

## Streamlining Surveillance

### CCTV Cabling Made More Cost-Effective

BY JEFFREY HERMAN

Orbit Systems, a New Hampshire-based security and surveillance systems integrator, is becoming one of a growing number of companies helping to streamline CCTV security and surveillance cabling installations by eliminating traditional coaxial cable and replacing it with unshielded twisted pair (UTP) cable. Orbit's recent installation at Taunton State Hospital, located in Taunton, Mass., is a typical success story in the deployment of UTP cable for CCTV security and surveillance monitoring systems.

#### Scope

The Taunton State Hospital CCTV surveillance system spans three buildings and provides indoor CCTV monitoring of all hospital hallways, exits and critical areas. Thirty-one CCTV cameras are deployed. Each building has three floors and cameras are on all floors. Monitoring equipment is located on the first floor of the main building in the security room of the main reception area. Figure 1 is a diagram approximating the actual installation.

#### Equipment Used

The CCTV monitoring equipment used in the installation includes the following:

- 14 Silent Witness V27 410 Lines Resolution CCTV Cameras
- 17 Silent Witness SWC20 410 Lines Resolution CCTV Cameras
- 3 Robot MV16P Black & White Video Multiplexers



- 3 Pelco TLR2024 Time Lapse Video Recorders
- 3 Sony SSM-175 Black & White 17" Monitors
- 62 NHC VideoEase CCTV Screw Terminal Baluns (500009)

The interior cabling of the hospital consists of 50 percent Category 3 UTP and 50 percent Category 5 UTP cable. The longest cable run is around 1,200 feet, with the average

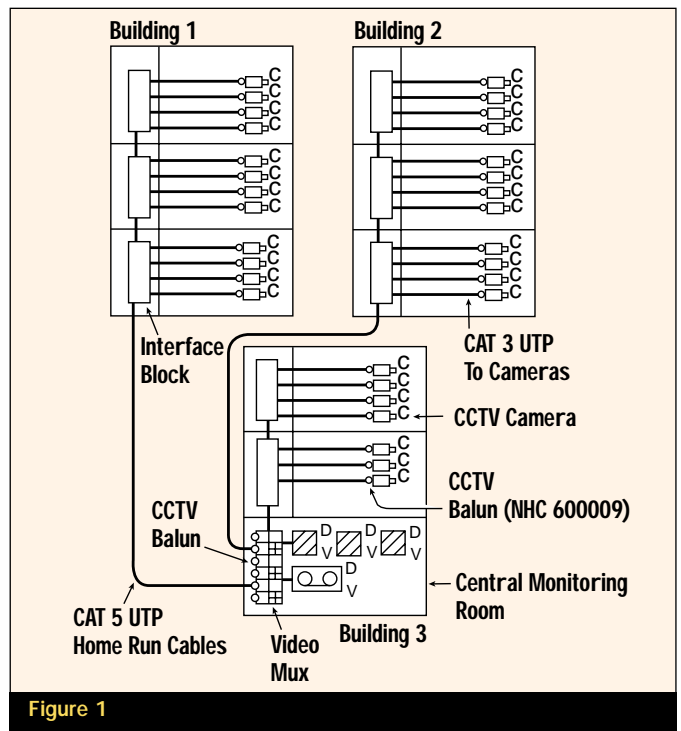


Figure 1

being around 500 feet. There are wiring closets throughout the complex, and the installation used interface blocks in many of the electrical closets to consolidate and distribute the camera wiring.

Most of the installation utilizes all four pairs of each Category 5 cable thus supporting four camera signals under one cable jacket. The Category 5 cables are broken out to each camera at the wiring closet via Category 3 cables. The CCTV balun that is used to eliminate the coax interfaces is the NHC VideoEase CCTV Balun (500009). (See Figure 2.) A total of 62 are needed to convert all interfaces.

According to Steve Feinberg, president of Orbit Systems, "The installation was trouble-free and the picture quality of the system was excellent. The customer is very satisfied."

## Benefits of UTP vs. Coax

During the course of the installation, Orbit Systems discovered many attractive points to cabling CCTV with UTP versus coax. According to Feinberg, the following benefits were noteworthy.

1. UTP is easier and faster to deploy than coax. A guide hole in the box ensures that UTP is pulled out without getting tangled. Coax on the other hand often gets tangled while being unspooled, leading to costly delays.
2. The size of the boxes of UTP required for a given length of cable is less than that required for coax, thus reducing the handling and



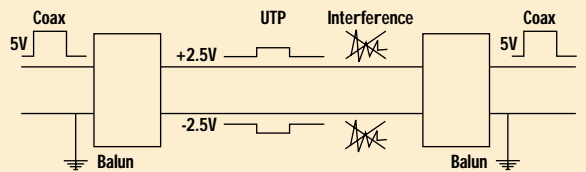
Figure 2

## What is a Balun?

A balun is the essential link between the CCTV equipment and the structured cabling system. Used in pairs, the CCTV balun allows CCTV video to be transmitted via UTP without visible

picture interference or distortion. The word balun is short for BALANCED to UNbalanced. The

balun converts an unbalanced signal (coax) to a balanced one (UTP) as illustrated in Figure A. The unbalanced signal is protected by an outer shield. The shield stops any outside interference that hits the cable.



UTP, on the other hand, does not have a shield to protect against interference. Therefore, the signal must be converted to a balanced one. The balun, used in pairs, performs this function. In essence, the baluns function as noise eliminators so any interference that impinges on the individual twisted pair conductors is canceled out by the baluns. In addition, the twists in the conductor pair help to also cancel out any interference. The result being that UTP is more immune to interference and the CCTV picture quality is transmitted reliably over extended distances.

