



Naval Surface Warfare Center (NAVSEA) Crane Division

Electromagnetic Interference Protective Backshells for Cables (US Patent No. 7,811,132)

Mini Market Study Report August 2011

Sponsored by:



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MARKET STUDY REPORT

Technology Synopsis

This invention is a protective backshell for electrical cables that protects against EMI. EMI (electromagnetic interference) occurs when two electrical signals cross paths and one signal acts as an antenna and draws in the signal of another source causing attenuation or loss of a signal. A backshell in an enclosure to protect the ends of two separate cables from EMI. The invention consists of an aluminum shell that protects cables. The shell contains an EMI protective gasket. Initial research consisted of talking with the manufacturers of the highest level of EMI radiation protection used in surveillances, radar, ships and control rooms with highly sensitive electrical equipment in naval applications.

This technology is used in cables that are highly susceptible to EMI. It solves the problem of cables being exposed to EMI and causing them to distort results or functions in electrical equipment. In the commercial sector, the technology can be potentially beneficial in the medical field with large scale electrical equipment used in hospitals. Therefore, a need exists for the usage of this technology to shield against interference from high powered electrical equipment and signals.

Potential Applications

Industry	Industry Segments	Application Segments
A. Military	1. Radar, surveillance	Control room equipment, large scale video and infrared monitoring, aircraft jamming
B. Medical	1. Large scale medical equipment	Magnetic Resonance Imaging (MRI) CT Scanners, LCD's

At this time the biggest area for potential applications are within the military and commercially in the medical field. The navy is currently using this technology in the E18 aircraft platform and has seen significant results. The next steps would be implementing the technology in the other military branches in their advanced electrical systems such as radar, and surveillance. The biggest commercial application is in expensive medical equipment. Because of its concern for the public health and safety, the Center for Devices and Radiological Health (CDRH) part of the Food and Drug Administration (FDA), has been in the vanguard of examining medical device EMI and providing solutions. ¹ With the development of more highly advanced medical equipment which is normally placed in areas heavily populated with other high powered electrical equipment EMI becomes a big issue. This technology can be easily implemented into such environments which can aid in ultimately protecting the health and safety of patients.

¹ <http://www.fda.gov/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm106367.htm>
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Competing EMI Backshell Manufacturers

Company Name
Glenair
TE Connectivity
Amphenol
Bendix

Competitive Advantage

The competitive advantage to this technology begins with the standards it meets. These backshells are held to standards higher than Mil Spec 461 making them more effective at shielding EMI than any military or commercial EMI protective backshell in America. Its shielding effectiveness is 95% or higher and it has been through 6 iterations of testing. R&D alone for this technology exceeds \$300,000. It is the only EMI backshell approved for the EA-18G aircraft platform and is used in satellite communication and radar. The EMI protective backshell is effective enough to jam any signal on the planet. This backshell is made of lightweight aluminum instead of composites used in most new backshells. The fact that it is made of a complete metal makes it more effective.² Another key advantage to this backshell is the shape. It was made to fit in tight hard to reach areas that are congested with wires and close to metal walls.²

Market Size

The market for EMI protective backshells is large and continually growing with the inception of stronger, more complex and higher priced electrical machinery. The market for RFI and EMI solutions is estimated currently at 4.6 billion and predicted to grow to 5.2 billion in 2016.³ The market for mechanical emi backshell assemblies was estimated at \$110 million in 2007, and is expected to grow at a five-year CAGR of 6.4 percent, reaching \$150 million in 2012.⁴ Glenair manufactures up to Mil Spec 461 standards and Amphenol to SAE, AS85049 standards. Amphenol backshells are also listed in the quality products list (QPL).⁵ The sustaining factors of this technology are all related its unmatched effectiveness. Studies have shown that this technology is 95% effective at shielding and feedback from the field has been 100% positive. The Navy Flight Control Inspector recently gave these backshells the highest possible rating for their extreme effectiveness. Cables without the EMI protective backshells experienced a significant amount more EMI than cables with the backshells. Many military programs require Electromagnetic Pulse (EMP) protection. Designing against EMP is basically the same as designing against EMI/RFI.⁶ Therefore the applications for the military are virtually endless. Due to the fact that there are no other backshells that are made to standards above Mil Spec 461 this technology can be implemented in many branches of the military.

