

TECH TIPS – I/O: Choosing the Right I/O for Your Application

Application Challenge

There are so many external connectivity standards, as well as styles and grades of connectors to choose from I don't know which way to turn. What should I be looking for in an [I/O connector system](#)?

Have You Thought of This?

Fortunately, there are several practical pointers to consider. Giving thought to these issues will best equip you to make informed connectivity choices:

- Suitability for intended application – consider size, weight, contact wear (frequency of connect/disconnect) and ease of use.
- Form factors and industry standards – many applications are supported by industry or *de facto* standards which spell out the connector, cable construction, wiring configuration and latching requirements, e.g. USB 2.0, SAS, miniSAS.
- Cable construction and electrical performance – due consideration should be given to the physical make up of the cable to meet attenuation, impedance, rise time, current carrying as well as handling and in-situ use requirements.
- Shielding from EMI/RFI – consult legal and industry standards for the permitted levels of susceptibility to and immunity from radiated emissions for your equipment type and chose the connectors and cables to suit.
- Contact design – consider the assembly and termination aspects of the product (wire wrap, crimp, solder, insulation displacement terminations) for the most suitable cable/connector interface, *as well as* the mating dimension (contact resistance, durability, corrosion resistance).
- Latching and mechanical fixtures – consider how your end-user will use your equipment e.g. in hospitals, nurses prefer quick release mechanisms to detach leads from patients or equipment, whereas in factories screw locks are preferred to ensure continuous mating in high vibration environments.
- Repair and replacement – remember the installation and repair technician's needs for handling, identification, on-site termination or repair.

Connectors broadly divide into two types based on the design of the wiping contacts: pin/socket and ribbon-style.

- Pin/socket: in pin/socket connectors, a round or square profile pin wipes against a socket contact formed of bent metal to make a complete circuit. However, in .050" pitch and smaller, the pins become fragile and more prone to breakage.
- Ribbon-style: most high density, high speed [I/O connectors](#) are of the ribbon-style design. The precise geometries of the pre-loaded ribbon contacts ensure reliable connection, while the supporting insulator reduces the risk of damage during insertion and withdrawal, even in sub 1.00 mm versions.

3M Tech Tips

- Using a standards-based connector (such as 3M™ (miniSAS) Connector or Cable Assembly or Camera Link® Connector and Cable Assembly) means, in principle, manufacturers' products are form, fit, and function intermateable: however, some standards leave out key details so there can be wide variation in actual product characteristics which affect long term reliability – consult your supplier and the standards issuing body for recommended practice.
- Choosing connectors with thicker gold plating of contacts (>15u") over flash alternatives generally makes the connector better able to withstand high mating cycles.
- The ever-popular pin/socket D Subminiature (D Sub) connector can be used with shielded or unshielded cable.
- High density 3M™ Mini Delta Ribbon System can be used with round and flat cables.
- High density 3M™ Mini Delta Ribbon System Assemblies are offered with thumbscrews or quick release latch options.
- Use cable clamps to neatly 'stack' multiple flat ribbon cable assemblies to reduce clutter at the front or rear of equipment.

- Mark cables or wires using 3M™ Cable Markers to make them easier to identify.
- Some I/O connector systems can be coded or keyed so each component uniquely fits its mating connector to aid in installation and maintenance – refer to the Tech Sheet of the particular connector to check the accessory options available.