



THE MULTIVIEW™ AK SERIES: THE APPLICATION OF INNOVATIVE TECHNOLOGY ENABLES UNPRECEDENTED UTP VIDEO PERFORMANCE

UTP (Unshielded Twisted Pair) or “category” cable has become the universal connectivity standard. UTP cable has been broadly embraced for reasons that include the following:

- Cost-effectiveness
- Ease of installation
- Versatility
- Modularity
- Small diameter
- Light weight

The “physical plant” is supported by a broad variety of off-the-shelf patch panels and cable management devices. Its universality makes it possible to reallocate the physical layer bandwidth by making simple changes via patch cords.

UTP is good for more than digital networks

UTP is capable of providing remarkably good signal transmission performance. It’s most often put to work as a digital network pipe. With the right electronics however, it’s also capable of transporting high resolution video and other high speed signals very effectively. To successfully do so requires a solid understanding of transmission line theory and an intimate understanding of UTP, being applied as a transmission line.

Magenta Research evolves the use of UTP

Magenta Research has carefully studied the impact of cable dynamics on video image quality. Our commitment to this course of study has grown out of our desire to remain at the technical forefront of UTP connectivity.

All transmission line cables, including UTP, impose losses and distortion products on signals. The types of losses imposed on signals propagating through a transmission line include the following:

- Resistive
- Skin effect
- Dielectric

Each form of loss impacts the quality of a video signal in a different way, and all of the losses increase with cable length.

An equalizing filter, with the appropriate transfer function, can reverse the effects of the losses imparted to the signal by the cable. For high resolution video, the equalizing filter must be very carefully designed and constructed. This is because even small errors in the equalization process result in artifacts that become visible in the presented image.

Magenta's signal management breakthroughs

Although generally not well understood by the industry, the following factor holds true and has a significant impact:

For any given distance of UTP cable, there is only one ideal transfer function for the compensating filter.

On this basis Magenta Research utilizes a proprietary Digitally Controlled, Complex State Variable Filter (DCF) technology. This unique filter (patent pending) is at the core of our MultiView™ AK1000 & AK1500 receivers. The filter compensates for any cable distance between zero and 1000 feet (305m) or zero and 1500 feet (457m).

Standard filter technologies utilized by competitive products often require multiple adjustments – for example, one for high-frequency and one for low-frequency bands. Some require three adjustments, including brightness. Using this approach, considerable adjustment can still provide unsatisfactory results. There may even be adjustments required at both the source and display ends – inconvenient at best and very difficult if the distance between the two is considerable. Plus, standard filters fall far short of the distances enabled by the DCF.

The approach used in the MultiView AK Series for cable length compensation is intended to provide the ultimate in intuitiveness. The adjustment is accomplished by turning a single control knob with infinite (i.e. not stepped) resolution, and takes place at the receiver end, while the user is viewing a simple test pattern on the nearby display device. No adjustment is required at the transmitter end. From a human perspective, this is the fastest, most accurate and understandable means for optimizing an image. Once the appropriate setting is visually determined by the user, the entire transfer function has been accurately and simultaneously calculated by the DCF.

The Magenta DCF technology provides constant bandwidth throughout the product's distance adjustment range and by doing so, preserves video rise times. Video rise time relates directly to video image clarity. It is the measure of time needed for the system to transition from black to white and white to black. Poor rise times cause a form of video image distortion called aperture distortion, an increase of which results in a horizontally smeared image.

By providing constant bandwidth, the MultiView AK Series is capable of providing consistently high resolution over any distance, a significant competitive advantage. Other equipment providers often specify resolutions and distances as “up to” certain figures, but these specifications can be misleading because the maximum resolutions and distances do not happen concurrently. Another number that is sometimes missing is the refresh rate. Magenta's technical advantage enables resolution specifications at a distance and refresh rate, for example 1920 x 1440 @ 1000 feet (305m) @ 70 Hz (AK1000 receiver), and 1600 x 1200 @ 1500 feet (457m) @ 60 Hz (AK1500 receiver).

Sync signal management

The best video performance in the world will be wasted unless the sync signals are delivered to the display with equal effectiveness. Most UTP video equipment manufacturers use common mode, brute force techniques to push the sync signals through the UTP in baseband. The consequences are significant and problematic, including:

- Poor noise immunity
- Display equipment incompatibility
- Horizontal image shift

Throughout the MultiView Series, a programmable logic array (PLA) is used to sample the incoming horizontal (H) and vertical (V) sync signals. These signals are converted into digital words before being ported into the UTP. At the receiving or display end, the transmitted, encoded sync signals are also equalized by the DCFs. By doing so, they arrive isochronously with the video, resulting in robust sync performance that is independent of distance. After equalization, the sync signals are reconstructed by a second PLA. The H & V sync signal outputted to the display equipment looks identical to the original source, including mark, space and polarity. This Magenta Research innovation, referred to as ClearSync™, results in razor sharp raster geometry and an absence of vertical line displacement.

Skew Compensation

Most UTP cables are designed for network applications where NEXT or “near end cross talk” must be minimized for reliable operation. To provide an adequate reduction of NEXT, cable manufactures twist each of the four pairs at different rates to reduce the magnitude of signal coupling between them.

Twisting the pairs at different rates helps to reduce the cross talk, but also introduces signal skew. As a pair of wires is twisted more tightly, a greater length of wire is needed to span a particular distance. This means that the most tightly twisted pair in given UTP jacket is electrically longer than the most loosely twisted pair. The signals on the loosely twisted pair will arrive before the signal carried by the tightly twisted pair. When transporting multi-component video, with red, green and blue components as an example, the difference in signal arrival time results in the appearance of color fringing on edges in the image. This effect is proportional to distance and at 1500 feet (457m) of standard UTP, it can become quite pronounced. (For example, the length difference in one common cable is 16 feet or 23 nanoseconds between the shortest and longest video-related pair.)

Typically, MultiView Series transmitters and receivers use three of the four pairs within the UTP to transport the entire video signal. The fourth pair is reserved for other applications, such as audio or serial communication. On that basis, for AK1000 & AK1500 applications, it is only necessary to align the signals from three of the pairs.

The AK1000 and AK1500 are designed to accept an optional MultiView skew compensation module (AkuComp™). AkuComp adds variable delays to the signal from the fastest pair or pairs and provides all of the video signal components isochronously to the display. It provides up to 31 nanoseconds of delay per color channel, in is adjustable in one-nanosecond increments.

A special very low-skew UTP cable cooperatively developed by Magenta Research and Belden Electronics (NanoSkew™ cable) is designed specifically for video applications and eliminates nearly all inter-pair signal skew. It is available in standard (Belden part number 7987R) and plenum (Belden part number 7987P) versions and provides an alternative to skew compensation in most cases.

Summary

MultiView™ AK1000 & AK1500 receivers include proprietary technology resulting in:

- Razor-sharp, attention-getting video utilizing the Magenta innovations, ClearSync™, DCF and AkuComp™

- The only 1500 foot (457m), high resolution UTP video solution

- The highest resolution at any distance

- Very simple installation and setup

- An included test pattern utility, eliminating adjustment “guesswork”

- One-knob adjustment, at the receiver (display) end only

- Compatibility with any 5-component display

- Extremely robust performance

Another very important feature is compatibility. The MultiView™ AK1000 & AK1500 are fully compatible with Magenta’s extensive family of signal management solutions. This enables the user to transport, distribute and switch high resolution video via UTP cable while adapting to each application’s “footprint.” In this manner, equipment and installation costs are minimized because solutions are tailored to a specific requirement set.