



World Wide Design

Display

Drivers

Backlights

Keypads/
Mechanical
Services

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Worldwide design and production facilities

Densitron Technology occupies both a unique and commanding position in each of our three core areas of operation, namely the processing, transmission and displaying of information.

Since 1970, as one of the largest designers and manufacturers of display technology, we have established the best local design facilities wherever you are in the world. Backed up by state of the art production facilities, situated globally and taking advantage of the most cost effective manufacturing base, we deliver every day highly competitive solutions to problems that trouble even the largest blue chip OEM's.

Our latest and most exciting technology brands solve real problems for product designers worldwide they are:-

Optimiser- ultra low power displays enabling long battery life from a single power cell.

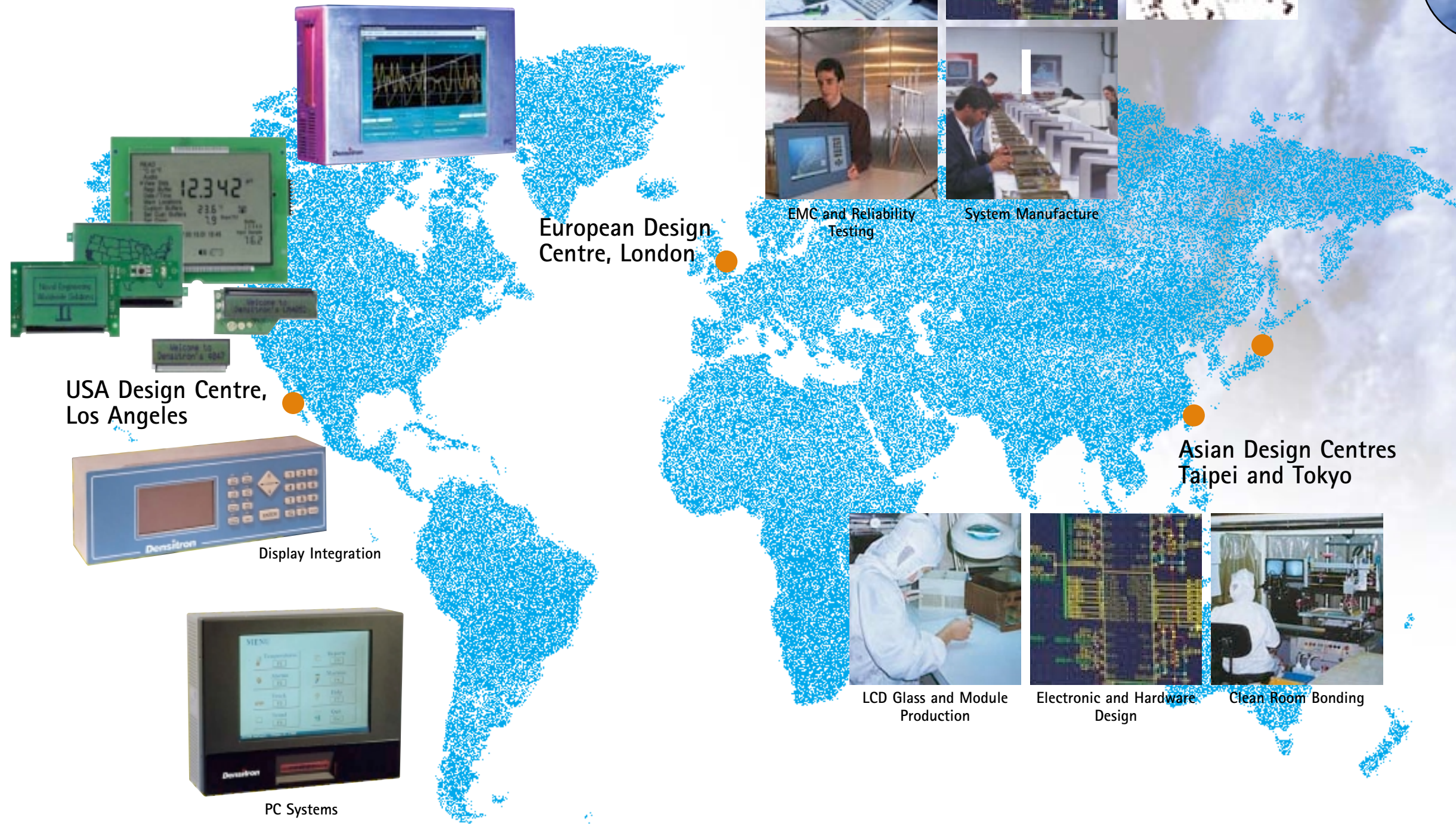
ECObright- No power backlighting for products used in the dark.

