MicroTouch™ ToughTouch II Integration Guide

3M Touch Systems

Read and understand all safety information
contained in this document before using this product.

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Document Title: *MicroTouch™ ToughTouch II Integration Guide*
Document Number: 33548 Version 01

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About This Manual

Congratulations on the purchase of your MicroTouch™ ToughTouch II product and welcome to the world of 3M Touch Systems — a world where using a computer is as simple as touching the screen.

MicroTouch™ ToughTouch II – along with its best-in-class MicroTouch™ EX II touch electronics – sets the standard in rugged capacitive touch screen offerings. Designed to withstand heavy abuse in unattended, vandal-prone applications, MicroTouch™ ToughTouch II capacitive touch screens are an ideal solution for extreme environments that require a toughened, shatter-resistant, liquid-resistant touch solution. Whether you're designing ticketing kiosks or gaming machines, providing ATM solutions or require a toughened product for challenging industrial environments, ToughTouch II touch screens can meet or exceed your design requirements.

ToughTouch II is constructed by optically laminating 4 mm glass to the back of a MicroTouch™ ClearTek™ II touch screen – the standard for capacitive touch screens. By combining ClearTek II's industry-leading features for reliability and robustness with laminated impact-resistant characteristics, ToughTouch II offers excellent touch performance when and where ever you need it.

- Laminated construction provides high impact resistance for vandal-prone locations.
- Excellent light transmission supports dynamic interactive applications.
- NEMA 4/IP66 seal-ability protects from liquids and other contaminants affecting touch screen operation or damaging the LCD display.
- UL-60950 Third Edition.
- Available "viewer privacy" feature with 3M Vikuiti Light Control Film for ATMs and many public applications.

Each MicroTouch™ ToughTouch II screen requires an EX II touch screen controller. These controllers come in different form factors and may be cased or uncased; refer to the appropriate *EX II Controllers Reference Guide* and the *MT 7 Software User Guide* for more information on your touch system. All technical documentation is available from the 3M Touch Systems website at http://www.3Mtouch.com/.

3M Touch Systems, Inc. is committed to being a premier supplier in touch systems throughout the world. As a 3M Touch Systems, Inc. customer, you are aware that we have strong internal programs that meet or exceed environmental regulations of our customers and the regions in which we conduct business.

As such, our approach to the European Union Directives 2002/96/EC (WEEE) and 2002/95/EC (RoHS) (the directives) is being addressed in the same rigorous manner. To ensure compliance with the directives, we are pleased to provide this RoHS directive compliant product.

⚠ WARNING

To reduce the risk of hazardous voltage which could result in serious injury or death:
You must be a qualified technician with experience in assembling and disassembling different types of displays. You must know the specifics of your display and have access to its documentation.

There may be hazardous voltages present in the display. If you do not understand display electronics, you may injure yourself, damage the touch screen, or damage the touch screen controller.

Important Safety Information

Read, understand, and follow all safety information before using this product. Follow all instructions marked on the product and described in this document. Pay close attention to the following installation warnings and safety precautions.

Intended Use

The *MicroTouch™ ToughTouch II Integration Guide* is intended to instruct and guide you in the integration of a ToughTouch II touch screen into an existing flat screen display. These touch screens are not designed for use in hazardous locations.

Explanation of Signal Word Consequences

⚠ **WARNING:** Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury and/or property damage.
⚠ **CAUTION:** Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury and/or property damage.
CAUTION: Indicates a potentially hazardous situation, which, if not avoided, may result in property damage.

⚠ WARNING

To reduce the risk of fire and/or explosion which could result in serious injury or death:

- Do not install or use this product in a hazardous location.

⚠ WARNING

To reduce the risk of hazardous voltage which could result in serious injury or death:

- You must be a qualified technician with experience in assembling and disassembling different types of displays. You must know the specifics of your display and have access to its documentation. There may be hazardous voltages present in the display. If you do not understand display electronics, you may injure yourself, damage the touch screen, or damage the touch screen controller.
- Do not use a damaged power supply.
- Do not use a power cord that is frayed or otherwise damaged.
- Disconnect the power to the LCD monitor before installation.
- Do not service the monitor.
- Do not use non-conforming replacement parts.
- Do not expose the monitor to rain or other sources of water, steam, or moisture.

To reduce the risk of fire and/or explosion which could result in serious injury or property damage:

- Do not use this product in any outdoor environment unless NEMA standards (or other similar standards such as IP rating) are followed.

⚠ CAUTION

To reduce the risk of electric shock which may result in minor or moderate injury or property damage:

Exercise caution when working with an ungrounded faceplate CRT. Because of the hazards involved, 3M Touch Systems recommends against using this specific type of CRT monitor in all touch applications.

Follow all instructions and recommendations in the manufacturer's documentation.

To reduce the risk of the potentially hazardous situations associated with the use of isopropyl alcohol which may result in minor or moderate injury or property damage:

- Follow all instructions and recommendations in the alcohol manufacturer's Material Safety Data Sheet and product label.

To reduce the risk of possible environmental contamination which may result in minor or moderate injury:

- Dispose of the monitor in accordance with federal, state and local regulations.

Important Notes for Video Displays

- Plug power cord into appropriate power source.
- Plug power cord into a grounded receptacle.
- When unplugging power supply cord, pull on the plug not the cord.
- Do not connect or disconnect this product during an electrical storm.
- Install the display in a well-ventilated area. Always maintain adequate ventilation to protect the display from overheating and to ensure reliable and continued operation.
- Do not expose the display to direct sunlight or heat. Passive heat may cause damage to the case and other parts.
- Do not install the display in areas where extreme vibrations may be generated. For example, nearby manufacturing equipment may produce strong vibrations. The vibrations may cause the display to exhibit picture discoloration or poor video quality.
- Ensure that metal enclosures or bezels do not directly contact the touch screen.
- To avoid ergonomic concerns:
  Do not install the LCD in a manner or location with awkward accessibility. Extended use may result in muscle, tendon, or fixed posture strains. It is recommended you take periodic breaks from continuous use.

Touch Screen Care and Cleaning

The touch screen requires very little maintenance. 3M Touch Systems recommends that you periodically clean the glass touch screen surface.

⚠ CAUTION
To reduce the risk of the potentially hazardous situations associated with the use of isopropyl alcohol which may result in minor or moderate injury or property damage: Follow all instructions and recommendations in the alcohol manufacturer's Material Safety Data Sheet and product label.

Typically, an isopropyl alcohol and water solution ratio of 50:50 is the best cleaning agent for your touch screen. You can also use straight isopropyl alcohol. In addition, 3M Screen Cleaner CL680 has been tested and approved for this use. Be sure to follow solvent manufacturer's precautions and directions for use when using any solvents.

- It is important to avoid using any caustic chemicals on the touch screen.
- Always dampen the cloth and then clean the screen. Be sure to spray the cleaning liquid onto the cloth, not the screen, so that drips do not seep inside the display or stain the bezel.
- Apply the cleaner with a soft, lint-free cloth. Avoid using gritty cloths.
- Always handle the touch screen with care. Do not pull on or stress the touch screen cable.

3M Touch Systems Support Services

3M Touch Systems, Inc. provides extensive support services through our website and technical support organization. Visit the 3M Touch Systems website at http://www.3Mtouch.com/, where you can download touch screen software and drivers, obtain regularly updated technical documentation on 3M Touch Systems products, and learn more about our company.

Whenever you contact Technical Support, please provide the following information:

- Display manufacturer and model number
- Touch screen part number and serial number
- Current driver version
- Operating system used
- Information on additional peripherals

Technical Support is available Monday through Friday 8 a.m. to 8 p.m. US Eastern Standard Time – 9 a.m. to 5 p.m. throughout Europe.

You can contact 3M Touch Systems Technical Support (US only -- Eastern Standard Time) by calling the hot line, sending email or a fax.

- Technical Support Hot Line: 978-659-9200
- Technical Support Fax: 978-659-9400
- Toll Free: 1-866-407-6666
- Email: US-TS-techsupport@mmm.com

Contact 3M Touch Systems

Contact information for all offices can be accessed through the website: http://www.3Mtouch.com/.

