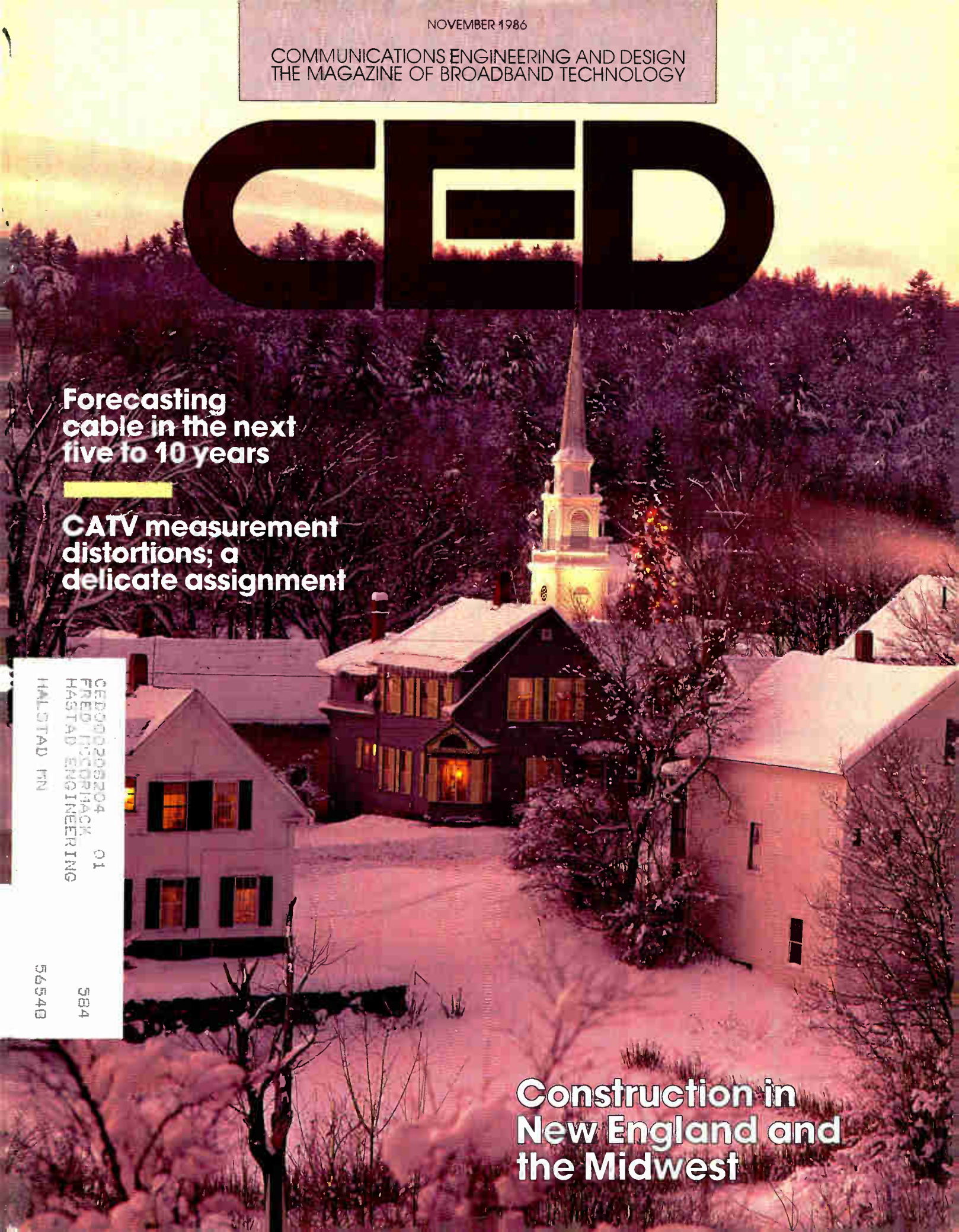
NOVEMBER 1986

COMMUNICATIONS ENGINEERING AND DESIGN
THE MAGAZINE OF BROADBAND TECHNOLOGY

CED



Forecasting cable in the next five to 10 years

CATV measurement distortions; a delicate assignment

Construction in New England and the Midwest

POWERDOUBLING™ FROM MAGNAVOX

First and still the best

When you needed a high-performance technology, we developed PowerDoubling. Your enthusiastic response has made PowerDoubling so successful others have tried to copy it. But they can't match our equipment's performance.

