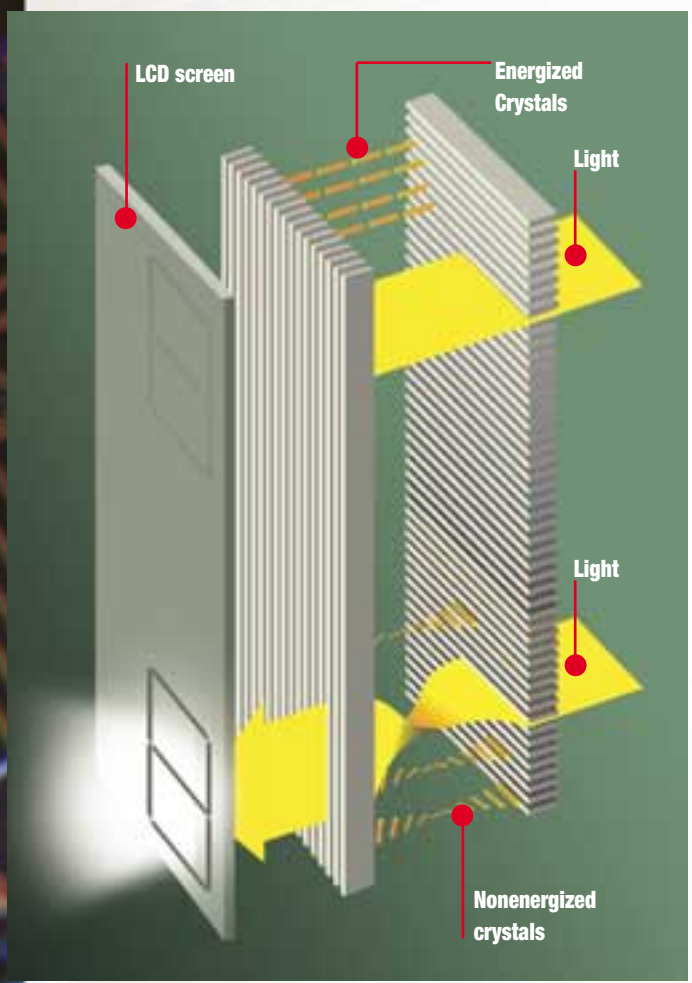
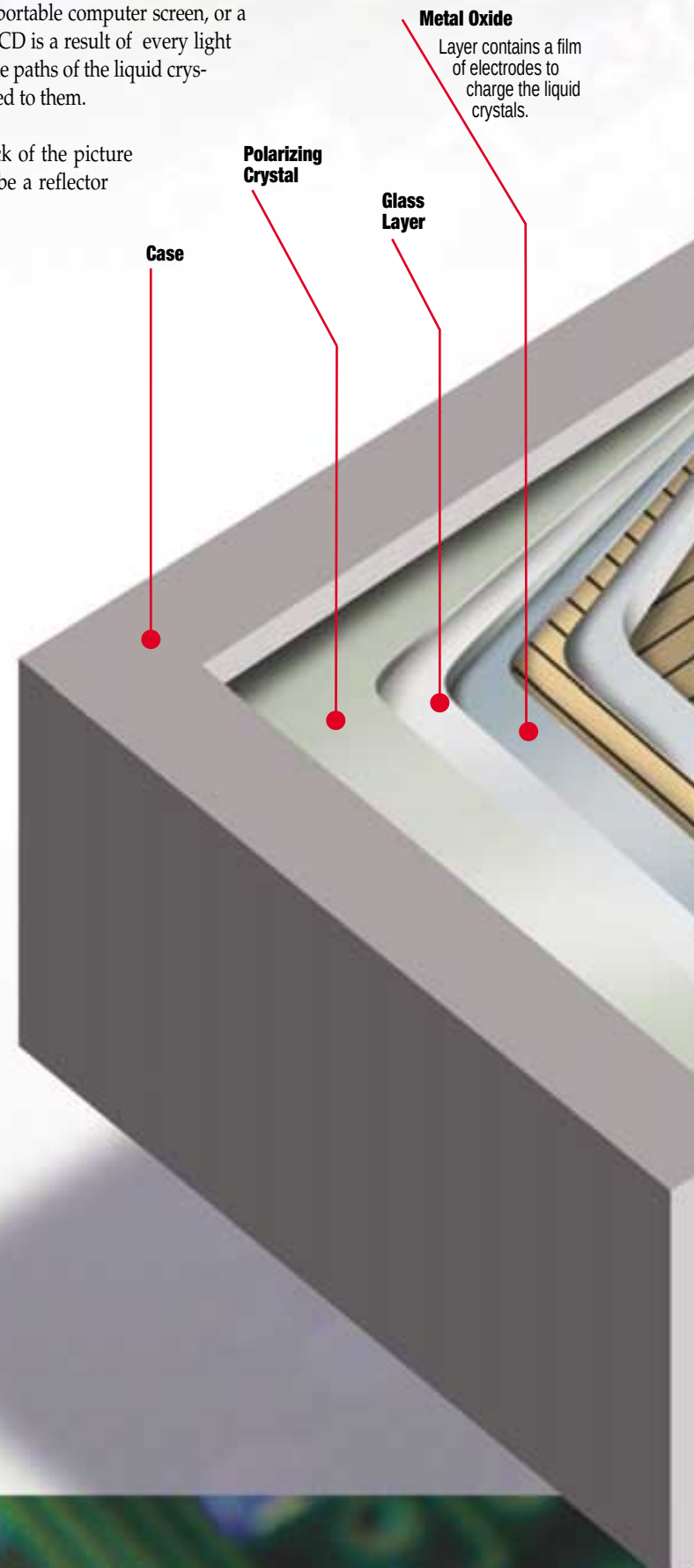
How Liquid-Crystal Displays Work

