CASE STUDIES

The Customer: Protran Technology (a Harsco Rail Company) is the leader in Secondary Advanced Warning Technology for the railroad industry. Protran manufactures electronic technology systems that provide on-track worker warning systems, HY-RAIL Limits Compliance, and train approach warning systems. With thousands of systems implemented throughout the US and Canada, Protran Technology provides safety products to reduce accidents and fatalities in the railway industry.

The Challenge: CDM Electronics needed to evaluate rail in-vehicle conditions and develop vibration and tensile-pull resistant coaxial jumper cables to accommodate Protran Technology's requirement for their newest generation Collision Avoidance System (CAS.)

The Details Railways are a solution to traffic congestion and pollution, however one drawback is the problem of noise and constant vibration. Much energy has been exerted into the goal of reducing vibrations in the vehicle itself, however these vibration levels are an unavoidable function of the forces generated by the train vehicle.

Given the nature of electrical interconnects being in practicality a mechanical assembly, in-field rail and mass transit cable assemblies are in a constant state of vibration and subject to various tensile forces. Also given the demands of consistent electrical and signal requirements through those interconnects, a steady uninterrupted current or signal is required. This is especially vital in the realm of rail and transit safety equipment dependent upon those interconnects.

Protran Technology has designed into their vehicle-mounted Collision Avoidance System (CAS) coaxial interconnect jumper cables for radio transmission functionality. The CAS had experienced a significant underperformance and failure rate ("pull off") of jumper cables provided by a previous supplier that were subjected to everyday nonlinear low- and mid-frequency vibration and tensile forces. As the vibration cannot in practicality be isolated nor the tensile demands be abated, the answer was to review the mechanical and electrical attributes of the interconnect cable itself.

Standard non-rugged-use coaxial cable assemblies terminated with the required TNC (Threaded Neill–Concelman) and N (Type N or Neill) connectors are not designed for exposure to nonlinear low- and mid-frequency vibration and repeated tensile forces (mating/unmating the interconnect or moving the equipment the assembly connects.) However the assemblies being utilized by Protran were connecting in-operation equipment and subject to regular mating/unmating and stretching the cable during placement and accidental mishandling. These "real world" usage issues negated the utilization of a conventional off-the-shelf coaxial assembly and Protran turned to CDM for an enhanced product.

While CDM Electronics was not aware to what mechanical standards Protran's then-current-underperforming and failed interconnect cables were configured nor manufactured, it was clear that a more robust design and termination would be required. It was also apparent that CDM would need to implement a quality testing program to more accurately reflect in-field conditions than the underperforming and failed cables were designed to accommodate.

CDM's first challenge was to develop a manufacturing protocol to consistently optimize conventional connector termination pull-strength to accommodate Protran's CAS aggressive handling and constant vibration. Standard best-practice measurements are highly variable for communications and broadcast coaxial cable applications, with no true industry standard specification. CDM chose to terminate harsh-environment Times Microwave Systems connectors with an oversized ferrule for added strength and standardized that protocol throughout manufacturing for this application.

To verify measure manufacturing consistency and applicability of the assemblies, CDM developed a 100% final inspection protocol subjecting all interconnect assemblies to enhanced pull-test requirements upon completion of manufacture. Standard best-practice measurements are highly variable for communications and broadcast applications, and Protran didn't specify a force limit requirement. As such CDM chose to utilize a well-known Aerospace/Military Manufacturer test specification developed for coaxial cable assemblies subjected to the most demanding harsh environments. Assemblies were placed on a custom-fitted Schleuniger pull tester with specialized fixtures for the Protran-specific cables. Pull test forces in this specification are typically set at 60% of the wire tensile strength at a rate of 1.0 +/- .25 inch per minute. This standard simulated the aggressive in-field tensile forces the product would be subjected to, and product passing the requirement went on to complete electrical testing appropriate for coaxial cable assemblies on automated Cirris state of the art test equipment.

Another challenge for CDM was to maintain RoHS-compliant status throughout the production cycle and for the completed product. To accommodate this requirement CDM utilized RoHS-compliant raw materials from Times Microwave Systems and Sumitomo Electrical Interconnect Products, and manufactured the jumper cables completely in-house at their ISO 9001:2008 and UL certified Turnersville, New Jersey, facility.

The Result: Due to the continual communication and collaboration between Protran and CDM Electronics, in-field delivery of the enhanced assemblies began in late 2014 with additional quantities continuing to be regularly delivered to date. Protran has experienced no electrical underperformance or mechanical failures in-use with the CDM products, and plans on continuing usage of the specialized assemblies for all updated and future CAS units.