

## Integrating 5-Wire Touch Sensors Into a Custom or Standard Bezel

### 5-Wire Resistive Integration Quick Reference

#### FRONT GASKET

Make sure that the front gasket does not overlap into the clear viewing area of the sensor. Failure to do this will result in shorting problems when the bezel is clamped and the top circuit of the screen is in permanently closed contact with bottom circuit. The touch screen is not designed to be held in place by the top film. Do not use high-tack adhesive tapes to attach the touch sensor to the bezel. Ideally, use a soft, closed-cell foam in conjunction with a mechanical clamp to hold the touch screen in place.

#### BEZEL

Make sure your bezel is designed in such a way that no pressure is exerted onto the active area of the screen. Ensure sufficient bezel stability. Avoid the bezel from applying inward pressure on the surface of the touch sensor when clamped.

#### TAIL CONNECTION

Do not crease the tail or use it as a handle. The tail is intended for electrical connection only. Ensure a minimum of .16 (4 mm) bend radius.

#### TAIL PLACEMENT

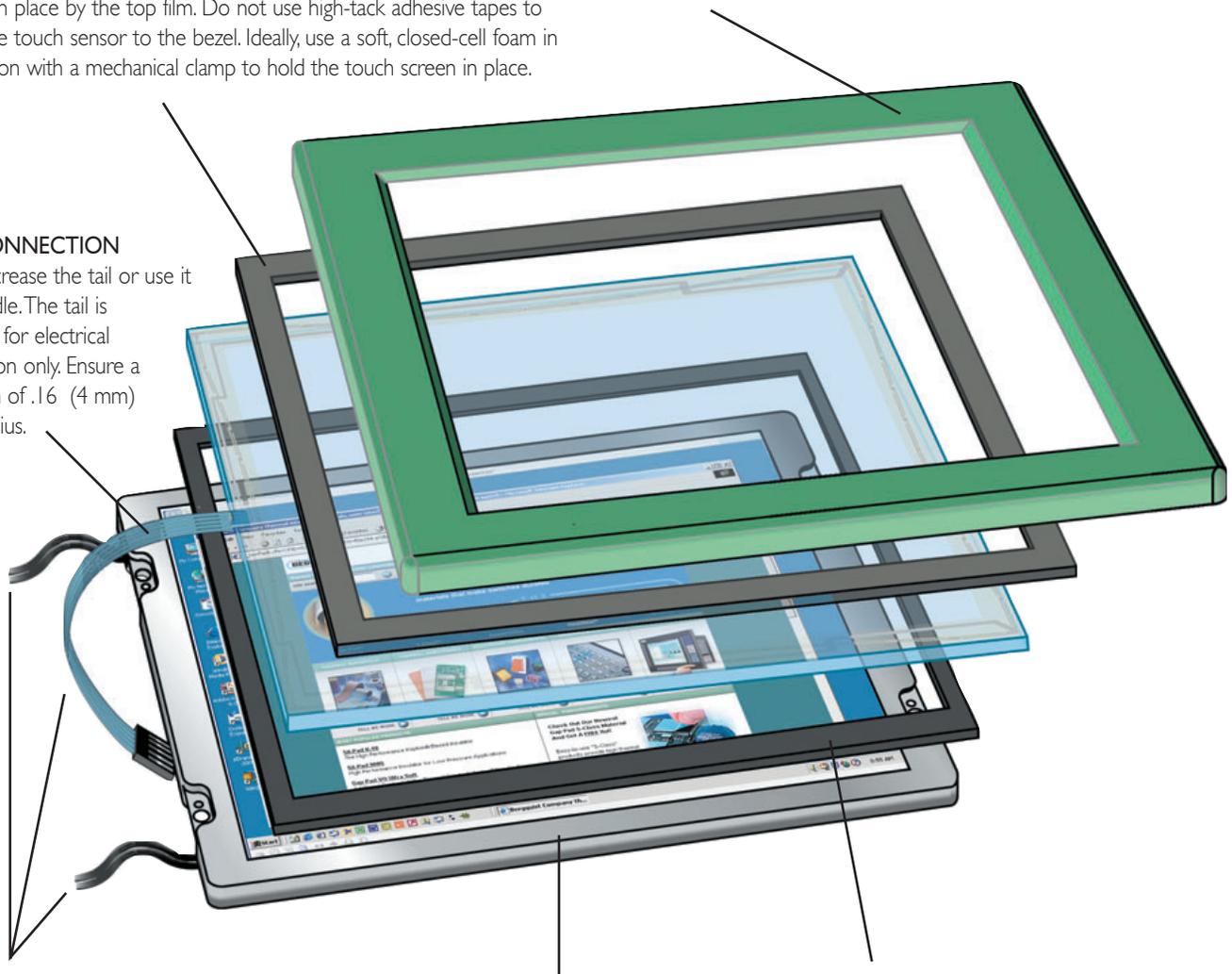
Do not run the tail past high power, voltage or frequency components and cables (e.g. power cables), display inverters or RF transmission devices.

