

### What is a CCD sensor?

Most CCTV cameras are now almost exclusively 'CCD' sensor type.

**CCD stands for Charge-Coupled Devices.**

These are light-sensitive chips, the sensitive area being split into a large number of individual pixels (small dots on the chip).

An image from a scene is focused through a lens onto the chip surface and charge is built up in each pixel proportional to the intensity of the light falling on it.

Hence an electrical representation of the optical image is formed.

Typical active pixel counts for CCD sensors is between 250,000 and 500,000 pixels.

Cameras are available in both monochrome and colour types.

### Lenses

Note that coSurveillance, in common with most other manufacturers, supply cameras without lenses fitted.

This is because there are many different types of camera and even more types of lens and so it would be impractical, and very expensive, to stock all possible permutations and combinations to meet each application. Hence - REMEMBER

TO QUOTE FOR THE LENS!

### Camera performance

The main criteria of a camera's performance are its sensitivity and resolution.

Sensitivity is a measure of the minimum amount of light required by the camera to give a 'useable' Image.

Resolution defines the amount of picture detail in the image produced by the camera.

## Sensitivity

The CCTV industry has many ways of stating an individual camera's sensitivity performance. Most common is minimum scene illumination required to give useable picture at a particular lens aperture e.g. 11.4. (This is inherently subjective).

Another, more objective definition is the minimum scene illumination required by the camera to give full video output i.e. 1v peak to peak. Few manufacturers use this definition!

Most manufactures provide a figure in LUX which is actually a light level (see chart below) the figures quoted are often like this 0.1 LUX.

The problem with this is that to get a true representation of the actual sensitivity of the camera the lens apertures must also be compared.

Lens apertures, i.e. the size of hole that light can pass through in the lens, must be compared in order to get a true comparison of performance.

Camera 1 requires a minimum scene illumination of 0.1 lux at a lens aperture of f1.4 to give a useable image.

Camera 2 requires a minimum scene illumination of 0.05 lux at f 1.0 to give a useable image.

This appears to say that camera 2 is twice as sensitive as camera 1 because it needs half the light to give a useable picture. In fact the cameras have equal sensitivities because the aperture through which light is allowed to fall on the sensor of camera 2 is twice the area of that for camera 1.

Typical sensitivities (defined as minimum scene illumination required for useable picture with lens aperture at f1.4) for current CCD cameras are as follows:

Medium Performance (General purpose) Monochrome	0.5 - 0.25 lux
High Performance (Low-Light/Outdoor) Monochrome	<0.20 lux
Medium Performance (General purpose) Colour	3.0 lux
High Performance (Low-Light) Colour	< 2.5 lux

Note that monochrome CCD cameras are still approx. 5 times more sensitive than equivalent colour cameras.

Typical light levels are as follows:

Full Summer Sunlight	50,000 lux
Dull Daylight	10,000 lux
Shop/Office environment	500 lux
Dawn/Dusk	1 - 10 lux
1/4 Moonlight	0.1 lux

## Resolution

Resolution is measured in lines and normally only horizontal resolution is quoted.

Vertical resolution of a camera is of little interest because pictures are generally speaking limited by the scanning system used to produce the image.

In the UK and Europe this is the CCIR system, which defines that a picture is built-up from 625 lines across the screen.

Of more interest in measuring camera performance is horizontal resolution.

This is the maximum number of black or white areas that can be identified across the picture. This is always specified per monitor height.

A typical general purpose monochrome camera has a horizontal resolution of 380 lines. This means that it should be possible to resolve 380 x 1.33 i.e.. 505 individual actual lines of black, white or grey along any one line of a CCTV picture image.

(The factor of 1.33 comes from the fact that a TV picture has an aspect ratio of 4 : 3)

Typical resolution performance for CCD cameras are as follows:-

Medium Performance (General purpose) Monochrome	380 lines
High Resolution Monochrome	600 lines
Medium Performance (General purpose) Colour	380 lines
High Resolution Colour	480 lines.

## Camera formats

Cameras will be quoted as 1/2", 1/3" or occasionally as 2/3". Newer cameras will be referred to as 1/4". This refers to the format of the camera and defines the size light-sensitive area of the imaging device used in the camera. In itself it gives no measure of a camera's performance although generally the smaller the format size, the smaller the light gathering area of the sensor. It is provided for information to enable the installer to match the camera to the correct lens. Camera formats are getting smaller in order to reduce the costs of the imaging devices and hence the cameras themselves as well as the lenses put onto them.

## IMPORTANT

**The format size of a lens must be equal to or greater than the format size of the camera it is being used on.**

If the lens is of smaller format size than the camera then the corners of the scene being viewed will be cut-off (vignetting).