CHAPTER 1

Getting Started

The MicroTouch™ ToughTouch II touch screen is the one of the most intuitive interfaces available for the PC today. Touch screens make using computers as simple as touching the screen. To begin installing your ToughTouch II touch screen, take a few minutes to review this chapter. It is your roadmap to a successful installation.

- Pay close attention to the important safety information. Disassembling a display can be a dangerous procedure. Be sure to follow all manufacturers' recommendations for assembly and disassembly of your flat screen display.
- Make sure you have the necessary equipment before starting the installation. Refer to *Supplies and Tools Needed for the Installation* later in this chapter.
- Set up a clean, comfortable, and spacious working area. Having sufficient room to work makes the installation easier.
- Test your display to ensure good working condition before you install the touch screen.
- Identify the different components to install and review the summary of the installation procedure. It is important to know how all the pieces eventually fit together before disassembling your system.

Note: If any points within this guide are unclear to you, or further clarification is necessary, please contact your 3M Touch Systems applications engineer.

Installation Information

3M Touch Systems recommends that only qualified display technicians install the touch screen.

If you decide to install the touch screen, take the following precautions:

- Follow each procedure carefully, work with the system powered off and unplugged, and observe all safety information.
- Protect your investment. The touch screen is a glass product. You must handle it with care.

Note: Consult the display manufacturer to find out whether the original warranty will be affected if you install the touch screen. Also, determine who will recertify the display. Recertification will be necessary to comply with safety and FCC or EMC regulations.

⚠ WARNING

To reduce the risk of fire and/or explosion which could result in serious injury or death:

- Do not install or use this product in a hazardous location.

To reduce the risk of hazardous voltage which could result in serious injury or death:

- Do not use a damaged power supply.
- Do not use a power cord that is frayed or otherwise damaged.
- You must be a qualified technician with experience in assembling and disassembling different types of displays. You must know the specifics of your display and have access to its documentation. There may be hazardous voltages present in the display. If you do not understand display electronics, you may injure yourself, damage the touch screen, or damage the touch screen controller.
- Disconnect the power to the LCD monitor before installation.
- Do not service the monitor.
- Do not use non-conforming replacement parts.
- Do not expose the monitor to rain or other sources of water, steam, or moisture.

To reduce the risk of fire and/or explosion which could result in serious injury or property damage:

- Do not use this product in any outdoor environment unless NEMA standards (or other similar standards such as IP rating) are followed.

⚠ CAUTION

To reduce the risk of electric shock which may result in minor or moderate injury or property damage:

Exercise caution when working with an ungrounded faceplate CRT. Because of the hazards involved, 3M Touch Systems recommends against using this specific type of CRT monitor in all touch applications.

Follow all instructions and recommendations in the manufacturer's documentation.

To reduce the risk of the potentially hazardous situations associated with the use of isopropyl alcohol which may result in minor or moderate injury or property damage:

- Follow all instructions and recommendations in the alcohol manufacturer's Material Safety Data Sheet and product label.

To reduce the risk of possible environmental contamination which may result in minor or moderate injury:

- Dispose of the monitor in accordance with federal, state and local regulations.

Supplies and Tools Needed for the Installation

Before starting the installation procedure, check that you have all items listed below.

Supplies Needed

- Safety glasses
- Small containers for holding loose parts (paper cups)
- Electrical tape (or black acetate tape)
- Clean soft cloth and cleaner for the display and touch screen
- Replacement screws for mounting flat panel to bezel or chassis
- Ring lugs or crimps
- Nylon spacers and washers
- Gloves for handling glass
- Clean, anti-static pad
- Foam blocks
- Foam pad
- Felt-tip marker pen
- Cable tie-wraps
- ROHS compliant solder
- Bezel sealing gasket
- LCD mounting tape
- 5 mil thick polyimide tape such as Kapton® tape

Tools Needed

- Flat-blade screwdriver with insulated handle
- 3 ft (1 m) insulated wire with alligator clips at each end
- Utility knife or single-edge razor blade
- Power drill
- Wire stripper
- Compressed air (optional)
- Philips-head screwdriver
- Soldering iron
- 3/32-inch (3 mm) insulating tubing (or electrical tape)
- Center punch
- Variety of drill, tap, and spade bits
- Crimping tool
- Dremel® tool or nibbler

Preparing Your Work Space

Comfortable Work Area

Select a comfortable work area with adequate space and lighting. Make sure that the area is free of clutter and/or objects that could scratch the touch screen and flat panel display. 3M Touch Systems recommends an area of at least 15 square feet (1.39 square meters). You need this space to handle components safely and to set major components aside during the installation.

Protective Material

Place anti-static protective material on the work surface. A padded surface protects equipment from scratches during installation. Foam blocks can be used to support the touch screen and make for easier handling of the touch screen panel.

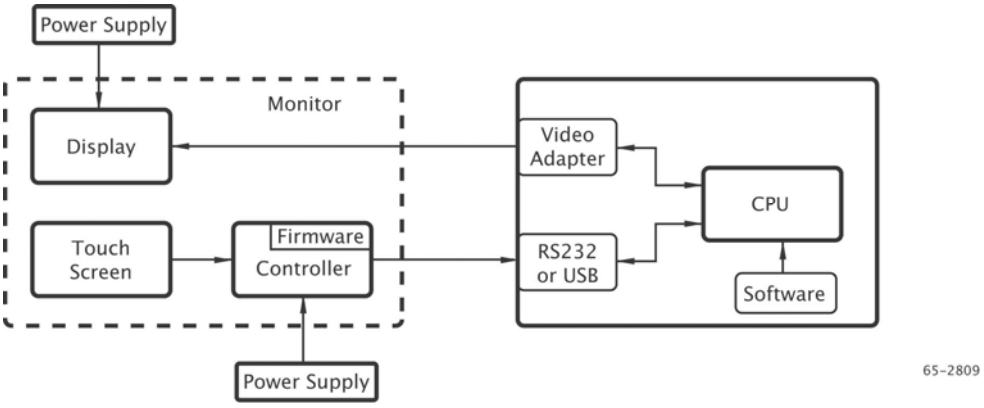
Small Containers

Have several small containers (such as paper cups) available to hold screws, washers, and other small components once you remove them.

Foam Pad

A foam pad is useful for holding the display while attaching the touch screen. The pad makes the screen easier to rotate for fastening screws, taping, etc.

Identifying the Components



The following components are needed for a successful integration:

- A MicroTouch™ ToughTouch II touch screen
- An EX II touch screen controller either USB or serial
- A serial (7310101) or USB cable (7312256)
- Software and documentation found on the 3M Touch Systems website at http://www.3Mtouch.com/.

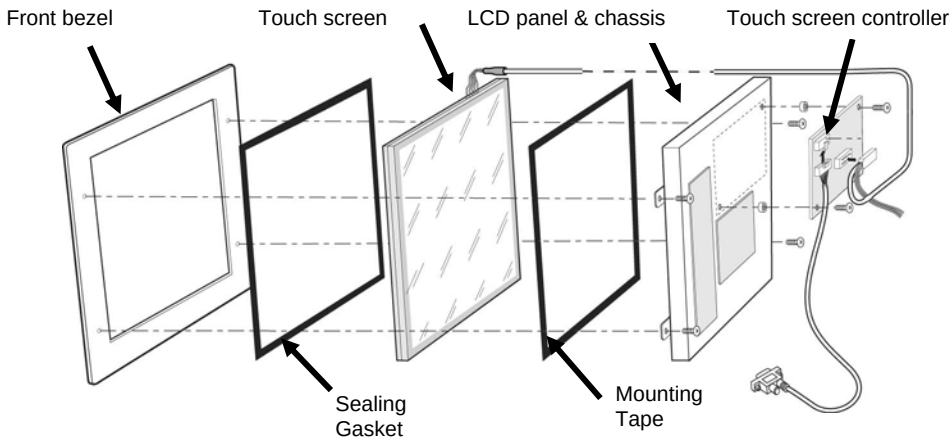
Save the invoice, shipping container, and all packing material in case you need to transport the equipment any time in the future.

