



**Capitalizing on IR touch technology
in the POS environment.**



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Introduction

Touchscreens are gaining acceptance among consumers as a preferred way to perform activities such as shopping, conducting bank transactions and obtaining information at libraries and museums. In fact, according to a survey released by Elo TouchSystems, 89 percent of respondents expect that touchscreens will soon become the standard method of checking in at airports, purchasing train tickets and checking out at the supermarket.¹ To capitalize on the growing popularity of touchscreens, companies are integrating touch-based technology into their business and service models. This white paper discusses various touch technologies, highlights important considerations when selecting touch technology for point-of-sale (POS) environments, explains why infrared (IR) technology is ideal for businesses and examines IR touch technology solutions offered by IBM.



Highlights

Touch technology offers businesses the ability to reduce cost, enhance productivity and increase efficiencies.

Immediate operational benefits of touch technology

Touch technology provides the ability to reduce operational and training costs. An intuitive user interface is easy to learn and use, resulting in minimal training requirements and potentially significant cost savings for your business. A single interface design means user actions map directly to intentions, and information and responses occur in the same place. Touchscreens present information applicable only to the immediate task, enabling users to better concentrate on their current activity. Unlike some traditional data entry tasks that require employees to read information and key responses on a separate keypad, with touch technology, users touch where they look. This helps increase the efficiency of hand and eye movements and eliminates the need to memorize key strokes—helping to enhance productivity and reduce errors. Touch icons represent common visual cues, so users can quickly recognize where they need to touch to perform tasks such as changing languages.



Highlights

Touch technology can help shorten transaction times and facilitate virtually immediate responses for instant consumer gratification.

Total cost of ownership, durability and image quality are important considerations when selecting a touch technology solution.

Touch input is faster than keying for certain POS-related tasks, such as menu selection and task tendering, and touch technology shortens the amount of time it takes to identify and select a target on the screen, resulting in improved transaction times. A single device for input and output is less intimidating to novice users when compared to separate displays and keying and pointing instruments. Implementing a single touchscreen helps eliminate unnecessary devices, such as keyboards, freeing up valuable counter space. And touchscreens facilitate virtually immediate responses for instant consumer gratification.

Available touch technology solutions

With several types of touch technologies available, selecting the solution best suited to your environment can be challenging. Keep in mind the following key considerations to help ensure an optimum investment.

- *Total cost of ownership—Consider not only the purchase price but also service and replacement costs.*
- *Accepted input devices—Depending on your requirements, determine if the technology will work with a finger, a gloved finger, a metal or nonconductive stylus, a credit card or a long fingernail.*
- *Image quality—Decide how important the readability of the underlying display is to the application; if the product will be used in high-ambient light conditions, take glare into account.*
- *Durability—Consider whether the coatings and enclosures can withstand the wear and tear of a public environment, including spills, cleaning with harsh chemicals and damage by sharp objects.*
- *Reliability—Evaluate the impact of calibration requirements and repair downtime on your business.*



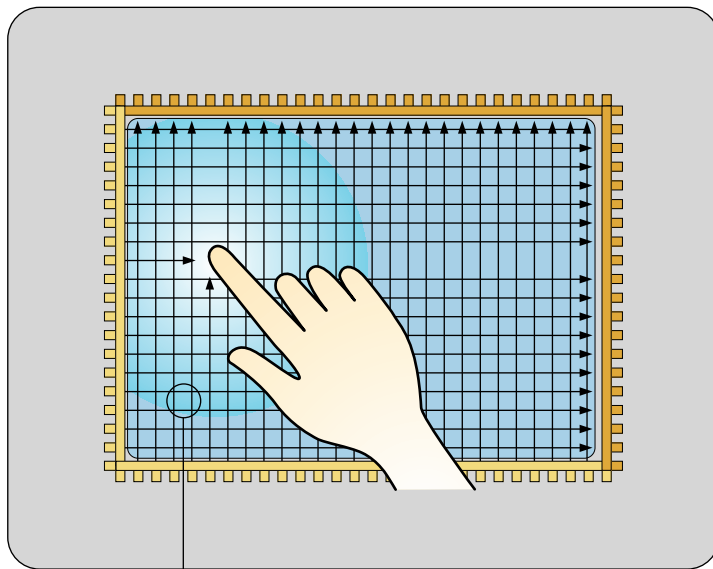
Highlights

Scanning IR technology identifies a touch when it detects no signal.

