



MicroTouch™ ClearTek™ II Integration Guide

3M Touch Systems

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

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About This Manual

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

The ClearTek™ II touch screen, 3M Touch System's innovative design for flat capacitive touch screens, incorporates advanced production techniques that result in high quality capacitive touch screens. The ClearTek™ II touch screen's sleek design provides easy installation in LCD displays. The clear border and wide viewing area, combined with durability, reliability, high transmission, and superior optical clarity, make the ClearTek™ II touch screen the ideal choice for all your touch applications.

ClearTek™ II touch screens are available in a variety of sizes, for use on a variety of displays. These touch screens come in three different configurations:

- With a 5-pin connector to attach to an EX II 7700 series controller;
- Mated with an EX II 7700 series controller;
- With a 12-pin connector for EX II 1700 and EX II 5700 series controllers.

Each ClearTek™ II touch 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.

What You Need to Know

WARNING

To avoid the risk of electric shock 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.

This manual describes how to complete the following tasks:

- Disassemble your display (if necessary)
- Mount the touch screen to the LCD panel
- Install the touch screen controller

Important Safety Information

Read and understand 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™ ClearTek™ II Integration Guide* is intended to instruct and guide you in the integration of a ClearTek™ II touch screen into an existing flat screen display. This manual provides specific instructions for an LCD panel with chassis attached to the front bezel, but these same steps apply to the majority of integrations. These touch screens are intended for indoor use only and are not designed for use in hazardous locations.

Explanation of Signal Word Consequences

 **DANGER:** Indicates a potentially hazardous situation, which, if not avoided, will result in death or serious injury and/or property damage.

 **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.

DANGER

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

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

⚠ WARNING

To avoid the risk of electric shock 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.

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

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

⚠ CAUTION

To reduce the risks associated with improper disposal, which if not avoided may result in minor or moderate injury from ground water contamination:

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

⚠ CAUTION

To avoid the risk of glass breakage which may result in minor or moderate injury:

- Handle the touch screens with care to avoid breaking the glass. Be aware of cracked or broken touch screens with sharp edges.
- If you need to remove the touch screen for servicing, do not try to pry the touch screen off the LCD panel. You may break the glass and injure yourself or others.

To avoid the risk of electric shock which may result in minor or moderate injury:

- Do not service the monitor.
- Do not use non-conforming replacement parts.
- Do not place wet or damp objects on the monitor.
- Do not expose the monitor to rain or other sources of water, steam, or moisture.
- Do not place foreign objects on the monitor or its cables.

To avoid 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 manufacturer's Material Safety Data Sheet and product label.

To avoid possible environmental contamination which may result in minor or moderate injury:

- Dispose of the monitor according to applicable governmental regulations.

Explanation of Symbols



Attention: Read accompanying documentation

Important Notes for Video Displays

- Plug power cord into an appropriate power source.
- Plug power cord into a grounded receptacle.
- When unplugging power supply cord, pull on plug, not 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 contact the touch screen.
- To avoid ergonomic concerns:
Do not install the monitor 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.

3M Touch Systems Support Services

3M Touch Systems 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 found on our website at: <http://www.3Mtouch.com/>.

CHAPTER 1

Getting Started

The 3M Touch Systems touch screen is the most intuitive interface available for the PC today. Touch screens make using computers as simple as touching the screen. To begin installing your 3M Touch Systems touch screen, take a few minutes to review this chapter. It is your roadmap to a successful installation. This manual describes how to retrofit an LCD display with a touch screen. However, the principles apply equally well to larger systems integrated with touch screens at an OEM level.

- Pay close attention to the installation warnings and safety precautions. 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 Warnings and Safety Precautions

3M Touch Systems recommends that only qualified display technicians install the touch screen for the following reasons:

- Due to the risk of injuring yourself
- Due to the danger of hazardous voltages present in the display
- Due to the risk of accidentally damaging the touch screen
- Due to the risk of altering the LCD's critical circuits

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 warnings.
- 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 CE 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 (coffee cups)
- Electrical tape (or black acetate tape)
- Clean soft cloth and glass 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
- Clean, anti-static pad
- Foam pad (optional)
- Felt-tip marker pen
- Cable tie-wraps
- Lead-free solder (RoHS compliant)
- Sealing tape – Flat, closed-cell foam (single sided adhesive)
- Mounting tape -- closed cell acrylic foam 3M VHB 4956 (double sided adhesive)

Tools Needed

- Flat-blade screwdriver with insulated handle
- 3 ft (1 m) insulated wire with alligator clips at each end
- Razor knife or single-edge razor blade
- Power drill
- Wire stripper
- Compressed air (optional)
- Phillips-head screwdriver
- Soldering iron
- 3/32-inch (3 mm) insulating tubing (or electrical tape)
- Center punch
- Variety of drill, tap, and spade bits
- 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 three square feet. 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.

