

Infinova[®]

The Integrator's Manufacturer



White Paper

Day/Night Video Demystified for Integrators

If a Day/Night camera is called for, it must be complemented with a quality Day/Night lens. However, there are nighttime applications that rely on visible light and don't require Day/Night cameras.

How do you assure that you are proposing a video system that will do everything that your customer wants, including recording clear images in all types of light, without running up the cost? Day/night cameras can be a dilemma. When do you propose them and when are they not required? What else do you need to propose as complementary products? Here are some answers to these questions and why.

This white paper is a guide for security Integrators on how to select the correct day/night camera and match this with the right lens and get the best low light performance from surveillance cameras.

Related White Papers from Infinova

Infinova has a series of white papers aimed at helping CSOs and senior security management to make the technical and business decisions needed to manage security and surveillance installations. The previous five cover:

- Coexistence strategy at the heart of a cost-effective move from analog to digital security video.
- Selecting cameras – analog to IP-based as well as megapixel and high definition.
- Fiber optics enhances the operation and business bottom line of surveillance solutions.
- Storage options and ways to determine which are the best for the needs of the enterprise.
- How to conduct a security site survey leading to a risk and vulnerability matrix.

These previous white papers are available for download at www.infinova.com

Day/night cameras are capable of providing usable images at night by changing camera parameters to work more efficiently in low light. A basic example of day/night operation is the use of infrared (IR) LEDs within the camera housing. That's because, although people can see only visible light, security cameras see both visible and IR light. The addition of artificial IR illumination enhances the ability of the camera to record an image without giving away the camera's presence or field of view.

While security cameras use color filters (blue, green, and red) to create a color image, each filter also allows IR light to pass through onto the sensor, muddying the colors. Since most lenses are designed for visible light only, most security cameras have an IR filter to block the IR light. This filter improves both the color fidelity and sharpness of the image.

Some lower cost Day/Night cameras (like those with IR illumination built into the camera housing) generally use software to create the best image they can, given the limitation of allowing both visible and IR illumination through the pixel color filters. At night, the algorithm changes, giving a slight improvement to dark image recording. Changes include desaturating the colors to give the viewer a black and white image.

Technology advances inside cameras have helped aid lighting needs. More sophisticated cameras, those cameras considered true day/night, can physically remove the IR filter from the light path, allowing the camera to see both visible daylight and IR light. This can make the camera 15-20 times more sensitive at night compared to a standard day-only camera. These cameras require day/night lenses to keep the scene in focus both day and night. Day/night lenses are generally more expensive because of the added complexity of focusing a broader color spectrum (from visible through IR) onto the sensor. But, show your customer the difference and the price will seem minimal.

What is a true Day/Night camera?

A true day/night camera has a movable IR filter. During day performance, the IR filter is in place blocking all the IR light, creating a nice color image. In this case, the IR filter (represented in brown on the chart) will block all IR light greater than about 750nm wavelength. At night, when light decreases, the IR filter is replaced with a clear glass dummy filter. The clear glass allows all available visible and IR light to reach the sensor and be recorded.

Although removing the IR filter improves the light sensitivity, it does so at the expense of color fidelity. To counteract the degraded color in night mode, the software for most day/night cameras de-saturates the colors, creating a monochrome image.

For an example of a true day/night camera, the Infinova V6102-N Series Fixed Day/Night IP Camera can automatically switch between color and B/W mode via ICR (IR Cut Removable) filter, which greatly enhances its sensitivity. Usable images can be delivered even in extremely low light conditions down to 0.01 lux @F1.2 (30 IRE, AGC ON). Some nighttime light sources such as the moon, street lights, and parking lot lights contain enough IR illumination to allow the camera to capture a good nighttime image.

Do You Need a Day/Night Lens?

A day/night lens may be used on any camera. However, a high quality day/night lens is absolutely required when using a day/night camera. Day/night lenses are designed with the criteria that they focus the infrared light to the same plane as the visible light. This means that the scene is in focus whether using visible light from the sun, moon, or street lights, IR light from these same sources or artificial IR illumination LEDs, or both. Without a day/night lens, the camera would give a soft focus effect at night when both IR and visible light are used at the same time.

