

Display Product Solutions

PANELVIEW
Enhancing the Vision



Panelview is a subsidiary of White Electronic Designs Corporation.

Display issues

NOW THERE'S A BETTER WAY TO ADAPT FLAT PANEL DISPLAYS TO BRIGHTER ENVIRONMENTS

Panelview's passive optical enhancement technology significantly reduces system power requirements, increases battery life in portable applications and extends backlight Cold Cathode Fluorescent Lamp (CCFL) operating life. Panelview's passive optical enhancement technology provides up to twice the factory brightness at no additional power.

Panelview's engineers are highly skilled in optical technology. With them on your side, you'll receive better viewability without adding more lamps, power or heat. No need to redesign your application when you can accomplish this without increasing the size of your mechanical package.

Before Panelview

Even in bright ambient light conditions, Panelview optics can help your display perform better.



After Panelview

Reduce system power requirements and increase battery life in portable applications using Panelview's optical enhancements.

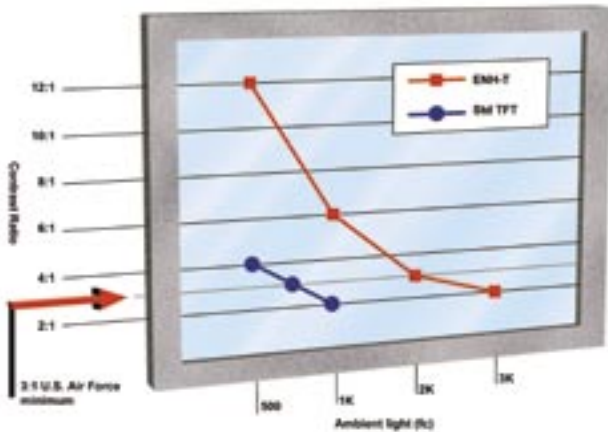
Passive Optical Enhancements

- Panelview's Index-Matched (IM) coatings on the display surface reduce reflections so the display is effectively two to three times brighter.
- Reflective Polarizers (RP) increase the display's brightness by as much as 45%.
- Enhanced Light Guide (ELG) increases a display's light output by up to 30%.

Active Optical Enhancement

- Backlight - in the most extreme conditions active brightness enhancements are added to Panelview's passive enhancements. This is accomplished by the addition of CCFLs in an edge light configuration or in a backlight light box system.

Bright environments



Panelview displays function as though they are two to three times brighter.

A 350-nit display that would have washed out in a 2000-fc environment will now be viewable in a 4000-fc environment. An acceptable contrast ratio range would be greater than 3:1.

Reflection and Reflective Loss

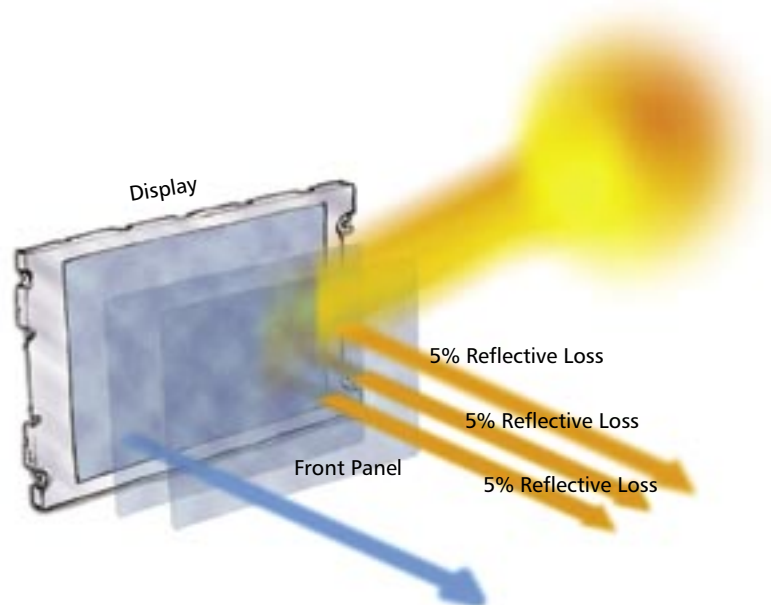
Reflection is the main cause of reduced contrast.

A percentage of the light in any environment will naturally bounce off the surface of the display. As the ambient light increases, the percentage of reflection becomes significant. As the light passes from one medium to another; as from a protective window or touch screen to the display surface, the difference between the “index of refraction” in the two mediums creates a transitional phase difference, increasing reflection. What’s more, the reflection from each surface is cumulative. If the combined reflection from all surfaces is greater than the light output of the display, the display washes out and is unreadable. To solve this problem, you either have to decrease the reflection or significantly increase the light output. Since adding backlights can cause issues in some environments, Panelview’s optical engineers first look at ways to reduce reflection and reflective loss.

