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GENERAL INSTRUMENT

Leakage report cards

July 1, 1990, has come and gone, the mad rush to get Form 320s turned in has died down and industry personnel are taking a breather from the headaches of CLI. But how is our industry doing leakagewise?

It may be a little too early to get an official report card from the FCC, although the commission has started a systematic "sweep" of possible problem plants. Based on some questionable Form 320s that were sent in, FCC field offices have been asked to check certain cable systems. It's quite likely that there may well be an operator or two asked to turn off aeronautical channels before all is said and done.

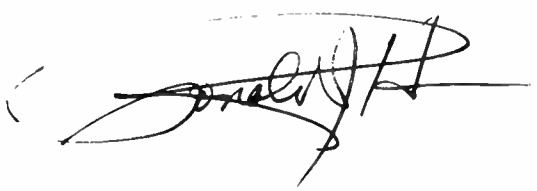
I decided to conduct my own *unofficial* sweep this summer, using my hand-held 2-meter ham radio to monitor for leakage on midband Channels 16-19. That radio will tune CATV offsets, and has very good sensitivity from 130-180 MHz. Giving operators the benefit of the doubt, I left the "rubber duck" antenna (it actually has several dB of loss compared to a dipole) on the radio and placed the whole setup on the dash of whatever vehicle I happened to be in at the time. While on vacation, attending conventions or speaking at SCTE seminars, I had my trusty transceiver listening for leaks in Colorado, Wyoming, Idaho, Florida, Nebraska, Illinois, Kansas, New Mexico and Tennessee.

In general, I found that the cable industry is doing a better job with leakage than in the past (I've made checks like this before), but still has much room for improvement. While my survey was very unscientific, from what I checked it appears that many smaller systems may have some of the more serious leaks. For example, in one Colorado mountain community the signal strength meter on my transceiver indicated full scale from a leak—and I was 200 feet from any cable plant. Remember, the radio and antenna were inside the car!

The worst problems consistently are in hotels hooked up to cable systems, especially those with cable-compatible TV sets connected directly to the cable. I almost always try to check into local ham repeaters from my hotel room, and invariably I find that the TV set makes a dandy antenna for radiating cable signals. Sometimes the leakage is so bad that even the video carrier's horizontal sidebands cause full scale signal strength indications on the radio across the room from the TV set! And many of those hotels are located close to airports.

I honestly hope that we're doing a whole lot better with leakage than what I've seen in some places. I have a real funny feeling that some of the submitted 320s may not actually reflect the real CLI in some systems, and considering what the FCC is doing right now they may feel the same way.

I plan to continue my spot monitoring during my travels, but so far my report card to the industry is not real flattering: our grade goes up a bit from a D (before July 1) to a C–.



When is a modulator not a modulator?

Reader Service Number 8

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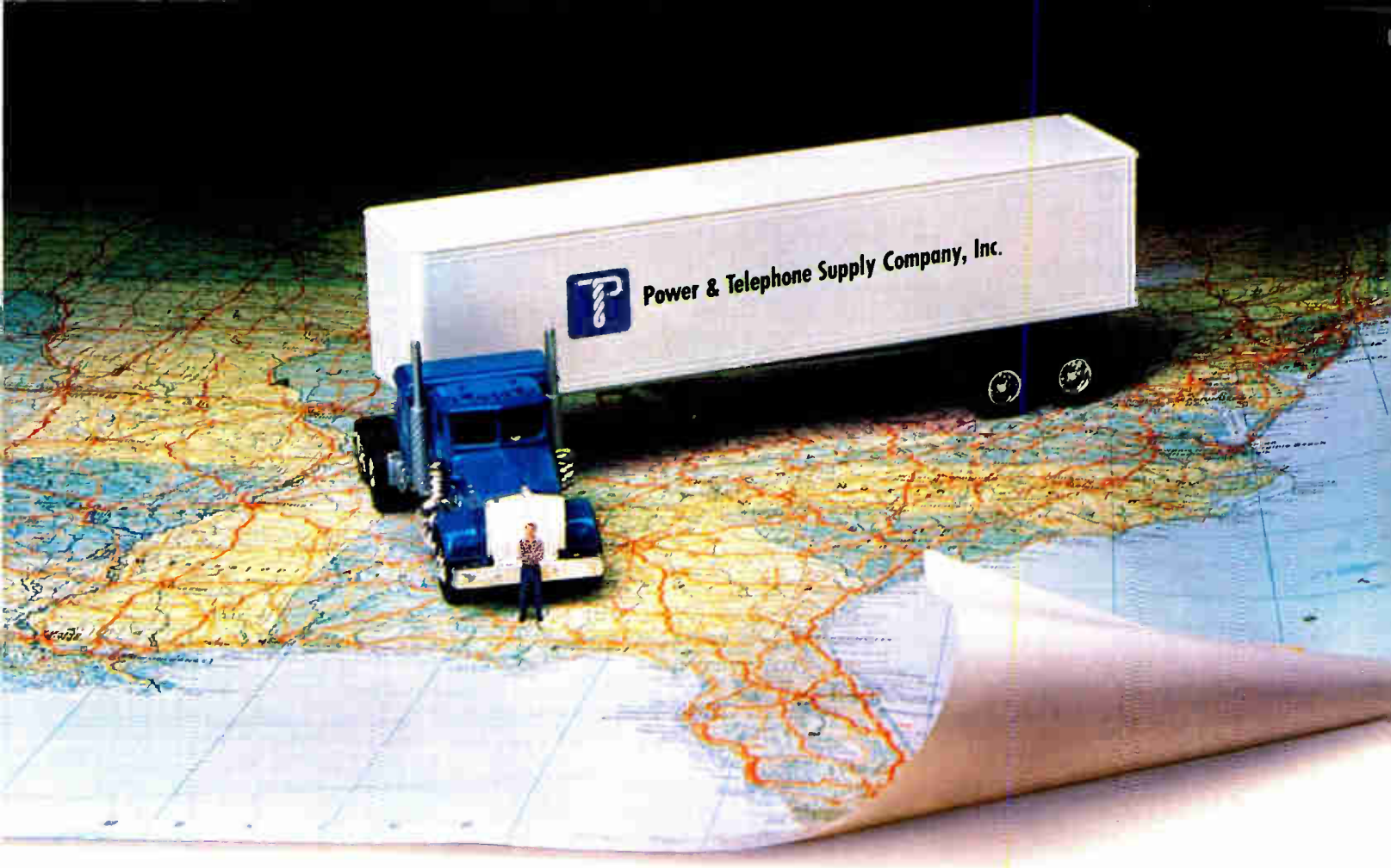

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Reader Service Number 68

LETTERS TO THE EDITOR

Tech survey

I just finished reading your July issue of *CT* and was not surprised by the answers given to the "Tech survey." During my training at Denver for "tech one" I had the opportunity to meet people from all over the country. Everyone agreed that there was not a uniform way of training, responsibilities were varied and of course pay differed. Ken Deschler was surprised. Send a survey out in one of your future issues for the guy on the pole to fill out and I bet there will be a lot of surprised people.

I would like to see more space devoted to issues such as reregulation, future of our industry and what type of training people should pursue. I feel that your magazine could interview key figures in the industry and get their perspectives on key issues, talk to managers and how they run their systems and how the chief techs train and run the tech department.

Michael Lofaso
Champaign, Ill.

Service

I was extremely impressed after reading your "Editor's Letter" in the July issue of *CT* regarding service. I am a 20-year veteran of CBS and ABC network TV and find it refreshing that a person of your renown would criticize the service element of the cable industry.

I certainly will take future note of your column as I think it is about time that the "real world" element comes out. There are problems in every industry and to date the cable industry has been a bit lax on dealing with the paying public.

If the cable industry can come to grips with the customer base as the larger stores and malls have, possibly service in general will improve.

Your honesty is delightful. Keep up the good work.

Wayne Wicks
Littleton, Colo.

More service

I am writing a response to your editorial that appeared in the July issue of *Communications Technology*. Like you, I am appalled when a potential customer (or current customer) receives poor treatment, as did the member of your staff. It seems that the cable TV industry is great at servicing 99 percent of our customers. However, there is 1 percent that gets stepped on. Most service businesses suffer this problem.

Problems involving contract installers occur often. It is up to the cable operator to follow through and manage the contractors. Your unburied drop is also a typical problem. The note for the drop to be buried was probably not entered into the computer system and, therefore, no work order was generated. I am not making excuses for any cable operator—I share your concerns.

I would like to take serious exception to one point you made in your editorial. You noted that you disconnected your service with United Cable. I am very concerned that you are the editor and vice president of a cable engineering trade magazine and you do not have cable service!

First, how can you be totally informed about our industry if you do not have service in your home? Your bad experience with United Cable prompted an editorial that challenges cable operators. Can you continue to fairly comment on service to subscribers if you (and some of your staff) are without service?

Second, cable is an optional product. We are not in every home, therefore we must work harder at servicing our customers. You publish an industry trade magazine. I firmly believe that you should be connected. Maybe your company should pay for employees' cable. Either way, it seems vital that you and the staff of *Communications Technology* be a part of the cable TV viewing public.

You are the editor at one of only two cable TV engineering publications in the country. How can you possibly *not* subscribe to cable? I trust that you will see my points as constructive criticism. I read and respect your publication.

Thomas B. Stark
Director of Operations and Engineering
Cable TV North Central
Roseville, Minn.

Editor's note: Our editorial staffer finally did get her cable hooked up by Mile Hi, but only after someone here who knows someone there made a call and "pulled a few strings." Unfortunately, members of the general public seldom have that luxury. As for me, I remain a non-subscriber and my drop still isn't buried. But I assure you, understanding customer service industry-wide doesn't require me to be a subscriber.

Video page generator

I read with considerable interest your review of the VIDG video page generator in the June 1990 issue of *Communications Technology*, "CT's Lab Report."

I own and operate a rural village cable system—66 subs, 104 passes—in Nebraska.I have been using a similar system for several years to generate pages of text and control a system line 21 decoder from Public Television. In addition to the text I use the system to display current time, temperature, maximum/minimum temperature, mean temperature and precipitation, and maximum/minimum temperature and precipitation for the past 24 hours all with an expanded VIC 20 (Commodore).

The video output from the computer feeds a Channel 4 modulator and the audio comes from the NOAA 24-hour weather service. It also is possible to have another source of audio that is controlled by the computer.

Also the program will dump to printer, if desired, all the meteorological data whenever the current temperature changes so I have a record. I am going to add to that program the heating/cooling degree days for forecasting energy usage.

The program is written in BASIC with a dwell time of about 15 seconds per screen and I am also writing a temperature calibration section for the temperature sensor.

The only real problem is that I did not include a write to disk of the text, therefore it is volatile. It would be no problem to include it and expand the number of pages. So far all I require is two pages of eight lines each plus the one page of meteorological data. Expanding the number of pages is a very simple task.

I have not included all the details of the system I have developed but the price was right: $25 for a used computer, about $100 for the disk drive and maybe $30 for the parts to assemble the control section.

If you are interested in any further details I will be pleased to pass them on to you or your readers. It isn't the fanciest program ever written and I am sure a professional could rewrite it in a more compact form but it does a pretty good job.

It is a pleasure reading your publication.

George W. Ketner
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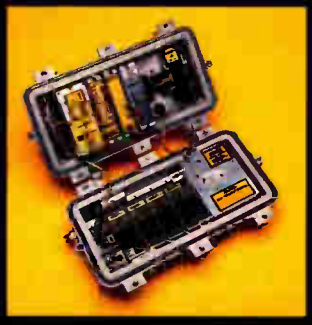

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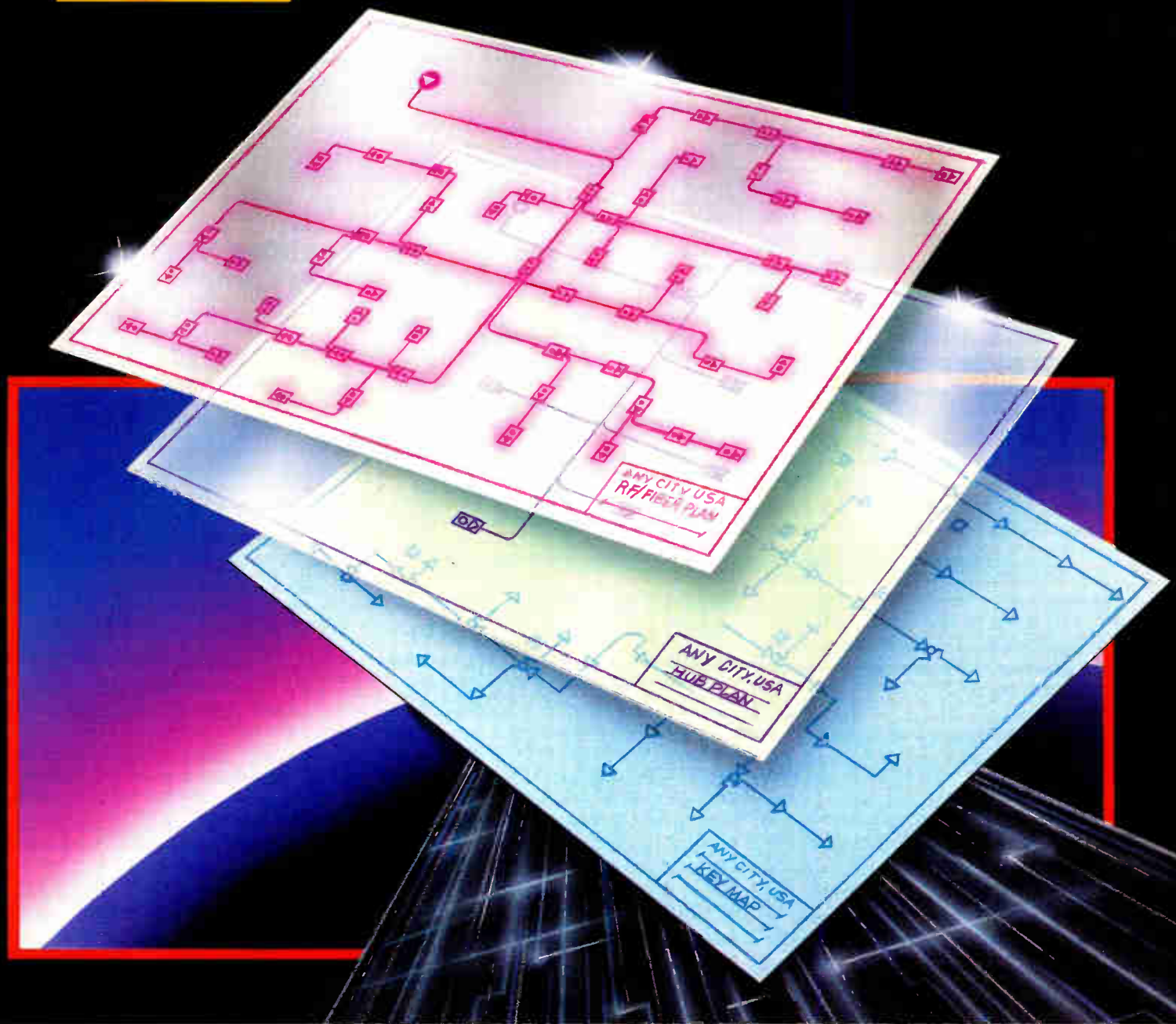

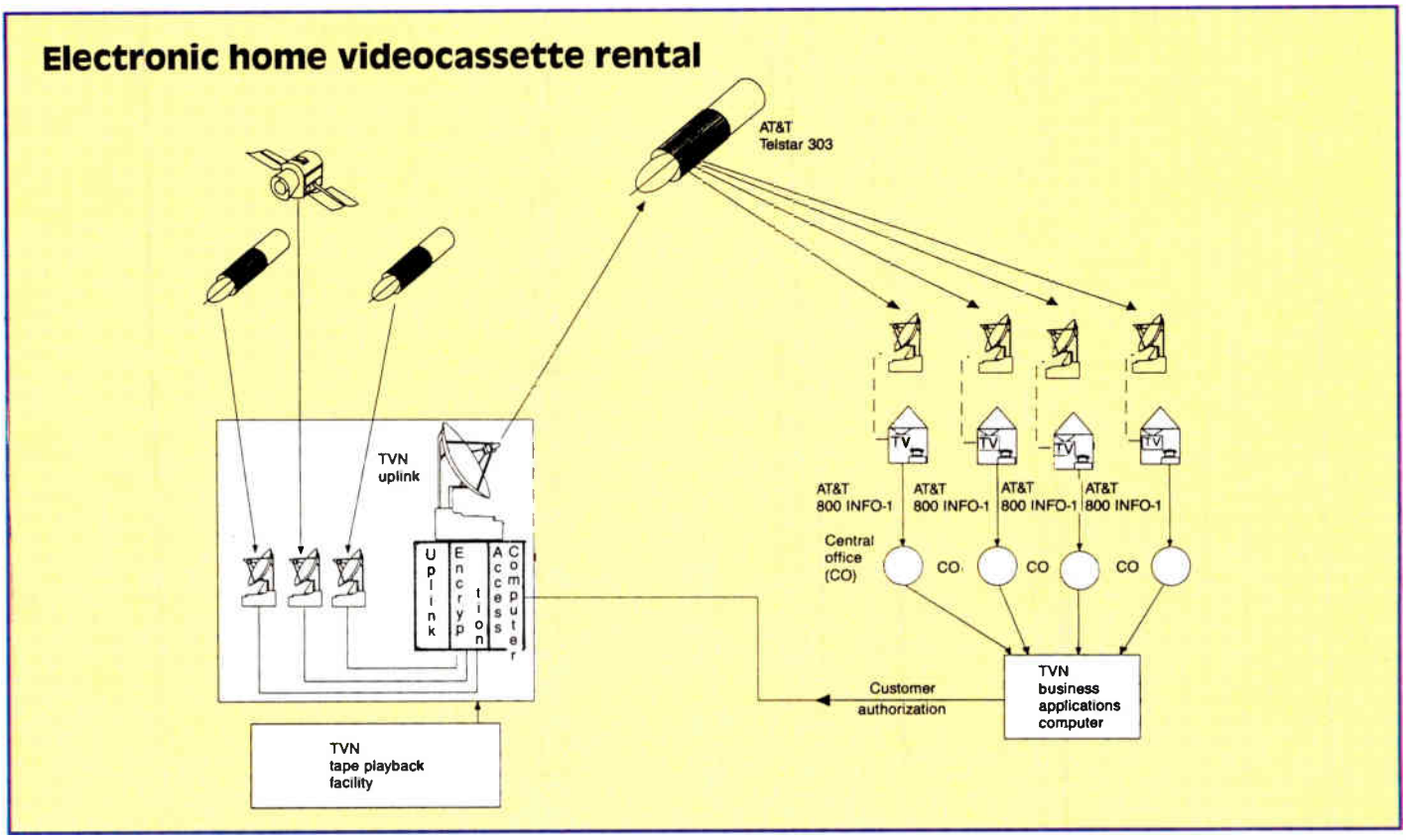

From design to dish

By Paul F. Beeman
Vice President-Engineering, TVN Entertainment Corp.

The concept of direct broadcast satellite (DBS) services has been with the satellite industry for many years. In fact, there have been several attempts to create, market and manage a DBS, or more appropriately direct-to-home (DTH), business in the last five years. Currently there are at least four major players in the next phase of evolution of DTH business. They are, alphabetically, K-Prime, Sky Cable, Sky Pix (all Ku-band services) and TVN Entertainment (a C-band service). All these services and those in the wings still being designed, can be seen as complementary services to the cable TV industry.

TVN's concept is to offer 17 channels of programming to the home TVRO marketplace. These channels will be 10 pay-per-view (PPV) movie/event channels, six basic channels (program services offered within the monthly cost for TVN) and one unscrambled promotional channel for the movie/events currently being offered by TVN.

The paramount issue any pay service has to contend with is that we cannot have a pay service if we can't get paid. The following are the technological hurdles the engineering group of TVN had to overcome and the direct impact on the business aspects of operating a DTH network.

There were several major engineering or technological subsystems required at the onset of development. In a macro view they were:

- receipt and high-speed implementation of the consumer's order;
- control of activation and deactivation of consumer descramblers;
- development of a cost-efficient descrambler utilizing high-speed addressing, and hard video and audio scrambling;
- a system that is secure and resists "economic" pirates that pose a financial impact on the business plan; and
- a consumer friendly descrambler that is easy to implement with a wide variety of home satellite receivers, integrated receiver descramblers (IRDs), and consumers' entertainment equipment (TV set, video monitor and stereo sound system).

Ordering and billing

The requirement of high-speed receipt and implementation of a consumer's request to view a program obviously meant capturing a large amount of data in a very short period of time. We decided to use AT&T's automatic number identification (ANI) technology to obtain the first piece of required data—the telephone number from where the consumer is placing a viewing order.

The second piece of information required is the movie or event the consumer wants to watch, preferably requiring no intervention from the consumer. We did not want the consumer to call a specific phone number and enter a PIN (personal identification number) or a number to indicate the chosen program. Reaching this point meant using a separate ANI phone number for each of the channels or (in our concept) "theater." Therefore, when a consumer calls an ANI telephone number, the information passed on to our control system would be indicative of the consumer's actual order. For example:

Data transmitted to TVN =
21255512344886

Where:
212 = area code
5551234 = originating phone number
4886 = last four digits of number called

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Reader Service Number 13

"The paramount issue any pay service has to contend with is that we cannot have a pay service if we can't get paid."

or event the consumer wants to watch.

One would think that after receipt of an order the next step would be to authorize the consumer's descrambler. Actually, the next step is to query the billing computer systems to ascertain whether that household paid their last bill. If their billing status is satisfactory, then the descrambler is authorized.

The speed of the transaction to this point is limited by the capacity of the ANI system and the computer control system sending the authorization data to the scrambler for transmission. Currently, the ANI capacity is 1,440 calls per second per telephone number. The computer control system has a capacity of 14,400 per second. (That is not a typo!) As more subscribers sign onto the system, AT&T will keep pace with the capacity of the ANI system.

Descrambler development

The device we chose had to be compatible with consumers' current TVRO and entertainment equipment. This simple requirement meant that video, audio and RF inputs and outputs had to be incorporated in the descrambler design. This allows a consumer to route baseband video and stereo audio through the descrambler from an external source.

Composite video (unclamped, unfiltered, de-emphasized) also is brought into the descrambler and a buffered output is provided for use with another descrambler or subcarrier demodulator. RF switching also is available to select the built-in TV modulator (Ch. 3 or 4) signal or external source, VCR, IRD, etc.

Ease of control of the descrambler also is extremely important to maintain consumer friendliness. Each descrambler is controlled via an infrared hand-held remote. The remote control commands such features as current available program for purchase; next available program for purchase; a help screen giving the customer the serial number of their descrambler (bar code), uplink identification, signal strength and telephone number to call for assistance; and function controls including audio source selection (Dolby stereo, two-channel mono based on the audio of audio Ch. 1, two-channel mono based on the audio of audio Ch. 2, subcarrier audio that allows for bilingual audio on subcarrier), parental password and local rating ceiling.

The most important concern regarding the descrambler was authorization and deauthorization of the correct descrambler and consumer. To ensure that TVN always had an accountable person for each descrambler, two facts became apparent immediately. First, the ownership of the descrambler should always be maintained by TVN. The consumer will pay a monthly charge to cover amortization of the descrambler, maintenance on the descrambler if it requires repair and basic programming.

Second, as noted before, when AT&T passes the ANI information on to TVN we receive a data packet containing the phone number of the consumer requesting authorization. This phone number *must match exactly* with the registered number in the control computer for each descrambler. For example, John Doe supplies the following information at time of registration for a descrambler: John Q. Doe, 123 Any Main St., Anywhere, Calif. 98767, (213) 555-1234. When John Doe calls an 800 ANI number to order a movie in Theater 1-10, calling from the phone number registered, *and* he is current with the billing computer, he will be authorized for the event/movie requested. However, if he calls from his neighbor's home, the ANI packet received at TVN will have an unregistered phone number and therefore the control computer will not be able to look up a descrambler address to authorize. Remember, you cannot have a pay-per-view service if you can't get paid!

Security and scrambling of the program content were the initial building blocks of the TVN project. We wished to have several key features in the scrambling technology. They were:

- high-speed addressing over the satellite link, 14,400 units/second/channel achieved.
- hard video scrambling in which each field of video is broken into two blocks of 120 lines per block; lines are randomly changed in position within each block; scrambling pattern changes 120 times per second
- hard audio scrambling
- individual descrambler control, group and area control for authorization, blackouts, authorization of multiple channels of programming simultaneously
- large number of program tiers

After reviewing the technologies in place at the time the project began, TVN licensed the Leitch ViewGuard technology with necessary modifications to "consumerize" a descrambler.

The first change in the ViewGuard technology was replacement of the standard digital audio subcarrier with digital stereo audio in the baseband of the video signal. The result was digital stereo audio transmitted as four level pulse amplitude modulation on the back porch of the horizontal blanking interval. The digital format would be Dolby Laboratory's ADM (Adaptive Delta Modulation) technology.

The second change was to reduce the cost of the analog-to-digital (A/D) and the digital-to-analog (D/A) converters, and to encompass the vast majority of the digital processing of video and audio into a single ASIC (application specific integrated circuit). The result of research and development in A/D and D/A converters was a cost reduction of a factor of 25. The ASIC when it was completed would include in excess of 12,000 gates.

The descrambler, excluding input and output buffer amplifiers and switches, can be broken down into input filter section, ASIC, secure microprocessor, Dolby ADM circuit, character generator circuit and output filter.

Putting it all together

Up to now we have dealt with TVN's D-CODE project as a single entity. In fact several major companies played key roles in pulling the entire project together. Each had its own unique specialty that allowed the project to mature from a concept into a final product directed at the nearly 3 milion consumer TVROs in the United States.

The team is:

- AT&T: TVN utilized AT&T's ANI technology to collect the data required to process the consumer's order. The concept of 17 channels of C-band DBS is made possible due to TVN's ability to lease 17 transponders on a single satellite, in this case AT&T's Telstar 303. Message traffic had to be relocated by AT&T to make 17 transponders available.
- Leitch Video International: Leitch's role was to evolve the current ViewGuard technology to reflect the changes required in audio transmission and cost reduction to enable a consumer descrambler to be manu-

(Continued on page 44)

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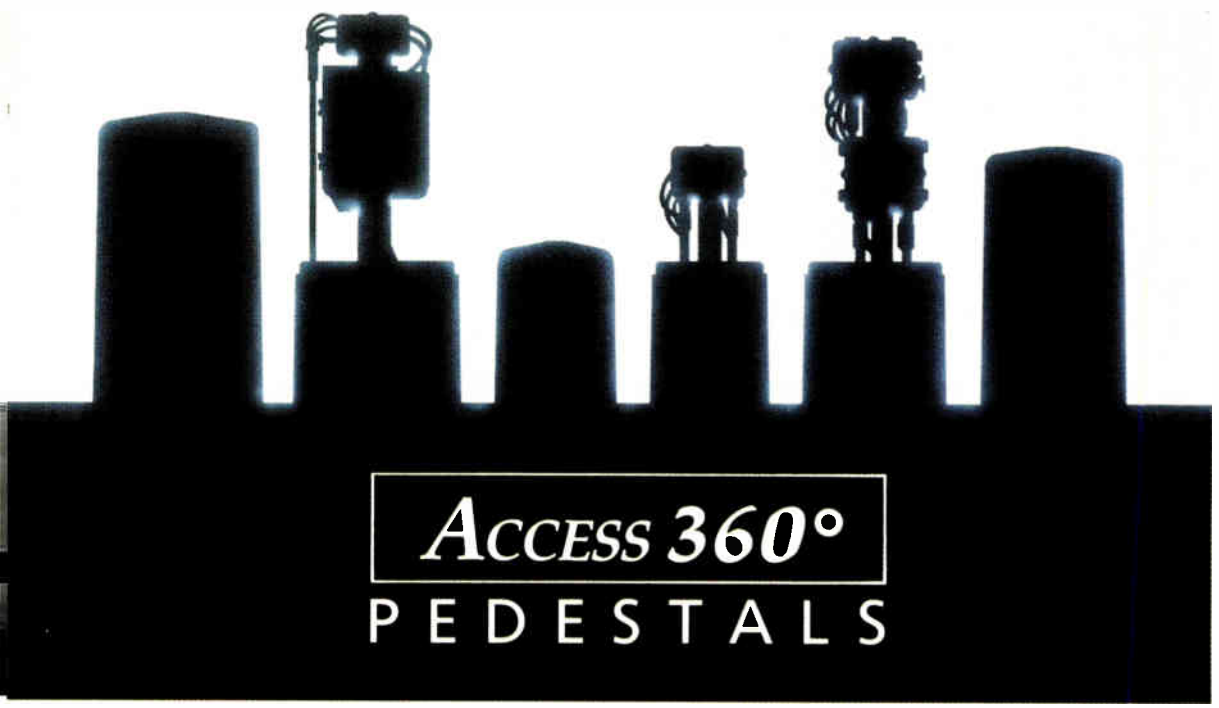

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Fiber-optics vs. satellite distribution

The cable TV industry has used satellites for distribution of cable programming since the mid-70s. Fiber optics is now beginning to play a part in the transportation of programming for the major broadcast networks and it's entirely conceivable that this mechanism could become part of the way systems are linked up with major cable programmers in the future.

