COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

CABLE'S

EXPANDING

BANDWIDTH

- Assessing designs and limitations
- Alternatives created with fiber
- Getting the most from DFB lasers

August 1993

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Reader Service Number 4

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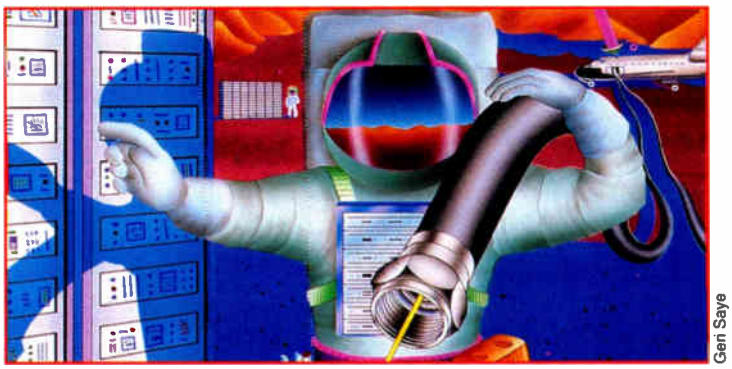

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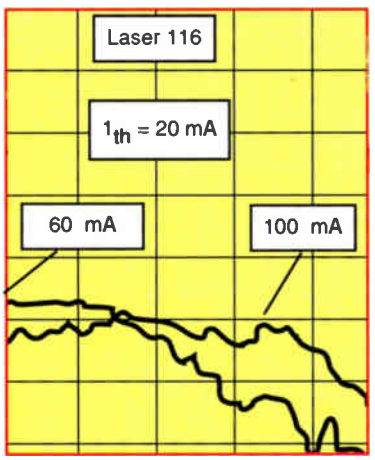

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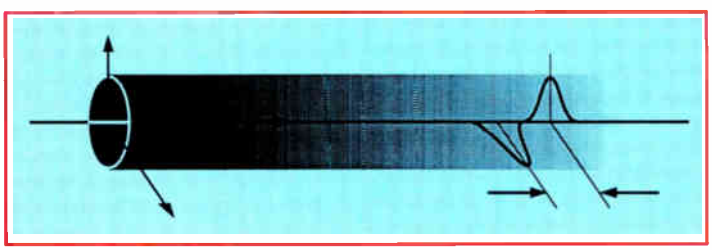

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Corporate Offices

Phillips Business Information Inc.
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Reader Service Number 17

ISO 9001 Reg

Cable involved in new EBS test

DENVER — From June 27-30, Denver hosted a test of various proposed technologies for the new emergency broadcast system (EBS). The tests were under the direction of Dr. Helena Mitchell of the Federal Communications Commission's EBS department. The tests were with the cooperation of various local TV and radio broadcasters, Tele-Communications Inc.'s Mile Hi headend, the State Emergency Operations Center, the National Weather Service, and various hardware vendors. Local amateur radio operators provided critical communications between the sites to help in test coordination.

The purpose of the exercise was to test various transmission methods and hardware in the timely delivery of emergency messages. Colorado was chosen because of its terrain and the difficulty of transmitting signals over this terrain. In-band and out-of-band signaling was tested. The primary signaling systems tested were the radio data service (RDS) and the National Weather Service's WRSAME system.

Initial results indicated that all technologies tested worked, with a few minor correctable bugs and that all of the technologies may have a place in the new EBS in various applications. — *Steve Johnson, Time Warner Cable*

TW/TCI team for advanced systems

Time Warner and Tele-Communications Inc. agreed to create a joint venture to pursue the development and implementation of compatible products that will function in an "open architecture" environment. The joint venture will invest in the development of selected hardware and software elements of interactive broadband networks.

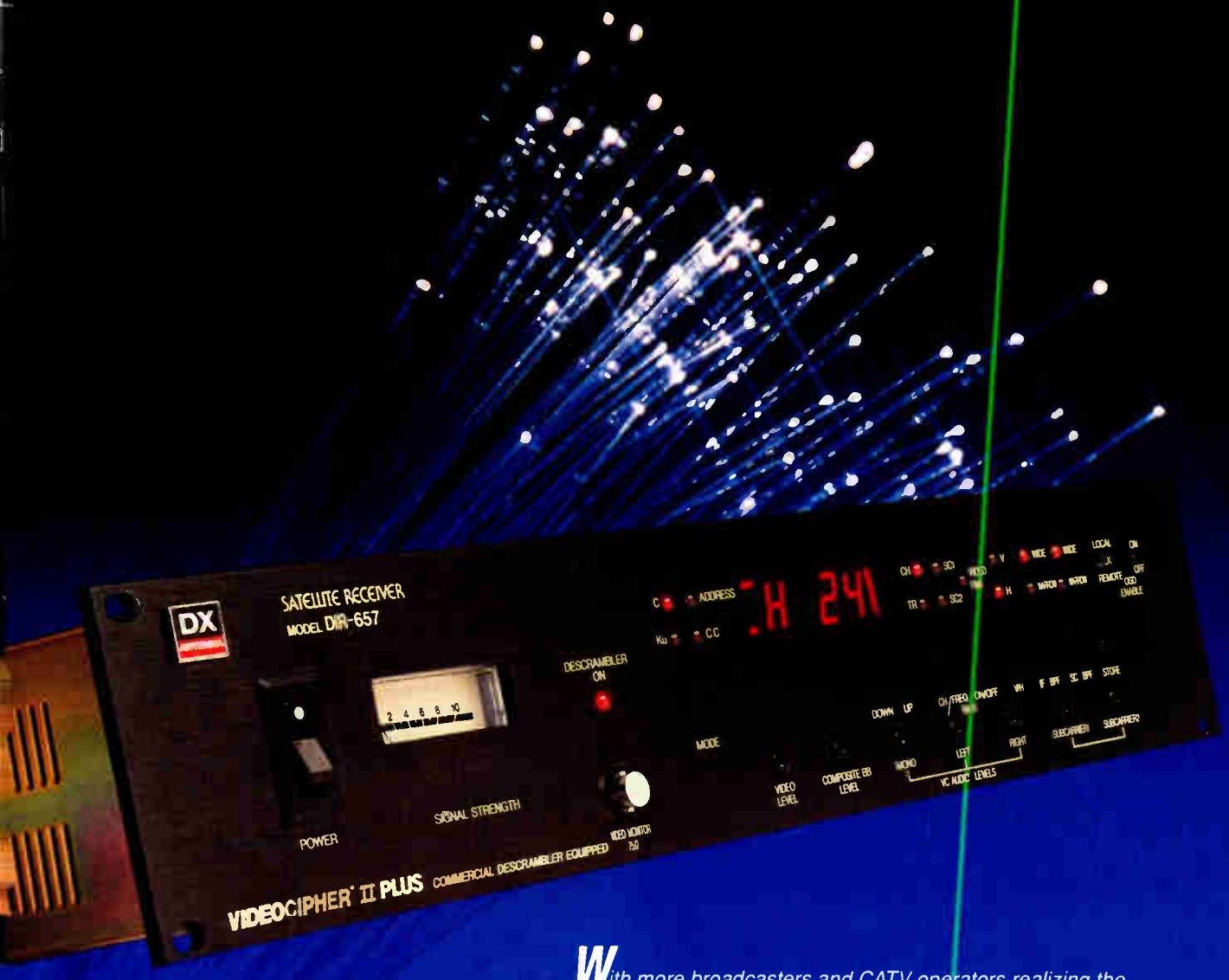
Among the network elements covered by the agreement are servers, network architecture and operating system software, set-top hardware design including microprocessor elements, set-top operating system software and user interface.

CableLabs selects lab for TV/VCR tuner tests

BOULDER, CO — Cable Television Laboratories selected the Carl T. Jones Corp. of Springfield, VA, to help establish test procedures that could be used to ascertain interference susceptibility of TV sets and videocassette recorders and to examine other performance parameters of tuners located in those devices.

The test procedures would address TV set and VCR susceptibility to direct pick-up interference (DPU), and to their ability to accept multichannel NTSC signals without producing video and audio distortions. CableLabs will share the information generated with its cable operator members,

Light up your fiber with the best broadcast quality video possible.



With more broadcasters and CATV operators realizing the benefits and switching to fiber optic networks, the demand for "signal purity" and higher signal quality transmission has increased.

DX sheds a new light on high performance for today's cable operators with the new DIR-657 integrated receiver/ descambler. With a long list of features, including RS-250B broadcast quality performance and optional RS-232C interface for remote operation, the new DIR-657 outshines all other satellite receivers in delivering the sharpest video and soundest audio signals possible.

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DX ANTENNA

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Paper guides and other TV listings are great but they can't help you change the channel or program a VCR. The 8600X solves that problem by giving you access to virtually any EPG. Viewers can easily navigate through cable's ever increasing number of channels and programming. And, with the VCR Commander™ option, viewers can set their VCR to record programs automatically.

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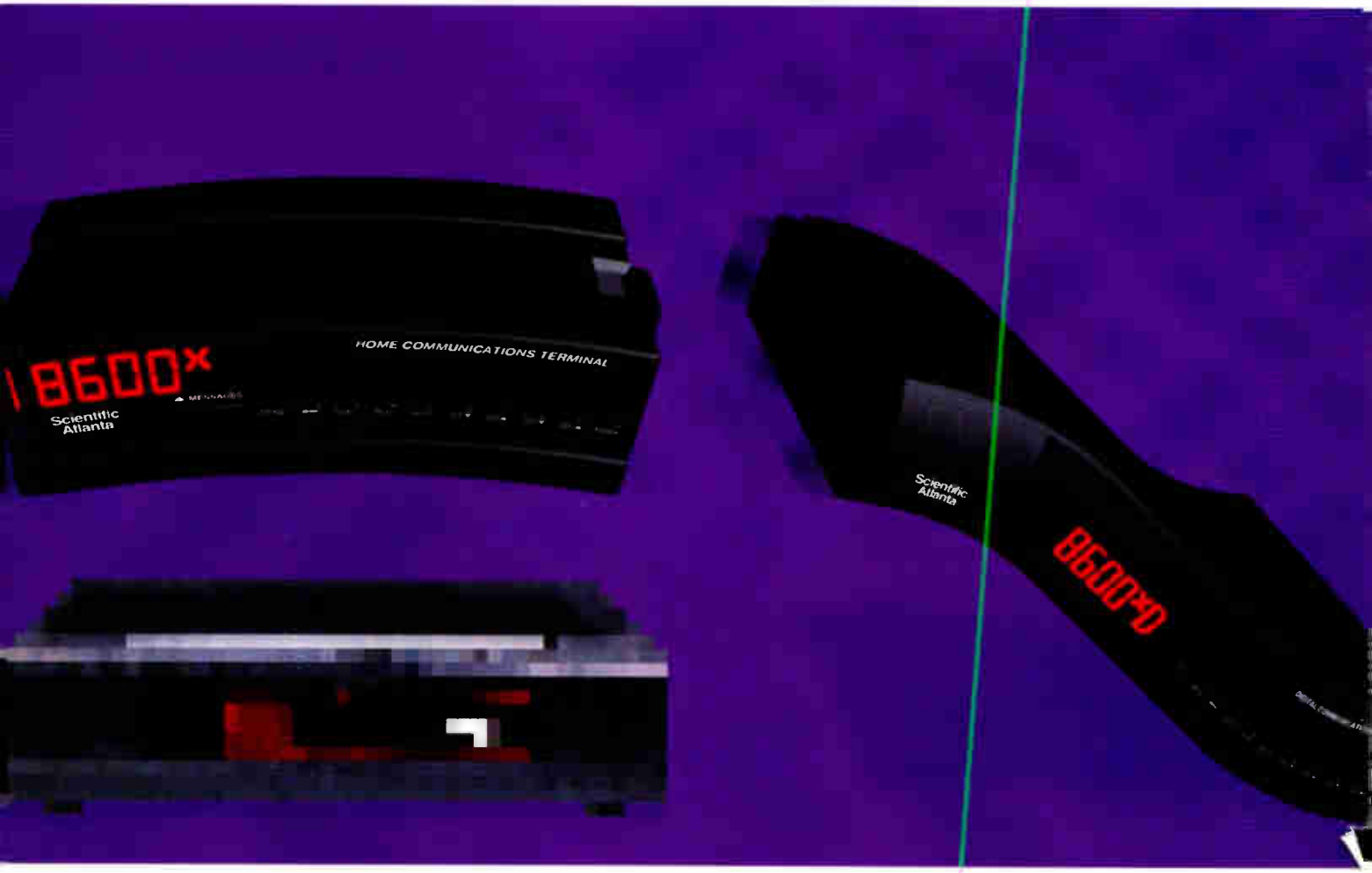
Outsmash video rental stores.

