

DATA SHEET

What is a CCD sensor? (CCD stands for Charge-Coupled Device)

Most CCTV cameras are now almost exclusively 'CCD' sensor type. These are light-sensitive chips, the sensor 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 surface of the chip and a charge is built up in each pixel proportional to the intensity of the light falling on it. An electrical representation of the optical image is created. Typical active pixel counts for CCD sensors are between 250,000 and 500,000 pixels. Cameras come in both monochrome and color formats.

Lenses

Note that, in common with most other manufacturers, supply cameras without lenses attached. This is because there are many different types of camera and even more types of lens. It would be impractical, and 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 a 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 fl .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 fl .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) Color 3.0 lux

High Performance (Low-Light) Color < 2.5 lux

Note that monochrome CCD cameras are still approx. 5 times more sensitive than equivalent color 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. For example, 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 380×1.33 i.e.. 505 individual actual lines of black, white or gray 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 is as follows: -

Medium Performance (General purpose) Monochrome 380 lines

High Resolution Monochrome 600 lines

Medium Performance (General purpose) Color 380 lines

High Resolution Color 480 lines.



The advice provided in this document is offered only as a guide.