

SHOOTIN' THE RAILS

Basic Model Railroad Photography

by
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Model railroad photography is a hobby within a hobby. It combines the skills of model building and layout construction with the skills of camera work and composition. The rewards can be very satisfying, especially if one is able to publish in the model magazines or enter the NMRA regional or national photo contests. Also, model railroad photography can figure significantly in the NMRA's Achievement Program (scenery, author, prototype).

The Camera, Film and Photographic Equipment

Today, photography can be divided into two broad categories, film (the old standard) and digital (the new technology). Both, however, use some of the same techniques, even though each has its own unique features. While there are many types of cameras on the market, the most widely used for sophisticated photography is the single lens reflex camera (SLR), where the photographer views the subject through the actual lens on the camera rather than through a viewfinder. (SLRs show you exactly what will be in the finished picture frame; viewfinders show you only approximately what will be in the finished frame.)

For film, you will need a camera body and a basic lens (usually 50mm) that shoots 35mm film (slides or prints) and that can be manually controlled (f-stops and shutter speed). For digital, it is best to have a camera that can shoot between 6 and 10 megapixels, particularly if you intend to publish your photos. Also, a digital camera that has either an automatic white balance function or else is capable of adjustment for different temperature ratings (or both) is to be preferred.

It is fair to say that digital photography is quickly supplanting film photography. Usually, camera lenses cannot be interchanged between the two types of cameras, and some types of film (e.g., Kodachrome) are being discontinued with more to follow. Hence, if you are just starting out, choose digital for longevity and versatility. Along with the basic camera, you may need the following, depending on the situation:

- 1) *Tripod* (most model photography has relatively long exposures requiring an absence of all camera vibration)
- 2) *Cable shutter release* (this accessory also is used to prevent camera vibration during long exposures); an alternative is a timed shutter release.
- 3) *Close-up rings* (for extremely close-up photography; close-up rings are considerably less expensive than a macro lens) They usually come in sets of three, which can be used in varying combinations with the stock lens on your camera.
- 4) *Two or more 3200° Kelvin lamps with stands and reflectors* (these items are a must for indoor film photography, and the 3200° temperature rating is designed to be color balanced with T-type films). You also may use halogen shop lights, which have a 3000° temperature rating. Flash photography is NOT recommended because of the harsh, unrealistic shadows inherent in the technique.
- 5) *Film for Indoor Photography: 64T or 160T Ektachrome film or other tungsten film* (colored balanced for the lamps previously mentioned; the "T" means the film is appropriate for tungsten lighting)

- 6)
- 6) *Film for Outdoor Photography: Kodachrome 25* (if you can get it), *Ektachrome 64* or *Fujichrome 50* (for outdoor slides); *Kodak Gold 100* (for outdoor prints). Don't forget to try some black and whites! Even though most model railroad photographers shoot color film, black and white is still an excellent medium, and if you enter the NMRA's Photo Contests, remember that there is a black and white category!
 - 7) *Photographer's reflector umbrella* (this item is useful for bouncing light to create soft shadows).
 - 8) *Gray card* for testing lighting conditions.

Model Railroad Photography Challenges

All of the challenges in normal photography apply to photographing railroad models, i.e., lighting, composition and exposure. However, the challenge of photographing models involves some special factors. The single most important of these is *depth of field* (i.e., clarity of focus for both near and distant objects in the photograph). Since model railroad photography usually is performed with the camera lens very close to the nearest object in the composition, obtaining depth of field throughout the photograph requires some special techniques. Also, unlike the real world, the model world has other unique limitations, namely, a front edge in the foreground and a two-dimensional plane in the background. These factors, plus the smallness of the subjects being photographed, add up to a real test of photographic skill. Furthermore, the smaller the scale, the more difficult the photography. Finally, the model photographer, unlike the real photographer, cannot enter the layout as a scale person and shoot from the low level angles that a real-life photographer can achieve.

Shootin' in the Sun

First, if it is possible to do one's photography out-of-doors in natural light (e.g., dioramas), by all means do so! Out-door photography offers several beneficial options. First, natural light is almost always more realistic than artificial light. Second, natural light spreads itself in bright, even distribution over the whole subject. Third, one can use real sky, and if the scene is carefully arranged, real background terrain, thus eliminating the flat plane of a backdrop and gaining the realism of nature.

