



# Connector Imperatives to Support Next Generation Electronic Equipment

## Computer, Telecom & Automotive Markets

Bishop and Associates has just released a new eight-chapter research report analyzing **Connector Imperatives to Support Next Generation Electronic Equipment**. This new report identifies emerging electrical, mechanical and economic attributes of connectors anticipated by the electronic system design community as well as provide examples of new products connector suppliers have released or are developing in order to address these emerging needs. The report is focused on three industry segments that are experiencing the most rapid and dramatic changes, and represent some of the most fertile markets for innovation in connector technology (Computers, Telecom and Automotive). Statistics are presented showing historical and forecast connector shipments for the years 2005, 2006, 2007 and 2011.

The key objectives of this new report are to identify specific attributes of electronic connectors as reported by the connector using community, and to compare them with new development work as well as recently released connectors from the connector manufacturing industry. Product extensions of existing features as well as new capabilities are reviewed.

### Some Of The Issues Explored In This Report

- Are connectors currently available on the market today capable of providing performance adequate to support systems for the foreseeable future?
- What new connector attributes or features will be required that may not exist today? When must these be in place? Will customers be willing to pay for these features?
- How has advanced transceiver chip technology enabled connectors to extend their design bandwidth?
- What role will emerging industry standards organizations and special interest groups play in influencing connector design, development and implementation in the future?
- Which electronic products or market segments are driving the need for higher connector performance? Why?
- What is the timetable required for new enhanced feature connectors to meet volume production requirements?
- What are the U.S. domestic, European, and Asian connector market values today and forecasts for connectors in the computer, telecom and automotive markets?
- Will new connector technologies being developed by small independent companies be able to influence system design using non-traditional interfaces or system packaging schemes?
- What are the greatest connector challenges now being faced by next generation system design engineers? What new products or technologies are connector users identifying as being critical to the successful development of their new systems?
- What new interconnect technologies now in the concept or development stage; have the potential to change traditional connector paradigms?
- Will contract manufacturers take over an increasing responsibility for actual system design? How will the use of EMS / ODMs in the manufacturing / design process influence the migration of new interconnect technology into new systems? How will that change the OEM/connector vendor relationship?

- Is the plated through hole in a PCB reaching a high-speed performance limit? Will surface mounted connectors or some other technology become the high-speed PCB interface of choice?
- How must power connectors evolve in order to address the growing thermal management issue? What new products have been introduced to address these needs?
- Is the process by which new connectors are developed and introduced changing? How, why?
- How has the lead-free and other environmental initiatives influenced connector design, performance, and cost?
- Will new materials and manufacturing processes developed from nanotechnology play a significant role in next generation connector designs?
- How are connector manufacturers marketing their new interfaces given the movement of design engineering to offshore locations? How is technical support being provided on a global 24/7 basis?
- Is the connector-using community ready to make major paradigm shifts regarding interconnect technology and architecture?
- Which connector suppliers are perceived as leading the industry in new interconnect technology?
- How will connector companies protect their intellectual property as the manufacturing and design migration to offshore locations increases?
- How are leading connector companies responding to customer demand for a viable second source on all critical interconnects?
- How will the expansion of wireless technology influence the use of traditional copper connectors?

The first iteration of this report was published in March of 2005, and identified a series of anticipated industry interconnect needs to support the next generation of electronic equipment within the computer, telecom and automotive market segments. In many cases, new connectors were either in development or recently introduced to address these needs. Now, nearly three years later, many of the same requirements remain the primary focus of systems designers. Targets in each metric have ratcheted up to support increased system performance. Continuing challenges in system bandwidth, signal density, and power management remain key concerns as all three spiral upwards, while pressures to reduce product cost and design cycle time make the selection of the most effective connector system a critical step early in design process. The results of extensive interviews with connector manufacturers and users in preparation for this report revealed that many of these key metrics have remained the same. Only the performance targets in terms of signal integrity, contacts per PCB inch, and amps per cubic inch continue to rise. Many of the recently introduced connectors outlined in this report reflect the recognition of these trends.



Although the electronic equipment market is perceived as a dynamic rapidly evolving segment, the desire to remain within an established comfort zone and minimize risk continues to have a powerful influence on the adoption rate of new component technology. Both connector manufacturers, as well as users, are trying to establish a fine balance between pushing the envelope to achieve their next generation equipment performance goals and cost constraints created by a highly competitive market. Several comments received during the research phase suggest that system design is now often being done by low margin ODMs who are focused on reducing risk, and that many OEMs no longer have the internal resources to even evaluate new technology. A host of new connectors have been introduced over the past three years that reflect this carefully measured pace of advancement.

Some old things are new again. The need to understand the basics of contact physics continues to be an issue as senior designers who have personally experienced the negative effects of such interconnect phenomenon as fretting corrosion, the formation of inter-metallic layers between dissimilar contact materials, and tin whiskers continue to retire or are laid off in downsizings. Although system problems due to the failure of a connector continue to be a relatively rare occurrence, product failures attributed to the interconnect are being revisited among the crop of new engineers who have little training or experience in connection technology. The replacement of gold with alternative non-noble plating, elimination of the nickel underplating, and the selection of an inappropriate contact design for the application were reported and illustrate the potential for failure.