#### DISPLAY

Make sure the housing of your display is strong enough to support the clamping forces required to hold it in place and seal a touch screen. If the mechanical design of your display does not allow for this, use a separate clamp to mount your touch sensor.

#### REAR GASKET

Make sure to recess the rear gasket from the viewing area of the display. Use a thin gasket to avoid the gasket or display housing from becoming visible when viewing at an angle.



## 5-Wire Resistive Integration

### Overview

This document discusses in detail how to properly integrate Bergquist 5-Wire touch sensors into a custom or standard bezel. As resistive touch screens are made of a variety of different sensitive materials, the touch sensor construction and correct integration are vital to obtaining and maintaining a mechanically, optically and electrically well-performing product.

These simple design and assembly instructions are designed to provide you with a good understanding of potential problems that may occur when a resistive sensor is integrated incorrectly, and how to avoid these problems before you begin designing the bezel, mounting clamps and gaskets.

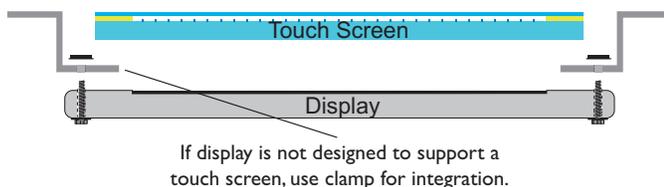
### Rear Gasket, Clamp or Adhesive

Before you begin designing the bezel, consider the following:

- Mechanical strength of display
- Distance to touch screen
- Mounting location(s) of display
- Cleanliness of housing interior
- Display warranty issues

### Mechanical Strength of Display

Make sure that the display of choice is strong enough to withstand the forces exerted on it when using the display to clamp the touch screen. Many displays are not designed for use as a touch screen clamp. In this case, you must use a separate clamp to hold the touch screen in place and to seal the perimeter to the bezel.



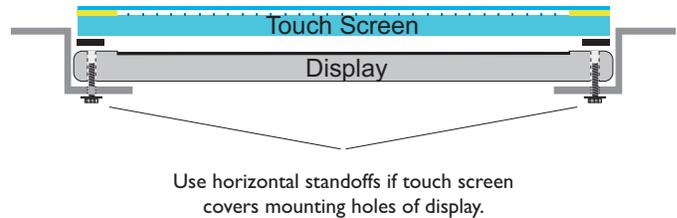
### Gap Between Display and Touch Screen

Allow for some space between the display and the touch screen. Never place the screen directly on the display as this may result in Newton Rings on the final product. This may also lead to scratching of the display's exposed polarizer when mounting the screen in a non-dust-free environment.

Also, make sure that you do not leave a large gap between the surface of the display and the rear of the touch sensor as this will lead to an offset between the touch location and the resulting cursor position when viewing and operating the system at an angle. Therefore, make sure that you keep a distance of 0.008" (0.2 mm) to 0.020" (0.5 mm) between the display and the touch screen.

### Display Mounting Locations

Ensure that the mounting holes of the display are not obstructed by the perimeter of the touch screen. Many newer displays have extremely slim perimeters that do not allow the display's mounting holes to be used to provide an adequate clamp. If this is the case, use rigid horizontal standoffs.



### Cleanliness of Housing Interior

When the display and touch screen are sandwiched together, keep in mind that dust may potentially obstruct the adequate appearance of the display and can no longer be removed without disassembly. Bergquist therefore recommends you assemble this package in a clean environment and use a rear gasket between the touch screen and the display to prevent dust from getting into this gap.

### Display Warranty Issues

Most display manufacturers will not accept warranty claims for failure of their product if a display is permanently mated with a touch sensor. Therefore, avoid using high-tack, non-removable, double-sided adhesives to hold the touch screen in place.