Testing the Display Video

Whether you are installing the touch screen on a new or older display, before you begin you should make sure that the display is in good working condition and the video output is functioning properly. Your initial test should verify that the video functions properly before you install the touch screen. You can also compare your results with the results you get after you complete the installation.

If the display is functioning properly, turn off your system, disconnect power plugs, and disconnect all cables from the display. You are ready to disassemble the display and install the touch screen.

Summary of the Installation Procedure



You can install a MicroTouch™ ToughTouch II touch screen on most flat displays. Although each particular display may have some unique integration considerations, the basic installation process consists of the following steps:

- Test that the LCD display's video works properly
- Disassemble the LCD display (if necessary)
- Mount the touch screen to the front of the LCD panel (recommended)
- Install the touch screen controller (internally)
- Reassemble the display (if necessary)
- Connect the display and touch screen to your computer system.

CHAPTER 2

Touch Screen Design Considerations

Before You Begin

Before you begin the installation, please review the following design considerations. An overview of the entire installation process will help to ensure a successful installation.

- Perform a bench test of all hardware to ensure functionality before you start.
- When installing the touch screen, be careful not to route the touch screen cable and power wires near the backlight inverter of the LCD panel.
- Ensure that nothing contacts the touch screen – it should be mechanically decoupled by the recommended foams.
- Before installing the touch screen and controller, be sure to account for the space needed by the touch screen and its cable.
- The front mounting frame or bezel may need to be modified to accommodate the sealing gasket and touch screen. Make sure that the mechanical integrity of the display is not compromised.
- The touch screen cable should be secured in place.
- If it is necessary to remove the touch screen from the display after it has been attached, do not pry it off. Carefully follow the instructions given.

⚠ CAUTION
To reduce the risk of glass breakage which may result in minor or moderate injury: Do not try to pry the touch screen off the LCD panel if you need to remove the touch screen for servicing. You may break the glass and injure yourself or others.

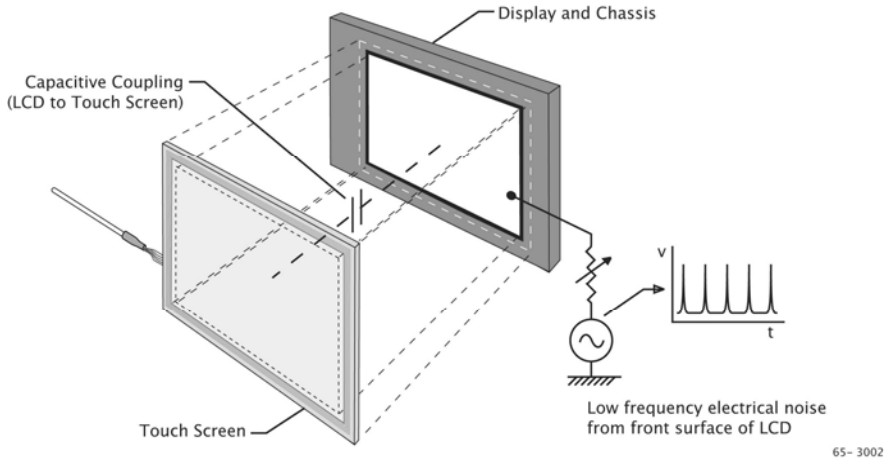
- Be sure to follow the solvent manufacturer's precautions and directions for use when using any solvents. Follow the manufacturer’s directions for suitable chemicals for your display.
- Be sure not to tighten any one corner of the bezel/mounting frame more than the other corners. Pressure should be evenly distributed across the touch screen.

Design Considerations

MicroTouch™ ToughTouch II screens are available in a variety of sizes, for use on a variety of displays. These touch screens come in two different configurations: one with a 5-pin connector to attach to an EX II 7700 series controller; and one with a 12-pin NOVRAM connector for EX II 1700 and EX II 5700 series controllers.

ToughTouch II is designed and produced without a backshield and takes advantage of the superior sensitivity and noise rejection of EX II controllers. Refer to the appropriate *EX II Controller Reference Guide* for instructions on how to select signal frequency for best EMI rejection.

Electrical Considerations



EMI and Shielding

The front surfaces of some flat panel displays carry potentials that fluctuate at the harmonics of display scan frequencies. EX II controllers default to a frequency (95.7 kHz) selected for best rejection of common LCD frequencies. Refer to the *MT7 Software User Guide* for additional information on how to change frequency. All technical documentation is available from the 3M Touch Systems website at http://www.3Mtouch.com/.

LCDs

The primary problem with some new types of LCD displays in a capacitive touch screen environment is that they generate much more electrical noise than their predecessors. The excessive electrical noise generated by these displays may couple into the touch screen circuitry and be interpreted by the controller as a touch signal.

A capacitive touch screen attached to the face of a LCD acts like a large capacitor meaning that it can be charged or discharged continuously. The capacitor consists of 2 plates: one is the face of the LCD and the other is the touch screen. In addition, some types of LCDs exhibit varying effective impedance to ground.

Inadequately supported touch screens may be susceptible to mechanical bending. Excessively large touch screens are more susceptible to stray capacitance changes, when mechanical distortions are present.

CRTs

Although this document focuses on LCD integration, you should be aware of the following issues when installing a MicroTouch™ ToughTouch II screen to a flat CRT.

MicroTouch™ ToughTouch II is not recommended on CRTs. If a CRT must be used, the user must first ensure that front CRT surfaces are adequately grounded to shield the touch screen from capacitively coupled noise and from charge build-up.

⚠ CAUTION
To reduce the risk of electric shock which may result in minor or moderate injury or property damage: Exercise caution when working with an ungrounded faceplate CRT. Because of the hazards involved, 3M Touch Systems recommends against using this specific type of CRT monitor in all touch applications. Follow all instructions and recommendations in the manufacturer's documentation.

When a touch screen integrated monitor, using an ungrounded CRT faceplate, is powered on, the charge created between the CRT faceplate and the back of the touch screen can be in excess of 40 kV. With an ungrounded faceplate, the built up charge will dissipate through the path of least resistance, typically through the touch screen controller.

The risk involved is that this high voltage discharge buildup on an ungrounded faceplate could result in minor or moderate personal injury due to shock, and/or damage to electronic components and internal touch circuitry.

3M strongly recommends that customers use a properly grounded CRT faceplate on all touch screen monitor integrations to prevent damage to the touch screen and/or controller. The high voltage created by an ungrounded CRT faceplate is outside the specification range of standard 3M Touch Systems touch screens and controllers. Resultant damage is not warranteed by 3M Touch Systems.

Mechanical Considerations

Cable Routing

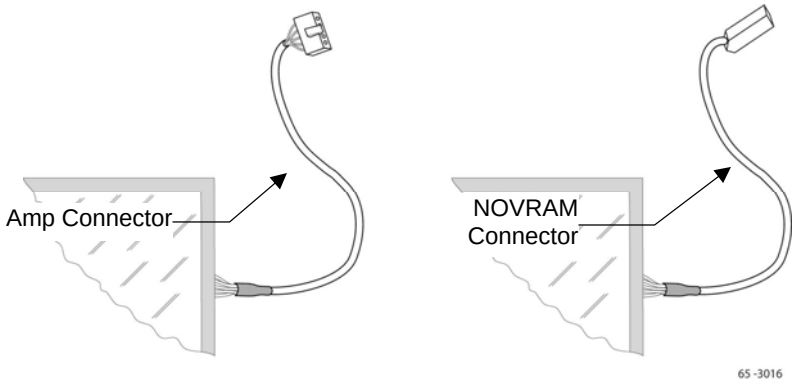
MicroTouch™ ToughTouch II has a discrete wired harness, rather than the flat tail of the standard ClearTek II product. Care must be taken to ensure that the wires have sufficient space and that they are not crushed or clamped during the mounting procedure. Refer to the marketing drawing for your product for details of the harness for your product. The wire connections on the surface of the touch screen are raised with respect to the active touch surface. Take care to allow for this extra height during design and choice of gasket material.

