CED

THE MAGAZINE OF BROADBAND TECHNOLOGY / AUGUST 1991

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Annual salary survey
1991-92 Frequency Chart

Digital video compression

Will it change the face of cable TV?

—page 56

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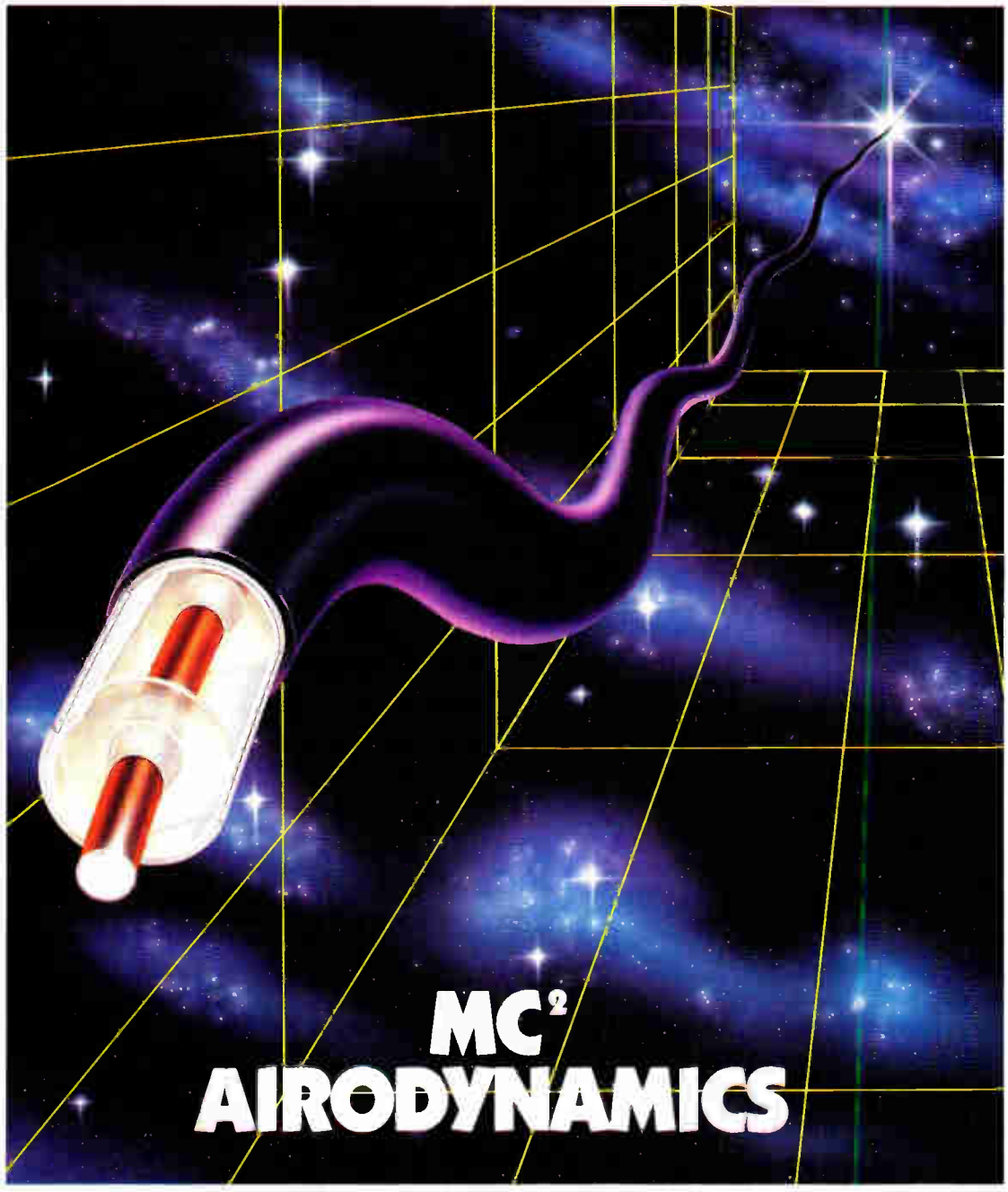

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About the Cover:
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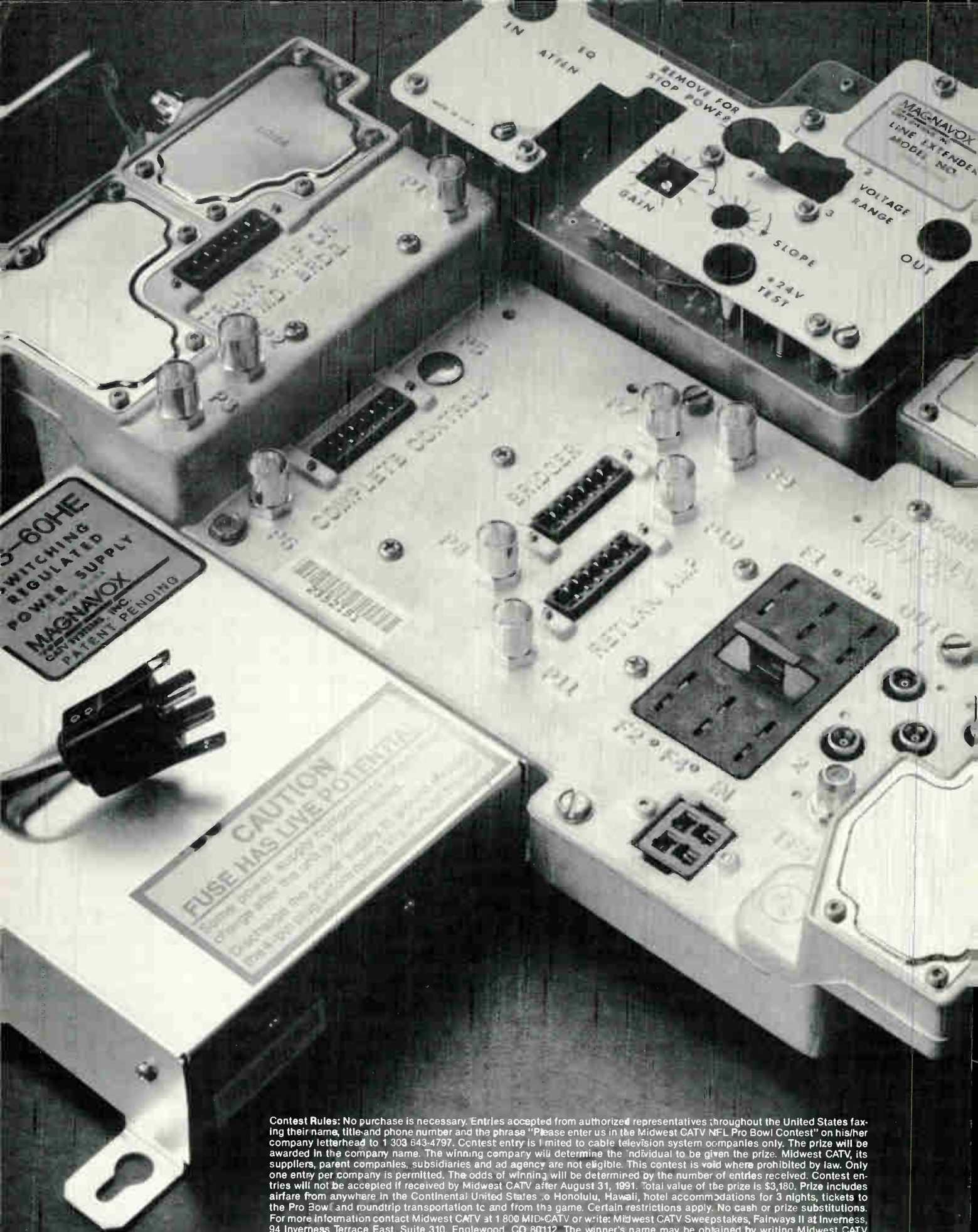

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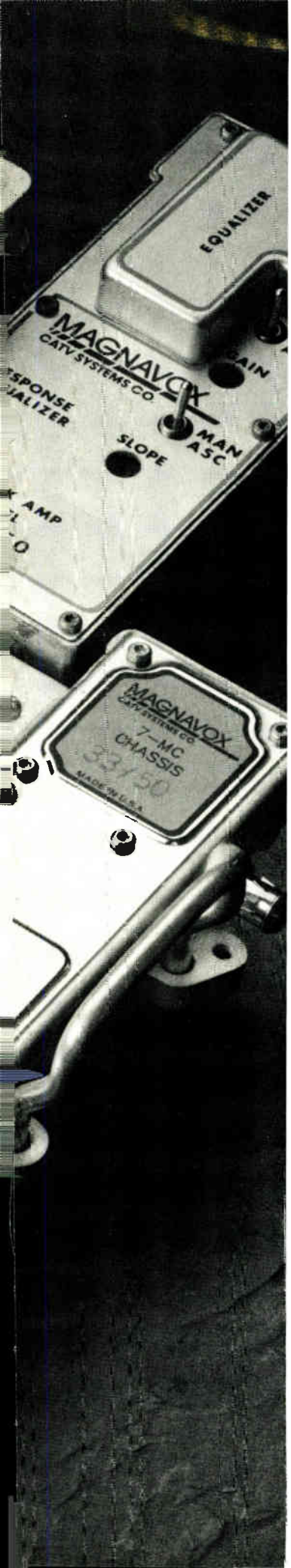

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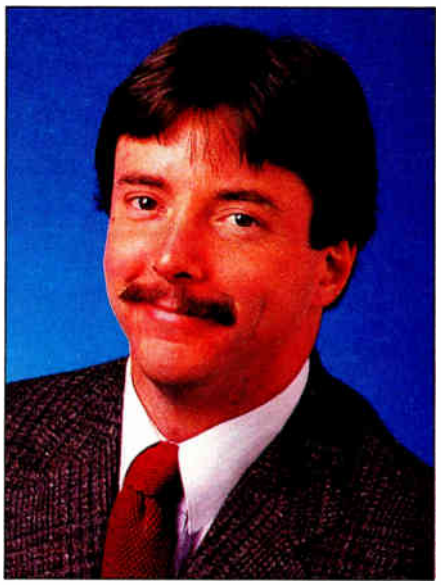
Circling in for the kill?

In some ways, the Federal Communications Commission can be likened to the great white shark: Rarely does it attack man, but when it does, it often has devastating results.

Cable system engineers might wonder what they've done to get the FCC's attention, but the Commission's proposed rulemaking on technical standards (see "Capital Currents" on page 20 for a full review of the standards) strikes at the heart of a cable system. By now, industry leaders have digested the proposed rules and are busily kicking their feet to get out of harm's way.

The Commission, meanwhile is simply hungry for progress. It knows the NCTA and the National League .of Cities have been negotiating for months over technical standards. It also knows that an agreement between cable operators and franchise authorities has been promised for several weeks, without success. The FCC has also said that if and when an agreement between those entities is hammered out, it's likely to go along with the accord.



The Commission's stated goal is better pictures. Plain and simple. But one man's better picture is another's heartache. Leading engineers are already grousing about having to rebuild their plants to meet a minimum 6 dBmV signal spec at the television. Others point out that much incoming signal strength will likely overload many televisions, undoing what it was supposed to do. Still others say the specs aren't practical from a cost standpoint.

There is likely to be much political wrangling over the next few months between the cable industry and the FCC. The industry will say the numbers the FCC proposes are too onerous; the Commission will say it wants improved pictures. No doubt some form of compromise will be reached. An agreement between cable and its franchisors will probably be struck and the Commission will likely accept it and go away happy.

But one thing is certain: Cable systems will have to work ever harder to deliver good signals to the subscriber. Systems will have to be designed for homes with more than one television/VCR. Tighter tolerances for interference and distortions will result. And cable systems will be held accountable for maintaining those specifications at higher and higher frequencies.

Once again the chore will fall to already taxed technical crews at systems all over the country. It's doubtful that most systems will hire additional personnel to make sure the specs are met, but technical managers and engineers will be the first ones called to the carpet if something goes wrong during an FCC field inspection.

I don't think the FCC was out for blood when it wrote its proposed specs. But there may be some bloodletting regardless.

Roger J. Brown

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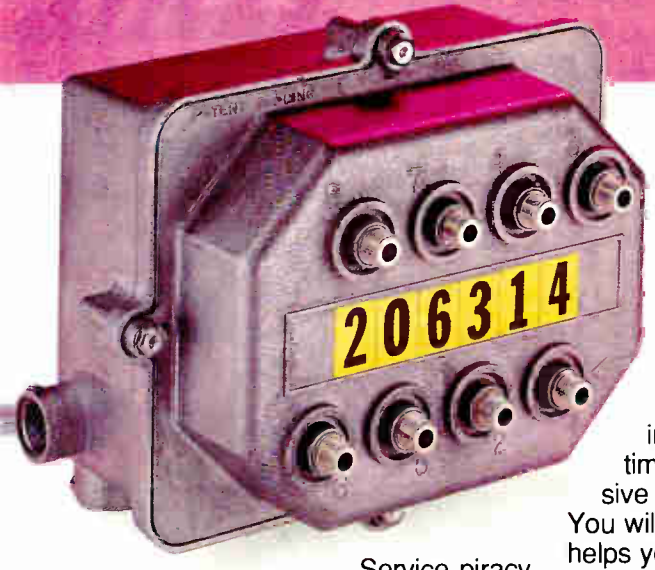

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Jones sees 'urgent' need to test video compression

Citing a "sense of urgency," Jones Intercable Chief Technical Officer Bob Luff suggested last month that his firm was intent on pushing ahead with its trials of SkyPix compression systems for terrestrial and satellite delivery and probably wouldn't wait for or necessarily use the Cable Television Laboratories standard for satellite delivery of compressed video. Luff made his remarks during a CTAM meeting in Denver that focused on video compression.

Jones plans tests in two of its systems this year. CableLabs officials, meanwhile, now hope to have a field trial of a proposed satellite delivery system underway by the first quarter of next year. CableLabs goal is to establish an industrywide "standard" that compression equipment vendors will be asked to adhere to. In order to do that, CableLabs established a consortium earlier this year to open a dialogue between compression proponents. To date, only Scientific-Atlanta and General Instrument have joined the consortium.

> Jones would be hard-pressed to delay what it believes is a imperative roll-out of compressed video.

But if SkyPix officials succeed in having a set-top subscriber unit ready by about the same time, Jones would be hard-pressed to delay what it believes is an imperative roll-out of compressed video movie services to its customers, Luff suggested. Calling video compression "the most significant technology development of the decade," Luff said Jones couldn't afford to come off second best in offering customers access to near video on demand services.

"DBS could offer 200 movie choices to customers overnight," Luff warned. Without compression, the best Jones could hope to do is offer 78 channels, he said. And that just isn't good enough, Luff believes.

"Every decade or so, technology changes in a way so fundamental that if you don't change with it, you go down," he warned.

Luff was emphatic in arguing that even engineers would not be able to see picture artifacts in the latest version of the SkyPix software. SkyPix chief scientist Robert Kniskern furthermore suggested that the scalable SkyPix compression system would continue to evolve over a period of time to handle live video and high-definition television as well. Some critics had argued SkyPix would be unable to do so.

HDTV testing gets under way

This is the month cable operators finally begin seeing their $4 million investment in a high definition television test center pay off. In the middle of July, equipment and personnel representing the Advanced Television Research Consortium moved into the Advanced Television Test Center in Virginia, ready to show what it can do. The initial tests of the system focused on terrestrial broadcast compatibility; now CATV gets it hands on the signal.

In case you've forgotten, the subjective and objective testing of the different systems will continue for the next year. Then, field tests will be conducted in 1992. A report and recommendation are slated to be delivered to the FCC, which will choose a standard by the middle of 1993.

Rather than join the ATTC, which is funded primarily by broadcasters, the cable industry chose to establish its own testing center within the confines of the ATTC and pay the Center for its presence. So far, CableLabs (which oversees the CATV test bed), has paid out $2.5 million to the ATTC and has committed more than $4.1 million to the lab and field test phases.

A portion of that fee supported production of the motion test materials used during the laboratory test phase. In addition, Craig Tanner, VP of ATV projects at CableLabs, chaired the working party which produced the material and delivered them at the beginning of July.

Plastic fiber? In the home?

Could it be that we'll have fiber *in* the home before we get it *to* the home? Maybe, and it could be made out of plastic instead of glass.

Two separate papers delivered to engineers at the IEEE's International Conference on Consumer Electronics in June seemed to dovetail together quite well. The first was Tom Bowling's paper on "Fiber In the Home," which outlined various scenarios of how fiber optics can be used in tomorrow's intelligent home.

The linchpin of the system is a device which is essentially a modification of today's electrical wall receptacle. The familiar two-prong receptacle is still there, but in between the two outlets would be a small "plug" for fiber attachment.

Bowling said the ideas were sparked by changes made to the National Electrical Code as a result of initiatives made by the SmartHouse organization. Specifically, "closed loop" power and "programmed power" concepts were the keys to the notion.

Closed loop power denies power to the electrical receptacle unless the connected appliance correctly identifies itself and provides an acknowledgement signal. Any deviation shuts off the receptacle. SmartHouse uses the concept as a safety feature.

Programmed power allowed appliances to "call up" something other than 120-vot, 60-Hz electricity. For example, DC power could be made available for devices that could be made more cheaply and more reliable in certain circumstances.

Bowling said these code changes demand a new circuit that allows conversation between appliances and a house controller. He believes the circuit requires new conductors and plug designs. He made the case for fiber optics, citing the "horrendous" electromagnetic interference environment within homes and the inability of twisted pair or coaxial cable to adequately deal with EMI.

Tom Ball of AMP Inc. took Bowling's introduction and expanded upon the idea, noting that plastic fiber cable is

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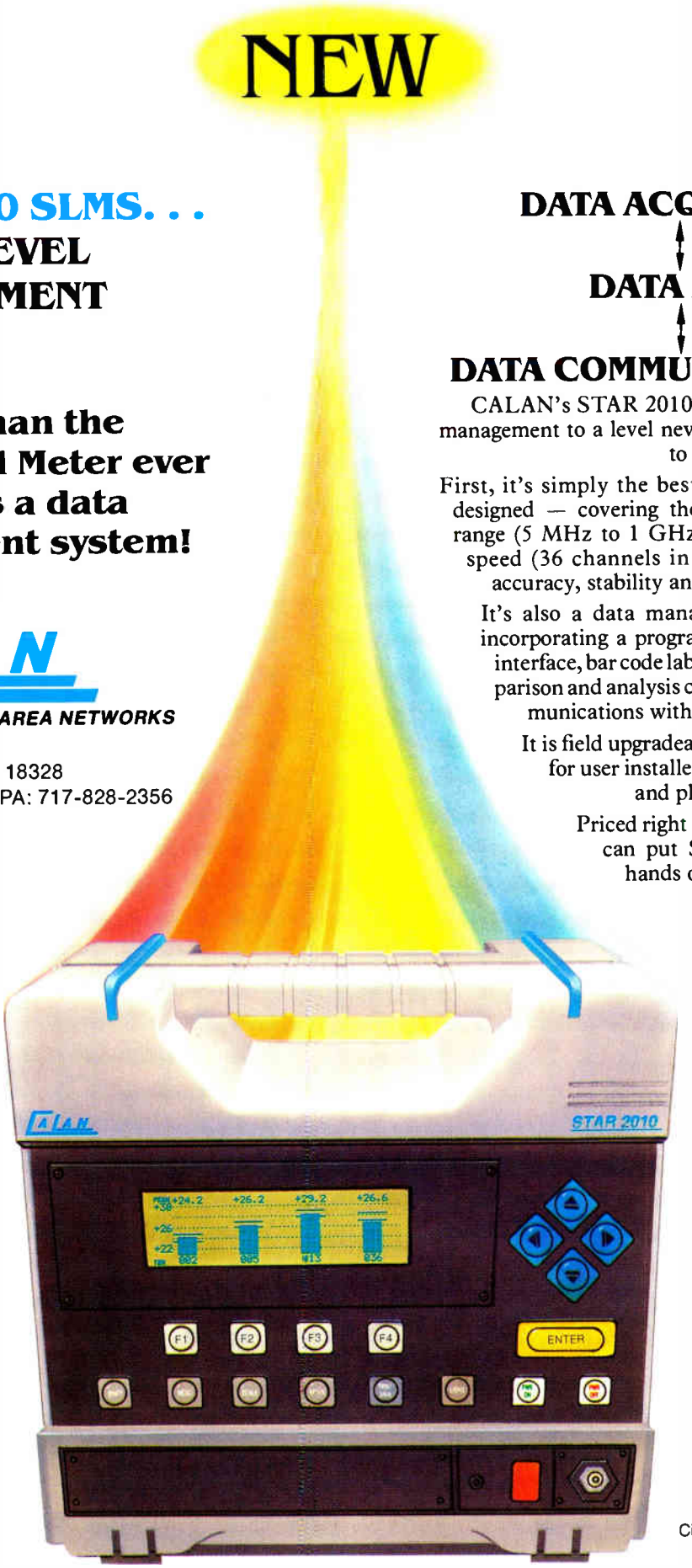

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appropriate today in several industries, from automotive to in-home. Generally, Ball said plastic cable is appropriate for applications haveing data rates to 20 Mbit/sec over distances up to 60 feet (50 Mbit/sec over longer distances is forecast for the near future).

Ball acknowledged that plastic fiber could never approach the performance of glass fiber, but said the technology requires little technical skill, has a low tooling cost and terminations can be made quickly.

The technology uses visible red light in the 660 nm range, which aids in troubleshooting. It does not pose a health hazard, Ball said, like infrared systems do.

Satellites in for major changes

Just as revolutionary change is underway in terrestrial signal delivery, so, too, is change expected in the satellite world. But just as the rapid pace of advancement in cable TV technology has perhaps forced some to take a moment and gather their thoughts, the satellite industry is "embarking on a period of uncertainty, said Dr. Joseph Pelton, director of the graduate telecommunications program at the University of Colorado. Pelton made his remarks during the IEEE International Conference on Communications, held in Denver in June.

Pelton predicted that satellites of the future will look, act and "feel" quite different than those today. They may operate in unconventional orbits, be highly intelligent (carry large amounts of processing power), use odd antenna arrays and require compact, lightweight optics/electronics.

