Communications Technology

OFFICIAL TRADE JOURNAL OF THE SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS

MARCH 1998

Digital Boxes

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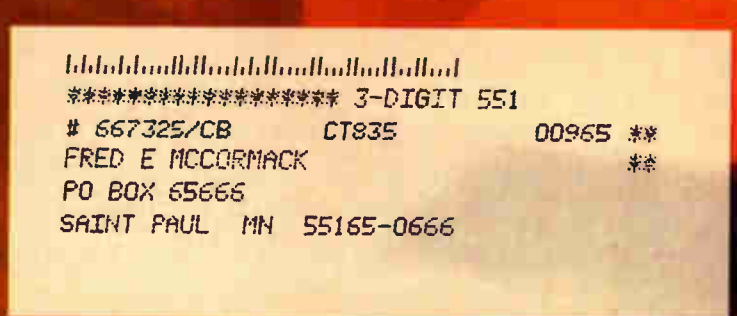

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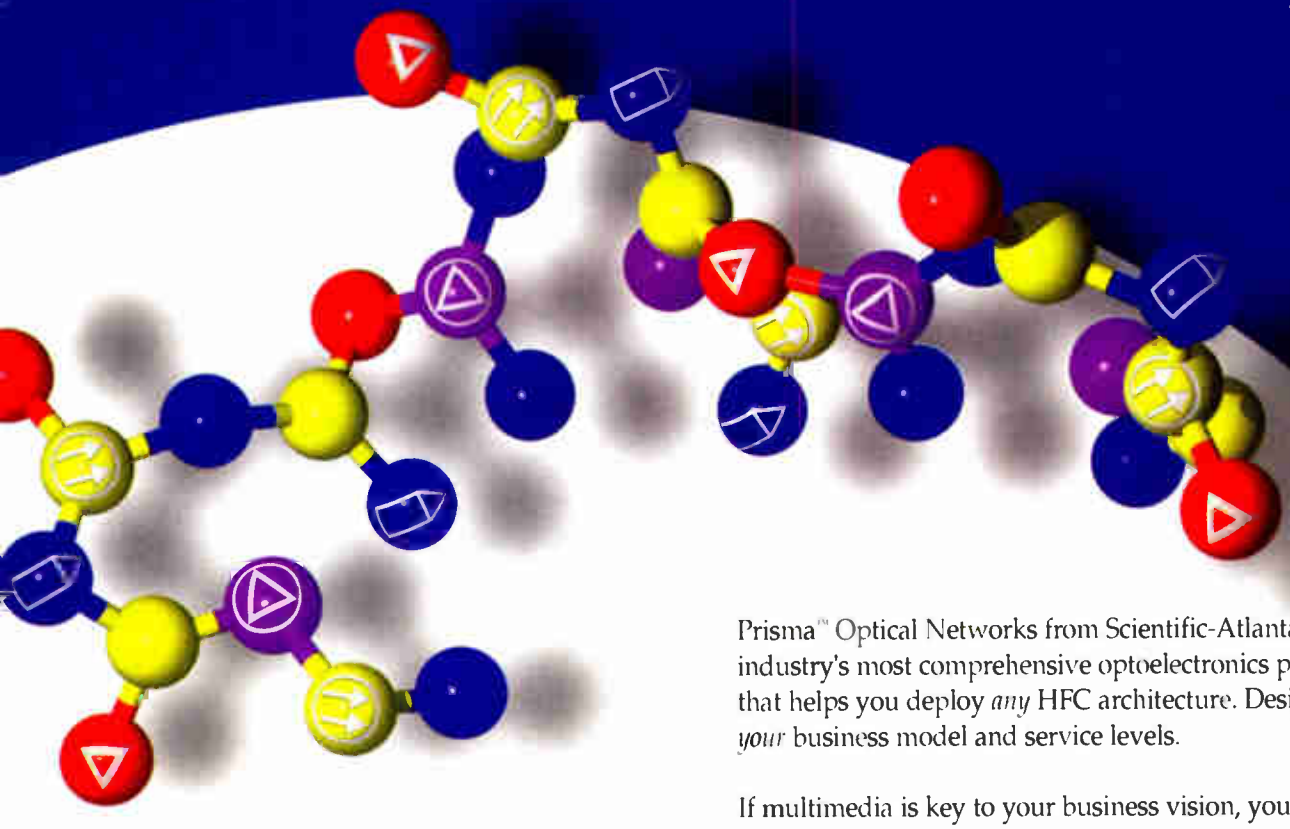

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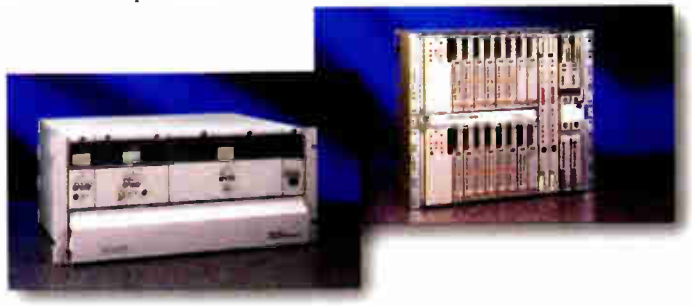

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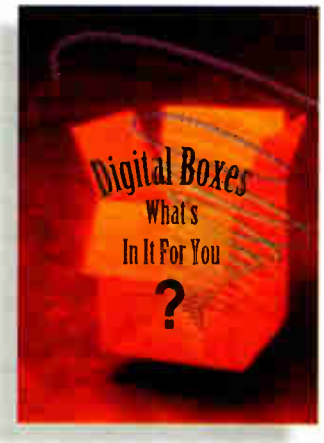

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Cover
Design by Maureen Gately

Photo: Super Stock

 Communications Technology™ (ISSN 0884-2272) is published monthly, except twice in July, by Phillips Business Information Inc., 1201 Seven Locks Road, Suite 300, Rockville, MD 20854, USA. Editorial and sales offices located at 1900 Grant St., Suite 720, Denver, CO 80203 USA, (303) 839-1565. March 1998, Volume 15, Number 3. Periodicals postage paid at Rockville, MD, and additional mailing offices. POSTMASTER: Send address changes to *Communications Technology*, P.O. Box 3230, Northbrook, IL 60065-9647.

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Reader Service Number 3

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"Technology by itself does not make such changes—people do, but by using such technology."

David Devereaux-Weber
Creator of SCTE-List

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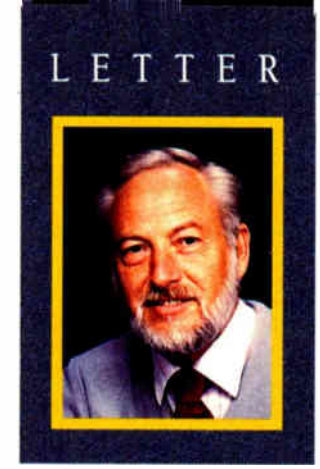
By Rex Porter



Must-Carry

Broadcasters have always applied to the Federal Communications Commission for license to serve the public interest by entertaining the public, educating the public and informing the public with NTSC video and audio programming. Cable operators processed and amplified those NTSC signals to make sure we provided the best possible pictures to our customers.

In 1965, the FCC released the first order and report, based on the Carter Mountain Decision. This document regulated cable systems, designated grade-A and grade-B stations as "must-carry" and required "nonduplication" equipment to be installed so distant network programming would not compete with local network programming. We operators and engineers had no problem understanding the meaning of must-carry.

In 1972, the FCC issued a new set of rules for cable, providing for distant signal importation, program exclusivity, public access and technical requirements. We may not have liked some of them, but we, again, had no problem understanding the definition of must-carry.

In 1986, the FCC revised the must-carry rules in response to the 1985 Quincy Cable Television vs. FCC decision.

In 1988, the FCC issued orders giving broadcasters the right to request that local cable systems blackout certain programs carried by distant stations.

In 1993, the FCC acted to require systems to negotiate retransmission consent agreements with local broadcasters, rearrange channels to accommodate must-carry signals and add new satellite services required to reach FCC benchmark levels. Later that year, must-carry/retransmission consent negotiations began. Network broadcasters demanded cash payments from cable systems for carrying network stations. Cable operators agreed to launch broadcaster-owned satellite networks in exchange for signal carriage. Almost nothing resulted from the negotiations.

As 1998 began, broadcasters started to insert ancillary data streams, embedding them along nonviewable portions of their signals. In fact, with their second channel donated from the FCC, they found they had more spectrum than they needed for new digital TV. They realized they could make huge profits by sending along this ancillary data with their TV signals. In fact, they found that they might be able to compete with cable systems for Internet and other data services.

To avoid losing this windfall, they decided to redefine must-carry. Now it means that cable operators cannot convert their vestigial sideband (VSB) signals to quadrature amplitude modulation (QAM). Actually, the broadcasters plan to ask the FCC to prohibit us from changing the signal, as transmitted, in any way.

They realize if the cable operator converts it, the operator might opt to carry the network audio and video only—and not the extra embedded data being transmitted by the broadcaster.

I have a deal for the broadcasters. If you want to change the meaning of must-carry, then we will change the meaning of "retransmission consent." Since we have so much time and money in QAM for cable TV, how about we define retransmission consent as an agreement whereby the broadcasters pay cable operators for our consent to retransmit their signals to our cable customers?

Rex Porter
Editor

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Phillips Business Information Inc.
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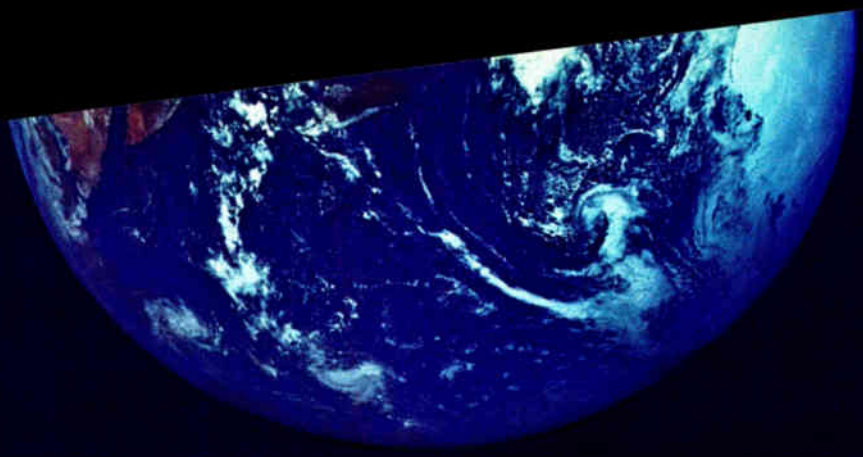

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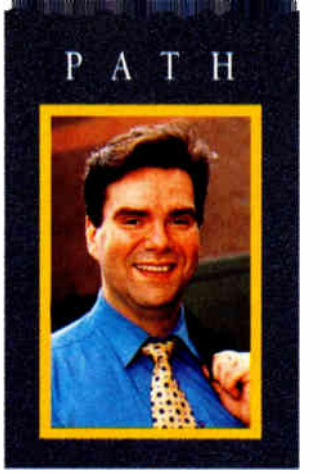

By Alex Zavistovich

A Frog in Your Pocket

While walking through the woods one day, a computer engineer finds a frog. The frog says: "I'm an enchanted princess. Kiss me and I'll become beautiful again, and I'll make you happy for the rest of your life." The computer engineer smiles at the frog and puts it in his pocket.

This happens three more times. Each time the computer engineer listens, smiles and puts the frog back in his pocket.

Finally the frog says: "I don't get it. I'm a beautiful enchanted princess. Why haven't you kissed me?"

"I'm a computer engineer," he answers. "I don't have time for girlfriends. But a talking frog is cool."

If you've ever talked to a computer engineer about providing Internet service, you get that attitude a lot. They know something you don't. They have a talking frog in their pocket.

The problem is, some cable operators are falling for it.

Initial results from an informal survey *Communications Technology* is conducting show an interesting trend: Almost as many computer networking staff (MIS) as engineering staff are involved in the buying decisions for equipment to be used by MSOs for data services.

Some Internet service providers (ISPs) love to hear that kind of stuff. Recently, I had what some people would call "a lively exchange of opinions" with a computer engineer on the West Coast. (Some people would call it that. I'd call it an argument. All I know is the sales exec who came with me was staring a hole through his notebook the whole time.)

This UNIX jockey was telling me that, basically, he didn't think cable engineers were smart enough to be able to handle the technical demands of data delivery! Of course, this was maybe the last guy on the planet I should have been having this exchange with. His company is targeting the corporate Internet access market only, and he's fully on board the telco's asymmetrical digital subscriber line (ADSL) bandwagon. He doesn't even own a TV set, for Pete's sake. Still, there he was, cracking wise about cable service reliability, throughput latency problems and poor penetration of cable modems in the marketplace. Then he started in on Macintosh computers, at which point I nearly had to be held back from coming across the conference table at him. (Yeah, I'm bad. I'm the Marlon Brando of magazine editors.)

Almost anyone will admit that cable modems' data throughput speeds may slow during peak demand times, but at least you've still got access, at better than integrated services digital network (ISDN) rates, too. Can you say the same for twisted pair? ADSL has committed data rates to minimize peak demand latency once you're connected, but access is still an issue. Besides, they don't just give away ADSL gear.

As for penetration, US Robotics wouldn't be planning to crank out a million cable modems per month if they thought the demand wasn't there. It's not like these

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Reader Service Number 11

modems will be going off the assembly line and right into the dumpster, you know. And I don't think giant players like 3Com, Bay Networks, Cisco and Siemens are spending money and time on the cable market as a big personal tax write-off at the end of the year.

I'm preaching to the choir on this, but you have to understand what the frog in the pocket of the computer engineer really is. It's at either end of the network: the routers, switchers and firewalls that connect your hybrid fiber/coax (HFC) network to the Internet backbone at the headend, and the connection to the PC via the cable modem at the customer premises.

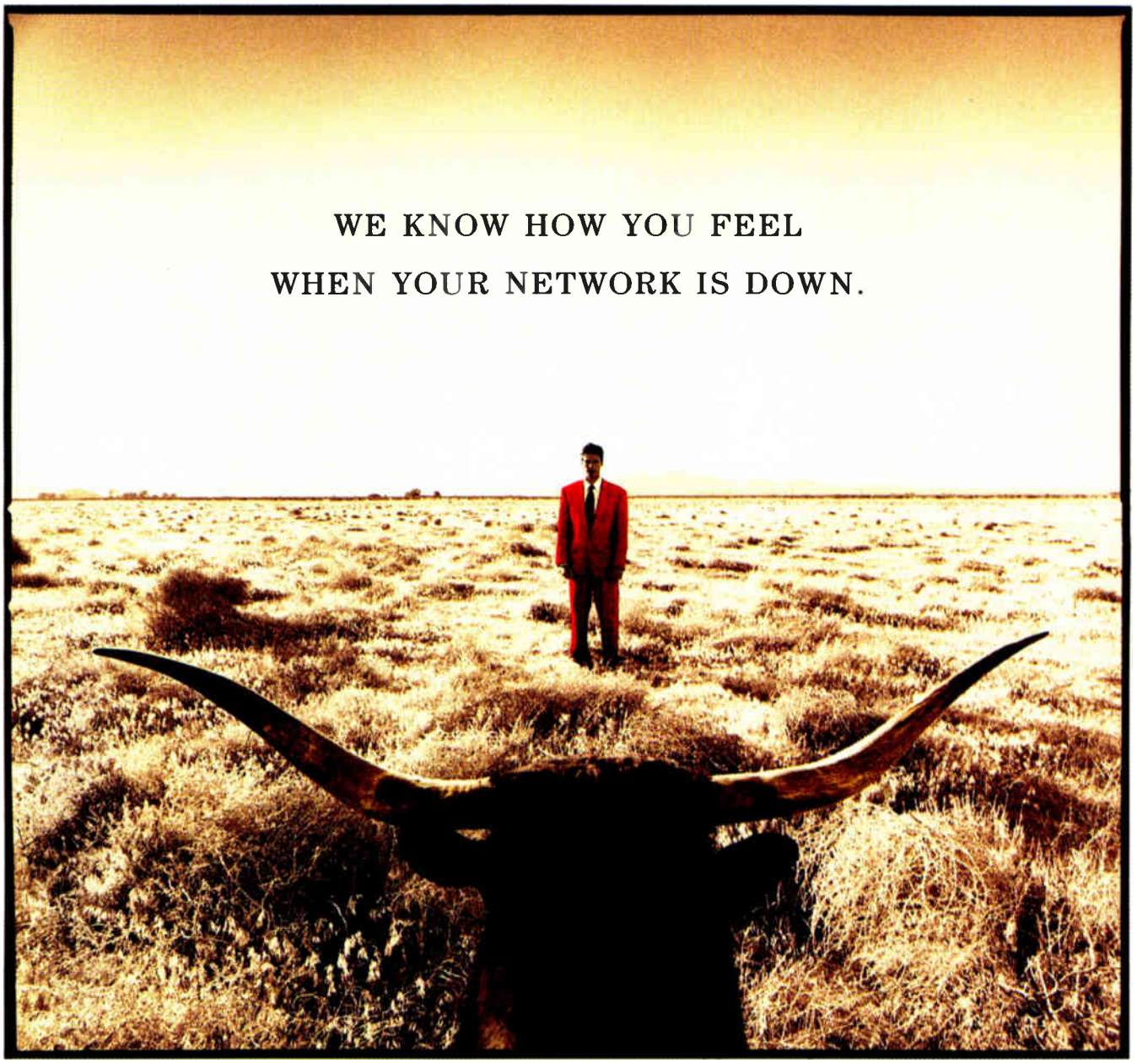
Obviously, not all ISPs think cable engineers are dumb. What's more, even if you lack computer knowledge yourselves, that's why God made system integrators. Pay the people with their own talking frogs to run interference for you. Just don't leave two-way service decisions to your MIS department.

"Obviously, not all ISPs think cable engineers are dumb."

As engineering managers, don't short-change your own operations. Are you uncomfortable with having someone outside your staff make decisions about what technology you'll be running on your HFC network? You should be. If you let go of this part of your domain, you're giving up the future of cable engineering.

If your operations people try to make you share the buying decisions for two-way service equipment with your MIS department, make sure you still control the project management. It doesn't matter who tells whom to buy what; when things start to hit the fan, it won't be the MIS department that takes the blame. No one knows your system and its components better than you do. Don't be afraid of someone with a frog in his pocket. It's just a frog, after all. CT

Alex Zavistovich is executive editor of "Communications Technology." He can be reached in Potomac, MD, at (301) 340-7788, ext. 2134.



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SCTE UPDATE

SCTE Announces Candidates for 1998 Board Elections

The Society of Cable Telecommunications Engineers is pleased to announce the nominees for its 1998-1999 Board of Directors election. The following individuals are candidates for the Board seats to be open in June 1998. (Editor's note: An asterisk (*) denotes the incumbent):

- Region 3: Norrie Bush*, TCI of Southern Washington; George Klenck, Chambers Cable; Tim Templeton, Thomas & Betts Communications Division
- Region 4: M.J. Jackson*, Gilbert Engineering; Jim Wood, PPC
- Region 5: Larry Stiffelman*, CommScope Inc.; Dick Beard, MediaOne; Dave Clark, National Cable TV
- Region 7: Jim Kuhns*, Comcast Cablevision; Rich Annibaldi, Pioneer New Media Technologies, Inc.
- Region 8: Steve Christopher*, Thomas & Betts/LRC; Don Shackelford, Time Warner Cable
- Region 10: Wes Burton, MediaOne; Chris Huffman, Times Fiber Communications, Inc.; Dick Shimp, ComSonics Inc.
- Region 12: John Vartanian*, Viewer's Choice; Roger Pience, Watson Technologies; Dan Murphy, TCI
- At-Large: Ron Hranac*, Coaxial International; Brian James, TAC Test Centre; Ken Wright, Intermedia Partners

Election packages containing the ballots will be mailed to all SCTE active national members in mid-January 1998. Also, a part of this year's election package is a referendum vote for changes in the Society's national bylaws.

Ballots must be returned to the Society's accounting firm no later than March 28; results will be announced in mid-April.

Newly elected Directors will take office at Cable-Tec Expo '98 in Denver.

Satellite Tele-Seminars Link Broadband Industry with Technical Training

SCTE has made it easier than ever for broadband professionals to receive the technical information they need for improved job performance.

SCTE's 1998 Satellite Tele-Seminar Program, as part of the Society's ongoing campaign to offer technical training in the latest technologies available to the broadband community, kicked off last month with "Data Over Cable" (Part Two).

Satellite Tele-Seminar Programs are one-hour instructional presentations on a variety of cable telecommunications industry topics. The seminars are broadcast via Galaxy 1R, Transponder 14, on the second Thursday of each month from 2:30 p.m. to 3:30 p.m. Eastern time. Upcoming seminars include:

- March 12: "Introduction to Digital Technology" (Part Two), "Preparing for Digital Deployment" (Part One)
- April 9: "Preparing for Digital Deployment" (Part Two)
- May 14: "The American Campus: Opportunity or Not?"
- June 11: "Digital System Deployment"
- July 9: "Outage Reduction Techniques I" (Part One)
- Aug. 13: "Outage Reduction Techniques II" (Part One)
- Sept. 10: "Outage Reduction Techniques II" (Part Two); "Signal Processing Centers: Location and the Physical Facility"
- Oct. 8: "Cable Modem Technology" (Part One)
- Nov. 12: "Cable Modem Technology" (Part Two); "Inside Wiring Issues" (Part One)
- Dec. 10: "Inside Wiring Issues" (Part Two)

Anyone with downlinking capability can participate in the program at no cost. Videotaping of any Satellite Tele-Seminar is encouraged for personal reference or for use as a company training tool.

For more information about this Society service to the industry, contact Janene Martin at (610) 363-6888, ext. 220; fax to (610) 363-5898; or E-mail to info@scte.org. Updated information also is available on the SCTE Website: www.scte.org.

SCTE Seeks Comments on New Standard

The SCTE Digital Video Subcommittee has issued a call for comments from interested and affected parties regarding its new DVS standard for System Information Protocol and Program Guide data compatible with MPEG-2 digital multiplex bit streams.

This standard (#DVS 097) defines the Program and System Information Protocol for transmission of the relevant data tables contained within packets carried in the transport stream multiplex. The DVS also seeks commentary on relevant tables within the electronic program guide (EPG) and timely review of this potential standard, as well as impact assessment.

The DVS anticipates that MSOs with their own EPGs, wishing to ensure that cable-ready digital TV sets can provide the viewer with these EPGs, will require that their EPG software providers access these tables. This would be in addition to existing mechanisms of providing EPG to digital set-top terminals.

This standard originated as an Advanced Television Standards Committee document designated as T3/S8-193. The DVS has conducted liaisons with the ATSC for the purposes of standards compatibility with cable operations.

The ATSC has been cooperative in coordinating its balloting schedule for adoption of this standard with a view toward any input received from the DVS.

Responses, questions and comments about this standard should be directed to:

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San Diego, CA 92121
Tel: (619) 404-2935 Fax: (619) 404-2485
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ET '98 Examines Digital Broadcast

Building the Digital Platform was the theme of this year's Emerging Technologies gathering. ET '98, held January 10-13 in San Antonio, focused discussion around preparing for digital TV (DTV), including what to do about delivering the technology over cable's quadrature amplitude modulation (QAM) systems when the broadcasters are planning to use 8-VSB (vestigial sideband).

Must-carry, typically more of an operations or legal issue, was discussed at length in two separate sessions. First, John Wong and Ron Parver of the Federal Communications Commission posed 10 questions on digital broadcast TV must-carry. The questions, designed to stimulate discussion, included:

- Should there be mandatory carriage for digital TV signals?
- Should cable operators be required to carry both the analog NTSC and the digital signals of a broadcaster during the transition to DTV?
- Should cable operators be required to carry the full complement of the broadcasters' digital signals?
- Should channel capacity be redefined to reflect digital transmissions?
- Should the analog on-channel requirements be considered for the digital environment?
- Should the cable operator be required to carry the broadcaster's DTV signal in the broadcaster's digital format?
- Should the cable operator or the broadcaster bear the upgrade costs of retransmitting the digital TV signal?
- Should the FCC also scrutinize retransmission consent and its impact on cable operators for digital?
- Should small cable operators be exempt from DTV must-carry requirements?
- Should the definition of "basic tier" be changed to conform with any DTV carriage requirements?

Another session featured a discussion between Arthur Allison, senior engineer for the National Association of Broadcasters and CableLabs' Tom Elliot. During the session, engineers in the audience questioned whether cable operators would be expected during the transition to digital broadcasting to carry both the analog and digital programming, thereby undermining their own channel capacity requirements. There also was subtext during the show that, by so doing, broadcasters may be using cable to carry their interactive and data-related offerings, which might take a chunk out of cable's market in that area of the business.

Richard White of Cox Communications presented observations of installation and beta testing of compressed digital video services. His paper concluded that "compressed digital TV via 64-QAM modulation has proven to be a viable and stable transport system for delivering programming in our HFC systems." White noted that the hybrid fiber/coax (HFC) plant needed no unusual conditioning to carry the 64 QAM signals. Once the plant was upgraded to 750 MHz, he noted, maintaining RF reliability was just a matter of routine service to keep the system tight and balanced.

What are some of the advantages of Gallium Arsenide (GaAs) hybrid power amplifiers in cable TV? According to a paper by General Instrument's Phil Miguelez, Gary Picard and Fred Slowik, the advantages include lower-cost optical and coax networks, fewer active devices with less respacing, better network performance and reduced power consumption. Other benefits include lower maintenance costs, increased channel capacity, less cable replacement and expanded reach in low density areas.

A paper from Darryl Schick and Edward McQuillen of RDL considered improvements in downstream bit error rate (BER) and carrier-to-noise ratio (C/N) by controlling the headend peak factor. Control of video carrier phases in a mixed analog/digital HFC headend reduces intermodulation distortion and BER, the paper noted, and synchronously spreading video sync pulses reduces the peak power of a headend signal.