To minimize the risk of electromagnetic interference, never run the touch screen cable near or over the LCD backlight inverter. The noise generated by an inverter covers a broad spectrum and can contain frequencies close to the controller’s operating frequency.

The touch screen cable is not a handle. Never pick your touch screen up by the cable. It is an electrical connection and is not designed for high stress.

Do not place constant stress on the cable during handling or integration. Do not expose the cable to mechanical stresses because of the integration design. Provide adequate slack to ensure there is no straining on the cable. Avoid lateral pulls that may overstress the outermost electrical contacts on the glass.

Always design your touch screen integration with the cable exiting from the top or sides of the display. Never design cable exits from the bottom as spills could accumulate in the cable attachment area and cause electrical shorting.



The ToughTouch II touch screen cable should not move freely after assembly. Secure the cable in a manner that does not apply stress to the cable.

Apply tape or other insulating material to sharp edges to protect the tail. Route the cable away from sharp edges whenever possible. If this cannot be avoided, secure the cable so it does not move.

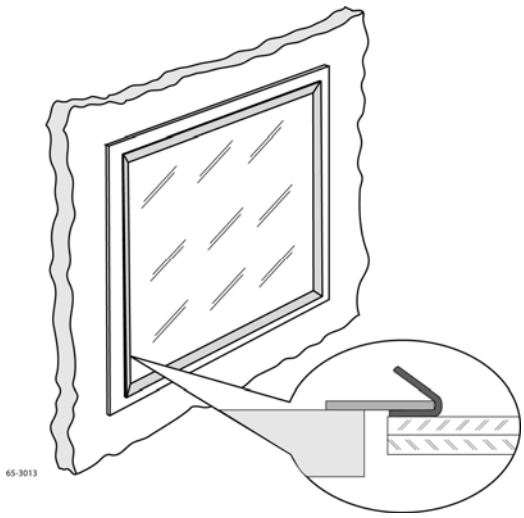
Note: 3M Touch Systems does not recommend having metal touch screen mounting brackets in direct contact with the glass. If metal touch screen mounting brackets must be used, be sure they are always appropriately grounded.

Sealing

MicroTouch™ ToughTouch II screens can be sealed in the same way as ClearTek II touch screens. However, you may wish to use more rugged gasket materials depending on the environment and intended use of the system. For example, closed cell foam tapes may not be the best choice for an outdoor application open to public use. In cases such as this, the materials used must still conform to the stated guidelines. It is often possible to find such materials in a different form that may be more suited to the application (e.g., a solid rubber seal, rather than closed cell foam).

In order to reach NEMA4 or IP66 rating, a single piece gasket frame is recommended, rather than individual strips of gasket material on each edge. Make sure to follow the recommended compression factors for the gasket material.

In environments where water may be present, it is important to choose a gasket profile so that water is not allowed to contact a metal bezel and the surface of the touch screen at the same time. One good method to seal the touch screen is to use a plastic water deflector as shown in the illustration below.



Sealing Gasket to Bezel

Proper gasketing is critical to any successful touch screen integration. All displays, regardless of environment, will be exposed to dust, dirt, spills, and grime and should be sealed with gaskets. Gasketing is relatively simple and straightforward. It can be either an o-ring or a flat, closed cell foam gasket applied around the perimeter of the bezel.

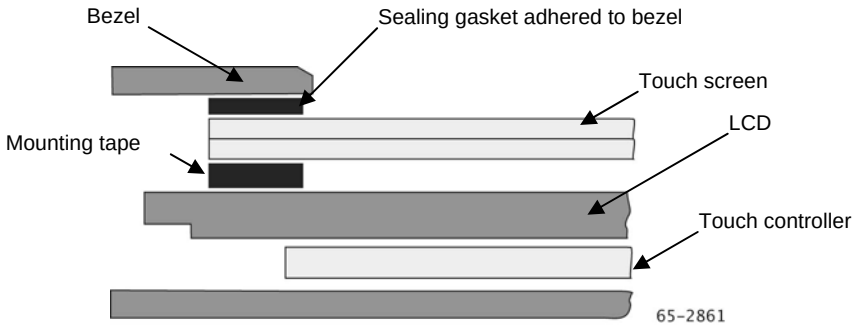
We recommend using nonacidic, pH neutral 3M brand tapes to seal your bezel and touch screen. 3M foam tapes provide superior resistance to moisture and chemicals over other traditional cellular foam tapes.

Important Note: Be aware that certain sealing materials may contain active chemicals (such as sulfur, acidic compounds or chlorine) that can, if allowed to diffuse, tarnish the silver conductors and thus affect the operation of the touch screen. In selecting sealing materials, it is important to know the chemical compounds used in the formulation and to avoid chemically active, corrosive, and/or recycled materials made from unknown ingredients.

Certain types of neoprene gaskets contain an excess of sulfur that makes them unacceptable for this purpose. It is essential that the user evaluate this product to determine whether it is suitable for their particular purpose and method of application. Common x-ray fluorescence testing by an analytical lab can differentiate gasket composition.

Consider using a larger touch screen than your display. This will provide you with a larger area for mounting clamps/brackets, gasketing, etc.

Single-sided tapes, adhered to the bezel, make for easy sealing of the touch screen. Simply align and adhere the tape to the bezel edge. Gaskets should follow the touch screen perimeter to ensure a good seal without interfering with the viewing area of the display. The gasket must contact the clear viewing area of the touch screen. Do not adhere the gasket to the touch screen surface.



Remember to choose a gasket material with recommended thickness of 3 mm or greater before compression and attach it to the inside of the bezel opening.

3M recommends attaching the ToughTouch II touch screen directly to LCD. Avoid mounting the LCD and touch screen independently to a common bezel. Stresses applied to the bezel may influence the gap between the touch screen and the LCD. This may cause erratic operation and false touches.

Avoid attaching the touch screen to a door if the LCD is mounted in a cabinet. If this cannot be avoided, do not operate the touch screen with a partially open door, which will cause erratic operation such as jittery cursor and variable offsets. Upon closing the door, always reset the controller.

The compression should be evenly distributed across the glass surface. Be aware of and follow material manufacturer's recommended compression specifications. 3M Touch Systems has successfully used Volara® 2AF tape for this purpose.

Mounting Tape to LCD

The touch screen must be mounted such that the spacing between the touch screen and LCD does not vary due to compression or expansion from touch forces or temperature changes. For optimal performance, we recommend using 3M brand 4956, 4956F, or 4979F tape for this purpose. Failure to mount the touch screen in a fixed position may result in reduced accuracy.

Caution: If thicker tape is needed, it is okay to double the recommended VHB tape. Do NOT use highly compressible tapes.

Note: When the touch screen is mounted to the LCD, any impact on the front surface will be transmitted to the LCD. It is the responsibility of the designer to ensure that the assembled unit meets their requirements for impact resistance.

3M VHB acrylic foam tapes (Product Numbers 4956, 4956F, or 4979F) are well suited for this purpose. These tapes were chosen for their thermal properties. The typical Thermal Coefficient of Expansion for these tapes is 1.8 X 10E4 mm/mm/°C.

These recommended tapes have been tested to be stable over the published touch screen operating temperature range. ***Any other mounting tape must be tested by the user to stability requirements before installing in touch screens.***

It is essential that the user evaluate this product to determine whether it is suitable for their particular purpose and method of application.

Metal Enclosures

Because conductive surfaces can present a stray capacitive loading to the touch screen, you must be careful when positioning the touch screen near metallic objects or materials. The following guidelines will help ensure a successful installation.

Do not let any metal — such as metal mounting brackets, screws or the LCD metal housing — *physically* contact the front or sides of the touch screen. This could be recognized as a touch.

In the design phase, avoid metal bezels if possible. If your current design has a metal bezel, ensure that it does not directly contact the touch screen. The bezel should be appropriately grounded and very rigid. Use insulating tape or gasketing as a spacer.

Be aware that some plastic bezels have conductive paint that could act as a metal bezel so the same design rules apply in these instances.