Touch technologies defined

Scanning IR technology – Based on light-beam interruption technology, a scanning IR touchscreen is a printed circuit board (PCB) frame around the perimeter of the display. Closely spaced IR light emitting diodes (LEDs) are placed on adjacent sides, and matching phototransistors are located on opposite sides. LEDs turn on and off in sequence, and the matching phototransistor reads the signal. A touch is identified when no signal is detected, indicating a blocked IR beam.

Infrared touchscreens



Grid of infrared light

■ IR LED ■ Phototransistors

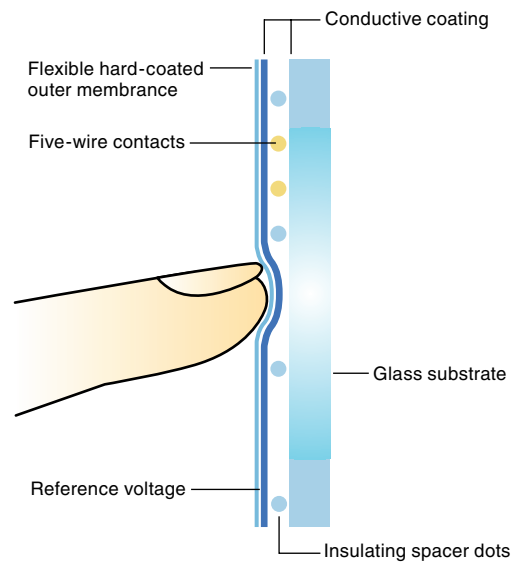


Highlights

A touch in resistive technology involves closing an electronic circuit.

Resistive technology—In a five-wire resistive design, the sensor is a piece of glass with a conductive coating on top, plus a polyester top sheet with a conductive coating on the bottom. The glass and polyester layers are separated by spacer dots, and a voltage is applied to the four corners of the glass. When a user presses the screen, the conductive side of the top sheet comes in contact with the conductive side of the glass, effectively closing an electronic circuit.

Five-wire resistive touchscreens



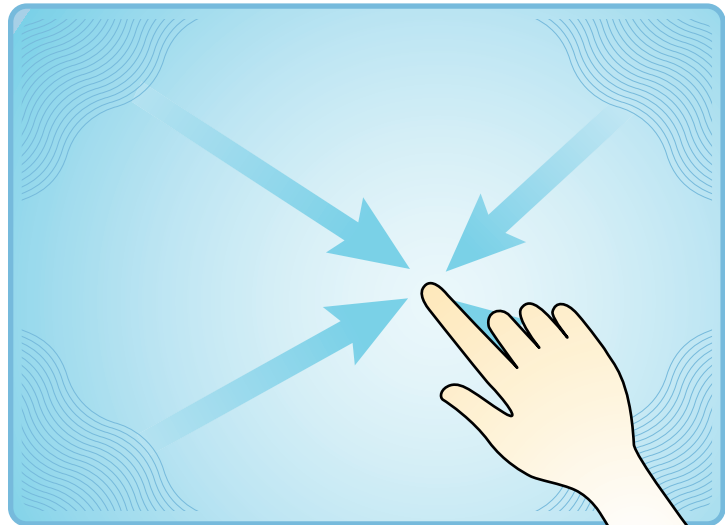


Highlights

Capacitive technology identifies a touch when it senses a voltage drop.

Capacitive technology—A capacitive sensor has a conductive coating on the front surface, with wires connected to each corner. When a person touches the screen, a small current flows to the touch point, causing a voltage drop that is sensed at the four corners.

Surface capacitive touchscreens



A voltage is applied to the four corners of the sensor.

When the screen is touched, a small current is drawn to that location, causing a voltage drop.