Vyvx (pronounced "vih' vix") National Video Network, a subsidiary of the Williams Telecommunications Group Inc., has been providing backhaul service since January for ABC, CBS and NBC, and is now doing so for CNN. Vyvx uses WilTel's 11,000-mile nationwide switched fiber network (Figure 1) for backhaul signal transportation and is laying the groundwork for signal distribution (e.g., broadcast networks to affiliates). Under consideration is the possibility of also distributing cable programming to headends using fiber instead of satellites.

By Ray Sensney
Vice President, General Manager, Vyvx National Video Network

Microwave and telephone circuits provided the only means of network TV distribution before the advent of satellites. This was an effective method; however, there were difficulties in reaching some areas of the country. Thus, satellite technology evolved and broadcasting saw an opportunity to reach all areas of the United States with improved quality.

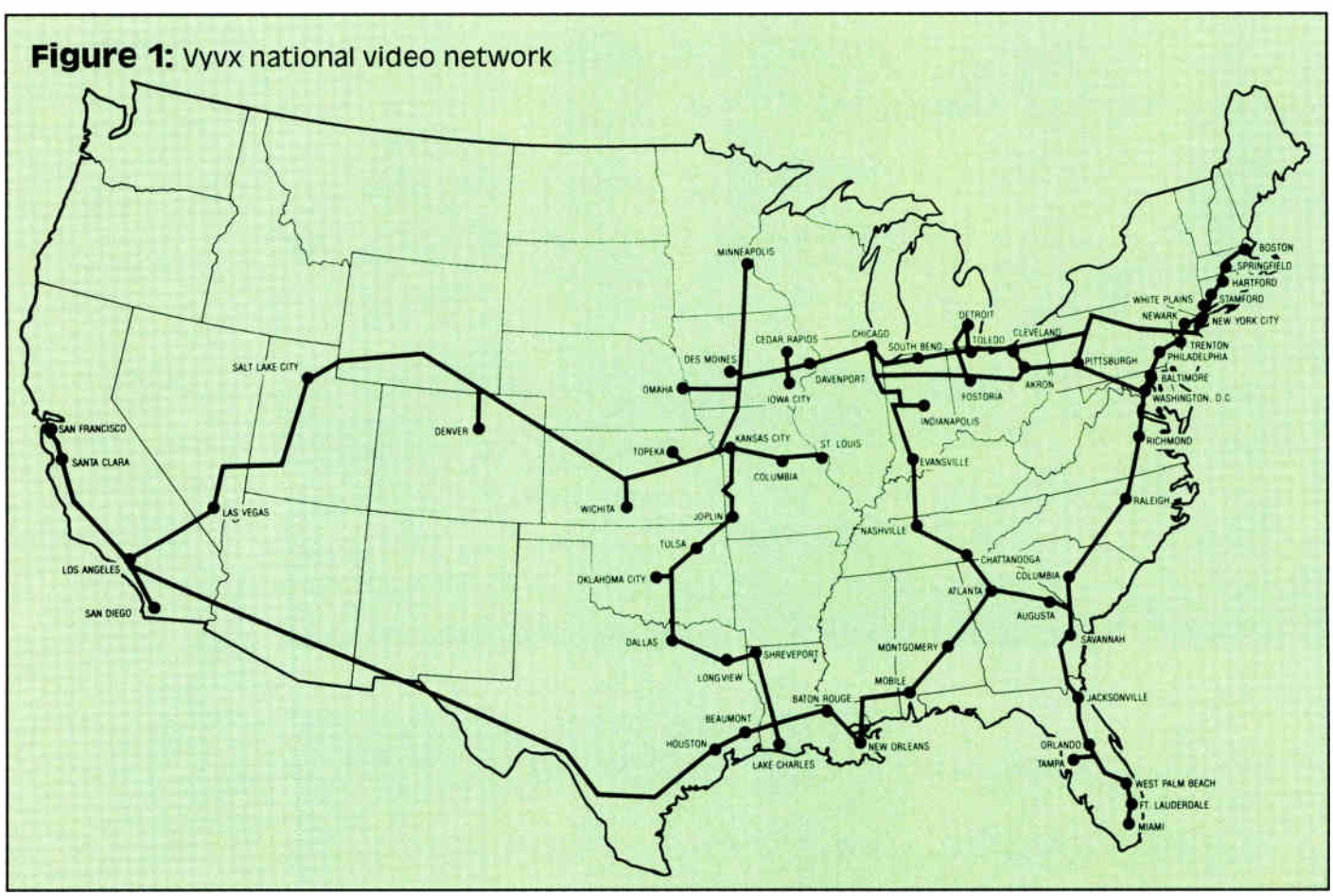
Satellite TV distribution allowed networks to send signal from the broadcast point (uplink) to a satellite, which then retransmitted the signal back to Earth to local TV stations across the country. The local station has a receiving antenna (downlink) that is aimed at the satellite to receive the network's signal. This process is referred to as point-to-multipoint distribution.

Most of the major networks, such as CBS, ABC and NBC, have depended primarily on satellite transmission since the early 1980s to meet their broadcast distribution needs. Satellite technology has served the networks' needs well; however, the limitations of the technology have become apparent. Today, the networks' concerns regarding the distribution of their broadcast signals are shown in Figure 2.

Reliability

Reliability is of key concern to networks or any other sender

Figure 1: Vyvx national video network



A comparison of fiber vs. satellite

Issue	Fiber	Satellite
Quality	64 dB S/N returned	50 to 60 dB S/N returned
Reliability	99.999% uptime	Inherently weaker: • Rain attenuation • Sun transit outages • Earth-based microwave interference
Security	Inherently secure from interception	Easily intercepted; security requires scrambling
Costs		
Initial	Last-mile installation typically $500 to $1,500 per point	Uplink can cost $300,00 to $500,000
Monthly	$4,500 to $110,000 depending on distance and terms	$50,000 to $150,000 depending on satellite availability and terms
Hourly	$400	Comparable—$200 to $780 depending on vendor, satellite, rate period, etc.
Availability	Nationwide long haul is wide open	Slightly constrained; future capacity is contingent upon launches in 1992 and after

of TV signals. Satellites provide networks with the capability to control their distribution and switching, substantially eliminating the telephone calls and coordination of people with the old microwave distribution system. Although reliability is improved, concern still exists about the switching required to avoid satellite sun outages and the potential for rain and adverse weather to affect the satellite signal. In the event of an outage a loss of critical signal occurs.

Satellite networks are not inherently redundant. The minimal but real possibility exists of a catastrophic loss of one or more satellites. Due to the recent number of satellite launch failures, including the catastrophic loss of the space shuttle Challenger, the communications industry has seen a decline in the number of satellites and transponders. To compound the problem, the Reagan administration issued a presidential order in 1986 prohibiting the launch of commercial satellites from future space shuttle missions.

Fiber-optic networks are very reliable for TV transmission. The Williams Telecommunications Group's fiber-optic network used by Vyvx is engineered to 99.999 percent availability. Unlike satellite transmission, fiber-optic networks are not affected by sun outages and adverse weather conditions because they are made of glass. Segments of the network are buried in decommissioned oil and gas pipelines for enhanced protection. Redundant routes are available to protect transmissions.

Security

Security of TV signals is becoming an extremely important issue. "Hackers" have interfered with signals as well as received proprietary signals. To major networks, cable companies and businesses, security is a multimillion dollar concern. The Motion Picture Association of America estimates that more than $320 million is lost annually in the United States due to satellite piracy and cable TV theft. Millions of dollars are spent on scrambling equipment to prevent unauthorized reception, interference and theft.

Satellite TV signals can be disrupted or received by virtually anyone with the right knowledge and equipment. And, as the technical capability to interfere with these signals becomes more prevalent with the increasing number of uplinks in the nation, it's almost certain that the number of occurrences will increase. The law governing unauthorized reception and theft of satellite signals also is vague and hard to enforce, further contributing to the problem.

Fiber optics provides a secure TV transmission medium because signals cannot be intercepted. This security offers major networks, cable companies and business TV networks tremendous advantages, including cost savings. No scrambling equipment is required to prevent unauthorized interception.

Cost

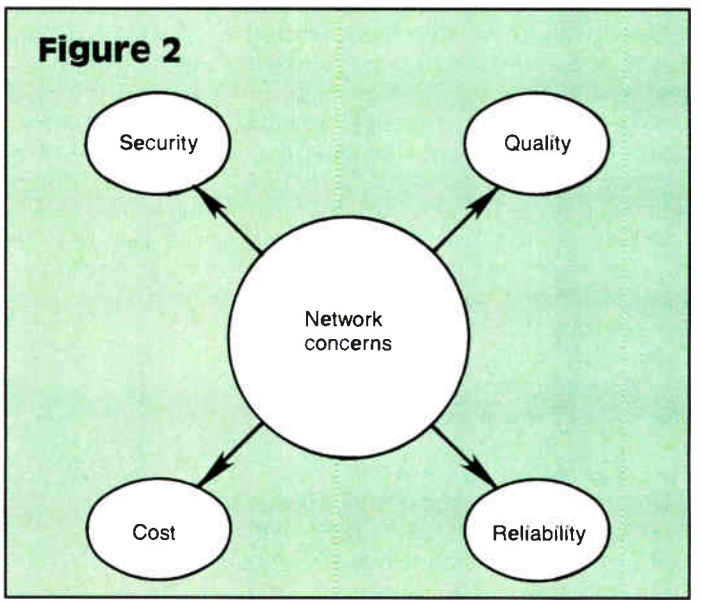
Fiber-optic and satellite transmission offer comparable costs. Consider these current cost comparisons. Initial set-up costs to transmit over fiber only require $500 to $1,500 per last-mile connection. A satellite uplink costs about $300,000 to $500,000. Monthly full-time fiber transmission will range in cost from $4,500 to $110,000 compared to satellite transmission costs of $50,00 to $150,000. Hourly transmission costs are also equitable, with fiber costing approximately $400 per hour compared to $200 to $800 an hour for satellite. However, within the next several years, the advantages of using fiber in terms of cost and services will increase substantially.

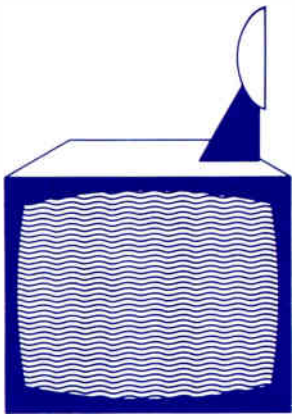
Broadcast signals are currently sent to major markets via satellites, microwave links or long-distance circuits. These methods all require a high degree of coordination. A major limitation is that many affiliates do not have the necessary equipment (uplink capacity) to transmit their own signals via satellite. Since the equipment cost to acquire this capability is a minimum of $200,000 (satellite news gathering truck), affiliates are limited as to what programs they can transmit to other affiliates.

TV stations would like to broadcast their own news material to other stations to enhance their market position. Typically, when

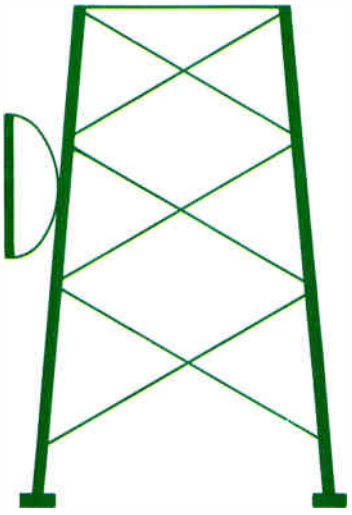
(Continued on page 46)

Figure 2





Filling the void with wireless



By Marty Jeffery
Vice President-Marketing
Microwave Distribution Systems

Remember when the broadcast industry felt cable was not viable? Some had a tongue in cheek attitude—and it persisted for years. In some ways nothing has changed. Yes, cable is believable now, but guess what? Those same "cable rebels" are acting exactly like their broadcast predecessors did (and are still doing in many cases) toward alternative delivery methods. They, like the people that believed flight was impossible, have remained unable to accept any changes in the status quo. So why are some of the "old school" rethinking wireless cable?

By and large, most cable franchises face a similar problem: Small and rural markets are in many cases just too expensive to hard-wire for cable TV. It's agreed that this situation has been frustrating, but it also may be dangerous. This danger lies in the fact that a competitor may obtain a license from the Federal Communications Commission for service to rural and underserved areas. This license could place a wireless operator right in your own backyard.

Today's low power wireless systems have the capacity to deliver premium, pay-per-view and, yes, even high definition TV signals. True, at present only 31 or so channels are allocated, but when it's "no fat" (i.e., market sensitive) programming that is priced right, then that outlying wireless system could soon establish itself and boom into a franchised territory with subsequent erosion of a hard-wired system's precious subscriber base.

The technology exists

Unlike futuristic glimpses of high power satellites and 100-channel direct broadcast systems, this technology is being marketed now. FCC-approved, this patented low power microwave technology is the brainchild of the communications giant GEC Plessey Telecommunications (Canada) Ltd. Getting away from expensive combining and filtering networks, the system uses only one broadband amplifier for each eight-channel block, eliminating the need for diplexers and over 50 percent of the components required for conventional high power microwave TV signal delivery. Start-up cost is as low as $8,300 per channel to implement at the headend; complete receive-end installations can be made for as low as $250.

Low power doesn't necessarily mean limited reach. Even at only 1 watt per channel, a well-engineered system will cover over 1,100 square miles with a picture quality rivalling that of the best possible cable delivery system. Rather than giving another party the opportunity to compete for your subscribers, this could be the answer to some of those nagging extension problems.

Why wireless now?

Although wireless has been around for a while, it has been plagued with many of cable's early problems. Many wireless operators simply over-leveraged their fledgling companies and the result was predictable. Another reason for the slow development was a lack of key programming. However, these problems appear to have been resolved.

"As most cable operators know, there is more than one way to skin a cat."

As well, it seems that the FCC and Chairman Al Sikes are squarely on the side of more competition for the cable industry and, therefore, in favor of alternate sources of delivery. Sikes is making the way easier for licensing MMDS and reliable sources claim that more frequency allocations are imminent.

The relative low cost of this system means financing isn't the major hurdle that it used to be. The lower towers required in LMMDS (50-160 feet) and product availability translate to speedy implementation once an operator receives a license. In other words, the technology has truly become "bite size"—markets of 150 subscribers can show a profit.

Taking the offense

The question is who will provide this service? Perhaps only time will tell, but the best defense is often a good offense. Cable operators can retransmit signals from an existing trunk line, therefore much of the costly headend receive equipment isn't duplicated. Like newspapers, cable operators could offer different city and rural programming packages. Programs of more specific interest to the rural viewer could be an option depending on operator's flexibility and target market demographics affecting viewership.

No existing cable operator wants to see an eroding subscriber base or a curtailment of future growth. If any outskirts operator should decide to provide a "no fat" premium programming package into a specific franchised area, the cream of that franchise might well be skimmed off the top. A well-run system with proper programming is hard to beat. Unless completely encumbered in FCC red tape, the future for extending and filling "voids" could be very profitable. As most cable operators already know, there is more than one way to skin a cat. **CT**

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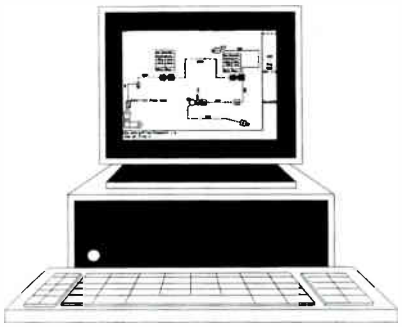
Sorting Out CATV CAD: Part 1



This article focuses on a myriad of complex CATV design issues you might encounter using the personal computer as an engineering tool to overcome the tedious and wearisome tasks of designing broadband systems by manual means—the calculator. PC design software tools are becoming popular for CATV design solutions, but there are many who still have little understanding of computer-aided drafting (CAD).

This article has been prepared in two parts. In this first part, we explore a short history of cable design, the evolution of the calculator for design, how computers entered into the design arena, and then various managerial issues that interact with the decision to computerize the design department.

In Part 2, we'll look at the various features of cable design software that will help you gain important insight in making a purchasing decision. In addition, we'll examine the issues of training, technical support, hardware requirements and map conversions.

By John S. Gutierrez
President, ComNet Co.

Before we begin our journey into the history of cable design, let's clarify what CAD is. It has nothing to do with design though there are similarities. Drafting, as taken from the dictionary's definition of the word draft, means to draw or to sketch. Design means to plan for an expected outcome. When CAD was originally introduced it was targeted for illustrators and architects. CAD was a solution to overcome the tedious drudgeries of mechanical drawing and it made drafting tables, T squares, compasses, rulers, stencils, pencils, ink pens, mylars, etc., a thing of the past. (This should sound familiar to many CATV designers.) CAM was added to the term CAD to become CAD/CAM, which means computer-aided drafting and computer-aided manufacturing. Now comes CAE (computer-aided engineering). But wait, there's more. There's CASE (computer-aided system engineering), CADD (computer-aided design drafting), CALS (computer-aided acquisition and logistics support) for DoD applications, and who knows what else. Perhaps it will be CAED for computer-aided engineering drafting. For our purposes, let's just call it CAD to put an end to this confusion. Now, for a little history of cable design.

Then there was twin lead

In 1948, when Ed Parsons of Astoria, Ore., set out to improve his TV reception by installing a TV antenna on a hilltop, he discovered he had more signal than was necessary to operate one TV set. Connecting his neighbors along the twin lead ladder cable route (probably on cedar fence posts and from rooftop to rooftop), he became the first CATV operator.

Splitters and taps for TV home distribution were practically unheard of then and Parsons probably made cable connections as direct cable splices. Who cared about design, signal losses, tilt, drop specs, ghosts, mismatches or return losses? It was all trial and error. When TV reception was behind a mountain anything was an improvement. Parsons improved his system's reliability and expanded his service area. Soon, many entrepreneurs would follow his idea, and would eventually develop a scientific approach to designing a system for that expected outcome.

Twin lead wire of the 300 ohm variety was replaced by 75 ohm coaxial cable. Single-channel vacuum tube amplifiers were ganged into a small ventilated chassis that provided some form of "expected" unity gain and tilt compensation. These pole-mounted amplifiers were spaced in accordance to calculated cable lengths (losses) and anticipated number of pressure taps (or vampire clamps). Pressure taps were attached anywhere on the cable and as near to the home to achieve the lowest attenuator pad value. Many homes were often spaced equally apart resulting in a periodicity effect, creating what is known today technically as a "suck out." The attenuation value for each pressure tap was intuitively guessed or made by trial and error for the best picture. If the picture looked snowy you just put in a lower attenuator value, despite the degrading effects on signal levels downstream.

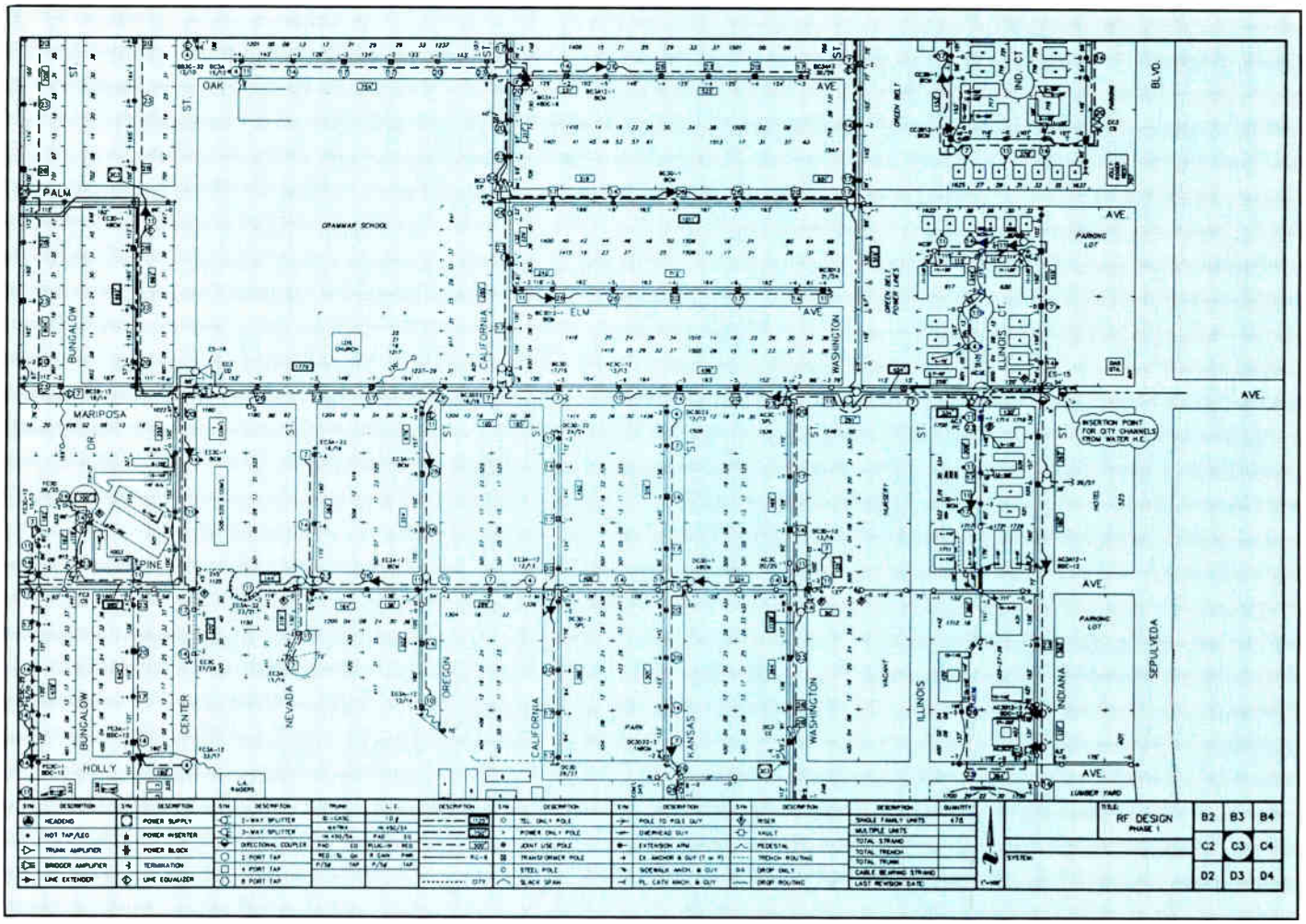
Distribution design was purely intuitive. In general, the design considerations were minimal. As these systems grew, they would soon live and experience a host of technical problems to which solutions would be created. Unfortunately, in the diversity of individual system economics many would delay or not accept the technical advancements.

Then came aluminum cable

The problem with rubber-sheathed coaxial cable was it suffered in the presence of ultraviolet light and ozone and rapidly deteriorated from weather elements. Aluminum-sheathed cable of the .412-inch or so varieties came along to solve this problem. Unfortunately the benefits of aluminum cable were lessened by the vampire clamp, which remained in use. This continued use would later haunt many system operators.

Aluminum cable looked and handled like electrical conduit and a new connector resembling pipe fittings entered the scene. Multiport taps replaced the pressure tap and were installed (spliced) at utility pole locations. Unfortunately, pin holes were left in the aluminum cable following their removal. RF leakage problems ran rampant in mid-channel upgrades and moisture ingress because the holes left by the pressure taps damaged the cable.

With in-line taps having a given port value, a design could be calculated based on the number of homes near a utility pole. In addition, AC powering could be inserted into the cable to operate a handful of amplifiers from a single power source. This was the turning point where CATV design was to become totally engineering-oriented rather than "by the seat of the pants design."



Creating a system design using computer-aided drafting is becoming increasingly popular in cable.

Would CATV design become standardized? How were the intuitive cable designer and technician attitudes going to be changed to cope with deterministic design methods?

Other changes came fast. When the investment community got a sniff of this great and promising market, they wooed the small time operators. Who had ever heard of MSOs and operators wearing pin-striped suits or a tie? Many family-owned (mom-and-pop) CATV operators welcomed the corporate buy outs. Eventually, MSOs would merge or buy out each other in frenzied acquisitions that would eventually create future problems. Modernizing every aspect of CATV operations was at hand and the adding machine became an essential CATV design tool.

Then came the calculator

Adding machines, as they were called, were the primary tools of trade for bankers, accountants and the Internal Revenue Service. The scientific community favored the slide rule. Eventually, the adding machine featured slide rule functions and the adding machine became the calculator. For cable design, the calculator was to became the substitute for the intuitive and trial-and-error approach. Of course, solid-state technology made the calculator smarter. Soon they had memory and could be programmed to solve complex problems. They became battery-operated and could be used out in the field.

In a simple design approach you would start a cable design with a known RF level in dBmV, then subtract from that level the cable dB attenuation to a tap point. A tap value would be selected based on an expected dBmV drop level to the TV set. The tap had a known insertion loss and was subtracted from the known tap input level. These calculations would be repeated again and again for every required tap.

When levels became too low an amplifier was added. In this manner, the total accumulated losses preceding the amplifier would be recovered by the gain of the amplifier—thus the unity gain concept.

The main design concern was the loss at the highest frequency of 211.25 MHz. The 54 MHz band edge was of no real issue. The early tube-type amplifiers had only limited provisions for plug-in pads or equalizers or none at all. These amplifiers had band separators with several tubes allocated to a frequency band. Each of the bands could be individually adjusted for gain. These independent gain adjustments over the amplifier's bandwidth overcame the cable tilt. The trunk also served as feeder. Automatic gain control (AGC) was not common and technicians spent most of their time adjusting amplifiers to the seasons.

Later, these amplifiers would evolve to become solid-state with broadband or wideband capabilities, embracing the entire bandwidth of Chs. 2-13, AGC and using plug-in pads and equalizers. Now cable designers had to calculate for tilt, which would result in designs taking twice as long because of the lower band edge calculations. In time, the band edges

(Continued on page 48)

Managing construction projects

By Ron Cotten
CEO, Engineering Technologies Group Inc.

While the need for CATV new-builds is clearly tapering off in our maturing domestic market, rebuilds, upgrades and plant extensions have become an ever present fact of life. Construction considerations therefore continue to operate as a primary constraint in the industry. Yet cable construction management is by no means a simple matter.

During cable's early years, rebuild/upgrade activities were primarily driven by the evolving technology. Today, however, mature market demands for greater channel loading capacity, improved quality and reliability of transmission, and features such as two-way interactive capability have become increasingly important decision factors. To complicate things even further, an existing subscriber base must now be assured of uninterrupted service during any and all construction activities.

Wayne L. Wicks Sr.

To achieve the desired objectives in the specific mix unique to each setting, current technology presents a complex array of highly refined and highly interrelated options in system architecture. In this environment, professional engineering decisions and solid project management have become essential to the successful completion of a market-tailored, cost-effective rebuild or upgrade project.

One important factor governing the initial planning stage relates to the internal resources available to the system. A few operating companies have sufficient internal resources (system level or MSO directed) to do total rebuilds/upgrades, some have virtually no internal resources, and most fall somewhere in between. However, under almost any realistic scenario, outside contractors are likely to be used to assist in one aspect of the project or another.

The type of contractor used and the nature of the operator/contractor relationship will depend upon the system's available internal resources, once again, and on the degree of oversight and/or participation the system staff is willing and able to commit to the subcontracted portions of the project.

As a general rule, rebuilds and upgrades will include the following activities, any of which can involve the use of subcontractors:

- needs assessment and business plan,
- detailed assessment of existing plant,
- engineering analysis and development of system architecture,
- vendor selection,
- mapping, walkout and makeready assessment,
- system design,
- aerial and underground construction, testing and proof of performance, drop

transfer/drop rework, and wreckout, and
- employee training for new technologies

Here, it may be useful to explore areas where outside consulting engineering and construction contractors can assist in each of these activities.

Needs assessment, business plan

A first step in any construction project involves an assessment of needs so that specific qualitative and quantitative objectives can be defined and a game plan laid out and funded to achieve them.

Channel capacity is a primary consideration. In today's market, a 450 MHz subsplit configuration probably sets the basement for channel capacity, although in many markets systems up to 550 MHz are appropriate.

In the qualitative area, as defined by the carrier-to-noise ratio (C/N) and composite triple beat (CTB) distortion, trade-offs are also possible. For example, in an area where off-air broadcast is poor and competition from other video providers is not great, a C/N of 46 dB and CTB of −52 dB delivered by the converter is probably appropriate. In major metropolitan areas where competition for the video entertainment dollar is more intense, those performance objectives might be tightened to a 50 dB C/N and −54 dB CTB ratio.

Channel capacity and performance objectives are directly related to the level of capital expenditures committed, which in turn should be directly related to the projected needs and revenues of the relevant market.

Whether subcontracted or not, a thorough engineering analysis is essential to ensure that the business plan objectives are optimal and will be achieved at the minimum cost. Consultants can be helpful in presenting and guiding selections from a menu of state-of-the-art options. Current strategies are likely to involve customized hybrids of fiber-optic, microwave and advanced amplifier technologies plus compatible subscriber equipment—all chosen with long-range system goals clearly in mind.

Assessment of existing plant

The days of "tear the old one down and put up a new one" are long gone. Even in the oldest systems some components can probably be reused to help reduce the cost of a rebuild/upgrade. Existing components need to be assessed, not only in terms of their location and condition in the field, but also with a view toward integration into the new project.

