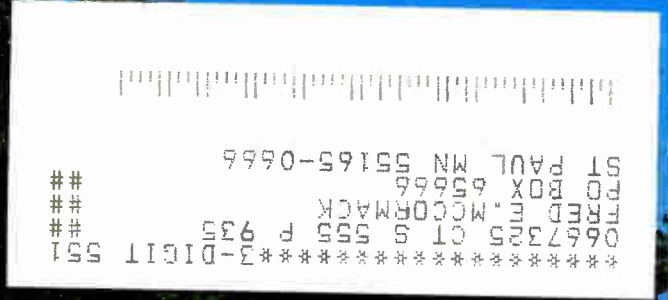
PBI

COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

Cable-Tec Expo '94

SCTE celebrates 25 years



Advances in fiber strategies

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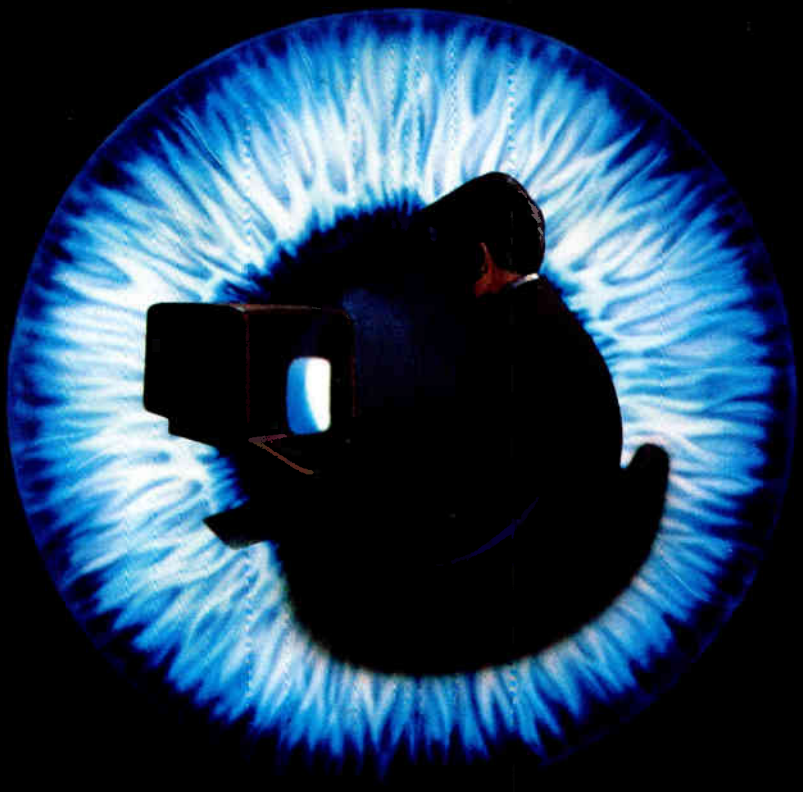
Signs of True Leadership



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True leaders of any high-tech industry are those who dare to take new paths in search of improved technologies. The accepted ways may be adequate to the job, acceptable in the marketplace. Complacency rules the day. But a true leader will take the risk of developing maverick thinking into revolutionary advances. And the conventional suddenly gives way to a new tradition of innovative progress. That's how the Trilogy tradition began, and continues to this day in the coaxial cable field.

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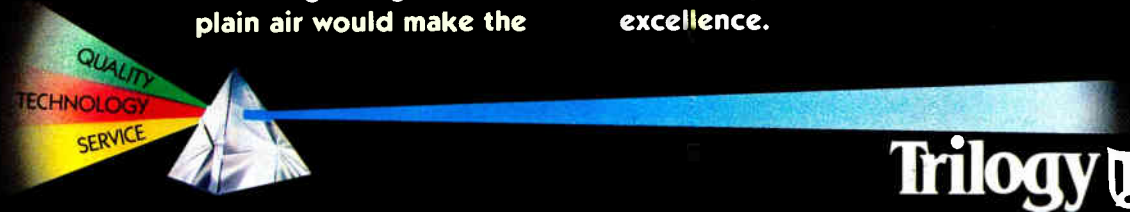

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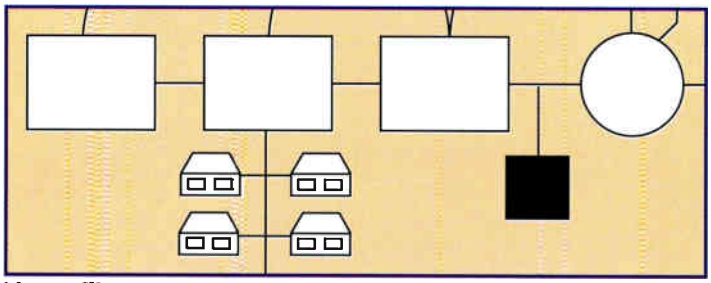

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Bob Sullivan

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 Communications Technology™ (ISSN 0884-2272) is published monthly by Phillips Business Information Inc., 1201 Seven Locks Road, Suite 300, Rockville, MD 20850. Editorial and sales offices located at 1900 Grant St., Suite 720, Denver, CO 80203, (303) 839-1565. August 1994, Volume 11, Number 6. Second class postage paid at Rockville, MD, and additional mailing offices. POSTMASTER: Send address changes to Communications Technology, Phillips Business Information Inc., 1201 Seven Locks Road, Suite 300, Rockville, MD 20850. Printed in U.S.A.

There's a New Addition to Our Family.

They're here! Regal wide body taps from ANTEC – developers of the first 1 GHz tap and line passive products for the cable industry.

Regal 1 GHz two-way and four-way wide body taps meet the needs of your growing network by affording you flexibility in system design and construction. These wide body taps allow you to upgrade any existing plant to 1 GHz without extension connectors.

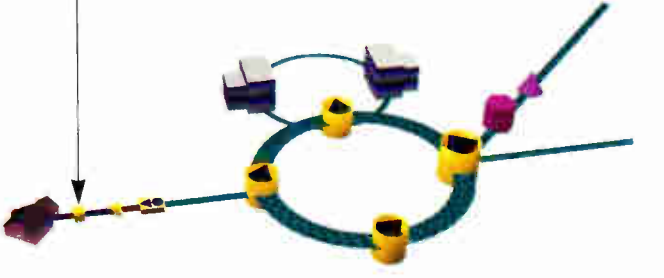
Regal wide body taps offer:

- 1 GHz bandwidth to accommodate emerging technologies such as Near Video On Demand, HDTV, and Digital Audio.
- Premium components for superior RF performance and dependability – the trademark of Regal products.
- Most extensive selection of main line distribution passives in the cable industry – including narrow and wide body taps as well as traditional and surge protected line passives.

Contact your local ANTEC representative and meet the new additions to our Regal product family.

Call 1-800 TO ANTEC.

Our Cable Integrated Services Network (CISN) is a "blueprint" for building a broadband network that accommodates interactive services in a 1 GHz spectrum. The Regal family of products by ANTEC supports this vision.



REGAL by ANTEC

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EDITOR'S LETTER

Time for a change?

This year marks the 25th year that the Society of Cable Television Engineers has been serving the CATV industry. We're now over 12,000 members strong and our membership represents something like 50 different countries. Our International Council provides a forum for information exchange and technical cooperation between the U.S. SCTE and similar organizations abroad.

In the United States alone, we have 73 chapters and meeting groups providing training at the local level and provisions to create international chapters were recently established. The Society has emerged as the leading training, certification and standards organization for cable, both here and overseas. Our annual Cable-Tec Expo is recognized as the leading hardware, technology and training show. (For details on this year's Expo, the coverage begins on page 32.) We've made a lot of changes during our 25-year history.

Even more dramatic are the changes that have occurred in the cable industry. "Convergence" is an often heard term, as is the "information superhighway." While it's safe to say that cable as we know it will be pretty much the same as it is now for the next few years, every indication suggests that in the long term our industry will evolve into something quite different.

Change the name?

The June 1994 issue of *Interval*, SCTE's monthly newsletter, has an important membership survey that all Society members should read and respond to. It concerns a proposal to change the Society's name. If you have not yet done so, I urge you to pick up that issue of *Interval*, turn to page 7, read the material, fill out the form, and fax it to SCTE headquarters at (610) 363-5898.

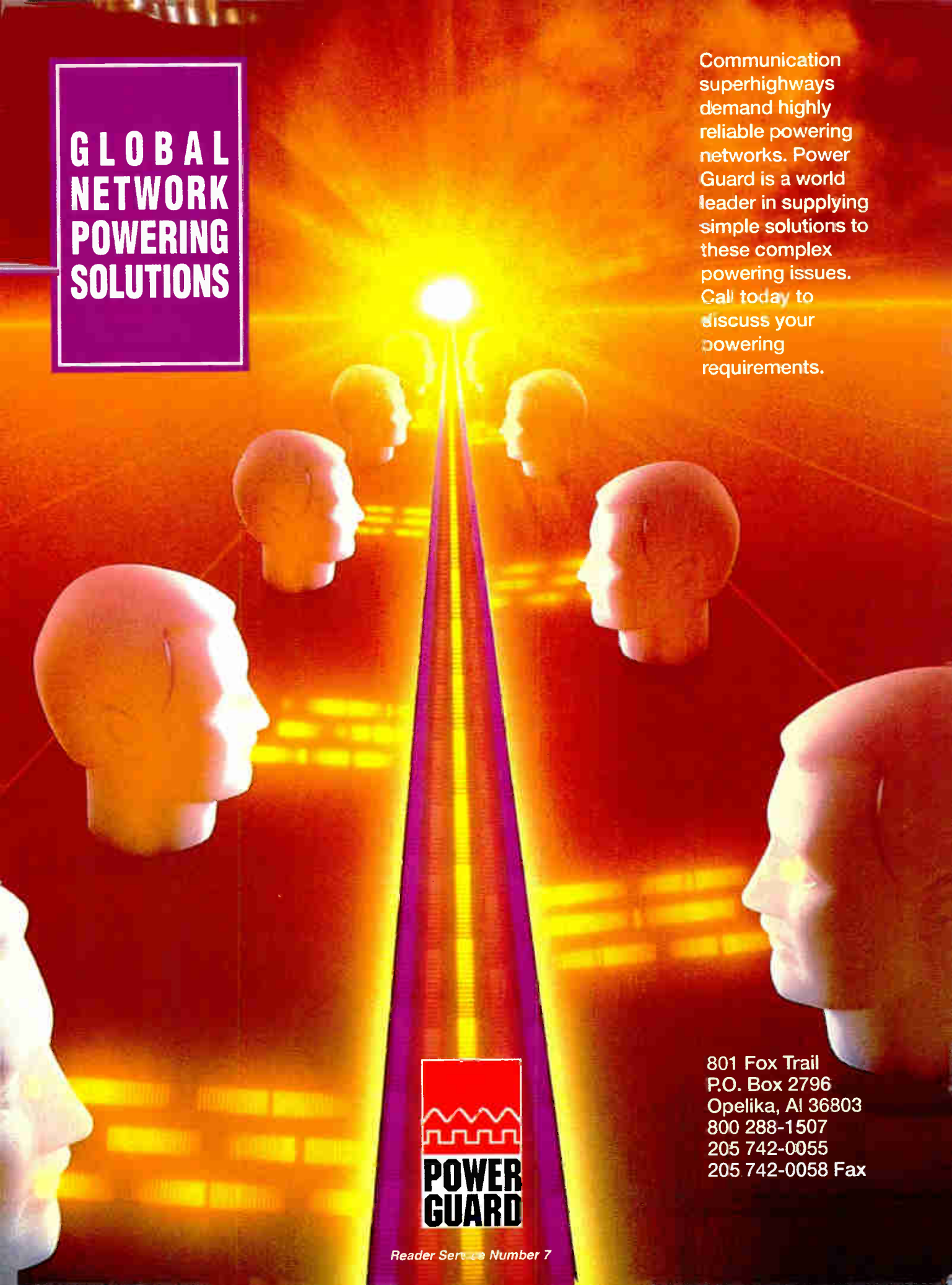
The basis for the proposed name change comes from the Society's Planning Committee. Recognizing that our industry and its core business is undergoing incredible change — and will continue to do so for the foreseeable future — the committee sees SCTE in a position to lead much of this technical change. As such, calling ourselves the Society of Cable Television Engineers may not be entirely appropriate as we move toward the next generation of communications.

If a name change is to be made, it is a given that "SCTE" will remain our designation. The question is whether or not SCTE should continue to mean "Society of Cable Television Engineers." The Planning Committee has proposed "Society of Cable Telecommunications Engineering" but is open to other ideas. (I personally prefer "Society of Cable and Telecommunications Engineers.")

Understand that none of this is cast in stone. First of all, SCTE needs your comments. Any decision will be based on membership input. The survey form in *Interval* asks if you agree with the proposed name change, if you think it should remain as it is now, or if you have a suggestion for alternative names. The board of directors will consider the Planning Committee's proposal at its September meeting. If the membership feels that a name change is important, then a referendum vote to change the bylaws accordingly will be sent out in the 1995 election package.

Ultimately it's up to you. But SCTE needs to hear from you. SCTE is your organization, and your voice establishes its direction. If you lost your copy of the June issue of *Interval*, contact SCTE headquarters — phone (610) 363-6888 — for a copy of the name change membership survey and send back the completed form by the end of this month.

Ronald J. Hranac
Senior Technical Editor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The TVM550 expands bandwidth to make agile modulation hotter than ever.

Standard's TVM450 was a revolution – the first frequency agile, PLL-controlled, broadband heterodyne modulator capable of near-crystal performance without heavy post-filtering.

Now the TVM550 is making agile modulation hotter than ever.

With the TVM550, you get a re-broadcast quality modulator with noise- and spurious-free RF output and ultra-stable, artifact-free agile PLL synthesized tuning anywhere from 54 to 550 MHz. So you can cover a much bigger slice of the broadband spectrum with one device.

And if that's not enough to make the TVM550 sizzle, there's more.

Talk about integration.

Short on rack space (and who isn't)? The TVM550 is designed to accept the seamless integration of options, including the CSG60 BTSC/MTS stereo generator and automatic high-level I.F. switching. By eliminating separate components for these functions, the TVM550 saves rack space, external wiring and AC power requirements, and reduces heat generated in the headend.

A few refinements.

The TVM550 also offers some very refined, practical features to make operations simple and obvious.

Video and RF test ports, a seven-segment deviation meter and BTSC indicator are all conveniently located on the front panel, while preprogammed FCC frequency offsets are microprocessor controlled for exact system requirements. The TVM550's advanced circuitry, slim-line design and high level performance characteristics make it the hot choice of cable MSOs.

Get it while it's hot.

When you add up all the TVM550 can do, it's easy to see why it's becoming a very hot seller. But you don't have to take our word for it. Call us, and we'll send you complete specs and pricing. And if that's not enough to convince you, we'll set it up and show you – in your facility or ours.

Call today. We want to prove the TVM550 is one hot idea where you won't get burned.

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Hot idea.

The following news ran in the "CT Daily" at Cable-Tec Expo '94 held in St. Louis.

H-P acquires CaLan

Hewlett-Packard Co. and CaLan Inc. signed a definitive agreement for H-P to acquire CaLan. The acquisition was expected to be completed by July 1, 1994. Terms were not disclosed.

H-P says the acquisition demonstrates its commitment to support the testing needs of the CATV industry. Cable TV operators now will have a single, full-service supplier that provides a comprehensive offering of test and measurement products and network monitoring systems.

CaLan's return-to-factory service and upgrade policy will remain in place and be incorporated by H-P's worldwide service program.

Expansion at Power Guard

Power Guard Inc. announced it recently completed an 18,000 square foot expansion of manufacturing facilities. Additional manufacturing and design equipment also has been added. The expansion was funded principally by a $3.4 million industrial revenue bond by the industrial development board of the city of Opelika.

Also, the company announced that it has hired over 100 additional manufacturing personnel, professional engineers and technicians in the past six months. The additional personnel were required as a result of the growth of the manufacturer of power supplies and security enclosures for the broadband communications worldwide market.

ANTEC success: Splice enclosures

ANTEC announced that it has deployed close to 1,000 FiberPak splice enclosures to MSOs in the six months the product has been available. Engineered for simplicity to reduce installation time, training and unnecessary parts, FiberPak eliminates the need for special tools, heat, adhesives, drills and power re-entry equipment. It is easy to install as an amplifier housing, making it "craft-friendly" for reliable installation.

ANTEC also announced that in early May, Tele-Communications Inc. launched a test of voice/data-over-cable technology using ANTEC's Cable Loop Carrier-500 (CLC-500) broadband digital telephony system. The field trial, taking place in TCI's South Florida system, is one of the first to employ cable/telephone technology in an operating business environment, which, in this case, involves work-at-home applications for a TCI supervisor and two customer service representatives (CSRs).

Finally, the company announced ANTEC and PowerGuard performed

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comprehensive testing of both common ferro and redundant power supplies. The test, which took place at ANTEC's technology center in Denver on May 9 and 10 demonstrated that the transfer from main to backup battery power in redundant systems occurs with no loss of data.

Times Fiber expands capabilities

Times Fiber Communications' Phase Two capacity expansion is underway to improve on what TFC already calls "Best in the Industry" delivery intervals.

In the last six months, TFC has increased capacity to 40%. Phase Two calls for further expansion to 55% by Sept. 1, 1994. Phase Three is in the final planning stage and, when completed in the first quarter of 1995, will result in a doubling of capacity from the January 1, 1994, level.

S-A, Harmonic pen component deal

Scientific-Atlanta and Harmonic Lightwaves signed a multiyear agreement for the marketing and sale of key components of Harmonic Lightwaves' fiber-optic system under the Scientific-Atlanta brand name. The complete system consists of transmitters, accompanying universal receivers, return path transmission and network management systems. Scientific-Atlanta has worldwide distribution rights with certain limited exceptions. In addition, the two companies intend to participate in joint development projects for future fiber-optic products and technologies incorporating Harmonic Lightwaves' products.

☛ Jerry Conn signed an agreement with General Instrument that will make Jerry Conn a stocking distributor. Currently, the company stocks 600 MHz and 1 GHz taps, line extenders, minibridgers, 750 MHz platform amplifiers and accessories. Also, it was announced that Scott Kiffin and Craig Hemperly have joined the company as traveling sales representatives.

☛ GI's CommScope announced its multistage plan to increase manufacturing capacity of its telecommunications cable products. These projects are the latest of several recent plant expansions that when completed by the end of this year, will provide a 30% increase of production capacity of cables over CommScope's capacity at the beginning of 1994. In addition, further expansion (targeted for completion by the middle of 1995) is already underway. Together, these projects represent an increase of over 75% of production capacity since the beginning of 1994.

☛ Porta Systems Corp. and Optotec (a wholly owned subsidiary of the Italian government-owned telephone company SIP) forged a vendor alliance to provide high-performance SC products critical for analog and digital video networks. Under the terms of the agreement, Optotec SC products will be marketed to end users in North America exclusively by Porta Systems, incorporating Porta's Ultra PC and APC finishes (70 dB return loss). Also marketed by Porta Systems will be couplers and WDMs with SC, APC or UPC finish, as well as complete passive video fiber management systems.

☛ Time Warner Cable has renewed its commitment to purchase drop wire cable from Trilogy for the second consecutive year since the contract was first awarded to Trilogy in June 1993. In

Sachs Communications celebrates its 20th anniversary with a birthday cake at Cable-Tec Expo '94 in St. Louis.

other news, the company announced the promotion of John Kaye to vice chairman.

☛ Channel Commercial announced a 100,000 square foot expansion of its manufacturing facility in Temecula, CA.

☛ dB-Tronics is investing in additional materials and service support to serve as a stocking distributor of genuine Scientific-Atlanta cable TV parts. S-A is supporting these efforts by assisting the company with a mix of parts for S-A's comprehensive line of cable TV headend, distribution, subscriber and related systems. Also, dB-Tronics announced its expansion and relocation to a new state-of-the-art facility. The building has 12,000 square feet with over 5,000 feet of shop space.

☛ The CommScope division of General Instrument announced it has an inventory program for the fiber feeder cable. The stocking plan currently is for cables with four, six or eight fibers in reel lengths of 10,000 feet with either matched or depressed clad fiber and are now in stock and available for immediate shipment. Until now, fiber feeder was available on a custom-order basis.

☛ Cable Leakage Technologies announced the issuance of U.S. patent #5,294,937 for the Wavetracker digital RF tracking/mapping system, a process the company says completely revolutionizes high-speed data collection and "on the fly" interpretation of signal leakage.

☛ Arrowsmith Technologies opened a new Denver sales office. Christine Conner, national account manager, will manage it. Previously, Conner was account manager with Advanced Telecommunications Solutions, responsible for developing new business within the telecommunications industry, with a focus on cable TV.

☛ Gemini Innovations added Alcoa Fujikura's line of fiber fusion splicers. It now sells Alcoa's single-fiber fusion splicer as well as its new palm-top and mass splicers.

☛ Sencore held a drawing at the Expo for two five-day all expenses paid trips anywhere in the CONUS. All you had to do was guess the selling price for its VIG 791 or VSA 794 test units. Tim Holdahl of Meredith Cable (Bismark, ND) and Jerry Kittleson from Lakes Cable Systems (Spirit Lake, IA) were the winners.

In other news ...

BellSouth to test interactive media

BellSouth applied to the Federal Communications Commission for permission to test the latest in interactive multimedia services for consumers in a first-of-its-kind trial in metro Atlanta beginning next year.

BellSouth's proposed video services trial, which must first be approved by the FCC, would reach approximately 12,000 homes near Atlanta providing cable TV, new interactive services such as movies-on-demand, home shopping, games and more. The new network would include a 60-channel cable TV service and more than 300 digital channels with access to the digital channels available to any and all providers of a new generation of interactive video services.

Plans outlined in the application call for BellSouth Telecommunications, the local service subsidiary of BellSouth, to build a new network for the trial capable of carrying a wide range of video, interactive multimedia and telecommunications services. The network will deliver the services over a combination of fiber and coax.

Assuming regulatory approval of the plan isn't delayed, service to the first customers could begin as early as the second quarter of 1995. Companies supplying specialized hardware and software for the trial include Hewlett-Packard (interactive video servers), Oracle (media server software and inte-

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gration of the server complex) and Scientific-Atlanta (integrated analog and digital video network equipment and set-top boxes).

PUC favors RBOC fiber net

As reported in *CableFAX*, the decision by the Pennsylvania Public Utility Commission that enacts a five-year freeze on telephone rates so Bell Atlantic can build its Pennsylvania infrastructure, will cost that state's rate payers $3.8 billion during the next 10 years, warned Pennsylvania Cable Television Association President Stan Singer. Despite an earlier ruling by three state administrative law judges, the commission deemed construction of a fiber network was in the public interest. Therefore, the public should pay for it.

Singer claimed that FiberSpan Pennsylvania will have 70% of rural Pennsylvania completely fibered by 2002. "The majority position is illogical and contrary to the law," said dissenting PUC Commissioner Joseph Rhodes.

"The majority position freezes already excessively high rates for a period during which the real cost of service will decline dramatically and then allows those rates to grow ad infinitum," Rhodes added.

Tech confab covers essentials

The New York State Commission on Cable Television in conjunction with the Society of Cable Television Engineers held a conference — Technology Update '94 — in upper New York state at the Roaring Brook Ranch at Lake George on June 27-29. There were 330 attendees and 40 equipment exhibitors. Seven papers were presented in the technical seminars.

Paul Gemme, vice president of engineering at Time Warner, presented a paper on "One GHz Systems" in which he noted that Time Warner has built three 1 GHz systems — Queens (NYC) in 1991, Rochester (NY) in 1992 and Orlando (FL) in 1993. During technical descriptions of broadband systems he observed that the amplifier spacing in 1 GHz systems is 1/2 that in 300 MHz systems. →

Eliminate Electrical Noise In Your Headend!!!

Description:

Intelvideo's Digital Impulse Noise Reducer Model INR is a state of the art signal processing system that essentially removes all electrical or ignition-type impulse noise from NTSC Color signals. It is also effective in detecting and correcting satellite or FM link threshold noise that normally appears as "sparkers" or streaks (it is, in effect, a means of extending threshold in FM links). The system may also be used as a stand alone tape dropout composite NTSC color signals.

Specifications:

Input: NTSC composite color signal, 1v pp into 75 Ohms
Return Loss ≥ 40dB
Output: NTSC composite color signal, 1v pp into 75 Ohms
Return Loss ≥ 35dB
Frequency Response: ± .5dB to 4.5MHz, < 3dB down at 5.6MHz
Non Linearity: < 2%
Differential Phase: < 1° plus quantizing effects
Differential Gain: < 1% plus quantizing effects
K Factor with 2T pulse: Better than 1%
System Delay: 1 TV Frame
Power Requirements: 120v AC 60Hz, 40 Watts
Operating Temperature: 32° F to 100° F, Ambient
Humidity: 10% to 90% non-condensing
Mechanical: 1RU cabinet; 1.75"H, 19"W, 15"L; 9 Lbs

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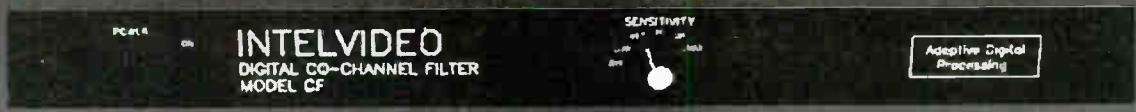

Description:

Intelvideo's Digital Co-channel Filter Model CF is a state of the art signal processing system that significantly reduces co-channel interference, random noise and other video errors. It is particularly effective in reducing the 10 KHz and 20 KHz co-channel beats and restoring video synchronization even when the co-channel level is so high as to cause loss of vertical and horizontal sync in most television receivers. The Model CF reduces the 10 KHz and 20 KHz co-channel beats by up to 30 dB and co-channel video by up to 9 dB. Under extremely severe co-channel conditions the Model CF replaces the sync pulses with stable and clean sync.

Specifications:

Input: NTSC color video signal, 1v pp into 75 Ω
Return Loss > 40 dB
Output: NTSC color video signal, 1v pp into 75 Ω
Return Loss > 35 dB

Frequency Response: ±.5 dB to 4.5 MHz
<3 dB down at 5.6 MHz
Non Linearity: <2%
Differential Phase: <1° plus quantizing effects
Differential Gain: <1% plus quantizing effects
K Factor with 2T pulse: Better than 1%
System Delay: 2 TV lines
Power Requirements: 90-240 VAC, 50-60 Hz, 35 Watts
Operating Temperature: 32° F to 110° F, ambient
Humidity: 10% to 90% non-condensing
Mechanical: 1RU cabinet; 1.75" H, 19" W, 14" L; 9 Lbs

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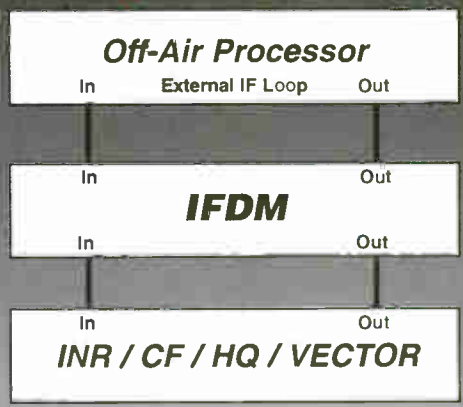

The IFDM is a high quality, commercial grade, IF signal processor. The unit consists of two sections, an IF demodulator and an IF modulator. The IFDM provides an external video loop, allowing for conditioning of the baseband video signal. These features make the IFDM an ideal interface to a wide variety of signal processing equipment, especially those requiring stringent performance characteristics. Some applications suited for IFDM include digitally based noise reducers, ghost cancellers and co-channel filters.

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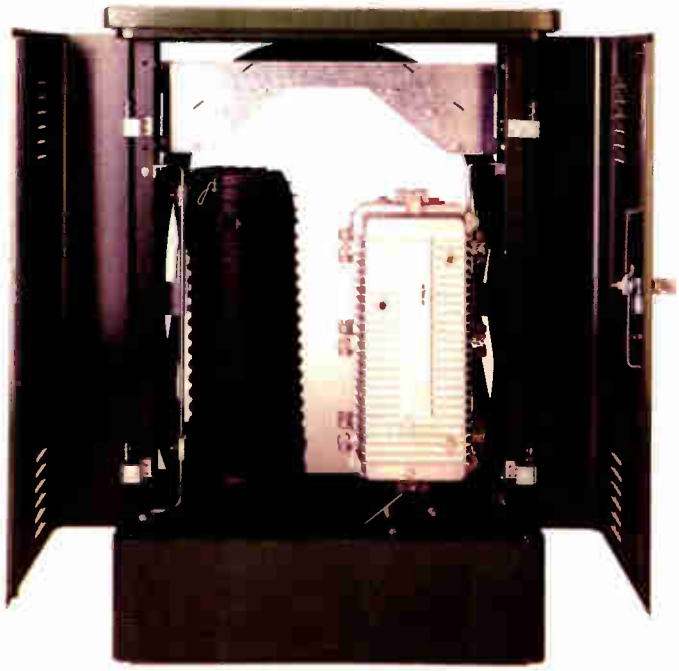
Universal Vertical Mounting Rods allow all amplifier brands to be installed using their strand mounting brackets.

Colors. Moore offers 3 Painted surfaces: Forest Green, Textured Almond and Pedestal Green.



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"System Architecture, Review and Analysis" was the topic covered by Ted Hartson, director of engineering for Post-Newsweek. He discussed system upgrades (e.g., to 550 MHz or 750 MHz and finally to 1 GHz) and the requirements that must be evaluated in making the upgrade decision, especially relating to both franchise negotiations and technical considerations.

Wendell Bailey, vice president of science and technology at the National Cable Television Association, talked about "Technical Standards and Proof-of-Performance Testing" in which he presented brief histories of the development of cable TV standards that have been adopted by the Federal Communications Commission and reviewed the values of most of the standards.

NewChannels Corp. Director of Engineering Tom Staniec gave a paper on an "Integrated Overview of Telecommunications." He emphasized that especially in telephone and data services the integrity and reliability of the network is paramount, and since one user in current network architectures can bring down the network it is necessary to use subscriber "gateways" to insulate the network from the subscriber. In a description of NewChannels' experience as a CAP (competitive access provider) supplying phone and data networking in the Syracuse, NY, area he emphasized the absolute necessity of using data standards.

Dr. Jeffery Krauss, a consultant, discussed "Consumer Interface Devices." He reviewed the history of the ill-fated EIA 563 MultiPort connector, which came out of a joint effort of the Electronic Industries Association and the NCTA. It was an attempt to make the cable TV installation more "user-friendly" but was never widely implemented. He reviewed many of the new FCC regulations and discussed in some depth the EIA/NCTA negotiations regarding new configurations of future TV set capabilities and the capabilities remaining in the cable operator realm, stating that these decisions are contained in the FCC Docket No 93-7.

Products of note

One company, Fiber Instrument Sales Inc. of Oriskany, NY, showed two new low-cost fiber test devices at Tech Update '94 that are designed for use largely in the headend, where splices, cross-connects, etc., are usually installed in fiber trays. These are not measurement instruments but are essentially simple to use trouble locators. The FIS visual fault finder (about the size of a calculator) was demonstrated. It provides a red visible light from a 670 nm 4 mW laser to assist the operator in locating macrobends, breaks or light loss in the fiber. OTDRs have "dead zones" — i.e., that portion of the fiber too close to the OTDR to allow time measurement of light reflection. With this device a broken splice or macrobend shows up as red light escaping the points in question caused by the dispersion at the fault point.

The company also showed a "flashlight" with a fiber connector so that a given fiber from many present in the tray may be selected by looking at the far ends of the fibers for the red light.

☛ Channel Commercial regretfully announced Carmine "Carl" De Simone died at 71 after long-term cancer. He had been with the company since 1962 and was its first salesman. De Simone retired in 1993 but continued with the company supervising trade show activity. He is survived by his wife, Gertrude, six children, 13 grandchildren and three great grandchildren.

