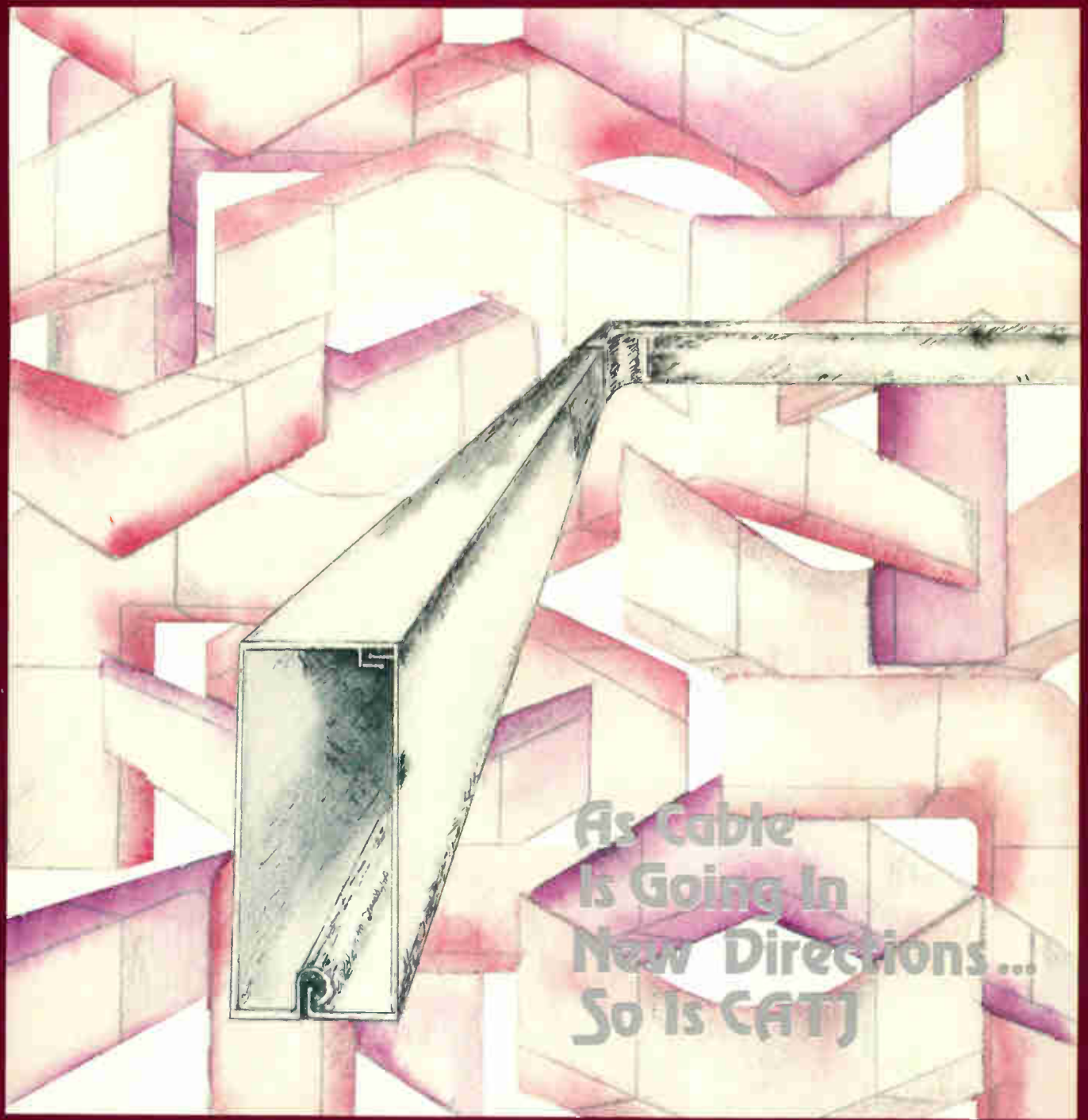
CATJ

OFFICIAL JOURNAL OF THE COMMUNITY ANTENNA TELEVISION ASSOCIATION

APRIL 1982



TRIPLE CROWN ELECTRONICS

PRESENTS

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This Rack Contains
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. . . on Pre-Packaged Head-Ends

Manufactured by Triple Crown
Sold by Ind. Co. Cable TV, Inc.
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WE DELIVER!

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1. B.E. Duval Company
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   San Pedro, Calif., 90732
   (213) 833-0951.
2. Ind. Co. Cable TV., Inc.
   P.O. Box 3799, 755-23rd Street,
   Batesville, Arkansas, 72501
   (501) 793-4174.
3. TR Pitts Company
   P.O. Box 57,
   501 W. 5th Street
   Winona, Minn., 55987
   (507) 452-2629.

MEXICO

4. Fag S.A.,
   Calle 15 #81
   San Pedro De Los Pinos, Mexico
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EUROPE

5. HF Transmissie Techniek B.V.,
   P.O.B. 385, De Smalle Zijde 8
   3900 AJ Veenendaal, Holland
   08485-17231

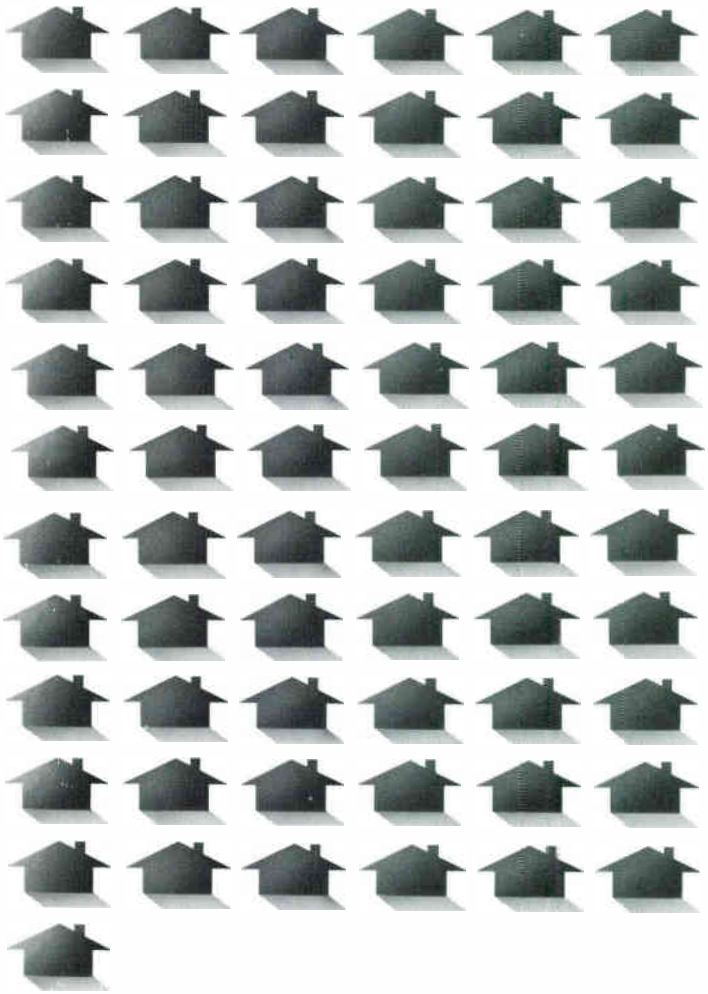
U.S. REPAIR

6. Lee Dorman Repair Service
   Tressler Street
   Pleasant Gap, Pa., 16823
   (814) 359-3161.
7. Superior Electronics Center, Inc.
   2010 Pine Terrace
   Sarasota, Florida 33581
   (813) 922-1511.

Homes passed per day.

Them.

Us.



This is one difference between their cable burial methods and ours.

If you've come to expect an average of 600-800′ of coax burial per day (that's about 5½ homes passed), get ready for some great expectations with GTC.

In a recently completed project for Cablevision Systems of Woodbury, Inc., GTC's 60-man crew buried 80 miles of cable and passed 5,000 homes in 75 work days. Each day's work included cutting the trench, laying cable, filling and sealing; digging, installing, and wiring vaults; and final clean-up of the entire area, with resodding at the vaults. The installation came in well ahead of schedule, and the job was so quick and clean that some residents didn't even know we'd been there.

GTC's innovative methods are designed to help you save time and money while enhancing community relations. We'll be happy to tell you how we work, and our new capabilities brochure is available for your file.

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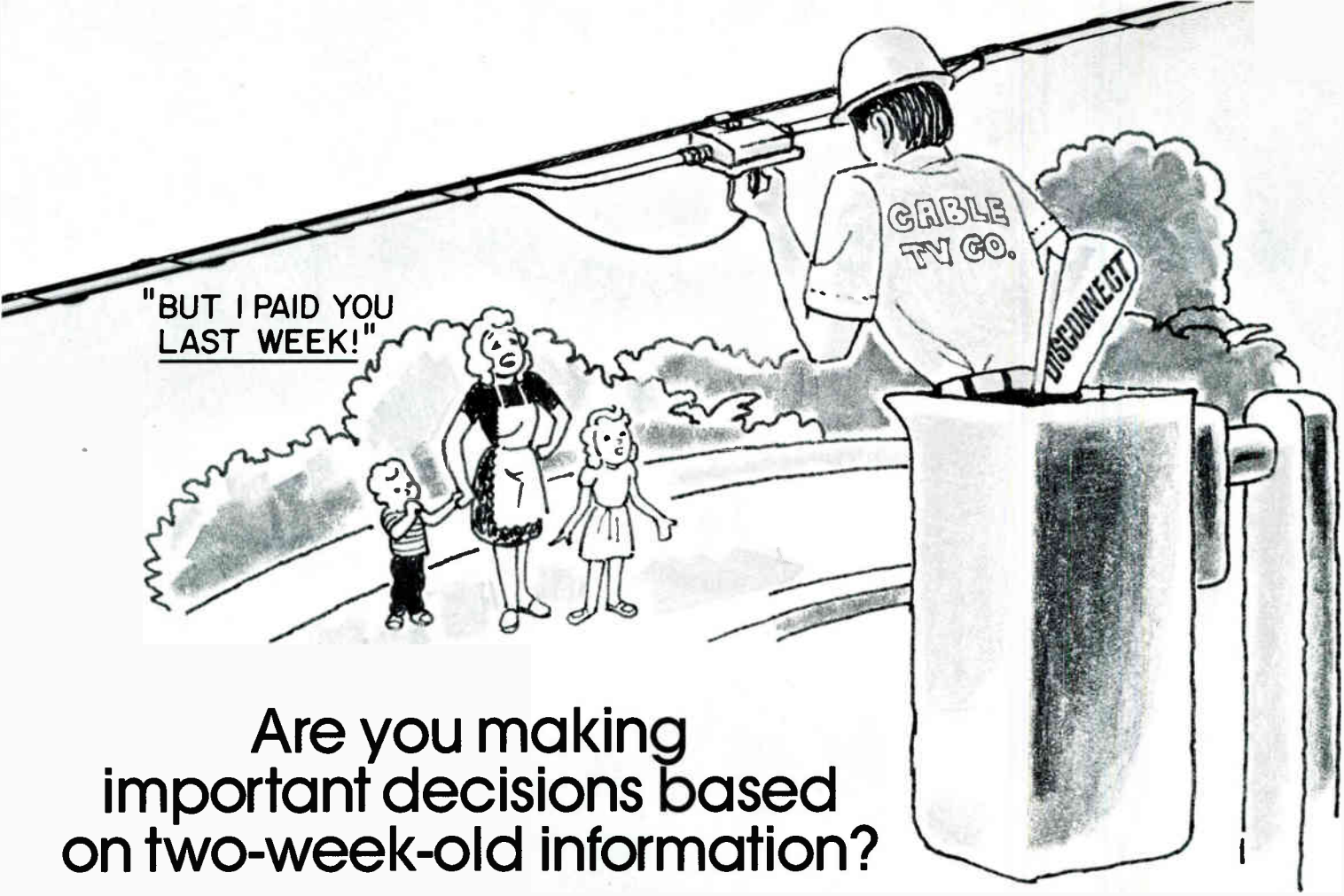
(516) 462-9810

GTC
Underground Systems Group

See Us At The NCTA Show Booth No. 1629



Are you making important decisions based on two-week-old information?

With a Toner Cable computer system, your subscriber records — both basic and pay — can be as current as the last payment received at the counter.

No more waiting for a service bureau to process your input material and mail it back! Management reports are available *at any time*, as often as desired.

No more sharing a computer with a batch operation, serving more than 8-million other subscribers! No more problems with zero flexibility, poor turnaround time, escalating costs, and inaccuracies that are never discovered until after-the-fact!

No more meaningless reports you don't really need! No more costly, after-the-fact corrections!

> "We decided against a service bureau because we want *control* over our computer, *with access to timely information whenever we want it. There isn't any trick to operating our Toner Cable computer system. It's simple to run and much more accurate than hand-posting.* You can learn to operate it in a few hours."
>
> Myron Pattison
> Crawfordsville Community Cable
> Crawfordsville, Indiana

Note: Mr. Pattison has purchased four Toner Cable computers for his CATV systems in Connersville, Crawfordsville, New Albany and Seymour, Indiana.

afraid of computers?

Still struggling with ledger cards? Anxious to improve cash flow, but leery of big computer manufacturers who don't understand CATV?

Toner Cable understands your business. We have the computers, the programs and the people to produce the results you want.

A Toner Cable computer system can help you ■ improve cash flow ■ maintain tighter management control over all subscriber accounts — basic, pay, multi-tier pay ■ generate work orders, coupon books, statements, late notices and timely statistical reports ■ while saving thousands of valuable dollars for a significant contribution to your bottom line.

> "Looking back, we see one prime reason for our successful computer operation. *We chose the right system* — a Toner Cable computer system — from people who understand what we need, and the way we need it."
>
> Richard Gessner
> Massillon Cable TV, Inc.
> Massillon, Ohio

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toner
cable equipment, inc.

Toner Cable Computer Systems, Inc.
969 Horsham Road
Horsham, PA 19044

See Us At The NCTA Show Booth No. 1502

CATJ

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The Community Antenna Television Association, Inc. is a nonprofit organization formed under Chapter 19, Title 18 of the Statutes of the State of Oklahoma. As such, no part of its assets or income shall be the property of its members, such assets and income shall be devoted exclusively to the purposes of the Corporation.

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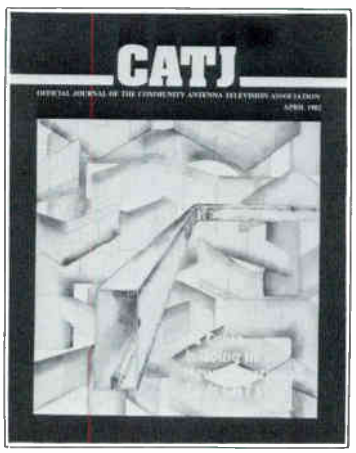
on the inside . . .

FEATURES

DEPARTMENTS



on the outside . . .

ABOUT THE COVER

CATJ has a new look with this month's issue; granted it is an abstract presentation and something different for us, but it does feature CATV service molding and, as it provides easy service for cable installation, so we hope CATJ provides you with easy access to useable and worthy information.

catatorial

Ben V. Willie,
President of CATA

Cable and Competition

The Community Antenna Television Association has always been in favor of the "free marketplace". We have opposed all efforts by the government to impose restrictions, even on potential competitors, that would be inconsistent with that free market approach. The only time we have favored the intervention of the government was when one party got an unfair advantage over another thus destroying the open marketplace. There are two principal examples of this; telephone companies that got government money at low interest rates to compete with cable operators, and broadcasters who get their spectrum space for free and then argue that we should compete with them in the "open" marketplace for programming. In those situations there is no such thing as an "open" marketplace. The government has already affected the marketplace and must therefore continue to regulate it in order to maintain some sort of balance.

Now a new situation is developing that could put cable at a severe disadvantage in the open marketplace. It is not a matter of some other industry, a competitor, getting a regulatory advantage over cable, rather it is the other way around — cable being burdened with too many regulatory requirements while our new competitors are snapping at our heels.

Who are these new competitors? Well, I am primarily talking about the major television markets, where cable is now in its fastest growth period, and where the awareness of cable television is focused. In those areas new competitors are being announced all the time. MDS, Multipoint Distribution Service, is a fast growing competitor. Now while it remains, in essence, a one channel service it will not present too much of a problem to a well run cable system. However there are now proposals before the FCC to expand that service to 14 channels These channels, as proposed, would be split among three applicants and those applicants would then get together to sell the service as a unit — a "wireless cable system".

Another potential "wireless cable system" could be composed of a group of low power television licensees (LPTV) in any given market. If they (say 10 of them) got together with their stations that just covered a dense metropolitan area, they could then afford to use an addressable scrambling system and offer ten premium channels without the cost of building the cable system.

Yet a third variation on the same theme is the Direct Broadcast Satellite (DBS). Here too, the purveyor of programming could, theoretically, sell directly to the public on an addressable basis, although this option may be more expensive than the first two. The cost, however, still does not compare to the rapidly escalating costs of building a cable system in a major market.

It is the REASON those cable construction costs are escalating that worries me most. It is not simply the laying of wire. The costs are shooting up in direct relation to the demands that are being made of the cable system, and the promises that are being extracted in the franchising process.

The LPTV, DBS, or MDS operator does not have the "expectation" problem that now burdens the cable operator seeking a big-city franchise. They do not have to talk to anyone about providing multiple channels of access. They do not have to build entire "shadow" plants because the pundits suggest that they will not have enough capacity in the future.

There are no demands of them that they provide an entire "institutional loop" for free to the local government, the local school system, and/or the local libraries.

What MDS operator who you know has mobile television vans available for community use, including instructors to show how to use them? What LPTV applicant has promised the local community millions of dollars of expenditures in local programming? Yet all these things are being forced on the cable industry. Why? Because there is a mistaken impression that cable is a monopoly that will totally dominate local television viewing, and for that reason much can be demanded in return for the theoretically lucrative cable franchise.

Maybe they are right. But I suspect that a point has been missed. Cable IS going to be subject to competition — very significant competition. The "bread and butter" of cable, as we all can see, is pay programming. There are a limited number of types of pay programming, it would appear, that make significant amounts of money. It is those very types of pay programming that our competitors plan to offer to the public. And they will be able to offer them at a very competitive price because they will not have to build as expensive a physical plant as the cable operator does. Further, they do not have the added costs of the franchising process that the cable operator must deal with. The result is that our competitors will be entering not a "free" market, but rather one where one of the most significant competitors, cable television, is severely handicapped.

Admittedly, cable has a major advantage. We have channel capacity that none of our rivals can match. However it is not at all clear that that will be sufficient. A subscriber can only watch one thing at a time, no matter how many channels are offered. Assuming that the technology will soon be here to allow addressable delivery of, say, MDS signals then the subscriber will still be able to make selections at will, without the cable system.

Am I suggesting here that cable television is doomed? That we are going to be obsolete? Not at all. I believe that there are competitive answers to the threat of new technological competitors. However those answers, the responses of the industry, depend on our being able to adjust our market strategy as the need arises. The heavy burdens being imposed, and accepted in the franchising process may make that very difficult to do. It is important that we all not only acnkowledge our present somewhat unique position in the marketplace but also educate those who feel that we must be regulated that there are many changes on the horizon.

will there be a "Free Marketplace" ?

At the very least franchising authorities should be advised about what is happening in other sectors of the communications business. They should be made aware that even if they demand strict controls of us today, they should be prepared to be flexible in the future if what we forsee as the future competition comes to pass. It will do neither the cable industry nor the cities any good if we write in stone a franchise that will only serve one purpose — as an epitath. Franchises must be living, flexible documents that can be altered as the competitive atmosphere changes. That will only happen if we act as responsible forecasters now. We are not against competition. We just want to be able to respond to it when it comes. And there is one thing that is certainly not in doubt — it is coming. □

editor's note

NEW LOOK

Dear CATJ Readers:

Over the past few months, you may have noticed a few added features which our Art Department has designed to give a new look to CATJ, thus enhancing its appeal. We like the "sprucing up" and appreciate the many kind comments that some of you have made on our "new look". On the cover of this issue, you will notice that it is changed, and for this particular issue, the art design for the cover is something unusual for us, but does depict a piece of CATV equipment that makes for easy and efficient installation, and that is what we want CATJ to do for you — being an easy assist to you as you operate your cable systems.

While we may have a new look in some areas, let me assure you that the direction of the magazine remains one of service and information, bringing new technology to you, "how-to" information, and articles by experts in their field. We have found continuing interest in CATJ, and we are dedicated to you, the operators, and the efficient and effective operation of your cable systems. There are many new people in the cable business today — not only operators, but suppliers as well — and we welcome the opportunity to be of assistance to them.

With the many regulatory and legislative matters on the forefront at the present time, not only will you continue to find technological information in CATJ, but matters facing you as principals in the cable industry will be brought out — copyright, franchising, cable system definitions, satellite news to name a few. Whatever you need to help you manage and operate your cable system, we hope to present to you in the pages of CATJ. If there is something particular you need help with, let us know — we'll try to assist you.

You've probably noticed advertisements on booklets that we have been preparing, and this is another effort on our part to provide helpful information to your employees. Our booklet on "CUSTOMER RELATIONS" that we presented as a tear-out section in our December issue was popularly received, and extra copies of that booklet were made available for providing to new employees to assist in their training as they represent your system for installation. A new booklet, prepared with the installers' training manual in mind, now offered is "NATIONAL STANDARDS FOR CATV SYSTEMS GRAPHIC SYMBOLS"; we anticipate that this will also be accepted as a valuable training piece. Our Wall Charts continue to be items that are sought by technicians for assistance.

Sum it up to say, CATJ may look a little different, but we're still there to help you operate your cable systems and will continue to offer our services to you. Thank you for your continued support and encouragement.

Celeste Lude

Managing Editor

How to protect against threats to your franchise.

Keep the franchise authorities happy. Local distribution using a Hughes AML system lets you fulfill your franchise obligations quickly and efficiently. Line of sight transmission means you can go directly to all the high priority areas first and recent Hughes AML system designs provide 108 and 160 microwave channels to support dual cable plants with their requirements for substantial upstream as well as downstream video and data.

Keep your subscribers happy. Hughes AML systems let you deliver all the features your subscribers have been reading about. Up to 60 channels per transmitter and receiver. And offers the ability to design with short cascades and highly flexible hubs which means higher picture quality and improved plant reliability. On rebuilds as well as new builds this flexible hub placement minimizes subscriber interruptions. And it handles all the latest multiple tier and addressable converter scrambling systems.

Keep your competitors unhappy. A Hughes AML system lets you get ahead of your competitors and stay ahead. Our philosophy of designing "upgradable" systems means your Hughes AML equipment never becomes obsolete. Even our first 12 channel system can easily be modified to match the performance and capacity of our latest 60 channel models.

For more information on Hughes AML systems, write or call: Hughes MICROWAVE™ COMMUNICATIONS PRODUCTS P.O. Box 2999, Torrance, CA 90509, (213) 517-6233. For 24 hour emergency service (213) 534-2170. In Canada: Micro-Sat Communications, Ltd., 975 Brock Road South, Pickering, Ontario Canada L1W3A4, (416) 839-5182.

NEW AML system designs provide more than 160 channels

HUGHES
HUGHES AIRCRAFT COMPANY

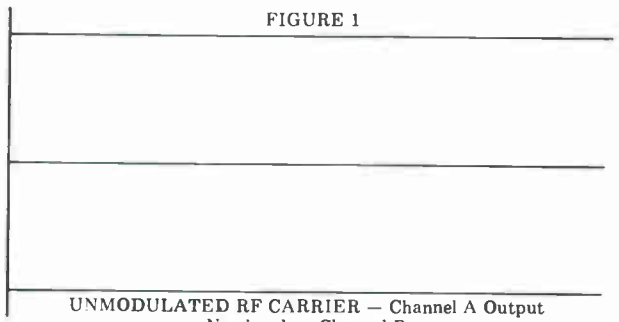
There are several types of distortion that affect the signals on a cable system. The three most talked about distortions are cross-modulation, inter-modulation, and third order beats. A great amount of confusion about these three distortion problems needs to be cleared up if we are to identify what caused the problem and what to do about it.

CROSS-MODULATION is the impression of modulation from one carrier into another and will appear in many different visable ways on the screen of a TV set. The most common effects of cross-modulation are moving stripes across the screen or slower and wider bands moving diagonally across the TV screen (windshield) wiper effect). When the levels of cross-modulation get worse, it may appear as a negative image from a different channel on your cable system superimposed on the channel being viewed. Another product of cross-modulation that is rarely seen on cable systems today is the result of the video carrier cross-modulating with the audio carrier within a television channel producing buzz in the sound and "audio lines" in the picture. This effect was minimized when we set the audio levels 15dB below the video carrier levels.

continued

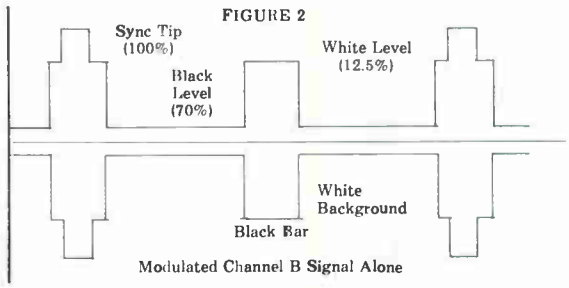
DISTORTION

FIGURE 1



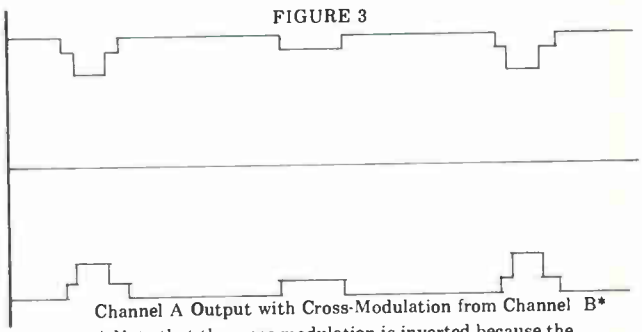
UNMODULATED RF CARRIER — Channel A Output
No signal on Channel B

FIGURE 2



Modulated Channel B Signal Alone

FIGURE 3



Channel A Output with Cross-Modulation from Channel B*

* Note that the cross-modulation is inverted because the transferred image of Channel B is the "negative" of the original modulation.