With the 8600X NMOD capability, movies can start every 5 to 15 minutes and virtually all subscribers need to do is pop the corn. No drive to the video store, no late penalty, no

dinary Digital.



tape to rewind, no membership card, no hassle. You're free to offer a complete on-screen schedule of new releases, old favorites, plus sports, comedy and music. It even has pause, rewind and fast-forward functions similar to a VCR.

8600X™

messaging feature for announcements, promotions and billboard advertising—a source of added revenue. Individual messaging makes a terrific greeting service and welcome screen. Subscribers can even check account status.

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watts per link), high speed fiber-optic data modules, compatible with the ANSI X3T9.3 fiber channel standard data rate of 531 Mbps.

- Scientific-Atlanta delivered the first of its new Model D9700 DS-3 interface to Vyvx and IDB Communications Group. The units that provides an option for the entertainment industry to deliver programming to cable headend over fiber circuits and new business opportunities for telephone companies and alternative carriers.
- Jerry Conn Associates and Alcoa Fujikura Ltd. made an agreement to have JCA represent Alcoa Fujikura's complete line of fiber-optic cable, fusion splicers and accessories. Jerry Conn will offer this new line over a 24-state area encompassing the eastern United States.
- Compression Labs announced that EDS has placed a $17.9 million order for its SpectrumSaver compressed digital video satellite broadcast system. EDS plans to take delivery of the systems during the next nine months. The companies reported they will initiate "the unprecedented delivery of guest room movies by using CLI's SpectrumSaver broadcast system to create an information and entertainment highway."
- Hughes Communications Inc. and IDB Broadcast announced a long-term transponder lease agreement on Hughes' Galaxy 1-R satellite. IDB Broadcast will market full-time digitally compressed capacity on cable-dedicated Galaxy 1-R to cable programmers.
- The full implementation of North America's first high power direct broadcast satellite (DBS) system has been "assured," reports GM Hughes. A contract between DirecTv Inc., a unit of GM Hughes Electronics, and commercial launch provider Arianespace has been signed. The contract calls for an Ariane 4 rocket to lift the second DirecTv DBS satellite into orbit for service in the summer of 1994.
- Twelve months in prison, restitution to the U.S. government and reimbursement to Jerrold Communications for investigative costs is what a cable pirate landed recently. Peter Greenwood sold cable descramblers in the southern portions of New Jersey and Philadelphia area through his company, United Technology. He pleaded guilty to one felony count of assisting in the interception of satellite cable programming.

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CT 8/93

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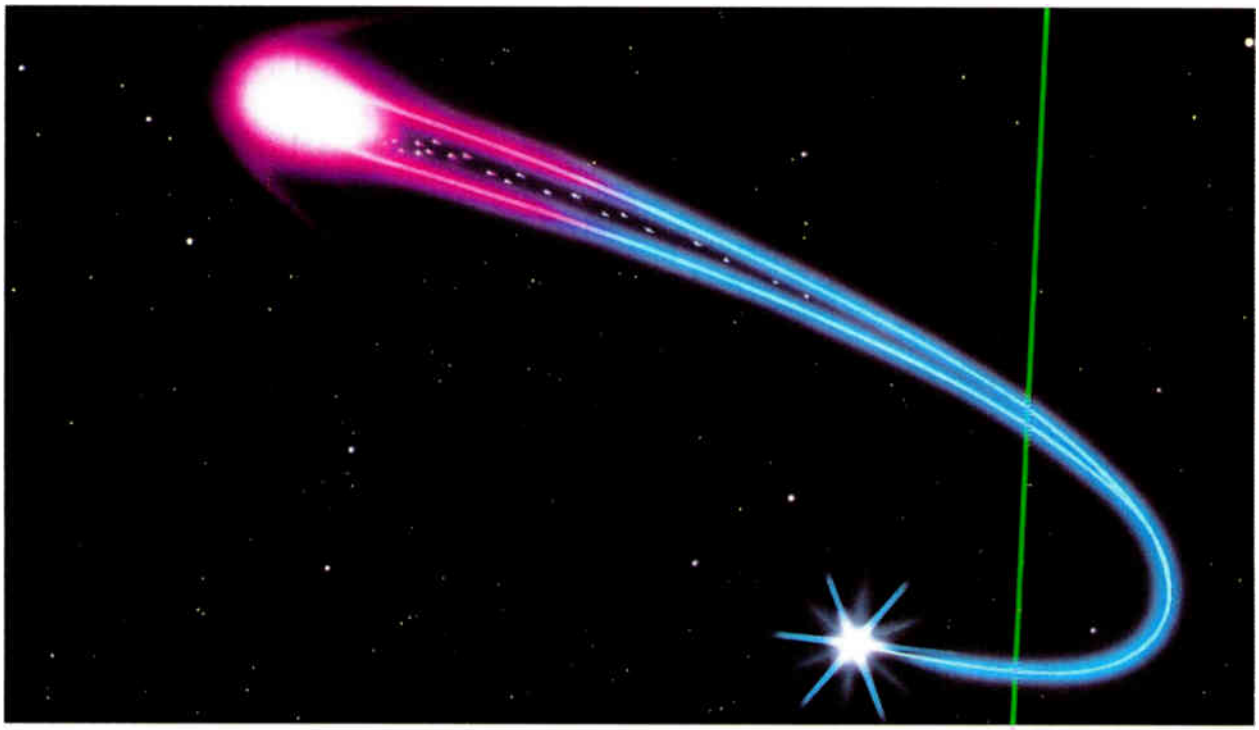

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Starfire 750

Jerrold
GI General Instrument

"All of the giants have declared their commitment to it through their projects, and when these projects are rolling, television will never be the same again."

gramming. Video will no longer be a stream of frames tied together. It will require a mesh of computer programming to make it easy for the user to access. This mesh, called an applications program interface (API) in computerese, will let programmers turn frames of video into shopping catalogs and other virtual worlds.

Random access will completely redefine the way programming is created. Malone explained, "The real issue is going to be how to attract people to the program. No longer will two or three shows stand behind *60 Minutes* as the locomotive. Programming will have to stand on its own."

TCI will be in a powerful position to take over random access from the telcos. It plans to offer 500 channels of video to every subscriber on its network. Five hundred channels divided by 500 homes, means that each subscriber will get his or her own channel. This means that each subscriber will be able get the kind of information they want when they want it.

US West is the first telco to dive into video random access in a big way. It recently invested about $2.4 billion in Time Warner. Biondi said, "You are going to need very large capital expenditures. It is not only access to technology but skills. People see a lot of logic in coming together." The two of them could bring randomly accessed video to most of the country by leveraging their existing infrastructures.

Random access is coming fast — and it will take cable from a $20 billion industry into the hundred billions, or even trillions. All of the giants have declared their commitment to it through their projects, and when these projects are rolling, television will never be the same again. **CT**

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To help systems and other industry operations in ensuring safe conditions for their personnel, SCTE has just published a new edition of its *Health and Safety Manual*. Extensively revised to be as current and accurate as possible, this manual will make employees safety conscious and aware of the hazards that exist in the day-to-day performance of their jobs, how to eliminate these hazards and the prevention of accidents caused by those hazards. Although much of the material is aimed at technicians in the field, there are also sections geared towards office personnel.

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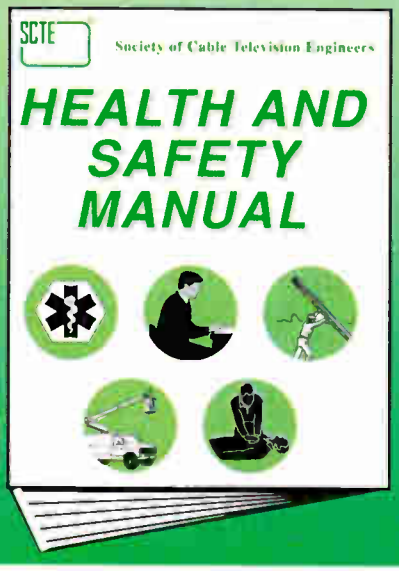

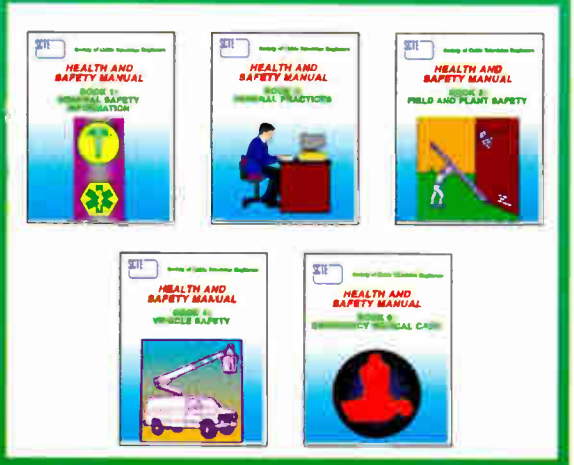

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Reader Service Number 47

the operator will pay a huge premium for extra fiber, construction and high-gain actives as compared with the operator who originally designed the system with future expansion in mind.

• A system that is designed at 550 MHz with the proper spacing and amount of fiber to allow for an easy upgrade to 750 MHz will cost approximately 10% more for the initial build. However, expansion from 550 MHz to 750 MHz will be relatively painless.

Conclusions

With the advent of such services as VOD and telephony-over-cable, and the continuing development of compression and multiplexing technologies, limiting the number of homes per fiber node is at least as important as (if not more important than) increasing system bandwidth.

"Limiting the number of homes per fiber node is at least as important as (if not more important than) increasing system bandwidth."

Relative to system design, decision makers can regard a 550 MHz, fiber-to-the-service area (2,000 or fewer homes per node) architecture as a starting point for deliberation. From there, the most important decision is whether or not to consider 750 MHz. If 750 MHz is considered, the operator can either build a 550 MHz system that is spaced for 750 MHz or the operator can build a 750 MHz system in the first place (which will cost about 10% more than a 550 MHz system spaced for 750 MHz). This decision must take into account both company finances and community demographics. For operators building a system today, it is important to keep the following in mind:

• Depending on the number of channels currently being used for conventional programming services, and taking into account local demographics, many system operators will find that there is no need to plan for a system capacity beyond 550 MHz. Many systems will be able to provide a full slate of conventional as well as interactive programming within that 550 MHz.

• If the operator knows that the system will expand to 750 MHz at some point during its life, it may be more economical to build at 750 MHz in the first place. Otherwise, the operator pays for a full set of 550 MHz electronics now, and has to scrap the entire lot for 750 MHz gear in a few years. In a case such as this, an immediate 750 MHz build will actually end up being less expensive than the 550 MHz build. While this point may sound obvious, it is often overlooked.