Take measures to ensure that a metal bezel presents a constant and stable stray capacitive path to ground at least during operation. If there is a conductive door or bezel, send a reset command to compensate for stray capacitance changes after closing the door. On most enclosures, a reset can be generated using the door open/close switch.

Touch System Location

Keep in mind the optics of the touch screen. Remember that different sources of light such as outdoor (natural sunlight) and indoor (incandescent or fluorescent) can cause different effects when viewing the touch screen.

If the system is to be used in an outdoor environment, consider the position of natural light from the sun at different times of the day. Situating the system where sunlight cannot fall directly on the display will ensure that it can be used at all times.

Remember that lighting changes over the course of a day and depends on weather. Consider the brightness of an area and how it will affect readability of the computer display image.

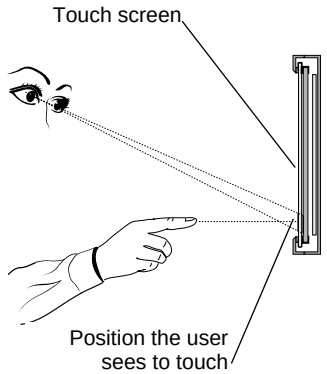
Consider using high brightness displays for better readability in bright ambient light conditions. Remember that sunlight comes in at different angles throughout the year. What might not be a problem in the summer could be an issue in winter.

Electromagnetic interference can cause problems with any electrical device. Be aware of devices that generate electrical fields, such as radio transmitters, mobile phones, pager transmitters, and security tag deactivators, and plan your installation accordingly.

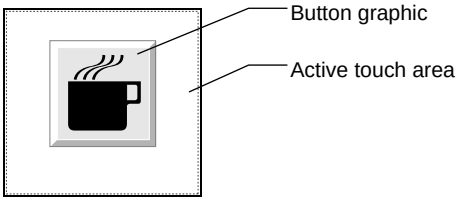
Designing Software Applications

With any touch application, the design can be crucial to the usability of the final product. Clear icons, bright contrasting colors, large buttons, button placement, and simple layouts will contribute greatly to the success of your installation.

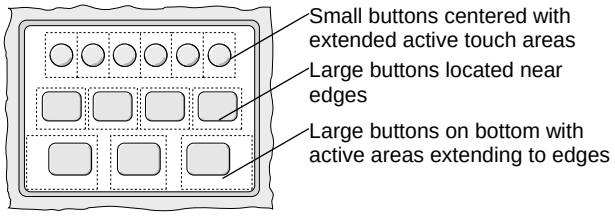
Because a ToughTouch II touch screen is thicker than a standard ClearTek II touch screen, it is important to understand the issue of parallax. Parallax, the effect of a target object appearing in different positions when looked at from different angles, is a common problem in many computer applications. The combination of the touch screen in front of the display and differing heights of users can cause parallax. When designing your touch system software application, use the following guidelines to help reduce the effects of parallax.



- Design large buttons to facilitate touch. Remember that a fingertip is much larger than a cursor.



- Design larger active border areas for buttons. For example, if the button graphic is 1 inch x 1 inch, the active touch area behind it could be 2 inches X 2 inches.
- Keep buttons away from the edges and corners of the screen. If this is impossible, make sure the active touch areas extend to the outer edges of the viewing area.



- Place buttons horizontally whenever possible. One size does not fit all! Consider the varying heights of users and thus viewing angles when designing the application.
- Turn off the cursor. Users may inadvertently try to drag the cursor to the correct location on the screen, emulating moving a mouse, instead of touching the button directly.
- Design your applications to activate with a single touch rather than a double-touch.

Reset Switch

The ToughTouch II system acts as a capacitor continuously charging and discharging. This capacitor is made up of the front active surface of the touch screen, the LCD panel, and any metallic bezel that the touch screen is near. If the distances between these objects are fixed, the environmental capacitance does not vary. However, if the distance between the touch screen and LCD panel or between the touch screen and a metallic bezel changes, the environmental capacitance will change also. If the touch screen is to be used in this type of situation, additional steps may be necessary.

If either the LCD panel or its enclosure/bezel is moved during operation (for instance while servicing the machine), and use of the touch screen is still required in such a state, resetting the touch controller is recommended. This may be done in several ways.

1. If opening the door requires the operator to enter some form of service program, it may be possible to use this program to issue a controller reset command through the driver. Further details are available from your local 3M Touch Systems field applications engineers.
2. An alternative method of triggering a controller reset command is by means of a switch. The switch should be mounted so that when the door is opened or closed, the switch is activated. This can then be linked to the PC. Upon activation, the PC can then issue a controller reset command through the driver.
3. Finally, it is possible to trigger a reset by cycling the power to the controller. In this scenario, a switch like that described above can be used. The switch should be attached so that the action of opening the door disconnects controller power momentarily then restores it. The same action should take place when the door is closed.

Clamping Force

The ToughTouch II touch screen is designed to pass the Impact Test outlined in UL60950 Clause 4.2.5. However, there are mechanical integration considerations that contribute to successful compliance with this standard.

When designing the mounting and enclosure for your system, it is important not to clamp the touch screen tightly to the bezel or the LCD. If the touch screen is too tightly clamped, the impact resistance of the touch screen may be compromised. Using the recommended materials for mounting and gasketing, compressed by the recommended amount, any mechanical energy due to an impact will be dissipated through the mounting and gasket tapes.

If the touch screen is attached directly to the LCD, the impact energy will be transferred into the LCD panel itself. It is important to check that this shock/vibration is within the specifications of the LCD panel.

CHAPTER 3

Installing a 3M Touch Systems Touch Screen

This chapter describes how to install a 3M Touch Systems ToughTouch II touch screen in a flat display. You can install a 3M Touch Systems touch screen on many different flat displays.

- The information in this chapter pertains to most flat displays.
- This chapter does not provide detailed instructions for any specific flat display.
- The procedures are only intended as guidelines and will vary depending on the display manufacturer.

Note: Given the variety of factors that can affect the use and performance of any product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is suitable for a particular purpose and suitable for the user's intended application.

Installation Considerations

Before beginning the installation, review Chapter 2. Planning ahead ensures a successful installation. To summarize:

- Perform a bench test of the hardware to ensure functionality before you start.
- Before installing the touch screen, be sure to account for the space needed by the touch screen and its cable.
- Assure that the integration design does not subject the cable to pinch points and/or mechanical stresses.
- When installing the touch screen, be careful not to route the touch screen cable and power wires near the backlight inverter of the LCD panel.
- Because the touch screen edges are electrically active, they should not come in contact with any conductive materials. Avoid direct contact with metal brackets, conductive bezel paint, etc.
- The bezel may need to be modified to accommodate the sealing gasket and touch screen. When trimming the bezel, make sure that the mechanical integrity of the display is not compromised.
- The touch screen cable should be secured in position with a light adhesive tape.
- If it is necessary to remove the touch screen from the display after it has been attached, do not pry it off. Carefully follow the instructions given.
- Be sure to follow solvent manufacturer's precautions and directions for use when using any solvents. Follow manufacturer's directions for suitable chemicals for your

display. Refer to the section on *Touch Screen Care and Cleaning* later in this chapter for further information.

- When reassembling the touch screen and bezel, do not over-tighten any corner. Do not over compress the sealing gaskets – take out the air but not beyond. Follow gasket manufacturer's recommendations for allowable compression ranges (typically 30 to 50%). Pressure should be evenly distributed across the touch screen.

Mounting the Touch Screen to the LCD Panel

Before you begin this process, please review the *Mechanical Considerations—Mounting Tape to LCD* section in Chapter 2 for additional important information on this subject.

Note: For ease of maintenance, you might want to put a border of Kapton® tape (or a similar strength tape) around the perimeter of the LCD panel in order to provide a surface to adhere the 3M mounting tape that will be easy to remove if the need arises.

