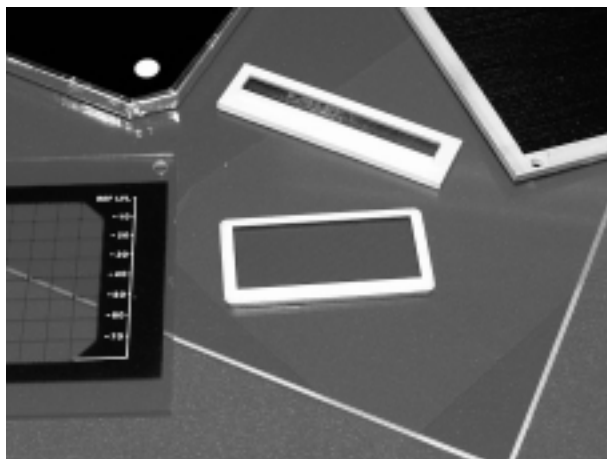


1800 Series Screened Optical Windows



Screened optical windows are used to provide a transparent EMI shield for optical devices such as CRT's, LED's, LCD's, Plasma displays, Electro mechanical displays and any aperture that needs to display information or indicator lamps.

Screening or shielding of optical windows is achieved by two basic methods. (1) Using a very fine woven wire mesh entrapped between or embedded in a clear optical substrate such as Acrylic, Polycarbonate or Glass. (2) Transparent vapour deposited conductive coatings applied to the surface of the clear optical substrate such as Indium Tin Oxide or Gold.

Optical Substrates

Acrylic is a very versatile substrate and can be supplied in many colours to match display outputs to improve contrast enhancement, including clear which exhibits 92% light transmission through to infra-red transmitting opaque materials. Acrylic is very easily machined and formed making it suitable for moulded CRT applications and front panels needing cut outs, holes, steps etc. Multiple layers can be fully laminated with the fine wire meshes in between, together with different colour combinations and the inclusion of circular polarizers. Acrylic has a UL94HB flammability rating. Hard anti-scratch, chemical resistant coatings can be applied to the surface as an optical flat or anti-glare.

Polycarbonate has very high impact resistance, more than 16 times that of Acrylic and 200 times more than glass making it most suitable for rugged applications. Light transmission is not as good as other substrates at 85%, however has the advantage of having UL94VO flammability rating over 2.4mm thickness, special grades as thin as 0.25mm are also available that meet UL94VO. Hard anti-scratch, chemical resistant coatings can be applied to the surface as an optical flat or anti-glare. Fine wire meshes can be fully laminated between two layers.

Glass has a very durable surface and will withstand high temperatures making it suitable for the application of vapour coatings such as ITO (indium tin oxide) for EMI shielding and or anti-reflection coatings that will reduce first surface reflections to less than 0.5%. Glass can be moulded or sagged to suit CRT applications but is not easily machined. Glass can be fully laminated with fine wire meshes and circular polarizers when required.

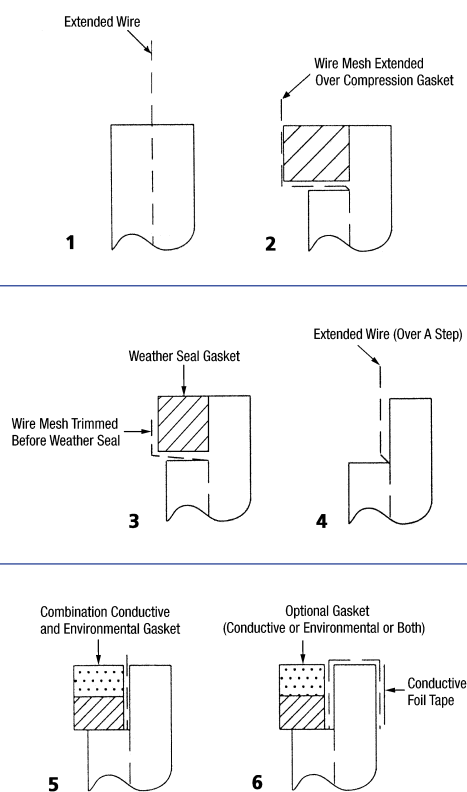
ADC (allyl diglycol carbonate) trade name CR39 has a very hard surface hence its use as spectacle lenses. ADC is normally cast and has good impact resistance and is highly formable but is easily broken if scratched or notched. ADC is the most expensive substrate, it meets UL94HB flammability rating.