A 1 GHz architecture may make sense for those systems involved in pioneering the development of new technologies, but 1 GHz is far too impractical for the overwhelming majority of cable systems. The cost premium for the 1 GHz system cannot be readily justified. (In fact, in most cases it is currently more economical to build a dual 550 MHz plant than it is to build a single 1 GHz plant). Today's cable operators will find much reward, both now and in the future, in limiting their current bandwidth planning to no greater than 550/750 MHz. **CT**

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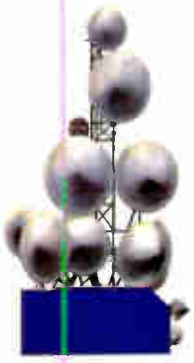

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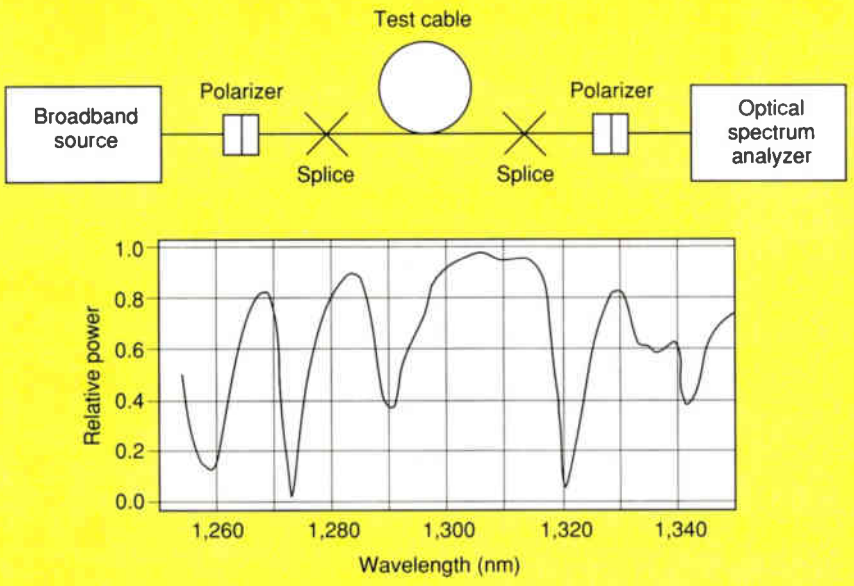
Figure 4: A wavelength scanning method for measuring PMD[4]



Polarization mode dispersion

(Continued from page 26)

national Electrotechnical Commission (IEC) have plans to study this topic.

Meanwhile, TIA/EIA FO-6.6.5 is considering an AT&T proposal that uses a wavelength scanning method.[3] Figure 4 shows an implementation of the test.[4]

The optical output from a broadband light source, such as a lamp or LED, passes through a polarizer that launches light having a fixed state of linear polarization into the test fiber. The output from the test fiber passes through another polarizer and into an optical spectrum analyzer. Because the state of polarization of the light before the second polarizer changes with wavelength, the amount of optical power reaching the spectrum analyzer fluctuates with wavelength. The number of peaks — or valleys — (n), occurring between the start λ_1 and stop λ_2 wavelengths in the oscillatory trace on the spectrum analyzer can be used to calculate the fiber's PMD by the relation:

$$PMD = \frac{kn\lambda_1\lambda_2}{(\lambda_2 - \lambda_1)c} \quad (1)$$

where k is a mode coupling factor ($k \leq 1$) whose value depends on the amount of optical power mixing between the two modes.

Fewer peaks and valleys mean lower PMD. The PMD obtained using the wavelength scanning technique is an average of the instantaneous differential modal delays. Slight perturbations on the fiber can change

the instantaneous delay through several mechanisms, one of which is mode coupling.

Mode coupling

The low intrinsic birefringence of single-mode fibers makes them sensitive to mild external influences. Slight perturbations arising from temperature, wind or vibration, change the instantaneous mechanical state of the fiber, and this causes power in one polarization mode to couple into the other. So, instead of two distinct pulses arriving at the fiber's end as in Figure 1B, a multitude of pulses arrive at slightly different times on each axis. Their superposition results in pulse spreading.

Mode coupling can alter the instantaneous differential modal delay with time, and causes it to vary with wavelength. Measuring the same fiber over and over again produces many instantaneous delays, and these have a Maxwellian statistical distribution. The average of all possible delays is the fiber's PMD. If a finite number of delays is measured, then their average is an estimate of the true PMD and has an inherent variability. The PMD computed using Equation 1 is an estimate of the fiber's true PMD. The measurement accuracy can be improved by making $\lambda_2 - \lambda_1$ large enough so that n>>1. Values of n ranging from 3 to 20 are typical.

"Because the PMD of single-mode fibers arises from a delicate interplay between internal stresses, geometry and external forces, the PMD of a cabled fiber cannot be predicted from a knowledge of only one causal mechanism."

PMD and fiber length

All things being equal, the longer a fiber's length, the higher its PMD. So, it is helpful to know how PMD scales with fiber length, and how the PMD of several individual fibers combine when they are joined together.

• *Length scaling.* For cabled fibers at least 1 kilometer long, the random mode coupling of power between the two polarization modes produces a statistical length scaling. PMD does not double if the fiber length doubles nor does it half when the fiber length halves. Instead, PMD scales as the square root of length. To obtain a normalized value of PMD that can be used as a figure of merit for comparing the PMD quality of different fibers, the measured PMD in ps is divided by the square root of the fiber's length in kilometers (km) and reported in the units of ps/$\sqrt{km}$. For example, if 1 ps of PMD is measured on a fiber 6 km long, the normalized PMD is $1/\sqrt{6} = 0.4$ ps/$\sqrt{km}$.

• *Concatenation.* When fibers are joined together during installation, the total PMD is approximately the square root of the sum of the squares

Figure 5: Time-varying CSO[6]

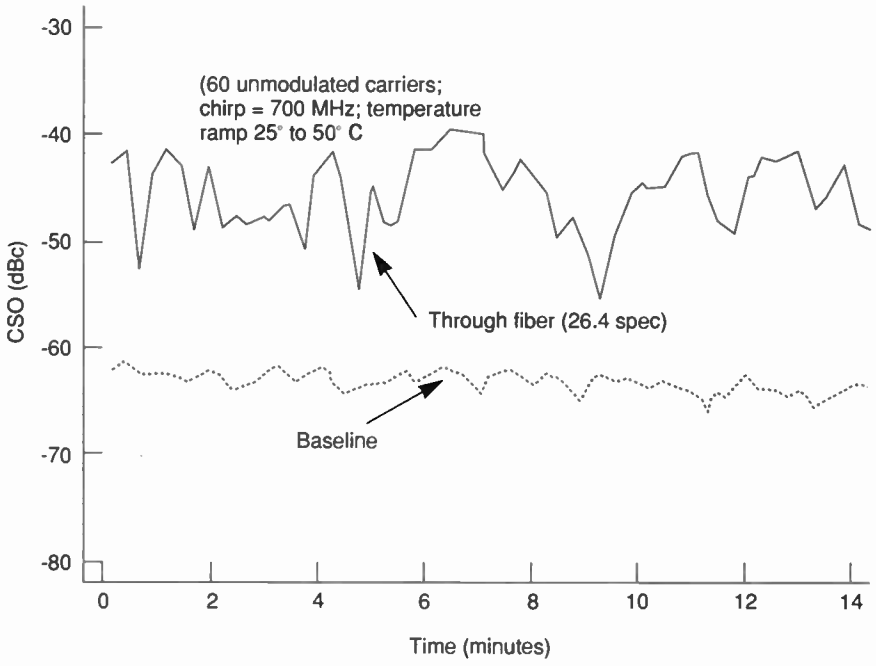
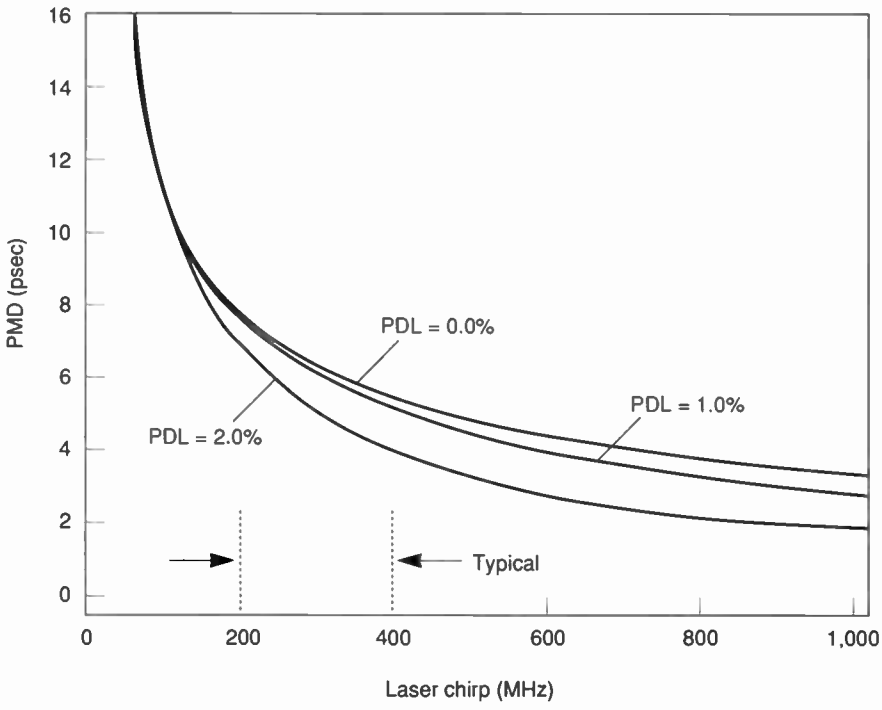


Figure 6: Tradeoffs among PMD, chip and PDL[7]



of the PMDs of each fiber. Termed root sum of squares addition, the computation is expressed mathematically as:

$$PMD_{total}(ps) = \left[\sum_{i=1}^{N} PMD_i^2(ps)\right]^{0.5} \quad (2)$$

where PMD_i is the PMD in ps of each constituent fiber. For example, three fibers having PMDs of 1, 0.5 and 4 ps will have a total concatenated PMD of:

$$\sqrt{1^2 + 0.5^2 + 4^2} = 4.2\,ps$$

Effect of PMD on transmission

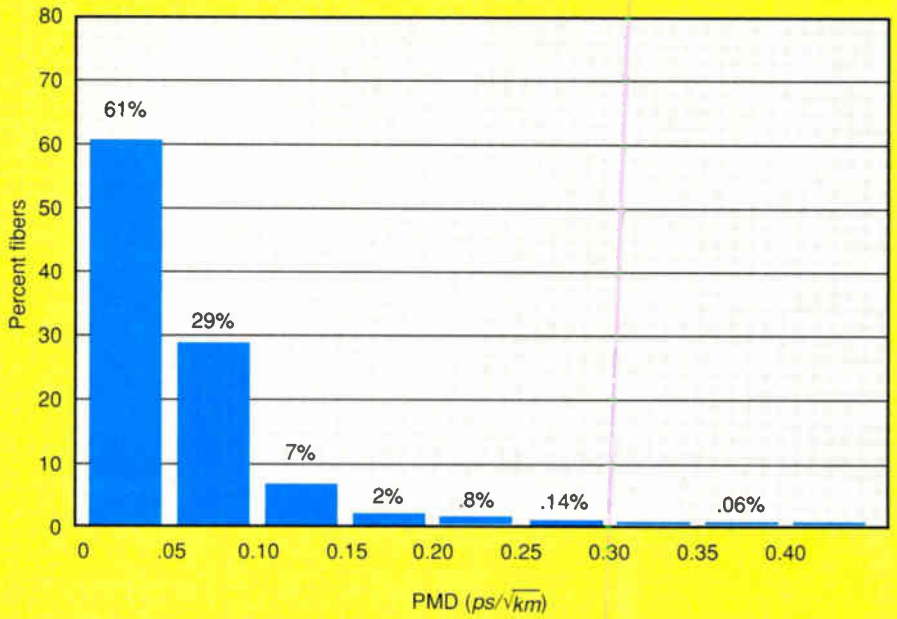
The effect of PMD on digital and analog transmission systems has re-

ceived much study. In digital systems, PMD causes a pulse broadening similar to chromatic dispersion, while in analog AM systems, PMD causes distortions. In both instances, the time-varying character of the instantaneous modal delay produces time-varying effects.

• *Digital systems.* PMD in digital systems can lead to pulse broadening and intersymbol interference. Unlike chromatic dispersion, the time-varying modal delays leads to a random fading of the baseband signal analogous to multipath fading in radio systems.[5] Consequently, PMD effects must be characterized statistically and one can derive the probability of exceeding the "margin" of a digital system as a function of PMD level. Specifically, for a chirpless laser, theory predicts that a margin of 1 dB will be met with 99.994% probability if the total PMD is less than one one-seventh the bit period. This equates to 141 ps at a 1 Gb/s transmission speed. Studies have shown that chirped sources can require PMD levels about half that for chirp-free sources. Higher-order dispersion effects arise from time variations in the differential modal delays and polarization states of the component pulses over the spectral width of the source.