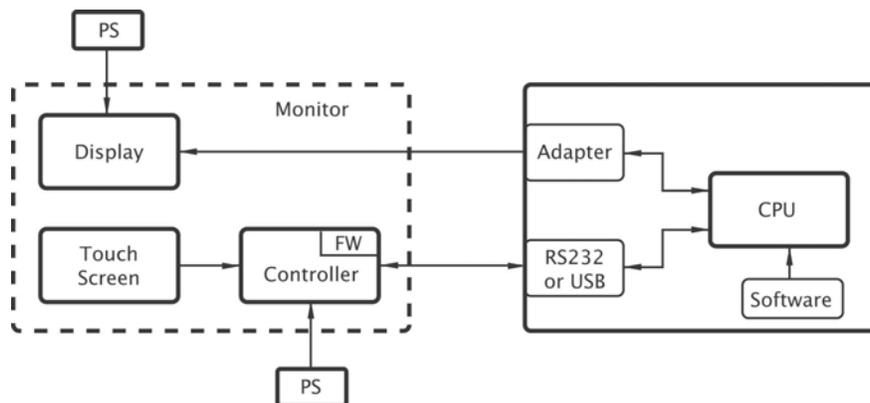
Small Containers

Have several small containers (such as coffee 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



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The following components are needed for a successful integration:

- A ClearTek™ II touch screen
- An EX II touch screen controller
- A serial cable (7310101) or USB cable (7312256)
- Software and technical documentation found on the 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, 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.

Optional Power Supply for a Serial Controller

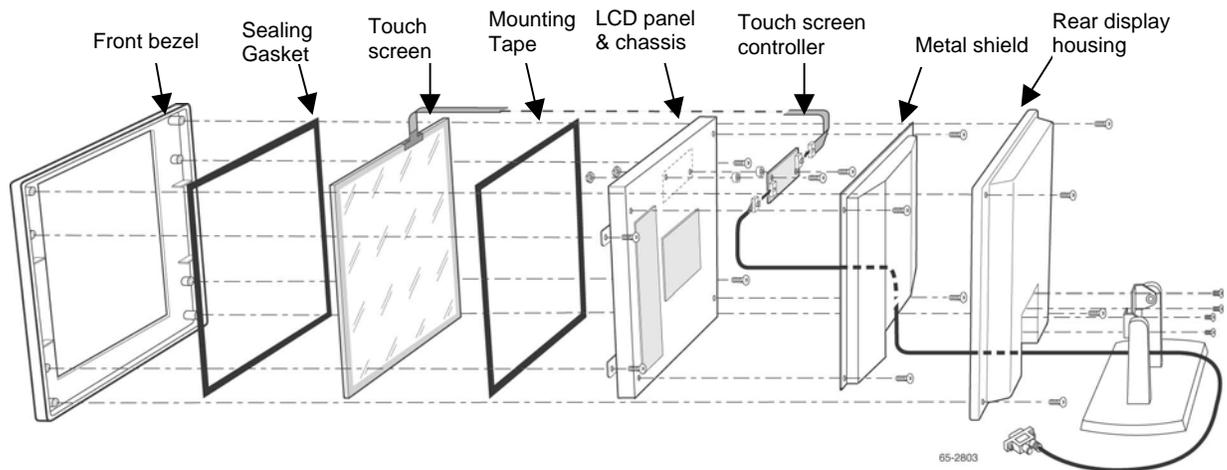
If you are using a serial controller, you may need some additional equipment depending on power and port requirements. Serial controllers include the EX II 1700SC series and EX II 7700SC series controllers.

When installing a serial controller, you must supply power to the controller. You can use internal power (using the NOVRAM cable orange/grey/green power wires tap power from inside the display) or use external power. If you decide to use external power, you will need a power supply. If you are using a standard 3M Touch Systems RS-232 serial cable (P/N 7310101), or a cased EX II 1700SC controller, consult your applications engineer for power supply specifications. For countries that use a 230/240-volt main system, it may be necessary to purchase a power supply locally.

For the EX II 7700 you can supply internal power +5V to +12 VDC through the 2-pin power input connector pin 2 (+5V to 12 V) and pin 1 (RTN). A square pin indicator on the bottom of the board marks pin 1.

Details on the power requirements of the EX II series controllers can be found in the *EX II Serial Controller Reference* manual available at <http://www.3mtouch.com/>.

