PULNiX **TECHNICAL NOTE**

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ELECTRONIC SHUTTER CAMERA RECAP

Electronic shutter cameras are getting popular these days and they are being used in greater numbers for many applications. Therefore it is a good idea to recap the nature of shutter cameras.

1. Vertical resolution

The majority of shutter cameras are interlace scanning and the shutter works at each field. When the picture is captured, the vertical resolution is only one field....244 pixels.

You can capture one frame of video (two fields) but the picture looks doubled because the object is normally moving. Without the shutter, the picture would be blurred.

Whenever a full frame of vertical resolution is needed, the common practice for capturing an image is using strobe lighting with an interline transfer CCD camera such as the TM-540, TM-745. (In any case the camera must be set in frame mode).

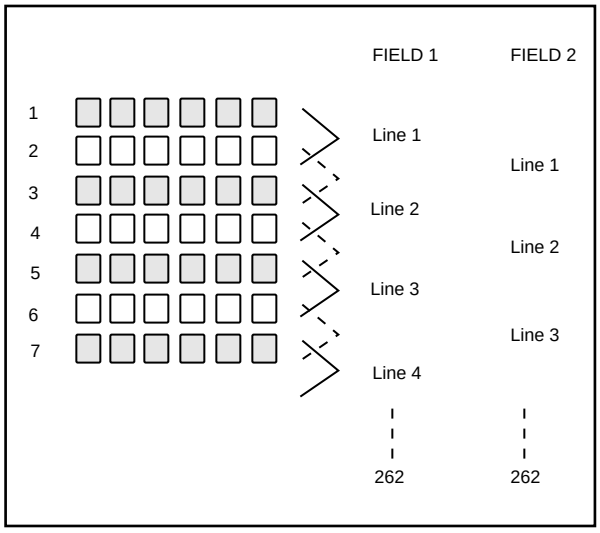
2. Sensitivity

Sensitivity is proportional to the exposure time; in other words, it relates to shutter speed just like a 35mm camera.

In order to increase sensitivity during shuttering, the following technique is used:

1. High AGC gain: internal gain is boosted to compensate the exposure time. The negative effect of this is a noisy picture and non linearity to lighting condition.

2. Two row scanning (FIELD MODE scanning): CCD or MOS imager pixels are scanned by two horizontal rows together at each field. Since vertical resolution is only half in shutter condition, two horizontal row scanning does not hurt the resolution. Instead, it can double the CCD photo sensitivity.



For normal conditions the scanning is still interlaced because the pairs of two rows are alternating between each field resulting in the same effect as frame resolution. (To be more precise, it is not pure pixel information but the sum of two alternating pairs and not exactly the same resolution as FRAME MODE).

In general, FIELD MODE has a great advantage for shutter application.

Pulnix cameras which come with selectable FIELD and FRAME MODE are the TM-745/TM-765 SERIES, the TM-20/TM-40 SERIES and the TM-440X/TM-460X SERIES.

TMC-514/TMC-516 SERIES TMC-74/TMC-76 SERIES.

Frame transfer type CCD models are all field mode only.

3. Shutter timing and speed control.

The shutter period is always before the transfer gate timing which occurs during vertical blanking. The majority of shutter cameras are synchronized with vertical reset. Unless specifically designed in (like the TM-845), the shutter timing cannot be variable. The speed is controlled by charge dump timing or reverse transfer timing in some cases. This timing determines the period of exposure or integraton before the transfer gate.

The shutter speed depends on type on the CCD, CCD control, etc.