Strips of high-density foam mounting tape (3M Product Numbers 4956, 4956F, or 4979F) with adhesive on both sides should be used to attach the touch screen to the LCD metal frame. These strips should not form a full seal – allow for ventilation (1-2 mm gaps) at the corners as shown below. Because new LCDs run significantly hotter than their predecessors, you should allow air to escape to avoid damaging the LCD with temperature and pressure equalization issues.

Caution: If thicker tape is needed, it is okay to double the recommended VHB tape. Do NOT use highly compressible tapes.

Failure to mount the touch screen in this fashion may result in reduced accuracy at extended temperature ranges.

Caution: To reduce the risk of damage to the LCD films, make sure the tape (either Kapton tape or VHB tape) does not touch the surface of the LCD. Ensure that the tape is aligned with the **frame** of the LCD (not in the viewing area).

The foam tape serves the following purposes:

- Holds the touch screen in place on the LCD panel
- Maintains a constant distance between the touch screen and the LCD panel
- Cushions the LCD and glass surfaces

- Prevents dust and other contaminants from getting in between the LCD and touch screen surfaces

Positioning the Touch Screen

The correct positioning of the touch screen is extremely important. You should practice positioning the touch screen on the LCD panel until you are comfortable with how the touch screen should be aligned with the horizontal and vertical center of the LCD face.

1. Place the LCD panel face-up on the foam pad, being careful of the components attached to the rear of the LCD.
2. Hold the touch screen so the cable exits from the correct location. If you are unsure of the correct positioning, contact your customer service representative to request a detailed drawing.
3. Place the touch screen onto the LCD panel and ensure that the touch screen is straight and the viewing area centered on the LCD panel.

Touch Screen Care and Cleaning

The touch screen requires very little maintenance. 3M Touch Systems recommends that you periodically clean the glass touch screen surface.

⚠ CAUTION

To reduce the risk of the potentially hazardous situations associated with the use of isopropyl alcohol which may result in minor or moderate injury or property damage:
Follow all instructions and recommendations in the alcohol manufacturer's Material Safety Data Sheet and product label.

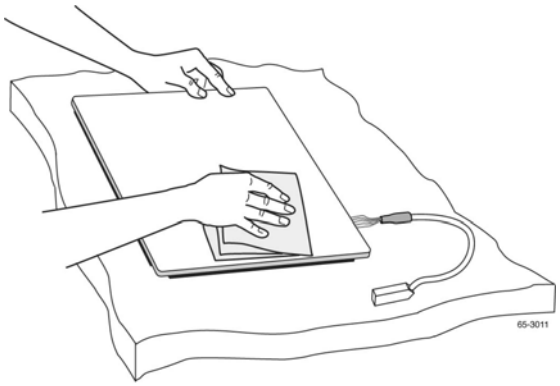
Typically, an isopropyl alcohol and water solution ratio of 50:50 is the best cleaning agent for your touch screen. You can also use straight isopropyl alcohol. In addition, 3M Screen Cleaner CL680 has been tested and approved for this use. Be sure to follow solvent manufacturer's precautions and directions for use when using any solvents.

- It is important to avoid using any caustic chemicals on the touch screen.
- Always dampen the cloth and then clean the screen. Be sure to spray the cleaning liquid onto the cloth, not the screen, so that drips do not seep inside the display or stain the bezel.
- Apply the cleaner with a soft, lint-free cloth. Avoid using gritty cloths.
- Always handle the touch screen with care. Do not pull on or stress cable.

Attaching the Touch Screen to the LCD Panel

Once you feel comfortable with the alignment and positioning of the touch screen, you are ready to permanently attach the touch screen to the LCD panel.

1. Use the recommended cleaner and a soft, lint-free cloth to clean the touch screen. Make sure the glass is clean and dry before you attach the touch screen.



2. Apply strips of the double-sided acrylic foam tape (3M VHB 4956) around the perimeter of the LCD panel. Refer to the *Mechanical Considerations* section in Chapter 2 for additional details.
3. Remove the paper backing from the double-sided tape on the LCD panel.
4. Hold the touch screen so the cable exits in the correct direction.
5. Attach the touch screen to the viewable area of the LCD panel with one smooth motion.

Inspect the Mounted Touch Screen

After you mount the touch screen to the LCD panel, inspect your results carefully and check that the touch screen is installed properly.

1. Set the LCD panel in its standard upright position.
2. Look at the front of the LCD panel, and ensure the touch screen cable exits from the correct location. Make sure you put the touch screen on right side up.
3. Check for proper alignment. Make sure the touch screen is not off-center or crooked. If the touch screen is not correctly aligned with the LCD panel, you must remove and remount the touch screen before you can continue with the installation.
4. Look for dirt or lint trapped between the LCD panel and the touch screen, as these particles will be visible later.

If any part of the inspection fails, you must remove and remount the touch screen.

Removing the Touch Screen (if necessary)

⚠ CAUTION
To reduce the risk of glass breakage which may result in minor or moderate injury: Do not try to pry the touch screen off the LCD panel if you need to remove the touch screen for servicing. You may break the glass and injure yourself or others.

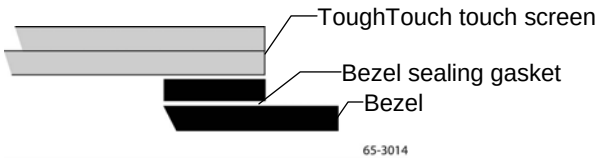
If you need to remove the touch screen, do not try to pry the touch screen off the LCD panel. You may break the glass and injure yourself or others.

1. Use a razor knife or a single-edge razor blade to carefully cut through the mounting tape.
   - Start at the top of the screen and work down the sides.
   - Be careful not to scratch the LCD panel or the touch screen.
   - Be sure to support the touch screen as it comes away from the LCD panel.
2. Use isopropyl alcohol to remove the foam tape and adhesive residue from the back of the touch screen. Be sure to follow solvent manufacturer's precautions and directions for use when using any solvents. Follow manufacturer's directions for suitable chemicals for your display.
3. Repeat the procedure for properly attaching the touch screen to the LCD panel.

Adding a Sealing Gasket to the Bezel

1. Place the bezel face down on an anti-static pad.
2. Use a die-cut gasket or cut strips of the closed cell, compressible foam sealing gasket tape to fit the inside edges of the bezel opening to form a **full perimeter** seal. To ensure tight fitting sealing joints, the gasket tape should be cut using a razor knife or single-edge razor blade.

   It is essential that the surface be clean and dry and free of grease or oils.



3. Remove the paper backing from the tape. Adhere a strip of gasket tape to each inside edge of the bezel opening. Align one edge of the gasket to the edge of the bezel opening. If the gasket overlaps the bezel edge, it will be visible from the front of the LCD. If the gasket is spaced away from the bezel edge, you will create a gap that can collect dust, liquids, etc.
4. Pay close attention to the bottom edge joints. Butt the gasket tape edges to create a tight fitting joint.

Reconnecting the System

1. Reconnect all wires, cables, and switches (if necessary).
2. Route the touch screen cable along the outside area of the chassis.
   a. Avoid contact with internal electronics that can affect the touch screen performance.
   b. Do not route the touch screen cable near the backlight inverter of the LCD panel.

CHAPTER 4

Installing the Touch Screen Controller

This chapter describes how to install the controller for your 3M Touch Systems touch screen. You may be using one of several EX II series controllers, refer to the appropriate *EX II Controller Reference Guide* for additional information on your specific controller. You may obtain a copy of these guides from the www.3Mtouch.com website under Technical Documents.

This chapter assumes you have already mounted the touch screen. For information on completing these procedures, refer to Chapters 2 & 3.

This chapter covers the following information:

- Mounting the controller
- Supplying power to the controller
- Connecting the controller to the computer

Types of Touch Screen Controllers

There are different 3M Touch Systems controllers that can be used to operate your touch screen. The most common types are the EX II 1700SC and EX II 7700SC series serial capacitive controllers, and the EX II 5700UC and EX II 7700UC series USB controllers. A short description of each of these is given below. Although the interface and form factor of each of these controllers is different, the functionality and installation procedure is the same.