Phoenix - True sunlight readable displays that never wash out in any lighting condition.

Chameleon - A highly reflective LCD technique offering the best viewability in all lighting conditions.

ASEPs - Application Specific Electronic Products that incorporate unique assembly methods to fit the smallest of spaces.

So wherever you are, if you have a design or manufacturing question that troubles you in the telecoms, medical, industrial or professional marketplace speak to us first - we probably have the answer already.



**USA Design Centre,
Los Angeles**

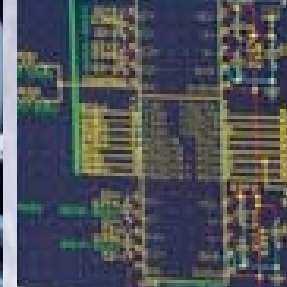
**European Design
Centre, London**

**Asian Design Centres
Taipei and Tokyo**

2D and 3D Design

Electronic Design

Software Design



EMC and Reliability Testing

System Manufacture



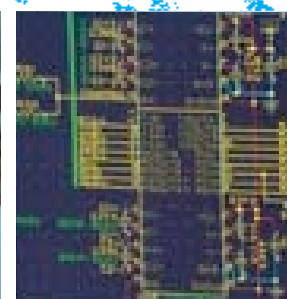
Display Integration



PC Systems



LCD Glass and Module Production



Electronic and Hardware Design



Clean Room Bonding



Display glass design – As a veteran of thousands of display designs, Densitron specialises in creating the right look at the right cost.

Densitron produces the widest range of glass technologies and construction in the industry for all applications from military to high volume consumer devices.

PIN: Metal pins can be added to one or more sides of our glass products at pitches of 1.8, 2.0, 2.54mm. When cropped to length they can provide suitable electrical and mechanical interconnection in through-hole or surface mount environments.

Seal Pip: A small covering of epoxy resin is used to seal the LCD injection port. Typically this can be placed on any non-connected side of the glass. (Typical size 10mm x 1mm)

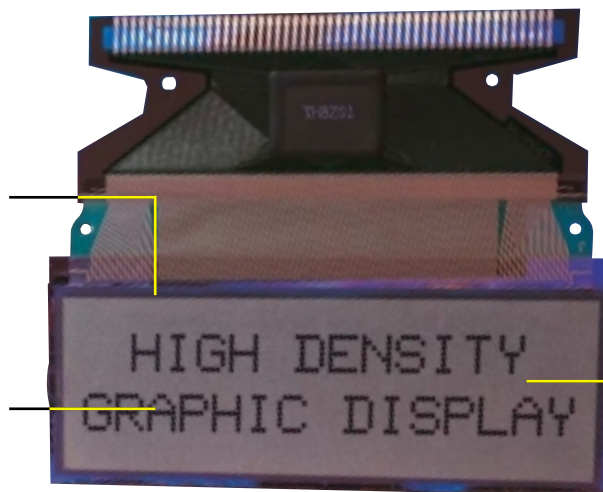


Digit Information: In common with PCB design LCD glass can have any combination of digits, icons, graphics and flags within the viewing area with the only provision being that an electrical connection can be made to it. In this way vivid high contrast images can be created.

Connection Edge: A connection edge is created from which the conductive layer can be attached to the host PCB by a wide variety of methods.

Heat Seal: The high density connection system of heat sealing enables a flexible connection to be made between the glass and the host PCB of almost any length with a pitch as small as 0.22mm, it also does not require any bezel.

High Density Pixel Array: A continuous matrix of rows and columns can be created within the view area suitable for displaying any information including full graphic images (so called 'bit map' images).



Background Colour: In FSTN glass the yellow and blue colours of STN are colour corrected with a compensation film to give a true black dot on neutral background. This can be further enhanced with colourful backlighting.

STN – High Duty: STN fluid is used where the duty cycle (or multiplex drive method) is higher than 1/8. By virtue of having a higher twist angle than TN it provides a high contrast image for most duty cycles across a wide range of operating conditions.

