Nikon D40 User's Guide

Please help KenRockwell.com

Nikon D40 with new 18-55mm lens.

Original files at

http://www.kenrockwell.com/nikon/d40/users-guide/index.htm

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PLUG

No one pays me anything to write all this. I do it because I love to help. If you find this as helpful as a book you might have had to buy or a workshop you might have had to take, please help me share more (http://www.kenrockwell.com/donate.htm).

Thanks!

Ken

REMARKS

by Sándor Nagy

The original html files contain high number of internal and external links. Each internal link was converted to an index to the relevant page of the PDF document, while the external links are left unchanged in the PDF as embeded links. Some of the external links (the most important ones) were typed explicitely too (especially on this page), or copied to the Appendix with the appropriate index to the relevant page.

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INTRODUCTION

Want free live phone support? In the USA, call (800) NIKON-UX, 24 hours a day, 365 days a year.

Looking for a specific control? Use my Search page. Be sure to mention the D40 in your search.

This lengthy article will teach you to be an expert on the Nikon D40's controls and menus. It also includes a lot of tips, tricks, and the settings I prefer to use.

To get great photos you still need to get yourself to the right place at the right time and point the camera in the right direction, which is a lot harder than mastering the D40. Right out of the box at default settings the D40 does a great job so long as you preset the exposure compensation to -0.7 . Making a great photo involves locations, timing, patienceand a whole lot more. I cover general photography issues here.

For more examples of why you'd want to change these settings and why, also see my Maui Photo Expedition page.

Below are the basics. Explicit details follow in later pages.

Many tricks are in the pages below, like inserting your © and contact info automatically into every fájl(page 38), Secret RGB Histograms (page 16) and Auto ISO (page 30).

BASICS:

CAMERA SETTINGS

I leave most settings at their defaults.

I shoot with the top mode dial in P, Program Exposure mode.

Many of these menu options are shown only after you select the FULL MENUS option in the Setup Menu (page 34) and are often deactivated in anything except the P, S, A and M modes (page 11).

I reset everything ery time I use my camera, much as a pilot uses a checklist before flight to prevent any switches from being in the wrong position. When I don't check first, I often have left my D40 in some screwy mode from shooting in the dark the night before.

Nikon has an easy reset feature. I use it every time! My standard operating setting is only a few clicks different from the defaults.

RESET

Unlike my other Nikons, I don't use the green reset feature. I find it easier to press the **I button** and run down the items on the left and bottom of the screen.

Quality

I use Large, JPG, BASIC

I'm a data cheapskate. I prefer small files. For most people not shooting hundreds of throw-away images a day, feel free to leave it in NORMAL, the default. NORMAL makes files twice as large with a tiny bit less blockiness if you're looking closely at the files printed 3 feet (1m) wide. I prefer smaller files in exchange for almost invisible levels of blockiness.

See my D200 Quality Settings page for more explicit detail and examples of these settings on a D200. My D40 does about the same thing, but lacks the Optimize Quality JPG Compression mode I prefer on my D200, and its image sizes are one size smaller.

Exposure Compensation

I set my exposure compensation to -0.7 because my D40's metering firmware is defective, just like the D80's meter. It usually overexposes.

Set -0.7 by holding the +/- button (page 13) near the shutter and turning the rear dial two clicks to the right.

Sadly we'll often have to adjust this depending on the subject. It's no big deal: just look at the image on the LCD and click it towards the left (+) to lighten the image, and to the right (-) to darken it for the next shot. This is why I prefer my D200, which has a superior meter because it rarely needs any fiddling.

Shutter Advance Mode

I use Continuous (the bearded rectangle) (page 28)**.** I get one shot with one press of the shutter, and if I hold the shutter button my D40 shoots 2.5 frames per second. I do this in dim light so I can pick the sharpest image. For most shots of moving things I fire several rounds and pick the one with the best expressions and gestures. Of course I use a professional sorting tool (**iVIEW MediaPro**) on a 30" screen to make selecting files trivial.

ISO

I use ISO 200 and Auto ISO (page 30).

Auto ISO increases the ISO automatically as it gets dark so I don't have to. It shoots at ISO 200 in good light, and at 1/15 of a second (or any speed you choose) it starts ramping up the ISO to a

maximum of 1,600 (or any ISO you choose) as it gets darker. Only if it gets still darker will it let the shutter speed go below 1/15 at ISO 1,600, exactly as I'd do manually.

I explain how to set Auto ISO and select the shutter speed at which the ISO starts to increase and the maximum ISO to which it will increase in the Custom Setting 10 (page 30).

I set Auto ISO to 1,600 max because the noise from the D40 at ISO 1,600 looks much better than blur. I set 1/15 because my Nikon 18-200mm and the kit **18-55mm** lens gives great results down to 1/15. I adjust the lowest shutter speed setting in the AUTO ISO menu if I change conditions or lenses. Unlike film, my D40 looks great at high ISOs, so I use them anytime I need them.

More details on setting ISO at the ISO Menu (page 25).

WHITE BALANCE

I use AUTO and a clear UV filter to protect my lens. The D40 has a much warmer color balance than earlier cameras like the D70 so I don't need the 81A filter or the -3 trim. See examples of different settings here (page 50) and details on my White Balance (page 44) page. White balance is how you set the color balance, and color is critical. It's also personal preference. Use whatever looks right to you. My D40's LCD is very accurate. If it looks different in print or on your computer, your printer or computer are out of calibration.

Luckily AUTO works great most of the time. I look at my LCD, and if it's not right, I'll set it to whatever looks good. Usually that's the Direct Sun or Cloudy positions. These settings give much warmer results than earlier cameras. I rarely use the warmer Shade setting on my D40 while I used Shade often on my D1H and D70.

OPTIMIZE IMAGE

This is set in the Shooting Menu (page 21). I crave vivid color! I tweak my D40 to give color as vivid as I can get. If it went to 11 I'd use that, too. I go to MENU > Shooting Menu (green camera icon) > Optimize Image > Custom. Here's how I set each item under Custom:

Image Sharpening: Auto (default).

Tone Compensation (contrast): Auto (default). The D40 automatically adjusts its contrast and dynamic range to each and every shot. It works great.

Color Mode: IIIa (three-a, default). This gives brighter colors than the other modes. Color mode II is pronounced "two" and not to be confused with 11 (eleven). You don't want Mode II even if you could use it. Details are here (page 24).

Saturation: +, of course. This gives brighter colors that the default.

Hue: 0 (Default). Don't touch this! it will subtly mess around with your colors. Leave it at 0.

After setting this it's critical to save it by selecting " Done" and clicking to the right actively to select OK. If you forget to hit OK it won't remember all these settings!

Read more at Shooting Menu (page 21).

FOCUS (AF) Mode

I use the default of AF-A. This mode automatically selects between the two older modes, AF-C and AF-S. These are explained under Focus Modes (page 27).

METERING

I use Matrix, the default. You set metering in Custom Setting 05 (page 29) or with the **<i> Button** (page 15).

Seeing how poor the matrix meter has become in the D40 (it requires constantly varying levels of compensation) I intend to try center weighted metering. With my intimate knowledge of the Zone System (page 69).it might let me nail the correct exposures more quickly. That would be a big step backwards; center weighting went obsolete in the mid 1980s then the Matrix meter was invented.

See my Exposure (page 55) page for details on getting perfect exposures.

LENS SETTINGS

Nikon D40 with new 18-55mm lens.

Many lenses have no switches or settings. If so, don't worry.

If a lens has an "A - M" switch, like the included 18-55mm above, leave it at "A." To get manual

focus with the included lens, move it to "M."

If the switch says "M/A - M " then use M/A. These lenses may be focused manually at any time in either position. As soon as you tap the shutter button in M/A you return to autofocus.

More advanced lenses, like the 18-200mm, 70-300mm VR and 18-135mm, and any lens with an M/A position, may be focused manually at any time without moving any switches. Leave them in their A or A/M positions.

Non-AF-S and non-AF-I lenses, like the new 10.5mm fisheye, won't autofocus at all.

The old 300mm f/4 AF has to be put in the M position to focus, and it only focuses manually.

Read your lens' manual, or in the USA ask Nikon 24/7/365 at (800) NIKON-UX.

Non-G lenses will have an aperture ring on the base of the lens where it's attached to the camera. Set this this ring to the smallest aperture (largest number), usually 22, if not 32 or 16. This number will be orange on autofocus lenses. There usually is a lock to keep this ring set there, since if it comes off that setting you'll get an error message from most cameras.

EXPLICIT DETAILS

These were the basics. Keep reading for explicit details.

CONTROLS

TOP PANEL CONTROLS

Nikon D40 Top Panel Controls.

Exposure Mode Selector Knob

(shown above.) Spin it to select among P, S, A and M exposure modes. I ignore the green AUTO (as shown above) and the other convenience modes (flower, lady in hat, etc.).

Many of the menu options are shown only after you select the FULL MENUS option in the Setup Menu (page 35) and are often deactivated in anything except the P, S, A and M exposure modes.

P: Program Automatic Exposure Mode

I use "P" for program auto exposure. In this mode the camera chooses the f/stop and shutter speed for you.

It's easy to get to any aperture or shutter speed you prefer in this mode: simply move the rear dial to shift them. This selects alternate combinations of f/stops and shutter speeds (page 88) which give the same exposure. Nikon calls this "Program Shift." A ***P** symbol appears on the bottom left of the viewfinder, to the left of the shutter speed.

Three easy ways to return to the standard program combination are to:

1.) flip to a different mode and back to P, or

2.) turn the D40 off and back on, or

3.) spin the rear dial back to its original position.

The *P symbol goes away when you've returned to the standard combinations.

The standard combinations are f/4 at 1/60, f/5.6 @ 1/125, f/8 @ 1/250, f/11 @ 1/500, etc.

A shifted set might use f/4 @ 1/1,000, f/8 @ 1/500 or might use f/4 @ 1/2, f/5.6 @ 1 sec, etc. Don't worry, just flick the rear dial until you get the combination you prefer.

A, S and M Modes

If you want to use only one aperture or one shutter speed then use S or A mode and the camera will automatically pick the other value. I never use these; I shift the program instead.

If you want to set both the hard way, use M, manual, mode.

In A or S mode you can only set one of the two values because the camera is setting the other one for you.

A Mode: Aperture Priority

In A mode you choose the Aperture and the D40 chooses the shutter speed.

S Mode: Shutter Priority

In S mode you set the Shutter and the D40 sets the aperture.

If the D40 runs out of available apertures you easily can get under or over exposure in S mode: watch that the D40 can select a correct aperture for your lighting.

M Mode: Manual Exposure

You have to set everything the hard way.

No one uses this mode except in complex conditions. Ignore old-timers who tell you you need Manual mode; they say that because that's the only mode cameras had back in the 1950s.

I look at the LCD to check exposure. You can use the bar graph in the finder - but why? If you wanted to do that use another mode and let the D40 do the setting for you.

The rear dial sets the shutter speed in manual exposure. To set the aperture, hold the +/- (*) (diaphragm) button near the shutter and turn the rear dial.

Firmware Defect: When turned ON, Auto ISO (page 30) remains active in Manual mode. I always turn off AUTO ISO when I enter Manual Mode, otherwise Auto ISO changes the ISO and ruins whatever you were hoping to accomplish with manual exposure mode.

OFF, ON and Shutter Release Button

Leave it ON unless you're putting it away. It draws no more power in ON than OFF. OFF is a lock to prevent accidental operation.

+/- and Diaphragm (*) Button

This button is next to the shutter button.

In manual exposure mode, hold this and turn the rear dial to change the aperture.

In every other mode, hold it and turn the rear dial to change the exposure compensation (brightness).

This exposure compensation button is very important. You'll probably wear the paint off this one. This button makes the photos lighter or darker. + is lighter, and - is darker.

This only affects photos as you take them. Use whatever setting looks best to you; there is no correct setting.

A flaw in the D40's meter firmware (same issue as the D80) makes most photos too light, so I leave mine set to -0.7. If your photo is too light, hold the +/- button and spin the rear dial to a more negative number, like -1.3. If your photo is too dark, hold it and spin the dial to a more positive number, like -0.3 or 0.0. It's perfectly OK to go to any number you need, like -3.3 or +1.0.

This error isn't a simple calibration issue. The D40 does different weird things with different subjects and different compositions. The D40's meter firmware is designed erroneously to expose for the darkest part of the image, so it's almost impossible to get the right exposure of someone wearing black, especially as they move around the image. You may need -2.0 or -3.0 compensation, while other shots of light objects may be fine with 0.0.

The need for constant variation and supervision is what makes this meter so bad. I prefer my D200, which rarely requires any correction.

Flash exposure is Nikon's usual perfection. You can change it's brightness along with the flash button (page 17).

HINT: You can see the + or minus value displayed in the finder as well as the rear LCD, so you can adjust this without taking your eye from the finder. The finder display only reads the value when the button is pressed, otherwise those digits read exposures remaining.

Info and Green Dot button

Tap this to wake up the D40 and show you what's going on with your settings on the LCD. Tap it again to turn off the LCD.

To change the settings, tap the other **< i >** and Green Dot button (page 15)on the rearof the D40.

Hold both **Green Dot** buttons at the same time for a few seconds to reset most of the tactical parameters, like exposure compensation, autofocus modes, ISO, White Balance, etc, to their defaults. I don't use this reset often, since I set enough things away from defaults. I would use it if I loaned my D40 to a friend and had it returned later.

REAR PANEL CONTROLS

Nikon D40 Rear (wife and dog front).

From top left to bottom right:

[>] (Play) Button

This plays an image, or stops playing an image.

You don't need this often, since the LCD turns off the instant you tap the shutter button, and if you set Image Review ON in Custom Setting 07 (page 30) it plays automatically after each shot.

With Custom Setting 07 (page 30) set to ON, you can do anything and everything to the image immediately after shooting without having to press Play. Want to zoom, scroll, or see other images? Just move the appropriate controls.

I thank my lucky stars with my Nikon, because on my idiotic Canon 5D I have to wait and press the Play button just to zoom in on a shot I just made! No need for this with Nikon, so long as you have Image Review (page 30) set to ON.

The only reason you may want Image Review OFF (its default) is if you prefer to make many immediate changes to your next shots.

If Image Review is ON, the image pops up after your shot, and the D40 responds to your dial inputs by showing the the next or previous image. My D40 won't change apertures or shutter speeds until I wait a moment and tap the shutter to put my D40 back into Shooting mode. If you want to change your settings immediately, turn off Image Review. (The Canon Rebel XTi is smarter than these, since the XTi has a sensor to determine if you have your eye at the viewfinder and switches automatically.)

MENU Button

This gets you into the menus, as explained at the many menu pages below.

You set almost everything about the D40 here.

You also can set many shooting parameters with the **< i >** Button (page 15) and Fn Button (page 19). They are different ways of setting the same things.

Minifying Glass / ? / Checkerboard Button

If playing, it reduces the images to fit 2x2 or 3x3 on the screen. If the image was zoomed, it zooms out.

If working in the menus, often this button will give more information about the setting at hand.

If the "?" is flashing in the bottom right of the viewfinder, that means you have a message waiting from your D40. This is a first! Press the "?" button and your D40 will tell you what's on its mind! It's usually telling you to turn on the flash.

< i > / Magnifying Glass / Green Dot Button

If the D40 is resting (LCD off), the **< i >** button wakes up the LCD and shows you the shooting info exactly as the info button (page 14) does.

If the LCD is in the Info (showing shutter speeds, etc.) mode, press the **< i >** button to change these settings. Use the Up/Down/Left/Right/OK buttons.

If playing, this button zooms in. Use the up/down/left/right button to scroll around.

Hold both **Green Dot** buttons at the same time for a few seconds to reset most of the tactical parameters, like exposure compensation, autofocus modes, ISO, White Balance, etc, to their

defaults. I don't use this reset often, since I set enough things away from defaults. I would use it if I loaned my D40 to a friend and had it returned later.

AE-L AF-L / Key Button (Top Right Center)

This can lock the focus and/or exposure or turn on the autofocus.

You set what it locks in Custom Setting 12 (page 32). I set mine to lock exposure for as long as I hold the button (AE lock only).

Rear Dial (top right)

Click this left and right to control most of the D40's functions.

Up/Down/Left/Right/OK Keys

This is the five-way thumb switch.

It works and feels much better than the mushy one on the D80 and earlier cameras. This excellent feel and interaction is a strong reason why I like my D40 so much, and prefer it to my doubly expensive D80.

While playing, this moves among your images (left/right) and the data for them (up/down). I find it more convenient to spin the rear dial to go forward and back; try it.

When playing a zoomed image, it scrolls around the image.

While shooting, it selects among the AF areas if you're in a mode which allows you to select an AF area. The selected AF area glows in red.

In the menus, it moves around your selections.

It feels good!

SECRET RGB HISTOGRAM TRICK: In playback, the OK button calls up the Retouch Menu (page 41). Select Filter Effects, then Color Balance to see an RGB histogram (page 83),critical for precise exposure. This trick and the huge RGB display are among the reasons I prefer my D40 to my six-times-as-expensive Canon 5D with double the pixels. The 5D has a dim screen with an illegible, tiny, RGB display.

If zoomed in (or zoomed out to the 2x2 or 3x3 modes), the OK button returns you to a normal sized image.

Trash Can Button

This is the D40's flush lever.

Press it while a photo is displayed to erase that photo. You'll get an "are you sure?" screen, and press it again to dump that shot.

Meatheads like me get used to double pressing it every time out of habit, which means I accidentally erase some shots. Serves me right.

