Introduction to Camera Settings

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Musselburgh Camera Club
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This presentation will introduce you to some useful camera settings, so you can take more control over your camera.

The presentation is based on my Nikon D610 camera. Other Nikon cameras will have similar settings. You may find the buttons in a different place, but the symbols will be very similar.
With a mirrorless camera you may find the settings visible on the back screen instead of on top of the camera.

Canon cameras will have similar settings but they may have a different name. Check your camera manual or ask a Canon expert.

Coming up…

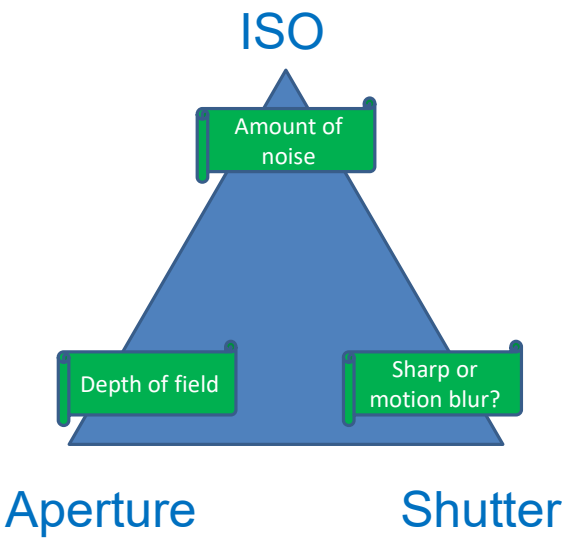
- Exposure settings.
- Focus settings.
- Shooting mode.
- Flash settings.
- Data quality and picture settings.

I will cover 4 main groups of settings: Exposure, Focus, Shooting mode and Flash. Data quality and picture settings are included at the end.

EXPOSURE SETTINGS

The Exposure Triangle

- Exposure Value = EV
  - A measure of the amount of light captured and recorded by the camera.
- EV depends on
  - **Aperture**: How much light can enter your camera?
  - **Shutter speed**: How long will your camera expose on that light?
  - **ISO**: How sensitive is your film or detector?



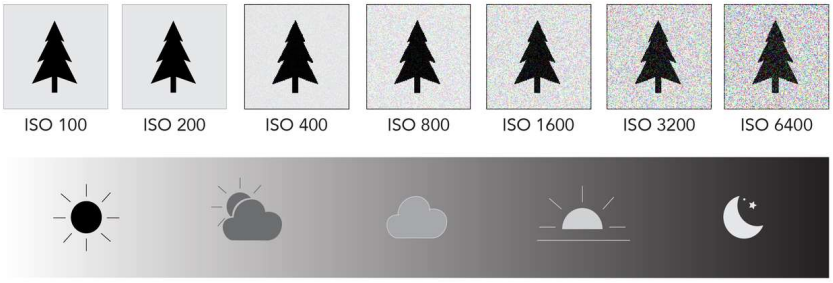
Exposure is often illustrated as a triangle, showing there are 3 settings which can affect the exposure of an image. The exposure value, EV, represents the amount of light captured and recorded by the camera, and this is affected by the following 3 settings:

- The aperture controls how much light enters the camera. The bigger the hole, the more light.
- The shutter speed controls how long the light is allowed to build up for.
- Finally, the ISO determines how sensitive the film or detector is to the light, in other words it controls how the camera reacts to a certain amount of light.

ISO

- Good colours
- Crisp images
- But slower shutter speeds
- Risk of camera shake

- Washed out colours
- Noisy images
- But faster shutter speeds
- Less chance of camera shake.



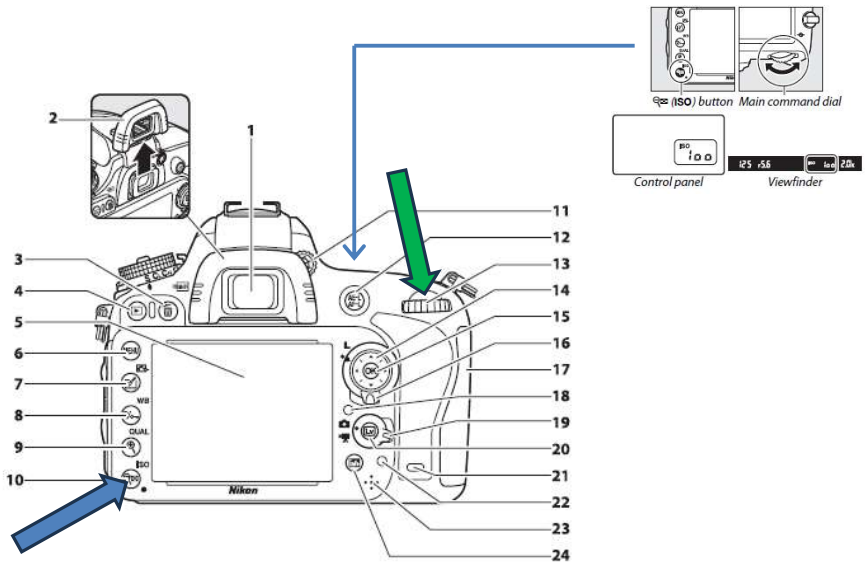
Sunshine, Cloudy, Shade, Indoors, Late evening, Night

Tripod, Stationary subjects, Moving subjects, Wildlife at dusk

The ISO setting controls how sensitive your camera is to light. Low settings are preferred because they produce crisper images with more vibrant colours. You should use the lowest setting you can for landscape and portrait photos taken in good light. If your camera is on a tripod, you can use a low ISO and a longer exposure to get a better result.

Higher ISO settings may be needed in low light or when you need a fast shutter speed to hand-hold a a telephoto lens or follow a moving object, for example wildlife photos taken at dusk. The disadvantage of a high ISO setting is that the images will become noisy and grainy, and colours will look washed out. At very high ISO settings you will lose detail.

Changing ISO setting

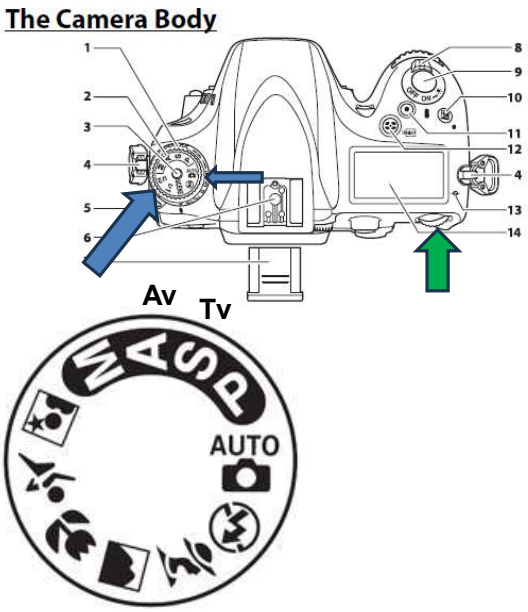


On most Nikon cameras you can change the ISO setting by looking for the ISO button, as shown here. Press the ISO button and rotate the rear dial. The selected ISO is shown on the control screen.

If you have a mirrorless camera, you use the rear screen to change the ISO setting.

Most cameras have an “Auto ISO” setting. This is useful when you are concerned about camera shake and want to make sure you can use a fast shutter speed. The camera will set the ISO based on the amount of light detected by the camera. “Auto ISO” is useful for sport and wildlife photograph, but I recommend turning it off and selecting a low ISO when your camera is on a tripod, or when colours are important (such as for landscape and flower photography).

