



## B2C Technology Story

*Web Summary:*

### **Display Monitor Screens**

*by Leon A. Enriquez*

**Reading Time:**  
8 minutes

**Reader Benefit:**

- ◆ Types of colour monitor display screens;
- ◆ Advantages and disadvantages of each technology, i.e., CRT or LCD;
- ◆ Before buying a monitor, understand the significant benefits of both CRT and LCD displays.

Pictures are the broadest band of information humans can process. Not surprisingly, electronic displays have become an important interface for human customers when dealing with electronic data and information streams. Such electronic displays are generically known as colour monitors – quite similar to the ubiquitous TV screens.

The two common monitor displays for PCs are CRT (Cathode Ray Tube) and LCD (Liquid Crystal Display) screens. CRT monitors have the following advantages, namely, CRT monitors can produce fast and rich colour output; can be viewed from a very wide angle; and is generally cheaper than LCD monitors. The advantages of LCD monitors include: LCD monitors require less than one-third the power; take up less desk space than traditional CRT monitors; and the radiation emitted by LCD monitors is negligible.



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CRT-based colour monitor screens for the desktop have been around for as long as we can remember. And the complaints about such monitors are justifiably true. CRT monitors are bulky, take up far too much desk space, and are not ergonomic. Furthermore, the screens strain our eyes.

Enter the LCD screens based on recent advances in technology that seems set to change our desktops. And they are definitely more ergonomic as far as design dimensions dictate. Soon, more of the precious space on your desktop will become more available to you!

### ***Benefits of LCD Screens***

Just consider the typical benefits of LCD screens and you'll be delighted:

- ◆ Space saving: LCD screens typically take up less than one-third of the footprint of a comparable CRT monitor, thus allowing ergonomic placement and efficient use of space;
- ◆ LCD screens do not emit any radiation and does not flicker therefore reducing eye strain;
- ◆ Better picture quality;
- ◆ Generates less heat than a CRT monitor; and
- ◆ Consumes less power.

### ***How LCD Works?***

A LCD monitor uses liquid crystal rather than a cathode ray tube, to create images on the screen. LCD monitors produce colour using either passive-matrix or active-matrix technology.

A passive-matrix display uses fewer transistors and requires less power, but its colour display is often not as bright as an active-matrix display. Images on a passive-matrix display can be view best only directly in front of the display.



An active-matrix display uses a separate transistor for each colour pixel, and can thus display high-quality colour that is viewable from all angles. Active-matrix displays are sometimes called TFT (Thin-Film Transistor) displays because of the technology used. Obviously, active-matrix displays require more power than passive-matrix displays.

The advantages of LCD monitors include: LCD monitors require less than one-third the power; take up less desk space than traditional CRT monitors; the radiation emitted by LCD monitors is negligible.

The disadvantages of LCD monitors include: LCD monitors are usually more expensive than CRT monitors; and LCD monitors can only be viewed from a very narrow angle compared to CRT monitors.

#### ***How CRT Works?***

A CRT monitor works like a standard TV because it also contains a cathode ray tube (CRT). The front of the CRT is the screen, which is coated with tiny dots of phosphor material. Each dot consists of a red, a green, and a blue phosphor, and the three dots combine to make up each pixel.

The advantages of CRT monitors include: it can produce fast and rich colour output; it can be viewed from a very wide angle; and is generally cheaper than LCD monitors.

The disadvantages of CRT monitors include: CRT emits higher electromagnetic radiation (EMR) than LCD monitors; and consume more energy than LCD monitors.

#### ***The Future is Here***

For the PC user, the colour monitor is the single most important peripheral attached to your PC. Why? Simply because your monitor translates the digital workings of the PC into a display that you can understand visually. Without this picture, your visual user-experience with your PC will not be possible, nor an enjoyable one.

Because of the vitality of visual impact, monitor manufacturers work constantly with R&D to produce better enhancements in monitor technology. LCD is the fruit of such an innovation.



Yet, LCDs are not new. In fact, LCD technology has been around for quite some time, e.g., in the display of calculators and digital watches for the last 20 years. However, LCD manufacturers have only recently developed displays of sufficient size and clarity to make LCD monitors.

Initially these monitors appeared on small portable computers. With continuing improvements in technology, notebook PCs were the first to benefit from LCD innovations. And now, LCD desktop monitors are the latest must-haves.

