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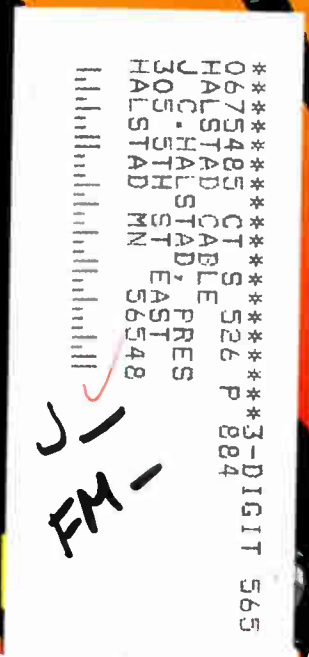

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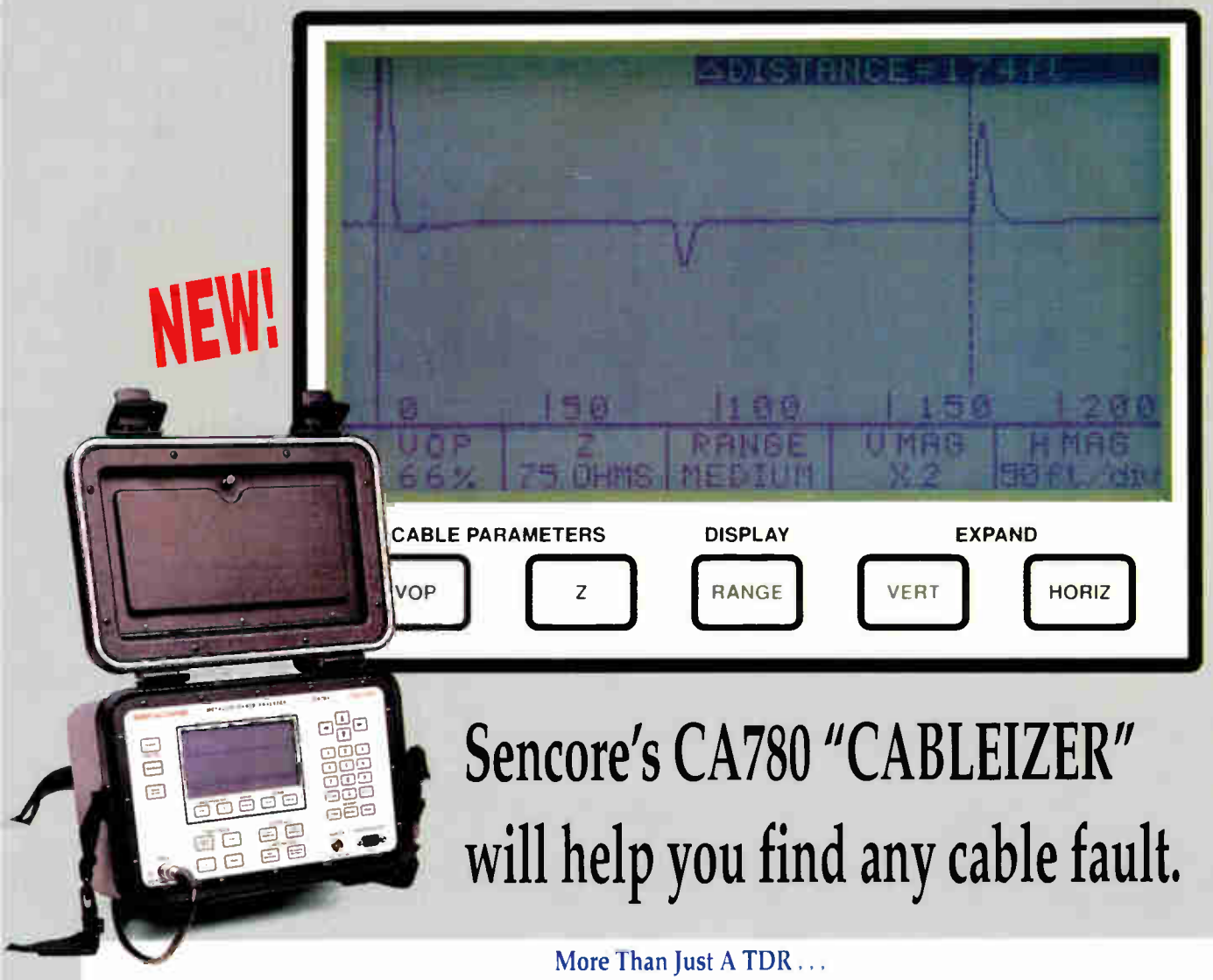

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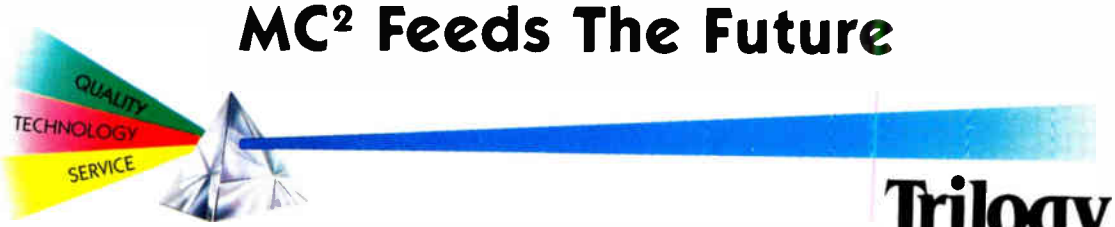

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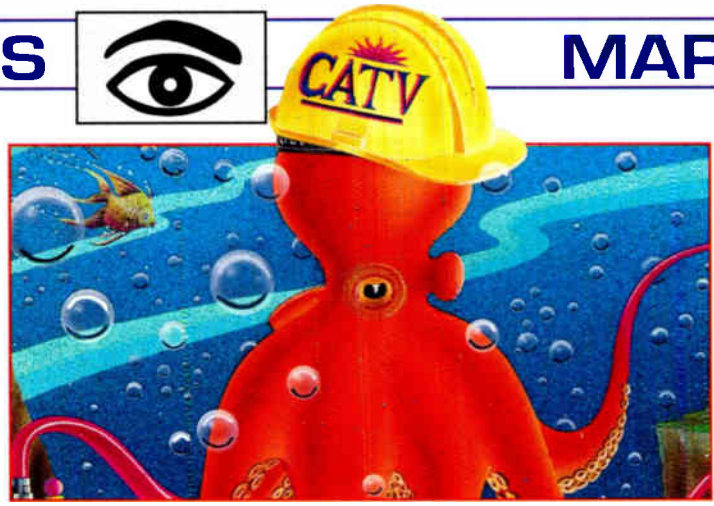

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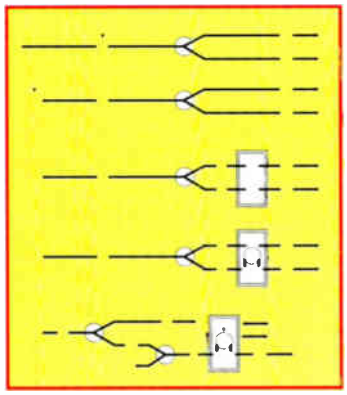

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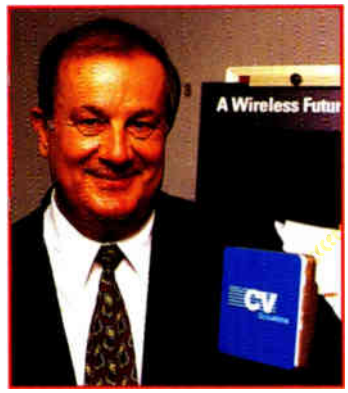

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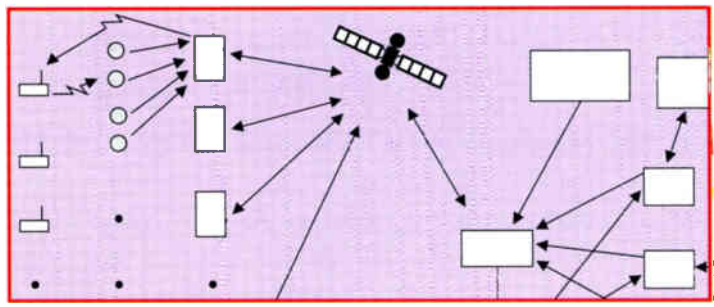

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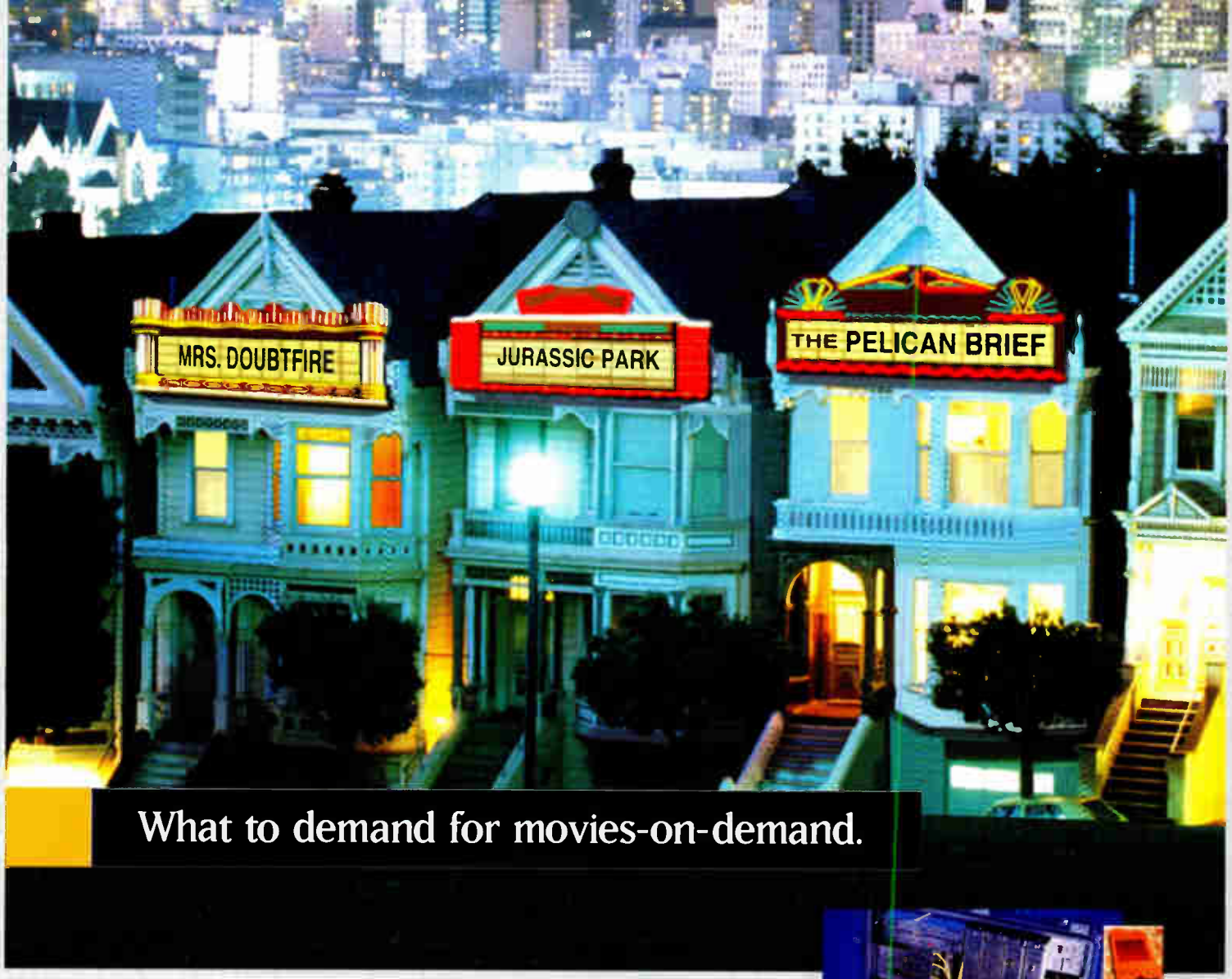

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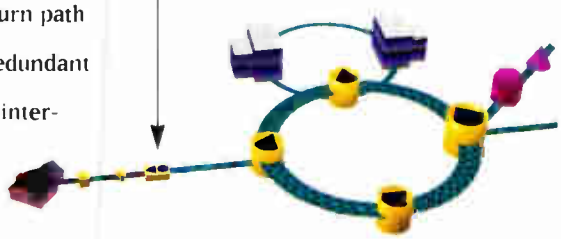

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EDITOR'S LETTER

Decent installer wages

A few weeks ago I was I was sitting at home reading (one of my favorite pastimes) and the TV set was on in the background with some network news program about President Clinton's welfare reform efforts. Normally I would have continued reading, but the program featured a young single mother discussing her desire to get off of welfare. What got my attention was the fact that she was going through a training program to become a cable TV technician in a New Jersey cable system. She stated on camera that she was embarrassed to be on welfare and wanted to provide more for her and her children. Good for her!

The TV show talked about the training program in which she had been participating, mentioning that after completion she would begin working at $7 per hour. The really sad thing though was that her welfare benefits, including housing, child care, food stamps, etc., totaled only $564 per year less than her starting wage at the cable system. That's a whopping $10.85 a week, or 27 cents per hour. Besides her own personal desire, there certainly was little cash incentive to get off welfare.

That $7 per hour starting wage is fairly typical for our industry, especially considering the East Coast location of the system. Many areas of the country have even lower starting wages for outside CATV plant personnel: $5 to $6 per hour. Customer service representative (CSR) starting wages are lower yet.

The point of all this? Simply that we should be embarrassed — no, ashamed — about the piddly wages we pay our system people. As I think back about that network program, I find it appalling that the cable industry's entry level wages are equivalent to welfare.

Management strives for every way possible to maximize cash flow and one of the most common ways is by keeping personnel costs trimmed to a minimum. Unfortunately, this approach ends up costing companies more in the long run, because lower wages mean fewer qualified people, higher turnover, more callbacks to fix sloppy work, etc. If we paid decent wages, we could attract more highly qualified people, we'd certainly have less turnover and long-term operating costs would be lower. What's a decent starting wage? Probably somewhere in the $10 to $12 range, or maybe even higher.

"I find it appalling that the cable industry's entry level wages are equivalent to welfare."

More than 10 years ago I was talking about cable TV wages to an acquaintance who worked for an independent telephone company in the Pacific Northwest. He commented that he wouldn't even think of climbing a pole for less than $11 an hour — and that was in the early 1980s! I guarantee you that today's telcos certainly don't pay their entry level outside plant staff anywhere near the ridiculous wages we pay ours.

If we want to be serious players in the telecommunications world of tomorrow, we're going to make a lot of changes. One of the big ones is how we compensate our people.

Ronald J. Hranac
Senior Technical Editor


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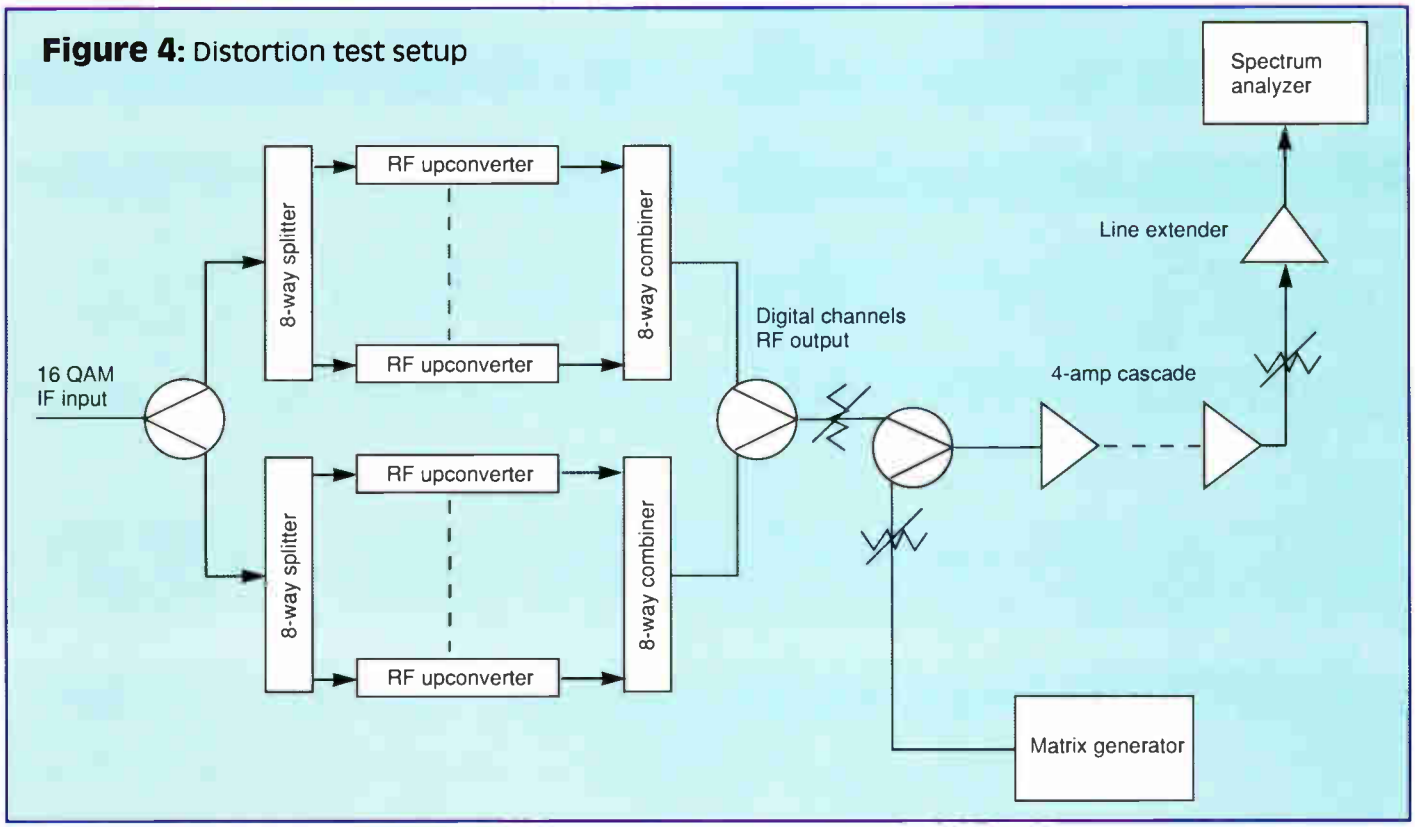
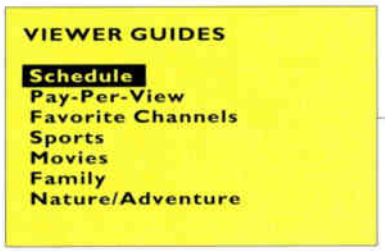
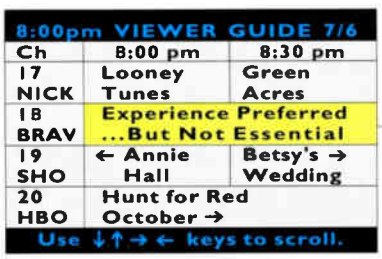
Figure 4: Distortion test setup



The effect of distortion as a function of digital bandwidth also was verified. This was done by measuring the adjacent channel noise floor with and without the digital signals present as described in the preceding paragraph and calculating the distortion using Equation 11. The number of digital channels was then reduced from 16 to 14 by disconnecting

A Touch Away From What's On Cable





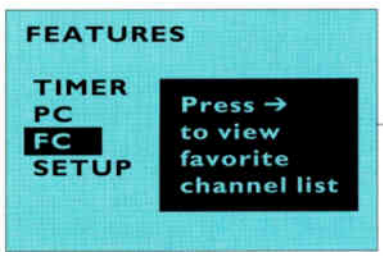


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Table 3: Digital noise and third order distortion

Line extender input (dBmV)	Adjacent channel measurements: Noise + distortion (dBm/Hz)	Adjacent channel measurements: Noise (dBm/Hz)	Calculated distortion (dBm/Hz)	Relative distortion (dB)	Relative noise (dB)
10.5	-115.7	-118.6	-118.8	0	0
14.9	-107.5	-114.5	-108.5	10.3	4.1
18.5	-93.7	-110.9	-93.8	25	7.7

Table 4: Distortion vs. digital bandwidth

Line extender input = 14.9 dBmV (-101 dBm/Hz)

Digital bandwidth (MHz)	Adjacent channel measurements: Noise + distortion (dBm/Hz)	Adjacent channel measurements: Noise (dBm/Hz)	Calculated distortion (dBm/Hz)	Relative distortion (dB)
96	-107.3	-114.5	-108.0	0
84	-108.8	-115.7	-109.8	-1.8
72	-110.8	-116.4	-112.2	-4.2
60	-111.9	-116.6	-113.7	-5.7
48	-113.2	-116.6	-115.9	-7.9
36	-113.8	-117.5	-116.2	-8.2
24	-116.8	-117.6	-124.5	-16.5
12	-116.5	-122.0	-128.0	-20.0

two digital channels at the upper end of the spectrum. The noise and distortion measurements were then repeated. This process was continued until only two digital channels remained on the system. Results are presented in Table 4 and shown graphically in Figure 6. From Figure 6 it is seen that there is good agreement between theory and experiment.

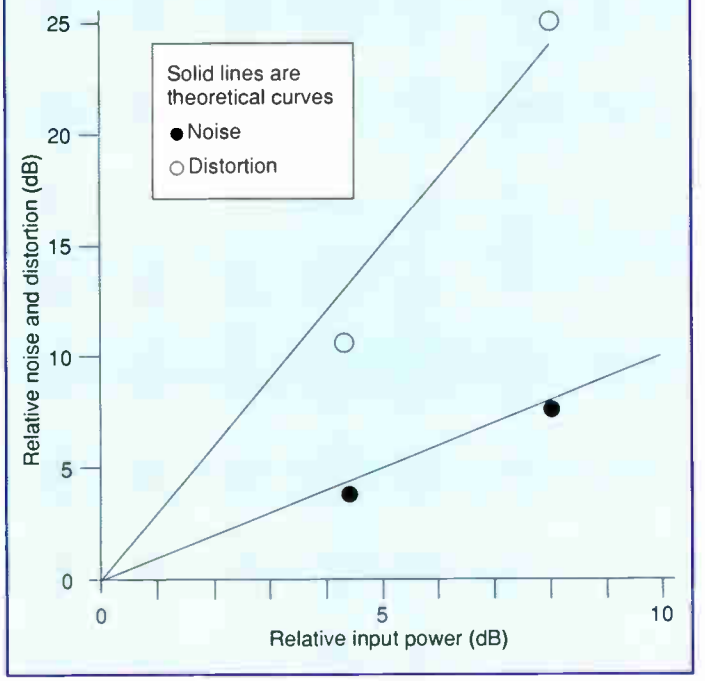
Since the objective of these tests was to predict the effect of digital distortion on adjacent analog channels, a third order intercept plot was constructed using the data from Table 3. This plot is shown in Figure 7. The first order slope is derived from the nominal gain of the line extender (35 dB) and the third order slope is plotted using the data from Columns 1 and 4 of Table 3. From Figure 7, it is seen that the third order intercept point is about -45 dBm/Hz (71 dBmV in 6 MHz). Based on this plot, it should be possible to predict the worst-case third order distortion (i.e., the distortion that will appear in the lower adjacent channel) for a given level of digital signal power.

The amount of third order distortion relative to a particular signal level can be calculated from the intercept point as follows:

$$D3 = 2(P_0 - IP3) \quad (12)$$

Where:
D3 = third order distortion in dB relative to digital signal power

Figure 5: Noise and distortion vs. input power



IP3 = third order intercept point

For example, suppose the digital signal level at the amplifier output is 33 dBmV, measured at an analyzer IF bandwidth of 300 kHz. This level is first converted to dBm/Hz as follows:

$$P_D \text{ (dBm/Hz)} = P_D \text{ (dBmV)} - 48 - 10\log(3 \times 10^5)$$

$$= 33 - 48 - 55 = -70 \text{ dBm/Hz}$$

From Figure 7, IP3 = -45 dBm/Hz. Therefore, D3 = 2(-70 + 45) = -50 dB below the digital signal. Conversely, if we wish to maintain a given level of distortion, the desired digital signal power can be calculated from:

Figure 6: Distortion vs. digital bandwidth

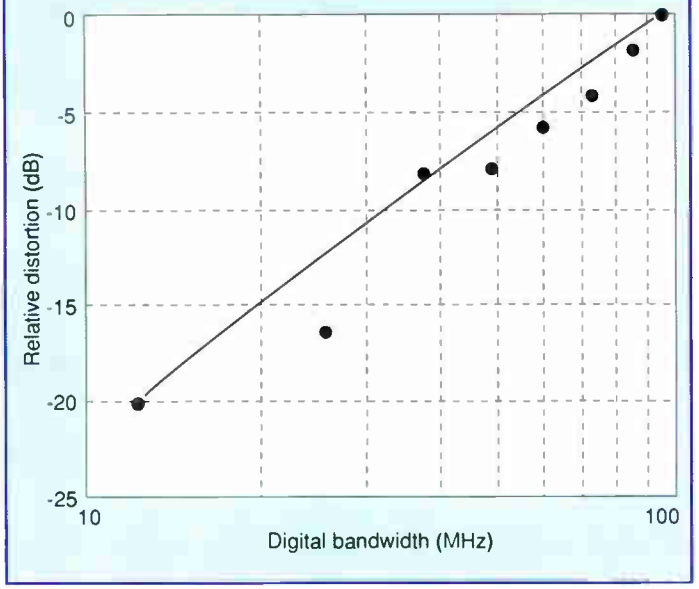
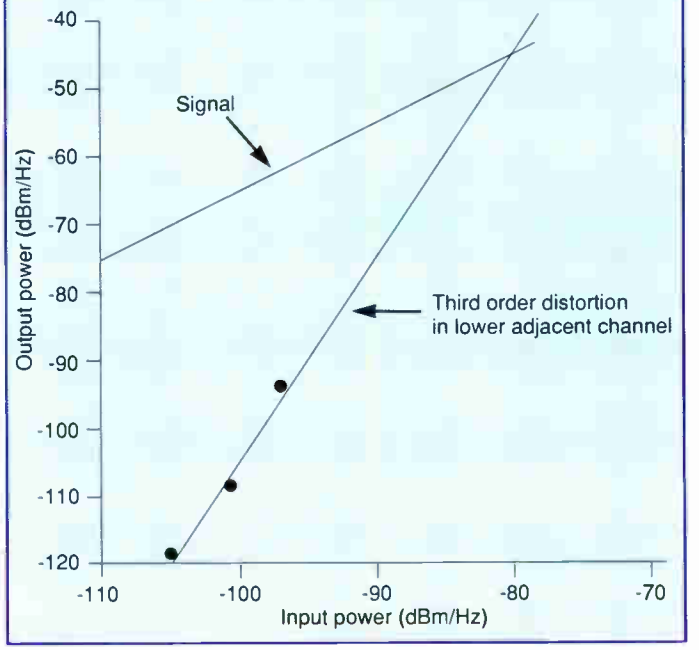


Figure 7: Third order intercept plot for 16 digital channels



P_D = IP3 + (d3/2) **(13)**

Suppose we wish to maintain a distortion level of -53 dB relative to the digital signal. Then, using Figure 7 and Equation 13, the output power is computed as follows: →

Table 5: Mixed signal system test results

P_D (dBm/Hz)	n_T (dBm/Hz)	n_D (dBm/Hz)	D3 (dBm/Hz)	Calculated D3 (dBm/Hz)
-68.8*	-113.3	-115.2	-119.0	-116.4
-70.8	-115.3	-117.2	-121.9	-122.4
-72.8	-116.8	-119.1	-123.4	-128.4
-74.8	-118.6	-121.0	-127.3	-134.4
-76.8	-120.1	-123.0	-131.1	-140.4
-78.8	-121.3	-125.0	-135.7	-146.4

n_A = -124.0 dBm/Hz
*Equal to analog carrier level

P_D = -45 - 53/2 = -71.5 dBm/Hz

If we were to try to set this power level using a spectrum analyzer IF bandwidth of 300 kHz, the level in dBmV would be:

P_D (dBmV) = -71.5 + 48 + 10log(3 x 10^5) = 31 dBmV

Unless the spectrum analyzer is capable of measuring power spectral density, the digital power level will depend on the analyzer IF bandwidth. Additional information on the use of the third order intercept point to compute distortion may be found in Reference 3.

