

MOUNTING SOLUTION

So, the question remains: How can one enjoy top-notch picture quality and bargain prices that many LCD TVs currently offer without falling victim to viewing angle issues? Nearly all experts agree that full-motion TV wall mounts are the ideal solution with their ability to tilt, swivel and extend in every direction. By placing an LCD TV on a full-motion mount, one can be certain that the optimal viewing angle is always available, whether watching TV from a favorite chair directly in front of the TV or from a couch in the corner of a room.

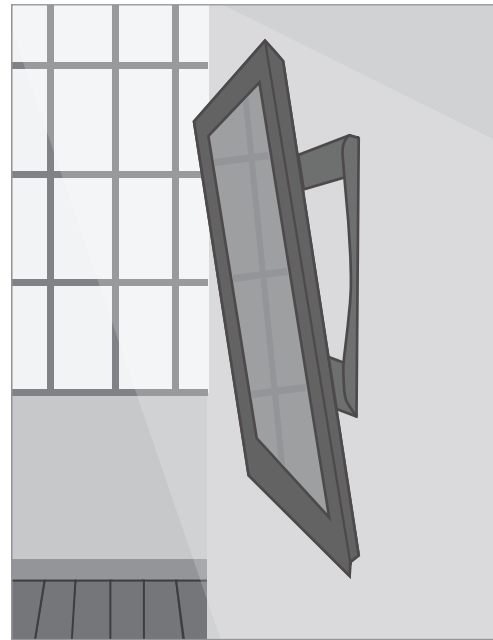
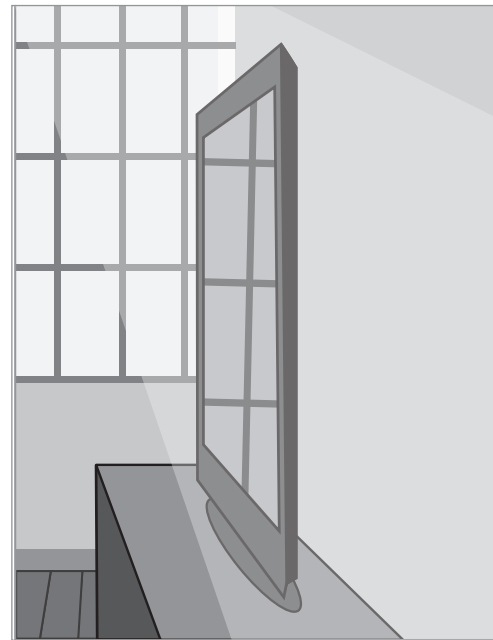
With the ability to tilt TVs up and down, tilting mounts are also a great solution to obtaining the optimal viewing angle. Tilting mounts ensure high picture quality when watching an LCD TV while lying on a bed or viewing a TV that is not mounted at eye level. Tilting mounts also highlight the thin look of many popular LED TVs on the market by placing them extremely close to the wall.

Both full-motion and tilting mounts not only improve viewing angle – they also help reduce glare on TV screens in rooms with many lights or windows. The ability to adjust a TV up and down or side-to-side can eliminate unwanted reflections on a TV screen.

SANUS® engineers and manufactures full-motion and tilting wall mounts that fit all sizes of LCD TVs. With full-motion mounts that extend as far as 28 inches from the wall, a SANUS mount helps ensure the proper viewing angle is available anywhere in a room. Adding to their mounts' convenience and versatility, SANUS mounts also offer exclusive technologies, such as Virtual Axis™ technology that allows effortless tilt motion with the touch of a finger and ClickStand™ mechanism that props TVs away from the wall for easy cable access.

Mounting a TV has many other benefits as well. It can make valuable space in a room by removing the need for furniture, creating a clean and sleek appearance. With the number of injuries and deaths resulting from unstable flat-panel TVs growing at an alarming rate, mounting a TV also adds to the safety of a room by helping to prevent accidental bumping or tipping.

With all the advantages that LCD TVs offer, such as choice among brands and performance in bright rooms, one should never be limited by viewing angle issues. To take full advantage of today's TV technologies, purchase a full-motion or tilting wall mount.



REFERENCES

Consumer Reports

- "Best Electronics: LCD&Plasma TVs." Consumer Reports, December 2008. 28 – 33.
- "Best Electronics: LCD&Plasma TVs." Consumer Reports, December 2009, 23 – 28.
- "Best TVs for the buck." Consumer Reports, March 2010, 22 – 25.
- "Viewing angle still the Achilles heel for most LCD TVs." Consumer Reports, July 17, 2009.
- "Why viewing angle matters with LCD TVs." Consumer Reports, November 2009.

