TRANSPARENT (TRANSLUCENT) DISPLAY TECHNOLOGY

FREQUENTLY ASKED QUESTIONS (FAQS)

PANELS DISPLAY KITS

&

SHOWCASES

"We will exhibit a number of our transparent kits and solutions at www.electronica.de (Hall A3 Stand 507) 11-14th November."

Introduction

This document was compiled by myself Chris Bartram (Managing Director at CDS) to help and aid companies and individuals that are considering utilising the transparent display technology in their products, design and applications.

It is not intended to be a specific design guide as every project is different but rather to pass on the experience and knowledge I and CDS have accumulated over the last few years with this niche technology.

Many points included in this documentation are not scientific points of fact but opinions based on experience to help readers when considering their options for the transparent Display technology. It is not aimed to be a scientific or physics thesis but rather a practical overview of the technology to help the readers also avoid some of the mistakes companies have made with the transparent technology since its inception.

For specific questions or projects we recommend contacting Crystal Display Systems on info@crystal-display.com.

As this technology is constantly evolving and improving things will change but we hope this document gives you an excellent overview of the technology based on questions we have been asked and information supplied.

I hope you find this document useful but if you feel other questions should be added please just send them to info@crystal-display.com and we will gladly look at these and add them where appropriate.

The final word is on terminology which as you know does change by market sector and country / region but I have tried to account for this so each point is clear. Just to be clear for this document there is no difference between transparent and translucent but we use it interchangeably as the questions came from all over the world and consequently they used different words.

Chris Bartram

Best regards
Chris Bartram

Transparent Display Frequently Asked Questions (FAQs)

1. **Does the Transparent Display go white (Clear) when powered off?**
   a. No they are dark (somewhat transparent) but need a voltage across the display (you can use the interface card and power supply we supply as a part of the kit) and when you apply a white pixel the displays become transparent. The transparency rate is around 15%.

2. **How does the content work?**
   a. You simply create content in the same way you would for any other display but you must just remember that black stops the light completely and white makes the display translucent (see through). Therefore, you can make products behind the display appear and disappear in front of your eyes.

3. **Does it work in sunlight?**
   a. Yes you can us these in sunlight as the films we use have sunlight readable properties but you will also need to ensure sufficient light behind the transparent display is present and ensure limited dissipation so the backlight is more effective than the sunlight in front of the display. When used in direct sunlight you should also apply Ultra violet (UV) protection on the front glass.

4. **How thin are the bezels on the Transparent Displays?**
   a. The size of the bezels depends on the size of the displays as obviously the larger the display the bigger the bezel must be to ensure a strong and rigid structure. Often the bezels are offset to accommodate the drive electronics from the TFT LCD panel.

5. **Can they be used for a videowall?**
   a. Yes they can like any other standard display BUT due to the bezel structure you will not be able to achieve a Super Narrow Bezel (SNB) solution as is possible with other displays that are specifically designed for that purpose as you can see here - Click here for ***videowalls***.

6. **What colour backdrop is needed?**
   a. It should be a white backdrop or background to achieve that look of a white colour and optimise the contrast to achieve the best results. You can see this in our transparent showcase products – click here for our ***transparent showcases***.

General Note on Backlighting

The transparent displays DO NOT include backlights and so the user / integrator etc. must supply their own backligting for the box / showcase solution with a sufficient brightness to ensure a good crisp image to optimise the performance. We mention later in this FAQs more about light transmission and possible lighting solutions.

7. Will it work without a backdrop?

   a. Possibly BUT there must be a lot of light to enable the image on the screen to be shown effectively and this is difficult unless the light is boxed in as it dissipates very quickly. We do not recommend this but it is possible with the correct lighting solution. Here is an example of a transparent display just simply put against a window looking out onto the car park with no additional lighting:


8. Does backlight have to be white?

   a. Yes this is what we recommend to optimise the contrast and image quality.

