Projected Capacitive Near Field Imaging™ ("NFI")

Integration Guide
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Edition

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Product Safety Information

Intended use

The Near Field Imaging™ (NFI) touch screen system is composed of components for incorporation in electrical or electronic apparatus, equipment or installations.

The NFI touch screen system has been tested to the standards that are cited in the Appendix of this integration guide to show compatibility for use in products requiring CE marking under the following directives: the EMC Directive 89/336/EEC, the Low Voltage Directive 73/23/EEC, and the Machinery Directive 89/392/EEC. Caution: Changes or modifications to this equipment not expressly approved by the manufacturer could void the user’s authority to operate this equipment.

The manufacturer of the end apparatus will, under their responsibility, comply with the applicable Directives in design and construction.

Safety notices

WARNING

To reduce the risks associated with electrical shock or mechanical function which, if not avoided, could result in death or serious injury and/or property damage:

- Do not use a power cable that is damaged or frayed or a power plug that is damaged.
- Do not use a damaged power supply.
- Handle the power supply with care.
- Do not service the NFI touch screen system. There no user serviceable parts. Refer all servicing to qualified service personnel.

CAUTION

To reduce the risks associated with glass breakable which, if not avoided, may result in minor or moderate cut-related injury:

- Handle a touch screen with care to avoid breaking the glass. Be aware of cracked or broken sensors with sharp edges.

CAUTION

To reduce the risks associated with environmental contamination which, if not avoided, may result in minor or moderate injury and/or cause property damage:

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

Safety labels

The following safety symbols appear on your NFI touch screen system or packaging materials:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Warning Symbol" /></td>
<td>Warning: Hazardous voltage</td>
</tr>
<tr>
<td><img src="image" alt="Caution Symbol" /></td>
<td>Caution: Item is susceptible to electrostatic discharge (ESD) damage if proper precautions are not taken.</td>
</tr>
</tbody>
</table>
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CHAPTER 1
Overview

This chapter provides:

- Description of the components of a typical MicroTouch™ Projected Capacitive Near Field Imaging™ (“NFI”) touch screen system
- Guidelines for cleaning the touch screen
- Terms used in the manual
- 3M contact information

Components

The NFI touch screen system includes the following components:

- **NFI touch screen and tail.** The touch screen is available in different sizes and can be used with most flat panel displays or adapted to fit flat cathode ray tube displays. The tail connects the touch screen to the controller.
- **Touch screen controller.** The controller decodes signals on the touch screen. It has connectors for the touch screen tail and for communications/power.

- **Floppy disk with linearization file (does not accompany 8.4-inch screens).** Linearization increases the accuracy of an NFI touch screen and is required for screens larger than 8.4 inches. For details on linearizing, see “Steps for resetting baseline”, starting on page 18.

- **Bar code sticker on the touch screen.** The serial number provided on the bar code stickers correspond to the linearization file that is installed (from the floppy disk) when setting up the touch screen system. The bar code sticker on the touch screen helps you to recognize which side of the touch screen is the front side and which is the back side. If you are looking at the printed side of the bar code sticker, you are looking at the front of the touch screen. You will need the serial number if it is ever necessary to:
  - Re-install the linearization file.
  - Contact 3M Touch Systems customer service.

### Cleaning the touch screen

Follow these guidelines for cleaning the NFI touch screen:

- To clean the touch screen’s back side, blow away dust with pressurized air.
- To clean the front of the touch screen, use cleaning solutions and cloths designed for cleaning coated optical glass (e.g., isopropyl alcohol and water 50:50 solution). Do not use any chemical that corrodes glass. Follow cleaner manufacturer’s material safety data sheet (MSDS) and follow all instructions and recommendations on product label.
- Apply the cleaner with a soft, lint-free cloth. Avoid using gritty cloths.
- Apply the cleaning liquid to the cloth, not directly to the screen.

### Terms

These terms appear in this manual and may be unfamiliar.

<table>
<thead>
<tr>
<th>This term</th>
<th>Refers to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>An electronic ‘picture’ of the touch screen and its immediate surroundings. Baseline must be reset after any physical or mechanical change is made to the NFI touch screen integration or system. With an up-to-date baseline, the touch screen system performs more accurately and efficiently.</td>
</tr>
<tr>
<td>Display area</td>
<td>The part of the touch screen that is positioned over the product’s display. Touches in the display area emulate the movements and actions of a mouse.</td>
</tr>
<tr>
<td>Continuous frame</td>
<td>Gasket material that has no ends.</td>
</tr>
<tr>
<td>Metallized bezel</td>
<td>Plastic bezel with conductive material applied to its interior.</td>
</tr>
<tr>
<td>Near Field Imaging (NFI)</td>
<td>A touch screen that uses a proprietary imaging technique to generate a precise profile of a touch from changes in the electrostatic field near to the point of contact.</td>
</tr>
<tr>
<td>Opaque area</td>
<td>A narrow border around the perimeter of the touch screen (usually silver-grey or black) that does not register touches. Sometimes called “the guard”.</td>
</tr>
<tr>
<td>Touch sensitive area</td>
<td>Part of touch screen’s viewing area that will register a touch.</td>
</tr>
<tr>
<td>Viewing area</td>
<td>The part of the touch screen that is within the opaque area.</td>
</tr>
</tbody>
</table>
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 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
- Current driver version
- Operating system used
- Information on additional peripherals

Technical Support is available Monday through Friday 8:00 a.m. to 8:00 p.m. US Eastern Standard Time, 9:00 a.m. to 5:00 p.m. throughout Europe. There is limited service on Saturdays and Sundays.

