## Exposure and Strobe Delay vs. Shutter Type Timing App Note

The exposure times and strobe delays will vary from camera to camera depending on the type of shutter used. This application note explains the differences between these shutters and provides an understanding on how to set the exposure and strobe delay appropriately.

Rolling Shutter Timing

With a rolling shutter, the top row of the sensor starts exposing before the bottom row starts. When the exposure time is reached, the top row is read out while the other rows are still being exposed. All rows are exposed for the same period of time but the time in which they start and stop exposing are different.

Rolling Shutter Timing
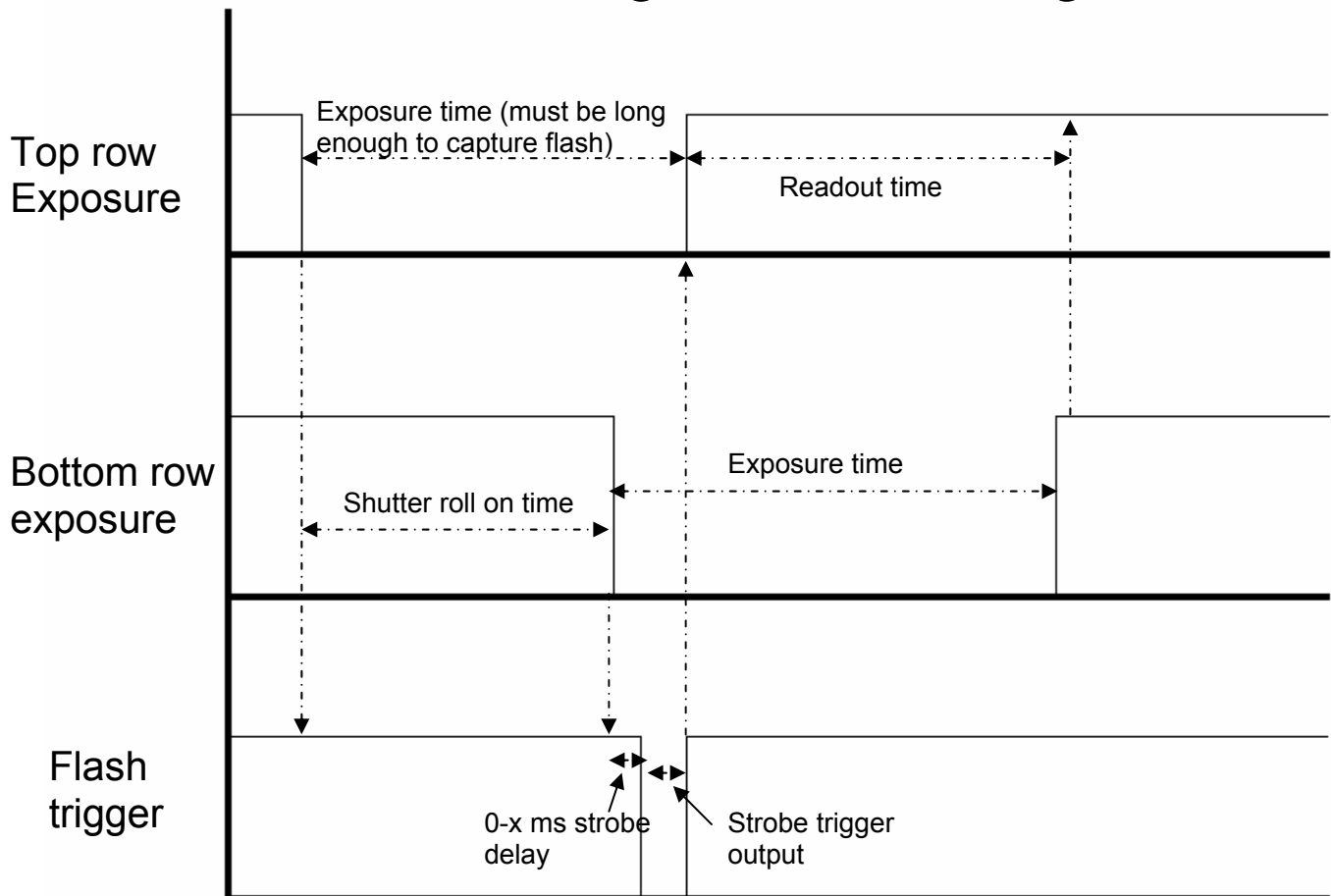
To properly synchronize a flash or strobe with this type of shutter you need to delay the firing of the strobe to the point where every row is completely exposed. Typically, this timing is the shutter roll on time. This time is usually the same time as the readout time of the sensor.
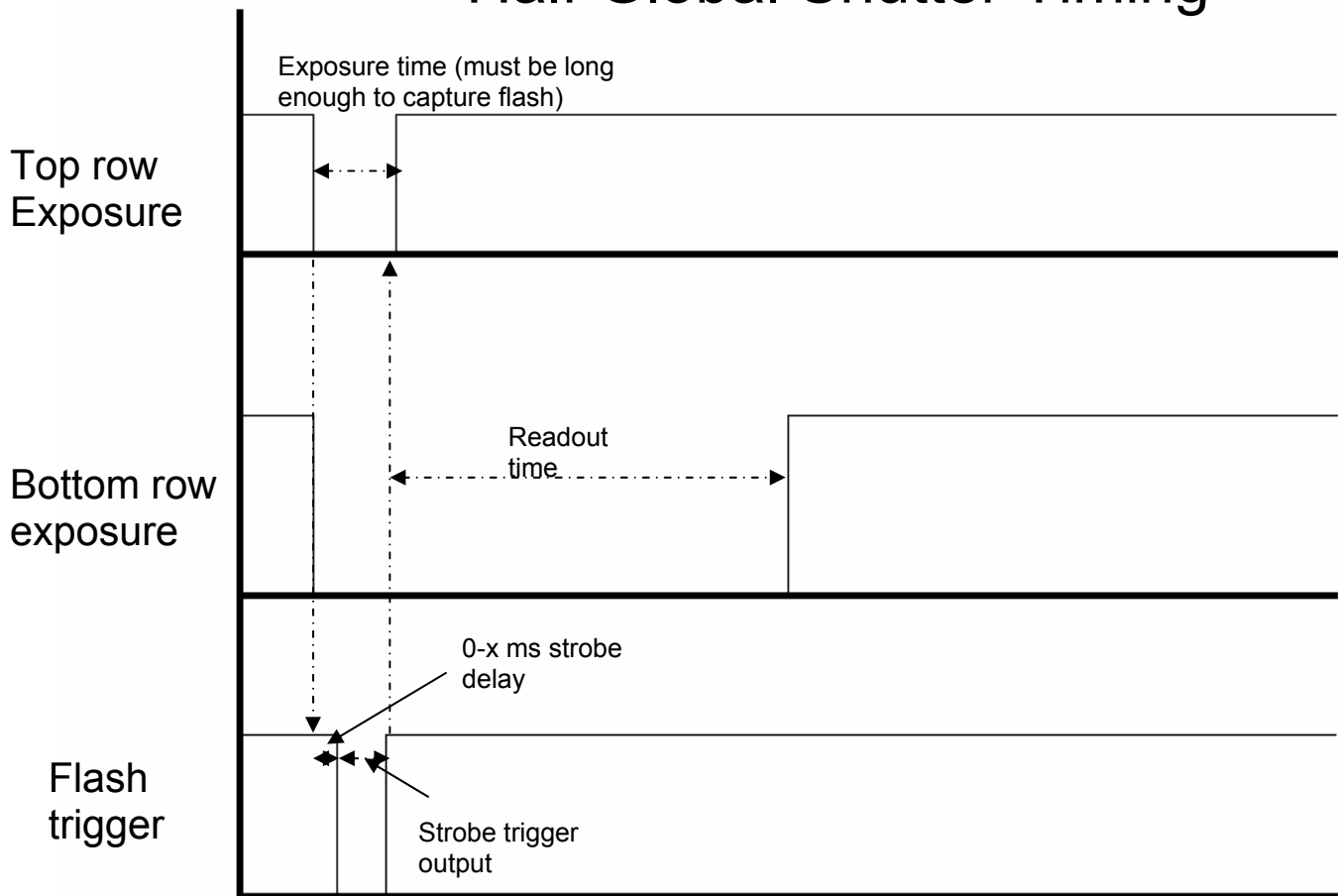
The exposure value also needs to be long enough so as to ensure that all rows are exposed at the same time but also provide enough time to capture the flash/strobe light that is reflected back from the target object.

