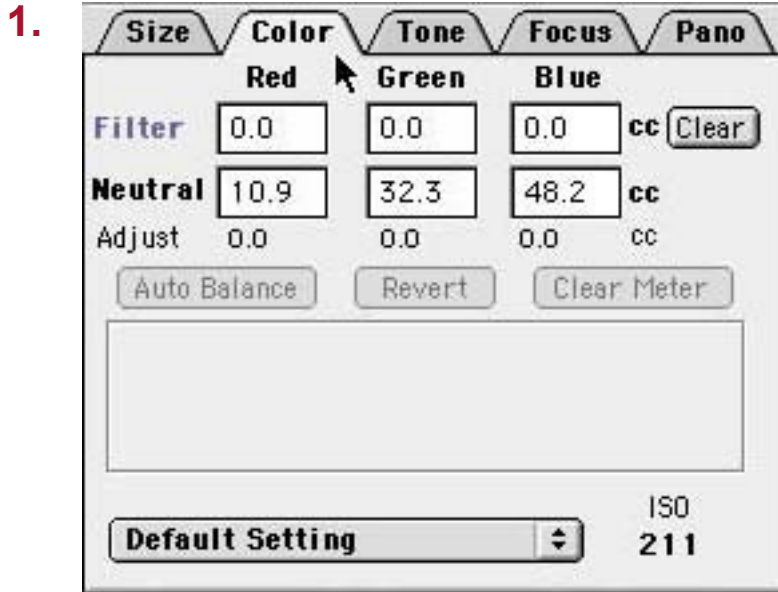
Also adjust the aperture of the camera if your prescan appears to be over- or underexposed.

12. Turn off any ceiling or other additional lights
13. Take a prescan

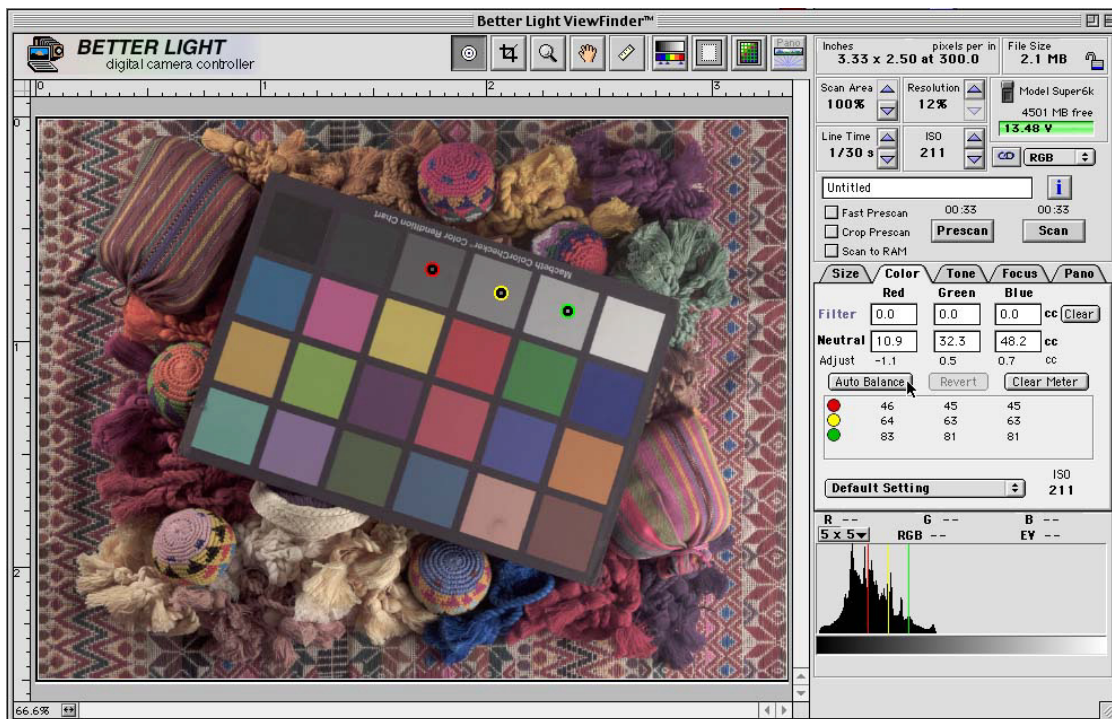


14. Balance grays with a Gretag MacBeth ColorChecker

Put the ColorChecker within the scan area and prescan. Then open the *Color* panel (1), and select a gray with the *Spot Meter* tool (2).



