3M

MicroTouch Flat Capacitive 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 touch screen and welcome to the world of 3M Touch Systems — a world where using a computer is as simple as touching the screen.

Touch screens are available in a variety of sizes, for use on a variety of displays. Flat touch screens come in two different configurations. One is the standard touch screen with a wire harness and a NOVRAM connector. The other is the Profile design with a 5-pin connector from a flat flex tail.

Each touch screen requires a touch screen controller. A variety of 3M Touch Systems touch screen controllers (serial, USB, and TouchPen™) are available for most PC platforms. These controllers come in different form factors and may come cased or uncased, refer to the appropriate *Controller Reference Guide* for more information on your controller. Technical documentation is available on the Touch Solutions CD (19-640) or from the 3M Touch Systems website http://www.3Mtouch.com/.

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 Capacitive Integration Guide* is intended to instruct and guide you in the integration of a 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.

⚠ 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 standards 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.
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 sensors 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.
• The anode cap output is at high voltage.
• 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 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 Monitors

- Plug power cord into 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 any metal enclosure or bezel does 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:

- Part number and serial number from your monitor

- 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. Limited call back service Saturdays and Sundays.

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

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CHAPTER 1

Getting Started

The 3M Touch Systems touch screen is the most intuitive pointing device 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.

- 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. You will need a collection of supplies and tools that are detailed below.

- Set up a clean, comfortable and spacious working area. Having sufficient room to work makes the installation easier.

- Test your display before you install the touch screen. You do not want to install the touch screen on a display that is not in good working condition.

- Identify the different components to be installed 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 delicate alignment of the display

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 EMC regulations.

Supplies and Tools Needed for the Installation

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

Supplies You Need

- Safety glasses
- Small containers for holding loose parts
- 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
- Nylon spacers and washers

- Clean, anti-static pad
- Foam pad (optional)
- Felt-tip pen
- Cable tie-wraps
- Solder
- Sealing gasket material -- both single-sided, closed cell foam tape and double-sided, open cell foam tape
- Ring lugs

Tools You Need

- 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 strippers
- Compressed air (optional)

- Phillips-head screwdriver
- Soldering iron
- 3/32-inch (3 mm) shrink tubing (or electrical tape)
- Center punch
- Variety of drill, tap, and spade bits
- Crimping tool
- Dremel tool or nibbler

Preparing Your Work Space

Comfortable Working Area

Select a comfortable working 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 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 some anti-static protective material on the work surface. A padded surface protects equipment from scratches during installation.

Small Containers

Have several small containers 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.

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.

Identifying the Components of the Touch Screen Installation

The following components are necessary for installing the touch screen and controller.

- A touch screen with a cable or flex tail attached
- A touch screen controller
- A serial cable or USB cable
- Touch Solutions CD-ROM (includes software and documentation) 3M Touch Systems provides one copy of the Touch Solutions CD (19-640) per monitor order. You may purchase additional copies through your sales representative.
- (For TouchPen™ systems) A TouchPen™ stylus with a cable attached

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

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 1000SC series and EX II 7000SC controllers.

When installing a serial controller, you must supply power to the controller. You can use internal power (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), you can use a 120-volt wall-mount power supply (P/N 19-408).

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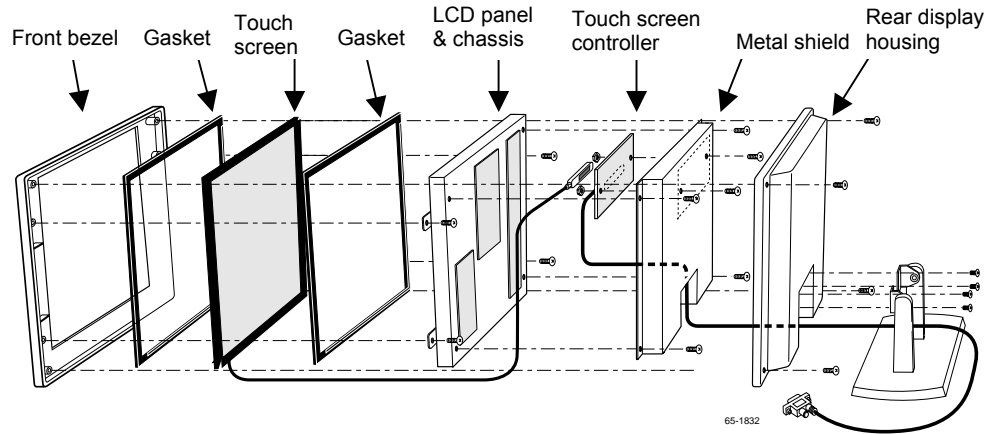
You can install a 3M Touch Systems touch screen on most displays. Although each particular display may have some unique integration issues, the basic installation process consists of the following steps:

- 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

Note: 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, polyethylene, closed cell gasket applied around the perimeter of the touch screen and bezel. We recommend using non-acidic, neutral pH 3M brand tapes to bond and seal your bezel and touch screen. These tapes not only provide high bond strength to various materials but also offer excellent sealing properties. 3M foam tapes provide superior resistance to moisture and chemicals over other traditional cellular foam tapes.

Be aware that certain gasketing and sealing materials may contain active chemicals (such as sulfur, acidic compounds or chlorine) that can affect the operation of the touch screen. In selecting sealing gaskets, 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.

For assistance in selecting an appropriate gasketing material, please contact 3M Touch Systems Applications Engineering.

Touch Screen Design Considerations

Flat touch screens come in two different configurations. One is the standard touch screen with a wire harness and a NOVRAM connector. The newer one is the Profile design with a 5-pin connector from a flat flex tail.

The Profile touch screen, 3M Touch System's innovative design for flat capacitive touch screens, incorporates advanced design and production techniques that result in high quality capacitive touch screens. The Profile touch screen's sleek design provides ease-of-installation for LCD panels and flat CRT displays. The narrow border and wide viewing area, combined with durability, reliability, and optical clarity, make the Profile touch screen the ideal choice for public access and business applications.

