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Practical Solutions for Electromagnetic Compatibility

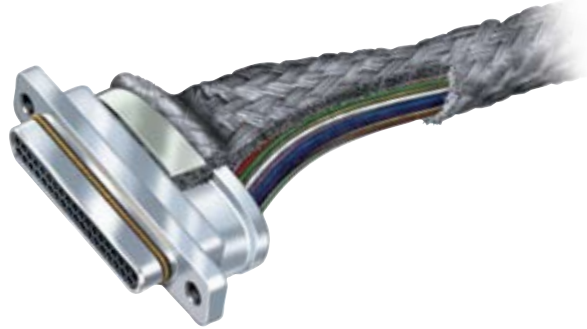
Designing interconnect systems which deliver clean data streams, undistorted by electromagnetic interference or pulses (EMI/EMP) is an enormous challenge. Electromagnetic Compatibility (EMC) requirements have been established to insure that the performance of an individual electronic device is not degraded due to its proximity to high-frequency electromagnetic interference, and also to prevent the device itself from becoming a potential source of EMI. Sensitive electronic devices also need to be protected from voltage spikes generated during transient states or static discharges in the overall system.

Protecting sensitive devices and achieving electromagnetic compatibility in an interconnect environment, such as an aircraft avionics bay, is typically achieved through the application of EMI/EMP screening, grounding and filtering technologies. Interconnect industry techniques for achieving effective EMC include:

- Reflecting the signals outright,
- Reducing line-of-sight entry points in equipment and cable shields,
- Absorbing the interference in permeable material and dissipating it as heat,
- Conducting the EMI along the skin of the device/cable and taking it to ground,
- Filtering out interference at the point of interconnection, using specialized connectors which provide EMI suppression, and/or,
- Adding transient voltage suppression diodes to clamp voltage spikes.

In most applications, EMI management is not accomplished through the use of a single technique such as filtering, but rather through the combined use of various EMC technologies. While black box device manufacturers may incorporate a filter connector as a universal

prophylactic against future, unknown levels of EMI, the final integration of the device into a complex application environment typically requires the use of additional EMC technologies. At the most practical level this includes grounding conductively plated equipment housings with studs and straps, shielding cable conductors with metallic braiding, tape or conduit, and eliminating line-of-sight entry points through which electromagnetic waves can penetrate or escape the equipment. This later step is commonly performed by backshell devices which provide a reliable grounding platform for cable shielding and mechanically mask the conductor-to-contact termination from noisy waves of EMI.



Cross-sectional view of a Micro-D connector assembly optimized for EMI noise suppression. Note the use of braided shielding, shield termination band and EMI ground spring. Effective EMI noise suppression may be accomplished solely with the use of filter connectors, but many designers prefer to augment the noise suppression provided by filters with accessory hardware such as banding backshells, conductive gaskets, gounding studs and cable shielding.

The frequency of the interfering signal is a critical concern when selecting EMI shielding devices. Low frequency magnetic waves in the 1 to 30 KHz range, for example, are most effectively shielded by absorbing the signals in permeable material. High frequency signals (30 KHz and above) are most effectively shielded by reducing entry windows and by insuring adequate surface conductivity to ground.