DisplayMate Technologies

- Soneira, Raymond, "LCD-Plasma Display Technology Shoot-Out." Displaymate.com, 2009.

New York Times

- Taub, Eric, "So Many Flat-Panel TVs, Which is Right for You?" New York Times, June 17, 2009.
- Taub, Eric, "TV Specs: Can they be trusted?" New York Times, June 30, 2009.

Sound and Vision Magazine

- Griffin, Al, "The Real Slim Shady." Sound and Vision Magazine, February/March 2010, 53 – 55.
- Griffin, Al, "Break on Through." Sound and Vision Magazine, June/July/August 2010, 45 – 47.

Widescreen Review

- Soneira, Raymond, "LCD-Plasma Display Technology Shoot-Out." Widescreen Review, August 2009, 24-29.

ZDNet

- Portnoy, Sean, "Study: LCD viewing angles are too narrow, many TV features are marketing fluff." ZDNet, July 7, 2009.

Wall Mounting: A Solution to LCD/LED TV Viewing Angle Issues

Outline: Despite major advances in technology, viewing angle remains a serious challenge for LCD and LED TVs. This paper will examine research on LCD viewing angle issues and show how full-motion and tilting wall mounts can alleviate this issue and help consumers get the most out of their television investment.

Walk into a local custom theater store or big box retailer, and it's hard not to be impressed. Row upon row of the latest and greatest LED and LCD TVs displaying bone crushing NFL hits and action scenes from the latest 3D movies. Yet, after dishing out thousands of dollars for a new set with picture enhancement technologies, such as "dynamic backlight" and "dynamic color," consumers are often left asking the same question: "Why doesn't my new TV picture look as good as it did at the store?"

In many cases, the answer is simple geometry. LCD TVs may display awe-inspiring images when viewed front and center, but sit a few feet to the left or right and there is a noticeable loss of picture brightness as well as change in color. In fact, recent studies suggest the viewing range for seeing the most vivid picture on an LCD TV is merely one person wide. While TV manufacturers have taken small steps to address this issue in recent years, the most current Consumer Reports TV ratings indicate that over half the TVs tested received only a fair or good viewing angle score—well below the excellent score that most tube-style TVs were rated at in past years.

This paper will take a look at how viewing angle plays a vital role in getting the most out of the TV viewing experience. It will show that placing a TV on a full-motion (up and down, plus side-to-side motion) or tilting (up and down motion only) wall mount is the most effective way to overcome limitations posed by off-center viewing.



©2010 Milestone AV Technologies, a Duchossois Group Company. All rights reserved. Sanus is a division of Milestone.