"An existing subscriber base must now be assured of uninterrupted service during any and all construction activities."

Cable is perhaps the most valuable asset to be mined for reuse—and cable has a fundamental impact on the new system's architecture. A competent assessment of an existing plant requires a good knowledge not only of cable types, routing and so forth, but also of construction, plant architecture and system design. Contractors hired for this purpose should understand the technical strategy being pursued and should field qualified personnel.

System architecture analysis

The success of any technical project is heavily dependent on the quality of the initial engineering analysis. The whole purpose behind "engineering" is to predict how a system will work *before* large sums of money are spent so the design can be optimized prior to construction. This requires a detailed knowledge of cable TV technology, including repeatered broadband trunking, distribution design, noise and distortion limitations, terminal technology, interconnect technology including fiber optics and microwave, and satellite communications. A sound understanding of system operation also is helpful in dealing with issues such as thermal instabilities, maintenance requirements, plant reliability, customer friendliness and so forth.

There is almost always more than one way to engineer a project. Each viable approach should be explored so objectives are met at minimum cost yet within the framework of a long-term business plan. Consulting engineers offer the advantage of highly specialized training and an objective viewpoint, but participation by the system management and technical personnel is critical. A team approach ensures that all concerns related to the project will be addressed and that the interdependence and timing of individual roles will be clearly defined.

Vendor selection

Cable's manufacturing sector has built up a well-deserved reputation for high quality and depth, which is a byproduct of the dynamic and highly competitive business environment that has characterized the industry for many years. Operators benefit from this through the cost advantages of competitive bidding for system components. Engineering plant architectures that are not vendor-specific can maximize the benefits of supplier competition.

However, it is important to look for the best *value*, which may or may not be found in the least expensive item. The initial cost represents only one component of value; the overall value of the product is determined by the cost over the life of that product. Points to consider are: vendor product support; maintainability; convenience to and preference of system personnel; customer friendliness; reliability features such as mechanical design, heat sinking and surge protection; compatibility issues; spare parts requirements; ease of installation; and on and on. Here, again, the expertise of the engineering consultant can be well utilized, in helping system personnel develop an agenda for evaluating plant hardware, assisting in product testing and negotiating with vendors.

Mapping, walkout and makeready

The mapping/walkout process provides for system data acquisition and input to the design phase. The general rule here is "the more information gathered the better" to make it possible for the designer to explore a reasonable range of alternative networking approaches.

As-builts and makeready assessments are often a part of the walkout process, so mappers should have a good knowledge of construction and code requirements. It also is important that the field personnel have appropriate surveying equipment, such as a sighting scope to ensure accurate measurements and optical range finders for stream and freeway crossings. Inexperienced personnel, whether subcontracted or in-house, can adversely affect the quality of the design by not recognizing problems in the field.

While strand mapping may be handled in-house in some cases, it is typically contracted out because of the production nature of the field work and drafting. There are literally thousands upon thousands of bits of information involved in the mapping of even a small system. A solid quality-control process is essential to avoid errors, which in CATV can have cost consequences down the road. It also is important for the operator to anticipate that some field verification will almost certainly

(Continued on page 76)

Outside-the-home addressability: Friendly and flexible

By Michael T. Hayashi
Director of Marketing, Subscriber Systems Division
And Angela Y. Bauer
Market Specialist, Subscriber Systems Division
Scientific-Atlanta

According to a study released by Paul Kagan Associates (2/28/90), the cable industry is expected to build a total of 69,808 miles of cable this year. Rebuild and electronic upgrade activity also is increasing for 1990. The top 50 MSOs will rebuild 4 percent more cable and upgrade 29 percent more miles of plant this year than in 1989. No matter what the activity, the time is now for operators to consider outside-the-home addressability.

When a new-build or rebuild is in the plans, outside-the-home technology is easily implemented. Even in most electronic upgrades there will be some feeder respacing, allowing the opportunity to pull subscriber electronics out of the home and make addressable equipment more accessible to the operator.

Major plant construction occurs infrequently and is a capital investment that should last 10 to 15 years. Therefore, the chance to consider changing the subscriber service method at the same time as plant construction is important. Plant design choices and distribution technologies employed need to incorporate subscriber technology considerations as well.

Technology

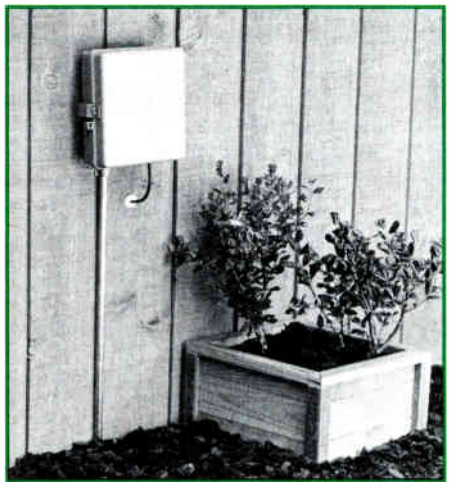
With the possibility of enhanced TV formats with expanded bandwidth, future compatibility with subscriber technology is very important. Addressable interdiction is flexible since it understands frequency assignments and is not tied to a NTSC specified 6 MHz channel bandwidth like a set-top. This feature will allow for future compatibility with HDTV and other enhanced TV formats that may require expanded bandwidth.

In general, the price of outside-the-home technologies is similar to addressable set-tops. The trapped approaches are less expensive but have less flexibility and limited channel coverage. The interdiction approach is slightly more expensive than addressable set-tops but will provide more benefits and flexibility than set-tops and traps.

In performing an economic analysis on subscriber technologies, there are pertinent factors to add to existing economic models that will capture features unique to an addressable interdiction tap. They are as follows:

- ✓reduced truck rolls for disconnect/reconnect/spin
- ✓tap inefficiency factor
- ✓density of homes per mile of cable-plant
- ✓reliability of cable drop
- ✓instant revenue collection for instant-connect
- ✓incremental marketing revenue due to increased choices for programmingpackages
- ✓penetration (basic and pay)
- ✓commitment to 100 percent addressability for the plant

The amount of additional programming available is increasing. With today's technology, it is very difficult for an operator to take advantage of the new programming in an effective and cost-efficient manner to deliver and market the channels. With outside-the-home technology, the operator can add or change a trap (for the trapped base approach) or issue an addressable command with the new channel lineup (for an addressable interdiction product).



Addressable interdiction device for a single dwelling unit.

Being out of the home and out of the way can be a competitive advantage. As new competitors such as DBS or MMDS arise, they will need to place equipment in the home since the signal delivery is scrambled. Outside-the-home technologies allow for differentiation. Signal delivery is in the clear with channel denial just before entering the home. Therefore, cable subs will not need any in-home equipment except for their cable-ready device.

Friendliness

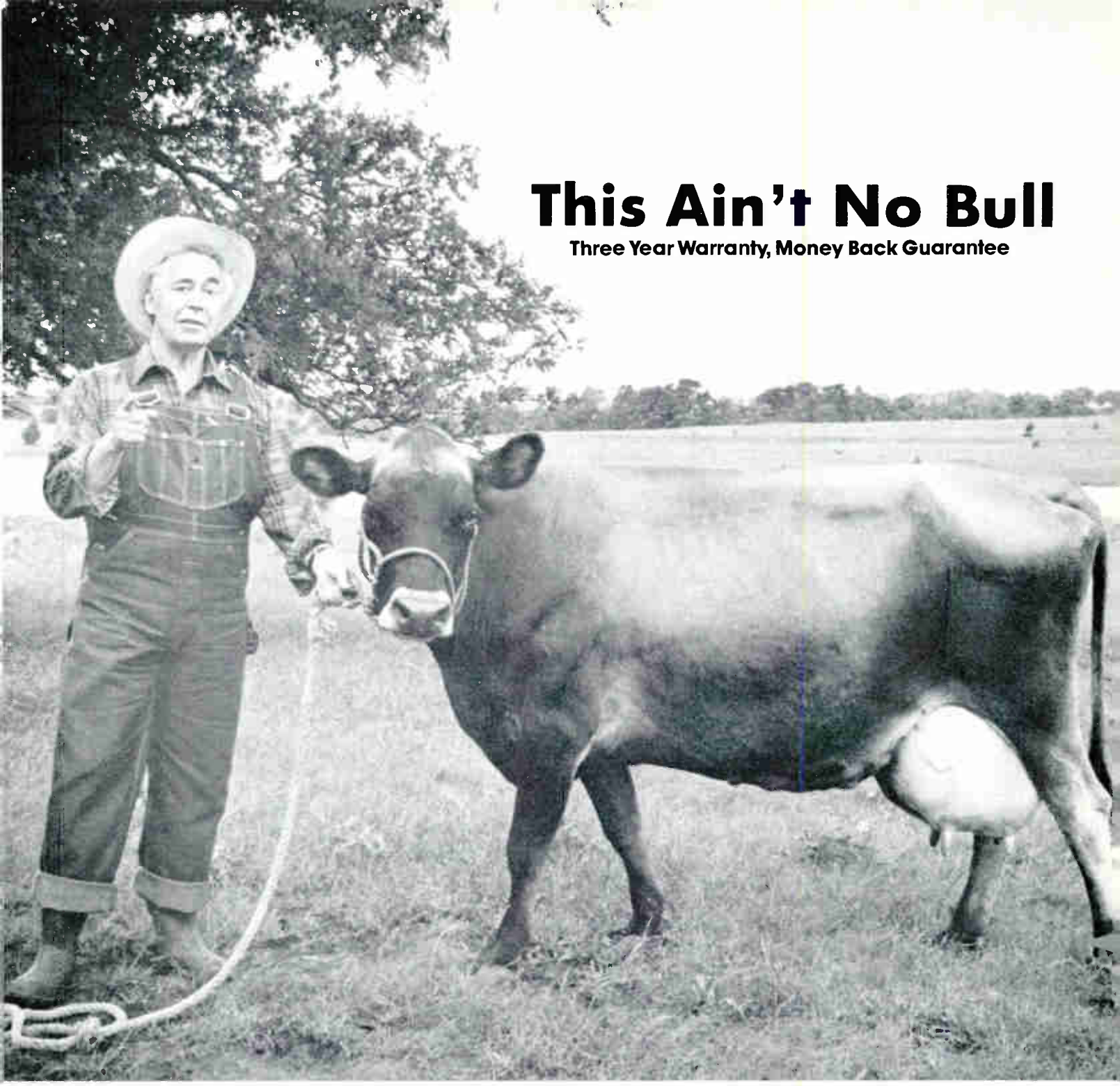
When planning the rebuild activity do not forget one of the most important reasons to consider outside-the-home technologies is friendliness. The phrase "consumer friendly" is almost a cliche´ anymore, however the importance of this feature cannot be overstated. No matter how comfortable an operator feels with current technology, the bottom line remains—subs want something very friendly to operate and easy to use.

Paul Kagan's report, *The Kagan Media Index* (May 17, 1990, pg. 5), shows VCR penetration was 69.1 percent in 1989 and is predicted to be 73.2 percent in 1991. With this rise in cable-ready devices, there is strong argument to get subscriber control equipment out of the house and make cable-ready sets truly cable-ready.

For the subscriber, a set-top terminal and dual remotes are not necessary. Also, since the signal is never scrambled, a better picture quality should be delivered. The operator also presents no complications to the customer since no in-home equipment is required. Finally, the same service is available to all TV sets in the home.

Another advantage to outside-the-home technology is friendliness not

(Continued on page 78)



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Reader Service Number 19.

Basic AC system design

This is the second in a series of articles that will sequentially build on each other and address the following general topics: basic AC design, expanding RF system topology (design considerations with fiber) and other alternative architectures (designing with interdiction). The first article (September 1990) covered basic RF design.

By Mark Bowers
Owner, CableSoft Engineering Services

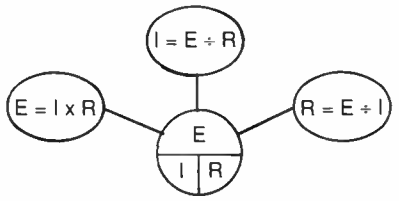
Basic AC system design involves some rather detailed concepts, however they are probably simpler than last month's subject of basic RF design. Many people struggle with AC design concepts, particularly in the area of proper power supply placement and loading. AC design involves some information and principles that we normally don't use in everyday cable system maintenance or operation, therefore they may seem foreign to us. Because a cable system is spread over a wide area, there are unique problems in supplying operating power to its various components. The amplifiers of a cable system are typically spaced 1,000 to 2,000 feet from each other and cover an entire community. Each amplifier must be supplied with operating power, and within a fairly narrow voltage range.

Because integrated circuit (and transistor) amplifiers operate on low DC voltages, it would seem ideal to transmit a low DC voltage along the coaxial cable with the TV signals. This is impractical, however, because of resulting electrolysis corrosion problems. This has been verified during many attempts to do so in early cable systems of the '50s and '60s, with less than optimal results.

This article will take a fresh look at these elements, then make several sample AC designs examining issues and overall concerns. As stated in the first article, this is meant to be neither detailed nor superficial, but rather a basic look examining concepts rather than delving into the complexities and formulas involved.

To determine the expected voltage drop between amplifiers plus final load voltages we must know the cable's length, its DC loop resistance and the amount of current carried. The design is then carried out so the amplifier farthest removed from the power supply or inserter will always have its minimum required operating voltage.

Figure 1: Ohm's law



Other considerations such as power supply efficiency and loading, plus overall current drain and correct supply positioning also will be discussed later in the article. Primary topics involved in AC system design and layout are:

- DC loop resistance(s) of coaxial cables
- Ohm's law and cable AC basics
- basic power supply and inserter concepts
- amplifier power and current ratings
- amplifier tree or nodal layout
- basic current and power calculations
- final calculations, discussions and precautions

DC loop resistance of coaxial cable: The nominal frequency of AC power is 60 Hz. A pictorial representation of this is a sine wave in which each full cycle of the waveform occurs 60 times per second. At this very low frequency there is very little difference between the loop resistance of the cable measured at DC and the AC impedance measured at 60 Hz. Impedance is the total opposition to current flow at some frequency other than DC. Generally, as the frequency increases in a circuit, the impedance also will increase. The point is that 60 Hz is very close to DC, therefore DC loop resistance measurements are used in cable AC design layout.

Most of the resistance in coaxial cable is in the inner conductor simply because it is smaller, but it is customary to specify the overall effect of the cable on the power supply voltage in terms of its loop resistance. This is a given length of cable's equivalent resistance (center conductor resistance plus shield resistance) and is usually stated in terms of ohms per 1,000 feet of cable. Actual loop resistance will vary from a fraction of an ohm for 1-inch diameter cable and larger, to more than 50 ohms for some drop wire types.

Although strand wire does reduce the resistance of the cable's outer conductor in system calculations, it is usually disregarded for several reasons. The overall amount of reduction is small (typically 5 percent or less) and this reduction does not apply for underground systems.

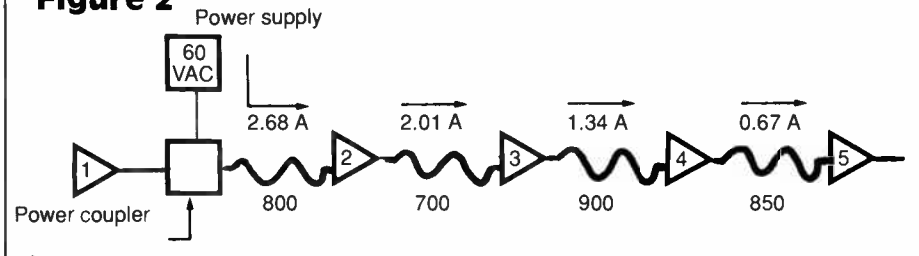
Ohm's law

Any treatise on AC powering in cable systems needs to begin with a discussion of *Ohm's law* (E = I x R). It can be most simply defined by saying that, given the three basic electrical quantities—voltage (E), current (I) and resistance(R)—current flow is directly proportional to total circuit voltage and inversely proportional to total circuit resistance (I = E ÷ R).

This is probably the single most important and basic theorem in electronics because it explains so much of circuit operation. It is simple and easily understood, yet forms the basis for highly complicated theories and circuit/system analysis. Ohm's law is shown more fully in Figure 1.

A law concerning power can be

Figure 2



Assume:
Cable loop resistance is 3.29 ohms per 1,000 feet.
Each amplifier station including power supply draws 0.67 A AC.

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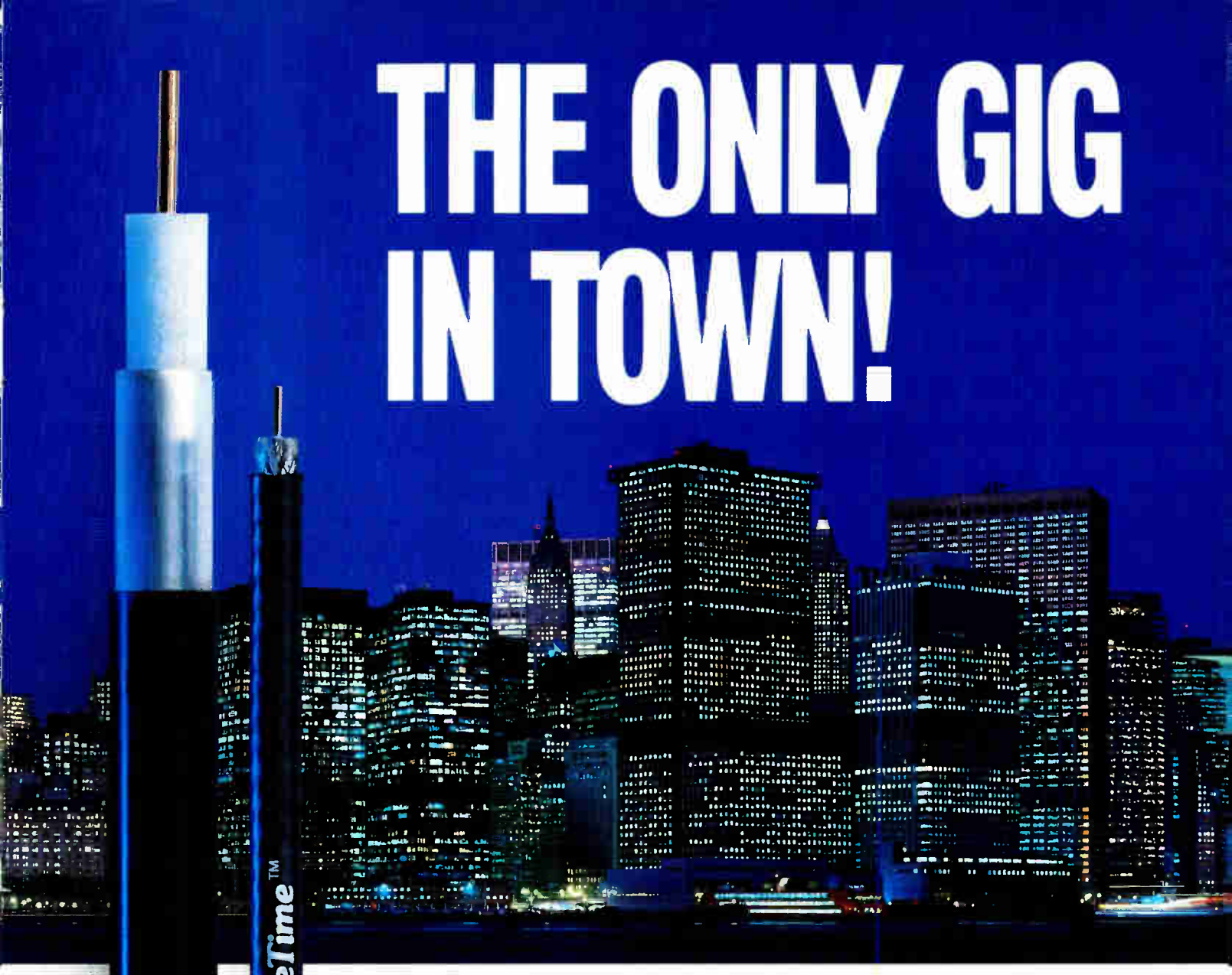

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Reader Service Number 20

directly derived from Ohm's law. If a certain energy level is supplied to an energy absorbing device, at least part of the energy will be absorbed and dissipated in some fashion (or in some cases stored for later use). Accordingly, the amount of energy left over for use elsewhere in the circuit will be less than the amount started with. Electrically, this energy is known as power (P), which is measured in watts (W).

From Ohm's law we see that for a fixed current flow and a specific fixed resistance point, there will be a voltage drop across this resistance. The amount of energy or power absorbed by the resistance is equal to the current flow times the voltage drop that occurs. In other words, power absorbed by a resistance equals the amount of current times the voltage drop across the resistance (P = I x E). Similarly, the power absorbed in an entire system is the total of individual voltage drops in the system times the current flow through each device. In actuality, this only occurs (all power absorbed by the load) when the load is purely resistive (has no reactive components, inductive or capacitive). This condition does not really exist in a cable system, but for our discussion purposes we will assume it does.

When applied to cable tree-and-branch architecture, we now observe that:

1) Every piece of electronic equipment requires a certain amount of power for operation. When supplied a specific fixed voltage, the equipment will absorb the required amount of power by drawing sufficient current as needed.

2) All electrical conductors (wire and cable) have a specific, very minute value of DC resistance, specified in ohms per foot or 1,000 feet, which is inversely proportional to the conductor's diameter.

Examining Figure 2, we see that any section of cable carrying current will have some small voltage drop per unit of length. As current increases, the voltage drop increases. In this example, the DC loop resistance of the cable is 3.29 ohms per 1,000 feet of cable (or 0.00329 ohms per foot), and each amplifier station draws 0.67 amperes (A). Basic voltage drops in this circuit can now be computed as follows:

A measurement of 0.00329 ohms per foot yields sectional DC loop resistances of:
800 feet = 2.632 ohms
700 feet = 2.303 ohms
900 feet = 2.961 ohms
850 feet = 2.796 ohms

Voltage drops can now be calculated as follows:
Amp 4 to 5 = 0.67 A x 2.796 ohms = 1.87 volts (V)
Amp 3 to 4 = 1.34 A x 2.961 ohms = 3.96 V
Amp 2 to 3 = 2.01 A x 2.303 ohms = 4.62 V
Power inserter to Amp 2 = 2.68 A x 2.632 ohms = 7.05 V
Total cumulative voltage drop is therefore 17.5 V.

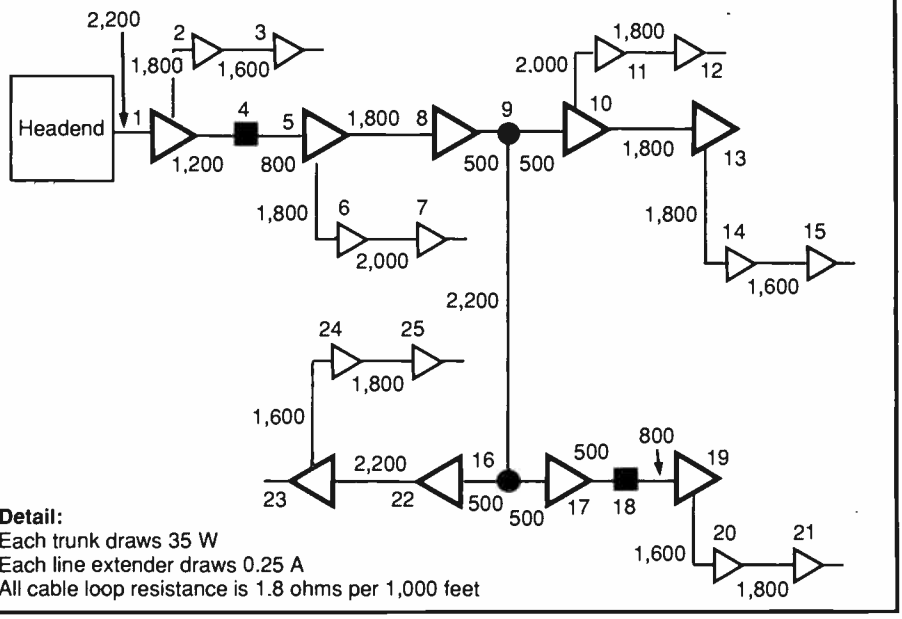
With the power supply at 60 V, the load voltage at Amp 5 is therefore 60 - 17.5 or 42.5 volts AC (VAC). It also is easy to see that voltage drops close to the power supply are usually higher since total current in cable spans closest to the supply is the sum of individual downstream currents.

Power companies minimize this voltage drop problem, which occurs over very long distances between power generation stations and substations, by using very high transmission voltages. It follows that a great deal of power can be delivered using very low current (and therefore very low dissipated power between source and load) if the supply voltage is kept very high.

In designing cable systems, manufacturers have used a similar principle. In the '60s and early '70s, cable equipment was powered with 30 V supplies. Now almost all products are powered by 60 V, with the possible need to go even higher. Since a single power supply can deliver only a given amount of power, using 60 V allows more equipment to be driven by a single supply because the voltage drop (and subsequent power loss) over a given distance due to cable resistance will be a smaller percentage of the total supply voltage.

Clearly, the end AC design goal should be fewer supplies throughout the system using a higher voltage. This further allows for a more efficient design in other areas. As we shall see later, however, we must be careful with the placement of these supplies or we may not gain the efficiencies needed and desired.

Figure 3: Nodal diagram



Detail:
Each trunk draws 35 W
Each line extender draws 0.25 A
All cable loop resistance is 1.8 ohms per 1,000 feet

Table 1: Typical amplifier ratings

Subsplit powering: 450 MHz

One-way stations:	AC power @ 60 V
Manual trunk station	17.4 W
AGC trunk station	21.5 W
Manual trunk/PP bridger	27.0 W
AGC trunk/PP bridger	30.8 W
Manual station/PHD bridger	35.0 W
AGC station/PHD bridger	39.0 W
Line ext. (current rating)	0.33 A

Two-way stations:	AC power @ 60 V
Manual trunk station	24.1 W
AGC trunk station	28.4 W
Manual trunk/PP bridger	33.4 W
AGC trunk/PP bridger	37.6 W
Manual station/PHD bridger	42.0 W
AGC station/PHD bridger	47.0 W
Line ext. (current rating)	0.52 A

Getting the power

Basic power supply concepts: Cable

(Continued on page 82)

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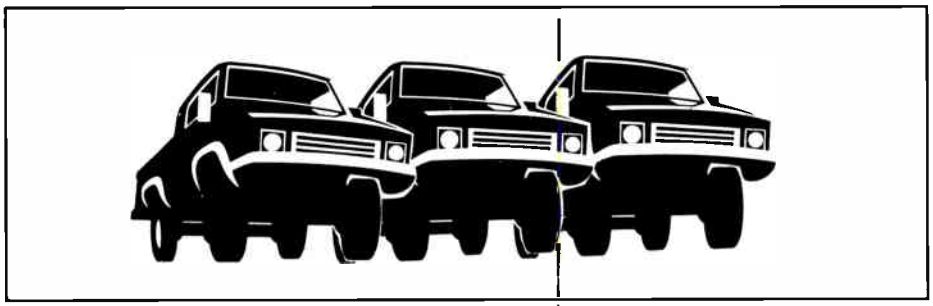
Reader Service Number 22

Fleet safety is profitable

By Steve Schultz
Trustee, National Association of Fleet Administrators



Billions of dollars are spent every year to buy, maintain and repair company vehicles. In an industry like cable TV, which is heavily dependent on fleets, those costs can be a sizeable portion of the operator's total budget. But professional fleet managers say that a strong focus on safety can cut the company's automotive costs significantly.

The National Safety Council reports that approximately one-third of all on-the-job fatalities are motor vehicle related. So cost aside, reducing accidents has to be a top priority at any company that operates a fleet of vehicles. But viewed from even a strictly monetary standpoint, safety saves dollars and makes sense.

The expense of repairing a damaged vehicle is only part of the total cost of an accident. Accidents also cost companies money for replacement vehicles, employee down-time, lost sales or service and higher insurance premiums. In some cases the company itself may have to foot the bill directly for medical expenses, property damage claims and other accident-related liabilities.

Another less tangible cost is depreciation. A vehicle that has never been in an accident is worth significantly more than one that has. The difference will show up in the value of the vehicle when it is ready to be sold.

The fleet administrators who have the greatest success in reducing accidents are those who follow a few basic guidelines. My experience as former fleet manager for Marion Merrell Dow and a trustee of the National Association of Fleet Administrators (NAFA) leads me to suggest the following points that you can use to tailor a safety program to the individual needs of your organization.

Hiring vehicle operators

- Make sure that all drivers—whether rookies or veterans—have valid driver's licenses.
- Check the driver's motor vehicle record. If you find violations, determine if they are serious, whether there is a pattern and if additional training can help the driver to avoid problems in the future. If the violations are serious and not correctable, carefully weigh the potential problems. Do you really need to hire that particular person?
- Evaluate the level of expertise needed to operate the vehicle. Does the operator have the right training and experience to handle it properly and safely?
- Test the driver's ability to operate the vehicle. Include a physical examination as well as a drug test as part of the hiring routine.
- Familiarize drivers with the vehicles and any special equipment it may have. Emphasize safety equipment and procedures.
- Familiarize drivers with their routes and clients. It is easier to concentrate on driving once you are familiar with both the vehicle and the territory.