EIGHT PAGE STANDARD MEMORY WITH STATIC WEATHER INTERMIX

WEATHER/MEMORY

Standard:

- Entire system in one keyboard housing
- Weather uses Texas Electronics sensors
- Field proven reliability
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- One thousand character crawl
- Eight colors
- Four character sizes
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- Built in fail-safe

Options:

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800-453-8822

Eastern Regional Sales Office and Service Center
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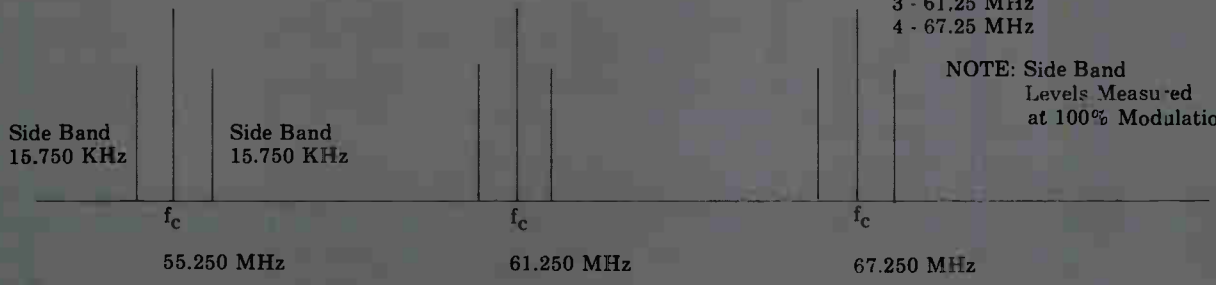
Marietta, GA 30067
404-952-3177
800-241-1453

FIGURE 4

CROSS-MODULATION RATIO

VIDEO CARRIERS
Channel 2 - 55.25 MHz
3 - 61.25 MHz
4 - 67.25 MHz

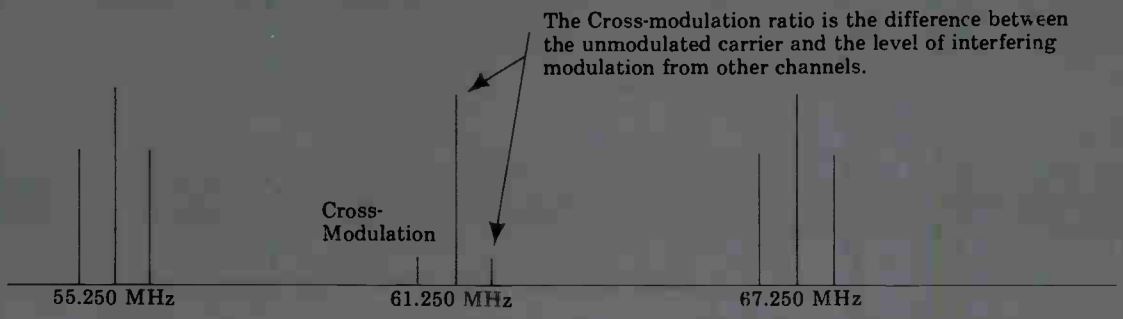
NOTE: Side Band Levels Measured at 100% Modulation.



55.250 MHz 61.250 MHz 67.250 MHz

Lower Side Band 55.234250 MHz
Upper Side Band 55.265750 MHz

MODULATED CARRIERS SHOWING SIDE BANDS FOR CHANNELS 2, 3, AND 4

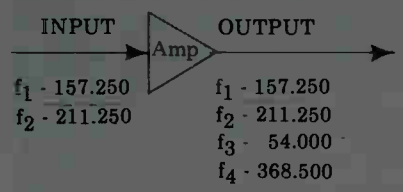


NOTE: Modulation Turned Off For Channel 3.

FIGURE 5

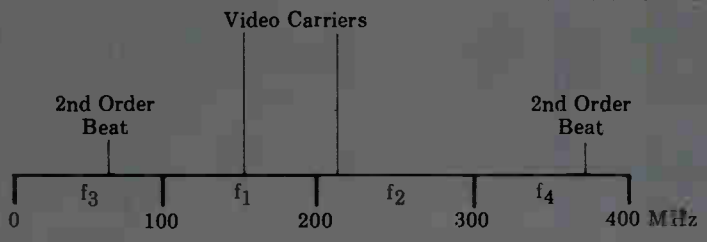
SECOND ORDER BEATS

CHANNEL G - 157.250 MHz
13 - 211.250 MHz



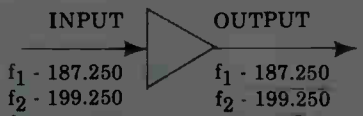
f_1 - 157.250
f_2 - 211.250

f_1 - 157.250
f_2 - 211.250
f_3 - 54.000
f_4 - 368.500



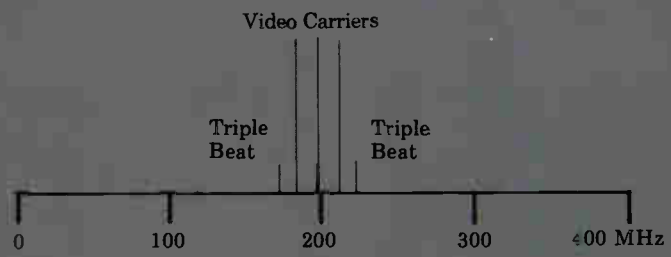
DISCRETE TRIPLE BEAT

CHANNEL 9 - 187.250 MHz
11 - 199.250 MHz
13 - 211.250 MHz



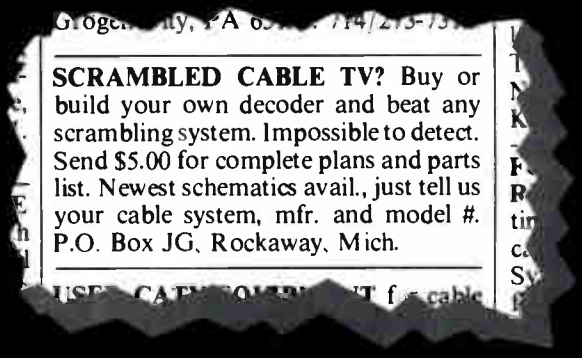
f_1 - 187.250
f_2 - 199.250
f_3 - 211.250

f_1 - 187.250
f_2 - 199.250
f_3 - 211.250
f_4 - 187.250
f_5 - 199.250
f_6 - 211.250



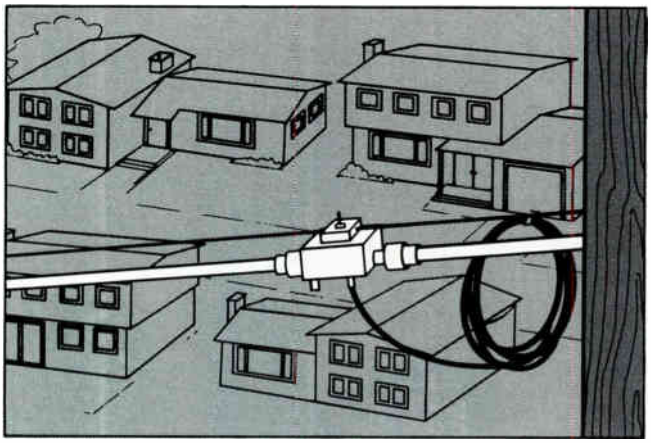
cont. on page 24

HOW TO STEAL THE SHOW.



SCRAMBLED CABLE TV? Buy or build your own decoder and beat any scrambling system. Impossible to detect. Send $5.00 for complete plans and parts list. Newest schematics avail., just tell us your cable system, mfr. and model #. P.O. Box JG, Rockaway, Mich.

HOW TO STOP IT.



Vitek multi-channel traps provide more security for your premium channels.

No matter how sophisticated a scrambled Pay-TV security system is, as long as the service goes into a home, it's vulnerable. For once it's inside the home, subscribers can clip wires, un-do security screws, buy "black boxes" and come up with ways you haven't even dreamed of to take your Pay-TV service for a ride.

Industrywide, theft of service translates into an operator's nightmare of up to $140 million annually*. And as cable systems increase their Pay-TV services by adding 2, 3, 4 and more premium channels, the temptation to cheat will increase just as dramatically.

Trapping outperforms scrambling.

That's why major MSO's and independent cable systems alike are turning to Vitek traps to protect their programming and their revenues. They already know how trapping outperforms scrambling schemes in effectiveness and in reducing costs.

Traps are more effective because they can block out up to 4 separate channels or other combinations of tiers, *before* they enter the home. That eliminates the chance of cheating by subs who don't pay for the service. And, best of all, trapping means zero degradation for your pay subscribers, compared with reconstituted decoding techniques.

With today's multi-TV set homes, traps are more economical because they eliminate the need to install one or more descramblers inside every home in your system. That means substantially lower overall costs, whether you are adding new pay service, bidding on new franchises, or rebuilding your existing system. And only Vitek traps have a patented construction that makes them virtually maintenance free.

Vitek is the most effective trap.

When it comes to Pay-TV security, the most effective method you can use is trapping. And the most effective trap is Vitek. That's why over a thousand cable systems are already using Vitek single and multi-channel cable traps to protect their revenues.

Make sure you maintain the profit in your pictures by calling Vitek today at (201) 287-3200—before anyone else tries to steal your show!

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Edison, N.J. 08817
Tel. (201) 287-3200

VITEK a subsidiary of AUGAT

I am concerned about my Pay-TV revenues! I am interested in:

- ☐ Upgrading System
- ☐ Rebuilding System
- ☐ New Franchise Proposal

Name _____

Title _____ Telephone _____

Cable System _____

Address _____

City _____ State _____ Zip _____

**Based on a Kagan report of monthly revenues in The Pay-TV Newsletter, April 30, 1981, and conservative estimates of a 10% piracy rate.*

VITEK a subsidiary of AUGAT **VITEK Electronics Inc.,** 4 Gladys Court, Edison, N.J. 08817 Tel. (201) 287-3200

by: J. Patrick Michaels, Jr.
Communications Equity Associates

Mention the word "broker" and many would-be buyers and sellers conjure up an image of a pauncy, cigar smoking wheeler dealer, clad in a red doubleknit polyester sports jacket, gladhandling them over a double bourbon. The broker image rivals that of a door to door suede shoe salesman in the minds of many cable operators.

Unfortunately, there are historical reasons for the development of this poor image in the industry since literally anyone may call themselves a "broker". There are no specific licensing requirements or educational degrees to be obtained; no professional associations to join. Hence, over the years, "finders" of every description have attempted to insert themselves into the buying and selling process in order to exact a fee, some deserved and some a basic rip-off. The cast of characters ranges from the equipment salesman, who trades tips on potential acquisitions for a gratuity if the deal closes, to a major banker with pinstripe finders masquerading as investment bankers.

In the cable television industry, the professional banker or investment

cont. on page 19

T4 PUTS TIMES TECHNOLOGY TO WORK FOR YOU

To deliver the superior dielectric performance you need, Times' Cable Television Division harnessed the latest advances in polymer chemistry and molecular engineering to create T4: a new generation of gas-injected dielectrics for trunk, feeder and drop cables.

T4 is a unique system of high-performance polymers and innovative process technology. It culminates a two-year program of research and development by Times' team of materiel scientists to produce a hard, tightly-structured foamed dielectric with outstanding strength and long-term durability.

What are Times' four T4 secrets? Proprietary nucleating agents, controlled adhesion, tailored polyethylene resins, and new rheological extrusion processes.

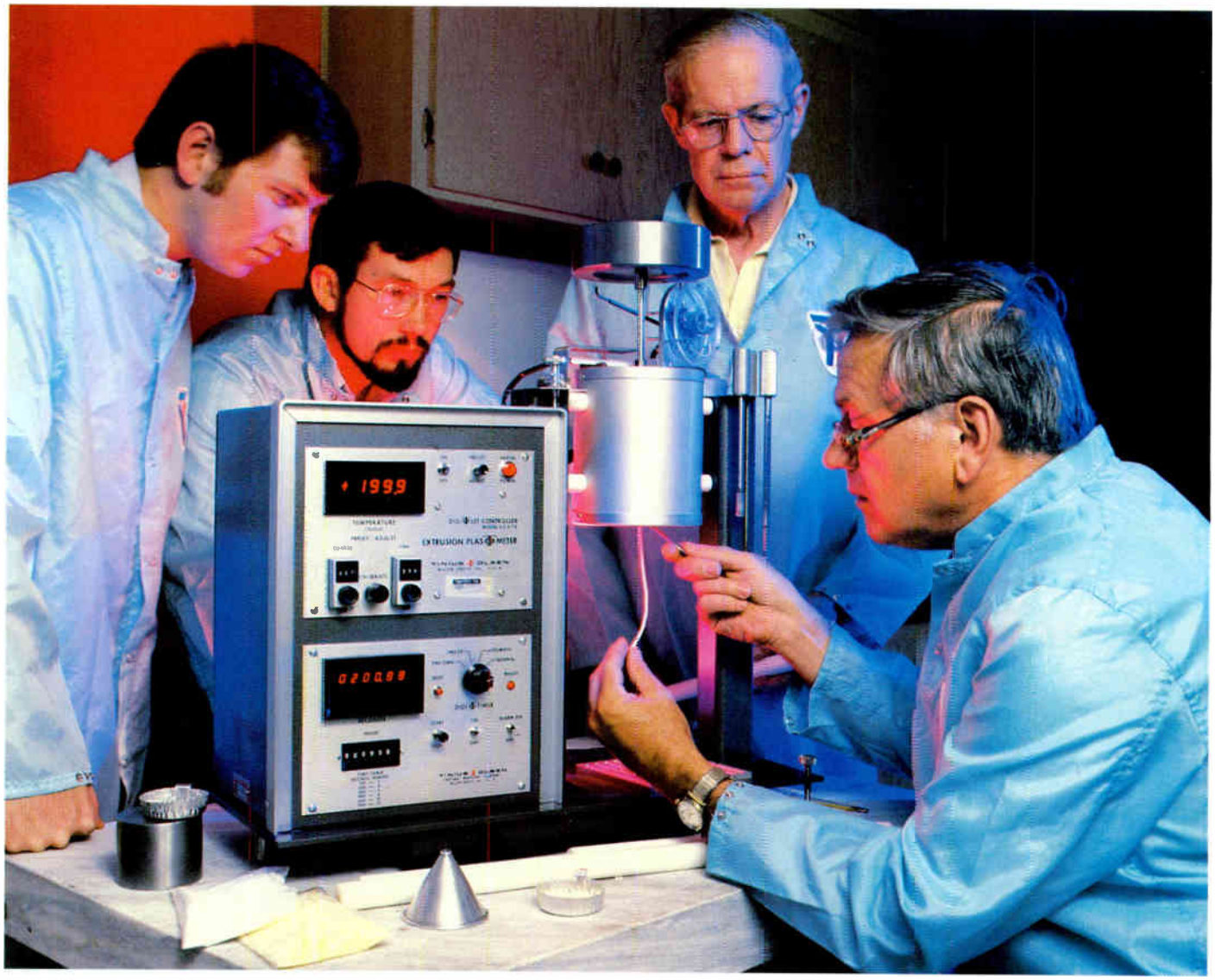
We put them together and now we have it! T4—Times' answer to your need for superior performance in total bandwidth systems.

Controlled Bonding for Long Life

T4 provides an improved barrier between the center conductor and dielectric for long-life moisture protection. T4 also provides controlled adhesion for superior strippability.

Tough and Durable Foam Structure

T4 high-strength resins and tight cell structure create a harder, tougher foam dielectric for easier handling, more reliable installation, and improved resistance to kinking and deformation.



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T4 provides a more uniform cell structure to give you improved structural return loss and outstanding attenuation performance.

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The T4 foam dielectric system is available in Times' full line of coaxial trunk, feeder and drop cable, ready now for specification on your next build.

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- Versatile video processing equipment ... our time-proven time base corrector, multi-purpose utility color generator, automatic proc amp and precision-built random deck control ... all **state-of-the-art** technology.

Of course, we still produce the GLR-500 and several advanced configurations with various accessories.

But we're more than just a Great Little Receiver. At Automation Techniques, we're more technology, more dependability and more affordable prices. What more do you need?

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cont. from page 15

banker can provide a very beneficial service and easily earn his fee. There are four or five firms with national representatives and experience in cable that are active in assisting would-be buyers and/or sellers. As a testimony of major success, some ninety percent of all reported cable television sales in 1980 were handled by these firms.

In choosing a broker, it is very important to obtain a list of references. Do not be shy about asking for a list of clients and previous clients which you may call. Ask the prospective broker to provide you with a list of completed deals for the past few years so that you may analyze the degree of success of the firm.

Prior to selecting any broker, ask for a written proposal of not only the fee structure, but a list of services which the broker and/or his firm can supply. Be sure to carefully examine the biographical sketches of the personnel to ascertain whether the firm has depth in expertise and knowledge. Also, require the prospective broker to provide you with a draft copy of the proposed representation agreement.

If you are a would-be seller, ask the broker to present you with a written opinion of what price range the properties might bring; and most importantly, a few pages of the sales strategy.

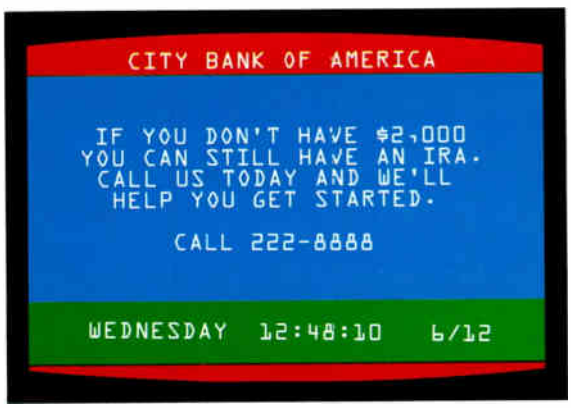
If you are a buyer, find out what other companies and individuals the proposed broker represents. Also, find out if the broker and/or his firm have any exclusive representation agreements with other buyers. Also, ask what the broker and/or his firm's policies are regarding making purchases for their own or affiliated accounts.

Also, if you are dealing with a firm as an individual, find out who will be assigned your account. Will more than one person be involved? Which officer or partner will supervise your account? How one's expense will be handled? Are retainers involved? Will the individual or firm perform on an incentive fee basis?

continued

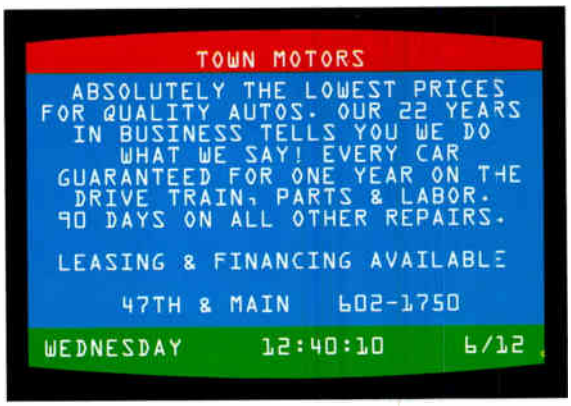
AUTOMATIC COMMERCIAL INSERTION CHARACTER GENERATOR

The BEI Marquee-800 offers you a low cost method for inserting commercials on tone commands. Marquee-800 detects the tones sent by the satellite service. It can be programmed to display as many commercial spots as desired within the time available and will return to the satellite service automatically.



SYSTEM I $4,295.00

- 16 pages of 8 lines
- Title lines
- 4-color background
- Programmable tone decoder



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SEE MARQUEE-800 AT NCTA...BOOTH 901

It is also advisable to ask to see copies of brochures prepared by the individual or firm on other deals. Read through them carefully. Are they professionally written? Do they contain adequate information? Do the brochures fairly represent the property? The brochure on a property should be comprehensive.

You should also ask how the broker plans to show the property. The method of handling the prospect towns are very important. It is necessary to the broker to spend time in the system familiarizing himself with the opportunity well before showing the property. It is also advisable to select a broker with extensive cable background.

Why use a broker? There are a number of valid reasons to seriously consider an experienced, respectable broker:

(1) **Saves Time:** An experienced broker knows who the active buyers are and what types of criteria they utilize. In representing sellers, a broker can be effective since he has spent time in researching potential opportunities and would have considerable access on an ongoing basis to opportunities.

(2) **Saves Effort:** A tremendous amount of time can be wasted in talking to unqualified prospects. A broker can prequalify prospective buyers very quickly. In representing buyers, a good broker can focus only on prospective opportunities which might meet your criteria.

(3) **Saves Money:** Large amounts of money can be expended in researching buyers; travel and related expenses wasted on prospects that are not qualified; traveling unnecessarily; legal and accounting fees can be reduced by qualified firms that have this in-house expertise to assist main clients through assisting the clients or professionals who may not have the expertise required.

(4) **Realistic Evaluation:** A reputable broker can provide you with a realistic image of prices which you might expect to receive for some property. One of the basic problems a proposal faces is knowing what the market is for their system. Rules of thumb are generally meaningless to a sophisticated buyer, and a broker can, through his expertise, tell you what to expect. If you are a buyer, your broker can advise you with regard to price and structure of a prospective acquisition.

(5) **Organized Approach:** A professional broker will approach the sale of your property on an organized basis. He works full time at buying and selling cable systems and should have a very concrete method and strategy to handle rules. By the very nature of being in business to assist buyers and sellers, the right broker will have a national preparation through industry experience, advertising, etc. The firm will have contacts that have taken years to develop.

(6) **Professional Brochure:** The selling document is critical. A professionally prepared brochure requires a substantial amount of expertise to develop. Not only is it a compilation of information; it is also the selling document. A poorly prepared brochure can not only result in substantial delays in the sales process, but also can result in a loss of prospects.

(7) **Inspections:** An experienced and properly trained broker is

cont. on page 41

At last, a big idea in addressability for the smaller system operator.

The new Oak MiniCon™ System. It's affordable addressability for operators with 8,000 or fewer subscribers—operators who need the cost savings, management information and marketing opportunities that come with addressability, despite their smaller systems.

MiniCon delivers the most important capabilities of Oak's larger TotalControl™ addressable system at a lower cost suitable for smaller operations. Like TotalControl, MiniCon allows headend control of every terminal in the system with up to 56 channels and 16 tiered program levels.

It helps smaller systems build revenue through more program options and better control.

It offers a much shorter payback period than other addressable systems because it costs just $21,000 to install with two scrambled channels.

And it's a way to enter the addressability market with a smaller operation, then upgrade to TotalControl when your customer base demands a larger system. All you do is change the headend hardware with no terminal or distribution changes.

Like any addressable system, MiniCon offers complete security. The decoders will unscramble only authorized programs. Any terminal can be activated or deactivated from your central office, eliminating late payment problems and pirated decoders.

MiniCon is a truly integrated system, including individually-coded home terminals, a secure scrambler, a computer system and home terminal control hardware. It comes with fully documented computer software and is used in conjunction with standard frequency synthesized 300 or 400 MHz TotalControl home terminals.

Since we've miniaturized the size and cost of our MiniCon System, there's no reason for you to forego the advantages of addressability because your operation is limited in size. A call to our toll-free phone number will bring you more information about MiniCon. Call 800-323-6556 (in Illinois 800-942-6345) and ask for the Oak Communications Systems Information Desk.

We're Oak Communications Systems, formerly Oak Communications CATV Division, and we haven't forgotten operators of smaller cable systems. After all, we were once a small company ourselves.

OAK

Oak Communications Systems
P.O. Box 517 Crystal Lake, Illinois 60014
Subsidiary of Oak Communications Inc.

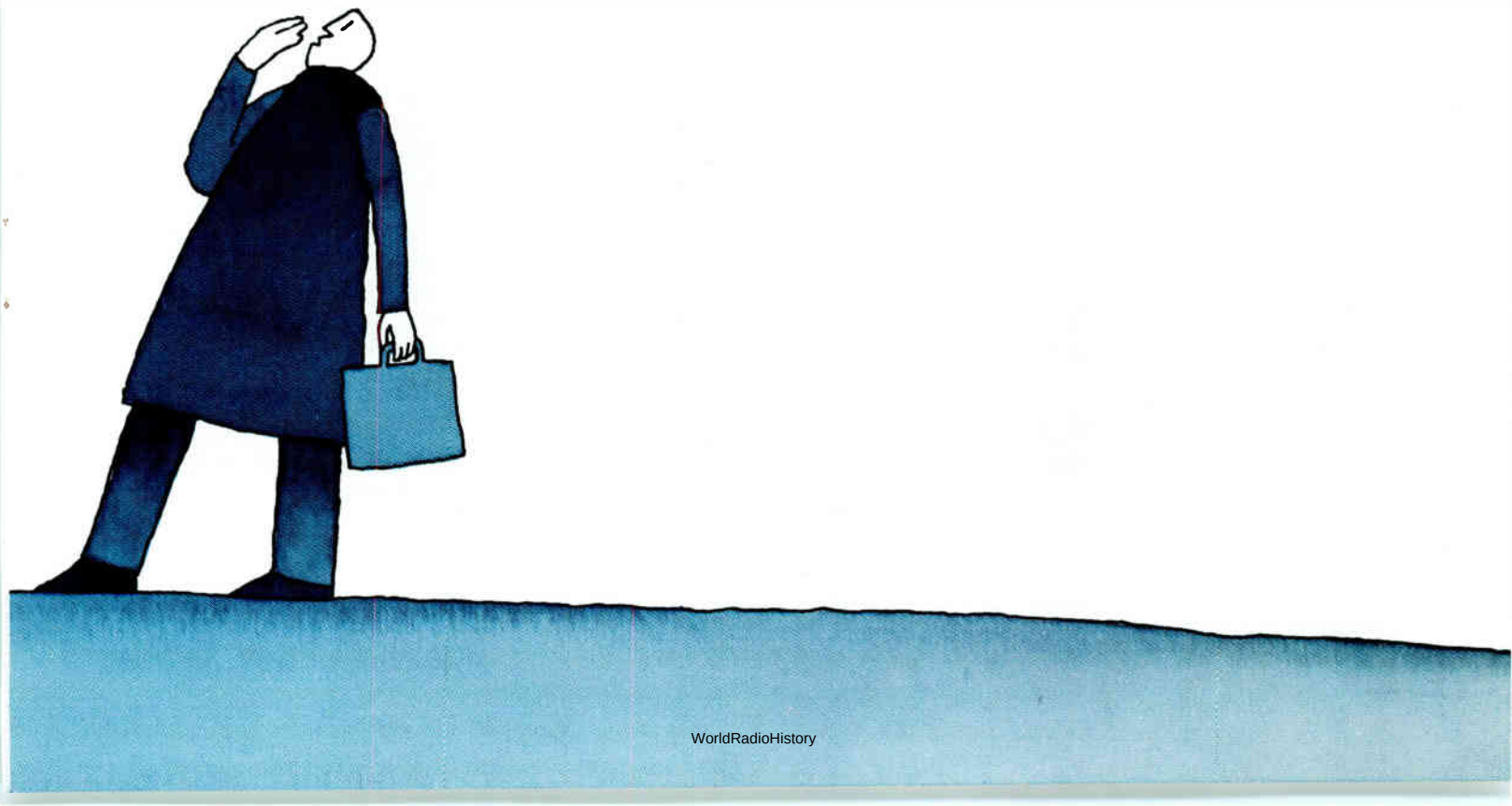

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FIGURE #1

In a television channel, the video portion of the 6MHz bandwidth contains pulses that synchronize the forming of the picture and recur at a rate of 15.75KHz (Horizontal Sync Pulses). These pulses are impressed (modulated) onto the channels video carrier.