Changing Exposure Mode



- **AUTO:** Quick and easy, but camera might get it wrong.
- **P:** Camera suggests shutter speed/aperture combination. Change with rear dial (green).
- **A:** Fix aperture with rear dial. Camera chooses shutter speed.
- **S:** Fix shutter speed with rear dial. Camera chooses aperture.
- **M:** Full control over shutter speed and aperture.

Virtually all cameras have a dial at the top that allows you to change the exposure mode. This is the most important mode to learn how to set. Leaving a camera in AUTO mode is convenient, but it takes away your creativity.

Nikon cameras label these exposure modes as P, S, A and M. The same modes are labelled on Canon cameras as P, Tv, Av and M.

Changing Exposure Mode

AUTO mode makes decisions about multiple camera settings.

Can use AUTO when learning about the camera. Your camera might be good at certain situations (e.g. "sport" mode).

A useful mode if you are in a hurry (e.g. sudden incident that needs quick photo).

But **AUTO** mode can make silly decisions (e.g. flash photograph when flash not allowed, underexposing snow) and takes away your creativity.

- **AUTO:** Quick and easy, but camera might get it wrong.
- **P:** Camera suggests shutter speed/aperture combination. Change with mode dial (green).
- **A:** Fix aperture with mode dial. Camera chooses shutter speed.
- **S:** Fix shutter speed with mode dial. Camera chooses aperture.
- **M:** Full control over shutter speed and aperture.

AUTO mode is quick and easy to use. In this mode the camera makes its own decisions. You'll find the camera will make a reasonably good job in normal situations (e.g. outdoor photos in daylight) but it can easily make a mistake (such as overexposing a portrait taken against a dark background or underexposing snow). It can also cause embarrassment, such as using the flash in situations where flash is not allowed. In general, AUTO mode takes away your creativity because it doesn't let you control the final image.

Most cameras will have a special selection of AUTO modes that you can choose from (e.g. LANDSCAPE, PORTRAIT, SPORT, NIGHT). These modes are a useful way of changing a lot of camera settings at the same time when you are in a hurry. For example, if an eagle suddenly appears in the sky and your camera is in the back seat of the car, pick up the camera, select SPORT mode, and most of the settings needed to capture that eagle on camera are defined quickly. So, these AUTO modes can be useful, but if you have the time, it's better to take control yourself.

Changing Exposure Mode

P mode automatically chooses a shutter speed/aperture combination, which you can override with the rear dial.

Also useful if you are in a hurry but want more control over other camera settings. You can correct exposure mistakes with the exposure compensation dial.

P mode can still make it more difficult to be creative. Not useful if you are aiming for a particular depth of field or long exposure.

- **AUTO:** Quick and easy, but camera might get it wrong.
- **P:** Camera suggests shutter speed/aperture combination. Change with mode dial (green).
- **A:** Fix aperture with mode dial. Camera chooses shutter speed.
- **S:** Fix shutter speed with mode dial. Camera chooses aperture.
- **M:** Full control over shutter speed and aperture.

P (programmed) mode is an intermediate mode which chooses the exposure settings automatically but gives you some control. The mode starts by choosing a shutter speed fast enough at the current ISO setting to avoid camera shake and then pairing this with a matching aperture setting. (You can change the slowest shutter speed in the camera setup menu to match how steadily you hold the camera.) If you don't like the combination chosen, you can use the rear dial to choose a different combination.

Unlike AUTO mode, this mode also lets you adjust other camera settings, so you can turn off the flash, set the metering mode (see later) or exposure compensation (see later). You have more control, but you can't deviate from the shutter speed/aperture pairs suggested.

Changing Exposure Mode

A (Av) is a useful mode that lets you control the aperture and depth of field with the rear dial. The camera chooses the shutter speed, based on its meter reading. You can correct exposure mistakes with the exposure compensation dial.

Useful for landscape, macro and portrait photography where depth of field is important and where the lighting is liable to change quickly.

A (Av) mode can be a problem if it chooses a long exposure that leads to camera shake. If the lighting is too dark, raise the ISO setting.

- **AUTO:** Quick and easy, but camera might get it wrong.
- **P:** Camera suggests shutter speed/aperture combination. Change with mode dial (green).
- **A:** Fix aperture with mode dial. Camera chooses shutter speed.
- **S:** Fix shutter speed with mode dial. Camera chooses aperture.
- **M:** Full control over shutter speed and aperture.

A (or Av) mode lets you choose and fix the aperture using the rear dial. This is a popular mode that lets you define the depth of field, which is useful in landscape, macro and portrait photography where depth of field is important. Fixing the aperture is also essential when making a panorama from overlapping images, which must all have the same depth of field to match properly.

The camera will choose a shutter speed that will give a good exposure with your chosen aperture and ISO setting. One problem with A (Av) mode is that in low light conditions the chosen shutter speed can sometimes be too slow and lead to camera shake. If you need to fix the aperture but avoid camera shake then increase the ISO setting (or use “Auto ISO”).

Changing Exposure Mode

S (Tv) is a useful mode that lets you control the shutter speed with the rear dial. The camera chooses the aperture, based on its meter reading. You can correct exposure mistakes with the exposure compensation dial.

Useful for telephoto, sport and wildlife photography where camera shake is a risk and where the lighting is liable to change quickly.

S (Tv) mode is not as flexible as **A (Av)** mode because the camera has fewer aperture settings to choose from. It can underexpose or overexpose a scene – watch out for the aperture value flashing. (A small underexposure is ok.)

- **AUTO:** Quick and easy, but camera might get it wrong.
- **P:** Camera suggests shutter speed/aperture combination. Change with mode dial (green).
- **A:** Fix aperture with mode dial. Camera chooses shutter speed.
- **S:** Fix shutter speed with mode dial. Camera chooses aperture.
- **M:** Full control over shutter speed and aperture.

S (or Tv) mode lets you choose and fix the shutter speed using the front dial. This mode is useful when shutter speed is more important than aperture, for example when you are using a telephoto lens hand-held and want to avoid camera shake by choosing a shutter speed faster than the focal length (e.g. select 1/250th second for a 200mm lens). S (Tv) mode is also useful to keep a high shutter speed when tracking fast moving targets.

S (Tv) mode is not as flexible as A (Av) mode because the camera can only choose aperture settings supported by your lens. Once it reaches the end of that range (watch for a flashing aperture value on the display screen) it can easily underexpose or overexpose the scene. It is ok if the camera underexposes a little if that guarantees you get the shutter speed you need, but if it underexposes too much then increase the ISO setting (or use “Auto ISO”).

Changing Exposure Mode

M mode gives you full control. Choose shutter speed with the rear dial and aperture with the front dial. The camera meter will show if it thinks the scene is under or over exposed.

Useful for controlled situations where the lighting is will only change slowly, or for situations where the other modes would be unable to cope:

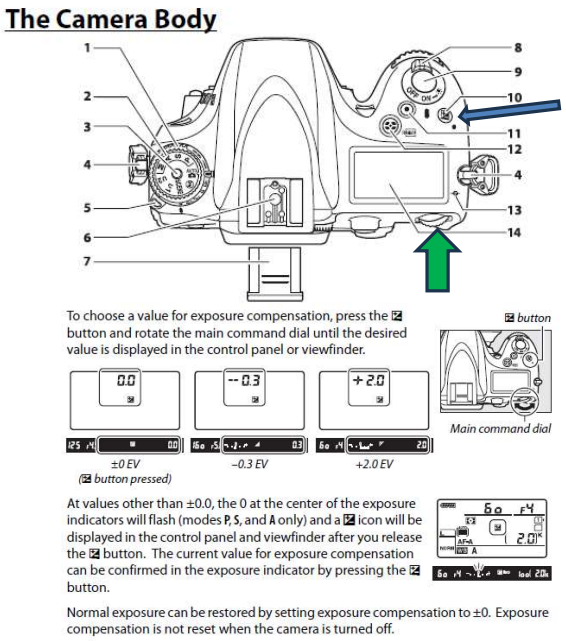
- Studio portrait or still life photography.
- Landscape photography.
- Long exposure photography through a neutral density filter.
- Astrophotography.

