



Winstar Display Co., LTD

華凌光電股份有限公司

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How to Avoid Image Persistence on LCDs

With the life style changing in the world, comes with a great consequence. All of the things that have been modified have their own advantage as well as their disadvantage. As the so fast spreading use of the LCD as what this technological era offers, comes with some complain. And one great issue related to it is the Image Persistence.

Winstar Display as a manufacturer of LCD and LCD modules would like to provide our experience to the LCD users to prevent image persistence while designing products.

What is Image Persistence?

The image persistence is most common for elements of the display that the users do not change. When utilizing LCD panels in applications where a fixed or semi-fixed image remains displayed on the screen for extended periods of time, users may experience this phenomenon. In LCD industry, image persistence sometimes also called “image retention” or “ghosting”. So items that are likely to generate a persistent image are the task bar, desktop icons and even background images. All of these tend to be static in their location and will be displayed on the screen for extended period of time. Once other graphics are loaded over these locations, it may be possible to see a faint outline or image of the previous graphic.

The image persistence effects are most often only temporary as the liquid crystals have a nature relaxed state. When a voltage is applied, the liquid crystals rearrange themselves to block certain light waves. If left with the same voltage for an extended period of time, the liquid crystals will develop a tendency to stay in one position. The tendency of liquid crystals to stay arranged in one position can throw the requested color off by a slight degree. It will look like the traditional “burn-in” problem on CRT displays. That’s why we suggest that the LCD users or software designers do not display the same image for too long and have to refresh the display image at least every 5 minutes.

The cause of the LCD tendency might be due to accumulation of ionic impurities inside the

liquid crystal, electric charge building up near the electrodes, parasitic capacitance or a DC voltage component that occurs unavoidably in some display pixels owing to anisotropy in the dielectric constant of the LCD.

How can the users avoid image persistence in the LCD display?

The image persistence usually is temporary, but can become permanent if the equipment designers or manufacturers do not face up to it at beginning. The liquid crystal could be ionic and will become permanent image persistence and can not be fixed. Actually, the image persistence on LCD display can be corrected in most cases and easily prevented. The below methods are commonly taken to prevent from permanent image persistence in LCD displays.

1. Use a screen saver with a black or medium gray background which is automatically set to come on if the device is inactive for more than 5 minutes. This also prevents an image from being displayed in screen for too long.
2. Avoid placing the monitor in poorly ventilated areas or in areas that will create excess heat around the monitor. As the environment situation is very important element to protect LCD.
3. Set the monitor to turn off after a few minutes of screen idle time. Turning off the display will prevent an image from being displayed on the screen for extended periods of time.
4. Try not to operate the LCD with a “fixed” image on the screen for more than two hours.
5. Rotate any background images on the monitors. Background images are one of the most common causes for image persistence. By switching backgrounds every day or few days, it should reduce the change of persistence.

For the software developers of the devices, there are some further suggestions as below:

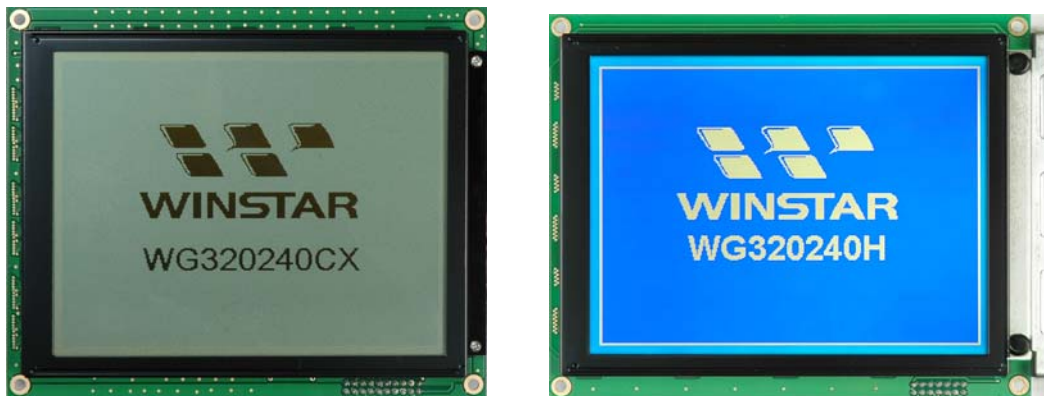
1. In defining the icons or buttons in the screen, try to utilize block patterns instead of distinct lines as borders for dividing the display into distinct area.
2. Try to utilize medium gray color for those areas that will have prolonged display times or remain static as other menu elements change.