3. UTP is easier to work with than coax. The smaller diameter and smaller bend ratio makes it easier to pull cable.
4. In installations where conduits were required, the smaller diameter UTP means fewer conduits are needed.
5. A single Category 5 cable can support up to four cameras under the same jacket. A coax cable supports only one camera signal. The result is greater savings in time and material cost per camera.
6. The lighter-weight UTP cable means easier handling and fewer trips to and from the service truck. According to cable vendors, for a given length of cable, UTP cable weighs up to one-third less than coax.

7. The cost-per-foot of UTP is lower. Plenum coax currently costs \$0.27/ft. Plenum Category 5 UTP currently costs \$0.15 per foot. Coupled with the fact that four camera signals may be transmitted under the same Category 5 jacket, the cost-per-foot-per-camera is \$0.04, yielding cost savings of almost 85 percent. On longer runs where four cameras are clustered in one zone, the savings truly adds up.
8. Standard UTP cross-connect blocks make it easier to terminate and connect CCTV cabling. Punch-down blocks were used by Orbit Systems in its installations.

## Picture Quality

One of the main concerns about using UTP rather than coax is the picture quality. Installers and end users have major concerns that the picture quality with UTP is inferior to that of coax. When Orbit Systems was qualifying the move toward UTP, it checked the picture quality using UTP versus

coax and found that on cable runs that are within the balun vendor's specifications, there was no perceivable difference in picture quality.

## Why the Balun Made the Difference

Orbit Systems found that the CCTV balun played an important role in getting the company to consider switching to UTP cable.

One reason was that the price of the CCTV balun was low enough to justify a material cost savings on longer cable runs. Other balun design features made the switch to UTP even more attractive. These included the following:

1. Screw terminals on the CCTV balun made cable termination easy since UTP crimping tools were not always available. And the screw terminals make tampering with the

camera connection more difficult.

2. The presence of a slide-on balun cover protects the wires and provides a measure of cable strain relief.
3. The size of the NHC balun was unique in that it was the only CCTV balun that could be mounted adjacent to each other on the back of a CCTV video multiplexer or sequencer. Most sequencers or muxes have BNC connectors that are spaced close together. The NHC CCTV balun chosen by Orbit was only the width of a BNC.

## Conclusion

The CCTV industry has lived with coaxial cable for years and there has been little impetus to change over to a UTP-based structured cabling system due to the perceived lack of monetary savings and the general concern about

picture quality. However, with the advent of new technology that allows CCTV video images to be transmitted over extended distances via UTP with virtually no picture degradation, CCTV specialists such as Orbit Systems are starting to benefit from the cost savings.



*Jeffrey Herman is a product manager at MuxLab Inc., a designer and manufacturer of connectivity solutions for the structured cabling and networking industry.*

*To find out more, call MuxLab at 877-689-5228, fax 514-905-0589 or visit the company's website at [www.muxlab.com](http://www.muxlab.com).*

*Orbit Systems recently merged with BCM Controls of Woburn, Mass. Steve Feinberg may be reached at BCM by calling 800-819-2569. BCM Controls can be found on the Web at [www.bcmcontrols.com](http://www.bcmcontrols.com).*

## CCTV Glossary

**BALANCED SIGNAL.** In CCTV, this refers to a type of video signal transmission through a twisted pair cable. It is called balanced because the signal travels through both wires, thus being equally exposed to the external interference. So by the time the signal gets to the receiving end, the noise will be canceled out at the input of a balun.

**BALUN.** Stands for BALanced/UNbalanced. Converts an unbalanced signal into a balanced one to allow data/video transmission over UTP.

**CCTV (CLOSED CIRCUIT TELEVISION).** A television system intended for only a limited number of viewers and with a dedicated purpose, as opposed to broadcast TV.

**CCTV CAMERA.** A unit containing an imaging device that produces a video signal in the basic bandwidth.

**CCTV INSTALLATION.** A CCTV system, or an associated group of systems, together with all necessary hardware, auxiliary lighting, etc., located at the protected site. Also refers to the act of installing.

**CCTV SYSTEM.** An arrangement comprised of a camera and lens with all ancillary equipment required for the surveillance of a specific protected area.

**COAXIAL CABLE.** The most common type of cable used for copper transmission of video signals. It has a coaxial cross section, where the center core is the signal conductor, while the outer shield protects it from external electromagnetic interference.

**COIL.** The transformer that goes inside a videobalun to

convert the unbalanced video signal into a balanced one.

**CROSSTALK.** The interference caused by a signal traveling over one cable pair on a signal traveling on an adjacent cable pair.

**GROUND LOOP.** An unwanted interference in the copper electrical signal transmissions with shielded cable, which is a result of ground currents when the system has more than one ground, for example, in CCTV, when we have a different ground resistance at the camera versus the switcher or monitor end. The induced electrical noise generated by the surrounding electrical equipment (including mains) does not discharge equally through the two grounds (since they are different) and the induced noise shows up on the monitors as interference.

**UNBALANCED SIGNAL.** In CCTV, this refers to a type of video signal transmission through a coaxial cable. It is called unbalanced because the signal travels through the center core only, while the cable shield is used for ground.

**VIDEO MULTIPLEXER.** A device that combines a number of signals into one. Often used in CCTV to describe a device that is primarily used to multiplex several video signals into one for the purposes of recording or microwave transmission. It can also refer to a fiber optics multiplexer, which combines a number of video signals into one in order to transmit all of them via a single fiber cable.

**VIDEO SWITCHER.** A device for switching more than one camera to one or more monitors manually, automatically or upon receipt of an alarm condition.