Defensive driving

- Hold seminars and courses on defensive driving. Even 30-minute segments scheduled on a regular basis will do a great deal to reinforce safety.
- Give frequent reminders about safe driving techniques.
- Develop drivers' understanding of the advantages of driving sober and the risks of drinking and driving.
- Mandate the use of seatbelts in all company vehicles and explain the safety benefits.
- Distribute driver safety literature on a regular basis.

"If your company doesn't have a fleet manager, consider assigning the program to the insurance, risk management or safety managers."

- Identify the cause of all accidents to help improve your defensive driving/safe driving program. Involve the drivers in this review and concentrate on facts, not faults.
- Offer rewards and incentives for safe driving on a time or mileage basis.

Use of company vehicles

- Establish a clear-cut policy on the limits of allowed usage, including both business and personal use. Specify the circumstances under which spouses, dependent drivers and others may use the vehicle, if at all. Indicate whether attachments, such as trailers or boats, are permitted.
- Spell out the penalties for violating the policy.

Once the program is established, safety guidelines should be continually and consistently reinforced within the company. Mail safety reminders to your drivers on a regular basis. They should contain practical information that is useful not only to the drivers but also (when possible) to their families and friends. Periodically check the status of driver's licenses and motor vehicle records as well.

Logically, the best person to oversee the driving safety program is your company's fleet manager. That's the person who usually has the most regular contact with drivers in the field and who is also most directly concerned with the maintenance and operation of your fleet.

If your company doesn't have a fleet manager, consider assigning the program to the insurance, risk management or safety managers. But regardless who is in charge, emphasize that the safety program is a top priority. An effective safety program will safeguard not only the health and well-being of the company's employees but also the company's investment in the vehicles they drive. **CT**

Fiber vs. satellite

(Continued from page 29)

stations share transmissions, there is usually a trade or barter agreement to pay for the service. However, since many of the remote broadcasts are news items, there is competition for the limited transponder time during the news hour. This is especially the case when a major breaking news item occurs. Each unique signal requires one transponder for transmission and only a limited number of channels are available to each network. The addition of transponders is a complex and expensive task. So, as the number of satellite trucks grow, competition for transponder time will intensify and drive up costs. With fiber optics, uplinks are seldom needed, thus reducing cost.

Quality

Networks must deliver "broadcast quality" signals. Any interference can cause catastrophic problems. Satellite transmission is currently affected by several types of factors. The quality of a TV signal degrades as it is processed through a series of equipment such as tape recorders, transmission repeaters, microwave systems, satellite transponders and switching equipment. Weather conditions, such as excessive rain, also can cause signal interference.

Interference from other satellite equipment is also a factor. An increasing number of affiliate, independent, religious and educational TV stations are buying their own satellite news gathering (SNG) trucks to transmit live remote news broadcasts, sports events and other material remote from their studios. Several hundred of these trucks are in operation right now. Law does not require the operators of these trucks to be licensed engineers. Thus, the probability is high that accidental transmissions from these vehicles will overlay network transmissions. The result in many cases is loss of critical signal. Due to all of these factors, typical satellite networks produce signals with 50-60 dB signal-to-noise ratios (S/N).

Fiber on the other hand consistently delivers 64 dB S/N. This higher quality is the result of several factors. Fiber networks can be all digital so signals are delivered to an affiliate city in equal quality and signal strength as the signal delivered to the originating city. TV signals transmitted on fiber do not experience degradation through processing equipment. Additionally, signals from uplinks or weather conditions do not affect fiber-optic transmission.

Conclusion

Security, reliability, cost and quality continue to be of primary concern to the major networks, as well as most other transmitters of TV signals. Dependable delivery of programming and advertising is still the core of networks' business.

The signal problems caused by sun outages, weather conditions, signal interference, as well as the concern about long-term availability of sufficient satellite capacity, are eliminated when transmitting on fiber. A nationwide broadcast-quality fiber-optic TV network provides improved security, reliability, cost and quality, offering networks an attractive alternative to satellite transmission. However, fiber does have its limitations. Satellites can reach some areas where fiber cannot. Nevertheless, broadcasters can now use a combination of fiber and satellite technology to transmit TV programming. This combination greatly improves the networks' overall TV backhaul and distribution transmission system. **CT**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Reader Service Number 25

CATV CAD

(Continued from page 33)

would grow further apart: 270, 300, 330, 400, 450, 550 and today some are talking about going to 1 GHz.

For large metropolitan CATV designs, designers had the arduous task of manually adding and subtracting with or without a calculator. It was pure drudgery but a way of life. If you had the fortunate ability to use a programmable calculator to do designs, you were the envy of many and ripe to enter the space age of computers. For many others, the programmable calculator seemed a bit too imposing, and others developed a fear and distrust of "smart" machines. For whatever the reasons, any business that ignores the power of the PC as a productive tool is a good candidate for higher labor costs. Cable design would get new help with the arrival of the PC, but how?

Then came the computer

For many, designing cable with a calculator was the way of life. Designing cable TV this way was like using a typewriter to write an important paper. If you missed a thought or idea in the middle of your paper, you'd probably have to retype the page on which you entered a new paragraph on or scheme some way to avoid retyping without making it obvious. Likewise with the calculator, if you made a mathematical error, you'd have to start all over again.

Editing text reports and letters with computerized word processors was done easily. You could insert new words and the previously entered text would move over. You could review and modify your document, even spell check it, before printing it. You could save your work on a magnetic disk, then return to it later. Sending out standard form letters without having to "retype" reduced labor wastes, errors, costs and carbon paper. Cable design needed to work as easily as these word processors.

The first computers were primarily developed for the scientific communities to solve complex math problems that could take hours, if not days, months or even years. These computers were huge and had thousands of tubes acting as buffers and memory. In time the computer would become miniaturized until it became personalized enough to be called the PC.

While PCs were growing in popularity, the programmable calculator was the choice of many cable designers. This "smart" calculator used magnetic strips or had built-in memory that could be programmed by the user. Simple branch designs were made easily and quickly but there was no memory storage capability for the design output. Some calculators could be attached to a printer for a hard copy recording.

However, the PC was more imposing than a calculator. Now you had to learn how to use the operating system—the ever popular DOS—and how to handle and format floppy disks for storing your data. The PC also had a keyboard like that of a typewriter.

Some important features of the PC are that it has more memory than a calculator and has the ability to save files to a floppy disk. The PC has a cathode ray tube monitor for much more viewing area than a calculator. In addition, the PC could be programmed to data base information and to do subroutine calculations while suspending the main program for a new input variables. It could recalculate long serial problems in a twinkling of an eye. This seemed like a perfect solution for cable design, but where could you go to buy a

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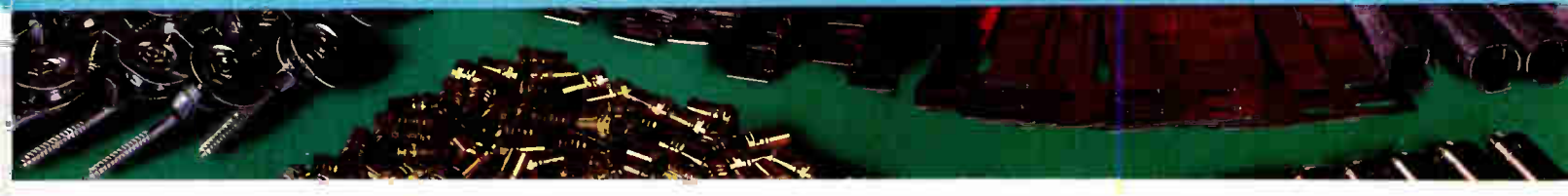

tion battle with your organization. Months of meetings later (if management hasn't turned over) you finally have chosen a vendor. It could be worse. You get it "wiped out" from the budget by standard accounting practices. If there are organizational changes, you could be back to square two—justification.

Engineering viewpoint

A CATV engineer by his nature is intrigued by new technologies, but he needs to blend in a sense of business savvy. His mentor personality is often transferred to his subordinates and soon everyone is in the business of fixing problems, saving money or finding better ways to do a job. Just about every major system has or had a chief engineer who "climbed the ropes" from technician or even installer. His love for cable made the job all the more fun. He learned how to do home installs, how to troubleshoot for a bad fuse or a bad amplifier, took care of his tools and his truck, balanced trunk lines, designed extensions, dug trenches with a spade, spliced cable, inventoried the warehouse, worked on headends, put in a satellite dish, planned for purchases, dealt with angry customers who couldn't understand rain fade, trained his employees and filled out endless reports. He was a genuine "hands on" kind of guy.

Today's modern system chief engineer has taken on one of a great variety of new titles such as: vice president of engineering, director of engineering, regional engineer, state engineer, system engineer, plant engineer, plant manager, etc. Often, he comes to a system with a college degree and sometimes not in the expected discipline. He'll have a degree in business, a B.S. or even a M.B.A. This seems OK because the modern engineer must spend a greater percent of his time making business decisions but somehow he's still perceived to be an engineer—a "nuts and bolts" kind of person. Today's "fraternized" engineer often takes command of many departments and charges them off to work and often overlooks the sweat and toil of his employees for the sake of improving budget performance.

For cable design and drafting tools, he might assume that the calculator and the traditional pencil and T square are sufficient and cost-efficient. This mentality of getting the job done for the lowest possible cost may well please higher management, but its effect eventually impacts everyone. Its effects often start slowly at the bottom with the changed attitudes of installers, technicians, designers, CSRs, supervisors and even secretaries, until finally the profit and loss statement is jeopardized. At this point, many businesses cut costs to survive. It is not recommended that any business should spend every cent for every form of modernization but it should maintain a positive sense of balance for productivity tools for profitability.

Consider new cable regulations such as cumulative leakage index (CLI). This has suddenly reduced capital budget restrictions because of the fear of being shut down by the Federal Communications Commission. Now systems *must* spend money and are forced to purchase the often ignored RFI equipment and spend money on maintenance procedures. Now additional money must go for technicians, software, PCs, printers, training, flyovers, drive outs and the cost of the time used to fill out the government forms. Yet,

(Continued on page 74)

Who Says You Can't Please Everyone.

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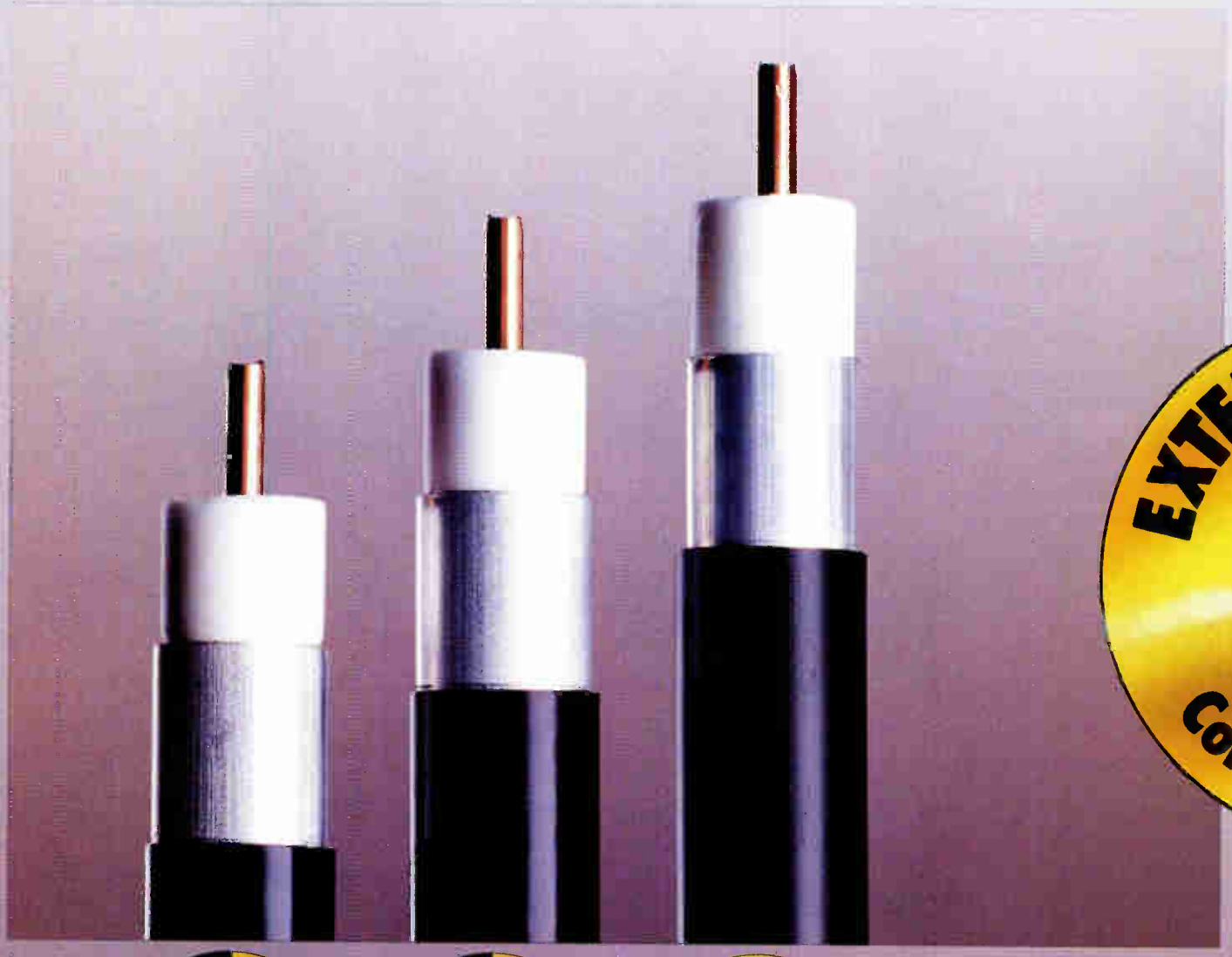

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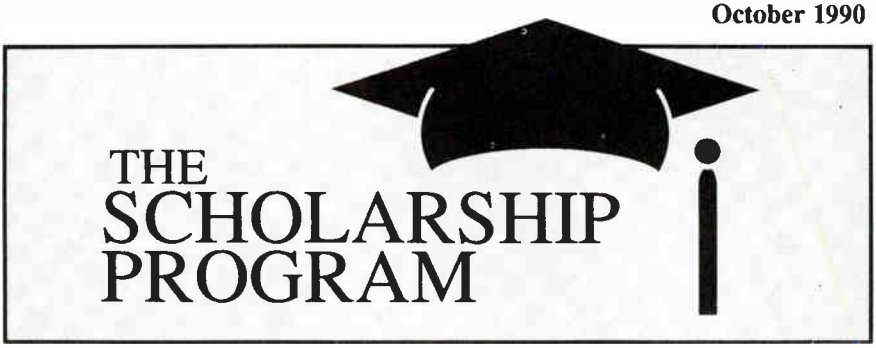
October 1990



Society Awards Five Technical Scholarships

The Society of Cable Television Engineers is proud to announce the recent presentation of five Tuition Assistance Awards through its Technical Scholarship Program. Receiving grants are: Frank Adams of Viacom Cablevision; Mark Davis of Cencom Cable TV; Michael Pieson of Paragon Cable; Jack Villa Jr. of Western Cablevision Inc.; and Paul Workman of Cox Cable. This brings the total number of scholarships awarded by the Society to 30.

Applications from the scholarship recipients were reviewed by the SCTE Scholarship Committee, which presents awards to industry personnel who show great potential for advancement in the industry. Recipients are given tuition assistance for a technical correspondence course of their choice selected from the course structure of the National Cable Television Institute. The awarding of a scholarship to Jane Lode in 1988 represented an important milestone in the program: the first instance of the Society awarding tuition assistance for college curriculum.

Inaugurated in November 1986, the Technical Scholarship Program was initially made possible through a $2,500 personal donation from Rex Porter. The NCTI agreed to match Porter's grant, enabling SCTE to award $5,000 in technical tuition assistance. This was originally conceived as a one-year program and was supposed to conclude following the awarding of the 12th recipient in October 1987. But through subsequent donations by Porter, the New York State Cable Commission, Steve Bell and Fred Rogers of Dudley Cable TV, Texscan and CT Publications Corp., plus NCTI's continued fund-matching arrangement, the program has continued to award scholarships

through 1990.

According to NCTI General Manager Tom Brooksher, recent graduates of NCTI courses taken through the SCTE Technical Scholarship Program include Sam DuLam, who graduated in April from the Advanced Technician Course; Grady Keenan, who graduated in May from the Broadband RF Technician Course; Paul Stephens, who graduated in May from the System Technician Course; and Jeff Lewis, who graduated in August from the Installer Course.

The Tuition Assistance Committee currently consists of: Toni Barnett, CT Publications (chairperson); Alan Babcock, Warner Cable Communications; Tom Brooksher, NCTI; Austin Coryell, Mile Hi Cablevision; Ron Cotten, Engineering Technologies Group; Ron Hranac, Coaxial International; Paul Levine, CT Publications; Pat McDonough, United Artists Entertainment; Pam Nobles, Jones Intercable; Rex Porter, Midwest CATV; Dave Willis, TCI; and Ron Wolfe, ATC National Training Center.

Applications for the Technical Scholarship Program are available by contacting SCTE national headquarters at (215) 363-6888.

The SCTE Technical Scholarship Program has previously awarded tuition assistance to the following people:

1986 Recipients
Ruben Gonzalez, Group W Cable, Santa Cruz, Calif.
David Wilhelm, Cable America Corp., Phoenix, Ariz.

1987 Recipients
Chris Crosby, Cablevision Industries Inc.
Peter Daly Jr., Rollins Cablevision
David Frauens, Adelphia Communications
Jeffery Goodman, Columbia Cable
C. Mike Hutchens, Freedom Cablevision
Danny Kivett, Freedom Cable
Bill Marshall, Storer Cable
Michael Pieson, Group W Cable
Johnny Ray, Marietta Cable
David Soldan, Lincoln Cablevision
Billy Williams, McCaw Cablevision

1988 Recipients
Jane Lode, Daniels & Associates
Michael Palmisano, Metrovision
Rosa Rosas, Galaxy Cablevision
Paul Stephens, Alert Cable

1989 Recipients
James Beavers, Complete Cable
Sam Du Lam, Choice TV
Dan Fischer, Rogers Cablesystems
Steve Fishman, Med-Sat
Ken Gabehart, Thompson Cablevision
Grady Lee Keenan, Galaxy Cablevision
Jeff Lewis, Midwest CATV
Thomas O'Brien, General Instrument/Jerrold Division
Andrew Skop, Anixter
Gary Strickland, Tele-Media Corp.
Charles Thibodeaux, St. Tammany Cablevision

BCT/E reviewing made easy

By Pam Nobles
Senior Staff Engineer/Technical Training, Jones Intercable

About two years ago, Steve Johnson (an engineer for ATC) and I embarked on a project probably very familiar to many of you, namely gathering all the recommended review materials together for the Broadband Communications Technician/Engineer

Missouri CTA Salutes BCT/E Candidates

This certificate was presented to candidates in the Society's BCT/E Certification Program in attendance at the Missouri Cable Television Association (MCTA) show, held Aug. 28-31 at the Lodge of the Four Seasons in Lake Ozark, Mo. Each certificate was signed by the MCTA's president and executive vice president.

(BCT/E) Certification Program. I thought perhaps we could join forces and resources (since Steve was almost done and I was just beginning!) and come up with some material that could be used by both Jones and ATC systems.

And so we did. At Jones, we added a separate introduction, which consists of BCT/E-related material from the November 1988 *Interval*, program applications and additional information about the certification program. We bound each of the six categories' review materials (Category VII requires no review material) into 2-inch wide three-ring binders, complete with tabs and a table of contents.

During the past two years, I have heard stories of how these review binders have been the envy of test takers at local chapter meetings. I have been flooded with inquiries by SCTE members yearning for their own copies. However, we had two problems. First, we weren't set up to make mass distributions to companies outside of Jones. Second, since these materials are copyrighted, they could be copied for use as reference material only, but could not be sold. Due to continued interest, we recently made arrangements with a local printer to create copies for the industry at the cost of printing and handling.

Program summary

The BCT/E Certification Program was established to raise the professional status of technicians and engineers by providing standards of professional competence in cable TV engineering. It will recognize individuals who meet these standards,

encourage technicians and engineers to continue their professional development and assist management in assessing competency of applicants for technical positions. Also, it replaces the FCC radio/telephone licensing procedure. There are numerous benefits to the SCTE member, including recognition within the industry, and incentive for continuing education and the achievement of excellence. It also encourages active participation in the industry and SCTE at all levels. Note that you have to be a member of national SCTE to participate. Applications and additional information can be obtained from the introduction to the BCT/E (see accompanying table) or by contacting SCTE national headquarters at (215) 363-6888. (Editor's note: The April 1990 *Interval* contains updated study outlines and bibliographies, as well as complete program information)

Seven examination categories, at two levels (engineer and technician) have been established by the BCT/E committee: Category I (Signal processing centers), Category II (Video and audio signals and systems), Category III (Transportation systems), Category IV (Distribution systems), Category V (Data networking and architecture), Category VI (Terminal devices) and Category VII (Engineering management and professionalism).

What you get

The assembled study material consists of approximately 90 percent of the periodicals, papers and articles recommended by the SCTE, as well as some others we thought appropriate. The reference books are *not* included. To reduce collation costs, we removed all the dividing tabs and recommended the categories be bound in GBC binding, in lieu of the three-ring binder. By using the table of contents included with each category, you can easily insert your own tabs.

Requests for individual manuals should be made directly to J. Dyer & Associates at (303) 722-2526. J. Dyer & Associates will charge the company requesting the manual(s). Feel free to request an unbound copy and copy your own for your company and chapter. But remember, *these materials cannot be sold!* If I can supply you with more information, please contact me at (303) 792-3111.

To keep up with the increasing number of program participants, the national staff has installed an automated exam grading system at SCTE headquarters to be used in conjunction with new computer-type exam answer sheets. BCT/E Curriculum Committees periodically review the exams, and create updated questions and answers as necessary. Other training companies also are supplying help with this endeavor. The National Cable Television Institute (NCTI) has begun to gear some of its new courses toward preparation for BCT/E certification. Recertification units can be earned by completing certain training courses offered by some manufacturers. Also, Jones' Mind Extension Institute (formerly The Business Learning Group) will be exploring the possibilities of aligning future technical interactive video programs with the BCT/E categories. The Mind Extension Institute has already started in this direction with the soon-to-be-released *Installer Training* interactive video, which helps provide the training necessary to be used in conjunction with the SCTE's Installer Certification Program.

You might begin to think that the BCT/E Certification Program is getting too soft—supplying the masses with the answers, so to speak. This is

not the case at all. The SCTE BCT/E committees have identified through these seven categories what is necessary to be a certified broadband communications technician or engineer. The point of the BCT/E program is not just to pass a series of exams, it's an assessment of where we are as an industry. It's up to us to help lead us all to where we should be in our industry, in technology, professionalism and excellence.

Cost for review material manuals

Category	Printing, binding and shipping
Intro to BCT/E	$ 9.70
I	25.00
II	32.90
III	23.80
IV	21.00
V	17.60
VI	26.90

Cable's Northern Exposure

Ron Smith, an SCTE member currently based in Anchorage, Alaska, submitted this photo of a group native of Alaskans being introduced to the wonders of satellite transmission. "They really didn't believe it would work until they saw it," Smith recalls.

Submissions Sought for '91 Directory

SCTE has begun preparing its 1991 *Membership Directory and Yearbook* and is seeking photographs to publish in the upcoming edition.

The Society is seeking photos from its membership that represent what it means to be in the cable industry and be an SCTE member. Photographs of local chapter or meeting group meetings, events and informal get-togethers will be welcome, as will shots of cable industry technical personnel performing on-the-job tasks.

The Society also is seeking photos from throughout the Society's history for the photo section. Shots of previous Cable-Tec Expos, local or national meetings, or any other SCTE event will be welcomed.

Like previous editions, the 1991

Membership Directory and Yearbook will include a complete listing of the Society's membership. It also will include listings of SCTE charter members, senior members and sustaining member companies, as well as the Society's local chapters and meeting groups and active committees.

The directory will feature sections on recent national events and Satellite Tele-Seminar Programs. It will include updated lists of recipients of such SCTE awards as the President's Award and the Member of the Year, as well as a current list of recipients of tuition assistance through the Society's Scholarship Program.

As a result of a 1989 decision by the board of directors, the *Membership Directory and Yearbook* is now published on an annual basis, a policy that began with the 1990 edition. It was previously published every two years.

Current plans call for the upcoming edition to be published in early 1991.

Photos or material to be submitted for use in the 1991 *Membership Directory and Yearbook* can be sent to Howard Whitman at SCTE national headquarters **no later than Nov. 15.** Anyone with questions about the directory can contact Whitman at (215) 363-6888.

SCTE Calendar

The **"SCTE Calendar"** is an *Interval* feature incorporating Satellite Tele-Seminar Program listings(*), news of upcoming national events and announcements of upcoming local SCTE chapter and meeting group seminars.

Dates for 1990

Oct. 3 Ark-La-Tex Meeting Group—Shreveport, La. BCT/E examinations to be administered in all categories at the technician level. Contact: Robert Hagan, (214) 758-9991.

Oct. 8 Greater Chicago Chapter—Information to be supplied. Contact: John Grothendick, (800) 544-5368.

Oct. 10 Delaware Valley Chapter—Williamson Restaurant, Horsham, Pa. Topic to be supplied. Contact: Dan McMonigle, (215) 265-4233.

Oct. 11 Chesapeake Chapter—Holiday Inn, Columbia, Md. Topic: "Video and Audio." Contact: Keith Hennek, (301) 731-5560.

Oct. 14 Old Dominion Chapter—BCT/E examinations to be administered in Categories III, IV, V and VII. Contact: Margaret Harvey, (703) 248-3400.

Oct. 16 Great Plains Chapter—United Artists Cable, Bellevue, Neb. BCT/E testing to be conducted in Categories II, III, IV and VII. Contact: Jennifer Hays, (402) 333-6484.

Oct. 17 Dairyland Chapter—Unicom system office, Milwaukee. Holiday Inn, Tomak, Wis. ATC system office, Green Bay, Wis. Installer Certification testing to be administered in three locations. Contact: Gary Wesa, (414) 496-2040.

Oct. 17 North Central Texas Chapter—Location to be announced. Topic: "Interdiction." Contact: M.J. Jackson, (800) 528-5567.

Oct. 17 Palmetto Chapter—Information to be supplied. Contact: Rick Barnett, (803) 747-1403.

Oct. 17 Penn/Ohio Meeting Group—Location to be announced. Topic: "Fiber Optics." Contact: Bernie Czarnecki, (814) 838-1466.

Oct. 19 Miss/Lou Chapter—Location to be announced. BCT/E examinations to be administered in all categories. Contact: Dave Matthews, (504) 923-0256.

Oct. 20 Sierra Chapter—Location to be announced. BCT/E testing to be conducted in Categories I, IV, V and VII. Contact: Steve Allen, (916) 786-2469.

Oct. 24 Ohio Valley Chapter—Columbus, Ohio. Topic: "Service from the Technician's Point of View." Contact: Jon Ludi, (513) 435-2092.

Oct. 27 Golden Gate Chapter—Location to be announced. BCT/E testing to be conducted in all Categories I, II, III and IV. Contact: Tom Elliott, (408) 727-5295.

***Oct. 30** Satellite Tele-Seminar Program, *Local Origination Equipment and Its Use (Part Two)* with Jay Dorman of MCPS Video Industries Inc. and Lenny Melamedas of UA Columbia Cablevision of New Jersey. Videotaped at Cable-Tec Expo `89 in Orlando, Fla.

Oct. 31 New Jersey Chapter—Holiday Inn, Wayne, N.J. BCT/E testing to be conducted in all Categories I, IV, VI and VII. Contact: Jim Miller, (201) 446-3612.

Nov. 1-2 Sierra Chapter—Howard Johnson's Motorlodge, Rancho Cordova, Calif. Topic: "The Basics of Cable Operations," for non-technical, customer service and management personnel. Program to be conducted on both days. Contact: Steve Allen, (916) 786-2469.

Nov. 7 Rocky Mountain Chapter—Location to be announced. Topics: "Data" and "Terminal Devices." Contact: Rikki Lee, (303) 321-7551.

Nov. 8 Big Country Meeting Group—Abilene, Texas. Information to be

supplied. Contact: Albert Scarborough, (915) 698-3585.

Nov. 10 Chaparral Chapter—To be held in Albuquerque, N.M. Topic: BCT/E Category III, "Transportation Systems" with Ron Hranac of Coaxial International. Contact: Brian Throop, (505) 761-6200.

Nov. 11-12 Old Dominion Chapter—Holiday Inn, Richmond, Va. Annual meeting/officers to be elected. Additional topics to be announced. Contact: Margaret Davison-Harvey, (703) 248-3400.

Nov. 13 Central Illinois Chapter—Sheraton Normal Hotel, Normal, Ill. Topic: "New Technologies." Contact: Ralph Duff, (217) 424-8478.

Nov. 14 Appalachian Mid-Atlantic Chapter—Holiday Inn, Chambersburg, Pa. Topic: "Microwave Transportation Systems*(tentative)*." Contact: Richard Ginter, (814) 672-5393.

Nov. 14 Dixie Chapter—Birmingham, Ala. Information to be supplied. Contact: Rickey Luke, (205) 277-4455.