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Reader Service Number 87

Optical storage and retrieval

By Lawrence W. Lockwood
President, TeleResources
East Coast Correspondent

Figure 1: Production of the stamper

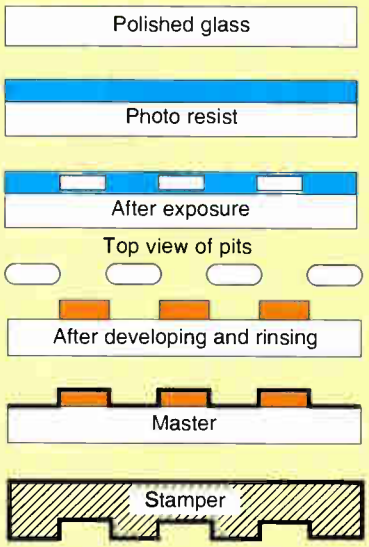
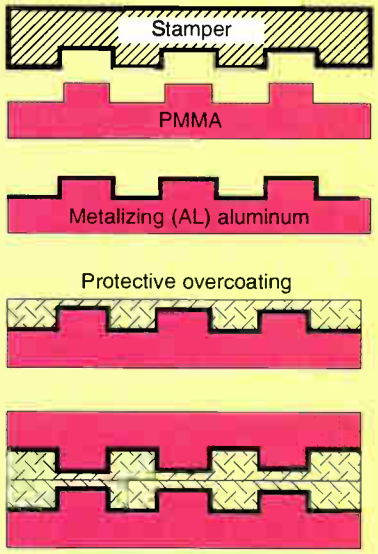


Figure 2: Mass production process for replicated laser discs



The first commercially available optical disc systems came in the mid-1970s. They were the read-only analog TV LaserDiscs. The next-generation optical disc appeared in the early 1980s. It was the read-only digital music CD (compact disc) standardized by Sony and Philips. Erasable optical technology for digital data initially became available in 1988. There have been rapid developments in optical disc storage capabilities in both data capacities and recording/reading rates. It has been suggested that optical disc

"It has been suggested that optical disc technology might seriously compete with the current magnetic disc technology in new video services in developing cable systems."

technology might seriously compete with the current magnetic disc technology in new video services in developing cable systems, e.g., VOD (video-on-demand) and NVOD (near-VOD).

Tape vs. laser disc specifications

Specifications	3/4-inch Sony	SVHS	LaserDisc
Horizontal resolution	330 lines	400 lines	425 lines
Video signal/noise	46-48 dB	45 dB	45 dB
Audio signal/noise	72 dB	72 dB	96 dB (digital)
Access time	4 min	2 min	5 sec
Noise reduction	Dolby C	Dolby C	CX
Maximum play time	1 hour	2 hours	1 hour
Number of plays	75-150	75-150	Infinite
Audio channels	Analog stereo	Analog stereo	Digital stereo/ analog stereo

Read-only analog TV laser discs

The laser disc is 12 inches in diameter and the audio and video information are on the disc in the form of tiny "pits" measuring 0.4 micron wide and 0.1 micron deep.[1] The lengths of these pits represent the analog video information and the associated audio. Rows of these pits form a single track spiraling from the inside of the disc to the outside. The distance between adjacent tracks is approximately 1.6 microns.

There are two common formats for videodiscs. They are constant angular velocity (CAV) and constant linear velocity (CLV). In CAV (standard play) the disc rotates at a constant speed of 1,800 RPM and each revolution of the disc corresponds to one frame of video. The playtime of a CAV disc is 30 minutes per side.

In the CLV format (extended play) one frame of video occupies the innermost track revolution. This linear distance is constant for all video frames on the disc. As a result three frames of video occupy the outermost track revolution. The rotational speed of the player varies from 1,800 RPM when reading at the center to 600 RPM when reading the outside edge. This format stores 60 minutes of play per side of the disc. While in CAV, freeze-frame, slow-motion and step-frame capabilities are easily achieved. In CLV they are not possible without the use of additional electronics, such as frame store memories.

In generating a videodisc master, a photo resistive (PR) material — similar to that used in semiconductor chip manufacturing — is deposited on the polished flat glass disc to form a thin layer on the glass. (See Figure 1.) The recording process begins by using an FM modulated composite audio/video signal to modulate the recording laser beam. The modulated laser beam "exposes" the PR material. After chemical "developing" and washing, the pits are left on the glass disc. In a vacuum de-

position chamber a vaporized finish of nickel or silver covers the glass master making the surface conductive. In an electroplating bath, a thick coating of electroplated nickel covers the master, forming the stamper.

In mass production of laser discs the first step consists of an injection molding or hot press operation. (See Figure 2 on page 20.) A hot plastic compound (a clear polymethyl methacrylate or PMMA) enters the cavity under high pressure. Once the plastic solidifies and cools, the disc is ready for removal and metalization with a layer of aluminum. Finally, the addition of a layer of a protective overcoating to the aluminum completes one side of a laser disc. The adhesive bonding of the protective layers of two sides of a disc forms a complete replicated laser disc.

A comparison of performance specifications of a laser disc and a 3/4-inch VTR and an SVHS tape recorder is shown in the accompanying table on page 21.

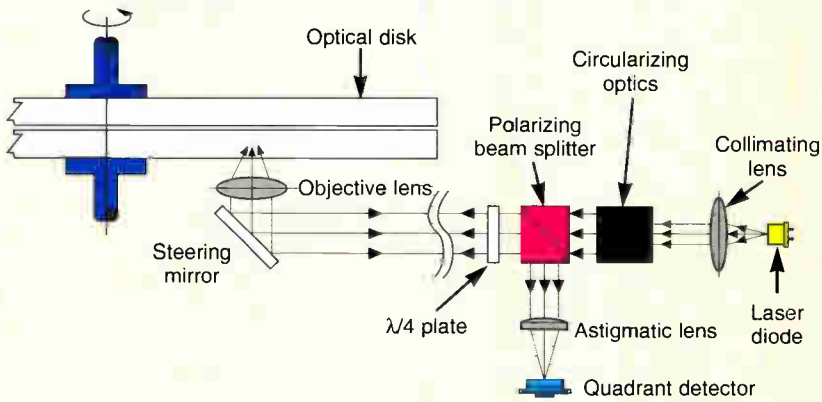
Pioneer has developed a computer-controlled LaserDisc player system called Pioneer Plus, which as shown in Figure 3 controls three LaserDisc players in the left hand cabinet and an optical autochanger in the right hand cabinet that can have up to 72 discs. The system as shown in the photo costs approximately $35,000. The complete system can control up to 32 LaserDisc players and a maximum of 32 autochangers.

Figure 3: Laser Plus system

Read-only music CD

The music CD is a 12 cm (4-3/4 inches) disc and is manufactured in the same step process as for the laser disc shown in Figures 1 and 2 (page 20). However, in this case the recorded information is digital. The original analog audio is converted to digital at a sample rate of 44.1 kHz to a depth of 32 bits (16 bits for each of two stereo channels), resulting in a data rate of 176.4 kbytes/sec.[2] The program information tracks extend from the inside track diameter of 50 mm to a maximum diameter of 116 mm. Thus the spiral track is laid in a 66 mm wide path but is over 5 km long (over 3 miles), and contains about 730 Mbytes of digital audio. The pit sizes

Figure 4: Read-only CD player



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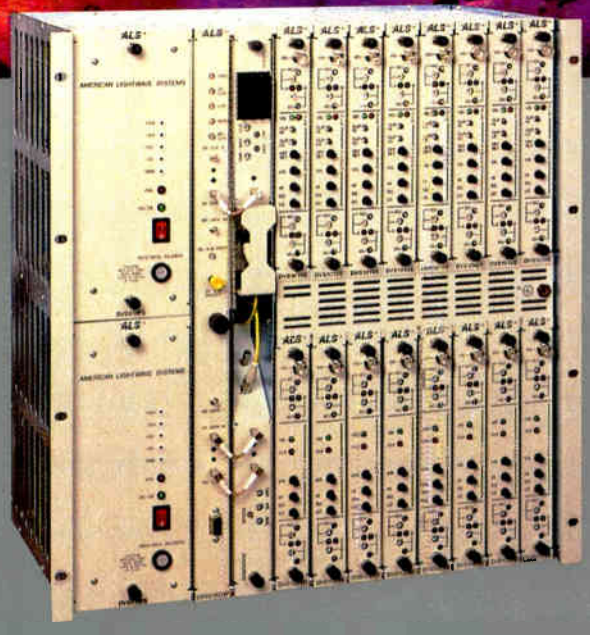

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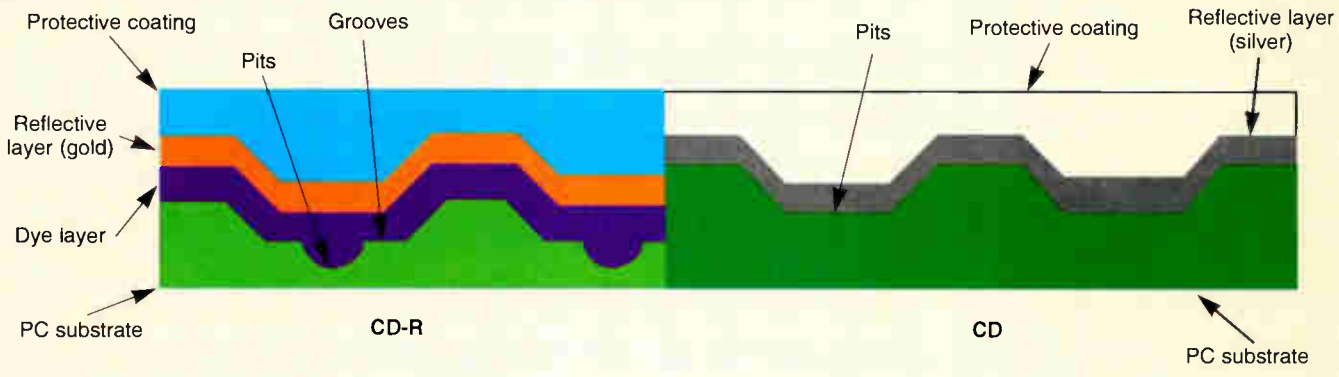
Figure 5: Cross-section comparison of a CD and CD-R disc



and track width of a CD are almost identical to those of the laser disc. The CD pits have a constant width of 0.5 micron, a depth of 0.1 micron and consist of nine different lengths ranging from 0.86 to 3.18 microns — the track width is 1.6 microns. The recording and playback of a CD is CLV and the track velocity in nominally 1.3 m/sec. A functional diagram of a read-only CD player is shown in Figure 4 (page 22).

As the disc rotates, the optical pickup system follows the track on the disc and reads the information encoded there.[3] A typical GaAlAs laser beam (in the 780-840 nm spectral region and 3 mW or less in power) is sent through circularization optics to a polarization beam splitter, which passes horizontally polarized light to a quarter waveplate that introduces a phase shift. The reflection from a flat area between two pits almost equals the intensity of the incident beam, and the reflection from the pit areas is very close to zero. The encoded beam reflected from the disc passes back through the quarter waveplate introducing another phase shift. Therefore it is now vertically polarized when it hits the polarization beam splitter, and reflects at 90°, to the photodiode leg of the system. The quadrant detector serves two purposes — it is an essential part of the tracking control system and it produces the electrical signal from the optical beam. It is a marvel of modern manufacturing and mass production that reliable units can be made to retail for $100.

CD-ROM and CD-R

A CD-ROM (compact disc read-only memory) is the same as the music CD

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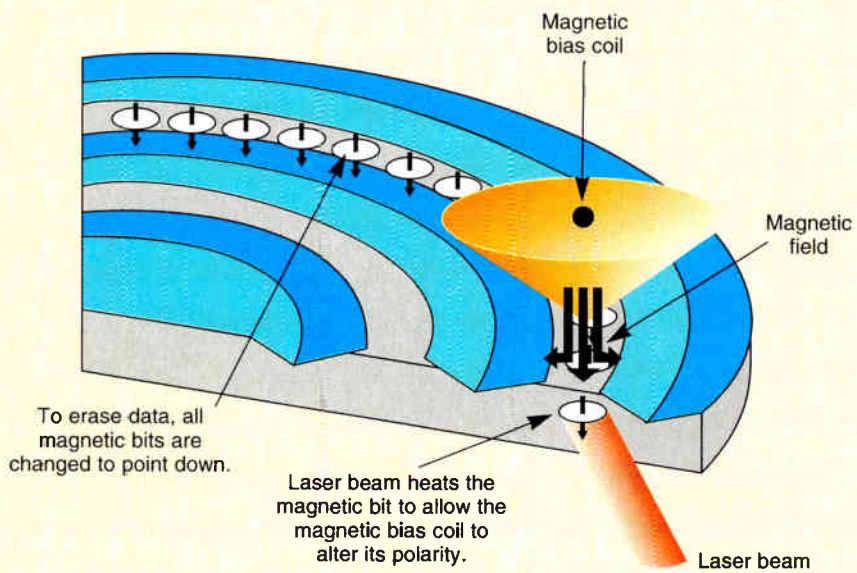
Figure 6: Plasmon CD recorder system

Figure 7: First pass erasing an MOD



except that the recorded digital data is not music but whatever computer data that is desired to be stored and read — e.g., an encyclopedia, games, etc. CD-ROM discs usually contain a maximum of 550-600 Mbytes and its read rate is the same as the music CD — 176.4 kbytes/sec (1.41 Mbits/sec).

A CD-R (compact disc recordable) disc has a polycarbonate substrate with prepatterned grooves topped by a layer of photosensitive dye and a thin gold layer sputtered atop this dye. The gold and the dye perform opposite functions. The dye absorbs light from the recording laser. When it absorbs enough light, it gets hot and explodes, making pits that are read by the CD-ROM. The gold comes into play during reads, reflecting laser light to the read circuitry. This type of recording is known as WORM (write once read many). A cross-sectional comparison of a CD disc and CD-R disc is shown in Figure 5 (page 24).

A CD-R offered by Plasmon Data Systems, Milpitas, CA, is shown in Figure 6. Plasmon offers two different discs: one (600 Mbyte, 63 min) can store approximately 240,000 pages of ASCII text and is priced at $21, the other (780 Mbyte, 74 min) is priced at $22. The recorder is priced at $6,000.

Rewritable optical discs

Although both read-only and WORM technologies can deliver high-density permanent storage, they are not erasable and cannot compete with magnetic storage on that level. Erasable optical technology comes in two distinct flavors: magneto-optics (MO) and phase-change.

The recording process in a magneto-optical drive (MOD) relies on the recording material's fixed temperature — the point at which magnetization is lost. This is called the Curie point (named after the French chemist who made this discovery in the late 19th century). In MODs, a laser heats the media (such as GdTbFe) to the Curie point of around 300° F, allowing the media's magnetic polarity (a zero or a one) to be changed with a relatively small magnetic field.

To record a sector of data in an MOD, the laser heats that sector while a magnetic field orients the areas of the magnet bits all in one direction — it erases clean the disc, analogous to creating a blank page. (See Figure 7.) Then a second pass is made by the laser. (See Figure 8.) But this time, the polarity of the magnetic field is reversed. In this pass, the laser only heats the bits that are to be changed and the reversed magnetic field changes the bits magnetic polarity.

Data stored on an MOD is read (with a much lower powered laser) by the polarized laser light's change of polarization due to the Kerr effect on the reflections from different magnetized (bits) of the MOD. The definition of the Kerr effect states that a change in state of polarization of plane polarized light occurs when reflected from the polished pole of an electromagnet. In the MOD the polarization plane twists one way or the other depending on which direction the magnetic polarity of the bit area on the disc is. (See Figure 9 on page 28.)

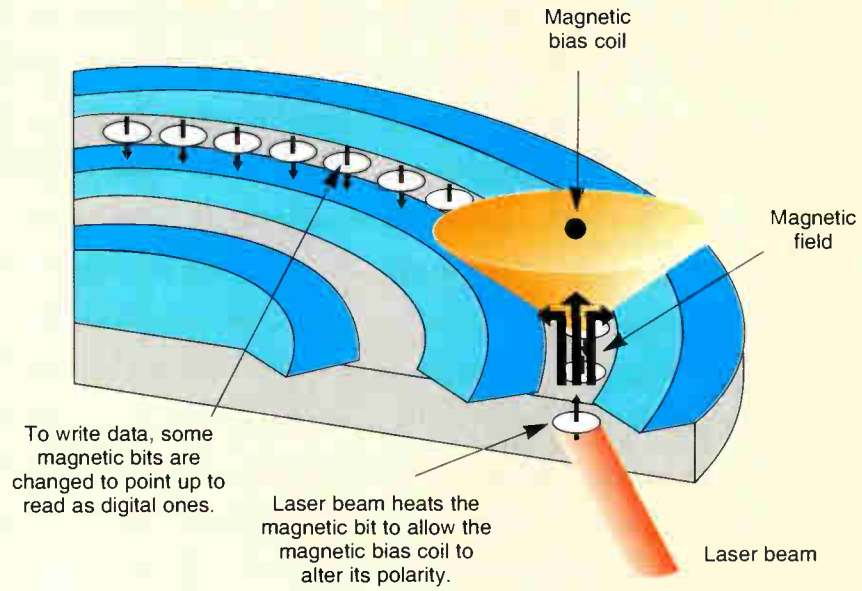
Phase-change media stores data as crystalline and amorphous regions in compounds such as GeSbTe. To write to a phase-change medium a laser pulse heats minute areas of the recording layer above crystallizing tempera-

ture, and these areas remain in a crystalline state as the heat is pulled away by heat-sink layers. The same laser at a much-reduced power can read the crystalline spots as deviations in reflectivity from the surrounding amorphous areas. (See Figure 10 on page 29.) Erasure is accomplished by returning the crystalline areas to their original amorphous state, which means setting the laser at medium power and heating the crystalline spots more slowly.

Most rewritable optical discs are 5-1/4 inches in diameter and the typical maximum memory storage is 1.3 to 1.5 Gbytes. However, Hitachi America has recently offered a rewritable optical disc drive with a 2 Gbyte capacity. Plasmon introduced two new 5.25-inch half-height products shown in Figure 11 on page 30. The MOD on the right has a 1.3 Gbyte storage capacity and the phase-change drive on the left has a 1.5 Gbyte storage capacity. They both have a read rate of 5 Mbytes/sec. The MO drive is about $4,500 (its discs are about $180) and the phase-change drive is about $4,000 (its discs are about $250)

Plasmon Data Systems also offers an optical disc jukebox with a storage capacity of 1,551 Gbytes at about $220,000. (See Figure 12 on page 30.) The 1,551 Gbytes is almost 2,500 times the storage of a CD-ROM. Figure 12 shows several Plasmon Data Systems jukeboxes with capacities from 150 Gbytes to 1,500 Gbytes. The 1,551 Gbyte optical jukebox contains four 1.5 Gbyte phase-change drives and two changers. The jukebox can accept up to 1,034 1.5 Gbyte phase-change discs. Using four drives with the disc changer in the jukebox re-

Figure 8: Second pass recording an MOD

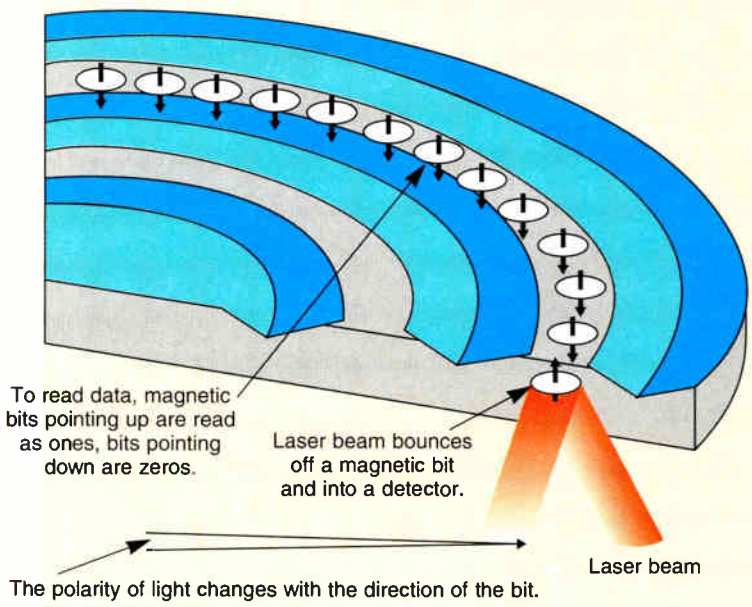


duces data seek time. Fully loaded the optical jukebox can provide storage and retrieval of more than 1.5 million 500-page books; 750 million single-page documents; or 30 million scanned images such as blueprints, maps, letters or schematics. As a comparison to PC storage amounts, 1,551 Gbytes is 1-1/2 *million megabytes*.

In comparing MO and phase-change discs, the main advantage of MO media is the number of erase cycles they can withstand. They have been shown to remain functional after 7 million cycles, whereas phase-change media last for only about 1 million.[4] On the other hand, the read/write mechanism of the MO drive is substantially more complex and more expensive than the phase-change drive.

Plasmon Data Systems' Executive Vice President David Kalstrom was asked for any ways that he might see that optical storage might be profitably used in cable. He suggested possible use in the near future of phase-change reader drives in video-on-demand. In the first place, he noted, a phase-change reader drive is much simpler and cheaper than an MO drive — it is functionally the same as the music CD drive, which currently can be purchased for $100. Therefore, instead of an expensive multigigabyte magnetic disc with its associated DRAM and elaborate software controls to serve multiple concurrent VOD customers,[5] why not have a $100 drive for each customer being served with one movie per disc? The economic comparison of using an expensive magnetic disc server vs. multiple inexpensive phase-change drives should be made by determining how many subscribers can be served with a single magnetic server and its cost vs. $100 times the number of simultaneous subscribers handled by the single magnetic server. The cost of the DRAM and software used by the magnetic server but not required by the multiple phase-change drives should be added to the cost of the magnetic servers to determine the total cost of the magnetic server method.

Figure 9: Third pass recording an MOD



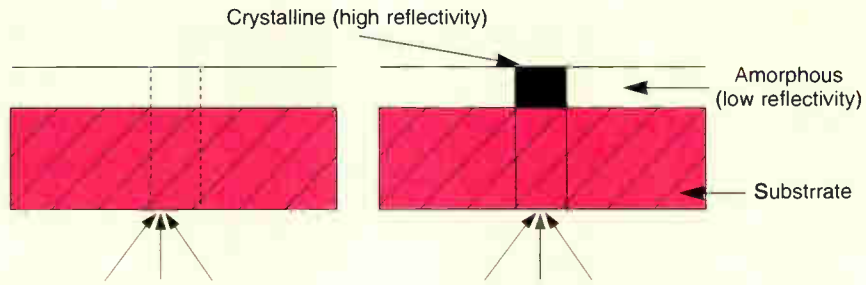
However, storage capacity of standard size 5-1/4-inch phase-change discs has to be improved. The numbers used in Reference 5 were based on a two-hour movie compressed to 4 Mbits/sec for a storage total of 3.6 Gbytes. The maximum storage available on an optical disc is the previously mentioned Hitachi America unit with a 2 Gbyte capacity, or about 1/2 that required.

However, as usual, science rapidly progresses. At an international optical storage conference in Hawaii in July 1993, IBM announced the development of a capability of increasing the optical data storage by five times. It achieves this increase in storage by using blue laser light at 428 nm in-

stead of the current infrared lasers in the 780-830 nm region. Since the diameter of the recording laser spot size is directly related to the laser's wavelength, IBM's halving of the wavelength alone quadrupled data density and other miscellaneous improvements boosted the density to the factor of five. Because of material problems, a stand-alone blue laser has not yet been achieved. This blue laser light is achieved by frequency doubling. (See Figure 13 on page 30.)

In this system a gallium-aluminum-arsenide (GaAlAs) laser diode emits coherent infrared at 856 nm that enters a potassium niobate crystal approximately 5 mm long. Because of the crystal's shape and internal coatings, the radiation circulates in a ring-like pattern, in effect into a resonant cavity and the frequency of the exiting light is doubled so that the wavelength is halved.

Figure 10: Phase-change technology



Conclusions

The storage capacity of optical drives has advanced rapidly in only a few years — from 650 Mbyte CD-ROMs to 2 Gbyte optical discs or over a 200% increase. Compared to a 1,551 Gbyte jukebox the increase is 240,000%.

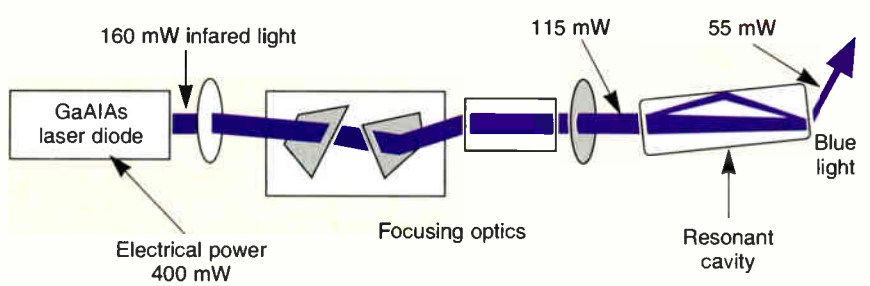
It is possible that optical drives may supplement or replace magnetic drives in VOD. However, for that to be possible the storage capacity of optical discs must be increased. In mid-May IBM's Almaden Research Center announced that it has devised a way to boost the storage capacity of a CD-ROM from 670 Mbytes to 6.7 Gbytes. In IBM's scheme this was accomplished by combining as many as 10 layers of discs by gluing together a stack of individual disc layers separated by spacers. The optical lens then moves up and down so the lens can read the desired layer of the disc. IBM states that this can be accomplished with only minor alterations to existing drives.

Currently, Pioneer has a read-only optical disc system called Alpha Vision. The 5-inch optical disc stores 2.12 Gbytes of MPEG-compressed video, at approximately 4 Mbits/sec, to provide one hour of video play back. It is only sold and used in Japan for Karaoke systems where bar patrons sing along with music and pictures. If the disc

Figure 11: Plasmon MO drive (right) and phase-change drive

Figure 12: Plasmon optical jukeboxes

Figure 13: Frequency doubler for blue laser light



"The storage capacity of optical drives has advanced rapidly in only a few years — from 650 Mbyte CD-ROMs to 2 Gbyte optical discs or over a 200% increase."

capacity were increased to 2.7 to 3 Gbytes, the program length of the stored movie could be the roughly standard movie length of 90 to 100 minutes. In March '93 a British company, Nimbus Technology & Engineering Ltd., announced at an international optical storage conference in Tucson, AZ, that it had developed an MPEG-2 based video CD format that packs 140 minutes of broadcast-quality video on a single 5-inch disc. Nimbus expects a formal launch of the product in 1996.

Victor Company of Japan (JVC) recently announced that it has prototyped a CD-sized optical disc system that can store 135 minutes of MPEG-2 compressed video. The system is based on a JVC-developed variable transfer rate technology that adapts to each picture frame, depending on the amount of motion from frame to frame.

Then there is the previously described IBM achievement of increasing the optical disc storage capacity by five times.

Whatever may develop it is well to remember a statement by Charles F. Kettering, the inventor who transformed the automobile industry and therefore modern life by inventing the electric starter, who said: "You will always underestimate the future." **CT**

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[2] "Photo CD-Music for Your Eyes," D. Howe, *Optics & Photonics News* (Optical Society of America), February 1993.

[3] "Spinning Sound in a Different Direction'" L. Pedulla, *Optics & Photonics News* (Optical Society of America), January 1994.

[4] "The Multimedia Drive," R. Comeford, *IEEE Spectrum*, April 1994.

[5] "Video Servers," L. Lockwood, *Communications Technology,* December 1993.

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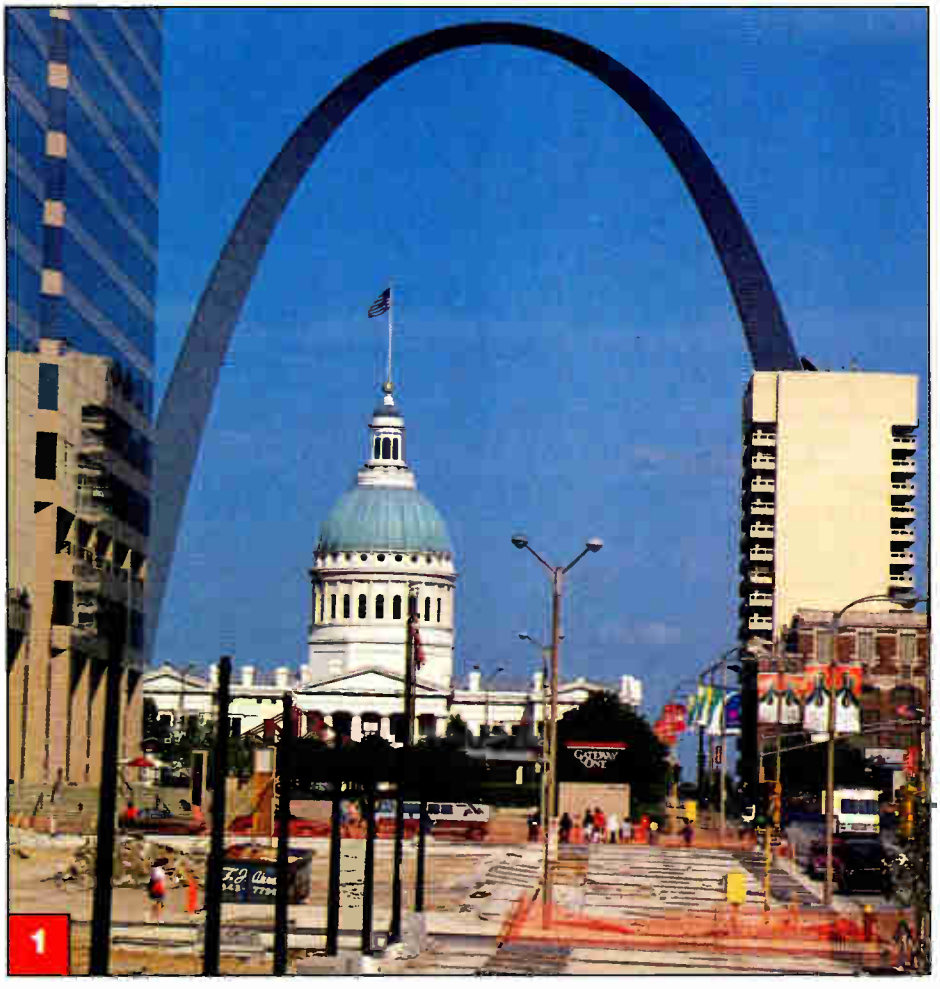
Reader Service Number 59

SCTE Cable-Tec Expo '94



By Laura Hamilton
Photos by Bob Sullivan

San Francisco in Summer 1969 may not immediately bring to mind the Society of Cable Television Engineers. But to the 79 people who attended the charter meeting of the SCTE in conjunction with the National Cable Television Show, it would. Now, 25 years later, the Society marks

***1)** Backdrop to Expo '94: The arch in St. Louis. **2)** SCTE President Bill Riker kicks off Expo with his welcome address. **3)** The SCTE Board of Directors met in St. Louis. **4)** Registration was up more than 21% over last year. **5)** TCI's Tom Elliot was re-elected Society chairman. **6)** National Cable-Tec champ George Caramico is congratulated by Games MC Ron Wolfe. **7)** SCTE videos, books and more were for sale at the SCTE Bookstore.*

meets under the arch

its quarter century thousands of members strong.

SCTE celebrated its silver anniversary at its annual confab, Cable-Tec Expo, held this year in St. Louis. It smashed all previous attendance records with a total of 5,200 Expogoers. Up from 2,300 last year, 2,800 registered attendees swarmed into Cervantes Convention Center (an increase of just over 21%). Also up from last year's 1,700 mark was exhibitor personnel; this year there was 2,400. You can read more about the exhibitions on page 50.

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Things kicked off with the all-day Annual Engineering Conference. Always a good forum to catch up on what our industry's top technical personnel are thinking about today's hot topics, this year's focus was on regulation, advances in system architectures, digital transmission and convergence. (Starting on page 39 is full coverage of the proceedings.) During the lunch break at the conference, SCTE took the opportunity to thank friends and honor members at the Annual Awards Luncheon (page 42).

For years the Expo has been touted as the best investment in technical education you can make in the cable TV industry. Expo workshops covered the gamut of cable technology — addressability, fiber, proof-of-performance, system powering, compression and more. (Turn to page 44 for the workshop round-up.)

Finally, since it was a birthday party of sorts, there was plenty to do in the evenings after a day of cable TV technology: the Arrival Night and Welcome receptions; the Annual Cable-Tec Games; the International Good Neighbor and ham operator parties; and of course the annual Expo Evening with its theme this year, "1904 World's Fair." The social side of Expo's wrap-up begins on page 52.

This wrap-up was written with assistance from Toni Barnett, Eric Butterfield, Wayne Lasley, West Coast Correspondent George Lawton, Shelley Ollig and East Coast Correspondent Lawrence Lockwood (of TeleResources).

1) Priming up for a day of cutting-edge cable TV technology. 2) Expo Program Co-Chairman Larry Lehman (Brooks Telecommunications) introduces the Engineering Conference '94 program.