A workshop on test procedures also was included in ET '98, with numerous contributions from the SCTE Interface Practices Subcommittee. Among the workshops were training on insertion gain or loss; frequency response and bandwidth; return loss; isolation; composite triple beat distortion; composite second order distortion; cross modulation distortion; group delay; and a test method for power consumption.

Cable Center Acquisition Committee

The National Cable Television Center and Museum has assembled a 20-member acquisition and documentation committee. It will acquire for the center's library materials reflective of important contributions to the development of telecommunications.

Committee members are: Chairwoman Ann R. Carlsen, president of Carlsen Resources; Kim Dority, the center's director of information and library resources; Gail Sermersheim, vice president of affiliate operations for Home Box Office and chairwoman of the center's Library Advisory Council; Bill Arnold, Texas Cable TV Association; Lee Clayton, Cablevision Communications; Lela Cocoros, Tele-Communications Inc.; Jack Cole, Cole Raywid and Braverman; Jim Faircloth, JFK Media Services; Rose Gatti, ESPN; Mark Greenberg, PrimeOne; Spencer Kaitz, California Cable Television Association; Claus Kroeger, Cox Communications; Chris LaPlaca, ESPN; Greg Liptak, Jones International; Rex Porter, *Communications Technology* magazine; John Reardon, TV Ventures Inc.; Richard Rosenberg, Jones Intercable; Stan Searle, Pioneer Cable; Erica Stull, Jones Intercable; and Sharon

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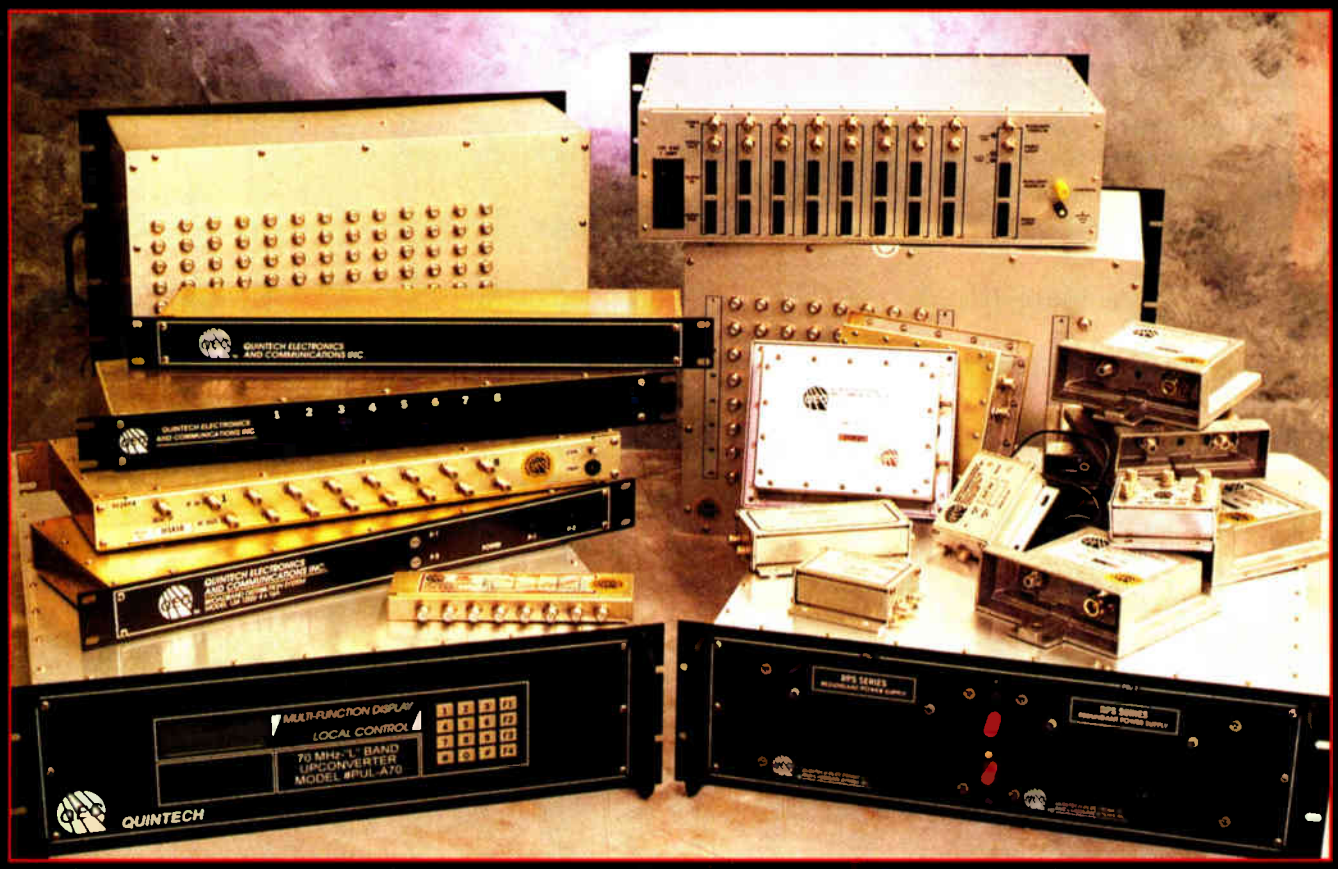

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Reader Service Number 16

Wilson, Wireless Broadcasting Systems of America.

High-Speed Data Launches

- Cox Communication Humboldt and its partner Internet Ventures Inc. has launched in the 32,000 subscriber Northern California cable system.
- In Cohasset, Hull, Norwell and Scituate, MA, MediaOne has launched to 18,000 households passed.

TCI, GI Cement Set-Top Deal

TCI's Headend in the Sky organization has entered a long-term agreement with General Instrument Corp. to buy digital set-tops, with final numbers expected to total between 6.5 million and 11.9 million over the next three to five years.

The set-tops will incorporate the OpenCable architecture adopted by CableLabs, the cable TV industry's research and development consortium, in November 1997.

John C. Malone, chairman of TCI, said the OpenCable effort bodes well for cable's future. "These scale advantages allow us to contemplate far more extensive distribution of these technologies to our customers in an accelerated time frame and with lower costs, as well as encourage widespread industry participation in further development," he said.

Edward W. Breen, president and CEO of General Instrument, agreed, saying, "As digital cable becomes widely deployed, our technology investments will enable the cable industry to derive new revenues from our cost-effective platforms." Of the deal at hand, he said, "We are working to establish technology and consumer electronics partners to expand the range of applications supported by these platforms."

Kraft, TCI to Cooperate on Ads

TCI and Kraft Foods have announced plans to use TCI's digital networks in 20 metro areas some time this year for digital insertion of targeted ads. Kraft says it plans eventually to pinpoint individual homes, maybe even specific TV sets, with such digital advertising.

S-A Set-Tops to Deploy Widely

U.S. cable operators planning 1998 deployments of Scientific-Atlanta's digital systems and Explorer set-tops include Comcast Cable in its Baltimore metro system; Marcus Cable in Glendale, CA, Ft. Worth, TX, and Birmingham, AL; and Adelphia Communications in its Buffalo, NY, cluster. Time Warner Cable, Cox Communications and MediaOne also will use the boxes, though they have not announced targeted cities. In Canada, three MSOs serving 4.8 million, or 60%, of that nation's cable customers also plan to use S-A Explorers this year. Rogers Cablesystems in Toronto; Videotron in Montreal; and Cogeco Cable in Burlington-Oakville, ON, make nine North American operators to deploy Explorer set-tops in 1998.

The Explorer 2000 set-top uses open Interne protocols, hypertext markup language (HTML) and JavaScript, and complies with expected OpenCable specifications. It is designed to act as a TV Web browser or a high-speed cable modem.

Cablevision to Go Retail

Wouldn't it be nice if consumers toting new computers out of their favorite electronics stores also had cable modems in the bag? And wouldn't it be great if they also subscribed to the local cable company's data service that was being demonstrated in the store? That's how Cablevision hopes things will go.

Cablevision announced it has reached an agreement in principle to acquire assets of the New York area's largest consumer electronics retail chain, Nobody Beats the Wiz, where it will show off its advanced telecommunications service offerings side by side with the electronics equipment consumers use to access those services.

Cablevision Chief Executive Officer James L. Dolan said, "Customers may, in one convenient location, purchase a new generation of digital electronics and select Cablevision's telecommunications products—backed by unparalleled service and support."

In other words, a customer could buy a computer, have a cable modem installed and choose to have the equipment delivered with an Optimum Online high-speed cable subscription ready and waiting.

MediaOne Launches Into Business Market

MediaOne now offers high-speed services to businesses, having launched MediaOne Connect in Louisiana, which the company expects to prove lucrative. Presently the service is available only in Louisiana, where network upgrades between 1996 and 1999 are expected to run about $250 million. The company offers high-speed data networking from 4 Mbps to 622 Mbps over fiber-optic lines, at a cost to customers ranging from $1,000 a month to $100,000 a month, depending on the size of the business. MediaOne has not yet released revenue projections or deployment schedules for other markets.

NEWS BITES

- Harmonic Lightwaves has announced that Panasonic Video Communications Co. has joined Harmonic's Cable Modem Partnership Program, which aims to provide MSOs with complete, interoperable, high-speed Internet service systems.
- Jones Cable Income Fund 1-B/C Venture, an affiliate of Jones Intercable, has sold its cable TV operations serving about 17,500 customers in Lake County, CA, including the cities of Lakeport and Clearlake, to Mediacom LLC of Middletown, NY, for $21.4 million.
- The Cable and Communications Division of Pioneer New Media Technologies is preparing to ship its first installment of analog set-top Entertainer terminals to Time Warner Cable's Houston Division. Pioneer will ship between 4,000 and 5,000 units per month on an ongoing basis starting in March.
- Harron Communications, based in Pennsylvania, has announced that it will purchase Community TV, based in Laconia, NH. Plans call for Harron to own and manage Community's southern New Hampshire properties and for a soon-to-be-formed company, which will have strong ties to Harron, to own and manage Community's northern properties. CT

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Reader Service Number 17

Interview with a Leader

By Rex Porter

Top of the List: David Devereaux-Weber

Photo by Jon Miner

David Devereaux-Weber
Creator of SCTE-List

David Devereaux-Weber is a network technician with the Division of Information Technology at the University of Wisconsin.

In 1997, the Society of Cable Telecommunications Engineers recognized Dave as its member of the year for his role in providing the "SCTE-List" as an Internet forum used by cable TV technicians and engineers around the world.

He may be e-mailed at djdevere@facstaff.wisc.edu. To subscribe to the SCTE-List, send an e-mail to listserver@relay.doit.wisc.edu. In the body of the message, type: subscribe scte-list your name.

Communications Technology: *Your cable experiences reach back to the 1960s. Tell us how you got involved in cable at such an early age.*
Devereaux-Weber: My first cable TV experience, 1967 through 1969, was at Janesville Senior High School (now Joseph A. Craig High), in Janesville, WI. Total-TV had just connected the school, and we started wiring the classrooms. I was a volunteer on the audio-visual staff. We added television to the list of equipment being offered.

We didn't know how to obtain a crimp tool, so we made one with pliers and a round file. We taped events on an Ampex 1-inch helical videotape recorder. We only had black-and-white cameras. Back then, Total-TV had a Weatherscan, a system for displaying local weather instruments and local announcements typed on 3 x 5 cards.

I also worked at radio station WCLO on Sundays as a "student engineer." I played records, prerecorded commercials, public service and program announcements. In 1969, the station had both the Associated Press and United Press International wire services, which were Teletype machines connected by phone lines to AP and UPI. One memorable event was the "Apollo 11" mission to the moon, in July of 1969. I still have the stories from both wire services announcing, "[FLASH!] The first men on the moon."

Communications Technology: *The next 10 years of your career were spent as a radio broadcast engineer. How important do you feel this background was to your future in cable?*
Devereaux-Weber: I sometimes moonlighted as a broadcast engineer to "augment my income." The work with station WORT was to start a volunteer-operated community radio station (still operating today). But I've always been fascinated with communications technologies and their effects on people and institutions.

Communications Technology: *What brought you over to the cable TV side?*
Devereaux-Weber: Actually, I had an application in at the local telephone company at the same time. I don't think there was a want ad for the cable company. I just decided I'd drop off a resume and see what would happen. I was going to leave when the secretary told me to wait, that the engineer might want to talk to me right away.

Communications Technology: *Tell us of your experiences with the advent of satellites, earth stations and programming from HBO, Showtime, and so on.*
Devereaux-Weber: I was working at Complete Channel TV in Madison. HBO and WTCG (now WTBS) from Atlanta went "live" on satellite around 1975, and we installed our first satellite antenna in Madison around 1976. I remember that it was winter, and there was so much frost in the ground that we had to trench with a jackhammer. (One of the corollaries to Murphy's Law must be that

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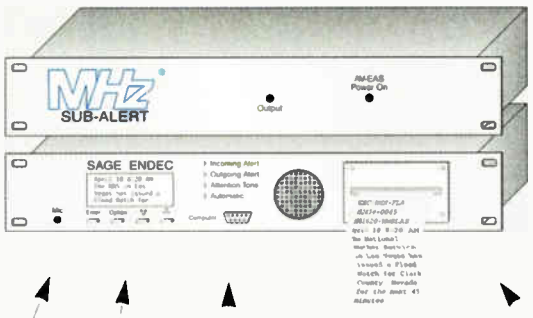

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Reader Service Number 18

projects like this only happen during the worst weather.)

We had the foundation laid and then had Scientific-Atlanta supervise the installation of the antenna and receivers. I was blown away when the S-A tech aimed the antenna by eyeball and said, "Let's go in and see what we have on the monitor." It wasn't a perfect aim, but the picture was pretty good. We certainly could tell it was WTCG. After fine adjustment, the pictures were very good.

Then came Cable News Network and so many others. What is interesting about CNN is that it could not exist without satellite transmission. The cost of microwave or metallic cable transmission made a national cable network infeasible. CNN was one of those innovations that demonstrates the effects of technology on people and institutions. Technology by itself does not make such changes—people do, but by using such new technology.

Communications Technology: *You also became aware of the potential of fiber optics in the late 70s. What impact did you think fiber would have on our business?*

Devereaux-Weber: As many of us in cable telecommunications have found, coaxial

"Technology by itself does not make such changes—people do, but by using such new technology."

is not the most hospitable environment. When I first began to read about fiber optics, it appeared to be an improvement over metallic coax in several ways: lower attenuation, smaller and lighter size, and less susceptibility to corrosion.

However, early fiber systems used only digital signaling, and that seemed to mean that fiber systems and the required digital electronics on each end would be too expensive for most applications. The work on analog signaling in the mid-1980s opened up a whole new world for our industry. By the late 1980s, I was testing analog fiber systems for franchise authorities and designing hybrid fiber/coax systems for cable clients.

Communications Technology: *It seems you were among the first cable engineers to recognize the future of data transmission by cable. Tell us about your work back in the early 80s.*

Devereaux-Weber: I don't think of myself as a leader in data over cable. I had experience with analog in two-way systems, and I simply applied that knowledge to digital data communications problems.

While I was an engineer at Complete Channel TV, the Madison Academic Computing Center at the University of Wisconsin (Madison was having a problem

connecting computer terminals to computers) was using twisted-pair copper. The amount and size of cables was quickly approaching the capacity of the conduits. Some research was done and Sytek Localnet was discovered, a system for serial data communications over coaxial cable. They put up a trial system with some mid-split Jerrold Starline 20 line equipment but weren't happy with it. I suggested, for a new system, the C-COR T-500 line would work better. They again built a test system and agreed.

Around that time, I left Complete Channel and went to a cable TV design position with Telephone Engineering Services. In another one of those fortunate coincidences in life, the University of Wisconsin person called me back and asked who could do a design for the campus. When I told him of my job change, he hired our firm to do the design.

So the first users of data over cable were on campus-scale installations back in the 1980s. This was around the time of the birth of the Internet, so no one thought of Internet as a viable service for cable companies to offer to the general public. Further, the data transmission equipment of that era would not scale up to a metropolitan-scale application.

Communications Technology: *From 1987 through 1992, you spent much of your time becoming an expert on data networking for cable, cellular telephone and local area networks (LANs). Was this time spent primarily in Wisconsin?*

Devereaux-Weber: While I was based in Wisconsin, I did a lot of traveling. TDS, the parent company of the consulting company with which I worked, put me in a corporate engineering position, and we developed several new cable systems in New Hampshire, Minnesota and Wisconsin, as well as operating existing systems in Tennessee and Mississippi. The new systems were "state-of-the-art" for that time—450 MHz, two-way with status monitoring, addressable converters and institutional networks. I did use some of my data over cable experience to connect addressable converter control systems in cable offices to addressable transmitters to character generators in systems headends.

In 1987, TDS divested most of its cable TV properties in order to focus its attention on the cellular telephone business. I moved back over to the consulting subsidiary and worked on spreadsheet-based financial estimation tools, and later, a geographic information system (GIS) market analysts tool.

The TDC chairman and cellular development team would want the answers to questions like: "We hear that XYZ is thinking of selling. Please create a map of all XYZ's properties which are adjacent to ours." This combined a tabular ownership database with a graphical market database. The first such queries took about three months to do; but with different software and hardware, we cut the time down to three minutes.

Communications Technology: *How did you get involved with the University of Wisconsin?*

Devereaux-Weber: I was looking for ways to reduce travel and improve the regularity of cash flow when I came upon a want ad for a technician to maintain the UW-Madison cable systems and do data communication work on campus. I applied and took the test. They gave me a tour and asked about my qualifications to do this kind of work. I was able to tell them that I was one of the designers of one of their systems. It is interesting (as in, "may you live in interesting times") to work on a system now, that I helped design back then.

In addition to the Sytek Localnet equipment that I mentioned previously, we also have some very early Ethernet cable modems. These were manufactured by Chipcom in the early 1980s. Compared to today's cable modems, these are quite primitive. At the time these were designed, there was no simple network management protocol (SNMP), and there is no bridge in them. In addition, the design limits the total system length to about five miles, so they wouldn't work in a metropolitan-scale system. We use them to connect to buildings which do not have university fiber-optic cable connections. It is ironic that when the cable industry is looking forward to the wide deployment of cable modems, we are trying to migrate our remaining connections to fiber-optic cable.

Communications Technology: *Who thought up the SCTE-List? How complicated was its deployment? How is the content monitored?*
Devereaux-Weber: I'm afraid I have no one to blame but myself. I had helped Dr. Barry Orton, here at the university, find out how to set up a list for the discussion of regulatory issues, so it seemed like a natural progression to do a list for cable technology. There are a few Usenet newsgroups related to cable TV, but, in my opinion, they appeared to be forums for the discussion and marketing of pirate descramblers and places for disgruntled cable subscribers. I wanted to help create a more hospitable forum for cable TV technologists.

Jonathan Kramer was the sysop for the cable TV section of the Broadcast Professional Forum on CompuServe and a subscriber to TelecomReg and gave me encouragement and moral support. I called Bill Riker (president of the SCTE) for his OK to use the name "SCTE-List," and he said he looked forward to what would become of it. Jonathan became subscriber number one.

The computer and software on which the SCTE-List and TelecomReg run is operated by the Division of Information Technology (DoIT) of the UW-Wisconsin—the same department I work in—so it was relatively easy to speak with them and get the correct forms. In fact, the person who administers the computer is four doors down the hall from me.

The hard part is the daily work of helping new people get subscribed, changing e-mail addresses or ending subscriptions.

I also keep an eye on the content of the messages to make sure discussions don't get out of hand. (Sometimes, on some lists or Usenet newsgroups, e-mail exchanges turn bad, erupting into so-called "flame wars," where someone makes a strong negative comment about another, and it starts to go back and forth.)

We have been very fortunate with the caliber of the subscribers of SCTE-List. There have been almost no flame wars. Further, because we don't permit nonsubscribers to post messages to the List, we have gotten very few Spam (bulk mail such as "Make Money Fast") messages.

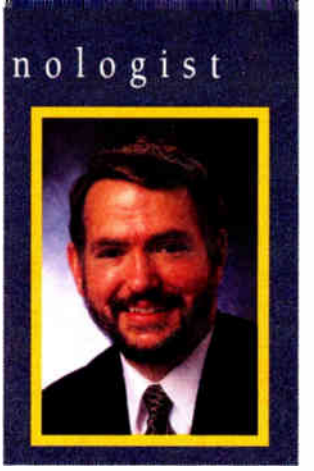
Communications Technology: *With your background as a pioneer in cable system engineering and being recognized as an authority on data networking, what career advice would you give to new installers and technicians?*
Devereaux-Weber: SCTE membership has never been more valuable. If you are not a member, join!

Getting an account on the Internet is a very valuable resource for career education. Online forums (like SCTE-List) are good places to see examples of cable telecommunications technical discussions and a good place to make contacts and get questions answered.

One of the most important things to keep in mind is customer service. If we are able to help customers understand and use our services, such as digital TV, data and Internet protocol (IP) telephony, we'll be able to keep them as we add new subscribers. CT

Rex Porter is editor of "Communications Technology." He may be e-mailed at tvrex@earthlink.net.

By Ron Hranac



A Different Look At Design Philosophy

For decades we've been designing our feeder networks for optimum efficiency, in large part to reduce the number of actives per mile of plant. One measure of design efficiency is how well the available signal is used. This goal commonly is met when active device input signal levels are as close to the design minimums as practical without going below them, and end-of-line taps are the lowest values possible.

With regard to the latter, this often means significant use of so-called self-terminating taps. Self-terminating taps are available in 4 dB two-port, 8 dB four-port and 11 dB eight-port values. It seems the more a design makes use of these particular low value taps, the better it is. Figure 1 (on page 32) shows a typical feeder with a 4 dB two-port end-of-line tap. A network designed like this would in most cases be considered to be an efficient one.

The problem

The problem with this design approach is that self-terminating taps don't terminate the feeder. These taps have no built-in termination for this purpose and rely on terminated F-ports to provide the proper 75 ohm termination. The reason is that self-terminating taps really are nothing more than splitters. A 4 dB two-port tap is electrically a two-port splitter; an 8 dB four-port tap is a four-way splitter, and an 11 dB eight-port tap is an eight-way splitter. If a self-terminating tap's F-ports are unterminated, then so is the feeder cable!

"No problem," you say, "simply install terminators on each tap port." That's fine during system construction and initial alignment, but as soon as you begin to connect subscribers you have to remove the F-port terminators. And the drops you connect to the tap ports are anything but a 75 ohm impedance.

Consider a 100-foot drop connected directly to a cable-compatible TV set, VCR or even one of your system's converters. Most of those devices' tuners have an input return loss close to 0 dB on every frequency except the channel to which they are tuned, and on that channel you might be lucky to see a whopping 6 dB return loss. A 0 dB return loss is the same thing as having an open or short circuit at the end of the drop, and 6 dB isn't much better. This big impedance mismatch causes much of the desired signal to be reflected back toward the source, producing standing waves in the cable and affecting the overall frequency response.

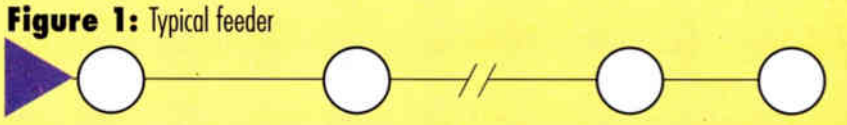
At higher frequencies, this might be tolerable because the cable's attenuation is substantial. For example, if that 100-foot drop is 6-series cable, its 750 MHz attenuation will be about 5.6 dB. So a 750 MHz signal traveling from the input connector of a 4 dB two-port self-terminating tap to the input of the TV set will be attenuated by close to 10 dB in one direction (probably a little more than 4 dB through the tap, and just under 6 dB through the drop cable). Assuming a worst-case 0 dB input return loss at the tuner, all of the 750 MHz RF energy will be reflected back toward the tap. By the time it reaches the tap's input connector, it will have been attenuated another 10 dB. At this point, the reflected energy will be down 20 dB relative to the incident signal. Not too bad.

But at 30 MHz the 100-foot drop's attenuation is just under 1.2 dB. A 30 MHz signal traveling from the input connector of the same 4 dB two-port tap to the input of the TV set will be attenuated by about 5 dB in one direction (probably a bit less than 4 dB through the tap, and just over 1 dB through the drop cable). The tuner's 0 dB input return loss will reflect all of the 30 MHz RF energy back toward the tap, resulting in a reflected signal that is down only 10 dB. If you swept this feeder's reverse path spectrum, you'd likely see a pretty flaky frequency response.

A solution

One solution would be to discontinue the use of self-terminating taps altogether and instead use the next higher value, or even second higher value, as the terminating tap. Doing so would allow you to install a 75 ohm chassis terminator on the tap's output connector, effectively terminating the feeder cable. Thus, the feeder's termination would not be directly dependent upon the last tap's F-ports' being terminated. Figure 2 (page 32) shows an example of an externally terminated 11 dB two-port tap at a feeder's end-of-line.

Figure 1: Typical feeder



ADVERTISMENT

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Blonder Tongue proudly announces the introduction of its new high dynamic range (70 dB) headend grade spectrum analyzer model BTSA 8558C. The BTSA-8558C analyzer is a light weight, battery operated spectrum analyzer that has a wide array of controls that allow for quick setup and measurement, including coarse and fine frequency tuning, digital frequency counter readout, 3 resolution bandwidth settings, including 30 kHz for composite triple beat distortion testing, 8 frequency span settings including ZERO SPAN for setting depth of modulation, 50 or 75 Ω input impedance, variable sweep rate, and "bright dot" center/marker frequency display. An optional calibrated noise generator is also available for sweeping frequency selective devices.

"Chase Beats in the Grass in Real Time"

I am a hard core test instrument addict. Ever since the discontinuation of the HP 8558B and the Tek 7L12 in the 1980s I have had a dream. That dream is to make available a personally affordable high dynamic range spectrum analyzer that is user friendly and provides the appropriate depth of measurement required for headend set up and trouble shooting. The 8558C is that dream come true. Because it is light weight and battery operated, the 8558C is appropriate for use anywhere in the system, especially the headend. The headend technicians job is most challenging in that he is tasked with identifying low level picture impairments and making them vanish. To do this he needs both 70 dB of dynamic range and a real time swept display. With this visibility, the technician can wiggle cables and connections, tap on chassis', tighten and loosen covers while observing improvements on the display. We addicts call this "chasing beats in the grass in real time". This is the first instrument I have seen with this capability, yet priced so that the technician can personally afford to own one.