Significant concern was expressed about a potential decline in system reliability as product manufacturing and more recently product design migrates to offshore locations. The impact of improper design and selection of inappropriate materials driven more by cost reduction, introduces an entirely new level of concern in insuring product reliability. More than one interviewee indicated that their company has either re-evaluated their design and manufacturing verification process, or actually brought their product manufacturing back to the U.S.

New products are reaching the market at an accelerating rate. Hand held consumer products that offer communications, entertainment and Internet access illustrate the faster, smaller, and cheaper trend. Advanced applications in such diverse markets as industrial control, medical imaging, and security, which utilize Internet access, continue to drive the need to upgrade the infrastructure of the network. The electronic content of automobiles is exploding, as drivers demand their car become an extension of the communication, computing and entertainment features available in their home. Additional navigational, diagnostic and safety equipment together with electronic management of every major component within the car further extend electronic content.

This relentless pace of new product introduction guarantees that the pressure to develop advanced interconnection systems will continue. Existing connector families will be fine tuned to address higher speed circuits, while entirely new interconnects will be introduced that address greater packaging flexibility and current density.

#### World Computer / Peripheral Connector Market By Geographic Region

Region	2006	2007E	Percent Change	2011E	2009/2011 CAGR
North America	\$1,222.0	\$1,136.0	-7.0%	\$1,006.0	-3.8%
Europe	\$662.0	\$674.0	1.8%	\$620.0	-1.3%
Japan	\$893.0	\$939.0	5.2%	\$1,070.0	3.7%
China	\$3,068.0	\$3,611.0	17.7%	\$6,407.0	15.9%
Asia Pacific	\$2,034.0	\$2,101.0	3.3%	\$2,910.0	7.4%
ROW	\$208.0	\$244.0	17.3%	\$419.0	15.0%
<b>Total</b>	<b>\$8,087.0</b>	<b>\$8,705.0</b>	<b>7.6%</b>	<b>\$12,432.0</b>	<b>9.0%</b>

\$ Millions

The following Table of Contents shows the detail provided in this new report **Connector Imperatives to Support Next Generation Electronic Equipment.**

## Table of Contents

### Chapter 1 - Report Scope And Methodology

Methodology and Approach  
Data Collection Forms:  
Connector Imperatives to support Next Generation Electronic Equipment  
Connector User  
Connector Imperatives to support Next Generation Electronic Equipment  
Connector Manufacturer

### Chapter 2 - Introduction

### Chapter 3 - Current Connector Technology

Universal Attributes of Future Connectors  
Lead-Free Electronic Assemblies  
Complete Families of Connectors  
Multiple Sourced Connectors  
High-Speed Performance Headroom  
Accurate Performance Data and Models  
Renewed Interest In The Use Of Alternative Card Architecture Including Mezzanine And Midplane Configurations.

### Chapter 4 - Connector Attributes, Computer, Telecom Markets

Computer / Telecom Industry  
Connector Attribute: Increased Signal Density  
Connector Industry Response  
Increased Signal Density  
Computer / Telecom Industry  
Connector Attribute: Increased High-Speed Performance  
Connector Industry Response  
Increased High-Speed Performance  
Computer / Telecom Industry  
Connector Attribute: Improved Power Connectors  
Connector Industry Response  
Improved Power Connectors  
Computer / Telecom Industry  
Connector Attribute: Increased Connector Robustness  
Connector Industry Response  
Increased Connector Robustness  
Computer / Telecom Industry  
Connector Attribute: Standards Driven Interfaces  
Connector Industry Response  
Standards Driven Interfaces  
Computer / Telecom Industry  
Connector Attribute: Connectors Optimized for Orthogonal Midplanes  
Connector Industry Response  
Connectors Optimized for Orthogonal Midplanes  
Computer / Telecom Industry  
Connector Attribute: Improved Differential Skew Control  
Connector Industry Response  
Improved Differential Skew Control  
Computer / Telecom Industry  
Connector Attribute: High performance / Density Fiber Optic Connectors

Connector Industry Response  
High performance / Density Fiber Optic Connectors  
Computer / Telecom Industry  
Connector Attribute: Increasing Use of Flex Interconnects  
Connector Industry Response  
Increasing Use of Flex Interconnects