Although the plot of Figure 7 is shown for 16 contiguous digital channels, it is easy to predict the effect of distortion for a greater or lesser number of channels. This can be done by calculating the power required to maintain a given level of distortion for 16 channels and then referring to Figure 6 to determine the required increase or decrease in digital power for a greater or lesser number of channels. For instance, for eight digital channels, a power level of -65.5 dBm/Hz would result in the same level of third order distortion (-53 dB) as for 16 channels at -71.5 dBm/Hz.

The validity of this method of determining distortion was verified by tests conducted on the mixed signal system shown in Figure 4. The mixed signal tests were conducted as follows:

- The digital signal power was set equal to the analog carrier power.
- The noise floor of the mixed signal system was measured in the center of the lower adjacent analog channel. This measurement is the sum of the analog system noise plus digital system noise plus digital third order distortion.
- The digital signals were disconnected and the analog system noise floor was measured.
- The analog channels were disconnected and the digital signals reconnected. The digital modulation was then removed and the digital noise floor was measured.
- The digital signal power was reduced by 2 dB relative to the analog carrier levels and the above process was repeated.

For each set of data, the digital distortion was calculated as follows:

$$D3 = 10\log(10^{\frac{n_T}{10}} - 10^{\frac{n_A}{10}} - 10^{\frac{n_D}{10}}) \quad (14)$$

Where:

n_T = noise floor of digital plus analog channels →

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Figure 8: Digital distortion in a mixed signal system

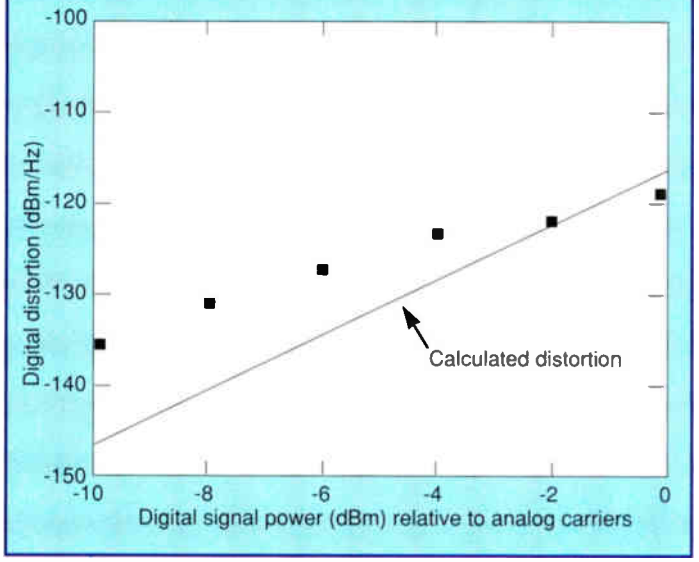
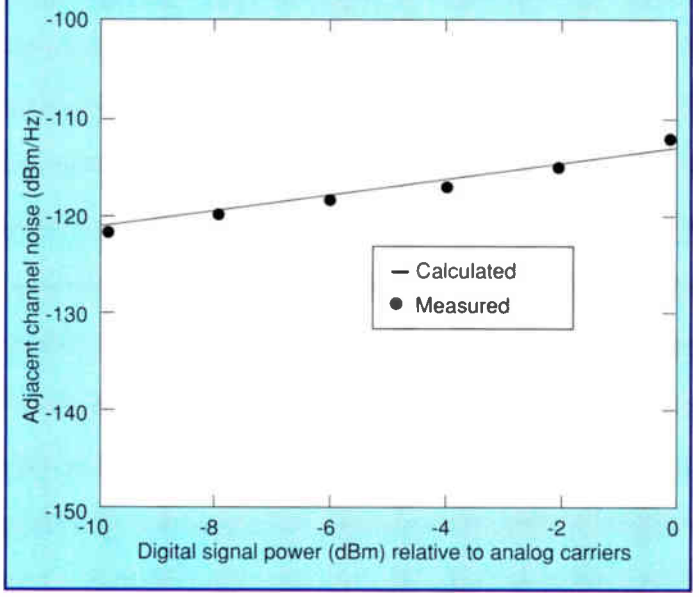


Figure 9: Total system noise, including degeneration due to digital distortion



n_A = noise floor of analog channels
n_D = noise floor of digital channels
D3 = digital third order distortion

The results of the computations are presented in Table 5 on page 72 and shown graphically in Figure 8. The solid line in Figure 8 shows the calculated value of third order distortion derived from the plot of Figure 7 (page 71) and Equation 12 (page 70).

From Figure 8, it is seen that the difference between calculated and experimentally derived values of D3 increases as the digital power is reduced. This could be attributable to the error incurred in measuring rather low levels of noise at the lower digital power levels. The effect on the total noise floor of the system at low digital signal levels is quite small. The total noise floor is, of course, given by:

$$n_T = 10\log(10^{\frac{n_A}{10}} + 10^{\frac{n_D}{10}} + 10^{\frac{D3}{10}}) \qquad (15)$$

If the values of D3 obtained from Figure 7 are used to calculate the total system noise n_T, the results do not differ significantly from the measured values in Table 5. This is shown in Figure 9. The dots in Figure 9 show the measured value of n_T (Column 2 of Table 5) vs. relative digital signal power. The continuous curve is a plot of n_T calculated using the values of D3 from Column 5 of Table 5. The difference between measured and calculated values of n_T is less than 1 dB for all points on the curve.

This experiment was conducted using a single digital modulator whose IF output was split for RF upconversion. Therefore, the RF signals that made up the digital spectrum were highly correlated. As a result, the distortion generated by the 16 digital channels was higher than would be expected for 16 uncorrelated channels. Computer simulation has shown that there is a difference of about -6 dB for 16 channels of uncorrelated data vs. 16 correlated channels. This needs to be verified by testing. However, the basic technique for estimating third order distortion (i.e., use of the third order intercept) should still be valid. **CT**

References

[1] C. Williams, *Designing Digital Filters,* Prentice-Hall, 1986.
[2] R. Higgins, *Digital Signal Processing in VLSI,* Prentice-Hall, 1990.
[3] R. Witte, "Distortion Measurements Using a Spectrum Analyzer," *RF Design,* September 1992.

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Reader Service Number 13

MPEG-II with B frames

(Continued from page 42)

pressed its support of MPEG-based compression with multivendor compatibility.

The MPEG-II standard with B Frames has been extended to achieve excellent studio and high definition TV performance, as well as compatibility with NTSC, PAL and SECAM TV standards — thus achieving true global compatibility.

Designed for diverse applications, including standard definition TV (SDTV), high definition TV (HDTV), computer imaging, multimedia and recorded media such as videotape and discs, the MPEG-II standard with B Frames has become the mainstream video and audio compression technology for all types of applications. Because of its universal compatibility, the MPEG-II standard allows easy and fast transfer of programming between media. The transfer of information and entertainment will become commonplace, including downloading complete movies to a VCR or computer hard disk.

From megahertz to megabits

The MPEG-II standard format with B Frames offers a wide range of data rates and reductions customized to the particular service being carried. Because these different data rates and service components (multiple audio channels, ancillary services, etc.) can be multiplexed and carried on the same RF carrier, future systems will be extremely flexible in packaging the services to be carried in the space of a 6 MHz TV channel. (For the next-generation cable TV system, the concept of a fixed 6 MHz space has little relevance in the digital domain, though we will probably continue to describe and compare carriage in such analogies.)

Multimedia and other types of low-motion video can be carried within a 1.5 megabits-per-second (Mbps) data stream. Good quality programming for direct broadcast satellite (DBS) and cable TV can fit within a 3 to 5 Mbps data stream, as can SDTV in 16:9 format video. Studio-quality CCIR 601 (625-line resolution) will require up to 8 Mbps. HDTV can be carried within 14 to 24 Mbps. All of these services can be multiplexed together onto a single complex carrier for transmission to a cable TV headend, a SMATV installation, a home TVRO receiver or a telco central office. The accompanying table shows some typical component data rates and the figure back on page 42 presents an example scenario whereby all of these can be placed on a single transponder.

"The MPEG-II format with B Frames ... provides capacity for programming and control of that programming that was not possible in the past."

MPEG-II video compression with B Frames is the preferred enabling technology for a practical DBS service in uncabled areas, and for cable TV to compete with services that do not have 600 MHz of real bandwidth. Everyone will have the opportunity to benefit from improved picture quality, better sound quality and additional services that do not even exist yet. Underserved markets such as hotels and planned communities can be addressed in an efficient way by providing unlimited pay-per-views, near-video-on-demand or even interactive services such as those offered in GTE's Main Street project.

HDTV will become available for many types of media, as will wide aspect ratio (16:9) home viewing. In fact, different aspect ratios and resolutions, whether for 4:3 or 16:9, are easily handled by the MPEG-II standard. Variances can be carried simultaneously to the headend, home, work station or studio. Naturally, picture-in-picture, service code identifiers and program guides can be imbedded in the MPEG-II coding format to improve the consumer interface. On-screen display of virtually any information the consumer might want is accommodated by the MPEG data stream "systems layer" definitions.

The MPEG-II audio compression standard, called MUSICAM, is particularly useful for international broadcasts. Because of the flexible allocation of bandwidth, any video program can carry multiple audio components, making MPEG-II with B Frames particularly attractive for programs that are broadcast in several languages.

Finally, but perhaps most importantly, the MPEG-II systems or transport layer facilitates selective multiplexing and encryption of services. It has no effect on the communications layer, nor the service layer. This means that, with the proper system, the actual addressable control of the subscriber can be "decoupled" from the program. The programmer or the cable TV operator can address and authorize any individual subscriber without the need for any third party intervention. The programmers and operators can thus obtain the privacy and convenience that they do not now enjoy.

Typical component data rates

Service component	Data rate (in Mbps)
MPEG video	
Standard/telecon	1.152
Film/broadcast	3.456
Live sports	4.608
16:9 wide aspect	5.760
Studio-quality CCIR 601	8.064
HDTV	14+
MUSICAM audio	
Mono	0.128
Mono	0.192
Stereo	0.256
Data	
Digital data	N x 0.0096
Vertical blanking interval data	
Digital VBI	N x 0.0096
Analog VBI	N x 0.1728
Service control data	
Service control	N x 0.03072
Component ID overhead	
2% of total component data rate	

Conclusion

Digital video compression following the MPEG-II format with B Frames is now the internationally accepted standard and will be implemented by most, if not all global electronics manufacturers. The resulting interoperability, extendibility and scaleability, with decoupled security, provides capacity for programming and control of that programming that was not possible in the past. Cable TV is well-positioned to take advantage of the technical breakthroughs in the coming decade, and video compression is the enabling technology for increased revenue and subscriber satisfaction. **CT**

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Digital modulation and transmission

(Continued from page 44)

restored image can be very close to the original.

The advent of digital processing technologies has made this compression task practical. There are many ways of compressing signals, but the one that seems most promising at this time uses discrete cosine transform (DCT) techniques. Efforts are under way to create an international standard using DCT known as MPEG-II.

Digital modulation techniques

Much work has been accomplished in the effort to establish the new U.S. standard for HDTV. Examination of the digital transmission schemes used by the various proponents shows that two methods predominate: quadrature amplitude modulation (QAM) and vestigal sideband (VSB). If we examine these transmission schemes in a terrestrial application we see that for an NTSC 6 MHz channel, 16-QAM and 4-VSB can provide roughly equivalent data rates. (See the accompanying table on page 44.)

Cable's benign environment permits more effective use of digital signals in a 6 MHz channel. Technical standards will require the peak carrier-to-noise ratio in a cable channel to be greater than 40 dB. Interfering signals, while not totally absent, are much lower than in a terrestrial environment. The greater noise margin available in the cable environment can be used to increase the information carried on a cable channel without requiring an increase in the compression already achieved with digital video technologies.

Signal-to-noise is only one of several conditions that must be met to successfully deliver digital data. The cable system must acquire and lock the modulated RF carrier, data clock and synchronization information. High state systems such as 32- and 64-QAM make it very difficult to extract information in a cost-effective manner. Locking and synchronization are made difficult because a pilot carrier is not feasible and phase noise and jitter are present, tending to mask the distinct states. To achieve a practical rugged system requires substantial reduction of the phase noise and jitter. Reduction of phase noise and jitter to tolerably low levels for these high state systems is extremely expensive because technology is not commercially available.

Benefits of 16-VSB

In cable applications it is possible to use a 16 data level VSB (16-VSB) digital modulation and transmission technique. As in the terrestrial application, a pilot carrier and data-segment sync signal are used and are independent of the data. The system is extremely rugged and achieves signal acquisition under adverse noise and interference conditions such as microreflections and impedance mismatches. These conditions are often found in cable systems due to plant imperfections from faulty connectors and other physical causes.

The absence of a quadrature signal results in a much less complex adaptive equalizer requiring less energy. This is especially important for wiring within the subscriber's home where improper terminations are more likely to occur. The resulting system can be effectively — and economically — detected and demodulated on cable systems using slightly modified commercially available conventional RF tuners and oscillators.

The implications of 16-VSB digital modulation and transmission are enor-

mous. On a cable plant the digital data rate capacity is increased from 21.5 to 43 Mbps per 6 MHz channel. Compressing a standard TV signal to 1.5 Mbps results in 23 movie channels. Live video compressed to 4 Mbps would provide nine channels. The 43 Mbps data rate would accommodate two HDTV programs or one HDTV program along with multiple standard TV programs. (Again refer to the table on page 44.)

Other applications important, too

We have discussed TV applications for this new digital technology. Important as television has been for the success of the cable industry, the availability of this technology now allows cable to look beyond its origins. TV programming is just part of the information that can be transmitted on the cable plant.

The expansion of channel capacity by extending cable bandwidth to 1 GHz and the use of digital transmission and compression provides an enormous opportunity for the cable industry. Cable has a huge data communications capacity at its disposal and digital technology makes the cable plant capable of providing a pipeline into subscribers' homes that can carry not only television but telephone, video conferencing, multimedia, data, information and interactive services.

"Compression and digital transmission will be central to the future competitiveness of the cable industry."

Why should the cable industry be interested in these opportunities when there already is a thriving entertainment business? The industry should be exploring opportunities beyond television because its future depends upon new businesses. Congress has seen in its wisdom to reimpose a regulatory rein on the industry and at a time when new subscriber growth is tapering off.

In less than a year, cable will have competition from direct broadcast satellite (DBS). In addition to having deep pockets, digital transmission and compression, DBS also will have its subscribers buying the satellite receiver and decoder. This will help lower DBS operators' cost of entry.

The collision of the telephone and cable industries is a "when-not-if" question. There are ongoing demonstrations of digital transmission and compression technologies that can deliver TV signals using asymmetrical digital subscriber line (ADSL) over twisted-pair telephone wires.

Conclusion

Compression and digital transmission will be central to the future competitiveness of the cable industry. Compression will allow many more program channels and offer subscribers more viewing choice, which is the core of cable TV's appeal. Digital transmission will not only provide compression but also will be the engine for the entry of the cable industry into new services for subscribers. Those services will include video conferencing, telephone, data, cable area networks, real-time interactivity, multimedia, teaching and games — just as starters.

Revolutionary technologies coupled with world-class digital video compression techniques, provide cable operators with the right tools to capitalize on the digital revolution. **CT**

Relationship of bandwidth to data rate

Mode	Audio bandwidth	Data rate
Mono	8.2 kHz	64 kbps
Dual-mono	10.5 kHz	128 kbps
Joint-stereo	20 kHz	128 kbps
Stereo	20 kHz	192 kbps
Dual-mono	20 kHz	192 kbps

MPEG digital audio

(Continued from page 46)

performed for each subband. This threshold is then used to compute the psychoacoustically best allocation of the available bits. This process is called dynamic bit allocation. Audio data is quantized using the dynamic bit allocation and thus the required bit rate for time-variant audio signals changes continuously due to the changing masking threshold. If there are an insufficient number of bits to completely hide the quantizing-induced noise, then the noise is placed in the least objectionable place in the audio sample. If there is an excess number of bits, then the extra bits are used to reduce the quantizing induced noise to as low as possible level.[1]

The encoder data output stream is comprised of the quantized audio information plus ancillary bit allocation and scale factor data. The information is encoded into frames representing 24 milliseconds of audio.

MPEG history

MUSICAM is an acronym for *m*asking pattern adapted *u*niversal *s*ubband *i*ntegrated *c*oding *a*nd *m*ultiplexing. The source coding system was jointly developed by the Centre Commun d'Etudes de Telecommunications et de Telediffusion (CCETT, France), Institut fur Rundfunktechnik (IRT, Germany) and PHILIPS Consumer Electronics (The Netherlands). Its development came as part of the overall European EUREKA 147 digital audio broadcast (DAB) plan.

Implicit in the development of a technology based on psychoacoustic research is the need for subjective testing. The algorithm emerged as a result of extensive testing by the MPEG International Organization for Standardization (ISO) committee. Much of the testing took place in July of 1990 and May 1991. Four algorithms were rigorously tested under controlled conditions. The test group included about 60 "golden-eared" professionals in the audio industry.

As a result of the testing, the MUSICAM algorithm was adapted by the ISO committee with the agreement that it would incorporate the best elements of the second-place ASPEC compression algorithm to produce the ISO audio compression standard.

The ISO committee conceived a standard with three layers of implementation: Layer 1 is a simplified equivalent to the MUSICAM algorithm, Layer 2 is the MUSICAM algorithm as tested by the ISO committee, Layer 2A indicates the joint stereo mode of operation and Layer 3 will incorporate the ASPEC improvements. "As a result of the ISO effort, the MUSICAM algorithm is now properly called the MPEG Layer 2 compression algorithm."[2]

ISO MPEG adaptation

The intensive subjective testing and acceptance by the ISO committee was a major element in many manufacturers' decision to implement the algorithm into satellite transmission systems. The results of the testing indicate the superiority of the MPEG algorithm over other technologies and provides a reasonable expectation that devices will be available, costs containable and that product can be supported over the long term.

Another important factor in the selection process was the practicality of designing a decoder that can take advantage of encoding improvements without field replacement. By making the MPEG decoder function as a slave to the encoder used at the uplink, the system can be upgraded to take advantage of encoding process refinements without reception equipment replacement or upgrade costs. The cost containment feature grows proportionately in importance with the quantity of satellite receivers deployed in the field. In large satellite broadcast networks, this "future-proofing" aspect is crucial.

An additional benefit in the slaving feature of MPEG decoder design is flexibility in system reconfiguration. The encoder has switch-selectable modes of operation (mono, stereo, joint-stereo). The MPEG decoder follows the encoder as these modes are selected.

MPEG technology provides new flexibility to the system designer. With that flexibility arrives the need to understand the impact of early design decisions on system performance. The following sections highlight some new technical considerations as an aid to decision-making.

Audio bandwidth, quality and data rate flexibility

The implementation of the MPEG algorithm into satellite systems allows a new ability for the system designer to balance audio bandwidth, audio quality and information data rate. These characteristics have a direct impact on system performance and operating cost. It may be helpful to separate these characteristics into two classes.

1) *Audio bandwidth and bit rate.* In a digital audio encoding system, audio bandwidth and data rate bear a direct relationship with each other. That is, it requires a higher data rate to transmit a wider audio bandwidth. A few examples of this relationship are shown in the accompanying table.

Subsequent forward error correction (FEC) and modulation technique determine the occupied bandwidth and power level of the transmitted signal. But the basic bandwidth/data rate tradeoff is a baseband consideration. Since modulator and demodulator data rates are fixed-hardware characteristics, audio bandwidth vs. data rate must be determined prior to construction.

2) *Audio bandwidth and audio quality.* A more subtle performance decision balances audio bandwidth and audio quality. This is a more subjective decision, which fortunately can be changed after the transmission system is operational. For a given data rate, the audio bandwidth can be reduced from the indicated maximum. A reduction in audio bandwidth means a reduction in the amount of information that the algorithm must process. Putting less demand on the algorithm results in a more transparent, or higher integrity, rendition of the original audio material. This is a very subtle "fine-tuning" of the system and may only be a consideration in lower data rate systems.

So the question arises, "Why would anyone want to do that?" For example,

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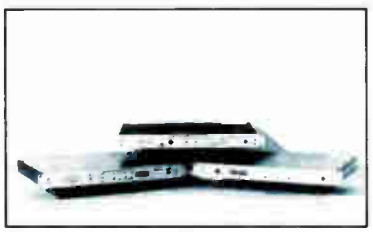

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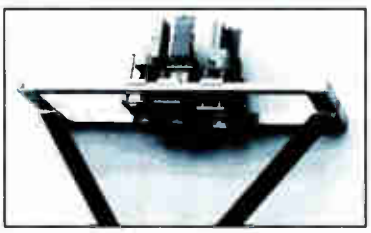

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in a business music application the operator typically transmits music and advertising on separate channels and switches between them. The content of the music channel would indicate the widest bandwidth. Conversely, the content of an ad channel (mostly speech) might indicate a reduction in audio bandwidth for greater transparency of the information processed.

As mentioned earlier, this decision can be delayed or changed. Encoders currently available provide DIP switch selection for analog audio bandwidth. Future versions may include automatic optimization. Once again, if the MPEG decoder tracks the encoder it will not require field adjustment.

MPEG error tolerance

One characteristic that usually differs widely between analog and digital transmission systems is performance in marginal conditions — interference or reduced signal level. A minor signal aberration in an analog system may go unnoticed or cause a barely perceptible pop. In a digital system, the same aberration is interpreted as an error and can result in the loss of a large block of data. The system may mute until valid blocks of data are received.

Under fading conditions, an analog signal will become increasingly noisy as the level approaches threshold, at which point the output usually is muted. A digital system again interprets bad data as errors and, without FEC, will cease operation at an earlier point in the fade. Therefore, high integrity FEC should be built into all

"One potential problem is that the auxiliary data is not error-protected within the MPEG processing."

MPEG products to detect and correct errors before the data is passed on to the MPEG decoder. Proper error detection and correction design imitates the fade generally associated with an analog system avoiding a "hard" or erratic cut-off.

Auxiliary data

The MPEG algorithm incorporates a separate asynchronous data stream into the aggregate audio data making it very adaptable to a point-to-multipoint satellite transmission system. This facilitates the transmission of textual information or control data. Text might include information relevant to the recording being played, such as artist, record label and library number. Or, it could include network information such as schedules, upcoming programs or advertisements available. A variety of applications are practical including separate information transmission for character generator, graphics or electronic mail.

Auxiliary data is transmitted at a rate up to the maximum indicated by the DIP switch setting. At every 24 millisecond frame the encoder looks to the auxiliary data buffer for data, packetizes it and transmits it in a packetized format along with the compressed audio information. When no data is present, the channel is not active. Auxiliary data transmission decreases the number of bits available to the audio channel. Some operators have used the auxiliary data transmission capability in higher bit rate systems at the 9.6 kbps maximum rate without noticeable degradation. This could be more of a factor in lower bit rate systems.

One potential problem is that the auxiliary data is not error-protected within the MPEG processing. Also, the MPEG decoder repeats the last 24 milliseconds of audio plus auxiliary data under certain error conditions. In this situation the auxiliary data is repeated, potentially causing command or text information errors. These difficulties are indicated within the MPEG documentation as ones that the system designer must handle.

References

[1] CCS CDQ2000 CODEC manual, p. 3, Corporate Computer Systems Inc.

[2] CCS CDQ2000 CODEC manual, p. 6, Corporate Computer Systems Inc.

[3] CCS CDQ2000 CODEC manual, Corporate Computer Systems Inc., Holmdel, NJ.

[4] "Source Coding for DAB and the Evaluation of its Performance: A major Application of the new ISO Audio Coding Standard," Gerhard Stoll, IRT, from the *Proceedings of the 1st International Symposium on DAB*, 1992.

[5] "Subjective Assessments on Low Bitrate Audio Codecs," Christer Grewin, Swedish National Radio Co., and Thomas Ryden, Swedish Broadcasting Corp.

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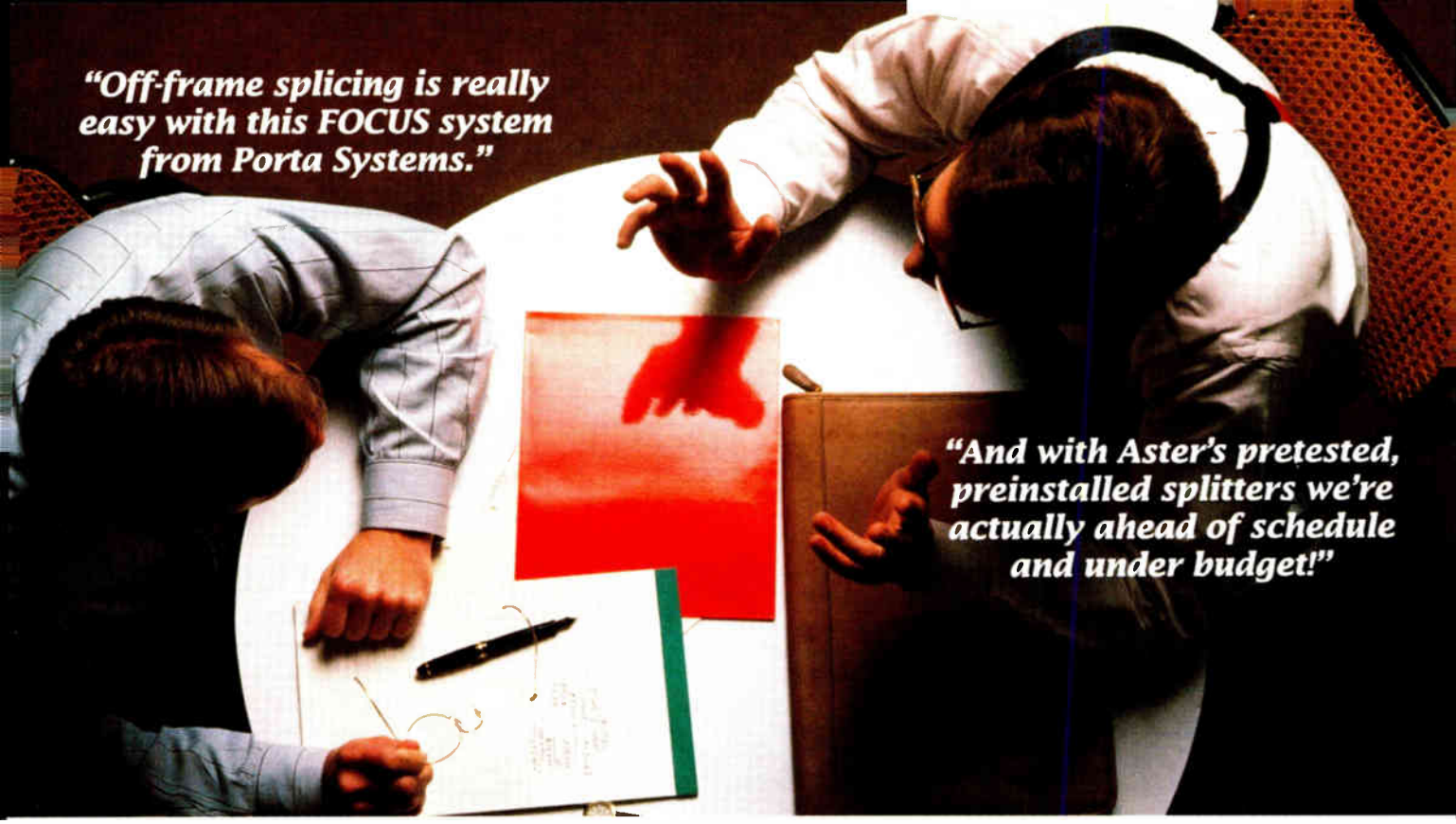

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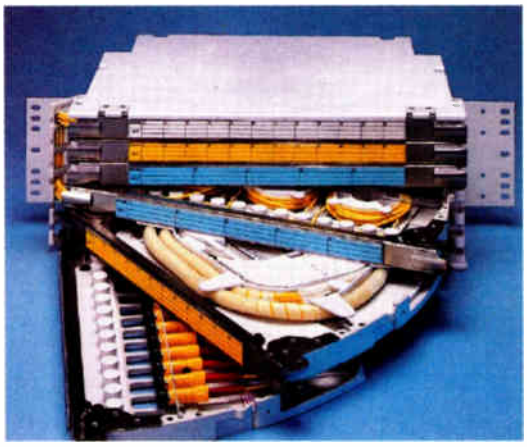

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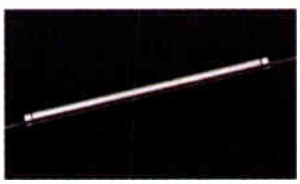

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Gigamerger hits the skids

It was to be the biggest merger in history, valued at $33 billion. That all changed Feb. 23, when Tele-Communications Inc. and Bell Atlantic Corp. called it off. Both cited the new 7% rate rollback by the Federal Communications Commission as the major impediment to closing the deal.

