

COAX FACTS



By George Winton, P.E.

Cutting, stripping, bending successfully



Figure 1

An automated system for processing flexible coax cable pulls the coax off the spool, straightens it, and then cuts it to a programmed length.

COAXIAL cable is commonly used to convey high-frequency signals in microwave communications systems. Uses include common commercial applications such as cell phone towers and specialized military purposes such as ship-to-ship satellite communications systems.

Two common types of coaxial cable are semirigid and flexible. Semirigid cable, which usually comes in straight sections, doesn't require any special handling or preparation before cutting. Flexible cable is supplied on a spool. It must be uncoiled, straightened, and measured before cutting.

Following are a few guidelines for cutting, stripping, and bending coaxial cable that can help ensure the finished product is free from defects.

CUTTING

The cutting requirements for semirigid and flexible coax are nearly identical. For several reasons, a high-speed saw is the preferred cutting tool.

First, coaxial cable consists of several layers. A typical cable has three layers: a jacket (usually copper or aluminum), a plastic insulator, and a copper conductor. Some have five—a jacket, an insulator, a conductor, another insulator, and another conductor. Regardless of the number of layers, a high-speed saw can cut through these materials with little trouble as long

as the saw blade is sharp and has the proper tooth size and set (see **Figure 1**).

Second, a saw cut can fulfill two chief criteria: a square cut with little burr. A small burr can create a big problem because the machines used in the next stage, stripping the ends, might not accept a cable end with excessive burr.

Finally, a saw can provide consistent cut lengths from one cable to the next. Consistency in cable length is critical. Communications systems are designed to minimize the voltage standing wave ratio (VSWR), which is a measure of the system's efficiency. Installing a cable that is longer or shorter than the system was designed for changes the VSWR, resulting in wasted power.

The only difference between cutting semirigid and flexible cable is that the cutting system must secure and support flexible cable on both sides of the blade. Lack of support can lead to poor cut quality.

STRIPPING

Stripping, or dressing, the ends often requires removing at least two layers—the jacket and the insulator (see **Figure 2**). The stripping process must not damage the conductor. A nicked conductor means a scrapped part. Therefore, the stripper's repeatability in cut depth and strip length is critical in making parts successfully.

BENDING

As with cutting and stripping, bending coax consistently is necessary for producing components that will work as intended after they are installed.

Consistent bending starts with a good set of bend tools—a bend spool, clamp die, and a wipe roller. For CNC bending, a collet is necessary. Bending coax by hand can yield the same results as bending with a CNC coax bender (see **Figure 3**). The difference is that when bending by hand, the operator must remain focused to prevent problems downstream.

When planning the bend, the operator should refer to the cable manufacturer's literature to determine the minimum allowable bend radius.



Figure 2

Dressing the end of a coaxial cable requires stripping at least two levels: the jacket (which exposes a length of the insulator) and the insulator (which exposes a length of the conductor). It can take as little as two seconds.

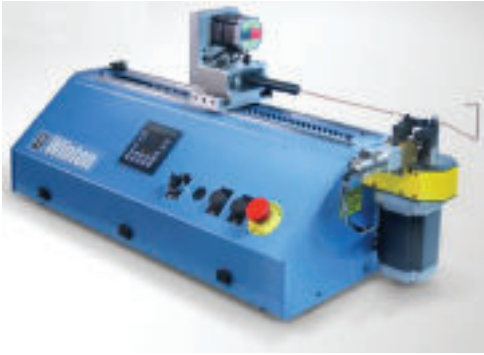


Figure 3


A benchtop-mounted CNC coax cable bender can bend semirigid or flexible coax with or without connectors installed. Most CNC coax cable benders have a capacity of 0.250 in. OD.

It is common practice to load long sections of semirigid coax into a bender for processing. These lengths are managed through the bending cycle using a hitch feed. The initial straight lengths can be longer than the bender itself. If the software accommodates a hitch feed system, the bender can advance the coax with ease.

For bending semirigid from a long stick, a cutoff saw often is mounted onto the bender. After a specific configuration is bent, the saw parts the formed section from the remaining stick.

QUALITY CONCERNS WHEN FABRICATING COAX

Inconsistent bending can affect the VSWR to a small extent. Within the bend zone,

surface defects such as dents on the outer jacket influence the VSWR; dents or defects in the straight sections between bends can also cause the VSWR to change. The imperfections often result from oversights in manual processes and usually are attributable to a change in clamping pressure or manual handling variations during the cutting or bending operations. 

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