SANUS®

www.sanus.com • 800.359.5520

SANUS®

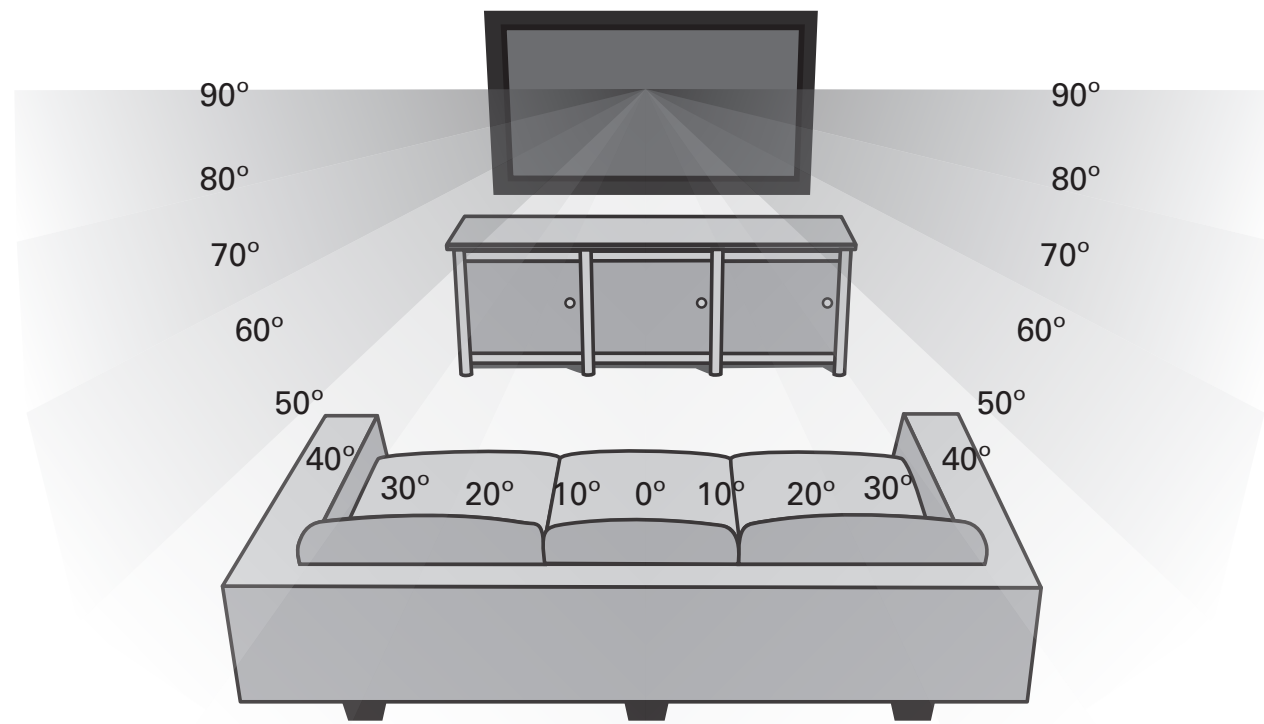
www.sanus.com • 800.359.5520

VIEWING ANGLE 101

Viewing angle is a TV specification that is often overlooked by consumers during the buying process. In its simplest terms, viewing angle is defined as the maximum angle at which a display can be viewed without losing brightness or experiencing color shifts. Optimal or ideal viewing can be defined as watching TV directly in front of the screen at eye level (0° below). As soon as one moves off center, either vertically or horizontally, TV picture quality begins to decrease – the screen looks dim and the color is faded. Most manufacturers do not specify the angle at which noticeable picture degradation occurs; rather, they only specify the angle at which the picture is still visible.

Due to the nature of the technology, LCD TVs have more viewing angle issues than plasma sets.

Nearly all LCD TV manufacturers claim a viewing angle of 88 degrees or more, with 88 degrees being the greatest side angle in which a TV maintains clearly defined images and accurate colors. According to the below illustration, one can stand almost completely to the side of a TV and still experience high picture quality. In most cases, by looking at an LCD TV once, one will realize the industry standard of quality viewing angles is debatable. In fact, recent industry research indicates there is noticeable picture quality degradation in as little as 10 degrees from the optimal viewing angle, even with the most expensive LCD TVs.



CONTRAST RATIO

Performance issues are most clearly depicted by contrast ratio numbers. Contrast ratio is the ratio of the white image brightness to the black image brightness. This ratio plays a vital role in a screen's clarity and image detail. Mathematically, contrast ratio is measured by the following equation:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness at the screen center when all pixels are "white"}}{\text{Brightness at the screen center when all pixels are "black"}}$$

The higher the first number in the ratio, the brighter the screen and the greater the contrast between black and white. For example, a contrast ratio of 2000 indicates the brightest white is 2000 times brighter than the darkest black on a screen. Currently, no industry standard exists on calculating contrast ratio, so the way each manufacturer calculates its numbers varies. For this reason, it is important to only compare contrast ratio numbers from the same manufacturer.

FIELD RESEARCH

While LCD TV viewing angle limitations have been rumored in the technology industry for some time, the most widely recognized research on this topic was conducted in 2009 by Dr. Raymond Soneira, President of DisplayMate Technologies. DisplayMate Technologies is a testing firm that produces video calibration, evaluation and diagnostic products for the technology industry. In his analysis titled "LCD-Plasma Display Technology Shoot-Out", Soneira tested the picture performances of the top 2008 lines of plasma and LCD TVs. He found empirical evidence of LCD TVs' inability to maintain picture quality when viewed from an angle.

Measuring the contrast ratio values of four HDTVs (Panasonic Plasma, Samsung LCD, Sharp LCD and Sony LCD) at 0 degrees and at a 45-degree viewing angle, Soneira found the plasma TV contrast ratio was down 9 percent; however, the 45-degree angle reduced the contrast ratio for all three LCD TVs by over 50 percent. On some LCD TVs, noticeable picture degradation was found at a viewing angle as low as 10 degrees. The findings below clearly illustrate the dramatic loss of contrast ratio when viewing an LCD TV at a 45-degree viewing angle.

