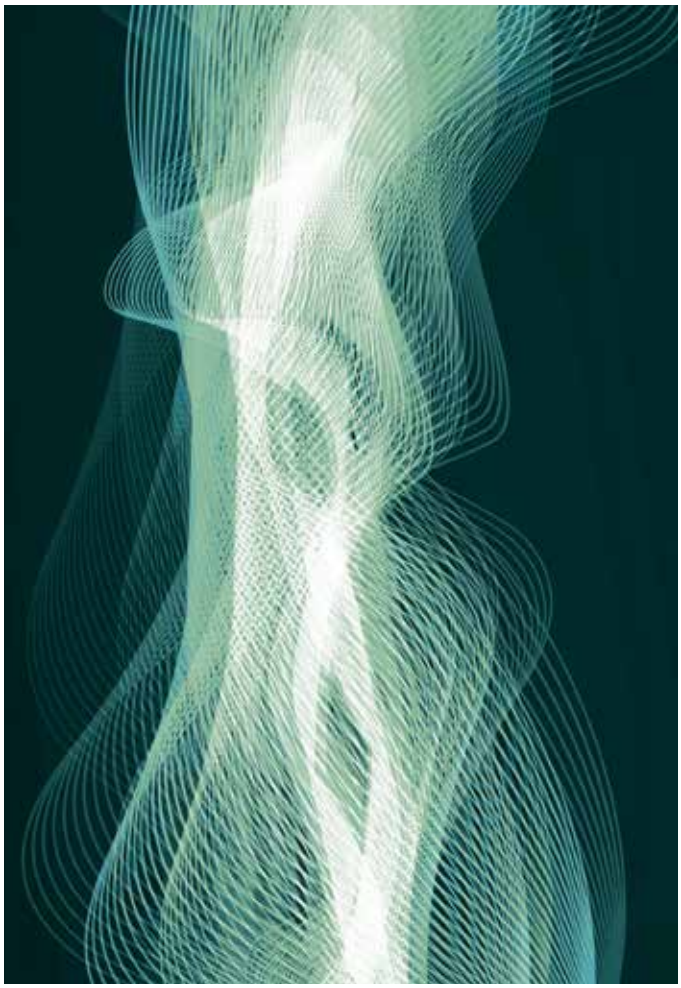
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POSITION PAPER

Test & Measurement:

Building a better test set-up starting with the interconnect

As new technology takes off, test and measurement become critical to designing new products, ensuring compliance to increasingly complex standards, and assuring quality products. Automated Test Equipment (ATE) is invaluable in testing everything from intricate wire harnesses or control systems to semiconductors and integrated circuits before incorporating into a final, high-tech assembly.



Developing an effective ATE set-up decreases manufacturing errors, reduces labor costs, and improves yields by providing consistent results. Equally as important as the ATE software that analyzes test results; the test harnesses must provide a robust solution to communicate between the ATE and device or units under test (DUT or UUT).

Thankfully, this critical aspect of ATE can be simplified with a reliable and robust Zero Insertion Force (ZIF) style connector. By selecting a ZIF connector, you reduce signal interference and contact fretting, while streamlining set-up processes and reducing the time between test batches.

What is a Zero Insertion Force Connector?

Zero Insertion Force (ZIF) connectors were initially developed by ITT Cannon for use in ultrasound equipment that required a high-density and high-mating cycle connector for image signals. Over time, they have found a powerful, secondary use in test and measurement.

ITT Cannon's ZIF connectors have an innovative contact and coupling system that ensures the bodies can fully engage without the contacts touching. The external cam system, or lever, allows gentle and complete mating of a large number of pins while eliminating associated wear and mating friction. Rather than utilizing a frictional mating force, a cam (typically a half-turn or quarter arrangement) goes into position with the rotation of a handle. Lining up numerous pins to mate a connector is tedious since you do not want to bend any of the pins and ruin the connector or, worse yet, cause a short during testing.

ITT Cannon's ZIF connectors come in many different styles: DL (plastic shell), the DLM (metal shell), DLP (enhanced shielded version), and QLC (miniaturized), all with a range of pin counts. The internal cam that engages these ZIF connectors can be operated single-handedly with a small external lever.