Annual Engineering Conference: Moving toward the ubiquinetwork

Regulation, advances in system architectures, digital transmission and convergence — today's topics that are propelling our industry onto a much-hyped "information superhighway." But before all those blue sky dreams of future communications systems become even close to reality, we have to plan, upgrade and build the network.

Some of the people who will be major players in "building the ubiquinetwork" were at the SCTE's Annual Engineering Conference held the day before the official commencement of Cable-Tec Expo '94. Familiar faces from our industry's technical community led an audience of cable TV engineers through glimpses of applying today's know-how onto tomorrow's systems. After SCTE President Bill Riker's welcome address, everyone settled down for a full day of cutting-edge cable TV technical topics.

Regulation and the cable industry

Jump starting the conference, panelists in this session discussed the impact of past, present and future Federal Communications Commission regulations on cable network equipment. Wendell Bailey, vice president of science and technology at the National Cable Television Association, said, "One thing to remember is that none of these rules happen in a vacuum. In fact, there are many technical issues wrapped up in what appear to be policy issues."

Consumer electronics companies have been claiming to sell cable-ready TV sets and VCRs for years. In 1981, Bailey sent a letter out to these companies questioning the way in which they promote cable-ready appliances. Bailey said that half of the recipients fixed their advertising campaign. A quarter told the NCTA to mind its own business. The rest asked for schematics and diagrams.

In the intervening years since then, consumers have grown increasingly upset that their cable TV service has taken away much of the functionality of their fancy new TV sets. Since most set-tops can only deliver a single channel at a time, consumers have been unable to program their VCRs to record on multiple channels, or use picture-in-picture features. Furthermore, some consumers have had to pay exorbitant prices for remote controls, even if they already had one with their TV set.

Pressured by angry consumers, Congress passed a clause in the Cable Act of 1992 that mandated that consumers should be able to enjoy full functionality of their TV sets and VCRs, while allowing the cable operators to maintain control over the piracy protection required for their system. This mandate has been passed to the FCC for execution.

Dave Large, director of engineering at Intermedia Partners, pointed out, "The commission recognized that you could not fix what is out there." There are millions of boxes that would have to be replaced. Consequently, the FCC has adopted a two-phase approach to the problem.

In the first phase, cable companies will be required to minimize the interference with consumer electronic devices with minimal investment. Beginning late last month, cable operators were forbidden from changing infrared remote control codes in such a way that they disable consumers' ability to use their own remotes. Cable operators also are forbidden from scrambling the basic tier of programming.

Functionality will be given back to VCRs through more consumer-friendly set-top boxes. Alan Stilwell, assistant to the chief engineer at the FCC, said that some of the ways of complying will include set-top boxes with multiple tuners and descramblers, or ones that pass along signals that do not require processing straight to the TV set.

In the second phase, an effort is being made to enable future TV sets to work in harmony with cable decoders. This will eventually become an interface that connects the decoder to the TV set or VCR, and enables infrared control signals to be passed from the TV set to the decoder, and video to be passed back to the TV set. This standard is currently being hammered out by a committee of consumer electronics and cable TV representatives.

Large said there are still several issues on how this interface will be implemented. There is a disagreement on the number of different commands that

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"Regulation and the Cable Industry" featured: 1) SCTE Of-Council Steve Ross (Ross and Hardies); 2) Alan Stilwell (FCC); 3) John Wong (FCC); 4) Dave Large (Intermedia Partners); and 5) Wendell Bailey (NCTA). 6) Jim Ludington of Time Warner moderated the system architectures session. 7) Speaking at "Advances in System Architectures": J.R. Anderson (ANTEC); Don Gall (Time Warner); John Mattson (Northern Telecom); Karl Poirier (Triple Crown); and Doug Wolfe (Corning).

can be passed through to the decoder. These will be required for supporting electronic program guides and other services that have not even been conceived yet.

Another issue that could impact cable operators is anti-buy through. This is a new FCC policy that would require cable ops to enable consumers to subscribe to any premium channel, without having to order multiple tiers. Bailey said that this could pose a problem for those operators who use traps to provide tiers of programming.

This could be even further complicated by the new FCC must-carry rules, which mandate that cable operators carry a TV signal on the same channel at which it is broadcast. What if a cable system is using the lower channels as the basic tier, and a UHF channel wants to be on your service on its existing broadcast channel.

Bailey said, "You could quickly find yourself using low pass filters, and high pass filters. This ruling exacerbates our problems and we must use more scrambling rather than less."

Even the subject of too much violence in TV programming could have an impact on cable TV network equipment. Congress has already started working on legislation that would enable the consumer to decide whether programming with too much violence or adult themes should be allowed into their homes.

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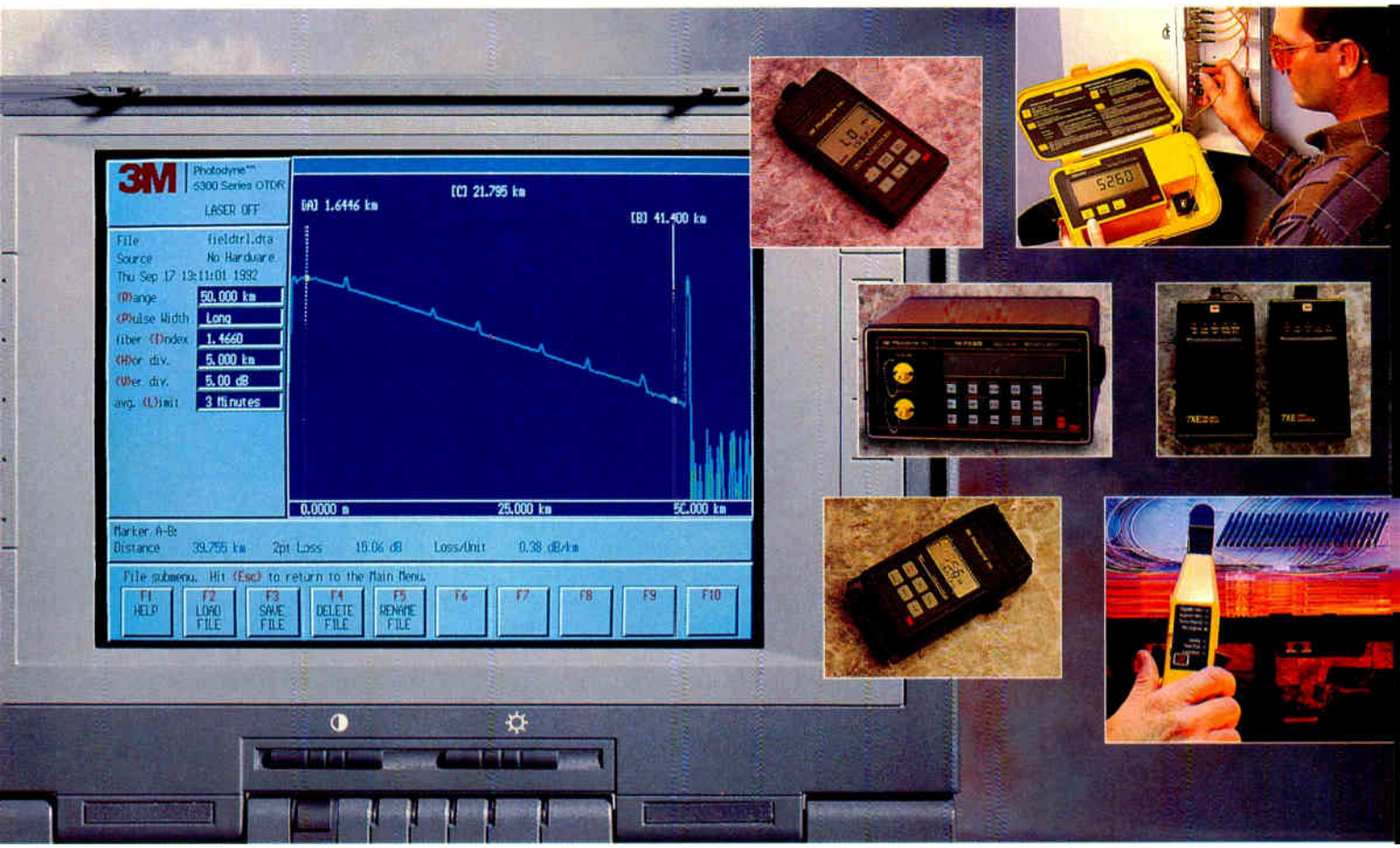

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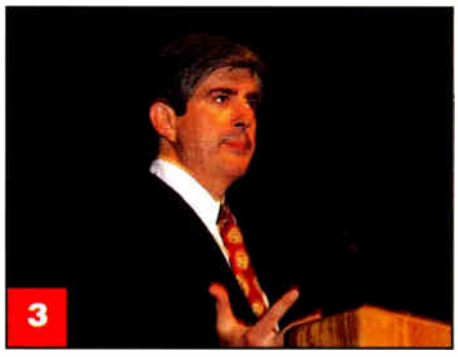

1) Moderated by TCI's Tom Elliot, "Digital Transmission Techniques" featured: 2) Jerrold/GI's Tony Filanowski; 3) Stellacom's Guy Beakley; and 4) WTCI's Bill Nash.

the cable industry, the industry has developed "Voices Against Violence." This group is hoping to address many of the issues raised by consumers.

Bailey said, "Subscribers should have the right to decide if violent programming comes into the home." Consequently the NCTA is creating an outside monitor to determine compliance with a ratings system, as well as consumer electronics companies to create a ratings control box.

Bailey said that such a box could operate off the Line 21, Field 2 vertical blanking interval now used for closed captioning. It would scan for key words in a transmission like "violence" or "adult themes" and block these off from the TV set.

Advances in system architectures

This session was moderated by Jim Ludington, vice president of technology, Time Warner Cable. Five papers were presented. J.R. Anderson, director, application-based technologies, ANTEC, spoke on "Advance System Architectures: Preparing the Cable Plant for the Future." Don Gall, senior project engineer, Time Warner Cable, spoke on "Fiber Deep: A Potential Alternative." John Mattson, director product marketing, Northern Telecom, spoke on "Architectural Alternatives for Interactive and Switched Services." Karl Poirier, vice president corporate development, Triple Crown Electronics, spoke on "The Radial Distribution Node: A Futureproof System Design." And Doug Wolfe, senior applications engineer, Corning (now with Siecor), spoke on "Cost Considerations for Cable TV Fiber Splicing."

Anderson, in discussing preparing for the cable plant of the future, emphasized the residential portion of the network, including the role passive architectures, network redundancy, powering, consolidated network management functions, and the subscriber drop will each have on migrating today's network to meet the demands of the future.

Don Gall outlined some of Time Warner's future approaches to implementing fiber in the network. He discussed a Time Warner scheme called the Ring/Ring/Star fiber architecture. He stated that in 1990 Time Warner had developed what they call the "fiber rich" design that is a 750 MHz network with 500-home nodes, with five to six fibers per node. He also discussed another architecture that they call the "fiber deep," which also has four to six fibers per node, but with less active devices has greater reliability. He described and presented a block diagram of an optical node in the fiber deep architecture.

John Mattson outlined a classic 500-home node network architecture with the digital services in the 550-750 MHz spectrum. He cautioned about possible problems for digital services that may be caused by current in-home wiring: reflections, bad impedance mismatches, etc. He said that in some cases possible rewiring may be required and presented cost considerations for various networking types.

Karl Poirier in describing a "futureproof system design" noted that the majority of the plant is "last mile plant." He described and discussed in some detail a scheme for converting the conventional cascaded line extenders to a "radial distribution node" type. He extended his description of a radial distribution node network to an outline of a neighborhood design, and presented a table with a quantitative comparison of a conventional design and a radial node design.

Doug Wolfe discussed factors affecting fiber splicing costs, noting that three major variables impact fiber splicing. He said splicing costs are a function of the maximum desired splice loss objective, the type of splicing technology chosen and the quality of the installed fiber, and discussed each in some detail.

Digital transmission techniques

Three papers were presented at this session, which was moderated by Tom Elliot, vice president of engineering and technology at TCI. Dr. Guy Beakly, vice president of Stellacom, presented "Testing Compressed Digital Televi-

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Featured in "Convergence" were 1) ONI's Andy Paff; 2) Philips Broadband's Chuck Mark; and 3) AT&T's Ken Metz.

sion;" Bill Nash, project engineer, WTCI, presented "National Digital Television Center;" and Tony Filanowski, DigiCable applications engineer, Jerrold/General Instrument, presented "Digital Transmission Techniques."

Beakly's paper addressed testing of compressed digital TV. He noted that to date the only evaluation of performance of digitally compressed TV has been subjective testing. He said that objective testing methods are needed to provide efficient, repeatable measures of video quality. Stellacom has implemented measures from a number of sources and others of its own design on a low-cost workstation. The measures utilize complex digital image processing techniques to analyze differences between source and processed video sequences. The paper presented some of these measurements and described their implementation of an automated system to capture and test digital video quality.

Bill Nash presented considerable information about TCI's "headend in the sky." He showed a series of pictures comparing analog vs. digitally transmitted video at various C/Ns. He also showed pictures of a number of different digital home terminals. In addition to the information in the paper he screened a video that showed and described TCI's Starport outside Denver, which is the uplink to the headend in the sky. The video also showed the TCI National Digital TV Center where TV channels are compressed and program editing also can be performed prior to uplinking. Nash also presented a proposed implementation schedule covering the time period of 1994-97.

Filanowski's paper compared transmission techniques for digitally compressed video from satellites at a master headend and distributed to remote hubs. The paper had two sections. The first section described synchronous optical network (SONET) transport and master headend equipment that receives an MPEG-2 transport stream from satellites and formats it into asynchronous transfer mode (ATM) cells. For interactive services, a video file server, ATM switch and computer control system make the connection to the SONET distribution network. The second section described 64-QAM RF transport over AM optical fiber. In the second section he described remote hub site equipment that distributes those signals to the local serving area, and describes a technique for transporting the purchase request signals from the subscriber back to the master headend.

Convergence

Moderated by Larry Lehman, vice president of engineering at Brooks Telecommunications, this session had three speakers. Chuck Merk, vice president of engineering at Phillips Broadband talked about "Convergence: Telephony and Video Distribution Network Migration Projections." Ken Metz from AT&T Bell Labs presented "Broadband Communication: Networking Options for Information Services." Andy Paff executive vice president at ONI, presented "Cost-Effectively Integrating Market-Driven Applications in the Cable TV Environment."

Merk started off by saying that 20 years ago while at AT&T, he projected the development of home shopping, banking and other services. Unfortunately his projection did not include ADSL, SONET and other technologies entering the market today. He covered the competitive advantages of cable vs. telephony in moving toward new services. Cable has 750 MHz of bandwidth vs. copper's 4 kHz. On the other hand, telephone networks can be switched. Future services will demand both high bandwidth and switchability.

Metz said there is a certain evolution toward ring architectures, like SONET. He described an architecture in which the traditional headend is broken into two components. One consists of the antennas and other equipment used for pulling signals from satellites. The second is a service node used for sending and receiving information from wide area fiber networks.

Paff said there is a move toward regional interconnects. He noted that ever since the franchise wars left operators with a lot of franchises, there has been a trend toward consolidating cable holdings in a single area. This leads to operation efficiencies and enables operators to eliminate headends. He also said that the cable piece of the ad insertion market was 10 times the size of the $300 million competitive access provider market. — *GL, LL*

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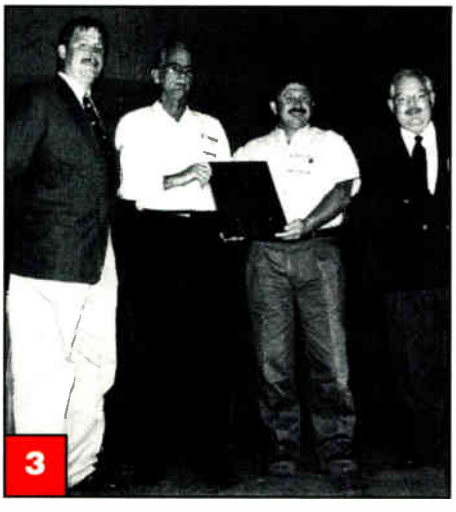


1) Personal Achievement Award winners and newly elevated Senior members enjoy the Awards Luncheon. 2) SCTE President Bill Riker and CT's Paul Levine congratulate Dan Pike of Prime Cable on winning CT's Service in Technology Award. 3) Rick Bechtel of the SCTE (far right) presents representatives of the Floribama Meeting Group with a plaque representing elevation to chapter status. 4) Riker with Member of the Year Wendell Woody of Sprint.

Kudos to Society members and friends

The SCTE Annual Awards Luncheon (held every year at the break between the Engineering Conference's morning and afternoon sessions) featured a get-to-the-point format, a TV set raffle and a side dish named after a familiar Society figure.

Expogoers took their seats for the new and improved annual awards. Taking into account suggestions made by Society members in response to past luncheons, the awards presentation moved along at a brisk pace and most everyone was inclined to stay until the very end to see if he or she could nab the TV set raffled off at the end.

After enjoying the newly dubbed "Potatoes Riker" (which the chef named after SCTE President Bill Riker), the following individuals and companies were honored for service to the Society:

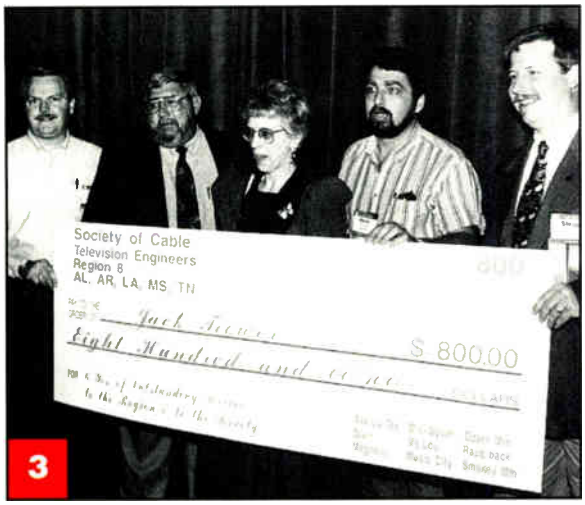
• Wendell Woody was the 1994 recipient of the Society's Member of the Year Award in recognition of his service to the Society. The Society's chairman from 1990 to 1992, Woody currently serves as an SCTE at-large director and has a long and distinguished record of participation in the Society.

• ANTEC was the recipient of the 1994 Chairman's Award in recognition of its support of the Society and the industry.

• New inductees into the Hall of Fame were Alex Best, Ron Cotten and Bill Grant.

• Expo Program Subcommittee members Larry Lehman and Bill Riker (co-chairmen), Roger Brown, Dan Delaney, Paul Levine, Ginny Morris and Wendell Woody received awards for their efforts in creating the Cable-Tec Expo '94 technical program.

• The Program Subcommittee of the Emerging Technologies 1994 conference was recognized for its efforts in the planning of the phenomenally successful January 1994 conference. Receiving awards were: Ted Hartson (chairman), Dean DeBiase, Mike Kaus, Harold Mackey,



1) SCTE Chairman Tom Elliot presents ANTEC's John Eagan with the Chairman's Award. 2) Bill Riker (far left) and Jerry Conn's Diana Riley (far right) induct Bill Grant, Ron Cotten and Alex Best into the Hall of Fame. 3) Region 8 representatives give outgoing Director Jack Trower (second from left) a check in appreciation for his years of service to the region. 4) Riker (left) and Vic Gates (right) present Sandy McKnight with first place in the Field Operations Award.

Dan Pike and Rex Porter.

• The former Floribama Meeting Group was elevated to full chapter status in the Society.

• Outgoing members of the SCTE board of directors were recognized: Norrie Bush (Region 3), Bill Arnold (Region 4), Jennifer Hays (Region 5), Jack Trower (Region 8) and Walt Ciciora, Ph.D. (Region 12).

• George Grills, Anthonie Herrman, David Hollowell, Larry Langevin and Ronald Larock were elevated to Senior member status in the Society, in addition to Al Dawkins, Gaylord Hart, Randy Midkiff, Dan Nofs and Matt Stanek, who were elevated earlier this year.

• Dick Beard, Robert Behrens, Keith Burkley, Kenneth Covey, Patrick Kelley, Jack Sachs, Mark Smith and Alan Tschirner were recipients of Personal Achievement Awards.

• Sandy McKnight of Capitol Cablevision received first place in SCTE's third annual Field Operations Award competition. Mel Welch of Genesis Cable and Paul Harris of Ventura County Cablevision were the second and third place winners respectively.

• CT's Paul Levine presented SCTE $2,500 for its scholarship fund on behalf of Service in Technology award winner Dan Pike. Pike is the vice president of science and technology for Prime Cable and has been in the industry since 1973. His commitment to cable TV technical education through the SCTE and other industry groups is a big reason CT is proud to present him with this year's award.

SCTE board members

Also recognized at the luncheon were the Society's officers for the coming year who were elected at a meeting held the day before. The officers for the 1994-1995 term are:

• Chairman — Tom Elliot

• Eastern vice chair — Michael Smith

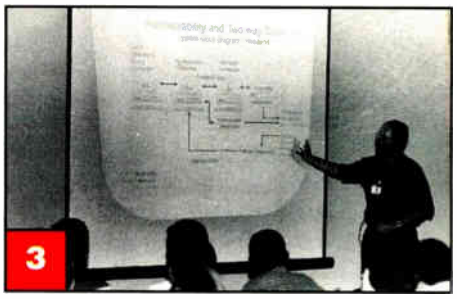
• Western vice chair — Pam Nobles

• Secretary — John Vartanian

• Treasurer — Robert Schaeffer

• Additional executive committee member — Wendell Bailey

The current SCTE directors are: Steve Allen, Jones Intercable, Region 1, CA, HI, NV; Pam Nobles, Jones Intercable, Region 2, AZ, CO, NM, UT, WY; Andy Scott, Columbia Cable, Region 3, AK, ID, MT, OR, WA; Rosa Rosas, Moffat Communications, Region 4, OK, TX; Larry Stiffelman, Comm/Scope, Region 5, IL, IA, KS, MO, NE; Robert Schaeffer, Star Cablevision, Region 6, MN, ND, SD, WI; Terry Bush, Trilithic, Region 7, IN, MI, OH; Steve Christopher, Comm/ Scope, Region 8, AL, AR, LA, MS, TN; Hugh McCarley, Cox Cable, Region 9, FL, GA, PR, SC; Michael Smith, Adelphia, Region 10, KY, NC, VA, WV, DC; Bernie Czarnecki, Cablemasters, Region 11, DE, MD, NJ, PA; John Vartanian, HBO, Region 12, CT, ME, MA, NH, NY, RI, VT; and At-Large Directors Wendell Bailey, NCTA, Tom Elliot, TCI, and Wendell Woody, Sprint.— *LH*



1) Expo featured two days of technical workshops. 2) General Instrument's Jim Toy and 3) Scientific-Atlanta's John Cochran head up the "Addressability and Two-Way Systems" workshop.

Workshops pack 'em in

At the heart of the Expo is what really is at the heart of the SCTE: technical training. The SCTE goes to a lot of effort to stress that part of its role in the cable TV industry. The exhibit floor is not open during technical sessions at Cable-Tec Expo and a wide variety of topics are offered to help satisfy the technical curiosity of everyone from high-level engineers to technical field personnel.

You had 10 workshops to choose from and conferees looking to pack as much information into their Expo experience could attend six over two days. Coffee service from the National Cable Television Institute helped everyone with early starts.

Even if you took full advantage of all the allotted workshop sessions, you couldn't attend them all. What follows is a round-up of what you might have missed. As well, you can get a good idea of exactly how much technical education goes on with weightier than ever Expo proceedings manual. If you need a copy, contact SCTE, 669 Exton Commons, Exton, PA 19341; phone (610) 363-6888.

Addressability and two-way systems

The workshop "Addressability and Two-Way Systems" was hosted by John Cochran, applications engineering manager at Scientific-Atlanta, and Jim Toy, applications engineer at General Instrument.

Toy talked about the current state of addressable systems and some of the issues involved with maintenance and troubleshooting. He said that addressable systems were first used for offering premium services like HBO and Showtime. Eventually they were adopted for pay-per-view services, in which a user would call in to place an order with an operator. The operators were eliminated by computers that could verify the caller's number, automatically bill them and send a signal to the addressable controller.

The next step was to build telephone modems into the cable boxes. This enabled consumers to order service from their set-tops. Others tried installing return path cable modems into the boxes. But these often proved troublesome due to the poor return path characteristics of most cable systems. There also were problems caused by collisions from multiple set-tops trying to send orders simultaneously.

Toy said that most two-way addressable cable systems today use store-and-forward technology to overcome this limitation. In this scheme, purchasing information is stored in the local set-top and passed to the headend when it is polled.

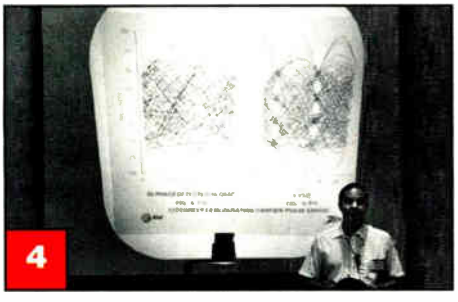
Cochran talked about the future of addressability and what would be required for the next generation of interactive services. They will be even more susceptible to existing problems like babbling set-tops, ingress and latency. He said that the transaction processing system will have to increase in capacity or else — "can you imagine pressing a button on the remote and having to wait a minute for something to happen."

Some of the problems caused by collisions of subscriber signals will be minimized by new fiber-to-the-neighborhood architectures that limit the number of subscribers per node. In conjunction with this, a high-end return path, such as 600-750 MHz, also could be deployed. However, this would require a different amplifier spacing for the return path. Cochran said, "I believe the low-end reverse path will be enough, as long as you can segment it small enough."

System powering

Alpha Senior Project Engineer Don Sorenson kicked off the "Advances in System Powering" workshop with the basic objectives: 1) reliable and safe operation of network passive and active devices, 2) the ability to transmit adequate amounts of energy to network actives, 3) maximum system powering efficiency, 4) uninterruptability of power to the network (a must for any full service network), 5) optimal power supply loading, which is dependent on network design, 6) serviceability and maintenance, 7) harmony with existing or new network architecture, and 8) compatibility with electric grid architecture, which has a direct effect on reliability.

Covering each of the elements contributing to the powering requirements of a cable system, Sorenson noted that switch-mode power supplies are the current wave, replacing the linear ones commonly used in the past. Although switch-mode types have a poor input power factor due to the voltage doubler, the voltage doubler does provide good hold-up time. As well, the switch-mode supply is very efficient due to the



"Advances in System Powering" featured 1) Alpha's Don Sorenson and 2) Power Guard's Marty de Alminana (center). 3) HBO's John Vartanian and 4) CableLabs' Brian James at "Digital Basics." 5) "CLI, Now and Tomorrow" with Trilithic's Terry Bush.

energy conserving voltage transformer effect of the buck regulator employed, which also eases the requirements on the input voltage regulation, something that required close regulation for successful operation in the linear models.

Marty de Alminana, international sales engineer for Power Guard, focused on increased operating voltages for CATV networks. Noting that the cable industry is going to have to change the power levels due to higher operating voltages, he said, "We can go to 90 V — so let's do it." But what about the NESC and NEC regulations you ask? Not only are waivers easily obtained, according to de Alminana, if the power passed through the communication circuits is to supply power solely to communications equipment, there are specific conditions where the NESC's limits may be exceeded. One of the problems involved with the NESC regs when exceeding certain powering levels is that "all circuits in such cables shall be owned and operated by one party and shall be maintained by only qualified personnel." This means that there will be a need for increased emphasis on training with the use of higher power in cable TV networks. Check the regs and talk to the NESC and NEC for the particulars.

Basics of digital compression and transmission

Standing room only indicated the popularity of the "Basics of Digital Compression and Transmission" workshop presented by John Vartanian of HBO and Brian James of CableLabs.

Vartanian presented various methods that compression systems use to reduce the amount of data necessary to produce high-quality, full-motion video. "Digital signals can be thought of as a light switch," he explained. "It's either on or it's off." He discussed the advantages of digital signals and the reasons why compression is necessary for transmission of digital video in standard channel bandwidths.

"Why do we need digital now?" Vartanian asked. "Acceptable quality and equivalent or justifiable costs," he stated. "The drive behind digital compression is HDTV and limited bandwidth."

Vartanian discussed the differences between analog and digital signals. "The difficulty with analog signals is that they are susceptible to noise, distortion and other signal impairments. Digital signals," he continued, "are not continuous but are discrete in time and amplitude. They are especially well-suited for satellite and cable transmission where noise and distortions are limited when the systems are designed. A second advantage of digital signals is that once they have been converted from an analog form, they can be compressed and multiple signals can be sent in one channel. A third advantage," he stressed, "is their security."

Brian James took a different tact in discussing digital compression. He explained transmission error detection and reduction techniques, and the impact of digital transmission on troubleshooting techniques. He went to great length to explain Reed-Solomon error protection encoding, a "block code type of protection that has a high data rate with low parity bit overload. Interleaving," he explained, "is a method of increasing the burst error correction capability of the Reed-Solomon code. Trellis coded modulation is a method of improving system performance in the presence of random noise without requiring an increase in the bandwidth of the channel."

James also explained vestigal sideband modulation, quadrature amplitude modulation, and the impact of digital transmission on troubleshooting techniques.

CLI, now and tomorrow

In the workshop "CLI, Now and Tomorrow," participants talked about cable leakage and ingress from a political and technical standpoint.

Robert Dickinson, president of Dovetail, talked about the history of cable leakage. He said that people began to become concerned with it about 20 years ago after problems caused by composite triple beat and hum. But once they got these problems under control, they discovered that a CB transmitting near a leaky cable could destroy one or more channels. By 1972

1) FCC speakers John Spencer (standing), Michael Lance and John Wong (seated) at "FCC Forms Completed With Confidence." 2) Lance fields questions from the audience. 3) "Fault Locating in Fiber-Optic Cable" featured Charles Mogray of CommScope. 4) The "Fiber Installation and Testing" workshop was conducted by Siecor's Billy Pyatt and Corning's William Morris.

the FCC created the 10 µV at 10 feet limitation on emission from cable networks. The FCC was going to require cable companies to cease transmitting on all channels that could interfere with aircraft communications or navigation, but that would have only left about six channels for television.

National attention was directed against the cable industry after a few infamous incidents. In Harrisburg, PA, aircraft heard a hum on their radio system that was traced back to the local cable company. Eventually these problems were solved by cable companies adjusting their frequencies around these signals. In the early days the aircraft radio frequencies were spaced at 50 kHz intervals. The number of channels was eventually doubled, forcing cable operators to adjust their offsets.

Now the FAA wants to again double the number of channels. That would make the spacing so smal, that normal drift could cause cable offsets to wander into these bands. Dickinson believes that now is a critical time for fighting cable leakage. The FCC has to decide that leakage is under control by the time the FAA gets its new channel spacing. Otherwise a draconian new order may be imposed on cable operators.

FCC forms

The Federal Communications Commission hosted a workshop covering the new variety of, what else? Forms. Three representatives from the Cable Services Bureau were on hand to make sense of the new forms, clear up some discrepancies and answer questions.

John Spencer outlined the benchmark method of justifying cable system rates, looking at what total revenues could be rather than calculating all costs. He presented a flow chart of costs and their allocations for justifying charges to subscribers. In particular, Form 1200, for setting maximum initial permitted rates, and Form 1205, for determining costs of equipment and installation, were covered extensively. Also was on hand to answer questions were Michael Lance and John Wong.

Fault locating in fiber

Duff Campbell, vice president sales and marketing, Riser-Bond. and Charles Mogray, applications engineering manager, CommScope, presented, "Fault Locating in Fiber-Optic and Coaxial Cables."

Duff Campbell started off the session with an explanation of basic TDR operation, and warned attendees of one problem with digital TDRs: they won't pick up a smaller fault beyond a bigger one. Read: always test from both ends. And retest for hidden faults.

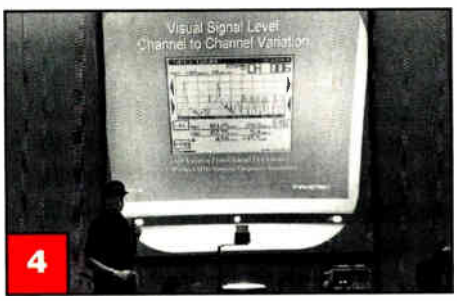
The variety of TDRs on the market were covered. In addition to the analog/digital debate, Campbell covered adjustable sensitivity technology and negative pulse, which offers the advantage of being able to pass through some anomalies a positive pulse cannot. The audience learned how to determine velocity of propagation (VOP) when working with a known coax length, which Campbell feels is a better way of determining VOP than looking it up in the book.

