Touch screen

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ABSTRACT

TOUCH SCREEN

First computers became more visual, then they took a step further to understand vocal commands and  
now they have gone a step further and became ‘TOUCHY’, that is skin to screen.  
A touchscreen is an easy to use input device that allows users to control PC software and DVD video by  
touching the display screen. A touch system consists of a touch Sensor that receives the touch input, a  
Controller, and a Driver. The most commonly used touch technologies are the Capacitive & Resistive  
systems. The other technologies used in this field are Infrared technology, Near Field Imaging & SAW  
(surface acoustic wave technology). These technologies are latest in this field but are very much expensive.

The uses of touch systems as Graphical User Interface (GUI) devices for computers continues to grow  
popularity. Touch systems are used for many applications such as ATM’s, point-of–sale systems,  
industrial controls, casinos & public kiosks etc. Touch system is basically an alternative for a mouse or  
keyboard.  
The market for touch system is going to be around $2.5 billion by 2004. Various companies involved in  
development of touch systems mainly are Philips, Samsung etc. Even touch screen mobile phones have  
been developed by Philips.

INTRODUCTION

A touchscreen is an easy to use input device that allows users to control PC software and DVD video by

touching the display screen. We manufacture and distribute a variety of touch screen related products.

A touch system consists of a touch Sensor that receives the touch input, a Controller, and a Driver. The  
touch screen sensor is a clear panel that is designed to fit over a PC. When a screen is touched, the sensor  
detects the voltage change and passes the signal to the touch screen controller. The controller that reads &  
translates the sensor input into a conventional bus protocol (Serial, USB) and a software driver which  
converts the bus information to cursor action as well as providing systems utilities.

As the touch sensor resides between the user and the display while receiving frequent physical input from  
the user vacuum deposited transparent conductors serve as primary sensing element. Vacuum coated  
layers can account for a significant fraction of touch system cost. Cost & application parameters are chief  
criteria for determining the appropriate type determining the system selection. Primarily, the touch  
system integrator must determine with what implement the user will touch the sensor with & what price  
the application will support.  
Applications requiring activation by a gloved finger or arbitrary stylus such as a plastic pen will specify  
either a low cost resistive based sensor or a higher cost infra-red (IR) or surface acoustic wave (SAW)  
system. Applications anticipating bare finger input or amenable to a tethered pen comprises of the  
durable & fast capacitive touch systems. A higher price tag generally leads to increased durability better  
optical performance & larger price.

The most commonly used systems are generally the capacitive & resistive systems. The other technologies  
used in this field are Infrared technology & SAW (surface acoustic wave technology) these technologies  
are latest in this field but are very much expensive.

How Does a Touchscreen Work?

A basic touchscreen has three main components: a touch sensor, a controller, and a software driver. The touchscreen is an input device, so it needs to be combined with a display and a PC or other device to make a complete touch input system.

1.Touch Sensor

A touch screen sensor is a clear glass panel with a touch responsive surface. The touch sensor/panel is  
placed over a display screen so that the responsive area of the panel covers the viewable area of the video  
screen. There are several different touch sensor technologies on the market today, each using a different  
method to detect touch input. The sensor generally has an electrical current or signal going through it and  
touching the screen causes a voltage or signal change. This voltage change is used to determine the  
location of the touch to the screen.

2. Controller

The controller is a small PC card that connects between the touch sensor and the PC. It takes information  
from the touch sensor and translates it into information that PC can understand. The controller is usually  
installed inside the monitor for integrated monitors or it is housed in a plastic case for external touch add-  
ons/overlays. The controller determines what type of interface/connection you will need on the PC.  
Integrated touch monitors will have an extra cable connection on the back for the touchscreen.  
Controllers are available that can connect to a Serial/COM port (PC) or to a USB port (PC or Macintosh).  
Specialized controllers are also available that work with DVD players and other devices.

3.Software Driver

The driver is a software update for the PC system that allows the touchscreen and computer to work  
together. It tells the computer's operating system how to interpret the touch event information that is sent  
from the controller. Most touch screen drivers today are a mouse-emulation type driver. This makes  
touching the screen the same as clicking your mouse at the same location on the screen. This allows the  
touchscreen to work with existing software and allows new applications to be developed without the need  
for touchscreen specific programming. Some equipment such as thin client terminals, DVD players, and  
specialized computer systems either do not use software drivers or they have their own built-in touch  
screen driver.