Peering into his crystal ball, Pelton predicted that half of the traffic carried on regional/national satellite systems of the 21st century will be devoted to video distribution, or "quasi DBS" services.

However, it will have to compete with a growing fiber optic cable network and will require high throughput as well as an interface with ISDN services.

These satellites will evolve from geosynchronous, Ku-band birds weighing two metric tons, lasting 15 to 20 years and offering 60 dBW of power to a low-orbit satellite in artificial geosynchronous orbit weighing 10 to 20 kilograms, with a lifetime of 25 to 30 years and 55 to 60 dBW of power. This latter satellite will offer separate beams for each U.S. time zone as well as one U.S. conus beam.

Ghost canceller moves ever closer

For all the promise high definition television offers, there still is much work to be done for NTSC signals. As reported in *CED* in February, significant effort is being placed on video ghost elimination. According to an IEEE paper delivered by Stephen Herman of Philips Laboratories during the International Conference on Consumer Electronics, it appears that major success is on the horizon.

Ghost cancelling circuitry built into televisions rely on broadcasters and cable operators a ghost cancellation reference signal sent in the vertical blanking interval.

The TV receiver uses the detected distortions in the received version of this signal to compute the corrections needed to cancel the echoes, or ghosts.

Philips has been field testing its ghost canceller in cooperation with WABC-TV in New York City and will continue in other markets as well. The purpose of the testing is to evaluate the robustness of the hardware, the algorithms and the choice of reference signals.

Ghost cancellation has become a priority with the advent of advanced television, which will only exacerbate the problems associated with poor signal quality.

A reference signal standard has been chosen in Japan and, in fact, there is presently debate over which signal to adopt for use in the U.S.

Turning stress into wellness

Cable installers, technicians and customer service representatives concerned about their personal and professional well-being may want to partake in the Rocky Mountain CTAM Chapter's new interactive video, due out this month.

Titled "The Mind, the Body and the Bottom Line," the video consists of panelists from TCI, United Artists, Mile Hi Cablevision (ATC), Jones Intercable and HBO who discuss ways in which to turn stress into "physical, mental and emotional wellness," says producer Lisa McVicker of HBO.

Moderator Marla Reigel, a wellness and stress-reduction specialist, leads the group through a series of typical day-to-day situations, with insights on how to better handle those black moments that arise. "It's a means of establishing exactly *what* it is that is causing stress; how to control it; how to take a few moments out for yourself; breathing exercises—but real lightly. There's no preaching here," McVicker explains. "It's mostly consciousness-raising."

McVicker expects the tape to be priced at under $100, and it is available by contacting Rocky Mountain CTAM president Bob Greene at (303) 850-7530.

Jottings

It isn't easy making news out of fiber optic deployment, but a couple of operators are working on it. **Continental Cablevision** is rebuilding its franchise near Dayton, Ohio with 3,000 miles of plant, a digital fiber backbone interconnecting headends, 200 nodes serving 2,000 homes and use of externally modulated lasers. In some cases, the link cost is about $6,500...Meanwhile, **Cablevision Industries** is converting 2,400 miles of plant in Columbia, S.C. to fiber to the feeder, with 300 receivers, 100 transmitters and nodes serving as few as 450 homes. The system features density of 56 homes per mile, yet can be built for the same price as conventional RF 450 MHz gear...The advent of **Encore** in TCI systems resulted in an order for more than 11,000 pieces of headend equipment for **Scientific-Atlanta**, which cranked out the equipment in less than 45 days. The $5 million order is one of S-A's biggest ever. The equipment was ordered in mid-April and was shipped before the end of May...**Time-Warner** continues to spread around the contracts for its showcase 1-GHz system in New York City. **Optical Networks International** will supply LXE fiber cable manufactured by AT&T...**Regal Technologies** has teamed up with **Zenith Cable Products** to offer cable operators a low-cost method of participating in the pay-per-view Olympics. Regal's RC-83 converter will be marketed with Zenith's add-on "Pay Master" addressable decoder....

Compiled by Roger Brown, Leslie Ellis and Gary Kim

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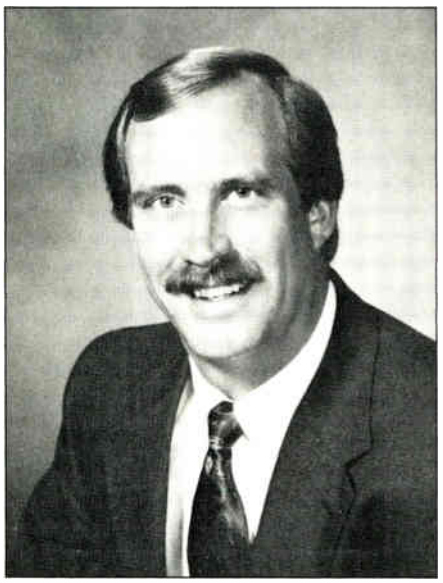

Ron Wolfe

A passion for training

More than 3,000 industry technical personnel are smarter these days thanks to the efforts of Ron Wolfe, manager of ATC's Denver-based National Training Center. In fact, since Wolfe took over the helm of the Center more than three years ago, attendance has more than doubled in classes ranging from "Basic Cable" to "Fiber Optics and Evolving Network Architectures."

To fill the position in 1989, ATC picked Wolfe from its crop of top-notch engineers because of his prowess in developing technical seminars. "I had put together a few workshops on CLI, fiber optics and tests and measurements," Wolfe explains. "When I was asked to take over the Training Center, I initially declined—attendance was way down. But I thought about it, and decided it would be an excellent opportunity to train cable's future leaders."

Hot button

Indeed, if Wolfe has a "hot button," training is it. "I believe very strongly that training plays a vital role in the current health and the future success of our business. It gives me a sense of accomplishment to know that our programs can have a positive impact on the cable business," Wolfe says.

In fact, training is the thread that weaves through Wolfe's professional life. A (very) active SCTE member, Wolfe currently chairs two subcommittees, both firmly trenched in training activities. As the BCT/E Career Path chairman, Wolfe is trying to "take the BCT/E format and rearrange it in a fashion that more closely typifies the chronology of a typical cable career path," Wolfe explains, "so that the BCT/E categories more closely resemble day-to-day job activities."

Cable Games hit the road

And as head of the newly established Cable Games subcommittee, Wolfe is extending his three-year history of coordinating technical "games" for SCTE members outside of his home-turf Rocky Mountain SCTE chapter.

"It used to be just a Rocky Mountain Chapter thing," Wolfe says. "This year, though, we've organized games at the Texas Show and the SCTE Expo, and we may be doing other shows this year. So it's coordinating events, prizes and thinking of innovative ways to test cable's technical community—in a fun way."

Those who have attended trade shows earlier this year will recall Wolfe as the guy with the neon-blue cast on his arm from a hair-raising (ahem)...*bowling* accident. The amusing thing is, though, that Wolfe's injury could well have happened during any one of his normal outdoor activities. He's admittedly a "double black diamond" downhill skier who enjoys trying to out-perform others on the slopes. His well-rounded athletic history also includes sky-diving and, on a less dangerous front, golfing.

An honest start

Wolfe got his start in cable television because "quite honestly, it was the first job I landed when I finished college," Wolfe amusedly admits. "After finishing up at the District I Technical Institute (in EauClaire, Wisc.), I hitchhiked over to Oshkosh for an interview with Warner Cable. They made me an offer, which I *immediately* accepted. I was at that time of life—21 years old, fresh out of school, and wanted a job *real* bad."

Wolfe apparently doesn't regret his decision. "I can't see myself leaving the industry," he remarks. During his 13-year cable career, Wolfe spent nine years with Warner as an installer, field technician, maintenance foreman and field engineer.

"I was on the road about 60 percent during my field engineer days," Wolfe recalls, "assisting with FCC proofs. I would travel to a regional office, borrow a car, and visit all the systems within the region to make sure all were in compliance with the FCC's technical standards."

In 1987, Wolfe moved to Denver to specialize in CLI and technical auditing for ATC. Then in 1989, he switched over to his current position leading the Training Center. "The hardest part of this job, I think," Wolfe explains, "is balancing current, everyday technologies with emerging technologies. For instance, the average technician we train is probably not going to be concerned on a daily basis about how we're going to put 150 channels of service in Queens, N.Y. as he is about how to properly read a signal level meter."

Wolfe keeps a finger on ATC's corporate engineering pulse via an ongoing series of "rubber room sessions" held at the Center. Late June marked the last such meeting, where ideas about the company's 150-channel Queens system bounced around the room.

"When you start thinking in terms of how many channels you have, there's a tendency to think about what kind of video will be there," Wolfe continues. "Really, the question should be what sort of *information* are we going to offer? We need to make sure that we don't lock ourselves into a video mindset. Again, it's a matter of balance—this time, video (programming) vs. other opportunities."

Wolfe's ability to maintain balance carries through to his management philosophy. "I'm both a 'puller' and a 'pusher,' when it comes to dealing with people," Wolfe explains. "I think you have to be adaptable in the way you manage people, because different personalities respond differently. There are those who need to be told what to do and when to do it; and then there are those who just need a hint—and they're off."

Clearly, though, Wolfe's quest for training leads his concerns. "In my public speaking role I usually have access to many of the current leaders in our industry," Wolfe says. "In my role as manager of the Training Center, I also have a unique opportunity to be a part of the development of the future leaders of the industry.

"I can only hope," Wolfe closes, "That we've in some way prepared those future leaders for what will undoubtedly be a period of tremendous growth and challenge." ■

—Leslie Ellis

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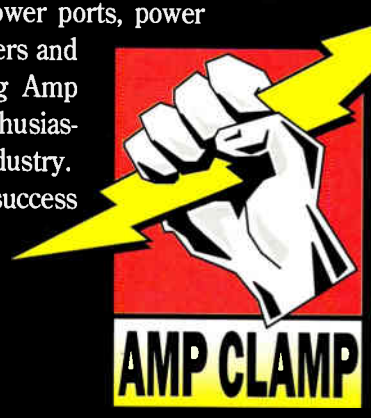

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Circle Reader Service No. 8

Montreux Symposium turns 17

Mid-June marked the seventeenth International Television Symposium in Montreux, Switzerland (on Lake Geneva). The Symposium, first held in the years 1961, '62 and '63, started out as a yearly event, similar to most U.S.-based trade shows. But Montreux officials quickly realized that not enough technical evolution took place in a year's time to justify a yearly meeting in Europe, so the Symposium went to an every-other-year format, held during odd years.

The result of the yearly hiatus between gatherings was that the International Television Symposium and Exhibition has become known as the premier television engineering event in the world.

This year's Symposium continued the unbroken stream of excellence which has come to characterize the event. The 1991 edition of Montreux was particularly interesting, because for the first time ever, a cable television executive delivered the keynote lecture on opening day.

Live from D.C.

James P. Mooney, president and CEO of the National Cable Television Association (NCTA), was prevented by the unfortunate scheduling of the FCC's action on effective competition from delivering the keynote lecture in person at Montreux. But by making an extraordinary effort, Mr. Mooney was in a local studio at 4 a.m. Washington time to deliver his lecture live via satellite to a packed audience at the Montreux Casino, where the opening session took place.

His lecture, albeit the distance, was extremely well-received and his message also indicated that cable is an equally valuable part of the Montreux Symposium.

By Wendell Bailey, Vice President Science & Technology, NCTA

Digital TV: SRO

And this year's Montreux Symposium contained many excellent sessions on both broadcasting and cable fronts, dealing with high definition television, new equipment innovations and methods for operating each of the respective businesses. In particular, the sessions examining digital television via cable were nothing short of outstanding—with standing room only crowds looking on.

In fact, cable sessions have become extremely popular in Montreux. While the proceedings from this venue consistently rank as an excellent set of papers rivaling broadcast versions, I should point out that the attendance of American companies in the exhibition side of the Symposium is still weighted very heavily toward the broadcast equipment manufacturers.

During each new Montreux trip, however, I am pleased to see new companies that offer equipment for cable television. Mostly I am afraid that this equipment is quite different from the equipment we use in the United States and Canada for building cable systems. Yet, as more and more American companies become involved in overseas projects, American companies have more and more opportunities to have their product used for these important systems.

Be there in '93?

It would be nice, therefore, to see more American companies with their mastheads displaying in the Montreux Exhibition. I look forward to seeing all of you in the 1993 version.

And speaking of the 1993 Montreux, Professor Wolfgang Kaiser, chairman of CATV sessions, Dr. Walter Ciciora of ATC and myself will once again be putting together the cable sessions. We'll be meeting later this year with the rest of the Montreux Executive Committee to lay out the generic details of the 1993 Montreux Symposium. We are already starting to narrow down the list of personalities in the world of North American cable television who are leaders in their field and can be asked to join the program committee for the next event.

Indeed, Walt Ciciora and I will soon be asked to give our recommendations to the Executive Committee for those names which should be included in an invitation to become part of the program governing body.

Press coverage weak

As to the press coverage of Montreux, I can't help but point out that the number of accredited press at this particular event set an all time record for Montreux. While there were some trade publications there, those publications primarily interested in cable or broadband interests were not in evidence. I understand the pressure we all have on budgets, but it is disturbing to read about the cable sessions as reported by other publications whose primary interests are not cable.

Since cable has become such an important part of this prestigious meeting, I would be effusive in my praise and forever grateful if more of the readers of this magazine made a point of considering a trip to Montreux in 1993.

I firmly believe that cable television is fast becoming the medium of choice for a large portion of the world. Representatives from more than 90 countries were at Montreux to hear about broadcasting and cable. A good cross section of them spent most of their time in the cable television sessions. The opportunity for us to utilize our expertise in this field can be greatly enhanced by the contacts we make on the beautiful shores of Montreux, Switzerland.

If you or your company's future plans run toward international or transnational projects, this is a place you should be. In the meantime, Professor Kaiser, Walt Ciciora and I will be seeking out people who will be agreeable to delivering top-notch, interesting papers at the next Montreux session in 1993.

The Montreux committee does not issue a call for papers. Instead, all presenters are invited by the respective managers. We are not adverse, however, to learning about subjects that you might like to do a paper on. Who knows? You just might get invited to be a cable television star in Montreux. ■

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Circle Reader Service No. 9

16-QAM

16-QAM is short for 16-State Quadrature Amplitude Modulation, and it is simply an extension of the QAM techniques discussed in my previous columns. It is a digital modulation technique that is theoretically (but not realistically) capable of squeezing as many as 4 bits of digital information in a single Hertz of bandwidth (4 bits/Hz).

In cable-speak that translates to a theoretical maximum of about 24 Mb/s in a single 6 MHz cable channel!

16-State QAM, as its name implies, is a digital modulation technique in which two RF carriers in phase quadrature are each independently amplitude modulated to 4 distinct amplitudes and then summed, resulting in a combined total of 4x4 or 16 different states. As shown in the block diagram of Figure 1a, this is usually accomplished through the use of a double sideband suppressed carrier modulation technique for both the I and Q channels.[1]

The incoming baseband two-level digital data stream is first commutated or split into two different data paths: the in-phase or I path, and the quadrature or Q path. This results in a data rate in each of the two paths that is one-half of the original data rate. Thus, if we were dealing with an initial data rate of about 20 Mb/s, the data is split into 2 quadrature paths at 10 Mb/s.

After the split, each digital data stream is then applied to a 2-level to 4-level converter. Here, every two bits of serial digital data is converted to one of 4 voltage levels called symbols, each symbol representing the various possibilities that each successive two-bits of the serial data stream may take (00, 01, 10, 11).

Note that since each discrete voltage level or symbol out of the level converter is a representation of 2 bits of digital information, the effective symbol rate out of the level converter is half the data rate at its input. In our example, the 10Mb/s data stream in each of the I and Q channels has therefore been further reduced to a 5 Mega symbol per second 4-level data stream to drive each AM double-sideband suppressed-carrier modulator in each of the two paths. After modulation, the two quadrature channels are then summed and filtered for transmission.

At the receive-end, the reverse process takes place. Here it is only necessary that each of the 4 amplitude modulated levels or symbols in each quadrature channel be capable of being detected and converted back to the original binary data stream. This is accomplished through the use of a series of threshold comparators.

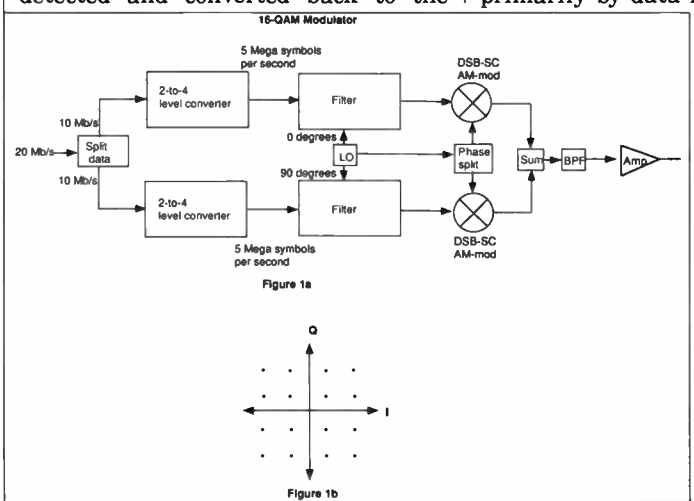

Figure 1a

Figure 1b

Figure 1b shows the constellation diagram of a 16-QAM signal. You may recall from a previous column, that a constellation diagram gives you a visual indication of the possible amplitude and phase states of the RF carrier for a digitally modulated signal.

Here we see a dot for each of the 16 possible amplitude and phase states that the 16-QAM RF carrier may take on, where the distance out from the origin represents the amplitude of the combined RF carrier, and the angle as measured from the x-axis represents the phase of the RF carrier.

Since the detector must be capable of detecting each of these various amplitude and phase states, and since each of these states is relatively close together, operation in noisy environments can become a problem. If you compare this constellation diagram to that of the 4-QAM case discussed in last month's column, for example, it becomes very easy to understand why 4-QAM is a much more robust signal than 16-QAM for transmission in noisy environments. The points in the constellation are simply further removed from each other in the 4-QAM case, and in noisy environments they are less likely to be incorrectly detected by the receiver.

The drawback, of course, with 4-QAM or QPSK when compared with 16-QAM, is that you are limited to a theoretical maximum of 2 bits/Hertz using 4-QAM techniques—fully half of the efficiency possible when using 16-QAM.

As might be expected, choice of a digital modulation technique is defined primarily by data rate and bandwidth constraints over a given transmission path. The current HDTV proponents are convinced that HDTV will not be possible in less than about 20 Mb/s total data rate. If we force this signal to be placed within a 6 MHz channel, we must use a modulation technique that will realistically provide a channel efficiency of 3.33 bits/Hertz (20/6).

Clearly QPSK is out, and we are left with using the most robust technique that has a modulation efficiency of better than 3.33 bits/Hz. 16-QAM is one such technique being considered. It certainly remains to be seen whether such a modulation technique is truly practical in a Broadcast or a Cable environment, especially at a data rate as high as 20 Mb/s. If it is doable, it will most certainly be very difficult—especially in a broadcast environment. ■

1. Feher, Dr. Kamilo, *Advanced Digital Communicatins Systems and Signal Processing Techniques*, Prentice Hall, Englewood Cliffs, New Jersey, 07632, 1987.

By Chris Bowick, Vice President Engineering for Headend Equipment, Scientific-Atlanta, Inc.

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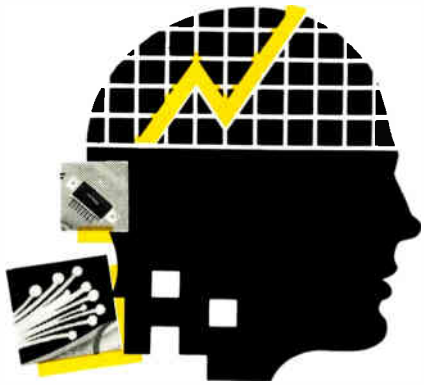

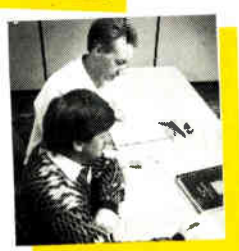

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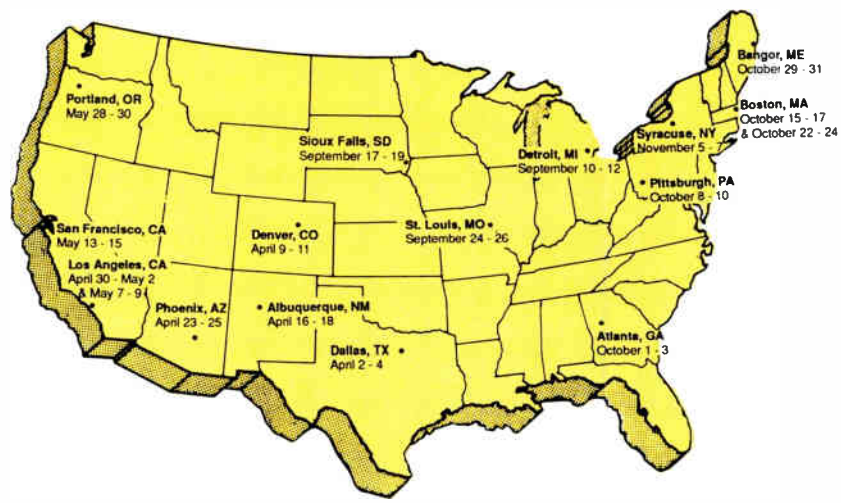

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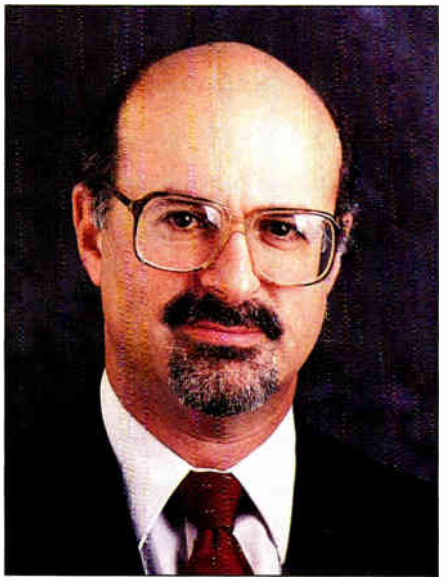

Update on recent FCC action

The Federal Communications Commission (FCC) has been busy the last several months, with several actions that affect cable TV technology. The two that most directly affect the cable industry are the Effective Competition decision and the Cable Technical Standards proposal. Others involve closed captioning decoders in TV sets, and interconnection for alternative local access carriers.

