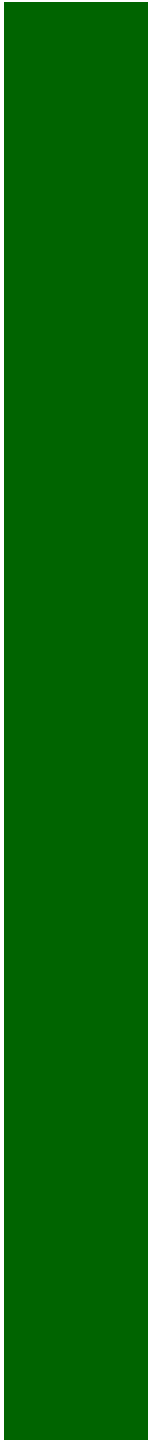
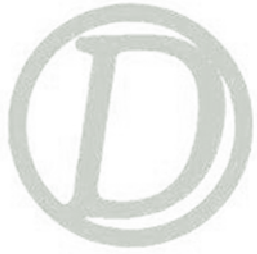


## **Bi-Stable Displays**

*Zero Power Technology Brought to You by Orient Display*

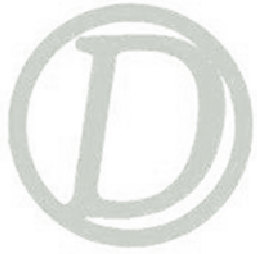




## What is a Bi-Stable Display?

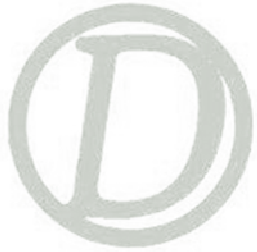
Bi-Stable can retain an image without power.  
The crystals may exist in one of two stable orientations.  
Power is only required to change the image.  
Bi-Stable is also known as Cholesteric.

Bi-Stable LCD can change colors,  
and keep the new color even when power is cut off.



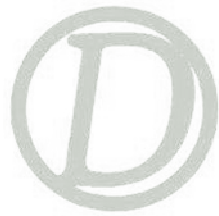
## Bi-Stable Advantages

- Reflective display with excellent sunlight readability.
- Low power: Zero power is needed to maintain the image.
- 20,000 pages of an e-book can be read with just two AAA batteries without a charge.
- Ultra wide viewing angle = 80 degrees in all directions
- High resolution graphic with 200 dpi.
- Up to 256 levels of gray scale.
- No polarizer, no color filter, and no backlight are used.
- No flickering = no eye strain when reading an e-book.



## Bi-Stable LCD Colors

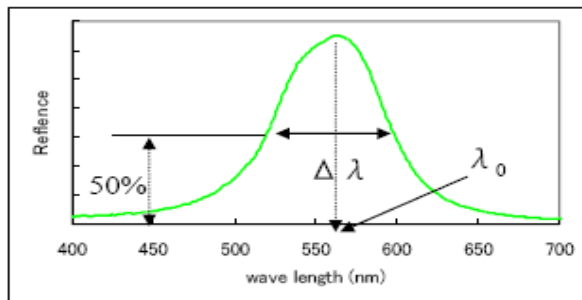
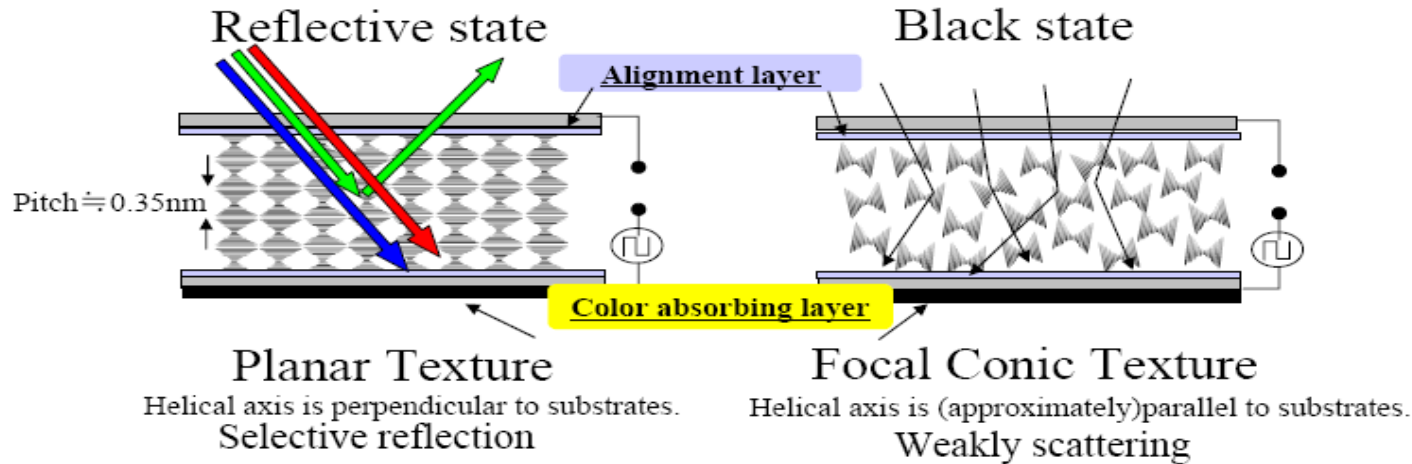
	Reflective Color of Bi-Stable LC	Color Absorbing Layer	Character Color	Background Color
Single Layer	Green ✘	Black	Green ✘	Black
	Yellow	Blue	White	Blue
Double Layer	Yellow Blue	Black	White, Yellow, Blue, Black	
Triple Layer	Red Green Blue	Black	Full Color	