FIGURE #2

When the gain of an amplifying device is increased to an overload condition where an increase of input level no longer causes an increase in output level (gain compression), the horizontal sync pulses will begin to modulate onto the video carrier of another channel creating cross-modulation.

FIGURE #3

Cross-modulation ratio is the difference between the level of the unmodulated carrier of the desired channel and the level of interfering modulation from other channels.

FIGURE #4

Picture interference becomes barely visible when cross-modulation reaches about 55dB below carrier level. While the minimum FCC specification for cross-modulation on a cable system is −46dB, a level of 55dB below video carrier is far more realistic for a cable system to be free of this type of distortion. If you will meet the latter specification, you will always be able to avoid the headaches of cross-modulation causing distortion on your subscribers TV sets.

INTERMODULATION is the result of an amplifying device generating new frequencies from two or more television channels because of the amplifiers nonlinearities. The video carriers are regarded as the source of the mixing and interaction that creates intermodulation since they have the highest level of amplitude in the channel bandwidth. The term "intermodulation" is the proper word for the three common distortions that have come to plague the cable industry.

SECOND ORDER DISTORTIONS are frequently called intermodulation or second order beats. While the amplifer will provide gain of the input video carriers to a prescribed output level, it also generates a mixing action between the two carrier frequencies producing additional carriers, or undesired beats, at frequencies other than the desired input carrier frequencies. For example, insert two television channels, Channel G (f1) and Channel 13 (f2) into an amplifier. The output of the amplifier will have the video carriers (157.250MHz and 211.250MHz) at the input level plus the gain level of the amplifier. The mixing actions of the amplifier will also produce f3 = f1 + f2 and f4 = f1 − f2.

FIGURE #5

The amplifier will also produce signals at frequencies equal to twice the carrier frequencies (f5 = $2f^1$ and f6 = $2f_2$ but this product will always be 6dB lower in amplitude than the sum and difference frequencies (f3 and f4).

JULY 3-6
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CCOS '82

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Oklahoma City, OK. 73107

As the sessions and experts presenting them are being finalized, listed below are some of the subjects that will be covered on the CCOS '82 program. The CATA Executive Committee working with the Board of Directors and CATA Director of Engineering, Ralph Haimowitz, has formulated a slate of sessions that holds subjects of vital interest to cable operators and technicians. The sessions are separated into two categories — MANAGEMENT and TECHNICAL — and will run simultaneously.

It will be two **full** days of information — you can't afford to miss this outstanding schedule of sessions, presented by experts in these fields.

To list some of them —

- **FOCUS ON OWNERSHIP — don't miss** this one as it is critical to every cable operator!!
- **THE COPYRIGHT MONSTER BREATHES FIRE AGAIN! —** absolutely vital!!
- A very detailed session on **ADVERTISING ON CABLE PAYS** — will include a comprehensive approach on cable advertising facts, sales, and the technical and mechanical way to implement an advertising program.
- Got a Non-Pay, Bad-Debt Situation? Get the information on **HOW TO COLLECT FROM NON-PAY SUBSCRIBERS**
- **WHAT IS A CABLE SYSTEM?** A basic program to inform new people in the cable business, cable operator spouses, salesmen, etc. on the concept and simple mechanics of cable television. A repeat of a session that was a smash!!!
- **BIG BUCKS IN A SMALL TOWN** (Rural cable development)
- **ARE YOU GOING TO HAVE TO SCRAP YOUR 4 1/2 METER DISH?** What is the 2° or 3° satellite spacing going to do to your earth stations? Attend this one and find out!!
- Do you have a Spectrum Analyzer and don't know how to use it? **TECHNIQUES OF SPECTRUM ANALYSIS** will help you!!

AND MORE!!!! Sessions on **CIRCUITRY — AGC/ASC CABLE SYSTEM INSURANCE COVERAGE, NEWS PROGRAMMING FOR LOCAL ORIGINATION, FINANCE**

Register today to take advantage of these helpful and informative sessions.

The Grand Staircase of the Opryland Hotel

Program Material for CCOS '82

THIRD ORDER DISTORTIONS are commonly referred to as triple beat or discrete triple beat. Once again, the nonlinearity of the amplifiers will produce undesired carriers or beats by the mixing action of three input carriers (f1, f2, and f3). These additional, interference carriers (fi) can be determined by computing all of the possible combinations of fi = f1 ± f2 ± f3.

COMPOSITE TRIPLE BEAT is the phrase used to describe the problem that occurs when the number of channels carried on a cable system increases to the point where large numbers of triple beats are generated around the video carriers. Since the frequency of each discrete triple beat will vary slightly, the beats in composite triple beat will appear as a noise pocket around the video carrier.

FIGURE #6

An example of the complexity of the triple beat problem is shown in Table I, where the number of beats per channel is given for a 35 channel system.

Intermodulation can affect the picture on a TV receiver in several different ways. Usually, the picture will be covered with thin diagonal lines moving across the screen which become wider as the intermodulation becomes worse. Another common visual indication is a flow of diagonal color bands moving across the screen. This is frequently called Rainbow Effect and is caused by beats in the color sub-carrier. Rainbow Effect can be determined when you turn down the color intensity channel and the visable problem disappears.

Another property of intermodulation that helps to identify where the beat is appearing in the carrier is that when the undesired beat falls precisely on a sideband, the pattern on the TV screen will be perfectly vertical and does not move. If the beat is slightly on the high side of a sideband, the pattern will be perfectly vertical and move slowly to the right. With the beat slightly on the low side of a sideband, the pattern again appears to be vertical, but moves slowly to the left. As the frequency of the beat moves away from a sideband, the beat pattern moves across the screen faster, and at 30Hz above a sideband it is moving at maximum speed. After the beat moves beyond the 30Hz point it becomes more on the negative side of the next sideband and the pattern begins to move in the opposite direction. Another characteristic of the intermodulation phenomena is that any multiple of the 60Hz rate will freeze the interference pattern and the pattern will begin to tilt from the vertical position as the beat goes up or down in multiples of the 60Hz rate.

The majority of second order beats occur at 1.25MHz above the channel carrier frequency (79th the sideband) and a visable change in the movement of an intermodulation pattern is usually caused by a change in the frequency stability of the system equipment where the video carrier drifts a few hertz one way or the other.

A 73.5Mhz pilot carrier causes a

Signal Optical Power Budget (Step 3)

Having designated the minimum required optical power at the receiver, a source and fiber combination must be selected which will deliver enough power to the receiver. To assure that the proper signal level is maintained through the system, a signal power budget is used.

An example of a budget for a 2 km, 1.4 Mb/s digital link is shown in Figure 6a at the end of this section. A low cost PIN detector was employed along with a high power LED emitter. The example shows the optical power analysis and the resulting cable lengths using different types of fibers.

For a particular application the blank form of Figure 6b can be completed using the information presented in the following sections.

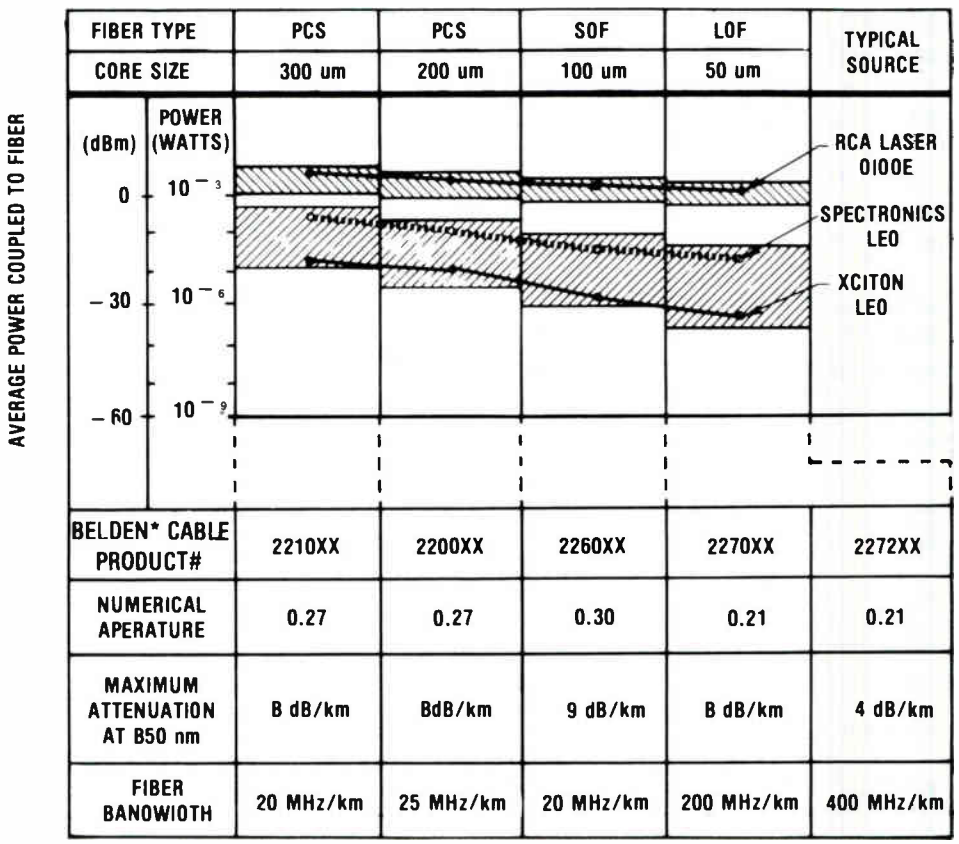
Source Selection

Enter the bandwidth/data rate and required bit error rate (digital system) at the top of the Signal Power Budget sheet in Figure 6b. Also fill in the required optical receiver power determined in line "A" of Step 2 and the receiver dynamic range determined in line "R". The maximum optical power allowed at the receiver in line "S" is the sum of the values in lines "R" and "A". This power should not be exceeded on short cable runs.

Careful attention should be paid to the use of average or peak optical power values for system attenuation analysis. Although the example and tables employ average power, the peak value may also be used. Once one convention is chosen it should be consistently employed.

Using Figure 7, select the type of source, either an LED (light emitting diode) or laser diode, which will couple an optical power greater than the minimum required for the receiver. Power coupled to fibers by a few typical sources are indicated. Coupled powers for each type of fiber should now be entered in the appropriate column of line "B" in the Signal Power Budget. Allow approximately 4 to 6 dB to account for thermal variations in the optical fiber, repair of damaged cables, and source lifetime degradation, and list the value selected in Line "D" of Figure 6b.

OPTICAL SOURCE—TO—FIBER COUPLING CHART



FIBER TYPE	PCS	PCS	SOF	LOF	TYPICAL SOURCE
CORE SIZE	300 um	200 um	100 um	50 um	
BELDEN* CABLE PRODUCT#	2210XX	2200XX	2260XX	2270XX	2272XX
NUMERICAL APERATURE	0.27	0.27	0.30	0.21	0.21
MAXIMUM ATTENUATION AT 850 nm	8 dB/km	BdB/km	9 dB/km	8 dB/km	4 dB/km
FIBER BANOWIOTH	20 MHz/km	25 MHz/km	20 MHz/km	200 MHz/km	400 MHz/km

*LAST TWO OIGITS XX OF BELOEN CABLE PROOUCT NUMBER SIGNIFIY THE NUMBER OF FIBERS PER CABLE

FIGURE 7

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A 73.5Mhz pilot carrier causes a

FIGURE 6

COMPOSITE TRIPLE BEAT

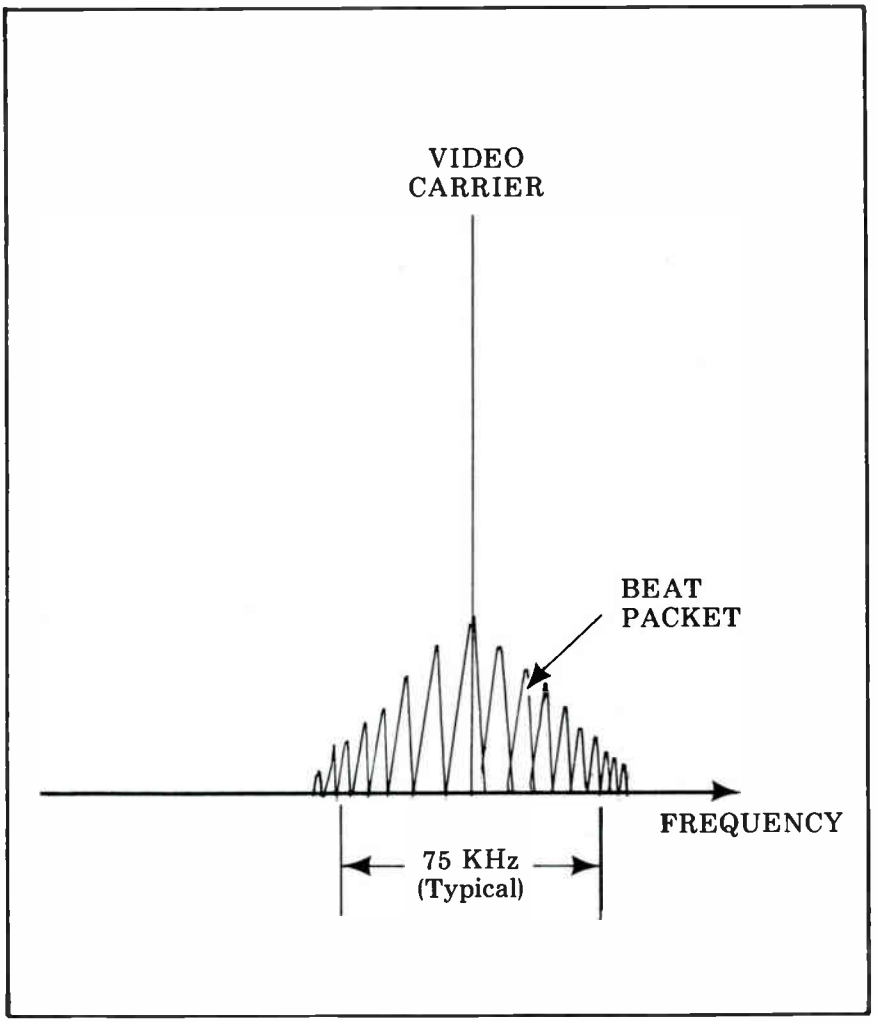


TABLE I

TRIPLE BEATS IN A 35 CHANNEL CABLE SYSTEM

Channel Number	#(A+B−C) Beats	#(2A-B) Beats	Total Beats
2	148	11	159
3	161	10	171
4	163	12	180
5	31	0	31
6	31	0	31
A	260	14	274
B	274	14	288
C	285	14	299
D	294	14	308
E	302	14	316
F	309	14	323
G	315	14	329
H	320	14	334
I	324	14	338
7	327	15	342
8	330	15	345
9	332	16	348
10	334	15	349
11	334	16	350
12	334	15	349
13	332	16	348
J	330	15	345
K	326	16	342
L	322	15	337
M	316	16	332
N	311	15	326
O	305	16	321
P	300	15	315
Q	293	16	309
R	286	15	301
S	277	16	293
T	268	15	283
U	257	16	273
V	245	15	260
W	229	16	245

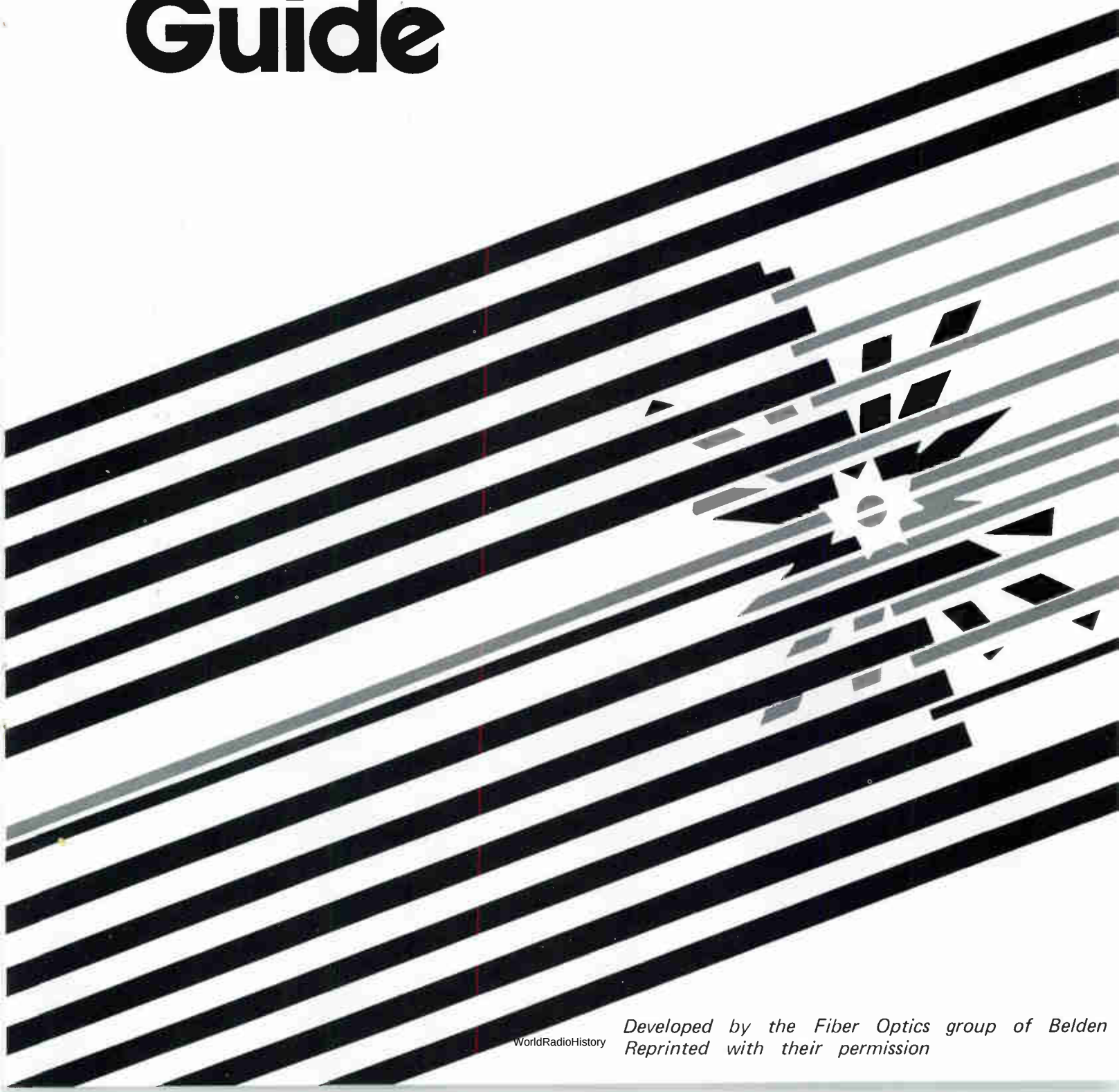
classic beat pattern in channel 5. In this case the TV set demodulator circuit senses the pilot carrier at 3.75MHz below the video carrier of channel 5 and interprets this signal as modulation of the channel 5 color sub-carrier. This problem can be corrected by reducing the level of the 73.25MHz pilot generator, or by moving the pilot frequency down to 73MHz.

If you are contemplating a system with 35 channels or more, you should seriously consider changing from an incremental system to an HRC system. In an HRC system, video carriers are locked exactly 60MHz apart. Second order beats are at a precise zero beat with the sidebands and will produce a 6 or 7dB improvement in intermodulation over an incremental system. □

(Illustration figures and Triple Beat Table provided by the Sylvania CATV Division of GTE Products Corporation)

BELDEN

Fiber Optic System Design Guide



Developed by the Fiber Optics group of Belden
Reprinted with their permission

Introduction

Digital computing, telephone, and video broadcast systems require new avenues for improved transmission. Fiber optic systems have significant advantages in features and performance compared to metallic systems so the investment in an optical communication system is often cost effective.

This design guide outlines some of the advantages that fiber optic systems can offer and provides the guidelines for designing a communications link. It is not intended to answer all design questions but to present alternatives available to the system designer interested in exploring the potentials of fiber optics.

Features and Advantages of a Fiber Optics Link

A simple fiber optic communication link shown in Figure 1 consists of an optical transmitter and receiver connected by a length of optical cable. Fiber optic cable is composed of glass fibers surrounded by all dielectric buffers which transmit optical instead of electrical signals. This dielectric material offers significant advantages, as outlined in Figure 2, over metallic systems such as immunity to lightning and high voltages. The transmitted signals are not distorted by high voltage, electronic, magnetic, or radio frequency interference.

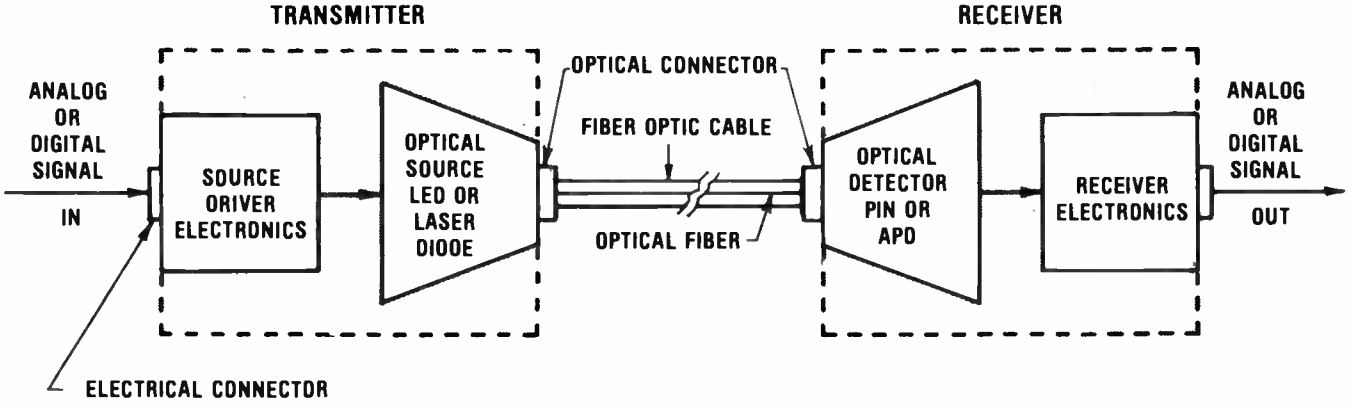


FIGURE 1
SIMPLE FIBER OPTIC LINK

Optical signals do not require grounding connections therefore the transmitter and receiver are electrically isolated. Advantages include safety from sparking and shock, increased reliability due to lack of terminal-to-terminal ground potential shifts, and safe operation in hazardous or flammable environments.

Fiber optic cables are smaller in diameter than conventional coaxial cables with the same signal carrying capacity and lighter in weight thereby providing ease of installation. Less duct space is required and heavy cable support equipment is eliminated.

Longer cable runs requiring fewer repeaters and high signal bandwidths allowing increased channel capacity make fiber optic links attractive.

FEATURES OF FIBER OPTIC SYSTEMS	FACTOR	
	COST	PERFORMANCE
ALL DIELECTRIC		
• LOW SIGNAL RADIATION	—	✓
• SECURE TRANSMISSION	—	✓
• RFI AND EMI IMMUNITY	—	✓
• LIGHTNING IMMUNITY	✓	✓
• HIGH VOLTAGE INSTALLATIONS	✓	✓
	—	✓
SMALL SIZE		
• LESS DUCT SPACE	✓	✓
• FEWER ADDITIONAL DUCTS INSTALLED	✓	✓
LOW ATTENUATION		
• GREATER DISTANCE/FEWER REPEATERS	✓	✓
• LESS INSTALLATION AND MAINTENANCE	✓	✓
OPTICAL SIGNALS		
• NO GROUND LOOPS	—	✓
• NO SPARK HAZARD	—	✓
• OPERATION IN FLAMMABLE AREAS	—	✓
HIGH BANDWIDTH		
• FUTURE SIGNAL CAPACITY EXPANSION	✓	✓

FIGURE 2

Systems Design Procedure

The five steps necessary to design a fiber optic communication system are to:

1. Describe the physical and environmental requirements.
2. Specify the system operational requirements.
3. Compute the signal optical power budget.
4. Perform a signal bandwidth analysis.
5. Review the system design.

These steps are presented in the following sections.

Physical and Environmental Requirements (Step 1)

By filling in the following table the parameters necessary for system layout and design are established.

System Layout

Locations of Equipment Building_____ Other_____

Distance Between Stations _____Meters

Routing Plan for Cables _____

System Environment

For Terminals and Repeaters Indoor_____ Outdoor_____

For Cables (based on routing) Ducts_____Buried _____Aerial _____Other_____

Temperature Range _____ °C to _____ °C

High Voltage Present _____No _____Yes _____Volts

Water Presence _____No _____Yes

Installation Constraints

Installation Equipment _____

Cable Pull Lengths _____ Meters

System Operational Requirements (Step 2)

An application requires signals of a certain type and quality. Figure 3 shows typical applications and signal properties sorted according to signal-to-noise ratio (SNR) for an analog system and bit error rates (BER) for digital systems. The class of signals or data to be transmitted establishes the type of terminal equipment and fibers. PCS, SDF, and LDF identify the types of optical fibers available, and these will be explained in the section on fiber selection to follow.

