



UNITED SIGNS[®]
ARCHITECTURAL SIGNAGE

WHAT ARE LED SIGNS?

They are known by many different names - **electronic message centers (EMC'S)**, digital displays, reader boards or electronic signs, just to name a few. Whatever you call them, it is our mission to help you feel confident and educated before you buy.

Double sided, single face, wall-mount or monument, an outdoor digital sign can make a huge impact on your business signage. An LED sign is a technical product, but choosing a sign company isn't a tough task if you do a bit of research first.

Other LED sign manufacturers may try to confuse you with meaningless specifications and complicated jargon. Not us. United Signs prefers to provide you with the knowledge you need to choose the right sign for your project. We want you to feel comfortable talking about our product with your business partners or board of director. At United Signs, we call them "EMC's". Here are a few of the key terms you will hear related to LED signs and why they are important to understand:

LED (Light Emitting Diode)

An LED (light emitting diode) is an efficient, effective and ultra-bright alternative to incandescent light bulbs. Unlike traditional light bulbs, LEDs do not burn out because there is no filament. United Signs uses only the highest quality single-bin LEDs that are grouped by color value and brightness to ensure uniformity throughout the sign. We also calibrate every XVS model sign and digital billboard for color and brightness to ensure consistent image quality from end to end and long-lasting, vibrant color. Our calibration process configures the whole sign to a level of uniformity that is 50x greater than the human eye can perceive, allowing our signs to age more gracefully. Lower quality LEDs and signs that are not calibrated can begin to show color variations in a "quilted" pattern - sometimes after only a few months of operation.



Pixel Pitch

You'll often hear digital signs referred to by their pixel pitch (e.g. 10mm, 19mm, 35mm). The pixel pitch is effectively the resolution of the sign. The resolution of a sign is dependent upon the distance between each pixel, which is typically comprised of a cluster of 3 LEDs – one red, one green and one blue (RGB). The distance is measured in millimeters and the smaller the pitch, the closer together the LEDs are placed, giving you a tighter resolution with crisper and more life-like images.

Matrix

LED signs are often talked about in terms of sign “matrix”. This is simply the number of pixels high by the number of pixels wide your sign will be. Two signs that have the same outside dimensions but are not the same pitch will each have a different matrix. For instance, a 12mm sign that is 4'5" by 8'3" has a matrix of 96 x 192 while a 16mm of the same size has a matrix of 72 x 144.

Viewing Distance

Optimal viewing distance is the point at which the individual pixels begin to blend together to form a smooth, consistent image. Generally speaking, signs with a short distance between each pixel, such as our 8mm models, are best for close viewing distances. Wider pixel spacing, found on our 19mm models, are better for locations where the sign will be installed at a great height or are farther away from traffic.

Viewing Angle and Reading Angle

LED's used in digital signs are generally considered directional light - where the output is pointed horizontally towards the viewer. Because of this, an LED is at full brightness when you look at it straight on, but as you move to the left or right of the LED, the brightness will decrease. The specified viewing angle is the angle at which the LED's brightness is 50% less than it is when viewed at dead center. All United Signs models have a horizontal viewing angle of at least 140°, which means that at 70° to the left or right of center, the brightness of the LEDs is half of what it is if viewed straight on.

Vertical viewing angles are calculated in much the same way, although sign louvers have been developed to reduce light spill away from the viewer. Vertical viewing angles are less likely to be equal above and below the LED, since signs are typically viewed from below and are designed to minimize the light that is cast upward.

Reading angle is the angle at which a people can adequately read your LED message, and while typically greater than the viewing angle, it varies depending on lighting circumstances and your sign's environment.

Here are more details to help you make an informed decision!

The LED sign industry uses pixel pitch as a standard measurement to indicate the resolution of a digital sign based on the spacing of LED clusters – also known as a pixel.