You can contact 3M Touch Systems Technical Support (US only — Eastern Standard Time) by calling the hot line or sending 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

3M Touch Systems worldwide offices

All offices can be reached through the website: www.3Mtouch.com.

<table>
<thead>
<tr>
<th>Country</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>978-659-9000</td>
</tr>
<tr>
<td>Australia</td>
<td>61-3-9582-4799</td>
</tr>
<tr>
<td>Canada</td>
<td>604-521-3962</td>
</tr>
<tr>
<td>France</td>
<td>33-(1)-30-31-68-32</td>
</tr>
<tr>
<td>Germany</td>
<td>49-(0)-2131-14-4003</td>
</tr>
<tr>
<td>Hong Kong/China</td>
<td>852-2333-6138</td>
</tr>
<tr>
<td>Italy</td>
<td>39-(0)-39-230-2230</td>
</tr>
<tr>
<td>Japan</td>
<td>81-(4)-4811-1133</td>
</tr>
<tr>
<td>Korea</td>
<td>822-552-3198</td>
</tr>
<tr>
<td>Singapore</td>
<td>65-6450-8851</td>
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<tr>
<td>Spain</td>
<td>34-934-15-6285</td>
</tr>
<tr>
<td>Taiwan</td>
<td>886-2-2704-9011</td>
</tr>
</tbody>
</table>
CHAPTER 2

Mounting the touch screen

This chapter outlines:

- Critical information to help you mount the touch screen successfully.
- Step-by-step mounting instructions.
- Basic information on the TouchSurround™ underlay.

If you are integrating the touch screen in an **outdoor application**:

- Using a **metal bezel**, see additional instructions starting on page 21.
- Using a **plastic bezel**, see additional instructions on page 25.

Critical information

**Prevent interference**
Mount the touch screen as far away as possible from:

- Components (such as radios) that generate a signal in the 50 kHz to 60 kHz range (unless they are adequately shielded).
- AC sources and backlight inverters (unless there is intervening grounded metal work or shielding).

**Observe minimum mounting clearances**
Minimum mounting clearances are shown in Table A to help integrators make mounting decisions that will minimize capacitive loading on the touch screen and tail. Read Table A while referring to Figure 1 or Figure 2 (whichever figure applies to your mounting materials).
**Figure 1:** Mounting (using metal bezel) with metal clamp (Top View)

**Figure 2:** Mounting (using metal bezel) with adhesive (Top View)

**Table A: Minimum mounting clearances (Use this table with Figure 1 or Figure 2)**

<table>
<thead>
<tr>
<th>Screen size</th>
<th>8.4”</th>
<th>10.4”</th>
<th>12.1”</th>
<th>15.0”</th>
<th>18.1”</th>
</tr>
</thead>
<tbody>
<tr>
<td>A — Front of touch screen to inside lip of bezel</td>
<td>0.020” (0.5 mm)</td>
<td>0.020” (0.5 mm)</td>
<td>0.020” (0.5 mm)</td>
<td>0.020” (0.5 mm)</td>
<td>0.030” (0.8 mm)</td>
</tr>
<tr>
<td>B — Front of clamp to back of touch screen</td>
<td>0.020” (0.5 mm)</td>
<td>0.030” (0.8 mm)</td>
<td>0.035” (0.9 mm)</td>
<td>0.045” (1.1 mm)</td>
<td>0.060” (1.5 mm)</td>
</tr>
<tr>
<td>C — Display to back of touch screen</td>
<td>0.060” (1.5 mm)</td>
<td>0.070” (1.8 mm)</td>
<td>0.080” (2.0 mm)</td>
<td>0.100” (2.5 mm)</td>
<td>0.120” (3.1 mm)</td>
</tr>
<tr>
<td>D — Side of bezel to edge of touch screen</td>
<td>0.030” (0.8 mm)</td>
<td>0.030” (0.8 mm)</td>
<td>0.030” (0.8 mm)</td>
<td>0.030” (0.8 mm)</td>
<td>0.030” (0.8 mm)</td>
</tr>
</tbody>
</table>

Viewing area & bezel opening: See NFI touch screen drawings on 3M Touch Systems website: www.3Mtouch.com
Observe best practices for different mounting methods

The touch screen can be integrated with either clamps or adhesive:

If mounting with a clamp

Use gaskets between the sensor and clamp and between the sensor and bezel.

Choose gaskets with the following properties:

- Non-conductive (with little or, preferably, no carbon content) to seal gap A in Table A.
- Low compression set.
- If foam gaskets are required, they should be water resistant (closed-cell and non-porous). Many neoprene and silicone gaskets have these properties.

Choose non-conductive spacers to achieve the minimum clearances for gap B (see Table A), or use an air gap.