Always start your testing at the shortest pulse width, Campbell stressed, reiterating that the TDR is a high frequency instrument and needs a good connection for proper testing. This also involves placing your cursors on the rising or falling edges of the waveform. Wondering how long those partial reels laying around are? Measure their length with your TDR, an additional application to fault finding and checking for shorts.

Charles Mogray covered noncatastrophic fault locating in fiber-optic cable, passing around a variety of damaged cables for inspection by the audience, including one "damaged by a grass fire in Waco, Texas." The audience laughed. "Well, that's what they told me," Mogray said.

Mogray defined a noncatastrophic failure as any failure where damage is not easily or readily identifiable. Causes of aerial cable damage were listed in this order of frequency: vehicle, firearm, fire, power line, rodent, craft error, extreme temperatures, etc. "Notice," Mogray pointed out, "that lightning is not on the list."

Emergency restoration needs a plan. Identifying the problem is central to its success, which led Mogray to his



1) Pam Nobles kicked off "Meeting Tomorrow's Technical Training Needs." 2) Nobles (seated, front), SCTE's Rick Bechtel (standing, center), and WTCI's Bill Nash (standing, right) ran the training workshop. "Proof-of-Performance Measurements" were discussed by 3) John Cecil of Hewlett-Packard and 4) Steve Windle of Wavetek.

discussion on OTDRs with stabilized light sources. Highlighted considerations included pulse width, proper setting of the index of refraction, and dead zones. Also, there are two design factors that cause fault locating errors: excess fiber length and overlength correction factor. In conclusion, Mogray stressed understanding the capabilities and limitations of the OTDR, the choice instrument for noncatastropnic fault locating.

Fiber Installation, testing

William Morris, cable applications engineering manager at Corning, presented the talk, "Fiber Installation: It's In Your Hands." He said that fiber's operational benefits, such as increased channel capacity and improved reliability have made it cable TV's medium of choice. Consequently cable TV engineers and technicians will be working with even more fiber in the next few years.

Morris said that fiber is stronger than copper wire of the same size. It has about three times the tensile strength of copper. However, owing to its small size, fiber is somewhat fragile. Furthermore flaws can be introduced during cable installation, splice preparation or termination. Cable technicians can avoid problems by keeping the work area clean and dry.

Morris pointed out that it is important to check all tools periodically and replace those that are worn out, even your favorite ones. Worn out tools can cause significant damage each time they are used.

It's critical to keep equipment clean, said Morris. A dirty cleaver can introduce mechanical damage or dirt into the fiber. The blade and clamp areas that touch the glass should be carefully inspected for dirt. But even if it looks clean, it is a good idea to minimize the number of times the tools touch the fiber surface.

Keeping fiber dry is important because moisture can adversely affect the strength and long-term performance of the fiber. Morris advised sealing and securing splice enclosures. If the fibers become wet, dry them out before handling.

Billy Pyatt, accounts manager at Siecor, presented a talk entitled "Cable Placement Techniques for CATV Applications." He said there are a number of preplacement considerations. These include inspecting the right-of-way, verifying splice point locations, accomplishing preinstallation construction and planning the installation.

Pyatt described the considerations involved in laying the fiber. These include monitoring the tension, maintaining a minimum bend radius, protecting exposed cable and ensuring sufficient slack.

Meeting tomorrow's technical training needs

Training in our industry — now more than ever — has become a necessity rather than a luxury. "Meeting Tomorrow's Technical Training Needs" featured Pam Nobles of Jones, Rick Bechtel of the SCTE and Bill Nash of Tele-Communications Inc. They all contributed to an interesting, informative presentation on making your technical training more interesting and informative.

Nobles highlighted what she calls the "buffet table of learning." That is, you take what you want away with you. The three main memory styles (visual, auditory and kinesthetic) were outlined, and you could have taken a test at the workshop to find out which style you tend to use most. Knowing that most engineers and technical people tend toward the kinesthetic (hands-on) style of memory will help you when you are preparing for your presentation. Nobles also covered the concepts of accelerated learning, adult learning and preparing for a presentation.

SCTE Manager of Chapter Development Rick Bechtel showed just how much the Society is contributing to training our industry. Whether it's the Expo or chapter and meeting groups, the SCTE's influence on educating the technical community quickly becomes apparent. For example, look in the technical want ads of cable trade publications and you'll often see potential employers looking for SCTE Broadband Communi-

1) "What's New With Safety in Telecommunications?" SCTE's Ralph Haimowitz had answers. 2) and 3) BCT/E testing at Expo.

cations Technician/Engineer-trained people.

Bill Nash wrapped up the workshop coming at you in all directions. He used video, audio and computer-based graphics to prove his "multiple media" point. There's a plethora of options out there on how to present your training in the most dynamic and informative way. Nash stressed you let your students know "why before what." He also took on the question of how to get senior management to approve a budget for training. Fear of being left behind as cable TV develops into a communications industry of the future can be a great motivator.

POP measurements

In a joint presentation, John Cecil of Hewlett-Packard and Steve Windle of Wavetek played to a lively audience regarding proof-of-performance measurements using a spectrum analyzer. Both presenters demonstrated the required FCC proof-of-performance RF and video measurements. (Cecil used H-P's 8591C spectrum analyzer, and Windell used Wavetek's Stealth spectrum analyzer.)

Both Cecil and Windle actually "walked" attendees through various measurements. Noninterfering measurement techniques were demonstrated for in-service testing with emphasis on noise, distortion, in-channel flatness and color video testing.

Lively questions and answers permeated the workshop from attendees pinpointing specific concerns while other attendees tried to assist in solving the problems.

Safety in telecommunications

Vehicles as workstations, selling your safety program and the Hantavirus were the answers provided by Ralph Haimowitz, SCTE's director of training, during "What's New With Safety in Telecommunications?"

Haimowitz updated attendees on whether employee vehicles are considered workstations — some OSHA offices do, some don't and still others haven't decided. If they are, each truck is required to have a plumbed or self-contained eyewash station that meets ANSI standards, which SCTE estimated would cost about $1,500 per vehicle for a self-contained unit. Personal eyewash units are only $35-40 per vehicle but don't replace the other ones under ANSI standards.

SCTE decided OSHA's directive may be interpreted as personnel are to be instructed on the use of portable eyewash units, and that in the case of an accident, the employee should contact someone who can take him to one of the plumbed units after using the portable.

What's a fire extinguisher for? To put out a fire, right? Wrong! Employees should be taught that extinguishers are to be used only to suppress the fire sufficiently enough to evacuate the premises and then call firefighters.

Vehicle safety is just part of an overall safety program, and safety managers often run into a "brick budget wall" when trying to get the funds necessary to implement it. Haimowitz suggested that you use the "tip of the iceberg" approach to convince management of that. For example, if the direct cost (medical) for an injured employee is $20,000, point out that hidden costs (hiring and training a replacement, lost customer time, etc.) add up to four times the direct cost. Best case, this one injury could cost $100,000.

What does OSHA expect you to do with employees who refuse to practice safe work habits? A verbal reprimand should be issued first, followed by a written one after the next violation. The employee should be suspended if he still fails to adhere to the rules and finally terminated. Document all these warnings, because if someone is hurt, OSHA will want to know what steps have been taken to prevent such accidents.

One new possible on-the-job hazard that Haimowitz feels needs attention is the Hantavirus. Carried by rodents, the virus is contained in their urine, feces and saliva.

Although the risk to humans is currently very small, prevention is very simple and inexpensive. Cable personnel should be aware of possible rodent habitats. Disposable latex gloves should be worn in such areas, and a solution of 10 parts water to one part bleach sprayed on the affected area. Then the matter should be swept into two ziploc bags and disposed of. Also, when opening a pedestal or other enclosed area, step back and allow the air to circulate for five minutes.

BCT/E testing

Not only was there more than ample opportunity to gain plenty of new knowledge at Cable-Tec Expo '94, but conferees also could test their technical know-how. Broadband Communications Technician/Engineer (BCT/E) Program and Installer Certification Program tests were administered at the show. — *EB, TB, LH, GL, LL, WL, SO*

How To Give The Right People The Wrong Signals.

As a cable operator, you want to give your subscribers the best picture and programming. But you don't want to give anything away. That's why the Pioneer BA-9000 addressable converter provides line-by-line ***digital signal security*** coupled with Dynamic Picture Shift (DPS) encoding.

An established leader in cable system security, Pioneer knows the importance of a secure revenue stream, as well as the value of revenue enhancing options like Near-Video-On-Demand. You'll find they're a valuable part of the BA-9000, along with ***icon-driven on-screen menuing, backwards compatibility*** and a ***future expansion port***. So give your revenue stream and yourself a feeling of security by calling Pioneer - the right people to help you send the wrong signals.

PIONEER
The Art of Entertainment

Walking the floor

A lot of people on the engineering side of the cable TV industry find Cable-Tec Expo the most exciting trade show to attend every year for one reason: It's all technical. If you're looking to tweak with the very latest in CATV technology, the Expo exhibit hall is one of the best places to do just that.

Exhibitors (numbering 260 companies strong) rolled in new products, prototype products and tried-and-true products. Fiber, digital, multimedia, advanced TV. All the buzzwords of the industry could be found on the floor.

Training lounge

This year's training lounge, located on the exhibit floor, included a fiber-optic splicing workshop where you could perform your own fiber-optic splice and receive a personalized certificate. The lounge was courtesy of AT&T, ANTEC, EXFO, Sumitomo and Tektronix.

SCTE bookstore

Before you hit the exhibit hall, you had the chance to visit the SCTE Bookstore. Items for sale included Expo T-shirts, cable TV textbooks, proceeding manuals from recent Society-sponsored conferences, training videotapes and more. If you missed your chance, see the April 1994 issue

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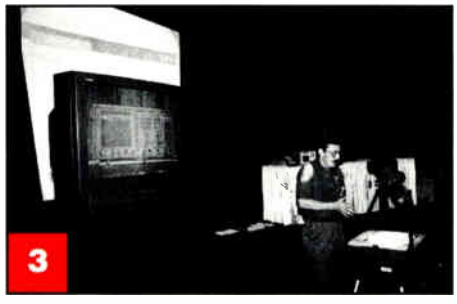
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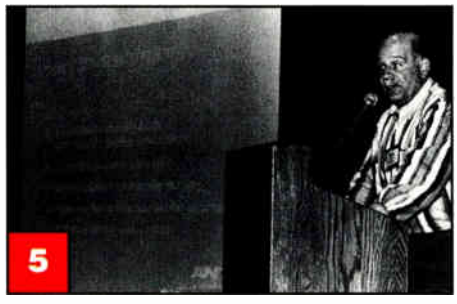
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1) The hub of activity was at the Cervantes Convention Center. 2) The rush is on for the exhibit floor. Presentations at the Technical Training Center were provided by 3) Sencore's Jack Webb, 4) ADC's Boyd Uppman, 5) HollyAnne's Dave Halperin and 6) Amherst International's Javier Campos.

1) Exhibiting companies numbered 260. 2) Hitting the floor. 3) Larry Fisher of CaLan and 4) Jud Williams of Performance Cable TV Products in the Technical Training Center. 5) and 6) The all-technical show floor.

of Society newsletter, *Interval*, for a full listing. Authors Bill Grant (*Cable Television*) and Neal McLain (*FCC Compliance Audit Checklist*) were on hand at the bookstore to autograph copies of their books.

SCTE training

First held at the last Expo, the special training programs for Society chapters and meeting groups was offered again this year.

• Rick Bechtel of the SCTE answered questions on chapter development and management.

• The Society's Howard Whitman offered tips on publicizing SCTE chapter and meeting group activities, emphasizing the need to inform management of the benefits of membership and participation in the meetings. Whitman also covered meeting reporting, especially for reports to be included in *Interval*. He stressed the need for more — more details, more text, more photos.

• SCTE's Marvin Nelson discussed proctoring BCT/E and Installer Certification exams.

• "SCTE Chapter Financial Management and Record Keeping" featured the ever-helpful Pat Zelenka. She gave tips to chapter officers present on how to simplify duties if you're an SCTE chapter treasurer.

Exhibitor training center

Formal presentations of specific products were offered in the exhibitor training center. These included:

• At "Headend Fiber Management, Planning and Deployment," ADC Telecommunications' Boyd Uppman discussed the company's solutions and approaches.

• Jack Webb explained how Sencore's products can ease performance of the 1995 FCC video tests.

• Lancity's Rouzdeh Yassini tackled "10 MBPS Data Over a CATV 6 MHz Channel Presentation" with information on his company's LCT Transmaster.

• At the ANTEC/HollyAnne presentation on the Emergency Broadcast System, HollyAnne Vice President Dave Halperin covered recent developments on revamping the EBS and what the compliance options are for cable operators. Included in the talk were highlights of the MIP-921 multiple input processor for providing EBS warning information to subs.

• Larry Fisher of CaLan offered up information on the company's Galaxy network management system.

• Javier Campos of Amherst International Inc. demonstrated the Ericsson FSU925 RTC fusion splicer, which was connected to a TV set displaying the unit's LCD video monitor.

• Jud Williams of Performance Cable TV Products provided details on his company's new DC uninterruptible power supply.

• Arrowsmith Technologies Inc. showcased the features of its Fleetcon fleet management system. It is capable of collecting information from a variety of sources ranging from status monitoring, to trucks in the field. For example, a truck with a GPS receiver could automatically check for CLI as it drove. If leakage got too high, it could automatically send a message back to home base reporting the leakage levels and location. A dispatcher could use Fleetcon to look at this on a map, and send out a repair technician. — *EB, TB, LH, GL, WL, SO*

Relaxing in St. Louis

St. Louis may not boast all the obvious attractions of past Expo locales but as SCTE President Bill Riker explained in his welcome address before the Engineering Conference, there was one very good reason for holding the Expo under the arch: the Gateway to the West's centralized location.

With this being the SCTE's 25th anniversary celebration, every effort was made so as many members as possible could conveniently attend Expo '94. With attendance up to 5,200 registered and exhibitor attendees, there was plenty of socializing to be done at the show with fellow techies from not only the United States but the world. →

1) A giant banner and 2) the world's smallest calliope welcomed everyone to Expo Evening. 3) It was all winners at Expo Eve's midway. 4) National SCTE staff and friends kick back at Expo Evening. 5) Old-time music, 6) games of chance, 7) clowns, and 8) lots of fun food from around the globe made for a memorable Expo Evening.

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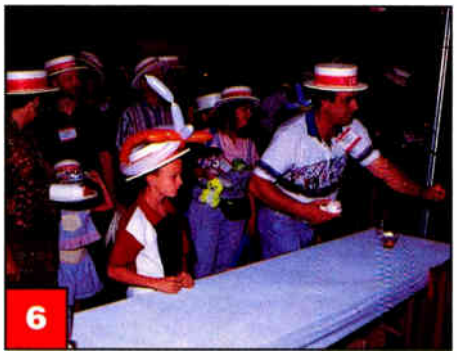
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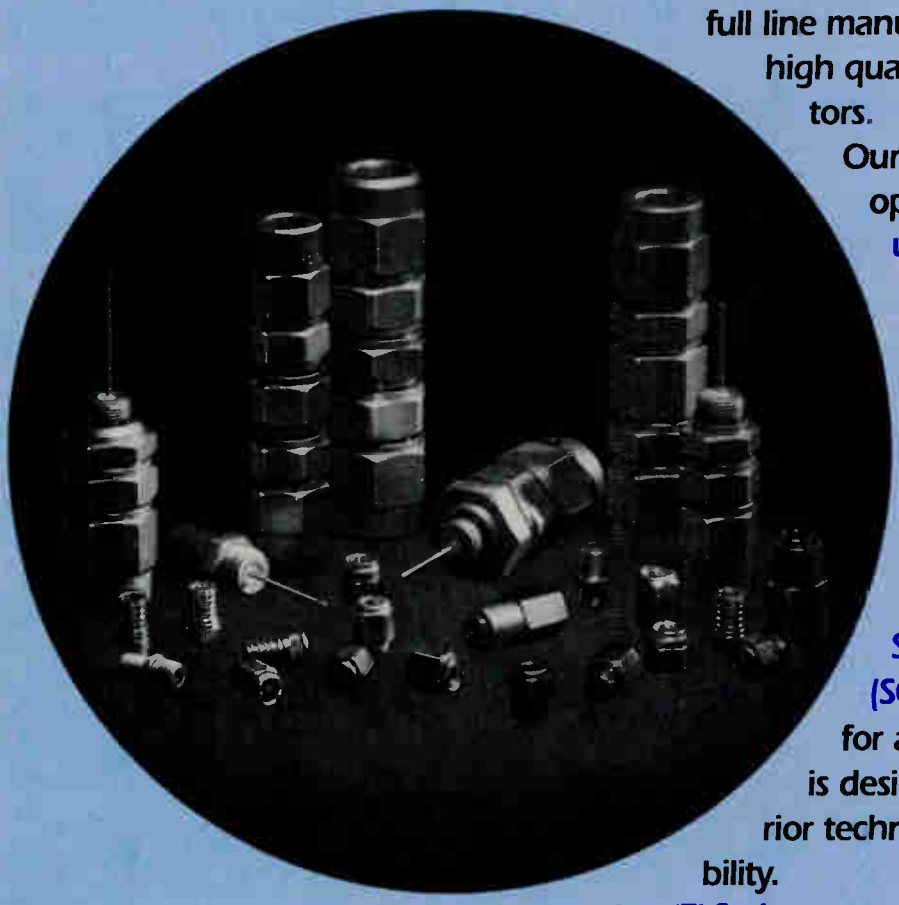

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Reader Response Number 102

1) Wavetek's Arrival Night Reception featured raffle prizes, 2) plenty of hot dogs and snacks and 3) the first chance to socialize. 4), 5) and 6) Hosting the next evening's festivities at the Welcome Reception were SCTE, AMP/Sprint, Pirelli, Power Guard, and Times Fiber.

Arrival Night, Welcome receptions

Wavetek RF Products sponsored the Arrival Night Reception at the Cervantes Convention Center with hot dogs, munchies, beer and soda. Everyone was sporting the latest in Expo-wear, Wavetek Stealth baseball caps, and had the chance to win raffle prizes.

The Welcome Reception took place the next evening at the Adams Mark Hotel. It was sponsored by AMP/Sprint, Pirelli Cable Corp., Power Guard, Times Fiber Communications and SCTE.

Cable-Tec Games

The back of the Welcome Reception hall was packed with spectators and participants in the always popular and competitive Cable-Tec Games. This was the Fourth Annual National SCTE Cable Tec-Games (sponsored by Communications Technology and SCTE) and techs spliced and measured their way through a variety of events testing their cable TV skills. Four teams competed from the following SCTE chapters: Penn/Ohio, Wheat State, Great Plains and Heart-of-America. Gold, silver and bronze medals were awarded for each event and individual overall winners took home medals as well.

The cable splicing event (sponsored by Comm/Scope and Gilbert Engineering) was won by Dale Kirk (first), Jim Fronk (second) and Bernie Cogan (third). The gold went to Marty Derry for the test equipment operation event (sponsored by Riser-Bond and CaLan). Silver and bronze were taken by Dennis Rinke and Jim Cox, respectively. "Cable Jeopardy," which the National Cable Television Institute sponsored, was won by George Caramico and second went to Vicki Marts. Third went to Jim Fronk. The winner of the signal level meter techniques event (sponsored by Trilithic and Wavetek) was Al Wilke. Silver was taken by Mark Perry and bronze by Vicki Marts.

As for overall winners, George Caramico struck gold with Vicki Marts nabbing the silver and Al Wilke the bronze. Team winners were: Heart-of-America (first), Penn-Ohio (second) and Wheat State (third).

Expo Evening

"1904 World's Fair" was the theme of the biggest reception of all, Expo Evening, held under the giant "Meet Me in St. Louis" banner in the convention center. Attendees got into the turn-of-the-century spirit by donning

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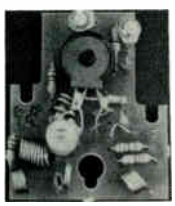

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Trunk Equalizers (Replaces SEP by Jerrold)
(ST 20 and SJ Chassis Compatible - Available in one-way or two way...4's and 5's)

TL - 5 thru 11 dB
L - 10 thru 16 dB
H - 16 thru 22 dB
ST - 18 thru 25 dB

(300 through 450 MHz Bandwidths)

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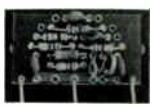
Values: 6 dB, 12 dB, 18 dB, 24 dB



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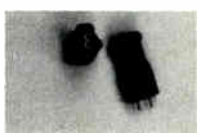

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4, 6, 8, 10, 12, 14, 16, 18, 20 dB
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1) Techs test their test equipment know-how at the National Cable-Tec Games '94. 2) NCTI's Steve Jaworski heads up the "Cable Jeopardy" event at the Cable-Tec Games. 3) Directors of Games Rick Bechtel of SCTE (far left) and Wendell Woody of Sprint (far right) with Cable-Tec Games overall winners: Silver Medalist Vicki Marts; Gold Medalist George Caramico; and Bronze Medalist Al Wilke. 4), 5) and 6) At their Ham Reception, Amateur radio operators traded call numbers and won prizes.

skimmers donated by CT Publications.

The World's Fair, held in city's Forest Park 90 years ago, introduced the ice cream cone and iced tea. Expo Eve attendees sampled plenty of those along with foods from around the world to the sounds of a live band recalling early-1900s tunes.

Also featured was a midway with games of chance. Kids of all ages tried their hand at the likes of cork gun shooting, "spill the milk," beanbag tossing and a game where participants tried to knock stuffed frogs into garbage cans. (That was the hard one.) Almost everyone left with mugs and stuffed animals bagged at the "fair."

Internationals

All attendees were invited to share food and drink with fellow cable TV technical people from around the world at the International Good Neighbor Reception. The party was sponsored by Belden Wire, CT Publications, Electroline, Lindsay Specialty Products, Triple Crown Electronics and SCTE.

ADC Telecommunications, Cable Link and International Cable magazine offered an International Lounge. It served as an informal business center for foreign guests and offered telephone and fax resources as well as light refreshments.

Ham reception

Turn to page 74 if you have any doubts as to how many amateur radio operators are employed in the cable TV industry. Twenty nonhams and 111 hams crowded the annual Cable-Tec Expo reception for refreshments provided by Scientific-Atlanta and the chance to win one of the 47 prizes donated by Alpha, ANTEC, ARRL, Cadco, CaLan, Coaxial International, ComSonics, Flight Trac, Ham Radio Outlet, Hewlett-Packard, Lindsay, LRC/Augat, National Cable Television Institute, Peregrine, Philips, Pioneer, Power Guard, RTK, Scientific-Atlanta, Standard, TCI, Tektronix, Texscan, US West, Westec and Zenith.

The grand prize — a Kenwood TS-690, power supply speaker, tuner donated by S-A and TCI — was won by W.E. (Bill) Evans. Evans is the president of EB Systems Ltd. in Winnipeg, Manatoba.

SCTE meetings

The annual membership meeting held again at this year's Expo is always a good place to offer up ideas in front of

the SCTE board and hobnob with fellow members. As well, there was an open meeting of the planning committee held at the show. All interested parties were invited to discuss the proposal of changing the name of the Society to the "Society of Cable Telecommunications Engineering." *CT* will of course keep you updated on what happens with the issue.

Golf tournament

Relaxing on the golf course has become the traditional end to Expo. The third annual SCTE Golf Tournament was held at Forest Park Golf Course and offered conferees a pleasant way to wrap up Cable-Tec Expo '94.

So wraps up another bigger and better Expo. Mark your calendars for Cable-Tec Expo '95 to be held June 14-17 in Las Vegas, NV. — *LH, SO*

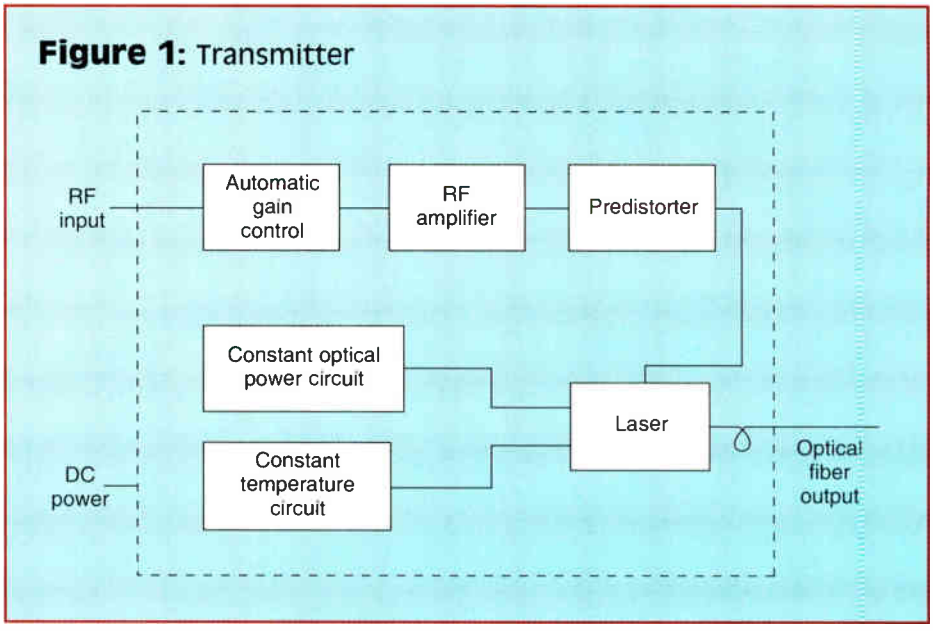
1), 2) and 3) Scenes from the International Good Neighbor Reception, which was sponsored by Belden Wire, CT Publications, Electroline, Lindsay, Triple Crown and SCTE. 4) Cindy Tandy of "International Cable" welcomes 5) attendees to the International Lounge. 6) SCTE board and staff field questions at the Annual Membership Meeting and House of Delegates where 7) Bill Riker, SCTE president, presented the new "Chapter Development Handbook."

Linear fiber-optic technology for broadband applications

This article provides an overview of fiber-optic technology currently being used in broadband applications. It also discusses some of the emerging trends relating to future applications. The intent is to provide a short introduction to this topic for engineers entering the field.

By John Frame
Broadband Engineering Specialist

And Daniel Renner
Director of Engineering
Ortel Corp.



The interactive age for CATV systems was born in December 1987 when the first AM-VSB fiber-optic link was demonstrated at the Western Show in Anaheim, CA. The impact of that demonstration and subsequent product development has revolutionized broadband communications systems. The historical CATV one-way tree-and-branch coaxial network with dozens of cascaded amplifiers has been transformed, through the capability of linear fiber optics, to a low-cost hybrid fiber/coax network with higher reliability, bandwidth and performance.

Crucial to these advances has been the rapid pace of development in optical components, especially the development of high-performance linear DFB laser transmitters and linear optical receivers.

Optical transmitters

There are two basic types of optical transmitters — directly modulated DFB laser-based and transmitters that use external modulation. For direct-modulation transmitters, the modulating current is injected directly into the light source so that the intensity of the optical output is proportional to the modulating current. For external modulation transmitters, the output of the source is held at a constant level, but then passed through a lithium-niobate optical modulator. The modulator is driven by the amplified input signal resulting in an optical intensity proportional to the modulating voltage.

Because of the lower cost, smaller size and high reliability, direct modulation transmitters have become the most common choice for fiber-optic transmission of multichannel video signals. Thus, the main focus of this discussion will be on directly modulated DFB transmitters.

A diagram of a direct-modulation transmitter is shown in Figure 1. The RF input to the transmitter consists of the combined output signals of the analog processors and modulators plus other signals (such as carriers modulated with compressed digital video signals) added in. The optical transmitter amplifies this composite signal to a level high enough to modulate the laser output optimally. In some cases, an automatic gain control circuit is used to keep the average drive current of the laser constant. In practice, predistorters also are used to meet the stringent linearity requirements of broadband video transmission. Also required are circuits that control the laser output power and operating temperature. Status monitor circuits and fault alarms are generally included to allow operators to monitor the performance of the transmitter. In many cases, optical power splitters are used so that one transmitter can transmit to more than one optical receiver.

Optical receivers

Just as an optical transmitter is built around the laser, an optical receiver can be built with the photodiode as the central component. An optical signal shining on the photodiode creates an electrical current that is proportional to the intensity of the incoming light. This current is usually increased by passing it through a broadband current transformer. This increases the amplitude of the signal, improving the noise performance of the optical link.

After the transformation, the current

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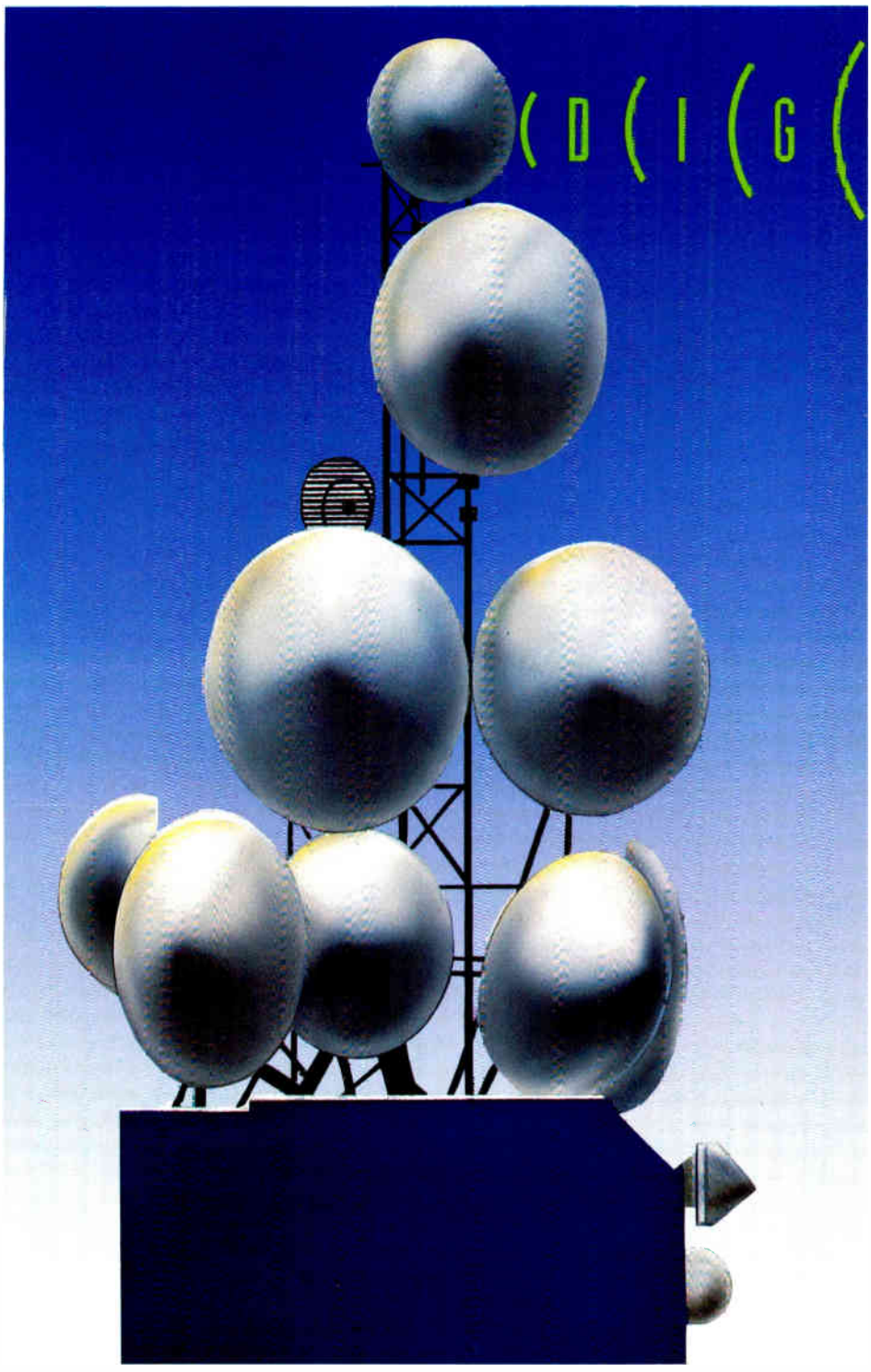

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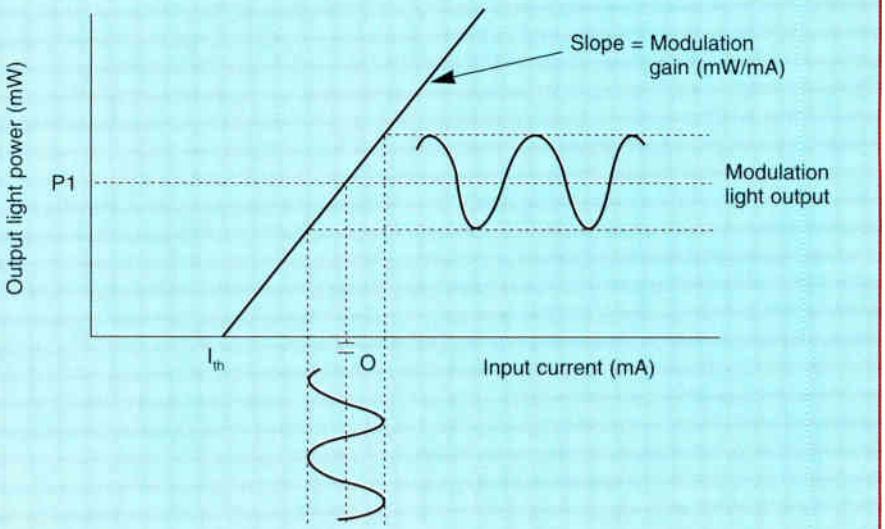
is applied to an amplifier chain with a low-level first stage followed by high-level output stages. The optical receiver can be thought of as a normal CATV amplifier with an optical input instead of an electrical input. Amplifier features such as automatic gain control, slope adjustment and status monitoring are normally added to the optical receiver.