The optimal time of day for most out-door photography is mid-morning or mid- to late afternoon, when there are medium shadows. Noon is usually not as good, since the sun is almost directly overhead and shadows are harshest and least defining. Early morning or late evening shots, however, can produce some rather dramatic lighting effects, though they will require longer exposures. Photographing on cloudy or partly cloudy days reduces shadows to a minimum, since the clouds act as a giant diffuser; the finished color in the photos will not be as bright as on sunny days, since the temperature rating will be different. An overcast sky has a temperature rating of about 6000°, while sunlight has a temperature rating of about 5400°.

In general, the sun needs to be shining more-or-less over one's shoulder in outdoor photography. Remember that the shadows in outdoor shots will be strong, so they play a significant role in the composition.

One may also use a sky-board backdrop for outside photography. One of the challenges here is that reflected sunlight on a sky-board may “fool” the light meter into an underexposure. Tilting the sky-board at various angles to control the reflected sunlight can compensate. By keeping the backdrop several inches behind the diorama, one often can gain the hazy appearance of distant terrain in the final picture, since it will be beyond the plane of focus. Also, if there are areas that need extra illumination, light can be bounced into these areas with a white reflector board.

Basic Indoor Lighting

Since out-door photography is usually limited to static models, modules, sections, and dioramas, all of which are moveable, most model railroad photography is performed in-doors. Basic in-door lighting for film usually requires two lamps or more (see above under camera and equipment). One serves as the main light source (i.e., the lamp that simulates sunlight in the real world and causes shadows), while the other is for fill (the light that bounces around in the real world and partially illuminates even shadowed areas). Usually, the main light is closer to the models and directed from an upper quadrant of about 1:00 to 3:00 o'clock or 9:00 to 11:00 o'clock. The fill light is positioned farther away and directed from the opposite side of the subject. If one wants very soft shadows (such as would be present on a cloudy day), the light must be directed into the reflector umbrella or from a white ceiling and bounced into the scene. If the scene is quite large, one may need to use more than a single main lamp and/or more than a single fill lamp, since the background objects, which are farther away, will receive proportionately less light.

If shooting digital, one can make use of fluorescent ceiling lights or tungsten lights so long as the camera is capable of compensating for different temperature ratings (white balance function), either automatically or by manual settings. Here are some of the more common temperature ratings for different types of lights:

Daylight fluorescent	6300°
Clear mercury lamp	5900°
Design white fluorescent	5200°
Daylight photoflood	4800° -- 5000°
Brite white deluxe mercury lamp	4000°
Cool white fluorescent	3400°
Photoflood	3400°
Professional tungsten photographic lights	3200°
100-watt tungsten halogens	3000°
Deluxe warm white fluorescent	2950°
100-watt incandescent	2870°
40-watt incandescent	2500°
High pressure sodium light	2100°
Candle flame	1850° -- 1900°
Match flame	1700°

Since most in-door photography will include a vertical plane backdrop, such as, as a painted sky-board or wall, care must be taken to position the lights so as to minimize cast shadows on this plane. When the backdrop is stationary and the scenery extends right up to it, this task can be difficult! If, however, there is room to manipulate a moveable backdrop (a sky-board, painted canvas, large poster photograph, etc.), the backdrop usually can be positioned farther back from the most distant three-dimensional objects in the picture, thus eliminating cast shadows. Otherwise, one must manipulate the main light, fill light and camera angle to avoid cast shadows. With digital photography, overhead fluorescents usually cast minimal shadows on the backdrop, since the lighting is coming more directly from above. Also, one can bounce light off of a white ceiling rather than aiming it directly at the subject in order to avoid cast shadows on the backdrop.

Maximizing Depth-of-Field

There are several techniques for maximizing depth of field, and some of them can be used in combination with each other. *The single most important one is setting the camera lens at its smallest aperture!* This is true regardless of whether one shoots film or digital. The smaller the lens opening during the exposure, the more depth-of-field throughout the photograph. Most camera lenses have an aperture range of between f1.7 and f22, so this means one should shoot the picture at f22. If the lens has an f32 stop, use it instead. In general, digital cameras will have better depth-of-field than film cameras when using the same settings (f-stops and shutter speed).