"Priced So That the Tech Can Personally Afford To Own One"

Interdiction system installation and maintenance also presents the unique challenge of separately verifying the jammer and visual carrier levels. The 8558C is particularly useful for making this difficult measurement. The technician can easily observe both levels simultaneously in real time.

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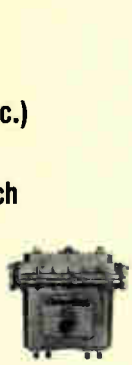

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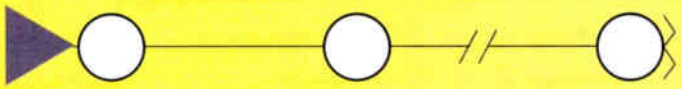
Figure 2: Higher value end-of-line tap



Using a higher value tap will provide additional in-line attenuation for reflected signals, improving the overall return loss from tap input to TV set. The bottom line will be fewer frequency response related problems, especially in the reverse spectrum. I've talked to a number of operators who have adopted this approach because of the problems that can occur when self-terminating taps are used. I've spoken with others who have been battling reverse path frequency response problems, only to find out the problems were caused by low value end-of-line taps.

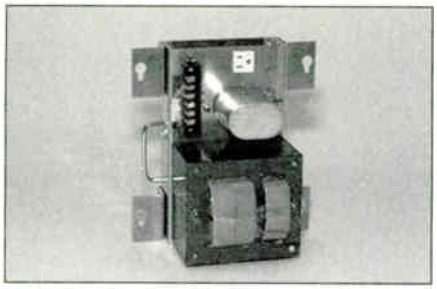
Is this trade-off worth the extra cost? There is little question that using higher value end-of-line taps throughout a system will drive up the plant's per mile electronics cost somewhat. How much will depend on several factors, including housing density, forward path design bandwidth and tap port design signal levels. You'll have to evaluate the cost difference for your particular situation. Personally, I suggest giving this idea serious consideration if you're planning two-way services. The potential problems related to poor reverse path frequency response include excessive group delay, which, if high enough, may cause an increase in your digital signals' bit error rate (BER).

> "If a self-terminating tap's F-ports are unterminated, then so is the feeder cable!"

Most data equipment manufacturers recommend keeping overall reverse path group delay below about 70 to 200 nanoseconds in the digitally modulated signal's bandwidth. As long as group delay doesn't exceed a specified threshold—which varies by manufacturer, modulation scheme and symbol rate—then the manufacturer will guarantee BER as it relates to group delay. A modest amount of frequency response ripple can cause all kinds of group delay problems.

The solution is to maintain frequency response as flat as possible, and one way to do that is to stop using self-terminating taps in our feeder networks. CT

Ron Hranac is senior vice president of engineering for the Denver-based consulting firm Coaxial International. He also is senior technical editor for "Communications Technology" magazine. He can be reached via e-mail at rhranac@aol.com.



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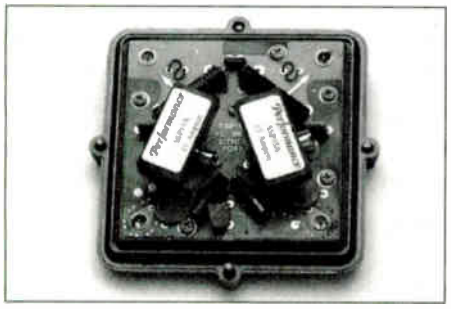

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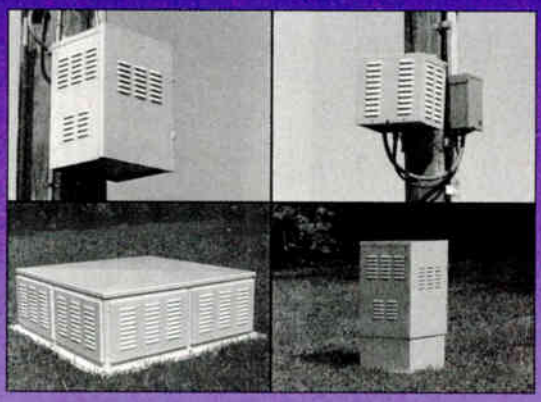

Reliability is what it's all about when selecting power supplies for your system, regardless of whether they're for an upgrade or a retrofit. Our industry-leading design and reliability assure that our products give years of trouble free service, but that isn't all, our confidence in the integrity of Performance power supplies is so positive,that we back them with a lifetime limited warranty. So call today to find out more about the many benefits of using Performance power supplies. You'll be glad you did . . . for years to come.

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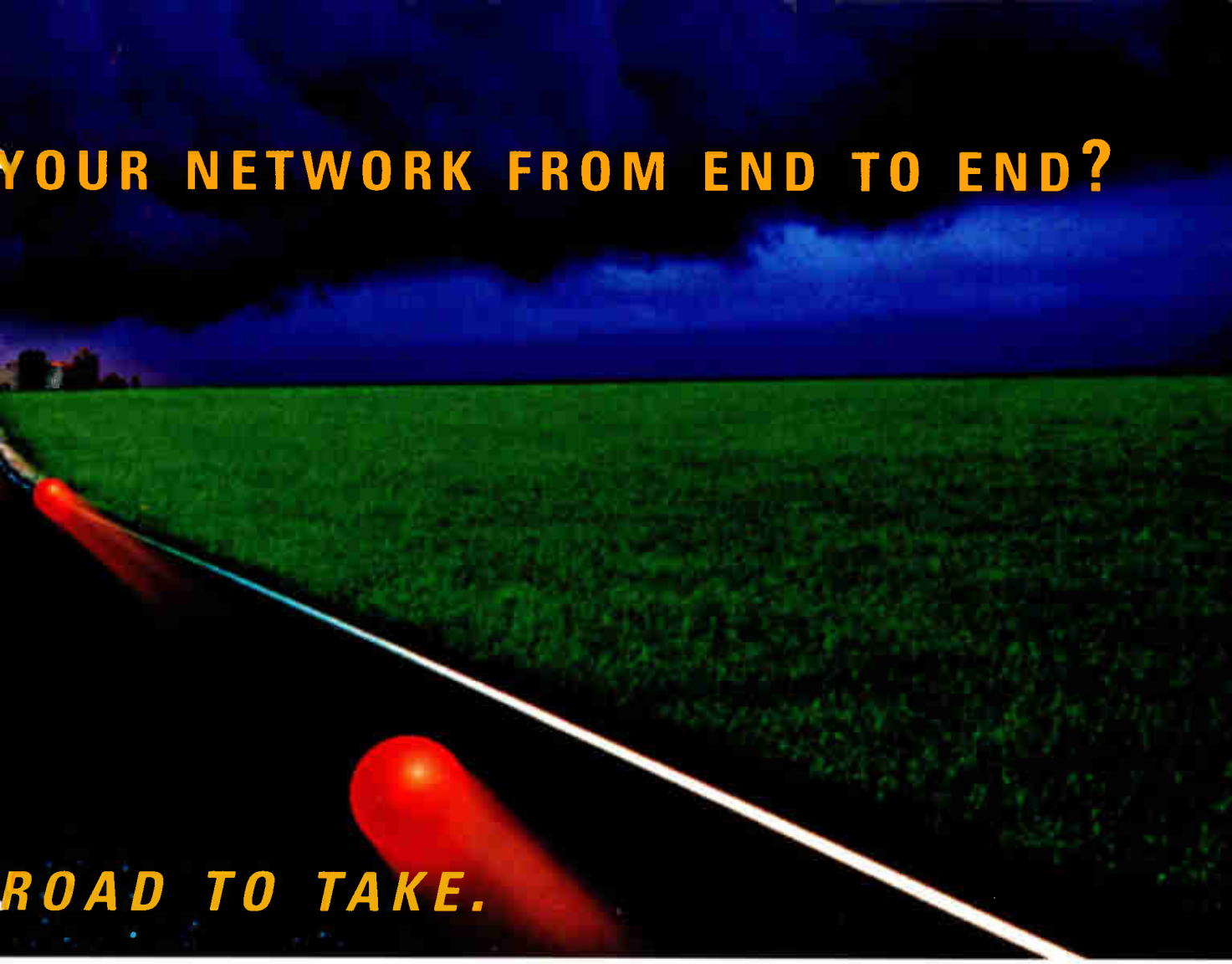

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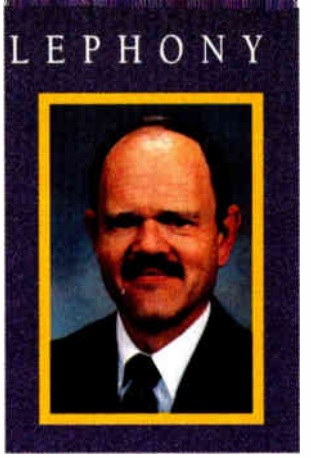
By Justin J. Junkus



The Telephony Return Solution

While I was attending a recent Society of Cable Telecommunications Engineers chapter meeting, the speaker asked how many in the audience were working with two-way ready plants. The answer was amazingly small—at most a handful of the 50 or so attendees.

It was especially surprising, given that the meeting was addressing the practical aspects of testing digital systems. This got me thinking that there may be more of a need than I had believed to provide enhanced revenue-generating services like high-speed data before two-way capability is completely available. Telephone return is one way of solving this problem.

What is it?

Telephone return is using the telephone company's twisted-pair connection through the public switched telephone network (PSTN) for a low-speed return path. The bandwidth of the telephone return is limited by the inherent capacity of twisted-pair copper wire, traditionally to an upper bound of about 4,000 hertz.

If you can live with the bandwidth limitations of twisted-pair, this is a way to use a communications competitor to help you get into new businesses. Of course, the forward path is still via the cable company's coax, giving the user a high-speed forward path connection to the headend.

The need for this alternative return path usually is driven by economics. Providing two-way high-speed service over coax requires extensive testing of the return path and typically involves adjusting or replacing amplifiers and/or lasers, possibly along with entire sections of older coaxial cable. Even in those systems where the return path had been used for system monitoring, the content differences between a low-speed telemetry application, such as amplifier status monitoring, and communications of more complex information dictates the need for tighter tolerances.

Often, all of this work is done in conjunction with a complete system upgrade to newer hybrid fiber/coax (HFC) technology, which brings fiber closer to the subscriber via fiber nodes, and uses coax only for the legs from the fiber node to the home. Upgrades of this nature require substantial financial commitment by the operator, and often the payoff comes only after the entire system is ready.

"The need for this alternative return path usually is driven by economics."

In the meantime, core services, usually one-way, must pay for the new investment, and that takes time. Telephone return can provide a way to introduce new revenue generating services before the entire system is upgraded. It also is an easy way to transition services from a traditional plant to HFC.

Candidates

Both digital set-top converter applications and high-speed data using cable modems are possible using telephone return. The high-speed data application will, of course, be high-speed only for the forward path, but that's where most of the high-speed need is, especially for Internet access applications.

Typically, subscribers need information downloaded from an Internet site and very seldom upload the same volume of data in the reverse direction. Reverse is largely used for simple requests for searches and then downloads.

In non-Internet applications like e-mail, high-speed upload is not usually critical to the user. Telephone return for high-speed data in the reverse direction is under control of software in the subscriber's PC and the cable modem. The software directs a telephony modem in the PC to dial up a connection to the headend or to a local Internet service provider. (The local ISP might be a better alternative, since a call to the headend could involve telephone toll charges. Of course, this requires a business arrangement between the cable operator and the ISP.)

If an ISP is used to complete the connection, a router at the ISP establishes the connection to the cable company headend. Some cable modem manufacturers (such as Zenith) can set their cable modems remotely for either a telephone or cable return, so that legs of the cable system can be changed over without a truck roll, as plant becomes ready for the return path.

The process is similar for two-way digital TV applications. In these cases, some type of data collector is accessed by the phone connection. Examples are real-time information transfer, such as a request for

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Radiant offers a full line of fiber optic cable plant products. The company guarantees drop cables with back reflections of -65dB for ultra polish terminations and -70dB for angle polish terminations. Available from 2 to 12 fibers with customer specified node connector. Also available are fiber optic assemblies, couplers, WDMs, customer premise cabinets, plus the industry's first and best low back reflection attenuators, both fixed and variable.

Reader Service Number 28

pay-per-view (PPV), or off-hours polling for billing information stored in the set-top converter. In these cases, it is the set-top converter that "dials" the call over the telephone line.

Installation

Telephone return installation can be very simple or complex, depending on the subscriber's existing telephone service and the application. Probably the simplest case is the wiring needed for polling of a set-top converter in off-hours for billing information. Because this can be done at night, the existing telephone line can be used—provided an outlet is available near the set-top. If it is, the service tech only needs to run "silver satin" telephone wire from the set-top to the telephone jack, the same as would be done if a standard telephone were being plugged into the jack.

If the jack already has a phone connected, and if it is one of the newer RJ-11 jacks typically found in homes constructed after the 1980s, the only change is to use a 2:1 adapter at the jack to accommodate the extra connection.

Sometimes, there is no jack, but there is a telephone junction box in the room. In this case, the technician must open the junction box, determine which pair of wires are connected to the active telephone line and add a jack. Here's where knowledge of basic telephony is a must because the tech needs to identify the appropriate wires.

The starting point typically is the demarcation point, or demarc. The demarc is the point where the telephone company's network meets the subscriber's premises wiring. It is a legitimate disconnect point for temporarily removing the phone company's wires from the customer's wires. In most cases, this can be done simply by disconnecting a single wire from a jack on the network interface device located at the demarc.

Once this is done, the technician can put test line tones on the premises wiring and search for the wires with the tone at various junction boxes or outlets. More importantly, once the house wiring is disconnected from the network, the technician no longer is in danger of getting a shock from 90 volts of ringing current if a call comes in while he or she is working on the new connection.

Sometimes the wires in a junction box no longer are connected back to the demarc. In those cases, the technician can either attempt to follow the physical connections from the box to find where it has been disconnected (often not possible because of wiring routes through walls and such), or run a new line to the room with the set-top converter.

High-speed data connections often require a separate line for the return to prevent any possibility of interference from existing telephone services or extension phones. In this case, the technician can connect the new premises wiring from the demarc to the room where the cable modem will be located, but the back office of the cable company needs to arrange for the new telephone number to be placed into service.

Just a word of caution if you ever are responsible for connecting telephone service: Make sure all the phones are working before you begin your installation, so both you and the subscriber know you have not affected any existing telephone service by your modifications.

Testing

Testing a new telephone jack or even a new line is a simple process using a commonly available tool—a standard telephone set. Three basic problems might occur: no dialtone, noise on the line or the inability to break dialtone when tone dialing.

No dialtone usually signifies an open line. To test whether this is at the subscriber's premises or in the network, you would go to the network interface device, disconnect the line from the network, plug in a working telephone set and listen for dialtone. If it is present, the problem is in the subscriber wiring. If there is no dialtone at the NIU, the problem is in the telephone company network.

Noise on the line usually is due to a loose wire or a faulty jack, and failure to break dialtone is caused by a reversal of the wire pair at the jack. ‹T

Justin J. Junkus is president of KnowledgeLink Inc., a training and consulting firm specializing in the cable telecommunications industry. To discuss this topic further, or to find out more about KnowledgeLink, you may e-mail him at jjunkus@aol.com.

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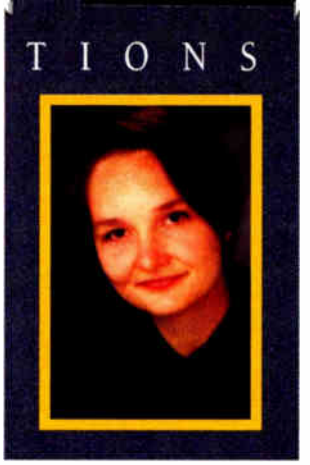

They're Bashing Your Network

Your cable engineering ears have been burning for so many years that you've started ignoring the sensation.

But now that it seems the whole world is bashing the cable TV industry's forays into the technology of high-speed data, it's getting harder to ignore all the swipes taken at your network.

It goes a little something like this: Your networks are not up to snuff when it comes to conquering competition in the data delivery cosmos. Add to that your outages, late installs and generally bad technical service, and what makes you engineering types think you'll ever be ready for data?

"Careful study has shown that nearly the entire cable network would need to be replaced to make it suitable for two-way data traffic, and satellite services have been stealing away cable's television customers at an intolerable rate."

Those words are from *Wired*, and no matter what your opinion is of that magazine, you should keep in mind its popularity and how many cable subs are reading that stuff.

Careful study? Hmm, there's plenty of you out there who would beg to differ. Unless you have one of the world's worst cable systems, "nearly the entire cable network would need to be replaced" is a humdinger of an exaggeration. And while cable certainly should continue to keep an eye on the competition, broadband engineers have some tricks left in their toolbox (namely, launching digital services) to compete with direct broadcast satellite (DBS). Whether they are stealing away customers right now at an "intolerable" rate certainly is a matter of whom you talk to.

Technical PR

Sounds like a public relations problem, you say. As an engineer, it's not really my place, you say.

But, hey, doesn't it make you even a little bit mad? While many of the horrible customer service marks the industry received in the past were deserved, do you really feel OK about all the over-the-top bad-mouthing of your systems that's going on right now?

Well, there are some things you can do, and what follows are ideas on how you can help shine up the technical community's image.

Consumer guide

Subscribers who criticize your system performance often are unwittingly an enormous part of the problem. The vast majority of those nasty ingress headaches in your network come from the customer premises. Your customers split the signal with mediocre hardware, loosen F-connectors that installers spent so much time carefully tightening, and generally run wild through your network from the comfort of their very own homes.

You can't be there every time a subscriber fancies himself an amateur installer, but you can help educate him as to why it's not such a good idea to operate willy-nilly on the wiring. But if he's going to do it anyway, why not give him some sound advice on doing it right?

The Society of Cable Telecommunications Engineers has dealt with the reality of this problem by way of a pamphlet, "Consumer's Guide to In-Home Wiring." More than 105,000 copies currently are in print. The piece informs cable subs and building contractors about proper ways to prewire homes and install additional outlets. Many systems have purchased copies customized with their logo on the cover as a service to their subscribers. Contact the SCTE at (610) 363-6888 for details.

Future is on Cable

"The Future is on Cable" is a program that includes initiatives focusing on establishing cable technology as the telecommunications leader. Included in the initiative are "CableFlashes" as well as a high-speed modem demo video.

CableFlashes are 30-second TV messages. While some spots mention certain operators by name, others are generic and suitable for general use on your system. Topics include cable's technical advantage with its vast hybrid fiber/coax (HFC) architecture and broadband pipeline, and cable as the superior deliverer of high-speed on-line services.

Produced in conjunction with CableLabs, the cable modem demo video runs two and a half minutes and quickly illustrates cable's advanced technological capabilities with a comparison of on-line speed among traditional phone lines, integrated services digital network (ISDN) and broadband HFC. This video is available to National Cable Television Association member companies. Contact NCTA at (202) 775-3629.

On-time

The "On-Time Customer Service Guarantee" was a big enough technical issue that SCTE President Bill Riker kicked off last year's Cable-Tec Expo Engineering Conference with details. Info is available on this multi-association-sponsored program by calling SCTE at (610) 363-6888.

"It's a great start to improving our rapport with subscribers," says Riker. "The guarantee states that if a scheduled installation is late, the installation fee is waived. If a technician is late for a scheduled service call, the subscriber receives a $20 credit on the next bill."

With a recent survey indicating that only 3% of consumers would choose their cable operator as a single provider for all their video, voice and data services, don't you think it's well past time for the technical side of cable to help clean up its image? CT

Laura Hamilton is senior editor at "Communications Technology" in Denver. She may be reached via e-mail at lhamilton@phillips.com.

RBI is turning the TDR world on its ear

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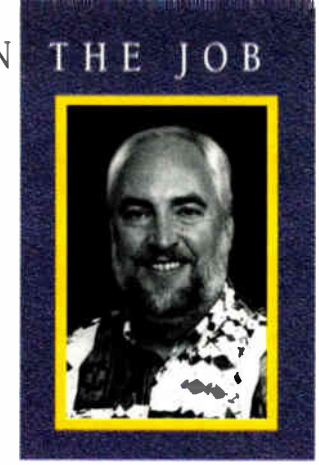
Reader Service Number 32

By Alan Babcock



Training Committee Scoop

The Society of Cable Telecommunications Engineers Training Committee met at the Western Show in Anaheim, CA, on Dec. 9, 1997. We had a good meeting and made decisions that will continue to move training forward for the Society.

Your board of directors also approved a budget that will significantly improve our ability to produce top-quality training materials.

Safety awards

One of Training Committee's subcommittees oversees Health and Safety issues. Ray Lehr of TCI chairs this subcommittee, and he presented an idea that we will pursue. Ray has been a safety professional in many industries and brings a tremendous perspective. According to Ray, one of the best ways to improve workplace safety is to provide recognition for appropriate safe behavior. This recognition can be safety awards, a line item on an annual review, monetary bonuses, public notices and many other forms.

While it's up to individuals to work safely, supervisors, managers, co-workers, members of the safety committee and others are in a position to recognize appropriate safe behaviors. Many companies either corporately or locally have instituted effective safety programs. SCTE would like to recognize those companies and/or operators who have aggressively and effectively sought to improve safety in the telecommunications industry.

SCTE's role

The details of how to provide this recognition are being sorted out even as you read this, but I wanted to get advanced information to you by way of this column to let you know what is going on. One of the ways to determine those deserving recognition is to compare the incident rates for accidents.

SCTE is considering publishing a survey that will be distributed in a variety of ways to collect data about the frequency and type of recordable injuries that have occurred in the previous year. The information requested would not be of a proprietary nature. The Occupational Safety and Health Administration already requires that this type of information be made public in February of each year on Form 200.

This information could be used to select a company or individual system for recognition, but it also could be used to provide information back to the industry as a valuable tool for safety professionals.

Public data collected today from OSHA is too general to be useful for our industry. It would be valuable to look globally at the accidents and recordable injuries occurring in telecommunications to determine what safety programs might best impact our industry.

Other evaluation tools that might be used to recognize effective safety programs would be written descriptions of programs, submitted samples of materials used in the programs, and personal testimonies from employees or company representatives. As stated earlier, this is in the concept stage. We would like input from any interested parties to help establish the guidelines for this recognition program. We are interested in helping to provide a safe work environment, and the Training Committee feels this will be a very effective tool.

Remember that safety is no accident.

Tech sessions

Did you know that the SCTE Training Committee works with state cable associations to plan technical sessions at state and regional cable shows? M.J. Jackson is the head of the Publications, Trade Shows and Regional Seminars Subcommittee. This subcommittee contacts companies and individuals seeking papers for presentation at regional shows. If you are interested in presenting a paper or are interested in helping identify people to speak at these shows, please contact M.J. at (972) 252-9235. Presenting a technical paper also is a great way to earn points toward recertification. Four points (or RUs) can be earned by doing a technical presentation.

New course

By the time you read this column, SCTE will have its new Broadband Technology course available for sale. This program includes videotapes, the text *Cable Television* by William Grant, student workbooks with exercises for practical application and leader guides to facilitate presentation of the material in a classroom. Contact national SCTE headquarters at (610) 363-6888 for more information. T

Alan Babcock is director of training development for the Society of Cable Telecommunications Engineers. He may be reached via e-mail at ababcock@scte.org.

TIMES-LINE

Times Fiber and the Cable Industry Celebrate their 50 Year Anniversary

1948

Times Wire and Cable is Established! First supplier of coaxial cable to the CATV industry.

1968

Times introduces low-loss cables to the industry.

1969

Times introduces copper clad center conductors saving the industry millions of dollars.

1976

Times introduces first commercial fiber optic system for CATV use, installed in NYC, using fiber manufactured by Times.

1978

Times Wire and Cable announces name change to Times Fiber Communications, Inc.

1979

Times advances dielectric state-of-the-art by introduction of low-loss gas-injected foamed polyethylene dielectrics.

Times develops 400 MHz expanded coax for CATV.

1981

Times establishes the world's first fiber optic earth station link.

Times introduces the fiber based MiniHub I.

1983

Times is first to introduce triple bonding for coaxial cable.

1984

Times is first to introduce a full line of CATV coaxial cable with 600 MHz capability.

1985

Times introduces lifeTime, its exclusive non-flowing floodant for aerial, underground and indoor applications.

Times introduces TX low-loss coaxial cable.

1986

Times leads the industry again in introducing a full line of 1GHz cables.

1996

Times is first to develop RF capable 50 Ohm coaxial power cables for the CATV industry.

1998

50 year anniversary of Times Fiber Communications, Inc. and the cable industry.

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D-Day is Coming.

By Bob Van Orden

For cable companies, "D-Day" is Digital Deployment Day. It's the day you, as a cable operator, move digital services from the concept stage to a working reality. Some cable operators, including Time Warner, Comcast, Adelphia, Marcus, Videotron and Rogers, are planning a series of D-Days this year for selected cities. This year, for the first time, they'll have the weapons vital for success in the marketplace: digital standards, digital content and Internet-ready digital set-tops.

A cable operator without its own D-Day plan is a cable operator at risk of losing market share to direct broadcast satellite (DBS) systems, especially among premium-service subscribers. With about triple the channel capacity of most analog cable systems, DBS providers have the ability to multiplex, offer a large selection of pay-per-view and offer targeted packages of services to different audiences. DBS also can offer services nationwide without the major investment of putting new, wired infrastructure in place.

If cable operators seize the initiative and capitalize on their own strengths, their position will change from defensive to offensive. While protecting market share from further erosion, they will be able to attract new subscribers with new, revenue-generating services. These can include Internet access on the TV set, home shopping, home banking, distance learning, near-video-on-demand (NVOD), true video-on-demand (VOD), multi-location interactive games, channel hyperlinking and e-mail.