Brightness vs. Contrast

Until now, the accepted answer for adapting flat panel displays to bright environments was to increase the display’s brightness. Unfortunately, that often introduced as many problems as it solved. Increasing brightness merely lightens the overall display. The light and black areas become brighter which means the contrast is actually lowered. By adding backlights to the display you only consume more power and create more heat in the LCD. The human eye eventually becomes “saturated” with brightness and stops responding to it.

Contrast, on the other hand, is the ratio of the display’s white level to its black level. As the ambient light is increased, the contrast is reduced. Unlike brightness, contrast is what the human eye most easily responds to and recognizes. Thus, the challenge is not to increase brightness but to increase contrast.



Contrast enhancements

Prevailing High Ambient Light in Outside Environments

In outside environments, high ambient light makes an LCD all but impossible to read. In understanding high ambient light it becomes apparent that there are two approaches to make a display clear in these conditions.

Adding high bright backlights to lessen the ill effects of the lighting condition.

By adding additional backlights the display is now drawing excessive power. This power is converted into heat, which in turn is sent directly into the LCD glass cell. In general, too many fluorescent bulbs increase the package thickness of the display, increase the power draw, make the display perform poorly in high temperature environments and increase the total cost of the display.

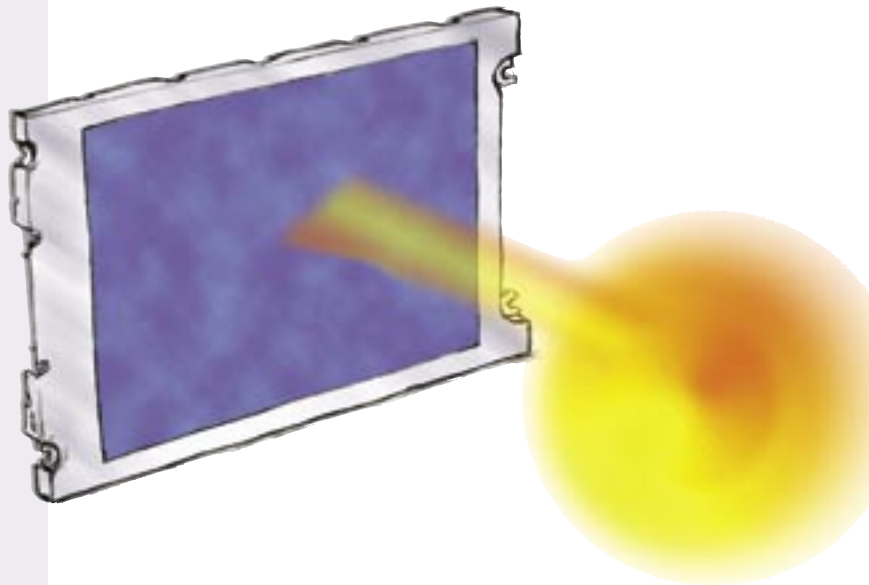
Remove the effects of high bright environments without adding any additional brightness.

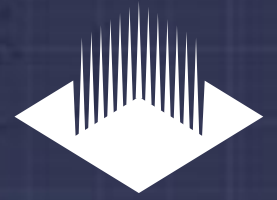
This will allow the display to perform as if it were much brighter. The elimination of the reflective loss means that the display will have the same crisp contrast ratio in high bright environments as it has in lower light conditions. Contrast enhancement is accomplished by matching the same "Index of Refraction" of air to that of the surface of the display. This index matching prevents the reflection of light off the surface of the display. Reflection of light creates the washed out look to a display, thereby lowering the contrast and preventing good contrast ratios.

Index Matching (IM)

Panelview offers IM lamination for applications that are cost sensitive. IM properties are added to most displays at a cost savings using a film lamination process. IM is a broadband, multi-layer coating applied to a thin, hard-coated plastic substrate. This lamination is 25% harder than the standard display polarizer and cleans easily. IM lamination is used for acrylic and polycarbonate windows and offers a significant reduction in reflective loss at a lower cost.

By matching the refractive index of a display's surface to that of free air, ambient, external light will be absorbed by the display. Panelview's optics significantly reduce surface reflection. Ambient light no longer 'bounces off' the display lowering effective contrast. Instead, the index-matched surfaces allow the light to pass through, substantially reducing washout. While the white levels are as bright as ever, the black levels are darker with enhanced contrast, color saturation and viewability.