Additional complications included TCI's reduced cash flow and Bell Atlantic's 21% drop in stock price since the deal was announced in October. According to the Associated Press, sources close to the deal said Malone used the FCC rollback to conveniently end discussions. People close to both companies claim disagreement over price has hampered discussions. In any case, the fallout puts into question similar pending deals, as well as the pace of the approaching age of interactivity.

AT&T to test interactive services

AT&T plans to test interactive video services in two different trials slated for the end of this year. The first trial will be conducted jointly with PacTel in the Silicon Valley, CA; the second with GTE in the Manassas, VA, area.

The Pacific Telesis Video Services (PacTel) and AT&T trial will let participants influence what will be on California's communications superhighway. The services will offer new ways of selecting interactive TV programming, making available to the customer a library of movies and TV programs.

The trial begins in November in the Milpitas, CA, one of the first areas where Pacific Bell is building its communications superhighway. The fiber/coax broadband network will connect more than 1.5 million homes in California by 1996 and more than 5 million by the year 2000.

PacTel will purchase transport from Pacific Bell when video dialtone tariffs are approved. PacTel and AT&T plan to deliver video services to customers over Pacific Bell's new fiber/coax network using AT&T's interactive video server, an new asynchronous transfer mode switch (the GCNS-2000) and prototype set-top boxes.

AT&T's digital production facility, digitization technology and content authorizing tools will be used to help content providers adapt and develop their programming. PacTel also plans to facilitate the development of interactive video programming for the trial. Both companies currently are negotiating with content providers.

The Manassas, VA, trial with GTE Telephone Operations will offer GTE customers an extensive choice of new interactive services over an information superhighway as part of a video dialtone network capable of providing in excess of 500 channels of digital programming.

Time Warner, Unisys to conduct joint evaluation

Time Warner Cable and Unisys Corp. agreed to conduct a joint evaluation of Unisys spread spectrum communications technology for its potential applications in cable TV networks. Both companies believe this technology can improve the quality and efficiency of frequencies used to

PCS via cable

(Continued from page 48)

the provision of voice and data circuits between the network elements of third parties who would be PCS service providers. This could be done with fiber and/or coaxial technology, using technologies like those used in competitive access provision.

Still others may prefer to participate by providing remote and distributed antenna systems for third party PCS service providers. The existing cable plant carries radio frequencies for video, and it also can carry radio frequencies for PCS.

It also is possible that cable operators could provide other services to third party PCS service providers, e.g., for customer service, sales or maintenance.

Cable-based PCS technology

Cable operators can bring to PCS the very important components of economy and speed of deployment. PCS can be deployed very rapidly if it makes use of the broadband plant that is already in place. Economy comes from trading bandwidth for cost. The cable plant (particularly the fiber portions) has a large flexibility for this. Simply by integrating conventional PCS technology into the cable plant, important benefits can be achieved. This would apply, for example, if PCS radio base stations were to be constructed like trunk amplifiers or line extenders, and were to be placed in the distribution system where they were needed to provide coverage for PCS users. This would avoid the necessity of having to find landlords for the base stations, installation would be straightforward, and power, communications and remote surveillance could be readily provided.

Even further economies can be achieved by using cable's RF transmission capability. For example, the PCS radio base stations could all be collected together at centralized points (like the headend or at fiber hubs) where their common costs could be shared, while the antennas themselves could be left at the places where the customers are located. The PCS RF signals could be carried over dedicated coax or fiber lines between the base stations and the antennas, using, for example, microcell extenders.

An extension of this is the remote antenna driver (RAD) concept, where the active two-way cable TV plant is used for carrying the PCS RF signals between the base stations and the antennas. The PCS RF signals will be at 900 or 1,800 MHz, so, to carry them on the two-way cable plant, frequency converters are placed at the base station and the antenna location to shift the PCS frequencies into the cable downstream or upstream passband. This was the technology used for the first PCS call on a cable TV system, which took place on Rogers Cablesystems' Vancouver, BC, system in August 1991.

These are examples of remote antenna systems. Distributed remote antenna systems can be created by connecting remote antenna systems together. The distributed antenna systems provide coverage over an area that is bigger than the area of a single cell, without the need for radio handoff within the coverage area. Particularly in low traffic areas, this could result in significant economies because the quantity of radio channels that would have to be equipped at the PCS base station would be significantly smaller than if there were base stations at each antenna location.

Other issues

- Return path bandwidth is limited in the coaxial portion of typical cable plant, but studies have shown that, as traffic grows, in most cases fiber node deployment may well have reached deep enough into the cable plant before coaxial upstream bandwidth becomes a problem.
- Ingress in the return path is a potential problem that must be managed. Studies into this are in hand. Some studies also are being made into locating the return path above the downstream frequency band, as an approach to the ingress and bandwidth issues.
- Transmission quality on the coaxial plant (in both directions) is a matter of concern. Studies to characterize this also are in hand. There are some areas of concern that are similar to those that are faced by digital TV, and some areas that are different.
- The reliability and restorability of the fiber and coaxial cable plants need to meet customer expectations. This may have to be different from what is required for entertainment, and is under study.
- The integration of PCS with the cable plant will lead to increased powering requirements, and reliability requirements also may influence powering strategies. These are under study as well.
- It seems likely that some form of handoff between cells will be required by users. Within the area of a distributed antenna, handoff will be simply a diversity event, but between adjacent distributed antenna systems the PCS network may have to do some handoffs. This is being studied.
- It will be necessary to set up, maintain and restore the integrated PCS network in a way that is transparent to customers and is economical and timely. Operations support systems will need to be added or expanded to achieve this.
- Studies have shown that PCS integration with cable can be harmonious for nearly every PCS air interface that has been proposed, but there are some sensitivities nevertheless. Actions are being taken in the standards bodies and with manufacturers about this.
- The U.S. PCS allocation will be in the band 1,850-1,990 MHz, under a regime of sharing with point-to-point microwave users. Integration of PCS with cable is expected to be harmonious with this.
- It will be important in deploying small cells to be able to do so economically, without great planning, installation and rework effort. On the other hand, the fine scale of obstructions and other effects at small cell sizes means that new approaches to propagation measures and tests are needed. These are being developed.
- Every item that has been identified for study so far is manageable.

Cable PCS inferences

Studies indicate that it is economical and easy to deploy PCS if the PCS components are integrated into and distributed throughout the pre-existing cable TV plant. A suitable place to begin is to put all the complexity at the headend and to provide service to the maximum extent by means of distributed remote antennas. Among other things, this is possible because of the cost vs. bandwidth tradeoff that can be made. As traffic grows, the distributed antenna areas can be segmented, and functionality can be moved toward the users as necessary to optimize the cost vs. bandwidth tradeoff over time.

Conclusion

The evolving cable architecture provides a flexible, economical base for timely deployment of PCS — whether on a cellular, cordless or some other basis. Whether cable operators become PCS service providers or they provide only transport, it is apparent that cable could play an important role in PCS. **CT**

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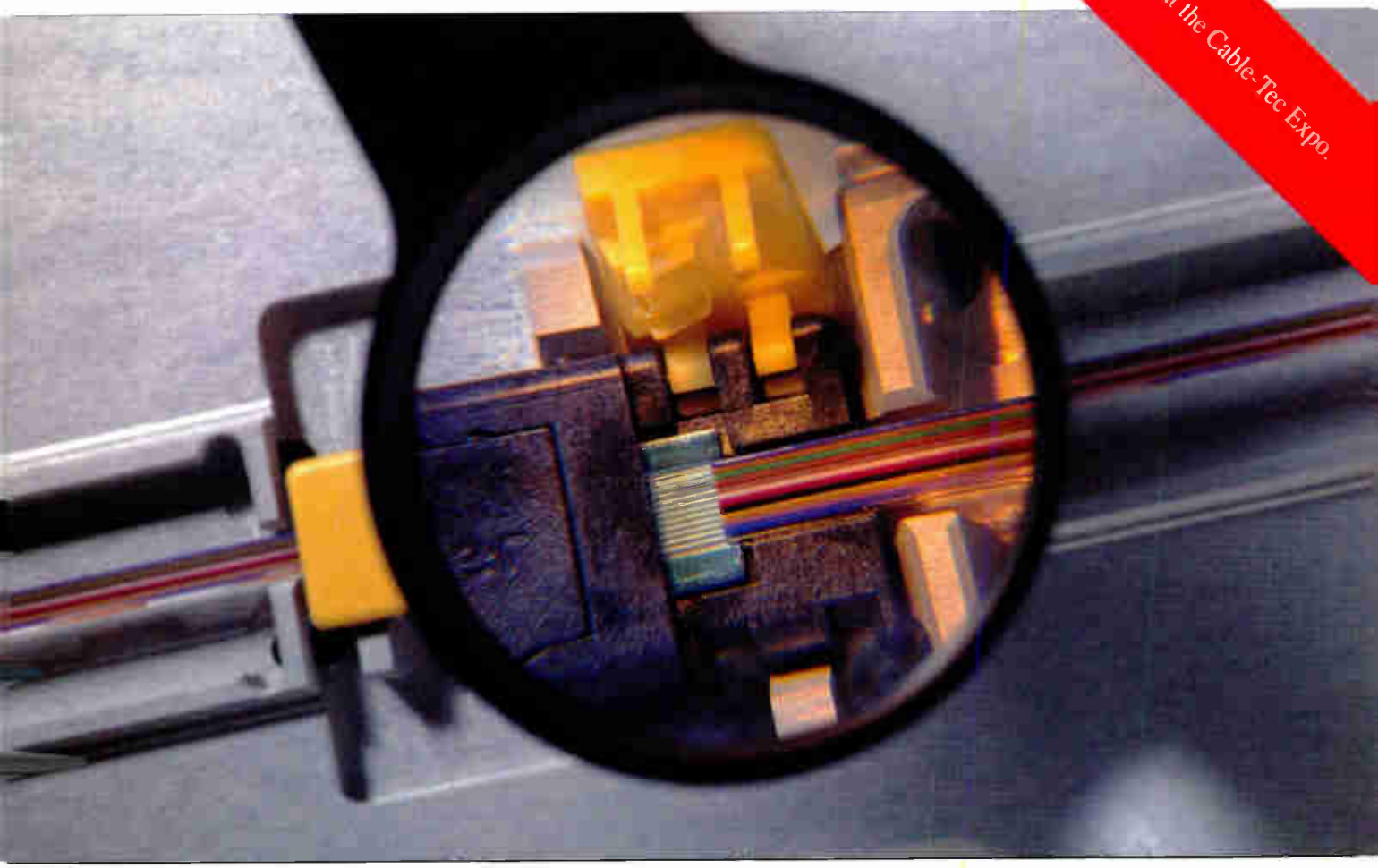

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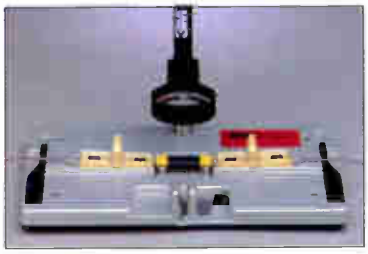

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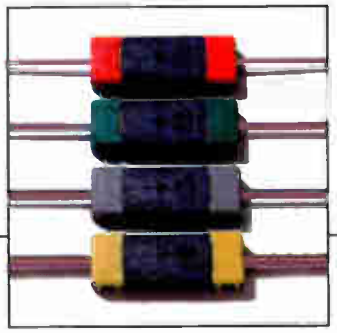
For a closer look at the Fibrlok Multi-Fiber Splicing System, call the toll-free number below, or contact your 3M sales representative or authorized 3M distributor.



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Reader Service Number 93

The dynamic duo

(Continued from page 50)

sion algorithms to choose from for PCS, much of the examination and research into these algorithms and processes has already been performed by the federal government through a requirement promulgated by the Department of Defense.

Because of the need for a next-generation secure telephone operating with better sound quality and reliability than existing models, DOD performed extensive testing and evaluation of 10 candidate compression algorithms submitted by university, commercial and government organizations. After a lengthy evaluation process, DOD selected one particular enhanced algorithm, code excited linear prediction (CELP), to be a new federal standard, FED-STD 1016, for 4,800 bps digitized voice. FED-STD 1016 became effective during 1991 and is required to be used by all federal departments and agencies (including the military) in the design and procurement of all radio equipment employing 4,800 bps digitized voice.

A federal standard suitable for PCS ?

The 10 candidate compression algorithms submitted to DOD for evaluation and testing during the selection process for a new 4,800 bps digitized voice federal standard were:

- SELP (AT&T Bell Laboratories)
- VSELP (Motorola)
- RELP (Motorola)
- CELP (DOD/NSA)
- MBE (MIT)
- LPCES (GE)
- SEV (Georgia Tech)
- VAPC (UCSB)
- STC (Lincoln Labs)
- Enhanced LPC (Entropic Speech)

According to a DOD after-action report, the evaluation process consisted of three phases. The first phase was a screening test where each sponsoring organization submitted a limited amount of processed speech and a short description of the candidate algorithm. During this first phase, the LPCES, Enhanced LPC, and SEV algorithms were eliminated from further evaluation. The remaining seven algorithms entered the second phase of evaluation and were tested for intelligibility, acceptability, robustness, runtime, coding delay, error tolerance and algorithm expandability. The results of the second phase showed three algorithms of similar structure to have the best performance. Consequently, these three algorithms — SELP, VSELP and CELP — were further tested in the third and final phase of the evaluation to investigate merging them into a single combined algorithm to be used as the new 4,800 bps federal standard.

After all tests were completed, it was concluded that all three algorithms were almost equally robust over all conditions and have good potential for evolution as digital signal processor (DSP) speeds increase. DOD began negotiations with Motorola (VSELP) and AT&T (SELP) to acquire the right to use their respective algorithms, but was not able to purchase the rights for commercial use. DOD believed that the overall performance of the three algorithms was sufficiently close that there was no justification for selecting a proprietary algorithm as the basis for a federal standard. As a result, a combined DOD and AT&T algorithm emerged based on CELP and SELP programs that excluded those SELP features proprietary to AT&T.

The enhanced DOD CELP algorithm ultimately became the new federal standard for 4,800 bps digitized voice, and DOD stated that the enhanced CELP algorithm was capable of producing high-quality decoded speech fully comparable to 32,000 bps CVSD digitized voice. It should be noted that improvements have been made on most, if not all, of the candidate algorithms since the original DOD study. However, the positive attributes of FED-STD 1016 for PCS applications have been convincingly demonstrated as a result of the study.

Regarding the ongoing controversy over the selection of either code division multiple access (CDMA) or time division multiple access (TDMA) as a standard for digital transmission in cellular communications, it should be pointed out that CELP and other such voice compression algorithms are fundamentally independent of the higher level digital transmission architecture chosen for cellular (and PCS) communications. CELP operates equally well over CDMA- and TDMA-based systems and the algorithm has been successfully operated through statistical multiplexers, VSAT equipment, fiber systems, LANs, local exchange networks and so forth.

In addition to the high level of audio quality and other advantages of the FED-STD 1016 algorithm, there is the very important benefit to PCS equipment manufacturers and service providers of not having to pay license fees to the federal government to use the algorithm. This is usually not the case with proprietary digitizing algorithms where license fees can become very significant for services that may ultimately have millions of subscribers (such as new wireless PCS).

Available hardware for FED-STD 1016

Deciding to use FED-STD 1016 4,800 bps digital voice (or other similar emerging low bit rate, low delay digitizing algorithms) for PCS products and services is one thing; how to go about implementing the algorithm in useful and economical hardware is quite another matter. A relatively small number of firms are known to be developing specialized hardware and software for incorporating FED-STD 1016 and other digitizing algorithms into commercial products.

Low-cost voice codecs

In order to provide the kind of small, economically priced, pocket-size handset in demand by potential PCS wireless subscribers, inexpensive digital signal processors and other components must be used to keep the total retail cost per unit below $200. Prices for major electronic components for PCS products continue to fall. In its present form, FED-STD 1016 requires a large number of mathematical functions to be performed in a real-time, full duplex mode in order to derive the desired quality of decoded sound and other characteristics required for high-quality voice communications. This may not be the case in the near future.

Research continues to lower the computational complexity and delay factors of voice compression algorithms, including FED-STD 1016. This research also strives to improve the quality of decoded digitized voice, increase the robustness of the algorithm in the presence of burst errors and multipath radio interference, and provide multirate and multichannel capabilities.

Increased research efforts will most likely lead to the near-term development of low bit rate (4,800 bps to 9,600 bps), low delay (10 millisecond frames) voice digitizing algorithms embedded in inexpensive single chip codecs. The decoded quality of audio from these algorithms and codecs will be "toll" quality or very near this performance level. Because of these developments, PCS providers should consider offering voice services operating at these lower bit rates rather than continuing to plan services and design networks using much higher bit rate voice compression algorithms. **CT**

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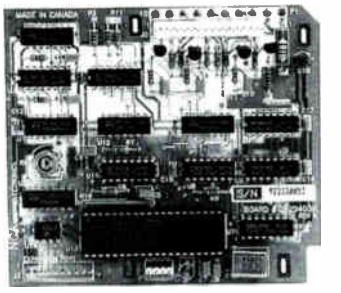

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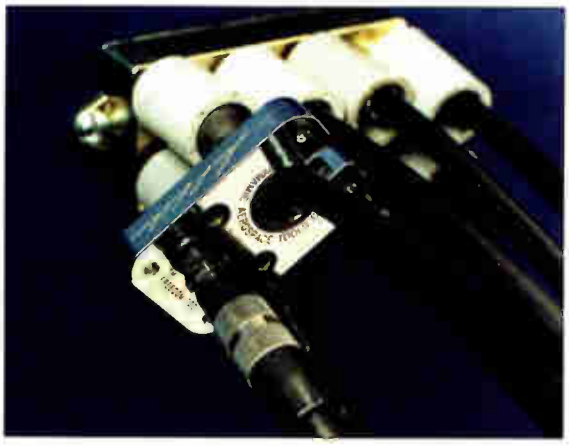

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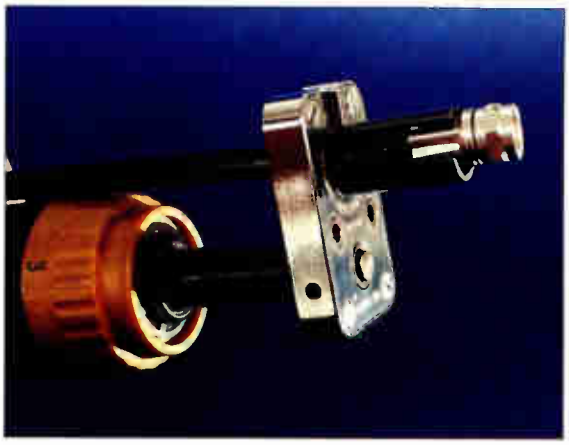

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Reader Service Number 95

April 1993

Spotlight o technical training

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Geri Saye

Table of Contents

A CSR's guide to technical problem solving

Quality improvement is the primary source of cost reduction ... The challenge is to view every element of every operation through the customer's lens; to constantly attempt to — literally — redefine each element of the business in terms of the customer's perceptions of the intangibles.[1]

— Tom Peters

By Robert Gordon
President, Orion Business Systems Inc.

Cable customers with technical problems — reduced reception quality or complete loss of service — want solutions now. How well a customer service representative (CSR) handles a problem colors a customer's overall view of the cable system's competence and value. Good service also means decreased costs for the system. Cable systems report that well-trained troubleshooters can reduce service calls by 20% and more.

The information in this article is directed toward preparing the "cable-ready" CSR to solve many kinds of service problems over the telephone. Cable-ready CSRs learn through formal training and experience. They are empowered by their companies to solve problems creatively and effectively.

The CSR's role as troubleshooter

The cable-ready CSR will be asked to solve technical problems over the telephone based on very sketchy descriptions of the symptoms. You will be like a doctor but you will not have a chance to examine the patient. However, CSRs are often successful in solving customers' problems. Some cable systems have specially trained "technical" CSRs who handle these kinds of problems. However, there is

Determining the problem

- What is the problem? No picture, no power? Snow, ghosting, a rolling picture? No sound?
- How long have you had this problem?
- Is this problem on all channels or just certain ones?
- Do you have the same problem on other TV sets?
- Is this a constant or a recurring problem?
- Is it getting worse?

Troubleshooting checklist

[ ] Check if the TV set and converter box are securely plugged into an outlet. They may have become disconnected.

[ ] Are other electrical devices in the room working? If not, you may have tripped a circuit breaker or blown a fuse.

[ ] Check wall switches that may control the TV set to see if they are in the "on" position.

[ ] Check the cable connections on the back of the TV making sure that they are on tight.

[ ] Is the reception problem occurring on all channels? If it affects only one channel, it may be a temporary station problem.

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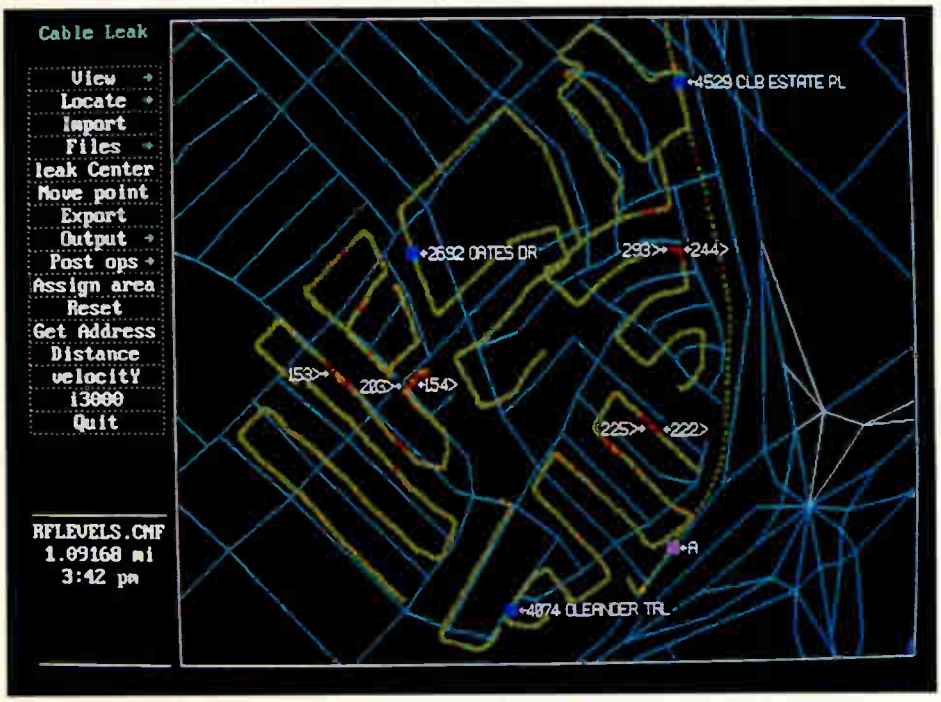

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Reader Service Number 97

no reason that you cannot deal with the majority of technical calls without referring them to someone else.

Typical causes of reception problems

Many things can affect a subscriber's cable TV reception. Some of the most common problems include:

- An entire section of plant is experiencing the same problem because of malfunctioning distribution plant equipment. This may affect many homes in a specific locale. Storms and downed power lines sometimes cause this problem.
- The subscriber adds a VCR, video game or other component to his or her system, and in so doing accidentally connects the cable to the wrong fitting.
- While cleaning or moving the TV set, the customer pulls off the cable fitting or loosens the connector.
- The customer fails to program the VCR properly and wants you to help him through the process.
- A power surge blows a house fuse or flips a circuit breaker to the "off" position and power is lost to the TV set.
- Some TV sets may be plugged into a switched electrical outlet and the wall switch controlling that outlet may inadvertently have been turned off by the customer.
- The batteries on the remote control handset wear out and need to be replaced.
- Normal wear and tear, including inclement weather, degrades the cable system causing poor reception. Trouble includes loose connectors, bad amplifiers, cuts in the cable, animal chews and many other component problems.
- Downed lines because of a storm or traffic accident.
- A power blackout or brownout has affected the area.
- The cable TV system makes an error and mistakenly disconnects an authorized customer.

Steps in troubleshooting

If anything can go wrong it will. Nature always sides with the hidden flaw.

— Murphy's Law

Murphy was an optimist.

— O'Toole's Law

The creative CSR will try to help a

Ten common customer complaints with answers

1. **C.** I'm only getting Channels 2 through 13.

A. Set the TV/CATV switch to CATV. This may be found on the remote control unit or the front or back of the TV set.

2. **C.** I put the TV on Channel 10 but I'm getting Channel 9! or, My TV set is off by one channel.

A. The TV set is probably not on Ch. 3. Tune the TV set to Ch. 3. If this doesn't solve the problem, then another possible cause is the fine tuning is misadjusted and should be readjusted.

3. **C.** I'm not getting any sound.

A. Remote control units and TV sets often come with mute buttons. Look for the remote's mute button and adjust it. Try the volume button on the remote and TV set. Also check the converter's volume control (if available).

4. **C.** My VCR is hooked into the system but it isn't able to record anything. I only see snow when I record.

A. The VCR is not fine tuned to Ch. 3. Adjust the VCR's fine tune control until you receive a clear picture.

5. **C.** The picture is fine but I'm getting a buzzing noise in my sound.

A. There are several possibilities: 1) The headend video modulation is incorrectly set. This is a system problem that should be checked out with your supervisor. 2) The discriminator or limiter on the TV set is out of adjustment. This is a TV set problem requiring a TV repairman. 3) This could be a situation where the cable and TV technologies are not working in harmony. In this case, the TV set's volume has been adjusted to the top of its volume range. However, the subscriber is controlling the volume using the cable converter's remote control. When the subscriber tries to increase the volume using the remote control unit beyond the TV set's capacity, a buzzing noise results. Tell the subscriber to reduce the TV set's volume to the low- to mid-end of its range and use the cable converter remote to adjust the volume from then on.

6. **C.** I hear sounds from other channels. What should I do?

A. Some TV sets come equipped with special stereo sound features. In such cases, adjust the MTS (multichannel TV sound) and SAP (second audio program) switches so that the MTS switch is set to main and the SAP switch to off.

7. **C.** My remote control unit doesn't work.

A. Make sure that the customer is pointing the remote at the TV set or converter when the buttons are pressed. Otherwise, try new batteries. If this doesn't help, the unit may have to be replaced. Lastly, the remote control capability of the addressable converter may be disabled. You should check with the system if this is the case.

8. **C.** I'm not getting any cable reception, everything is snowy.

A. Particularly in the spring and summer, gardeners and construction crews tend to cut cables. Cable is buried from 2 to 24 inches underground and, therefore, is susceptible to cuts. (Many systems have adopted a minimum cable burial depth standard of 18 to 24 inches. Find out what your particular system's policy is.) Buried cable sometimes surfaces because of erosion of the soil above it. Ask the customer if he or she has noticed anybody working or digging around the house. If so, ask the customer to inspect the area for exposed or damaged cable. Send a technician if the cable has been damaged or appears too close to the surface. Educate the customer to call "Miss Utility" before further digging. (Editor's note: Underground utility locate services may have different names depending on the locality.)

9. **C.** My TV picture gets shadows from time-to-time. But this only happens sometimes, mostly in the early evening.

A. Intermittent problems are the biggest headache to cable technicians. They are never sure when to schedule a call or if the problem will appear when they get there. The problem may exist when the customer calls but disappear by the time the technician arrives. Some customers call in to postpone the service call, but it's too late and a truck roll has been wasted. Technicians often tell customers to call them when the problem reappears, but they may be unavailable at the time because they are in the field with other duties. This can anger customers. One solution is to ask the customer to record the problem on the VCR. This will help the technician with the diagnosis.

10. **C.** I hear interference on Channel 17, 18, 19, 20 or 21. What's the problem?

A. These channels are in the midband frequency range that overlaps with the frequency band used by mobile communications services (e.g., police and fire radios). If there is a fault in the cable (such as a bad connection or cut in the line) "ingress" into the cable system may happen. That is, outside radio signals enter the cable system and interfere with normal program signals, causing interference at the customers' TV sets. This problem can only be repaired by a service technician. It is a difficult problem to fix. Another very common problem with cable-compatible TV sets or VCRs is the poor or non-existent shielding inside the set that may allow direct pickup of the interference. If this is happening, the only solution is to use a converter to tune those channels.

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customer solve his or her picture problems over the telephone. This will save the customer's time and reduce your system's cost. Troubleshooting is a science and an art. With experience, you will get better at it. Be patient and persistent.

Every day the CSR faces the situation in which the customer calls up and says: "The service is messed up." "My cable is not working." "I don't know how to operate the equipment." Assume that the customer is thoroughly unfamiliar with the equipment and the terminology. Use simple terms and instructions. Methodically troubleshoot with the customer. But don't talk down to the customer!