It doesn't do anything else. It ignores you if pressed without an image displayed, except it is used for deleting bad characters in the secret message embed mode (page 38).

Almost Invisible (when off) Green Light

This light should be red, because it means the D40 is talking to the SD memory card and you must not remove it. If you're dumb enough to yank out the card with the light on, you not only will lose some photos, you may destroy your SD card.

This normally blinks when the D40 is turned on or off or wakes up to shoot. It blinks for a moment after each shot to record it to the card. it blinks as you select different playback images as it reads them from the card. It can stay lit for a minute or more while data gets written, if you insist on shooting a lot of fast sequences in raw.

You may ignore it while shooting. You don't have to wait for it, except to pull out your SD card. The D40 has a fat buffer to let you shot as fast as you want without having to wait for this light.

SIDE CONTROLS

Nikon D40 with new 18-55mm lens.

From the top down:

+/- Lighting Bolt (Flash) Button

1.) Press once to pop up the built-in flash.

2.) Hold it and the +/- (*) diaphragm button (page 13) at the same time and spin the rear dial to alter the brightness of the flash. 0.0 is normal and I leave it there almost all the time. Only in rare instances do I ever need to adjust it towards the minus side to make it darker, or the plus side to make it lighter.

This is much easier to do than it sounds; it's quite natural.

3.) Hold it and spin the rear dial to select the flash sync mode. The sync mode is displayed on the lower left of the LCD.

Here are the modes and what they do:

Normal (a lightning bolt, which is the default): In Program and A exposure modes, the shutter won't stay open longer than 1/60 second.

I always use Normal mode and it looks great.

In this mode you won't get blur indoors, but you may get black backgrounds. The best way to avoid dark backgrounds with the D40 is to use an external flash like the SB-400 and bounce it off the ceiling (flip it up. I love the look of the bounced SB-400 external flash; you can see a zillion examples at my baby Ryan Rockwell's website.

Unlike other Nikons, the D40 doesn't have a custom function to choose a longer speed, like 1/8, in P and A exposure modes (page 11) to lighten backgrounds indoors. You'll have to use S or M mode which takes more cunning to setup. You can use the Slow Sync (page 18) mode below, but indoors or at night it often results in uncontrolled crazy long speeds up to 30 seconds, which lead to blur.

Red-Eye (eyeball and bolt icon): I never use this. It shines an obnoxious light in your subject's eyes for a couple of seconds and then releases the shutter. If I set this mode by accident it bugs the heck out of me, because the camera doesn't go off until several seconds after I've pressed the shutter, but I have no idea why because I've set no self timer! It doesn't do much to reduce redeye anyway. Skip this mode.

SLOW (SLOW and bolt icon): This mode can be very useful. It lets the shutter stay open as long as it needs to so dim ambient light can expose properly with flash. Of course if it's dark these exposure times can get long. You can get blur from subject motion and camera shake.

In daylight SLOW is the same as NORMAL, since exposure times are short. SLOW unlocks the camera in P and A exposure modes (page 11) to make exposures as long as it wants to in dim light.

Have a look at most issues of National Geographic and you'll see many indoor shots made in this

mode. The background exposes correctly, people may be blurred, and a burst of flash freezes them along with the blurry ghost images.

Normal and SLOW do the same thing in S and M exposure modes (page 11), since you or the camera may select any shutter speed in these modes regardless of flash sync. I usually prefer to choose an exact slowest shutter speed in the M or S exposure modes (page 11). In SLOW mode and dark conditions the shutter speeds can become too long for comfort.

Red-Eye SLOW (eye and SLOW icon): This is the SLOW mode and redeye. I don't use it for the same reason I don't use Redeye.

REAR (REAR and Bolt icon): Normally the flash goes off the instant the shutter opens. With long exposures and blurred ghost images you ordinarily get the ghost streaming out in front of the subject. Think about it: if a car is driving, the flash goers off and freezes it, then the car moves forward. You'll have a ghost image ahead of the car, which usually looks stupid. Select REAR mode to have the flash go off as the shutter closes. Now you'll have motion blurring behind the frozen flash image.

Another reason to select REAR is because the flash goes off at the end of the exposure. People presume photos are made the instant a flash fires, then leave. This wreaks havoc with long exposures. If you use REAR mode with long exposures they'll stay put and not move until the end. Of course you'll also want to select manual flash mode (page 32) to eliminate the preflash.

REAR doesn't do anything with short exposures.

Fn - Backwards Clock Button

By default, press this to set the self timer.

Custom Setting 11 (page 31) lets me set this to do other things instead. I prefer to have it give me more direct access to White Balance. See Custom Setting 11 (page 31) for details.

Big Button Below "D40"

This unlocks the lens. Push this straight in and rotate the lens to remove it. It's a bayonet mount.

MENUS

PLAYBACK MENU ("[>]" icon)

Want free live phone support? In the USA, call (800) NIKON-UX, 24 hours a day, 365 days a year.

How to Get Here

Press MENU, click to the left and then up to select the top "[>] " (play) icon. You'll then see PLAYBACK MENU at the top of the color LCD.

What it Does

It sets a few playback options.

What I Change

I leave it alone.

Delete

This is helpful if you want to delete all images while saving those you locked with the Key / AE-L AF-L button (page 16).

I don't use this. I do all my editing and selection in my computer and I do my in-camera deletions one-by-one with the trash can key.

Playback Folder

The camera can record to and play back from different folders.

CURRENT ignores photos in folders other than the one to which you're recording.

ALL shows you everything on the card. I leave my D40 set to ALL. It tends to reset itself to Current, meaning it won't play images made on a different camera if they are on your card.

Rotate Tall

This is Japanese for rotating the vertical shots on playback, presuming you've set Auto Rotate to ON in the Setup Menu (page 40).

It doesn't affect your images or files; it only changes how they are displayed on the D40.

Slide Show

This lets you amaze your friends with an exciting slide show on the tiny screen. I don't bother with this. I guess it's popular in Japan. Whoo hoo! Let's all watch a show on a 2.5" screen! You could plug the D40 into a TV or video projector, but video resolution is so bad everything will look awful.

Print Set

I never use this. I guess it's popular in Japan. This lets you mark images for printing if you sorted and then printed directly from your D40, and had a lab which could read this data.

SHOOTING MENU (camera icon)

Many of these menu options are shown only after you select the FULL MENUS option in the Setup Menu (page 35) and are often deactivated in anything except the P, S, A and M modes (page 11).

This menu really should be called the Film menu and shown with an icon of a roll of film. More camera settings, like autofocus, flash and timers, are set in the Custom Settings Menu (page 26), shown by a pencil. This is Nikon's mistake; don't penalize yourself if the menu names and icons make little sense at face value.

How to Get There

Press MENU, click left and then up and down to select the camera (shooting) menu. You'll see "SHOOTING MENU" on the top of the LCD monitor.

What it Sets

It sets parameters related to what film used to do. The Shooting Menu sets ISO, grain, contrast, color and a zillion other critical things that set the look of your images.

The shooting menu would make more sense if it were called the Film menu, since many other menus also affect shooting.

The D40 appears to have all the custom image tweaks of the D2Xs and other Nikons. I can't see anything missing except the high ISO NR strength. The D40 does have selectable dark-frame subtraction noise reduction!

What I Change

I change a lot here. This is where I get the wild colors I love from my D40.

Optimize Image

This is where you set the look of your image, like the saturation I love.

These choices are art. There is no right or wrong if you know what you're doing and know what you want.

I'll tell you what I use. Ignore me and Be Yourself if you prefer a different look.

Preset Choices

There are six fixed preset modes. They cannot be altered. They are:

N Normal

SO Softer

VI Vivid

VI* More Vivid

PO Portrait

BW Black-and-White

You might think I would use Vivid or More Vivid, except that they crank up some of the contrast and sharpness settings and leave them there. I want vivid colors, but leave the contrast and sharpness on Auto. This way as subjects get contrastier I don't have to stop and turn the contrast back down. In VI* you can easily blow out a slightly high-contrast scene.

Therefore I use the Custom (pencil icon) setting:

Custom (pencil icon)

This is where Nikon hides the critical adjustments other camera makers make more obvious.

Canon lets you define many of these and recall them easily. Nikon only gives you one setting. Canon also gives you a wider and more precise range of adjustments, and therefore it's easier to make bad mistakes with Canon. The extreme settings here aren't very extreme. Play to your heart's content and see what you prefer.

Done

"Done" is the most important Custom Optimize Image menu item. If you forget to select it and then click to the right to select OK it forgets everything! Always remember to select DONE and OK after you change any of the settings below, otherwise they will be ignored.

Image Sharpening

I leave mine on AUTO. I've never messed with the manual settings. Sharp*ening* is an artificial effect not to be confused with sharp*ness*. When I first got a digital camera I thought: "cool, I'm cranking this to 11," and realized my error. Don't turn it up for no reason, since the image can start to look artificial. Play with it if you want. I've played with it out of curiosity, and always leave it on AUTO.

Tone Compensation (Contrast)

Nikon meant to say Contrast. I always leave mine set to AUTO. In AUTO the D40 automatically applies the Zone System (page 69) and adjusts contrast to match your subject, for each and every shot!

If Nikon's marketing department was paying attention, they would promote this as Automatic Dynamic Range Optimization, since that's what it does and Canon has nothing like this.

The D40 automatically lowers contrast and increases dynamic range for very contrasty subjects, and cranks up contrast for dull subjects.

Saturation also varies with this setting. If you crank it to + it looks vivid and bold for flatter subjects, but when you have a contrasty subject it's too much and blows out. Leave it in AUTO and you won't have to piddle with it.

Avoid **Custom** tone compensation. Most people call this a custom curve. I've never used it. To

use it you have to buy Nikon Capture and create a curve. You then use Nikon capture to load it into the D40. Once you've done that you select it here. If you haven't loaded your own custom curve and select this you get the default Normal curve. Custom curves are way beyond anything with which I want to bother. The curves in the camera are the best ones anyway. Real photographers pay more attention to their subject's lighting.

Color Mode

Color Mode has three settings:

Color Mode Ia (one-a, sRGB) is default. It's normal and boring.

Color Mode II (two, Adobe RGB) gives dull colors. Don't touch this unless you *really* know what you're doing *and* print your own work. See Adobe RGB vs. sRGB.

Color Mode IIIa (three-a, also sRGB) gives bolder colors. I use it all the time.

I have no idea how Nikon cooked up these numeric designations.

Saturation

This sets the vividness (strength) of colors.

A Auto: I don't use this. I suspect it cranks up the color for dull scenes and puts it back to normal for scenes that are already colorful. I prefer always to have my saturation cranked up.

0 Normal: For normal people shots you're probably better off with 0. This is the default.

- Moderate: tones down the colors, which I've never liked. "Moderate" sounds like British understatement. In America we call this "dull and boring." Personally I want colors so bright you have to put on sunglasses, or I go directly to B/W. Your interests and taste will differ.

+ Enhanced: I prefer violent color, so I crank it up to +. I'd use ++ or +++ if my D40 had it, but that's me.

Hue Adjustment

Don't touch this! This rotates all your colors to different spots around the color wheel. If you use this to fix one color it screws up all the other colors. God only knows why this adjustment is here.

Image Quality

This selects the kind of file (raw, JPG or both), and the size of the JPG file (FINE, NORMAL or BASIC).

I always use JPG, never raw. (see JPG vs. Raw.)

I usually use BASIC JPG and sometimes NORMAL JPG.

BASIC JPG looks almost the same as NORMAL, unless you're making six foot wide prints. It also makes a file half the size of Normal, which speeds up everything and saves space on my hard drives and backup CDs.

I never use FINE; it looks the same as NORMAL and wastes space. Feel free to use any settings you like; that's why they're here.

You can see examples from my D200 at D200 Quality Setting Examples.

Image Size

This selects L, M or S image (pixel) size for the JPG images. I always use L.

I print L BASIC JPG files at 12 x 18" (30 x 50 cm) and they look great.

I might use M if I'm shooting many hundreds and hundreds of images of something I don't expect to print larger than 8 x 12" (20 x 30cm), like sports, weddings and parties.

White Balance

I leave my WB at AUTO. See also How to Set White Balance (page 44) and White Balance Examples (page 50).

Trick: to fine-tune (make warmer or cooler) each setting individually, after selecting it in the menu, press OK (or click right) to get to the +3/-3 trim setting. + is cooler (bluer) and - is warmer (more orange). This delicate, but critical, adjustment is missing from the D50, and it was my biggest complaint about the D50.

The WB settings are:

Auto (A): I use this all the time. It makes its best guess for WB. It's usually very good. Indoor tungsten can be too orange unless you have some bright tungsten light also in the image. If you do, it removes the orange and compensates completely. If not, the D40 only partly compensates and you get a nice warm image instead.

Tungsten (hanging light bulb icon that's easy to confuse with the sun icon): This makes the picture very blue. Use this only for deliberate Arctic freezing effects, or under conventional tungsten light bulbs.

Fluorescent (glowing tube icon): Used to make crappy fluorescent light look less crappy. These settings rarely work; use the preset setting for better results.

Direct Sunlight (sun icon): Use this in direct frontal sunlight. Use other settings for shadows or indirect sunlight.

Flash (lightning bolt): I never use this. It's almost the same as direct sun. I'm told it's really for studio strobes, since the Auto mode compensates magically for flash if you use it on-camera. The

reason to use this is if you use a different trim value for your strobes than you do for sunlight.

Cloudy (cloud): Warmer (more orange) than the sunlight position. I use this in shade, too.

Shade (house casting a shadow): very warm (orange). Use this for sunset shots and deep shade.

Preset (PRE): You use this setting with a white or gray card to get perfect color matching.

I use this in bizarre artificial light that I wish no make look natural, or to get exact color with my studio strobes. An Expodisc makes this easier, but even without an Expodisc or white card I shoot off anything neutral, like a piece of paper or a T shirt.

Any light weird enough to need this setting won't care about small inaccuracies in the neutral reference. To set this:

1.) Ensure your card or other neutral object is in the light representative of the light on the subject.

2.) Select PRE via the menu button (or the Fn button (page 17) and spinning the dial).

3.) Press OK (or click to the right).

4.) Select Measure and click OK (or to the right). (The Use Photo option is a backwards bow to Canon's convoluted setting method. Canon Jihadists used to brag about this. It does the same thing, but requires twice as many steps. Ignore this option.)

5.) Select YES.

6.) Point your camera at the card or neutral colored thing and press the shutter.

7.) If the LCD says "data acquired or the viewfinder flashes "Gd," you're set. Shoot away!

8.) If the display flashes "unable to acquire" or the viewfinder flashes "no Gd" then repeat from step 2.).

ISO Sensitivity

I usually set my ISO to 200 and let the D40's Auto ISO (page 30) adjust as needed.

Auto ISO makes all the ISO adjustments for you. I always use Auto ISO since it's as smart as I am.

Firmware Defect #1: the Auto ISO (page 30) options are hidden in the Custom Settings Menu (page 26), where I explain them in depth.

Firmware Defect #2: The Auto setting in this ISO menu refers instead to letting the D40 preset the ISO as it guesses appropriate to the preset scene modes (sports, portrait, macro, etc.) as they are selected. This Auto setting isn't Auto ISO, and it isn't available in the P, S A and M modes (page 11) I use.

Higher ISOs can give sharper images in dimmer light because they let the D40 shoot at faster shutter speeds or smaller apertures, but they also can add more grain (noise) to your photos.

ISO 200 gives the cleanest images, but the most potential for blur in dim light.

ISO 400 and ISO 800 are perfect for outdoor sports.

ISO 1,600 gives the noisiest images, with the least potential for blur. ISO 1,600 still looks pretty good if you need it, but I only use it indoors.

ISO 3,200 is for use as a last resort. It is grainy, and lets you shoot in the dimmest light without flash.

Auto ISO selects magically among all these (except for ISO 3,200) so you and I don't have to worry about it. See Auto ISO (page 30).

Hint: ISO goes from 200 to 3,200. Nikon code-names ISO 3,200 as "HI 1" to scare amateurs away from using it, because these same amateurs would clog up Nikon's (800) NIKON-UX support lines complaining about grainy photos.

Hint: If you've set AUTO ISO ON, Auto ISO turns off if you select ISO 3,200. Auto ISO come back on when you set a lower ISO.

Noise Reduction

This is short for Long Exposure Dark-Frame Subtraction Noise Reduction.

It doesn't reduce noise or grain. It will eliminate the occasional hot pixel, and correct purple fog around the edges of insanely long astronomical exposures.

OFF: Default. Leave it here.

ON: Don't use this. If you do, the D40 will double the amount of time you have to wait around for time exposures of a second or longer. You people who need this know who you are, and even for you I suggest trying the D40 with out NR first. it may save you a lot of time waiting around out in the cold.

I have details with examples from my D200 at D200 Dark Exposures.

CUSTOM SETTING MENU (Pencil icon)

Many of these menu options are shown only after you select the FULL MENUS option in the Setup Menu (page 35) and are often deactivated in anything except the P, S, A and M modes (page 11).

This menu really should be called the camera menu and shown with an icon of a camera, except

that Nikon used the Camera icon for the shooting menu (page20), which really should be called the Film menu. Camera settings, like focus, flash and timers, are set here in the Custom Settings Menu, shown by a pencil. This is Nikon's mistake; don't penalize yourself if it makes little sense.

How to Get Here

Press MENU, go to the left and select up and down to the pencil icon. You'll see CUSTOM SETTING MENU on the top of the color LCD.

What it Does

This menu sets many things related to the camera and taking pictures, like autofocus, exposure, timers, flash and more.