Using a higher numbered f-stop means that in order for the film to receive enough light, the exposure time must be longer, since the smaller lens opening allows less light to enter the camera. Here, the light meter, tripod and cable shutter release or timed shutter release are indispensable. The light meter gauges how long the exposure should last, and the tripod and cable shutter release or timed shutter release ensures there is no camera shake when the exposure is made. Exposures at f22 or f32 under 3200° Kelvin lamps may require exposures of 1/8 second or longer, depending on the conditions.

More sophisticated lenses may have even higher f-stops, though they are generally more expensive and hard to find. For the highest possible f-stop, one can use pinhole photography for film cameras, that is, an ordinary camera body equipped with a pinhole lens. A pinhole lens gets its name from the fact that it has a lens opening about the size of a pin-hole. Such a lens can be purchased or even made from an ordinary 50mm or 35mm lens, cf. Mike Tylick, "Pinhole Photography," *Model Railroader* (Sept. 1986). The skill level for taking apart a camera lens and making the necessary modifications is about the same as disassembling a brass locomotive and making modifications. (The cost of mistakes is comparable, too.) Alternatively, pinhole lenses occasionally are advertised in the model railroad magazines.

With pin-hole photography, two important factors should be remembered. First, the exposures will be comparatively long, ranging from 1 to 4 seconds or longer. Since standard light meters will not have settings to gauge lens openings this small, one must experiment by shooting a roll or two of film using a wide variety of exposure settings to find the appropriate range for given lighting conditions (i.e., shooting at 1/4 second, 1/2 second, 1 second, 2 seconds, 4 seconds, 8 seconds, etc.). Keep a log of your shots, the lighting conditions and the final results so you can refer to it later.

While pinhole photography using a film camera will produce the most even depth-of-field so that close objects and distant objects will be in nearly identical focus, it also diminishes definition slightly for the whole picture. Thus, all objects in a pinhole photograph will appear slightly less defined than the most sharply defined object in a photograph taken with a normal lens.

For digital cameras, a new computer technology offers the possibility for virtually perfect depth of field. Helicon Focus, a computer program developed especially for macrophotography, microphotography, and hyperfocal landscape photography, can be used to achieve incredible depth of field by combining the pixels of multiple images of the same shot with different focal lengths. The ground-breaking article by Rich Yourstone (*N Scale Railroading*, Jan-Feb 2006) is the place to begin, or simply have a look at Helicon's website at <http://www.heliconfocus.com>. Helicon Focus is not fool-proof, and one must be careful about superimposing the silhouette edges of near objects over the silhouette edges of distant objects so that they form tangents. Helicon sometimes confuses the lines. Nonetheless, this technology is quickly being adopted by photographers who want to publish in the major railroad magazines.

Yet another way of enhancing depth-of-field, whether with film or digital photography, is to compose the picture so that the most important objects in the composition are at about the same focal length (i.e., the same distance from the camera lens). For instance, if there is a structure, a locomotive and a boxcar in the composition, try to set up your camera so that the distances between each of them and the camera are not widely different.

The fact that depth-of-field in close-up photography will not be completely even throughout the picture sometimes can be used to advantage, of course. One can de-emphasize the background and/or emphasize the foreground by controlling the focus point of the photograph.

Where to Focus

Generally speaking, one should focus the camera on a point about one-third of the way into the main object of interest in the composition. For example, if the main object is a steam locomotive to be photographed at a three-quarter angle, the point of focus should be about a third of the way from the front of the boiler. This point of focus is not merely mechanical, however. It may need to be adjusted due to other elements (i.e., lettering which must be legible, model figures which must be in focus, etc.). Finding the best point of focus is a combination of experience and artistic imagination.

One also should consider the plane of focus. The plane of focus for any photograph will be the radius from the camera lens which equals the exact distance between the camera lens and the point of focus. Thus, any object in the picture which lies at this distance from the lens will be in sharp focus, whether or not it is the main object of interest. This means that in arranging the composition, the photographer must pay attention not only to the main object, which is the point of focus, but also any other objects that lie in the same plane of focus, since they will appear in sharp outline. In the finished photograph, objects in clearest focus will be emphasized more than other objects in the composition, since they will have the sharpest definition.