Nov. 14 Greater Chicago Chapter—Location to be supplied. Topic: BCT/E Category V, "Data Networking and Architecture." Contact: John Grothendick, (800) 544-5368.

Nov. 14 North Country Chapter—Sheraton Midway, St. Paul, Minn. Topics: "Fiber Optics" and "Feedforward." Contact: Rich Henkemeyer, (612) 522-5200.

Nov. 14 Great Plains Chapter—Lincoln, Neb. Topic: "Headend, Studio and Test Equipment Maintenance." Contact: Jennifer Hays, (402) 333-6484.

Nov. 15 Sierra Chapter—Location to be supplied. Topic: "Computer Aided Design (CAD Systems for Cable Designs)." Contact: Steve Allen, (916) 786-2469.

Nov. 21 Razorback Chapter—Information to be supplied. Contact: Jim Dickerson, (501) 777-4684.

***Nov. 27** Satellite Tele-Seminar Program, *Installer Certification Program* with SCTE Director of Chapter Development and Training Ralph Haimowitz. Plus *Data Transmission Techniques (Part One)* with Andy Paff and Don Patton of Anixter Cable TV. Videotaped at Cable-Tec Expo '89 in Orlando, Fla.

Nov. 28 North Country Chapter—Edina Community Center, Edina, Minn. BCT/E examinations to be administered in Categories II, III, V

and VI. Installer Program examinations to be administered. Contact: Rich Henkemeyer, (612) 522-5200.

Nov. 28 Piedmont Chapter—Location to be supplied. Topic: "Fiber-Optic Technology Update." Annual membership meeting to be held. Contact: Rick Hollowell, (919) 968-4631.

*Tele-Seminar Programs may be downlinked by any cable system and recorded for immediate and future employee training purposes. All Tele-Seminar Programs will air from 12-1 p.m. ET on Transponder 2 of Galaxy III.

Steve Allen (fifth from left) poses with the board of directors of the Sierra Chapter. Pictured are Eric Brownell, Bob Forde, Fred Kurzhals, Mark Vande Voorde, President Allen, Debi Abate, Ron Chamberlain, Secretary/Treasurer Terry Mast, Mark Thompson and Bill Bragg. Not pictured is Vice President Lee Erickson.

Member Profile: Steve Allen

"Member Profile" is an "Interval" feature that puts the spotlight on you, the Society's members. Each month, an SCTE member will be profiled in this feature: his career, his experience, his involvement with the Society. Members featured will be chosen from all levels within the industry; from engineer to installer, from manager to technician.

Many cable employees enter the industry primarily to have a vocation, but in the case of Steve Allen, it is a matter of family tradition. The son of former NCTA Chairman Ed Allen, Steve is currently chief engineer of Jones Intercable's system in Roseville, Calif.

"I did installs when I was eight years old," Steve recalls. "That was

how my father babysat me. He would send me out with installers, and I would crawl through attics and houses. It was fun—I was helping! One time, he took me to a headend, and while he was working, I climbed up 300 feet of a 600-foot tower."

Raised in Winona, Minn., he got his professional start in the cable industry following his graduation from high school in Lafayette, Calif., working as a system auditor for Concord TV Cable in Concord, Calif. He later attended Chico State University, graduating with a bachelor's degree in television broadcasting.

Following graduation, Steve worked for Concord TV Cable's construction department. He soon was working a midnight to 8 a.m. shift, concentrating on the activation of rebuild plant. "I hated those hours," he recalls, "but I learned how to drink coffee. Also, it was interesting because you meet a whole different group of people in those hours.

"I remember one time when I was up on a pole splicing in an amplifier," Steve says. "The truck was stolen with me still in the bucket. The thief drove about a half a block before he heard me yelling and saw me up there. Fortunately, I didn't run into any strand."

Steve also recounts a night when "a man ran down a well-lit street in combat boots and jockey shorts while we were working on a pole. He was hacking at trees with a machete. We hoped he wouldn't cut the pole down, and were quiet and didn't move. He ran down the block and disappeared."

Life became more stable for Steve in 1979 when he joined the staff of Viacom Cablevision in Oroville, Calif., as chief technician. In 1982 he became the regional engineer for Viacom's North Bay region and was responsible for nine systems serving 110,000 subscribers. He next worked at Viacom's headquarters in Pleasanton, Calif., but says that "the population began to close in, and I longed for the quality of life in the foothills." He joined the Jones Intercable-owned Roseville system in 1988.

Steve first became involved in SCTE in 1979. "I had read a little bit about it," he recalls, "and I was aware that there was a tremendous vacuum in learning and training opportunities that this organization could fill. It looked to me to be a way to learn more, and I've been happy to watch it grow ever since."

Steve served as the vice president of the Golden Gate Chapter from 1986-87, but had to step down from the position due to relocation. He has since distinguished himself as a founding member and current president of the Sierra Chapter, which was elevated to full chapter status at Cable-Tec Expo `90 in Nashville.

"It's been a real personal challenge to watch us grow from a meeting group into a chapter," Steve comments. "It certainly hasn't been a one-man effort, though. It never could have been done without the efforts of the chapter's board of directors.

"I love to help other people develop in the industry," Steve says, "because it helps make my job easier. I have a hard time finding qualified people, and SCTE serves a tremendous purpose for those who want to learn and advance themselves."

Certified in the BCT/E Program at the engineering level since 1989, Steve is an avid supporter of technical certification, stating, "The BCT/E Program deserves more recognition from the industry. There are two people in my office that I am helping with it because I believe certification is a very desirable thing."

Steve serves as co-chairman of the

program committees for Cable-Tec Expo '91. He holds an FCC radiotelephone license and is certified by the National Association of Business and Educational Radio.

With all of his professional activity, it might seem like he would have little time for a personal life, but he has been married for 10 years to his wife Carol. They have a son, Michael, 4.

Steve's hobbies include off-road racing, camping and communications. He also keeps busy with construction and building work. "I'm trying to be handy with my hands," he says.

Steve has enjoyed his 21 years in the cable TV industry, stating "I do love doing this. I always knew I'd be doing this. I hope I'm doing it well, and I think SCTE is the best vehicle of raising the quality of what we do."

Award Presented, Panels Held at New England CTA Convention

Wendell Woody

Bob Foote (left) of Anixter and Frank Anthony (right) of Continental Cable present a plaque to Bill Riley on behalf of the New England Chapter at the chapter's July 31 meeting, held in conjunction with the New England Cable Television Association (NECTA) convention at the Marriott hotel in Newport, Conn. Riley received the award in recognition of his co-founding of the chapter and service as its president since its formation.

Wendell Woody

The "Operations and Rebuilds" panel, organized by the New England Chapter for the NECTA convention, featured Al Heffner of TCI, Kevin Casey of Continental Cablevision, George Deimen of ONI-Anixter, Ray Fournier of Continental Cablevision and Michael Kay of MultiVision.

Speakers at the Big Sky Chapter's July meeting get together with the chapter's officers. Pictured are Thale Seal, Mike Mason, SCTE Director of Chapter Development and Training Ralph Haimowitz, Western Vice President and At-Large Director Richard Covell, John Kero and Marla DeShaw.

Chapter and Meeting Group Spotlight

"Chapter and Meeting Group Spotlight" is an *Interval* section that focuses on recent SCTE chapter or meeting group events noteworthy for their topic, attendance numbers or innovative approaches to technical training.

Editor's Note: Safety, a growing concern in the cable industry, is the focus of a number of local SCTE meetings reported on this month. The Society's Chattahoochee, Great Plains, Inland Empire and North Central Texas chapters all have devoted recent group meetings to this topic that is so vitally important to the industry. Once again, SCTE is at the forefront of CATV training, focusing on the new and important concerns of current times.

The Chattahoochee Chapter's July 10 meeting, held at the Perimeter North Inn in Atlanta, focused on safety from a variety of viewpoints. It featured presentations by Tom Harvey of OSHA on "Safety Requirements," Dudley Ellis of the Georgia Department of Transportation on "Roadside Operations," Stanley Word of Liberty Mutual Insurance on "Accidents and Hidden Costs" and George Hayes Jr. of G.E.S. on "Hazardous Communications Programs." Chapter Secretary/Treasurer John Williamson Jr. reports that 29 people were in attendance.

The Great Plains Chapter met in conjunction with the 1990 Nebraska Cable Show Aug. 30 at the Marriott Hotel in Omaha, Neb. Technical presentations included an "OSHA Workshop" with SCTE Director of Chapter Development and Training Ralph Haimowitz and sessions on "Addressable Traps" presented by Eagle Comtronics and "Interdiction and System Security" presented by Scientific-Atlanta.

The Hudson Valley Chapter's July 11 meeting, held at the Capital Cable Studio in Albany, N.Y., featured presentations on "Character Generators" with Jim Miller of dB Communications and Ruth Marshall of Texscan; "Video Switching," also conducted by Miller; "Video Wave-

forms" with Sarge Catherall of WXXA-TV; and "Video Measurements" with Larry Sayer of Tektronix.

The Inland Empire Chapter held a meeting July 25 at the Holiday Inn in Coeur d'Alene, Idaho. Chapter Secretary Carl Sherwood reports that in his presentation on "Climbing Equipment Safety and Maintenance," Kip Hayes of Sun Country Cable gave an "introduction to climbing equipment and covered the sharpening and testing of gaffs, the inspection of body belts and safety straps and climbing techniques." A presentation entitled "Clearances, Traffic Safety and Flagging" by the Idaho Department of Labor and Industries included, according to Sherwood, an "overview of flagging control and covered warning signs and the placement of cones and signs."

Forty-nine people attended the **Miss-Lou Chapter's** June 29 meeting, which was held in conjunction with the Mississippi Cable Television Association show at the Royal D'Iberville Hotel in Biloxi, Miss. The meeting featured training sessions by SCTE Secretary and Region 9 Director Jim Farmer of Scientific-Atlanta on BCT/E Category I, "Signal Processing Centers"; and Paul Valiante on BCT/E Category IV, "Distribution Systems."

"Headend Consolidation Through Fiber and Supertrunking" was the topic of **The New England Chapter's** June 13 meeting, held at the Sheraton Inn in Boxborough, Mass. According to Chapter Secretary Jeffrey Piotter, the seminar, which drew 65 attendees, featured speakers representing three MSOs currently involved in different stages of fiber-optic deployment.

Piotter reports that "Brian Bedard of Greater Media Cablevision spoke on taking a working microwave system and replacing it with fiber-optic cable. He showed proposed layouts of the towns that have new franchises coming up, and how they were going to be serviced by fiber. He also related how to present plans to management to implement this new technology.

"Our next speaker was Mike Angi of Colony Communications. His presentation started with a review of the evolution of headends, buildings and tower sites. The discussion turned to how to properly plan a new building allowing room for channel expansion and equipment for fiber transmissions, BTSC stereo and other upcoming new developments. Other considerations were discussed, including proper cooling, electrical concerns and standby power. He also touched on earth stations and how to determine the proper size for a dish. This all led to the question: Why take the time to look at all of this? Because, he explained, if you are going to serve a majority of your subscriber base from one site, you must maintain a great amount of technical integrity. He also discussed digital transmissions and the commercial aspects of providing data services to local businesses.

"The last presentation was given by Kevin Casey, Ray Fournier and Paul D'Arcangelo of Continental Cablevision. Casey started the presentation off by discussing how and why Continental started consolidating headends to one transmission source and transmitting everything via fiber to each system. He then turned the program over to Fournier, who gave a general overview of the transmission principles of AM and FM fiber and covered channel loading and the different ways of combining these channels for input to the lasers. He also covered how Continental was in the process of using fiber to carry phone and data traffic from system to sys-

Officers of the Iowa Heartland Chapter gather with national President Wendell Woody for the Iowa Cable Television Association show, held Aug. 22-24 in Lake Okoboji, Iowa. From left is President Denis Martel, Woody, Vice President of Training Chris Toalson and Secretary/Treasurer Mitch Carlson.

tem. He then covered loss budgets and the use of different transmitting frequencies.

"D'Arcangelo then spoke on the construction aspects. Showing slides of actual construction, he stressed the importance of proper tension and 'figure-8' techniques. Proper marking of all fiber cable is a must for quick identification in case of emergency, he said. He also covered the proper documentation of splice points and OTDR pictures for use in his preventative maintenance program. Another important concern he covered was how to respond to a fiber outage or a pole hit involving fiber. He has two pre-spliced splice kits with a roll of fiber standing by along with construction personnel to repair any damage.

"Casey concluded the presentation by discussing overall operating and financial considerations. He presented a cost comparison of building a standard coax plant and a new fiber plant. The costs were very close and this convinced him to go with fiber use. Another concern was outage control. By eliminating lengthy coax supertrunk runs and implementing fiber supertrunk and fiber trunk nodes, they have eliminated many amplifiers. In doing so, they have eliminated the possibilities of major outages due to trunk amplifier failure in the beginning of a trunk run. With the fiber node concept requiring 10 or less amplifier cascades, it leaves you with great final numbers and controls the number of subscribers affected by any type of problem.

"All in all," Piotter concluded, "this was a super session. There were many questions asked and the interest was high."

New Jersey Chapter Secretary Jim Miller reports that the chapter met Aug. 29 at the Holiday Inn in Wayne, N.J. The meeting focused on BCT/E Categories VI, "Terminal Devices," and VII, "Engineering Management and Professionalism." In his presentation on Category VI, Secretary and Region 9 Director Jim Farmer of Scientific-Atlanta, according to Miller, "gave a well-prepared presentation on this category. As committee chairman, he has been well-informed." Of the session on Category VII by SCTE Executive Vice President Bill Riker,

The officers of the recently reformed Bluegrass Meeting Group, based in Elizabethtown, Ky., meet with Region 10 Director Mike Smith at the group's organizational meeting. Pictured are Treasurer Joe Dixon, First Vice President Ron Burrell, Second Vice President Max Henry, Secretary Liz Robinson,

Miller reports that "Bill's presentation on Category VII was thought-provoking. He broke down our meeting group into subgroups. Each subgroup had to respond to a given set of circumstances. There was a lot of interaction and many people signed up to take this exam at our next testing session." Twenty people attended the event.

A tragic incident inspired a beneficial discussion at the Aug. 22 meeting of **The North Central Texas Chapter**. Chapter Vice President Roy Kraft discussed the recent accident that killed Sammons installer Ricky Roper. In talking about the details of the accident, Kraft offered precautions that can be taken to reduce the risks of a similar accident. The meeting also featured a representative of TU Electric discussing the company's safety program and how it could possibly be utilized by the cable personnel in attendance. Besides safety, the meeting also focused on fiber-optic construction, as presented by Dick Beard of U.S. Cable. His program showed the differences between handling fiber and coax. Twenty-one people were in attendance at the meeting.

The Rocky Mountain Chapter presented technical sessions in conjunction with the Colorado Cable Television Association annual convention, which took place July 11-13 at the Beaver Run Resort in Breckenridge, Colo. Thirty people attended the sessions.

According to Chapter Media Director Rikki Lee, the sessions opened with an address by recently elected national President Wendell Woody, who charted the membership and financial growth of the Society. "He also unveiled sites for upcoming Cable-Tec Expos," Lee reports, "as well as new directions for the Society in training and standards."

Jones Intercable's Pam Nobles presented the first session, 'Safety—It's Your Responsibility,' with audience participation on accident prevention. Students watched a videotape about a Jones technician's fall from a ladder and the reactions of his family and co-workers. After a discussion on OSHA compliance, she showed a rough edit of a module from an upcoming Jones interactive videodisc on safety, concerning power lines.

Next, Eric Himes of Magnavox examined 'Management Techniques,' analyzing professional behavior in work, social and personal areas; he extolled the use of principals over personality when making manage-

ment decisions. He emphasized the importance of leading by example, training one's own replacement and communicating goals to employees. He concluded with tips on how to take the BCT/E Category VII essay test.

After lunch, Broadband Technology's John McKlosky took seminar attendees into the world of "Digital Information on Fiber Optics." He explained the differences between single-mode and multimode fiber, as well as laser diodes and LEDs. His primer on digital transmission included a lesson in counting in binary and digitizing voice signals via phone lines. He ended with a discussion of pulse spreading and bit error rates.

Finally, Ron Wolfe of the ATC National Training Center presented slides on 'Lake City: A Case Study in Fiber Optics.' He described the planning process of the system's rebuild to 55 MHz. After examining the various options (including AML microwave, fiber supertrunking and fiber trunk-and-feeder), Lake City's engineers decided to combine several technologies.

The chapter also met Aug. 10 and 11 at the Stouffer Concourse Hotel in Denver for consecutive BCT/E review and testing sessions. Sixty-five people took part in the sessions, which featured reviews of Category I by Chris Bowick of Scientific-Atlanta, Category II by Ron Hranac of Coaxial International
, Category III by Doug Greene of Jones Intercable and Category IV by Richard Covell of Jerrold Communications.

The Lake Michigan Meeting Group reports that its June 26 meeting, held at the Day's Inn in Grand Rapids, Mich., attracted attendance of 21 people. Devoted entirely to "Fiber Optics," the event featured a presentation by Rick Cole of Anixter on "AM and FM Fiber Applications," as well a session conducted by Mike Witcraft of AT&T.

AT&T Engineer, SCTE Member Dies

SCTE member **Richard Barks** passed away August 27. An equipment engineer with AT&T in Ballwin, Mo., he had worked with AT&T for 23 years and served as one of the company's first sales representatives for CATV services from 1986 to 1989. A member of the Society's Gateway and Heart of America chapters, he had attended and given technical presentations at meetings of both groups.

He is survived by his wife Janice, his daughter Renee and his son Richard Jr.

"Rich was known by just about everybody," comments Dan Stone, Bark's co-worker at AT&T. "His death has been quite a loss to many of us. It was very untimely and very unexpected." Stone said that donations could be made in Barks' name to a leukemia association or related charity, and condolences and announcements of donations could be sent to the following address: Janice Barks, 105 Coil Rd., Fenton, Mo. 63026.

SCTE

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Editors—Howard Whitman and Bill Riker

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Reader Service Number 34

CATV CAD

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somehow one could believe and assume that CLI compliance would have never been created by the FCC if companies would have operated with good engineering practices instead of "what looks good" accounting practices.

A designer's viewpoint

We've taken a long journey that was supposed to be on the subject of cable design but has instead taken the resemblance of a commentary. However, it is important to understand the intricate and dynamic processes taken by an organization to purchase new technology (in this case CAD) and first we had to explore where this need evolved. Now it is meaningful to look at the designer's viewpoint.

Most cable designers, like the chief engineers, learned cable TV operations as a technician, a draftsman or in construction. He learned about losses, about taps and passives, and he observed how systems were designed. He often decided what tap value to use based on readings from a field strength meter. Here is a designer groomed in the trenches, but this knowledge and experience is often a prerequisite before he assumes the tasks of designing. When he becomes a designer, he'll shed his tools of trade (sweep generators, scopes, field strength meters, voltmeters, etc.) for new ones—a calculator and a drafting table. Then he's told to design and BOM umpteen miles for a plant upgrade within two weeks because the phase is behind schedule. And there's still another 1,100 miles to go!

He's aware that PC cable design programs can easily produce the design with time to spare. Though he views the task as monumental one and over-ambitious for time, he somehow prides himself for carrying a part of the company's future on his shoulders. However, he is dismayed when he sees other departments of equal significance modernized with software tools.

If the designer began his career as a draftsman, he's probably still a draftsman but with a calculator. How does he get his boss to understand his real needs? Will his boss be assertive enough to prove the needs to upper management? Is he his own victim for not speaking up to inform his boss how PC design tools could increase productivity? Or, is he a victim of standard accounting practices or ultimately, his own lack of understanding and interest in CAD design technologies. Does this mental attitude continue until the government decides to regulate design engineering practices and every designer is forced to be a state licensed P.E. and must use CAD design tools?

Many system operators today reap the benefits of CAD. Simply stated, it makes good sense. You don't do financial statements or forecasts with an abacus. And a farmer wouldn't plow a large field with a mule or harvest with a sickle. You would use the appropriate modern tools for the job at hand. Now how do you make sense out of the design tools available and choose the one best for your system?

Why use CAD?

Five basic reasons make CAD sensible. First, it is a method by which the computer solves complex design problems in a fraction of the time compared to doing it by hand. While we are far superior to the computer in many other

ways, the PC is far superior to us for serial computations. Therefore, cable design is best served by a computer rather than by a calculator. Second, CAD does repetitive mathematical functions and saves valuable time by eliminating the need for constant data re-entries required on a calculator. Third, it is a method by which you can record or data base every major design component and record where it's located. This allows you to build a BOM as you design without tracking it in your head or on a paper pad. If a mistake is made, an edit entry can update both the design levels and the BOM in one sweep. Fourth, CAD is an engineering tool for productivity and employee efficiency. Fifth, it provides design optimization while observing user-defined system specifications.

But, there is one important thing to remember. A software program will only be as good as its operator. Just as a word processor can't write a good book, neither will a CAD program result in a good cable design. Training becomes another issue for CAD and will be discussed in Part 2.

CAD design standards

The CATV industry has not adopted any standard for CAD drafting and design. While there are Society of Cable Television Engineers and National Cable Television Association standards, you'll get a lot of different answers when you ask designers which one they follow. For LANs that use broadband technology, the IEEE 802.7 was formed to produce design and operating standards of broadband LAN design. Cable design programs that met these standards were adopted by many to ensure optimized network operations.

CATV design practices are often unique to a system's requirements and are taught on the guild system. This school of CATV design involves passing information from one person to another. Eventually everybody has his own way of designing and no two systems are designed identically. When a designer replaces another designer, design philosophies also transfer. Unfortunately, this is the paradox of the cable TV design industry today. Establishing CATV design standards for CAD is important and necessary. There should be a uniform design standard that all CATV systems follow. CAD helps to develop consistent designs through standardization, regardless of the person designing.

As already examined, CAD for cable simply cannot be a BASIC program nor a commercial spreadsheet from the shelf. In CAD's true form, you should be able to design a new-build, upgrade an existing system, design new extensions and design multiple dwelling units. You can determine your current plant inventory and material costs with CAD. If a specific amplifier model's cost increases, you can easily refigure a revised cost without paging through tabloids of maps to find out which amplifiers are affected. By data basing your design, you can quickly locate any device or know how many DC-8s you've got installed in seconds. By data basing your design, you can upgrade to a higher frequency to yield a new design or consider "what ifs" without re-entering data.

Cable design programs that data base designs are now commercially available as specialty software. In Part 2 of this article we'll explore what to look for in selecting CAD hardware and software. In addition, we'll look at the issues in training and support services. **CT**

Managing projects

(Continued from page 35)

be required during the design process to clarify difficult interpretations.

System design

The system design process is the "nuts and bolts" job of designing the system within the framework of the system architecture. Once again, this is normally contracted out or done by in-house specialists who act as contractors to the system. In either case, prior field experience strongly supports the designer's decision base.

While computer-aided design has become an essential requirement in the engineering of modern cable TV systems, the designer's training and expertise make the critical difference. Computers allow the designer's educated decisions to be implemented quickly and efficiently; field experience and extensive design training allow the designer to accurately assess alternative approaches to the network and make those educated decisions. Again, because of the specialized nature of design work, most system operators can benefit from subcontracting this work out to experts.

Construction

Most CATV construction is performed by outside contractors. Both aerial and underground construction require massive amounts of specialized equipment and labor that will be used only during the construction project. Only in rare instances can the requisite equipment and workforce be fully utilized by the system after the project is completed.

Another point favoring the use of contractors is the specialized nature of the installation of semirigid aluminum sheath cables. In general, reliability problems experienced with aluminum cables can be attributed to improper construction techniques, rather than to any problems inherent in the cable. Knowledgeable contractors understand the installation procedures necessary to assure long plant life.

Perhaps the strongest argument favoring the use of contractors for these activities is that the operator still has a business to run and customers to serve and satisfy over the course of the construction project.

Employee training

Unfortunately, this very basic project complement is frequently slighted by operators involved in rebuild/upgrade construction projects. All too often the last people to be considered when new technology is adopted are those who must live with that technology after the dust settles.

Most manufacturers support their equipment and are delighted to provide on-site training as part of the package. Where a single manufacturer has furnished most system components, training on a network level can usually be obtained in conjunction with training on a component level. Where a variety of equipment has been used, network training should be undertaken in-house or in cooperation with the engineering group involved in the project.

It makes no sense whatever to spend the kind of money required to build a cable system and then neglect to train the people who must maintain it. The maintenance requirements of modern high capacity systems are very demanding; this is *not* an area to slight. Further, in consideration of the leaner margins predicted for a mature industry, it is doubly important for the personnel responsible for system maintenance to work smart.

Project management

Rebuilding or upgrading a cable system is a complex undertaking in any circumstances. A *project management* approach

therefore offers many advantages. In this scenario, the construction project is considered as a whole—a framework within which individual subprojects are scheduled, coordinated and completed within an established timeframe.

A key word here is *management*—in the case of a CATV construction project, the assignment of a clear responsibility to manage the project on a full-time basis. Typically it is the smaller projects that are problematic in this area; the operator may feel the system technical staff can handle a rebuild in stride along with their routine day-to-day activities. With any rebuild or upgrade, however, it is probable that a good deal of the project will be done by contractors.

There are real benefits to using a company that can bring a project management approach to the job. A company that provides a full range of services can undertake a turnkey approach to system rebuilds, leaving the system's own technical staff to focus on the day-to-day problems of running their system. Further, when the turnkey firm handles project management as well as field services, engineering analysis, design and construction, all elements are coordinated to ensure a smooth flow throughout the life of the project.

Within the turnkey, walkout personnel understand the information needs of the designers, who in turn support the needs of the construction supervisor. Communication channels are open and operating between project personnel despite their assignments to different phases of the project. Questions can be resolved quickly before they become problems.

Whether a turnkey or individual subcontractor approach is selected, however, a number of issues should be addressed as a part of the contracting process. Specifically, the contractors/consultants should:

1) be recognized experts in their field and clearly understand the methodology/technologies involved in producing high quality work of the type required,
2) have available the tools, materials and personnel required to produce the quality and quantity of work required in a timely fashion,
3) have an appropriate quality control structure in place,
4) have a management structure appropriate to the project,
5) be appropriately insured,
6) warrant the work performed, and
7) be able to demonstrate all of these factors in advance.

Likewise, to ensure the success of the project, the operator should:

1) see that the previously mentioned criteria are met and documented,
2) see that the contractors/consultants are given a good working knowledge of overall project goals and constraints,
3) establish and maintain appropriate channels of communication between system personnel and the members of contractors'/consultants' staff,
4) schedule and attend meetings on a regular basis as necessary,
5) monitor progress and provide feedback and coordination/liaison as necessary,
6) approve completed work on schedule and approve for payment, and
7) work with system or corporate level staff as necessary to ensure that contractors/consultants are paid in a timely fashion.

While outside consultants and contractors can and do offer valuable support to operators involved in construction projects, it is the *operator* who occupies the driver's seat. **CT**

Addressability

(Continued from page 36)

only to the subscriber, but to the operator. For the operator, no in-home equipment is necessary for compatibility with a subscriber's cable-ready device. This means no set-top related theft, damage, truck rolls or customer education. In addition, greater security is inherent (out of the home and out of sight).

Another reason to consider outside-the-home addressability is operator access to the equipment and other efficiencies inherent in the technology. With operator equipment outside of the home a truck roll is no longer needed to physically connect or disconnect a drop cable. The equipment can be placed at the pole, pedestal or on the side of the home. This means the technician has access for maintenance, repair or audits at any time.

Outside-the-home addressability is very flexible. Operationally, changes in channel lineup for various reasons, including tiering, reduced basic or simple addition or deletion of a channel, can all be accomplished easily. In addition, interdiction technology can addressably control and secure up to 35 channels. Also, *instant* connect, disconnect and change in programming levels can occur without rolling a truck.

The on-premises approaches using positive and negative traps can secure eight channels or tiers. The technology is addressable and accessible to the operator on the side of the home.

Considerations

There are many issues to keep in mind when considering outside-the-home addressability. First, the operator must plan the design of the cable plant for the future. If there are locations with a two-port tap that may require a four-port tap because of additional subs or new homes, the designer needs to take this into account from the start.

Also, outside-the-home addressability serves the whole home and not just the outlet. Authorizing or denying the channels before entering the home means all TV sets will receive the same signal with the exact same services. Therefore, the consumer-friendly features of the product raises the issue of additional outlet revenue. This whole home approach is similar to that of the utilities. For example, if customers order call waiting for their telephones, they receive that service on all phones in the house.

In addition, these technologies provide the potential to convert the cable plant to 100 percent addressability. An operator needs to be comfortable with addressable technology, but will realize substantially more benefits from outside-the-home equipment than with traditional addressability.

Opportunities

There are some unique opportunities created by these technologies. The operational opportunities include a complement to the operator's CLI compliance plan by increased drop reliability and preventive maintenance work vs. repair and outages.

The drop can become a permanent part of the plant since there is no need for a physical disconnect. This will assist the system in its CLI compliance efforts and will allow for increased drop reliability since there is less handling and less opportunity to "harden" the drop cable.

"The interdiction approach is slightly more expensive than addressable set-tops but will provide more benefits and flexibility than set-tops and traps."