To strike back, cable operators need to go beyond merely duplicating DBS services. Instead, they need to leverage their key asset—the hybrid fiber/coax (HFC) architecture—to create permanent competitive advantages. How do you leverage this asset? With a robust digital delivery system that includes computing power built into the subscriber's set-top.

Surveying the terrain

The success of DBS has proven that there is strong demand for digital TV. By offering vast selection and superior video and audio quality on more than 100 digital channels, DBS has succeeded in attracting approximately 7.5 million subscribers.

The cable industry's response to this competitive threat has been hampered by several obstacles. Standards were lacking, so set-tops deployed in one system would not necessarily be interchangeable with those deployed in a neighboring system.

Another major concern was the high price and limited functionality of broadcast-only digital set-tops, which as recently as a year ago was the only set-top choice for digital deployment. Cable operators found a dismal business case for upgrading their networks just to add new digital channels. And even if interactive set-tops were available at reasonable costs, few digital services were ready to take advantage of interactivity.

Over the last year and a half, however, five developments have changed the outlook considerably:

1) The explosive growth of the Internet has handed cable operators a golden opportunity to immediately support high-speed data and Internet access via either TV sets or PCs.
2) Set-top standards have finally gelled. CableLabs has made considerable progress in achieving industrywide consensus and writing North American specifications for interoperable, two-way digital cable networks.
3) Sparked by availability of hypertext markup language (HTML) and JavaScript-based authoring tools for set-top applications, content providers are readying new services for cable systems.

Interactive Channel, Network Computers, PowerTV, WorldGate and many other content providers are announcing new services and conducting trials with set-top manufacturers and cable operators. The availability of new content will

Are You Ready?

spur many consumers to pay not only for new services, but also for the set-tops that bring these services into the home.

4) The percentage of two-way-capable plant is soaring. At the end of 1996, only three of the top six MSOs had two-way capability in more than one third of their systems. By the end of 1997, all six had two-way capability in at least 50% of their plant. By the end of this year, more than half of all cable homes are expected to be served by upgraded plant, according to Donaldson, Lufkin & Jenrette.

5) Integrated circuit and memory chip prices have fallen to levels that make the price of set-tops significantly more attractive.

The DBS-killer

Set-tops determine what kinds of services the cable system can offer. Therefore, the primary factor in making a business case for initial deployment of any digital architecture is what return on investment can be anticipated from new services.

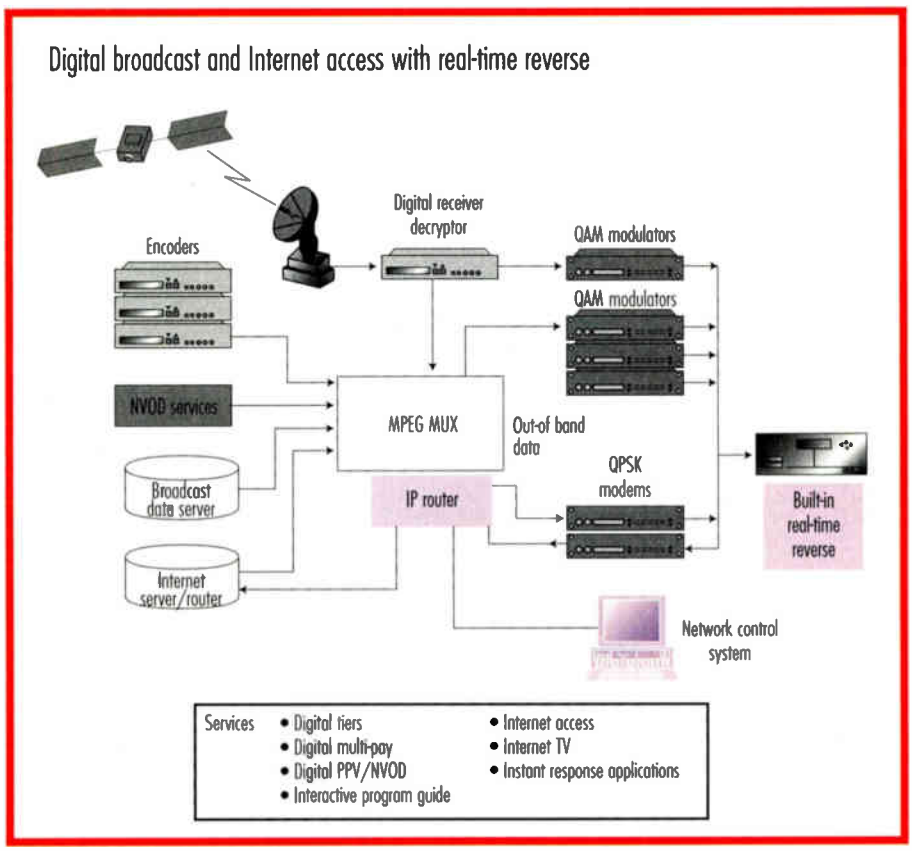
With one-way broadcast-only digital set-tops, operators have insufficient opportunities to generate new revenue over the life of the unit. Without a viable upgrade path, the entire system—not just the set-top—likely will become obsolete soon after deployment.

That's another reason why your digital deployment plan needs to look beyond the "more channels" mentality of a DBS service. What, then, are the key considerations in the all-important set-top decision? Here are some guidelines:

1) Change your perception of set-tops. In the digital world, that box on top of the TV set isn't just a set-top. It really needs to be a set-top computer with capabilities similar to a local area network (LAN)—while remaining as easy to use as a TV set. To enable Internet access and a wide variety of two-way services, it needs a built-in reverse path transmitter to communicate back to the headend instantaneously, or in real-time, over the HFC plant.

It also needs sufficient central processing unit (CPU) power, memory and intelligence to run robust multimedia applications, provide stringent security and even serve as a cable modem. Yet, to succeed, the set-top computer must offer all of these capabilities at a price competitive with one-way broadcast-only digital terminals.

2) Plan a migration path. In all likelihood, achieving parity with DBS is your initial deployment's goal. But as noted earlier, the set-top decision forces you to look beyond a broadcast-only digital system. A must-have



feature for your system's digital set-tops is the ability to migrate from broadcast-only to an operator-determined mix of Internet access and other two-way services as demand materializes and network infrastructure is in place.

3) Insist on OpenCable specifications. By the time you read this article, CableLabs' OpenCable initiative for North American interoperability specifications will be mostly "inked." The specifications likely will cover at least four levels or choices of set-top capabilities, called Model A, Model B, Model C and Model D. Choose a set-top that currently meets at least the Model A specifications.
4) Be ready for Internet connectivity. Your set-top computers should be able to operate in dual TV/PC data modes. They will perform as a high-speed cable modem connected

BOTTOM LINE

Prepare for Digital Deployment Day

Here's some pointers to help you prepare for "D-Day," Digital Deployment Day:

1) Develop a business plan. One side of the balance includes anticipating consumer wants, weighing the costs and potential revenues of providing new services, and responding to changing market demand.
2) Determine a flexible architecture. Operators should ensure that their network design is scaleable and encompasses the necessary technologies for both digital broadcasting and high-performance data communications. With a "source neutral" architecture from the headend-to-the-home, HFC operators can accept all types of feeds and tailor their own digital service tiers from content delivered by satellite or by other sources.
3) Prepare the infrastructure. Upgrade your plant to at least 750 MHz—or perhaps even 860 MHz. Improve reliability by reducing node size. Optimize reverse plant signal levels. Forecast future service patterns and usage to determine appropriate bandwidth requirements. Establish a frequency spectrum plan. And, tighten up the plant.
4) Test consumer needs. Beyond the obvious—more channels, Internet access and multiplexed movies—what digital services should cable operators offer subscribers? One report to check out is from the Excite lab at Simon Fraser University, which conducts ongoing research to identify ways to foster wider acceptance of interactive TV content delivered through two-way cable systems. Excite's most recent report analyzed consumer preferences and attitudes about interactive TV and how operators can meet their needs with interactive services.

directly to a PC or as an Internet access device using the TV for display. To do this, they'll need to provide full Internet Protocol (IP) connectivity. They also need to understand HTML and JavaScript application programming interfaces (APIs), which are the software interfaces required by developers to author interactive applications.

5) Don't accept a mediocre operating system. For interactive services to work smoothly for subscribers, two powerful computers—a server in the headend and the set-top computer—must work in harmony. That requires a sophisticated operating system in the set-top.

   A set-top's operating system must be powerful enough to drive real-world, interactive delivery of entertainment and information services to the consumer. Advanced operating systems can support photo-quality graphics and provide complete session and signaling management on HFC networks. (See the accompanying figure on page 45.)

6) Remember that all conditional access systems are not created equal. A locally controlled conditional access system should provide advanced security features that can enable electronic banking and shopping services. These features include public/private key security message authentication and digital signatures.

7) Ask where the reverse path goes. A real-time, reverse-path set-top isn't enough—the reverse path must be controlled. Traffic, contention, effective bandwidth utilization, authorizations and session management are functions of a digital network control system. Examine it carefully.

8) Work with an experienced integrator. The digital set-top computer is just one part of a scaleable digital broadband delivery system. The other components include the headend equipment, network control systems transmission equipment and distribution equipment. Ideally, the set-top vendor has considerable expertise in these related areas and also can act as the cable operator's system integrator or prime contractor. Your integrator should have a strong team devoted to making digital work—not just as a technology, but also as a very real business.

9) Don't ignore analog. Unlike DBS networks, HFC networks—set-tops included—must continue to seamlessly support both analog and digital channels.

10) Don't delay. There's no longer any reason to wait. Standards are here. Chip prices are dropping. Digital content is arriving. What about the set-top computers? They're arriving, too. In fact, for their forthcoming "D-Days," many MSOs will be deploying an advanced digital set-top computer that meets all of the requirements cited in this article.

A year ago, many cable operators feared being among the industry's digital pioneers. With the emergence of new standards, new markets, new services and new set-top technology, those fears are no longer valid. Pioneers have already blazed the trails to providing digital services on HFC networks; now it's time to turn those trails into digital highways serving every cable subscriber. CT

Bob Van Orden is director of digital video systems for Scientific-Atlanta.

Digital Set-Top Strategies

Add Service without Breaking Your Budget

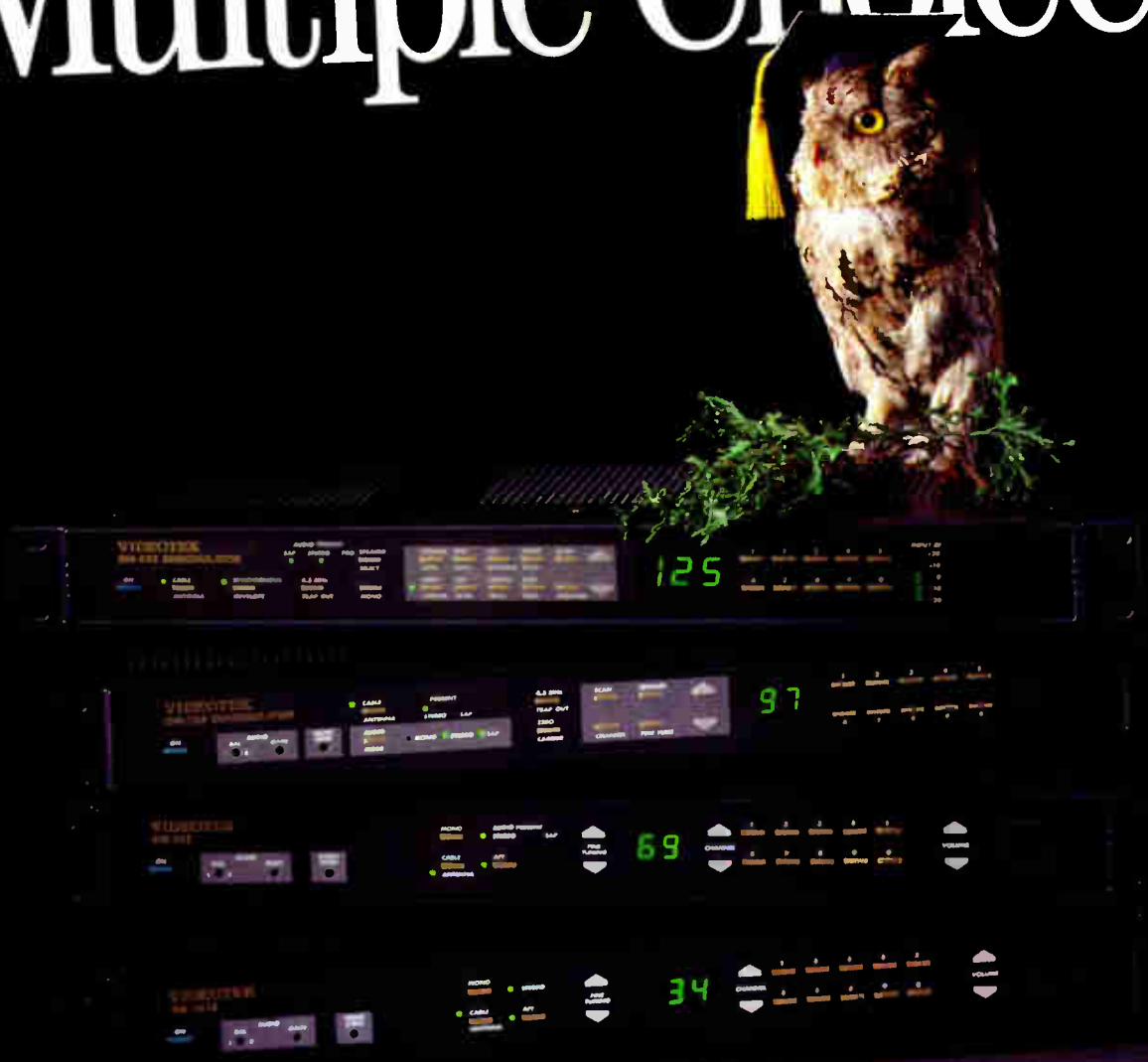
By David Fritch

Digital cable systems provide numerous benefits and services to consumers, from enhanced basic cable service offerings to entirely new interactive applications. By offering their customers digital cable, operators benefit as well with an enhanced competitive position and new revenue streams.

Operators need digital solutions that are flexible enough to meet the complete range of services and functionality required by their digital plans. Each operator's digital rollout has different requirements. These requirements directly relate to each operator's technical and financial situation, competitive pressures, customer demographics and special needs.

Operators should seek a full range of digital solutions that offer forward and backward compatibility for all of their systems' components. Forward and backward compatibility enables operators to offer different service tiers to their customers. It also provides a smooth transition path from a basic

Multiple Choice.



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Digital broadcast systems

Digital broadcast systems are where the benefits of a digital system begin—with a one-way broadcast of digital video and audio streams integrated into the operators' existing service offerings. This integration offers customers the basic tier of digital services, including increased channel lineups, clear digital video and CD-quality audio, electronic program guides, and the use of virtual channel-based services requiring no return path. Digital set-top terminals targeted at these basic services can serve as either baseline terminals or as inexpensive second set-tops for customers' homes.

Digital interactive systems

Most digital rollouts, however, begin with a digital interactive system. All of the digital set-tops already shipped (which total more than 500,000) fall into this category.

A digital interactive system offers all of the features of a digital broadcast system plus two-way return path functionality. The return path may take the form of a telephone modem for unidirectional networks, or it may leverage the cable plant's return path with an RF return path modem for two-way capable cable plants.

This return path capability opens the door for a new generation of interactive services, such as impulse pay-per-view (IPPV), video-on-demand (VOD), Internet access, community networking, educational services, and more. Most of these services can be offered with a telephone modem. However, RF return path modems, when deployed on a two-way capable cable plant, allow these applications to operate at maximum performance.

Most operators' near-to-medium-term deployment strategies are centering around interactive services having a small upstream data requirement with a large downstream data requirement. Even the most demanding of today's interactive applications (such as VOD) share this characteristic. Very little upstream data is required to place an order for a movie, while a great deal of downstream data is needed to deliver it.

This principle holds true for other interactive applications, such as Internet access, where very little data comes from the user and most of the data comes downstream. Therefore, return path technologies such as time division multiple access (TDMA) are unnecessary for many interactive applications. In many cases, they may be less efficient. Operators need to evaluate the available return-path technologies, keeping in mind the type(s) of networks they have deployed and the kinds of applications they want to offer.

Advanced digital

Recently, the industry has focused on the convergence of PC and Internet

BOTTOM LINE

The Best Digital Set-Top Strategy

Not all set-tops are right for all customers or all networks. By looking for a complete range of digital solutions, operators can position themselves to deploy the right set-tops for the right applications, leveraging a full range of digital set-tops to inter-operate on a single digital network. Let's look at some of these different digital ranges:

- Digital broadcast: Providing the basic digital services, such as digital video and audio, increased channel capacity and electronic program guides.
- Digital interactive: Adding two-way return capability to provide interactive services such as video-on-demand (VOD), impulse pay-per-view (IPPV), Internet access and more.
- Advanced digital interactive: Adding dedicated upstream bandwidth capability to your network to accommodate more high-end applications requiring large upstream data transmissions. These networks also demand set-tops with the processing and graphics capabilities needed to handle these high-end applications.

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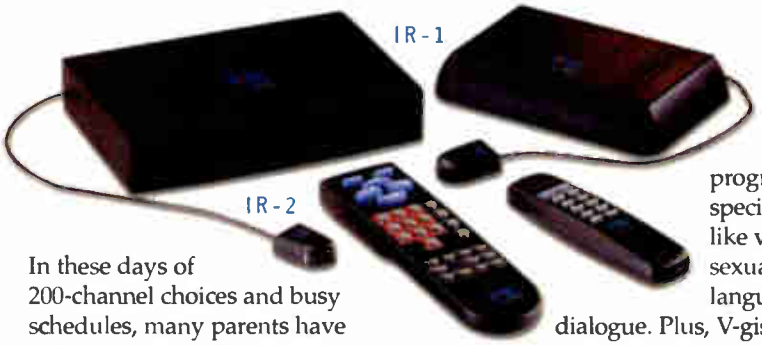

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technologies with cable operators' plants and set-top infrastructures. High-profile software companies have expressed interest in porting new applications to a cable network, raising the expectations for digital set-tops capable of running more processing-intensive, PC-like applications.

The next-generation, high-end digital set-tops will have more PC-like functionality built into them to meet the needs of new interactive applications

and the operating systems and middleware needed to run them. Combining the features of an interactive platform with significant processing and graphics upgrades will enable these set-tops to run new high-end applications and display more PC-like graphics, including 3-D rendering and picture-in-graphics capabilities.

Next-generation set-tops will integrate PC-like features such as built-in hard disk drives for added local storage capability and enhanced processor and memory capacity. These new features will further enable the next-generation set-tops to provide users with a rich PC-like experience through their TV sets. This experience will be enhanced even more by the networking power of the operators' digital networks, which will allow operators to offer services like Internet access at downstream speeds 1,000 times faster than traditional telephone modems.

An open platform with a selection of operating systems will enable operators to fully deliver a rich suite of applications—and receive the best return on

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The Move to Digital—Fad or Necessity?

Building a Case for Digital Set-Tops

By Nick Hamilton-Piercy

Digital certainly has sizzle, but is it really needed? That depends on your current system capacity and vision for new revenue opportunities.

Digital has been just around the corner for several years, and its penetration today just scratches the surface. Chicken Little has continuously cried, "The sky (read DBS) is falling," but it seems the dreaded death stars have had insignificant impact on systems practicing effective customer service.

So why burden our already stifling debt loads with baskets full of the elusive $350 (or $250 or $400, depending on whom you believe) digital set-tops? Maybe it does make sense if your vision includes new revenues from interactivity or avoiding a costly system rebuild.

It seems that in every trade journal or newsletter we pick up today there is at least one article announcing a new launch of digitized and compressed video (digital) services and set-tops. Stories abound on conspiracy theories of Big Bad Bill from Redmond taking over the cable industry, to deep pockets from Silicon Valley canceling out all our debts. Behind this hype is the absolute belief that we have to place set-top computers in our customers' homes as soon as we can. Let's stand back a bit and apply some logic to this digital confusion.

There is no doubt that digital works as a technology. One could even say it is becoming a mature technology. All of our significant competitors use digital to distribute video and audio programming.

The most prevalent use today is in direct broadcast satellite (DBS) services distribution. Companies such as DirecTV, USSB, Primestar, EchoStar and Canada's Star Choice and Expressvu use the technology

to distribute their programming to six million customers across North America. Wireless cable operators using microwave distribution also are building up a customer base using digital video technology.

The telephone companies use digital technologies in their copper-plant asynchronous digital subscriber line (ADSL) service. Although this technology can support digital video services, with the exception of some specialized trials today, the focus is on high-speed data services. Over-the-air broadcast programming also will move to digital during 1998, as the first standard and high-definition TV broadcasts are launched. Although I suggested the most prevalent use of digital right now is DBS, it soon will be surpassed by the rental and sale of digital video discs (DVDs) as these replace video-cassette rentals.

The quality issue

A consequence of this bombardment of digital is that customers are exposed to very good quality, essentially noise-free TV pictures and high dynamic range—near CD quality sound. This is raising the quality expectations for all of our video customers, especially those with larger TV receivers equipped with baseband video or S-video input connections.

Matching this quality with analog cable distribution is, to say the least, a challenge. Even newly rebuilt cable plant with very short distribution amplifier cascades and first-class headends cannot provide the day-to-day quality and consistency of digital without stringent design specifications and very tight maintenance procedures. The quality issue may not be apparent on a 19-inch TV receiver at normal residential viewing distance, but it is apparent when viewing larger screen receivers. This is especially so in a side-by-side comparison,

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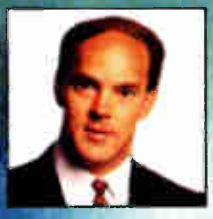

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when digital and analog channels are tuned in succession as the viewer channel surfs across the cable offering.

Quality comparison might become more of a concern when the customer can compare local broadcasters' digital service, rental digital disc or DBS or wireless operators' service against the analog cable service (either in the home or at the consumer electronics store or at a neighbor's home). Quality is one argument for moving to digital, but in itself it is not likely to justify the $350 set-top investment, except for the few quality-obsessed videophiles.

Channel expansion

Digital technology enables six to 10 quality video programming services and 10 to 14 quality film-based programming services to fit into a 6 MHz cable channel. Even more aggressive compression is possible by exploiting statistical multiplexing benefits further, specially processing signals prior to their compression and making a small sacrifice in picture sharpness.

Somewhere near 80 digital programming services can be squeezed into 50 MHz of cable network bandwidth. This expansion of effective channel capacity by digital can be used as an alternative to upgrading a cable system from, say, a 300 MHz or 450 MHz capability to a 550 MHz or higher.

It also can be more cost-effective if the percentage of customers expected to take the digital services is less than half of all customers. For example, let's say the rebuild is expected to cost about $100 per home passed, the system enjoys 70% service penetration and the set-top is $350. At about 40% digital set-top penetration, the decision to spend capital on set-tops or a rebuild to get channel capacity might go either way.

Ultimately, digital for channel expansion is more attractive because capital is required only when a customer upgrades to the digital package (demand driven). The converter-descrambler cost normally required is avoided because the digital set-top already provides this function. Of course, if the system had already been upgraded for extra channel capacity, this justification for digital is not applicable.

New revenue

The digital platform and associated set-tops provide the opportunity for new revenues. This might start simply by the inherent improved security for premium services, such as pay-per-view (PPV). Some operators already are claiming they have experienced several percentage

BOTTOM LINE

What's the Deal with Digital?

The digital bandwagon is rolling by, and the question is not so much whether to jump on, but when and for what reasons. Despite all the hype surrounding digital technology, it does offer significant concrete benefits, such as:

- Quality—Customers are being exposed to digital quality by other media, getting excellent pictures and sound. Such exposure raises quality expectations, which adoption of digital can help satisfy.
- Channel expansion—Nearly 80 digital programming services can fit into 50 MHz of bandwidth, and the added capacity might be an alternative to upgrading the entire system to a greater bandwidth.
- New revenue—Improved security and other enhancements of pay-per-view, new avenues for advertiser-supported applications and various forms of telephony open up myriad opportunities. Also, an incremental approach would help to reduce out-of-pocket costs for operators who want to upgrade. Rather than converting the whole system at once, installing the digital platform in piecemeal fashion when customers ask (and pay) for digital upgrades can help keep costs down.

points' lift in their pay services following their conversion to digital. Or this could be as a consequence of exploiting real-time two-way interactive services.

The channel expansion provided by digital permits significant enhancements to PPV by supporting multiple channels of PPV service. This might be utilized for enabling multiple titles or multiple start times of a title, or a combination of both. Significant increases in movie buy rates can be anticipated when this enhanced PPV service is provided in conjunction with the selection and ordering capabilities of the interactive program guides (also enabled by the digital platform) and the impulse ordering function.

The computational power of the digital set-top's internal processor, the on-screen graphics capabilities and the silicon memory make the set-top a powerful computer. Used in conjunction with the two-way capabilities available with the digital set-top and appropriate headend servers and software, many new applications with revenue potential can be supported. These may be as simple as advertiser-supported graphics overlays, showing such information as traffic reports and local weather, or as complex as Internet-provided data, synchronized with and supporting broadcast programming. E-mail, Internet browsing, electronic billing, electronic catalog shopping, music and video-on-demand are other applications with significant revenue potential.

Options soon to be provided with digital set-tops include built-in high-speed cable modems, codecs for Internet protocol (IP)-based telephony and video telephony and decoding of high definition TV signals. As with automobiles, when adding options, set-top costs rapidly increase, and the business case may support fully loaded units for only a much smaller segment of the customer base.

Additional revenue derived from these interactive services has yet to be determined. Some revenue might be indirect, such as from sponsorship/advertising linked to interactive services' other revenue direct from subscription.

Early consumer research has shown at least 30% of the customer base has a definite interest in an enhanced cable service offering interactivity at 15% to 25% increase in monthly cable subscription. These "mouse potatoes," unlike "coach potatoes," are not averse to being actively involved in their TV entertainment. They don't want the interactivity typical of PC usage; rather, they want to be passively entertained and to interact when they wish to enhance their entertainment or seek further information.