9. What makes our technology better compared to others?

   a. CDS offer the latest transparent technology maximising transparency whilst utilising high quality base panels to ensure viewing angles and the colour gamut is optimised to result in the best panel and solution performance. But we say simply try our technology and you will not be disappointed. Plus we are constantly expanding our range to help offer the right solution for every application where possible which now includes FULL HD 1920 x 1080 resolution as well as Ultra HD 4K (3840 x 2160) resolution in our 84" Transparent.

10. How is the content updated?

   a. Our interface card solution (see below) gives you a kit that you can then use either the USB (for simple local updates, or VGA and HDMI inputs to connect your own choice of PC or media player. As you can see this offer a very flexible reliable solution for your application.
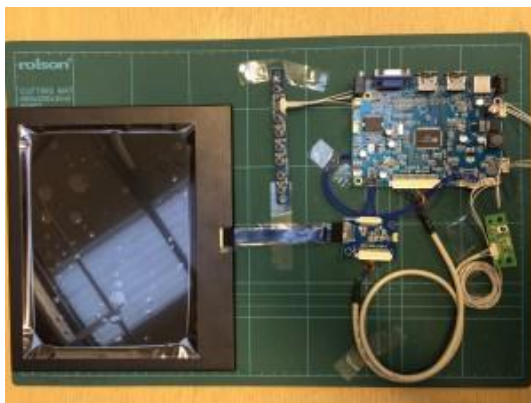
11. What file types can we use for content with your transparent kit solution?

    a. Our interface solution offer a number of options for your content with the most common being MPEG4 at a resolution of 1920 x 1080. But please click on the following link to download our Interface card which includes all accepted file formats / codecs etc. **Transparent Interface solution**

12. Can they be updated remotely?

    a. Yes they can by simply connecting your PC or media player to our kit solution via the HDMI input on the interface card provided. We can offer the full solution including a cloud based Media player. For more information please go to ***FULL HD Media Players***. Easy ☺

13. Is touchscreen available?

    a. Yes we have a full range of touch screen technologies available but if you can use it we recommend Infra-Red which with its pure glass front (i.e. no transparency lost through say wires or ITO layers with other technologies) it gives and excellent image quality and finish. Infra-red touch panels are currently available for ALL our transparent displays.

14. How many touch points?

    a. Currently we can offer up to 32 touch points but this may increase with time, although we always recommend customers consider if they really need so many touches as this just adds to cost with often no benefits!

15. What is MTBF rate on your panels?

    a. We do not have this information available but we can confirm that the MTBF is very high due to the fact that our transparent displays have no backlight and the backlight is traditionally the 'weakest link' in standard TFT LCD. Our transparent displays have shown the highest reliability and quality.

16. What are the temperature ranges?

    a. Standard operating temperatures are 0-50 degrees Celsius. If you need extended temperature versions please ask our technical sales team for information / advice.

17. Can they be used in refrigerators / Coolers?

   a. Yes they can and have been in a number of applications already. We can supply you with Transparent kits to fit into a number of refrigerator sizes (21.5" up to 55") or we can supply fully equipped Transparent fridges as finished products and they can be found here:

   Transparent refrigerators and coolers

   If you take the Transparent kits you would have to integrate this yourselves.
   We can also have a custom built door to meet your specific requirements or to match the current door you already have. Please ask us for more details.

18. Can they be used in freezers?

   a. At the time of writing we have not found anyone achieve this in production due largely to the negative temperatures. It may not be impossible but would take some investment and testing to somehow build in and insulate the transparent display between 2 pieces of glass so it is not negatively affected by the temperature of the freezers.

19. How would a touch interactive refrigerator work, does it work through glass or need to be layer on the outside?

   a. This can be done in a number of ways but the simplest would be to affix an infra-red touch screen to the outside of the refrigerator door with a PC built into the back and it could then work like any touch screen monitor. But we always ask the customer is this really necessary and why would people touch a refrigerator? To get information? We always want applications to be practical and effective not just 'gimmicks'

20. The backside of some transparent displays are mirrored. Why is that?

   a. This is standard on all displays now as the mirror acts as a contrast enhancement film, and increases the contrast and colour depth of the image, as well as maximises the light within the showcase, unlike some other displays.