PowerDoubling from Magnavox provides twice the power output so you can use more gain without sacrificing quality. Since PowerDoubling has the highest compression point of any hybrid, you can also increase reach.

More bandwidth lets you offer customers more choice, including 550/600 MHz. And our bypass option ensures signal reliability.

All this performance is cost effective too:

- Often no need to change trunk spacings or move amplifiers.
- A high-efficiency switch-mode power supply to save on power bills.
- Compatible with most existing systems, so you can upgrade economically.
- As easy to install and maintain as our conventional amplifiers.

Find out about PowerDoubling from Magnavox. Because the first is still the best. Ask your Magnavox account executive, or call toll-free 800-448-5171 (in NY State 800-522-7464; Telex 937329).

Magnavox CATV SYSTEMS, INC.

Magnavox CATV Systems, Inc.
A North American Philips Company
100 Fairgrounds Drive
Manlius NY 13104
Reader Service Number 1

TRILOGY LEADS IN TECHNOLOGY:

That unique achievement resulted in the only coaxial cable with 93% velocity of propagation. Which means the lowest attenuation over the longest distances. It means fewer amplifiers in new installations, and stronger signals with less noise in rebuilds and upgrades. Cost-effectiveness in all situations is significant.

And the polyethylene sleeve—totally bonded to sheath and disc spacers—assures superior handling characteristics. With MC², you don't have to trade off signal strength for tight bends and ruggedness.

Trilogy
COMMUNICATIONS INC.

Reader Service Number 2

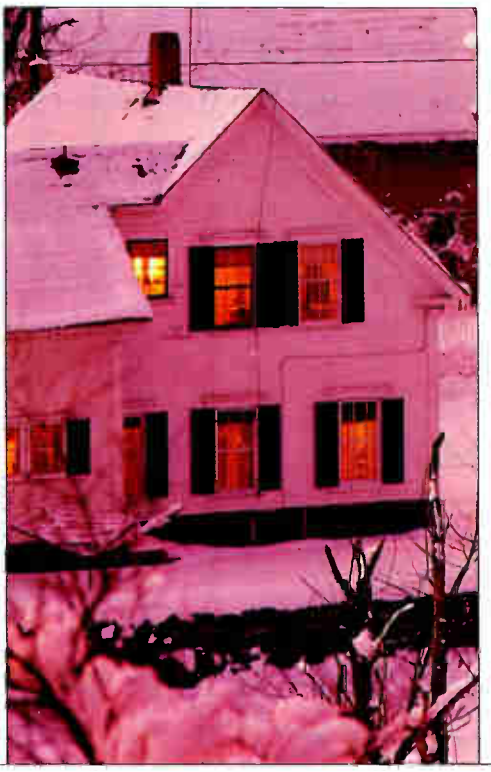
Call or write for a free sample and brochure:
TRILOGY COMMUNICATIONS INC. • 2910 Highway 80 East, Pearl, Mississippi 39208 800-874-5649 601-939-4461

