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About LED Displays



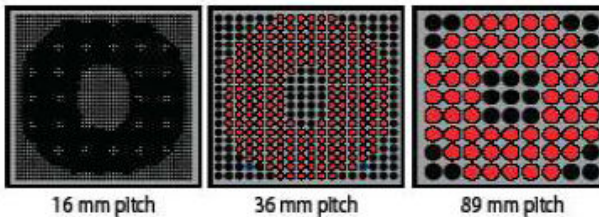
About LED Displays

Unlike traditional media such as newspaper and magazines, LED displays quickly capture attention with a combination of light, color, motion and graphics that get noticed. They also offer infinite options for creating a brand that gets remembered and, in turn, gets results. For most advertisers, the most important market is the local one. Think of LED displays as local advertising and sales partners that are “on” 24/7, working night and day to attract attention, deliver marketing messages and drive sales. LED displays also cost 40 to 60 percent less per thousand viewers than most other forms of advertising. In fact, businesses can communicate with thousands of people each day for just a few dollars. When purchasing an LED display, it is important to understand a few basic principles that will help you select the right product for your application. The pages to follow present a brief overview of some of these basic principles.

Pitch (Resolution)

Resolution, or the total number of pixels in a display, is a very important factor that affects the performance of the sign. More resolution means more LED diodes and more circuits, which usually means better picture quality.

Pitch is the distance (usually in millimeters) between pixels. Pitch is always measured from the center of one pixel to the center of an adjacent pixel. The smaller the pitch number, the higher the resolution quality. Larger the pitch numbers indicate a lower resolution. A pixel can be one single diode, or a pixel can be a cluster of many diodes running off the same circuit.