21. Is heat a problem within transparent showcases & what temperatures do they get to?

   a. Heat is normally not a problem as they produce very little heat themselves as they have no backlight and a simple connector box on the back incorporating a small PCB. They will only be effected by heat from the LED backlighting within a showcase box solution but as every application / design is different we cannot comment on those but just recommend that when our kits are designed into a boxed application that the temperature is measured to stay within the panel specification. Air vents can also be utilised for heat dissipation and ventilation if this is a concern.

   We recommend LED backlighting to help keep the heat to a minimum.

22. Can the transparent showcases be used for old artefacts such as museum pieces?

    a. Transparent display showcases have been used for museums but this has to be looked at on a case by case basis especially with very old artefacts as to how they are effected by such conditions, especially light. Most museums have their own or know of experts on light etc. to ensure such artefacts are not damaged or negatively affected.

23. Do I need a power supply for the Transparent Displays?

    a. The interface board comes as a part of the kit and this requires a custom 12 volt power supply but we supply this as a part of the kit so you have the complete kit solution.

24. Will the transparency be as clear a normal window or piece of glass?

    a. No it will not and cannot be as the TFT LCD is made up of glass, a TFT LCD array (of RGB dots) plus polarizers all of which absorb light. Transparency is around 15% so one needs good brightness behind the display to ensure an excellent image. When the display is off it is a dark colour that is barely translucent so cannot be clearly seen through.

25. What brightness is needed behind the screen?

    a. This depends on what brightness you want at the front of the screen but with transparency at around 15-20% to achieve 300cd you will need around 1500cd etc. But with the new high bright white LEDs this is not a problem and not that expensive.

26. What is the resolution of images?

    a. Resolution (i.e. dots per inch) will depend on the display itself plus the content put onto the screen but as regards the actual number of pixels per display we offer anything up to 4K (3840 x 2160) on the 84" and every display from 21.5" is now FULL HD 1920 x 1080. If you have a specific question or project for a specific resolution please email us your question at info@crystal-display.com

27. What resolution is your 9.7" screen and the content in your showcase?

    a. This is a 1024 X 768 resolution screen in portrait mode, and can run 640 x 480 content resolution due to the built in media player which looks excellent on such a small display.

28. How do I add content to your CDS transparent 10" showcase product?

    a. You simply put your content onto a USB drive inside a folder called _autoplay and our solution will automatically play your video or images. If you have more than one image / video it will play them in order of file name by number and then letter so you can name them accordingly to play in the correct order. Basically, it downloads the content to a local memory.

29. How much lighting do we need behind the display to create a good crisp image?

    a. This will depend largely on the size of the showcase box you are using / designing but please refer to question 25 above on brightness.

30. What inputs / Connections do you offer for your transparent solutions?

    a. We offer this with a USB / VGA and HDMI connections on the input to make it very easy for you to connect to your system.

31. How do we connect from the board to the Translucent Display?

    a. You simply connect via the LVDS cable into the display, which is supplied as a part of the CDS kit. See below.

32. What backlighting do you use or recommend for showcases?

    a. The standard LEDs we use are 6000K cool/daylight white. They are fixed on and non-dimmable.

33. Is the lighting dimmable in the showcases?

    a. Dimming could be achievable but we would need to know how you would want to control the dimming?

34. How do colours work with Transparent Displays

    a. Basically if you take the 2 extremes of black and white, Black blocks out the light so nothing can be seen behind the screen whereas white becomes translucent so it is 'see through' and all those colours in-between become more or less transparent depending on how dark or light they are! So for example dark blue or grey are not very translucent but light pink or pale blue are very translucent. This can be better appreciated if you think about a window and Black = blinds down and white = blinds up so you can see in the window. This is how you can make products inside your showcase box appear and disappear before your eyes!

