Micro-D Connector Versions Adjust to Fit Many New Design Challenges!

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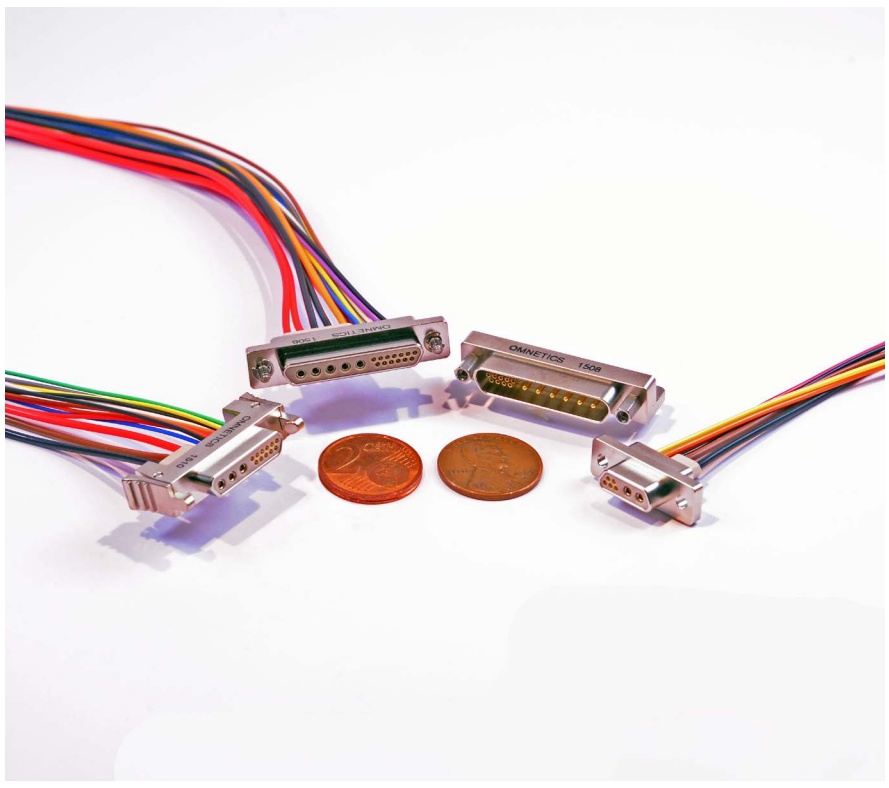
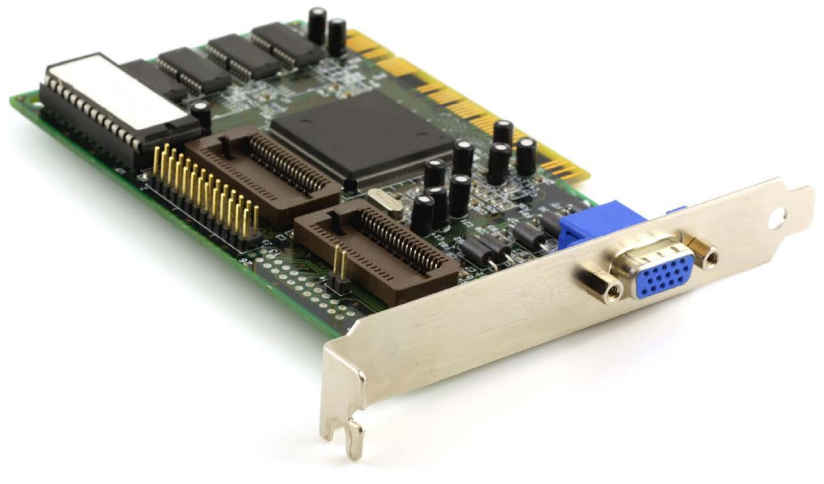
The evolution of high technology electronics is rapidly moving in the direction of miniaturization and high density. Designing the Micro-D connector for many formats and functions to support military specifications and beyond, is critical in this fast-moving industry.

Mobile circuitry and robotics are providing answers throughout our industries from machinery to personal worn devices. Early portable electronic instruments were moved about using hand-trucks and then plugged connected to other instruments. In time, rack-mounted portable instruments became available and those could be pulled in and out of tall metal racks and moved to bench tops or connected to other instruments. By the 1980s instrumentation electronics began using more integrated circuits that required lower voltage and minimal current for operation. This helped develop standard sizes that fit bench-tops systems instead of the old rack-mount towers. Today's portable test instruments include fully active electronics compared to their predecessors that were purely passive measurement devices. As these new portable instruments evolved in functionality and included additional attachments, they collect high levels of data acquisition. This requires significant increases in the number of wires and connectors involved in advanced systems. As an example, early medical ultrasound equipment stepped-up regularly from 32 wires, to 64, and on to 128 wires to deliver ever improved ultrasound images. Computer test equipment, such as emulator probes and detector analysis equipment for computers grew in similar steps. During this evolution, solid-state chips handling the internal functions of the instruments, continued to grow in functional capability, while simultaneously demanding less and less voltage and current to perform their processes. Military electronic industries followed, (and sometimes led), this evolution driven by the chip technology.