### Chapter 5 - Connector Attributes, Automotive

Automotive Market  
Automotive Industry  
Connector Attribute: Compliant Pin, Surface Mount and Compressive PCB Termination  
Connector Industry Response  
Compliant Pin, Surface Mount and Compressive PCB Termination  
Automotive Industry  
Connector Attribute: Lower Mating Force Connectors  
Connector Industry Response  
Lower Mating Force Connectors  
Automotive Industry  
Connector Attribute: Greater Variety Of Consumer Accessible Interfaces  
Connector Industry Response  
Greater Variety Of Consumer Accessible Interfaces  
Automotive Industry  
Connector Attribute: Low Cost Filtered Connectors  
Connector Industry Response  
Low Cost Filtered Connectors  
Automotive Industry  
Connector Attribute: "Integrated Connectors"  
Connector Industry Response  
"Integrated Connectors"  
Automotive Industry  
Connector Attribute: Increased use of Shielded and Coaxial Connectors  
Connector Industry Response  
Increased use of Shielded and Coaxial Connectors  
Automotive Industry  
Connector Attribute: Fiber Optic Connectors  
Connector Industry Response  
Fiber Optic Connectors  
Automotive Industry  
Connector Attribute: Standards Driven Interfaces  
Connector Industry Response  
Standards Driven Interfaces  
Automotive Industry  
Connector Attribute: Hybrid Connectors  
Industry Response  
Hybrid Connectors

### Chapter 6 - Additional Issues

Protection Of Intellectual Property In The Global Marketplace  
Impact of Wireless Technology on Copper Interfaces  
Differential Impedance Changing From 100 to 85 ohms  
Global Migration of System Design  
Nanotechnology in Connector Fabrication  
Connectors With Integrated ESD Protection

Non-Traditional Interfaces  
Connections to Non-Conventional Materials

### Chapter 7 - Connector Market Values

World Computer / Peripheral Connector Market By Geographic Region  
World Telecom / Datacom Connector Market By Geographic Region  
World Automotive Connector Market By Geographic Region  
Market Forecast by Region of the World  
Computer / Peripheral Connector Market Forecast  
Computer / Peripheral Connector Market Share by Region - 2006  
Computer / Peripheral Connector Market Share by Region - 2011  
Telecom / Datacom Connector Market Forecast  
Telecom / Datacom Connector Market Share by Region - 2006  
Telecom / Datacom Connector Market Share by Region - 2011  
Automotive Connector Market Forecast  
Automotive Connector Market Share by Region - 2006  
Automotive Connector Market Share by Region - 2011

### Chapter 8 - Major Findings And Conclusions

Computer and Telecom Markets  
Key Considerations  
Cost Drivers  
Compressive Connectors  
Resistance to Change  
Gb/s Performance  
Surface Mount  
Scalability  
Performance Headroom  
Orthogonal Midplane Connectors  
Industry Standards  
Technical Support  
Wireless Technology  
Connector Content Value  
Offshore Migration  
Connector Technical Support  
IP Protection  
Mezzanine Connectors  
Connector Support Tools  
Performance Comparison  
High-Speed Channel Metrics  
85-Ohm Differential Impedance  
Increased Pin Density  
Automotive Market  
Key Consideration  
Expanding Electronic Applications  
EMI/ESD Connectors  
Compliant Pin & Surface Mount Termination  
Optic Connectors  
Second Source  
Consumer Interfaces  
Connector Integration  
General Observations  
Environmental Standards  
Industry Standards  
Flex Circuitry  
Nano Technology  
Second Source Imperative  
Emerging Markets  
Incremental Advances  
Continuing Trends

### Appendix - Connector Definitions, Acronyms And Technologies

Ambient Temperature  
Ampere  
Anti-pad  
ATCA  
Attenuation

Bandwidth  
BGA  
Bit Error Rate  
Blindmate Connector  
BOM  
Breakdown Voltage  
Broadside Coupled  
Bulk Resistance  
Capacitance  
Characteristic Impedance  
Clearance Distance  
Conductivity  
Constriction Resistance  
Contact Resistance  
COTS  
Creepage Distance  
Crosstalk  
Current  
Current Rating  
DC  
D-to-D Converter  
De-emphasis  
Derating  
Dielectric  
Dielectric Constant  
Distributed Power Architecture  
Differential Signaling  
Dry Circuit Resistance  
Edge Coupled  
EMC  
EMI  
EMS  
EYE Patterns  
GBIC  
Heat Sink  
Hot Swap  
Inductance  
Insertion Loss  
Intersymbol Interference  
I/O  
Jitter  
Joule  
LAN  
LGA  
Loss Tangent  
MEMS  
Microstrip  
MSA  
N+1 Redundancy  
Normal Force  
ODM  
OEM  
Ohm  
Ohm's law  
Operating Temperature  
Parallel Signaling  
PCB  
Power  
Propagation Delay  
PTH  
PICMG  
PMC  
Reflections  
Resistance  
Risetime  
RoHS  
S Parameter  
SERDES  
Serial Signaling  
SFP  
SIG

Signal Integrity  
Single Ended Signaling  
Skew  
Skin Effect  
Smith Chart  
SPICE  
Stripline  
Supertemperature  
Surge / inrush current

TDR  
Telematics  
Thermal Runaway  
Transmission Line  
VME  
VoIP  
Volt (V)  
Watt  
WiMax



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