

# WHY CATV CABLE DOES NOT WORK ON CCTV SYSTEMS AND WHAT TO DO ABOUT IT IF YOU HAVE TO USE THIS TYPE OF CABLE

BY: Frank McClatchie  
FM SYSTEMS, INC.  
Tel: 1-800-235-6960

When pricing out the cable to use to build a Closed Circuit Television System (CCTV) to connect cameras to a central monitor location, many system operators are seduced by the much cheaper price of CATV cable. After all the specs quoted about the transmission at, say 300 MHz look really good, so after all that cable should work really well for video transmission, right? ---- No, wrong!!

The killer is that while the loss of the CATV type of coaxial cable is quite low at very high frequencies such as 300 MHz, the loss at video frequencies is quite high, therefore picture content may be quite dim by comparison to cable intended for use for CCTV purposes.

The reason for this difference at video frequencies (D.C. to 5MHz) is that the center conductor of the CATV type of coaxial cable is made of copper plated STEEL, not pure the oxygen-free copper needed for low loss at video frequencies. Steel is lower in price than copper, thus the lower price of the CATV cable. As we all know, steel has a much higher resistance (thus loss) than pure copper, therefore the CATV type of cable is not at all suitable for CCTV purposes.

The reason that the CATV systems can use the steel center conductor cable is that at the higher frequencies used by that industry, the copper plating is thick enough so that none of the RF energy penetrates into the steel core and thus induce loss. It is the skin effect that makes this possible. In this case the CATV Industry only uses the steel to help support the cable between the house and the telephone pole.

The center conductor of the CCTV and the CATV cable can look very much alike because the copper plated steel looks very much like the pure copper type of cable center conductor, even after cutting the cable because the shinny steel blends in with the copper color of the plating. One good test to determine the difference is to cut off a small peace of cable, remove all covering off of the center conductor and apply a magnet. If it is CATV cable, the center conductor will stick to the magnet, but the CCTV type of cable will not.

Since many cables come in 1000 foot rolls or "lay-ups", another excellent way to tell whether you have a copper or steel center conductor is to measure the resistance of the center conductor of the coaxial cable with an ordinary Volt/Ohm Meter "VOM". Connect the Volt/Ohm Meter probes to the opposite ends of the cable protruding from the cable roll and measure the total resistance of the center conductor, (center conductor only). On a 1000 foot roll of RG6/U type coaxial cable the copper center conductor resistance will read about 7.5 to 15 Ohms, whereas a steel coaxial cable will measure about 45.5 to 61.5 Ohms, depending on the model number of cable. This is a very large difference in resistance and can be estimated in proportion to cable length, for other lengths of cable. It is this extra resistance that is the cause of excessive loss in the video transmission of the cable.

There are hundreds of RG59/U and RG6/U types of cables manufactured by various manufacturers and you have to read the fine print in the specification sheets to discover which cables have copper plated steel center conductors, and which have solid copper center conductors. The cable specifications for loss of high frequencies (above 5 MHz) is not a good determining factor in the selection of coaxial cable for use at video frequencies (below 5 MHz).

The best way to determine which model number of cable to select is to look at the loss at 1.0 MHz for each type of cable that you are considering using, and then compare the losses of the cables available. There can be a considerable difference between various cable types and the difference between, say a loss of 0.25 dB and 0.5 dB may not seem like much, but the 0.25 cable will go twice the distance as the 0.5 dB cable, with the same performance!

As an example of the differences to be encountered in the cable specifications, consider the differences between the Belden 9146 steel center conductor cable and the Belden 9290 copper center conductor type of cable.

<u>TYPE</u>	<u>BELDEN#</u>	<u>CENTER</u>	<u>OHMS</u>	<u>100' LOSS @ 1 MHZ</u>	<u>DIAMETER</u>
RG6/U	9146	STEEL	58.8	0.5 DB	.275"
RG6/U	9290	COPPER	9.5	0.2 DB	.288"

In case you happen to have incorporated some CATV type of cable in one of your systems, all is not lost!! Don't tear out the cable, there is a much cheaper solution than replacing the cable. You can make up the loss of the cable completely and correct not only the "flat loss" caused by the steel in the cable, but also any fine detail loss caused by high frequency loss in the cable (even up to 2000 or more feet of cable), by simply adding the FM SYSTEMS, INC., GB-60, GB464 or ACE472 cable equalizers at the receiving end of the CCTV system. This will completely eliminate the losses incurred by using steel center conductor cable, and act as a permanent cure for the problem while giving you a better picture to boot!

The cost savings of the CATV cable may even out-weigh the cost of adding cable equalizers in the system, especially when the improved pictures are taken into account, not to mention the cost of labor for removing the old cable and re-installing the correct type of cable.

