Global Services, Inc.
47456 FREMONT BLVD, FREMONT, CA 94538 T: (510) 659-9199 F: (510) 659-9198

Touch Screen Technology

1. There are a number of types of touch screen technology:

Resistive

A resistive touch screen panel is coated with a thin metallic electrically conductive and resistive layer that causes a change in the electrical current which is registered as a touch event and sent to the controller for processing.
Some resistive panels can estimate the area (and hence the pressure) of a touch based on calculations from the resistances.
Resistive touch screen panels are generally more affordable but offer only 75% clarity[*citation needed*] (premium films and glass finishes allow transmissivity to approach 85%[*citation needed*]) and the layer can be damaged by sharp objects. Resistive touch screen panels are not affected by outside elements such as dust or water and are the type most commonly used today.

Surface Acoustic Wave (SAW)

Surface Acoustic Wave technology uses ultrasonic waves that pass over the touch screen panel. When the panel is touched, a portion of the wave is absorbed. This change in the ultrasonic waves registers the position of the touch event and sends this information to the controller for processing. Surface wave touch screen panels can be damaged by outside elements. Contaminants on the surface can also interfere with the functionality of the touchscreen.

Capacitive

A capacitive touch screen panel is coated with a material, typically indium tin oxide that conducts a continuous electrical current across the sensor. The sensor therefore exhibits a precisely controlled field of stored electrons in both the horizontal and vertical axes - it achieves capacitance. The human body is also an electrical device which has stored electrons and therefore also exhibits capacitance. When the sensor's 'normal' capacitance field (its reference state) is altered by another capacitance field, i.e., someone's finger, electronic circuits located at each corner of the panel measure the resultant 'distortion' in the sine wave characteristics of the reference field and send the information about the event to the controller for mathematical processing. Capacitive sensors can either be touched with a bare finger or with a conductive device being held by a bare hand. Capacitive touch screens are not affected by outside elements and have high clarity, but their complex signal processing electronics increase their cost.

Infrared

An infrared touch screen panel employs one of two very different methodologies. One method used thermal induced changes of the surface resistance. This method was sometimes slow and required warm hands. Another method is an array of vertical and horizontal IR sensors that detected the interruption of a modulated light beam near the surface of the screen. IR touch screens have the most durable surfaces and are used in many military applications that require a touch panel display.

Strain Gauge

In a strain gauge configuration the screen is spring mounted on the four corners and strain gauges are used to determine deflection when the screen is touched. This technology can also measure the Z-axis. Typical application include protecting new touch-screen railway ticket machines from vandalism.

Optical Imaging

A relatively-modern development in touch screen technology, two or more image sensors are placed around the edges (usually the corners) of the screen. Infrared backlights are placed in the camera's field of view on the other sides of the screen. A touch shows up as a shadow and each pair of cameras can then be triangulated to locate the touch. This technology is growing in popularity, due to its scalability, versatility, and affordability, especially for larger units.

Dispersive Signal Technology

Introduced in 2002, this system uses sensors to detect the mechanical energy in the glass that occur due to a touch. Complex algorithms then interpret this information and provide the actual location of the touch. The technology claims to be unaffected by dust and other outside elements, including scratches. Since there is no need for additional elements on screen, it also claims to provide excellent optical clarity. Also, since mechanical vibrations are used to detect a touch event, any object can be used to generate these events, including fingers and styli.

Acoustic Pulse Recognition

This system uses more than two piezoelectric transducers located at some positions of the screen to turn the mechanical energy of a touch (vibration) into an electronic signal. This signal is then converted into an audio file, and then compared to preexisting audio profile for every position on the screen. This system works without a grid of wires running through the screen, the touch screen itself is actually pure glass, giving it the optics and durability of the glass out of which it is made. It works with scratches and dust on the screen, and accuracy is very good. It does not need a conductive object to activate it. It is a major advantage for larger displays

2. Touchscreens, touch screens, touch panels or touchscreen panels are display overlays which have the ability to display and receive information on the same screen. The effect of such overlays allows a display to be used as an input device, removing the keyboard and/or the mouse as the primary input device for interacting with the display's content. Such displays can be attached to computers or, as terminals, to networks. Touchscreens also have assisted in recent changes in the PDA and Cell-Phone Industries, making these devices more usable.

3. Applications

Touchscreens have become commonplace since the invention of the electronic touch interface in 1971 by Dr. Samuel C. Hurst. They have become familiar in retail settings, on point of sale systems, on ATMs and on PDAs where a stylus is sometimes used to manipulate the GUI and to enter data. The popularity of smart phones, PDAs, portable game consoles and many types of information appliances is driving the demand for, and the acceptance of, touchscreens.

The HP-150 from 1983 was probably the world's earliest commercial touch screen computer. It actually does not have a touch screen in the strict sense, but a 9" Sony CRT surrounded by infrared transmitters and receivers which detect the position of any non-transparent object on the screen.

Touchscreens are popular in heavy industry and in other situations, such as museum displays or room automation, where keyboards and mice do not allow a satisfactory, intuitive, rapid, or accurate interaction by the user with the display's content.

Historically, the touchscreen sensor and its accompanying controller-based firmware have been made available by a wide array of after-market system integrators and not by display, chip or motherboard manufacturers. With time, however, display manufacturers and System On Chip (SOC) manufacturers worldwide have acknowledged the trend toward acceptance of touchscreens as a highly desirable user interface component and have begun to integrate touchscreen functionality into the fundamental design of their products.

4. Touch screen filter

This is an article describing the EMI and Optics filters that can be manufactured and incorporated onto touch screens.

A number of filters and light guides into touch panels to achieve a variety of applications. In addition, all of these transparent devices are available as non-touch filters. The filters fall into two categories of 1) reducing electromagnetic emissions or interference (EMI) and 2) optics to manipulate the physics of light.