Colour Choice: Whereas TN glass offers exclusively a black dot on a clear or grey background (for duty cycles up to 1/8 maximum) STN offers a range of colours as follows: Blue dot yellow background, or blue dot grey background. In negative mode a deep blue background colour with a dot colour created by the colour of the backlighting is created.



Characters: As well as discrete icons or graphics, dot matrix characters can be created within the view area to display alpha numeric information.

Zebra: The high density connection pitch seen on alpha numeric displays may require an elastomeric connector (zebra strip) to interconnect to the host PCB. This will require a bezel to hold the assembly together with the correct pressure.

As a brief explanation to the choices available we have set out this glass design section to assist the designer in conjunction with marketing and our product designers to get the best look available for your product.

Chameleon: Densitron's unique chameleon technology provides the designer with the ability to actively switch viewing modes from reflective positive to transmissive negative depending on ambient light conditions. It offers twice the reflective properties as a standard polariser, giving the user the clearest possible image under all light conditions.



Light Mode: When the ambient light is high the display operates in a highly reflective mode, giving a dark dot on a bright background.

Dark mode: As the ambient light reduces and the backlight intensity increases respectively, the image is magically transformed via the chameleon technology to display a negative image on a dark background.

Negative Image: For normal lighting applications seen in domestic and industrial environments a negative image display (one where the characters are lit and the background dark) can provide the most attractive looking display by virtue of clever backlighting. Multi-colour backlights and filters can be used to further enhance the look of the display.

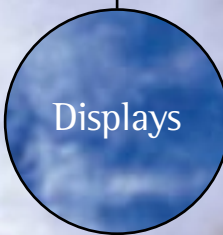


Black Mask: To accentuate sections of a negative image display and cut out stray emitted light, a black mask can be used either on the rear of the display or internally to enhance contrast.

Pseudo Colour STN: When combined with suitable control technology, Densitron's PCSTN technique allows a standard STN cell to display up to 4 colours, eg: red, orange, blue, purple, green, etc.



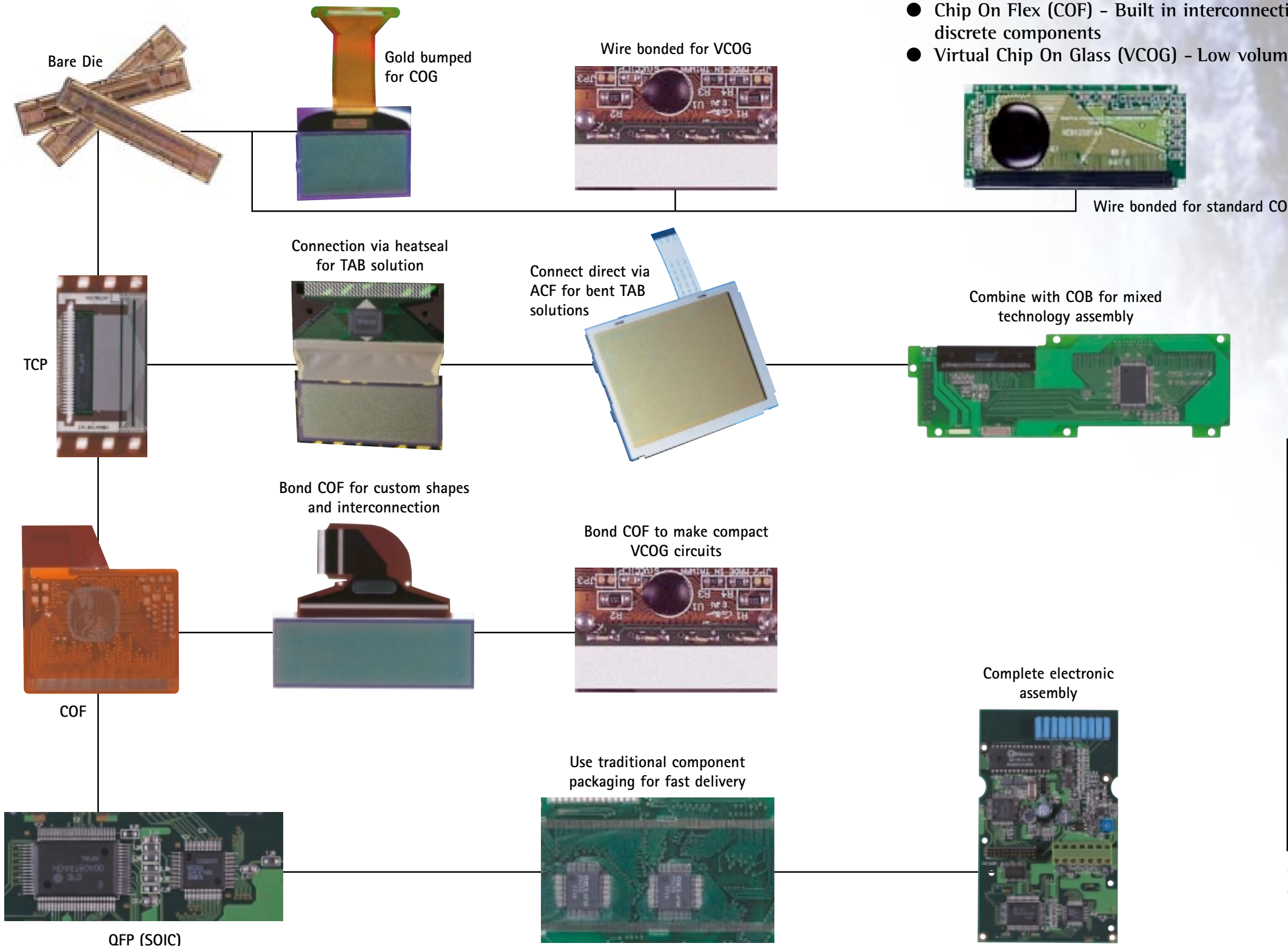
Layout: As with any glass technology a wide range of icons, characters and graphic image can be shown with PCSTN technology up to a maximum duty cycle of 1/64.