Troubleshooting is a four-step process that includes: 1) finding out specifically what the problem is; 2) getting a clear mental image of the subscriber's equipment configuration; 3) finding out if anything has been done recently to cause the problem; and 4) using your judgment and the diagnostic tables to instruct the subscriber what to do.

To begin with, the CSR needs to ask probing questions — that is, use open and closed questions to obtain information

• Step 1 — Determine the problem. Like a doctor, you must ask a lot of questions to get at the root of the problem. Some subscribers will volunteer the problem — others will need coaching. The doctor asks: "Where does it hurt?" and "When did you first notice this problem?" You will ask similar questions to focus your thinking on the problem's cause. But you have the disadvantage of not being able to see the sick TV set. The sidebar on page 92 offers some sample questions and a checklist to determine the problem. Remember, troubleshooting requires patience and persistence.

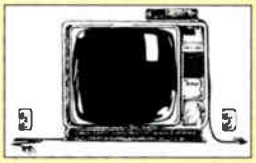
System problems may affect many subscribers in an area. Your data base system or bulletin board will tell you if a major system problem has been found and which areas are affected. Trouble spots may be identified by ZIP+4 codes. Let the customer know that the problem is being addressed.

• Step 2 — Determine the configuration. "Is the TV set cable-compatible?" "Do you have a converter? A VCR?" "Is there any special additional equipment?"

• Step 3 — Changes to the system. "Have you moved or disturbed the TV

CRS troubleshooting guide

Symptom 1



There is no picture/sound. The TV set or converter doesn't come on.

Possible problems
- The TV set or converter may be unplugged.
- A fuse or circuit breaker may be blown or switched off.
- The remote control unit (RCU) may be disabled.
- A wall switch controlling the TV set may be turned off.

Tell the customer to
- Make sure the TV/VCR are plugged in and the wall switch is on.
- Check the fuse or circuit breaker. Test the outlet with a lamp.
- Replace the RCU's batteries; if this fails exchange the unit.

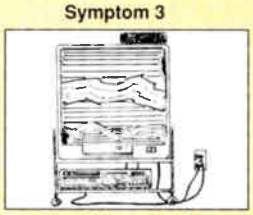
Symptom 2

The images on all channels are fuzzy or the picture screen is snowy but visible. There is a "hissing" sound.

Possible problems
- The TV set or VCR may be set on the wrong channel.
- The Cable/TV switch may be set wrong (for channels 14 and above).
- There may be a loose fitting in the house drop.
- The converter may be malfunctioning and needs to be replaced.
- A system problem may be affecting several customers.

Tell the customer to
- Tune the TV set to Ch. 3 (or 2 or 4 as appropriate).
- Adjust the switch to the "CABLE" or "75 ohm" position.
- Check and hand tighten the cable fittings to the converter, TV set and VCR.
- Bypass the converter/VCR. Connect the cable directly to the TV set.
- The converter is bad. Please bring it in for a replacement.

Symptom 3



Chs. 2 through 13 won't come on or they are unclear.

Possible problems
- A fitting may have come loose or been damaged.
- The fine tuning may be out of adjustment.
- The TV set is fine tuned one channel off.

Tell the customer to
- Hand tighten all fittings or bypass the converter/VCR.
- Tune the TV set to Ch. 3 (or 2 or 4 as appropriate).
- Adjust the fine tuning control until the picture is clear.

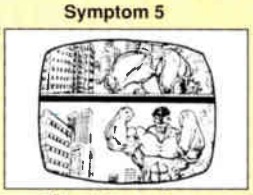
Symptom 4

Single or groups of channels above 13 don't come on or they are unclear

Possible problems
- The "Cable/TV" switch may be set wrong.
- The fine tuning may be out of adjustment.
- The TV set is fine tuned one channel off.
- The problem may be at the headend affecting many customers.

Tell the customer to
- Adjust the switch to the 'CABLE' or '75 ohm' position.
- Fine tune the TV set or tune the set to Ch. 3 (or 2 or 4 as appropriate).
- Adjust the fine tuning control until the picture is clear.
- We are experiencing a system problem that we are fixing.

Symptom 5



The picture rolls, jumps or flashes on and off.

Possible problems
- The TV set's vertical hold may be out of adjustment.
- The fine tune may be out of adjustment.
- An F-connector may be loose.

Tell the customer to
- Adjust the vertical hold control until the picture is clear.
- Adjust the fine tuning on the TV set, VCR or converter box.
- Check and hand tighten the cable fittings to the converter, TV set and VCR.

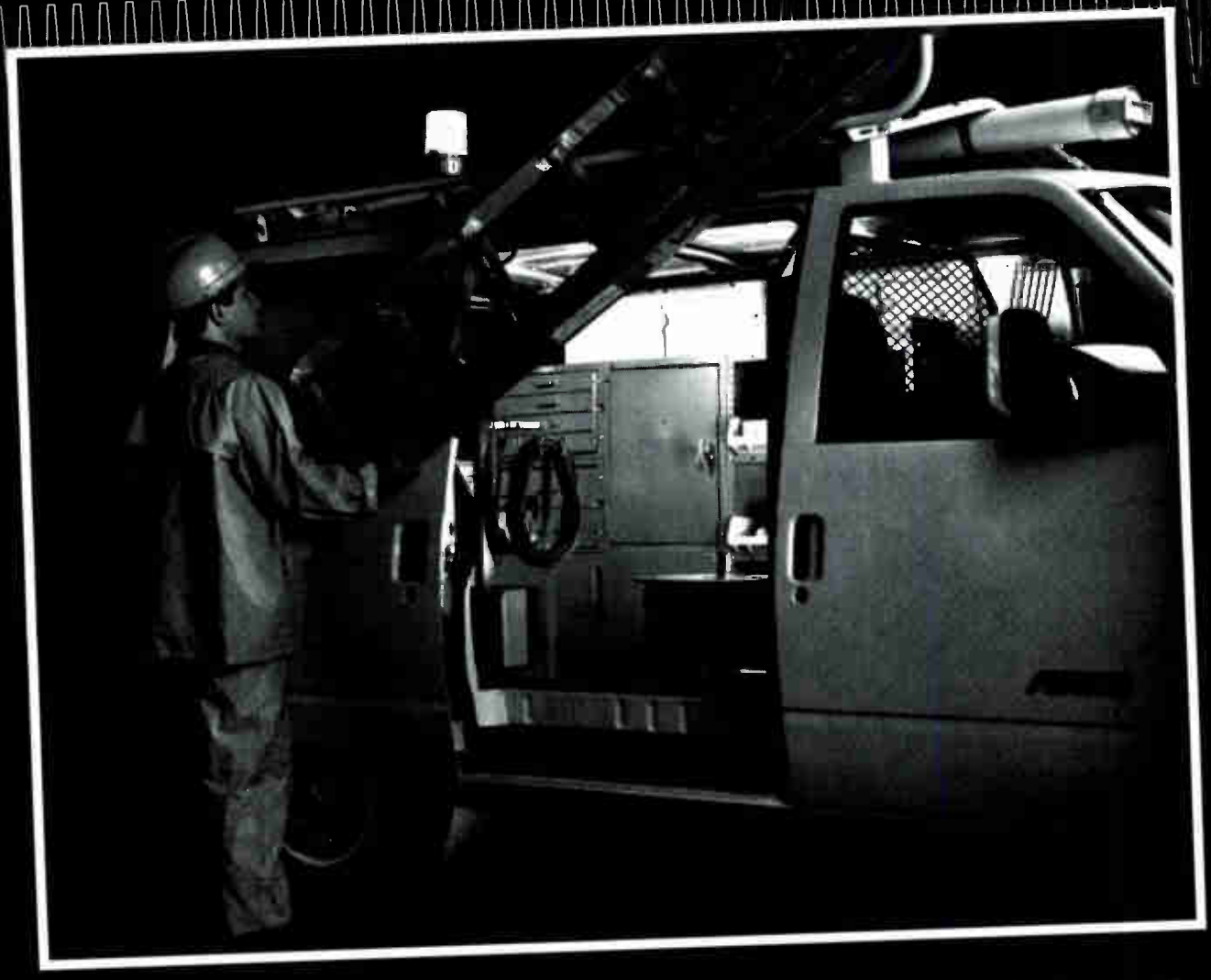
Symptom 6

The TV picture shows a double or multiple image or faint "ghost" on off-air channels

Possible problems
- Ghosting is caused by an ingress of off-air signals into the TV, through the cable system, or the TV's antenna.
- An F-connector may be loose.
- The cable plant may have a "leak" in the area.

Tell the customer to
- Check and hand tighten the cable fittings to the TV set and VCR.
- Remove the antenna from the VHF terminals when cable is used.
- A converter or A/B switch may be needed to correct the problem.

→



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set in any way? Have you vacuumed or cleaned behind the TV set recently?" "Have you attempted to repair the problem in any way?" "What steps have you taken to repair the problem?" "Have you added anything to the system?"

• Step 4 — Use the troubleshooting guide. The "CSR troubleshooting guide" on this page and page 96 can help to diagnose picture and sound problems. Familiarize yourself with the information. As you solve problems you will find yourself referring less and less to it.

In the guide's left-hand column is an illustration and brief description of the TV set's symptom. If this is the customer's problem go horizontally across to find some of the possible reasons that they may be having trouble. Explain to the customer that these may be the causes of the reception problem. Ask the customer to check the possible solutions listed. If this doesn't help, then schedule a service call. A list of 10 common customer complaints with answers to them is in the sidebar on page 94.

You will not be able to suggest a remedy in every case. In those cases where you cannot help the customer solve the problem, arrange for a service call.

This process may seem complicated and time-consuming. However, once you become familiar with the most common symptoms and their related technical problems, you will be able to quickly help customers and save expensive service calls.

One final word. When you are asking the customer to help you find the source of the problem, tell him or her that this will help save time because in a few minutes he or she may be able to restore good service rather than having to wait for a technician. Don't let customers feel that you are unwilling to provide them with service. Don't tell them that sending a technician is expensive.

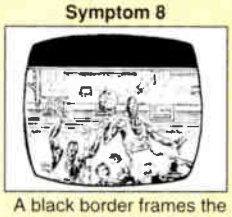
Symptom 7

A herringbone pattern, faint lines, or a "hum" bar distorts the picture.

Possible problems
- The fine tuning may need adjustment.
- An F-connector may be loose.
- The cable plant (e.g., amp) may be out of adjustment in the area.

Tell the customer to
- Adjust the fine tuning on the TV set, VCR or converter box.
- Check and hand tighten the cable fittings to the TV set and VCR.
- Be patient. A service call may be required to repair the problem.

Symptom 8

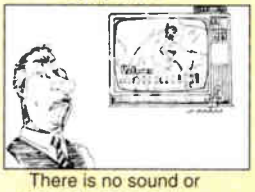


A black border frames the top or bottom of the screen

Possible problems
- The TV set's vertical height control may need adjustment.
- This is probably not a cable system problem.

Tell the customer to
- The vertical height should be adjusted by a TV repair technician.
- If this doesn't work, a service call may be scheduled.

Symptom 9

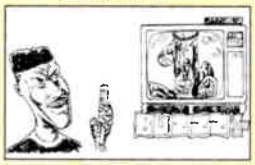


There is no sound or the volume is too low.

Possible problems
- The volume may be turned down on the TV set or muted on the RCU.
- The RCU's mute function may be on.
- An earphone may be in the earphone jack.

Tell the customer to
- Turn the volume up on the TV set.
- Turn off the RCU's 'mute' function.
- Remove the earphone from the jack.

Symptom 10



The audio has a distinct buzz or hum when the volume is adjusted with the RCU.

Possible problems
- The TV set's volume is adjusted to the top of its range.
- The customer is trying to increase the volume with the converter's RCU.

Tell the customer to
- Reduce the volume on the TV set to low- to mid-range.
- Adjust volume to the desired level using the converter's RCU.

Additional symptoms	What to do
11) Loss of color in picture.	Adjust the TV set's fine tuning control.
12) Channels change by themselves.	Adjust stuck remote control button.
13) TV set's RCU doesn't turn set off.	Plug TV set's power into wall; not converter.
14) RCU doesn't work.	Replace batteries or exchange RCU.
15) Power failure or brownout.	The electric company will fix this.

Other instructions
- Check with the service department or the headend to determine if you have a temporary system problem.
- Schedule a service call if the problem cannot be solved over the telephone.

Reluctant customers

Some customers are more than eager to help solve the problem themselves. Other customers will be reluctant to give you information. They may object to your questions with comments such as:

• "I haven't any idea, I'm not an electrician."

• "Can't you just send out a technician? I don't have all day to figure this out."

• "It's really too complicated for me."

• "It's your responsibility, isn't it?"

They may need a little coaxing. It's best to tell customers that this could save them time and money. The National Cable Television Association standards require that cable operators respond to a service interruption within 24 hours and other service problems within 36 hours. Many systems set up a service call for the next day. When customers learn that they may be without cable service for this time, they may become more willing to work with you in troubleshooting the problem.

If it's clearly your cable system's responsibility then offer suggestions and schedule a service call if the problem cannot be fixed over the telephone. Most cable systems do not charge customer's for any service call regardless of the cause. However, some cable systems charge customers for service calls if the problem is unrelated

Recipient of
Communications Technology's 1993

Service in Technology Award

John Malone

President & CEO of Tele-Communications Inc.

John Malone: 1993 Service in Technology Award recipient

You've heard his name many times connected with some cable TV accolade or industry accomplishment. This won't be the first honor hanging on his wall, but *Communications Technology's* 1993 Service in Technology Award is proudly presented to John Malone, president and CEO of Tele-Communications Inc. since 1973.

Malone is a director of TCI and serves on the board of directors for Turner Broadcasting, the Bank of New York and Cable Television Laboratories Inc. He also is chairman of the board for Liberty Media Corp.

Malone's career begins back in 1963 when he started at Bell Telephone Laboratories/AT&T in economic planning and research development. In 1968, he joined McKinsey & Co., and in 1970 he became a group vice president at General Instrument Corp. Later he was named president of Jerrold Electronics.

From 1974 to 1977, he served as a director of the National Cable Television Association. He was treasurer from 1977-1978 and a director again from 1980 to present. He also serves on the NCTA board's Executive Committee.

The NCTA Vanguard Award — one of the highest honors in the cable TV industry — was presented to him in 1983. The roster of other awards and honors is long and varied: *TVC* magazine Man of the Year (1981); *The Wall Street Transcript's* Silver Award (1984 and 1989); *The Wall Street Transcript's* Gold Award for best CEO in the cable industry (1982, 1985, 1986 and 1987); Women in Cable Betsy Magnes Fellowship (1987); the University of Pennsylvania Wharton School Sol C. Snider Entrepreneurial Center Award of Merit for Distinguished Entrepreneurship (1988); and the American Jewish Committee Sherrill C. Corwin Human Relations Award (1988). He was inducted into *Broadcasting* magazine's Hall of Fame in 1991.

Malone was born in Milford, CT. He was a merit scholar and Phi Beta Kappa and received a B.S. in electrical engineering and economics from Yale in 1963. He got an M.S. in industrial management from Johns Hopkins in 1964 and an M.S. in electrical engineering from New York University in 1965. He got his Ph.D. in operations research from Johns Hopkins in 1967.

CONTENTS

VISIONARY

TELE-COMMUNICATIONS, INC.

SALUTES

DR. JOHN MALONE

RECIPIENT OF THE

1993

SERVICE IN TECHNOLOGY

AWARD.

We're taking television into tomorrow.

OF OUR TIME

TCI's history of cable technology and growth

Everyone knows what TCI stands for. Tele-Communications Inc. But what's behind those familiar letters and the phenomenal results in seeking out and integrating CATV technology into its systems?

The company's origins stem back to 1956 and a venture called Community Television Inc., which had 700 cable TV customers in Memphis, TX. That eventually was parlayed into TCI and the creation of the nation's largest cable TV operator, serving about 9.5 million customers in 48 states, Puerto Rico and the District of Columbia. It's the classic cable TV mega-success tale.

Commitment to technology

TCI President and CEO John Malone's 1993 Service in Technology Award presented by *CT* is a reflection of his company's commitment to shaping the future of communications through technology advancement.

"John Malone is a shining example of the brilliant achievements that can result from the combination of intelligence with integrity. John's loyalty and decency toward others in both his company and the industry have made him a trusted leader, and he has used this leadership responsibility to break new ground in operations and technology.

One of John's great strengths has been in strategic planning, where, by his patience and perceptive assessment of opportunities, he has demonstrated the wisdom of good timing. His ability to choose strategic partners for these plans has lead to innumerable profitable ventures that changed the face of our business. His continued exploration of new opportunities and his reaching out to other industries to forge additional innovative alliances is yet another example of his courage and imagination. The cable TV business is far richer for having had the benefit of John Malone's technological genius and business acumen.

I'm very glad he's young and I hope he plans to spend many more years leading our industry forward."

— William J. Bresnan
President, Bresnan Communications Co.

"John Malone has played a key leadership role in the growth of the cable TV industry. He has long been a friend to Turner Broadcasting and to me personally."

— R.E. "Ted" Turner
Chairman and President, Turner Broadcasting System

"John's vision is a unique blend of a far-reaching imagination and real-world practicality. He's one of the few people who can find solutions for a pathway to the future that takes into consideration each of the steps required to get there."

— Jeffrey C. Reiss
Chairman and CEO, Reiss Media Enterprises

"Anyone who ever has had the good fortune to cross paths with John Malone knows full well that this is no ordinary man. John stands head and shoulders above just about anyone I've ever met in the cable TV business.

When there's a risk to be taken, John's the first to take us around that corner. If our industry becomes myopic on any issue, John has the courage to take the long view, and he understands instinctively the rewards that lie far down the road. The longer I've known John, the more I've marveled at his technological brilliance and his unparalleled business sense. No one could be more deserving of this award."

— Alan Gerry
Chairman and CEO, Cablevision Industries Inc.

TCI maintains that it holds true to its beginnings with its entrepreneurial operating style, staying close to the customer to ensure responsive services and programming.

On the optics front, the company is aggressively pursuing the upgrade of its systems with fiber. As well, it is an active member and supporter of Cable Television Laboratories and R&D efforts in high definition TV (HDTV), digital signal compression (see page 12) and personal communications networks (PCNs).

Presently, TCI is conducting market tests of several new services like viewer-controlled cable TV (VCTV). This is a joint venture with US West and AT&T and will determine consumer interest in expanded pay-per-view (PPV) and video-on-demand (VOD) services. Initial response has been strong. (More on VCTV on page 22.)

TCI and McCaw Cellular just finished testing the PCN concept to explore the technology's viability. (See page 26.) TCI also is market testing potential services like medical imaging, telecommuting and commercial alternative access telephone service.

You'll enjoy television

That's what the sign over the door read at the small cable company, Community Television Inc. In 1958, that company merged with a small common carrier microwave company, Western Microwave Inc., to provide

"John Malone is a person gifted with unique vision and true creative genius. High on the list of his many accolades should be the critical role he played, and continues to play, in the birth and nurturing of our industry's 'pathway to the future' — CableLabs."

— Dick Roberts
President and CEO, TeleCable Corp.

TV signals to customers in Montana, and Community Television Communications Inc. was born.

By 1965, the partnership had grown to six systems with 12,550 customers and had moved to a central location in the cable capital, Denver. In 1968, the companies consolidated operations and called themselves American Tele-Communications Inc. That name was changed later that year to avoid conflict with competitors.

TCI as we know the company today goes back farther than that though. It has its roots in the early '50s with an Oklahoma cottonseed salesman/part-time cattle rancher and his wife, Bob and Betsy Magness. A chance encounter with some people who had just built their first cable system in Paducah, TX, sparked Magness' immediate interest in the fledgling CATV industry to provide quality TV signals to rural communities that otherwise couldn't receive television. Community Television Inc. built its first system in Memphis, TX, in 1956 and the following year brought cable to nearby Plainview, adding another 3,000 customers.

Malone joined the company in 1972, becoming president and CEO in '73. Magness became chairman. With more than 1,000 employees across the country, TCI began heavy construction and acquisition of U.S. cable systems. →

"In early 1988, when daily newspapers across the country were awash with headlines detailing one religious TV scandal after another, John Malone and several of his colleagues in the cable industry decided that something had to be done to improve the quality and the economics of religious TV. When it became clear that VISN would need a significant amount of start-up capital, John Malone stepped up to the plate and made it happen. And again last year, Dr. Malone was instrumental in enabling the two largest interfaith cable networks, VISN and ACTS, to work together to create a combined channel that now reaches 20 million cable homes.

VISN/ACTS is a great force for building bridges of hope and understanding among people of diverse backgrounds and beliefs. Much of the credit belongs to Dr. John Malone."

— Bill Airy
President, VISN/ACTS

"John's technical knowledge and background has been immensely helpful in charting our course at CableLabs. We are very lucky to have John in cable's corner as we approach the difficult technical and business choices that will determine the industry's role in the telecommunications future."

— Dr. Richard Green
President, Cable Television Laboratories

TCI was a forerunner in pay TV. It tested a premium channel service in its Hamilton, OH, system with eight movies for an additional monthly fee. TCI then began using the Republic Pictures library and bicycled films between systems.

By 1975, TCI's cable system subsidiary, Community Tele-Communications Inc., was the second largest cable operator in the U.S. and served 651,690 customers from 149 cable systems in 32 states. Western Tele-Communications Inc., the microwave subsidiary, completed an $11 million expansion program in 1974 and became the nation's second largest microwave common carrier.

Becoming the biggest

In 1982, TCI became the nation's largest cable operator and passed the 2 million subs milestone. Larger markets followed a couple of years later. TCI acquired Buffalo, NY, and Pittsburgh, and agreed to build systems in Chicago and St. Louis. As well, it was a major investor in the Washington, DC, franchise.

"John Malone has contributed his wisdom, his leadership and his integrity to the cable TV industry for more than two decades and no one has ever given more to his industry, to his shareholders, or his friends. John Malone is truly a singular man."

— Leo J. Hindery Jr.
Managing General Partner, InterMedia Partners

TCI acquired a large portion of Group W Cable in 1985. Group W was at that time the nation's third largest cable operator. More acquisitions followed: In 1990, it was Heritage Communications Inc., with 975,000 basic subs. In 1991, TCI purchased United Artists Entertainment, adding 86 cable systems plus several foreign cable investments.

Quality programming support

Programmers like Black Entertainment Television, CNN, The Discovery Channel and VISN had the strong commitment and financial support of TCI. TCI encouraged diversity of viewing choices over the years by making several passive programming investments. John Malone serves on the board of directors for Turner Broadcasting.

TCI spun off most of its programming interests and minor operating investment into a separate, publicly held company, Liberty Media Corp. Malone is chairman of the board. Among Liberty's investments are X*PRESS Information Systems Ltd. and Encore.

TCI continues to grow and make efforts to better serve its large cus-

"It's truly a pleasure to do business with Dr. John Malone. He combines a talent for visionary thought unrivaled in the cable industry with a clear-eyed understanding of business realities. John has always been supportive of A&E and the network has profited from his insistence that our industry provide the very highest quality service to our subscribers, both technically and creatively."

— Nickolas Davatzes
President and CEO, A&E

tomer base. It launched a 33-point national customer service program, "The Customer First." Also, the company shows a strong commitment toward education with its TCI Education Project that offers hookups, X*PRESS software, commercial-free educational programming and teacher support materials at no charge to schools in TCI's service areas.

Today, headquarters are just south of Denver in Englewood, CO. The company employs 22,000 people in more than 500 offices in over 3,900 communities nationwide. Revenues of $3.6 billion in 1990 represented average monthly revenue of $29.66 per subscriber.

Looks like "you'll enjoy television" was right. From 700 customers almost four decades ago to 9.5 million today, TCI continues to be an innovative member of the communications business. Its continuing success story is strongly connected to its management's commitment to the cable technological front of the future.

provide a two-way link in the interactive networks of the future. The technical evaluation will be conducted by CableLabs.

CableLabs will evaluate this technology's transmission robustness and its potential for spectrum-sharing among multiple users at its Louisville, CO, facilities. These laboratory tests, directed by CableLabs engineering and technical services staffs, will be conducted in cooperation with Time Warner Cable engineering management with the assistance of engineers from the Unisys Government Systems Group facility in Salt Lake City.

Digital and USA Video sign OEM agreement

Digital Equipment Corp. signed an original equipment manufacturer (OEM) agreement with USA Video Corp., intended to increase both companies' respective market shares of the worldwide video-on-demand (VOD) industry. Together the companies will offer video information services, including interactive video servers and end-to-end VOD solutions, to the interactive information services market.

The companies expect to demonstrate the new relationship by jointly supporting Bell Atlantic Corp.'s upcoming market trial of video dialtone through the Chesapeake and Potomac Telephone Co. of Virginia. USA plans to function as a video information provider in the trial, delivering interactive video services that employ Digital's interactive video server technology. The market trial is a commercial deployment of VOD that will be offered to 40,000 end users in northern Virginia in the spring of 1994.

TCI wins in court

The U.S. Court of Appeals for the 10th Circuit affirmed a ruling in U.S. Tax Court that rejects the IRS's arguments that franchise fees (the difference between the value of an acquired company's book value and the purchase price) should not be deductible, *CableFAX* reports.

TCI listed roughly $10 billion in franchise fees at the end of 1992. The court decision could mean $2.8 billion in tax credits to the company over the next 10 years. Sources say the ruling could apply to any company holding a broadcast license.

- *Fiber Optics News* reports that Corning Inc. and Siecor Corp. signed an agreement to acquire the assets relating to the optical fiber and optical cable businesses of Northern Telecom Ltd. for a total of $130 million in cash. Under terms of the agreement, Corning will provide $87 million of the purchase price and Siecor will provide $43 million.
- Ericsson Network Systems Inc. and Reliance Comm/Tec Corp. formed a joint team to define, develop and implement video-on-demand field trials for the U.S. market. The team combines Ericsson's ATM switching and access expertise with Reliance's next generation digital loop carrier, hybrid fiber coax and fiber-in-the-loop access experience.
- Philips Digital Videocommunications Systems and Compression Labs Inc. were chosen by Bell Atlantic as suppliers of digital entertainment terminals for the first commercial digital TV and information services networks to run over telephone lines. This video-on-demand system, a roadbed of the National Information Infrastructure, is scheduled to begin operation later this year.
- TV/COM International reached an agreement with GTE Main Street to provide additional units for customized interactive home terminal systems. The order is to be delivered by third quarter 1994.

Dr. John Malone

President, Tele-Communications, Inc.

" Congratulations on receiving the 1993 Annual Service in Technology Award in recognition of your contributions to our industry !"

ANTEC℠

TCI pursues a digitally compressed future

"Television will never be the same," says John Malone.

He's talking about TCI's plan to roll out to its cable customers a wide range of additional TV programming options delivered in a compressed digital format by January 1994. TCI believes these will be the world's first major consumer applications of compressed digital TV technology.

"Our ability to transmit television, data and voice in a compressed digital format will be a bonanza for our customers," continues Malone, "the technology makes possible greatly expanded pay-per-view offerings, including multiplexed hit movies, a broad range of new sports options, documentaries, holiday programming, concerts and theater events; a huge array of niche cable channels; high definition TV; intriguing new interactive services and computer networks; and, most importantly, a range of new educational services for the school and home."

He added that much of the equipment to deliver these new services can be deployed incrementally as justified by demand.

Picking vendors

TCI signed a letter of intent to purchase up to 1 million set-top compressed digital terminals from General Instrument and AT&T, and said it intends to negotiate for the purchase of additional terminals and related equipment from Scientific-Atlanta and other industry vendors. As a part of the agreement with TCI, AT&T and GI will license key components of their technology to other terminal manufacturers.

TCI believes the equipment and related systems will be consistent with international standards now being finalized by the Motion Picture Experts Group II (MPEG-II). TCI will manage the technical aspects of its digital compression system from a new access, control, encryption and uplink center using technology developed by GI. (This center will be somewhere in the Denver area and will employ up to 100 people, perhaps more over time.)

What subs will see

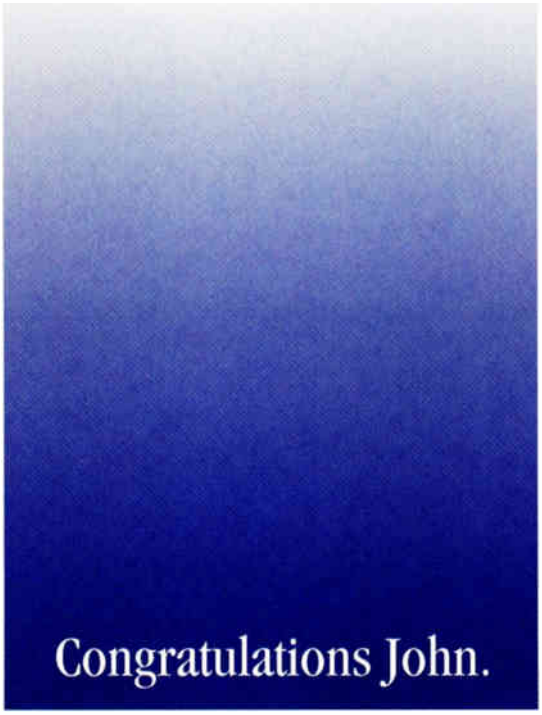
Malone says, "Programmers already are approaching us with ideas that would have been entirely unrealistic only a year ago.