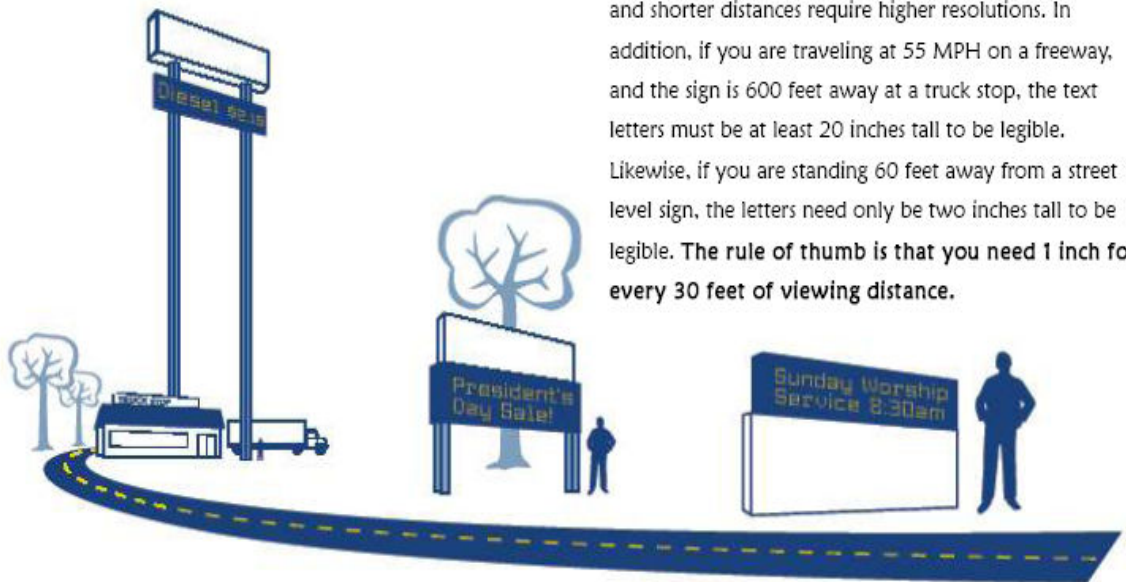


About LED Displays



Viewing Distance and Speed

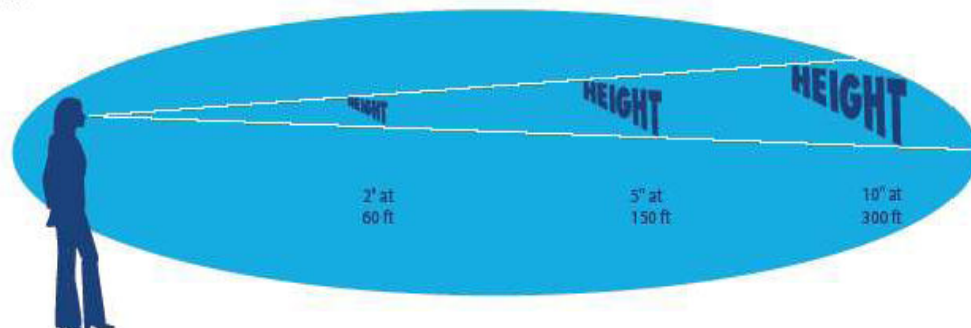
The distance between your sign and its viewers is the number one factor in determining the type of LED display you will need. Longer distances require less resolution and shorter distances require higher resolutions. In addition, if you are traveling at 55 MPH on a freeway, and the sign is 600 feet away at a truck stop, the text letters must be at least 20 inches tall to be legible. Likewise, if you are standing 60 feet away from a street level sign, the letters need only be two inches tall to be legible. **The rule of thumb is that you need 1 inch for every 30 feet of viewing distance.**



Character Height

In addition to the discussion of viewing distances, it is important to know that at least seven rows of diodes are required to make one text character. For multiple lines of text, it requires an eighth line as a separator. This means that for each line of text there needs to be eight rows of pixels, and that those eight rows together measure the required character height.

In other words, if you need three lines of ten inch text characters, you need to have 24 rows of 36 mm pitch pixels to get the proper character height. Of course, you can always use a higher resolution display and combine lines to make bigger text letters.



About LED Displays



Viewing Distance and Time Chart

Viewing Distance (ft)	Recommended min Text Height (Inch)	Recommended min. Pitch (mm)	Approx. Viewing Time @ 30pmh (sec)	Approx. Viewing Time @ 55mph (sec)
30	1	12	1.0	0.5
60	2	12	1.5	1.0
90	3	12	2.0	1.0
120	4	12	3.0	1.5
150	5	16	3.5	2.0
180	6	20	5.0	2.5
240	8	28	5.5	3.0
300	10	30	7.0	4.0
360	12	34	8.5	4.5
420	14	36	9.5	5.5
480	16	45	11.0	6.0
540	18	63	12.5	7.0
600	20	63	13.5	7.5
720	24	63	16.5	9.0
840	28	89	19.0	10.5
960	32	89	22.0	12.0
1080	36	89	25.0	13.5
1200	40	127	28.0	15.0
***Please note that all data are approximations				

Viewing Distance and Time Chart

LED diode density and pixel pitch are the two most critical factors to determine the quality of resolution and display brightness. LED density of a display is the total number of LED diodes in one square meter. It is calculated by multiplying the number of pixels per square meter by the number of LED diodes per pixel.

Signs Plus LED display systems have always featured more LEDs per pixel than major competitors around the world. In other words, Signs Plus signs have very high LED density. High density displays offer significantly higher brightness and longer display lifespan since you do not have to drive the LEDs on your display hard in order to achieve good brightness level.

