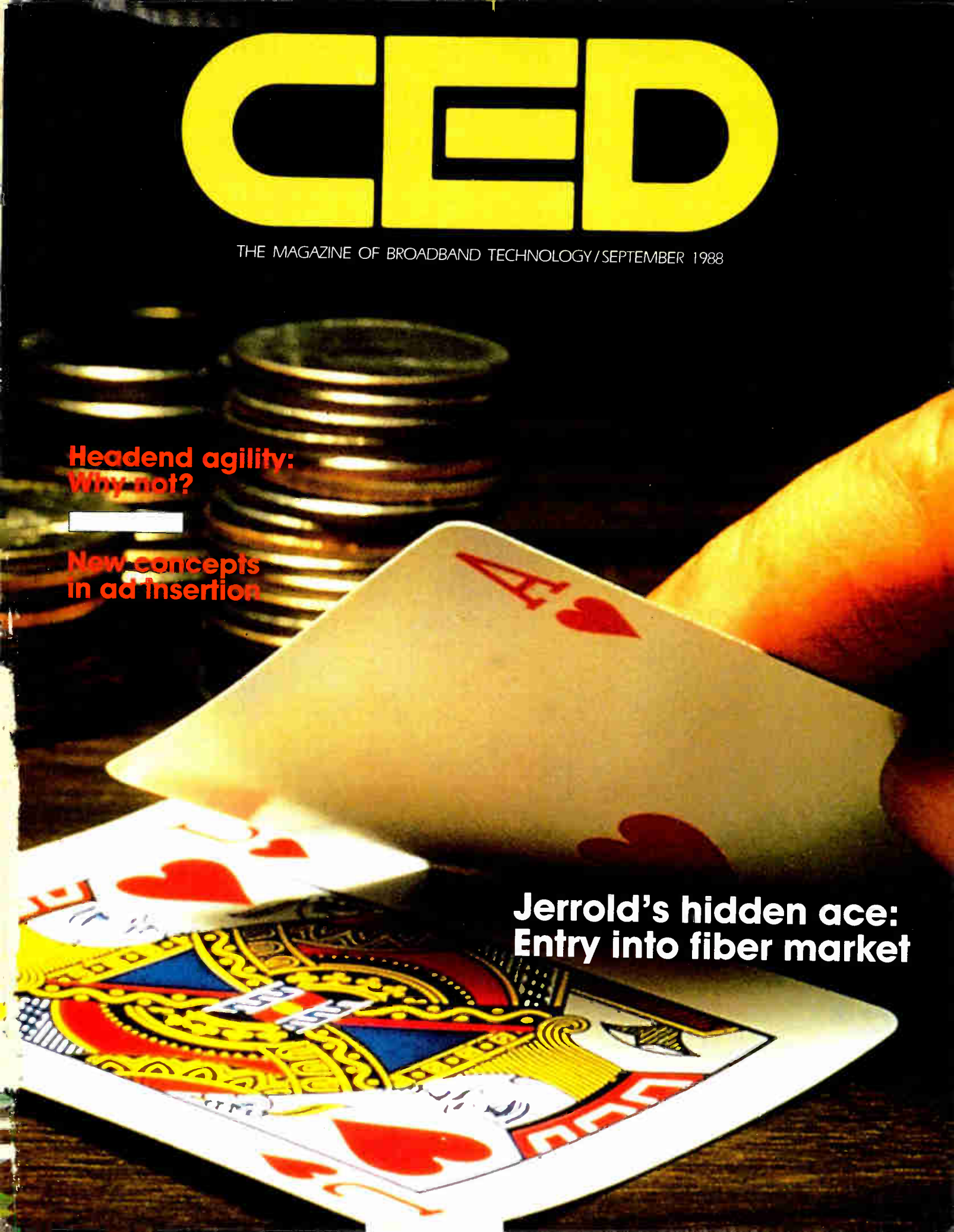
CED

THE MAGAZINE OF BROADBAND TECHNOLOGY / SEPTEMBER 1988

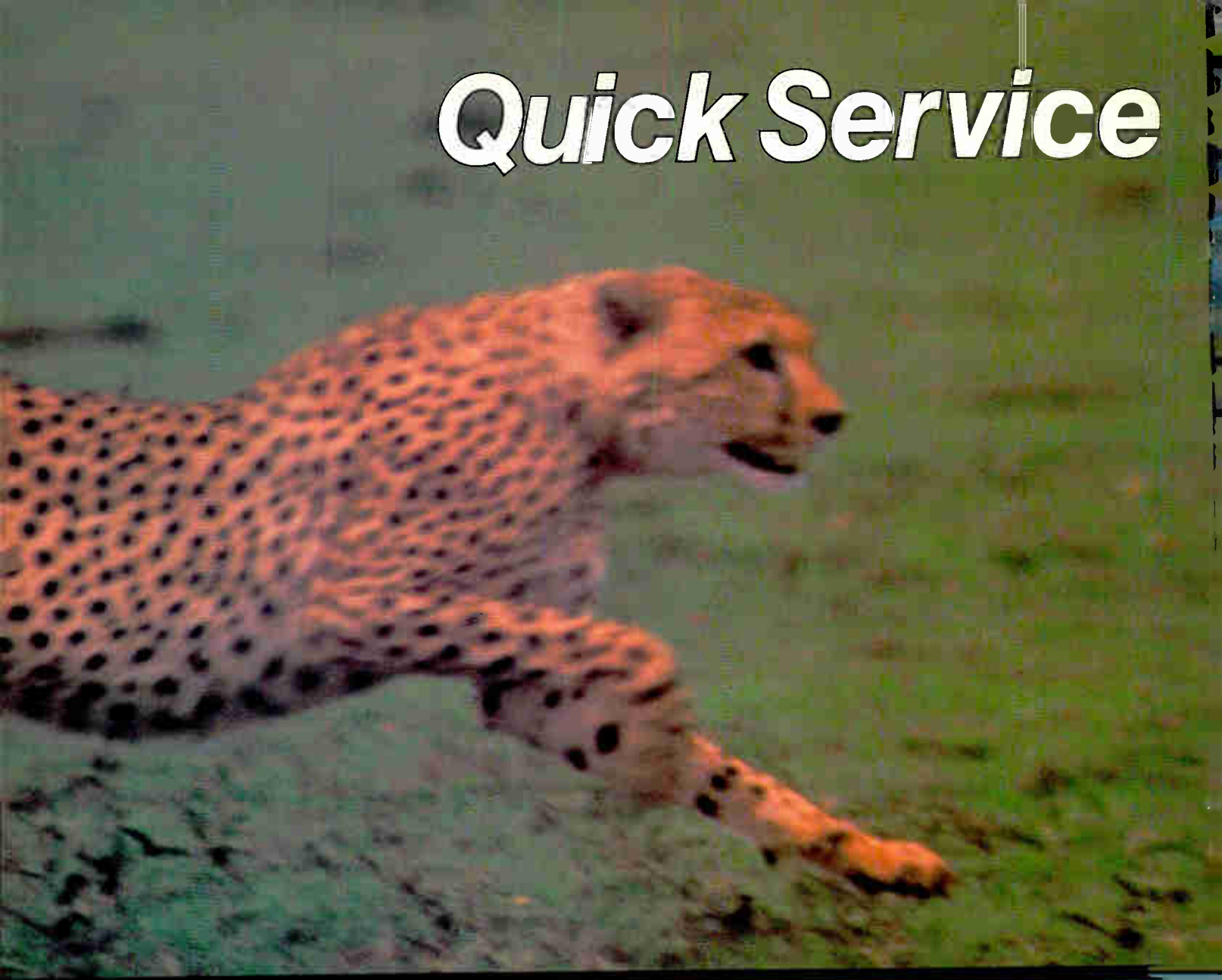


Headend agility: Why not?

New concepts in ad insertion

Jerrold's hidden ace: Entry into fiber market

Quick Service



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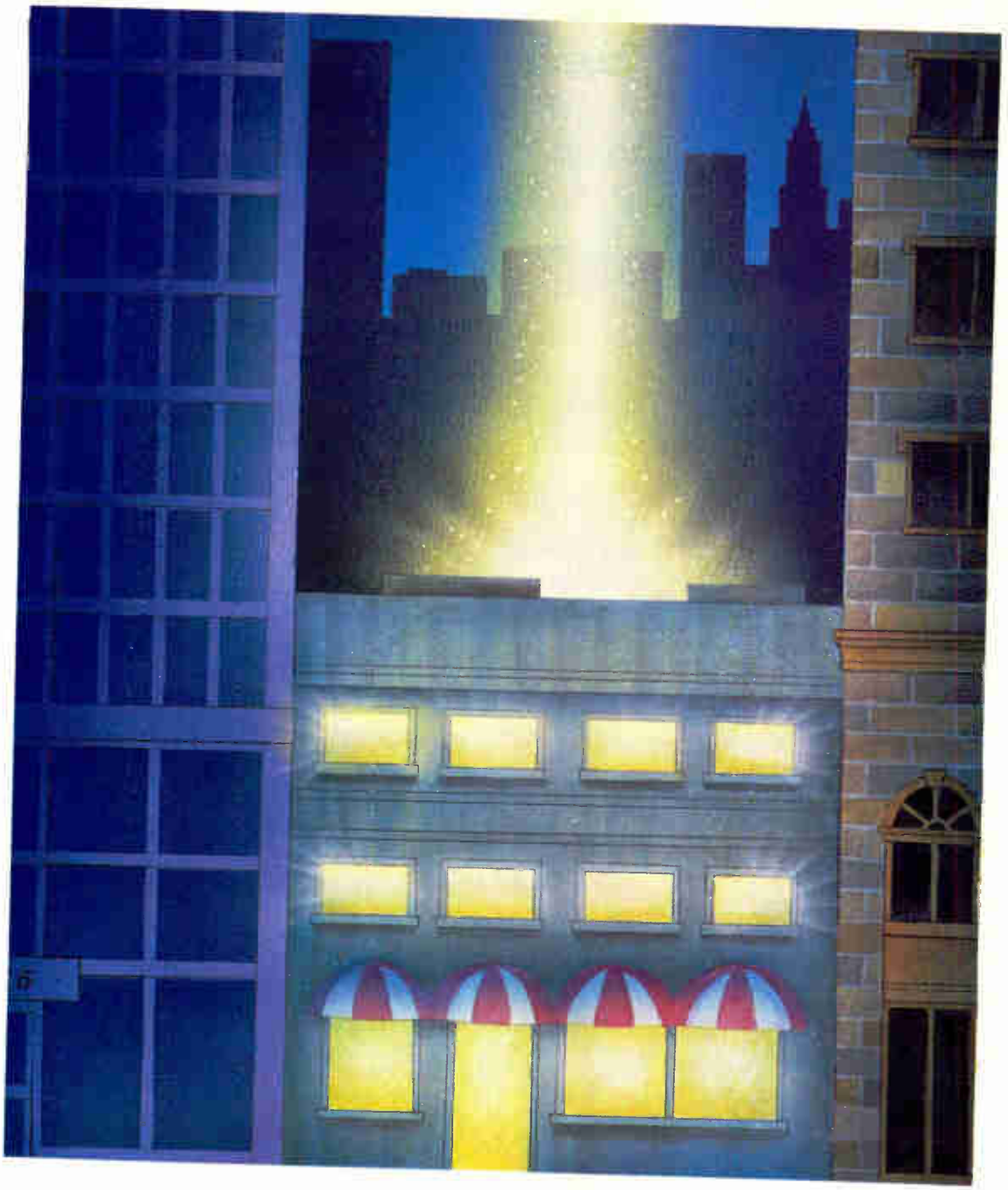
Reader Service Number 1



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Reader Service Number 3

September 1988

CED

Volume 14, Number 9

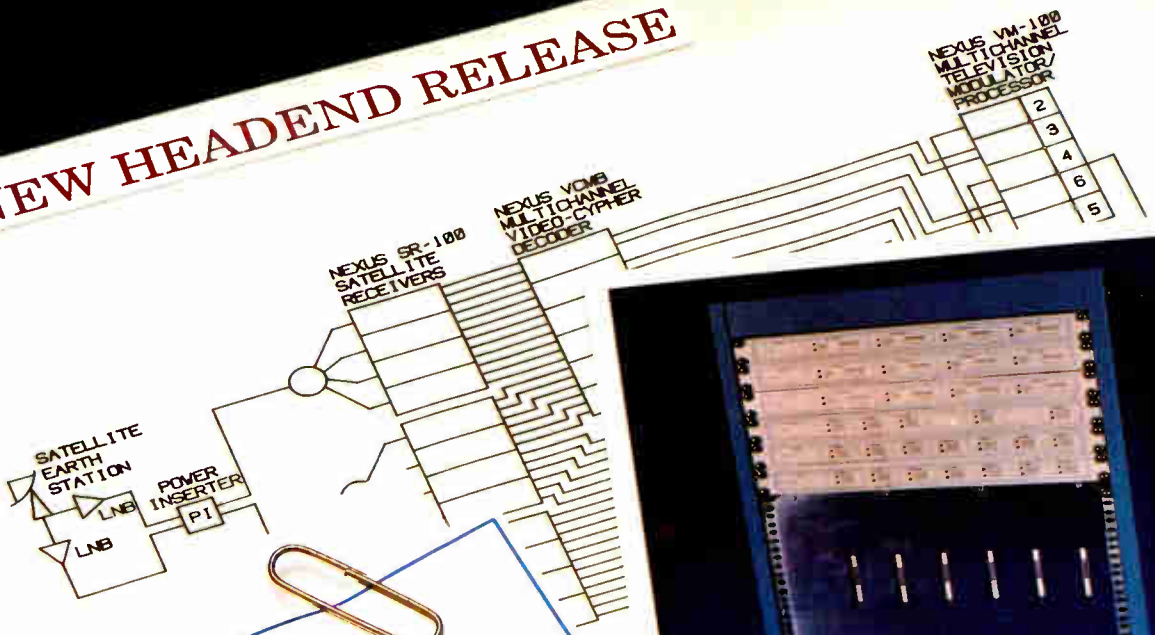
About the Cover:
Word has it that Jerrold plans to enter the fiber optic equipment marketplace with a splash at the 1988 Western Show. The move will up the ante substantially for the other players in the game. Photo by Uniphoto Inc.

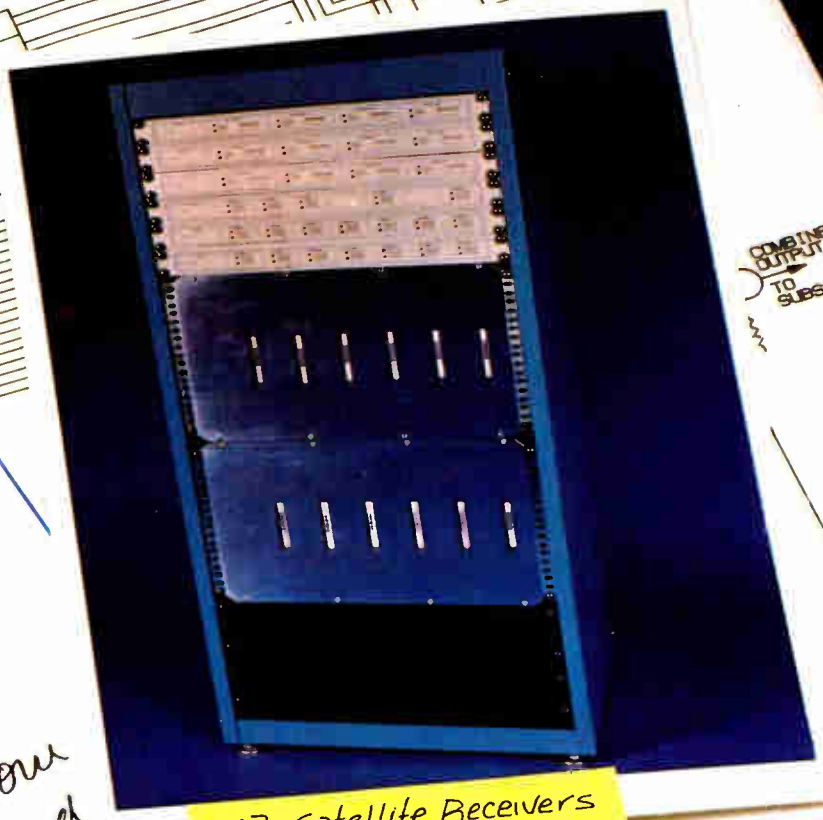
DEPARTMENTS

CED. (USPS 300-510) (ISSN 0191-5428)is published monthly by International Thomson Communications Inc., 600 S. Cherry St., Denver, CO 80222. ©September 1988, Volume 14, Number 9. Subscriptions free to qualified industry readers. All other one-year subscriptions are $26, prepaid in U.S. funds only. Second-class postage paid at Cleveland, OH. and additional mailing offices. CED is published on behalf of the cable television and broadband communications industries. POSTMASTER: Please send address changes to 600 S. Cherry St., Suite 400, Denver, CO 80222. MEMBERS OF THE BPA.

ABP BPA

NEW HEADEND RELEASE





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WIN THROUGH VOLUME CONTROL

Our new 8590 is the friendliest and fullest featured volume control addressable in the industry. A unique display lets your subscribers *see* sound on a volume level indicator. And it guides them easily through the VCR programming process. The 8590 keeps a secret better, too. With a choice of 50 security modes, utilizing three advanced security technologies: dynamic sync suppression, dropped field, and video and sync inversion. It includes easy-to-implement, plug-in IPPV. It's compatible with the rest of the set-top family. And, since it's also compatible with Oak and a long list of others, the 8590 can help you out with the old and in with the new.

WIN THROUGH VALUE

The new 8570 addressable set-top is the value packed younger brother of the industry standard 8580. It comes with all the subscriber features of its older brother. And then some. It shares the same new advanced VCR timer with the 8580 and 8590, taping twice as many events as before. It simplifies impulse like the 8590, with a one-touch buy key on both the remote and the set-top.

in
ve
ys.

WIN THROUGH FRIENDLINESS

Our Complete Remote Control is so smart it generates revenue while solving problems. Ninety percent of subscribers with set-tops have two or more remotes per set; thirty percent have three or more. That's a problem! The CRC eliminates multiple remotes by quickly and easily learning their functions, without the obsolescence risk of preprogramming. And, if your subscriber has a remote control TV–it can provide volume control *without* a volume control set-top. That's friendliness your subscriber will pay for.

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Our new 9650 IRD beats today's rack space squeeze by cutting space needs in half. The 9650 integrates the leading CATV receiver–the 9640–with a satellite descrambler in one package the size of the receiver alone. Result: You get twice as many channels in the same rack–with perfect compatibility.

WIN THROUGH AGILITY

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Reader Service Number 4

CED

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ITCI

INTERNATIONAL THOMSON COMMUNICATIONS INC.

Freedom for the thought you hate

Reader John Coiro, vice president of sales for ISS Engineering, incredulously asks the editors of this magazine why an article he vehemently disagrees with was published (see Coiro's letter on page 30). At least a few other readers, including Bill Smith, vice president, marketing for Cadco, also think we dropped the ball on this one.

The objections seem to center on the article's "self-serving" substance and tone. Briefly, Basil Peters and John Hacker of Nexus Engineering argue against the practice of using agile modulators for every channel in a headend. They argue that agiles are more expensive, more complex, produce excessive broadband noise and are more unreliable than fixed frequency modulators.

They also describe the results of reliability testing of four modulators according to MIL-217 to support their arguments.

Hoodwinked?

Were we hoodwinked? Did the editors not know that industry opinion is divided on the merits of agile modulators?

We do not claim ignorance. We are well aware of the conflicting positions. "Quality" as understood by one camp is "overkill" to the other camp. "Simplicity" as virtue contends with "primitive" as vice. One side claims broadband noise is a problem; others deny it.

Are there other measures of reliability? Certainly. Industry vendors will gladly tell you what those measures are.

Is this article simply an advertisement? It certainly is not disinterested. Self-serving? Perhaps. But we think our readers are smart enough to recognize that each vendor has a point of view that takes physical form in a product line.

Those of our readers who have spent any time at all talking to manufacturers of modulators know that a range of product exists. Prices, features and design philosophies are quite distinct and you can scarcely escape learning what the differences are.

Here's the other side

Without question, this article argues strongly for one point of view. The article on page 50 of this issue strongly argues the opposing view. That's no accident. We set it up that way, because it isn't our job to tell our readers what to think. But it is our job to give them the information they need to make their own decisions.