- **AUTO:** Quick and easy, but camera might get it wrong.
- **P:** Camera suggests shutter speed/aperture combination. Change with mode dial (green).
- **A:** Fix aperture with mode dial. Camera chooses shutter speed.
- **S:** Fix shutter speed with mode dial. Camera chooses aperture.
- **M:** Full control over shutter speed and aperture.

M mode is the one that camera pundits will recommend because it gives you full control over everything. You can define any shutter speed with the rear dial and any aperture with the front dial. The camera won't stop metering the scene, but instead of using its meter to select the settings it displays an indicator on the screen to show if it expects your settings to underexpose or overexpose. The M setting is useful in any situation where the camera is unable to cope or would make the wrong decisions: for example, astrophotography at night, landscape photograph at sunrise or sunset, or long exposures taken through an ND filter.

A feature of M mode is that your settings are fixed no matter what happens. This can be helpful if you want to guarantee no change, for example when collecting exposures to turn into a time lapse video. But this same feature can also be a problem if your lighting is changing (e.g. defining the exposure for a wonderful landscape scene and then the sun bursts out from the clouds, or you are taking a group portrait indoors when someone turns a light on elsewhere in the room). M mode is better when you have control over the lighting, such as when making a studio portrait or still life. If the lighting is changing, you can still have full control over the exposure by using A or S mode combined with Exposure Compensation" (next slide).

Exposure Compensation



Exposure compensation can correct mistakes made by auto-exposure mode. For example:

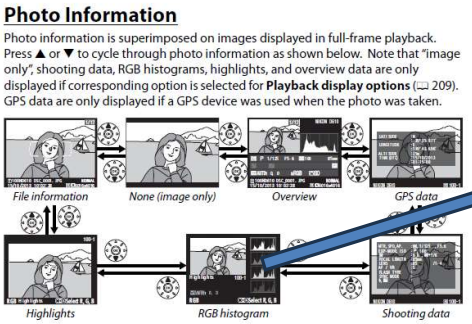
- +1.0 for snow scenes.
- -1.0 for sunsets.
- -2.0 for night scenes.

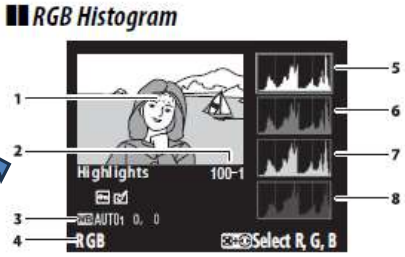
But if you need to use it a lot then consider M mode.

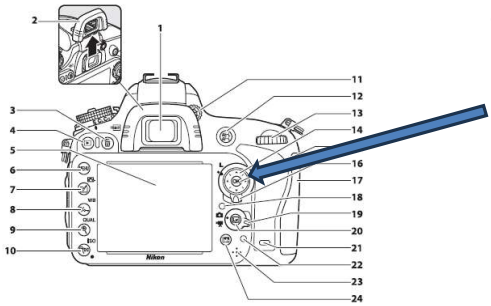
Look for a button on your camera (or a setting on the rear screen) labelled with a plus/minus symbol as shown here. This is the exposure compensation button. You can use this button to change the exposure selected by the camera in P, S or A mode. A negative value reduces the exposure and a positive value increases it. You can change the exposure compensation to correct mistakes made by the camera: for example, if it underexposes a snow scene try +1.0, or if it overexposes a sunset try -1.0.

If the light is changing you can imagine the light level as a roller coaster. The P, S and A modes will follow that roller coaster, but the M mode will leave the exposure settings the same. When the P, S and A modes are combined with exposure compensation they will still follow that roller coaster but keep the same distance above or below it. This is a good way of preserving the effect you want while the lighting is changing.

The Histogram

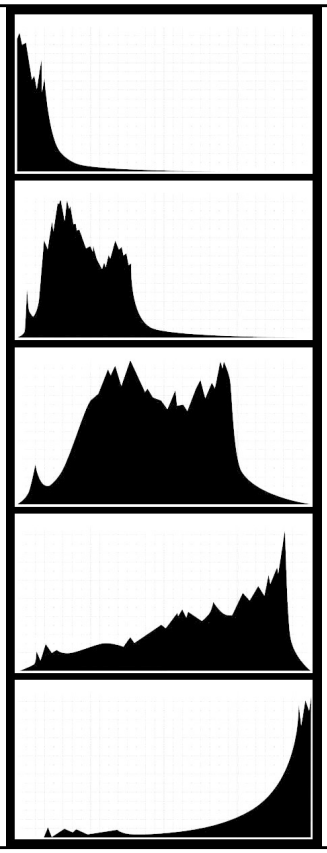






- Press the up/down buttons until you see the histogram display on the back of the camera.

After you have taken an image, you can check whether it is exposed correctly by looking at the histogram. First display your image on the back of the camera, then use the selector buttons (or equivalent) to step through the display options until you see a histogram, such as shown here.



Underexposed: Shadow detail will be lost. Dark areas will be noisy.

Peak to the Left: Perfectly ok for low-key scenes, such as night sky or coal shed. Shadows may be noisy.

Neutral exposure: Safest result. There will be detail in shadows and highlights.

Peak to the Right: Expected for high-key scenes, such as snow. Optimum result, as long as highlights not clipped.

Overexposed: Highlights will be clipped. Detail lost in bright areas.

The histogram shows you the balance between light and dark within an image, with dark on the left and light on the right. A dark image will tend to peak on the left and a light image will tend to peak on the right. A spike on the left means your image is underexposed and a spike on the right means it is overexposed. Try to match what you see in the histogram with what you expect from the scene you are shooting. Dark scenes (e.g. at night) will look like the second image and bright scenes (e.g. snow) will look like the third image.

Blown highlights are bad in a digital image because they cannot be recovered. You can use the “highlight clipping” display on your camera to check for blown highlights (these are normally indicated in red or by making the display flash). Small areas of blown highlights around bright lights or specular reflections are ok, but if a large part of your sky is blown-out your image is probably overexposed.

Footnote: If your subject is much darker than the sky, you may need to use a fill-in flash or accept a blown-out sky to keep your subject well exposed. Taking bracketed exposures (i.e. taking exposures below, at and above the recommended exposure setting) may help balance this kind of scene. Photoshop can be used to blend bracketed images or convert them into a High Dynamic Range image.

