

What is a Polarizer ?

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Ordinary light from an incandescent bulb or from the sun is randomly polarized, that is, it includes waves that are oriented in all possible directions.

A polarizer is a material that is used to convert a randomly polarized ("un-polarized") beam of light into a polarized one, oriented in such a way that light with E_2 (electric vector) along the x axis is absorbed, while the E_1 along the y axis is transmitted. What emerges is that component of the original wave which had the y direction polarization. In the example above, the polarizing direction is along the y axis.

Positive image reflective liquid crystal displays have a polarizer applied to the front of the display and a reflector applied to the rear of the display. The liquid crystal molecules control the polarization state of beam of light polarized by the front polarizer. Controlling the orientation of the liquid crystal molecules will change the polarization of the beam.

As the polarized light from the front polarizer passes through an un-energized display, it will be rotated 90 degrees by the liquid crystal and either absorbed or passed by the rear polarizer. When the display segment is energized, the liquid crystal will rotate in the direction of the electric field and no longer rotate the polarized beam of light. Again, depending on the direction of the analyzer, the light will be either absorbed or passed. In the case of a positive image reflective display, this would produce a dark character on a light background. It is important to note that twisted nematic liquid crystal displays must have a polarizer applied to both the front and rear surfaces for them to function as useful devices.