Effective competition

The FCC has made a decision to change the standard for "effective competition" that triggers local rate regulation. Local rate regulation will be prohibited if there are six or more unduplicated TV broadcast stations available to the community, or a competing multichannel video delivery service is available to at least 50 percent of homes passed and subscribed to by at least 10 percent of homes passed.

Under the 1984 Cable Act, local rate regulation only applies to "basic service," which includes any tier that carries local broadcast signals. Many cable systems have already rearranged their channel lineups so that they can redefine their tiers in order to escape local rate regulation of most of the basic cable programming services.

Actually, creating the new tiers will require many cable systems to upgrade both their hardware and software, so it will not be done immediately. The costs of these and other upgrades may justify rate increases greater than the automatic 5 percent annual rate increase that is allowed by the 1984 Cable Act. This new FCC decision allows cable systems to achieve a fair return on investment, taking into account the costs of equipment and programming, if the 5 percent increase is insufficient.

Cable TV technical standards

The FCC has proposed to adopt a range of new cable TV technical standards. Here are the key requirements:

- Visual signal level at least 6 dBmV.
- Aural signal 13 dB to 17 dB below visual signal level.
- Frequency response ±2 dB across 6 MHz channel.
- Visual signal-to-noise level and signal to co-channel interference level at least 43 dB.
- Visual signal to coherent interference level at least 53 dB (noncoherent system) or 47 dB (coherent system)
- Terminal isolation at least 18 dB.
- Hum less than 3 percent of visual signal level.
- Chroma delay less than 150 nanoseconds.
- Differential gain less than 20 percent.
- Differential phase less than 5 degrees.
- Proof of performance tests required at least once a calendar year.

The formal written comments are not due until September 17. A final decision might be adopted by the FCC by next June.

Cable technical standards have been under review by the FCC since 1985. The proceeding responds to a 1988 court decision that rejected an FCC policy of voluntary federal technical standards pre-empting local regulation. The standards in this proposal would be mandatory, not voluntary. State and local governments would not be permitted to adopt standards that differ from the federal standards.

Agreement needed

In its massive "Cable Report" to Congress last year, the FCC said that it would wait until the cable industry and the National League of Cities reached an agreement on standards, and then adopt that agreement as federal policy. An agreement has never been achieved, however, and so the FCC has gone ahead on its own with this proposal. There is some suggestion that the FCC is still willing to accept an agreement between the cities and the industry, if it can be reached.

TV captioning decoders

The FCC has adopted final rules requiring all TV sets with screens larger than 13 inches to have line 21 captioning decoders built-in, starting in 1993. The cable industry was successful in having a paragraph added to the new regulations pointing out that cable scrambling and copy protection technologies can sometimes modify the NTSC signal so that some methods of finding line 21 will not work. In particular, counting of lines or timing from the start of the vertical blanking interval may fail to find line 21. TV set manufacturers now have the obligation to contact cable equipment manufacturers to learn about these cable technologies, so that they can design aro nd them.

Alternative access carriers

Alternative local access carriers have had problems interconnecting with local telephone companies. These local access carriers include Metropolitan Fiber, New York Teleport, and a number of cable TV systems. They provide local voice and data networks that compete with the local telco. They sometimes need to lease channels from the telephone company, and sometimes need to interconnect with telco-provided private networks and with the public switched telephone network.

A new FCC proceeding proposes to establish requirements and regulate rates for interconnection of private access channels (so-called "special access" channels) supplied by alternative carriers with telco-supplied facilities. It also inquires about the need for similar requirements for "switched access" channels that are used with switched long distance services.

This could be a major step forward in stimulating competition in local voice and data communications, in the same way the Execunet decision in the late 1970s stimulated long distance competition. But it will take several years for this to really shake out. ■

By Jeffrey Krauss, Independent Telecommunications Policy Consultant and President of Telecommunications and Technology Policy of Rockville, Md.

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NQV and G-Line

Old timers Ken Simmons and Len Ecker captivated the engineers attending the recent SCTE Cable-Tec Expo in Reno with an engaging treasure of tales from the early days. Strat Smith recalled the convoluted legal and legislative quagmire through which our industry had to slog; and I expressed the view that cable TV might not have happened at all but for the war-time and subsequent FCC freezes on broadcast TV.

NQV

Some of us remember well Len Ecker's tale about Dubuque, Iowa. In 1954, Dubuque was larger by far than the typical small towns where CATV was beginning to flourish. Television signals would have to travel through much longer coaxial cables than ever before.

To make it work in Dubuque, they would have to convert to lower frequencies. How low in frequency could they go? Would you believe a visual carrier at 5.75 MHz, aural carrier at 1.25 MHz for the inverted channel 1.0 - 7.0 MHz?

They called it NQV. Not Quite Video. Using a separate cable for each of the five low-band VHF channels, an arrangement later known more professionally as space division multiplex, NQV looked like a great idea.

Coaxial cables available in the mid-'50s were manufactured to the military specification RG-11/U, widely used in lengths normally measured in hundreds of feet, but not often in miles. A single copper braid, of unspecified coverage, comprised the outer conductor. CLI (cumulative leakage index) had not yet been invented. Lashed together in a tight bundle, those cables talked to each other like backyard gossips.

Don Kirk came to the rescue with a spectacular answer which he called HLD (for High Loss Dirt). Although consideration of NQV continued for a couple of years, its appeal was limited to direct burial situations, and collapsed utterly in the face of expanding channel capacity demand.

G-Line

Low-loss transmission lines of many types were tested and installed in the '50s and early '60s. Based on the theory of surface wave transmission, the G-Line is, in effect, a coaxial cable with conventional polyethylene dielectric, but no outer conductor of any kind. The radio frequency wave is launched at the surface of the dielectric by means of a short rigid coaxial stub, the diameter of whose outer conductor is increased in a gradual taper to form a long, narrow funnel about one quarter wavelength in diameter at the mouth.

Think of the **G-Line** launcher as simply a piece of coaxial cable whose outer conductor is gradually increased until it no longer matters. Instead of terminating in the outer conductor, the electric fields form longitudinally along the surface of the dielectric. With properly designed launchers at both ends, and dielectric diameter at least three times the diameter of the wire, the surface wave mode of propagation can be made practically non-radiating.

Launcher radiation

Losses are about half those of a two-wire line, due primarily to the launchers, but the **G-Line** has a practical lower limit of 50 MHz. The problem was that the launchers did radiate. In fact, we found that the ranchers outside Helena, Mont., were pushing their Yagi's right into the mouth of the launcher funnel to steal excellent reception from our 13-mile test **G-Line**.

The surface wave propagated on the dielectric is severely disrupted by proximity to any metallic objects. Therefore, the **G-Line** has to be suspended on nylon cords, in a manner comparable to the suspension of high tension electric power lines using ceramic insulators instead of nylon cord.

Moreover, sharp corners must be avoided to prevent disruptions of the surface wave. Therefore, 90-degree bends have to be taken gradually, in several segments of a few degrees each.

The **G-Line** was patented by Dr. George Goubau, a leading German scientist who, like Dr. Werner von Braun, was expropriated by the U.S. as part of the *spoils* of World War II. The surface wave **G-Line** should not be confused with the 450-Ohm open wire balanced line manufactured and sold by the now defunct Gonset Company, which many hams learned to call **G-Line**. It was the Goubau surface wave line that my colleagues installed in Helena in the early 1960s, and that Earl Hickman, VP of Ameco, tested extensively in Phoenix, Ariz.

Goubau's **G-Line** has been used in Europe by utilities and railroads. The launchers and dielectric can be configured to create a "leaky transmission line" for such applications as trackside communication with moving railroad cars, or in tunnels.

As it happens, satellites and optical fibers have pretty well ended the search for low loss, non-radiating transmission media. Nevertheless, we still have fond memories of NQV and **G-Line**. ■

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

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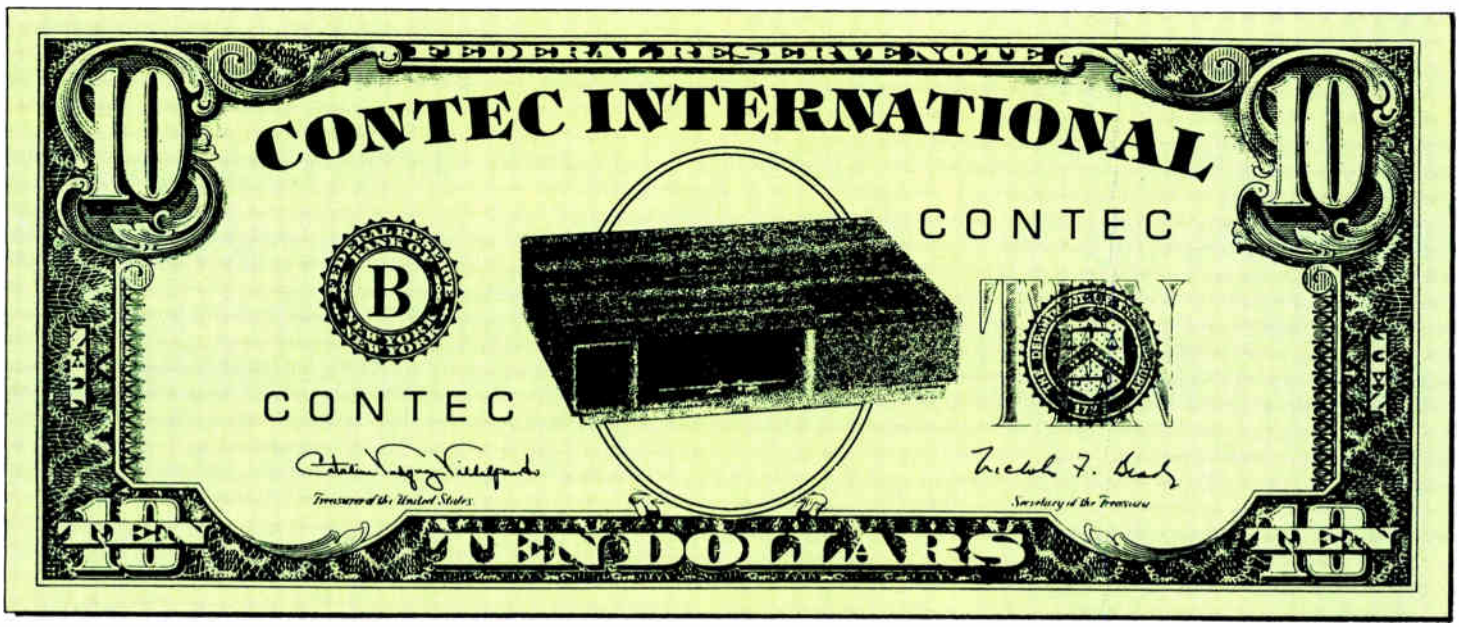

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Article too commercial?

I am writing regarding an article published in the June 1991 edition of *CED* entitled, "Planning for the Future with Fiber," by Jon K. Chester. The discussions contained in the article on Cablevision's optical fiber applications were very interesting and informative. However, much of the article amounted to little more than a promotion for Corning and Siecor products. The repetitive use of trademarks (e.g., Titan and Minibundle), and the detailed descriptions of specific product features lent a strong commercial character to the paper.

The philosophy of Comm/Scope, when publishing technical articles, is to minimize commercial content, and I believe we were successful in the paper, "Fiber Optic Cable Designs," by John Chamberlain of Comm/Scope, published in the same *CED* edition. The discussions were entirely generic, containing neither tradenames nor endorsements of particular product types. Indeed, our staff received numberous comments comparing the differences in nature of the two articles.

CED is a quality publication and has a significant impact on the CATV industry. It is my hope that commercially oriented articles will not become the norm, and that this recent article is an exception. I believe that the quality of your publication will suffer unless objectivity remains an important criterion in your selection process.
Chris Story, Director, R&D
Comm/Scope Inc.

As a publication designed to promote communication throughout the cable television industry, CED continues to believe strongly in objectivity. However, objectivity is sometimes a difficult concept to define in a competitive environment and when contributions from vendors are welcome. One man's news is another's hype.

It has been a longstanding policy at CED to publish only generic articles because it is recognized that authors representing vendors have built-in biases and a motivation for writing articles with certain "slants." The article Mr. Story refers to was a case study, however, and those types of stories sometimes carry different rules. For example, it may be absolutely critical for the reader to know which brand of equipment was installed in a given environment or what its performance level was.

But after hearing numerous comments from several sources wondering about the commercial flavor of the article, I now believe the article in question was not edited as tightly as possible.

I want to assure Mr. Story and all other CED readers that objectivity remains the goal here. Therefore, these types of stories will be more rigorously reviewed in the future to make certain they carry only information deemed pertinent to the reader.—**Editor**

Kudos for NCTA package

The *CED* team did a wonderful job chronicling the NCTA Engineering Committee and 40th convention. We couldn't have asked for a better anniversary celebration.
Katherine Rutkowski, NCTA

The training era begins

Annual survey shows managers worried about training

If you expect a long, fruitful career in cable television engineering, you'd better head back to school.

That's the message that is trumpeted loud and clear in *CED* magazine's salary and job satisfaction survey. According to this exclusive survey, managers are deeply distressed about the lack of well-trained personnel who want to climb the technical ladder. In fact, they're so worried about the shortage that it has become their number-one concern, replacing competition and regulation as their top worry.

CED's fourth annual survey consisted of a 24-question questionnaire mailed directly to 450 managers, engineers and technicians. Those names were gathered from the database of CableFile Research and, as such, represent a random, not scientific, sampling of the industry. One hundred and forty-one surveys were returned: 60 from management titles, 51 from engineers and 30 from technicians. The response rate was nearly 32 percent.

Highlights of this year's findings include:

- Fewer respondents than ever (11) said it was unlikely they'd still be employed in the cable industry three years from now. This is in stark contrast to last year, when a record number of people said they expected to leave the cable industry for something more fruitful.
- Managers' top priority is recruiting qualified technical personnel and training those persons to understand advancing technology.
- Ninety percent of the systems represented in the survey offer to pay for formal education or training courses. Seventy-seven percent of the persons responding said they have enrolled in such courses.
- More than 42 percent of the systems represented in the survey have hired an additional technician in the past year.
- The threat of competition continues to loom large in the minds of the respondents. The two most feared competitors are the telephone companies and direct broadcast satellites (DBS), in that order.
- Generally, survey respondents are satisfied with the wages and compensation packages they receive from their employer. However, career advancement opportunities remain a source of consternation for many.
- Those surveyed gave good marks for their overall technical and safety training, but expressed deep dissatisfaction with the management training that's been made available to them.
- Seventy-five percent of those who

Industry Personnel Profile

		Manager	Engineer	Technician
Average age (years)		39.4	37.6	36
Annual salary	1990	$37,800	$34,700	$24,000
	1991	$40,800	$36,100	$26,500
	Increase	8%	4.2%	10%
Time in present position (years)		4-6	1-3	split between 1-3 and 10+
Time with present employer (years)		4-6	4-6	2-4
Length of CATV career to date (years)		10+	10+	10+
Average number of persons supervised		14.4	14.6	5.5
Average monthly cost for medical insurance		$74	$71	$51
Average number of vacation days per year		16.1	16.7	13
Employer pays for outside education		95%	90%	73%
Personally enrolled in education/training courses		83%	77%	63%
Employer pays for SCTE membership		83%	76%	64%
SCTE member		78%	79%	57%

Source CableFile Research/CED

Figure 1

responded are members of the Society of Cable Television Engineers.

- Technical personnel living in the Northeast region of the country continue to be compensated higher than their counterparts in other areas. However, they also typically supervise more people and pay more for their health insurance. Those in the Midwest are compensated less, but also pay less for their benefits. Respondents from the West reported the largest salary increases—wages in 1991 were up more than 10 percent over a year ago.

Some changes, some consistency

Last year at this time, the technical/hardware side of the CATV industry began its long, deep slide into economic hard times. The slowdown, as has been well documented, was the result of several factors, not the least of which were the national scarcity of capital and the threat of industry regulation.

Not much has changed since last summer, at least in the minds of many. According to this year's survey, pending re-regulation still weighs heavily on the minds of most engineers and technicians. Managers, however, have apparently accepted the fact that some amount of regulation will occur and have now shifted their efforts toward: 1) finding qualified personnel to keep their systems running, and 2) beating back competitors, especially the telephone companies and MMDS operators.

But clearly it's training that holds the key to cable's future. While industry leaders continue to work to control regulation and competition, those considerations are generally out of the industry's control. But identifying tomorrow's leaders and training them well isn't.

Last year, Women in Cable commissioned a study called CableForce 2000 which showed that the number of skilled applicants for technicians, customer service reps and other entry level positions was declining rapidly. According to the report, nine million fewer people will have entered the workforce in the 1990s than in the 1970s. The U.S. population is forecast to grow just three-quarters of one percent, the smallest increase since the Great Depression.

> Technical people in the Northeast region continue to be compensated higher than other regions.

These numbers are compounded by growing functional illiteracy and reduced basic skill and knowledge levels. The subject has garnered the attention of many industry leaders, including pioneer Bill Daniels, who devoted the entire June issue of the *Daniels Letter* to the subject.

Here is what Daniels recommends: "Skilled entry-level workers will be in high demand, creating competition among service-oriented companies for a shrinking workforce that is less skilled than in years past. We suggest developing and widening networks with local minority and women's organizations, vocational schools, local government jobs programs and high schools."

According to Daniels research, the average entry-level cable employee requires about $3,000 and three to six months to train. But cable continues to be plagued by high churn rates (varying from a high of about 50 percent in urban systems to 10 percent in rural operations). Daniels argues that the investment in training low-level personnel is much less than the cost of dealing with churn.

Incentives needed

Here's more: "We believe that cable operators who use training and career paths as employment incentives and can present a clear understanding of the business and employee potential for upward mobility will attract the most qualified workers.

With the advent of digital compression and 150-channel systems, training programs will take on a whole new dimension, requiring trainable applicants with minimal basic skills to learn the far-reaching complexities of this new technology and its marketing applications."

The letter concludes: "This issue strikes at the heart of the cable industry, which is only as good as its people and products. We believe investments should be made in both. It's also an issue that will mushroom. For many operators, particularly rural operators,

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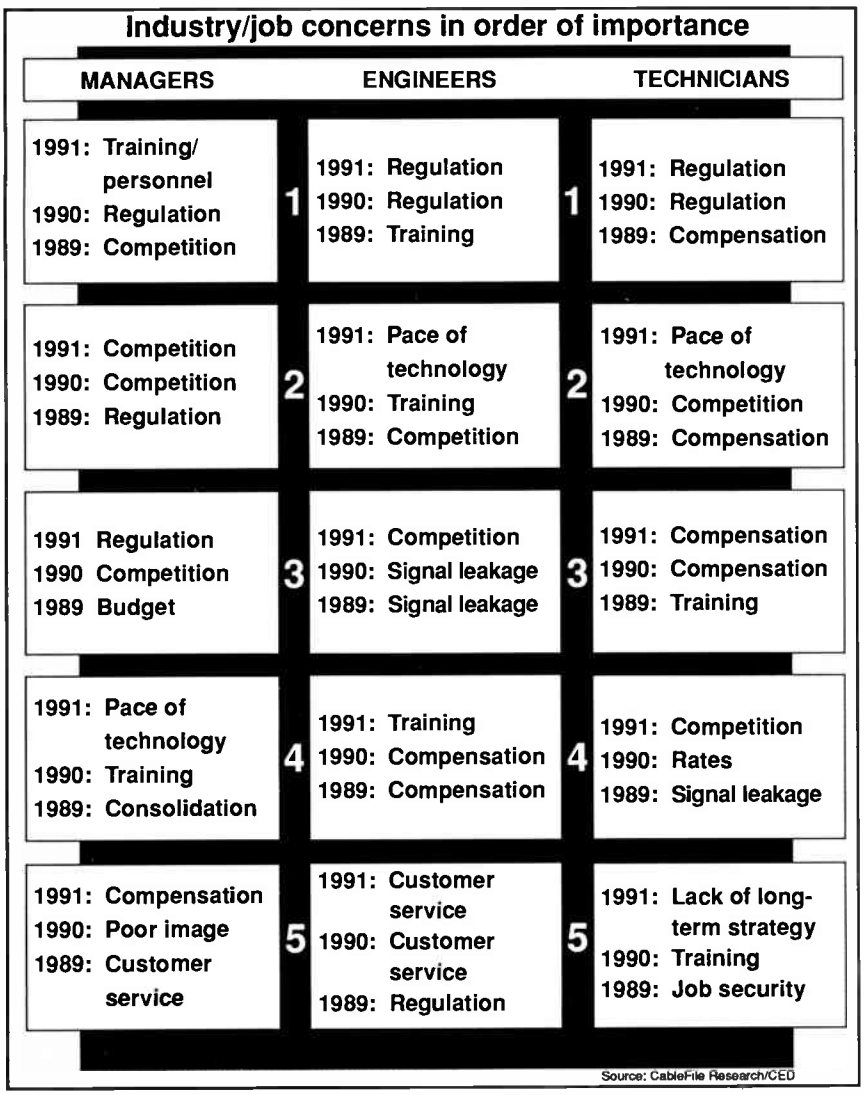


Figure 2

a shrinking labor pool is not yet a priority issue. In our opinion, an effective networking system and attractive employment package should be designed and implemented soon if the cable industry is to compete for qualified employees."

Fortunately, many seem to have recognized this trend, even among the top personnel echelon. Consequently, MSOs are getting more creative with their compensation packages. Today, it's not unusual for key persons to count stock plans, equity positions, paid life insurance, better titles and more travel among their bonus plans, according to Scott Warren, a principal with Warren, Morris & Madison, an executive search and management recruiting firm.

Warren says bonus/incentive plans are becoming more commonplace with the technical side of cable systems whereas they were considered unusual just a few years ago. Incentives are often geared toward budgets, signal leakage performance, customer relations and the like.