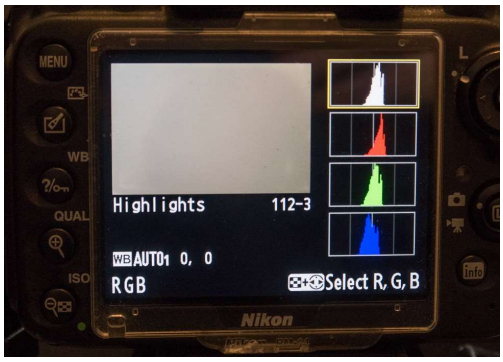
Demo/Exercise

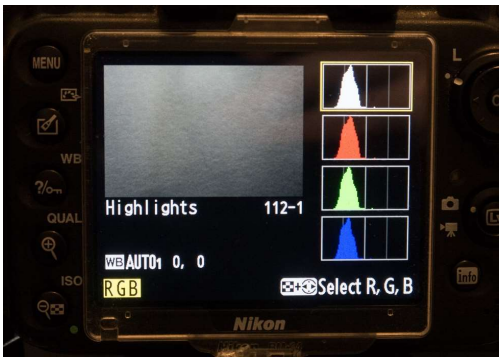
- Photograph a piece of white paper with your camera set to AUTO, P, A or S mode.
  - Observe the histogram.
  - What colour does the paper look on the camera display?
  - Try again with +1.0 exposure compensation (P, A or S).
- Photograph a piece of black paper with your camera set to AUTO, P, A or S mode.
  - Observe the histogram.
  - What colour does the paper look on the camera display?
  - Try again with -1.0 exposure compensation (P, A or S).

The first demonstration will show what happens when you photograph black paper or white paper with one of the auto modes. The camera will try to turn any scene it photographs into grey, so it underexposes the white paper and overexposes the black paper. In AUTO mode you are stuck with this result, but in P, A or S modes you can apply some exposure compensation to correct the image.

Results with my camera

White Paper **Black Paper**

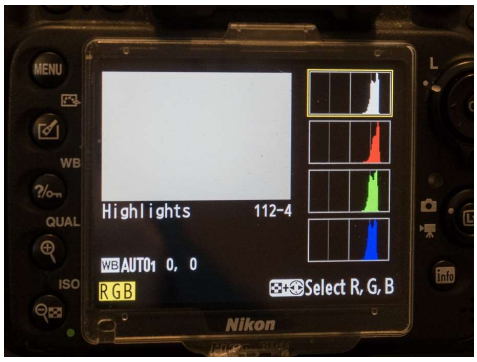




This is what my camera produced. Both sheets of paper are reduced to a shade of grey.

Results with my camera

White Paper with EV + 1.0

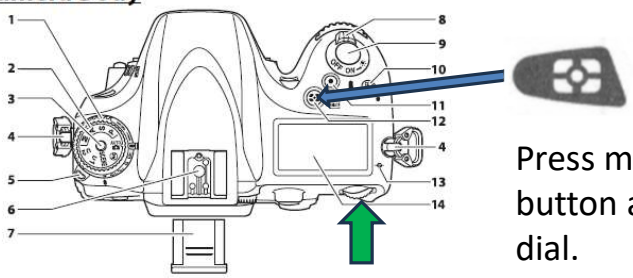


Black Paper with EV – 1.0

These are the same scenes with exposure compensation applied. The white paper now looks white and the back paper looks black.

Metering Mode

The Camera Body



Press metering mode button and rotate rear dial.

- Spot metering. Useful when subject more important than background.
- Centre weighted. Useful when centre more important than edges.
- Matrix metering. Samples the whole scene.

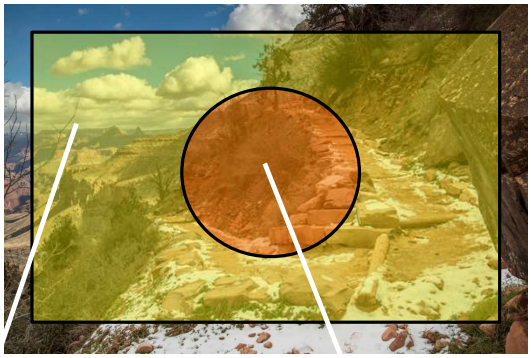
Up until now we have talked about the camera measuring the light and choosing the right combination of ISO, aperture and shutter speed to make the right exposure. The metering mode controls how your camera measures that light.

Look for a button with a symbol similar to the one shown here. You can change the metering mode by pressing that button and rotating the rear dial (or changing the setting on the rear screen).

Most cameras support these 3 metering modes. The matrix mode is better for landscape images where the whole scene is important. Centre weighted would be better for a group portrait where the people in the centre are more important that the edge. Spot metering mode is useful when you have one important subject against a different background.

Note that the metering mode is relevant in M mode as well as in the auto modes. In this case the metering mode controls the exposure indicator shown on the back of the camera.

Metering Mode Settings



Spot: Useful when the subject is more important than the background.

Matrix: Useful when the whole scene is important (e.g.landscapes).

Centre weighted: Useful when the edges are less important than the centre.

Your camera may provide a number of auto exposure modes. The default mode is normally “Matrix”. The camera analyses the whole scene to decide on the best exposure. (Some cameras can detect when a scene is lighter at the top and decide to expose for a landscape shot.)

“Centre weighted” is similar to “Matrix” but you are telling the camera that the centre of the scene is more important than the edge. This mode is useful for group portraits, or for subjects inside a frame, such as within a tunnel.

A “Spot” mode is useful when your subject is much lighter or much darker than the background, or if you are taking a high contrast portrait and want to expose the skin correctly. The camera will adjust the exposure to balance the scene only in the tiny area contained within the spot. You might need to tweak the result using exposure compensation (or switch to “M” mode) to get the best result.

Demo/Exercise

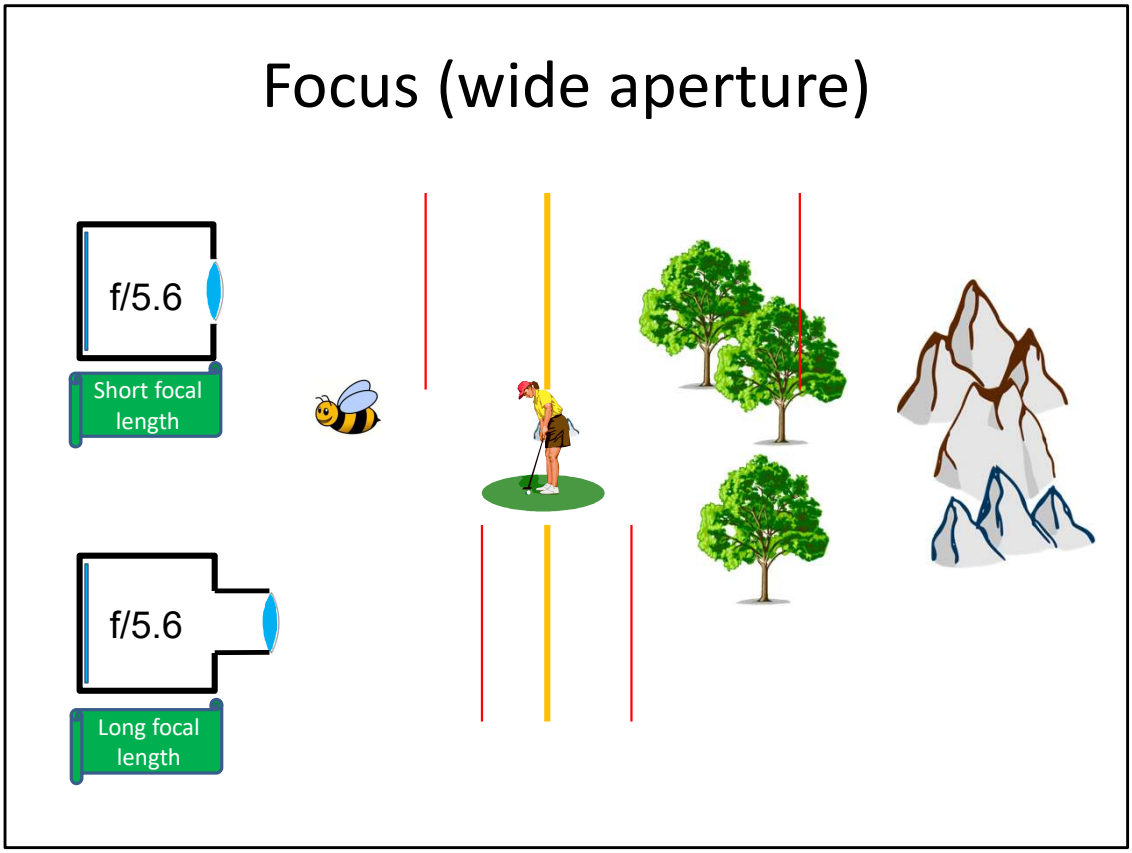
- Photograph a white object against a dark background (P, A or S mode) and compare:
  - Matrix mode
  - Centre-weighted
  - Spot mode
- Photograph a dark object against a white background (P, A or S mode) and compare:
  - Matrix mode
  - Centre-weighted
  - Spot mode