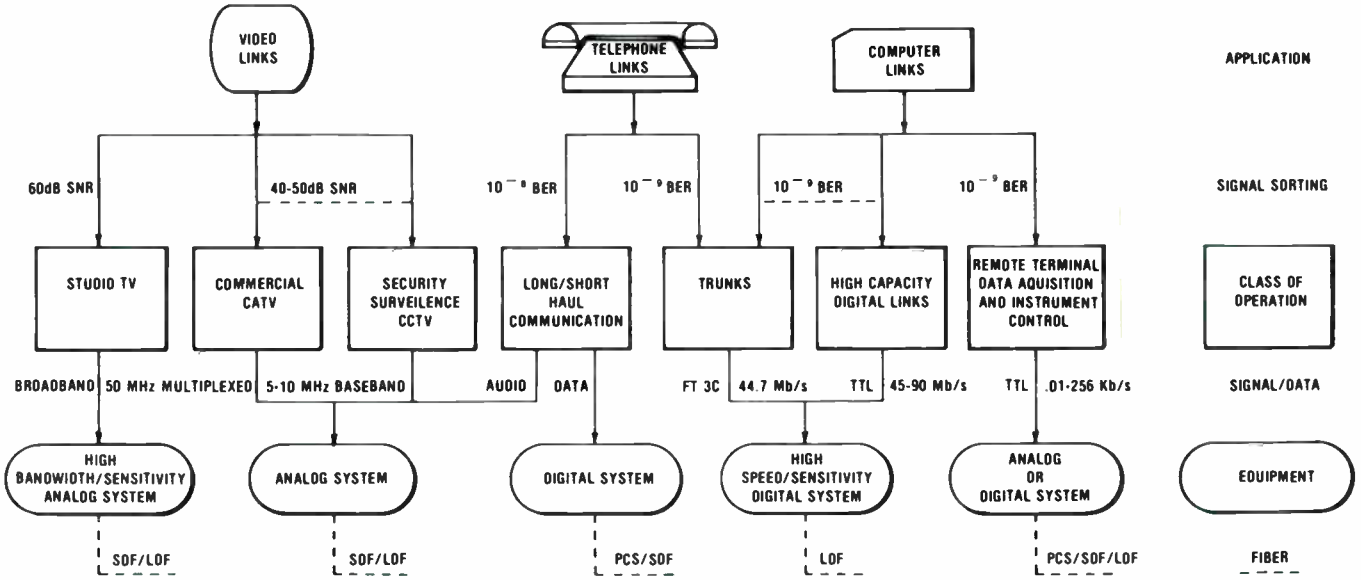


FIGURE 3
FIBER OPTIC APPLICATIONS

Important considerations in the design process are shown in Figure 4. This process starts with determining the signal-to-noise ratio or bandwidth/data rate for an application. The next step is to determine the minimum optical power required at the receiver for either a digital or analog system using the graphs in Figure 5a and 5b respectively. List this value at line "A" under "Type of Signals" for use later in the Signal Power Budget. Also list in line "R" the receiver dynamic range as this value will determine the maximum optical power allowed at the receiver when using short lengths of optical cable. The dynamic range, specified by the manufacturer, is typically between 10 and 25 dB.

The graphs in Figure 5 represent the average performance of typical receivers. To apply these graphs the detector selection must be made based on the application. Typically PIN photodiodes are employed because of lower cost and simpler circuitry. However, to obtain the ultimate distance in cable runs with the greatest power margin between transmitter and receiver APD's (Avalanche Photodiodes) are also used. Terminal equipment product guides are available, and in many cases an entire receiver unit may be purchased where the minimum optical power required for a particular bit error rate or signal-to-noise ratio is specified. This value may then be used directly in line "A" for "Type of Signals".

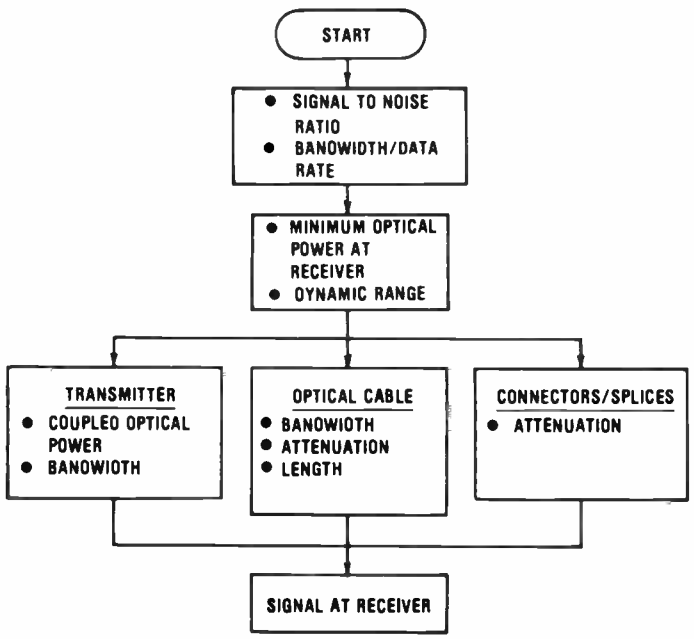


FIGURE 4
SYSTEM CONSIDERATIONS

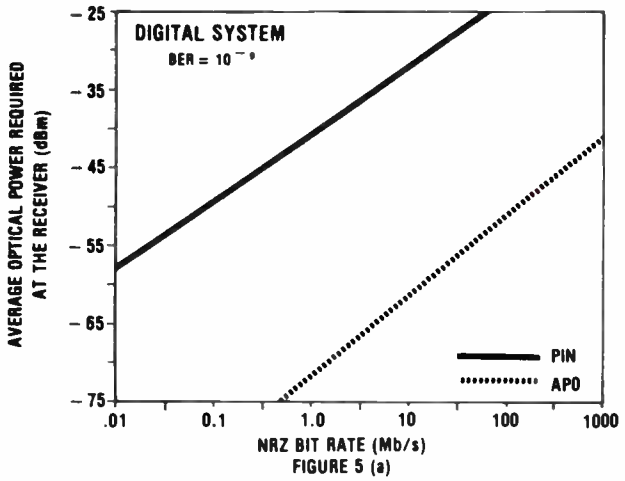


FIGURE 5 (a)

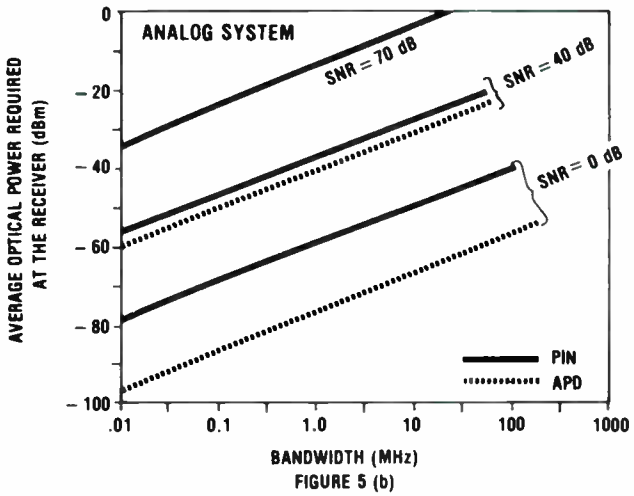


FIGURE 5 (b)

Fill in the following parameters based on known information and use of Figure 5.

Application

TV_____ Telephone_____ Computer_____ Other_____

Type of Signals

Analog:

- System Bandwidth _____MHz
- System Signal-to-Noise Ratio _____dB

Digital:

Coding Scheme NRZ_____ RZ_____ Other_____

Data Rate _____ Bits per second

Bit Error Rate 10^{-8}_____ 10^{-9}_____ Other_____

Logic Format _____TTL _____ECL _____Other

- **(A)** Minimum Required Receiver Optical Power (from Figure 5a and 5b or manufacturer's data) _____dBm Average _____Peak_____
- **(R)** Receiver Dynamic Range (from manufacturer's data) _____dB
- **(S)** Maximum optical power allowed at receiver (A + R) _____dBm Average _____Peak_____

Numbers of Channels _____

Terminal equipment

Space available for:

Transmitter_____" × _____" × _____"

Receiver _____" × _____" × _____"

Repeater _____" × _____" × _____"

Terminal Equipment Connections RS-232_____ BNC_____ Other_____

Terminal Equipment Mounting PC Board_____ Rack_____ Other_____

Power Supply Requirements:

Voltages AC_____ DC_____ Volts_____

Current _____ mA

Frequency _____Hz

Signal Optical Power Budget (Step 3)

Having designated the minimum required optical power at the receiver, a source and fiber combination must be selected which will deliver enough power to the receiver. To assure that the proper signal level is maintained through the system, a signal power budget is used.

An example of a budget for a 2 km, 1.4 Mb/s digital link is shown in Figure 6a at the end of this section. A low cost PIN detector was employed along with a high power LED emitter. The example shows the optical power analysis and the resulting cable lengths using different types of fibers.

For a particular application the blank form of Figure 6b can be completed using the information presented in the following sections.

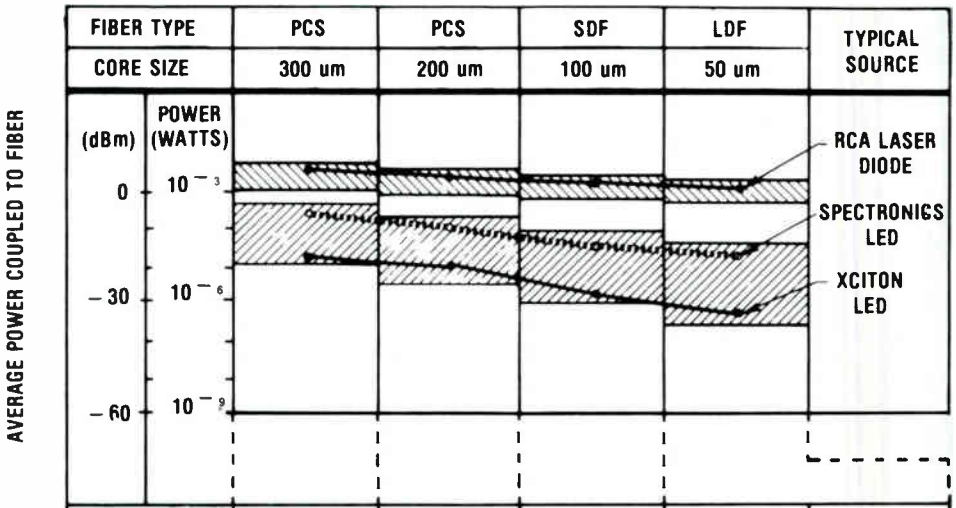
Source Selection

Enter the bandwidth/data rate and required bit error rate (digital system) at the top of the Signal Power Budget sheet in Figure 6b. Also fill in the required optical receiver power determined in line "A" of Step 2 and the receiver dynamic range determined in line "R". The maximum optical power allowed at the receiver in line "S" is the sum of the values in lines "R" and "A". This power should not be exceeded on short cable runs.

Careful attention should be paid to the use of average or peak optical power values for system attenuation analysis. Although the example and tables employ average power, the peak value may also be used. Once one convention is chosen it should be consistently employed.

Using Figure 7, select the type of source, either an LED (light emitting diode) or laser diode, which will couple an optical power greater than the minimum required for the receiver. Power coupled to fibers by a few typical sources are indicated. Coupled powers for each type of fiber should now be entered in the appropriate column of line "B" in the Signal Power Budget. Allow approximately 4 to 6 dB to account for thermal variations in the optical fiber, repair of damaged cables, and source lifetime degradation, and list the value selected in Line "D" of Figure 6b.

OPTICAL SOURCE—TO—FIBER COUPLING CHART



FIBER TYPE	PCS	PCS	SDF	LDF	TYPICAL SOURCE
CORE SIZE	300 um	200 um	100 um	50 um	
BELDEN* CABLE PRODUCT#	2210XX	2200XX	2260XX	2270XX	2272XX
NUMERICAL APERATURE	0.27	0.27	0.30	0.21	0.21
MAXIMUM ATTENUATION AT 850 nm	8 dB/km	BdB/km	9 dB/km	8 dB/km	4 dB/km
FIBER BANDWIDTH	20 MHz/km	25 MHz/km	20 MHz/km	200 MHz/km	400 MHz/km

*LAST TWO DIGITS XX OF BELDEN CABLE PRODUCT NUMBER SIGNIFIY THE NUMBER OF FIBERS PER CABLE

FIGURE 7

Fiber Selection

Three types of fibers are available as shown in Figure 7. Generally the larger core diameter plastic clad silica (PCS) step index fibers allow more optical power to be coupled from a source than the graded index long distance fiber (LDF). PCS fibers are limited in their low temperature operation and can be more difficult to connectorize than LDF or SDF fibers. The LDF fiber provides an order of magnitude greater bandwidth and is useful for high capacity, long distance communication links. Partially graded index fiber, (SDF) for short distance computer applications, offers temperature stability and ease of connectorization.

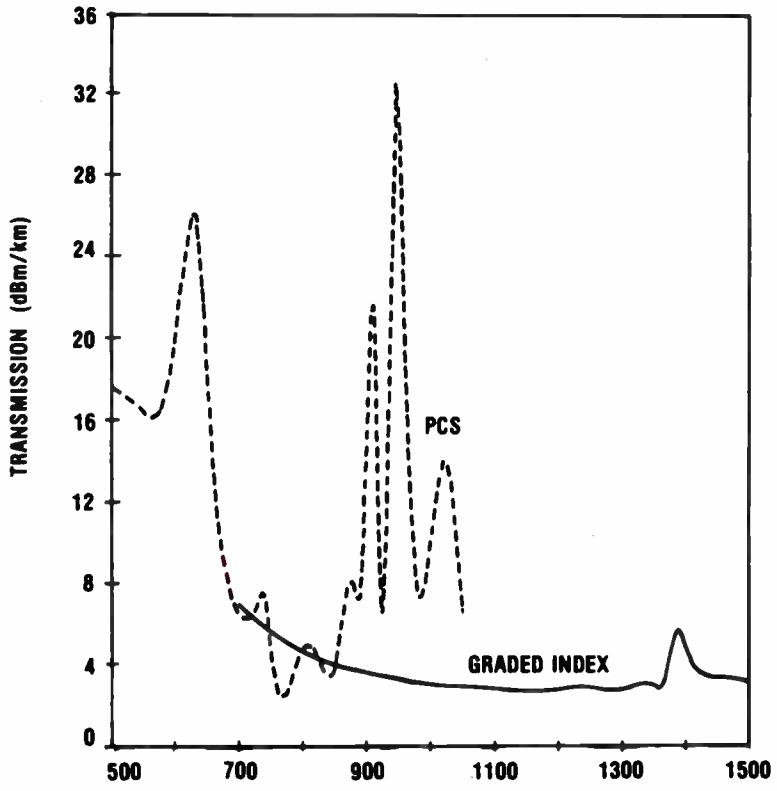
The table below summarizes the properties of the various fiber types.

Fiber Type	Index Profile	Core Diameter	Cladding Diameter	Numerical Aperature (NA)	Cable Attenuation At 850 nm	Bandwidth
PCS	Step	300 um	440 um	0.27	4-8dB/km max.	20 MHz-km
PCS	Step	200 um	380 um	0.27	4-8dB/km max.	25 MHz-km
SDF	Partially Graded	100 um	140 um	0.30	4-9dB/km max.	20 MHz-km
LDF	Graded	50 um	125 um	0.21	3-8dB/km max.	100-1500 MHz-km

LDF fibers may be selected from a variety of bandwidths and attenuations in either first or double window versions. The following table shows the ranges to choose from.

Type	Cable Attenuation At 850 nm	Cable Attenuation At 1300 nm	Bandwidth
First window LDF fiber	3-8dB/km	not specified	200-1500 MHz-km
Double window LDF fiber	3-5dB/km	1-3dB/km	200-1000 MHz-km

Attenuation of optical fibers will vary depending on the source wavelength of the transmitter. Typical spectral response curves for the various fiber types are shown in the following graph.



TYPICAL FIBER SPECTRAL ATTENUATION

Connectors

Plastic or metallic connectors are used to terminate the fiber optic cable. In most cases an epoxy potting and polishing procedure is required. Some connectors, however, can provide low-loss terminations without potting and polishing, usually at an increase in cost.

The following table shows some typical connector properties. Other types of connectors are available which are not included in the list.

Connector Type	Fiber Types Accommodated	Nominal Attenuation
AMP	All	2-3dB/connector
Amphenol	All	1.5-2dB/connector
TRW-Cinch	SDF, LDF	1-1.5dB/connector

Specific information about optical connectors may be obtained directly from the manufacturer.

Splices

Splice losses vary between 0 dB (unmeasurable) and 0.5 dB, depending on the splicing technique. Arc fusion splicing generally results in average losses of 0.25 dB per splice.

Power Margin

To compute the power margin in Figure 6b subtract the degradation allowance and coupled power for each fiber type from the minimum required receiver power. The power margin is the amount of optical power remaining for connector, splice, and fiber attenuation.

Cable Lengths

Determine the maximum attenuation allowed for a cable employing each type of fiber by subtracting the attenuation for all connectors and splices from the power margin. The maximum cable length possible with each fiber type is found dividing the loss available for the cable by the attenuation of the cable in dB/km.

An example diagram (Figure 8) permits visualization of the lengths of cable possible using each fiber type.

SYSTEM LINK OPTICAL POWER DIAGRAM

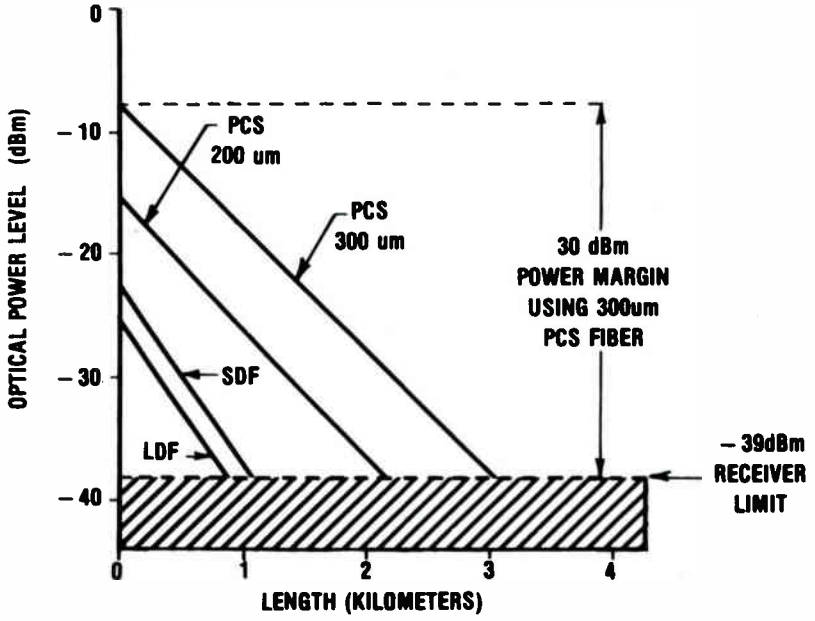


FIGURE 8

Signal Power Budget Example

	Required Bandwidth (Data Rate)	(NRZ, 1.4 Mb/s)
	Required Bit Error Rate	10^{-9}
(L)	Required Length of Run	2 km
(A)	Minimum Optical Power Required for PIN Type Receiver (From Step 2, Line "A")	– 39 dBm Average
(R)	Receiver Dynamic Range	20 dB
(S)	Maximum Optical Power Allowed at Receiver (A + R)	– 19 dBm
	Transmitter Type LED Wavelength	850 nm

Source-to-Fiber Coupling:

	Fiber (Core dia., Type)	300 um PCS	200 um PCS	100 um SDF	50 um LDF
(B)	Coupled Power (From Figure 7)	– 3 dBm	– 10 dBm	– 17 dBm	– 20 dBm
(C)	Power Difference (B-A)	36 dB	29 dB	22 dB	19 dB
(D)	Degradation Allowance	6 dB	6 dB	6 dB	6 dB
(E)	Power Margin (C-D)	30 dB	23 dB	16 dB	13 dB
(F)	2 Connectors (Average Loss: 3dB/Connector)	6 dB	6 dB	6 dB	6 dB
(G)	0 Splice (Average Loss: 0.25 dB/splice)	0 dB	0 dB	0 dB	0 dB
(H)	Maximum Cable Attenuation Allowed (E-F-G)	24 dB	17 dB	10 dB	7 dB
(I)	Cable Attenuation at 850 nm (From chart in Figure 7)	8 dB/km	8 dB/km	9 dB/km	8 dB/km
(J)	Total Cable Loss (I × L)	16 dB	16 dB	18 dB	16 dB
	Maximum Cable Length Allowed (H/I)	3 km	2.1 km	1.1 km	875 m

Figure 6 (a)

Signal Power Budget

	Required Bandwidth/Data Rate	_____
	Required Bit Error Rate	_____
(L)	Required Length of Run	_____ km
(A)	Minimum Optical Power Required for _____ Type Receiver (From Line "A" in Table Step 2)	_____ dBm Average_____ Peak_____
(R)	Receiver Dynamic Range	_____ dB
(S)	Maximum Optical Power Allowed at Receiver (A + R)	_____ dBm
	Transmitter Type LED_____ Laser Diode_____	Source Wavelength_____

Source-to-Fiber Coupling:

	Fiber (Core dia., Type)	300 um PCS	200 um PCS	100 um SDF	50 um LDF
(B)	Coupled Power (From Figure 7)	dBm	dBm	dBm	dBm
(C)	Power Difference (B-A)	dB	dB	dB	dB
(D)	Degradation Allowance	dB	dB	dB	dB
(E)	Power Margin (C-D)	dB	dB	dB	dB
(F)	Connectors (Average Loss: _____dB/Connector)	dB	dB	dB	dB
(G)	Splices (Average Loss: _____dB/splice)	dB	dB	dB	dB
(H)	Maximum Cable Attenuation Allowed (E-F-G)	dB	dB	dB	dB
(I)	Cable Attenuation (at above source wavelength)	dB/km	dB/km	dB/km	dB/km
(J)	Total Cable Loss (I × L)	dB	dB	dB	dB
	Maximum Cable Length Allowed (H/I)	km	km	km	km

Figure 6 (b)

Signal Bandwidth Analysis (Step 4)

A fiber has a 3dB (half power) optical signal magnitude decrease at the bandwidth specified for that fiber. Conversion between electrical and optical bandwidth for the system or any component such as a fiber, receiver, or transmitter unit is performed using:

$$BW_{optical} = 1.41\ BW_{electrical} \quad (1)$$

The electrical bandwidth (BW in MHz) for a component is related to its 10%—90% rise time (t in ns) by:

$$BW = 350/t \quad (2)$$

and the total system electrical bandwidth to each component bandwidth by:

$$BW_{system} = \frac{1}{\sqrt{BW_R^{-2} + BW_C^{-2} + BW_T^{-2}}} \quad (3)$$

where BW_R, BW_C, and BW_T are the electrical bandwidth of the receiver, cable, and transmitter respectively.

In some cases a receiver or transmitter manufacturer will specify risetimes so equation (2) allows an approximate conversion from risetime to bandwidth.

For digital systems the system bandwidth will depend on the data rate, (R in bits per second) and the coding format according to:

$$BW_{system} = R/K \quad (4)$$

where K equals 1.4 for a non-return-to-zero (NRZ) coding format and 1.0 for a return-to-zero (RZ) format.

The system bandwidth is limited by the lowest bandwidth component in the link. A 10-MHz receiver and a 20-MHz transmitter were chosen to demonstrate this in Figure 9 (a) using each fiber type. When high bandwidth LDF fibers are employed, the system frequency response is influenced more by the terminal equipment than the fiber.

A general guideline in selecting the terminal equipment is to choose a receiver with a bandwidth equal to or greater than the required system bandwidth. The transmitter and optical fiber should then have bandwidths about 1.5 to 2 times greater than the receiver.

Fill in the bandwidths for the application in Figure 9 (b) and compute the total system bandwidth using each fiber type. Lower case letters in the figure provide directions for each step.

Series Connected Cable Bandwidths

Care should be taken in estimating the optical bandwidth in MHz-km of series connected cable runs with lengths greater than a kilometer. The general relationship between the total cable bandwidth (BW_{co}) and one kilometer section bandwidths (BW_f) is:

$$BW_f = BW_{co}\,(L)^X \quad (5)$$

where X equals 1.0 for cable run lengths (L) of one kilometer or less. L is the fiber length in kilometers. X equals 0.75 for SDF and LDF and 1.0 for PCS cable run lengths greater than a kilometer.

Design Considerations

The options to increase the length of the run are:

- Higher optical power transmitters using other LEDs or laser diodes
- Greater sensitivity receivers with APD detectors
- Lower loss fiber optic cable

Any of these options may increase the cost and complexity of the system, however, avoiding repeater stations can provide a significant cost savings and performance improvement.

Consideration must also be given to bandwidth. Cables with LDF fibers that have bandwidth in excess of 1.5 GHz-km are possible. This permits 10 kilometer runs with data rates of approximately 300 megabits per second. This option of fiber bandwidth selection is not currently available for other fiber types.

Unlike long distance high bandwidth applications, lower bit rate systems may utilize any of the fiber types. The only difference is that the maximum cable length varies for each fiber type.

Terminal equipment for bit rates under one megabit per second is available in a complete package. The Belden Bit-Driver™, for example, consists of a transmitter-receiver pair mounted in a common enclosure. The Bit-Driver is RS-232-C compatible and operates at 56 kilobits per second in full duplex mode. Allowed cable run distances for the Bit-Driver vary with fiber type according to the table below.

Fiber Type	Cable Product Number	Operating Distance
200 um PCS	220002	1 km
300 um PCS	221002	1.2 km
100 um SDF	226002	1.8 km
50 um LDF	227002	1 km
50 um LDF	227202	2 km

Complete fiber optic cable assemblies terminated with AMP connectors are offered for these units.