"The '80s were just wild in terms of people's ability to move between companies and escalate their salaries," says Warren. But the industry has matured, consolidation has reduced the number of jobs available and companies don't have to pay as much as they once did," Warren adds., says Warren.

Consequently, operators want technical people with bachelor's degrees from four-year colleges. They want self-starters who have kept up with the important issues by reading trade journals, taking correspondence courses and becoming active in local SCTE chapters. "It's imperative—you have to keep up," Warren says. "Being educated is everything. Operators don't want doers (as their key people), they want thinkers."

Operators want technical people with bachelor's degrees from four-year colleges.

Managers

Today's typical technical manager is nearly 40 years old, makes $40,800 per annum (an increase of 8 percent over last year's reported salary) and has been in his present job for 4 to 6 years. He's been in the industry for

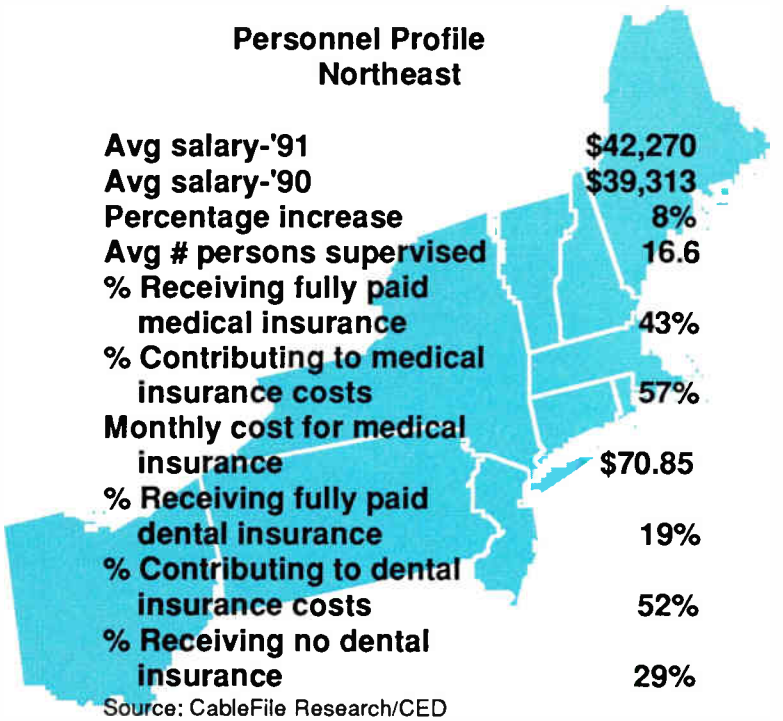


Figure 3

more than 10 years, with his present employer for between 4 and 6 years, supervises 14 persons and has earned 16 vacation days per year.

Nearly all have the option of taking outside educational courses and having them paid by their employer and 83 percent have done so. Almost 80 percent are members of the SCTE.

Predictably, managers are haunted with thoughts of competition and regulation as well as training issues. However, they're now being overwhelmed by the new technology choices that exist (fiber optics, video compression, interdiction, bandwidth, etc.) "The industry is moving so fast, I hope our company will not be left behind," wrote one manager from Pennsylvania.

Another concern is bottom-line pressure exerted by corporate headquarters which have begun to feel pinched from previous highly leveraged buyouts. "As times change, I wonder how much money MSOs will be willing to put back into the systems," asked a respondent from Georgia. "Will profit margins remain the same or will the MSO lower the margins to be more competitive with new technologies?"

Another points out that all the bickering over rate regulation and competition is moot when it comes to the customer:

"Many standards have come out for customer service, but all the customer really wants is a good product at a fair price. If a system provides that, it'll have no problem."

Today's technical manager is nearly 40 years old and makes $40,800 per year.

Compensation still bothers some managers. A man from Iowa expects to enter a different industry because they offer better wages and benefits. He says cable systems often expect their techs to get projects done no matter how long it takes, which in turn creates burn-out and high turnover rates.

Engineers

The industry's average system engi-

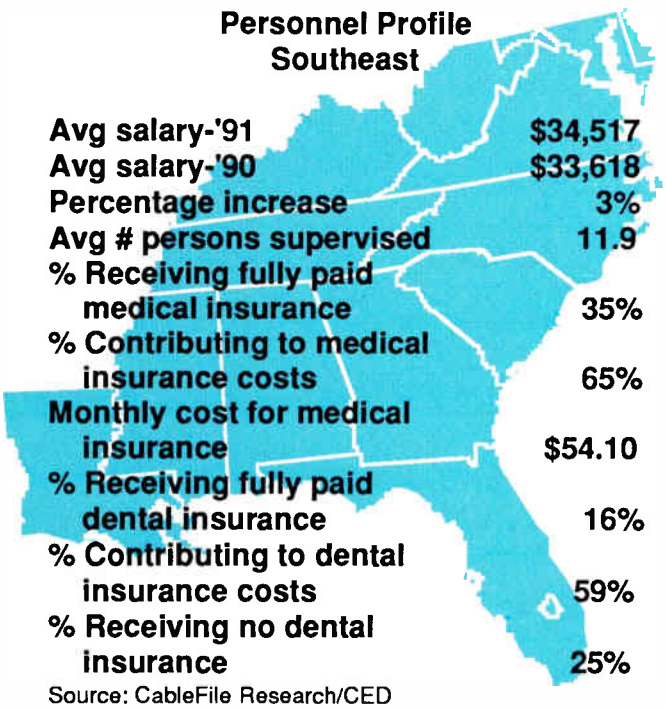


Figure 4

neer is nearly 38 years old, takes home $36,100 a year (an increase of 4.2 percent over last year), has held his present position for between 1 and 6 years (but had his current employer for 4 to 10 years) and is typically an industry veteran with more than 10 years of experience.

Just about 90 percent are employed by companies that offer paid training and education and 77 percent said they have taken advantage of outside courses. Only 77 percent said their employers pay for SCTE membership, but 79 percent said they are SCTE members (some out there pay their own way).

In fact, the SCTE is becoming highly important to engineers. Here's a comment from a Pennsylvania engineer: "I would like to attend more SCTE workshops and (I've gone to) only one SCTE convention, because I won a free trip from our chapter. I had to take a week of vacation to go. My company will send me to the (NCTA) national convention, which I get very little out of, but will not send me to the SCTE conventions."

Others point to the need for customer service training. "Cable TV companies need to give their employees the means to achieve those (customer serv-

ice) goals," wrote one engineer. "There are too many unwritten rules.... Do we wire any street that wants cable? When do we NOT provide same-day service? Why are the pictures snowy on the higher channels and why don't we have the time or manpower to fix it?"

A couple others took their employers to task for the way they treat their employees. "I'm sick of big business and their nasty employee treatment," wrote one. Another wrote: "The industry treats employees no better than dogs. Most cable personnel live in poverty while MSOs get fat profits."

Technicians

Today's technician is 36, makes $26,500 (up from $24,000 last year) and most are industry veterans with more than 10 years of experience. However, this year's survey shows a large number who have held their positions for just one to three years, perhaps suggesting a new crop of techs entering the industry. In fact, the survey showed that more than 40 percent of the systems represented hired a new tech in the last 12 months.

Compared with past surveys, the techs wrote surprisingly few comments about their jobs. However, one who said

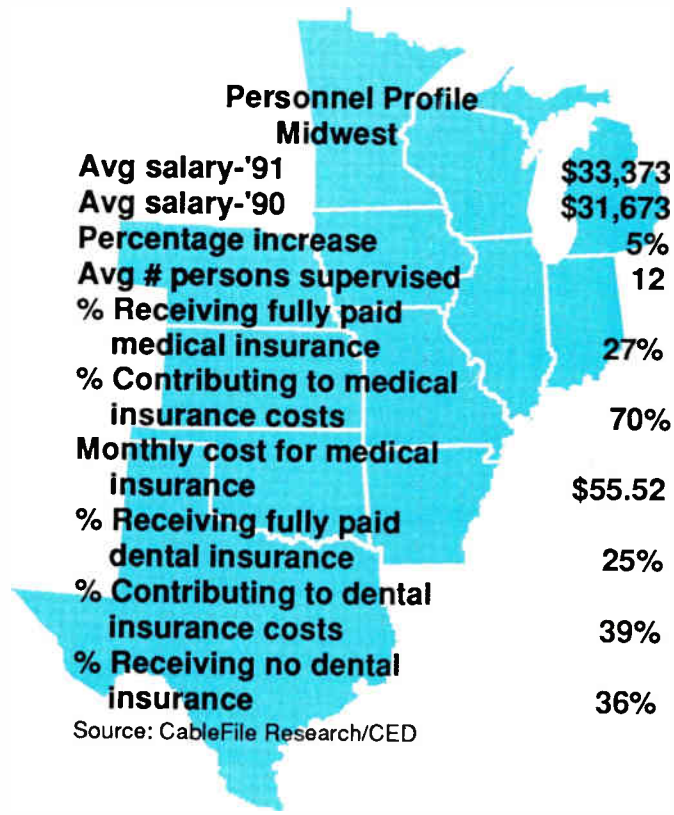


Figure 5

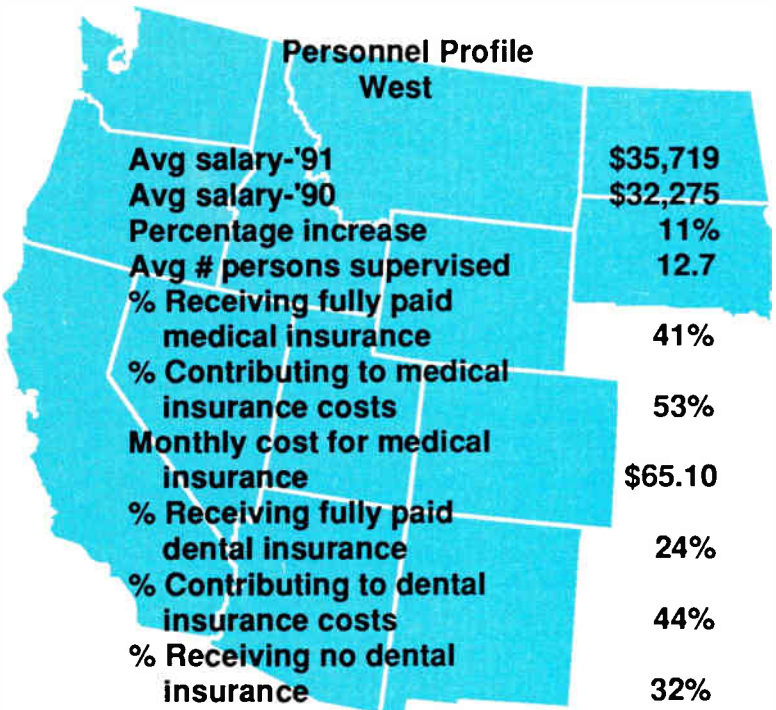


Figure 6

he expects to leave the industry said he was "getting burned out" because his salary ($17,000) is way below average. However, because the job market is "tough, they have you over a barrel," he wrote.

Another said the industry seems to lack a coherent set of goals for the future. "How will CATV fare in the future," he wondered. "If we don't take the torch, someone will." Yet another had problems communicating with his management. "It is woefully deficient, considering we're in the communications industry."

Problems controllable

Although the industry seems fraught with internal problems and issues, most people surveyed are veteran members of the industry who wish to remain. They're at least mildly satisfied with their income and benefits, but see competition and regulation looming as potential threats. However, most believe CATV's biggest problems are controllable (training, customer service, rates and image).

"There are more alternatives to cable being developed and it is unclear where our strongest competition will come from," wrote a 31-year-old engineer from Texas. "These uncertainties make me apprehensive, but I have great faith in ourselves to excel." ■

—Roger Brown

Where's your career headed?

Why is that the careers of so many technicians, engineers and plant personnel hit the wall and sometimes sideline the person right out of the industry? This is an emerging, frightful trend for many in engineering and plant operations.

There was a time when the industry was growing so rapidly that management couldn't staff their systems with well-qualified technicians and engineers. I've heard many candidates say, "I learned from the school of hard knocks." Unfortunately, this just isn't good enough today.

Hiring officials today are far more demanding than ever—and they scrutinize resumes closely. They are looking for people who stay abreast of current technology, are pursuing an electronics degree, completing the SCTE BCT/E courses, etc. As the industry has matured, competition is everywhere. Whereas every rung of the career ladder used to be wide open, now there is someone occupying every rung.

I've seen the careers of good people with strong work ethics limited because they've been too busy to keep up with the industry trade journals or pursue an education. Consolidation of operators has eliminated positions or made certain jobs redundant. Those who have had a difficult time staying in the industry are usually those who haven't been committed to furthering their education or taken a proactive role in the industry. Often, they are resigned to positions with limited upward mobility.

I suggest we all take a serious, hard look into the future of cable television and make sure we maintain a position of strength in this industry—and our careers.

—Scott Warren

Scott Warren is a partner and founder of Warren, Morris & Madison, Ltd., an executive search and management recruiting firm specializing in cable television and cellular telephone. He is headquartered in Portsmouth, N.H. His firm recently made a donation to the SCTE scholarship fund. This commentary does not necessarily reflect the views of the staff or management of CED *magazine. Reply comments are invited.*

OPTICAL NETWORK DESIGN MADE EASY

Unmatched Network Flexi

From headend to feeder, new-generation Sumitomo Series II optical transmitters and receivers make network design easier and more cost-effective. How? By delivering features, performance and reliability you can't find anywhere else. Ask your Sumitomo representative about all the possibilities.

Think All Brands Are Alike? Just Look Under The Hood.

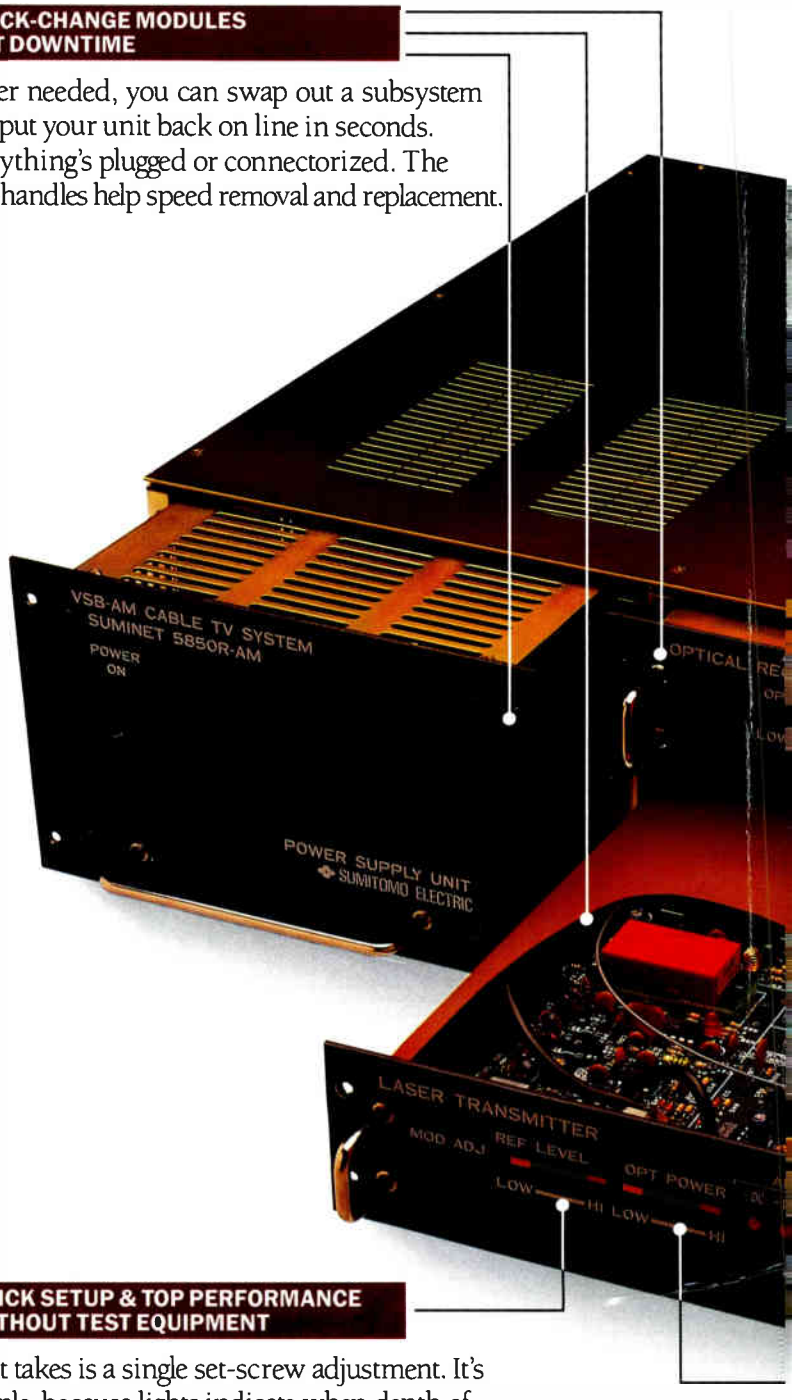
Optical transmitters and receivers are not created equal. Sumitomo Electric has long been a leading designer and manufacturer of VSB-AM optical transmission equipment. One result is Series II — transparently compatible with coax cable TV systems up to 550 MHz, and assembled with all the advantages shown here.

Uniform Specs Save Management Headaches

Anyone can give you best-of-the-bunch "hero" lasers that squeeze out an extra dB or so. But what happens when you face real-world maintenance, repair and replacement needs? Sumitomo Electric offers a saner approach: *lasers that meet uniformly high performance specifications in every unit we make.* Result: you get consistent high performance, plus components that are interchangeable throughout the network. Which makes for low-cost spare stocking — and makes managing the entire system a lot easier.

QUICK-CHANGE MODULES CUT DOWNTIME

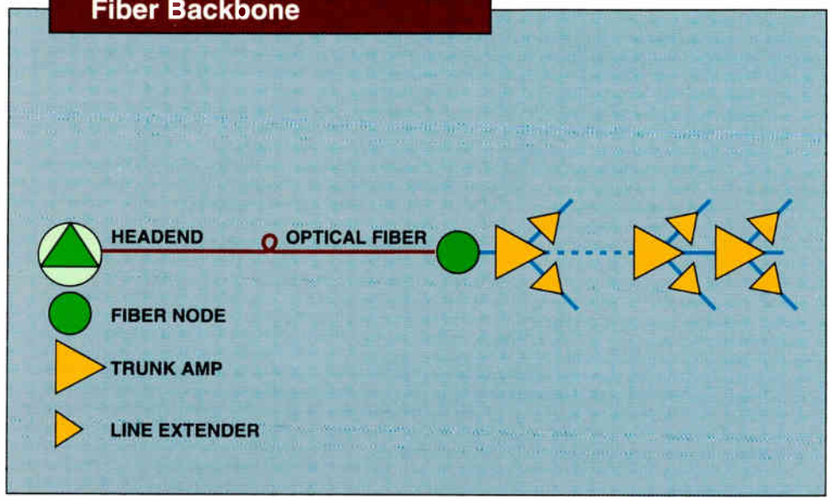
If ever needed, you can swap out a subsystem and put your unit back on line in seconds. Everything's plugged or connectorized. The pull-handles help speed removal and replacement.



QUICK SETUP & TOP PERFORMANCE WITHOUT TEST EQUIPMENT

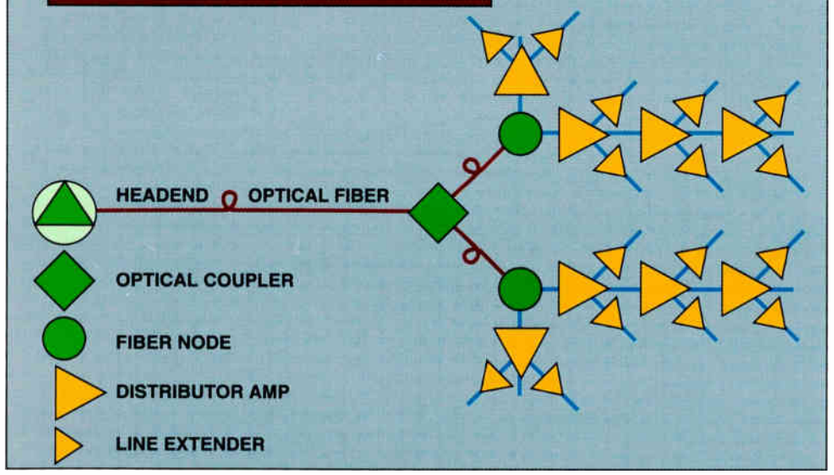
All it takes is a single set-screw adjustment. It's simple, because lights indicate when depth of modulation is optimized for both C/N and CTB — your quick reference to link performance. Walk into the headend, and lighted display shows instantly if all links are performing at optimum.

Fiber Backbone



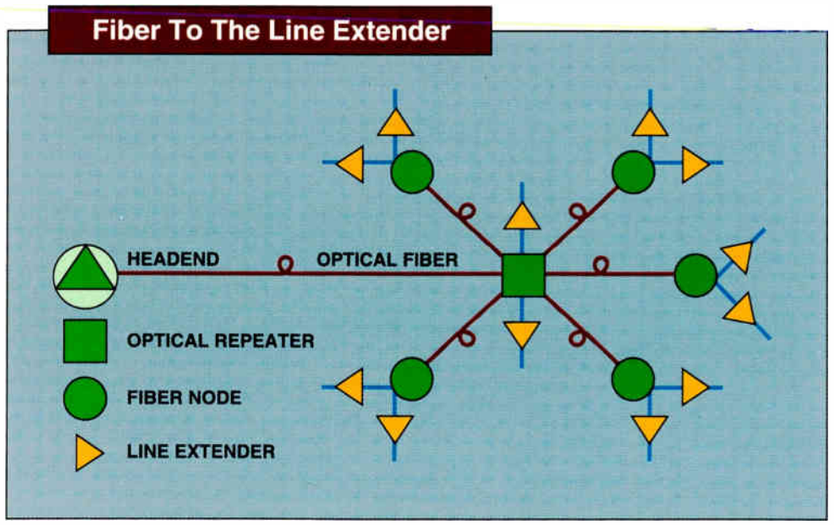
Conventional fiber backbone reduces active cascades as compared with coaxial trunk system. This improves picture quality and service reliability while extending system range. Sumitomo full bandwidth transmission and plug-in filters provide flexible split-channel loading. A/B switch provides system redundancy.