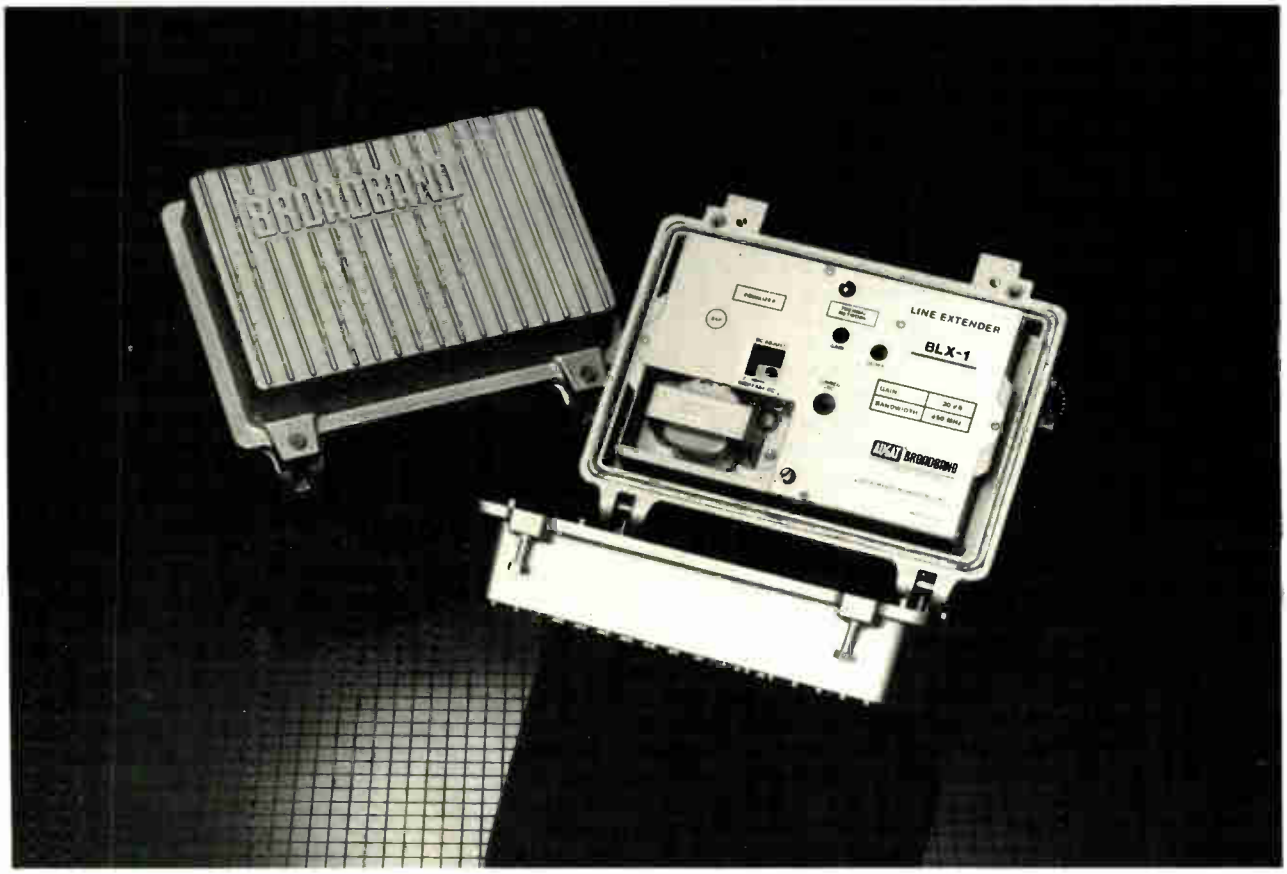
We don't expect you to agree with all the points of view expressed by all the authors whose work appears in *CED*. In our great industry we find room to disagree about lots of things. Ask 14 engineers what they think about any given issue or practice and you'll probably get 29 answers.

We don't expect vendors to agree with everything they read on our pages. That can hardly be the case since we deliberately make a practice of presenting opposing views in what we hope is a fair and balanced manner. We aren't close to perfect. We don't always get it completely right. But we try as best we can to achieve both perfection and complete accuracy. When we don't, we make amends as quickly as we can.

People disagree

We believe the truth emerges from a clash of ideas. And there are very few industry issues upon which there is unchallenged uniformity of technical belief. We assert that our readers deserve to know what the various ideas are and what those ideas and products can do for their businesses.

There are some things *CED* will not do. We aren't in the business of censor-



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Quality and Innovation

Reader Service Number 5

ing ideas, product strategies or technologies which exist in the real world and which have real supporters and real detractors. But we might reject or revise an article if it is a simple product pitch with no redeeming value.

This doesn't mean we will avoid controversy. There are a good many important issues upon which people of good faith can and will disagree.

Were we careless?

This article was sent out for review before we made a final decision on it. It went to companies with opposing views. We read it carefully. We asked ourselves whether the methodology was flawed, whether the test data could be doctored, whether the parameters were reasonable. We knew some people wouldn't agree with the points made.

That didn't bother us. It's no secret that opposing interests are involved here, not just an abstract engineering philosophy. We expect people to defend their interests. Besides, we already had lined up an article making the opposite point. Both points have a right to be heard. Both represent valid engineering points of view that presently exist in the CATV industry.

We don't believe it ever makes sense, in an engineering context, to argue that a given practice "always" makes sense, or conversely, that something "never" makes sense. It just depends on the situation and the application.

We don't have a position on when to use agile modulators. We aren't saying "always" use them or "never" use them. Our authors, who reflect existing and important industry views, may take such a position. We don't mind having a strong point of view argued. Our job is to make sure the opposing or different points of view also are represented.

Hated ideas

"I disagree with what you say, but I will defend to the death your right to say it." It's just that simple.

We don't believe in malicious attacks, harassment, hounding or badgering. We try very hard to be fair, balancing competing points of view when required.

Despite our attempts at good faith, we will err from time to time. We will apologize. We will rectify matters as best we can, as quickly as we can. Sure, we'll get into hot water now and then. That's the nature of the business. But we don't mind being criticized or enlightened because we can't avoid making an occasional honest mistake.

We think our treatment of the issue will prove to be fair. Read the opposing views in this issue. Write or call if you have comments. We thank Bill and John for taking us to task. We know without asking that at least a few more engineering and marketing readers will be gnashing their teeth because they read this article.

We stand by the decision to publish the article as well as this month's opposing view. We believe the two articles represent a real difference of engineering philosophy that most of our readers must weigh at some point. And that's why we ran them.

Advertorials

On a somewhat related subject, the editors wish to clarify *CED*'s position on paid advertising pages that run in magazines both inside and outside our industry. An "advertorial" is a paid advertisement that is made to look like actual editorial copy. It's a practice most American journalists frankly detest, although European journalists—perhaps most world journalists—probably have an altogether different perspective.

The roots of our distaste date to the very foundation of the Republic. A terribly unusual position (unusual then, unusual even today) was taken by America's Founding Fathers. They declared that one of the principles upon which our experiment in democracy would rest is freedom of speech, press and assembly. Political rights could not be guaranteed without a free press, they declared.

The intentional sacredness of the principle of a free press lies in its relationship to the process of "truth-seeking" in a democracy. In the 18th century, before the rise of independent commercial power and influence as we now know it, governmental abuse and restraint was clearly the impediment to "truth-seeking." Governments simply would not allow to be printed what governments opposed.

Thus, a cornerstone of the democratic experiment is a limitation on the power of government (or other power centers that have arisen since the 18th century) to censor unpopular ideas. There's a sort of political Darwinism at work here. Unpopular ideas have a nasty way of later proving correct. Letting unpopular "weeds" bloom is a sort of Darwinian insurance policy. Sometimes we decide weeds are actually flowers.

So journalists are taught early on to seek and print the "truth," and let contending ideas have their say. They also are trained to keep clearly editorial matter separate from clearly advertising material. Advertorial always has been troublesome because—overtly, covertly or innocently—it deliberately blurs the line between advertising and editorial.

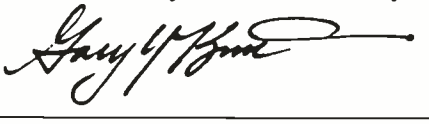
We reluctantly acknowledge that advertorial forms of advertising are a growing reality. Many fine journals we respect (the Wall Street Journal, Business Week, Forbes, and Fortune among them) run special advertorial sections. You've seen them.

In the cable industry advertorial recently has begun to appear in a slightly different form. Typically, one-page ads are placed, rather than a multi-page special supplement. Although we continue to dislike them, we recognize that an advertiser has a right to say what he or she pleases (so long as we think it's legal, in good taste and the "truth," within general bounds) in a form of his or her choice.

We've given the matter some thought and we're presently developing guidelines and restrictions for advertorial copy running in our magazine. In general, the guidelines are for the protection of the reader, so he never confuses ad copy for a story we have chosen, edited and consider important enough to present to our readers. Advertisers who choose to present their message via the advertorial vehicle will be made to abide by the guidelines, or we won't accept the ad. It's as simple as that.

We hope by setting this policy to continue to bring our readers the highest possible standards of journalism and to offer our advertisers the best possible advertising vehicle in our market.

Finally, we've added a new columnist to our stable of industry leaders who speak out on technology. The column is called "Capital Currents" and it's now a part of *CED* because you asked for it. Join us in welcoming NCTA Deputy General Counsel Mike Schooler, whose monthly column will concentrate on the legal and regulatory issues that have a direct bearing on the technical operation of cable systems. This month he kicks off his column with a look at syndicated exclusivity. ■



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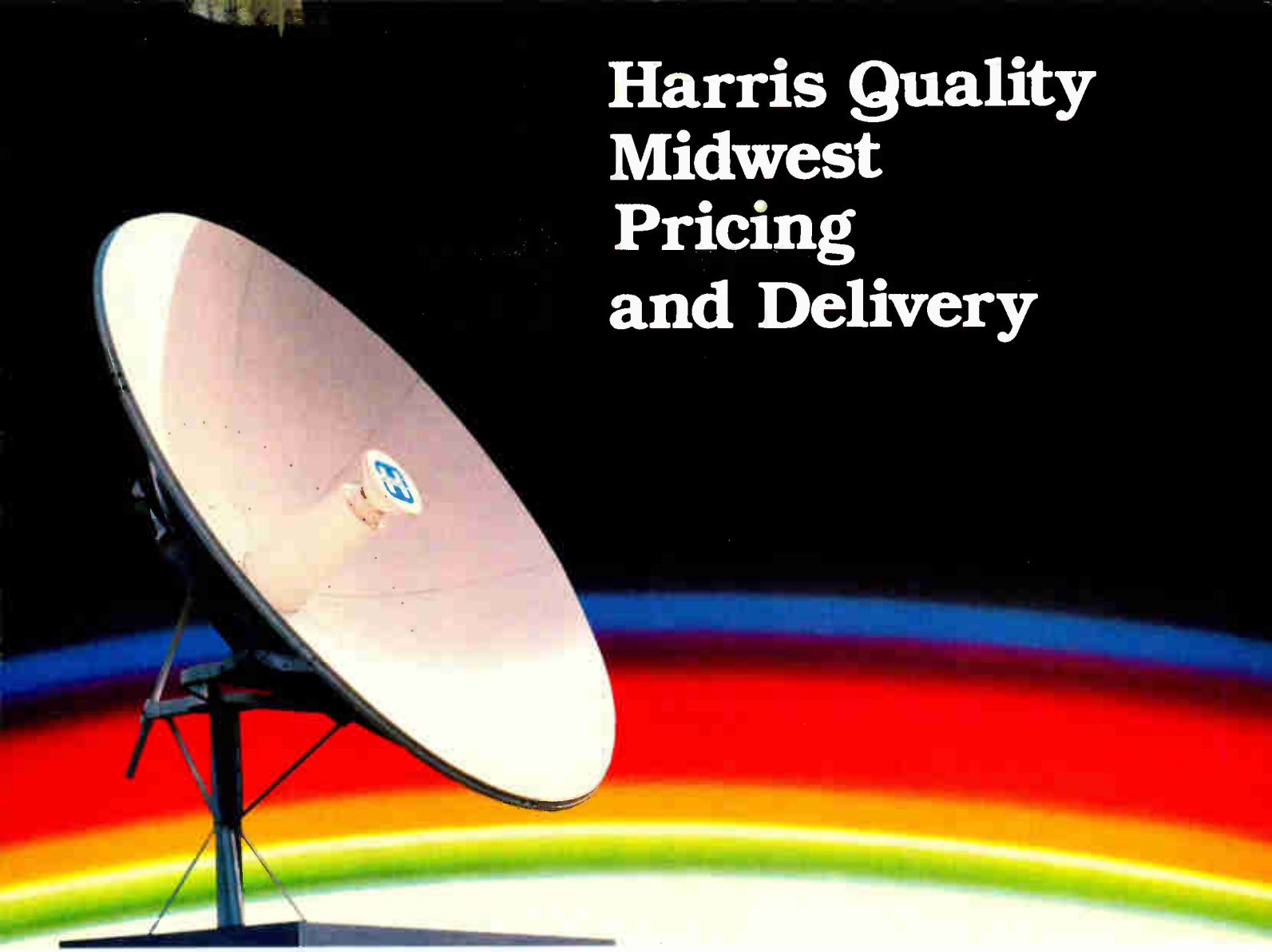

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Reader Service Number 6

Hranac carries SCTE message

Like the Olympic torchbearers who symbolize teamwork, desire and discipline by running thousands of miles to pass along the Olympic flame, Ron Hranac symbolizes the technical spirit of the CATV industry as he travels around the country expounding the benefits of quality, reliability and education.

Hranac, the man just installed at the president of the Society of Cable Television Engineers, is the latest in a line of quality-minded engineers from Jones Intercable. As the 12th-largest MSO's senior staff engineer, Hranac is one of the driving forces behind Jones' dedication to doing things right-. In addition to being a resource for other staff engineers and Jones system engineers around the country, Hranac oversees lab testing and product evaluation, the technical operation of the MSO's Galactic Radio programming service, microwave engineering and myriad other endeavors known as "special projects."

But that's not all. The bearded 33-year-old father of two manages a full 54-channel, two way cable system with full headend, TV production studio and nine-meter earth station that is part of the MSO's corporate headquarters located just south of Denver's Tech Center.

Hranac has been aptly described as "the engineer's engineer" by Jones Intercable's Vice President of Engineering Bob Luff. Hranac likes the role he plays at Jones because unlike many corporate engineers, he has stuck to the engineering side of the business. "I've stayed more on the side of being a tinkerer," he says. "I'm one of the few high-level engineers who still has the luxury of pulling a diddle stick out once in a while and tweaking something or repairing things."

Ron Hranac

Started in high school

Hranac's been a part of the cable industry since he was a senior in high school, when he landed a job as a camera operator for a local origination station on a TelePrompter system in the Pacific Northwest. At the time, Hranac was contemplating college, but the job sidetracked him. "The job popped up and college never happened," he recalls. "Cable television did."

Within three years he was in charge of the L.O. operation, but the MSO decided to close all the L.O. stations excepted where they were mandated by franchise requirements. Undaunted, Hranac joined the ranks of the pole climbers.

His natural curiosity, ability to learn quickly and several good teachers resulted in Hranac's fast rise from installer to electronics technician (similar to an assistant chief tech) for the system in Richland, Wash. in 1979.

From there it was on to Jones Intercable and a move to Clear Lake, Calif. as a system engineer. Hranac paralleled Jones' meteoric rise to the top with stints as a regional engineer, division field engineer, western division engineer and then a job at the corporate headquarters when Jones consolidated all its divisions and converted to the fund system it now uses.

"More and more companies are leaning toward the degree engineer, and rightly so as our industry evolves and becomes more complex, I think it's necessary," says Hranac. "I'm one of the last of the engineers who came up through the ranks."

It is perhaps ironic that Hranac made it to the lofty position he now holds without the benefit of an engineering degree and now preaches the importance of education. But Ron has filled in that gap by being the first person to complete the installer portion of the BCT/E certification program (he has since completed certification at the technician level as well), and spends a lot of time learning by doing.

Payback time

A few years ago, Hranac decided the best way to pay back the industry that has been so good to him was to give some of his technical knowledge back so that other self-motivated people could do their jobs at least a little better. So he got involved.

He got involved by writing articles, putting together charts, making speeches and presentations, performing special projects at Jones and running for national office on the SCTE Board of Directors. He is often seen leading some of the technical sessions at local, regional and the national SCTE shows and the NCTA National Show.

And although the SCTE has more than 4,000 members nationwide (and the membership numbers continue to grow), Hranac feels that not enough technically oriented employees are getting the full message.

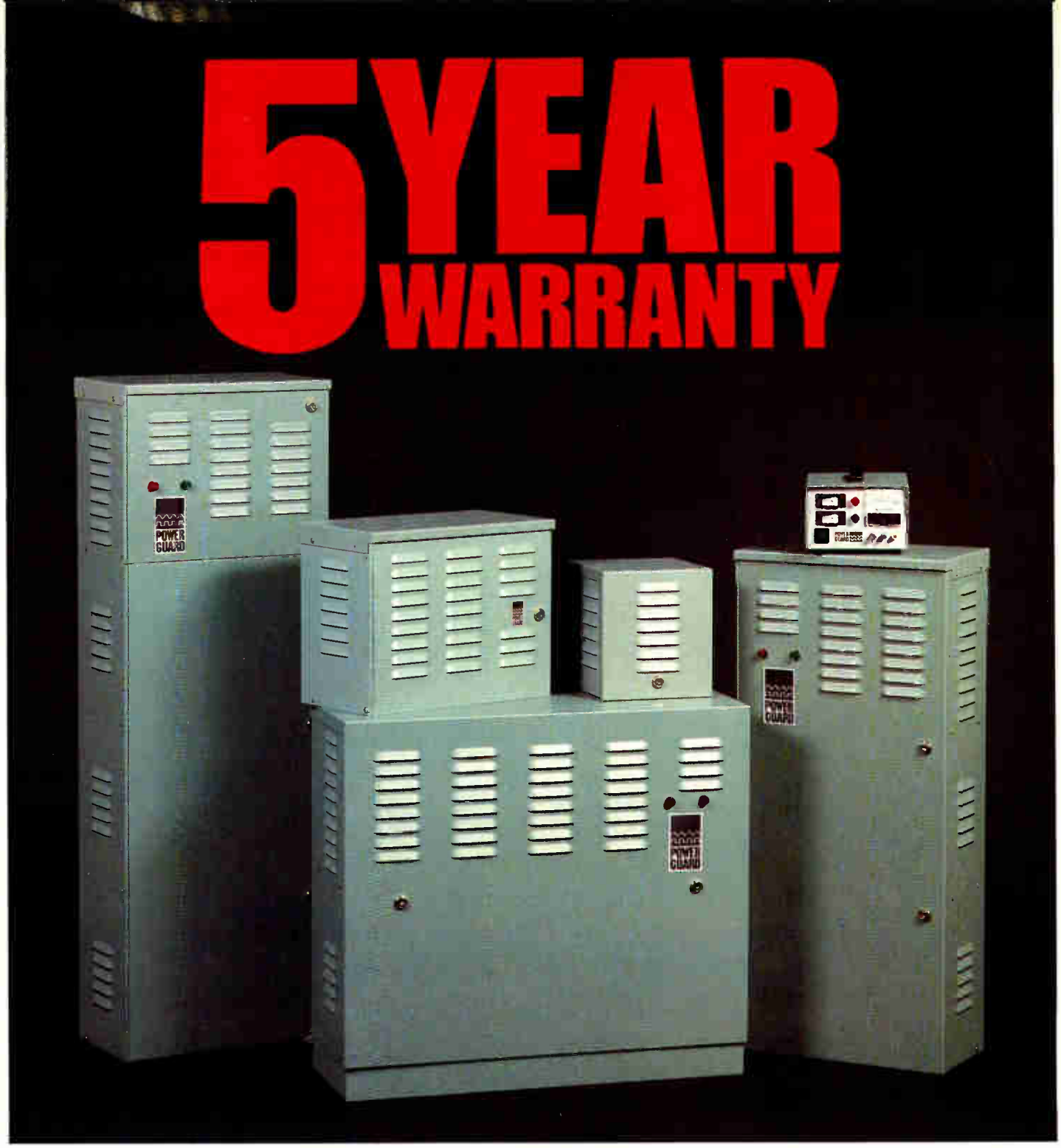
"There is still a good sized number of people who don't get the technical training message," he says. "We still have a need to get to a lot of people."

And that, simply, will be the focus of Hranac's administration. Augmenting the existing technical training and education available from such sources as NCTI, ATC's national training center and other in-house programs via MSOs, manufacturer's programs and articles in industry trade publications with solid programs at the local level through the various SCTE chapters and meeting groups will be of paramount importance to the future of the industry, says Hranac.

Attitude key obstacle

One of the hurdles yet to be overcome is management's attitude that SCTE

5 YEAR WARRANTY



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1-800-288-1507 **POWER GUARD**

Reader Service Number 7

meetings waste too much of an employee's time. Hranac has heard system-level managers worry that technical personnel get together just to find a better job. "If that's the feeling, then there's something wrong in that system to begin with," Hranac says. "I know the opposite is true because I've gone through it. Well-trained people return the investment (in education and training) 10-fold."

Unfortunately, the management attitude is pervasive. Hranac tells of a meeting hosted by the Wyoming Meeting Group that cable personnel in some cases traveled 350 miles to attend, but no one from the town where the meeting was held showed up.

How important is the need for education? Hranac says the future of the industry hinges upon it, especially when telephone companies are allowed to enter the industry as a competitor.

"When the sales rep from the phone company knocks on the door and says to the homeowner, 'I have cable service via fiber optics, you have cable via coax; which would you like?' If we're ready for it, that customer's going to say, 'I'm happy with the cable service I have.' The other response obviously is, 'The cable system here is unreliable, the picture quality is mediocre, thank God you're here, I've been waiting for you for a long time.

"We have those two alternatives to look at," Hranac says, "and they all tie together. The technical education, the quality, the reliability are all woven together in this big fabric we call cable TV and they've got to be the buzzwords—they absolutely have to."

For those systems or MSOs currently focused on marketing programs, Hranac says it's important to keep the technical program afloat, too. "The industry is technically driven as well as marketing driven. It's important we keep that in mind because the issues of high quality pictures and high reliability are in my mind equally as important as good marketing programs. The two can work very well together."

Systems that emphasize nothing but marketing and ignore technical quality invite overbuilds, buyouts and competition from a variety of sources, says Hranac.

Telcos need not be feared

Speaking of competition, telcos will be allowed to provide cable service someday, predicts Hranac. But that doesn't mean they'll eat CATV's lunch. "I think (the telco issue) can be a two-edged sword: it may force some people to wake up and provide better quality, training and pictures," he says.

"And we can take the whole fiber optic issue the phone company is touting and embrace it in what we do," says Hranac of the "technological edge" the telcos boast of. "We can make it part of our systems and (because coax will still exist in the house) still have the consumer friendliness at the back of the television."