The acceptance of e-mail usage through the TV set is more of a surprise but appears to be in demand. E-mail in this context is not the telecommuter reading/sending messages to business colleagues but rather the casual "family and friends" notes back and forth that might occur. A flashing light on the set-top or a small blinking icon on the TV screen alerts the viewer to a waiting message. This might be accessed at the viewer's convenience, and can be responded to either by picking off letters from an on-screen keyboard replica or an infrared-connected "belly top" (aka laptop) typewriter-style keyboard.

Other benefits from digital

The digital platform and set-top, especially when included with interactive services, can provide a service package untouchable by wireless and satellite alternatives. Even though erosion of customer base has been minimal for most systems so far, a full digital services package has the potential of eliminating it totally if priced right for the market and supported by fine customer service. Depending on the assumed numbers used for potential erosion, a significant portion of the digital set-top's cost can be justified.

The two-way digital set-top has other value in operations, in that every terminal is a system-performance monitoring point. This enables accelerated time to locate and repair problems and avoids unnecessary home truck rolls. These saved expenses and improved customer service complement the other cost benefits to be considered when justifying a move to digital. CT

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Macrosoft

An Overview of Software in Advanced TV Systems

By Joe Buehl and Neil Jones

Software is becoming a major component of advanced cable systems as digital, interactive and downloaded services are being deployed. An infrastructure that allows applications to be effectively developed, deployed and maintained must be built before these services are able to reach their potential.

Advanced cable systems promise to deliver greater value to the viewing audience, due in part to their rich feature set, which includes access to huge libraries of information, real-time data, two-way communication, personalization and low overhead commerce. With the broad cable bandwidth available, new interactive applications will arise specifically tailored to this environment. To realize this value, cable equipment suppliers must meet many unprecedented challenges in software design, including data delivery and formatting, consistent interface metaphors (both for input and display) across dissimilar media, security, and seamless integration of the broadcast TV (one-way) and interactive (two-way) experiences.

The key to presenting the "best of both worlds" lies in maintaining the expected experience of television and delivering the value of interactive TV on demand. As such, one goal of enhanced TV viewing will be to use interactive resources so that the viewer perceives it to be an evolutionary change rather than revolutionary. For the viewer, the experience of "watching television" should remain undisturbed, regardless of what appears on the screen.

To meet this goal, some specific milestones for this system should be:

- An integrated environment for analog and digital broadcast services
- Support of open and interoperable systems
- Support for multiple conditional access systems
- A customizable look and feel for user interfaces
- Support for retail set-tops
- Developer access

While defining standards for transmission of data within cable networks are becoming clear, on the higher software levels, standards are just now being formed. Three specific areas remain to be addressed, which are:

- Navigation
- Content management
- Developer support

Traditionally, software in cable systems has been limited and confined to a single piece of hardware. This architecture has been successful because the embedded and proprietary software was bundled with hardware using closed architectures. (See Figure 1 on page 62.)

This must change to enable interoperable components like retail set-tops, since a single-vendor solution is no longer viable. In this day of technology alliances and open systems framework within the computer software market, the probability of success for closed proprietary systems is extremely low. For multiple vendors to compete, the various software components must be clearly identified and the interfaces standardized.

To define an open, interoperable architecture, companies must define the key components of the system with an aim toward interoperability between system vendors. Software vendors must be able to build components in which they specialize and which have well-defined, open interfaces and compatibility with components supplied by other vendors.

As such, six classes of software that may be supplied by different vendors are:

- Applications
- Resident applications
- Platform server software
- Platform client software
- Operations support systems (OSS)
- Conditional access and encryption (CA&E)

Figure 2 (on page 62) illustrates how the software might be divided from the point of view of supporting different types of software vendors in an advanced cable system. Each area represents software components that may be supplied by a vendor. As indicated, software is divided along two major axes: client-server and application-platform.

The client software runs in the set-top or receiver. Everything else, including software that runs in the distribution hubs, headend and cable office, is considered server software.

Similarly, application software generally is visible to the consumer and adds value to the system. The software that exists to support applications and provide common functionality is platform software. In the diagram, the boxes representing applications extend across the client and server hardware. This demonstrates that each application may have components that exist both in the set-top (client) and in the controller (server). To optimize the components integrated in the set-top and

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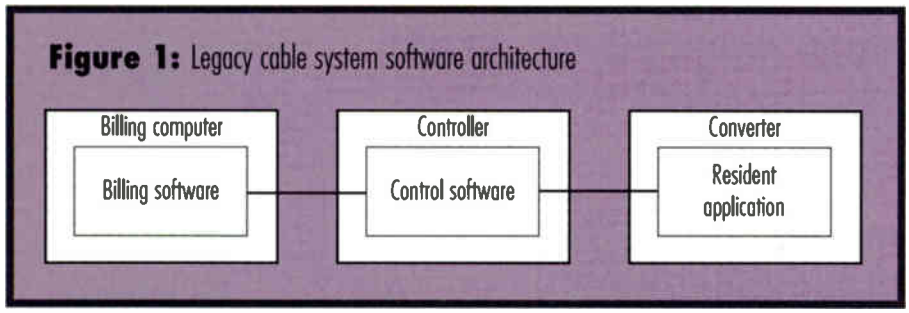
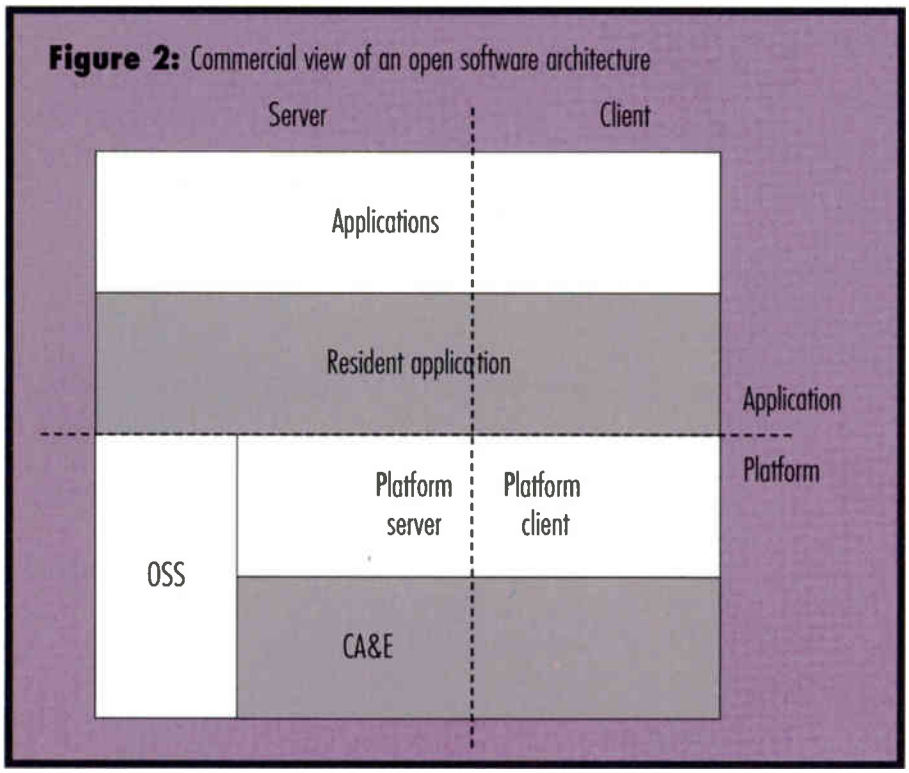




controller, the application developer must be supported in developing both the client and server portions of the application.

Applications

Applications implement services provided to the customer. Many are distributed applications, meaning they may have both a client and server component. Applications may present a server-user interface, a client-user interface, or both. Applications may have components resident in the set-top, or they may be downloaded to the set-top through the network. The client-server interface of an application may be proprietary, but an applications developer may open this interface. Similarly, interfaces between application components may be declared open at the discretion of the developer. Lastly, interfaces between applications on either the client or server may be opened.

Applications also are not limited to executable code. Most services require a number of different components to work properly. If pieces are missing, the service will be impaired or unavailable. An advanced cable system should provide the tools to manage these components and not depend on the individual application developers.

At present, several applications are applicable, such as home shopping, home banking, video-on-demand and so forth. However, do not forget that the TV set is primarily an entertainment appliance. Fifty years of viewer experience with the "appliance" dictate that a TV set should act like a TV set so it does not alienate viewers. Similarly, the interactive environment between the viewer and the user interface to the advanced services being offered should be simple and intuitive. When such services and user interfaces are deployed, it'll be unlikely that successful applications will simply be ports of current PC applications.

Resident applications

At least one of the previously mentioned applications is required to provide

BOTTOM LINE

What's in the Box?

Advanced TV and cable systems promise to deliver greater value to the viewing audience. Interactive entertainment means the deployment of digital technology, plus the ability to download user-specified services.

For this to happen, the cable industry must meet many milestones in software design and build an infrastructure that will allow applications to be effectively developed, deployed and maintained before these services reach their potential.

Viewers should feel like they're "watching television," no matter what service appears on-screen. To meet this goal, some specific milestones for an advanced system platform should be:

- An integrated environment for analog and digital broadcast services
- Support of open and interoperable systems
- Support for multiple conditional access systems
- A customizable look and feel for user interfaces
- Support for retail set-tops
- Developer access

The guts of the box: In normal operation, the basic functions of an advanced service platform ought to include:

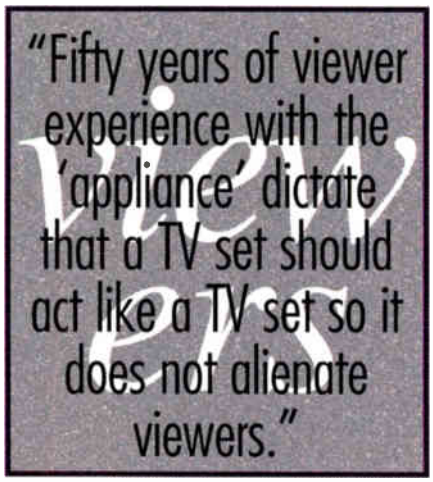
- Operating system kernel
- Navigation support
- Messaging
- Input and output
- Resource management
- Inventory management
- Content management
- Application management

basic functions to the user. It must exist in a set-top upon power-up. This allows basic functions, such as watching video independent of headend services.

The term "resident application" implies it is completely contained within the set-top, but in reality it is a distributed application. The platform client provides a basic engine for navigation functions. This type of client application may reside with other resident applications within the set-top.

The following functions are a minimum set for the resident application. Other functions may be included in a particular resident application for business reasons, such as pay-per-view or virtual channels.

- Navigation—Provides user control of services, basic channel selection, volume control and selection of other functions such as program guide and configuration.
- Video application—Basic "watch TV" capability is mandatory.
- Configuration—Customization of the functionality and look-and-feel, both on an installation basis and an individual user basis.
- Information presentation—Services and schedules, such as a channel banner and program guide.



Platform client and server

The platform is a collection of objects that provide basic services required by all application components and should not present a user interface. All user interfaces should be implemented by applications that request functions of the platform through well-defined, open application programmatic interfaces (APIs).

Platform software may be split into client and server components for commercial reasons. The client platform is likely to be contained in read-only memory (ROM) of the set-top, provided by the set-top manufacturer. In addition, the platform client software must work with platform server software provided by another vendor.

The platform client exists completely within the set-top hardware, but it shares that hardware with distributed applications that may exist both in the set-top and in server hardware. The platform server may be physically distributed over more than one piece of hardware, which it may share with application server software.

In normal operation, the basic functions of the platform would include:

- Operating system kernel
- Navigation support
- Messaging
- Input and output

- Resource management
- Inventory management
- Content management
- Application management

The implementation of the broadest range of designs is important in promoting the advancement of the technology. Support for navigation should be standardized and become part of the platform. This is because it is a function every resident application will perform, and, while different user interfaces will be developed, the underlying functionality should be similar.

Similarly, the traditional definition of an analog TV channel is an "analog broadcast video source," and a channel map is the accompanying association of a channel number with a 6 MHz bandwidth allocation. Even when analog TV production and transmission transitions to the new era of digital TV (DTV), the introduction of advanced services should not change this paradigm.

Any new method of navigating the TV environment must recognize that the services rely on how they are used (that is, their function to a viewer) and what content is contained within them. Until recently, services could not be described in terms of content. Also, navigation had to be backward compatible, incorporating existing TV services while allowing for new and often unforeseen interactive applications. The bottom line is that the approach to navigating these services should present a user interface that is consistent, understandable and seamless with traditional modes of channel navigation; it should not require the viewer to learn new channel surfing habits.

OSS

Operational support systems (OSS) provide the operator-user interface to run the basic functions of the system and to provide subscriber management and billing.

These systems generally have a server component interface to the platform server software to manage inventory, services and resources. They also communicate with other applications to administer them. An example is a billing application that controls the pay-per-view application.

Conditional access

The final component of advanced TV systems is the ability for the user or content provider to safeguard against the theft or viewing of targeted program content. Conditional access and encryption agents typically have client and server components and usually have a proprietary client-server interface.

These functions may seem to require "to the metal" coding for security purposes, but that should not be considered part of the server or client operating systems. Last, multiple independent conditional access agents should also be supported. CT

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"Sorry, This MDU is Taken!"

The Race to Outfit Multiple Dwelling Units

By Todd Schieffert and Greg Hutterer

As a large, planned community of townhome clusters and apartment buildings was being built near a major metropolitan area, a planner from the local exchange carrier called the developer to confirm installation of telephone service. He was politely told that the business had been awarded to another provider.

Services up for grabs

This actual incident demonstrates aptly that nothing is automatically the province of an incumbent telco or MSO anymore. The race is on among service providers to garner as big a share of the market as possible for shared tenant services.

For MSOs, the rewards for winning are substantial: not only retaining control of video delivery, but also gaining the opportunity to expand into high-revenue data and telephony services.

What's the best vehicle for MSOs seeking to increase revenue through a broader portfolio of services? For small- to mid-sized multiple dwelling complexes that are either all-residential or an even mix of commercial and residential, there are distinct advantages in using a hybrid fiber/coax (HFC) architecture with multiple dwelling units (MDUs) at the subscriber end. (See Figure 1 on page 70.)

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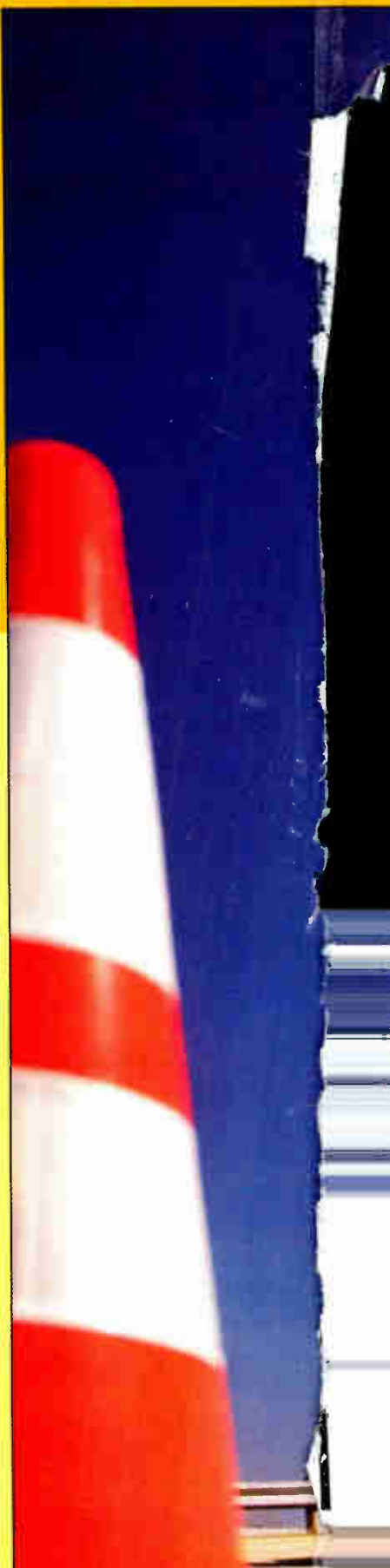

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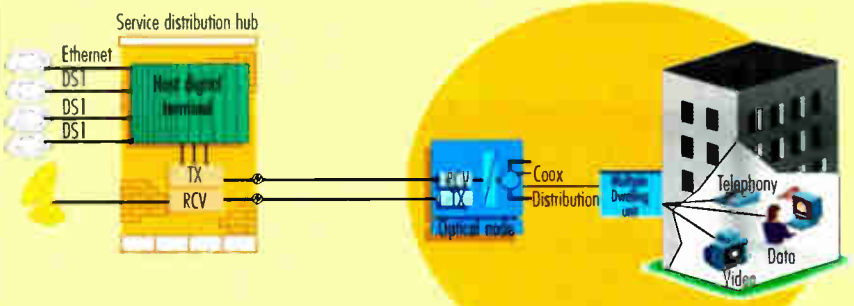
Figure 1: MDUs with HFC networks



shared tenant facilities. Where MSOs are already providing video service, the coax is installed, so the physical layer is in place. Capitalizing on existing resources is far less expensive than adding an overlay architecture—such as digital loop carrier (DLC)—side by side with the coax. Each MDU connected to an HFC system enables the delivery of telephony services as well as video.

Delivering telephony services

When comparing the cost of equipment needed at the headend and the customer end to deliver telephony services, DLC isn't best for shared tenant facilities with fewer than 150 subscribers. An HFC system with MDUs at the customer end offers greater cost-effectiveness. (See Table 1 on page 72.) ➤

BOTTOM LINE

Benefits of the HFC/MDU Combo

As a multiple system operator, you've asked yourself, "How do I provide a large cache of services, and at the same time get great returns on my investment?"

The answer for small- to mid-sized multiple dwelling complexes that are either all residential or an even mix of commercial and residential is to use a hybrid fiber/coax (HFC) architecture with multi-dwelling units (MDUs) at the subscriber end. You are already providing video service, the coax is installed, so the physical layer is in place. Remember, capitalizing on existing resources is far less expensive than adding an overlay architecture.

The rewards?

You'll retain control of video delivery, but also gain the opportunity to expand into high-revenue data and telephony services.

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Table 1: Cost comparison: HFC/MDUs vs. DLC

	HFC with MDUs	DLC System
Headend	$35-$75 per DS0	$25-$100 per DS0
Customer Premises Equipment (CPE)	$150-$200 per DS0	$100-$200 per DS0
Total	$185 - $275 per DS0	$125-$300 per DS0

Table 2: Cost Comparison for Data Delivery

	HFC with MDU	DLC with xDSL
Headend	$35-$75 per DS0	$300 per DS0
Customer Premises Equipment	$150-$200 per DS0	$300 per DS0
Total	$185-$275 per DS0	$600 per DS0

A number of factors come into play in determining the actual costs, including the utilization of the host digital terminal (HDT), as well as the concentration and volumes of traffic. In general, however, the crossover point for selecting between HFC with MDUs and a DLC system is about 150 subscribers per location for delivering telephony services. Under 150 subscribers, HFC systems with MDUs are more cost-effective.

At over 150 subscribers under one roof, DLC-based systems become more cost-effective, with a cost per line under $200, possibly as low as $125 to $150. (See Figure 2 on page 74.) That's because DLC systems can handle many more lines out of one box—up to 672 and in some cases even 2,000 lines—whereas MDUs handle four to 32 lines per box. On the other hand, the smaller number of lines per MDU allows service providers to start with only a few subscribers and then add more later, without a substantial up-front investment in customer premises equipment.

While there are many multi-tenant buildings with over 150 subscribers, there are even more buildings with fewer subscribers, and, with an HFC system in place, MDUs are an attractive option. Providers can start small and add more subscribers without large jumps in cost. This is important both for voice service and for higher-revenue telephony services like private branch exchange (PBX) trunks, WATS lines, Ethernet service for data communications and Internet access, and other high capacity circuits. MSOs can easily incorporate these special telephony services beyond plain old telephone service (POTS) through the MDU for about the same cost as adding a POTS line.

Delivering data services

Perhaps even more significantly, an HFC-based system with MDUs is optimum for the cost-effective delivery of data services—an area where the potential exists for greatest revenue generation. In an HFC system, cable data modems can be integrated with the MDU. The HFC integrated solution is more cost-effective in delivering data services today than a DLC solution employing digital subscriber loop

THE CHALLENGE

Design a headend for high signal quality that also minimizes out-of-service conditions and lowers corrective maintenance costs.

THE SOLUTION

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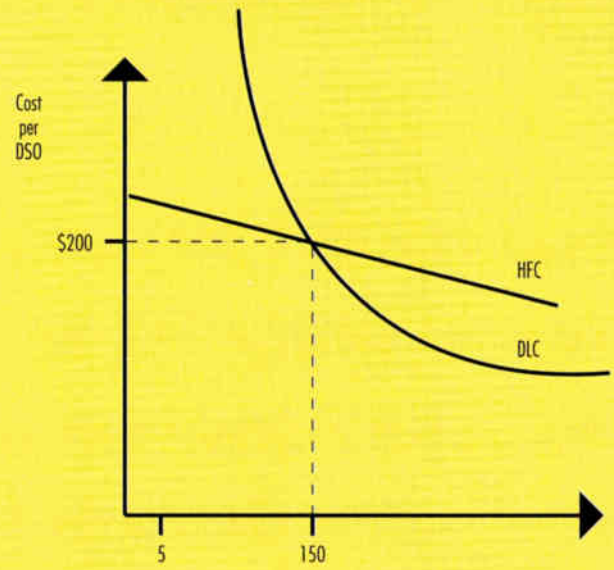
Figure 2: Crossover point between HFC/MDUs and DLCs



(DSL) technology. Table 2 demonstrates how the relative costs look. Another factor to consider is that xDSL has had only limited deployment to date, especially over long local loops. It's still relatively unproved and expensive at $600 per subscriber, while cable data modems are coming in at half that or less.

HFC and data services

Besides being more cost-effective for many installations, HFC systems can offer flexibility in deployment, making it possible for service providers to quickly and easily deliver higher-bandwidth two-way services. For example, by configuring an MDU and off-the-shelf hubs and routers, service providers can deliver two to eight megabits per second of symmetrical data. Bandwidth of this magnitude also is important in applications like videoconferencing, telecommuting and Internet protocol (IP) telephony.

Combining an MDU with symmetrical cable data equipment can provide a guaranteed quality of service. This is especially important for telecommuters and other power users who want to be assured of fast, reliable connections. Guaranteed quality of service cannot be provided by most asymmetrical cable data modems.

The relentless push of technical innovation combined with deregulation is opening new areas for MSOs, notably the huge market for telephony and data services in shared tenant facilities. Service providers have to weigh a number of factors carefully before choosing the right infrastructure to take advantage of this opportunity. For many installations, an HFC/MDU architecture offers several compelling benefits. CT

Todd Schieffert is director of marketing and Greg Hutterer is director of product management access platforms systems for ADC Telecommunications Inc. Schieffert and Hutterer can be contacted at (612) 938-8080.

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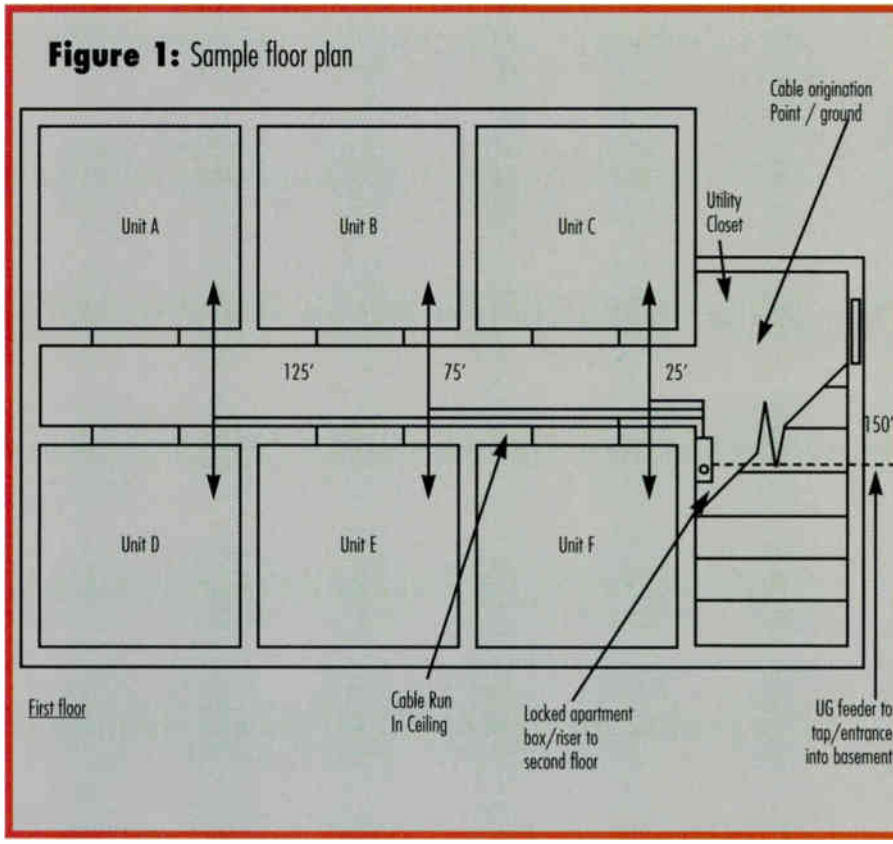
Figure 1: Sample floor plan



conduits, ceilings or similar spaces. Routing cables through spaces that have individual access to the crawl space or attic within the residence could lead to future maintenance problems and make auditing, signal leakage repair and installation of other residences more difficult.

In general, run new cable and abandon the existing antenna system.

Many types of ducts are available, allowing the concealing of the cable in corridors and along baseboards. Security is moderate. If possible, these types of ducts should be installed in locations where they are not readily accessible to the residents, to avoid tampering. For instance, if running molding duct in a hallway, place the duct along the edge of the ceiling, out of easy reach. Follow the manufacturers' installation instructions.

Outside routing of cable

In cases where no other methods are feasible, and where permission is obtained, run outside cable to each unit. Make every reasonable attempt to hide the cable on the building, such as using molding or conduits.

In some cases you may be able to partially conceal the conduit by attaching it next to other wires or pipes, such as downspouts. Never attach directly to these items, but rather attach to the building as close as legally allowed and physically possible.

In order to keep the conduit to a minimum, use "common routing" as much as possible. Common routing refers to cables bundled together as they are routed up the side of the building; drops to individual units are split off as necessary. (See Figure 2 on page 80.) Use straight vertical and horizontal runs and secure cable adequately. Avoid diagonal cable runs.

All MDUs must have a lockbox at the distribution point. Grounding (bonding) must be done from this point.

Clearly label all cables. Proper labeling can save countless hours of sorting and testing cables on future trips to the building.

Loop-through and home-run systems

Two methods of routing the inside cable are used for MDUs: loop-through and home-run methods. Loop-through systems route the cable in series to all outlets within a residence. Home-run systems route individual cables from a central origination point, such as the apartment house box. (See Figure 3 on page 80.)

In a home-run system:

- Each unit is connected or disconnected from a central location. ➤

BOTTOM LINE

Tackle the MDU challenge

How does installing MDUs differ from residential installation? The main difference is someone other than the individual who has requested cable service nearly always owns the building.

Aside from the obvious consideration of more than the normal number of outlets, there are several other factors that must be examined prior to beginning installing an MDU:

- Building access: Follow the "Right of Entry" agreement.
- Site survey: Complete an accurate floor plan.
- Cable routing/methods: Plan for the shortest possible runs, make the system neat and inconspicuous, allow access for maintenance, and use the correct cable for the location per the NEC.
- Grounding: Grounding (bonding) shall comply to NEC.
- Maintenance: Routing of cables, labeling of drops, auditing and signal leakage monitoring should be an essential part of MDU maintenance.
- Cable origination point: Ensure the origination point allows installers and technicians access, and that grounding according to the NEC is possible.
- Measuring footage: Measure the distance from the central origination location to each unit.
- Amplifiers: May be needed.
- Molding/ducts: Use to conceal the cable in corridors and along baseboards.
- Apartment boxes: All MDUs must have a lockbox at the distribution point, so ground (bond) at this point, and clearly label all cables.
- Loop-through and home-run systems: Home-run systems are preferred over loop-through.
- Security: Know where tools and equipment are at all times, and lock pedestals and apartment boxes.

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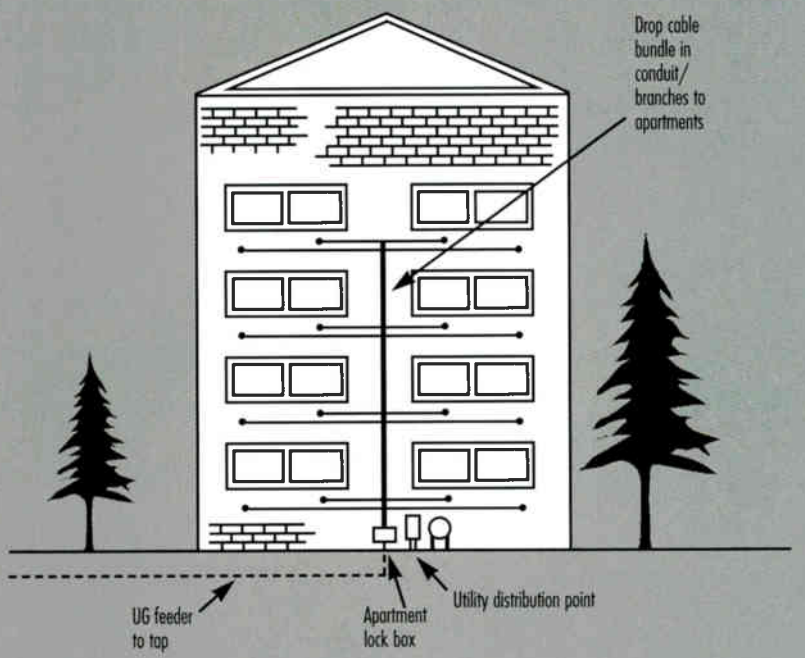
- Each cable to a particular unit is isolated, preventing problems and interference from being transmitted through the system to other customers in the building.
- In trapped systems, the traps can be secured in a central location.

Loop-through systems may be easier to install but are not recommended, since:

- Access to the individual apartment must be gained to perform a disconnect or change of service.
- The series nature of the cable circuit lets problems and interference generated in one unit pass to other units, and security of signals also is difficult to achieve.
- Access to individual apartments must be gained to perform maintenance and troubleshooting, including apartments not affected by a problem.

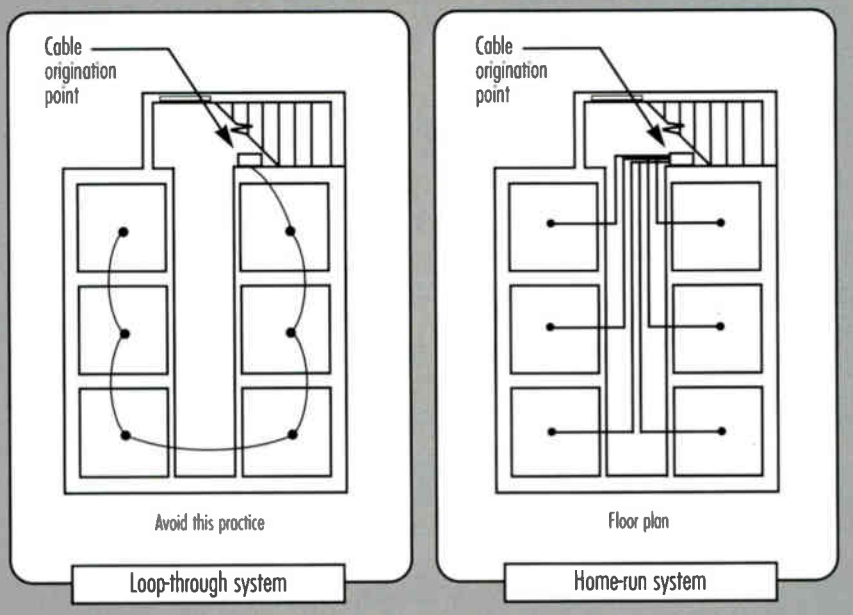
In general, loop-through systems should be changed to home-runs.

Figure 2: Common routing



Common routing

Figure 3: Loop-through and home-run system



Additional MDU considerations

When working on several units at the same time, try to finish inside work that would require tenants' presence as quickly as possible. Avoid keeping a tenant home while you are working in other areas.

Use care when drilling holes. It may be difficult to determine the exit point of your drill. Also, you may be unaware of wiring and other obstructions.

Although always important, be especially courteous in your contact with the tenants in MDUs. A complaint from a single tenant could prompt the owner of the property to deny the company access to the entire building, resulting in the loss of dozens, or even hundreds, of potential customers. Do not leave debris in attics.

Know where your tools and equipment are at all times. MDUs typically have high traffic levels, and careless placement of tools and equipment can create a safety hazard, as well as result in the loss of valuable equipment. Always lock pedestals and apartment boxes.

Grounding/maintenance

Grounding (bonding) shall comply to the NEC. The input cable to the apartment box must be grounded. If more than one input cable exists, ground each individual cable or bond the splitters together to form a common ground.

MDUs typically have a higher level of illegal tap-ins than single family homes. With this in mind, routing of cables, labeling of drops, auditing and signal leakage monitoring should be an essential part of MDU maintenance. Make sure pedestals and security boxes are securely mounted and locked at all times. CT

Pam Nobles is manager of technical development at Jones Intercable Inc. She may be reached at (303) 792-3111.

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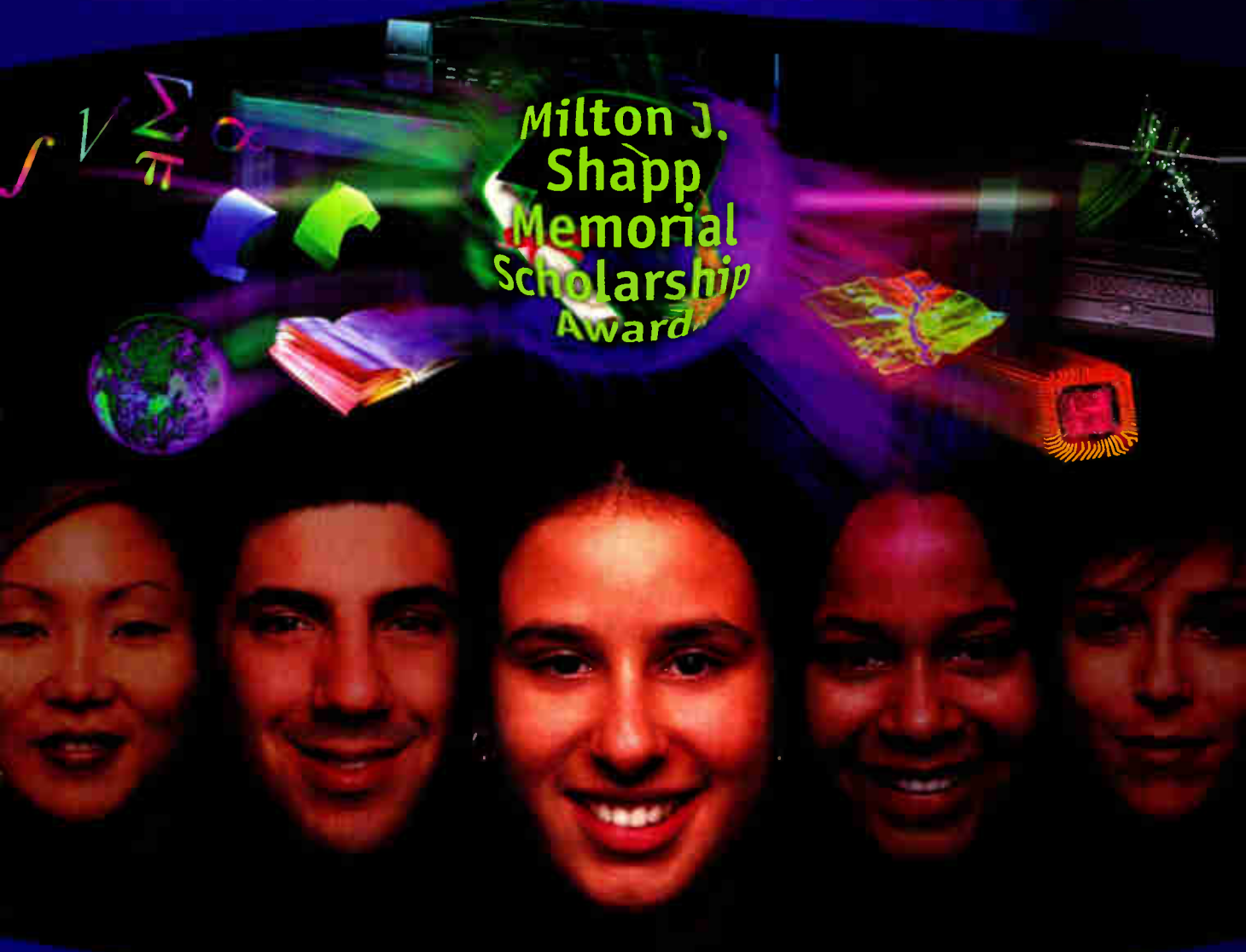

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Reader Service Number 58

Headache-Proof Your Headend for MDUs

By Jim Dillon

Headend design and installation is the key to your system's versatility. The site should include sufficient real estate for satellite-receiving antennas, over-the-air receiving antennas or amplitude modulated link (AML) antennas and the like. Equipment buildings should be large enough for future expansion of channel lineups.

Power and air conditioning should be more than adequate to accommodate upgrades in the future. When possible, find a site that allows easy access for those times of emergency when the system goes down. Site location is a critical aspect because it is the main point of all satellite and over-the-air antenna reception.

By all means, do an RF propagation study, over-the-air signal survey and a terrestrial interference test. The RF propagation study helps determine the feasibility of future AML transmission or reception at this site. This study should take into account the local terrain and city ordinances.

The over-the-air signal survey should provide information about the location of local affiliate transmitters and the quality of signal that you can expect to receive. Signal level readings of all stations and multipath problems should be recorded.

This information should be used to determine the number of antennas and type of equipment you will need to process a high-grade picture for your viewers. Signal levels of 15 dBmV or higher received at 174 MHz or above from a typical dipole antenna or rabbit ears should also be of concern. High-level over-the-air reception can cause problems with direct pick-up at the customer's home if the TV tuner is poorly shielded.

Terrestrial interference can be the toughest problem an operator will face in a typical C-band TV reception only (TVRO) system. Taking this part of the survey for granted would be like building your headend equipment room in a flood zone. If it's worth doing, do it right. Always use a spectrum analyzer and do a 360 degree sweep with a low noise block converter (LNBC) attached to a feedhorn. Check the 3.7 to 4.2 GHz band for any sign of microwave interference that may exist from telephone systems or other sources. This study also can be used as part of the registration process with the Federal Communications Commission to protect your site from interference on an ongoing basis.

Headache prevention

Planning the system headend can prevent

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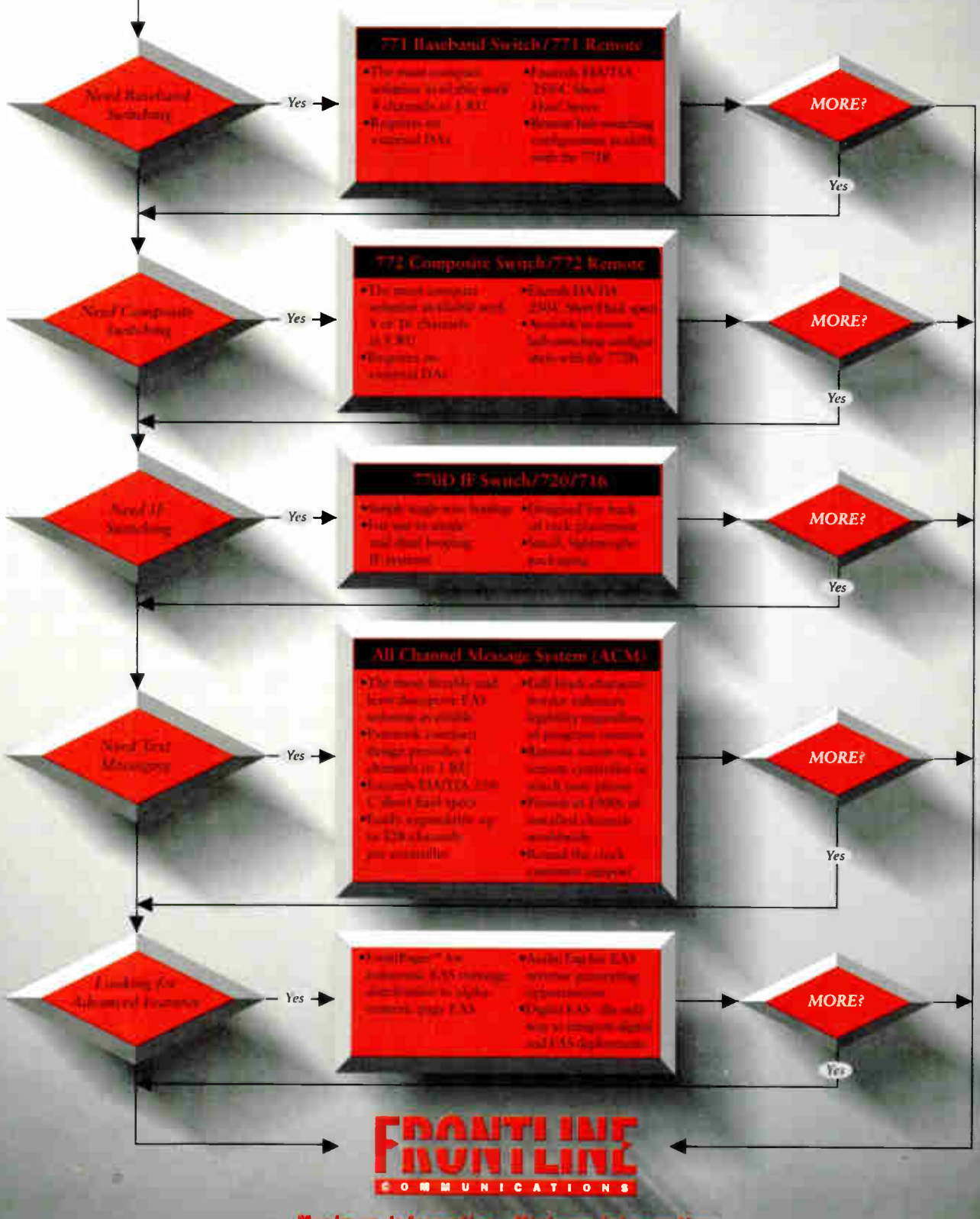

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a multiple dwelling unit (MDU) headache. When the site has been selected, there are a few items that should be addressed before the start of actual construction.

Put together a channel lineup and determine exactly what channels you plan to carry. Design a channel lineup that will allow basic, expanded basic and premiums to be easily separated by frequency groups such as very high frequency (VHF) low-band, mid-band, high-band, superband and hyperband. A well-designed channel lineup is easily secured with interdiction or trapping. If possible, keep the basic channels in the VHF low and high-bands. Set up your mid-band with the premiums, and fill the super and hyperbands with the expanded basic.

Also take into account the TV guide, trying to stay as close as possible to the local listings so that viewers are not confused. Decide what type of signal security to implement, such as trapping, interdiction or scrambling. This information is a useful item for headend and distribution design.

Earth station antennas must be properly planned. Antennas that are too small or installed too close together can cause carrier-to-noise ratio (C/N), side lobe and alignment problems. Use antennas that are 3.7 meters or larger with plenty of gain and structural stability that stands up to Mother Nature. Use multibeam feeds only on stronger satellites that can afford the loss associated with dual or triple feeds. Keep in mind you're planning for the

BOTTOM LINE

Building the MDU

It's time to get real and plan for tomorrow. You've got to stay on top of the latest technological advancements when it comes to designing an MDU system.

Some important items to consider:

- Does the headend building have plenty of room to allow for additional equipment in the future?
- Is there enough room to install an additional satellite antenna or feed to your system?
- Are there spare lines from all antennas and towers to feed additional equipment?
- Is the air conditioner adequate for the system's needs, and does the facility have more than enough power to handle more equipment?
- Is telephone service available at the headend facility?
- Have signal surveys and terrestrial interference (TI) tests been completed?
- Is the system designed to handle digital signals?
- Was the plant designed to incorporate a return signal path?
- Will the plant handle 750 MHz of bandwidth?

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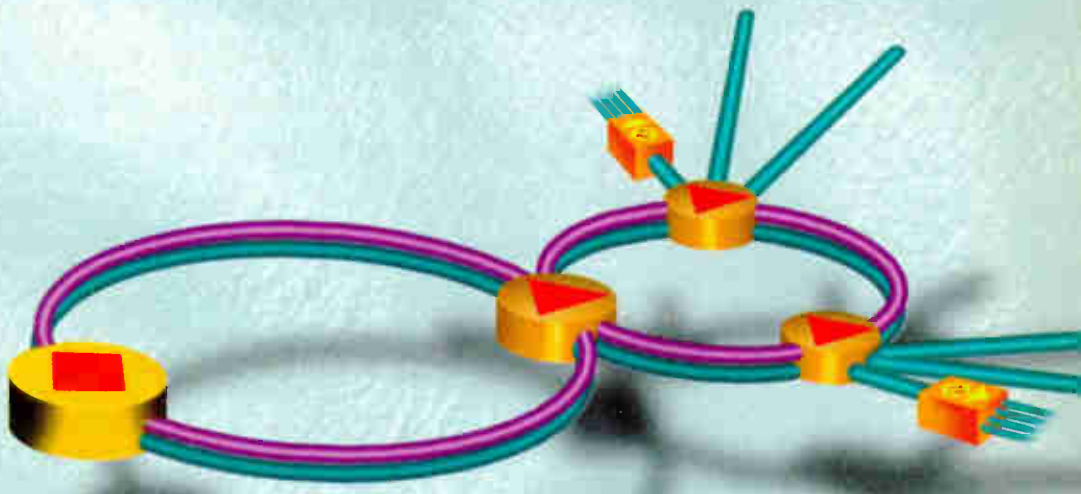

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Reader Service Number 62

future, so use large conduits and pull in a few extra cables to those antennas.

If you're using more than one over-the-air antenna, keep in mind that proper antenna spacing is imperative. Placing the antennas too close will cause problems with gain reduction and ghosting.

Grounding the headend is a very important aspect of the project. Dig a trench through the entire facility. Lay #2 copper wire in the trench and attach with approved clamps or weld to 8-foot ground rods driven at 8-foot intervals. Attach and run #2 copper wire from the ground ring to each antenna and tower. Also run a #6 copper wire from the ground ring to the equipment racks and power supply, which should be tied together with ground straps.

Equipment racks should be strategically placed to allow for proper cooling and easy access to front and rear of equipment for servicing, adjustments and replacement. Make a detailed wiring and racking schematic that shows, specifically, where every component is racked and where every cable goes. Be sure to individually mark all wiring and to test each piece of equipment to ensure specified performance and operation. Record all equipment operating levels such as the satellite receive system, over-the-air levels, modulators, processors, preamps, post-amps and the like.

The performance record is very useful when doing troubleshooting and alignment. For easier troubleshooting, make sure to keep copies of all the electronic maintenance and installation manuals.

To ensure FCC compliance, keep copies of all required tests as well as site maintenance logs, which show an ongoing service program is in place.

Basic installation

The basic idea for MDU installation does not vary significantly from typical cable TV systems that supply single-dwelling homes. Distribution consists of larger cable, such as half-inch hardline for main feeder cable, with taps installed at each building's point-of-entry. At the point-of-entry or lock box, interdiction units or taps and splitters feed the individual units via RG-6 or larger cable, depending on the signal loss calculations. The ideal distribution system is neatly wired, easily accessible and well-documented.

A poorly documented system is a technician's nightmare, especially when 300 angry customers are waiting for their TV sets to come back on. Some of the most common problems with distribution systems are improperly installed F-connectors, bad hardline splices, stretched or kinked cable and sloppy workmanship. But most of all, the lock boxes should be well-secured, and customer drops must be correctly labeled. Inaccurate or missing drop tags cause erroneous disconnects, irate customers, unnecessary truck rolls and suspicions that the cable company is incompetent. CT

Jim Dillon is chief technician for Satellite Management Services. He may be reached at (602) 921-2090, ext. 310, or e-mailed at jdillon@smstv.com.

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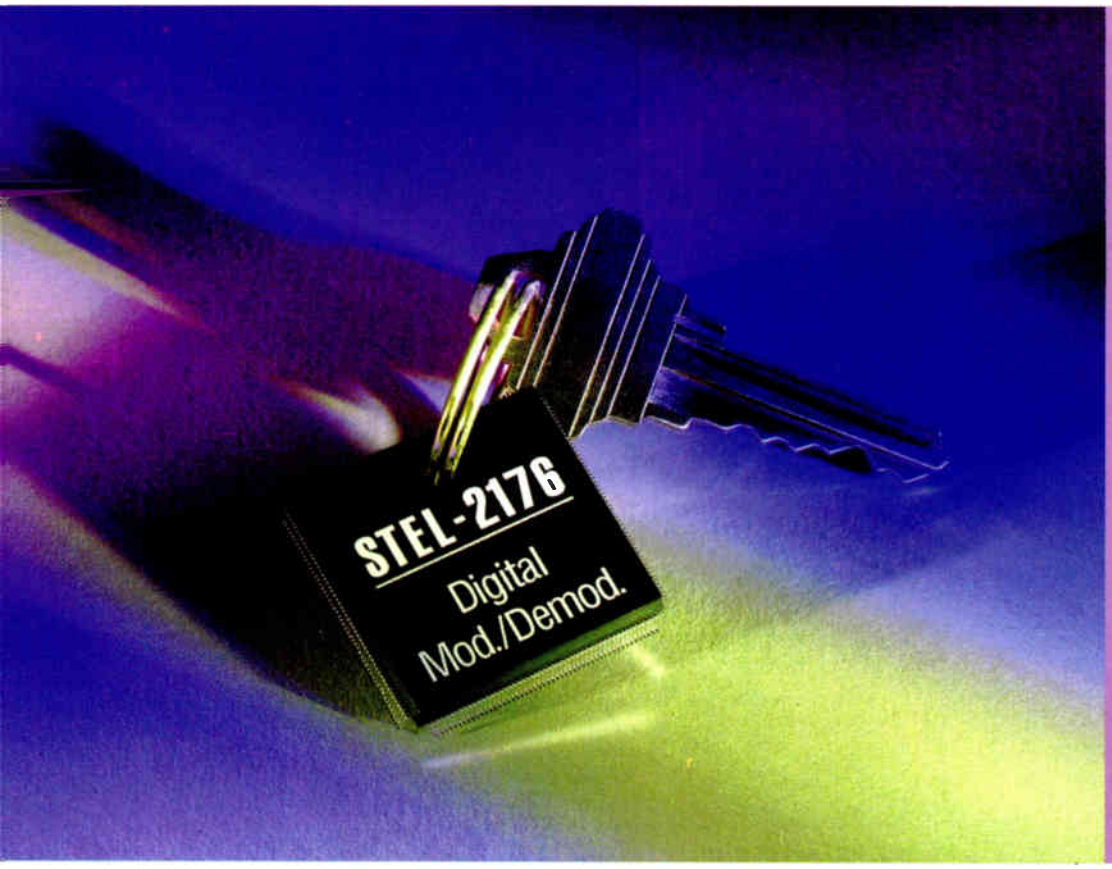

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Reader Service Number 64

HFC Telephony

"Back-Room" Service Launch Issues

By Keith E. Kreager

As engineers continue to fine-tune hybrid fiber/coax (HFC) systems, an equally important aspect of telephony is causing new concerns—the "back-room" operations.