Try photographing a white ball on a black background. In matrix mode you will find your camera will overexpose the ball. If you display the image and zoom into the ball, can you see the details on its surface? If you get closer to the ball you'll find centre-weighted mode will do a better job. But the best result can be obtained using spot mode. Note that the spot can be moved around using the up/down/left/right arrow buttons on the back of the camera.

Try the same exercise using a black object against a white background. This time the black object will be underexposed.

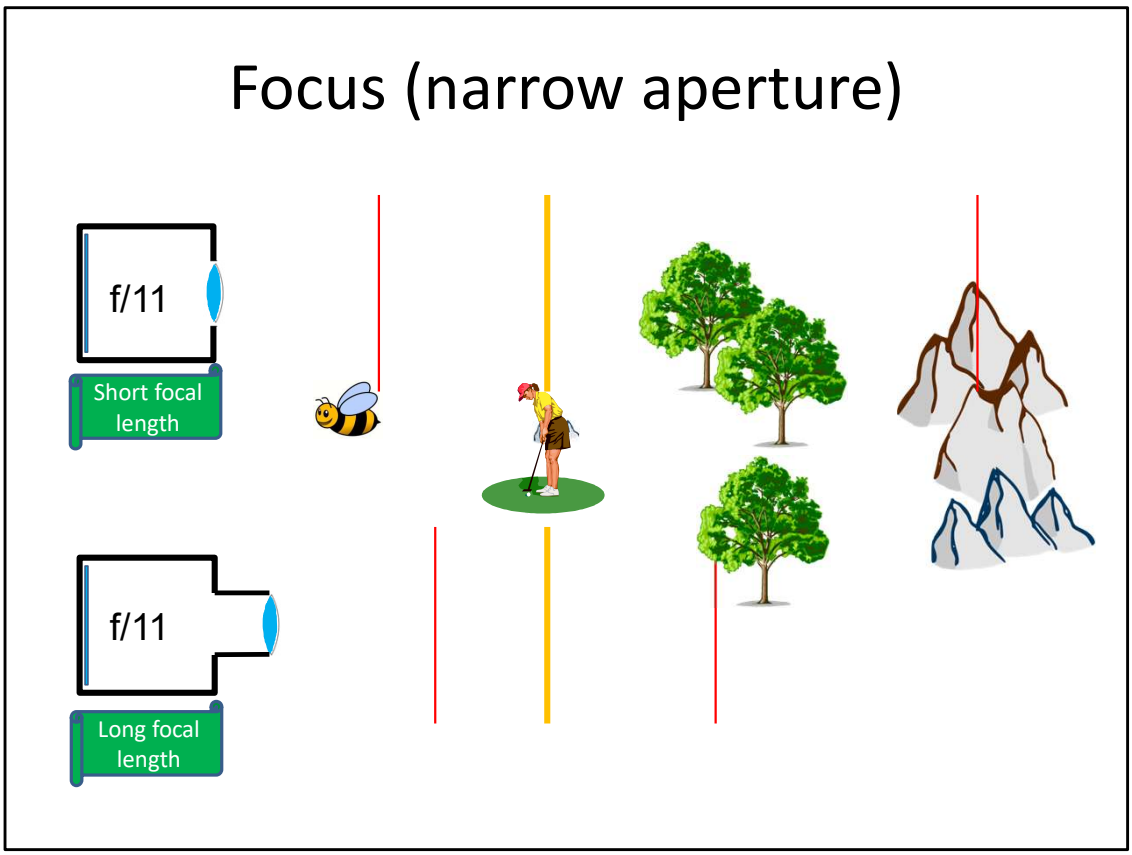
Useful information: The spot is the same one that will be used to define the focus in AF-S mode (see later).

FOCUS SETTINGS



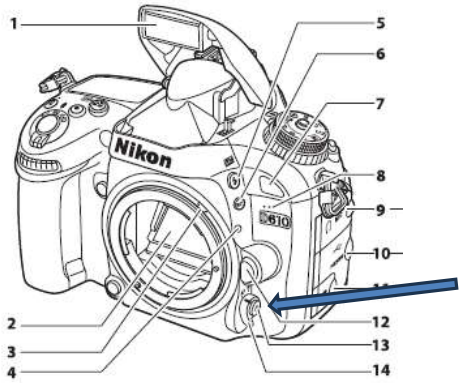
Depth of field varies with the focal length of your lens and with the aperture setting. Longer focal lengths and wider apertures have the narrowest depths of field.

This graphic shows how the focal length at a wide aperture varies with focal length. The longer lens has a narrower focal length. You might be able to get the golfer and the trees in focus at f/5.6 with a wide-angle lens, but with a longer lens only the golfer will be in focus. If the trees are distracting that could be a good thing.



This graphic shows how the focal length at a narrow aperture varies with focal length. When the aperture is narrowed, say to f/11, the depth of field increases. The depth of field is still greater with the wide-angle lens than with a longer lens. Now the wide angle lens can reach the mountains, but the longer lens may still struggle with the trees.

Autofocus Mode



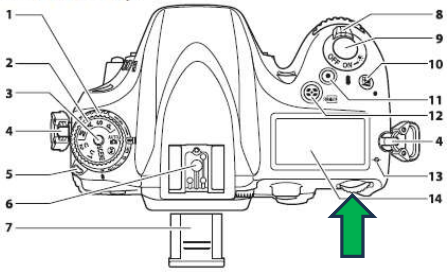
Rotate focus button

- **AF:** Autofocus
- **M:** Manual focus

Press focus button and rotate rear dial.

- **AF-A:** Auto. Automatically detect if subject is moving.
- **AF-S:** Single servo. Stationary subjects. Shutter will not fire unless focus locked.
- **AF-C:** Continuous servo. Moving subjects. Focus tracks continuously and does not lock. Some shots may be out of focus.