Design Considerations

Proper integration of your touch screen into an LCD or flat CRT display will help prevent contamination from outside sources that could eventually cause problems.

- To minimize the risk of EMI interference, never run the touch screen connector near or over the LCD backlight inverter.

- 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.

- Always design your touch screen integration with the flex tail exiting from the top or sides. Never design tail exits from the bottom as spills could accumulate in this area and cause electrical shorting. Remember the sealing is water-resistant, not waterproof!

1 inch from the top is a good design
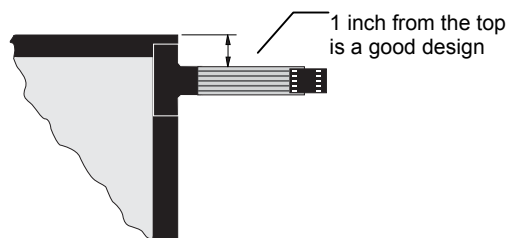
- The touch screen tail is designed to be flexible, although it should never be creased. The bend radius should be greater than 1/8 of an inch.
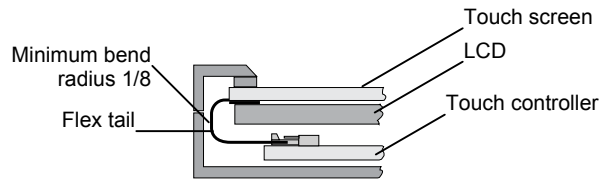
- Ensure that the tail and controller are aligned such that the tail remains straight (90°), not pulled or twisted in an odd angle from the touch screen. Good engineering design avoids awkward electrical connections.
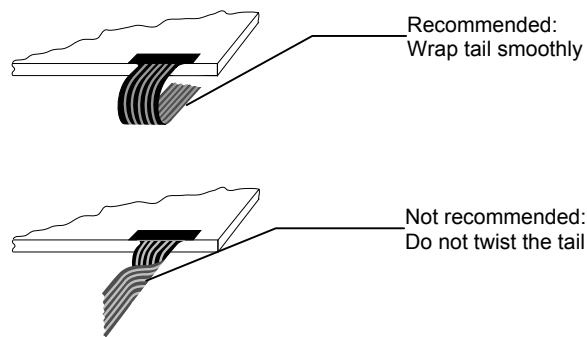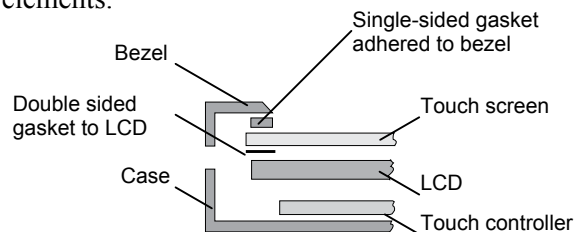

- The touch screen tail should be secured in place with a light adhesive and should not move freely after assembly.

Gasketing

Proper gasketing is critical to any successful touch screen integration. We recommend using nonacidic, neutral pH 3M brand tapes to bond and seal your bezel and touch screen. These tapes not only provide high bond strength to various materials but also offer excellent sealing properties. 3M foam tapes provide superior resistance to moisture and chemicals over other traditional cellular foam tapes.

Be aware that certain gasketing and sealing materials may contain active chemicals (such as sulfur, acidic compounds or chlorine) that can affect the operation of the touch screen. In selecting sealing gaskets, 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.

- Single-sided tapes, adhered to the bezel, make for easy alignment of the touch screen. Simply align and adhere the tape to the bezel edge. Gaskets should contact the touch screen viewing area to ensure a good seal.

- A die-cut or full perimeter of double-sided, thin, open cell foam gasket should be used as a dust barrier and insulator between the touch screen and the LCD metal frame. 3M Touch Systems has used 3M brand 4962 tape for this purpose.

- A neoprene flat gasket or O-ring seal between the bezel and the touch screen is also a good choice. The compression should be evenly distributed to the glass surface. Be aware of and follow material manufacturer's recommended compression specifications.
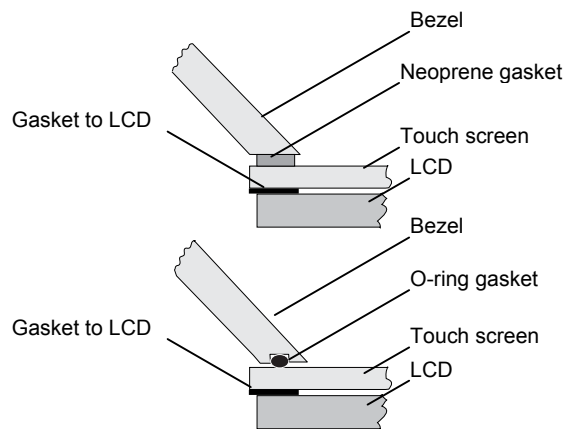
- Ensure that any gaskets do not interfere with the viewing area of the touch screen. 3M Touch Systems defines precision area to be 94% of the touch screen active area. Within the precision area the touch screen meets or exceeds ±1% accuracy levels. Refer to the specific Touch Screen Specification Sheet that applies to your touch screen.

Size your touch screen such that the LCD viewing area equals the touch screen precision area
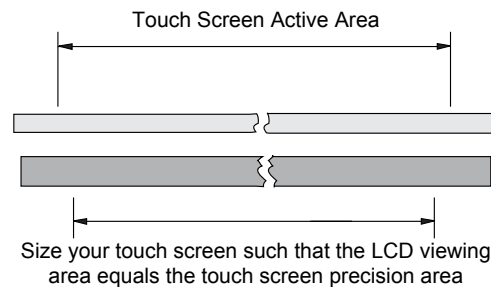
Metal Enclosures

Because metal may interfere with the performance of the touch system, 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 any part 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 doesn't directly contact the touch screen. It should be appropriately grounded and very secure (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.

Touch System Location

- 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.