Comparing Touch Technologies

Each type of screen has unique characteristics that can make it a better choice for certain applications.

The most widely used touchscreen technologies are the following:

4-Wire Resistive Touchscreens

4-Wire Resistive touch technology consists of a glass or acrylic panel that is coated with electrically  
conductive and resistive layers. The thin layers are separated by invisible separator dots. When operating,  
an electrical current moves through the screen. When pressure is applied to the screen the layers are  
pressed together, causing a change in the electrical current and a touch event to be  
registered.  
4-Wire Resistive type touch screens are generally the most affordable. Although clarity is less than with  
other touch screen types, resistive screens are very durable and can be used in a variety of environments.  
This type of screen is recommended for individual, home, school, or office use, or less demanding point-  
of-sale systems, restaurant systems, etc.

Advantages Disadvantages

• High touch resolutio

• Pressure sensitive, works with any stylus  
• Not affected by dirt, dust, water, or light  
• Affordable touchscreen technology • 75 % clarity  
• Resistive layers can be damaged by a sharp object  
• Less durable then 5-Wire Resistive technology

Touchscreen Specifications

Touch Type: 4-Wire Resistive  
Screen Sizes: 12"-20" Diagonal  
Cable Interface: PC Serial/COM Port or USB Port  
Touch Resolution: 1024 x 1024  
Response Time: 10 ms. maximum  
Positional Accuracy: 3mm maximum error  
Light Transmission: 80% nominal  
Life Expectancy: 3 million touches at one point  
Temperature: Operating: -10°C to 70°C  
Storage: -30°C to 85°C  
Humidity: Pass 40 degrees C, 95% RH for 96  
hours.  
Chemical Resistance: Alcohol, acetone, grease, and general household detergent  
Software Drivers: Windows XP / 2000 / NT / ME / 98 / 95, Linux, Macintosh OS

5-Wire Resistive Touchscreens

5-Wire Resistive touch technology consists of a glass or acrylic panel that is coated with electrically  
conductive and resistive layers. The thin layers are separated by invisible separator dots. When operating,  
an electrical current moves through the screen. When pressure is applied to the screen the layers are  
pressed together, causing a change in the electrical current and a touch event to be registered.

5-Wire Resistive type touch screens are generally more durable than the similiar 4-Wire Resistive type

Although clarity is less than with other touch screen types, resistive screens are very durable and can be  
used in a variety of environments. This type of screen is recommended for demanding point-of-sale  
systems, restaurant systems, industrial controls, and other workplace applications.

Advantages Disadvantages

• High touch resolution  
• Pressure sensitive, works with any stylus  
• Not affected by dirt, dust, water, or light  
• More durable then 4-Wire Resistive technology • 75 % clarity  
• Resistive layers can be damaged by a sharp object

Touchscreen Specifications

Touch Type: 5-Wire Resistive  
Cable Interface: PC Serial/COM Port or USB Port  
Touch Resolution: 4096 x 4096  
Response Time: 21 ms.  
Light Transmission: 80% +/-5% at 550 nm wavelength (visible light spectrum)  
Expected Life: 35 million touches at one point  
Temperature: Operating: -10°C to 50°C  
Storage: -40°C to 71°C  
Humidity: Operating: 90% RH at max 35°C  
Storage: 90% RH at max 35°C for 240  
Chemical Resistance: Acetone, Methylene chloride, Methyl ethyl ketone , Isopropyl alcohol, Hexane,  
Turpentine, Mineral spirits, Unleaded Gasoline, Diesel Fuel, Motor Oil, Transmission Fluid, Antifreeze,  
Ammonia based glass cleaner, Laundry Detergents, Cleaners (Formula 409, etc.), Vinegar, Coffee, Tea,  
Grease, Cooking Oil, Salt  
Software Drivers: Windows XP, 2000, NT, ME, 98, 95, 3.1, DOS, Macintosh OS, Linux, Unix (3rd Party

Capacitive Touchscreens

A capacitive touch screen consists of a glass panel with a capacitive (charge storing) material coating its  
surface. Circuits located at corners of the screen measure the capacitance of a person touching the overlay.  
Frequency changes are measured to determine the X and Y coordinates of the touch event.

Capacitive type touch screens are  
very durable, and have a high clarity. They are used in a wide range of applications, from restaurant and  
POS use to industrial controls and information kiosks.

