



TECHNOLOGY DISTRIBUTORS



Comparative Touchscreen Technologies

The touch screen is not a new technology. There are many different systems available. But on closer inspection, it is easy to see the benefits of NextWindow's scalable and simplified touch screen system over other technologies.

There are traditionally four major types of touch screen input devices:

- Resistive
- Capacitive
- Surface Acoustic Wave (SAW)
- Infrared

All of these technologies have their own distinct characteristics, with both advantages and disadvantages. NextWindow's optical imaging solution creates a fifth major technology, which has substantial benefits over and above earlier technologies.

NextWindow's Optical Imaging Technology

NextWindow's [optical imaging technology](#) uses line scanning techniques to record the touch point. Using this unique technology, the touch actually registers up to 2 mm (0.08") before the physical touch on the touch screen surface.

The NextWindow solution effectively scales to touch-enable very large displays. Surface coating overlays are not used on the touch screen surface, therefore excellent image clarity is preserved. In addition, scratches on the touch surface will not affect the touch screen operation. NextWindow's technology provides a solution without calibration drift, therefore, once the touch screen has been calibrated it does not require any further adjustment.



Summary of Touch Screen Technologies

Product	NextWindow	Capacitive	SAW	Infrared	Resistive
Technology	Optical imaging	Electrostatic field	Sound waves	Light interruption	Resistive
Activation	Zero activation force required	Low activation pressure required	Low activation pressure required	Zero activation force required	Low activation pressure required
Transmissivity /optics	Very good >92%	Very good >92%	Very good >92%	Very good >92%	<82%, some distortion to graphics due to coatings