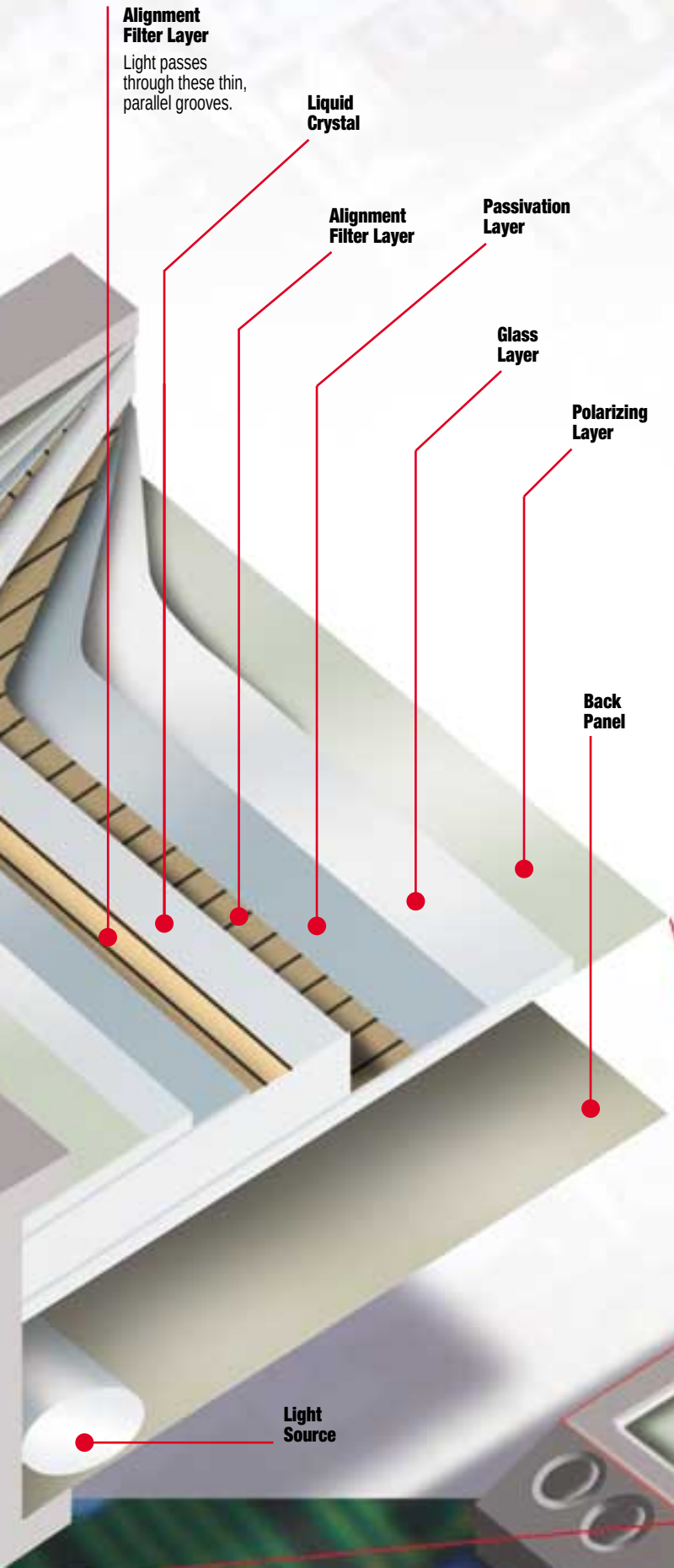
An LCD consists of multiple layers, each one crucial to the functionality of the display. No matter what type of LCD you have, a desktop monitor, a portable computer screen, or a calculator, they all have similar layers. Everything you see on an LCD is a result of every light ray's path through the layers of the display. The light rays follow the paths of the liquid crystals, which decide on their course by the amount of electricity applied to them.

