
Crystal Touch Frequently Asked Questions

1. What is Crystal Touch?
2. How does Crystal Touch compare to resistive touch screens?
3. What's the resolution of a Crystal Touch panel?
4. Does Crystal Touch require user calibration?
5. Will Crystal Touch reduce the visibility of the LCD?
6. Is there a cost premium for Crystal Touch?
7. What sizes are available?
8. How do I interface Crystal Touch to my hardware?
9. Can I connect to Crystal Touch via USB?
 10. What software drivers are available?
 11. How do I write my own software driver?
 12. Will Crystal Touch work with gloves?
 13. Can I use a stylus?
 14. How big should I make my touch areas?
 15. Can I place touch areas around the edges of the screen?
 16. Can I increase the sensitivity of the touch screen?
 17. Is Crystal Touch susceptible to radiated noise?
 18. Can I use Crystal Touch to create a flat enclosure surface?

1. What is Crystal Touch?

Crystal Touch is Ocular's projected capacitive touch screen technology. A projected capacitive touch screen projects an electromagnetic field through the surface of the touch screen. As a user's finger approaches the touch screen, it begins to capacitively couple with the field. This coupling changes the capacitance of the touch screen and is used to identify the location of the finger.

For more information see [Projected Capacitive Touch Technology](#).

2. How does Crystal Touch compare to resistive touch screens?

2.1. Construction

Both Crystal Touch and resistive touch screens are formed from two parallel layers of Indium Tin Oxide (ITO), a transparent conductive material. With Crystal Touch both layers of ITO are bonded to sheets of glass. With resistive touch screens the bottom layer of ITO is bonded to glass while the top layer of ITO is bonded to a flexible film.

2.2. Durability

As the user presses, bends, cleans, and scratches the flexible film layer of a resistive touch screen, the characteristics of the film change. This causes drift, which requires frequent recalibration. Further, a resistive touch screen can easily be damaged to the point where the touch screen fails to function.

Crystal Touch's all glass construction prevents any drift of the ITO over time or temperature. It also protects the conductive layers from damage. Consequently, Crystal Touch screens are much more durable than resistive touch screens.

2.3. Operational Parameters

Crystal Touch and resistive touch screens have similar response times and resolutions.

For more information on the differences between projected capacitive and resistive touch screens see [Projected Capacitive Touch Technology](#).

3. What's the resolution of a Crystal Touch panel?

All Crystal Touch panels have a touch resolution of 2048 x 1536 where 2048 is always the long axis of the panel. Typically the software driver will translate this native coordinate system into screen's resolution. For example, when used with a 480 x 272 panel, the screen coordinates of the touch can be calculated like this:

$$X_{LCD} = 480 * (X_{TP} / 2048)$$

$$Y_{LCD} = 272 * (Y_{TP} / 1536)$$

4. Does Crystal Touch require user calibration?

Crystal Touch performs a self calibration on every power up. This calibration is related to the construction of the panel which does not change over time. You

can leave your Crystal Touch touch screen powered up indefinitely without having to recalibrate it.

5. Will Crystal Touch reduce the visibility of the LCD?

All touch screens have some impact on the amount of optical clarity of the LCD. This clarity can be measured in two ways: haze and transmittance

5.1. Haze

Haze, defined by JIS K7361-1, is a measure of how the touch screen affects the crispness of the underlying image. All touch panels induce some amount of haze. Typical resistive touch screens have haze rates of between 5% and 10%. The Crystal Touch haze rate is less than 3%.

5.2. Transmittance

Transmittance is a measurement of how much light makes it through the touch screen. Typical resistive touch screens have transmittance rates of 80% to 85% (meaning 80% of the light from the LCD makes it through the touch screen). The Crystal Touch transmittance rate is 90%.

6. Is there a cost premium for Crystal Touch?

Crystal Touch generally has a higher initial cost than resistive touch screens due to the added cost of a controller chip (if you have to buy a separate controller chip for your resistive touch screen, the price difference is much less). In larger screen sizes the controller chip is a smaller percentage of the total cost, so the cost difference between Crystal Touch and resistive touch screens decreases as the screen size increases.

Looking at total lifetime costs, Crystal Touch is less expensive than resistive due to its increased reliability and durability, resulting in decreased maintenance and replacement costs.

7. What sizes are available?

Crystal Touch comes in standard sizes of 3.5", 4.3", 5.7", 7", 8", and 10.1". Custom sizes are also available.