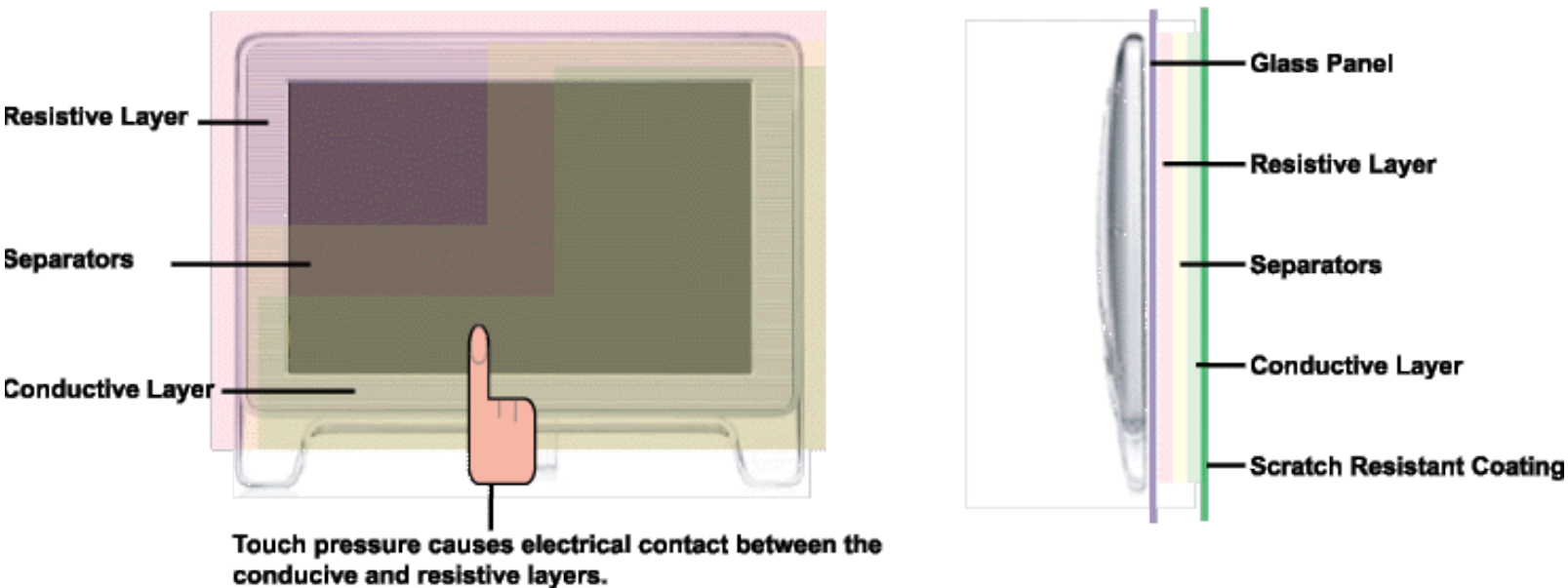
Drag and drop	High resolution, draws smooth lines	Requires constant pressure to draw smooth lines	Requires constant pressure to draw smooth lines	Low resolution due to spacing of IR sensors and interpolation	Requires constant pressure to draw smooth lines
Calibration	No drift	Requires periodic recalibration	Requires periodic recalibration	No drift	Requires periodic recalibration due to wearing of coatings
Surface contaminants /durability	Resistant to moisture and other surface contaminants	Resistant to moisture and other surface contaminants	Adversely affected by moisture or surface contaminants	Potential for false activation or dead zones from surface contaminants	Unaffected by surface contaminants. Polyester top sheet is easily scratched
Sensor substrate	Any substrate	Glass with ITO coating	Glass with ITO coating	Any substrate	Polyester top sheet, glass substrate with ITO coating
Multi-touch	Can discern two distinct points	NA	NA	NA	NA
Display size	23"-65"	8.4"-21"	10.4"-30"	10.4"-60"	up to 19"
Size constraints	Can be easily made for any display 23" or greater	Originally designed for smaller sizes, and may not scale easily; largest is 19"	Originally designed for smaller sizes and may not scale easily; largest is 30"	Scales to larger size	Originally designed for smaller sizes and may not scale easily; largest sensor is 19"
Right mouse	Activated by holding finger in one place	NA	NA	NA	NA
Integration	Two Versions: Overlay for standard displays or as component for integration in custom enclosures	Component only	Component only	Large frame overlay	Component only
Touch method	Can use any pointing device	Human touch	Finger only	Can use any pointing device	Can use any pointing device
Drivers	HID compliant no additional drivers required	Proprietary drivers, may not be compatible with all software	Proprietary drivers, may not be compatible with all software	Proprietary drivers, may not be compatible with all software	Proprietary drivers, may not be compatible with all software
Main limitations of technology		Requires human touch, scratches in coatings causes dead zones. Field replacement difficult due to calibration	Surface contaminants cause dead zones and requires periodic recalibration.	Surface contaminants can cause false activation. Thick border area around display	Polyester top sheet affects optics and is susceptible to damage. May not scale easily over 19" screens

Resistive

Resistive is the most common type of touch screen technology. It is a low-cost solution found in many touch screen applications, including hand-held computers, PDAs, consumer electronics, and point-of-sale-applications.

A resistive touch screen uses a controller and a specially coated glass overlay on the display face to produce the touch connection.

Resistive Touch Screen Technology



The primary types of resistive overlays are 4-wire, 5-wire, and 8-wire. The 5-wire and 8-wire technologies are more expensive to manufacture and calibrate, while 4-wire provides lower image clarity.

Two options are generally given: polished or anti-glare.

- Polished offers clarity of image, but generally introduces glare.

- Anti-glare will minimize glare, but will also further diffuse the light, thereby further reducing the clarity.