Fine wire mesh

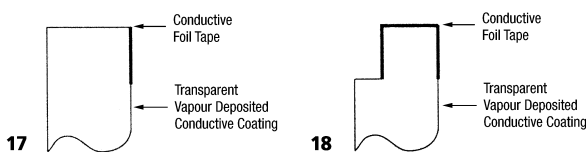
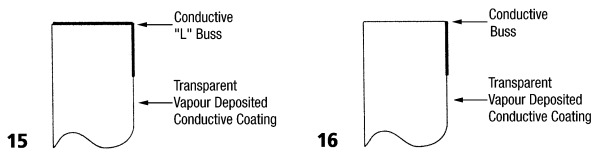
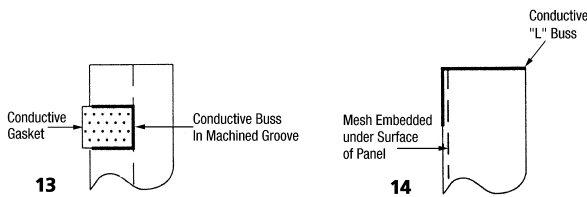
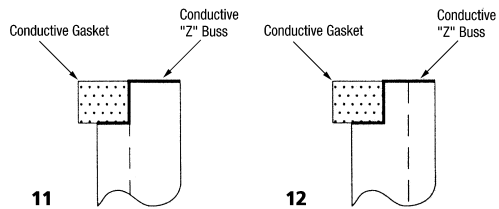
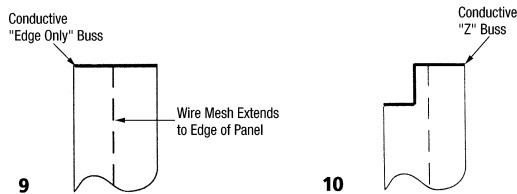
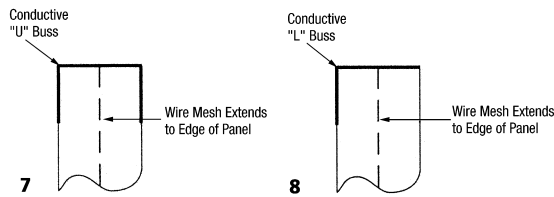
Wire mesh provides the highest level of shielding while maintaining excellent optical properties. Wires used as the EMI shield are stainless steel or copper. The stainless steel mesh ranges from 50 wires per inch up to 250, copper 70, 100 and 145. Wire diameters are 0.025mm or 0.056mm for stainless, 0.056mm for copper. The greater wire density gives better shielding performance but light transmission and optical clarity is degraded. The optimum wire count to achieve good shielding and optical characteristics is around 80-100 wires per inch. The wire is plated and blackened to fuse the wire crossovers ensuring consistent EMC performance and the blackening reduces reflection from the mesh enhancing the optics. Wire meshes can cause moiré fringing on some displays in particular CRT's, to eliminate this the wire is orientated in the substrate at an angle to be determined during the window design, this maybe from 11 to 45 degrees dependent on the display.

Window design and mounting

Windows are custom items and drawings or detailed specification are required. Sizes available range from 1cm² up to 1 X 2 metres for architectural use. Windows can be moulded to suit CRT's, machined and fabricated, silk screened or printed with logo's, information etc. Termination can be by mechanical clamping or bonded with conductive adhesive.



1800 Series Screened Optical Windows



Transparent vapour deposited conductive coatings

ITO (Indium Tin Oxide) and Gold can be applied to the substrates but do not provide as good shielding effectiveness as wire mesh. Their advantage is that optical clarity is maintained and there is no degradation in resolution. The coating can be applied in various thicknesses to achieve a resistance of 5, 10 or 25 ohms/square.

Shielding Effectiveness Stainless Steel Wire Mesh

H Field			
Frequency	1	2	3
2KHz			2dB
15KHz	6dB	6dB	13dB
100KHz	15dB	16dB	30dB
1MHz	32dB	32dB	49dB

E Field			
Frequency	1	2	3
2KHz			>60dB
15KHz	82dB	86dB	89dB
100KHz	86dB	87dB	87dB
1MHz	81dB	85dB	87dB
10MHz			88dB

E Field & Plane Wave			
Frequency	1	2	3
18KHz			92dB

Plane Wave			
Frequency	1	2	3
30MHz		73dB	80dB
60MHz	62dB		81dB
100MHz		74dB	84dB
150MHz			84dB
180MHz			90dB
300MHz		70dB	
400MHz			77dB
650MHz			
1GHz	58dB	59dB	62dB
3GHz		50dB	
5GHz	40dB	43dB	
7GHz		43dB	
10GHz	34dB		47dB
15GHz	30dB	38dB	44dB

- 80 mesh type 304 stainless steel with a .0011" wire diameter, silver plated (fusing the wire crossovers) and blackened, with a black conductive corrosion resistant plating.
 - 100 mesh type 304 stainless steel with a .0011" wire diameter, silver plated (fusing the wire crossovers) and blackened, with a black conductive corrosion resistant plating.
 - 100 mesh type 316 stainless steel with a .0022" wire diameter, silver plated (fusing the wire crossovers) and blackened, with a black conductive corrosion resistant plating.
- Port size 20" x 24"; test performed in accordance with NSA-65-6 and MIL-STD-285

Shielding Effectiveness Copper Wire Meshes

H Field	
Frequency	1
15KHz	5dB
100KHz	21dB
1MHz	41dB

Plane Wave	
Frequency	1
30MHz	80dB
60MHz	82dB
100MHz	84dB
150MHz	92dB
180MHz	90dB
400MHz	77dB
1GHz	62dB
5GHz	51dB
10GHz	42dB
15GHz	43dB

E Field	
Frequency	1
1KHz	>60dB
15KHz	90dB
100KHz	89dB
1MHz	89dB
10MHz	90dB

E Field & Plane Wave	
Frequency	1
18MHz	88dB

- 100 mesh copper with a .0022" wire diameter, plated (fusing the wire crossovers) and blackened, with a black conductive corrosion resistant plating.
- Port size 20" x 24"; test performed in accordance with NSA-65-6 and MIL-STD-285