Battlefield technology and electronics place a strong emphasis on lightweight, feature-rich portable systems. These systems are also becoming interconnected to one another to enhance multiple functions as they relate to one another. The modern warfighter may carry radios, computers, micro-sensors, speakers, surveillance systems, as well as illumination devices at any given moment. Each device has its own job to do and each device takes and distributes power and signals accordingly. These can also include GPS devices, night-vision aids, as well as full out Wi-Fi hotspots capable of transmitting real-time battlefield intelligence that exceed 5 Gigabits/second. Within all of these electronics, one common characteristic remains... all require rugged electrical cables and connectors capable of transmitting uninterrupted field data and power transmission in some of the harshest environments on the planet.

Cables and connectors can no longer be heavy, bulky and stiff. Soldier worn and high portability in the new high-speed digital world has changed the demand on interconnections as much as it has on the modules themselves. New designs of un-conventional cable design and connector formats are becoming “application specific” in nature. Unmanned vehicles, soldier worn electronics and portable electronic support vehicles with miniaturized Ethernet processing systems all require size and weight reduction while including power and increasing performance. i.e.: SWaP, (size, weight and power) have become a keystone for designing, battlefield cable and connector systems.

Yesterday’s connectors are less of an option to meet the demands in the highly aggressive mission critical battlefields of today. Often times, Mil-DTL-24308 and 38999’s are simply too big and heavy, as they were designed for older, larger bulkhead-type panel mounted systems used more traditionally on aerospace applications as opposed to soldier worn. For example; the Italian Soldata Futoro, (Future Soldier Program), raised soldier worn technology to the next level. Starting with the uniform itself, the material was designed specifically for temperate and desert environments to which many of today’s battles are being fought. Woven within the material, are small ruggedized Nano Subminiature D connectors that match MIL-DTL-32139. These connectors pass data and power simultaneously underneath the body armor and are protected from stab and blast damage. Helmets were also redesigned to feature two visors, (splinter and bullet proof), as well as...
helmet-mounted displays (HMD) that present information from a low level TV camera mounted on the back of the helmet. This unit is also night vision capable.

Powering and supplying signals simultaneously in one miniaturized cable has been key to increased mobility and safety of the battlefield troops involved. Cable with both power and high speed digital signal processing require new and additional wire system design and jacketing. To assure strength and environmental resistance while maintaining flexibility, small diameter cable materials have also changed. Additionally, EMI shielding and insuring Cyber isolation requires improved shielding methods, often using multiple shields and drain wire methods. Conventional HDMI cables use shielded twisted pairs for everyday household use but for the battlefields, these cables must be smaller in diameter and must include multiple strand elements as well as the inclusion of separate shielded wrapped pairs with assigned drains per pair. New specifications too are being written to accommodate these designs in an effort to help achieve very high speed digital signal quality for the applications. Nano-miniature connectors are no different and also require to be wired differently. Protecting the impedance coupling from set to set implies new wiring layouts within the connectors. Power sections are also isolated as part of the connector design and match up with the cable. Finally, the process of over-molding the connector using a polyurethane material bonding to the same polyurethane cable jacket assures IP-68 moisture protection and strain relief on the cable to connector interface. Meanwhile, deep inside the connector, the pins and sockets are designed to full military specifications and are gold plated to assure over 2,000 mates and de-mates. This provides long term reliability of the new power and signal cable throughout the battle field duration.

Additional demands for military portability of powered circuits and connected/signal interconnects are emerging regularly. Recently, a company offering ruggedized miniature tactical computing electronics developed an enhanced soldier worn application. Black Diamond Advanced Technology, (Chandler, AZ) is using Omnetics miniature hybrid connector and cable technology in their APEX Predator System (see photo opposite). Black Diamond's APEX is a modular, wearable system which consists of a controller for both power and data distribution, a tablet computer, as well as a number of IP68 cable system designed to connect to a number of peripheral cable and the main power unit. This system offers 5Gbps Super Speed USB 3.0 in rugged miniature form factor.

As we power up our modern battlefield electronic technologies, we see the evolution of miniaturized modules from sensors, cameras, communicators and actuators. Circuit chips now run on lower voltage and current levels while the data is routed shorter distances. This trend embraces the use of smaller, lighter electronics all around. This trend also allows highly portable power systems to be integrated into one common cable routing system and lower current carrying connectors. We are also seeing new cutting edge connector securing options that reduce the use/need for tools to mate and de-mate connectors. New latching Micro-D’s and Nano-D’s are now readily available and have proven to withstand any and all of the rugged shock and vibration tests of yesterday's Mil-Spec options including both MIL-DTL-83513 and 32139. These changes allow for faster change over and eliminates the use of carrying hand tools in the battlefield. Thanks to miniaturization, mobilized ground troops today can carry much of the highest technologies, process and distribute data among their mission team more easily and without fear of power loss or of interruption.

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