According to Soneira, the findings were surprising. "Everyone that came to see the test, including industry experts, manufacturers, engineers, reviewers, journalists and ISF instructors, were shocked at how strong the viewing angle effect is," said Soneira. "Everyone knew there were effects, but the side-by-side comparison shows how incredibly large it actually is."

Along with contrast ratio values, LCD TV color quality also proved to be affected by viewing angle. All three LCD TVs that were tested showed noticeable degradation in color accuracy at a viewing angle of just 15 degrees, and this accuracy decreased exponentially at 30 degrees off-axis.

	0 Degrees	45 Degrees
Panasonic Plasma	3,842	3,502
Samsung LCD	1,877	462
Sharp LCD	1,330	174
Sony LCD	1,344	467

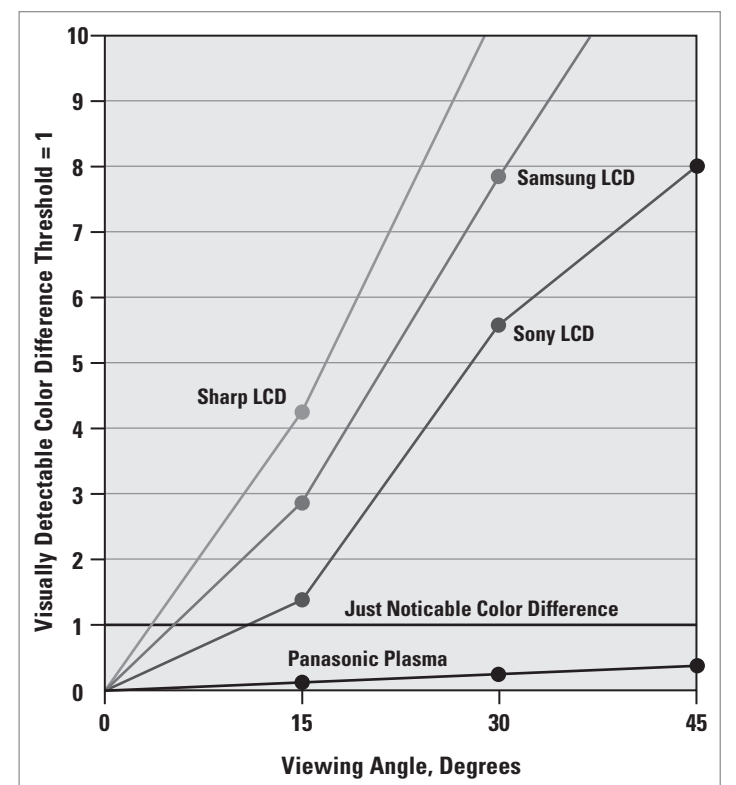
DisplayMate Technologies

"The significance of this is enormous," explained Soneira, "because it means the 'sweet spot' for seeing an accurate picture on an LCD TV is about one person wide."

Recently, in its annual consumer ratings, Consumer Reports added viewing angle to its TV evaluation criteria, highlighting the importance of this element. The publication explained: "Viewing angle remains a challenge for most LCD displays. Some models have gotten better in this respect, but most still lag far behind plasma and picture-tube TVs in providing a virtually unlimited viewing angle." In the most recent Consumer Reports TV ratings, no LCD TV earned an "excellent" rating for viewing angle, and more than half of the tested LCD TVs received only a fair or good viewing angle rating.

It is also important to note that viewing angle performance did not discriminate based on price point. Some of the most expensive units tested received a high rating in picture quality but fell short in the viewing angle category.

Those who hope new 3D HDTV technology will fix viewing angle issues will be disappointed. Despite delivering eye-popping images, 3D TVs also suffer from viewing limitations. In fact, some argue that the 3D technology increases the problem. Early 3D reviews indicate that "ghosting", defined as light shadows around objects on the screen, is apparent when viewing from an angle. In May 2010, during its first 3D TV reviews, Consumer Reports noted picture degradation when testers moved off-center. Furthermore, in his June 2010 review of the Samsung 46-inch 3D LED TV, Sound and Vision Magazine's Al Griffin claimed that "like other LED TVs the Samsung had a limited viewing angle – its picture contrast and color accuracy took a hit when I shifted more than 15° off from the center line in either direction".



DisplayMate Technologies