Fiber To The Feeder



Optical coupler, and economical Sumitomo receiver serving as a secondary node, provide unprecedented network design freedom. Fiber-to-feeder architecture further reduces active cascades and reduces maintenance by eliminating RF trunk amplifiers.

Fiber To The Line Extender



Sumitomo strand-mount optical repeater and secondary-node receiver eliminate need for trunk and distribution amplifiers. Resulting fiber-to-line-extender architecture minimizes active devices between headend and subscriber. Advanced design also minimizes maintenance, and allows expansion without backbone redesign or rework.

SPECIFICATIONS — SUMINET 5850 SERIES II

RACK UNIT

	COAX RF		OPTICAL	
	IN		**OUT**	
Transmitter	Bandwidth	50-550 MHz	Source	DFB-LD
	Level	25 ± 5 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Isolator	Yes
	Return Loss	14 dB Min	Avg Power	4 mW
	Connector	F-Female	Output	Pigtail (5 m)
	OUT		**IN**	
Receiver	Bandwidth	50-550 MHz	Detector	PIN-PD
	Level	30 ± 5 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Performance	SEE GRAPH
	Return Loss	14 dB Min	Input	Pigtail (5m)
	Connector	F-Female		

NOTE: Rack Mount Chassis Accommodates Two Units — Either Transmitters or Receivers or one of each.

STRAND UNIT

	COAX RF		OPTICAL	
	IN		**OUT**	
Transmitter Forward	Bandwidth	50-550 MHz	Source	DFB-LD
	Level	30 ± 5 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Isolator	Yes
	Return Loss	14 dB Min	Avg Power	4 mW
	Connector	Standard ⅝ x 24	Output	Pigtail (2 m)
	OUT		**IN**	
Receiver Forward	Bandwidth	50-550 MHz	Detector	PIN-PD
	Level	30 ± 5 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Performance	SEE GRAPH
	Return Loss	14 dB Min	Input	Pigtail (2 m)
	Connector	Standard ⅝ x 24		
	IN		**OUT**	
Transmitter Return	Bandwidth	5-30 MHz	Source	DFB-LD or FP
	Level	25 ± 5 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Isolator	Yes
	Return Loss	14 dB Min	Avg Power	4 mW
	Connector	Standard ⅝ x 24	Output	Pigtail (2 m)
	OUT		**IN**	
Receiver Return	Bandwidth	5-30 MHz	Detector	PIN-PD
	Level	25 ± 5 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Performance	SEE GRAPH
	Return Loss	14 dB Min	Input	Pigtail (2 m)
	Connector	Standard ⅝ x 24		

NOTE: Strand Housing accommodations: Up to 4 receivers, one transmitter (Forward or Return) and two receivers or two transmitters, an A/B switch plus status monitoring. Also, it can be configured as a repeater with one receiver and transmitter.

SECONDARY NODE

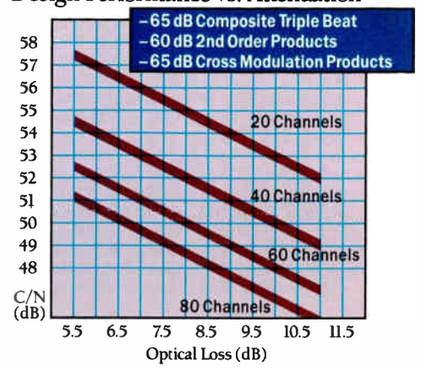
	OUT		IN	
Receiver Forward (FTLE)	Bandwidth	50-550 MHz	Detector	PIN-PD
	Level	46/43 dBmV	Wavelength	1310 nm
	Impedence	75 ohms	Performance	SEE GRAPH*
	Return Loss	14 dB Min	Input	Pigtail (2 m)
	Connector	Standard ⅝ x 24		

GENERAL	RACK UNIT	STRAND UNIT
Power	110/220 VAC 50/60 Hz 30 W/RCVR 60W/XMTR	30/60 VAC 50/60 Hz 30 W/RCVR 60W/XMTR
Operating Temperature	0° C to 40° C	−20° C to 50° C
Operating Humidity	Max 85% RH	Max 100% RH
Dimensions	EIA 19″ Rack Mount 3⁹⁄₁₀″ High (2 RU)	18¾″ L x 8″ H x 7″ D
Weight	25 lbs Max	25 lbs Max
Splice Ctr	—	3 Tray (12 Fibers)

Specifications are subject to change without notice.

VSB-AM Optical Transmitters And Receivers

Single Transmitter/Receiver Design Performance vs. Attenuation



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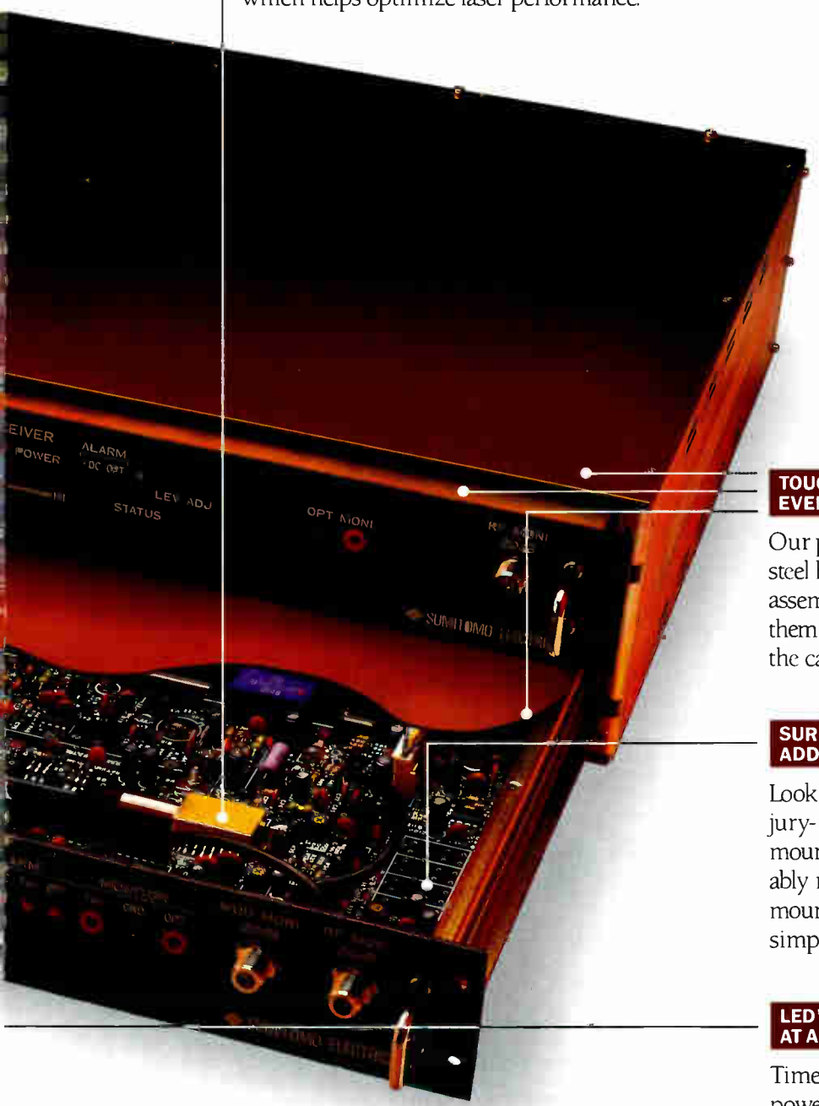

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Time is money. Don't waste it monitoring laser power. Indicator lights automatically show optimum laser power output — your quick reference to laser performance.

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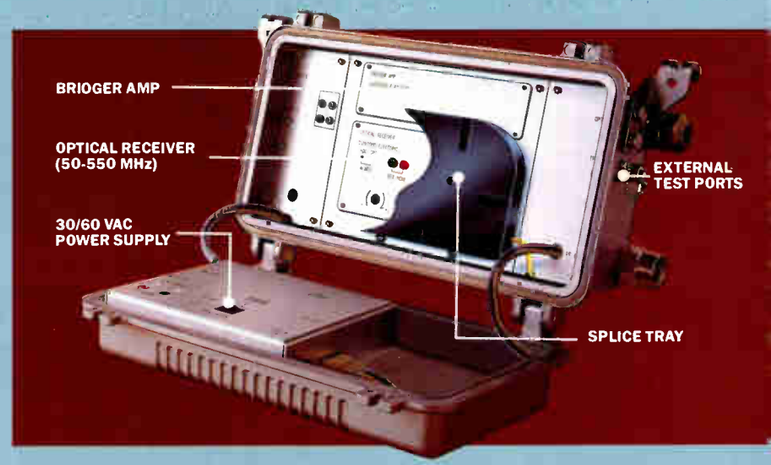
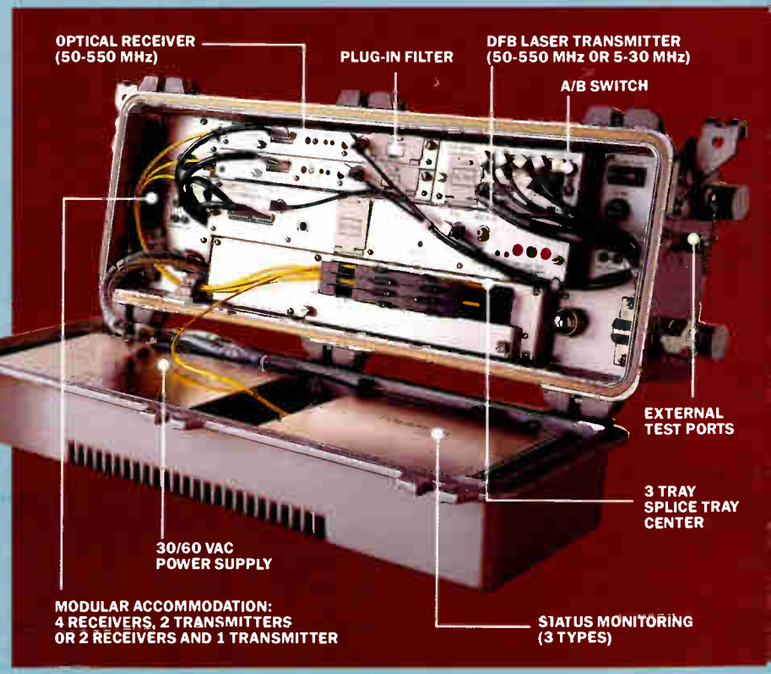
Fiber in, RF out. Use this cost-effective unit as a secondary node outputting 48 dBmV directly to feeder lines. "Fiber to feeder" eliminates trunk amplifiers, dramatically reducing active cascades. The result: better picture quality, reduced maintenance and improved service to subscribers. Status monitoring available.



MODULAR RECEIVER/TRANSMITTER OFFERS DESIGN FLEXIBILITY

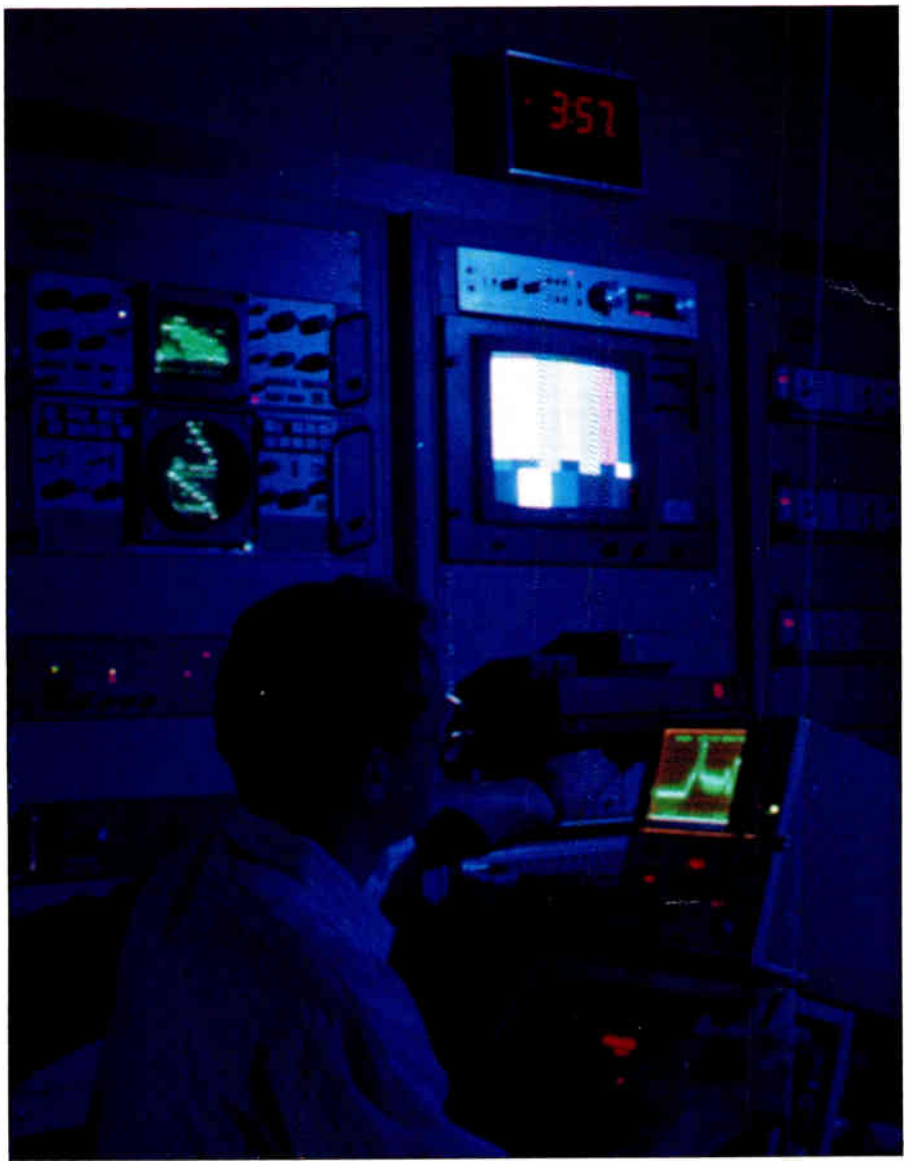
Gain new freedom for today's design and tomorrow's expansion. Unit offers fiber-in, fiber-out, and local RF drops. Unit can be used with conventional fiber backbone as a mini-headend in "fiber to feeder" architectures, or repeated extended reach to remote hubs.



Organizing for outages

Part II

Editor's Note: *This is the second of a two-part article on system outage management. Last month, Mr. Ehman's article discussed procedures a cable system can institute to help it cope with unplanned outages. This month's installment concludes with tips on staffing, procedures, goals and reviews.*



Cable systems should make every effort to extend (human) coverage over the maximum number of daily hours and the maximum number of days per week in order to be prepared for an outage.

This includes the necessary dispatch backup. If records are kept for a couple of weeks, a chart can be developed such as that shown in Figure 1. These are real numbers from a real system which had extended dispatch hours and 160,000 subscribers. The demand peaks are clearly discernable and easily dealt with by controlling shift times and perhaps using temporary help.

Having one or more technicians on duty, in the plant, and fully equipped restore an outage is vastly superior to the procedure of calling someone out from their home with all the attendant delays.

In medium to large systems, this can be done with innovative shift staggering. Many systems bring technical and service staff on too early to decently call on homes and could better use the time toward the end of the day.

One system gets extended coverage and a six-day week **without overtime** by having a Tuesday to Saturday shift as well as the Monday to Friday shift. There is also an "early" shift and a "late" shift. Hours and schedules are arranged so that every third week each individual finds himself with a four-day weekend.

On larger systems when you consider the standby pay, plus the minimum for a call-out, plus hours worked, it is a relatively small increment to have one or more techs actually working on the system doing "no pix" calls or other chores on Sundays, especially during peak viewing.

Minimum downtime

Together with extended hours for the office/dispatch and service techs, spares plus training is the most important single factor in keeping the duration of outages down. This key philosophy can be stated as follows. "Every service/line tech must be equipped and trained so that, even if he was the only person on the system, he could restore any outage whatsoever in a minimum of time with no recourse to outside help or supplies."

This seems a little trite and obvious, but consider the question of spares. Not only must each and every service/line tech have at least one of every module and passive used in the system, but he must also have adequate supplies of RG11 or similar with adapter connectors that will match each and every fitting that has ever been installed in that system.

With regard to fiber outages, here again advance planning is essential. If it is to be done by third parties the contract should be in place and operational. A test call-out for response time may even be in order.

If fiber repairs are to be done in-house, consideration should be given

By Roy Ehman, Director of Engineering, Jones Intercable

to a fully equipped system or regional trailer that can be quickly picked up and taken to the trouble spot by one or more vehicles with matching towing equipment. The trailer should provide adequate shelter and working environment for the fiber splicing task and personnel procedures and splicing skills should be rehearsed twice a year.

Customers must be provided with something to watch as quickly as possible, even if the quality is degraded. Otherwise they will start switching to antennas and VCRs and probably cause a number of service calls.

A full complement of modules is expensive and must be budgeted into the cost of fully equipping a truck. It helps to set up a paperless method of module exchange whereby techs exchange a bad or burned module for a good one, leaving any paperwork to the warehouse. Keeping the trucks up to snuff requires frequent checks. It can be really disheartening to hear someone on the radio "broadcasting" an appeal for a good module or a certain connector because he did not refresh his truck stock in a timely manner.

A must in conducting an outage is to have trunk tree and powering maps available in the trucks and at the operating position. The maps in the truck should be of a size that is manageable in the space available. 200:1 map sections broken down into 11 x 17 pages with hard covers in binders is most appropriate. Microfiche has also been used for this purpose.

The post mortem

We have talked about having a plan and having equipment and training adequate to restore any outage singlehandedly. Now we need to set a goal. Every cable system should set a goal or target for the maximum individual outage down time. Then we know what we are striving for, and when that goal is exceeded we need to have a post mortem/outage review as soon as possible after the outage while everyone's memory is still fresh.

The idea is not to castigate the personnel that were involved in the outage but rather to analyze the situation to see if any possibilities exist to improve the performance, or maybe to rewrite or fine tune the plan. Another purpose of the post mortem (PM) is to focus on outages which appear to occur for the same causes, in the same areas, or both. Jones Intercable has adopted a goal of one hour.

This is a tough goal and is frequently unattainable for good reason. But if you don't have a tough goal, you will not be striving for improvement and you will not be conducting enough PMs to see how your procedures could be improved.

The best and only way to ensure constant improvements in outage downtimes is to faithfully hold the post mortems. For example, if an outage review finds that the tech(s) took 45 minutes to cross from one end of town to the other at 5 p.m., it highlights the consideration of having zoned technicians working each quadrant of the system to reduce transit time (if the number of personnel permits).

Another example might be that the tech got to the scene in good time and could not localize the problem. This would indicate a possible need of more training on outage localization using the system mock-up board. Or perhaps the CSRs/dispatchers did not recognize that there was an outage for a while or the radio went out with the power. The remedies soon become obvious and should be embodied in a fine tune of the plan.

Under "miscellaneous" falls the old problem of self-induced outages. That means taking equipment down during normal viewing hours and even short breaks, like changing equalizers. A practice which must stop is switching modulators off in the headend one at a time to localize a beat or other problem. This kind of work and other changeouts must be done in the wee hours of the morning.

If it is absolutely necessary to take down plant during normal viewing hours, then we owe our customers the courtesy of advising them in advance that there will be breaks in service on certain dates for the purpose of increasing the system's quality and reliability.

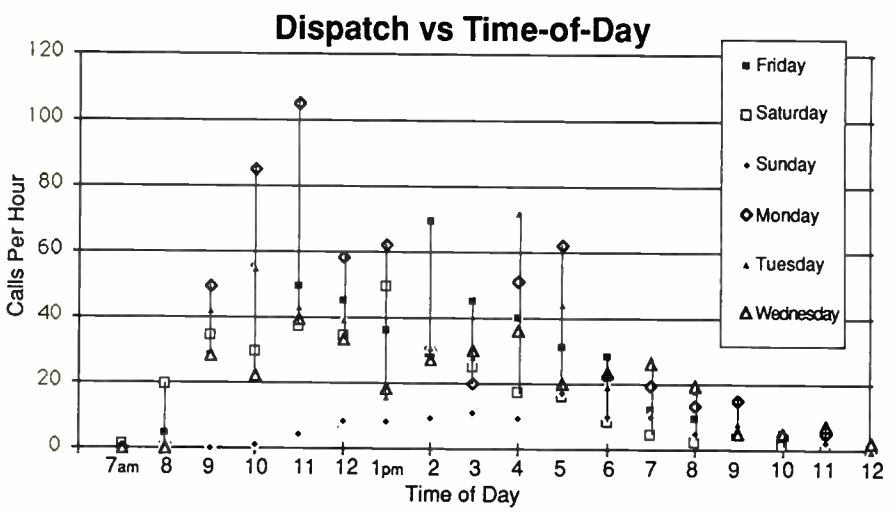
Here is one last organizational suggestion. Try to establish excellent relations with the local power company. This has been known to do wonders for some systems. Not only will you get more timely advice of impending changes but you may even be able to reduce the number and duration of outages by having them connect your standby power supplies to the "good" phase. In many cases a phase will have a disruptive load and your supply can be transferred to the other phase.

Have you ever noticed some street lights still on during a power outage? This would be a major breakthrough if you could get your supply wired to that circuit, assuming of course that the power is continuous and the lights photo-cell controlled!

In summary, to organize for reduced outage durations, we need:

- Extended hours for dispatch and field staff,
- A technically competent dispatcher,
- Written outage control and reduction procedures,
- Every service/line tech equipped and trained to handle *any* outage singlehandedly,
- A maximum outage duration *goal*,
- And an outage review (post mortem) to look for improved methods to fine-tune the written procedures.