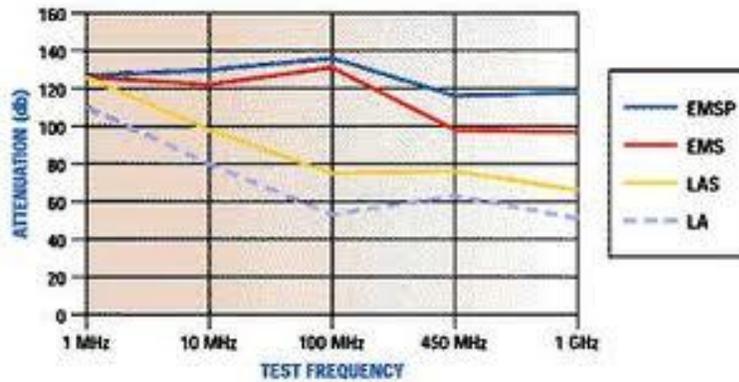
² Inventor Interview: Bruce Carpenter. July 19th 2011

³ <http://www.fda.gov/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm106367.htm>

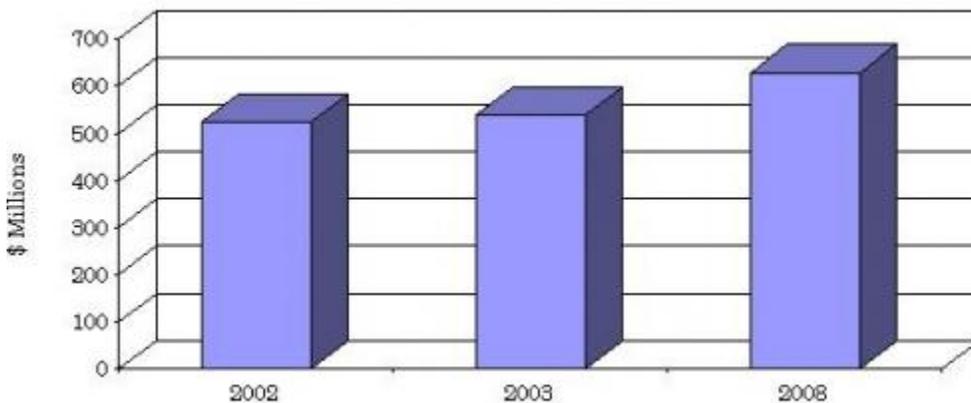
⁴ http://www.connectorsupplier.com/EXTRA/Articles08/extra_Colwell_IndustrialNetworks_5-13-08.htm

⁵ <http://www.backshellworld.com/qualifications.asp>

⁶ <http://www.connect-solutions.com/backshells.html#e-emi-rfi-backshells>



The graph above compares different configurations of EMI protective shielding with backshells to show its effectiveness at preventing attenuation or loss of intensity of the electrical signal.⁷



The graph above shows the U.S. DEMAND FOR EMI/RFI SHIELDING OPTIONS for the years 2002, 2003, AND 2008.⁸

Cable Assembly Type	2007/2012		
	2007	2012	CAGR
Fieldbus, Insert Molded	\$340	\$500	8.0%
Fieldbus, Mechanical	\$110	\$150	6.4%
Industrial Ethernet	\$180	\$270	8.4%
Total	\$630	\$920	7.9%

\$ Millions

The market for mechanical emi backshell assemblies was estimated at \$110 million in 2007, and is expected to grow at a five-year CAGR of 6.4 percent, reaching \$150 million in 2012.⁹

⁷ <http://www.measurement-testing.com/about113.html>

⁸ <http://www.bccresearch.com/report/PLS005G.html>

⁹ http://www.connectorsupplier.com/EXTRA/Articles08/extra_Colwell_IndustrialNetworks_5-13-08.htm

Potential targets for licensing

The major players in licensing this technology are Glenair and TE Connectivity. These companies have been identified as potential targets due to their interest in the product, as well as their existing relations with the military. Both of these companies currently manufacture EMI protective backshells and sell to the military. Glenair is known for fully complying with Mil Specs and has the greatest potential to adopt this product in their line. Glenair has had a partnership with the U.S. Military since the 1950's to produce electrical equipment to Mil Spec standards. Although Boeing is the manufacturer of the aircraft, Northrup Grumman would also pose as a great potential for licensing of the backshell since they are the manufacturers of the electronic warfare capability of the EA-18G aircraft including installation of electrical wiring systems. Both of these companies serve as great targets and should be thoroughly sought after.