# How Does a Bi-Stable LCD Work?

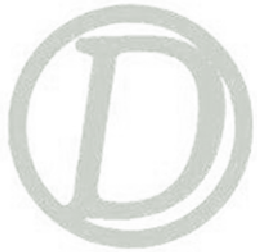
For *Cholesteric* materials with positive dielectric anisotropy, the molecules in the planar structure will realign parallel to an applied electric field, and generate the reflective layered structure. Applying a voltage of 6V to 30V will break up the helical layered structure. In order to switch back from focal conic state back to planar state, a higher voltage is needed (35V). The focal state is less stable than the planar state.

✓ (Bragg refraction :  $2d \sin \theta = n \lambda$  )



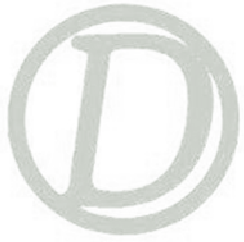
$$\lambda_0 = n \cdot P \quad [ n = ( n_{\parallel} + n_{\perp} ) / 2 ]$$

$$\Delta \lambda = \Delta n \cdot P$$



## Precautions with Bi-Stable LCDs

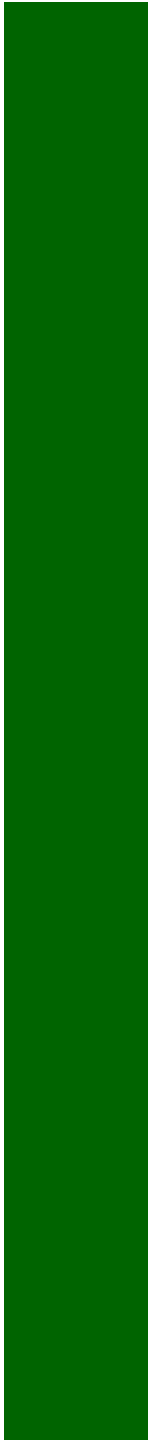
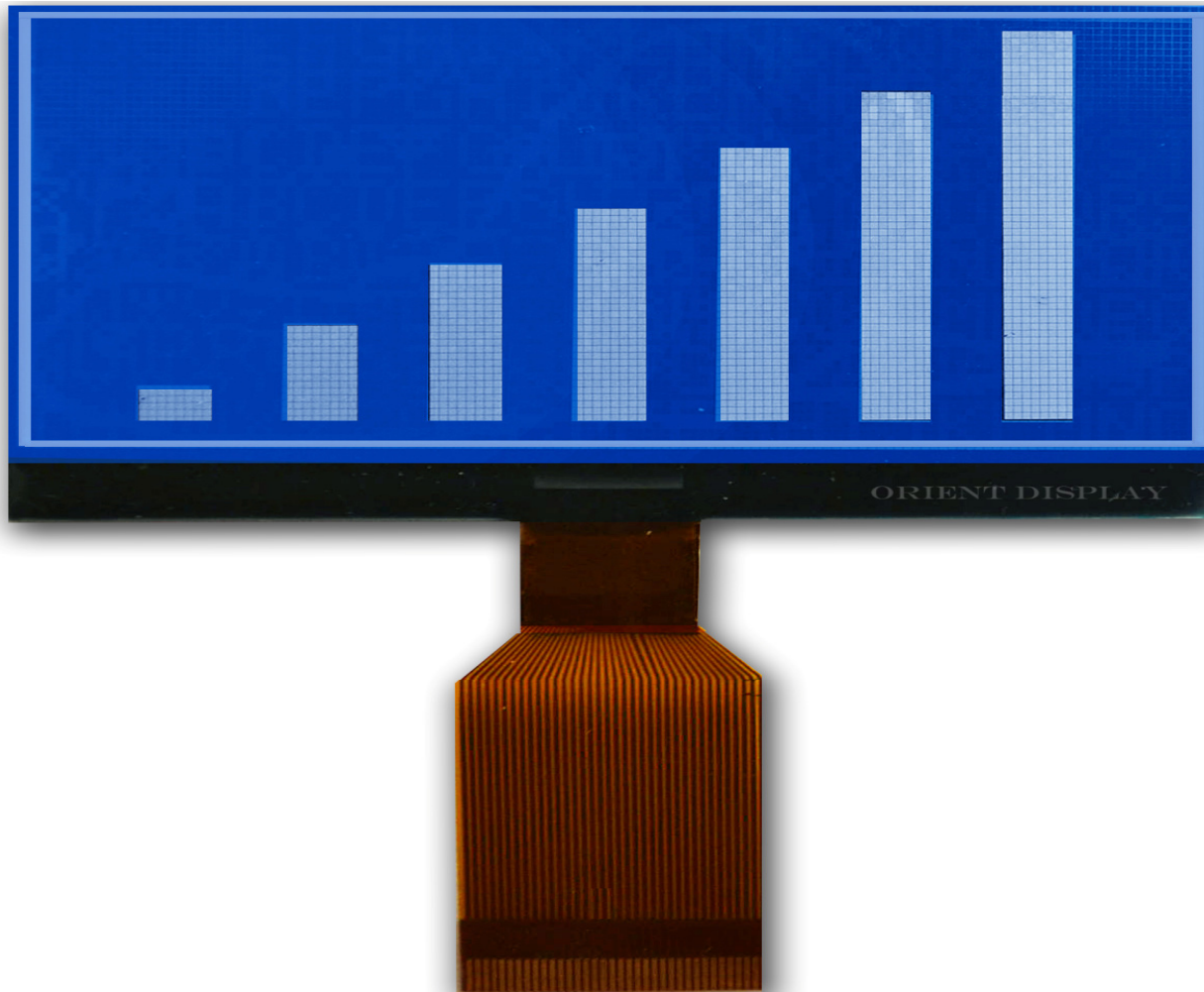
- Bi-Stable LCDs require protection from UV light. They require UV blocking material with a minimum 98% cut off at 380nm and lower.
- The transition to a new image in a Bi-Stable LCD is slow. Response time is typically 8 seconds at 25C.
- Add a transparent cover such as acrylic or polycarbonate to protect the viewing area of the display. Place the protective cover as close to the display module as possible.
- Add an anti-glare or anti-reflective surface film or finish to the viewing side of the cover to improve optical performance.
- Bi-Stable LCDs require a charge pump to boost the 3V supply to the 35V operating voltage. Consider this voltage in your application.
- Bi-Stable LCDs are limited to one color of character and one color of background. The dot matrix area can be “color mapped” over fixed areas and layers to show different colors.