It is important that the three readings for each gray are equal. Click on *Auto Balance*. Observe changes to the histogram and the preview image. *Revert* and *Clear Meter* until you get a satisfying histogram. A good histogram has an even distribution of peaks over the whole width of the graph. You might have to choose different shades of gray to balance the overall color. The program allows for four shades of gray to be chosen at the same time.



For better contrast, and to capture details in shadows and highlights, you might want to choose the black, middle gray, and white fields. Click on *Auto Balance*, and then adjust the readings for the black to about 25 by changing the line time and ISO settings.

The gray balance is important because it corrects the colors of an image to produce a color realistic photo. Gray is a neutral color that posses all wavelengths of light in equal amounts. Thus by balancing the grays, i.e. eliminating any irregularities in its wavelengths, all other colors will be balanced as well.

If you select “Embed ICC Profile” in the Preferences the ViewFinder will do two things. First, it will embed the profile into the final scan file. Second, it will use the profile for displaying the preview image in ViewFinder. After each prescan, the profile will be applied, and the preview image will be updated with the color management version. This will only work if you have a profile for your monitor. Photoshop should also be set to “Use embedded profiles”, so that it will use the camera profile properly.

The histogram should peak roughly in the middle of the chart. Both piedmonts of the histogram hill should be well inside the chart. If any edgy of the base of the hill is touching either edge of the chart then you are either underexposed (far to the left) or overexposed (far to the right).

The more corrections you make in the camera software, the less you will have to correct the image in Adobe Photoshop later on.³

You can make changes to the contrast range with the tone panel. The panels on the right of the graph have the following functions:

- i. Increase/decrease brightness
- ii. Increase/decrease contrast
- iii. Choose between 5 or 7 control points
- iv. Negative

The three buttons at the bottom of the graph control the range of manual adjustment allowed for the curve control points.

If you have selected a black, middle gray and white, you will first have to move the circles into the middle of the colored fields. When you are using 5 handles, use the middle 3 circles. For 7 handles, use the 2nd, 4th and 6th circle.



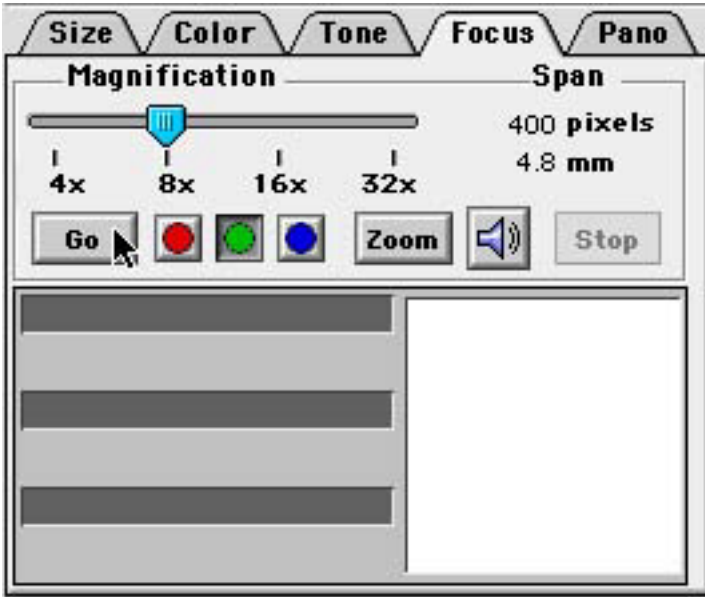
Then click on the Vertical Move button to locate the exact output density, and to keep the circle inside the square.

Drag the square corresponding to the black to a value of 25, the middle gray to 120, and the white to 240.