Figure 2: Diode laser L-I curve



Optoelectronic devices

Successful operation of a linear fiber-optic link depends strongly on the use of high-performance optoelectronic devices. That is, diode lasers in the transmitter and photodiodes in the receiver.

• *Diode lasers.* Lasers are essentially oscillators operating at frequencies in the range of visible light (or near the range of visible light). For diode lasers, the optical gain needed for oscillation is provided by a semiconductor material and the feedback is provided by a resonant cavity. The cavity can be formed by placing two parallel partially reflecting mirrors at either end of the optical gain material. This configuration is called a Fabry-Perot (FP) laser. The resonant cavity also can be formed by adding a grating along the axis of the optical gain material. This configuration is called a distributed feedback (DFB) laser.

For broadband linear systems, the light source utilized is typically a DFB laser operating at a wavelength of 1,310 nm. This wavelength corresponds to a window of low loss and low dispersion in standard optical fibers. For operation at 1,310 nm a compound semiconductor material is used, indium-gallium-arsenide-phosphide (InGaAsP). Links based on DFB lasers offer improved noise performance.

The input/output power characteristics of a diode laser are described by its light-current (L-I) curve, as shown in Figure 2. The optical output power of the laser is very low for currents below its lasing threshold (I_{th}). For currents greater than the lasing threshold, the output efficiency increases significantly and this is where the device is normally operated. The efficiency is typically 0.2 mW/mA.

An important operating parameter is the total optical power coupled into the fiber. This parameter has increased rapidly in the recent past. At this time, linear DFB lasers are available commercially offering in excess of 16 mW coupled into the fiber. Laboratory experiments have demonstrated powers as high as 30 mW, indicating the continuing trend of increasing powers.

Diode lasers are inherently linear devices. There are several mechanisms, though, by which the output of a DFB laser can become nonlinear. Using careful design rules, these effects can be minimized although not eliminated completely. Some devices meet the requirements of broadband systems without additional linearization techniques when one distortion mechanism cancels another by chance. Most devices require some additional linearization, which is provided by an external predistorter meet-

"The historical CATV one-way tree-and-branch coaxial network with dozens of cascaded amplifiers has been transformed, through the capability of linear fiber optics, to a low-cost interactive fiber/coax network with higher reliability, bandwidth and performance."

ing the most demanding requirements of linear broadband transmission.

• *Photodiodes.* Linear broadband receivers use PIN photodiodes, constructed from appropriate semiconductor materials that absorb the incoming light and generate an electrical current. Once again, using appropriate design guidelines for the device, the electrical current is linearly proportional to the incoming light signal. The absorbing semiconductor material used in systems operating at 1,310 nm wavelength is typically a ternary compound semiconductor, indium-gallium-arsenide (InGaAs). At this wavelength, the current/light proportionality constant (responsivity) of the photodiode is typically 0.9 mA/mW.

Specifications for optical links

Many of the performance specifications relevant to optical links are identical to those of standard coaxial distribution systems, such as carrier-to-noise ratio (C/N), composite second order distortion (CSO), composite triple beat distortion (CTB), and cross-modulation distortion (X-mod). Frequency flatness and RF input return loss also are important parameters of optical transmitters. Similarly, flatness and output return loss are important characteristics of optical receivers.

Using the previous specifications, optical links can be treated just as any other component in a system design with predictable contributions to system noise, distortion and flatness.

One of the fundamental characteristics of an optical link is the output power of the laser. A laser with higher output power can be used to improve link C/N, drive more optical receivers or transmit the signals over a greater distance. Choosing a transmitter with the optimum optical output power is an important consideration in designing with fiber optics.

Although the performance parameters for fiber-optic links (as mentioned earlier) are familiar to the system designer, there are several effects specific to fiber that must be kept in mind. The most important of these effects are outlined here.

Because optical fiber is an amorphous substance, light passing through it is subject to scattering. Therefore, a small portion of the forward traveling optical signal is reflected back to the laser. A portion of this backward traveling light is then re-reflected back toward the receiver. The twice-reflected light then appears at the optical receiver, where it interferes with the main optical signal. This interference appears as noise at the optical receiver, resulting in a degradation of the link C/N. The amount of degradation depends on many different parameters, the most important of which is the length of the fiber. Therefore, an optical link with a short fiber and a lot of optical splitting will have a higher C/N than a link with a long fiber and little or no optical splitting, even if the optical loss is the same for each case. Therefore, the system designer must consider the fiber length in the design to prevent overspecifying performance for short links or underspecifying it for long links.

The unavoidable scattering is not the only source of optical reflections in a link. Reflections also are caused by optical connectors, splices, receivers and splitters. Minimizing the reflections from these devices is crucial to ensure optimum link performance. Excessive reflections can severely degrade the noise and distortion performance of optical links.

These problems, however, can easily be avoided by following a few simple guidelines. The use of high return loss angle-polished optical connectors such as FC/APC or SC/APC prevents reflection problems that can occur with flat-polished connectors. The use of fusion splices instead of mechanical splices also prevents problems caused by reflections. Finally, most optical receivers and single-mode splitters have sufficiently low reflections that problems do not arise. Following these

rules, CATV operators have successfully installed thousands of optical links.

Advantages of fiber transport

Of course, fiber-optic technology must benefit the system operator. Those who have used fiber optics have reaped benefits of improved performance, reliability and cost.

One of the main benefits of using fiber optics is improved link performance leading to higher picture quality for the customer. The extreme low loss of the optical fiber greatly reduces the number of RF amplifiers in the coaxial portion of the network required to deliver the signals to the customer. Since each amplifier adds both noise and distortion to the signal, a reduced amplifier cascade leads to better signal quality at the home.

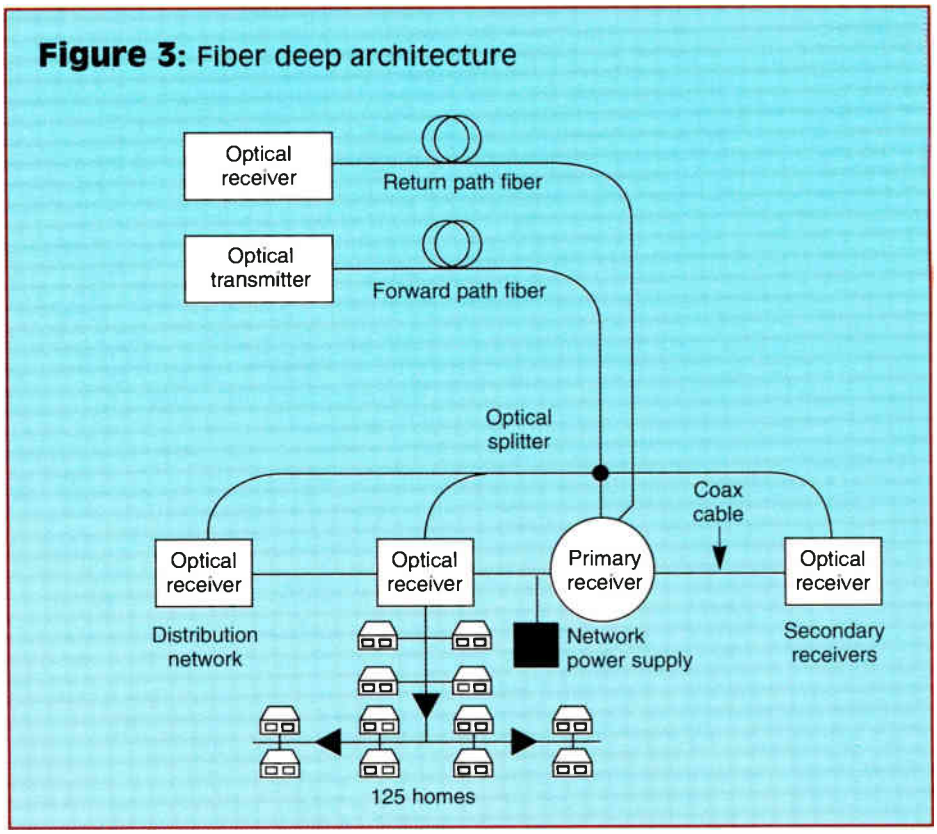
Another performance benefit of fiber optics is increased bandwidth. A long cascade of RF amplifiers will cause a large frequency roll-off in the system, even if the roll-off of each individual amplifier is small. Reducing the amplifier cascade results in a larger available bandwidth at the subscriber. This extra bandwidth can be used to provide new services (discussed later) to the customer, resulting in an additional source of revenue for the operator.

Reducing the amplifier cascade of a coaxial system not only improves signal quality, but also increases the reliability of the system. Obviously, fewer active elements between the headend or central office and customer reduces the number of signal outages. Also, an amplifier in a short cascade serves fewer customers than an amplifier in a long cascade, so outages are not only less common, they also affect fewer subscribers.

One of the most beneficial characteristics of linear fiber optics as applied to broadband networks is that the capability of the network is dramatically increased for essentially the same cost as an all-coaxial network. The price of fiber-optic transmitters and receivers has been dropping more than 20% per year with the result that it is cost-effective for multiple system operators (MSOs) to build networks with ever smaller nodes sizes.

MSOs are benefiting, not only from building more powerful networks at essentially the same cost, but also from reduced operating costs due to higher reliability and reduced time to repair. In fact, the reduction of operating costs is becoming a major benefit of linear fiber networks as the percentage of the distribution electronics spent on fiber continues to increase.

Figure 3: Fiber deep architecture



Fiber-optic architectures

The significant advantages listed previously have led system designers to search for system architectures that best exploit the inherent benefits of fiber-optic transport. As optical transmitter performance rises and price falls, system architectures have been gradually shifting to use more fiber.

The original use of fiber-optic links was mainly to gain the advantages of reduced amplifier cascades. The "fiber backbone" design used a fiber link to a point along a long trunk cascade. The amplifiers on the near side of the optical receiver were then turned around to transmit the signals back toward the headend. In this architecture, optical nodes served thousands of subscribers, and trunk amplifier cascades were reduced to typically three or four. The feeder portion of the network did not change.

As transmitter performance and cost improved, it became practical to serve fewer subscribers per optical receiver or node. The fiber-to-the-feeder (FTTF) design increased the number of nodes in the field, and made use of optical splitting in the headed to drive more than one receiver. This type of design typically has a three- or four-way optical split with each node serving around 500 homes.

The FTTF design with its reduced number of homes per transmitter, allows the operator to consider providing other services for the subscribers. Narrowcast transmission of digitally compressed channels, for example, can be supported on this type of architecture.

The continuing reduction of fiber-optic equipment prices has given rise to another architecture called "fiber deep" (Figure 3). In this design, each transmitter serves groups of around 500 homes. The transmitter output is typically split four ways, leading to node sizes of approximately 125 homes. In this design, maximum amplifier cascades are reduced to typically three or four, greatly increasing system reliability. A further benefit of this architecture is the large amount of available bandwidth per home.

Perhaps the ultimate case of fiber usage is the "passive coax" design (Figure 4 on page 64). In this approach, the number of amplifiers following the optical receiver is zero. All of the required RF gain is inside the optical receiver housing.

Trends

The predominant trend in system design is toward smaller numbers of homes

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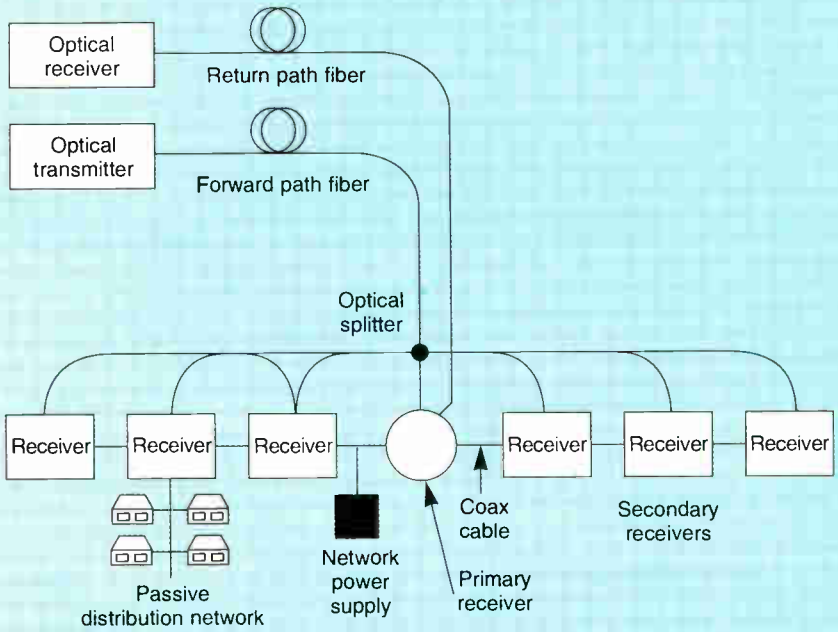
being driven by each transmitter. This trend is made possible by falling equipment prices but the driving force behind the new architectures is the potential profits from new services that fiber optic technology enables.

One growing area of interest in system design is the use of fiber-optic links for return path applications. A laser transmitter installed into a forward-path optical receiver can transmit signals from the optical node to the headend or central office, where a return-path receiver can convert the optical signal back to electrical form.

With a return-path link in place, a full two-way network is available. This allows many new services to be provided over the distribution plant — telephone service, home shopping, interactive video games and video-on-demand are just some possibilities. At present, many operators are already running trials of these services on their systems.

In just a few short years since its first demonstration, fiber-optic technology has revolutionized broadband communication systems. Operators and system designers are now striving to best exploit the tremendous technical and economic benefits enabled by fiber optics. Those who do best can certainly look forward to rich rewards. **CT**

Figure 4: Passive coax architecture



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the most sense relative to expected revenues. Cable TV has traditionally relied on the pay-as-you-go model, although the competitive horizon is likely to accelerate capital outlays beyond traditional return on investment considerations.

Much of the hybrid fiber/coax deployment being done today has been focused on the fiber cable. That is, establishing fiber counts based on models of future downstream and upstream bandwidth needs and creating the appropriate physical pipeline of fiber cable in the network. Over 80% of the fiber cable currently installed in the cable network is for future nodes or future services.

The optoelectronic portion of the plant has been much more speculative in terms of current deployment/spending vs. future needs. Only within the last year have DFB lasers been delivered that have adequate 750 MHz performance. At the receiver level, most of the focus has been on matching the RF capability of the receiver to the needs of the remaining coaxial plant surrounding a service node. Some basic receiver functionality includes fiber handling or connectorization, low-speed data return and basic status monitoring.

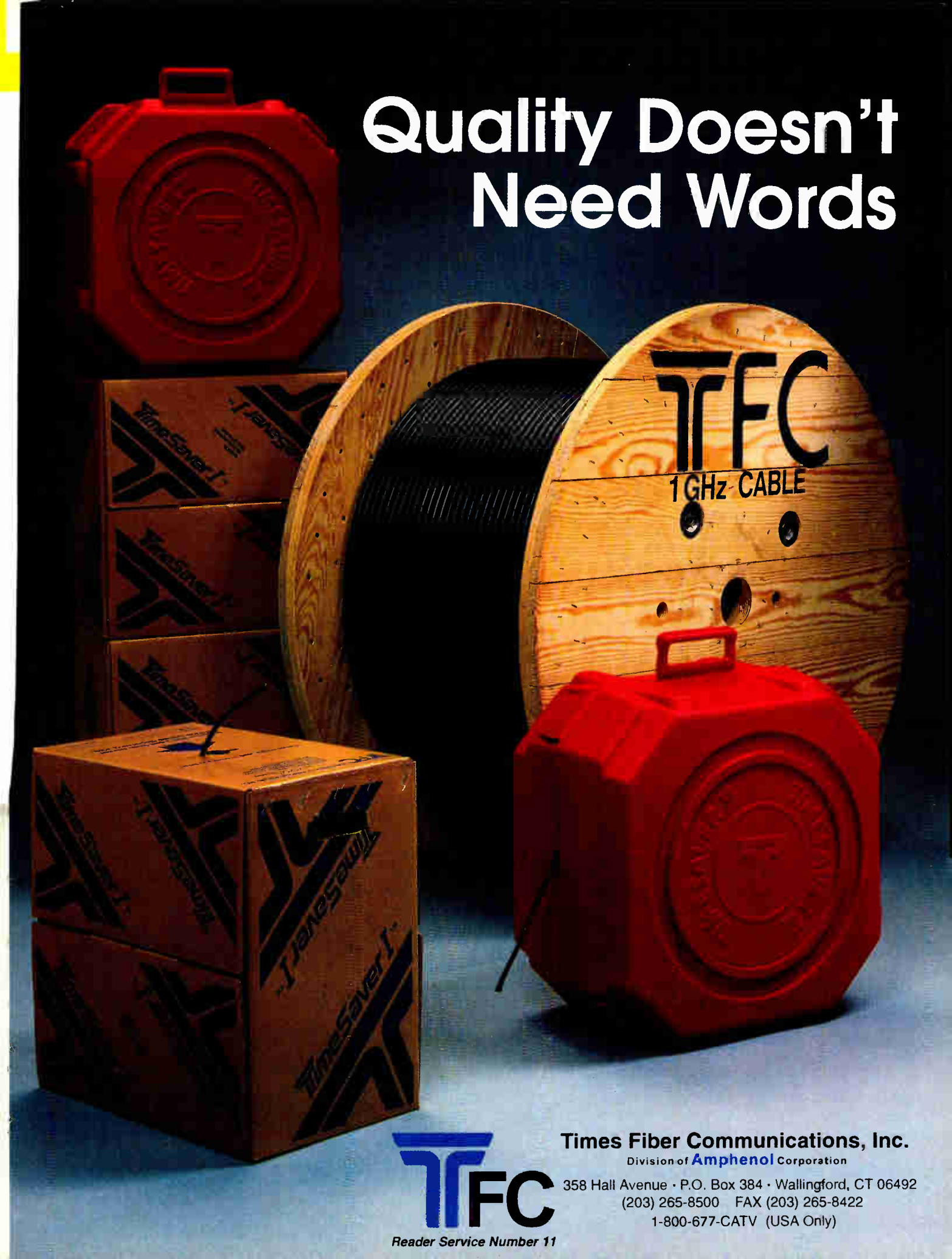
Many system engineers believe that today's category of "mini-bridger" receiver possess limited life cycles. From a capital outlay standpoint, a $1,500 receiver in a 500-home node costs only $3 per home passed. These basic receivers act as enablers to allow the fiber outlay of the network and robust, reliable downstream RF delivery. Future subnode functionality can then play catch-up with applications and current receivers can be "retired" after three- to five-year life cycles.

So what happens when the delivery of critical telecommunications services and fault-intolerant services becomes viable? What if this window comes sooner than later? For real-world applications, the return on investment is usually based on justifiable revenue dollars. Providers of ubiquitous service such as the regional Bell operating companies (RBOCs) have long been guaranteed a rate of return based upon spending capital dollars with longer-term pay backs. What are the plant and equipment considerations at the node site for a cable operator to not only meet but beat the competition?

In the broadband distribution plant, the optical receiver location and its ability to enhance the overall reliability of the plant represents a critical link in delivering new services to subscribers. The most important criteria are likely to be survivability and redundancy, remote network interrogation and management and scalability.

Another important aspect in future positioning is the receiver platform's capability to monitor component status and operation. The bidirectional nature of telephony services, its need for switched services, and the efficient management of subscriber billing will all require attention from cable systems contemplating telephony as a new service offering.

In making decisions regarding redundancy and network management, today's cost-effectiveness always must be weighed against technology options. A cost-cutting measure today will not be cost-effective when it causes unacceptable reliability problems that, for example, don't support telephony or return path needs. This problem is magnified even further when considering a near-term solution that will result in equipment change-out



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and obsolescence costs in the foreseeable future.

For this reason, scalability represents another important element in the choice of receiver platforms. Today, most cable systems require optical video receivers to deliver today's entertainment services. Tomorrow, when interactive services prove in, will that same receiver be able to accommodate return data lasers and the ability to add redundant capabilities? For systems seeking to "future-proof" their systems, scalability of the receiver platform should be another critical element in the decision-making process.

RF bandwidth needs

Another element in the choice of receiver platforms lies in RF output because multiple high-level outputs are a key component in network evolution. Today's architectures often require between 44 and 49 dBmV output on each coaxial leg, depending on plant topology. Multiple outputs will segment the system into discrete return legs where fiber can be implemented later as an overlay of the existing coaxial cable. By extending fiber deeper as new service and bandwidth demands increase, frequencies could then be reused to provide for increased capabilities in the return path.

"A scalable platform that allows the optical receiver to grow into a fully redundant, bidirectional-capable unit clearly represents a solution for systems seeking a graceful migration path toward a fully passive system."

Determining what type of "return" information would be expected from the subscriber represents another key concern. Initially, "bursty" information, such as quick data packet from a PC or an order for a NVOD movie, could be handled within the traditional 5-40 MHz return spectrum as a short-term solution.

As penetration rates increase and bandwidth needs expand, new optical receiver sites can be implemented further into the network. In this case, return path needs could still be accommodated through the existing coaxial cable and would be returned to a centralized optical node site. This interim solution will help control costs and make efficient use of the coaxial cable plant as new markets such as telephony or data transfer begins to expand. However, should four nodes return information in the same spectrum (5-40 MHz), those return signals would "crash" into one another at the centralized node site.

For this reason, a frequency upconversion method could be used to stack the return signals (e.g., Subnode 1 would use 5-40 MHz, Subnode 2 would use 41-76 MHz, etc.). This would eliminate the need to place return data lasers at each outlying optical receiver site until demand for more bandwidth-hungry interactive services proves in.

In the future, higher return bandwidth (750 MHz-1 GHz) may prove viable for return data. However, in today's environment, diplex filtering used in distribution amplifiers limit the

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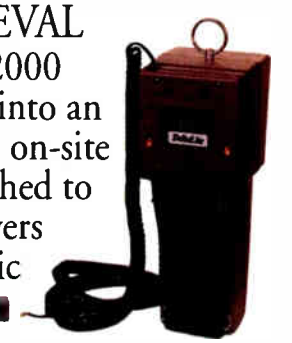

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return path to the 5-40 MHz range (though the receiver platform should be capable of accommodating higher bandwidth return). Should a service such as a data application be returned at, say, 925 MHz, amplifiers would not be able to accommodate the service. For this reason, migration of the network to a fully passive system will be required.

Fiber count and node migration

Emerging interactive services — and the new revenue streams each creates — will drive the continued downsizing of service nodes. Ultimately, this downsizing will migrate the network toward a fully passive architecture.

Put simply, passive networks increase the reliability, flexibility and capacity of the cable plant by eliminating distribution amplifiers and feeding smaller pockets of subscribers from a single optical node. Then, as more redundant features are added at each receiver location, the cable plant can achieve the near 100% reliability today's RBOC customers have come to expect. In addition, the smaller sized nodes mean services can be narrowcast and upstream bandwidth can be increased.

In today's network designs, evolving the network to the fully passive system means provisioning enough fiber to today's optical nodes. The optimal design method lies in breaking down service areas into passive nodes of 50 to 150 homes (depending on subscriber densities and the distances between homes), with at least four fibers dedicated to that node. From there, fibers counts can be taken back to optical nodes that are cost-effective to implement today. Then, when new service demands require more dedicated bandwidth capabilities, the pre-installed fiber can be extended — whether that expansion is systemwide or in individual serving areas. This allows subscriber demand in any given service area to drive further network evolution. Costs can be recovered by new revenue streams created in each node.

Today the fully passive architecture is expensive to implement and operators may not see its benefits in the short-term. In the future, however, the passive architecture will become not only more viable but necessary to support a variety of new services. It's important to note that today's plant design and current optical node positioning will play a crucial role in the migration path to the passive network. Without careful planning, system operators may be forced to lay new fiber from the headend to a new node and/or to change-out all of the optoelectronic equipment, including each receiver.

Summary

A number of issues arise in the proper selection of optical receiver platforms. Many system operators are currently deploying optical receivers with short life cycles. In fact, some engineers freely admit that they are installing "throw-away" receivers. However, a scalable platform that allows the optical receiver to grow into a fully redundant, bidirectional-capable unit clearly represents a solution for systems seeking a graceful migration path toward a fully passive system. Network operators looking to the future should plan their migration strategies so today's equipment doesn't become obsolete and the system isn't forced to initiate another major rebuild in the future. **CT**

Ham radio operators in the cable TV industry — Part 1

The following is the first part of a list (in alphabetical order) of amateur radio operators employed in the CATV industry. It was compiled by Steve Johnson, N0AYE, who is in the process of adding a new category to include packet addresses for each of the hams. Please send any additions or corrections to Steve Johnson, Time Warner Cable, 160 Inverness Dr. W., P.O. Box 6659, Englewood, CO 80155-6659; fax (303) 799-5651.

Name	Call	Company	Location
Acevedo, Nelson	KP4FEN	CATV Noroeste	San Antonio, PR
Adams, John	AB6ID	Sonic	Sacramento, CA
Adams, Mark	KA4WCB	Scientific-Atlanta	Norcross, GA
Alexander, Gary	KE5BS	Post-Newsweek	Altus, OK
Alfred, Arvid	KA7GFQ	Glacier Cablevision	Deming, WA
Allen, Fred	KA0YAE	TCI	New Hope, MN
Allen, Steve	KC6VCC	Jones	Roseville, CA
Almeida, Harry	N1NXI	Dimension	Weymouth, MA
Almeyda Jr., William	KN4BX	Prestige Cable	Cartersville, GA
Amos, Alan	KN1O	Jerrold	Stow, MA
Anderson, David	N7PQA	TCI	Seattle, WA
Andrews, David	N1ESK	Storer	New Haven, CT
Annibaldi, Rich	N8TBJ	Pioneer	Columbus, OH
Arthur, Tom	KB5QH	TCI	Englewood, CO
Ash, Ivan	K4IML	Consultant	Columbia, MD
Atkins, Gary	W0CGR	CSU Tech Service	Ft. Collins, CO
Austin, Daryl	WD8KJZ	Paragon	San Antonio, TX
Bach, Thomas	KA9PDM	Clear Cablevision	Saline, MI
Bailey, Wendell	KC3BU	NCTA	Washington, DC
Baker, James	N6WRV	USATEC	Jolon, CA
Baker, Steven	KA1OEX	Continental	St. Paul, MN
Bannister, David	KK4FL	Fairfax County	Fairfax, VA
Barnes, Richard	W4IXN	Scientific-Atlanta	Atlanta, GA
Barnes, Ron	N0PDC	Triad Communications	Littleton, CO
Barr, Stuart	AB5PV	AOFR Americas Inc.	Richardson, TX
Bartlett, Dave	N0CQC	TCI	Englewood, CO
Barton, Rod	N2UFQ	Comcast	Meadowlands, NJ
Baur, Wayne	WB9HIE	TCI	Cahokia, IL
Baxter, Frank	K2ZLA	Tele-Media	Pleasant Gap, PA
Beckham, Chuck	N4XZV	Voltex Batteries	Doraville, GA
Beeman, Paul	KA2MUM		
Belyea, Brinton	W4GSF	1st Commonwealth	Gloucester, VA
Bentley, Bill	N5POB	Dimension	Midland, TX
Berends, Dennis	N8VWH	TCI	Grand Rapids, MI
Beuret, Kit	KH6JDE	Time Warner Cable	Honolulu, HI
Biggar, Norm	VE3MTV	Maclean Hunter	Owen Sound, ON
Blackstone, Larry	W8FZ	Dantron	Milton, FL
Blais, Brian	N1KQQ	Continental	Springfield, MA
Packet address: @N1MEA.#WMA.MA.USA.NA			
Blakeway, Roger	G1PXM	UK SCTE	
Blanchard, David	KA0HIB	Municipal Utilities	Coon Rapids, IA
Blanchard, James E.	N1FEC	Adelphia Cable	Sandwich, MA
Blumberg, David	N1HHI	ACS	Manchester, NH
Blumsack, Harvey	W1VIK	Superior Optic	Marietta, GA
Bohnhoff, Mark	WB9UOM	M. Bohnhoff	Wheeling, IL
Borchert, Marshall	KD0DU	Riser-Bond	Aurora, NE
Borsetti, Paul	N4PMT	Scientific-Atlanta	Atlanta, GA
Bourne, Dave	WB8TMP	Pioneer Comm.	Columbus, OH
Bowen, Todd	KB5OVM	Textel Cable	Austin, TX
Bowick, Chris	WD4C	Jones	Englewood, CO
Bowles, Tom	W7VA	King Video	Seattle, WA
Boye, Greg	WB8NGA	Time Warner Cable	Columbus, OH

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Bray, James R.	W0FBC	Time Warner Cable	Kansas City, MO
Brillhart, Scott	N5JJZ	TCI	Tulsa, OK
Brinkley, Chris	WA4LSW	Marks Cable	Portage Lake, OH
Packet address:	@WB8BII.#NEOH.OH.USA.NA		
Brown, Bob	N0EUH	Westec	McLouth, KS
Brown, John H.	W7CKZ	TCI	Olympia, WA
Brown, Philip	WA0ZFE	Sumner Cable TV	Wellington, KS
Brown, Charles	KD4BCX	Time Warner Cable	Greensboro, NC
Brownell, Eric	KB6YI	Sonic	Sacramento, CA
Bryan, Larry	WB8LIG	Time Warner Cable	Lima, OH
Bryan, Tim O.	WH6CAD	Jones	Hilo, HI
Burns, Bob	K1RB	Continental	Brockton, MA
Burrell, John	KF0QY	Tektronix	Denver, CO
Burton, Jack S.	WB2CJS	Cablevision	Woodbury, NY
Butts, John	N2JUG	MCTV	New York, NY
Bybee, Jerry	KG7GQ	TCI	Portland, OR
Caci, Joe	KA2OCF		
Cady, Terry	KC4HPU	King Video	Tujunga, CA
Campbell, Leroy	W8JMP	TCI	Alpena, MI
Campbell, Richard	KE6EFB	Simmons	S. Lake Tahoe, CA
Cappe, Roger	WA4PEA	Cox	Gainesville, FL
Capron, John	WB2RUQ	Philips	Manlius, NY
Carey, Bill	KC4BPK	Time Warner Cable	Fayetteville, NC
Carr, George	WA5KBH/G0	Cablevision Bedsh.	Luton, UK
Carr, Mike	N4PON	Paragon	St. Petersburg, FL
Carr, Peter	WB3BQO	Montague CableTV	Montague, NJ
Carvis, Timothy	WB9ULP	NYT Cable TV	Cherry Hill, NJ
Cerino, Charles	WB3HVH	Comcast	Philadelphia, PA
Chambers, Chris	N8PAS	Cable Link	Columbus, OH
Charlton, David	N7SDN	HFU-TV	Coleville, CA
Checketts, Rick	KA0KZB	Jensen Tools	Phoenix, AZ
Chesney, Tom	WH6CED	Time Warner Cable	Honolulu, HI
Christensen, Joseph	WB7WTS	White Pine Cable	Ely, NV
Christianson, Tom	N1APV	Tektronix	Boston, MA
Ciciora, Walt	WB9FPW	Consultant	Stamford, CT
Clayton, Francis	AH6X	Kauai Cable	Kekaha, HI
Cohen, Jeff	N1ACQ	Harron	Londonerry, NH
Cohn, Bill	N9MHT	Zenith	Glenview, IL
Packet address:	@W9ZMR.IL.USA.NOAM		
Colegrove, Tom	WA6QBQ		Santa Clarita, CA
Packet address:	@K6IYK		
Colter, Dave	WA2ZCN	Block Island Cable	Block Island, RI
Coombs, Gary	N4OJW	Scientific-Atlanta	Atlanta, GA
Cooper, Ed	WB5RLN	ONI	Englewood, CO
Cordero, Francisco	KP4CJ	CATV Noroeste	Aguadilla, PR
Coufal, Jerry	WB0DEK	TCI	Englewood, CO
Crow, Ron	N5GP	TCI	The Woodlands, TX
Crown, Ron	KH6JI	Kauai Cable	Kalaheo, HI
Cvetnich, Joe	N0PXM	Multimedia	Wichita, KS
Danekind, John	WD8PXI	Coast CATV	Cincinnati, OH
Davidson, Alan	G4PSU	ABP Ltd.	Bramley, UK
Davis, Gary	WD8LTS	Antietam Cable	Hagerstown, MD
Davis, Keith	N9IBS	Comcast	Paducah, KY
Davis, Matt	N8OCO	Cable Link	Columbus, OH
Dawkins, Al	K0FRP	US West	Denver, CO
Dean, Brad	K1KEK	TCI	S. Yarmouth, MA
DeHart, Steve	N2PFB	Philips	Manlius, NY
Deierlein, Peter	KD2LN	Philips	Manlius, NY
DellaGuardia, Joe	WB2WLY	TCI	Baltimore, MD
Dewey, Steve	N8JRJ	TCI	Royal Oak, MI
Dickinson, Bob	W2CCE	Dovetail	Bethlehem, PA
Dickinson, Ed	WB2FAC	Dovetail	Bethlehem, PA
Dineen, Jim	WB7RIQ	TCI	Aberdeen, WA
Ditlow, Doran A.	WA8EOW	TCI	Grand Rapids, MI
Dodds, Al	W0KJV	Dodds & Dodds	Huntington Beach, CA
Domina, Frank	N9MXI	Zenith	Glenview, IL
Driscoll, Sean	WA2CRB	Cross Country	Warren, NJ
Dryden, James	W6KIS	Buckeye Cable	Toledo, OH
Duda, Lada	OK2BLD	Cable Plus	Ostrava, Czech
Dudley, Mike	KB7POJ	TCI	Boise, ID
Dudziak, Ted	WA1GPC	EIP Microwave	San Jose, CA
Dusbabek, Lee	WB6KAJ	Cableware Elec.	Brea, CA
Packet address:	@WB6YMH.#SOCAL.CA.USA		
Duval, Joe	AA4JV	Hillsborough County	Tampa, FL
Dzuban, Mark	KB2IT	AT&T	Short Hills, NJ
Edwards, Jim	KD4TGA	Tektronix	Huntsville, AL
Eggert, Dana	KE4CWJ	Scientific-Atlanta	Norcross, GA
Ehman, Roy	VE6EV	Retired	Maryville, TN
Eichenlaub, Frank	N0TPR	ANTEC	Englewood, CO
Eide, Joe	KB9R	Time Warner Cable	Eau Claire, WI
Emig, Tim	KK4YU	Storer	Louisville, KY
Engelman, Paul	N6KZW	Continental	Stockton, CA
Epling, Jack	KC6HMP	Ventura County	West Lake Village, CA
Evanko, Steve	N2HCR	Blonder-Tongue	Old Bridge, NJ

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Hranac, Ron	N0IVN	Coaxial International	Denver, CO
Hudson, Dave	WB6VXH	TCI	Dubuque, IA
Huf, Ted	K4NTA	Adelphia Cable	Rivera Beach, FL
Huffman, Chris	W4MKJ	CommScope	Hickory, NC
Hughes, James	KC4ZMI	Rankin Co Cable	Pearl, MS
Huhn, Chris	N8OPB	Cable Link	Columbus, OH
Packet address: @W8CQK.#CENT.OH.USA.NA			
Humpage, Richard	VE3UOD	Rogers	Don Mills, ON
Packet address: @VE3YRA			
Hunt, Bill	KC4ILF	Marion County Schools	Ocala, FL
Hunwick, Fred	KA5WWW	Sammons	Ft. Worth, TX
Hutchins, Bill	KB6CYS	Times Mirror	Palos Verdes, CA
Packet address: @WB6YMH-2.#SOCA.CA.USA.NA			
Idler, Steven	KA9UIE	Scientific-Atlanta	Atlanta, GA
Imbody, Don	N4PFS	Power Guard	Fairborn, OH
Jackson, William G.	W8GHK	Cable America	Phoenix, AZ
Jage Jr., Richard M.	N5LCR	Texscan	El Paso, TX
Jaudon, Bob	KC4IEE	Paragon	Tampa, FL
Johnson, Glenn	WB7UXS	Time Warner Cable	Emporia, KS
Johnson, Ken	WA7YHN	Pullman TV Cable	Moscow, ID
Johnson, Rey	K8JCB	Consultant	Denver, CO
Johnson, Steve	N0AYE	Time Warner Cable	Englewood, CO
Packet address: @W0GVT.#NECO.CO.USA.NA			
Johnston, Bob	WB7AHL	TCI	Lander, WY
Jones, Herb	KA4NIF	Time Warner Cable	Melbourne, FL
Jordan, Peter	KA2HIG	Philips	Manlius, NY
Jordan, Robert	N5RKN	Dimension	Midland , TX
Packet address: @N5IST.#WTX.TX.USA.NA			
Joyce, Dan	WD8IDY	TCI	Grand Rapids, MI
Joyner, John	KB2IPC	Time Warner Cable	Albany, NY
Jubon, Jan	K2HJ	Malarkey-Taylor	Washington, DC
Kallina, Henry	WA5VSG	Consultant	Englewood, CO
Kaplinsky, Alex	WA5UNY	Cablewave	Dallas, TX
Karr, Randy	KC4IOT	Channel Master	Clayton, NC
Kasekamp, Marlon L.	KK3L	TCI	Cumberland, MD
Kaser, Gary F.	AB8Y	Adelphia Cable	Richland, MI
Kavanaugh, Ed	N8XDH	TCI	Alpena, MI
Kaylor, William	W9DSM	Philips	Knoxville, TN
Kean, Peter	K2AXI	Mystic Star	Rock Tavern, NY
Keller, Robert	KY3R	Fleischman & Walsh	Washington, DC
Kellough, Larry	WB9AZQ	Cox	Harahan, LA
Kelly, Jeff	N3MFT	Service Electric	Beth, PA
Kelsey, Charles	WB2EDV	Village of Mayville	Mayville, NY
Kessler, Steve	WA8ZMC	Cedardale Sat.	Springboro, OH
King, Michael	WB0NCB	Circuit Doctor	Frisco, CO
Kirby, Dave	N8JQX	Cablevision System	Maple Hts., OH
Kirsche, Dick	N1CBW	Greater Media	Ludlow, MA
Kittelson, Jerry	KF0CL	Lakes Cable	Spirit Lake, IA
Kline, Ron	WD7R	TCI	Boise, ID
Knies, Mike	WB8MMR	Time Warner Cable	Columbus, OH
Kolins, Jerry	K2PFW	Prof. Elect. Co.	Schenectady, NY
Kosek, Bill	WA2KXY	Time Warner Cable	Albany, NY
Kramer, Harold	WJ1B	Tele-Media	Seymour, CT
Kramer, Jonathan	KD6MR	Comm. Support	Encino, CA
Krebsbach, Ed	KF7KE	TCI	St. Helens, OR
Krom, Ed	WD4KHP	Media General	Fairfax, VA
Kuhns, Jim	KG8FT	Comcast	Warren, MI
Kujat, Matthew	WB3FNZ	CATV Service	Freeland, PA
Kuzmanoff, Chris	WH6CEQ	Time Warner Cable	Honolulu, HI
La Joie, Mike	KC6GEM	Time Warner	Burbank, CA
Lambert, Matt	KC4NYO	Continental	Richmond, VA
Lampman, Don	N9JEY	TCI	Madison, WI
Land, Ed	N3GSC	Sammons	Oil City, PA
Langevin, Larry	K1GXU	Greater Media	Ludlow, MA
Large, David	WZ6V	Intermedia	Los Gatos, CA
Lawhon, Dwain	K0LOA	AOFR	Richardson, TX
Lazzaro, Tom	VE3KZJ	Lindsay	Lindsay, ON
Lemon, Gary	N0IZF	Time Warner Cable	Cable Gastonia, NC
Leonard, Michael	KA1IOD	Time Warner Cable	Portland, ME
Lett, David	WD4NSX	Scientific-Atlanta	Atlanta, GA
Levy, Bob	K2LET	NY Cable Comm.	Albany, NY
Lewis, Jon	KH6MS	Time Warner Cable	Honolulu, HI
Leyrer, David	K8HMF	Aero-Trac	West Warwick, RI
Lies, Gene	NN5A	Jones	Albuquerque, NM
Lipoff, Stu	W1GRI	A.D. Little	Cambridge, MA
Littlefield, Phillip	KB5YIA	Spectradyne	Dallas, TX
Littlejohn, Craig	N7YKR	Times Mirror	Phoenix, AZ
Lloyd, Tom	K0CPI	Vantage	Kirksville, MO
Long, Bill	N3KEN	Sammons	Dallas, TX
Lonn, Robert	WA6PHN	Cox	San Diego, CA
Louie, Dom	VE7CKL	Rogers	Vancouver, BC
Lozzoro, Tom M.	VE7KZJ		Lindsay, ON
Luff, Bob	W3GAC	Scientific-Atlanta	Atlanta, GA
MacFarquhar, Ian	VE3OS	CUC Broadcasting	Scarborough, ON
Mackenzie, Kevin	WB6BVW	J.D. McKay Corp.	Aloha, OR
MacLeod, Doug	N8ASM	Comcast	Warren, MI
MacPhedran, Don	WA2ZOZ	Cablevision	Cresskill, NJ
Madison, Scott	KA1MRO	James Cable	Bloomfield Hills, MI
Maes, Craig	WD8NJS	Omnicomm	Plymouth, MI
Malo, Butch	KK4CU	Adv. Satellite	Ormond Beach, FL
Malson, Tom	N6RLN	Eagle Comtronics	Torrance, CA
Manka, Patrick	WB5KMX	Paragon	San Antonio, TX
Mann, Scott	KD6EPZ	Times Mirror	Rolling Hills Est., CA
Mannikko, Roy	WB9PKN	Cox	Macon, GA
Manzi, Steve	K3GIY	Times Mirror	Hatboro, PA
Maples, David	WB4FUR	SVT	Stennis Space Ctr., MS
Marquart, Hugo	N0DYZ	Bismark-Mandan	Bismark, ND
Marriam, Scott	KB2BDB	Philips	Manlius, NY
Marroni, Nestor	LU8AJK	Satcom SA	Buenos Aires, Argentina
Marsh, Stephen	KB9DTC	Cable Exchange	Chicago, IL
Martin, George E.	WD0FJH	SW MO CATV	Carthage, MO
Massey, Larry	KU7C	Cooke Cablevision	Tucson, AZ
Mauney, Bob	WB4RPM	Bell South	Atlanta, GA
May, Larry	KD4BNK	Clay Cablevision	Orange Park, FL
Maziarz, Joe	K8BIU	NASA Lewis	Cleveland, OH
McArthur, Douglas	N3KJL	Suburban Cable	King of Prussia, PA
McArthur, Len	VE3KSU	Cablesystems	Don Mills, ON
McCoy, Cecil	WB4CTF	Cox	Norfolk, VA
McDonald, Stan	WA4IZI	Scientific-Atlanta	Atlanta, GA
McDonough, Tom	N4YKK	Time Warner Cable	Cocoa, FL
McFadyen, Brian	N9HJR	MetroVision	Palos Hills, IL
McGehee, Mark	KA5CEV	Post-Newsweek	Ada, OK
McMillan, John	KA4SSB	Time Warner Cable	Lumberton, NC
McMonigle, Dan	N3IXQ	Suburban Cable	Linwood, PA
Packet address: @N3FOA.#EPA.PA.USA.NA			
Mellring, Chuck	K3GDZ	Cable Link	Columbus, OH
Mersinger, Tom	KB4VQX	Prime	Atlanta, GA
Metzger, Steve	KC7VH	Paragon	Portland, OR
Meyer, Ken	WB9YUY	Door Cablevision	Sturgeon Bay, WI
Michael, Tracy N.	AA9Z	TCI	Hartford City, IN
Michaels, Joe	KA0GIB	Time Warner Cable	Emporia, KS
Midkiff, Randy	WB8ART	Continental	Kettering, OH
Miller, Rick	WB4WPI	Storer	Sarasota, FL
Miller, Ronald	K4NGQ	Frankfort Plant Bd.	Frankfort, KY
Milner, Ed	WA4OHW	NCTI	Denver, CO
Money, Marshall	N4SIO	Summit	Woodstock, GA
Monroe, Jerry	KC2UT	Philips	Manlius, NY
Moore, Doug	KA0TQJ	Time Warner Cable	Kansas City, MO
Moore, Marc	KB6HMO	King Video	Tujunga, CA
Moore, Marcus	N4RYD	Scientific-Atlanta	Atlanta, GA
Morris, Stephen	N4ZUX	Rock Hill Cable	Rock Hill, SC
Mortimer, Walt	WA6ELI	Viacom	Redding, CA
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Mullan, John	KD2LQ		
Mundy, David	N0MYU	Continental	Overland, MO
Murphy, Russ	KC4YIU	Family Channel	Virginia Beach, VA
Packet address: @WD4MIZ.VA.USA			
Musser, Dennis	N0UXA	Time Warner Cable	Denver, CO
Packet address: @W0GVT.#NECO.CO.USA.NA			
Myers, Ron	KH6JQP	Commband Tech.	Virginia Beach, VA
Nakashima, Ray	WH6CEO	Time Warner Cable	Honolulu, HI
Narramore, Frank	W5BGW	Y-S Cable TV	Yellville, AR
Nelson, Barry	KA9YIS	Time Warner Cable	DeKalb, IL
Nelson, Jim	N5IZT	Pwr. Cntrl. Tech.	San Antonio, TX
Newell, Steve	KA8USS		Owosso, MI
Newlin, Jeff	N4UPS	Continental	Richmond, VA
Newton, John	KA2ZZL		
Norman, Tom	WA7HFY	UWTV	Laramie, WY
Nusco, Fred F.	WA2DWO	Time Warner Cable	San Diego, CA
Nydegger, Charlie	WA9HCU	Cardinal	Crawfordsville, IN
Nykjor, Ole	OZ2OE	Triax	Horsens, Denmark
Obert, Paul	K8PO	Microwave Radio	Lowell, MA
Orwen, John	KB0XE	Metrovision	Lincoln, NE
Osterland, Derick	AH6KC	Time Warner Cable	Honolulu, HI
Ottinger, Michael A.	NX9Q	TCI	Lebanon, IN
Oyama, Blaine	NH6FM	Jones	Hilo, HI
Pandzik, Mike	WB0PTZ	Nat. Cable TV Co-op	Lenexa, KS
Panetta, Carlo	AG2C	Eagle Comtronics	Clay, NY
Pangrac, Dave	WA0RNP	Time Warner Cable	Englewood, CO
Paperman, Dave	WQ5Y	TX Childrens Hosp.	Houston, TX
Parmiter, Donald	N8LJF	TCI	Zanesville, OH
Pastor, Tom	N8HUS	Continental	Painesville, OH
Patrick, Al	WA4URT	Scientific-Atlanta	Atlanta, GA
Payne, Tim	N6DRA	Cox	San Diego, CA
Pearce, Grant	K8BKT	Reliable	Grand Rapids, MI
Perry, Buck	K4ITT	Moffet, Larson	Falls Church, VA
Peterson, Michael	KA0YAD	TCI	New Hope, MN
Peterson, Par	AB6LF	Western Comm.	San Francisco, CA
Pezzenti, Al	N8NED	Northeast Cable	Youngstown, OH
Pezzenti, Albert	N8NED	NE Cable TV	Youngstown, OH

(More names will follow in a future issue)

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IRD - 6175
- C, Ku Bands 950-1750 MHz Range
- Integrated VideoCipher® IIDescrambler

CESR - b
- C, Ku Bands 950-1750 MHz Range
- 70 MHz IF Loop

Modulators

AM Series - Agile
- 40 or 60 dBmV Output Levels
- 50 -550 MHz Range

MAVM - Channelized
- 42 dBmV Output Level
- 50 - 550 MHz Range

Processors

AP Series - Agile
- 40 or 60 dBmV Output Levels
- In: 50 - 806 MHz Out: 50-550 Mhz Range

SAVP - Channelized
- 42 dBmV Output Level
- In: 50 - 806 MHz Out: 50 -550 MHz Range

Broadband Amplifiers

BIDA/ACA Series
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- 50 - 300/450/550 MHz Range

Masterline® Series
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- VHF LB/FM, MB HB and UHF

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OC - Passive
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- 50 - 450 MHz Range, High Isolation

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Splitters/Couplers
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- 5 - 900 MHz Range

Versatap - Wall Taps
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- 5 900 MHz Range

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Reader Service Number 18

CT DAILY

From *Communications Technology* magazine

Cable-Tec Expo Edition

ADC Demonstrates Convergence

ADC Telecommunications exhibited a variety of fiber-based products from advanced systems to critical components that ensure end-to-end network connectivity for converging technologies.

With the company's Homeworx hybrid fiber/coax access platform, service providers can migrate from offering basic and premium cable TV services to more sophisticated services such as video-on-demand and interactive television, plus telephony services as technology, customer demand and budgets dictate.

Also on display was the company's modular fiber distribution frames designed to ensure network flexibility. Service providers can configure a frame that meets their specific needs by choosing among connector, storage and splice modules. Value-added connector modules also can be easily incorporated into the system to make the addition of optical componenets such as wavelength division multiplexers, splitters, variable attenuators and optical switches. **Reader service #208 (Homeworx), #207 (frame)**

LightScan Shows New Hand-Held Laser Source

LightScan Advanced Technologies introduced the LST2135 handheld fiber-optic laser source, featuring a single port design that allows test equipment users to test at both 1,310 and 1,550 nm without having to change the connection.

The unit's output power is stable over the entire operating temperature range to give users the accurate, repeatable performance demanded by the CATV industry. Users can choose to transmit a continuous wave, a modulated wave at frequencies of 270 Hz, 1 kHz or 2 kHz, or automatically scan the modulated frequencies. The unit self tests on power-up and continuously monitors the lasers to ensure they are transmitting power.

The units come standard with an AC wall cube and either a rechargeable NiCad battery tray or AA alkalines. The NiCads last eight hours and recharge in less than 2-1/2 hours. The recharging circuitry is designed so the unit will function while it is recharging. When using alkalines,

Power Guard Intros Power Supply

Power Guard announced a newly designed standby power supply with a unique battery compartment designed to extend battery life. It is mounted on an underground vault that contains the batteries. The underground vault will allow for cooler battery operation with improved battery life in virtually any environment condition. Installation and battery costs are projected to be substantially less than current products being used in similar applications. **Reader service #205**

the source will operate for 15 hours.

Typical applications include troubleshooting fiber-optic cables and networks, point-to-point connection or loss verification, installation verification and measurement of connector and splice loss. **Reader service #204**

Universal Remote New From TVC

TVC introduced a new three-function universal control unit. The Easy Touch 3 features ease of setup and operations with all controls located in logical groups. Large, easy-to-read keys are simple to find even in dimly lit areas, according to the company.

The product has positive user feedback during setup. LEDs indicate if the remote control is in the setup mode and upon completion of code entry that the program has been entered successfully. The remote has color-coded keypad layout operation and numeric entry pad. Keys 1-0 provide for code entry plus direct entry of channel numbers where required.

Many universal remotes provide access to some of the obscure functions of TV sets, VCRs or CATV converters that are not required in regular day-to-day operations. Easy Touch 3 reduces these functions to the most frequently used keys. hundreds of TV set, VCR and CATV devices are supported by the unit. **Reader service #206**

CLT Debuts Hardware/Software Products

Cable Leakage Technologies announced several new products at the show. Wavetracker for Searcher Plus takes advantage of coherent spectral analysis, the most advanced signal leakage analysis software available, according to the company.

Wavetracker Quick Utils takes all the rideout disk DOS commands into a "point and shoot" format for increased user friendliness. Also, Mapinfo's 3.0 Streetinfo Upgrade has much improved "hit rates" for street addresses and has the latest construction, new street names, and any 911 or city-style addressing system changes that have been implemented through the 1992 Tiger files. **Reader service #202**

Channel Commercial Self-Locks Its Enclosures

Channel Commercial Corp. announced its Self-Lock locking system for the Signature Series pedestal enclosure (SPH) line. All Self-Lock units come with free security keys. No additional tools are required. This eliminates additional tool stocking and resupply problems, not to mention tool breakage and additional parts to carry on the service truck.

Also, at no additional cost, each enclosure comes with a universal locking plate. This allows for the use of any of three optional locks: a hasp configuration for a padlock, a threaded bushing for Diversified systems, and accommodation for Highfield or innertight barrel lock systems. **Reader service #201**

Sachs Introduces Suspension Clamp

Sachs Communications showed its new SC213 "3-Bolt" suspension clamp, made to Bell specification for securing messenger strand to the pole. It is designed for use with messenger strand of 1/4-inch (6.6 mm) through 7/16-inch (16 mm) in aerial telecommunications or utility pole-line plant.

The SC213 mounts with a single 5/8-inch hanger-bolt through the pole and is made of high grade steel, hot-dip galvanized identically to the clamp itself. **Reader service #200**

Superior Welcomes Another Cheetah To Family

Superior Electronics introduced two new status monitoring products to its Cheetah family of systems. The HEC-3 headend controller and the CMM-3 transponder was shown for the first time at the Expo.

The HEC-3 provides multiuser access to integrated status monitoring and test systems. Based on a 386 chip design, it is the highest speed headend communications controller available and supports up to eight telephone and RF modems.

The CMM-3 is a universal monitoring module compatible with major manufacturers of power supplies, fiber-optic receivers, nodes and amplifiers. Featuring frequency agile modems and downloadable firmware updates, the CMM-3 offers maximum flexibility to make network changes without replacing field devices. **Reader service #199 (HEC-3), #198 (CMM-3)**

Alcatel Advances Fiber-Optic Coating Systems

Alcatel Telecommunications Cable highlighted its new AFC3 coating system for optical fibers. The company says the improved dual-coating system is designed to retain its strength and strippability characteristics through the aging process like no other commercial coating on the market. The AFC3 system is said to be the only coating exhibiting increased tesile strength while aging at 85°C in both 85% relative humidity and water immersion. In addition, laboratory experiments prove that AFC3 coated fiber's static fatigue performance in aged conditions is the highest in the industry with a stress corrosion factor (n-value) of greater than 35.

This coating system also has been designed to be an easily stripped product that leaves a smooth surface free of sticky residue even with aging. The product's mechanical and heat strippability has been proven in a variety of environments. Also, the coating exhibits low microbending effects in aggressive low temperature environments. Alcatel designed the new coating system to meet the rigorous demands of both Loose Tube and Uniribbon applications in both long haul and local loop environments. The coating was developed after careful study to provide the robustness needed for FITL deployment and long-term reliability. **Reader service #196**

Extend Your Training Mind With Mind Extension Institute

Three new programs developed by Mind Extension Institute were featured at the show: "The Technical Troubleshooting Challenge"; "Customer Service Through Troubleshooting"; and "DBS: The Inside Story." The last one is a two-parter that will comprise the June and July offerings in the "Rethinking Cable for the 21st Century" video training series.

ME/I also announced that it will be marketing and distributing the new Jones Cable Television and Information Infrastructure Dictionary (4th Edition), which provides 2,900 cable, telecommunications and interactive multimedia terms. It is available in hard cover, desktop software and CD-ROM formats.

The two troubleshooting programs were developed based on case studies from the leading industry trainers and provide a systematic approach to troubleshooting. These programs were designed to help systems save on service calls, truck rolls and associated costs. "The Technical Troubleshooting Challenge" targets service technicians, installers and technical supervisors and trainers, and addresses the symptoms for 80% of all troubleshooting calls from the drop to the home. The companion, "Customer Service Through Troubleshooting," is aimed at anyone who interacts with customers and can possibly solve problems over the phone.

Addressing upcoming competition, "DBS: The Inside Story" is a training program designed for all cable system personnel. This two-part program covers how DBS works, equipment, programming, satellite and radio communications, telephony, telecommunications, interactive multimedia and engineering terms. The desktop software and CD-ROM formats allow users to search by terms, browse through definitions, and jump quickly between 850 "hot link" terms. **Reader service #193 (training programs), #117 (dictionary)**

Panels And Fiber Management At ADC

ADC Telecommunications displayed its FlexLight 2000 rack-, cabinet- and wall-mount panels that provide a convenient point for terminating, connecting and splicing fiber-optic cables. The units incorporate a modular 6 pack connector plug-in, along with removeable, angles retainers; built-in cable management and protection; quick and easy rearrangement of fibers; and a high degree of bend radius protection.

Also on hand was the Plenum FiberGuide fiber management system that protects optical fibers that run beneath raised computer room floors and above suspended ceilings. The system, constructed of sturdy aluminum, protects optical fibers by physically separating them from copper communications cables, power cables, ground cables, heating/ventilating duct, water pipes and many other obstructions commonly encountered in plenum air spaces. **Reader service #195 (panels), #194 (FiberGuide)**

New Boxes Displayed By Eastern/Polotec

Eastern Electronics/Polotec showed several new products that are scheduled for delivery during the third and fourth quarters of 1994.

The PhaseKrypt encoder and add-on decoder box is said to bring low-cost addressability and security to plain CATV systems already installed with your existing customers. The company's new UHF/VHF CATV converters bring up to 125-channel capacity to CATV converters for off-air and/or cable. Addressable PhaseKrypt CATV converters bring an advanced baseband encryption method to CATV converters for much less cost than existing addressable systems. The new MMDS wireless cable systems are coming in the first quarter of 1995. The new products will be available in NTSC or PAL versions. **Reader service #175**

CommScope Unveils Drop Cable Packaging

A new concept in drop cable packaging, EZ-PAK, was highlighted by General Instrument's CommScope division. EZ-PAK is a coil of drop cable in a recyclable plastic cover that eliminates wooden reels or cardboard boxes. The package reduces the amount of wasted cable because the amount of cable left inside a partially used package is easily visible and it reduces costs of waste disposal because there are no boxes or reels to dispose of. Cable in EZ-PAK is available in exact 500- or 1,000-feet packages for easy inventory and can be stacked, even outside. **Reader service #174**

Communications Gateway Highlighted By Philips

Philips highlighted its new Broadband Communications Gateway (BCG) in St. Louis. It is a system for transmission and delivery of telephone and data services to individual subscribers using a hybrid fiber coaxial transmission network typical of today's state-of-the art cable TV systems.

The BCG interfaces to the telephone central office switch and adapts the communications for transmission to the end user via the HFC. At the end user's location a network interface unit adapts the subscriber's customer premise equipment to the network. **Reader service #173**

Channell Your Mapping Efforts

Channell Commercial Corp. introduced the updated edition of its Broadband System Mapping Template. This sophisticated engineering template includes all the symbols needed for creation of a hand-drawn broadband system map.

The template has been greatly expanded and includes all RF/coaxial symbology as well as the optical fiber symbology recently standardized by the SCTE and NCTA. Not only does the template meet the technical standards of these two organizations, the project is co-sponsored by them. The goal of the project is the wide and rapid dissemination of the standardized symbols. To this end, the templates are offered free of charge to SCTE members and others involved in system technical decision making, design, mapping and construction.

The new template is expanded from the original version to accommodate today's symbols. In addition to the RF/coaxial and optical fiber symbology, the template includes a small group of symbols for drawing the company's and Carson-Brooks Plastics' underground and flush-to-grade enclosures.

The new template size is such that it will fit into a three-ring or five-ring binder (the European style). An accompanying brochure explains the background and use of the template and, on the back cover, lists all symbols, their abbreviations and full identifications. While the abbreviations are nonstandard, they are intended to be logical and simple so as to facilitate recognition and memorization.

The primary use of the unit will be in the field. That is, engineers and technicians will typically use the template for basic map creation, correction of existing maps, expansion of existing maps to include extensions of a broadband system into, for example, a new housing

tract, or for system "walk outs."

And with today's widespread use of computers in broadband system design and mapping, the company has taken the advanced step of creating an AutoCAD-compatible version of the template.

This program, designed to operate within the AutoCAD software environments of Release 11 and 12, amounts to a sophisticated and practical tool for all telecommunications engineers involved in broadband system design and mapping. Hence, it will facilitate the convergence of the telecommunications industry around broadband technology, domestically and internationally. Available for either DOS or Windows users, custom versions will also be available for users of older releases of AutoCAD. **Reader service #168**

New Guy Hook And Bracket From Sachs

Sachs Communications announced the availability of the new SC217 guy hook and attachment bracket for down-guy attachment, plus securing a suspension clamp or any other single-bolt device, at any type or size of pole in aerial plant. The SC217 is designed for lag or machine bolt mounting to a wooden pole or to a metal or concrete pole of any shape using Sachs SC66 Series SAX-A-BAND. The design of the product provides for a wide variety of guying and attachment applications and is said to be ideally suited for use on concrete and steel poles.

The SC217 has dual indentations for no-slip attachment and greater retention of pole-bands while mounting holes permit using a lag screw through a wooden pole. The product provides a curved-edge bearing surface for the down-guy to prevent guy strand damage under tension. It is made of high-grade steel and is hot-dip galvanized according to ASTM A 153.CSC 164 standards for long service life. **Reader service #171**

Sweep And Signal Level Measurement System New From CaLan

CaLan Inc. introduced its Starpower 3010 sweep and signal level measurement system, featuring a noninterfering, high speed, continuously referenced sweep functionality utilizing the industry standard company transmitter. The unit can be upgraded from the STAR2010 SLMS and is capable of being "evergreen" upgraded to future options including return sweep.

Also, the company announced the 1776-2 with Starpower, an integrated sweep/signal level measurement system offering maximum flexibility in sweeping. Both units can measure system carriers and sweep from the 1777 or 1777P to create a stable high resolution sweep response. Added features include full reporting capability including FCC pass/fail reports. In addition, the 1776 functions as a precision spectrum analyzer. **Reader service #165 (3010), #164 (1776-2)**

Addressable Control System New From Cable Link

Cable Link Inc. announced the latest version of its Microtrol 100 Plus addressable control system. Originally developed in 1990, the system was designed for the small to medium-sized operator, providing the convenience and benefits of complete addressability.

Affordable for even the smallest cable systems, the system is in operation in systems as small as 150 subscribers. It delivers all the important capabilities of larger addressable systems, but eliminates all the "gingerbread" features that cost so much more money up front. Also available is a variety of optional lease and/or finance programs so the operator can select the most convenient payment method. **Reader service #163**

VCS Shows Surge Suppressers, AC/Coax SAFEsignal

Voltage Control Systems announced three products: two rack-mounted surge suppressers and the AC/Coax SAFEsignal. The two surge suppressers offer 10 plug-in receptacles and self-test diagnostics to alert you to faulty wiring or shorts that may have occurred in the wiring schemes of your headend. The AC/Coax SAFE-signal is available to cable operators who want to protect the major investment in digital converter boxes soon to be placed in subscriber homes. **Reader service #161**

New Generation Monitors From Barco

Barco displayed its new generation of monitors, the CVM 3000 Series, that includes both control room and viewing monitors and offers a unique combination of advanced technology, performance and reliability.

The CVM 3000 Series' control panel provides quick access and easy operation. A dedicated memory feature stores settings for screen format, screen size, picture tube parameters and light output, ensuring stable picture at all times. An auto set-up probe allows monitor output signals to be consistently calibrated within three minutes. Operation in dark environments is easier with a new back-lit keyboard that can easily be switched on and off. With the infrared remote control, users have the ability to control an entire monitor system from anywhere in the room. **Reader service #169**

Enhanced Tricorder Rolled Out By Trilithic

New functions, new signal measurement, leakage and data logging functions and enhanced leakage sensitivity have been added to the Trilithic Tricorder distribution meter. The Tricorder II measures signal levels, logs measurement data and monitors leakage. Unavailable in previous Tricorders, calibrated leakage measurement is now offered as an option.