If you are mounting the NFI touch screen outdoors, refer to Chapter 5.

If mounting with adhesive

Choose adhesives with the following properties:

- Non-acidic, neutral pH adhesive such as room temperature vulcanizing (RTV) adhesives.
- You can also integrate the NFI touch screen with closed cell foam with adhesive on both sides.

Warranty note: If you use an adhesive to mount an NFI touch screen into a bezel, the touch screen must be detached from the bezel and adhesive to be returned to 3M Touch Systems under warranty.

If your application requires an exceptional seal to prevent moisture or dust entering the bezel, please see instructions for outdoor applications in Chapter 5.

Steps for mounting an NFI touch screen

For specific information on mounting a touch screen outdoors, refer to Chapter 5.

1. On a protected surface, line up the gasketing or adhesive with the bezel.
   Do not allow the bezel and gasket to encroach on any side of the touch screen’s viewing area by more than 0.020 inches (0.5 mm). Encroaching by more than that amount may adversely affect the performance of the touch screen.

2. Check that the minimum clearances have been met for gap A (Table A on page 6).

3. Position the NFI touch screen on top of the gasketing or adhesive.

4. If you use clamps to integrate the touch screen, then spacers are required to push the touch screen against the gasket. Align the spacers and install the clamps and screws according to the instructions provided by the bezel manufacturer.

5. If the NFI touch screen is integrated with adhesive, follow the instructions provided by the manufacturer to ensure that the bonding is set correctly.
**TouchSurround™ underlay (optional)**

A TouchSurround underlay can be fitted behind an NFI touch screen (when the touch screen is larger than the display) to allow part of the touch screen to be used to define keys such as the ones on a keyboard (Figure 3).

![Figure 3: TouchSurround underlay](image-url)
CHAPTER 3
Mounting the controller

This chapter provides the following information:

- Critical information about mounting the controller. Following the recommendations in this section will help ensure you are successful in mounting the controller.
- Materials required
- Step-by-step instructions

Critical information

Ground properly

- There is only one correct grounding location on the controller (see “Grounding Hole” in Figure 4 on page 10) and it must be connected for the controller to operate correctly.
- Extend the grounded metal surface (to which the controller is mounted) by at least 0.25 inches (6.4 mm) beyond the outline of the controller.
- If the controller is above a grounded continuous metal surface, place it no less than 0.10 inches (2.5 mm) and no more than 0.30 inches (7.6 mm) from that surface.

Avoid contact with shields

- Make sure that nothing touches the top or bottom shields (Figure 5 on page 11).

Prevent interference

- Minimize electromagnetic interference. Specifically, make sure that the controller is:
  - Away from sources of noise (e.g., transformers, AC sources, backlight inverters, and high-voltage switching noise).
  - As far away as possible from components that generate a signal in the 50 kHz to 60 kHz range (unless they are adequately shielded).

(For guidelines on electrically connecting portable applications, contact “3M Touch Systems support services” on page 3.)
**Materials required**

To mount the NFI controller, the following materials are required:

- Screwdriver appropriate for No.4 Phillips or M3 screws
- 4 No. 4 Phillips (or M3) pan-head screws
  Make sure the screw heads are small enough that they do not touch the circuitry surrounding them (see Figure 5 on page 11 and Figure 6 on page 11).
- 4 No. 4 (or M3) compression washers
  If compression washers are unavailable, star washers, single coil washers or shakeproof washers may be substituted. Make sure the washers are small enough that they do not touch the circuitry surrounding them (see Figure 5 on page 11 and Figure 6 on page 11).
- 1 grounding wrist strap

---

**Figure 4: Dimensions of controller**

**Critical**

There is only one grounding location and it must be connected for the controller to operate correctly (See Figure 5 on page 11).
Steps for mounting an NFI controller

1. The components on the NFI controller are sensitive to damage from electrostatic discharge (ESD). To prevent damage from ESD, put on a grounding strap, connect to ground, and touch a grounded object to discharge any built-up static.

2. Locate the mounting holes on the NFI controller (Figure 5).

3. Insert the screws and washers into the mounting holes. Take care to not short out the surrounding circuitry with either the screws or washers. Tighten the screws so that the controller is firmly in place and the washers will not move.

Figure 5: Controller’s mounting holes, grounding/mounting hole

Figure 6: Mounting controller
4. Ground the controller. 3M Touch Systems recommends grounding the controller using a ground screw through a metal stand off (Figure 7). If the stand off is not grounded, attach a grounding cable (Figure 8).

Figure 7: Grounding controller using stand off

Figure 8: Grounding controller using cable

5. Make sure that the grounding cable, compression washer and metal grounding screw do not touch or short out the surrounding circuitry.
CHAPTER 4
Making connections and resetting the baseline

This chapter provides the following information:
- Critical information and steps for connecting the NFI touch screen tail.
- Critical information and steps for connecting power/communications.
- Critical information and steps for resetting the baseline.

Critical information: Connecting the tail
The touch screen tail connects the touch screen to the controller. The following tail connection practices are essential for achieving a successful integration.