- Daylight, particularly direct sun, can affect the paper, inks, and adhesives in any artwork your installation may contain. Make sure that these materials are UV stable.

- Consider using high brightness displays for better readability in bright ambients. 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.

- Keep in mind the optics of the touch screen. Remember that different sources of light such as outdoor (natural sunlight) and indoor (incandescent versus fluorescent) can cause different effects when viewing the touch screen. The touch screen data sheet can provide more detail on optical specifications.

Designing Applications

With any touch application, the design can be crucial to the usability of the final product. Clear icons, bright contrasting colors, large buttons, 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.

Touch screen

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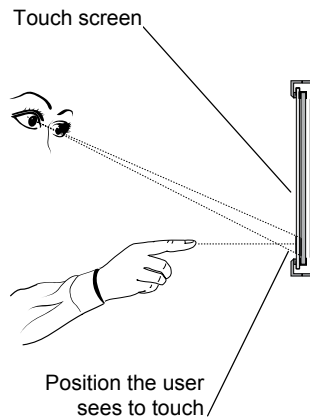
- Design large buttons to facilitate touch. Remember that a fingertip is much larger than a cursor.

Button graphic
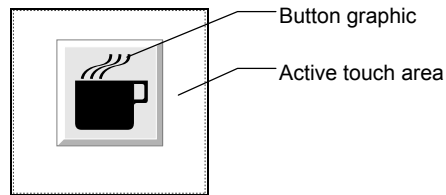
Active touch area

- 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.

Small buttons centered with extended active touch areas

Large buttons located near edges

Large buttons on bottom with active areas extending to edges
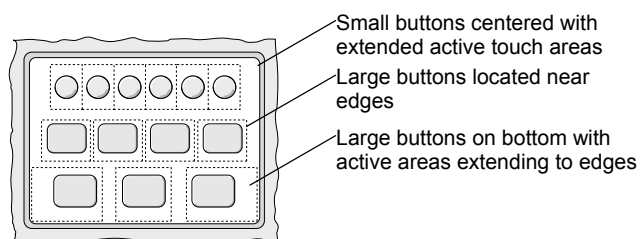
- Place buttons horizontally whenever possible. One size does not fit all! Consider the varying heights of users when designing the application.

CHAPTER 3

Installing a 3M Touch Systems Touch Screen

This chapter describes how to install a 3M Touch Systems touch screen to 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, there are a few design considerations that should be reviewed. Planning ahead will help to ensure a successful installation.

- Before installing the touch screen, be sure to account for the space needed by the touch screen cable or flex tail. The Profile capacitive touch screen has a flex tail that is wider than the wired models.
- When installing the touch screen, be careful not to route the touch screen cable or flex tail and power wires near the backlight inverter of the LCD panel.
- Because the touch screen edges are not insulated, they should not come into 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.
- Do not crease or fold the flex tail that exits from the touch screen.
- 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.

- When reassembling the touch screen and bezel, be sure not to tighten one corner too tightly. 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 assembly, 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 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. 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.
2. 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.
3. Remove the screws securing the pedestal to the display. Be sure to label these for re-assembly.
4. Remove the pedestal and set aside.

Removing the Display Housing

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. 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 or clips, and/or release buttons.

3. Lift off the rear housing to expose the display chassis. Remove any screws holding optional accessories (such as speakers or control buttons).
4. 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 don't compromise the mechanical integrity of the display.

    b. You can reassemble with a gap between front and back housings to be covered later in the section labeled *Completing the Installation*.

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.

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1. Place the bezel face down on an anti-static pad. Be sure to orient the top of the bezel towards you.

2. Place the touch screen face down against the inside of the bezel opening. Be sure to orient the touch screen so the cable 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 taped edges (or black edges on Profile) of the touch screen extend into the bezel opening.

4. Note which ribs and fins of the bezel are in direct contact with the touch screen. Pay particular attention to the corner areas and the area where the cable exits from the touch screen.
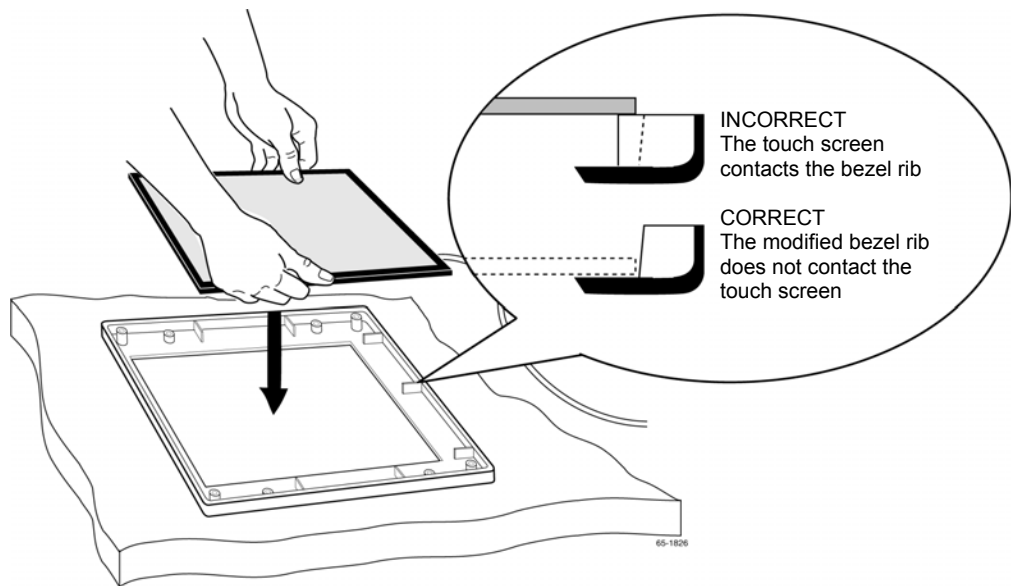
5. Carefully cut out a notch in each rib and cut back each fin that contacts the touch screen.

    •   Make sure you remove only enough material to facilitate the installation of the sealing gasket and touch screen.