"For starters, imagine choosing from more than 20 college football games in a single afternoon; having several chances to see your favorite TV shows at different times; browsing through an interactive video shopping center and ordering from the comfort of your own home; and controlling these and a myriad of other options with consumer-friendly interactive gateways, like that under discussion at The Discovery Channel, and specially designed on-screen guides."

Fiber's role

Within four years, TCI says it will be serving over 90% of its customers with state-of-the-art fiber-optic cable systems. The fiber will facilitate digital transmission and the systems will feature optical fiber to neighborhood nodes with coaxial cable distribution downstream from that point. The company's capital budget will be substantially increased for this purpose. (TCI's capital budget for 1992 was around $450 million.)

The compressed digital video and data services planned will achieve 10:1 compression ratios and ultimately could provide over 500 channels of advanced TV options to TCI customers.



Under your visionary leadership, TCI continues to push the develpment of technology for the benefit of our industry and subscribers worldwide. We're proud to be part of that effort.

Scientific Atlanta

Our customers are the winners.

AT&T
is proud to salute

Dr. John Malone

Winner of
Communications Technology's
1993
Service in Technology Award
for his contributions
to the cable industry.

AT&T

Congratulations

Dr. John Malone

President
Tele-Communications, Inc.

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US ELECTRONICS
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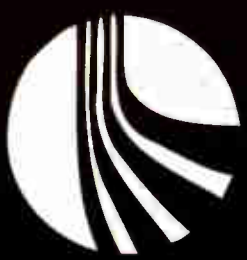

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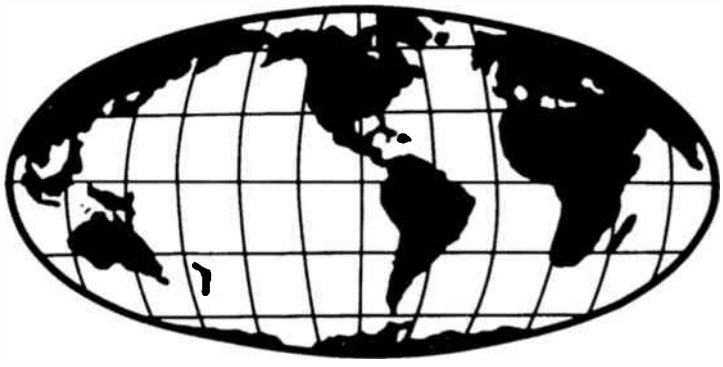

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TFC Times Fiber Communications

The next generation of cable: VCTV

John Malone sees the dramatic developments in fiber, digital and digital compression technology as making possible the deployment (within the next few years) of advanced interactive cable TV systems. Without the technological leaps, Malone says the services wouldn't be cost-effective. And TCI is showing its commitment to interactive possibilities with its involvement in the viewer-controlled cable TV (VCTV) project.

This test, which is scheduled to last until the end of this year, is the largest test anywhere of the market for video-on-demand (VOD) and enhanced pay-per-view (PPV).

TCI, AT&T and US West are cooperating in the trial, which is taking place in Arapahoe Country, south of Denver. TCI runs the VCTV enter and maintains the distribution network to the test homes (300 at any given time). AT&T provides the custom-made hardware and software, and the set-top equipment and remote control designed specifically for the trial. US West is providing a fiber-optic trunk that carries signals from the center to the TCI headend. As well, US West is conducting the market research.

TCI's Malone said, "These (interactive) services will feature hundreds of new programming options and exciting new possibilities for viewer control. We already know customers want more control of the selection and timing of programming, and this market test will begin to show us how these desires will play out in a real market setting."

Movies and events on command

Half of the suburban Denver VCTV trial participants can use the remote control to select from a printed list of more than 1,000 movies and special events. They have total control over what to watch and when, without having to leave home. They can "pause" programs for up to 10 minutes at a time.

The other half of the test group have an enhanced PPV service and are able to watch any of 15 movies and features a day. At least six movies are available to them at any one time, and they are scheduled to begin as often as four times an hour. Various prices are being tested, but are said to be generally equivalent to those found in video stores.

Consumers did not have to be a current subscriber to cable to participate in the trial.

"This is as close as we can come to and electronic video store," Malone says of the VOD service.

About halfway through the test, both groups were set to get both services. The VOD service is called "Take One" and the enhanced PPV is "Hits at Home."

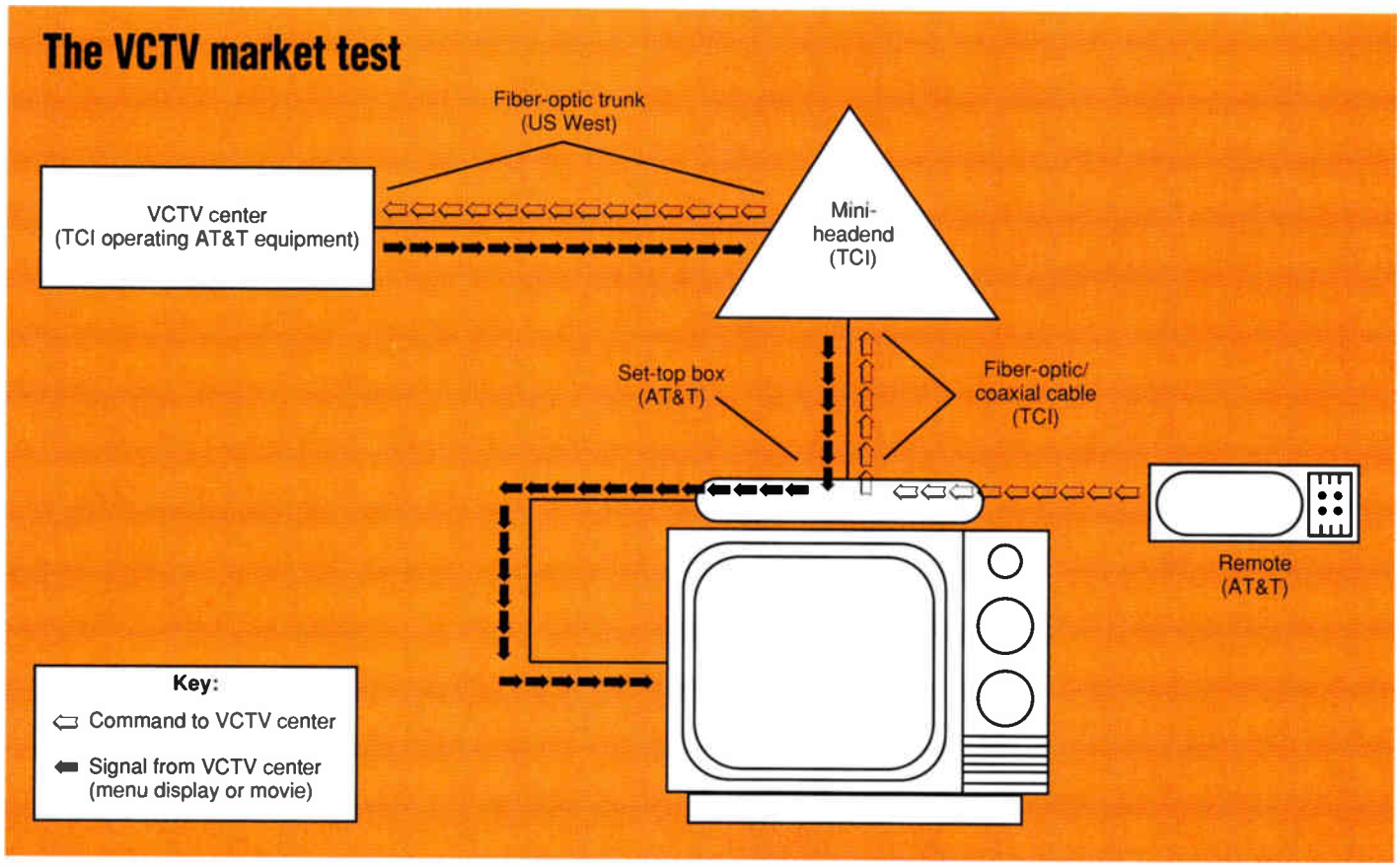
Supplier response

Jerrold Communications supplies the set-top equipment, modulators, encoders and scramblers for the video source system. Optical Networks International supplies its Laser Link optoelectronics and AT&T-made fiber.

Looking forward

With this trial, TCI again is showing it is giving more than lip service to the possibilities the CATV technology boom has spawned.

"What we're trying to do here is figure out the next generation of investment for the cable TV industry," says Malone.



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Congratulations,
John!
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THANK YOU
For All you do
for the Cable Industry!

TCI explores the PCS front with McCaw

The TCI and McCaw Cellular Communications test of personal communications service (PCS) in Ashland, OR, not only allowed the companies to determine market demand for the wireless telephone service, but also gave TCI the opportunity to enhance cable TV service by installing new fiber into its Ashland system. TCI has announced its commitment to be serving 90% of its customers with fiber within four years.

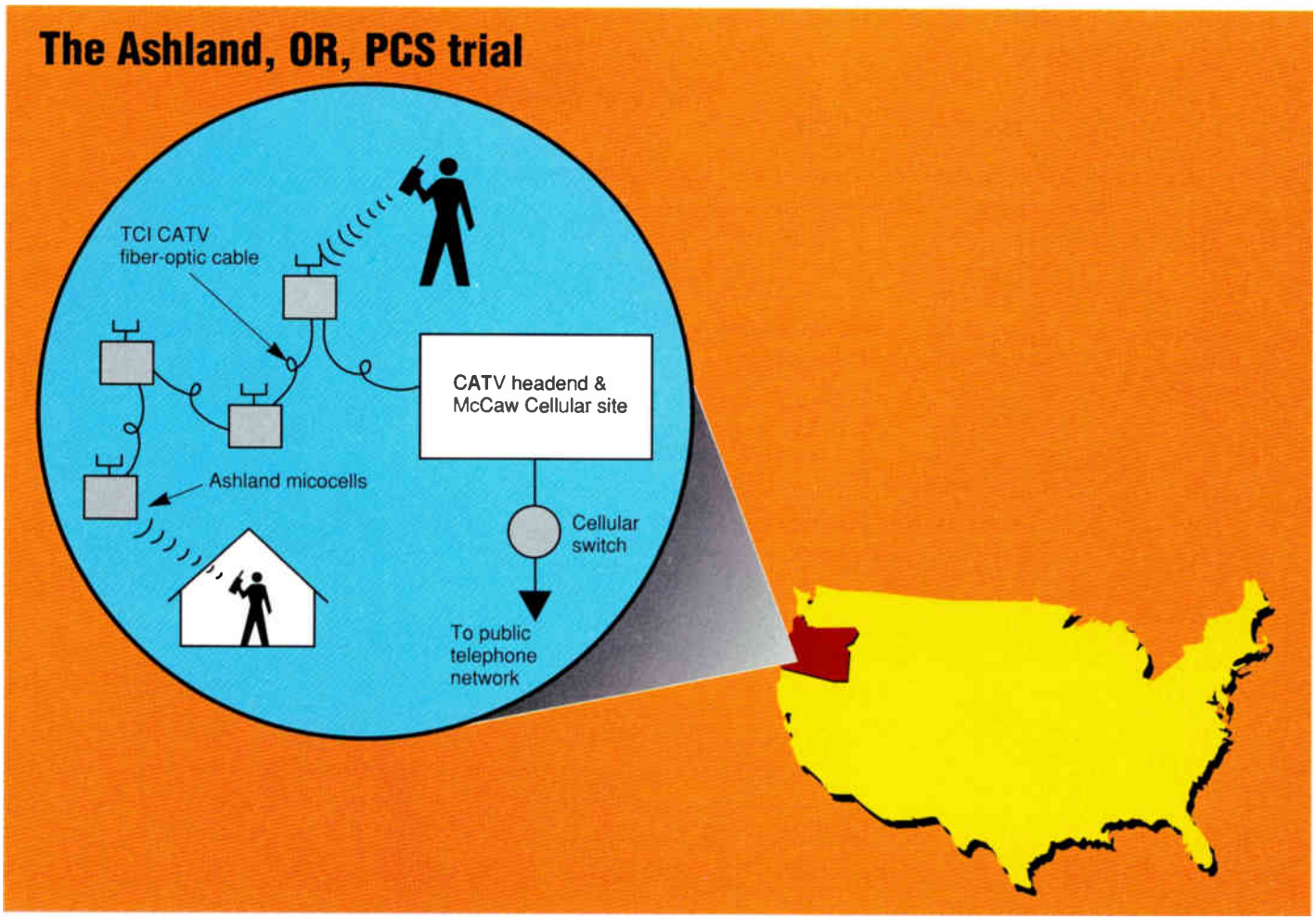
The Ashland Personal Telephone Service test began in March 1992 and was set to last six months. The companies envisioned PCS to be more like a cellular service than a cordless telephone, but it could be a less expensive service, having fewer features and more limited mobility than full-scale cellular.

"From a consumer marketing standpoint, this test is significant. If there is indeed a market for an affordable second-tier, cellular-like service, the cable industry can greatly accelerate its deployment in cooperation with the nation's cellular providers," said TCI President and CEO John Malone.

How the test was run

The Ashland service used pocket-sized, battery-powered telephones and cellular-like technology connected by fiber. There were two options for the 200 Ashland residents who participated in the trial. One provided wireless phone service in Ashland with the added convenience of cellular service outside the immediate area. The other was designed to work as a cordless extension of a home or business phone, allowing callers to place and receive calls anywhere in Ashland.

Participants for the trial were acquired through local advertising in newspapers, radio and television. After the completion of the trial, participants were involved in evaluating the service and identifying the benefits they realized from the service.



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of all you mean to the communications universe.

May you continue to use your
vision, leadership, and financial acumen
to further the interests of our industry.

John J. Rigas
President

ET '94: Record attendance

Nine hundred fifty people were in attendance when the Society of Cable Television Engineers held its 1994 Conference on Emerging Technologies Jan. 4-6 at the Pointe Hilton Resort on South Mountain in Phoenix, AZ. This figure represents a 25% increase over last year's attendance and the largest group to convene since the conference began.

Once again, this year's attendees had the opportunity to participate in the preconference tutorials that were held prior to the event. "We received a great response from the telephone industry in this year's conference," said SCTE President Bill Riker, "So the tutorials were held to acquaint people with telephony and digital terminology."

The 1994 conference reflected the recent changes in the telecommunications landscape by addressing the issues of digital compression, advances in fiber-optic technology and delivering

enhanced services over advanced networks.

Day one was comprised of two sessions. Opening the conference, Session A moderator Walt Ciciora, Ph.D., led a panel discussion on "Digital Compression and Transmission Techniques" with a focus on MPEG, a standard developed for storage and transmission of digital video. Session B, "Advances in Fiber-Optic Technology," was moderated by Dan Pike, vice president of science and technology for Prime Cable. Discussions centered around both practice and theory on the use of fiber, with a focus on advancements and fiber in future planning. Luncheon keynote remarks, addressing "Iridium," a new PCN network, were delivered by Raymond Leopold, chief engineer at Motorola Satellite Communications.

On day two, Session C, "Delivering Enhanced Services Over Advanced Networks," was moderated by Dean DeBiase, vice president of marketing with Zenith Electronics Corp. Panelists discussed interactive possibilities, full service networks and making technologies consumer-friendly. Luncheon keynote speaker Gary Arlen, president of Arlen Communications, addressed past interactivity efforts with a look toward the future in his speech, "It

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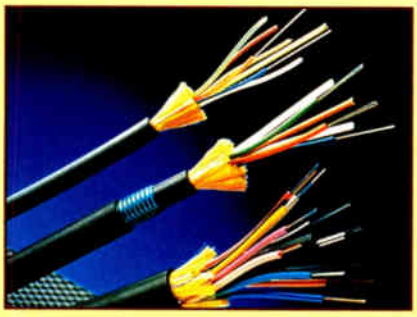
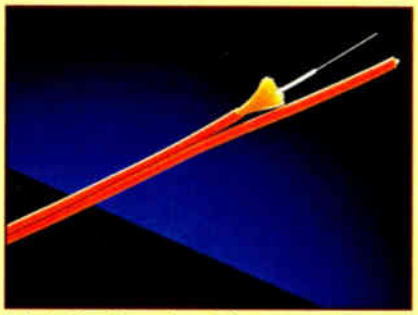


Loose tube cables.



Tight buffered cable.

Mini-Lesson #3 — Fiber-optic cable types

Optical fiber must be cabled for virtually all applications and several techniques exist. For outside plant cables, a design is needed that 1) isolates fibers from external forces, 2) mechanically decouples fibers from the cable, 3) provides excess fiber length allowing the cable to expand without affecting fiber performance, 4) impedes water migration through the use of gel-based fillers or water absorbing materials, 5) is optimized for long runs, 6) has high fiber packing density, and 7) allows easy fiber identification and administration. The loose tube design provides these necessary features.

Fiber-optic cables used inside headends and hubs must be 1) flexible, 2) easy to handle and connectorize, and 3) meet building fire codes. The tight buffered cable design is most often preferred indoors.

Mini-Lesson #4 — System basics

1) *Analog vs. digital.* Digital transmission of TV channels over a single fiber requires a much greater bandwidth than analog transmission. With the current technology, this requirement can restrict digital transmission to be used only for longer distance applications. This, however, is changing with the introduction of digital compression.

2) *System architectures.* Today, fiber is primarily used for trunk and supertrunk applications. Coax is used from the trunk to the home. Newer architectures, such as fiber-to-the-feeder (FTF) are now being used. With fewer cascading amplifiers, FTF is more reliable and offers high signal quality, high channel capacity and has the flexibility to permit system growth.

may differ from coax. Both the use of existing cable runs and new construction stipulations should be discussed. And, future upgrade potential and how to accommodate it must be studied. For example, should cable with spare fibers be installed? Is a heavier messenger required for future overlashing?

Craftsmen should be instructed in cable handling techniques through discussion and hands-on experience. The differences in handling fiber-optic cable and coax cable should be understood prior to installing the cable plant. Installation techniques for aerial, buried and duct applications are essential for field personnel. (See Mini-Lesson #5.)

Hands-on training

Actual product use and handling is an important feature of technical training. Demonstrations by instructors may provide initial insight, but each student should have ample opportunity to work with the products and tools required for proper handling and installation of fiber-optic cable. Safety precautions should be taught and practiced during training, for example. (See Mini-Lesson #6.)

Hands-on instruction should be presented within the context of the system. For example, splicing instruction should not be limited to operating a fusion splicer, but also cable sheath removal, fiber handling and closure assembly.

Both splicing methods — fusion and mechanical — should be taught. For permanent splicing in cable TV systems, the fusion method ("melting" two fiber ends together) is typically used. Mechanical splicing is typically

Fiber-optic training enhances system effectiveness

By Rebecca S. Frye
Training Supervisor, Siecor Corp.

If your cable system currently uses or is considering using fiber-optic technology, training is a must. Initial training introduces staff, engineers and technicians to the principles of fiber optics within the requirements of the cable TV system, fiber-optic products and how to use them, and the latest splicing, testing, documentation, restoration and maintenance procedures. For those systems where fiber is currently in place, refresher training is needed to ensure all who use the products are kept up-to-date on the procedures.

Anyone involved with a fiber-optic system — from the decision-making manager to field personnel — should understand the basic principles of fiber optics. Training introduces managers to the fundamentals and can arm them with the terminology and concepts necessary to make educated decisions. Hands-on courses for craftsmen should always begin with fundamentals, building the foundation for these skills.

An up-front investment in training quickly pays for itself by the quality of service provided by your staff; the level of performance attainable is much higher. Training costs money, but ignoring training needs ultimately can prove more expensive. "Trial-and-error" training will prove more costly in the long run than initial training conducted by professionals.

In addition to discussing the "whys" and "hows" of training, this article also will highlight curriculum topics through mini-lessons.

Initial training

Initial training should incorporate both an introduction to the principles of fiber-optic technology, as well as hands-on experience using up-to-date products. Skills should be provided to assist operators in developing and implementing maintenance and restoration plans as well. A basic course outline typically includes:

I. Introduction to fiber optics — basic theory and terminology.
II. Introduction to fiber-optic cable designs and applications.
III. System basics — analog vs. digital, system architectures, route planning.
IV. Fiber-optic cable installation — handling and placement techniques, and safety requirements.
V. Hands-on work — cable sheath removal, proper use of fusion splicers, assembly of mechanical splices and field-installable connectors, achieving low splice loss, closure assembly and operating test equipment.
VI. Documentation.
VII. Troubleshooting.
VIII. Emergency restoration.
IX. Maintenance plans.

In preparing to splice, a cable's sheath must be removed to access fibers. For loose tube cable: 1) remove appropriate length of outer sheath. If the cable includes armor, remove it as well. 2) For armored cable designs with an inner sheath, remove the appropriate length of inner sheath. 3) Cut the ripcord. 4) Ground the cable if necessary. 5) Cut the strength member and central member to the specified length. 6) Unstrand and clean buffer tubes. 7) Remove the buffer tubes in six-inch increments to the specified length. 8) Clean the exposed fiber.

Mini-Lesson #1 — How fiber works

The information is encoded into electrical signals and then converted to light signals. The light then travels down the optical fiber. At the end of the fiber run, a detector changes the light signals into electrical signals, which are decoded into information.

Introduction to fiber optics

An introduction to fiber-optic technology as it applies to cable TV systems is of value to anyone within a cable system — from general management and design engineers to installers and technicians. Knowing and understanding that fiber optics is a medium in which information is transmitted through glass fiber in the form of light is a necessary first step. (See Mini-Lesson #1.) It also is important to understand the advantages optical fiber brings to cable TV systems, including low loss, large bandwidth, immunity to electromagnetic and radio frequency interference, small size and light weight. Cable TV system operators have found optical fiber systems offer increased reliability and capacity for a variety of current and future architectures. Learning about the universality of fiber optics for video, data and voice communication provides operators with details on system growth potential.

Optical fiber brings with it a new set of terms and operational principles to understand on a basic level; understanding how it works will help installers and tech-

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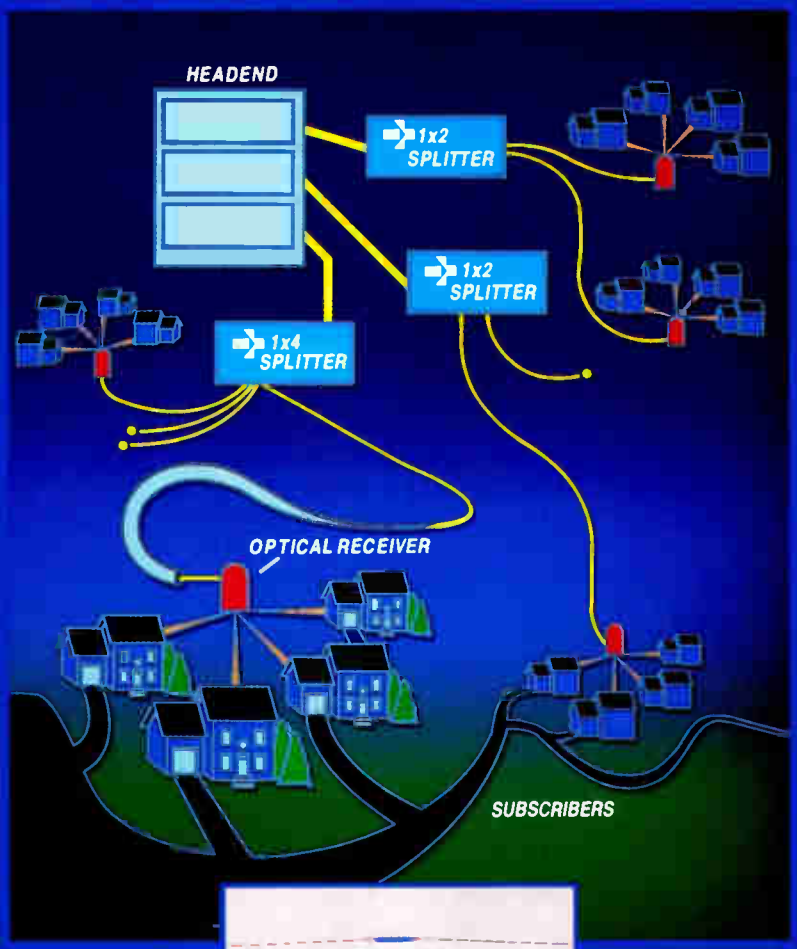

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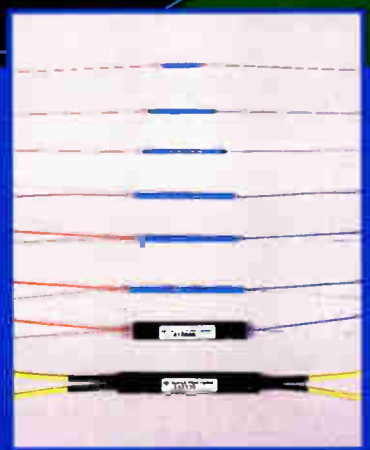

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Mini-Lesson #5 — Construction tips

1) Before placing the cable, inspect the right of way for any obstacles or problems with accessibility, and verify that splice point locations are accessible and protected from traffic.

2) Plan for cable reel setup and protection, winch setup, pull direction and plan, and lubrication points if necessary.

3) Be sure to monitor tension — tensions greater than the manufacturer's recommendation can cause permanent cable damage and invalidate the manufacturer's warranty. A breakaway swivel can be used to prevent cable damage in conjunction with tension-monitoring equipment.

4) Bend radius should be controlled. Minimum cable bend radius is specified by the cable manufacturer for both cable under tension and for long-term storage (installed condition). Bending a cable tighter than the minimum bend radius may result in power loss or fiber breakage. In general, it is recommended that the minimum bend radius be no less than 15 times the cable diameter during installation, and no less than 10 times the cable diameter during storage or after installation.

5) Optical cable may be overlashed to existing aerial coax plant or self-supporting designs may be used to provide an alternative to installing separate messengers or overlashing. There are two primary methods used when installing aerial cable: the drive-off method and the stationary reel method. The method used depends on the environment and operator preference.

6) Cable slack should be available for emergency repair or future plans. Slack and the completed splice point can be stored in a cable enclosure mounted to a pole, attached to the messenger or stored in a remote location such as a pedestal.

Mini-Lesson #6 — Safety tips

1) Do not look directly into a laser. Its light is invisible, so viewing directly does not cause pain. However, serious damage to the retina is possible because the iris will not close involuntarily as when viewing a bright light.

2) Gloves and safety glasses should be worn when handling and stripping cable.

used for restoration splicing.

While most fusion splicers include some degree of automation, practice is required to become proficient in using this equipment. Mechanical splicing is usually completed manually, with the two fibers being held in place by compression, friction or epoxy. Whether using the fusion or mechanical splicing method, achieving an acceptable splice loss is very important. Proper handling of optical fibers, alignment accuracy as well as environmental factors can impact splice loss results. (See Mini-Lesson #7 on page 106.)

Selection and use of optical hardware closures and cabinets should be taught as well. These products are needed to store and protect fibers at all splice and termination points. For outside plant environments, splice closures are used to protect fibers and splices. Students should be instructed in how to select splice closures for various applications, based on the number of splices, number of cables and application.

While most of the optical closures and panels are used in the outside plant today, indoor panels will be used for wiring headends as new architectures evolve. Like their outside plant counterparts, indoor termination cabinets are available in many shapes and sizes, for connectors, splices, couplers or other passive components, and for rack- or wall-mounting. Selection criteria should be provided as part of training.

In addition to operating splice equipment, students should use test equipment, including light sources, power meters and the multifunctional optical time domain reflectometer (OTDR). The types of tests most often required are fiber continuity, attenuation and splice loss.

As part of splicing and testing, training courses should teach students the procedures for developing link loss budgets for their specific system require-

ments. A link loss budget — the maximum allowable optical loss — considers transmitter power, receiver sensitivity, laser aging penalty, system length, splicing method and loss, repair margin, connector loss, and optical splitters or other passive components.

Documentation

The importance of test records and procedures for developing basic system documentation also should be part of the initial training program. Test records should be kept on end-to-end attenuation readings, a signature OTDR trace of the as-built system, route and cable plans, and a splice loss plan. This information is important to system operators to ensure long-term continued success of a system regarding maintenance, performance upgrade and system reconfiguration.