### ***Special Uses for LCD monitors***

The unique features of LCD monitors make them especially desirable in certain professions and environments, including:

- ◆ *Government and Financial:* Anyone who needs the maximum amount of information available must have more than one monitor. The smaller footprint and energy-conscious nature of LCD monitors make them ideal for anyone who needs to use multiple monitors, like government analysts and financial market traders.
- ◆ *Medical:* Being both energy efficient and lightweight, LCD monitors are very portable – making them a natural choice for medical professionals, who frequently need to take their equipment to the patient.
- ◆ *Military:* Because of their portability and low emissions, LCD monitors are ideal for the mobile and stealth-nature of the military.
- ◆ *Laboratories:* Low emissions make LCD monitors the perfect choice for laboratories that need to measure energy in the range broadcast by CRT monitors.

### ***Buying a LCD Monitor?***

Until recently, your choices were limited when it came to LCD monitors. They were used almost exclusively on portable computing devices.

Today, you can choose from a much wider array of LCD monitors – for the desktop or for use with portable systems. Most laptop and notebook PC makers now offer more choices of monitors with their portable systems, with a greater variety of sizes, resolutions, and features.

LCD monitors are gaining popularity with desktop systems, despite their relatively high cost when compared to CRT monitors. Desktop LCD monitors – also called “flat panel monitors” – are available in very large and very small formats. LCDs provide excellent clarity and colour performance.



You should be well-informed before buying an LCD monitor. Research all of the latest monitors and look for articles comparing features, quality, and cost.

Some important questions to ask yourself are:

1. *What are my needs?* LCD monitors may have a lot of appeal just as a cool toy, but make sure you actually need the advantages of the LCD monitor before you consider buying one. If you do need one, how big should it be?
2. *What can I spend?* LCD monitors are more expensive than CRT monitors. Currently a 15-inch LCD monitor costs about \$750, while a 17-inch monitor costs more than \$1000. High-resolution CRT monitors, depending on size and features, can be purchased for about \$300.
3. *What is the preferred resolution of my software?* Because LCD monitors have a native resolution and many software applications are designed with a given resolution in mind, you should make sure your current applications display properly at the native resolution of the LCD monitor.
4. *Do I need an analog or digital interface?* LCD monitors use digital technology. However, most PCs expect an analog monitor. Do make sure that the LCD monitor can connect to your PC.

### ***The Future of LCD Monitors***

LCD monitors are continually improving. Last year (2002), Samsung – the company that built the first TFT active-matrix display – developed a LCD monitor with a record-breaking 430,000 pixels per inch. IBM has developed a high-resolution LCD that is on the verge of looking like a printed page.

While no one is certain what the future holds, you can expect:

*Increased size:* As higher resolutions make larger pictures more readable, you can expect larger LCD monitors.

*Reduced cost:* Any new technology goes through a period of high-priced development. However, as manufacturing practices stabilise and product demands increase, prices should drop.

*Increased viewing angle:* Viewing angles as high as 160 degrees are already in development, making the LCD monitor almost completely viewable from the side.

*Improved picture quality:* As LCD monitors increase in size and resolution, colour and brightness improve as well.



Box Story 1:

## **Will LCD Screens Outsell CRT Monitors?**

A recent IDC research report predicts that sales of LCD monitors will reach US\$20 billion in 2003. Sales of conventional CRT monitors is expected to decline as LCDs become more popular.

On a worldwide basis, the PC monitor market is expected to be 4.8% this year as compared to 2002 which enjoyed a mere 0.7% sales growth for monitors noted the IDC report – no doubt driven by the improving economies, and better PC sales growth.

Not surprisingly, LCD monitors are steadily grabbing market share with improved manufacturing technology and cheaper prices. The popular LCD form factor now is the 15-inch screen. The market will shift to 17-inch screens by 2005. According to IDC, as prices for LCD monitors continue to fall, and CRT manufacturers fail to justify the advantages of their products to end-users, the shift to LCD is expected to progress further.

The human eye needs to see 25 frames per second to be convinced that the motion on-screen is continuous. In the past, LCD monitors have failed to meet this specification, thus less attractive for showing fast-moving graphics such as those found in computer games.