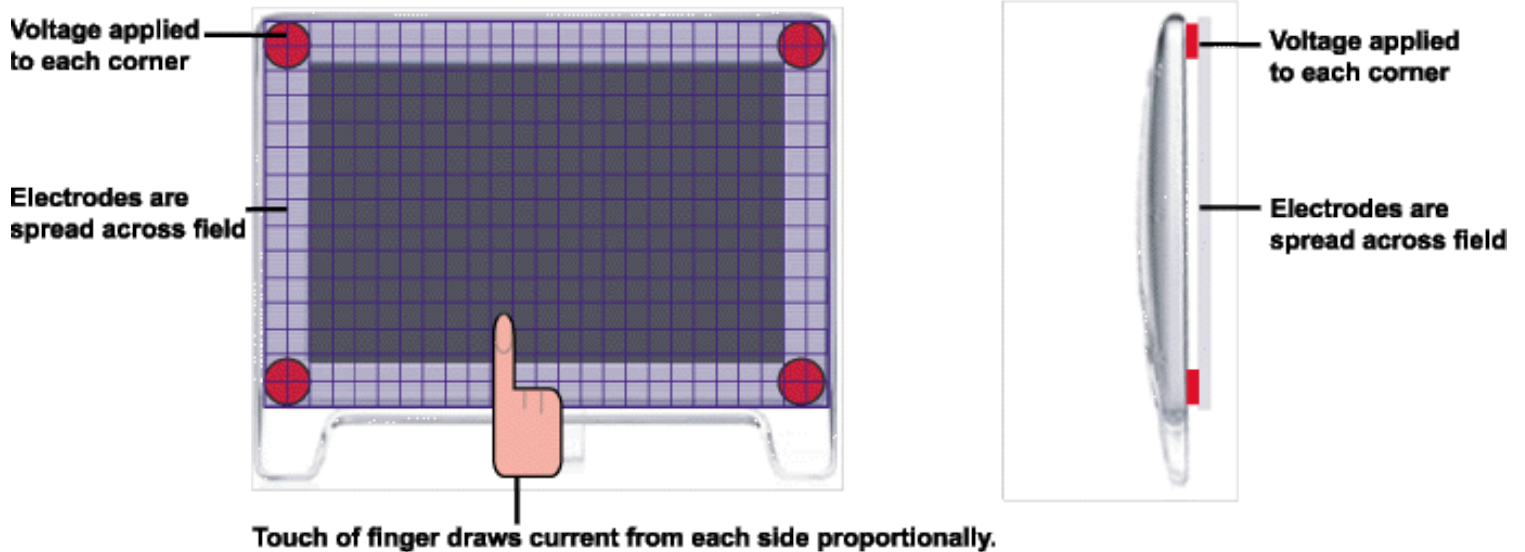
- One benefit of using a resistive display is that it can be accessed with a finger (gloved or not), pen, stylus, or a hard object. However, resistive displays are less effective in public environments due to the degradation in image clarity and the need for periodic recalibration caused by the layers of resistive film deteriorating, and its susceptibility to scratching. Resistive displays are susceptible to vandalism and touches will not register if the resistive sheet is cut or scratched.

Despite the trade-offs, the resistive screen is the most popular technology because of its relatively low price (at smaller screen sizes), and ability to use a range of input means (fingers, gloves, hard and soft stylus).

Capacitive

Capacitive touch screens are all glass and designed for use in ATMs and similar kiosk type applications. A small current of electricity runs across the screen with circuits located at the corners of the screen to measure the capacitance of a person touching the overlay. Touching the screen interrupts the current and activates the software operating the kiosk.

Capacitive Touch Screen Technology



Because the glass and bezel that mounts it to the monitor can be sealed, the touch screen is both durable and resistant to water, dirt and dust. This makes it commonly used in harsher environments like gaming, vending retail displays, public kiosks and industrial applications.