About LED Displays



Brightness

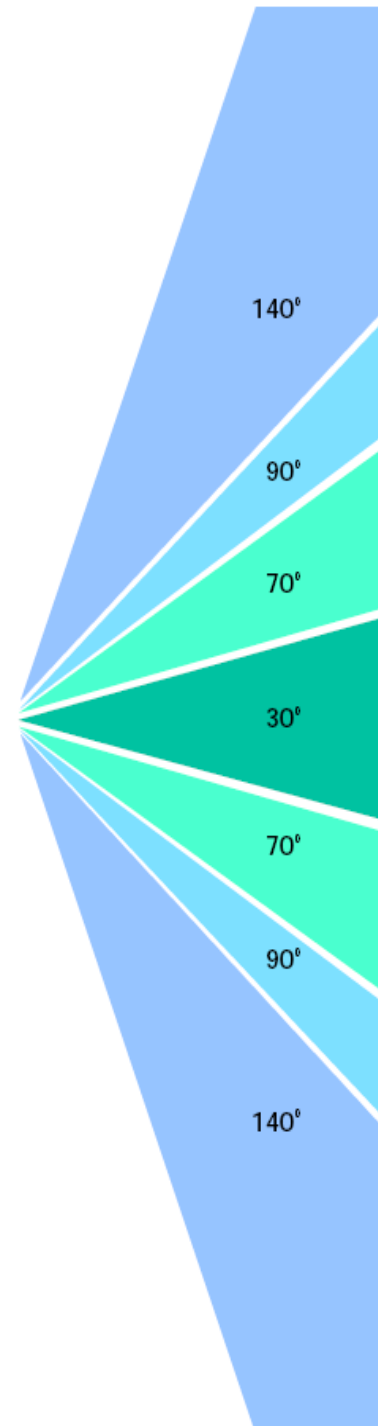
The Brightness of an LED display is generally expressed by a numerical value in NITs. A NIT is defined as unit of illuminative brightness described as candela output per square meter (cd/M2). The higher the number of NITs, the brighter the display. In general, 1,500 NITs, provides readable text in outdoor daylight, while grayscale and outdoor video require up to 5,000 NITs for acceptable color depth.

Signs Plus displays are built with a high-density of super-bright, high quality LED diodes, so our displays typically exceed this standard by a long shot. Contrast ratio is another important factor in overall brightness, and refers to the difference between levels of blacks compared to the levels of whites in the display. Things like reflective surfaces, glare from the sun, and dimming all affect contrast ratio. To optimize the contrast ratio and overall brightness, Signs Plus features a unique louver system to shade each individual diode from the glare of the sun. The louvers were computer modeled to optimize the view from onlookers below while blocking the maximum amount of sun from all sides. No other system on the market offers this unique, individual diode shading. Together with the high-density array, the Signs Plus sign is truly the brightest product on the market today.

Viewing Angles

Diodes can put out a single, narrow beam of light like a flashlight, or they can output a wide array across a room like a light bulb. Diodes output about the same amount of light no matter what type they are—but the “high-beam” diodes with a narrow angle focus more light into one small spot, whereas the “wide angle” diodes spread their light across the horizon. So, if you were to stand in front of a sign made from “high-beam” diodes with narrow viewing angles, you would see an extremely bright sign if you stood directly in front of it, but the minute you walked away from the small spot light of its focus, you would see nothing but black. On the other hand, if you were to build a sign with lots of “wide angle” diodes, you could move around and to the side of the sign, and still see a great image. Signs Plus displays use wide viewing angle diodes, with super wide viewing angles up to 140 degrees. Together with the high-density of diodes, the Signs Plus displays are both bright and have wide viewing angles at the same time.

LED DISPLAY



Application Gallery



Application Gallery

Knowing the right application is key to selecting the right system. The descriptions below offer a general overview of the basic LED applications to help guide you.

Monochrome EMC

Signs Plus' Monochrome Electronic Message Centers (EMCs) are the most cost-efficient, on-premise media tools. With our user friendly software system, text and graphic creation are made simple. Signs Plus' Monochrome EMCs also feature easy-to-use scheduling software that allows messages to be displayed at various times of the day.