How to avoid crosstalk on a high pin count connector?

When dealing with high pin counts and unique test requirements, ITT Cannon ZIF connectors can be configured to suppress unwanted signals generated from other signal or power wires housed in the same connector. For example, if you feed a mixture of 30 signals and power sources into ITT's DLM ZIF 60-pin connector, crosstalk can be addressed by using the 30 unused connections as grounding paths. Grounded wires can effectively shield signal-carrying wires from interference generated by power wires, even if they are all housed in the same connector. ITT Cannon's DLM-, DLP-, and QLC-series connectors also include an EMI/RFI shield-locking feature that helps deliver exacting performance requirements.



Figure 2: This 156-pin connector is part of the Cannon DL series of ZIF connectors. The cam in the center is the basis for zero force insertion. Single-handed actuation makes it easy to mate. A broad range of pin count, size, materials, and performance options are available for finding the exact choice. (Image: ITT Cannon)



Figure 1: The cam in this test rack is easy to engage with the lever. For tight spaces, the lever can be replaced to move the cam. Another option is a self-actuated cam that, for example can mate and unmate when a drawer is closed or opened. (Learn more at Duotechservices.com)

How do they work?

All of ITT Cannon's ZIF connectors achieve a slight wiping action as pins in the connectors engage. This is because a film can build up on contacts over time that is unless contacts exist in a vacuum. The slight wiping action gently cleans without causing wear-inducing friction. ITT Cannon offers several types of ZIF connectors in a 60 to 408 range pin count from authorized distributors. (ITT Cannon also manufactures custom pin count connectors.)

If there's not enough movement or force when mating, films that develop on the pins are not going to be penetrated and can insulate against a true connection. However, if the movement of the contact "plowing" through the film is too great, it can create debris that increases resistance against making good contact. The slight wiping of ITT Cannon's superior cam system occurs every time the contacts are mated in the ZIF connectors, reinforcing reliability.

The QLC series of ZIF connectors come as 260 or 440 contacts in a slender form factor meant for mounting on Printed Circuit Boards (PCBs) or portable applications. The QLC series can withstand up to 20,000 mating cycles, be mated and unmated in less than 2 seconds, and carry up to 0.5A/pin with no impact on performance.

The ITT Cannon DL Series of ZIF connectors are ideal for medical, commercial, and industrial equipment marketplaces as high-performing, multiple-wire power and signal connectors that are also cost-effective. You can mate ITT Cannon's ZIF connectors from 10,000 (DL) to 20,000 (QLC) times with no fear of failure.

Why ITT Cannon ZIF Connectors?

ITT Cannon has over 100 years of designing and manufacturing a variety of interconnect solutions to fit a wide range of complex design requirements. One option with these ZIF connectors includes polarizing posts so that similar connectors will only mate in predefined receptacles. The choice of materials in connectors (such as plastic or metal) offers either lightweight or more rugged operation. Optional anti-static protective covers for static-sensitive or harsh environments are also available. Bus contacts are available, which enable DL series connectors to increase current capacity up to 60 amps in one connector.

Quality connectors are critical to success. Test and measurement connectors need to work consistently well if you want to avoid faults that lead to long hours of troubleshooting problems that don't exist on your device. How do you determine if a connector is reliable? The Hertz Stress test is a nearly foolproof way to predict connector reliability. It considers the primary factors that generate current flow and resistance. A high Hertz value virtually guarantees good connector performance.

To find out more about the Hertz Stress test, look at the white paper Can Your Connectors Pass the Ultimate Stress Test? (PDF). The paper states, "To achieve the optimum, stable Hertz stress levels and good connector performance, the ideal connector is designed not with flat surfaces, but with domed surfaces."

There is a lot more to connectors than making a simple contact connection. It's worthwhile to decide on quality test connectors that are designed with Zero Force Insertion to avoid breakdown from constant human handling. ITT Cannon's ZIF connectors have been successfully applied in markets that involve high volume usage, such as in ultrasound equipment.