All Crystal Touch panels are between 2mm and 3mm thick depending on the size. See a specific module or Crystal Touch datasheet for exact measurements.

8. How do I interface Crystal Touch to my hardware?

All Crystal Touch screens have the exact same hardware interface, a 10-pin flat cable (FPC). The pinout is:

Pin No.	Symbol	Description
1	SCK	SPI Clock
2	MISO	SPI Master In Slave Out
3	SS_N	SPI Select
4	DR	Data Ready
5	MOSI	SPI Master Out Slave In
6	GND	Ground
7	V _{DD}	Power Supply
8	GND	Ground
9	SNSN	Stylus input
10	GND	Ground

SCK, MISO, SS N, MOSI: These pins are a SPI communications bus.

DR: This pin indicates when the Crystal Touch controller has data to send and when the Power On Self Test (POST) has completed successfully.

SNSN: This pin is for a dedicated stylus input.

Use Molex connector part number 55207-1060 or equivalent to mate with the FPC. See the [Crystal Touch User's Manual](#) for more information.

9. Can I connect to Crystal Touch via USB?

A USB option is available as a custom solution. Contact Ocular for more information.

10. What software drivers are available?

XP/Vista and Win CE drivers are available. A Linux driver is available for kernel 2.6.26 and later. Contact Ocular for more information.

11. How do I write my own software driver?

Crystal Touch has a simple SPI interface that can be easily adapted to any microprocessor. See the [Crystal Touch User's Manual](#) for more information.

12. Will Crystal Touch work with gloves?

When a user's finger approaches the surface of the touch screen, it begins to capacitively couple with the electromagnetic field generated by the touch screen. Anything that alters the capacitance of the finger affects the ability of the touch screen to detect its presence.

While gloves do not directly affect the capacitance of the user's finger, they do affect how close the finger gets to the internal conductive layers that are generating the electromagnetic field. Therefore, thinner gloves tend to work while thicker gloves do not. Furthermore, the sensitivity of the panel can be altered to compensate for some gloves. However, this can make the touch screen difficult to use without gloves.

In general, Crystal Touch works well in applications where the user's hand is covered with a thin material and/or where the same material is used consistently (e.g., medical applications).

13. Can I use a stylus?

Crystal Touch works well with an active stylus, that is a stylus that is electrically connected to the system. A passive stylus can work if the stylus is conductive (i.e., metalized) and if it is making direct contact with the user's skin.

Contact Ocular for more information on using an active or passive stylus.

14. How big should I make my touch areas?

Each touch area should be at least 10mm². The touch areas should be 5mm to 10mm apart to prevent accidental activation of an adjacent touch area.

The minimum touch area and spacing can be decreased with software techniques such as adaptive guessing and telescoping. Adaptive guessing, typically used with touch keyboards, is a software algorithm that attempts to guess what the user is typing based on a dictionary, previous input, contact lists, etc. Telescoping is a software zoom-like feature where the area being touched dynamically grows or extends above the user's finger. This helps the user confirm that they are touching the correct area.

15. Can I place touch areas around the edges of the screen?

A valid touch is based on the centroid of the user's finger. When the user touches the edge of the screen, they may not have a sufficient amount of their finger over the electromagnetic field to register a touch. For this reason, touch areas should be at least 10mm from the edge of the screen.

16. Can I increase the sensitivity of the touch screen?

The sensitivity can be adjusted in hardware and software. Ocular can help define the correct hardware sensitivity based on the application. Sensitivity can also be adjusted in software by changing the amount of capacitive coupling required to define a touch event. See the [Crystal Touch User's Manual](#) for more information.

Keep in mind that the hardware sensitivity adjustment defines a minimum level of capacitive coupling. The software sensitivity adjustment is applied after that.

17. Is Crystal Touch susceptible to radiated noise?

All Crystal Touch panels include an integrated ground plane which shields the touch panel from radiated noise coming from the TFT.

18. Can I use Crystal Touch to create a flat enclosure surface?

Because the user is interacting with the touch screen through an electromagnetic field and not through direct, conductive contact, the touch screen can be sealed beneath a layer of clear material such as glass or acrylic. For example, the touch screen can be bonded to the interior surface of a clear enclosure, creating a completely flat enclosure surface.

Keep in mind that the sensitivity of the panel may need to be adjusted to compensate for the added distance between the touch screen and the user's finger.