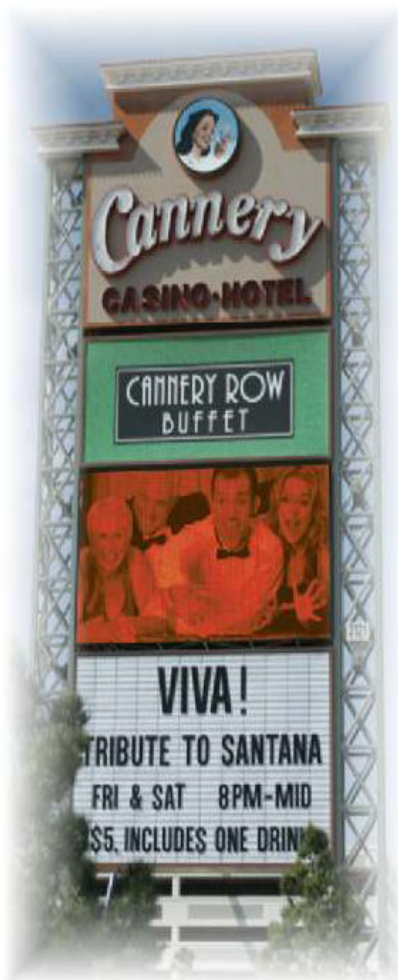
Application Gallery



Application Gallery (cont.)

Grayscale 256 Series

In addition to animated text messages, the GS 256 series can display photo-quality pictures and full motion video. It's a powerful advertising medium that stands out and grabs attention.



Application Gallery



Application Gallery (cont.)

RGB Full Color Displays

With its super brightness and contrast, Signs Plus' RGB full color display systems are the perfect choice for large outdoor applications such as video walls and billboards.



Application Gallery



Application Gallery (cont.)

Digit Displays

Signs Plus offers a wide range of digit LED displays such as price changers and time & temperature displays. The Price Changer product line provides a changeable pallet for gas stations, hotels, and other applications. The Time and Temperature product line is a classic addition to an existing static sign to attract attention and reinforce a sign's presence in the community.



Hybrid Pixel



Technical Information

Before looking at our product specifications, it is important to understand some of the key technology Signs Plus is offering today. The next few pages will briefly cover some of our signature hardware and software technology.

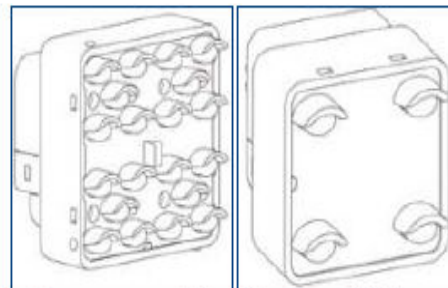
Hybrid Technology - Advanced Detachable Pixels

With Signs Plus' unique hybrid pixel technology, each pixel is hot swappable, reducing time and cost to service a display. Hybrid technology also provides a flexible platform to create custom shape LED displays such as curved face displays. With each pixel sticking out instead of attached to the surface, Hybrid pixels have the widest viewing angle and best heat ventilation in the world.

Instead of 1 louver per pixel, each LED lamp on a Hybrid pixel has its own lamp louver which provides highly focused LED light output for superior color contrast, brightness and maximum horizontal viewing angle.

Inside each pixel, there is an individual circuit controlling each LED lamp. Together with the advanced controller system, we can control brightness/color shadings down to each LED lamp level vs. competitors' individual pixel shading. The result is better color mix, contrast, higher virtual resolution and longer LED life since we can turn off individual LED lamps when not needed.

Signs Plus uses only the best quality LEDs to manufacture its displays. We also provide more LED diodes per pixel than other competitors. Together with the Hybrid Technology, Signs Plus LED displays simply provide the best brightness, viewing angle, and color in the industry.