As military and other high technology systems evolved, another technology had to follow the trend. The connector cable industry became the routing highways of ever-increasing electronic volume and signal speed. New electronics have been added to process increased data processing, and signal management. The trend became, "circuits could do more, if they could do it faster". Information collection and storage became an important function, because stored information could be used and addressed faster than re-developing the information each time it was needed. This completed a complex system of "data-acquisition"– "data-analysis" "processing-functions, and "processing-deployment" to other systems or instruments. As a result, we see dramatically increased data storage and data retrieval as part of our future in reference information utilization.

Data process industries are rigorously involved in signal management improvements to keep up with the ever growing industry. Computers are getting smaller and yet handle massive increases in processing capacity. Many computers do not use the old cold storage data centers, because equipment heat is less and less of a problem with the efficiency of the new chip technology. Computers and instruments have become workstations for multiple users and share individual desk tops within the office and cable has continued to be in demand. Satellites used for earth orbit systems must remain small and light weight. Single board computers are maintaining key functions such as position and satellite attitude while tracking the position of reference stars deep in space. Early connectors began as large circular screw-on devices when military reliability was required. The cable often carried over 15 amps per line. Ground cable and shields were always required. The military





specifications became a standard of ruggedness and of quality. These giant-sized connector-cable systems were the work horses of the electronic routing systems on early electronics. Then the solid-state chip evolution began. Using new materials and technology, instruments began to add groups of interchangeable board modules inside their equipment. This allowed standard base systems to include customized circuit options inside instruments. Expansion bays offered additional processing functions, when needed and the famous, “Mother Board” system was perfected. New boards and modules were added to the evolving market with personal computer systems. Data processing on desktops, on portable test equipment and in medical instruments needed connector and cable that fit new applications and smaller connectors were needed.

Rectangular shaped connectors fit the aspect ratio of the printed circuit board layout methods and became somewhat standard. Earlier rectangular boards were often set at a pin to pin distance of 75 and 100 mils, called, “pitch”. These new “D-Subminiature” connectors became a standard for routing power and data into and out of many printed circuit boards in the industry. D-sub-miniature size connectors were used extensively and offered a standard in rugged reliability, “for a number of years.” Applications beyond military supported the addition of electronics into the industrial and emerging robotics industry. Printed circuit boards became equivalent to mother boards in their handling of multi-functions and processes. Many board to board interconnections became the trend for plug-in components to add to the board and rack capability.

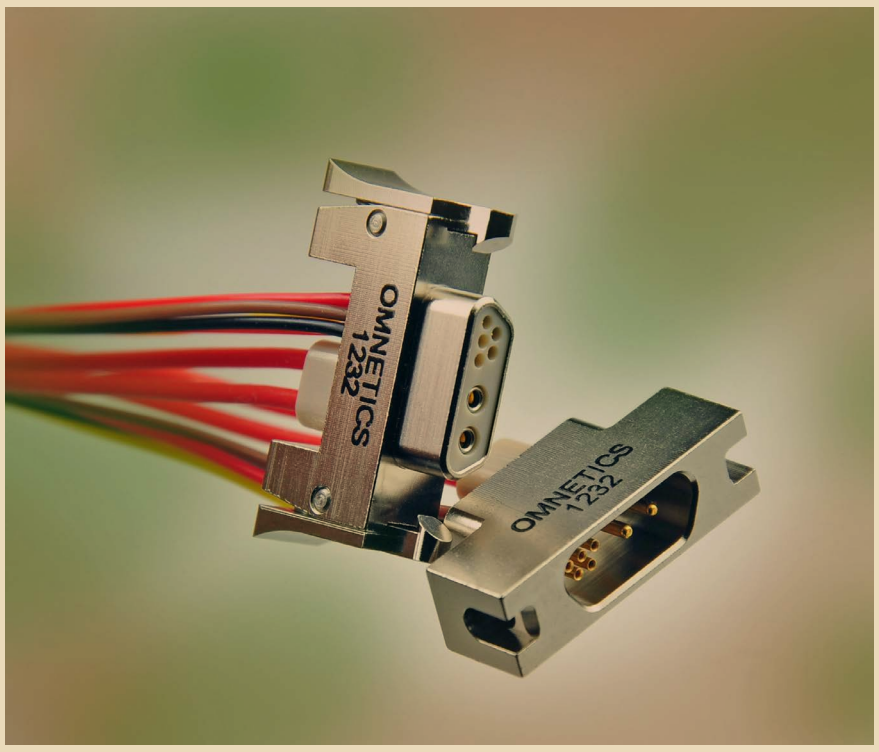
Micro-D and cabling evolved with ever increasing wire count while using less space and weight of D-sub-miniature interconnection systems. The MIL-DTL-83513 specification became the standard for assured reliability and useful in supporting multiple suppliers. In addition, standard printed circuit board patterns were built into circuit design software and could be depended on to match the Micro-D connectors that were made to the standard specification. The standard Micro-D materials, shells and inter-locking mechanisms have helped set Micro-Ds as one of the largest volume connectors built in the world. Manufacturers offering QPL (Qualified product listing) models are registered and offer products that achieve the standards.