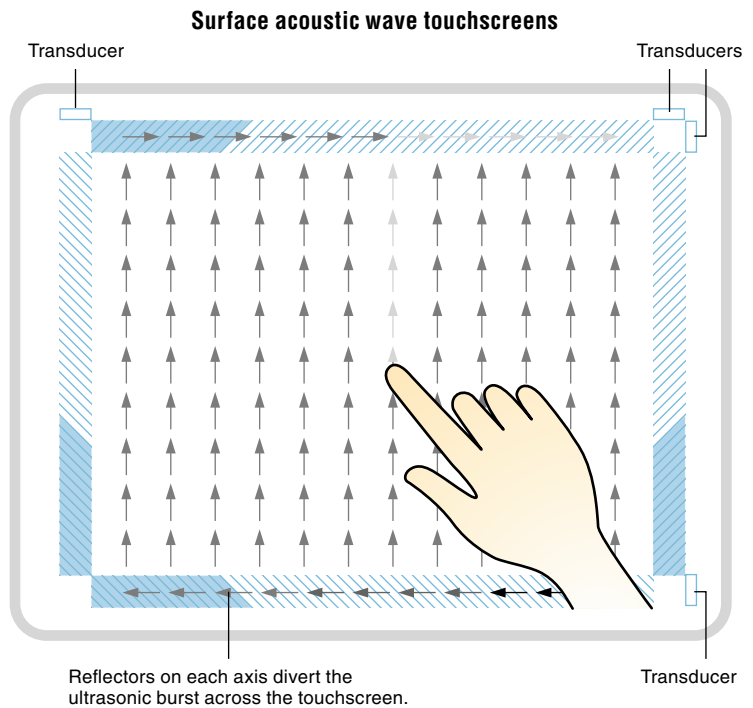
The location of the touch is determined by the amount of voltage drop at each corner.



Highlights

A touch in SAW technology is identified when a drop in sound wave amplitude is detected.

Surface acoustic wave (SAW) technology—A SAW touchscreen is a piece of glass with reflectors placed along all four edges. Emitting transducers are mounted in two corners and receiving transducers are mounted in an opposing corner. A sound wave travels parallel to the glass and the reflectors distribute the sound across the touchscreen. A touch is identified when the receivers detect a drop in amplitude of the sound wave, such as that caused when a finger comes in contact with the glass.





Highlights

IR, resistive, capacitive and SAW touch technologies offer a wide range of advantages and disadvantages.

See the comparison below of the advantages and disadvantages of the available touch technologies.

Advantages and disadvantages of various touch technologies

<i>Technology type</i>	<i>Advantages</i>	<i>Disadvantages</i>
Infrared (IR)	<ul style="list-style-type: none"> • Highest quality of underlying image <ul style="list-style-type: none"> – Very high light transmittance – Excellent antiglare features • Very high durability and reliability • High accuracy • Built-in, permanent calibration • Can be activated with almost any device 	<ul style="list-style-type: none"> • Slightly lower touch resolution (4 pixels) than other technologies² • Some surface obstructions can cause a false touch
Resistive	<ul style="list-style-type: none"> • Can be activated with any device 	<ul style="list-style-type: none"> • Least light transmittance and overall optical quality • Least durable touch technology • Requires periodic calibration • Shorter life than other technologies, especially considering cosmetic wear
Capacitive	<ul style="list-style-type: none"> • High durability • High light transmittance 	<ul style="list-style-type: none"> • Most glare of all technologies • Requires periodic calibration • Susceptible to electromagnetic interference • Performance and responsiveness depend on human and environmental capacitance • Accepts input only from a bare finger
Surface acoustic wave (SAW)	<ul style="list-style-type: none"> • Very high light transmittance • Very high durability 	<ul style="list-style-type: none"> • Cannot be sealed against chemicals and some liquids • Some surface obstructions can cause a false touch • Requires a soft input device



Highlights

IR touch technology eliminates time-consuming calibrations, offers exceptional screen visibility and is durable enough to withstand frequent use in customer-facing environments.