Mega hybrid with four 5-LED

Hybrid with one 4-LED pixel per

pixel per hybrid unit

hybrid unit

THE PATENT PENDING HYBRID TECHNOLOGY	
DESIGN	Individual "louvers" over each LED lamp
LUXAN PANEL	No Luxan face panel allowing even greater brightness
EFFICIENCY	Individually removable and replaceable hybrid pixels
BRIGHTNESS	High brightness and contrast
RELIABILITY	Optimum reliability - no heat accumulation
MAINTENANCE	Easy to service: individual pixels are "hot swappable"

Cabinet Design

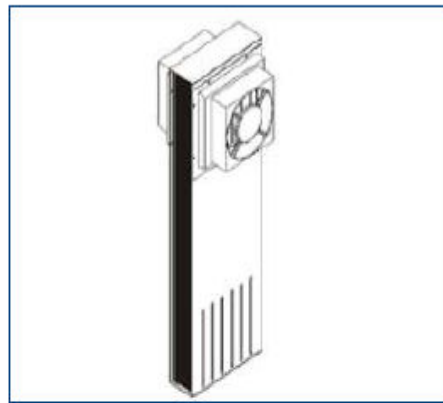


Resilient Display Cabinets

Ultimately, LED displays are only as good as the cabinets that house them. From components, service panel design, to water proofing and heat ventilating, engineers are continuously working on improving our cabinets. In late 2005, display cabinets were proven to be able to withstand the worst hurricanes. Today, you can choose from traditional vented cabinets with thermostatically controlled fail-safe cooling system to the advanced fully enclosed, no outside air exchanging sealed cabinets. It is continuously seeking improvements in little details like this makes our sign last longer than competitors' products.



Service Panel Design



Heat Exchanger Cooling System



"We are very delighted with our sign! The staff was extremely helpful in the sign selection process and was very supportive with our post-installation needs. In fact, the display has weathered 2 massive hurricanes and was instrumental in replaying emergency information to the local community. "

Jay Wilson
AIG Baker, Project Developer

Communication Options



Communication Options

Monochrome/RGB OPTIONS

RS-232
Standard hard-wired communication to low-bandwidth displays. Controls only a single display. Recommended maximum distance of 50 feet between the display and PC.

RS-485
Hard-wired communication to low bandwidth displays or display networks. Maximum 4000 feet of cable can be used to control up to 32 displays.

RF-Modem
Wireless radio frequency communication to low bandwidth displays. Requires clear line of sight between wireless devices. Maximum transmission distance tested by Optec is 1000 feet.

Dial-Up Modem
Remote communication to low bandwidth displays. Sends data to sign over standard telephone lines utilizing telephone modems.

Fiber Optic
Hard-wired multi-mode or single-mode fiber optic cable for communications over great distance or in areas where high EMF interference is encountered. Maximum distance is 2.5 miles.

Ethernet
Ethernet communication to displays on a LAN or WAN network. An IP addressable Ethernet serial server is required to convert Ethernet signal to RS-232 signal. Maximum distance from the LAN is 300 feet.

RGB Full Color/Grayscale 256 OPTIONS

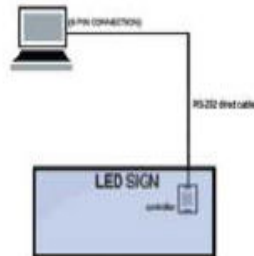
Ethernet
Ethernet communication to displays on a LAN or WAN network less than 300 feet away. Additional Ethernet serial server is not required.

Fiber Optic
Hard-wired multi-mode or single-mode fiber optic cable for communications over 300 feet or in areas where high EMF interference is encountered. Maximum distance is 2.5 miles.

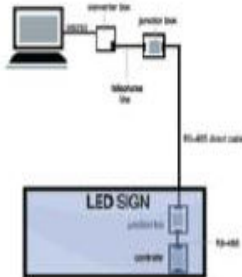
Wireless Ethernet
Ethernet communications to displays on a LAN or WAN network. Instead of using cables, it sends Ethernet Data over Wireless Bridge devices. Requires clear line of sight. Maximum tested distance by Optec is 0.5 miles.

Broadband Internet
DSL/Cable internet connection used for remote communications to mid to high bandwidth displays. Static or dynamic IP Addressable.