Please see us at the Western Show Booth #1154

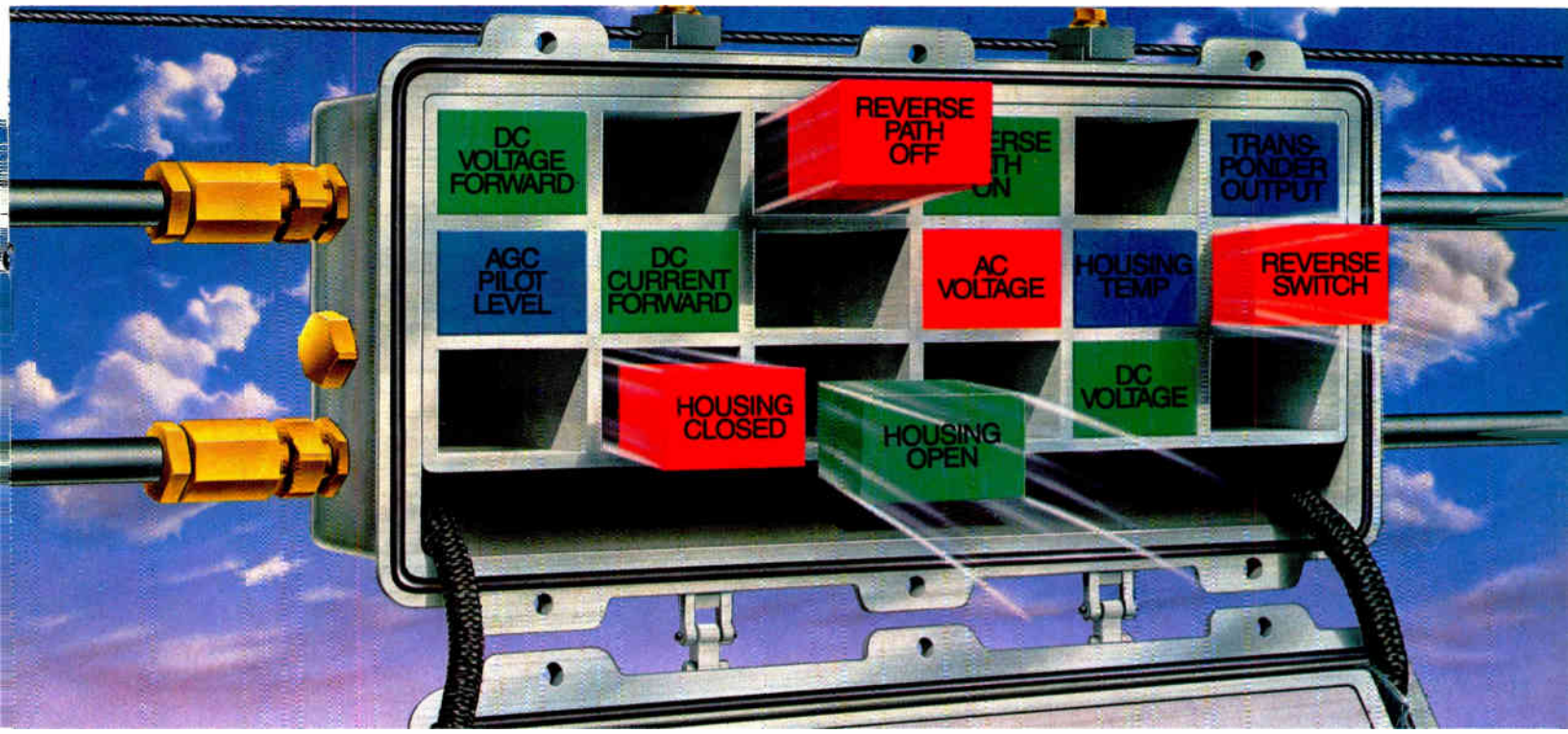
CED

November 1986 Volume 12, Number 11

 CED. (USPS 300-510) (ISSN 0191-5428)is published monthly by International Thomson Communications Inc., 600 Grant St., Denver, CO 80203. November 1986, Volume 12, Number 11. Subscriptions free to qualified industry readers. All other one-year subscriptions are $26, prepaid in U.S. funds only. Second-class postage paid at Denver, CO. and additional mailing offices. *CED* is published on behalf of the cable television and broadband communications industries. POSTMASTER: Please send address changes to P.O. Box 5208 T.A., Denver, Colorado 80217. MEMBERS OF THE BPA.



About the cover
Winter in New England makes a good setting to start the CED *four-part construction survey. Photo provided by Shostal Associates Inc.*



MULTIPLE CHOICE MONITORING.

INTRODUCING THE FIRST FLEXIBLE STATUS MONITORING SYSTEM.

At Scientific-Atlanta, we think you should be able to monitor the functions of your distribution system that are important to you. That's why our new 6585 Status Monitoring System lets you monitor or control up to 21 functions of your choice and define the operating parameters of each one. No more pre-determined, preset functions.

CHOOSE FLEXIBILITY.

The 6585 Status Monitoring System is easy to use because you only buy the features you need. And you can always upgrade later. Begin with the basic system: an IBM® PC/XT, color monitor, printer and software; an RF subsystem to interface the computer with the cable system; and 2-way transponder modules, circuit boards and switches which snap in and out of the trunk station housing for quick installation, changes or upgrades.

CHOOSE SERVICEABILITY.