What I Change

I change a lot here, so read on.

[R] Reset

This resets everything in this menu to its defaults. I don't use this, unless my camera was loaned out.

01 Beep

Turn this OFF!!!

This is the idiotic and annoying focus confirmation beep. Turn it off!

The beep annoys others and is very rude. Focus confirmation is indicated by a dot in the lower left of the finder.

02 Focus Mode

This sets the autofocus mode for still or moving subjects.

AF-A, the default I use, magically selects between the next two modes.

AF-S stands for AF-Single. The D40 focuses once, then locks AF for you to recompose and shoot.

AF-C stands for AF-Continuous. The D40 keeps focusing as the subject moves. Use this for sports and vehicles in motion, like cars, birds and aircraft.

MF Is manual focus. I'm unsure why'd you'd use this setting, since lenses that autofocus on the D40 (AF-S and AF-I) have these switches on the lenses, and older AF lenses that can't autofocus on the D40 default to manual focus whether you want them to or not.. I suspect this option is here because it isn't anyplace else on the D40, and there probably is, or will be, lenses that need this to revert to manual focus.

03 AF-Area Mode

This selects how the D40 uses its three AF sensors.

You'll want to change this for action, still subjects or handing your camera to a non-photographer. I wish my D40 had a dedicated switch as my D200 does. On the D40 we need to go into this menu every time our subject matter changes.

[xxx] Closest Subject selects the closest AF area by magic, which just happens to be the right one every time. Use this when you hand your camera to a non-photographer, if things are moving too fast for you to do your own AF selection, or if you're holding your D40 in your arm pointed back at yourself for a self portrait.

This feature works great. I'm always surprised at the great results I get in this mode.

[x] Dynamic Area lets my D40 automatically select which sensor to use as a subject moves around the frame. It really works! I use this for sports, running animals and birds in flight.

[o] Single Area is used for still subjects. I use this most of the time. My D40 uses whichever area I select with the rear Up/Down/Left/Right selector. Of course with only three sensors only the left and right buttons do anything.

The D40 first uses whichever area you select with the rear Up/Down/Left/Right selector, and proceeds to select other areas automatically if the subject moves. You won't see which area is selected in the finder, but you can see it on playback if you use the right software.

04 Shooting Mode

This selects the shutter advance mode.

[S], single frame mode, means the D40 takes one picture each time you press the shutter, regardless of how long you hold it. This is the default.

Bearded Rectangle (continuous advance mode) takes one picture if you press and release the shutter. If you keep the shutter pressed, the D40 takes pictures continuously at 2.5 frames per second for as long as you hold the shutter.

I use this mode. I can take one picture with one press. If I want several, as I do in dim light or people pictures so I can choose the best later, I keep the button pressed.

10s Self Timer takes a picture 10 seconds after you press the shutter.

Remote 2s Delayed Mode takes a picture 2 seconds after you press the optional $20 ML-L3 remote control. If you don't select this or the next mode the D40 will ignore the remote control.

Remote Quick Response Mode takes a picture when you press the excellent ML-L3 remote control. The D40 This is the mode I use for serious self-portraits like this:

Trick Self Portrait. My ML-L3 is in my other hand out of the picture.

Hint: Be sure to select a long enough Remote ON Time time in Custom Function 17 (page 34). The D40 ignores the remote after the length of time set in Custom Function 17 (page 34).

05 Metering

This selects Matrix, Center-Weighted or Spot.

I always use Matrix, shown by an icon which looks like a weird rectangle with cross and circle in it.

Matrix, in other Nikons, was an almost perfect meter. In the D40 and D80 it's defective and instead of giving correct exposures it exposes for the darkest part of the image. It often requires a lot of Exposure Compensation to get the correct exposure, especially with contrasty subjects. This Matrix meter is designed for dingbat photographers who shoot heavily backlit subjects without flash. Nikon succumbed to the lowest common denominator who would shoot in awful light without knowing it, get dark images, and then blame it on the camera.

The default Matrix meter of the D80 and D40 ensure no image is ever too dark. Sadly it usually ensures images are too light.

Center Weighted (a dot with a ring around it) pays attention to the middle of the frame. It's the old-style meter that Nikon used since 1959. I may have to try using this, since it might give more consistent results, presuming you are fluent in the Zone System (page 69), than the botched Matrix meter.

Spot (a small dot), reads only from the small spot of the selected AF zone. If you've chosen

Closest Subject AF (page 28), it reads from the center one. I never use this.

06 No Memory Card?

I leave mine at LOCK. If I have no memory card it won't let me take pictures.

Don't set it to OK. If you do, you could have no memory card and be shooting all day, thinking you're making pictures when you really aren't. Shoot one wedding without a card and this set to OK and you'll see how stupid you'll feel.

Only set this to OK if you want to demonstrate the D40 in a camera store with no card.

07 Image Review

ON plays the picture after you take it. **OFF** leaves the screen dark.

When the image pops on the screen, even if the D40 is still at your eye, spinning the command dials will change the playback, not the shooting settings like apertures. While shooting you might want not to use this, or remember that you must wait a moment and tap the shutter release to reset the D40 to interpret the command dials for changing shooting settings instead of playback screens.

08 Flash Level

You can ignore this menu, because it's much easier to adjust this with the Flash Button (page 17). Hold the Flash Button (page 17) and the +/- Compensation Button (page 13) and spin the dial. You will see the flash brightness value in the finder without ever needing to take your eye away. This is much easier than it sounds.

I have no ideas why Nikon added this as a menu option, except to match Canon which has some cameras so clumsy that the only way to adjust them is through the menus. Maybe Nikon is pandering to Canon users; I don't know.

09 AF Assist

I leave this at **ON**.

Turning this **OFF** disables the bright white light that shines in the dark to help you focus. I turn this off if I'm shooting where I don't want to disturb people, or be identified as photographing.

10 ISO Auto

This is one of the strongest reasons I prefer my Nikons to my Canons. Canons lack this critical feature.

ISO Auto Increases sensitivity (ISO) in dim light automatically to prevent blur from slow shutter speeds.

I use this all of the time, unless I'm using manual exposure mode. Auto ISO is a crucial

component of Modern Exposure Technique.

Today I adjust the Auto ISO's minimum shutter speed as I change lenses and conditions. I no longer adjust ISO directly, as we did in the old days before 2004. This is a time-saving step towards the future, just as program exposure was a step ahead of aperture priority in the 1970s.

You can choose the highest ISO to which the Auto ISO will go (Max sensitivity). I let my D40 go all the way to to ISO 1,600, since it looks fine at ISO 1,600 and any small amount of grain is better than a blurry photo. If you prefer blur to grain, feel free to limit the D40 to ISO 800 or 400. Try ISO 1,600: the D40 is better at high ISOs than film ever was, and far better than any compact digital camera at these speeds.

You also may set the minimum shutter speed (Min Shutter Speed) below which the D40 starts raising the ISO. Select the slowest shutter speed at which you'll get sharp images under your present shooting conditions.

I wish this function was smart enough to recognize which lens I'm using and adjust accordingly, but it's not.

HINT: You set the lowest ISO used in Auto ISO with the ISO button, of course.

Firmware Defect #1: Nikon's firmware leaves Auto ISO active even in manual exposure mode. This makes the D40 change the ISO automatically and defeat the purpose of manual exposure. Remember to deactivate Auto ISO when using Manual exposure mode.

Firmware Defect #2: The Auto setting in the ISO menu (page 25) section of the Shooting Menu (page 20) refers to something completely unrelated, even though it has the same name. The AUTO setting in the ISO menu (page 25) instead lets the D40 preset a fixed ISO it expects to be relevant for a selected scene mode, like sports, portrait, macro, etc. This Auto setting isn't Auto ISO, and it isn't available in the P, S A and M modes (page 11) I use.

Nice Touch: unlike my other Nikons, you can set ISO 3,200 manually in the ISO menu (page 25) without having to deactivate Auto ISO first. When you set a more reasonable ISO, Auto ISO again becomes active. You used to have to turn Auto ISO on and off the hard way coming in and out of ISO 3,200. Thank you Nikon!

11 Self Timer / Fn Button

This selects the function of this button, which is located on the side of the D40 (page 17) just below the flash button.

Self Timer: In this default setting, press the Fn button (page 19) to set or unset the self timer.

Shooting Mode: Press and hold the Fn button (page 19) while turning the rear dial, slowly. You'll cycle through the shooting (shutter advance) modes (page 28).

QUAL: Press and hold the Fn button (page 19) while turning the rear dial, slowly. You'll cycle through all the File Type and Quality (page 23) and Image Size (page 24) modes.

ISO: Press and hold the Fn button (page 19) while turning the rear dial, slowly. You'll cycle through all the ISO Settings. (page 25) . An added nicety lacking on more expensive Nikons is that you have full ability to go to and from ISO 3,200 (HI 1) without needing to turn off Auto ISO (page 30).

WB: I use this option, since I change my WB more often than any of the other options.

Press and hold the Fn button (page 19) turning the rear dial, slowly. You'll cycle through all the WB Settings (page 24). An added nicety is that you can set a manual preset (white or gray card) white balance by holding down the Fn button again after selecting PRE. More at my D40 WB section (page 24).

12 AE-L/AF-L

This selects what AE-L/AF-L button (page 16) does.

AE/AF lock (default) locks both for as long as you hold the button. You'll see "EL" in the bottom left of the finder when it's locked. There is no AF-L finder indication.

AE Lock only holds the measured exposure for as long as I hold the button. I use this setting. You'll see "EL" in the bottom left of the finder when it's locked. I usually shoot in Single or Auto AF mode (AF-S or AF-A) (page 27), which locks the focus separately.

AF Lock only locks the autofocus. This is handy if you want the lens to stop focusing, for instance, if reframing a portrait or if you're panning while a target goes behind a tree. There is no AF-L finder indication.

AE Lock Hold requires just a tap, after which the D40 holds the exposure until you tap it again. You'll see "EL" in the bottom left of the finder when it's locked. This eliminates the need to hold the button, but also requires you to remember to press the button again to unlock, and press a third time to lock again.

AF ON focuses the D40 when the AE-L/AF-L button is pressed. This deactivates the normal AF action of the shutter button. The only way to autofocus with this selection is to press the AE-L AF-L button.

13 AE Lock

This lets you lock the exposure when the shutter is pressed.

The default is off, which I use. The shutter button doesn't lock exposure.

I prefer to use the AE-L button (page 32, above) to lock exposure.

14 Built In Flash

This lets you set the function of the excellent built-in flash.

TTL (default) lets the flash work normally and give great exposures all by itself.

M (manual) lets you force the flash to one brightness value. It adjusts in full stops from full power down to seven stops below, shown as 1/128 power.

I use manual if I'm using the built-in flash to trigger my studio strobes or if I'm trying to set up something tricky which isn't working in the usually perfect TTL mode. The manual mode also cancels the preflashes for photographing peope with REAR flash sync (page 19) or to eliminate blinking.

The D40 lacks wireless control and Flash Exposure lock of more expensive Nikons. If you want to uses these features, get a D80 or D200. I explain these at D80 Built-in Flash Modes.

15 Auto Off Timers

This changes the time delays of the various battery-saving timers that turn off the D40 and its LCD when you ignore it.

This setting is more advanced than more expensive Nikons, for example, there's no way on my D80 to extend how long an image stays on in Image Review (page 30) to other than 4 seconds. When making self portraits with a tripod my D80 tauntingly shut off its Image Review (page 30) the moment I get back to the tripod, and there's no way around that.

On my D40 I can choose to have the Image Review hang for as long as I want.

The settings are:

SHORT: Everything turns of more quickly to extend battery life.

NORM: Default.

LONG: Everything stays on longer so it's less likely you'll have to wake up the D40 in the middle of something.

CUSTOM: I use this. You may set the time individually for each of:

Playback/Menus: How long the monitor stays lit for most uses.

Image Review: How long the just-shot image stays up after you shoot it. Of course pressing any other button lets the D40 immediately change to whatever more you want.

Auto Meter Off: How long the D40 and it's meters stay on before you take a picture. The meter turns on when you tap the shutter. The meter turns off after you take a picture, or after the tie you set here.

In the old days (2002) my Nikon D1H and D1X sucked through batteries and we did everything we could to get more than 200 or 300 shots on a charge of the huge Ni-Cd batteries. Today battery life is so long I'd select whatever value you find the most convenient. I've played with my D40 menus for hours at a sitting with no complaints.

For those of you counting Custom Settings as if more were better, please note that the D40 intelligently has this one Custom Setting controlling what takes two custom settings in the D80 (Custom Setting 27 and Custom Setting 28), and adds a third setting, Image Review Time-Out, not available in the D80 at any price. HA! (The D80 always has image review at 4 seconds, while the D200 keeps image review on for the same time chosen in Custom Setting c5.

16 Self Timer

This selects the time, presuming you have the self timer (page 19) active, between pressing the shutter and the shutter firing.

I leave this at 2 seconds, since I use the self timer only if I forgot my ML-L3 remote control.

I use my ML-L3 remote, not the self timer, if I'm taking pictures of myself.

17 Remote On Duration

This selects how long the D40 stays awake waiting to be released by the ML-L3 remote control, presuming you've set it to work via remote control (page 28).

The default is one minute, which is silly, since when I'm using my remote I don't want to have to take a picture every minute or have to reset my D40 to pay attention again.

I set mine to 15 minutes.

SET UP MENU (wrench icon)

Many of these menu options are shown only after you select the FULL MENUS option in the Setup Menu (page 35) and are often deactivated in anything except the P, S, A and M modes. (page 11).

How to Get Here

Select the Set Up Menu by pressing MENU, moving to the left and then up or down to select the wrench icon. You'll then see SETUP MENU on the top of the color LCD.

What it Sets

This sets the usual housekeeping items like languages, video formats, auto image rotation, the clock and file numbering.

What I Change

This menu contains the secret message mode (page 38) I use to encode my © and contact information into every file shot with my D40.

CSM/Setup Menu

This allows me to set what I need once, like languages, and then turn off those items in the menus. It's wonderful to be able to clarify the menus down only to what I use daily.

If I ever want to reset anything obscure, like reset the menus to Korean when I loan my D40 to a pal, I simply choose FULL menus again.

The choices are:

Simple (default): only the most basic settings are shown.

Full is what you should set as soon as you get your D40. It allows you full access to every menu option, so long as you are in the P, S, A or M exposure modes (page 11).

My Menu is where you can deactivate the display of any or almost all of the menu options. Every option you've altered remains in effect, but you won't see it displayed to alter.

For instance, set language to Korean, then deactivate the Language option. Language remains in Korean, and good luck to your pal trying to reactivate the language menu to return to English. I'm scaring you; I use this mode to turn off all the menu items I set once when I buy a camera, like Beep (page 27). and if I ever need to set them again, it's trivial to select Full.

This My Menu is more powerful than you may realize. I turn off all the junk, and it leaves all the items I set often on one page, making it much faster and clearer to set and unset Auto ISO (page 30) everytime I go into Manual exposure mode, for instance.

Format Memory Card

I format cards every time I put one in my D40, and every time I go shooting.

Reformatting completely renovates the card. Erasing does not, and leaves potential errors lurking.

Professionals reformat a card each and every time a card is put in the camera. This is because files and folder structures are sometimes messed up or changed when the card is read in-camera or with a reader or used in any other camera. Professionals prefer to be safe than sorry. We don't use cards to archive previous photos. One time I kept saving my winner shots on a card by simply erasing the rest each time. After a few months I started to get errors. These went away as soon as I reformatted the card.

Info Display Format

This option is new in the D40. It lets you change the appearance of the LCD display screens in which you make adjustments.

You may select one look for the P, S, A and M modes, and another for the preset scene (idiot) modes like Lady, Baby, Sports, Flower, etc. Nikon calls the idiot modes **"Digital Vari-Program."**

Here are how these look. They each show the same things and have the same functions.

Classic: I use this option because it makes everything the biggest and easiest to see.

The menus in Classic mode are as they are in my other Nikons: white on dark blue.

Graphic: This is the default. Most things are smaller to make room for the goofy moving picture of a diaphragm on the left. Change the aperture and it changes. This is supposed to help new photographers, but it won't. We who understand apertures don't want this in the way, and photographers who don't understand it aren't going to learn anything with it here. God bless Nikon for trying; it's one of three options.

The menus in Graphic mode are softer dark gray on light gray.

Wallpaper: This is the cutest, although I don't use it. It's like Graphic above, with smaller numbers, and sets everything on top of a photo of your choice, presuming you've shot the photo on your D40. I selected a photo of my mother-in-law, and it remains in the D40 regardless of formatting or removing memory cards.

A more practical use is to write PROPERTY OF with your complete contact information on paper and use a photo of that as your wallpaper. I tried, and JPG files saved out of Photoshop aren't read by my D40, so I haven't been able to import graphics directly for this.

OK, since I can choose one mode for the real P, S, A and M modes and another for the play modes (baby, night, etc.) I just left my mother-in-law up in the Wallpaper mode for those modes, called "Digital Vari-Program" here.

The menus in Wallpaper mode are softer dark gray on light gray.

Auto Shooting Info

This is **OFF** by default.

ON lights up the rear LCD with all the shooting info if you tap the shutter and release it without taking a picture.

This saves you from having to hit the info button (page 14) to activate the LCD screen to make settings and adjustments.

I'm unsure if this helps; try it yourself and see if you like it.

World Time

This sets the date and time.