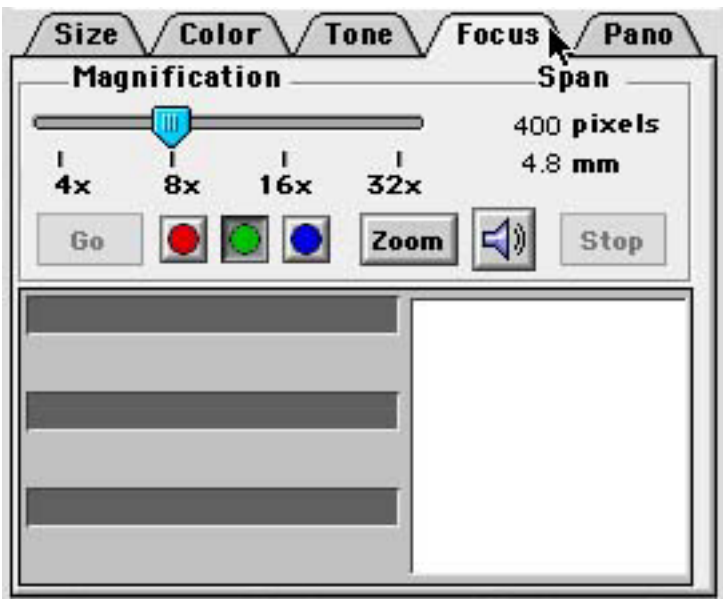
³ I am not yet familiar with ways to automatically incorporate ICC color profiles into the photograph. www.picot.com shows CandelaColor InCamera profiling software. This works with Gretag Macbeth ColorChecker. InCamera is on OEM product. For the consumer this was originally part of ColorSynergy 4.1 or higher. Now InCamera Professional 3.1 is available for both Mac and PC. InCamera from Pictographics has a digital camera profile checker with noise analysis module among other neat feature. Works with the X-Rite DTP92 Color Monitor Optimizer. After you have your images taken, you might consider editing them in iCorrect, another product from Pictographics. This won an award from PEI magazine for the year's best Photoshop plug-in.



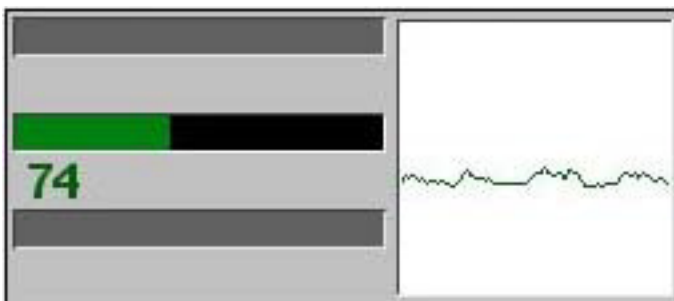
15. Focus



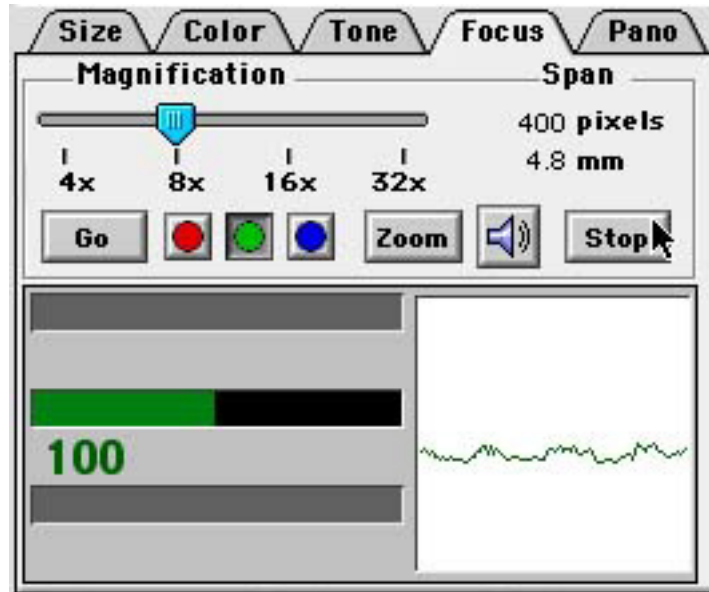
Open the *Focus* panel.
 Select the area of the image where you want to accomplish better focus and click on *Go* (digital focus on non-flat objects is also be done best about 1/3 into the object, and not at the center).



A horizontal bar and a number will come up.

