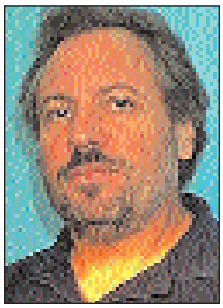

Spectrum Testing of Coaxial Cable Plants

By Orrin Charm ■ *InfiniSys, Inc.*

Responsibility for video cabling installation now falls on property owners and managers. The lack of performance Standards for that cabling makes it difficult for properties to ensure quality services for their residents.

Only a few years ago, most Cable TV systems were owned and installed by the franchised Cable System Operator in the area. The local operator was responsible for all aspects of system design, installation, programming and maintenance.

Since the deregulation of the Cable TV industry, much of the construction of residential coaxial cable drops and distribution has been done or commissioned by the property owners, in many cases even prior to the selection of a Service Provider or the signing of Service Contracts.

This has put the responsibility for the distribution system performance onto the property owners, rather than on the Cable Service Providers.

To ensure that the system will provide the best possible quality of service to residents, the system must be tested for compliance with the specifications of the intended Service Provider.

When there is existing video service to the property, the task is relatively simple – a Signal Level Meter, or a TV set can be connected to the cable outlets, and the signals can be measured, or the picture quality observed.

However, in the majority of cases, the distribution plant installation is completed long before service is brought to the property, and the installation contractors have been long gone when service is initiated, leaving Quality Control issues to the hapless new resident, the site maintenance staff, or the Leasing Manager.

Although the installation contractors are clearly responsible for the quality of the installation, they are usually not equipped to provide rapid response to maintenance issues long after they have left the property. Distribution System testing is usually required as part of the installation contract, but the testing that is generally specified- using an audio tone generator and an amplifier probe – is likely to overlook many potential problems when a broadband cable signal is connected.

An additional complication is that there are many types of video delivery and distribution systems available, with widely differing requirements. Traditional CATV systems require about 750MHz of bandwidth, but many Digital Cable systems require close to 1000Mhz, and systems based on a Digital Broadcast Satellite service may require as much as 2150MHz on one or two coaxial cables. Many systems are now two-way, and require a clean return path for data in both directions. In many cases, the delivery method may not have been determined when the cabling needs to be installed, or the method may change in the future, as providers change, or new services become available.

Because operators traditionally maintained cable services, universal Standards still do not exist as they do in the Data Communications field. The ANSI/EIA/TIA Standards closely define the performance of data communications networks, but only loosely define components for the video network. In fact, the only requirements in the TIA/EIA 570-A Standard for coaxial cable are:

8.4.1 Test requirements

The minimum test requirements for 75-ohm coaxial cable shall include:

w Continuity for center conductor and shield.

- Attenuation.
- Length.
- Local, state, and federal required testing.

No specifications are given for any of these parameters. Consequently, the variety of Certification Testers that is

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available for testing twisted-pair cable for data still do not exist for video networks. Contrast this with the TIA-570-A Standards for Data Communications cabling, which are specifically focused on overall system performance.

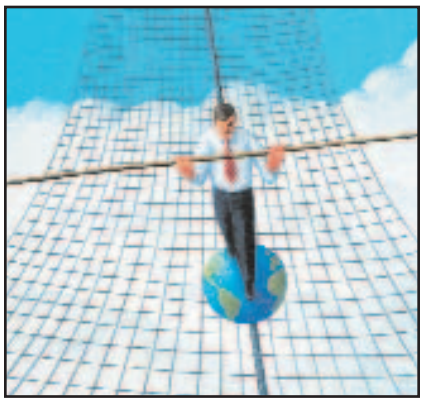
Category 5 (and higher) testers are generally designed to be easy to use in the field, yet store detailed test results for certifying the performance of each "link" in the network. They generally provide simple "PASS-FAIL" results on-screen, allowing test technicians to quickly mark any non-conforming links for further testing or troubleshooting. The testers are generally in two parts, with one unit on each end of each link, so the link is tested from end-to-end, including all connectors, splices, patch cables, etc. Tests are generally carried out to 100MHz, 250MHz, 350Mhz or more, depending on the desired certification level.

To effectively test coaxial cable links, testing needs to be carried out to 750MHz, 870MHz, 1000MHz or 2150MHz, depending on the needs of the eventual Service Provider. For two-way systems, tests must be performed in both directions, if there are any devices, such as splitters, taps, amplifiers, etc. in the distribution path.

If a multi-channel video signal is available at the site, then there are a number of testers that can provide on-the –spot results, although few are capable of storing more than a few test results (This is apparently because most residential installers cannot test more than 20-30 homes in a single day, although multifamily installers may be expected to test hundreds of outlets in that time period).

If there is no video service installed at the site, an alternative is to use a Broadband Noise Source to simulate a CATV system. Noise Generators will produce a reasonably flat level of white noise across the desired spectrum, but do not generate any of the video or audio carriers, so some of the tests may not provide meaningful results. However, this type of testing will provide a much more reasonable measurement of broadband response than audio tone or single-channel testing.

A better test setup would include a signal generator that more accurately mimics a real-world CATV signal. Such a system can be built, using modular headend modulator units, such as the Blonder-Tongue Modular Headend products, plus a DVD player or other video source and a suitable distribution amplifier. However, such a system is quite bulky and expensive, and typically is limited to the 5-860MHz spectrum.



Absolute measurements are of little value using broadband noise as a test signal- the actual measurement may vary greatly, depending on the measurement parameter of the test instrument. We got readings from +20dBmV to -20dBmV for the same signal, depending on the meter used and measurement parameters that were set. This is because the actual power level is dependent on the measurement bandwidth, and because testers "weight" the measured results because they are looking for carrier signals.

Nevertheless, it is the relative loss from one end of the network to the other that is significant, and these tests permit the observation of loss characteristics over the spectrum.

I evaluated a number of test equipment products designed for CATV system testing, including Noise Generators, Spectrum Analyzers, and Signal Level Meters. The results will be featured in the next issue of this magazine. ■

About the Author

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Standards

One issue that has become quite obvious in trying to establish effective testing methods is that there are no existing Standards to use as a basis for testing. The TIA-570-A Standard only references the Society of Cable Telecommunications Engineers (SCTE) Standards for coaxial cable and connectors, and neither Standard provides any guidelines for distribution system performance, other than suggesting continuity from one end of the cable to the other.

The TIA is currently in the process of creating a new TIA-570-B Standard which may address the issue, but no specifics have been released yet.

The FCC has regulations pertaining to the quality of CATV services, but these only address the final signal as it is available at a wallplate for connection to a television set, and does not address the distribution system components.

The lack of a recognized Standard for system performance measurement has prevented test equipment manufacturers from designing and building test instruments comparable to the TIA-568 Certification Testers used in Data Communications. Such an instrument would be extremely expensive and bulky, if it were built for only a handful of users.

The fact that the TIA Standards have become the critical benchmark for any data communications system has driven the test equipment manufacturers to build better, cheaper, smaller and faster instruments. It will take a similar confluence of market forces and Standards to create effective test instrumentation for video.

As a result of the research I did for this article, I have submitted several proposals to the TIA 42.2 Standards Committee that is developing TIA-470-B, urging them to develop Performance Standards for coaxial cable distribution plants, similar to their data communications Standards- probably in conjunction with the SCTE.

If you have been similarly frustrated by the lack of Standards in this area, please respond to this magazine, and your comments will be forwarded to the TIA. Your support will greatly help to expedite the Standards process!