

News Spotlight

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by Vince Meli



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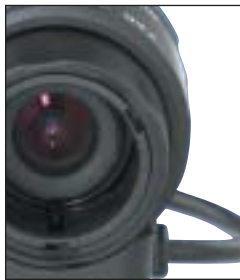
The value of the lens to the camera

By Vince Meli

Today, manufacturers are designing CCD sensors with enhanced performance, allowing cameras to operate in the most stringent applications. Additionally, lens manufacturers have improved the design of lenses by providing a crisper, sharper image to the monitor. The significance of the lens is often underrated. The lens is to a camera as speakers are to a stereo. Higher quality speakers deliver superior audio sound; similarly, higher quality lenses produce a crisper, sharper consistent image on the monitor. The lens is the first interface between the live scene and the eventual picture on the monitor. Therefore, the quality of the system is very much affected by the choice of the lens. The good news is the difference between a high-end and low-end lens is negligible in price, but significant in quality.

Lens Functions

Focal Length



The primary function of the lens is to collect the reflected light from the scene and focus the

light on the CCD sensor. Typically, the more light that is focused on the sensor, the clearer and sharper the image will be on the monitor. The manufacturing process of optics is extremely important to the amount of light the lens will pass through to the sensor. The material characteristics of the optical resin require an optimized temperature during the molding, polishing and coating process.

The lens selection depends on the site and system requirements. The two key

factors that must be considered when selecting a lens are focal length and iris control. The focal length determines the field of view. The longer the focal length, the narrower the angle of view; similarly, the shorter the focal length, the wider the field of view. If the application requires positive identification of an unknown person, the head and shoulders would need to fill the screen. This would require a lens with a longer focal length. The two basic types of lenses are Fixed focal and Varifocal length. Fixed focal lenses are used in applications where the angle of view is already predetermined. Varifocal provides the flexibility to adjust the focal length over a range. The added flexibility allows the user to adjust the angle of view at the installation site.

Iris

The primary function of the iris is to control the amount of light that will eventually reach the sensor, similar to the pupil of a human eye. Bright light causes the pupil to close, compensating for the excess light. Adversely, darkness causes the pupil to collect as much light as possible. Depending on the applications, the iris can be manually or automatically adjusted. Indoor applications with constant lighting use manual iris lenses. Auto iris lenses are best used in applications with changing lighting conditions, such as outdoor settings.

F-Stops

The function of an F-stop is also not fully understood. The F-stop is a hole in the lens that controls the amount of light that reaches the CCD sensor. The larger the hole, the more light that will reach the sensor. The diameter of the hole is defined by an alphanumeric number. The larger the F number, for example F1.8, the smaller the opening of the hole (iris), allowing less light to pass through to the sensor. The F number could be compared to the bottom of the fraction. For example, which hose would pass more water through it, one with a diameter of 1/2" in or one with a diameter of 1/8"? Similarly, which lens will pass more light through to the sensor, F1.2 or 1.8? The lens with the F1.2 has a larger diameter hole; therefore it passes a greater amount of light to the camera.

ADEMCO Video has recently released a lens with an F-stop of F/0.95. The iris in this lens has an extremely large hole, allowing the maximum amount of light to be passed through to the sensor, even in the most stringent lighting conditions. Lenses that have low F-stops (larger diameter iris) improve the camera's sensitivity to produce useable video.

Camera Sensitivity



A camera's sensitivity is one of the most important specifications found on a data sheet or

architecture engineering specification. Sensitivity is typically measured in lux, indicating the minimum light level required to obtain an acceptable video picture. Some manufacturers don't reveal all the variables of how the camera was tested, to come up with the minimum illumination (lux). Therefore, the camera may appear to have higher performance based on the limited information on the data sheet. The variables that should be defined on a data sheet are reflectance, the F-stop and whether or not the Automatic Gain Control (AGC) was on or off.

Flexibility

How are these variables defined?

Usually when light falls on a subject, a certain percentage is absorbed and the balance is reflected, moving towards the lens in the camera. This is known as reflectance. Depending on the surface, for example, snow 90% and brick 25% reflectance, the higher the reflectance percentage means more light that is reflected back to the lens. The size of the F-stop (iris opening) will define the portion of light that falls on the CCD sensor. The AGC is an important factor that determines the minimum illumination (lux) specification. Manufacturers sometimes test the camera with AGC on, boosting the video signal and ultimately improving the camera's sensitivity. The purchaser should always be aware of all of the above variables for a true understanding of the camera's performance.

The ADEMCO Video ACC334E standard resolution color camera has a sensitivity of 1.8 lux, with a lens that has an F/1.4 F-stop. The same camera will have a much higher sensitivity of 0.9 lux with a lens that has an F/0.95 F-stop. In the above example, the scene reflectance is 80% and the AGC is on. If the AGC were off, on the F/0.95 example, the result would be a lower sensitivity performance.

Customer Benefits

When purchasing products, typically the better the performance, the higher the cost. In difficult lighting, a camera with higher sensitivity must be used to produce acceptable image quality; typically this camera is at a premium. Compared to the cost of a camera, a lens is inexpensive. Selecting a lens with a lower F-stop (large iris opening) ensures optimal sensitivity and increased camera performance. Subsequently, a higher quality lens may save the customer the cost of a more expensive camera.

Competitive Outlook

Most large lens manufacturers, offer lenses with lower F-stops and wider focal ranges. ADEMCO Video has designed a lens with one of the lowest F-stops in the industry, having greater light collectability than the competition. We have also added an extended focal range from 2.9-13mm, and reduced its physical size, making it one of the most versatile and compact lenses in the industry.