### Rear Gasket Material

For the rear gasket, use a material that prevents dust and contamination from getting in between the display and the touch screen backer. If possible, use a soft material that compensates for manufacturing tolerances of both the touch sensor and LCD. Select gasket material with the cleaning agent for the display's polarizer in mind, ensuring that the cleaning agent will not dissolve or discolor the gasket material. Select a dark color to prevent reflection in the display.

### Rear Gasket Adhesives

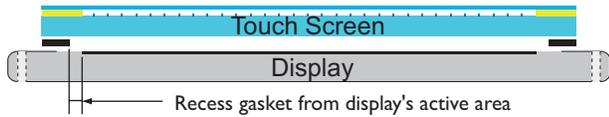
It is not necessary to use an adhesive on the rear gasket to hold the touch screen in place. If the sensor can be accurately aligned and placed between two foam gaskets, the clamping forces are generally sufficient to ensure a solid placement and dust seal.

However, for simplified integration, use a permanent, low-tack, easily removable adhesive that allows you to remove the touch screen from the display in the event of display/sensor contamination or misalignment.

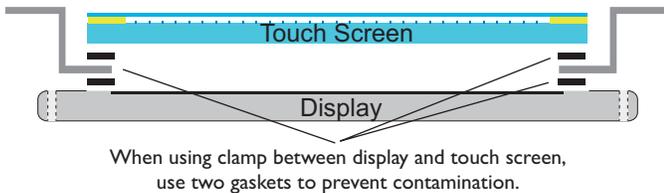
Remember that the display will get warm and that you must prevent adhesive from re-flowing. Therefore, select an adhesive that performs within the operating temperature range of the display.

## Rear Gasket Design

Recess the rear gasket from the viewing area of the display to allow for alignment tolerances and deformation of the material under compression.



When using a clamp between the touch screen and the display, make sure you use two gaskets (between the clamp and the touch screen backer and between the clamp and the display) to prevent dust from getting in between this optically-sensitive area.



## Rear Gasket Assembly

The rear gasket can first be placed on the rear of the touch screen or directly to the housing of the display. When using an adhesive gasket, make sure to avoid adhesive streaks that will contaminate the display polarizer or rear of the touch screen backer; thus influencing the optical appearance of the system. Therefore, carefully peel back the gasket liner and place the gasket on the display or sensor perimeter in such a way that it does not penetrate into the display's viewing area.

## Touch Screen Alignment and Mounting

It is advisable to first align the touch screen to the display. For best results, use a low-tack rear gasket adhesive that allows you to correct alignment errors. Place the touch screen on the display in such a way that the distance between the display's viewing area and the touch screen's active area is identical in all directions. Use the innermost resistor segments of the screen and the opening in the display's housing for reference.

**Note:** Due to tolerances of cut glass size tolerances, edge registration is not recommended.

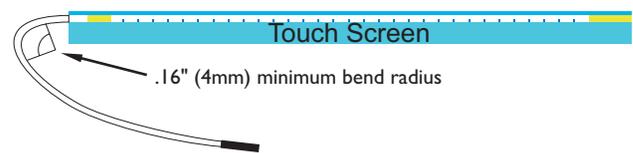
Once the screen has been properly aligned with the display, use the display's mounting hole and/or clamp accuracy to properly align the touch screen/display package to the bezel.

## Tail Placement

*Touch screen tails are designed for electrical connection only and are not meant to be used as a handle.* Although the interconnect tails are strong, the touch screen will not perform as intended if the tail is creased, cut or when the tail bond is broken. Therefore:

- Never crease or trim the touch screen tail
- Never pick up the touch screen by the tail

Make sure that the tail wraps around the electronics easily without inflicting pressure, stresses or creases. Always ensure a minimum bend radius of .16" (4 mm).



**IMPORTANT!** The 5-Wire touch screen is resistive technology, meaning it operates by accurately measuring voltage drops across its surface. This is achieved by applying constant voltages to the corners of the screen and sensing the voltage of a touch position through the tail. It is therefore vital that the tail is not influenced by static, high frequency or voltage. To ensure this does not happen, do not run the tail past any power or high frequency components or cables, such as backlight inverters, power leads or wireless communication antennas.

**Avoid close proximity or contact of touch screen tail with high voltage or frequency components such as backlight inverters or cables.**



## Front Gasket Material

The front gasket's primary task is to provide adequate sealing capabilities against dust, moisture or fluid ingress. Bergquist recommends using a soft, closed-cell-expanded polymer foam material that will compensate for manufacturing tolerances in the bezel and provide superior sealing attributes in both compressed and uncompressed states.