There is a nice map for finding time zones. Want to reset your D40 for Fiji or Tonga? Just click. You can swap among time zones without having to reset the seconds, a boon for me who keeps his D40 set to the exact second.

Firmware Defect: You set the time under the DATE option.

LCD Brightness

This changes the midtones on the LCD. It changes backlight intensity only by 10%. It is mostly a gamma (midtone contrast) control.

For the adjustment to take effect you must remember to hit OK after making a selection.

I leave mine at 0.

Unlike my Canon DSLRs, My D40's LCD is always bright, contrasty, color accurate at every angle and sunlight readable.

I never have to twiddle with the brightness adjustment.

If anything, the brilliant LCD makes even underexposed images look great! Be sure to check the color histogram (page 16) if you're shooting in a dark environment.

Video Mode

This sets the format of the video output.

Use NTSC (525 lines, 59.94Hz) in the Americas and Japan, and PAL (625 lines, 50Hz) in Europe.

This output will always look much worse on a TV or projector than images do on a computer or projected through a computer. Read Why Images Look Awful from the Video Output for more.

Language

This sets English or other languages.

As suggested before, set yours to Swedish and see if you can navigate back to English. Fun!

Image Comment

This lets you add a secret text message into every file. Mine is set to (c) KenRockwell.com with my phone number! You see this text looking at the EXIF data with software on a computer. Sadly Nikon provides no real © symbol.

You set this by going to MENU > Set Up Menu > Image Comment > Input Comment > (add your message like you did on 1970s video games) > Enter. You must hit ENTER or it will forget everything you just did!

To edit or remove a character, select it in the Input Comment screen by holding the checkerboard button and clicking the big thumb selector. Select a new character with the same selector and press the center of the selector to add it. Press the Trash button to delete a character.

When you get your text message spelled out, go to Attach Comment and hit SET so a small

checkmark shows. Now go to and select DONE. If you forget to check Attach it won't attach, and if you forget to hit DONE it will also forget everything you just did. Sorry, I don't write the firmware.

It's great having everything you shoot have your contact info embedded. It also allows you to prove ownership in a third-world country when catching a thief with your camera. Help the cop go through the menus and read your personal ID information.

This text is added in the file's EXIF data. It doesn't appear in the visible image. I insert my visible © notices with Photoshop.

USB

This selects how the camera behaves when plugged into a computer via USB.

I leave it at mass storage, which means my D40 appears as an external hard drive between which I can drag and drop images and folders in my Mac OSX Finder or Windows Explorer.

PTP is used if you want to control the D40 as an external device, for instance, via Nikon Camera Control Pro for remote camera control. PTP makes the D40 look like a device instead of like a drive.

Use whichever works best with your computer and workflow.

Folders

You can create, name and rename folders on your memory card. They are named with a 3-digit number from 100 through 999.

Select Folder selects the folder into which new photos are written.

You could use this to record images into a previous folder. I never do this: if I want to get that complicated I wait until I get to my computer where it's much easier to sort.

You might want to use this feature if you shot one event or subject, went on to a second and made a new folder for it, and then returned to the previous subject.

New is used to create a new folder. Unlike the pro cameras like the D200, there is no trick by which you can hold the ? button on power-on to create a new folder automatically.

Rename and **Delete** are self-explanatory.

File No. Sequence

This ensures your file numbers keep counting up. Set this **ON**.

If you leave it at default you'll start from DSC_0001 every time you reformat (page 35). Over time you'll have hundreds of photos on your computer all called DSC_0001. It will drive you crazy if you ever try to use two of them in the same document and it will be too late to do anything about it.

Set it to **ON**, which should be the default but isn't.

Mirror Lock-up

Mirror Lock-up isn't. It's not a lock up for telephoto lenses on tripods.

This setting is used to lock up the mirror to clean the CCD. I never use this, since I find it easier to set the camera to Bulb and hold open the shutter. I'd never stick anything into the camera to touch the CCD; the only people who suggest this are the people who want to sell you the tools to clean your CCD.

Firmware Version

This lets me confirm if my D40 is up-to-date with Nikons' free firmware updates.

Mine, as of 02 January 2007, reads A 1.00 and B 1.00.

Dust Off Ref Photo

This is used to take a picture of the dust on your sensor. If you pay Nikon another $150 for Nikon Capture software you can use this to erase the dust more easily from your images shot in raw. You people know who you are. I don't do this!

I've made 80,000 combined shots on my Nikon D70, D200, D40 and D80 and have had no problems with dust. Thankfully the modern Nikon sensors have filters far enough in front of the imaging surface to throw dust sufficiently out of focus.

All I ever use is an air bulb to blow off the big chunks. The small ones remain invisible. If I ever had a problem, I'd let no one but Nikon clean my sensor, since they'll replace the camera if they screw up.

The additional work involved in shooting raw, for the amount of images I create every day, is far more than any need, once in a blue moon, to spot an image in Photoshop. See also Raw vs. JPG.

Auto Image Rotation

This sets a flag in vertical images which keys most software to display the image vertically.

It does not actually rotate the images; it merely sets a flag. Someday the camera's firmware will work properly and rotate the image itself, but no camera does this yet.

I rotate the images themselves later in iView.

Auto Image Rotation helps me identify which of hundreds of images I shoot each day need rotation.

Auto Image Rotation is easy to fool if you're shooting directly up or down.Turn it off if you're photographing your shoes on your feet.

RETOUCH MENU (brush icon)

How to Get Here

Select the Retouch Menu by pressing MENU, moving to the left and then up or down to select the brush icon at the bottom. You'll then see RETOUCH MENU on the top of the color LCD.

Trick: Press the OK button when an image is displayed to get to most of the retouch menu.

What it Sets

This lets you manipulate images in-camera. The originals are unaltered. The D40 creates new versions of the images and saves them.

Concatenation: The D40 is sneaky enough to know if a file was created with these trick modes, and often won't let you apply the same filter twice. You can concatenate different filters.

Firmware Defect: the new images are saved with a file number one more than the most recent image, and are prefaced with CSC, not DSC. The EXIF create time is unaltered, so you'll have to sort images by create time if you can.

This double-defect means that the file numbers of the newly created versions are scrambled from the originals. If you're playing with the most recent image the file numbers are close, but if you're playing with an earlier file, it's file number will be unrelated to the original.

By prefacing the file with CSC instead of DSC the modified files will sort differently than the originals.

The correct way to have done this would be to retain the same file name and append -edit, -edit1, -edit2, etc. For instance, if you make a new version of DCS_0123.jpg, the new file might be called CSC_5837.jpg. Good luck sorting them out! If done correctly, the new version would be named DSC_0123-edit.jpg.

D-Lighting

This creates new versions of images with lightened shadows similar to Photoshop's Shadow/Highlight Adjustment tool.

You have three levels of lightening: Low, Normal, and High. (this is the same, with much clearer labeling, than the D80's Moderate (less), Normal and Enhanced (more) options).

You'll never need this with the D40, because the D40's meter firmware is defective, just like the D80's meter, and usually overexposes, especially images with dark sections.

This trick D-Lighting would have been clever on one of the cameras with a good meter, like the D200, D70 and D50, but not the D80 or D40 which expose for the shadows with a vengeance.

Red-Eye Correction

This creates new versions of images attempting to rectify flash-induced red eyes. This filter is sneaky enough to know if you used flash or not to make the image, and won't let you use this filter if you didn't use flash.

I've never had a problem with red-eye with my D40, so all the better. When I was able to cause red-eye, this filter only corrected half of the eyes!

Trim

This creates new cropped versions of images. No pixels are moved or changed in size. Trim removes unwanted pixels from the sides of an image and saves a smaller image.

Monochrome

This creates new black-and-white versions of images.

It has three modes:

Black-and-White,

Sepia (Brown-and-white) and

Cyanotype (Blue-and-White).

Filter Effects

This creates new versions of images with different colors. You've got your choice of:

Skylight: slightly warmer and pinker.

Warm Filter: slightly warmer.

Color Balance: This one's slick. It calls up a better control panel than Photoshop's color balance tool, which dates from the 1980s.

Nikon's tool reminds me of what we have on million-dollar color correction machines used in Hollywood telecine to color correct motion pictures.

The Nikon D40 shows three histograms (reminiscent of Tektronix' WFM700 waveform monitors) and the D40's Up/Down/Left/Right key becomes the color correction track ball. Click it left and right to alter blue-red, and up down for magenta - green.

If you have something neutral, watch the waveforms, oops, histograms, until they are about equal. Left - right on the Up/Down/Left/Right key slides the red and blue in opposite directions, and green

- magenta slides the red and blue equally left or right. The green stays put.

Small Picture

This creates a much smaller version of an image. You've got your choice of 640x480, 320x240 and 160x120 pixels.

Image Overlay

This is silly. It creates a new image by adding two others together in the z-axis (intensity).

It only works with raw originals.

A reader wrote me about a genius plan to use this for in-camera mutilation of large dynamic range scenes by combining two very different exposures. I don't see it working. I'm missing the genius part.

You can't get to this with the OK key on playback. You have to use the menu button.

APPENDIX

A1 How to Set White Balance

Auto White Balance. Photo made indoors while cloudy outside. Way too blue and ugly! 99% of people make this shot and never think anything more about it.

Cloudy White Balance. Wow! Warm, golden, and just like it's supposed to look. I did this on my Canon SD700 point-and-shoot. Every digital camera over $50 and even most camera phones provide this adjustment.

Setting the White Balance when needed is the key to great color photos. This comes out the same with an $5,000 camera or a camera phone. I know: I also tried this on a Canon

5D ($3,300) and 16-35mm L ($1,700) and got the same results. You need to adjust the White Balance at times with *every* camera. I've also found point-and-shoots to be better than the more expensive DSLRs at auto white balance!

Also see:

Explicit Examples (page 50)

How to Change the White Balance of an Existing Image

The Expodisc

INTRODUCTION

This is so simple it often confuses people who think it's supposed to be complicated.

White Balance is nothing more than an adjustment to get the color you want. You set it to look good on the camera's LCD and that's it until the light changes. There is no right answer; it's what looks good to you. **Skip to my Examples (page 50) and forget this page if you prefer.** Getting the image to look right is all that matters. Tweak WB until it looks good. Period.

That's right: I play with it until it looks good on the color screen on the back of my camera. SIMPLE! Of course it helps to know what the tweaks do to help you get there.

Photos can look too orange, blue or green even if the subject looked OK to our naked eyes. Since we can preview the photos on our color LCDs setting white balance is easy.

Our eyes adjust this automatically just as they do for lightness and darkness. It would be great if cameras did this as well as our eyes do, but cameras often need a little help just like they do with exposure.

White balance settings may be altered for deliberate creative purposes, exactly as we do with exposure.

You can change the orangeness or bluishness of your images to make them as warm, neutral or cool as you want without having to use glass filters. You even can get rid of the green cast from fluorescent lighting, all without the glass filters we need for film. Cool, huh?

Skip straight to the Examples (page 50) or Application (page 47) sections unless you really care about the scientific details.

BACKGROUND

Just skip to Application (page 47) if you just want to learn to make good photos. This section is only if you really care about the "why" behind all this.

Different kinds of light require different adjustments to give a good picture. If we consider full daylight as "normal," then indoor incandescent screw-in light bulbs look orange by

comparison and candle light looks almost red. Likewise, blue sky without the sun is very blue although when you're in the shade everything looks OK to you and I. If you make a photo in the shade the picture comes out way too blue or cool looking.

This is because different kinds of light have different amounts of red, green and blue. Incandescent lights and candles have a lot of extra red because they make light by heating something hot enough to glow. Blue sky has a lot of blue because the sky appears to be lit by light scattering from assorted dirt particles and the various gas molecules which make up the atmosphere. This scattering effect, described by Rayleigh, varies as the fourth power of the wavelength. Fluorescent and metal halide lights have a lot of extra green because they make light by exciting ions of gasses made from dog poop which glow greenish.

Low pressure sodium (deep orange) street lights are always going to look orange because they *are* orange. They are monochromatic with only one wavelength at 589 nm. They have no red, green or blue light to balance.

High pressure sodium lights (whiter orange) can sometimes be white balanced. Most cameras lack the range to do this. If your camera can, you can get the scene to look as if it is under white light and not the orange of the street lights!

DEFINITIONS

The silly phrase "White Balance" comes from professional video. Videographers make it tough and use a special kind of oscilloscope called a waveform monitor to match or "balance" the signals from the camera's red, green and blue channels to make whites look neutral under these different kinds of light.

In digital photography (and amateur video) we have it much easier. You can just press a button to make whites neutral, or let the camera do this automatically. It's also trivial to use this adjustment instead to make whatever colors you prefer.

Digital and video cameras have this adjustment and film cameras don't for the same reason dogs and cats lick themselves: because they can. Since digital and video cameras are electronic it's simple to set colors by adjusting each one separately. Film can't do this, since color film is processed all at once. This is why we need color balancing and conversion filters with film cameras and don't with digital.

Forget about Kelvin temperatures unless you're an engineer. Kelvin degrees work backwards from how we expect them to work in photography and common sense. Kelvin degrees are the same as Celsius, except for being 273 degrees apart. (C = K - 273.) This scientific classification refers to how hot something would have to be heated to glow the same color. Imagine your electric heater or range. At lower temperatures it's more red and gets oranger as it heats up. If it got to 3,200 degrees Kelvin (3,200K) you have the same color as a typical light bulb (and the heating element would explode). If you heated something even more to say 5,500 K it would be brighter and bluer and similar to daylight. Heat the thing up further to say 8,000K and it might be as blue as shade. Yes, the hotter Kelvin looks bluer or cooler, which is why you should ignore this unless you are a scientist.

APPLICATION

Basics

Different settings change the amount of orange or blue color cast, usually to compensate for any cast in the lighting. If you have no blue or orange cast you get neutral whites, which is what you usually get if you use the settings suggested by the instruction book. The Fluorescent settings take out the green from Fluorescent, mercury, HMI and metal halide lights used in your garage, sports stadia and parking lots. Forget about shooting under orange street lights: they'll always look orange because they are orange. White balance only adjusts far enough to make lights that look white to us look white in photos.

In the AUTO mode the camera makes its best guess for each shot. I use the AUTO white balance mode when I can. It works great in my Nikon D70 and Canon A70, but poorly in my Nikon D1H. Even though it may or may not work well for normal photos, AUTO (also called AWB in Canon) almost always works great for under weird mixed artificial lighting without flash.

AUTO (also called AWB) mode works OK with flash and indoors and outdoors. Usually the images will still be fairly blue in shade and pleasantly warm indoors at night. When the flash is on most cameras automatically switch to flash white balance.

The fun starts when you take it out of AUTO and set it yourself. Here's what the other settings do:

Tungsten (symbol of a light bulb also called "indoor"): Very, very blue most of the time except indoors at night, for which it looks normal. "Tungsten" is the name of the metal out of which the bulb's filament is made. Even indoors many people prefer the warmer AUTO setting. **TRICK**: Set -1 or -2 exposure compensation and use this setting in daylight to simulate night! In Hollywood we call this "day for night."

Daylight (symbol of a sun): Bluish normal. This is a little bit bluer than I usually prefer. Only use it for shooting test charts in direct sunlight.

Cloudy (symbol of a cloud): I prefer this. It's a little warmer than the daylight setting and best for most shots outdoors in direct sunlight. Why not the daylight setting? The camera manuals are written by engineers, not artists. The engineers are interested in copying color test charts, not making a good photo. I prefer things on the warmer side.

Flash (symbol of a lighting bolt): Almost identical to cloudy but sometimes redder depending on the camera. Use this the same way. On Nikons like the D70 you usually can set separate fine-tuned adjustments for each setting, so you can set different adjustments under cloudy and flash for quick access. This is optimized for the little on-camera flashes that tend to be blue, thus this setting tends to be warm to compensate. With large studio strobes you probably don't want to use this, since the images may be too red. Try the Daylight setting to match carefully daylight balanced studio strobes.

Shade (symbol of a house casting a shadow): Very orange. This is perfect for shooting in shade, since shade is so blue. It's also for shooting when you are under a cloud on a partly cloudy day since most of the light is coming from the blue sky. It's also for shooting in

backlight, again since the subject is lit more by the blue sky instead of the direct sunlight. **TIP**: Some cameras skip this critical setting. If so, manually set the CUSTOM preset while in shade (also called one-push, Manual and white card and other things depending on manufacturer) and use this setting in place of the missing shade setting. **TIP**: I often use this mode even in direct sun when I want to make things look warm and inviting. Try it and you'll probably love it. The SHADE setting is a professional secret for getting great images, pass it on!

AUTO White Balance

SHADE White Balance

Example under ordinary shade. The skin looks much more warm and natural with the correct SHADE setting. I have never seen an AUTO setting that adjusts correctly for shade. These were made with a pocket camera.

AUTO White Balance

SHADE White Balance

Example under warm afternoon sunlight. I prefer the even warmer tones from the SHADE setting. These were made with a DSLR and an 81A filter.

Fluorescent (symbol of a long rectangle or Fluorescent tube): Use this if your photos are too green or under Fluorescent, mercury, HMI or metal halide lights as you might find in street lights. It will make other things look a bit purplish. With Nikons the fine-tuning adjustment (+-3) is much stronger in this setting and adjusts from fairly warm to fairly cool. Because of this you may not be able to get the exact color you want under Fluorescent lighting, in which case try AUTO or preset.