These records of test results and cable data will minimize unnecessary service calls, changes and downtime. System operators should be taught that careful planning and accessible documentation also will help avoid costly retesting or cable plant replacement when subsequent upgrades or reconfigurations occur.

Mini-Lesson #7 — Splice loss

How is a low splice loss achieved?

1) Accurate handling and preparation as well as operation of equipment is influential in the final results. For example, the fiber end faces must be mirror smooth, with no chips or other imperfections. Accurate cleaving will provide this smooth end face. If the end surface is poorly prepared a high splice loss will typically result.

2) Proper fiber alignment is very important. Fibers may be aligned using one of four methods: a) visually align the outside diameter of the fibers by looking at them through a microscope, b) take an OTDR reading and minimize the light loss across the gap between the fibers, c) LID-SYSTEM unit, or d) a lens profile alignment system.

3) The fiber geometry itself is another important concern. Light may be lost due to the differences in core shape of the fibers being spliced, for example. Or, loss can occur if the core is not centered on the fiber.

Troubleshooting

Knowing proper troubleshooting methods also will help keep a cable system healthy. Technicians should practice troubleshooting a cable plant to identify potential problems before they impede system performance. (See Mini-Lesson #8.)

Restoration

Troubleshooting is a primary step in system restoration. Once the problem is identified, system restoration can begin. The training course should include restoration techniques for field personnel and plan development for engineers and managers.

Maintenance plans

In addition to emergency restoration plans, a standard maintenance plan should be developed for cable systems. The pros and cons of on-site and on-call maintenance should be part of manager and engineer training. The components of a maintenance plan — personnel, records, equipment and materials, training, inspection schedules and restoration procedures — also should be part of the curriculum.

Refresher training

Once the initial training is complete,

Mini-Lesson #8 — Troubleshooting techniques

1) Localized cable attenuation may mean a cable bend is too tight.
2) Distributed increase in cable attenuation could be caused by exceeding installation specifications.
3) Excessive splice loss readings may mean a bad splice or fiber stress in the vicinity of the splice.

refresher training should be scheduled regularly to ensure operators, installers and technicians properly use equipment needed for installation, maintenance and restoration. To ensure refresher training occurs regularly, consider making it part of the maintenance plan.

Much of the refresher training involves hands-on operation of equipment used in the system. If installers use a fusion splicer or an OTDR infrequently, then regular practice should be scheduled to keep these skills fresh. If new test or splice equipment is purchased, anyone who will be responsible for using the equipment should receive training. This equipment should be used within the context required for the system, as well. For example, splicing exercises should involve more than just operation of a fusion splicer or assembly of a mechanical splice. It also should include cable preparation and closure assembly as required by the cable system.

Refresher training also should include system-specific procedures. It is hoped, of course, that cable cuts are not a common occurrence within any cable system. However, when they occur, every staff member involved in restoration should feel confident in completing the tasks required. Regular mock restoration exercises are recommended to provide experienced craftspeople the opportunity to keep these skills fresh. Cross-training should be considered for back-up assistance.

Top training courses

Select a training program that best meets the needs of *your* staff. Consider the size of the classes offered — smaller classes usually provide more practice by students and more access to the instructor for questions. Instructors should have field experience. This "real-world" aspect ensures your instructor understands your application needs. Instructors may have insight to specific issues and can share their actual field experiences.

A lion's share of the training should be hands-on — by the pupils. Watching an instructor perform splicing in a classroom or on video does not equip the student with the skills needed to work in the field. Each student should be given ample opportunity to work with the equipment; groups assigned to single pieces of equipment greatly hamper hands-on time.

Training is most beneficial when the student understands the entire cable system, not simply individual components. This allows students to think through a trouble situation and identify potential causes with a full understanding of all the components, their operation, interaction and connectivity. As an analogy, just because your car has stalled doesn't mean it is out of gas.

On-the-job training may be used to meet a specific installation need. An instructor may be available to come to your location, instruct your staff in procedures and then remain available to assist installers on-site.

Whatever program is selected, keep in mind that both initial training and refresher training are essential for a quality system operation. **BTB**

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Technical training — Another leadership resolution!

By Ralph Haimowitz
Training Director
Society of Cable Television Engineers

Three cheers for Ron Hranac and his "Editor's Letter" in the January issue of *Communications Technology*. He has hit the proverbial nail right on the head with a "smart bomb."

I have spent many years looking at the problems in this industry, and one of the basic faults is that not nearly enough training is given to provide employees with the knowledge to perform their jobs at maximum efficiency. Hranac's assessment of the primary concern being the bottom line is all too true. There never seems to be enough funding in the budget to do the training job to provide the kind of service — good service — that results in customer satisfaction.

Too many people justify their actions by saying, "We have a great technical staff that gets the job done." But what I hear and see in the field is in conflict with this opinion. Let me say first of all that the technical people are doing one tremendous job, particularly when you consider the inadequate amount of training that they have had. The vast majority of our technicians know they could do their jobs far better and more efficiently if they could only get the training they need.

Other excuses for not providing the training needed are:

1) We don't have the time or enough personnel to let anyone go for training.

2) We can't afford to send anyone for training.

3) We can't spend the time for new hires to be trained before we put them to work.

4) We do all of our training through in-house, on-the-job training (OJT).

5) Our people have been maintaining our systems and providing service to our customers for a long time. They already know their jobs.

6) Just about any other excuse you can think of.

"The vast majority of our technicians know they could do their jobs far better and more efficiently if they could only get the training they need."

Bottom line, meet front line

Let's look at some specific examples. Which individuals within the cable company usually have face-to-face contact with customers at the beginning of the customer/company relationship, and are the ones that new customers base their opinion of the company and its employees upon? If you answered the installers, you got it right.

In most cable companies, who are the employees least likely to receive little more than token training to do their job, are usually one of the lowest paid groups, are usually given more work orders to accomplish than can be done properly so that they are forced to cut corners, and are frequently told that they must work their way up the ladder to be successful by becoming technicians? Again, if you answered installers, you are correct. For some, the solution was to use contract installers — people who get paid by the number of installs they do per day. (This really promotes quality work don't you think?)

The drop cable and fitting manufacturers must be happy — they sell enough of their products to redo almost every house drop and fitting every year. Yet the average drop today should last 12 to 15 years under normal circumstances. The reason appears to be that installers and technicians either do not know how to troubleshoot problems or are not given enough time to find the specific cause, so they replace all of the fittings first and then, if that doesn't correct the problem, they replace the entire drop. It seems to me that this should have a dramatic effect on the proverbial bottom line.

Time after time it has been said and proven that the house drop causes 90% of the reception problems in cable, and the majority of those are caused by bad fittings. Do you believe that those bad fittings are the result of product failure or improper installation? How much effort is being placed on training of installers and technicians to see that they have the best tools and knowledge to do the job right? How much quality control is done within our systems to see that these employees continue to do the job right?

The SCTE has had a program that began three years ago to certify installers, yet the involvement nationwide has been poor. Although this program only costs $25 per person and should be given to every installer and service technician in the industry, the feedback I get from the field is that most systems can't make that kind of financial investment in installers. In fact, most systems do not pay for their technical staff to be members of the Society or attend training seminars unless they are supervisors.

Cable TV is not an industry that can operate properly without having well-trained, skilled employees — particularly those that work on the cable plant. This is not just a put-it-in, change-it-out, turn-it-on business. To perform the skills involved with installing and servicing the customer, and maintaining the cable system from signal source to TV set in the most timely and efficient manner, requires a much greater amount of training than most systems are provid-

ing. We are facing new technologies that can ensure a great future for our industry for years to come if we do our jobs right, but how can we keep up with this technology when our employees don't even have a thorough knowledge of the basics of cable TV yet?

Now we are again faced with federal regulation. The Federal Communications Commission has adopted new, more stringent technical standards that we will have to live with. These regulations were adopted to ensure that cable customers are receiving the quality and service they are paying for. Does anyone really think that this was imposed upon the industry because we were doing the job right?

What may be our last opportunity is here and now to make those "resolutions" that Ron Hranac suggested. Is there technical training available in our industry to ensure that our technical employees are highly skilled and well-trained to do their jobs more efficiently and keep our systems operational with fewer outages and problems that cause customer dissatisfaction? Absolutely! Are in-house training programs and OJT enough to meet the industries needs? Absolutely not! In-house training and OJT are essential to proper job performance but do not go far enough in providing the theory and understanding of how a cable system works or how to troubleshoot problems quickly, correctly and efficiently.

The line starts here

Let's take a look at some of the better known resources that provide the type of training needed by technicians at all levels in a cable system. The National Cable Television Institute offers new correspondence courses that cover every aspect of cable TV from installations to fiber optics. The SCTE, in cooperation with NCTI, has a scholarship program that individuals may apply for to use for these courses when their cable company will not provide the cost of this training.

Several of the manufacturers have some very in-depth technical training available. Among these are Jerrold, Scientific-Atlanta and C-COR for cable plant and headend courses, and Phillips with its traveling Mobile Training Center. Tektronix has a course for the new FCC proof-of-performance tests that trains technicians and engineers in how to meet these new requirements.

Most other manufacturers and vendors provide technical training about their type of product through local SCTE chapter and meeting group seminars, as well as many other experts in cable technology who provide training and information about every aspect of the technical side of our industry. These local meetings offer the most for the money as their full sessions average between $10-$30 and usually include lunch.

The Society is probably the greatest provider of training to the industry. It has a library of publications and videotapes that are for sale to members and non-members alike. Each year, we hold two confabs filled with several days of technical training. The first of these, the Emerging Technologies Conference, occurs in January each year and presents topics concerning new and developing technology for the cable industry, such as the latest in fiber optics, direct broadcast satellite (DBS), and digital compression. The other program is the annual Cable-Tec Expo, where the first day is an Engineering Conference followed by two and a half days of technical workshops, exhibits and certification testing.

The Society also has three-day technical training seminars that are offered at various locations around the country eight to 10 times a year. These sessions are usually accompanied by a one-day Occupational Safety and Health Administration/safety seminar that every system manager and safety coordinator should attend to see what they are responsible for regarding the safety, health and welfare of their employees and what materials are available to help them reach compliance.

There is only one source of certification for cable TV engineers, technicians and installers, and that is through the Society of Cable Television Engineers. The Broadband Communications Technician/Engineer (BCT/E) Certification Program offers testing at the engineer or technician levels in seven categories covering every area from headends to the customer's equipment in the home. Successful completion of each of these categories shows that the individual who passes them knows the information that the category is based upon. The Installer Certification consists of three examinations — one is written and two are practical — that show the individual can perform and troubleshoot installations using the latest generic techniques, and perform efficient, problem-free installations for improved customer satisfaction and fewer return trouble calls.

The sources to improve our operations and performance are there. This industry can overcome our reputation of providing poor service to dissatisfied customers. We can survive the competition if we just do the job right. Now it is up to you to present this information to your management and convince everyone that the time has come to get our employees properly trained, to change our image and meet the needs of the industry. **BTB**

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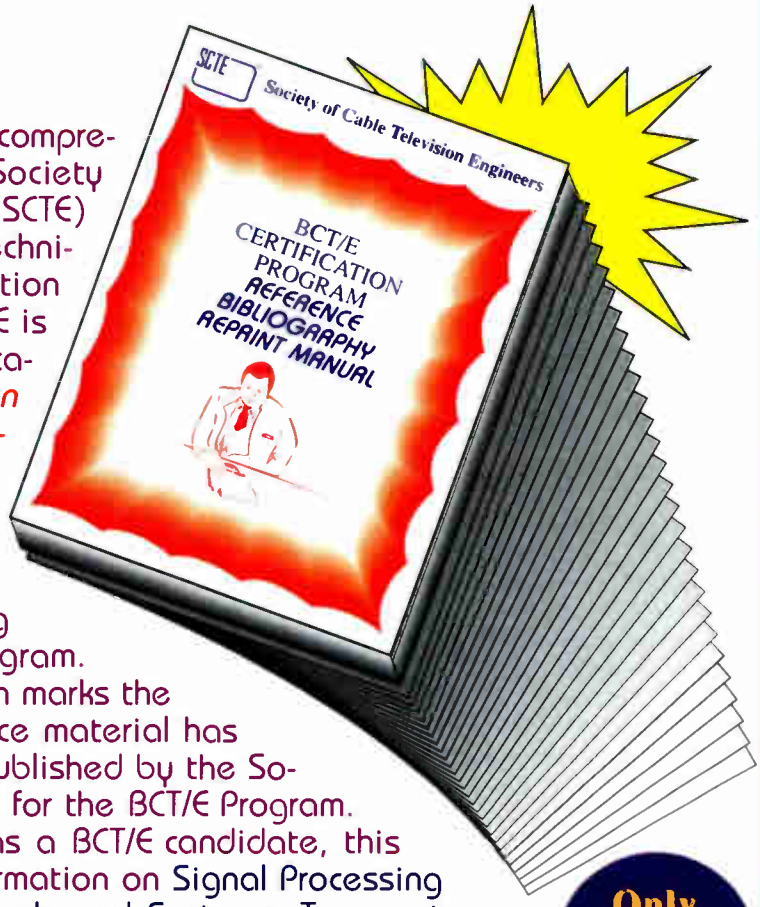

If you've been waiting for a comprehensive study guide for the Society of Cable Television Engineers (SCTE) Broadband Communications Technician/Engineer (BCT/E) Certification Program, the wait is over! SCTE is proud to announce the publication of the *BCT/E Certification Program Reference Bibliography Reprint Manual*, a deluxe book collecting reference materials recommended as study materials to assist BCT/E candidates in preparing for Categories I-VI of the program. This fully authorized publication marks the first time this valuable reference material has been officially compiled and published by the Society for use as study material for the BCT/E Program. Even if you are not enrolled as a BCT/E candidate, this manual offers a wealth of information on Signal Processing Centers, Video and Audio Signals and Systems, Transportation Systems, Distribution Systems, Data Networking and Architecture and Terminal Devices. It's a must for any cable TV technology library!

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Safety training using NCTI self-study courses

By Raymond G. Rendoff
Director of Technical Curriculum Development
And Douglas B. Ceballos
Senior Technical Curriculum Writer
The National Cable Television Institute

An uninformed CATV technician lacking in safety consciousness, is inviting an accident, injury, death and/or property damage. Self-study training material can provide both the necessary in-depth technical information and the related safety references and requirements to safely perform routine tasks. References are made throughout each National Cable Television Institute self-study lesson to safety standards and the required safety equipment to help the cable employee minimize the risk of personal injury, death and/or property damage.

NCTI self-study courses provide the appropriate rules, regulations and specific safety requirements for safely installing, troubleshooting and maintaining the CATV system. Self-study training material can present safety issues, practices, equipment and techniques that are relevant to the cable system's needs. Various training devices are used to help the cable installer/technician learn the safety requirements. Examples of these training devices include the text, cautions, warnings, charts, graphs, illustrations and safety equipment/safety application photos. The included illustrations clarify safety conditions or requirements, while actual field photos portray correct safety practices and proper applications. Hazard warning boxes convey potential danger to the installer or technician and the urgency of following particular safety practices and requirements to minimize the risk of personal injury, death and/or property damage.

References to safety standards, equipment and practices are written and illustrated in the context of the cable employee's job responsibilities, tasks and working environment. Safety also is taught and emphasized in all aspects of electronic theory and system troubleshooting. Each self-study lesson is revised every two years (if necessary) with any changes in the safety codes or regulations and relevant safety equipment.

"NCTI self-study courses provide the appropriate rules, regulations and specific safety requirements for safely installing, troubleshooting and maintaining the CATV system."

How the courses work

Each self-study student has many opportunities to learn about all aspects of safety throughout the course of study. This safety training material is presented in the text, the illustrations, the labels and the figure captions. Review questions at the end of each section reinforce and examine comprehension of the most important material.

The questions challenge the student's ability to recall and the extent of comprehension, while the answers confirm the actual amount of correct understanding and comprehension. The glossary of terms that appears before the daily exam lists and defines all new terms. These definitions clarify the safety terminology used in the text and illustrations. The degree of comprehension can be quantified through the 10-question written exam at the end of each self-study lesson. A closed-book, 50-question

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final exam proctored by an on-site system person is required upon successful course completion.

Self-study courses are concerned with both the accuracy of the technical information and related safety areas. The integrity of the course content depends upon the accuracy, relevance and practical application of the material, and how current it is. This overall integrity is ensured by conducting adequate research of current safety standards, soliciting technical support from the appropriate equipment vendors, interviewing veteran CATV field personnel, employing CATV system experienced writers, editors and instructional designers, and utilizing a credible technical review committee comprised of industry experts in the particular field of study.

The members of the technical review committee review the self-study lesson for technical accuracy, relevance, practicality and safety emphasis. They are requested to inject their views on current practices based on current safety standards and their own company policies. This invaluable feedback permits NCTI's writers, editors and instructional designers to include those system and corporate viewpoints.

There are many rules and regulations that cover the cable TV industry. While the cable industry has been paying strict attention to the Federal Communications Commission, Equal Employment Opportunity, state and local cable ordinances and regulations, concern about safety is increasing. Too many accidents, injuries, deaths, Occupational Safety and Health Administration (OSHA) fines, lawsuits, and/or damages to property have occurred or are now occurring. Safety-related information included in NCTI self-study courses addresses this increased concern.

Proper compliance with OSHA, the American National Standards Institute (ANSI), the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Manual on Uniform Traffic Control Devices (MUTCD), local ordinances and cable company policies all have a direct impact on ensuring a safe working environment for the cable installer/technician.

It is important that all cable TV installers and technicians have access to this information to safely complete their jobs. NCTI self-study courses provide this important aspect by presenting the safety information, equipment and corresponding regulations that pertain to job performance and responsibilities.

During a typical installation, work performance is covered by OSHA, ANSI, MUTCD, NEC, NESC, local ordinances and cable company installation procedures. The MUTCD specifies correct procedures for parking the company vehicle, traffic cone channeling and tapering distances when the vehicle causes a diversion of traffic flow. OSHA uses Title 29 of the Code of Federal Regulations and ANSI standards to cover safety requirements of personal safety equipment and tools used in a CATV drop installation. Both the NEC and NESC cover safe grounding procedures and minimum drop cable clearances. State, local, county or city ordinances and CATV company procedures also specify safety requirements, procedures and drop cable clearances.

It is important that this safety information is available to all technical personnel. Not only should the lower level technicians be informed, but also the lead technicians, technical supervisors and technical managers. Ignorance is no defense when dealing with the safety of an installer or technician. **BTB**

Benefits summary

There are many benefits in using NCTI self-study training material to satisfy safety training requirements. They include:

1) Reference resource to obtain safety rules and regulations information.
2) Readily available reference material.
3) Highly illustrated to visualize critical concepts.
4) Applicable and relevant to job responsibilities.
5) Rationale and application of safety-to-job performance.
6) Provides some checklists for inspecting safety equipment prior to use.
7) Supplemental material for safety meetings.
8) Prerequisite and/or supplemental material to on-site training.
9) Convenient to schedule study time (no classroom or computer necessary).
10) Credible content.
11) Updates available every two years.
12) Affordable means to train employees and validate retained knowledge.

Hands-on learning: The key to the MTC

By Laurie K. Caraher
Technical Writer, Philips Broadband Networks Inc.

The best way to teach technicians how to sweep an amplifier cascade or perform a fiber splice is to provide them with some basic instruction and then let them try it for themselves. The problem with doing this in a real cable system, however, is that subscribers will not appreciate their mistakes.

The opportunity for subscriber-free, hands-on learning is the key to the Philips Mobile Training Center (MTC), the only traveling cable system in the CATV industry. Developed by Larry Richards, manager of technical support services, and his staff over a decade ago, the Philips MTC is a 45-foot trailer containing a complete headend, amplifier cascade, RF and fiber-optic transmission system, and various types of test equipment. Coupled with the thorough, three-day mobile training seminar, this traveling laboratory gives students the chance to apply what they've learned in the classroom to real situations.

Cutting-edge training mobilized

These traveling seminars, accompanied by the MTC, visit various locations throughout the United States each year. Since its inception in 1981, the MTC has helped over 8,000 students better understand CATV practice and theory. Philips' application engineers lead the seminars and laboratory demonstrations. Class sizes are limited to between 30 and 35 students so that everyone attending can experiment with the equipment in the laboratory.

Classroom topics include RF and video distortions, headend basics, amplifier applications and operation, interdiction and personal communications networks (PCNs), system architecture, fiber optics, and digital compression. There is a two-hour hands-on session on each day of the seminar, and activities include: using the spectrum analyzer, sweeping an amplifier cascade, and a demonstration of direct broadcast satellite (DBS) and digital technology. In addition, an optional hands-on fiber-optic session gives students the chance to make mechanical and fusion splices.

See and do what you learn

The MTC strives to put theory into practice by watching how classroom hypotheses behave in real situations. Before the company gave him the opportunity to develop this training center on wheels, Richards often was frustrated by the necessity of creating fictional demonstrations of such things as distortions. The MTC lets students actually see what they've been learning about.

"If I can show you distortions and demonstrate how to measure them, that's important," Richards said.

Who benefits?

The seminars are open to students of all levels of technical experience in the cable TV industry. According to John Koczan, supervisor of application engineering and MTC instructor, students range from non-technical cable personnel to installers and technicians to senior engineers. Instructors often "fine tune" their presentations to match the technical level of the audience while still covering the same course material. A challenge for all instructors, this fine tuning allows all students to actively participate in the lectures and laboratory work. Instructors also try to keep classes informal so that all students are comfortable enough to participate in discussions.

"We encourage everyone to speak up and ask questions," Koczan said.

Not a sales pitch

Besides the traveling laboratory, the content of the seminars also makes the Philips program unique in the industry. The program strives to teach CATV principles and technology without stressing equipment brands.

"We teach generic CATV you can apply to any equipment," Richards explains. Such generic training demonstrates Philips Broadband Networks' commitment to the advancement of CATV technology, which is beneficial for the company.

"The people we train today are the decision-makers of tomorrow. They'll remember that we helped them learn about CATV," Richards added.

New training techniques for '93

Several changes are planned for both the seminar and the MTC in 1993. Prompted by the number of students who attend more than once and developments in fiber optics and digital compression, Richards and his staff have expanded the curriculum and added new equipment to the laboratory. The seminar now offers its students what Richards calls a "primer for digital compression."

"The (Philips) program strives to teach CATV principles and technology without stressing equipment brands."

The program will explain the basics of this new technology to the people who will be involved in its use in broadband networks — the technicians, installers and managers. Providing the basics now, while digital compression is still being explored, will help them keep abreast of its technical developments. Philips has added equipment to the MTC to illustrate classroom discussions on digital compression. Students will learn about video measurements and sweep with digital systems and participate in demonstrations.

Besides this introduction to digital technology, Richards and his staff are developing a pilot program stressing the more practical aspects of fiber. Currently, Richards said, the seminar stresses the electrical engineering aspects of fiber. Many systems are preparing to add fiber to their systems, however, so Richards is hoping to add a program oriented to mechanical engineering that includes practical topics like site planning. Such a program would require adding a fourth day to the seminar.

When and where

The MTC kicks off the spring leg of its 1993 route in Mobile, AL, and completes its journey eight stops later in Bellingham, WA. The fall session begins in Minneapolis and winds up in Syracuse, NY.

Mary Dunn, who coordinates the MTC's activities, expects 540 students to visit the MTC this year. Selection of training locations is based on several criteria, Dunn explained. Often she schedules seminars in areas that are convenient to major cable systems, particularly those that regularly use the seminars as a training vehicle. The traveling seminar also tends to revisit areas that have attracted full classes in the past. Finally, she often listens to the recommendations of outside sales reps who may know of operators interested in sending employees.

This year, Philips hopes the MTC attracts an international audience by stopping in Bellingham, WA and Plattsburg, NY, Dunn said. Both locations are convenient to U.S. and Canadian systems.

Philips instructors often take the training seminar abroad. Usually arranged by Philips' outside sales reps, the seminar has visited countries in Latin America, Europe and the Far East (including Argentina, Brazil, England, Israel, Poland, Japan, Korea and China). While the MTC cannot travel outside the United States, instructors still give their students the opportunity for hands-on learning by using a demonstration cascade, which "is a small cable system on movable dollies," Richards said. Although not as extensive as the equipment on the MTC, the demonstration cascade also allows students to work with real distortions, like composite triple beat and carrier-to-noise.

A complete package for both the accomplished veteran and the non-technical novice, the seminar offers two important things. First, the training applies to any brand of equipment. Second, and most importantly, the MTC brings to the seminar a working cable system on which students can practice what they've learned — without forcing subscribers to live with the mistakes. **BTB**

PRODUCT NEWS

Mini-OTDR

Tektronix introduced the TFS3030 FiberMini mini-OTDR for fiber-optic system installation and maintenance. The company says the unit offers most of the features of a high performance, full-featured OTDR at a price 25% less than other mini-OTDRs. The unit also features automated fiber analysis and a rugged, mini package.

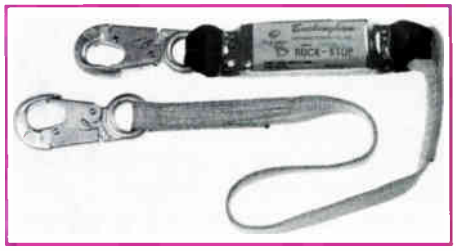
It is field-portable and offers single or dual wavelength analysis. Patented algorithms and a specialized, digital signal processor combine to offer an automated event finder mode that accurately reports more events across greater fiber lengths than any other mini-OTDR, according to the company.

This unit features multiple measurements, OTDR-like resolution, control over measurement parameters and a display with infinitely variable zoom. The basic configuration provides 18 dB of measurement range for a 0.5 dB loss measured within three minutes, up to 55 km from the front panel.

The unit has single-button, automated location of events as small as .05 dB displayed in either table or symbolic waveform format. Three configurations are available. All versions have an RS-232 port for screen output to a printer.
Reader service #180

Deceleration lanyard

According to Buckingham Manufacturing Co., its new Buck Stop deceleration lanyard reduces the impact force of a 200-pound simulated torso to less than 700 pounds if dropped six feet. It activates when 600 pounds of pressure is applied. In contrast, the same test for a nylon rope lanyard would exceed 2,400 pounds.
Reader service #207



Design system

Cadix International Inc. announced the CX-2001 CATV design system, which operates on a Hewlett-Packard workstation. The company says it totally automates the plant design process, performs on-line engineering analysis and assists in plant maintenance. High-speed display functions, when combined with a workstation's power, make the redraws, zooms, etc., extremely fast, even with large maps, according to the company.

The system's flexibility allows the

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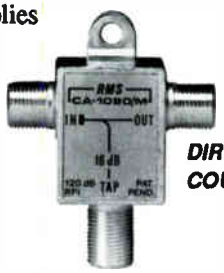

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performance of "what-if" designs. Utilizing the vector over raster capabilities, existing base maps can be scanned quickly and design begun immediately. During design, the system automatically performs signal loss calculations. Errors are automatically detected to ensure the integrity of the design. CATV design architecture such as tree/bush, tree/branch, switch/star and fiber-optic, can be accommodated.
Reader service #208

Cable monitoring

Automated Light Technologies Inc.

introduced what it says is the first fiber-optic cable monitoring system designed to use the cable sheath to identify cable damage as well as vandalism or penetration of cable splices and handholes. The 1200 cable monitoring system (CMS) combines the features of the company's 1100 CMS with the ability to place remote sensors anywhere on the cable route.

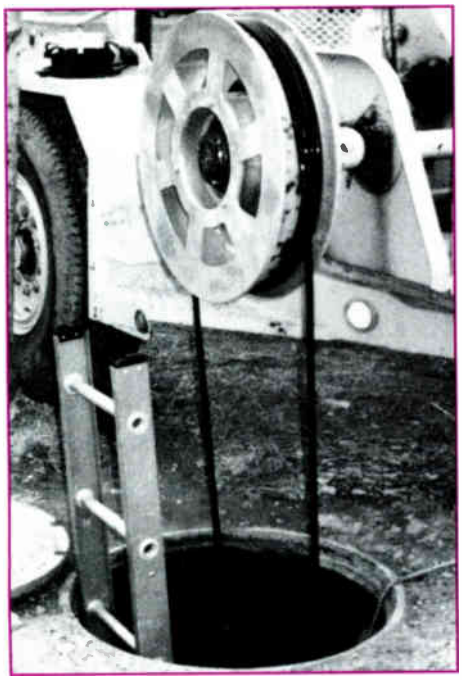
The company says the new system continuously monitors up to 100 miles of fiber cable and up to 99 remote sensors. It alarms on any damage to the outer covering or jacket of any type of cable with at least one metallic element. The system is permanently located at one end of a cable and continuously monitors for a change in cable condition. An adjustable alarm threshold allows it to show only new cable damage. Separate alarms are generated for cable sheath faults, cable breaks and remote sensors.