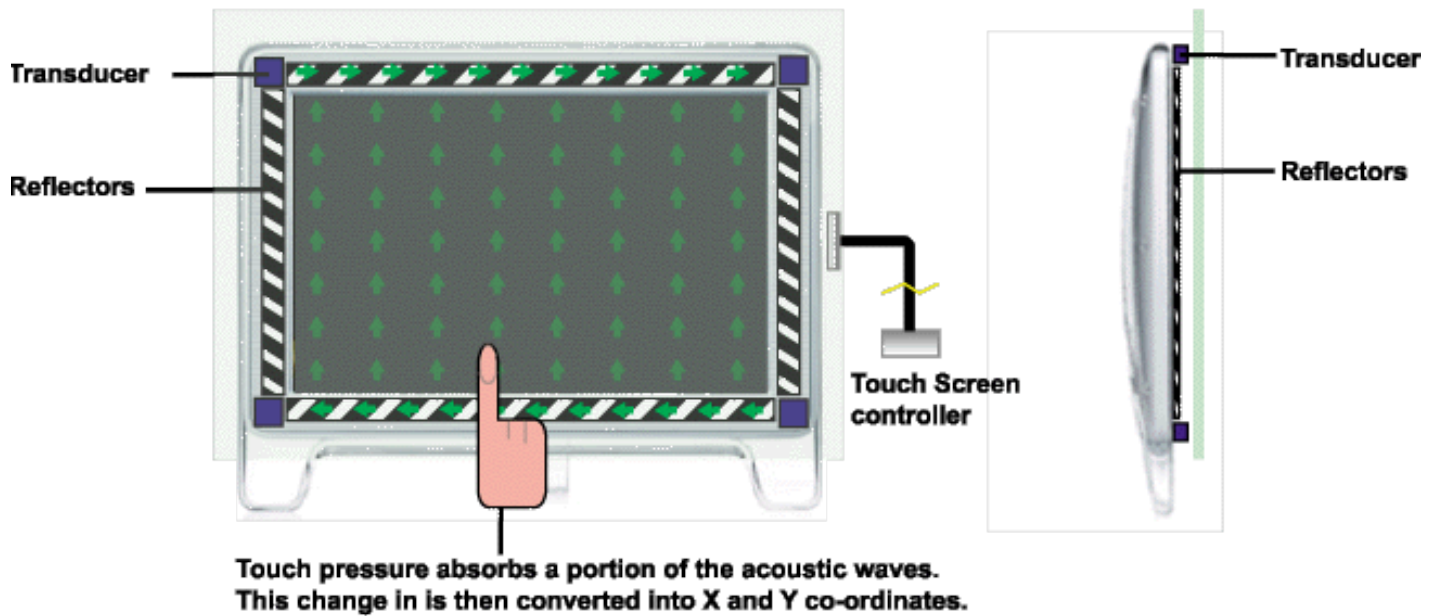
However, the capacitive touch screen is only activated by the touch of a human finger and scratches in the coatings can cause dead spots on the screens. A gloved finger, pen, stylus or hard object will not work. Hence, it is inappropriate for use in many applications, including medical and food preparation. The technology was originally created for small screens and will not scale to larger screens easily and can require periodic recalibration

Surface Acoustic Wave (SAW)

SAW technology provides better image clarity because it uses pure glass construction. A SAW touch screen uses a glass display overlay.

When sound waves are transmitted across the surface of the display:

SAW Touch Screen Technology



Each wave is spread across the screen by bouncing off reflector arrays along the edges of the overlay;

Two receivers detect the waves;

When the user touches the glass surface, the user's finger absorbs some of the energy of the acoustic wave and the controller circuitry measures the touch location.

SAW touch screen technology is used in ATMs, amusement parks, banking and financial applications and kiosks. The technology is not able to be gasket sealed, and hence is not suitable to many industrial or commercial applications as it can be adversely affected by surface contaminants and water. The contaminants can cause dead spots on the screen requiring periodic cleaning of the sensor and sometimes also recalibration. Due to the way the technology works it can also be susceptible to "noise".