• *Analog AM systems.* PMD can contribute to composite second order (CSO) distortion in AM vestigial sideband systems.[6,7] Figure 5 shows what can happen when several parameters combine in an extreme scenario.[6]

Figure 7: Cabled fiber PMD in the 1,310 mm window

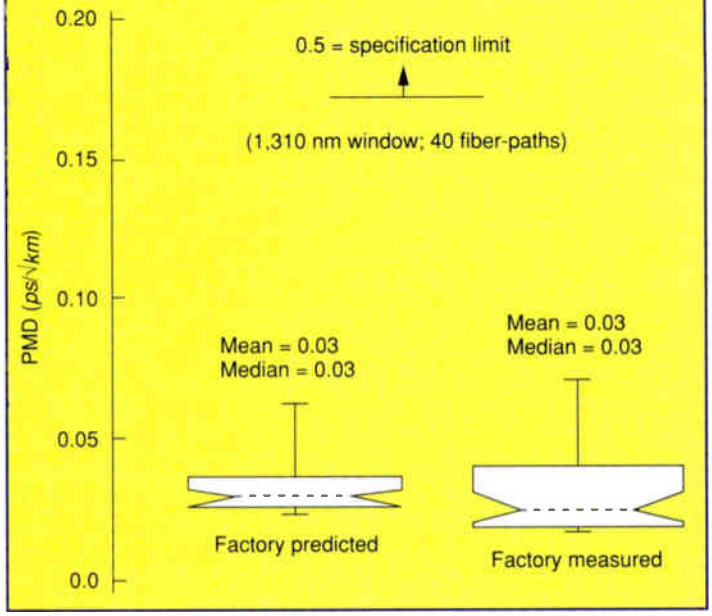


In a laboratory experiment, 60 unmodulated carriers were used to directly modulate a high chirp 1,310 nm DFB (distributed feedback) laser. With the laser connected directly to the receiver, CSO remained stable over a 14-minute interval. This performance changed dramatically when a deliberately chosen fiber having high PMD and a device having high polarization dependent loss (PDL) were inserted into the transmission path. As the fiber temperature increased from 25 to 50° C, the average CSO not only degraded, but also fluctuated with time.

In the experiment, laser chirp and PDL were introduced to encourage the CSO degradation. PMD alone does not impair CSO. Laser chirp is needed too, and PDL exacerbates the problem.

• *Laser chirp.* Laser chirp is the unintended modulation of a laser's wavelength when its optical intensity is modulated. With DFB lasers, the wavelength change is several thousandths of a nanometer. Laser manufacturers prefer to convert this wavelength change to a frequency change expressed in the units of MHz. Typical direct modulated DFB lasers have chirp levels ranging from 200 to 400 MHz per video channel. Externally

Figure 8: PMD is stable with installation



modulated lasers on the other hand have negligible chirp.

• *Polarization-dependent loss.* PDL is a variation in the optical loss of a fiber-path or device when the state of polarization of the light launched into it changes. PDL can occur in splices, connectors, optical couplers, wavelength division multiplexers, optical isolators and packaged photodetectors. To minimize time-varying system impairments, the magnitude of the PDL after a high PMD fiber-path should be zero. Optical couplers and photodetectors typically have higher PDL levels than splices. So, couplers with PDLs higher than 2% should be avoided near the receiver.

Designing an AM system for PMD

• *System requirements.* Just as the optical loss and chromatic dispersion of a fiber path need to be known when designing transmission systems, so too do PMD, laser chirp and sometimes PDL. Figure 6 on page 56 shows the tradeoffs among chirp, PDL, and PMD for a 60-channel AM system having an average CSO of -70 dBc.[7] The graph shows that if chirp doesn't exceed 400 MHz and the total PDL doesn't exceed 2%, the fiber path should theoretically have a total PMD of less than 4 ps. The comparable value for an 80-channel system is 2 ps. These stringent PMD levels can be readily met with fibers in today's commercially available cable.

• *Cabled fiber PMD.* The first reports of extensive PMD data on fibers in completed cables suggested that measurement refinements were necessary to improve the ability to measure small values of PMD.[8] Recent results confirm this.

Figure 7 on page 57 shows data on 1790 fibers in AT&T Lightpack LXE cables. The fibers were of the conventional, depressed-clad design manufactured using the MCVD process. The median of 0.04 confirms the earlier, more limited data on these types of fiber, and is lower than values reported by others.[9,10]

The cabled PMD data from Figure 7 was used to statistically compute the total PMD of a 30 km long route

"Today's fibers have PMD levels low enough for expected future AM and digital systems and these low levels remain stable with installation."

comprised of six 5-km long cable reels. Rarely does the total PMD exceed 0.5 ps, more than enough to meet the theoretical 4 ps required for a 60-channel system, and the 2 ps required for an 80-channel system.

• *Stability of PMD with installation.* The validity of using factory-measured PMD data to design optical transmission systems was verified by comparing the factory-measured PMD to field-measured PMD in a real-life application. Factory-measured PMD data on fibers in 13 cables were used in Equation 2 on page 56 to compute the expected PMD of 40 spliced fiber paths (ranging from 5.5 to 20 km long) serving 10 optical nodes in a field installation. The PMD of the 40 installed fiber-paths was measured and compared to the predictions.

Figure 8 shows two boxplots. (A boxplot is a method for comparing sets of data. The horizontal dashed line inside the box represents the median value of the data. The box contains 50% of the data values with the remaining values outside the box. Twenty-five percent of the values lie between the lower edge of the box and the end of the lower whisker, and the other 25% lie above the upper edge of the box and the upper whisker. The notches on the box represent a 95% statistical confidence interval on the median.)

The first boxplot shows the normalized PMD (in the units of ps/$\sqrt{km}$) for the 40 installed fiber paths predicted from the factory data, and the second boxplot shows the PMD actually measured in the field. A comparison of the two boxes shows that the median values of PMD did not change from factory to field. The slightly larger variability in the field data compared to the factory data can be attributed to the limited measurement capability of the field test set. This produced a larger quantization of the measured PMD values and hence the larger spread.

This aside, the field data shows that the factory measured PMD did not change because of installation. Furthermore, the maximum field measured PMD value of 0.07 ps/$\sqrt{km}$ is comfortably within the factory specification limit of 0.50 ps/$\sqrt{km}$.

Conclusions

With the continuing trend toward longer fiber paths operating at higher digital speeds and at increasing channel loads, PMD has become as important as optical loss and chromatic dispersion when designing optical transmission systems. In digital systems, PMD increases pulse spreading and produces a time-varying bit error rate. In AM systems, PMD may cause time-varying distortion.

Adaptive optical equalization of PMD has been shown

to improve the bit error rate performance of digital systems[11] and has the potential for improving the CSO performance of AM systems. However, the only practical method now available for overcoming PMD limitations in AM systems is to use low chirp lasers.

Today's fibers have PMD levels low enough for expected future AM and digital systems and these low levels remain stable with installation. **CT**

References

[1] I. P. Kaminow, "Polarization in Optical Fibers," *IEEE Journal of Quantum Electronics*, Volume QE-17, pages 15-21, 1981.

[2] Ashish M. Vengsarkar, A.H. Moesle, L.G. Cohen and W.L. Mammel, "Polarization Mode Dispersion in Dispersion-Shifted Fibers: an Exact Analysis," Optical Fiber Communication (OFC) Conference, paper ThJ7, February 1993.

[3] W. B. Gardner, "Polarization Mode Dispersion," *Lightwave*, March 1993.

[4] "Polarization Mode Dispersion Measurement for Single-Mode Optical Fibers by Wavelength Scanning," FOTP-113, submitted to TIA/EIA Jan. 26, 1993.

[5] C.D. Poole, R. W. Tkach, A. R. Chraplyvy and D. A Fishman, "Fading in Lightwave Systems Due to Polarization-Mode Dispersion," Photonics Technology Letters, Volume 3, pages 68-70, 1991.

[6] T.E. Darcie and C.D. Poole, "Polarization-Induced Performance Variables," *Communications Engineering and Design*, May 1992.

[7] C.D. Poole and T.E. Darcie, "Nonlinear Distortion Related to Polarization-mode Dispersion in Analog Lightwave Systems," Conference on Lasers and Electro-Optics — CLEO, May 1993.

[8] A.F. Judy, J.B. Haber, W.B. Gardner, W.T. Greene, A.J. Ritger and K.L. Walker, "PMD Characterization of Production Cables for Evolving Lightwave Systems," OFC, paper PD20, February 1993.

[9] N. Gisin, et. al., OFC paper Wk5, February 1992.

[10] C. DeAngelis, et. al, *Journal of Lightwave Technology*, Volume 10, no. 5, page 552, May 1992.

[11] J.H. Winters, Z. Haas, M.A. Santoro and A.H. Gnauck, "Optical Equalization of Polarization Dispersion," *SPIE's OE/FIBERS*, September 1992.

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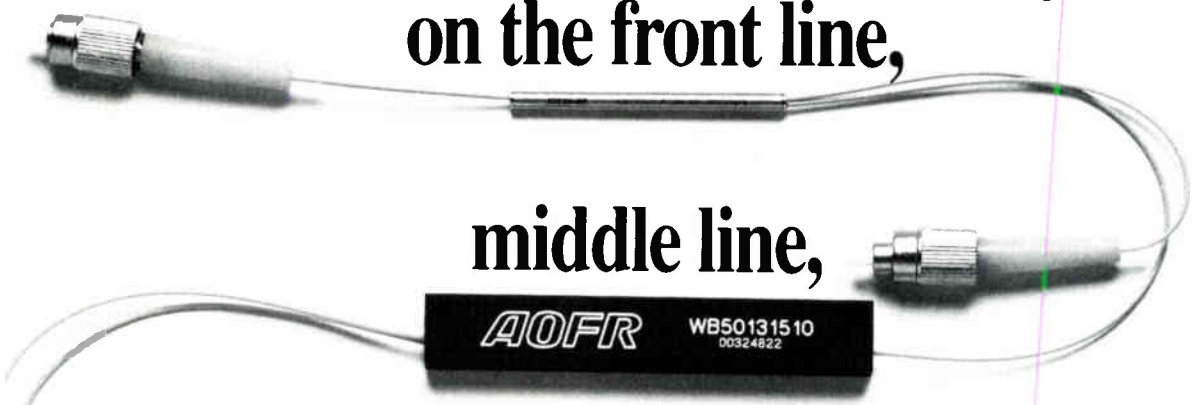

middle line,

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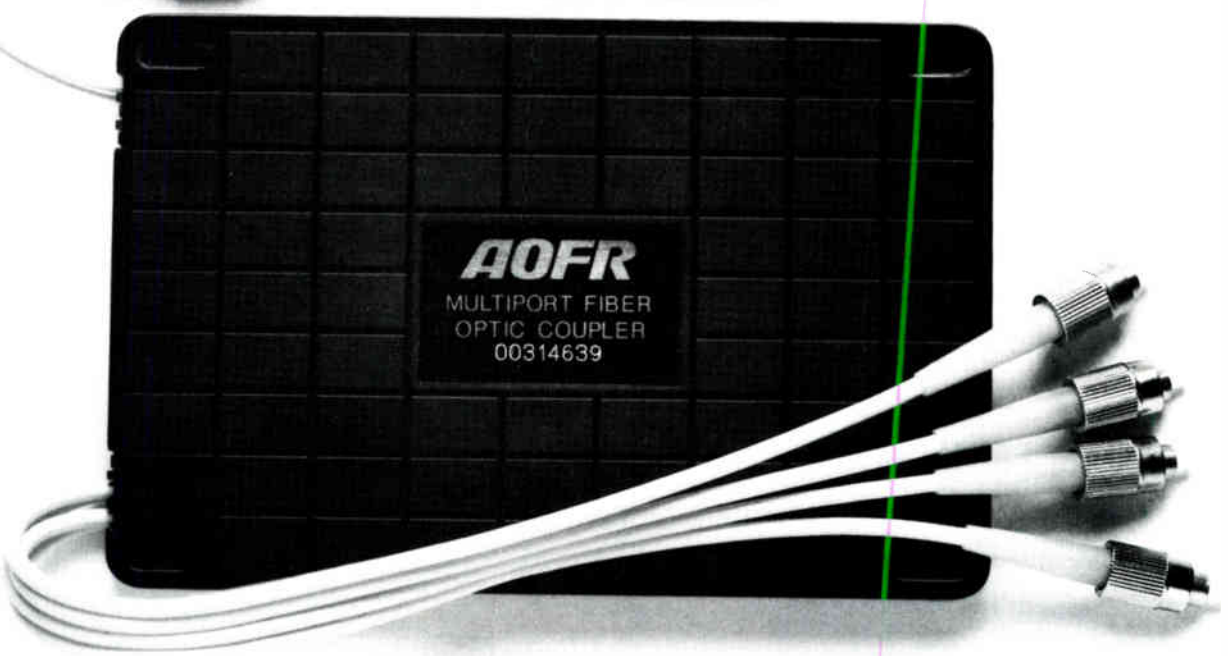

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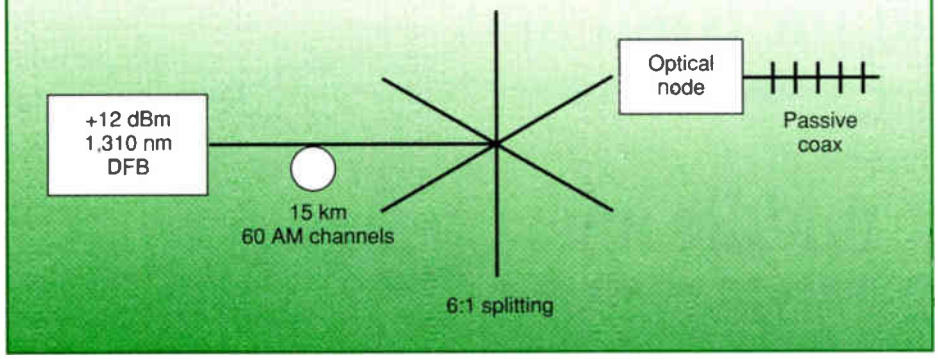
Figure 4: Fiber-to-the-last amp architecture using high power 1,310 nm DFB lasers



1,310 nm DFB lasers

(Continued from page 32)

C/N of 50 dB, fiber losses of 0.4 dB/km and 1 dB loss margins are assumed. A receiver noise of 7 pA/Hz$^{1/2}$ and typical values of laser interferometric noise are assumed. Eighty-channel links are assumed to operate at 3.5%/channel and 60-channel links are assumed to operate at 4%/channel This allows for margin from the clipping limit to add digital channels. If a laser output power of +12 dBm is assumed, then a 20 km link with 60 channels can have a 4:1 split assuming a 7 dB loss for the splitter. A 15 km 60-channel link can have 6:1 splitting and a 10 km 80-channel link can have 8:1 splitting.

In FTLA architectures, more of the system distortion budget also would typically be allocated to the fiber link compared to more conventional fiber-to-the-feeder (FTF) networks. This improves the yield and therefore the cost of high power DFB lasers for FTLA.

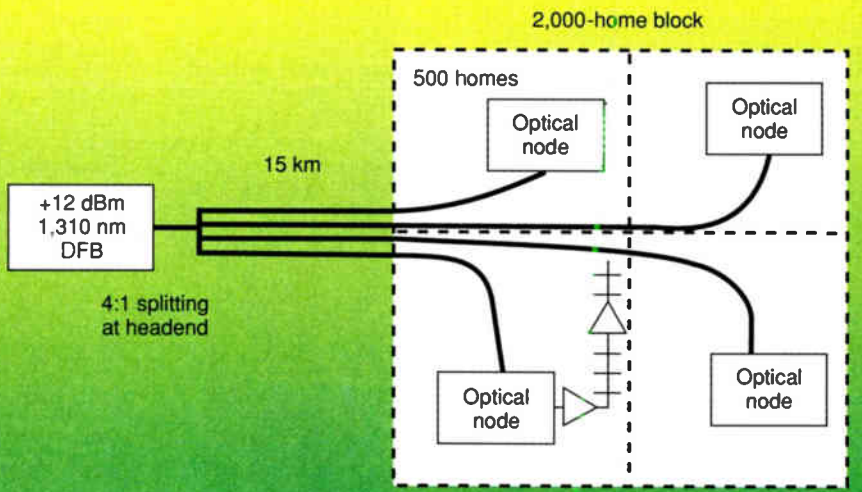
Another application of high power DFB lasers is as an intermediate step toward a network with dedicated lasers for groups of about 500 homes. Such an architecture is shown in Figure 5, with all of the splitting done at the headend. In this case, higher performance levels of FTF networks are generally required of the fiber links. This reduces the amount of optical splitting compared to FTLA, but still allows the transmitter to initially be shared by several optical nodes. At the time of a future upgrade, additional lasers can be added at the headend until there is a dedicated laser for each receiver. No changes are required to the network beyond the headend.

Summary

DFB laser technology is rapidly evolving to meet the needs of future CATV networks. Two of the main areas of advancement are in the area of bandwidth expansion and optical power improvement. Because of the high inherent dynamic range and 3 dB bandwidths of DFB lasers, no device improvements are required to add digital or other lower dynamic range channels to an AM laser. The

only requirements are improvements in the bandwidths of the RF electronics associated with a laser transmitter. High power DFB lasers allow for cost-effective solutions for network architectures with fiber penetration to optical nodes serving smaller blocks of homes than current architectures. This can be used to build networks that are better able to provide for anticipated future services as well as for services not yet contemplated. **CT**

Figure 5: Using high power 1,310 nm DFB lasers as an interim step to fiber rich narrowcast architectures



References

[1] "Analysis of the Carrier Induced FM Response of DFB Lasers: Theoretical and Experimental Case Studies," P. Vankwickelgerge, F. Buytaert, A. Franchois, R. Baets, P. Kuindersma and C. Fredriksz, *IEEE J. Quantum Electron.*, Volume QE-5, pages 2,239-2,254, 1989.

[2] "Multichannel Intermodulation Distortion in High Speed GaInAsP Lasers," P. Iannone and T.E. Darcie, *Electron. Lett.*, Volume 23, pages 1,361-1,362, 1987.

[3] "Optimum Laser Chirp Range for AM Video Transmission," H. Blauvelt, P. C. Chen, N. Kwong and I. Ury, *Technical Digest Cable '92*, pages 79-85, 1992.

[4] "A High Speed InGaAsP/InP DFB Laser with an AirBridge Contact Configuration," T. R. Chen, P. C. Chen, C. Gee and N. Bar-Chaim, *IEEE Photon. Tech. Lett.*, Volume 25, pages 776-777, 1989.

[5] "Fundamental Limit on Number of Channels in SCM Lightwave CATV System," A.A.M. Saleh, *Electron. Lett.*, Volume 25, pages 776-777, 1989.

[6] "Practical TV Channel Capacity of Lightwave Multichannel AM SCM Systems Limited by the Threshold Nonlinearity of Laser Diodes," C.J. Chung and I. Jacobs, *IEEE Photon. Tech. Lett.*, Volume 4, pages 289-292, 1992.

Figure 4

Figure 5

Electromagnetic interference

(Continued from page 40)

quency (HF) operation (signals below 30 MHz), the solution to the problem may be as simple as the installation of a differential-mode, high-pass filter in the cable that feeds the set-top converter. Figure 3 on page 40 shows one way to do this. Even if this filter doesn't cure the interference, leave it in place, at least for the time being.

Time to get down to brass tacks

There are a number of cable channels that can be affected by cable system ingress. These channels make use of over-the-air frequencies that are allocated to other services, often located immediately adjacent to amateur, business or pager frequencies. The table on page 38 lists the frequencies for a standard system with no offsets. Many systems use offsets, or one of the other channel schemes.

If the interference results to Ch. E,

Ch. J or Chs. UU through YY from amateur VHF operation, it will not be possible to filter the undesired signal from inside the cable without affecting the desired TV signal as well. All is not lost however. Sometimes the TV receiver, VCR or set-top converter will exhibit a strong response to the common-mode signal present on the outside (shield) of the cable, or to a lesser extent the common-mode or differential-mode RF signals that may be present on the AC electrical system wiring. After all leaks have been repaired, it may be possible to do something about these signals.

The common-mode filter

The common-mode filter or choke may be one of the best-kept secrets in the Western world. Ingress problems that are not caused by cable leakage are usually the result of the common-mode response of the TV receiver, the VCR or the set-top converter. This common-mode response usually can be cured with the use of a common-mode choke.

The simple cable TV installation shown in Figure 4 is virtually bullet-proof. The placements of the cable and AC line common-mode filters have been chosen to minimize the amount of undesired common-mode energy reaching the set-top converter. Two different cable common-mode filters are shown in Figure 5. Do not substitute unsuitable ferrite materials for those specified in the description. As an example, it might be possible to scrounge some ferrite from an old TV set's deflection yoke, but the ferrite material used was designed to perform at 15.75 kHz. It may, or may not, work well at the frequency of the radio station.

Common-mode filters for coaxial cable should be installed as close as possible to the cable input connector of the set-top converter, TV receiver or VCR. In extreme cases, it may be necessary to install a common-mode choke at each end of all interconnecting cables (VCR to TV set, for example) in the system.

AC line filtering

• *AC line common-mode choke.* The undesired signal also can be coupled into the subscriber's equipment through the AC power lines. These lines can function as antennas. The signal that is induced into AC power lines can be either common- or differential-mode. Install a common-mode choke on the AC line cord of the TV set, as close as possible to the point where the cord enters the set. This choke should be made by wrapping 10 to 20 turns of the AC line cord through the ferrite toroid (or onto a ferrite rod). This will reduce any common-mode signal that has been picked up by the AC lines.

• *The AC line differential-mode filter.* If the AC line common-mode choke doesn't help, add a differential-mode AC line filter. The is the type of AC line filter commonly sold by electrical supply companies. (They also are sometimes called "brute force" AC line filters.) This filter should be installed as close as possible to the point where the AC line cord enters the TV set.

These "standard" cures will probably take care of 90% of the interference problems that plague your subscribers. But that other 10% can be the most difficult to pin down. Part 3 of this series discusses some of the more advanced troubleshooting techniques and cures, and lists several sources of help. **CT**

Fiber-optic technologies

(Continued from page 36)

It uses more fiber, and that leads to increased implementation cost.

Direct vs. external modulation

Direct modulation of a distributed feedback laser is accomplished by adding the bias current with the modulating signal, as shown in Figure 2 (page 36). At present, most fiber systems used for transport of AM-VSB in CATV applications use this method of modulation for a variety of reasons. Directly modulated DFB lasers have proven to be a capable and reliable set of products. A large number of these links are in the field and there have not been any major problems reported. The performance of this technology has steadily increased over the years and will continue to improve. As stated earlier, DFB vendors are researching several areas to improve 1,310 nm laser's performance. Also, techniques such as predistortion are being developed and refined to improve the link's performance.

External modulation, on the other hand, uses two different elements to accomplish the modulation. First, a laser (most commonly a Nd:YAG) is run in CW mode. This optical signal is then applied to an electro-optical modulator, typically a $LiNbO_3$ modulator. The benefit of this approach is the laser can be optimized for output power, beam quality, spectral characteristics and RIN, while the modulator can be optimized for optical loss, bandwidth and frequency response.[4] The modulators are inherently nonlinear. This has required the development of linearizing techniques.

There are two different techniques to accomplish linearization, optical feedforward and RF predistortion. Optical feedforward is accomplished by splitting off a part of the main optical signal, converting it back to RF and comparing it to the original electrical signal. The error signal that is derived from these two signals is then modulated through a DFB laser and coupled into the fiber.[5] As an alternative, RF predistortion is similar to other predistortion applications discussed earlier. The circuit creates distortion out of phase with the main signal's distortion. The distortions cancel when the two signals are recombined.[4] Both of these techniques have been reported to suppress the unwanted distortion to levels that are acceptable for CATV applications.

Conclusion

Many alternatives are to be considered when deciding how to use fiber optics in today's CATV system. Operating wavelength and modulation technique are two decisions that must be made. Links operating at 1,310 nm have demonstrated their ability to deliver high-quality video, while 1,550 nm technology has its own advantages of reach and amplification. Likewise, direct modulation has proven to be a reliable method of modulating the source. However, external modulation has found its niche in higher power applications. **CT**

"Direct modulation has proven to be a reliable method of modulating the source. However, external modulation has found its niche in higher power applications."

References

[1] H. Blauvelt, P.C. Chen, J. Paslaski, I. Ury and N. Bar-Chaim, "Trends in Output Power and Bandwidth of 1,310 nm DFB Lasers for AM Video," NCTA Technical Papers 1993, pp 385-390.

[2] Gary Lyons, "AM Fiber Supertrunking: A Performance and Economic Evaluation," proceedings from Fiber Optics Plus 1992, pp 37-50.

[3] Douglas E. Wolfe and Don Frymyer, "The Use of Dispersion-Shifted Fiber for Cable TV Applications," 1992 NCTA Technical Papers, pp 49-54.

[4] Israel M. Levi, Moshe Nazarathy and Josef Berger, "External Modulation System for AM Fiber CATV Transport," proceedings from Fiber Optics Plus 1992, pp 51-62.

[5] Robert J. Plastow, "80-Channel AM-VSB CATV Transmitters Utilizing External Modulation and Feedforward Error Correction," LEOS 1992 Summer Topical Meeting Digest, pp 10-11.

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Aligning headend equipment

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

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Norrie Bush of Columbia Cable of Washington makes them easy.

Industry's First: Ortel's 16 mW Laser

Ortel Corp. introduced the 3620 Series of CATV lasers and board assemblies offering up to 16 mW of output power. This series is a complete fiber-optic transmitter subassembly designed to meet the needs of OEM manufacturers of CATV fiber-optic transmission products. The series is available in 600 MHz (Models 3620B and 3620D) and 860 MHz (Model 3620C) versions for U.S. and international frequency plans.

The higher output power supplied by the 3620 allows the signal to be transmitted over longer distances, or it can be split into multiple receivers with higher performance, or a combination of both. The products include a high performance DFB laser and an RF predistorter board. To maintain laser temperature and bias control, the board must be used in conjunction with DC circuits that can be supplied by the company.

The lasers are specifically designed for AM distribution. Internally the laser modules have an optical isolator, TE cooler, monitor photodiode and thermistor. They operate at 1,310 nm over single-mode fiber. These products are completely tested for CNR, CTB and CSO performance with multicarrier test signals. **Reader service #165**

Siecor Enhances Fiber Access Tool

Siecor Corp. announced enhancements to its optical fiber access tool that simplify midspan access of fibers in loose tube cables. Design modifications make it easier to enter buffer tubes to safely access optical fibers for splicing for system rearrangement or upgrade. The hand tool accommodates most commonly used buffer tube sizes.

The tool clamps over a buffer tube. As the tool is pulled along the tube, two offset blades slit the tube without damaging the fibers inside. Fibers can then be spliced without disturbing working traffic on other fibers within the tube. **Reader service #176**

Interface With Interface Report And Generator Software At H-P

Hewlett-Packard displayed its new HP 85916A PC interface and report generator software. It is designed for storage of CATV system measurements and provides full measurement configuration, data collection, trend analysis and report generation capabilities. No programming is required.

When used with an H-P CATV analyzer, the software enhances the user's ability to monitor and maintain cable TV systems by providing the ability to store and analyze test data from multiple test sites. The software provides easy set-up and scheduling screens for immediate and timed measurements. The program includes a standard test plan with the option to easily create a custom plan by selecting channels and available test options. To conveniently sort and organize test data, multiple test sites are entered into the software's file menu. Once the test site files have been created, the appropriate CATV system and test site can be selected for measurement. When CATV system monitor data is generated, it is automatically stored in the appropriate file. The stored data can be reviewed on a PC in either tabular format, or X-Y graph format that includes user-defined limits.

Measurement results from the HP 85916A data base can be converted to FCC proof-of-performance reports and plotted in graphical or tabular format. Data also can be exported to programs such as Lotus 1-2-3 and dBase IV for further analysis. **Reader service #162**

New Standard Product From Pirelli: 100 kpsi Cabled Single-Mode Fiber

Pirelli Cable Corp. expanded its fiber product line with the new 100 kpsi cable single-mode fiber. Until now, fibers have been subjected to a minimum 50 kpsi proof testing level, which has been the industry standard requirement.

The increased testing load adds assurances to the end user that low stress "flaws" will be screened out during the fiber making process. This becomes increasingly important over the "last mile" of the network, where fiber handling is expected to increase. **Reader service #164**

Electroline Says New Broadband Addressable System Cuts Operating Costs

The upgraded multi-tier security (MTS) was highlighted by Electroline Equipment Inc. It is designed for multiple dwelling unit and resort housing applications, offers flexible signal control (12 premium channels, plus on-off control of a basic and expanded basic tier) and rapid payback on invested capital, according to the company. Electroline reports this is done by automating the process of activating and disconnecting service in buildings where access is a problem: by eliminating truck rolls in downtown areas where parking is difficult; by getting customers on-line an extra three to four days earlier; and by avoiding annual audits of lock boxes.

The upgraded MTS features operating bandwidth of 862 MHz and control of up to 12 channels over a 600 MHz range. In addition, the MTS now features addressable control of jamming frequencies, on a remote basis, from the headend. The MTS is available in four jamming frequency ranges: 120 to 195 MHz (Chs. 14-22, 7-10); 175 to 280 MHz (Chs. 7-13, 23-33); 250 to 400 MHz (Chs. 29-53); and 400 to 600 MHz (Chs. 54-86).

The system uses an interdiction signal consisting of both horizontal and vertical synchronization jamming pulses, with the level of the jamming signal varied continuously. Standard carrier frequencies are 53 MHz, 73 MHz and 118 MHz. Other frequencies are available on request. **Reader service #158**

New "Simple And Affordable" Fiber Identifier At Siecor

The CheckPoint fiber identifier was unveiled by Siecor. It is said to be a simple, self-contained installation and maintenance tool that safely detects the fiber path and transmission direction without disrupting service.

The identifier can show which fibers are carrying live traffic, a 2 KHz pulsed signal, or no signal at all, utilizing a nondestructive macrobend technique that does not interrupt normal service or compromise fiber integrity. This is especially useful for identifying specific fibers prior to splicing installation, branching, rerouting or live cutovers. The handheld unit can be use on virtually all single-mode fibers including 250 micrometer acrylate coated, 900 micrometer tight-buffered, 3 mm jacketed and ribbon fibers.

The product can be used in conjunction with a laser source such as Siecor's OS-210 optical source that is capable of transmitting a 2 kHz pulsed light signal. Once the laser source is connected to the fiber, a CheckPoint unit can identify, at any point along the fiber, which fiber is carrying the 2 KHz signal. This pulsed signal effectively distinguishes a fiber from other traffic-carrying or dark fibers.

Designed for field use, the unit is constructed of a rugged metal housing and has the widest operating temperature available at -10°C to +50°C. The sensitivity provided by the CheckPoint fiber identifier is -30 dBm/-35 dBm at 1,310/1,550 nm. It operates using a 9 volt alkaline battery. **Reader service #157**

TV/COM Demos MPEG-2 Compliant Compression System

TV/COM International featured an MPEG-2 compliant digital compression demonstration. Using the company's Compression NetWORKS system, TV/COM is transmitting 10 channels simultaneously over GTE Spacenet's GSTAR 2 satellite transponder. Variable bit rates ranging from 1.15 Mbps to 5 Mbps, and resolutions ranging from 352x240 to 480x480, were shown in the 10-video sequence.

A highlight of the demonstration was the system's variable rate transport layer showing 60 Mbps time division multiplexed (TDM) and 2 Mbps single channel per carrier (SCPC) signals operating on the same transponder. The center frequency of the digitized transmissions were operating within 22 MHz of each other with no interference. **Reader service #163**

FCC Testing With Trilithic

Trilithic's new NCC-1701 provides a simple, cost-effective solution to in-channel response testing. When connected to the input of a modulator, it produces a flat, continuous sweep at channel frequency that can be measured by any spectrum analyzer.

When viewed on a spectrum analyzer equipped with digital storage, the unit sweeps out a block of frequencies extending from ±0.5 MHz from the carrier to the limits of the channel's video passband. The full video spectrum can be seen, not just a few "multiburst" frequencies, allowing narrow notches and even traps to be measured.

Specifications include 0.5-5 MHz frequency range; 0.2-2.0 V peak-to-peak RF output level; switch-settable DC offset for all-positive, all-negative or DC-centered RF output; in-band harmonics and spurious at least 30 dB below output amplitude; out-of-band harmonics and spurious at least 45 dB below output amplitude; 115 VAC.

Also on display was the new NC-1 tricorder multiple battery charger. It charges up to four tricorder NCB-1 battery packs simultaneously. Separate charging circuits for each battery ensure the fastest possible charge, according to the company. The unit can be powered by a single tricorder power cube (not included) or connected to 13 VDC vehicle power. **Reader service #156 (NCC-1701), #155 (battery charger)**

ALS Does Its Fiber/Coax Homeworx

American Lightwave Systems featured its new Homeworx hybrid fiber/coax system for deployment of VSB/AM and digital video, plus advanced telephony systems that are primarily for provisioning of 64 Kb/s to DS1 to each coax telephone subscriber, for providing advanced future services that require digital bandwidth beyond a DSO. **Reader service #166**

Amps, Generators, Demodulators At Blonder-Tongue

Blonder-Tongue Laboratories Inc. showed a family of rack-mounted hybrid distribution amplifiers. The RMDA is a low profile (1.75-inch), full-featured, rack-mount amplifier. It was designed specifically for signal distribution systems requiring the low distortion characteristics only available using hybrid CATV integrated circuits. These amplifiers are useful in systems that use a "cable drop" as a signal source or as the first stage of amplification in the head-end of a cable system. The unit is available in two gain versions (30 dB and 50 dB) and two frequency ranges (50-450 MHz and 50-550 MHz).

Also, the unit is available with one or two hybrid amplifier gain blocks. The use of two hybrid modules with interstage controls provides superior noise performance over the entire range of the gain and slope controls. The single hybrid units provide the same output capability at a modest price. In addition, 30 dB gain versions are available with power doubling hybrids. This allows an increase in output level capability of 3 dB, thereby increasing the reach. The combination of these two architectures in the RMDA family results in models with a variety of performance features to satisfy simple or stringent applications. **Reader service #154**

Cable AML Rolls Out New CARS Band Receivers

New from Cable AML was a full line of microwave CARS band receivers with several upgradable options to optimize the receiver to any given application. Five receivers make up the product line, all sharing a two-piece design. This consists of a small microwave downconverter connected by cables to a VHF unit.