Integrators also need to understand IR corrected lenses. As earlier mentioned, many natural light sources contain infrared light. However, the amount of light changes as the light source changes over a 24 hour time period. Because wavelengths vary under different types of light (artificial and natural), a non-Day/Night lens may not be able to focus all the light to the same plane resulting in a condition known as focus shift. This occurs when the

camera is focused during the day under natural or visible light (daytime). In night mode when the IR filter is removed, the additional IR light reaching the image sensor may be out of focus or blurred.

An IR corrected lens such as Theia's SL183 megapixel lens minimizes this light defocus, which results in a continually focused image during the day and at night. This eliminates the need to re-focus a camera lens at night or when using IR illuminators to provide a light source.

Also be aware of back-focus. Many video cameras come with an automatic back-focus feature that can enable a camera to see a sharp image in IR light without the use of an IR correcting lens. When the camera is operating in night mode, the mechanism automatically moves the sensor to the focal plane for IR light. However, during twilight when there is a combination of visible and IR illumination, the image will not necessarily be in sharp focus. A quality Day/Night corrected lens is still required to keep the image in good focus with this type of camera.

New lenses on the market, such as Theia Technologies' SL183 and SL940 series, even provide day/night performance for megapixel cameras in applications such as parking lots, warehouses, power transformer lots, lobbies, ATMs, and other places that need surveillance on a 24/7 basis. Achieving Day/Night correction with a megapixel quality lens is difficult due to both the increased light spectrum that must be focused at a single plane and the decreased focus spot size required for megapixel cameras.

Illumination Sources

Artificial IR illumination can be provided by IR LEDs. These can enhance the naturally occurring light in the scene. Such lights can be mounted anywhere as long as the IR light can shine on the object that the camera is watching. There is no requirement that the IR lights be mounted at or near the camera. They can be scattered throughout a parking lot, for instance, bathing the entire area in IR light.

However, many visible light sources such as street lights, warehouse lights, incandescent lights, not to mention the sun and moon, are also sources of IR light that can be recorded by the camera's sensor. If the scene has such a light source at night, a day/night camera can record the scene without the aid of additional IR illumination.

Are You Really Sure that Your Customer Needs a Day/Night Camera?

If there is enough visible light in the scene, a standard camera (with IR filter) can be used for night security applications. Illumination sources like those mentioned above may provide sufficient visible light that use of a day/night camera in night mode may not be necessary at all. In this case, the use of a day/night lens is optional.

When there is adequate visible light at night, a non-day/night lens can be used with a standard, non-day/night camera. Just make sure that the lens can support the number of megapixels in the camera.

Bottom line, for night surveillance, if there is enough visible light in the scene, it may not be necessary to use a day/night camera and lens. However, if a day/night camera is called for, it must be complemented with a quality day/night lens. In this case, artificial illumination with IR LEDs will enhance existing light from streetlights and other sources.



By helping channel partners provide their customers with complete, affordable, best-in-class, large and small video surveillance solutions, Infinova helps integrators generate more business more profitably. Leveraging a manufacturing process certified to ISO 9001:2000 standards and over 250 engineers with a list of video industry firsts, Infinova channel partners provide their end-users with industry-acknowledged product reliability and technical leadership.

So that Infinova channel partners can create complete solutions, Infinova provides IP surveillance cameras and components, CCTV analog cameras, DVRs and components, camera accessories, monitors, power supplies and fiber optics communications devices. Infinova also has the technical ability and manufacturing flexibility to let integrators propose customized solutions. In addition, Infinova will partner with other manufacturers making other surveillance equipment and software to help its channel partners create turnkey solutions. Contrary to most other companies, Infinova will back-up their partners' products as well as its own to assure both the integrator and its customers that one call – to Infinova only – takes care of everything.

Infinova works diligently to assure its channel partners can provide cost-conscious solutions. With Infinova's hybrid systems, channel partners can propose systems that protect a customer's investment in its already-installed analog surveillance system but that also put them on a dynamic migration pathway to IP systems.

Infinova is lauded for its exceptional maintenance programs. A major highlight is the company's 24-hour advanced replacement policy in which a substitute product is shipped immediately upon notice of a problem.

With such customer focus, Infinova is often referred to as "the integrators' manufacturer."



Theia Technologies was established in 2006 to develop ultra wide angle lenses without distortion. Theia was created to continue developing markets for the ultra wide angle lens by taking it into camera markets such as security surveillance and machine vision.

Theia has several issued and pending US and foreign patents for lens technologies.

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