    •   Make sure you preserve the structural integrity in the rest of the rib area.
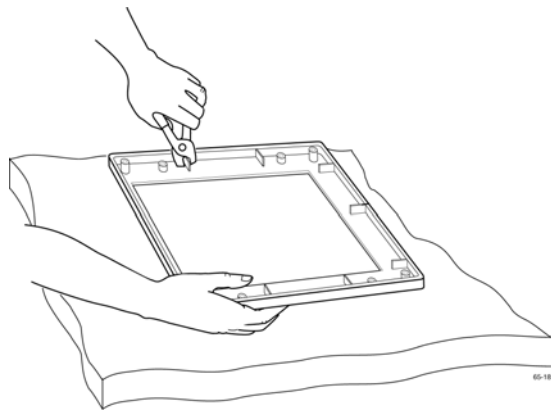
Mounting the Touch Screen to the LCD Panel

The touch screen is mounted to the LCD panel using strips of 1/32 in (0.8 mm) double-sided foam tape. If shock and vibration issues exist, thicker tape should be used. Curved glass would require 1/16 to 1/8 in (1.587 to 3.175 mm) thick tape, while flat would require 1/32 to 1/16 in (0.8 to 1.587 mm) thick tape. The foam tape serves the following purposes:

•   Holds the touch screen in place on the LCD panel

•   Maintains a distance between the touch screen and the LCD panel

•   Cushions the LCD and glass surfaces

•   Prevents the touch screen from contacting any conductive 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 harness and cable (or flex tail) exit from the correct location. If you are unsure of the correct positioning, contact your customer service representative to request a detailed drawing.

Note: Be careful not to crease or fold the cables or flex tail.

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.

Typically, 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 675 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. 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 cables.

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. Ensure that the adhesive tape around the inside edge of the touch screen does not become wet.
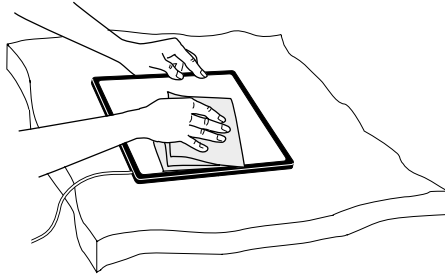
2. Apply a solid strip of the double-sided foam tape around the perimeter of the LCD panel.

3. Remove the paper backing from the double-sided tape on the LCD panel.

4. Hold the touch screen so the cable or flex tail exits from the correct location.

5. Attach the touch screen to the LCD panel with one smooth motion. Use your corner marks, if available, to help with the placement.

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 or 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.
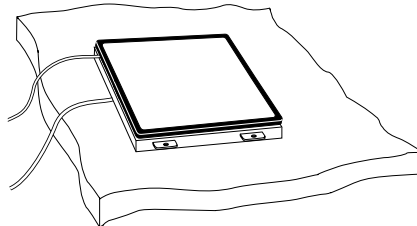
If any part of the inspection fails, you must remove and remount the touch screen. Instructions follow later in this chapter.

Cover the Gap

If you did not use a die-cut or full perimeter gasket, you should cover the gap between the LCD panel and the touch screen with electrical tape (or black acetate tape). The tape prevents dust and dirt from accumulating between the touch screen and the LCD panel and creates a sturdier stack-up to hold the touch screen in place.

We recommend using non-acidic, neutral pH 3M brand tape to bond and seal your touch screen. These tapes not only provide high bond strength to various materials but also offer excellent sealing properties. 3M brand tapes provide superior resistance to moisture and chemicals over other traditional tapes.

Be aware that certain sealing materials may contain active chemicals (such as sulfur, acidic compounds or chlorine) that can 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.

- Make sure the tape completely covers the space between the LCD panel and the touch screen. Do not leave any gaps or openings.

- Make sure the tape will not be visible once the display is reassembled.
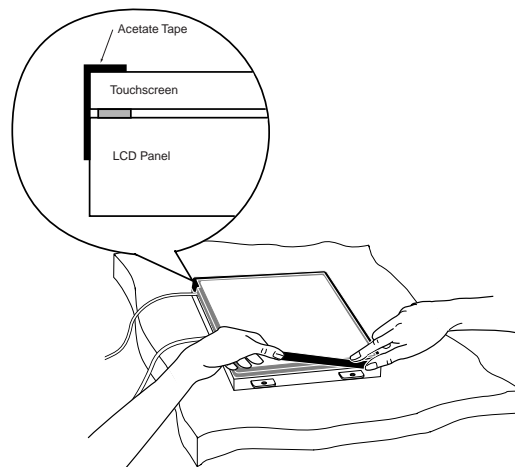
To Service the Touch Screen

⚠ 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 for servicing, do not try to pry the touch screen off the LCD panel. You may break the glass and injure yourself or others.

1. Remove the tape, if present, that covers the gap between the LCD panel and the touch screen.

2. Use a razor knife or a single-edge razor blade to carefully cut through the foam 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.

3. 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.

4.   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.   Cut strips of the closed cell, compressible foam sealing gasket tape to fit the inside edges of the bezel opening. To ensure tight fitting sealing joints, the gasket tape should be cut using a razor knife or single-edge razor blade.

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 will 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 double-sided tape on the back of the touch screen and the gasket seal (if used).

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 1/16 inch gasket, 1/32 inch mounting tape, and a 0.125 inch touch screen with cable attached.

1.   Insert a temporary post, such as a cable tie-wrap or toothpick, in each bezel hole.

2.   Place a nylon spacer over each temporary post. The size of this spacer (usually 3/16-inch) will compensate for the thickness added by the sealing gasket, mounting tape, and touch screen. The size of your spacer may be different. You may need to provide additional spacing and support.
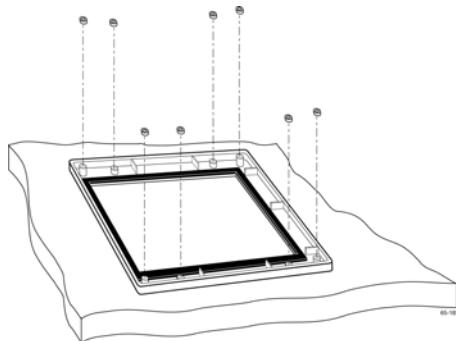

3.   Align the screw holes (or tabs) over the temporary post. Each LCD hole/tab must rest on top of the spacer and washer above the bezel screw hole.