Unless one is using a sophisticated camera with a depth-of-field function (a button one can push to see what sort of depth-of-field to expect before taking the picture), the depth-of-field one sees through the viewfinder of an SLR camera will NOT be what one actually gets in the photograph. Actually, the depth-of-field in a finished photograph shot at f22 will be considerably *better* than what one sees through the viewfinder at the time of exposure. (This anomaly results from the temporary opening of the aperture for viewing, which in turn disguises the smaller and better focused final exposure.) The lack of depth-of-field in the viewfinder can create a pitfall, however. Objects that are nearly invisible due to lack of focus when one looks in the viewfinder (such as foreground telephone poles, background shadows, derailed wheels, etc.) may be quite visible in the finished photograph. To allow for this, one should temporarily shift the focus back and forth throughout the composition to be sure that you see all the elements that will appear in the

finished shot. After you are certain of what will be seen in the finished picture, then you can pick the best point of focus before exposing the shot.

Bracketing Exposures

It is tempting when shooting with film to take single exposures of a composition in order to save film and money, but this temptation should be resisted. Virtually all model railroad photographers bracket their exposures, that is, they shoot more than one exposure for each composition to ensure that they get at least one good shot. For normal model photography, it is usually sufficient to bracket your shots by shooting three exposures of each composition, a *+1 exposure* (one f-stop more than the shutter speed indicates by the light meter), an *exact exposure* (the shutter speed indicated by the light meter), and *-1 exposure* (one f-stop less than the shutter speed indicated by the light meter). Of course, this means that about half to two-thirds of each roll of film will result in rejected shots, but in the long run, bracketing exposures will give the best results. If one is shooting with a pin-hole lens, extra brackets might be needed (i.e., +2 and -2 in addition to the other brackets) to guarantee a good exposure.

If you are using a digital camera, you have the advantage of taking as many exposures as you want without any additional cost, since you can simply delete from memory any exposures that are unsatisfactory. However, a word of caution is in order. The viewing screen on digital cameras may not show a true representation of the shot, so you still may wish to bracket your exposures. Still, exposure is somewhat less critical for digital photography, since once your digital images are downloaded into a computer, there are a variety of software programs by which you can adjust various elements to improve them. These include digital manipulations for brightness, contrast, sharpness, temperature, saturation, hue, and red, green, and blue factors. Commonly available digital manipulation programs are Adobe Photoshop (professional and quite expensive) Adobe Photoshop Elements (much less expensive), Picture Perfect and Photo Finale.

Angle of Elevation

While the general purpose of model railroad photography is to create compositions that look as natural as possible, the fact that the model photographer cannot enter the layout as a scale person and shoot from the angles available to a real-life photographer complicates the task. In the first place, the angle of model photography is necessarily higher than in real life. The model photographer cannot shrink himself and his camera to shoot from scale elevations that correspond to real life. In the extreme, the angle of the model photograph may be so high that the composition looks as if it were shot from an airplane or a high hill rather than from trackside. At times, this high level panorama angle may be desired, but more often than not, it is monotonous and unrealistic.

Two techniques make it possible to nearly achieve the low level angles one would get in real-life photography. The simplest (and least expensive) is to shoot the models near the edge of the layout, so the placement of the camera is slightly below the front edge of the layout and angled upward, thus simulating a trackside position. It helps tremendously if there is at least some scenery below the track level to fill in the foreground of the low angled shot.

The other technique involves shooting into a front-surface mirror. Admittedly, front surface mirrors are expensive and difficult to locate. A mirror about 6" x 8" will run about \$35.00. They can be purchased from the *Edmunds Scientific Catalog*, which offers various scientific and industrial optical devices. The mirror is positioned on the layout and angled upward at about 45°. The camera is positioned to shoot straight down into the mirror so as to capture the reflected image. The angle of the mirror will approximate the photography angle of a scale person.

Gaining Space on the Front Edge

Frequently, the model railroad photographer will discover that the front edge of the layout becomes visible, thus spoiling many possible compositions. Also, unless the photography angle is exactly 90° to the layout edge, the perspective lines of the layout edge will recede toward the background, thus coming into view at the edges of the photograph. Unfortunately, many of the best composition angles are not 90° to the front edge.