Signal Bandwidth Analysis Example

Receiver Bandwidth PIN Type: BW_R = 10 MHz

a) $1/BW_R^2$ = 10^{-2} MHz^{-2}

Transmitter Bandwidth LED Type: BW_T = 20 MHz

b) $1/BW_T^2$ = 2.5×10^{-3} MHz^{-2}

Fiber Optic Cable Bandwidth

c) Fiber Length L = 2 km

Fiber (Core dia., Type)	300 um PCS	200 um PCS	100 um SDF	50 um LDF
d) Bandwidth BW_f (from figure 7b)	20 MHz-km	25 MHz-km	20 MHz-km	200 MHz-km
e) Cable Optical Bandwidth* BW_{CO}	10 MHz	12.5 MHz	11.9 MHz	118.9 MHz
f) Cable Electrical Bandwidth BW_C (e/1.41)	7.1 MHz	8.9 MHz	8.4 MHz	84.3 MHz
g) $1/BW_C^2$	2×10^{-2} MHz^{-2}	1.3×10^{-2} MHz^{-2}	1.4×10^{-2} MHz^{-2}	1.4×10^{-5} MHz^{-2}
System Bandwidth				
h) Sum of Squares (a + b + g)	3.2×10^{-2} MHz^{-2}	2.5×10^{-2} MHz^{-2}	2.6×10^{-2} MHz^{-2}	1.3×10^{-2} MHz^{-2}
i) System Bandwidth $1/\sqrt{h}$	5.5 MHz	6.3 MHz	6.2 MHz	8.8 MHz
j) Required System Bandwidth	1.0 MHz	1.0 MHz	1.0 MHz	1.0 MHz
Bandwidth Margin (i-j)	4.5 MHz	5.3 MHz	5.2 MHz	7.8 MHz

*See note in step 4 of text on Series Connected Cable Bandwidth

Figure 9 (a)

Signal Bandwidth Analysis

Receiver Bandwidth _____ Type: BW_R = _____ MHz

a) $1/BW_R^2$ = _____ MHz^{-2}

Transmitter Bandwidth _____ Type: BW_T = _____ MHz

b) $1/BW_T^2$ = _____ MHz^{-2}

Fiber Optic Cable Bandwidth

c) Fiber Length L = _____

Fiber (Core dia., Type)	300 um PCS	200 um PCS	100 um SDF	50 um LDF
d) Bandwidth BW_f	_____ MHz-km	_____ MHz-km	_____ MHz-km	_____ MHz-km
e) Cable Optical Bandwidth* BW_{CO}	_____ MHz	_____ MHz	_____ MHz	_____ MHz
f) Cable Electrical Bandwidth BW_C (e/1.31)	_____ MHz	_____ MHz	_____ MHz	_____ MHz
g) $1/BW_C^2$	_____ MHz^{-2}	_____ MHz^{-2}	_____ MHz^{-2}	_____ MHz^{-2}
System Bandwidth				
h) Sum of Squares (a + b + g)	_____ MHz^{-2}	_____ MHz^{-2}	_____ MHz^{-2}	_____ MHz^{-2}
i) System Bandwidth $1/\sqrt{h}$	_____ MHz	_____ MHz	_____ MHz	_____ MHz
j) Required System Bandwidth	_____ MHz	_____ MHz	_____ MHz	_____ MHz
Bandwidth Margin (i-j)	_____ MHz	_____ MHz	_____ MHz	_____ MHz

*See note in step 4 of text on Series Connected Cable Bandwidth

Figure 9 (b)

System Review (Step 5)

Cable Selection

The type of design and materials used in the cable construction will depend upon the system environment and operation defined in Steps 1 and 2. Typical jacket materials are PVC and polyethylene.

Cables may be all dielectric in construction or contain metallic members. Hybrid designs have both optical fibers and metallic conductors included in a single cable.

The number of fibers for a cable depends on the number of channels or signal carrying capacity desired. Cable employing fibers with high bandwidth, transmitting multiplexed signals, require fewer fibers per cable.

Standard cables with 1, 2, 6, 12, and 18 fiber constructions may use any of the fiber types. Such cables are of all dielectric structure with PVC jacketing. Other jacket materials such as polyurethane are used in products such as extremely flexible Bit-Lite™ cables. Special materials and constructions have resulted in numerous cable designs which incorporate a variety of fibers to meet specific applications.

The cable and fiber should be specified by filling in the following list.

Cable Structure

Cable Construction — Hybrid_____ All Dielectric_____ Metal Strength Members_____ Other_____

Jacket Materials — PVC_____ Polyurethane_____ Polyethylene_____ Other_____

Environmental Protection — Water Blocking Compounds_____

Rodent Protection_____

Flame Retardency_____

Sunlight Resistance_____

Abrasion Resistance_____

Nuclear Radiation Resistance_____

Other_____

Chemical Resistance_____ To Oil_____, Acid_____, Alkali_____, Solvents_____,

Others_____

Number of Fibers (Same as Number of Channels in Step 2) 1_____, 2_____, 6_____, 12_____, 18_____, Other_____

Fiber Features

Core Size (NA)	300 um_____ (0.27)	200 um_____ (0.27)	100 um_____ (0.30)	50 um_____ (0.21)

Bandwidth _____MHz-km

Special Features — Double Window_____ Low Loss_____ Other_____

Connectors — AMP_____ Amphenol_____ Other_____

Now that consideration has been given to the system operational parameters the requirements for the link can be summarized as shown.

SYSTEM CONSIDERATION	EXAMPLE	REQUIREMENTS FOR OPERATION
Data Rate (Bandwidth)	1.4 MB/S (1.0 MHz)	
Signal to Noise Ratio (Analog)		
Bit Error Rate (Digital)	10^{-9}	
Coding Scheme (Digital)	NRZ	
Receiver		
Type	PIN	
Bandwidth	10 Mhz	
Sensitivity	– 39 dBm Average	
Signal to Noise Ratio		
Bit Error Rate	10^{-9}	
Dynamic Range	20 dB	
Transmitter		
Bandwidth	20 MHz	
Coupled Optical Power	– 10 dBm	
Wavelength	850 nm	
Optical Fiber		
Fiber Type	200 um core PCS	
Bandwidth	25 MHz-km	
Attenuation (at Transmitter Source Wavelength)	8 dB/km	
Fiber Length	2 km	
Number of Splices	0	
Total Splice Attenuation	0 dB	
Number of Connectors	2	
Total Connector Attenuation	6 dB	
Degradation Allowance	6 dB	
Excess Power Margin	1 dB	
Bandwidth Margin	5.3 MHz	

System Costs

The cost of each component should be totaled to determine the system cost.

_____Connectors at	$_____/connector	=	$_____
_____Transmitters at	$_____/transmitter	=	$_____
_____Receivers at	$_____/receiver	=	$_____
_____km of Cable at	$_____/kilometer	=	$_____
_____Repeaters at	$_____/repeater	=	$_____
Installation Costs			$_____
Maintenance Costs			$_____
Other Costs			$_____
Total System Cost			$_____

Since prices vary, it may be difficult to determine component costs without contacting the manufacturer directly. Other costs such as installation and maintenance may require further estimations. Optical links will sometimes appear expensive when compared to metallic systems; however added performance features such as lower maintenance and repair may provide additional savings.

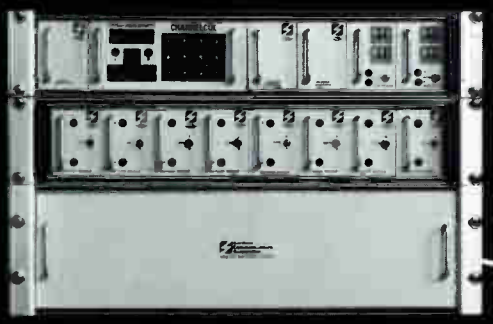
Conclusion

Hopefully this guide will permit the identification and description of a suitable fiber optic system. Due to extensive tradeoffs and advancing technology some designs can be quite complicated. This design guide is based on currently available components. Future advances may provide superior components which can result in improved system design. Should additional analysis or review be desired, contact Belden's Fiber Optic Department. □

EVERYTHING IS COMING OUT GARDINER!

4110 RECEIVER

HETERODYNE PROCESSORS



CHANNELCUE™

CHANNELCUE™ COMMERCIAL INSERTION SYSTEM
(NOT ON RACK SHOWN)

TM 2400 MODULATOR

4200 RECEIVER

Gardiner Communications Corporation A Burnup & Sims Company

3605 Security Street Garland, Texas 75042-7680 (214) 348-4747 TWX 910-860-5198

J. Patrick Michaels
cont. from page 21

familiar with the aspects that sophisticated buyers have interest and concern in. The broker can not only show the system in a realistic and positive manner, but can turn buyers' objectives into buyers' reasons. Moreover, it is important for sellers to realize that the basic reason people buy is because they generally believe there is significant reason for improvement and increase in cash flow. It is much easier for a third party to address these issues than the principals or management.

(8) **Negotiations:** Maximizing the after-tax gain is more of the game. An experienced broker will usually have some knowledge of tax implications, or preferably the brokerage firm employed will have a CPA who is a specialist in tax and cable related consequences. Since taxes are like an algebraic equation, in fact, the consequences are different to buyers and sellers, price is usually significantly affected by structure. In addition to the tax considerations, negotiating is really the fine art of selling. In essence, the negotiations are generally a series of compromises leading up to and continuing through the offering process.

(9) **Structuring and Valuing the Offer:** Carefull consideration must be given to focusing the offer or offers along lines which achieve the goals of buyer and seller. An offering price means little unless the structure is acceptable. Frequently, in a seller's market where there are several serious prospects, the offers will be varied, and a qualified broker should work with the seller's accountants and attorneys to fairly evaluate the proposals. This frequently entails not only the tangible aspects, but also intangible considerations. The broker should be able to assist the seller in selecting the best bid.

(10) **Letter of Interest:** Once the offers are analyzed and one is selected, the normal course of events is for the buyer to submit a letter of intent to the seller. The broker should assist the buyer in developing the letter of intent, which is an outline for and sets forth the proposed transaction. The broker must make sure at this stage that both parties adequately understand the proposal so that no major misunderstandings occur at the purchase agreement stage which follows.

(11) **Negotiating the Letter of Interest:** All the time, money and effort spent to this point can be in vain unless the buyer and seller enter into a legally binding purchase agreement. Frequently, at this point of setting forth the details of the transaction, concessions may be requested by both parties. An experienced broker will be familiar with many different types of franchise agreements, as well as some of the major potential problem areas. The broker can be of great assistance in assuring that an agreement is revised. A good broker will also have a standby franchise ready if the deal fails to materialize.

(12) **Pre-closing:** After the purchase agreement has been executed, there are many items that must be accomplished, not the least of which are franchise transfers and other approvals. The broker should stand ready to provide assistance to buyer and seller right through closing.

(13) **The Closing:** Many times problems arise at closing that can either delay or even terminate a deal. A qualified broker can minimize, these problems by working with the attorneys for both parties to make sure that all details are covered before closing day.

(14) **Other Considerations:** By utilizing a professional broker, the seller can be assured of having

cont. on page 43

Filtered Earth Station..

Part #8

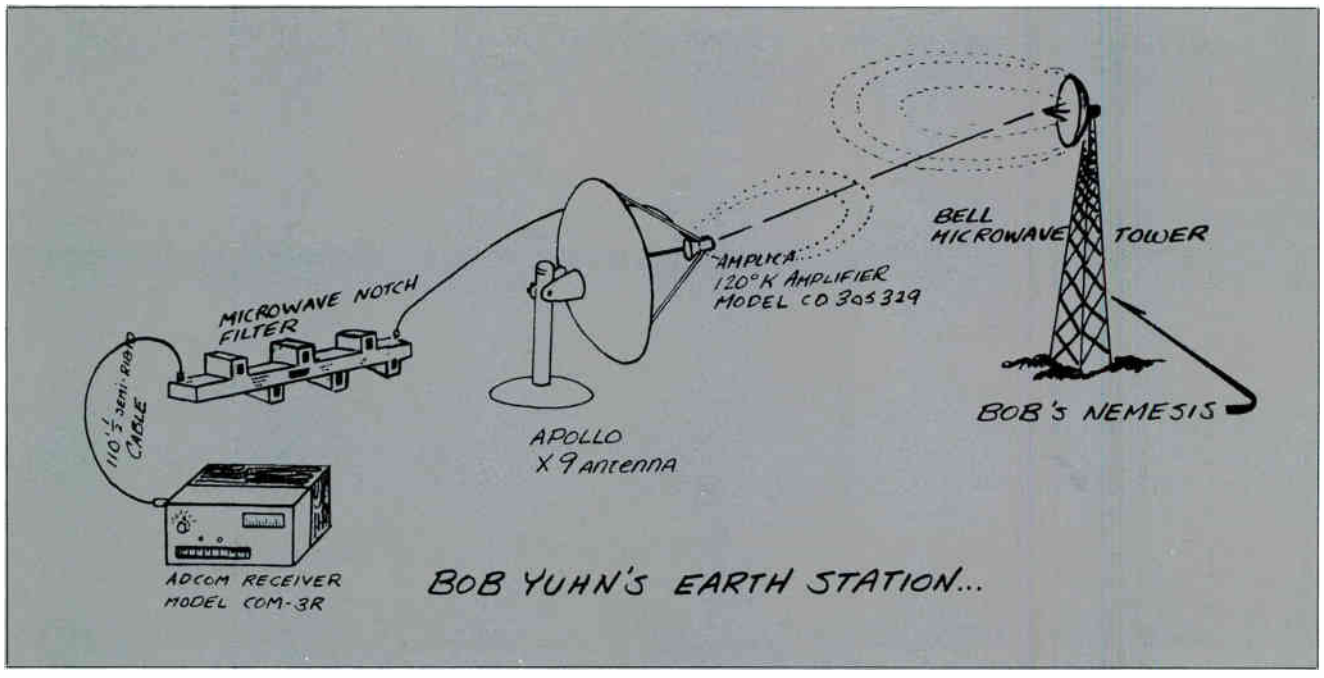
Bob Meets The Snowman

Glyn Bostick
Microwave Filter Co., Inc.

SNOWMAN THUS FAR

When we first introduced the SNOWMAN problem **(CATJ, Feb. '82)** we confined ourselves to a definition of the problem — down-converter overload and picture "snowout" due to very strong microwave telephone carriers between transponders — and to a description of the type of filter needed to deal with the problem.

The type is a narrow microwave notch filter placed before the down-converter to notch out the telephone carrier. In the previous issue we described the construction and performance, as well as suggested standardization, of such filters. In this issue we will review an extreme case in which the telephone carriers were not just very strong, but there were **six** of them — the maximum number allowed on a tower feed.



BOB'S DILEMMA

Bob Yuhn runs a company called **Zeda Ltd.**, that installs earth stations, and one day he pulled a real boner: He installed a system without a pre-installation site survey. As a result, he got only one watchable transponder, #24, from Satcom R3. All the other transponders either hand SNOWMAN (completely blank screen) or were completely unwatchable.

After presenting Bob with the "El Stupido" award, I asked him why he'd neglected to survey the site prior to installation, especially since he knew the site was in the general vicinity of a Bell System long lines tower. "Because I'd installed several others in the same locality and didn't have any unwatchable pictures," was his sheepish reply. When I'd explained (for the thousandth time) that the little side and back lobes are also antennas and you *can* luck out and have Bell fall in between them (into a null), we mutually set about to salvage the disaster.

I agreed to design a multiple-notch microwave trap if Bob would run down the number and exact frequency of the interfering carriers, install the trap himself and feed back the results to me so I

cont. on page 44

the role handled in a confidential nature. This is good business practice, not only to avoid alarming and/or losing key employees, but also to avoid problems with franchising authorities or competitors. Also, a brokerage firm that provides well-handled investment banking services might be of assistance in certain instances in arranging financing for a buyer where necessary or assisting a seller in certain aspects of estate planning. Additionally, if the seller is to later seek other reinvestment opportunities in cable, the broker can provide assistance and guidance.

In selecting a qualified broker, it is very important to choose one with experience and an industry-wide reputation of integrity; to select a firm that has personnel with a wide variety of expertise. The fees should be competitive, but it is inadvisable to select a firm on the basis of fee schedule alone since the best brokers will earn their fee many times over in maximizing the price and minimizing taxes and other costs.

With regard to fee structure, except in very large transactions, most reputable firms operate on a sliding scale basis. Generally, unless there are some unique aspects to a transaction, most firms will accept an exclusive listing on a one hundred percent (100%) contingency fee basis so long as the contract is for a reasonable period of time. Most brokers carry their own expenses.

The contingency fee basis is the so-called "Lehman Formula", wherein the broker receives at closing a fee based on the total consideration changing hands under the purchase agreement as follows:

5% of the first million dollars;
4% of the second million dollars;
3% of the third million dollars;
2% of the fourth million dollars; and
1% of all excess.

Consideration normally includes preclose price for stock or assets, including debt, consulting and non-compete agreements; in some cases, continuing management fees; purchase of real estate; notes; future buyouts; etc. It is very important for both parties to have a clear definition of not only the fee structure — when and how it is to be paid, but also a clear definition of what constitutes "consideration".

It is essential to employ a broker under a mutually agreeable contract which has been carefully reviewed by an attorney. Never employ a broker on a verbal contract and never provide information on your company to someone who claims to represent a buyer unless you have a letter from the broker clearly indicating that the broker has been employed by the buyer. If you fail to do this and your system is sold, you may have unwittingly set yourself or the buyer up for a lawsuit.

Most reputable brokerage and investment banking firms will refuse to handle a transaction on a non-exclusive basis. Non-exclusive agreements are hunting licenses, which generally lead to confusion among prospective purchasers as to who really legally represents the seller; lack of control, whereby your deal is widely shipped, frequent misrepresentation; competing claims for fees; lack of confidentiality; etc.

It is better to retain a reputable broker on an exclusive basis under a contract which requires inedmnifications from the broker against any disclosed third party claims. Such agreement should prohibit co-broker or co-finder agreements without the express written consent of the seller.

In conclusion, the old Chinese proverb, "He who treats himself has a fool for a doctor," can easily be applied to selling a cable company. Mergers and acquisitions of businesses require a very high degree of sophistication to maximize results. It will pay you many times over, whether buyer or seller, to retain a qualified, reputable broker or investment banker to provide assistance. The cost, in terms of fees based on success, are small relative to the importance and magnitude of the transaction. The cost of failure to maximize the opportunity can be devastating. □

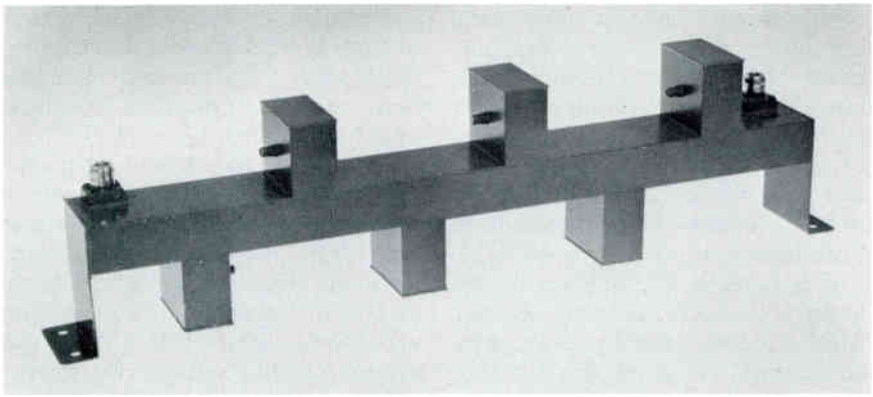


FIGURE 2
Six-notch microwave filter. Note fine-tuning screw on each notch, and Type N coaxial input/output.

TABLE I

Courtesy Bob Yuhn, Zeda Ltd.

SATCOM 3R	ORIGINAL INSTALLATION		WITH NOTCH FILTER	
TRANSPONDER #	QUALITY	PROBLEM	QUALITY	PROBLEM
1	SNOWMAN	—	PERFECT	—
INTERFERENCE > (3750)				
2	SNOWMAN	—	PERFECT	—
3	SNOWMAN	—	SNOWMAN	—
4	SNOWMAN	—	PERFECT	—
5	U	D	W	S
6	SNOWMAN	—	SNOWMAN	—
INTERFERENCE > (3830)				
7	SNOWMAN	—	U	D
8	U	SS	PERFECT	—
9	U	SS	PERFECT	—
10	SNOWMAN	—	PERFECT	—
INTERFERENCE > (3910)				
11	SNOWMAN	—	PERFECT	—
12	U	SS	PERFECT	—
13	U	SS	PERFECT	—
14	SNOWMAN	—	PERFECT	—
INTERFERENCE > (3990)				
15	U	SS	PERFECT	—
16	SNOWMAN	—	PERFECT	—
17	U	SS	PERFECT	—
18	SNOWMAN	—	W	S
INTERFERENCE > (4070)				
19	SNOWMAN	—	W	S
20	U	D	W	S
21	U	D	PERFECT	—
22	U	D	U	D
INTERFERENCE > (4150)				
23	SNOWMAN	—	U	D
24	W	S	PERFECT	—

Bob's Code:

SNOWMAN	=	NO PICTURE
U	=	UNWATCHABLE
W	=	WATCHABLE
PERFECT	=	NO DEFECTS NOTED
S	=	SPARKLIES
SS	=	SEVERE SPARKLIES
D	=	DIM PIX UNDER INTERFERENCE

could help him fine-tune the individual notches. Bob lucked out and the local Bell people supplied the needed information immediately — there were six carriers, the maximum number allowed on a feed. See **Table I** and note that the interfering carriers were exactly 80 MHz apart (as indicated in **CATJ, Feb. '82).**

THE FILTER

Figure 2 is a photo of the completed filter. The notches (the square bumps) were built in WR229 waveguide (to get High Q and therefore deep notches with narrow 3 db bandwidths) and placed in series with one another on a piece of waveguide. Built-in adapters at each end allowed input/output connectors to be Type N so the filter could be patched into the line between the LNA and the downconverter. Figure 3(a) is an analyzer photo of the 500 MHz band and shows all six notches. Figure 3(b) is a blowup of the typical notch.

RESULTS

Table I, indicating before-and-after picture quality, was supplied by Bob. Before the application of the notch filter, Bob received one watchable transponder; with the filter in place he received *nineteen*. His installation was "salable" at that point.

HINDSIGHT — SOME IMPROVEMENTS

The interference level was unknown and it was "guessed" that notches 25 db deep would be sufficient, and that was the design goal for the typical notch. Final test data on the notches are as follows: *on P. 46*

Notch "laws" say that notch depth and bandwidth run proportionally: the deeper the notch, the wider the bandwidth. The data above roughly illustrates this, but is not totally faithful to it.