Back-room operations impact the customer's perception of network value and reliability as much as, if not more than, the HFC system. Back-room operations cover a multitude of operations and procedures, including:

- Company and department organization
- Intra-department and inter-department coordination
- Fault management
- Operational support system
- Escalations procedures
- Customer care
- Billing
- Regulatory issues

Let's take a closer look at some of the operations and procedures behind today's HFC telephony systems.

Organization

Two different organizational structures are available. In one organizational structure, telephony operations are separated from HFC operations (See Figure 1 on page 90.)

This method incorporates telephony issues into training and day-to-day operations. However, telephony personnel also may have trouble diagnosing HFC-related problems, such as ingress, as well as dispatching the technicians who can correct the problem.

The other organization combines and cross-trains plant/line technicians and installation personnel for both HFC and telephony. (See Figure 2 on page 90.) This type of structure is beneficial for plant fault isolation and has personnel available for installations. However, it can be difficult to train technicians and installation personnel on both HFC and telephony practices. Also, procedures must be outlined to define priority issues.

Department coordination

Internal and intra-department coordination is critical to resolving plant issues. Intra-department coordination must include, for example, the network interface device (NID) installer and the test desk or network operations center (NOC).

"A centralized call center requires an operational support system."

When a new install is being performed, the installer will add a power-passing faceplate or new power-passing tap to power the NID. This may cut the downstream signal and power, which in turn affects other telephony customers who may be online. In this instance, the NOC needs to know where the new install is located so that it can determine the best time to schedule the install.

Inter-department coordination has been one of the hardest practices to initiate because it requires a clear line of communication between the telephony and HFC groups. It is important that the HFC group informs the telephony group of all maintenance work performed and does not disrupt services or adjust the system without communicating with the telephony group. Self-induced outages represent 56% of the outages and are caused by procedural and planned outages such as maintenance work, system upgrades, software upgrades and system testing. (See Figure 3 on page 92.) ➤

BOTTOM LINE

Telephony Operational Procedures

Implementing telephony services on a hybrid fiber/coax (HFC) network requires a comprehensive plan. Commercially deployed HFC telephony systems that are in place in several of today's systems tell us that we can make the system work and have it meet the 99.99% reliability specification.

There is much that can be learned from existing HFC telephony systems. For starters, operators must develop operational procedures for the following:

- Company and department organization
- Intra-department and inter-department coordination
- Fault management
- Operational support system
- Escalations procedures
- Customer care
- Billing
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Figure 1: HFC operations

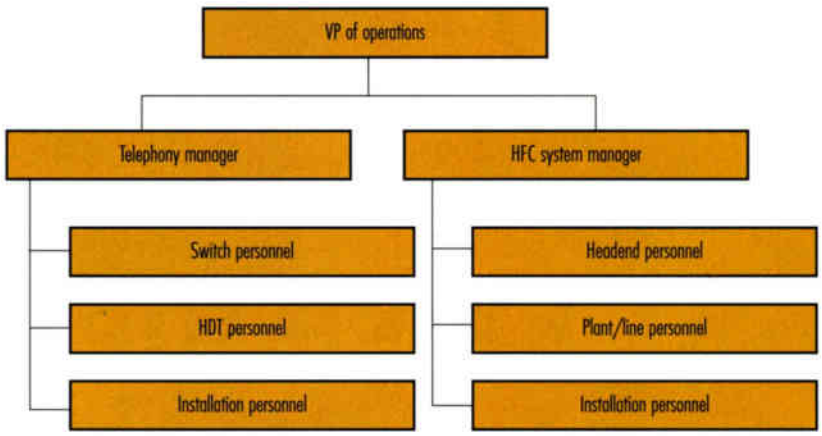
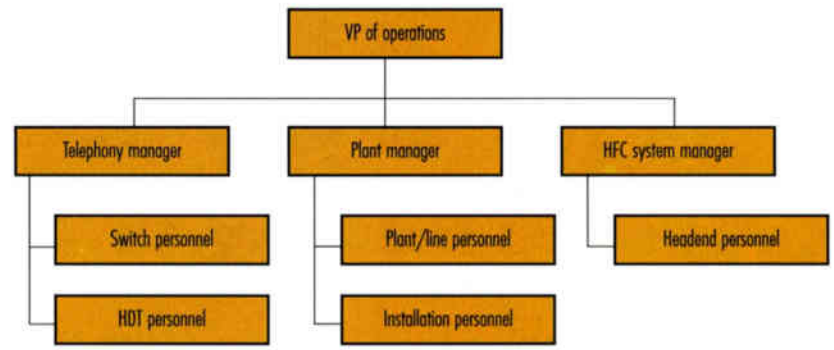


Figure 2: HFC and telephony



Proper coordination between departments and clear lines of communication can significantly reduce this category. Therefore, a procedure should require all groups to inform a centralized service desk or NOC of all work that will be done in the plant. This centralized service desk should serve as the brain center of the HFC system. Continue to route all system information through the center for all departments to access. (See Figure 4 on page 94.)

Fault management

A centralized call center requires an operational support system (OSS). An OSS can vary from a simple element manager of the different components in the system to a hierarchy of management systems that tie in all the element managers, dissect the information and make intelligent responses. These systems assist in fault management of potential and existing problems. Keep in mind that a smart OSS cannot replace knowledgeable employees. Employees and an OSS must work together to operate the system.

Escalation procedures

All personnel in the telephony and HFC groups must have escalation procedures for emergency situations. These procedures should outline whom to contact when the HFC group is performing repairs, who is on-call for troubleshooting, who is the prime vendor contact and specify who has the proper test equipment for downstream and upstream diagnostics. A disaster plan should outline where emergency equipment is located, prime vendor support, regulatory issues and other pertinent information.

Customer Care

Customer care service representatives (CCSRs) also will require cross training.

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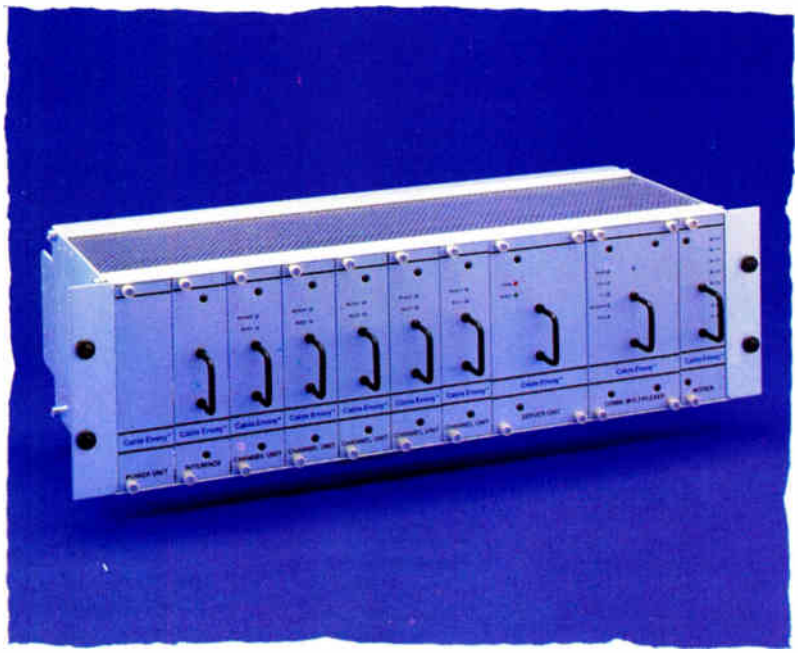

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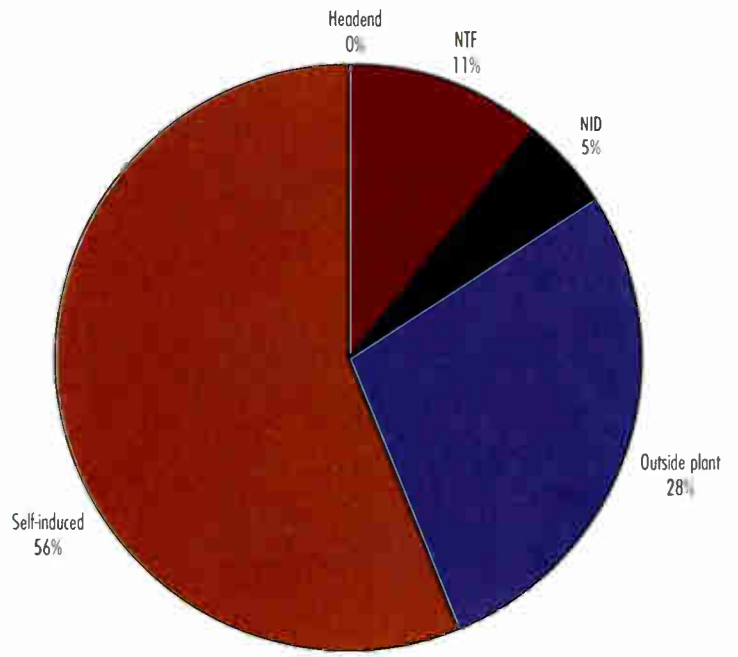
Figure 3: Causes of outages



The CCSRs must be able to address the differences in transactional-based telephony service and video services. Remember: Cable customers want one-stop shopping for all video, telephony and data services. Therefore, CCSRs must receive proper training for interacting with the customers.

Billing

Most third-party billing systems are being developed by companies with a telephony history. Therefore, customer ID numbers are linked to various aspects of a telephony network, such as switch port or copper-distributions shelf slot. In the telephony world, customers will remain on the same distribution system.

HFC telephony utilizes an interim device called a host digital terminal (HDT) that uses modems to take DS-1 signals and convert them to an RF signal. These modems are assigned to DS-1 links and/or switch ports. Dividing the node into smaller pockets and redesigning the HDT modems to account

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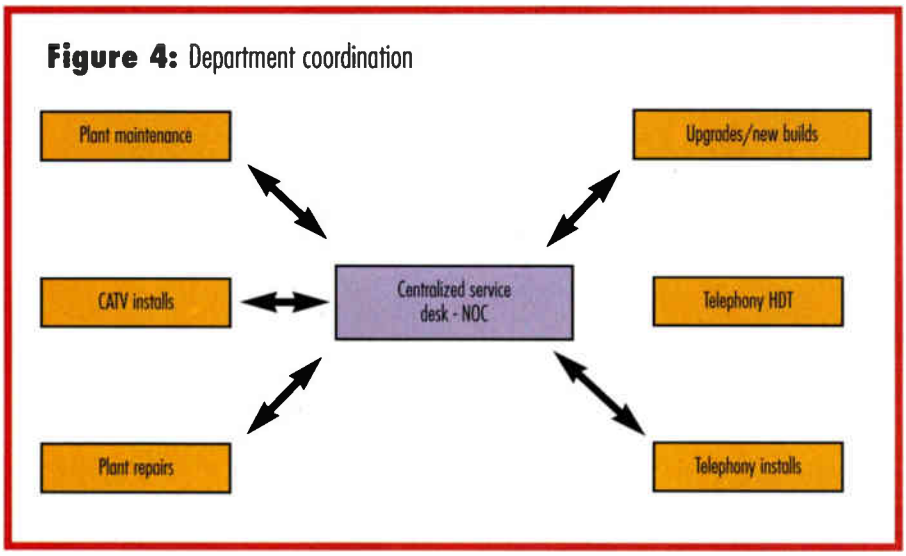
Figure 4: Department coordination



for differences in penetration rates may require the modem to be assigned to the switch. In some billing systems, these changes are not easy, especially with RF concentration.

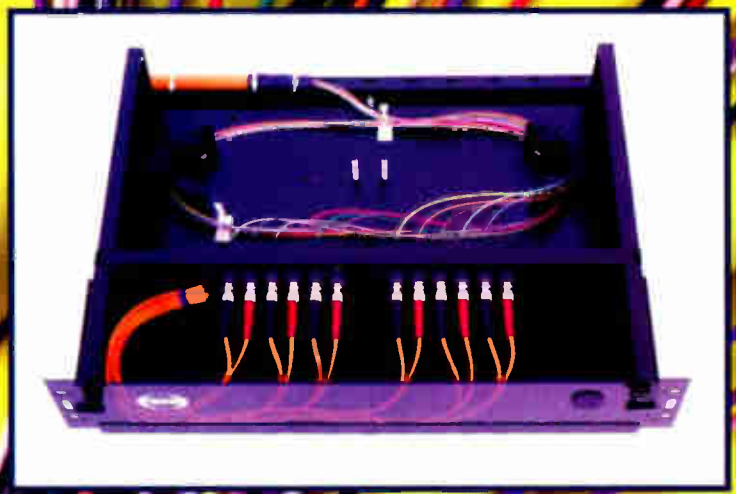
Regulatory issues

There has been much confusion about where the installer can disconnect the existing twisted wire pair (TWP) and connect to the NID. Each local exchange carrier (LEC) currently has its own opinion of what it owns in the system. However, some legal issues on demarcation points still need to be approved by all parties.

Demarcation points also are being questioned with the National Electric Code (NEC) and National Electric Safety Code (NESC), as well as 90 V powering down the drop to the NID on the side of a home and into a building. The NEC is proposing Article 830, which will affect the way a 90 V drop is installed to the NID. A representative from the Society of Cable Telecommunications Engineers and the National Cable Television Association is working with the NEC on existing Articles 800 and 820 as well as the proposed Article 830. Cable operators should contact their representative to stay informed on the demarcation point issues.

There is no doubt that telephony over the HFC network is exciting. As this new service continues to evolve, operators also will continue to find solutions that will expedite the implementation of telephony on cable TV systems. CT

Keith Kreager is director of product planning for Digital Systems Division, ANTEC Corp. He can be contacted at (770) 441-0007, ext. 8283 or e-mailed at keith.kreager@antec.com.



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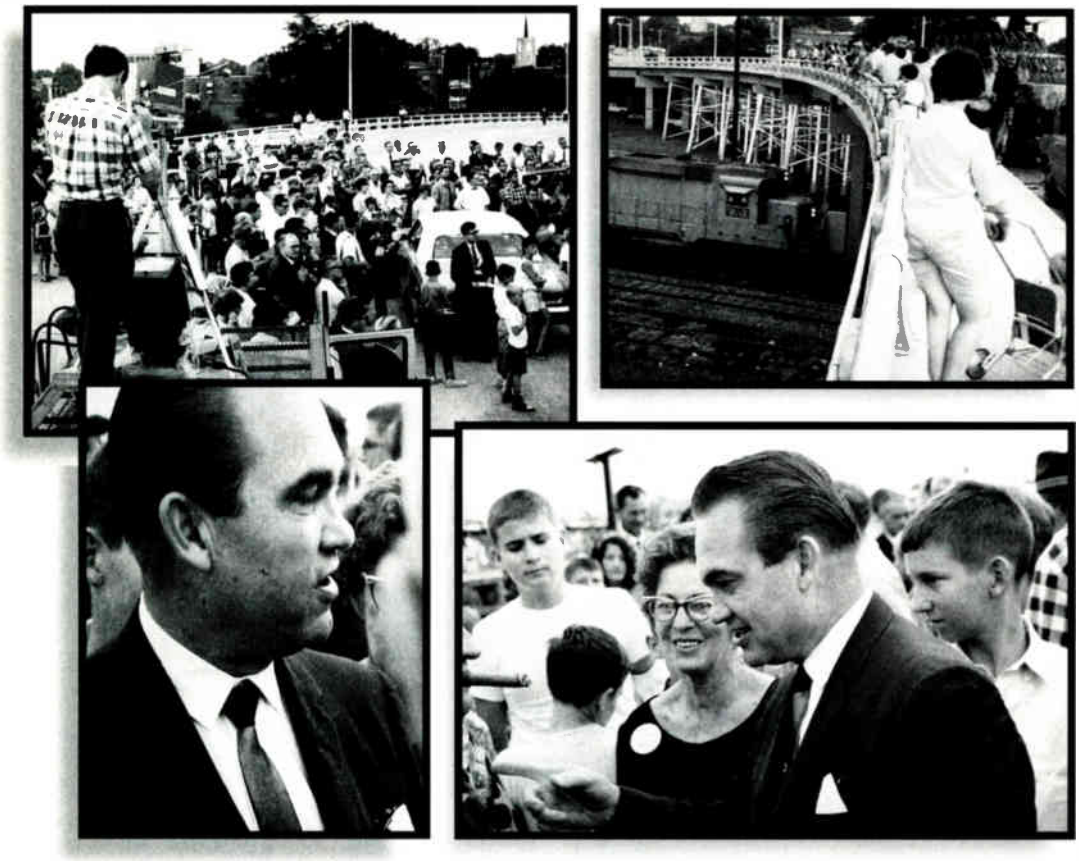

The Good Ol' Days

Early cable TV coverage of the dedication of a new highway and railroad overpass in Decatur, AL, in Spring 1965.

Top left: View of the remote van and operation of remote broadcasting, which helped provide programming to local TV stations from various locations.

Top right: Railroad overpass being dedicated by George Wallace, then governor of Alabama.

Bottom right: Wallace mingles with the crowd.

Bottom left: Wallace addresses the audience.

Return Path—60s Style

By Rex Porter

As far back as the early 1960s, some of us engineers recognized the need for return paths within our cable systems. We didn't have the sophisticated equipment of today, so we had to innovate.

When we designed and built the Decatur, AL, cable system 35 years ago, the local TV station had no remote broadcast capabilities. We pulled additional ".408" cable to points throughout the city, from where we felt civic events and local programs might be televised. We had two main legs of the .408 cable leaving our headend to serve the northern and southern sectors of Decatur.

At 15 dB spacing (approximately 2,000 feet then), we inserted ATS-20 amplifiers. These amplifiers were designed especially for the Decatur system by Donn Nelson, head of Ameco's Research and Design department. These ATS-20s were slightly larger than the familiar ATM-20 line extender, and we mounted them directly onto the strand. Little did we realize that we probably were the first to install a strand-mounted amplifier, other than a line extender.

Had to improvise

Each leg of the .408 cable was terminated upon reaching the destination. Splitting the .408 distribution was made possible with regular line splitters. One power supply, located at the headend, supplied adequate voltage to the eight ATS-20 amps in this closed-circuit network. Directional taps of the 8 dB value were inserted in the .408 line at the point of program origination. The taps were installed backwards for proper operation. Simply, the directional taps were used to insert signal, not to tap signal off the line (just the opposite of their intended use).

At locations where programming originated regularly, we left drops from the taps permanently, making sure that any extra tap ports and the drop itself were securely terminated.

A full-time remote van was equipped for use with this ancient return path. There were two reels of .408 cable mounted in the truck on payouts,

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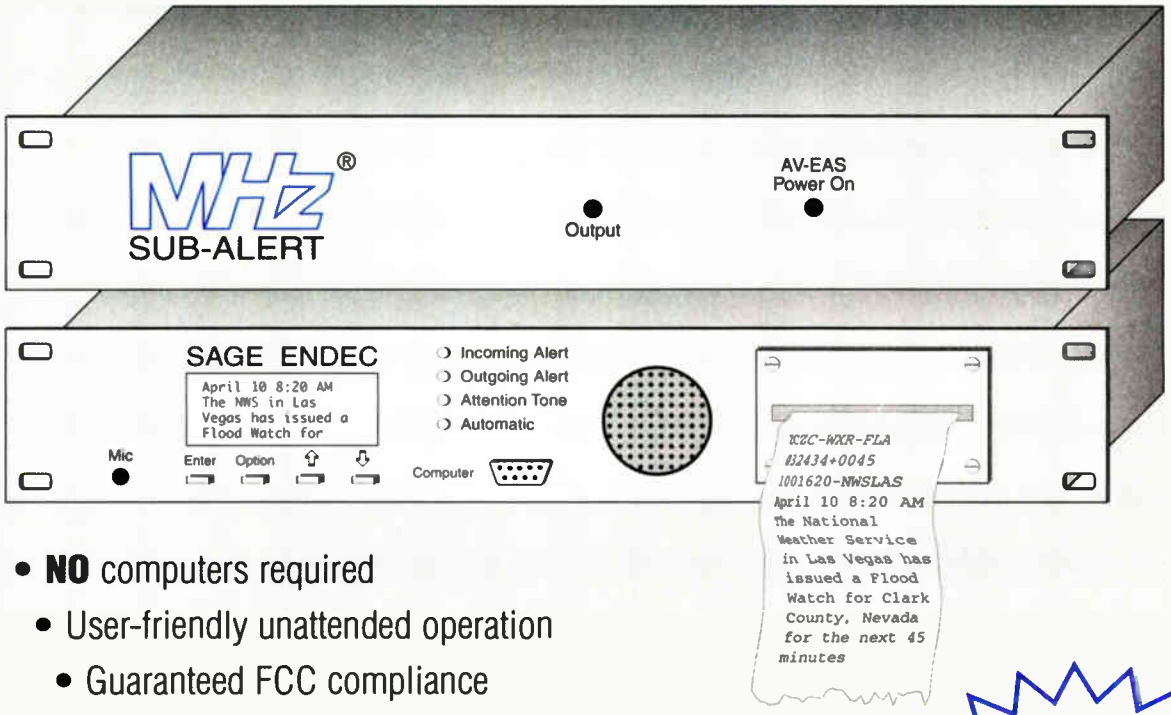

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which allowed an extra 700 feet of cable for hookup between the remote transmitter and the camera/audio equipment. Two more payouts held heavy-duty electric cable to supply power to distant locations.

An old tube-type "Amecotran" and audio amplifiers were locked into place in our cable-remote van. We had two Blonder-Tongue TTVC-1-1 vidicon cameras set on two heavy-duty tripods. We mounted a video monitor slanted upward from the base of each tripod for use by the camera operators; another monitor was located at the headend so another technician could monitor the signal quality before broadcast over the cable system. We set the Amecotran transmitter's frequency at 45.75 MHz.

The signal was fed into the tap and sent back to the headend where we had a modified Conrac AV12E demodulator. Since we were transmitting at 45.75 MHz (the intermediate frequency of the demodulator), we simply removed the tuner drawer and fed

"One thing we learned early on was that we always had to 'hit' the modified demodulator with a little more signal to make up for the lack of gain with the tuner drawer removed."

the input signal directly to the IF strip of the demodulator. One thing we learned early on was that we always had to "hit" the modified demodulator with a little more signal to make up for the lack of gain with the tuner drawer removed.

But it worked

Owners and operators flew into Decatur from across the nation to see this return path system operate. Sure, it was on a separate cable, but that's all we had in those days. We would have appreciated two-way amplifiers. If we had data service back then, I'm sure we would have modified this closed-circuit loop to offer our own brand of Internet access.

What did we do with this system? As I stated earlier, the local TV station, WMSL (Ch. 23), like many smaller TV stations, didn't have remote capabilities. We televised parades, dedication of railroad and highway overpasses, discussions by Red Cross members and talks by members of the National Cancer Society. We also allowed the local TV station to televise services from two different churches in Decatur.

It was always kind of heartwarming to see a commercial TV broadcaster's "live" programming with a banner at the bottom that read, "This program courtesy of Decatur Cable TV!"

Rex Porter is editor of "Communications Technology." He can be e-mailed at tvrex@earthlink.net.

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Network Analyzer

Hewlett-Packard has announced enhancements to its RF vector network analyzer, which measures critical performance parameters of RF components up to seven times faster than HP's previous model. The new HP 8753E vector network analyzer operates from 30 kHz to 6 GHz, and capability for simultaneous display of all four S-parameters should be available in June as a firmware upgrade.

Reader service #302

Cable Modem and Bridge

NetGame Cable recently introduced its end-to-end solution, consisting of the NeMo cable modem and NC bridge. Together they provide high-speed data communications over cable TV networks at speeds of up to 10 Mbps. Besides data exchange, the NetGame solution supports fast Internet connectivity, telecommuting, video conferencing and local area network (LAN) interconnectivity.

Reader service #300

Network Tool Kit

Because of increasing demand for specialty network tools, Jensen Tools has assembled a new kit for technicians and support staff who install, maintain, troubleshoot and repair networks. The kit includes more than 60 tools, most with a lifetime guarantee, and a ballistic nylon case.

Reader service #298

Water Sensor

Mark Products recently announced the HydroSensor, designed to detect water in fiber-optic splice cases. It uses microbend technology to induce a small power loss when water is present. The clip-on dielectric sensor requires no metal surface to signal water's presence, the wet sensor's location can be determined using a standard optical time domain reflectometer (OTDR), and it remains in "alarm" mode until replaced.

Reader service #299

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Reader service #312

CATV Filter

Communication & Energy Corp. has introduced the Model TXDLP-MHz/MHz, which removes large portions of the CATV spectrum and opens it up for new programming. For example, the TXDLP-504/541 has a stopband of 541.25 MHz to 750 MHz. Passband is 5 MHz to 503.75 MHz, exclusive of the stopband, with a passband insertion loss of 2.0 dB (typical). Maximum passband insertion loss is 6.0 dB at 503.75 MHz. Stopband rejection is 70 dB (typical) with 50 dB on Ch. 77 and 40 dB on Ch. 75.

Connectors are 75-ohm male and female Type F. Each unit is enclosed in two cylinders measuring 0.812 inches in diameter and 7 inches long. Weight is one-half pound.

Reader service #310

Remote Monitoring Software

Anritsu Co. has developed software that lets its MW9070B miniature optical time domain reflectometer (mini-OTDR) monitor remote fiber-optic lines from a centrally located personal computer (PC). The PC controls the mini-OTDR, feeds it basic data for measurements and contains its own monitoring schedule.

The software features three fault-location functions: high-speed fault-detection within a specified range, scanning of the entire optical fiber for fault scope and location, and detection of entrance-end problems.

Reader service #311

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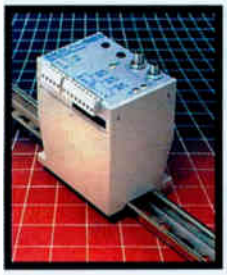


Fiber Modem

Telebyte Technology has introduced the Model 8241, a fiber-optic modem intended for point-to-point applications in office-to-factory environments. The fiber-optic capability protects both data and hardware from EMI/RFI, lightning/surges and ground loops found in many commercial environments.