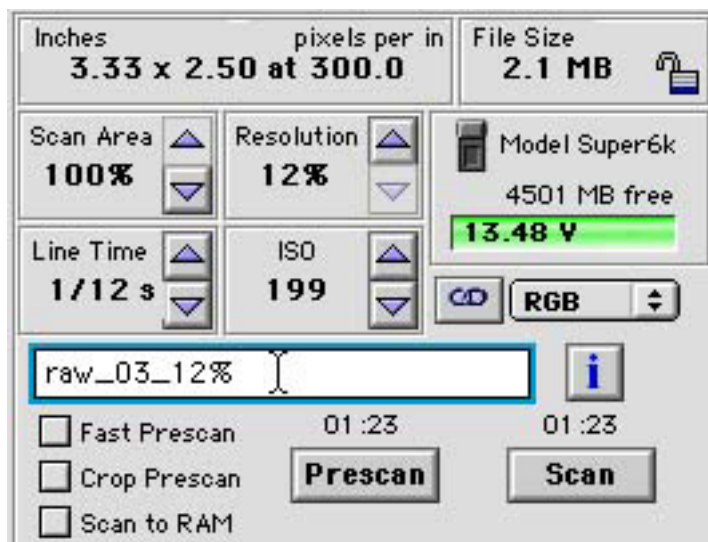


Turn the dials on the camera until you have reached the highest number. There is no ideal number. Then click on *Stop*.



It is usual to focus only on the green channel. If you can't get a proper focus you might have to manually focus again. Keep in mind that inserting the scan back or changing the aperture might change the focus slightly due to camera movements.

16. Prescan until you get a satisfying result
It might be helpful to take notes of the final settings for future reference. You can do that under *File, Save settings*.
17. Choose 12% resolution for the scan⁴
Choose the resolution according to the purpose of the photograph.
18. Choose a name for the photograph
You can also add additional information by clicking on the "i" icon next to the scan option.