35. Can it be used in shop/ store windows etc.?

a. There is no reason why not but it must have sufficient light behind the screen to counter balance any light directly being shined onto the store widow. As every window is different a site survey would have to be carried out as there is a big difference between say a south facing window in California and a side road in Moscow for example. Our experience with shop windows has made us consider such things as:

  i. Position of window
  ii. How much direct sunlight?
  iii. Any reflections on the outside store widow?
  iv. Sufficient light behind the transparent screen?
  v. Would it not be better placed inside the store as people enter the main doors etc?

36. How are your transparent displays packaged for shipping?

a. Due to the potential fragility of transparent displays custom packaging is very important to us so we use custom boxes that are also suitable for International travel and freight forwarding. Clearly the exact box depends on the size and quantity but you can see an example below.

37. Can we show white content on a white background?

    a. Transparent LCD technology if effectively a filtering technology. It filters the light behind the display to create the image. The display is made up of pixels. When the pixels are 'White' they are effectively 'open' and therefore letting you see through the pixel.

    So effectively white is clear.

    In the below example the world map 'white colour' is fully open cell (i.e. Clear) and what you are actually seeing as white is the backdrop of the light box behind (Note there should be light box behind to get the best contrast and brightness).

    The area around the world map, that looks slightly darker, is an off white colour, creating a shade as the pixels are slightly 'closed'

    The Dark black colours in the MAP (USA, UK, India, and Australia) are full black, so the pixel are fully closed.

In respect to your particular application, where you are trying to show white text on a white background. I am afraid this would not be possible.

The only thing we could suggest is that you outlined the white text/Graphic with a black outline

EXAMPLE OUTLINE TEXT OR **USE BLACK TEXT ON WHITE BACKGROUND**

38. If I purchase a kit what else would my company need to supply to have a transparent showcase solution / product?

    a. You would only need to supply the white LED lighting and the box / cabinet, plus some content to show on the screen. That is all. We can actually supply you with some test content when you purchase a kit or showcase from us as a part of our customer service support system!

39. Your 10" transparent showcase (see image below) is a great product but how do we change content?

    a. Please find the details on updating the showcase you have as follows:

- The showcase has a built in memory and will take the content from a USB flash drive and copy/overwrite the content on its internal memory.
- In order to trigger the upload use a fresh and clean USB flash drive.
- Create a folder on the root directory of the USB called **'_autoplay'**
- Within this folder you can put the content you wish to be transferred.
- Copy the content to the folder, then connect the USB flash drive to the showcase.
- The showcase will recognise the content and automatically copy it to its internal Memory.
- We have found the best codec to use is: DivX, 640x480, 29.97 fps, 1 pass Constant bitrate, 3500 kb/s, 720p Profile

40. On your showcases how is the front made up if it includes touch screen?

    a. We have the showcase box, LCD transparent panel, multi touch screen which acts also as a protective outer layer. If there is no touch then a protective glass is put in place. An example of the construction can be seen here:

For more rugged applications it may be possible to have a projected capacitive touch screen and have a sacrificial layer, but this would very rarely be required.
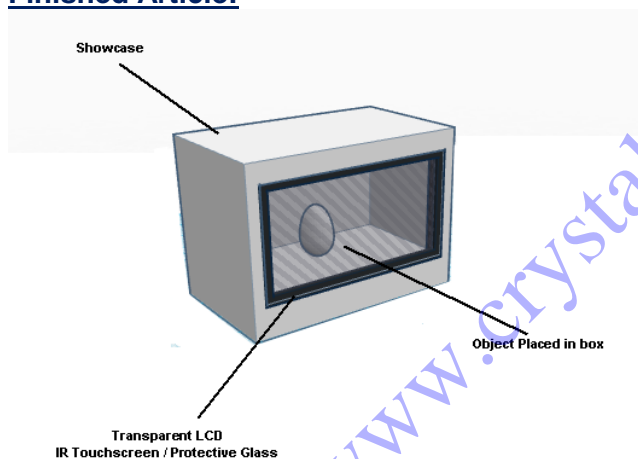
41. We have never seen a Transparent Showcase (only in videos) so could you show us how it is constructed, also with Touchscreen?