The system also supports up to 99 remote sensing units (RSUs) that can be placed anywhere on the cable. Detectors are attached to the RSUs for different types of problems, including water detection tape to determine if a splice closure is leaking and intrusion detectors to alarm the instant a handhole or manhole cover is removed. Any normally open detector also can be used with an RSU. Once triggered, the RSU communicates a unique two-digit code to the system. This code identifies which alarm has been activated. The RSU uses the cable sheath for all power and communications. No separate power or wiring is required.
Reader service #206

Batteries

Two new batteries were introduced by Gates Energy Products to the company's Genesis application-built, sealed-lead rechargeable battery product line. Designed specifically for standby, cyclic and extreme duty power applications, the line now includes a 50-watt/cell battery in the high rate discharge (HrD) series and a 12 ampere-hour battery in the cycle duty (CyD) series.

The company says both new batteries offer up to a 40% lower internal resistance rating compared to equivalently powered conventional batteries, while also providing a high voltage delivery. In addition, both batteries are almost 20% lower in height, up to 27% lighter in weight and offer twice the shelf life of comparable sealed-lead batteries. Greater performance in a smaller and lighter package is attributed to a proprietary pure lead-tin grid manufacturing process. The lead-tin chemistry provides increased power density over lead-calcium, while also providing long life.
Reader service #205



Pulling capstan

GMP's new fiber-optic pulling capstan can be easily and inexpensively used with existing pulling equipment, winches and capstan drives in a special "accessory approach," according to the company. The unit can be mounted on existing equipment without special modifications or new pulling gear. It pulls the cable with synthetic rope or Muletape, or pulls the cable directly.

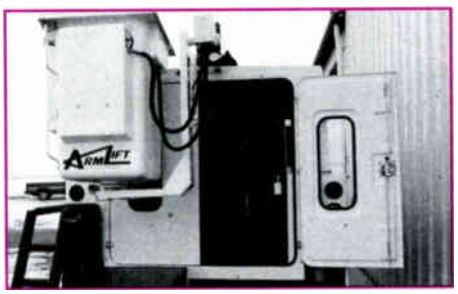
Constructed of aluminum alloy, the capstan has a 25-inch (635 mm) working diameter and pulls with 600 pounds (2,700 newtons) force and 600 fpm speed. It can be set up as a mid-assist booster for use in pulling longer continuous lengths while keeping the pulling tension below the minimum threshold. It also can be coordinated with quadrants, sheaves and other GMP accessories.

Two versions are available: with or without an integral torque limiter that limits the pulling tension to a calibrated maximum, typically set at the factory at 600 pounds force. Either unit can be easily mounted on a 2-7/16-inch diameter drive shaft with either a bayonet or cross pin type connection.

Reader service #204

Bucket

Armlift, a division of TG Industries Inc., introduced its rotating walk-through bucket for telescopic lifts. The company says the hydraulically leveled bucket features 200° rotation and an infinitely locking brake for stability in any work position.



The bucket can be equipped with optional fiberglass lid and full splicing curtain, folding seat and bucket heater. It allows the operator to position the bucket for convenience in cable splicing without repositioning the splicing machine or truck. Rotating buckets are available on both side and end hung models.

Reader service #203

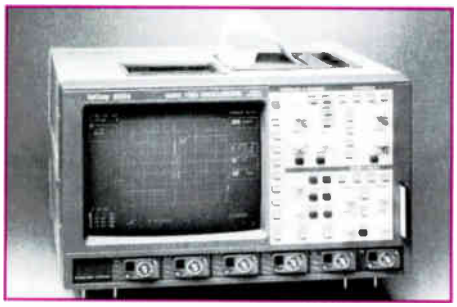
Power inverter

Dimensions Unlimited Inc. says its new series of power inverters that transform DC battery power to AC current are stable enough to drive video monitors without distortion. The inverters are designed for CATV trucks that use power sensitive video equipment and need a mobile, economical and

stable source of on-board 120 VAC electrical power.

Features include wall or shelf mounting, easy AC connection and an improved waveform stabilizer circuit. A new Video Wave option has been developed especially for the cable TV market. This option provides a correct AC waveform for distortion-free video monitor viewing. Three models have been introduced. Continuous power output ratings range from 1,400 to 2,100 watts.

Reader service #202



Digital oscilloscopes

LeCroy announced a new family of 1 GHz digital storage oscilloscopes and FET probes, whose repetitive waveform measurement and data processing capabilities deliver two times the performance/cost value of any other scope in its category, according to the company.

Models 9320 and 9324, two- and four-channel configurations respectively, feature 5K memory per channel, 8-bit flash converters and smart trigger modes, including glitch and pattern triggers (for triggering on glitches down to 1 nsec and logic patterns).

In addition to the main timebase, the units provide two delayed timebases for high-resolution time measurements. The crisp raster display shows from one to four independent waveform grids, and persistence and X-Y display modes. Automatic pass/fail testing is standard. Waveform processing options include FFT, enhanced resolution, waveform zoom math and averaging.

An optional internal graphics printer can produce high resolution screen dumps in under 10 seconds. Both GPIB and RS-232 interfaces are standard and may be used to control the scopes, which are fully programmable. A centronics interface also is available for parallel printers. Engineers writing reports can use the optional floppy disk to import waveforms, then store them as graphics files directly into their documents.

Reader service #201 (two-channel); #200 (four-channel)

PC-based OTDR

EXFO has designed a multimode PC-based OTDR on a card. The FCS-102D performs like three units in one: a featured OTDR, an automated fault finder and a one-button break finder. The card offers quick and accurate full fiber characterization (attenuation and return loss) with the touch of one key. According to the company, this 1,310 nm OTDR offers fast testing (<3 minutes) and powerful documentation possibilities for much less than the cost of a traditional OTDR.

The unit features 20-dB range (40

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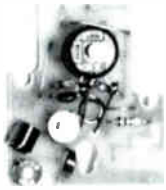

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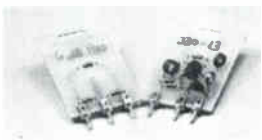
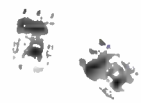
✦ ✦ ✦ NEW ✦ ✦ ✦





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km) and a 5-m dead zone with 1,310 nm optics, and typically requires 30 seconds to characterize a 10-km fiber network. The application software takes advantage of the computer PC notebook technology for ease of documentation (storage, printing, sending over modem) and operation (color/monochrome display, simple software upgrade, etc.).

Reader service #199

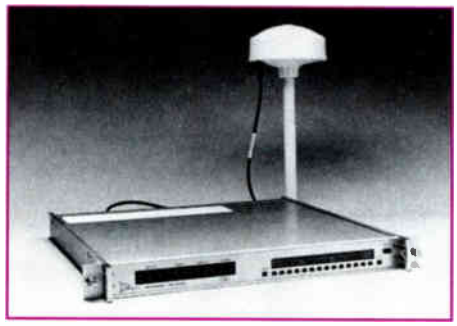
Safety manuals

The Society of Cable Television Engineers announced the forthcoming publication of two safety manuals written specifically for the cable TV industry.

The *SCTE Health and Safety Manual* contains information about the responsibilities of managers and supervisors, safety coordinators and employees. Sample manuals for managers, safety coordinators and employees are included to be tailored to your company. The remainder of the publication contains specific training material for use in presentations of safety training for system employees, from office safety to field safety. This manual was designed to provide new chapters as they become available until every area of cable TV is covered.

The second manual provides systems with pertinent information about OSHA and includes general OSHA requirements, recommended OSHA publications and materials, records and training, the OSHA visit, the Right-to-Know (Hazardous Communications) program, and more. Included is a sample written HAZCOM program for cable systems, a sample ergonomics training session and a HAZCOM training session.

Reader service #198 (safety manual); #197 (OSHA manual)



Time system

Datum Timing added a GPS capability option to the company's Model 9700 programmable time system. According to the company, the addition of this GPS time input option makes the unit the only currently available programmable time system to allow GPS synchronization.

Once this option is enabled, global position is automatically determined (latitude/longitude/altitude) and time is transferred to the time code generator with sub-microsecond precision, according to the company. Time messages from the NAVSTAR satellite system are constantly received and used to validate and correct the unit's time.

The unit is based on a microprocessor-based design and modular construction. It is available in two configurations: as a time code generator or generator/translator suitable for data correlation or magnetic tape recordings. Models come with either six or 12 expansion slots.

Reader service #196

Laser diodes

Philips Key Modules (KMG) introduced two analog lasers for CATV and telecom applications. The CQF93/D and CQF/94D are 1,310 and 1,550 nm DFB types specifically designed to

meet the stringent requirements of the CATV industry. These requirements include a wide bandwidth (600 MHz minimum, 5 GHz possible), high channel loading (60 channel minimum) and a maximum RIN of -155 dB/hertz. The lasers have built-in optical isolators and thermo electric coolers.

In addition, two new 1,310 and 1,550 nm DFB laser diodes in butterfly packages were announced. The CQF91/D and CQF92/D are high speed (2.5 Gbit/sec) and have built-in optical isolators as well as thermoelectric (TE) coolers. They also feature an internal bias network and electrical matching.

The CQF752 and CQF756 pump lasers are available in DIL or butterfly packages. Both are 1,480 nm MQW-FP types with up to 70 mW and a maximum operating temperature of 70°C. The power output and operating temperature is made possible by Philips quantum well strained layer technology. The units were designed for erbium-doped fiber amplifier (EDFA) applications.

Reader service #195 (analog lasers); #194 (diodes); #193 (pump lasers)

OTDR system

Photon Kinetics Inc. introduced the OASYS 1000 OTDR automation system. The company says the modular system combines automated design and a simple, menu-driven interface to provide fast, consistent OTDR measurements for manufacturers of both single-mode and multimode optical fiber cables. Designed for multifiber testing, the system performs unattended, repeatable OTDR measurements of fiber ribbons or up to 12 "ribbonized" loose tube fibers.

The system includes an OTDR, multiple fiber handler and system computer. Under the control of the system computer, the multiple fiber handler sequentially aligns the OTDR pigtail to each of the fibers in a fiber ribbon for testing. The system computer also controls the OTDR, including configuring it for measurement, acquiring and analyzing the OTDR signatures, computing results and generating reports. Measurement results include single and bidirectional attenuation, point defect location, loss and reflectance and attenuation non-uniformity. A bidirectional, two-wavelength OTDR fiber test can be accomplished with the system in less than 90 seconds from fiber alignment to report generation, according to the company.

As used in mass fiber splicing, the multiple fiber handler employs video profile alignment for low-loss coupling and easy inspection of all fiber ends prior to measurement. According to the company, the system's alignment technique ensures the fibers are aligned without contacting any surface, virtually eliminating the risk of measurement failure due to fiber end contamination.

Reader service #192

Surge protector

ACT Communications Inc. announced the ACT 451 single line surge protector. The unit is a maximum duty surge protector that has the capability of handling a surge up to 85,000 amps

(8 x 20 μS), according to the company. It is equipped with a 10-amp circuit breaker that gives visual indication if the protector is in a failed state. The company says the unit reacts in less than a nanosecond. Each unit is equipped with two 3-foot 10 AWG pigtails that can be connected to any power arrangement. An optional remote alarm feature also is available.
Reader service #191

Measurement system

A Windows-based FiberLoop measurement system has been announced by KeyTek Instrument Corp. It is designed for making non-invasive analog and digital measurements within an EUT before, during and after pulsed-EMI susceptibility tests. Typical susceptibility tests include ESD (electrostatic discharge), EFT (electrical fast transients) and surge. The non-invasive EUT measurements are made by a series of battery-operated, microprocessor-controlled FiberSense modules, interconnected within the FiberLoop to a control center via fiber-optic link. According to the company, this exclusive use of fiber-optic loop communication frees the test results from any possibility of error due to spurious ground loops or "antennas."

The modules for measuring DC and peak voltages, AC voltages and digital patterns within the EUT are all available to help evaluate EUT performance during each EMI test. Measured EUT parameters can then be correlated with observed EUT upset and/or failure. In addition, changes from nominal signal values or patterns, during or after each test, can give valuable diagnostic information for troubleshooting

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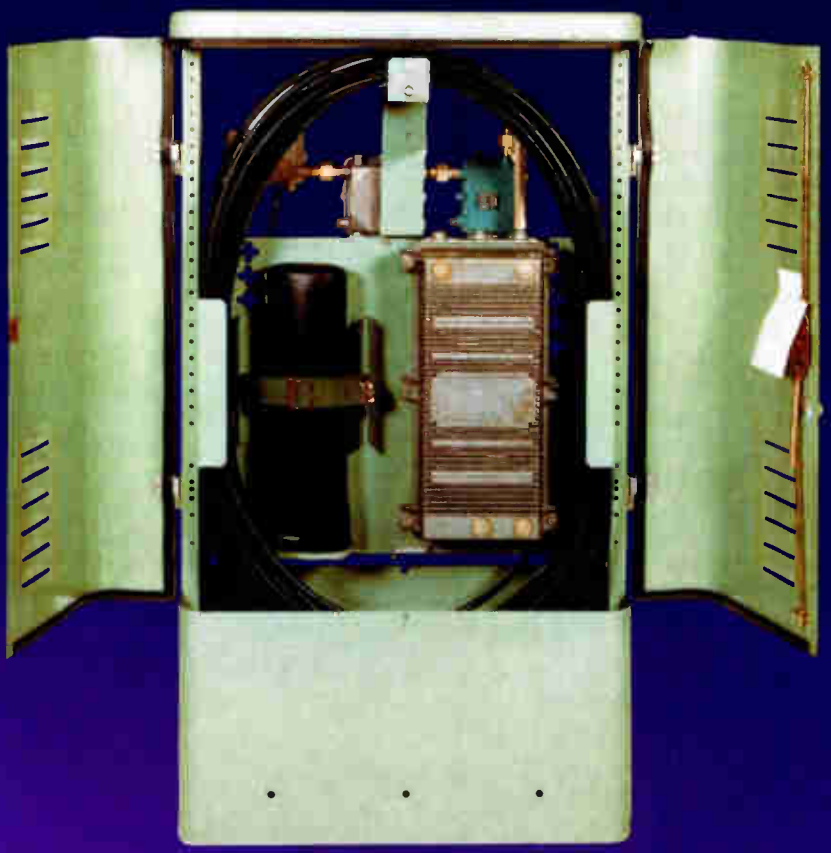

Pure functionality is what we had in mind when we developed the **OPFO-TV8** Fiber/Coax Conversion Enclosure.

On one side this versatile enclosure can house most fiber splices, an amplifier and up to 150-ft. of optical cable. On another side you can mount a tap, a splitter and a line inserter. This kind of functionality means one **OPFO-TV8** can obsolete multiple pedestals at a site.

The **OPFO-TV8** was designed with hinged, removable front and rear doors and a removable cap for 360° access.

The **OPFO-TV8** is manufactured from heavy-gauge, mill-galvanized steel treated with our patented nine-step finishing process to guard against corrosion.

Reliance Comm/Tec manufactures a complete line of fiber distribution terminals, and the Corelink™ Mechanical Fiber Splice.

For more information on the **OPFO-TV8** and the TV2500/**OPFO-TV8** conversion kit, call Reliance Comm/Tec at 708-455-8010 or your authorized distributor.

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EUT susceptibility problems.

The system runs with turnkey software in a Windows environment on any compatible PC. The software includes user-oriented graphics incorporating a model of the specific components used in the particular test setup. Also included are list boxes for each set of parameters being monitored, along with their user-entered limits and user-selected event results for each parameter. Default values are available for all common parameters to minimize the need for user intervention. The system is available by itself or in conjunction with the company's ECAT (expert computer-aided test) system.

Reader service #179

Video solution

According to LSI Logic Corp., the new L64112 MPEG decoder is the industry's first MPEG video decoder optimized for receiving broadcasting compressed digital video signals. The company says the unit is capable of delivering studio quality (CCR601) component video signals and provides the technology to develop a system with 500 channels on existing cable. The unit can be used in cable TV head-ends, CATV set-tops, direct broadcast satellite (DBS) set-tops, wireless CATV set-tops, video-on-demand set-tops over phone lines, business TV systems, educational TV systems, and consumer video applications such as digital video laser discs, digital VCRs, CD-I, CDTV, digital karaoke and PC multimedia cards.

The unit is designed to provide a single-chip glueless solution in a digital TV set-top. The device accepts serial or parallel coded channel data directly from a demodulator subsystem or from an 8-bit microcontroller at a sustained data rate of up to 15 Mbps. It extracts the MPEG video data stream from the MPEG system stream and performs error detection before fully decompressing the video data. The chip outputs digitized video data in an interlaced or progressive format together with horizontal and vertical sync signals. This digital YUV output interfaces directly to most off-the-shelf NTSC/PAL encoders. The unit has complete on-chip channel buffer and display buffer control, and supports direct connection to commodity DRAMs for frame reconstruction. The only external devices required with the unit are an 8-bit microcontroller for testing, initialization and monitoring the status of the device, and commodity DRAMs for storing channel and display data.

Features include 3:2 pulldown, error detection and error concealment, programmable resolution up to CCIR601 both for PAL and NTSC formats, video synchronization signals, rate recovery mechanism, 16:9 mode operation and interlaced or progressive video outputs. Additional features for digital applications include on-chip support for audio/video synchronization, time base correction, channel switch, virtual channels, closed captioning, teletext data, anticopy mechanism, etc.

Programmable parameters include frame size, sync pulse widths, active image size and position, frame mode channel buffer size, etc. The programmability of these parameters increases the flexibility of the decoder for systems with different resolutions and display characteristics. The memory interface is optimized for 4-bit and 1-bit commodity DRAMs, and the total memory requirements also are programmable with the resolution. For a full CCIR601 (720 x 480) display, the total external memory required to store

channel data, display data and an additional field for 3:2 pulldown is four 4-bit DRAMs (16 Mbits). As the resolution decreases the amount of DRAM memory required also decreases.

The company says the unit is fully compliant with the MPEG1 standard and is designed with the MPEG2 standard requirements in mind. Most of the control on the unit is internally microcoded, which can be modified by the company to meet MPEG2 specifications. Furthermore, the unit's memory interface and reconstruction pipeline are designed to accommodate MPEG2 performance requirements. Currently the unit does not decode an MPEG2 bitstream, but the company says it will upgrade the unit design to a full MPEG2 decoder when the MPEG2 draft standard becomes stable.

Reader service #178

Fault detector

Fiber Instrument Sales (FIS) introduced a hand-held visual fault detector designed to locate macrobends, breaks or light loss in multimode as well as single-mode fiber-optic cable.

The VL-100 emits a visible red 670 nm light, with power out at 1 mW ± 0.5 mW. For easier detection in low light field conditions, the continuous wave beam can be switched to a pulsed light mode. The company says the 4-mW laser is powerful enough to transmit light through a 3-mm PVC jacket. The unit's safety toggle switch eliminates the chance of accidentally turning on the unit when connecting to fiber. It is powered by a standard 9-volt alkaline battery, rates a safety classification of IIIA and has an operating temperature range of 0 to 40°C.

Reader service #177

Transmission link

Ortel Corp. added the Model 10345A, a high dynamic range transmission link, to the company's System 10000 modular rack-mount line. The unit transmits analog RF signals over single-mode fiber at 1,310 nm. The transmitter provides high CW output power and low RIN and distortion.

The unit is a directly modulated distributed feedback (DFB) laser transmitter that, according to the company, can achieve dynamic ranges as high as 120 dB-Hz$^{2/3}$ from 100 to 550 MHz over 1 km of optical fiber with a noise figure of less than 3 dB.

The built-in optical isolator reduces the effect of optical reflections, allowing higher laser-to-fiber coupling efficiency. The overall loss in the fiber-optic link is reduced approximately 10 dB compared to a standard non-isolated laser and reduces the fiber-optic receiver noise contribution in long links. The unit is designed for use in antenna remoting applications for RF communications and signal surveillance systems.

Reader service #176

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System Delay: 1 TV Frame
Power Requirements: 120v AC 60Hz, 40 Watts
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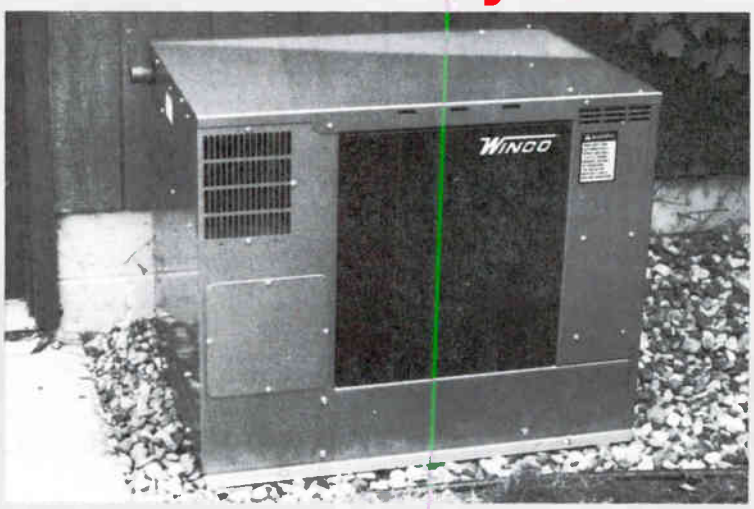

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BOOKSHELF

The following is a listing of videotapes currently available by mail order through the Society of Cable Television Engineers. The prices listed are for SCTE members only. Non-members must add 20% when ordering.

• *EBS and the Cable Industry* — This program features Frank Lucia, Helena Mitchell and Kenneth Wright and provides an understanding of the current and future demands upon the Emergency Broadcast System, and why cable TV will become such a critical part of EBS. As you will see, EBS has numerous state and local applications. The type of hardware that will become necessary also is discussed. This is an important topic, since the time to voice our operational and hardware recommendations to the FCC is now. (60 min.) Order #T-1117, $45.

• *How Will the New NEC, NESC and OSHA Regulations Impact Your System?* — Featuring James Kearney and Roger Keith, this tape covers NESC requirements such as clearances both on the pole and midspan. Recommendations also are provided for meeting the new grounding requirements of the NEC. If your system has not established an employee safety program, or if your program is not current, you should start by viewing this program. Consider the fact that local officials will now participate in safety inspections, and that the average system has between 75 and 100 hazardous substances that require employee safety training. Vehicle safety also is covered. (75 min.) Order #T-1118, $45.

Note: Videos listed this month were recorded at Cable-Tec Expo '92 in San Antonio, TX. They are in color and in the 1/2-inch VHS format only. Videotapes are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

Shipping: Videotapes are shipped UPS. No P.O. boxes, please. SCTE pays surface shipping charges within the continental U.S. only. Orders to Canada or Mexico: Please add $5 (U.S.) for each book or videotape. Orders to Europe, Africa, Asia or South America: SCTE will invoice the recipient for additional air or surface shipping charges (please specify). "Rush" orders: a $15 surcharge will be collected on all such orders. The surcharge and air shipping cost can be charged to a Visa or MasterCard.

To order: All orders must be prepaid. Shipping and handling costs are included in the continental U.S. All prices are in U.S. dollars. SCTE accepts MasterCard and Visa. To qualify for SCTE member prices, a valid SCTE identification number is required, or a complete membership application with dues payment must accompany your order. Orders without full and proper payment will be returned. Send orders to: SCTE, 669 Exton Commons, Exton, PA 19341 or fax with credit card information to (215) 363-5898.

A listing of other publications and videotapes available from the SCTE is included in the March 1993 issue of the Society newsletter, "Interval."

CALENDAR

April

17: SCTE Chesapeake Chapter meeting, Installer and BCT/E exams administered, Woodbridge, VA. Contact Scott Shelley, (703) 358-2766.

19-22: SuperComm '93, Georgia World Congress Center, Atlanta. Contact (202) 457-4912.

20: SCTE Cascade Range Chapter meeting, Installer exams administered, Vancouver, WA. Contact Cynthia Stokes, (503) 230-2099.

20: NCTA Engineering Committee meeting, Orange County Convention Center, Orlando, FL. Contact NCTA, (202) 775-3637.

21: Cable Construction Roundtable '93, Peabody Hotel, Orlando, FL. Contact Cable Television Contractors Council, (800) 542-7222.

21-24: SCTE Cable-Tec Expo '93, Orange County Convention Center, Orlando, FL. Contact SCTE, (215) 363-6888.

21: SCTE Dakota Territories Chapter meeting, Installer exams administered, Bismark, ND. Contact Tom Heier, (605) 299-1775.

21: SCTE North Country Chapter meeting, Installer exams administered, Hugo, MN. Contact Bill Davis, (612) 646-8755.

22: SCTE New Jersey Chapter meeting, BCT/E exams administered. Contact Linda Lotti, (908) 446-3612.

24: SCTE Tip-O-Tex Chapter seminar, power supplies, CLI and FCC testing, Zapata County Library, Zapata, TX. Contact Joe Lopez, (512) 425-7880.

26-27: California Cable Television Association annual spring meeting, Sacramento Hyatt Regency Hotel, Sacramento, CA. Contact CCTA, (510) 428-2225.

27-29: Philips mobile training course, RF and video distortions, headend basics, amplifier applications, record keeping and maintenance, Los Angeles. Contact Yvonne Jordan, (315) 682-9105.

28: SCTE Inland Empire Chapter meeting, Shep Rock Hanger, Coer d'Alene, ID. Contact Butch Boyd, (208) 667-5521.

28-30: Scientific-Atlanta training seminar, fiber optics, San Francisco. Contact S-A, (404) 903-6306.

29: SCTE New Jersey Chapter seminar, test measurement practicing, BCT/E exams administered, Holiday Inn, Wayne, NJ. Contact Linda Lotti, (908) 446-3612.

29: SCTE Northern New England Meeting Group seminar, FCC proof testing, Ramada Inn, Portland, ME. Contact Bill DesRochers, (207) 646-4576.

30: SCTE Wheat State Chapter meeting, BCT/E exams administered, Multimedia Cablevision, Great Bend, KS. Contact Lisa Hewitt, (316) 262-4270, ext. 191.

30: SCTE Shasta/Rogue Meeting Group seminar. Contact Dan Barger, (916) 547-5438.

Planning ahead

June 6-9: National Show, San Francisco. Contact (202) 775-3669.

July 14-16: Rocky Mountain Cable Expo, Snowmass Village, CO. Contact (303) 863-0084.

Aug. 16-18: Great Lakes Cable Expo, Indianapolis. Contact (317) 845-8100.

Aug. 25-27: Eastern Cable Show, Atlanta. Contact (404) 252-2454.

Oct. 5-6: Atlantic Cable Show, Atlantic City, NJ. Contact (609) 848-1000.

May

1: SCTE Sierra Chapter meeting, Installer and BCT/E exams administered, Roseville City Hall, Roseville, CA. Contact Rocco, (916) 354-3500.

2-5: WIC National Management Conference, Palmer House Hotel, Chicago. Contact Reenee Kaiser, (312) 661-1700.

4-6: Philips mobile training course, RF and video distortions, headend basics, amplifier applications, record keeping and maintenance, San Francisco. Contact Yvonne Jordan, (315) 682-9105.

6: SCTE Chesapeake Chapter seminar, cable technology for nontechnical personnel, Arlington, VA. Contact Scott Shelley, (703) 358-2766.

6: SCTE Rocky Mountain Chapter meeting, BCT/E exams administered. Contact Ron Upchurch, (303) 790-0386, ext. 403.

6: SCTE Upstate New York Chapter meeting. Contact William Grant, (716) 827-3880.

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Focus on technical standards

By Bill Riker
President, Society of Cable Television Engineers

At the 1993 Texas Cable Show I had the opportunity to serve as moderator of a special panel entitled "SCTE standards activities." The speakers on this panel were the chairmen from four of the Society's engineering subcommittees: Design and Construction Subcommittee Chairman Keith Burkley, EBS Subcommittee Chairman Ken Wright, Interface Practices Subcommittee Chairman Jim Haag, In-Home Cabling Subcommittee Chairman Larry Nelson and Maintenance Practices and Procedures Subcommittee Chairman Bruce Weintraub. (CLI Subcommittee Chairman Terry Bush was absent.)

What are the subcommittees?

In 1990, the board of directors voted to create five standing committees to which all SCTE subcommittees would report. They were the Training, Engineering, Operations, Planning and Finance committees. The first subcommittee formed under the restructured Engineering Committee was the Interface Practices Subcommittee, which was created to define standard dimensions for coaxial cable, connectors and housing entry ports. Its first accomplishment was the standardization of the female F-connectors, which was achieved after two years of effort. Not only has this standard been accepted by SCTE and the U.S. cable industry, but it is currently being considered by CENELEC as a standard for broadband communications connectors throughout Europe.