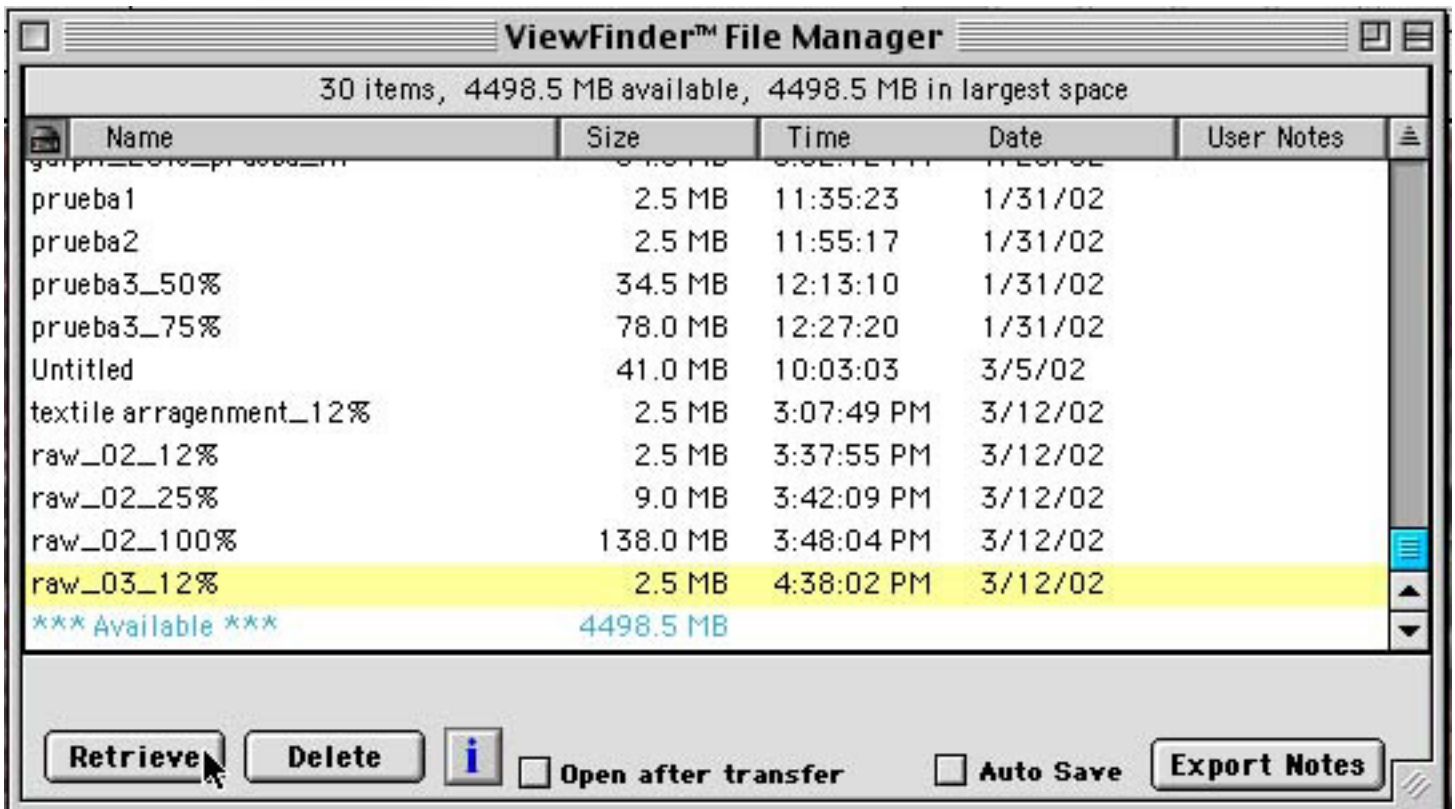


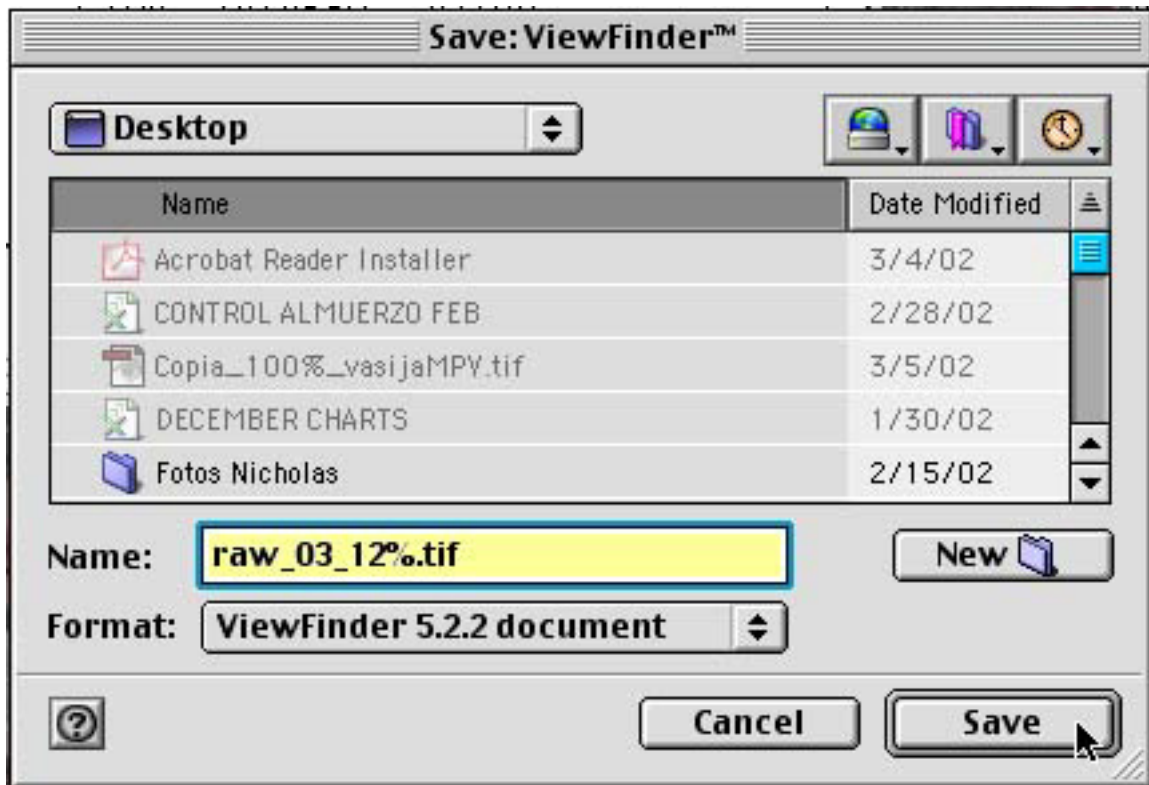
⁴ Do not take photographs larger than you need. Dye sub and digital imagers need about 300 dpi. Piezo printers with 1440 dpi may want 250 to 300 dpi. Most thermal inkjet printers such as Encad, Hp, and ColorSpan only need 150 dpi. Sometimes 120 dpi might be enough for a thermal printer.

