

EMI/RFI Suppressing Connectors

Crane Connectors Address EMI/RFI Issues

INTRODUCTION

"Noise" -- electromagnetic interference (EMI) -- is playing havoc with electronic products today. With the continuing growth of high speed electronic systems and equipment, the number of requests for EMI solutions has risen noticeably. As a result, we've noticed a marked increase in requests for Crane connectors combined with **ferrite "beads, slabs and cores."** The purpose of the ferrite is to provide an inductive device that will suppress (minimize or eliminate) the effects of EMI.

EMI & RFI INTERFERENCE

Electromagnetic interference can be defined as "any significant signal energy that causes unintended, undesirable circuit function or inadequate EMC performance." In short, EMI causes a piece of electrical equipment to "misbehave" due to unwanted electrical energy in the wrong place at the wrong time. RFI (radio frequency interference) is a subset of EMI.

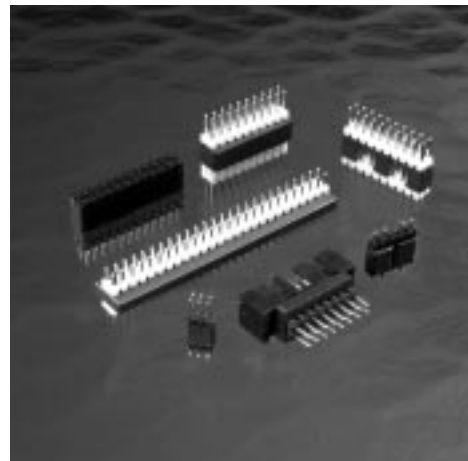
Common examples of EMI interference range from scrambled reception on a television when a hair dryer is run, to the potential disruption of avionics equipment by cellular phones and laptop computers. That's why airlines prohibit their use during takeoffs and landings. Man-made sources of EMI include "power lines, rotating machinery, ignition systems, television and radio, computing devices and transmitters of all types."

RADIATED VS. CONDUCTED EMI

EMI produced by electrical equipment is classified either as RADIATED emissions through space (similar to television transmissions) or CONDUCTED emissions of energy along wires (similar to telephone signals). Until recently, most EMI requirements focused on the "noise" **generated** by a product. The new EC standard will enact IMMUNITY standards that will "require manufacturers to design and test their products so that they will not malfunction when **subjected** to external EMI sources."

ADDRESSING EMI EMISSIONS

The best solution for solving an EMI problem in an existing product is to **redesign the product**. The penalties associated with this option -- a reduction of market share and profits due to lost time -- may not be acceptable. Many choose to solve the problem by RETROFITTING products with shields and filters, and worrying about redesigns on future generations.



If a company wants to control the effects of EMI, they have several strategies to follow. One is to address EMI issues at the board level with filters, capacitors or other shielding. This is the most common approach to the problem, assuming the need is **known in advance**. Sometimes, however, the problem isn't surfaced until the product is tested **after the fact**.

There are many situations that may lead a designer or retrofitter to solve the problem **at the connector**. One is a lack of space on the PCB for filters, which makes a VERTICAL solution attractive. Another more common situation is the need to rework or retrofit **existing designs**. Because of the expense and time required to redesign a board, as well as the lack of available board space, the best solution again may be a VERTICAL one (at the connector).

THE FERRITE CONNECTION

Reducing EMI at the connector is a VERTICAL SOLUTION. In other words, filters are added to the connector -- usually increasing overall height -- instead of areas on the PCB before or after the connector. As such, it's a viable alternative for those companies that need to rework (retrofit) existing designs. It's also an excellent option for PCB's so densely populated that there's no room to add filters. The most common vertical solution at the connector is to add a ferrite filter to the connector itself. Noted below are three situations where Crane connectors were TAILORED to meet a customer need for EMI control.

EXAMPLE 1: Tailored MPLS Shrouded Header

(Reference pages 34-35 in C57 catalog)

A Crane customer -- who manufactures a digital video system -- exports their products to Europe. Although they were already using a Crane PLS Shrouded Header as an interface, the new EC requirements forced them to further reduce EMI susceptibility. Since overall height was not a concern on their board, Crane was able to solve the problem by TAILORING an MPLS Shrouded Header. Since this part features a second insulator (see Figure 1) for added height, a ferrite slab was added prior to putting the second insulator on. The ferrite slab was captured tightly between the two insulators.