Summary of the Installation Procedure



You can install a 3M Touch Systems touch screen on most displays. Although each particular display may have some unique integration considerations, the basic installation process consists of the following steps:

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

CHAPTER 2

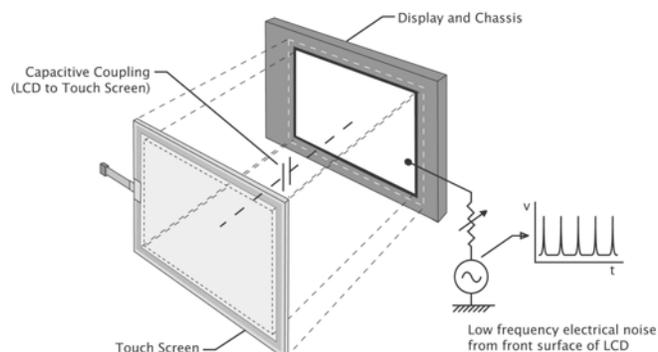
Touch Screen Design Considerations

Design Considerations

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

Standard ClearTek 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 *EX II Controller Reference Guide* for how to select signal frequency for best EMI rejection.

Electrical Considerations



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EMI and Shielding

The front surfaces of 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.

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

CRTs

ClearTek 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 capacitive coupled noise and from charge build-up.



CAUTION

To avoid 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 warranted by 3M Touch Systems.

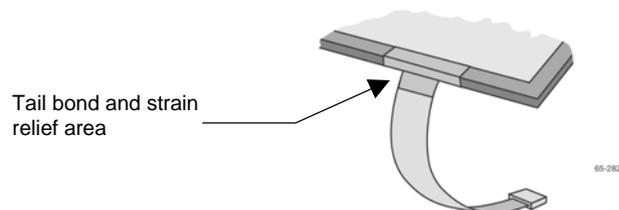
Mechanical Considerations

Tail Routing

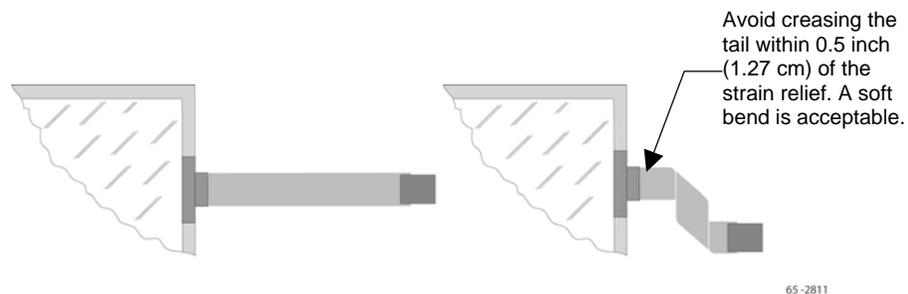
To minimize the risk of electromagnetic interference, never run the touch screen tail near or over the LCD backlight inverter. Although the tail is shielded, the noise generated by an inverter is broadband and can contain frequencies close to the signal frequency.

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

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



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



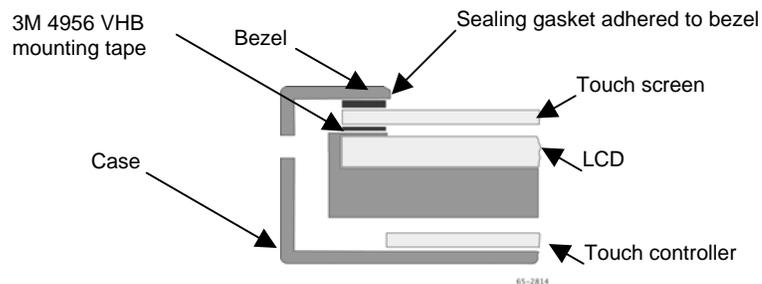
The touch screen tail is designed to be flexible, and it may be creased *once in a single direction*, in multiple locations along the tail and then secured in position with a light adhesive tape. Avoid angular creases (45°) to the tail directly in the area of the bond and tape strain relief.

The touch screen tail should not move freely after assembly. Apply tape or another light adhesive to secure the tail in a manner that does not apply stress to the tail.

Apply tape or other insulating material to sharp edges to protect the tail. Route the cable away from sharp edges whenever possible.

Sealing Gasket to Bezel

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 contact the touch screen perimeter to ensure a good seal without interfering with the viewing area. Do not adhere the gasket to the touch screen surface.



The compression should be evenly distributed to 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.

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 elements.

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.

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 strongly recommend using 3M brand 4956, 4956F, or 4979F tape for this purpose. Failure to mount the touch screen in this fashion may result in reduced accuracy.

Note: 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 1.8×10^{-4} 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.

Caution: The gasket tape should have a minimum thickness of 1/16 inch (1.587 mm). Avoid using thinner tapes. If thicker tape is needed, it is okay to double the recommended VHB tape. Do NOT use highly compressible tapes.

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 whenever 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. 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.

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.