Prevent interference
- Position the tail and controller away from:
  - Components that generate a signal in the 50 kHz to 60 kHz range (unless components are adequately shielded).
  - AC sources (such as backlight inverters) and high-voltage switching noise. If this is not possible, make sure the AC or noise source is appropriately shielded and grounded.
  - Conductive surfaces — at least 0.10 inches (2.5 mm) away.
- If the tail must run along a large conductive metal surface, keep it at least 0.10 inches (2.5 mm) from the surface and make sure that it cannot move (e.g., by using an adhesive foam spacer).

Bending and position the tail properly
- Do not bend the tail past a radius of 0.100 inches (2.5 mm). The tail can be damaged and the touch screen may not operate correctly if it is severely creased.
- To provide extra protection for the touch screen tail, consider wrapping the entire tail in an insulator (i.e. foam or nylon).
- If the tail wraps around a sharp edge in your product, use an insulator on the edge of the surface to prevent chafing.
Steps for connecting tail to controller

To connect the touch screen tail to the controller:

1. Put on a grounding strap, connect to ground, and touch a grounded object to discharge any built-up static on your body.

2. Place the touch screen on a non-conductive surface (e.g., cardboard). Make sure the side of the touch screen with the bar code visible is face up.

3. Remove the controller from its ESD-protected plastic envelope. Make sure that the major electronic components are face up.

4. Use two fingers to gently pull out the retaining clip so that it protrudes slightly from the controller’s connector. To protect the retaining clip from damage, do not remove it completely (Figure 10).
5. Orient the end of the touch screen tail so that the shiny (conductive) side faces you (Figure 11).

6. Attach the tail by inserting it gently — with the shiny side up — between the retaining clip and the connector on the controller. Make sure that the tail is seated straight and fully inserted in the connector (Figure 12).

7. With a finger on each side of the retaining clip, push it until the retaining clip fits snugly inside the connector (Figure 13).
Critical information: Connecting communications and power

Check power supply
Before connecting the NFI controller to the host computer’s COM port and power source, make sure that:

- The NFI controller has a regulated DC power supply of 5V ±5 percent, capable of providing at least 300 mA.
- There is at least 4.75 VDC measured on the NFI controller (otherwise it will remain in reset mode).
- For the NFI controller, 3M Touch Systems recommends using a Class 2 power source according to the standards set by the U.S. National Electrical Code or the Canadian Electrical Code. Using a power source other than Class 2 may require additional safety certifications for your product.

If the power supply is noisy, it may be necessary to isolate the power and other cables by using a ferrite core.

Use an RS-232 power/communications cable
To connect the controller, a standard RS-232 power/communications cable is required:

- An NFI RS-232 power/communications cable (which comes with stripped flying leads) is available from 3M Touch Systems. This cable can then be completed to fit the power supply and communications requirements of your application. To purchase this cable contact “3M Touch Systems support services” on page 3.
- Alternatively, you may choose to make a cable using the information located in Table B and Table C.

Making an RS-232 power/communications cable
Table B provides information on recommended components for the cable.

### Table B: Components for RS-232 power/communications cable

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power and communications connector on the controller</td>
<td>JST*</td>
<td>S08B–PH–SM3–TB</td>
</tr>
<tr>
<td>Recommended mating connector housing</td>
<td>JST*</td>
<td>PHR–8</td>
</tr>
<tr>
<td>Recommended mating connector contacts</td>
<td>JST*</td>
<td>SPH–002T–P0.5S</td>
</tr>
</tbody>
</table>

*For information on JST products, refer to www.jst.com.
Table C provides information on the pin out for the controller and cable.

**Table C: Pin out for RS-232 power/communications cable**

<table>
<thead>
<tr>
<th>Controller Pin</th>
<th>Controller Function</th>
<th>Controller In/Out</th>
<th>Connector Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unused</td>
<td>Unused</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>SGND</td>
<td>RS-232 signal ground</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>RXD</td>
<td>RS-232 receive</td>
<td>IN</td>
</tr>
<tr>
<td>4</td>
<td>TXD</td>
<td>RS-232 transmit</td>
<td>OUT</td>
</tr>
<tr>
<td>5</td>
<td>_RST</td>
<td>Reset — active low TTL logic level (leave unconnected if not used)</td>
<td>IN</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
<td>Common</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>Gnd</td>
<td>Common</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>+5VDC</td>
<td>+ 5V DC</td>
<td>IN</td>
</tr>
</tbody>
</table>

**Steps for attaching power/communications cable**

To attach the RS-232 power/communications cable to the controller:

1. Locate the power/communications connector (Figure 14).
2. Orient the end of the cable so that it is aligned with the connector on the controller. Pin 1 of the RS-232 power/communications cable lines up with Pin 1 of the connector on the controller (Figure 15).

![Figure 15: Attaching power/communications cable]

3. Insert the cable fully into the connector. Secure the cable so that it cannot move.

4. Attach the remainder of the cable as appropriate for the specifications of your application.

**Critical information: Resetting the baseline**

The baseline must be reset after any physical or mechanical change is made to the NFI touch screen system (e.g., after integrating in a bezel or display assembly, adding or replacing gaskets, mounting or re-mounting the unit).