Fine Tuning (+3 to -3): Color is critical. The basic settings above get you close, but probably not exactly what you want. These fine adjustments allow you to get the exact amount of coolness or warmth. + is cooler and - is warmer. Nikons allow you to adjust this and remembers your preference for every setting while the Canons often skip this. Without the ability to fine tune these settings I find the Canon Rebel, 300D and 10D cameras not very useful. One can even fine tune Nikon's AUTO setting. Most photos on my D70 are made in AUTO -3.

Manual, Custom or Preset (sometimes a symbol with a dot and two triangles): This allows you to point the camera at something you want to be neutral and it makes it that way. Read the manual to your camera for specifics. Usually the camera sets itself to what's in front of you. Some cameras also can set themselves to something in an image shot previously**. TRICK**: Set it pointed at something colored or through a colored filter and your resulting photos will have a color cast opposite the color to which you set it! Set it on something blue and photos come out yellow, set it on something purple and the photos come out green. Point it at something warm and you get cool and vice versa. You even can buy specially tinted "white" cards for this and see examples here.

You use this setting if you have some weird light that otherwise you can't get to look good. I rarely use it, since auto does almost the same thing and makes it much easier.

MORE TIPS:

Indoor Sports

When shooting under fluorescent or mercury lighting the color of the light may actually change hundreds of times a second as the AC power cycles. This is no problem with long exposures. On the other hand shooting indoor sports this drove me completely insane until I figured this out. I was shooting at ISO 3,200 and 1/500 of a second. Exposures and color were very different from frame to frame and I had no idea why until I realized that the lights by design were flickering 120 times a second from the 60 Hz power. There is no way around this other than to retrofit the arena with high frequency ballasts for all the lights or otherwise replace or overpower the arena's lighting. We use high frequency ballasts for our HMI lights in Hollywood so we don't get beats with the 24FPS film cameras, but its expensive and not done in stadiums. Good luck!

Flash Indoors

What setting do you use for fill flash under tungsten light? If you use AUTO or Flash you'll get orange backgrounds and normal subjects, and this is pretty good. If you are shooting under fluorescents you'll get a nasty green background with normal looking subjects, not good.

If you change the white balance to tungsten or Fluorescent the backgrounds will look normal, but now the fill light on the subject will look blue or purple. Not good.

Here's the trick from Hollywood: you need to gel (filter) the flash to match the ambient light and then set the white balance for that ambient light. Now everything will look normal. You could gel all the ambient light to match the flash instead, but that's a lot more work since there's a lot more lights. In Hollywood movies we'll spend a day gelling all the different

kinds of lights and even gel set windows to make outdoors match tungsten. (The funny part is Hollywood is still based on gelling everything to tungsten, since that's the film we shoot, but almost no lighting is tungsten anymore.)

The best place to buy gel filters, which are just colored sheets of plastic, is your local theatrical stage and lighting supply store. They are a couple of feet on a side and cost a few bucks each. You cut them with scissors and tape them where you need them. Popular brands are Roscoe and Lee. You can get a free sampler from these stores to try out which color works best before you blow a whole few bucks on a full size filter. In the stage world we worry about selecting from among the hundreds of colors they offer. Get the book for cinegels color conversion and corection filters.

How to Change the White Balance of an Existing Image

SUMMARY

That's it. I have no idea why people make this so complicated. Just use what looks good.

A1/2 White Balance Examples

see also White Balance (page 44), How to Change the White Balance of an Existing Image and The Expodisc.

Note: The last row of each shows the WB setting in degrees Kelvin, or K. Tungsten is the same as 3,200 K, Daylight is the same as 5,400 K, Cloudy is about 6,000 K and Shade is about 7,500K.

Explaining where and why we calculate Degrees Kelvin is complex so I'll skip it, but what it does is easy to remember: the more degrees set in WB, the warmer the image looks.

Direct Sunlight (Outdoors)

Here Auto WB does a perfect job, as does the Direct Sunlight setting. We expect this.

You can use the other settings for a cool blue or deep orange effect, or to trim blue and amber any way you prefer.

Shade (a white car in an open garage)

Auto again does a great job, otherwise this would turn out too blue. This is from a D200, which does much better than my D70 and other cameras at compensating correctly for shade. Most other cameras leave this too blue. No problem, on other cameras set Shade manually.

Tungsten (conventional light bulbs in my refrigerator)

This looks a little warm in AUTO. The tungsten setting looks better. The 2,500 K setting is also good, if not a little too blue.

Most Auto WB settings balance correctly for tungsten if you have a bright tungsten light source in the image, or a lot of illumination. With less illumination most Auto WBs don't compensate completely and stay a bit orange. This is deliberate: they presume high light levels mean studio lights and that you want perfect accuracy, and that at lower light levels you'll prefer a pleasant warm tint to interiors.

Refrigerator bulbs are usually warmer colored than this. In this case I had some blue skylight filtering into my kitchen.

Indoors at night, low-wattage tungsten bulbs

Home lighting, especially lower wattage bulbs, are much warmer looking than 3,200 K studio lights. These 40W bulbs look right at about 2,500 K! Auto WB never can balance this low - it stays orange.

Of course the orange effect may be desired. If so, use it.

SUMMARY

That's it. I have no idea why people make this so complicated. Just use what looks good.

A2 All About Exposure

See also Digital Exposure (page 57), The Nikon Matrix Meter (page 60) and Perfect Exposure with Large Format Cameras.

INTRODUCTION

Exposure is the easiest thing to master, yet causes the most confusion.

Exposure is simple. Just add or subtract until it looks right.

You need to experiment to know how much to add or subtract in different conditions. A fear of experimentation is what stalls most beginners. Just like sighting in a new sniper rifle, you always make tests first so that you nail your target with your first and only shot every time.

Once you make a few tests in different conditions you'll always know how to get perfect exposure every time. Try every possible condition in advance and you'll be prepared for everything.

EXPOSURE MODES AND METERING

Want to know a professional secret? I always shoot in Matrix metering and Program automatic! I only revert to manual exposure in rare cases where I really need to lock down an exposure in changing light.

I never use center weighted or spot metering!

When I need to make something lighter or darker I use the exposure compensation control with my camera in automatic. Every camera has a compensation control or buries it in a menu.

HOW-TO: DIGITAL

1.) Make a shot.

2.) Look at it on your LCD.

3.) Adjust Exposure Compensation until it looks perfect.

This seems silly, but you'd be amazed how many beginners are afraid to take control and spin that compensation dial. Usually only one or two thirds is all you need, but in some cases like interior photos with open windows you might need to use a few stops. Don't be timid, just adjust it until it looks correct.

Many compact cameras and some DSLRs may always be a little off. In these cases just leave the compensation set where it works well. My Canon A70 point-and-shoot is always left at -2/3, since as it ships that model tends to overexpose.

With experience you'll recognize the few kinds of scenes which require compensation and you'll be smart enough to adjust the compensation before making the first shot. Thankfully many cameras today, especially the matrix meters on Nikons, are usually correct more and more often. That's a reason I love my Nikons; they are very hard to fool and don't require much twiddling, which saves time and lets me make more great images.

HOW-TO: FILM

Same as digital above.

The only catch is that you have to get film processed between steps 1 (shooting) and 2 (evaluating). You then apply any correction on your next shoot.

With film it takes more experience to learn what works where, since you always have to have done your homework in advance.

The only things that fool modern meters are light subjects in subdued light, or completely black subjects with no background. In sunlight or with a background there's no problem, but in less light the camera just can't tell that your subject is white. With my F100 I knew to add +1/3 or +2/3 for light subjects under clouds. You learn that by experience

Professionals used to use Polaroid film to gauge their exposure. Today I just use a digital camera! You of course need to make tests the first time to correlate your film results to the digital camera. I explain that here (page 87).

WHAT YOU CAN'T FIX

You can fix exposure. Exposure can't fix bad lighting.

If there is too much range between light and dark then no exposure will look correct.

If the shadows are too dark use fill flash, reflectors or wait for the light to change to lighten the dark sections.

To darken the highlights we use scrims, or dark screens, placed between the light source and the subject. Scrims don't affect the shadows.

THE ZONE SYSTEM

Knowing the zone system is helpful, but not mandatory, as you learn all this. See my page on the Zone System (page 69).

LIGHT METERS

I use what's built into my camera. It's better than an external meter because it looks through my lens and filters. The only people who tell you that external meters are better are the people trying to sell you light meters.

For cameras lacking a built-in meter I use a digital camera and look at what exposure it

used. See my page on how to use a digital camera as a light meter (page 87).

Today I only use my handheld meters for their calculator dials to convert the readings from the digital camera's ISO to the reading I need for my film's ISO. I use the hand-held meters reading only as a sanity check.

See also my page on light meters (page 77).

FINAL RECOMMENDATIONS

Have fun! Just shoot a lot and know that it's normal to need compensation. Be bold and just make your images as you want them. Never think that the meter is responsible for a correct exposure. It's your responsibility to know your meter and interpret its readings as needed.

A2/2 Correct Digital Exposure page and Do Nikons Underexpose (page 57)?

See also Exposure (page 50) and The Nikon Matrix Meter (page 50).

INTRODUCTION

Correct exposure is different for different kinds of film and very different for digital.

Because of this there is a lot of confusion over what is correct exposure.

Let me explain.

BASICS

Exposure

Exposure is the lightness or darkness of a picture. That's the easy part.

The confusion starts when people misconstrue exposure as an absolute.

It's not.

Correct exposure depends on what you're going to do with any given file or film.

Correct exposure also depends on the subject's lighting ratio (range from light to dark).

Exposure Latitude

Exposure Latitude also is not an absolute. Latitude, or how far off your exposure can be and still be acceptable, depends on all the factors above. Latitude is your room for error in

making exposure.

Latitude is broad if your subject has little contrast and if you will edit the image before use.

Latitude is the amount by which your camera's dynamic range exceeds the range of the subject, if and only if you have the opportunity to edit the image before final use.

There is very little latitude if you're using a digital file or transparency as-is. Digital files need to be within 1/3 of a stop if you use them as-is! Luckily most cameras are this good today.

Latitude slims as subject contrast increases. *Latitude evaporates when your subject has too much contrast. When this happens there is **no** correct exposure.* It looks bad no matter how you set the exposure. This stumps many beginners. Many times we encounter subjects with too much contrast to be captured without modifying the light.

If there is so little to no latitude today, why do people still discuss it as if it was helpful? Black and white negatives were 99% of photography for the first 150 years of photography. Color only went mainstream in the mid 1970s and digital has only been popular for the past 48 *months*. B/W negatives have always had broader range than almost any subject. You could overexpose five or ten full stops and get great prints, if you were willing to expose the paper long enough. Old timers take latitude for granted. Digital has no tolerance for overexposure, although, unlike film, it takes a couple of stops of underexposure easily.

Subject Contrast and Lighting Ratio

*If the subject's contrast exceeds the brightness range of your digital camera or film, there is less than no latitude and there is **no correct exposure**!* These images look awful no matter how you set the exposure.

An example is photographing indoors and expecting to see both the room's interior and the view out the window.

This confuses beginners. Beginners waste time with hocus-pocus get-rich-quick Photoshop schemes like HDR (High Dynamic Range) compositing to attempt to turn crappy light into a good photograph.

Good photographers modify the lighting to make the subject photographable. Add light to the dark parts with fill flash or other lighting or reflectors, dim the bright sections, or both. Bright windows are dimmed by putting gels (sheets of gray plastic filter material bought at stage and movie lighting supply houses) over windows. Scrims (black mesh cloth mounted in frames) are used to dim the light falling on something outdoors.

This is why you'll see all the things you do on a movie set. That's the lighting and rigging required to make a scene photograph naturally. Shooting in available daylight looks horrible and amateur: shadows in people's eye sockets look completely black on film and make people's heads look like skulls while sun shining off foreheads make everyone look bald. Fill the shadows with fill flash or a white reflector and dim the direct light with a scrim held above and out of the picture for pro results.

End Use

If you're using a digital file for direct printing or a transparency for projection or this is easy. Just make it look right.

If the subject contrast was too great there is no correct exposure. You could lose your highlights *and* your shadows at the same time! At best you might retain either one, but the photo is still awful.

Optimum exposure is more complicated if you're editing the file before printing or scanning or printing the transparency. In these cases you need to understand your use and your medium before you make your image.

It's critical to preserve the highlights. Shadows are trivial to pull out in digital, and vary from transparencies depending on your scanner.

Overexpose the highlights by as little as a third stop in digital and they're lost forever. Slides are much easier: you might have a full stop of wiggle room. Luckily this is easy to avoid in digital: look at a full RGB histogram and you can see if the highlights are lost. Beware: single-color histograms are less than useless, since they usually miss blown out highlights! See my RGB histogram (page 83) page for more.

Do Nikon Digital SLRs Underexpose?

This is why I wrote this article.

When I first used a Nikon D1X in 2001 I thought it was awful. If there was an open window in an indoor shot it would underexpose horribly, or so I thought.

I was wrong. The shot looked dark because the D1X was exposing to preserve the highlights. I was being a bad photographer having too much contrast and not doing enough to add fill flash.

Digital cameras are supposed to make images look dark in high-contrast situations. You easily can resuscitate the image in Photoshop's Image > Adjustments > Shadow/Highlight tool.

If the highlights were blown out instead, they're left as white blobs forever.

Many beginners think their cameras are underexposing. Nope. These photographers are trying to photograph under crappy light. Turn on your flash to fill the shadows and see what happens. Magic.

Nikon cameras are very smart. My D70 turns on its "Use Flash" bolt in broad daylight when the contrast is too high. I'll bet you you ignore the "Use Flash" bolt in these conditions. Nikon's flash bolt isn't a low light idiot light: it also warns of excessive contrast!

If you use fill flash and see the bolt blink rapidly right after your shot that means that the flash ran out of power and the image may still be dark. Use a bigger aperture, get closer or use a more powerful flash and you'll fix the problem far better that trying to pull your image

out of the mud in Photoshop.

If you're shooting in crappy light and intend to print directly from the files without editing, use the exposure compensation control to dial in as many stops as needed. I've had to use several stops of + (lighten) compensation in these instances.

Another source of confusion is the incorrect use of the Matrix Meter (Evaluative Metering in Canon). Dark filters, like polarizers, often fool the artificial intelligence of these meters and lead to underexposure of light subjects in daylight. More at my Matrix Meter (page 60) page.

Negative Film

Negative film gets little use today, so I excluded it from the above. It exposes completely differently than anything else.

There is no way to direct-view the exposure of a negative. The closest way to see a negative is to make a "perfect proof," which is a contact print made with the minimum amount of exposure required to make the unexposed film edges print as dark as the paper can get. You determine the correct print exposure by making a test strip. Look at the edge of the unexposed film against the black of the paper. Use the exposure time of the first bar in which the black of the edge of the film matches the black of the paper.

Contact sheets or prints in which the edge of the film looks less black than the rest of the paper have been underexposed, and that tells us that the negatives are also underexposed.

A2/3 The Nikon Matrix Meter 19 August 2001

Caution: If you shoot print film the exposures you see on your prints has *nothing* to do with the exposure you made in the camera. Exposure is an issue of your one-hour lab's jr. high school technician, not your technique or your negative. *Ignore* this section *entirely* or shoot transparencies instead. Only by shooting transparencies or doing your own lab work will you be able to control your final results.

If you are having exposure problems with your prints it most probably was how they were printed, NOT how they were exposed.

If you see muddy, dull, grainy or light shadows with no detail in your prints then you have an underexposed negative; otherwise, the only reason a print will be too dark is if it was printed incorrectly.

INTRODUCTION

The superior Matrix meter is the main reason to choose Nikon over other brands.

Nikon's Matrix metering, introduced as "Automatic Multi-Pattern" (AMP) metering in the FA camera in 1983, was the world's first meter that actually measured exposure, instead of just light. It is one of the most important advances in photographic technology. This meter

knows how to make white snow or sand look white, instead of a conventional light meter's making everything look medium 18% gray. It applies the zone system automatically to attempt to render a correct exposure under difficult and contrasty situations. When shooting in a hurry under rapidly changing conditions, which is the whole point of using a small format camera like a Nikon, there is no better way to meter your exposures.

An example of too much scene contrast midday.

No meter can correct for poor lighting or too high a lighting ratio. This confuses many into thinking that their meters are defective, even though the meter is perfect. If you have problems with highlights washing out even though your subject is well exposed, or with shadows going too dark even though the main subject is OK, your problem is with too much contrast in your lighting, not your exposure. For photographs with people, use your Nikon flash under all conditions and you will probably improve most of these problems.

Lighting is the most important technical and artistic aspect of painting, art and photography. Others have already written a lot about lighting, so I won't try to duplicate that here. I like to write about things you can't find anyplace else. It is imperative that you learn to be sensitive to the quality of light, and learn to be patient in waiting for it. This is very, very important!

All the other major SLR makers since about 1990 have imitated this meter under many different names. Canon calls it "evaluative," and most camera makers brag about it by specifying how many sensors they use. Even Leica attempts to copy it. Today's Leica R8 has about the same technical sophistication as the 1983 Nikon FA.

The number of sensors is unimportant. The wisdom that goes into the firmware that interprets the data from the sensors IS what's important.

The original Nikon FA had only 5 metering sensors. Today even the F100's Matrix meter works with the same 5 main sensors, and only adds the 5 spot sensors into the mix for fine tuning. Canon's excellent Rebel 2000 claims 35 sensors; I still prefer the Nikon meter's programming. The Nikon N90 had a whole bunch of sensors right in the very center of the image, which makes for an impressive number-of-sensors spec, but has nothing to do with the meter's ability. Nothing is wrong with the N90's meter; it's just that the N90 sounds like a toy when it runs.