	Large form factor	Small form factor
Serial	EX II 1700SC series	EX II 7700SC series
USB	EX II 5700UC series	EX II 7700UC series

Table 1. ToughTouch II Compatible Controllers

EX II 1700SC series	
Communications protocol	Serial RS-232
Documentation	EX II Serial Controller Reference Guide (29087)
Form factor	Cased: 3.75 in (95 mm) by 2.5 in (64 mm) by 0.84 in (21 mm)
	Uncased: 3.5 in (89 mm) by 2.25 in (57 mm) by 0.3 in (8 mm)
Touch screens supported	ToughTouch II screens with NOVRAM cable
Installation options	Internal (uncased) or external (cased)
EX II 5700UC series	
Communications protocol	USB 1.1 (USB 2.0 compatible)
Documentation	EX II USB Controller Reference Guide (29489)
Form factor	Cased: 3.75 in (95 mm) by 2.5 in (64 mm) by 0.84 in (21 mm)
	Uncased: 3.5 in (89 mm) by 2.25 in (57 mm) by 0.3 in (8 mm)
Touch screens supported	ToughTouch II screens with NOVRAM cable
Installation options	Internal (uncased) or external (cased)
EX II 7700SC series	
Communications protocol	Serial RS232
Documentation	EX II Serial Controller Reference Guide (29087)
Form factor	1.3 in (33 mm) by 2.44 in (62 mm) by 0.32 in (8.1 mm)
Touch Screens supported:	Standard ToughTouch II screens with Amp connectors
Installation options	Internal only
EX II 7700UC series	
Communications protocol	USB 1.1 (USB 2.0 compatible)
Documentation	EX II USB Controller Reference Guide (29489)
Form factor	1.3 in (33 mm) by 2.44 in (62 mm) by 0.32 in (8.1 mm)
Touch Screens supported	Standard ToughTouch II screens with Amp connectors
Installation options	Internal only

Disassembling the Chassis

1. Remove the screws securing the display control panel cover to the chassis. Be sure to save and label these screws for reassembly.
2. Take a moment to inspect the display's internal hardware before you disconnect any wires.
   a. Take a digital photo or note where each wire is attached and how each wire is routed.
   b. Label each wire. Labeling the wires makes reassembling easier.
   c. Most LCD display manufacturers connect the major components with detachable cables that have keyed connectors and labels. In addition, cables are of such lengths that they usually connect to only one place. However, not all displays

have easy and intuitive cable connections. When in doubt, make notes of all connection points.

Once the chassis has been disassembled, you can mount the controller and connect it to a sufficient power source following the instructions below for powering the controller either internally or externally.

Mounting the Touch Screen Controller Internally

Mounting the controller inside the display housing results in a neater, cleaner finish but requires internal space. Before you begin, make sure that there is sufficient room for the controller board inside the chassis.

Find an appropriate location for mounting the controller taking into consideration electrically sensitive connections while still following appropriate grounding rules. It may be easier to use external mounting points rather than mount to the chassis itself.

Care must also be taken when attaching the controller board internally, as the boards can short out if they are not attached properly. Additional space will also be needed between the controller board and the metal shield to prevent shorting of the board.

Figure 1. EX II 1700 and 5700 Dimensions

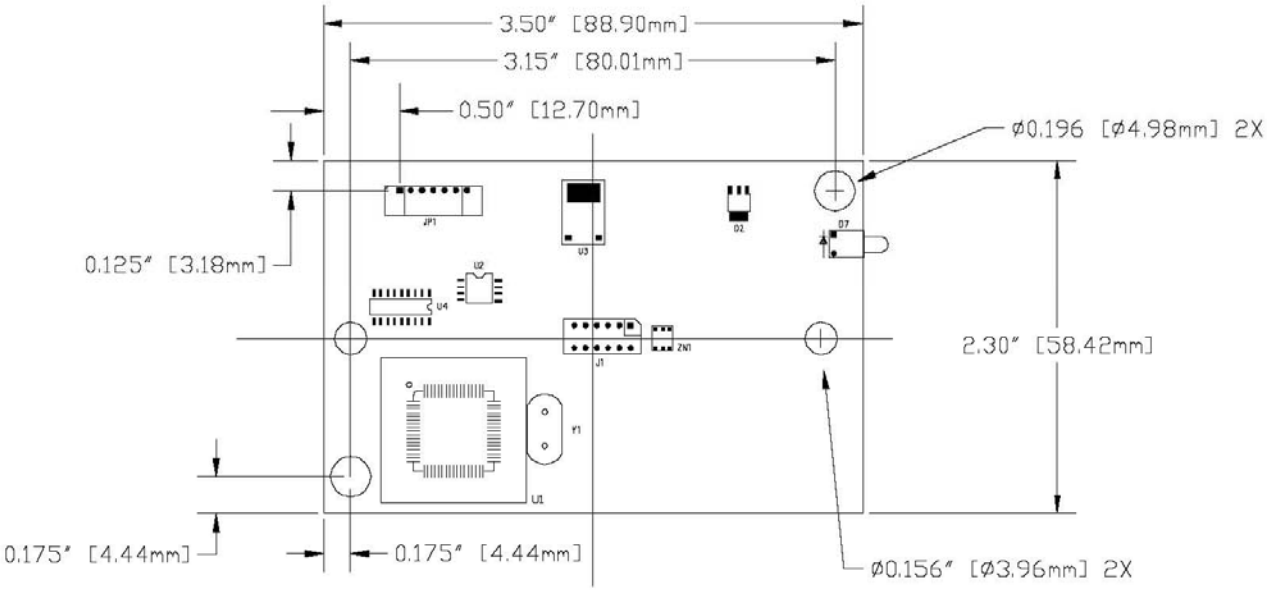
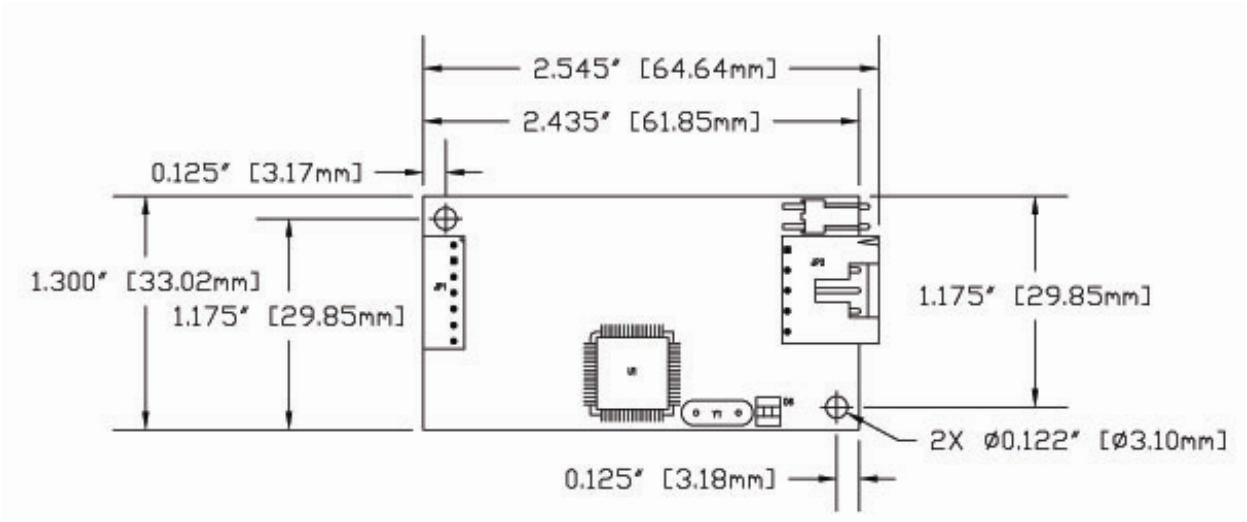


Figure 2. EX II 7700 Dimensions



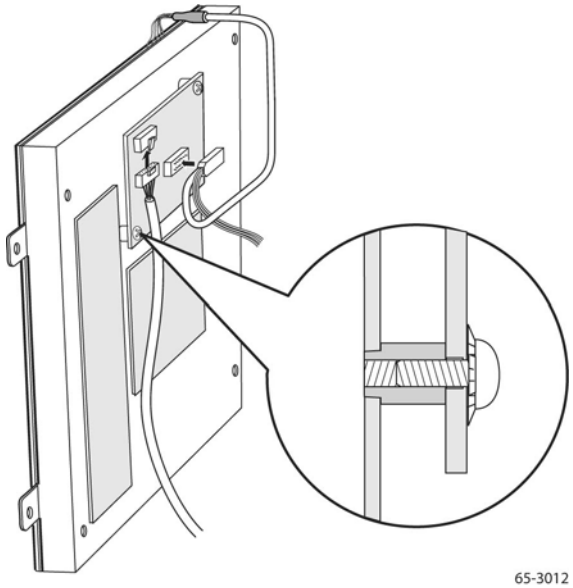
Completing Controller Mounting

Note: The method and location selected in mounting a touch screen controller internally is dependent on the mechanical design and assembly of the LCD display being integrated. There may be several alternatives to integrating the controller. The following illustrates one mounting method that may work for some LCD display products.