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 ears to the bezel.

    b. Work diagonally from one corner to the opposite corner.

    c. Do not tighten any one side all at once -- distribute pressure evenly.

    d. You must be able to complete at least three full turns of the screw to 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.

    f. Be careful not to torque one side or corner too tightly. Pressure should be evenly distributed across the touch screen.
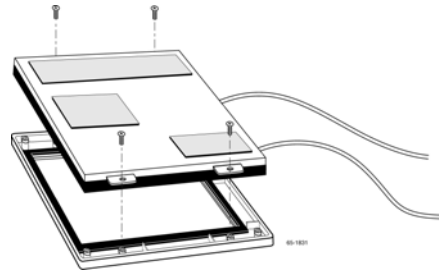
Inspect the Attached LCD Panel and Bezel

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 then 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 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.
3. Use cable tie-wraps to secure the touch screen cable to the chassis.

CHAPTER 4

Installing the Touch Screen Controller

This chapter describes how to install the controller for use with 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* or *Controller Specification Sheets* for additional information on your specific controller. You may obtain a copy of these guides from the www.3Mtouch.com website under Technical Documents or from the Touch Solutions CD 19-640.

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 Chapter 2.

After you attach the touch screen, return to this chapter for 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 1000SC and EX II 7000SC series serial capacitive controllers, the EX II 3000SP series serial TouchPen™ controller, and the EX II 5000UC and EX II 7000UC series USB controllers. A short description of each of these is given below. Although the functionality of each of these controllers is different, the installation procedure is the same.

Table 1. EX II Controllers Overview

New Controller	Type	Technology	Size	Controller Reference Guide www.3Mtouch.com
EX 1000SC	Serial Cased or uncased	Capacitive	2x3	EX II 1000SC Controller Reference Guide (19-252)
EX 3000SP	Serial Uncased	Capacitive TouchPen	5x1.5	EX II 3000SP Controller Reference Guide (19-256)
EX 5000UC	USB Cased or uncased	Capacitive	2x3	EX II 5000UC Controller Reference Guide (19-259)
EX 7000SC	Serial Uncased	Capacitive	1x2	EX II 7000SC Controller Reference Guide (19-263)
EX 7000UC	USB Uncased	Capacitive	1x2	EX II 7000UC Controller Reference Guide (19-264)

Serial Capacitive Controllers (EX II 1000SC & EX II 7000SC)

A serial controller connects to your computer through one of the serial ports. You must supply power to a serial capacitive controller. You can supply power either internally or externally.

If you use external power, you will need +5 volts DC supplied by a power brick. Instructions on supplying power externally are given in *Completing the Controller Installation* section later in this chapter.

If you want to power the serial capacitive controller internally, you will need to tap a source inside the display. Complete instructions for tapping internal power are given later in this chapter.

Serial TouchPen™ Controllers (EX II 3000SP)

The TouchPen™ controller is powered internally, which means that it is necessary to tap power from inside the display. This process will be explained in *Powering the Touch Screen Controller* section later in this chapter. In addition, the TouchPen™ controller must be mounted internally as it is only offered as an uncased controller board.

USB Controllers (EX II 5000UC & EX II 7000UC)

USB controllers are bus-powered controllers that plug into USB ports on the computer. They require neither internal nor external power. They operate when properly connected to the computer through a USB certified port.

Mounting the Touch Screen Controller

Before beginning the controller installation, it is important to plan where and how the controller will be attached to the LCD display housing. Depending on the controller, there are two ways in which the controller can be mounted to the display housing: internally and externally.

- Mounting the controller inside the display housing results in a neater, cleaner finish but requires internal space. Care must also be taken when attaching the controller board internally, as the boards can short out if they are not attached properly.

- Mounting the controller outside the display housing is less complicated than an internal mounting, but requires making more modifications to the display housing. It is necessary to drill holes in the rear display housing to accommodate the controller casing that will be attached to the outside. Refer to *Drilling Holes for the Controller* later in this chapter.

- The controller must be mounted to allow easy access to the touch screen cable.

- Internal mounting must be away from noisy power or high frequency sources.

Mounting the Controller Internally

The controller can be mounted inside the display housing if there is sufficient space. Before you begin, make sure that there is sufficient room for the controller board inside the chassis. Approximate sizes of the various controllers are given in the table below.

Table 2: Approximate Controller Sizes

Controller(s)	Enclosure	Length	Width	Thickness
EX II 1000SC EX II 5000UC	Uncased	3.5 in. (89 mm)	2.25 in. (57 mm)	0.3 in. (8 mm)
	Cased	3.75 in. (95 mm)	2.5 in. (64 mm)	0.84 in. (21 mm)
EX II 7000SC EX II 7000UC	Uncased	1.3 in. (33 mm)	2.435 in. (62 mm)	0.32 in (8.1 mm)
EX II 3000SP	Uncased	1.35 in. (34 mm)	4.8 in. (122 mm)	0.275 in. (7 mm)

Additional space will also be needed between the controller board and the metal shield to prevent shorting of the board.

Mounting the Controller Externally

Some touch screen controllers can be mounted externally on the rear of the display housing. In order to mount the controller externally, you will need to create an opening in the back of the display cover for mounting the controllers' plastic case. This will require drilling holes in the rear display cover.

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. Also, 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.

3. Remove the metal shield protecting the video board being sure to label and set aside all screws.

4. Remove the main video board as follows:

    a. Disconnect all cables connecting the main video board to the LCD panel.

    b. Disconnect any cables connecting the main board to the bezel. For example, you may need to disconnect the following cables:

- Power switch cable
- Control panel cables
- Microphone

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 and externally.

