Resistive and Capacitive Touch Screens Introduction

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Resistive touch screens were once the most dominant type of touch screen interfaces incorporated on a LCD Display, but their use has definitely declined. In the current market place the best fit for resistive touch screens are in low-cost Liquid Crystal Display designs or where the user must wear gloves. These markets include medical, industrial and military environments. In more recent years capacitive touch screen have gained in market share and in user popularity. The extremely popular smartphones and tablets in recent years incorporate capacitive touch functionality.

**Resistive-Touch-Screen**

A resistive touch screen panel is one in which the panel is coated with a thin metallic layer. This layer has properties which are both electrically conductive and resistive. The top layer has charge going from top to bottom and the second layer has charge going from side to side, with a thin air gap in between them. When touched by a human finger or an object the change in current is registered and sent to a controller to be processed. This type of touch screen is in general more affordable and resistive to the elements such as dust, wind and water. It also offers superior handwriting recognition. The downside is they offer only 75% visual clarity and can easily be damaged by sharp objects. It is also not very sensitive, so you have to press harder and it does not support multi touch.

Phones which utilize resistive touch screens include:
Spice Mi-270, Nokia C2-02, Samsung Star Duos, Spice FLO, LG P520, Nokia C5-05, LG Cookie Joy, Samsung Champ Duos and Nokia C2-02
SURFACE WAVE Touch Interface:
A LCD equipped touch screen panel with surface wave technology is one which uses ultrasonic waves to determine the point on the screen which has been touched. Which this methodology, Ultrasonic waves pass over the touch screen panel. When the panel is touched the changes in the ultrasonic waves is then registered by the controller and processed. This is the newest method and possibly most advanced but is not as rugged as resistive or capacitive touch screens and can be damaged by the elements.

**Capacitive-Touch-Screen**

Capacitive touch screens applied to a TFT (Thin Film Transistor) or OLED (Organic Light Emitting Diode) offer higher clarity than the resistive method and are not affected by the outside elements. The capacitive touch screen panel is one which is coated with a thin material which stores electrical charges like a capacitor. There are two layers of glass, each coated with Indium Tin Oxide (ITO). When this type of surface is touched a small charge is drawn to the point of contact. The circuits which are located in the corners then relay this information and send it to the controller to be processed. Advantages of this method: because it is made of glass instead of plastic it looks brighter and sharper. It is highly touch sensitive, doesn’t need a stylus and supports multi-touch. One drawback of this method is the capacitive touch screen must be touched by a human finger or a capacitive stylus. The technology relies on the capacitive nature of the human body. Other drawbacks include:

- A complex structure
- Higher Cost
- Less durability; glass breaks much easier than plastic

Phones which utilize capacitive touch screens include:
- HTC Incredible S, Apple iPhone 4S, Spice Mi-310, LG Optimus Black, HTC Sensation, HTC Explorer, Samsung Omnia W, Samsung Galaxy Ace Plus, Samsung Galaxy Note, Samsung Galaxy SII and Nokia Lumia 800
RESISTIVE VERSUS CAPACITIVE TOUCH SCREENS:

Both resistive and capacitive touch screens use Indium Tin Oxide (ITO) sensors, but in ways that are not similar. For resistive touch screens the mechanical action of two layers of ITO are pressed together, making an electrical connection. For capacitive touch screens the methodology is basically taking advantage of the fact that the human body is a walking capacitor! When a human finger touches the capacitive touch screen, the capacitive levels are changed dramatically and can be registered.

Capacitive touch screens are laid out in a checkerboard pattern to sense touch. It is normally laid out in two layers but can be made with only one, of ITO. When made with only one layer it will provide a clearer screen. With capacitive touch-screen control a layer of safety glass can be used to cover the top of the structure to seal it. This provides a much more durable design than that provided by the flexible sheet of polyurethane for resistive screens. The glass itself is chemically strengthened to become very resistant to scratches and damage. Instead of the touchscreen being a weakness of the device it has become a strength. Reliability of capacitive touchscreens is higher. If a field worker has a broken or shattered touchscreen it can still be used until the screen can be replaced in most cases. With a resistive touchscreen a field worker would most likely have to stop collecting data. With resistive touch screens extended, use can cause wear points where it becomes increasingly difficult to register a touch. With resistive touch screens, you can use any kind of stylus. It’s not necessary to have a capacitive tipped stylus. Since resistive touch screens have a greater amount of sensors per square inch, a finer tip stylus can be used. For applications with small buttons this can be a great advantage. Resistive touch screens have less sensitivity which can be an advantage for weather conditions such as rain touching the screen. If precision is a requirement and work in a creative area such as a digital artist, the lack of a stylus on the capacitive touch screens would result in a lack of control and precision. For a digital artist, a Wacom is almost a necessity.

Conclusion:

If you are in the market for a new touchscreen the market has been moving towards capacitive touchscreens for the past few generations of most modern devices such as smart phones and tablets. If you are a high end creative design type professional with a need for a Wacom and are using software such as CAD, or for artistic touches in Adobe Photoshop then a resistive touchscreen would be a better choice.

Are you designing a new product and unsure of which user interface to choose? Contact one of our LCD support technicians at Focus Display Solutions 480-503-4295.

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