When you reset the baseline, an electronic ‘picture’ is taken of the touch screen and its immediate surroundings. To ensure that the baseline is reset successfully, make sure that nothing is touching the screen, bezel, or controller during the baselining process.

**Steps for resetting baseline**

There are different procedures for resetting the baseline, depending on which NFI touch screen driver you are using. Follow the instructions below that are appropriate for your touch screen driver. After the NFI touch screen is fully integrated see the *Near Field Imaging™ (NFI) Software User’s Guide* for information on setting up and installing the NFI software.

**Critical**

If a message appears indicating that baselining was not successful, check to make sure that nothing is touching the touch screen, bezel, or controller and that nothing conductive is touching the tail, then try resetting the baseline again.
Making connections and resetting the baseline

Windows XP/2000 drivers
1. From the Windows desktop, select **Start » Programs » Touch » NFI Setup Utility**.
2. Select **NFI Setup Wizard**.
3. Select **Continue**.
4. Select **Start** to begin resetting the baseline. Do not touch or allow other things to touch the touch screen, bezel, or controller during baselining.
5. Select **OK** to acknowledge that baselining was successful.
6. Select **Skip** (linearization data is not required to reset the baseline).
7. Select **Start** to begin re-aligning the touch screen (the touch screen must be re-aligned after the baseline is reset).
   - When aligning, be sure you are directly in front of the touch screen. Use a finger or alignment tool to align the touch screen. An alignment tool produces a more accurate alignment.
8. Select **OK** if you are satisfied with the new touch screen alignment.
9. Select **Exit** when the NFI Setup Utility dialog box reappears.
10. Power cycle the controller.

Windows NT/9X drivers
1. From the Windows desktop, select **Start » Programs » Touch Screen Utilities » NFI Setup Wizard**.
2. Select **Next** to start the Wizard.
3. Select **Next** and then select **Start** to begin setting the baseline.
4. Select **Next** if baselining was successful.
5. Select **Next**.
6. Select **Cancel** (linearization data is not required to reset the baseline).
7. Select **No** to confirm that you do not want to download linearization data but that you want linearization to continue to function on the NFI touch screen system.
8. Select **Next** to proceed with touch screen alignment (the touch screen must be re-aligned after the baseline is reset).
9. Select **OK** and then follow the on-screen instructions to align the touch screen.
   - **Note**: If your touch screen has defined TouchSurround buttons, be sure that the Align TouchSurround check box is selected before selecting OK.
   - To cancel alignment without changes, press ESC at any time. When aligning, be sure you are directly in front of the touch screen. Use a finger or alignment tool to align the touch screen. An alignment tool produces a more accurate alignment.
10. Select **Done** when alignment is finished and you are satisfied with the alignment.
11. Power cycle the controller.
For Windows 3.1 and MS-DOS drivers
If you are using Windows 3.1, exit to MS-DOS.

1. At the MS-DOS prompt type `CD \TOUCH` (note that there is a space after `CD`).
2. Type `NSD` to start the NFI Setup and Diagnostic utility.
3. Type `1` and then press `Enter`.
4. If you are using a COM port other than COM 1, follow the on-screen instructions to change the COM setting.
5. Select `Y` and press `Enter` to skip downloading linearization data (linearization data is not required to reset the baseline).
6. Select `Y` and then press `Enter` to begin resetting the baseline. A message will appear on the screen after the baseline has been successfully reset.
7. The touch screen must be re-aligned after the baseline is reset.
8. At the MS-DOS prompt, type `ECAL` and then press `Enter`.
   Follow the on-screen instructions to re-align the touch screen.
   When aligning, be sure you are directly in front of the touch screen. Use a finger or alignment tool to align the touch screen. An alignment tool produces a more accurate alignment.
9. After the touch screen is re-aligned, if your touch screen has defined TouchSurround™ buttons, you must also re-align the TouchSurround underlay. To do so, follow these steps:
   - At the MS-DOS prompt, type `ECAL /S` (note that there is a space after `ECAL`) and then press `Enter`.
   - Follow the on-screen instructions to complete the TouchSurround underlay alignment.
10. Power cycle the controller.
CHAPTER 5
Outdoor applications

This chapter provides:

- Critical information on how to integrate the NFI touch screen system outdoors using a metal bezel. Information in the first section of this chapter (“Critical information: Integrating with a metal bezel”) assumes that your bezel is metal.

- Critical information for metalizing a plastic bezel. Although most of this chapter assumes that a metal bezel is being used, 3M Touch Systems recommends that, for outdoor applications, a metalized plastic bezel be used whenever possible.

This chapter assumes that you have already read information on mounting the touch screen (Chapter 2), mounting the controller (Chapter 3), and making connections and resetting the baseline (Chapter 4).

If you are integrating outdoors and information in this chapter conflicts with information elsewhere in this manual, this chapter takes precedence.

Critical information: Integrating with a metal bezel

Prevent electrical shorts

The top priority when integrating an NFI touch screen into an outdoor application, is to prevent water from shorting the 55kHz signal on the touch screen to the grounded bezel. This is especially important when using a metal bezel to integrate outdoors (as is assumed in this section of the chapter).