Another opportunity made possible with outside-the-home addressability that replaces the tap is unique marketing ability. Having the hardware in place can potentially help operators market their franchise to TV viewers, including non-subscribers. Marketing flexibility stemming from the operational and technical flexibility allows the marketing staff to be very creative. Additional revenue is possible from existing subs for additional program offerings and non-subs for pay-per-view; cable for the day, week or weekend; and other packages.

Also, the operator can provide free trials of the product without requiring in-home equipment as before. The ability to view a variety of programming before purchase or for a limited trial will greatly aid an operator's marketing campaign. **CT**

Let the Wavetek 1882A sweep you in

ONE of the most difficult aspects of making capital purchases for the cable industry is finding equipment that has an immediate as well as long-term payback. The Wavetek 1882A Sweep Analyzer offers the remarkable versatility and capacity to let you provide better subscriber service now and in the future – even if the conventional system technology changes.

A clear path home.

Today's complex systems contain many long amplifier cascades which can create signature build-up that distorts reception. In the eyes of your subscribers, that's not what they're paying for.

Storing and comparing successive amplifer response in the 1882A memory will allow you to detect the small changes that add up to major problems. Today, signature build-up can be a thing of the past.

No interference.

Why tolerate extraneous signals that simply load your system or interfere with revenue generating signals? That's precisely why you sweep, to make sure that your system properly passes each active channel.

The Wavetek 1882A utilizes the multitude of signals already on your system to test the frequency response. So you're not adding extra carriers that can interfere with picture quality, set top converter operation, or VCR usage.

1000 MHz to grow on.

The growth of cable very likely means increased frequency response requirements – 600, 800 even 1000 MHz. Why buy a sweep system that can't accommodate these increased frequency ranges?

See the light.

Fiber optic cable is already being used to shorten amplifier cascade lengths.

The 1882A lets you sweep the amplifier cascades from the fiber node by simply storing your reference at the fiber node and sweeping the rest of the system as you normally would, without an elaborate field transmitter.

You could also test parameters most affected by laser nonlinearity – cross-mod, and second and third order distortion.

Elegant but easy.

The Wavetek 1882A does so much, but so easily. Most modes of operation are entered by pressing one, two or three keys. If you make a mistake, it lets you back up, asks you a question, or lists your options.

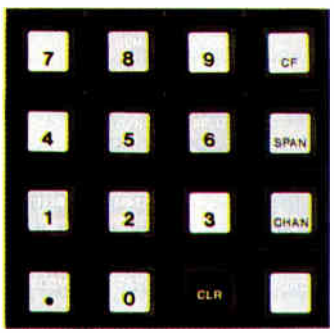
It takes only a few minutes to store your HEADEND,

to the future. Without interference.

FIRST AMP, or FIBER NODE reference – a fraction of the time other instruments require.

Then simply connect to your test point, press "3", "1", FUNCTION, and you are sweeping.

Because the 1882A is so easy to learn and use, your sweep techs will be more efficient and effective.



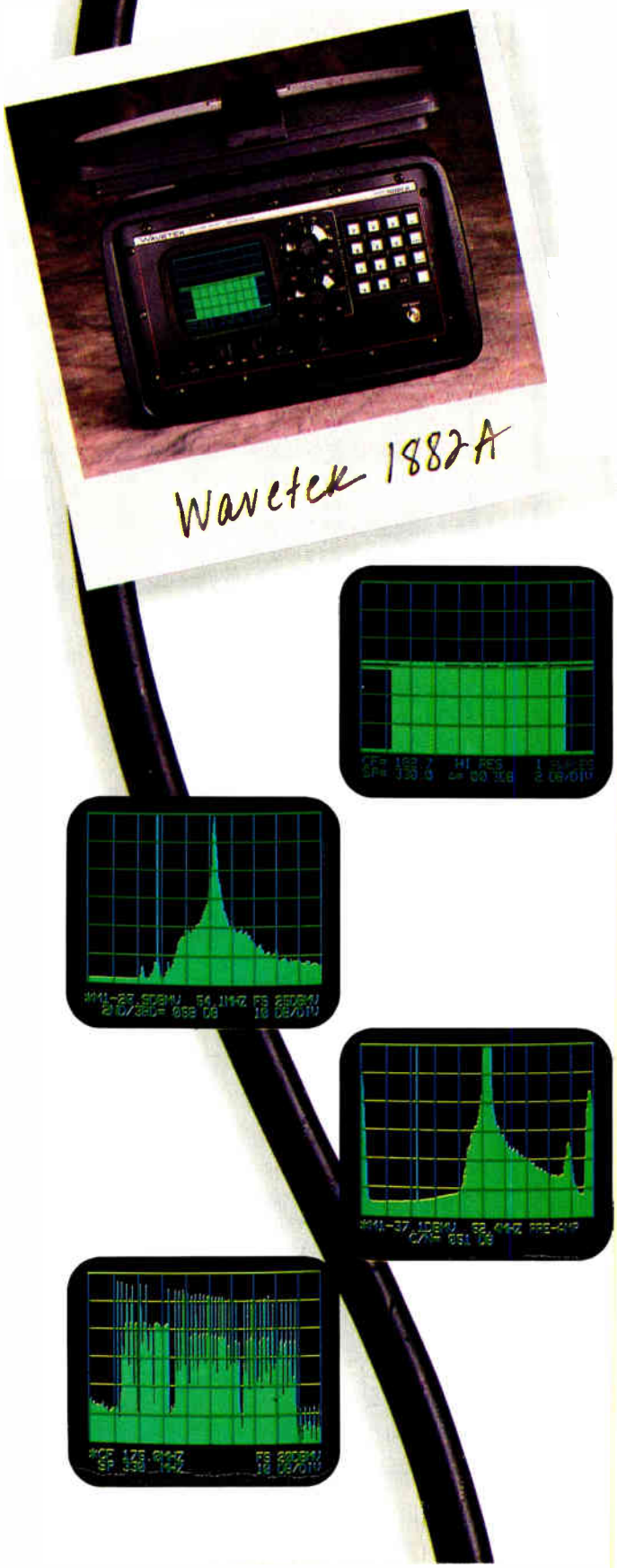
Fill in the blanks.

Before the Headend is turned on or when your frequency spectrum is not fully utilized, you still want to sweep your system. A special "blanking filter" available for Wavetek sweep generators will allow you to sweep unused spectrum and used spectrum at the same time.

Since you're generating a sweep signal only in the spectrum with no video or sound carriers, there is no chance of interference. You also sweep at sound carrier level so system loading is negligible.

Find the faults.

When you use a sweep generator with your 1882A, you can set up one of the channel plans for a small span and 100 KHz resolution. This will allow you to see standing waves reflected from almost any point in the span. No other non-interfering sweep system provides you with this type of resolution for fault finding.



Bring back the hard facts.

Sometimes you want to record a site problem for later analysis. With the 1882A you can store the sweep or analyzer results in memory, or print a hard copy with the P-1 printer option.

When you reach the end of the line.

Before your move on to the next trunk or line, make those end of the line measurements that ensure a quality picture for your subscribers.

The 1882A can measure C/N, second and third order distortion, X-mod and HUM – as easily as using the sweep. Just a few simple keystrokes, and you've finished a job well done.

Get the picture?

The 1882A will improve your profit picture by easily and effectively helping you deliver the best picture quality to your subscribers. No other instrument will work so hard to keep your system performing within its design parameters, now and well into the future.

And for all it does, the 1882A is the lowest priced complete system sweep available.

The Wavetek 1882A may be the single most important capital equipment investment you make.

For a demo, call Wavetek at

1-800-622-5515

or your local Wavetek representative.

Reader Service Number 41

WAVETEK®

Table 3

Power supply at Node 9

Node	Voltage	Current inserted	Total current downstream
1	47.48	0.74	1.24
2	46.13	0.25	0.50
3	45.53	0.25	0.25
4	49.71	0.00	1.24
5	51.19	0.68	2.42
6	49.84	0.25	0.50
7	49.09	0.25	0.25
8	57.73	0.61	3.03
9	60.00	0.00	9.57
10	58.32	0.60	2.23
11	56.82	0.25	0.50
12	56.15	0.25	0.25
13	55.27	0.63	1.13
14	53.92	0.25	0.50
15	53.32	0.25	0.25
16	45.77	0.00	4.31
17	44.17	0.79	2.13
18	43.16	0.00	1.34
19	41.55	0.84	1.34
20	40.35	0.25	0.50
21	39.68	0.25	0.25
22	44.14	0.79	2.18
23	39.57	0.88	1.38
24	38.37	0.25	0.25
Total current for supply			9.5728 A

footages are less than those indicated on system maps. This can occur for a variety of reasons, one of which is a common practice during strand or as-built mapping of slightly overestimating footages when in doubt (i.e., the measurement seems to be 102 feet, mapper writes down 105 or 110 feet).

3) Actual loop resistance values are usually less than the cable manufacturer's published values.

4) Many (if not most) designers lay out systems using fully loaded amplifier station numbers. For example, you may use a power rating for a trunk station that includes reverse amplifiers, although the stations are installed without them.

5) AC voltmeters that are not true RMS meters (most low-cost DMMs and analog meters) will read up to 10 percent high when measuring quasi square wave waveforms.

All of these reasons add up to the following scenario. You've carefully laid out your AC design and calculated all parameters. When the system or section is built, you decide to make a field trip to compare measured parameters with computed ones. You find that actual system voltages at various locations are higher and your total power supply current load is less than anticipated.

You can consider this as headroom or begin to recognize and allow for these conditional parameters that will affect your design's overall accuracy. For example, more accurate amplifier power ratings can be obtained by bench testing a large sample of them under varying AC load voltage conditions and developing your own ratings to use. This headroom in your design is not necessarily bad, unless carried to an excess where it begins to affect supply efficiency, plus the quantity of supplies and therefore overall system reliability (downtime and outages due to power outages).

Modern AC supplies should be loaded at close to 100 percent of rated value for proper operational efficiency. If significantly underloaded (less than 75 to 80 percent), the supply's efficiency will fall off dramatically. At best, you end up paying for wasted power dissipated as heat. At worst, you'll experience premature failure of supplies in your systems. If your design dictates only 5-6 A at a given location, install a smaller amperage supply to maintain proper efficiency. Many power supply manufacturers offer graduated values from 5-15 A. You can choose the size of supply that best meets your design need. **CT**

October 1990

Focus on construction

BACK TO BASICS

The training and educational supplement to Communications Technology magazine.

Geri Saye

Table of Contents

Formerly Installer/Technician

Figure 1: Loose buffer tube cable cross section

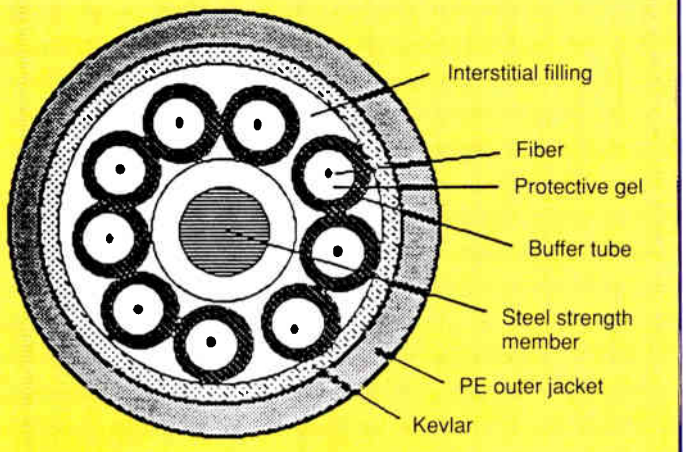
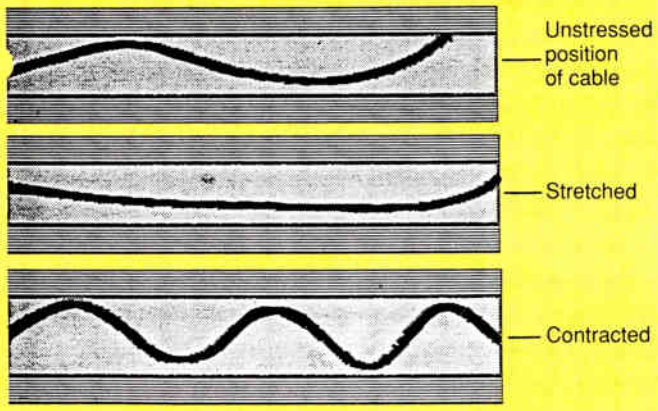


Figure 2: Buffer tube allows safe cable stretching



Outdoor fiber installation: Part 1

By Jim Hartman
Project Manager and Trainer, FiberLite International

While writing this, I discovered that fiber-optic articles are not immune to lightning and electromagnetic interference. It was late in the evening and I had been pounding away at the keyboard for over two hours when lightning caused a surge and locked up my computer. Goodbye article. Hello midnight oil. There is nothing more frustrating than going back and redoing something that has already been completed. Well, that is what this article is really about. If you plan your installation carefully and execute your plan with precision using the following basic installation guidelines, you should succeed the first time around and not have to repeat performances.

Three types of installation

The three ways terrestrial fiber-optic cables are installed are underground, aerial or in a type of ducting or conduit. While most fiber installations are remarkably similar to copper cables, there are special areas of concern to protect fiber from stress and pressure. Optical cables are lighter, smaller and more flexible. While the fibers are cabled to allow for stress and usually further protected by strength members, fiber cannot withstand the same pulling tension as can copper. Also, the light signal can be attenuated by pressure on the cable or from too sharp a bend. General abuse of an optical cable can break fibers or cause structural damage that may result in the fiber failing later under unusual conditions such as extreme cold or heat. Fiber does not need to be babied but it does require more care than its copper cousin.

Outdoor cable types

First we'll explore the core construction of fiber to discover its strengths and weaknesses. Let's start with a typical outdoor cable and build it from the fiber out.

The first layer of defense is the primary coating. It generally comes from the manufacturer with an uncolored primary coating made of acrylite. When it gets to the cabling plant colors are added in order tc provide identification for installation and repair. The reason for coloring is that there is usually more than one fiber in the buffer tube. If there is only one fiber per buffer tube, the cable manufacturer may choose to leave the primary coating clear. This coating is considered to be a part of the fiber, not the cable, and provides protection, strength and flexibility for the fiber. The primary coating is actually a dual coating. The first layer of coating is a softer material that allows the fiber to "float" inside. This prevents fiber stresses when the coating expands and contracts at different rates than the silica fiber. The outer coating is harder and tougher and serves to protect the fiber. Dual coating is very effective and is definitely an underrated breakthrough in fiber.

The next line of defense common to most cables is halar filling made of a polyurethane compound. This filling, akin to a heavy syrup, is commonly called "pur" filling. It buffers the fiber and protects it from moisture. After this layer, the core construction of outdoor cable falls into four categories. These are loose buffer tube, slotted core, ribbon and loose tube. The latter two are AT&T creations. Credit for loose tube cable goes to Siemens with Siecor (*Sie*mens and *Cor*ning) as the largest manufacturer. The primary maker of slotted core is Northern Telecom.

The fiber in loose tube (see Figure 1) cable lies inside a semirigid buffer tube and is most commonly removed by use of a ring tool. There may be from one to12 fibers per buffer tube and each is pur filled. The purpose of the buffer tube is to isolate the fiber from any external damage or vibrations and to allow the cable to be stretched without damaging the fibers as shown in Figure 2. There are 13-15 meters/km more fiber than cable. This allows for the best fiber tensile ratings of all the cable types. This also means one must multiply the optical distance measured by the optical time domain reflectometer (OTDR) by .985 (1,000 m-15 m) to get the accurate cable length for troubleshooting purposes.

The hard, crush-resistant buffer tubes are also color-coded for easy identification. Sometimes there are buffer tubes included that have no fibers inside of them. These are called "dummy" tubes and are inserted to maintain the symmetry of the cable. Some are not hollow and they may have wires inside them to help strengthen the cable. Some dummy tubes are color-coded and the fiber bearing tubes are left clear or gray. Often there will be a plastic tape wrapping around the buffer tubes to hold them together. Around this will be yel-

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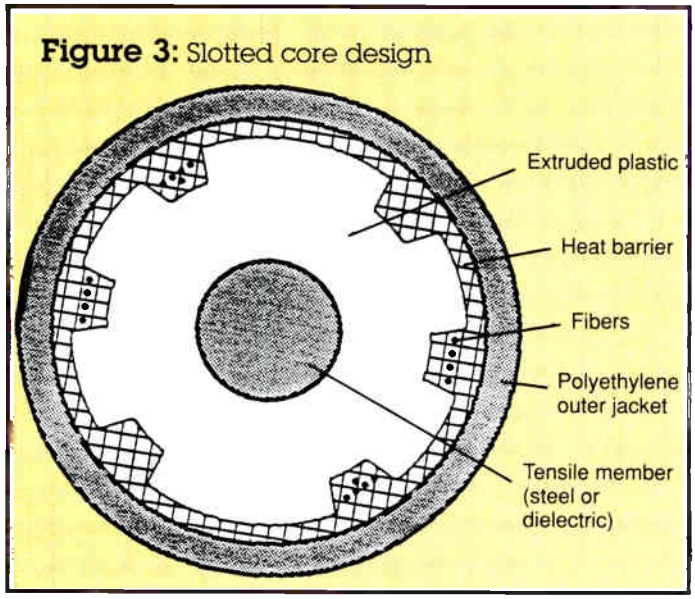


Figure 3: Slotted core design

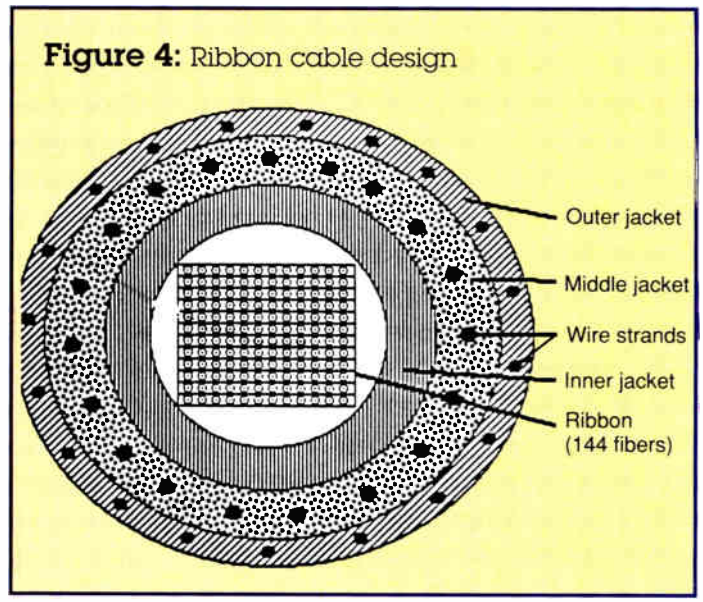


Figure 4: Ribbon cable design

low Kevlar material that provides added tensile strength. Kevlar is the material bulletproof vests are made from. It is usually considered to be a load-bearing member of the cable. It is also non-conducting and therefore is ideal for dielectric cables.

Most outside cables have an inner strength member made of either fiberglass and epoxy or steel to provide tensile strength and to protect the cable from stretching during the pulling process. It also provides protection when the earth moves from freezing and thawing or other disruptions.

Coating the buffer tubes and Kevlar is the infamous buffering substance called polyurethane filler or more commonly known as "icky pick." When you work with it you will immediately see how it gets this name. I'm convinced it was a diabolical plot by the paper companies to have this inserted in the cables so technicians would have to use mountains of paper towels to clean tubes when preparing for work on the fibers.

Now comes a protective jacket made of polyethylene (PE), polyurethane (PUR), polyvinyl chloride (PVC) or Tefzel. For some outdoor cables such as aerial cables, this will be the outer protective coating and if so it will protect the buffer tubes from dirt, moisture, abrasions, sunlight, crushing and temperature variations. However, for buried cables it will be an inner jacket to provide an inner line of defense for the cable. Around it may be another layer of Kevlar and one or two metal sheaths. These metal sheaths may have a black tar substance on or between them.

Finally is the last protective jacket, also made of PE, PVC or PUR. Knowing which outer jacket the cable has is important since the pulling friction varies widely among them. PUR jacket has almost three times the pulling friction as does the more slippery PE coating. PVC jacket friction falls in between the two. Length markers, called sequentials, will be imprinted on the outside of the cable along with the type of cable and the manufacturer's name.

Another type of cable used in outdoor environments is called the "slotted core" or "open channel" design. It is similar to the loose tube cable design in that its fibers lie loose within the tough slotted core (see Figure 3). A colored thread marks the groups of fibers. Covering the slotted core is a fiberglass weaving holding the fibers secure and protected. Seam rippers are a useful tool to remove this weaving. Outside this coating are the standard cable jacket materials mentioned previously.

The ribbon cable as shown in Figure 4 is another design for outside use. Note the layered effect of the ribbons. Remember, the fibers are very small and even with 144 fibers in one cable they still fill a very small portion of the core. This allows the ribbon cable to be the smallest diameter, lightest weight cable on the market. For pulling long duct runs this is a definite advantage since the length of a duct pull is related to the weight and especially diameter of the cable. A strong sheath surrounds these ribbons. Outside of this is are two layers of .017-inch steel wires laying in opposite directions. These add tensile strength and prevent cable twist. Since ribbon cable has no central core strength member it is very crush- and squeeze-resistant. For direct burial applications, the cable will come with two stainless steel sheathings or with a stainless steel and copper sheathing. The loose fiber cable (Lightpak) is simi-

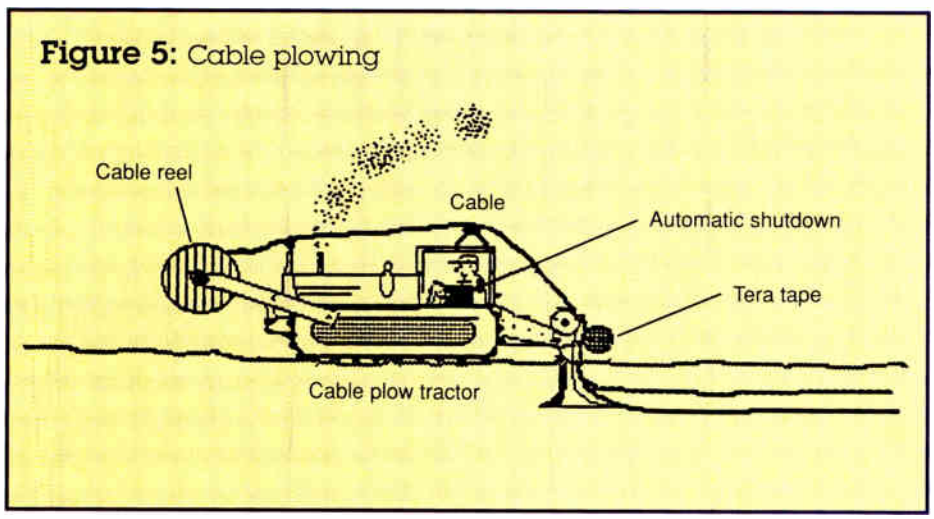


Figure 5: Cable plowing

lar to this but doesn't have the ribbons.

Planning and installation

Every good installation begins with a complete set of engineering specs. These plans are drawn up in a variety of forms with certain factors basic to the drawings. Those that are superimposed on aerial photographs of the actual route of the line to be placed provide the greatest amount of information for the various contractors that will work on the construction. Project managers can save the expense of unnecessary labor hours by carefully planning factors such as cable lengths, supplies needed, placement strategies and man-hours needed to complete the pull. This step in planning is much more necessary for fiber than for copper installs and should not be neglected.

Where the cable plows into the ground as shown in Figure 5, there are several concerns. It must be placed below the frost line where applicable. This means the cable will be buried 30 inches or more (typically 48 inches deep). When cable goes over bridges or similar structures it must be protected from water getting trapped in the duct and freezing (see Figure 6). The freezing ice can exert enough pressure to attenuate optical signal in the fibers. The earth settling on the cable or the piping used also may crush the cable and disrupt the signal.

Most states and cities will not allow you to plow cables through a roadway or dig a trench through the road. Therefore, the most common method of getting under the road is via a push or boring process. In Figure 7 you can see a pit was dug on both sides of the road to allow a mechanism to be placed on one side of the road to push a solid steel rod through the ground underneath the road. A hydraulic device is used to push the rod through. Even though it is a simple operation, it can be very frustrating. Rocks will throw the rod off and cause it to come out too high or low on the other side of the road. Not all water mains, communication cables or toxic waste lines are marked on the engineer's drawings.

When the first rod is through at an acceptable depth, an enlargement device attaches to it and it is drawn back to enlarge the hole. The process is repeated until the hole is the correct diameter to place galvanized or black iron pipe. In many systems 1-1/4 inch ducts are placed inside the pipe and

Figure 6: Cabling over bridges

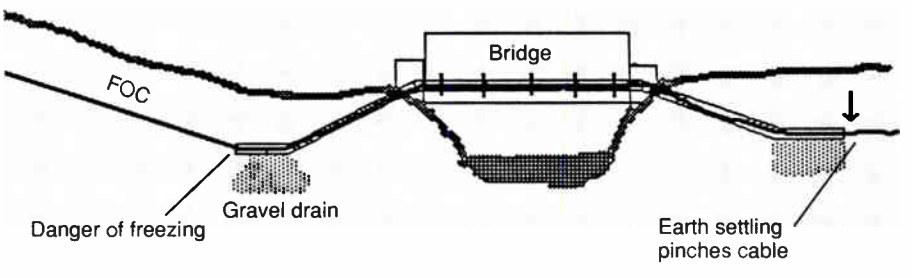
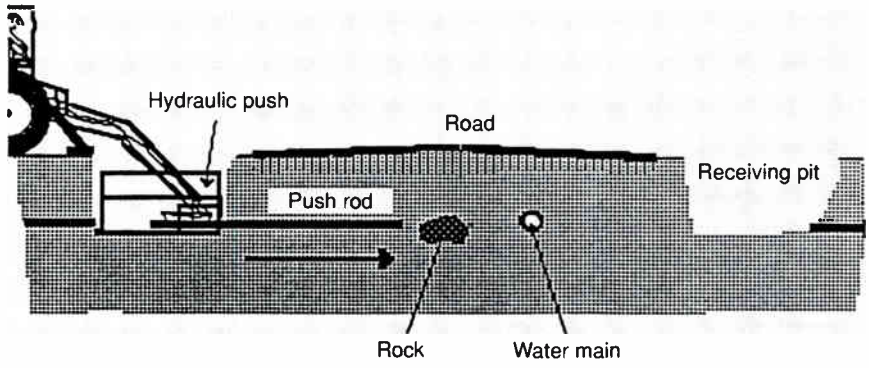


Figure 7: Pit digging to allow pushing of steel rod



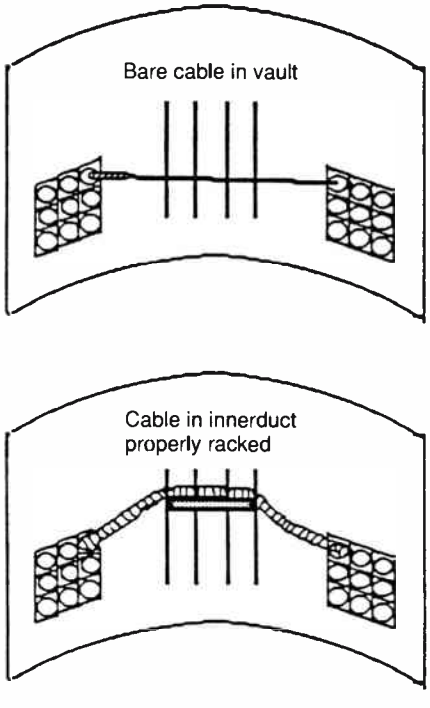
the optical cable is pulled through the duct for added protection of the cable. The metal pipes generally extend through the pit dug on each side of the road to protect the cable from added stress when the earth settles.

. The ground under the streets, existing manholes and the aerial poles are bulging with wires and pipes of every type and description. To preserve the integrity of their streets and sidewalks, most cities are requiring that cables be placed in conduits, especially those under the streets and often everything placed within the city limits.

Hazards of direct burial

In most areas of the country, rodents are a threat to the cable. They have to continually chew because their teeth do not stop growing and if they didn't their mouths would eventually lock open. There are two methods of protection against rodents: large diameter rigid pipe and metal tapes. Aggressive cable-loving groundhogs are capable of chewing through these rigid pipes and getting to the cable. It is *not* common for cable chompers to do this but you are nonetheless leaving your cable less than 100 percent impermeable to these critters. Laboratory studies demonstrated that these rodents do not penetrate steel tape. The two types of sheathing are stainless steel and regular steel. Both are equally protective but consider if the outer PE jacket is chewed away the regular steel is left open to rusting, leaving a cable vulnerable to another attack.

Figure 8: Cable protection in manhole



While the fiber itself is immune to electrical currents, the sheathing or metal strength members are not. Care must be taken to protect the system from lightning strikes. One form of protection is to check the grounding of wires or systems that are near to the fiber. When lightning strikes it will flow to the best ground. Thus, in their efforts to assure that the cable is well-protected some installations have an increased chance of lightning damage because the grounds are so much better than the one nearby, thus drawing the lightning to the fiber cable.

There are two methods of lightning protection for fiber. The first is a single or double stainless steel jacket. This will protect the cable up to about 85 kiloamps. About 95 percent of the lightning strikes are below this amperage. If your cable is in a lightning-prone area, consider using steel and copper tapes for ultimate protection. The copper is better and this combination will protect the fibers at 140 kiloamps. The PE coating may be melted but the inner core will still remain intact.