Super Bright Low Reflectance (SBLR™) Benefits

SBLR™ is a patented technology that significantly reduces glare and reflections in liquid crystal displays (LCDs) while simultaneously increasing brightness. The result is clear vivid images under the harshest light conditions, even in bright sunlight. SBLR™ is the ultimate in contrast enhancement. This technology is accomplished when there is a complete optical bond of the display window directly to the face of the display. With the utilization of specialized optical window glass this combination reflects the lowest overall amount of light, which makes displays amazingly viewable with the highest performance contrast treatment.

Panelview's proprietary process using specially formulated optical bonding material, creates a solid bond between the window glass and the display. This bond, approved for the most demanding high reliability military programs, can withstand the most severe environmental applications. This unique bonding process can also be used to bond touch switch devices directly to the display. SBLR™ is only available for use with glass windows. With SBLR™, there is no requirement for an additional window for the display. SBLR™ can be incorporated into any LCD configuration to enhance the display's performance, thereby ensuring the highest quality display images in any industry.

Clear Vivid Color



with SBLR™

without SBLR™

SBLR™ or IM

Which is right for you?

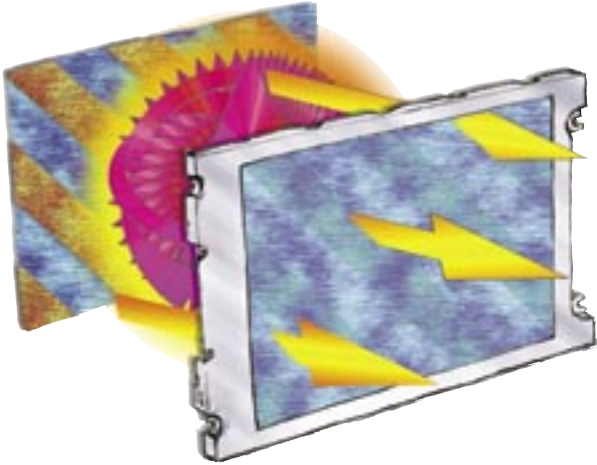
Every industry uses different display components to meet a customer's unique requirements.

Both approaches include the following:

- Readable in bright sunlight
- Minimizes eyestrain
- Reduces power consumption
- Extends battery life

SBLR™ is a trademark of White Electronic Designs Corporation.

Brightness enhancements

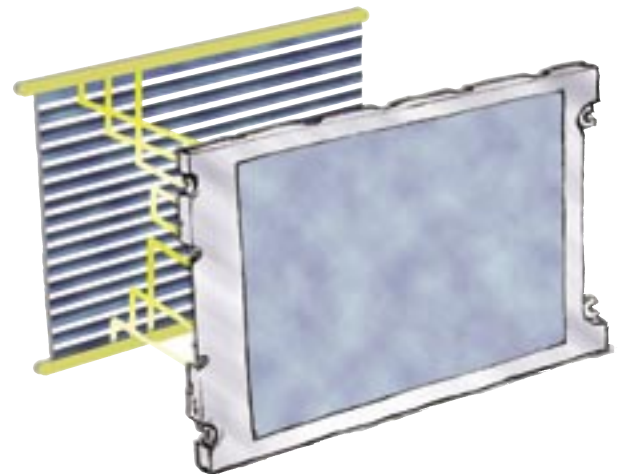


Reflective Polarization (RP)

All LCDs polarize light linearly using front and rear polarizers. Light from the backlit LCD system will be transmitted only if it is in the same orientation as the rear polarizer. If it is not, the rear polarizer absorbs the light. Normally, a full 50% of the display's backlight output is absorbed. Rather than just adding more light to compensate, our optical engineers employ reflective polarizers to reorient the existing light. All misaligned light is reflected back, compensated and rotated until it is in line with the polarizers. Our innovative RP system increases the display's brightness by up to 45% without using more power, increasing heat output or reducing viewing angle.

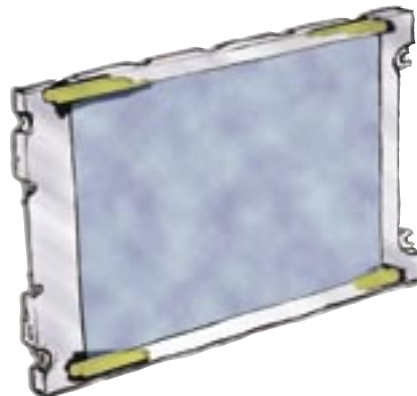
Enhanced Light Guides (ELG)

LCD display panels are usually side lit. A light guide, normally just an inert sheet of acrylic, helps spread the light across the back of the panel. This light is non-directional and is not focused to the forward direction of the display. Furthermore, the light is uneven and must be corrected with diffusers, again reducing light transmission. We solve this problem with a unique ELG that collects, redirects and reflects the light via a series of exacting optics. By channeling previously lost light from the CCFL and the "recycled" light from the RP, Panelview's ELG improves light output by approximately 30%.