If water is allowed to pool in the area between the bezel edge and the sensor, it can become an electrical bridge and electrically short the touch screen system and/or generate false touches. Salt water has an even greater potential to cause this sort of problem.

To help prevent electrical shorts:

- Observe minimum mounting clearances. Minimum mounting clearances for metal bezels are shown in Table D to help integrators make mounting decisions that will minimize capacitive loading on the touch screen and tail. Read Table D while referring to Figure 16 or Figure 17 (whichever figure applies to your mounting materials).
Figure 16: Mounting (using metal bezel) with metal clamp (Top View)

Figure 17: Mounting (using metal bezel) with adhesive (Top View)

Table D: Minimum mounting clearances

<table>
<thead>
<tr>
<th></th>
<th>Screen size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.4&quot;</td>
</tr>
<tr>
<td>A — Front of touch screen to inside lip of bezel</td>
<td>0.020&quot; (0.5 mm)</td>
</tr>
<tr>
<td>B — Front of clamp to back of touch screen</td>
<td>0.020&quot; (0.5 mm)</td>
</tr>
<tr>
<td>C — Display to back of touch screen</td>
<td>0.060&quot; (1.5 mm)</td>
</tr>
<tr>
<td>D — Side of bezel to edge of touch screen</td>
<td>0.030&quot; (0.8 mm)</td>
</tr>
</tbody>
</table>

Viewing area & bezel opening: See NFI touch screen drawings on 3M Touch Systems website: www.3Mtouch.com
If mounting outdoors with a clamp:
- **Use only** foam closed-cell gaskets that do not absorb moisture and that have a low compression set.
- **Use spacers** to push the touch screen against the gasket. Align the spacers and install the clamps and screws according to the instructions provided by the manufacturer.

If mounting outdoors with adhesive, follow the instructions provided by the adhesive manufacturer to ensure that the bonding is set correctly. 3M Touch Systems recommends:
- Use a **non-acidic variety of RTV** (room temperature vulcanizing) or **silicone** adhesives. Using a non-acidic adhesive helps prevent corrosion.
- If you choose to use **foam adhesive**, it is preferable to purchase it in a large square and then cut it to create a continuous frame that fits your touch screen and bezel. This method is the best way of creating a moisture-resistant seal when using this type of adhesive.
- **Do not use** PSAs (pressure-sensitive adhesives) for outdoor applications. PSAs will eventually deteriorate and admit water between the touch screen and bezel (and potentially short out the touch screen).

**Design and position** the NFI touch screen as described below:
- For best results, **design the bezel ledge so that it slopes away** from the touch screen exposing the gasket and opaque area of the touch screen (Figure 18). By recessing the bezel from the touch screen, water will be shed easier.

![Figure 18: Recess bezel to expose gasket](image-url)
Do not allow the bezel and gasket to encroach into the touch screen’s viewing area. It is critical to expose the opaque area on the perimeter of the touch screen by enlarging the bezel opening as much as possible — especially along the bottom and sides of the touch screen — so that the bezel is as far as possible from the touch screen’s viewing area (Figure 18).

A good rule of thumb is to expose the opaque area by at least the height of the water that you anticipate might collect on the ledge of the bezel.

You will need to strike a balance between exposing the opaque area and ensuring an adequate seal for your application. If the bezel opening is too large, the gasket may be too thin and the seal might be compromised.

Mount the touch screen system (bezel and touch screen) as vertically as possible.

To give the touch screen extra protection from precipitation and direct sunlight design and install a canopy over the touch screen. Direct sunlight can cause the display to become very hot and may reduce the display's life expectancy.

To help prevent moisture from collecting on the unit, you may want to consider designing and creating a durable plastic "lip" to adhere to the opaque area of the touch screen (see Figure 19 for an example). Note that adding a durable plastic lip may help prevent water from pooling on the bezel ledge, incorporating a plastic part is not appropriate for all applications (e.g., environmental conditions may cause the plastic to crack or melt).

Figure 19: Possible setup of plastic “lip”

Warranty note: If you use an adhesive to mount an NFI touch screen into a bezel, the touch screen must be detached from the bezel and adhesive to be returned to 3M Touch Systems under warranty.
Critical information: Integrating with a plastic bezel

Before mounting an NFI touch screen in a plastic bezel, metalize the bezel using conductive paint with conductivity of 10 ohms/square or less.

- **Leave an unpainted strip** that is about 1/8-inch wide between the edge of the bezel and the conductive paint. This helps prevent water from reaching the metallized (painted) area (Figure 20, Figure 21, and Figure 22).

- **Apply the grounded metallization past the edge of the touch screen.** This prevents interference with the touch screen from objects near or touching the bezel.