Remember, as I mentioned last month, Webster defines stoicism as "uncomplaining endurance." There is certainly no room for that when it comes to outages! ■



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DESCRIPTION: Alpha offers the well-known AP Series Standby Systems, and the newer "XP" Series. The XP, a compact modular system, offers universal status monitor, hand-held data logger, and self-test capability. The new 'FiberUPS', with AC or DC outputs for fiber applications, and modular non-standby models (4 Amps to 18 Amps) are also featured.

Lectro Products, Inc. . . . .(404) 543-1904
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420 Athena Dr.
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PERSONNEL: Mike Kearns, National Sales Manager; Arlene Adams, Customer Service Manager
DESCRIPTION: Lectro manufactures a complete line of single ferro and dual redundant standby power systems and a full range of ferroresonant power supplies with outputs of 2 to 18 amps. A wide range of high quality products for the U.S.A. and international markets is available including dual output for CATV and telephone system powering.

Power Guard . . . . . .(800) 288-1507
FAX . . . . . .(205) 742-0058
506 Walker St.
P.O. Box 2796
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DESCRIPTION: Power supplies engineered for the technology demands of tomorrow, foreign or domestic, including the Power Cast™ non-standby and the new Small Simple Standby™. Simple, reliable, and highly efficient, this high quality, no nonsense standby will keep your initial investment and operating costs to a minimum. All products available in 3-6-9-12 and 15 amps.

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DESCRIPTION: Our product lines include all CATV related power supplies, uninterruptable power supply, and custom power products for the domestic and international markets. PTI is a medium sized company which allows us the highest degree of attention to be given to all customers and products.

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Alpha Technologies . . . .(206) 647-2360
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Power Technologies, Inc. .(206) 435-9530
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18931 59th Ave. NE
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PERSONNEL: Werner Krajicek, President; Lois Gilbert, Sales Manager
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DESCRIPTION: Manufacturer representative for a complete line of Alpha standby and non-standby power supplies for CATV, broadband and local area networks in the Southeast.

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WATS . . . . . .(800) 367-1450
FAX . . . . . .(317) 849-8317
8120 Knue Rd.
Suite 106
Indianapolis, IN 46250
PERSONNEL: Scott Widaman, Sales Manager; Brenda Gentry, District Sales
DESCRIPTION: Manufacturers representative for: Alpha standby, non-standby, and UPS power supplies, Standard Communications, satellite receivers, modulators, IRDs and stereo encoders. Catel headend and fiber optics equipment, Panasonic converters, Channelmatic commercial insertion and compiler equipment, FM Systems test equipment, Cadco headend equipment, VDS character generators and Superior Electronics.

The impact of digital compression on system rebuilds

Digital video compression technology has recently become the hottest topic in the CATV industry. The reasons for this are its promises of robust transmission capabilities and efficient bandwidth utilization, in combination with its projected near-term availability (only two to three years away).

Of obvious concern to system operators is how to best incorporate this technology into upcoming distribution plant bandwidth expansion/quality improvement program planning. Digital compression for cable transmission alters the traditional relationships between RF bandwidth, channel capacity and picture quality.

Future channel capacity requirements

Recent marketing/programming experiments indicate a potential explosion in the number of channels that will be required to support future CATV services. HBO and Cinemax have announced "multiplex" trials, where HBO will become a three-channel service and Cinemax a two-channel service. The announced intent of this plan is to reduce customer disconnects industrywide by 10 percent and generate an estimated $200 million of additional profit for operators.

has selected vendors to expand the bandwidth in its Queens, N.Y. system to 1 GHz. The primary thrust of this program is to determine demand for multiple channel pay-per-view and near video on demand.

TCI, AT&T and US West have announced joint testing in the Denver suburbs, where they also are attempting to establish a demand scenario for video on demand and multiple channel pay-per-view. To do this testing, TCI will be installing a totally new, second coaxial cable plant to serve the test area.

Impact on system design

Each program indicates a potentially significant increase in channel requirements for pay services, pay-per-view services and the potential for near video on demand.

Other factors defined to weigh heavily on digital compression include high definition television and narrowcasting opportunities created by more effective transponder utilization.

In a few years, digital compression will be a viable option for cable system transmission, significantly altering the bandwidth channel capacity equation. The operator is now faced with the difficult task of planning and executing his system rebuild or upgrade in this new environment. To determine the best approach for a particular system, it is important to understand how the use of digital transmission affects distribution plant design.

There are two important ways in which digital compression and transmission affect the distribution plant. The most obvious is that compression offers the promise of carrying two,

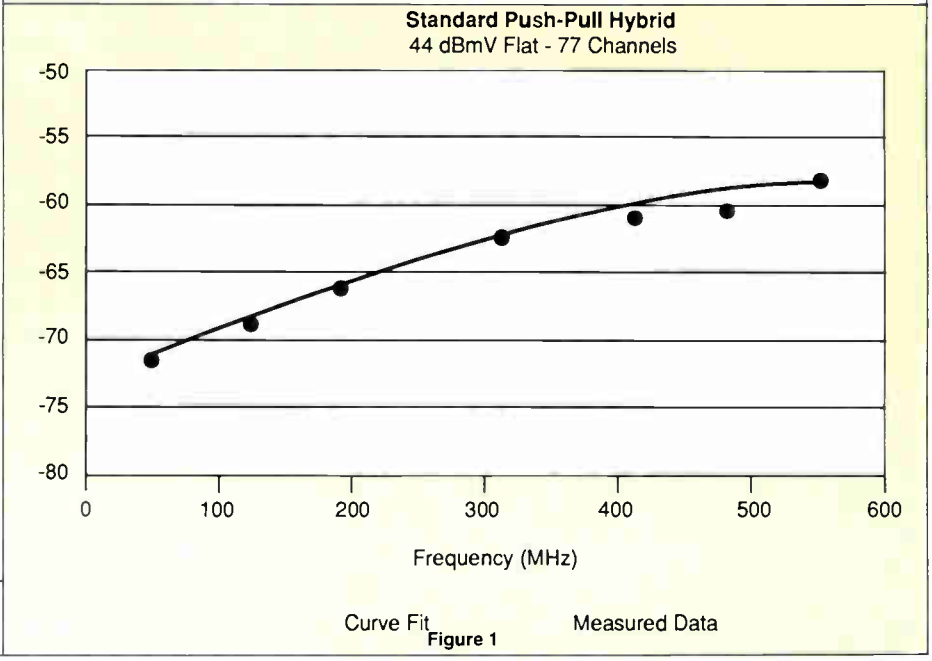


Figure 1

By David Grubb III, Manager, Advanced Engineering, Jerrold Communications

three or even five NTSC video programs in one 6-MHz channel. The second factor is that the distribution plant design can be optimized to take advantage of the inherent ruggedness of the digital signal, resulting in significant cost savings.[1,2]

The first question one might ask is, "Why not transmit all my signals digitally?" This is certainly an option, particularly for those few operators who currently scramble all the channels on their system. However, most operators carry basic services in the clear to avoid the consumer problems associated with cable-ready sets and basic subscribers.

The consumer interface issues will not change with digital compression technology, and the cost per converter is estimated to increase significantly. This would seem to mandate that a prudent approach would be to carry a mix of AM and digital signals over the distribution plant.

How much AM capacity a hybrid AM/digital system will need over its life turns out to be an important factor in determining the system cost. AM capacity is defined as the total number of VSB/AM channels, including scrambled AM channels, that the system must be able to deliver with the desired level of performance.

Worst case CTB for AM channels 450/550 MHz split push-pull cascade hybrid

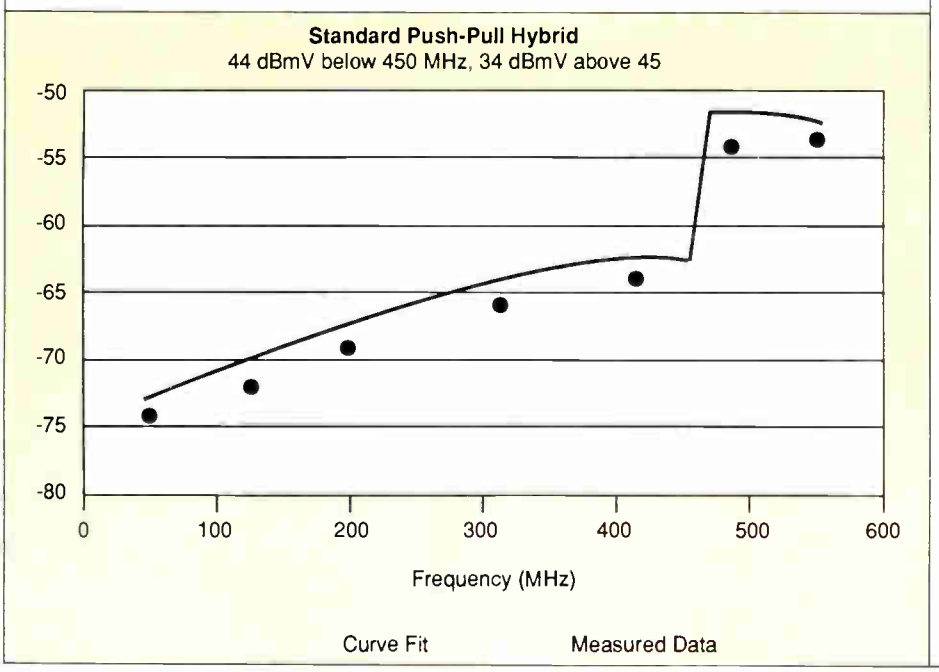
Tilt	All AM	AM/Dig	Improvement
0	−58.5	−62.5	4.0
6	−63.5	−68.5	5.0
10	−65.9	−71.7	5.8

Table 1

The impact of digital signals on distribution plant performance stems from the fact that the picture quality of the digital channel is not affected by system noise and distortion, as long as the carrier-to-noise ratio remains above the system threshold. The precise threshold for a particular digital system depends on the channel characteristics and the modulation format and error correction system chosen. Since the carrier-to-noise plus distortion ratio exceeds threshold, the digital data is recovered accurately and the subscriber receives a picture with the same quality as is available at the headend.

The noise threshold for a typical digital system (16 QAM) is about 25 dB. This is a dramatically lower requirement than for a VSB/AM video transmission, which requires a carrier-to-noise ratio of roughly 52 dB to be perceived as noise free or 48 dB to be perceived as "not objectionable."[3]

Because of the low C/N requirements of the digital signals, they can be transmitted through the cable system at lower levels than the accompanying VSB/AM signals. This reduced loading results in improved amplifier performance for the AM channels. By taking advantage of this improved performance, it is possible to reduce the plant cost, compared to a traditional system with the same RF bandwidth carrying all VSB/AM channels.



Amplifier performance

To determine how CATV amplifiers will perform when loaded with a mix of AM and digital signals, we employed both computer simulation and lab measurements, using conventional amplifier hybrids. We assumed that the digital signals would be carried at a level 10 dB lower than the accompanying AM signals. This choice of level provides most of the performance improvement that can be obtained for the AM channels, while maintaining a fair amount of headroom for the digital signals.

The data presented here assumes a 550 MHz system, loaded to 450 MHz with AM signals (60 channels) and

	Bandwidth (MHz)	Channel Capacity AM	Digital	Total	Performance C/N	CTB
Existing system	330	42	0	42	45	−51
Approach A (All AM)	550	77	0	77	47	−53
Approach B (Hybrid)	550	60	51	111	47	−53

Note: assuming 3 channels per 6 MHz for the digital system

Table 2

loaded with digital signals between 450 MHz and 550 MHz (17 channels; 34 to 85 video programs depending on the amount of compression).

To obtain a baseline for our measurements and computer simulation, we measured the distortion performance of a typical amplifier hybrid with 77 channels at 44 dBmV, with flat output. This data is shown in Figure 1.

We fit a curve to the measured data to characterize the amplifier performance over frequency for the computer simulation. Figure 2 shows the amplifier performance when loaded with the AM channels at 44 dBmV out and the digital channels at 35 dBmV out. The graph shows that there is good correlation between the predicted and actual performance.

Figures 1 and 2 also show that the worst case CTB for an AM channel improves by 4 dB, with hybrid AM/digital loading under flat output conditions. Table 1 summarizes the performance improvement with 6 dB and 10 dB of operational tilt.

In designing a cable system to carry a mix of AM and digital signals, it is possible to take advantage of the distortion improvement factor by raising feeder levels, thereby feeding more homes from each active device. This lowers the number of actives per mile and, therefore, lowers system cost.

Upgrade scenarios

In a recent study, the cost of upgrading an existing 330 MHz system to 550 MHz was evaluated for both the hybrid AM/digital and a traditional all-AM scenario. The existing system had a maximum 25-amp cascade and used P3-0.750 trunk and P3-0.500 feeder. Table 2 outlines the channel capacity of the existing system and of the two alternatives.

Table 3 outlines the costs associated with the two upgrade options. The existing cable was used in both designs. Both upgrades used a 15-amplifier headend trunk cascade, with fiber backbones serving the remaining trunks. The system, optimized for hybrid operation, saved $350/mile in equipment and $650/mile overall, when installation was included.

Note that there is no reason that system A could not used to transmit digital signals to provide the same capacity as system B.

In fact, if system A is operated this way, there will be roughly a 5 dB improvement in distortion performance. This could be traded off for higher operating levels with a resulting system performance of C/N = 49 dB and CTB = −54 dB.

Note also that the hybrid approach provides the same total channel capacity as an all-AM, 750-MHz system. This is quite dramatic because it would take a complete rebuild to take the

system to a 750 MHz capacity. The cost of this would be on the order of $12,000 per mile.

We can see from this data that for a given RF bandwidth, the system upgrade cost is strongly influenced by the desired AM channel capacity. This says that an important part of the rebuild or upgrade planning process is an assessment of future AM channel requirements.

Rebuild

In a system rebuild, when one is not constrained by the existing system design, the designer has considerably more flexibility. The conclusion that one should design for a target number of AM channels with additional bandwidth still applies. There are some variations possible, depending on the operator's needs.

For example, if long-term plans call for 77 channels of AM capacity, then an operator may want to build a 550 MHz system, but space the design for a higher bandwidth, possibly 750 MHz. This allows for a drop-in module upgrade to 550/750 AM/digital operation in the future, with a total capacity of 176 channels; 77 AM and 99 digital (at three per 6 MHz). Note that this is roughly equivalent to a 1.2 GHz AM system.

It turns out that in FTF designs, the cost of "short spacing" the amplifiers is not large. In our internal studies, we have found that the premium is roughly $100 to $200 per mile at densities of 100 homes per mile. The premium is small because in feeder networks a great percentage of the line extenders are not operating at full gain.

Conclusion

Digital video compression will play a role in the projected explosion of channel capacity requirements. Lower transponder overhead costs will make available more basic channels, while premium services will be handled more frequency-efficiently.

To meet these needs, hybrid (VSB/AM and digital) systems, offering 111-channel capacity, can be made available through upgrades to existing cable plants by using present day fiber/RF 550 MHz products.

In addition, 150-channel systems can be economically constructed with near-term available, 750 MHz products, at only a slight cost premium over 550 MHz systems. ■

	Upgrade cost per mile		
	Equipment	Installation	Total
Approach A (All AM)	$2,720	$1,680	$4,400
Approach B (Hybrid)	$2,370	$1,390	$3,760

Table 3

References

1. D. Grubb, "Future hybrid AM/digital CATV systems," NCTA 1991 Technical Papers, pp.256-262.
2. C. Robbins, "Digital video for CATV," *Communications Technology*, May 1991, pp.26-44.
3. B.L. Jones, "Subjective assessment of cable impairments on picture quality—a preliminary report," National Cable Television Association 1991 Technical Papers, pp.92-94.

Making in-home wiring work

Efforts underway to standardize practices

When the guys at Scripps Howard's Chattanooga system went around measuring signal leakage last year, they ran head-on into a signal so strong it was "lighting up the neighborhood" recalls Mark Haley, an engineer working at the system. The crew's detection efforts led them to a house in which the owner had strung together two 20-dB pre-amps in series in order to provide a better picture to his television. Needless to say, the subscriber's best intentions resulted in a major problem for the cable company.

Although the case is an isolated one, it exposes a nagging problem cable operators have had to contend with for some time—in-home wiring performed by someone other than themselves.

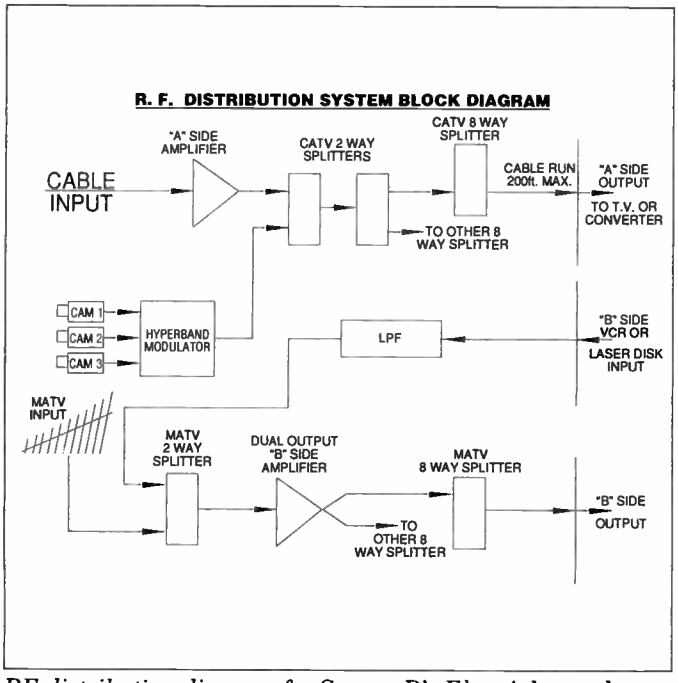
The new weak link

Over the last half-decade, major technical advances have been made in the satellite, headend, trunk and feeder portions of the cable TV network. And while some limited advances have been made in the tap-to-TV (or "subscriber") link, that portion of the system is considered by many to be the weak link of the chain.

Certainly it is the most abused. Industry statistics note that the vast majority of service calls are related to the drop system, forcing system technicians to change connectors or install an entirely new drop. The industry collectively purchases enough drop cable every three years to completely re-wire all the drops in existence. And untold millions of dollars are spent each year on F connectors, splitters and traps. One trap manufacturer says he continues to expect his sales to sag every year (as set-top addressability grows), yet sales remain strong year after year.

Today, there is much effort being put forth to shore up the subscriber link. A year ago, the NCTA Engineering Committee organized an in-home wiring subcommittee to examine ways to improve the performance of the link. Recently, the SCTE established its own subcommittee, which is charged with developing a set of recommended practices. Both subcommittees are chaired by Larry Nelson of Comm/Scope.

Specifically, the SCTE subcommittee is looking at suggesting minimum cable shielding requirements, and isolation figures for passives; it will also examine cable sizes, connector types and in-home amplifiers and their relationship to providing quality video to the television.



RF distribution diagram for Square D's Elan Advanced Home Network

Ultimately, Nelson hopes to write a document establishing a practice for in-home wiring that includes recommended minimum specifications that the operator can either adopt fully or amend as it sees necessary. The intent is to distribute the specifications to local homebuilders, contractors and subcontractors so that they install wiring and connectors the operator will agree to hook up to. The document should be ready in about a year, Nelson reports.

Benefits all

"The standard will help us all," from CATV equipment vendors to consumer electronics manufacturers and consumers themselves, says Nelson. For example, consumers who buy new homes and pay to have them pre-wired for cable-TV are often wasting their money because contractors have been known to use sub-standard hardware that the cable operator refuses to connect to.

CableLabs involvement

In addition to the work the NCTA and SCTE is doing, CableLabs has focused its efforts on the subject as well. Scott Bachman, director of technical operations projects at the Labs, says CableLabs will support the work cited above, perform some additional work and create a task force with NCTA and SCTE participation that will undertake various projects and print the documentation.

Presently, in-home wiring is envisioned as a long-term project that could result in more direct communication with the National Homebuilders Association (as well as homebuilders at the local level), joint projects with retail outlets and perhaps the creation of an information clearinghouse. For example, when the telephone industry was broken up in the mid 1980s, it created BICS (Building Industry Consulting Services) to standardize the process of wiring and installing telephone service in commercial buildings. The emphasis was on local participation. Bachman believes the cable industry now stands where the phone companies were in 1984—and should take a similar step.

Both Bachman and Tom Jokerst, a regional director of engineering for Continental Cable, say the problem of subscriber-installed wiring is a pervasive one that should be dealt with sooner rather than later. But, predictably, different operators have different ideas of how to deal with the problem.

Perhaps the easiest way would be to take the approach adopted by Tele-Communications Inc. Its policy is to

provide a broadband service to the house. There are no charges for additional outlets. Therefore, the subscriber doesn't see the need to avoid additional fees by purchasing a splitter and indoor amplifier of poor quality from a local retailer and installing it himself.

Other operators, however, are not willing to give up the additional income generated from fees for additional outlets, remote controls and the like. Therefore, subscribers are more likely to visit the local electronics store, buy the cheapest in-line amp, splitter, cable and connectors, and do it all himself.

It is because of this dichotomy of approaches that the in-home wiring subcommittee work was undertaken. If retailers and consumer equipment manufacturers have ready access to, and understand, a cable operator's needs, then consumers can not only buy better product, but can be properly educated on how to make the best connection possible.

"This is a tough nut to tackle" because operators have different ideas about what's acceptable, notes Bachman. Consequently, CableLabs will be actively seeking comments and information on how to best proceed. He will solicit ideas from operators who have implemented good educational programs or aggressively sought to create a good relationship with local homebuilders and then will attempt to duplicate those efforts.

One effort already underway

In addition to the subcommittee work, at least one private company is making an effort to integrate video, voice and audio services in newly built homes. Square D, a company that has specialized in home electrical protection products, has introduced the Elan Advanced Home Network. This concept "reorganizes" the way a house has traditionally been wired for electricity, video, voice and audio.

The Elan video wiring system uses dual runs of coaxial cable so CATV and VCR signals can be routed to any room simultaneously. Closed circuit television is an option that can also be controlled. To insure the best picture quality, cables are home runned from the distribution center to each receptacle.

Square D has chosen the following familiar suppliers and equipment for the video portion of its network:

- Comm/Scope and Belden: coaxial cable, wall plates and connectors.
- Regal Technologies: amplifiers, splitters and switches.
- Raychem Inc.: EZF and EZ Twist connectors.
- Eagle microwave: low pass filter.