The 6585 System helps you manage your maintenance and repair resources for maximum efficiency. Complete, real-time system monitoring and reporting give you the power to perform trend analyses on key operating parameters such as power supply voltages, swings in AGC range, and internal housing temperatures. Right in your office. And if you already have a Scientific-Atlanta distribution system, installing our status monitoring is usually as easy as snapping in our status monitoring modules.

CHOOSE PROFITABILITY.

Greater control means greater profits. The 6585 continuously polls up to 2048 Scientific-Atlanta distribution trunk stations and automatically identifies potential trouble spots before they become expensive problems. That reduces fault-finding time and trouble-shooting costs dramatically.

CHOOSE ALL OF THE ABOVE.

How did we manage to offer so much in a status monitoring system? Simple: we asked people like you what they wanted to monitor and control. Then we built a system that gives them a choice. We can give you a choice, too. For more information on our status monitoring equipment, other distribution products, or any of our full line of cable products, call us at **1-800-722-2009** or write to: Scientific-Atlanta, Dept. AR, P.O. Box 105027, Atlanta, GA 30348.

Scientific Atlanta

VISIT US AT THE WESTERN SHOW, BOOTH 904.

Reader Service Number 3

Len Ecker

Ecker cites training biggest industry ill

"The cable industry is not technically competent to do the job that is necessary to be done. I don't think the technician in the cable industry has gotten the kind of recognition which he deserves, nor has he gotten the attention from his principals concerning how much he knows and what he needs to know."

Chances are, you know the man who made that statement, because he probably taught you how to understand a cable system. If you don't know him, you've probably at least heard of him. He's Len Ecker, a cable pioneer and present-day consultant who has more than 35 years of cable television experience.

Like a father who has watched his son grow up and then go astray, Ecker has taken the role of industry gadfly, unafraid to speak his mind in the hopes that his criticism will incite both change and growth in the areas he considers important. And the subject he gets most exercised about—the lack of adequate technician training—relates directly to the level of technical knowledge and competence presently found among lower-level cable technicians.

And he knows what he's talking about. Ecker has been teaching Jerrold technical training seminars off and on for about 30 years. During that time, he's presided over more than 300 seminars and figures he's "talked to just about everybody in the cable industry."

A Georgia Tech graduate, Ecker got his start in the cable industry in 1950 when he built his own cable system in South Williamsport, Pa. While employed elsewhere, Ecker and his wife were visiting his wife's hometown when he became acquainted with a man who was looking for an engineer to assist in building a cable system. Ecker decided to take on the task and although his partner promptly left, Ecker built the system anyway. He says he was the first person to use solid aluminum shield cable (in 1952) and was the first to offer a broadband five-channel system.

He then turned his attention to consulting, designing and constructing other systems in Nevada, Texas, West Virginia and other Pennsylvania communities before going to Jerrold in 1956 as a bench engineer.

Getting into a developing industry on the ground floor provided ample opportunity for Ecker to be involved in a number of "firsts" that later, upon reflection, came to be considered significant industry developments. In his early years at Jerrold, Ecker helped design the first broadband sweep generator and assisted in the development of what was, essentially, an impulse pay-per-view system. Dubbed Program-by-Program Billing, or PBPB, the system generated interest from Hollywood but was never used because the early subscription TV service it was designed for "went down the drain before we finished it (PBPB)," Ecker says.

In 1962, Jerrold was commissioned by the FCC to study the feasibility of using UHF channels for broadcast television. Ecker served as project manager of the year-long study in New York City that ultimately resulted in the FCC order mandating that all TVs be able to tune both VHF and UHF channels by 1965.

Because of that involvement with the FCC, Ecker often became involved in other committee work. Looking out for cable's best interests, Ecker helped quash a proposal that would have assigned unused channels to the mobile radio group. "In the early days of cable, most systems were fringe-area systems and had they (FCC) decided to turn over to the mobile people those channels which weren't used in the precise area (the system was in), cable would've died on the spot, I think."

After brief stints as plant test engineer and plant manager for microwave products, Ecker returned to Jerrold's headquarters to form the first international field engineering force, responsible for servicing Jerrold equipment in such exotic places as Saudi Arabia, Belgium, England and Venezuela. Closer to home, his staff was responsible for proofing out systems installed by General Motors, the CIA and Dow Chemical, among others. Before retiring from Jerrold in October 1982 to once again turn his attention to consulting, Ecker formed the application engineering department to act as a liaison between the marketing and engineering staffs.