The SCTE can expect nothing less than total dedication to the education effort from Hranac because here's a man who becomes so involved in the activities that interest him, he becomes driven. When he was 11 years old, Hranac was modifying walkie-talkies and stringing long-wire antennas so he could talk to cross-town friends. And when he was in junior high school, he wanted a telephone in his room. So he

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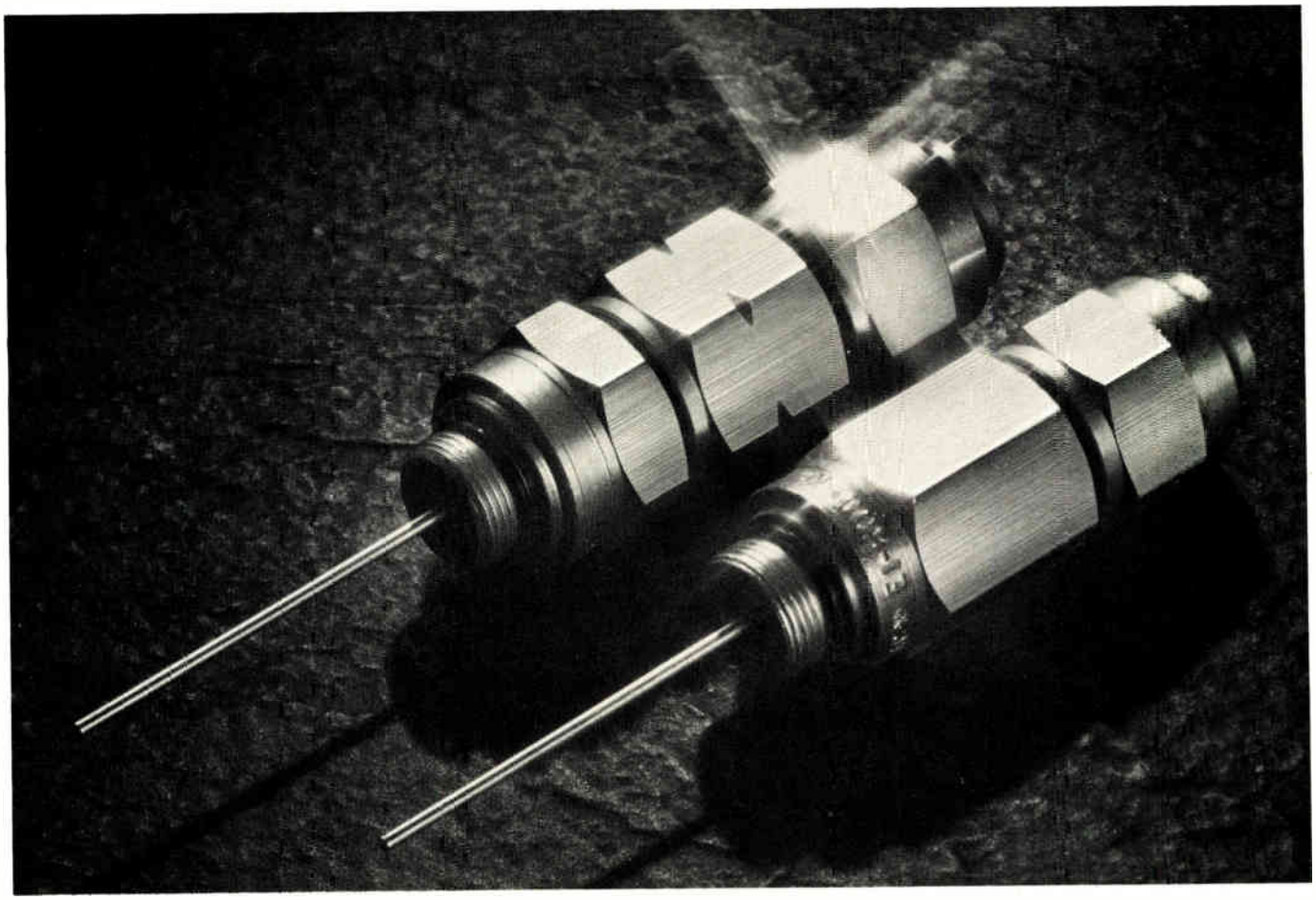

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built one.

"When I get interested in something, there's a drive—like a train behind me pushing me to go for 120 percent—and I don't stop until I've accomplished that," he says.

What's next?

There's no doubt about that. At 33, Hranac has to be one of the youngest corporate senior engineers in the business. What's next in his career? Ron's not sure, but he does want to stay in CATV and prefers to stick with Jones because Glenn Jones, Bob Luff and previously, Al Kernes, all showed faith in him. Night school and a sheepskin are possibilities. A job as director of engineering would be nice, he says.

But in the meantime, Ron has plenty of activities outside Jones that keep him busy. In addition to backpacking, photography and even drag racing, Hranac is working to bring video to the National Weather Service's early warning system.

Working with Steve Johnson of American Television and Communications and a few others, Hranac believes it would be beneficial to augment the voice network of weather spotters with several spotters who would provide live, real-time video of suspected funnel clouds and other potentially damaging weather directly to the NWS in Denver to keep the service abreast of the changing weather patterns.

> 'When I get interested in something, there's a drive—like a train behind me pushing me to go for 120 percent—and I don't stop until I've accomplished that.'

Hranac and Johnson have discovered they can use CATV hardware to make the system work. For example, headend modulators make terrific transmitters; line extenders can be used as power amps and deliver 1 watt of power ("with a watt and a good antenna, that TV picture can go 20 miles," says Hranac); and set-top terminals make great receivers.

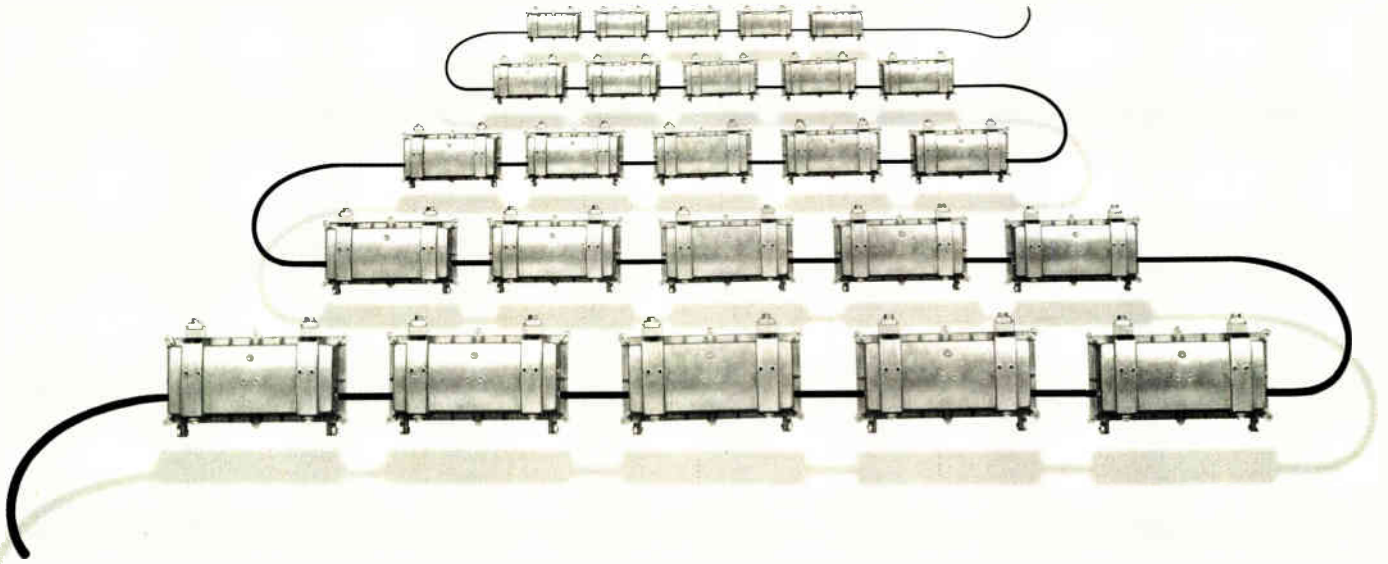
That type of concern and dedication aimed at bettering the community in general is what Hranac is all about. And he's grateful to the SCTE members and board who have demonstrated faith in his leadership abilities. After all, if he can get just one other person as excited about CATV as he is, all the talking, writing and lecturing will have been worth it.

Where's the answer?

But the answer is at the system level. The level of training there is so important. When Hranac wa trained, he rode around with supervisors and trainers for three months before being turned loose. "Those people were so willing to listen to questions and answer them. I wish everybody had that opportunity. How do you pay somebody back for that except to go out and pass along that same information to other people and hope the 'trickle-down' effect will work?" ■

—Roger Brown

NO SIGNAL SHOULD HAVE TO GO THROUGH ALL OF THIS



It's well known that line amplifiers directly diminish CATV signal quality. Yet today's cable distribution systems rely upon an architecture in which signals must pass through as many as 60 amplifiers before they reach a subscriber.

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Reader Service Number 12

Smart House: is it so smart?

The first demonstration of one of the latest "gee whiz", high-tech projects was presented in January 1986, in Dallas, by the Smart House Development Venture Inc. Smart House products are targeted for selected markets in 1991. The following highlights from a recent brochure by SHDVI may help to explain the concept.

The basic component is a flat-ribbon cable that includes #12 wires for distributing 120 volt electrical power, wires for a 12 volt uninterruptible power supply (UPS), several wire pairs for audio, telephone and control signals, and two coaxial cables for video (CATV). The hybrid cable terminates in one or more universal high-tech receptacles in each room for connecting all kinds of appliances and devices.

Smart House switches and controls are user-programmable for maximum flexibility. Wall switches, for example, need not merely turn the nearest light on and off, but can be programmed to control any device the homeowner might choose.

All-knowing sensors

Sensors would be used to detect smoke, heat, light, motion and to monitor energy consumption at each appliance. Control data are transmitted at each receptacle indicating electrical overload of any individual appliance, or signaling that the roast in done, or that the laundry can be transferred to the dryer.

The generous use of microprocessors and digitally operated controls leads naturally to the potential for interactive cable TV service. Although the Smart House is planned to be self-sufficient, it does provide for remote control and monitoring. Cable TV could certainly supply the necessary intercommunications circuits. However, except for video signals for motion detection, it is hard to conceive of any Smart House features that might require higher speed or wider band upstream interconnection facilities than could be provided by the ordinary telephone circuits. Cable TV has few inherent advantages in this application, but suffers the disadvantage of much lower penetration than telephone.

New revenue opportunities

On the other hand, the Smart House concept includes installation of two coaxial cables to one or more outlets in each and every room. This feature invites the greater use than ever before of multiple outlets for FM radio and audio programming as well as for cable TV. With home shopping by Telaction, and other transactional and interactive video services now under development, the opportunities for new revenue could be significantly enhanced at the Smart House.

In converting from the "gee whiz" future to the real world, the Smart House will encounter two hurdles, with counterparts in the industry served by this publication, *CED*.

1. A sort of human inertia, generating resistance to change, seems to increase, on the average, in rough proportion to age, although the spread is great between the young-at-heart and neanderthals of any age. The older we get, the more difficult it becomes to reprogram our mental data banks.

More trouble than benefit?

Jeanne Kirkpatrick, a Georgetown University professor and recently Ambassador to the United Nations, writes that her family has moved "into a new house that is five miles and two light-years away" from their previous home. "Nothing in philosophy, history, literature, or life," she writes, "prepared us for the array of switches, buttons, flashing lights and peremptory commands that surround us in the new house. Our bedroom wall resembles the instrument panel of a medium-sized commercial airliner.

"In the last three days, we accidentally have set off a piercing alarm three times, locked the cat in the garage, broadcast private conversations throughout the house on an open intercom system, watched while a large washing machine nearly destroyed itself in convulsions of chills and fevers, and barely saved our Yorkie from the trash compactor. We have contacted the cable television outfit four times, missed a whole week of the *Washington Post*, and learned to operate one zone of a two-zone air-conditioning system. You get the picture."

So much for the Smart House!

2. It appears to be impossible for mere humans to foresee all possible interactions between other humans and their machines with sufficient clarity to prepare understandable and comprehensive instruction manuals, or to design the control mechanisms with functional logic, identified in the language of the street.

In addition to the problem of retrofitting 90 million old-fashioned, low tech households, the Smart House must deal with the Jeanne Kirkpatricks of the world, because most of those who are young enough to make it work cannot afford it. Experience to date is discouraging. VCR and TV users manuals are often useless. Logic is irrelevant to any except the original designers.

Reliability questions

But the most overlooked aspect of modern high-tech design is the consequence of equipment failure, software shortcomings or unexpected human interaction. Fail-safe design is expensive, and not always even possible. Software programs are written by humans who can only try to anticipate all possible situations. Although computers and microprocessors can fail, they do exactly what they are programmed to do, with inhuman consistency and reliability. Sometimes the consequences of Murphy's Law can be catastrophic.

So much of our lifestyle depends on sophisticated technology beyond our comprehension that we tend to forget that, with anything created by the fallible hand and mind of humans, failures are not only possible, but probable. Smart House has a long way to go. ■

By Archer S. Taylor, Senior Vice President, Engineering, Malarkey—Taylor Associates Inc.

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Reader Service Number 13

How to beat the telco threat

It certainly will come as no surprise to anyone who has paid attention to the FCC in recent years that it has released a Notice of Inquiry (NOI) to gather information on whether or not the telco-cable cross-ownership rules should be changed to allow telephone companies to provide cable television service in the same areas as they provide dial tone service. For a long time certain (non-Bell) telephone companies have been allowed to provide cable television. For instance, telephone companies independent of the Bell system were allowed to provide cable TV, but only outside the areas they served with dial tone.

From this type of activity has arisen certain industry leaders, such as Centel Corp. A Bell System operating company, however, was prevented from providing any services other than common carrier services either inside or outside of their service area by the 1956 consent decree.

Subsequently, in 1984, a new consent decree was agreed to by AT&T and the government and its provisions prevent the Bell operating companies from providing information or content services. The rules do allow them to provide cable television service in certain areas where it is clear that the only way people in rural or low density areas can get cable TV is if the local telephone company will provide them. This is done through a waiver process that the FCC controls.

By Wendell Bailey, Vice President Science and Technology, NCTA

FCC's stance clear

What the Commission is getting information on now, however, relates to allowing telephone companies to provide cable TV service in their own service areas, in particular, regional Bell operating companies. What's no secret is that the Commission has already made up its mind on this point, stating that it believes the telco cross-ownership rule should be changed. The Commission has stated its desire to inject competition into the cable television industry and allow the technological behemoths to bring their technical muscle into our industry. The Commission seems to have forgotten the number of times that the cable television industry has attempted to provide these services only to be legislated or regulated out of the business.

To further compound the issue, the FCC has proposed changing the requirements under which existing telephone companies can get waivers of the rules. This is significant since the cable television cross-ownership rules themselves are part of federal law and cannot be changed, per se, by the FCC. The interpretation of the rules and under what circumstances waivers to the rules can be granted, however, are under the jurisdiction of the FCC. So a change in the reasoning on granting waivers could, in fact, result in an effective elimination of the telco/cable cross-ownership rules by a regulatory body's granting of mass waivers.

Checks and balances

The FCC believes that it is possible for them to prevent anti-competitive behavior of the telephone companies by imposing certain accounting and reporting rules. This effort comes from the same Commission that has for years bemoaned the fact that it has a hard time understanding any accounting procedures at the Bell operating companies because of the incredible diversity and complexity of financial matters in that business. But, more to the point, there are still several rules in place that make the immediacy of the FCC's issue rather uncertain.

There is, for instance, the fact that Judge Greene, who retains jurisdiction over the modified final judgment (divestiture agreement) between AT&T, the Justice Department and the regional Bell operating companies, has made it clear he does not intend to allow the RBOCs to get into businesses of this sort. Then there is the previously mentioned fact that the cable/telco cross-ownership rules are part of federal law; they are codified in the 1984 Cable Act. Third, and perhaps most significantly, there is the fact that telephone companies have a lot of business interests and probably are thinking hard about whether they should risk money being involved in this industry when they've got their own business and customers to serve.

They want in

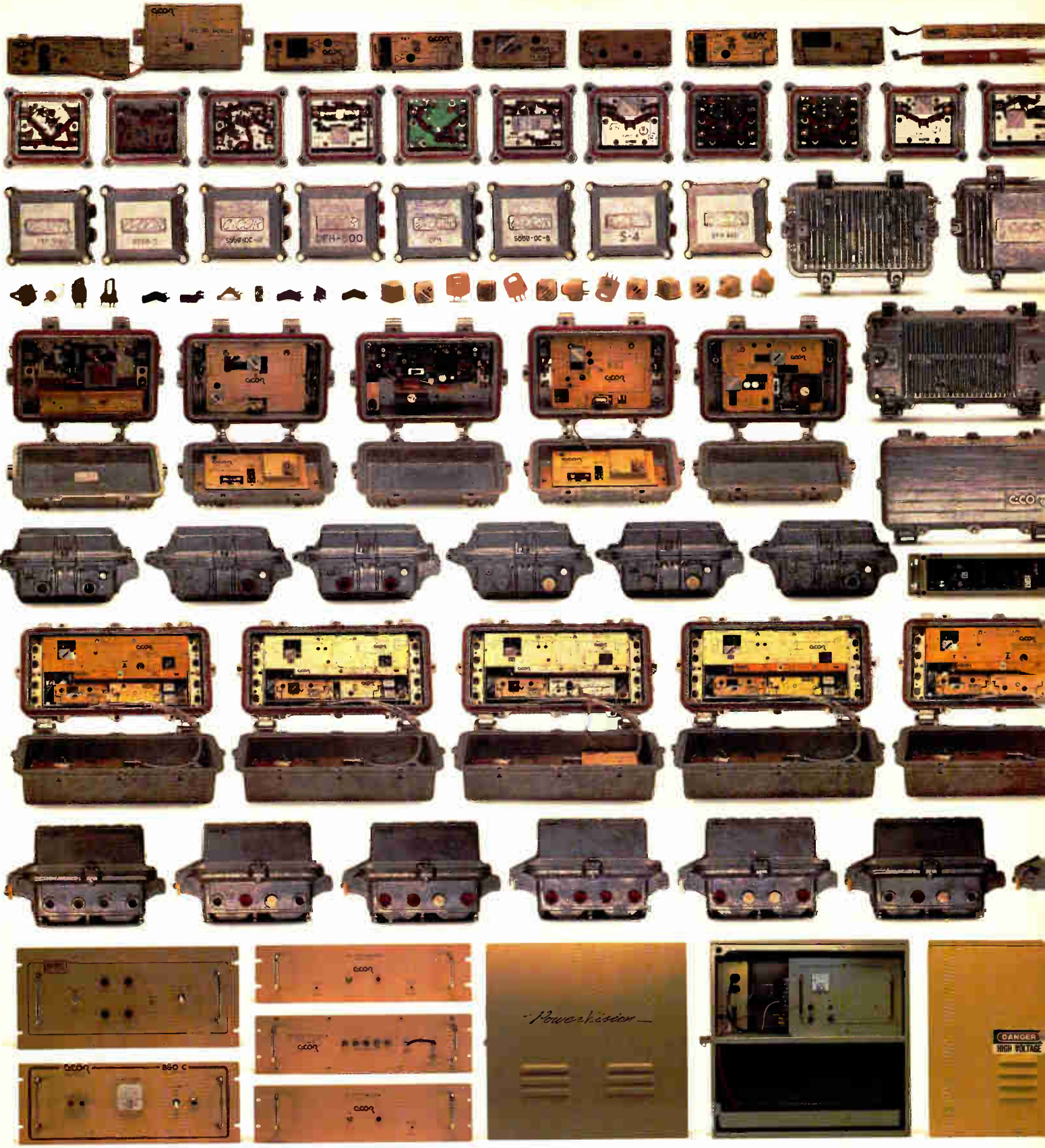
But make no mistake about their intentions. It has often been stated here and elsewhere that they want to be in the cable television business. They want to be the carriers of choice and they would prefer if there was no choice in who the carrier had to be.

Imagine, if you can, a hypothetical situation. It's 15 years from now (I think it could take 15 to 20 years before the telephone companies could get seriously wound up to providing cable TV services, if they are allowed), and the telephone man knocks on the door of one of your subscribers. That subscriber is likely to have one of two reactions. The first reaction, and the worst reaction, would be if the cable subscriber said, "Thank goodness, you're here at last! I have waited so long for good service that I can't tell you how pleased I am to see you here. Tell me what your plan is and I'll agree."

The second and best possible reaction would be if the customer said to the telephone person, "Thanks for coming, but quite frankly, I have had good service for many years from my cable TV company. They give me good product, good value and good service—the kind of deal that can't be beat. If I ever have trouble with them I'll be sure and call you. Thanks and good day."

Do the work now

If we can do the work necessary now to elicit that second reaction from our subscribers, it won't matter what the FCC, Judge Greene, Congress or the courts do. We'll have our business, we'll have our customers and we'll have our careers. ■



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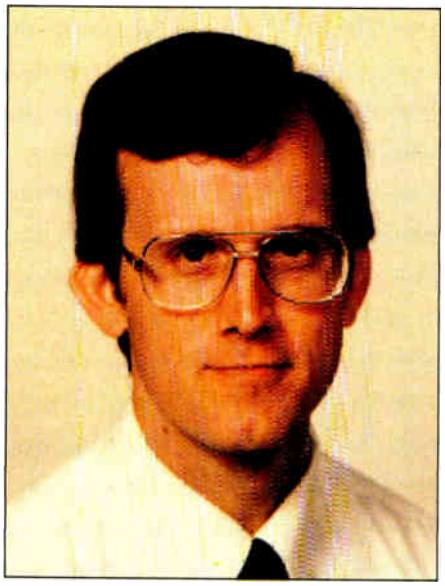
Reader Service Number 14



Incidental carrier phase modulation

Incidental carrier phase modulation (ICPM), expressed in degrees, has historically been defined as a superfluous Phase Modulation (PM) of the video carrier with changes in video signal level, as the video signal level varies from sync to reference white (-40 to 100 IRE). Ideally, vestigial sideband transmission of the video signal should be a pure form of amplitude modulation. The carrier's frequency and/or phase should not be altered by the modulation or demodulation process. Unfortunately, neither the modulation nor demodulation process is perfect, and results in some amount of residual phase modulation.

Causes of ICPM

The causes of ICPM are many and varied: Improperly neutralized broadcast transmitters; over-modulation in a broadcast transmitter or CATV modulator; poor balance in a "balanced" modulator; AM-PM conversion in the Nyquist slope filter of a TV receiver; and noisy tuners or local oscillators. Incidental carrier phase modulation can also be classified as either *differential-mode* or *common-mode*.

The classical definition is the differential-mode case, where ICPM is imparted only to the video carrier. This is the type of ICPM that occurs in broadcast transmitters, for example, where the video and audio carriers are transmitted through completely distinct circuit paths. As a result, if the video carrier is contaminated with ICPM, the audio path is left clean—that is until it reaches its destination.

By Chris Bowick, Engineering Dept. Manager, Scientific-Atlanta

Common-mode ICPM

Common-mode ICPM, on the other hand, is ICPM which is imparted to both the video and audio carriers simultaneously, as might occur due to a noisy local oscillator in a set-top terminal (STT).

ICPM was never really a factor in producing audio buzz in the early days of television. Early TV receivers, like broadcast transmitters, maintained completely separate video and audio paths and, as a result, single-mode ICPM on the video carrier was never given a chance to contaminate the audio carrier.

Common-mode ICPM didn't become a significant factor until the advent of the STT. As TV receiver technology matured however, an audio demodulation technique called "intercarrier detection" became widespread.

In this technique, the video and audio carriers are mixed together, with the video carrier acting as a local oscillator. One of the resulting "beat" products of this mixing process is the 4.5 MHz intercarrier. At this point, the 4.5 MHz intercarrier contains both audio information in the form of FM, and unwanted video information in the form of amplitude modulation. Limiters are then used in the 4.5 MHz sound path to remove the unwanted AM, leaving only the frequency modulated audio information for subsequent demodulation.

Since the video carrier is used as a local oscillator in this process, any ICPM that is present only on the video carrier (differential-mode) will be directly transferred to the audio intercarrier. Once ICPM has made its way onto the 4.5 MHz audio intercarrier, the sound detection circuits can't tell the difference between the wanted audio information and the unwanted ICPM. The ICPM is therefore detected (demodulated) and becomes audible as buzz. This holds true for both monaural and stereo signals.

It's interesting to note that the intercarrier detection technique, while susceptible to differential-mode ICPM, is *not* susceptible to common-mode ICPM. This is because, for the common-mode case, both the video and audio carriers contain equal amounts of ICPM, thereby maintaining a constant relationship between the two. In the intercarrier mixing process, common-mode ICPM is therefore eliminated.

Televisions with direct detectors aren't necessarily immune to the effects of ICPM either. In a direct detector (sometimes called split-sound), a phase lock loop (PLL) is used to regenerate a "clean" video carrier that is identical in frequency to the original video carrier, but void of amplitude modulation.

Video mixed with audio

This clean video carrier is then mixed with the audio carrier to produce the 4.5 MHz audio intercarrier. If the PLL has a narrow (around 5 kHz) loop-bandwidth, then the regenerated clean video carrier will contain very little ICPM. Therefore, for the differential-mode case, ICPM on the 4.5 MHz intercarrier signal and its subsequent buzz problems are all but eliminated. Common-mode ICPM, on the other hand, will be directly transferred to the 4.5 MHz intercarrier. This is because, even though we have regenerated a clean video carrier, essentially free of ICPM, the *audio* carrier still contains its portion of the original common-mode ICPM. The 4.5 MHz intercarrier therefore becomes contaminated as a result of the mixing of these two signals.

If, on the other hand, the PLL's loop-bandwidth is *wide* (about twice the audio baseband bandwidth) then any ICPM on the video carrier will remain on the regenerated clean video carrier. Therefore, differential-mode ICPM will be transferred to the 4.5 MHz intercarrier, while common-mode ICPM will be eliminated through the intercarrier detection process.

More next month

ICPM, and its associated audio buzz, is a phenomenon that has been in existence since the early days of television broadcasting. Not until recently however, with the advent of high quality stereo sound, has there been much emphasis placed on the subject. Next month we'll discuss techniques for monitoring, measuring, and minimizing ICPM in CATV modulators. ■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Syndex redux

Editor's Note: This is Mr. Schooler's inaugural column that will focus on regulatory issues of interest to technical personnel. The column will appear monthly.

Eight years after the Federal Communications Commission seemed to be getting rid of them for good, syndicated exclusivity rules are back. Once again, cable operators will be required to black out a syndicated program imported on a distant broadcast signal if a local broadcaster has the exclusive right to the program in the cable community.

If the new rules survive judicial review and take effect as scheduled one year from now, cable operators will face an unpleasant choice. They can continue to carry distant signals but delete a substantial portion of those signals' programs. Apart from the technical problems that this approach will cause, it is sure to confuse and irritate subscribers who will not understand why the program listed in the TV magazine fails to appear. Alternatively, the operator may simply choose to delete the distant signals altogether, even though such signals are popular among subscribers.

Why the reversal?

What could have caused the FCC to reverse itself and bring back rules that were and will again be so unpopular among subscribers? Actually, while the new syndex rules are similar in form and effect to the old rules, they are based on an entirely different rationale. The old rules were blatantly protectionist; they were designed to prevent cable from inflicting such serious economic injury on local broadcasters as to threaten their survival or impair their ability to provide supposedly unique local-oriented programming. In 1980, after conducting a lengthy economic inquiry, the FCC determined that the importation of distant signals caused no significant harm to broadcasters.

But the new rules are not intended to protect broadcasters from competition. What the FCC now believes is, that by protecting the right of each programmer to distribute its products in what it perceives to be the most efficient manner, syndex rules will promote competition and provide incentives for production of more programming. The FCC's theory is well-founded, although it has misapplied it in this case. It used to be the case that territorial exclusivity and other restrictions between manufacturers and their distributors and retailers were generally viewed as anticompetitive as they restrained competition among distributors of the same product.

Formerly unlawful

Indeed, not too long ago such arrangements were held to be flatly unlawful under the antitrust laws. But economists (and courts) now generally agree that manufacturers usually will not choose to grant territorial exclusivity to distributors (and, therefore, to raise the retail price and limit the availability of their product) unless there are countervailing efficiencies and benefits that will make their product more competitive and more attractive to consumers.

For example, the costs of distribution may be significantly lowered if there is only one retailer in each market. In addition, a retailer who has exclusive local distribution rights may be willing and able to spend more time and money promoting the product in a manner that ultimately attracts more buyers. Although there are exceptions, exclusivity arrangements generally are designed not to create a monopoly that results in fewer sales at higher prices but to enhance competition in a manner that increases sales.

Distribution of syndicated broadcast programming may, however, be one of the few exceptions to this rule. With respect to most manufactured goods, even if there is only one distributor of a product in a community, customers can still purchase as many items as they want whenever they want. But syndicated exclusivity restricts the number of times that a viewer may watch different episodes of a program and it limits the time periods during which the program is available.

Territorial fights

Nevertheless, the economic theories recognized and relied upon by the FCC are critically important to the cable industry, which has its own interest in establishing the legitimacy of exclusivity arrangements. Those who compete with cable franchisees in the distribution of video programming—SMATV and MMDS operators and distributors of programming to TVRO owners, for example—argue that they should be entitled to distribute cable program services and that cable operators should not be allowed to maintain exclusive territorial rights.

What the theory adopted by the FCC suggests, however, is that if a programmer chooses to make the cable operator its exclusive local distributor, this is probably because granting such exclusivity is the most efficient manner of competing effectively with other programmers. Unlike the case of syndicated programming, which appears at different times with different episodes on different broadcast stations, cable network programming is satellite-delivered and generally, appears simultaneously whether it is distributed by cable, DBS, MMDS or any other retailer. So, cable exclusivity agreements do not generally reduce the number of times or restrict the time periods when a program is available.

In sum, the economic rationale relied upon by the FCC ironically are more applicable to cable network exclusivity agreements than to syndicated exclusivity. That rationale suggests that exclusivity agreements in the sale of cable network programming are likely to be efficient and procompetitive. But requiring cable operators to delete syndicated programming on distant signals produces no such benefits and will only hurt consumers. ■

By Michael Schooler, Deputy General Counsel, NCTA

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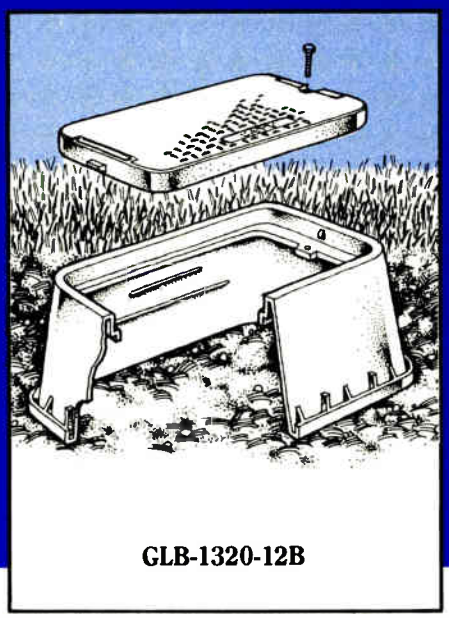

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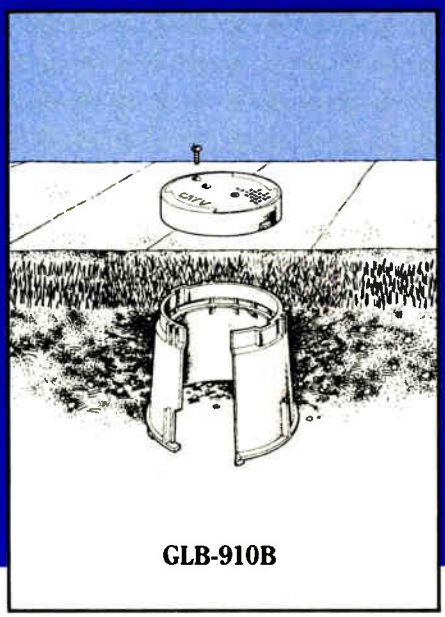

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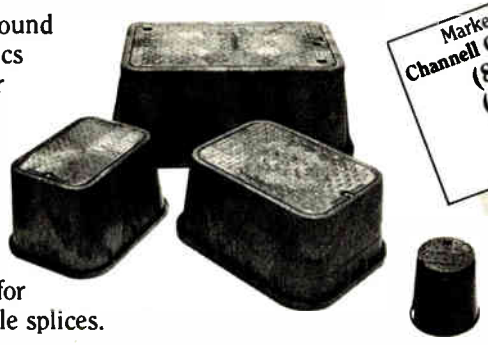

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Reader Service Number 16

Let's rethink residential wiring!

The majority of the CATV plant in the U.S. is in trouble. Real trouble. Expensive trouble.

How can this be? What's wrong with all that gleaming aluminum sheathed cable, securely lashed to its steel strand or lying snugly in deep trenches or conduits? What's the problem with all those shiny new amplifiers with their increased channel capacity, switching power supplies and reliable hybrid broadband amplifier modules? That's not where the problem is. No, our problems are in our drops and in the wiring inside the homes.

This RG-6 or RG-59 cabling represents more than half of our total system mileage, as well as an enormous majority of our connectors and passive RF devices (transformers, splitters, etc.). Depending upon the type and the reliability of the converters a system is using, subscriber wiring is our largest single cause of service calls.

This is not to say there aren't installations where every F-connector has been meticulously prepared and crimped to just the right extent; been weatherproofed and fastened down with clips; is neatly run parallel to the telephone drop and dressed along the baseboard to the television set. No, there are drops like that—just not enough of them.

By Jim Chiddix, Sr. Vice President, Technology and Engineering, ATC

Horror stories abound

The industry has always talked a lot about training installers in proper procedures and in making a good impression on the customer. Yet horror stories abound (just ask your service technicians!) of drops snaked through hedges and lying on top of sidewalks; loose, leaking F-connectors without proper weatherproofing or drip loops; of sloppy snarls of RG-59 stuffed behind television sets; and rude or scary-looking installers.

Why is it that our installers still manage to perform work that generates between one-third and one-half of our service calls? Why, in spite of all the customer contact courses, training programs and installation manuals, do these employees cost us untold millions of extra dollars and truckloads of ill will?

Every technical supervisor in the cable industry knows the answers to these questions. We are a cash-flow driven business, and that means there is great focus on short-term financial results: get lots of installs done and keep headcount and expenses low. Hire contract installers on a piece-work basis and avoid extra benefits and overhead. Make it through this week's workload; worry about next week later.

We all sense that if we hired more selectively, had an in-house installation work force with the time to get jobs done right, overseen by supervisors with the time and motivation to *supervise* instead of doing overflow or difficult installs, that we could lick many of these problems.

What's to be done? Certainly we should provide better supervision and training. Certainly we should take a very hard look at the true cost of using installation labor, with its fundamental economic motivation toward the quick-and-dirty. We should examine closely the option of having an in-house installation work force that can do things right the first time and save us substantial amounts of money. We should take the time to train our installers so that they can prepare a perfect F-connector blindfolded.

Immediate benefits

Turnover would drop as installers began to regard themselves, and be regarded, as essential craftsmen rather than bottom-of-the-heap laborers. And our customers would be much, much happier.

Many of these changes are simple in concept but relatively difficult in implementation. But there are some ways that we could make them easier. We should try to learn some lessons from the residential wiring strategy adopted by the telephone operating companies. They adopted a simple but reliable wall-plate and connector system, and gradually wired the rooms in our homes with it. They made sure that installations were done right, with good materials, clear procedures which were universal across their industry, and specially designed tools which minimize the craft-intensity of the job.

After a while the wall-plate system reached critical mass. It is significant that today we almost never see a telephone employee inside our homes. We buy our own phones and pick up extension cords at Radio Shack. We are free to do what we will to the inside wiring in our home, as long as we are willing to maintain it or pay the telephone company to maintain it for us.

Can it be done?

How much of this strategy can we emulate? It may be that we need a connector which is not an F-connector at all; which does not use the copper-coated center conductor as its primary signal contact under gentle spring pressure, and which is so foolproof to install that the homeowner could do it.

The Europeans have such an RF connector. It comes in male and female cable-mounted versions, to make back-of-the-set and VCR wiring more foolproof. It provides a positive seizure on both the center conductor and shield of the RG-59 type cable which is used, and comes with its own cable preparation tools and even a plastic torque wrench for tightening the back nut. While it is suspect in terms of the kind of RF shielding which the CATV industry in the U.S. needs, it does provide a lesson. It required planning and forethought, but has made RF wall-plates and wiring in Europe nearly as simple as RJ-11 jacks are in the telephone industry in the U.S.

The prescription is simple, the challenge of implementation is enormous, but the rewards to our customers and our business from such an undertaking is absolutely critical if we are to continue to run healthy businesses in a competitive age. ■

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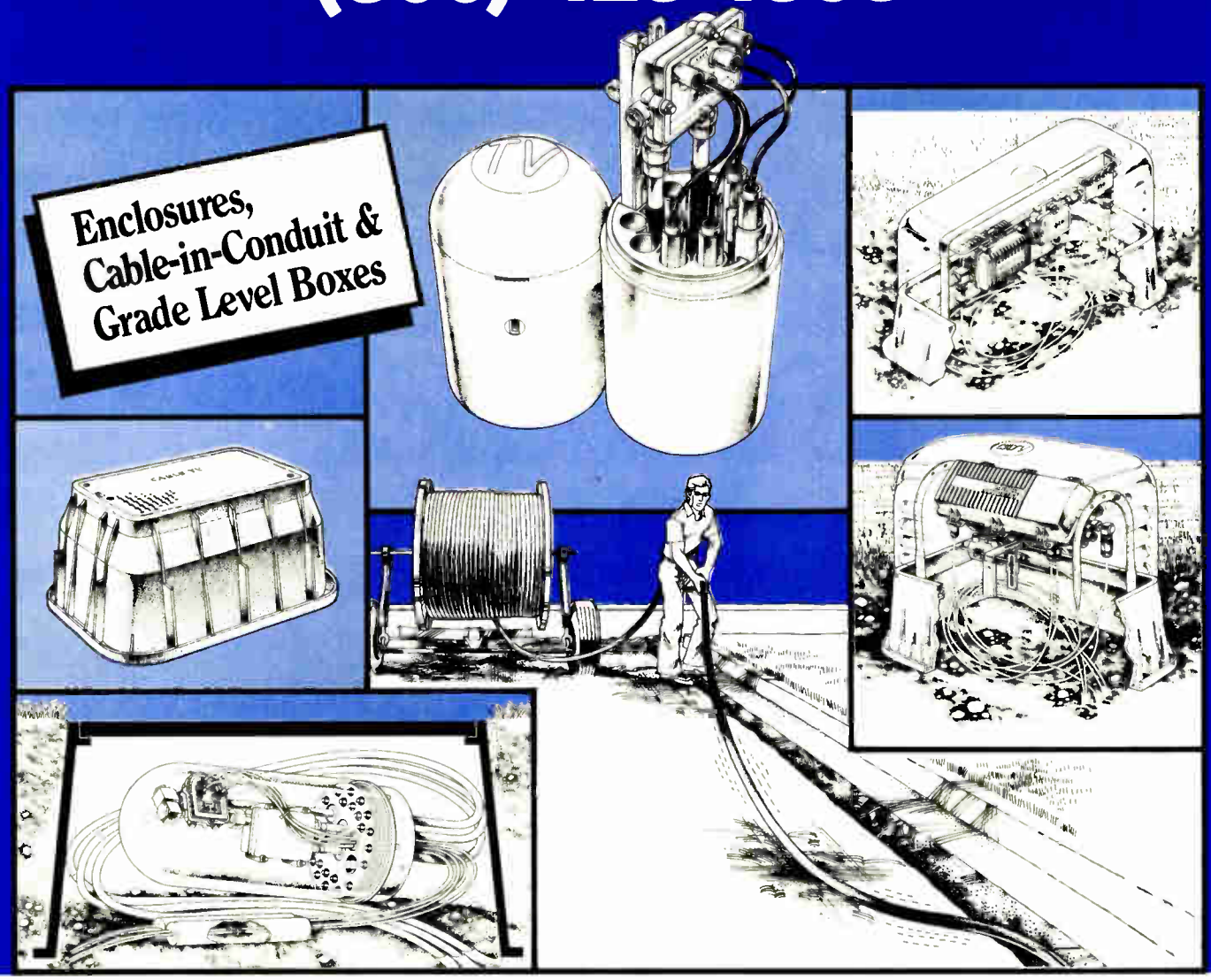

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Reader Service Number 17

Offense taken to story on agile reliability

I have just finished reading an article from your July issue ("Agile modulator reliability," p.58) and could not believe what you printed.

Gary, just what is your magazine doing? I read this piece and feel that we at ISS Engineering have been deliberately and maliciously libeled as well as a majority of the manufacturers of agile products. There are too many definitive and blatantly untrue statements made as a supposed "fact." While I cannot blame Basil Peters for trying to sell his product, this "article" was not even a thinly veiled attempt at seriousness, but an outrageous four-page sales pitch which was laden with untrue "facts" and misrepresentations of fact and statistics. Your book has printed many truly fine articles by manufacturers which were written to provide a fair and unbiased approach to the subject. What happened here?

List of problems

I will provide a few points randomly in which I have grave feelings over, but will not and cannot go into greater detail or I would be reworking the entire article.

- Manufacture of the ISS Engineering product line is done both here and in Japan, by HIGHLY SKILLED individuals. A quick check of the real economic cost vs. value of Japanese High Tech electronics manufacturing would illustrate the "low labor costs" and "low level product specific training" does not apply here.
- Inaccurate comparison of products and features. The article does not state that ALL units tested met the same performance criteria as stated by the manufacturer. If an agile modulator was expected to provide 60 dB output at 433.25 MHz and had dual IF loops it would have a greater power dissipation than a single channel, Ch. 13, 35 dB output with no circuitry for IF or other STANDARD features in CATV. Were all units within the same stated operating and output characteristics or are we comparing apples and oranges?
- As far as power consumption goes, who *really* cares about statistical analysis? If a major metro system suffers damage which knocks out two premium channels serving 10,000 subscribers @ $9.95 a channel, the four-week lead time for fixed replacements could cost $199,000...(and that's making the assumption that four weeks is the longest delay for fixed channel). That's a lot of Kilowatt hours you would need to offset the dollar losses at that order of magnitude. Or like our customer in the Northwest who lost his entire headend in an unfortunate mishap, the ability to be back in operation using agility in less than 48 hours meant far more than an average power consumption difference of 17 watts when a KWH is from 10 to 14 pennies.
- MIL-217...A fine example of "specsmanship and gross assumption." If the logic here were to be followed, do not go to sleep tonight...the early warning system, the missile guidance system and defense electronics systems have too damn many parts to work properly...just check MIL-217 and find out! MIL-217 does have a valid place in the design and production of electronics as far as reliability prediction, but in presenting it in such a way as to allow an individual to make untrue assumptions is a far cry from the intended purpose of this spec.
- Figure 2 and failure *rate vs. temperature*. This is an excellent graph. However, if you look at *only* the lower furthermost left portion, you will find the realm of reality. I know of no manufacturer who specs the upper operating range of temperature over 50 degrees C. So by isolating only the relevant part of the graph, the REAL area of concern reflects a change of Relative Failure Rate of *LESS THAN 0.5!* This chart also assumes that an engineer would allow his headend operation continuously in temperatures in excess of 113 degrees F. I cannot speak for other manufacturers, but ISS Engineering builds its products to be used by cable television engineers in systems which adhere to accepted heating/cooling methods. The figures shown in that graph would be more appropriate to the inside of a pizza oven than a CATV headend. The 131-degree to 167-degree range adds a new meaning and dimension to Basil's comment on "cook"ing satellite receivers.

Incongruous stance

In conclusion, by way of publishing this as an article rather than a PAID advertisement (the way ISS PAID for our last advertorial), you have endorsed its content as true and correct and a reflection of International Thomson's backing of the content. It seems incongruous that one month you will accept $1,500 for my advertorial and follow up with free space to totally contradict and damage the content and effort of what I paid to advertise. You further used my advertorial as a tool for your sales staff to promote to other manufacturers the concept of advertising in your book.

I am challenging the content and the broad and sweeping statements such as "lower picture quality and higher maintenance costs" from agile modulators and "agile modulators should never be used exclusively to build a complete headend" as inflammatory and unfounded. You have insulted ISS Engineering, other manufacturers and taken a potshot at the intelligence of thousands of operators (your readers) from the largest MSOs to the smallest system operators who are utilizing agility as a primary item in their headend. In publishing that article, I feel that you have caused a potential for all manufacturers of agility to suffer a loss of income as well as other damages.

Rebuttal opportunity

I feel that a publication which has a strong sense of responsibility to its advertisers, subscribers and a commitment to the industry it serves would be highly motivated to retract in full in a prominent position in the magazine, to allow an equal number of column inches in the same position to rebut this material and present a more accurate reflection of agility as it exists in today's market and technological state. If you opt to let this matter stand, I am requesting complete verification of the testing methods used, complete protocols, equipment utilized and tested as well as true and correct copies of all results of these tests. I sincerely hope to hear from you on this matter. Until such time as we can set the record straight on agility in the headend, I am requesting ISS Engineering cease all space purchases in *CED* and urging my associates at other manufacturing firms who are involved in agility to do the same.