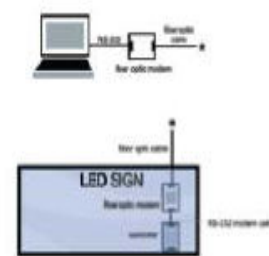
RS-232 Communication



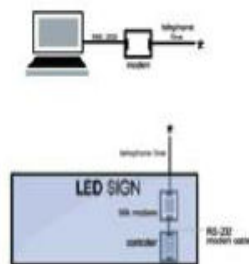
RS-485 Communication



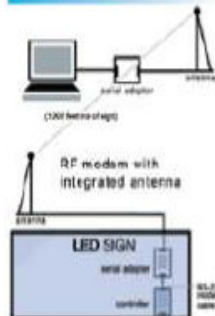
Fiber Optic Modem Communication



Telephone Modem Communication



RF Modem Connection



Software



Software

MEDIA EDITOR 3

Media Editor is our new content creation software for RGB and GS-256 display. The latest version ME3 was designed with a new interface and a new host of features to provide the highest quality display content software available to date. The graphical user interface makes creating dynamic movie files simple with features such as timeline effects, pop-up menus, and frame templates. ME3 is both powerful and simplistic, requiring a short learning curve to transition from basic movies to utilizing advanced concepts.

Media Editor Program Specifications

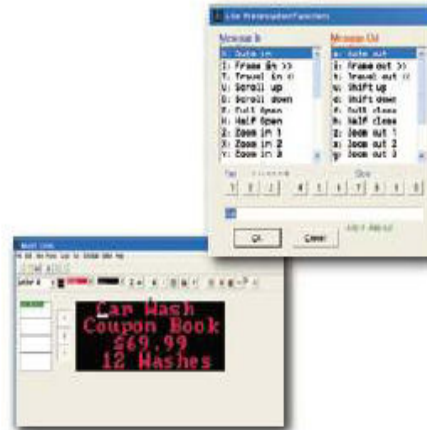
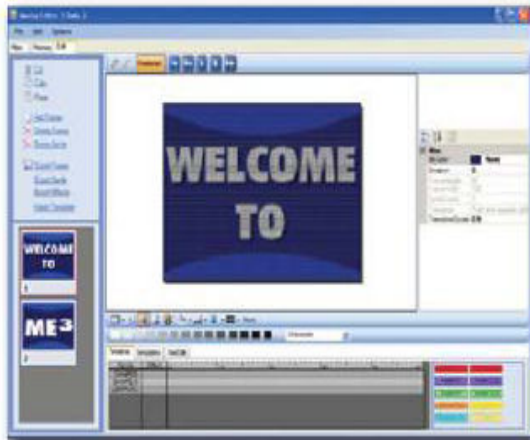
Operating Systems Windows 98/Windows 98 SE/ME/XP/2000	Time and Temperature 12- or 24-Hour Clock Format Data and Days of the Week Celsius or Fahrenheit Modes
Fonts Supports all Fonts Types	Message Frames Global or Editable Message Frames Cut, Copy, and Paste Functions Rearrange Message Frames Import .bitfiles Drop in Functions
Content Creation Real Time Editing Simple Timeline Effects Management Import Graphic Animations and Movies Import Pictures Create Gradients, Fill Effects, Patterns Key Text over Animations and Background Effects	Scheduling Comprehensive Scheduling of Animations and Animation Sequences Logging of Valid Played Files for Accounting Control
Display Modes 65 Transition Effects 10 Basic Object Sprite Effects to Form Various Combinations Comprehensive Speed and Dwell Time Controls	Updates Auto Updates via internet access

WINEDT / WINECL

WinEDT/WinEDL is the software package for creating animated text messages and scheduling for all of our Monochrome displays. This software package is simple to use, yet offers a robust feature set of user controls. Create text messages, import graphic files, create animated graphics, and transmit animated schedules to the display with WinEDT/WinEDL.