Even though he is no longer a Jerrold employee, the company remains one of his biggest clients. And he continues to teach training seminars.

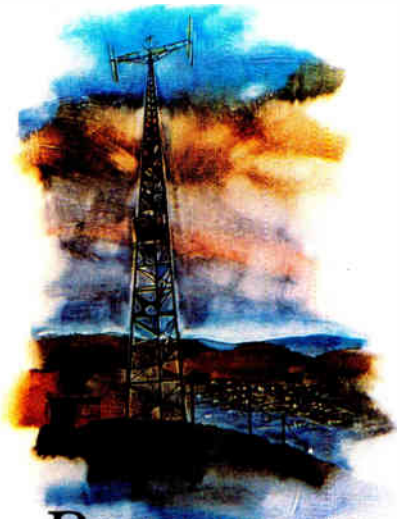
Although the subject matter covered in the classroom has changed because of hardware innovations, the overall goal remains the same. "Fundamentally, my seminar provides the working technician with enough information to do his job better," says Ecker. "I try to give him a total understanding of what a cable system is all about and how it works so that he can work up a program as to how to do his job best."

It is this classroom experience that has given Ecker keen insight into the state of technical knowledge within the industry. He finds major fault among entry-level technicians. "It's appalling to find out that many technicians have never heard of Ohm's Law. It's difficult to really do a good job training a technician if he doesn't have an electronics background." Consequently, he urges his students to get a good, formal education before entering the industry. "This industry certainly isn't hi-tech, but so much of it is now based on computers that the guys really need to have some background in that stuff."

The organizations making an attempt to improve technical knowledge

Remember when 20, 12-even 5 channels were your maximum potential? Now...

Rebuilding? Save Money With JERROLD



Remember, back in 1951, when TV stations were low in power and antennas not very efficient? Milton Jerrold Shapp, the founder of Jerrold, didn't realize he was helping to create a new industry when he developed an amplifier that Bob Tarlton needed for his Lansford, PA community antenna system.

Cable was new, but it grew rapidly. And Jerrold grew with it, developing improved amplifiers, channel equipment, and numerous innovations that increased revenue potentials for operators, and established Jerrold as the leading supplier in the industry.

Expand the bandwidth of your system - and your revenue-producing channel potential - simply by dropping in Jerrold STARLINE® SJ-330 modules. This quick and easy upgrade to 330 MHz can help you maximize your revenues and requires:

- No respacing of trunk amplifiers
- No major equipment costs
- No prolonged construction

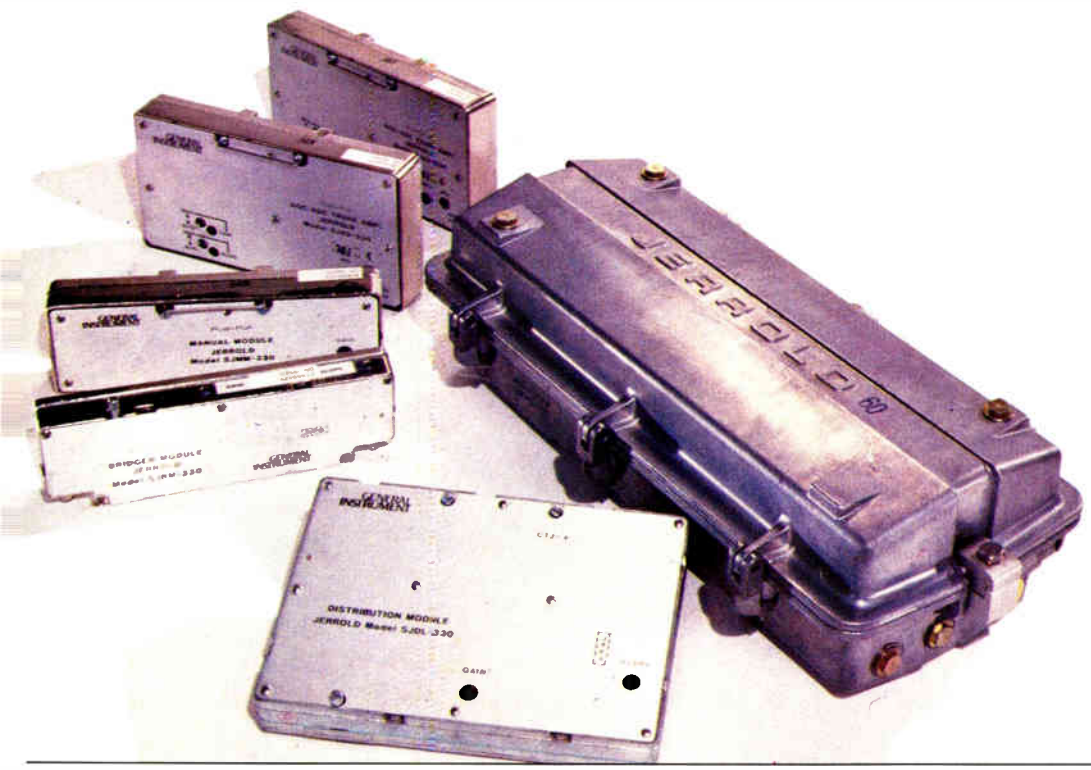
Regardless of the make or vintage amplifiers now in your system, Jerrold can show you how to rebuild economically. If you have STARLINE 20 equipment, you'll realize the biggest savings with Jerrold STARLINE SJ-330 drop-ins. Other amplifiers can be replaced easily and economically by a complete STARLINE SJ-330 station. Detailed information on what you will need and what savings you can achieve is contained in a new Jerrold STARLINE 20 SJ Series brochure - yours for the asking.