To offset this problem, the model photographer can construct “front edge extenders” by modeling ground cover on foam core boards in the same way one would model it on the layout (i.e., fixing ground foam, dirt, ballast, shrubs, logs, etc. with dilute white glue). Such extenders can be used over and over in a variety of settings. One or two such extenders should be sufficient for most purposes. They should be about 6" to 8" deep and anywhere from 18" to 36" long. They can be detailed as much or as little as desired. Most important is simply to have dirt and/or grass so that the foreground of the photograph looks natural. Details can be added temporarily as needed. Also, keep in mind that most of the foreground area will not be in sharp focus, so exquisite detail is usually superfluous unless, of course, one is using a pinhole lens or intends to achieve maximum depth of field in a digital image via Helicon Focus.

Composition

Composition is the part of photography where technology stops and artistic imagination takes over. Still, there are two or three basic rules of composition that one should obey most of the time. (Of course, "rules are made to be broken," but breaking them in the interests of artistry after one has mastered them is not the same thing as breaking them because of ignorance.)

Most photographers follow the "rule of thirds," that is, the principle that informal balance is usually more interesting. Informal balance is such that the visual weight of the picture is somewhat off-center. If one divides a picture into thirds both vertically and horizontally, the intersection of the lines (there will be four such intersections) are usually the best places to put the main object of interest.

Watch out for tangents, that is, the convergence of visual lines where the silhouettes of foreground or background objects become confused with the silhouette of the main object, thus causing a distraction.

Be sure to remember that “what you see is not always what you get.” Even though in an SLR camera the viewfinder actually shows what the camera sees, the angle by which the internal mirrors in the camera transport this image to the eye may leave the image in the viewfinder slightly smaller than the finished photograph. Hence, be sure to give a bit of “extra room” on the edges of the composition to avoid including unwanted elements.

Finally, try to bisect strong horizontal lines with some sort of vertical element to prevent the eye from sweeping out the edge of the picture. For instance, place some vertical object(s) in front of a strong horizontal element, such as, a tree or telephone pole in front of a long stretch of horizontal track. This causes the eye to “pause” rather than sweep through the composition.

Shooting for Publication

It goes without saying (but I'll say it anyway) that model railroad photography for publication must excel at several levels, such as, composition, photographic technique and subject interest. Before shooting for any particular magazine, it is incumbent to find out the magazine's requirements. These can be found either on their masthead in the magazine, on their web site if they have one, or by simply contacting the editorial department by mail or email and asking. For film, magazines generally prefer slides over prints, though many still accept both. If they accept print film, some magazines want the actual film clips so they can print it themselves. More and more magazines are preferring digital images over film. For digital images, 4-8 megapixels are usually recommended, 4-5 megapixels for the internal article pages, and 6-8 megapixels for covers. However, these suggested parameters vary from magazine to magazine, so check before putting a lot of time and energy into a project. Digital images can be stored as JPEG files (a standard method of compression), TIFF files (a flexible, adaptable file format), or RAW files (files without compression). Editors generally prefer RAW files, but keep in mind that RAW files may not be capable of display on your computer without special software. (Advanced Nikon digital cameras, like the D200, offer the option of saving any picture in both RAW and JPEG files at the same time, which in turn means the JPEG files can be displayed on most computer screens even if the RAW files cannot.) Also, some magazines prefer TIFF files over JPEG files. Keep in mind that some editors discourage digital manipulation (i.e., color adjustment, sharpening, contrast adjustment, etc.). They prefer to do their own manipulation.

It is usually wise to send a few vertical as well as horizontal formatted pictures. This gives the editor some additional options for page layout. If you hope for a cover, vertical formats are often necessary. Label every slide (on the sleeve) or print (on the back) with your name and address. If you burn a CD with digital images, be sure to label that as well. Code your photos (e.g., Photo 1, Photo 2, etc.) and code your written photo captions also, so that photo captions can be easily coordinated with the proper photograph. If you send slides, place them in clear plastic display sleeves, both for their protection and for ease in viewing by the editor.

Shootin' for Fun

One of the things that model railroaders do more and more with the current digital technology is share photos over the internet. Some even create their own websites where they display digital images. Others e-mail pictures to friends.

If you use digital images in this way, keep in mind that you do not need high resolution exposures. In fact, for e-mail or web pages, photos should be less than one meg and preferably less than half a meg. Many web sites or photo storage sites will automatically reduce them anyway. Above all, have fun!