### O-Ring Gaskets

The use of O-ring gaskets and high clamping pressure may cause portions of the screen to distort and degrade the product's optical appearance.

### Front Gasket Adhesives

Bergquist resistive touch screens are not designed to be mounted to the bezel or to be held in place by an adhesive. In addition, pressure sensitive adhesives usually generate micro fissures that allow for fluid ingress over time, thus proving to be an ineffective sealing material when high NEMA or IP sealing is required.

For applications that do not require NEMA4 or IP65 sealing capabilities, low-tack adhesives can be used to align the touch screen to the bezel.

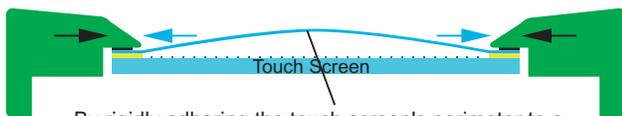
Avoid using high-tack adhesives. The touch sensor is designed in such a way that its top film is allowed to move slightly, allowing the material to expand and contract with thermal and environmental changes. This prevents the top film from distorting when exposed to elevated temperatures.

Adhering the top film to the bezel with a permanent, high-tack adhesive may lead to contact problems due to the de-lamination of the touch screen's top film from the perimeter and, consequently, its electrical interconnect materials. In the worst case, if the touch screen is not supported at the backer, a complete, de-lamination of top film and glass circuitry may be the case.

When the top film is adhered to the bezel with a permanent, high-tack adhesive, contact problems may arise due to the de-lamination of the touch screen's top film from the perimeter and, consequently, its interconnection.

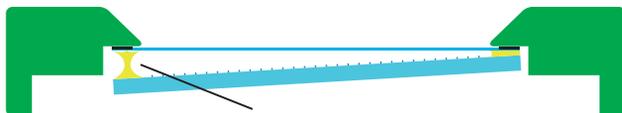
Using a permanent adhesive to hold the screen in place on a bezel may result in one or more of the following problems:

- Distortion of the top film due to temperature changes.



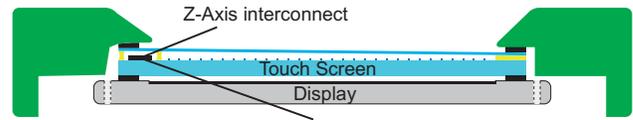
By rigidly adhering the touch screen's perimeter to a gasket the top film has no room to expand and will result in a pillow when exposed to elevated

- De-lamination of the touch screen layers, if not additionally supported through its backer:



By rigidly adhering the touch screen to the bezel without further support to the backer the screen may de-laminate

- Contact problems due to distortion of the bezel and de-lamination of the Z-axis interconnect.

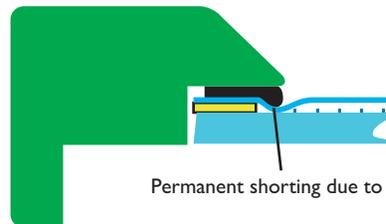


When rigidly adhered to the bezel, the Z-axis interconnect may be broken if the bezel distorts

To avoid such problems, use low-tack, removable adhesives instead of double-sided adhesive gaskets.

### Front Gasket Design

Using the correct dimensions is equally critical as selecting the correct materials for the front gasket. Because the front gasket expands when compressed, make sure it does not reach into the transparent viewing area of the touch screen. This is achieved by recessing the gasket from the screen's viewing area (depending on material compression ratio and thickness, as well as clamping pressure and placement tolerance). Failure to do so may result in permanent shorting when the screen is clamped between the display/mounting bracket and the bezel.



In addition, to prevent the gasket from wrapping around the perimeter of the screen when the gasket is compressed, recess it from the edge of the touch screen by at least .05" (1.4 mm).

### Front Gasket Assembly

Use a fixture to accurately place the gasket on the touch screen or to attach it to the bezel. When mounting the gasket to the touch screen, do not use the touch screen perimeter as registration points. Instead, place the gasket on the touch screen using the resistor network's center resistors as reference.

### Bezel Design Considerations

Make sure the bezel is designed in such a way that the area that clamps onto the screen does not distort. Any inward pressure on the screen may result in a pillowing effect as shown earlier.