Circuit chips are handling more information and run faster, always pushing the cable and connectors to be designed to meet new applications. An early example of this evolution is exhibited in changes from “serial-port to parallel-port”. Connector design quickly followed the evolution to the new Ethernet cable and connectors used in higher speeds. As circuits evolve, designers must add specific attention to printed circuit board pads and layout details. Multiple layout guidelines are available to avoid crosstalk, noise and induced EMI to their signal paths. There are multiple noise coupling mechanisms, such as radiation, and magnetic or electric field coupling. When connectors are directly in line with signals on P.C boards, the “direct coupling” mechanism to input/output signals must be considered. The cable-to-connector can become an antenna adding noise onto one of the signal lines. This noise can then be coupled to the printed circuit board pads and contaminate the signal processing on the P.C. boards. Many higher density circuit boards use Micro-D connectors directly inline with cable. Connector pad and layout standards were adopted to help spread-the-distance from pad to pad on the circuit board. This extra distance tended to reduce “Induced EMI” effects on newer higher speed digital signal methods. One example is with Pulse amplitude modulation (PAM) signaling that offers multiple digital lines going through one connector and each signal uses a “burst” of different voltage levels to isolate each signal from each other. These sudden changes in voltage levels can be noisy, if run to close to other signals of the P.C. board. Micro-D connectors are also offered in higher density pad configurations for circuits less dependent on signal to noise ratios.

New digital differential cable systems are also needed to handle more information without causing cross-talk or confusing electromotive interference between cable lines. Complications like impedance and skew are easily managed with the micro-D connector format. Connectors can host both analog and digital signaling between chips, modules, printed circuit boards and the outside electronic interface. Increased analog circuit speeds, improved modulation techniques, matched parallel circuit propagation and timing circuits, can fit into small and highly portable electronic modules.

Omnetics Flex Pin

Adapting Micro-D Connectors to Special Applications



New versions in size, shape and function are readily available to meet new applications. Multiple materials are ready, from shells made of Aluminum to Stainless Steel and beyond.

Shell plating is selected to match the environmental exposure issues and various polymer insulators are available for holding connector pin and sockets in place. Back-potting and sealing epoxies are available that can hold above 200˚C or sustain deep space travel with NASA selected low Outgassing. For extended strength and highest vibration and shock resistance, the Omnetics Flex Pin was designed from one single piece of BeCu (Beryllium Copper) tempered to 17,200 ksi spring tension. Eliminating the welds and joints in pin design has eliminated potential reliability failures seen in some connectors. The pin and sockets are pre-formed and subsequently plated with 50 micro inches, (1.27µm) of gold over 50 micro inches, (1.27 µm) of nickel. When selected, the back section of the pins or sockets are formed to insure wire crimping without using solders.

As size, weight and mixed signal technology goes mobile, connector shapes, angles and board mounts can be selected from website listing and catalogs but then changed to meet specific system requirements, such as backshells for EMI shielding and cyber insurance. Mating standard Micro-D connectors is done with jackscrews that take time and tools.

New Latching Micro-Ds solve those problems for many new applications. Designers can also specify their connectors with silicone ring-seals for different levels of dust and water using ingress protection (IP) rating charts when circuits will be exposed to more extreme elements. Over-molded backshells can bridge the metal connector shell down onto the cable jacket allowing for a smooth transition and supporting the joints from cable to connector. This strain relief area will greatly extend the life of the cable to connector system.

As cable systems become more complex, demand increases for smaller and lower weight systems. Mixed signals and multiple connector sizes can be designed to serve multiple portions of the instrument involved. The Micro-D allows for up to 26AWG insulated wire that can carry up to 3 Amperes continuous power for a main supply. In parallel, coaxial lines can be added to the same cable for RF data. Digital signal pairs, with isolated drain wires can also be included. These more complex cables and other specialty designed systems simplify instrument design and support module to module replacement in the field.

Designers are now free to design beyond standard connector forms while using proven materials and process already in place.

A RAPID AND EASY APPROACH TO DESIGN A CUSTOMIZED MICRO-D

1. Start by reviewing current high rel. micro-Ds in catalog or online.

2. Compare them to your own physical and electrical requirements.

3. If one fits, request a sample from Omnetics or your vendor.

4. If one is close but needs adjustments, call a Connector designer for an online Solid modeling session. This should take less than two days.

5. Work in line with the connector designer to match your form, fit and electrical needs.

6. Ask for a 3-D model to be made of your new device – This should take 2 days.

7. Receive the model and insure it fits and or call the designer for final tweaks.

8. Order the new first article connector and or an order of what you need.

> ***Mixed signals and multiple connector sizes can be designed to serve multiple portions of the instrument involved.***