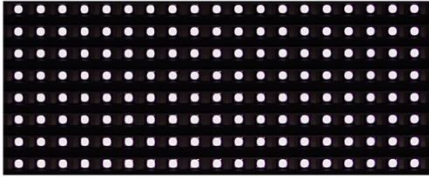
All of our outdoor LED signs are built with 12 inch by 12 inch digits, or "modules". Each grouping of 3 LEDs - one green, one red and one blue - represents a pixel. Pixels are populated to each module and spaced consistently

The pitch of each module is derived by measuring the distance between each pixel. Increasing the pitch is going to spread out the pixels and give you a *lower* resolution for a more grainy image. A smaller pitch is going to compress the pixel spacing and result in a higher resolution and a more detailed image. Our pitch values range from mm, which is our highest resolution, to 20mm, our lowest resolution.

When deciding what sign and pixel pitch is best for your sign, location and viewing distance are the two most important factors. High detail product photos and up close viewing – like pedestrian audiences or slow moving, very close traffic, for instance -- generally work best with a higher resolution. However, signs that will be installed far from traffic or very high can be a lower resolution.

Pixel pitch is a common way the sign industry describes an LED sign's resolution. A pixel is comprised of a single grouping or cluster of LED diodes – typically one red, one blue and one green. The pixel may share a lens, as in the case of a surface mount diode, or it may be made up of three separate LEDs. The simple rule of thumb is that a lower pitch measurement, where each cluster is close together, results in a higher quality image. Unfortunately, some manufacturers have introduced alternative pixel distance calculations as a way to reduce costs. These configurations are often marketed as “virtual,” “enhanced,” or “optimized.” Here is a look at a few different pixel options and how they impact image quality.

Our way!



True pixel configurations are measured from the center of each pixel and do not rely on sharing LEDs. United Signs 10mm uses a surface mount device (SMD) that contains red, green and blue under a single lens. This produces a high-quality display that provides exceptional resolution for crisp, vivid content and wide viewing angles.

United Signs high resolution 8mm and 10mm displays are ideal for locations with significant pedestrian traffic, a nearby busy intersection or traffic congestion. The closer your LED sign is to your audience, the greater the visual impact and messaging flexibility.

The tight pixel pitch on high resolution signs will allow you to display more graphics and content on your sign, even if square footage is limited. Theaters, entertainment venues, sports arenas and shopping malls are just a few examples of businesses using this type of sign to take advantage of close viewing ranges. Our 8mm and 10mm displays are also well-suited for locations with space constrictions, either because of local zoning ordinances or existing structures.



THE TWO-RED IMPOSTER

Virtual pixel configurations are set up completely different. In order to pass off a lower resolution product, some manufacturers will add a second red LED to each cluster. This configuration results in a pixel that has two red, one blue and one green LED. Then to claim the product is high resolution, these deceitful manufacturers will market it based on the measurement between each individual LED. The product will be marketed as an optimized 10mm, but in reality it has a true pixel pitch of 20mm.



THE MISSING LED

Another way some manufacturers are being deceptive is by using a technique known as LED sharing to claim a higher resolution. LEDs are shared to neighboring pixels to complete a grouping, effectively counting some LEDs up to four times. This layout has visibly larger spaces between LEDs and may even give the appearance that an LED is missing from the board layout. To market this configuration, pitch is measured between overlapping pixels so that the product can be promoted at a much higher resolution than it actually delivers.



THE COLD SHOULDER

Some manufacturers also use through-hole LEDs for higher resolution products like a true 10mm sign. Placing individual red, green and blue LEDs into a circuit board with 10mm spacing creates a product that is not robust enough for long term reliability. This configuration also creates an issue known as shouldering, where the LED lenses block the light of neighboring diodes. Shouldering results in limited viewing angles and can make the display look discolored when it is viewed off-center.

Disadvantages of Virtual Pixel Configurations:

- LED sharing results in weak color contrast and uneven edges on text as the pixels bleed into one another when they overlap.

- Virtual resolutions with two red LEDs cause white graphics and text to look pink because red LEDs dim at a slower rate than blue and green.
- Pixel layouts that use 4 LEDs do not allow for consistent black space. This result in fuzzy images that may appear washed out.
- Color blending suffers on virtual configurations using the missing LED layout, compromising image quality.

Manufacturing pictures:

