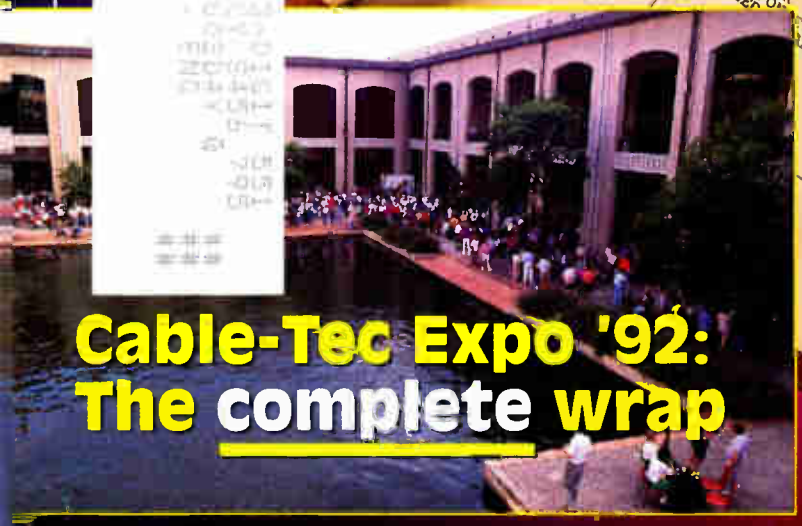
COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

Troubleshooting coaxial plant

Evaluating, measuring headend video



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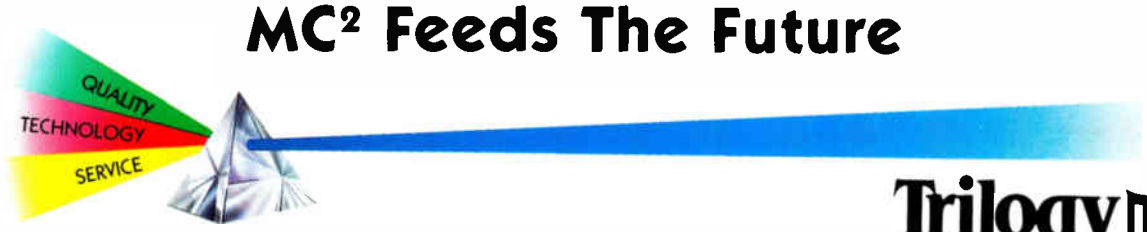

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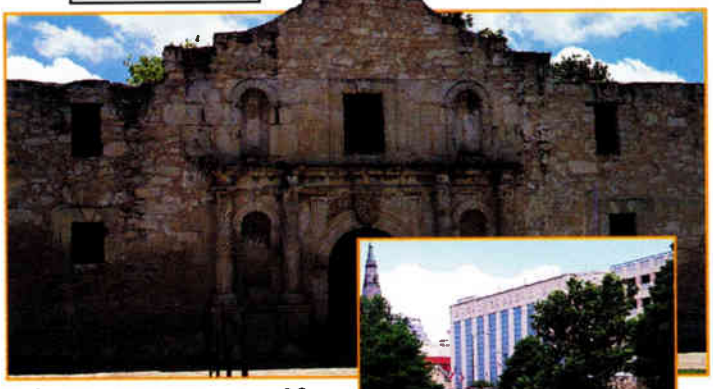

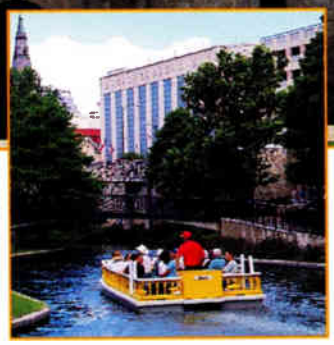

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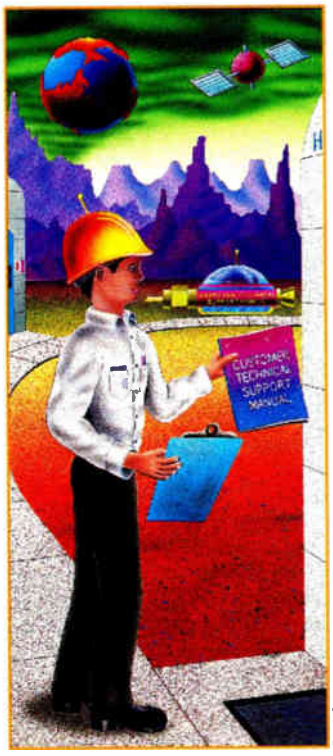

Geri Saye

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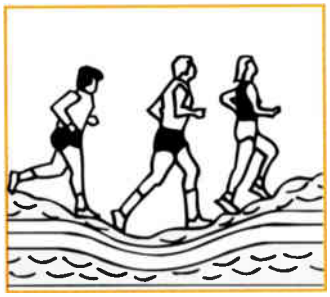

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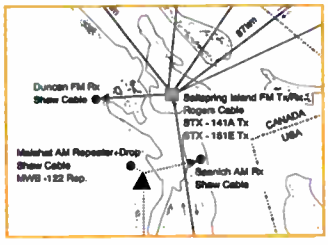

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ONI
OPTICAL NETWORKS INTERNATIONAL

Optical Network News

The following highlights are from Optical Networks International's quarterly newsletter.

How has fiber impacted plant reliability—you tell us!

Can you quantify the impact of fiber on quality of service in your system? *Optical Network News* is looking for stories from the field to share with our readers. Put your ideas together and call, fax, or write Kathy Berlin, Editor, ONN, 8101 E. Prentice Ave., Suite 210, Englewood, CO 80111, Phone: 303-740-8949, Fax: 303-740-9420.

Bone up on your bits and bytes

Watch *CED*'s SCTE Focus column for a useful series of articles by ONI's Director of Training, Randy Reynard. A three-part series on digital basics begins with the August issue, when Reynard discusses analog to digital conversion. Subsequent articles in the September and October issues will cover multiplexing techniques and digital equipment.

Migrating toward the regional hub

An often overlooked advantage of the Star-Star-Bus (SSB) architecture is its ability to cost-effectively migrate toward a ring architecture. The ring design offers significant advantages in providing highly reliable transmission paths, setting the stage for new business opportunities in data and voice services.
(See related story in the Fall issue of ONN.)

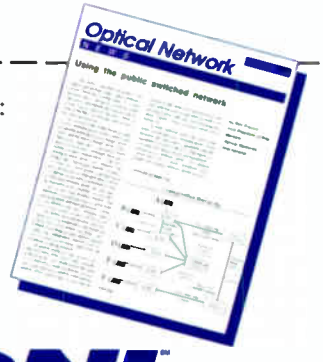
Denver Training Center Update

ONI is offering several classes at the Denver Training Center in August and September, but early sign-up is recommended because they fill up fast! Mark your calendars for these dates:

FIBERWORKS ..... Comprehensive fiber optic course: 8/10-14
..... 9/14-18

Digital Networks ..... Digital basics and network design: 8/24-28
..... 9/21-25

ONI's traveling fiber optics course, "Taking it to the Streets", can also be booked at your own location. Available in 1-2 day formats, recommended class size is ten. Call Randy Reynard for more information, at 1-800-FIBER-ME.



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EDITOR'S LETTER

Hams propagate at expo

As has been done at past Cable-Tec Expos, ham radio operators got together for an evening reception (see pages 46-47) courtesy of Scientific-Atlanta and the Society of Cable Television Engineers. This year's gathering was the fourth annual ham operator's reception held in conjunction with the expo. Numerous other vendors also supported this get-together by donating door prizes, and about half of the more than 100 attendees took a goodie home with them. Besides a chance to visit with other hams in the CATV industry, the reception also provided the group with an opportunity to conduct some official "business."

During the previous year, a 20-meter net (meeting held via two-way radio) had been conducted the second and fourth Wednesday of each month. Unfortunately, propagation conditions have been less than favorable — at least for reliable domestic contacts. So during the expo ham reception, a decision was made to change to the 40-meter band.

The over-the-air gathering will continue to be held the same days each month at 8 p.m. mountain time (10 p.m. ET). Because of the potential for foreign broadcast interference, the net's frequency will be 7,235-7,245 kHz, ±QRM. Even if you're not a ham, you still can listen using a shortwave receiver capable of picking up lower sideband transmissions. Early indications are that the change from 20 to 40 meters was a worthwhile improvement.

Here is the schedule for the remainder of 1992: Aug. 12 and 26, Sept. 16 and 30, Oct. 14 and 28, Nov. 11 and 25, and Dec. 16 and 30. ATC's Al Dawkins, K0FRP, will continue to be primary net control as his travel schedule permits. If you happen to tune in and don't hear him, give a holler anyway. Because of the generally informal nature of the net, hams are encouraged to enjoy the get-together with or without a net control station. When Dawkins does run the net, he usually calls it up as the "SCTE ham radio net."

Speaking of hams and CATV, Steve Johnson is the caretaker of a list of radio amateurs in the industry. (See *CT*, June '92, page 44.) Several hundred from our ranks are now on that list, including the likes of Wendell Bailey, Chris Bowick, Walt Ciciora, Jim Farmer, Ted Hartson, Bob Luff and Dan Pike. (Rumor has it that Pike may yet spring for a rig.) If you're a licensed ham and aren't yet on the list, contact Johnson at ATC's national division office in Englewood, Colo. The number is (303) 799-1200. The list is a great resource for contacting others in cable about leakage and interference issues, particularly those that may be ham-related.

For all there was at this year's expo, see "News" on page 12, the wrap-up beginning on page 26, "Products" on page 74 and "President's Message," page 94.

"Ask a fiber expert"

For many of us, the migration from RF to optical transmission necessitates learning an entirely new way to approach design, construction, maintenance, etc., to cope with our evolving networks. Although this conversion can be confusing, it doesn't have to be. If you have any question(s) involving fiber-optic technology, we want to help.

We've lined up Doug Wolfe, a senior applications engineer with Corning who is responsible for technical support of the cable TV industry's development of optical fiber systems (and also a member of *CT*'s advisory board) to do just that — answer your questions. Wolfe's "Ask a fiber expert" column will be an open forum Q&A designed to take the mystery out of fiber optics. So give us your best shot, I'm sure our expert has the answer. Send your questions to: Fiber Expert, *Communications Technology*, 50 S. Steele St., Suite 500, Denver, Colo. 80209; or fax them to (303) 355-2144.

Ronald J. Hranac
Senior Technical Editor

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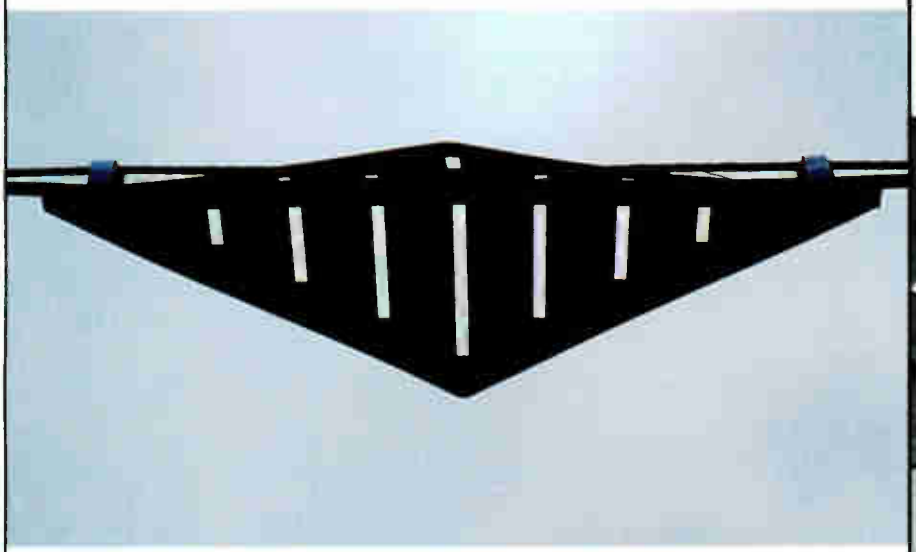

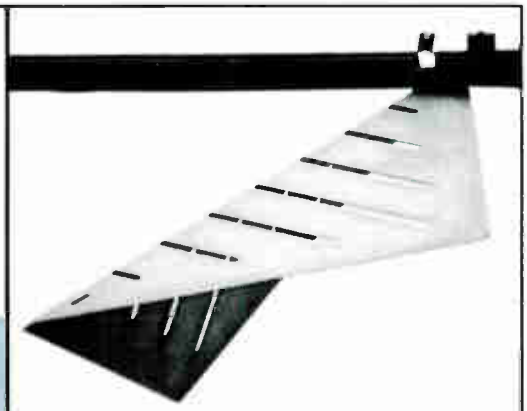

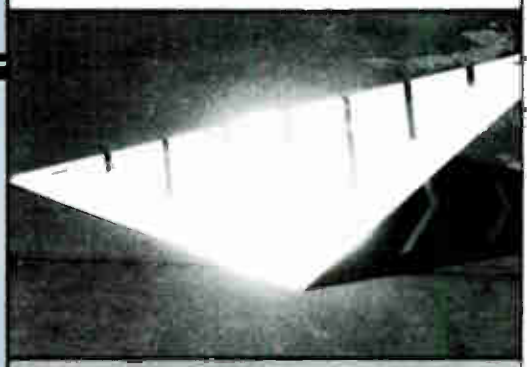

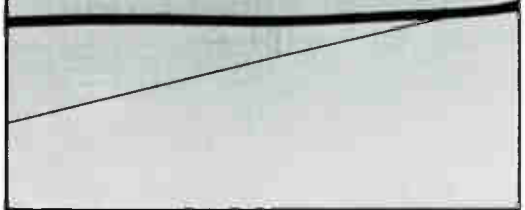

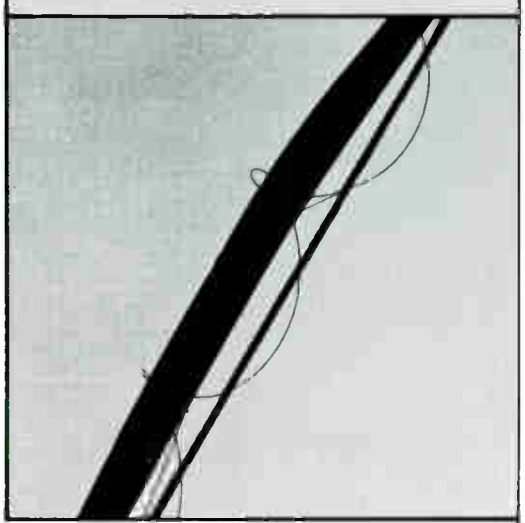

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Pirates TKO themselves for fight

NEW YORK — Adelphia Cable's International Division in western New York successfully used its "Operation Technical Knockout (TKO)" campaign to snag cable TV pirates during the recent Holmes-Holyfield fight on PPV. A message was inserted locally over the video signal from Las Vegas 20 minutes before the event urging viewers to call a number to receive a free hat and T-shirt. The catch: only illegal decoders connected to the system received the offer. During those 20 minutes, hundreds of individuals called. Adelphia plans to seek punitive damages up to $10,000 from each offender.

Adelphia's engineers installed a new technology to communicate with the illegal converters without affecting the legal subscribers in the system. The company also said its engineers are preparing electronic counter measures that will render the pirate decoders permanently useless in the near future.

Catching the digital wave

BEVERLY HILLS, Calif. — From June 23-25, the Digital World '92 conference here presented a glimpse into the future of evolving digital media and drew together experts from fields as diverse as cable TV to computer multimedia generation.

Terry Hershey of Time Warner said that the company's 1 GHz cable TV system in Queens, N.Y, will eventually become a digital-analog hybrid. Time Warner plans to convert half of the system's channels into digital, which will offer over 500 channels of service after compression, according to Hershey.

The company will offer a multitude of options, Hershey explained. After describing the possibilities from interactive games to personal communication systems, Hershey added, "The point is the supplier will be able to supply what he wants. Now he has to target lots of people."

Bob Niskern, chief technology officer at SkyPix, described how the company's digital satellite transmission technology has the potential to dramatically alter the viewscape across the nation. SkyPix now has a fully digital system for delivering video, audio and any other type of data across the country in a digital format on 80 channels at a total rate of 80 billion bytes per hour.

Niskern explained, "This allows us to bring to market the first fully integrated digital system. Now, there is no one infrastructure that seamlessly handles audio, video and data products."

Each channel transmits at 3.375 Mbits/s and includes forward error correction, video and a supervisory control channel. Each user can be individually addressed for access to a given channel. Users anywhere in the country can access the network with an $850 package that includes a 36-inch

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DX ANTENNA

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antenna and a programmable set-top converter. The boxes can convert incoming signals into analog video or audio output. Alternatively an RS-232 interface can download data at a rate of 300 kbytes/s.

Although SkyPix has focused on television, Niskern said the market will probably develop into numerous other areas such as distance learning, electronic publishing, electronic delivery of multimedia and software distribution.

Steve Webert, vice president of business development at Oracle Corp., painted a different picture of wireless digital communication through a cellular infrastructure. "We are trying to become the Henry Ford of radio data communication," said Webert.

Oracle is establishing a joint venture with McCaw Cellular and numerous other undisclosed cellular operators to create a wireless data distribution network for selective delivery at up to T1 speeds (1.5 Mbits/s). Webert envisions bringing a halt to government printing presses and other types of paper-intensive information distribution through this network.

Right now the Center for Disease Control wants to deliver information to 3,000 sources. Webert explained that the existing mail-based distribution costs too much and can be out of date due to the processing time at both ends. Oracle's wireless distribution scheme will instantly provide doctors in the field with reports of the latest developments.

Another development presented at the show promises to add value to the large installed cable TV base. Wavephore Inc. of Tempe, Ariz., announced successfully testing a system that can piggyback data on top of an active TV signal with no distortion. Charles Jungo, Wavephore vice president of engineering, said the system can now send 384 kbits/s. The future version will support T1 rates.

In the experiment, a terminal used a 9,600 baud modem to request medical imaging data from the server at the headend. Jungo pointed out, "Many data applications are asymmetrical — meaning you only have to transmit large quantities of data in one direction. The beauty is that we can put 384 kbits/s (of data) on every single channel a cable TV system has today."

Wavephore is developing a proposal for an information library connected to a number of local schools. Students will be able to download visual, audio and other types of high bandwidth data from a central location in real-time. Jungo said, "We see many other applications in single point-to-multipoint distribution."

Tom Stobs, Wavephore's director of sales, said "Although final pricing has not been determined we expect the price of each decoder to be in the $3,000 range once they go into volume production." — *By George Lawton*

NCTA Engineering Committee met at expo

SAN ANTONIO, Texas — The National Cable Television Association Engineering Committee met here June 12 just prior to the Society of Cable Television Engineers Cable-Tec Expo '92.

The "Washington Update" came from Wendell Bailey of NCTA. He began by describing the first Technical Standards Seminar to be held the following day (see page 42). On legislative matters, Bailey reported that the Senate had passed a cable bill

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(S-12) earlier this year and that the House is working on its own version. Bailey explained Senate and House bills' long and arduous paths to becoming laws. He explained further that the Markey bill was too stringent (by House committee members own admission) but was voted for just to move it along. One of the problems impeding the bill is that several congressional committees feel they have some jurisdiction over issues contained in the bill.

Technical issues are being debated as well, Bailey continued. Consumer compatibility — a ban on scrambling any channels — and rewiring the customers' homes at their request and at the cable companies' expense are some of the more important technical issues. The NCTA offered alternative language to the bill. At issue is what consumer electronic manufacturers must do in order to call their products "cable ready."

On other matters, Bailey explained that the FCC had, for the most part, accepted the joint proposal of the cities, the NCTA and others in finalizing the new cable technical standards. Occasionally the FCC may have used unclear and indirect language in formulating the new rules. The NCTA and other cable industry people feel that it is necessary to seek clarification and further explanation of the language from the FCC. On May 1, the NCTA, a group of cable operators and five additional parties filed with the FCC a petition for clarification and partial reconsideration. The NCTA did not file opposition to any of the other petition filings.

A six-page special report was prepared by the NCTA's legal department summarizing the FCC's new cable TV technical standards. The text of the new rules are included in the report. A copy may be obtained from the NCTA's Science and Technology Department at 1724 Massachusetts Ave., N.W., Washington, D.C 20036; phone (202) 775-3637. The report is also available for downloading from the department's computer bulletin board system (BBS). The BBS may be accessed at (202) 775-3663; 1200/2400,N,8,1.

Tom Osterman of Alpha Technologies demonstrated how the sharp rise-time of standby power supplies can in some instances cause interference to cable systems by saturating the ferrite-core transformers in taps and causing momentary signal loss through the tap. A detailed technical discussion followed a demonstration of the interference on videotape. It was noted that this kind of interference is not limited to any one manufacturer of standby power suppliers or taps.

Brian James of CableLabs gave a report on the current status of HDTV proponent system testing and of the plans for testing the proposed ghost canceling signal. Norm Weinhouse of Weinhouse Associates explained the recently published "Satellite Good Practices Bulletin." Weinhouse also alerted the committee to a slight error in the bulletin. The practices bulletin recommends using NTC-7 VITS. (It should recommend the FCC version of the VITS.) There is a difference in the average level of the modulated stairstep signal between the NTC-7 and the FCC VITS.

Tentative plans were made for the next two meetings to take place in Vancouver on Aug. 12, and in Washington, D.C., Oct. 14-15. The Decem-

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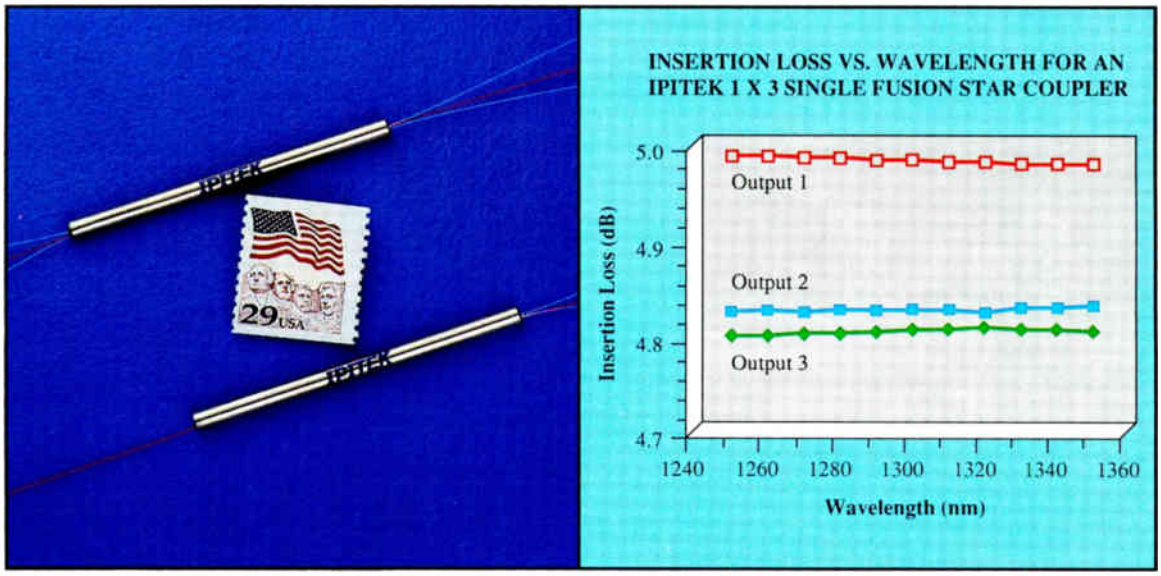

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ber meeting will be held in the Denver area. — *By Roger Pience, Director of Engineering, Science and Technology Department, National Cable Television Association*

News notes: Cable-Tec Expo

The following are news and personnel announcements that ran in the "CT Daily" at Cable-Tec Expo '92. The complete wrap-up of the show starts on page 26 with the new products covered in the "CT Daily" starting on page 74.

☛ General Instrument announced that Multivision (a Mexico City-based program supplier) signed an agreement that will result in what GI says is the world's first entertainment video system using satellite-delivered, digitally compressed signals. GI's Jerrold and VideoCipher units will supply the technology/hardware enabling Multivision to initially deliver six program services to cable systems and backyard satellite dishes throughout Mexico.

☛ AM Communications announced it signed up two more sales representative companies. Mega Hertz of Englewood, Colo., will cover Colorado, Kansas, Nebraska, New Mexico, Utah and Wyoming. John Weeks Enterprises of Lawrenceville, Ga., will cover Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee and the Caribbean.

☛ Wavetek and Cable Leakage Technologies announced a strategic partnership that they say allows them to offer cable systems a "total leakage measurement solution." This solution is a leakage tracking/mapping system comprised of CLT's computerized GPS receiver and mapping and analysis software and a Wavetek CLM 1000. As well, Wavetek and AM Communications announced the formation of a strategic partnership to collect market data related to the present and future needs of the CATV industry and specific customer requirements. The research will be focused on current and future automated testing and status monitoring requirements. The impact of FCC regulations will be a major consideration, according to the companies.

☛ Storer Cable in Richmond, Va., and Jones Intercable in Lancaster, N.Y., reported that they find Scientific-Atlanta's Jerrold-compatible Model 8600s easily compatible with existing Jerrold settops. S-A said more than 600,000 compatible 8600s have been installed or committed to by operators in the United States, Europe, Asia and Latin America.

☛ Optical Networks International announced the delivery of five Harmonics Lightwave HLT 6000 transmitters. The YAGLink transmitters were shipped to Vision Cable, Albemarle, N.C.; Kingwood Cable, Kingwood, Texas; Dynamic Cablevision (a Colony system), Hialeah, Fla.; United Artists, Mamoroneck, N.Y.; and TCI Chicago. As well, ONI announced an agreement with Comcast for the optoelectronics, apparatus and activation of Phase II of Comcast's Flint, Mich., system. The fiber-optic project will reduce three 40-amplifier cascades to a maximum of 10 amplifiers. Six Laser Link II transmitters and 12 Harmonic Lightwave HLT 3000 receivers will be used for the project.

☛ Jim Emerson was appointed director of sales and marketing for Sachs' CATV Group.

☛ Trilogy appointed James Oldhame to vice president, sales.

☛ Richard Monks was appointed president an COO of Contec International.

☛ Kathy Rauch was named market development manager for cable TV by Corning.

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Reader Service Number 1

Troubleshooting coaxial cable — A basic review

By Rickey Luke
Plant Manager, Storer Cable TV

When you have properly installed coaxial cable lines, whether they are in the air or underground, they just sit there and work forever. No problem, right? Not!

Let's back up a minute. You need to realize that coaxial cable has been the choice transmission medium for cable systems since the first one was built in 1950. Coaxial cable has two conductors of which one is the center (or inner) and the other is the sheath (or outer). Since both are concentrated about the same axis, we have the qualifying term "coaxial."

Coax basics

The hardline coax cable typically used in trunk and feeder applications consists of an aluminum outer sheath and a copper-clad aluminum inner conductor with a gas injected polyethylene foam dielectric material that separates the two conductors and maintains the distance between them. Sizes are determined by the outer diameter of the sheath. Typical sizes are .412, .500, .540, .625, .750, .860, .875, 1.000 and 1.125 inches. Underground cable or cable subject to adverse environment conditions may be jacketed.

The cable used to connect the customer to the feeder system is a more flexible "drop" cable that typically has a copper-plated steel center conductor with an aluminum braid over aluminum foil as the outer sheath. Dielectric material is usually foam polyethylene and the outer sheath is jacketed with polyvinyl chloride or polyethylene. The most commonly used sizes include (RF/59) .241, RG16 .276, RG11 .405, and no RF designation .340.

The electrical properties of coaxial cable are such that each conductor is a series of small inductances, with the dielectric material separating them, acting as small parallel capacitances. The characteristic impedance of these coils and capacitors in an infinitely long piece of cable is approximately 75 ohms. Since cables are not infinitely long, the same effect on shorter length is achieved by connecting a purely resistive load equal to the cable characteristic impedance between the conductors at the end of the cable not connected to a voltage source. This is called terminating the cable into a matched load.

Coaxial cable attenuation is directly proportional to the frequency and inversely proportional to the conductor size. Larger conductor diameters have less attenuation. With regard to the dielectric material, the closer the dielectric constraint is to that of a vacuum, the less the attenuation.

Problems associated with coaxial cable and connectors typically have the same type of symptoms, however most of the problems are not really coax problems, but connector ones. Assuming all the connector problems and those associated with actives and passives have been ruled out, the cause may be from a myriad of coaxial cable problems. They vary from the simplest of problems (such as a staple in the cable) to the most complex problem to locate (a cracked shield maintaining some type of continuity).

Drop problems

When considering the drop wire itself, one must keep in mind the attenuation of the cable as signal is measured at various points. Loss that is still higher than normal (after connections have been found in good order) generally indicates degradation of the cable, requiring its replacement. Probably the most common cause of drop wire degradation is corrosion. If corrosion is found in a connection, water was present. If water has entered the connection, it also probably entered the drop wire and migrated down its length. Once this happens, corrosion of the drop wire also occurs. This results in gradual signal egress problems.

Drop wire manufacturers have made some improvements over the years that help prevent the penetration of water and the subsequent corrosion. These include better center conductor bonding, better foam dielectric and, more recently, corrosion protecting flooders. Of course, there are other causes of drop wire failure besides corrosion. To name a few: squirrel chews; lightning; dry rotting; severe or continuous contact with trees or other objects; flattening or piercing by fasteners; and the braids in the actual drop cable being cracked because of tight bends or age within the drop material itself.

Trunk/feeder problems

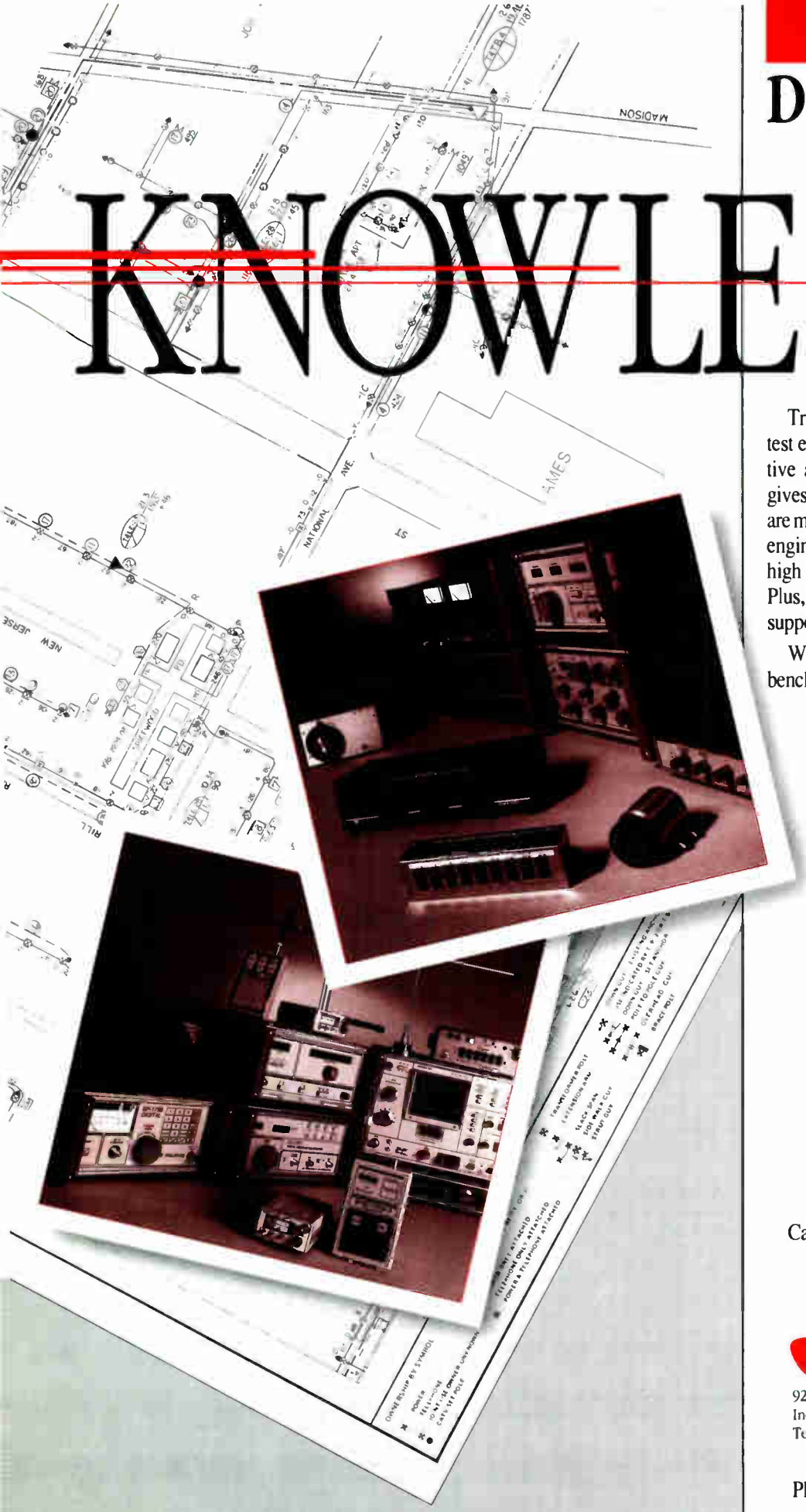
The symptoms of a coaxial cable problem in the trunk and feeder may show up as low inputs or no inputs to a given device, or as automatic gain and slope control problems that take on an intermittent form. For example, in the early morning or late hours of the evening, an amplifier will go into cross-modulation or other distortions. However, during the day, pictures may be perfect with the exception of maybe one snowy channel. This may be because of a cracked shield causing a suckout at a pilot channel frequency that is changing as temperature changes.

Other symptoms are ringing in the pictures and (in the event of a strong local off-air station) direct pickup problems that typically result in a shadow on the leading edge of video information. Random interference (such as that from CB radios, government-fixed and mobile communications, and other radio sources that are operating perfectly within the legal compliance of their frequency spectrum) also may appear in a cable system that is supposed to be a closed-loop system.

On the hardline side of the trunk and distribution system, one is faced with having to deal with squirrels that like to sharpen their teeth by gnawing on the cable (which can wreak havoc in as short as a day). Other concerns with these overhead cable lines have to do with the cracked shields that occur in the suspension drop loops because of the expansion and contraction of the cable. Occasionally a lineman from the power company accidentally spikes the cable or a telephone employee pulls our line to get up the

(Continued on page 48)

DEPTH of KNOWLEDGE



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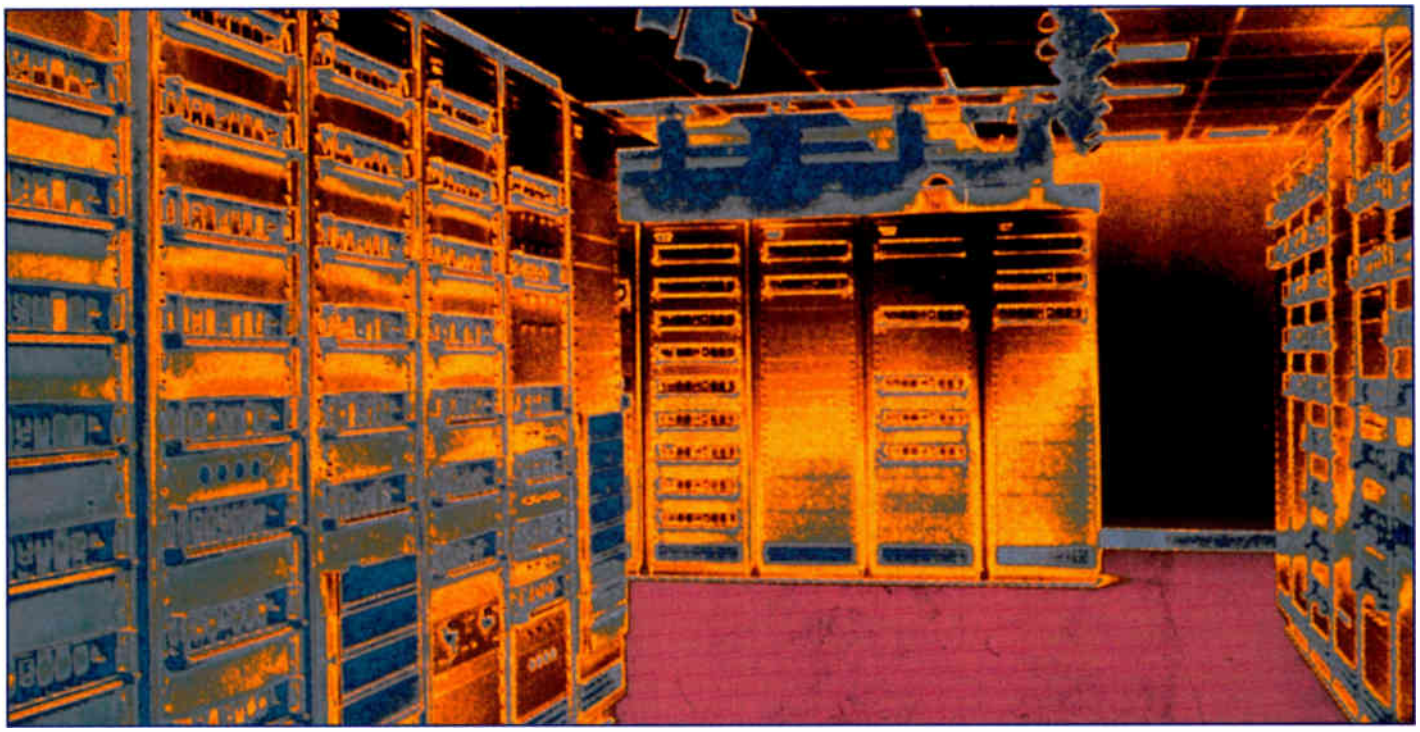
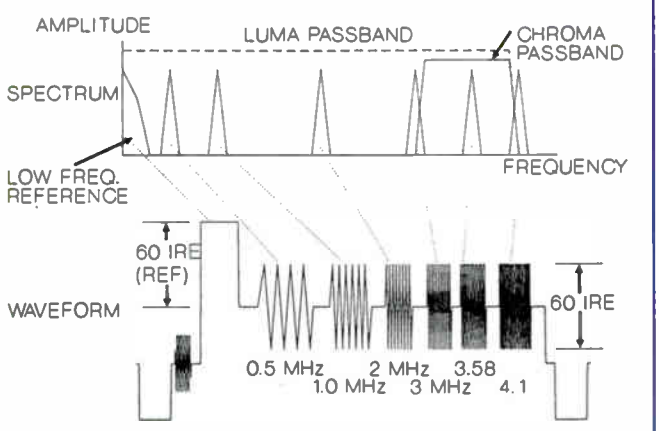


Measuring and evaluating video signals in the headend — Part 1

As many of you are aware, the National Cable Television Association and the franchising authorities/cities agreed to, among other things, a set of basic measurements to be made on video signals. These were then submitted to the Federal Communications Commission as recommendations in its proceedings on new technical and operational regulations for the cable industry, which have since been issued (see "CT," May 1992, page 34). This article, which covers measurement test techniques and obtaining test waveforms, is adapted from a paper that ran in the "1992 NCTA Technical Papers," and is reprinted here with permission from the authors and the National Cable Television Association.

By Blair Schodowski
Senior Staff Engineer
And James O. Farmer
Division Technical Manager
Scientific-Atlanta Inc.

Figure 1: Multiburst waveform



Among the changes in the new FCC rules are that, for the first time, you will have to make certain basic baseband measurements in your headend. This article seeks to explain the measurements you must make. By no means does this represent a comprehensive set of measurements and minimum compliance does not necessarily mean that you are supplying impeccable pictures. However, they are a starting point for improving pictures.

Of the following, in-channel frequency response will have to be measured in the field (typically at subscriber test points), while the remaining three — differential gain, differential phase and chrominance-to-luminance delay — will have to be performed at the output of the headend.

Frequency response

No measurement on a TV channel is more basic than that of frequency response. Errors can cause picture softness, close ghosting, smearing, weak color and other nasty things that cable TV claims to improve. You are familiar with

measuring the RF response of a channel. This is directly related to the baseband frequency response, but the relation is not always simple.

In some parts of the spectrum, a big error at RF can translate to a small error at baseband, and at other frequencies a big error at RF can produce a big error at baseband. Since the RF carrier is only something we add to the baseband picture for part of its journey from studio to home, we are primarily interested in the baseband response of a system. Frequency response may be measured in many ways, and this article cannot cover all of them. Rather, we concentrate on one simple means of measuring frequency response. It is accurate enough for most everyday needs and should satisfy the needs of the agreement with the cities.

The technique uses the multiburst waveform. This is a simple signal composed of a pedestal (40 IRE in the example — you will see multiburst elements of other amplitudes) on which bursts of different frequencies have been added. By measuring the relative amplitude of each frequency burst, one can get a good idea of the approximate channel response. Figure 1 shows a multiburst waveform. Above it is a spectrum diagram indicating the spectrum occupied by each burst. Intentionally, the spectrum is not shown exactly above the corresponding burst. The X-axis of the waveform is time; the Y-axis of the spectrum diagram represents frequency. Each burst in the multiburst occupies a different part of the baseband spectrum and will be affected by the amplitude response of the channel. By measuring the amplitude of each burst after demodulation, one can ascertain the response of the channel from the point of injection of the multiburst.

For example, suppose that we measure the 0.5 MHz burst amplitude to be 60 IRE (the nominal amplitude) and the 1 MHz burst to be 40 IRE. The frequency response of the channel at 1 MHz compared with 0.5 MHz is:

20log(40/60) = -3.52 dB

We use 20log because we are measuring voltage. Frequency response is measured with respect to some reference frequency. Many times that reference frequency is taken to be 0.5 MHz (this being the frequency of the lowest burst). This is not a preferred way to evaluate the channel, however, because it leads us to ignore the channel response below 0.5 MHz. These lower frequencies constitute an important part of the channel, which contains most of he luminance energy. Errors in low frequency response can cause picture streaking, brightness variation from left to right in the picture, and synchronization problems, among others.

A preferred measurement technique is to measure response with respect to the reference bar on the left of the Figure 1 waveform. This bar also has an amplitude of 60 IRE, the same as that of each burst, measured between peak white and the 40 IRE pedestal on which the bursts are imposed. The energy in the bar occupies the lowest frequency part of the spectrum. We can use this as a reference and get a much more relevant picture of channel response. The easiest way to make the measurement is to set the gain of your oscilloscope to make the bar amplitude 60 IRE as shown (relative to the 40 IRE multiburst pedestal), then measure the IRE amplitude of all the bursts, calculating frequency response as shown previously.

Notice that we have drawn each burst as occupying a narrow band of frequencies rather than a single point. (If we drew this accurately, we would spread out the spectrum even more.) This is because each burst can be thought of as a carrier in its own right — 100 percent amplitude modulated by a rectangular wave that turns it on for a short time every so often. This modulation causes sidebands, as would any other modulation of a carrier. Thus, the spectrum spreads out. Is it difficult to think of the bursts as carriers? The 1 MHz burst is in the middle of the AM broadcast band and 3.58 MHz is near the lower edge of the amateur 80 meter CW band.

Figure 2: Multiburst with 2.9 dB frequency roll-off

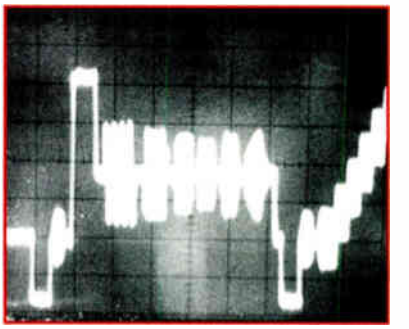
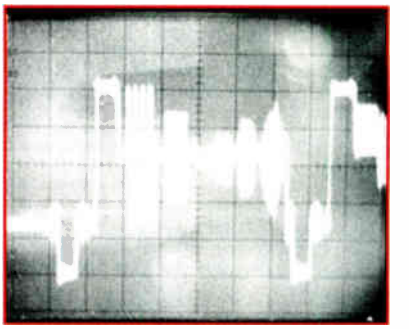


Figure 3: Multiburst on channel protected by positive trap



In practice, you will never see the last burst (between 4 and 4.2 MHz, depending upon the generator) look very good after a trip through a band-limited channel. This is because the burst is at the very edge of the passband, which theoretically ends at 4.18 MHz in NTSC transmission, but which rarely extends this high. (NCTA standards assume a video bandwidth of 4 MHz.) The modulation sidebands associated with this burst extend past the channel edge. The result is often a trapezoidal envelope on the last burst, which may not have time to reach its CW amplitude. For this reason, frequency response is normally measured only to 3.58 MHz when using the multiburst. Interpretation of the last burst is dangerous and is best left to an expert (most of whom ignore it).

Notice that we show the chroma passband as occupying the spectrum about ±600 kHz from the 3.58 MHz carrier. (Technically, one component of the color extends 1.2 MHz below the color subcarrier, but this exuded bandwidth is rarely used in consumer equipment.) The color bandwidth can be smaller than the luminance bandwidth because of the way our eyes perceive color. We perceive sharpness in the luminance signal much more than in the color information. The luminance bandwidth is shown overlapping the chrominance bandwidth. Lower cost TV sets cannot recover this bandwidth, but higher cost sets with comb filters can separate the chrominance and luminance as a result of the way information is interleaved in the spectrum. The details are beyond the scope of this article.

(Continued on page 49)

AML technology review

This article is adapted from a paper that ran in the "1992 Canadian Cable Television Association Technical Papers."

By John Hood
Vice President Engineering, Comlink Systems Inc.
And Tom Straus
Chief Scientist
Hughes Microwave Products Division

From 1971 to 1984 only channelized amplitude modulated link (AML) transmitters were available for CARS-band microwave transmissions. These units were largely based on klystron technology, with the higher power version employing a klystron amplifier in each channel and the lower power version employing high level parametric upconverters that shared the klystron as a pump source among eight channels. Then, in 1984, the advent of high-power field effect transistors (FETs) with substantial gain at 13 GHz made possible the first broadband AML transmitter. Initially, these units had a very restricted output capability, but this capability increased very rapidly through advances in FET technology and through the utilization of linearization techniques.

Figure 1 summarizes the situation. While the first broadband design had 18 dB less output than even the "low-power" channelized AML, the most recent broadband unit comes within 1 dB of matching the output capability of a "high-power" channelized AML array. This 27 dB increase in power capability has a profound impact on CATV system design choices.

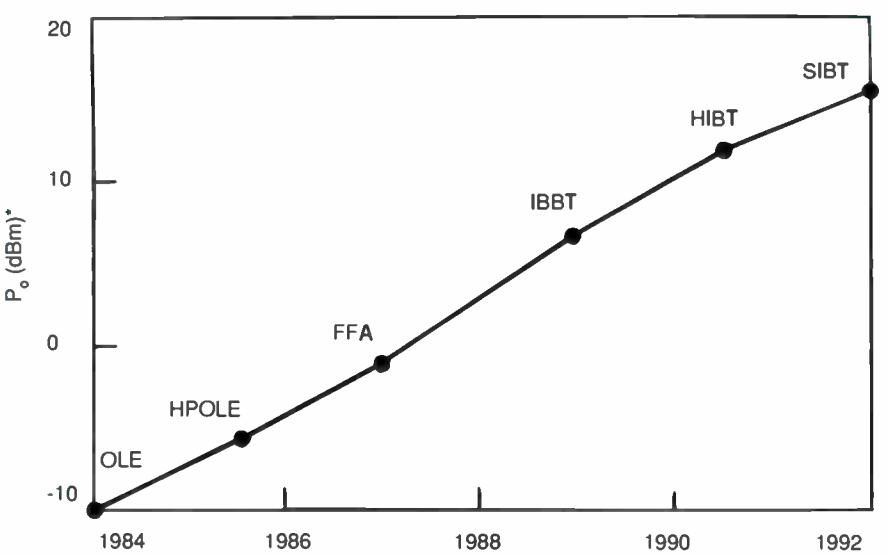
Broadband transmitter developments have not been the only fallout of microwave FET technology. The same techniques are applicable to AML repeaters. Such repeaters, which are in essence broadband amplifiers incorporating automatic gain control (AGC), obviate the need to reprocess the microwave signal at the repeat point. As a consequence, line-of-sight problems can be economically overcome and the range can be significantly extended.[1] In addition, low-noise FETs are now utilized to reduce the receiver noise figure by as much as 5 dB. When added to the previously mentioned 27 dB advance in broadband transmit power, a 32 dB increase in microwave link margin is now possible.

Finally, the new technologies also have affected the channelized AML transmitter designs. A solid-state high-power AML utilizing a 5-watt amplifier and predistortion linearization was developed several years ago.[2] More recently, an even higher power FET amplifier was developed to serve as a direct replacement for the klystron in the traditional high-power AML. This retrofit installation includes the amplifier power supply mounted onto a bracket at the rear of the RF chassis. The significance of this arrangement lies in the fact that the separate klystron high-voltage power supply is no longer required and, therefore, twice the number of channels can be accommodated in the same rack space. Moreover, even with twice the number of channels, the total transmitter array power dissipation is significantly reduced in the solid-state AML as compared to the older klystron-based technology.

Table 1: SIBT-121 power output and C/N for 65 dB C/CTB and 65 dB C/CSB

# of chs.	Po	C/N
12	24 dBm	66 dB
21	22 dBm	64 dB
35	19 dBm	61 dB
60	16 dBm	58 dB
80	15 dBm	57 dB

Figure 1: Broadband AML transmitter power development



* Power output per channel for 60-channel loading at 65 dB C/CTB (CW measurement)

Broadband vs. channelized AML

Table 1 provides the key performance specifications of the most recently developed broadband transmitter. Comparison of the SIBT-121 power output capability to that of a channelized STX-141 array shows that this latest broadband block upconversion approach comes within approximately 1 dB of matching the traditional high-power AML on one of its multiple outputs. The number of such outputs depends on the channel multiplex combining network, but is usually 2M, where M is an integer related to the number of channels (N) in the STX-141 array by the formula M = (N/4) - 1.

(Continued on page 55)

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Video improvements using FM delivery

Figure 1: Two applications of microwave

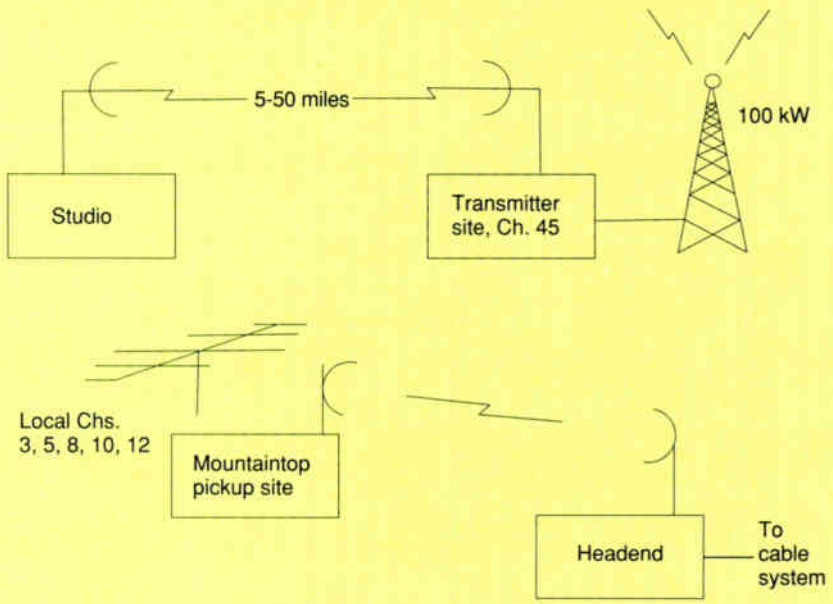


Figure 2: Local ad insertion setup

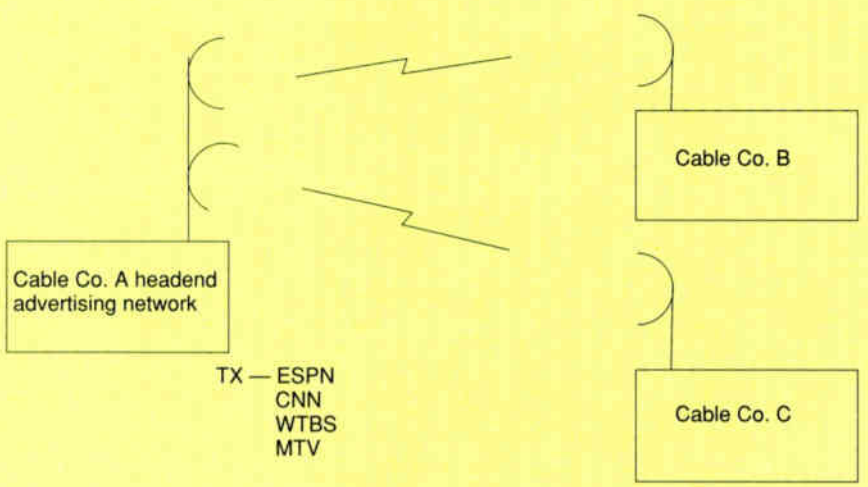
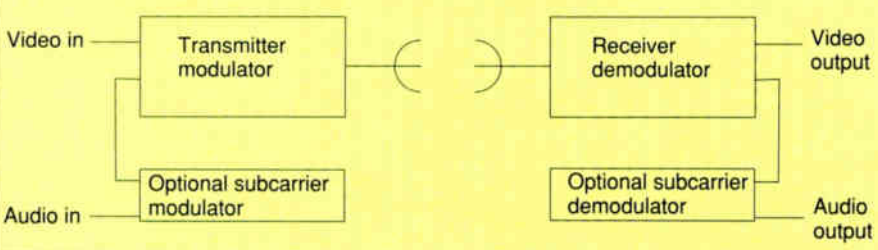


Figure 3: FM baseband



By Chris Radicke
Supervisor, Applications Engineering
Westec Communications

The use of microwave to deliver video programming information is a technology that has been around for many years. The main focus of this article is to reintroduce the attributes of frequency modulation (FM) delivery of video programming. To accomplish this we should review the microwave system and the three types of systems available and some general applications. See Figure 1 for two of the many applications.

FM microwave is used in many systems today where it is desired that the transmission be virtually transparent with little or no degradation of the signal. This involves the delivery of satellite programming, long-haul broadcast signals and video transportation links, studio-to-transmitter links and electronic news gathering (ENG) links for live news feeds.

The high quality of FM has not been without its cost compared to amplitude modulated (AM) systems commonly in use in the transportation of CATV signals. A comparison is shown in the table on page 60 outlining some of the main trade-offs between FM and AM microwave transmission. Depending upon the application, both AM and FM have their unique places in the cable TV and broadcast worlds.

The need for the superior FM performance in cable systems involves at least two applications. The most recent is due to the growth of the revenue generated by local ad insertion (Figure 2) by the cable operator. The distribution of high-quality signals to adjacent areas and towns has many advantages such as shared costs and zone-selective ad delivery.

Types of systems

The basic microwave system is composed of three parts: transmitter, receiver and antenna system. The distance between the transmitter and the receive equipment is called the microwave path. The path is for all practical considera-

(Continued on page 59)

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Reader Service Number 20

Cable-Tec Expo '92: S

By Laura K. Hamilton
Photos by Bob Sullivan

Every year it gets harder to come up with new superlatives other than bigger and better to describe the Society of Cable Television Engineers Cable-Tec Expo. But really, this year's upbeat show (held in San Antonio, Texas, from June 14-17) was just that — bigger and better than ever before. Expo '92, like its predecessors, proved there's no other show in the industry that offers this kind of comprehensive CATV technical training and education.

The show's success is apparent from the following highlights:

• You couldn't get far without running into fellow SCTE expogoers in San Antonio. Up from last year's show, there were 2,000 registered attendees and 1,600 exhibitor personnel.

• Exhibit space for Expo '92 at the San Antonio Convention Center sold out. This marked the sixth year in a row that the expo's exhibit hall was fully rented. This year, 208 exhibitors (up from 189 at last year's expo in Reno, Nev.) had attendees pouring into their booths. Turn to page 44 for more on-the-floor details.

• The Annual Engineering Conference attracted conferees to the huge Lila Cockrell Theatre in the convention center to get up-to-date on digital compression, new Federal Communications Commission regulations, meeting subscriber expectations, and other hot CATV topics like fiber, high definition TV, personal communication networks and outage reduction. Coverage of the conference begins on page 28.

• The SCTE Annual Awards Luncheon honored industry veterans, new ideas, and CATV technical excellence. Full coverage of the awards starts on page 31.

• On page 34 you can read about what is really the heart of the expo,


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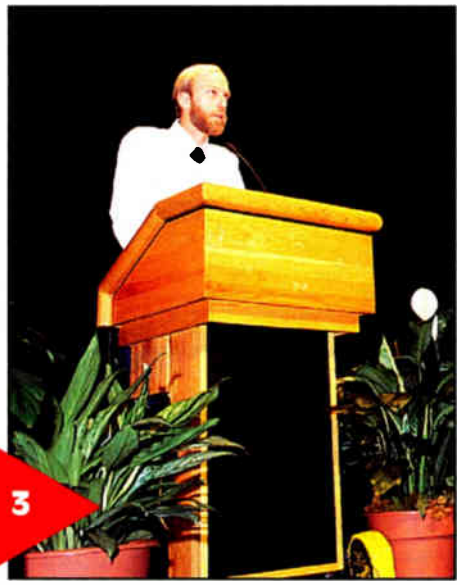
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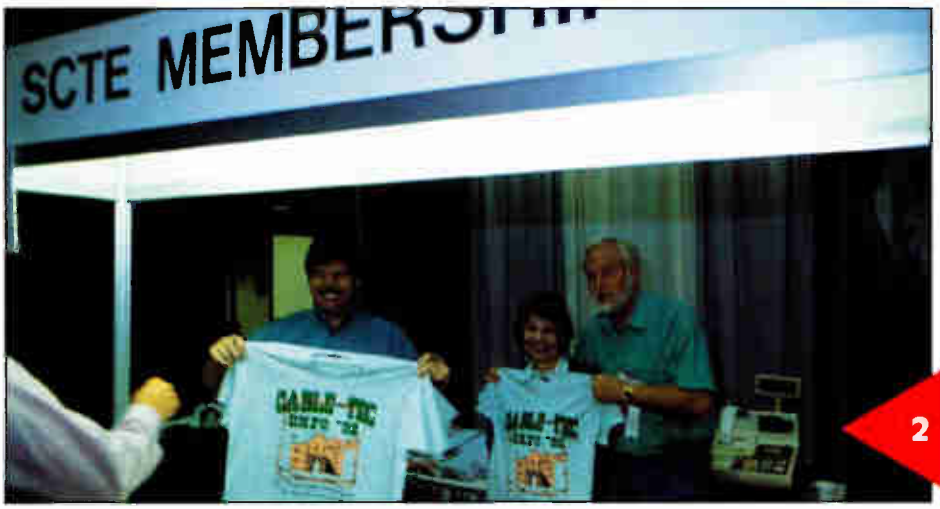
1) The Riverwalk was a favorite haunt for expo attendees. 2) The SCTE board met prior to Cable-Tec Expo '92. 3) Dan Pike, vice president of engineering, Prime Cable, and expo program co-chair, helps open the Engineering Conference. 4) Bill Riker, SCTE president and Expo program co-chair, kicks off the Engineering Conference.

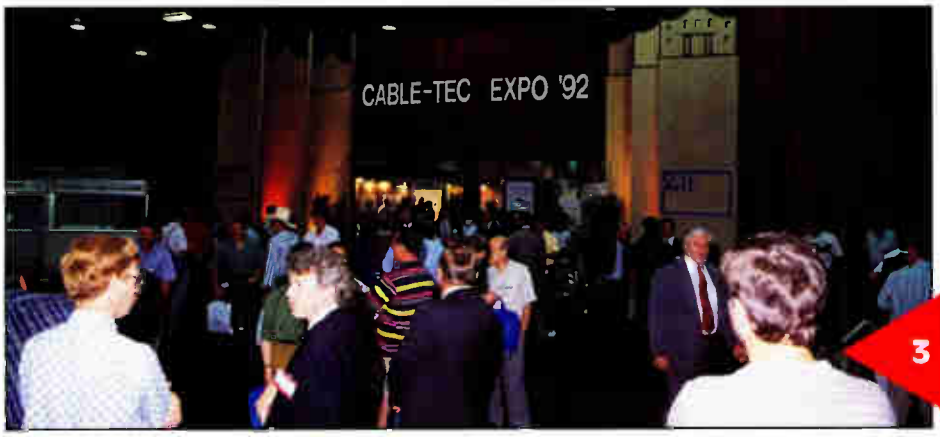
CTE takes the Alamo

technical training. Various workshops dealt with everything from the new FCC regs, local origination, tests and measurements, outage reduction, and more ...

• Expo receptions and parties always offer one of the best opportunities for attendees from all over the country (and the world) to relax with colleagues from the technical community. Starting on page 45 you can remember the fun including the Welcome Reception, the International Good Neighbor Reception, the ham operators reception, the second National Cable-Tec Games, and a particularly boisterous Expo Evening.

This wrap-up was written with assistance from Toni Barnett, Ron Hranac, Wayne Lasley, Shelley Ollig, TeleResource's Lawrence Lockwood, and the National Cable Television Association's Roger Pience.





1) Many expogoers saw the infamous Alamo. 2) Expo T-shirts were a hot item at the SCTE membership booth. 3) The entrance to the exhibit hall at the San Antonio Convention Center. 4) The rush was on at the exhibit hall.

Current events preside over Annual Engineering Conference

Always well-attended, the Society of Cable Television Engineer's Annual Engineering Conference at Cable-Tec Expo has let attendees and panelists alike wax nostalgic or peer through the crystal ball or consider today's buzzword technological issues. This year's conference tended toward the latter, focusing mainly on the likes of digital compression, the new Federal Communications Commission regulations, fiber optics, high definition TV (HDTV), and personal communication networks (PCNs).

Before opening the conference, SCTE President Bill Riker did his annual salute to the city where the expo is held. This year he donned two alter egos for his opening remarks on what San Antonio, Texas, had to offer. "Wild Bill" Riker and "Guillermo" Riker led attendees through a tour of where to go (the Alamo, Sea World, the Riverwalk, and much more) after a busy day of technical sessions or walking the extensive exhibit floor. With all that in mind, attendees settled in for a day-long indulgence into current CATV engineering issues.

The following spoke on digital compression at the Enginneering Conference: 1) H. Allen Ecker of Scientific-Atlanta, 2) Geoff Roman of Jerrold and 3) Richard Prodan of CableLabs.

Video and audio quality

The first session of the Engineering Conference was on developments in digital compression of television and was moderated by Tom Elliot, TCI vice president of engineering and technology. In the first paper presented, H. Allen Ecker, senior vice president of technical operations and chief technical officer for Scientific-Atlanta, described a system that would deliver four to 24 standard TV signals for satellite delivery and two to 12 signals per channel for cable delivery. The end-to-end system would deliver standard video at data rates of 0.25 Mb/s to 8.5 Mb/s and HDTV at a rate up to 17 Mb/s. The total data rate for the multiplex including audio, data, text, conditional access and error correction is 21.5 Mb/s. Two multiplexes (43 Mb/s) fit into a typical C-band satellite transponder; one multiplex (21.5 Mb/s) can be delivered in a 6 MHz channel.

Richard Prodan, director of the CableLabs Advanced Television Laboratory, gave an overview of experimentation, tests and evaluation of compression work done at CableLabs. Geoff Roman, vice president of technology and new business at Jerrold Communications, predicted "the first impact of compression on the cable industry will begin to be felt this summer. Products will be available that allow carriage of multiple programs in a satellite transponder, enabling cost-effective multiplexing by major programmers."

Technical compliance

Moderated by Steve Ross of Ross and Hardies and the SCTE's of-counsel, the session on "How FCC Regulation Will Impact Your System Operations and Maintenance Practices" provided a good overview of what's in store for our industry. Wendell Bailey, the National Cable Television Association's vice president of science and technology, reviewed exactly what "standards" are and went into detail on Parts 76.601 and 76.605 of the new rules, as well as covering the number of test points required for various systems. Bailey emphasized that the cable industry delivers TV signals for money and said, "We have an obligation to deliver the best signals we can. These new technical standards will work very nicely" in meeting that goal.

Jonathan Kramer, president of Communications Support Corp. and the individual who spearheaded the cities' input in the new standards, covered what the cities are looking for: better quality and service. John Wong, assistant chief of the Federal Communications Commission's Cable TV Branch, discussed the standards' impact on systems. "What do the technical standards mean?" he asked. "That you're delivering a good picture." Concerning policing the new tech standards, Wong said, "I suggest

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the formation of a committee between the local authorities and MSOs because the FCC can't do it all." With regard to CLI, Wong stated that in the last two years, there has been great advancement.

Engineer/franchising authority relationship

Are you as a technical manager at your system "missing in action?" Judging from the presentations given at the "Cable System Technology: Meeting Subscriber Expectations" session at the Engineering Conference, that's how some franchising authorities view you. So how can you change that perception?

Margaret Combs, president of Combs and Co., moderated the session and suggested you view your franchise authority as the "collective customer." Thomas Robinson of the Cable Regulatory Division, Department of Customer Affairs from the County of Fairfax, Va., said he feels cable's technical personnel are "the right people with the right tools" for facilitating customer satisfaction, and he'd like to see more communication with the franchise authority about what you're doing to keep subs happy. That way, the authority gets the positive side of the story rather than only the side that comes from a frustrated cable sub who finally breaks down and calls the authority.

If you have a big system, you need to communicate more with the franchise authority than a smaller system would, added Jay Hamm of the City of Dallas. He also recommended you keep the authority informed of rate increases, promotions with negative options, changes in programming and changes in technical personnel so the authority doesn't hear it from the subscriber first by way of an angry call.

Finally, Communications Support Corp.'s Jonathon Kramer focused on the need for engineers to let the authority know not only when there is a major outage and what you're doing about it, but how you prepare for outages before they occur. As well, he added that since many systems are already meeting the new FCC technical standards, it might help the franchise authority/cable system relationship if you informed the authority of your compliance.

Bob Fielder

Bob Fielder

1) The new FCC technical regulations were discussed, with speeches by 2) NCTA's Wendell Bailey and 3) FCC's John Wong. 4) Margaret Combs moderated a discussion on subscriber expectations with Jonathan Kramer, Jay Hamm and Thomas Robinson. 5) Tom Elliot, Jim Chiddix, Ed Callahan and Tom Jokerst (moderator) discussed current events in cable TV.

"Secret asset" — CATV networks

The last session of the engineering conference, "Current Events in Cable Technology: Fiber Optics, HDTV, PCN and Outage Reduction," was moderated by Thomas Jokerst, vice president of CableLabs' Office of Science and Technology. Three speakers were followed by about a half-hour of questions from the audience. The speakers were Edward Callahan, vice president of technology, Antec; Jim Chiddix, senior vice president of engineering and technology for ATC; and Thomas Elliot, vice president of engineering and technology TCI.

Callahan described in some detail an Antec fiber architecture development called SSB-500 or star-star bus 500, a star-star bus to feed a 500-home serving area with no more than two active devices between the subscriber and an optical bridger. Chiddix opened by describing the nation's "secret asset" — our cable TV networks. He went on to say that because of the fragility of a TV signal these CATV networks have characteristically higher C/N ratios (about 40+ dB) than other wideband transmission systems, e.g., 10-11 dB for satellites, hence the upcoming 1 GHz systems on CATV will provide for a very good path for the anticipated new services, many of which will be digital. Elliot reviewed analog and digital techniques in general and revealed that TCI plans to have a service transmitting 8-12 movie-based shows in a 6 MHz channel in the '94 time frame. — *TB, LH, LL*

SCTE honors members' achievements

1) SCTE President Bill Riker presides over the awards. 2) ATC's Ron Wolfe is member of the year. 3) Jim Chiddix accepts the President's Award on behalf of ATC from SCTE past President Wendell Woody. 4) Region 8 Director Jack Trower presents a Personal Achievement Award to Don Gall of ATC. 5) Riker and Region 11 Director Diana Riley induct (left to right) Jim Stilwell, Dave Willis and Rex Porter into the SCTE Hall of Fame.

You know how awards luncheons can be. There's a lot of excellence to recognize, but that second piece of cheesecake you just polished off makes you more ready for a nap than sitting through long presentations, photo opportunities and acceptance speeches. In an effort to get expogoers back to the Engineering Conference and back to the technical agenda at hand, the Society decided to keep its awards luncheon snappy and to the point while still recognizing the very deserving members and friends of the SCTE.

There was no keynote speaker at the luncheon this year and graphics and video presentations kept the ceremony lively. Awards were as follows:

- Ron Wolfe of ATC National Training Center was the 1992 recipient of the Member of the Year Award. Among his SCTE activities are serving as chairman of the Cable-Tec Games Subcommittee and Career Path Working Group, as well as serving on the Publications and Videotape Development and Scholarship Subcommittees.
- ATC was the recipient of the 1992 President's Award in recognition of its support of the Society.
- Cable industry pioneers Rex Porter, Jim Stilwell and Dave Willis were inducted into the SCTE Hall of Fame by Region 11 Director Diana Riley.
- Expo Program Subcommittee members William Riker and Dan Pike (co-chairmen), Bill Arnold, Richard Clevenger, M.J. Jackson, Paul Levine and

Leslie Read received awards for their efforts for Cable-Tec Expo '92.

• The Program Subcommittee of the "Fiber Optics Plus 1992" conference was recognized for its efforts in the planning of the successful January 1992 conference. Receiving awards were Alex Best (chairman), Edward Callahan, James Chiddix, David Fellows, Bill Riker, David Robinson and David Willis.

• The following were recognized for their contributions as technical program coordinators at regional cable shows: Wendell Woody (Texas Show); Diana Riley (Atlantic Cable Show); Vic Gates and Ralph Haimowitz (Great Lakes Expo); William Riker (Western Show); and Richard Henkemeyer (North Central Cable Show).

• The former Magnolia Meeting Group of Brandon, Miss., was elevated to full chapter status.

• Outgoing members of the SCTE board of directors — Ted Chesley (Region 3), Vic Gates (Region 7), Les Read (Region 4) and Wendell Woody (Region 5) — were recognized.

• Elevated to senior member status were Frederick Baker of Viacom, Robert Baker of TCA Cable TV, Richard Beard of Continental Cablevision, Paul Biederman of ComSonics, William Cohn of Zenith Electronics, David Devereaux-Weber of American Communications Consultants, Darrell Eichelberger of Cablevision of Shreveport, Sydney Fluck of CaLan Inc., Donald Gall of American Cablevision, Joseph Gregory of Cablevision Systems, Lawrence Lockwood of Tele-Resources, Jon Ludi of Continental Cablevision, Pam Nobles of Jones Intercable, Edward Parsen of Spirit Lake Cable TV, Thomas Prichard of Engineering Technologies Group, Peter Rumble of TCI Cablevision of Washington, David Slabaugh of Cencom Cable Associates, Alan Tschimer of American Cablevision, John Vartanian of HBO, Norman Weinhouse of Weinhouse Associates, and Gary Wesa and Ronald Wolfe of ATC.

• Jack Gobbo of United Artists Cable of Santa Cruz, Calif., received first place in SCTE's second annual Field Operations Award competition. He won for his presentation on "The Jack Knife." Fred Hall of Cablevision in Hauppage, N.Y., and William Gorecki of MetroVision in Detroit were the second and third place winners respectively.


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1) Long-time SCTE members were awarded senior member status. 2) Jack Trower and Marv Nelson with Steven Christopher and Bob Marsh of the newly elevated Magnolia Chapter. 3) Tom Elliot received a Special Recognition Award. 4) Riker and Vic Gates present the Field Operations Award to Jack Gobbo.

• SCTE Personal Achievement Awards, which were established (based on the SCTE Outstanding Achievement Award) to recognize technical personnel in our industry for outstanding job performance, were presented to Pierre Cubbage of Mega Hertz Sales, James Fronk of Multimedia, Don Gall of ATC, Mark Graalman of Buckeye Cablevision and Mark Wuller of Continental Cablevision.

• SCTE At-Large Director Tom Elliot of TCI received a Special Recognition Award in honor of his active participation in the Society's Engineering Subcommittees.

As well, *Communications Technology's* Paul Levine presented a check on behalf of the magazine's 1992 Service in Technology Award recipient, ATC (see *CT*, June 1992), to SCTE President Riker for the Society's Scholarship Subcommittee scholarship fund. *CED's* Rob Stuehrk also presented a check to Riker representing the proceeds of the *1992 SCTE Membership Directory*, which the magazine published for the Society.

1) CT's Paul Levine presents a check for the scholarship fund. 2) Levine and Bill Riker with Service in Technology Award recipients Jim Chiddix, Jay Vaughan and Jim Ludington of ATC. 3) Riker welcomes Ron Hranac as chairman, and 4) Les Read, Ted Chesley and Vic Gates bid the board farewell.

1992-1993 officers

Also recognized at the luncheon were new Society officers, which the board of directors of the SCTE elected for the coming year at its meeting before the show officially started. No doubt you'll see some of the technical community's more recognizable names in the newly elected group. The officers for the 1992-1993 term are: Ron Hranac of Coaxial International, chairman; Michael Smith, Adelphia Communications, eastern vice chairman; Tom Elliot, Tele-Communications Inc., western vice chairman; Rich Henkemeyer, Paragon Cable, secretary; and Mark Wilson, Multimedia, treasurer. In addition, Walt Cicioria of ATC was named as an additional board member on the Executive Committee.

This board meeting also saw the installation of Bill Riker, formerly the Society's executive vice president, as SCTE president.

The current SCTE board consists of: Region 1 Director Tom Elliott, Catel, serving California, Hawaii and Nevada; Region 2 Director Ron Hranac, serving Arizona, Colorado, New Mexico, Utah and Wyoming; Region 3 Director Norrie Bush, Columbia Cable, serving Alaska, Idaho, Montana, Oregon and Washington; Region 4 Director Bill Arnold, Texas Cable TV Association, serving Oklahoma and Texas; Region 5 Director Mark Wilson, serving Illinois, Iowa, Kansas, Missouri and Nebraska; Region 6 Director Rich Henkemeyer, serving Minnesota, North Dakota, South Dakota and Wisconsin; Region 7 Director Terry Bush, Trilithic Inc., serving Indiana, Michigan and Ohio; Region 8 Director Jack Trower, WEHCO Video Inc., serving Alabama, Arkansas, Louisiana, Mississippi and Tennessee; Region 9 Director Jim Farmer, Scientific-Atlanta, serving Florida, Georgia, Puerto Rico and South Carolina; Region 10 Director Michael Smith, serving Kentucky, North Carolina, Virginia, West Virginia and the District of Columbia; Region 11 Director Diana Riley, Jerry Conn Associates Inc., serving Delaware, Maryland, New Jersey and Pennsylvania; Region 12 Director Walt Ciciora, serving Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont; and At-Large Directors Wendell Bailey, NCTA; Richard Covell, Texscan; and Tom Elliot. — *LH*

Expo '92 offers technical spree

It's obvious by now that one of the best ways in our industry to advance your CATV technical knowledge is to attend the expo. Cable-Tec Expo '92 proved that once again with its workshops, engineering meetings, technical demonstrations, and more.

Six workshop periods were scheduled over two days and attendees had a large and varied batch to pick from. Unfortunately, no one person could attend all the workshops in full, so what follows is a summary of all of them including the special local origination sessions.

Assessing picture quality

This workshop was conducted by Richard Annibaldi, product development manager for Pioneer, and Brian James, director of advanced TV testing, CableLabs. During the workshop, two tapes were shown and discussed that were made by CableLabs and Jerrold respectively. They showed controlled tests of many types and various amounts of picture impairments, e.g., signal-to-noise, group delay, composite triple beat (CTB), phase noise, etc. After the tape showing, Annibaldi demonstrated various distortions on a complete equipment test configuration. In his oral presentation, Annibaldi asked, "How good a picture is good enough?" and detailed past tests on subjective evaluation of picture quality, i.e., TASO and CCIR tests. He gave a tabulation of penetration of some high end TV equipment: 8 percent of homes have projection sets, 1 percent of homes have TV laser discs, 35 percent of homes have a CD player and 31 percent of homes have stereo.

Brian James emphasized that as a result of past and current tests, "present-day viewers are less tolerant of impairments than even the 1983 viewers," referring to a 1983 TASO test. He noted that CableLabs has undertaken a comprehensive study of "picture quality vs. impairment to determine the tolerance to impairments of present subscribers." These impairments to be tested include random noise, phase noise, microreflections, CTB and envelope delay.

BCT/E overview

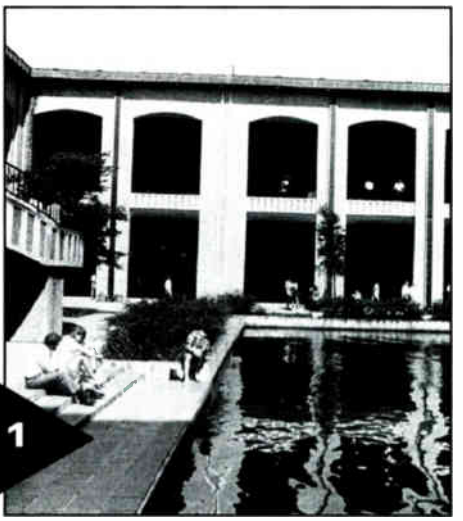
Marvin Nelson, SCTE director of chapter development, kicked off this session in which the goal was to pinpoint the problem areas in various BCT/E categories. In Category I (Signal Processing Centers), he stated that "phase delay seems to be a major problem. Phase is just another way of saying 'time.' Any time you add filters, you can't compensate for the variances and have to adjust." Another problem area of this category involves testing processors and modulators, he said. One of the best standards to go by is put out by National Cable Television Association.

In Category II (Video and Audio Signals and Systems), the most trouble concerns production equipment. There needs to be some kind of grasp of this equipment because, while we don't operate studio equipment, we're the ones that have to fix it. According to Nelson, "The Tektronix people will be your best source of information for the BCT/E programs."

The baton was then passed to Les Read, field service engineer for Sammons Communications. He covered problem areas in other categories.

Read stressed: "Category III (Transportation Systems) is our most difficult category. Problems mostly involve microwave calculations, fiber optics (definitions) and FM links. Category V (Networking) is probably the one we're least familiar with regarding terms."

Category VI (Terminal Devices) causes problems if you don't do double logarithms and dBmVs, he said. "The best advice I can give," said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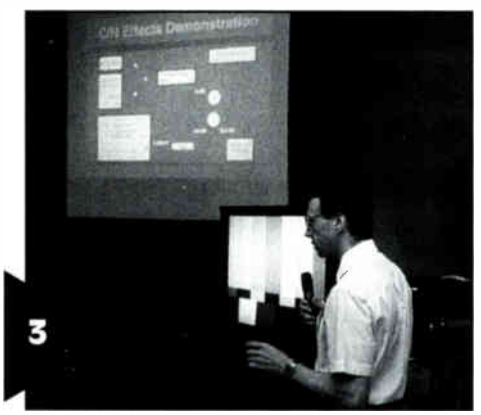
1) The San Antonio Convention Center offered attendees a sunny spot to take a break. 2) The North Hall lounge was a handy meeting area. 3) "Assesing Your System's Picture Quality" with Richard Annibaldi. 4) "BCTE Certification: An Overview of Technical Certification and Related Category Exams" with Les Read.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1) "The Best of Fiber Optics Plus '92" with Joe Van Loan. 2) "Customer Service: Doing the Job Right the First Time" with Willis Smith (seated), Ralph Haimowitz and 3) Connie Buffalo. 4) "EBS and the Cable Industry" with Kenneth Wright and 5) Helena Mitchell.

Read, "is to take all your test materials with you when taking the exam."

Fiber Optics Plus

"The Best of Fiber Optics Plus '92" workshop was extremely popular, often playing to standing room only. The presentation was made by Richard Mueller, vice president operations engineering at Cox Cable Communications, and Joseph Van Loan, senior vice president of engineering at Cablevision Industries.

Mueller's presentation, titled "Improvements in Outage Performance Through Fiber-Optic Deployment," detailed various tests and results on some Cox CATV systems. He presented some of his views of the future of CATV — among them "the consumer in the not too distant future will demand a plethora of service types be available at his command instantaneously." Mueller noted that broadcast media will never be able to meet this need. He emphasized that "reliability is the key strategic issue for the future of our industry" and there are "essentially three critical things involved in outage measurement: how frequently they occur (incidence); how long they last (duration); and how many customers are affected by each outage (impact)."

He detailed much of Cox's efforts with fiber in its systems to address these problems. In his conclusions he related the projected costs of possible CATV and telephone future services and said, "The telephone industry network (has) an astronomical cost — estimates I've seen range from $1,100 to $3,000 per customer. The CATV industry can adapt its current network to achieve the same functionality for only a fraction of the cost ($150 to $300 per customer)."

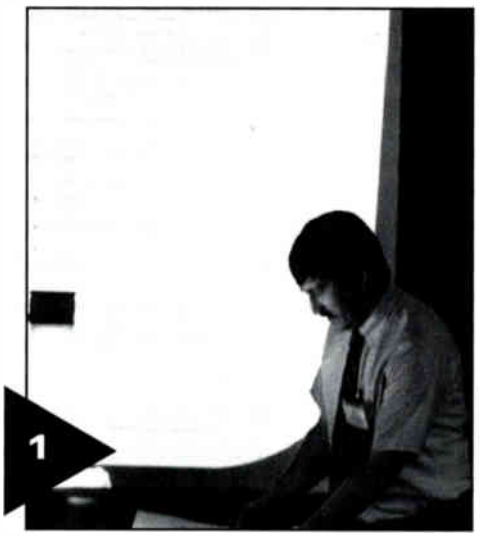
In his presentation, "An In-Depth Examination of Fiber Upgrades," Van Loan stated that his experience had shown that "FTF construction has proven to be no more costly than conventional construction, yet the superior performance has proven to be popular with both system personnel and customers alike." He noted some specifics about fiber designs (i.e., "existing designs in relatively dense areas lend themselves to FTF upgrades more readily than plant in sparsely populated areas. Designs with 100 homes passed/mile seem to be economically more practical than designs with only 30-40 hp/mi").

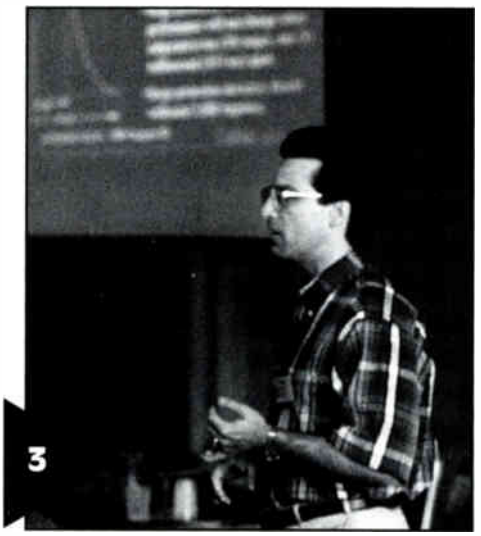
Customer service

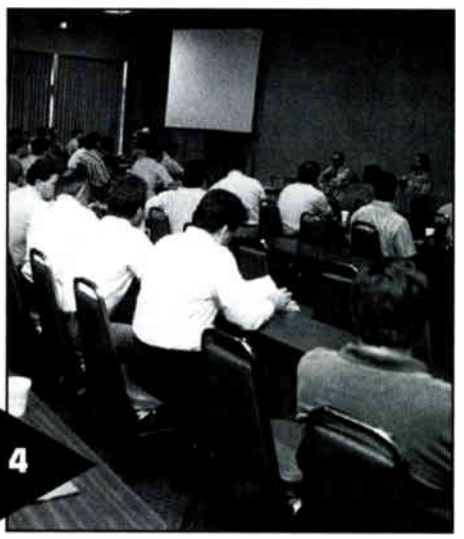
Coordinated by Ralph Haimowitz, SCTE director of training, this session provided a well-rounded look at the problems dealing with customer service. Connie Buffalo, an enthusiastic speaker from Mind Extension Institute, stated that to get people involved, we need to motivate them. Buffalo quoted the findings of a Fortune 500 study on incentives for doing the job right: #1 was working with people who treated

them with respect; #2 was interesting work; #3 was recognition of good work; and #4 was a chance to develop skills. "Create a goal for your team," she said. "Have options to appease customers."

Willis Smith, technical manager for MetroVision, provided a dissertation on customer service standards. His discussion concentrated on several main problem areas: installers not communicating, not being professional and not being friendly, and that customers can expect too much. As a result, MetroVision designed a training system for its techs and installers as well as various management levels. After the training session, MetroVision had one complaint in three months and about two in six months. Ralph Haimowitz noted that around three years ago the NCTA came up with a recommended program to improve customer service with CSR training. At that time NCTA said the main customer complaint was being kept on hold on the telephone for too long a time. However, according to Haimowitz, "the real problem was bad pictures."







1) "How Will the New FCC, NEC, NESC and OSHA Regulations Impact Your System?" with Jim Kearney and 2) Roger Keith. 3) "Outage Reduction Techniques" with Scott Bachman and 4) Robert Moel.

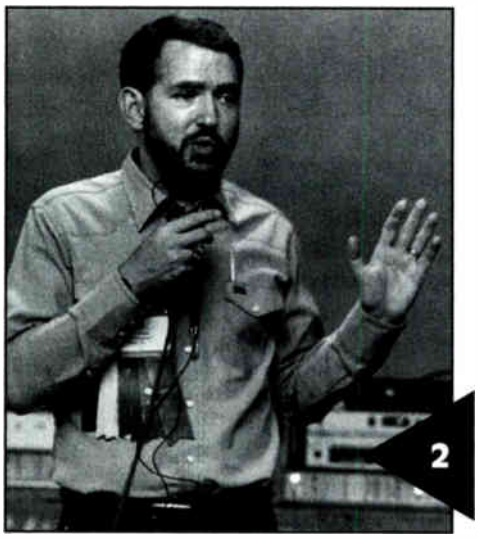
Cable turns on to EBS

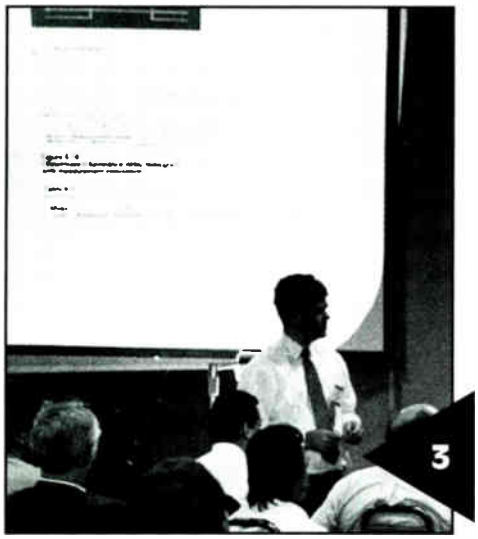
If the Emergency Broadcast System conjures up ideas of old "duck and cover" procedures from the 1950s and that ear splitting, irritating tone, you probably are one of the people who think it has outlived it usefulness. Nothing could be farther from the truth, according to speakers at the "EBS and the Cable Industry" workshop. While EBS has never actually been used for its original intent (providing an emergency connection from the president to U.S. citizens during war time and national emergency), the system is reportedly activated almost 100 times a month at the state and local level.

FCC Chief of EBS Helena Mitchell informed attendees that the commission is doing a "basement to attic review" on the system and cable TV involvement is a huge part of that. She mentioned that one consideration for improvement included possibly renaming EBS to better reflect cable's involvement as it evolves. The technical facets of EBS and automating the system so CATV could be more involved were covered by Frank Lucia, also of the FCC. Jones Intercable's Kenneth Wright discussed putting in a realistic EBS system at a financially viable level and covered details on what the SCTE's EBS Subcommittee's goals are.

Regulation changes

"How Will the New NEC, NESC and OSHA Regulations Impact Your System?" began with a look at changes to NESC and NEC. Malarkey-Taylor's Jim Kearney detailed recent and impending NESC changes including power companies being allowed to place communications lines in their space to provide competitive telecommunications services to other users on the pole, and the requirement that as of Jan. 1, 1994, all direct-buried cables must be marked to indicate the class of the cable. He then discussed the NEC code and said the 1993 version is expected to recognize NESC for clearances above ground for communications cables. He suggested that everyone get copies of the new NEC and NESC, and work out a good relationship with the power companies, asking





1) "Primary Testing Under Technical Reregulation" with Steve Windle. 2) "Secondary Testing Under Technical Reregulation" with Ron Hranac and 3) John Vartanian. 4) "Standards Deviations" with the FCC's John Wong and Michael Lance.

that attendees call him if they have a problem with them.

"As usual, I don't have any good news for you," said NCTI's Roger Keith at the beginning of his presentation on OSHA. The recent plant fire in North Carolina has affected state-planned OSHA offices, requiring them to justify themselves to the federal government. The result is that the chances are greater than ever that cable systems in state-planned states will be subject to an OSHA visit. He also discussed the new OSHA Reform Act and highlighted important areas for cable systems to focus on such as motor vehicle safety, Hazard Communications Standard compliance and ergonomics.

Outage reduction

It may not carry the high profile prestige of implementing fiber, digital compression or 1 gig, but you're probably going to hear a lot more about outage reduction in the future. The "Outage Reduction Techniques" workshop emphasized the huge importance subscribers place on low number of outages and gave an overview of the work the CableLabs' task force has been doing to study the outage situation as it exists in the industry today.

Scott Bachman, director of technical operations projects at CableLabs, kicked off the discussion with an overview of the task force's objectives: Ascertaining the effect of outages on customers; establishing range within the industry of system outage performance and developing a method of tracking; and determining what causes outages and developing recommended practices that operators or vendors can employ to reduce outages. As well, the task force took on the challenge of defining "outage." It came up with the following: "The loss of signal on one or more channels affecting two or more customers arising from a common cause. Loss is defined as an interruption rather than a degradation of signal."

The task force also set out to create a reliability model, which Robert Moel (vice president of engineering at Paragon) covered in his presentation. The purpose of the model was to create a tool to test performance of future designs before they are built and to provide an assessment to review performance of existing systems to isolate and correct reliability problems. As well, modeling is cheaper than building a test system, Moel said.

A preliminary draft of a document on the task force's findings and recommendations was circulated around the workshop. This document is set to be completed and provided to CableLabs member companies shortly.

Primary testing under tech rereg

As expected, this session on the new technical rules drew maximum attendance. Jim Farmer of Scientific-Atlanta outlined how operators need to concentrate on primary measurements in the headend and distribution system, and emphasized that this seminar would be addressing how to improve TV pictures. "Most of the measurements are made using RF," Farmer noted, "using either a spectrum analyzer or a signal level meter. These measurements will not add unduly to your burden, and will help ensure that the pictures you send to your subscribers will be of high quality." Farmer urged operators to take the time to learn the theory behind what you are

doing, and to learn how to use your test equipment properly.

Rex Bullinger of Hewlett-Packard prepared a summary of the Rules and spoke specifically about Rules 76.601 (performance tests), 76.605 (technical standards) and 76.609 (measurements). "I'm going to talk about navigating my way through the new rules," he stressed, and discussed various methods to do the tests. Wavetek's Steve Windle detailed primarily performance dealing with technical standards.

1) "Local Ad Insertion in a Tight Budget Year" with Dave Allen, Ian Dennett, Mike Watson and Barry Kenyon. 2) "Incremental Revenue in a Tight Budget Year" with Mike DeHart and 3) Peter III. 4) "Pay-Per-View Technology From Headend to the Subscriber" with Paul Braun, Greg Tresness, Henry Kalina and Dan Maloney.

Secondary testing under technical rereg

This workshop featuring Coaxial International's Ron Hranac and Home Box Office's John Vartanian began with a background of the FCC's technical standards, from those developed in the early 1970s to the recently adopted requirements in §76.605 that include provisions for certain baseband video distortion measurements in cable headends. The specific video parameters that the FCC will require cable operators to test every three years — differential phase, differential gain, and chrominance-to-luminance delay distortion — were described, along with their causes and how they affect the TV picture.

The test signals that can be used to measure the three distortions were covered, as well as the general types of test equipment necessary to make those measurements. A hands-on demonstration of acceptable measurement techniques was performed, with an emphasis to attendees that shortcuts using lower quality equipment will not be adequate for compliance with the new rules. It was pointed out that the cost of suitable test equipment will range from a low of $26,000 to as much as $45,000. Hranac and Vartanian commented that since many individual systems will have difficulty justifying such a purchase, it's likely that MSOs will have to acquire one or more sets of the equipment and bicycle it among their systems. Alternatively, system operators may be able to lease or rent the equipment, or make use of third-party firms that can make the required measurements on a contract basis.

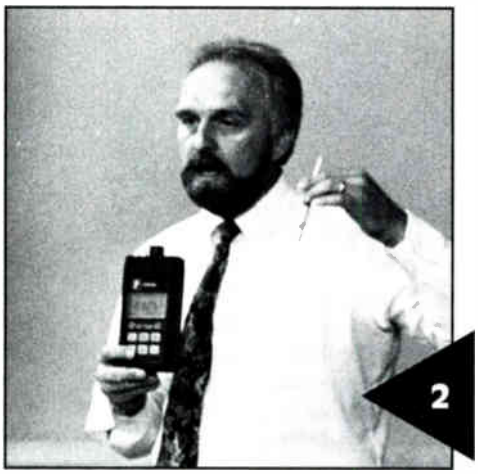
New FCC rules

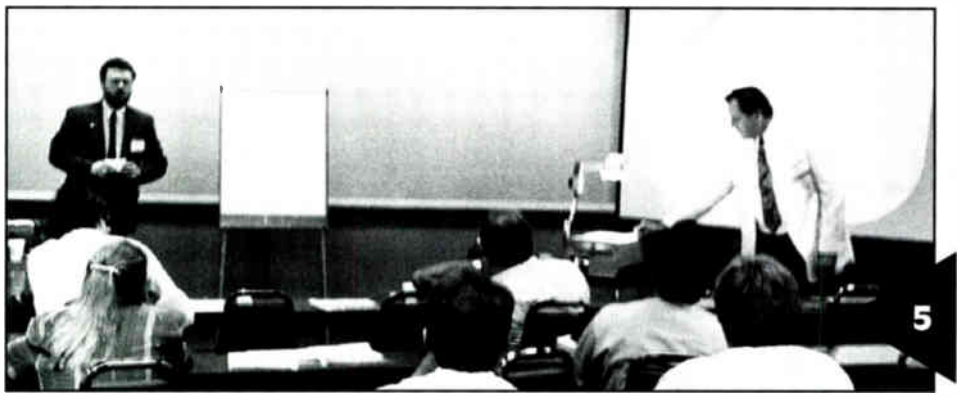
If you have something atypical about your system that affects your compliance with the new Federal Communications Commission technical rules, there was a chance to get your questions and concerns answered at the expo by the FCC's John Wong, assistant chief of the Cable TV Branch, at the "Standards Deviations" workshop. Wong covered the gamut of the new rules during his discussion and pointed out areas where a special situation might pop up. For example, he explained that the commission did not expect a cable system to improve upon a signal over which the operator had no control — say a weak broadcast signal.

Also at the workshop was FCC Electronics Engineer Michael Lance who discussed the improvements in CLI filing and the reduction in careless errors on the forms. His recommendations for better CLI filing compliance included not basing a decision for a flyover on price alone ("Having to do the flyover again will cost more") and careful explanation to the commission on any unusual factors in your system that might make the CLI filing look different.

LO production trends

Coordinated by Paul Braun Jr., ATC-National Division vice president of programming, this session on local origination focused on video formats and the selection process. Neil Neubert, manager of video recording products for JVC Professional Products, covered the three most popular formats — 1) color-under, 2) MII and Betacam, and 3) digital — and their attributes. Color-under (S-VHS, Hi-8mm





Technical demos at the Exhibitor Training Center were done by : 1) CaLan's Bill Morgan, 2) Multilink's Bob Jemsen, 3) Telecommunications Techniques' Mike Provencher, 4) Triple Crown's Karl Poirier, 5) Microwave Filter Co.'s Bob Paul and Vince Cupples, 6) Tektronix' Rick Jaworski, and 7) Comm/Scope's John Chamberlain.

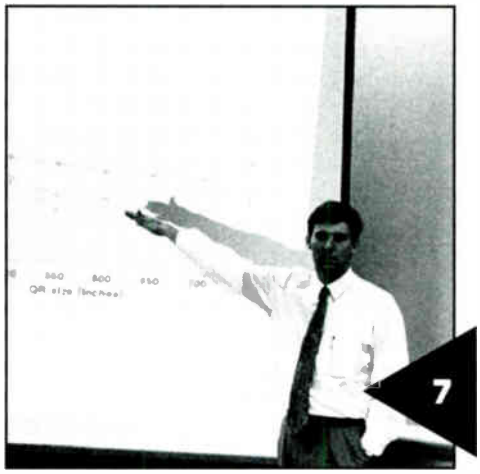
and 3/4-inch) offers satisfactory picture quality, inexpensive equipment costs, modest technical complexity and a very low cost to operate. MII and Betacam deliver good picture quality, are modestly priced, technically complex and have a modest to high cost to operate. The high end of the three, digital, offers excellent picture quality, however the equipment is expensive, and it's technically difficult and expensive to operate.

Tom James, group sales manager for Panasonic's cable unit, covered the importance of component choices, and told attendees that when making a decision as to what to buy, keep in mind the functionality of the equipment/format for future uses. He also pointed out that improvements in LO equipment will be driven by the new regulations requiring improved picture quality delivered to subscribers; operators should try to achieve a seamless look between locally originated and imported programming.

Testing video in baseband domain

You're operating in baseband domain now said Margaret Craig, manager of RF product development for the Tektronix Television Division, as she opened the local origination session on "Establishing Quality Control, Production and Maintenance Standards." The presentation centered around the proper test equipment — picture monitors, test signal generators, waveform monitors and vectorscopes — and techniques used to optimize signal quality in an LO operation.

Craig said the single most important



thing to do as an LO system gets more complex and goes to a synchronous environment, is to ensure the system timing is set correctly. She also addressed the use of frame synchronizers to mix video from a remote source with an in-house one, and measuring various linear and non-linear distortions. Craig closed out her discussion with a brief look at audio (for video) covering design issues including balanced inputs, voltage distribution systems and reference levels. She emphasized two points when dealing with stereo audio: The phase and amplitude of the of the left and right channels must be properly matched, and the wiring polarity is very important when going between mono and stereo.

Some of the SCTE subcommittees that met at the expo were: 1) the Scholarship Subcommittee, 2) the In-Home Cabling Subcommittee, and 3) the EBS Subcommittee.

Local ad insertion in a tight budget year

Citing loss of revenue due to lower pay unit buys and bottom line pressures to raise rates, moderator Ian Dennett, manager of ad sales and marketing for ATC's National Division, said increased local ad sales can help relieve both these concerns. In 1981 local ad sales revenues per sub were $13.50; in 1995, he said, they should be $25/sub. How LO operations can achieve growth and still live with a tight budget isn't easy.

Barry Kenyon, western region sales manager for Texscan MSI, provided six ways to "cost-effectively" expand existing systems: 1) Place any decommissioned VCR controllers back in service. This is a short-term approach with costs ranging from $0 to $2,500. 2) Determine if existing controllers have any unused satellite inputs; cost is $0 to $2,500. 3) Check with your equipment sales rep to see if any used or demo controllers are available; they can be discounted 25-50 percent. 4) Purchase a controller with one deck for random sequential insertion. The next budget year, upgrade it and run a second deck for random access insertion on any one-minute avail network. Your cost: $2,500 to $4,500. 5) Purchase a shared network controller with modular expansion from a 1:1 to a 16:8 configuration; cost is $3,100 and up. 6) Purchase a controller with dual satellite inputs with one deck for random sequential insertion now and add additional decks next budget year; your cost is $5,400 to $10,000.

Dave Allen, sales vice president for Ad Systems Inc., pointed out that while spending $10,000 (initial equipment outlay) to do insertion on four channels may strain some budgets, keep in mind it can be used for PPV promos as well as ad sales. Increased PPV buys in addition to the ad sales revenues can help justify the cost.

The final panelist, Channelmatic Vice President of Sales Mike Watson, said to look at the whole picture before you make an equipment selection, stressing approaches that match expense to revenue are the way to go. He also pointed out that low-cost equipment sometimes has higher operating costs. For those considering digital equipment, Watson said that depending on the system's size and application it could be cost-effective, particularly in larger ad insert operations doing it with 12 channels of full random access. All three panelists indicated that in late '92/early '93 there will be a lot going on with digital ad insertion.

Implementing tech standards

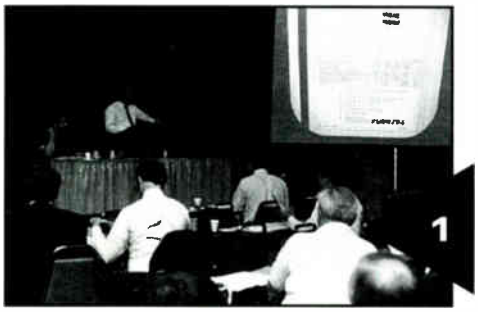
The local origination sessions workshops continued with "Local Implementation of Network Technical Standards," moderated by ATC's Dave Franklin. Viacom's Mike Aloisi began with a brief history of the company's Network Operations Center, then discussed programming service locations by satellite. He also covered commercial insertion transmission parameters, commercial insertion for the NCTA ad campaign, monthly video and audio performance test procedures, and Viacom's test schedule.

ESPN's Jon Eberhard highlighted the Blackout Switching Retune System. He also said that blackout programming will be on Galaxy I, Transponder 6 until October; on Galaxy I, Transponder 14 until April; then on Galaxy V, Transponder 14 from April on.

Wes Hanemayer of Turner Cable Networks talked about problems with Turner signals, including the fact that CNN sometimes drops ads for late-breaking stories, and that 0 dB of audio is delivered while everyone else is at 8 dB, but "we're not adverse to changing it, maybe going up 1 dB a month." He also said he'd like to have cable operators match audio levels.

Incremental revenue

Ideas for bringing more money into cable systems were provided at the LO workshop, "Incremental Revenue in a Tight Budget Year," moderated by ATC-National Division's Paul Braun. Peter III of the Weather Channel highlighted TWC's "crawl," a 48-second long advertising vehicle accommodat-



The 1) Interface Practices Subcommittee, 2) CLI Subcommittee, and 3) Design and Construction Subcommittee met as well.

ing 255 or 280 characters. He described how systems can use it, how to sell it and what types of businesses might buy it, such as hardware stores, sporting goods stores and furniture dealers.

Turner Cable Network's Mike DeHart discussed Headline News' *Local Edition*, a twice-hourly, six-minute segment that allows operators to add local news and sell local ads. He focused on the technical concepts involved, including insertion methods and timing, and suggested operators have eight-12 inserts in a 24-hour period.

Digital Planet's Doug Talley suggested digital audio as an incremental revenue source, saying ops could use their experience selling premium and PPV to sell it and that multipay households, basic-only households, music lovers and businesses using Muzak are all potential subscribers. He predicted pay-per-listen opportunities and a music version of home shopping five years down the road.

PPV technology

Another programming-focused workshop, "Pay-Per-View Technology," (moderated by ATC's Henry Kalina) covered the options, from simple to complex. Jerrold's Dan Maloney discussed addressability as an option and the equipment required to implement it. Benefits include tight office control, enhanced customer features, improved picture quality and expandability to future applications.

Greg Tresness of Arcom Labs focused on traps, dispelling the misconception that addressability is absolutely necessary for PPV. He then talked about Arcom's Gaussian System, a cost-effective way for operators to offer infrequent PPV events, and looked at ways filters could be distributed.

ATC's Paul Braun examined PPV from programming, marketing, order-taking and engineering perspectives. He felt order-taking was a big stumbling block, citing the fact that 10 percent of potential customers are lost because of trouble with the ordering method. He suggested operators implementing PPV have a barker channel, get an on-site PPV manager, implement IPPV if possible and dedicate more than one channel to PPV.

Vendor demonstrations

The workshops weren't the only way to brush up on your CATV know-how. If you wanted details on a specific company's product or service and what it could do in your system, you could always head for the company's booth or even attend one of the in-depth technical demonstrations in one of the rooms designated as part of the Exhibitor Training Center. Just a few steps from the convention hall, exhibitors demoed their products and let attendees ask questions and tweek the products in a hands-on training atmosphere. Vendors participating included the following:

- Microwave Filter Co.'s Bob Paul and Vince Cupples focused on basic filter design and CATV filter applications.
- Comm/Scope President John Chamberlain's presentation centered on fiber/coaxial cable hybrid system designs from the passive component point of view. Data from an analysis of the most cost-effective coaxial cable to use in fiber rich systems showed that larger, lower loss cable is more economical to use because less actives are needed.
- Carrier-to-noise measurements using the CaLan Star 2010 SLM and the CaLan 1776 and 1776-1E sweep system/spectrum analyzer were explained by the company's Bill Morgan.
- Multilink's Bob Jemsen detailed some of 3M's products including the 9XT light source, Photodyne 1700/1710/1720 light sources, and the 8000XG fiber identifier.
- Ray Blair detailed how to measure RF carrier level and frequency, audio-to-video ratio, carrier-to-noise (on and off channel) and more with the Sencore SL750A.
- Rick Jaworski (product marketing manager, RF and Cable TV products, Tektronix Television Division) covered system sweeping using the Tek 2721/2722 non-interfering sweep equipment.
- Sachs Communications' Outside Plant Specialist T.E. "Stoney" Connor described his company's solutions for reducing service calls by way of training and custom-designed products.
- Telecommunications Techniques Corp.'s Product Marketing Engineer (T-Berd Division) Mike Provencher discussed acceptance testing of fiber-optic CATV systems using the Fibertech 462 Optical Smarts single-mode attenuation/reflection test set.
- Triple Crown's Karl Poirier highlighted his company's Titan trunks, Minex Ultra-Small line extenders, LA indoor/outdoor distribution amplifiers and TDA subscriber drop amplifiers. →

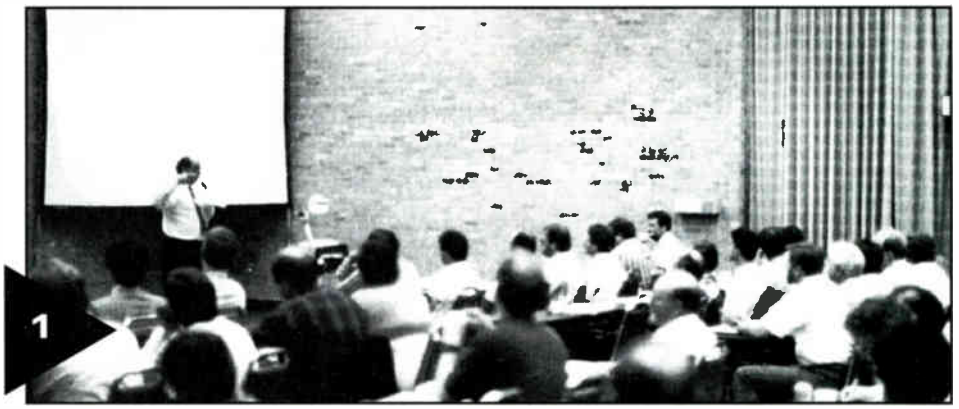
NCTA technical standards seminar

The first NCTA technical standards seminar (held the day before the expo) opened to a standing-room-only audience. More than 350 engineers and technicians crowded the meeting room to listen to NCTA Vice President of Science and Technology Wendell Bailey open the day-long session.

Diane Burstein, assistant general counsel for the NCTA, led the agenda with a presentation covering regulatory and legal issues concerning the new FCC rules and regulations. Ted Hartson, vice president and chief engineer of Post-Newsweek Cable, who has conducted many CLI seminars as "Dr. Strangeleak," reappeared under a new nom de plume — "Dr. Strangelook." Covering the new technical standards, Hartson's presentation was detailed, interesting and informative.

After lunch, the seminar continued with a lively Q&A period. Later in the afternoon, Dr. Strangelook took over again with a presentation on test techniques. Moderated by Wendell Bailey, the roundtable discussion with John Wong of the FCC; Jonathan Kramer, co-chairman of the Cities/NCTA joint task force; and Hartson provided insight to the mindset of the FCC and the cities. The NCTA plans several of these seminars over the next year, with the next one to be held in Boston in August, followed by one in Chicago in September. The schedule will be announced when dates and locations have been finalized.

Watch for details to be published or call the NCTA computer bulletin board (BBS) at (202) 775-3663 for the complete schedule and details. Registration will be required and can be accomplished by fax — (202) 775-3698 — or the computer BBS.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1) NCTA held a seminar on the reregulation of technical standards the day prior to the Engineering Conference. 2) BCT/E exams were administered at both the technician and engineer levels. Installer Certification exams also were given. 3) The SCTE board and staff fielded questions during the annual Membership Meeting following the Engineering Conference.

SCTE subcommittees

In addition to the SCTE's Scholarship Subcommittee, which got together Sunday, the Society's engineering subcommittees met early on the last day of the expo and continued on into the afternoon. A roundup of the engineering meetings follows.

The In-Home Cabling Subcommittee, chaired by Comm/Scope's Larry Nelson, met early Wednesday. Nelson covered the subcommittee's objectives, organization and mode of operation. Items discussed by working groups were cabling and architecture, passives and in-home amplification, connectors, test procedures, and intrapremises cabling.

The Emergency Broadcast System Subcommittee meeting featured the FCC's Chief of EBS Helena Mitchell offering up recommendations to the subcommittee as to how it could get the ball rolling in response to the FCC's pending Notice of Inquiry. Audience members kept Mitchell busy

1) After stretching one's brain with the myriad of training opportunities offered throughout the expo, the river level at the San Antonio Convention Center provided a relaxed place for discussion.

fielding questions on what kinds of EBS systems would be most applicable to cable and what the FCC would expect of cable in its involvement. The FCC's Frank Lucia and John Wong were at the meeting as well to help quench subcommittee members' seemingly unquenchable thirst for information on EBS. Wong cautioned the subcommittee on the perils of adding another box on top of subscribers' TV sets for EBS purposes. Chairman of the EBS Subcommittee Kenneth Wright also helped answer questions like "How involved would local city officials be in a cable EBS system?" and "What about the possibility of being able to have an EBS system through cable TV wherein the TV set wouldn't even have to be turned on for an emergency signal to be brought into the home?"

The open meeting of the Interface Practices Subcommittee began with a few brief remarks from its chairman, ATC's Dave Franklin, and then the podium was turned over to George Bollinger of Comm/Scope, who heads the Drop Working Group. The first order of business was adoption of specs for the recommended male feed-through F-connector, complementing the group's recommended female F-port specs released in March. The European standards group CENELEC is reviewing these recommended specs for possible adoption as well. Presented for review and comments were recommended specs for the optional "trap" male F-connector, and the 59 and 6 Series male push-on F-connector. The Mainline Working Group's chairman, Jack Radzik of Augat/LRC, then took the floor where discussion centered on the proposed specs for the 5/8-24 female and 5/8-24 pin-type male interfaces.

SCTE's immediate past president, Wendell Woody, kicked off the now open-ended CLI Subcommittee meeting with a brief overview of how the SCTE is organized, its relationship with CableLabs and NCTI, and the Engineering Committee Manual. Chairman Terry Bush took suggestions for developing the new charter, one of which was to change the name to Signal Leakage Control Subcommittee. Six working groups were set as follows: 1) training, 2) public relations, 3) equipment survey, 4) status, 5) complaints and 6) SMATV.

The inaugural meeting of the Design and Construction Subcommittee was kicked off by SCTE's Wendell Woody, who provided an overview of the Society's organizational and committee structures. He then introduced the subcommittee's chairman, Keith Burkley of ATC, and secretary, Bruce Habeck from Antec. TCI's Tom Elliot, chairman of the parent Engineering Committee, spelled out the need for this new subcommittee and the desire for making it a proactive group. Burkley took over the meeting and revealed four planned working groups, each of which will be co-chaired by one operator and one vendor representative. The working groups are: 1) basic construction, co-chaired by Paul Wilson of Comm/Scope; 2) fiber construction, co-chaired by Bernie Czarnecki of CableMasters; 3) design (which was broken down into two task forces, one covering CAD and the other on engineering/make-ready/mapping); and 4) upgrade/rebuild. This subcommittee (just as all SCTE engineering subcommittees do) has an open membership available to all interested parties. You merely need to attend a meeting to become a member. For more information or to participate, contact Burkley at (303) 799-5517.

The engineering subcommittees are scheduled to meet again during the Atlantic City (N.J.) Show, Oct. 13-14.

Exams and Q&A

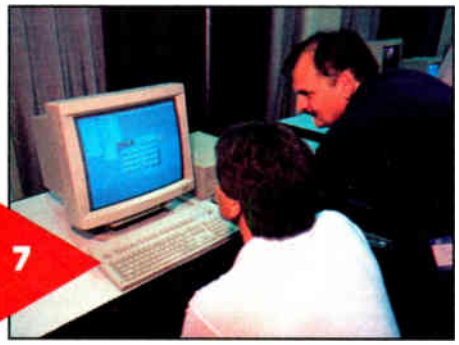
That was a lot of opportunity to expand your cable TV technical know-how. But if you still wanted more, there was a chance to prove your CATV prowess by way of the Broadband Communications Technician/Engineer Professional Designation Certification exams at the show. Exams were administered Monday, Tuesday and Wednesday at both the technician and engineer levels. Installer Certification exams also were given.

And speaking of Q&A, immediately following Sunday's Engineering Conference, the Annual Membership Meeting was held. Members took this opportunity to pose questions and express their concerns with the Society's board of directors and national staff representatives. — *TB, LH, LL, WL, RH, SO, RP*

Hitting the floor

And you thought there was a lot to see on last year's expo exhibit floor in Reno, Nev.! It's hard to fathom, but you still had more to see this year. Expo '92 boasted 208 exhibitors (up from Expo '91's 189) at the San Antonio Convention Center. Vendors displayed the very latest in CATV technology as well as old favorites: demodulators, pay-per-view systems, status monitoring, power supplies, TDRs, OTDRs, couplers, stripping tools, drop clamps, fiber test sets, design software, sweep systems and really just about all that you could possibly have on your wish list.

Whether your fancy was seeking out a digital HDTV demo, or seeing what's available for 1 GHz, or reminiscing with historic equipment, the expo floor had you covered (even if it was a challenge for you to cover the whole expo floor).



1-4) Expo attendees peruse the wares in 208 exhibit booths. 5) The National Cable Television Center and Museum's Pamela Czapla shows nostalgic equipment to the SCTE's Bill Riker and Wendell Woody. 6-7) The Training Lounge offered expogoers the opportunity to perform a fiber splice and view numerous training aids via computer.

SCTE booth

If you stopped by the SCTE's membership booth directly outside the convention hall, you could pick up SCTE T-shirts, golf shirts, coffee mugs, design templates, literature, videotapes, and more. As well, you could even join the Society (if you're not one of the over 10,000 members already). Familiar Society faces could be seen manning the booth and answering questions or just catching up with the membership.

Equipment from yesteryear

The National Cable Television Center and Museum was taking donations of historic cable TV equipment at its booth again this year for possible inclusion in the SCTE Room in the museum at Pennsylvania State University. Looking at the old CATV tools and a loyal (yet somewhat beat-up) lasher at the booth provided an excellent way to keep in perspective just how far our industry has come.

Training lounge

If you've thought about the benefits of interactive video training, there were displays in the Training Lounge on the exhibit floor to let you get a hands-on look.

Mind Extension Institute offered up video training in both "General Safety" and "Installer Training." Scientific-Atlanta covered "Distribution Architecture and Balancing Techniques" while "Your Line on Cable" (a non-technical introduction to cable for CSRs and marketing personnel) came from Viacom Cable. The National Cable Television Institute's general contribution to training was covered in the Training Lounge as well as Gilbert's computer-based training. Alpha showed its "CAT-PAK" training for power supplies and ATC covered "Troubleshooting Cable TV Systems."

In addition, AT&T, Optical Networks International and Sumitomo sponsored fiber-optic splicing in the Training Lounge. At final count, 229 participants received personalized certificates for performing mechanical splices.

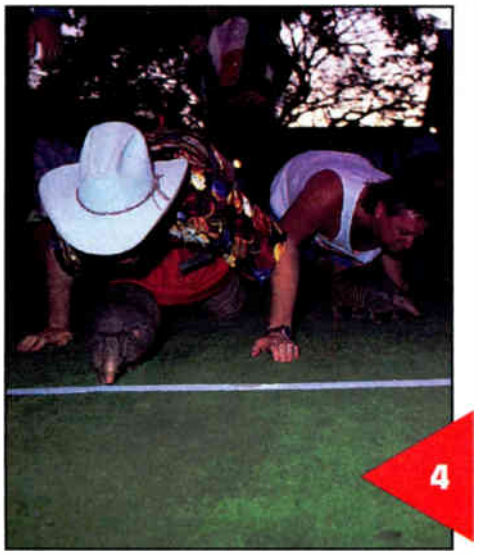
For details on new products released at the show, turn to page 74. — *LH, WL*

Kickin' back in San Antonio

If you couldn't find something exciting to do after a big day at Cable-Tec Expo '92 in San Antonio, well, then you just weren't trying hard enough.

Seemingly mild-mannered cable TV engineers and techs who weren't already in cowboy attire (which was the official dress code of this year's show) slipped on their Lucchese boots and Stetson hats at night and descended on the expo's receptions and parties. Then there were always the hospitable establishments on the famous Riverwalk. (No official count is available on just how many expo attendees "decided" to take a "swim" in the river. Sorry.)

Kicking if off on Saturday night, Wavetek continued its tradition of sponsoring the Arrival Night Reception complete with beer/soda mug giveaways. (Just a few more expos, and most SCTE members will have a complete set.) On Sunday night, Philips Broadband Networks, Power Guard, Times Fiber Communications, U.S. Electronics and the SCTE sponsored the Welcome Reception at the River Court of the convention center.



Expo Evening

Sure, you remember the Alamo. But how many of you who attended the show got caught in the "tequila jail house" once too often and are a little vague on Expo Evening?

Held at La Villita and sponsored by Antec, Comm/Scope, Jerrold, Scientific-Atlanta and SCTE, this year's bash was a "Texas/Mexico Border Party." On the Texas side you could strap on the old feed bag with down home vittles like chili, beef stew and cobbler. If you could

1) Many saw their first expo cowpokes during the Arrival Night Reception. 2) Expogoers enjoy the Welcome Reception, 3) complete with a mariachi band. 4) Armadillo "jockies" coax their steeds to the finish line during Expo Evening. 5) Relating and rockin' on the Texas side at Expo Evening. 6) SCTE staffers and friends shoot the breeze during Expo Evening. 7) Among other delectables, Expo Evening offered south-of-the-border sweets.

slip across the "border" safely, tamales (gringo and hot), chili con queso, and homemade corn tortillas were waiting there. "Border guards" would try to apprehend revelers at the border and if you got caught without a "passport" you spent time in the tequila jail house. You didn't have to post bail, but you would have to partake in a shot of tequila to get out.

In addition to food and spirits, Expo Evening offered armadillo races, dancing, caricature drawings and the Second National Cable-Tec Games. The Games had 16 contestants from across the country competing in events designed to test CATV skills and knowledge. Ron Wolfe of the ATC National Training Center and chairman of the Cable-Tec Games Subcommittee organized the competition, which was sponsored by SCTE, Antec and *Communications Technology*. Wolfe also emceed the Games along with Eric Himes of Phillips Broadband. Scoring and rules enforcement were provided by Pam Nobles of Jones Intercable and Shelley Ollig of *CT*.

Events and their sponsors were as follows: "Splicing," Gilbert/Comm Scope; "TDR Fault Location," Riser Bond; "Go Fetch," ATC National Training Center; "Cable Jeopardy," National Cable Television Institute; "Signal Analysis," CaLan; "SLM Testing," ComSonics; and "Amplifier Technology," Phillips.

Cheerleading, organization and "competitive threats" came from team captains Richard Covell, Rich Henkemeyer, Eric Himes and Don Runzo. Particularly popular was the "Cable Jeopardy" event, which had enthusiastic spectators trying to get the "question to the answer" before the contestants.

The final results of the Second National Cable-Tec Games were very close. Gold, silver and bronze medals were awarded to the following contestants for first, second and third place:

- "Splicing": Bruce Brossom (Henkemeyer's team), first; Gene O'Brien (Runzo's team), second; and Gordon Bennett (Henkemeyer's team), third.
- "TDR Fault Location": Frank Anderson (Covell's team), first; Kelly Watson (Covell's team), second; and Lloyd Stewart (Himes' team), third.
- "Cable Jeopardy": Jimmy Smith (Covell's team), first; Al Wilke (Henkemeyer's team), second; and Bill Watson (Runzo's team), third.

- "Go Fetch": Wilke, first; Denny Karr (Henkemeyer's team), second; and Jimmy Shultz (Runzo's team), third.

In the overall scoring category, a minor glitch in the scoring program resulted in the incorrect results being announced. Wolfe said, "I wish I could blame it on the heat and humidity, but when rewriting the spreadsheet, I missed a bug. Al Wilke actually won the overall competition with the announced winner, Bill Watson, finishing a very close second."

Third place overall went to Jimmy Smith. As for overall team results, Henkemeyer's team took first overall with second and third going to Runzo's and Himes' teams respectively.

Due to the mix-up in scoring, both Wilke and Watson received the grand prize of an expenses paid trip to tour the Phillips manufacturing facilities in Manlius, N.Y. The grand prize was presented to Watson by Al Kernes of Phillips as part of the closing ceremonies and Wilke will receive his award from Wolfe and the ATC Training Center.

On a Cable-Tec Games record note, Wilke's showing secured him enough medals to make him the most decorated contestant in the history of the Games. The national competition will be held

1) Cable-Tec Games included "TDR Fault Location," 2) "Splicing" and 3) "Cable Jeopardy." 4) Games' winners: Rich Henkemeyer, Gordon Bennett, Denny Karr, Al Wilke (who also won individual gold) and Bruce Brossom. 5) Hams gather at their reception for door prizes with 6) SCTE of Counsel Steve Ross' assistant picking winners.

1) Members of the EIA of Japan and 2) engineers from Latin America met with SCTE representatives to exchange ideas and ask questions. 3) Worldly minglers and 4) hungry conferees from all over the globe broke bread at the International Good Neighbor Reception.

again at next year's expo and watch for regional Games at shows in your area.

Ham reception

As you were looking through the June issue of *CT*, you might have noticed the "Ham operators in CATV" listing and just how extensive it is. Amateur radio ops had the opportunity to chat face to face with fellow hams and win door prizes at an Expo '92 reception. (Also see the "Editor's Letter," page 6.) Scientific-Atlanta provided the refreshments and a door prize. Other companies donated prizes as well and the big winners were as follows:

- Shirley Seal (N7LEP), who is the wife of Thale Seal of TCI, won the Kenwood HF transceiver donated by S-A and TCI.
- Martha Haworth (KD4FAC), who is the wife of Jim Haworth of ATC, took home the Yaesu 6-meter transceiver donated by ATC.
- The standby power for computer or ham station was donated by Alpha and won by US Cable's Jeff Spence (KA0QEJ).
- Video Cable Communications' Gustavo Salas (LU3DNN) won NCTI's donation of a Yaesu dual-band handie-talkie.

Other door prizes were donated by Antec, Jerrold, Lectro, Hewlett-Packard, Wavetek, CaLan and Texscan.

Meeting our world neighbors

Technical personnel from abroad came to the Expo this year to see what's up with cable here as well as to enjoy the social aspects of the show.

On the business side, members of the Electronic Industries Association of Japan (EIAJ) and engineers from Latin America met with SCTE board members to exchange ideas and ask questions. SCTE Chairman Ron Hranac, President Bill Riker and Region 12 Director Walt Ciciora fielded questions about the future of U.S. cable, the Queens 1 GHz project, telephony, competition from direct broadcast satellite (DBS), the impact of expanded bandwidth and fiber use. Hranac and Ciciora also shared comments about how U.S. and Japan CATV are related and how they're different.

Following this, Spanish-speaking attendees met with SCTE Past President Wendell Woody as well as Hranac, Riker and Ciciora to discuss the possibility of SCTE chapters being formed in Latin America. The board members said that the U.S. Society wouldn't expand its borders but it would, along with the International SCTE Council, help these countries form their own Society. Riker also mentioned that they could join the U.S. Society to receive all the materials U.S. members receive. Attendees also asked about the possibility of receiving SCTE materials in Spanish, the provision of translators at future seminars and more workshops with an international focus (all of which is under consideration).

On a more social note, techies from all over had a chance to mingle over munchables at the International Good Neighbor Reception. SCTE's Woody acknowledged the events sponsors — Cable Lock Connectors, Electroline, Lindsay, Nexus, Triple Crown and SCTE — and recognized two gentlemen for their contributions. Triple Crown's Karl Poirier and the Ontario SCTE's Ken New received special awards for advancing the SCTE through their support of the National Canadian SCTE Council and International SCTE Council.

Golf tourney

On the final day of the expo, 144 of the industry's best *technical* golfers participated in the first annual SCTE Cable-Tec Expo Golf Tournament. The tourney was a four-man scramble and was followed by a Texas barbecue luncheon and awards ceremony. Team prizes, closest to the pin awards, long-drive awards and over 50 door prizes were given away.

After the conclusion of play, taking the title of SCTE National Golf Champions was the team of Art and Steve Whitaker (both of Sawtre Electronics), Jack Trower of WEHCO Video, and Mike Sprague of Prime Cable. Second place went to the team of Comm/Scope's Jim Baldwin, MetroVision's Vic Gates, Nexus' Bailey Shewchuk, and Southwest Micronet's David Murphy. The third place award went to the team of Tony Barclay of Optical Networks International, Steve Brown of TCI Central Division, Matt Besette of Jerrold, and Herman Holland of Lawton Cablevision.

With that, another bigger and better expo is a wrap. See you April 21-24 for Expo '93 in Orlando, Fla. — *LH, SO*

Troubleshooting coaxial cable

(Continued from page 18)

pole. The problems in the underground areas come from people who outright cut your cable in two and then you have the sneaky ones who nick it, cover it back up and say nothing (waiting for a potential problem later on).

What you'll need

The tools of the trade to troubleshoot these sorts of problems, assuming one has used the appropriate wrenches for the conglomeration of the different hardline cables and the hand 7/16 wrench to eliminate any drop cable problems, will be a signal level meter (SLM), ohm meter, a leakage detector, time domain reflectometer (TDR), a sweep system and a TV set. Most of the time, troubleshooting a drop problem is much simpler than troubleshooting a hardline problem. If the problem has been identified in the drop or in the drop cable itself, the best thing is to replace that portion of the drop. By portion, I mean from the pole to the home ground block or from the ground block/splitter to the converter or customer terminal.

By using the tools of the trade mentioned, one can narrow down a problem to a specific length of cable and have an idea of what type of cable fault to expect. Center conductor problems tend to affect low frequencies whereas shield problems affect the higher frequencies.

Sweep systems can be used to determine whether the cable is faulty, but not necessarily where. Leakage detection equipment is useful in locating cracks and large holes in the cable. However, it will not locate all faults and must be used while the suspected cable is still attached to the cable system. Ohm meters may be used to localize an open or shorted cable. Once the problem has been segmented to a particular cable run, but the fault has not been identified, the TDR may be used to identify and determine the location of the fault. Then appropriate measures may be taken to implement successful repairs.

Coaxial cable has been used in cable systems for the past 40 odd years and, even with the rapid deployment of fiber optics in cable systems today, the cable industry will most likely still be using coax in some form for the next 40 years. **CT**

Video signals in the headend

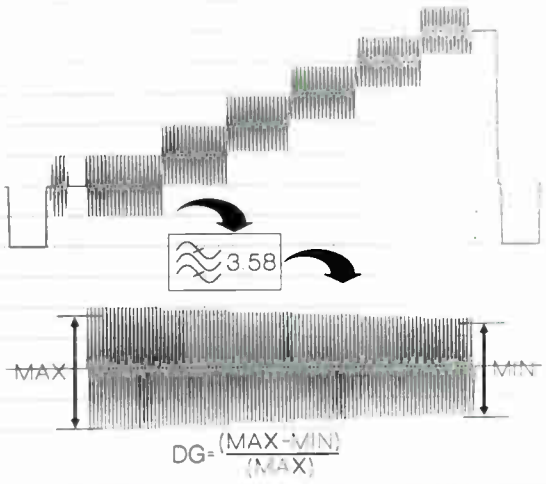
(Continued from page 21)

Figures 2 and 3 on page 21 show examples of deficient multibursts that we have found on cable systems. (The pictures were taken with a low-cost oscilloscope and a clamp/sync separator.) Figure 2 shows a frequency response roll-off of about 2.9 dB at 3 MHz. This part of the spectrum carries luminance detail information, so the picture will not be quite as sharp as it should be. By the way, we measured the baseband response by using a ruler to measure the heights of the bursts from the photo. We then took 20log the ratio of heights in inches. Measuring in volts or IRE is not necessary: When you are making ratio measurements such as this, it is only necessary to make both measurements in the same units.

You can also see from Figure 2 the effect of spectrum truncation of the last burst. It has a triangular shape due to the inability of the system to pass the high sideband.

Figure 3 shows the effect of a positive trap. The 2 MHz burst is missing and the higher bursts are grossly reduced in amplitude. This is the reason that channels protected by positive traps have the reputation of being "fuzzy." Also, note that the multiburst in Figure 3 is a full amplitude multiburst, meaning that the amplitude of each burst is 100 IRE peak-to-peak, and so must be measured with respect to the leading edge of the bar rather than with respect to the trailing edge. Transmission of full amplitude bursts is not recommended but is permitted for cable programmers.

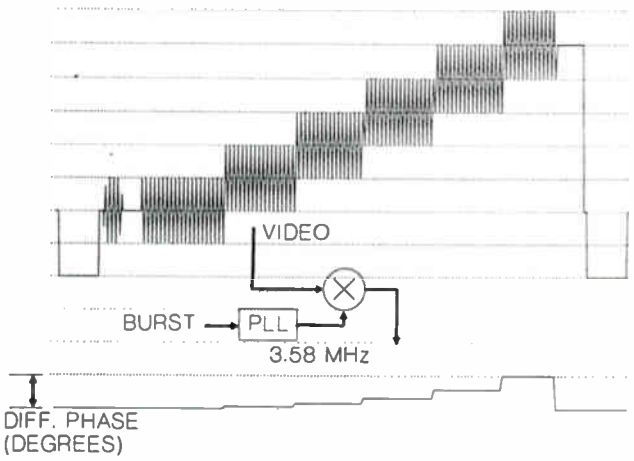
Figure 4: Measurement of differential gain



Differential gain

The amplitude of the color subcarrier determines the saturation, or "purity" of the color on the screen. Adjusting the "color" control of a TV receiver effectively adjusts the amplitude of the chroma signal. One of the important parameters that you are asked to measure in the new FCC rules, is differential gain. This is a measure of how much the chroma amplitude changes as the luminance level on which it rides changes. To appreciate the importance, consider a picture of a baseball stadium with green grass on the playing field. Now

Figure 5: Measurement of differential phase



consider that half of the stadium is in shade and the other half is in sunlight. The "greenness" of the grass is the same in sunlight or shade, but if we have differential gain in the system, the grass in one area will appear greener than in the other.

Figure 4 on page 49 shows the idea behind measuring differential gain. A test signal is generated on one or more TV lines consisting of several (5 or 10) steps of luminance, from 0 to 100 IRE. A gradually rising ramp also can be used. Each luminance step has superimposed on it a sample of the color subcarrier, 3.58 MHz. (OK, for those of you who take pleasure in examining things with a micrometer, you caught us: The subcarrier on this and the next figure is drawn as if it were 2 MHz. We just did this so the figure would be a little clearer. Most other figures are literally correct as far as frequencies and durations are concerned.)

If the system has differential gain, the amplitude of the subcarrier component will change on different steps. The signal is passed through a 3.58 MHz bandpass filter to eliminate all but the color subcarrier. The change in peak-to-peak amplitude can be measured, and the differential gain computed as shown in the figure. The amount of differential gain shown is 20 percent. By the way, this is a lot of differential gain. You should be ashamed to have this much in your headend. (Not that it will affect the picture that much but modern equipment can do much better, and you are not to be forgiven for low quality in your headend. For cost reasons, most of the tolerable distortion must be allocated to the subscriber end.)

Differential gain may be measured on a waveform monitor using the method shown. Vectorscopes pass the filtered signal to a detector, and display a line calibrated in percent differential gain.

Differential phase

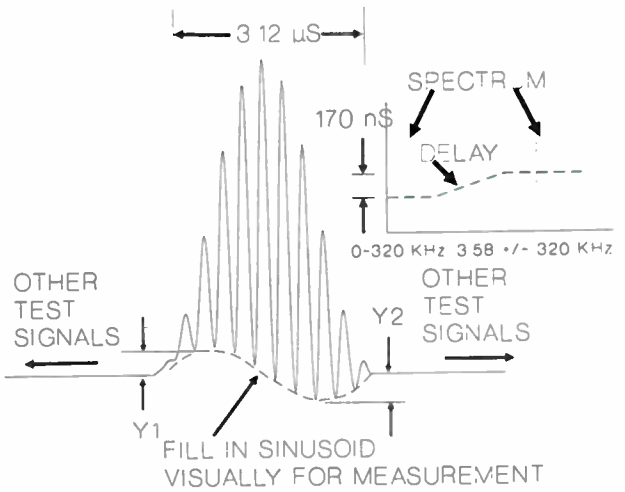
The phase of the chroma subcarrier determines the actual color or tint. Adjusting the "tint" control of a TV receiver is analogous to changing the phase of the subcarrier with respect to the burst. The primary operative specification is differential phase. Differential phase is similar to differential gain. Indeed, by sheer coincidence, they often have about the same numerical value. Differential phase is a measure

of how much the phase of the signal changes as the luminance changes. In our stadium example, if the system has differential phase, the grass could look green in the shade and blue in the sun! Obviously this is an extreme example, but the idea is that the color of the grass could change between light and dark areas if the system has differential phase.

Figure 5 shows the idea behind measuring differential phase. A 3.58 MHz oscillator is phase-locked to the burst, and supplies one input to a phase detector. The other input to the phase detector is the video signal itself. Output of the phase detector may be applied to a CRT, and will produce a plot as shown at the bottom of the figure. As the relative phase of the chroma subcarrier changes with different steps, the phase detector output changes. Note that this is not an absolute measurement. One measures the change in phase as luminance changes from 0 to 100 IRE. The calibration shown is not absolute, but if one division on the lower part of the scale represents 10°, the differential phase shown is at the agreement limit. Again, you should be able to do better in a headend.

Differential gain must be measured with a vectorscope. A waveform monitor or oscilloscope cannot measure it.

Figure 6: Modulated of 12.5 T pulse showing about 170 ns delay



Chrominance-to-luminance delay

The final baseband specification to be measured is chrominance-to-luminance delay.[1] Refer again to Figure 5, which includes the baseband spectrum. Delay is a nasty side effect of filtering that must be done to the RF and baseband signals. Some frequency components in the TV spectrum go through a filter faster than do other components. This can cause what is often termed the "funny paper effect." The name comes from the tendency in funny paper printing, to misalign the three primary colors, each of which requires the paper to pass under a different press. If the paper is not positioned precisely at each pass, the colors are not properly registered. The corresponding situation in a TV signal is group delay, a consequence of the picture spectral components at different frequencies getting through at different times. The most obvious problem (and a very

practical one) is that the color information will not make it through as quickly as will most of the luminance information. This is often due to the sound trap, which is located only 300 kHz above the theoretical edge of the video passband.

Figure 6 (page 51) shows a modulated 12.5 T pulse used to measure group delay, after the signal has passed through a system having about 170 ns of group delay. Later you will compare this with an ideal modulated 12.5 T pulse. Of interest in Figure 6 is the small spectrum diagram to the right, which shows the situation modeled in developing the figure. The lower frequency video components get through the system faster than do the chrominance components, which are "delayed." By measuring the deviation from a flat baseline of the bottom of the modulated 12.5 T pulse, we can compute both delay and amplitude differences between the luma and chroma components. The modulated 12.5 T pulse is on a line of video that also includes a bar, which is set to 100 IRE. Then the positive and negative deviations of the baseline, Y1 and Y2, are measured in IRE units. A nomograph may then be used to read both the amplitude and group delay. The nomograph has been published many places, including the video waveform chart that appeared in *Communications Technology* in November 1991.

A somewhat intuitive approach to group delay

The other measurements with which we have dealt have been rather more intuitive than is group delay. It will be profitable for us to take a few moments to develop the group delay concept and measurement further.

Chroma-to-luma delay is usually measured using a modulated 12.5 T pulse. "T" is a constant measured in microseconds, related to the bandwidth of the TV system. It is the shortest pulse that can theoretically pass through the system. The NTSC system has a maximum channel frequency response of 4 MHz (more accurately 4.18 MHz, but good luck getting this). Thus, the maximum frequency that can pass is 4 MHz. Now consider the width of the minimum pulse that can produce a white vertical line on the screen. A 4 MHz wave will, in one cycle, produce a white-and-black line pair. The minimum pulse that can produce a luminance level is thus half of this 4 MHz period.[2] This is the period we call "T." It is equal to one-half the reciprocal of the maximum passband frequency of the system. For NTSC, this is:

$T = 1/[2(4\ MHz)] = 125\ ns$

The unmodulated 12.5 T pulse has a half amplitude duration (from 50 percent rising edge to 50 percent falling edge) of 12.5 times this minimum, and a total duration of twice this. Mathematically, the 12.5 T pulse is expressed as:

$v(t) = \sin^2(t/\tau)$

Where:
$v(t)$ = voltage waveform
t = time
$\tau = 2(12.5)T/p$
T = 125 ns for NTSC

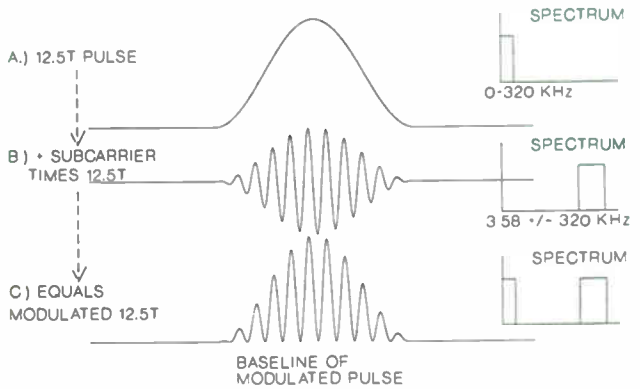
The upper waveform of Figure 7 is this 12.5 T pulse, generated from the previous formula. It occupies a spectrum from nearly 0 to 320 kHz. The spectrum occupancy is relatively uniform over this range (though not as uniform as illustrated), which also is where the majority of the luminance energy is located. To make a modulated 12.5 T pulse out of this, we use it to amplitude modulate the 3.58 MHz chroma subcarrier. The modulation is done by multiplying the subcarrier by $v(t)$ in the previous formula. This is equivalent to double sideband suppressed carrier amplitude modulation and produces the waveform and spectrum shown in the middle of Figure 7. The spectrum is centered at 3.58 MHz (the "carrier"), and extends 320 kHz either side. This is the spectrum occupied by a majority of the chroma energy (the extremes of the chroma band are further out, but this band includes most of the energy). We can measure the chrominance-to-luminance delay by combining (adding) the two signal components shown in Figures 7a and 7b, obtaining the waveform shown in 7c. This is the ideal modulated 12.5 T pulse, having the combined spectrum shown.

We can use this waveform to test for channel amplitude and delay irregularities, as intuitively developed as follows. We obtain the waveform of Figure 7c by adding the waveforms of A and B. The baseline of the modulated pulse is flat because waveform b is of precisely the correct amplitude to fill in waveform a. If the channel response is higher at 3.58 MHz than at low frequencies, the amplitude of B will be greater than it should be to fill in A. It is easy to see that in this case, the baseline of waveform c will "hang down" below the normal flat baseline, with the maximum value in the center of the pulse. The envelope of the baseline describes a cosine function in this case. On the other hand, if the amplitude of waveform b is correct but is delayed with respect to waveform a, then the peak of the 3.58 MHz envelope will arrive too late to properly fill in the center of waveform a. This is the delayed chroma case illustrated in

Figure 7. The baseline envelope describes a sinusoid. In general, a channel can have both amplitude and delay errors, resulting in a waveform between a sinusoid and a cosinusoid. The response errors can be determined with the aid of the nomograph referenced previously.

Referring again to Figure 6 (page 51), it includes a small spectrum display showing the concept of delay in the frequency domain. The theory behind measuring group delay with a modulated 12.5 T pulse is based on the assumption that the delay is flat over the luma bandwidth occupied by the modulated 12.5 T pulse. It also is assumed to be flat over the spectrum occupied by the chroma subcarrier, but between the two bands the delay changes. This is a useful approximation, but is hardly real-world! In practice, one often can assume that the delay is flat over the luma band. Over the chroma band, the amplitude and delay response often are anything but flat. The effect is to distort the baseline of the 12.5 T pulse so that it is not sinusoidal. Reading the delay in such a case is somewhat questionable, as is the whole concept of group delay. The group delay concept is none-the-less useful, and going further is the subject of future work.

Figure 7: Composition of 12.5 T waveform



Getting all test waveforms

The test waveforms shown previously are all available from any of a number of test signal generators that you might own. However, you don't need (or really want) to use them for most signals because what you need to measure is the performance of the entire headend signal chain. Fortunately, many broadcasters and cable programmers supply these signals free of charge. These and other signals are located in the vertical blanking interval (VBI) of signals you are carrying now. We call these vertical interval test signals (VITS). To evaluate the overall performance of your system, simply demodulate the output of the channels you are carrying, and look for the VITS in the VBI. You will need a waveform monitor (vectorscope required for measuring differential phase) and a good demodulator.

Your first requirement will be for the best demodulator you can get. Since demodulators will add distortion, it will be worth your while to buy a professional frequency agile demodulator if possible. Some excellent professional demodulators only tune one channel, having been designed originally for off-air applications not requiring agility. Fixed-channel input converters will yield the highest quality input, but

make it difficult to test all channels. If your demodulator will accept an IF input at the TV standard IF of 45.75 MHz, you can take the IF output from your modulators and processors and demodulate it. This will generally allow you to test most of the signal chain, with the exception of the output converter of the modulator or processor. The output converter can affect frequency response but is not likely to have an appreciable effect on delay response if the frequency response is within reason. You can sweep the output converter with a conventional sweep setup to confirm its performance.

Alternatively but not recommended, you can use an RF (never a baseband) set-top converter in front of the demodulator, but you must be very careful to confirm the performance of the set-top. They are not made for measurement applications and do not have appropriate specifications. If you must use one, you should consult the manufacturer for instructions as to how to sweep it, and pick out the best converter response you can find. After taking into account the response of the converter, it may still be a limiting factor in how well you can measure VBI signals. Caution: the response of a converter will not be the same on every channel. Some of the photographs in this article were taken using Scientific-Atlanta RF set-top converters and 6250 demodulators.

If you can't get anything better, you will still be able to get some information from the baseband output of a TV set or VCR. In this case, unless you have some way to independently test the performance, your ability to make measurements will be very limited, and you may well not be able to measure to the limits required. However, you will be able to get some idea of the performance of your signals in the VBI and you should be able to check depth of modulation with the calibrator we'll tell you about in Part 2.

In order to measure baseband characteristics, you ideally will have a waveform monitor and vectorscope. At this time, we don't know of any way to measure differential phase except by using a vectorscope. Lacking a waveform monitor, you can do most tests using any good DC-coupled oscilloscope having a video response of 10 MHz or more.

Thus, the minimum setup for observing baseband signals is a TV set or VCR with a baseband output, an oscilloscope and a sync separator circuit. This will be enough to make some important measurements, though not all those required. A better setup is a professional-quality demodulator with agile front-end (or using IF interface as described previously) with a waveform monitor and vectorscope. Automated test indicators also are available, but are very expensive and have their own set of limitations in some situations.

(Editor's note: Whatever techniques you choose to perform headend output baseband video measurements will ultimately have to correlate to measurements made with the more expensive broadcast-grade equipment that will be used by the FCC.)

End notes

[1] More generally, the term group delay is applied. We often use the terms interchangeably, though technically, they are not quite the same. Group delay is a general term and chroma-to-luma delay is a special case.

[2] We are aware of the sloppy use of "pulse," vs. half-cycle of a sine wave. The two are not the same but the effect of a pulse and a half-cycle of a sine wave are similar when viewed on a TV screen and the concept is useful. **CT**

AML technology review

(Continued from page 22)

In a large metropolitan area with a large number of receive sites, all of the outputs are utilized. Quite often, however, many of the available outputs are not required. Moreover, it may be that only one of the receive sites is very far away. In such cases, a customized power-splitting network at the output of the SIBT may very nearly provide the overall system with the same performance as the STX-141 array.

For somewhat larger systems, multiple SIBT transmitters configured in a parallel arrangement could be considered. In this particular application, 60 channels were provided to nine receive sites. Each of the three IBBTs[3] were capable of carrying all the channels, but by loading each with only 20 channels and passively combining the channels in the customized output multiplex network, the total power output is three times as high as could be achieved with a single IBBT-116 transmitter.

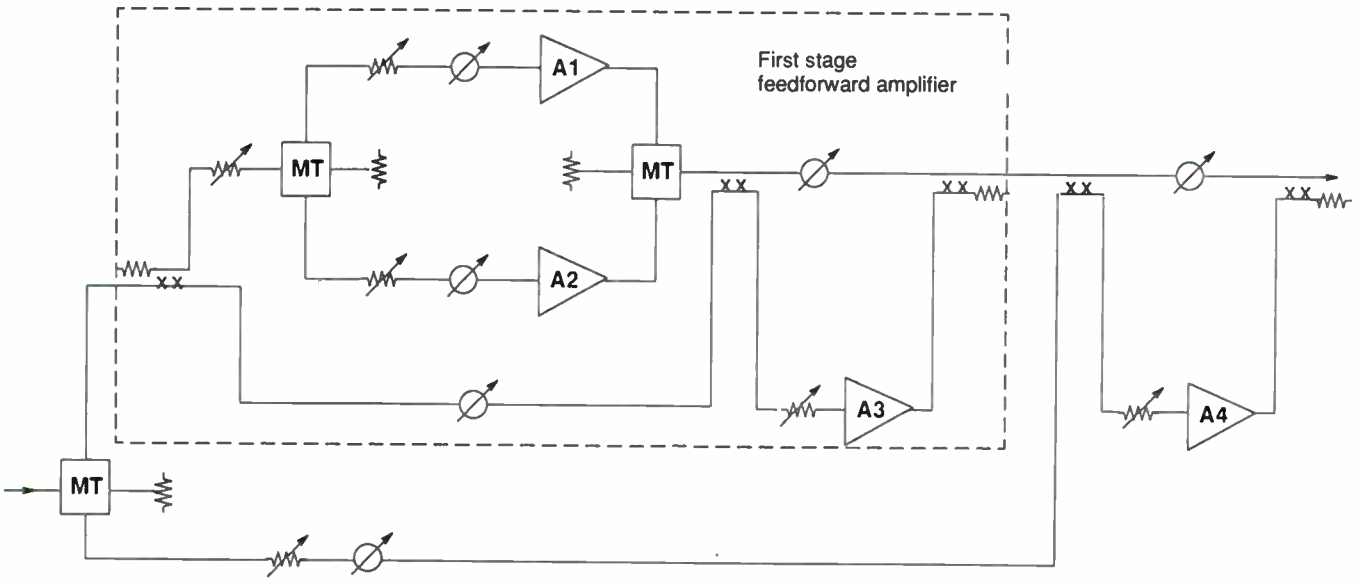
Moreover, if one of the transmitters is taken off-line for maintenance purposes, those VHF input channels can be redistributed to the remaining two racks with only a small reduction in output level to re-establish the desired composite triple beat (CTB) performance.

It should already be clear that each system application must be considered on its own to determine whether an economical broadband approach might not be substituted for the channelized version. However, with the 9 dB increased power capability of the SIBT vs. the IBBT transmitter, it can be expected that system requirements can be fulfilled with the broadband approach in many more cases than before. How is this increased power capability achieved? The 5 dB is obtained through the use of a second feedforward correction loop as in the HIBT-118 transmitter.[4] The HIBT uses the same 5-watt amplifier previously referred to.[2] The additional 4 dB of power provided by the SIBT is made possible through the use of the more powerful FET amplifier, for which the reliability is already verified by the retrofit usage mentioned before.

Figure 2 (page 56) is a block diagram of the dual feedforward amplifier employed in the SIBT. The power-doubled arrangement of amplifiers A1 and A2 constitute the main amplifier. Figure 3 on page 57 shows the improvement in the amplitude transfer function of the SIBT when amplifiers A3 and A4 are switched on. Note that in addition to linearizing the transfer function, the phasing through the error amplifiers is such that the single carrier saturated output power increases by 4 dB! Of the increase, 3 dB is because of the fact that when the error amplifiers are turned on, the SIBT is operating with four instead of two high-power amplifiers. The remaining 1 dB is a consequence of reducing the insertion loss of the error inserting couplers because of the phasing effect.

Referring again to Table 1 on page 22, the transmitter carrier-to-noise ratio (C/N) can be understood to play a significant role in the overall microwave link performance. This also is the case with the klystron-based high-power transmitter array for which one can expect a channel loading independent number of 60 dB. However, the solid-state channelized transmitters are much better in this regard (C/N > 70 dB) because of the relatively low noise

Figure 2: SIBT-121 double feedforward



FMT = Magic Tee
A = 10 watt FET amplifier

Table 2: SIBT-121 transmitter with four 29-km paths

Type of transmitter	SIBT		
Minimum transmitter input level	27.2	dBmV	
Transmitter output power	30	Chs.(dBm/Ch.)	17.2
Transmitter output multiplexing			-6.0
Transmit elliptical waveguide	100	feet	-3.6
Transmit antenna	10	foot	48.8
Free space loss	29	km	-143.9
Receive antenna	10	foot	48.8
Field factor			-2.0

LNA input			-40.6
LNA noise figure	3.5	dB	
LNA gain			15.0

LNA output			-25.6
Receive elliptical waveguide	100	feet	-3.6
Receiver input AGC attenuation			-8.8

Receive carrier level			-38.0
Receiver noise figure	8	dB	

Transmitter C/N	59.2	Transmitter CTB	70.3
LNA C/N	63.9	LNA CTB	71.6
Receiver C/N	62.0		------
	-----		(+) 66.2
*Overall C/N in AGC [+]	56.5	Receiver CTB in AGC	71.2
			------
		*Overall CTB in AGC [+]	65.0

Statistical estimates
Multipath factor (A x B) = 0.25
CCIR climate region = B1

Hours per year below 35 dB C/N: Multipath	0.6
Hours per year below 35 dB C/N: Rain	0.1
Total hours per year below 35 dB C/N	0.7
Percentage reliability	99.992

[+] Denotes power addition
(+) Denotes 60° addition
* Overall C/N and CTB to be added to those of transmitter input

figures of the FET amplifiers. During occurrences of path fading, this noise is attenuated along with the carrier so that transmitter noise, if it does contribute significantly, only does so during clear weather conditions.

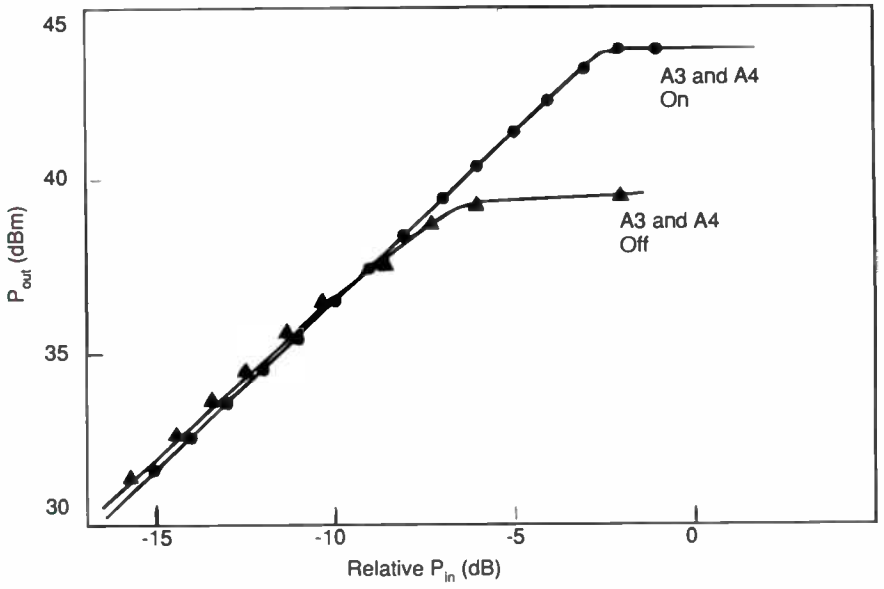
Another sometimes significant factor differentiating broadband and channelized systems is that the latter incorporate relatively narrowband filters that introduce group delay. In the future era of digitized, compressed video signals transmitted through cable systems utilizing high-order modulation formats such as 64 QAM, group delay and channel frequency response (particularly in the STX-141, which employs two narrowband filters as well as the klystron) may degrade the digital system performance despite equalization in the modem. Replacement of the klystron with a broadband FET amplifier in the STX-141S will result in slightly less group delay. Better yet is the SSTX-145 because it uses a broader bandwidth filter in the upconverter section. However, best of all are the broadband transmitters where channel flatness and group delay are totally negligible.

It should not be concluded that all channelized AML is incompatible with all forms of digital transmission. Quite the contrary; many cable systems already carry digitized DMX audio through STX-141 channels. As of this date, test results of compressed digital video transmission through channel-

ized AML are unavailable, but transmission of the SkyPix QPSK signals through broadband AML has already been successfully demonstrated.[5] In any case, broadband AML will always be more adaptable to changes in digital or FM formats since channel boundaries are not delineated by filters in this type of microwave equipment.

A final comparison between broadband and channelized systems should of course be made on the basis of cost. In general it appears that broadband is much more economical, particularly when a large number of channels are considered. However, for very large urban systems with multiple distant receive sites, the channelized approach can still be the most cost-effective. Moreover, one factor may still be noteworthy when an extremely long path is included. The STX-141A has a 4 dB power advantage over the highest power broadband equipment, even if only one path is considered. Thus, the klystron still has its place in the face of the rapidly advancing solid-state technology.

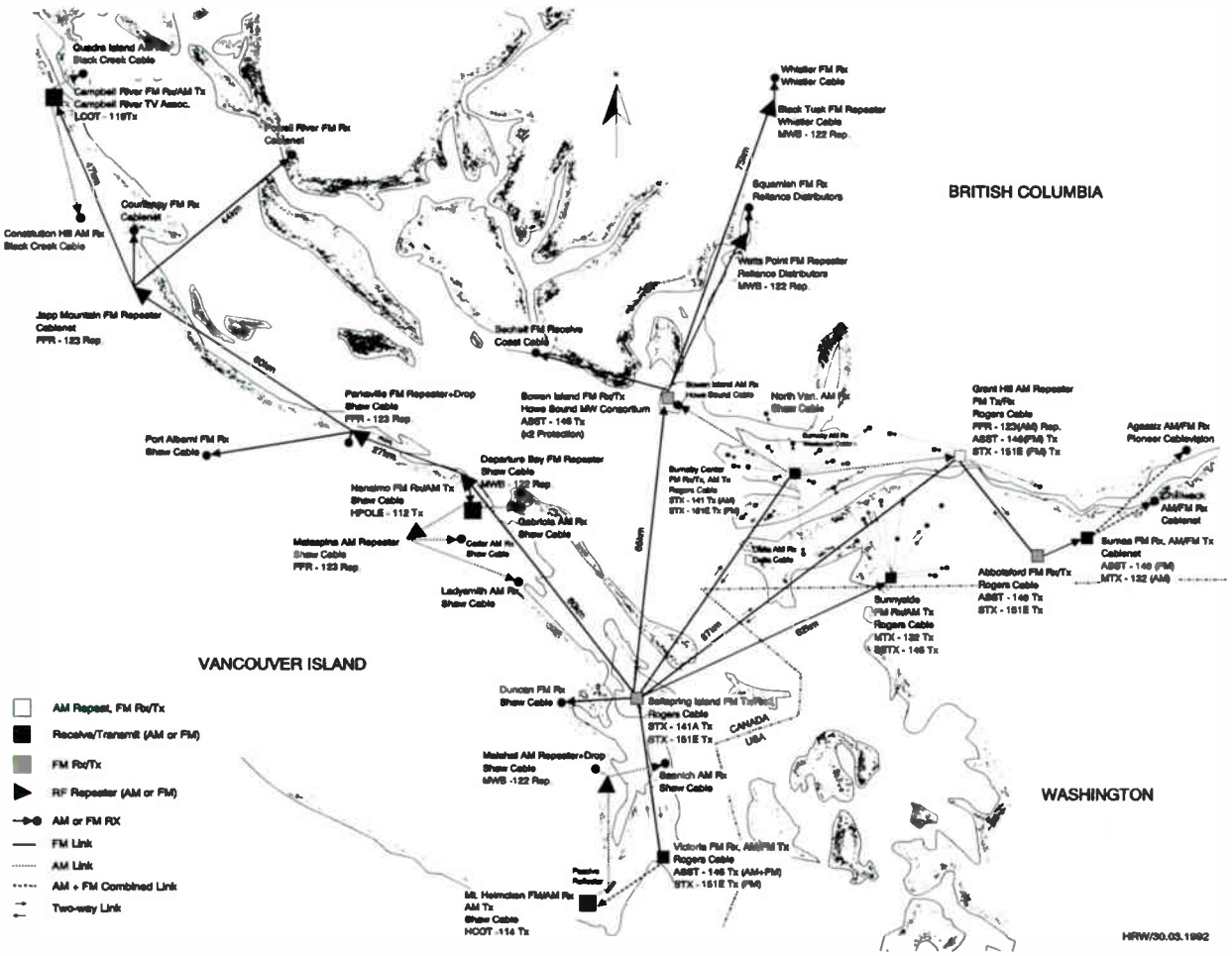
Figure 3: SIBT linearity improvement



System examples

VHCM multihopping and supertrunking have been used in Canada since the first broadband equipment was developed. Figure 4 on page 58 shows the different 13 GHz technologies being used in British Columbia[6,7]: AML and FM-AML, channelized and broadband transmitters, and bidirectional paths (all at 13 GHz). These recent microwave advances have allowed a number of cable operators to upgrade their systems by using the high-power broadband transmitters and repeaters. The Barrie and Calgary operations are a good example of how

Figure 4: 13 GHz southwest British Columbia AML system



high-power broadband transmitters have been used to complement, and thus increase, the channel capacity of channelized transmitters. In eastern Canada, there are systems in Quebec that have used high-power broadband repeaters to extend their reach and channel capacity.

A final example of an SIBT transmitter application is illustrated by Table 2 on page 56. As shown, it is assumed that 30 channels are to be transmitted on four separate 29-km paths with the single SIBT transmitter. A second SIBT transmitter could then be added to increase channel capacity to 60 channels utilizing the fail-soft redundancy concept. The magnitude of high performance capability illustrated by this example (i.e., 56.5 dB C/N for each of four 29-km paths) is consistent with some very large system requirements.

Summary

Microwave FET technology advances and linearization techniques have had a profound effect on AML cost and performance parameters. The primary result is the 500-fold increase of the broadband-type transmitter and repeater power output capability. Since these are relatively low-cost units, the general trend in VHCM system design is toward the greater utilization of broadband systems and even the substitution of broadband equipment to replace older channelized equipment. However, the same technological elements also have led to all-solid-state channelized options, which in certain circumstances are still the most cost-effective approach. **CT**

"Microwave FET technology advances and linearization techniques have had a profound effect on AML cost and performance parameters."

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FM microwave

(Continued from page 24)

tions a straight line between the transmit and receive antennas.

There are multiple ways to transport video/audio baseband information using microwave: FM baseband (Figure 3 on page 24), FM intermediate frequency (IF) heterodyne (Figure 4 on page 60), and amplitude modulated link (AML) as in Figure 5 (page 60). AML is more commonly used in cable TV because of cost advantages.

When using FM baseband, the video and audio information are modulated onto a carrier wave by shifting the carrier wave in frequency corresponding to changes in the video and audio signals. This modulation can be accomplished at IF and then upconverted to the desired microwave frequency or it can be done directly at the microwave frequency. At the receive end, the signal is demodulated to recover the applied information. During this process some distortion is added to the recovered signal.

In the FM IF heterodyne system, the baseband information is modulated onto a 70 MHz carrier. This carrier is called the IF. The 70 MHz IF is then upconverted to the desired microwave frequency. At a receive site the microwave signal is downconverted to the 70 MHz IF, then amplified and upconverted back to the desired microwave frequency for retransmission to the next site. In this form of transmission scheme the modulating signal is never demodulated back to baseband until reaching the final receive point. This increases the number of times the signal can be retransmitted before the same amount of distortion is present, as in a compatible FM baseband system.

In the AML system the baseband video/audio is modulated in the standard vestigal sideband amplitude modulation (VSB-AM) TV format by a CATV modulator. The output of the modulator is normally a very high frequency (VHF) TV frequency. The VHF signal is then upconverted to a microwave signal and transmitted to a receive site. At the receive site the microwave signal is downconverted back to the original VHF signal with some added distortion. This VHF signal can then be transported via the cable system to the subscriber. The final demodulation is done at the subscriber's TV set.

Frequencies

Cable TV operators are permitted to transmit signals in the CARS frequency band of 12.7-13.2 GHz. The system most commonly used is VSB-AM or AML. There are several frequency utilization plans commonly known as frequency groups. These groups define the start and stop frequencies of the band and the center frequencies along with the channel separation. The groups are as follows: A, B, K, C, D, E, F. The A, B and K groups are the FM frequency groups and all others are AM. In the A and B groups the carriers are spaced with 25 MHz separation from center to center with 20 channels available in each group. In the K group, the carriers are separated by 12.5 MHz with 40 channels available. The C, D, E and F groups are VSB-AM signals 6 MHz wide.

Advantages of FM vs. AM

The main attributes of FM video delivery over VSB-AM are measurable improvements in signal-to-noise ratio (S/N), frequency response and immunity to impulse noise. As well, increased transmission distance vs. S/N is attained because of the almost transparent performance of the FM link.

Comparison of FM to VSB-AM

A comparison of FM to channelized

VSB-AM video generally yields an improvement (with FM) of both frequency response and differential phase/gain. The FM system also has less chrominance-to-luminance delay.

S/N is another big advantage of using FM transmission. FM offers approximately 9-20 dB of S/N improvement over that of VSB-AM when both types of modulation are operated in identical carrier-to-noise (C/N) environments. **CT**

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FM vs. AM trade-offs

Advantages

AM	FM
Less expensive	Longer path lengths
Less complex	Less noise
More 6 MHz channels available	Less video distortion
Single conversion delivery	Improved frequency response
More practical for point-to-multipoint signal delivery	Less effects from IM or CM
	Better for point-topoint signal delivery

Disadvantages

AM	FM
High noise contribution	More expensive
Limited number of hops	Wider occupied bandwidth

Figure 4: FM heterodyne

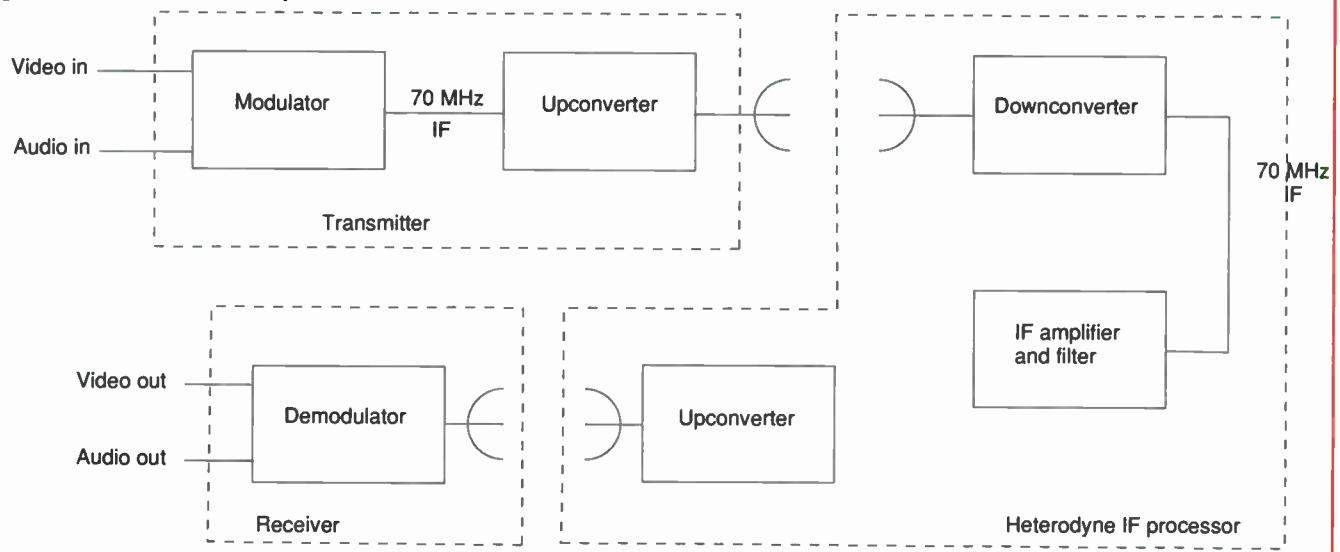
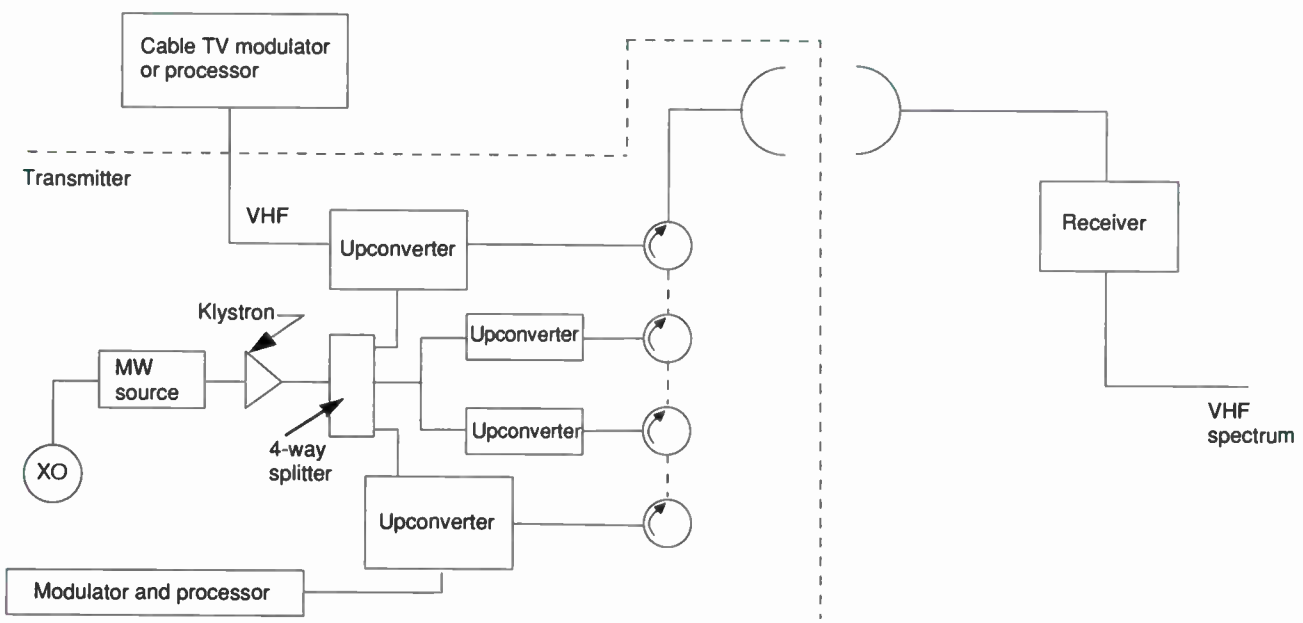


Figure 5: AML system



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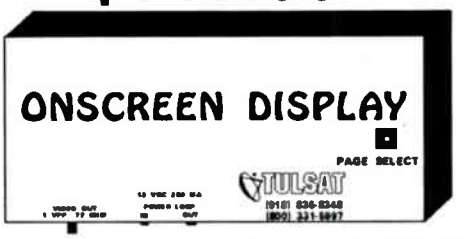

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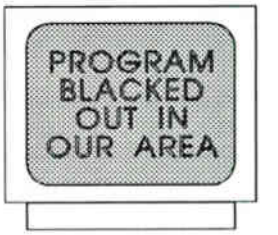

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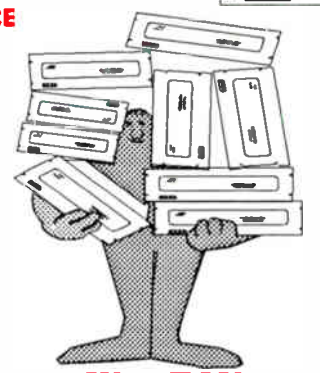

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What is a soliton?

By Lawrence W. Lockwood
President, TeleResources
East Coast Correspondent

Standing alongside a local barge canal in 1834, John Scott Russell, a Scottish shipbuilder and engineer, observed a solitary wave moving across the water's surface. The wave seemed to travel as far as he could see without losing its shape. Intrigued by the phenomenon, Russell jumped on his horse, as the story goes, and followed the wave for several miles along the canal. By the end of the century, an equation had been developed for Russell's solitary wave. In 1965, two Bell Laboratories scientists observed that solitary light waves survive collisions with one another — and thus renamed them solitons.

A soliton as used in fiber-optic communications is a light pulse, designed to retain its shape, duration and strength as it moves through a fiber. In a single-mode fiber, a soliton is immune to the effects of pulse-broadening chromatic dispersion and to the frequency-broadening effects of light intensity.

"Solitons can be made only for pulse (digital) transmission, and not for analog transmission."

Figure 1: Intersymbol interference in digital transmission

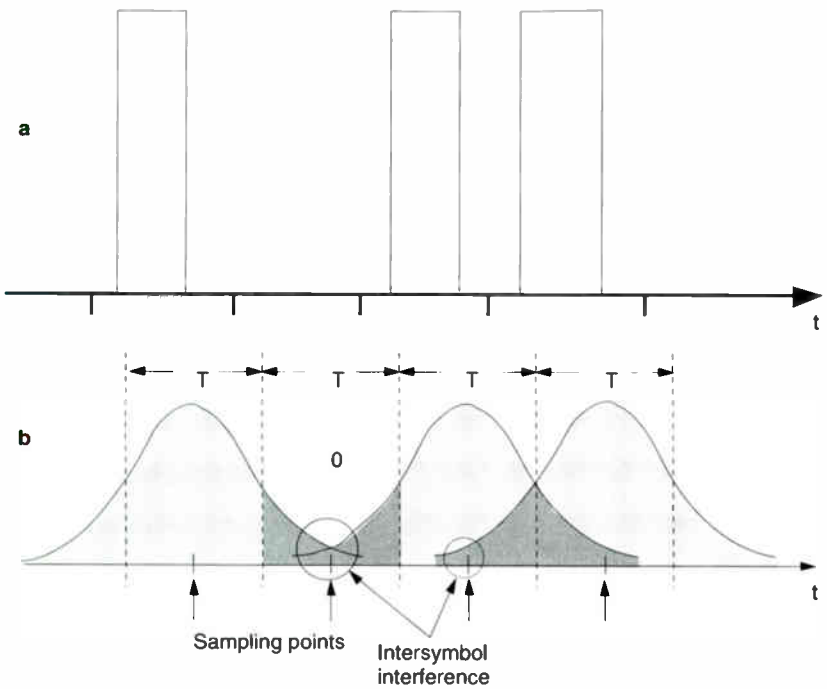
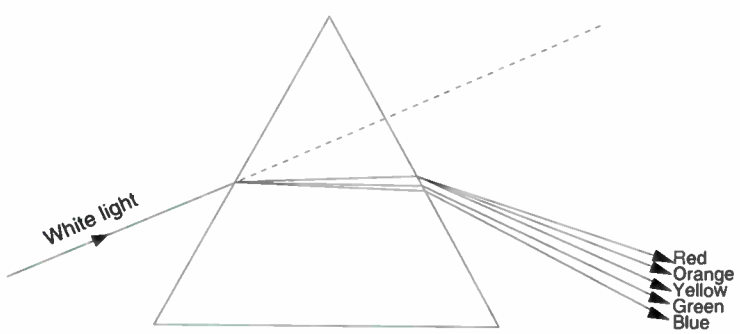


Figure 2: Spectrum of light frequencies produced by a prism



Dispersion

The effects of dispersion on the transmission of a pulsed data stream causing intersymbol interference is shown in Figure 1. As seen, the transmitted pulses in Figure 1a after traversing the fiber are broadened (dispersed) so that at the receiver point — Figure 1b — they interfere with each other (intersymbol interference) to the extent that the receiver cannot properly determine if a 1 or 0 was sent.

What causes this dispersion? The index of refraction (n) of a material is the ratio of the speed of light in a vacuum to the speed of light in the material and it varies with frequency. A handy example of this variation of n with frequency is the familiar simple prism as seen in Figure 2. The blue (high frequency) light is slowed down in the

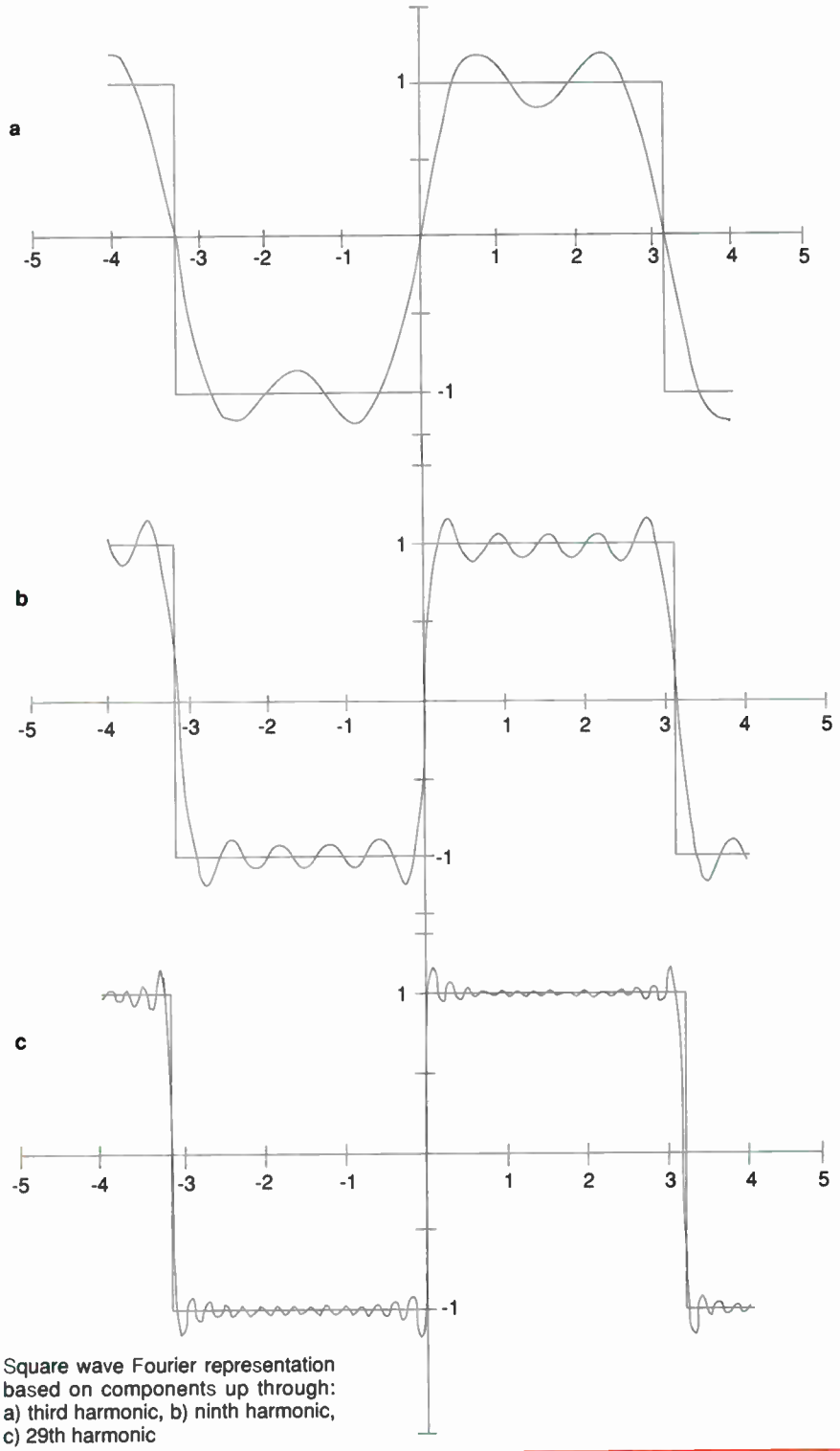
glass more than the red and therefore bent more than the red (lower frequency).

A popular misconception is that a laser emits only a pure monochromatic light, i.e., light of just one frequency. Most lasers emit several frequencies around a dominant one. Consequently, the generated pulse is composed of these frequencies and the higher ones are slowed down more than the lower ones in their travel down the fiber — thus dispersion. However, in fiber at wavelengths longer than 1.3 µm (zero dispersion wavelength) the higher frequencies run ahead of the lower ones.

For the purpose of illustration let's assume a perfectly monochromatic laser (not perfectly attainable in the real world, but can be close). Even in this case any pulse itself is made up of different frequencies as specified by a Fourier series. See Figure 3.

Any minimum bandwidth pulse of reasonable shape and peak intensity greater than a 2:1 ratio will evolve into an exact soliton as it propagates along the fiber. It should be noted here that in pulse transmission on fiber the laser is not turned off completely at the zero points — the 1's and 0's are sent with "brighter" and "less bright" light.

Figure 3: Illustration of different frequencies contained in a pulse



Square wave Fourier representation based on components up through: a) third harmonic, b) ninth harmonic, c) 29th harmonic

Soliton performance

Extensive experimentation with this phenomenon has been conducted by many telecommunications organizations but recently AT&T Bell Labs announced that it had demonstrated error-free transmission of solitons at 5 Gbits/s over 15,000 km (9,300 mi) and 10 Gbits/s over 11,000 km (6,800 mi). Of course, like all light pulses, solitons are attenuated by the silica fiber and for long transmission paths optical amplifiers must be used wherever required. AT&T is looking into using solitons in long-distance undersea fiber cabling.

Soliton formation

Solitons exist only in a non-linear medium — a material whose index of refraction is changed by varying the intensity of the light. The interaction of the light's electric field with the material is what gives the soliton its unique properties.

One of the best non-linear materials for solitons is rarely regarded as non-linear: the silica glass of optical fibers. If a fiber is coupled to a laser, "within a certain range of input powers and pulse shape, you can't help but get solitons," said Linn Mollenauer, distinguished member of the technical staff at AT&T Bell Labs in Holmdel, N.J.

In an optical fiber, the high-intensity light of the pulse traveling down the fiber creates a well of changing index of refraction that accelerates the slower low frequency components and retards the faster high frequency ones. The bunched pulse, or soliton, that results can travel long distances without changing shape, i.e., no dispersion — on intersymbol interference.

As a simplistic analogy, the soliton can be viewed a self-trapped pulse as depicted in Figure 4 (on page 82) showing runners on a mattress. Each runner represents a finite wavelength

(Continued on page 82)

OSHAct and safety training

By Michael H. Morris
President, Taylor Morris and Associates Inc.

Numerous managers avoid training because they don't understand it. They make it difficult because of their lack of knowledge and/or a fear of training. Training need not be the complex myriad of problems that many supervisors make it. Quite simply, training provides all employees with the information they need to perform their work assignments in a safe and healthy manner.

OSHAct

Although the Occupational Safety and Health Administration Act (OSHAct) does not specifically address cable TV training, it encourages employers and employees to reduce the number of occupational safety and health hazards at the workplace, to institute new and perfect existing safety programs. Employers (through the OSHAct) are not required "verbatim" to provide training to employees. However, if an employee is not properly trained and is injured or killed, the employer will likely be cited. In other words, the employer did not comply with OSHA's general duty clause.

Various standards in the OSHAct — such as the Hazard Communication Standard (1910.268) — do require specific training, documentation and reporting mechanisms. As an example, every employee is required to receive training in hazardous chemicals and/or materials with which they may come in contact while performing job assignments. Given the foregoing, it would be a reasonable assumption that one way to comply with the OSHAct is to provide the specific training that employees need to perform work assignments in a safe and healthy manner.

Training's history and future

Now that we know what the OSHAct says about training, let's talk about where training came from, what training is, and what it should mean to you and me. Training is as old as society. Cavemen learned early on not to mess with the big animals that bit back. They probably learned that advanced planning, group cooperation and training were necessary to effectively hunt large animals in a safe and healthy manner.

Training is still with us today. We train our children not to cross the road without looking. We teach them to avoid situations that may be hazardous and, given their inexperience, could result in serious injury or death.

In late 1991, a surveyor entered a manhole in Boulder, Colo. When he did not come out or answer, a second surveyor entered the manhole. When he did not come out, a third person entered the manhole. All three men died.

This same scenario is repeated day after day all around the country. The specifics are different. The results are the same — injuries, illnesses and deaths that could have been avoided if employees had received appropriate training.

Many job duties that you perform on a daily basis are inherently (and not so obviously) dangerous: pole climbing, the use of extension ladders, working in and around traffic, working near electrical conductors, using hazardous chemicals and/or materials, using machinery and equipment, and much more.

Defensive safety

Perhaps the real lesson that you should learn from this article is to empower yourself to practice defensive safety. We all know what defensive driving is, but what about defensive safety? All of us have the ability to recognize potentially dangerous situations, but what do we do about them, that's what defensive safety is — doing something about unsafe situations and making sure you have adequate training and safety equipment to do the job in a safe and healthy manner.

So what types of training do you need? All employees are required to have (but is not necessarily limited to) training in the OSHAct of 1970, the Hazard Communication Standard of 1987, the Bloodborne Pathogens Standard of 1992 (AIDS and hepatitis), and emergency evacuation procedures.

Additionally, you need training that addresses your job function. If you climb poles, you should be trained in pole climbing. If you operate a bucket truck, you should be trained in the proper use of one. If you operate machinery in an office environment, you should be trained in its proper use.

OSHA (generally) considers demonstrated proficiency to be adequate evidence of past training. In other words, if you learned how to climb or operate machinery in a past job, your employer does not necessarily have to retrain you in those specific areas. However, your employer is not necessarily exonerated of documentation and record keeping requirements under various OSHA standards (such as the Hazard Communication Standard).

So what do you do if you do not feel that you have adequate safety training? You have an obligation to your employer, to your family and to OSHA to communicate your concerns to your supervisor. If you feel that your request is inappropriately addressed, you (by OSHA protection) can communicate those concerns to your company's health and safety officer without fear of recrimination. Other rights (and obligations) that you and your employer have are defined in the OSHA poster #2203, "Job Safety and Health Protection." All employers are required to post it in a communal gathering place where employees meet and/or congregate. Failure to provide this poster is an automatic $1,000 fine.

OSHA gives you, as an employee, the right to work in an environment that is safe, healthy and free of dangerous situations. That goal can best be addressed by practicing defensive safety and by training. To many, training is a four-letter word. On the contrary, training is not a four-letter word and it is not difficult. It is not inherently expensive and it saves time. A well-defined health and safety program saves your company money and more importantly, protects the employees against injury and death.

A high-level cable TV executive recently told me, "The problem with common sense is that it's not so common." In reflection, it seems to me that the reason that common sense is not so common is that it's not inherited — it is learned. In other words, common sense comes from training. **CT**

August 1992

Technical customer relations

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Geri Saye

Table of Contents

The hidden value of a TSR

By George F. Taylor
President, George F. Taylor and Associates Inc.

Once upon a time in the land of cable TV, there were general managers, customer service representatives, technical supervisors, computer personnel and many others. Today, these personnel are known as GMs, CSRs, CSCs, MCSRs, TSRs, and by many more acronyms. Lost in this valley of depersonalized titles are the TSRs or, as they were known before the days of "acronymology," technical service representatives — people who have the skills of a customer service representative and enough technical knowledge to correct many customer-related technical problems over the phone, thus preventing the need for a service technician to visit the subscriber's home.

Wasted time

The service tech spends a significant amount of time driving to and from customers' homes, asking highly technical and earth-shaking questions such as, "When did this problem begin? Do you have the problem on all channels? Do you have the problem on more than one TV set? Did you have problems adjusting the color before the cable was installed? Is your TV set on Channel 3 (or whichever channel is system-specific)?" After all these questions, the customer may respond with: "I had this problem before the cable was installed." "That's why we subscribed to cable — to fix the problem." "We have the problem on all channels." "We only have problems on the TV set in the basement." "No, we never had color problems before — this was a black and white set before the cable was installed." "I don't know. Is it supposed to be on Channel 3?"

What if someone had already asked these questions and noted the important answers on the service work order or, even better, resolved the problem over the phone? Believe it or not, that is exactly what the TSR can do.

Cable operators often use the CSRs to respond to all customer inquiries, including billing, service, sales information, credits, customer account information and technical complaints. The CSRs have enough to deal with in processing and answering customer information, let alone technical problems. Further increasing their work load is the fact that cable systems often undergo a significant number of changes throughout the year and some of those technical changes must be passed on to the CSRs in order to address technical complaints.

This lack of knowledge often causes more problems than are resolved, and unless the customer's problem is obvious, it will not be corrected and a service order will be generated. If the problem is severe enough, it will be transferred to dispatch and radioed to a service technician. It is not unusual to involve three departments to take care of a problem that could have been resolved by one individual — the technical service representative. Time is lost, work is delayed, efficiency is reduced and profits are affected.

TSRs focus on one thing — fixing the problem to the customer's satisfaction, over the phone if possible. If they cannot correct the problem over the phone they list the critical information in the computer data file, thus ensuring that it's on the work order for the service technician to review before attempting to locate the malfunction. Some companies add information about one or two of the most recent technical complaints while others use a series of service codes relating to specifics in certain areas, like trunk, distribution, converter, drop, etc.

"TSRs focus on one thing — fixing the problem to the customer's satisfaction, over the phone if possible."

Service call savings

Technical service representatives can have a significant effect on the cost of an average service call. Consider the fact that the cost to have a service technician go to the customer's home ranges from $30 to $75, depending on the location and size of the system, employee wage, overhead, etc. If the position of TSR doesn't yet exist in the system, additional phones, phone lines and a work area for them would be needed; however, the savings could still be significant.

Consider the questions earlier posed to the customer by the service technician: "When did this problem begin? Do you have the problem on all channels? Do you have the problem on more than one TV set? Did you have problems adjusting the color before the cable was installed? Is your TV set on Channel 3?" The TSR could have asked all those questions and, in most instances, would have begun another series of questions to resolve the matter.

Customers don't always answer questions correctly or, for that matter, honestly. Often they don't really understand the question and therefore answer incorrectly. In addition, no one wants to admit that they have disconnected the cable from the TV set/converter or dropped the converter or never had a VCR until that morning. TSRs develop skills at extracting information from customers much like a mother can obtain details from her child about a vaguely described occur-

rence. They also learn to interpret what the customer is not saying and develop more questions to resolve the issue. This ability allows service technicians to use their skills to repair serious problems while the TSRs reduce the service call workload.

To ensure that the TSRs are made aware of changes to technical standards used in the system, the installation supervisor, service supervisor and/or maintenance supervisor should conduct training classes about their specialties. These training sessions can be done in small groups and take as little as 30 minutes. TSRs should keep this training information in a handbook they can use for reference.

Why or why not?

With all of the positive influences a TSR brings to a cable system, the question may arise, "Why hasn't every cable system taken advantage of them?" The answer is simple: Either the cable system can't afford a TSR or its management doesn't understand the position. Managers of very small cable systems often fill the positions of salesman, CSR and headend technician, while the other person in the system is the installer, service and maintenance technician, construction engineer and whatever else is required, all rolled into one.

At the other end of the spectrum is the large cable system where management is comprised of a vice president/general manager, vice president of marketing, vice president of anything and everything, and managers for every department. Even though large systems may be able to afford TSRs, the trend is thinking that if TSRs aren't currently in use, they aren't needed.

Analyze the types of service calls normally received, evaluate how many of those calls never should have been issued, then decide if there is a need or value in adding the TSR position to the staff. If the conclusion is affirmative, consider assigning a few CSRs to be a temporary technical service staff to test the conclusions of the analysis. Give them the necessary training and sufficient time to make the mindset change in their new jobs. The odds are excellent that everyone will be pleased, from the service technician who doesn't have to make useless runs to the system owner who appreciates the improved bottom line. **BTB**

Technical customer relations

By Joseph C. De Caro
Lead/Tech, Triax Communications

Service calls can require a different approach than installs because unlike the install, subscribers may be a lot less friendly and possibly be irate that their cable reception is poor.

Service technicians must be people-oriented, and by that I mean they must be able to get along with people even under the most trying conditions. The way you interact with the subscriber and even the first words you say can affect the outcome of your meeting. Either the subscriber will feel at ease with your efforts or become more irate with you and the cable company.

First impressions count

On arrival to a service call, address the subscriber by name (e.g., Mr. Smith), and be polite and courteous (even though you may have had an unpleasant day). Make it part of your troubleshooting procedure to ask the subscriber exactly what type of problems are occurring. Then ask to see the TV set and have the sub turn it on so you can see the problems firsthand.

Quite often the problem may be something as simple as fine-tuning the TV set or even plugging in the converter. If so, instruct the subscriber on the proper tuning procedures used to fine-tune, and take enough time so he or she understands. By no means tell subscribers either in words or in action that they did not know their own equipment.

If in your troubleshooting you feel you need assistance in solving the problem, do not hesitate to call your supervisor or another technician who can help you out. If not, subscribers will sense that you do not know what to do and feel that their cable reception may never be corrected.

Verify your work

After you have corrected the problem, be sure to go through all the channels with the subscriber to verify that all is working properly and that there are no other difficulties. Before you leave a subscriber's premises, ensure that you have removed any and all debris that you have left around, and also be sure to get all of your tools.

The following are steps for ensuring subscriber/technical relations:

1) Be sure to arrive on time.

2) Be courteous and address subscriber by name.

3) Ask the subscriber to explain the problem and then verify it at the TV set.

4) If problem is in the TV set, explain this to the sub and verify with a test set.

5) If it is a cable problem, begin the troubleshooting procedure.

6) Call for help as soon as you feel you may need it.

7) After repairs have been made, verify all channels with subscriber.

8) Clean up any materials you may have left and get all tools.

9) Thank the subscriber and let him or her know not to hesitate to call again if any problems arise.

In closing, I can't stress enough the importance of proper technical training (possibly through such organizations as the National Cable Television Institute and the Society of Cable Television Engineers). **BTB**

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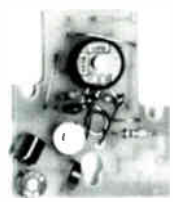

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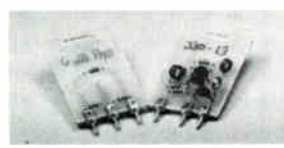

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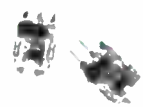

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Reader Service Number 39

Service call reduction: The total concept

By Dave Lisco
Chief Tech, Jones Intercable

Service calls come in all shapes and sizes, and account for more than a significant portion of the operating budget. Depending on the formula that is used, a truck roll could cost anywhere from $35 to $50. In these hard economic times you must look at the way the service call is handled, from the moment the phone is answered until the technician completes the call with the dispatcher.

To reduce the service call rate it's important that a goal must be set, and it has to involve all departments, including technical, customer service and marketing. All departments have to take responsibility for this goal because all departments contribute to the problem: CSRs by not troubleshooting the problem, setting up service calls for outage related problems and not offering box exchanges at the counter; installers by not explaining the hookup, not verifying before and after pictures and, most important, not performing the installation right the first time; and marketing by not explaining the capabilities of the system and selling customers more than they want.

The emphases of this article will be on the three areas that can have the most impact on the service call rate: the initial contact with the CSR, what makes up the complete service technician and plant maintenance. I also will briefly touch on two other topics: hiring for the next position and training sources.

The initial contact

From the time the CSR answers the phone until the call is dispatched to the tech in the field, 60-70 percent of the trouble calls can be resolved. A well-trained CSR is a very valuable asset to a cable company.

CSRs not only must have good customer service skills but they also must be able to troubleshoot TV hookup problems. One of the hardest tasks is to try to talk a customer through a problem without being able to see what the customer is doing.

How does a CSR become a service expert? There isn't any easy way, but there are some very good tools. Interactive training has become one of the best ways of exposing a CSR to real-life situations without the pressure. Cross-training with service technicians is another way to expose the CSR to the array of hookups and compatibility problems. In our system we have developed a method that not only provides service training to CSRs but CSR training to service techs. We call it the "Buddy System." In this system we rotate a service tech one day a week with a CSR. The service tech answers calls with the CSR that day and when a service call is scheduled they both go out on the call.

Using this method, the service tech and the CSR both see the other side of the job and have a better understanding of the other's problem areas. This teamwork shows CSRs what they might have missed on the phone, gives them a different perspective for asking questions on the phone and exposes them to the vast array of home entertainment systems. It also helps the service tech better handle the difficult customer, become more aware of how the customer perceives the problem and develop sales skills.

The complete service tech

Once the call is handed to the service tech, he should have everything he needs to complete that call — the parts and the knowledge. The complete service tech should have a well-maintained and stocked truck or van to work from. The truck or van should be clean (remember that this vehicle's appearance is a reflection of the company), and well-organized. Too many times a call is rescheduled because the tech did not have the proper part when he initially performed the call. Unnecessary calls cost money, and an additional truck roll for a $5 part does not make sense. The service tech's vehicle should be checked periodically by the supervisor, and good vehicle condition should be part of the service tech's performance standards.

The service tech should have a good knowledge of the system. When he knocks on the door of the customer's home he should have all the information needed to complete that call, including service level and the number of additional outlets the customer has. If you don't think this information is important, check the percentage of customer-related service calls you have been running and the number of illegal outlets that are being identified through signal leakage. Remember, the more information the tech on the job has, the better he can do his job.

If the call cannot be isolated to the tap, the tech should have updated maps to work with. Remember the philosophy of training for the next position. Have your techs responsible for the system back to the last active or the bridger. This not only reduces additional truck rolls, but also provides job expansion and job fulfillment if you challenge your service techs to rise to the next level. It must be your philosophy that when you get that work order signed off, the customer is back in service and satisfied.

We have talked about what we view as the complete service tech, and how service starts the minute the phone is picked up. What are the other areas that will help reduce service calls?

Plant maintenance

There are four crucial areas of maintenance that, if they are monitored and perform well, will pay dividends. Those areas are trunk sweep, distribution sweep, signal leakage and end-of-line monitoring.

All trunk should be swept at least once a year. A trunk station with fittings properly connected, heat shrunk and swept, and housing closures properly tightened will not significantly change in the course of a year or even the following year. A trunk station will change response if the fitting was not installed properly (i.e., dielectric on the center conductor, or the center conductor ringed or scored, and if the housing closures are not tightened and moisture is allowed to get in).

Sweep techs who do a proper job the first time have the hardest and the easiest jobs. If on the first pass they make sure that all connections are made well and heat shrunk, the station has the proper equalizer and pad, the station has the right voltage to operate, and all this information is documented,

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they can spend half their time fishing on the next pass. They could just go to the terminating trunk station, take a response, compare it to last year and then find something else to do.

Distribution sweep is a little harder because there are more hands involved and more outside influences. Response changes can occur from tap changes, untightened face plates, poor connections and undiscovered damage to the feeder. All the same problems that affected trunk response will affect feeder response, and there is more opportunity for problems (remember that feeder connectors outnumber trunk connectors by at least 7-to-1). All these factors necessitate a feeder sweep at least twice a year and demand that techs who work on feeders are properly trained in making fittings on distribution cable.

Signal leakage monitoring is one of the best sources of information on the effectiveness of your maintenance program. Keeping track of leaks per mile, leaks per zone, the associated repairs, and then comparing that information with service call rates in those areas will tell you where maintenance needs to be concentrated.

End-of-line monitoring is a very useful tool in evaluating the performance of the maintenance technician and the maintenance program. All maintenance techs should know the system specifications and how they are calculated. A simple Lotus spreadsheet can be set up to give system performance at every amp in the system. A copy of this in a maintenance tech's clipboard is very valuable.

End-of-line monitoring should be performed in conjunction with trunk and feeder sweeps. As areas are swept, and the end-of-lines are sampled, this information along with the signal leakage reports will give you a fairly accurate assessment of the quality of your maintenance program.

"Once the call is handed to the service tech, he should have everything he needs to complete that call — the parts and the knowledge."

Management areas

Too often the service tech is an installer who was good at his trade. He was promoted to service tech under the halo principle — "Since he was a good installer he'll be a good service tech." Or he may have been promoted under the warm body theory — "We need someone to do these calls." Neither of these are good reasons to use when placing a person in the service tech position. Before a person becomes a service tech for your organization, he should meet all the requirements of that position.

So you ask, "How do I fill the service tech position, if I don't have anyone ready to move up and I want to hire from within?" The answer is, you look to the installers. You find the most qualified individual and you start to expand their responsibilities. You provide additional training, but you do not give them the job until they are qualified. This also gives incentive to the candidates to do well.

Training, training and more training

A system must constantly develop its people. You must continue to develop your people, especially in these tough times when the training dollar is usually the first to be cut. By improving their skills, they work more efficiently, and use less overtime and parts. As well, picture quality improves, customers are happier and penetration rates improve. It may sound like an exaggeration, but what would happen if we didn't train and our people were incompetent. Would the pictures look as good? Would the customers be happy? If the customers weren't happy, what would happen to penetration rates? Knowledge is never wasted and training is never useless!

Some of the most economical sources of training are vendors. Vendors need to sell product, and they are more than happy to teach you how to use it. If you are reading this article, you have discovered another source of training. Pass this article along. Make sure your people get this magazine. SCTE meetings and monthly satellite seminars are excellent sources of inexpensive training. So are NCTI courses, especially if they parallel the technicians in-house training. **BTB**

The author wishes to thank Jones Intercable's Bruce Furman, service supervisor, and Lisa Bryden, office manager, for their assistance with this article.

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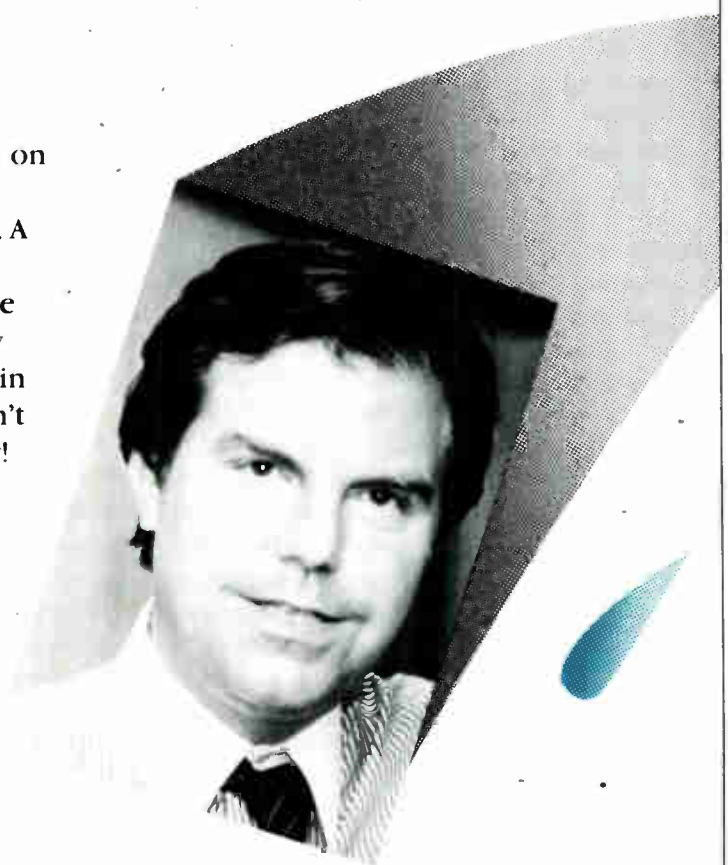

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PRODUCT NEWS

The following are the new product highlights covered in the "CT Daily" at Cable-Tec Expo '92.

ABC Cable Products introduced a coax-to-fiber converter. The product is intended for various applications to be employed by cable TV, high-speed computer peripheral manufacturers and personal communications systems. Named CBLinX, the unit is designed to accept an analog signal and convert it to an optical output. The optical output is coupled to an 8.5 micron core single-mode optical fiber. At the end of the fiber, the optical signal is input into another CBLinX and converted back to an analog signal and coupled to a coaxial cable. Other CATV applications include: mixing of coax and fiber-optic transmission facilities; repair of fiber breaks with coax; and repair of coax breaks with fiber.
Reader service #209

ACP International displayed its fiber splice protection sleeves, consisting of a hot-melt adhesive tube that bonds to both the fiber and the heat shrinkable outer tube to encapsulate the fusion splice. A stainless steel rod provides additional rigidity to prevent microbending of the fiber.
Reader service #208

Aeroquip Corp. showed FoDuct multicell innerduct at this year's show. This high-capacity, flexible innerduct for fiber-optic cable is designed to maximize existing duct systems by installing up to six chambers in 4-inch duct.
Reader service #204

Alpha Technologies hosted a hands-on training session during the expo in the Training Lounge where its interactive, standby power supply tutorial software package called Cat-Pak was demonstrated.

Also, automatic performance monitoring is now available for Alpha's FP series, the company's newest standby power supply family. The APM board initiates a self-testing function, the duration and interval of which can be operator-programmed. If a problem is detected, the "inverter fail" or "battery fail" LED will light and the internal and external "system status" LED will flash to alert the operator that a failure has occurred. The FP also includes programmable, temperature-compensated battery charging.
Reader service #203 (Cat-Pak), #202 (monitor)

AM Communications showed the DGT-MDU-I remotely controlled CATV/SMATV addressable tap designed for multiple dwelling units. The device comes in 4-, 6-, 8-, 10-, 12-, 14- or 16-port configurations. The company says the tap's low price and low power consumption make it the ideal choice for controlling churn and non-pay disconnects and reconnects.

AM Communications also unveiled its latest general purpose control modems — Models TMC-8041 and TMC-8041-SP. Featuring eight digital monitor inputs, eight digital monitor outputs and four analog inputs, a TMC-8041 can be commanded by LANguard system software to perform a variety of tasks. The digital inputs can be configured to monitor security intrusion loops, smoke/fire detectors or temperature sensors. The outputs can be employed to control locks, switch power loads or control lighting systems, and the company says the analog inputs are extremely useful for fiber node monitoring. The TMC-8041 is available as either a 115 VAC line-powered or a 60 VAC system-powered model.
Reader service #206 (DGT-MDU-1), #205 (modems)

American Lightwave Systems unveiled a new digital fiber-optic fiber transmission system called the DV6000. It is designed to transmit 16 video channels with accompanying audios at an aggregate speed of 2.4 Gb/s over repeaterless fiber links exceeding 32 dB, or approximately 91 kilometers (57 miles) with RS-250C medium-haul performance. ALS says the DV6000 is the first digital video system capable of transmitting scrambled channels. The system is capable of transmitting DC-coupled signals and can be used to interconnect headends and eliminate multiple scrambling locations.
Reader service #207

Antenna Technology showed its new 3-meter C/Ku-band parabolic antenna, which is available for immediate shipment. The prime focus parabolic is a solid, galvanized steel, petalized antenna that can be equipped with either a fixed El/Az mount or a steerable polar mount. The company says the complete draw die forming provides a highly accurate antenna surface that fully meets FCC 2° spacing guidelines, with a C-band gain of 40.4 dB and a Ku-band gain of 50 dB.
Reader service #201

Belden Wire and Cable announced the upgrade of its standard drop cable product line to 1 GHz. The company has converted all drop cable manufacturing processes from the existing 55/750 MHz format to 1 GHz. Included in the upgrade are all 59, 6, 7 and 11 series cables for indoor, burial and aerial applications. All Belden products will be offered with a minimum structural return loss of 20 dB from 5 MHz to 1 GHz. According to the company, it also has upgraded its production line testing capabilities to assure conformance to the 1 GHz standard. In addition, all new drop cables introduced by Belden in the future will meet the 1 GHz requirement.

Belden also introduced CoreGuard corrosion protectant as an option for enhancing drop cable performance and durability. CoreGuard is a protective gel applied between the braid and jacket on drop cable products. This protectant acts as a moisture barrier safeguarding the aluminum braid from corrosion. By stopping corrosion, CoreGuard is said to promote a higher level of shield effectiveness. It is available on specially constructed series 59, 6, 7 and 11 cable TV products. As well, Belden has expanded the product line to include 15 codes of aerial, burial and indoor cables.
Reader service #200 (drop cables), #199 (CoreGuard)

Ben Hughes/Cable Prep featured the new SCT-715QR tool for Comm/Scope's Quantum Reach cable, which fully prepares the cable for connectorization. The tool contains two integral parts, cores the dielectric to the prop-

er depth, strips back the jacketed aluminum and removes the outer jacket.

Also offered were two new tools in its CPT prep tool line. The CPT-1250 red-bodied tool provides a 1/8-inch prep dimension for 6 and 59 series cables and the CPT-1100 blue-bodied tool is for the 11 and 7 series cables providing a 1/4-inch prep dimension.

Another new product, the SCT-700TX stripping/coring tool, is designed for Times Fiber's 700TX cable. This tool produces a beveled edge on the aluminum sheath. To remove the jacket from the 700TX cable, Ben Hughes/Cable Prep has manufactured the JCS-700TX. Blade angle allows maximum jacket removal to prepare the cable for coring.

Reader service #198 (SCT-715QR), #197 (CPT-1250), #196 (CPT-1100), #195 (SCT-700TX), #194 (JCS-700TX)

Budco presented its ground wire tag called the Weatherometer, which it says offers better durability, strength and longevity outdoors. After the equivalent of 10 years in an independent test lab, the new polyethylene ground wire tag did not crack, blacken or noticeably fade. The standard 1-1/2- x 3-inch orange or green tag has a black UV-cured legend that is both weather- and scratch-resistant. Also available from Budco is a new ratchet wrench that is said to reduce signal leakage in CATV installation. The Gap Wrench, which is both torque-limiting and open-ended, was developed with suggestions from cable linemen and installers. The torque-limiting feature addresses the care and sensitivity that must be used to prevent crushing the coaxial connectors during installation.

Reader service #193 (Weatherometer), #192 (Gap Wrench)

Cadco Broadband Communications introduced the Model 375 demodulator, incorporating several improvements upon its Model 370. The zero chopper (zero carrier reference) provides a reference signal used to set the depth of video modulation without the need for a spectrum analyzer. It features three output ports, one with video/4.6 MHz audio subcarrier selectable separately or as a composite, two additional standard video ports, and horizontal and vertical sync output ports.

Reader service #177

C-COR Electronics introduced its UHF AM fiber-optic transmission system designed specifically for the international market. The UHF optical transmitter and receiver accommodate a 47-860 MHz RF bandwidth. The optical receiver module is housed in C-COR's standard eight-port housing, and an A/B switch module is optional for "CAN" type architectures. The receiver unit also features a power doubling bridger, a status monitoring module and two optical reverse path options.

And in conjunction with American Lightwave Systems, C-COR announced a new high power DFB laser transmitter in its LiteAmp AM fiber transmission family. The new LiteMaster laser transmitter has an output power of 10 to 13 milliwatts, which translates to more than double the output power than standard DFB-based fiber transmitters used for AM video transmission. The high output DFB laser technology is said to minimize the distortion-limiting drawbacks associated with externally modulated YAGs. This new product complements C-COR's existing line of AM and digital fiber-optic transmission equipment.

C-COR also showed two new 550 MHz amplifiers in its PHD trunk amplifier line. According to the company, the PT509 and PT519 provide improved distortion performance over push-pull amplifiers and are well-suited to upgrades, rebuilds and new construction. The amplifiers are fully compatible with C-COR's eight-port housings and standard trunk accessories, including the dual-output PHD bridger amplifier and the status monitoring transponder.

Also new from C-COR Electronics is a series of main line passives with an operational bandwidth at 1 GHz. The passives contain all of the features in C-COR's S-900 series passives such as 90° entry ports, fusing capability and keyed faceplates. The 1 GHz passives are C-COR's latest addition to its 1 GHz product line and will replace the company's line of 900 MHz passives.

Reader service #191 (transmission system), #190 (laser transmitter), #179 (amps), #178 (passives)

Diversified Fastening Systems now produces a #8 x 2-inch hex head Con-Sert masonry screw for mounting ceramic insulator blocks to poured concrete, concrete block and brick materials with a common 1/8-inch drill bit or 1/4-inch hex driver (or a patented #8 Con-Sert tool system). A carbide drill bit is included with every box of #8 screws. All Con-Sert screws are heat treated with dichromate over zinc-plated corrosion resistance.

Reader service #173

DX Communications introduced its DIR-657 integrated receiver/descrambler. The company says it is the industry's first RS-250B satellite-specified IRD. Its features include an RS-232C interface for remote operation and status monitoring, broadcast-quality video, two tunable subcarriers and front panel controls (including IF and subcarrier bandwidth selection). A data I/O port allows for the control of up to 100 DIR-657s through a single receiver equipped with the RS-232C interface.

Reader service #174

Gilbert Engineering featured its Wing Nut F-connector, which is designed to help eliminate unnecessary truck rolls caused by loose F-connectors while ensuring long-term contact stability without wrench-tightening. In-

tended for finger-tightening by both CATV personnel and/or subscriber, the Wing Nut is said to provide an improved grip resulting in approximately three times the torque as achieved with a 7/16 hex surface using only fingers. If a user needs to return to the original hex configuration, the plastic Wing Nut is easily cut with diagonal cutters.

Gilbert also introduced connectors for the new Comm/Scope .715 Quantum Reach "express feeder" and for Times Fiber's 700 TX cables. As well, Gilbert is "reintroducing" a reduced-size connector for Trilogy's .650 MC^2. All three connectors can be installed on directional taps with 1-1/2-inch spacing, allowing room for heat-shrink installation, and are said to exhibit a minimum return loss of 30 dB at 1 GHz.

Reader service #172 (Wing Nut), #171 (Comm/Scope connector), #170 (Times Fiber connector), #169 (Trilogy connector)

Ipitek announced the latest member of its passive optical components. This device is a single-mode, optically broadband, single fusion 1 x 3 coupler or splitter for CATV and telecommunication applications. The company says the single fusion approach to 1 x 3 couplers increases system reliability (fewer splices) and decreases excess loss and size when compared with conventional tree configurations.

Ipitek also offered the first member of its family of digital video transport products, the CQ-4. The CQ-4 can simultaneously send and receive up to four channels of video, 16 audio channels, four RS 232 signals and two separate data channels of 25 Mb/s. All of this information can be carried over a single fiber to a distance of 25 miles.

Reader service #167 (1x3 coupler), #166 (CQ-4)

New products from **Jerrold Communications** included the LifeLine status monitoring system and the Cableoptics minibridger (Model AM-MBR). The MBR fits in the lid of minibridger housings, making it compatible with all existing and future RF electronic minibridgers. The 550 MHz MBR features a single fiber forward path, a data return laser option and easy installation. Each receiver module is provided with a standard FC/APC connectorized fiber pigtail and a two-fiber connectorized service cable for ease of splicing to cable plant.

Reader service #165 (LifeLine), #164 (fiber minibridger)

Kaptron exhibited its single-mode wideband coupler, used to create taps and 1xN tree couplers in optical communications networks and test/sensor systems. They're available in a wide range of packaging options to split and combine light with typical excess loss as low as 0.1 dB. Wavelengths available are 1,310 ±40 nm, 1,550 ±40 nm and a "dual window" 1,310/1,550 ±40 nm.

Also displayed by Kaptron was the fully reversing low-profile FDDI bypass switch module, which retains the performance and the characteristics of the original. The compact design allows for internal mounting on FDDI carrier cards in dense packaging applications. Options available are fiber size, various electrical connectors and LEDs to indicate node insertion.

Reader service #160 (coupler), #159 (switch module)

Long Systems' Technical Stan-

dards Basic Training VHS video covers recommended equipment, testing procedures and briefly touches on the its proof-of-performance (POP) software. This video shows an example of each test being taken. It also covers the effect being "out of spec" has on subscribers' pictures, and how to get back into spec. It is intended for both training new techs and experienced engineering personnel.

Long Systems' POP computer software is designed for printing data input sheets, analyzing test results and creating required public records. It runs on IBM PCs and 100 percent compatible computers. POP provides the cable operator with one central place to store the volumes of test data generated. It complies with all FCC regulations and the NCTA recommended practices.
Reader service #157 (video), #156 (POP software)

The Ghost Buster from **Mega Hertz** is said to eliminate or reduce cable TV picture signal interference caused by external RF signals picked up and carried by the shielding of a coaxial cable communication with a TV or VCR. Nominal specifications (to 550 MHz) are: 0.6 dB insertion loss, 18 dB return loss, 100 dB RF shielding and 75 ohm impedance. The effective range of beat reduction is from 40-225 MHz.
Reader service #155

Monroe featured a new VCR controller with the Series 3000 program timer and 617A audio/video module that in conjunction provide real-time or timed control of up to four tape machines. VCRC software is included with the unit and gives any user the power to upload, download and edit all switching information with an undedicated IBM PC or compatible. The program timer is a microprocessor-based timing control unit with applications in the cable and commercial TV, broadcasting and process control industries.
Reader service #154

Multilink displayed its new emergency fiber-optic restoration kit. According to the company, the kit includes all of the components required to make quick repairs to fiber-optic cable in both aerial and burial applications. The restoration kit features 3M fiber products. As well, the Multilink fiber splice preparation kit is available for inclusion in the restoration kit and by itself. The prep kit provides all the tools necessary to splice fiber along with the 3M Fiberlok assembly tool (Part #2002-FSPKF). At your option, you can order the prep kit without Fiberloks or the Fiberlok assembly tool (Part #2003-FSPK) and use your own type of splice.
Reader service #153

Nexus Amplifier Solutions Corp. introduced new cable distribution amplifiers in its ASL Series. With higher gain performance to 860 MHz, the ASL 2000HO is designed for indoor and outdoor MDU amplifier needs. Also available is the ASL 1000 that offers 550 MHz performance with the gain and specifications of the ASL 2000HO.
Reader service #152 (ASL 2000HO), #151 (ASL 1000)

Northeast Filter Co. displayed its new PPF power passing traps and decoding filters for multiple dwelling units (MDUs). The devices are designed to handle 10 amps continuous 60 cycle power and are manufactured to order based on the particular combination of negative or positive channels to be trapped. Also displayed was the new group delay equalizer quality in positive trap security. The video

corrector is installed at the headend modulator video input on each channel being scrambled by interfering carrier. Then while viewing the desired channel after descrambling with a positive trap, the detail and sharpness controls are adjusted for optimum subjective picture quality improvement. The GDE-102 does not effect VITS or line 21 closed-captioned data.
Reader service #162 (PPFs), #158 (GDE-102)

Optical Networks International's Test, Measures and Restoration Group featured a new addition to the Restorpak restoration line. Dubbed the Restor-C-Pak, the kit uses AT&T's UCB1 enclosures, giving operators added flexibility during an emergency restoration. Using the enclosures enables a technician to secure and protect the restored splice in the field until a permanent fix can be completed. The UCB1 enclosures also provide the option to make the restoration a permanent fix. The Restor-C-Pak, measuring 25 inches long, 30 inches wide and 14 inches deep, includes 400 feet of prepared LXE cable with each end terminated into a UCB1 closure. This is a one-case design, as compared to the two-case design of the original Restorpak, and uses AT&T's CSL (cleave, sleeve and leave) splice technology.
Reader service #175

Philips Broadband Networks (formerly Magnavox CATV Systems), featured its new MultiMask four-port addressable interdiction system that eliminates the need for converters and descramblers. It is available in four-port and one-port models, each port capable of masking up to 72 channels simultaneously within the 48 to 600 MHz range. A capacity for four jammer modules provides a choice of four, eight, 12 or 16 oscillators, which are programmable in several security modes.
Reader service #150

Pioneer's rewritable videodisc recorder, the VDR-V1000, was demonstrated in conjunction with the Queue Master, manufactured by Telecommunications Products Corp. The VCR-V1000 is a dual-head, broadcast-quality, component recording system providing true instant start, real-time, non-linear playback and virtually instant access to any cue point on a 32-minute disc. The non-contact media can be recorded/erased over 1 million times and facilitates unlimited playback capability without signal degradation. The units' applications include commercial insertion and computer graphics.
Reader service #149

Power Guard's Power Clamp series of CATV system protectors adds IEEE 587 protection at discrete points throughout the distribution system for system reliability in areas prone to power surges or lightning strikes. This bidirectional circuit provides a low impedance surge clamping action for AC or DC circuits. The Power Clamp is available in several kits designed for retrofit of existing power inserters, distribution splitters and couplers, and also is available for plug-in installation in Power Guard power supplies.
Reader service #147

Power Technologies introduced ADCOM's next generation of standby power supplies incorporating the Battery Management System. The BMS/SPS incorporates a microcomputer that monitors battery voltages and currents independently for each individual battery. It maintains a complete record of the cumulative charge and discharge of watt hours of each individual battery, and battery charging is controlled based on current temperature within the battery compartment and actual battery conditions. The BMS detects selected error conditions and modifies its charging patterns accordingly. According to the company, this feature greatly increases the life expectancy of batteries by not overcharging or undercharging.
Reader service #146

Production Products featured its new indoor subscriber-friendly, reusable F-connector. This brass connector eliminates the older method of six to eight turns of a nut onto a threaded port for fastening a conventional connector, eliminating stripped or distorted, twisted or broken equipment ports to contend with. PPC says the connector will work properly on any drop cable with specifications of 40 to 80 percent braid coverage and on all varied braid prep lengths from 1/8- to 1/2-inch. The new connector allows a full and complete seating of the connector to the port before lock-up occurs. Full lock-up is provided through a simple half twist turn locking sleeve.
Reader service #145

Some of the over 2,500 varieties of connectors and adapters from the recently merged **Pyramid/Cabelcon** were shown at the expo. Featured was the new fiber-to-housing connector.
Reader service #144

Quality RF featured an upgraded version of its QDAX series of indoor amplifiers now with parallel ("quad") power doubling. Designed for MDU and LAN needs, it has two-way capability, a 600 MHz bandwidth and the company assures UL-approved powering for code compliance as well as a guarantee to exceed CLI isolation.

Also new from QRF is a line of drop-type amplifiers for use with long drops or multioutlet homes that enables operators to deliver the level of signals required by the new FCC rules.
Reader service #143 (QDAX amp), #142 (drop-type amp)

Riser-Bond introduced its Model 3000 simplified digital time domain reflectometer cable fault locator used to troubleshoot all types and sizes of coaxial cable. Distance to fault readings in feet or meters and type of fault are displayed on a large, high-resolution LCD. High precision accuracy (±1 percent) helps assure timely repairs. The Model 3000 features display readability to 20,000 feet, multiple range settings, variable sensitivity control, oscilloscope output and a built-in storage compartment.
Reader service #176

RS&I featured the ACS 1001 over-the-air laser system capable of transmitting up to 42 channels of video, as well as audio or data signals. It is designed to eliminate typical construction for crossing roads, rivers, etc., for a distance up to 3,500 feet. Also featured was the ACS 2000 18 GHz microwave system, which transmits AM, FM, DSB, SSB, scrambled and digital signals. Its range is up to 10 miles, 50 to 500 MHz bandwidth and is FCC-licensed.
Reader service #141 (ACS 1001), #161 (ACS 2000)

Sachs Communications showed its SC16 "Saxxit" metal cable clip

made of galvalume steel and used for securing and maintaining a uniform installation of the coaxial cable to concrete, mortar, stucco or wood. According to the company, the galvalume metal construction of the SC16 will endure all types of weather conditions and ensure the ultimate cable attachment with a reduction of cable maintenance. The SC16 metal cable clip is supplied with a preinserted self-taping screw or a drive pin.
Reader service #140

Sage Alerting Systems and **Dynatech Cable Products** introduced what they say is the first integrated audio/video cable TV override system. The Sage I is proposed as a replacement for the existing Emergency Broadcast System. According to Sage and Dynatech, it is able to interface with all radio, TV and cable facilities, and provides audio and video information from emergency actuation centers on all or selected channels.
Reader service #139

Sanko Fastem USA showcased its San-Tap line of masonry screw anchors, specifically the #8 screw. The second-generation #8 screw was designed for cable installations. It features a sharp, self-piercing point that penetrates metal and wood with equal ease. Also exhibited was the All-Drill bit, which drills through wood, light gauge metal and masonry. The bits are available in extra-long lengths for cable applications.
Reader service #138 (screw), #137 (drill bit)

Scientific-Atlanta introduced a new Headend Manager system controller that is said to be the first to provide remote backup of any channel in a headend, automatically controlling all switching and channel selections, enabling a cable operator to back up remotely and quickly any failed channel in the headend, whether off-air, satellite-delivered or locally originated. The status monitoring and control bus (SMC) interface is a multidrop, asynchronous, full-duplex communications link designed to interconnect equipment for remote control and switching applications.