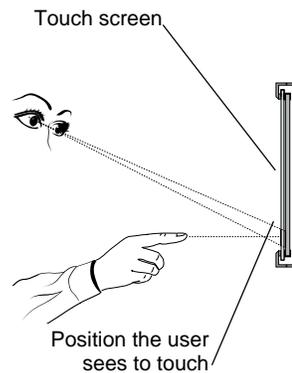
Consider using high brightness displays for better readability in bright ambient light conditions. Remember that sunlight comes in at different angles throughout the year. What might not be a problem in the summer could be an issue in winter.

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

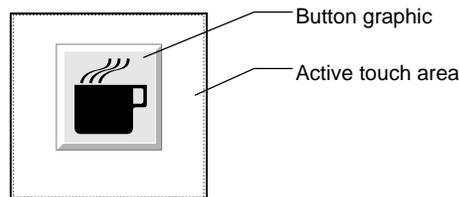
Designing Software Applications

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.

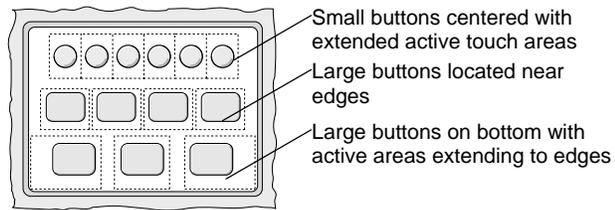
Parallax, the effect of a target object appearing in different positions when looked at from different angles, is a common problem in many computer applications. The combination of the touch screen in front of the display and differing heights of users can cause parallax. When designing your touch system 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 work with a single touch to activate rather than a double-touch.

CHAPTER 3

Installing a 3M Touch Systems Touch Screen

This chapter describes how to install a 3M Touch Systems 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. Plan ahead to ensure a successful installation. To summarize:

- Before installing the touch screen, be sure to account for the space needed by the touch screen and its flex tail.
- Assure that the integration design does not subject the flex tail bond area to pinch points and/or mechanical stresses.
- When installing the touch screen, be careful not to route the touch screen flex tail 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 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 tail is designed to be flexible, and it may be creased *once in a single direction*, in multiple locations along the tail and then 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.
- Perform a bench test of the hardware to ensure functionality before you start.

Disassembling the Display

The process of disassembling the display is slightly different depending on the model of monitor; however, the components within the display housing are equivalent.

Note: This manual assumes that you have an LCD panel with chassis that are attached to the front bezel, but since the internal components of most assemblies are basically the same, these same steps are applicable to all flat display installations.

Disconnecting the Power and Removing the Pedestal

Most displays consist of a flat panel supported by a pedestal. The pedestal may house the wiring for the display. Before the display casing can be disassembled, the power must be disconnected and the pedestal removed.

1. Look at the front of the display. Some displays have a small door that hides the brightness and contrast controls. It is a good idea to tape this door closed to prevent damage when handling the bezel.
2. Gently place the display face down on a foam pad or other scratch resistant surface so that the rear of the display and pedestal are accessible.
3. Disconnect the power and video cables attached to the rear of the display housing. These cables may run through the pedestal where they connect to the base of the display.
4. Remove the screws securing the pedestal to the display. Be sure to label these for re-assembly.
5. Remove the pedestal and set aside.

Removing the Display Housing

1. Place the display face down on a clean, anti-static pad. Remove the screws that secure the rear housing to the display, being sure to label them and set them aside.

Note: The way in which the rear housing is attached to the display varies from model to model. LCD display manufacturers may use screws, quick-release latches, clips, or release buttons.

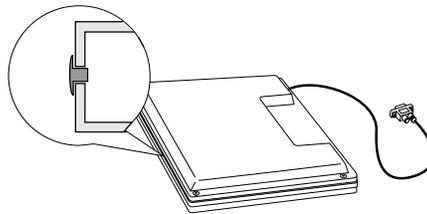
2. Lift off the rear housing to expose the display chassis. Remove any screws holding optional accessories (such as speakers or control buttons).
3. Remove the screws that secure the chassis to the front bezel. Carefully lift the chassis off the front bezel and set the bezel aside.

Fitting the Touch Screen

The sealing gasket and mounting tape add approximately 1/16 to 1/8 inch (1.587 to 3.175 mm) and the touch screen adds approximately 1/8 inch (3.175 mm) to the thickness of the display assembly. You will need to make sure there is enough space to reassemble the display once the gasket, tape, and touch screen are fully integrated.

Checking for Adequate Space

1. Inspect the inside of the rear display cover.
2. Note the clearance between the inside surface of the rear cover and the rear of the LCD panel or chassis. You may be able to look through the vents and openings in the cover to check the available space.
3. You must be able to move the LCD panel or chassis about 3/16 inches (4.7 mm) into the rear of the housing. If there is not enough space, you may not be able to reassemble the display once the touch screen is installed. Here are a few solutions:
 - a. You can trim some plastic sections from inside the housing making sure you do not compromise the mechanical integrity of the display.
 - b. You can reassemble with a gap between front and back housings. This gap is a result of the thickness added by the touch screen. For aesthetic purposes, a plastic “belly band” can be inserted in the gap. This band is a T-shaped strip (usually made of Teflon) that fills in the gap and smoothes the edge.



