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Application Report

The Perils of Improper Quad-Shield Preparation

Introduction

It is well documented that improper cable termination and connector preparation are major contributors to call backs, maintenance costs and unnecessary subscriber dissatisfaction. Also, as signal quality requirements in the forward and return band have increased, operators are selecting products that offer higher levels of shielding integrity. Unfortunately, cable products with higher levels of screening have traditionally been more difficult and time consuming to prepare.

Quad Shield cables offer higher levels of shielding than tape braid or tri-shield cables, but are difficult enough to prepare that many technicians and installers have developed shortcuts, or in the worst cases "cheats", to improve the efficiency of the process. These shortcuts can have disastrous effects on the cable connector interface, as this document will show.

An operator who selects Quad-shield cable must be prepared to invest in training, QA and continuous improvement to stay ahead of the natural human tendency to take a short cut. The installer personalities described below, in our era of high turnover, can only be avoided with focused effort.

Proper Preparation

A properly terminated Quad cable requires 5 distinct steps. First, the jacket and dielectric must be removed using a standard stripping tool. Second, the outer braid must be folded back. Third, the outer tape must be removed. This step is the most time consuming and often ignored. Finally, the inner braid is folded back and a connector applied. A properly prepared quad cable end will look like Figure 1.

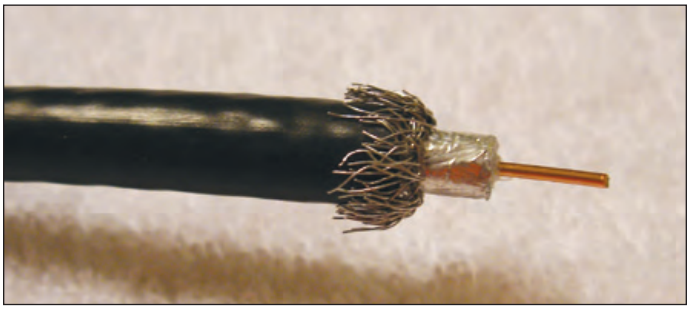


FIGURE 1

The Stuffer

If the foil is not removed as described, the braid and foil will often bunch up and make connector insertion difficult. Figure 2 shows a cable that is improperly seated due to leaving the foil in place. This incomplete insertion can make the center conductor seizure intermittent, and can produce incomplete grounding inside the connector body.

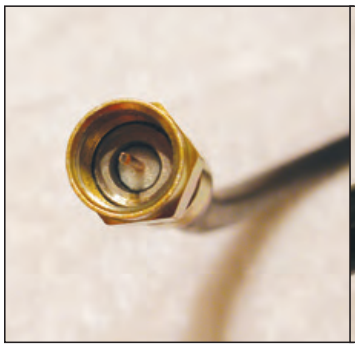


FIGURE 2

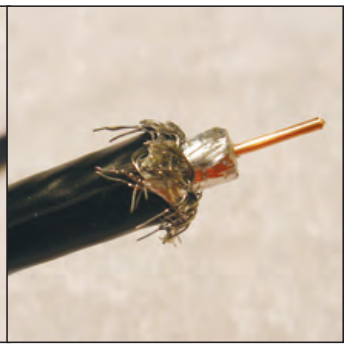
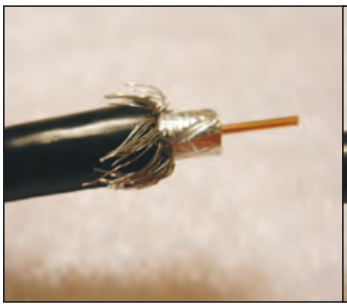


FIGURE 3

Additionally, when the foil is not removed it is easily crumpled or wadded up while being forced down over the cable's jacket along with the braid wires. Where the foil is crumpled in amongst the braid wires it greatly increases the difficulty with which the connector can be inserted onto the cable due to the limited space in the interior of the connector. The connector can become almost impossible to install. See Figure 3.

The Speeder

Figure 4 shows an example of a cable where the tape has been removed, but the time has not been taken to spread braid wires properly around the circumference of the cable. This will make insertion of the cable difficult, and may force the cable to one side in the connector allowing the post to cut the dielectric tape off, as shown in Figure 5. Poor grounding will likely result, and difficulty in fully seating the connector is assured.



