COMMSCOPE®

Application Report

Why is Galvanic Compatibility Important to Your Broadband Network Integrity?

In high school chemistry class you learn about different elements—how those elements have various charge levels and how electrons and protons jump from one element to another when they are in proximity to each other.

Most people never truly recognize what this means in real life. A perfect example of this is rust. Oxygen reacts with iron and its alloys in the presence of water and other pollutants in the air and the result is rust, a red substance that ends up causing the eventual decay of the iron. While this is an example of oxidation, this reaction is similar in nature to galvanic corrosion. Galvanic corrosion is the corrosive effect of two metals instead of a metal and oxygen. In marine applications a sacrificial metal such as zinc is used as an anode to protect other metals (cathode) such as iron or steel that are more critical from corroding. The zinc corrodes much faster because of the voltage generated by the dissimilar metal effect **(see Anodic index chart)**.

The greater the voltage difference between two metals, the higher potential for corrosion between these two metals.

Now, flash forward to your broadband network. Various metals come in contact throughout your network, but one of the most critical areas that you do not want to corrode is at your bonding point. **The National Fire Protection Agency Association** requires that your broadband network be properly grounded to prevent voltage spikes, fires and other property damage. Broadband system operators have standardized on annealed solid copper or **Copper Clad Steel (CCS) products** for the bond wire.

But one area sometimes overlooked is the actually bonding apparatus. Many bonding product suppliers promote ground block products that use various metals such as zinc, aluminum or stainless steel; however the basic materials in the network are copper. The F-Connector used in the CATV space has primarily been standardized on brass (primary element is copper) and the bond wire is

copper or CCS. So the obvious question is if galvanic compatibility or dissimilar metals cause corrosion and potential signal integrity issues, why wouldn't you protect the integrity of your subscriber using a copper based bonding apparatus?

A brass connector mating to a non-brass interface will begin to corrode. This corrosion may take months or years, but the basic metal-to-metal interface will corrode. A non-brass interface to the bond wire will face the same corroding effect as the connector to the non-brass interface. What does this really mean? This corrosion, over time, builds up contaminants and these contaminants interfere with the signal propagation through these interfaces. This will be seen in the increase of the resistance from the Connector to the bonding apparatus, or the bonding wire or both. The American National Standard from the Society of Cable Telecommunication Engineers (ANSI/SCTE 129 2007) states that after 1000 hrs of Salt Spray, the grounding interface must maintain < 50 milliohm resistance between the device and the bond wire.

As these interfaces corrode and the resistance increases, you begin to lose your path to ground. A simple rule of thumb is that

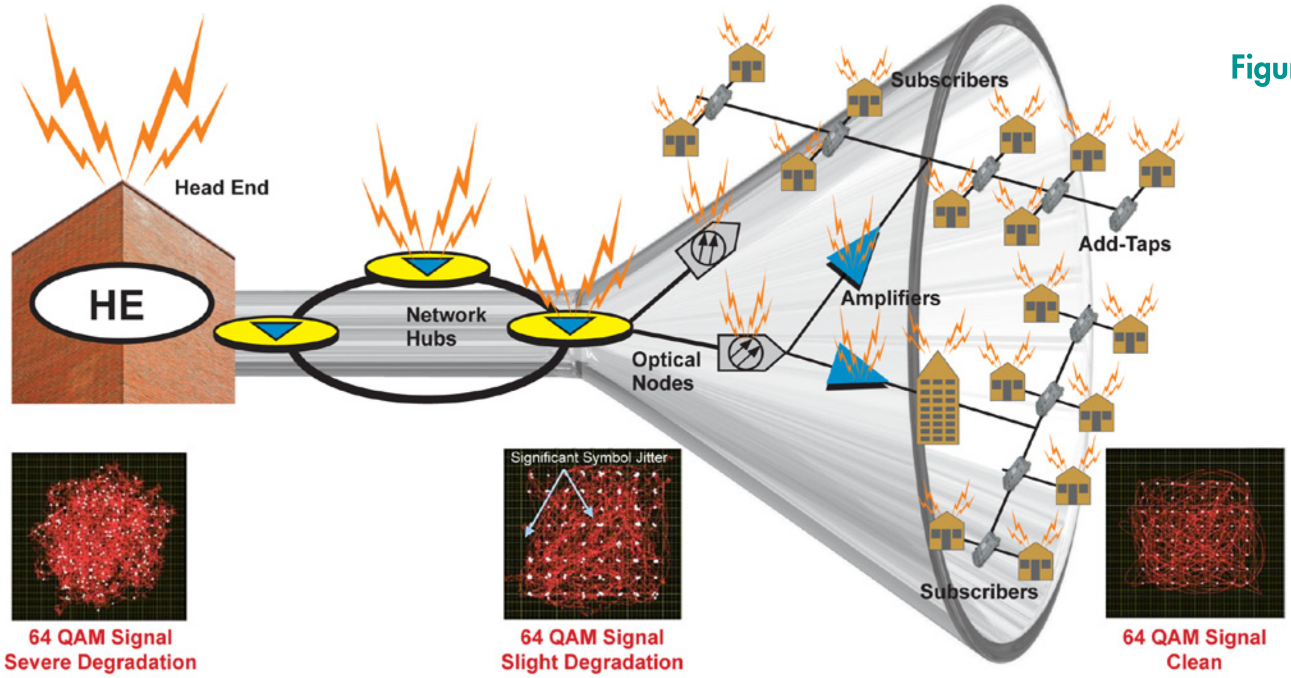

Figure 1

a signal will take the path of least resistance to ground. This may have been through your bonding device on day 1, but now as the corrosion and the resistance increases, it may be back at the tap, or in the home at the back of a television or set top box. These various ground points may not be adequate to shunt electrical noise interference from in-home sources such as refrigerators and microwaves or external sources such as electrical storms and surges to ground. The in-home network may distribute this noise back toward the network as shown in **Figure 1**.

This noise may take one of several forms. It may be random or discrete ingress from external sources, and it may be common path distortion generated by the non-linear effects of the corrosion itself. Once the noise begins to funnel back toward the network, it will be combined both as interfering ingress and as thermal noise and will be amplified multiple times before eventually making its way back into the headend cable modem termination system controllers. Once noise makes it into the signal path it is very difficult to filter out since it is now occupying the same bandwidth as your intended signaling and can significantly reduce the Signal-to-Noise performance of your system.

How can this be prevented?

One easy way to prevent this basic corrosion is to match your galvanic materials together. CommScope has provided a copper based solution for many years with their solid brass line of Ground Blocks. These products were developed specifically with your broadband network in mind to provide the ultimate corrosion resistance and leading lightning suppression capability. These ground blocks are made from forged brass. This is very densely compacted brass. The dense brass body and our nickel plating resist corrosion from external influences like moisture and pollution. The brass itself is made up primarily of copper, the same copper found in the brass F-Connectors and the annealed solid copper or CCS bond wire. From the Anodic index chart, brass and pure copper have an Anodic voltage delta of less than +/-0.15V which meet the MIL-STD-889 for suitable in a harsh outdoor environment. All CommScope brass ground blocks use our 7/16 split bolt to provide a large contact area to the bond wire and the ability to exert a measurable torque onto the bond wire without twisting or tearing into the copper.

Why chance your network integrity with bonding blocks made from other metals or even multiple metals when you can make a clear informed decision and standardize on a true solid brass design?

For more information on these grounding products, please visit **www.commscope.com** or **CommScope's eCatalog.**

COMMSCOPE®

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