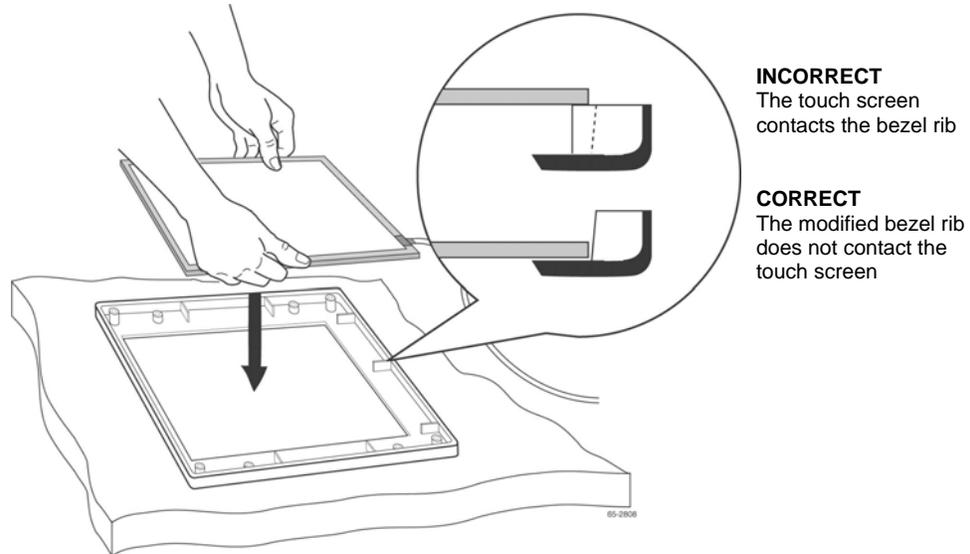
Modifying the Bezel

You now need to determine if the sealing gasket and touch screen fit into the bezel. If necessary, you must trim the ribs and fins on the bezel that are in direct contact with the touch screen or the touch screen cable.

Note: When trimming the bezel, make sure you do not compromise the mechanical integrity of the display.

1. Place the bezel face down on an anti-static pad. Be sure to orient the top of the bezel closest to you.
2. Place the touch screen face down against the inside of the bezel opening. Be sure to orient the touch screen so the flex tail exits from the correct side of the bezel. Refer to the mechanical drawing of the touch screen for details of your specific touch screen.
3. Align and center the viewing area of the touch screen. Make sure the limits of the viewing area do not extend into the bezel opening.

4. Note the ribs and fins of the bezel that are in direct contact with the touch screen. Pay particular attention to the corners as well as the area where the flex tail exits from the touch screen.



5. Carefully cut out a notch in each rib and cut back each fin that contacts the touch screen.
 - Make sure you remove only enough material to facilitate the installation of the sealing gasket and touch screen.
 - Make sure you clean any excess material or shavings from the cutout area.
 - Make sure you preserve the structural integrity in the rest of the rib area.



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 above. 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.



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Caution: The tape should have a minimum thickness of 1/16 inch (1.587 mm). Avoid using thinner tapes. 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. 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 flex tail exits from the correct location. If you are unsure of the correct positioning, contact your customer service representative to request a detailed drawing.

Note: The touch screen tail is designed to be flexible, and it may be creased *once in a single direction*, in multiple locations along the tail and then secured in position with a light adhesive tape. Tail bond should not be placed under mechanical stress. Refer to *Tail Routing* in Chapter 2.

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 avoid 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 manufacturer's Material Safety Data Sheet and product label.

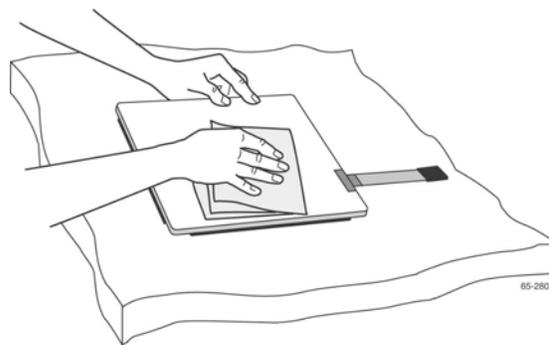
Typically, an isopropyl alcohol and water solution ratio of 50:50 is the best cleaning agent for your touch screen. You can also use straight isopropyl alcohol. In addition, 3M Touch Screen Cleaner CL680 has been tested and approved for this use. Be sure to follow solvent manufacturer's precautions and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

- It is important to avoid using any corrosive chemicals on the touch screen. Do not use any vinegar-based solutions.
- 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 flex tail.