The color Matrix meter of the F5 ought to be extraordinary. This is why Canon contract photographer Arthur Morris has said that the world's best camera is the Nikon F5. I have not tried it, because if I did I'm sure I wind up having to haul an F5 all over the place. I'm being obstinate by not trying the F5, you don't have to be. Meter accuracy is the most important aspect of image quality contributed by the camera, and why I shoot with Nikon.

This article refers to the conventional Matrix meter introduced in the FA in 1983 and continues to this day in all Nikon AF SLRs.

BASIC EXPLANATION

see full original documentation here>>

Guessing your subject type

The Matrix meter first tries to guess what you are photographing (the hard part) and then makes the appropriate exposure calculation (the easy part.)

You may have read that the Matrix meter compares the light reading to "over 30 million billion zillion onboard stored images" or some other baloney. Those images aren't in the camera. What the camera does do is use the experience gained from professional photographers and analyzing many, many photos (that's your 30,000 number) in order to help program the camera's firmware to recognize what sort of photo you are trying to make. Once it has classified your image it then can make the best calculations for your exposure.

The camera classifies images as shown on page 5 of the documentation.

Sunlit white values

These meters all also make use of a very important observation: the sun is always about as bright on a clear day as is it is every other clear day. If a camera sees something above the brightness of a gray card in sunlight (LV15), it knows that it is seeing something lighter than gray. It knows this because it is smart enough to know that the sun didn't just get twice as bright.

When it sees something that needs to be made lighter it deliberately "overexposes" compared to a dumb meter so that the light items look light.

This is simple zone system application; if the meter sees something two stops above where a gray card in daylight would be (LV15 + 2 stops = LV17, page A 33) then it knows to "overexpose" this section two stops, in order to make it look white instead of gray.

If the Matrix meter sees segments that are really bright, say anything above LV 16-1/3, it just ignores them. It knows that they represent bright highlights or direct sunlight, and should not use them to calculate exposure. It instead puts more weight on the other segments.

Absolute light levels

To guess your subject type and determine what really is white in sunlight the Matrix needs to know the absolute level of light *outside* the camera. Remember that the light *inside* the camera will differ from the light level outside the camera depending on the speed (f/stop) of your lens.

Therefor the Matrix needs to read the true f/stop of the lens. The FA camera read that with a special new lug on the back of AI and newer lenses. AF cameras read this electronically. Other cameras have not needed this, since they did not try to guess what sort of subject you were photographing and therefore were happy only knowing how much light made it through your lens to the film.

For instance, the Matrix knows how bright daylight is, so it knows if it sees something that is bright enough to be bright sand in full sun it knows to add exposure to make it look light and not just gray.

If the camera can't tell the actual maximum aperture of the lens then it can't determine absolute light levels and cannot do Matrix metering.

Absolute maximum aperture coupling

Manual AI lenses have a special internal mechanical coupling lug on the back of the lens that tells the F4 and FA what the exact maximum aperture is, like f/4 or f/2.8. All AF lenses have these same mechanical lugs for the FA and F4 (thank you, Nikon), and also have electronic contacts for the AF cameras.

Heck, the camera also wants to know the light falloff of the lens, and I think that's also coded into the depth of the mechanical lug. The camera uses this to get the right readings for the meter segments on the sides of the image. This is entirely different than the lug on the external aperture ring that tells the camera *relationship* between the aperture you set on the lens and the maximum aperture. I don't think any cameras were ever designed to read the falloff mechanically, just as AI lenses also have a mechanical lug to couple the focal length of the lenses to cameras that were never built.

All AF cameras read the f/number via electronic contacts. Except for the F4, no AF camera has a feeler to read the mechanical lug from the back of the manual lenses, and therefore all AF cameras (except for the F4) will revert to center weighted when you put a manual focus lens or teleconverter on them. This is a defect in the design of AF cameras probably designed to make you have to buy new AF lenses.

I believe that the AF lenses also tell the Matrix about the falloff of illumination so that it can more accurately measure the corners of the image.

Use with teleconverters

The only way to get real Matrix metering on an AF camera is to use a TC-14E or TC-20E (or the new "II" versions). These only work with the exotic AF-I and AF-S telephoto lenses.

There is no other way to get real matrix metering with other TCs on AF cameras other than the F4.

To get Matrix with the manual focus lenses on an FA or F4 you need a TC that has yet another feeler added to it to couple the absolute aperture information mechanically. The TC-201 has this coupling. The TC-200 does not. The manual focus TCs do not give either autofocus or Matrix metering when used on AF cameras.

Oddly this means that to get Matrix metering with any lens other than an AF-I or AF-S lens and a teleconverter you have to use the old F4 or FA and a TC-201 or TC-301 (or I think TC-14A or B). Otherwise you can't get Matrix with a teleconverter and any other AF camera!

When you can't get Matrix on a camera it defaults to center weighted if you have selected Matrix. Most AF cameras tell you this on the meter pattern indicator. The FA does not have an indicator for meter pattern.

From what I've seen, discount teleconverters like the Kenko PRO, Tamron, Sigma and Tokina do not properly couple the maximum aperture to the AF cameras and will confuse the Matrix on occasion, especially in bright light. If your TC lets you get to the marked maximum aperture on your AF camera you have *improper* coupling. An AF camera should only indicate one or two stops less maximum aperture in the camera than marked on the lens when the TC is used.

What about 3D metering and D lenses?

You can safely ignore this if you are buying your lenses used.

D lenses help the meter a little bit in guessing what you are trying to photograph. It has very little effect.

Because impressionable people mistakenly believe that D lenses serve some wonderful purpose you can get the perfectly good non-D lenses cheap today used.

In making deliberate tests of D and non-D lenses with the same subject at the same time I have seen no differences. The only time I've seen a difference is doing the one thing for which they are good: making of flash photos straight into a mirror.

The only non-D AF lens made today is the fine 50mm f/1.8 AF. It is a bargain.

3D meteriing may safely be ignored.

Color Matrix Metering

The F5 ups the ante by adding sensitivity to color. This, unlike 3D, is very important. This allows the F5 to make yellow as light as it should be, and red as dark as it should be.

Color, along with all the segments in the F5 meter, also allow the camera to guess what your subject is more accurately, which in turn allows the camera to apply a potentially more accurate metering algorithm to your photo.

This feature is unique to the F5 among all film cameras.

TIPS

When to use Matrix

The easiest thing to do is to trust the Matrix meter for everything; it will be correct more often than most people's ability to override a conventional meter.

To understand how matrix metering works requires a knowledge of the zone system (See books in reference section) as well as the EV and LV (page 75) systems. Once you understand those, then read the documentation on the meters. Nikon has not publicized this much today, which is unfortunate because without this information it is much harder to learn how and why the Matrix meter does what it does.

For technically fluent photographers the Matrix meter is very predictable and easy to compensate when necessary, but it is far more complex than averaging meters. This complexity is what makes the Matrix meter so good, but also what makes it so difficult to learn and why some photographers still don't trust it.

When and how to use flash

Use Matrix fill flash all the time unless you specifically don't want the subject highlighted or frozen in lower light. The Nikon Matrix' ability to balance flash and natural light is unbeaten. Use the SLOW REAR sync mode indoors to allow the background to look natural.

Use the Matrix setting, which on older flashes (SB-22, SB-23) is the default setting and on newer flashes (SB-28) is shown by the TTL symbol and a little five-segment Matrix symbol on the flash's LCD.

Make sure you have plenty of flash power and range in very contrasty places (like shooting into the sun), otherwise turn off the flash. Here's why:

In contrasty light the Matrix meter will reduce the exposure of the ambient light by as much as 2/3 stop to bring very bright highlights down to within the range of the film, expecting that the flash will fill the even darker shadows. This usually gives great results since you usually have enough flash power to fill the shadows.

If you are outdoors and contrasty subjects are out of flash range, turning on your flash can actually result in *as much as 2/3 stop underexposure* for the whole scene since the ambient exposure is reduced and the flash won't be able to fill in the shadows! Don't worry, you'll see the insufficient flash power indicator flashing if this happens. Just don't presume that only the fill will be too dark because you also may have the ambient light underexposed, too, outdoors. I wasted a few rolls one time shooting up into backlit trees and ignoring my insufficient flash power indicator (the rapidly blinking ready light) thinking that only the fill would be a little darker. All the shots were too dark; I should have just turned off the flash.

You can confirm this effect simply by pointing your camera at a very contrasty scene. Turn the flash on and off while observing the exposure indicated by the meter. You will see the exposure reduce when the flash is turned on in very contrasty light.

What about using AE lock in Matrix?

It works just fine. I do it, although rarely.

The Matrix meter works by first guessing what you are photographing (the hard part) and then setting the exposure accordingly (the easy part).

If you lock it to something else then it is much less likely that the meter can guess correctly what your real subject is. If you are deliberate enough to want to lock exposures it is better to do it with the center weighted meter.

The first Matrix camera, the FA, omitted the lock button for just this reason.

Subjects that can fool the Matrix

The Matrix meter has been fine-tuned for over 20 years. These are about the only subjects that fool it today:

1.) Predominantly light colored subjects not in direct sunlight. Since these are not bright enough in absolute terms (LV16 or above, page A 33) the Matrix cannot guess that they are supposed to be light. It will tend to render them as gray. If your subject has both dark and light areas the Matrix is fine. If the entire image is a white card in the shade then you'll still have to dial in + compensation to make the white card look white.

2.) Bright overcast skies. These are dark enough that the meter can't tell that you want them to look almost white in your image, because they are below LV16 (page 75). You will have to dial in + 1 or even +2 compensation if the bright gray sky takes up most of your image, say when photographing flying birds against the bright gray sky.

3.) Deep or dark filters. Remember that the meter needs to know the absolute Light Value (page 75) of the subject as explained above under "Absolute light levels." (page 62).

If you put a dark filter like a polarizer over the lens then you may fool the matrix into thinking that you have a different kind of subject because the transmission of the filter is *not* communicated to the Matrix meter.

If you put a filter over the lens you have just confused the matrix meter. Light filters, like a UV, skylight or A2 (81A) only absorb a third of a stop at most, so the worst-case error these filters will introduce is a 1/3 stop underexposure on snow or other very bright scenes. You can ignore this, and I do.

However, let's consider a polarizer with a 2-stop filter factor. With a polarizer your camera will see what it thinks is LV15 when looking at bright sand or snow, instead of the correct LV17. Because of this the meter can't tell that you have a bright sunlit white in your image, and you may get unintended underexposure.

I don't worry too much about this, but then again I don't often use polarizers.

Remember this if you have very bright conditions.

You may want to make a manual Matrix reading without the filter, AE lock that reading and then add that filter factor as a compensation value after adding the filter. Actually, if you are going to go to this much trouble you may as well just use a Pentax spot meter and a view camera, but this does illustrate potential problems.

This is another reason to choose Nikon brand polarizers: they only lose 1-1/3 stops of light, not 2 as most other polarizers do.

4.) Medium light items in sun, like California stucco. For things you want rendered as Zone VI, a light rendering but not white, some of the earliest Matrix and AMP meters rendered them a bit dark, closer to an 18% Zone V. In these cases you needed to dial in about +2/3 compensation. Modern (F100) matrix meters seem to be OK with these subjects.

Which cameras give matrix metering with which lenses?

All current AF cameras, and most older ones, too, give matrix metering with all AF lenses. None of them except the F4 can do it with manual focus lenses.

Nikon deliberately crippled the AF cameras, except the F4, so that they only give center-weighted metering with manual focus lenses. Nikon probably did this to encourage you to have to buy new AF lenses in order to get the very important matrix metering. The F4 AF camera and FA manual focus camera have mechanical encoders to allow these cameras to read the maximum absolute f/stop from a lug on the lens. This is required for the matrix to function. Since all other AF cameras lack these encoders they can't give matrix metering with manual lenses.

There are fringe factions who attach chips to manual focus lenses to trick AF cameras into giving matrix metering. These probably work.

Nikon adds chips to two manual lenses: the old 500mm f/4 P AI-s, and the new 45mm f/2.8 P, so that these two lenses uniquely give matrix metering on all AF cameras.

To get matrix metering with manual focus lenses use either the F4 AF camera, or the FA manual focus camera.

All manual focus AI and AI-s and AF and AF-I and AF-S lenses give matrix metering on the FA and F4. The only ones that don't are pre-AI lenses from before 1977.

Pre-1977 lenses that have been AI converted will not give matrix metering on the F4 or FA, unless one also adds a special lug to the back of the lens. You can have an ancient lens AI converted for about $25, but that same guy wants about $200 to add that special lug. Forget about it.

Also manual focus lenses only give manual and aperture preferred automation at best on the AF cameras. One does not get Shutter-preferred or Program modes with manual lenses on AF cameras.

The FA camera provides all the P, S, A, and M modes to work with all lenses newer than 1977. This is because Nikon is still good enough to ensure that all new AF lenses still provide all the mechanical lugs to couple to the older cameras. In fact, the latest AF-S 80-

200 f/2.8 lens not only works flawlessly on the FA camera, it also has the lug to put the FA into the high-speed program mode for telephoto lenses.

Next Page>

Look here for more info on night exposures

See factory matrix documentation here

A2/4 How to Use the Nikon Spot Meter

see also The Zone System (page 69) and Metering (page 77).

CAVEATS

Unless you really want to spend a lot of time learning the Zone System (page 69). FORGET the spot meter and just use Matrix as I do. I only use an external spot meter with my 4x5 camera because I have to. I never use the spot meter in my Nikons. The Matrix is the main reason I shoot Nikon. I use Matrix almost all the time. You have to be quite a virtuoso in the Zone System to get better results using the spot as opposed to the Matrix meter, and then it still takes more time.

If you just want to measure a small area, you are better off using the center-weighted meter. The spot meter is too narrow to give reliable results useless you are fluent in the Zone System.

This is mode only for slide film. If you are shooting print film then use Matrix and forget about spot metering. Unless you print your own negatives or shoot slides you won't see the difference.

Most people will get poorer results using spot metering because one needs either ideal subjects (for which the spot isn't needed anyway) or fluency in the Zone System (page 69).

I never use the spot meter in my Nikon. I use Matrix and know how to use exposure compensation.

One cannot simply point the spot meter at the subject and get a decent result, because the spot is so small it will most likely point at something darker or lighter than the proverbial middle gray (zone V) and give you an poor exposure. In these cases you will get a very biased and incorrect exposure.

In fact, many subjects have no middle gray, making simple use of the spot meter impossible without knowing the Zone System.

The Zone System is a fancy-sounding system that simply means how much deliberate over- and under- exposure you need to give to dark and light areas of your image to make them look right.

The best way to learn the zone system is to read this Ansel Adams book. That's how I learned. Before going any further you need to know the zone system. Go learn it either by Ansel's book or my page here, then we'll get to the next section.

Presuming you know the Zone System:

HOW-TO

Put the camera on Manual exposure and point the camera around while looking at the exposure bar graph. That's right, to use the Zone System you have to be very systematic and the auto modes (my usual favorites) are not the way to go.

You adjust the manual exposure so that the elements of your image are exposed, according to the bar graph, as you want them to be rendered on film.

Zone II = -3 stops
Zone III = -2 stops
Zone IV = -1 stop
Zone V = +- 0 stops
Zone VI = +1 stop
Zone VII = +2 stops
Zone VIII = +3 stops

On many Nikon cameras like the F100 one gets only a maximum of +- 2 stops on the bar graph unless the camera is set to 1/2 stop intervals in the custom settings.

Here's where the art comes in: you are in charge. It is up to your aesthetics to determine just how you want your image to look. You need to think as a painter and ask yourself with what tone you want a certain part of the image rendered. As I said, the spot meter is not easy since it only works reliably as part of a Zone System approach.

Presuming you know the Zone System as required for using the spot meter, you know that anything darker than -3 stops or brighter then +3 stops turns completely black or white. You often will have scenes where the highlights and shadows are too dark or light. Zone System people know what to do in these cases (hint: change the light!), and again I refer you the Zone System (page 69) page or Ansel's book for details.

A2/5 The Zone System

INTRODUCTION

Zones are levels of light and dark.

A Zone System is a system by which you understand and control every level of light and dark to your best advantage. It works in digital just as it does for sheet film. Having a system allows you to understand and be in control, instead of taking whatever you get. Ansel Adams was asked in the 1950s if he thought the Zone

System was still relevant in that then-modern world. He replied "If you don't use the Zone System, then what system will you use to know what you've got as you photograph?"

There are many ways to evaluate what you'll get in your final print or display as you photograph. The Zone System is one way to get a handle on everything. When you know what you're going to get you can make changes as you're photographing to optimize your final prints.

The Zone System applies as much to color, digital and video as it does to black-and-white. Ansel Adams even shows us in The Negative how to use it with point and shoot cameras!

Ansel Adams chose to divide the range between white and black into about ten zones. Each is an f/stop apart. Color film and digital tend to have fewer zones, but that's not important. What's important is understanding how these zones relate to one another and how they change as they go through each step of any photographic process.

From the 1920 through the 1960s The Zone System usually required weird film developing, since people developed sheet film one shot at a time and printed on fixed-contrast papers. It was a pain.

In the 1970s through today the Zone System for film became more involved with printing as people tended to shoot rolls of film that are developed all at once and print on variable contrast paper.

With digital in the 2000s the Zone System focuses more on understanding how digital cameras respond to different levels of light and dark. The Zone System is the basis of understanding PhotoShop's Curves command. With digital cameras you set contrast in-camera, or do as I do and let the camera do this automatically.

The biggest advantage of understanding a Zone System is understanding what's going on. You'll be able to concentrate on making great images instead of worrying about petty things like technique and exposure.

