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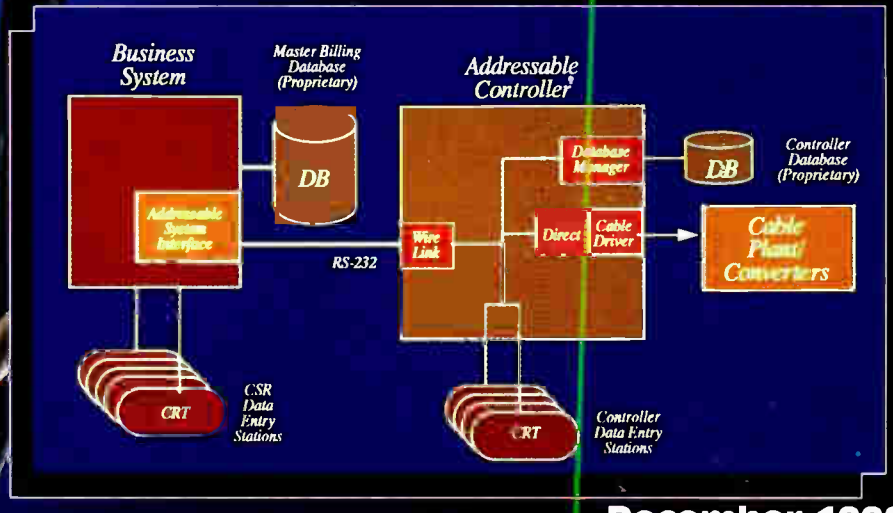

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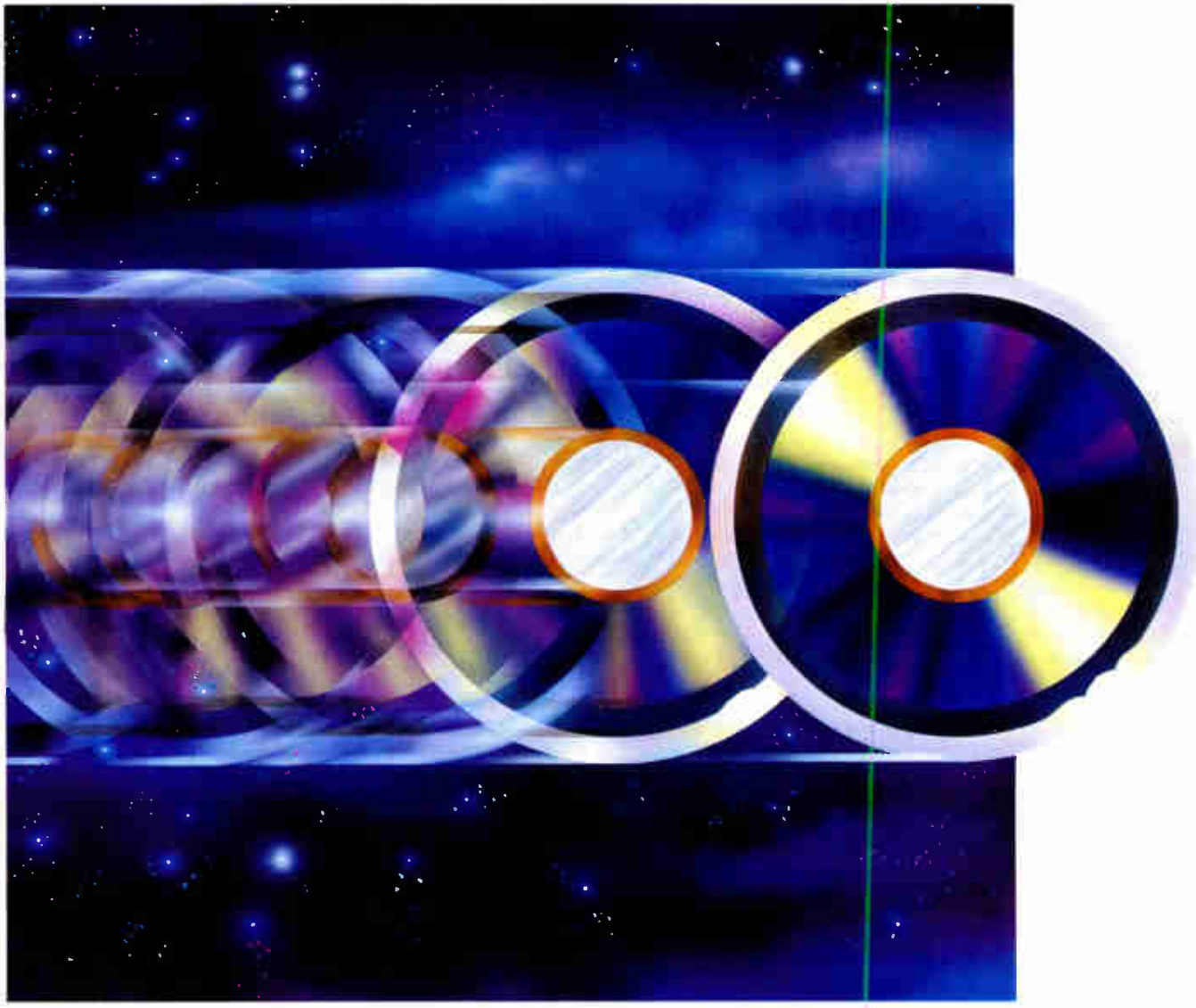

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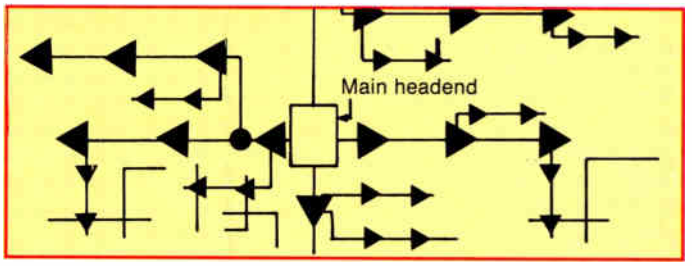

Fiber design 29

Geri Saye

Back to Basics 79

Courtesy Hewlett-Packard

Lab Report 102

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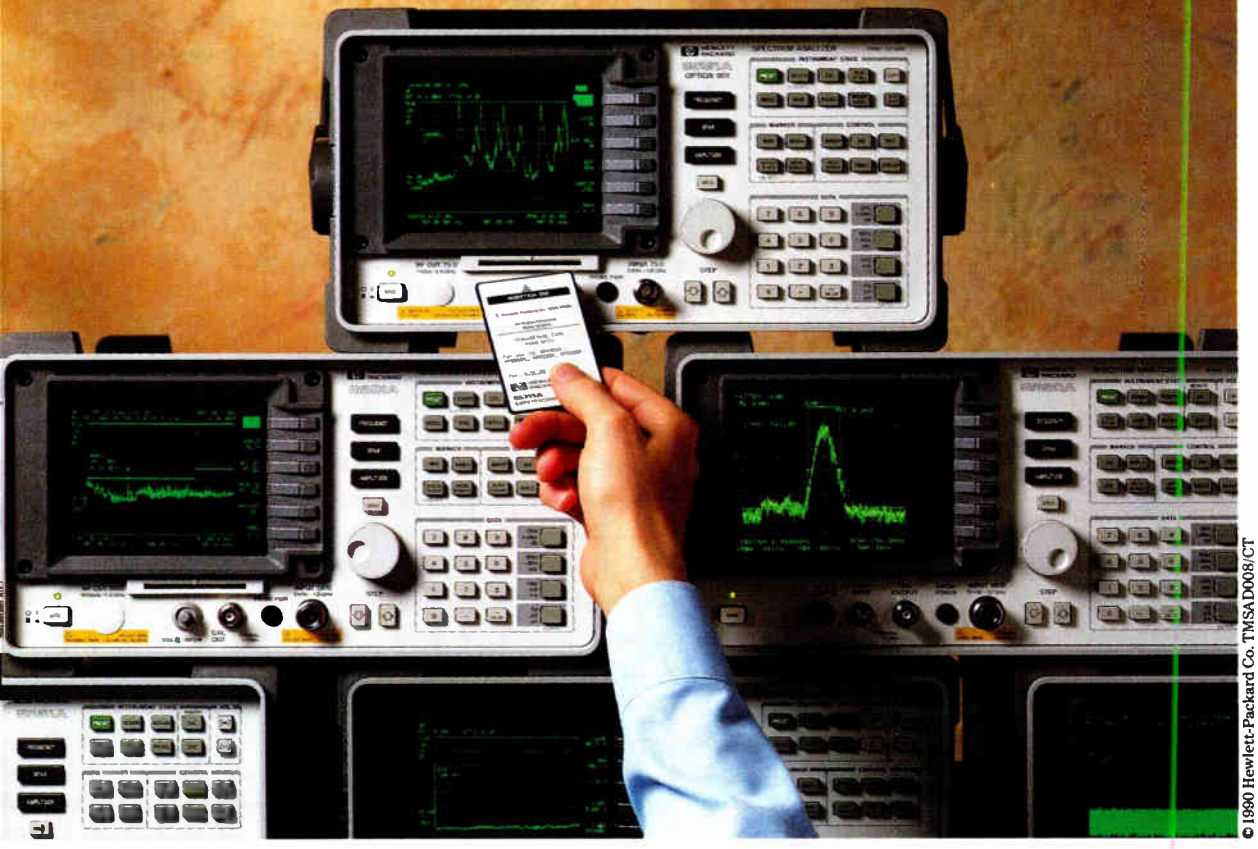

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EDITOR'S LETTER

Potpourri

Communications Technology has been the official trade journal of the Society of Cable Television Engineers since 1984, and that relationship will continue with the recent renewal of that endorsement status. It's been a pretty good relationship for both of us (it started when *CT* was created in '84), and we look forward to continued future growth together.

Speaking of growth, SCTE's national membership as of Oct. 1 was 7,440; by the time you read this it should be around 7,500. At the local level, there now are 61 chapters and meeting groups. Nice job!

Here's one you probably don't think about: Did you know that none of the FCC's commissioners are engineers? These are the folks who are setting regulatory policy for our communications spectrum. This hasn't gone unnoticed by representatives of the Society of Broadcast Engineers, however. I had a nice visit with Hammett & Edison's Dane Ericksen, an SBE board member.

He advised me that at its October meeting the SBE board of directors approved a proposal to start a congressional lobbying effort to amend the Communications Act with a requirement that at least one of the commissioners be an engineer. The thinking at this point is that an engineer "from the trenches" would be ideal. To that end, SBE's proposal recommends that the qualification to be an engineer for this post could be fulfilled with a four-year or higher engineering degree, *or* registration as a professional engineer in any discipline in any state, *or* fellow or senior member status in an engineering society such as SBE, SCTE, IEEE, SMPTE or NARTE.

What do you think of this idea? Would having at least one of the FCC's commissioners be an engineer better serve the interests of the users of the communications spectrum? Drop us a line with your thoughts to our "Letters to the Editor" column.

Here's something else to ponder: Why do some of our vendors continue to provide what I would classify as substandard equipment to people/systems just because they want to buy it? Old style two-piece F connectors and coax with non-bonded foil come to mind as two great sources of signal leakage. For that matter, installing non-messengered aerial drops of any length using those spiral type (or similar) grip supports at the ends also contributes to leakage. (To see why, carefully cut open the jacket of a drop cable near the end of the grip sometime; after a few months of flexing in the wind the foil will develop "tiger stripe" cracks around the circumference of the cable.) The solution? Use messengered drop cable for all aerial drops regardless of length.

Our industry has been very concerned about fire and electrical safety, but did you know that the four-foot ground rods you can still buy don't comply with the National Electrical Code's definition of a grounding electrode? If you must install a ground rod, it's supposed to be an eight-footer! There are other examples, but I'm sure you get the point. Unfortunately there still exists with some a mentality that "if someone is willing to pay for it, we'll continue to make/sell it."

Changes

Some of you may have heard about the recent changes that concern me. I accepted an offer to be vice president of engineering for Denver-based Coaxial International, an international cable TV management and consulting firm. At the same time I was named senior technical editor for CT Publications Corp., and will continue to be closely affiliated with both *Communications Technology* and *International Cable*. I'll still be writing my regular articles and columns in *CT* (including these editorials) and will remain involved in its continued evolution. This dual role allows me to be involved with the best of both worlds: engineering and publishing!

Ronald J. Hranac
Senior Technical Editor

COMMUNICATIONS TECHNOLOGY

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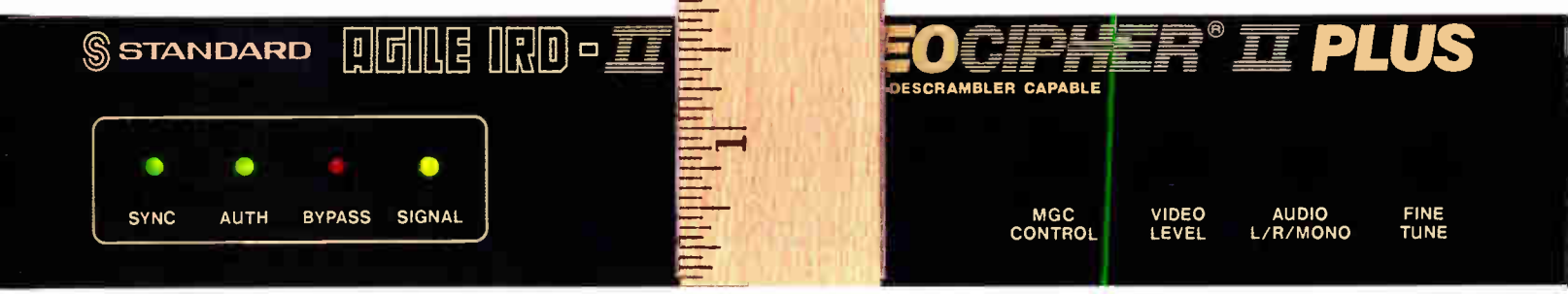

See Our Entire Standard Line at Western Show Booth 1,2,3.
Reader Service Number 10

Training and motivation

Since reading the July issue of your *Communications Technology* magazine and being generally concerned about the issue of personnel training I feel compelled to write and express some of my concerns. Many of us in the field have read of the excellent training programs the larger MSOs have made available to their employees. Some of these MSO training courses also are available at a nominal cost to employees of other companies. Also, the National Cable Television Institute courses are excellent and available at a nominal cost. The problem as I see it is motivation. What is needed to instigate employees to seek or pursue more training?

In the past I have been involved with the SCTE chapter formation (New England Chapter) process and helped arrange technical seminars. Of course I have attended many and have observed only a fraction of the technical employees attending. We all know that everyone cannot attend at once and somebody has to mind the store. However, even taking this into account, attendance and involvement is sparse. Again motivation is the key; motivation on the part of the company and the employee as well. In order to motivate the technician many operating systems offer promotions and monetary rewards. But many or most do not. The small system with its three or four technical people does little or nothing in the training department.

Back when I was involved with forming cable companies, right off the bat I had problems finding technical personnel. There was a shortage of available technicians in the work force. When I managed to find some and hire them I was disappointed. Many were fired or left their former employees with no available recommendations. As a former teacher in an engineering college I decided early to train my own technicians and as you can imagine it was a formidable task. My student employees had to get through my training program or they were out and they came from such places as electrical contractors, the Army Signal Corp., the construction industry and even fishing boats (marine people are very resourceful). This program worked for me and even though many left for greener pastures, many did stay and I kept repeating such courses on company time for quite a few years.

As you may know, I wrote a book entitled *Cable Television Technology and Operations*, published by McGraw Hill in April 1990. Therefore, I have joined the ranks of John Cunningham, Bill Grant and Glenn Jones as authoring books on cable TV. This book is a refinement of my training notes I used successfully over the years and I must say, although a lot of work, I enjoyed the project immensely.

The question is how does one motivate a technician or cable engineer to purchase a book that will possibly aid in job performance and knowledge? If a company purchases a book for a technician what will motivate the reading and use of it? I bet John Cunningham and Bill Grant asked the same question. Somehow the technical people are going to have to help themselves.

Eugene R. Bartlett, P.E.
State College, Pa.

Editor's note: The book, "Cable Television Technology and Operations," may be ordered by calling (800) 2 MCGRAW.

JULY 1990

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SCTE forms international council

EXTON, Pa.—The Society of Cable Television Engineers wants to help fellow societies "get established, expand their functions and objectives, and meet their goals," says Wendell Woody, SCTE president. To accomplish this, the Society has formed an international council that will serve as the organization's cooperative forum for sharing, exchanging and supporting other cable TV engineering societies throughout the world.

The council will consist of two ambassador delegates from each participating country, which at present include the United Kingdom, Canada and the United States. (See "President's Message" for more details.)

In other news, the SCTE will present "Fiber Optics 1991," Jan. 9-10 at the Hyatt Regency Grand Cypress Hotel in Orlando, Fla. The conference will feature 24 technical sessions. (For the complete agenda, see *The Interval.*)

Manufacturers get input from operators

BOULDER, Colo.—Cable operators, hybrid manufacturers and cable equipment makers met Oct. 25 to discuss the development of components that hold the key to improving cable system performance and expanding capacity beyond 100 channels. Hosted by Cable Television Laboratories, the session served as a forum in which manufacturers received input from system ops on the next generation of hybrids.

It was determined that the cable industry, as always, is willing to use advanced technology where it makes sound business sense. Also, the industry's vendors are prepared to meet these needs with technically feasible and cost-effective solutions.

In other news, CableLabs issued a request for information (RFI) regarding a project that seeks to study alternative technologies and techniques for establishing a CATV industry electronic program guide.

BRAD/PTS now ConTec

SCHENECTADY, N.Y.—Westinghouse Credit Corp. made a multimillion dollar refinancing commitment to "improve and restructure" BRAD/PTS. The company was renamed ConTec International and will continue its role as a leading provider of sales, service and repair of cable equipment and parts. The new chairman is Danny Cachuela.

- The NCTA has sent out its 1991 call for nominations for the Vanguard Awards to its members, state/regional cable associations and allied industry organizations. Nominations must be received no later than Dec. 14; the awards ceremony will be held March 27 at the conclusion of Cable '91 in New Orleans. For more information, contact (202) 775-3622.
- Jerrold Communications says it has taken addressability to its "logical next step" by making it a main part of today's home entertainment system. The result is one of the highlights of Jerrold's Western Show exhibit.

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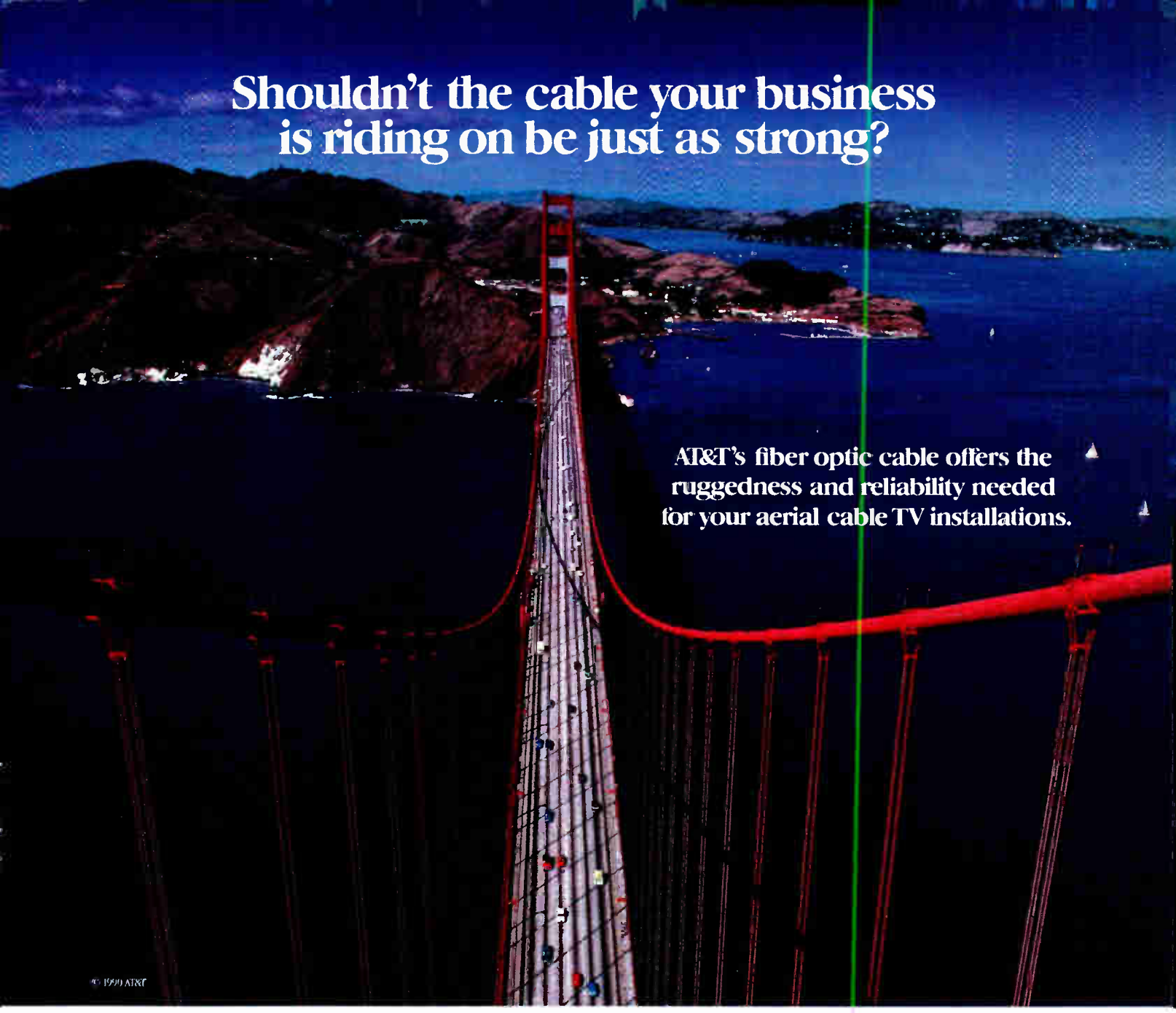

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Reader Service Number 13

AT&T
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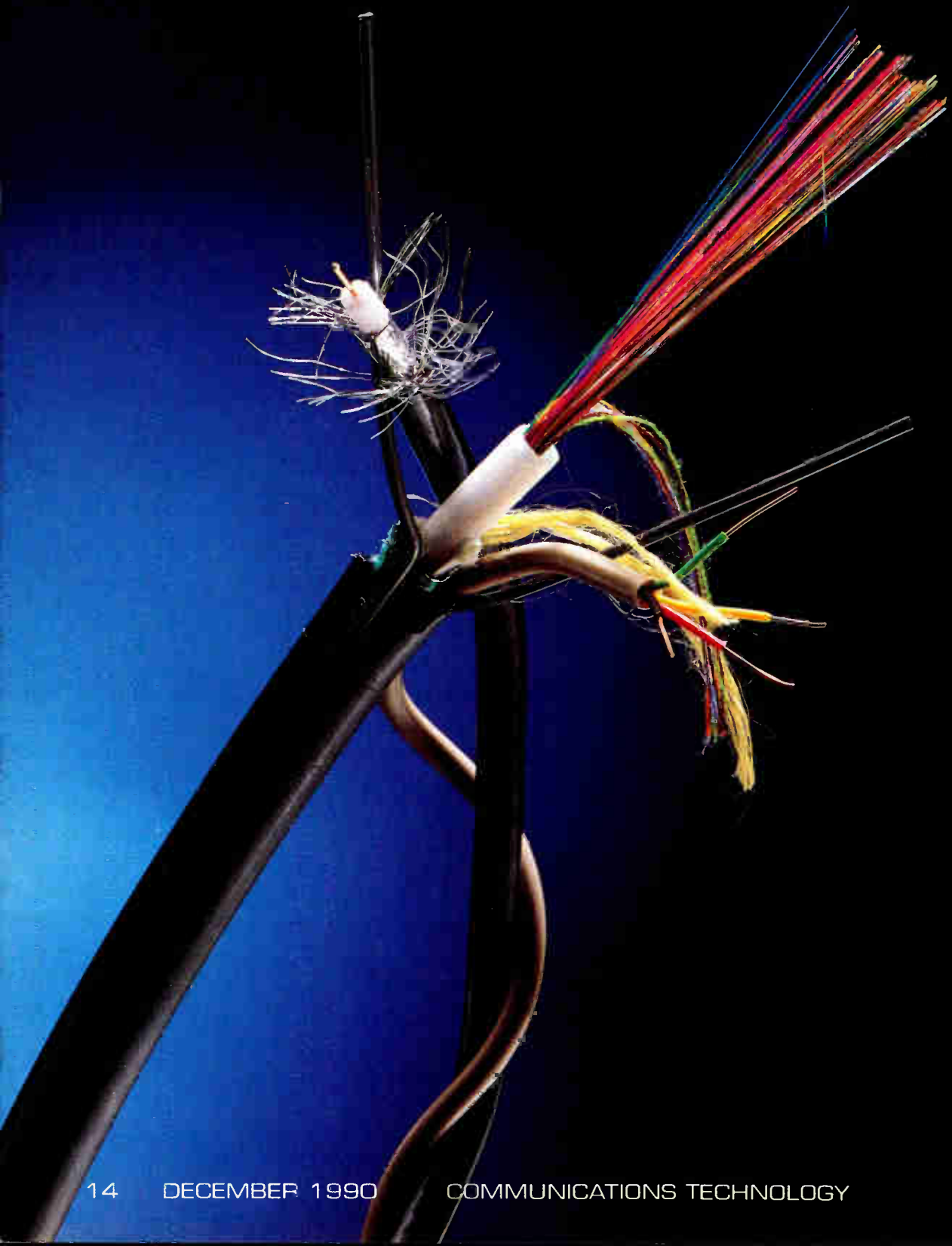
Cable TV: Architects of an American information



age infrastructure

The following is adapted from a presentation given at the SCTE's Cable-Tec Expo '90 in Nashville, Tenn.

By Tom Gillette
Vice President of Business Development and Technology Transfer
Cable Television Laboratories

The title of this article, "Cable TV: Architects of an American information age infrastructure" is carefully chosen to indicate the critical premise by which cable believes America should move into the information age. That is, our country will reap the benefits of that age through many infrastructures working independently and together to serve all Americans. One of those information age infrastructures will be cable's.

Conversely, then, we strongly believe that one network—specifically the all-digital, broadband ISDN, fiber-to-the-home network suggested by the telcos—cannot best serve:

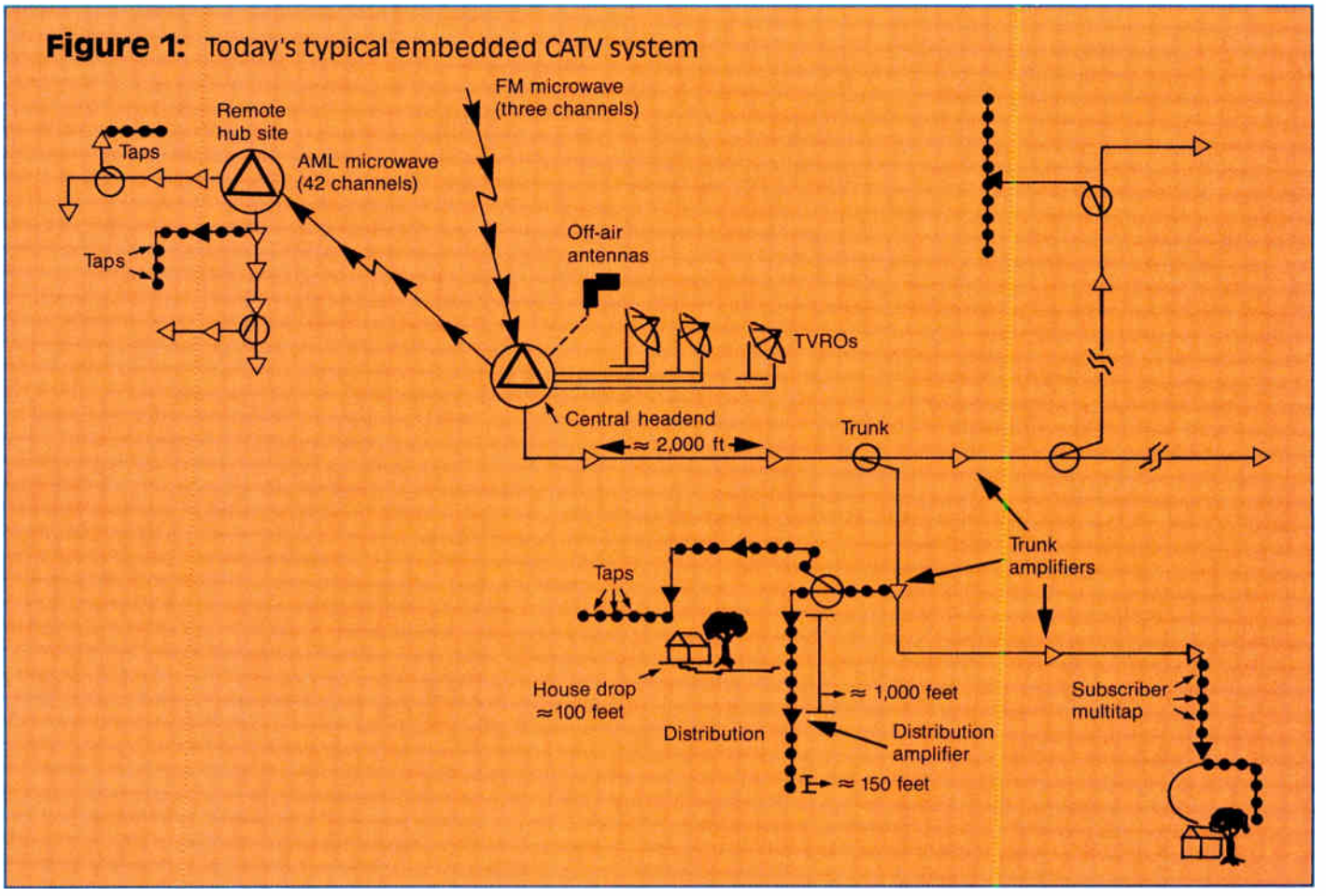
- the diverse needs of businesses, large and small;
- computer centers, from super to less than super;
- specific industries such as educational and medical; and
- the home, whether affluent or not, whether urban or rural, whether they want just to talk on their phone, just to watch television or to in fact access information services.

The jack-of-all-trades network proposed by the telcos will be the proverbial master of none. Fiber-to-the-home does not make sense for voice, data or video. Therefore, as will be discussed in this article, cable will be one of the critical infrastructures focused to optimally serve a particular market need and also to work synergistically with other infrastructures within our country's total integrated infrastructure system. Just like it takes many different systems (planes, automobiles, trucks and trains via airports, interstates, state and county highways, local roads and rail) to move people and goods around our great country, so too will it take many infrastructures to move information throughout our country's businesses and homes.

This article will discuss what makes sense for the information age for America and Americans. And making sense out of this issue is becoming harder and harder for some to do. I am continually dismayed by those that, for example, argue we must have fiber to every home in America because:

1) we need to tie together our supercomputers with fiber; or
2) France has the Minitel videotex service, which is working over copper; or
3) we need medical imaging or we need to tie remote hospital operating rooms to medical centers; or

Figure 1: Today's typical embedded CATV system



"The network planner must be working to minimize the delivery cost of telephone and television, yet the network design also must encourage service enhancements or market entry of new services."

4) it will only cost $200 billion to $400 billion, but the telcos want to spend that anyway, so let's just let them go on spending.

Let's see if we can develop a better plan for our country. To do that we will discuss the following four areas:

1) the fundamental planning principles that should be the basis by which we design and build our telecommunications networks;
2) a recommendation on what is the optimum network for providing home video;
3) a recommendation on the optimum voice and data network to serve the home; and
4) why a synergistic information age infrastructure is best for America since we can now have it everywhere in America at a fraction of the cost of the fiber-to-the-home alternative, which to date is only being test deployed to a few affluent suburban developments.

Planning principles

So, let's begin with a discussion of network planning principles. To do that, be aware of our assertion that essentially there are the following three home services:

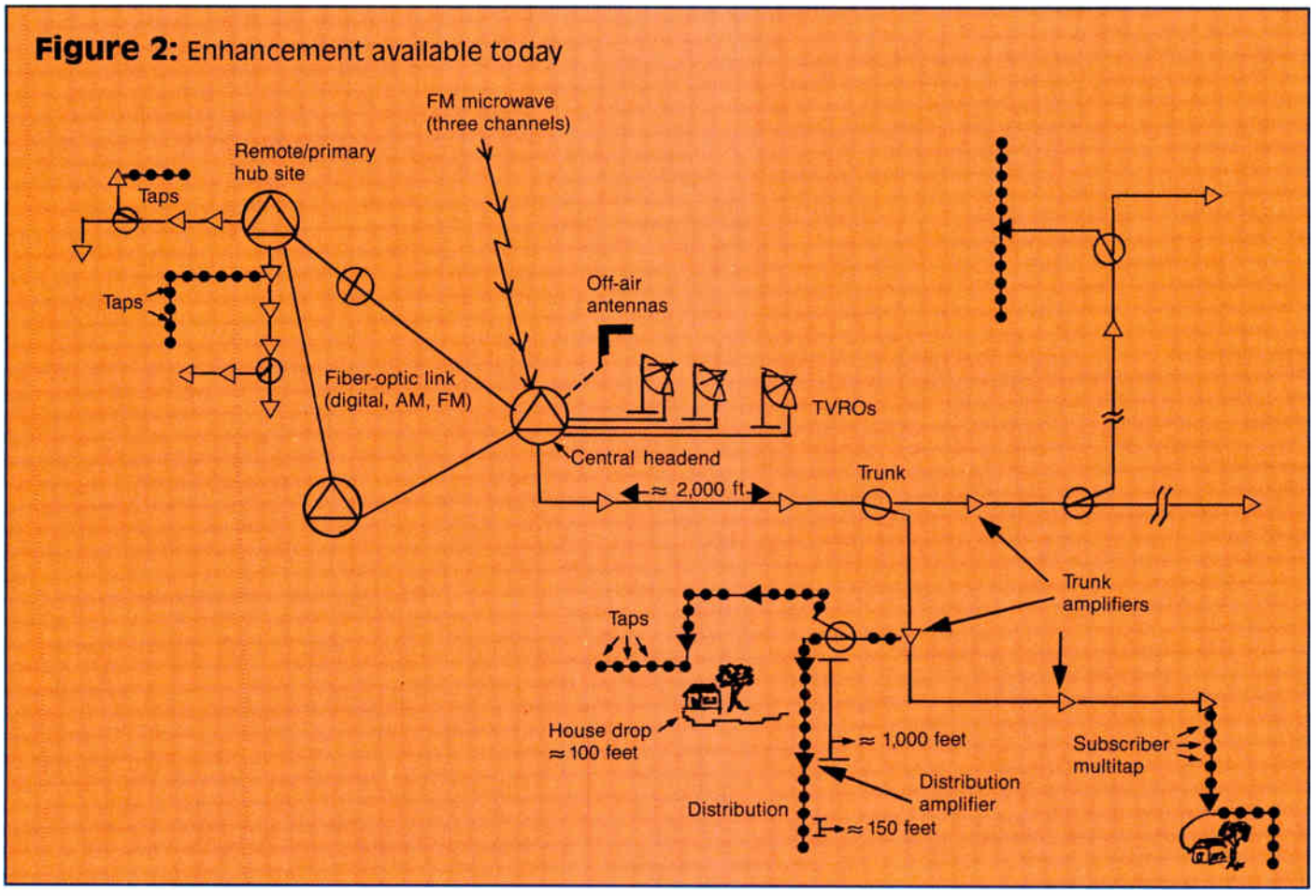
- watching television—on the average done for several hours per day in essentially every home in America;
- talking on the telephone—on the average for many minutes in almost as many homes as those that have television; and
- information services—used a little by a few homes.

The first network planning principle is that to serve the home's two megaservices—television and telephone—the delivery system must be highly efficient, cost-effective, user-friendly and extremely high quality. Providing ubiquitous services requires that the network be designed at its optimum performance for that individual service. It would be wrong to expect customers of these universally demanded services to pay extra to subsidize other services. For example, the telephone user should not be expected to pay rates that subsidize an information user. The network planner must be working to minimize the delivery cost of telephone and television, yet the network design also must encourage services enhancements or market entry of new services.