In **Table II** notches are labelled "adequate" or "inadequate" to

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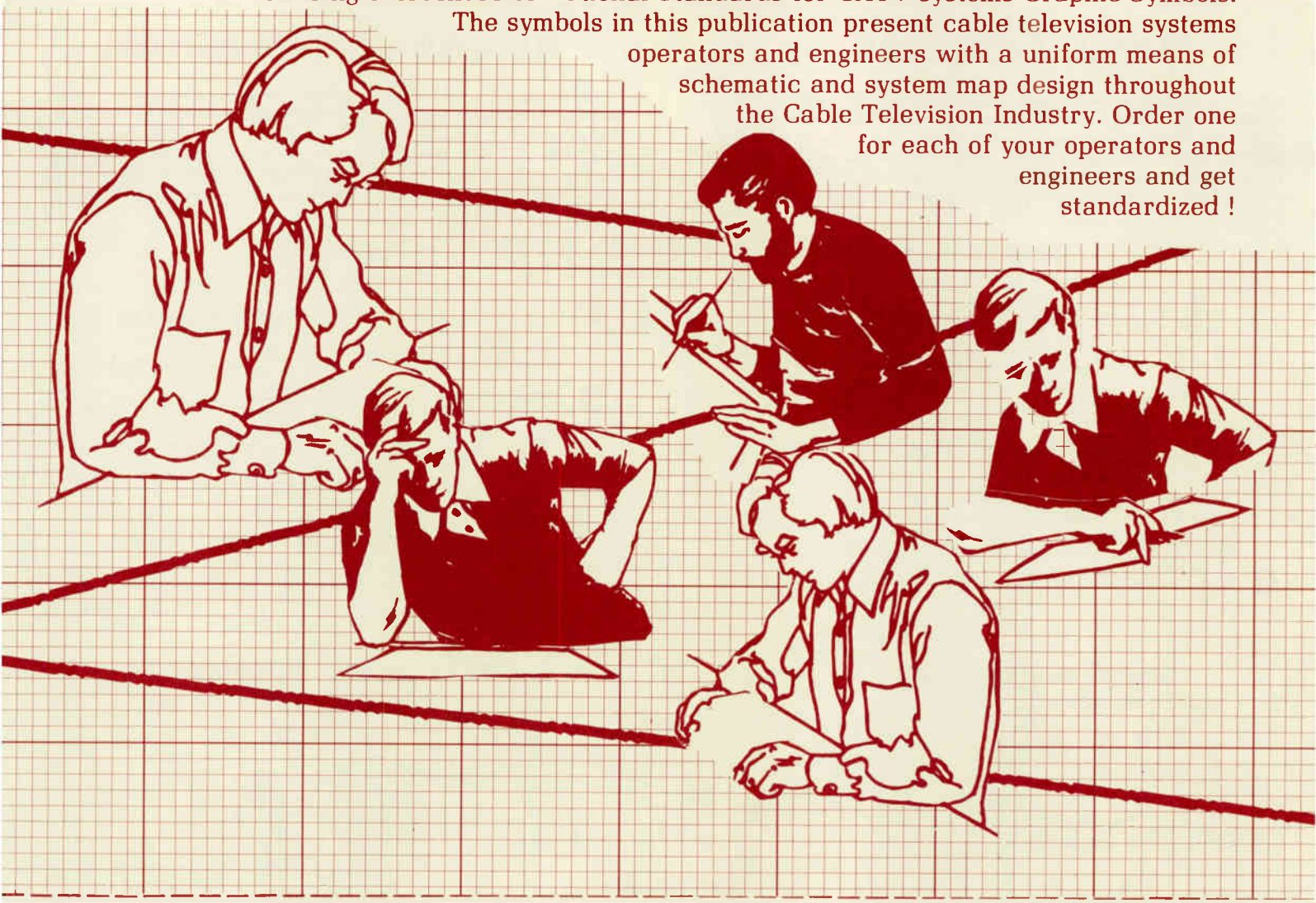

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TABLE II

Performance	Center Frequency	Notch Depth (A)	3 db Bandwidth (B)	AxB
Inadequate	3750 MHz	23.8 db	7.44 MHz	177
Inadequate	3830	26.4	9.65	255
Adequate	3910	27.3	10.66	291
Adequate	3990	25.7	9.25	238
Adequate	4070	24.2	13.20	319
Inadequate	4150	21.5	6.38	137

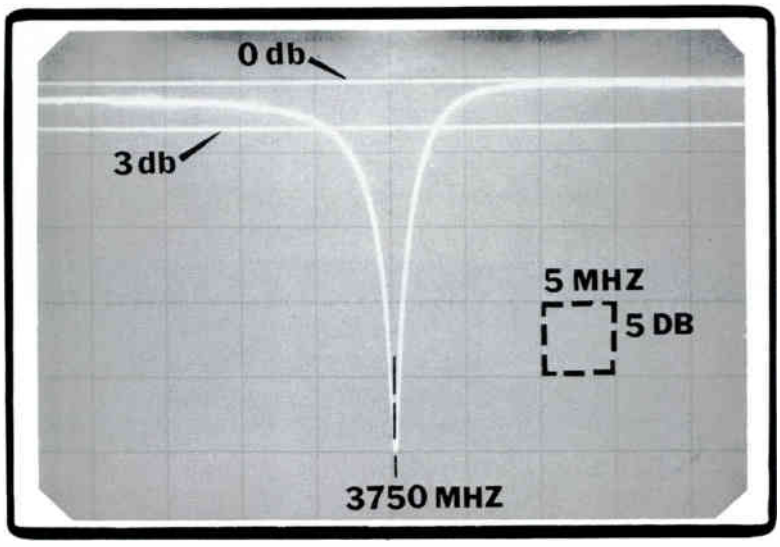

Fig. 3(b) Single Notch

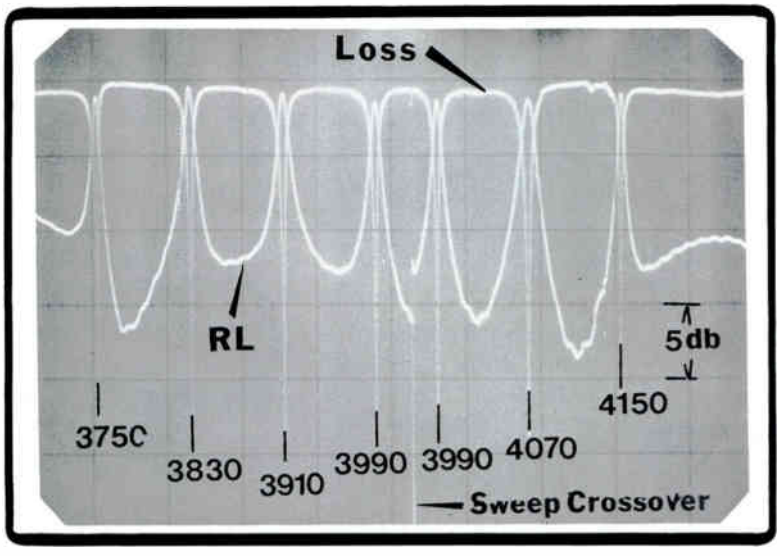

Fig. 3(a) Sweep showing the 6 notches (Vertical: 5 db/division)

denote that they did or did not do an acceptable job. Also, in the last column, we've tabulated notch depth x bandwidth to form a rough index of the amount of energy removed from the interfering carrier. This number is seen to correlate roughly with adequacy. Less than perfect correlation may be due to different amounts of dissipation loss within the traps or to some level difference between the carriers.

At any rate, our 25 db "guess" is off, so we will have to deepen at least the first two notches and the last notch. It probably wouldn't hurt to touch up to 4070 notch also, but that's a story for another day.

It was indicated **(CATJ, Feb. '82)** that the microwave notches must be very narrow (3 db bandwidth), say about 3-5 MHz, so as not to roll up too much transponder bandwidth and injure picture quality, even after "unloading" the downconverter. In defiance of this, note from Table II that some of the best notches are 10 MHz wide.

WHAT DOES IT ALL MEAN, BOB?

The microwave trap technique is a useful tool (along with the 3.7-4.2 GHz bandpass filter and IF traps) in salvaging badly-sited earth stations, and the typical system appears to be very forgiving of trap bandwidths wide enough to make useful notch depth possible.

But don't count on a *perfect* miracle, Bob, and get a survey next time.

In the final installment of "The Filtered Earth Station" series, we will summarize the causes and cures for microwave interference with a troubleshooting table. □

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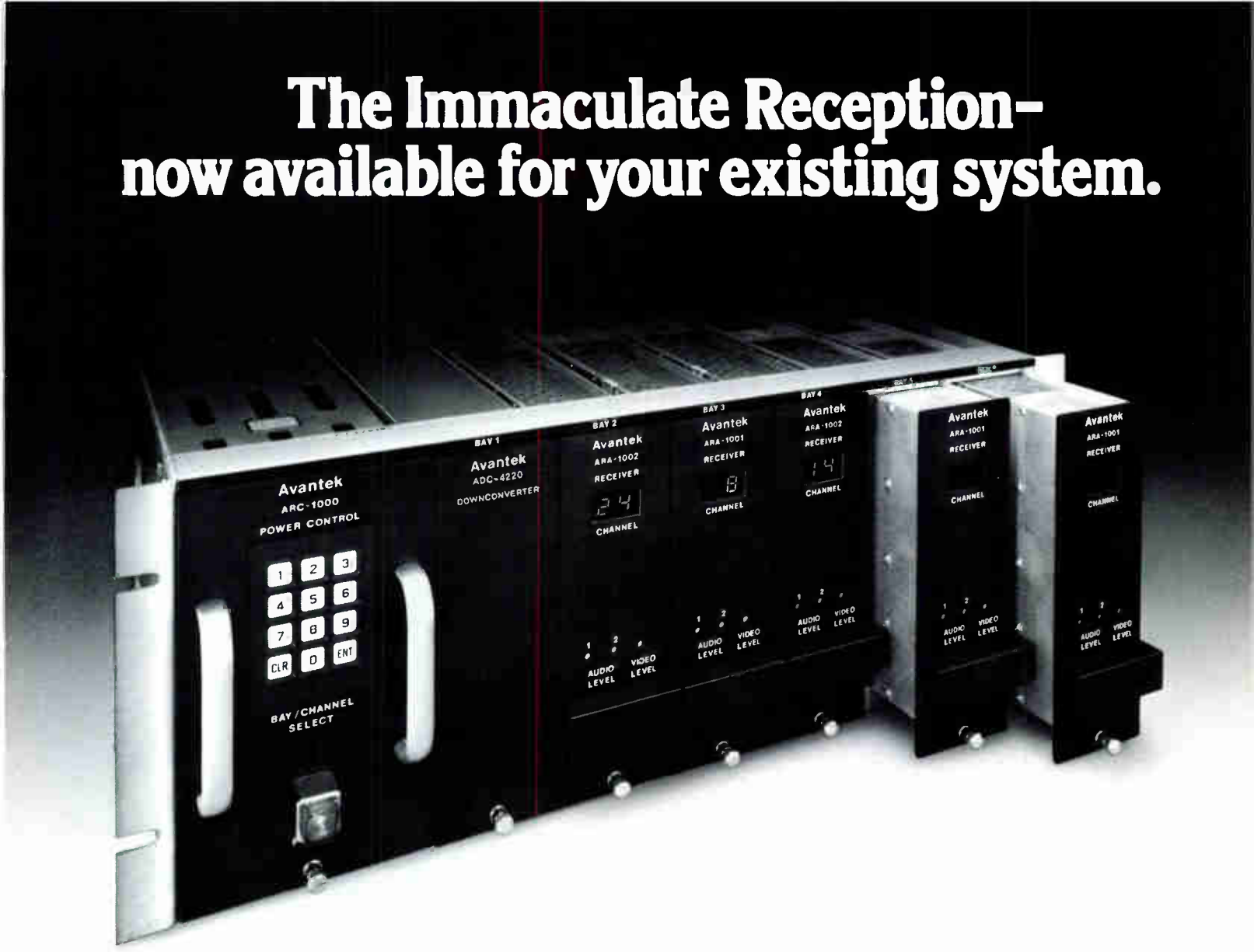

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Circular Polarization

A Simple Approach

In the February 1979 issue of CATJ, I described a 4 GHz feed horn I had developed two years earlier for my experimental terminal, to permit reception of satellite TV signals with either horizontal, vertical, right-hand circular or left-hand circular polarization. At that time virtually all prime focus fed TVROs in the USA employed the pyramidal horn waveguide feed. It isn't impossible to adapt this kind of feed for circular polarization (CP) but it seemed a bit messy, so I went for a horn with circular symmetry. This meant, for simplicity, using circular rather than rectangular waveguide as the input port of my low-noiser downconverter.

I had available some two-inch copper tubing, which with a cut-off frequency of 2.95 GHz would pass the 3.7 to 4.2 GHz band comfortably. The dish profile I had no control over, it being the available 8-foot Andrew terrestrial microwave antenna, with an f/D ratio of 0.375. The first calculations showed that if I wanted a 10 to 15 dB edge taper I was in trouble, since the horn aperture needed to be smaller than the diameter of my waveguide! So the simple conical horn was out.

Now I knew that all the big, no nonsense antennas used corrugated horn feeds. They also used shaped reflector Cassegrain geometry, wherein the main reflector departed from true paraboloid and the subreflector from true hyperboloid shape, in order to maximize aperture efficiency. Such things were beyond my reach at that stage, but the corrugated horn looked attractive, if difficult to fabricate.

How did it work? It seemed the corrugations made the walls of the horn present a reactive boundary to the fields in the mouth of the waveguide, generating a hybrid (HE_{11}) propagation mode from a combination of transverse TE and

The PTFE Slab Polarizer is just visible in this view of an LNA under test in the author's terminal.

TM modes. This mode resulted in a spherical (i.e. circularly symmetric) wavefront from the horn, enabling efficient reflector illumination and a low axial ratio, important for frequency re-use CP systems, as have now come into everyday use with the new Intelsat V satellites.

What was the advantage to me? I discovered that the flare angle of the corrugated horn could be increased to 90 degrees, simplifying considerably the construction problem, and that at this angle it was possible to obtain optimum illumination of my 0.375 f/D reflector desite the 2-inch waveguide, and moreover that by adjusting the penetration of the waveguide mouth through the corrugation plane, fine tuning of the horn's illumination angle could be achieved.

The next problem was how to generate a circularly polarized wave. Or, from the receiving viewpoint, how to depolarize such a wave so that a simple monopole element could be used in a waveguide-to-coaxial transition. One elegant method employed a birefringent Cassegrain subreflector — a grid of fine wires reflected one linear component an eighth of a wavelength in front of the solid subreflector, giving the required quarter-wave path difference. But I had decided against a Cassegrainian configuration. The most commonly used circular polarizers were periodic structures within the waveguide, usually posts or irises. Other methods employed a length of asymmetric cross-section, rectangular or elliptical, or a dielectric insert. I chose the periodic solution, posts being used since these could employ screws to make the structure adjustable — I didn't trust my calculations to give the right answer first time.

So the hybrid mode scalar horn went into full time use here, and many were built in the USA, as experimenters sought the exotic offer-

Steve J. Birkill

horn, as far back as the step transition, and protrude by about an inch. Fig. 1 shows the dimensions as used here, for the Gorizont band (3650 to 3950 MHz) — a slightly shorter slab may be a better compromise for the Intelsat 3700 to 4200 MHz band. The width has a slight taper to match that on the casting, and the edges are trimmed to a radius using a woodworker's plane, to ensure a snug fit in the waveguide. Fig. 2 shows the position of the polarizer for single reflector reception of right-hand CP, as presently used for all international TV, except the French Symphonie transmissions which use LH CP. LH CP will eventually come into use on some Intelsat V TV circuits, but has not yet been observed here. It is suggested the length be optimized by trimming to null a mid-band RH CP transmission with the polarizer in the LH CP position (90 degrees from that shown in Fig. 2, or 45 degrees the opposite way from the LNA probe, if you like.) The curved edges are perhaps an unnecessary nicety, but being a tight push fit allows the slab to stay put without worrying about adhesives, lossy or otherwise.

Much variation is possible on this theme. A more tapered shape should theoretically reduce the VSWR of the polarizing section, but I doubt the difference could be detected in such a short length of guide. PTFE has a low dielectric constant (relative permittivity) demanding this fairly large slab to perform the required function. A high-dielectric constant material need not have the same bulk, though there is a trade-off to be made between dielectric loss and price. Fiberglass is cheap but lossy. Alumina, quartz, sapphire and commercial laminate materials like Epsilam-10 combine low loss with high dielectric constant, but are costly, comparatively speaking. Even Teflon is not exactly cheap.

Incidentally, don't be confused by consideration of the solid-state polarization rotator. These devices, such as the Luly Polarizer, employ Farady rotation in a magnetized ferrite to change the angle of a linearly polarized wave. So a single-port antenna system can be switched by application of an electric current, between vertical and horizontal transponders, without any requirement for a feed rotation motor. What the Faraday rotator will not do (alone) is to switch between linear and circular. But if applied to a system that has a CP deploarizer the vertical/horizontal switching of the ferrite device is transformed to LHCP/RHCP selection. The rotator sits of course between the polarizer and the LNA — if you try to rotate the CP wave you'll not detect any change!

I write this at my home in Sheffield, England, while awaiting the final stage in the granting, by the US Embassy in London, of full US immigrant status. But I may be in Tulsa by the time you read this, or shortly afterwards. We shall see.

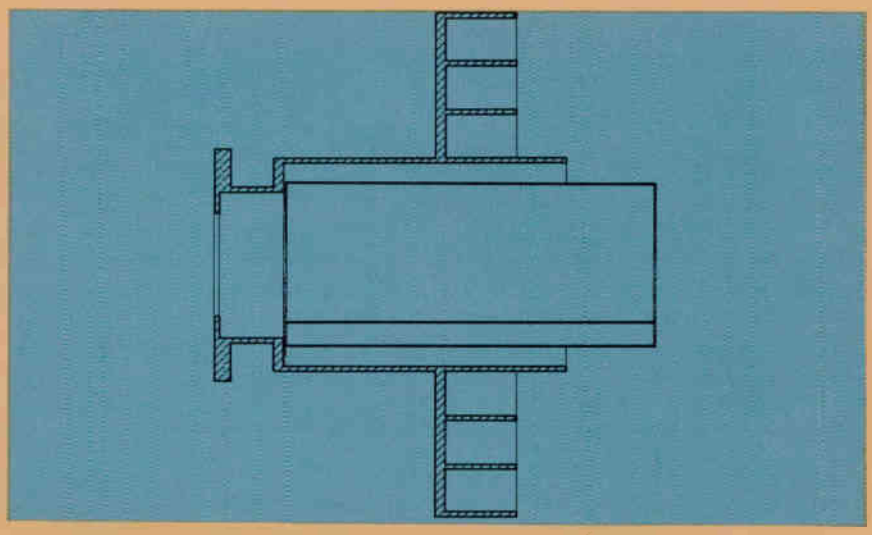
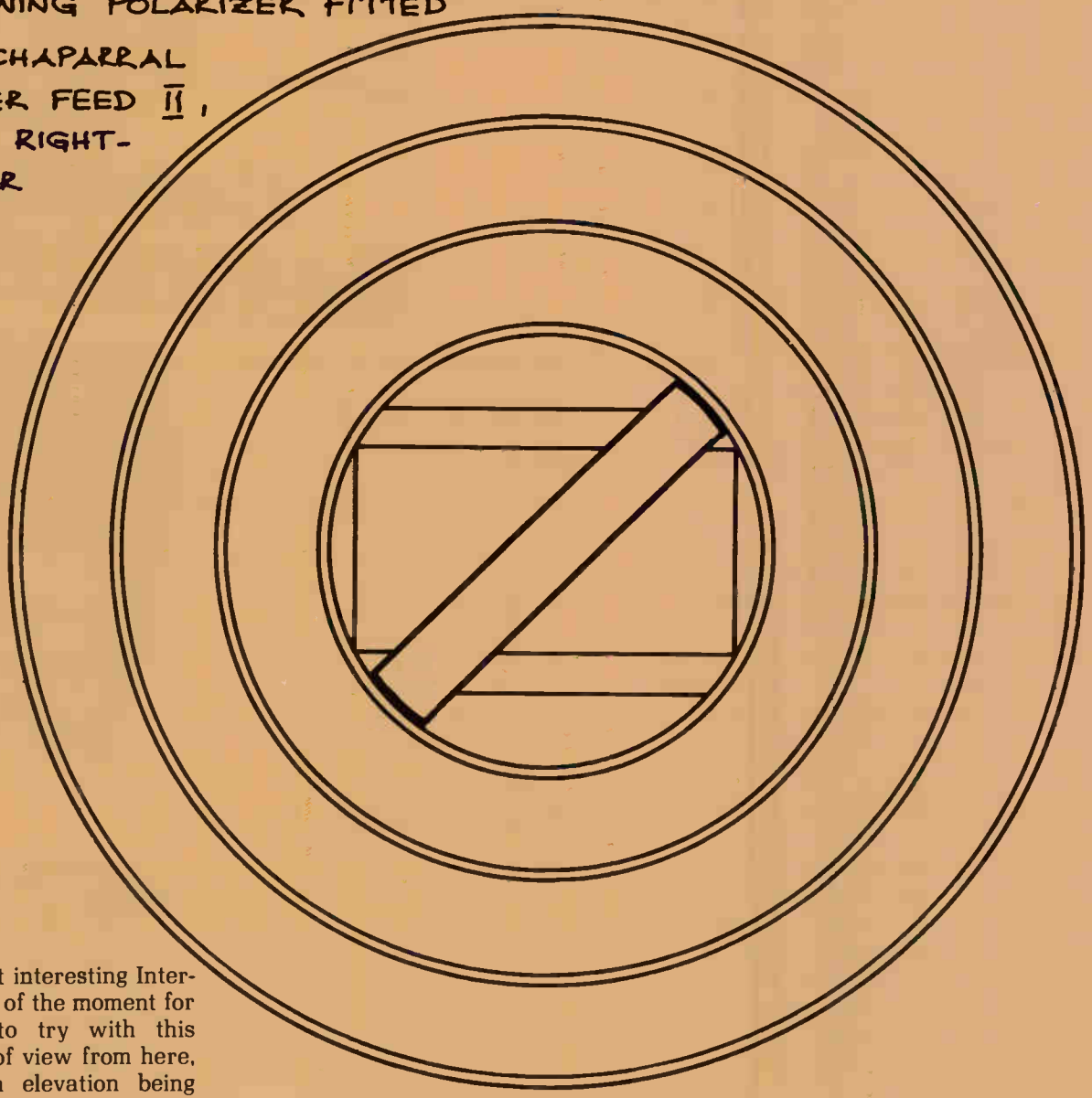


FIG. 2 SHOWING POLARIZER FITTED TO CHAPARRAL SUPER FEED II, AND SET FOR RIGHT-HAND CIRCULAR POLARIZATION.



Perhaps the most interesting International satellite of the moment for CATJ readers to try with this polarizer is out of view from here, its low western elevation being obscured from my antenna by a local building, so I can't tell you which transponders to watch or whether there's any full-time TV there yet — you'll have to look for yourselves. For interest only of course, as the Intelsat system does not permit anything amounting to a direct broadcast service. At 53°W, Intelsat IV F3 is in a prime western Atlantic region slot above the mouth of the Amazon. From here it is well placed to provide domestic lease service to South and Central America. I believe Mexico is a prime candidate for TV service from this satellite. Right-hand circular polarization applies to all downlinks from the Intelsat IV series. □

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What is a Cable System, Satellite News ...

on update Washington update Washi

WHAT IS A "CABLE SYSTEM"?

That may sound like a silly question at first, but it is becoming very important as the cable industry evolves into new businesses. As most of you know (just check the recent CATAtorials in CATJ), CATA is intent on letting the world know that there are at least two very different businesses that are now being defined as cable television. One is the cable television industry we all know about, and which most of us are a part of, and the other is the newer, "broadband" communications systems that are being offered in the major television markets. We will not go into the many distinctions as we now see in those two businesses right now. Suffice it to say that it is very important for all of us that our local, state, and federal officials fully understand that they are different businesses.

The question we are raising today, however, goes to all of the variant forms of the business. Who, or what defines a cable television system? Why, you might ask, is it important? To be brief, cable systems have to pay copyright fees, cable systems have to register with the FCC, and cable systems have technical standards imposed by the federal government. The FCC also has the authority to fine cable operators for violations of the federal rules (see related story - this issue). However if you are NOT a "cable system" then none of the things just mentioned apply to you. Just take a look at the systems being built in hotels and motels as an example.

So it is important whether you are a "cable system" or not. Several CATA members have called the Washington office lately asking what would happen if they simply took all of the broadcast signals off of the system. Would they still be subject to the FCC rules? Would they still have to deal with Copyright? Unfortunately, as is usually the case, there is no simple answer.

The definition of a **"cable television system"** under both the FCC rules and the new definition proposed in H.R. 3560 is as follows:

" 'Cable television system' " means a nonbroadcast facility consisting of a set of transmission paths and associated signal generation, reception, and control equipment, under common ownership and control, that distributes or is designed to distribute to subscribers the signals of one or more television broadcast stations, but such term shall not include (1) any such facility that serves fewer than fifty subscribers, or (2) any such facility that serves or will serve only subscribers in one or more multiple unit dwellings under common ownership, control or management"

Now that sounds like a relatively simple definition, and in fact it has been in use at the FCC since the 1972 rules were adopted. The original copyright law did make some changes that result in attempting to call all MATV systems that carry "non-local" signals cable systems for the purpose of copyright liability, but even the copyright office is now urging that that definition be changed since they cannot possibly enforce such a rule. So we are (if H.R. 3560 is adopted) going to have a uniform definition for "cable television", at least at the federal level.

But what about the operator who has simply gotten tired of all the nonsense with the "must carry" rules, and "distant signal equivalents" and all that stuff? What about the operator who has sufficient local television signal availability that he can offer his subscribers an A/B switch and make the cable channels available for other programming? Will the subscribers be satisfied with going back to an antenna for their broadcast service so that the cable

and More!

Steve Effros
Executive Director, CATA

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operator can offer additional non-broadcast fare? We don't know the answers to all those questions, but we do know that for some small systems it may be the easiest way to "expand" channel capacity until they rebuild. Clearly if you have the channel capacity then you provide a valuable service by including the broadcast signals. But what if you don't, or what if the rules, regulations and hassles just get to be too much?

Well, under the rules, if you do not carry broadcast signals you do not qualify as a cable television system and presumably none of the FCC or Copyright laws would apply to you. We are not quite sure what you would be called, but for legal purposes it would appear that you are not a "cable system" in the strict federal interpretation. This makes a lot of sense since the FCC jurisdiction is based on the concept that the "cable system" has some sort of effect on broadcasters — technically the jurisdiction is called "ancillary to broadcasting". If the system does not carry the broadcast stations then it cannot be "ancillary" in so far as jurisdiction is concerned.

The same, of course, true on copyright. The entire premise of the 1976 copyright law liability for cable is that we carry broadcast signals. If we don't carry them, we shouldn't have to pay for them. There is just one hitch, and it was called to our attention by CATA member Jeff Krumme; the wording of the definition is ". . . that distributes OR IS DESIGNED TO DISTRIBUTE". Well, we cannot argue that we are designed to distribute, or at least we have the capability of distributing broadcast signals. That is also true for data, electronic mail, alarm systems, power control systems, and a whole host of other things that COULD be put on the system. Does the wording mean that we are still "cable systems" and still liable even if we don't carry broadcast signals? We don't think so.

When Jeff brought up the question the Washington office checked with the FCC. The original definition was stated that way because at the time, you will remember, we had to file for a "certificate of compliance" before building the system. That meant that they had to apply the rules to someone who was "designing" a system with the intention of carrying television broadcast signals. They had no intention of applying the rules to someone who did not in fact carry those signals. There is every indication that the copyright office feels the same way about the issue — they are not looking at the technology so much as they are looking at the question of whether or not television broadcast signals are carried.

Remember that carriage, via satellite, of WTBS, WOR, or WGN is still considered to be carriage of a "broadcast signal" therefore you will be considered a "cable system" as soon as you carry one of those signals, and that, in turn, will trigger the "must carry" rules and all of the other nonsense. So if you are seriously considering not being a "cable system" you must eliminate ALL broadcast signals. That, for many of you, would probably not sit very well with your subscribers. We are not necessarily recommending that you do this — but we wanted you to know what the implications are of eliminating all television broadcast signals — you would no longer be a "cable system".

ABC — WITH "FRIENDS" LIKE THIS, WHO NEEDS ENEMIES?

You remember ABC, the American Broadcasting Company — the folks who used to be the leaders of the pack at the FCC to hogtie cable television development, the folks who objected to the CATA petition to allow cable operators to use small earth terminals, the folks who suddenly become "born again" regarding cable television

when they decided to start a joint venture with Westinghouse to compete with Ted Turner's all-news channels. Remember those folks? Well, they have apparently had a relapse.

ABC is backing a new group of the ABC affiliates, the "Viewer Information and Education Committee', better known as VIE, that is dredging up that old warhorse again; "Save Free TV"! This time the campaign is more organized than ever. They have video taped "commercials", they have brochures, the whole works. As a matter of fact, in one speech it was even recommended that local newscasts and "mini documentaries" be done ". . . on the subject of Pay-TV vs. Free-TV, or the implications of unregulated cable TV growth". Now how is that for the "integrity" of the "free press"! These are the same folks who are demanding complete First Amendment rights for broadcast journalism! It is entirely incredible to us that ABC affiliates would be advised, or urged to intentionally create news programs with the clear implication that they do it for political reasons — yet, we have the transcripts that show that that is EXACTLY what happened!