With improvements to its IR technology, IBM has virtually eliminated the problem of some surface obstructions potentially causing a false touch.

As the comparison chart illustrates, IR touch technology provides numerous advantages over resistive, capacitive and SAW solutions—making it ideal for businesses. While capacitive and resistive technologies require periodic calibration, IR’s fixed optical alignment lasts throughout the life of the display, eliminating time-consuming calibrations. Unlike a resistive solution that features a plastic overlay, the hard glass of an IR touchscreen resists scratches and is durable enough to withstand constant use in a consumer-facing environment. A higher contrast ratio and reduced glare offer improved screen visibility, even when positioned in brightly lit environments.

Cost-effective IR touch technology also enables use of a broad range of interaction tools—from a finger to a credit card—while maintaining high levels of transaction accuracy and speed. While an advantage of IR touch technology is its ability to accept any input stylus, some surface obstructions could cause a false touch. IBM has improved its IR touch technology to virtually eliminate this problem. An optional blocked beam monitor program, which runs in the background, visually notifies the system operator if a permanent obstruction is detected. And the system will report a touch only if the size of the input device is comparable to or smaller than expected input devices—such as a finger, the blunt end of a pen or the corner of a credit card. Based on its experience with various touch technologies and vendors, IBM has compiled the following quick-glance comparison chart of IR, resistive, capacitive and SAW touch technologies.



Highlights

A quick-glance comparison of IR, resistive, capacitive and SAW touch technologies illustrates how each performs in certain categories.

Quick-glance touch technologies comparison chart

	<i>Infrared (IR)</i>	<i>Resistive</i>	<i>Capacitive</i>	<i>Surface acoustic wave (SAW)</i>
Transmittance	+++	-	+	+++
Glare	+++	++	-	+
Durability	+++	-	++	+++
Reliability	+++	-	++	++
Sealability	+++	++	++	-
Calibration issues	+++	-	-	+
Accuracy	+++	++	++	++
Gloved finger touch ³	++	++	-	++
Hard stylus entry ⁴	++	++	-	-
Soft stylus entry	++	++	-	++
Long fingernail touch	++	++	-	-
Credit card touch	++	++	-	-
Surface obstruction issues ⁵	-	++	++	-
Electromagnetic interference and compatibility issues	+++	+++	-	++

Legend:

- poor
- + fair
- ++ good
- +++ excellent



Highlights

Applying best practices to the GUI customization and implementation of a touch technology solution can yield cost savings and speed time to benefit.

Best practices for touch technology user interfaces

Once you've selected the appropriate touch technology for your requirements, applying certain best practices can help optimize your solution. When you implement a touch solution, the screen provides you with a blank canvas on which to create a graphical user interface (GUI) that is customized to your technology environment and business needs. While there is no one-size-fits-all GUI approach, successful GUIs share certain characteristics. They are intuitive and easy to read, make touchable areas obvious and guide users as much as possible. They use a simple point-and-click interface and feature large buttons, and they don't require double-clicking, pull-down menus, scroll bars or dragging methods. Successful GUIs feature bright backgrounds, avoid the color black to reduce reflection, and stay away from solid colors to minimize fingerprints and to keep the eye focused properly. They also enable cursor deactivation and provide immediate visible and audible feedback.

Depending on your business requirements, correct implementation of your GUI can reduce costs and speed touch technology solution benefits. For example, you can configure your GUI to:

- *Make results of user actions immediately obvious*
- *Simplify tasks and minimize steps*
- *Provide reminders or cues that associate cause and effect*
- *Offer useful points of reference for users concentrating on a task*
- *Follow natural mappings between intentions and actions*
- *Leverage existing knowledge*
- *Use metaphors to introduce new concepts and technology*
- *Allow the user to drive the system.*



Highlights

Tested and proven IR touch technology, unmatched service and support and an extensive IBM Business Partner network enable IBM to provide comprehensive, reliable POS solutions.