According to the company, the receiver design yields maximum flexibility since the downconverter can be mounted directly behind the antenna feed. The two-piece design also is said to result in better system performance and reduced overall system cost because both of the external LNAs and waveguide at the receive end can be eliminated. Operating in the CARS band (12.7 to 13.25 GHz) these receivers are compatible with all Cable AML microwave equipment as well as most other CARS systems. They are available in several options with different noise figures and VHF and/or microwave AGC. **Reader service #159**

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4	30	56	82	108	134	160	186	212	238	264	290
5	31	57	83	109	135	161	187	213	239	265	291
6	32	58	84	110	136	162	188	214	240	266	292
7	33	59	85	111	137	163	189	125	241	267	293
8	34	60	86	112	138	164	190	216	242	268	294
9	35	61	87	113	139	165	191	217	243	269	295
10	36	62	88	114	140	166	192	218	244	270	296
11	37	63	89	115	141	167	193	219	245	271	927
12	38	64	90	116	142	168	194	220	246	272	298
13	39	65	91	117	143	169	195	221	247	273	299
14	40	66	92	118	144	170	196	222	248	274	300
15	41	67	93	119	145	171	197	223	249	275	301
16	42	68	94	120	146	172	198	224	250	276	302
17	43	69	95	121	147	173	199	225	251	277	303
18	44	70	96	122	148	174	200	226	252	278	304
19	45	71	97	123	149	175	201	227	253	279	305
20	46	72	98	124	150	176	202	228	254	280	306
21	47	73	99	125	151	177	203	229	255	281	307
22	48	74	100	126	152	178	204	230	256	282	308
23	49	75	101	127	153	179	205	231	257	283	309
24	50	76	102	128	154	180	206	232	258	284	310
25	51	77	103	129	155	181	207	233	259	285	311
26	52	78	104	130	156	182	208	234	260	286	312

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

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

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

D. Do you plan to rebuild/upgrade your system in:
31. ___ 6 months
32. ___ 1 year
33. ___ 2 years
34. ___ 5 years

E. In the next 12 months, what cable equipment do you plan to buy?
35. ___ Amplifiers
36. ___ Antennas
37. ___ CATV RF Distribution/ Distribution Electronics
38. ___ CATV Passive Equipment Including Cable
39. ___ Cable Tools
40. ___ Compression/Digital Equip
41. ___ Computer Equipment
42. ___ Connectors
43. ___ Converters
44. ___ Controllers
45. ___ Descramblers
46. ___ Fiber-Optic Cable
47. ___ Fiber-Optic Electronics
48. ___ Headend Equipment
49. ___ Interactive Software
50. ___ Lightning Protection
51. ___ MMDS Transmission Equip.
52. ___ Microwave Equipment
53. ___ Other Security Equipment
54. ___ Receivers and Modulators
55. ___ Remotes
56. ___ Safety Equipment
57. ___ Satellite Equipment
58. ___ Splitters
59. ___ Subscriber/Addressable Security Equipment
60. ___ Telephone/PCS Equipment
61. ___ Power Suppls. (Batteries, etc.)
62. ___ Vehicles
63. ___ VideoCiphers
64. ___ 2-Way Radio

F. What is your annual cable equipment expenditures?
85. ___ up to $50,000
66. ___ $50,001 to $100,000
67. ___ $100,001 to $250,000
68. ___ $250,001 to $500,000
69. ___ $500,001 to $1,000,000
70. ___ over $1,000,001

G. In the next 12 months, what cable test & measurement equipment do you plan to buy?
71. ___ Fiber Optics Test
72. ___ Oscillators
73. ___ Service Monitors
74. ___ Signal Level Meters
75. ___ Spectrum Analyzers
76. ___ Sweep Tester
77. ___ CATV RF Test Equipment

H. What is your annual cable test & measurement equipment expenditures?
78. ___ up to $50,000
79. ___ $50,001 to $100,000
80. ___ $100,001 to $250,000
81. ___ $250,001 to $500,000
82. ___ $500,001 to $1,000,000
83. ___ over $1,000,001

I. In the next 12 months, what cable services do you plan to buy?
84. ___ Consulting/Brokerage Services
85. ___ Contracting Services (Construction/Installation)
86. ___ Technical Services/ Engineering Design

J. What is your annual cable services expenditures?
87. ___ up to $50,000
88. ___ $50,001 to $100,000
89. ___ $100,001 to $250,000
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S-A Introduces Optical Fiber Receiver

Scientific-Atlanta introduced an "all in one" optical receiver that fits into the lid of the company's System Amplifier II (SA II), combining to offer a full-featured fiber feeder amplifier for fiber-to-the-serving-area architecture applications. Current SA II users can easily deploy the receiver as they push fiber deeper into their systems.

Advantages of the receiver include: 1.5 GHz bandwidth platform; simplified bandwidth expansion using the SA II's reversible signal flow feature; platform for advanced system monitoring, reverse video and wave division multiplexing; dual fiber cable inputs to accommodate RF switching of redundant fiber routes; modular construction permits easy troubleshooting and upgrading; simplified maintenance through separate optics and RF sections; individual module LED displays to alert technicians to any problems during field checkouts; and capability to interface with personal communications networks. Cable operators will have the option to purchase the SA II and new receiver as a complete station or add the receiver to an existing SA II.

Also, new services were demonstrated on the Model 8600^X home communications terminal. Included in the demo was an electronic programming guide (EPG) from TV Guide On Screen that shows its "flip, browse and menu" modes for all listings by channel or by category; and United Video's Prevue Express EPG, formerly known as TV Trakker.

The 8600^X terminal will accept and display program data from virtually any EPG supplier. With its bit-mapped graphics and optional downloadable software, the unit is the only available platform that can support a variety of EPG services, according to the company.

At the heart of the terminal is Motorola's 68HC11 microprocessor that powers all of the terminal's new features including not only EPG and virtual channels, but on-screen menus, bit-mapped graphics, downloadable software and an advanced messaging capability.

Motorola's 68HC05 SC21 secure microprocessor, which is normally used in smart card applications, is being used by S-A to provide exceptional protection for these new interactive and premium services. Renewable security is provided through the Genius card system, which can utilize the SC21 should the need arise.

Other new features of the 8600^X include expanded pay-per-view for near movie-on-demand; easy VCR programming with the optional VCR Commander controller; on-screen menus and graphics with several type sizes and fonts; downloadable software to upgrade the unit with new feature sets and as new services are developed; and upgradability through Genius cards to add memory to support interactive games and other services. **Reader service #152 (receiver), #151 (8600^X)**

Prodigy Links Interactive Content Producers And Cable Operators

Prodigy Services announced it will open its distributed interactive delivery network to third parties and become a national link between local cable operators and producers of interactive programs, products and services for cable TV viewers.

Prodigy said it expects the rapid growth of its home-computer-services business to continue and now intends to broaden its delivery strategy to include cable, with its even larger installed base of cable TV homes.

Such services (both in stand-alone products and as a supplement to existing video programs) are the most feasible way to let cable TV viewers "talk back" to content producers. Prodigy already has the infrastructure in place to make that happen, having made the multimillion dollar investment to build a highly sophisticated, distributed national interactive network. At its center is the nation's largest consumer information transaction processing facility, responding to interactive commands more than 35 million times a day.

Prodigy's network can just as easily deliver interactive services to cable TV customers, without the need for cable companies, program networks or producers to make heavy capital investments and invent their own networks.

In addition to offering network services, Prodigy also is developing interactive TV services. A prototype of these services, designed to work on the advanced new digital set-top converter box from Jerrold/General Instrument, was demonstrated.

Prodigy is encouraging other providers of interactive programming to develop their own content and deliver it through Prodigy's existing infrastructure.

The combination of Prodigy-devel-

oped and third-party-developed content on Prodigy's network is expected to provide the critical mass of applications to drive consumer demand.

With interactive TV, viewers could supplement video programming with on-demand information overlays. For example, while watching a baseball game, a viewer could use his remote control to pull up a batter's lifetime average against the pitcher. Or, he could check the price of stock he's been following — and even buy the stock — without leaving the game in progress. **Reader service #149**

Pirelli Intros Stranded Loose Tube Riser Cable

Pirelli Cable Corp. highlighted its new stranded loose tube riser cable that is said to save space and offer greater compatibility with outside plant fiber products. It is available in two to 96 fiber counts and the cables' colored fibers are protected in buffer tubes rather than being individually tight buffered in a 900 µm coating. The stranded loose tube riser cable design takes up less space than traditional riser cable designs.

Termination procedures with these stranded loose tube riser cables are compatible with typical outside plant fiber-optic procedures. Users can simplify splicing and cable termination because the same hardware and methods can be utilized. This streamlines fiber storage and management and saves time and retraining cost often associated with many new product introductions. **Reader service #153**

Organize And Manage Your Fiber With Siecor

Siecor Corp.'s modular Fiber Organization System Fiber Distribution Frame (FOS FDF) allows users to design a flexible fiber-optic cabling system in a cable TV system headend that expands easily as upgrades and rearrangements are required.

The FOS FDF is a complete, modular system to be used as an interface between outdoor and equipment cables in a fiber-optic system. It can be used in either a cross-connect or an interconnect capacity for single-mode cable systems.

The components of the FOS FDF include the universal 12-fiber module, the 72-fiber connector housing, and the 24-fiber connector housing, all of which can be used interchangeably within the system.

The universal 12-fiber module serves as the building block component of the system, ensuring maximum flexibility. The modules can be preinstalled in the 24-fiber and 72-fiber housings with the company's interconnect sleeves and/or cable assemblies or cable stubs.

The versatility of the system results from its modular design that allows connector and splice housings to be interchanged. Housings can be stored in a rack for optimum modularity and provide for splicing of connectorized assemblies to outside plant cables, field connectorization of cables, or the use of preconnectorized jumpers. Bend radius controls not only aid in fiber management but also provide protection for jumpers, even when accessing connectors or attenuators.

The system meets Bellcore specifications for cables, connectors, jumpers and fiber distribution frames.

The company also highlighted its fiber distribution center product line, including enhancements to improve the ease-of-use and installation of these fiber management cabinets in optical cable systems.

New top and bottom knockouts permit easy routing of fibers and cables between units without the use of removable panels. This will improve the ability to set up and reconfigure fiber management systems.

Edge grommets for entry and exit ports protect fiber bend radius and cush-

Intervision Shows Computer Video Conferencing

Intervision Systems demonstrated its InVision video conferencing for Windows, in the Digital Equipment Corp. booth. Using Ethernet bridging hardware form LANcity, the demonstration is designed to show cable TV executives how they can expand their current profits by supporting corporate customers with wide area computer network and computerized video and audio conferencing services over standard CATV cabling.

"Combining the full-motion video and audio features of InVision with the cabling advantages of CATV will bring new, cost-effective connectivity options to corporate users seeking a campus-wide conferencing solution," said James Geddes, president of InterVision Systems. "By using the pre-installed cable TV infrastructure, it will be easy for corporate customers to create an inexpensive, campuswide computer network without having to lay cable from building to building. And InVision will make it possible for executives to set up face-to-face meeting without ever having to leave their office. With this demonstration, we intend to dramatically show the cable industry how cable TV and computer technology can come together to meet the needs of corporate customers." **Reader service #150**

ion the fibers as they route through the ports. Entering the cabinet is simplified with new squeeze latches that are self-aligning when closed. The latches also are available on the rear of the unit for easy access to the current screws that hold the unit in place. Hemmed edges provide better structural rigidity for a more rugged design with improved aesthetics.

These new features, developed in response to customer comments, remain compatible with FDC units already in use.

The company's fiber distribution center product family includes connector module housings, splice module housings, FDC units and jumper storage housings. At the heart of the product family are connector panels preloaded with interconnect sleeves and prewired connector modules to customer specification. These building blocks attach to connector housings with snap-on fasteners.

Fiber distribution centers support both interconnect and cross-connect functions between outside plant, riser and horizontal distribution cables and the opto-electronic equipment. They are designed for use in every area of premises distribution as defined by the EIA/TIA-568 Commercial Building Wiring Standard.

The company's interconnect hardware is part of the Universal Transport System for structured fiber-optic cabling. **Reader service #148 (FOS FDF), #147 (fiber distribution)**

AT&T Introduces Video Server Offering Video-On-Demand, Emerging Info

AT&T introduced a full-motion video storage and retrieval system that will enable local telephone companies, cable companies and other network service providers to offer pay-per-view and video-on-demand entertainment programming.

These capabilities will be available in the first release, with initial availability scheduled for mid-1994.

As the video and multimedia market evolves, the system's capabilities will be enhanced to operate within networks that provide highly interactive services such as multimedia education and reference materials, video games and advanced video telephony.

AT&T's interactive video server is a network element that stores video programs and permits viewers to individually select titles they want to see, at whatever times they want to see them. It is the latest in a series of AT&T products, including the GCNS-2000 ATM switch that will help service providers enhance their networks to provide interactive broadband services.