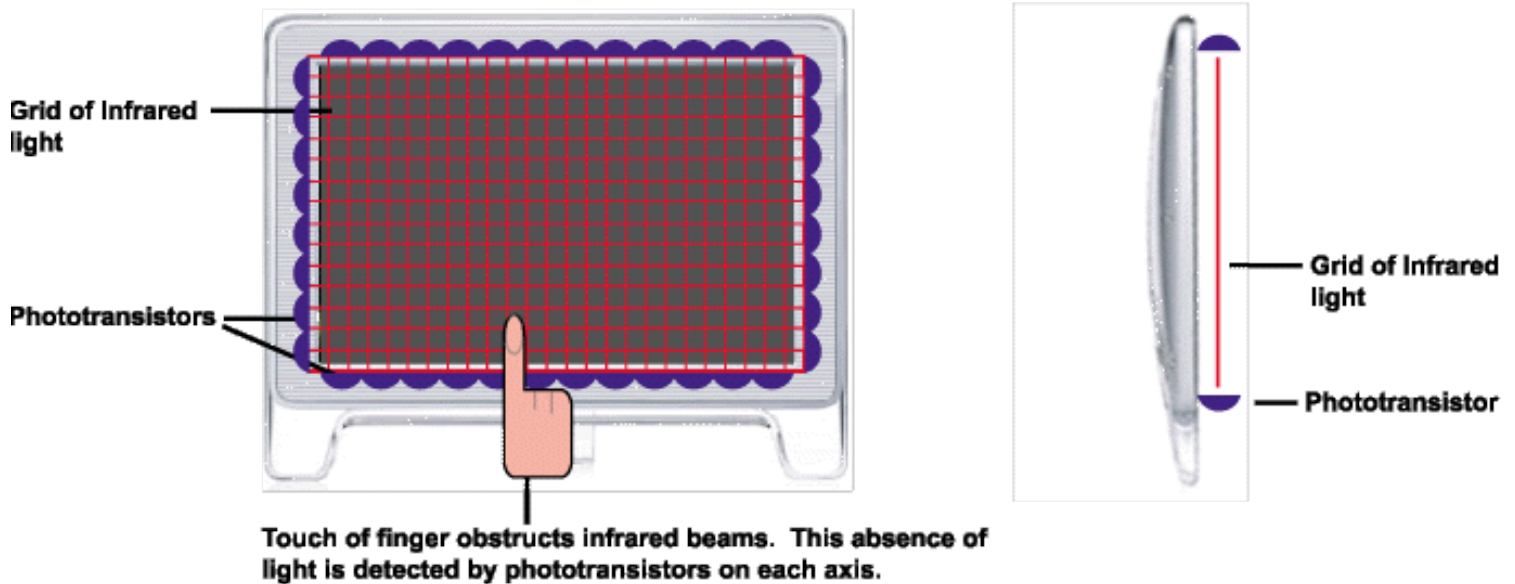
Compared to resistive and capacitive technologies, it provides superior image clarity, resolution, and higher light transmission. However, it was again originally designed for smaller screens and may not scale easily to screens sized over 30".

Infrared

Infrared technology relies on the interruption of an infrared light grid in front of the display screen. The touch frame or contains a row of infrared LEDs and photo transistors, each mounted on two opposite sides to create a grid of invisible infrared light.

The frame assembly comprises printed wiring boards, on which the electronics are mounted, and is concealed behind an infrared-transparent bezel. How it functions:

Infrared Touch Screen Technology



The bezel shields the electronics from the operating environment while allowing the infrared beams to pass through;

The infrared controller sequentially pulses the LEDs to create a grid of infrared light beams;

When a stylus, such as a finger, enters the grid, it obstructs the beams;

One or more phototransistors detect the absence of light and transmit a signal that identifies the x and y coordinates.

Infrared touch screens are often used in manufacturing and medical applications because they can be completely sealed and operated using any number of hard or soft materials.

The major issue with infrared is that the seating of the touch frame is slightly above the screen. Consequently, it is susceptible to early activation before the finger or stylus has actually touched and surface. Contaminants can also cause false activation on the screen inside the thick border that is required for the frame. The cost to manufacture the infrared bezel is also quite substantial.