

PICTURE QUALITY IN TERMS OF LINES OF RESOLUTION WHAT DOES IT ALL MEAN?

First of all, the LINES OF RESOLUTION (LOR), in a NTSC video picture, does not refer to the number of actual lines transmitted by the Camera. The NTSC picture always consists of 485 actual transmitted lines per complete picture (even and odd field together), but refers to the number of horizontal pixels that can be discerned in any one line of the picture. The LOR actually refers to the number of pixels that are engraved in one line of the Camera and becomes the quality level of that Camera. Thus the total number of pixels transmitted in the NTSC picture equal 485 times the LOR for that camera.

Modern cameras are basically LOR-limited by the number of pixels that are engraved on the Camera's CCD "Charge Coupled Device". The relationship between bandwidth and the number of LOR for a standard 3 X 4 ratio NTSC video signal is:

$$\text{LOR} = 107 \text{ times MHz}$$

Therefore a 650 Line Camera must have a bandwidth of a least 6.075 MHz to be able to transmit a 650 Line picture. Of course the bandwidth of the Camera, Transmission System, and Recorder must also be able to transmit that bandwidth with a total loss of less than 3 dB. If the coaxial cable (or other transmission system) has a limited bandwidth, then the overall picture will also be reduced in Picture Quality proportionately. For instance, if a 650-Line Camera is connected to a coaxial cable that limits bandwidth to 4.49 MHz (at -3 dB), **the picture quality delivered through that cable is then reduced to 480 LOR, even though the Camera is capable of 650 LOR.** . This is the main reason that loss in a coaxial transmission line is critical, and usually determines the ultimate quality of the picture on cable runs exceeding a few hundred feet.

The cut-off of cable transmission is usually defined as the frequency at which 1/2 the original energy is lost in transmission, and does not get to the destination. Therefore it would be useful to plot the maximum distances that RG59/U cable will transmit more than 1/2 of the power at several standard Camera Quality Levels.

TRANSMISSION		
<u>LOR</u>	<u>MHz*</u>	<u>LINE IN FEET</u>
650	6.07	474'
600	5.61	502'
540	5.05	517'
480	4.49	547'
330	3.08	705'

* The highest frequency needed to transmit the desired LOR.

This table shows that low definition cameras can transmit a greater distance than high definition cameras, but of course the low definition cameras may not deliver an acceptable picture. Once the picture quality is decided upon, all the other minimum bandwidths are stipulated. Providing a high quality camera, and then following that with a lower quality transmission system or Recorder will **not** deliver the originally desired quality of picture.

The solution to the cable bandwidth problem is to provide an ACE-1 Automatic Cable Extender at the end of the coaxial cable. This will enable a high quality picture to traverse any length of RG59/U cable, up to 5,500 feet between the Camera and Recorder without any loss of picture quality. When better Cameras are available the ACE-1 will deliver even better pictures!