

Illuminating Infra Red

For half the year in Britain there are twelve hours or less of daylight each day. Any installation that fails to consider nighttime illumination is clearly compromising its effectiveness. Criminals understand this and so it comes as no surprise that a high proportion of crime takes place in the dark. Used correctly, Infra-Red (IR) - light visible to cameras but not to the human eye - can play a vital role in deterring and reducing crime. Understanding IR illumination is therefore essential.

When designing CCTV systems for effective 24-hour surveillance three issues are central: the camera, the lens and illumination.

Camera

It can be a minefield for installers faced with impressive claims of zero or low lux cameras, but in essence, without light there can be no picture.

All CCD cameras offer some degree of IR response though some have enhanced IR performance that make them more suitable for longer range applications or for use with low power IR sources such as LEDs. The latest chip sets offer excellent low noise, high resolution, and low smear characteristics together with excellent IR response.

Day/night cameras are intended to provide the best compromise for 24 hour surveillance - colour by day and monochrome / IR sensitive by night. There are different forms of day/night cameras with some incorporating optical filters that are moved over the CCD sensor for daytime/colour operation - and removed during night-time/monochrome to maximise the low light sensitivity. Other camera designs incorporate specialised filters which do not move but which have both good colour performance and IR sensitivity.

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Lens

At night, you want to maximise the light gathering capability of the lens (i.e. have the smallest `f` stop) but this will reduce the depth of field of the picture, which may cause focusing problems. An auto iris lens will naturally open to its maximum aperture (lowest `f` stop) in low light operation but on a fixed lens there may need to be a compromise between the low light operation and its depth of field focussing.

Daylight and IR light have different focal lengths/points because the different wavelengths of light pass through the lens differently and do not focus on the CCD at the same point.

This may cause a focus shift between daytime and IR operation. The degree of focus shift may depend on a variety of factors depending on the quality of lenses, the wavelength of the IR filter (830nm & 950nm will give a more exaggerated focus shift) and the IR response of the camera.

Some manufacturers have developed a range of lenses with zero focus shift between daytime and IR performance. This is of considerable interest to CCTV designers – especially for unmanned or non-telemetry controlled installations.

Illumination

The key to a successful night scheme is having sufficient light, the right quality of light and the right control over the light. The best solution is Infra Red lighting at the camera head controlled by either telemetry or photocell.

The distances you can expect to achieve depend upon camera and lens type and these can affect system performance by as much as 50%. All Cameras are less efficient at 850nm and achievable distances can be reduced by at least 25%, whilst at 950nm the performance of many camera/lens combination can be reduced by over 60%.

When choosing an IR lamp, consideration should be given to the lamp's ability to provide even illumination. Additional factors such as bulb life and running costs should also be taken into account. In general, IR lamps driven via the mains tend to have considerably lower bulb life and higher running costs than low voltage IR lamps.

It is also important to match the camera lens to the beam pattern of the Infra Red light. Mis-matching in this area can lead to either poor picture quality or loss of IR efficiency.

Solid-state devices such as LED's (Light Emitting Diode) bring major advantages, including lower maintenance levels and lower power consumption.

The LED units can provide up to 10 years' life. However, they provide less power on scene than halogen IR lamps. LED's are beginning to make a bigger impact on the CCTV scene because of the increased IR sensitivity of emerging monochrome cameras.

Certain manufacturers combine the camera, lens and LED illumination into one package. These are sometimes termed IDN products, which means Integrated Day and Night (IR) performance. These products sense the ambient light levels and switch on the IR when insufficient light is available. However, the achievable distance with IDN products is usually less than 50m.