

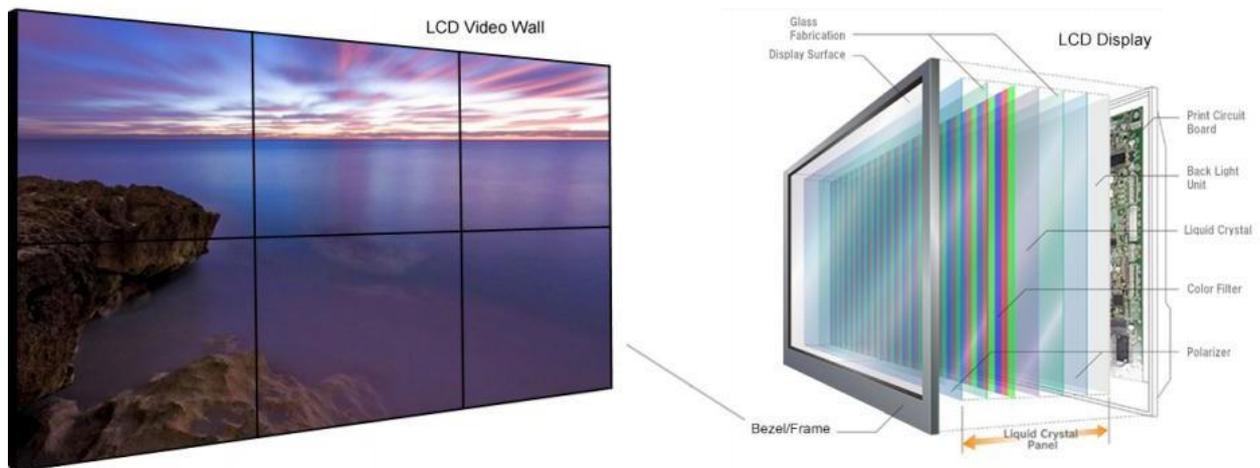
## LCD Displays for Digital Signage

Today the range of use of LCD Digital Signage displays extends from small and narrow shelf edge displays, kioks, touch tables, wall mounted indoor displays to outdoor stands typically from 19" to 98" with brightness from 350 to 2,500 Nits.



### What is a Liquid Crystal Display (LCD)

A liquid crystal display (LCD) has liquid crystal material sandwiched between two sheets of glass. The crystals can be orientated to change the polarisation of light passing through them. 256 different levels can be directed into each Red, Green and Blue filter to create almost any colour needed.



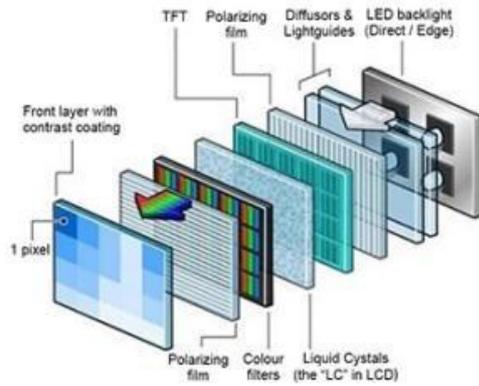
Thin film transistors (TFT) are used to control the crystal orientation and control the direction of light. By sending signals to the TFT light is passed through filters to create colours that we see on the screen as images.

OLED and QLED are further developments of LCD technology. When deciding between a QLED and an OLED display, QLEDs have much more brightness and aren't affected by burn-in. However, OLED displays still have a better contrast ratio and deeper blacks than QLEDs.

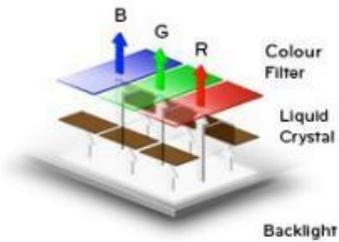
### How do LCD displays work

Liquid crystal display (LCD) screens are a sandwich of thin sheets of glass. On one of the sheets are thin film transistor (TFT) "cells" formed by first depositing a layer of indium tin oxide (ITO), an unusual metal alloy that you can actually see through.

### LCD Display Layers



### LED/LCD



- Complex Structure
- BLU (Backlight Unit) CCFL, LED
- Lighting Unit = Pixel Unit

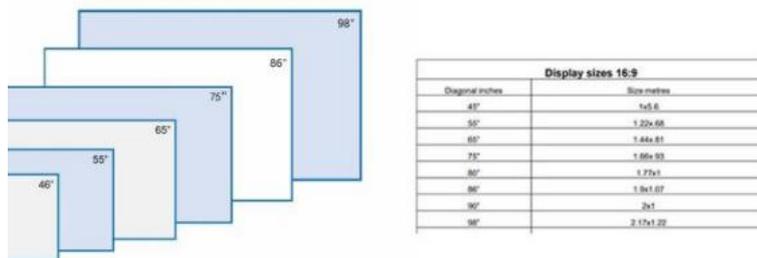
Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

Light from an LED light source at the rear of the display passes through a vertical polarising filter, the TFTs rotate the light, which then passes through red, green and blue filters and then another horizontal polarising filter to create the "pixels" of light that we see. Each color channel is expressed from 0 (least saturated) to 255 (most saturated).