In 1991, Larry Nelson brought to the SCTE board of directors a recommendation from the National Cable Television Association Engineering Committee that the Society specify acceptable hardware to be used for the wiring of subscribers' homes by outside contractors. Shortly thereafter, the In-Home Cabling Subcommittee was born.

The In-Home Cabling Subcommittee is developing a residential wiring manual, which is aimed at electrical contractors and home builders. The pamphlet-style document was designed and written in non-technical terms to discuss the impact on signal quality caused by the improper selection of cables, connectors and active devices, and alert these users to generally low-quality equipment available through electronics and retail stores.

The manual also details correct procedures for planning the layout and selection of materials and equipment, while offering remedies to problems commonly experienced by the "do-it-yourselfer." Most importantly, it reinforces to the builder, contractor and/or homeowner that professional installation by their local cable system operator is their safest and simplest option.

Comments on the first draft of the residential wiring document are currently being received. Anyone interested in reviewing the current work for comments is welcome to do so. Inquiries can be made to Larry Nelson or Chris Huffman at (800) 982-1708.

Following the extensive viewership of CNN (and cable TV in general) during the Gulf War and hurricanes here at home, the U.S. government decided that cable TV should play a major role in the country's Emergency Broadcast System (EBS). The FCC then called for the cable industry to become involved in upcoming rulemakings regarding emergency broadcasts. As a result, the EBS Subcommittee was created and has already filed comments with the commission on behalf of the Society. It was formed to investigate the cable industry's current and future involvement in the Emergency Broadcast System. From the subcommittee, two working groups were formed to research areas for which the subcommittee needed more in-depth information.

The first group is investigating EBS hardware that is available to cable operators through various vendors. The second group is tracking the EBS activities of local cable systems and local, regional and federal EBS organizations.

Although it was suggested several years ago that SCTE develop "good engineering practice" recommendations for the proper maintenance of CATV systems, the Maintenance Practices and Procedures Subcommittee was not created until its first meeting was called at the 1992 Atlantic Cable Show.

The CLI Subcommittee is responsible for reviewing the needs of the Society's membership relative to information and education on signal leakage control and reporting. It recommends educational training, reviews published materials and has reviewed and reported on field problems through publication in the Society's newsletter, *Interval*.

The Design and Construction Subcommittee held its first meeting at Cable-Tec Expo '92 in San Antonio, TX. This subcommittee plans to set standards for basic construction, fiber construction, design (including computer-aided drafting and engineering, makeready and mapping), upgrades and rebuilds.

Join us!

Contained within this month's issue of *Interval* are excerpts from information presented at the Texas Cable Show panel concerning ongoing SCTE standard-setting activities. At the panel, each of the subcommittee chairmen addressed the need for increased membership in their groups, *especially greater representation from MSOs.* All engineering subcommittees are planning to hold meetings in Orlando, FL, prior to Cable-Tec Expo in accordance with the schedule to the left. *Everyone is invited to attend and participate.* All subcommittee activities are performed by volunteers.

Since their work will greatly impact our industry — and therefore your future — everyone has a personal interest to become involved with these subcommittees and help them shape the future of your industry. We hope to see you there! **CT**

Engineering subcommittee meetings

(Tuesday, April 20, Orange County Convention Center)

Room 12A-B
1-2:30 p.m.: In-Home Cabling
2:45-4:15 p.m.: Interface Practices
4:30-6 p.m.: Maintenance Practices and Procedures

Room 12C-D
1-2:30 p.m.: Design and Construction
2:45-4:15 p.m.: EBS
4:30-6 p.m.: CLI

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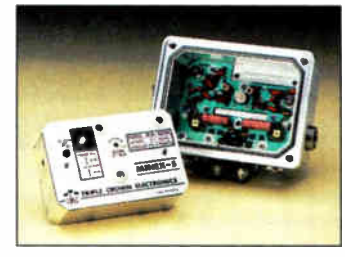

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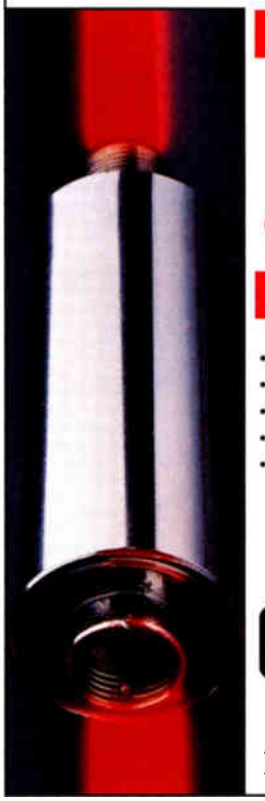

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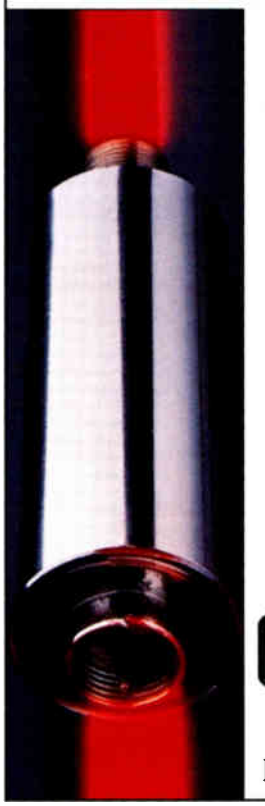

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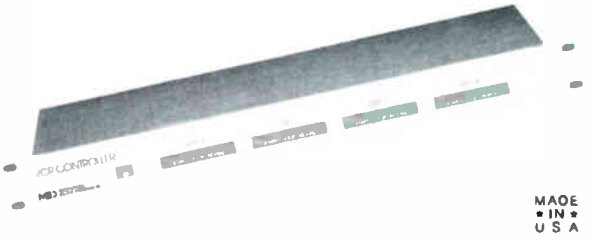

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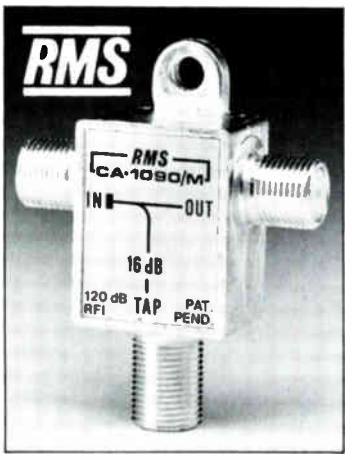

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S-A's frequency agile output converter

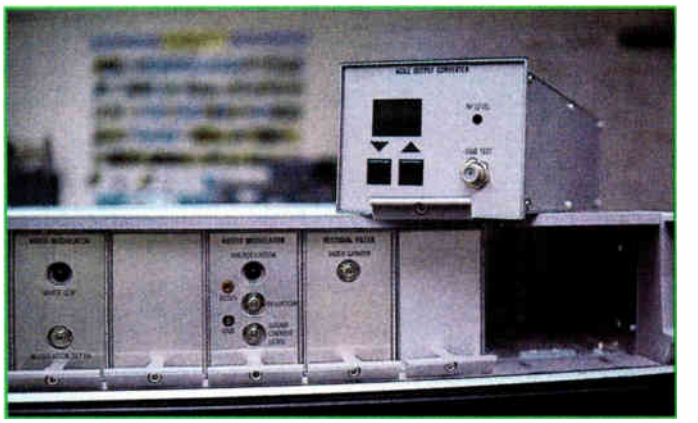
The following originally appeared as "CT's Lab Report" in the July 1990 issue of "Communications Technology."

By Ron Hranac

Frequency agile operation in headend equipment has enjoyed a renewed popularity in recent years with the availability of low-cost phase locked loop circuits (PLL) that provide good frequency stability and operation over wide frequency ranges. Several manufacturers have introduced stand-alone frequency agile headend equipment that is being used in both backup and full-time applications.

In 1990, S-A introduced a plug-in frequency agile output converter (FAOC) module for its 6150 processor and 6350 modulator series. It replaces the two far right modules in either chassis and provides agile operation from 50 to 550 MHz. *CT* obtained one for this lab report and gave it a good wringing out in Jones Intercable's corporate evaluation lab.

The FAOC module (as shown in the accompanying photo) is physically the same size as two individual 6150 or 6350 modules and is intended to replace both the output local oscillator and output converter modules. Rear connectors are plug-in compatible with the existing chassis of either the processor or modulator. The front panel of the FAOC includes a -20 dB test point, RF level control, LED display and two push buttons for frequency selection and offset programming. Depending upon the existing chassis configuration and installed options, it may be necessary in some instances to change the power supply from the standard 1 amp model to the heavier duty 1.5 amp version. (Contact S-A for more details.)



S-A's FAOC module, ready for installation.

The FAOC will operate on any EIA standard, IRC or HRC cable channel from 50 to 550 MHz and is capable of automatic aeronautical frequency offsets. The user also has the flexibility of manually programming offsets up to ±50 kHz from the standard frequency in 12.5 kHz increments. Comb generator phase lock operation is possible, but the conventional phase lock servo module must be replaced with an agile phase lock servo module. If phase lock operation is desired in a chassis that is not so equipped, then a phase lock wiring kit (S-A p/n 229435) must be installed in the chassis rear compartment.

The module itself requires +42 dBmV visual carrier IF level, which can be checked using a module extender and SLM prior to installing the FAOC. The processor or modulator video carrier level control should then be adjusted to provide the required 45.75 MHz signal amplitude.

When first powered up, the LED display on the module will briefly indicate the software version number (e.g., "1.0") followed by a reference code "PL" if a phase lock reference is present, or "no" if one is not available. It will then display the channel number that was last programmed. Changing channels is a matter of pressing one of the two front panel buttons. To prevent accidental changing of an output channel, S-A has built a delay into the button functions, so you must hold a button in for two seconds before anything will happen. When the unit is changing channels its output is squelched to prevent interference to other channels carried on the system.

The FAOC can be tuned to any cable channel between 50 and 550 MHz by pressing either of the two buttons on the front of the module. The "up arrow" button tunes higher in frequency and the "down arrow" button tunes lower. (S-A calls them "increment" and

Figure 1: FAOC RF ourput spectrum

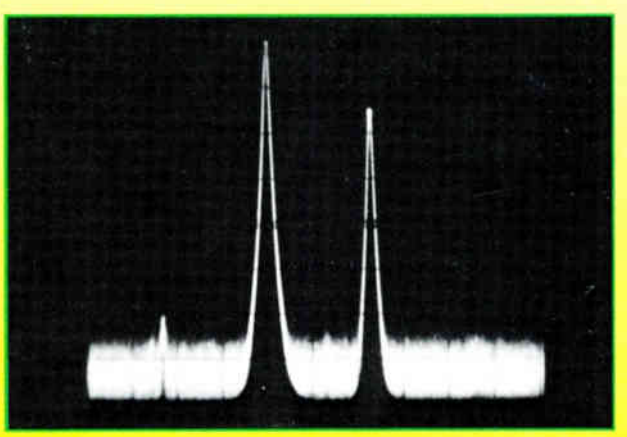
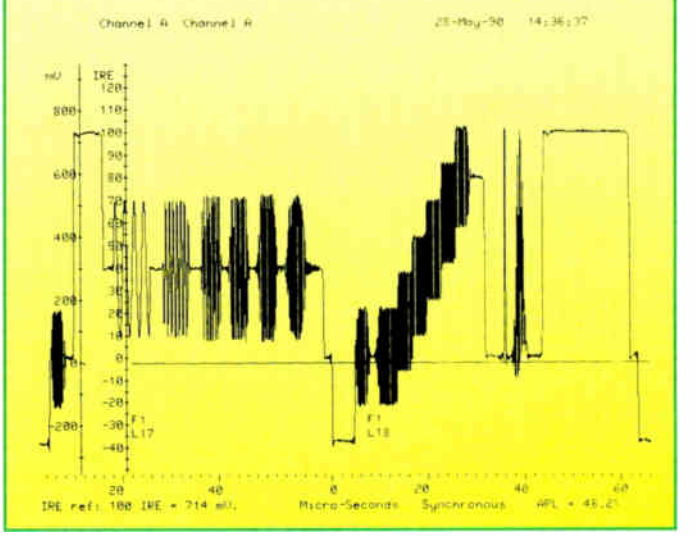
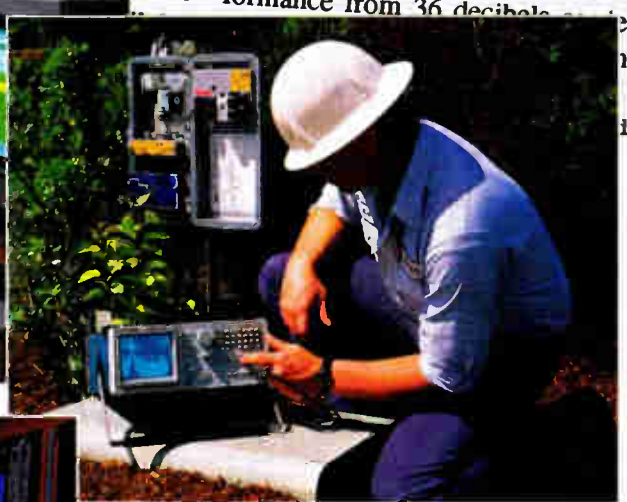


Figure 2: Demodulated VITS waveforms



No problem!



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to comply with the new set of standards, operators will be required to conduct baseband video proof-of-performance tests. Specifically, these will include chrominance-luminance delay inequality, differential gain and differential phase measurements.

In order to create a uniform, nationwide scheme, the FCC said its standards will preempt local standards. However

rural cable systems serving fewer than 1,000 people will be allowed to negotiate with the franchising authorities for less restrictiv
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"decrement" buttons respectively.) To program aeronautical offsets, you hold both buttons in simultaneously for two seconds until the LED displays the current frequency plan two-digit code.

The first character of the code will be S, I or H, indicating standard, IRC or HRC operation. The second character is a number that corresponds to the programmed offset. For standard and IRC operation, numbers zero through nine represent various possible offset programs; zero is no offset, one is automatic offset, two is +12.5 kHz manual offset, three is +25 kHz and so on. For HRC, only numbers zero through two are available; zero is conventional HRC with no offset, one corresponds to new HRC frequencies locked to a 6.0003 MHz comb generator, and two provides automatic squelch of RF output if phase lock is lost.

To program the frequency plan, press the "down arrow" button to change the first character of the program code and the "up arrow" button to change the offset digit. When you have programmed your choice, wait a couple seconds until the LED display stops flashing and the frequency plan and offset will be stored in non-volatile memory. (Channel choice also is stored in NVM.)

In the event of problems with the FAOC, the unit's LED will display error messages. Documentation provided by S-A is thorough, and includes installation instructions and easy-to-follow operation and programming information. The FAOC's list price is $1,865, and as with many products on the market, MSO price discounts apply.

Lab measurements

The FAOC was installed in a 6350 modulator chassis (non-phase locked)

Table 1: Standard frequency measurements

Channel	Standard frequency (MHz)
2	55.24936
6	83.24933
7	175.24922
13	211.24918
14	121.24929
36	295.24908
52	391.24896
60	439.24891
70	499.24883
78	547.24876
99	115.24930

Table 2: Measured video distortions

Avg. picture level	48.3 %
Bar amplitude	99.4 IRE
Sync amplitude	38.2 % bar
Blanking variation	1.4 % bar
Sync variation	2.0 % bar
Burst amplitude	114.8 % sync
Burst amplitude	43.8 % bar
FCC sync width	4.84 μs
FCC sync setup	9.80 μs
FCC front porch	1.49 μs
FCC burst width	8.8 cycles
Sync risetime	141 ns
Sync falltime	140 ns
FCC equalizer	51.0 % S.W.
FCC serration	4.79 μs
VIRS setup	7.2 % bar
VIRS luminance ref.	49.8 % bar
VIRS chroma amp	102.1 % burst
VIRS chroma amp	44.7 % bar
VIRS chroma phase	−1.1 deg
Line time distortion	1.7 %
Pulse/bar ratio	102.4 %
2T pulse K-factor	0.9 %
S/N lum-weighted	58.8 dB
Chroma-lum delay	25.4 ns
Chroma-lum gain	108.6 %
Differential gain	2.33 %
Differential phase	0.82 deg
Lum non-linearity	2.44 %
Relative burst gain	−0.19 %
Relative burst phase	−0.36 deg
FCC multiburst flag	99.5 % bar
FCC MB packet 1	61.2 % flag
FCC MB packet 2	61.4 % flag
FCC MB packet 3	64.8 % flag
FCC MB packet 4	64.2 % flag
FCC MB packet 5	66.2 % flag
FCC MB packet 6	34.6 % flag

whose output was connected to a Rohde & Schwarz precision demodulator. The demod was connected to a Tektronix VM-700 automatic video measurement system and test signals were supplied by a Tektronix 1900 digital video generator. A Hewlett-Packard 8558B spectrum analyzer was used to check the unit's RF performance and a Philips lab counter measured output frequency.

With +42 dBmV IF input to the module, its visual carrier RF output could be adjusted from +39 to +60 dBmV and the aural carrier level adjusted from 4 to 42 dB below the visual carrier. Subsequent measurements were made with the visual carrier output set at +60 dBmV and the aural carrier at +45 dBmV. At these levels, a third order intermod 4.5 MHz below the visual carrier was 60 dB down and an in-channel beat about 2 MHz above the visual carrier was more than 65 dB down. (See Figure 1 on page 7.) Neither caused any picture impairment.

The output RF spectrum above the channel tuned to had no spurious or harmonic products that were measurable but several were found below the channel. With the exception of one at -58 dBc (about 30 MHz) all others were greater than 60 dB down.

Output frequencies were checked on a number of channels between 50 and 550 MHz and Table 1 summarizes what was measured. Offset operation also was checked, and Ch. 14 was measured at 121.26178 MHz (+12.5 kHz) and Ch. 99 was 115.27428 MHz (+25 kHz). When switched to HRC, Ch. 6 was 83.99933 MHz and IRC yielded 85.24932 MHz.

Figure 3: In-channel frequency response measured with Sin X/X test signal

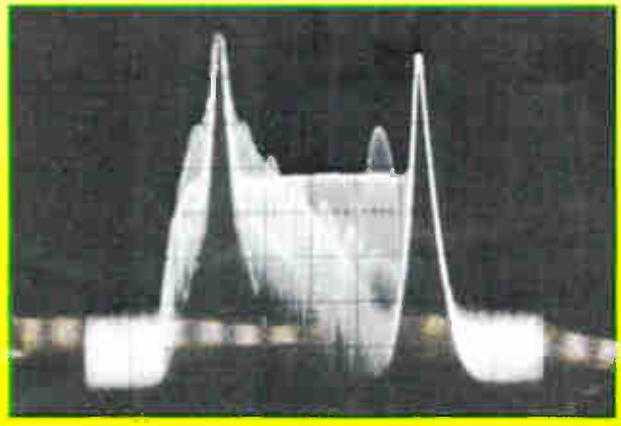

Table 2 summarizes measured video distortions, which include the contributions of both the modulator and FAOC. Figure 2 (page 7) is the demodulated VITS waveforms with the demod's sound trap switched off. Figure 3 is a photo of the modulator/FAOC combination's in-channel frequency response measured with the Sin X/X test signal and shows ±0.5 dB response.

Comments

The module worked as specified and will be useful for those systems desiring to provide modular backup for S-A headend equipment. While the FAOC could be used for full-time operation in place of the standard 6150 and 6350 output modules, I suspect most operators would elect to use one or more for backup purposes. Its 50 to 550 MHz bandwidth and frequency programming capabilities make it suitable for most applications and its modular packaging is convenient for use with S-A's existing headend gear.

PRODUCT HIGHLIGHTS

Addressability

PageTap Inc. announced a new line of off-site addressability to facilitate the system operator in providing cable services to consumers in apartment complexes. The company says PageTap allows for complete control of the system, eliminates the need for converter boxes while not adding equipment to the headend, and makes off-site addressability cost-effective for apartment complexes with as little as eight subscribers.

Being faced with a decrease in revenues and an increase in expenses, advantages to the operator include: full accounting of all records, both receivables and hook-ups/disconnects; instant hook-ups/disconnects 24 hours a day, seven days a week; reduction of truck rolls (and their subsequent expenses), allowing the operator to retain a more substantial percentage of hook-up charges; ability to retrofit any existing trap tiered system without adding separate power supplies or headend equipment; eight tiers and 32 ports for unlimited viewing options; and no more converter boxes — ending worries of theft, maintenance and capital investment.

Reader service #309

Test set

A dual wavelength fiber-optic test set is now available from the 3M Telecom Markets Division that measures 1,300 and 1,550 nm wavelengths simultaneously, reducing measurement time, inaccuracies due to connect/reconnect problems and the time and cost involved in making two separate measurements.

The Photodyne brand 2260XFX dual test set features easy-to-use two-button operation and a large liquid crystal display (LCD) showing both the wavelength and associated loss at all times. The LCD panel also displays the dBm reference.

The company says its laser-based test set has a 55 dB dynamic range for today's longest link needs. The unit can be powered by either AC or rechargeable batteries and can be used in the central office (CO), CEV or field.

Reader service #308

Video system

Fiber Options Inc. introduced its Series 170B video system, designed for use where long video runs are required or where transmission lines are subject to high levels of interference or ground loops.

According to the company, the system can be used in place of coax cable wherever runs are greater than 1,000 feet (305 meters) and signal quality must be maintained. It also can be used where video signals are run in open space between buildings. System bandwidth is 10 MHz with a signal-to-noise ratio of greater than 67 dB for short distances (10 feet or 3 meters), and greater than 54 dB over long distances.

The system consists of a transmitter and a receiver, and includes level-loss indicators for determining received opti-

cal power and video-presence status indicators. Automatic gain control circuitry based on received optical power also is included. According to the company, these features ease installation of the fiber-optic links and eliminate the need for adjustments either at installation or periodically thereafter.

The system can be ordered for single- or dual-channel operation in either stand-alone or rack modules. The latter fit into the company's Series 515R card cage system or Series 517R racking system.

Reader service #307

Calibrators

Sadelco announced two new instruments based on its patented white noise generator technology. According to the company, both Models SC600 and SC1000 have flatness specs of ±1/4 dB, calibrate signal level meters and check the response of all CATV and local area network distribution equipment.

Features include: expanded frequency ranges (4.5-600 MHz for Model SC600 and 4.5-1,000 MHz for Model SC1000), increased noise output level to +20 dBmV, a new precision rotary attenuator, horizontal and vertical sync pulse modes of the CW signal, switchable 1 kHz modulation of the noise and the facility for inputting external markers.

Reader service #304

Cable monitoring

Automated Light Technologies Inc. introduced what it says is the first fiber-optic cable monitoring system designed to use the cable sheath to identify cable damage as well as vandalism or penetration of cable splices and handholes. The 1200 cable monitoring system (CMS) combines the features of the company's 1100 CMS with the ability to place remote sensors anywhere on the cable route.

The company says the new system continuously monitors up to 100 miles of fiber cable and up to 99 remote sensors. It alarms on any damage to the outer covering or jacket of any type of cable with at least one metallic element. The system is permanently located at one end of a cable and continuously monitors for a change in cable condition. An adjustable alarm threshold allows it to show only new cable damage. Separate alarms are generated for cable sheath faults, cable breaks and remote sensors.

The system also supports up to 99 remote sensing units (RSUs) that can be placed anywhere on the cable. Detectors are attached to the RSUs for different types of problems, including water detection tape to determine if a splice closure is leaking and intrusion detectors to alarm the instant a handhole or manhole cover is removed. Any normally open detector also can be used with an RSU. Once triggered, the RSU communicates a unique 2-digit code to the system. This code identifies which alarm has been activated. The RSU uses the cable sheath for all power and communications. No separate power or wiring is required.

Reader service #300

Digital audio

Wegener Communications began production of a new line of single channel per carrier (SCPC) products utilizing MPEG II (MUSICAM) compression technology. The company says this compression technology permits the transmission of near CD quality audio programming yet occupies less than half the transponder bandwidth of an equivalent analog transmission. →

Seemed Like A Good Idea at the Time."

The final session of the conference, "Who Are Those Guys?" was moderated by Ted Hartson, vice president/chief engineer of Post-Newsweek Cable, and focused on today's competitive marketplace. In total, 21 technical papers were presented over the two-day conference by some of the cable TV and telco industries' engineering leaders.

All attendees received a copy of the Emerging Technologies 1994 Proceedings Manual, a 260-page collection of each paper presented at the conference. The manual is currently available through SCTE for a limited time at the member price of $25 ($40 for nonmembers). For further information on ordering the manual, please contact SCTE at (610) 363-6888.

Requirements: International chapters

The Society's national board of directors recently approved requirements for establishing meeting groups, attaining chapter status and maintaining chapter status outside of the United States or its territories. They are as follows:

- All members of the local chapter or meeting group also must maintain national membership in the U.S. SCTE. Due to the liability insurance provided by the Society for any official gathering, all members of local chapters and meeting groups holding a meeting in countries other than the United States must be active members in the Society.
- All chapters and meeting groups must know and comply with the laws and regulations of their nation and any local municipalities. It is the responsibility of each chapter and meeting group to be aware of all rules and regulations of the local governing body. All chapter and meeting group operations must comply with these rules. If a conflict exists between the rules of the local government and those set forth in the Chapter Development Handbook, the chapter or meeting group must make SCTE national headquarters aware of such conflict in writing. In such cases, the local group will work with national headquarters to establish procedures.
- Dues for members outside of the United States includes an additional charge. Members who reside outside of the United States are charged an additional fee to cover the increased costs of mailing Society materials throughout the year. If desired, a member may have all mail sent to an address within the United States and thereby avoid the additional charge. All dues are payable in U.S. funds. Visa or MasterCard are the preferred form of payment. However, checks or money orders in U.S. funds and drawn on a U.S. bank will be accepted.
- The SCTE logo is a registered insignia of the Society of Cable Television Engineers Inc. in the United States. Any use of the SCTE logo requires prior written permission by the Society. It is not to be used in association with any other form of communication or advertising that by its use would imply the Society's endorsement of any product or service.
- Representation: At-large directors on the Society's board of directors shall represent constituents in foreign countries. The board appointed "SCTE liaison" shall assist with visitations of foreign chapters and meeting groups.

The Model DR96 digital audio receiver derives mono or stereo audio channels from a digital data stream. Upon receiving a highly compressed data channel transmitted by MPEG compression algorithm, the receiver uses its demodulation, error correction and MPEG decoding algorithm to restore the audio to high quality mono or stereo. Its application of MPEG compression technology allows for increases in carrier access and reductions in backhaul costs while audio quality is maintained, according to Wegener.
Reader service #305

UPS systems

Two models have been added to Superior Electric's line of Stabiline uninterruptible power supplies in order to meet requirements calling for maximum output load ratings of either 1,000 or 1,500 VA.

The true on-line units are designed for 120 V, 60 Hz duty. The company says they provide clean, continuous sine wave AC power to computers and other sensitive equipment. They protect systems and their data from the harmful effects of blackouts, brownouts, sags, surges, spikes and transients. Extended backup is provided during sustained brownouts because batteries are not called upon until utility voltage falls below 96 VAC. An RS-232 signal level interface DB-9 connector interacts with commercially available advanced computer/LAN operating system software.
Reader service #301

Optical fiber analyzer

Telecommunications Techniques Corp. introduced the Fiberscan 1000, an optical fiber analyzer that functions as an optical time domain reflectometer (OTDR), stable source and power meter. The unit features proprietary technology that allows the analyzer to operate in a pulsed OTDR mode or as a stable CW source. An optical power meter can be added to complete the set.

According to the company, this is the only test set that provides the functionality of a power meter, source and OTDR in one portable test set. It is designed for the installation and maintenance of fiber-optic carrier, telco and CATV systems. The unit is designed for outside plant use and is weather-tight. It includes an internal charger, eliminating the need for an external charging adapter.
Reader service #303

Digital transmission

A new format transparent serial digital transmission system is now available from Meret Optical Communications Inc. The Meret Live Link 500 transmits serial digital signals at bit rates from 5-400 Mbps on single-mode fiber. The transmitter/receivers are packaged in 3-inch long units and will move these signals 10 kilometers.

Immediate applications for the LL500 line include both digital NTSC, PAL and forthcoming HDTV video formats. The 400 Mbps top transmission speed is above the 360 Mbps transmission rate proposed for wide screen NTSC.

According to the company, the 5 Mbps bottom rate justifies the system's use for single, severely bandwidth-compressed TV signals, obviating the need for conversion to analog NTSC for transmission and storage. The 400 Mbps speed is compatible with digital HDTV signals that have been compressed for economical transmission and storage.
Reader service #302

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