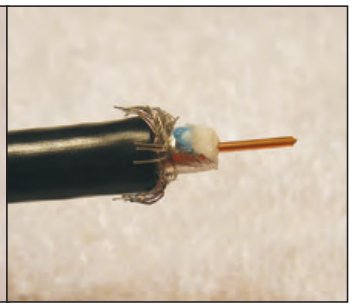


FIGURE 4 **FIGURE 5**

The Jammer

Difficult connector installation should be a sign to the installer that something is wrong and a new connector should be installed. Unfortunately installers will often force the connector on, and the post will force the braid and tape down into the jacket, where a noticeable lump is seen as in Figure 6. In this case, the proper ground connection and connector retention force are unlikely. Additionally, with enough force an installer may kink the cable, changing its impedance and inducing reflections as in Figure 7.

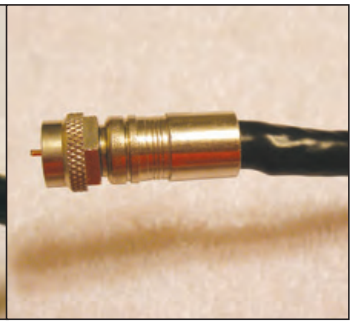
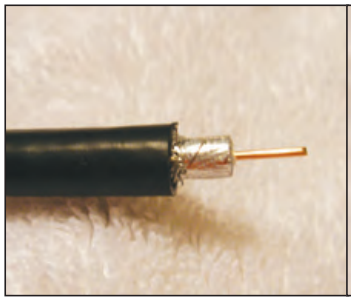


FIGURE 6 **FIGURE 7**

The Barber

Many installers and technicians, in an effort to improve their efficiency, have developed short cuts for quad shield connectorization. In the first of these, the technician will use the trim tool twice, once normally to remove the jacket/dielectric, and then a second time moving the trim tool back which cuts off both the foil and braid at the base of the jacket, as shown in Figure 8. The connector will now glide right on, but it will not have adequate grounding or connector retention as specified.



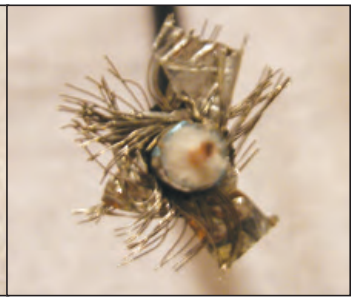


FIGURE 8 **FIGURE 9**

A second technique involves spreading the foil along with the braid wires out flat at 90 degrees to the cable as shown in Figure 9, then trimming off both the braid and the foil with a pair of cutters as shown in Figure 10. The resultant connection will exhibit the same deficiencies as the previous example.

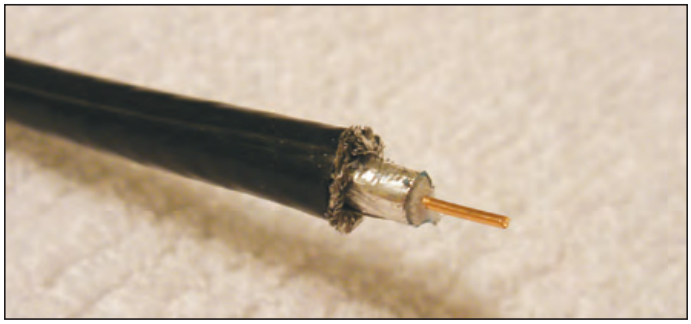


FIGURE 10

The Surgeon

A fairly common method used to remove the foil is to bend both the braid and the foil down over the jacket similar to what is shown in Figure 9 and then use a pair of needle-nosed pliers to pluck the foil out from among the braid wires as shown in Figure 11. This method can produce varied results. Using this method the braid wires are often plucked along with the foil which can either stretch them, break them off or both. Stretched wires will end up being longer than the recommended ¼ inch length, which can result in them being long enough to enter the connector's water seal as in Figure 12. Braid wires in the seal area will allow water migration into the interior of the connector. Any broken off braid wires will reduce the connector's pull-off force.

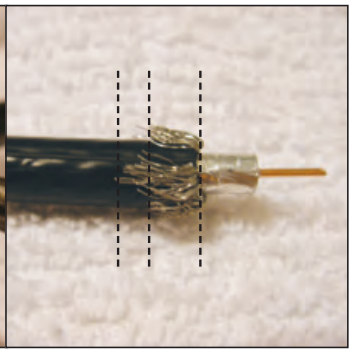


FIGURE 11 **FIGURE 12**

The Butcher

Use of a knife is a common and problematic issue with connector preparation. Even used with the best of intent, knives can score metals and weaken interfaces, leaving the opportunity for braid wires to find their way into the moisture seals of a connector.

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