That brings us to the second planning principle, which is investments in service enhancements should be made as precisely as possible to the exact place where the enhancement is required. This is similar to the current principles ("just in time") in materials management or inventory control. Get the goods to the right place just when it is needed and do not waste invest-

(Continued on page 42)

Figure 2: Enhancement available today



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Reader Service Number 14

The addressable controller of the future

The following is adapted from the "1990 NCTA Technical Papers."

By Gregory F. Vaeth
General Instrument/Jerrold Communications
And John J. Feras
Enertec Inc.

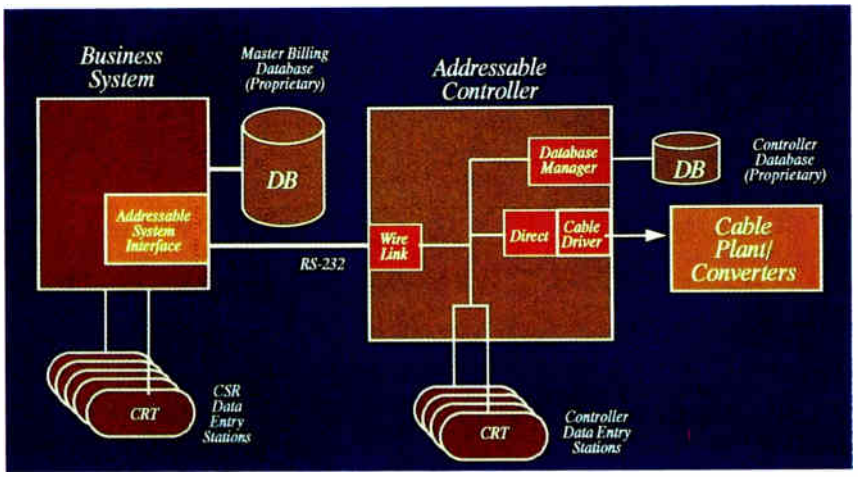
The rapid growth of pay-per-view (PPV) has forced changes in the role of the addressable controller. No longer does it merely translate billing system commands into vendor-specific addressable converter "language."

In a PPV environment, the controller must now maintain event scheduling information and control scramblers. The billing system interface handles higher peak traffic for last-minute buys of PPV events. In an impulse PPV (IPPV) environment, additional tasks are required including: monitoring and maintenance of the two-way data path (RF or telephone) and purchase management from converter to billing system. New services built around PPV and IPPV and more sophisticated in-home devices will place additional requirements on the addressable controller.

This article describes an addressable controller architecture that will efficiently accommodate currently foreseeable needs and provide the flexibility to conveniently implement those that are not yet conceived. Topics to be discussed herein include:

1) Low-cost, powerful personal computer hardware and state-of-the-art operating systems, data bases and human interfaces
2) Open software architecture with computer and cable industry interface standards that provide user-friendly operation, development speed and flexibility and access by cable operator application programs
3) High bandwidth billing system interfaces

Figure 1: Current architecture



General purpose

Today's addressable controller is a general purpose computer, typically a microcomputer. As such, it consists of a central processing unit (CPU), RAM memory, data storage devices (disk and tape) and peripheral devices (video displays, keyboards, printers, etc.). To make it an addressable controller requires the following additional components: 1) an interface to the cable plant for communication with converters and other addressable equipment, and 2) an interface to the cable operator's business system. (Although most controllers are capable of operation without a direct link to the business system, it is not practical to operate a cable system of any size without such a link.)

The addressable controller's primary function is control of the cable system's population of converters. On a one-way system this control consists of, but is not limited to the following:

✔ Initialization of configurable parameters
✔ Background refresh of selected parameters
✔ Activation/deactivation
✔ Authorization/deauthorization of static services (subscriptions)
✔ Testing/diagnostics

A data base is established and maintained on the addressable controller so the business system does not have to be programmed with information that is converter vendor-specific. This parallel data base also allows consistency checking of business system transactions. In a system offering PPV services, more control is required as follows:

✔ Authorization/deauthorization of dynamic services (events) such as movies, sports, etc.
✔ Scheduling of events and allocation of scrambling codes (tags) for each event
✔ Configuration/monitoring of scramblers associated with PPV channels

Parallel addressable controller data

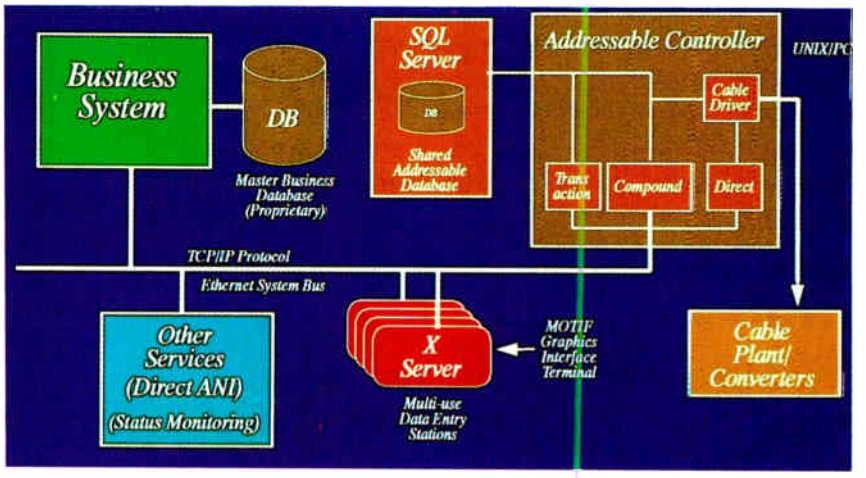
bases exist for these functions also—again to free the business system from requiring vendor-specific knowledge and to allow consistency checking.

An IPPV system demands still more control functions as follows:

✔ Monitoring/reporting of the ability of the two-way converter population to communicate with the controller
✔ Configuration/monitoring of the two-way data path, including addressable and non-addressable equipment
✔ Collection of event purchases from converters and upload of purchases to the business system

PPV and IPPV have expanded the functionality of the addressable controller and new technology. Innovative applications of present technology promise to further this expansion. Home shopping and other interactive services, on-screen display of channel layout and program guides and integrated cable/telephony are only a few of the challenges to current addressable controller architecture and functionality. It will not suffice to merely buy more powerful computers and shoehorn these features into current systems.

Figure 2: Network architecture



New computer technologies

Hardware. The trend in computer hardware has been a dramatic reduction in the price/performance ratio and it is continuing. For instance, the IBM PC (introduced in 1980) was powered by an Intel 8088 microprocessor and cost about $1,500. Today an 80386-based PC costs about $1,500 and is 30 times more powerful. Very soon, 80486-based PCs will be available offering even more performance at similar prices.

Similar advances are being made with the Motorola 680X0 series processors (Macintosh, Amiga) and with even more powerful reduced instruction set computer (RISC) based technology. Comparable progress has been made with peripherals—displays, disks, communication devices, etc. The result is relative unlimited availability of computing power, disk storage and display resolution at an ever-lowering price.

Software. The future addressable controller will be one component of a computer network and as such will be required to provide a wide variety of services to other elements of the network. This increase in services, coupled with the trend to larger subscriber bases per controller (as MSOs continue to combine systems), indicates the need for a controller based on high performance computing hardware that utilizes high bandwidth communication technologies.

In order to meet these requirements, the software resident in the controller must be portable, flexible and compliant to industry standards. Software that is portable will be easily "migrated" to a new hardware platform in order to take advantage of the increases in performance of new technology. Flexible software provides an "open architecture" that allows access to internal data storage from other members of the network. Compliance to industry standards will provide both the ability to communicate with other systems and a mechanism that will allow the construction of a consistent user interface for the controller.

Currently, and for the foreseeable future, the only operating system that will provide an environment containing all of these features is Unix. Designed in 1970 at Bell Labs, Unix cannot be thought of as an unproven technology. Although mature, its original design goal of portability has allowed it to grow in step with advances in computing and communications technology with versions available for all 16- and 32-bit computer architectures.

Unix is a multiuser, multitasking operating system and thus provides a large number of users and programs the ability to share both computing resources and information. The multiuser capability will allow control functions to be initiated from any terminal connected to the controller. Multitasking allows programs to execute concurrently—an absolute necessity for a system required to communicate with a billing computer while collecting IPPV transactions from converters.

As mentioned previously, the ability to communicate with other machines in a network is a major requirement of the future headend control system. Unix addresses this issue with two software subsystems: the networked file system (NFS) and transport control protocol/internet protocol (TCP/IP). Both of these packages have "grown" around Unix and are industry standards for machine-to-machine communications.

NFS provides disk file access capabilities on a networkwide basis, so that a program or user on one machine in the network can transparently access a file on the disk of a remote system through the network. TCP/IP is a set of communications protocol services that allow interaction between elements at various "layers" in the network. TCP/IP controls the routing of data through a network between machines, applications and users. Both of these mechanisms operate most efficiently on Ether-

net, a high-speed synchronous communications technology.

The core of an addressable control system is its data base. Throughput limitations in existing control systems frequently can be traced to the transaction response time in their data base management software.

As of this writing, sophisticated, high performance, relational data base management system (RDBMS) packages are just becoming available in the microcomputer Unix environment. These packages can be controlled via an industry standard data base language, structure query language (SQL), which provides a common interface to all relational data base packages, regardless of vendor. These packages also feature a high transactions-per-second rating (>10), on-line backup capability and network access (via SQL).

Unix is available on all classes of computing equipment, from PCs to mainframes. The choice of Unix as the software platform, off-the-shelf/industry standard technology for the data base management system and a careful design of the cable downstream hardware interface will guarantee a control system capable of growing to meet its future requirements.

The current controller

Architecture. The current addressable controller/business system architecture is outlined in Figure 1. The two computers are linked via a serial interface cable that is used to communicate various requests that the business system can make of the controller. The business system contains a software module, called the addressable controller interface, responsible for communication with the controller. On the other end of the link, the addressable controller's wire link module is responsible for servicing business system requests. The requests can be divided into the following three groups:

1) *Direct*—where the controller simply acts upon the request by performing communication with the converter
2) *Transaction*—where the controller manipulates its internal data base in response to the request from the business system
3) *Compound*—where the controller both communicates with a converter and manipulates its internal data base

In the existing control system this

Sophisticated, high performance, relational data base management system (RDBMS) packages are just becoming available in the microcomputer Unix environment."

grouping is not formal and the individual requests that make up each group have been invented on an "as needed" basis. The protocol used for communication between the business system and the addressable controller is also non-standard and each business system vendor is responsible for conforming to the protocol used by each addressable controller vendor. The multitude of business system vendors, control system vendors and converter types has contributed to this profusion of features that leads to confusion during configuration and operation of the cable system.

Limitations. While today's addressable controller provides a wide array of power and functionality, there are some limitations that vary in magnitude depending upon the particular addressable controller/business system pairing. Most important is system performance as measured by business system transaction throughput.

As systems increase in size and new converters and applications are implemented, more and more transactions are forced through a pipeline whose expansion potential is constrained. These constraints are a result of both the physical connection between the two systems and the inflexible interface protocol defining the communication. The necessity of reconciling the various parallel data bases adds to the transaction volume. Added to this "normal" traffic are high volume PPV transactions generated by last-minute purchases. The result is a frustrating situation for both cable operator and customer.

The inflexible business system interface is responsible for a less immediate source of frustration. Current protocols and architectures have extended the time required to implement new addressable converters and applications of addressability on both the addressable controller and the business system. Further, little provision has been made for interfacing to non-business system entities (e.g., direct automatic number identification—ANI).

For those systems that are hosted on proprietary technology microcomputers (e.g., Digital Equipment, Hewlett-Packard, etc.), more factors come into play. Costs, both acquisition and maintenance, tend to be higher. Further there is typically a limited expansion path for increasing processing power, disk or memory capacity, etc. When the expansion path does exist, the cost is much greater than for a proportionate increase in power or capacity on a PC-based system.

The last limitation to be mentioned concerns the human interfaces of both the addressable controller and the business system. At the operating system level, two separate bodies of knowledge are required for routine operation of the computer system. This has an affect on the number and technical expertise of computer operations staff. Perhaps more important is the interface at the application level, where users must learn how to request the same function in a different way for each system.

A proposal

Figure 2 is a system architecture that attempts to address future requirements, current and anticipated limitations with new hardware and software technology. The use of SQL-oriented relational data base server technology and the creation of network-oriented application software on the controller will lead to an addressable controller that works within an "open architecture" with the business system. Certainly, business system vendors also must evolve their software toward this goal in order for the cable operator to reap the full benefits of this technology.

A relational data base server embedded in the addressable controller will allow all business systems access to the controller's data base in an industry-standard language, SQL. All requests of the transaction class in the current architecture would be rephrased to be expressed in SQL.

(Continued on page 74)

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Reader Service Number 15

Cellular radio + cable TV = cellular cable

By Bill Grant
President, GWG Associates

The current enthusiasm for lightwave transmission utilizing optical fibers is certainly understandable. Here's a technology that presents substantial bandwidth for use without the penalties of frequent reamplification. Certainly for high traffic density applications such as telephone trunking between communities fiber is a superior alternative, particularly when combined with a higher bit rate digital carrier. Our enthusiasm should certainly be subjected to the tests of reason and logic, however, and we should not automatically assume that fiber is the ultimate choice for all transmission scenarios.

Consider the question of fiber in the subscriber loop in telephone service. Should we or must we accept without question the popular position that fiber will inevitably replace all pairs throughout the exchange plant of the future? The magnitude of such a replacement program, the numbers and costs, are staggering, and if such replacement is on a one-for-one basis, then we're really talking about placing a dedicated transmission facility per point of service. This is essentially the same philosophy employed with twisted pair plant, isn't it?

With the extensive experience with paired exchange plant surely we can recognize the inefficiencies and inflexibility of this approach. How many miles of pairs in place today do not, and never will, produce any revenue at all? Certainly all those that, due to the economics of standardized cable sizes, extend past the actual points of local service. And what is the average utilization of the individual pair in say a 24-hour period; six, eight or 10 minutes? Simply replacing the pair with fiber will in no way alleviate or eliminate these inefficiencies.

We might also question the premise that the exchange loop can be or only be served with digital transmission. Certainly the telephone trunking applications that represented high traffic requirements on a single point to single point basis were best served digitally, and certainly our experience in doing so has been successful and satisfactory, but the individual subscriber loop presents an entirely different requirement. As an objective observation the experience with carrier derived subscriber service on an analog basis has been equally satisfactory.

What about cable TV?

The questions raised here are complex and we should be leery of absolute solutions, but there may be some small merit in broadening the base of the entire discussion. The direct comparison of pairs and fibers from the perspective of telephone service alone does not address the questions of other subscriber services at all. What of cable TV or the multiplicity of futuristic requirements such as power load management, data, etc.?

If we seriously consider some future replacement of the extensive exchange paired plant in place, how can we reasonably ignore the existence of the equally extensive, or nearly so, coaxial cable plant now in place? Remember that this includes service drops also, and that in toto these facilities present substantial transmission bandwidth for use to the same subscriber premises. What are its capabilities, its shortcomings, and what does it offer as a facility in place for exchange telephone service?

The typical CATV plant can provide bidirectional transmission capacity on the order of 400 MHz or more out to the subscriber terminals and 25 MHz or so back to the system headend. These are wideband facilities that presently utilize frequency division multiplexing to provide TV services, at least, on an analog basis. Although much work has been done and this effort is still being pursued to digitize video signals, there are no practical systems in service today carrying any truly significant number of TV signals for CATV service.

The nature of these systems is different from paired telephone plant in that outside of the service drop itself, no physical transmission facility is dedicated to any individual point of service. The entire transmission bandwidth is presented for use at all points of service and in this respect, a more direct analogy might be made with the 60 Hz transmission systems of power distribution. If we use a telephone term and think of the TV signals as traffic, the conventional CATV plant might be called traffic insensitive; that is, the number of subscribers taking service from the system at any given instant in time has no impact whatever on the initial cost or operation of the transmission facility itself.

It seems a fair statement that coaxial cable transmission is a mature technology and the design of such systems has become highly refined. The amplifiers and hardware are adequately reliable, at least for this service, as evidenced by the public support and subscription revenues that such systems enjoy. Technically, however, CATV systems are limited in length and transmission capacity by the practical considerations of the multiple reamplification that the transmission losses impose. As well, the cascade or serial connection of many such amplifiers not only introduces cumulative noise and distortion but introduces some vulnerability to service interruptions.

The development of lightwave transmission utilizing optical fibers has generated as much interest and excitement in the CATV industry as it has in telephone, but here we do not have the natural stimulus of high traffic, long distance transmission trunking that the telephone network provides. Thus the incorporation of fiber into CATV plant has been somewhat slower and largely focused on the local distribution applications that are the basic nature of CATV.

Although still evolving, due to the nature of the end devices served—the subscriber-owned TV receivers—the thrust

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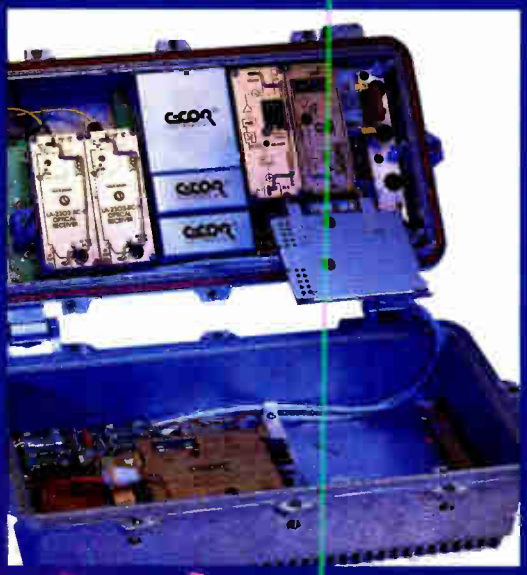

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appears to be toward analog transmission on fibers employing amplitude modulation (AM). Fiber does offer significant relief for the technical limitations of coaxial plant in that the system length and transmission capacity, which were previously somewhat limited by reamplification requirements, can be optimized in a hybrid system design employing both fiber plant for distance and "reach" in conjunction with limited length, limited amplifier cascade coaxial distribution plant. Such hybrid systems represent a satisfactory solution to many of the present inadequacies of CATV plant and may well become widely utilized, perhaps even universally in years to come.

Enter the subsystem or cell

Note, however, that the basic CATV system could still be a wideband transmission facility and would still be analog in nature using frequency division to multiplex the TV signals. In effect, larger communities will be served with a multiplicity of what might be called subsystems (we could call them cells) consisting of a local fiber link reaching out into the area and limited to feeding a restricted section of conventional coaxial cable plant. Each subsystem would be technically independent of any other, thus reducing the impact of equipment or plant failure and service outage to a smaller portion of the community.

If we now consider the possibilities for superimposing telephone exchange service onto such a system, the question of transmission technique and modulation for the telephone service itself may be more readily defined. Since the transmission of a multiplicity of TV signals is a more complex requirement, and if this requirement is established to be best served in an analog fashion, then the introduction of digital transmission for the secondary telephone service alone seems an unnecessary complication. Surely analog transmission on some form of telephone carrier could provide adequate transmission quality.

As far back as 15 years or so a small field trial was conducted using modified subscriber telephone carrier equipment on coaxial CATV plant, including the coaxial service drop. The carrier employed was analog, amplitude modulated hardware capable of providing eight individual telephone lines on a single twisted pair.

This was a frequency division carrier and required that transmission frequencies be dedicated to each individual point of service. The limitation of the program at that time was the lack of any high density (say 300 lines or so) subscriber carrier and the necessity for dedicating two transmission frequencies for each point of service imposed a significant cost penalty against the further development of such higher density carrier. The telephone service was sustained over a period of several months and was, in all respects, entirely satisfactory. Although this test was interesting and did demonstrate some practical service sharing of operating coaxial plant, it may well have been a bit before its time.

But time marches on and new technologies are presented and refined. The introduction of cellular radio suggests that perhaps we might usefully re-examine our earlier efforts.

A cellular radio system can provide about 300 individual transmission channels and it does this without dedication of any single operating frequency to any single channel. The equipment is all frequency agile and assigned an operating frequency on demand. A station only occupies and uses this frequency during the period of actual transmission service.

Although developed for service in the 800 to 900 MHz range it should not present any great difficulty to convert the equipment for use in spectrum available in conventional CATV systems. From the headend or "cellular terminal" out to the distributed stations, for example, 10 or 20 MHz could be easily accommodated in either the mid- or super-band spectrum of the coaxial cable plant. Return transmission from the stations would fit comfortably within the standard coaxial return spectrum of 5 to 30 MHz. Then if we simply consider the present cellular radio systems as coaxial cable carrier systems, we might derive 300 telephone stations on any modern, in-place coaxial plant almost immediately. By adding a second cellular system, telephone capacity might be easily doubled to 600 lines.

Note that we need not fund any extensive new product development at all in this effort. Activity would be limited to adapting, simplifying and perhaps even reducing the cost of existing cellular hardware. Also, the coaxial cable plant would require no modification or development effort either. As a wideband, analog facility already providing adequate spectrum it would seem quite suitable as is and the telephone service should function in the presence of the CATV signals nicely.

Cable plant maintenace practices and system designs must be reviewed of course, but this does not seem an insurmountable task. And surely we have sufficient telephone experience with statistical loading, etc., to forecast preliminary channel requirements for a given service area.

Cellular cable is born

The determination of this practical telephone service area may well become the design basis for the subsystems or cells, with each of these cells comprised of a limited cascade of analog amplifiers being fed its own optical fiber that has not been previously tapped for service. If we may be allowed some artistic license the term "cellular cable" seems curiously appropriate for the resultant new network structure.

If serious thought is given to the replacement of exchange pairs with optical fibers, the problems of replacement or more correctly of transition of the actual plant and services, become self-evident and somewhat intimidating. Let's briefly examine a similar transition from pairs to a cellular cable system as outlined here. Given paralleling coaxial plant in-place including service drops, any new telephone service requirements of any reasonable magnitude—even a dozen or so new lines—could be fully implemented as cellular carriers with no regard or concern for the existing paired plant condition or capacity at all. Areas that now appear candidates for paired cable relief or replacement could simply be coaxially implemented, even on a single station at a time basis.

The transition would be graceful and expenditures would be limited to terminal devices and equipment entirely. Surely this is a much more tolerable situation than an extensive and costly replacement of all outside transmission facilities. Lead times on terminal devices are shorter and investments can more closely track actual requirements. Remember also that additions of telephone service require no modification or change in the coaxial (cellular cable) plant at all.

Consider present paired plant that extends out five miles or so. Let's assume a heavy service load (100 stations) in the first half mile of cable and relatively light service loads (10 stations) in the last half mile length. What happens if the service requirements are drastically altered? For a worst case, let's simply reverse the loads to 10 stations in the first half mile and 100 stations in the last section. Obviously pairs are available in the first half mile all right, but a sudden new requirement for 100 lines out at the end of the cable could be quite awkward to accommodate. Even if a digital carrier is applied then engineer-

(Continued on page 76)

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Reader Service Number 47

Design considerations with fiber

Primary fiber topics to be considered in this third in a series of articles on CATV design are:

- *Review of tree-and-branch concepts*
- *Advantages and disadvantages of fiber*
- *Current fiber system proposals*
- *Caveats and concerns*
- *Design considerations*

The next installment will examine other alternative architectures (designing with interdiction).

By Mark Bowers
Owner, CableSoft Engineering Services

Tree-and-branch (T&B) architecture has been with the cable industry since its inception and has served our industry well. Therefore, it is important to start our discussions investigating design with fiber with a review of T&B concepts.

The early cable system usually consisted of three to four off-air local stations only. By comparison, a state-of-the-art cable system today can provide around 80 channels with a total bandwidth of 550 MHz for a single coaxial cable system. Most modern cable systems use a T&B-type architecture (Figure 1). Although this type of architecture has served the cable industry well and is very cost-effective, it has reached some technical barriers. T&B architecture presents some definite problems for the future—*particularly when we try to adapt it to an all-fiber distribution medium.*

The typical cable system uses coaxial cable as the signal distribution vehicle. Coaxial cable is a fairly rugged medium and offers many advantages such as high immunity to signal ingress and egress, fairly constant characteristic impedance, and a substantial bandwidth—on the order of 1 GHz or greater. One major disadvantage of coaxial cable is high signal loss per unit length. Because of this high signal loss, amplifiers have to be placed "approximately" every 2,000 feet on average, and the modern T&B cable system contains many amplifiers.

Tree-and-branch architecture is basically divided into two main portions: the "tree trunk" (or trunking system) and the "branches" (or the distribution system). The trunking system is utilized to route the signals throughout a community and bring them *close* to each potential customer. Power levels per channel are kept rather low in the trunk system. Because the trunk system operates at fairly low power levels, intermodulation distortion is kept to a minimum but a fair amount of noise is contributed to the signals. A small portion of the trunk signal is sampled at each trunk station and fed into a bridger amplifier. The bridger amplifier and subsequent line extender amplifiers operate at much higher power levels per channel and their purpose is to distribute the cable signals to customers' homes with optimum power distribution efficiency. Because they operate at much higher power levels a great deal of intermodulation distortion components are generated and accumulated. When properly designed, these distortions are kept to controllable levels.

There are several major disadvantages of T&B architecture as applied to a total

Sample FTF design results

	Cost/ mile	Percent change
Conventional T&B	$5,100	N/A
FTF w/push-pull	$8,750	71.6
FTF w/parallel hybrid	$7,650	50.0
FTF w/feedforward	$6,650	30.4
FTF w/express feeder (FF/PHD optimal use)	$5,850	14.7

Figure 1: Typical T&B architecture

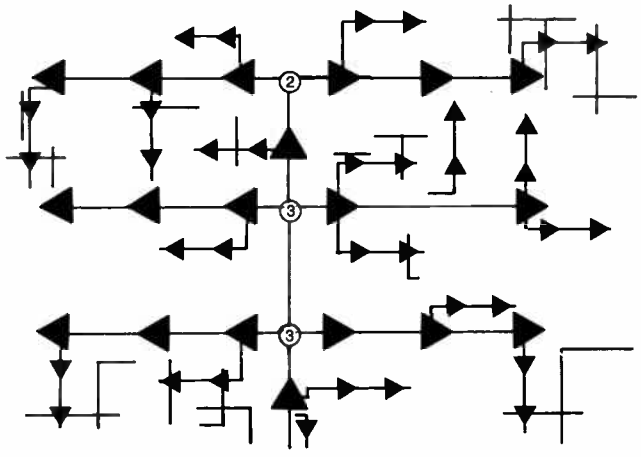


Figure 2: T&B with fiber supertrunk

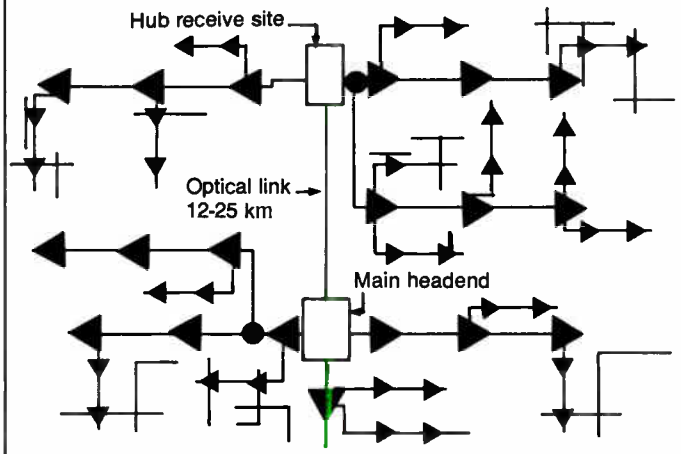


Figure 3: Fiber backbone

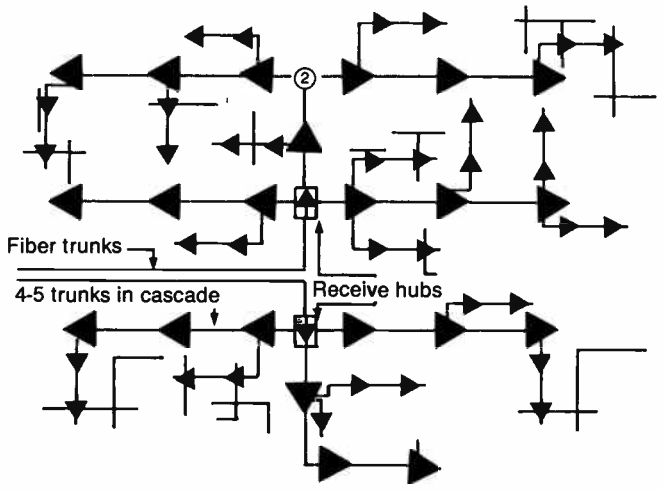
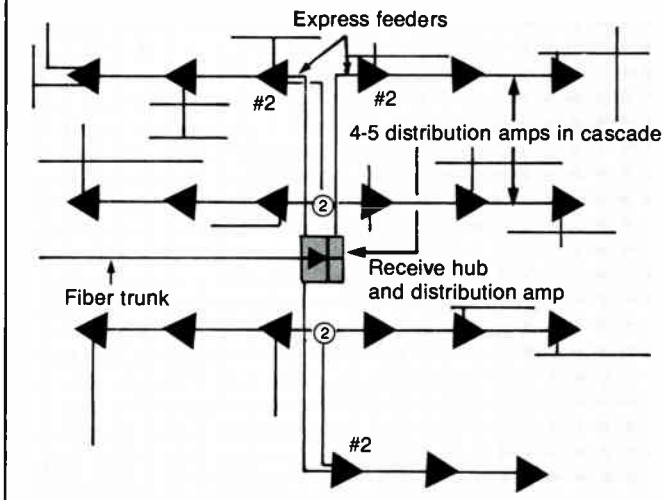


Figure 4: Fiber-trunk-feeder



fiber system. These problems suggest that tree-and-branch architecture is generally prohibitive to a total fiber system—given current technology. As long as T&B architecture is employed the delivery mechanism used in the "last mile" to the subscriber will likely remain coaxial cable; that's why current hybrid application efforts, such as fiber-trunk-feeder (FTF), that increase effectiveness are so important. Current use of T&B architecture requires, among other criteria, the availability of:

- Low cost and moderately efficient directional couplers.
- Low cost, easily performed and repeatable splicing.
- The ability to place *many* splices within the plant without serious degradation to the system or signals.

These problems are of some consequence in total application of fiber and should not be underestimated. While there is a great deal of research going on at this point in the development of low cost optical couplers, much work remains toward a total fiber T&B architecture. Meanwhile, and perhaps more importantly, rapid integration of fiber into the cable trunking system bypasses some of these concerns and new innovative designs are rapidly taking place in design rooms across the country.

Advantages and disadvantages

Let's briefly discuss what fiber brings to the table. Why are we so sure that fiber offers dramatic improvements—whether in reliability, signal quality, system design, design/operation economics or all of the above? What are the disadvantages, if any?

The possibilities of what can be gained with fiber as a distribution medium for broadband signal delivery are impressive. Systems can be designed and operated with vastly expanded bandwidths. Maintenance reduction costs of as much as 90 percent have been projected compared with existing coaxial designs. Additionally, operators will be able to provide many new services to their subscribers when desired.

A few of the advantages of fiber for our industry are as follows:

1) Since fiber is an optical medium the signal is immune to EMI/RFI problems—including leakage.

2) With single-mode fiber the attenuation of the signal can be easily kept to below 0.4 dB per kilometer at 1,300 nanometers wavelength with today's fiber. Contrast this with typical .750" coaxial cable loss at 550 MHz of 1.24 dB per 100 feet (or around *41 dB per kilometer*). The use of fiber as the signal distribution medium, with its low loss, presents tremendous potential along varied fronts including the elimination of cascades of amplifiers, many power supplies (at least in theory and if we're careful) and periodic RF sweeping and testing requirements.

"(Tree-and-branch) architecture presents some definite problems for the future—particularly when we try to adapt it to an all-fiber distribution medium."

3) The physical size of a fiber cable is much smaller than coaxial cable. Fiber-optic cable is the preferred medium in areas where space is at a premium, such as in conduits or underground ducts. Fiber also is more durable than coax, since aluminum cable suffers from temperature expansion and contraction, aluminum migration and must be protected from contaminants in the air, etc.

4) The life expectancy of a copper/aluminum-based coaxial cable is around 20+ years, whereas fiber appears to have a potential for 30 to 40+ years of normal usage. Since the bandwidth of the fiber is no longer the limiting factor (the theoretical bandwidth of single-mode fiber is almost infinite and on the order of 100+ GHz would appear to be attainable), electronics can be changed over the coming years as new technologies become available, with the larger investment in fiber remaining in use.

There also would appear to be some disadvantages in fiber-optic applications as well—at least for the moment. Being such a new technology, many cable TV operators are having some difficulty assessing its true long-term implications and applications. The most expensive portion of a fiber-based system is the cable itself. A hybrid fiber/coax application still is more costly than a similar coaxial system in many instances. The cost gap between fiber and coax, however, continues to narrow every day as prices decline and as our applications adapt better to current architectures. A final, albeit disappearing, concern is a lack of adequate reliable high performance elec-

Figure 5: Second-order beat analysis

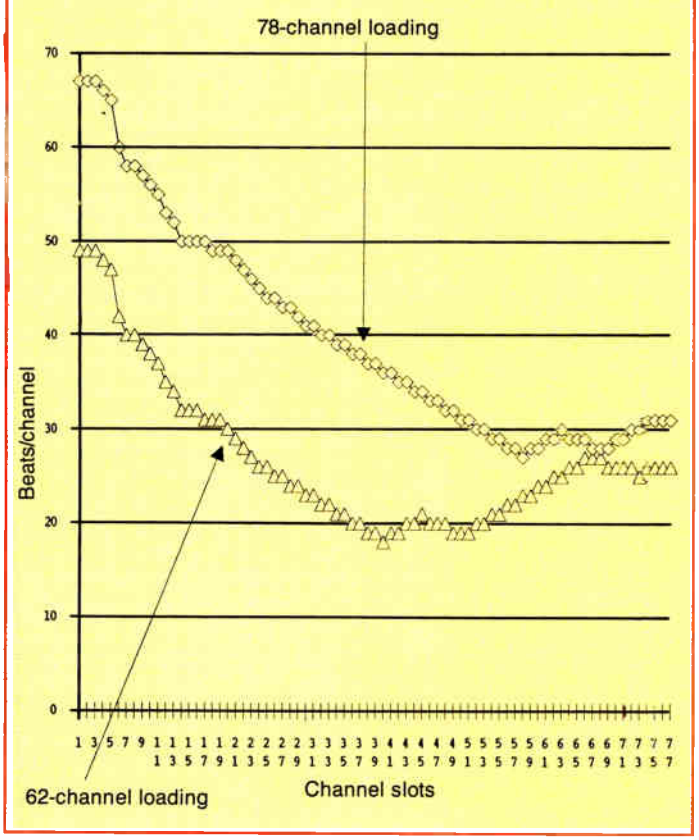
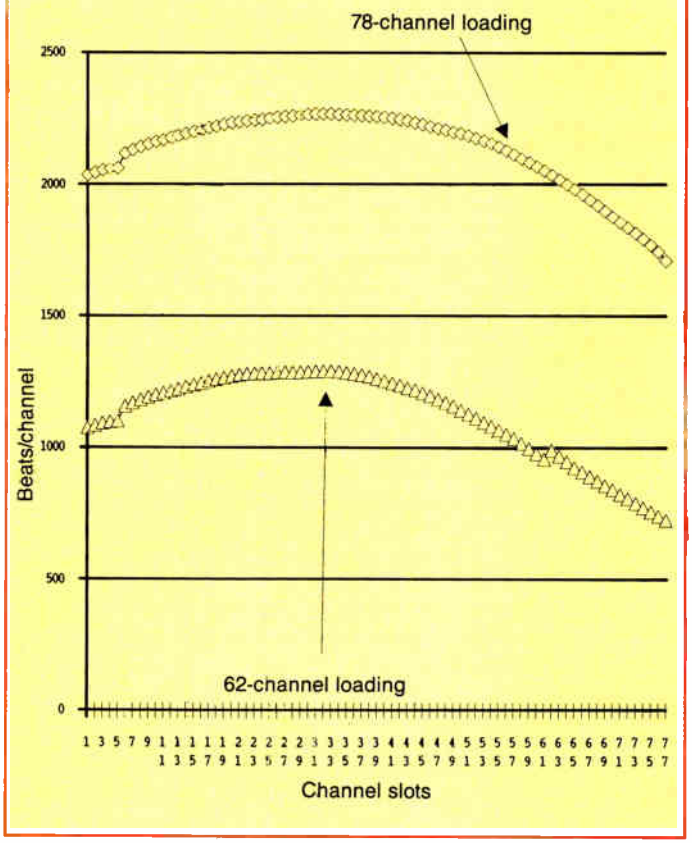


Figure 6: Third-order beat analysis



tronics for the cable industry, which is truly needed to fully exploit the inherent advantages of this new medium.