Keys to Commercialization

The keys to commercialization for this technology begin with its market potential. Today, with cabling carrying more low voltage data signals than ever before, proper shielding is of prime importance if the integrity of the transmitted data is to be maintained. An effective shield should be capable of preventing the reception of undesired signals as well as confining extraneous signals generated within the cable itself.³ This statement proves that there is a large market for this technology. What seems to be the biggest issue with this technology is differentiation from similar products on the market. There are many companies that manufacture EMI protective backshells such as Glenair and Northrup Grumman which have been identified as primary research targets. These two companies have been manufacturing backshells for the military since EMI became a major problem. They also serve as companies that can be potential partners in licensing and manufacturing. Another key issue would be the ability to retrofit the backshells onto existing cables. With this advantage whole electrical systems will not have to be re-configured. The biggest key is convincing companies to switch from their current solutions to this technology that is of a higher quality and is better at shielding. So the next steps would involve:

- Looking into possible installations of the backshells in other military aircraft such as the 318 Boeing F/A-18E/F Super Hornets in the US Navy.
- Contact Tad Rothbauer at Glenair, Inc. to discuss possible licensing agreement.
- Begin discussions with Northrup Grumman for a license to install the backshells in future EA-18G aircraft.

Recommendations and Next Steps

- Look into possible installations of the backshells in other military aircraft such as the 318 Boeing F/A-18E/F Super Hornets in the US Navy.
- Contact Info: C Scott Stamper
Account Executive
Aerospace, Defense & Marine Division
Central Sales
(502) 718-1835 mobile
(502) 243-8862 fax
sstamper@te.com
TE Connectivity
- Attend Medical Design and Manufacturing Midwest Trade Show: September 20-22 2011, Rosemont, IL
- Contact Info: Tammy Belcher

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Indiana University Health University Hospital

Appendices

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Appendix I



Primary Research Contact Information and Interview Summaries

NAVAL SURFACE WARFARE CENTER – CRANE

TE Connectivity

Contact Info:

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Communications and Industrial Solutions (CIS)
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e-mail: cwrohde@te.com

Background Info:

Our engineering team knows agency standards and regulations. From military specifications, QPL, and COTS, to rugged optics built for harsh conditions, to the latest commercial standards, we design and rigorously test our products for unmatched performance.

Our Electronic Components Division is the world's largest supplier of passive electronic components, including connectors and interconnect systems, relays, switches, circuit protection devices, touchscreens, sensors, and wire and cable.

TE's ability to serve your present and future requirements is realized through the synergies of a strong R&D program, expertise in materials science, product design, process engineering, and our network of knowledgeable application engineers, sales representatives and customer service personnel.

Key questions and answers:

Q. What are your most effective emi protectant backshells at this time? Specifications? Data sheets?

A. The particular backshells I am responsible for are designed for D-subminiature connectors only. If you have another connector in mind, I suggest you contact the local TE Sales Engineer for assistance. He/she can put you in touch with the Product Engineer for the backshell for the connector you have in mind.

The D-sub backshells I have were designed many years ago before EMI from high speed sources became a problem. Therefore there is little test data on them. There is one relevant Product Specification 108-40032 which you can download online.

The most effective emi protectant backshells are probably those found on the following drawings: 5745171, 5745172, 5745173, 5745174, 5745175, 5745854, 5747099, 5745833, 5747100, and 5747098.

We also have connector kits that include shielding components. Examples of these are found on drawings: 1658654 and 1658655. Assembly instructions are found on 114-40030, 408-9172, and 408-9010

Q. Would your company possibly be interested in a new technology along the lines of an emi protective backshell developed by the navy?

A. This would require a business decision beyond my engineering function. Again I suggest contacting the local TE Sales Engineer for assistance.

Q. What are the major strengths and weaknesses to your current backshells?

A. They were designed before emi became a major problem. They have a broad customer base so they are apparently effective for their needs despite a lack of emi data.

Q. How much do your best most effective backshells cost?

A. The local TE Sales Engineer can provide this info.

Q. Are they able to be retrofitted on current cables in commercial and military applications? If not what specific applications are they designed for?

A. Depending on how the connectors are attached to their mates, the backshells described above could conceivably be retrofitted.

Q. Where are most of these backshells installed? Military? Commercial companies?

A. Both.

Q. Hypothetically what would it take as far as protocol to get a technology such as this in your current product line?

A. Discuss with local TE Sales Engineer.