



## HP Photosmart Digital Cameras Technical Backgrounder

### Anti-Shake Technologies and Optical Image Stabilization.

#### What are these technologies?

Both “anti-shake technology” and “optical image stabilization” (OIS) refer to technologies that strive to solve the problem of camera motion during exposure. A third term, “digital image stabilization” is not in wide spread use in digital still cameras, but is described here for completeness. Since there is no standard for describing or naming these technologies you sometimes have to read beyond the headlines to understand precisely what is being provided. This backgrounder will provide information on how to understand what is being provided and the benefits to each methodology.

#### What is the problem being addressed?

In photography, whether film based or digital, apparent blurring of the image can result from motion of the camera during the exposure. If the camera moves during the exposure, objects in the photograph will be blurred. Often motion blur is mistaken for focus failure. This problem is typically seen when exposure times are longer than about  $1/60$  second for photographs taken at relatively low zoom. At higher zoom, the problem of camera motion appears at shorter exposure times. A rule of thumb that is often applied is the so-called “hand held limit” which says that the longest exposure that can be used without a tripod is equal to  $1/(35\text{mm focal length})$ .

The photographs below show the same scene with and without blur due to camera motion.



Image with camera motion blur



Same scene with no camera motion blur

## What is the difference between Anti-Shake Technology and Optical Image Stabilization?

Actually, optical image stabilization is a form of anti-shake technology. However, in most cases when a camera is marketed as having anti-shake technology, it implies that the method being used is not optical image stabilization. Care should be taken though because; in at least one case optical image stabilization *is* being marketed as “anti-shake technology”.

Three terms that describe various image stabilization methods are:

- Optical Image Stabilization: A component in the optical path is being moved to stabilize the image.
- Anti-Shake Technology: The camera is being operated in a manner intended to minimize the effect of camera motion, but no optical components are being actively moved.
- Digital Image Stabilization: This term is more prevalent in video cameras and typically refers to shifting the image frame to frame in the video stream to compensate for camera motion. If applied to digital still cameras, consider that it may refer to the video mode of the camera and if not, it is not optical image stabilization, rather a more general anti-shake technology.

## How does Optical Image Stabilization work?

Optical image stabilization is achieved by inserting a movable component in the optical path, then moving that component in response to, and to compensate for, camera motion during exposure. Essentially, when the camera moves, the optical component moves such that the image on the sensor remains fixed. To measure the motion of the camera, a set of gyroscopes must be installed on the camera to detect the motion of the camera. The precise technique used for optical image stabilization varies from camera to camera and lens system to lens system.

The advantage of optical image stabilization is that it allows longer exposure times while still allowing the camera to be hand held. Optical image stabilization can allow up to 2 stops of increased exposure time – equivalent to an exposure that is 4 times longer.

Of course, no technology is without tradeoffs. In the case of optical image stabilization, the tradeoffs include: Increased cost in the lens due to the movable optical element, decreased battery life due to power consumed by the motion actuators, increased cost in the camera to the addition of motion sensors and increased size relative to the same optical system without optical image stabilization.

It is also important to note that optical image stabilization does not compensate for *subject motion* in the scene, only for *camera motion*. Indeed, optical image stabilization may make the problem of subject motion worse because the longer exposure time allows more subject motion to occur during the exposure. *Subject motion* is caused by people or objects in the scene moving during the exposure.

## What is Anti-Shake Technology?

Anti-shake technology attempts to address the problem of camera *and* subject motion blur in low light situations by forcing (or allowing) the camera to operate at shorter exposure times for a given scene. In fact, this process is very similar to what an experienced photographer may do using manual exposure controls or by, in the case of film, 'pushing' the film. (Pushing film refers to the technique of purposely underexposing the film, then over-developing it to make up for the short exposure).

Typically, anti-shake technology in a digital camera is embodied in the form of an operating mode that is chosen. In that mode, the camera sensitivity (ISO) is increased, often beyond the level that is available in manual controls, and the exposure time decreased. For instance, in full auto mode, the camera may calculate an exposure of 1/15 of a second at ISO 200, but in anti-shake mode, the camera will capture the exposure at 1/60 of a second and ISO 800. Recall, doubling the ISO and halving the shutter speed result in the same exposure. In this example, the exposure time is shortened by a factor of four, and the ISO increased by a factor of 4, resulting in the same 'exposure'.

Of course, like optical image stabilization, anti-shake modes come with a tradeoff. When the effective ISO of a digital camera is increased, the noise in the image increases as well. Therefore, while the anti-shake technology will limit both camera and subject motion blur by shortening the exposure time, the resulting photograph will show more noise. This same effect was seen when pushing film as described earlier.

*Note: optical image stabilization is a form of anti-shake technology. Some cameras may market optical image stabilization as "anti-shake" technology. More often, "anti-shake technology" refers to non-optical methods.*

## Do HP Photosmart cameras have these technologies?

Like all camera manufacturers, HP could work with lens vendors to obtain lenses with optical image stabilization. In addition, HP has patented technology for optical image stabilization. However, at this point, no HP cameras include optical image stabilization.

HP cameras do include anti-shake technology today though it is not specifically referred to in that manner. Specifically the HP Photosmart R817 and R818 digital cameras use anti-shake technology to enable the Theatre mode. In Theatre mode the camera is operated in a manner to minimize the effect of camera motion during low light image capture. In addition, in theater mode, several of HP's Real Life Technologies are optimized for low light photography. HP has not chosen to label the technology as 'anti-shake' but, in fact, it is an anti-shake technology.

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