The Camera Body

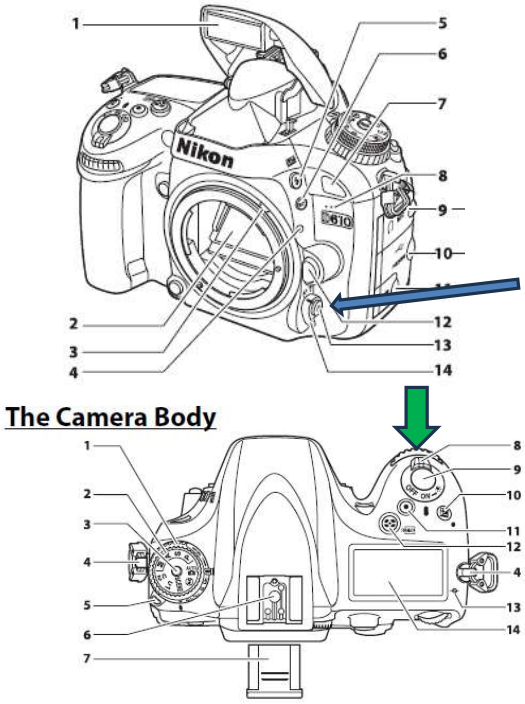


You can change your camera's focus mode to match the kind of subject you are photographing. Your camera may have a focus button next to the lens labelled "AF/M", as shown here. If your camera doesn't have such a button, you will find one on the side of your lens. Changing this setting to "M", by rotating the button on the camera or sliding the selector on the lens, can be used to select manual focus. Manual focus is useful when you want full control over the focus setting, for example when photographing a stationary object from a fixed point, such as in macro photography or a studio portrait taken from a tripod. It is also useful when there is not enough light for the camera to autofocus (for example night photography or long exposures with an ND lens).

When the focus mode is AF, pressing the button and rotating the rear dial lets you change the autofocus mode. If your camera doesn't have an autofocus button you may need to change this setting on the rear screen. There are two main settings:

- AF-S or Single Servo: In this mode, the camera focuses on the subject once when the shutter is pressed half way, the focus is locked and the shot is taken. You can't take a shot unless the focus has locked. This mode is useful for stationary subjects.
- AF-C or Continuous Servo: In this mode, the camera focuses continuously. It tracks moving objects while they are visible in the viewfinder. When the shutter is pressed the shot is taken with the latest focus setting. The focus doesn't lock, so a shot might be out of focus. This mode is useful for tracking moving objects, such as birds, aircraft, racing cars, etc…
- My camera also has an AF-A mode, where the camera tries to detect if an object is moving and sets the mode for you. It can sometimes get this wrong. If you find your bird shots are out of focus, try selecting AF-C.

Autofocus Area Mode



The Camera Body

Press focus button and rotate front dial.

- **S:** Single point. Useful with AF-S for stationary subject (e.g. macro).
- **d9:** Dynamic 9-point. Predictable moving subjects (e.g. racing).
- **d21:** Dynamic 21-point. Unpredictable moving subjects (e.g. football).
- **d39:** Dynamic 39-point. Difficult to track subjects (e.g. flying birds).
- **3D**: 3-D tracking. Erratic moving subjects (e.g. tennis).

Pressing the focus button and rotating the front dial lets you change the number of focus points. If your camera doesn't have an autofocus button you may need to change this setting on the rear screen.

A single point is useful for a stationary subject where you want to make sure the most important thing is in focus, such as the petals of a flower or the eyes of a model.

Choosing a larger number of focus points lets the autofocus sample a larger portion of the scene. This helps it chooses the best focus for a wide angle landscape scene. If you are tracking a moving object, having more points lets the autofocus track that movement more accurately. Look for "static", "single point" and "dynamic" in your camera's focus settings.

Demo/Exercise

- Use a wide aperture (f2 to f4) and focus on a stationary object in front of a background:
  - Try AF-S autofocus mode with a single point.
  - Try manual focus.
- Now try a moving object in front of a background:
  - Does AF-S with a single point still work?
  - Try AF-C autofocus mode with a dynamic area mode.
  - For an erratically-moving object try 3D mode.

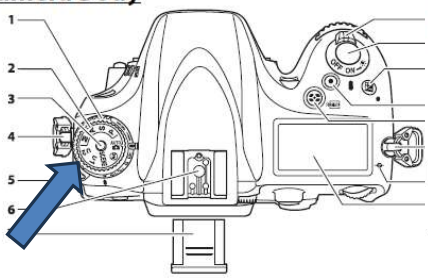
Try focusing on the Loch Ness monster toy against a background. You'll find that the AF-S mode and manual focus modes will work well.

Now try photographing the chaotic pendulum against a background. You'll find that AF-S mode can't cope with the erratic movements. A dynamic AF-C mode with a large number of focus points is the best option.

SHOOTING MODES

Changing Shooting Mode

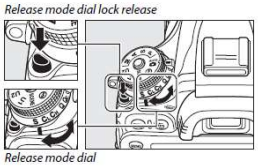
The Camera Body



- **S:** Use for stationary subjects, such as landscapes and macro.
- **CL:** Use for portraits or slow-moving subjects.
- **CH:** Use for fast-moving subjects, such as birds, aircraft, racing (**Qc** useful for wildlife).

The Release-Mode Dial

To choose a release mode, press the release mode dial lock release and turn the release mode dial to the desired setting (🕮 83).



Mode		Description
S	Single frame	One photograph is taken each time the shutter-release button is pressed.
CL	Continuous low speed	The camera takes photographs at a slow rate while the shutter-release button is pressed.
CH	Continuous high speed	The camera takes photographs at a fast rate while the shutter-release button is pressed.
Q	Quiet shutter-release	As for single-frame, except that camera noise is reduced.
Qc	Qc (quiet continuous) shutter-release	The camera takes photographs while the shutter-release button is pressed; camera noise is reduced.
	Self-timer	Take pictures with the self-timer.
	Remote control	Take pictures with an optional ML-L3 remote control.
MUP	Mirror up	Raise the mirror before taking photographs.

Cameras often have a dial that enables you to change the shooting mode. This is often combined with the exposure mode dial, as shown here.

Most shots are usually taken in S mode, where the camera takes a single shot when you press the shutter button. The self-timer mode is also useful when you want to include yourself in a portrait, or if you want to avoid shaking the camera when it is attached to a tripod.

If your camera supports continuous shooting, shots will be taken continuously while the shutter is pressed. The camera will keep taking shots until a memory buffer fills up. Here there are two modes:

CL: A low speed mode, where shots are taken more slowly but cover a longer time period. This mode is useful for group portraits where you want to capture a shot without anyone blinking.

CH: A high speed mode, where shots are taken rapidly over a short time period. Try this mode for fast moving subjects, such as a bird in flight, aircraft, racing cyclists, canon firing, etc… It is a useful to combine this shooting mode with the AF-C focus mode, as it increases the chance of getting a shot in focus.

Demo/Exercise

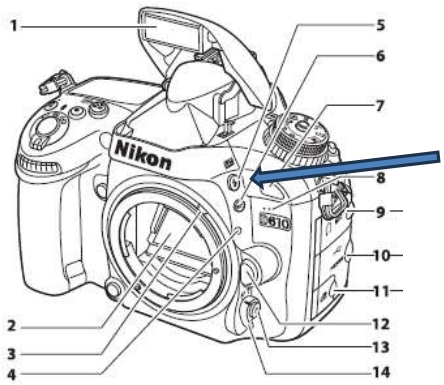
- Use S mode and set a shutter speed faster than 125th sec. Increase ISO if the lighting isn't bright enough.
- Repeat the previous exercise with a moving object but try fast continuous shooting (**CH**) mode.
- At home you could try photographing a dripping tap, or birds fighting on your bird table.

Try photographing the erratic pendulum again, only this time using a continuous shooting mode.

