

Touch screen Technology

Touch screen is the modern great looking monitor screen that is becoming a new user interface and industrial standard worldwide. Touch screens are now everywhere and are embedded in Mobile phones, Office instruments, Remote controls, Medical equipments, ATMs etc. Touch screens provide a high level of security from tampering, durability from wear, weather resistant etc.



Inside the Touch screen

Basically there are Five important elements in the touch screen.

- 1. Bezel or Front panel**

Bezel forms the outermost skin of the touch screen system. It is the protective covering of the screen that resists scratching to the underlying touch sensor.

- 2. Touch controller**

This is the Microcontroller based Integrated circuit(IC) present between the touch sensor and the embedded system controller. It is meant for transferring the informations from the touch sensor to the embedded system.

- 3. Touch Sensor**

It is the clear glass panel sensitive to touch. The touch sensor layer is placed over the LCD (Liquid Crystal Display). The touch sensor layer covers the whole screen area. When the touch sensor senses the pressure from the finger, a voltage or signal change occurs which is then sensed by the touch controller and determines the location of touch on the screen.

- 4. Liquid Crystal Display**

Most touch screens use LCD technology. It is based on the principle that, a small electrical change takes place in the crystal array of LCD where it gets pressure from touch.

- 5. System software**

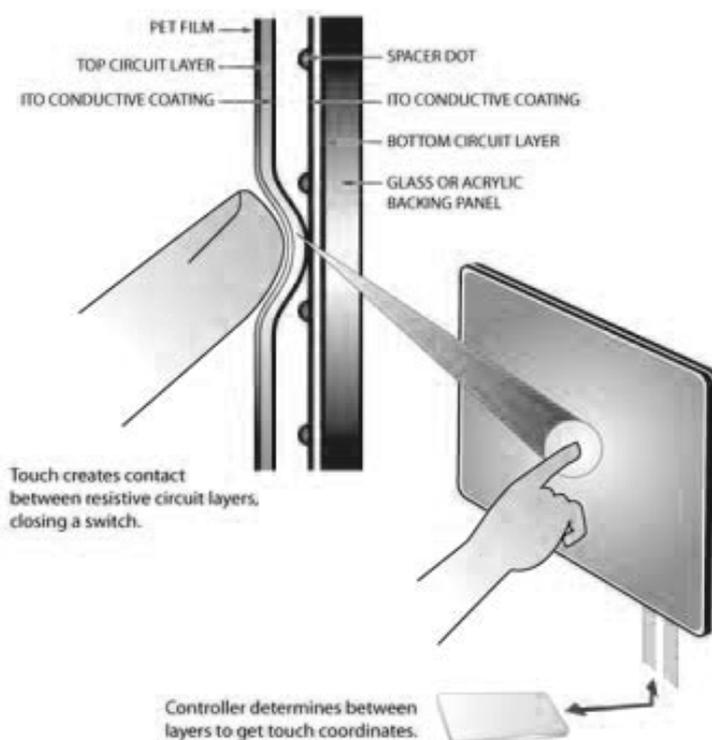
The software in the touch screen system allows the touch screen and the system controller to work together and tells how to interpret the touch information send to the controller. The touch screen driver works just like the mouse of PC.

Types of Touch screens

There are two common types of touch screens. These are Resistive type and Capacitive types. Projected capacitive touch screen is the latest introduction.

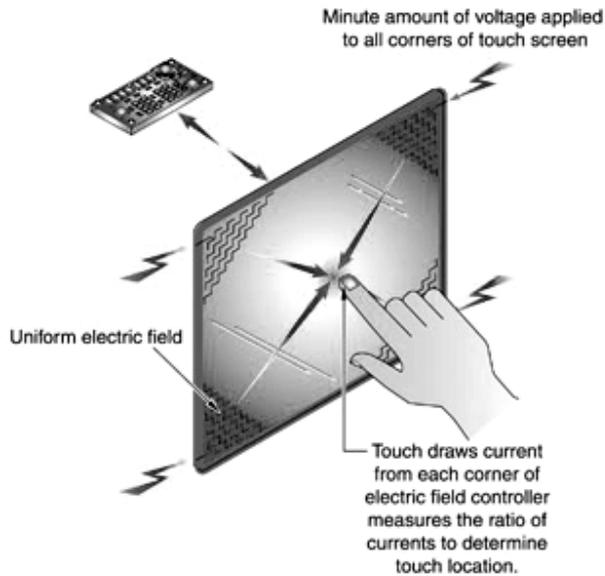
1. Resistive touch screen

It is the most commonly used type of touch screen in high traffic applications. It is immune to moisture and debris on the screen. It can be activated through finger or pencil like objects.