Among the new features are a new delta dB function that measures aural, visual or pilot carrier ratios at the push of a button and a new bag-mounted antenna offering up to four times the leakage detection sensitivity of previous Tricorders. When recording measurement data in the optional data logging mode, the operator can now add a four-digit number to the data record, linking it to the respective work order. **Reader service #172**

Cable Innovations Announces Amp Surge Protection

Cable Innovations Inc. announced the first 65 amp surge protection product. The CLPS-4065 and the CLPS-4065PI (power inserter) virtually eliminate overvoltage related outages.

Incorporating its suppression technology in a 40 amp case with dual 65 amp SCRs, the company says it has created the toughest, most reliable suppresser ever made available to the CATV industry. With this product, technicians will no longer have to venture out on a rainy night to repair and replace equipment damaged by lightning and other surges. **Reader service #167**

NCTI Announces New Course, Dictionary

The National Cable Television Institute introduced a course titled "Fiber-Optic Technician." The new course replaces the former one, covering the latest in 750 MHz technology, and fiber and digital applications and architectures. In addition to current information on fiber-optic systems, the course presents applications, rack-mount optical transmitters and receivers, forward and return optical node operations, activation, status monitoring, fiber-optic design topologies, fiber design cost studies, fiber-optic system design, fiber construction, fiber tests and documentation, and optical test equipment.

The course takes a position in the Technical Career Path structure developed by NCTI in partnership with the cable TV industry, and now includes the following course offerings: Installer, Installer Technician, Service Technician, System Technician, the new Fiber-Optic Technician and Advanced Technician. NCTI recommends satisfactory completion of the System Technician course preparatory to taking the new course.

Also, the company announced a Spanish/English illustrated dictionary of cable TV and broadband terms. The first section of the book presents English terms with Spanish translation and definition. The second section offers Spanish terms with English translation and definition. **Reader service #159 (course), #158 (dictionary)**

Telecommunications Techniques Highlights Mini-OTDR

Telecommunications Techniques Corp. says it is pioneering a new approach in the development of mini optical time domain reflectometers (OTDRs) for the installation and maintenance of fiber-optic systems. The Fiberscan 1000, which was on display at the company's booth, is the first mini-OTDR that also functions as a stable source and power meter, according to the company.

In one rugged and portable package, the unit combines field-interchangeable optics and one-button fault-finding with ease-of-use for installation and maintenance of fiber-optic systems. It identifies problems quickly with automatic fault-finding capability for maintaining long-haul, fiber-in-the-loop, fiber-to-the-curb or CATV systems. **Reader service #166**

Fiber Pulling Capstan Highlighted By GMP

The new fiber-optic pulling capstan displayed by GMP can be easily and inexpensively used with existing pulling equipment, winches and capstan drives in a special "accessory approach."

The unit can be quickly mounted without special modifications or new pulling gear. It is very easy and safe to use, pulling the cable with synthetic rope or Muletape, or pulling the cable itself directly.

Durably constructed of aluminum alloy, the capstan has a 25-inch (635 mm) working diameter and pulls with 600 pounds (2,700 newtons) force and 600 fpm speed. It can be set up easily as a mid-assist booster for use in pulling longer continuous lengths while keeping the pulling tension below the minimum threshold. It also can be easily coordinated with quadrants, sheaves and other company accessories.

Two versions are available: with or without an integral torque limiter that limits the pulling tension to a calibrated maximum, typically set at the factory at 600 pounds force. Either unit can be mounted on a 2-7/16-inch (63 mm) diameter drive shaft with either a bayonet or cross pin type connection. **Reader service #162**

ALS Announces New Fiber Transmission System

American Lightwave Systems announced the capability to provide DS3 and DS1 channel transport for CATV metropolitan and required area networks with its DV6000 fiber transmission system. DS3 and DS1 are the two most frequently used channel speeds in telephony. Now with one transport system cable operators will be able to create regional networks connecting dozens of hubs and have complete control over VSB/AM video, digital video, RF scrambled video and telephony signals.

This new capability is provided by the DV-6101-DE data encoder and DV-6102-DD data decoder cards. Each card provides two individual DS3 channels plus two individual DS1 channels and occupies the same space as one DV6000 video channel. Telephony channels can be dropped, added and/or passed at each hub location. The separate DS1 capability is very attractive to CATV operators who want to consolidate customer service centers inexpensively without the need for expensive channel multiplexers at each hub location. **Reader service #151**

Mega Hertz Debuts Emergency Alert System

The new AV-EBS emergency alert system from Mega Hertz is specifically designed to interrupt the IF loop of modulators and processors in multi-channel broadband applications. It allows the user to select individual channels that will be over-ridden with both audio and video messages. It addresses the requirements of cable TV operators, while also providing for the needs of both sight and hearing-impaired subscribers. **Reader service #160**

Advanced Custom Applications Displays ULTRAsleeve

Based upon demand for a nonheat cured fusion splice protector, Advanced Custom Applications has developed the ULTRAsleeve, a plastic injection molded hinge type mechanical protection device that shields fused fibers. It is composed of two halves that are hinged together to form an open "U" shape, and neither half has grooves or any other fixed alignment guides. The ULTRAsleeve accepts either single fiber, any combination of 250 to 900 micron buffers, or multifiber fused joints up to four fiber ribbon, and is available in 40 or 60 mm lengths. The device is applied after the fiber joints are fused (the fibers are not prethreaded) and the fibers are placed into the fold on the hinge. Along with the acrylic sealer inside the cover, the mechanical snap-together housing keeps the ULTRAsleeve in the closed position.

Once the cover is snapped together, the protector is permanently closed. The device requires no heat shrink, gluing or curing. The inside of the cover has a double coated acrylic foam closed cell tape that seals the buffer along with the fused fiber joints and protects them from many chemicals and environmental hazards. No apparent degradation of the tape is noted when splashed tested with most common solvents, including gasoline, JP-4 jet fuel, mineral spirits, motor oil, ammonia cleaner, acetone or methyl ethyl ketone (MEK). Moisture resistance for a 12-month period shows integrity remains excellent when submersed in water or salt water. The UV resistance is equally excellent as results indicate with outdoor weathering tests.

The main body is plastic injection molded from liquid crystal polymer and withstands every environmental test such as hot water, electrical properties (arc track resistance and high dielectric strength), fatigue, high heat, weather and chemicals. The main body is delivered in a 60-degree open position so that the fused fiber joints can be placed into the opening. Before the fibers are placed into the protector, the user has to remove the tape guard, which will allow the acrylic tape to seal the fibers.

Once the cover halves are closed, due to the mechanical engineering of the ULTRAsleeve, it cannot be reopened or used for any other fiber joints. **Reader service #156**

Tektronix Debuts SignalScout, MTDR

Tektronix unveiled its new signal level meter, the Tektronix RFM150 SignalScout. Also new was the TV110 CableScout metallic time domain reflectometer (MTDR) optimized for testing coaxial cable used by cable TV operators.

The SignalScout maintains signal accuracy of ±1 dB over temperatures ranging from 0° to 50° C, making it the most accurate signal level meter on the market, according to the company.

SignalScout's accuracy is complemented by unmatched consistency in signal readings. Unlike others meters, whose readings can vary between units of the same brand and manufacturer, the Tektronix SignalScout delivers consistent readings across all units.

The TV110 CableScout is the first MTDR optimized for testing coaxial cable used by cable TV operators. It features CATV-specific software and settings for cable type, waveforms and pulsewidths. The setup menu contains preset specifications for CATV cable types used throughout the industry plus room for custom cable setups. Prestored sample CATV waveforms and room in memory for up to 20 waveforms plus notes make it easier than ever for the operator to compare and analyze readings. The 6 and 12 nanosecond pulsewidths also are optimized for CATV, providing high-resolution measurements for all cable lengths used in the industry. **Reader service #145 (RFM150), #144 (MTDR)**

Next-Generation Converters From GI

On display at the General Instrument Corp. booth were the company's next-generation addressable converters, available in the third quarter of this year. The units will give subscribers flexible control of program

content based on violence and other ratings.

Each converter has a parental lock-out feature that allows entire channels to be locked out with re-entry coming via a preselected subscriber code. Next-generation converters will allow subscribers to lock out programs based on ratings, then, via on-screen programming options, unlock those programs individually. **Reader service #157**

Comm/Scope Adds New Product To Fiber Line

The Comm/Scope division of General Instrument added 216 fiber cable, a 12-fiber Fiber Feeder cable and a self-supporting Fiber Feeder cable to its Optical Reach fiber-optic product line.

The self-supporting Fiber Feeder cable is the first of its kind, according to the company, and was developed because of the need for a self-supporting version of fiber cable used in hybrid fiber/coax architecture where no existing strand is available and can be used for spans of up to 400 feet in low, medium or high ice and wind loading areas of the United States.

Self-supporting Fiber Feeder cable saves the system operator money on materials and labor associated with conventional strand and lash construction. **Reader service #155**

Trilithic Announces Tricorder III

The newest member in the Trilithic Tricorder family performs all of the tests needed to maintain a CATV trunk or active distribution system, according to Trilithic. The Tricorder III measures signal levels, carrier-to-noise and hum, and monitors leakage. Unlike previous Tricorders, calibrated leakage measurement is now available as an option.

Among the many new features are a delta dB function that measures aural, visual or pilot carrier ratios at the push of a button, and a bag-mounted antenna offering up to four times the leakage monitoring sensitivity of previous Tricorders. When recording measurement data in the optional data logging mode, the operator can add a four-digit number to the data record to link it to the respective work order. **Reader service #154**

New Chameleon From NCA MicroElectronics

NCA MicroElectronics introduced the Chameleon-2 baseband scrambling system. Adapting to today's changing market, the system uses many of the principles of the first Chameleon, such as random algorithms and locked microprocessor technology to provide a secure and affordable baseband scrambling system.

Wireless and MMDS market needs are met with the new Chameleon-2. With over 120 tiers available, the system can handle a la carte or multiple channel packaging with ease. Also, it has full feature addressability for maximum system flexibility.

The system controller is PC-based and uses Windows software that provides the operator with complete control of all levels of service and total customer addressability. The system can be interfaced easily with most billing systems and ARUs.

Like its predecessor, the Chameleon-2 provides a full range of features that can fit the needs and budget of the smallest cable system to the largest MSO. **Reader service #148**

Radiant Intros Low Backreflection Attenuators

Radiant Communications Corp. showed its Series JLBR low backreflection attenuated jumpers. The Series JLBR (V), variable attenuated jumper, achieves attenuation from 1 dB to 45 dB at 1,300/1,550 nm. The Series JLBR (X), fixed attenuated jumper, is available up to 20 dB in 1 dB increments. For both products, return loss values are <70 dB (connector-dependent). The Series JLBR attenuated jumpers are available unconnectorized for splicing applications. The attenuated jumper is a cost-effective alternative to split-ratio couplers used at the headend for CATV applications, according to the company. **Reader service #153**

General Instrument Displays Addressable Converters, GUI

General Instrument showed a number of next-generation addressable converters. Among the units on display were the CFT-2000 Series, with on-screen display programming; the CFT-2900, with near-video-on-demand and interactive program guide from StarSight; and the CFT-2200 addressable terminal with upgradability to both interactivity and digital compression. As an option, the CFT-2200 will integrate both video and digital audio capabilities, for use in systems with Music Choice, the commercial-free digital audio service. The CFT-29000 is now being used by Viacom and TCI in separate interactive tests.

The company also demonstrated its on-screen graphical user interface (GUI) developed for its addressable terminals. The GUI, which eases subscriber use of terminal features with a number of easy-to-understand graphics, is built into GI addressable terminals. It is being field-tested extensively to determine subscriber preferences. It serves as the navigational tool for enhanced services and features available through GI's new analog and digital set-top terminals — CFT-2200 and DigiCable. **Reader service #146 (converters), #114 (GUI)**

Splice Case Debuted By Multilink

Multilink Inc. introduced the Starfighter 2000F low-count, low-cost fiber-optic splice case. The product was designed with the technician in mind, and is, according to the company, the first fiber splice case that addresses the need for a low fiber count/node location splice case. No special tools or equipment are needed for installation, and only minimal prep time is required, saving time and increasing technicians' productivity.

The case uses the same basic design principles of the trunk amp housing the CATV industry has used for the past 20 years with regard to sealing, hinge mechanisms and mounting. This built-in familiarity feature increases the performance and productivity of field personnel. **Reader service #152**

S-A Shows Off Latest Version Of 6350 Modulator

Scientific-Atlanta showed the latest version of its Model 6350 TV modulator, with 750 MHz capability to provide added channel capacity for new cable programming and services.

The included integrated stereo encoder can generate industry-standard BTSC stereo signals within the modulator to save rack space. The video switch with automatic gain control provides automatic video loss protection and switching to an alternate source for backup, emergency broadcast requirements and other switching applications.

Dual IF loops furnish separate audio and video IF signals for use with pulse-sync and sine wave suppression scrambler systems. IF automatic gain control provides amplifications and gain control of an external high level IF input. The modulator can be upgraded to 1 GHz. Also, current Model 6350s can be modified to be 750 MHz or 1 GHz capable, although operators may want to consider the new factory-delivered 750 model because of ongoing improvements in the 6350 product line. **Reader service #140**

RMS Electronics Adds 750 MHz And 1 GHz Taps

RMS Electronics Inc. added 750 MHz and 1 GHz in-house splitters and directional couplers to its full spectrum of CATV equipment. These products extend the bandwidth of cable systems, making more channels available to the consumer. The company says the new products build a reliable system charged for the future. **Reader service #147**

Electroline Now Features 90 DropAmp Configurations

With the addition of the high-isolation DropAmp, Electroline Equipment Inc. now offers 90 different configurations of its 1 GHz subscriber amplifier. The DropAmp family was created to meet the needs of broadband network operators offering both analog and digital services over hybrid fiber/coax networks of high bandwidth. Such networks must compensate for high drop line attenuation and the need to support multiple outlets and devices inside a home, up to at least eight TV sets or VCRs.

All DropAmp versions feature: 1 GHz-plus bandwidth, 15 dB gain, noise figure less than 3 dB, filter options for 30 or 40 MHz return bandwidth, port-to-port isolation greater than 22 dB, remote powering option, and one, two, four and eight ports.

The EDA 4G-ISO high-isolation amplifier offers 35 dB of isolation, specially optimized for networks delivering digital video. It addresses the problem of microreflections and other signal discontinuities caused inside a consumer's home by multiple outlet, multiple connector, multiple TV set and VCR environments. When customers channel surf on numerous sets, for example, unwanted energy travels back from the converter, TV tuner or VCR toward the tap. Because in-home splitters often have inadequate isolation, these unwanted reflected signals can impair the reception of pictures at other TV sets inside the home also outfitted with digital decoders. Though analog signals may tolerate such disturbances, complex digital signals, such as those typical of compressed video, are not so fortunate. **Reader service #139**

ABC Adds "Dog Gone Easy" Remote

ABC Cable Products Inc. previewed the latest addition to its family of remote control units. The "dog gone easy" ProMote two-in-one universal remote controls are specifically designed to permit CATV subscribers to control the converter, TV and DMX/DCR in one remote control unit. The units feature programmable channel keys, indicator light for easy customer use and toll free support number. Models are available for Jerrold, Scientific-Atlanta, Zenith and Pioneer, as well as other CATV converters.

The company also demonstrated its cost-effective optical transmitters and receivers. The CBLinX-1 provides high performance fiber application for limited video channels and data. **Reader service #150**

Sprint/North Supply Announce Line of CATV Products

Sprint/North Supply, a subsidiary of Sprint Corp., announced its full line of cable TV products and services as a new national distributor in the cable TV market. The company has created a new cable TV sales group, with more than 80 inside and outside sales representatives serving customers of the new CATV department, as well as other existing markets: independent telephone companies, regional Bell operating companies and Sprint companies. The products will be available through a comprehensive catalog, to be available after the first of the year. **Reader service #142**

Leaming Unveils New Feature For BTSC Stereo Encoder

Leaming Industries, a developer of subcarrier program and data channel terminals used in microwave, cable TV, telephone and satellite systems, highlighted its SE-1 stereo encoder. The unit provides a high quality BTSC stereo signal in a compact design. Features include a Bessel-null calibration test tone, 14 kHz frequency response and dbx licensed companding.

Even if you'd seen the product before, you could stop by the company's booth to check out a new feature. That is, the product's peak flashers have been replaced with dual four-segment LED bar graph metering. **Reader service #149**

New Flexible Demodulator From Barco

Barco is showing its new TMD 200 demodulator. It is said to be the most flexible demodulator available for both broadcast and cable measurement applications today. The product provides a new solution for operators looking for tunable or fixed downconversion plus measurement quality synchronous/envelope detection, quadrature output, zero reference pulse and video measurement demodulation.

The unit features "sound trap off" for sweep measurements of transmitters over the full frequency range or group delay precorrection characteristics. It has four switchable RF inputs, manual or automatic selection of input attenuators, remote control via Barco's RCDS system and high signal-to-noise ratio.

Barco says its remote control and diagnostic system (RCDS) is the first system capable of simultaneously monitoring and controlling the three most critical components of a cable TV network — the headend, the coaxial network and the fiber-optic network. RCDS is designed to give cable operators more control over the operation and maintenance of their cable system by allowing for problem identification

and notification, as well as higher transmission quality. The system operates from a central PC or several technician-based PCs. Both options can provide operators the flexibility to control transmission reception and to remotely back-up systems.

Making use of preprogrammed parameters, the RCDS automatically notifies the service tech of problems. Supervisors can diagnose the problem from a central office computer and send an informed technician to the site with the appropriate equipment.

The headend monitoring is assured by an RF supervisor (FSM 860) that constantly scans all present channels for comparison with user-defined windows. The universal input/output interface box (I/O box) translates any source information, even from non-Barco products, into RCDS-compatible data. A number of line monitors (LM 860) mounted in the coaxial network communicate the status of the network including signal levels and quality. Finally, a return path optical transmitter informs the operator about all critical status information of the fiber-optic path. **Reader service #138**

Leakage Busters New From Trilithic

The Super Plus leakage receiver and the Super CT channel tag were introduced by Trilithic.

The Super Plus performs all of the functions of a Trilithic Searcher Plus but offers as much as four times the sensitivity — enough to find the small leaks where ingress may enter a CATV system. The unit only responds to carriers that have been "tagged" by the company's Super CT and so is immune to ignition noise or power line interference or even leaks from an overbuilt system operating on the same frequency.

The Super CT also can be used with a standard Trilithic Searcher or Searcher Plus to identify the source of leaks in an overbuilt area. The product hides a tag in the video carrier used for leak testing that is invisible to the viewer, but causes a Searcher or Searcher Plus to "warble" when it detects a leak. **Reader service #134 (receiver), #133 (tag)**

New Capabilities On Ipitek's Fiber Transmission System

Ipitek added RS-449, T1/E1 repeater, 10-bit video and 10-channel capabilities to its IMTRAN digital fiber-optic transmission system. A variety of personality modules can be mixed and matched within a 3 RU IMTRAN frame allowing the user a fully customizable system. Distance covers more than 40 miles over single-mode fiber, up to 2 km using multimode. **Reader service #143**

Bending Tool Highlighted By Endeco

Endeco Corp. introduced its Bender Buddy tool for forming industry-standard expansion bend in aerial coaxial cable. Using clip devices, the tool allows the tech a hands-free approach to forming and holding bends in place — a distinct advantage in avoiding lasher "pull outs" of the expansion bends.

The tool provides the strengths required for hard everyday use while maintaining light overall weight of under 10 pounds. Advanced composite alloys and materials are used. Its light weight and durability encourages its use while a padded and formed bending shoe provide sensitively applied forces, resulting in less distortion, less line leaks, crushing and kinking of the coax. **Reader service #136**

Wavetek Enhances Stealth Products

Multiple enhanced features to the portable Stealth System Sweep and Stealth SAM units were unveiled by Wavetek.

Two additional Stealth features eliminate the need for buying expensive excess equipment packed with unnecessary features. The spectrum analyzer mode performs the required Federal Communications Commission in-channel response measurement and locates spurs and beats. The video modulation depth measurement allows proper video modulation adjustment on headend modulators. Because the 3ST unit is mounted in the headend, technicians can quickly check modulation depth on all channels.

The Stealth SAM also features the new spectrum analyzer mode, video modulation depth measurement and 24-hour FCC test capabilities. **Reader service #137**

C-COR Features Complete Network Solutions

C-COR Electronics showed an active display of "complete network solution" products at the Expo. Included in the exhibit was the company's new, high performance LinkNet AM fiber-optic transmission system (featuring the high performance Ortel laser), new 700 Series FlexNet amplifiers and digital fiber-optic equipment. **Reader service #141**

CommScope Offers New Twisted Pair And Coax

The CommScope division of General Instrument unveiled composite twisted pairs and coaxial cables for the CATV/telephony hybrid systems of the future. The product line is called MultiReach and is available with any size coaxial 1 GHz drop cable (59, 6, 7 or 11) in standard or SuperShield shielding configurations with twisted pair options from DC powering or a 4 kHz standard telephony to Category 3 data communications pairs in up to five pairs.

As well, the company is making available the new version of its CATV construction manual. The new manual covers construction procedures for the company's Parameter II and Quantum Reach coaxial trunk and distribution cables in aerial and underground applications as well as fiber. **Reader service #132 (cables), #131 (manual)**

ARU For PPV Debuted By Cable Link

Cable Link announced the Microtel ARU-100 automated response unit (ARU) for pay-per-view (PPV). It is said to be the perfect match to the company's Microtel addressable controller developed in 1990. The new ARU enables unattended PPV ordering with up to four independent telephone lines. This means that subscribers need wait no more than just a few seconds while ordering a PPV event or premium channel upgrade.

The product provides the added convenience of individualized response messages that can be customized to the cable system's specific needs. **Reader service #135**

Overlash Block Shown By GMP

A new fiber-optic overlash block that improves lashing of fiber-optic or coaxial cable was shown by GMP. The block is suited for lashing to new messenger strands from 1/4-inch to 3/8-inch in diameter or overlashing to existing lashed cable bundles up to 2 inches in diameter. Easy to raise and attach with the company's wire raising tool, the block securely retains the cable and messenger strand for lashing. It weights just 1.5 pounds, and its electrogalvanized steel frame is designed for optimum strength-to-weight ratio.

The frame is equipped with and anti-friction roller and a lever-actuated keeper bar that encloses the cable within the block and the strand. **Reader service #130**

☛ SHOW BRIEFS ☚

☛ **Radiant Communications** introduced its Series RMC rack-mount patch panel. The product can accommodate up to 10 coupler modules with each module handling up to 1 x 12 coupler. Taking up only 9 inches of rack space, it can either be flush or center-mounted on 19- or 23-inch racks. **Reader service #129**

☛ Available from **Porta Systems Corp.** is the "CATV Network Design Guide," which details new approaches to designing both headends and OTNs, utilizing passive coupler/ splitter and connector components. Also, the company introduced its latest fiber management products. **Reader service #128**

☛ **Cable Innovations** introduced 65 amp surge protection products. The CLPS-4065 and CLPS-4065PI (power inserter) will virtually eliminate overvoltage related outages, according to the company. The products use a patented suppression technology in a 40 amp case with dual 65 amp. **Reader service #127**

☛ **Contech**, a manufacturer of connector protection products, introduced Poly/Flex SFT-150 self fusing tape. This EPR tape was designed to protect housing-to-housing connections from moisture and corrosion. Contech also introduced a new drop cable marking system for multiple dwelling unit (MDU) boxes. Poly/ Chem-Shrink Clear Shrink Tubing provides a permanent streamline marking system installed over cable jacket. **Reader service #126 (tape), #125 (MDU marking system)**

☛ **Radiant Communications** rolled out its low backreflection fiber assemblies. Yielding typical return loss of -60 dB at 1,300/1,550 nm, they are available with ST/PC, FC/PC, SC/PC connectors all having a nonoptical disconnect feature. **Reader service #124**

☛ **Voltage Control Systems** (VCS) announced the availability of a new thermal dynamic enclosure in conjunction with its new true on-line 60 VOH power supply for use in the distribution network. Using a special surface preparation process, VCS can now manufacture power supply and OTN enclosures for existing applications. **Reader service #123**

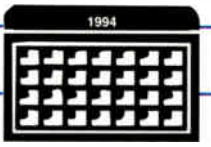
☛ **Broadband Networks** showed its fiber-optic product line for use in interactive multimedia networks, including its single channel video/audio and video/audio/data links, two-way two fiber and single fiber V/A transceiver links, multichannel transmitters, multichannel rack receivers and multichannel desktop receivers. **Reader service #122**

☛ **Passive Devices** showed its Surgender, designed to protect coaxial cable connected equipment from damage caused by lightning or manmade voltage surges on the coaxial cable. It also displayed its line of PDI Super Splitters, available in two-way, three-way and four-way models. **Reader service #121 (Surgender), #118 (splitters)**

☛ **Cableready** introduced F-Conn Industries, which manufactures a new line of F-connectors designed to be used with Cable Pro's new RTC 360 radial crimper. The company says with the RTC 360 crimper and F-Conn's connectors, users get the performance of a high-end connector at a standard F-connector price. **Reader service #120**

☛ **Diamond Communications** announced several new products: the meter box ground clamp, the Screw and Snap, and the tap/trap mounting system. **Reader service #119 (clamp), #113 (Screw and Snap), #112 (tap/trap)**

CALENDAR



August

1-3: Eastern Show, Inforum Exhibit Hall, Atlanta. Contact (404) 252-2454.

3: SCTE Rocky Mountain Chapter seminar, BCT/E exams to be administered, NCTI, Littleton, CO. Contact Leslie Ellis, (303) 393-7449.

4: SCTE Golden Gate Chapter seminar, BCT/E and Installer Certification exams to be administered, TCI Haywood office, Haywood, CA. Contact Mark Harrigan, (415) 358-6950.

5: SCTE Iowa Heartland Chapter seminar, Five Seasons Hotel, Cedar Rapids, IA. BCT/E and Installer Certification exams to be administered. Contact Mitch Carlson, (309) 797-2580, x3700.

6: SCTE Llano Estacado Chapter seminar, CATV theory and applications, and BCT/E and Installer Certification exams to be administered, Cox Cable office, Lubbock, TX. Contact David Fielder, (806) 793-3930.

9: SCTE Penn-Ohio Chapter seminar, Installer Certification exams to be administered, Baker Installation office, Pittsburgh. Contact Marianne McClain, (412) 531-5710.

9: SCTE Southeast Texas Chapter seminar, Installer and BCT/E Certification exams to be administered, Warner Cable office, Houston. Contact Rosa Rosas, (409) 582-4855.

9: SCTE Wheat State Chapter seminar, BCT/E Certification exams to be administered. Contact Jim Fronk, (316) 792-2574.

10: SCTE Delaware Valley Chapter seminar, digital technologies, and BCT/E and Installer Certification exams to be administered, Williamson Restaurant, Willow Grove, PA. Contact Bob Lauer, (215) 876-5000.

10: SCTE Penn-Ohio Chapter seminar, Installer Certification exams to be administered, Baker Installation office, Pittsburgh. Contact Marianne McClain, (412) 531-5710.

10: SCTE North Central Texas Chapter seminar, cable safety and OSHA rules, and alternate access and data communications, Vandergriff Park Center, Arlington, TX. Contact Scott Wilber, (817) 328-1281.

11: Society of Cable Television Engineers Satellite Tele-Seminar Program to be shown on Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Contact SCTE national headquarters, (610) 363-6888.

11: SCTE Gateway Chapter seminar. Contact Duane Johnson, (314) 272-2020.

11: SCTE Great Plains Chapter seminar, BCT/E and Installer Certification exams to be administered, Courtyard Cafe, Bellevue, NE. Contact Randy Parker, (402) 292-4049.

11: SCTE Mount Rainier Chapter seminar, BCT/E Certification exams to be administered, TCI Bremerton office, Bremerton, WA. Contact Bruce Gladner, (206) 869-4116.

11: SCTE Music City Chapter seminar, alternate access phone service, and BCT/E and Installer Certification exams to be administered, Ramada Inn, Contact: Kenny Long, (615) 244-7462, x392.

13: SCTE Central Indiana Chapter seminar, BCT/E and Installer Certification exams to be administered. Contact Al Orpurt, (317) 825-8551.

15-18: Siecor fiber-optic training course, fiber-optic installation, splicing, maintenance and restoration for cable TV applications, Hickory, NC. Contact (800) SIECOR1, x5539.

16: SCTE Penn-Ohio Chapter seminar, Installer Certifica-

Planning ahead

Oct. 5-7: Atlantic Cable Show, Atlantic City, NJ. Contact (609) 848-1000.
Oct. 11-13: Mid-America Cable Show, Kansas City, MO. Contact (913) 841-9241.
Nov. 13-15: Private Cable Show, Atlanta. Contact (713) 342-9826.
Nov. 30-Dec. 2: Western Cable Show, Anaheim, CA. Contact (510) 428-2225.

tion exams to be administered, Baker Installation office, Pittsburgh. Contact Marianne McClain, (412) 531-5710.

16: SCTE West Virginia Mountaineer Chapter seminar, grounding and surge protection, Ramada Inn, South Charleston, WV. Contact Steve Johnson, (614) 894-3886.

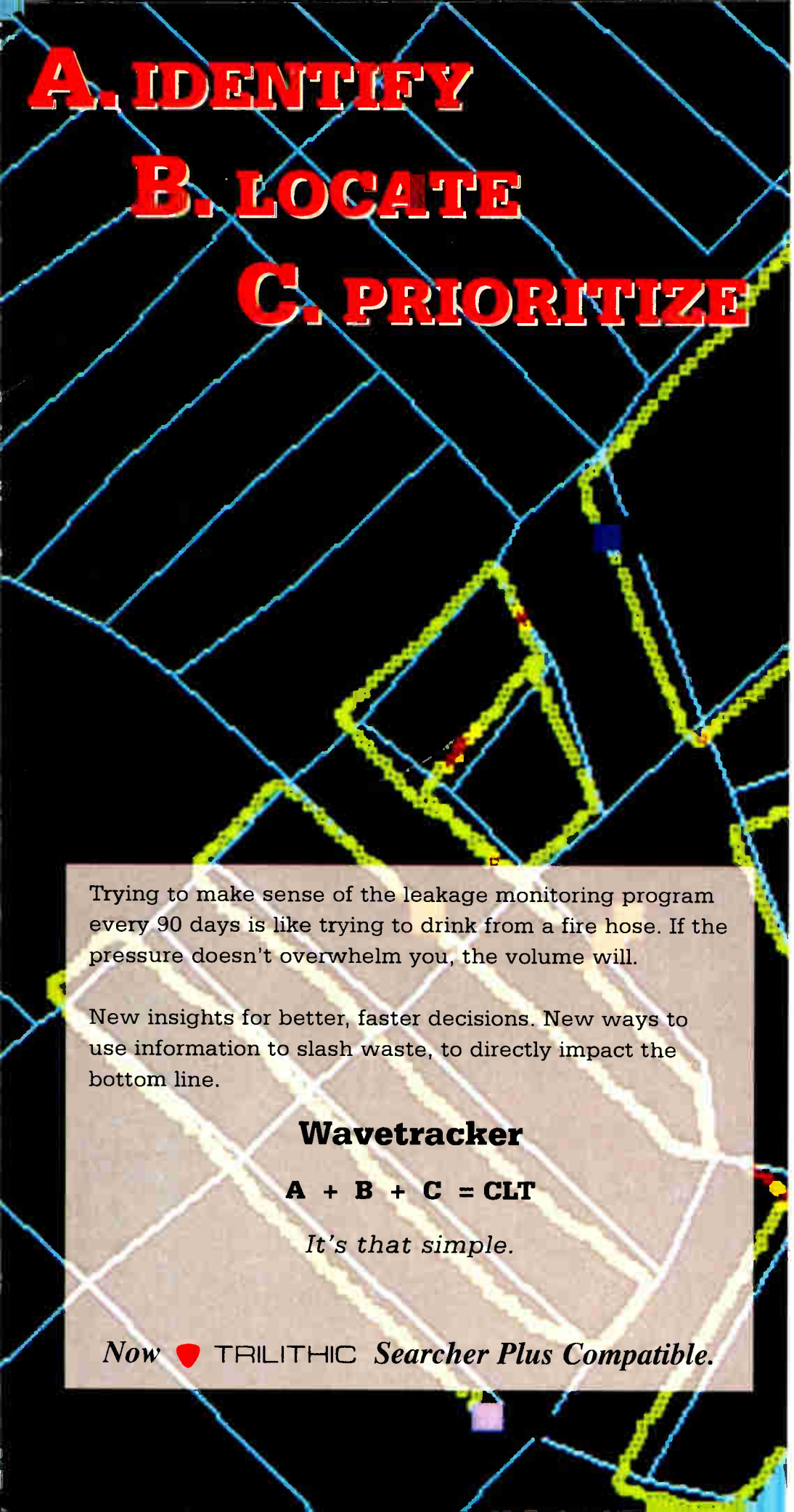
17: SCTE Central Florida Chapter seminar, video/audio, and BCT/E Certification exams to be administered, Lakeland, FL. Contact Pam Kernodle, (813) 371-3444.