These are the same folks, ABC, who are trying to tell cable operators around the country that they have "seen the light" and that they are now trying to assist the cable industry by bringing us a second set of all-news channels to compete with CNN! With friends like that, as we noted before, who needs enemies?

But it doesn't stop there! ABC seems to be working both sides of the fence so hard that maybe their affiliates don't really know what is going on either. As an example, while they are "out front" blasting "pay-tv" and "protecting the public interest in the free, over-the-air broadcasting system", they are also, behind the scenes, introducing some very curious amendments to the Copyright "Son of Compromise" bill (H.R. 3560). One proposal they have made would modify the compromise language that presently says that STV stations would not be considered "must carry" signals. They want it changed to say that only stations that are "PREDOMINANTLY" scrambled, STV signals are not "must carry". Now why would they want to add language like that if they are so strongly opposed to "pay-tv" and are such guardians of "free-TV"? Might it be that ABC sees that in the future they may be "born again" on the "pay-tv" issue too? Might it be that they see the prospect of going to a scrambled signal for say one or two hours a night rather than full-time, and therefore they want to make sure they are both a "must carry" signal and are protected against being elimnated if they do some, but not a "predominant" amount of STV? Do the ABC affiliates know anything about this sudden, but almost anonymous interest in STV on the part of ABC? Tune in next month and we will let you know where ABC stands on these issues then! We are even considering having a contest — the "ABC Position of the Month" where everyone could guess which side of their corporate mouth they were talking out of at any given time.

To be a little more serious about this, however, it would be wise for ALL cable operators to notify the local ABC broadcast stations as soon as possible that you trust they recognize that the issue of "pay-tv", cable-tv, and "free-tv" are controversial issues, and that any advertisements or "documentaries" or editorials, or anything else done by the station regarding the subject should be considered "controversial". That results in two things. First, the station is on notice, and should they agree they will have to put a "tag line" on any commercial showing the public who paid for it. It may also lead to the availability of some sort of "balanced" coverage requirement under the Fairness Doctrine. At the very least you should let them know you know what they are up to. Do it in writing, and register the letter so that there is no dispute later about whether they knew this might be a controversial issue.

SPEAKING OF "PAY-TV", HBO ANNOUNCES IT WILL SOON BE ABLE TO CUT YOU (OR ANYONE ELSE) OFF IF YOU DON'T PAY — THEY ARE GOING TO SCRAMBLE THEIR SATELLITE SIGNAL.

The time has finally come, apparently, to stop the growing piracy of satellite signals. As usual, however, there is a dispute as to how to go about doing it. Home Box Office, in their typical fanfare style announced that they planned to scramble all satellite signals starting sometime early in 1983. This should not come as too much of a surprise. Showtime, in a much more relaxed fashion announced that they, too planned to scramble their signal some time ago. The reason, of course, is the problem of home TVRO's. Now there is really no solid information on how many of the home dishes are really out there. There is even less indication of what people who own such dishes are watching. But HBO and Showtime, at least feel it is a good bet that their services are part of the package. So they have a few choices. First, they could simply charge folks who voluntarily notified them that they were watching at home. That would be fine if everyone really did call in. That, however, is not likely. The second option is to go for legislation. That is now in the process. Rep. Waxman (D-Cal) introduced a bill that would deal with satellite signal piracy (H.R. 4727). Showtime, and in particular Warner-Amex (The Movie Channel) had been putting a lot of effort and hope into that bill as a way to solve the problem. It certainly would have been a lot cheaper! HBO estimates that the tab for sending and receiving a digitized signal will run somewhere around five million dollars! They intend to provide free decoders to all affiliates, and expect the cost of the decoders to be somewhere in the neighborhood of $1500 each. You can image why the Warner people were a little miffed that HBO announced its plans before the bill got adopted — they were apparently hoping to save some money. However even a strong bill, with heavy fines would have been questionable as to effectiveness. After all, how would it be enforced? It would be the same problem as Congress now faces with home video recording.

In any event, it looks like digital signals from the satellite are on the way, and that piracy, at least of the pay signals will be reduced. Not all pay programmers are likely to take this path, but a lot probably will. There are some added benefits: in particular, the audio portion of the signal can be substantially improved. HBO may offer

the audio in stereo once the technology is worked out. That, by the way, may be more of a problem than the press announcement indicates. HBO is working with a lot of different suppliers trying to find the "ideal" system, but they haven't picked one yet. They also say they have no intention of selling decoders to home owners. That statement, we suspect, must be qualified with a ". . . for now".

One last note on this latest technological wonder. It also allows HBO, or whoever employs it, to turn cable system receivers on and off automatically. That means they will have a powerful new weapon to use against slow paying accounts. A word to the wise is sufficient.

Will this mean the end of the "home terminal" market? We doubt it. There is still lots of good stuff up there that people can see, and after all, how many other programmers are going to spend that amount of money to scramble? It might put a crimp in the market if the other two "biggies" do it as well, and if we were the pay programmers, or even cable operators in areas where home dishes are becoming a problem (we don't really know of any at this time) we would make darn sure that the publicity went out from this time forth that scrambling was coming — the PR may put more of a cabosh on the market than the actual scrambling!

HERE COMES THE COMPETITION!

If it wasn't clear before, the handwriting is now not only on the wall, it is across the forehead of all cable operators competing in the major markets: they are not going to be the only ones out there seeking to hook up homes! We have been saying this for quite a while, and it is very important that cable operators get this message across to regulators and legislators at all levels of government! Two new ideas to reach the home entertainment market were announced just recently.

The first one is not actually new, it is an expansion of what is already proving to be competition in some markets; MDS. Now MDS, as we said, is not new. There are MDS services, leased by pay programmers, active in most major markets. The problem for them right now is that they can only provide one channel. That may be great in a community that does not have cable, say, and where lots of folks are willing to pay to see uncut movies. But when the cable operator does start to wire the town it would appear that he can offer such an attractive package that the single-channel MDS operator is probably in for a rough time. The same is true, of course, for the single channel STV operator, or the LPTV station. (For those of you who have forgotten how to read alphabet soup, that stands for Multi-Point Distribution Service (MDS), Subscription Television (STV), and Low-power Television (LPTV).

Now, however, the FCC has been asked to grant up to fourteen MDS channels in each of the top 50 television markets. The proposal comes from Microband, which is the largest MDS operator right now, and which is now owned by Tymeshare, Inc., a computer processing and information service company. The idea would be to grant three licenses in each of the major markets. Two licensees

would have five channels each to play with, and the third would have four. They would be allowed to work together to offer a variety of services. Microband envisions the entire 14 channels as being available to apartment houses or home owners who would not only be able to get any of the 14 channels, but would also be able to pick and choose what programs they wanted to watch by using their telephones as the "return mode" to a computer — thus at least simulating two-way cable.

The Microband brass describe the proposed system as, in essence, a "wireless cable system". They pointed out in the filing to the FCC that the current pressure on cable companies in the major markets to promise all sorts of exotic services, combined with the problem of slow-moving franchise authorities and high interest rates will probably result in many of the major markets not being wired. They estimate that at least 30 million homes in urban markets will still not be wired come 1990. They also estimates that to wire the two-thirds of the country that is not yet wired will cost about 19 billion dollars! That's more than triple what cable has spent to date.

To give some idea of what the competition looks like, Microband points out that the construction of a multichannel MDS system in each of the top markets would cost no more than $35 million, and that it could be completed within two years of the first FCC grant of a license! Now that's competition! The numbers get even worse from here. The filing goes on to note, in a comparison with a Warner-Amex bid in New York which proposes an average subscriber charge of $28 and an 11.3 percent return on equity that the MDS system could offer service for an average of $25 per sub and still get a 35 percent return on equity! Now of course it is not all that simple. The MDS operator would not have as much to sell as the cable operator, and the reception problems of MDS still exist. But it does raise an interesting question; do subscribers in the major markets REALLY want all those goodies that the city fathers are demanding? Do they really want twenty access channels and a library loop and hook ups in every school and all that other stuff, or do they really want to see pay services; the movies, the sports, the cultural programming, and maybe a blue movie or two in the comfort of their own home? If the answer is the latter, as we suspect it may be, then the big city cable boys are in a heap of trouble. The cities are making them (and, of course they are guilty too, since they are bidding, and signing contracts too) build the ivory towers — they may stand as monuments of technological waste as the true services that subscribers want are provided in other ways.

If MDS were the only potential competitor we could at least breath easy for a year or two — after all, the FCC has to go through its long-winded decision process before any multiple MDS grants are made, and the proposal would take spectrum away from the educational folks, which always means there will be a fight. But that is not the only plan on the horizon.

Another one, and this one is literally on the horizon, would supply pay programming to apartment buildings, other multiple dwelling units, and presumably individual homes at some point, from the ANIK-C satellite — this is a 12-ghz service and should require much smaller, and cheaper dishes. The Canadian satellite is scheduled to go up in November, and United Satellite Television is planning to beam four nationwide channels of pay programming from it. They have leased 10 transponders to do the job with coverage in every time zone. The cost for the transponders is around $25 million. UST hopes to be in service by Feb. of 1983, and they say they are also aiming to service the small independent cable television operators around the country. We are looking into the whole situation for CATA members, but suffice it to say that for now, the big threat will once again be the competition in the big markets. There is some indication that UST will supply 2 pay and 2 non-pay channels in an effort to be a "supplier" to condos, apt. houses, small cable systems, etc. The plans all aim toward the northern United States since that is where the satellite footprint is strongest. Both Canada and the U.S. have to approve the plan. The Canadians are said to be in favor. No word yet from the U.S., however you can bet that other potential competitors, such as Comsat, will have something to say about it.

IN OTHER SATELLITE NEWS . . .

Western Union has successfully put up its fourth satellite, with 24 transponders. This one is supposed to provide the first true competition for RCA regarding the cable market. As of this writing the bird is in orbit, but has not yet been put into a geostationary arc, and we all know what can happen when you try to do that! Meanwhile, Satcom IIIR is working well, and is now the principal "cable" satellite. SSS is one of the companys now using the new bird, and they warn that you should be sure to aim your dish at the center of the satellite's "window". All satellites wander a little bit within their "parking space" above the equator and it can make a major difference if you have not focused on the center of the area designated for Satcom IIIR. If you need to know the exact position, call for Satcom information at (201) 827-8444. That number gives you a tape recorded message 24 hours a day. If you need any other information call Satcom Spacecraft Operations at (201) 827-9400. Naturally the farther toward the edge of the footprint you are, the more critical all these alignments can be. But we understand that once you get everything aimed right, the picture is very solid.

Something that is on a little shakier ground is the question of satellite spacing. The FCC is considering closing up the spacing from the present four degrees to either three or two degrees. That COULD mean trouble for small dish owners. There are major disputes within the industry as to whether the smaller terminals will work with closer spacing. The NCTA has now come out with a statement that 3 degree spacing would be ok, but 2 degree might cause problems unless the Commission does some creative assignment juggling. The 2 degree spacing apparently could work if adjacent birds were not competitive in terms of bandwidth, direction, or polarity (or at least one of these variables was different). The FCC has made no decision as yet, and needless to say the engineers are working

hard on the subject. CATA will have a major technical seminar on this subject, with engineers taking all sides of this controversial issue on tap at CCOS-82 in Nashville. Be sure to be there! It could mean the difference between your investment in an earth terminal working for you, or having to be replaced! That, in itself, is worth the trip!

COPYRIGHT UPDATE

Have you noticed that there was no big headline about copyright at the front of this issue? The reason for that is simple; bad timing. As of this writing the Judiciary Committee is supposed to take up H.R. 3560 on March 9. However that date is far from certain. The result of the meeting, whenever it is held, appears to be getting clearer, however. The "Son of Compromise" bill will probably come out of the Judiciary Committee pretty much intact, with a few minor changes. That is not to say that a lot of folks won't be trying for major changes, but they will not get through the voting process. At least that is what it looks like right now. The next step will be the Communications Subcommittee headed by Tim Wirth. The Chairman of the full Commerce Committee, John Dingell (D-Mich.) has already stated publicly that while he has not made up his mind about the issues involved in the bill he has asserted jurisdiction, meaning that there is no question the bill will be referred over to his committee once the Judiciary Committee is done with it.

From CATA's point of view, the most important thing that can be done once this bill is out of the Judiciary Committee, assuming no major changes have been made to it during the full Committee deliberations, is to make sure that the Commerce Committee members know we expect to present our views on the bill at hearings we expect them to hold. We have never really had a chance to testify on the "must carry" aspects of the bill. They were not really part of the Copyright subcommittee's jurisdiction and therefore they asked that we not testify on those parts of the bill before them. The appropriate place for such testimony, they said, was before the Wirth subcommittee. Well, we want to make sure that subcommittee does indeed have hearings! It will require all of you to sharpen your pencils once again and let the Commerce Committee, including the Communications Subcommittee know what you want, and what your position is. Hopefully this time we will not only have the Washington lobbyists testifying, but we will get some cable operators in as well to let the subcommittee members know what is really going on out there in the real world. But it will only happen if you write, telephone or wire your desire for hearings to Washington. Be sure to do it!

YOU CAN'T TELL THE PLAYERS WITHOUT A SCORECARD!

Now it's a joint venture between CBS and Fox to do just about anything under the sun regarding cable, videodisc, production, videotape, etc. The new joint venture will be known as CBS Fox — you can see the logo now. Anyway, it is an important merging of talents, and it probably means good things in the long run for CBS Cable, which has proved to be about the classiest cable programming we have to offer our subscribers. If you have never seen

the CBS Cable presentation at a cable convention, be sure to see it the next time you have a chance. It is a film about 15 minutes long that we would love to see played at every franchise renewal hearing where an operator was about to bring in CBS Cable. You would have the council in the palm of your hand by the time it was over. Anyway, all that is to say that the CBS Fox combination should prove to be a powerful one.

Another partnership has also been announced. BET, Black Entertainment Television and TAFT Broadcasting have gotten together. That, too, is good. TAFT will bring more money into the worthwhile venture started by Bob Johnson. TCI has always been a part of the BET team, so with the addition of TAFT (which also has a deal with TCI) the money will be there for BET to go from 3 to 42 hours weekly come April.

SHORTS

* * * Guess who is changing their name? Broadcasting Magazine, that stalwart protector of the broadcasters image is going to add "Cablecasting" to its name.

* * * FCC Commissioner Ann Jones has announced that she is inclined to vote for elimination of the franchise fee limitations that are still a part of the Commission's rules. She said she expects to be able to vote on the issue shortly.

* * * One of the most appreciated "giveaways" at a convention booth has got to be the "PICO PEDS" which were distributed at the last Western Show by Pico Products, Inc. Those very clever folks looked around and saw a great need to be filled; foot pads for your shoes as you walk through the endless miles of displays at the big national trade shows. Hats off to Pico for a great idea, and a great service. At CCOS-82 we won't have miles of displays. We try to keep everything human-sized so that we can sit down with the vendors and really talk about what our needs are, and what they can provide. It seems to work better for all concerned that way. A note to the vendors, however, . . . the limited booth space is running out. If you have not sent in your cash for reserving your space you had better call CATA's Business Manager, Celeste Rule, in the Oklahoma City office right now!

* * * HDTV High Definition Television, is something you are going to be hearing a lot about. CBS is the one pushing it most at the moment. What is it? Well, it is a specially developed 1,125 line television system using special television receivers and, of course, special transmission facilities. CBS hopes to conduct a test with the "super" television signals (12 GHz) in San Francisco. Expectations are that High Definition Television will go over well with special interest audiences, such as movie buffs, photography buffs, etc. To deliver a high definition TV picture over a cable system will use about 5 regular channels, and the guessing is that there will be more use of HDTV on cable than anywhere else, after all, what else are the big city systems going to do with 100 or 200 channels? ☐

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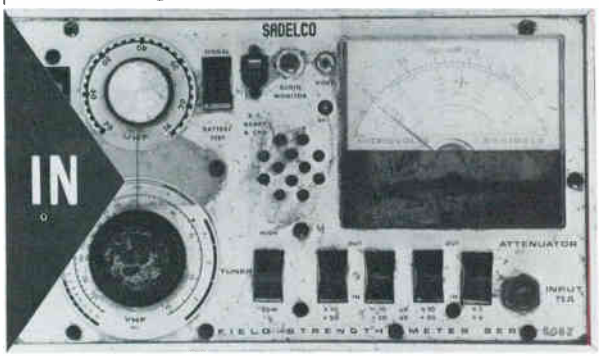

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HAIMO-WITS

RALPH HAIMOWITZ,
CATA'S DIRECTOR OF ENGINEERING

What better way to start the new year than with a new project? That is what a few of us have decided to do — and what a goal we have set for ourselves. This isn't one of those ideas that is limited to a small group of individuals, but will require the help of anyone or everyone in the cable industry.

The project, as proposed by a few of our pioneers, began in one of those evening social sessions at a convention and trade show where I was fortunate enough to be sitting in with these gentlemen and, of course, the discussion was about cable television. As the conversation progressed, more and more of the talk was about "the good old days" when cable television was in its infancy. Those were the days when a few enterprising individuals decided to bring television reception in for their friends and neighbors in those valleys surrounded by mountain ranges where the best roof top antennas were only good for bird perches.

I happened to remark that the vast majority of people in cable today have no idea what it was like to build your own antennas, headends, and broadband amplifiers using RG-11 to co-axial cable purchased from Army surplus as transmission line to distribute the television signals to the homes. As a matter of fact, only 15 to 20 percent of the people who attended our seminars in 1981 knew what a pressure tap was and those few who did know were unfortunate enough to still have pressure taps in their systems.

Well, one thing led to another until an obvious conclusion was agreed upon by all — we need a cable museum and, if we don't try to start it now, it will be too late because there will not be any of the earliest equipment available anywhere. In fact, it isn't easy to locate some items today.

The project is slowly beginning to take shape as we have collected a few items already, including an old,

more HAIMO-WITS

Recently, I had the very pleasurable opportunity to meet and talk with one of the real pioneers of the cable television industry. Ken Simmons is one of the first cable television engineers from the "prehistoric" era of cable television when a system was constructed of seperate cables and amplifiers for each channel in use. Everyone built their own tube-type amplifiers in those days and the technology was all trial and error.

Ken is one of the most interesting individuals I have met and he not only knows cable television from A to Z, but he has that marvelous ability to share his experiences with the technicians and engineers of today. A packed house at the February South Florida SCTE Technical Meeting in Fort Pierce enjoyed Ken's mixture of wit and knowledge as the lead speaker. If you have never been fortunate enough to meet Ken in the past, I hope you have the opportunity to do so in the future. A highlight of Ken's presentation was the analogy of a high frequency signal radiation device that works most efficiently, using easy to understand terminology, and a beam adjustable light.

Dick Kreiger from Selkirk in Fort Lauderdale provided an excellent program on intermodulation, complete with a video tape presentation that visually showed the effects of third order beats at various levels of these undesired signals. I was pleased to see that Dick fees that this particular subject is one that deserves more exposure to the cable technicians and engineers (see CATJ article on Distortion).

Rounding off the program was Bob Dickinson from ECOM with a presentation on digital communications in the cable industry. This is definitely the up and coming technology for cable and it will behoove each and every one of us to learn what digital is all about. CATJ will be having several articles on digital technology, including the basics, in the near future.

If you haven't received a brochure for the 1982 CATA Technical Training Seminars just drop a note to the CATA Engineering Office, 518 21st Street S.W., Vero Beach, Florida 32960, or give us a call at (305) 562-7847. □

STW-OMIAH

homemade directional coupler, the first commercial model directional tap and its next two improved models up to and including pressure taps, and a tube-type broadband amplifier. There are still a lot of missing items, from head-end trip amps to one of the old, small, round screen, black & white TV sets in working or restorable condition, circa 1940's.

You can become a vital part of the project by donating or helping us find any equipment items from the period of the first cable television system up to the change over to solid state equipment. Any such items are most welcome, particularly those from the beginning of the cable era. Please look through your junk rooms and nostalgia hideaways to see if there isn't something there that we can use and let me know about it. I am presently storing these items and, with the help of several pioneers, restoring these items to working conditions.

Our present plans are to alert the industry that the accumulation of this equipment is underway and to ask cooperation to gather this material. Long-range plans would include the display of this equipment at various trade shows, perhaps in the form of a mobile museum, and ultimately a permanent facility to house a complete history of cable television for posterity.

In order to accomplish this project, we do need YOUR HELP. Even if you don't have any equipment that is needed, keep your eyes open in case you run onto a fellow cable operator that has something. If you wish to participate, let me know, and we will coordinate shipment of equipment at a later time. Also if you would be interested in helping with the project by collecting and preparing a written history of the cable industry, or restoring some of the equipment, that too is needed. ANY and ALL assistance will be gratefully appreciated.

Yes, indeed this is an ambitious project, but one that we need to do. If we don't do it now, it will be too late and we won't be able to uncover the materials we need. Let me know your thinking on this and any comments or suggestions. Write me in care of CATJ for any contributions, comments, or suggestions. □

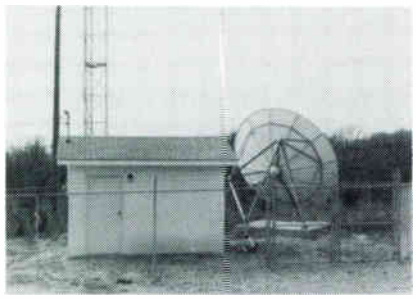
SHOWCASE!

NORTH SUPPLY AND MVC: A SERVICE TO RURAL COMMUNITIES

The emergence of the cable television business as a "big bucks" market has lured some CATV companies to the big cities complete with their lucrative outlying suburban areas. The potential number of subscribers runs in the thousands, maybe even into the hundreds of thousands. But, there's a flip side to the coin, and Meramec Valley Communications, Inc. (MVC), in eastern Missouri, is proving it. and CATA Associate Member, North Supply Company, Lenexa, Kansas, helped!!!

Serving several small communities, just southeast of St. Louis, MVC has pledged itself to service. Under the able direction of Wm. P. (Bill) Bagley, MVC president, the company now has five systems on-air and three more planned to go on-air within the next year. The rural communities of Sullivan, St. Clair, St. James, Potosi, and Steelville receive much more than a pre-packaged cable TV subscription for their monthly fee — they get service and dedication. MVC, a young, aggressive company, currently employs 16 local residents from these communities to look after the daily activity of MVC's five operations.

With a limited amount of network programming available locally, MVC offers 17 channels (with a total capacity for 35), three educational channels, selective entertainment tiers, and diverse programming including children's shows, sports and movies. In the future, MVC plans to broaden its service base to include a security and alarm feature for their subscribers . . . a very real need, not only in the big cities, but also in the outlying



This equipment: tower, headend building, and earth station, bring hours of cable TV enjoyment to rural southeastern Missouri.

rural areas of the country.

MVC's system build-up started in the spring of 1980 and was completed September 1, 1981. Working along side MVC was **North Supply Company**, a full-line CATV equipment distributor. **North** supplied not only all the construction materials, cable and hardware, they also furnished the financing through their leasing department for the Sullivan operation — a total of $350,000. "This is the first time a system has been leased through a distributor," stated Roy Lee, **North's** Leasing Manager.

MVC President Bill Bagley and **North Supply Sales** Representative Rod Smith worked closely during the months of construction to assure that work progressed

MVC is a full service organization. Vans are readied to serve all subscribers.

smoothly, so that the systems would be ready to service the communities on the promised date.

A total of 8,000 homes have been passed with 4600 subscriptions on-air. In Sullivan alone, 2600 homes were passed with 1000 subscribers. Approximately 1300 subscribers are projected at the end of one year's service in the Sullivan area. MVC boasts an exceptional 94% of pay tier takers, far above the national average. In one system, this average is 120% and it's only been on the air three months.

With companies like Meramec Valley Communications around, rural areas like Sullivan, Missouri, don't have to wait long for service and commitment to the progress of their communities, and North Supply played a big part in this progress. □

Klungness Electronic Supply Company

(KES), distributors of CATV systems and supplies, has opened a new distribution center in Indianapolis, Indiana. This new fully stocked warehouse will supplement the KES Iron Mountain, Michigan facility and allow KES to provide faster, more efficient service to the cable television industry. This new facility is the first of several such distribution centers planned for other key market locations. For faster service in that area, give Klungness in Indianapolis a call. □

Winegard Company has announced their new expanded line of earth station products. **Winegard** is offering four complete, commercial grade quality earth station packages ranging in list price from $7995 to $10,600. Each package includes two LNA's, 24 channel tuneable receiver, polar mount, dual-polarized feed and segmented fiberglass antenna. Combination packages of 10-foot and 12-foot antennas and 120° and 100° LNA's are available. Customers can also buy components separately.

In addition to the earth station packages, Winegard has demonstrator units available for site surveys. These are complete earth station packages including trailers.

For more information contact John Schweizer, Satellite Communications Manager, Winegard Company, 3000 Kirkwood St., Burlington, Iowa 52601. □

New Comsearch Lab

Comsearch, Inc., of Falls Church, Virginia announces that as of March 1, 1982 the Electromagnetic and Environmental Control (EMEC) division will be performing EMI/EMC measurements in the company's new electronic laboratory.

The laboratory will contain a 10' x 12' shielded enclosure. The EMEC division will perform MIL-STD-461, VDE, FDA tests for medical instrumentation, special EMI tests and FCC testing in the laboratory.

For more information regarding scheduling and rates contact Les Polisky at 703-356-9470 or 800-336-3382.

Comsearch, Inc. also provides engineering services for frequency coordination of satellite earth stations and terrestrial point-to-point microwave systems. □

SCIENTIFIC ATLANTA SCHEDULES SATELLITE COMMUNICATIONS SYMPOSIUM '82

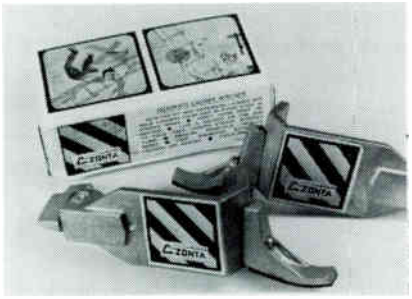
Scientific-Atlanta will sponsor the Satellite Communications Symposium '82 November 1-3, 1982, with pre-registration on the evening of October

31st. This will be held in downtown Atlanta at the Marriott Hotel.