The above steps can be done to minimize the image sticking phenomenon. Unlike the usually irreversible “burn-in” effects commonly associated with direct view phosphor display devices such as CRTs, an image stick on an LCD display can be reversed as the nature of liquid crystal. Here are a few steps that can be used to try and correct it:

1. Please run a screen saver with a turning image and run it for a period of time. The color should help remove the persistent image but it could take a long time.
2. Turn off the screen for a period of time. It can be as little as several hours or it could be as long as several days.
3. Run the screen with a single solid color or bright white for a period of time. This will cause all of the crystals to be reset at a single color setting and should erase and previous image persistence.

Furthermore, there is an important issue that the device designers and manufacturers need to address at the beginning of the design stage – to choose a suitable LCD type for the application.

Sometimes, the image persistence problem is caused by using incorrect display mode of the LCD. Many controller ICs have positive and negative mode functions. But that doesn't mean that the designers can choose positive or negative mode as their preference. If the application is required a sunlight readable LCD, the designers should choose a position LCD type. Even though, the controller on the LCD modules might have the positive or negative modes, we suggest the users do not choose the negative LCD and use reversed mode of the controller to show the display pictures. This kind of display methods on the LCD will easily caused image persistence on screen.



Right: A Positive Mode LCD module Left: A Negative Mode LCD module

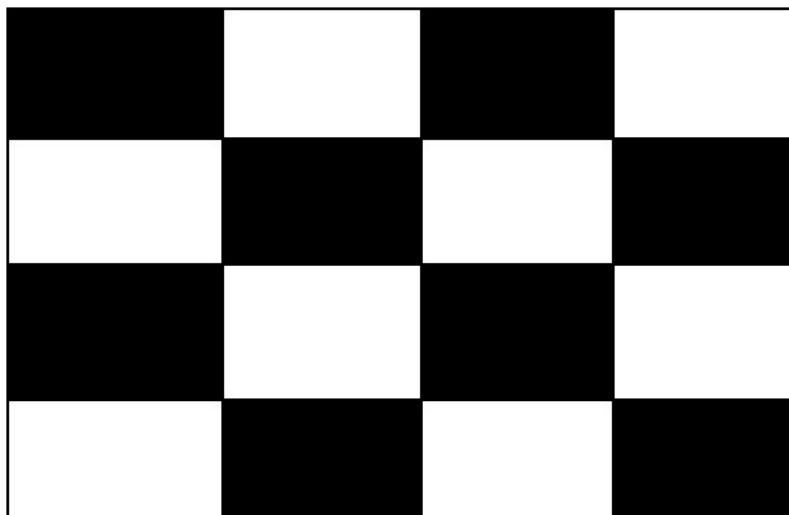
In order to prevent the image persistence problem is coming from the bad LCD glass, the LCD or LCM manufacturers can do something to prevent it on inspection stage. The manufactures can set a test program consisted with more graphic images/pictures to inspect the LCD before shipment. Below are the examples of testing images as reference:



LCD Inspection Test Images examples

The following test program is good and simple way to inspect the LCD image persistence:

1. Put the LCD display in normal temperature.
2. Turn on the LCD and display as below black and white chessboard.
3. Display the image for 1 to 2 minutes.
4. Turn off the captioned image and check if the black and white chessboard image would be visible.
5. If the black and white chessboard image still be visible, that means the LCD have image persistence.



Winstar Display

Hopefully with this article, it would be a great help for the users to prevent image persistence on LCD displays. With all the preventative steps in place, a user should never really have to encounter this problem. If you need further information, please contact with us.

Winstar Display Co. Ltd.

No. 163 Chung-Chung Road.

Taichung City, Taiwan, R.O.C.

Tel: 886-4-24262208

Fax: 886-4-24262207

sales@winstar.com.tw

www.winstar.com.tw