The fiber transmitter port provides a 15-dB power budget for operation over distances of 4 km. The 8241 offers full duplex asynchronous communications at data rates up to 64 kbps.

Reader service #303

Router Control Panel

Sigma Electronics Inc. introduces a new master control panel for the company's line of Series 2100 matrix routing switchers. The SYC-16S's 16 X 16 control panel features one button per input selection and one button per output destination. A numeric light emitting diode (LED) status display above each output button shows the selected source, so operators can see at a glance which input is assigned to each output. The SYC-16S may be used with any of Sigma's Micro Matrix, Small Matrix or Sigma Lite routing switchers.

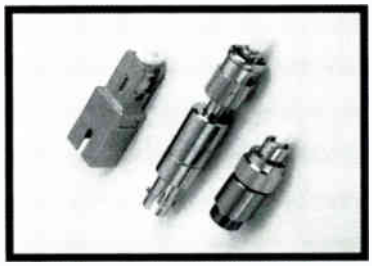
Reader Service #297

WDM Publications

To help explain wavelength division multiplexing (WDM) and its measurement needs, EXFO recently published its *Introduction to WDM Testing* reference guide and *Dense WDM Testing Methods and Products* catalog. Both are free.

The reference guide contains articles on the impact and challenges that WDM testing brings to testing practices. The catalog contains an overview of EXFO instruments as well as WDM test instructions and quick tips.

Reader service #305

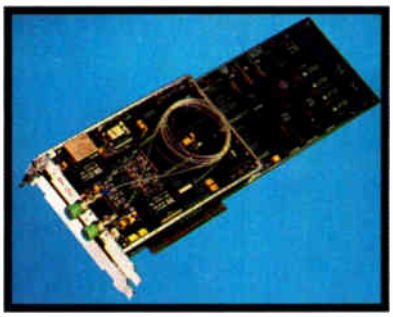


Line Buildout Attenuator

AWC/US Fiber Optics has introduced the LBO line buildout attenuator family for ST, FC and SC formats. These single-mode attenuators are available in stock attenuations of 0, 5, 10, 15 and 20 dB increments. They operate at both 1,310 nm and 1,550 nm wavelengths, and other attenuation values are available on request.

Performance specifications are ±1 dB at attenuation value with a standard return loss of -45 dB, and -55 dB is available on request.

Reader service #306



ATM Adapter

The TNS 1200 PCI bus adapter from Tekelec Telecom handles the exchange of data and compressed video on asynchronous transfer mode (ATM) networks. The unit works with any digital video system with ATM connections, including servers for video-on-demand, news-on-demand, broadcast video and multimedia systems.

The adapter supports ATM Adaptation Layer 1 (AAL1) as well as AAL5 and has concurrent connections for variable or constant bit rate operation. Flexible design lets the device function with different physical formats, including 34 Mbps PDH, 155 Mbps SDI for UTP5, or fiber optics.

Reader service #304

Fiber-Optic Polisher

The Fiber Optics Group of Seiko Instruments USA has added the OFL-12 fiber-optic polishing machine to their line of polishers. The new machine is designed for medium volume mass production and can polish up to 12 connectors in four minutes.

The OFL-12 accommodates such polishing styles as Flat, Super PC, Ultra PC and Angle PC, and can process various ferrule materials, including zirconia ceramic, alumina ceramic, stainless steel and ceramic/stainless composite. The unit handles such connector styles as SC, FC, ST, D4 and APC.

Reader service #308

Fiber Connector Viewer

TII-Ditel has introduced the FCV-1 fiber connector viewer, which eases inspection of fiber-optic connectors in patch panels and sophisticated transmission equipment. The unit's design makes disassembling the connector from the adapter in hard-to-reach spots unnecessary.

A 14-inch insulated rigid probe with a built-in miniature charge coupled device (CCD) camera affords easy access to the rear of the chassis, where it focuses on the ferrule surface of the installed connector.

Reader service #307

Monitor/Timer

Analog Devices Inc. has introduced the ADM9690, a dual-purpose component that acts as both a power supply monitor and watchdog timer monitor. The ADM9690 is part of the ADM69xA family, with a unique feature: two reset outputs, one 10 ms delayed from the other. The ADM9690 is designed to monitor the 5 V power supply to a microcontroller or microprocessor and their operation via a watchdog timer, including a series of programmable watchdog time-outs to accommodate different software environments. Target applications include printers, process control and industrial circuits, or applications where there is a need for one reset for a microprocessor and a delayed reset signal for other parts of a circuit.

Reader Service #295

Male Crimp Plug

RF Connectors has released the RSA-3000-C connector as part of the company's Sub-Miniature line. The plug, for RG-58/U cable, features Teflon insulation, gold contact and nickel-plated body. It can be used with the following coaxial cables: RG-58, -141 and 400/U; Belden 8219, 8240, 8259, 8262, 9201, 9301 and 9311; Comm/Scope 0268; Cushcraft Ultralink TL92463 TL92887; Intercomp 4585A; and Times Microwave LMR-195.

Reader service #309

Power Supply Management

C-COR Electronics Inc. has introduced a power supply management agent (PSMA) for cable operators who want to supplement their standby power supplies with an inexpensive and reliable management agent. The PSMA features a compact design to fit in standby enclosures.

The PSMA allows cable system operators to remotely cycle the batteries in a standby power supply and detect problems before they lead to an outage. Because it is an intelligent management agent, it autonomously alerts the C-COR Cable Network Manager (CNM) software to any problems without waiting to be polled. Standard product features include broad frequency agility in the forward and reverse paths and downloadable firmware.

The PSMA, part of the CNM System 2 family of products, currently supports supplies from Alpha Technologies and Exide Electronics (Lectro Products), with other manufacturers to follow.

Reader Service #296

Stereo A/V Modulator

Leaming Industries has introduced the SVM+50, which provides cable TV, satellite master antenna TV, private and wireless cable systems with an affordable, high-quality stereo audio-video modulator in one-half of a rack space. The unit generates a TV channel output from video and left and right audio baseband signals. Built-in features include: stereo encoder; SAW filter; output from 50 MHz to +50 MHz; agile from the front panel; and video automatic gain control.

Reader Service #294

Headend Monitor

Avantron Technologies announces PC dial-in capability for its AT2000HM headend monitor. It allows the engineering staff to dial into the headend or hubsites and view reverse path ingress right on their PCs. Users have remote spectrum analyzer capability and can view the spectrum and other measurements in real time on their computer screens, and adding a node switch allows remote selection of the node to be viewed.

Reader service #301

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www.amcomm.com
sales@amcomm.com
David L. DeLane (215) 538-8703
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Norcross,GA 30092
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www.antec.com
Brad Halverson
brad.halverson@antec.com
ANTEC Network Technologies, the manufacturing division of ANTEC Corp., designs, manufacturers, distributes and markets active transmission, powering, passives, and interconnection products for fiber-optic coaxial and twisted pair networking. ANTEC Corp., head-quartered in Rolling Meadows, IL, is an international communications technology company.
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BOOKSHELF

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- *Applications of Digital Technology*—This program, featuring Scott Bachman, Roger Brown, Tom Elliot and Jim Ludington, provides an overview of the types of changes to expect. Topics covered include: super highway, driving forces behind computer capacity and digital compression, comparison of CATV delivery to RBOCs, ATM protocol, cable's window of opportunity, and applications of digital technology to cable advertising. (70 min.) Order T-1137, $45.
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9A. ❑ Microwave
9B. ❑ Telecommunications Carrier
9C. ❑ Electric Utility
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34. ❑ Approve
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CALENDAR

March

3-5: Philips Broadband Networks Mobile Training Center, Lanacaster, CA. Contact Sarah London at (800) 448-5171, ext. 2273.

8-10: Tektronics International Technology Conference—DWDM, physical layer testing, MPEG-2 and more; Portland, OR. Fax Mari Moore at (503) 221-0564.

10: Society of Cable Telecommunications Engineers Cascade Range Chapter technical seminar, Holiday Inn, Wilsonville, OR. Topic and speakers to be announced. Contact: Betty Reed, (360) 891-3295.

10: Wheat State SCTE Chapter testing session, Wichita, KS. BCT/E certification examinations to be administered. Contact: Joe Cvetnich, (316) 262-4270.

11-13: Northern California SCTE Chapters vendor show and golf tournament, Concord Hilton, Concord, CA. Contact: Steve Allen, (916) 786-4353.

11: Old Dominion SCTE Chapter vendor show, TBA, Richmond, VA. BCT/E, Telephony, Service Technician and Installer certification examinations to be administered. Contact: Maggie Fitzgerald, (540) 248-3400.

11: Sam Houston SCTE meeting group and technical seminar, Time Warner Offices, Houston, TX. Topic: "Fiber Design and Emergency Restoration" with a speaker from Siecor. Contact: William Bartley, (713) 329-7814.

12: Penn-Ohio SCTE Chapter technical seminar and testing session, Sheraton Inn North, Pittsburgh, PA. Topic: "Safety—CPR Certification and Pole Top Rescue" with speakers to be announced. BCT/E certification exams to be administered. Contact: Marianne McClain, (412) 531-5710.

12: SCTE Satellite Tele-Seminar Program, "Introduction to Digital Technology (Part Two)" and "Preparing for Digital Deployment (Part One). Contact SCTE National Headquarters, Janene Martin, (610) 363-6888, ext. 220.

17: North Country SCTE Chapter vendor show, Hyatt Hotel, Minneapolis, MN. Annual Vendor Day and Cable-Tec Games with speakers to be announced. Meeting in conjunction with the North-Central Cable Show. Contact: Dan Shea, (612) 572-9290.

17: Ohio Valley SCTE Chapter vendor show, Columbus, OH. Contact: Gia Phelps, (800) 769-1441.

18: Big Sky SCTE Chapter technical seminar, Locomotive Inn, Laurel, MT. Topic and speakers to be announced. Contact: John Anderson, (406) 755-7200.

18: Oklahoma SCTE Chapter testing session, Edmond, OK. BCT/E, Service Technician and Telephony certification examinations to be administered. Contact: Tom Heddlesten, (405) 348-5750, ext. 312.

18: Piedmont SCTE Chapter technical seminar and testing session, Raleigh, NC. Topic: "Reverse Path Alignment, Deploying Two Way Services" with speakers to

be announced. BCT/E certification examinations to be administered. Contact: Mark Eagle, (919) 829-2630.
18-21: Southern California SCTE Chapter testing session, Alhambra, CA. BCT/E certification exams to be administered. Contact: Charles Harper, (714) 816-0570.
19: Big Sky SCTE Chapter technical seminar, exchange, Helena, MT. Topic and speakers to be announced. Contact: John Anderson, (406) 755-7200.
19: San Diego SCTE Chapter technical seminar, TBA. Topic and speakers to be announced. Contact: Kevin Coldani, (714) 458-2288.
20: Wheat State SCTE Chapter vendor show, Red Coach Inn, Wichita, KS. Show will feature Cable-Tec Games. Contact: Paul Truitt, (316) 262-4270, ext. 140.
25: Ark-La-Tex SCTE Chapter technical seminar, Holiday Inn, Shreveport, LA. "Lightning Surge Protection and Grounding" with Mike Helms of ITD. Contact: Terry Temple, (318) 631-3322.
25-27: Great Plains SCTE Chapter vendor show and technical seminar, JD Porterhouse, Bellevue, NE. The Vendor Show will be followed by a two-day seminar on "Data Technology for Technicians" presented by Marvin Nelson with SCTE. Contact: Daniel Karnish, (402) 597-5665.
26: Dakota Territories SCTE Chapter technical seminar, TBA, Jamestown, ND. Topic: "Construction & OSHA" with speakers to be announced. Contact: Tony Gauer, (605) 426-6140.
26: Ohio Valley SCTE Chapter testing session, Columbus, OH. Installer certification examinations to be administered. Contact: Beth Humphrey, (800) 875-2225, ext. 18.
27: Wheat State SCTE Chapter testing session, Great Bend, KS. BCT/E certification examinations to be administered. Contact: Joe Cvetnich, (316) 262-4270.
29: Terra Nova SCTE Chapter technical seminar, St. John's Curling Club, St. John's, NF. Topic: "Headends" with Jim Farmer from Antec and Luc Orlandi from NextLevel. Contact: Patrick Dunn, (709) 753-7583.
30-April 1: 1998 Broadband Access Forum, hear service provider, manufacturer, FCC and university perspectives on challenges and solutions in broadband; Orlando, FL. Contact the International Engineering Consortium at (312) 559-4600.

Planning Ahead

April 27-29: Internet & Electronic Commerce & Exposition, sponsored by the Gartner Group Inc. and Advanstar Communications Inc. Contact (203) 256-4700.
May 12-14: Pacific Equipment & Technology Expo, Orlando, FL. Contact Robert Morock, (800) 525-7383.
June 7-9: Consumer Electronics Manufacturers Association's CES Habitech '98, Atlanta, GA.
June 10-13: SCTE Cable-Tec Expo, Denver. Contact (610) 363-6888.
September 13-16: ICSPAT & DSP World Expo '98, Toronto, Ontario, Canada. Contact Liz Austin, (415) 538-3848.

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TRAINING

By the NCTI

Troubleshooting the Drop System: Part 7

This month's installment continues the series on troubleshooting directional couplers. The material is adapted from NCTI's Installer Technician Course, complemented by performance training suggestions to reinforce the material in a hands-on classroom setting. © NCTI.

Poor radio frequency interference (RFI) shielding on a directional coupler can result in both ingress and egress. To determine if the cable signal leakage is from poor RFI shielding at the coupler's housing, disconnect the output and tap cables and terminate both the output and tap ports of the directional coupler, as shown in Figure 1. If the signal leakage detector does not alarm, the signal leakage is either at or downstream of the F-connectors that were connected to the directional coupler's tap and output ports. If the detector alarms, the housing is not shielded properly, the input cable's F-connector is defective or there is an RF leak upstream of the input F-connector.

Reconnect the appropriate cables to the directional coupler's output and tap ports. Disconnect the input cable, install an F-81 barrel connector and a 75 Ω terminator on the F-connector, and test again for signal leakage (Figure 2). If no signal leakage is present, the directional coupler is defective. If signal leakage is present, replace the F-connector on the input cable and recheck for signal leakage. If leakage is still present after replacing the F-connector, the leakage source is further upstream. Always check for loose fittings and tighten if necessary. Follow your company's signal leakage policies about using proper signal leakage detection equipment.

Next month's installment will continue this series on troubleshooting drop system.

Hands-on performance training

Proficiency objective: Troubleshoot directional couplers to determine if cable signal leakage is coming from poor RFI shielding at the coupler's housing.

Ensure that you have a sufficient quantity of signal leakage detectors for your number of students and work stations feeding broadband cable signals to pre-installed directional couplers that are used in your system. Purposely compromise some of the DCs' RFI shielding and/or the F-connectors at different work stations.

Demonstrate performing leakage tests to show proper procedures for locating the source of signal leakage.

Have students practice procedures at several/all of the work stations.

Verify that each student can correctly perform leakage tests to determine if cable signal leakage is from poor RFI shielding at a directional coupler's housing. CT

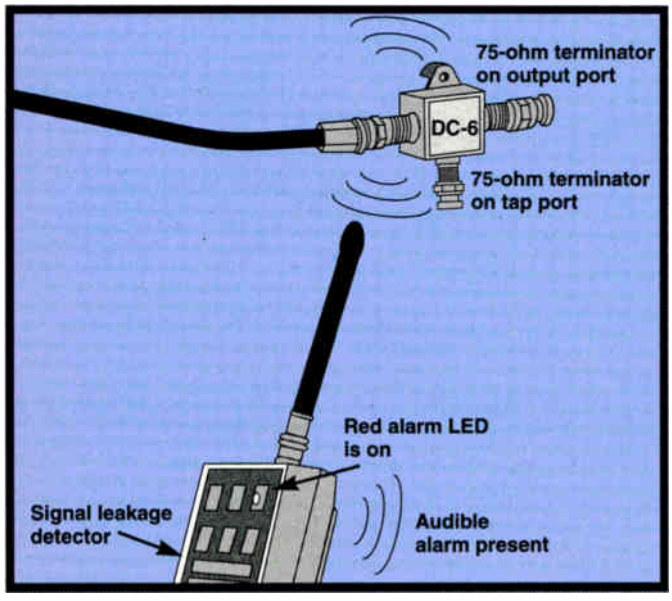

Figure 1:
Signal leakage present with output/tap ports terminated indicates defective input F-connector, poor housing shielding or upstream leakage.

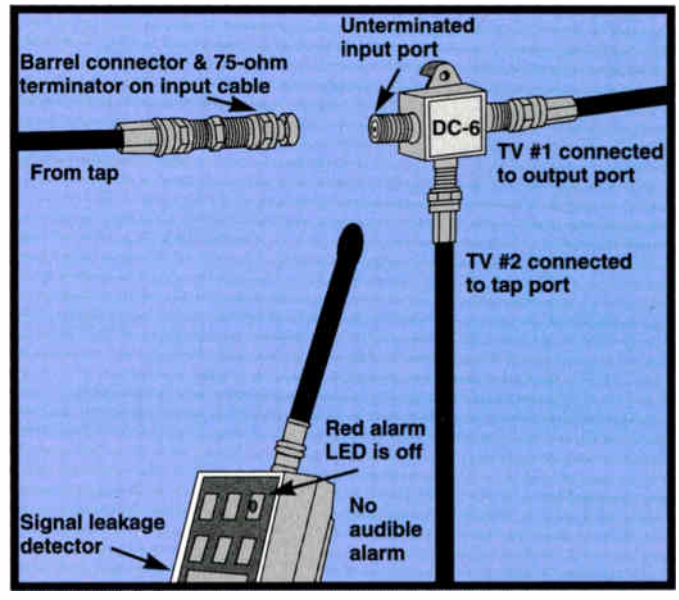

Figure 2:
No cable signal leakage present with F-connector on input cable to directional coupler terminated indicates defective directional coupler.

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- **President's Letter** from Bill Riker, SCTE President
- **Editor's Letter** from Rex Porter, SCTE Hall of Fame Member
- **Hranac's View** from Ron Hranac, SCTE At-Large Director
- **SCTE on the Job** from Alan Babcock, SCTE Director of Training
- **Registration information and show wrap-ups** for SCTE Cable-Tec Expo '98 and SCTE Conference on Emerging Technologies '98
- **SCTE Update**, featuring Society news and information
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By Bill Riker

Gear Up for Expo '98

With our record-breaking 1998 Conference on Emerging Technologies now behind us, the Society of Cable Telecommunications Engineers' national headquarters staff has moved its efforts in planning for the upcoming Cable-Tec Expo into high gear. Even as you read this, we're busy finalizing the program for what promises to be one of the most memorable events SCTE has ever hosted.

This year's show should be especially exciting for the telecommunications community. Not only is Expo '98 being held in the epicenter of the broadband universe, Denver, but it is happening in the middle of a year that is a major milestone for our industry, its 50th anniversary. What better way to celebrate than to converge with thousands of your peers to discuss the future of cable telecommunications?

That future, technically speaking of course, is the focus of our Denver show. The Cable-Tec Expo '98 Program Subcommittee, co-chaired by SCTE Board Chairman Steve Johnson of Time Warner Cable and myself, has sought to bring together leading experts from various aspects of the telecommunications realm to create a comprehensive learning experience for you, the attendees. I would like to thank the following members of the Program Subcommittee for their many valuable ideas and contributions of time and resources: Chris Bowick of Jones Intercable, Roger Brown of *CED* magazine, Paul Gemme of Time Warner Cable, Byron Leech of NCTI, Rex Porter of *Communications Technology* magazine, Oleh Sniezko of TCI and Mike Schwartz of CableLabs. Together, these individuals have laid the groundwork for an exciting event.

Pre-conference sessions

Our tentative plans for Expo '98, to be held June 10-13 at the Colorado Convention Center, include pre-conference sessions covering three hot issues affecting today's broadband world. The lineup is set to include "Local/Wide Area Network (LAN/WAN) Basics and the Transport of High Speed Data in CATV Networks" and "Basics of Cable Modems and Multimedia Cable Network System (MCNS)," as well as an introductory-type course on the "Components of Digital Technology."

> "Expo '98 [is] being held in the epicenter of the broadband universe, Denver."

Engineering conference

The annual Engineering Conference will include a panel discussion among some of our industry's leaders. Under the guidance of moderator Dick Green of CableLabs, a select group of chief executive officers from large and small cable companies will share their visions of broadband's future. As operators, what they foresee as new services and technologies in the next three to five years could give you a better understanding of where your organization could be headed as we enter the next millennium.

Session B, "Technology and Operations—Implementing the Vision," will feature several chief technical officers discussing how these new technologies will be implemented.

Workshops

As in previous years, our Expo workshops are designed to instruct attendees on the practical aspects of broadband technology. At press time, the program subcommittee had developed plans for 10 exploratory workshops on topics that run the gamut of most telecommunications employees' interests, including:

- Return Path Testing
- Return Path—Ingress Mitigation
- Return Path—Design Components and Alignment
- HFC Architectures
- Excellence Through Customer Service
- Powering Issues
- Network Management/Status Monitoring
- Regulatory Update, Emergency Alert System (EAS)
- Digital Video Deployment
- Digital Video Testing

In addition, attendees will have the opportunity to participate in tours of CableLabs (which is celebrating its 10th anniversary this year), TCI's Digital Television Center, National Cable Television Institute and the National Cable Television Center and Museum. All of this will be available on Saturday, June 13.

All in all, Cable-Tec Expo '98 will be an event not to be missed this year as the industry re-evaluates its future. I hope all of you will join us in Denver to celebrate not only CATV's 50th anniversary, but to once again appreciate the many technologies that make our industry successful: yesterday, today and tomorrow. CT

Bill Riker is president of the Society of Cable Telecommunications Engineers.

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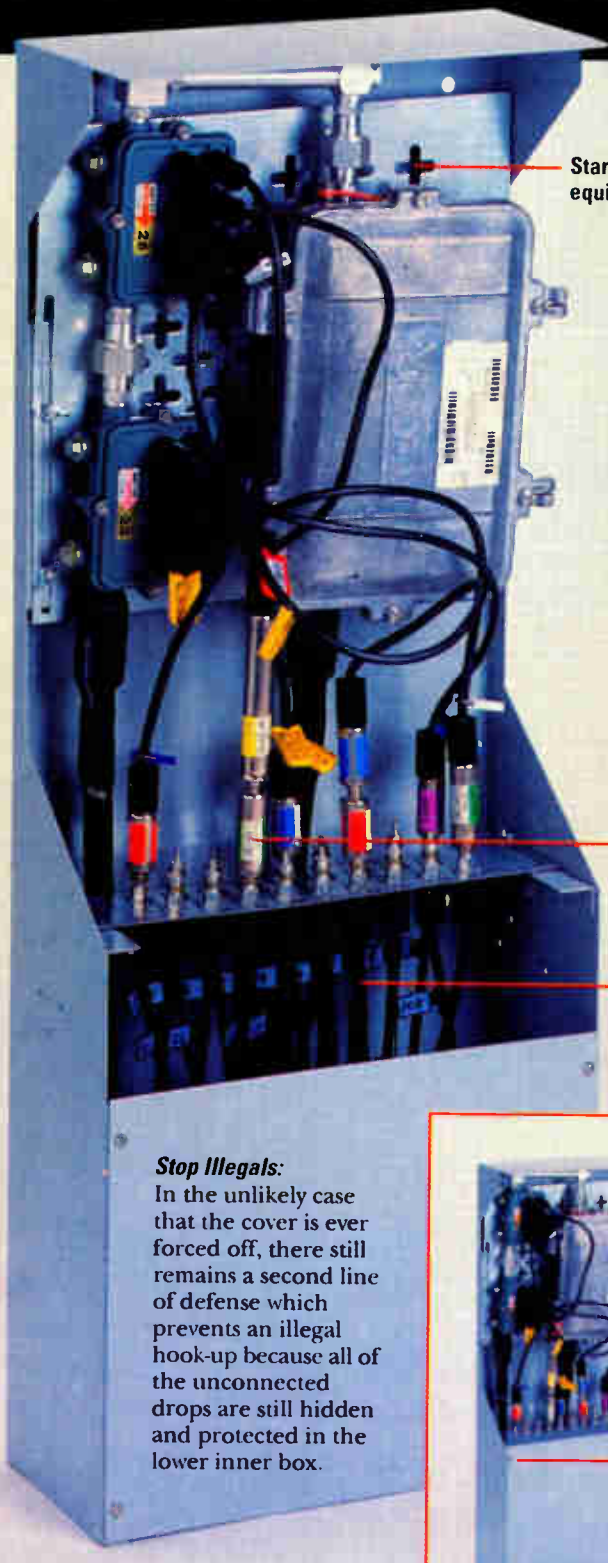

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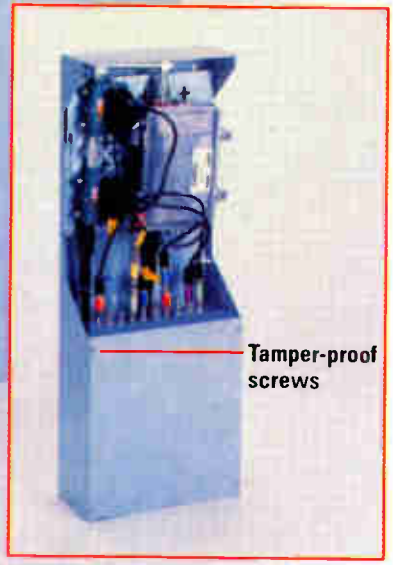

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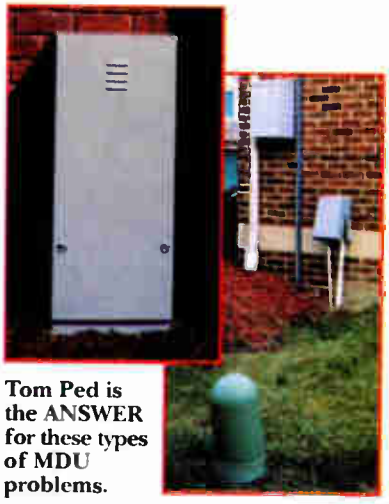

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