Display Controller and Driver Selection – All assembly technologies all under one roof gives us the flexibility on production volumes and construction.

Not tied to any specific silicon manufacturer, Densitron occupies a strong position to select the most appropriate driver and its associated mounting package specific for your application. This will broadly fall in line with one of the 6 types shown on this page.

- Gold Bumped – Smallest XY size
- Die Only – Very low cost
- Chip On Board (COB) – Low cost, low profile assembly
- Quad Flat Pack (QFP) – Availability
- Tape Carrier Package (TCP) – Availability and ease of use with built in interconnection system
- Chip On Flex (COF) – Built in interconnection and possibility for mounting other discrete components
- Virtual Chip On Glass (VCOG) – Low volume highly flexible electronic assembly



Example Resolution	QFP	DIE	GOLD	TAB	COF
1X8 (Chars)	✓	✓			
1X16 (Chars)	✓	✓	✓		
2X16 (Chars)	✓	✓	✓		
4X12 (Chars)	✓	✓	✓		
4X20 (Chars)	✓	✓	✓	✓	●
16X96 (Dots)		✓	✓	✓	●
32X96 (Dots)		✓	✓	✓	●
32X100 (Dots)		✓	✓	✓	●
33X102 (Dots)		✓	✓	✓	●
32X128 (Dots)		✓	✓	✓	●
32X132 (Dots)		✓	✓	✓	●
64X100 (Dots)		✓	✓	✓	●
64X128 (Dots)		✓	✓	✓	●
32X256 (Dots)		✓	✓	✓	●
65X132 (Dots)		✓	✓	✓	✓
100X160 (Dots)		✓	✓	✓	✓

✓ = Standard
● = Custom Option

TYPICAL APPLICATION

Backlighting – From no powered Ecobright to sunlight readable Phoenix technology, Densitron's application knowledge helps you create the best in any environment.

Wherever a product is used in a low light condition some form of additional illumination can be used. Densitron offers the widest range of backlighting to suit all applications from our “no” power ECObright technology to the ultra high brightness Phoenix sunlight readable solutions.

POWER / BRIGHTNESS

Electroluminescent

Occupying a mere 0.25mm space beneath the LCD glass, EL offers a highly compact and even illumination system. Driven by high voltage AC it requires a small drive circuit which can be built on-board the module or fitted externally to the unit. A wide range of colours and an infinite variety of shapes can be made using a simple silk screen and die cut tooling process.



Typical EL application



Colourful, even EL foil (15-20Cd/m²)



No power backlighting (5-10 Cd/m²)

ECObright

Developed to provide zero power, long life, low intensity backlighting, ECObright requires no external power and lasts up to 8 hours without further sunlight charging. Available in sheets and moulded shapes, it is extremely easy to implement in any application.

