

# Touch screens for medical instruments

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The popularity of touch screen technology, also referred to as 'touch panel' or 'user interfaces', has increased a great deal in the last few years. Integrating interfaces with LCD is becoming increasingly popular. It is estimated that touch screen revenue will reach \$16 billion in 2012, and nearly double in six years, reaching \$31.9 billion by 2018.

In the medical field, touch screens offer solutions to all sorts of everyday issues. They offer simplicity by reducing peripheral devices like a mouse or keyboard and eliminating external components like buttons, switches and dials, which are often bulky and inefficient. Excess components increase the size of the product and the probability of component failure over time.

Touch screens also mean all information will be—literally—at the medical professional's fingertips. By removing external controls and replacing them with a touch screen, all available user options, like menu selection, time and frequency division, contrast adjust, and volume can now be displayed as menu options on the LCD glass.

### **Easy upgrades, big savings**

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The new technology means medical devices can be easily upgraded in the field eliminating the need for expensive replacement devices. Touch screens are software-driven and independent of the products' external controls, so older medical instruments can be upgraded with new software to meet new standards of compliance, while adding additional functionality like new menu options and the latest user manuals, training documents or calibration instructions.

Plus, simplifying upgrades reduces training costs. The training curve for a brand new system is much steeper, and requires additional hours of instruction. If the software is just being updated, personnel only need to learn what has changed as opposed to an entirely new platform. Finally, upgrading also offers the ability to create and then maintain a standard platform across all locations. A string of hospitals, ambulances or military medical locations would use one standard piece of touch-screen-equipped equipment. When the manufacturer of the equipment needs to add functionality or meet new compliance standards, they would simply release a software patch to bring all products up to the same standard. An employee trained at one location could be operational at a different location with no delay.

### **Resistive touchscreens**

Resistive touchscreens, used in credit card readers and hotel kiosks, are the most popular user interface technology, but becoming less popular with the advent of capacitive sensing.

The resistive touch screen is very thin and constructed by combining layers of material with a small air gap between each layer. When pressure is applied to the top layer it comes into contact with the layer beneath and creates a short in the circuit. The touch screen is then able to calculate the exact location of the touch. The screen can be operated using fingers, a fingernail, the edge of a credit card or the soft end of an eraser, making it an ideal solution for medical instruments designed for harsher environments. This includes ambulance and military service, where the operator is wearing gloves or touching the panel using any stylus that is convenient at the time. Other ideal applications include portable diagnostic equipment used by search-and-rescue services and clinics located in third world countries. This technology is perfect for medical equipment that is not located in controlled atmospheric locations like operating rooms and air conditioned doctor's offices since it functions in high humidity, ultra-low temperatures, and noisy surroundings. For example, Tastitalia SRL of Italy, has a resistive touch panel ideally suited for harsh environments. The screen is shock resistant, operates in any level of humidity, resistant to oil, chemicals, many solvents and will operate as low as -15C and as high as +45C.

Unfortunately, the top layer of the panel can be easily damaged by both sharp objects and excessive wear. When the top layer is damaged, it loses much of its sensitivity, which could cause problems in emergency situations.

Resistive overlays are the lowest cost option and require minimal programming to integrate with a LCD module, ideal for cost-sensitive medical instrumentation like a glucose reader, or thermometer. The usable lifetime of a resistive touch screen can

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range from 10 million to 35 million touches. This number would seem to exceed the life time of most medical products, but should be a design consideration for some consumer medical products. It is possible to replace the damaged touch screen on the display, although the cost to replace the LCD may exceed the replacement cost of the entire medical instrument.

Resistive interfaces tend to reflect strong ambient light similar to what is found in bright offices or in direct sun light. Touch panel manufacturers are developing new materials and coatings to reduce the reflex index of the top layer. One new anti-reflective coating, HydroSeal from North American Coating Laboratories, can reduce glare and reflections by as much as 99 percent.

### **Capacitive Resistive Touch Panels**

Capacitive touchscreens are found in newer cell phones and the majority of tablets, such as the Google Nexus 7. The touchscreen panel contains an insulating material like glass, coated with a transparent conducting material such as indium tin oxide (ITO). The human body acts as an electrical conductor, so that when the surface of a finger comes in contact with the surface of the glass, the electrostatic field is interrupted. The panel is then able to locate the position of the contact. This touch technology does not rely on pressure like a resistive interface does so the interface is more responsive, allowing movements such as swiping and pinching.

Capacitive touchscreens are more responsive than resistive, but users are limited when it comes to what the screen will respond to. Capacitive touch panels sense a change in the amount of charge so when an object with conductive properties, like a finger, comes into contact with the surface of the touch screen, a capacitor is formed. This newly formed capacitor changes the amount of charge at the point of contact, thereby allowing the touchscreen to calculate the exact position of the touch. Other non-capacitive objects, such as a glove or finger nail, are not conductive and will not form the capacitive charge necessary for the touch screen to sense this change.

In the future, this may not be a deal breaker. A new type of user interface technology in development eliminates the need for a stylus by tracking eye movements of the operator. In surgery, this upgrade could offer a significant time savings by eliminating the need for the user to move from patient to keyboard/mouse/touch screen and back to the patient. Plus it reduces the risk infection by eliminating contact between personnel and the peripherals. This technology allows the computer to recognize user commands by tracking eye movements. Nurses, assistants or even the doctor would be able to review medical images or adjust setting such as flow rate with the movement of the eye, and never having to move away from the operating table.

Capacitive touchscreens can sense and track multiple touches simultaneously. The user is able to scroll through multiple menus with a small stroke of the finger, or with two fingers, pinch to zoom in or expand any region of the display. The ITO coating of a capacitive touch screen offers a very low reflective index. The lower the reflection index, the lower the glare from overhead lights; hence, making it easier to

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read the display in bright ambient lighting conditions. This is a big benefit in outdoor applications where direct sun light is a constant issue. Capacitive touchscreens are more expensive to manufacture than resistive, but the cost difference may be worth the additional cost.

### **Emerging Technology**

What does the future of interface technology hold? A touchscreen that can identify the operator by their touch. The idea is being developed by Disney, yes, by Mickey Mouse. This technology would differentiate between various users and removes the need for passwords. An additional feature could allow the equipment to track times when an employee accesses a specific piece of equipment. This may also offer the ability to set permissions on who can access different menus. Supervisors would have access to all menu options, where medical personnel with lower clearances would be restricted to view a limited number of menus and be denied access to others.

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