Powering the Touch Screen Controller

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

- The EX II 1000SC or EX II 5000UC series controllers use the three colored wires attached to the end of the touch screen cable: green, gray, and orange.

- The EX II 3000SP TouchPen™ controller has 2 wires -- orange and gray as part of the RS232 cable.

- The small form factor EX II 7000SC controller does not have power cables supplied -- it is necessary to create a suitable power cable as detailed later.

- The small form factor EX II 7000UC controller does not require any power connection.

If the touch screen controller is powered internally, the wires must be connected to an appropriate power source within the monitor. If external power is used or if the controller is bus-powered, the wires must be trimmed and finished. These processes are covered later.

With a serial controller (EX II 1000SC series, EX II 3000SP series, or EX II 7000SC series), you must supply power to the controller. You have the following options:

- Tap power from a source inside the display.
- Provide power by using an external source, such as a power brick. In this case, you will need to properly trim and finish the gray and orange wires. The green wire (if present) goes to chassis ground before connecting the NOVRAM cable.

With an EX II 3000SP TouchPen™controller, you must supply internal power—external power is not an option. External power sources are only an option EX II 1000SC and EX II 7000SC-series controllers.

With the EX II 5000UC or EX II 7000UC USB controller, you will need to connect the green and gray wires to chassis ground and properly trim and finish the orange wire because the USB controller is bus-powered.
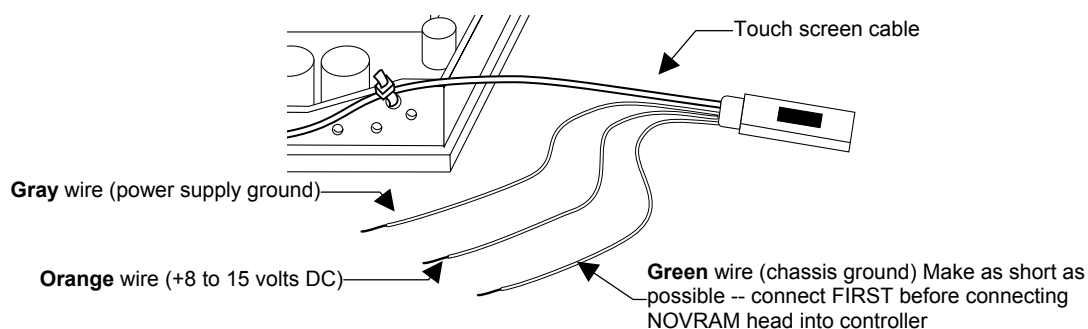
Table 3: Controller Power Requirements

Controller Type	Power Option	What To Do with the Wires
Serial Capacitive EX II 1000SC series	Internal tap from display	Use these wires to power and ground the controller.
	External tap (power supply)	Trim and finish the gray and orange wires -- green goes to chassis ground and must be connected first.
Serial Capacitive EX II 7000SC series	Internal or external	You design your connection. Refer to the appropriate Controller Reference Guide.
Serial TouchPen™ EX II 3000SP series	Internal	Use the gray and orange wires to power and ground the controller.
USB Capacitive EX II 5000UC	Bus-powered -- Receives power from the USB port	Trim and finish the orange wire. Gray and green go to chassis ground.
USB Capacitive EX II 7000UC	Bus-powered -- Receives power from the USB port	Not applicable

Powering the Controller Internally

If you are installing an EX II 3000SP TouchPen™ controller or if you have chosen to power your serial controller internally, you need to tap a power source within the monitor. It is helpful to locate this power source before beginning the controller installation. Either a multimeter or the display schematic can be used to locate a sufficient power source on the display's controller board.

Once an appropriate power source has been located for the controller, the wires can be connected. The green and gray wires ground the chassis and the power supply, respectively. Be sure to connect the green wire to chassis ground before connecting the NOVRAM cable into the controller. The orange wire is the power source. Connect these wires as follows.

Touch screen cable

Gray wire (power supply ground)

Orange wire (+8 to 15 volts DC)

Green wire (chassis ground) Make as short as possible -- connect FIRST before connecting NOVRAM head into controller

Note: All touch screen and power wires should be kept to minimum lengths wherever possible. When installing the touch screen, be sure not to route the cable or flex tail near the backlight inverter of the LCD panel.

1.   *Green* wire (not used for TouchPen™) to chassis or earth ground.

2.   *Gray* wire to an appropriate logic ground point on the main board.

3.   *Orange* wire to a sufficient power source on the main board.

Once the wires have been connected, the voltage drop across the connection must be checked. The voltage drop cannot exceed 100 mV once the touch screen is in operation. The voltage drop can be tested by:

1. Plugging the cable into the touch screen controller.

2. Plugging in the display and allow it to warm up for approximately ten minutes.

3. After the display has warmed up, using a multimeter to determine the voltage at the connection (orange wire).

Note: The difference in the voltages before and after the wires were connected cannot exceed 100 mV. If this voltage drop is exceeded, find a different power source location.

Powering the Controller Externally

If you have chosen to power your serial controller externally, you will need to trim and finish the green, gray and orange wires. Connect these wires as follows.

1. Finish the *green* and *gray* wires to chassis or earth ground.

2. Finish the *orange* wire to an appropriate power source. Cut this wire short (2 in or 50 mm) and cover with heat shrink to prevent accidental shorting of components.

Completing Controller Mounting

Below are instructions for completing the controller mounting/installation. Go to the section specific to your controller—internal or external.

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.