19. Scan



20. Open the *File manager*, and retrieve the image





21. Open the picture in Adobe Photoshop
22. If you wish to take another shot of the same object, be sure to change the name of the file to prevent erasing one of the shots by mistake.

IV. Further explanations

a. Support equipment

The BetterLight tri-linear scan back has its own processor with battery, the former being about the size of a laptop computer. It is totally portable, but since electricity is needed to power the lighting, rollouts are usually taken within the reach of a power source.

A SCSI cable connects the processor to the Macintosh computer. A laptop computer is more convenient for location photography, but we recommend a G4 with a 22" cinema display for a better display of the rollout photographs. Problems might occur when using an add-on SCSI. The newer Mac laptops lack SCSI, and we therefore recommend an older model with internal SCSI such as the Wallstreet model of the G3 laptop.

FireWire connectors are not yet available, but might be implemented in the future to make it possible to use the newer Macintosh G4 Titanium laptops.

b. How does the camera work

There are different digital camera systems with different photographic modes. The BetterLight camera for example has options to work in panorama mode, rollout mode, QTVR mode, or normal mode. The Seitz SuperRound Shot can operate in panorama mode, rollout mode, or linear mode.

In panorama mode the camera is affixed to the turntable, which causes the camera to rotate. As it rotates it scans the landscape, one vertical pixel column at a time. At full resolution it takes about 28 minutes to do a panorama of roughly 180 degrees. Panos of 120 to 180 degrees tend to produce the most pleasing results, but the software is also capable of doing 360 degrees panoramas. The disadvantage of Adobe Photoshop is that it cannot open panoramas larger than 180 degrees in full resolution, which limits the choice in degrees.

In rollout mode the turntable is on one tripod and the camera on the other. The vertical tri-linear CCD sensor comes out to roughly the middle of the 70x90mm area and remains stationary during the process of taking the rollout photograph. As the cylindrical object rotates, the CCD takes one vertical pixel column at a time, 29,000 pixel columns in total. This is also the reason why the rollouts can be enlarged to 14 feet long. The BetterLight software automatically puts the columns together. The average size for a full-scale rollout is between 250 and 420 MB.

In linear mode the system is turned 90 degrees. Here the camera is put on the turntable and the latter acts as a drive wheel on a track. This system makes it possible to take pictures of really long objects such as murals, newspaper printing presses or long building friezes. Seitz produces a carriage and track for this kind of photography.

In normal mode the camera is also on the tripod but takes normal photos for architectural, studio or other purposes. The image area is roughly 70x90 mm.

V. Glossary

Apochromatic lens:

Focuses all three colors roughly on the same plane.

CCD:

Stands for Charged Coupled Device. A type of image sensor that converts light into a proportional (analog) electrical current.

Depth of field:

The area between two points on the photograph that to the eye appears to be in acceptable focus. Influenced by lens aperture, focal length, and camera-to-subject distance.

Focal length:

Distance from the surface of the lens to the focal point where the light rays converge. Measured in mm. Every lens is marked with its focal length. It influences the perspective of the image, depending on the choice of lens, e.g. a wide angle, normal or telephoto lens (the smaller the focal length of a lens, the wider the angle of view).

Gray balance:

The combination of cyan, magenta, and yellow to make a neutral gray. Important in proofing and printing.

Histogram:

Graph of brightness that indicates normal, under- or overexposure

Line time:

Digital equivalent to shutter time.

QTVR:

An enhanced version of the Quick Time standard developed by Apple for displaying multimedia content (animation, audio, and video) on computers. With this version it is possible to display and rotate objects in three dimensions.

SCSI:

Stands for Small Computer System Interface. Pronounced "scuzzy". Faster than the serial and parallel ports but slower and harder to configure than the newer USB port.