LED Backlighting

The use of LEDs in Densitron's backlighting broadly falls into 3 categories, namely Optimiser, Edge Lit and Array. The Optimiser backlight provides the highest efficiency backlighting giving the lowest current and most even light distribution compared to other similar technologies. Edge Lit backlighting can be achieved by using side firing LEDs in either packaged or raw dice form. Light sources can be placed on one or more edges surrounding the display and light is distributed under the display by means of a plastic diffuser. Array backlighting achieves the highest intensity by using a surface array of LEDs placed directly underneath the viewing area of the display.



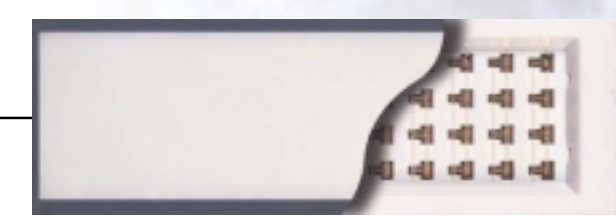
Typical LED application (Optimiser)



Single edgelit backlight (15Cd/m²)



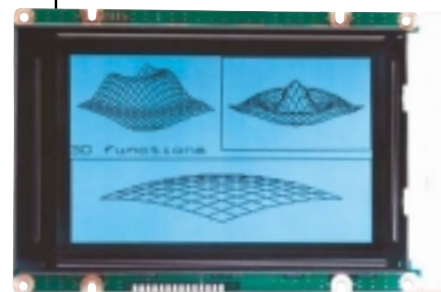
Dual edgelit backlight (30Cd/m²)



Surface array backlight (80Cd/m²)

CFL (Cold Cathode Fluorescent Lamp)

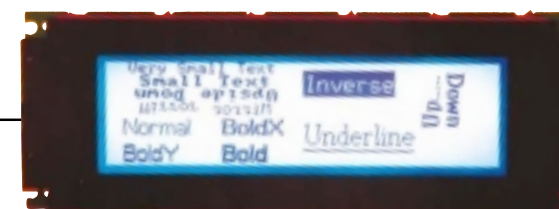
CFL offers a true white light source for any display. It is driven from a high voltage high frequency current source. Various intensities can be achieved by either 'edge lit' assembly (where the lamp is placed at one side of the display area and diffused underneath) or by the 'direct' method of placing the lamps directly under the view area. The brightest form of CFL lighting is achieved through Densitron's unique Phoenix concept enabling in excess of 2000 Cd/m² surface brightness.



Typical CFL application



Edgelit CFL (100Cd/m²)



Direct CFL (200Cd/m²)

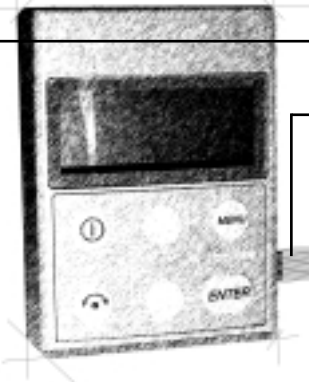
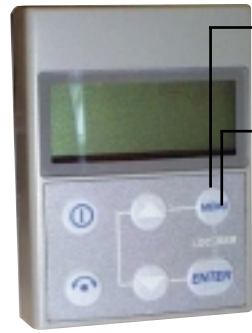


Phoenix (2000Cd/m²)



TYPICAL APPLICATION

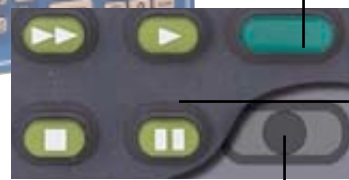
Keypads



Polydome embossed or metal dome integrated underneath the surface layer gives additional tactile feedback to the user.

By means of silk screening graphics, logos and multi colour images can be created.