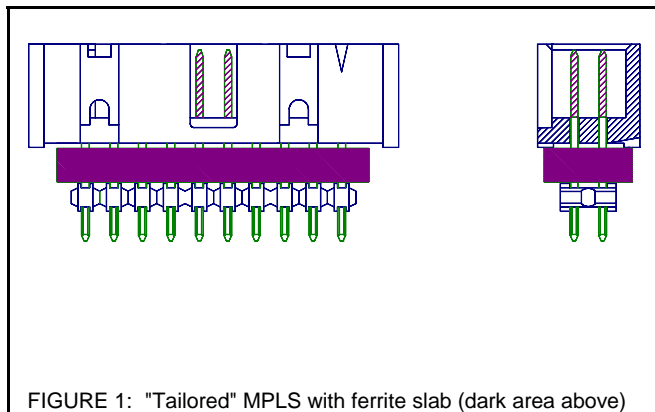


FIGURE 1: "Tailored" MPLS with ferrite slab (dark area above)

EXAMPLE 2: Tailored MPLS Dual Insulator Header

(Reference page 12-13 in C57 catalog)

A Crane customer manufactures a hand held breath analyzer used for home incarceration. The unit not only measures the amount of alcohol content in a person's blood stream, it has voice recognition capability as well. Needless to say, it's a sensitive device and accuracy is critical. As a result of the need to filter out the noise coming into the unit -- it had high susceptibility -- the customer chose to add filters to a Crane MPEG. By adding ferrite cores to the signal pins only (see Figure 2), the customer was able to solve the problem and still meet a board stacking need. Crane added stops at the

bottom of each core to prevent possible damage -- **ferrite is very brittle** -- in movement.

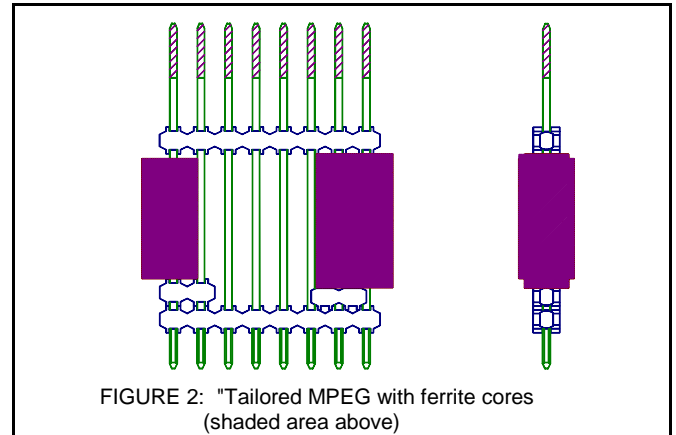


FIGURE 2: "Tailored" MPEG with ferrite cores (shaded area above)

EXAMPLE 3: Tailored GMPEG (SMT) Header

(Reference pages 20-21 in C57 catalog)

Two Crane customers -- both manufacturers of mid-level modems -- requested Crane combine board stacking needs with EMI protection. Since both were retrofit applications, a VERTICAL SOLUTION was chosen to solve the problem. One of the designs required parts for surface mount application. Again, Crane was able to TAILOR a GMPEG (see Figure 3) and meet the requirement. Since the application required filtering of all pins, a ferrite slab was used instead of beads or cores. Our customer also chose to utilize Crane's patented PEG hold down feature, which prevented movement of the part during the reflow solder process.

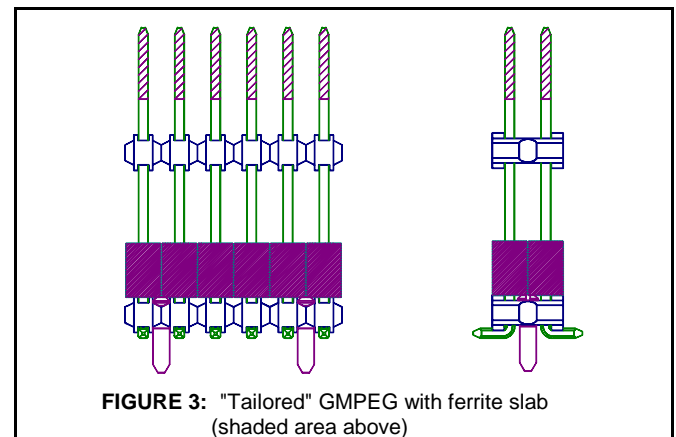


FIGURE 3: "Tailored" GMPEG with ferrite slab (shaded area above)

THE CRANE OPPORTUNITY

Telecommunications, medical instrumentation, industrial controls, test and measurement, automotive - these industries, along with countless others, are now scrambling to meet EMI requirements. The need to retrofit is increasing, and **CRANE CAN HELP!** Call us if you need assistance or more information.