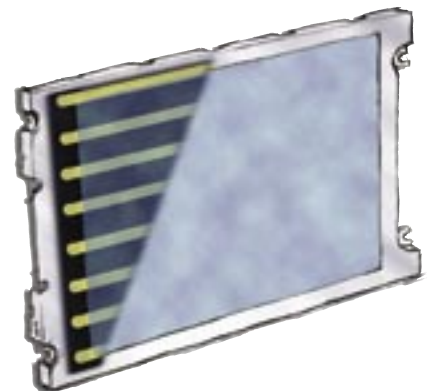


Backlight Systems

Our 4-Lamp, Plus Edge Light System and 5 to 12 Lamp, Backlight Brite System offer active enhancements for the most demanding applications. When your application requires even more brightness, we can install additional CCFLs (Cold Cathode Fluorescent Lamp). The 4-lamp, Plus Edge Light System increases output levels from 600 to 1000 nits without adding thickness to the mechanical package. Our top-of-the-line Backlight Brite System uses up to 12 lamps to increase brightness levels up to 1500 nits.



Plus Edge Light System
(4 Lamp CCFL Edge Light)



Backlight Brite System
(5-12 Lamp CCFL Back Light)



Windows and Filters

Panelview has a variety of solutions to overcome the contrast shortcomings previously described and to enhance viewability. Our windows and filters are designed to meet the special requirements of VF, LED, LCD and EL displays. Functionality is increased with the added benefit of protection.

VF

For an appealing blue-green emissive display with poor contrast we recommend a blue-green or neutral-gray filter. Our acrylic-based filters with hard coatings and non-glare treatments provide superior optical characteristics and protection from scratching or abrasion. Significant improvement in extreme conditions is achieved with the addition of circular polarized windows.

LED

Red, yellow, green and blue: today's LEDs are found in many popular applications. Providing aide for low contrast, our solution offers windows and filters that match the background. This increases contrast and improves viewability and functionality. To defy abrasion or chemical damage further augmentation with our hard coating is done to the window surface.

LCD

LCDs need protection regardless of the environment. The polarizing film surface is soft and can be easily damaged by vandals, accidents or water. To protect them we offer a variety of solutions from acrylic and polycarbonate windows to chemically strengthened or safety laminated glass windows.

EL

With EL displays, contrast is especially low and the electrodes are visible through the background. Our solution to maximize functionality is the use of a circular polarized filter. Available in a variety of colors, including the often recommended neutral gray, this suits a wide range of applications.

Enhancement Technology

State-of-the-art optical enhancement technology has been tested and proven in numerous real world applications. Choose from our expanding selection of standard configurations or call on our design and engineering team to meet your unique specification needs. In either case, your enhanced displays will be shipped to you on your manufacturing schedule, 100% inspected and ready to install. Design in our systems and you design in extra value.

Panelview offers outstanding visibility with low power requirements, even in the most challenging environments. Our markets include: aviation, banking, marine, automotive, golf carts, hand-held GPS, industrial applications, kiosks, point of sale displays, gas stations, medical and test & measurement.



For ordering or information on any of our products and services, call Panelview, our Display Products Subsidiary at 503-690-2460 and ask for a Sales Representative.

White Electronic Designs

CORPORATE HEADQUARTERS
3601 E. UNIVERSITY DRIVE
PHOENIX, AZ 85034
TEL: 602-437-1520
FAX: 602-437-9120

MICROELECTRONIC PRODUCTS
410 FOREST STREET
MARLBOROUGH, MA 01752
TEL: 508-485-4000
FAX: 508-485-4110

AEROSPACE/DEFENSE
3601 E. UNIVERSITY DRIVE
PHOENIX, AZ 85034
TEL: 602-437-1520
FAX: 602-437-9120

DISPLAY PRODUCTS
21333 NW JACOBSON ROAD
HILLSBORO, OR 97124
TEL: 503-690-2460
FAX: 503-690-2490

ELECTRONIC KEYPAD PRODUCTS
539 INDUSTRIAL MILE ROAD
COLUMBUS, OH 43228
TEL: 614-279-6326
FAX: 614-279-0249

VALUE-ADDED SERVICES
3333 W. FLOWER STREET
PHOENIX, AZ 85017
TEL: 602-484-0084
FAX: 602-484-0744

MECHANICAL & INTERFACE PRODUCTS
8000 BLUFFTON ROAD
FORT WAYNE, IN 46809
TEL: 260-747-3121
FAX: 260-747-9601

WWW.WHITEEDC.COM
WWW.INTERFACEDATA.COM

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