

Taking LCD Displays Outside

The challenges and considerations of deploying digital displays outdoors

FACTORS TO CONSIDER

when taking a display outside



1. The Environment

The Impact of the Sun / Variations in
Temperature / Weather Conditions / Dust/
Wind Load

2. Security

Vandalism

3. Installation & Operations

Challenges of Installation / Service /
Duty Cycle

A vibrant, sun-drenched forest scene. Tall, slender trees with dense green foliage stand in a field of wildflowers and grass. Sunlight rays (crepuscular rays) stream down from the canopy, creating a magical atmosphere. The overall color palette is dominated by various shades of green, from deep forest greens to bright, sunlit yellows and whites.

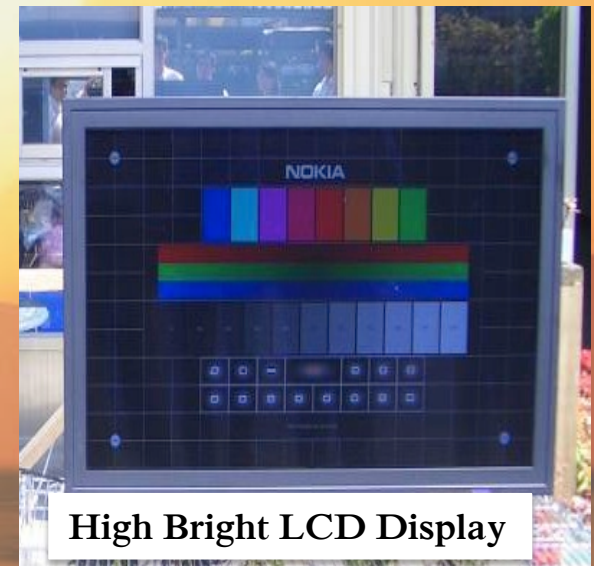
THE ENVIRONMENT

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THE SUN

Visibility

- Digital Displays must be brightly illuminated in order for the image to be visible in direct sunlight
- In bright sunlight and in high ambient light conditions, standard LCD screens suffer from fading, washed-out colours and poor performance
- An LCD display can also lose 10-15% brightness *every year* it is exposed to sunlight.
- It is generally agreed that a brightness of at least 1500nits [cd/m^2] is required for adequate outdoor visibility of an LCD display panel.



THE SUN

Visibility



When in an isotropic state, the LCD turns black and is unreadable.

Solar Clearing (aka Isotropic Behaviour)

When exposed to constant direct sunlight (in conjunction with internal heat from backlighting), there is a risk of the LCD crystals absorbing too much heat causing it to turn black in certain spots.

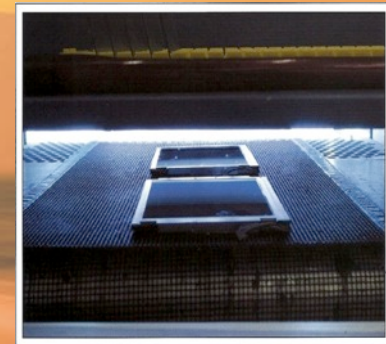
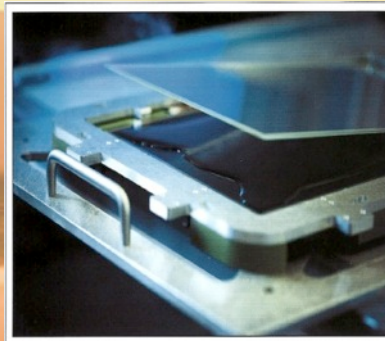
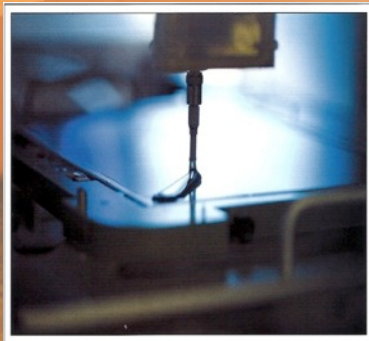
Solar Clearing causes degradation in the display, which in turn reduces the operating life of the display.

THE SUN

Visibility

What can be done to improve visibility in LCD screens?

- **Install High brightness screens.** They are designed to emit more light, which means more luminance and contrast, than traditional commercial-grade screens.
- **Optically bonded glass** reduces the reflection caused by glass or air and reduces unwanted glare effects and mirror images that make the display difficult to read.
- **Install ambient light sensors** to automatically adjust brightness at different times of the day.
- **Use LED backlights** instead of CCFL bulbs to reduce internal temperature inside the display.