Current fiber applications

Now let's briefly review current ideas on how to incorporate fiber optics into our T&B architecture discussed earlier, including a brief look at telephone companies' current application of this medium.

- *Telco ISDN:* The integrated services digital network will offer simple, economical access to an unrestricted range of services without the cost and complexity of multiple access loops. ISDN by definition is completely digital in construction and distribution; carries voice and non-voice (data and telemetry) services; has an intelligent control overlay; and has a defined set of user-to-network and network-to-network interfaces. ISDN specifications, by themselves, do not require the integration of fiber optics and will function quite well in most instances with copper-based technology.
- *Telco BISDN:* The broadband integrated services digital network is an ongoing natural evolution of the ISDN scheme, which is basically a narrowband service offering (144 kbs and 1.544 Mbs). Broadband rates for BISDN are still under final consideration but rate offerings are expected to be approximately 150 Mbs and 600 Mbs, and to be compatible with SONET. BISDN will be an extension of the ISDN service offering and broadband in nature. It therefore has all of the features and advantages of ISDN. BISDN, given its greater bandwidth, will in theory be able to provide such services as full motion video (CATV), HDTV and transmission of high fidelity stereo sound—to name only a few. Because of the vastly expanded data rates and bandwidth, BISDN does require the use of fiber optics.
- *Telco SONET:* The synchronous optical network is a system under development to define an optical interface standard that will be used to connect equipment from different suppliers. SONET will have major impact on our pending generation of optical telecommunications equipment. It offers the promise of national and perhaps worldwide uniformity at data rates of up to 1,327 Gbs. Formal adoption may take some time, but basics have been sufficiently settled for aggressive vendors to begin producing equipment. SONET by definition is a single-mode fiber transportation network, constructed as a progressive hierarchy of synchronously multiplexed tributary signals. It is optical, digital and synchronous in nature, and has the capability of surveillance-based maintenance. Information is carried by signal overhead bytes so that facility and equipment maintenance activities can originate from the network elements.

Early telco fiber-optic applications were central office-to-central office, then fiber's use spread from the central office to remote switching sites (remote terminals), with a final evolution pending from the remote terminal to the business or private residence. It is obvious that the new higher bandwidth advantages of fiber are not fully realized until the entire distribution plant has been changed. The high bandwidth of the single-mode fiber based BISDN evolution will allow dramatically increased data transmission rates and services. The primary remaining handicaps for the typical telephone "switched-star" or "switched multistar" distribution system are the high cost involved due to individual line requirements from the central office or remote switching center to the customers' premises, and the cost to change out switching centers to much higher data rate equipment. Recognize, however, that the dynamic and configurable approach to BISDN and SONET allows for a slow expansion of a layered system toward customers' premises. →

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Figure 7: Fiber hub placement model (amps vs. cascade level)

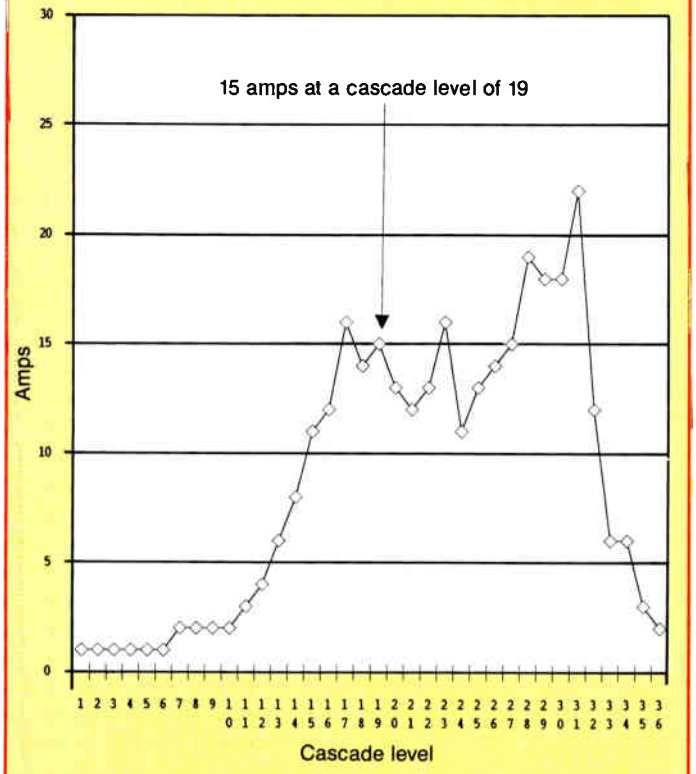
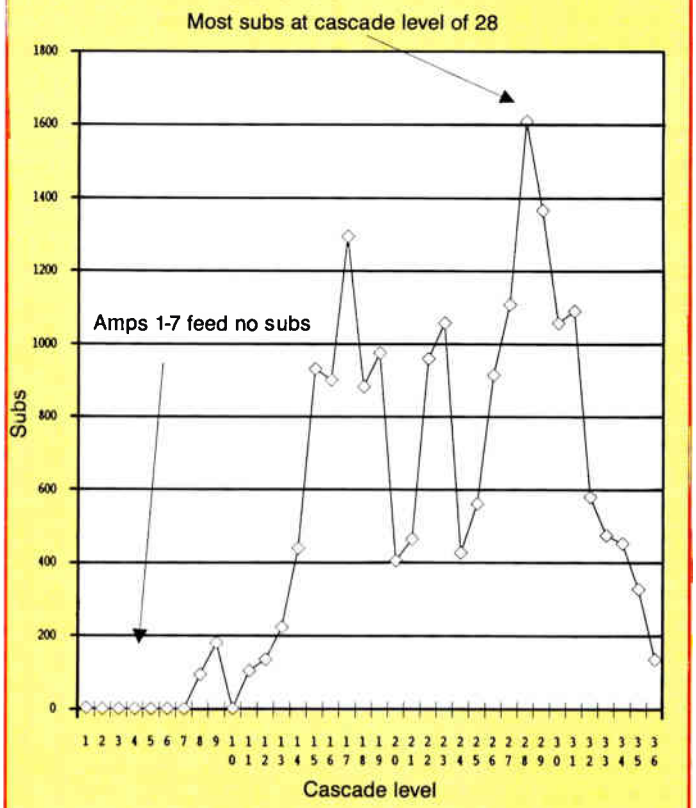


Figure 8: Fiber hub placement model (subs vs. cascade level)



● *Cable supertrunking:* This is a method that has been used by the cable TV industry for many years in the transportation of signals from one point to another. The purpose is to transport video, audio and other signals over fairly lengthy distances without significant degradation in their quality. Normal trunking techniques utilized by modern systems prohibit cascades beyond 30 to 40 amplifiers without some sort of enhanced method of signal processing/amplification.

Cable industry fiber-optics supertrunking has utilized FM modulation techniques in the past, but VSB-AM techniques are now under widespread development and application as well. Figure 2 shows a fiber-optic supertrunking application. Industry applications for supertrunking include tying of headends with remote sites or other headends and feeding several remote areas of as many as 15 to 20.

As the number of receive hubs involved escalates, the supertrunking concept begins to blend with the fiber backbone approach, which says: "Place one receive hub every so many trunk stations." Then, one can either feed all stations in the direction they fed before and use the old trunk for a redundancy feed, or turn some trunk amps around and feed larger areas with each hub but still retain a maximum cascade limit.

● *Cable fiber backbone and CAN:* Various fiber backbone (fiber trunk overlay) concepts have been proposed by major MSOs during the past several years. Both fiber backbone and cable area network (CAN) apply primarily to upgrade applications. As stated earlier, the premise in this type of application does not differ a great deal from the supertrunking concept except in the number of nodes used. The coaxial trunking system is broken into smaller segments. By definition this is no more than four to five amps, although in real applications segmentation of the trunk is rarely this small. A separate AM fiber and AM receive node feeds each minitrunk segment, with resulting distribution fed from this trunking section with normal design methods. The primary advantage gained is a drastic reduction in overall cascading of amplifiers. The normal trunk cascade of 20 to 40 amplifiers is now reduced to four to five. Figure 3 demonstrates this type of application. With distortions held relatively constant between normal coax layout and a backbone overlay, the carrier-to-noise ratio (C/N) typically will be improved from the low 40s (in normal cascade lengths) to around −46 dB to −47 dB.

Again, this type of application has typically been employed in new-builds, as the requirement to build a complete coaxial system, both trunk and feeder, along with all fiber runs to each optical receiver keeps cost prohibitive. In an upgrade, however, where the coaxial portion has been significantly depreciated, effective economics sometimes can be realized.

● *Cable fiber-trunk-feeder:* FTF, a fairly new proposal, seems to have application for both new-builds and upgrades, although originally proposed for new-build environments only. FTF proposes to replace the trunk system entirely with fiber runs to many receive hub sites. Each receive hub then feeds a fairly large distribution-only area. Original suggestions were that each receive hub site should be able to feed an "equivalent" distribution system area that typically could be fed with four trunk/bridger locations. Current design applications are taking that a step further, with each fiber-optic receive hub site feeding somewhere around 12 to 16 miles of distribution. Resulting cascades are typically four to five distribution amplifiers in cascade, with the first located with the receive hub electronics. Because of this sharp reduction in overall cascade length along with elimination of the trunking system, some significant improve-

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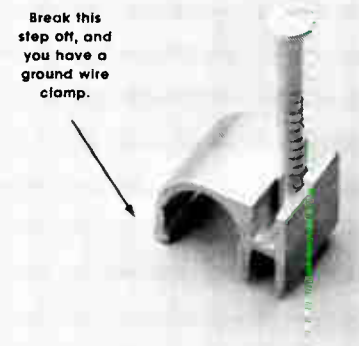

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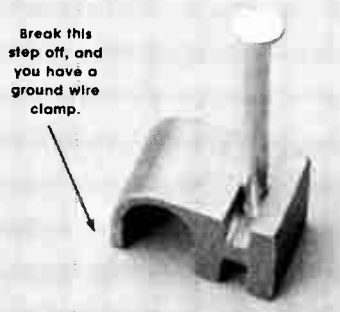

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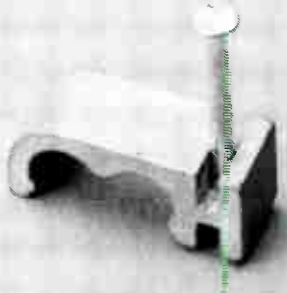

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ments in performance can be realized. Listed below are improvements in C/N (with other distortions held constant) over normal coax T&B, with backbone and FTF applications:

	Normal	Backbone	FTF
C/N	−42.1 dB	−46.6 dB	−51 dB

Because the trunking system is eliminated in this approach, there are significant savings realized and FTF seems to have application for both upgrades and rebuilds—where those upgrades require replacement of significant portions of the trunking system. Figure 4 illustrates an FTF application.

Caveats and design concerns

Given earlier discussions, and before we jump into some specific design examples, what are areas of change or concern as we begin this process? To begin with, and in many applications, fiber simply still costs more at this juncture. In addition, the cable industry has a current installed coaxial plant base that represents billions of dollars of investment and any replacement of coaxial plant will tend to be gradual. In the design process care needs to be taken in the financial analysis area when attempting to ascertain the true cost vs. system improvements gained by utilizing the fiber medium. (Later, we'll review some price comparisons in my examples based on comparison designs.)

Another area of concern for the designer has to do with distortion analysis. Coaxial designs in the past have primarily been third-order distortion-limited (cross-modulation in earlier systems at 300 MHz and less: composite triple beat in systems between 300 and 550 MHz). Current AM fiber links, however, are second-order distortion-limited. Great care needs to be taken in the area of distortion analysis and final system testing when your design incorporates the AM fiber transportation medium.

Distortions may not behave as they have in the past—particularly under real system testing. Finally, system designs that utilize a bandwidth of 550 MHz or greater are composite second order-limited. This is not because the number of second-order beats overtakes third-order, but because second-order beats are much higher in amplitude in our systems, and at 550 MHz and beyond there is adequate accumulation to become the limiting factor. Figures 5 and 6 illustrate the effect of total beat accumulation in 450 and 550 MHz systems, and demonstrate the large numbers of beat components involved.

The point to all of this is that greater care should be taken in your designs when combining the effects of total distortions from the AM fiber system with the distortions produced by the remaining coaxial system. The component mechanisms producing these distortions are radically different in optical- vs. coaxial-based generation.

Design considerations

Now let's examine some design ideas using fiber backbone and FTF concepts. The FTF architecture variation, of all proposed thus far, probably has the most potential for changing the way we design and operate our systems with resulting improvements in delivered signals to our customers. I say this because it currently goes the furthest in addressing the inherent limitations of fiber application to the T&B architecture that we reviewed earlier.

- *Fiber backbone:* Figure 3, as mentioned earlier, illustrates a backbone-type application. The backbone concept usually suggests one hub for each four to five trunk amps, but in real application this has rarely occurred. More than likely the

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system upgrade operates under a limited budget. We are then faced with the question, "Where should I place the (budgeted) hubs to gain the most improvement for money spent?" The best placement is typically where we gain the most reduction toward: 1) cascades of amplifiers on an amplifier basis, 2) cascades of amplifiers on a subscriber-fed basis and 3) cascades of amplifiers by examining both of the previous issues.

Figures 7, 8 and 9 demonstrate graph printouts from a computer model developed that aids in optimal placement of fiber hubs in the backbone approach—where a limited budget only allows for a certain number of hub sites. In that scenario, we can't place a hub every four amps, etc. We therefore want to place them to get the "most bang for our buck." Analysis can be performed with this model that graphically portrays, as shown in Figures 7, 8 and 9, where optimal placement of each fiber hub should be. Figures 7 and 8 illustrate cascade levels by trunk amp and subscriber in a system cascade without fiber; Figure 9 illustrates improvements with strategic placement of a single fiber hub. Different locations can be tried until optimal locations are known.

- *Fiber-trunk-feeder:* As mentioned earlier, Figure 4 illustrates a FTF-type application. Many variations of the FTF concept were experimented with, computing designs and equipment requirements for various types of distribution amplifiers, operational levels and other factors, with a final analysis of design economics.

The accompanying table illustrates composite results of those sample designs. The sample design was undertaken by using pure T&B coaxial architecture, then redesigning and comparing with the application of various FTF placements and variations. This sample design was developed for comparison purposes only between the architecture variations.

As can be seen from the table, FTF compares fairly well economically to new-build costs, with the higher quality distribution equipment producing more efficient designs and therefore better economics. The use of "express feeder" lends particular improvement to the FTF design effort. In this application, each FTF receive hub (with distribution amplifier) was strategically placed. An express feeder (no taps) was then routed to a strategically chosen second site for the second distribution amp (DA). Feeder then emanates from all DAs with backfeeding as necessary and as designed. When used in ugprade scenarios, existing trunk can be used for the express feeder

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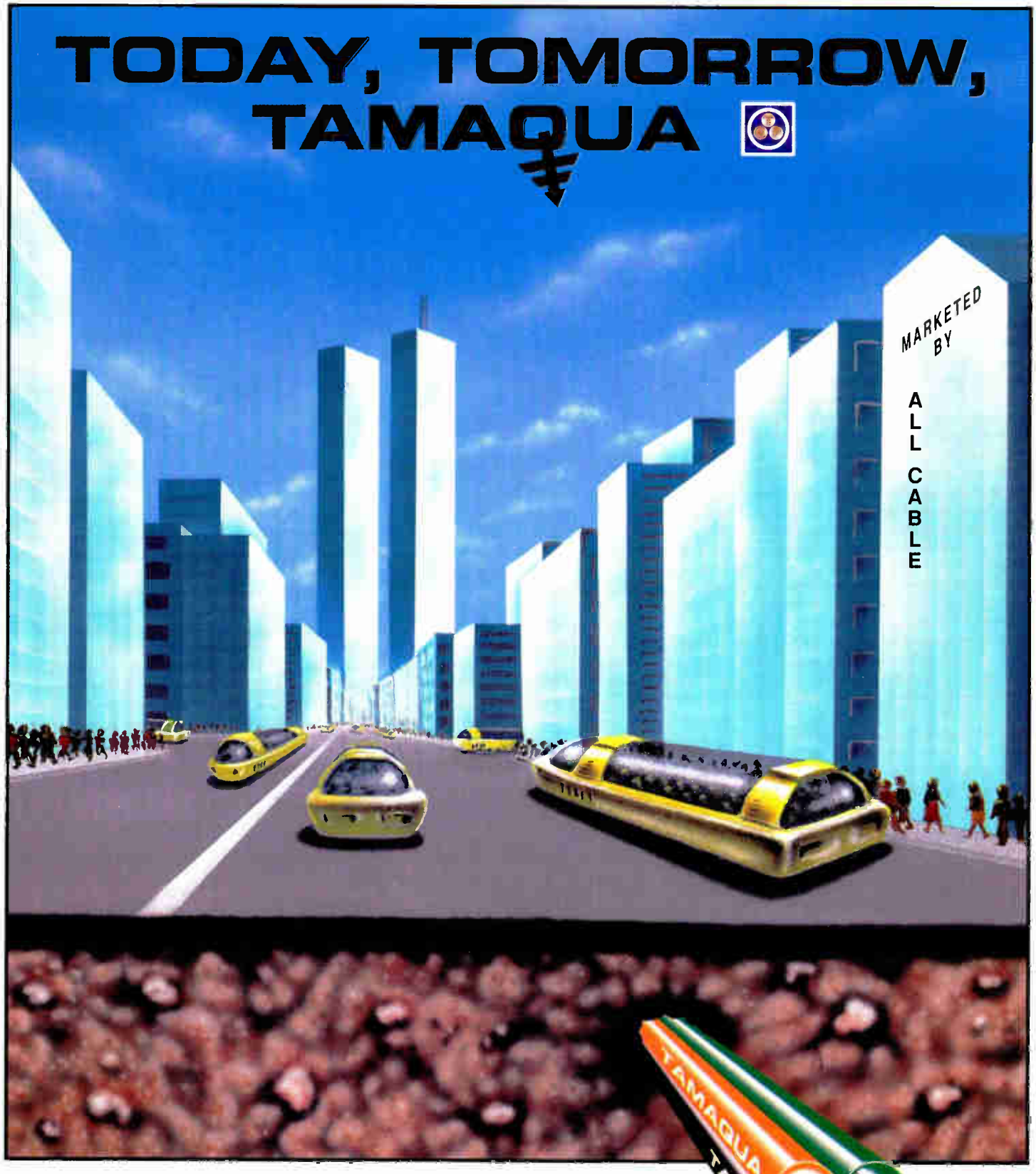

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in many situations, with existing feeder lines used for backfeed applications.

Sample designs indicate that four DAs in cascade (receive node plus three more) can cover an area of 10 to 12 miles of plant; five DAs in cascade (receive node plus four more) can cover an area of 14 to 16 miles of plant. Distortion improvements were listed earlier and are impressive compared to conventional design. Feedforward amps contribute to overall design economics because they allow for much higher operational levels with full 78-channel loading compared with parallel hybrid or conventional push-pull. These higher levels allow for increased design efficiencies that more than offset the higher cost of electronics, hence the cost improvements demonstrated.

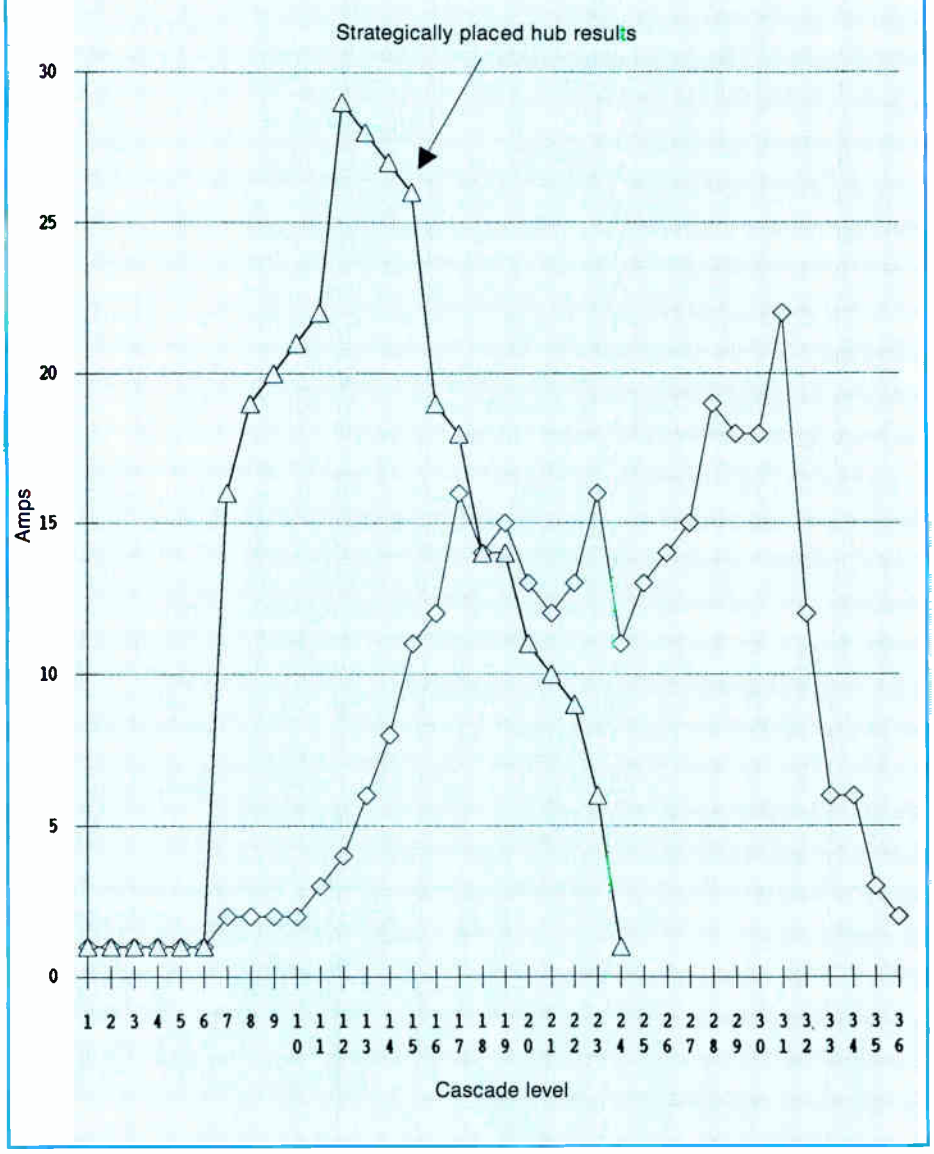
Finally, powering the FTF area also requires some brief discussion. It would seem that an ideal approach to powering in an FTF application would be for one power supply to handle all amplifiers within the FTF design area. Research on new AC design techniques and methods suggests that this in fact may be possible and offer significant improvements in AC design efficiency with a reduction in power company-related service outages.

One possibility that the industry should consider is raising power supply voltages beyond the current 60 VAC. Raising this voltage, perhaps significantly, would accomplish the following:

- Allow powering of significantly greater numbers of amplifiers than is currently possible.
- Reduce the amount of AC power dissipated in the coaxial cable itself, thus improving overall efficiency and lowering powering bills.
- The higher voltage and greater range would allow strategic placement of AC supplies in a way not possible today and would correspondingly reduce power company-related outages.
- The use of higher voltages would reduce the effects of sheath current-induced voltages and ultimate equipment failures significantly.

Space in this article does not permit full delineation of the techniques under consideration, but powering of a full FTF node is easily possible under raised supply voltage conditions and is eminently desirable for the reasons listed above plus others. (More on this in the future.)

Figure 9: Fiber hub placement model (amps vs. cascade level)



Conclusions

For cable TV to embrace a total fiber delivery system, current tree-and-branch topology eventually will have to be modified or abandoned for reasons discussed throughout this article. An optimal hybrid fiber/coaxial system such as FTF goes a very long way toward improvement of current delivery techniques and the resultant quality of the delivered video services.

This article has focused primarily on design and technical considerations. Cost issues have been summarized, with full delineation beyond the scope of this article. Suffice it to say that designed (sample and real) systems on current drafting tables suggest that real price compatibility between coax-only and fiber/coax hybrid systems is finally arriving, with many operational and technical advantages offered.

Ultimately a total fiber system will likely evolve for our industry. The advantages of all-fiber compared to current coaxial technology seems to preclude the likelihood to do otherwise. Given our current financial investment in coaxial plant, however, this evolution will take some time.

In terms of design considerations, great care should be taken in the primary areas discussed in this article: combination of distortion components and layout of fiber in such a way as to gain the most advantages for the fiber investment. Design tools such as computer models that accurately place the hubs in a backbone approach or aid in design comparisons between alternative placement techniques in FTF vs. conventional design, along with accurate distortion analysis models that include AM fiber calculations are invaluable.

In my final article we'll take an in-depth look at designing with interdiction technology, an area I believe holds great promise for our industry. **CT**

Information age

(Continued from page 16)

ment by having goods produced prematurely to their actual market need. While this principle is counter to today's residential network planning, which tends to be on an area basis, later in this article I will show how this "just in time" network planning principle can be applied.

The first planning principle—optimized delivery of each mega-service—in and of itself does not preclude one network as being the best solution. It does require, however, that each service be individually analyzed and then the best one be determined. The accompanying table shows some of the characteristics of home voice and video services. As can be seen, there are some major differences that have tremendous impact on the network design.

Many of these (that is differences in length of viewing time vs. talking time, need to connect two points anywhere in the world vs. need to deliver some specific things to every home in America, two-way vs. broadcast) are probably familiar to all. But one item, intelligence and functionality, is of special importance. The need to establish a two-way point-to-any-point conversation path requires that the intelligence and functionality of that network be centralized. However, the home video customer has invested in intelligent consumer electronic equipment —which, for example, performs switching (channel selection), displays messages on screen, etc.—and thus the network to serve the intelligent equipment, in order to be optimized, should not duplicate those already purchased features.

The result of careful consideration of these services characteristics is that the network planning requirements for serving video and for serving plain old telephone service (POTS) are too dissimilar to permit an efficient, optimized single network solution.

Service enhancements

However, we also must keep in mind the second planning principle, which is to be positioned to encourage customer desired enhancements. In the home voice and data area it means being able in some homes to have the ability to allow simultaneous usage of service, which could be two voice conversations or voice and data. Also there should be the ability to serve a growing data service requirement. For video, the customer drive for more programming choices will continue. Not only must the network be able to deliver those, but it must be able to help the viewer intelligently and easily know what is available to be seen.

In cable's average system today, with 35 channels, we offer our customers over 1,000 programming choices per day and in some of our systems it is already thousands of choices. For information services, it continues to be the hope of many of us that some information services will finally become desired. That may be interactive shopping or, hopefully, it will be exciting educational services.

Which information service will finally become in high demand still remains a mystery. However, it is cable's firm belief that every known or imagined information service requires either the bandwidth available over copper-based ISDN or the video bandwidth available over cable's coax. Thus there is no service that requires a transmission rate of between basic rate ISDN (144 kilobits per second) and video rate (45 megabits per second).

Optimum video network

With those planning principles in mind, what then is the opti-

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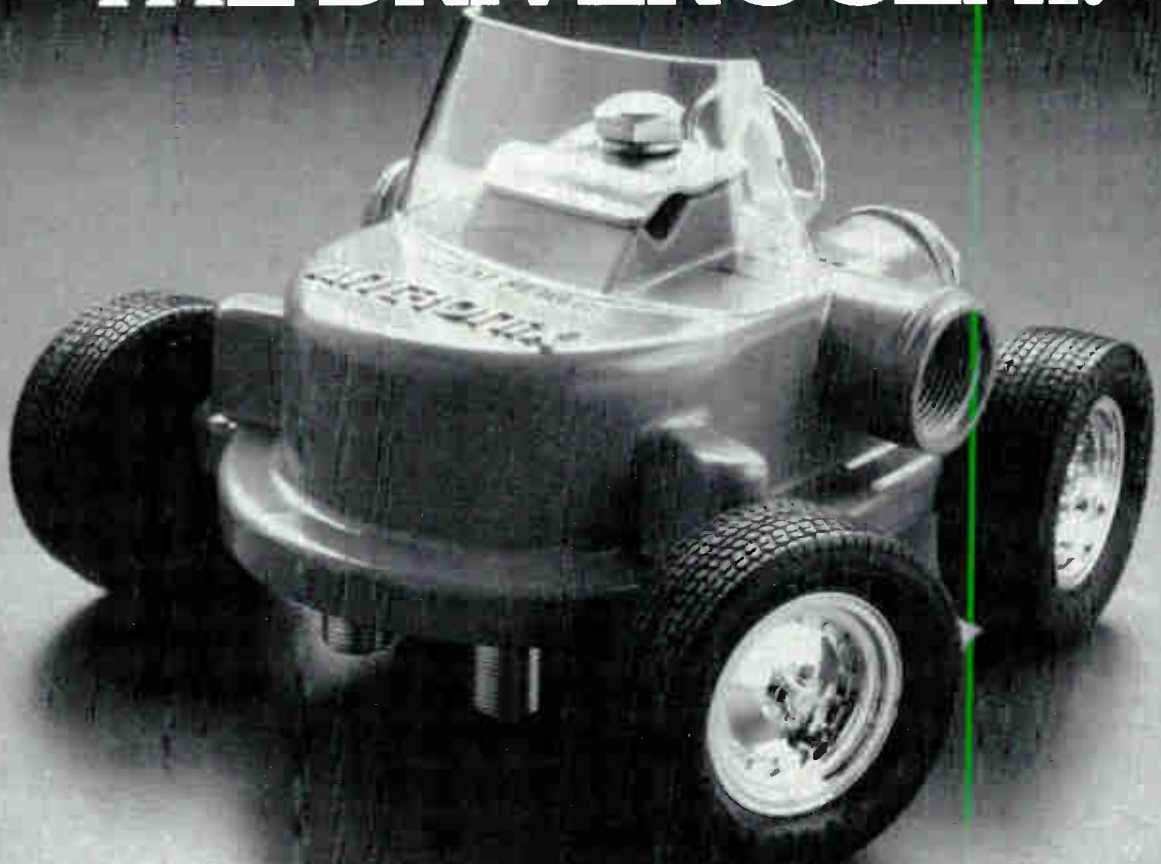

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"It is cable's recommendation that a new ISDN—integrated services via dual (or more) networks—is also the optimum way to provide information age capabilities and services now and into the future."

mum video network? Before designing any network, it is always best to carefully consider what the customer wants. This market-driven approach, which should be so obvious, is sometimes missed by those trying to justify a technology, instead of trying to serve a customer. Based on observations of customer video consumer electronics purchasing and video program viewing habits, the following are the key points to consider when designing a video network into—and I emphasize into and not just to—the home:

- First is it must be compatible with the home consumer electronic equipment, especially the newest TV set or VCR purchased. That means all of the channels need to be delivered to the back of the TV set, the interconnection should be coax and the network should complement the home equipment's functions, such as picture-in-picture, etc.
- As best as possible the home viewing experience should mimic the theater experience. That means quality of audio and video needs to improve and higher resolution will be needed to drive larger screens.
- Programming choices available to the consumer must and will continue to grow. However, although available options are increasing, only a relatively few of those options are in fact watched by many viewers. The demand for programs drops off quickly after the top few favorites.

What then is the best video network? It was CableLabs' hypothesis, proven in a market-driven speech, and supported by many others, that a fiber/coax hybrid network using analog modulation can provide all video services better, sooner and more economically than a switched-star, digital, all-fiber network. As supporting evidence of the truth of that hypothesis, it is interesting to note that every full scale, commercial cable TV network built by a telco has used either just coax or the fiber/coax hybrid, including those in Europe and what is currently the world's largest cable new-build, in Hong Kong.

As noted, our proof showed the fiber/coax network is the best home video delivery network. That is because it enriches the customers' investments in home consumer electronic equipment, efficiently shares network resources, optimally meets the needs of the video customer and positions cable to deploy future enhancements and offer new services.

Progressive enhancements

Let's look at how our typical embedded cable system, that is those that are passing over 85 percent of American homes, can be enhanced via intelligent refinements. Figure 1 shows what is typically in service now.

The headend receives video signals from various sources—satellites, microwave and/or off-air. These are then

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There is a cable product today that you can count on for the growth in your future. Quantum Reach.

QR, from Comm/Scope, is unmatched for its superior handling and attenuation characteristics. It has a unique construction that makes it like no other coax made today. QR has a medium-density polyethylene outer jacket for greater cut-through and abrasion resistance. But now, to that, we've added more bandwidth giving it 1GHz capacity. So, when we tell you that QR is the "1" to build with, you know what we mean.

For more information about QR or any of our Extended Reach family of 1GHz cable products, contact your nearest Comm/Scope representative or call Comm/Scope, Inc. (800) 982-1708 or (704) 324-2200.

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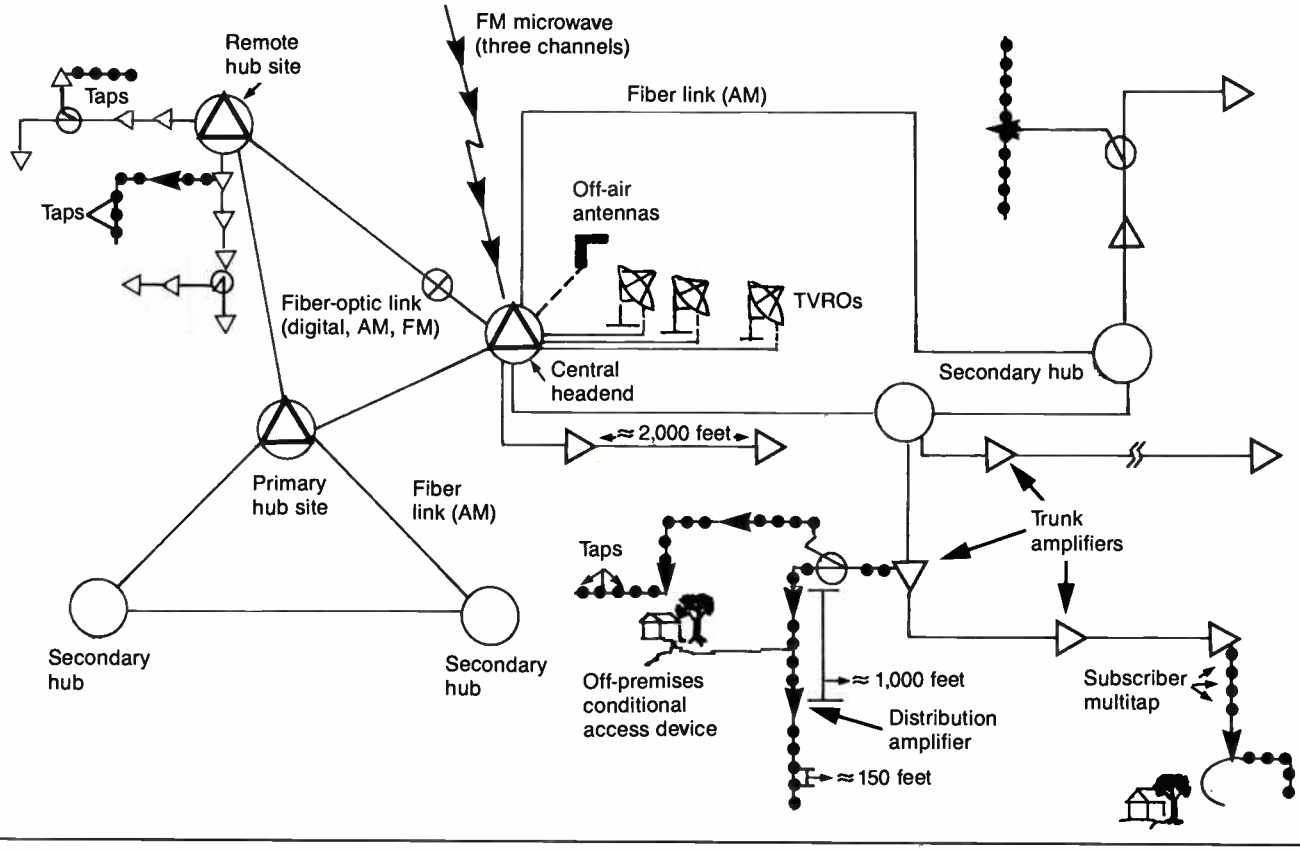
Reader Service Number 77

Figure 3: One of today's state-of-the-practice



the INTERVAL
SCTE
DECEMBER 1990

SCTE Executive Vice President Bill Riker congratulates Diana Riley on her appointment as Region 11 director at the Eastern Show held Sept. 16-18 in Washington, D.C.

Diana Riley Named Region 11 Director

The SCTE board of directors has appointed Diana Riley as Region 11 director, succeeding Pete Luscombe, who recently resigned from the position. Currently sales manager with Jerry Conn Associates Inc. in Chambersburg, Pa., Riley will serve the states of Delaware, Maryland, New Jersey and Pennsylvania in this position.

"I'm very excited about this appointment," Riley says. "I have already contacted all of the SCTE chapters and meeting groups in my territory and plan to go to as many of their meetings as possible."

Riley has served as president, vice president and second vice president with the Society's Delaware Valley Chapter. She also has been very active with the Appalachian Mid-Atlantic Chapter and currently is working with the recently formed Penn-Ohio and South Jersey Meeting groups. She has served as associate director of the Maryland/Delaware Valley Cable Television Association and currently is in her second non-consecutive term as associate director of the Pennsylvania Cable Television Association.

A native of England, Riley came to America in 1970 and became a U.S.

citizen in 1974. She joined Jerry Conn Associates as a secretary in 1977 and advanced to her current position of sales manager, in which she has worked for two years.

Riley joins a board consisting of President and Region 5 Director Wendell Woody, Anixter Cable TV; Eastern Vice President and Region 7 Director Vic Gates, Metrovision; Western Vice President and At-Large Director Richard Covell, Texscan; Secretary and Region 9 Director Jim Farmer, Scientific-Atlanta; Treasurer and Region 4 Director Leslie Read, Sammons Communications; Region 1 Director Pete Petrovich, Petrovich and Associates; Region 2 Director Ron Hranac, Coaxial International; Region 3 Director Ted Chesley, CDA Cablevision Inc.; Region 6 Director Bill Kohrt, Kohrt Communications Inc.; Region 8 Director Jack Trower, WEHCO Video Inc.; Region 10 Director Michael Smith, Adelphia Cable Communications; Region 12; Director Walter Ciciora, Ph.D., ATC; and At-Large Directors Tom Elliot, CableLabs Inc.; and Robert Luff, Jones Intercable.

Board Revises Committee System: Five New Committees Are Organized

The SCTE board of directors approved the reorganization of the Society's committee structure during its meeting held Sept. 6 in Reno, Nev. The board gathered in Reno to plan for SCTE's Cable-Tec Expo '91, which is to be held June 13-16 in this city. It the board voted in favor of the creation of five administrative committees that will oversee the Society's 24 previously organized committees, which will now be classified as subcommittees.

The five main committees are as follows:

* **Operations**—Jack Trower, WEHCO Video, Chairman
* **Finance**—Les Read, Sammons Communications, Chairman
* **Planning**—Bill Kohrt, Kohrt Communications Inc.
* **Training**—Walt Ciciora, Ph.D., ATC, Chairman
* **Engineering**—Tom Elliot, CableLabs Inc., Chairman

These committees were created by the board to oversee and provide guidance to the 24 subcommittees, as well as to facilitate the consistent flow of information through regular reporting to the board. It is currently being determined which subcommittees will operate under which of the five committees in accordance with the new system.

FCC Commissioner To Speak at Fiber Optics 1991 Conference

The Society currently is planning "Fiber Optics 1991," a three-day national conference on this vitally important topic. This conference will be held Jan. 9-10, 1991, at the Hyatt Regency Grand Cypress Hotel in

The Hyatt Regency Grand Cypress in Orlando, Fla., site of Fiber Optics 1991.

beautiful Orlando, Fla.

Andrew Barrett, a commissioner with the Federal Communications Commission, will give the luncheon address on the first day of the conference. This address will provide essential insight into the FCC's perspective on the role of fiber optics in the cable TV industry.

SCTE has scheduled a total of 24 outstanding technical sessions, to be presented by some of the industry's most prominent technical leaders. The conference will focus on the planning and use of fiber optics in the cable systems of today.

The first day of the conference will focus on fiber technology from a management perspective; a special one-day registration for system managers is available.

The preliminary schedule for the conference is as follows:

<u>Tuesday, Jan. 8</u>

7-9 p.m.
Arrival Night Reception
Sponsored by Optical Networks International (ONI) and AT&T

<u>Wednesday, Jan. 9</u>

8:15-8:30 a.m.
Opening Remarks
William Riker, Executive Vice President, SCTE

8:30-9 a.m. "Fiber's Role in CATV—Present andFuture" with Jim Chiddix, Senior Vice Presi dent - Engineering and Technolo gy, ATC

<u>AM SESSION: FIBER FOR MANAGEMENT—Real Life Case Histories Examining the Dollars and Sense of Fiber Usage</u>

Session Moderator: Scott Esty, Customer Development Specialist - MSO, Corning Inc. →

9-9:30 a.m.
Case Study: A Financial Analysis of Fiber; Proven Factors in Suburban Boston" with Kevin Casey, Director of Engineering Continental Cablevision of New England
9:30-10 a.m.
"Case Study: The Economics of the St. Petersburg Fiber Story, Rebuilding with Fiber to the Feeder" with Gene White, Vice President, Engineering, Paragon Cable
10:30-11 a.m.
"Case Study: How Cable TV Systems' Technical Performance Objectives Can Complement Financial Performance Objectives" with Dick Mueller, Director of Operations Engineering, Cox Cable Communications
11 a.m.-12 noon
"Roundtable Discussion: The Answers to Your System Management Questions" with a panel of industry experts
12-1:45 p.m.
Luncheon
Speaker: Andrew Barrett, Commissioner, FCC

PM SESSION: FIBER PROJECT MANAGEMENT

Session Moderator: John Walsh, Vice President of Engineering, Cablevision of Central Florida

1:45-2:15 p.m.
"Case Study: Planning a Major Fiber Upgrade" with Al Johnson, Director-Technical Operations, Cablevision Systems Development
2:15-2:45 p.m.
"Case Study: Planning the Fiber Rebuild in Augusta" with Mike Scott, Chief Engineer, Jones Intercable
2:45-3:15 p.m.
"Fiber Construction Techniques" with Daniel Pope, Supervisor, AT&T Bell Labs
3:30-4 p.m.
"Case Study: Fiber Plant Construction" with Les Smith, Vice President, Southwest Operations, Cable Constructors
4-4:30 p.m.
"Fiber Planning, Construction and Proofing" with Charles Mogray, Applications Engineering Manager, Comm/Scope
4:30-5 p.m.
"Fiber System Testing, Maintenance and Restoration" with Sandy Lyons, Vice President, Engineering, Siecor Corp.
5-7 p.m.
Exhibits Open
7-9 p.m.
Welcome Reception
Sponsored by Jerrold Communications

Thursday, Jan. 10
AM SESSION: FIBER FOR ENGINEERS—PERFORMANCE ISSUES

Session Moderator: Jim Chiddix, Senior Vice President-Engineering and Technology, ATC

8:15-8:35 a.m
"Designing Approaches to Fiber Upgrades" with David Grubb III, Manager, Advanced Engineering, Jerrold Communications
8:35-8:55 a.m.
"Designing Fiber to the Feeder in Rebuilds" with Robert Loveless, Manager, Applications Engineering, Scientific-Atlanta
8:55-9:15 a.m.
"Full Fiber Deployment Designs"

with Ronald Cotten, Chief Executive Officer, Engineering Technology Group Inc.
9:30-9:50 a.m.
"Case Study: Designing a Plant Upgrade with Fiber" with Larry Lehman, Vice President, Technology and Planning, Cencom Cable Associates Inc.
9:50-10:10 a.m.
"Case Study: Plant Extension and Upgrade Design" with James Kersnowski, Western New England District Engineering Manager, Continental Cablevision
10:10-10:30 a.m.
"Case Study: System Rebuild Design with Fiber" with Thomas Staniec, Engineer, NewChannels
10:45-12 noon
Roundtable discussion sparked by questions from the moderator and the floor
12-1:45 p.m.
Luncheon
Speaker: Glenn Jones, Chairman, Jones Intercable

PM SESSION: NEW DEVELOPMENTS IN FIBER
Session Moderator: Pete Petrovich, President, Petrovich and Associates

1:45-2:15 p.m.
"Fiber-Optic CATV Transportation Using Combined PCM and VSB-AM Transmission" with Stefhan Sherman, Product Manager, Video, Sumitomo Electric
2:15-2:45 p.m.
"Digital Delivery Technology for CATV Networks" with Carl McGrath, Supervisor, CATV Lightwave, AT&T Bell Labs
2:45-3:15 p.m.
"FTF Design Analysis and the Application of Amplifier Technology" with Colin Horton, Product Manager, Data Distribution Products, C-COR Electronics Inc.
3:30-4 p.m.
"Status of 1,550 nm Analog Fiber-Optic Systems and Performance" with Rezin Pidgeon, Principal Engineer, and Lee Thompson, Vice President, Engineering Distribution, Fiber-Optic Products, Scientific-Atlanta
4-4:30 p.m.
"CATV AM Optical Transmission Links Using the 1,550 nm Window" with Vincent Borelli, President, and Hermann Gysel, Vice President, Engineering, Synchronous Communications
4:30-5 p.m.
"Applications of Erbium Doped Fiber Amplifiers in CATV Networks" with Clive Holborow, Distinguished Member of Technical Staff, AT&T Bell Labs
5-5:30 p.m.
"Effects of Chromatic Dispersion on Analog Transmission" with Louis Williamson, Member, Technical Staff, ATC
5:30-7 p.m.
Exhibits Open
7-9 p.m.
Closing Night Reception
Sponsored by Scientific-Atlanta

Registration fees for the conference are as follows: $195 (SCTE member), $295 (non-member), and $235 (non-member joining SCTE). Reservations must be received by Dec. 10, 1990. Attendance is limited, so early registration is advised.

For further information and registration materials for "Fiber Optics 1991," please contact SCTE national headquarters at (215) 363-6888 or write to: 669 Exton Commons, Exton, Pa. 19341.

SCTE Calendar

The "**SCTE Calendar**" is an *Interval* feature incorporating Satellite Tele-Seminar Program listings(*), news of upcoming national events and announcements of upcoming local SCTE chapter and meeting group seminars.

Dates for 1990

Dec. 4 Florida Chapter, Central Florida Meeting Area—Lakeland, Fla. BCT/E examinations to be administered. Contact: Keith Kreager, (407) 844-7227.

Dec. 4 New England Chapter—Location to be announced. BCT/E examinations to be administered in Categories III and V at both engineering and technician levels. Contact: Jeffery Piotter, (508) 685-0258.

Dec. 5 Ark-La-Tex Meeting Group—Holiday Inn, Longview, Texas. Topic: "FCC Regulation" with Sandra Morris of FCC of Dallas and "CLI" with Les Read of Sammons Communication. Contact: Robert Hagan, (214) 758-9991.

Dec. 5 Bluegrass Meeting Group—Information to be supplied. Contact: Liz Robinson, (609) 299-6288.

Dec. 5 Delaware Valley Chapter—Williamson Restaurant, Horsham, Pa. Topic: "Newbuild and Rebuild Construction." Contact: Dan McMonigle, (215) 265-4233.

Dec. 5 Florida Chapter, First Coast Meeting Area—Jacksonville, Fla. BCT/E examinations to be administered. Contact: Keith Kreager, (407) 844-7227.

Dec. 6 Upper Valley Meeting Group—Holiday Inn, White River Junction, Vt. Topic: "System Powering and Design." Contact: Matthew Alldredge, (203) 328-0640.

Dec. 8 Rocky Mountain Chapter—Location to be announced. Topic: "Basic Cable for CSRs." BCT/E examinations to be administered *(tentative)*. Contact: Rikki Lee, (303) 321-7551.

Dec. 10 Greater Chicago Chapter—Information to be supplied. Contact: John Grothendick, (800) 544-5368.

Dec. 11 Central Illinois Chapter—Information to be supplied. Contact: Ralph Duff, (217) 424-8478.

Dec. 11 Desert Meeting Group—Location to be announced. Topic: "Installation Practices." Contact: Chris Middleton, (619) 340-1312, x258.

Dec. 12 Penn/Ohio Meeting Group—Location to be announced. Topics: "Construction and Installation Standards and Practices" and "Safety." Contact: Bernie Czarnecki, (814) 838-1466.

Dec. 13 Chesapeake Chapter—Holiday Inn, Columbia, Md. Topic: "BCT/E Certification." Contact: Keith Hennek, (301) 731-5560.

Dec. 13-14 Sierra Chapter—Party Palace, Fairfield, Calif. Northern California Vendors meeting to be held, featuring tabletop demonstrations and breakout discussions. Contact: Steve Allen, (916) 786-2469.

Dec. 19 Great Plains Chapter—Information to be supplied. Contact: Jennifer Hays, (402) 333-6484.

Dec. 19 North Central Texas Chapter—Location to be announced. BCT/E examinations to be administered in Categories II, V, VI and VII. Contact: Terry Blackwell, (214) 578-7573.

Dec. 25 Satellite Tele-Seminar Program, *"Data Transmission Techniques (Part Two)"* with Andy Paff and Don Patton of Anixter Cable TV. Videotaped at Cable-Tec Expo `89 in Orlando, Fla. To air from 12-1 p.m. ET on Transponder 2 of Galaxy III.

Jan. 9 Central Illinois Chapter—Peoria, Ill. Information to be supplied. Contact: Ralph Duff, (217) 424-8478.

Jan. 9-10 "Fiber Optics 1990" National SCTE Conference—Hyatt Regency Grand Cypress, Orlando, Fla. Panel discussions and "hands-on" demonstrations to be held, focusing on "Planning and Using of Fiber Optics in Your Cable System Today." For further information, contact SCTE national headquarters, (215) 363-6888.

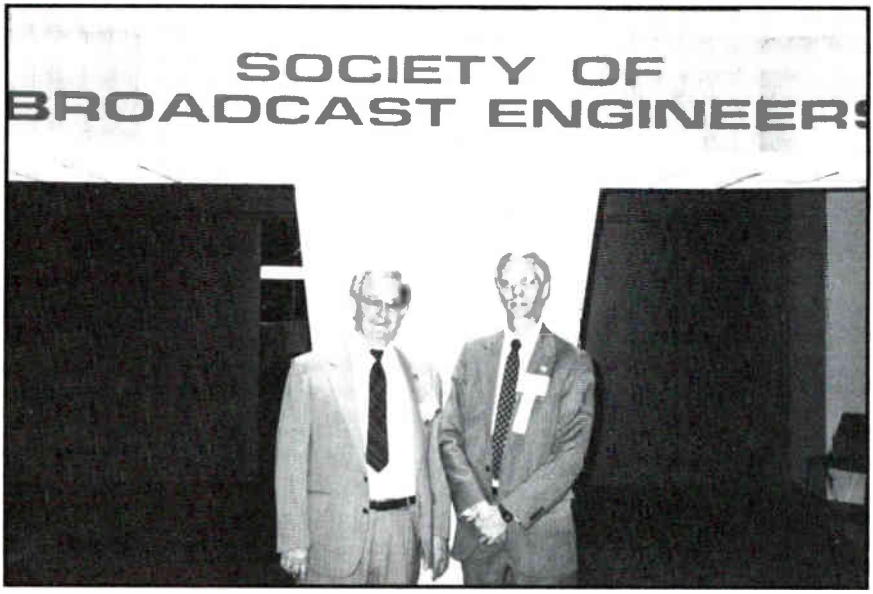
Jan. 19 Cactus Chapter—Location to be announced. Topics: "Fiber Optics, Microwave and Supertrunk Technologies." Contact: Harold Mackey Jr., (602) 866-0072, x282.

Jan. 22 Florida Chapter, Gulf Coast Meeting Area—Location to be announced. BCT/E examinations to be administered. Contact: Keith Kreager, (407) 844-7227.

Jan. 23 Florida Chapter, South Florida Meeting Area—Location to be announced. BCT/E examinations to be administered. Contact: Keith Kreager, (407) 844-7227.

*Tele-Seminar Programs may be downlinked by any cable system and recorded for immediate and future employee training purposes. All Tele-Seminar Programs will air from 12-1 p.m. ET on Transponder 2 of Galaxy III.

Society Active at Industry Shows

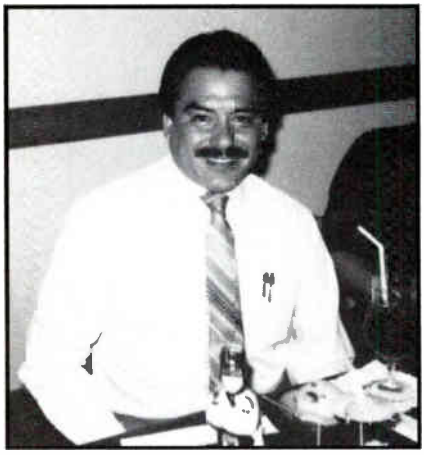


SCTE President Wendell Woody meets with Brad Dick, president of the Society of Broadcast Engineers (SBE), at the SBE Convention held Oct. 4-7 in St. Louis.

SCTE President Wendell Woody (right) moderates a panel on "Fiber in CATV" at the Fiber Optic and Computer Networking Conference held Oct. 24-26 at the World Trade Center in Boston. Also participating in the panel were Kevin Casey of Continental CableVision Inc., Mike Angi of Colony and Rand Reynard of Optical Networks International.

Member Profile: Frank Maldonado

"Member Profile" is an "Interval" feature that puts the spotlight on you, the Society's members. Each month, an SCTE member will be profiled in this feature: his career, his experience, his involvement with the Society. Members featured will be chosen from all levels within the industry; from engineer to installer, from manager to technician.



Frank Maldonado

Frank Maldonado is accustomed to a busy and demanding working day. As director of Operations for United Artists Cable in City of Industry, Calif., he is responsible for overseeing all technical aspects of the system's operations, including headends, maintenance, service, dispatching, installation, construction and the warehouse. But he is no newcomer to hard work.

A 20-year veteran of the cable TV industry, Frank got his start in 1970 as an installer for Cablecom General in Colorado Springs, Colo. He was promoted to the levels of service and maintenance technician and in 1974 went to work for United Cable TV in Albuquerque, N.M. "They were building a new franchise there," he recalls, "and I was hired as the lead technician to help supervise the construction." He remained with the system when it was bought by Tribune, serving in the position of technical manager until 1981. During this period he earned a bachelor of science degree in business administration from National College in Albuquerque, N.M.

Frank settled in the area that has since become his home at the beginning of 1982 when he joined the Rogers system in Downey, Calif. "I was fully responsible for the build and activation of a new addressable system that served five cities," he recalls. He remained with Rogers until 1984, when he was recruited by Falcon Communications to serve as director of engineering at the company's corporate office. In 1985 he joined Group W, which became Paragon Cable. He joined United Artists Cable to serve in his current position in 1987.

An SCTE member since 1982, Frank is a founding member of the Southern California Chapter, and served as its president in 1988 and 1989. He remains on the chapter's board of directors and also has served on the board of directors of the Southern California Cable TV Association.

Frank was recently elected president of Latinos in Cable, an organization he describes as "primarily a group formed by Hispanics to help promote Hispanics in the cable industry through seminars and discussions. We are also providing information for builders on what the Spanish community is looking for from cable service. Everybody has their own likes and dislikes, so we try to provide that type

of information to cable systems serving primarily Hispanic areas. We currently have 180 members and see it as something that will continue to grow as we provide training and information to Latinos in the industry."

With his years of intensive experience in the industry, Frank has encountered some unusual situations over the course of his career. He recalls one special project he undertook in San Francisco's bay area. "Amplifiers were exploding," he says. "It was obviously a very odd thing, and it was suspected that it might have been sabotage. The person who was my boss at the time and I checked into it and discovered that the cable was not cooked long enough in the manufacturing process, and methane gas was building up in the amps and causing them to explode when any kind of spark occurred. We got a gas detector to measure it and got together with the manufacturer, who was then responsible for replacing quite a bit of cable. I think they learned to let it cook a bit more after that."

Frank has two sons, ages 11 and 16, and enjoys gardening, woodworking and listening to music in his spare time. He enjoys working in the industry and has positive feelings about the Society's role in it, stating, "I feel very strongly about what the Society is doing in providing education and skill building opportunities that are so needed in the industry's technical arena. I am especially supportive of the certification programs and encourage my employees to participate in these very beneficial endeavors."

Legal Watch: Temporary Licensing in the Private Land Mobile

By Stephen Ross, Esquire
and Robert D. Primosch, Esquire
Fletcher, Heald & Hildreth
Washington, D.C.

Last December, the Federal Communications Commission amended its rules to provide for "conditional temporary self-licensing" in the private land mobile radio services. Generally, the FCC's temporary licensing procedure is available for facilities operating on frequencies below 470 MHz. On frequencies above 470 MHz, temporary licenses are available where:

a) The applicant is using (or proposes to use) an existing community repeater as an "add-on" licensee;
b) The applicant is (or proposes to be) a licensed user of an existing SMR system; or
c) The applicant requests a paging facility on frequencies in the 920-930 MHz band.

Temporary licensing is *not* available where:

a) The facility is above Line A or below Line C (near the Canadian border);
b) The antenna needs FAA clearance;
c) FCC authorization of the facility requires a rule waiver;
d) FCC authorization of the facility would be a "major" environmental action; or
e) The facility would be in one or more of the radio "quiet" zones.

Temporary licensing also is not available for private microwave relay stations used by cable systems (i.e., "CARS" stations).

A temporary license becomes

effective once an application for the facility is filed with the commission. The temporary license is valid for 180 days or until the commission disposes of the application. If the application is dismissed, the temporary authority lapses automatically. Applications that trigger a temporary license include those for 1) new facilities, 2) modified facilities and 3) facilities that are being assigned or transferred to another party. For applications requiring frequency coordination, the temporary license becomes effective when the frequency coordinator forwards the application to the FCC. For assignments or transfers of control, a temporary license in the name of the assignee or the transferee becomes effective upon the filing of the assignment or transfer of control application. Hence, temporary licensing permits prompt closing of cable system sales that involve private land mobile facilities.

To take advantage of the temporary licensing procedure, the applicant should keep a complete FCC-stamped copy of their application on hand at all times. That document is evidence that a temporary license is in effect.

Now that the FCC's temporary licensing procedure is in place, STAs have become largely unnecessary and hence very difficult to obtain. Therefore, cable and other private radio users are advised to use temporary licenses where authorization to operate or sell a facility is needed right away. Note, however, that where frequency coordination is required it may take up to a month before the coordinator files the application with the FCC, thereby delaying the effective date of the temporary license.

Chapter and Meeting Group Spotlight

"Chapter and Meeting Group Spotlight" is an *Interval* section that focuses on recent SCTE chapter or meeting group events noteworthy for their topic, attendance numbers or innovative approaches to technical training.

The Appalachian Mid-Atlantic Chapter met Sept. 19 at the Holiday Inn in Chambersburg, Pa., for a seminar on "RF Electronics, Digital and AM Fiber Products." C-COR representatives Colin Horton, Dave Jordan and John Snyder were the speakers for the event, which concluded with a tour of the production plant of Nitterhouse Concrete Products, a manufacturer of preconstructed concrete buildings.

The Cactus Chapter held a meeting Sept. 15 at the offices of Dimension Cable in Phoenix, Ariz. Chapter Secretary Jondavid Herring reports, "In his presentation on 'Basic Electronics,' Farrel Anderson covered basic electronics capacitance, impedance, conductance, power, slope and tilt. Chris Radicke spoke on 'System Design,' covering basic RF design, AC design, expanding RF system topology and alternative architectures. Harold Kronberg gave a presentation on 'Modern System Design' that taught us how to identify and define numerous terms and variables commonly used, as well as how to construct a balance between performance and cost." Twenty-two people were in attendance at the meeting.

The Cascade Range Chapter reports that it presented its 18th technical seminar Sept. 11 at the Holiday Inn in Wilsonville, Ore. The morning session opened with a presentation on the topic "Rebuild Considerations of the 1990s" by Hugh Bramble of

Columbia International. This was followed by a presentation on BCT/E Category V, "Data Networking and Architecture," by Bob Turner of Proven Solutions. After a buffet luncheon, John Koczan of Magnavox spoke on "Rebuild/Design Considerations, Line Monitoring Equipment and Preventative Maintenance."

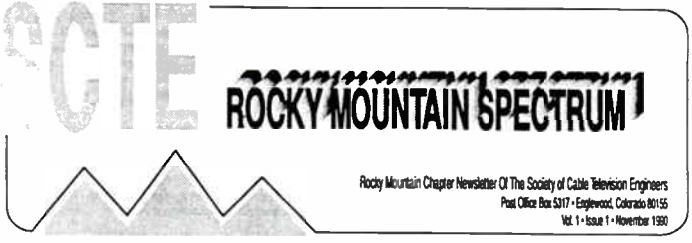
"Technical Training" was the focus of **The Delaware Valley Chapter**'s Oct. 10 meeting, held at the Williamson Restaurant in Horsham, Pa. Presentations included "Motivational Training for Technicians" with Mickey Diamond of the Lenfest Group, "Developing an In-House Training Program" with Rich Blanford of Garden State Cable TV, "The Whys and Hows of Technical Training" with Ron Wolfe of the ATC Training Center and "NCTI's Support Role in Technical Training" with Tom Brooksher of the National Cable Television Institute. Forty-one people were in attendance at the meeting, which concluded with the administration of BCT/E examinations.

The First Coast Meeting Area of **The Florida Chapter** focused on "NCTA Cable Standards" and "Customer Service Methods" at its Sept. 19 meeting, held at the Quality Inn South in Jacksonville, Fla. Joe Passero, the secretary for the meeting area, reports that Jack Pottle of Rifkin "discussed the NCTA committee's intent when they drew up NCTA standards. Jackson Hatten of TCI discussed his company's customer service methods. A panel consisting of Ray Grimsley, Joe Passero, David Reid, George Thorry and Bob Wright discussed legislation and current approaches to customer service as well as how to meet standards." Twenty-one people were in attendance.

"Fiber Optics for the Front Line and System Technicians" was the topic of the Oct. 17 meeting of **The Golden Gate Chapter** held at the Alameda County Fairgrounds in Pleasanton, Calif. Grif Morrel of BT&D Technologies discussed optical passive and active devices including what they are, how they work and how to use in them in systems. Split ratios, back reflections and insertion loss were discussed. Tom Elliott of Catel Telecommunications explained several fiber architectures including the fiber backbone, the CAN system and fiber trunk and feeder. Applications for each architecture, as well as applications for AM, FM and digital signal delivery. A panel discussion followed, featuring engineers from area systems that have deployed fiber sharing both their positive and negative experiences.

The Great Lakes Chapter met Sept. 26 at the Holiday Inn in Livonia, Mich., for a seminar devoted to BCT/E Category I, "Signal Processing Centers." SCTE Western Vice President and At-Large Director Richard Covell of Texscan was the speaker on this topic, and Chapter Secretary Marv Nelson reports that Covell "covered the basics of headend amplifiers and headend processing of RF signals and then showed the interconnection of all equipment." The meeting also featured a practical demonstration on testing headend equipment such as processors and modulators conducted by chapter President Daniel Leith of United Cable of Oakland. Fifty-five people attended the meeting.

The Heart of America and Gateway Chapters held a joint meeting in conjunction with the Missouri Cable Television Association's meeting on Aug. 30-31 at the Lodge of the Four Seasons in Lake of the Ozarks, Mo. A panel consisting of Pierre Cubbage



President's Corner

Welcome to the new SCTE Rocky Mountain Chapter newsletter, *The Rocky Mountain Spectrum*. Our editor Doug Ceballos, from NCTI, has some great ideas. This format should allow us to better inform you of the things that are happening with the SCTE.

We had a great turnout for the 1990 Cable Games this year and we hope that everyone had a good time. Next year's Cable Games should again be a good challenge for all the participants.

Our next seminar will be held at the Tele-Communications Inc. (TCI) corporate offices on Wednesday October 31, 1990. The subject for the next informative seminar will be "Data" in the morning and "Terminal Devices" in the afternoon. AT&T will be covering Data and Scientific-Atlanta and Jerrold will be conducting the Terminal devices portion. Details can be found in the back of the newsletter. The election for the 1991 Rocky Mountain Chapter Board of Directors will be coming up soon. If you or someone else you know are interested in running for election to the board, please contact me at 721-5390 or Eric Himes at 424-4976, or write to:

Rocky Mountain Chapter of SCTE
P.O. Box 5317
Englewood, CO 80155
ATTN: Steve Flessner

We need to find new board members to keep a fresh look at our operations. We would also like to know if you have any ideas for seminars, or if you would like to sponsor or host a technical seminar.

Again, welcome to our newsletter and please feel free to make any comments or suggestions to our editor.

Steve Flessner, TCI

V. P. COMMUNICATION

About two years ago, Steve Johnson and I embarked on a project very familiar to many of you-namely, gathering all the recommended review materials together for the Broadband Communications Technician-/Engineer (BCT/E) Certification Programs. I thought that perhaps we could join forces and resources (since Steve was almost done and I was just beginning!) and come up with some material which could be used by both Jones and ATC systems. And so we did. At Jones we added a separate introduction, which consists of BCT/E related material from the November, 1988 Interval program applications, and additional information about the certification program. We bound each of the six catagory review materials (Catagory VII requires no review material) into 2" wide, three-ring binders, complete with tabs and a table of contents.

During the past two years, I have heard stories of how these review binders have been the "envy"of test takers at local chapter meetings. I have been flooded with inquiries by SCTE members yearning for their own copies. However, we had two problems: first we weren't set up to make mass distributions to companies outside of Jones, and second, since these materials are copyrighted, they could be copied for reference material, but could not be sold. Due to continued interest, we have recently made arrangements with a local printer to create copies for the industry at the cost of printing and handling.

Review Materials Content:

The assembled material consists of approximately 90 percent of the periodicals, papers, and articles recommended by the

(Continued on Page 2)

This sample page from the newsletter of the Rocky Mountain Chapter is handsome and professionally produced and is indicative of the group's dedication to furthering the goals of SCTE.

(moderator) of Mega Hertz, Dick Beard of Continental Cablevision, Terry Cordova of Galaxy Cablevision, Steve Dyche of United Video Cablevision and Don Henry of ATC discussed CLI, specifically Missouri operators' compliance with the FCC's CLI deadlines. Don Gall moderated a panel consisting of Ken Covey of Jones Intercable, Larry Douglas of St. Joseph Cablevision and Garland Thomas of CenCom Cable to discuss fiber-optic applications among the state's cable TV operators. SCTE Region 8 Director and past President Jack Trower of WEHCO Video and current President and Region 5 Director Wendell Woody of Anixter Cable TV provided an update on SCTE for managers, focusing on the Society's impact on company performance and the industry as a whole. A total of 56

people attended the sessions.

The Michiana Chapter focused on "Fiber Optics" at its Sept. 12 meeting, held at the Signature Inn in South Bend, Ind. The speaker for the event, Barbara Bliss of Siecor Corp., gave "an informative, interesting presentation that included basic fiber theory, fiber manufacturing techniques, aerial installation considerations, AM vs. FM overview, cable plant architecture and demonstrations of mechanical and fusion splicing," according to chapter Secretary Russ Stickney. Plaques were presented to Steve Rhoades and Doug Wilson in appreciation of their efforts as founders of the Michiana Chapter.

The New England Chapter held a meeting Sept. 11 at the Sherator Inn in Boxborough, Mass. According to a report by Tom Kennedy, "Two BCT/E review sessions were held—one for Category III, 'Transportation Systems,' and the other for Category V, 'Data Networking and Architecture.' The morning session on Category III was given by Randy Karr of Channel-Master Corp. The session was very informative and Randy gave an excellent presentation. Topics covered included why to use microwave, FM transmitter, signal channel and receiver theories, AM systems, single sideband upconversion, microbeam systems and calculations for noise, distortion and path.

"The afternoon session on Category V was conducted by Randy Reynard of Optical Networks International," Kennedy continues. "Once again the presentation was excellent! Included among the topics covered were synchronous vs. asynchronous systems, serial vs. parallel, sampling rates, standards, LAN configurations, fiber optics, troubleshooting, design and testing. Total attendance for the day was 28 people."

The Ohio Valley Chapter held consecutive meetings Aug. 14 and 15 at the Holiday Inn in Cleveland and the Rodeway Inn in Cincinnati respectively. Both meetings featured speaker Dane Walker of Hughes Microwave who gave presentations on BCT/E Category III, "Transportation Systems." BCT/E examinations were administered at both sessions. Forty-three people were in attendance at the Cleveland meeting, while 54 people were present the following day in Cincinnati.

The Old Dominion Chapter met Sept. 16-17 at the Holiday Inn in Richmond, Va. Chapter Secretary/Treasurer Margaret Davison-Harvey reports that the 16th was devoted to the administration of examinations in the BCT/E and Installer Certification Programs, while the following day featured presentations by Roy Ehman of Jones Intercable on "Outage Control and Lightning Protection," Alan Rebeck of AM Transector Systems on "Surge Supression" and Marty Connor of Optical Networks International on "Fiber Optics." Twenty people were in attendance Sept. 16 and 33 people attended the Sept. 17 session.

The Palmetto and Piedmont Chapters reported on a series of technical seminars, "New Cable Technologies of the 90s," which were held in conjunction with the annual meeting of the South Carolina and North Carolina Cable Television Associations Aug. 13-14 at the Kingston Plantation in Myrtle Beach, S.C. Included among the technical sessions presented by the chapters were "Digital Audio Services on Cable Systems" with Tom Ferraro of Jerrold Communications, "Fiber-Optic Cable and Electronics" with Richard Ellis of Sumitomo Electric and Barbara Bliss of Siecor Corp., "Fiber Architectures and AM Fiber Equipment Design

Guest speaker David Pangrac of ATC, SCTE President Wendell Woody, Region 11 Director Diana Riley and Penn/Ohio Meeting Group President Bernie Czarnecki gather at the group's Oct. 16 meeting held in Pittsburgh.

Objectives" with Gary Lyons of Scientific-Atlanta, "AM Fiber" with Dean Bogart of John Weeks/Orchard Communications, "FM Fiber" with Larry Lindler of Catel, "Fiber-Optic Support Services" with Tim Holzer of Anixter Cable TV/Optical Networks International, "AM Fiber-Optic System Equipment" with Bob Harris of C-COR Electronics and "OSHA's Gonna Get You If You Don't Watch Out" with SCTE Director of Chapter Development and Training Ralph Haimowitz. The event also offered demonstrations of fiber-optic cable and splicing techniques by Siecor Corp. and Sumitomo Electric. Fifty-three people attended the sessions, the chapters reported.

"Connectors, Cable and NEC Rules" was the topic of **The Rocky Mountain Chapter**'s Sept. 22 meeting, held at the offices of Jones Intercable in Englewood, Colo. SCTE Region 2 Director Ron Hranac of Coaxial International provided an update on the national Society. Kimberly Winter of Mind Extension Institute provided, through the use of graphics, a demonstration of F connector installation. Pam Nobles of Jones Intercable gave a summary of NEC and NESC rules and discussed installation clearances, drop cable fire ratings and the grounding of installations. Barry Smith of Times Fiber Communications concluded the meeting with a presentation on advancements in corrosion protection in regards to drop cable and connectors. A total of 26 people attended the event.

The Southern California Chapter held a meeting Sept. 18 at the Days Hotel in Diamond Bar, Calif. The topic of the seminar was BCT/E Categories I, "Signal Processing Centers," and II, "Video and Audio Signals and Systems." Richard Olson of United Artists was the speaker for the event.

The Tip-O-Tex Chapter met Aug. 25 at the Alice National Bank in Alice, Texas, to review Category III of the BCT/E Certification Program, "Transportation Systems." Chapter President Mike Strakos reports that in his presentation on optical fiber

trunks, Tim Holzer of Optical Networks International "presented basic fiber information relating to lasers, detectors and basic system designing. The local CATV signal was injected into a eight-mile piece of fiber to demonstrate the operation of a laser and strand-mount type detector." The presentation on terrestrial microwave delay systems by Dane Walker of Hughes Microwave featured, according to Strakos, "general operation specs of AML receivers and transmitters. He also reviewed how to install and maintain dishes on towers and grounding practices for feed lines on towers." Fifteen people attended the meeting.

The Ark-La-Tex Meeting Group met Oct. 3 at the Holiday Inn in Shreveport, La. "SCTE Region 8 Director and past President Jack Trower gave a good summary of the Society and what it had to offer," reports chapter Secretary Robert Hagan II. "Bruce Porter of Ayers Institute gave a presentation on training, briefly describing his company's approaches to training personnel. Joe Agostini of ATC gave a really good outline of the Installer Certification Program." Twenty-two people were in attendance.

The Lake Michigan Meeting Group held a meeting Sept. 13 at Lennie's Place in Grand Rapids, Mich. The topics for this event were "System Sweeping" and "New Safety Rules." Jon Lander of CaLan and Steve Windle of Wavetek spoke on system sweeping, and Richard Kennedy of the Michigan Department of Labor brought the group up to date on new OSHA rules, as well as MSDS, GFI, boots, hard hats and safety glasses. Thirty people attended the meeting.

The Penn-Ohio Meeting Group conducted its first seminar on fiber optics Oct. 17 at the Cranberry Motor Lodge in Pittsburgh, Pa. The program was designed to take a look at current fiber-optic technology and how it relates to CATV system rebuilds and upgrades. There were vendor displays with factory representatives on hand to answer questions. Speakers for the event were Dave Pangrac of ATC and SCTE President and Region 5 Director Wendell Woody of Anixter Cable TV.

SCTE Member Tony Flores Dies

SCTE member Tony Flores passed away Sept. 20 in Washington, D.C. A consultant for both the telephone and cable TV industries, he had worked with the Rural Electrification Administration (REA), a division of the U.S. Department of Agriculture, for over 20 years.

Author William Grant, a longtime friend and associate of Flores', recalls that "he became active with cable TV while working with the REA and subsequently became a very enthusiastic and supportive member of SCTE. He was very instrumental in the organization of a meeting group in the Washington, D.C. area and conducted classes for a number of the Society's local groups. He also served on committees for the BCT/E program when it first started up."

An electrical engineer, Flores spent the last seven years doing consultant work. "Although he wasn't primarily a cable person," Grant recalls, "he was very enthusiastic about the industry. He will be sorely missed."

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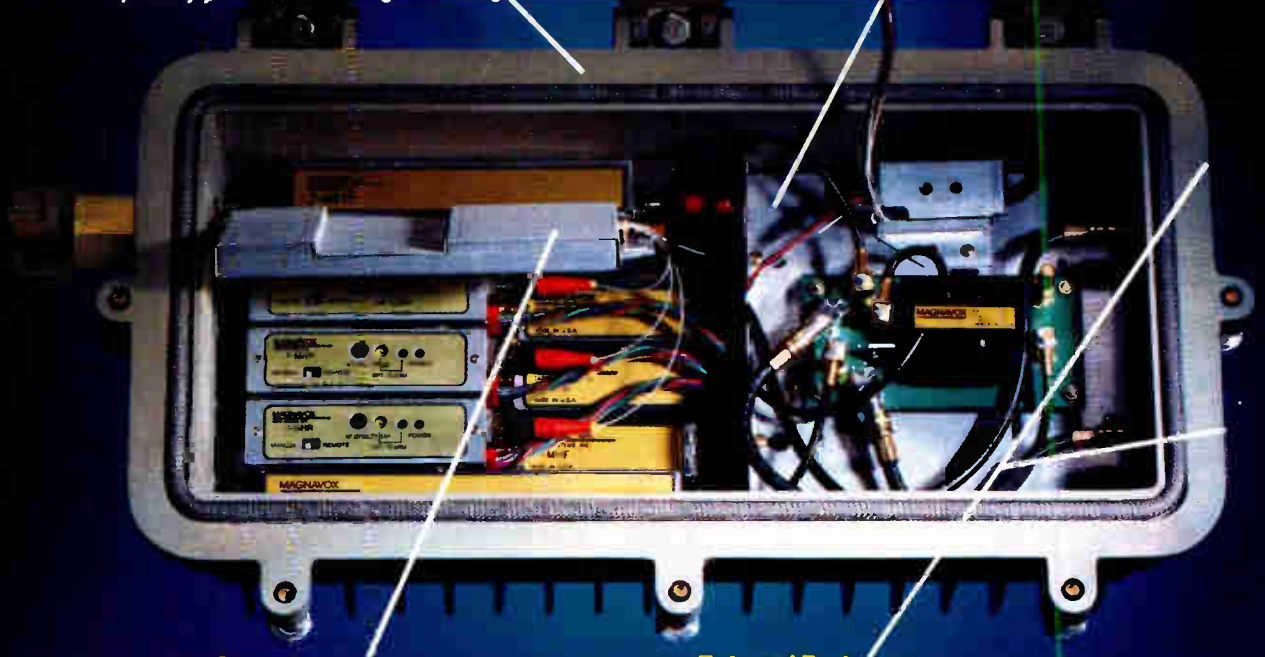

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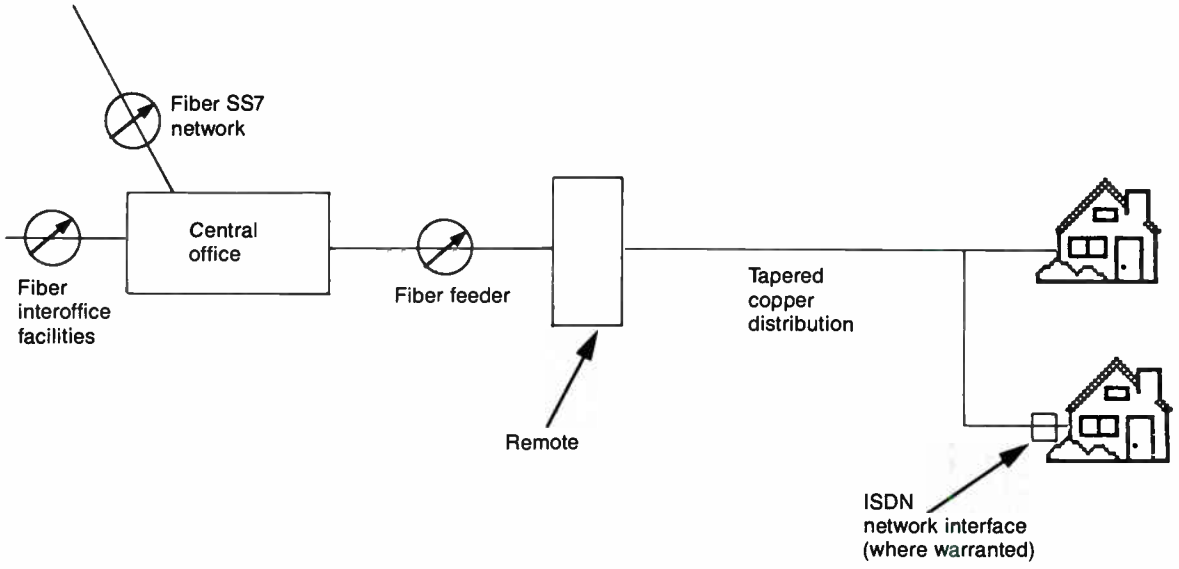
Figure 4: Telco state-of-the-practice network



distributed to homes via tree-and-branch coaxial networks composed of trunks, trunk amplifiers, distribution cable, distribution or line amplifiers and drop cables. There is a limit to how many amplifiers can be put between the customer and the headend in order to still achieve our signal quality goals. If that limit is exceeded, then we might use microwave techniques to extend our signal to a remote site and then from there use our tree-and-branch distribution.

Today, one way we are enhancing that typical network is by using fiber instead of microwave between our headends and remote sites (see Figure 2). Either digital, FM or AM techniques are used at this point in the distribution and the fiber may be

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Network planning principles

	Voice	Video
Usage	Minutes per day per home	Hours per day per home
Selection	Billions and billions worldwide at any moment	Relatively few (35-channel average)
Connectivity	Two-way point-to-any-point	One-way point-to-multipoint
Intelligence and functionality	Centralized; owned by telco	At end of network; owned by customer
Customer equipment	Analog phones	Analog TV reception
Inside wire	Twisted pair	Coax

installed in a ring architecture in order to have additional network reliability.

Figure 3 shows additional enhancements also available today, which call for using fiber to reduce the number of amplifiers between the customer and the video signal. This is done by using AM fiber and essentially cutting into our existing tree-and-branch coax plant. Another functional enhancement, currently being trialed by cable, is to add conditional access devices either on the side of the house or near the house so the converter box in the house will not be needed for "cable ready" TV sets. This is more user-friendly than installing converter boxes to deliver the desired video services to the customer.

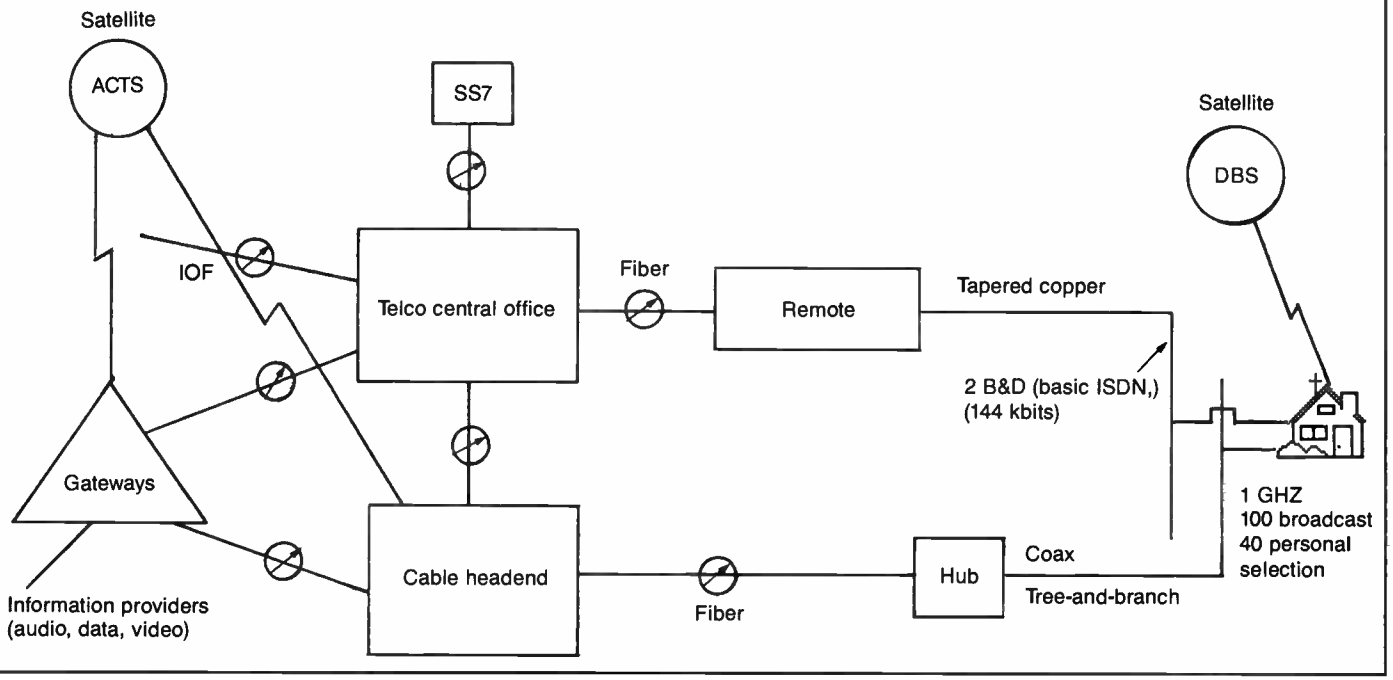
This broadcast tree-and-branch network is by far the optimum way to deliver the megaservice of home TV viewing. It is extremely efficient and thus low cost, very user-friendly and, because of its compatibility with the customers' home electronics, high capacity. This efficiency means the hybrid network can be expanded to deliver 140 video channels to the home, provides high picture quality (rivaling that available from home video equipment) and is highly reliable. Plus, it is the perfect platform from which evolutionary enhancements can be added in order to offer revolutionary new services.

Expected enhancements include increasing viewing options further by not only increasing the number of channels to each home, but also enhancing the ability and user-friendliness of seeing some shows on a time-shifted basis. This can be done by requesting that a show be downloaded to a home storage device and increasing beyond just pay-per-view type of functionality to allow true personal selection of viewing options. Because the customer will have so many programming choices, a further enhancement will be the addition of intelligent, interactive program guides that can provide value-added tuning capability by aiding the viewer in knowing what options are available and in choosing what they actually see.

Optimum voice/data network

Let's now consider what is the optimum network for voice and data to the home. To answer that let's begin with a deep appreciation for what is already in place to serve home voice and data. The ability for any home to call essentially any place in the world at any time is in place now. Further, the transition to the use of fiber for intertelephone company central office facilities (trunks)

Figure 5: ISDN—Integrated services via dual (or more) networks



and the deployment of digital central offices is well underway.

However, the capabilities of the existing telco networks are being challenged in a few ways. Some business and government agencies are requiring additional transmission capacity and functions that go beyond the capabilities of the copper plant currently deployed. The response to that is already underway with fiber being used to directly serve major business locations, supercomputers, hospitals, etc. On the residential side, there remains a need (as there has since telephone began) to reduce

(Continued on page 72)

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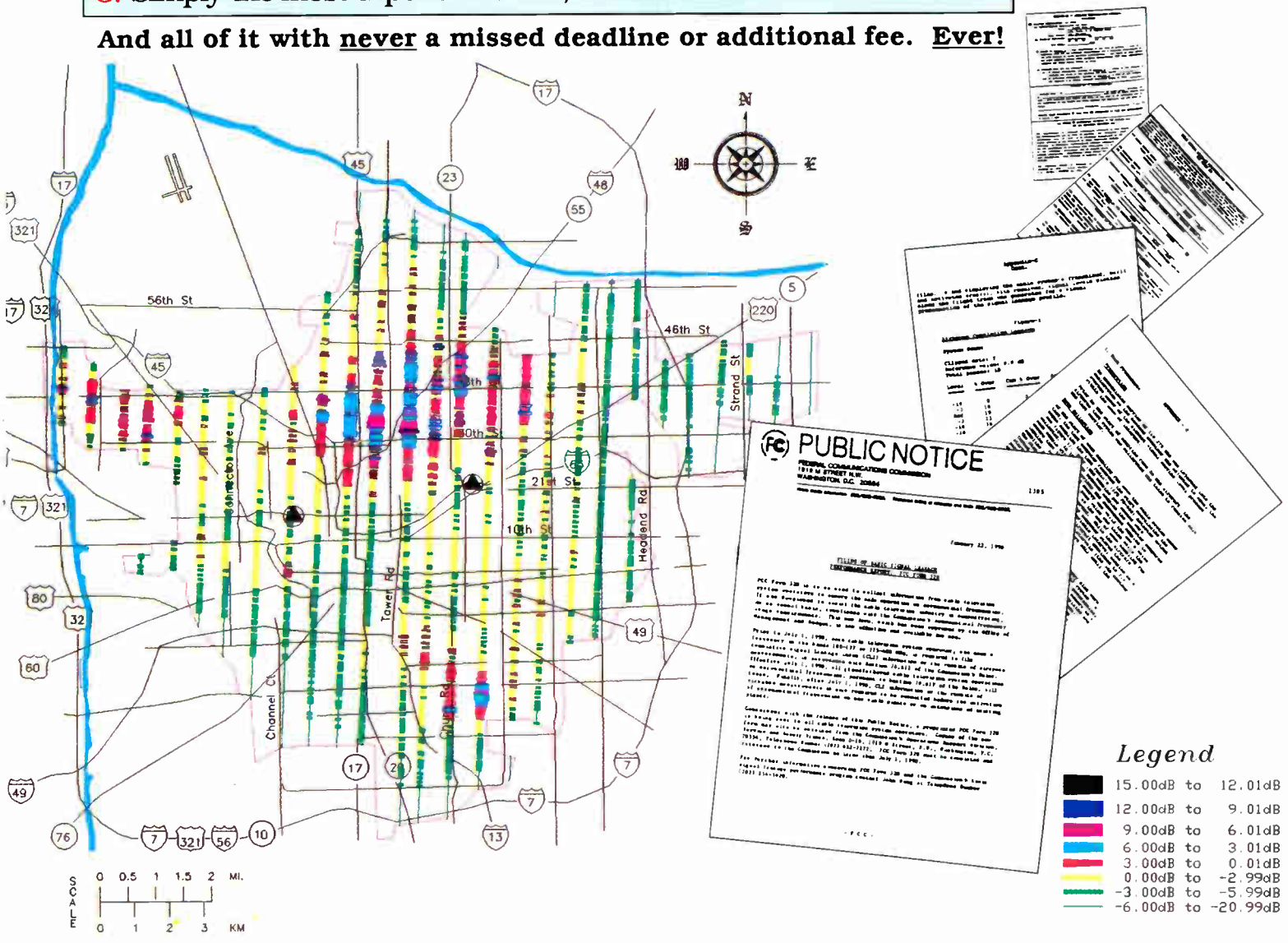

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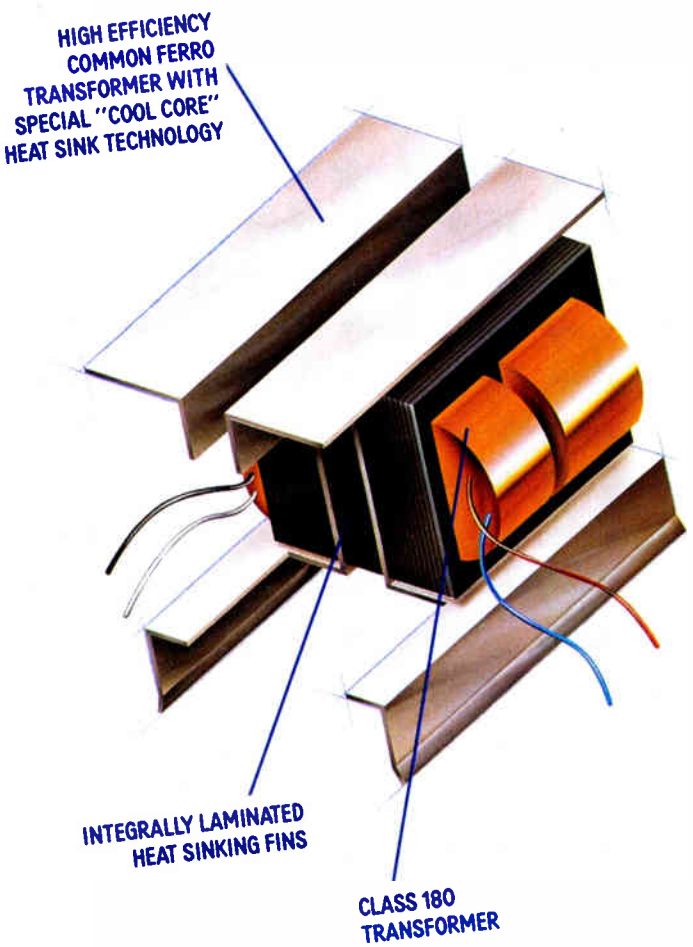

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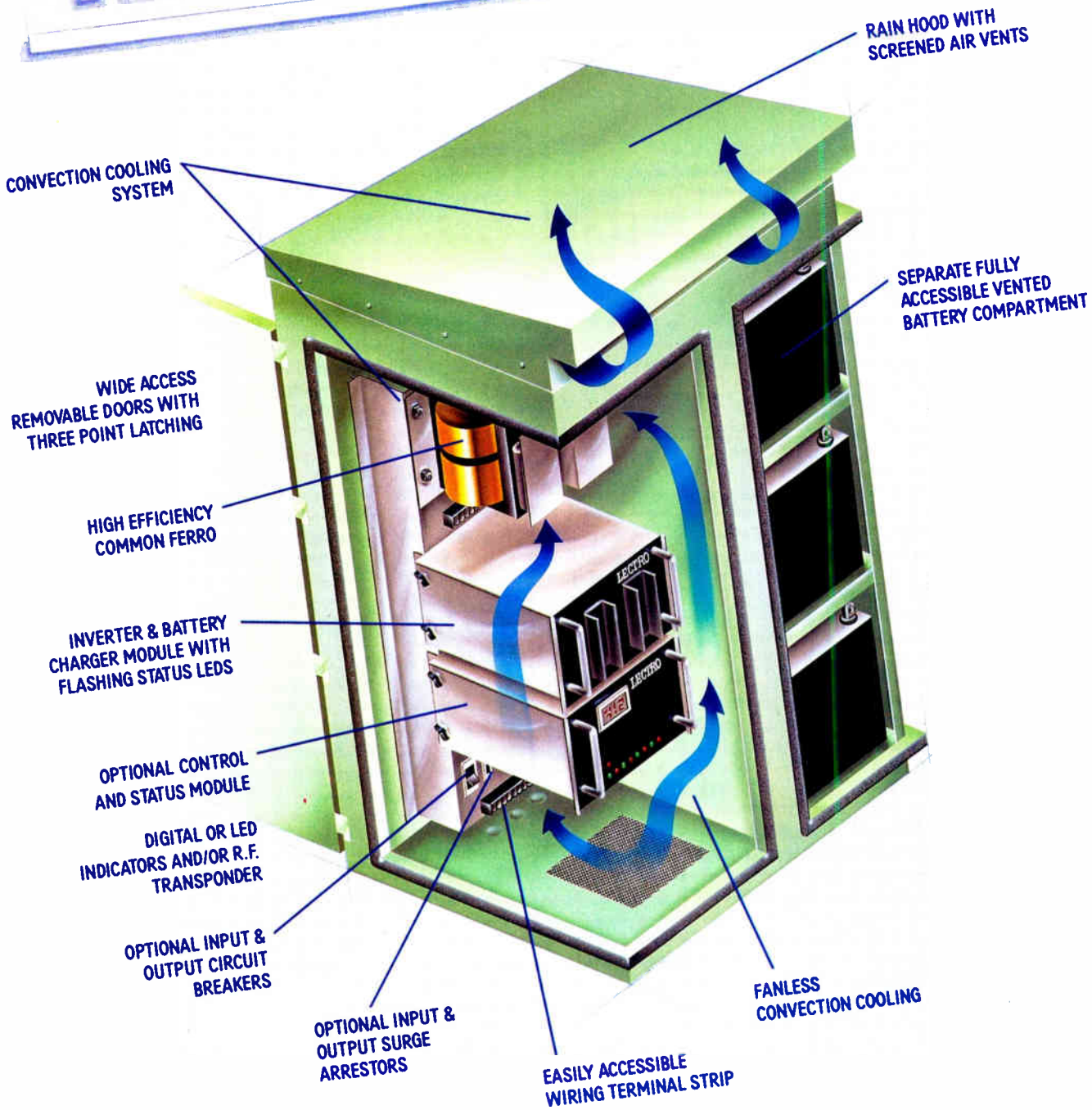

Information age

(Continued from page 52)

the cost of home POTS service so that there is not only universal service, but affordable universal service. And when the demand for information services arises, it must be served no matter where in America that may be.

Based on challenges such as that, the telcos already have many programs underway. All of these enhancements significantly improve the ability of the installed telco network to deliver new services and to provide existing services better. This then becomes the optimum network for serving residential voice and data needs (see Figure 4). Fiber backbone networks of interoffice facilities and the Signalling System 7 network service a digital central office. Fiber then is used to feed a remote site. From the remote site the existing copper plant is distributed to the home. Plus, if required, ISDN electronics are being added at the side of the home.

The results of the telco network is that for the "talking on the telephone" megaservice, there is improved transmission quality and reduced capital and operating costs. Within the basic telco network—that is fiber/copper without ISDN—almost all information services can be provided. Electronic mail, videotext, home shopping or banking, etc., are all easily possible.

For those homes requiring more, ISDN electronics can be added specifically where demand warrants. Thus the home that needs it can get more than a 200 percent increase in capacity and can have digital to the home. Even services such as home video conferencing are possible over telcos' fiber/copper ISDN networks. Therefore, a fiber/copper hybrid with selectively focused ISDN functionality is the optimum way to service home voice and data demand.

Synergistic information age infrastructure

But if we have one optimized network serving home video needs and another network serving voice and data, does the development of information services get helped or hindered?

Cable's thorough analysis of information age network alternatives has shown us that a synergism of different networks is the best path for America. It is cable's recommendation that a new ISDN—integrated services via dual (or more) networks—is also the optimum way to provide information age capabilities and services now and into the future.

Figure 5 depicts how the two independently optimized networks of cable's fiber/coax and telco's fiber/copper, perhaps augmented by satellite services such as direct broadcast satellite (DBS) or next generation ones such as NASA's advanced communications technology satellite (ACTS), can work to deliver any service to any home in America. Some services might get delivered via only one network and other services might require more than one network. The customer only need know that the service be delivered, not how or by which network. Thus this optimum way of providing information services to America is in fact accomplished through the coordination of multiple infrastructures. These complementary infrastructures would include multiple fiber backbone networks, satellite communications, high capacity cable networks and digital (where required) telco networks.

An example of how these networks might work together to provide an information service is in the education area. A student at home might be at his PC accessing a data base about a particular subject. The PC could be communicating over the D channel of the telco ISDN network, through the telco fiber/copper network, to a gateway and on to an information provider.

The gateway could, for many subjects, have text, audio, videotext and video information available.

For most of those, the telco fiber/copper network (with or without ISDN) can be the only needed network. However, if video were available and requested, then the telco gateway could communicate with the cable network to request a dedicated channel to the student's home. A personal selection channel is chosen from those available at the hub serving the student's home. The cable network reserves that channel and informs the gateway which channel it is.

The gateway then, via the telco network, displays on the home PC screen a message such as: "Turn to Channel 42 in five minutes to view your selected video." The video information provider transmits the selection through the gateway to the headend and then on down the cable system to the home. If desired the student might record the selection or just view it real time. The customer receives an integrated service via cooperative yet independent networks, yet the multiple delivery technologies are transparent to the customer.

Working together for America

What then are the results for America by following this multiple network approach for the information age? We would have multiple fiber backbone networks that were easily available to everyone. Telcos, cable companies and others have begun to establish local, regional and national backbone networks. Such information expressways should be encouraged to expand and accelerate. Through these fiber expressways such important services as distance learning and medical imaging/diagnosis are being delivered today.

All customers would be served by the highest quality, lowest cost optimized networks. Through the power of these networks, citizens and companies could choose to locate anywhere in America. Information services would be available to any customer anywhere. And new services would have easy market entry so that innovative new services would flourish. The optimum U.S. infrastructure is made up of focused, coordinated, entrepreneurial infrastructures and cable is and will be one of those major American infrastructures.

The telephone and cable industries are two great American industries that have applied their expertise to wire and serve America. Is our country best served if the rules are now changed so that telcos try to take away cable's core business and vice versa? Is the customer best served by each industry trying to bypass the other?

The economics of network transport to the home do not justify duplicate networks. No one argues in favor of two electric lines to the house and, in fact, the early history of the telephone industry showed the absurdity, high cost and customer dissatisfaction with multiple telephone companies serving the same customer location.

Transporting competition to the home (whether for electric, telephone or cable) instead of lowering consumer rates, can ultimately only result in inflated costs due to wasted capital. Those higher costs will result in many customers not being able to afford telephone or cable and will put our country at a cost disadvantage in the international competitive arena.

Instead of needless competition, let's have the telco, satellite and cable industries working together to optimally serve America now. Transport cooperation can and will maximize the services competitively offered to the home. Such transport cooperation and services competition provides Americans with the best information age value and places America in the strongest position internationally. **CT**

Addressable controller

(Continued from page 22)

At another level, the addressable controller can be viewed as an "addressable system server," capable of handling requests corresponding to the direct and compound classes of the current architecture. This can be accomplished through the creation of controller software that is conscious of the fact that it resides in a network and supports one (or both) of the following concepts:

✔ *Application program interface* (API). This would allow software from the business system (or any computer in the network) access to functions in the addressable controller that have traditionally been accessible only by programs in the controller.

✔ *Addressable control language* (ACL). Just as SQL allows application programs running on various machines throughout a network to perform operations on data bases regardless of their internal format and location in the network, ACL would give the business system the ability to perform operations of the direct and compound class regardless of the configuration of the addressable controller.

These concepts represent a step toward machine interoperability not currently available in the industry. In order to bring these concepts to reality, the various vendors must come together to agree on common terms for the functions and features of addressable control systems. One feature that must be inherent in both the language and API is extensibility, as the role of addressable systems continues to expand. Adoption of this approach throughout the industry would yield the long-term benefit of every business system being capable of communication with every addressable controller.

"In order to bring these concepts to reality, the various vendors must come together to agree on common terms for the functions and features of addressable control systems."

The use of Unix in the addressable controller allows for the use of new technologies that yield the capability to create user interface software that is graphical and gives the operator a consistent "look and feel" to all operations performed on the system. These technologies, X-Windows and Motif, are becoming the standards in the computer industry for intuitive, graphical command environments.

X-Windows is a communication protocol that describes how image information is passed between computers and graphic input/output (I/O) devices over a network, typically Ethernet. Motif is a set of standards that control the way in which images are displayed, how elements are selected from graphic lists and how windows on the graphic I/O device are managed.

The multitasking features of Unix, coupled with the multiple windowing of these graphical technologies will allow for the construction of a user interface providing common access to the various computers in the network. Multiple windows will make it possible for a user to initiate several simultaneous functions on any and all computers in the network. The long-term goal of using Motif on both systems as the operator interface standard would a allow a single operator to have the skills to easily control each system.

Conclusion

The addressable controller of the future can be based on any hardware platform capable of supporting an open architecture, networked environment. Its software components will include:

✔ Unix operating system
✔ X-Windows/Motif graphical user interface
✔ SQL-oriented relational data base server
✔ Application software implementing the "addressable system server" concept

An addressable controller based on this architecture will solve many of today's problems. But to fully realize the potential of this architecture for the entire cable system, all vendors must come together and adopt industrywide standards that will ultimately benefit the cable system operaton. **CT**

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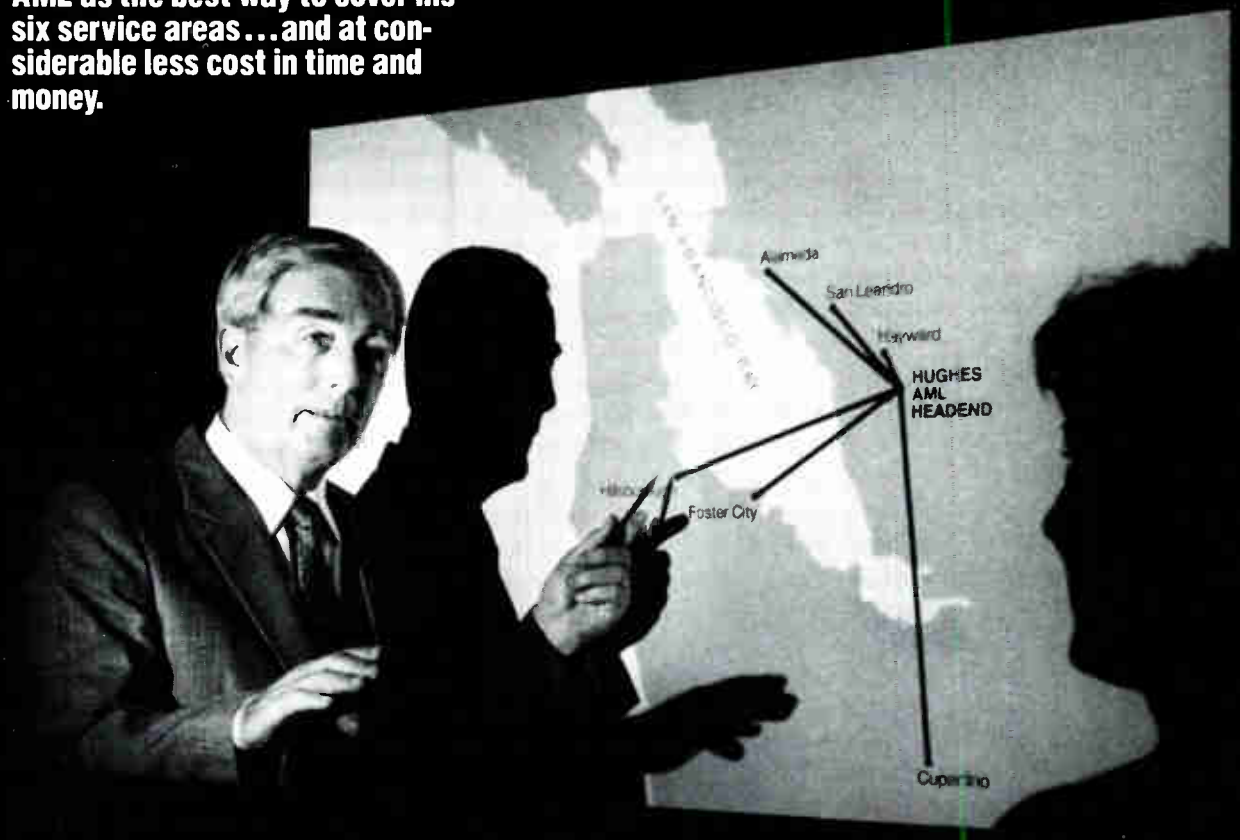

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Cellular cable

(Continued from page 26)

ing, procurement, placement, etc., are inevitable.

In a cellular cable network the only problem would be the physical relocation and reconnection of terminal station equipment. There would be no plant construction required at all, no splicing, no pair reassignments, etc. This inherent flexibility would be quite attractive, wouldn't it?

Sometimes overlooked is how easy it is to restore service in a wideband transmission system. Consider a 200 pair telephone cable that suffers massive mechanical damage. Service restoration involves quite a bit of splicing with the possibility of pair splits or transpositions and consequent incorrect restoration of some services. A similar catastrophe in coaxial plant requires only that RF transmission continuity be re-established. All individual circuits or services are automatically and correctly restored without any testing or complex splicing operations. The restoration process is simple, fast and foolproof, and is essentially the same in all instances regardless of the number of services or stations involved.

There have been about two dozen field trials placing optical fibers in telephone exchange loops, although it is interesting to note that all of these have been distinctly limited in scope to only 200 stations or so and no subsequent fiber loop placement on a larger scale seems to have developed from them. One might assume that the tests have not conclusively demonstrated the economic or technical practicality of this approach as yet. I submit that some further review and possibly some limited field trials of the cellular cable approach are clearly indicated as worthy of consideration. **CT**

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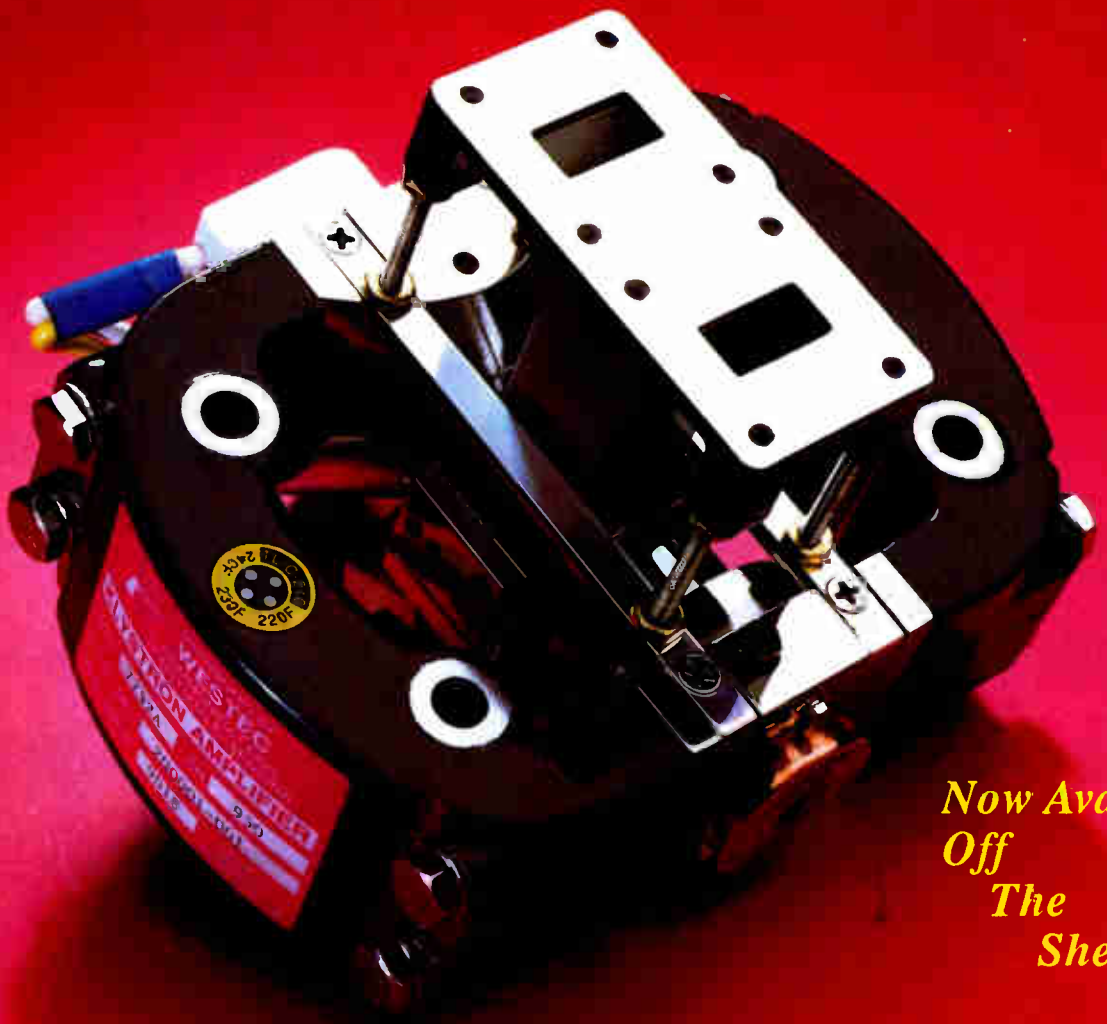

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December 1990

Training today for tomorrow

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Geri Saye

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Formerly Installer/Technician

The time has come for CPR training

By Jim Kuhns
District Technical Training Manager
Continental Cablevision

"Unfortunately it takes a fatality about once every three years to keep everyone on their toes. Our last fatality was about two and a half years ago and it shows. The crews are getting complacent and so are their supervisors. I haven't done a full blown safety seminar in three months. That will all change when someone is seriously injured or 'buys the farm.' It always has before."

So said a power company safety director who requested to remain anonymous. Regrettably this gentleman was a very busy person and several months later (as he had predicted) someone "bought the farm."

In a July 1984 article in *Communications Technology*, Bob Luff discussed a situation wherein a gentleman at a convention he was attending had a heart attack and no one knew what to do. As a line technician, that article impressed me so much that I promptly went out and got certified in CPR (cardiopulmonary resuscitation). I also forgot very promptly everything I learned in the course and did not renew my certification the following year. Why? I suppose it's because the initial concern or scare had worn off by that time. I don't recall if I even realized that my certification had expired. That was then. This is now.

The Occupational Safety and Health Administration states the following in Part 190.268 (c) of its regulations—Such training shall, where appropriate, include the following subjects:

1) Recognition and avoidance of dan-

gers relating to encounters with harmful substances and animal, insect or plant life
2) Procedures to be followed in emergency situations
3) First-aid training, including instruction in artificial respiration.

Depending on how you interpret the OSHA standards, the CATV industry may or may not be required to supply CPR and first-aid training to technical personnel. Continental Cablevision's Eastern Michigan District felt that regardless of how you interpret the OSHA regulations, first aid and CPR should be a part of every technical employee's training.

Setting up the program

To have an instructor come in and teach classes during the day presented a problem. It became immediately apparent that it was going to be difficult to find instructors who could teach weekday classes. It wasn't practical to send all our people to the local American Red Cross so we decided to instruct the classes at our own district training center. This meant an individual (or individuals) from our company should get instructor certification. We found instructor training was available through the local Red Cross unit at no cost other than for books and course materials.

Red Cross offers a wide variety of courses that include infant and child CPR, adult CPR, community CPR (infant, child and adult CPR together), basic life support (BLS) for the professional rescuer, as well as standard first aid (SFA).

Continental chose the SFA course for several reasons. First, SFA would include rescue breathing (artificial respiration), clearing obstructed airways (choking) and CPR for adults as well as training in dealing with shock, fractures, internal and external bleeding, burns (including electrical burns), heat and cold exposure, eye injuries, bites and stings and more. Second, all of this could be taught in two, four-hour sessions, using videos, lectures and skill practice sessions. We felt for the amount of class time the SFA course best fit the needs of our field personnel.

Instructor certification

While very demanding, the instructor's course was personally rewarding. For the first time in my life I felt that I could really use these skills if called upon to do so. My instructor/trainer had one criteria for grading practice skills: "Can you do it well enough to save my life?" If the answer was "yes," you moved on to additional training. If the answer was "no," you practiced some more.

Time also was spent teaching portions of the actual course in front of the other instructor candidates to give them classroom presentation experience. Surprisingly, the teaching portion of the class seemed to bother some of the instructor candidates more so than any other part of the course. For some people, getting up and speaking in front of a group is extremely difficult. The instructor's course recognizes this and as a result a large portion of the course is devoted to this area.

Although I only needed instructor certification in SFA, I decided to get BLS certification also. As a pole climbing instructor, some of the advanced skills taught in the BLS course were of interest to me, like learning to use a barrier mask (a device that allows you to perform CPR or rescue breathing without actually making mouth to mouth contact with the victim).

From start to finish the BLS instructor certification course takes one night a week for six weeks. Homework consists of studying the materials and preparing teaching assignments. One hour to an hour and a half per night should be set aside for study time. Once certified, you must teach at least one class per year to maintain your certification. I try to teach at least one class per month because I find this keeps the materials fresh in my memory and my practice skills sharp.

Setting up classes

Although the Red Cross recommends the class size be held to six students per instructor, I have done classes with as many as 15 students at one time. This many students does put a lot of responsibility on the instructor, but it can be done. Class size depends primarily on the number of mannequins (or "Annies") that are available. Generally, a maximum of three students for each mannequin is the limit and whenever possible, two students for each mannequin is ideal.

The basic torso mannequins are $500 and up. They can be purchased outright from a distributor (this can be very expensive) or a much more inexpensive way is to buy it through your

local Red Cross unit. Another option is borrow—most Red Cross units have travel sets available free of charge to qualified instructors. All you need to do is call the local unit, schedule the date of your class and give the type and number of mannequins that you will need. (Hint: Schedule these dates as early as possible. The travel mannequins stay in high demand and are sometimes scheduled out six to eight weeks in advance.)

Over the past several months Continental has built a rapport with the Oakland and Macomb County Red Cross Units and as a result, we have had very few problems getting the necessary Annies and equipment needed for our classes. Getting the equipment in this manner also has the additional benefit of making people outside of the company aware of our safety training program. Workbooks and other materials such as bandages and splints also can be purchased through the Red Cross at a nominal cost.

Implementing and showing off

Continental's program is set up so that all new technical employees receive this instruction as part of initial training during their first 90 days. Existing employees are being put through the course at the training center as well as at their system. Within two mornings we were able to train an entire system's technical staff in their system's local origination studio. While this on-site method might not be practical for systems with large technical staffs working a wide variety of shifts, it's very efficient for maximizing training with small to medium groups of employees. If you decide to do on-site training, it is important to have an open area such as a studio, conference room or a large break room. Nothing kills a student's interest faster than an uncomfortable classroom setting.

Once the course has been successfully completed, the students' certification cards are sent to their general manager. This allows copies of the cards to be placed in the students' personnel files as a permanent record of training. The cards are then presented to the students at their system. Medallions also are placed on the students' hard hats indicating they are "Certified CPR" and "Certified First Aid."

Students who have been through the training have given it excellent reviews. Some have even asked about additional courses such as infant and child CPR and several others have indicated an interest in becoming instructors. To date, no one has had to used their skills on the job, although one installer stopped by to tell me that he had used what he had learned in class to dislodge a piece of candy from his younger brother's throat. He said he didn't panic because he was confident that he knew what to do. If nobody else ever has to use the skills, this one incident would make the entire program a success.

"Within two mornings we were able to (CPR) train an entire system's technical staff in their system's local origination studio."

Additional benefits

Once certified as an instructor, you can teach outside the company as well. The Red Cross is constantly looking for volunteers to teach the various courses they offer and if you decide to teach, it is an excellent public relations tool for your company. Whenever I teach a class outside the company, I make it a point to wear some type of clothing that displays our logo. Students will invariably ask an instructor what he or she does and many are surprised to learn that their cable company is involved in first-aid training.

A gentleman in one of my evening classes summed it up when he said, "Being one of your customers, it's nice to know that if I ever needed assistance, all I would have to do is flag down one of your cable trucks. I've got to remember to tell my wife about this!" (Fourteen other heads nodded in agreement.) With the current onslaught of cable bashing, public relations of this kind certainly won't hurt the industry's image.

Everyone is concerned about safety these days. But is your concern deep enough to commit the time and resources necessary to train your people to know what to do in the event of a life threatening emergency? **CT**

What's a fuzzie?

Customer service for field personnel

By Willis G. Smith
Technical Manager Director, MetroVision
And George J. Takacs
Partner, Takacs Techniques

For years all that really mattered in the cable business was that field personnel repaired the customer's cable. Today, however, cable customers want more. They are demanding better face-to-face customer service, especially when a technician must come on their property or into their home.

The need for improved customer service training recently became apparent to the technical manager of the service department for MetroVision of Prince George's County, Md. The manager discovered that his employees and their customers were averaging one to three hostile encounters a week. These encounters ranged from customers telling technicians to leave the house to customers physically threatening the technicians. The technical manager realized that something needed to be done to improve the customer service skills of the field technicians.

First, the technical manager identified a menu of the most common problem areas that needed to be addressed. The identification was based on the manager's observations and intervention in various "hostile encounters" and on suggestions from the technical supervisory staff.

Customers complained that technicians:

✔ Were disrespectful
✔ Were not professional
✔ Were non-communicative
✔ Had invaded private areas
✔ Had tampered/disrupted property

Technicians complained that customers:

✔ Threatened them physically
✔ Verbally abused them

"These (hostile) encounters ranged from customers telling technicians to leave the house to customers physically threatening the technicians."

✔ Were not helpful
✔ Questioned their competency
✔ Expected too much

Luckily, MetroVision was planning customer service training for office personnel in the upcoming weeks. The technical manager decided that any training for field personnel should be specifically geared toward the field and the problem areas he had identified.

Next, the technical manager talked with the consultant who was going to do the training. The manager outlined these problems areas and the field-oriented approach he wanted to take. He stressed that he wanted something besides a lot of theory.

The consultant then developed a two-hour training session designed to improve field personnel awareness and skill level in the following areas: 1) nonverbal communication, 2) customer relations and 3) dealing with irate customers.

The technical manager, however, strongly doubted that the class would work. Despite the sound instructional design, how would the technicians react to what could be interpreted as "sissy stuff"; after all—"They got the cable fixed, didn't they?"

The work done at MetroVision was more than just "training." It was really a series of actions taken to improve and change behaviors with the goal of improving customer service. The actions were successful because of the following six factors:

1) Technical management/supervision involved themselves in the development of the training and encouraged the use of the skills taught.

2) The activities taught not only professional skills, but also skills that would enable each technician to grow as a person.

3) The participants had a job that kept them mobile during the day. Therefore the training had to reflect their mobile work environment.

4) Some students became involved in developing what they were going to learn.

5) All participants, from executives on down, developed goals for applying this training back on the job.

6) Some managers and supervisors encouraged the use of the new skills.

Factor One: The technical manager actively participated in the development of the training and in its reinforcement. If this one factor had not been present, the results would have been minimal.

The participants knew that everyone in the organization was going to customer service training. As a result, the participants did not feel isolated and picked upon. (Whenever one group is singled out for training, the members spend more time and energy trying to figure out why they have to go than on learning new skills.) Just as important, the supervisors attended the class with their field service personnel. The supervisors led by example, not just words.

A common complaint heard by consultants from participants goes something like this: "What you are presenting is fine and helpful, but the person who really needs to be here is my

boss." When this attitude is prevalent, the students resist some of what they are learning and do not feel comfortable talking to the boss about it. Here, the boss was present in the room learning the same information. Everyone shared a common experience that can now be referenced when discussing future problems.

Participants need feedback that management supports the skills being taught. An outside consultant cannot cause change in an organization. Studies have shown that the immediate supervisor has the most effect on employees. The employees follow the supervisor's lead when they determine what is important in a company. Employees respond more to the behavioral messages of a supervisor than to the verbal message.

What was interesting was that the group that did not have their supervisor present had the least questions, comments and enthusiasm. This group was the hardest to work with. Those group members are probably showing the fewest results.

Factor Two: The workshop taught professional skills and personal growth skills. As Jan Carlzon, CEO of Scandinavian Airlines, discovered in turning around his once troubled airline, training that provides for personal growth produces more results in the area of customer service than strict technical training.

This is true because customer service people are interacting with customers all day long. Constant interaction becomes draining after awhile. Something has to be done to help the customer service people deal with the stress they develop during the day. Something has to be done to help them deal with the angry customers they encounter. Far too many customer service people take the anger directed their way personally. They have not learned to separate their work role from their personal identity.

The training enhanced personal growth and customer service skills through covering such topics as body language and how to interpret it, stress management, how to deal with anger, how people communicate and "transactional analysis." When one of the participants asked the question: "Can this stuff be used on dates as well as with the customer?" the consultant had them hooked into learning. When the consultant presented the positive (warm fuzzies) and negative (cold pricklies) stroking ideas of transactional analysis the participants really made some connections in their personal life. Once the participants made that connection and personally validated the ideas, then application to the customer became easy.

Factor Three: The participants move around a lot during their work day, going from location to location on service calls. They have relative freedom from over-the-shoulder supervision. Therefore, the classroom presenter made certain they had a chance to move around and participate in the learning. The participants learned new ideas and skills because they practiced them in class.

For example, the distance you are from another person affects how well you communicate. The participants stood various distances from each other ranging from 12 feet to touching shoulders. In each position they wrote down how it would feel to talk with people around them. After the exercise, the class as a whole compared notes. They all felt that 12 feet was too far away; one foot and touching was too close; and four feet was about right. From this the technicians learned that talking to the customer from the customer's driveway when the customer was in the doorway would not work. In addition, after knocking on the door the technician should step back so as not to be in the customer's face when the door opens.

This exercise was especially relevant because there were at least four cultural groups in the class. Each culture has a slightly different interpretation of space. Not only did the participants learn about the use of body space with the customer, but they also discovered some reasons why other cultures made them feel uneasy from time to time.

"The most significant factor of the training was that field personnel were both relieved and empowered by...skills that gave them more control in situations involving irate customers."

Factor Four: Some students became involved in developing what they were going to learn. All the supervisors participated in a two-hour group interview to help design the course. The purpose of the interview was to find out the problems they were facing as supervisors. The supervisors then chose which problems they wanted to address in the time allotted. The consultant then designed training that spoke directly to their needs—not the needs others thought they had. This procedure gave the participants ownership of their learning. They participated in class because it helped them solve some of their problems.

Factor Five: All participants, from executives on down, developed an action plan after the training session. In the plan they committed to try out some new skill they had learned or to accomplish some goal by using new techniques. There was a follow-up session for supervisors and executives where they shared with each other how they had done on their plan. The goal was not necessarily to accomplish the plan, but to try to use the new skill.

Factor Six: Some managers and supervisors encouraged the use of the new skills. This encouragement came first by the supervisor's attendance in class with their employees. Second, by discussing the action plans with the employees. Third, by recognizing good work through verbal or written commendations. One supervisor even took his crew to lunch once they completed a task he had been trying to get them to do for over six months. The technical manager has given out letters of commendation to employees who have performed above average in customer contact situations.

Measuring the results

Measuring the total impact of customer service training is somewhat difficult. What measurement is available, however, does show improvement.

Some technicians seemed genuinely consternated about how giving off the right kind of "fuzzies" might effect their macho personas. On the other hand, the technical manager noticed many of them using the terms and ideas taught in training in their daily interaction with each other. One is the

idea of personal space: "You're getting in my space" can be heard on various occasions.

One result began to stand out notably as weeks progressed since the training—the technical manager had not received any reports of employees and irate customers. In fact, it was close to three months before he received a single report of any problems at all. At this point he began to realize the significant impact the customer service training had accomplished. It was more than his initial reservations had thought possible.

Perhaps the most significant factor of the training was that field personnel were both relieved and empowered by interpersonal skills that gave them more control in situations involving irate customers. They now know that an irate customer's anger is not directed at them as a person. The customer is angry because of the problem with the cable. The customer will be angry no matter who comes to the house.

In addition, the training also empowered them with verbal and non-verbal communications skills that allowed them to feel and act more comfortable. The technician is now in control when in a confrontation with an irate customer.

It is apparent that they are using the communication skills in their personal lives and daily interactions. This use further helps to internalize and solidify those skills as part of their normal behavior.

Recently when the supervisor was listening to a group of technicians describe how they dealt with irate subscribers. One technician was describing the various methods he used when verbally stroking an irate customer; while another interjected about what kind of "fuzzies" he gave off. Another technician commented that the bottom line was that the customer's cable would be fixed or the customer would know the reason that it couldn't be.

The bottom line for MetroVision's field operations, however, is that it has been six months since the training and the supervisor has only heard of one complaint from an irate sub—certainly an improvement from the one to three a week that were received before this intervention. **CT**

Reference

[1]Jan Carlzon, *Moments of Truth*, Ballinger Publishing Co., Cambridge, Mass., 1987.

Design and decisions for interactive video training

By Connie Buffalo
Director of Educational Product Development
Mind Extension Institute

You can be sure of one thing when you visit a cable company. A person will emerge from one of the honeycomb offices whose eyes will light up when you talk about training. This person has been around long enough to know the advantages of good information constantly reinforced and implemented. The good news is that the training awareness is spreading. As systems survey opportunities to increase profit, the back room that training once occupied is getting a lot of attention.

General managers are becoming aware that often 30 percent of truck rolls are to fix an installation in the field that wasn't done correctly the first time. Estimates are coming in now that one out of eight cable employees will have an accident each year costing an individual company almost $2 million a year. When executives look ahead, they see jobs requiring more knowledge and complexity and a future work force with less education and literacy. This is compounded with installer turnover ranging from 30 to 50 percent. Is training worth some serious consideration and some investment dollars? You bet it is.

The training solution has a variety of forms and price tags ranging from riding with a seasoned installer to intense headquarter sessions. No matter what your preference, all agree that a good video presentation can be an asset. Video that stops to ask you questions, helps you to understand a difficult point with remediation, or documents a trainee's progress for the risk management folks is an even more intriguing approach.

For those who want to get into developing their own video or the newer interactive video, here are some ideas and tips that may be useful.

An actual installer filled in for the actor during the pole climbing shoot.

Commit to communicate, not just "teach"

It's easy to say "identify what you want to train and then develop the measurement tools to see if you accomplished your objectives." What's more of a challenge is to ask yourself if you are designing a training program that empowers individuals to use the information they are learning. Especially with the diversified work force we are now experiencing and anticipating, first learn what motivates your students. What will cause resistance in them or where will they be most apt to lose your message? How often will pictures reinforce what you're teaching? What can you use as examples that relate to their current lives? The number one way humans learn is by making mistakes. Consider designing your program so that the learning situation is presented, practiced and the information easily reaccessed for long-term retention.

Remember your best training experience? What did that person do to get you involved? Apply your learning to your project. Assemble a group of frontline workers, top performers and even those who don't respond. Plan a brainstorming session with no restrictions on the best way to communicate the information. Let the ideas fly freely. After you have the options exposed, then go in and make them practical.

In the development of the interactive technical training series, for example, we used literal installers to communi-

cate the technical information. With safety training, we decided that a nightmare would be a better video treatment for power awareness. In it, the installer is placed in a courtroom where he is being prosecuted for negligence. Every time he lies about power, he receives a jolt of electricity. Students go through the same interrogation and while they aren't zapped, they still discover the consequences of unsafe practices. You'll find a wide range of alternatives that you may not have explored under traditional approaches. With video, you can use your imagination to create interest and accountability throughout the program.

While developing our interactive technical programs, we invited the 40 MSOs that currently use our interactive video programs to a "users consortium." Their representatives identified the major topics to be covered in installer and general safety programs. We identified the students, their levels of comprehension and how much information they might be able to absorb at a sitting. Then we said, "If you had no limitations, what would the most productive training consist of." We had different procedures, rules and processes that had to be incorporated into one program that would work for the industry. More than anything, we had a shared vision of creating programs that prepared the individual with important skills, affected behavior in terms of attitude and performance, and influenced the culture to support high professional standards. A "subject matter expert" (SME) team was selected that guided the programs through to completion. A budget and timeline was attached to the now defined project and the work began in earnest.

A nightmare sequence in a courtroom was used to depict an installer being prosecuted for negligence.

"If you are thinking about interactive training be sure to place all changeable information on the computer and not the video."

Save time, money from the start

Once you've defined the project, developed the outline and planned the creative presentation of the training material, you can save time and money by testing your assumptions before you begin writing. In this phase of the course development, our team, now consisting of writers, SMEs, producers, directors and an instructional designer, took the interactive training segments and simulated them to discover if these were in fact the best and most cost-efficient approaches.

This design stage goes beyond the idea that you simply teach and test. Filling a student up like an empty cup often results in short-term memorized knowledge that can be recited within a relatively short period of time, but is hazy when the installer actually needs it. The challenge then is to construct your course so that the logic necessary to implement an activity is taught along with the facts. It's more work up front, but it saves dollars both in focused production and a better trained work force.

When it comes to writing, be sure to allow enough time. Technical training is so detailed that taking the extra days to ensure accuracy can save rewriting or reshooting when mistakes are found. Once the scripts were written, we invited the user's consortium back to review the courses in their early drafts. We allowed one week per program, which was barely enough. Review involves checking major points as well as all remediation. If you are thinking about interactive training, be sure to place all changeable information on the computer and not on the video. This results in an easily updatable program that can serve you for many years.

Once in production, remember those SMEs. You will need several to ensure credibility as well as technical accuracy. We used the experts not only behind the scenes, but on camera as well. A real installer became the "stunt man" when climbing, wiring and F-connector demonstrations were portrayed. The scenes where the snarling dog's teeth dug into the installer's arms did require special volunteers.

The interactive video options

In considering interactive video training, you face three major choices: 1) Should I produce it or buy preproduced courseware. 2) What kind of hardware is required? 3) Will it be cost-efficient and increase on-the-job efficiency?

☛ *Courseware:* Interactive courseware costs from $80,000 to $125,000 per side to produce. It requires interactive video designers and producers. Development time can run between nine and 18 months. Preproduced programs also are available. ATC has developed a course on troubleshooting and Mind Extension Institute offers training on

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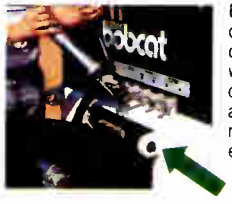

Bobcatch™ is a hydraulic, quick-attachment change system that, when combined with the optional three-point hitch, allows the 3020 Series models to use many Category One attachments.

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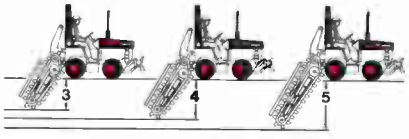

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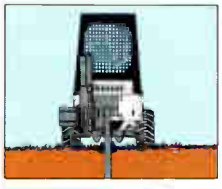

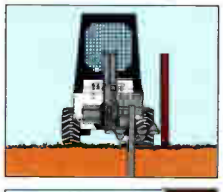

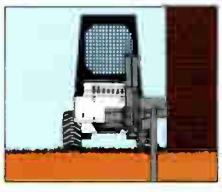

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Reader Service Number 56

customer service, cable sales, installer training and general safety training. Course costs run from $1,200 to $2,800 for the full training program; workbooks are additional.

☛ *Hardware:* Two interactive video hardware systems are now in use in the cable industry. The first, a two-screen configuration, combines a TV set, a PC (or PC compatible) and a Pioneer LVD 4200 laser videodisc player. Assuming the presence of the TV set and PC, the player cost is $1,200. Students watch the video and respond via keyboard to computer exercises and explanations that reinforce their learning. Scores are displayed throughout the training and optional course completion documentation may be printed on any printer. The Pioneer player can be easily bicycled from system to system in a travel case.

The second option is the Sony View System, which combines all equipment into one unit. A mouse or touch-screen activates the student responses. The unit cost is between $7,600 and $8,400. Interactive activities are basically the same throughout the training process. The upside is that over 300 courses on many subjects are available for the Sony. The downside is that this equipment is not easily bicycled. This is a fine piece of hardware that is best used in a training center.

☛ *Cost efficiency:* Each system has to put pen to paper to compute its own analysis. This is done by taking an average course cost of $2,000 and dividing it by the number of employees that will go through the course in the average three- to five-year shelf life of the course. If a system only trained 20 people a year over three years, that would be 60 trainees. Divided by the $2,000 cost, it averages around $33 per person plus workbook. The cost analysis goes beyond hard dollars. In most systems this technology is used in addition to existing training programs, not as an alternative. If you factor in the time saved by trainers that could be applied elsewhere, flexible student hours and immediacy of training, it all adds up.

There is no question that training has been propelled into greater importance. The only issue is how best to create, acquire and implement it. Lee Iococca put it well: "In the end, it all comes down to three things—people, product and profit. People come first. Unless you've got a good team, you can't do much with the other two." **CT**

Where does fiber fit in training?

By Joel Welch
Senior Technical Instructor
Continental Cablevision
New England Regional Training Center

Many cable TV operators are making major investments in fiber optics as a strategy to improve reliability and reduce costs over the long term. Training becomes a vital component in the success of fiber implementation.

Since most operators have some type of technical training programs, the key issue becomes how to integrate new fiber-optic technology into these programs. Because no two training programs are alike, solutions may vary. This article will share some of the things we have learned in the past five years at Continental Cablevision's New England Regional Training Center.

Our fiber strategy

Fiber is key to Continental's strategic plan for cable architecture in the 1990s. In New England, we plan to triple our deployed fiber base to more than 4,300 fiber miles by 1993.

The addition of fiber adds a new dimension to the system technician's scope of responsibility. We also have found that all employees need to understand the basics of fiber-optic theory so they can communicate clearly both internally and with customers and the community.

The New England Regional Training Center provides training for approximately 1,400 employees each year. Of the 35 courses offered, 10 now include fiber-optic theory.

We began planning our fiber training strategy by addressing several key questions:

◆ Who needs fiber-optic training and at what point in their careers do they need it?
◆ How much do people really need to know about fiber optics?
◆ Where does this learning fit in our current training curriculum?
◆ What is the best way for people to learn?

We discovered that interest in fiber was not limited to our technical staff. Because fiber has been heavily promoted and publicized, almost everyone—from customer service representatives to salespeople, installers, technicians and even our customers—have heard about it.

We have always encouraged employees to learn how the entire system fits together. Since many technical terms come up in daily conversation, it is essential that all employees have a basic level of understanding about what a headend does, how we receive signals, how signals are distributed to our customers, what amplifiers and taps are and now how fiber works.

"Basic Cable Theory" is a half-day session that is included in all entry-level courses at the training center. Employees from all disciplines—customer service, sales and technical—begin with this common base of knowledge. The section on fiber has become a high point in the course. Participants enjoy holding the fiber and bending it. They are amazed at its small size and their enthusiasm is evident.

In addition to giving people an opportunity to see and touch optical fiber, the course covers the basics. What is fiber? Where does the light travel? What is the core and the cladding? How is fiber used as the system backbone? Discussion is limited to general terms and seems appropriate for a basic level of understanding and common vocabulary. With this knowledge, employees are able to communicate the benefits of fiber and Continental's strategy as they interact with customers and the community.

Technicians, of course, need more specialized in-depth knowledge and skills. The training center provides a series of programs for technicians as they advance in their careers and become more technically sophisticated. This building-block approach allows people to acquire a more detailed understanding. We chose to integrate fiber training into existing programs at the appropriate level, as well as to develop one- to two-day workshops covering a variety of fiber-related topics.

System replicated for training

Because people learn best through actual hands-on practice, we replicated a fiber-optic system at the center. We already had a satellite dish, headend, pole farm and prototype customer's house. With the help of Anixter, we added fiber-optic technology so that technicians could gain critical skills in a controlled training environment.

Technicians who attend the two service technician courses become familiar with signal strength and the concept of the decibel. They have a basic understanding of amplifiers and the relationship between cable loss and the diameter of the cable. We add a discussion of fiber and how its characteristics relate to these other areas. This raises more sophisticated questions, such as:

◆ How does the light stay in the core?
◆ What is it that produces the light energy?
◆ How do I splice two pieces of fiber together?

One key we have learned from past experiences with training is that participants need an opportunity to use their new knowledge. In this case, the participants (either as a group, a team or as individuals) use a fusion splicer to join two pieces of fiber. In some classes, we also measure signals on the output of the AM system in the lab and see if there are any differences in pic-

ture quality before and after. Many times participants walk away with their eyes wide in amazement, shaking their heads and smiling. To them, the concept of fiber can be unbelievable.

Maintenance technicians are usually at a point in their careers where they begin to have questions about theory and why things happen. They are familiar with sweeping and balancing. They have a fair understanding about what a modulator or processor does. Some may even be actively involved with headend maintenance. Many are familiar with system calculations and design.

When fiber is introduced, they are able to relate some of their past training and experience with coaxial cable to this new technology. Here we introduce basics about design philosophies. This would be an appropriate place to talk about loss budgets, lasers, the difference between an FM system and an AM system and other technical specifications. If they are to troubleshoot a system problem, they will need to know what areas are common to fiber and coax systems and in what ways they differ. Distortions and noise are two key areas that we cover.

Prepare for emergencies

If the fiber system were to fail in an emergency situation (in the middle of the night for example) the maintenance technician on call will be the first person to respond. The cause may be headend- or hub-related problems or possibly a downed pole.

Because these problems can affect thousands of customers, it is critical that the maintenance technician have the skill and knowledge to respond quickly to restore service. If a pole is hit that carries fiber transportation, it may cause problems in communities 20 miles away. The person responding must know how to splice fibers and have the appropriate tools to get the system back on.

"We are committed to providing our technicians with fiber experience in as realistic a situation as possible."

The best way to be prepared for an emergency is to practice and that practice is best done before the problem actually occurs. Then there is no time pressure—the system is not really out. A "Fiber Restoration Workshop" provides this experience as part of our advanced technical courses.

Training programs must be flexible and modifiable as technology changes. Nowhere is this more important than in a rapidly evolving industry such as cable TV today. As we develop new programs we ask what issues are going to become more important in the next few years. What changes in the industry will warrant modifications to the programs already in place? What topics are no longer critical? At the New England Regional Training Center we have replaced those materials and topics that are not absolutely needed with sessions on new technologies that are becoming more and more a part of our business.

As our systems add fiber, they change the way they operate and the way they are structured. As a result, employees have new responsibilities. When should you start training people in new technologies? The answer is now. The training needs are both immediate and ongoing.

Techs want fiber training

Some in the technical community feel that fiber optics has been talked to death. On one level this may be true. But the people who will be working in the systems on a day-to-day basis, answering our customers' questions, maintaining the reliability and experiencing the rapid change will say they need and want fiber-optic training.

Technicians need more sophisticated solutions. Most importantly, they need hands-on practice. They need to touch, to splice, to manipulate and to make mistakes now, not later. There is no better teacher than experience. We are committed to providing our technicians with fiber experience in as realistic a situation as possible, thereby allowing them to gain the skills they need before their lack of skills affects customers. We have developed as many different scenarios as possible so they can practice in the controlled environment our lab provides. In this way, we help them become proficient before proficiency really matters.

Our employees are right—optical technology is amazing and exciting. We need to make sure they are trained in it. **CT**

Troubleshooting Jerrold line extenders

By Jud Williams
Owner, Performance Technological Products

Several versions of Jerrold's JLE line extenders are currently in use. The distinguishing difference among them is the use of hybrids in some versions while others incorporate quads. Hybrids are complete RF amplifiers within themselves, while quads are transistor arrays requiring additional external components to be functional, making it necessary to test them in-circuit.

Signal injection is an effective way to test quads, soldered-in hybrids and transistors. It involves isolating and examining each stage of an amplifier by injecting a signal into the input section and observing it at its output. The signal produced by a sweep generator is inserted into the input of the circuits under examination so problems may be located without going through the tedious process of disassembling the amplifier. Note that the cable normally carrying the AC power is used for signal injection so the AC must be

Figure 1

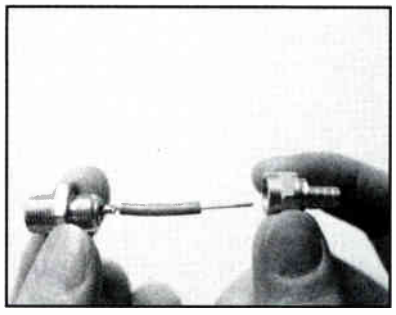
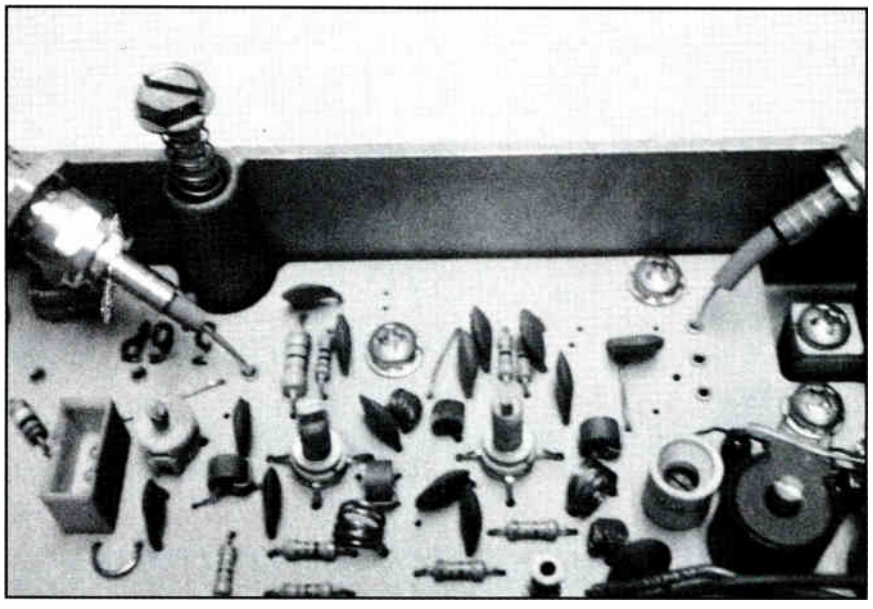


Figure 2



switched off and the amplifier under test receives its voltage from a DC bench supply.

Since no probes for inserting the signal into a circuit are commercially available, a description follows of how one may be easily constructed. Only four parts are required: a type GF-61A female bulkhead receptacle, an RG-59U connector, a 1 1/4-inch piece of solid 18 gauge wire and a 1/2-inch piece of insulation stripped from a scrap piece of wire.

Solder the end of the 18 gauge wire to the pin protruding from the GF-61A. Slide the insulation over the wire followed by the RG-59U connector, which is screwed onto the GF-62A so the insulated wire protrudes through the RG-59U. (See Figure 1.) The 18 gauge wire is the correct diameter for insertion into the attenuator/equalizer pins on the amplifier's PC board. When using the probe be sure that its outer surface is firmly in contact with the amplifier chassis so there is a good RF ground.

The Jerrold JLE-5-6P-2W line extender serves as a good example of how signal injection works because it has two transistors followed by a soldered-in hybrid and they are isolated from each other. As a first step, examine the circuitry to determine if there are any burned or damaged components requiring replacement. Next, power and sweep the amplifier in the usual manner to observe its response and verify that the internal power supply is functioning properly.

If further troubleshooting is indicated, remove all attenuators and equalizers, turn off the AC power and attach a bench supply adjusted to 24 volts to the B+ test point of the amplifier. The probes are attached to the cables connected to the "RF out" and "RF in" (detector) terminals of the sweep generator.

To test the transistors making up the first stage of the line extender, insert the probe containing the RF signal from the sweep generator into the attenuator pin adjacent to the first transistor. The probe that returns the signal to the sweeper's detector is inserted into the pin on the output side of the second transistor. (See Figure 2.) If the circuit is okay, the sweep will be fairly flat with a gain of about 18 dB.

Next, move the RF probe to the pin connected to the hybrid input. Remove the test probe from the output cable going to the sweeper detector and attach that cable to the amplifier's RF output connector. This allows the response of the hybrid to be observed without unsoldering it from the amplifier. It is normally flat with a gain of about 30 dB.

The JLE-6-400-2W, which contains one transistor and two quads, may be tested using the same technique. The transistor stage incorporating the slope control is tested first. It has a gain of about 5 dB. Next, both quads are checked together using the same method as the aforementioned hybrid. RF continuity of inactive sections of the circuit also may be tested using this same method. The major difference is that the attenuator of the sweep generator is set to 0 dB so the response curve may readily be observed. In the examples, response of each circuit has been viewed individually so any defect or malfunction is quickly isolated by use of signal injection.

Next month I will explore some of the problems encountered when repairing Jerrold line extenders. **CT**

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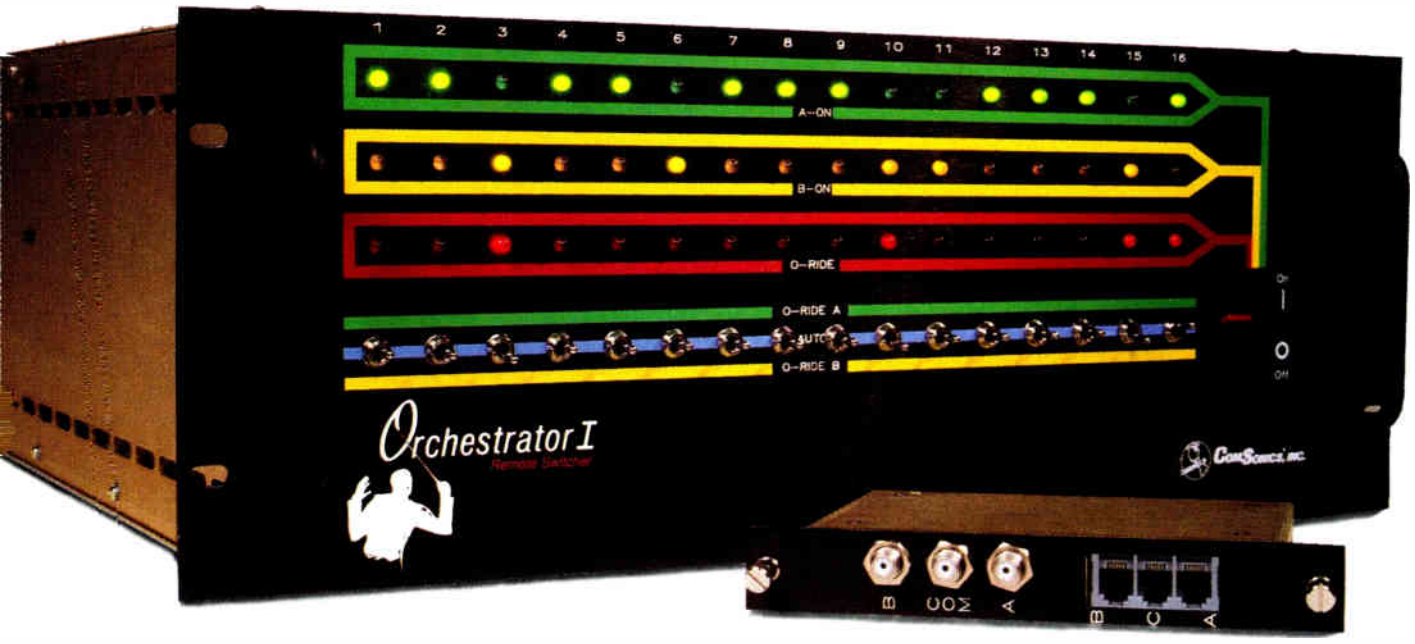

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Twenty questions for a first draft

By Rikki T. Lee
Editorial Consultant

Technical writing's a lot like the national pastime. You could end up on first, second or third base; it all depends on how much you put into your swing—the first draft. But unless you revise, you'll never reach home plate. So to help you score, here's a score of questions to ask yourself as you begin to rewrite your paper.

1) I say, do you sound like a fuddy-duddy? If you don't normally speak like a chap from the 19th century, then don't write like one. Remove such phrases as: "Albeit...," "It behooves you...," "Pursuant to..." and "It is incumbent upon us..."

2) Did you actively avoid passive verbs? In front of another verb, a form of "be" can sting you. By focusing on the object of your work, you and your paper lose impact. Don't write: "The lab tests have been performed." Instead: "We performed the lab tests."

3) Are your ducks lined up properly? It's not too late to check the validity of your facts and the conclusions you draw from them. Of course, this doesn't mean performing the experiment or the research over; simply compare the numbers with your original notes.

4) Do I have to draw you a picture? Add substance to any generality; explain what you mean and use specific examples or analogies. "Lab techs must maintain performance and skill levels compatible with standard practice." So, give examples of these levels.

5) Are you man-handling? Eliminate gender when it isn't necessary. Use plurals or neutral words ("line tech," not "lineman"), or try to alternate genders in your examples. Watch it, man: "The tech must have his tools." Much better: "Techs must have their tools."

6) Is your paper in for a bad spell? Unless you can alter your software, CATV terms are rarely in the spell checker. Consult a dictionary or tech glossary. Commonly misspelled words include heterodyne, addressability, converter, compatibility and VideoCipher.

7) Did you seek out the lines of your outline? Before writing, you should have done an outline—anything from a list of topics to connected paragraph summaries. If you have an outline, compare it to your draft. Be certain the paper maintains the same logical order.

8) Have you charted your course? You can vastly improve your paper with illustrations that spotlight a fact or make something more understandable. If you think a visual can help, choose the type that best fits your purpose—graph, table, schematic, photo, etc.

9) Also, did you have the right connections? Nothing confuses the reader like two consecutive paragraphs that don't mesh. So, start the second paragraph with connecting words: "As previously described," "On the other hand," "However," "Also," etc.

10) Could you say that one more time? Get serious with redundancies; they'll hurt you again and again. Instead, make sure every word has a job to do. Avoid these: new innovation, assemble together, close proximity, general rule, root cause, exact same, etc.

11) Did participles leave you dangling? Make a connection between the participle and the word after the comma. Bad: "After reviewing the research, Jim's approach was declared feasible." Good: "After reviewing the research, we declared Jim's approach feasible."

12) Like, did you use slang? Except for emphasis ("You pays your money and you takes your chance."), avoid bad grammar, shortcuts or meaningless phrases. Instead of "intro," write "introduction." For "hopefully," use "I hope." Remove "basically" entirely.

13) Yes, did you accentuate the positive? If it's not unlike you to doubly negate yourself, you're in a not unsmall group. Negative forms of words dilute the strength of your facts and arguments. So, when positive words exist, use them. Any "un" is a bad "un."

14) Are your major points stressed out? You want to emphasize certain sentences in your paper—OK. But there's a danger: The more you emphasize, the less anything you emphasize seems important. So use exclamation points, underlining and boldface sparingly.

15) Are you in for the long haul? If a sentence runs too many lines, your reader will get confused and go back six times to read it. Here, shorter is sweeter. So vary the size of your sentences and paragraphs; take those never-ending paragraphs and break them up.

16) Does punctuation puncture you? Don't fear this one. When you find yourself asking if it's time for a comma, read the sentence aloud. Where you naturally pause, put the comma there. For other punctuation rules, go with your gut or consult a reference book.

17) Have you nipped those cliches in the bud? After all is said and done, such well-worn phrases tend to wear thin. Time and time again, cliches are taken for granted by the reader—no thought is given to your words. Replace "old chestnuts" with what you mean to say.

18) Can we come to an agreement? Make sure your plural (or singular) subject agrees with your plural (or singular) verb. A problem with prepositional phrases is (not "are") that they get in the way. Example: "A group of staff members always comes in late."

19) Is that superdupercolossal or what? Don't hit your readers with gargantuan (big) words; go for the miniscule (small) ones. If you love the thesaurus, use (not "utilize") it to find smaller versions. (This rule usually doesn't apply to technical terms.)

20) Have you omitted any? After you've cleared up the major problems, read the tech paper again to add any words that you might have forgotten in your haste. "There is reason to believe" differs from "There is no reason to believe"; which do you really mean?**CT**

Author's note: This column received inspiration from William Safire's "Fumblerules: A Lighthearted Guide to Grammar and Good Usage" (Doubleday, 1990).

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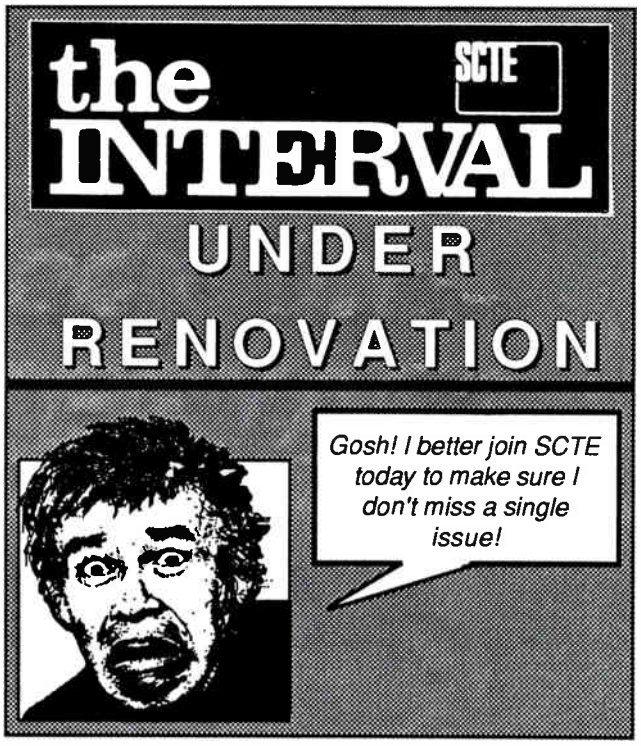

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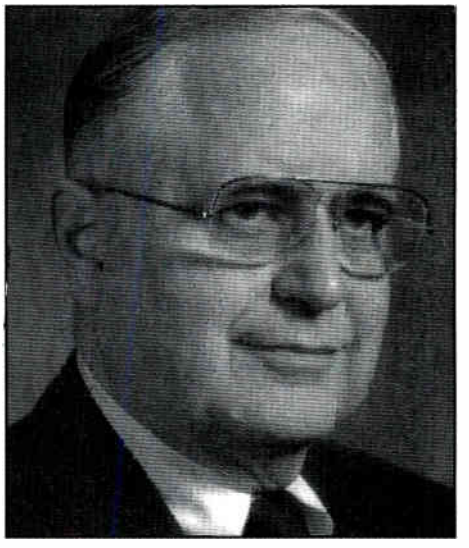
IEEE 802.7—A standard for broadband LANs



By Lawrence W. Lockwood
President, TeleResources
East Coast Correspondent

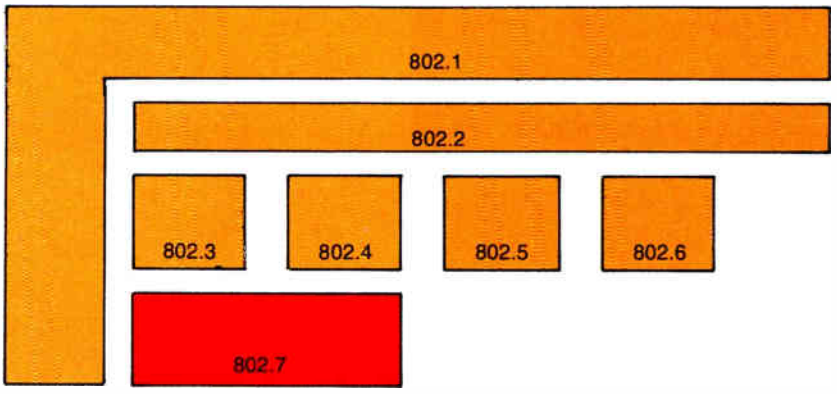
Editor's note: Lockwood was a member of the IEEE 802.7 Standards Committee throughout its creation and was a member of the balloting committee for its approval.

Finally, after five years, we have an Institute of Electrical and Electronics Engineers (IEEE) and American National Standards Institute (ANSI) approved IEEE 802.7 LAN (local area network) standard. The original reason for the creation of the 802.7 standard was that many people were building broadband data and video LANs for IEEE 802.4 applications. Since many of the designers (being largely computer people) had little or no experience with broadband networks (i.e., CATV) many incompatible networks were made. Therefore to correct this situation and standardize the broadband LAN design, construction, operation and maintenance the IEEE 802.7 group was formed.

A brief definition of the 802.7 standard (as taken from the standard's abstract) is it "specifies the design, installation and test parameters for a broadband cable medium. The medium supports the communication of IEEE 802.3b, IEEE 802.4, video, and narrowband radio frequency (RF) modem devices. The broadband bus topology consists of amplifiers, coaxial cable and directional couplers that create a full duplex directional medium. Inbound signals flow from user outlet transmitters to a central headend location. The headend processes the signals and then transmits the signals via an outbound path to all the user outlets. The medium utilizes frequency division multiplexing (FDM), which supports the simultaneous coexistence of services. Each service is assigned a unique inbound and outbound channel frequency." Definitions of the other IEEE 802 standards and a diagram of their relationships is shown in Figure 1.

During the five years of 802.7 standard creation, fiber-optic applications in LANs have grown immensely, particularly for high speed data transmission; e.g., the ANSI standard FDDI (fiber distributed data interface), which has a 100 Mbps transmission rate while the 802 standards are usually limited to 10 Mbps (20 Mbps at the most). Some analysts believe that by the middle of the decade 24 percent of all LAN installations will be of one or another fiber format. However, in my view, while not as large as anticipated at the start of the 802.7 standard five years ago, there will always be application of coaxial broadband LANs to requirements presented to system designers and operators. As a matter of fact developments are progressing rapidly to use FDDI in many applications as a backbone network to link existing smaller or distributed LANs that are based on existing standards—e.g., 802.3, 802.4 or 802.7. Another interesting development is the growth of a new

Figure 1: IEEE 802 standards



P802.1 P802.1 describes the relationship among 802 standards and their relationship to the ISO Open Systems Interconnection Reference Model. This document will contain network management and interconnection standards. (Project currently under development.)

802.2 IEEE Std. 802.2-1989 (ISO 8802-2), logical link control protocol.

802.3 International Standard IEEE/ISO/ANSI 8802-3-1989(E) Information Processing Systems—Local Area Networks—Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications, specifies an Ethernet-like LAN media, the physical layer and the media access control or MAC protocols. (Note: This publication replaces ANSI/IEEE 802.3 and it includes the ISO approved version of supplement ANSI/IEEE Standard 802.3a.) List, $65; IEEE members, $58.50.

802.3 b,c,d,e ANSI/IEEE Standard 802.3 b,c,d,e 1989 Edition Supplements to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) is the companion document to 8802.3-1989. It contains the new ANSI/IEEE-approved Supplement "d," MAU and baseband medium specifications for vendor independent fiber-optic inter repeater link (IRL). Be sure you have these supplements if you are ordering 8802.3-1989. Supplement "a" is now included in 8802.3-1989. List, $49.50; IEEE members, $44.50.

802.4 Internal Standard ISO 8802.4: 1989 Information Processing Systems—Local Area Networks—Part 4: Token-Passing Bus Access Method and Physical Layer Specifications, deals with all elements of the token-passing bus access method and its associated physical signaling and media technologies. It specifies baseband and broadband media. The standard cites the electrical and/or optical and physical characteristics of the transmission medium and specifies the electrical or optical signaling methods used. (Note: This publication supersedes IEEE Standard 802.4-1985). List, $75; IEEE members, $67.50.

802.5 IEEE Std. 802.5-1989 (ISO 8802-5), a ring utilizing token passing as the access method.

802.7 802.7-1989 IEEE Recommended Practice for Broadband Local Area Networks, specifies the physical, electrical and mechanical characteristics of a properly designed IEEE 802.7 broadband cable medium. The characteristics described are intended as the minimum acceptable parameters for the design, installation and test of an IEEE 802.7 cable plant. Single and dual cable systems are specified for the support of existing ISO 8802-3 and IEEE 802.4 broadband devices. List, $40; IEEE members, $20.

fiber/coax broadband LAN manufacturer founded and managed by experienced CATV veterans—Broadband Networks Inc. of State College, Pa. One of its suggested fiber/802.7 system configurations using equipment of its design and manufacture is shown in Figure 2.

The average length of time for creating and accepting an IEEE standard is about three years. I believe one of the reasons for the extra time taken for this standard may have been due to the heavy tilt the membership of the 802.7 Committee had to the computer world.

Coordinating 802.7 with CATV standards

In the seemingly innumerable drafts (there were a total of eight) early on I continually corrected specifications that were

Capital Gain

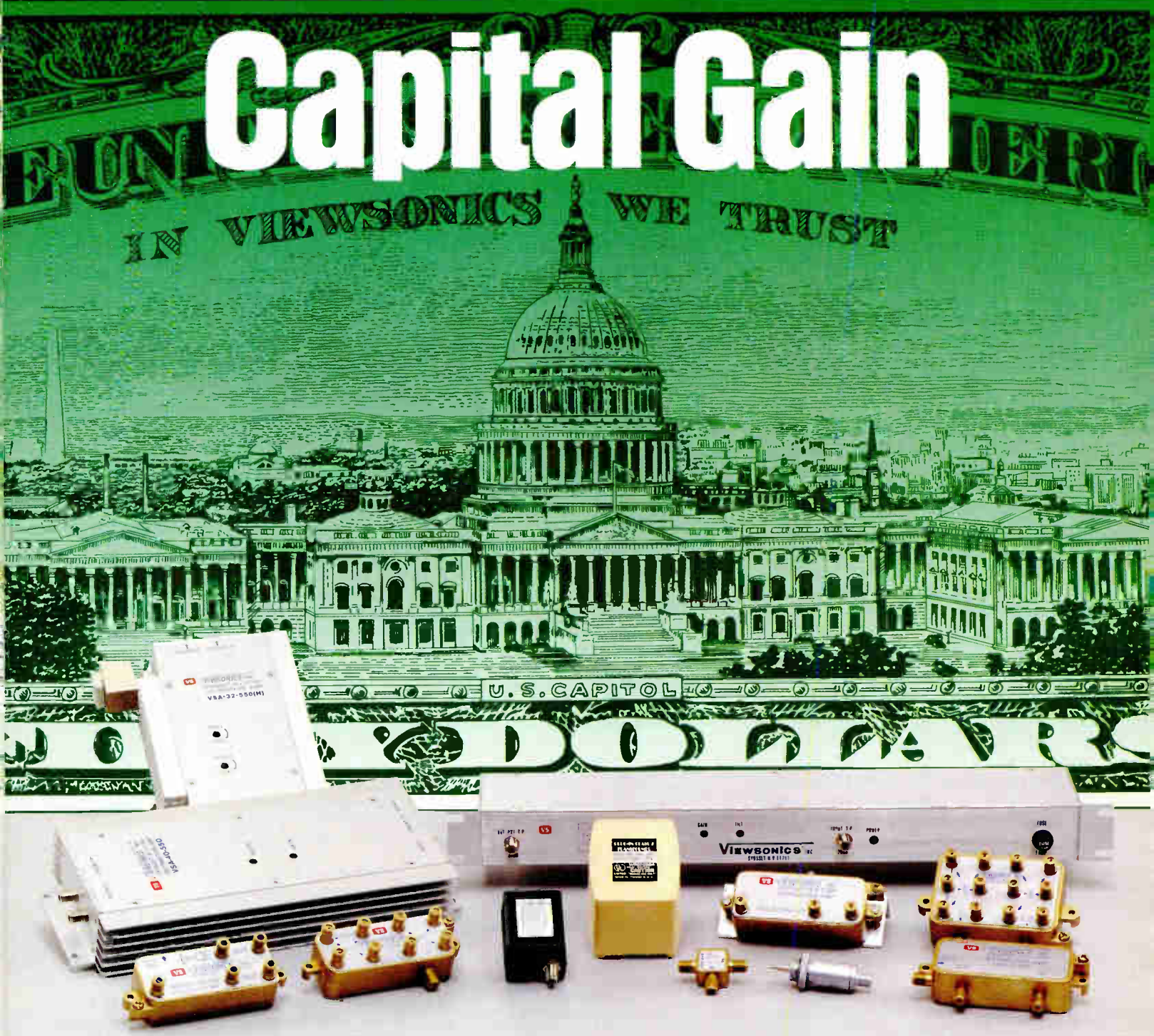


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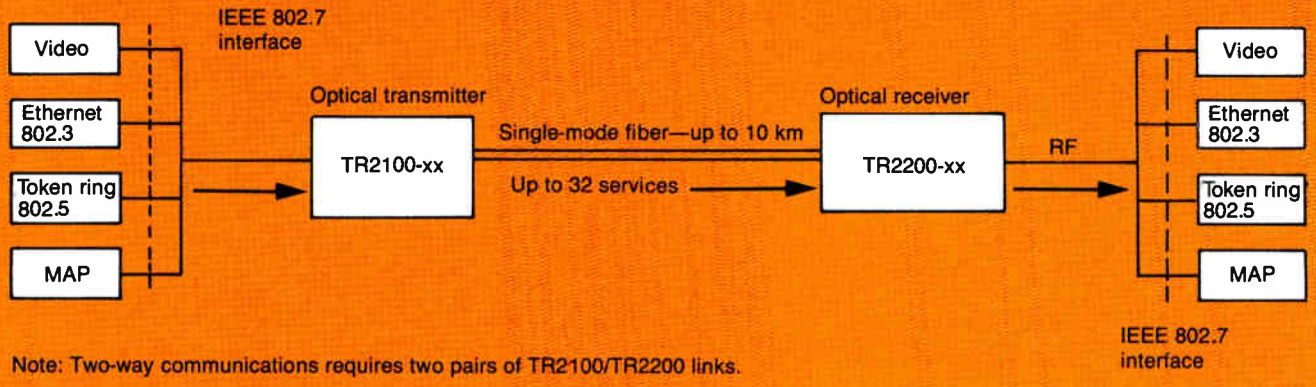
Figure 2: A Broadband Network Inc.'s fiber/802.7 LAN system configuration



Note: Two-way communications requires two pairs of TR2100/TR2200 links.

different from CATV practices and/or National Cable Television Association (NCTA) standards. However, several years ago when one of the drafts appeared likely to be submitted as a final standard recommendation I was quite concerned since it differed in so many significant respects from accepted CATV standards and if accepted we would have created just another incompatible standard.

I discussed this situation with Archer Taylor of Malarkey-Taylor and we brought this problem to the attention of the NCTA Engineering Committee. Should we or should we not make the substantial effort to provide the extensive changes necessary to make the 802.7 broadband LAN standard compatible with CATV standards? It was decided by the committee that we should. Taylor and I took a large number of suggestions to an 802.7 Committee meeting in San Francisco. As an example of some of our submissions regarding a few of the many issues the following is but a brief excerpt:

The maximum permissible composite triple beat level, relative to visual carrier level, can only be stated in terms of a definition based intrinsically on the method of measurement; and, whether or not the carrier assignments are harmonically related, or otherwise at precisely equal intervals. The −53 dB standard means little, even for design purposes, without proper definitions, which are carefully set forth in the *NCTA Recommended Practices*. Perhaps it is a minor point, but would it not be more consistent to use the positive carrier-to-interference ratio for the composite triple beat, as in carrier-to-noise and C/I in satellite link budget analyses? The cable industry has fostered, willy-nilly, the bad habit of specifying CTB backward in negative figures.

Sec. 1.5 defines the channel energy (power) in the reference model as "NCTA TV Standard." The NCTA Standard noise power bandwidth has always been 4.0 MHz, not 4.2 MHz as used in Section 2. NTSC (National Television Systems Committee) and FCC have, however, defined the baseband *video* spectrum for the standard color TV

"IEEE 802.7—a LAN standard that is compatible with CATV."

channels as 4.18 MHz. The difference in noise power is an insignificant 0.2 dB. Nevertheless, it would be more consistent to stick with the NCTA 4.0 MHz standard for RF.

The Definitions in Appendix B, pages 94-95, incorrectly equate "slope" and "tilt." The difference is significant, and must be properly understood:

- "Slope" is the gain (or loss) vs. frequency characteristic of cable, amplifiers and other devices.
- "Tilt" is the relative level of multiplexed carriers with respect to a designated reference carrier.

An amplifier with zero *slope* has a flat frequency response. The multiplexed carriers transmitted through an amplifier with zero slope may have 5 to 10 dB *tilt*; i.e., the high frequency carriers transmitted at 5 to 10 dB higher output level than the low frequency carriers. In some cases, manufacturers specify a "block tilt" or "half tilt" or "true tilt."

In Appendix A, page 82, dBmV is defined as "decibel referred to one millivolt; 0 dBmV = 1 mV." On page 88, Appendix B, the definition correctly states that 0 dBmV is defined as 1 millivolt *across 75 ohms*; but the previous sentence omits the essential 75 ohm part of the definition.

Section 3.4.4 states that: "The limit of perception, based on subjective tests, corresponds to a luminance-chrominance delay between 150 and 200 ns." This is not correct. In the classical study on this matter, in the August 1971 Journal of the SMPTE, Anthony M. Lessman, Bell Telephone Laboratories, reported that 150 ns delay was found to be imperceptible by only about 10-15 percent of the observers; 200 ns, by none. For 90 percent of the observers, 200 ns delay was "definitely perceptible, but only slight impairment to picture." This is for "shaped delay." About 75 percent of observers commented that 200 ns "flat delay" resulted in "impairment to picture, but not objectionable."

The comments in Sec. 3.4.2 regarding leakage interference to vital services are now obsolete and incorrect. The FCC Second Report and Order in Docket 21006, adopted Oct. 1, 1984, and modified in June 1985, includes several principles of importance to data transmission. The NAV band (108-118 MHz) may now be used on cable without specific approval, providing all carrier frequencies or signal components are offset by 25 ± 5 kHz from any radionavigation frequency (in MHz) that is an even integral multiple of 0.025. Frequencies in the band also may be used if the power level in any 25 kHz band, averaged over any 160 microsecond period, is less than 10^{-4} watts (38.75 dBmV), at any point in the system.

Sec. 3.4.2 of the 802.7 draft, page 31, fails to mention the fact that the 225-400 MHz band also is restricted by FCC Rules with 12.5 ± 5 kHz offsets for average power levels greater than 38.75 dBmV. Power averaging may be a useful concept for data transmission either in the 108-137 MHz band, or in the 225-400 MHz band. Broadband LAN users also should be aware of the leakage monitoring requirements imposed by FCC Rules, 76.610 and 76.614 on users of any of the aeronautical bands.

Conclusions

All of our suggestions were accepted and became part of the final standard thus accomplishing my original goal to create a broadband LAN standard that is compatible with CATV. As a matter of fact the IEEE 802.7 standard can be used for a CATV network design. (There is one minor signal level difference imposed because 802.7 had to be compatible with levels specified in 802.4.) After we balloted and accepted the final draft it then became a matter of acceptance by the IEEE general standards organization and subsequently by ANSI, all of which ultimately did occur. Finally success and FINIS. **CT**

Ordering information for published IEEE standards is available from the IEEE Standards Department, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, (800) 678-IEEE. If one wanted the complete broadband LAN standards, order IEEE 802.3b, 802.4 and 802.7.

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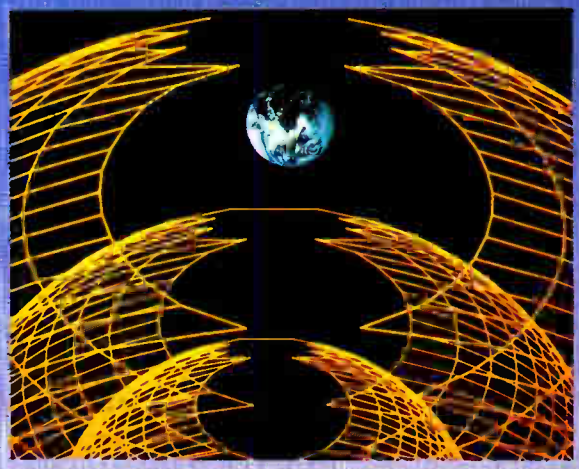

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Hewlett-Packard's HP 8591A spectrum analyzer

By Ron Hranac
Senior Technical Editor

Many of us cut our "spectrum analyzer teeth" on Hewlett-Packard's older analog spectrum analyzers. The last HP analog spectrum analyzer that had cable TV in mind was the HP 8558B equipped with an optional 75 ohm input and calibration in decibels per millivolt (dBmV). A few years ago the company introduced its Model HP 8590A—a digital display microprocessor-controlled instrument—as a replacement for the workhorse HP 8558B. Two things set it apart from other equipment on the market: It was available with an optional CATV measurement software package built-in (including a 75 ohm input) and it cost less than its analog predecessor. The HP 8590A evolved into the HP 8590B, and now an even more advanced unit—the HP 8591A—is available that has yet more capabilities.

Before going much further, I'd like to take a moment to define what a true spectrum analyzer is. A number of manufacturers sell what are purported to be spectrum analyzers, but are in fact spectrum monitors. In general, a spectrum analyzer has the ability to select among various resolution bandwidths, which in effect allows changing the IF bandwidth with different internal filters. As well, the vertical scale can be either logarithmic (e.g., 10 dB, 2 dB, 1 dB per division) or linear, and the frequency span per division can be varied over a range from zero to several MHz or more per division in selectable steps. Besides these differences, a spectrum analyzer will usually cost quite a bit more than a spectrum monitor.

This report primarily covers just the CATV measurement

Courtesy Hewlett-Packard

functions of the HP 8591A spectrum analyzer, since there isn't enough space in this column to highlight all of its capabilities. (HP supplies two three-ring binders with the HP 8591A comprising several hundred pages that do the job quite nicely.) Microprocessor-based operation allows most analyzer measurements to be made by pressing a few buttons, simplifying measurement tasks and reducing the chance of operator error. The CATV-specific software available for the HP 8590 series of analyzers literally turns the host equipment into an easy to use dedicated CATV test instrument.

The product

The HP 8591A is one of the family of HP 8590 spectrum analyzers; the HP 8590B and HP 8591A both cover 9 kHz to 1.8 GHz, and the HP 8592B and HP 8593A operate to 22 GHz. The HP 8590B and HP 8592B are more economical "basic" versions; the HP 8591A and HP 8593A are quite a bit more sophisticated, but reasonably priced considering that many of their capabilities are normally found only on far more expensive analyzers. All share the same portable case (13.25″ W x 7.25″ H x 18.12″ D) and can be configured for

Figure 1

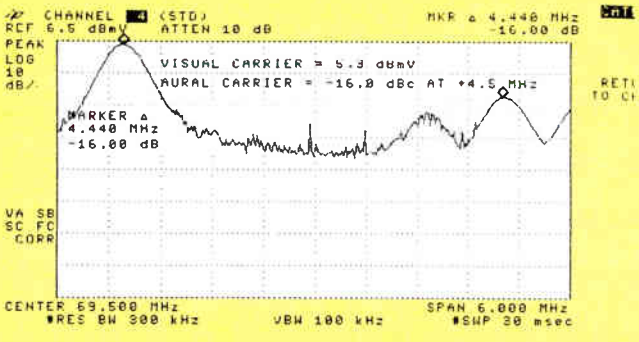
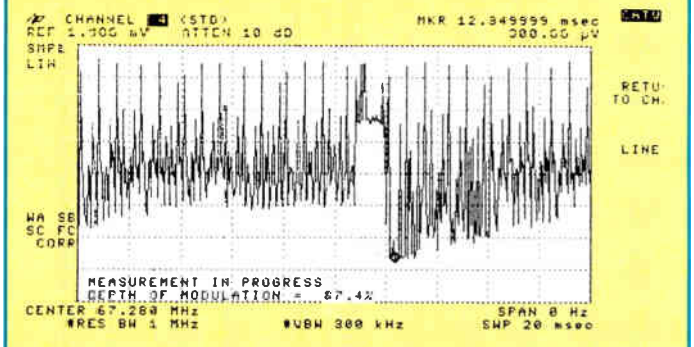


Figure 2



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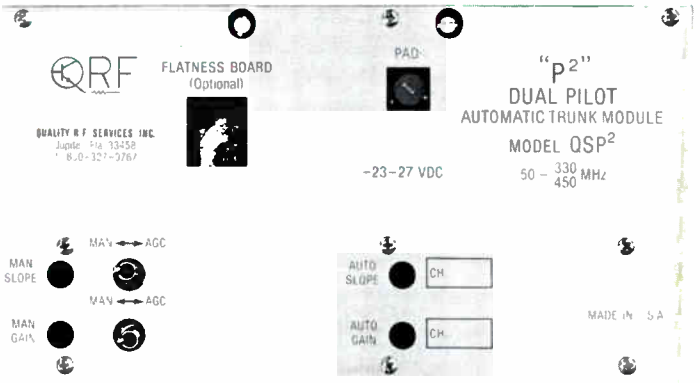

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	PARALLEL	CONVENTIONAL	PARALLEL	CONVENTIONAL	PARALLEL	CONVENTIONAL	PARALLEL	CONVENTIONAL
Passband MHz	50-300	50-300	50-330	50-330	50-400	50-400	50-450	50-450
Flatness ± dB	0.2	0.2	0.2	0.2	0.25	0.25	0.25	0.25
Min. Full Gain dB	29 or 30	29 or 30	29 or 30	29 or 30	30	30	30	30
Gain Control Range dB	8	8	8	8	8	8	8	8
Slope Control Range dB	-1 to -7	-1 to -7	-1 to -7	-1 to -7	-2 to -8	-2 to -8	-2 to -8	-2 to -8
Control Pilots ASC: Turned to Ch.	"Q"	"Q"	"W"	"W"	"W"	"W"	"W"	"W"
Oper. Range dB	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable
AGC: Turned to Ch.	4	4	4	4	—	—	—	—
Oper. Range dB	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable	Selectable
Return Loss dB	16	16	16	16	16	16	16	16
Noise Figure dB	6	6	6	6	6	6	6.5	6.5
Typical Oper. Level dBmV	34/30	34/30	34/30	34/30	35/30	35/30	35/30	35/30
Distortion at C/CTB	-93dB	-88dB	-92dB	-87dB	-91dB	-86dB	-89dB	-84dB
Typical Oper. XMod	-94dB	-89dB	-93dB	-88dB	-91dB	-86dB	-89dB	-84dB
levels 2nd order	-85dB	-82dB	-85dB	-82dB	-85dB	-82dB	-85dB	-82dB
DC Requirement mA at -23 VDC Note 1	630-730	420-500	630-730	420-500	650-750	430-500	650-750	430-500

Note 1: DC requirements are stated as typical to maximum.
Note 2: Specifications should be referenced to the modules, not the connector chassis.

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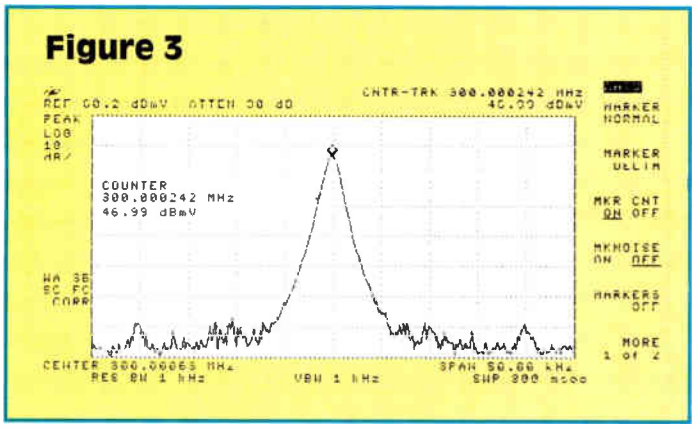
Figure 3



"The HP 8591A can be given different 'personalities' by loading software into the analyzer through its front panel read/write memory card slot."