John Coiro, VP sales
ISS Engineering

For CED's response to Mr. Coiro's letter, please see this month's "In Perspective" on page 8.—Ed.

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Reader Service Number 18

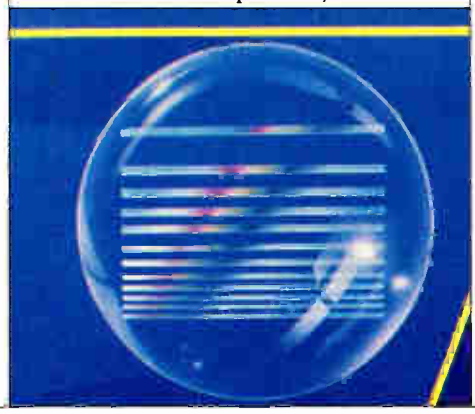
Media Lab puts Jerrold at forefront of R&D

Operators feeling the hot breath of competition down their necks can breathe a bit easier now. General Instrument's Jerrold Division is preparing to meet—and beat—all comers with a bold, visionary strategy aimed at keeping CATV number one as the market undergoes turbulent change. What's new here is a fundamental rethinking of where the business is headed, where competitive threats may arise, and what products and services must be developed to meet the demands of a marketplace radically different than anything the industry has faced before.

What Jerrold sees are the first faint cracks in the dam that has separated CATV from the telephone companies, CATV from broadcast, consumer electronics from the utility business, cable as a network business from cable as an entertainment business.

Although Jerrold does not profess to know precisely what will happen when the dam breaks, it is certain the ensuing flood will wash away the foundations of the business as it exists today. Will there be only one wire into American homes, providing voice, video and data services? Jerrold isn't sure. But it is convinced that whomever the players are—CATV or telco or both—the pipe or pipes will be broadband.

Jerrold assumes that telcos increasingly will be freed from regulatory restraints keeping them out of CATV. Jerrold also assumes CATV will have equal rights to pursue the data-to-the-home and voice-to-the-home markets. So it's a new game with new rules. To brace for the competition, Jerrold is taking an audacious new stance.



Jerrold's Media Lab

If we understand Jerrold's position correctly, an industry grown gun-shy of technical innovations may be vastly underestimating the value of the broadband pipelines it already has in place. To put it bluntly, the cable TV industry may be in possession of a technology that begs further application.

A Gordian knot? Not for Jerrold.

The Gordian knot was tied by Gordius, king of Phrygia. He decreed that whoever could untie the knot would be the future ruler of Asia. To solve a problem insoluble in its own terms, one sometimes must innovate. So Alexander the Great unsheathed his sword and cut the knot cleanly.

Saber in hand, Jerrold plans a similar innovative attack. Consider the planned thrust of Jerrold's research and development efforts, for example. In years past, Jerrold has focused on technical research aimed at improving the performance of CATV plant and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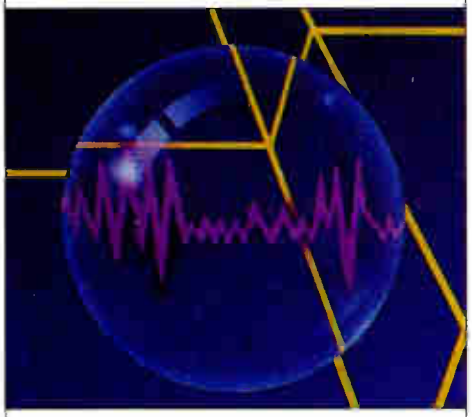
associated devices. No longer.

Technical prowess still is important. But for the first time, Jerrold is plowing significant corporate resources into long-term primary research aimed at subscribers. Why? Because the critical task in the years ahead is to marry technology with the applications consumers will pay for.

Inspired by MIT's futuristic $45 million Media Laboratory, Jerrold seems to believe, as does MIT Media Lab founder Nicholas Negroponte, that "all communications media and technologies are poised for redefinition." And like the MIT lab, Jerrold's Applied Media Lab expects to enlist the help of academics and CATV industry sources to investigate consumer reaction to and taste for new services CATV can deliver. Such as?

Impulse technology applied to many types of transactional services, including pay-per-view home shopping, interactive cable advertising and pay TV. But banking and financial services are other possibilities.

Advanced TV and data services are seen by the regional Bell Operating Companies (RBOCs) as prime revenue generators. Jerrold doesn't think the optimism can be ignored. Over the short term, Jerrold believes Super-VHS quality services are the best bet for generating immediate consumer acceptance and revenues. But long



term? High-definition TV likely will offer revenue-generating opportunities as well. The point, Jerrold argues, is that until the industry gets a better grip on what consumers want, it is not likely to make the right marketing choices.

Who's eating whose lunch?

Data services? Today, most operators probably are worried that any leasing of bandwidth to corporate users might lead to public utility commission regulation. And, to be sure, there have been public industry failures in this area.

But any full telling of the story would have to recount the intentionally underpublicized and lucrative bandwidth leasing agreements that many operators are quietly providing all over the country. By and large, switched voice isn't what operators are selling, nor is it what corporate customers expect.

But some astute operators have followed the explosive growth of corporate demand for T-1 (1.544 Mbps) trunk circuits used for bypass. And they've stepped in to offer such point-to-point links for individual customers. The RBOCs, you can bet, are quite well versed in the economic appeal of such links and have responded by restructuring the terms and rates available to users seeking T-1 service. In some cases they've even resorted to offering bypass services themselves.

Could the industry take a higher profile here? Jerrold wants to find out.

Far-fetched?

Telemetry, home electronics control

Continued on page 41

Common myths of agility

by John Coiro

There are many common myths about agility and its "limitations" in Cable TV applications. While many of these myths were true at one point in time, technology has taken agility beyond its earlier limitations.

Spurious beats. *"Agiles throw beats all over your system."* Development and implementation of better convertors and better alignment techniques have made "beats" an unheard of complaint at ISS. Of all QC reports for the last six months beats have not accounted for a single rejection.

Carrier to noise. *"You can't stack agiles without C/N eating your lunch."* True, it is a known fact that a broadband hybrid outputs a low level noise on the unmodulated bandwidth, and the summation of these "noises" will pull your C/N to an unacceptable level. However, rather than a) pretend the problem does not exist or b) go elsewhere and use an inflexible technology, we have opted to do something unheard of in the industry...work with the customer. If you are going deeper than four channels, ISS will provide at no cost the filtering necessary to exceed the NCTA spec of a C/N of 60 dB. In fact, this filtering allows C/N of better than 90 dB out-of-band. The C/N actually becomes unmeasurable on most test equipment found in CATV systems.

Why buy agile, my system lineup won't change. True, and pressure taps are good enough and 220 MHz is all the bandwidth needed for cable. Literally hundreds of firms and individuals are reaping fortunes in the sale of surplus equipment annually. This surplus is simply because system needs and lineups DO change. This change, sadly enough, occurs before a piece of equipment has lived its useful life. This only serves to increase the real cost of equipment.

Another key factor for both the customer and manufacturer is that the Cable TV version of Mr. Murphy's Law states that *"Regardless of the channel desired, there will be a six-week lead time before that item is manufactured and in stock."* With agility there is no need for a manufacturer to forecast what channels to build for the next production and any channel you might need is available with a simple selection of a dip switch. If someone needs a channel W and inadvertently orders a "WW" there is no panic, no restocking charge and no lead time. You simply retune, via a dip switch, from WW to W.

Stability, offsets, scramblers and the FCC. *"Brand X says that the only way to get required stability in hyperband is to buy special outputs and a comb generator"* or that *"Special charges apply for your offset requirement,"* or *"To get the offset you need, we offset the IF and your scramblers won't work."* We have been able to offer as a standard specification ±5 kHz stability from 2 through WW. But this is only a specification and not to be believed. In actual measurements in the field and in QC the ISS modulator averages ±3 kHz throughout the entire bandwidth. Offsets are a user selectable option with ISS. You can choose 0, plus, or minus in 12.5 and 25 kHz. In offsetting, you do not lose standard IF frequencies. The ISS modulator offsets via microprocessor control, not by shifting the IF frequency. In fact, ISS agile equipment meets all FCC requirements through 1990.

HRC, IRC or T channels. *"You just can't get agiles for these requirements."* Because of microprocessor control, all of these are available (even in the demodulator) with a whopping one-week lead time and $150 option charge.

Reliability. *"The technology is too new and they just won't work for more than a month."* In fact, the technology used for agility is not new; it has been proven in other markets but is now being applied to Cable TV. The reliability of ISS agile modulators allows us to stand behind them with a **full three-year warranty**.

Jerrold plans entry into fiber optic fray

Confident it will have orders, Jerrold will introduce a fiber optic trunking system as part of its product line at the Western Show in December and expects to ship product early in 1989. In a move with far-reaching implications, Jerrold has changed its mind about the economics of supertrunking as a market.

Until recently, Jerrold considered the supertrunk market a specialty application unsuited to the volume-manufacturing business that is the company mainstay. Previously content to let microwave or fiber vendors handle the business, Jerrold now believes a sizable market will soon exist for trunking applications using fiber optic cabling. Spurred by the increasing regional consolidation of cable systems and the increasing importance of local ad nets and fiber backbones, the company sees a new market where it can add value.

The shock waves will reverberate throughout the industry, fundamentally changing the nature of the market faced by microwave and fiber trunk vendors, upping the ante for competitors of the Hatboro juggernaut, and sending a message to potential competitors outside the industry that the sleeping CATV giant has shaken off its slumbers and now is prepared to defend its turf.

Jerrold plans to deliver an FM supertrunk system, followed by an AM backbone version when that technology improves. Rejecting a licensing approach, the company will build its own transmitters and package its own receivers so it can offer a full system that will integrate seamlessly into the company's existing coaxial product line.

Don't expect Jerrold to creep into this business. It fully intends to be the leading, or one of the leading players, in fiber distribution systems for CATV. As a byproduct, the company will redefine itself as a supplier of video transmission systems, not simply RF coaxial transmission systems.

With currently available technology a point-to-multipoint architecture working in broadcast mode makes most sense, says Applied Media Lab spokesman Dave Robinson. But the company also is investigating switched star architectures as well. The longest-term program has Jerrold working on extending fiber capability beyond the trunk/backbone network into the distribution system—perhaps to the line extender.

A general plan of attack calls for supertrunking systems using FM, followed by backbone products along the lines of the ATC and other hybrid models. At the same time, the company will push hard for products that get fiber closer to the customer. Ultimately, Jerrold believes it must develop fiber-to-the-home systems.

To give you some idea of the far-reaching vision Jerrold has adopted, consider that the company also is exploring digital modulation techniques in some form. Not that it makes immediate market sense. But things could change, and today's Jerrold is very much the visionary.

Reactions to the development were varied. Officials at Scientific-Atlanta, CATV's other full-line equipment manufacturer, said that company's own fiber optic strategy won't be affected by

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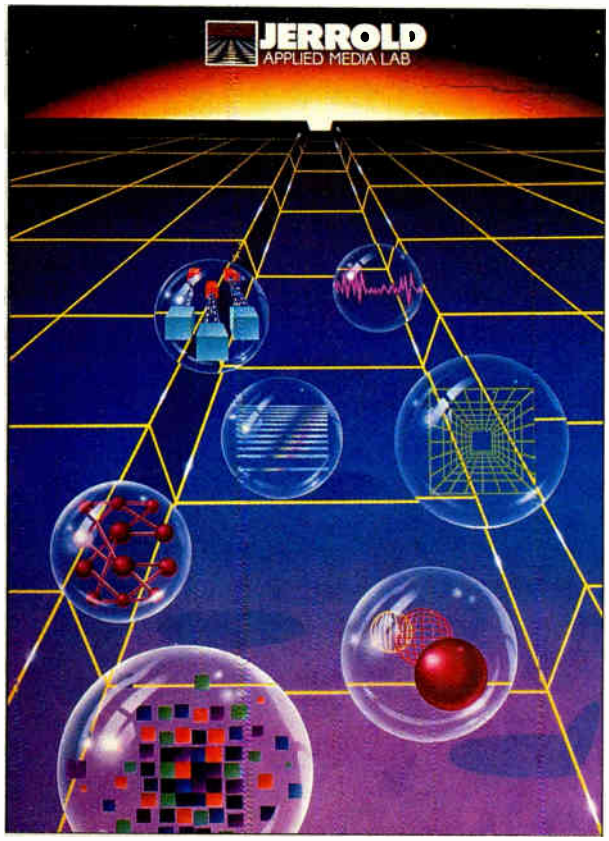

Jerrold's announcement.

In fact, David Fellows, director of marketing, said he believes the supertrunk market is just a tiny fraction of the hardware market. Fellows says S-A is developing a "core product" based on AM modulation and capable of carrying 42 channels per fiber at least 15 kilometers with at least 50 dB C/N. Fellows said the Atlanta-based supplier has a system that brings C/N "in the high 40s" now.

"We won't rush to make a product announcement" until proper field tests have been performed, said Fellows. Those tests are slated to begin starting within the next six to 12 months, he added. He also expects to exhibit S-A's latest fiber optic "product demonstration" at the Western Show.

On the other hand, John Holobinko, vice president of marketing and sales for American Lightwave Systems, which has its own FM supertrunking product, welcomed Jerrold into the fold.

"The fact that someone the size of Jerrold has thrown its hat into the ring legitimizes the market" and actually increases it, says Holobinko. Cable operators who are interested in fiber as an alternative will have more vendors from which to compare products and choose a solution to their supertrunking needs. Additionally, just the fact that Jerrold will have a fiber optic product line will force engineers to consider fiber for their CATV plants, Holobinko says.

Catel's President Jim Hood was caught off-guard by the development. Although his "whole game plan was predicated" on the concept that either Jerrold or Scientific-Atlanta or both would enter the market, he did not suspect that Jerrold was so far along in its research and development. "I'm surprised that they're so far along."

As for American Lightwave's thinking, Hood disagreed. "I don't consider (Jerrold's entry into the fiber optic equipment market) as good news," he says. Nevertheless, Catel will still be

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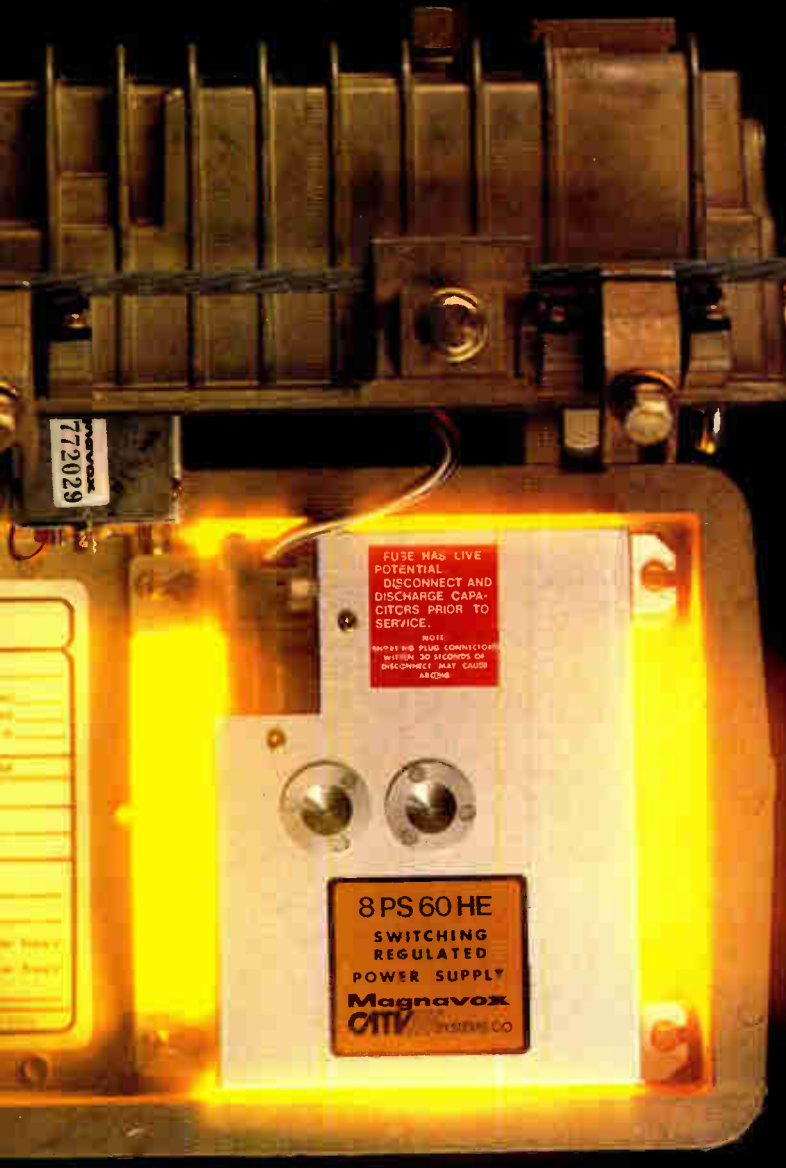

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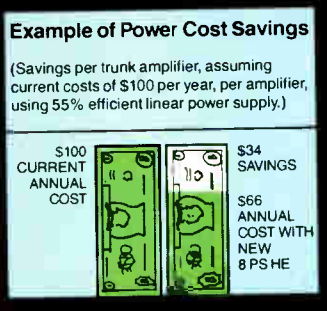

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there. "I'll just have to run harder and faster" to stay ahead and position the company as a leader, Hood adds.

Synchronous President Vince Borelli says his business won't be affected much because his company only builds headend equipment. "We're not in the distribution business, we've never been in it," he says. "We honestly believe that...the more fiber that gets purchased by cable TV operators, the more FM is going to be used, so our business goes up."

On the AML side, Hughes Microwave's AML Manager Abe Sonnenschein suggests that cable operators exercise caution when looking at fiber alternatives because FM solutions are expensive (especially for multiple hubs) and AM schemes don't deliver the improved performance CATV operators are seeking.

"Those kinds of products have been on the market for a long time," says Sonnenschein. "They have a certain niche in the marketplace, but they cannot be directly competitive against the usual AML application, where you go from a single point to a multiplicity of points. We're not losing much sleep over this."

—Gary Kim and Roger Brown

Continued from page 34

or home data services? Many rational businessmen believe money can be made providing such services. Among those rational businessmen are the leaders at Southern Bell. The aggressive telco recently estimated it could install and maintain fiber-to-the-home drops at an initial cost of about $2,280 per home. That would include remote equipment, transmission and switching facilities and terminal devices. Amortizing that investment at $58 a month, Bell South believes revenues totaling $59 a month could be realized from subscribers with a monthly package including, but not restricted to, the following services and rates:

- phone services $24
- videotext $10
- CATV $6
- home security $6
- energy management $4
- meter reading $1

Sound far-fetched? Bell South doesn't think so, and neither does Jerrold.

Visionary and practical

Audio services? Jerrold believes the industry can do for broadcast audio what it already has done for broadcast TV: fundamentally alter consumer expectations and behavior. Digital audio offering compact disc quality likely would play a part.

But activities at the Media Lab won't be confined to researching customer demand for these applications. Jerrold also believes it must work on practical methods for increasing headroom in existing plant. Fiber optics, advanced hybrids and rethinking system architectures are a few of the methods to be investigated.

To secure the much higher value of these potential new services, advanced scrambling techniques are required. Off-premises, cable-provided voice services and new uses for converters are other avenues Jerrold believes must be explored. Converters? You bet. "Originally, converters were just tuners," Lab spokesman Dave Robinson says. "Then addressing and signal security functions were added. But conceptually, there's no reason all these, or just these, have to be done in the box. Maybe the future converter is an integrated home terminal with many interface capabilities."

Humility helps

Like any good market researcher,

power supplies. The subtrunks utilize the conventional powering method. Figure 2 illustrates the lightly loaded standbys on supertrunk. With RF feeds to subtrunk only and with dedicated AC powering, the supertrunk becomes immune to feeder problems and is a very reliable trunk run through the franchise area.

Independent powering

The last method of powering is independent powering for trunk and feeder within the entire system or at least on the main trunk arteries.

As systems are upgraded or rebuilt, the use of feedforward trunks and parallel hybrid feeder electronics has become commonplace. Having additional stages of push-pull amplifiers, these new amplifiers conserve more power.

Figure 3 illustrates this by showing the percentage increase in current they require over conventional push-pull electronics. Independent powering is accomplished by utilizing lightly loaded standby power supplies for the trunk stations and nonstandby conventional pole mounted power supplies for the feeder or small dead-end sections of subtrunking. The dead-end and feeder sections do not require standby because the power outage will most likely affect the subscribers' TVs as well. As with supertrunking, this method improves reliability by isolating feeder problems and by reducing the quantity of standbys and associated battery maintenance.

All three methods have certain advantages and disadvantages and can be utilized within the same system. Operators need to be aware that there are multiple options to the powering scheme. ■

FIGURE 3

Electronics comparison
% of AC current increase

1. Trunk with Bridger (as Compared to Push-Pull Electronics)	
High Gain Push-Pull Trunk with Parallel-Hybrid Bridger	15%
Parallel-Hybrid Trunk with Parallel-Hybrid Bridger	43%
Feedforward Trunk with Push-Pull Bridger	33%
Feedforward Trunk with Parallel-Hybrid Bridger	54%
Feedforward Trunk with Feedforward Bridger	77%
2. Line-Extender (as Compared to Push-Pull Electronics)	
Parallel-Hybrid Line Extender	41%
Feedforward Line Extender	63%

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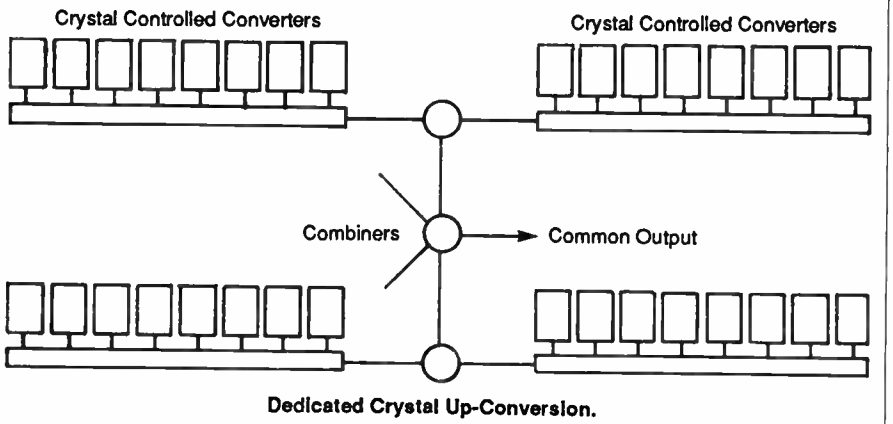
GENERAL INSTRUMENT

Headend processing: why frequency agility?

FIGURE 1



Dedicated Crystal Up-Conversion.

Two different design concepts for new headend construction or channel addition are available today: non-modular (no front panel modules) frequency agile up-conversion (FAC); and front panel modular, dedicated crystal up-conversion (DCC).

This article contrasts the two concepts and their impacts on the operation of a cable system in areas such as carrier-to-noise ratio, flexibility, reliability, frequency stability, phase noise and price.

Carrier-to-noise ratio

The impact of carrier-to-noise ratio is one of the more prevalent concerns faced by an operator constructing a frequency agile headend. The dedicated crystal design employs single channel filtering within the up-converter, hence noise output is limited to the filter band-pass (or carrier-to-6 MHz of noise). The frequency agile concept, Jerrold's Commander 5 for example, has only a 550 MHz low-pass filter at the output to permit any channel generation from 2 to 86. Thus, the noise bandwidth would be 500 MHz when viewing the output of the device. In combining the frequency agile devices, the combining network will add the broadband noise on all channels on a 10 log basis. Therefore, filtering will be required in the combining network for the FAC design concept.

Present outboard filters would be eight channels wide to limit the noise floor rise. These block filters still support the sequential channel schemes used by most operators. (If non-sequential combining is favored, small individual channel filters may be employed. The individual channel filters would also give the same C/N as a DCC device.)

At this point some operators would be alarmed, fearing noisy subscriber pictures. However, it is important to put the contribution of headend C/N in perspective. The following calculations show system C/N for headends using dedicated crystal up-conversion of frequency agile up-conversion:

Given:
C/N_D = C/N ratio DCC = 65 dBc
C/N_A = C/N ratio FAC = 65 dBc
C/N_T = C/N ratio trunk
= 59.2 + IL − NF + 10 log N

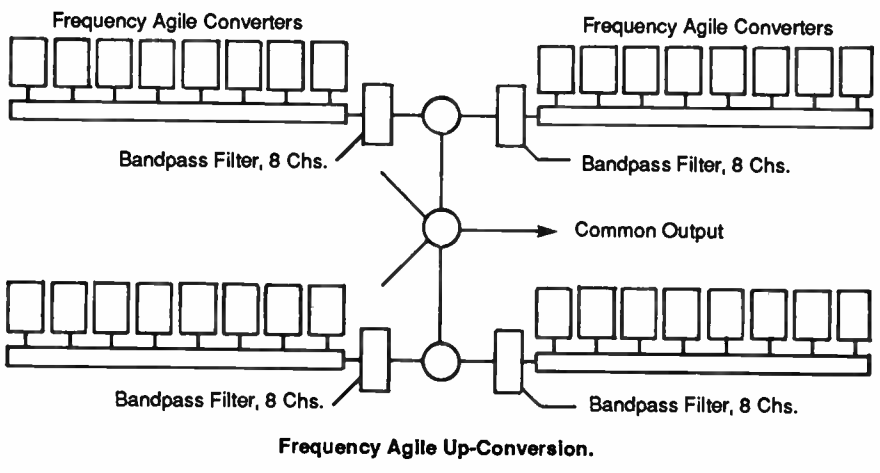
Where:
IL = input level
NF = noise figure
N = # of trunk amps in cascade

If IL = NF and N = 20
Then C/N_T = 59.2 − 10 log 20
C/N_T = 46.19 dBc
C/N total = C/N_T + C/N_D
(46.19) (65)
C/N total = 46.13 dBc
For 8 FAC channels
C/N_{8A} = C/N_A − 10 log 8
C/N_{8A} = 65 − 9.03
C/N = 55.97
C/N total = C/N + C/N
(46.19) (55.97)
C/N total = 45.76 dBc.

The net difference between the two concepts shows a 0.37 dB degradation for the eight-channel filter system. This change falls well within the accuracy of most test equipment and is considered negligible.

In reality, the degradation is not even that great since the out-of-band noise floor (the band-pass beyond the first conversion band-pass filter, see

FIGURE 2



Frequency Agile Up-Conversion.

By Bill Beck, Applications Engineer, Jerrold Division of General Instrument

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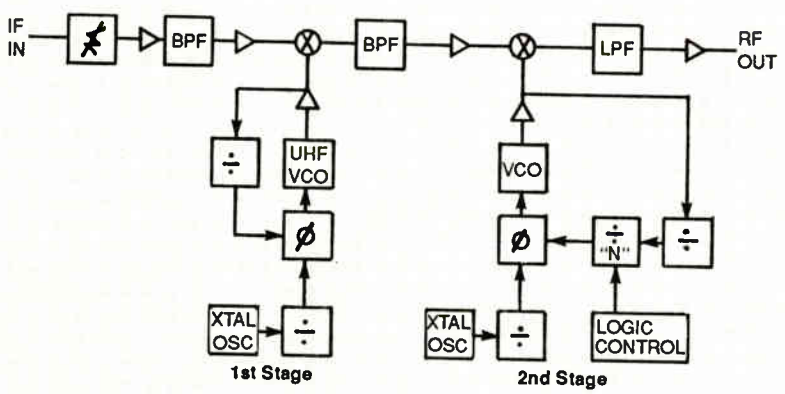
Figure 3) may be lower by 3 dB to 5 dB since we are not combining the full 500 MHz noise bandwidth of the first conversion stage.

FIGURE 3



Frequency Agile Conversion.

Flexibility

The first reaction to the previous combining network is that the ability to preserve C/N agility, and therefore flexibility, has been lost. It was never considered that an operator would change his modulator and processor outputs on a daily, weekly or even yearly basis. The subscriber disruption alone would negate such activity.

The flexibility of a frequency agile device is the breathing room it can allow an operator or engineer. For instance, taking a modulator from one headend to another, setting the channel carrier after all the managers and marketing people have made their final decision, or even complying with an FCC-mandated channel move are all made inestimably easier with frequency agility.

In contrast, the DCC concept offers flexibility with the modularity of its design. Once the basket or chassis has been installed in the rack, flexibility is possible by swapping output modules for channel changes. When performing the change, the network filtering is removed with the module. This provides the DCC concept with its greatest advantage, since any channel may now be employed because the combining network is not frequency limited. All the operator needs is the correct channel in-hand. This is probably the DCC's biggest drawback, because the operator must stock or order the up-converter and accept the penalty in time or stocking cost.

Maintenance, repair and spares

Again, it is necessary to compare the two concepts. In the DCC design, on-line repair is accomplished by module swapping. Since the design of the modulator was a similar construction up to the output drawer, one spare chassis or basket can be successfully used as a spare for the entire headend modulator population. If we include the output channel module, the operator can support his maintenance effort by stocking all the up-converters or by

having one FAC-type device.

In the past there has been some prejudice about FAC design because some FAC products sacrificed performance for agility. Performance degradation was evident in poor C/N ratios (50 dBc) or spurious beats in the entire pass-band or even low output levels.

In recent years, however, FAC technology has made significant gains to the point where C/N ratios of 65 dBc and spurious beat performance of 60 dBc for +58 dBmV output are easily attainable. With performance which is comparable to the standards set by the DCC design, the convenience of on-line repair and spare stocking deserve additional consideration.

Although the filtering for noise limitation is in the combining network, the FAC concept can be considered as 30 or 40 like devices (the population of modulators or processors in the headend) instead of 30 or 40 unique devices. One FAC modulator can fully support any other by treating the entire basket as a module. If a failure does occur, the FAC device can be completely removed from the rack and replaced with an identical spare. Spare stocking means less capital investment with no change in picture performance.

It is arguable which concept can be troubleshot faster. Finding a failed module in the DCC design versus exchanging the complete basket in the FAC design would depend upon technician capability, available physical space in the headend and the nature of the failure.

Reliability

Reliability has been the subject of considerable discussion of late.

Figures 3 and 4 show simplified block diagrams of FAC and DCC designs, respectively. In comparison, what is immediately apparent is that FAC goes through two conversion states, adding complexity, components and power consumption. The dual conversion eliminates any image, harmonics or spurious beats which may otherwise fall within the band-of-interest and allows a wide tuning range. It would be easy, therefore, to raise the objection that doubled components would double the number of things that could go wrong and the heat dissipation from the increased power would diminish the reliability.

To counter these objections, a manufacturer can cite accelerated life testing. For example, in concurrent timeframes, samples of Commander 5 were tested at 75°C for 2,000 hours to yield an uninterrupted service life of five years. Extended time in the field for a large population of devices, however, remains the best test of reliability. Since high performance FAC products are relatively new, no measure of this form is available.

Design simplicity for the upconverter certainly has an advantage with DCC, however, an extensive wiring harness and a great many push-to-fit connections are required to implement DCC modularity. In our own product lines, the FAC design reduced the number of interstage connections by 88 percent. This gives FAC design an edge in the elimination of intermittents, bent pins or RF level drops due to improper module seating in the basket or chassis.

Frequency stability

Assurance is needed that the conversion device will be compliant with the ±5 kHz specification for standard channel assignments stipulated by the FCC. At present, there are two trains of thought concerning the DCC design:

FIGURE 4

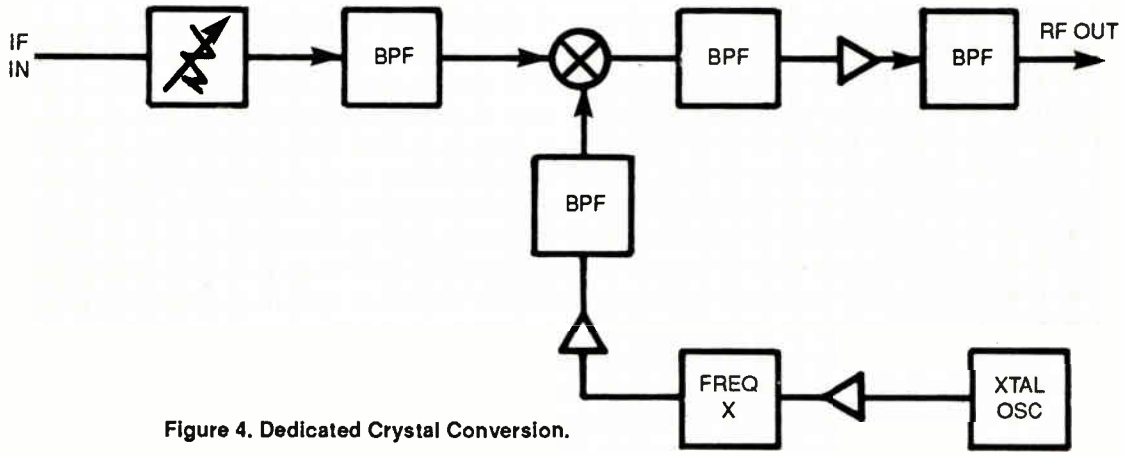
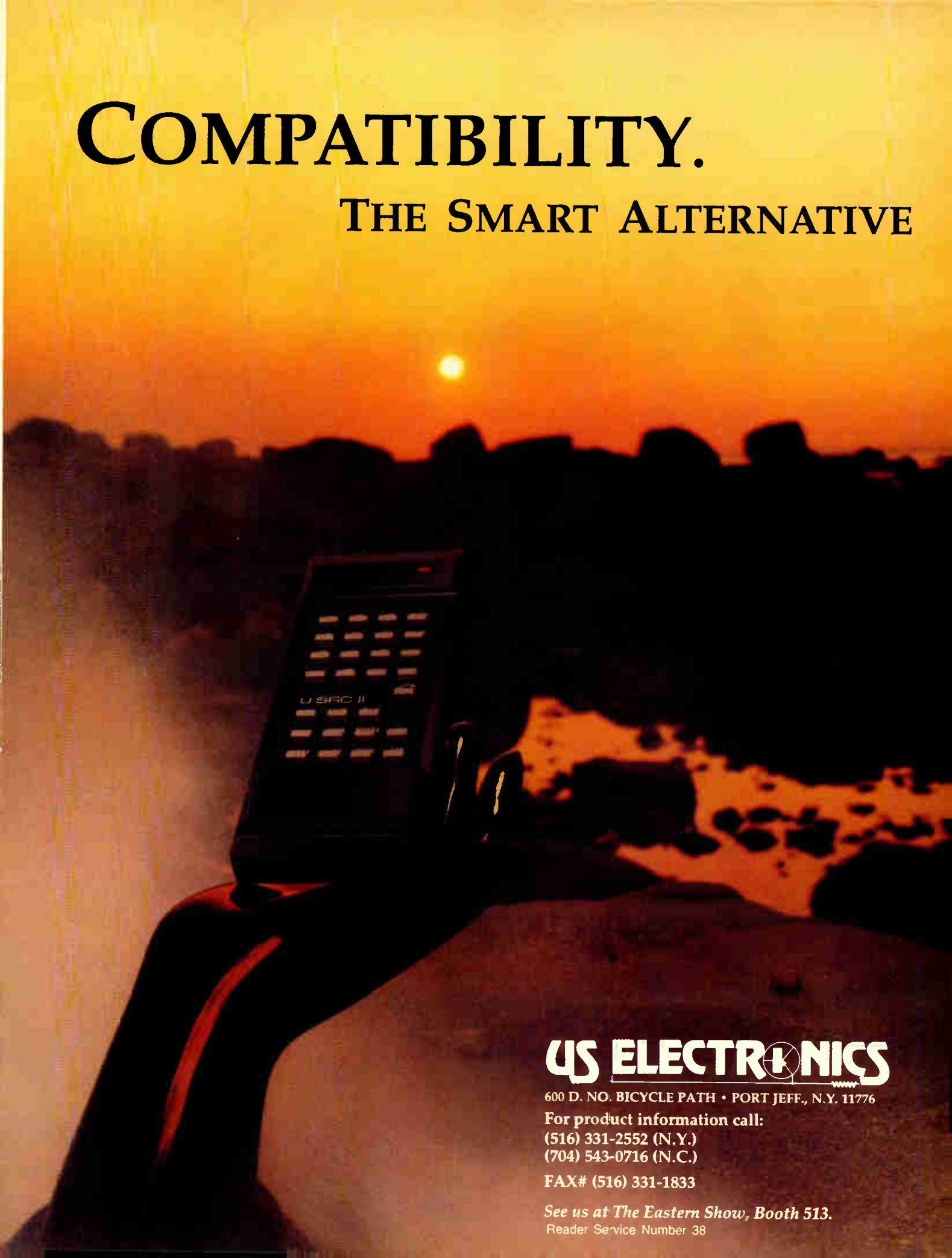


Figure 4. Dedicated Crystal Conversion.

that crystal technology can be compliant with the specification as long as the headend's temperature environment is relatively controlled (60° to 100° F) or that to be compliant within the FCC specification the subject channels must be phaselocked to a comb generator.

Using the first theory and employing the standard crystal specifications used in Jerrold's DCC design, the calculated stability of the highest picture channel frequency (397.2625 MHz) is as follows:

Given:
397.2625 MHz picture carrier.
Then the local oscillator must be 443.0125 MHz.
(L.O. – IF = Pix)
For a 10°C change, the corresponding percentage change in frequency would be 0.0003 percent. Hence,
443.0125 x 1.000003 = 443.013829
= 1.3 kHz.
When the step is made to FAC, a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corresponding improvement in crystal performance is also required. For example, crystals used as phaselocked loop references must have stabilities of ±1 ppm and ±2 ppm (first and second stage, respectively) for a temperature range of zero to 50°C.

1st L.O.
672.987520 MHz x 1 ppm = 674 Hz
2nd L.O.
1116 MHz x 2 ppm = 2232 Hz
2nd L.O. − (1st L.O. and IF) = Pix
Ideally:
1116 − (672.98752 + 45.75) = 397.26248 MHz
With errors:
1116.002232 − (672.988193 + 45.75) = 397.264039
Net Change = 1.539 kHz

Since both crystals are in the same environment, it is likely that their frequency deviations will travel together. Further, because the error created in the first stage is ultimately subtracted from the error of the second stage, the net error is very close to the DCC concept. (Actually, the higher performance crystals exceed the stability of DCC when viewing the increased temperature change.) Obviously, there are a number of components that can influence the stability of both concepts, but it should be noted that the improvement in crystal performance for FAC meets that of the DCC designs in use today.

Phase noise

Phase noise, often measured as residual FM, is the unwanted random variation of phase angle or frequency of a carrier. It usually appears as horizontally streaked noise in a TV picture.

Fundamentally, the phase noise of an oscillator is dependent upon the Q of the oscillation frequency determining resonator.

In crystal-controlled oscillators, the quartz resonator has such a high Q that the phase noise is usually negligible, in terms of television transmission requirements.

Frequency agile systems use varactor-tuned oscillators in which the frequency determining resonator is made up of conventional inductor and capacitor components. The resulting Q is necessarily lower than that of a crystal and the phase noise is higher. The phaselocked loops that control these VCOs can modify the spectrum or amplitude of the phase noise either adversely or beneficially, but the oscillator Q is the most important factor.

The 1984 NCTA paper, "Signal Purity Considerations for Frequency Synthesized Headend Equipment," by David L. Kelma, showed that a standard nyquist television demodulator would convert ±750 Hz RSM FM noise to −60 dBc AM noise. The acceptability of a modulator's phase noise can be judged from this.

By the way, this phase noise is nothing new. We have been phaselocking output converters to comb generators for HRC and IRC coherent carrier operation for many years.

Price

Complete headend pricing is the only fair way to compare the cost of FAC and DCC installation. For this comparison, the list pricing of Commander IV modulators (DCC type) will be compared to Commander 5 modulators (FAC).

The DCC-type modulators will usually have an increasing price structure which follows the frequency or band of frequencies for the up-converter. As the

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output channel is raised, the price goes concurrently higher. This structure is based on the order quantities and component costs of the different up-converters. Further, the production line must be attuned to the differences in alignment procedures and cannot be as productive as lines where every part is the same.

DCC pricing:
VHF output = $1,935
Mid + super-band output (14-36) = $2,130
Hyper-band output (37+) = $2,660

Examining the average cost per channel of a 52-channel headend, the allotted costs would be as follows.

12 VHF-band	$1,935 =	$23,220
23 Mid/super-band	$2,130 =	$48,990
17 Hyper-band	$2,660 =	$45,220
		$117,430
		52 channels
	Average Price	$2,258.27

For the FAC concept, the outboard or external filtering must be added into the cost so that the C/N performance can be maintained. Under this scheme, eight channel filters at the following prices are required.

4 @ $200
4 @ $225
$1,700
52 channels
$32.69

List price for the FAC modulator is $2,200, therefore the average price per channel becomes $2,232.69.

For those who do not follow a sequential channel scheme, individual channel filters (which do not require rack space) are available for $75. The average cost per channel then becomes $2,275.

It should be noted that FAC is price-competitive with DCC. If phaselocking is called for for FCC compliance, the cost of a $5,000 comb generator and phaselockable up-converter, as well as associated distribution network, would clearly push the average channel price in FAC's favor.

In conclusion, we have determined that when employing FAC, the passive noise limiting filters, which were historically part of the processing devices, have been moved from the unit to the combining network. This means the headend C/N ratio is prevented from significantly influencing the subscriber's picture quality. Further, even though the fixed filters are present, the originally intended flexibility of FAC is not lost. The operator may still select any output channel and flex his decision process as needed. The high quality FAC designs permit the units to become universal standbys or spares. This, by far, simplifies the spare stocking issues.

Though the FAC concept requires more complex circuitry, higher performance components and more power, the problems of intricate wiring harnesses and push-to-fit connections have been eliminated. At this point, reliability statements must be on hold until the test of time can provide proof.

With the implementation of higher reference crystal performance, FAC design can easily meet FCC-mandated stability. Phase noise can be a factor in the FAC design, however if it is held to a −60 dBc limit it becomes a non-issue with respect to picture quality.

This article has shown that the price of today's FAC designs make them cost-competitive with DCC design, whatever kind of filtering is deemed necessary.

So really, why not frequency agility? ■

minutes after the hour, as in MTV, or 29 and 59 minutes after the hour, as in Nashville Network. Since, for the satellite sports network, games can go on and on, the available spots for commercials are unscheduled. Any new system being designed for commercial insertion will have to be flexible enough to allow for changes in schedule.

Demands growing

It should be apparent by now that the demands on commercial insertion equipment design are indeed becoming great. So far only the criteria of inserting (switching) the advertisement on and off the network has been considered. Making the tapes containing the advertisement is also a problem to be considered since this is a labor-intensive procedure.

In the past, the ads were placed on a tape in the sequence of appearance on a network channel. The insertion switching equipment would, in essence, listen for the cue tone signaling to start the tape machine rolling, make the switch to make the ad appear on the TV channel, and when the stop cue tone arrives, switch back to the program.

Such a system indeed had flaws. Sometimes the stop tone did not arrive and the ad tape played through to the end and infuriated the subscribers waiting for the program to return, as well as the producers of the advertisements who paid to have their ads appear in their proper spot. A simple cure was to apply the stop cue tone on the tape upon completion of the ad, thus assuring there would be a tone at the true completion of the advertisement. The actual switching time was fast and on the so-called fly, which was used to try and maintain the switching vertical roll. Once vertical interval switching was introduced, a clean switch from program to ad to program source resulted. This simple system was known as Run of Schedule (ROS). The commercials were inserted on the required channel in sequence. See Figure 1.

Such a system indeed had flaws. Sometimes the stop tone did not arrive and the ad tape played through to the end.

This simple system required one tape machine per channel, which is really quite efficient. This type of equipment is still used today in many systems. The main drawback is that it is a tedious task to prepare the ad tapes with all ads arranged neatly in sequence.

Eliminating restrictions

A new design should not place much, if any, restriction on making the ad tapes with enough space between spots to allow for pre-roll time necessary for proper cueing. Many manfacturers offer features such as sequential random access of ads to partial random access to full random access. Full random access essentially means that any ad can appear on a network during any available break time. Such a system provides ads on a large number of

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ing high broadcast standards, preferably 20 MHz wide to cover any future HDTV requirement as well as stereo audio.