Today's breakthroughs in LCD technology has improved pixel response time and can show more than 60 frames per second as some manufacturers attest. A good example is the new Diamond View DV159 LCD monitor from Mitsubishi Electric Corp.

Notice that as LCD monitors become cheaper, PC vendors will increasingly offer LCDs bundled with PCs. IDC expects the standalone LCD monitor market to shrink.

IDC figures show that the U.S. is presently the world's largest monitor market, accounting for 34.4% uptake; and followed by Asia with 24.6% of monitors sold.



Box Story 2:

## Pros and Cons of LCD Monitors

Like any form of technology, LCD monitors are a compromise of features, cost, and quality. LCD monitors have several advantages over CRT monitors, as well as some important disadvantages.

The advantages of LCD monitors include:

- ◆ *Small footprint:* LCD monitors are naturally thin, sometimes as thin as 1/4 inch on some notebooks. As a result, even desktop LCD monitors have a very small footprint compared to a CRT monitor.
- ◆ *Flat, square display:* An LCD monitor makes a picture by controlling crystals sandwiched between thin sheets of square flat glass. Because there is no need to warp the screen to accommodate an electron gun, LCD displays are not distorted like a conventional CRT.
- ◆ *Superior image clarity:* LCD monitors display their image across a nearly seamless sheet of liquid crystal. Because the individual crystals are bunched so tightly together, there is almost no perceivable gap between pixels – giving you a bright clear image. In contrast, CRT monitors actually measure their clarity by describing the dot pitch, or size of the gap between pixels.
- ◆ *Absence of flicker:* The crystals in the LCD monitor display are illuminated to make a picture. Unlike the dots of phosphorus in a CRT monitor, which must be continually refreshed (and which fade between refreshes), an LCD's crystals stay illuminated until the monitor turns them off. Because of there is no pixel fade, there is no flicker as the monitor refreshes the display.
- ◆ *Low emissions:* LCD monitors emit virtually no electro-magnetic radiation or heat, making them very safe, and greatly reducing their risks both as a fire hazard and as a source of radiation.
- ◆ *Energy efficient:* LCD monitors are more efficient than CRT monitors, using up to 70 percent less energy to make an equivalent picture.
- ◆ *Lightweight:* LCD monitors do not have an electron gun or its associated power supply and shielding. As a result, LCD monitors are much lighter than CRT monitors. For example, a 15-inch LCD monitor might weigh 2kg, while an equivalent CRT monitor might weigh as much as 13kg.
- ◆ *Naturally digital:* Unlike CRTs, LCDs are naturally digital, making them a logical choice for future displays like high-definition television (HDTV) and digital TV.
- ◆ *Portable:* Because LCD monitors are small and energy efficient, they are highly portable.



The disadvantages of LCD monitors include:

- ◆ *High cost:* Although prices must inevitably drop as newer breeds of LCD monitors come into higher production, they are still relatively expensive compared to CRT monitors. And, CRT monitors are dropping in price, so LCD monitors must get much cheaper before they can compete purely on a price basis. Unfortunately, notebooks and other portable computing devices require an LCD display – so their prices are tied to LCD monitor prices.
- ◆ *Limited viewing angle:* The viewing angle is the arc around the monitor, measured in degrees, within which the screen is still easily visible. For example, if you stand in front of a LCD monitor and lean to the left, the right edge of the screen becomes increasingly hard to read. If you lean to the right, the same thing happens on the left edge of the screen. The viewing angle describes how far you can lean to the left and right and still see the whole display clearly.

LCD monitors project a flat square image directly forward of the display, and as a result they have a narrow viewing angle. Active matrix monitors are much better, with viewing angles around 140 degrees. With a wider angle, two or three people can sit side by side and use one monitor.

- ◆ *Fixed native resolution:* LCD monitors have one crystal for each pixel on the display. This means they have a natural resolution. Generally, the resolution is high (at least 1024 x 768), so you should have a high-enough resolution. However, if you want a resolution lower than the native resolution, the LCD must either give you a smaller picture or a distorted image.
- ◆ *Limited brightness and contrast:* The brightness and contrast of an LCD display are directly tied to the number of crystals and the monitor's control over those crystals. As technology improves and the number of crystals per inch increases, brightness and contrast are improving dramatically. As such, older technology LCD displays are very hard to see in all but the best lighting.

#### ***About the Author***

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