Digital cameras no longer require spot meters. Spot meters were used to evaluate subjects before they were photographed. It was the only way we had to predict exactly how to expose, develop and print before we made an exposure on film. Today we have histograms and LCDs instead. Today I use a digital camera instead of a spot meter (page 87) to evaluate this better than a spot meter for my view camera!

That said, let me offer that the rest of this page was written in 1999 when I wrote it to apply to color slides.

The Zone System allows you to get the right exposure *every* time without guessing. It does not require you do any special film development and you never have to waste time with bracketing. Now aren't you interested?

The Zone System is very important to understand, especially for color slides.

Today the Zone System is the careful and analytical setting of exposure. Almost no one does special development for each negative any more.

I learned it all from Ansel Adams' book "The Negative." He covers the Zone System for use with color film and point-and-shoot cameras, too.


Ansel Adams, "The Negative"

Ansel worked in the days when everyone shot sheet film developed individually by hand, and when the only decent papers were fixed contrast.

Therefore of course he suggested screwing with the development of each sheet to print on grade 2.

Today most people shoot color or roll film and variable contrast papers are among the best papers available. Therefore custom development of each image just isn't happening! **Today we usually use standard development and vary contrast in printing.**

Even Ilford recommends today what I do for color and B/W negatives: ensure you get enough exposure in your shadows, develop your film normally, and then use variable contrast paper for your prints if you need to.

For color one always uses standard development. The colors get very screwed up of you try to vary development times. I have tried with Velvia and guess what: the overall contrast remains almost unchanged with even a plus or minus two stop push or pull! The DMax and shadow level changed, but the contrast of the active image was about the same. Worse, the color balance goes a nasty cyan with a pull. Color takes on a nice warmth with a push, although I only push when I need speed.

Here are my quick suggestions:

METERS much more here (page 77).

If you are shooting a modern SLR, use your built in meter in Matrix (Nikon) or evaluative (Canon) and forget about most of this. You will need to know when to compensate you meter a bit, but otherwise all Matrix and evaluative systems incorporate the Zone System automatically.

I have a page on how to use the Nikon built-in spot meters here. (page 68).

If I am shooting a camera with no meter, I use the same meters Ansel did, and you can still buy them today. I use either the Pentax Spotmeter V (analog) or Pentax Digital spotmeters. The digital one is smaller and I use it today as Ansel did at the

end. The analog model is more precise and easier to read and interpret, however it is bigger and more delicate. The Pentax meters are superior to the complex, confusing and more expensive Gossen and Sekonic models.

COLOR NEGATIVES

For the color negatives shot by most amateurs just set the camera on automatic and GO! The films today have so much latitude that you just can forget it. Honest, I have tried shooting the same scene at normal and FIVE STOPS overexposed on Fuji 800 and in my prints I can't tell which was which. Never underexpose, that will lead to murky dull shadows. Overexposure by a couple of stops may increase contrast and saturation a little. If color is as important to you as it is to me, unless you print your own work, shoot slides and not prints. See the film page for that info.

B/W NEGATIVES

The same applies as it does for color! Amateurs worry far too much about this. I suggest adding one more stop to your exposure and adding a yellow filter. Try this and be amazed! Details are on my film page starting here.

If you want to get deeper into it, I suggest using your spot meter and setting the darker part of the image to -1 or -2 stops exposure, which is the same as saying Zone IV or Zone III. See more at the bottom of this page, too.

COLOR SLIDES

For now, what you need to know is that if you use anything other than a modern SLR Matrix or evaluative meter, that you need to add or subtract exposure depending on how bright or dark the subject is. Use the spot or center weighted meter and add exposure for light subjects or areas, and subtract for dark ones. SIMPLE!

Here's how much to add or subtract with the center-weight or spot manual meters:

-3 stops (Zone II): Your slide film goes pretty black here. Don't do this unless you want something pretty much completely black. Yes, you can see some detail on Velvia even at -4 stops (Zone I), but good luck trying to print it.

-2 Stops (Zone III): Normal shadows in landscapes are set here. You will use this a lot. This is about as much underexposure you can use and still have detail. For instance, make a spot reading of the shadow and set your camera to underexpose that shadow spot by two stops. If you are lucky everything else will fall into the proper exposure. You don't really need luck: use your spot meter to make sure that at the exposure you set that everything else falls where it ought to per this chart.

-1 Stop (Zone IV): Very few things are set here. This is a dark middle tone, like a red painted barn.

Normal exposure (Zone V): This is where you set middle tones or a gray card. Sometimes the north sky is set to normal (+-0). Oddly, in many scenes there is no

middle tone, which is why spot meters usually cannot be used without knowing the zone system. Sometimes green grass falls here.

+1 Stop (Zone VI): Medium light parts of an image. Skin and granite rocks go here. For most landscape photos you'll set your light rocks here, and the shadows at -2 stops. Bright yellow is set at +2/3 stops.

+2 Stops (Zone VII): White things like snow and sheets of white Fome-cor are set here.

+2.7 Stops (Zone VIII): This is where slide film goes clear.

This is how the zones of the classic zone system correspond to the analog bar graph on your exposure meter:

Zone II = -3 stops
Zone III = -2 stops
Zone IV = -1 stop
Zone V = +- 0 stops
Zone VI = +1 stop
Zone VII = +2 stops
Zone VIII = +3 stops

If you are lucky, all the elements in your image will fall within -2 to +2. Usually they won't. Sorry.

If your spot meter tells you that the shadows are darker than -2 stops that simply means they will be fairly black, and if the whites get too much hotter than +2 that they will be completely white or clear.

Slide film usually goes clear at +2.5 stops. It usually starts getting pretty murky at below -2 stops, although you can still see things down to -4 stops on Velvia.

You need to think as a painter does and ask yourself at what level of tone you want each part of your image to render. You need to be in control, and the Zone System lets you be in control. Otherwise you'll simply be gambling that your images will "turn out." With the Zone System you will know when you need to alter your lighting.

Problems

There will be plenty of occasions in nature where God is not putting the light range where you want it. The Zone System is useful here because it tells you before you waste a lot of film that you are probably going to get garbage and thus you can plan or change the light or filtration accordingly.

What do you do if the lightest and darkest parts of the scene are beyond the range of your film, typically +- 2 or 3 stops?

Simple: you have to change the lighting somehow. If you have a very high-contrast scene there is no correct exposure and you will never get what you want.

This is where many amateurs get lost: exposure cannot correct for bad light. OK, nothing can fix bad light. You have to wait for it. Photography takes patience. You can try a graduated Neutral Density filter which often helps bring down an overly bright sky or too dark foreground. Here's an example of one.

Some people try to tweak development to compensate for crummy light. It's much better to fix the light. Ignore the temptation to tweak development; this is why we in Hollywood pull up three trucks of lighting equipment to light a scene outdoors.

If you do your own developing the Zone System gets far more complex if you want to adjust the exposure and development to attempt to fit the range of the scene into the range of the film. This used to be popular in B/W before good variable contrast paper was available, as in Ansel's day. Today B/W shooters make sure that they expose enough for the shadows (make sure everything for which you need detail is exposed at not less than -2 stops) and then use a lower contrast setting for their paper.

If you're asking, no, I have no idea how Ansel got ten zones. Today we only get about seven. OK, actually I do know how he got ten zones: Ansel used less development and slower speeds for his negatives than the manufacturer's ratings. We can't do that with color today. You can do this in B/W, and you have to do a lot of custom testing and developing.

In Ansel's day everyone shot sheet film and used graded paper. Therefore it made sense to develop each sheet differently so it could print on grade 2 paper.

Today people shoot roll film (your Nikon or Mamiya) and need to develop the whole roll the same way. One uses VC (variable contrast) papers to control the contrast, not developing.

You always develop color the same way, unlike B/W. Changing developing times for color often messes up all the color balances.

I have pushed and pulled Velvia and saw little contrast change. The colors shift and the black level changes, but the contrast does not vary as does B/W film.

You have to change the light yourself or wait for God to do it. This is art. Only your heart can tell you what to do. You have to know at what level you want various light and dark areas to render, just as a painter has to decide what colors to take from her palette. There are no written formulae for good photos. Ansel covered this quite well in his books.

A2/6 What are LV and EV

Introduction

LV, Light Value and EV, Exposure Value, are terms used to allow easy discussion of exposure and light without the confusion of the many equivalent combinations shutter speeds and apertures.

LV refers to how bright the subject is. EV is the exposure setting on the camera.

You may have seen them if you like to read the fine print of camera specifications. They are used to specify ranges of light levels for metering and autofocus.

EV and LV follow an open-ended scale. Each one is one stop away from the next. In photography values of about 0 to 18 are commonly used. Negative values are perfectly valid, just very dark and only occur in night photography. LV 15 is full daylight, for example.

Each Exposure Value, or EV, represents any of many different but equivalent combinations of f/stop and shutter speed. For instance, 1/250 at f/8 is EV14, and so is 1/125 at f/11. 1/125 at f/8, one stop more exposure, is EV13, and 1/250 at f/11, one stop less exposure, is EV15. You don't need to remember these, they are on the dial of your exposure meter.

Understanding them will allow you to recognize common lighting values and guess correctly at exposures even without a meter.

This system is the correct way to discuss photographic light and exposure because it avoids all the confusion of f/stops and shutter speeds, if all you really want to discuss is light and exposure levels. it replaces the idiotic question I get all the time while shooting, "what f/stop are you using," which of course means nothing by itself.

LV, or Light Values

An LV, or Light Value, is a number that represents how bright a subject appears in absolute terms. It does not take film speeds or exposure into account. LVs are very handy photographic terms to use to describe lighting levels.

LVs measure light coming from a subject, or "luminance." They are not a measure of how much light is falling on a subject. In other words, the same light falling on a black object will have a lower LV than the same light falling on a white object.

Some light meters, especially spot meters like the wonderful Pentax Digital Spotmeter and analog Pentax Spotmeter V, read directly in LV. You transfer this number to a dial that, along with your film speed, reads out all the combinations of aperture and shutter speed that will give the correct exposure.

Here's a table of common Light Values associated with common situations. If you use one of the Pentax meters you will quickly start to learn these without even

needing the meter after a while. This is because the same number pops up for each subject each time. LVs eliminate the confusing issues of film speeds and f/stops that hide these simple truths when using SLRs or other light meters:

LV18 and above: Bright reflection off a sunlit object, including reflections off the sea
LV17 White object in full sunlight
LV16 Light gray object or skin in full sunlight
LV15 Gray card in full sunlight; typical exposure for ugly front-lit noon daylight photos
LV14 Typical light level for side-lit daylight shots in good afternoon light
LV13 Typical shadow cast in a daylight scene; cloudy bright days
LV12 California bright overcast
LV11
LV10 Dark, dreary overcast day in Boston, London or Paris
LV 9
LV 8
LV 7 Typical indoors; light outdoors about 10 minutes after sunset
LV 6
LV 5
LV 4
LV 3 Brightly lit night street scenes
LV 2 Typical night street scenes
LV 1 Dark scenes outdoors at night
LV 0 LV Zero is defined as the light level that requires a 1 second exposure at f/1 with ISO/ASA100 speed film.
LV-1
LV-2
LV-3
LV-4
LV-5 Scene lit by the full moon
LV-15 Scene lit only by starlight. I have loaded sheet film in light this dark, so don't expect to photograph it or meter it.

Some light meters use a similar scale, but shifted by a constant amount. For instance, the Gossen Luna-Pro uses a scale that reads 5 units higher, or reads 20 in full sun. It's still the same concept, and even those meters calculate the same Exposure Values, or EV, once you set your film speed. That brings us to:

EV, or Exposure Value

Exposure Value, or EV, varies from LV, or Light Value, depending on your film speed.

EV = LV at ISO 100

With ISO/ASA 100 speed film you expose with an Exposure Value (EV) equal to the Light Value (LV).

Easy, eh? Your meter will do this for you, but you can do it in your head, too, if you forget your meter. Here's how:

If you shoot slower film you of course have to use more exposure (EV) for the same Light Value (LV), and vice-versa.

The EV is easy to calculate even if you forgot your meter, since each unit is one stop different than the next. For instance, with film a stop slower than ISO/ASA 100 (like 50 speed Velvia) you just subtract one from the LV to get the EV. This adds one stop of exposure.

For instance, if your subject is at LV14, expose at EV13 with ASA 50 film. EV13 gives one stop more exposure than EV14.

With ISO/ASA 400 speed film you add two to the LV to get the EV, which is the same as subtracting two stops of exposure. Therefore with an LV14 subject you expose at EV16.

Remember that the higher numbers refer to higher light values, and therefore less exposure. This is because the exposure values that correspond to those higher numbers give less exposure.

EVs are a great idea: by talking about an EV you are talking about any one of many different combinations of aperture and shutter speed that give the SAME exposure. Cameras started to use these numbers in the 1950s, but today only the Hasselblad retains them. With every other camera one needs to use the scales on light meters to determine the EV values. Some cameras can be adapted, as I did to my Plaubel Makina 67, which simplifies their use with spot meters.

Zero EV is defined as f/1.0 at one second. Therefore, EV0 is a pretty long exposure. This is the same exposure as f/1.4 at 2 seconds, f/2.0 at 4 seconds, f/2.8 at 8 seconds and so on. EV1 is one stop less: f/1.4 at 1 second. EV 2 is two stops less: f/2.0 at 1 second or equivalent EV is a camera setting. It was popular in the 1950s to couple camera controls together so that once one set an EV one could rotate locked f/stop and shutter speed rings to choose between different equivalent settings. Today only Hasselblad continues the tradition. It is much easier to remember typical light conditions as a single EV number than combinations of camera shutter and aperture settings.

So what's the correct exposure for Velvia (ASA/ISO 50) in side-lit daylight? That light is LV14. Since Velvia is one stop slower than 100 we need to give it one more stop exposure, or SUBTRACT one EV from the LV to get the EV. Therefore, LV14 - 1EV= EV13. EV13 is 1/125 at f/8 or 1/15 at f/22. Light meters that read in EV have scales on the side that show you all the equivalent camera settings for any EV.

What tricks does this tell us? Well, in nature nothing gets brighter than something lit by full sun, which is LV15. If you see LV17 in your meter you know that that must be a white object in daylight. Guess what: that's how evaluative and matrix meters know that, too!

A2/7 Exposure Meters

see also

The Zone System (page 69)

Using the Nikon Spot Meter (page 68)

EV & LV (page 74)

INTRODUCTION AND BUILT-IN METERS

How to use a digital camera as an excellent light meter (page 87)

HINT: As of 2006 the best meter for any film camera is a calibrated digital camera. You can use a DSLR's LCD to preview the effects of lighting, light ratios, zone values, color temperatures and everything. It's like looking at a processed chrome on a light table. Once you get the look you want on the LCD you just transfer the exposure from the DSLR to your film camera! Be sure to read here (page 87) on how to calibrate it to your film camera.

The best meter is the one built into your camera. I always use the matrix meter in my SLR and shoot in Program Automatic. I only mess with handheld meters with my larger format cameras that have no meters built in. I hate using the hand held meters I address below.

If you aren't getting the exposure you want then adjust the camera's exposure compensation, which is usually marked as "+/-" on today's cameras or a dial that goes from +2 to -2 on 1970s - 1990s cameras. Buying a new meter won't fix that.

Built in meters usually read Through-The-Lens (TTL) and consider your filters' and lenses' light transmission which make them more accurate than hand held meters, unless you custom calibrate the hand held meters. Your efforts are probably better spent calibrating the camera's meter. The multi-pattern and matrix meters built into my Nikon and Canon film and digital SLRs and point-and-shoots are far smarter than any professional reflected or incident meter. Not only that, but today they're an integral part of everything the camera does, especially when it comes to White Balance and Flash.

This article is if you are shooting digital or slides. If you're shooting negatives (print film) then you can just guess at exposure unless you're printing yourself. If someone else is printing your negatives then exposure issues are almost always caused by bad printing and not your exposures, although the lab will try to blame it on you.

HAND-HELD METERS

Ansel Adams used a Pentax Digital Spotmeter. It's my favorite. It was sold new through 2005, and as of 2006 seems to no longer be available new. Before the digital meter, which has red LEDs at the bottom of its viewfinder, Ansel and I used

the larger, heavier, more delicate, more precise and less expensive Pentax Spotmeter V which uses an analog needle on a scale. They have the same accuracy, which is pretty much perfect. I have two analog and one digital spot meter and they all agree with each other. That's very unusual. Most meters never agree with each other. The Digital meter used to be sold here and the analog meter used to be sold here. I bought all three of mine used in the 1990s and they've all worked perfectly for years.

You have to use the Zone System (page 69) with a spot meter.

The Pentax Digital Spot V (analog) takes three S76 or A76 or 357 or LR44 etc. button cells. You can get these at Radio shack and every grocery store.

The Pentax Digital Spot takes an A544 or 4LR44 or L544 battery, 6 volts. You can pay $10 at the camera store, or $2.33 at Home Depot in the garage door opener department. The 544 is actually four of the above cells in a single case.

The orange mark on the shutter speed scale is 1/50 second, which you use in Hollywood for movies shot at 24 FPS with a 180 degree shutter. 180/360 times 1/24 = 1/48, close enough to 1/50.

The weirdest scale is the IRE scale that goes to 100. IRE stands for the Institute of Radio Engineers (!) who defined the scale back at the dawn of television in the 1930s and it is used to this day in video and television to measure the equivalent of the zone system. It is the scale over which you paste your zone system sticker. IREs go from 0 (black) through 50 (gray) to 100 (peak white). Why radio engineers? Simple: that's who invented TV back then. You couldn't have had TV engineers before TV was invented, could you?