Internal Mounting

Once power has been supplied to the touch screen controller, the mounting process can be completed. In order to mount the controller board to the inside of the metal shield, two holes will need to be drilled as shown below. It may also be necessary to drill a hole to accommodate the touch screen cable or flex tail.
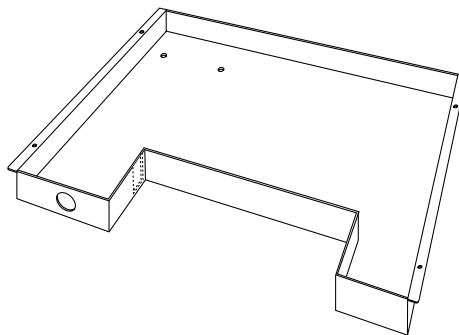

1. Mount the uncased controller board to the inside of the metal shield using two metal screws.

2. Insert a nylon spacer between the controller board and the metal shield as shown in the following diagram. These spacers will prevent the board from shorting out.
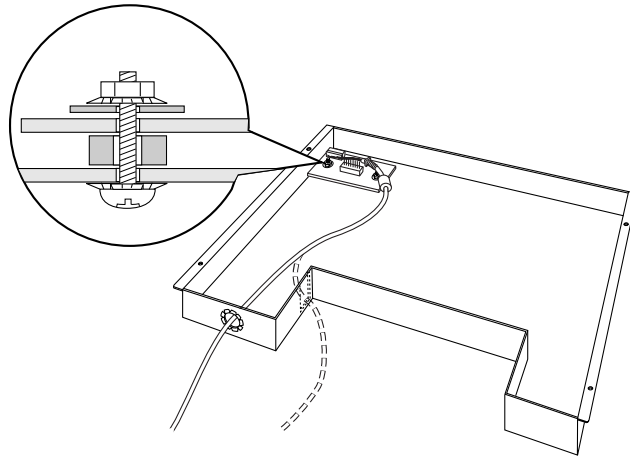
3. Plug the touch screen cable into the controller board, making sure that the pins are oriented in the correct direction.

4. Reattach the video board, making sure to include all connections. Reconnect all cables that were attached to the video board, such as the power switch, control panel, and microphone cables.

With the video and controller boards properly mounted, all cables connected, and excess wiring cable-tied as shown below, the metal shield can be attached.
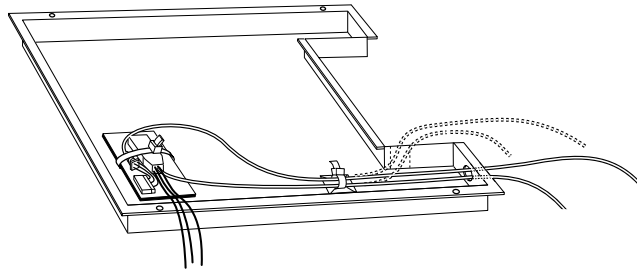
As mentioned earlier, it may be necessary to make changes to the metal shield and the rear display housing to accommodate the touch screen cable. Usually it is necessary to make a hole in the shield and the housing so that the touch screen cable can be routed through, however some models may have an existing opening that can be used.

With a sufficient opening, the touch screen cable can be fed through and the metal shield reattached. Please see the illustration on the following page.

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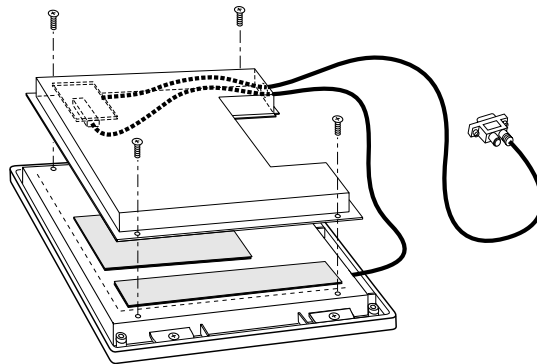
Note: When routing the touch screen cable through the metal shield and rear display cover, be careful to avoid the inverter and other high noise sources.

Modifying the Display for the Touch Screen Cable

1. Select a location on the rear of the display's cover for the touch screen 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.

Back cover
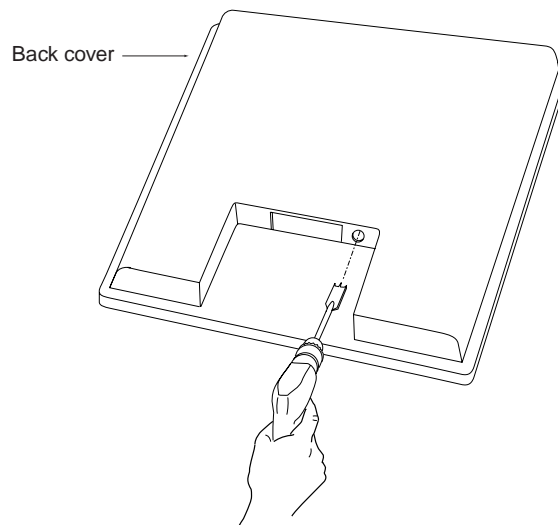
Note: If a TouchPen™ controller has been added, it will be necessary to create a second hole to accommodate the TouchPen™ cable.

Remounting the Display Cover

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

2. 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.

3. Remount the cover to the chassis assembly.

4. Attach the screws put aside during disassembly or use new longer screws as required.
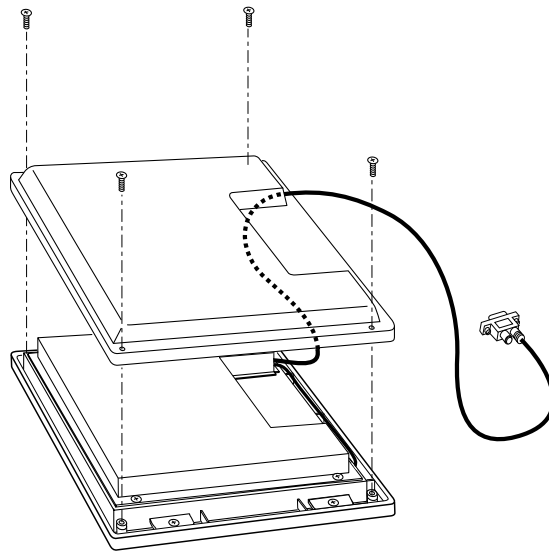
Installing the Cable Grommet

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.