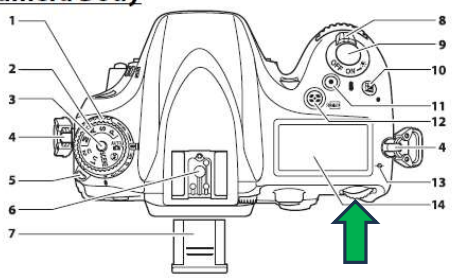
Try photographing the cat toys, which simulate a bird in flight.

FLASH SETTINGS

Flash mode



The Camera Body



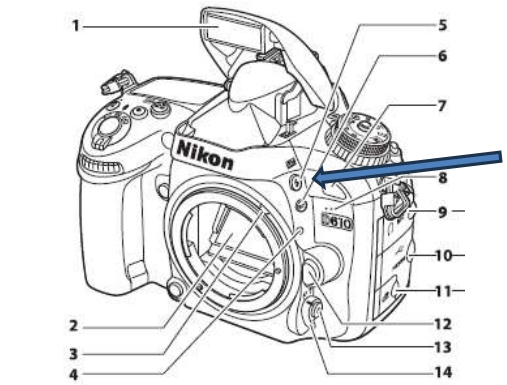
Press flash button and rotate rear dial.

- **(Empty box):** Normal flash. Shutter will synchronise. Often produces a dark background.
- **(Eye):** Red-eye mode. Flash will fire twice.
- **SLOW:** Slow sync mode. You can choose a slower shutter speed. Useful for night portraits.
- **REAR:** Rear curtain sync mode. As above but flash waits until end of exposure. Useful for making trails with moving subjects.

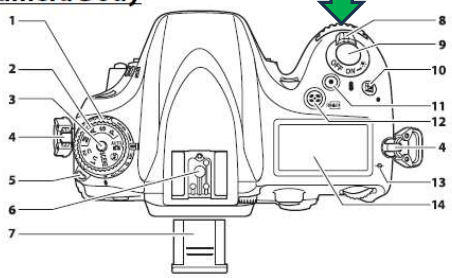
It is also useful to be able to change the flash mode. In normal mode you will find that most portraits taken with a flash tend to show a bright subject against a darker background. You control the flash to change the lighting on the subject, but you can't control the background lighting (unless you are shooting in a studio). Pressing the flash button and rotating the rear dial lets you change the flash mode. If you don't have a flash button, you may need to do this on the back of your camera, or in the settings menu of your flash gun. Besides the normal mode (and the red eye mode if you are in the habit of firing a flash directly into someone's face) most cameras will support two kinds of "slow sync" mode. Slow sync stops the shutter speed from synchronising with the flash and lets you choose a slower shutter speed.

- SLOW: This mode lets you choose a slow shutter speed and fires the flash at the *beginning* of the exposure. It is useful for night portraits, because you can change your flash setting to light your subject but choose a long exposure to balance the brightness of the background. No more night portraits against a dark background. You may need to use a tripod.
- REAR: This mode lets you choose a slow shutter speed, but this time it fires the flash at the *end* of the exposure. This mode is useful for photographing moving objects with flash. The long exposure blurs the movement, but the flash captures a sharp image at the end of that movement. It works well with a dancer or a moving vehicle.

Flash Compensation



The Camera Body



Press flash button and rotate front dial.

- **0.0:** Normal metered flash.
- **Negative values:** Useful when the flash makes the subject too bright relative to the background. Useful for close subjects.
- **Positive values:** Useful if the flash has not lit the subject properly. (But the flash can't fire brighter than its maximum brightness. Are you too far away?)

Flash compensation is similar to exposure compensation, but this time it controls the strength of the flash. Here I am changing it by pressing the flash button and rotating the front dial. You camera may use a different method. Look for a button with a flash indicator and +/- symbol.

Demo/Exercise

- Turn off the room lights but leave just a little light.
- Turn on your flash.
- Use a shutter speed of around ¼ to ½ second.
- Ask someone to dance around or swing a pendulum.
- Take some photographs and compare the standard, SLOW and REAR flash modes.

Try taking some photographs of the moving cat toys with different flash modes.

DATA QUALITY AND PICTURE SETTINGS

This is an optional section that introduces data quality and picture settings.

Image Quality & Size

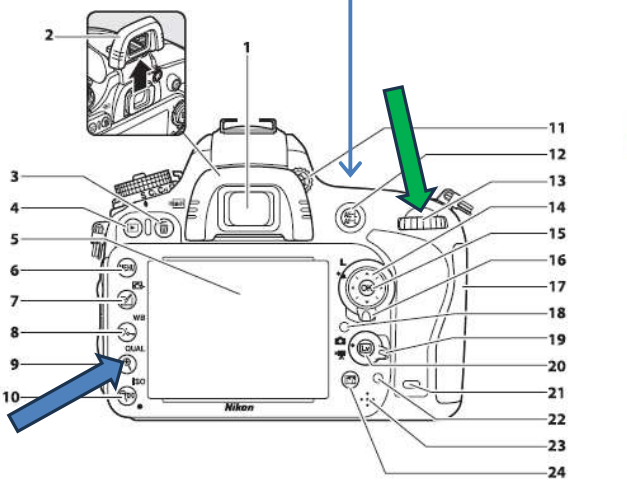


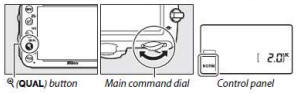
Image Quality

Choose a file format and compression ratio (image quality).

Option	File type	Description
NEF (RAW)	NEF	Raw data from the image sensor are saved directly to the memory card. Settings such as white balance and contrast can be adjusted after shooting.
JPEG fine	JPEG	Record JPEG images at a compression ratio of roughly 1:4 (fine quality).*
JPEG normal		Record JPEG images at a compression ratio of roughly 1:8 (normal quality).*
JPEG basic		Record JPEG images at a compression ratio of roughly 1:16 (basic quality).*
NEF (RAW)+ JPEG fine	NEF/ JPEG	Two images are recorded, one NEF (RAW) image and one fine-quality JPEG image.
NEF (RAW)+ JPEG normal		Two images are recorded, one NEF (RAW) image and one normal-quality JPEG image.
NEF (RAW)+ JPEG basic		Two images are recorded, one NEF (RAW) image and one basic-quality JPEG image.

* **Size priority** selected for **JPEG compression**.

Image quality can be set by pressing the (**QUAL**) button and rotating the main command dial until the desired setting is displayed in the control panel.



(**QUAL**) button Main command dial Control panel

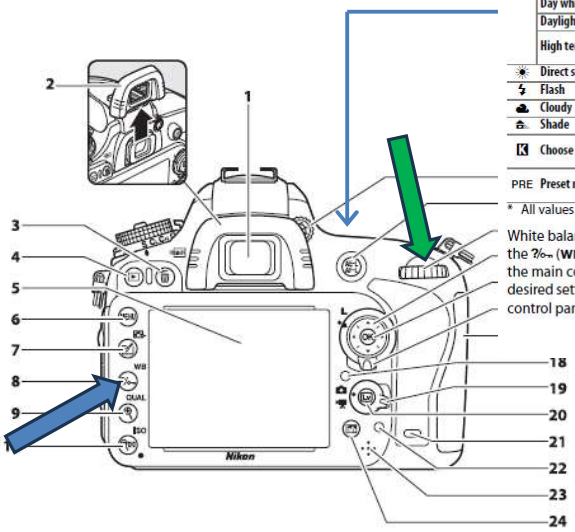
I always use RAW.

