

Vigitron IP Infrastructure Design Educational Series



Transmission Limitation

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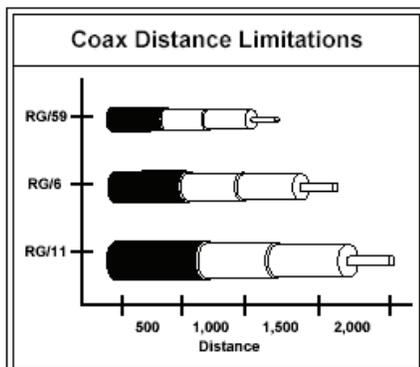
Transmission of video and PoE power for IP security cameras over infrastructures can be confusing. Network infrastructures are designed on twisted pair cabling, which is referred to as CAT (short for Category) cable or UTP (Unshielded Twisted Pair). Analog based security systems that transmit over coax cable and use adaptors can also transmit over CAT cabling. This can be broken down into single pair twisted and untwisted applications.

Any physical medium is a form of resistance to any element carried on that cable. With regard to network transmission over CAT 5 or greater (5e, 6, or 7), these limitations are applied to distance limitation of 328 feet or 100 meters. The standards state that the bandwidth applied at one end of the cable at 10/100/1000Mbps (1G) will be recognized at the other end. This is also where we find the first limitation. At this same 328 feet distance, there is a loss of PoE power. 802.3af or 15.4 watts is a value realized only at the PoE source. According to the standards, after traveling through 328 feet, the power at the camera is 12.95 watts. The same is true for 802.3at, which is a source power of 30 watts and 328 foot distance power of 25 watts.

The first thing you should realize is that there are no standards for network transmission over coax. The advent of IP security cameras has resulted in the need to maintain existing coax cables for networking applications. In reality, the characteristics governing coax can be considered the opposite of CAT twisted pair cable. CAT cabling for network transmission consists of 4 wire pairs, 2 of which are used for signal and PoE transmission. This ability to separate the transmission of PoE and bandwidth over two pairs maximizes power transmission. Coax cable is limited to a single pair (center conductor and shield) when used in the same application. Its characteristics promote bandwidth, but limit PoE transmission compared to UTP cable.

There are various types of cables that are either called UTP and coax. All of these cables have different characteristics that have a direct impact on their ability to transmit bandwidth and PoE. The standards for UTP transmission are set for CAT 5 (5e). CAT 6, 7, and above will tend to have a lower cable resistance and a longer transmission distance. CAT 3 has a higher resistance and a shorter distance.

The same applies to coax cables. The typical cable found in analog security applications is RG-59. For general applications, distance limitations run between 750 to 1000 feet, which is greater than the 328 network limitation. This is why extenders are required to convert coax to UTP and to extend the power range. There are different grades and types of coax. All of these differences generally apply to cable resistance and distance performance. The most common types of coax cable are: RG-59, RG-6, and RG-11.



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This is important because when you are specifying equipment for a video security system, you are generally dealing with existing wirings and a fixed performance requirement. It is important to know the type and condition of the wiring in order to know if the system performance requirements can be met. The second reason is a function of understanding specifications for the transmission equipment that will be used in the infrastructure. As noted when maintaining coax, the use of coax to Ethernet convertors/extenders is required. In many case, even when UTP is used, distance over the 328 feet limit are required.

For example, a manufacturer's product specification sheet can truthfully state their products can perform at 100 Mbps, can handle 802.3at 30 watts and can transmit distances up to 6,000 feet. However, these specifications must be viewed as separate performance claims. Notice in these statements that nothing ties 100Mbps and/or 30 watts and claimed distance of 6,000 feet together. It doesn't even indicate the type of cable used. By themselves, each individual claim is truthful. However, applications require they work together and this is usually not the case. Most of the time, it is difficult to read between the lines of manufacturer specifications. Failure to do so can cost additional time and money, and will even lead to removing the infrastructure.

There is a simple solution to all of this. Call the manufacturer and have them confirm that their solutions will perform as required for your specific application. If necessary, ask for proof that they have conducted testing to support their performance claims. You do not need to be an expert to understand infrastructure. You just need to ask the right person(s) the right questions.

Vigitron's Symmetric Bandwidth (SBW™) and Pass-Through-PoE (PTP™) assures the minimal loss of bandwidth and PoE over quoted distances using standard CAT cabling, RG-59, and single pair UTP/STP wiring. Performance claims are supported by certification and inter-operation testing with the leading IP camera manufacturers.

Vigitron offers several different product and product combinations designed to address the situations discussed this article and to assure reliable operation.

Suggested Vigitron Product(s):



Vigitron offers free and without obligation Design Center Services staff by trained factory engineers. To access Vigitron's Design Center, click [here](#) or direct any questions on any Vigitron related subjects to support@vigitron.com.

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