



Large format PCAP reinvented

The trend in large format touch screens is driving the need for new types of PCAP products

Executive Summary

Self-service or Service Automation is only one of many application trends that is driving the development of larger and larger PCAP products and their underlying enabling technologies. These types of kiosks are designed for the public domain and as such they present challenging requirements when it comes to the size, reliability and functionality of the touch screen. In this white paper, we will discuss the many options that you have as a system designer when choosing the right solution for your next large format PCAP project.



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1. Large format trends

It wasn't that long ago a 32" TV was considered large and would create envy from your friends and neighbors. Today the recommended size for your living room starts at 55" and doesn't stop until you run out of space or money, whichever comes first. This trend has carried over to the commercial space where larger and larger touch-enabled displays are being used in many different applications.



How large is large?

There is no universally adopted size range that classifies a touch screen as 'large' but at Elo we consider anything over 24" diagonal to be large. This is mainly due to the fact that the technical challenges tend to change around that size.

A larger size display creates visual attractiveness in a store, mall, lobby or restaurant but it also creates a very functional touch surface where graphics can be designed for ease of use with large icons and buttons. When the kiosk is not in use, businesses can use the display to advertise products and services grabbing your attention with stunning graphics and video. The self-service kiosk trend has accelerated in recent years and many kiosk applications now use a 32" touch screen, for example. The screen is typically oriented in portrait mode to take full

advantage of the touch surface at eye level with content that matches the motion range of the user.

Sometimes the screen may be touched by multiple users simultaneously so an even larger 55" or 85" screen may be necessary to accommodate such use cases. In casino gaming, for example, use cases may include multiple players using a touch-enabled table simultaneously.

2. PCAP versus other technologies

There are a number of technologies that compete with PCAP for the large format market including Optical (Camera), IR, FTIR and Surface Acoustic Wave (SAW).

There are many key considerations when making your technology choice, not to mention the budget available for your design. As with any touch technology, they all come with certain tradeoffs that are important to understand.

PCAP, SAW and FTIR are all so called "zero bezel" technologies allowing you to create an edge-to-edge cover glass design that not only looks better, but is also easier to keep clean. IR and Optical solutions require a plastic bezel to hide the optoelectronics around the perimeter of the screen creating a less contemporary appearance.

Tech	Touches	Contaminants	Bezel	Sunlight	Optics
PCAP	+10	Best	No	Best	Good
IR	+10	Good	Yes	Good	Best
FTIR	+10	Poor	No	Good	Best
SAW	2	Good	No	Best	Best
Optical	6	Poor	Yes	Poor	Best

Touches *Number of possible simultaneous touches*

Contaminants *Ability to work through dirt, dust etc.*

Bezel *Requires a plastic bezel versus an edge to edge design (zero bezel) that has better aesthetics and is easier to clean.*

Sunlight *Touch performance in direct sunlight*

Optics *Refers to optical performance i.e. the clarity of the screen that impacts the graphics shown by the LCD panel*

Challenging environments created by high usage

Large format touch displays are a lot more likely to be placed in public spaces, and unlike employee facing systems, they will be used by consumers, a high usage model that can take its toll on the long-term reliability of the product.



One significant issue with public displays is contaminants — the build up of dust, dirt, oils and other particles that over time can impact the performance of the touch screen. Imagine a shopping center with hundreds, if not thousands, of people touching the screen daily, transmitting contaminants to the surface of the screen. FTIR for example uses infrared beams that are affected by surface contamination creating false touches and other performance issues, if not maintained properly.

PCAP is relatively immune to contamination and performs better than all other technology options based on Elo's extensive research. However, we have also had good success with SAW technology in public spaces, a technology that is widely deployed in kiosk applications due to the clarity of the screen and extremely reliable operation.

Don't hide that beautiful content

Most of the touch technologies presented in this whitepaper have good optical properties. That is, they don't blur or distort the underlying image on the display. In the past, large format PCAP had some undesirable effects such as moiré (optical effect creating a rainbow like appearance) and pattern visibility. However, with Elo's new Pro-M range, the optical performance is almost at the

level of glass-only solutions. Without question, a large format SAW screen with a pure glass sensor does a fantastic job of showing off that high resolution content but it is becoming less of a factor with the latest generation of film-based, large format PCAP.

Performance and reliability is key

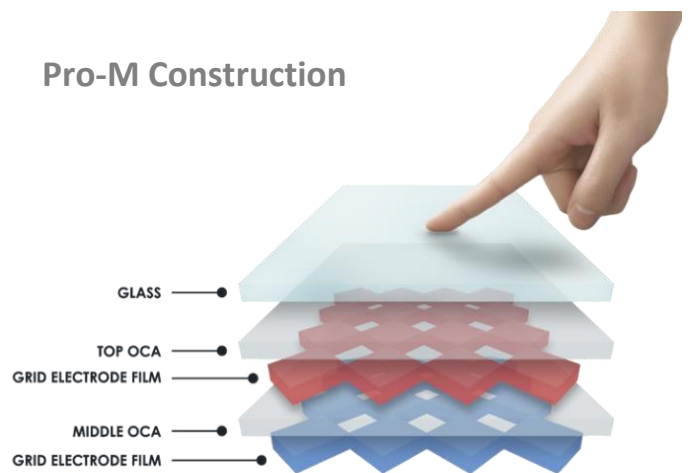
When it comes to touch performance, PCAP is the undisputed leader with its highly sensitive touch, accuracy and speed. With camera-based optical systems, alignment of the camera is key and can cause performance issues over time, since it is very difficult to create a design with the required tolerance.