There are other bigger, more complex and more expensive meters like the Sekonic, Minolta and Gossens. I find these too big and complex. In the zone system it's easiest to do everything on a simple linear scale, which you just draw or stick on the Pentax meters' dials. The more complex meters lack scales and try to do everything in their own internal computer. Good luck figuring them out; I never have and you probably won't either.

The Zone System is simple when you learn it. A complex meter only ensures you never will. The Pentaxes make it simple.

USING A CAMERA METER AS AN EXTERNAL METER (page 87)

A2/8 How to Use Histograms

INTRODUCTION

The best way to evaluate exposure is to look at the picture, not a histogram.

Histograms are a way to measure exposure more objectively for those who can't see very well. Histograms don't replace your eyes and experience. Histograms are helpful in sunlight where it's hard to see an LCD, or in the shop if setting something exactly. Your eyes are always the final judge.

A histogram is just a guide. Worry about your image more than the histogram.

HISTOGRAM BASICS

A histogram is a graph counting how many pixels are at each level between black and white.

Black is on the left. White is on the right.

The height of the graph at each point depends on how many pixels are that bright.

Lighter images move the graph to the right. Darker ones move it to the left. Easy!

More Pixels

Fewer Pixels

Black - Dark - Medium - Light - White

A Histogram

A good image often, but not always, has a histogram spread all over.

HISTOGRAM HISTORY

Histograms are rocket science. Histograms have been used for automated image evaluation and optimization in self guided missiles for decades. When Tomahawk missiles share America's freedom with millimeter precision, you can thank histograms. Raytheon calls this "Digital Scene Matching Area Correlation," or DSMAC. This all used to be classified.

You are smarter than a histogram. Use them as guides, not Gods.

COLOR HISTOGRAMS

Color histograms (page 83) are required for color digital photography. Many cameras lack these. I cover this later (page 83). If your camera only has a single histogram, like the Nikon D70s, D1X or Canon 20D, ignore the histogram! Single histograms are dangerously

misleading.

I use a single histogram as a simplified example. DON'T use a histogram to set exposure unless you have a color (RGB) histogram!

SETTING EXPOSURE

Warning: I show a single histogram to simplify. DON'T use a single histogram to set exposure! You need a color histogram, otherwise you may overexpose colored areas and not know it. Read on to Color Histograms (page 83) after you read this.

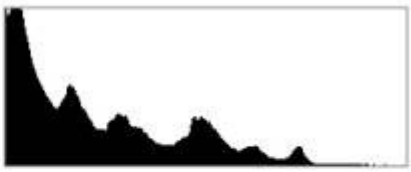
Contrary to your camera manual, the histogram doesn't have to be in the middle. Black cats in coal mines may only use the left half. Snow scenes may only use the right half.

The critical thing for which a histogram is helpful is to determine if any highlights have been clipped and washed out. Overexposure is death for a digital image. Histograms make this easy to check. If you have washed-out areas of 100% white (digital value 255) you'll see a tall vertical line at the far right of the histogram.

If you blow an image to smithereens you'll see more than just one line peaked on the right. You may see a train wreck!

-2 stops underexposure.

Even the whitest whites (the little hump in the middle) are medium gray. Everything else is dark and lumped on the left. This would be OK for a black cat in a coal mine, but not for a normal shot.



-1 stop underexposure.

Some very small highlights are reaching towards white. That's the very slight extension to the right.

Normal exposure.

The little hump on the right are the pixels corresponding to the white door. They are where you want them: close to white, but not clipped. The hump means the values are spread around a little bit, meaning you have detail and not a flat, washed-out door. You could give it a little more exposure and be OK. You'll learn from experience. that this is close enough, because even 1/3 stop more would clip. Look carefully and you'll see a few pixels indicated to the right of the hump at the brightest levels. These are specular highlights and are OK to clip in moderation.

+1 Stop Overexposure

See the subtle vertical line on the right in addition to the box enclosing the histogram? That what used to be the hump that was the white garage door! Overexposure smashed it into the right side of the histogram. It is washed out and clipped at 100% white instead of having detail.

Overexposure is shown on a histogram as this subtle peak on the far right.

-2 stops underexposure.

Even the whitest whites (the little hump in the middle) are medium gray. Everything else is dark and lumped on the left. This would be OK for a black cat in a coal mine, but not for a normal shot.

Reduce exposure if you see clipping. Try to get the histogram as close to the right side as possible without touching it.

If your scene looks too dark when you do this there is no correct exposure: the scene's dynamic range (lighting ratio) is too great. In these cases professionals will correct the lighting by adding fill light to the shadows and/ or using scrims to dim the highlights. Amateurs scramble to attempt to increase the dynamic range of their cameras using hocus pocus like my increasing dynamic range trick.

A little bit of clipping is OK on things like the highlights of sun dancing on water or the disk of the sun. Clipping broad areas like someone's forehead looks awful and often shifts colors. This is art and you'll have to learn what looks good to you. There is no law, so don't worry about being scientifically correct.

Look closely and you'll see a peak on the left at 100% black, even when overexposed. This is the dark shadow on the left of the photo. This shows that the camera's contrast needs to be lowered, or better still, add fill light in the shadows. This is why you would see three huge trucks full of electric generators and lighting equipment if this was a Hollywood movie shoot. It takes a lot of artificial lighting to make a scene look natural on camera. Cameras respond very differently than our eyes.

Usually an image is underexposed if no channel of the histogram goes all the way to the right. Images that are too dark are easy to correct later; just drag the right slider in Photoshop's Levels command to the left to meet the edge of the histogram.

Overexposed digital images are almost useless. Anything that washes out to white is gone forever. There is no way to drag Photoshop's Level slider to the right of the right side because there's no data out there beyond 255.

A2/9 How to Use Color Histograms

INTRODUCTION

I explain basics of histograms at How to Use Histograms (page 79). Read it first. This page

covers the specifics of color histograms.

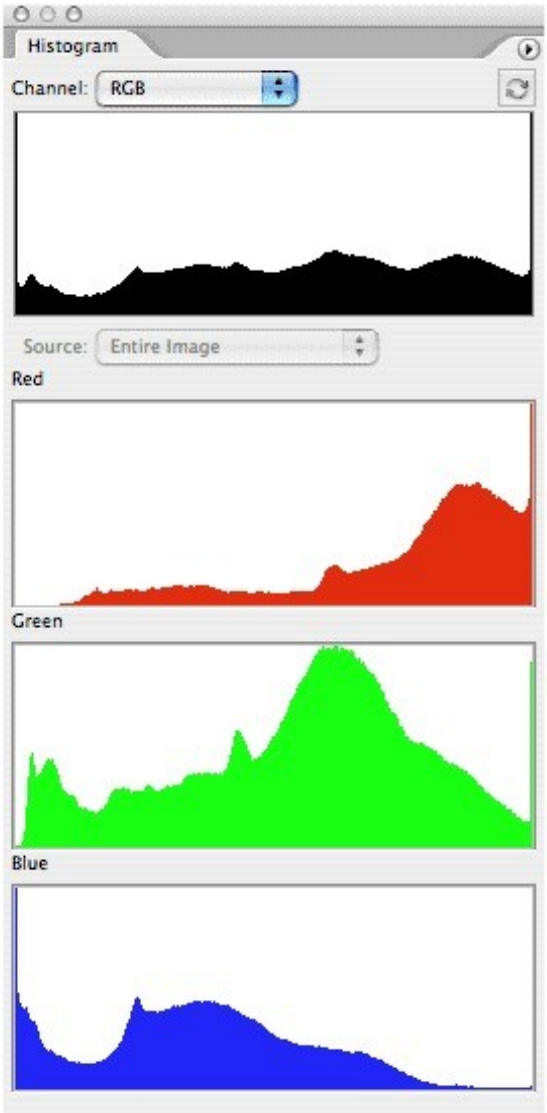
Color histograms are three separate histograms, one each for the R, G and B channels. They help determine correct exposure in an instant.

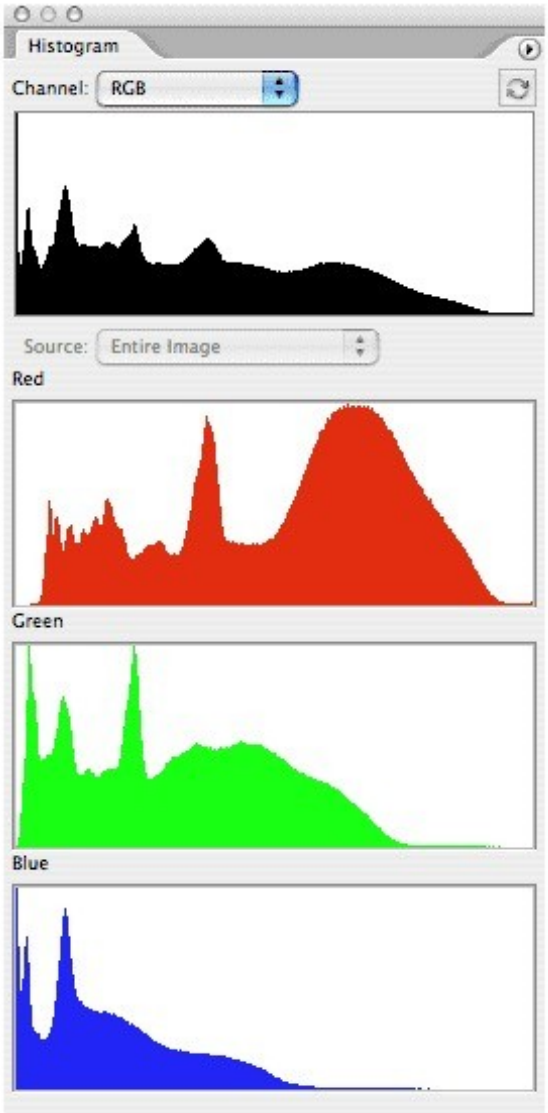
Single histograms, popular in many cameras, are misleading and worse than useless for color photography. This is because single histograms can indicate correct exposure while colored areas can be hideously overexposed!

WHY YOU NEED COLOR (YRGB or RGB) HISTOGRAMS

Overexposure with Nikon one-color histogram. Highlights look like cheese pizza.

Correct exposure set with full RGB histogram. Highlights look like wood.





Histograms in the left column: Nikons' single histogram only looks at the green channel. The green channel looks fine here. (Actually I need a better example because the green channel is a tiny bit overexposed as well.) The red channel, ignored by earlier Nikons and other digital cameras, is completely obliterated with overexposure.

Histograms in the right column: In this example all colors, especially red, are correctly exposed. This wood isn't that red. This problem is worse with more saturated colors.

Nikons have had a dirty little secret for years. All the earlier digital SLRs, which means the D1X, D50, D100, D70s, etc., only read a histogram for the green channel! These cameras completely ignored red and blue! This is easy to see: pull up the image in Photoshop and compare to the camera's histogram. It matches the green channel.

This is awful because any color other than green can overexpose and you won't know it from the histogram. Worse, if you don't look at the photo, the histogram alone can lead you to overexpose and destroy your images!

Newer Nikons, like the D200 and D2X, have color histograms. Even the Casio pocket cameras have them.

Most digital cameras have useless single-color histograms. I ignore them and look at the image on the LCD instead.

Ditto for blinking highlights: on cameras with single histograms the blinking is only looking at one channel. You can have gross overexposure that never blinks!

You need to have a histogram that shows each of the R, G and B channels. Single channel histograms don't show when just one color is overexposed.

Most camera makers call color histograms "RGB." I call them YRGB since they also show luminance, called "Y" by engineers, which is the combined value of R,G and B. Casio cameras and Nikon D200 and D2 series have full YRGB histograms, although the Nikons cheat and still use the green channel for Y. Just look at it: the Y histogram is identical to the green one.

Color histograms can be laid out many ways. Some cameras, like Nikon, separate them as above. Other cameras, like the Casios, put colored lines on the same graph.

READING WHITE BALANCE FROM A HISTOGRAM

You need a color histogram to do this.

When you shoot a flat card you'll see a spike in each color channel's histogram.

You're balanced (neutral) if the spike happens in the same place in each channel. If not, you're not balanced. This is easy: if the red channel is too far to the right (too light) you have too much red. You get the picture.

You don't even need a card. Look at your histograms. If all stop at the same point then your highlights are neutral. If not, your highlights aren't neutral. Obviously if you have sky you'll see the blue channel further off to the right.

A2/10 How to Use a Digital Camera as an External Light Meter

see also

Light Meters (page 77)

The Zone System (page 69)

Using the Nikon Spot Meter (page 68)

EV & LV (page 75)

Why buy a separate meter when you can buy a complete camera with a built in meter for less than a separate professional meter? Yes, for the same price or less as a pro meter you can buy a digital point-and-shoot that weighs less and lets you preview the images for color and contrast.

As of October 2004 I no longer use my Pentax Spotmeter. Instead I look at the LCD screen of my Nikon D70 and copy that exposure for use with my film camera, presuming the LCD image looks as I want it. This is better than any meter; it shows me the effects of lighting and color temperatures and simulates my chromes on a light table.

Watch for these issues:

1.) Overall camera calibration. My Nikon D70 is right on, and my Canon A70 is one stop more sensitive than rated. That means that my A70 set to ISO 50 is really at ISO100, so for Velvia I have to add a stop to what the A70 at ISO 50 says. Make a few shots at various ISO variations to see which one matches your film.

2.) Filter factors. Put the same filter over the lens of the digital camera. If you have different or no filters on one camera then be sure to apply the differences in filter factors.

3.) Light Transmission. Not all lenses transmit all of the light, so you may also have to take "lens factors" into account as well as any aperture calibration variations in lenses. Zoom lenses, especially older ones, may lose as much as 2/3 of a stop compared to fixed lenses due to light lost as internal reflections. This is never a problem with TTL SLRs because TTL metering automatically corrects, however it will alter the reading if you are trying to use the reading from one camera on another.

4.) Differing ISOs. It's unlikely that your preferred digital ISO setting will just happen to match your preferred film. You'll be shooting photos with your digicam and not just using it as a meter. It is cumbersome to keep swapping ISOs between what matches your film and where you prefer to shoot the digicam. If you swap ISOs you are likely to forget and use the wrong setting and waste film. I suggest leaving the ISO of the digicam where you prefer and calculating exposure conversions in your head or use the calculator dial on a light meter. You even can use a broken old meter for this. I use the scales on my Pentax meters. Here's how:

4a.) Set the digicam's effective ISO on the Pentax meter. You figured out the effective ISO from tests in 1.) above, which may or may not be the ISO indicated on the digicam.

4b.) Set the indicated exposure from the digicam on the Pentax scale. Don't move the ISO setting.

4c.) Reset the ISO on the Pentax meter to your film's ISO. Don't move the LV ring. Now read the film exposure off the Pentax scale.

A3 What are Shutter Speed, Aperture and ISO?

Introduction

These issues are very simple, in fact, so simple that they confuse beginners who worry about them. In the old days before 1980 you had to worry about them, but today almost all cameras just set these themselves in Program mode so we rarely need to bother ourselves.

Rarely does one need to change apertures and shutter speeds away from what the camera chooses at the Program setting. If you do need to change these, most SLR cameras have a knob that shifts among the various equivalent combinations of aperture and shutter speed.

Explanations

Shutter Speed is how long the camera stays open to expose itself to the image. Most of the time it's just a short fraction of a second. The dimmer the light the longer the camera needs to collect it to make a good looking image. At night outdoors without a flash this can stretch into seconds or minutes.

If you want to change how motion is rendered you can use different speeds. 1/30 of a second looks about natural for running water. 1/500 of a second freezes everything. For sports use the fastest speed you can for most things unless you want deliberate blur. Several full seconds will make waves look like a big, foggy blur.

Aperture is how wide the lens' iris opens. The wider it opens the more light gets in. It's exactly the same thing as the iris of your eye which opens as the light gets darker. The wider it opens for the same subject the shorter the shutter speed will be to get the correct exposure. This is because the camera chooses shutter speed based on how much light gets into the camera. A brighter subject or wider aperture lets in more light.

Big apertures have smaller numbers, like f/4. Smaller apertures have bigger numbers like f/16. These are fractions, so 1/16 is smaller than 1/4. Big apertures like f/4 will tend to have just one thing in focus. A smaller aperture like f/16 will tend to have everything in focus. How much is in focus is called depth of field.

ISO or ASA is how sensitive your film or digital camera is to light. This depends on the the film, and can be changed with special development called pushing or pulling. Digital cameras can be set to almost any ISO. ISO is the same thing as ASA. We used ASA up

through the 1980s and have called it ISO since then.

Use the lowest ISO that gives you the apertures and shutter speeds you need. Pump up the ISO up to get smaller apertures and faster shutter speeds. Unlike film, digital interchangeable-lens SLRs usually look great even at ISO 1,600. Don't be bashful: crank it up and it will look great.

For film or point-and-shoot digital cameras a normal ISO is 50 or 100. Faster ISOs are something like ISO 800 or 1,600. Digital SLRs are more sensitive to light than film or fixed-lens digital cameras, so their slowest ISO is often ISO 200.

The reason you want the slowest ISO is for lack of noise or graininess. The faster settings often are more grainy than the slower ones.

Summary

That's it. I have no idea why people make this so complicated. It has very little to do with photography. If you want to spend more time on this any book on basic photography covers it. I prefer the Ansel Adams' book "The Camera" here.