In its initial application providing enhanced pay-per-view services, viewers will be able to select from first-run movies or other high-demand titles that will play continuously throughout the day, with starting times as often as every five or 10 minutes.

Viewers also will be able to select movies and other video programming in a video-on-demand mode, where the server will individually retrieve and play the title at the viewer's request with VCR-like features such as pause, rewind and fast-forward.

The video server reflects AT&T's commitment to be an end-to-end provider of visual and multimedia communications systems for local exchange telephone companies, cable TV companies and other service providers, using a variety of media. For example, AT&T last year announced digital compression technology that enables service providers to deliver several hundred programming channels to viewers over cable distribution systems.

Based on AT&T's experience with switching and transmission equipment, the company's interactive video server will work in concert with billing and maintenance systems.

The modular architecture of AT&T's interactive video server will accommodate any number of advanced storage and processor options to meet differing customer needs, including magnetic and optical disk arrays along with state-of-the-art semiconductor storage devices. The modular architecture also will support numerous industry-standard interfaces, which makes it easier for application developers to create and implement new interactive video services.

Participating in the development with AT&T Network Systems is NCR Corp. whose recently announced Telecom Solutions and Integration Group is contributing to the server's architectural design.

The server will initially be situated in or near a service provider's headend, satellite uplink center, or central office, where video programs are distributed to viewers. As viewer demand and the variety of services expands, it can be deployed in a network of servers, headends and central offices, interconnected by broadband asynchronous transfer mode (ATM) switches and SONET transmission systems. **Reader service #145**

Plex Looks Toward Future With NovaVision

Plex Communications Group showed NovaVision from Novaplex, a new personal communication/information system offering an array of "futuristic" products for the cable TV industry. Two NovaVision products are now available to cable operators: the Personal Communications Terminal (PCT) and the Studio.

The PCT is a full-featured CATV converter configured as a programmable, addressable or interactive subscriber device. Its proprietary programmable logic circuits provide multi-vendor compatibility with most existing cable systems, allowing subscriber ownership of top-of-the-line cable equipment while providing built-in signal security and undiminished revenue flow. The unit can function as a basic converter, programmable converter-descrambler, addressable converter-descrambler or interactive converter-descrambler. The PCT can be configured for complete compatibility with Hamlin, Jerrold, Pioneer, Regency, Scientific-Atlanta, Sylvania and RCA systems.

The Studio is an open-ended device utilizing proprietary software to provide nearly limitless capabilities for the home user. It is designed as a plug-and-play add-on companion to the PCT. It features a backlit LCD display and ports for a printer, CD ROM drive, personal computer and a number of other popular consumer electronic devices that will interface with cable's new "500-channel super information highway" format.

Together, the PCT and Studio software and port configurations will allow users to order pay-per-view events at the touch of a button. Users also may send, receive and store fax transmissions, set up messaging networks through existing

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1993 Membership Directory and Yearbook

By Bill Riker
President, Society of Cable Television Engineers

Since the end of the Society of Cable Television Engineers' most successful Cable-Tec Expo to date, the staff at national headquarters has been enthusiastically working on its next major project, that of producing the 1993 *Membership Directory and Yearbook*. This project has been especially exciting this year as it is the first issue to be done completely in-house. Each department is contributing to what we believe will be the finest yearbook published by the Society to date:

The Membership Services department has been responsible for supplying the entire member listing (over 11,000), including final proofreading. This department also has gathered all the information concerning SCTE subcommittee members and scholarship recipients.

Chapter Development supplied the complete chapter and meeting group listing, including officers, as well as providing logos for each group.

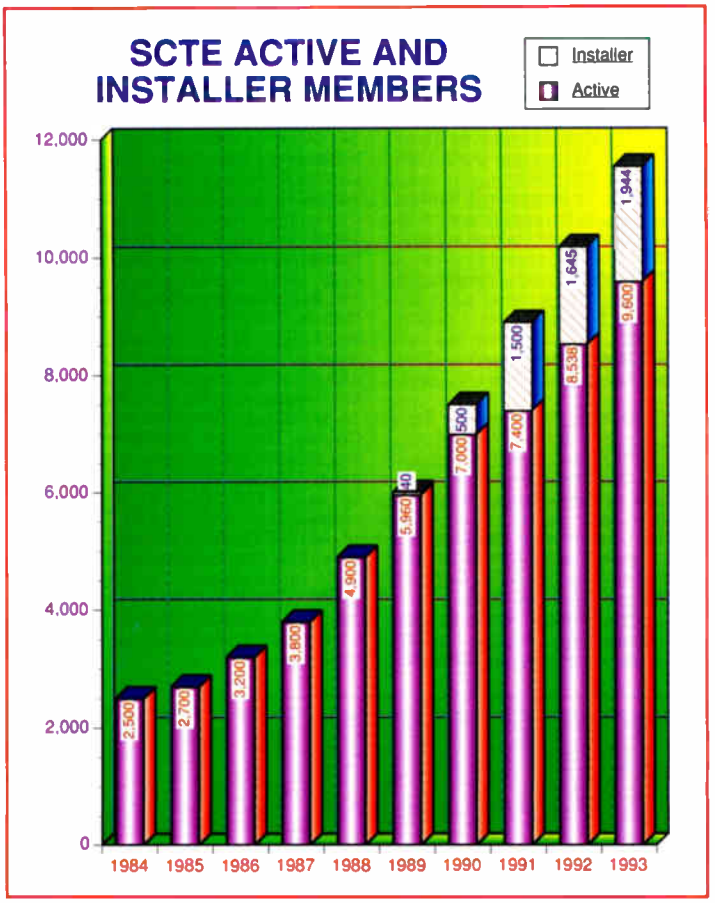
The Certification department was responsible for verifying all certified installers, technicians and engineers, and submitting photos of the different types of certificates.

Special Projects conducted the ad sales campaign, coordinating the different sizes, types and placement of each advertisement, confirming sales of ad space with many of the industry's top manufacturers and suppliers, and keeping track of all copy and artwork received.

Editorial and Promotion has been directly supervising each facet of the project, compiling all the information submitted from the other departments, scanning to merge text with photos and laying it out for final publication.

A year of firsts

It has been an exciting learning experience for our staff and a time of "firsts" for the directory. For the first time, the entire "Year in Photos" section will be printed in full color. Due to improvements in desktop publishing software, we have gained a growing expertise in working with color and page design. The cover will be a full color collage depicting 1992-93 Society happenings. Also for the first time, our membership will be listed geographically in addition to alphabetically. It is our hope that this will enable our members to contact others who live in the same area in order to exchange information and ideas.



Along with our "firsts," our publishing capabilities have allowed us to also improve upon what we have done in the past. At each stage of compilation, SCTE Manager of Editorial and Promotion Howard Whitman learned more about just how much we could and could not do with the technology we had at present. The first priority was to upgrade our equipment. At the onset of the project, Howard was working with a black and white handheld scanner. To save time as well as to give us a sharper image when working with company and chapter logos, we purchased a flatbed color scanner. You also will notice a new slant on the SCTE logo in this year's directory, which gives it an improved, bolder look. Entering massive membership files, which have increased as shown on the chart accompanying this article, became quite a challenge using the existing memory of the computer system at hand, and we had to upgrade that as well, increasing the memory by installing SIMMs chips to provide greater computing power as well as speed.

We have always felt that the *Membership Directory and Yearbook* has been one of the Society's most important membership offerings. Indeed, in a poll conducted earlier this year, 99% of our members rated the directory as an important benefit. This publication allows us a look back on the past year's achievements and serves as a database for communication opportunities between members and companies in our industry.

When we decided to take on the task of an in-house publication, our intent was to make it the best issue we could offer as an important member benefit. Next month the *1993 Membership Directory and Yearbook* will be mailed out to over 11,000 SCTE members. We hope you enjoy our efforts. **CT**

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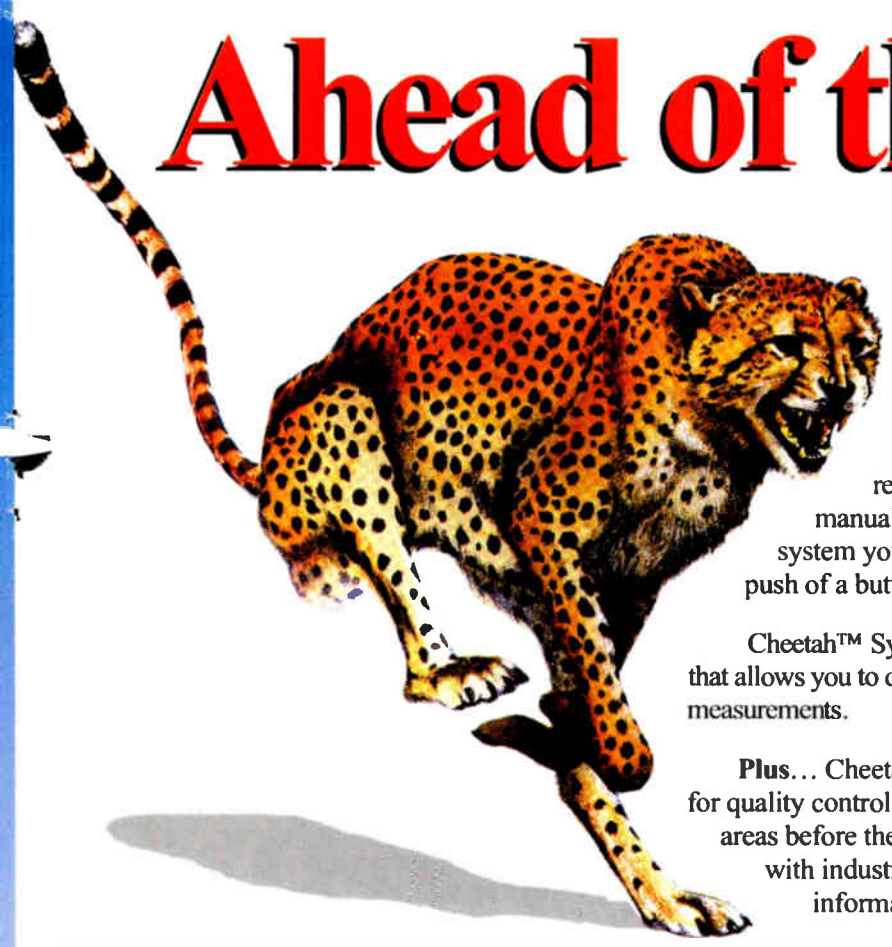

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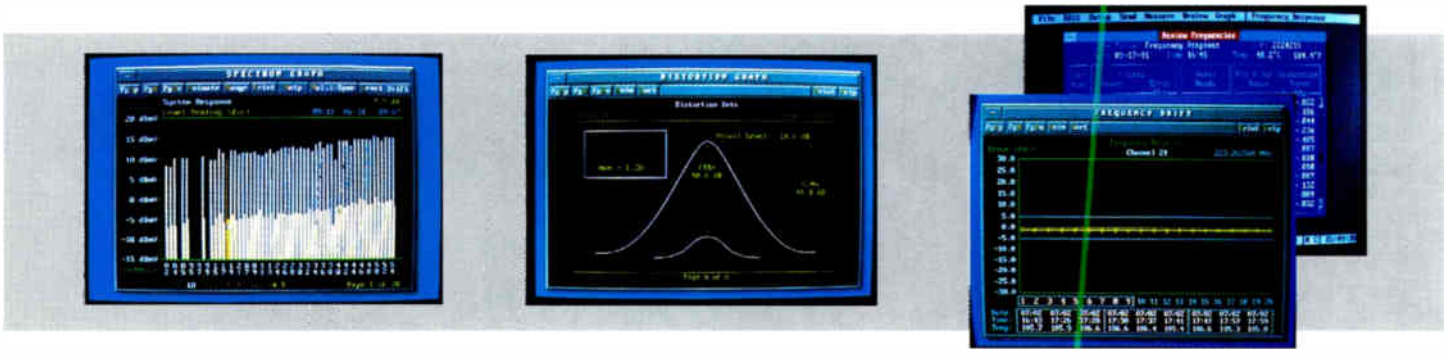

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