Advantages Disadvantages  
• High touch resolution  
• High image clarity  
• Not affected by dirt, grease, moisture. • Must be touched by finger, will not work with any non-  
conductive input

Touchscreen Specifications

Touch Type: Capacitive  
Cable Interface: PC Serial/COM Port (9-pin) or USB Port  
Touch Resolution: 1024 x 1024  
Light Transmission: 88% at 550 nm wavelength (visible light spectrum)  
Durability Test: 100,000,000 plus touches at one point  
Temperature: Operating: -15°C to 50°C  
Storage: -50°C to 85°C  
Humidity: Operating: 90% RH at max 40°C, non-condensing  
Chemical Resistance: The active area of the touchscreen is resistant to all chemicals that do not affect  
glass, such as: Acetone, Toluene, Methyl ethyl ketone, Isopropyl alcohol, Methyl alcohol, Ethyl acetate

Ammonia-based glass cleaners, Gasoline, Kerosene, Vinegar

Software Drivers: Windows XP, 2000, NT, ME, 98, 95, 3.1, DOS, Macintosh OS, Linux, Unix (3rd Party)

PenTouch Capacitive Touchscreens

PenTouch Capacitive touchscreen technology works with the CRT and LCD touch monitors. This screen  
combines durable Capacitive technology with a tethered pen stylus. The screen can be set to respond to  
finger input only, pen input only, or both. The pen stylus is a good choice for signature capture, on-screen  
annotations, or for applications requiring precise input.

Surface Acoustic Wave Touchscreens

Surface Acoustic Wave technology is one of the most advanced touch screen types. It is based on sending  
acoustic waves across a clear glass panel with a series of transducers and  
reflectors. When a finger touches the screen, the waves are absorbed, causing a touch event to be detected  
at that point.  
Because the panel is all glass there are no  
layers that can be worn, giving this technology the highest durability factor and also the highest clarity.  
This technology is recommended for public information kiosks, computer based training, or other high  
traffic indoor environments.

Advantages Disadvantages

• High touch resolution  
• Highest image clarity  
• All glass panel, no coatings or layers that can wear out or damage • Must be touched by finger, gloved  
hand, or soft-tip stylus. Something hard like a pen won't work  
• Not completely sealable, can be affected by large amounts of dirt, dust, and / or water in the  
environment.

Near Field Imaging Touchscreens

NFI is one of the newest technologies. It consists of two laminated glass sheets with a patterned coating of  
transparent metal oxide in between. An AC signal is applied to the patterned conductive coating, creating  
an electrostatic field on the surface of the screen. When the finger or glove or other conductive stylus  
comes into contact with the sensor, the electrostatic field is disturbed. It is an extremely durable screen  
that is suited for use in industrial control systems and other harsh environments. The NFI type screen is  
not affected by most surface contaminants or scratches. Responds to finger or gloved hand.

Infrared Touchscreens

Infrared touch screen monitors are based on light-beam interruption technology. A frame surrounds the  
display’s surface. The frame has light sources, or light-emitting diodes (LEDs),on one side, and light  
detectors on the opposite side. This design creates an optical grid across the screen. When any object  
touches the screen, the invisible light beam is interrupted, causing a drop in the signal received by the  
photo sensors. One concern with this technology is that it might respond to a very light touch, even that of  
an insect crossing the monitor, making unwanted system adjustments. This is the only type of touch  
technology that are available for large displays such as 42-inch Plasma screens. It is a durable technology  
that offers high image clarity. Responds to any input device or stylus.

Information Kiosk Systems

A Kiosk (pronounced key-osk) is a computer based terminal or display that is used to provide information  
or services, typically in a public place. Kiosk systems are being used in a variety of applications, including  
information directories, customer self-service terminals, electronic catalogs, internet access terminals,  
tourism guides, and more.  
Complete Kiosk Systems

Several affordable and easy to use kiosk enclosures are available with integrated touch screen monitors

Available with several of the leading touchscreen technologies and with a variety of laminate, stained oak,

and painted metal finishes.

Mountable Monitors for Kiosk Systems

A variety of mountable displays that can be used in kiosk applications, including mountable CRT

monitors and several types of mountable flat panel monitors are available.

Other Components for Kiosk Systems

A variety of hardware components that can be used in information kiosk systems, including mountable

printer, fan, and speaker grills are available.