WinEDT/WinEDL Program Specifications

Operating Systems Windows 98/Windows 98 SE/ME/XP/2000	Graphic Animation Full Graphic Animation Capabilities Text in Graphic Mode Foreign Language Font Support in Graphic Mode Import Graphic Image Files .gif, .bmp Auto Animation Maker for Easy Creation of Smoothly Animated Images
Fonts Draft, Draft It7, Letter, Bold and Auto	Preview Individual Frame Preview Overall Message Preview Animation Preview
Display Modes 22 "Message In" Transitions 15 "Message Out" Transitions Dwell Time Controls	Communication Protocols Two-Way Communication Protocol Optional One-Way ASCII communication protocol
Time and Temperature 12- or 24-Hour Clock Format Data and Days of the Week Celsius or Fahrenheit Modes	
Message Frames Editable Message Frames Cut, Copy, and Paste Functions Rearrange Message Frames Import .bitfiles	
Scheduling 10 Different Schedules 19 Time Periods Per Schedule 5 Messages Per Time Period	



RGB Full Color Displays



RGB Full Color Series

The world's most technologically advanced LED displays, with brilliant color and clarity, creating a powerful marketing message that makes an impact, night and day. Our RGB Full Color Displays incorporate full-color, video quality imagery and are available in pitches from 12mm to 89mm. They have the capability to playback standard file formats including .avi.

General Technical Specifications

Pixel Pitch:	12mm, 16mm, 20mm, 23mm, 28mm, 34mm, 45mm, 89mm
Pixel Type:	Hybrid (16mm, 23mm, 30mm, 34mm, 45mm, 89mm) Mega Hybrid (12mm, 20mm, 23mm, 28mm)
Color Options:	Red or Amber
Color Capability:	16.7 million or optional 281 trillion colors
Estimated LED Lifetime:	100,000 hours
Average Brightness:	8000+ (NITS)
Viewability:	140 degree
Brightness/Contrast Enhancement:	Individual louvers for each individual LED diode
Graphic Capability:	Text, animation, picture, and video
Control Software:	VGA Sign Controller/Media Editor 3 package
Display Dimming:	100 levels
Scan Rate:	300 Hz
Frame Rate:	60 frames per second
Power:	120/240 single phase
Service Access:	Standard Front access with optional rear access
Sealed-Cabinet Cooling System:	Optional
Communication Options:	Ethernet, Wireless Ethernet, Fiber Optic, Broadband Internet



There is no substitute for quantity when it comes to quality!

- Higher Brightness
- True White
- Better Contrast
- Less Pixelation



Left: 20mm video display with 3 LED per pixel (matrix: 48x128)
Right: 20mm video display with 5 LED per pixel (matrix: 48x96)
LED Spec: Same model Nichia Super Ovals
Environment: 90 F, bright California summer, 11:30am, 6/25, 2006

When it comes to an LED display's performance and picture quality, there is simply no substitute for the quality and quantity of the LEDs used to make the displays. Signs Plus' LED displays are built with a high density of top quality LED lamps to make sure our customers always have the brightest and best looking displays.

There are other advantages of having more LEDs per pixel than just higher brightness. For example, in order to achieve adequate outdoor brightness with low LED density, some manufacturers have to drive their LED lamps at higher currents than they should; the result is a shorter display life-span. Having more LEDs per pixel also reduces pixelation and increases contrast, thus higher picture quality and resolution.

Don't settle for an inferior product, choose a top quality LED display that will maximize your company's sales, brand and investment. Please feel free to contact us for more information on LED displays.



HOW TO COMPARE LED PROPOSALS

I certainly understand your need for "due diligence" in obtaining your bids. I would like to offer my assistance on your spec sheets and variables that need to be taken into consideration when trying to compare "apples to apples". I am offering the following 9 things as suggestions for you to compare and understand the technology the various companies are offering. If you have questions, please do not hesitate to contact me.