THE ELEMENTS



Temperature

- If the LCD screen and display enclosure is not rated for extreme temperature fluctuations it can lead to screen blackouts, damaged electronics and decreased efficiency.

Weather & Humidity

- Humidity has a very detrimental effect on the electronics housed within the display. Rain & snow can severely corrode the housing itself.
- Strong or gale force winds could potential knock over the display

Dust & Dirt

- Brake fumes, dust and pollution can also reduce the lifespan of a display by
 - Damaging the LCD panel
 - Destroying the Electronics
 - Clogging air intakes

THE ELEMENTS

Solutions for Weatherproofing displays

PROTECT THE DISPLAY

- Ensure the enclosure is strong enough to withstand gale force winds up to 140 mph

PROTECT THE SCREEN

- Outdoor LCD's must be designed for temperatures down to -35°C (-30°F) and up to 50°C (122°F)
- Configure the display to warm up properly when operating in freezing conditions. Likewise ensure that there is an efficient internal cooling system in place.
- Install a waterproof screen

PROTECT THE ELECTRONICS

- Have a display that is properly sealed, in order to prevent condensation forming inside the cover glass
- Ensure that the display is housed in a waterproof enclosure

An aerial night photograph of a dense urban landscape, likely Tokyo, featuring a complex highway interchange with long-exposure light trails from vehicles. The city is illuminated by numerous lights from buildings and streets, with a prominent skyscraper under construction visible in the upper left. The sky is a deep orange and red from the setting or rising sun.

SECURITY

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VANDALISM

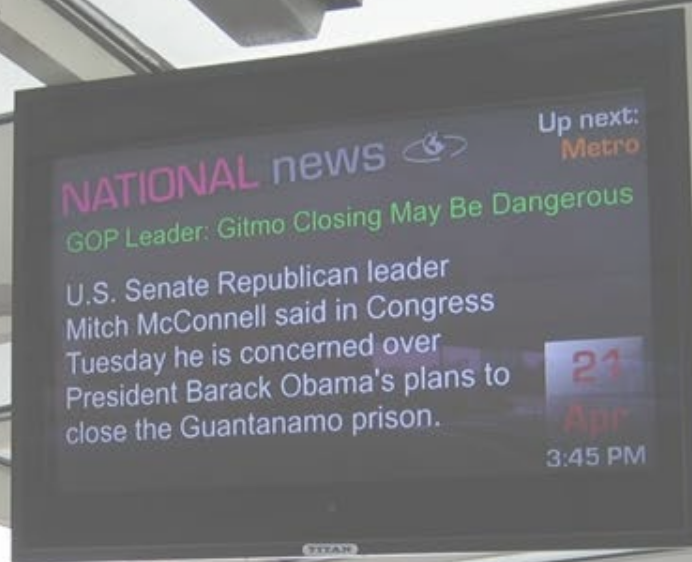
LCD screens can be easily damaged without the proper protection. In order to be protected from deliberate attacks, utilizing shatterproof screens and tamperproof enclosures to ensure product longevity and prevent harm. Even a screen in a supervised location and not vulnerable to vandalism requires physical protection as accidental impacts or even wind blown debris can damage a screen.

HOW TO SECURE A DIGITAL DISPLAY

Install shatterproof glass that is resistant to impact

Use a steel enclosure to house the LCD screen.





INSTALLATION & OPERATION



INSTALLATION

What sorts of things are needed for a successful installation?

- Acquire ALL required permits and certifications *before* installation
 - ✓ Determine if there are any city by-laws restricting full motion video from facing traffic
 - ✓ Be sure to have all electronics certified by an established product safety certification board, such as Underwriters Laboratories.
 - ✓ Investigate if there are any codes about dimming or shutting off power at certain hours.
- Investigate power supply options thoroughly before installation
 - ✓ Make sure that it is established where the display is sourcing its power from and:
 - ✓ Who is paying for power
 - ✓ Determine end of life power requirements
- Establish cost of ownership (i.e. cost of running the display) before installation



OPERATION



Power

- Monitor power sources closely
 - ✓ how is the display receiving power?
 - ✓ Is it pulling power from other sources?
 - ✓ Are the power sources using dirty power
- Be sure that the display can handle fluctuations in power and shut down gracefully in account of a power outage

Duty Cycle

- An outdoor display can have a duty cycle of 24 hours a day, seven days a week. This can decrease the display's life cycle by years.
- Ensure that the LCD monitor and player is treated for an outdoor duty cycle

Service

- Determine who will be responsible for onsite service and general maintenance, or
- Should the display be serviceable remotely?



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