Flat flex tail offers easy integration onto the host PCB



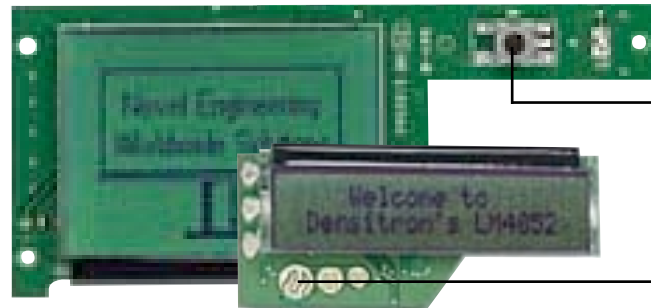
Silicon rubber can be injection moulded into any custom shape to create both large and small keymat areas with any number of keys creating easy to fit, cost effective input.

High durability and additional tactile feel can be created by a range of hard top coats.

Artwork, numbers, letters, etc can be silk screened in one or more colours directly onto the key pad.

By altering the shape and design of the key mat various tactile feels can be achieved.

Conductive carbon pills are attached to the key pads to complete an electrical circuit once the key pad is fitted to the PCB.



Discrete individual keys: Any manufacturers switch choice, can be fitted onto Densitron LCD modules offering a reduction in cost over a separate switch PCB assembly. Tactile switches are available in 5mm, 9mm, 12mm and various other sizes and shapes.

Key ready PCB. We are also able to design our PCB circuit to integrate with your external key map ensuring long term reliability in use.



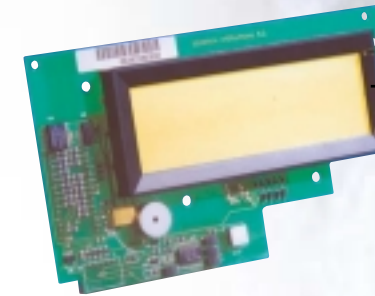
Touch panels - Densitron has more than 10 years experience in the integration of analogue resistive panels into display systems.

Any size and shape of touch panel can be created and additional silk screen printing, sealing gaskets and hard coats can be combined to provide a rugged, reliable user interface.

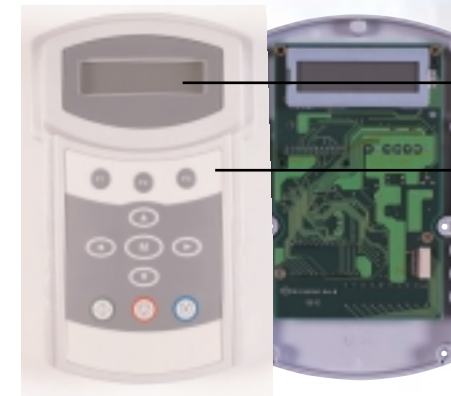
By combining a discrete touch panel with one of Densitron's range of LCD panels the most attractive and cost effective use of these technologies can be achieved.

Mechanical Services

Mechanical Services - in building up our capability to produce the widest range of display technologies Densitron has invested heavily in production equipment. Much of this investment has been in the production of mechanical parts required at all stages of the display manufacturing process. We are able to offer our expertise in all these fields to complete your sub-assembly or entire product through our vertically integrated factories.



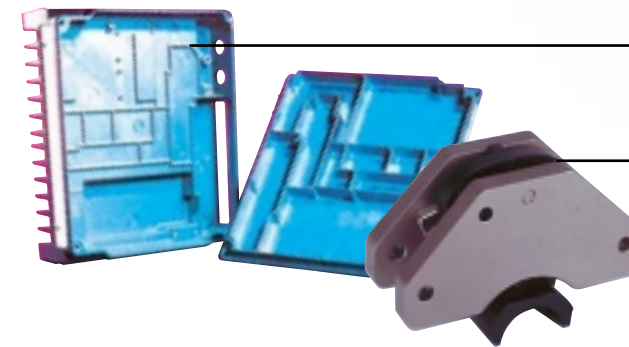
Plastic injection moulding is used very frequently in display bezel and backlighting manufacture.



Optically clear polycarbonate windows are often used as protective covers in front of our displays.

High quality silk screen printing can be made on both flat and curved surfaces in any colour and design with great accuracy.

Through our 2D and 3D design network we can design tools for extremely complex shapes in a wide range of plastic materials. These include ABS, PC, acrylic and phynol.



Densitron is also expert in metal fabrication, casting and machining. High quality aluminium, zinc and magnesium materials can be die cast whilst steel can be stamped, machined and formed with a wide variety of hard production tools

As a veteran of more than 1000 new product designs, we can complete the product image with a colourful design of packaging, manuals and point of sale material.

CUTTER