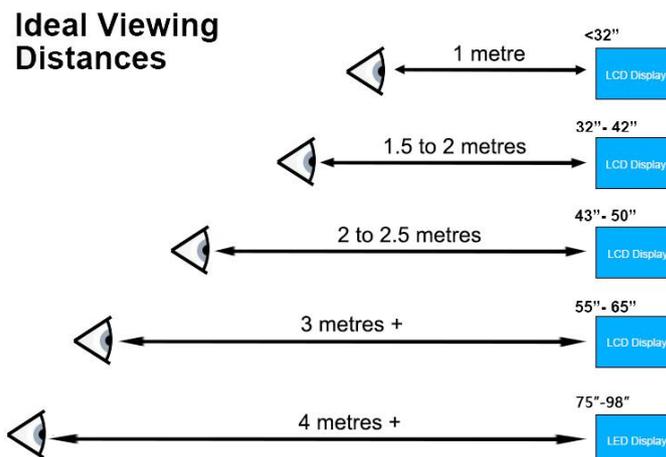
16,777,216 different colors can be recreated in this RGB color space. Click diagram above to see video on Youtube.

### How big are LCD displays

Typical sizes for standard commercial LCD screens range from 19" to 98" and an aspect ratio of 16:9. Small screens are made in non-standard sizes (ie not 16:9 ratio) for stretch bar and shelf edge applications and larger screens available which are expensive.



### What is the best viewing distance for LCD screens



## What is the brightness of LCD Displays

Desktop monitors and TVs are typically up to around 350 nits. Digital signage displays are typically 450 to 500 nits. Outdoor displays range from a low end of 700 nits to typically up with 2,000~2,500nits.



## What is the resolution of LCD displays

LCD Displays typically have a higher resolution than LED screens. So, a customer can view the screen at a closer distance without seeing the pixels.

If you're looking for a video wall option, LCD displays do have bezels around each display unlike LED.

While some large-screen CRTs have a dot pitch of 0.51 mm, many computer displays have a dot pitch of 0.25 to 0.28 mm. Similarly, the dot pitch on most LCD panels is between 0.20 and 0.28 mm. Dot pitches as low as 0.15 mm are found on some high-end screens intended for scientific or medical images.

In contrast the highest resolution LED displays have 0.7 mmm pixel pitch which is the industry's smallest pixel pitch LED video wall display, providing high resolution images at the closest viewing distance, and allows for 4K and 8K resolution video walls.

Display Type	Pixel Pitch Range (mm)
LCD	0.15 - 0.5
LED	0.7 - 10+

## How do LCD compare with LED displays

In the past Digital Signage relied on relatively small-size displays that were viewed from a small distance. The advantage of LCD was it's small size and delicate display construction. Before the birth of small-pitch LED displays, LCD was the mainstream indoor display for digital signage. Nowadays the entire industry has been committed to reducing chip size and pixel pitch.



With the improvement of resolution, small-pitch LED displays have begun to enter the indoor market and compete head on with LCD for larger kioks and wall mounted displays. For close viewing when details of media are needed to be seen clearly LCD is the winner even for outdoor wayfinding maps LCD screens still prove better than LED for screens up to 100" when fine detail is the key parameter.

LED technology has improved drastically in recent years improving quality while driving costs down. LED is a bigger investment up front but generally has a lifespan of about 100,000 hours. LCD is cheaper and generally more familiar. A LCD screen typically has a lifespan of about 50,000 hours.

	LCD	LED
<b>Brighness</b>	Low with max about 2,000 - 2,500 Nits good indoors	High with max 5,000 - 6,500 Nits good outdoors
<b>Resolution</b>	Very high resolution 0.15 - 0.5 pixel pitch excellent for close viewing.	Low resolution - best 0.7 but up to 10+ pixel pitch for long distance viewing
<b>Size</b>	Limited to smaller displays	Not suitable for small but excellent for large displays particularly video walls and outdoor
<b>Indoor/outdoor</b>	Best for indoor but good for details on outdoor stands and Kiosks	Excewllent for outdoor and large indoor video walls
<b>Bezel</b>	Yes so shows bezel between screens on video walls where multiple screens used	No bezel
<b>Life</b>	50,000 hours	100,000 hours
<b>Price</b>	Good for small screens indoors except video walls	Good for outdoor and indoor video walls but expensive and poor resolution for small indoor screens

## How are video walls made from LCD screens

LCD video walls are made from a number of standard screens with bezels (frame around the screen) which are typically 16:9 aspect ratio. So unlike LED video walls LCD video walls have a limited range of sizes and the wall is segmented with visible bezels showing, thinner bezels are becoming thenorm but still visible.



Thin bezel 55" LCD screens in Video wall.

With the lowering costs of modular LED technology and the high cost of multi[e LCD screens the LED solution will normally outweigh the LCD option.