The issue with this type of sensor is that, while the sensor is waiting for the shutter to open and close, each exposed line is still accumulating light. For larger sensors this could cause over exposure of the images if the ambient light is too strong. To minimize this effect, smaller aperture lenses are required to minimize the amount of ambient light that seen by the sensor.

Half-Global Shutter Timing
With the half-global shutter, the entire sensor is exposed at the same time. When the exposure time is reached, the first row is read out while the other rows continue to gather light. The effect of this type of shutter is that the bottom rows are more exposed than the top rows.

Half Global Shutter Timing

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These types of cameras make it easier to synchronize a flash. Since each row of the sensor starts exposing at the same time, the strobe delay can be minimized. This shutter type allows for shorter exposures when using a flash.

The drawback to this type of shutter is that it still accumulates light while the rows of the sensor are being read out. If there is a lot of ambient light, the lower rows of the sensor will seem brighter in the acquired images. This is more noticeable with short exposures.

Global Shutter Timing
With a global shutter, the entire sensor is exposed at the same time and stops accumulating light at the same time. The top row of the sensor starts and stops its exposure at the exact same time.

These types of cameras are the easiest to use with a flash. There are no issues with accumulating unnecessary light in the images and are great at stopping motion.

Global Shutter Timing
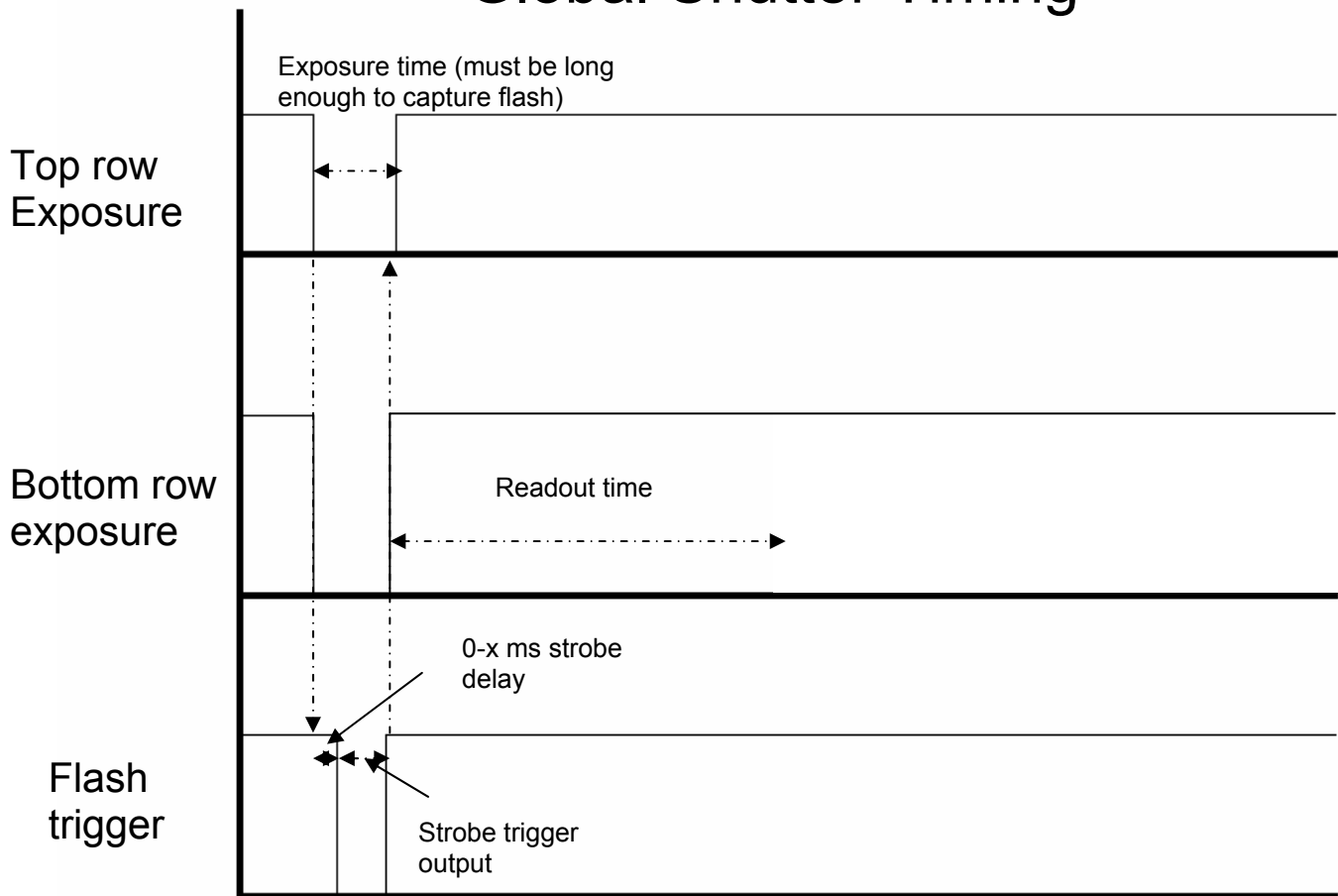
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