If JPEG, use a large memory card and select JPEG (fine).

I always save my images in RAW format because this gives the best image quality. RAW format is also more forgiving because it can cope better with underexposed or overexposed images.

But if you use JPEG make sure your camera is set to maximum quality and maximum file size. Memory cards are sufficiently large and cheap that it doesn't make sense to reduce the quality to save the memory card.

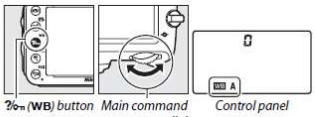
Changing White Balance



	Option	Color temp.*	Description
AUTO	Auto	3,500–8,000 K	White balance is adjusted automatically. For best results, use type G, E, or D lens. If built-in or optional flash fires, results are adjusted for flash.
	Normal		
	Keep warm lighting colors		
	Incandescent	3,000 K	Use under incandescent lighting.
	Fluorescent		Use with:
	Sodium-vapor lamps	2,700 K	• Sodium-vapor lighting (found in sports venues).
	Warm-white fluorescent	3,000 K	• Warm-white fluorescent lights.
	White fluorescent	3,700 K	• White fluorescent lights.
	Cool-white fluorescent	4,200 K	• Cool-white fluorescent lights.
	Day white fluorescent	5,000 K	• Daylight white fluorescent lights.
	Daylight fluorescent	6,500 K	• Daylight fluorescent lights.
	High temp. mercury-vapor	7,200 K	• High color temperature light sources (e.g. mercury-vapor lamps).
	Direct sunlight	5,200 K	Use with subjects lit by direct sunlight.
	Flash	5,400 K	Use with built-in or optional flash.
	Cloudy	6,000 K	Use in daylight under overcast skies.
	Shade	8,000 K	Use in daylight with subjects in the shade.
K	Choose color temp.	2,500–10,000 K	Choose color temperature from list of values (📖 120).
PRE	Preset manual	—	Use subject, light source, or existing photograph as reference for white balance (📖 121).

* All values are approximate and do not reflect fine-tuning (if applicable).

White balance is set by pressing the ?/WB (**WB**) button and rotating the main command dial until the desired setting is displayed in the control panel.



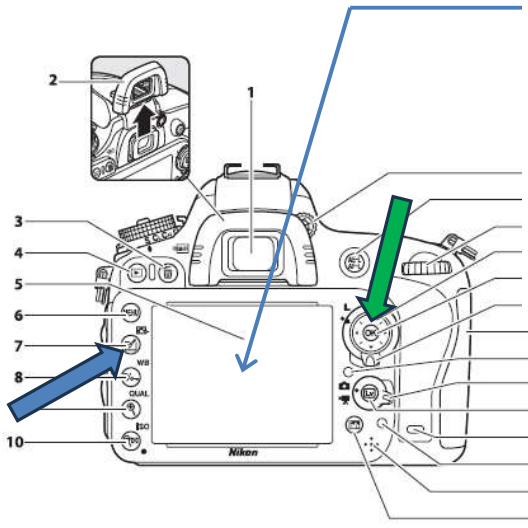
?/WB (WB) button *Main command dial* *Control panel*

Saving in RAW lets you lets you adjust the white balance later (last slide).

The same scene can be lit very differently (e.g. under yellow incandescent lights or bright daylight), but we would like the colours to look the same in both cases. The camera normally adjusts the colours to make this happen, but you can change the white balance setting to tell the camera what kind of lighting you are using.

Changing the white balance setting will change the way the image is displayed on the back of the camera, and it will change how the image is saved to JPEG, but it will not affect an image saved in RAW.

Picture Controls

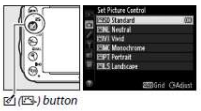


Selecting a Picture Control

The camera offers a choice of preset Picture Controls. In **P**, **S**, **A**, and **M** modes, you can choose a Picture Control according to the subject or type of scene (in other modes, the camera selects a Picture Control automatically).

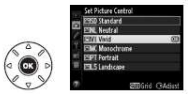
Option	Description
SD **Standard**	Standard processing for balanced results. Recommended for most situations.
NL **Neutral**	Minimal processing for natural results. Choose for photographs that will later be extensively processed or retouched.
VI **Vivid**	Pictures are enhanced for a vivid, photoprint effect. Choose for photographs that emphasize primary colors.
MC **Monochrome**	Take monochrome photographs.
PT **Portrait**	Process portraits for skin with natural texture and a rounded feel.
LS **Landscape**	Produces vibrant landscapes and cityscapes.

1 Press ☑ (PICT).
A list of Picture Controls will be displayed.



☑ (PICT) button

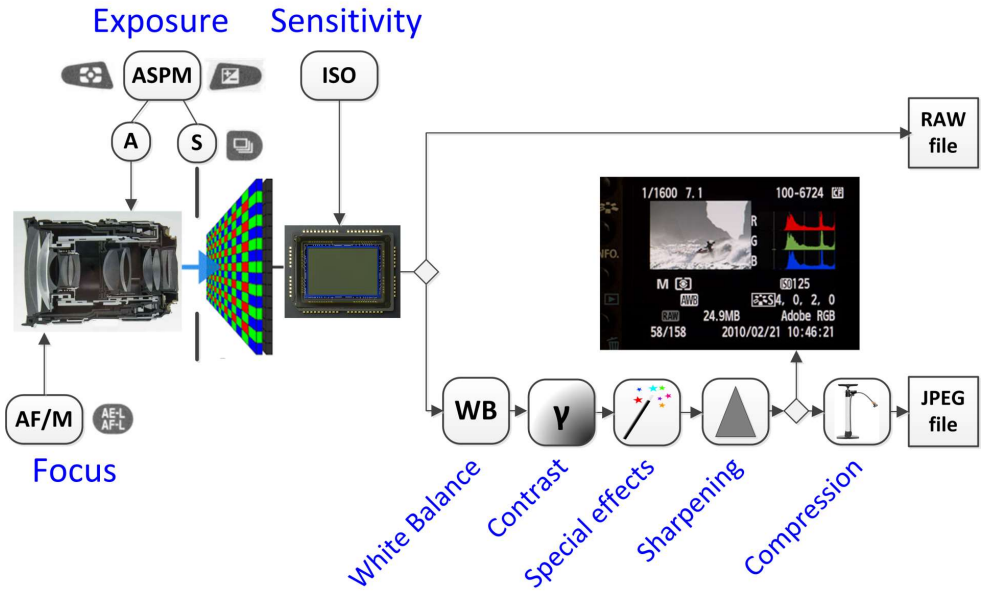
2 Choose a Picture Control.
Highlight the desired Picture Control and press OK.



Affects what is shown on the screen but is only saved to JPEG (last slide).

A camera might have picture controls that let you process an image before saving it. For example, my camera has these picture control settings. The settings change the way the image is displayed (e.g. MONOCHROME can be used to visualise what the scene looks like in black and white) and they affect how an image is saved as a JPEG but they don't affect how an image saved in RAW

What Happens to Information Collected by a Digital Camera?



This is the flow of information through a digital camera. The exposure, focus and ISO settings on the left change how an image is captured by the camera. Once an image has been captured it is saved to a RAW file. The white balance setting and picture controls are applied to the image, which is then displayed on the screen. If you asked the camera to save JPEG files, the processed image is then saved as a JPEG.

The advantage of saving in RAW is that a lot of the processing decisions (such as the white balance setting) can be adjusted later using Photoshop.

TIME TO TRY OUT THE SETTINGS…

Time to try out the excercises.