In order to be an authorized Elan contractor, companies are required to take five to six hours of training on system layout, wire rough-in, coax handling and terminating, system checkout and troubleshooting. The contractor will also be required to develop a relationship with the local CATV company, according to Square D officials.

As operators focus their efforts on delivering high quality video to their subscribers, it's important not to forget about the system from the tap to the TV (and especially the part *in* the house, where most service problems exist. Efforts to improve components and installation practices are underway and could be exacerbated by the FCC's pending action on technical standards (which calls for a minimum 6 dBmV signal level at the converter or TV).

It may take some emotional adjustment, but many believe the only way the system will improve is through proactive efforts. ■

—Roger Brown

IN-HOME WIRING CALLBOOK

The following companies have paid a fee to have their listing appear in the In-Home Wiring Callbook.

Drop Cable

BELDEN

Cooper Industries . . . . .(800) 235-3362
Belden Division
FAX . . . . . .(317) 983-5503
P.O. Box 1980
Richmond, IN 47375
PERSONNEL: Jim Hughes, National CATV Sales Manager; Les Hunt, CATV and Broadcast Product Manager
DESCRIPTION: Full line manufacturer of coaxial drop cables including RG-59, RG-6, RG-7 and RG-11 constructions. Product offering features messengered and non-messengered cables, as well as flooded burial products. Shield configurations including Duobond II (foil/braid), Duobond III (tri-shield), Duobond IV (quad) and Duobond Plus designs. Belden cables conform to NEC requirements including CATV rated cable for in-house applications.

Comm/Scope, Inc.
THE Cable in Cable TV.

Comm/Scope Inc. . . . . .(800) 928-1708
FAX . . . . . .(704 328-3400
P.O. Box 1729
Hickory, N.C. 28603
PERSONNEL: Elaine Jones, Customer Service Manager
DESCRIPTION: Comm/Scope offers a full line of drop cables tested to 1 GHz, including two versions of corrosion-resistant drop cables and cables that meet NEC requirements.

Trilogy COMMUNICATIONS INC.

Trilogy Comm. Inc. . . . .(800) 874-5649
FAX . . . . . .(601) 939-6637
2910 Hwy 80 E
Pearl, Miss. 39208
PERSONNEL: William Kloss, National Sales Manager; Daryl Gambrell, Sales/Service Manager
DESCRIPTION: Full line of quality drop cables for the CATV industry. Products include single, tri- and quad-shields; available with Trilogy's corrosion inhibiting compound. All drop cables meet current NEC requirements.

TFC TIMES FIBER COMMUNICATIONS, INC. an LPL company
358 Hall Ave • P.O. Box 384 • Wallingford, CT 06492

Times Fiber Comm. Inc. . .(203) 265-8500
FAX . . . . . .(203) 265-8422
358 Hall Ave.
Wallingford, Conn. 06492
PERSONNEL: Sanford Lyons, Director of Sales and Marketing; Frederic Wilkenloh, Director of Engineering
DESCRIPTION: High quality, flexible coaxial cables (series 59, 6, 611 and 11) with high bandwidth and low attenuation. Featuring multiple shielding configurations with superior transfer impedance characteristics for excellent shielding performance. Underwriters Laboratories listings for NEC flame retardancy. Corrosion protection options for underground and aerial, self-supporting and dual constructions.

In-House Amplifiers

AUGAT COMMUNICATIONS GROUP INC.

Augat Comms. Group Inc. .(800) 327-6690
FAX . . . . . .(206) 938-8850
2414 S. Andover Street
Seattle, Wash. 98106
PERSONNEL: Sherwood Hawley, Application Engineering; Sally Kinsman, Product Manager
DESCRIPTION: Augat's Signal Stretcher amplifiers provides additional gain (16 dB) for long house drops and multiple TV outlets at specifications comparable to line extenders. These versatile amplifiers have single or multi-output (port) models, can serve one or two way applications and have bandwidths to 1 GHz.

C-COR® ELECTRONICS INC

C-Cor Electronics Inc. . . .(800) 233-2267
(814) 238-2561
FAX . . . . . .(814) 238-4065
60 Decibel Rd.
State College, PA 16801
PERSONNEL: Ed Kopakowski, National Sales Manager, Commercial Systems
DESCRIPTION: C-Cor has teamed up with Smart House to offer C-Cor CHAMP, a coaxial headend amplifier which provides for two-way transmission of numerous services (multichannel video, audio, voice and data communications) for the home automation/entertainment network of the future. The C-Cor CHAMP is currently in production and available for sale to MSOs and Smart House authorized electrical distributors.

Lindsay

Lindsay Specialty Products .(800) 465-7046
FAX . . . . . .(705) 324-5474
50 Mary St. W
Lindsay, Ontario K9V457
PERSONNEL: Brian Ward, Key Account Manager; David Atman, Director of Marketing
DESCRIPTION: Lindsay introduces the indoor amplifier solutions: LDA-10 650 MHz drop amplifier featuring UL approved, radiation secure 10 dB gain amplifier with a 4.5 noise figure and improved distortion characteristics. 700 Series 550 MHz apartment amplifier featuring two-way power doubling options with superior mechanical features for radiation security and heat dissipation. Call your local distribution center.

QRF

Quality RF Services Inc. . .(800) 327-9767
(407) 747-4998
FAX . . . . . .(407) 744-4618
850 Parkway
Jupiter, Fl. 33477
PERSONNEL: Fred J. Rogers, President; John Tinberg, Applications Engineer
DESCRIPTION: **Newly designed for the 90s...**Indoor distribution amplifiers offering high performance at low cost. **Save money** while solving CLI compliance and outage problems caused by heat stress. If your present unit lacks performance, runs too hot, costs too much or is less than perfect for any reason, give us a call.

TRIPLE CROWN ELECTRONICS

Triple Crown . . . . . .(416) 629-1111
Electronics Inc.
FAX . . . . . .(416) 629-1115
4560 Fieldgate Dr.
Mississsauga, Ontario L4W SW6
PERSONNEL: C.J. Evans, President; K. Poirier, Vice President, Corporate Development
DESCRIPTION: Triple Crown's in-house amplifiers cover a very wide range of gain and bandwidth varieties, many employing the latest power doubling hybrid technology. Options include bandwidth to 750 MHz, one-way or bi-directional, automatic level control, and cable or line-powered. All Triple Crown amplifiers feature built-in signal level and slope control and do not require separate plug-in pads or equalizers.

IN-HOME WIRING CALLBOOK

Connectors

AUGAT COMMUNICATIONS GROUP INC.

Augat Comms. Division . .(607) 739-3844
LRC Electronics
FAX . . . . . .(607) 739-0106
901 South Ave.
Horseheads, N.Y. 14845
PERSONNEL: Ken Wood, VP Engineering; Larry Massaglia, Sales
DESCRIPTION: Subscribers are notoriously hard on indoor drop connectors. Frequent loosening and finger-tightening can result in hard-to-track signal leakage and high maintenance costs. But, with Augat LRC's new Push-N-Lock™ connector, one push gives the installer or subscriber a positive RF seal on any mating F port. No wrenches, no tightening, no accidental pull-outs. One push locks in dependability, locks out leakage.

Signal Level Meters

CALAN Inc. . . . . .(800) 544-3392
(717) 828-2356
FAX . . . . . .(717) 828-2472
1776 Independence Dr.
Dingmans Ferry, Pa. 18328
PERSONNEL: Ian R. Jones, President; Phyllis Thompson, Director, Major Accounts
DESCRIPTION: Calan manufactures the STAR 2010 SLMS signal level measurement system. The STAR 2010 is a revolutionary new signal level meter. In addition to one-step measurement of all the carriers on your system, the STAR 2010 makes data acquisition, data analysis and data communication a functional reality. The STAR 2010 will enhance your ability to perform system maintenance. Calan has done it again—bringing the same high quality you've come to expect from our sweep systems to the signal level meter market.

Install Tools

cable prep®
BEN HUGHES COMMUNICATION PRODUCTS CO

Cable-Prep®
Ben Hughes . . . . . .(203) 526-4337
Communication Products Co.
FAX . . . . . .(203) 526-2291
207 Middlesex Ave.
P.O. Box 373
Chester, Conn. 06412-0373
PERSONNEL: Deborah Morrow, President; Eric Smith, National Sales Manager
DESCRIPTION: Manufacturer of cable installation tools including hex crimp tools for CATV, MATV, STV and standard RF connector applications; coring and stripping/coring tools for all major cables; the CPT-6590 for RG-6 and RG-59 drop wire cable; jacket stripper tools and other accessory tool items. Products are sold through major distributors.

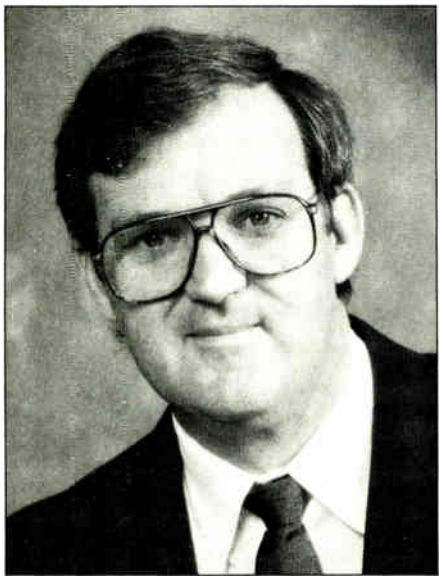
Installation Services

RTK CORPORATION

RTK Corporation . . . . . .(908) 665-0133
FAX . . . . . .(908) 665-0990
120 Floral Ave.
New Providence, NJ 07974
PERSONNEL: James MacGeorge, President
DESCRIPTION: Full/modified turnkey residential and commercial installations, audits, rebuilds, converter changeouts and upgrades, MDU pre- and post-wiring, survey and design.

Fiber and finances

Capitalizing on new architectures



Eugene M. White, Paragon Cable

Editor's note: *This is the second in a series of "Fiber and finance" articles examining the economic benefits of optical fiber deployment from a cable operator's perspective.*

When Paragon Cable halted construction on its $26 million, 1,400-mile rebuild last year, the MSO couldn't have been happier about its decision.

The Florida cable operator wasn't facing construction or financial problems. In fact, the situation was just the opposite: Eugene M. White, the company's vice president of engineering, had discovered that a new optical fiber architecture would actually cost less than the conventional construction then in progress.

His decision also made a bit of cable TV engineering history—it was the first large-scale application of a "fiber to the feeder" (FTF) system architecture. Most importantly, the move will eventually save more than $750,000 in labor and material costs over the life of the project.

Having activated more than 250 miles of FTF network in 1991, White's experience may provide other cable operators with some helpful insights into this system design.

By Jon K. Chester, Market Development Manager—Cable Television, Telecommunication Products Division, Corning Inc.

The project began in 1988, when Paragon's St. Petersburg system was in the process of franchise renewals. The franchise agreement called for 54-channel capacity, among other improvements. The existing complex was an 18-year old, 270-MHz system, which had been upgraded to 300 MHz in the mid-1970s.

The St. Petersburg system served 17 communities and delivered 36 channels to approximately 108,000 subscribers. The system's blueprint was typical of its era: 750-MHz trunk, 500-MHz feeder, three headends, and a 32-trunk amplifier cascade followed by two line extenders.

The well-maintained plant would have been a good candidate for an upgrade using the fiber backbone architecture. However, two factors prevented Paragon from upgrading the system: moisture migration in the dynafoam cable, and corrosion caused by the salt air of the coastal Florida environment.

> 'Moisture and salt corrosion forced us into a total rebuild.'

"The moisture and the salt corrosion forced us into a total rebuild," White said. "We started the rebuild in June 1989 in the southernmost franchise areas, and planned to work north over four years. Our plan was to rebuild 1,400 miles of plant at an estimated cost of $26 million, or an average of $18,500 per mile."

The rebuild plan included 550-MHz electronics, 875-MHz trunk, 625-MHz feeder, one-inch supertrunk cable, four headends, a 28-trunk amplifier cascade, 2-line extender cascade and standby power. The headends were to be interconnected by fiber utilizing FM transmission equipment.

Construction halted

With all of this "state of the art" architecture going for Paragon, White felt the plan was working out pretty well. But 13 months into the project, he ordered a complete halt to system construction. He had learned of a new architecture—fiber to the feeder—and decided to re-estimate construction costs based on that architecture.

Fiber to the feeder (FTF) is a star-based, fiber-rich architecture, as opposed to conventional coaxial cable tree-and-branch design. The concept was introduced in March 1990 by American Television and Communications (ATC).

FTF reduces operating costs by eliminating the trunk and bridger amplifiers and associated power supplies typically used in cable TV systems. In Paragon's case, the new architecture relied on an optical link to transmit signals from the headend over fiber to optical receivers, or nodes, and from there to distribution amplifiers.

According to White, distribution amplifiers will replace line extenders for the majority of future FTF applications. The amplifiers, which previously had been used in tapped trunk applications and for termination amplifier purposes in apartment complexes, were critical to Paragon's FTF implementation efforts. The ability to convert an input signal as low as +10 dBmV to an output signal as high as +48 dBmV, along with increased ease of signal splitting, allowed White to eliminate conventional line extenders.

This, in turn, allowed the MSO to scale back on the number of active devices specified for the system, another important cost-saving measure.

"Justification to change the rebuild to FTF was purely financial," explains White. "Once we determined that the cost of FTF would be no higher than conventional architecture, the technical advantages of FTF architecture swung the decision. We could no longer justify a capital expenditure of $26 million for a conventional rebuild."

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With our new line of fusion splicers, Siecor offers a greater range than any other manufacturer. A range that satisfies every level of need. Our completely automated M90 model is the only fusion splicer with the proven LID-SYSTEM® unit and Profile Alignment in the same package. Our M91 splicer has a built-in LID-SYSTEM unit, too, plus easy three-axes alignment. And our low-cost M92 splicer is simple to operate with fixed V-groove alignment. All three splicers are the product of five generations of fusion splicer development, making them fast and easy to use in the field with excellent quality results. And all three are also the product of our particular strength—listening to what our customers say and responding to what we've heard. So write Siecor Corporation, 489 Siecor Park, Hickory, NC 28603-0489 or call 800 245-4225. Or outside North America, write RXS Schrumpftechnik-Garnituren GmbH, Hagen, Federal Republic of Germany.

The way we listen means you not only get what you need, you also get what you want.

SIECOR

Circle Reader Service No. 30

Conventional Architecture

	Total	Cost/Mile	Material	Labor
Common Cost				
Pre-Engineering	$ 61,928	$ 588	$ 0	$ 588
Make Ready	210,113	1,995	0	1,955
Strand & Hardware	300,794	2,856	1,155	1,701
Other	60,138	571	339	232
Cable Installation				
Trunk	192,630	1,829	963	866
Feeder	379,257	3,601	1,581	2,020
Splicing Passives				
Trunk	24,961	237	112	125
Feeder	206,533	1,961	957	1,004
Splicing Actives				
Trunk	152,819	1,451	1,151	300
Feeder	138,496	1,315	812	503
Quality Control				
Trunk	63,297	601	0	601
Feeder	189,787	1,802	0	1,802
Subtotals				
Common	632,973	6,010	1,494	4,516
Trunk	433,708	4,118	2,226	1,892
Feeder	914,072	8,679	3,350	5,329
Project Total	**$1,980,753**	**$18,807**	**$7,070**	**$11,737**

Table 1

This table includes Paragon Cable's calculations of the costs associated with a rebuild using conventional architecture.

Institutional advantage

Because ATC is a managing partner in Paragon Cable, along with Houston Industries Inc., White received an in-depth look at the new system design. ATC's engineering management team studied the rebuild plan, reviewed the financial details and confirmed that White's plan "proved in" under the new design parameters.

"No one ever doubted the technology," White remarks. "We knew that the budget was set and wouldn't be increased. It came down to working through the numbers."

Financial justification

White took a basic approach to determining the projected costs of FTF vs. conventional rebuild. By analyzing the cost of 105 miles of just-completed coaxial 550 MHz plant, he had a platform with which to calculate the cost of FTF. White broke down the "as-builts," or completed plant construction, into three categories—common costs (made up of strand, hardware, shared conduit and power supplies), trunk costs and feeder costs. He separated those three categories into two subcategories (labor and materials.)

Then, he extracted the cost associated with the trunk, inserted the corresponding fiber cost, and made the necessary minor changes in the feeder plant. The calculations resulted in a cost comparison between conventional architecture (see Table 1) and FTF architecture (see Table 2).

Overall, the projected cost of FTF for the first phase of the project was 4.4 percent lower than a conventional rebuild. FTF offered a projected cost savings of $831 per mile, for a total savings of $87,521 for the 105-mile completed portion of the system.

By projecting these economies over the entire 1,400-mile rebuild, the cost savings will total more than $1.1 million. A significant level of those savings will be reinvested in the system, including additional purchases of optical cable, according to White.

Working the numbers

The substitution of fiber for coaxial trunk in the system drove down the rebuild costs, especially in the "cable installation," "splicing actives," and "splicing passives" categories. Using the FTF approach, the installed cost per mile of optical cable was about

$850. In a conventional rebuild, trunk cable installation costs were approximately $1,829 per mile.

Because fewer fiber-optic couplers would be needed in comparison to the number of RF splitters and directional couplers used in trunk applications, splicing costs were reduced substantially.

In addition, FTF required only one fiber-optic receiver for every seven

> 'FTF allows us to exercise firm control over the labor portion of the project.'

miles of plant. In a conventional rebuild, the same plant would have required nine conventional trunk amplifiers.

The fact that fiber splicing is projected to be completed by Paragon's in-house fiber crews, and the density of the St. Petersburg system (137 homes per mile), kept the final cost of FTF lower than that of conventional construction.

"FTF allows us to exercise firm controls over the labor portion of the project. Essentially, this is an exercise in trading off the trunk coaxial cable cost versus the fiber cost, with the feeder remaining relatively stable. On the basis of this analysis, we suggest that FTF should work in systems of any size and any density," White comments.

Fiber restoration also played an important role in Paragon's rebuild decision. "Restoration begins in the planning stages," White remarks, "Our fiber philosophy is geared around the question, 'How fast can we get back on if service is interrupted?' We feel that there is no cut that our technicians cannot repair temporarily in one hour. Naturally, we'll return to the site during off-peak hours to make permanent repairs.

"To meet those standards, we train and retrain our technicians constantly. Our emphasis is on doing it right the

From Vision to Reality-Our

February, 1988

March, 1988

April, 1988

June, 1988

February, 1989

March, 1990

July, 1990

October, 1990

March, 1991

ONI has pioneered the use of fiber optic technology in the cable TV industry. Along with AT&T and Bell Labs, we've developed the infrastructure that will carry fiber optics far beyond the applications of today's cable systems. But ONI is more than a resource for product development.

Our staff of engineers provides RF and optical system engineering and design, total system project management and 24-hour technical support while our relationship with AT&T's R&D group and Bell Lab engineers keeps us at the forefront of technology and products.

Circle Reader Service No. 33

Record Speaks for Itself...

Anixter and AT&T agree to develop analog optical transmission networks for cable TV

Optical Networks International formed to integrate this technology

First LXE™ fiber optic cable developed for aerial applications

First Laser Link™ AM optical transmission system installed

First hybrid AM/FM system activated

Laser Link installed in first rebuild using fiber trunk system

500th Laser Link activated

Laser Link integrated into the first fiber to the feeder system

ONI integrates Alternate Access network for voice and video services

Integrating fiber technology into cable systems provides not only outstanding performance but also opens the way to a whole new generation of revenue producing services. PCN's (personal communications networks), interactive digital systems and alternate access for voice and video will bring cable systems into the 21st century. ONI enables you to choose the directions that work best for you and your subscribers.

Your vision of the future demands technologies, products and services. ONI can make that vision a reality. Call us at 1-800-FIBER-ME.

ONI OPTICAL NETWORKS INTERNATIONAL

CORPORATE HEADQUARTERS: OPTICAL NETWORKS INTERNATIONAL, 8101 E. Prentice Avenue, Suite 210
Englewood, Colorado 80111 • 303-694-9220 • Fax 303-694-0127

Fiber to the Feeder

	Total	Cost/Mile	Material	Labor
Common Cost				
Pre-Engineering	$ 61,928	$ 588	$ 0	$ 588
Make Ready	210,113	1,955	0	1,955
Strand & Hardware	300,794	2,856	1,155	1,701
Other	60,138	571	339	232
Cable Installation				
Fiber	89,522	850	565	285
Feeder	400,532	3,803	1,783	2,020
Splicing Passives				
Fiber	3,686	35	20	15
Feeder	204,110	1,938	934	1,004
Splicing Actives				
Fiber	3,265	31	13	18
Feeder	250,767	2,381	1,878	503
Quality Control				
Fiber	10,532	100	0	100
Feeder	179,255	1,702	0	1,702
Fiber				
Transmitters	79,201	752	752	0
Receivers	39,390	374	374	0
Subtotals				
Common	632,973	6,010	1,494	4,516
Fiber	225,595	2,142	1,724	418
Feeder	1,034,664	9,824	4,595	5,229
Project Total	**$1,893,232**	**17,976**	**7,813**	**10,163**

Table 2

This table includes Paragon Cable's calculations of the rebuild costs associated with a fiber to the feeder rebuild.

first time," White continues.