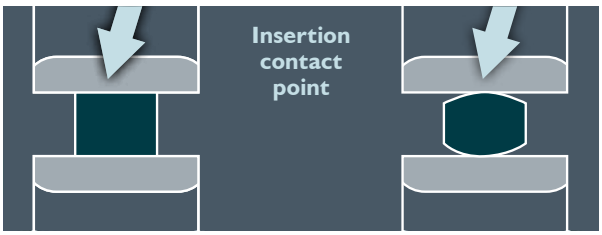


Figure 3: To assume that the use of normal force predicts contact performance is flawed thinking. The domed connector on the right delivers greater reliability because the normal forces are being channeled through a smaller area. Thus, there is more force per unit area available to penetrate the one obstacle standing in the way of stable contact resistance: contact films. (Image: Can Your Connectors Pass the Ultimate Stress Test?)

ZIF connectors: the best in test and measurement

Robustness, long-term reliability, and ease-of-use can make a huge difference in the productivity of test and measurement equipment. As the number of electronics applications increases exponentially, many industries benefit from ATEs, including automotive electronics, aerospace, avionics, and defense systems; transportation (train/locomotive) control systems, industrial equipment (e.g., automation, robotics, control systems), medical devices (e.g., ultrasound, portable imaging equipment), semiconductor Integrated Chip (IC) testers, telecommunications (e.g., switching systems, manufacturing test equipment), broadcasting, concert lighting and sound systems; and more.

Over the last two decades, the cost of electronics components, especially ICs, has gone down while testing costs have remained the same or increased. A test harness with quality connectors that can withstand a beating and increase time-to-market is an obvious choice. To learn more about the DL Series ZIF connectors and their performance, visit **www.ittcannon.com**



Explore our wide range of Zero Insertion Force connectors



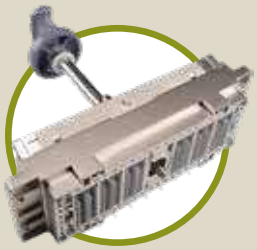


DL and DLM Series

The DL & DLM Series of Zero Insertion Force (ZIF) connectors fill the need in the medical commercial/industrial and peripheral equipment market places for low-cost, high performance, multiple-wire power and signal connectors. The connectors feature a minimum rated life of 10,000 mating cycles with no performance loss. They can be mated and unmated in less than two seconds and their high-bandwidth pinouts (up to 360 contacts) allows for full-flexibility and reconfigurable I/O.

- **10,000 mating cycles**
- **EMI/RFI shielding for DLM**

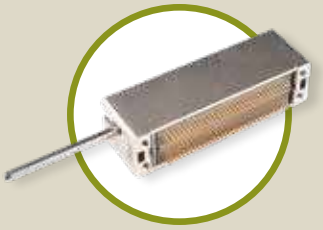
DLP Series



The DLP series provides reliable performance with contact wiping action directly on a PCB pad. A high-density contact module enables a high pin count connector (136-408 contacts) and flexibility. The nickel-plated aluminum housing along with the embedded grounding springs offer superior performance under the harshest EMI conditions.

- **10,000 mating cycles**
- **EMI/RFI shielding**

QLC Series



The miniaturized QLC device meets size, reliability, and mating requirements for portable medical equipment. Similar to the DL Series connectors, the QLC connector is easily assembled during harnessing and features a high pin count, 260 contacts in PCB-mount style. The receptacle is available in both standard solder tail and press-fit contacts. The QLC employs rugged nickel-plated aluminum housing and features a minimum rated life of 20,000 mating cycles with no performance loss.

- **20,000 mating cycles**
- **EMI springs & shield-locking mechanism**

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Why ITT

ITT is a focused multi-industrial company that designs and manufactures highly engineered critical components and customized technology solutions. ITT's Cannon brand is a leading global manufacturer of connector products serving international customers in aerospace, defense, medical, industrial and transportation end markets. ITT's Connector business, which also includes the Veam and BIW Connector Systems brand, manufactures and supplies a variety of connectors and interconnects that make it possible to transfer data, signal and power in an increasingly connected world.

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