CATV-specific measurements using ROM-card downloadable software.

The HP 8591A weighs about 32 pounds, and will operate from 115 VAC or 230 VAC (rear panel switchable). For true portable use, the company has a separate battery operated inverter-based AC power source that will operate the HP 8591A or any other AC-powered instrument up to a 200 watt load.

The HP 8591A can be given different "personalities" by loading software into the analyzer through its front panel read/write memory card slot. The CATV software is one example of a user-loadable personality. It is stored on a battery-backed ROM memory card that is about 3/32" thick and the size of a regular playing card. Battery-backed 32 kb RAM cards also are available that provide a convenient way to store instrument states, screen traces, amplitude correction factors and programs. Even without using the card read/write functions, 50 traces and instrument states can be stored in internal memory.

By itself the HP 8591A is a pretty versatile spectrum analyzer even without user software. Microprocessor control allows over 100 instrument functions to be controlled by front panel push buttons and menu-driven soft keys. Complex tasks such as determining 6 dB points or making third-order measurements are one-button operations. It also incorporates FFT (Fast Fourier transform) that can turn a zero span time domain display into a very low frequency spectrum display. This allows measurements as close as 1 Hz to the carrier; the CATV hum measurement function uses this feature to characterize 60 and 120 Hz power line components. With the right options, this analyzer can be connected to a computer or used as a marker-driven demodulator. (This second feature is nice: just center a marker over an unknown signal and turn the AM/FM demod function on and listen to the signal with the analyzer's speaker.)

The CATV personality adds several automated cable TV specialty functions. Included are a channel tuning function that can be set to NTSC standard, HRC, IRC, over-the-air VHF and UHF, as well as PAL and SECAM channels. Other one-button CATV-specific measurements are visual and aural carrier levels, carrier-to-noise, hum, cross-mod, CTB, video depth of modulation, system frequency response, and a separate beat measurement function for CSO or various discreet types of intermodulation. The CATV software also provides a function called minimum hold that is useful for identifying low level beats in the presence of video modulation, a task that is usually difficult or impossible on most digital display spectrum analyzers.

The unit tested was equipped with Option 001 (75 ohm input) and had the HP 85711A CATV measurement software loaded in. Other options included a built-in precision frequency reference (Option 004), fast time domain sweep (Option 101), AM/FM demodulator, speaker and TV sync trigger (Option 102), an RS-232 interface (Option 023), a front panel cover (Option 040), an RS-232 cable (HP 13242G), and an RS-232 ThinkJet printer (HP 2225D).

This configuration totaled up to a fairly substantial

(Continued on page 109)

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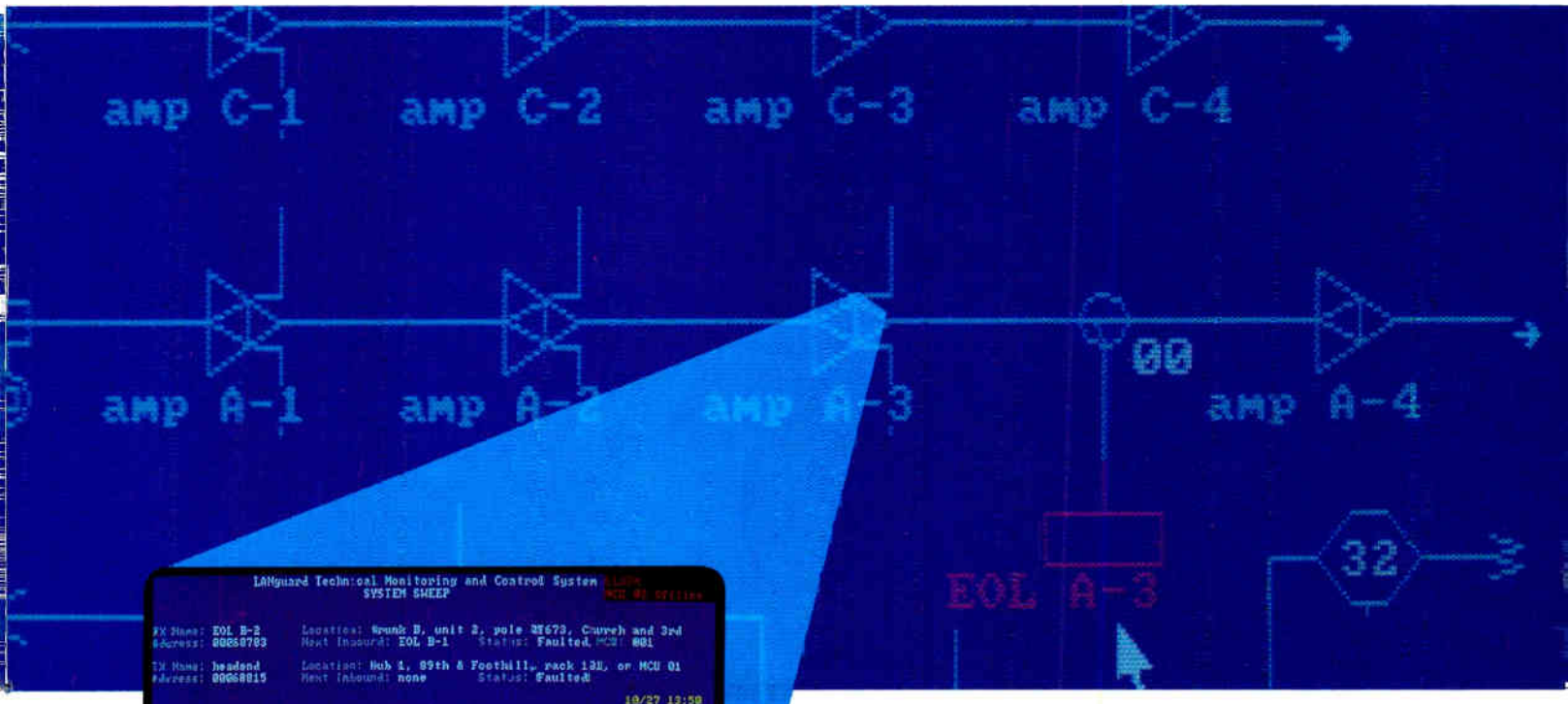

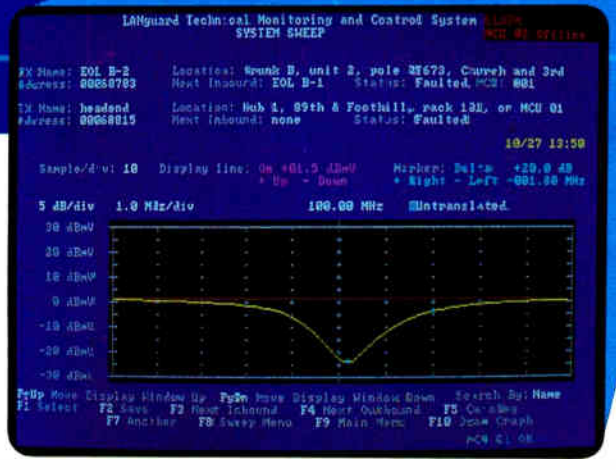

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13	32	51	70	89	108	127	146	165	184	203
14	33	52	71	90	109	128	147	166	185	205
15	34	53	72	91	110	129	148	167	186	206
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5	24	43	62	81	100	119	138	157	176	195
6	25	44	63	82	101	120	139	158	177	196
7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

(Continued from page 104)

$19,198, not including the special H81 option that displays a demodulated NTSC picture on the CRT and provides a rear panel video monitor output. The base HP 8591A is $12,625 and comes standard with a memory card reader; there is no charge for the 75 ohm input option, and the CATV measurement software card is $600. (For those who are a little more budget-conscious, the not-quite-as-fancy HP 8590B including an *optional* memory card reader, CATV software and 75 ohm input is a more modest $10,970.)

Lab measurements

As specified, the channel select function can be set to the common CATV channelization schemes. Any channel from 1-99 can be chosen by entering its EIA number; the display is automatically set so that the full screen width is 6 MHz and both the visual and aural carrier are shown. The HRC and IRC channel assignments are the older non-offset frequencies, but that does not seem to cause any problems because the horizontal display resolution is 600 kHz/division in the channel select mode.

After selecting a desired channel, its visual and aural carrier amplitudes can be measured by pressing the "carrier level" soft key, resulting in a display shown in Figure 1. A reference carrier level of +3.5 dBmV was used to check the analyzer's accuracy: With video modulation present the HP 8591A read +3.2 dBmV and with modulation removed it read +3.3 dBmV (we tried other levels with similar results). HP's spec is ±2 dB, which was easily met. The minimal difference between modulated and unmodulated readings indicates a good peak detector.

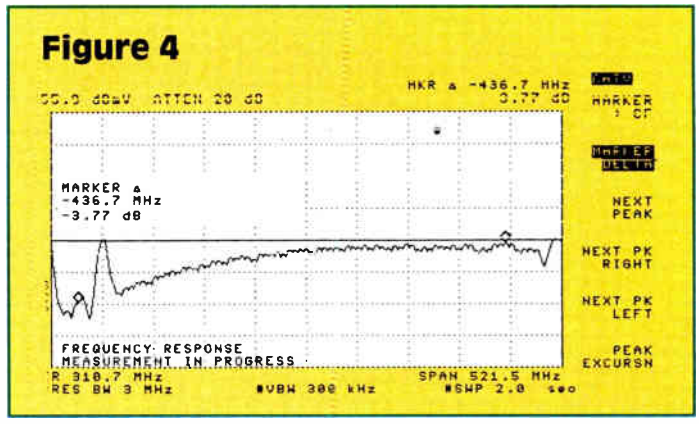
The depth of modulation function requires that VITS be present for greatest accuracy, and when compared to a known reference we found the HP 8591A read within 0.5 percent (Figure 2). HP's spec for this measurement is ±2 percent; it, too was easily met. One new feature in the latest CATV software version is the ability to measure depth of modulation on a single line of video. We selected line 17 and let the analyzer measure depth of modulation again; in this mode it read about 1.5 percent high, still within spec.

One standard capability of the HP 8591A is a built-in frequency counter function. This particular analyzer had the precision frequency reference option, which allows even more accurate frequency counter measurements (Figure 3). While not a CATV software function, it is a feature that can be useful in system measurements. We found its accuracy to be within 150 Hz over the 50-650 MHz range.

An automated 750 MHz Matrix (Dix Hill) system in Jones Intercable's corporate engineering lab was used to check the accuracy of the HP 8591A's distortion measurements. Carrier-to-noise was within 0.2 dB of the lab reference, CTB read 1.9 dB higher than the reference, and CSO (using the additional beat measurement function) read 1.6 dB lower than the reference. All of these were made using an external bandpass filter, and all were within spec except for the CTB measurement; it was out of spec by 0.65 dB.

Cross-modulation measurements are a controversial subject (see Earl Langenberg's article on the same subject in the November 1990 issue of *CT*). The spectrum analyzer measures it differently than the Matrix does, resulting in a 6 dB difference between the two. Taking that into account, the reading was within 0.8 dB of what was expected. We didn't get a chance to check the accuracy of hum measurements on this particular analyzer, but when I evaluated a CATV software-equipped HP 8590A a few years ago, its hum modulation accuracy then was within 0.2 dB.

Figure 4



The final CATV function checked was frequency response measurement. This is in effect a "sweepless sweep" that uses system carriers for the measurement. An initial reference—for example, the headend—is stored in memory, then subsequent measurements are compared against the reference. This technique is limited in portions of the spectrum where no carriers are present, but is fairly accurate where there are carriers. This function can accommodate scrambled channels, since the analyzer sweep rate can be slowed down to catch unsuppressed vertical sync pulses. We found it to be within spec in portions of the spectrum where carriers were present, but misleading "spikes" can occur where there are no carriers (Figure 4).

Comments

If you have ever made measurements with an older analog-type analyzer, you can certainly appreciate the difficulty of many of those measurements. Hewlett-Packard's HP 8590 series equipped with CATV software reduces the most complex of those measurements to pushing a few buttons. I have run across some who have been a little reluctant to give up the comfort of an analog display in exchange for a digital one, though. This is understandable, but the features in the HP 8591A are able to work around the digital display limitations common in some equipment. Do you remember all of the manual steps and adjustments necessary to calibrate the older analog analyzers? The self-calibration feature makes this an easy one- or two-button process.

Furthermore, the HP 8591A takes much of the user intimidation out of analyzer measurements by having the ability to load instrument personalities such as that provided by the CATV software. All of the normal spectrum analyzer functions are retained, allowing quite a bit of versatility in one unit. If you want to sweep filters and other passive devices, an optional built-in tracking generator—either 50 or 75 ohm—is available. The use of the low cost ThinkJet printer and RS-232 interface does away with a scope camera and messy film, too (all of the figures accompanying this article are ThinkJet plots of the analyzer's screen). And should you need to label the screen plots, the HP 8591A has user-selectable screen titling including date and time.

For more information, contact Hewlett-Packard at (800) 752-0900, ext. 1937. **CT**

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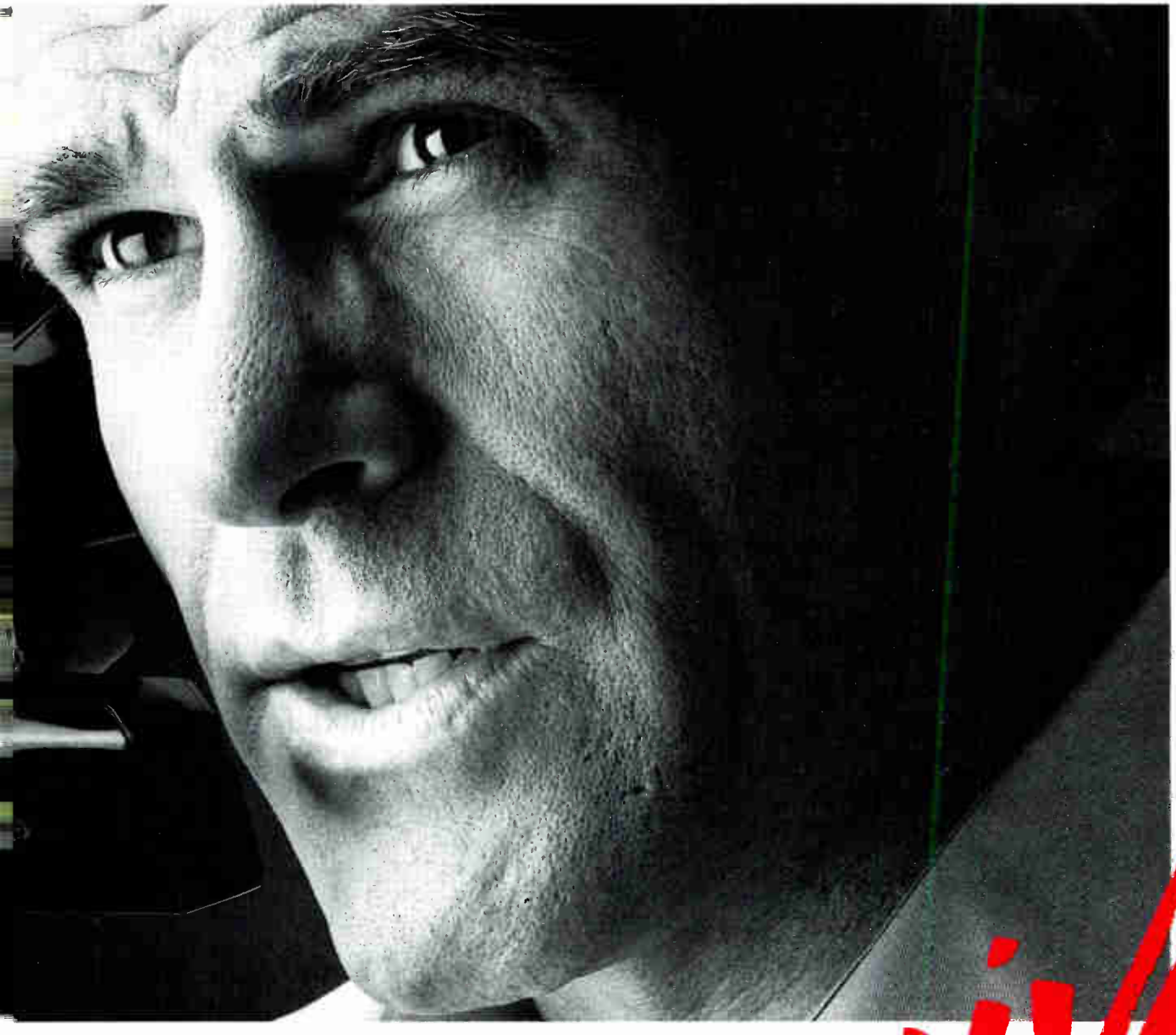


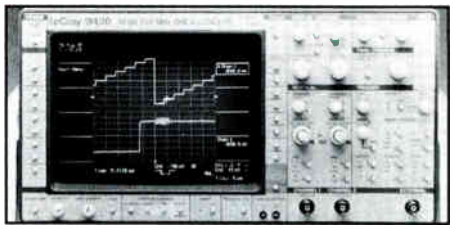
Responsive

JERROLD COMMUNICATIONS

Oscilloscope

The Model 9430 digital, 10-bit, dual-channel oscilloscope was introduced by LeCroy. It provides a bandwidth up to 150 MHz, extra-high sensitivity up to 20 μV/div and state-of-the-art ±1 percent DC accuracy. Signals are captured with two independent (one for each channel) 10-bit ADCs. These can sample repetitive phenomena at up to 4 gigasamples per second and single-shot signals at up to 100 megasamples per second.

Filtering and averaging techniques can be used to increase resolution by up to eight times (or from 10 to 13 bits). The unit can also be expanded with the installation of firmware to perform FFT spectrum analysis. According to the company, this turns the oscilloscope into a spectrum analyzer with a dynamic range of up to 80 dB.



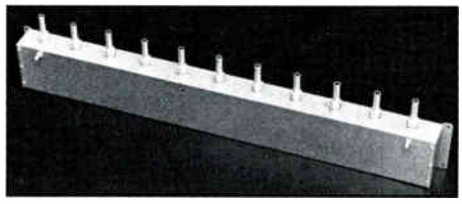
Reader service #141

Set-top terminal

Scientific-Atlanta introduced its Model 8602 PAL set-top terminal for the U.K. market. Features include step-by-step on-screen instruction, direct channel access and color-coded, easily identifiable keys. In addition, the product offers direct channel access from the set-top's keypad as well as the remote. It contains baseband, stereo-compatible volume control circuitry with an on-screen indication of volume levels.

The unit comes ready to handle pay-per-view purchasing activities with a one-touch "buy" function. It can be upgraded for impulse PPV. The final design concept uses multiple AM fiber nodes with up to 12 dB optical loss in each fiber trunk. The output of each laser transmitter is optically split a number of times with an average of three receivers for each transmitter and the nodes feed cascades of up to three distribution amplifiers using a combination of parallel hybrid and feedforward electronics.

Reader service #140



Test filter

The Model 7056 super selective CATV test filter by Microwave Filter isolates a 10 MHz spectrum in hyperband for testing of composites and triple beat. The 3 dB passband is 437-447 MHz and models can be made with 10 MHz passbands anywhere in hyperband.

The 60 dB stopbands are 0-434 MHz and 450-550 MHz and impedance

is 75 ohms. Connectors are type F. The case measures 3.25 x 11 x 30 inches.
Reader service #139

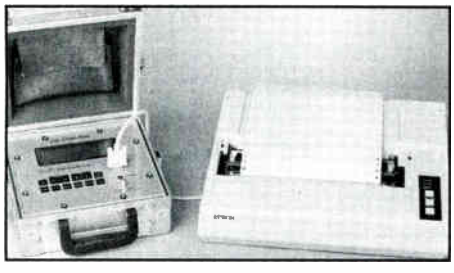
Amplifier

Ameritron announced its AL-811 linear amplifier that uses three 811A tubes to deliver 600 watts PEP or 500 watts CW from 160-10 meters. According to the company, easy modification instructions for 10/12 meters operation requires presentation of valid amateur license.

A Pi-network tuned input circuit matches the tubes to 50-ohm exciters. Dual illuminated meters are said to give a complete picture of the operating condition. One meter gives a continuous reading of grid current and a second switchable meter allows monitoring of high voltage and plate current.
Reader service #138

Power meter

Sadel R&D introduced its Sadel Lite miniature fiber-optic power meter. It has a single LED bar graph display and a dynamic range from +1 dBm to –23 dBm with flashing over negative range. It is switch selectable from 850 nm to 1,300 nm. It is battery operated via a momentary pushbutton switch.
Reader service #137



Fault locator

The Model CCR-4 fault locator for coaxial cable is available from Clic Instruments Ltd. The unit is a step-rise time domain reflectometer. It locates and identifies impedance mismatches on coax with a display resolution to 3.5 inches and a maximum range to 3,000 feet. It can locate taps, splitters, traps and filters, poor splices, bad connections and partial shorts and opens.

It displays a line response on a graphic, backlit liquid crystal display (LCD). Features include an extended operating temperature range, keypad control, online help information, 75 memory allocations, computer assisted calibration and analysis of cable characteristics and an RS-232 port for downloading to a computer or printer.
Reader service #136

Redundancy switch

Fairchild Data Corp. introduced its Model MS291 1:1 redundancy switch that provides automatic redundancy switching of modems for satellite data transmission applications, primarily at remote sites. It can be used with domestic and international open or closed networks and provides independent 1:1 transmit and receive switching of both baseband terrestrial inputs and IF signals. It is designed to switch reference clocks when the Tx signal clocks out the Rx buffer and therefore does not need to switch the entire modem. Only the individual transmit or receive channel that fails has to be switched.

The front panel of the unit or a serial RS-485 communications link can provide complete monitor and control. A parallel control input permits either TTL

or relay closure control. Power can be AC or DC. The front panel uses a combination of keys, LEDs and a segmented display for ease of use.
Reader service #135

Laser source

Noyes Fiber Systems introduced its Model OLS2-1300 laser source. It is a hand-held adjustable unit for testing fiber-optic cable attenuation at 1,300 nm. When the company's OLS2 is used in conjunction with the OPM 1-3 optical power meter it can prequalify fiber for operation at 1,300 nm. The unit is available with an FC connector.
Reader service #134

Attenuator

EXFO E.O. Engineering's Model FVA-80 variable attenuator allows both single-mode and multimode fibers to be used out of the same unit. Features include 65 dB of range, .05 linearity, 0.01 dB/step, a low back reflector option and 850/1,300/1,550 nm calibration.

Powering is through line voltage and a built-in battery. It is said to be ideal for BER testing, ATE testing, system analysis, etc. It has linearity of ±0.05 dB from <-3 dB to -65 dB, 0.01 dB resolution, repeatability or ±0.01 dB. Its program mode allows up to 60 attenuation levels to be executed by the unit with a delay of one second to one hour between each allowing BER to be simplified and automated, according to the company.
Reader service #132

Analyzer brochure

A brochure covering the Model TR4173 spectrum analyzer is available from Advantest. It details features and functions for GaAs amplifier and radio tests as well as applications for photonic devices. Sample screens are pictured to demonstrate the functions of the unit. Technical specifications for the unit are also outlined.

The spectrum analyzer itself contains a built-in tracking generator, which enables the user to measure amplitude characteristics from 100 kHz to 4.5 GHz and phase, group delay and impedence characteristics from 400 kHz to 4.5 GHz. The product can measure noise from analog semiconductor devices and low-level electromagnetic interference generated by electronic devices.
Reader service #133

Cable tie

Sachs' Model SC053 aluminum cable tie is designed to support the coaxial drip cables on the strand, in the pedestal, lock box and along the wall in single family units and on MDU applications.

Made of malleable aluminum the ties are fire retardant and meet fire code. According to the company they can be used over and over and will not kink or crush the cable, which eliminates the chance for sheath or dielectric damage.
Reader service #131

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Baby bottle warmer

By Isaac S. Blonder
President, Blonder Broadcasting Corp.

A one act drama tenuously based upon a real life happening. Scene: a shambles of an office, crammed with boxed and partially assembled household appliances, presided over by John Highbrow, the vice president of research for said products sold by a $50 million subsidiary of the Gigantic Corp. Seated comfortably across the desk is Tom Bottomline, the Gigantic corporate MBA. Both men are in their 40s, classmates and old friends.

Tom: You probably heard through the grapevine why I am here. My boss, the Gigantic CEO, has demanded that this year's annual review of profitability will hew to his guidelines or else! I am required to verify and compile the figures on this list that he went to the trouble of personally composing. First and most important item, do you earn more than 15 percent on capital investment? Keep in mind that Gigantic needs to earn a safe margin over the cost of money, which runs as high as 12 percent these days. Secondly, the gross margin over cost of materials and labor should always be in excess of 40 percent. Thirdly, the proper target for net profit is 6 percent of sales.

John: Hey Tom, give me a break, I run an R&D department with 10 scientists at a budget of $1 million, servicing the appliance division. That is only 2 percent of sales, a low figure for research, and besides we help out the factory when they encounter the occasional theoretical roadblock.

Tom: Your department can and should be measured by the number of new products you deliver each year whose contribution to profits is measured by a percentage of sales, usually 5 percent of the items covered by patents. Of course, any license income from other entities is included.

John: Before we talk about today's stats let us review the history of the appliance division. Before Gigantic picked us up, we had a 40-year history of introducing new products for the home, including the pop-up toaster, the steam hand iron and the electric hair curler, to mention a few. Competition was only from other U.S. companies with a similar cost basis and we prospered. Now we are underpriced by the world and the quality of new product research abroad is obsoleting all our staple items. Fortunately, at the time we were added to Gigantic's stable, Jim Dropout, our star engineer and inventor, came up with the Mini-Microwave Baby Bottle Warmer, which quickly became the top performer in our line of household gadgets. Millions of the warmers were sold and even today this patented item is the preferred choice of the American housewife. But trouble appeared in Paradise. The glass bottle of yesterday is no more! Plastic has taken over and our warmer is no longer convenient and safe to use. We are frantically trying to come up with a new version that includes a scanning temperature sensor and a companion variable strength, focused and scanned microwave beam that together will ensure that the baby bottle of milk is safely kept at the exact temperature that daddy wants. No more testing the temperature on the back of the hand.

Tom: What a terrific idea for a new product! How lucky Gigantic is to have the Highbrow engineering team in place.

John: Not so fast, my old friend Tom. The technical complexity of focusing and scanning the microwave beam is too much for my present team. We need...

Tom: What about your resident genius, Jim Dropout?

John: Well, first of all, he retired and won't even come back as a consultant. Second, Jim never did get his college degree because he claimed school was too boring, but his lack of solid math kept him from a lot of the new technology. Maybe he could not handle this project. But Jim was a real inventor and I'll bet you he would have done the job. However there is no Jim and we haven't been able to replace him.

Tom: The sad fact is that your output of competitive new products is too low to meet the Gigantic guidelines of profitability. This leaves me no choice but to recommend to the CEO that if your output doesn't take a sudden upturn, your outfit is kaput.

John: How does shutting down research benefit Gigantic? What about my future and that of my friends and fellow workers?

Tom: You, my old friend, will have a new title: vice president of corporate development. Your chief task will be to search out and acquire new growing firms with new products in the appliance field, naturally meeting our CEO's profit targets. As for your employees, Gigantic is always looking for engineers and there should be jobs for all, but not in research.

John: Thanks, as usual, for looking after your old friends, but I have this very uneasy feeling that a dam is about to break and drown us all. If every U.S. enterprise follows the Gigantic footprints, how can America prosper as research moves overseas and our factories become non-competitive worldwide?

(Yes, my friends, how indeed?) **CT**

"If every U.S. enterprise (dumps R&D), how can America prosper as research moves overseas and our factories become non-competitive worldwide?"

"CONFIDENTIAL" ...For SCTE members only

By Wendell Woody
President, Society of Cable Television Engineers

It is SCTE's annual election time again in a few weeks and only current paid-up national members will receive an election package and ballot. These same national members also will receive free copies of the *1991 Membership Directory & Yearbook* and SCTE engineering seminar proceedings manuals, along with discounted registration fees for SCTE seminars and the Cable-Tec Expo, and reduced prices on SCTE training materials and promotional items. The benefits of your national SCTE membership are valuable and rewarding but, more significantly, it gives you the *right to vote*!

Your contribution to this industry is expressed by exercising your voting rights in electing strong qualified leaders for our Society; your right to vote is paramount to the SCTE's future.

Next, it is shameful to report that less than one-third of the national members who receive their voting package take the time to respond. Please don't be a *procrastinator* this year.

Know the candidates

Our Society's elections are not intended to be an industry popularity contest, therefore you should know the qualifications, accomplishments and abilities that each candidate brings to the SCTE. Your election package will contain a biography of each candidate. Read and study each carefully and discuss the candidates with others in the industry who may know them better than you. You can even contact the candidates directly to find out where they stand on issues important to you.

Two of the three at-large directors' positions are up for election this year. A group of outstanding, well-qualified candidates have been nominated to run, and each national member may cast a vote for two at-large directors. Otherwise, you may vote only for the director in the region in which you reside (your SCTE mailing address). In order to maintain continuity on the board of directors, only one-half of the regions elect new directors each year. This year's elections will be held for Regions 1, 2, 6, 9 and 11.

Meeting the members

Recent travels have taken me to two new outstanding SCTE meeting groups: the Bluegrass Meeting Group, Lexington, Ky., with Billy Grubbs as president, and the Penn-Ohio Meeting Group, Pittsburgh, with Bernie Czarnecki as president. These are both exemplary groups. While in Kentucky, we also addressed the Kentucky Cable Television Association's annual convention on behalf of the SCTE.

In cooperation with the Fiber Optic and Computer Networking Exhibition & Conference (Fiber Tour), held at the World Trade Center in Boston, the SCTE chaired two panels with cable industry participants. The panelists—Michael Angi, Kevin Casey, Rand Reynard, Dr. Donald Raskin, Carl McGrath and Dean Bogert—are to be commended for their excellent presentations. Both panels drew capacity audiences. Our "industry publisher," Paul Maxwell, also participated on a third panel on behalf of SCTE.

In Canada recently we met with Ken New, president, Ontario SCTE Group, and Daniel Lefebvre, president, Societe Des Cabletechniciens SCTE, Quebec. We assisted in their meeting at the Ontario Cable Telecommunication Association (OCTA) Convention & Trade Show. They are working toward establishing a National Canadian SCTE Council to better serve the present four Canadian SCTE groups.

A large group of U.S. SCTE members attended the Cable Television Association (CTA) show in London, as well as the special U.K./U.S. SCTE meeting. This was the first ad hoc committee meeting held toward establishing the International SCTE Council. The second such meeting will be at the Western Cable Show, Anaheim, Calif.; the planned third and final meeting will be at the National Show in New Orleans.

Coming next month

Dynamic changes in the format and distribution of the SCTE *Interval* will start next month. First, the size will be expanded to 8 x 11-inch pages and will take on the format of a "newsletter." There will be additional departments and special feature articles—with lots more photos of SCTE events and chapters/meeting groups. Please support your local group with photos from your group's events and awards. Perhaps you should consider appointing or electing a chapter/meeting group photographer. (Remember, we need photos for the annual SCTE *Membership Directory & Yearbook* too.)

The second major change is that the *Interval* will be published as a standalone SCTE newsletter and will no longer appear in *CT* magazine. It will be distributed to *national SCTE members only*! Additional copies also will be sent to each chapter and meeting group for them to make available and distribute at their regular local SCTE meetings.

Remember the election—*your vote counts!* **CT**

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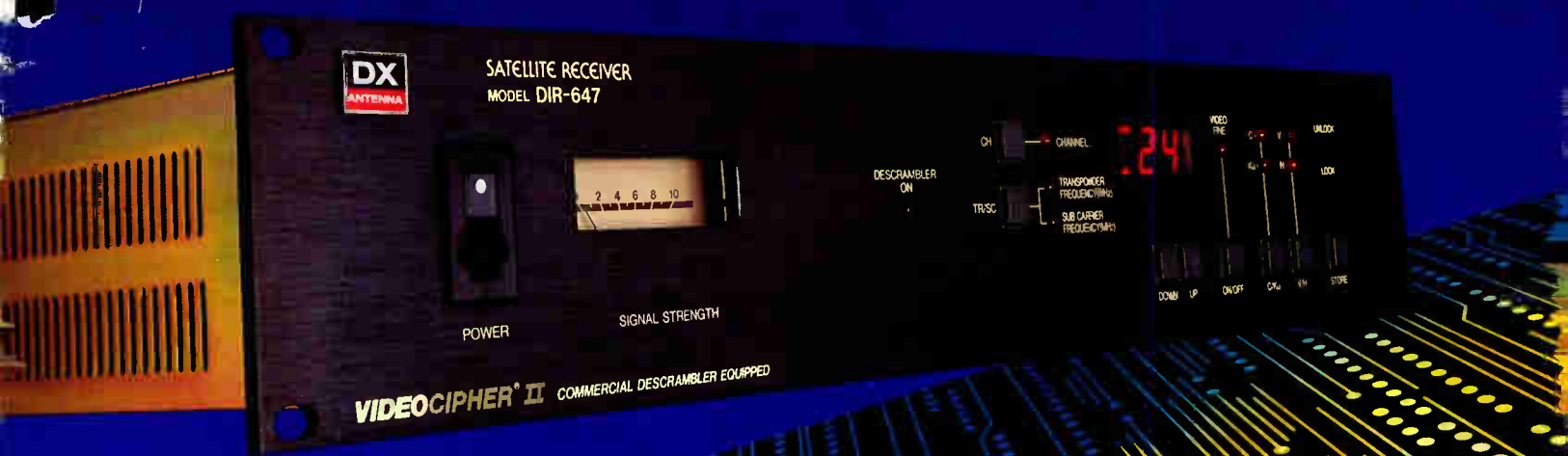

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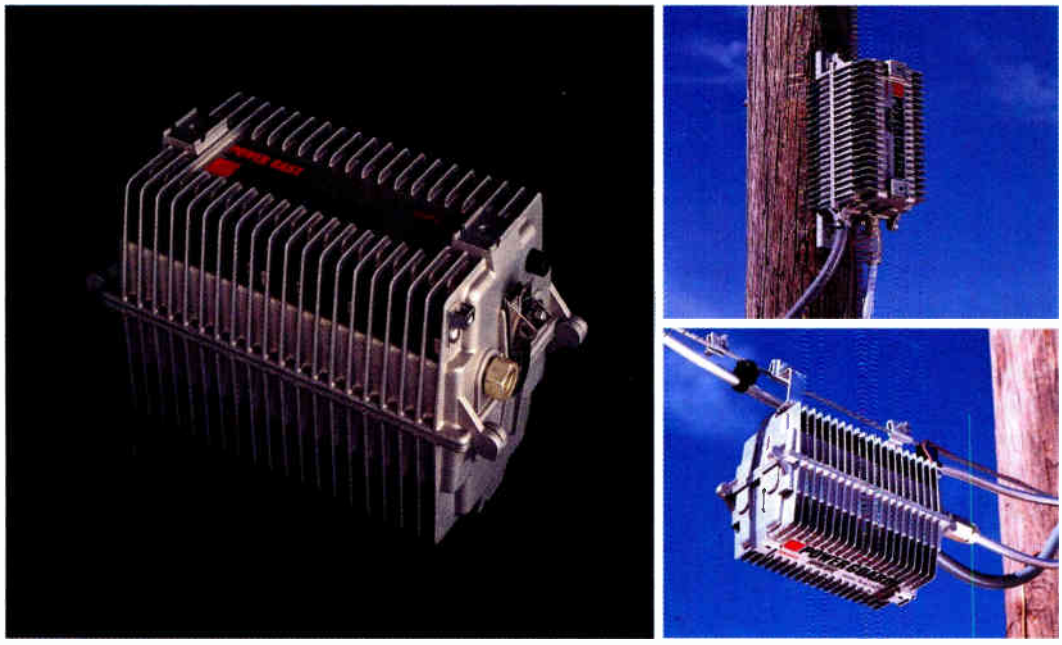

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