17: SCTE Ohio Valley Chapter seminar, Installer and BCT/E Certification exams to be administered, Rodeway Inn, Cincinnati. Contact Frank Adams, (216) 826-2941.

17: SCTE San Diego Chapter seminar, BCT/E and Installer Certification exams to be administered, San Diego, CA. Contact Kathleen Horst, (310) 715-6518.

17: SCTE West Virginia Mountaineer Chapter seminar, grounding and surge protection, Holiday Inn, Bridgeport, WV. Contact Steve Johnson, (614) 894-3886.

18: SCTE Great Plains Chapter seminar, emerging technologies, and BCT/E Certification exams to be administered, Scottsbluff Inn, Scottsbluff, NE. Contact: Randy Parker, (402) 292-4049.



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4	30	56	82	108	134	160	186	212	238	264	290
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7	33	59	85	111	137	163	189	125	241	267	293
8	34	60	86	112	138	164	190	216	242	268	294
9	35	61	87	113	139	165	191	217	243	269	295
10	36	62	88	114	140	166	192	218	244	270	296
11	37	63	89	115	141	167	193	219	245	271	927
12	38	64	90	116	142	168	194	220	246	272	298
13	39	65	91	117	143	169	195	221	247	273	299
14	40	66	92	118	144	170	196	222	248	274	300
15	41	67	93	119	145	171	197	223	249	275	301
16	42	68	94	120	146	172	198	224	250	276	302
17	43	69	95	121	147	173	199	225	251	277	303
18	44	70	96	122	148	174	200	226	252	278	304
19	45	71	97	123	149	175	201	227	253	279	305
20	46	72	98	124	150	176	202	228	254	280	306
21	47	73	99	125	151	177	203	229	255	281	307
22	48	74	100	126	152	178	204	230	256	282	308
23	49	75	101	127	153	179	205	231	257	283	309
24	50	76	102	128	154	180	206	232	258	284	310
25	51	77	103	129	155	181	207	233	259	285	311
26	52	78	104	130	156	182	208	234	260	286	312

A. Are you a member of the SCTE (Society of Cable Television Engineers)?
01. ___ yes
02. ___ no

B. Please check the category that best describes your firm's primary business (check only 1):
Cable TV Systems Operations
03. ___ Independent Cable TV Syst.
04. ___ MSO (two or more Cable TV Systems)
05. ___ Cable TV Contractor
06. ___ Cable TV Program Network
07. ___ SMATV or DBS Operator
08. ___ MDS, STV or LPTV Operator
09. ___ Microwave or Telephone Comp.
10. ___ Commercial TV Broadcaster
11. ___ Cable TV Component Manufacturer
12. ___ Cable TV Investor
13. ___ Financial Institution, Broker, Consultant
14. ___ Law Firm or Govt. Agency
15. ___ Program Producer or Distributor
16. ___ Advertising Agency
17. ___ Educational TV Station, School, or Library
18. ___ Other (please specify)_____

C. Please check the category that best describes your job title:
19. ___ Corporate Management
20. ___ Management
21. ___ Programming
Technical/Engineering
22. ___ Vice President
23. ___ Director
24. ___ Manager
25. ___ Engineer
26. ___ Technician
27. ___ Installer
28. ___ Sales/Marketing
29. ___ Other (please specify)_____

D. In the next 12 months, what cable equipment do you plan to buy?
30. ___ Amplifiers
31. ___ Antennas
32. ___ CATV Passive Equipment including Coaxial Cable
33. ___ Cable Tools
34. ___ CAD Software, Mapping
35. ___ Commercial Insertion/ Character Generator
36. ___ Compression/Digital Equip.
37. ___ Computer Equipment
38. ___ Connectors/Splitters
39. ___ Fleet Management
40. ___ Headend Equipment
41. ___ Interactive Software
42. ___ Lightning Protection
43. ___ Vaults/Pedestals
44. ___ MMDS Transmission Equipment
45. ___ Microwave Equipment
46. ___ Receivers and Modulators
47. ___ Safety Equipment
48. ___ Satellite Equipment
49. ___ Subscriber/Addressable Security Equipment/ Converters/Remotes
50. ___ Telephone/PCS Equipment
51. ___ Power Suppls. (Batteries, etc.)
52. ___ Video Servers

E. What is your annual cable equipment expenditure?
53. ___ up to $50,000
54. ___ $50,001 to $100,000
55. ___ $100,001 to $250,000
56. ___ over $250,000

F. In the next 12 months, what fiber-optic equipment do you plan to buy?
57. ___ Fiber-Optic Amplifiers
58. ___ Fiber-Optic Connectors
59. ___ Fiber-Optic Couplers/Splitters
60. ___ Fiber-Optic Splicers
61. ___ Fiber-Optic Transmitter/Receiver
62. ___ Fiber-Optic Patchcords/ Pigtails
63. ___ Fiber-Optic Components
64. ___ Fiber-Optic Cable
65. ___ Fiber-Optic Closures & Cabinets

G. What is your annual fiber-optic equipment expenditure?
66. ___ up to $50,000
67. ___ $50,001 to $100,000
68. ___ $100,001 to $250,000
69. ___ over $250,000

H. In the next 12 months, what cable test & measurement equipment do you plan to buy?
70. ___ Audio Test Equipment
71. ___ Cable Fault Locators
72. ___ Fiber Optics Test Equipment
73. ___ Leakage Detection
74. ___ OTDRs
75. ___ Power Meters
76. ___ Signal Level Meters
77. ___ Spectrum Analyzers
78. ___ Status Monitoring
79. ___ System Bench Sweep
80. ___ TDRs
81. ___ Video Test Equipment

I. What is your annual cable test & measurement equipment expenditure?
82. ___ up to $50,000
83. ___ $50,001 to $100,000
84. ___ $100,001 to $250,000
85. ___ over $250,000

J. In the next 12 months, what cable services do you plan to buy?
86. ___ Consulting/Brokerage Services
87. ___ Contracting Services (Construction/Installation)
88. ___ Repair Services
89. ___ Technical Services/ Eng. Design
90. ___ Training Services

K. What is your annual cable services expenditure?
91. ___ up to $50,000
92. ___ $50,001 to $100,000
93. ___ $100,001 to $250,000
94. ___ over $250,000

L. Do you plan to rebuild/ upgrade your system in:
95. ___ 1 year
96. ___ more than 2 years

M. How many miles of plant are you upgrading/ rebuilding?
97. ___ up to10 miles
98. ___ 11-30 miles
99. ___ 31 miles or more

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18	44	70	96	122	148	174	200	226	252	278	304
19	45	71	97	123	149	175	201	227	253	279	305
20	46	72	98	124	150	176	202	228	254	280	306
21	47	73	99	125	151	177	203	229	255	281	307
22	48	74	100	126	152	178	204	230	256	282	308
23	49	75	101	127	153	179	205	231	257	283	309
24	50	76	102	128	154	180	206	232	258	284	310
25	51	77	103	129	155	181	207	233	259	285	311
26	52	78	104	130	156	182	208	234	260	286	312

A. Are you a member of the SCTE (Society of Cable Television Engineers)?
01. ___ yes
02. ___ no

B. Please check the category that best describes your firm's primary business (check only 1):
Cable TV Systems Operations
03. ___ Independent Cable TV Syst.
04. ___ MSO (two or more Cable TV Systems)
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06. ___ Cable TV Program Network
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10. ___ Commercial TV Broadcaster
11. ___ Cable TV Component Manufacturer
12. ___ Cable TV Investor
13. ___ Financial Institution, Broker, Consultant
14. ___ Law Firm or Govt. Agency
15. ___ Program Producer or Distributor
16. ___ Advertising Agency
17. ___ Educational TV Station, School, or Library
18. ___ Other (please specify)_____

C. Please check the category that best describes your job title:
19. ___ Corporate Management
20. ___ Management
21. ___ Programming
Technical/Engineering
22. ___ Vice President
23. ___ Director
24. ___ Manager
25. ___ Engineer
26. ___ Technician
27. ___ Installer
28. ___ Sales/Marketing
29. ___ Other (please specify)_____

D. In the next 12 months, what cable equipment do you plan to buy?
30. ___ Amplifiers
31. ___ Antennas
32. ___ CATV Passive Equipment including Coaxial Cable
33. ___ Cable Tools
34. ___ CAD Software, Mapping
35. ___ Commercial Insertion/ Character Generator
36. ___ Compression/Digital Equip.
37. ___ Computer Equipment
38. ___ Connectors/Splitters
39. ___ Fleet Management
40. ___ Headend Equipment
41. ___ Interactive Software
42. ___ Lightning Protection
43. ___ Vaults/Pedestals
44. ___ MMDS Transmission Equipment
45. ___ Microwave Equipment
46. ___ Receivers and Modulators
47. ___ Safety Equipment
48. ___ Satellite Equipment
49. ___ Subscriber/Addressable Security Equipment/ Converters/Remotes
50. ___ Telephons/PCS Equipment
51. ___ Power Suppls. (Batteries, etc.)
52. ___ Video Servers

E. What is your annual cable equipment expenditure?
53. ___ up to $50,000
54. ___ $50,001 to $100,000
55. ___ $100,001 to $250,000
56. ___ over $250,000

F. In the next 12 months, what fiber-optic equipment do you plan to buy?
57. ___ Fiber-Optic Amplifiers
58. ___ Fiber-Optic Connectors
59. ___ Fiber-Optic Couplers/Splitters
60. ___ Fiber-Optic Splicers
61. ___ Fiber-Optic Transmitter/Receiver
62. ___ Fiber-Optic Patchcords/ Pigtails
63. ___ Fiber-Optic Components
64. ___ Fiber-Optic Cable
65. ___ Fiber-Optic Closures & Cabinets

G. What is your annual fiber-optic equipment expenditures?
66. ___ up to $50,000
67. ___ $50,001 to $100,000
68. ___ $100,001 to $250,000
69. ___ over $250,000

H. In the next 12 months, what cable test & measurement equipment do you plan to buy?
70. ___ Audio Test Equipment
71. ___ Cable Fault Locators
72. ___ Fiber Optics Test Equipment
73. ___ Leakage Detection
74. ___ OTDRs
75. ___ Power Meter
76. ___ Signal Level Meters
77. ___ Spectrum Analyzers
78. ___ Status Monitoring
79. ___ System Bench Sweep
80. ___ TDRs
81. ___ Video Test Equipment

I. What is your annual cable test & measurement equipment expenditure?
82. ___ up to $50,000
83. ___ $50,001 to $100,000
84. ___ $100,001 to $250,000
85. ___ over $250,000

J. In the next 12 months, what cable services do you plan to buy?
86. ___ Consulting/Brokerage Services
87. ___ Contracting Services (Construction/Installation)
88. ___ Repair Services
89. ___ Technical Services/ Eng. Design
90. ___ Training Services

K. What is your annual cable services expenditure?
91. ___ up to $50,000
92. ___ $50,001 to $100,000
93. ___ $100,001 to $250,000
94. ___ over $250,000

L. Do you plan to rebuild/ upgrade your system in:
95. ___ 1 year
96. ___ more than 2 years

M. How many miles of plant are you upgrading/ rebuilding?
97. ___ up to10 miles
98. ___ 11-30 miles
99. ___ 31 miles or more

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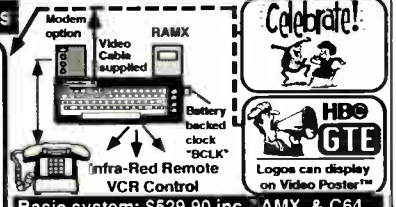

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BCLK	$ 69.95	Battery clock (with RAM) restores time & date if power fails
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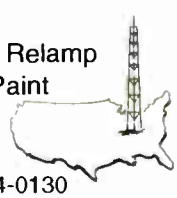

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David Cheeseman

Fiber attenuation: Causes, measurements

In his inaugural column, our new fiber expert answers your questions about optical fiber attenuation, reviews the causes of attenuation and describe how it is measured.

By Don C. Vassel
Senior Applications Engineer
Corning Inc.

☛ What causes attenuation in fiber?

When light travels through optical fiber, some of the light is lost over a given distance. This signal loss, known as attenuation, is caused by both intrinsic and extrinsic factors. Intrinsic factors, such as absorption and scattering, are inherent to the raw materials used to manufacture fibers, while extrinsic factors include cable manufacturing, environmental effects and physical bends.

Absorption generally results from impurities and defects in the molecular makeup of the glass. Intrinsic scattering, also known as Rayleigh scattering, is a fundamental loss mechanism that decreases with increased wavelength.

Most extrinsic factors that induce fiber attenuation can be categorized into two different bending phenomena: microbending and macrobending. Microbending loss is caused by small-scale, microscopic perturbations along the fiber length. It is induced primarily at cold temperatures since cabling materials have a higher coefficient of thermal expansion than the fiber. As the cable contracts at low temperatures, the fiber is compressed along its length. Small-scale buckling can occur and cause microbending.

Macrobending is associated with large-scale bending of the fiber or cable. Undesirable bend diameters during installation or splicing may leave the fiber or cable bent too tightly, which can lead to excessive light loss at those locations. When a fiber is bent tightly, part of the light traveling through the fiber is no longer guided and is radiated out from the fiber. Macrobending creates a wavelength-dependent loss that typically is observed within the 1,550 nm window before the 1,310 nm window. Therefore, your cable TV plant should be thoroughly tested at the 1,550 nm wavelength even though you may only be planning operation at 1,310 nm.

☛ How is attenuation or signal loss determined for a fiber?

The total optical loss through a fiber is defined as the logarithmic relationship

between the optical output power and the optical input power. It is expressed in decibels per kilometer and can be calculated as follows:

dB = -10log(optical output power/ optical input power)

Fiber attenuation also can be represented as a percentage of total input power transmitted through an optical fiber. For example, at 0.5 dB/km, 90% of the light travels through 1 km of fiber; at 3 dB/km, 50%; and at 20 dB/km, 1% of the light reaches the other end.

In the early 1970s the commercial viability of optical fiber was demonstrated when scientists achieved a signal loss below 20 dB/km with 1% of the light retained after a kilometer. This level of received light was considered sufficient for the practical detection of optical signals.

Since then, there have been dramatic reductions in fiber attenuation. Today, 1% of the light is retained after being transmitted almost 125 kilometers. To fully appreciate the current purity of silica glass, consider the loss in regular window glass where 50% of the light is lost (3 dB attenuation) through a 3 cm thick piece of glass.

☛ What tools do you use to measure attenuation accurately?

One of the most effective and powerful fiber-optic measurement instruments is the optical time domain reflectometer (OTDR). It sends short pulses of laser light down one end of a fiber and measures the light reflected back to it (a characteristic known as backscattering). This function enables field technicians to estimate fiber attenuation, measure splice loss and identify potential trouble areas where the fiber may have excess loss. The OTDR's ability to identify potential trouble areas such as tight fiber bends and fiber breaks makes it an excellent troubleshooting device for cable TV operators.

Another commonly used measurement option for measuring attenuation is the optical power meter. Using a light source, the optical power meter can measure the amount of optical power coupled into and out of the fiber cable, enabling the technician to determine the amount of power loss through the cable. This loss then can be normalized over the length of fiber cable to determine the attenuation rate.

Although power meters typically are calibrated for use at three standard wavelengths — 850, 1,300 and 1,550 nm — all measurements should be made at the wavelength of system operation. This will provide a more accurate representation of true system performance. **CT**

Don Vassel was recently named senior applications engineer for cable TV by Corning. He assumes the role previously held by Douglas Wolfe (who has joined Siecor). Vassel has been with Corning since 1988 and has extensive experience in system engineering and optical fiber manufacturing technology.

Readers with fiber-related questions can send them to: Ask a Fiber Expert, c/o Communications Technology, 1900 Grant St., Suite 720, Denver, CO 80203; fax (303) 839-1564.

FCC sets deadlines for cable/electronics compatibility

The following is the first installment in a new "Communications Technology" department specializing in cable TV legal and regulatory matters. If you would like to speak to the author of this column, he can be reached at (202) 728-0400.

By Thomas K. Crowe, Esq.
Communications Attorney
Irwin, Campbell & Crowe, P.C.

The Federal Communications Commission's recently released cable system/consumer electronics compatibility plan contains diverse technical requirements as well as numerous compliance deadlines for cable system operators and manufacturers of TV receivers and VCRs. While the FCC continues to abundantly issue cable rulings and regulations, cable system operators and equipment manufacturers must be thoroughly familiar with the new requirements and deadlines.

On May 4, 1994, the FCC released its first report and order adopting rules designed to facilitate compatibility between consumer electronics equipment and cable TV systems. The rules are mandated by the Cable Television Consumer Protection and Competition Act of 1992 ("Cable Act").

Phase I compliance

The FCC's compatibility plan can be divided into three "phases": existing equipment, new equipment and future technologies. Under Phase I, the FCC's first report and order adopted rules designed to relieve incompatibility involving existing equipment in a number of ways. First, cable systems using scrambling technology will be required to provide supplementary equipment (e.g., set-top devices with multiple descramblers and/or timers and bypass switches) to enable operation of extended features and functions of consumer equipment that make simultaneous use of multiple signals. This requirement takes effect on Oct. 31, 1995.

Second, cable systems will be prohibited from scrambling basic tier signals, which will allow subscribers to receive basic tier service without the need for a set-top device. Cable operators that scramble signals to prevent service theft or for other justified reasons may apply to the FCC for a waiver of this requirement. For cable systems that did not scramble prior to enactment of the Cable Act (i.e., Oct. 5, 1992), this requirement took effect on July 31, 1994.

Cable systems offering remote control rental are required to actively enable operation of their set-top devices with commercially available remote control units (or otherwise take no action preventing the use of such remote control units). This requirement has already been implemented, having taken effect as of May 31, 1994.

Finally, effective Oct. 31, 1994, cable operators will be required to provide to their subscribers a consumer education program on compatibility matters. The program must inform subscribers that special features and functions of consumer TV sets and VCRs may be inhibited, and that some TV set and VCR models may not be able to receive all channels offered by the cable system when connected directly to the system. Cable systems offering remote control capability must include in their consumer education program a written notification that subscribers may purchase a remote control unit from other sources that is compatible with the cable system. This consumer information must be provided in writing both at the time of initial customer sign-up and at least once per year thereafter.

Phase II compliance

Recognizing that the previous measures would not provide a full solution to the current compatibility problems, the FCC adopted Phase II rules for new consumer equipment.

The Phase II rules adopt new standards for all consumer electronics equipment marketed as "cable-ready" or "cable-compatible." Cable-ready equipment would be required to include a decoder interface connector that meets the new specifications of the EIA IS-105 standard, which is in the final stages of development. The FCC set the date as Aug. 2, 1994, to see if EIA finalizes the new decoder interface standard. If the new standard was not available at that time, the FCC planned to establish a standard using its internal resources. New TV receivers and VCRs using the terms "cable-ready" or "cable-compatible" must comply with the cable-ready equipment standards beginning June 30, 1997.

Under the new rules, TV receivers and VCRs that incorporate features intended to be used with cable service but do not fully comply with the cable-ready standards may not be marketed with terminology that gives the impression that the device is cable-ready or cable-compatible. Such equipment must be labeled with an advisory stating that the product does not comply with FCC requirements for cable-compatible equipment. This rule applies to all TV receivers and VCRs manufactured or imported after Oct. 31, 1994, unless such equipment complies with the cable-ready standards.

"Under the new rules, TV receivers and VCRs that ... do not fully comply with the cable-ready standards may not be marketed with terminology that gives the impression that the device is cable-ready or cable-compatible."

Finally, cable-ready TV receivers and component decoders/descramblers will be subject to FCC authorization under its "verification" procedures. New cable-ready TV receivers and VCRs also will be required to have minimal capability to tune all cable channels over the 54 MHz to 806 MHz frequency range in accordance with the cable channel identification plan specified in the new EIA/ANSI IS-132 standard. These requirements will apply to equipment manufactured or imported after June 30, 1997.

Phase III compliance

Phase III of the FCC's compatibility plan is to develop standards for the next generation of cable and consumer electronics equipment, including the standardization of cable digital transmissions. The FCC plans to initiate a separate proceeding in the future addressing standards for digital transmission, as well as compression and decompression methods, among other remaining issues.

The FCC's cable system/consumer electronics compatibility plan is multifaceted and, as is apparent, contains differing compliance deadlines. Both cable system operators and manufacturers of TV receivers and VCRs should take steps now to ensure that they are fully familiar with the new rules and have adequate time to meet the deadlines. **CT**

The author was assisted in preparing this article by Michael Jones, an associate with Irwin, Campbell & Crowe, P.C.

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Jerrold's DigiCable™ is forever changing the future of cable with more services and better quality.

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

☛ *TV, Your Primary Diagnostic Instrument* — This program, which is the 1994 version of the old *Diagnosing Common Cable Faults* videotape, clearly demonstrates picture impairments found in modern day cable systems. Possible causes also are discussed. Due to the detailed nature of some of these impairments, this tape is available in 3/4-inch format only. Picture impairments demonstrated include carrier-to-noise, composite triple beat, low signal, low modulation, excessive signal, excessive modulation, hum, impulse noise, ghosting (reflective, ingress/direct pick-up), cross-modulation, terrestrial interference, chroma/luma delay and differential phase. (40 min.) Order #T-1001-A (available in 3/4-inch U-matic format only), $59.

☛ *Video Test Signals* — This program concentrates on evaluation of video testing techniques. Blackboard presentations examine frequency domain, baseband video signals and Institute of Radio Engineers (IRE) unit scales. Common video waveforms are defined, including multiburst, sine pulse, window, line time distortion, modulated stairstep/differential gain and phase, luminance nonlinearity, modulated 12 1/2T, modulated pedestal, field rate square wave and vertical interval reference (VIR). (30 min.) Order #T-1007, $35.

Note: The videotapes are in color and available in the 1/2-inch VHS format only (unless otherwise indicated). They are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

Shipping: Videotapes are shipped UPS. No P.O. 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 videotape or book. 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 (610) 363-5898.

Listings of other publications and videotapes available from the SCTE are included in the March 1994 issue of the Society newsletter, "Interval."

How do we follow Cable-Tec Expo '94?

By Bill Riker
President, Society of Cable Television Engineers

Quite simply, it was the biggest and the best yet — a very hard act to follow. I'm referring to SCTE's Cable-Tec Expo '94, this year's edition of our annual conference and trade show, which was held June 15-18 in St. Louis. The Expo has, I believe, gained the reputation as the CATV industry's preeminent technical training and hardware trade show, but Expo '94 exceeded all expectations.

Let me tell you all about it.

A total of 5,200 people, including 2,800 registered attendees and 2,400 exhibitor personnel, gathered at the Cervantes Convention Center, the impressive site of the event.

This year's attendance figures represented a 30% increase over the statistics for Cable-Tec Expo '93, at which a total of 4,000 were present in Orlando, FL.

The Expo began on June 15 with the Annual Engineering Conference — a full day of technical and management papers and panel discussions that were presented to a capacity crowd by many of the industry's engineering leaders. Many vitally important topics currently facing our industry were discussed in these panels. "Regulation and the Cable Industry" featured discussions of the compatibility and interfacing of cable and consumer electronics, as well as new federal regulations from the viewpoints of the National Cable Television Association and the Federal Communications Commission. "Advances in System Architectures" focused on preparing cable plant for the future and alternative methods for fiber plant, interactive and switched services, system design and fiber splicing. "Digital Transmission Techniques" covered the testing of compressed digital TV and methods of digital transmission. Finally, "Convergence" offered presentations on telephony and video distribution networking, as well as integrating market-driven applications into the CATV environment. (For more details on the conference, see page 34.)

After the Engineering Conference, the Society held its Annual Membership Meeting, which was combined with the SCTE House of Delegates, allowing SCTE members and representatives from our 73 chapters and meeting groups to pose questions and concerns directly to the organization's national board of directors and staff.

Cable-Tec Expo '94 officially began on Thursday, June 16, with the presentation of 10 educational workshops that were delivered to standing-room-only audiences.

The workshops included: "Addressability and Two-Way Systems," "Advances in System Powering," "Basics of Digital Compression and Transmission," "CLI, Now and Tomorrow," "FCC Forms Completed with Confidence," "Fault Locating in Fiber-Optic and Coaxial Cables," "Fiber Installation and Testing," "Meeting Tomorrow's Technical Training Needs," "Proof-of-Performance Measurements" and "What's New with Safety in Telecommunications." (See page 44 for full coverage.)

More than 260 industry companies displayed their products and services on the Expo's exhibit floor, which opened Thursday, June 16, at the Cervantes Convention Center. For the first time, the exhibit floor was open an extra day, offering attendees and exhibitors additional floor hours on Saturday. (On page 50 you can read more about the exhibits.)

Friday's Expo Evening, sponsored by ANTEC, CommScope, Jerrold, Scientific-Atlanta and SCTE, was based on the theme of the 1904 World's Fair, which actually was held 90 years ago in St. Louis' Forest Park. Attendees enjoyed carnival games and entertainers and foods from around the world, including hot dogs, iced tea and ice cream, all of which were introduced at the 1904 World's Fair.

The St. Louis locale of Cable-Tec Expo '94 enabled attendees to enjoy a variety of area attractions, including the world-famous Gateway Arch and St. Louis Cardinals games at Busch Stadium. (More on the social side of Expo starts on page 52.)

Overall, the Expo was a resounding success that generated very positive responses and a great deal of enthusiasm among both attendees and exhibitors. If you were with us, you know how spectacular it was. If you weren't, you still have the opportunity to benefit from this amazing event's training offerings through our publication, *Cable-Tec Expo '94 Proceedings Manual* (collecting each of the papers presented at the conference and workshops), as well our series of Expo '94 videotapes, documenting the four conference panels and six of the workshops. For ordering information, see the ad in this issue or call us at (610) 363-6888.

A hard act to follow

Since Expo '94 was so successful and well regarded, we come to the big question: How do we follow Cable-Tec Expo '94?

The answer is simple: Do bigger and better events next year. And that's just what we plan to do.

Our next national seminar, the 1995 Annual Conference on Emerging Technologies, will be held Jan. 4-6, 1995, in Orlando, FL. If you aren't familiar with this conference, it evolved from our annual conferences on fiber optics to encompass discussion of essential new technological advances affecting the telecommunications world. Many of the industry's engineering leaders are on hand at this conference to present papers on these cutting-edge technologies and analyze their effects on our industry. Already regarded as the premiere forum for discussion of CATV innovation, our Emerging Technologies Conference should not be missed. Its location should prove popular as well. Who wouldn't want to go to Orlando in January?

If you are interested in speaking at the 1995 Emerging Technologies Conference, our call for papers has been launched and we will be accepting proposals and abstracts for potential presentations until Sept. 1, 1994. You can send them to me, care of SCTE, 669 Exton Commons, Exton, PA 19341.

If attendance trends are any indication, Cable-Tec Expo '95, to be held June 14-17 in Las Vegas, NV, will eclipse this year's massively popular event, both in terms of attendance and scope. Many of you will remember Cable-Tec Expo '91, which was held in Reno, NV. Judging by your response to the Nevada attractions, atmosphere and climate, next year's event will mark a welcome return to that state. We plan to put together a technical program and exhibit hall that will be sure to keep you away from the "tables," so you may enjoy the many training opportunities only Expo can offer. **CT**

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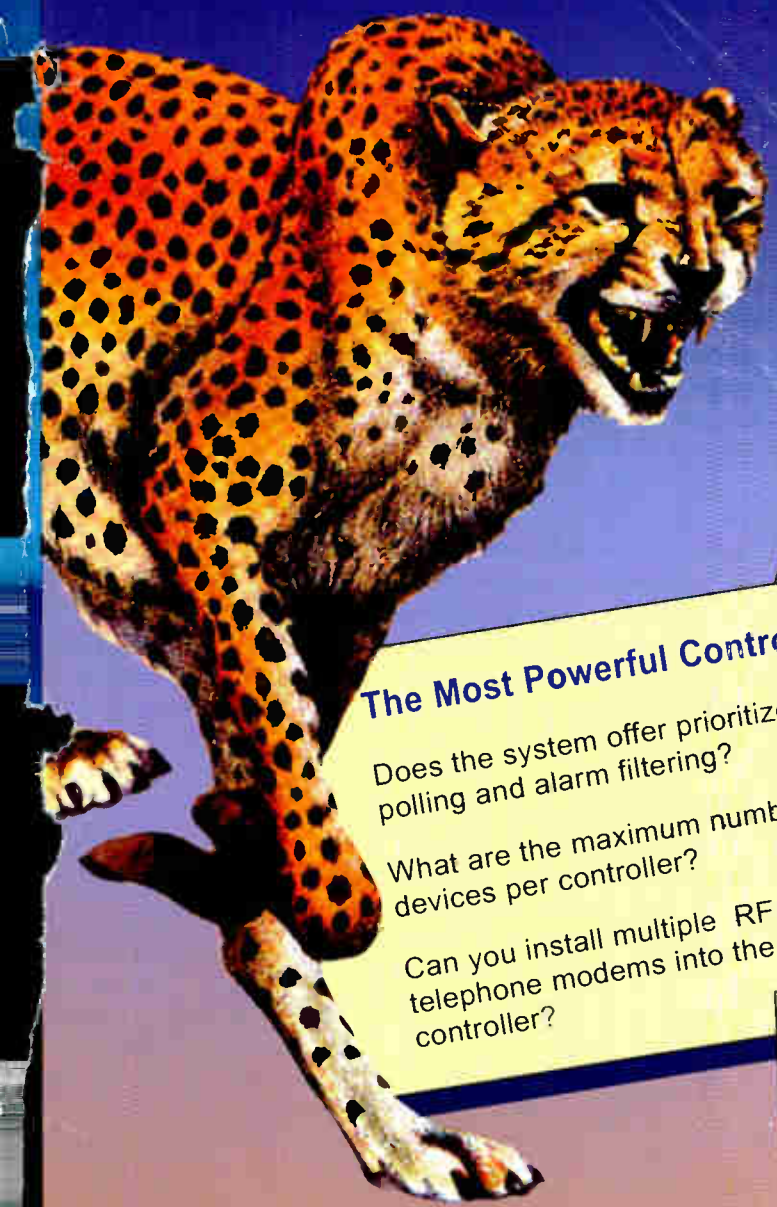

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Consistency, component compatibility and longevity are not your only considerations when engineering and purchasing your subscriber drops. *Consider these –*

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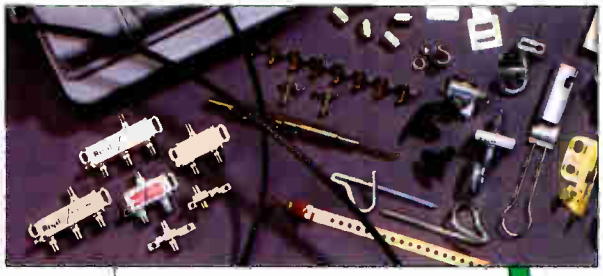
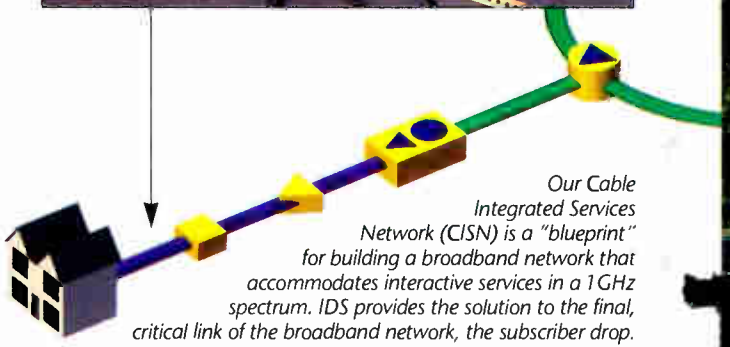
- In a digital world, poor drop installations, incompatible components and loose connections can cause signal loss or frozen images. Is your drop system ready and able to pass digital signals successfully?
- Truly interactive networks require the drop to transmit or pass bi-directional signaling. Is your drop system ready and able to handle return signal with minimal signal loss?

Integrated drop systems are compatible with expanded bandwidth up to 1 GHz as well as bi-directional and digital signaling. Build your network for tomorrow. Use ANTEC's Integrated Drop System today! Call your local ANTEC representative for more information.





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