Another thing you should be aware of when installing fiber is sharp rocks that can cause a macrobend as the earth settles on the cable. A special split ducting is used in areas where this can be a problem and can be plowed in right along with the cable. Duct reel is mounted on the plow tractor along with the cable. In a two-step process, the duct is split as it passes over a knife on the top of the plow tractor and the fiber is inserted into the duct as it is plowed in the ground. This is much more productive than laying conduit first and then pulling the cable. Another option is to have the inner duct already on the cable. There are manufacturers that will do this for you using an extrusion process.

Protecting the splice point

Underground installation calls for a variety of methods of burying splice enclosures. An early method was simply to coil the excess cable and closure in the soil. Yet it was found that when the contractor drove the backhoes over the ground to pack and level the soil, the cables were crushed against each other and eventually developed macrobends. Most cables are now installed in metal and/or concrete handholes. A main concern in this area is bringing the cable into the handhole so that when the structure settles it will not put excess pressure on the cable. The handhole needs to be marked to prevent some future contractor from digging into it with his backhoe and to enable maintenance or repair people to find it. One device often used to mark buried closures is commonly referred to as the "toilet seat" because of the similarity in appearance. It has a magnet in it to respond to electrical detectors.

This is a place for potential abuse to the cable. One way to protect the cable is to install a section of flexible conduit over it. During the installation process slip the conduit over the cable down the duct out of the way. When you are ready, you can slide the conduit out of the duct and place it securely in the racks. Remember to allow enough excess cable in each manhole for racking (see Figure 8). **CT**

In Part 2 of this article, we'll look at aerial installation, cable pulling requirements and planning the cable run.

MDU post-wiring: A success story

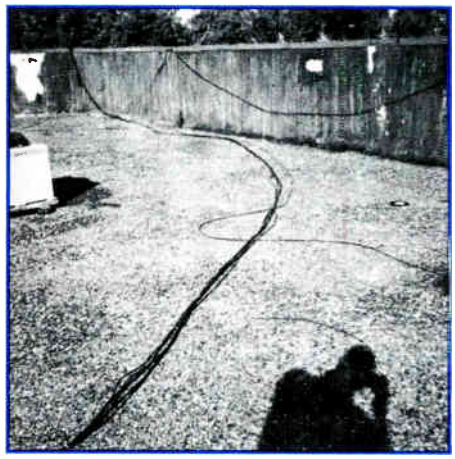
By Kenny Faust
Installation Supervisor, Heritage Cablevision

Post-wiring multiple dwelling units (condominiums, apartments, dormitories, etc.) is a difficult task under normal circumstances. Add to this a flat-topped roof and several floors per building and the difficulty increases. With no attic space to hide and contain the bulk of the wiring, exterior routes must be utilized.

Polyvinyl chloride pipe (PVC) is a great container for mounting coaxial cable on MDUs. Unfortunately, on an apartment complex PVC looks like what it is—cold water pipes. Along with almost every other cable installation department in the nation, Heritage of Tennessee was utilizing these water pipes to post-wire everything from condominiums to motels. Sure, some apartment owners complained about the appearance but when they were given a chance to pay for a nicer type of conduit, they opted for the pipe. Because of the cost factor involved, this method of post-wiring for cable would still be our standard except for a flat-roofed condominium complex in an affluent area of our system.

Mish-mashed mess

These units had been haphazardly



Wires run across the roof before the rewire.

wired over a period of five years. Since there were not attics to run the cable lines through, the installers used plastic clips to route the drops from the pedestal over the roof and down to an entry hole in the front of the home. Most of the wires had melted into the roof tar causing a signal leakage nightmare. Added to this mish-mash of wire were a ton of two-way, three-way and four-way splitters spliced in at sundry locations around the units to provide that "Easter egg hunt" aspect to the service technician's job.

"The moulding looked exactly like drip moulding on the buildings. The results were so perfect we even had technicians who didn't know the complex had cable."

To say this complex needed to be rewired was an understatement. Unfortunately, the condominiums were all owned by individuals and the board of directors overseeing the complex did not see the need to implement a change. It took a year of negotiating with the board before we could even complete a test building (there were 50 buildings to wire) for their approval.

The real problems started when we post-wired the building with our old standby, PVC pipe. This, of course, brought the project to a screeching halt. The tenants thought we had installed a sprinkler system on their expensive homes, and the board immediately rejected our proposal.

We went back to the drawing board. The board of directors were divided on most of the issues we had discussed—how many outlets each unit would have, where the outlet locations would be and which building would be done first—but they all agreed a rectangle-shaped moulding would be acceptable on the units.

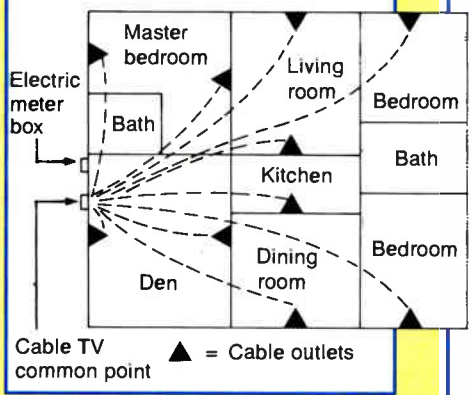
Since we had already budgeted money

Two-way splitter before moulding.

Heritage's specs for MDU post-wires

1) RG-59 67 percent braid coverage coaxial cable is used as specified.
2) Each cable shall be run continuously from the wall outlet location to the lock box. (A home run configuration, see accompanying figure.)
3) Each unit shall have a minimum of three outlets: one in the living room, one in the master bedroom and one in the extra bedroom or family room.
4) The lock box shall be mounted next to the power meter when possible.
5) In all cases the lock box splitters shall be grounded to the building's common ground.
6) The minimum ground wire size shall be No. 12 AWG. The preferred ground wire size shall be No. 6 AWG.

Home run configuration



7) Each wire shall be marked individually as LR (living room), MBR (master bedroom), BR2 (extra bedroom) or FR (family room) and bundled together by the last two digits of a unit's address.

Lock box with moulding.

Horizontal moulding run.

for the PVC pipe, we had to look for ways to fit a rectangle moulding into those figures. Our first moulding didn't meet the requirements because it cost us $2.42 per foot, which raised the cost of the project 300 percent. We were given the go-ahead to post-wire another building. Up went the $2.42 moulding. It received immediate approval from the board. The main problem now was the fact we only had money allotted for one-third of the project. We checked into more prices.

A solution found

Finally, we found a plastic rectangle mould for 72 cents per foot. This was comparable in price to the plastic pipe cost after we had factored in the fittings and glue. We completed another building. It was received even better than the last and we were on a roll. The beige color of the moulding blended perfectly with the light brown color of the condos' fascia and soffit.

Ron Berry, the contractor for the job, hand crafted each section using only a butane lighter, a utility knife and a pair of tinsnips. There were no connectors needed as each piece butted against the other with the recommended 1/8-inch gap between each section. At first we used lagbolts to affix the mould to the fascia, then changed to roofing nails and finally to staples injected by an air gun. This proved to be the best method and provided superb support. In a 1" by 2" by 8' piece of moulding we were able to place 18 RG-59 drops without binding. The moulding looked exactly like drip moulding on the buildings. The results were so perfect we even had technicians who didn't know the complex had cable.

The once adversarial relationship between Heritage and the board of directors turned into one of cooperation. They sent a letter to our general manager extolling the quality of the installation and placed a note in their monthly tenants' bulletin stating that Heritage deserved their patronage.

In addition, the percentage of unauthorized viewers in this 276-unit complex had dropped from astronomical to zero. The complex passed the cumulative leakage index with flying colors and the picture quality improved dramatically.

To top it all off, we came in under budget on the project and started another post-wire project with the same type of material. From the plumbing fixture decor to the showplace look, the rectangle moulding led the way. The next time you have an MDU post-wire, use rectangle shape moulding for a professional finish. **CT**

Tech Tips

Coaxial stubs

By George E. Martin
Technician, Southwest Missouri Cable TV

The coaxial cable we take for granted to transport our CATV signals to our subscribers can be used in some rather interesting ways. For example, did you know that you can make a trap out of a simple coaxial tee and a small length of cable? Let's review some of the theory behind what makes this possible.

A piece of coax can take on the characteristics of a resonant circuit when it is cut to a length corresponding to an electrical quarter wavelength of the frequency of interest. In fact, when a quarter wavelength of coax is shorted at one end, it behaves much like a parallel resonant circuit (see Figure 1). In such a configuration, this piece of cable will appear as a high "resistance" to its corresponding frequency, and will impede that frequency.

Conversely, if the short is removed, that quarter wavelength section of coax will be the equivalent of a series resonant circuit (see Figure 2), and appear as a low "resistance" and pass the frequency of interest.

From this it is apparent that a short- or open-circuited section of coax does not actually deliver power to a load and is not in the truest sense a transmission line. But because a section of cable a certain length can have inductive or capacitive reactance, it reasons that such a piece of cable might also resemble a circuit component. When *less* than a quarter wavelength long, the short-circuited coax will resemble an inductor, and the open-circuited coax will take on the characteristics of a capacitor.

Figure 1: Short-circuited quarter wavelength coaxial stub

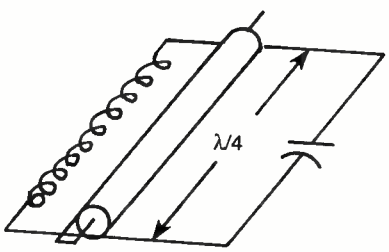
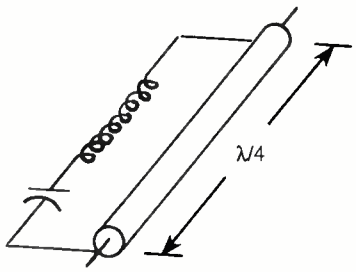


Figure 2: Open-circuited quarter wavelength coaxial stub



A free space quarter wavelength can be found with one of the following formulas:

λ/4 (in feet) = 246/frequency in MHz

λ/4 (in inches) = 2,952/frequency in MHz

When cutting a quarter wavelength section of cable, you must also take into account the cable's velocity of propagation (V_p), which will make the actual length somewhat shorter than the free space value as shown in the following:

λ/4 (in feet) = (246 x V_p)/frequency in MHz

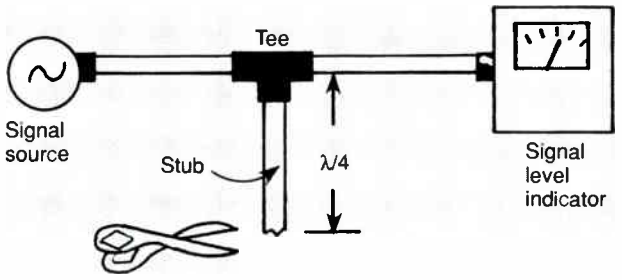
λ/4 (in inches) = (2,952 x V_p)/frequency in MHz

Low cost trap

One good application for what has been discussed is the construction of a simple trap. Let's say that the input of your Ch. 6 off-air processor is being overloaded by a strong FM broadcast band carrier at 95.1 MHz. Placing a trap designed for the frequency of the offending carrier in the Ch. 6 antenna downlead should solve the interference problem.

Assuming the coax you are using has a V_p of 83 percent (check the manufacturer's specs for the actual

Figure 3: Simple trap using open-circuited quarter wavelength stub connected to coaxial tee



cable you use), the length of cable necessary to construct a quarter wavelength trap can be found with the following formula:

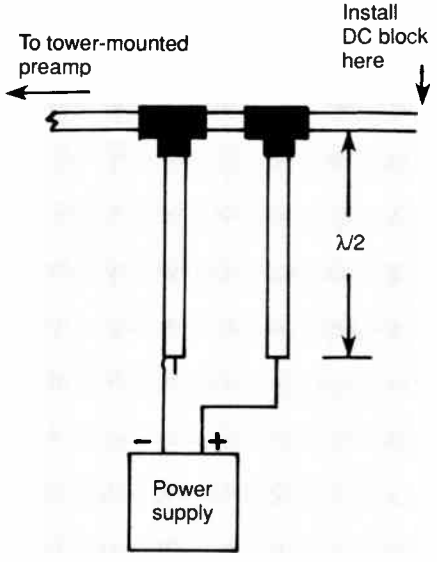
$\lambda/4 = (2{,}952 \times V_p)/\text{frequency in MHz}$
$= (2{,}952 \times 0.83)/95.1$
$= 2{,}450.16/95.1$
$= 25.76$ inches

Cut the cable a few inches longer than what was calculated, and install a connector on one end of it. Connect the antenna downlead to one side of a tee (see Figure 3), the other side to a spectrum analyzer or signal level meter that is tuned to the offending FM carrier, and the coaxial stub to the remaining tee connector.

While monitoring the level of the FM carrier, begin trimming the stub in small increments (be sure not to allow the cable's center conductor and shield to short together after each cut). As the length of the stub—which will include the connector and part of the tee—approaches an electrical quarter wavelength of the desired frequency, the offending carrier's amplitude will decrease.

When the carrier is nulled to a minimum, you have an effective low cost trap! The quarter wavelength piece of coax should have the end that is not connected to anything open-circuited (*not* shorted), resulting in a series resonant circuit. Tape the open end and coil up the stub to keep it out of the way, and reconnect the downlead (with the tee and stub) to the processor input. The advantage of this type of trap is that it can be used on a powered coax without worry of shorting out the power source.

Figure 4: Power inserter using two open-circuited half wavelength stubs



Half wavelength stubs

Coaxial stubs cut to an electrical half wavelength (twice as long as a quarter wavelength) exhibit similar, but opposite properties. An *open-circuited* half wavelength piece of cable will behave like a parallel resonant circuit, and one that is *short-circuited* will be like a series resonant circuit. The latter could be used as a trap, assuming no power on the coax.

One application for open-circuited half wavelength stubs is the fabrication of a simple power inserter for a single channel antenna downlead that is feeding a tower mounted preamp. This requires that two tees be installed in the downlead, with a half wavelength stub connected to each tee (see Figure 4). The power supply is then connected to the center conductor of one stub and the shield of the other stub.

Because the open-circuited stubs are parallel resonant circuits with high impedance at the desired frequency, the incoming RF signal will not pass through the stubs and into the power supply. **CT**

Please don't take him!

By Steve Allen
Chief Engineer, Jones Intercable, Roseville, Calif.

"The officer handcuffed the installer, and informed me that he would be arraigned later this morning and bail set."

The wind was blowing hard and the sky was threatening, but it looked like a good day for non-pay disconnects. The front office had done its part by calling everyone and reminding them of the bill and the consequences. All we had to do was go out and get the work done.

Everyone was gathering in the shop that morning; some were getting their orders sorted, some were having a last cup of coffee. It looked like we were ready to go. Then I noticed a person in a different uniform walk in. It had a gun attached. My mind said, "This doesn't look promising." Of course it immediately caught the attention of the rest of the employees and a couple started moving toward the back door.

I had to ask the question. "Good morning officer, my name is Steve Allen. I'm the chief engineer. May I help you?"

"I have a warrant for the arrest of Michael Bitsko," he said. "Is he here?"

An unpleasant surprise

Mike was just coming out of the bathroom and looked startled when he saw the officer. I asked him to come over, which he did reluctantly. The officer proceeded to read the warrant, which indicated he was being arrested for failure to appear in court for a traffic ticket he had received.

I said to myself, "This is not a good time to lose an installer." I could find no humor in this situation.

The officer handcuffed the installer, and informed me that he would be arraigned later this morning and bail set. With that, he escorted the installer out of the shop, leaving me with 40 disconnects and an uncertainty regarding Mike's return.

I became angry and frustrated inside. Why did he do this? Why didn't he tell me he got a ticket? I might have been able to help. Doesn't he know that his job depends on his ability to drive?

I reassigned the work to the other two installers and they weren't very happy about it. This caused a tremendous inconvenience to everyone and we still didn't know if Mike would be back.

To make a long story short, Mike was fined $600 and his license was suspended for 90 days for drunk driving and refusal to submit to a blood test. He and a buddy had stopped off after work at a watering hole on a Friday evening and stayed until closing. Mike was arrested for engaging in a drag race and being under the influence.

Under company policy, Mike was terminated for not being able to carry out his job responsibilities and having a valid driver's license. Mike has a wife and a 7-year-old boy, and he lost his job because he couldn't act responsibly. They have since moved out of the area in an effort to find work. It's going to be pretty difficult without a driver's license.

Our company now requires that all job applicants provide a printout of their driving record prior to a job offer. We also enroll them in an employer notification program with the Department of Motor Vehicles. This provides the employer with timely notification of any violations or activity on an employee's driving record. This has resulted in several employees being disciplined for failure to notify the employer of traffic offenses that may affect their driving privilege. One employee was terminated for driving with a revoked license.

Driving is a privilege so many of us take for granted. Upon reaching the age of 16, we do not even think of not being able to drive. Yet it happens time and time again. Cable TV is an outside job and it requires that drivers be every bit as responsible as a bus driver or long-haul trucker.

The loss of your license is the loss of your livelihood, and will have a tremendous impact on your future. Insurance costs are going up and companies are finding it very expensive to keep individuals with poor driving records on their payrolls. Think about it. **CT**

Hands On

Is it a short or an open?

By Jud Williams
Owner, Performance Technological Products

Often when we receive equipment at our repair facility "short" or "burned" will be scratched onto the chassis. "Burned" certainly describes many of the conditions quite accurately. The word "short" is often misused and is occasionally confused with something that is "open."

An on-off switch is a good example of the difference between an open and shorted condition. When in the off position, the contacts in the switch are open. In contrast, the on position is equivalent to a short. When using an ohmmeter the indication for an open is a reading of infinity while a short will register as 0 ohms.

When dealing with CATV distribution equipment and power supplies we are constantly confronted with shorted and open components and circuits. Often a short will cause something else to open, as in the case of the foil on the PC board. When subjected to short circuit current, the foil acts like a fuse by opening up, thus interrupting the continuity of the circuit.

The troubleshooter will have two problems to deal with: the open foil and the malfunction causing it. Many times the cause of the burned foil may be found by locating a burned, blistered, puffed or discolored component. An ohmmeter featuring a continuity tester that beeps is a convenient aid in locating these problems. An example of a condition causing the foil to burn is a shorted transient suppressor at the input or output of a line extender or trunk amplifier.

Not all components are shorted, even though they may register 0 ohms on the meter. As an example, a transformer winding will read 0 ohms (in the case of an RF transformer) or the resistance will be very low, in the range of 0.5 ohms to possibly 2 or 3 ohms if it is a power transformer. Thus the ohmmeter's use is limited to locating an open winding in a transformer rather than a short. Chokes and coils also are included in the category.

Which failure for which component?

Components vary as to the kinds of failures one might expect. Resistors, for instance, generally open up when they fail. Capacitors can go either way, although bypass capacitors (with one lead connected to ground) usually short and burn, often scorching the PC board in the process. A bypass capacitor in good condition will read infinity on an ohmmeter while a shorted one will be 0 ohms. Electrolytic capacitors tend to dry out over a period of time and often become shorted in the process. When used as a filter in a power supply, a shorted capacitor will often burn out the transformer and rectifiers. This happens because the fuse is usually in the wrong location or its rating is too high.

Rectifiers often will short rather than opening and are relatively easy to test with a digital ohmmeter since they are supposed to conduct in only one direction. Rectifiers (sometimes called diodes) will exhibit a resistance value in the forward (or conducting) direction and read approximately 500 ohms for large stud-mounted devices and about 1,000 ohms for small rectifiers and signal diodes. In the reverse (non-conducting) direction, the reading for a good rectifier is infinity. Most meters have their 2,000 ohm range marked with a rectifier symbol to tell you that it is the proper one to use.

A likely place for an open to occur in an amplifier is the AC path due to the fact that many are inadequately designed and will not handle the current they are often required to carry. Poorly mounted chokes can contribute to open conditions as they break loose from their solder pads. To check this condition, gently rock the choke back and forth to feel for looseness.

The RF connectors at the input and output of amplifier modules may gradually become open as the connection heats due either to poor contact or having to pass excessive AC current through them. When tagged, the burned connector is usually described as a short when in fact it is truly an open.

Two other components often exhibit open conditions, usually showing up as intermittents. When a switch is exposed to the elements its contacts tarnish and lose their ability to make good contact. Potentiometers (also called pots or controls) will deteriorate over time and their wiper arms will gradually lose contact with the resistance material. This causes their resistance value to fluctuate, showing up as noise or erratic gain in an amp. **CT**

How sharp are your people skills?

By Rikki T. Lee
Editorial Consultant

1) Your supervisor buzzes your office and says, "I need a report on your lab tests—ASAP." But you're buried in work. How do you respond?
a) "Why do you wait to the last minute? I'll have to work overtime."
b) "Sorry, ask somebody else. I've got way too much to do."
c) "Is that a higher priority than what I'm working on now?"
d) "I'll do it, but you probably won't get it until next week."

2) A tech you supervise says he's come up with a better method to organize materials in back of the truck. You're busy; what do you say?
a) "Could you come back at 3:30? I'd like to hear about it."
b) "Write me a memo; I'll look at it when I've got the time."
c) "Nothing's wrong with our method. Get out there and do your job."
d) "That reminds me of an idea I had a few years ago..."

3) At the water cooler, a co-worker whispers that your immediate supervisor has accepted a job in another company. What should you do?
a) Seek out someone else in the office who has more information.
b) Immediately corner your supervisor and ask to verify the rumor.
c) Go to the supervisor's boss and prove you can fill the vacancy.
d) Wait until your supervisor tells you or the news becomes official.

4) Some tech department employees have been slipping in a few minutes late during your Monday morning meetings. What should you do?
a) Announce that future latecomers will face disciplinary action.
b) Ask each employee to prepare an oral report for every meeting.
c) Don't start until all are present, then get mad at everyone.
d) Don't meet regularly but surprise people with impromptu meetings.

5) Your best designer has missed work for four of the past six Mondays. You call her into your office. What's the first thing you say?
a) "Listen to me and listen good. You're this close to being fired."
b) "Would you please tell me if you're having any personal problems?"
c) "Report to the clinic right now for blood and urine tests."
d) "You're an important part of our team. But we've got a problem."

Improving your people skills

In Scenario 1, you must avoid a conflict in scheduling. Whining (a) won't make you feel better or raise your supervisor's opinion of you. Refusing to work on the project (b) is a fast route to unemployment. And attempting to set your own work priorities (d) can cause resentment. Instead, put the matter in perspective. First, the work must be done on time and at your best. Second, it's likely that other work

may suffer. Communicating this in a non-threatening way (c) is the best response. So how do you escape this sticky situation? Just ask the right question.

Scenario 2 probes your ability to listen to suggestions. Launching a put-down now (c) can make your tech uncooperative later. Cruising down memory lane (d) subtly tells him you don't care. Asking for a memo (b) is OK, but how well does he express himself in writing? Will you have the time to read it? Making time to listen to his idea (a) is the best way.

Whatever your job title, listening is the most difficult task you must do. To improve your skills, concentrate on what the speaker is saying. Don't think of your response. Then rephrase what you've heard. ("Let me see if I understand.") Ask clarifying questions and listen to the answers. Now respond. If it's a good idea, ask him to try it. If not, thank him but gently tell him why it's not possible to implement.

How do you deal with rumors (Scenario 3)? Seeking out data (a) can make you appear rude or nosy. Asking the supervisor directly (b) embarrasses your supervisor, you and the rumor-

"Communication is a narrow two-way street; look out for oncoming traffic."

monger, who can be found out. Jockeying for position (c) puts you in the role of a manipulator. So the best way is to wait until the word is official (d). So, no matter the source, a rumor is a lousy path for news to travel. Unfortunately, the less communicating and listening a company does through official channels, the more it unwittingly lets gossip and rumor take over. But remember, just because you heard it through the grapevine doesn't mean it's true.

Scenario 4 discusses the meeting, a time for potentially great communication—if you plan it that way. Berating latecomers (a) only creates fear and loathing and solves nothing. Waiting for stragglers and then getting angry at everyone (c) wastes time, embarrasses the early birds and solves nothing. Holding a "pop" session (d) catches your staff unprepared, results in a dull meeting and solves nothing. But requiring oral reports (b) ensures attendance and participation—if you encourage questions. For weekly meetings, always begin on time. A few days prior, issue memos with an agenda; assign latecomers their reports first.

In Scenario 5, you've got a staff problem. Threatening your designer with dismissal (a) might scare her but doesn't help either of you. Demanding she be tested for drugs or alcohol (c) makes her defensive and puts you back at Square One if the results are negative. Airing out her personal problems (b) is OK if you're a great listener but really doesn't address her needs or yours. Helping her feel at ease before mentioning unacceptable behavior (d) works best. Ask her how she could improve her performance and become a better designer. And don't forget to listen well.

A two-way street

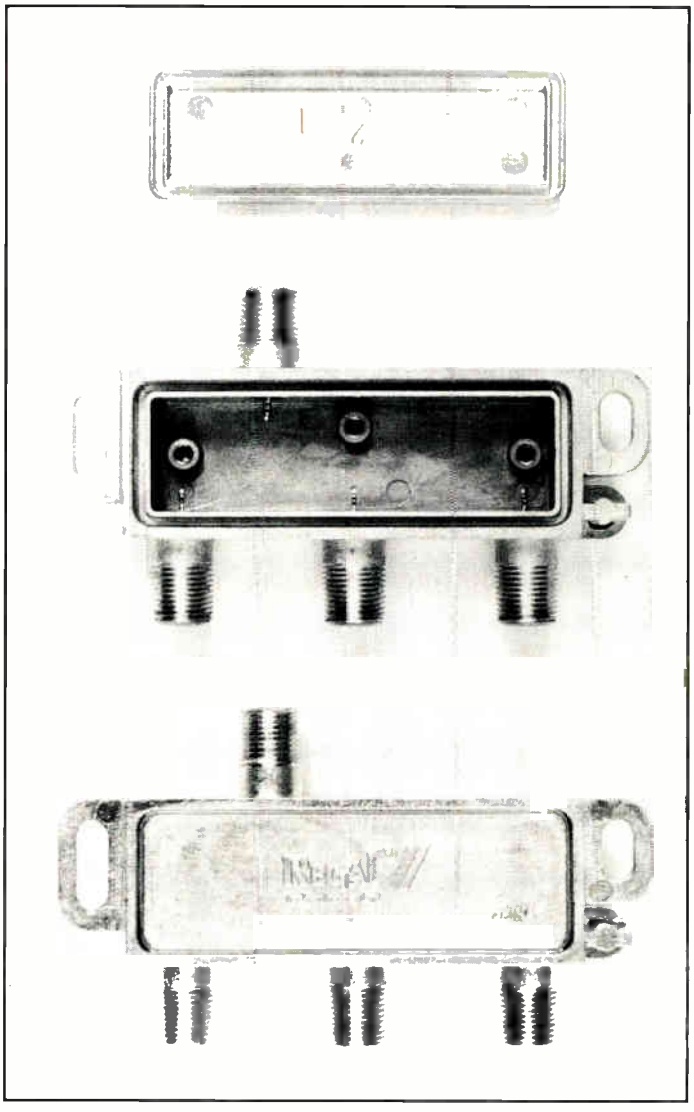
Situations like these happen daily. You'll handle them better by sharpening your people skills. Not only will you be more effective, but your staff and co-workers will become happier and more productive. Communication is a narrow two-way street; look out for oncoming traffic. **CT**

Regal Gold Label 1 GHz drop passives

By Ron Hranac
Senior Technical Editor

As the industry's push toward wider bandwidths continues, manufacturers have been designing and producing products that provide good performance to as high as 1 GHz (1,000 MHz). We have connectors, cable and amplifier motherboards that operate at that lofty frequency, and our suppliers are working on amplifier and passive designs. While some 1 GHz passives have been available, they generally have been limited production specialty items for satellite and microwave communications. I am aware of at least one European manufacturer that has been providing 1 GHz CATV/MATV drop passives, but they haven't been marketed on a large scale to the U.S. cable industry.

Regal Technologies Ltd., a Skokie, Ill.-based manufacturer, recently introduced what it calls the Gold Label series of drop splitters, with performance specified to 1 GHz. We obtained samples of Regal's GS2DGH two-way, GS3DGH three-way and GS4DGH four-way splitters for evaluation, which were tested in Jones Intercable's corporate engineering lab by Frank Eichenlaub.



Bob Sullivan

Interlocking channels cast into the splitter back plate and housing provide high RFI shielding.

About the product

These passives represent a bit of a departure from convention when it comes to drop passive design. First of all, Regal decided to use microstrip circuitry and surface mount device technology instead of the more traditional PC board assembly techniques. This results in more consistent electri-

Courtesy Regal

Regal's Gold Label series of drop splitters.

cal performance from unit to unit, and achieves a wider operating bandwidth.