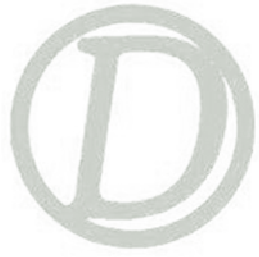


## Single Layer Bi-Stable LCD

Background = Blue; Characters = White

JAZZ-CW-B

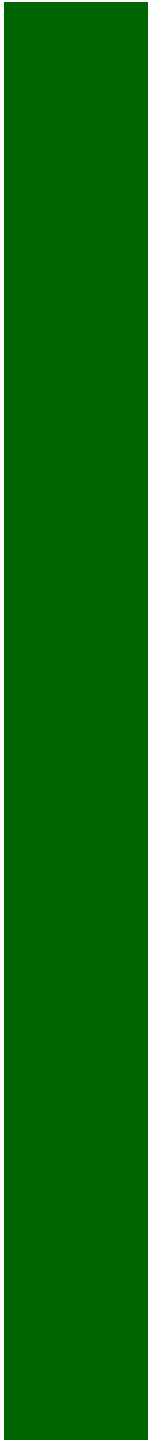




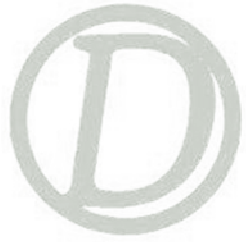
# Single Layer Bi-Stable LCD

Background = Black; Characters = Green

JAZZ-CG-D







# Single Layer Bi-Stable LCD

Background = Black; Characters = Yellow

JAZZ-CY-D





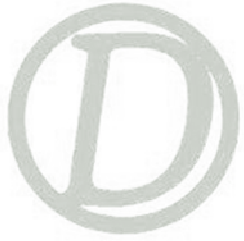
## Double Layer Bi-Stable LCD

Background = Pink; Characters = Yellow

Background = Blue; Characters = Yellow

JAZZ-CY-PB





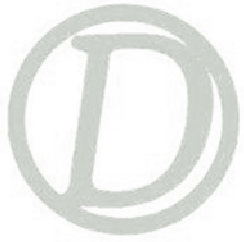
# References

## **Standard Product Information:**

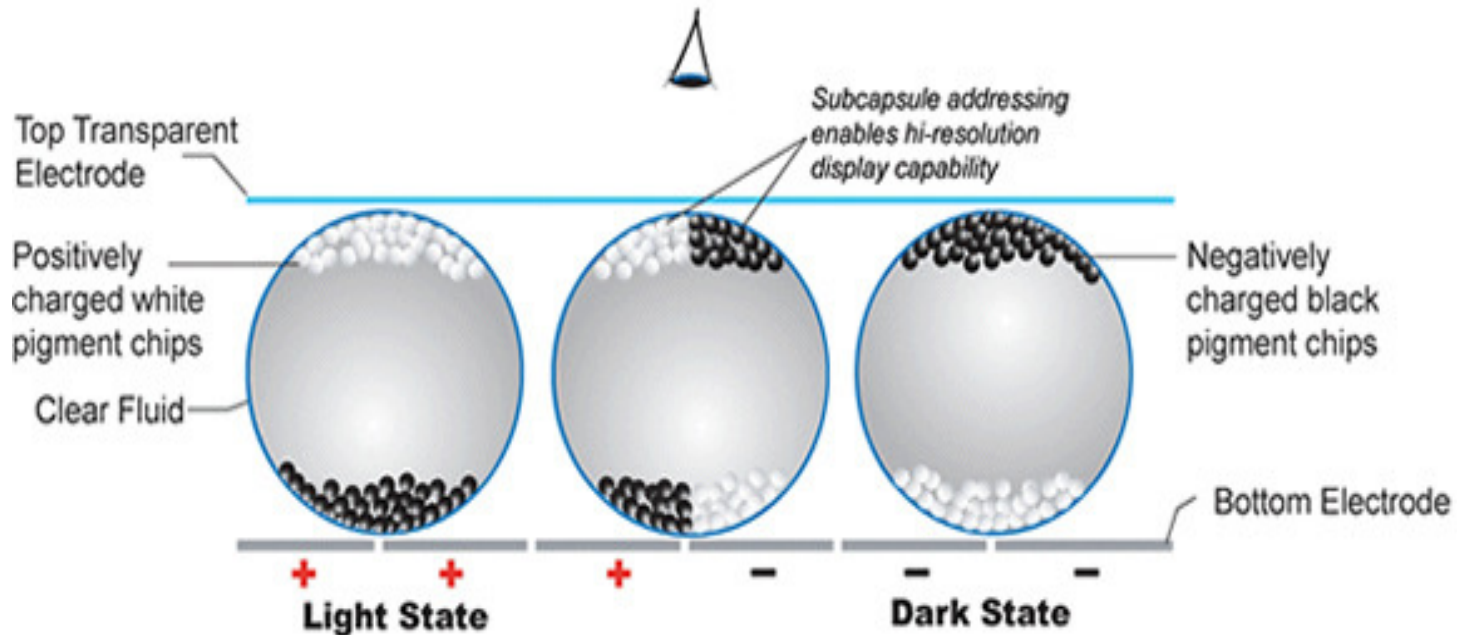
<http://www.orientdisplay.com/bistable-lcd-modules.html>

## **Custom Bi-Stable LCDs:**

Any type of monochrome & multicolor LCDs including segment, character, & dot matrix graphic LCDs can be custom made with Bi-Stable technology!



# Alternative Technology = E-Ink; Coming Soon from Orient Display





*Total LCD Solution Provider*

**USA OFFICE**

**Orient Display (USA) Corp**

14925 SE Allen Road, Suite 203 B  
Bellevue, WA 98006  
Tel: (425)698-1938  
Fax: (425)698-1852

Seattle Office  
Hours of Operation  
Monday - Friday:  
8:00 am - 4:30 pm  
(Pacific Time)

**CANADA OFFICE**

**Orient Display (North America)**

145 Royal Crest Court Unit 42  
Markham, ON L3R 9Z4 Canada  
Tel: (905) 477-1166  
Fax: (905) 477-1782

Canada Office  
Hours of Operation  
Monday - Friday:  
9:00 am - 5:30 pm  
(Eastern Standard Time)