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## Optical Bonding FAQ

### What is optical bonding?

Optical bonding is the process of laminating cover glass or touchscreens to the LCD cell. Silicone gel or other adhesive, such as urethane, is inserted between the cover glass and LCD to completely fill the air gap. The assembly is cured in a process that affixes the panels together while solidifying the gel.

### Why would someone need optical bonding?

*Protection* - LCDs have plastic surfaces that are not vandal or weatherproof. To protect your display investment most LCD installations require a cover glass or polycarbonate lens to protect the LCD.

*Clarity & Viewability* - Optical bonding eliminates the internal reflection between the LCD and the cover glass or touchscreen because the bonding process creates a single index of refraction. Reducing internally reflected light loss increases display contrast and viewability. Improved display contrast enables displays to be more readily seen in bright ambient conditions, without increasing backlight brightness and the associated unwanted higher power and higher operating temperatures.

*Shake & Shock* - Optical bonding is an effective means of improving resistance to shake and shock. This benefit is especially useful for military and transportation applications.

*Dust & Moisture* - Filling the gap between the protective glass and LCD keeps out dust and moisture. Condensation or dust can make a display unreadable.

### Does optical bonding change a display's operating temperature range?

No. Optical bonding only alters the surface of the display rather than the components, so the operating temperature will not change.

### What applications can benefit from optical bonding?

Any display in an outdoor environment or high ambient light conditions can be improved with optical bonding. Example applications include in-vehicle displays and digital signage, defibrillators, marine displays and in-flight entertainment systems.

### What types of displays can benefit from optical bonding?

Optical bonding can be used on any type of direct view display technology, including AMLCD, plasma, passive LCD, monochrome and transparent electroluminescent, as well as new emerging flat technologies such as OLED (organic light emitting diodes).

### **What are the different types of bonding? What types will Planar offer?**

There are three types of bonding: silicone cured with UV, urethane, and epoxy. Planar will focus on providing silicone bonding because of its improved flexibility during the bonding process, but it has experience with all three types of bonding.

### **What other types of display enhancement services are available?**

Planar can add coatings and performance films to further enhance viewing performance by minimizing specular reflections (mirror type reflection) or minimizing unwanted high ambient background light and minimize fingerprints.

Planar can perform the following display enhancements:

- Performance films and coatings
  - Anti-glare
  - Anti-reflective
  - Linear and circular polarizers
  - State-of-the art ITO EMI coatings
- Vandal glass
- EMI shields
- Transparent display heaters
- LED backlights
- Touchscreens

### **What are the important selection criteria for choosing an optical bonding vendor?**

Although simple in concept, the process of optical bonding actually involves numerous steps and requires several diverse capabilities. Prospective vendors should:

- Demonstrate a track record of optical bonding displays
- Have in-house capability and expertise to properly process your display in a low ESD (Electro Static Discharge) and clean room environment
- Test the enhanced displays for their target environments

There are numerous "garage shops" offering optical bonding, but only a few have comprehensive quality and engineering systems and processes in place to certify their work.

### **Why choose Planar as an optical bonding vendor?**

Planar's optical bonding and film enhancement technologies make average TFT displays look fantastic. Planar has more than 20 years' experience bonding glass to display surfaces, from 100,000 electroluminescent (EL) displays, to high performance cockpit AMLCDs. Planar can deliver consistent quality and predictable results because it has:

- ISO 9001-quality systems
- MIL-spec and FDA-level standards
- Extensive in-house optical test verification capabilities
- A certified clean room and other environmental controls
- Strong relationships within the Asian display industry

### **How long has Planar been bonding overlays on displays?**

Planar has a long history of optically bonding displays. The company's facility in Finland has been environmentally encapsulating over 100,000 pieces of glass annually for more than 20 years. Planar also has experience with optical bonding for avionics applications.

**Where does the optical bonding process occur?**

Planar's optical bonding facility is located in Beaverton, OR, USA. The facility includes a class 10,000 clean room with focused workstation environments of Class 10 to ensure proper handling of your displays during the enhancement process.

**Can I get a tour of the facility?**

We welcome visitors to our facility and will gladly show off our optical bonding and other display enhancement capabilities.

**Will optical bonding be available on your standard catalog items?**

Planar has a wide array of standard catalog items across a variety of applications and display technologies. We are currently evaluating which parts of our product portfolio will be expanded with standard products that include optical bonding and other popular display enhancements.

**What sizes can you bond?**

Up to some of the largest sized displays (e.g., 60"+)

**What are prices?**

Prices vary based on size of the display, optical glass surface treatment, volume and lead time.

**Will Planar work with consigned displays?**

It is our preference to own the entire supply chain for the optical bonding process to provide the best service, quality and cost control. However, if the need arises, Planar will consider consigned displays.

**Has Planar done any reliability testing of the bonding process?**

Yes, we have tested the critical performance metrics to a battery of military environmental and industrial standards, which include temperature cycling and temperature shock extremes, humidity, altitude, mechanical shock and vibration, liquid and dust ingress.

**Does Planar's bonding process result in the yellowing of displays that are exposed to UV light?**

Planar uses silicone in our optical bonding process which does not yellow displays that are exposed to UV light.

**Where can I learn more about Planar's optical bonding process?**

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