Attaching the Touch Screen to the LCD Panel

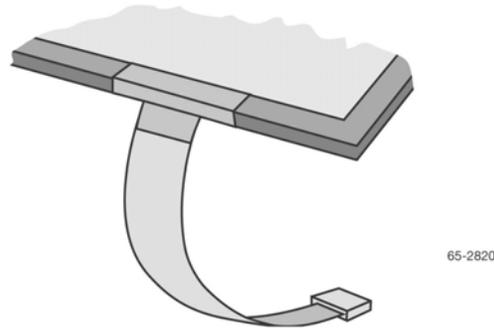
Once you feel comfortable with the alignment and positioning of the touch screen, you are ready to permanently attach the touch screen to the LCD panel.

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.

Note: To distinguish the front surface of the touch screen, understand that the printed frit pattern and the touch screen tail connection are on top. The tail is bent and exits from the back surface of the touch screen.



3. Remove the paper backing from the double-sided tape on the LCD panel.
4. Hold the touch screen so the flex tail exits from the correct location.
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 flex tail exits from the correct location.
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.

Repair or Removing the Touch Screen (if needed)



CAUTION

To avoid 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. 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.

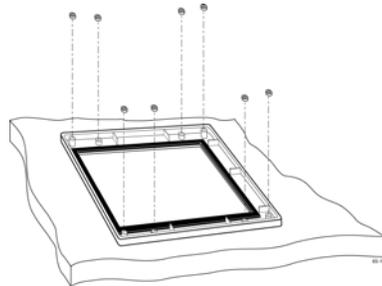
Adding Spacers to the Bezel

You may need to insert nylon spacers and washers over each bezel post to accommodate the additional space of the sealing gasket and touch screen. The spacers provide safety clearance for the touch screen and prevent conductive materials on the bezel from contacting the touch screen. **Do not omit these spacers and washers.**

You need to determine the correct amount of space to add to the bezel. At a minimum, you must add enough space to adjust for the thickness of the touch screen, the mounting tape on the back of the touch screen and the gasket seal.

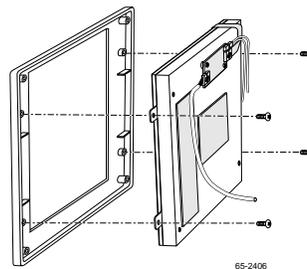
Following is an example of adding spacers to the bezel to accommodate the extra space created by the touch screen. In this example, assume a sealing gasket, mounting tape, and a touch screen.

1. Insert a temporary post, such as a cable tie-wrap or toothpick, in each bezel hole.
2. Place an insulating nylon spacer over each temporary post. The size of this spacer will compensate for the thickness added by the sealing gasket, mounting tape, and touch screen. The size of your spacer may be different to provide additional spacing and support.



3. Align the screw holes (or tabs) over the temporary post. Each LCD hole/tab must rest on top of the spacer and washer above the bezel screw hole.
4. Adjust the LCD panel so that it is centered in the bezel and remove the temporary posts.
5. Select a replacement screw for the factory-installed bezel screws. 3M Touch Systems recommends that you replace the factory LCD panel screws with longer screws to accommodate the sealing gasket and touch screen thickness and prevent the glass from breaking by forcing too short screws to work.

The replacement screws should be the same type and size as the factory screws, but 3/16-inch to 1/4-inch (4.76 to 6.35 mm) longer. The size depends on the amount of space you added between the bezel and LCD panel.



6. Install the replacement screws as follows:
 - a. Thread the screws into the holes that connect the LCD to the bezel.
 - b. Work diagonally from one corner to the opposite corner.
 - c. Do not over-tighten any one side or corner. Pressure should be evenly distributed across the touch screen.
 - d. You must be able to complete at least three full turns of the screw into the original threads.
 - e. If you install the screws correctly, the screws should be seated properly and be a little tighter than finger tight. A close fit will prevent liquids and/or particles from damaging the internal electronics, however, the screws should not be so tight that they add stress to the LCD panel or the touch screen. If the bezel starts to warp when you tighten the screws, stop and loosen the screws.

Inspect the Attached LCD Panel and Bezel

Once you attach the LCD panel and the bezel, inspect your results as follows:

- Check the front of the assembly for proper alignment and adjust if necessary.
- Check that each bezel screw is seated properly and a little tighter than finger tight. The screws should not be so tight that they add stress to the LCD panel. If the bezel is warped, loosen the screws.

Note: If the screws are too tight, you may damage the touch screen, damage the LCD panel, or bore right through the bezel.