External Mounting

Once power has been supplied to the touch screen controller, the mounting process can be completed.
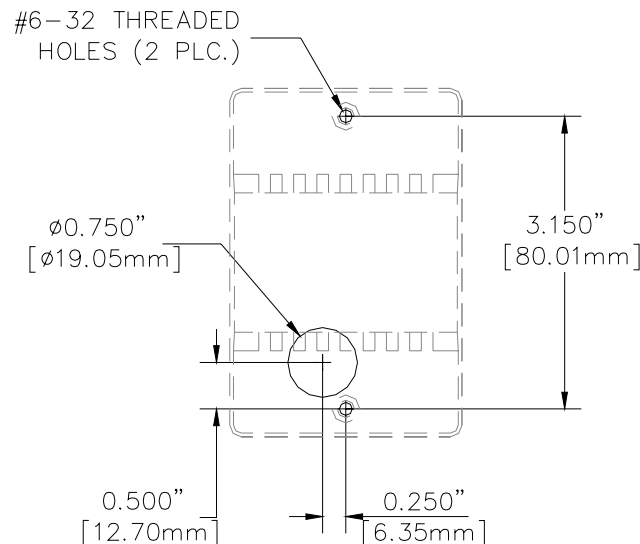
1. Reattach the video board, making sure to include all connections. Reconnect all cables that were attached to the video board, such as the power switch, control panel, and microphone cables. With the video board properly mounted, all cables connected, and excess wiring cable-tied, the metal shield can be reattached.

2. The touch screen cable will be routed through the metal shield to the outside. It may be necessary to make changes to the metal shield to accommodate the cable. Some shields may have an existing opening that can be used; otherwise a hole can be drilled in the shield.

Touchscreen cable
can be routed through
drilled or exsisting holes
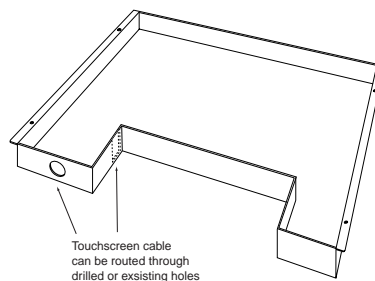
After the metal shield has been modified and reattached, the rear display housing can be remounted. The following section gives instructions for modifying and remounting the rear display cover.

Drilling the Holes for the Controller

1. Select a location for the controller on the rear cover.

   - The selected location must allow the touch screen cable to reach the connector on the back of the controller.

   - If possible, the selected location should not hide the display's identification, the display's voltage and current requirements, or the regulatory compliance information.

2. Because all external mount controllers are supplied in a standard case, a template for mounting holes from one controller can be used for any other. Measure the placement of the three holes on your casing so that it can be mounted accurately. Use a center punch to place a dimple at the locations of the three holes.

3. Drill and tap two #6-32 holes (3 mm). Using nylon screws to hold the controller case to the display cover is recommended. Be very careful when tapping these holes. You must use a very slow speed and stop the rotation approximately 1/8 inch (3.2 mm) before you reach the last threads of the tap. Use the reverse function at a very slow speed to back out the tap.

4. Use a 3/4-inch (20 mm) spade bit to drill out a hole for the touch screen cable.

## Reassembling the LCD Panel and Display Cover

Once you drill the holes in the display cover for the touch screen cable and controller, 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 cable 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 touch screen 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.

4. Plug the touch screen cable into the back of the controller.


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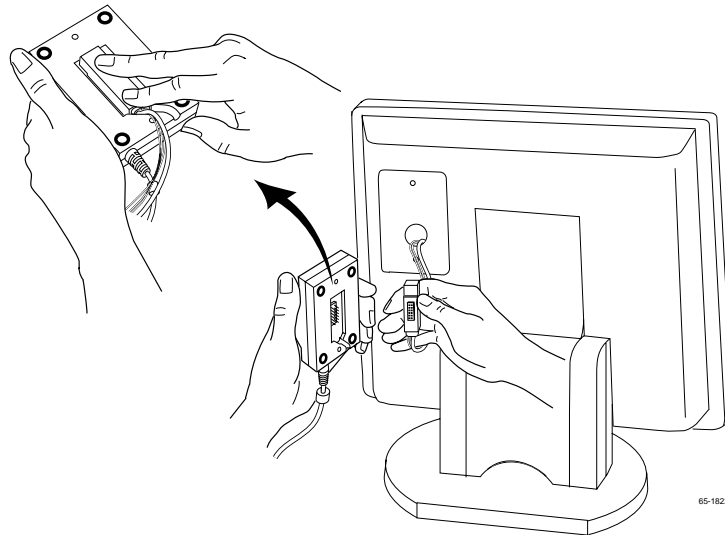
5. Align the controller over the two mounting holes you drilled in the display cover.

6. Use two nylon screws to attach the controller to the display.

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

Completing the Installation

Now that the wires have been finished and the controller has been mounted either internally or externally, it is time to complete the installation process so that you can turn on your system.

When you reassembled the display and attached the rear display housing, you may have noticed a gap between the front bezel and the rear display cover. 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.
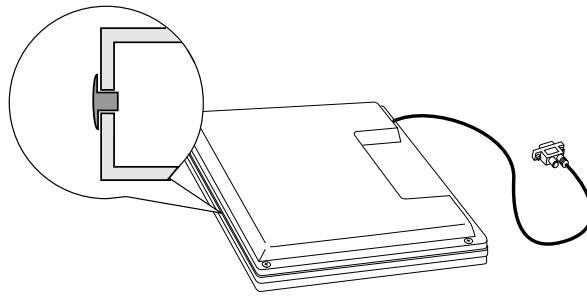
Using Your 3M Touch Systems Touch Screen

Installing TouchWare™ Software

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

- Windows XP
- Windows 2000
- Windows NT 4.0
- Windows 9x
- Windows Me

These drivers, as well as relevant documentation and legacy drivers, can be found on the latest 3M Touch Solutions CD or 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 TouchWare™, 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 user documentation.