3. How it works

PCAP comes in many different variations, each with specific costs and functional outcomes. The core design of PCAP technology begins with two grids of conductive traces patterned vertically and horizontally for X and Y axes. These are laminated together with a glass cover layer. A high frequency electronic signal creates an electric field which projects through and above the glass. A finger touch disturbs the electric field and the controller interprets this to pinpoint the touch location. Multiple simultaneous touches can be detected.

GFF dual film construction used in Pro-M

GFF (Glass, Film, Film) design consists of a passive cover



glass bonded to a double layer of film sensors laminated

together with Optically Clear Adhesive (OCA). The conductive grids are printed onto thin PET film material.

Pro-M products from Elo use a highly transparent metal mesh film with ultra-thin electrodes carefully arranged in an irregular grid/mesh pattern on layers of plastic film. The metal mesh electrode sizes are so small, 4µm, they cannot be seen with the naked eye, which allows Pro-M designs to deliver a very sensitive touch experience without moiré issues as described earlier.

All large format PCAP products are not created equal so it is important to pay attention to the construction and materials used. For example, products using so called wire mesh have visibly embedded wires that distract the user and take away from the aesthetics of the display. Some of these wires can be as thick as 100µm so they are clearly visible to the naked eye.

Other variants of PCAP sensors can produce high haze levels creating an unattractive look impacting the optical performance. The Pro-M sensors have industry leading haze levels of less than 1.5%.

4. Design Considerations

PCAP requires tuning of controller parameters that are specific to each touch sensor design and are optimized for the particular display panel and product application. Full touchscreen solution providers, such as Elo, who offer both touchscreen design and controller solutions are best suited for supporting PCAP rather than sourcing touch sensors and controllers with different vendors. A single vendor responsible for the performance and testing of a complete solution will ensure performance is equally driven by touch panel design, controller capabilities, management of display electrical noise and controller tuning.

The Pro-M line of large format touch screens offers a family of controllers that covers the entire size range including 50 touch controllers for multiple users.

When selecting a large format PCAP screen solution there are some very important factors to consider.

- Where will the display be used? Is it an indoor or outdoor environment?
- If outdoors, will it be covered or completely exposed to the elements, such as sunlight?
- What are the impact requirements? Does it need to be vandal-resistant?
- What surface treatment is required for the cover glass, for example AG (anti-glare)?
- What performance criteria are required in the presence of liquids and contaminants, such as rain, dust/dirt, or even sea mist?
- Do you want the touch screen to work with a fine-tip passive stylus?

Working with an experienced touch solution provider to help select and design the appropriate PCAP solution for your application is highly recommended in order to ensure these types of considerations aren't overlooked. For example, exposure to sea mist in marine or coastal environments can be a serious problem for PCAP. Saltwater is conductive, and even a fine mist or small droplets can confuse some PCAP screens to report a 'touch'. This might not be critical for an information kiosk in a tourist spot, but for control and navigation on boats it could be a serious problem

Elo's advanced controllers and tuning expertise can also help users that require vandal resistant designs utilizing thick cover glass (up to 9mm). Chemically strengthened and heat tempered glass are other options available to help create an even more robust design.

At Elo, we can design touch screens to work in such environments, and even suggest additional application safeguards based on our extensive experience. Elo has been designing touch solutions from the ground up for over 40 years and exhibits world-class design, test and manufacturing capabilities.

5. What's next?

Over the last few years, the optical and touch performance of large format PCAP has increased steadily, while costs have continued to decline. This has led to the emergence of a new market for large touch-enabled displays and kiosks. As part of the rapidly expanding Internet-of-Things, multi-use interactive kiosks will soon be ubiquitous as urban centers transform into connected smart cities.

Customers considering PCAP technology should work with a touchscreen provider early on in their development cycle to integrate the touchscreen design into the full system concept, similar to a smartphone, because PCAP screens added as an afterthought to a non-touch monitor will not have the same level of quality and durability.

Millions of Elo's touch screen solutions have been deployed and proven in around the world in a wide range of environments for over 40 years.

Visit www.elotouch.com to learn more about how Elo is reinventing the touch experience

About Elo

Elo is a global leader in touch screen solutions. The inventor of the touchscreen, Elo now has 20+ million installations in 80+ countries. The Elo portfolio encompasses the broadest selection of OEM touchscreen components, touchscreen monitors and displays as well as all-in-one touch computers for the demanding requirements of diverse markets, including gaming machines, hospitality systems, industrial automation, interactive kiosks, healthcare, office equipment, point-of-sale terminals, retail displays and transportation applications.