2. Capacitive type

In surface capacitive touch screen, sensors are placed at the four corners of the screen. These sensors detect the capacitance change caused by the touch. This type of touch screen can be activated only by fingers.



3. Projected Capacitive touch screen

This is the latest technology that gives superior quality and optical clarity. It can sense multiple touches at the same time and do not require positional calibration. These are used in Mobile phones, Music players etc.

How it works?

The most commonly used touch screen system is Resistive type generally used in ATMs, Railway stations etc. Both Resistive and Capacitive types use the electrical conductor called Indium Tin Oxide (ITO).

Resistive touch screen

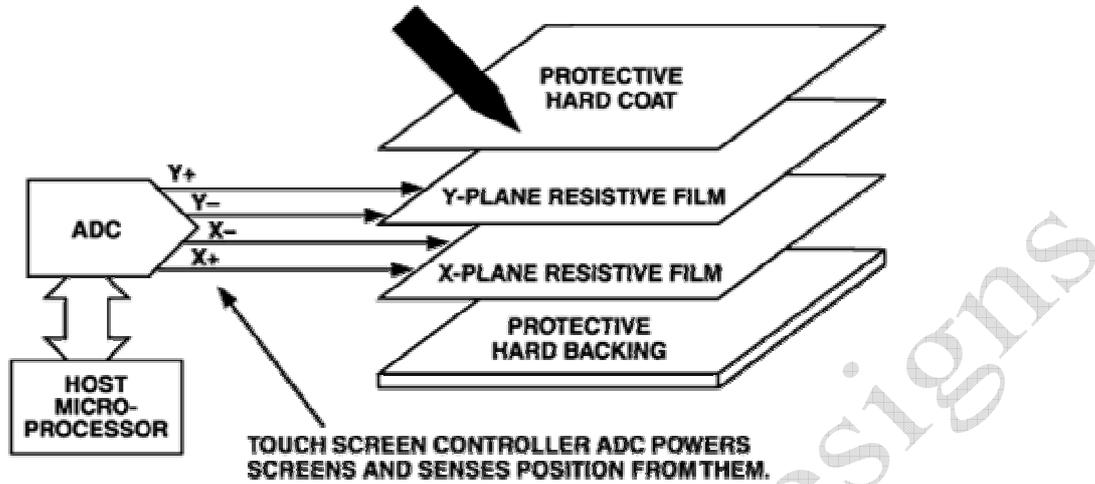
The resistive touch screen has a flexible top layer called **X layer** formed of **Indium Tin Oxide**. Below the X layer is an **Air gap**. Below this is the **Y layer** formed of Indium Tin Oxide. So it is just like a sandwich arrangement of **X layer-Air gap – Y layer**. Four wires are connected to the Indium Tin Oxide layers. In the X layer, the wires are connected at the left and right sides while in the Y layer the wires are connected at the top and bottom sides.

When the finger touches the flexible X layer, the finger pressure presses the X layer to the Y layer through the Air gap. The X layer then makes contact with the Y layer. The location of touch is sensed in two steps.

1. Right part of the X layer is driven to a known voltage.
2. The left part of X layer is driven to ground.

This voltage level is detected by the underlying Y layer. This process repeats for the other axis also to detect the exact position of the finger.

In some resistive touch screens, the X layer Indium Tin Oxide is replaced with a conductive material for durability. In such screens there are Five wires connected.



Capacitive touch screen

In this type a capacitance of about **15 PF** is created on the screen when the finger touches. The capacitance between the finger and screen is measured by the sensor layer in the screen. The most common method of capacitance measurement is the **Sigma-Delta Modulator (CSD)** technique. In this method, the discharge time of current through a bleeder resistor is measured.

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