Software for Kiosk Systems

Several software packages can be used in a kiosk environment, including a presentation development

package and an on-screen keyboard package.  
Software, Cables, and Accessories  
Software:

Touchscreen related software, including presentation development software and other utilities

1. MYTSOFT

My-T-Soft On-Screen Keyboard Software

2. RIGHTTOUCH

RightTouch Right-Click Utility Software

MYTSOFT

My-T-Soft On-Screen Keyboard Software

My-T-Soft is an On-Screen keyboard utility that works with any Windows 95 / 98 / Me / NT / 2000 / XP software. It provides on-screen keyboards and user programmable buttons that allow users to enter data using a touchscreen display.

My-T-Soft can be used by itself in home or workplace applications, and it includes a developer's kit that

allows the keyboard to be called up from Web pages and other programs.

By allowing systems to operate without the need for a physical keyboard, external templates, membranes, or buttons, My-T-Soft can provide the finishing touch on sealed systems that only require a touchscreen for user input.

My-T-Soft uses a concept called "Heads Up Display" technology and its principal objective is to keep the  
users focus and concentration centered in one place. My-T-Soft uses that concept to reduce the visual re-  
focusing and re-positioning caused by the  
head's up and down motion of going from screen to keyboard to screen.

Features:  
Over 40 "Heads-Up Display" Keyboards with 12 base  
sizes and infinitely larger sizes

ABCD Alphabetical, QWERTY, 3 DVORAK's, and over 40

International (German, Spanish, French, etc.) with Edit and Numeric panels.

Store up to 2000 keystrokes/menu selections (or the applications macro scripts) on each button. Up to 15

buttons can be grouped on individual Panels, which auto-open when their assigned application becomes

active.

Developer friendly  
Show & Hide keys, program keys in Key Options, Custom logo display, Operator mode, on-demand  
functionality. The Developer's Kit comes with all kinds of utilities, source code, sample code, and a wealth  
of information for integrating My-T-Soft with your own application. Assignable Functions for Pointing  
Device Buttons

RIGHTTOUCH

RightTouch Right-Click Utility Software

An easy interface to bring Right Click capability to any touchscreen.

Most touchscreens work by emulating left mouse button clicks, so that touching the screen is the same as  
clicking your left mouse button at that same point on the screen. But what if you need to right click on an  
item? Some touchscreens do include right click support, but many do not. The Right Touch utility  
provides an easy way to perform right clicks with any touchscreen.

The Right Touch utility places a button on your desktop that allows you to switch the touchscreen between  
left and right clicks. When the screen is emulating left clicks, simply touch the Right Touch button to  
change to right click mode. Touch again, and you're back to the standard left click.

Software Requirements

Windows95/98/ME/NT/2000/XP

Please Note: Many of the touchscreen systems include a similar right-click tool with their software driver.

The Right-Touch software is useful for touchscreens that do not have an included right click utility.

Cables:

Cables for use with the touch monitors, includes video and serial port extension cables

Serial Cables  
SERIAL25: 25-Foot Serial Extension Cable  
SERIAL50: 50-Foot Serial Extension Cable  
SERIAL100: 100-Foot Serial Extension

VGA Video Cables  
VGA25: 25-Foot VGA Extension Cable  
VGA50: 50-Foot VGA Extension Cable  
VGA100: 100-Foot VGA Extension Cable

VGA-Y: VGA Video Y-Splitter Cable

Accessories:

Stylus Pens

A stylus pen can be used along with our touchscreen systems for precise input.

STYLUS1

Stylus Pen for Resistive Touchscreens

STYLUS2

Stylus Pen for Surface Acoustic Wave

Touchscreens

Touch Screen Drivers

UPD Driver 3.5.18  
These drivers are for 3M Dynapro SC3 and SC4 Controllers  
The new UPD Driver will work for the following controllers: SC3 Serial, SC4 Serial, SC4 USB. Supported  
platforms are Win2000/WinNT/Win9x/Me/XP. DOS and other drivers

Linux Drivers for SC3 and SC4 Controllers  
Linux drivers for SC3 and SC4 were developed by a third party, not 3M Touch Systems, and are provided  
for our customers convenience. 3M Touch Systems cannot offer any warranty or technical support for  
them.