- Adjust the spacers or screws to get a secure attachment to the bezel without squeezing too tightly. Make sure the bezel ribs and fins do not contact the touch screen at any point. If necessary, remove the bezel and trim the ribs and fins. For more information, refer to *Fitting the Touch Screen* earlier in this chapter.

Reconnecting the Bezel and Chassis

1. Reconnect all wires, cables, and switches.
2. Lay the touch screen flex tail 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 flex tail 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 disassembled the display and mounted the touch screen to the front of the LCD panel. 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. ClearTek 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	ClearTek II touch screens with NOVRAM cable adapters
Installation options	Internal (uncased) or external (cased)
EX II 5700UC series	
Communications protocol	USB 1.1
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	ClearTek II touch screens with NOVRAM cable adapters
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 ClearTek II touch screens
Installation options	Internal only
EX II 7700UC series	
Communications protocol	USB 1.1
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 ClearTek II touch screens
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. 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.

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

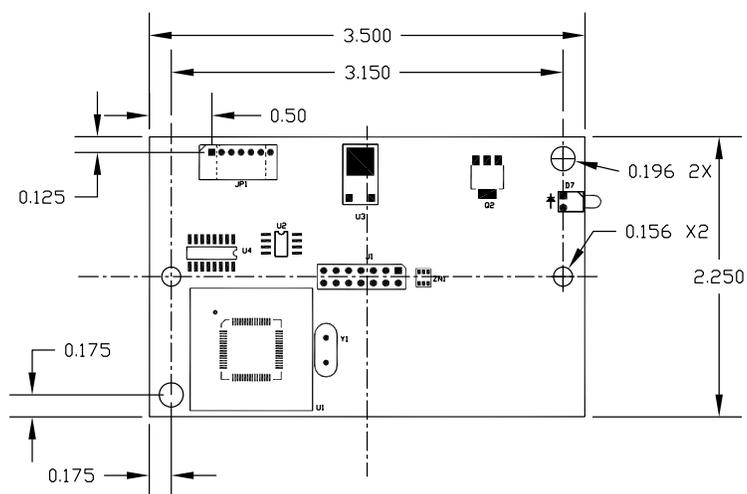
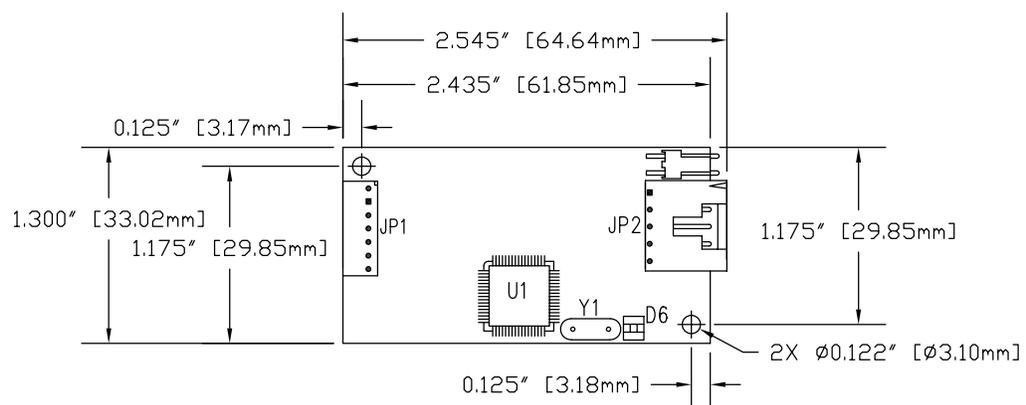


Figure 2. EX II 7700 Dimensions



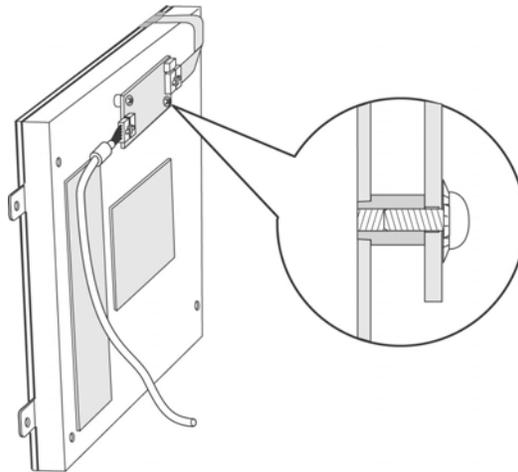
Completing Controller Mounting

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.

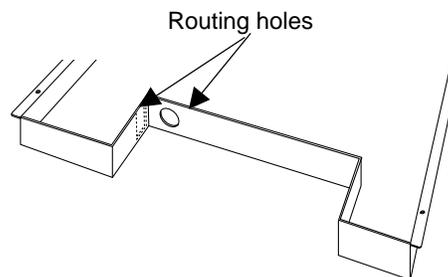


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3. Plug the touch screen cable into the controller board, making sure that the pins are oriented in the correct direction.