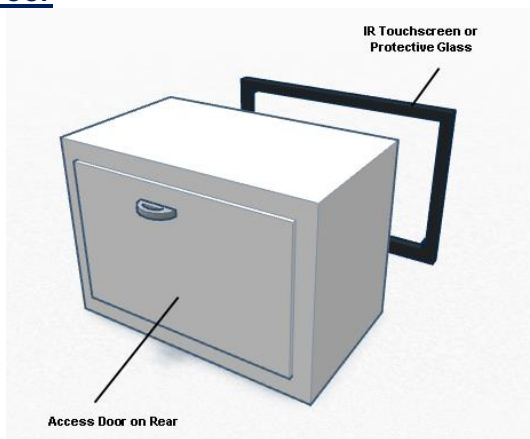   a. Please see the following rendered images that may help:

Front View with Product:
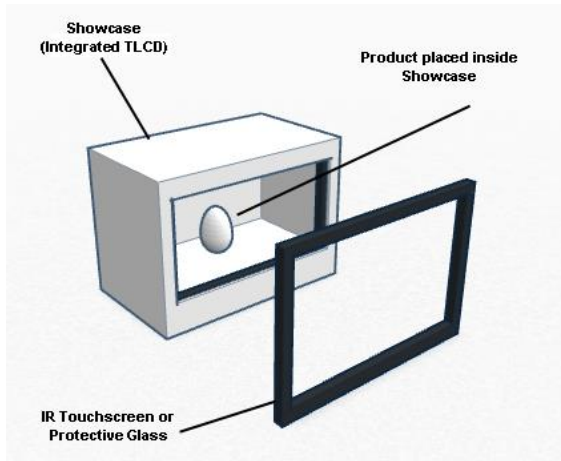
Finished Article:

Rear Door

42. Do you have any other information on housing, colours etc. on your transparent showcases?

  a. Please see some additional information below but these are just examples and may change depending on the customer requirement and final design.

43. How do we replace the items / contents inside your showcase products?

  a. You simply open the box from behind, place or replace your products, and simply close the back door. It is that easy. Please click on the video below.

44. Do you have multi touch options?

  a. Yes we have multi touch up to 32 touches, both as a kit or as a showcase product.

45. The Samsung 22" transparent panel was an unusual low resolution, do you have Full HD options?

  a. Yes we do with (at the time of writing) all our 21.5" and above sizes Full HD 1920 x 1080 and the 84" being 4K 3840 x 2160 pixels!

46. Do you have an overview of your transparent display sizes?

a. Please see the table below but this is constantly changing as we add new displays to our range so we recommend regularly visit this webpage for **_transparent displays_** or sign up for our product updates.

Diagonal Size	Part Number	Resolution	Surface	Frame?	Manufacturer	Remarks
5.7"	LCD-057-TRN	640 x 480	Glare	No	CDS	50pcs MOQ
7"	LCD-070-TRN	800 x 480	Glare	No	CDS	50pcs MOQ
9.7"	LCD-097-TRN	1024 x 768	Glare	Yes	CDS	Sunlight Readable properties
15"	LCD-150-TRN	1024 x 768	Glare	Yes	CDS	Sunlight Readable properties
21.5"	LCD-215-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
23"	LCD-230-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
27"	LCD-270-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
32"	LCD-320-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
42"	LCD-420-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
46"	LTI460AP01	1366 x 768	Glare	Yes	Samsung	Announced End Of Life in 2014
47"	LCD-470-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
55"	LCD-550-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
70"	LCD-700-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties
84"	LCD-840-TRN	1920 x 1080	Glare	Yes	CDS	Sunlight Readable properties

47. Are the transparent panels manufactured by hand or by machine?

a. They are manufactured in a factory in clean room conditions but also go through final human visual inspections as a part of the quality control process. Here you can see a video of the production facility

