

Video Security Basics

Coaxial Cable - An Overview

The most common means of conducting video signals from one piece of equipment to another is coaxial cable. Coaxial cable is often referred to as simply "coax". Not only is coax the most commonly used cable, but also the least expensive, most reliable, most convenient, and easily maintained way of transferring electronic images in a CCTV system.

Coax is available from many manufacturers and comes in a variety of sizes, shapes, colors, specifications and capabilities. The most commonly recommended "coax" type is RG59/U, but this designation actually represents a family of cables with widely varying electrical characteristics. Other varieties like RG59/U are RG6/U and RG11/U; these are used predominately in CCTV and video work.

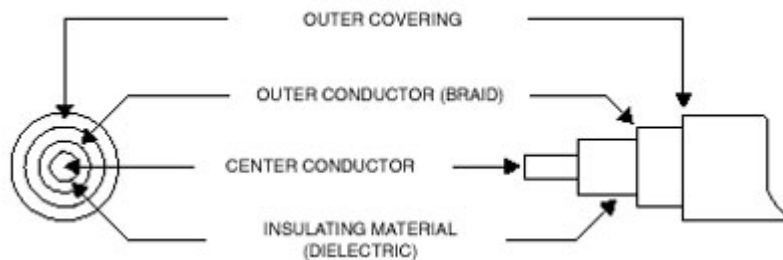
Though similar in many ways, each cable group has its own various physical and electrical characteristics, which must be taken into consideration.

All three "coax" cable groups are included in the same general family classification for coaxial cables. The RG reference is the cable specification for use as a "radio guide", while the numerical value helps differentiate the specifications of each individual cable. Although each cable has its own number, characteristics, and size, there is no difference in the way these different numbered cables work.

Coax Construction

Common "coax" cable RG59//U, RG6/U, and RG11/U is circular. Each has a center conductor surrounded by dielectric insulating material, which in turn is covered by a braid to shield against electromagnetic interference (EMI). The outer covering is the "jacket".

The coaxial cable's two conductors are separated by a nonconductive or dielectric material. The outer conductor (braid) acts as a shield and helps isolate the center conductor from spurious electromagnetic interference. The outer covering helps physically protect the conductors.



Center Conductor

The center conductor is the primary means of carrying a video signal. The center conductor comes in varying diameters, usually ranging from 14 gauge to 22 gauge. The structure of the center conductor generally is solid copper or copper-clad steel, designated as bare copper weld, or BCW. For CCTV applications, solid copper conductors are required. Copper clad, copper weld, or BCW cables have much greater loop resistance at baseband video frequencies and should never be used for CCTV. To determine the type, look at the cut end of the center conductor. Copper clad cable will be silver in the center instead of copper all the way through. Variation in the size of the center conductor has an overall effect on the amount of DC resistance offered by cable. Cables which contain large diameter center conductors have lower resistances than cables with smaller diameters. This decreased resistance of large diameter cable enhances the ability of a cable to carry a video signal over a longer distance with better clarity, but, it is also more expensive and harder to work with.

For applications where the cable may move up/down or side-to-side, select cable that has a center conductor consisting of many small strands of wire. As the cable moves, these strands flex and resist wear due to fatigue better than a cable with a solid center conductor.

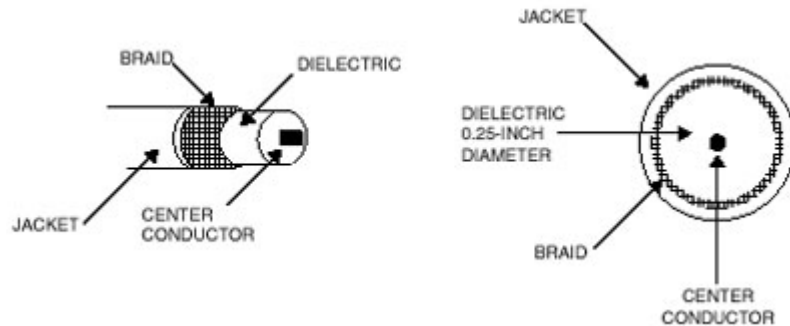
Dielectric Insulating Material

Surrounding the center conductor is an evenly made dielectric insulating material which is available in some form of either polyurethane or polyethylene. This dielectric insulator helps determine the operating characteristics of coax cable by maintaining uniform spacing between the center conductor and its outer elements over the entire length of the cable. Dielectrics made of cellular polyurethane or foam are less likely to weaken a video signal than those made with solid polyethylene. This lower attenuation is desirable when calculating the loss/length factor of any cable. Foam also gives a cable greater flexibility, which may make an installer's job easier. Although foam dielectric material offers the best performance, it can absorb moisture, which will change its electrical behavior.

Because of its rigid properties, solid polyethylene maintains its shape better than foam and withstands the pressures of accidental pinching or crimping, but, this characteristic also makes it slightly more difficult to handle during installation. In addition, its loss/length attenuation factor is not quite as good as foam, which should be considered in long cable runs.

Braid or Shield

Wrapped around the outside of the dielectric material is a woven copper braid (shield), which acts as a second conductor or ground connection between the camera and the monitor. It also acts as a shield against unwanted external signals commonly called electromagnetic interference or EMI, which may adversely affect a video signal.



The amount of copper or wire strands in the braid determine how much EMI it keeps out. Commercial grade coax cables containing loosely woven copper braid have shielding coverages of approximately 80 percent. These cables are suitable for general purpose use in applications where electrical interference is known to be low. They also work well when the cable is to be installed in metal conduit or pipe, which also aids in shielding.

If you are not sure of the conditions and are not running pipe to screen out more EMI, use a cable with a "maximum shield" or heavy braid--type cable containing more copper than those of commercial grade coax. This extra copper obtains the higher shielding coverage by having more braid material made in a tighter weave. For CCTV applications, copper conductors are needed.

Cables using aluminum foil shielding or foil wrap material are not suitable for CCTV work. Instead, they usually are intended to transmit radio frequency signals such as those employed in transmitter systems or in master antenna distribution systems.

Aluminum or foil cable may distort a video signal to such a point that signal quality may be far below the level required for proper system operation, especially over long cable runs, and therefore not recommended for CCTV use.

Outer Jacket

The last component comprising a coax cable is the outer jacket. Although other materials are used, polyvinyl chloride, or PVC, is commonly used in its construction. Available in many colors such as black, white, tan, and gray, the jacket lends itself to both indoor and outdoor applications.

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