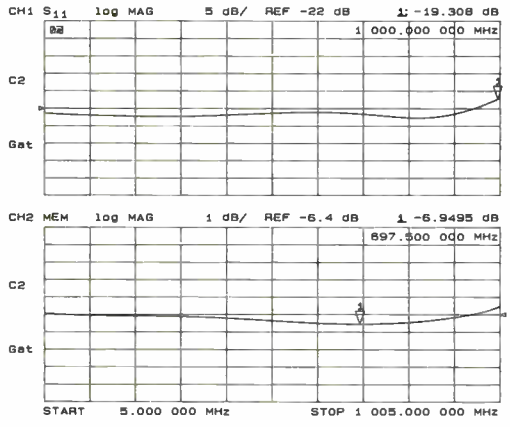
Another consideration was good RFI shielding, so the splitter back plates are cast with interlocking channels and are pressed into mating channels in the housing. Then an epoxy seal is applied for environmental protection. Similar shielding designs have been employed by other manufacturers, and have been proven to be far superior to the use of the stamped metal backing plate used in many splitter designs.

These passives are available only in the horizontal configuration shown, and have a much heavier feel than the usual drop splitter. Regal had just started production when this evaluation was done, and final pricing had not been set. The estimated unit cost for the two-way is $2.50, about $4 for the three-way and $5 for the four-way.

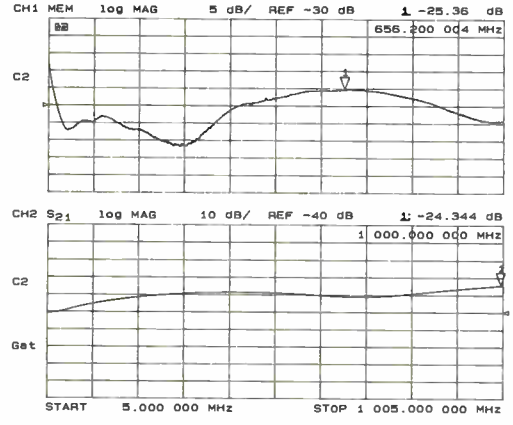
All electrical measurements were done using a Hewlett-Packard 8753B network analyzer and 85046B 75 ohm S-parameter test set. The network analyzer's time domain option was used to gate out reflections that might contribute to measurement errors. Insertion loss, return loss and isolation were tested from 5-1,005 MHz.

RFI shielding was measured in an untuned RFI chamber connected to the network analyzer. The bandwidth of the external post amplifier limited shielding measurements to 40-450 MHz. Regal's shielding spec is 125 dB, which in itself is

Typical input port return loss (top) and splitter insertion loss (bottom) of a four-way splitter



Output port return loss was good to beyond 1 GHz (top) as was port-to-port isolation (bottom)



a very difficult value to measure, but all the samples tested were essentially at the noise floor of the measurement system (–120 to –130 dB). Unfortunately we could not check shielding beyond 450 MHz. In any event, compared to the stamped metal backing plate design, the Regal design is as much as 30-50 dB better.

Several samples of each splitter were tested, and the following table summarizes the average worst-case performance compared to the manufacturer's worst-case spec. The accompanying network analyzer plots (four-way splitter) are indicative of the performance of the Regal splitters.

		Worst-case spec*	Worst-case measured
GS2DGH two-way splitters			
Insertion loss	(P1)	4.4 dB	3.53 dB
	(P2)	4.4 dB	3.63 dB
Return loss	(Input)	15 dB	19.70 dB
	(P1)	15 dB	27.07 dB
	(P2)	15 dB	23.73 dB
Isolation	(P1-P2)	20 dB	19.97 dB
GS3DGH three-way splitters			
Insertion loss	(P1)	8.2 dB	6.63 dB
	(P2)	8.2 dB	6.53 dB
	(P3)	4.4 dB	3.30 dB
Return loss	(Input)	15 dB	16.53 dB
	(P1)	15 dB	23.03 dB
	(P2)	15 dB	27.80 dB
	(P3)	15 dB	25.03 dB
Isolation	(P1-P3)	20 dB	28.10 dB
	(P2-P3)	20 dB	28.53 dB
GS4DGH four-way splitters			
Insertion loss	(P1)	8.2 dB	6.97 dB
	(P2)	8.2 dB	6.77 dB
	(P3)	8.2 dB	6.93 dB
	(P4)	8.2 dB	6.73 dB
Return loss	(Input)	15 dB	20.03 dB
	(P1)	15 dB	27.23 dB
	(P2)	15 dB	26.43 dB

		Worst-case spec*	Worst-case measured
GS4DGH continued			
Return loss	(P3)	15 dB	25.63 dB
	(P4)	15 dB	22.43 dB
Isolation	(P1-P2)	20 dB	31.27 dB
	(P3-P4)	20 dB	29.93 dB
	(P1-P4)	20 dB	30.17 dB

*Note: Regal specifies its splitter performance in the following frequency ranges: from 5-10 MHz, 10-20 MHz, 20-400 MHz, 500-600 MHz and 600-1,000 MHz. The values shown are their worst-case specs (600-1,000 MHz). The worst-case actual performance was in the same frequency range.

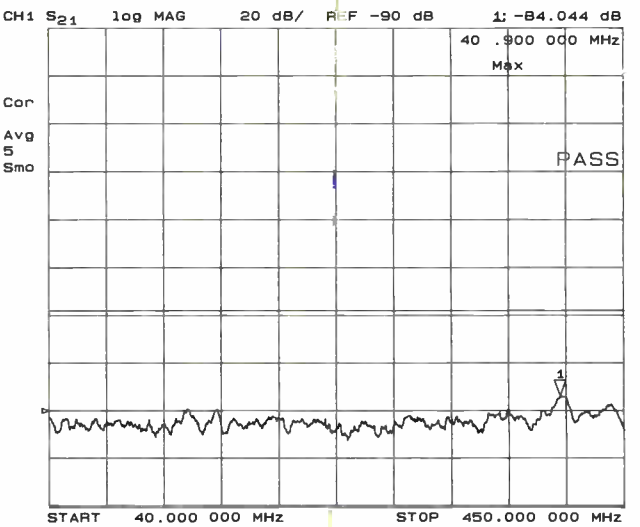
Comments

One might think that "a splitter is a splitter," but obtaining good broadband performance out to 1 GHz is difficult to do in a passive RF device. The incorporation of microstrip and SMD technology provides that, and Regal has applied for patents on the internal circuitry. I had a chance to look at the splitter circuit boards (very impressive), but we were asked not to show them at this time.

The performance of Regal's Gold Label splitters is quite good and if your future calls for the use of 1 GHz drop passives these will fit the bill nicely. Their higher cost is reflected in the broadband capabilities of the devices and the nature of the technology used to obtain those capabilities. Little details, like plating the center conductor pin vises before folding them, machined threads and the generally heavy-duty construction (die cast zinc with zinc chromate plating) will contribute to long-term performance.

For more information, contact Regal Technologies Ltd., 4711 Golf Road, Skokie, Ill. 60076, (708) 677-2600. **CT**

RFI shielding was at the noise floor of the test setup; Marker 1 is at -126 dB (-84.044 dB plus 42 dB gain post amplifier)



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Reader Service Number 64

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Microlasers

Amoco Laser Co. announced its new series of single-frequency, laser-diode-pumped, solid-state microlasers. They use Amoco's end-pumping configuration for linewidths of <5 kHz at 1,064 nm and 1,319 nm. Features include 20 MHz frequency stability over a two-hour period, >2,000:1 linear polarization, low relative intensity noise, single-mode fiber pigtail option and output powers up to 400 mW.
Reader service #141

Fault locator

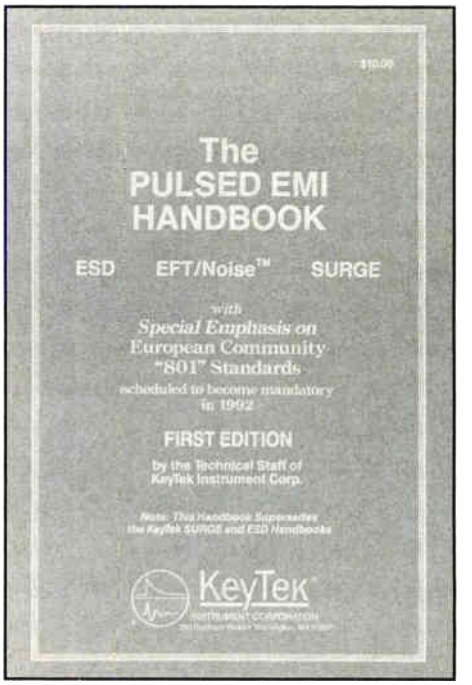
Biddle Instruments made available its four-range, battery-powered, handheld TDR cable fault locator that provides a cable trace indicating faults on cables up to 9,500 feet in length. The product uses the principle of time domain reflectometry enhanced by microprocessor technology, is pushbutton-operated and has LCD display.

To use, you check the velocity of propagation, set the range, move the cursor to fault or discontinuity on the trace and then the instrument automatically shows distance to the fault. The unit can identify and locate opens, shorts, taps, splits and resplits and water saturation on cable. Accuracy is better than 3 percent of selected range.
Reader service #139

Power supply software

The Power Supply Maintenance Software Version 3.00 was announced by Dumbauld and Associates. The software allows the user to account for all power supplies, tracking service visits, scheduling preventive maintenance visits and exceptional conditions. Exceptional condition reports are printed for power supplies that are out of tolerance (set by the user). The software can check output voltage, load voltage and specific gravity of the battery fluid.

The product is menu-driven and the preventive maintenance scheduling function generates work orders on a weekly basis in the form of a checklist to assist the service technician in obtaining the pertinent information needed. It is IBM-compatible and requires a hard disk drive system with 512K bytes of RAM and monochrome or color monitor. The quantity of power supplies that can be maintained by the software is limited only by the amount of storage on the disk drive. A real-time clock is recommended.
Reader service #140



Pulsed EMI handbook

KeyTek published a new 80-page handbook on pulsed electromagnetic interference (EMI), including electrostatic discharge (ESD), electrical fast transient bursts (EFT) and surge on both power lines and I/O lines. The handbook is a basic introduction to a series of two-day seminars that the

company is holding on designing and testing equipment to meet the mandatory EC92 European EMI standards. The book describes the requirements of principal standards including IEC 801-2 for ESD, IEC 801-4 for EFT, and IEC 801-5 for surge as well as ANSI C63 for ESD and ANSI/IEEE C62.41 for both EFT and surge.

Details are included on threat waveforms, test levels, test setups and key differences among the various documents. The company's seminars are scheduled for various cities in fall 1990.
Reader service #138

Frequency counter

EIP Microwave Inc. introduced the EIP Model 628A, a 10 Hz to 26.5 GHz CW microwave frequency counter. The unit provides the ability to selectively measure individual signals in a multisignal environment. The YIG-preselector on the product provides protection from the accidental application of high level signals to the counter's microwave input, up to 30 watts of continuous power or 200 watts of peak pulsed power.

GPIB programmability is included as a standard feature and kickback noise emission is specified as < -70 dBm. An ovenized oscillator option includes a 12 VDC input to keep the oven at operating temperature during long transits to remote sites.
Reader service #137

Logging, analysis system

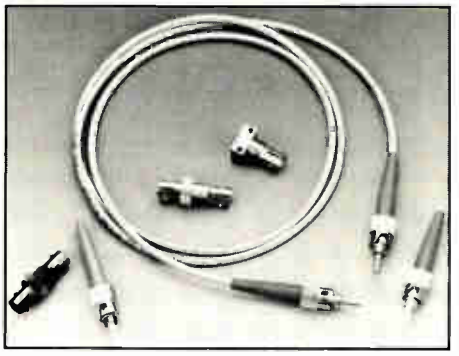
ACE Communications made available its computer-driven frequency logging and analysis system. The complete package includes a receiver that covers 100 kHz to 2,036 MHz and control software and serial interface hardware. It is designed for stand-alone, unattended monitoring and logging on any group of frequencies within the receiver coverage range, in wide FM, narrow FM, AM or single sideband operating modes.

The two basic types of analysis and logging functions offered with the package are a tabular method and a spectrum analyzer type display. The first lists active calls by frequency, signal strength, date, time and keys the call to a tape recording of the audio portion of the radio transmission. The second method displays on a computer monitor "spikes" of received frequencies vertically ranked by signal strength. The horizontal axis represents the radio frequencies being received. The display can be viewed on a screen printed on a dot matrix or laser printer. Tabular data also can be printed or stored on a disk.
Reader service #136

Parts tester

The Model 815 parts tester with digital readout was introduced by B&K-Precision. It was designed for field service or general industrial applications and tests capacitance and resistance in a variety of components and tests transistors, SCRs, diodes, LEDs and batteries in 26 ranges. The unit is designed to withstand a five-foot drop and is water- and overload-resistant.

The product tests capacitance from 0.1 pf to 20 mF in capacitors, cable switches and other components with accuracies ranging from 0.75 percent to 1.5 percent. Resistance measurement spans from 0.1 ohm to 20 megaohms. Other features include a 3-1/2 digit 0.8-inch LCD readout, tilt stand for bench use, test leads and component insertion sockets.
Reader service #133

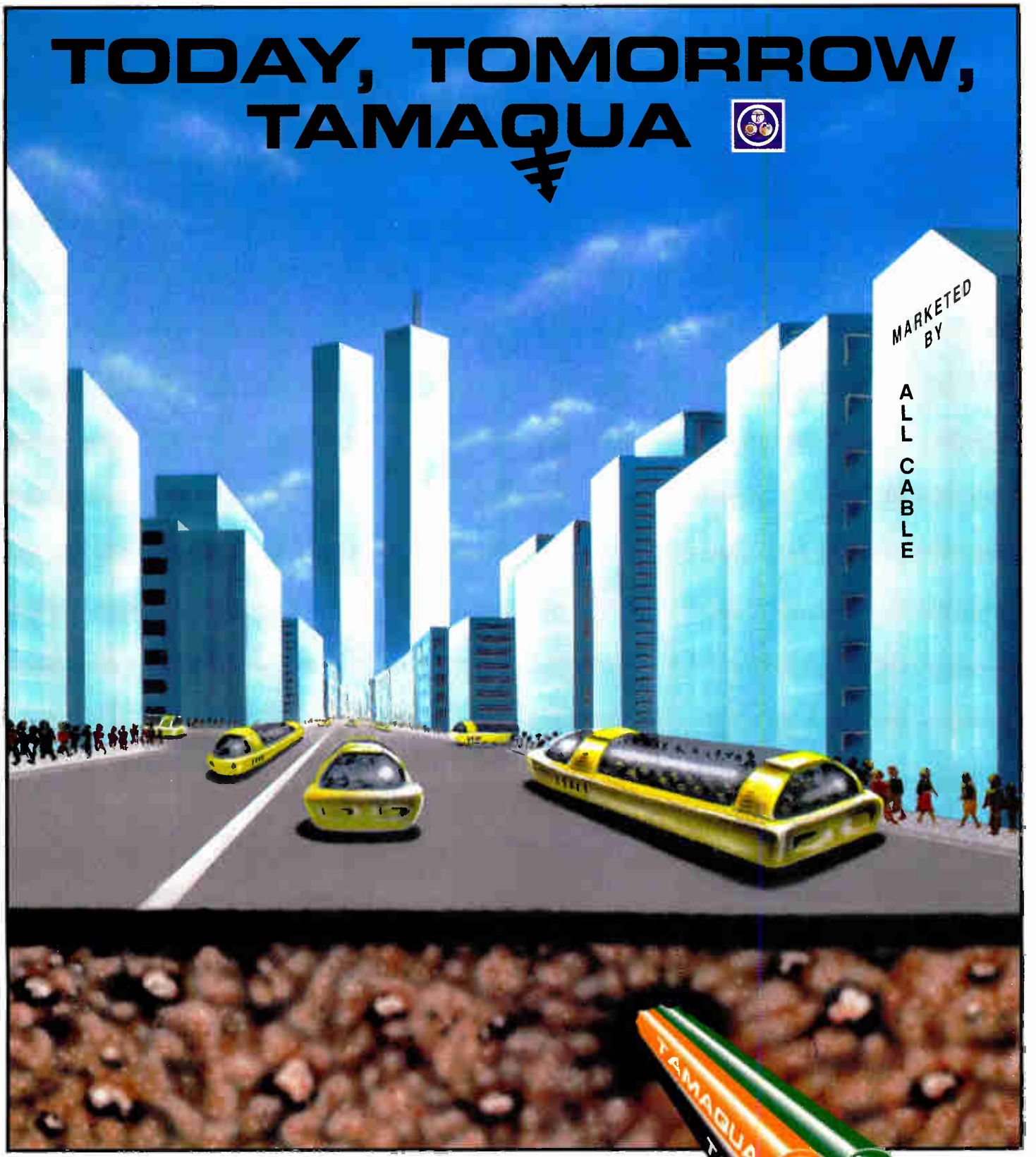


FO connector

Channel Commercial Corp. announced availability of the SMT single-mode connector from Augat, which is designed for long-haul applications. The ST-type connector has both low insertion losses and low back reflection characteristics.

The field-installable SMT connector system is intermateable with ST-type connectors and features a keyed, bayonet-latching coupling mechanism to assure consistent alignment with every connection. The connector body is made of nickel-plated zinc and has a radiused zirconia ceramic ferrule. The backpost of the connector is blackened for easy differentiation from Augat's multimode connector.
Reader service # 132

TODAY, TOMORROW, TAMAQUA



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Reader Service Number 67

T&M catalog

Hewlett-Packard is making its 1991 test and measurement catalog available free. It contains new product updates, comprehensive product descriptions, current pricing and specs. Detailed selection guides and tutorials also are included.

Information is cross-indexed by category, alphabetical listing and model number. The catalog is over 700 pages and describes more than 1,500 HP products and services.

Reader service #131

Pocket test guide

Fotec's new pocket-sized *Fiber-Optic Testing Guide* is free upon request and describes the methods used to test fiber-optic cables and networks. All basic fiber test methods for cable loss, transmitter and receiver power and loopback testing are covered.

The guide is applicable to all fiber networks. The tests detailed follow industry standard practices, including appropriate EIA fiber test procedures. It includes conversion tables for dB to watts and dB to percent loss.

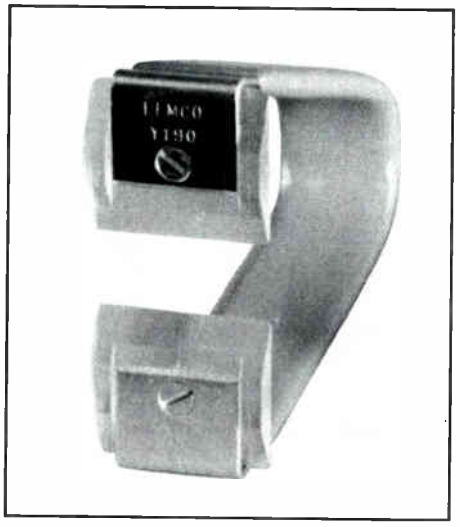
Reader service #130

CATV software

Cable Information Technology Co. introduced CostTrax, which is a software system designed specifically for CATV system accounting and engineering departments. It is capable of tracking any and all costs associated with CATV plant operation including labor (employees and contractors), parts and materials, and maintenance costs. It also provides the ability to do automated purchasing, receiving, inventory and converter tracking as well as fleet and project management.

The software system was developed by a team of CATV system engineers and computer system developers. The product is a new system and not a reworked accounting system.

Reader service #129



Conductor cleaner

Lemco introduced its center conductor cleaner that is used to remove dielectric and adhesive from the center conductors of all coaxial cables from .412 through supertrunk. The tool is 3 inches wide by 4.5 inches long, which according to the company enables the splicer to use the power, speed and control of his whole hand.

The plastic scrapers quickly clean the center conductor without damage to the copper coating. The scrapers are reversible and can be sharpened with a fine file. Replacement scrapers are available (Lemco Part 582). The handle is made of plated spring steel and has a plastic coating.

Reader service #126

FO termination kit

A new fiber-optic termination kit was announced by FOCS. It can be specified for any industry standard connector or combination of connectors. It comes with all tools and instructions needed to carry out field installation of the selected connectors.

Additional connectors and tools can be bought from the company to expand the capabilities. Each kit has sufficient connectors and consumables to do 25 terminations. Replacement consumables packages are available.

Reader service #128

Powder coat paint

A new powder coat paint is being put on all C- and Ku-band LNAs, LNBs, feedhorns and wireless cable products by California Amplifier. The new paint is said to be a better performing environmental barrier and is environmentally safe to apply. The process does not emit undesirable fumes and offers the covered surfaces better protection from the elements, according to the company.

The product is applied with a typical paint gun and then dried and cured in special purpose heat ovens. The finished products are the same glossy grey color the company has been using for several years.

Reader service #125

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CALENDAR

October

Oct. 8: SCTE Greater Chicago Chapter technical seminar. Contact John Grothendick, (800) 544-5368.

Oct. 9-11: Mid-America Cable Television Association Mid-America Cable Show, Kansas City, Mo. Contact (913) 841-9241.

Oct. 10: SCTE Delaware Valley Chapter technical seminar. Contact Dan McMonigle, (215) 265-4233.

Oct. 10: Backbone Networks Corp. training series on understanding fiber-optic networks, Embassy Suites, San Clara, Calif. Contact (508) 754-4858.

Oct. 10-12: Magnavox CATV mobile training center seminar, Greensboro, N.C. Contact Amy Costello Haube, (800) 448-5171 or (800) 522-7464 in New York state.

Oct. 11: Backbone Networks Corp. training series on how to plan and buy (or sell) a fiber-optic backbone network, Embassy Suites, San Clara, Calif. Contact (508) 754-4858.

Oct 11: SCTE Chesapeake Chapter technical seminar on video and audio, Holiday Inn, Columbia, Md. Contact Keith Hennek, (301) 731-5560.

Oct. 15: Backbone Networks Corp. training series on understanding fiber-optic networks, Doubletree, Marina Del Rey, Calif. Contact (508) 754-4858,

Oct. 16-18: Magnavox CATV mobile training center seminar, Roanoke, Va. Contact Amy Costello Haube, (800) 448-5171 or (800) 522-7464 in New York state.

Oct 16: Backbone Networks Corp. training series on how to plan and buy (or sell) a fiber-optic backbone network, Doubletree, Marina Del Rey, Calif. Contact (508) 754-4858.

Oct. 16-18: C-COR technical seminar on basic theory, installation and maintenance of cable TV systems, Phoenix. Contact Teresa Harshbarger, (800) 233-2267.

Oct. 17: SCTE Palmetto Chapter technical seminar. Contact Rick Barnett, (803) 747-1403.

Oct. 17: SCTE Penn/Ohio Meeting Group technical seminar on fiber optics. Contact Bernie Czarnecki, (814) 838-1466.

Oct. 17: Fotec training seminar on fiber-optic basics and applications, Boston. Contact (800) 537-8254 or (617) 241-7810 in Massachusetts.

Oct. 20: Western Society of Cable Television Engineers fall general meeting and technical seminar on rebuild engineering, MMDS, off-air antenna technology, safety and AM fiber-optic trunking projects, Delta Airport Inn, Vancouver, British Columbia. Contact Gary Barrows, (604) 985-2151.

Oct. 22-25: Backbone Networks Corp. hands-on fiber-optic workshop, Worcester, Mass. Contact (508) 754-4858.

Planning ahead

Nov. 28-30: Western Show, Anaheim, Calif.
Dec. 5-7: DBS '90 conference, Bermuda.
Feb. 27-Mar. 1: Texas Cable Show, San Antonio, Texas
Mar. 24-27: National Show, New Orleans
June 13-16: Cable-Tec Expo, Reno, Nev.

Communication: A two-way system

This is the second of a two-part "President's Message" advocating communication within the Society.

By Wendell Woody
President, Society of Cable Television Engineers

Last month I answered some questions I have encountered in my travels as SCTE president. The following are other frequently asked questions.

BCT/E exam results

- *Why are exam results sometimes fast and sometimes very slow?* It depends on the volume of exams received to be graded and processed. The Cable-Tec Expo, Western Show and various other regional cable shows where exams are administered in large numbers generate an overload of exams to be processed at the SCTE headquarters in a reasonable period of time.
- *I'm ready to take exams again but I don't know the results of my last tests yet.* Your national staff and board of directors certainly regret this situation does exist more often than is acceptable. Here again, exams are manually graded and processed. The volume of exams to be processed at given peak times far exceeds the workload capabilities of our headquarters staff.
- *What is the national board of directors doing to expedite exam results?* We are implementing automated procedures for grading examinations and processing test results expeditiously. We have purchased a new automated exam reader and are developing customized answer sheets for the BCT/E tests to be graded by this equipment.
- *How will the answer sheets differ?* On the multiple choice questions you will no longer enter a letter on your answer sheet. Instead, with your lead pencil you will fill in the box by the letter to identify your choice for your answer to the question.
- *Is there a new procedure for Category VII, Engineering Management and Professionalism?* No, this test remains as a handwritten essay examination.
- *What is the timetable on this new BCT/E test processing?* The national staff has been working on the changeover for several months. All tests given this month will use the new customized answer sheet and will be graded by the new automated equipment.
- *Why can't my chapter just order BCT/E exams a few days before we need them?* The SCTE headquarters is not staffed to handle "impulse" testing requests. The integrity of this BCT/E program is maintained by administrating it in a well-organized and disciplined manner.
- *Why am I always in trouble seeking examination date approval?* Just a little planning and respect for the rules will keep everyone's temper cool!
- *Have you made the rules harder to meet?* Not at all. The original 60-day lead time (which was badly abused) has now been reduced to 45 days and strictly enforced.
- *How do you expect me to know 45 days in advance how many tests to order?* We don't. That's merely the requirement for your initial examination administration request form. Upon receipt, your request is logged onto the examination work schedule, then approved by Bill Riker and returned to you within a week. Only at this point in time, with your approval form in hand, should you announce the absolute testing date to your chapter and the trade journals. Then you have until 14 days prior to the exam to order the quantity of each test needed.

Installer Program

- *What is the status of the new Installer Program?* The development has been completed and the program implemented. Some 500 to 600 members have enrolled and have been issued their membership cards. Over 50 members have completed the program and have been mailed their certification. Your chapter or company should be making use of this program. See *The Interval* included in this issue of your *CT* magazine for complete information and implementing procedures on this dynamic program. Remember, CATV installers are most likely the only people in our industry who will ever see the subscriber face to face. Let's provide them with the proper education and training skills to favorably represent our industry to the public.

Membership cards

- *When will I get my new SCTE membership card?* You should have it by the time you are reading this article or at least by the end of the month.
- *What has been the delay?* We are changing the type of card and the process by which it is generated.
- *Why did you make the change?* We are changing to a computerized system. With 7,000 members and growing, the manual recordkeeping and typing of the individual cards was no longer practical.
- *Why has the changeover taken so long?* First, the new computer program was purchased and the 7,000 members' personal status data information was manually entered into the computer. Next, a new card printer was purchased that would handle a special ribbon made for typing the plastic membership cards.
- *Will the new cards be an improvement over the old cards?* Yes, the new plastic "silver" cards will be more durable and the applied information printed on the card will be long lasting. Once the new system is fully implemented and the backlog caught up to date, new and renewal membership cards will be run twice a month and new memberships will be input daily. **CT**

"The SCTE headquarters is not staffed to handle 'impulse' testing requests. The integrity of this BCT/E program is maintained by administrating it in a well-organized and disciplined manner."

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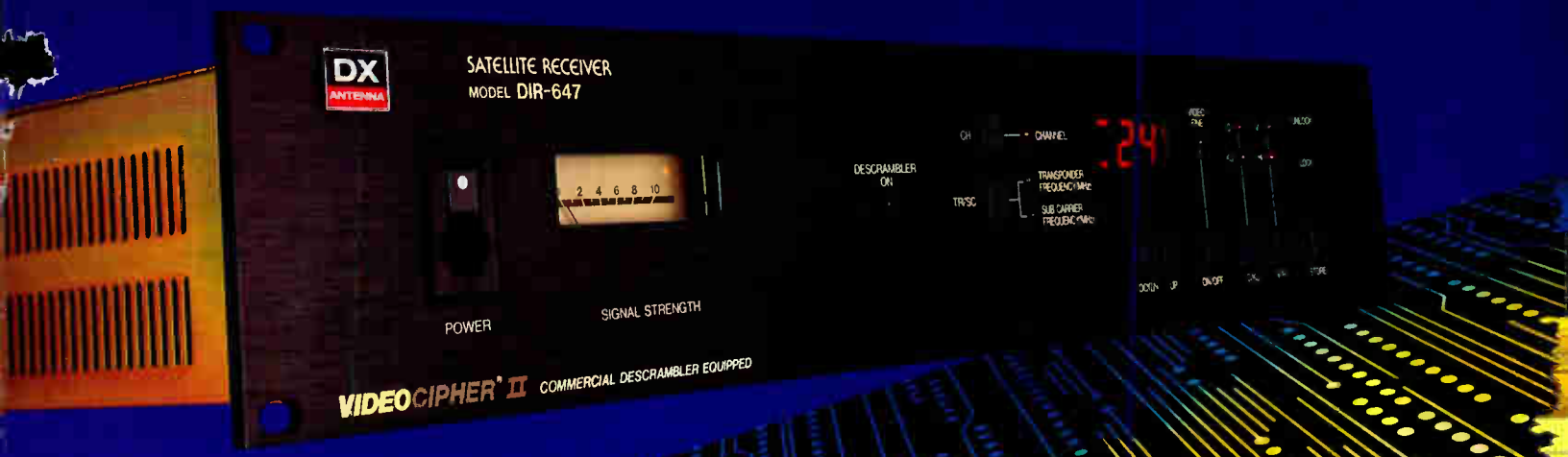

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