1. Please provide any "special requirements" you are aware of. Whatever you have found out from zoning: heights, widths, and any restrictions they may have on LED signage. (ie: static or motion requirements or restrictions). You also want to make sure that even if a company meets the zoning requirements, does it meet your needs? The speed limit, budget, set-back, and primary use of the sign also need to be disclosed so you can ensure that the sign meets the churches needs.
2. Although all the sign companies may meet your height and width requirements, etc. - the most important thing to take into consideration is the PIXEL MATRIX of your sign or in other words the number of pixels on your sign. Some companies out there use a 5 inch retainer around the LED cabinet, others will use 3 inch or less. The way to determine how you are getting the most for your money, is to know what pixel matrix you are being quoted. (If you have a proposal for a 48 x 160 pixel sign - it means there are 48 pixels high by 160 wide) If someone else is quoting a 40 x 112, but still meeting all of your height and width restrictions, **IT IS NOT THE SAME SIGN!**
3. You may also want to request that vinyl decoration NOT BE USED, on the identification portion and logo of your sign. The vinyl will crack, peel, and fade. The vinyl manufacturer (3M) will only warranty this application for up to 7 years depending on which grade of vinyl is used for this decorating technique. I strongly suggest that your specs include a paint design factor for your sign.
4. All companies should be providing you with a "high definition" sign - Which means the pixels sit close together and must be less than an inch apart. A .6" TO .7" is considered High Definition. Anything wider than this will have a "grainy" appearance. The proposals should provide you with the definition information referred to in a millimeter format. (ie: 17mm vs. a 36mm model).
5. You want to have sign companies disclose to you the "frames per second" at which your sign will operate. For instance, if you have a 30 frame per second model, there will be the "tick,tick,tick" of the letters and graphics. You want your sign to be smooth and transition seamlessly. A model that operates at 60 frames per second will provide you with the high definition seamless and easy viewing capabilities you need.
6. You also want to know what your viewing angle is. This is important to understand at what point will the picture "fade" as the car travels by your sign. Viewing ANGLES vary from 75 all the way up to 140 degrees. Don't be fooled by the terminology viewing CONE. Basically what companies do is double the angle and come up with a

- viewing "cone" which is a deceiving statement. Speaking of deceiving #'s - request that you receive "ACTUAL" FREIGHT shipping AND Handling fees included in the bottom line pricing. Estimates or surcharge later or invoice later language in the pricing is not providing you with your bottom line cost. Read the FINE PRINT!
7. If at all possible, you will want the companies to price out the newest "shaded" technology capabilities. If you are getting shading as an option on your sign, you will want to know "how many shades" are available. The variables run at 32, 64, or 256 shades. The more shades you have the better the graphics. You don't want the "shaded" technology on anything less than a 4 line sign. You would then want to go up to a 32 high pixel sign, if it can fit within your requirements. If someone tries to convince you to purchase shading on anything less than a "4-line" sign, they are just trying to make more money off of you and you won't be happy with the result. It would be like looking at 1/2 of a TV screen for your animation and graphics.
 8. Request that they disclose the number of graphics and capabilities included in the proposal. For our 256 shaded models we include over 300,000 graphics and 200 animation motion video applications for your sign.
 9. Pixel Boards vs. Hybrid Individual Pixels - Hybrid technology is the most advanced technology available for the LED signs. If you have a pixel board issue and it needs to be repaired or removed for any purpose, you run the risk of having at least a week worth of downtime on your sign. Pixel Board replacements can cost \$350 plus, Not to mention the cost of hiring someone to remove, ship, and replace the board. With the Hybrid technology, facilities have the capabilities of replacing pixels individually. No downtime on the sign, no need to pay for labor or shipping costs. Your purchase of a HYBRID sign would include 10 replaceable pixels and if you needed more, for the first 5 years they will be free, but after five years your out of pocket expense would be approximately \$5.00.

I hope this information proves helpful to you. It doesn't matter who you buy your sign from as long as you not only have the information you need to make an informed decision but understand it as well. I look forward to answering any questions you may have on my or any other proposal. I look forward to continuing to work with you on your project

Kindest Regards,
Maria Manzur
Manzur & Associates



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