The diagram at the right shows the layers in an LCD. The back of the picture displays a backlight tube to illuminate the screen. This can also be a reflector that bounces external light back through the LCD.

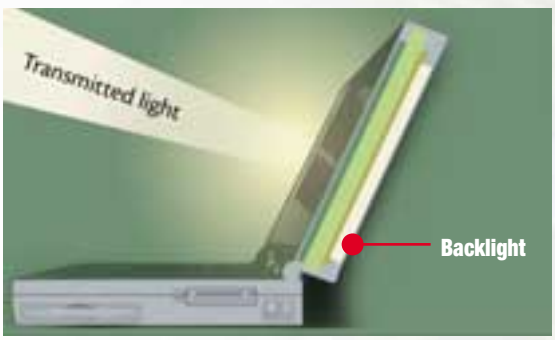


Filtering Light. Two polarizing filters encase the liquid crystals in the LCD. One filter is etched with horizontal lines; the other with vertical. Light enters the liquid crystal compartment parallel to the first filter's lines and follows the path of the liquid crystals. If the liquid crystals become energized, the crystals and light rays do not twist to become parallel with the second filter. Light rays reach the second filter perpendicular to its lines and cannot pass through to the viewer's screen image. If the crystals are not energized, they twist themselves and the light rays to allow light to pass through and illuminate the LCD.

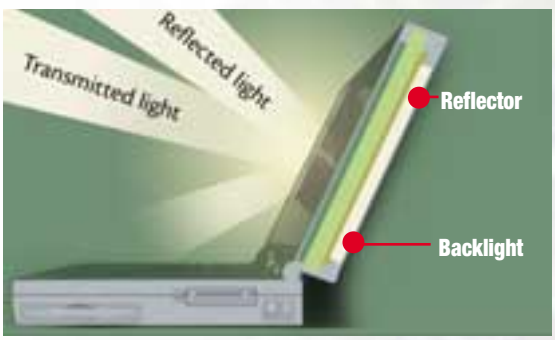




Reflected Light. Some liquid-crystal displays rely on outside light to illuminate the screen. Light enters the screen and hits a reflector at the back. The light bounces off the reflector and begins its trek through the layers of the LCD.



Transmitted Light. LCDs that have their own inner light source contain parallel light tubes instead of a reflector. The light rays begin at the rear of the screen, eliminating the need for outside light but requiring more power.



Combination Light. A few LCDs offer both light sources, using transmitted light when available and reflected light when used in dark places.

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