

GETTING THE HIGHEST PERFORMANCE FOR YOUR CCTV SYSTEM DOLLAR

Getting more performance on a CCTV system usually involves at least two different parameters and usually the two are at odds to each other. The two parameters in this case are PICTURE QUALITY and the DISTANCE between the Cameras and the Monitors. Usually the greater the distance traveled the poorer the picture quality. There is a way to get the highest quality picture and the greatest distance for just a few dollars more.

PICTURE QUALITY

Picture quality is defined in terms of LINES of Definition. But just what does this term mean? After all, analog cameras in the U.S.A. all produce 525 horizontal lines per picture, no more, no less. What the camera specifications are describing is the number of picture elements (or vertical Lines) that could be distinguished on any given horizontal line. Obviously the more vertical lines that can be displayed by the camera, the higher the picture quality will be.

That leads to the first reality of CCTV design. It is vital that all parts of a CCTV system have similar Line resolution capabilities, since the quality of the overall system will be limited by the component that has the lowest Line resolution. Since some parts of a CCTV system are specified in terms of Line resolution and other equipment in terms of frequency response, the following table equates Line resolution to Frequency Response and can be used to compare the two specifications.

LINES TRANSMITTED	BAND WIDTH REQUIRED
330	3.1 MHz
380	3.6 MHz
400	3.7 MHz
460	4.3 MHz
470	4.4 MHz
480	4.5 MHz
570	5.3 MHz

TRANSMISSION MEDIA

Having chosen the optimum combination of Cameras, Monitors, Recorders, and other associated equipment, the next concern is how to connect these various pieces of equipment together. For our purposes, we will be concerned with Coaxial Cable and Unshielded Twisted Pair (UTP) cables that may be as long as 5000 feet. All coaxial cables used for CCTV systems should have a characteristic impedance of 75 Ohms and all Cameras, Monitors, Recorders, etc. should also have terminal impedances of 75 Ohms. Another aspect of coaxial cable is that it is an unbalanced transmission medium with a central wire surrounded by insulation and, usually a conductive jacket of woven shielding wires.

By contrast, UTP cables are a balanced transmission system consisting of two insulated wires (lightly) twisted together and bundled with other such pairs into a cable. The characteristic impedance of this transmission system is 100 Ohms, and so must be coupled to CCTV terminal equipment with 75 to 100 Ohm unbalance-to-balanced conversion devices called Baluns. Passive Baluns are a form of impedance converting wide band transformer, while electronic equipment meant to interface with UTP cables do not require separate Baluns. Both coaxial cable and UTP wires lose energy as they get longer. With both cables the higher the frequency or Line resolution the greater the loss at any given distance. This means that the longer the cable the weaker the signal and even more so, the fuzzier the picture becomes. Just how much loss of detail is involved in cable of various lengths?

One reasonable measure of picture definition loss is when more than ½ of the energy is lost at the frequency associated with the Line Resolution. Assuming that the Camera, Recorder, and Monitor can handle the Line Resolution then the limiting factor for quality transmission becomes the loss incurred in the Coaxial Cable or UTP transmission facilities. The table below shows the half Line Resolution point at various distances for Coaxial Cable and Twisted Pair transmission facilities.

<u>LINES</u>	<u>COAX LENGTH</u>	<u>UTP LENGTH</u>
330	686 feet	289 feet
400	615 feet	259 feet
470	585 feet	246 feet
570	570 feet	198 feet

HOW TO GET BOTH PICTURE QUALITY AND GREATER DISTANCE

If the Coaxial Cable loss is corrected by a GB60 or GB464 Receiving Amplifier / Equalizers, the cable length can be extended up to 2500 feet for any "Lines" quality level up to 570 "Lines" and thus completely eliminate all losses due to the cable facility. The picture quality at the end of 2500 feet of coaxial cable will be exactly as could be observed directly at the Camera Output once the cable has been equalized by the GB60 or GB464 Receiving Amplifier / Equalizer.

If UTP cable pair loss is corrected by a GB60-UTP or GB464-UTP Receiving Amplifier / Equalizer, the Twisted Pairs can be extended up to 3000 feet at full quality level up to 570 Lines and thus completely eliminate all losses due to the twisted pair facilities. The picture quality as seen at the end of 3000 feet of equalized cable will be exactly as could be observed directly at the Camera output once the cable pairs have been equalized by the GB60-UTP or GB464-UTP Receiving Amplifier / Equalizer.

Even longer UTP cable pairs may be traversed by pre-equalizing the UTP cable facility at the Camera location using the TPS-2000 Twisted Pair active Video Sender. This Video Sender can pre-equalize zero feet, 1000 feet, or 2000 feet (selectable) of UTP cable and when used with the GB60-UTP or GB464-UTP Receiving Amplifier / Equalizer can fully equalize UTP cables up to 5000 feet long.

A further extension of fully equalized Twisted Pair facilities is possible by placing a TPT-4000 Twisted Pair Repeater / Tap at the cable mid-point. In this way UTP pairs can be extended from 5000 feet (using the TPS2000 Sending Equalizer and GB464-UTP Receiving Equalizer), to 9000 feet using the TPT-4000 Twisted Pair Repeater / Tap. The TPT-4000 Repeater also provides a 75 Ohm tap to observe the video signal at that location for active secondary monitoring or as a simple test point.

The spacing between any two locations (i.e. Camera to Tap or Tap to Terminal) may be any distance up to 5000 feet by adjusting the input and output equalizers accordingly. By adjusting the amplifiers and equalizers while measuring the Sync Pulse and Color Burst to 40 IRE Units at each location where the video response must be "flat", a perfect system alignment can be assured.



[Was this article useful? If so, you can sign up for our monthly newsletter and receive helpful articles like this one once a month. Go to \[fmsystems-inc.com\]\(http://fmsystems-inc.com\) and sign up or CLICK HERE to Sign Up.](#)