In order to mount the controller board to the housing, two holes must be drilled.

1. Mount the uncased controller board to the housing using two metal screws.
2. Insert a spacer between the controller board and the metal shield as shown in the following diagram. These spacers will prevent the board from shorting out.

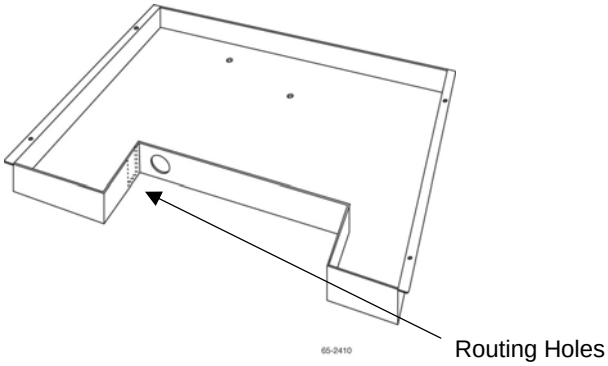
Note: Ensure that the two controller mounting holes are connected to the chassis ground of the LCD display.



3. Plug the touch screen cable into the controller board, making sure that the pins are oriented in the correct direction.

With the controller board properly mounted, all cables connected, and excess wiring cable-tied, the metal shield can be attached.

As mentioned earlier, it may be necessary to make changes to the metal shield and the rear display housing to accommodate the touch screen cable. Usually it is necessary to make a hole in the shield and the housing so that the touch screen cable can be routed through, however some models may have an existing opening that can be used.



With a sufficient opening, the touch screen cable can be fed through and the metal shield reattached.

Note: If a hole is drilled in the metal shield to accommodate the touch screen cable, be sure to fold back the edges or install a grommet so that the cable does not fray on the sharp edges.

Note: When routing the touch screen cable through the metal shield and rear display cover, be careful to avoid the inverter and other high noise sources.

Powering the Touch Screen Controller

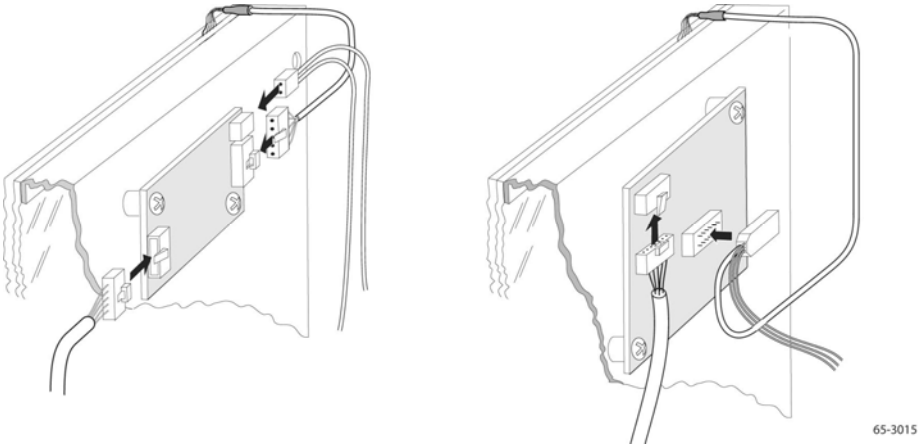
After deciding where to mount the touch screen controller, it is necessary to determine how the touch screen controller will be powered. As mentioned in the previous section, each type of controller requires a different power source.

Table 2. Serial Controllers

EX II 1700SC series	
Internal power option	Power input contacts: Orange, green and gray wires attached to the touch screen cable connector.
Connections (NOVRAM):	Green/yellow: Chassis ground Grey: GND RTN Orange: 12VDC
External power option (RS-232 Power Plug)	Power input contacts: Auxiliary plug on the RS-232 connector of controller cable. Refer to the controller reference guide for external power options.
Connections:	Green/yellow: Chassis ground Grey: cut and insulate, do not use in conjunction with RS-232 Power Plug Orange: cut and insulate, do not use in conjunction with RS-232 Power Plug
EX II 7700SC series	
Internal power option	Power input location: Two pin connector on controller board adjacent to touch screen connector
Connections (2-pin power):	Pin 1: GND RTN Pin 2: 5VDC to 12VDC
External power option	Power input locations: Auxiliary plug on the RS-232 connector of controller cable. Refer to the controller reference guide for external power options.
Connections:	None required Controller must be properly grounded through the mounting holes.

Table 3. USB Controllers

EX II 5700UC series	
USB Bus Power option	Power input from USB connection to PC
Connections (NOVRAM):	Green/yellow: Chassis ground Grey and Orange: Insulated with no electrical connection
EX II 7700UC series	
Bus Power option	Power input contacts: Use connection to PC
Connections:	None required Controller must be properly grounded through the mounting holes.



Locating Power for the Touch Screen Controller

If you have chosen to power your controller internally, you need to tap a power source within the display. It is helpful to locate this power source before beginning the controller installation. A multi-meter or the display schematic can be used to locate an appropriate power source on the display's main board.

The power source must meet the following requirements:

- Minimum current supplied: 100mA
- Maximum voltage drop allowed: 100 mV

To determine the display's voltage drop at the power source conduct the following test:

1. Measure voltage across the power source contacts
2. Connect touch screen to controller, and controller to power source.
3. Power up the display and allow it to warm up for at least 10 minutes
4. Measure voltage across the power source again

The difference in voltages before and after the wires were connected cannot exceed 100 mV. If this voltage drop is exceeded, you must find a different tap point location.

Using Your 3M Touch Systems Touch Screen

Installing Touch Screen Software

Both MT 7 and TouchWare software include the touch screen driver and control panel that enables your touch screen to work with your computer. When you install this software, the correct driver for your system will automatically load. 3M Touch Systems currently supports touch screen drivers for the following PC operating systems:

- Microsoft® Windows® Vista
- Microsoft® Windows® 2000
- Microsoft® Windows® XP
- Microsoft® Windows® XP embedded
- Linux® (Kernel 2.4, 2.6)
- Microsoft® Windows® CE 4 and 5

These drivers, as well as relevant technical documentation and legacy drivers, can be found on the web at www.3Mtouch.com. After the software is installed, restart your computer to load and activate the touch screen driver. To complete the setup of your touch monitor, make sure you calibrate the touch screen.

Refer to the *MicroTouch™ MT 7 User Guide* for additional information.

Regulatory Requirements

This product, when installed to our specifications, can meet the following regulatory compliance standards.

- CE Compliance
- EMC Emissions – EN 55022:1998
- EMC Immunity – EN 55024:1998
    - ESD Susceptibility – IEC 61000-4-2
    - EMI Immunity – IEC 61000-4-3
    - Burst Immunity – IEC 61000-4-4
- FCC Class B / CISPR22 Class B
- VCCI Class B ITE Emissions (Japan)
- AS/NZS 3548:1995/CISPR 22 Class B ITE Emissions (Aus.)
- UL/cUL (EN 60950)