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

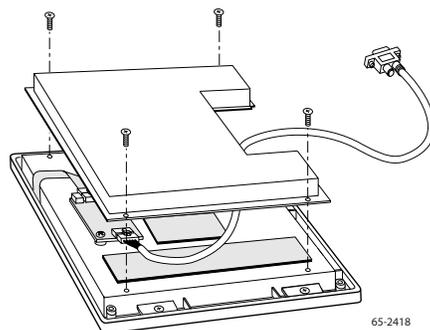
As mentioned earlier, it may be necessary to make changes to the metal shield and the rear display housing to accommodate the touch screen cable. Usually it is necessary to make a hole in the shield and the housing so that the touch screen cable can be routed through, however some models may have an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



65-2410

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

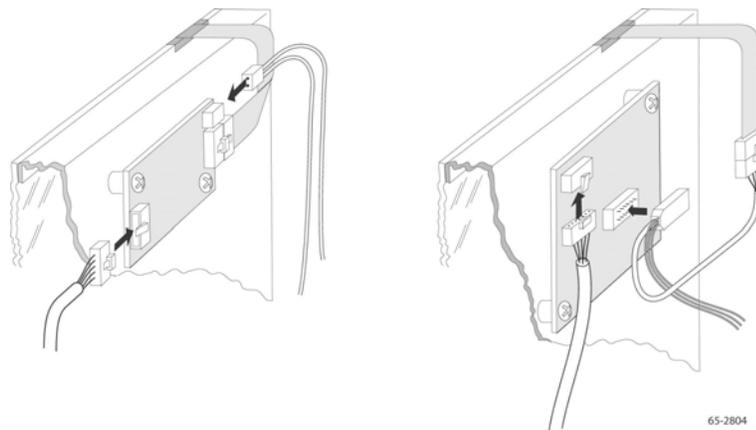
After deciding where to mount the touch screen controller, it is necessary to determine how the touch screen controller will be powered. As mentioned in the previous section, each type of controller requires a different power source.

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.
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.
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

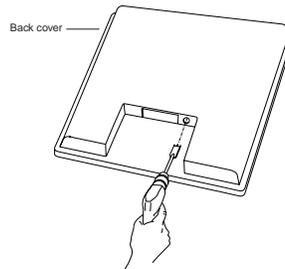
To determine the display's voltage drop at the power source conduct the following test:

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.

Modifying the Display for the Controller Cable

1. Select a location on the rear of the display's cover for the controller cable. You need to be able to thread the cable from outside the display in through the opening.
2. Use a center punch to place a dimple at the selected location.
3. Drill a hole using a 3/4-inch spade bit as shown below.



Installing the Controller Cable Grommet

You will also need a grommet to place around the controller cable. The grommet seals the opening between the cable and the display cover.

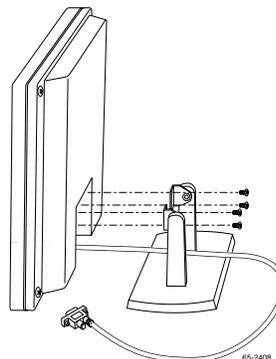
Attach the grommet around the controller cable. Carefully insert the grommet into the mounting hole using a blunt tool.

Reassembling the LCD Panel and Display Cover

Once you drill the holes in the display cover for the touch screen controller cable, you are ready to reassemble the display.

1. Check the LCD panel mounting for proper adjustment. Make sure all wires are properly attached, including the touch screen's green wire to the chassis ground.

Check for video and power cables that originate inside the display. If these cables exist, be sure to thread them through the appropriate opening in the display cover. These will be reconnected through the pedestal.



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

2. Align the display cover for reattachment to the chassis and thread the controller cable through the hole.

3. Remount the cover to the chassis assembly and attach the housing screws you removed when you disassembled the display or use new longer screws as required.

Note: Do not tighten the screws beyond the “just tight” position. Nylon threads strip easily.

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® 2000
- Microsoft® Windows® XP
- Microsoft® Windows® XP embedded
- Linux® (Kernel 2.4, 2.6)
- Microsoft® Windows® CE
- Microsoft® Windows® Windows NT 4.0
- Microsoft® Windows® Windows 9x
- Microsoft® Windows® Windows Me

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.

Calibrating the Touch Screen

After you connect your touch monitor and install our software, you must calibrate the touch screen. *Calibration* serves two purposes:

- Sets the active area of the touch screen
- Aligns the touch screen’s active area to the underlying video

To calibrate the touch screen, open the touch screen control panel and select Calibrate. Follow the directions displayed on the screen. For more information on calibration, refer to the online help or the technical user documentation.