Linux Drivers

TouchWare Driver, Release 5.63 SR3

These drivers are for MicroTouch Touch Controllers (EXII, SMT3, MT3000, MT410, MT510)

This release improves performance for Windows XP drivers. It provides multiple monitor support,  
including dual head video adapters, from TouchWare 5.63. Supported platforms are  
WinXP/Win2000/WinNT/Win9x/Me.  
This service release also corrects known problems with silent installation.  
Microcal 7.1  
Use this utility to modify controller settings and to calibrate the sensor at different resolutions under  
DOS. Microcal is compatible with fully-integrated ClearTek capacitive and TouchTek resistive  
touchscreens. This release supports any serial and PS/2 SMT controller, PC BUS controllers and the  
MT400 controller.  
Near Field Imaging OEM Drivers  
Use the OEM drivers below with Near Field Imaging touch screen products.  
For Windows NT/9X:  
8.4-inch Near Field Imaging touch screens (approx. 2.5MB)

For Windows NT/9X/3.1 and MS-DOS:

10.4-inch and larger Near Field Imaging touch screens (approx> 3.6MB)  
For Windows XP/2000 for 10.4-inch and larger Near Field Imaging touch screens  
Linux Drivers for NFI

Linux drivers for NFI were developed by a third party, not 3M Touch Systems, and are provided for our

customers' convenience. 3M Touch Systems cannot offer any warranty or technical support for them.

APPLICATIONS

The touch screen is one of the easiest PC interfaces to use, making it the interface of choice for a wide

variety of applications. Here are a few examples of how touch input systems are being used today:

1. Public Information Displays  
Information kiosks, tourism displays, trade show displays, and other electronic displays are used by many  
people that have little or no computing experience. The user-friendly touch screen interface can be less  
intimidating and easier to use than other input devices, especially for novice users. A touchscreen can help  
make your information more easily accessible by allowing users to navigate your presentation by simply  
touching the display screen

2. Retail and Restaurant Systems  
Time is money, especially in a fast paced retail or restaurant environment. Touchscreen systems are easy  
to use so employees can get work done faster, and training time can be reduced for new employees. And  
because input is done right on the screen, valuable counter space can be saved. Touchscreens can be used  
in cash registers, order entry stations, seating and reservation systems, and more

3. Customer Self-Service  
In today's fast pace world, waiting in line is one of the things that has yet to speed up. Self-service touch  
screen terminals can be used to improve customer service at busy stores, fast service restaurants,  
transportation hubs, and more. Customers can quickly place their own orders or check themselves in or  
out, saving them time, and decreasing wait times for other customers. Automated bank teller (ATM) and

airline e-ticket terminals are examples of self-service stations that can benefit from touchscreen input.

4. Control and Automation Systems  
The touch screen interface is useful in systems ranging from industrial process control to home  
automation. By integrating the input device with the display, valuable workspace can be saved. And with a  
graphical interface, operators can monitor and control complex operations in real-time by simply  
touching the screen.

5. Computer Based Training  
Because the touch screen interface is more user-friendly than other input devices, overall training time for  
computer novices, and therefore training expense, can be reduced. It can also help to make learning more  
fun and interactive, which can lead to a more beneficial training experience for both students and  
educators.

6. Assistive Technology  
The touch screen interface can be beneficial to those that have difficulty using other input devices such as  
a mouse or keyboard. When used in conjunction with software such as on-screen keyboards, or other  
assistive technology, they can help make computing resources more available to people that have difficulty  
using computers.

Take a look at how one of our customers, CHI Centers, Inc., has developed a system that allows non-

verbal individuals to communicate using a PC and touchscreen display.  
ADVANTAGES OVER OTHER POINTING DEVICES  
Touch screens have several advantages over other pointing devices:

• Touching a visual display of choices requires little thinking and is a form of direct manipulation that is

easy to learn

• Touch screens are the fastest pointing devices.  
• Touch screens have easier hand eye coordination than mice or keyboards.  
• No extra work space is required as with other pointing devices.  
• Touch screens are durable in public access and in high volume usage.

Disadvantages  
• User’s hand may obscure the screen.  
• Screens need to be installed at a lower position and tilted to reduce arm fatigue.  
• Some reduction in image brightness may occur.  
• They cost more than alternative devices.

Conclusion

Touch systems represent a rapidly growing subset of the display market. The majority of touch systems include touch sensors relying on vacuum-deposited coatings, so touch coatings present opportunity for suppliers of vacuum coatings and coating equipments.

Touch sensor manufactures currently require thin films in the areas of transparent conductors, optical  
interference coating and mechanical protective coatings. Touch sensors technical requirements dovetail  
well with those of the flat panel and display filter markets. The reality should provide value added  
opportunities to operations participating in these areas.

References

1. www.touchscreen.org  
2. www.touchscreen.com  
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