Also introduced by S-A was the 9656 addressable IRD that switches automatically to alternate satellite feeds by command from programmers such as ESPN. The system utilizes a special VideoCipher R II RCM descrambler module and automatically selects the appropriate LNB input and tunes to the correct satellite transponder. New features include a built-in 6:1 RF switch for LNB selection and 40-character LCD display. Also on display was the new Model 9660 Slimline IRD, which occupies only 1-3/4 inches of vertical rack space. It is compatible with the SMC bus in the new headend manager.

S-A also introduced the new LE-II line extender, featuring a high-efficiency, transformerless power supply that is said to offer lower power bills for operators. In addition, the LE-II offers an optional wideband automatic gain control that allows the cascading of line extenders beyond the traditional two or three. The wideband AGC looks at a number of channels for accurate control over a wide variety of conditions. The LE-II is "750 MHz ready" to be prepared for the continuing demand for higher bandwidth. Scientific-Atlanta also introduced a programmable remote con-

trol designed to replace the three remote controls for the TV set, set-top terminal and digital audio tuner.
Reader service #136 (SMC), #135 (IRD), #134 (Slimline IRD), #133 (LE-II) #148 (remote)

Sencore featured two new signal level meters, the GL750A and the SL7500. Both units allow the user to pinpoint RF/video problems and performance test any headend, trunk or line equipment in any RF distribution system. Tune from 5-810 MHz or "off-air" VHF/UHF/FM with direct keypad entry for exact carrier frequency or channel. The meters feature exclusive C/N, hum, A/V and pilot tests (all on a modulated channel).

Sencore also displayed the SL750A Channelizer. It allows the user to tune to any cable RF carrier from 5-810 MHz or off-air VHF/FM/UHF with direct keypad entry for exact carrier frequency or channel, and measure RF signal levels down to -40 dB sensitivity and simultaneously monitor the RF level of both the high and low pilots, with the exclusive pilot test. It also tests C/N and hum on active channels without tuning off-channel or removing modulation to make these tests. Other features include automatic data collection and color display.
Reader service #132 (SLMs), #131 (SL750A)

Siecor Corp. previewed its new coupler housing for CATV applications — a fiber organizer unit designed to house and protect optical couplers. The housing occupies only one rack space and is organized with individual shelves.
Reader service #130

The new StormWatcher from **StormWatcher Systems** allows cable systems to become the primary source for comprehensive weather reporting. One feature for viewers is that the color radar display is seen on a customized map of the local area within a 20- to 50-mile radius. The audience can relate trouble spots to recognizable roads and landmarks in and around their communities. Aside from eliminating monthly subscriber payments to an outside source, system management gains complete control over programming and advertising schedules. StormWatcher includes all of the required rooftop instrumentation for collecting and transmitting all information to the studio below. It requires no special expertise to operate.
Reader service #129

Superior Electronics featured a portable access work station (PAWS) that allows complete portability of all the measurement functions that its Cheetah system offers. Packaged in a rugged case with battery or AC operation, PAWS permits the operator to move and store data at multiple test sites for review and documenting through the Cheetah Director software.

Superior also announced the new addition to its automated remote testing system equipment line, the Cheetah switch controller, Model CSC-16. This unit will allow automated multichannel measurement of CTB, C/N, hum and CSO. The CSC-16 will allow automatic programmable shut-down of multiple channels to comply with the newly imposed technical standards. This additional function allows the operator to incorporate multiple test monitors to simultaneously record and store distortion measurements.

Also, Superior introduced Cheetah Scan to the Cheetah line of automated remote testing equipment. Cheetah Scan is a software-controlled interface that allows the operator spectrum analysis capabilities with enhanced Cheetah hardware. The user may select the center frequency, frequency span, amplitude range, tuning resolution and many other spectrum features. One reading can contain up to 10,000 data points. Graphs may be measured interactively and then stored in a data base for reviewing and printing later.
Reader service #128 (PAWS), #127 (CSC-16), #126 (Cheetah Scan)

New from **Tailgater** is its line of van equipment, including fully customized aluminum interiors and ladder racks.
Reader service #125

The **Tektronix** Television Division featured a new demodulation system based on its 1450 series demodulator mainframe. The system, known as the DS 1450-1 TV demodulator system, incorporates two Tek instruments, the 1450 mainframe and the newly announced TDC-10 tunable downconverter (for synthesized tunability up to 1 GHz). The DS 1450-1 provides accurate demodulation of cable TV signals for use with baseband video measurement equipment. Unique circuitry developed for the DS 1450-1 is said to virtually eliminate demodulation distortion, delivering a transparent picture of performance levels. When combined with Tek's VM 700A automated measurement set or its 1780R video measurement set, the DS 1450-1 supports all newly required FCC baseband requirements.
Reader service #189

Telecommunications Techniques displayed the Fibertech 462 Optical Smarts single-mode attenuation/reflection test set. It provides backreflection, power and loss measurements for characterizing and acceptance testing of fiber-optic cable plants and components used for wideband analog or high-speed digital data transmission. It is available with one or two laser or LED stable optical sources and comes standard with a second internal InGaAs detector for return loss measurements.

Also on display was the Fibertech 190 series fiber-optic test sets, combining a stable optical source (100 series) with a hand-held optical power meter (130 series). Sources are available at 850, 1,300 and 1,550 nm wavelengths for both single- and multimode applications.

Telecommunications Techniques also displayed the Fibertech 300/301 visual fault locators (VFL), said to be an easy-to-use light source for fiber installers and maintenance technicians. When connected to a fiber, the VFL uses a visible red laser light source to make breaks and macrobends glow, pointing out problem areas along the fibers. The glow also can be used to visually align mechanical splices for minimum loss. The Fibertech 300 has a usable range beyond 6 km and the Fibertech 301 has a usable range beyond 4 km.

Also exhibited by Telecommunications Techniques was the portable, lightweight Fibertech 200 attenuator for optical loss simulations and margin measurments. The 0.1 dB direct reading digital display acounts for the insertion loss of the Fibertech 200, making it unnecessary to add a nominal insertion loss to the reading — the actual attenuation is displayed. Two display modes provide additional measurement flexibility:

(Continued on page 82)

COMMUNICATIONS TECHNOLOGY

Name _____

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Reader Service Card

August 1992 (Valid until October 1992)

CT 8/92 - 1

Simply circle the number(s) below corresponding to products of interest!

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1	20	39	58	77	96	115	134	153	172	191
2	21	40	59	78	97	116	135	154	173	192
3	22	41	60	79	98	117	136	155	174	193
4	23	42	61	80	99	118	137	156	175	194
5	24	43	62	81	100	119	138	157	176	195
6	25	44	63	82	101	120	139	158	177	196
7	26	45	64	83	102	121	140	159	178	197
8	27	46	65	84	103	122	141	160	179	198
9	28	47	66	85	104	123	142	161	180	199
10	29	48	67	86	105	124	143	162	181	200
11	30	49	68	87	106	125	144	163	182	201
12	31	50	69	88	107	126	145	164	183	202
13	32	51	70	89	108	127	146	165	184	203
14	33	52	71	90	109	128	147	166	185	204
15	34	53	72	91	110	129	148	167	186	205
16	35	54	73	92	111	130	149	168	187	206
17	36	55	74	93	112	131	150	169	188	207
18	37	56	75	94	113	132	151	170	189	208

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August 1992 (Valid until October 1992)

CT 8/92 - 2

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2	21	40	59	78	97	116	135	154	173	192
3	22	41	60	79	98	117	136	155	174	193
4	23	42	61	80	99	118	137	156	175	194
5	24	43	62	81	100	119	138	157	176	195
6	25	44	63	82	101	120	139	158	177	196
7	26	45	64	83	102	121	140	159	178	197
8	27	46	65	84	103	122	141	160	179	198
9	28	47	66	85	104	123	142	161	180	199
10	29	48	67	86	105	124	143	162	181	200
11	30	49	68	87	106	125	144	163	182	201
12	31	50	69	88	107	126	145	164	183	202
13	32	51	70	89	108	127	146	165	184	203
14	33	52	71	90	109	128	147	166	185	204
15	34	53	72	91	110	129	148	167	186	205
16	35	54	73	92	111	130	149	168	187	206
17	36	55	74	93	112	131	150	169	188	207
18	37	56	75	94	113	132	151	170	189	208

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1. Are you a member of the SCTE (Society of Cable Television Engineers)?
Yes ☐ No ☐

2. In the performance of my job, I authorize, specify or recommend products and/or services for purchase.
Yes ☐ No ☐

CT 8/92

3. Please check the category that best describes your firm's primary business (please check one only).

1. Cable TV Systems Operations
   - ☐ a. Independent Cable TV Systems
   - ☐ b. MSO (two or more Cable TV Systems)
- ☐ 2. Cable Tv Contractor
- ☐ 3. Cable TV Program Network
- ☐ 4. SMATV or DBS Operator
- ☐ 5. MDS, STV or LPTV Operator
- ☐ 6. Microwave or Telephone Company
- ☐ 7. Commercial Television Broadcaster
- ☐ 8. Cable TV Component Manufacturer
- ☐ 9. Cable TV Investor
- ☐ 10. Financial Institution, Broker, Consultant
- ☐ 11. Law Firm or Government Agency
- ☐ 12. Program Producer or Distributor
- ☐ 13. Advertising Agency
- ☐ 14. Educational TV Station, School or Library
- ☐ 15. Other _____

(please specify)

4. Please check the category that best describes your job title/function.

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- ☐ B. Management
- ☐ C. Programming
- ☐ Technical/Engineering
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  - 2 ☐ Director
  - 3 ☐ Manager
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Products

(Continued from page 80)

absolute and relative. The relative mode provides a referenced attenuation for measuring optical margins.
Reader service #124 (Fibertech 462), #123 (Fibertech 190), #122 (VFLs), #121 (attenuator)

The Phonejak PX 102, designed to facilitate PPV ordering, was on display at the **Toner** booth. It offers a base unit that connects into the telephone company's supplied phone line. The extension unit plugs into the AC outlet at the TV set and communicates back to the base unit on FM frequencies transmitted over the electrical wiring in the home. The user plugs the converter box into the extension unit and PPV communication is ready. The product is said to be easy to install (with complete installation taking less than two minutes and no certification or training needed).

Also shown by Toner was the TLE 450-60 line extender amplifier that incorporates the latest in IC hybrid circuitry. The amplifier is enclosed in a small, weatherproof, corrosion-resistant, aluminum housing designed for strand or pedestal mounting. The housing uses neoprene rubber and stainless steel wire mesh gaskets. These gaskets, along with the double tongue-and-groove design of the housing ensure RFI integrity and environmental protection, according to the company.
Reader service #120 (PX 102), #119 (amp)

U.S. Electronics showed its Universal 3-Function Plus digital radio option remote control. It operates the subscriber's cable box, TV set and VCR. Delivery is slated for Fall '92.
Reader service #118

Videotek displayed the TVM-700 waveform monitor/vectorscope series, which features two operating levels, one for operators and one for engineers. There are three independent digital line selects, each able to display any line of any field of any input. The SC/H phase measurement can display four separate composite inputs at once, and the 3-D vector display matches luminance, phase and saturation.
Reader service #116

Viewsonics introduced a new series of miniaturized amplifiers with single and multiple outputs. The frequency ranges are 45-550 MHz, 45-860 MHz and 45 MHz-1 GHz. These new amps are scheduled for delivery in September.

Viewsonics also previewed a new concept in multi-output distribution taps. Using a modular concept, this series of multitaps have various port values within 16-, 24-, 32- and 48-port models. According to the company, home-run installs with extreme distance variations are easily served and the multitaps provide for more selectivity in signal level. Tap values are from 14 to 35 dB and from 5-600 MHz.
Reader service #115 (amps), #114 (taps)

Vikimatic featured Divide-A-Duct, a polyethylene "web" that can be pushed through an occupied duct without becoming twisted with existing coax or fiber-optic cable. It creates a space on top of existing cable to allow placement of new fiber-optic or coax cable. A rope is pushed or pulled in with the Divide-A-Duct. Then new cable can be pulled in, riding on the low friction duct web.
Reader service #113

What is a soliton?

(Continued from page 63)

within a pulse of high-intensity light. This creates a moving "valley" of higher dielectric constant fiber material. The moving valley pulls along the slower runners while retarding the faster ones to maintain the original pulse shape as the valley propagates along the fiber.

Figure 4: Runners on a mattress illustrate process of soliton formation in an optical fiber

Conclusions

Solitons can be made only for pulse (digital) transmission, and not for analog transmission. Hence solitons cannot be made, therefore cannot be used, in current CATV, which is an analog transmission medium. Even when we start transmitting compressed digital TV on say 1 GHz systems, solitons cannot be made because the digital information will be modulated on an analog RF carrier — thus analog transmission (even though conveying digital information).

However, there are possibilities for future use in CATV. Currently there are at least two proposed business areas (and inevitably many more as yet undiscovered ones in the future) that can make good use of solitons in CATV system applications. One is the increasing activity in the interconnecting of separate CATV systems — e.g., the multiple systems in and around San Francisco. Another attractive application possibility is in the area of telephone and data transmission, i.e., PCNs (personal communication networks), telephone alternate access or bypass, etc. All these may be done efficiently with a digital baseband transmission (time multiplexed rather than RF multiplexed and therefore solitons will be attractive to permit high data rates over longer distances.

Inevitably, as with any new conception, there will be those who doubt. However a declaration from that noted sage Casey Stengel seems appropriate — "They say you can't do it, but sometimes it doesn't always work." **CT**

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3) "The World of Communications is Moving to Fiber Optics," M. Leonard, *Electronic Design*, Jan. 9, 1992.
4) "Light That Acts Like 'natural bits,' " T. Bell, *IEEE Spectrum,* August 1990.
5) *Modern Optical Engineering,* W. Smith, McGraw-Hill, 1990.

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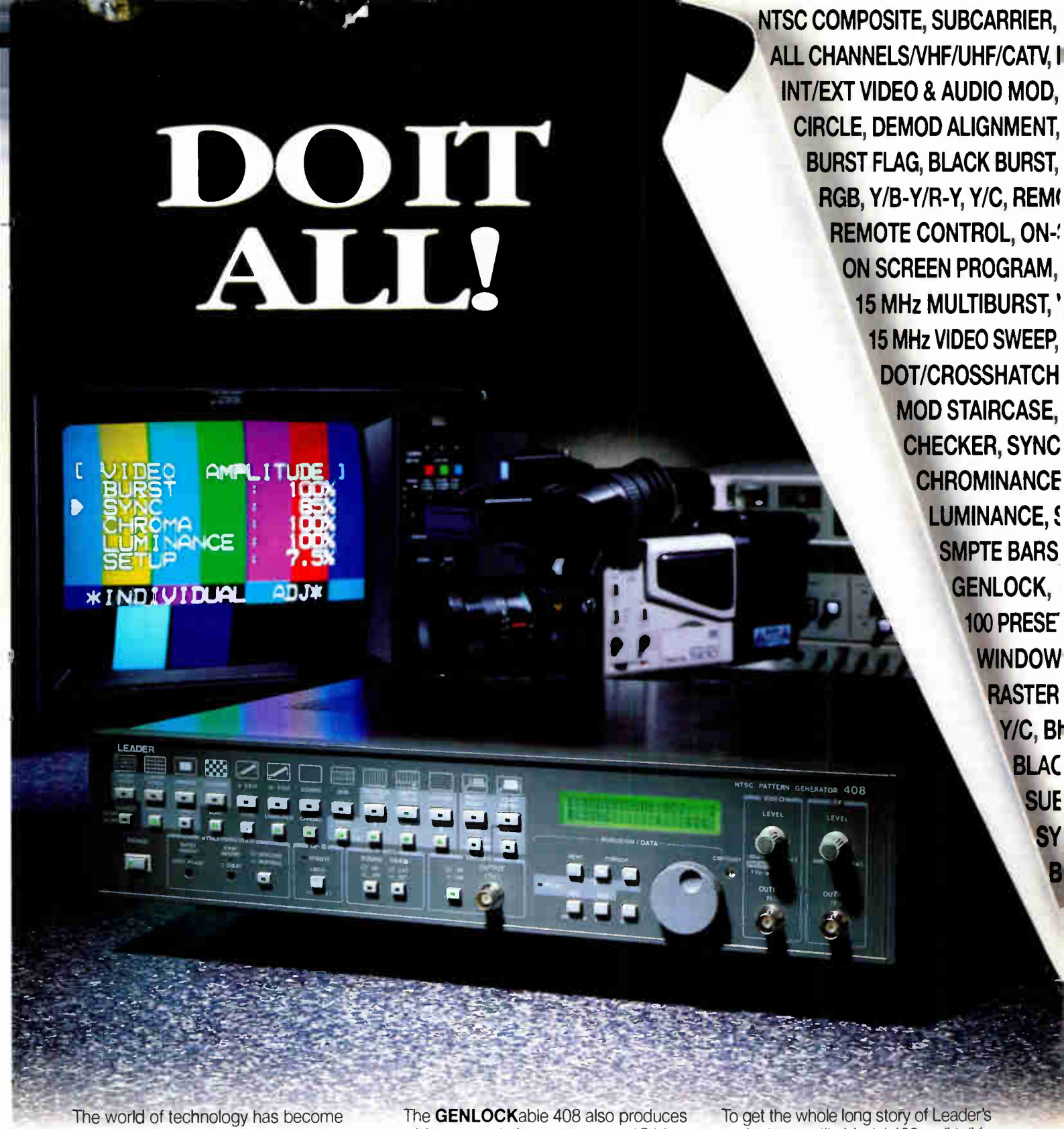

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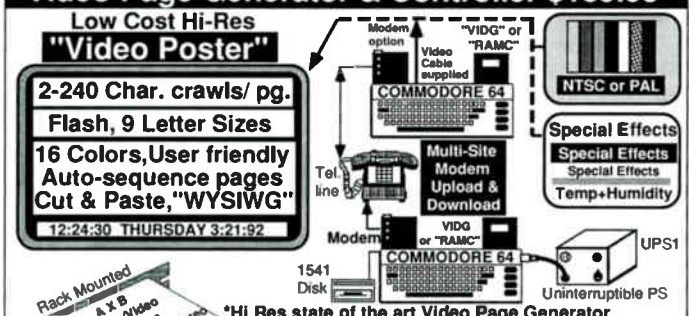

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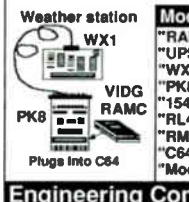

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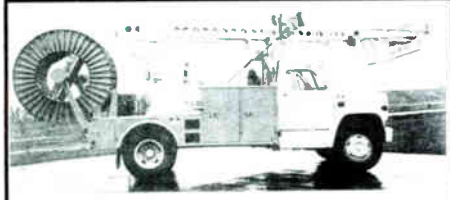

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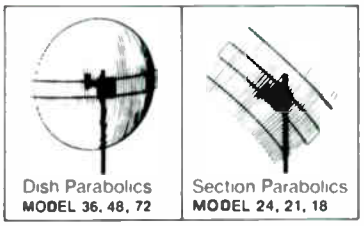

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BOOKSHELF

The following is a listing of videotapes currently available by mail order through the Society of Cable Television Engineers. The prices listed are for SCTE members only. Non-members must add 20 percent when ordering.

- *Standby Power Supply Maintenance* — Alpha Technologies produced this in-depth program on this important topic, which features company representative Bob Bridge, for the SCTE Product-Specific Tele-Seminar Program. (1 hr.) Order #T-1052, $35.
- *RF Field Strength: Principles and Practices* — An effective presentation of the basics of an RF field, relating what it is and how it reacts both inside and outside of a cable. Ron Adamson of Texscan covers the principles of shielding, wavelength and the use of a dipole antenna for detection. In addition, the terminology of the FCC's "microvolt per meter" is discussed in relation to cable's "dBmV." (1 hr.) Order #T-1053, $35.

Note: *T-1056 and T-1057 were videotaped at Cable-Tec Expo '88 in San Francisco.*

- *High-Definition Television Technology* — This panel discussion from the 1988 Engineering Conference features Walt Ciciora of ATC, Donald Wilkinson of Fisher Broadcasting Co., Lawrence Lockwood (then of Contel) of TeleResources, Paul Resch of The Disney Channel and William Thomas of Nielsen Media Research. (1-1/2 hrs.) Order #T-1056, $45.
- *Frontline: Senior Cable Engineers* — This video features technical leaders from the cable industry and related fields in a panel discussion moderated by Wendell Bailey of NCTA. The discussion focuses on changes in delivery systems, as well as interfacing newer consumer equipment to CATV systems, issues that every cable engineer and technician will face in years to come. (1-1/2 hrs.) Order #T-1057, $45.

All SCTE videotapes are in color and are available in the 1/2" VHS format only. Videotapes are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

Shipping: Videotapes are shipped UPS. No post office boxes, please. SCTE pays surface shipping charges within the continental U.S. only. Orders to Canada or Mexico: Please add $5 (U.S.) for each book or videotape. Orders to Europe, Africa, Asia or South America: SCTE will invoice the recipient for additional air or surface shipping charges (please specify). "Rush" orders: a $15 surcharge will be collected on all such orders. The surcharge and air shipping cost can be charged to a Visa or MasterCard.

To order: All orders must be prepaid. Shipping and handling costs are included in the continental U.S. All prices are in U.S. dollars. SCTE accepts MasterCard and Visa. To qualify for SCTE member prices, a valid SCTE identification number is required, or a complete membership application with dues payment must accompany your order. Orders without full and proper payment will be returned. Send orders to: SCTE, 669 Exton Commons, Exton, Pa. 19341 or fax with credit card information to (215) 363-5898.

CALENDAR

August

4-5: Scientific-Atlanta technical training class, out-of-band systems, Models 8550 and 8590, Atlanta Training Center, Atlanta. Contact Bridget Lanham, (800) 722-2009.

4-6: C-COR Basics of fiber optics for CATV seminar, the Courtyard, Denver Tech Center, Englewood, Colo. Contact Kelly Jo Kerstetter, (814) 231-4422.

5: SCTE Ark-La-Tex Chapter seminar, fiber and digital video compression, Longview, Texas. Contact Robert Hagan II, (903) 758-9991.

6: SCTE Upper Valley Chapter seminar, BCT/E Category I, "Signal Processing Centers," and BCT/E exams to be administered, Holiday Inn, White River Junction, Vt. Contact Matthew Alldredge, (802) 885-9317.

6-7: Scientific-Atlanta technical training class, Model 8600 implementation, Atlanta Training Center, Atlanta. Contact Bridget Lanham, (800) 722-2009.

7: SCTE Rocky Mountain Chapter, BCT/E exams to be administered at all levels. Contact Patrick Kelley, (303) 267-4739.

10-12: Technology for Technicians II national SCTE seminar, Holiday Inn, Richmond, Va. Contact SCTE, (215) 363-6888.

11: SCTE Cascade Range Chapter seminar. Contact Cynthia Stokes, (503) 230-2099.

11: SCTE Desert Chapter seminar, headends and new technologies. Contact Chris Middleton, (619) 340-1312, ext. 258.

11-12: Scientific-Atlanta technical training class, design considerations and sweep and balance, Atlanta Training Center, Atlanta. Contact Bridget Lanham, (800) 722-2009.

12-13: SCTE Ohio Valley Chapter seminar, digital compression, Holiday Inn, Cleveland (12th) and Rodeway Inn, Cincinnati (13th). Contact Jon Ludi, (513) 435-2092.

12 & 14: SCTE Chesapeake Chapter seminar, Installer Certification review and tests to be administered, Comcast Cablevision, Timonium, Md. (12th) and Arlington Cable TV, Arlington, Va. (14th). Contact Jennifer Wardrop, (410) 461-7017.

13: SCTE Chesapeake Chapter seminar, Installer Certification, Holiday Inn, Columbia, Md. Contact Jennifer Wardrop, (410) 461-7017.

13: SCTE Satellite Tele-Seminar Program, *Video and Audio Measurements Part Three,* to air from 2:30 to 3:30 p.m. ET on Transponder 6 of Galaxy I.

15: SCTE Golden Gate Chapter, BCT/E exams to be administered, Viacom, Pleasanton, Calif. Contact Mark Harrigan, (415) 358-6950.

18: NCTA technical standards seminar, Boston Marriott Copley Place, Boston, Mass. Contact Christie Love, (202) 775-3637.

18: SCTE Southeast Texas Chapter seminar, Warner Cable office, Houston. Contact Rosa Rosas, (409) 646-5227.

18-19: Scientific-Atlanta technical training class, Model 8600 operation and maintenance for new System Manager 10 users, Atlanta Training Center, Atlanta. Contact Bridget Lanham, (800) 722-2009.

19: SCTE San Diego Chapter seminar. Contact Kathleen Horst, (310) 831-4157.

20: SCTE New England Chapter, BCT/E exams to be administered. Contact Jeff Piotter, (508) 685-0258.

20-21: SCTE Great Plains Chapter seminar, technical standards, and BCT/E exams to be administered. Contact Jennifer Hays, (402) 333-6484.

20-21: Scientific-Atlanta technical training class, pay-per-view and impulse pay-per-view, Atlanta Training Center, Atlanta. Contact Bridget Lanham, (800) 722-2009.

22: SCTE Cactus Chapter seminar, National Electric Codes. Contact Harold Mackey, (602) 352-5860, ext. 135.

25-26: Scientific-Atlanta technical training class, fiber-to-the-serving area architecture, Atlanta Training Center, Atlanta. Contact Bridget Lanham, (800) 722-2009.

26: SCTE Greater Chicago Chapter, BCT/E exams to be administered, Willowbrook, Ill. Contact Bill Whicher, (708) 362-6110.

26: SCTE Miss/Lou Chapter seminar, Slidell, La. Contact Dave Matthews, (504) 923-0256, ext. 309.

27: SCTE New Jersey Chapter seminar, future technologies: dBs, compression, 16 GHz and PCN, and BCT/E exams to be administered. Contact Jim Miller, (201) 446-3612.

27: SCTE Upstate New York Chapter seminar, transient protection, Four Seasons Restaurant, Amherst, N.Y. Contact William Grant, (716) 827-3880.

27: SCTE Northern California Meeting Group seminar, Mt. Shasta, Calif. Contact Dan Barger, (916) 547-5438.

27-28: Scientific-Atlanta technical training class, Model 8600 operation and maintenance, Atlanta Training Center, Atlanta, Ga. Contact Bridget Lanham, (800) 722-2009.

Planning ahead

Oct. 6-8: Mid-America Cable Show, Kansas City, Mo. Contact (913) 841-9241.

Oct. 13-14: Atlantic Cable Show, Atlantic City, N.J. Contact (609) 848-1000.

Dec. 2-4: Western Cable Show, Anaheim, Calif. Contact (415) 428-2225.

Jan 6-7: SCTE Fiber-Optic and Emerging Technologies seminar. Contact (215) 363-6888.

Feb 23-25: Optical Fiber Conference '92, San Jose, Calif. Contact (202) 223-8130.

Feb 24-26: Texas Cable Show, San Antonio, Texas. Contact (512) 474-2082.

April 21-24: SCTE Cable-Tec Expo, Orlando, Fla. Contact (215) 363-6888.

June 6-9: NCTA National Show, San Francisco. Contact (202) 775-3669.

September

1-2: Wisconsin Cable Communications Association convention, Chula Vista Resort, Wisconsin Dells, Wis. Contact (608) 256-1683.

9-11: Eastern Cable Show, Atlanta. Contact (404) 252-2454.

15-17: Great Lakes Cable Expo, Cleveland Convention Center, Cleveland. Contact Holly Mills, (517) 482-9350.

15-17: Magnavox mobile training center seminar, Cleveland. Contact Patricia Morgenstern, (315) 682-9105.

Accomplishments of the team

The following is adapted from the author's outgoing address presented during the Awards Luncheon at Cable-Tec Expo '92 in San Antonio, Texas.

By Wendell Woody
Immediate Past President
Society of Cable Television Engineers

Almost visible advancement this year was the adoption of an action item to utilize the titles of chairman and vice chairman to better reflect the actual positions of the elected board officers who serve voluntarily. The current title of the Society president will be used to identify the Society's employed head of staff; this action changes the title of the current executive vice president, Bill Riker, to that of president. There is a side benefit for the Society generated by Bill's new title — we now have our own "first lady," Anna Riker.

A significant achievement this year was expanding our national staff with the employment of Marvin Nelson as director of chapter development.

I wish to acknowledge our board of directors, and particularly the new members who attended their first board meeting yesterday. I also want to acknowledge our special guests from the state and regional CATV associations who are here in attendance, also the director of engineering, Antoine Boucher, from the Canadian Cable Television Association, Ottawa, Canada, plus our many friends from the Federal Communications Commission and each of you.

Achievements

Again this year, our board of directors, the standing committees and many subcommittees have achieved many many goals. They have researched and established a SCTE mission statement: "Training, Certification and Standards." A well-documented F-connector standard has been established by the Interface Practices Subcommittee and is currently being reviewed by CENELEC in Europe.

Four engineering committees have been initiated this year. Two are currently very active: In-Home Cabling and EBS. Two others are being kicked off at this expo on Wednesday: CATV Design and Construction and CLI. (For more on these subcommittees and their meetings at the expo, see the section of the wrap-up beginning on page 34.)

As your outgoing president, I'm most proud of the board's accomplishments as an elected team — and even more so for the outstanding individual exemplary dedication and contributions each made to the Society.

President's Award

As SCTE president it is my duty to announce the recipient of the SCTE President's Award, given annually to the company, organization or individual that has provided outstanding support to SCTE. In the history of the Society, never has a cable operator received this award, yet our 73 chapters and the national membership consist predominately of cable operator employees. Therefore, I am extremely proud this year's award has been earned by a cable operations company. I hope this is a stimulant for all other cable operators to demonstrate their support toward the SCTE with active participation in local chapters, national subcommittees, the BCT/E Program, seminars and even attendance to next year's Cable-Tec Expo.

This year I have chosen American Television & Communications. The reasons are:

I) ATC Senior Vice President of Engineering and Technology James Chiddix has served as chairman for the national SCTE Nominations Subcommittee (1992), as well as a member of the Planning and Program Subcommittee for the SCTE Fiber Optics Plus technical seminar. In addition, he has spoken on many occasions for the Society both at chapter meetings and national events.

2) ATC's Walter Ciciora, Ph.D., serves on the SCTE national board of directors and is the chairman of the SCTE Training Committee.

3) ATC's David Pangrac, Jay Vaughan and Louis Williamson are all active speakers at SCTE technical seminars.

4) ATC's Keith Burkley has accepted the chairmanship for the newly established engineering subcommittee on CATV Design and Construction.

5) ATC's David Franklin serves on the national SCTE Engineering Committee and he is chairman of the Personal Achievement Awards and Interface Practices subcommittees.

6) ATC's Ron Wolfe is chairman of the national Cable-Tec Games and Career Path Proposal subcommittees.

7) ATC's Steve Johnson is BCT/E certified and is assistant chairman for the EBS Subcommittee, and serves on many others. As well, he maintains the SCTE ham radio operators roster (see CT, June 1992, page 44).

8) ATC's Austin "Shorty" Coryell has served the SCTE national Scholarship Subcommittee for many years.

9) ATC has six employees serving as chapter presidents, 18 others serving as chapter officers or board members, and many installers, technicians and engineers with membership in local chapters.

Wendell Woody and SCTE's first lady Anna Riker with a "border guard" during Expo Evening.

New leader

It is my pleasure to introduce the new leader for the Society, the first board-elected chairman. It goes to a person who already holds a string of Society firsts:

- First person to be BCT certified.
- First American to become an Honorary Fellow member of the British SCTE.
- First Fellow member in the U.S. SCTE.

And now, our first chairman of the Society, Ron Hranac. **CT**

Editor's note: For all there was to see and do and learn from this year's expo, see the "News" section starting on page 12, the special wrap-up, "Cable-Tec Expo '92: SCTE takes the Alamo," beginning on page 26 and "Products," page 74.

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