48. Do you offer ultra-wide stretched displays as transparent displays also?

a. Yes we do but these are limited in there sizes and currently we have 17.2" ands 29.3" diagonals with 38" to follow soon. For the latest information please click here: ***Transparent bar types***

49. Where can I see some of your Transparent Displays or videos of them?

a. At different times there are different sizes and designs on show throughout the world but this is constantly changing so best ask when you want to see something. Alternatively you can go to our Youtube channel and you can see a number of our transparent displays there. **www.youtube.com/crystaldisplay1**
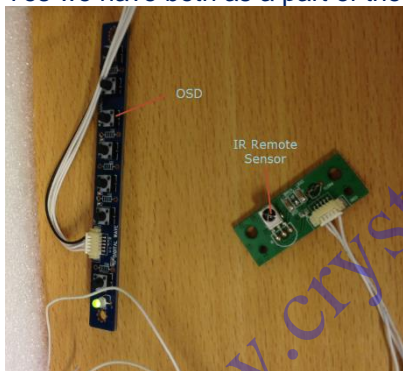
50. What puts does your interface card have?
a. We have USB for your USB drive, HDMI or VGA (see below)
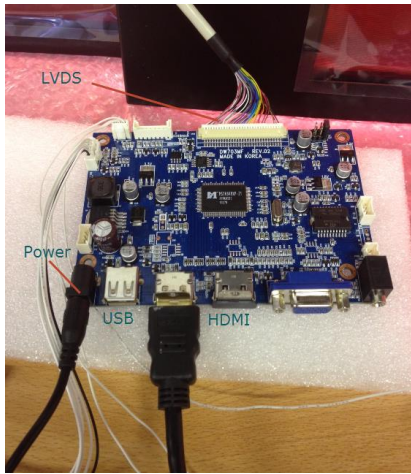
### 51. Do they also have an OSD boards and / or infra-red option?
a. Yes we have both as a part of the standard kit. Please see images of the components below.

52. Where can we source the lighting for our own showcase Housings?
a. You can purchase your own white hibrite LED backlights but we can also supply you with our LED backlight blocks (see below) which are what we use in our own showcase solutions. These as you see come either in individual units or in a connected form as you can see in the photo below. For more information and cost please email info@crystal-display.com.
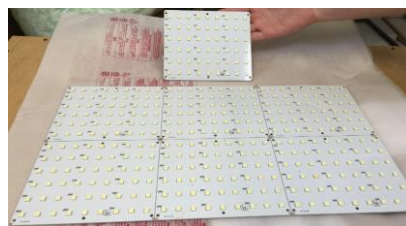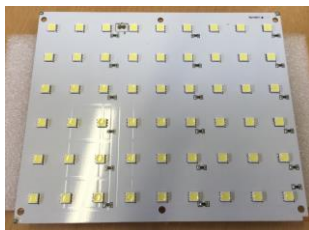
53. What benefits do your transparent panels, kits and showcases offer?

    a. Please see some of our benefits below but hopefully this document demonstrates the knowledge and expertise we have built up over a number of years which can benefit our clients. We have been involved with many designs and applications all over the world and this experience is invaluable when supporting all our global as well as local customers!

Finally some advantages of our Transparent solutions include:

- *Longer term availability as we design and manufacture the metal frames so even if the original panel goes obsolete we can use a new panel within the SAME mechanical dimensions.*
- *Same interface solution for all sizes giving consistency.*
- *High reliability interface solution has VGA, HDMI as well as simple USB inputs to give flexibility (Spec. attached)*
- *Custom IR Touch screens for all Transparent panels*
- *Focus on full HD panels where possible*
- *With longer term availability spares and repairs are much more practical*
- *We specialise in Transparent (Translucent) displays unlike Samsung or LG that see them simply as a technology demonstrator and not a long term product as the market volumes they desire are not there!*
- *Standard and Custom transparent showcase boxes*

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