For additional information concerning the schedule on business communications via cable and satellite, contact Betsy Crawley (404) 449-2274 or John Feight, Manager of the Marketing Communications Division of Scientific Atlanta (404) 441-4000, or write One Technology Parkway, Box 105600, Atlanta, Georgia 30348. □

Ladder Security Device - "GZONTAS"

The Drop Shop Ltd. is marketing "GZONTAS": a ladder security device to prevent ladders from falling left or right due to weight shifts or strong wind. GZONTAS affix to the side rails of a ladder with feet designed to rest on the roof, gut-



ter or any flat horizontal surface. This prevents the ladder from traveling a curved path to the ground. The stability of the structure is imparted to the ladder through the action of the GZONTA which utilizes the roof as a stop. This device is an excellent addition to strand hook feet for extra personal safety.

For more information please call **The Drop Shop** sales staff at (800) 526-4100 or call collect (201) 241-9300. □

Communications Supply Announce New Low-Cost Remote Converter a

Communications Supply, Inc. has announced a new remote CATV converter offering full-feature performance at low cost, and the first in a series of products designed to secure premium service television signals.

The **MRI Remote Converter** Incorporates a reliable, field-proven 36-channel converter unit, and an attractive corded remote control. The rugged, dial-operated channel selector features long-life, low wear characteristics. A low unit cost of $34.95 makes the MR1 ideally suited to mass installation in new franchise situations, or as a second set converter for existing customers.

The new multi-tier S.T.A.R.S. (Scrambling, Tiering and Recovery System) incorporates horizontal interval scrambling leaving the vertical interval untouched and available for future services. The STS2000 Scrambler requires only video and IF inputs for complete operation.

The programmable STR200 Descrambler is compatable with standard CATV converters and will secure an unlimited number of channels with up to eight levels of tiering combinations. A sophisticated proprietary coding chip is used to provide a uniquely high level of security.

Optional features include an STC2200 System Controller which ensures inter-tier incompatability in multi-tier operation. The head-end main frame can accommodate eight scramblers, one power supply and one data processor interface for future addressability.

The MRI Remote Converter and S.T.A.R.S. are distributed exclusively by Communications Supply Inc., P.O. Box 1538, West Chester, PA 19380. 800-345-8266 (US) 800-662-2428 (PA only). □

VITEK DEVELOPS 14 CHANNEL BLOCK CONVERTER

VITEK's new 14 channel block converter provides an inexpensive way for cable systems to upgrade to 26 channel capacity. This dual block inverted carrier converter utilizes one block of 7 mid-band channels and another block of 7 super-band channels.

This rugged unit features:
Fine Tuning Control
Totally Shielded R.F. Module
Power Supply Regulator I.C.

The model TC-2 is available in beige with a walnut grain accent and measures only 2" x 7" x 6" and weighs less than 2 lbs. The price range is $20-25., depending upon quantity ordered; the unit is available immediately.

VITEK Electronics Inc. is a subsidiary of Augat, Inc. and is a primary supplier to the CATV industry. For more information contact:

Joe Griffin
Vice President, Marketing
VITEK, Electronics Inc.
Four Gladys Court
Edison, New Jersey 08817
(201) 287-3200 □

Microdyne Develops New Technique For Parabolic Antennas

Microdyne Corporation today announced the development of a new cost effective manufacturing technique for its parabolic antennas. The technique was developed by Microdyne's antenna subsidiary, Antennas for Communications.

The process is a vaccum assisted, resin-injected technique. This method of manufacture results in a substantial reduction in labor costs. AFC's accomplishment was acknowledged at the 37th Annual Conference of the SPI Reinforced Plastics/Composite Institute by the award of first place in the Electrical/Electronics Division.

Management is optimistic that the cost effectiveness of this process and of the new products yet to be introduced, will help maintain margins and also strengthen Microdyne's competitive position.

Microdyne's corporate office is located in Ocala, Florida, with manufacturing facilities in Rockville and Cumberland, Maryland; for more information contact them at P.O. Box 7213, Ocala, Florida 32672 or call (904) 687-4633. □

Associate Roster

Alpha Technologies, 1305 Fraser St. D-G, Bellingham, WA 98225 (**M9, Standby Power Supplies**) 206—671-7703
AMCOM, Inc., Bldg. E, Suite 200, 5775 Peachtree-Dunwoody Rd., N.E., Atlanta, GA 30342 (**S9, Brokering & Consulting**) 404—256-0228
Amplica, Inc., 950 Lawrence Dr., Newbury Park, CA 91320 (**M4**) 805—498-9671
Anixter-Pruzan, Inc., 4711 Golf Road, Skokie, IL 60076 (**D1**) 312—677-2600
The Associated Press, 50 Rockfeller Plaza, New York, NY 10020 (**S9 Automated News SVC**) 212—262-4014
Avantek, Inc., 481 Cottonwood Dr., Milpitas, CA 95035 (**M8, 9 TVRO Components**) 408—946-3080
B E I (Beston Electronics, Inc.), P.O. Box 937, Olathe, KS 66061 (**M9 Character Generators**) 913—764-1900
Belden Corp., Electronics Division, P.O. Box 1980, Richmond, IN 47374 (**M3**) 317—966-6661
Broadband Engineering, Inc., P.O. Box 1247, Jupiter, FL 33458 (**D9, replacement parts**) 1-800-327-6690
Broadcast Equipment Leasing, 7 Wood Street, Pittsburgh, PA 15222 (**S3**), 412—765-0690
Budco, Incorp., 4910 East Admiral Place, Tulsa, OK 74115, (**D9, Security & Identification Devices**), 800-331-2246
CATEL-Division of United Scientific Corp., 1400-D Stierling Rd., Mountain View, CA 94043, 415—969-9400
C-COR Electronics, Inc., 60 Decibel Rd., State College, PA 16801 (**M1, M4, M5, S1, S2, S8**) 814—238-2461
CBS Cable, 1211 Avenue of the Americas, 2nd Floor, New York, NY 10019 (**S4**) 212—975-1766
CCS Hatfield/CATV Div., 5707 W. Buckeye Rd., Phoenix, AZ 85063 (**M3**) 201—272-3850
CRC Electronics, Inc., 2669 Kilihau St., Honolulu, HI 96819 (**M9 Videotape & Headend Automation Euipment**) 808—836-0811
CWY Electronics, 405 N. Earl Ave., Lafayette, IN 74904 (**M9, D1**) 317—447-4617
CableBus Systems Corporation, 7869 S.W. Nimbus Avenue, Beaverton, OR 97005, (**M1**) 503—543-3329
Cable-Text Instruments Corp., 705 Avenue K, Suite #4, Plano, TX 75074 (**M9 Generators**) 214—422-2554
Cable TV Supply Company, 5933 Bowcroft Street, Los Angeles, CA 90016 (**D1, D2, D3, D4, D5, D6, D7, D8, M5, M6**) 213—204-4440
Century III Electronics, Inc., 3880 E. Eagle Drive, Anaheim, CA 92807 (**M1, M3, M4, M5, M7, M8, S1, S2, S8**) 630-3714
Capscan, Inc., P.O. Box 36, Adelphia, NJ 07710, (**M1, M3, M4, M5**)
Channel Master, Div. of Avnet, Inc., Ellenville, NY 12428 (**M2, 3, 4, 5, 6, 7**) 914—647-5000
Collins Commercial Telecommunications, MP-402-101, Dallas, TX 75207 (**M9, Microwave**) 214—690-5954
Comm/Scope Company, Rt. 1, Box 199A, Catawba, NC 28609 (**M3**) 704—241-3142
Communications Equity Associates, 651 Lincoln Center, 5401 W. Kennedy Blvd., Tampa FL 33609 (**S3**) 813—877-8844
Communications Supply/Communications Construction, Inc., 319 J Westtown Rd., P.O. Box 1538, West Chester, PA 19380, (**D1, 3, 4, 5, 6, 7, 8, 9, S1, 2, 8, 9**) 800—345-8286
Computer Video Systems, Inc., 3678 W. 2105 S. Unit 2, Salt Lake City, UT 84120 (**M9**) 801—974-5380
ComSearch Inc., 7633 Leesburg Pike, Falls Creek, VA 22043 (**S8, S9, Earth station placement frequency coordination**) 703—356-9470
ComSonics, Inc., P.O. Box 1106, Harrisonburg, VA 22801 (**M8, M9, S8, S9**) 703—434-5965
DF Countryman Co., 1821 University Ave., St. Paul, MN 55104 (**D1, S1, S8**) 612—645-9153
Davco, Inc., P.O. Box 861, Batesville, AR 72501 (**D1, S1, S2, S8**) 501—793-3816
Ditch Witch, P.O. Box 66, Perry, OK 73077, (**M9**), 405—336-4402
The Drop Shop Ltd., Inc., Box 284, Roselle, NJ 07203 (**D3, 4, 5, 6, 7, 8, 9, M5, 6, 7, 8, 9 Plastics**) 800—526-4100
Durnell Engineering Inc., Hwy 4 So. Emmetsburg, IA 50536 (**M9**) 712—852-2611
Eagle Com-Tronics, Inc., 4562 Waterhouse Rd., Clay, NY 13041 (**M9 Pay TV Delivery Systems & Products**) 313—622-3402 and 800-448-7474
Eales Comm & Antenna Serv., 2904 N.W. 23rd, Oklahoma City, OK 73107 (**D1, 2, 3, 4, 5, 6, 7, S1, 2, S7, 8**) 405—946-3788
Eastern Microwave, Inc., 3 Northern Concourse, P.O. Box 4872, Syracuse, NY 13221 (**S4**) 315—455-5955
Electroline TV Equipment, Inc., 8750-8th Ave., St. Michel, Montreal, Canada H1Z 2W4 (**M4, 5, 7, 9, D7, 9**) 514—725-2471
Electron Consulting Associates, Box 2029, Grove, OK 74344, (**M2, D1, S1, 8**) 918—786-5349
Entertainment and Sports Programming Network, ESPN Plaza, Bristol, CT 06010 (**S9**) 203—584-8477
Ferguson Communications Corp., P.O. Drawer 1599, Henderson, TX 75652 (**S1, 2, 7, 8, 9**) 214—854-2405
Franey & Parr of Texas, Inc., (Formerly Doherty & Co.), One Turtle Creek Village, Suite 524, Dallas, TX (**S9, Insurance**) 214—528-4820
GTE Products Corp., Sylvania CATV Trans. Systems, 10841 Pellicano Dr., El Paso, TX 79935 (**D7, M4, M5, M6, S4, S8**) 800—351-2345
Gardiner Communications Corp., 1980 S. Post Oak Rd., Suite 2040, Houston, TX 77056 (**M9 TVRO Packages, S1, S2, S8**) 713—961-7348
General Cable Corp., 1 Woodbridge Center, P.O. Box 700 Woodbridge, NJ 07095 (**M3**) 201—636-5500
Gilbert Engineering Co., P.O. Box 23189, Phoenix, AZ 85063 (**M7**) 1-800-528-5567, TWX 910-951-1380
Harris Corporation-Satellite Communications Division, P.O. Box 1700, Melbourne, FL 32901 (**M2, M9, S2**) 305—724-3401
Heller-Oak Communications Finance Corp., 105 W. Adams St., Chicago, IL 60603 (**S3**) 312—621-7661
Hoarty & Raines Assoc., Inc., 8637 O'Neal Rd., Raleigh, NC 27612 (**S7, S9 Consultants**) 919—781-1734
Home Box Office, Inc. 7839 Churchill Way—Suite 133, Box 63, Dallas, TX 75251 (**S4**) 214—387-8557
Hughes Microwave Communications Products, 3060 W. Lomita Blvd., Torrance, CA 90505 (**M9**) 213—517-6233
Jerry Conn Associates, Inc., P.O. Box 444, Chambersburg, PA 17201 (**D3, D4, D5, D6, D7, D8**) 717—263-8258
KMP Computer Services, Inc., 703 Central Ave., Los Alamos, NM 87544, (**S4, 5**) 505—662-5545
Karnath Corporation, 2001 Westridge, Plano, TX 75075 (**S1, 2, 8, 9**) 214—422-7981 or 7055
Katek, Inc., 134 Wood Ave., Middlesex, NJ 08846 201—356-8940
Klungness Electronic Supply, P.O. Box 547, 107 Kent Street, Iron Mountain, MI 49801 (**D1, D8, S2, S8**) 906—774-1755
LRC Electronics, Inc., 901 South Ave., Horseheads, NY 14845 (**M7**) 607—739-3844
Larson Electronics, 311 S. Locust St., Denton, TX 76201 (**M9 Standby Power**) 817—387-0002
Lemco Tool Corporation, Box 330A, Cogan Station, PA 17728 (**M6, 9 Tools**) 717—494-0620

Distributors	Manufacturers	Service Firms
D1—Full CATV equipment line	M1—Full CATV equipment line	S1—CATV contracting
D2—CATV antennas	M2—CATV antennas	S2—CATV construction
D3—CATV cable	M3—CATV cable	S3—CATV financing
D4—CATV amplifiers	M4—CATV amplifiers	S4—CATV software
D5—CATV passives	M5—CATV passives	S5—CATV billing services
D6—CATV hardware	M6—CATV hardware	S6—CATV publishing
D7—CATV connectors	M7—CATV connectors	S7—CATV drop installation
D8—CATV test equipment	M8—CATV test equipment	S8—CATV engineering
D9—Other	M9—Other	S9—Other

Lester Kamin & Company, 2020 North Loop West, Suite 111, Houston, TX 77018 (**S9 Brokers, Consultants**) 713—957-0310
Lindsay Specialty Products, Ltd., 50 Mary Street West, Lindsay, Ontario, Canada, K9V 4S7 (**M1, 2, 4, 5, 7, 9**) 705—324-2196
Magnavox CATV Division, 100 Fairgrounds Drive, Manlius, NY 13104 (**D4, 5, 7, M4, 5, 6, 7, S3, 8**) 315—682-9105
McCullough Satellite Systems, P.O. Box 57, Salem, AR 72576 (**M2, 9, D3, 4, 6, 7**) 501—895-3167
Microdyne Corporation, 471 Oak Road, Ocala, FL 32672 (**M9 Satellite TV Receivers**) 904—687-4633
Microwave Associates Communications Co., 777 S. Central Expwy., Suite 1G, Richardson, TX 75080 (**M9 Microwave Radio Systems**) 214—234-3522
Microwave Filter Co., 6743 Kinne St., Box 103, E. Syracruse, NY 10357 (**M5 Bandpass Filters**) 315—437-4529
Midwest Corp., CATV, Divn., P.O. Box 226, Clarksburg, W. VA. 26301 (**D1, 2, 3, 4, 5, 6, 7, 8**) 304—624-5459
Miralite Corp., 1012 Brioso, Suite 201, Costa Mesa, CA 92627 (**M2**) 714—851-9000
Modern Cable Programs, 5000 Park St. N., St. Petersburg, FL 33709 (**S4**)
National Com-Service, Inc., 2255-E Wyandotte Rd., Willow Grove, PA 19090 (**D1, 2, S8, 9 repair service**) 215—657-4690
National Screen Service Corp., 1600 Broadway, New York, NY 10019 (**M9**) 212—246-5700
North Supply Company, 10951 Lakeview Ave., Lenexa, KS 66219 (**D1, 2, 3, 4, 5, 6, 7, 8**) 913—888-9800
Oak Industries Inc/CATV Div., Crystal Lake, IL 60014 (**M1, M9 Converters, S3**) 815—459-5000
Octagon Scientific, Inc., 476 E. Brighton Ave., Syracuse, NY 13210 (**M9**) 315—476-0660
Power and Telephone Supply Company, Inc., 530 Interchange Drive N.W., Atlanta, GA 30336 (**D1**) 404—691-6813
Prodelin, Inc., 1350 Duane Avenue, Santa Clara, CA 95050 (**M2, M3, M7, S2**) 408—244-4720
Pyramid Industries, Inc., P.O. Box 23169, Phoenix, AZ 85063 (**M7, 8**) 602—269-6431
Q-BIT Corporation, P.O. Box 2208, Melbourne, FL 32901 (**M4**) 305—727-1838
RMS CATV Division, 50 Antin Place, Bronx, NY 10462 (**M4, M5, M6, M7, M9**), 212-892-1000
Reuters, 1212 Avenue of the Americas, 16th Floor, New York, NY 10036 (**D9**) 212—730-2715
Rockwell International, Collins Transmission Systems Division, M.S. 402-101, Dallas, TX 75207 (**M9, Microwave/Satellite**) 214—996-5954
S.A.L. Communications, Inc., P.O. Box 794, Melville, NY 11747 (**D1**) 516—694-7110
Sadelco, Inc., 75 West Forest Ave., Englewood, NJ 07631 (**M8**) 201—569-3323
Scientific Atlanta Inc., 3845 Pleasantdale Rd., Atlanta, GA 30340 (**M1, M2, M4, M8, S1, S2, S3, S8**) 404—449-2000
Shafer Associates, Inc., 9501 Briar Glen Way, Gaithersburg, MD 20760 (**S9, consultant**) 301—869-4477
Showtime Entertainment inc., 1633 Broadway, NY 10019 (**S4**) 212—708-1600
Southern Satellite Systems, Inc., P.O. Box 45684, Tulsa, OK 74145 (**S9**) 918—481-0881
Station Business Systems, 600 West Putnam, Greenwich, CT 06830 (**S4, 5, 9**) 203—622-2400
T.E.S.T., Inc., 16130 Stagg St., Van Nuys, CA 91409 (**M9 Encoders & Decoders**) 213—989-4535
TV Guide, Radnor, PA 19088 (**D9**) 215—293-8500
TeleCom Systems, Inc., P.O. Box 5214, Charlotte, NC (**S1, 2, 7, 8, 9**) 704—332-6064
Teledac, In., 1575 Tascherean Blvd., Longuevil, Quebec, Canada J4K 2X8 (**M9 Character Generators**) 514—651-3716
Tele-Wire Supply Corp., 122 Cutter Mill Rd., Great Neck, NY 11021 (**D1, 2, 3, 5, 6, 7, 8, 9**) 516—829-8484
Texscan Corp. 2446 N. Shadeland Ave., Indianapolis, IN 46219 (**M8 Bandpass Filters**) 317—357-8781
Theta-Com CATV, Division of Texscan Corporation, 2960 Grand Avenue, Phoenix, AZ 85061 (**M1, M4, M5, M7, M8**) 602—252-5021
Times Wire & Cable Co., 358 Hall Avenue, Wallingford, CT 06492 (**M3**) 203—265-2361
Tocom, Inc., P.O. Box 47066, Dallas, TX 75247 (**M1, M4, M5, Converters**) 214—438-7691
Tomco Communications, Inc., 1145 Tasmin Dr., Sunnyvale, CA 94086 (**M4, M5, M9**)
Toner Cable Equipment, Inc., 969 Horsham Rd., Horsham, PA 19044 (**D2, D3, D4, D5, D6, D7**) 800—523-5947, In Penna. 800—492-2512
Triple Crown Electronics Inc., 42 Racine Rd., Rexdale, Ontario, Canada, M9W 2Z3 (**M4, M8**) 416—743-1481
Turner Communications Corp. (WTBS-TV) 1050 Techwood Dr., Atlanta, GA 30318 404—898-8500
Tyton Corp., P.O. Box 23055, Milwaukee, WI 53223 (**M6, 7**) 414—355-1130
USA Network, 208 Harristown Rd., Glen Rock, NJ (**S4**) 201—445-8550
United Press International, 220 East 42nd St., New York, NY 10017 (**S9 Automated News Svc.**) 212—682-0400
United States Tower & Fab Co., P.O. Box 1438, Miami, OK 74354 (**M2, M9**) 918—257-4257
United Video, Inc., 5200 S. Harvard, Suite 4-D, Tulsa, OK 74135 (**S9**) 918—749-8811
VU-TV, Inc., 4201 N. 16th St. #250, Phoenix, AZ 85016 (**S4**) 602—277-8888
Van Ladder, Inc., P.O. Box 1557, Spencer, IA 51301 (**M9, Automated Ladder Equipment**) 712—262-5810
Video Data Systems, 40 Oser Avenue, Hauppauge, NY 11787 (**M9**) 516—231-4400
Viewstar, Inc., 705 Progress Ave., Unite 53, Scarborough, Ontario, Canada M1H 2X1 (**M9 Cable Converter**) 416—439-3170
Vitek Electronics, Inc., 4 Gladys Court, Edison, NJ 08817 201—287-3200
Warner Amex Satellite Entertainment Corporation, 1211 Avenue of the Americas, New York, NY 10036, (**S4**) 212—944-4250
Wavetek Indiana, 5808 Churchman, Beech Grove, IN 46107 (**M8**) 800—428-4424 TWIX 810—341-3226
Weatherscan, Loop 132, Throckmorton Hwy., Olney, TX 76374 (**D9, Sony Equip. Dist., M9 Weather Channel Displays**) 817—564-5688
Western Communication Service, Box 347, San Angelo, TX 76901 (**M2, Towers**) 915—655-6262/653-3363
Winegard Company, 3000 Kirkwood Street, Burlington, IA 52601 (**M1, M2, M3, M4, M5, M7**) 319—753-0121

Note: Associates listed in bold are Charter Members.

classycats

Classy-Cat advertising is offered as a service by CATA for its membership. ANY member of CATA may advertise in the Classy-Cat section FREE of CHARGE (limit of 50 words per issue - 3 issues per year.)

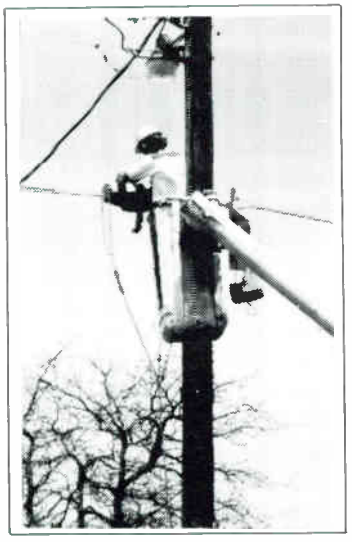
CATA offers three types of memberships:

1.) Systems - paying regular monthly dues based on number of system subscribers.
2.) Associate Members - pay an annual fee.
3.) Individual Members - pay an annual fee.

NON MEMBERS may also use the Classy-Cat section at the rate of 50 cents per word with a minimum charge of $20.00 . Add $2.00 for blind-box. Non-members should include full payment with the ad insertion.

Deadlines for all Classy-Cats is the 1st of the month for the following month,s issue.

Address all Classy-Cat material to: CATJ, Suite 106, 4209 NW. 23rd, Oklahoma City, Okla. 73107.



ATTENTION!

SYSTEM MANAGERS — TECHNICIANS NEEDED

Excellent opportunity for system managers and technicians for our systems in Colorado, Texas, and Oklahoma. Need qualified personnel for these Southwestern locations; good working conditions and opportunity for the right people who want to work and stay actively involved in the cable business. These systems have good equipment to work with and offer excellent situations to grow in the cable business. If interested, send resume to the box number indicated below.

Box 71080
c/o CATJ
4209 N.W. 23rd
Suite 106
Okla. City, OK 73107

FOR SALE

60 (VIKON-CORAL) FUTURA 12 AMPS (18 trunk line and 42 Full Stations) - plus 110 Line Extenders; also have 5-30 volt pole mounted power supplies and 25CAS 237 28DB gain amps - plus many spare modules, splitters, taps, etc. $10,000 for the lot or deal separately. **(614) 753-2686.**

FOR SALE

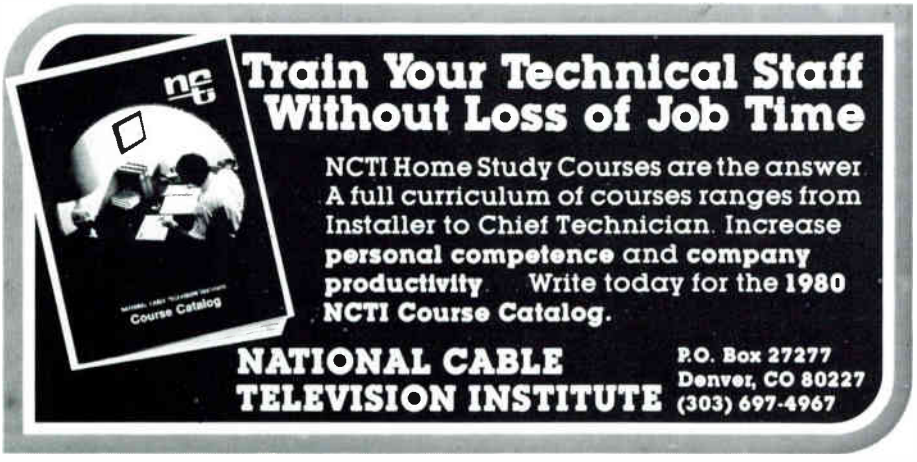
Surplus Commscope Parameter I Cable Jacketed, Copper clad
108,000 FT. - .412
177,500 FT. - .500
77,500 FT. - .750
Full Length Reels - Not partials.
Harte-Hanks Cable
Box 898
Katy, TX 77449
ATTN: Martin J. Walker
(713) 578-0525

Disbanding MATV service selling tower, strip amplifiers, converters, band pass filters and passive devices. **Call Doris Berger at 716-773-4065. Write P.O. Box 188, Grand Island, New York, 14072.**

MANAGER/TECH

In addition to management skills, the job requires someone with strong technical experience in system maintenance, headend work and system proofs. Excellent salary and benefits.

Send resume to:
P.O. Box 857
Rolla, Mo. 65401



IRS TAX TIP

On Tax Credits

Home Energy-Savings Credit—If you paid for insulation or other energy-saving devices, you may be able to claim a credit for these expenses.

Check your tax instructions for details.

A public service message from the Internal Revenue Service

ADD UNLIMITED PAY CHANNELS TO YOUR SYSTEM WITHOUT LOSING YOUR INVESTMENT IN CONVERTERS.

Now, That's The Ticket!

If you're like most cable systems, you've spent almost $225,000 on converters. Don't throw away that investment! With Eagle's Descrambler, you can add 15 tiers of service and unlimited channels to your system using your present converter.

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