- Provide dual video and chroma paths within a commercial insertion controller to permit future Y/C transmission on the cable system.
- Use exact frame counting in the vertical interval to assure exact cueing and to reduce machine wear and tear.
- Use of load sharing to reroute around a defective tape player without the loss of a commercial spot, and with alarm to identify tape player failure.
- Simplifies the preparation of tapes containing commercial advertisements.
- Utilization of the vertical interval for commercial identification and for cueing to avoid loss of an audio track.
- Be able to utilize any new equipment containing the commercial ads, i.e., S-VHS tape and/or optical disk or mix of sources.
- Able to interface with any external billing system, i.e., talk computer language.
- Able to be configured for remote operation and large, multi-location networks.

This may seem like a tall order; however, at least one new system design complies. A system that embodies all of the above attributes with a personal computer as the control system brain is a good approach because it avoids certain constraints of EPROM programmed controllers and has the ability to run with user controlled programs.

Many system operators shy away from full spot random access operation.

VTR intensive

Many system operators shy away from full spot random access operation because of the capital outlay required to accommodate this technology. Indeed, a brief analysis of the availability of local insertion shows at least 16 networks with a 30-second spot total of 80 spots per hour, and a requirement for 43 tape players. Figure 2 shows the 16 services that have been analyzed with a time scale showing when those breaks occur.

A capital outlay in excess of $200,000 would be required to implement such a system for 16 networks with 43 tape players and associated racks, cabling, operational and billing computers.

The need for a more flexible system architecture is imperative to control system costs and maintenance problems. Many third-generation advertisement insertion systems still in use today can operate with two tape players per network, thus possibly reducing the number from 43 to 32. Clearly, this is a benefit. However, the advertisement spots have to be assembled in a fixed and unflexible semi-break random access format by the production people.

Flexibility is key

A state-of-the-art system has been designed for full spot random access operation with the flexibility to com-

FIGURE 2

Break Occurrence

	Break Length (Sec.)	No. of VTR	0	5	10	15	20	25	30	35	40	45	50	55	60	30-Sec. Spots Per Hr.
VH-1	60	2			X							X				4
MTV	60	2					X						X			4
Nash	60	2							X						X	4
Life	60	2						-----						-----		4
CNN-2	60	2							X						X	4
BET	60	2							X						X	4
CBN	60	2				X						X				4
Weather	60	2				X					X					4
Discovery	60	2							X						X	4
Country	60	2			X		X			X	X			X		10
Nickel	60/120 (N)	4												XX		4 day/ 8 night
CNN-1	60/120	4						X						XX		6
A&E	120	4	--	--	--	--	--	--	--	--	--	--	--	--	--	8
FNN	120	4						XX						XX		8
ESPN	60/90 (NFL)	3	--	--	--	--	--	--	--	--	--	--	--	--	--	4 (6 NFL)
USA	60/120 (N)	4	--	--	--	--	--	--	--	--	--	--	--	--	--	4 day/ 8 night
16		43														80 day/ 88 night (90 NFL)

REVENUE.

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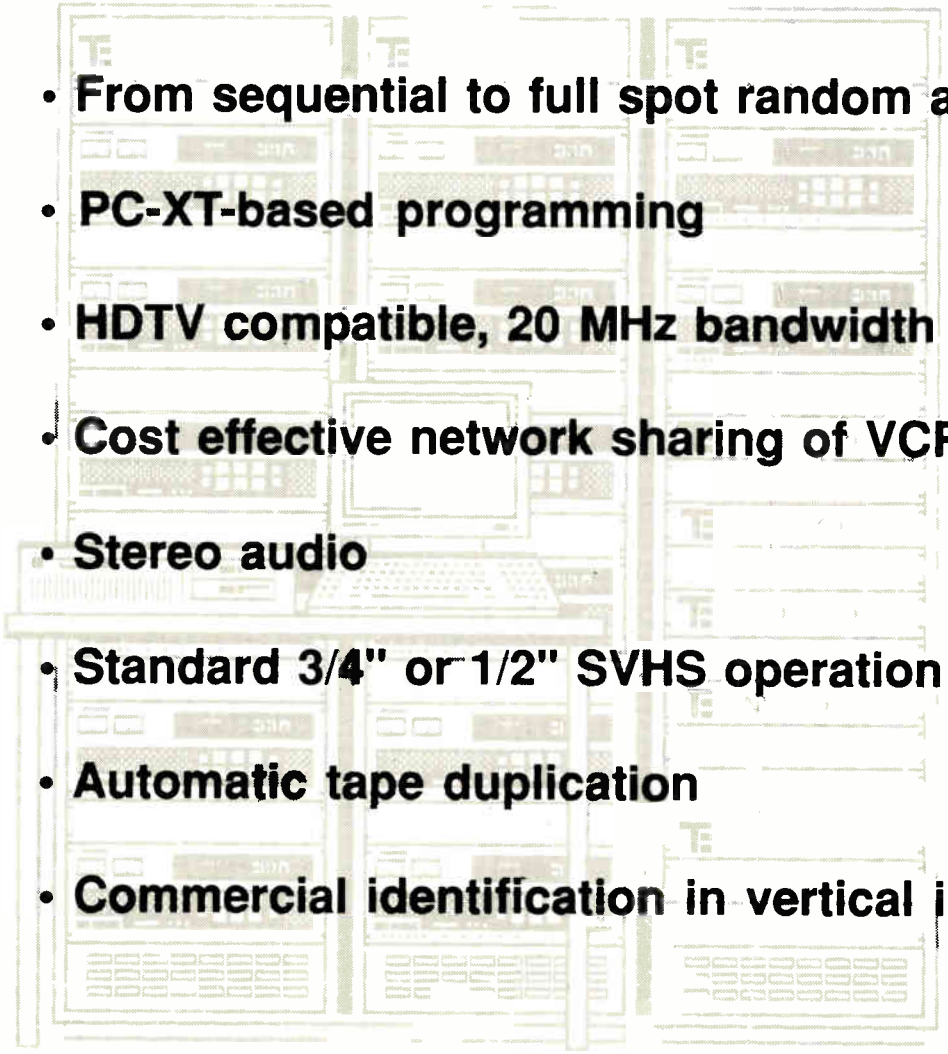

- **From sequential to full spot random access**
- **PC-XT-based programming**
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- **Standard 3/4" or 1/2" SVHS operation**
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- **Commercial identification in vertical interval**

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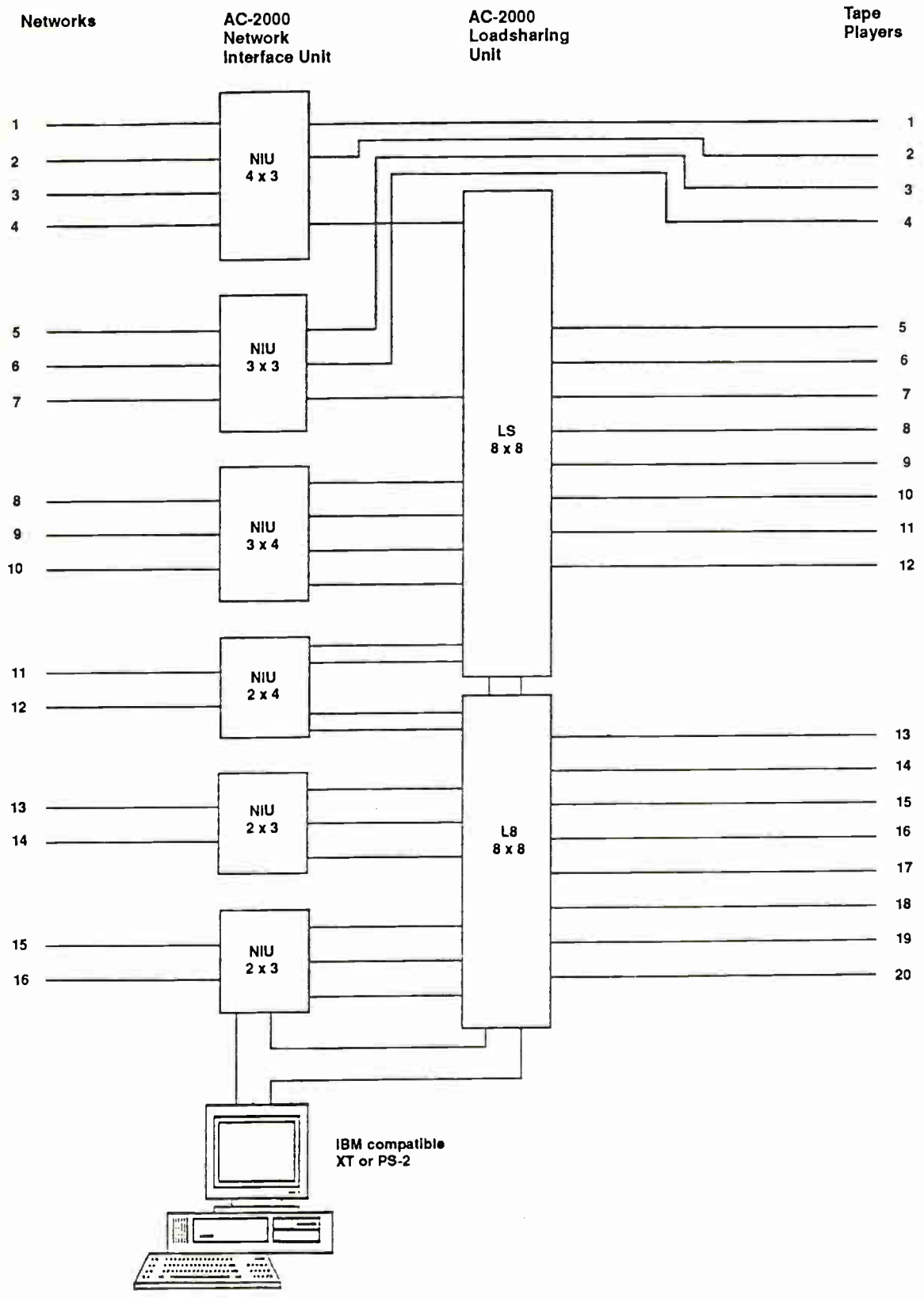
Reader Service Number 48

FIGURE 3


Networks
AC-2000 Network Interface Unit
AC-2000 Loadsharing Unit
Tape Players
1
2
3
4
NIU 4 x 3
5
6
7
NIU 3 x 3
LS 8 x 8
8
9
10
NIU 3 x 4
11
12
NIU 2 x 4
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NIU 2 x 3
L8 8 x 8
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NIU 2 x 3
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IBM compatible XT or PS-2

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Reader Service Number 49

bine multiple networks in one Network Interface Unit to conserve the staggering number of required tape players. In addition, this system design uses true frame counting, commercial identification in the vertical interval, is fully S-VHS compatible throughout with two video paths (Y/C), has a bandwidth of over 20 MHz to permit HDTV, and accommodates stereo audio commercials.

The flexibility of the system architecture permits the combining of non-interfering commercial breaks in the NIU by adding multiple network cards. As an example, VH-1, MTV, CNN-2, and Nickelodeon (daytime) can be combined in an NIU equipped with four network cards and provides full spot random access for these four networks with only two tape players. Another similarly economic system layout is the combination of the Weather Channel, CBN, and BET in a 3 x 2 NIU with only two tape players.

Networks with unscheduled break occurrences, such as ESPN, USA, A&E and Lifetime can be combined with fixed scheduled services such as CNN-1, Discovery, FNN, Nashville and Country Music in 2 x 4 or 3 x 4 NIU configurations followed by an 8 x 8 Load Sharing Unit to conserve and minimize the tape player population. As a result, an innovative system will provide full spot random access operation for 16 networks with 20 tape players in a three rack layout. Eighty spots per hour, or 1,920 spots per day, can be sold using the new system for up to 16 networks for a total capital outlay of well under $120,000.

The main control function is provided by a personal computer.

Eliminating obsolescence

Using an IBM compatible computer for programming, scheduling and billing, with the ability to utilize ¾-inch, S-VHS ½-inch players, or laser disks, and with features such as stereo audio, HDTV compatibility, frame counting and vertical interval tape identification, such a system outperforms older product and will likely be available for a long time without fear of obsolescence.

Even though it can be calculated that 1,920 spots per day can provide revenues of more than $1.4 million per year at only $2 per spot, one may not be in the position to pay the initial capital outlay. Should that be the case, then one could start with four, six, or eight networks and a minimum number of tape players, set up spot production and a sales force, and then add networks when the revenues are starting to flow. The new system has been designed for growth and can be upgraded at any time by adding network cards, VCR cards and load sharing.

Figure 3 indicates an overview block diagram of the system components required for a 16-network commercial insertion system. The units marked NIU 4 x 2 simply mean Network

Interface Units with four networks and two tape players. The units marked LS 8 x 8 mean Load Sharing Switch eight input by eight output HDTV video/stereo audio matrix switch.

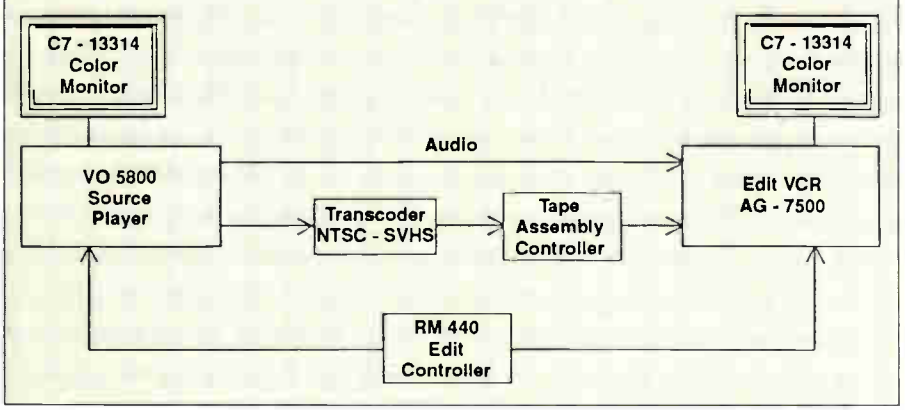
The accompanying diagram (Figure 4) illustrates a tape editing system with the Tape Assembly Controller shown. This unit is necessary so the commercial advertisement tapes are appropriately coded and identified.

The TAC signals mark taped ad spots in vertical interval for identification as to ad name, frame count, ad begin and ad end. Since the TAC system operates in the normal video vertical interval it can be used in any standard NTSC video/audio recording medium such as S-VHS and optical disk recording.

Under software control, extreme flexibility can be realized that will minimize the number of VCR machines and/or distribute the use. Thus, one particular machine will not be worn out by excessive use.

If remote use of the controlling computer is desired, i.e., the hub/headend is on a mountaintop, the advertisement insertion system can have an optional three-inch floppy disk drive installed that will record the logs and operate the system. Control from the computer located at the local office can be connected to the ad insertion system through, for example, an ordinary telephone modem. In this manner, large networks can be developed using only one central computer for program download and billing services.

FIGURE 4



The main control function is provided by a personal computer of the IBM compatible XT, AT, or PS-2 Model 30. The network interface units receive the DTMF cue tones or other designated signal signifying the beginning of a commercial advertisement. The computer, knowing the spot time, selects the appropriate tape machine and cues the advertisement. When the computer is signaled by the NIU that the start signal is received, the computer runs the tape. After the correct number of frames has been counted, indicating completion of the ad, the computer receives the end-of-ad signal from the NIU and logs the data.

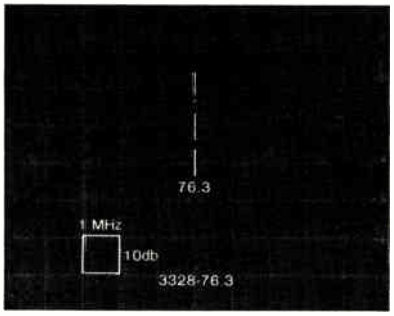
If presence of video is not detected or there is an error in frame count, the information is recorded by the computer as a defective ad. Also, selected tape machines may be dedicated to a single network channel or group of channels that a Run of Schedule (ROS) type of service is desired. Such a system can utilize a floating tape machine that can be shared on network channels containing few available ad breaks.

An S-VHS player with a maximum playing time of two hours, compared to one hour for 3/4-inch U-Matic systems, can provide twice as many advertisements. The shuttle time from end of tape to beginning of a ½-inch S-VHS tape player is identical to that of a ¾-inch U-Matic system. Therefore, commercial ad inventories can be doubled using S-VHS equipment. Other advantages of S-VHS are reduced costs of tape cassettes and editing equipment. Tape cassette storage of S-VHS tape is four times more space-saving than U-Matic. All these considerations are important to reduce the required capital outlay. Optical disk with its two-to five-second maximum access time looks like a good candidate for the library of advertisements as soon as the proposed costs become more competitive. The commercial insertion system will be equipped to handle disks whenever you decide to use them. ■

By Ernest Tunmann, President, and Eugene Bartlett, Product Designer, Tele-Engineering Corp.

Internal interference suppression

This time we look at interference generated within the CATV system and discuss how to apply filters to reduce it. We start at the antenna and "walk" down the system.

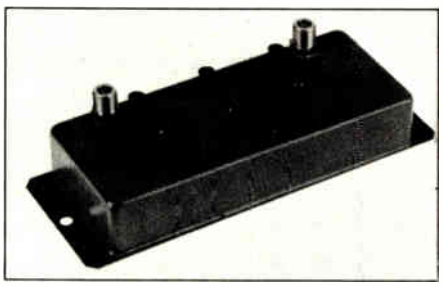


Narrowband BPF frequency response

Interference at the processor

Reception of even low level adjacent channel signals at the processor can translate into spurious outputs, even though their strength is not great enough to require preamp protection (See "Curing off-air interference from adjacent channels," *CED*, July 1988, p.72.) A selective bandpass filter installed between preamp and processor will suppress these and result in cleaner processor output. Aside from interference, this will usually result in better quality signals.

The noise figure of any receiving system is often improved by preselection. Some processors themselves generate some spurious outputs which may impact other channels: adjacents or further away. In this latter case, a bandpass filter installed immediately after the processor will prevent these spurious signals from reaching the common combiner.

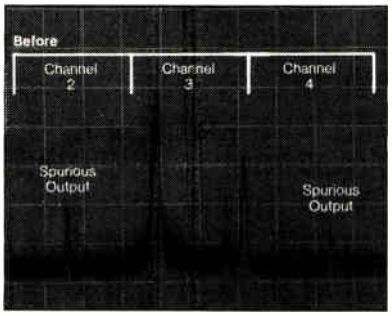


Narrowband bandpass filter

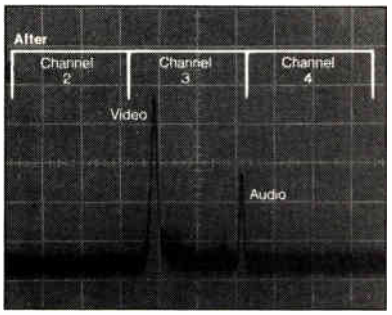
By Glyn Bostick, president, Microwave Filter Co., Inc.

RF modulator interference

Like processors, some RF modulators emit spurious (out of band) signals. Often the adjacent channels are affected when the modulator output is tapped onto the line to combine it with other channels. This interference can be suppressed by installing a bandpass filter between modulator output and line connection. If the problem is with adjacent channels, a very selective filter will be needed, one that suppresses the entire adjacent channel, beginning with the nearest principal carrier, video or sound.



Spectrum of channel 3 modulator direct output showing spurious outputs into adjacent channels



Channel 3 modulator spectrum filtered through a bandpass filter. Adjacent interference is removed

It is often possible to suppress adjacent spurious interference by installing appropriate traps after the modulator. Regular negative video pay-TV traps for the adjacent channels are often effective in reducing the level of interference. Where the spurious outputs are semi-adjacent or beyond, a less expensive bandpass filter with less selectivity is used.

Pilot carrier interference

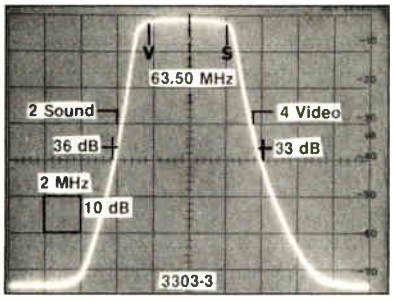
Pilot carriers control the operation of converters, descramblers, amplifiers and other devices. However, they continue on throughout the system and often interfere with reception on specific channels. For example, pilot carriers in the 72 MHz to 76 MHz band often impact reception of channels 4 and 5 which bracket this band.

Selective bandpass filter

Available tunable notch filters can be used for suppression of these carriers. Where there is at least 1.5 MHz separation between the nearest channel principal carrier and the pilot carrier, it is often possible to obtain a low-cost, retuned negative pay trap. This is the economical approach, if the interference is to be suppressed at several points in the system.

Encoding interference

In some scrambling systems, scrambling is done by injecting a carrier into the TV-IF band. In some cases it has been found that the scrambling generator output contains spurious signals at other frequencies, which impacts the quality of the decoded subscriber signal. The cure here is a narrow bandpass filter (bandwidth about 1 MHz) which will admit the scrambling signal and suppress all other signals emited from the scrambler generator. ▪



Selective BPF frequency response

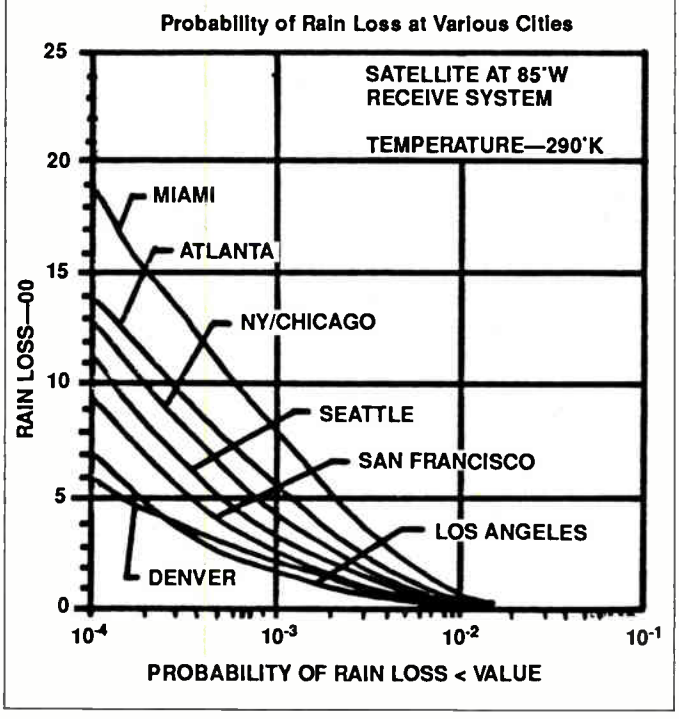
Measuring Ku-band earth station parameters

This paper proposes a quick and inexpensive method of measuring the operating parameters of Ku-band satellite television receive-only (TVRO) antennas by utilizing calibrated microwave absorbers called Ku-Band Margin Pads. The parameters that can be checked include clear sky carrier-to-noise ratio, optimum elevation and azimuth angles, optimum cross-polarization discrimination, receiver center-frequency tuning and rain margin.