IBM touch technology solutions

IBM brings together reliable technology, a vast services organization and an extensive network of IBM Business Partners to provide a trusted source for all your touch technology needs. IBM IR technology-based POS displays can integrate with the equipment you already have, protecting your technology investments. And IBM conducts functional, usability, environmental and durability testing, including rigorous spill resistance, performance and electrostatic discharge tests to help extend the life of your touch technology solution. Plus, we've integrated proven IR touch technology into the suite of IBM POS solutions, including:

- *The IBM SurePoint™ solution – a family of standalone, flat-panel, full-color POS displays that feature innovative IR touch technology for rapid, accurate transactions*
- *The IBM SurePOS™ 500 series – delivers a powerful combination of speed, affordability and reliability; equipped with IR touchscreens, SurePOS 500 systems are ideal for harsh environments*
- *The IBM SurePOS 300 series – an excellent choice for small to midsize businesses looking for a cost-effective POS solution that doesn't compromise on power, flexibility or reliability; by integrating the IBM SurePoint solution with the SurePOS 300 system, you can take advantage of the benefits of IR technology*
- *The IBM SurePOS 700 series – provides next-generation POS systems that deliver the advanced functionality and power you need to respond dynamically and quickly to changes in today's on demand business environment; integrates with IBM SurePoint solutions so you can capitalize on IR technology*
- *The IBM Kiosk – designed for style and engineered for performance, the IBM Kiosk enables you to run self-service applications in any environment; featuring IBM IR touch technology, the IBM Kiosk can withstand the rigors of unattended use.*



Highlights

IBM IR technology enables retailers to deliver a superior customer experience and to empower their employees with technology to boost productivity and efficiency.

IBM IR technology supports the IBM Retail Environment for SUSE LINUX®, IBM 4690 and Microsoft® Windows® operating systems. IBM IR solutions can run world-class IBM applications—such as IBM 4690 GUI Advanced Store Touch Retail Application (ASTRA), IBM SurePOS Application Client/Server Environment (ACE), IBM VisualStore and IBM SureVision GUI for 4690—as well as applications from independent software vendors (ISVs) and IBM Business Partners.

Rely on industry-leading experience and technology

With the ability to reduce operational and training costs, leverage an intuitive user interface, improve productivity, reduce the likelihood of errors and enable faster transaction speeds, it's no wonder businesses are integrating touch technology into their POS environments. By offering features including high reliability and durability, superior accuracy and activation with almost any device, antiglare and high-quality underlying images, IBM IR touch solutions are optimized for retailers making the move to on demand business. IR touch technology enables you to deliver a superior customer experience to help build customer loyalty and motivate spending. And by empowering your employees with leading-edge IR touch technology, you can boost productivity and enhance efficiency.



Highlights

IBM provides IR touch technology solutions that enable retailers to gain a competitive edge by enhancing customer satisfaction and loyalty, and increasing revenue.

IBM has more than 30 years of global retail experience – and nearly two million point-of-sale terminal installations worldwide. We have helped revolutionize the retail industry through more than 60 patented innovations, including the barcode. With a global network of more than 1,500 IBM Business Partners in the retail industry, we provide consulting, planning, design, implementation and integration capabilities designed to deliver IR touch technology solutions that can help you boost customer loyalty and satisfaction, increase revenue and gain a competitive edge.

For more information

To learn more about IBM IR touch technology and IBM hardware and software solutions, contact your IBM representative or visit:

ibm.com/industries/retail/store



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09-04
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The IBM home page can be found at ibm.com.

¹ Kioskmarketplace.com. "Young adults increasingly favor touchscreen technology." June 7, 2004.

² Typical IR resolution is 4 thin-film transistor (TFT) pixels. Coupled with the excellent accuracy of IR touch technology, when attempting to touch small icons, IR resolution offers higher performance than other technologies.

³ Because capacitive touch technology requires electrical conductivity, it cannot accommodate a touch by a gloved finger.

⁴ Because SAW touch technology requires sound-wave absorption, it cannot accommodate a touch by a hard stylus.

⁵ While surface obstructions may block a light beam, the remainder of the screen will still function. An optional utility will generate a warning message so the obstruction can be removed. Removing the obstruction restores normal performance.