![Figure 20: Metallizing a plastic bezel](image)

- **Ground the metallized area** through screws that attach to the bezel.
- **Observe minimum mounting clearances** (Table E on page 26). Note: The mounting clearances in Table E apply whether integrating into a plastic or metal bezel.
Figure 21: Mounting (using plastic bezel) with metal clamp (Top View)

Figure 22: Mounting (using plastic bezel) with adhesive (Top View)

Table E: Minimum mounting clearances

<table>
<thead>
<tr>
<th>Screen size</th>
<th>8.4&quot;</th>
<th>10.4&quot;</th>
<th>12.1&quot;</th>
<th>15.0&quot;</th>
<th>18.1&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A — Front of touch screen to inside lip of bezel</td>
<td>0.020&quot; (0.5 mm)</td>
<td>0.020&quot; (0.5 mm)</td>
<td>0.020&quot; (0.5 mm)</td>
<td>0.020&quot; (0.5 mm)</td>
<td>0.030&quot; (0.8 mm)</td>
</tr>
<tr>
<td>B — Front of clamp to back of touch screen</td>
<td>0.020&quot; (0.5 mm)</td>
<td>0.030&quot; (0.8 mm)</td>
<td>0.035&quot; (0.9 mm)</td>
<td>0.045&quot; (1.1 mm)</td>
<td>0.060&quot; (1.5 mm)</td>
</tr>
<tr>
<td>C — Display to back of touch screen</td>
<td>0.060&quot; (1.5 mm)</td>
<td>0.070&quot; (1.8 mm)</td>
<td>0.080&quot; (2.0 mm)</td>
<td>0.100&quot; (2.5 mm)</td>
<td>0.120&quot; (3.1 mm)</td>
</tr>
<tr>
<td>D — Side of bezel to edge of touch screen</td>
<td>0.030&quot; (0.8 mm)</td>
<td>0.030&quot; (0.8 mm)</td>
<td>0.030&quot; (0.8 mm)</td>
<td>0.030&quot; (0.8 mm)</td>
<td>0.030&quot; (0.8 mm)</td>
</tr>
</tbody>
</table>

Viewing area & bezel opening: See NFI touch screen drawings on 3M Touch Systems website: www.3Mtouch.com
CHAPTER 6

Troubleshooting

This chapter provides:

- Strategies to assist you in troubleshooting the NFI touch screen system.
- A guide to interpreting the LED status lights on the NFI controller.

Strategies

The strategies listed below will resolve most problems.

If problems persist after working through this section and referring to other relevant chapters in this manual, contact 3M Touch Systems technical support (“3M Touch Systems support services” on page 3).

Check integration procedures

The information below regarding integration is not a substitute for the detailed information in Chapters 2, Chapter 3, Chapter 4, and Chapter 5.

- Check the way the touch screen is mounted to be sure that:
  - Touch screen and tail are mounted securely so they do not move when the touch screen is used.
  - Tail is inserted correctly between the retaining clip and the connector on the controller.
  - Controller is grounded to the product’s chassis with the grounding screw.
  - Controller is receiving the specified voltage (see “Check power supply” below).
  - Touch screen, controller, and tail are mounted in accordance with instructions in this manual.
Check port settings and connections
- Check that the COM port and COM port settings are correct (the system communicates with the host computer using the RS-232 protocol).
- Double-check all connections to be sure that:
  - The tail is properly connected to the controller.
  - Cable pin-outs are correct.
  - The power/communications cable is properly connected to the controller.

Check power supply
Check power to be sure that:
- NFI controller has a regulated DC power supply of 5V ±5 percent, capable of providing at least 300 mA.
- At least 4.75 VDC is measured on the NFI controller (otherwise it will remain in reset mode).

Prevent interference
- If there is interference between the touch screen system and a radio or television (which can be determined by turning the equipment off and on), try the strategies below. (The NFI touch screen system can radiate radio frequency energy. Some communication devices may also cause harmful interference to the NFI touch screen system):
  - Re-orient or relocate the TV or radio antenna.
  - Increase the distance between the touch screen system and TV or radio.
  - Connect the touch screen system to a different outlet on a circuit different from that of the TV or radio.
  - Consult the dealer or an experienced TV or radio technician for help.
- The touch screen system may also experience interference when near:
  - Components that generate a signal in the 50 kHz to 60 kHz range (unless they are adequately shielded).
  - AC sources and backlight inverters (unless there is intervening grounded metal work or shielding).

Reset the baseline
- Always reset the baseline if the NFI components in the touch screen system have moved.
- Run the Setup Wizard to reset the touch screen’s baseline. Do not touch — or allow other things to touch — the touch screen, bezel, or controller during baselining. After baselining, power cycle the controller.
  For details on resetting the baseline, see page 18.
Interpreting the controller’s status lights

When you provide power to the touch screen controller, all four LED status lights on the controller board (shown below) should illuminate briefly. The table below recommends strategies for different status light characteristics.