The first aspect of the proposed method is the alignment of satellite TVROs. Calibrated microwave absorbers are placed at the antenna feed/air interface until impulses appear on the television receiver or monitor. The elevation and azimuth angles are peaked by minimizing the number of impulses and similarly, the polarization is optimized by rotating the orthomode transducer for minimum impulses. The satellite receiver tuning can be set by fine-tuning until the number of black impulses approximately equal that of white impulses.

The second aspect of the proposed method is the actual quantification of earth station operating parameters. Calibrated microwave absorbers are placed at the antenna feed/air interface to attenuate the signal to a known reference level called impulse noise threshold. This point is used as a visual reference because in most FSS television transmission in the United States, given a set of satellite operating conditions, it occurs predictably at a carrier-to-noise ratio of 9 dB to 10 dB. The station's rain margin is found as the sum of two factors: 1) The amount of attenuation required to bring about impulse noise; and 2) The additional noise due to an increase in system temperature, or delta G/T. Clear-sky C/N is equal to the rain margin plus impulse noise threshold.

FIGURE 1



The Fixed Satellite Service (FSS) downlink frequency band at 11.7 GHz to 12.2 GHz, commonly called the Ku-band, is now gaining wide acceptance as a reliable television transmission medium due to the following reasons: 1) small-aperture antennas are able to produce high-quality television signals because of higher-power transponders (pending FCC approval, succeeding generation of satellites will have even higher power); 2) since the FCC has assigned Ku-band primarily for satellite transmission, downlinks do not require frequency coordination; 3) after years of propagation studies and operational experience, the effects of precipitation and proper link design are now well understood; and, 4) significant developments in semiconductor technology, design and manufacturing techniques have resulted in increased features/performance of earth station hardware while reducing installation and maintenance costs.

Rain margin

When operating above 10 GHz, which includes Ku-band, the combined effects of precipitation such as rain, ice and snow can degrade signal availability. Studies have shown that rain attenuation is the dominant factor that affects the availability of a system; therefore, rain attenuation must be considered in link design. To find the required rain margin, the user must first determine what constitutes an unacceptable signal quality during the presence of precipitation, and for what percentage of time such a degraded signal can be tolerated. Then, for a given site, the required rain margin at a chosen probability is calculated by using accepted rain models.

$RM. = RL_{(p)} + \phi\ G/T$ (dB)
Where RM = rain margin, dB
$RL_{(p)}$ = rain loss at the chosen probability, dB
$\phi\ G/T$ = an increase in system temperature due to rain attenuation, (dB)

Signal acceptability criteria

The signal may be deemed unacceptable to a user if: 1) the video p-p signal/RMS noise quality has dropped below the user's arbitrary limit, or industry standard limits such as NTC-7 and RS-250B; 2) impulse noise (sparklies) appear in the picture; or, 3) in cases of secured transmissions, if the C/N has degraded to a point where descramblers lose synchronization.

Rain margin is built into the system hardware by increasing the antenna gain through better efficiency or larger aperture; and/or by using amplifiers with lower noise figures. The greater

By Craig Cuttner, Engineering Director, and Virgil Conanan, Senior Systems Engineer, Home Box Office Inc.

Strongest link.

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Reader Service Number 53

Straight talk on static dissipation

By Bruce A. Kaiser, President, Lightning Master Corp.

This paper presents a discussion of point discharge technology as it relates to dissipation of static ground charge for the purpose of lightning protection. This application of point discharge technology is controversial. Many swear by it; others swear at it. This application also offers a solution to a problem common to telecommunications operators with towers.

Lightning Master Corp. would like to share the results of its research and the practical application of that research to lightning protection.

Lightning is the result of the interaction between different electrical potentials within clouds and between clouds and earth. Friction caused by rising and descending air currents and/or particles within storm clouds (particularly during the ice producing phase of a storm) produces electrical charges around and within those clouds. Electrical potential varies between regions within the clouds and between clouds and the earth. When the potential gradient becomes high enough to overcome the resistance of the intervening air, a lightning strike occurs.

The charged cloud, as it travels through the atmosphere, concentrates beneath it a "shadow" of opposite charge, commonly referred to as the "ground charge," or more accurately, the earth surface charge. This ground charge, interacting with the charge in the cloud, produces cloud-to-ground lightning. Since it is cloud-to-ground lightning we are attempting to prevent, it is this ground charge with which we must be concerned.

Point discharge theory

Point discharge theory holds that electrical discharge from the point of an electrode to a surrounding medium will follow predictable rules of behavior. That discharge creates an electric field around the electrode. The theory, as it applies to this discussion can be described by these basic formulae:

$$\Sigma = \frac{Q}{4 \pi E r^2} \quad \text{and} \quad D = \frac{Q}{4 \pi E r}$$

where: Σ = electric field intensity
Q = charge (in coulombs)
E = permittivity of space
r = radius of sphere
D = flux density

Static dissipators are relatively low-technology products; products based on technology as old as Ben Franklin. Patents covering the subject go back as far as 1839, with most progress having been made in the late 1920s and early 1930s.

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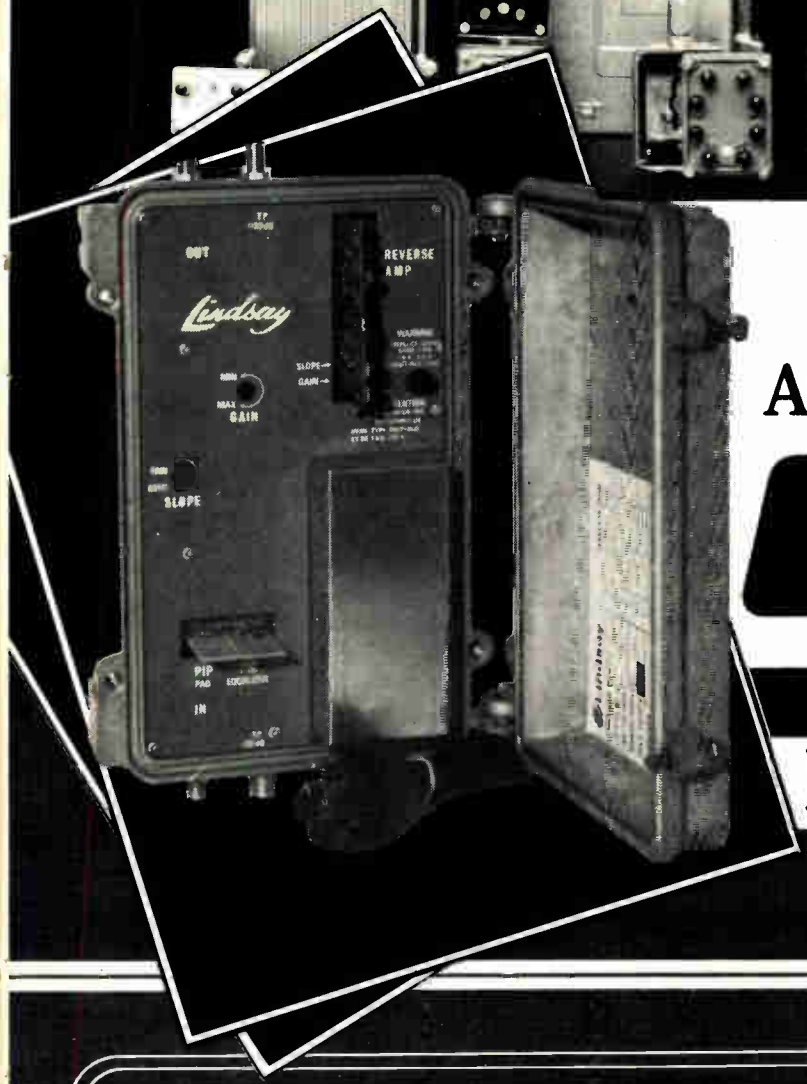

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Reader Service Number 58

mented for CATV and Local Area Network documentation. New Release 2.1 features pull-down windows, icon menus, direct attribute access and bill of material reporting. The new Cable Length Measurement Rings feature simplifies drawing cable distances because the end-points are indicated on the drawing. Call for details, (617) 969-8552.

Long Systems Inc. now offers the Vehicle Information Center software, designed to track vehicle fleets of cable TV systems. VIC tracks four categories of data: vehicles, drivers, maintenance and accidents. The software works on all IBM and 100 percent compatible machines. Call (619) 530-1926 for detailed information.

Compusen offers a computer-based sales, surplus inventory management and information network. The software allows industry "networking" to buy and sell merchandise, exchange news, study market trends or communicate problems and solutions. For info, write Compusen, 217 Rock Road, Glen Rock, N.J. 07452.

People on the move

Cable Television Labs (Cable Labs) has announced its new chief. **Richard Green**, former senior vice president of broadcast operations and engineering at Public Broadcasting System in Alexandria, Va. will take over the helm sometime in mid-Fall.

Peter Fannon, former president of the National Association of Public Television Stations, will be the executive director of the Advanced Television Test Center, the entity formed by various broadcasters to test advanced TV systems.

Ed Breen has been named vice president of sales at Jerrold. He replaces Larry Fry, and will report directly to Hal Krisbergh, president. **Ed Ebenbach** formerly VP of international marketing, will replace Breen as VP of marketing for the subscriber systems division.

John Strandell has been named vice president of sales and marketing for Northeast Filter Co. He was formerly with Arcom Inc.

George Woodruff is the new vice president of marketing and sales for TeleSciences Transmission Systems, the new name of the Avantek Transmission Systems Division.

David Fellows has been appointed director of marketing-distribution, headend/earth station products. He was previously in charge of strategic operations for S-A's Network Systems Group.

James Quigley Jr. has been named national sales manager for Pico's cable TV division.

David Jordan has been appointed product manager for C-COR Electronics' CATV group.

Brenda Bangle-Gentry has joined R. Alan Communications as regional sales representative. She was previously with Texscan.

James Emerson has been appointed general manager of BradPTS' RF division in Florida.

Sachs Communications has opened a new facility in Denver. The new location will be used for inventory support and as an installation training school for Sachs' customers. Leo Garcia, former regional training manager for Continental Cablevision and corporate trainer for ATC, has been appointed director of technical training at the facility. Sam Wells has been tapped as national training manager, while Peter Hineson has been named western division manager and corporate national distributor. Finally, Edward Manley has been named national sales manager.

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3. GM, E, $35K	CH ENG, NE, $45K	LN TECH, E, $10.00/HR
4. GM, NE, $38K	PLT MGR, E, $60K	HDEND TECH, MW, $12.00
5. DIR MKTG, E, $60K	CH TECH, E, $35K	LN TECH, S, $10.00/HR
6. DIR MKTG, E, $40K	CH TECH, E, $32K	LN TECH, TX, $9.00/HR
7. DIR MKTG, NE, $40K	CH TECH, W, $28K	LN TECH, W, $12.00/HR
8. CUST SER MGR, MW, $30K	CH TECH, SE, $26K	SW TECH, MW, $10.00/HR
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DESCRIPTION: Supply converter repair parts and equipment for Jerrold, Jerrold addressable, Hamlin, Oaks and others. We also buy and sell inventory.

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Schenectady, NY 12301
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REGIONAL OFFICES: Corporate headquarters: 5233 Highway 37 South, Bloomington, IN 47401, (812) 624-9331. Regional Offices: 701 Parkway View Dr., Pittsburgh, PA 15205, (412) 787-3888; 110 Mopac Road, Longview, TX 75601, (214) 753-4334; 4941 Allison St., #11, Arvada, CO 80002, (303) 624-7289; 4147 Transport St., Ventura, CA 93003, (805) 644-2598; 4630 Pacific Hwy, East, Ste. B-7, Fife, WA 98424, (206) 922-9011; 150 Venus St., #7, Jupiter, FL 33458, (407) 747-1808; 5906 Breckenridge Pkwy, Suite #1, Tampa, FL 33610, (813) 623-1721; 2010 Pine Terrace, Sarasota, FL 34231; (813) 922-1551; 575 University Ave., SW, Atlanta, GA 30310, (404) 753-5311; 1255 Boston Ave., West Columbia, SC 29169, (803) 794-3910; Highway 19 Old Socco Road, Cherokee, NC 28719, (704) 497-3314; 112 East Ellen St., Fenton, MI 48430, (313) 750-9341.
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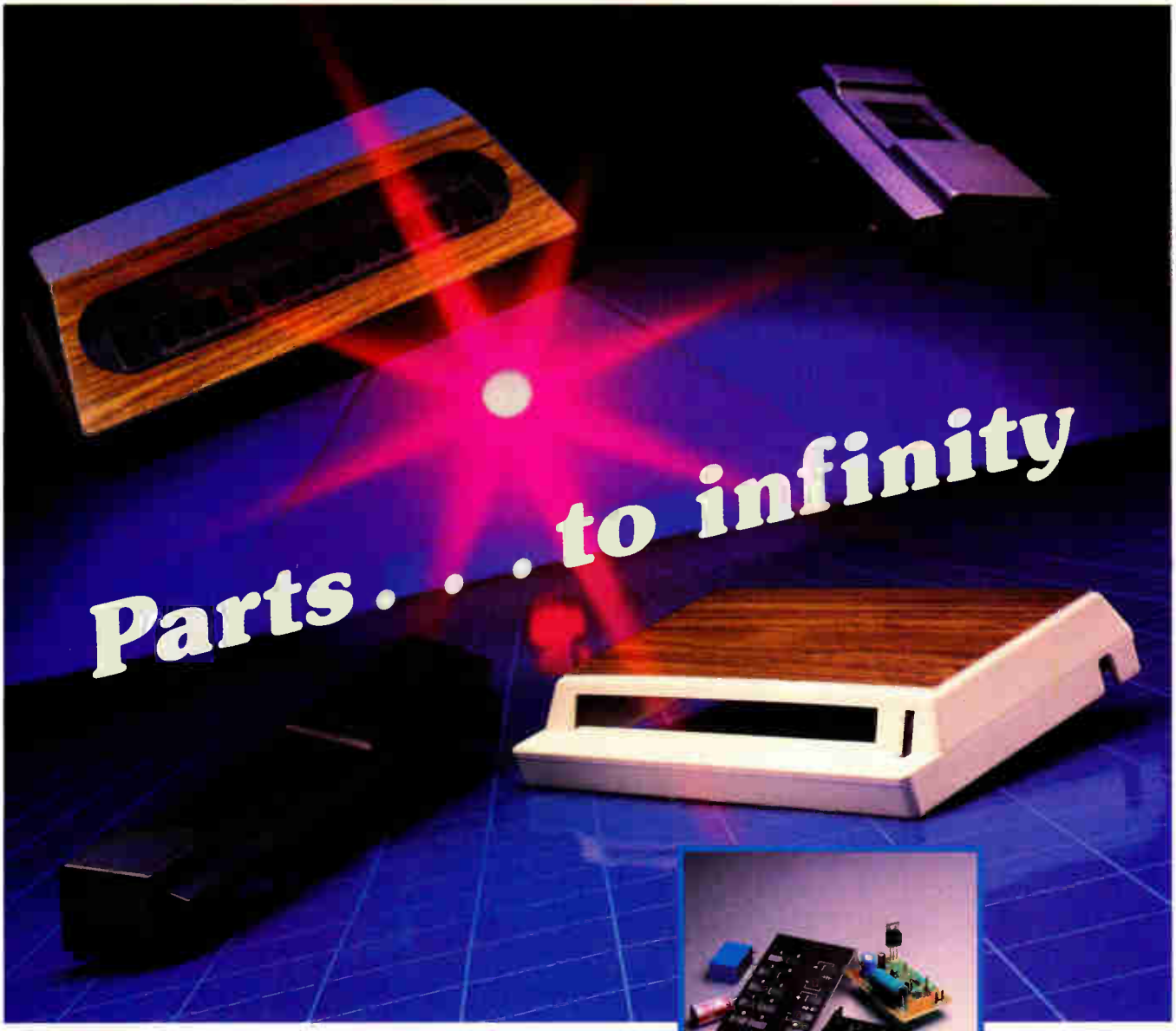

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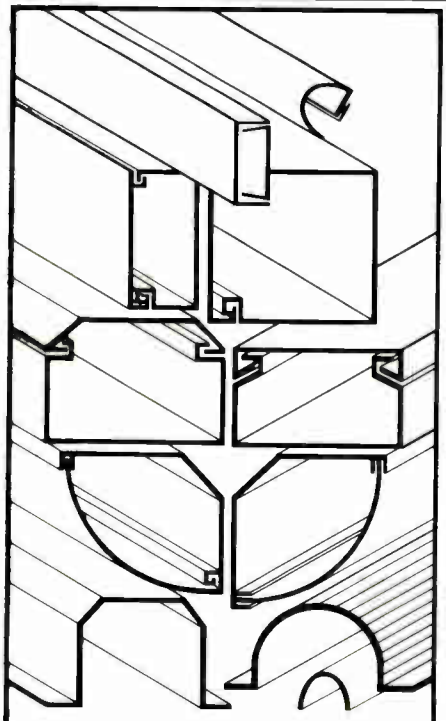

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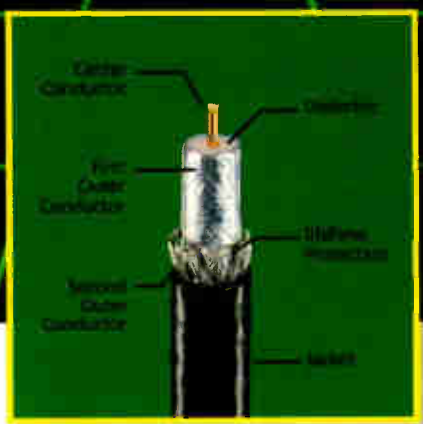

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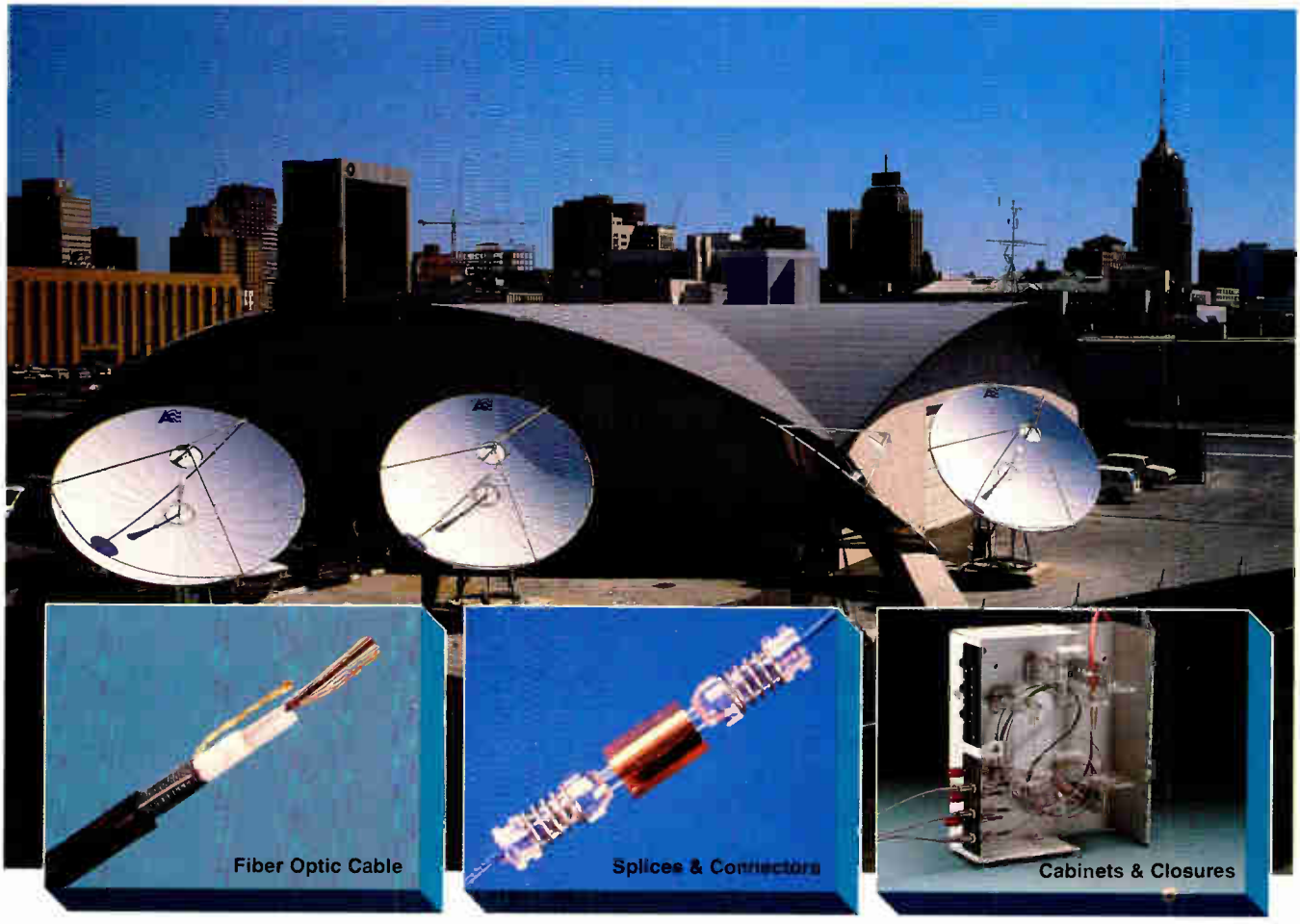

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