Working with fiber

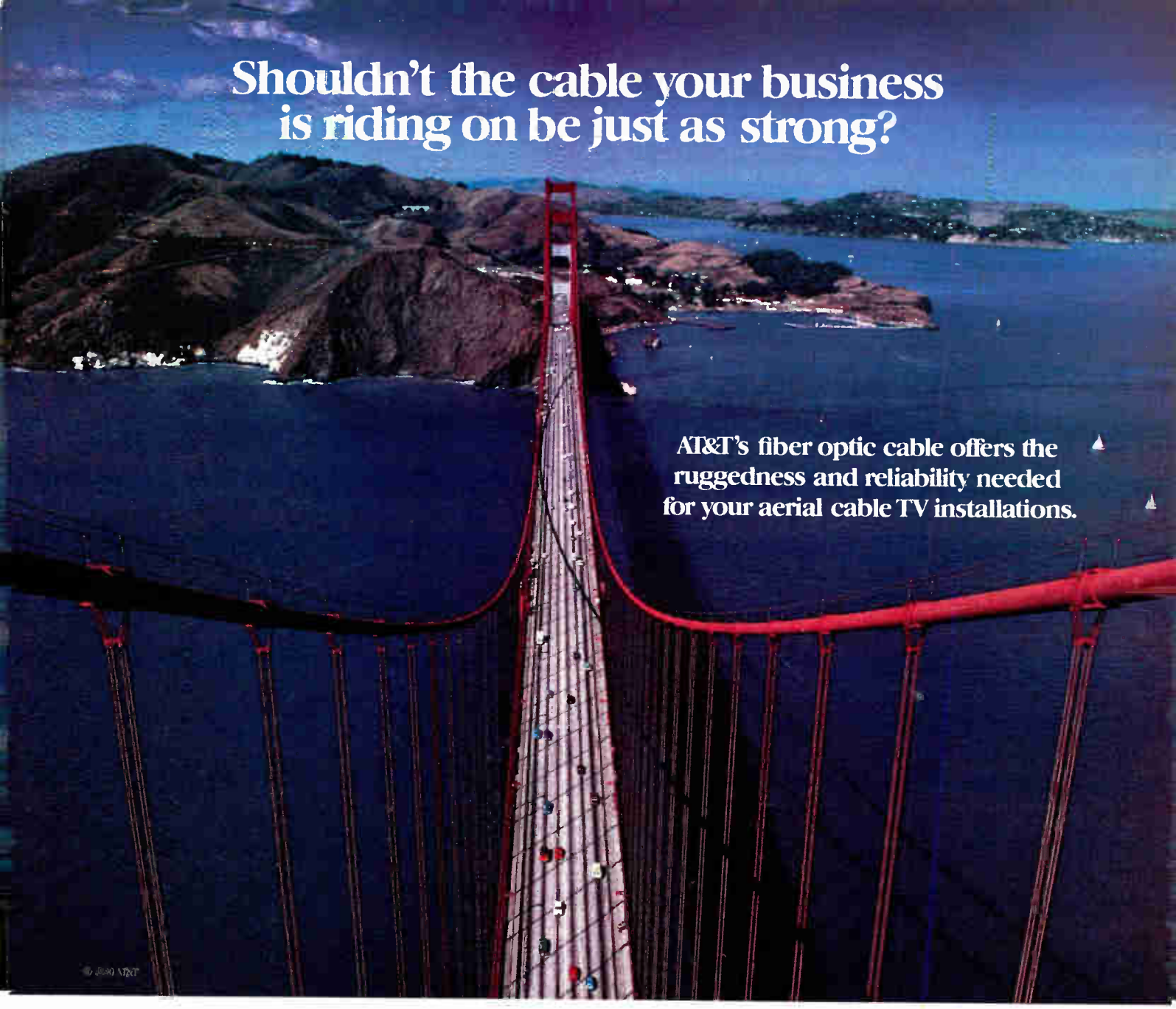
White is no stranger to lightwave transmission, having worked with his first fiber-based system in 1984. Prior to the St. Petersburg system FTF rebuild, he interconnected six headends with 90 miles of fiber and FM transmission equipment for Paragon's 110,000-subscriber Hillsborough, Fla. operation two years ago.

In fact, he tested the FTF application on a "dry run" basis with a 17-mile rural system rebuild in Davenport, Fla. as preparation for the St. Petersburg changeover.

White offers this advice for cable operators considering fiber and architecture options: "First off, there's no reason to be afraid of fiber. In just the past three years, there's been a great deal of fiber installed in our industry and there's plenty of information available on the technology.

"When the time comes to think about a rebuild, my recommendation boils down to this," White concludes, "Install as much fiber as is possible in your network. Your investment will be rewarded." ■

Shouldn't the cable your business is riding on be just as strong?



The cable you're installing now may seem great today, but how's it going to hold up against tomorrow's heat? And the ever present gnawing by nature's pests? Install AT&T's fiber optic cable and you won't have to worry.

That's because all AT&T fiber optic cable is designed to withstand harsh temperatures, rodents, lightning, and a host of other environmental stresses.

Take a look at our LXE family of lightguide cable. Available in multiple sheath designs, each is made with a high-density polyethylene jacket to resist abrasions—making it easy to pull and inexpensive to install, too.

The LXE also allows for easy end-prep and midsheath entry. Rip cords lie beneath the jacket and armor, to allow for entry without damaging the fibers.

AT&T's fiber has the smallest mode field diameter of any standard single mode fiber available. Light stays more tightly confined to the fiber core, providing outstanding transmission performance—at both 1310 and 1550 nm.

And our D-LUX™ 100 coating offers excellent stripability, static fatigue performance, and aging characteristics, for superb splicing capabilities.

You'll find, too, that all our fiber optic cable is backed by the design expertise and technology of AT&T Bell Laboratories.

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WHAT'S AHEAD

SCTE

Following is a list of SCTE technical seminars with contact name. If known, location and seminar topic are listed.

August 13-16 *Great Plains Chapter* To be held in conjunction with the Nebraska Cable Communications meeting in Scottsbluff, Neb. BCT/E testing, board meeting and seminar on fiber optics and alternate access with Herb Dougall III. Contact Jennifer Hays, (402) 333-6484.

August 14 *Delaware Valley Chapter* "High Definition and Digital Technology." To be held at Williamson's Restaurant, Willow Grove, Pa. Contact Denny Quinter, (215) 378-4637.

August 14 *Golden Gate Chapter* "Data Networking and Architecture," BCT/E category V. Contact Mark Harrigan, (415) 785-6077.

August 16-17 *Rocky Mountain Chapter* "BCT/E Review on August 16; BCT/E examinations to be administered August 17. Contact Pam Nobles, (303) 792-3111.

August 18 *Southeast Texas Chapter* To be held at Warner Cable, Houston, Texas. Contact Tom Rowan, (713) 580-7360.

August 19 *Satellite Tele-seminar Program* "Getting it Right the First Time: Field Supervision Techniques," featuring Wendell Bailey of NCTA (moderator), Alan Babcock of Warner Cable Communications, Dana Eggert of Performance Plus and Kathy Keating of ATC. Videotaped at the Cable-Tec Expo '90 in Nashville, Tenn. To air from 1 to 2 p.m. eastern time on transponder 6 of Galaxy I.

August 21 *Greater Chicago Chapter* BCT/E examinations to be administered. Contact Bill Whicher, (708) 438-4423.

August 21 *San Diego Meeting Group* "Installation, Drops and Splitters," to be held at the Elks Lodge in Oceanside, Calif. Contact Frank Gates, (714) 492-4606.

August 22 *Tennessee Chapter* To be held in Senatobia, Miss. Contact Don Shackleford, (901) 365-1770.

August 24 *Golden Gate Chapter* BCT/E examinations to be held in categories IV, V, VI and VII. To be held in Pleasanton, Calif. Contact Mark Harrigan, (415) 785-6077.

August 25-28 *Chattahoochee Chapter* To be held in conjunction with the **Eastern Cable Show**. Contact Hugh McCarley, (404) 843-5517.

September 9 *Satellite Tele-Seminar Program* "Advances in Corrosion Protection," featuring Dr. Chak Gupta of Comm/Scop and Barry Smith of Times Fiber Communications. Videotaped at the Cable-Tec Expo '90 in Nashville, Tenn. To air from 1 to 2 p.m. eastern time on transponder 6 of Galaxy I.

September 10-11 *Dakota Territories Chapter* To be held in conjunction with the South Dakota Cable Association Annual Meeting at Goldhill Resort in Lead, South Dakota. Topics: "OSHA and Safety" with Terry Thomas of Village Cable and "Professionalism" with SCTE director of chapter development and training Ralph Haimowitz. Contact Kent Binkerd, (605) 339-3339.

September 11 *Dixie Chapter* To be held in Birmingham, Ala. Contact Richard Murphy, (205) 631-9681.

NCTI

The following training courses have been announced by the National Cable Television Institute (NCTI):

August 20-21 OSHA Compliance for CATV operators in Biloxi, Miss.

September 10 Fundamentals of Supervision Seminar for CATV personnel in Chicago, Ill.

September 11-12 OSHA Compliance for CATV operators in Chicago, Ill. For information on NCTI's new training seminars, call Michael J. Wais at (303) 761-8554, or fax inquiries to (303) 761-8556.

Trade Shows

Eastern Show **August 25-27** Atlanta, Ga. Contact Nancy Horne, Southern Cable Television Assoc., (404) 255-1608.

International Society for Optical Engineering Symposium **September 3-6** Boston, Mass. Contact SPIE at (206) 676-3290.

Forum '91: Home Systems and Services (including in-home wiring) Show **September 22-24** Phoenix, Ariz. Contact Parks and Associates at (214) 490-1113.

Great Lakes Show **September 23-25** Cobo Center, Detroit, Mich. Contact Diane Drago or Kimberly Garner, (517) 482-9350.

Atlantic City Show **October 1-3** Atlantic City, N.J. Contact Rhonda Moy, (609) 848-1000, ext. 304.

Optical Society of America's Engineering Program Series **October 3-4** Albequerque, N.M. Contact the Optical Society of America's Meeting Department at (202) 223-0920.

International PCS Symposium **October 15-17** Denver, Colo. Call (303) 843-0956.

Great Lakes CABLE EXPO

The must-attend regional cable show of the '90s.

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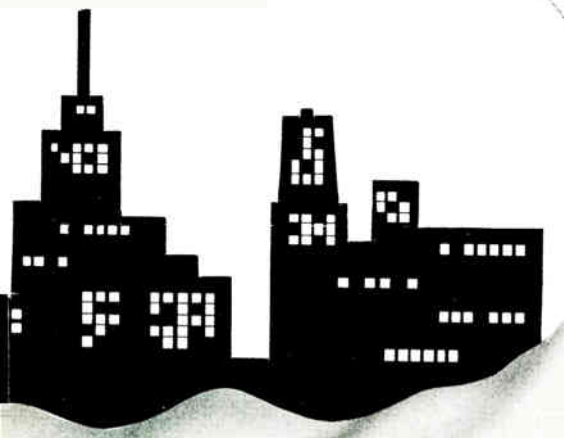

Opening Panel

Positioning Your Company for the Future

Marketing

It's O.K. to Sell

Management

Dynamics of Business Communication with Jayne Tear
Tomorrow's Workforce Today:
Beyond the EEOC Requirements
Public Speaking

Technology

Fiber, Surge Protection, Digital Compression
Rebuilds: Back to the Basics Where the Customer Lives
PCNs

Government Relations

Ameritech States Legislative Update

For more information on GLCE '91, complete and mail to:
Great Lakes Cable Expo
c/o Public Sector Consultants, Inc.
300 S. Washington Square, Suite 401
Lansing, MI 48933

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See You! September 23-25

Circle Reader Service No. 37

Announcements

Motorola, Wegener ink deal

Wegener Communications has announced a contract with **Motorola Inc.** in Wegener will manufacture a new receiver/demultiplexor unit. An initial order stands at 250 units.

The product will be used in Motorola's new EMBARC (electronic mail broadcast to a roaming computer), and will allow users of small "palm-top" computers to receive information anywhere in the country via high-frequency radio signals. The system will go into commercial use in the fourth quarter of 1991. The backbone for the system will be Wegener's satellite receiver, which meets the strict environmental and technical specifications Motorola requires.

"We at Wegener take this as an important sign that our quality commitment is contributing to opportunities with other quality-conscious corporations," says Bob Placek, Wegener president.

Fixed bandpass filter

CaLan Inc. has introduced a tubular fixed bandpass filter, designed specifically for cable television. The company's Model FF-xx Preselector Fixed Bandpass Filter provides high attenuation in the stopband and low insertion loss in the passband, company officials say. The universal design allows it to be used with any signal or spectrum analyzer.

To use the system, the line technician places it online to the sweep or analyzer input when making low-level distortion measurements in the presence of other high level carriers.

The FF-xx acts to extend the dynamic range of distortion measurement functions and attenuates unwanted adjacent carriers from 30 dB to 60 dB below the desired carrier's level. This prevents the creation of distortion products within the sweep system or spectrum analyzer.

Five-section filters are available with appropriate center frequencies for channels 5, 13, 14 and 36, and a seven section filter is available for channel 61. Standard F-type input and output connectors are provided, and each unit is optimized for the customer's frequency requirement prior to shipment.

The filters are available immediately. For more information, contact CaLan, (800) 544-3392 or, in Pennsylvania, (717) 828-2356.

Magnavox increases optical power

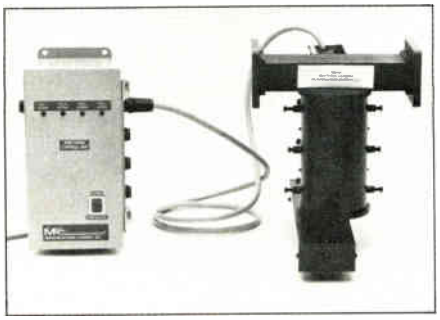
Magnavox CATV Systems has announced a 50 percent increase in its output power specifications on 3100 series externally modulated optical transmitters. The increase allows AM fiber optic links to exceed 20 miles and enable link arrays of under $6,000 per node.

Magnavox's Model 3102-TX, for example, is now specified at 15 mW optical power on each of its two output arms, totalling 30 mW. The unit previously carried a 20 mW specification. Similarly, the Model 3104-TX is now specified at 10 mW over four output arms, totalling 40 mW. The unit was previously specified at 7 mW/arm. Notably, the 3104-TX's new specification enables it to provide nearly 10 times the optical output power of the nearest alternative, a DFB laser transmitter, company officials say.

For more information on Magnavox products, call (315) 682-9105 or fax inquiries to (315) 682-9006.

MMDS automatic combiner

New from the **Microwave Filter Company** is the Model 9000SA channel combiner, which includes a voltage activated switch that disconnects the



Microwave Filter's MMDS automatic combiner

unit from the main line when a transmitter fails.

An electronic control box interfaces between the combiner and transmitter. Its purpose is to disconnect the combiner during a transmitter failure so that a standby frequency agile transmitter connected to the main line wideband input can resume broadcast of the failed channel.

The unit is priced at $7,156 for a four channel, automatic combiner. A four channel mechanical combiner costs $5,888.

For more information, call (800) 448-1666 or fax inquiries to (315)-437-3953.

High-res distribution amp

ESE has announced its new ES-237 120 MHz distribution amplifier, designed to provide a low-cost solution to demanding video requirements including high definition television. Priced at $195, the 1x4 distribution amp features loop-through input and four isolated ports.

ESE's ES-237 120 MHz distribution amplifier

For more information, contact ESE at (213) 322-2136.

Fibertron opens facility

Fibertron Corporation, a specialty distributor of fiber optic cables, connectors, couplers, transmitters and other optical gear, has opened the doors to a new stocking and sales facility in East Hanover, N.J. Martin Rein, Fibertron's newly appointed general manager for its northeast facility, will maintain responsibility for sales administration and customer service in the new facility.

For more information, call Fibertron at (201) 515-9200 or fax inquiries to (201) 515-9269.

Earth station antenna control

Sunnyvale, Calif.-based **TIW Systems** has announced availability of its new Model AC3 antenna control system, designed for use with earth station antenna systems in satellite communications service.

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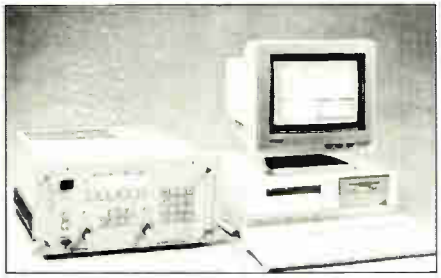
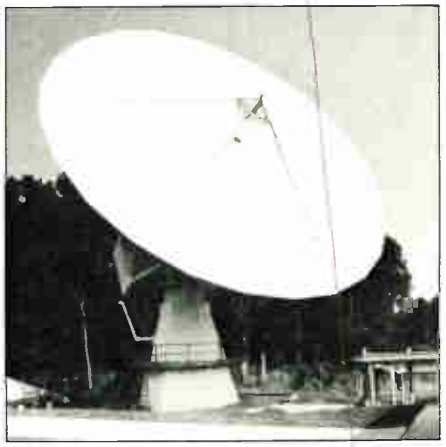


TIW Systems' Model AC3 antenna control system

The control and tracking system offers a monopulse tracking receiver, RF synthesizer for tracking frequency selection, polarization control, position conversion and display and remote computer interface.

Optionally, an IBM-compatible program tracking interface computer is available that features menu-driven displays of all antenna control functions as well as providing tracking functions for Norad, Intelsat, Star Track and Smart Track satellites in inclined orbit.



TIW Systems' dual C- and KU-band antenna system

18 meter earth station

Also new from TIW is an 18-meter earth station antenna capable of simultaneous C- and Ku-band operation in Intelsat networks. The system is designed to meet Intelsat standard A and C specifications, and utilizes a single corrugated horn feed in a cassegrain reflector.

The antenna system is also equipped with the company's previously mentioned tracking system. For more information on TIW's new products, call (408) 734-3900 or fax inquiries to (408) 734-9012.

Catel appoints Canadian distributor

Catel Telecommunications has announced the exclusive appointment of Ontario, Canada-based **Angstrom Communications** to distribute Catel products in Canada's CATV and broadband markets. "The principals at Angstrom have demonstrated their technical competence in system and solution selling," says Jim Caldwell, VP of sales and marketing for Catel. "Their market focus fits well with our market philosophy."

For more information on Catel products or to get in touch with Angstrom, call Catel at (800) 827-2722.

Printer option for Wavetek 1865 sweep

Cable Instrument Services Co. has released a printer option for Wavetek's Model 1865 Sweep Receiver. An expanded memory option (33 traces) is also available. For more information, call CISCO at (800) 359-5637. ■

—Leslie Ellis

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Advertiser's Index

Sources of interface complexity

Last month we began a careful look for the sources of complexity in the interface between cable and consumer electronics products. We'll continue this month. There are a number of areas where cable is faulted, I think, unfairly. In most cases, there really isn't anyone at "fault." Rather, the complexity is just a natural result of the early stages of a maturation process. There may be some surprising conclusions.

Technological maturation

When a technology is first introduced, if it is successful, it provides some important benefit. Usually, the technology is introduced in a form that is not quite "consumer friendly"—but consumers embrace it for its benefits. They are likely to complain about some of the difficulties of use, but it gains a foothold. As the technology matures, it becomes more "user-friendly."

An interesting such example stems from the automobile industry. The first cars had a crank starter—definitely an unfriendly interface. But that was all the state of the art could support at the time of the introduction of the automobile. No one would argue that the automobile should have been held back until the electric starter was invented. Eventually, this interface issue was solved.

I believe that the same can be said of the interface between cable and consumer electronics. Both cable and consumer electronics have brought significant benefits to consumers. As the technology matures, the interface issues will be resolved in an affordable manner.

By Walter Ciciora, Vice President of Technology, American Television and Communications

Where does complexity start?

An unimpassioned review of the consumer electronics situation reveals that the major increase in complexity occurs when a viewer adds a VCR. In that situation he has to deal with two tuners, two remote controls, a timer and an interconnecting maze. This is especially the case if stereo sound or surround sound is involved. Adding a cable box adds more complexity, but at a smaller increment than caused by the VCR itself. The cable box compensates for this by enabling more viewing choices. Certainly, a TV and a cable box is less complex than just a TV and a VCR.

Here's an important, usually overlooked point: For the subscriber who has fully mastered the use of a modern VCR, using the cable box is a simple matter. No new skills are involved, just a re-use of some of the skills required to operate the VCR. If the subscriber can't work the cable box, he certainly can't work the VCR. It would be a relatively safe bet that the subscriber who complains about the complexity of his cable box has given up on trying to use the timer on his VCR. The "gating factor," or the "critical path" is the VCR's complexity.

A subscriber with a cable box and a VCR must determine the channel to be taped by the tuner in the cable box. This means he cannot tape shows on different channels without visiting the cable box to change channels between the tapings. This is something he can't do if he is not at home. Some new cable box designs include a timer for changing channels. While this does add complexity, the subscriber who was capable of programming his VCR simply applies that skill to the cable box in addition.

It is instructive to note that the cover article titled "I Can't Work This ?#!!@/ Thing!" on the cover of the April 29, 1991 issue of *Business Week* did not mention cable even once in its tightly written six pages. On-screen displays, better universal remotes and other such technologies make the VCR less of a pain. The same technology makes the cable box's small increment in complexity even smaller.

Picture in picture

Scrambling has been said to deprive the subscriber of using "Picture-in-picture (PIP)". In fact, except for the very high end, most TV receivers with PIP have only one tuner. If the off-air channels are not scrambled on a cable system, the subscriber is better off for the purposes of PIP by being on cable than just connected to an antenna.

If the off-air channels are scrambled, the subscriber is no worse off than his antenna-based cousin. The viewer must have another device with a tuner to take full advantage of PIP. The cable converter and the VCR are such devices. If the subscriber doesn't have a VCR, the cable converter enables him to use the otherwise unusable PIP feature. In no case is he worse off than if he were an off-air viewer. The cable viewer has more unscrambled choices for his PIP usage than the off-air viewer.

In addition, he has a scrambled channel to add to his options.

Who provides help?

The cable industry simply does not get credit for the help it provides. A major fraction of the service calls and service call time goes to consumer education and to hooking up VCRs. These are usually VCRs purchased at a discount house or department store and brought home by the subscriber. Free installation and in-home instructions on how to use the VCR are not available from the consumer electronics industry. In most cases, these services aren't available at all. If they are available, the cost of the service approaches the cost of the product itself.

So when you hear discussions about the complexity of using cable, clarify the issues. Explain how early technology is often unfriendly. Technology evolves to become easier to use. Point out the role of the VCR. Point out that engineers from both the cable and the consumer electronics industry are working to make these things better. They have already become better. They will get better and easier to use, but it takes time for the technology to mature. ■

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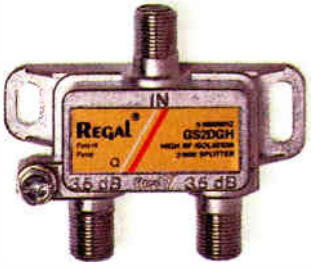

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