<table>
<thead>
<tr>
<th>LED</th>
<th>Characteristics</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1 Heartbeat/Communication</td>
<td>Green, blinking light.</td>
<td>If DS1 is blinking and no other LEDs are illuminated, no action is required.</td>
</tr>
<tr>
<td></td>
<td>Should begin blinking within a couple of seconds of powering up controller.</td>
<td>If DS1 is not blinking, make sure power is connected.</td>
</tr>
<tr>
<td></td>
<td>A dual purpose light:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blinks about two times per second when controller is idle.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blinks faster rate when there is communication between controller and touch screen (e.g., when screen is touched).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If DS1 is blinking and no other LEDs are illuminated, no action is required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If DS1 is not blinking, make sure power is connected.</td>
<td></td>
</tr>
<tr>
<td>DS2 Valid Touch</td>
<td>Green light.</td>
<td>If DS2 does not illuminate when the screen is touched and DS3 does illuminate, see “Strategies” for DS3 below.</td>
</tr>
<tr>
<td></td>
<td>Illuminates briefly with every readable touch to the screen.</td>
<td>If DS2 is flashing rapidly (faster than one per second), the baseline may need to be reset (see “Reset the baseline” on page 28).</td>
</tr>
<tr>
<td></td>
<td>If DS2 does not illuminate when the screen is touched and DS3 does illuminate, see “Strategies” for DS3 below.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If DS2 is flashing rapidly (faster than one per second), the baseline may need to be reset (see “Reset the baseline” on page 28).</td>
<td></td>
</tr>
<tr>
<td>DS3 Unreadable Touch</td>
<td>Red light.</td>
<td>Occasional illumination of DS3 is not cause for concern.</td>
</tr>
<tr>
<td></td>
<td>Illuminates briefly when controller detects an unreadable touch.</td>
<td>If DS3 is solidly lit the touch screen system may be shorted out, improperly grounded or have an inaccurate baseline. Rectify the situation and reset the baseline.</td>
</tr>
<tr>
<td></td>
<td>If DS3 is solidly lit the touch screen system may be shorted out, improperly grounded or have an inaccurate baseline. Rectify the situation and reset the baseline.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If DS3 is illuminating often:</td>
<td>If DS3 is illuminating often:</td>
</tr>
<tr>
<td></td>
<td>Make sure your hand is not resting on screen or bezel.</td>
<td>If DS3 is illuminating often:</td>
</tr>
<tr>
<td></td>
<td>If wearing gloves while touching the screen, set sensitivity to higher setting.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reset baseline, re-align the touch screen, and power cycle the controller (see page 18 of this manual or the NFI software guide applicable for your operating system).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work through “Strategies” on page 27.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If problem persists and sensitivity is set at 1, try changing sensitivity to a higher setting. If that does not resolve the error, contact 3M Touch Systems technical support.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX

Product standards and certifications

Standards

The Near Field Imaging™ (NFI) touch screen system is composed of components for incorporation in electrical or electronic apparatus, equipment or installations. The NFI touch screen system is evaluated for use with a Class 2, Limited power source. If integrated according to the guidelines in this manual, the NFI touch screen allows certification to the following standards for the overall product:

Safety standards

Evaluated to:
- UL/CSA 60950
- EN 60950
- UL Recognized Component (File E 217706)

Evaluated for use with a Class 2, limited power source

Dust and moisture resistance

CSA C22.2 No. 94–M91 Special Purpose Enclosures, enclosure 4X, enclosure 12
NEMA 250 Electrical Enclosures, Type 4X, Type 12
IEC 529 Degrees of Protection Provided by Enclosures, IP66

Electromagnetic emission standards

Tests were successfully conducted on a sample of the equipment for the purpose of demonstrating EMC compliance with EN 50081-1992 Generic Emission Standard, FCC CFR 47, Part 15, Subpart B, and ICES 003 (see “FCC compliance note” below).

<table>
<thead>
<tr>
<th>Standard</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiated and conducted emissions</td>
<td>FCC CFR 47, Part 15, Class B limits</td>
</tr>
<tr>
<td>Radiated and conducted emissions</td>
<td>EN 55022, Class B limits</td>
</tr>
<tr>
<td>Power line harmonics</td>
<td>EN 61000-3-2</td>
</tr>
<tr>
<td>Power line fluctuations and flicker</td>
<td>EN 61000-3-3</td>
</tr>
</tbody>
</table>
FCC compliance note
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules and ICES 03. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of more of the following measures:
- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Electromagnetic compatibility immunity standards
Tests were successfully conducted on a sample of the equipment for the purpose of demonstrating EMI compliance with EN 61000-6-2 Generic Industrial Immunity Standard and EN 55024 Information Technology Immunity Standard.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic discharge</td>
<td>EN 61000-4-2</td>
</tr>
<tr>
<td>Radiated immunity, modulated</td>
<td>EN 61000-4-3</td>
</tr>
<tr>
<td>Radiated immunity, keyed carrier</td>
<td>ENV 50204</td>
</tr>
<tr>
<td>Electrical fast transient/burst</td>
<td>EN 61000-4-4</td>
</tr>
<tr>
<td>Surge transient</td>
<td>EN 61000-4-5</td>
</tr>
<tr>
<td>Conducted immunity</td>
<td>EN 61000-4-6</td>
</tr>
<tr>
<td>Power frequency magnetic field</td>
<td>EN 61000-4-8</td>
</tr>
<tr>
<td>Voltage dips and interruptions</td>
<td>EN 61000-4-11</td>
</tr>
</tbody>
</table>

Certifications

UL Recognized component (File E 217706).

CE Information Technology Equipment — Europe
The NFI touch screen system has been tested to the following standards to show compatibility for use in products requiring CE marking under the following directives:
- EMC Directive 89/336/EEC
- Low Voltage Directive 73/23/EEC
- Machinery Directive 89/392/EEC
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