

# RAW vs JPEG

## What is a JPEG?

Named after it's creator, the [Joint Photographic Expert Group](#).

JPEGs are normal digital camera images. Cameras create JPEG images from raw image sensor data based on your camera settings, like sharpness, white balance, colour saturation. All digital cameras technically shoot RAW. When a camera is set just to store the image as a JPEG file, the camera makes the JPEG from the RAW file and then automatically deletes the RAW data as soon as the JPEG is recorded to the memory card.

The camera 'compresses' the data by squeezing out a certain amount of information, preserving enough to recreate the image, but making the file size smaller so it does not take up too much storage space.

The degree of compression can be adjusted, allowing a selectable trade-off between storage size and image quality. If the JPEG setting is FINE or Highest Quality the compression will be less and the file size will be bigger. This usually results in an image that cannot be distinguished by eye from the original.

## What is RAW?

A digital RAW file is simply what its name implies, a file containing the unprocessed raw data captured by the sensor in the digital camera at the time of exposure.

The RAW file does not contain a finished photograph.

To acquire that, the RAW file must first be converted. Camera settings for colour space, sharpness, saturation, and white balance also are not in the RAW file; they are tags which accompany the RAW file through the conversion process.

The process of converting a raw image file into a viewable format is sometimes called developing a raw image.

RAW image files are sometimes called digital negatives, as they fulfil the same role as negatives in film photography. The negative is not directly usable as an image, but has all of the information needed to create a image.

Camera manufacturers use their own unique RAW formats:

- Canon = CRW
- Fuji = RAF
- Nikon = NEF
- Olympus = ORF
- Sony = ARW

All these image formats can usually be processed by a RAW converter.

Each camera manufacturer usually supplies their own raw conversion software with the camera.

There are various 3rd party RAW converters that work as 'stand-alone' programmes for example '[Phase One](#)'. Adobe make a plug-in for Photoshop and Elements called [Adobe Camera RAW](#) which is regularly updated to support new RAW formats.

JPEG records 256 levels of brightness, and RAW records between 4,096 to 16,384 levels! This is described with the term 'bit'. JPEG captures in 8bit, and RAW is either 12bit or 14bit.

In summary, the RAW file contains more data but this data must be processed with special software in order to become a finished image. To draw an analogy, the RAW file is similar to a frame of exposed film waiting to be developed.

# The RAW advantage

## 1. No lost data

JPEG files are convenient because they are small. To become small, JPEG files are compressed, and when they are compressed, a certain amount of file data is discarded. The JPEG format is known as a “lossy” format, because the more the file is compressed the more data it loses.

The RAW file does not lose data. When converting a RAW file into an image, most photographers save the image in TIFF or PSD (Photoshop) format. These formats are referred to as “loss-less”, because they preserve image quality and lose no data irrespective of the number of times they are opened and saved.

## 2. More control over the data

Essentially when shooting in JPEG the camera is acting as your darkroom, processing the image and even allowing you to crop in camera to produce a ‘finished image’. Using the camera’s factory ‘scene’ presets - Portrait, Landscape, Night, Fireworks etc. will save the image as a JPEG file.

In the JPEG format, the camera’s inbuilt computer is programmed to convert the raw data captured by the sensor into an image based on the settings (exposure, contrast, sharpening, saturation, white balance, etc.). The in-camera computer, not the photographer, applies a tone curve to the data in an attempt to create an image with acceptable brightness and contrast levels. The original raw data captured by the sensor is altered, and the camera deletes the RAW data after the JPEG is created.

RAW file conversion, on the other hand, allows the photographer more control over processing the original data on a desktop or laptop computer. The photographer is then able to adjust the colour space, contrast, sharpening, saturation, white balance, and exposure. And since the raw data is converted on the photographer’s computer, the effect of these adjustments can be observed in real time on screen.

Also, the photographer is always free to return to the RAW file to change settings and process the image differently whenever necessary, because RAW conversion does not alter the underlying data. The original RAW file is preserved.

## 3. White Balance

The colour temperature of the light, and often the mood of an image, is controlled by white balance. If a photographer incorrectly sets the white balance on a camera prior to taking a picture in JPEG format, the colour balance is fixed. The only hope lies in an attempt to adjust colour, hue, and/or saturation in an image editor to correct the error, and even then there is no guarantee of success.

However, during the process of converting a RAW file into an image, the photographer can reset the white balance to any specific value, just like resetting the white balance before taking the shot, without any loss or damage to the underlying data.

In Adobe Camera Raw, the colour temperature of the light can be carefully fine-tuned. Viewing the differences between various white balance settings on screen is like being able to try out a white balance setting before taking the picture.

## Which format to shoot in?

This very much depends on your needs as a photographer.

### JPEG is best for:

- Snapshots.
- Sharing over the internet/Social Networking.
- Sending to newspapers to meet a tight deadline.
- Action shots if your camera can't write the data to the memory card fast enough.

If an image is captured in JPEG at the largest file size, with the detail setting at "maximum", a good colour print can be produced, assuming the colour balance and exposure are correct. A high quality JPEG will allow for some improvements to be made in an image editor without seriously degrading the image quality.

However to get the most from JPEG, you must be confident of your camera's settings because problems like wrong white balance and over-sharpening can be difficult to fix later.

### RAW is best for:

- When the very highest level of quality is required.
- Giving you more control over your final image.
- Correcting dramatically over/under exposed images and helping to recover blown highlights and clipped shadows.
- Images produced for high quality printed publications or as high-quality colour prints. It records so many more colours and tonal variations than a JPEG. Prints reveal more detail, have smoother tonal gradations, and avoid 'posterization' and 'colour banding' which is sometimes found in JPEGs.

### The downside to shooting in RAW:

- Files need to be processed - therefore a good understanding of image editing software is required.
- Files take up more space - however camera memory cards, along with computer hard-drives have come down in price as their storage capacity has increased.
- Shooting RAW can slow older DSLR cameras down - worth testing this on your camera.
- Camera manufacturers have their own proprietary formats. Companies like Adobe either need to license software to decode the RAW files or reverse engineer how the files should be converted. The problem here is that you can't be certain that in 5, 10 or 20 years you'll be able to easily open that RAW file if you don't have the proper software to decode it! A new open source RAW format has been developed in order to overcome this obstacle. It was developed by Adobe and is known as **DNG (Digital Negative)**. Some newer cameras can shoot in DNG format but in Photoshop or Lightroom, you can convert your proprietary RAW files into the open source DNG format. It's an extra step, but it will ensure your files are readable far into the future!

If still in doubt, many digital SLR cameras today will allow you to record both JPEG and RAW files simultaneously. So for a little more file space, you can have the best of both worlds!