And Jerrold has other possibilities for you too. For longer cascades and greater channel capacity, there's Jerrold STARLINE X feedforward and power doubling amplifiers. Whatever your specific needs, there's a reliable, low-cost Jerrold product to satisfy them.

Send for the Jerrold STARLINE 20 SJ Series brochure, today. Call or write: Jerrold Division, General Instrument Corporation, 2200 Byberry Road, Hatboro, PA 19040. (215) 674-4800.

JERROLD

You know we'll be there.



GENERAL INSTRUMENT

Please see us at the Western Show Booth #421

Reader Service Number 4

Over the course of his teachings, Ecker estimates he's spoken to more than 15,000 technicians.

and training receive high praise from Ecker. "I think the SCTE deserves credit for the educational programs it offers," says Ecker, who also gives kudos to the recognition given techs by the SCTE. "The fact that it (SCTE) has only about 3,000 members is a crime."

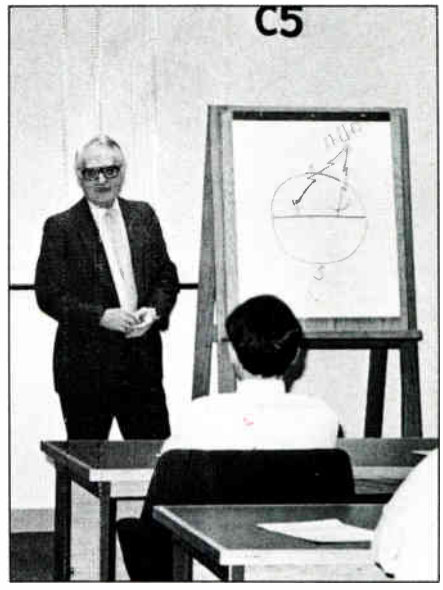
Over the course of his teachings, Ecker estimates he's spoken to more than 15,000 technicians, an accomplishment he considers his most lasting. And, as he continues to teach, he's discovering his wisdom now spans at least two generations.

"I really enjoy working with the young guys in the industry," he says. "And now I'm finding that many of the technicians I teach weren't even born yet when I built my first system. Sometimes, one of these young guys will ask if I know a certain person and if I really think hard, sometimes I can recall the person. He'll then tell me 'Well, that's my Dad.' So I jokingly have said that the first time someone comes up and gives me that story and tells me that's his grandfather, I'm going to quit."

Beyond adequate training, the industry's biggest miscue was opting to develop more channel capacity at the expense of better signal transmission, Ecker says. "I think we've been blinded by looking at total channel capacity rather than in improvement of the service we actually provide to our subscribers. I think what we need to concentrate on is fewer channels with higher reliability and better-quality pictures."

Ecker says that in many cases, rooftop antennas outperform a cable system in terms of picture quality, which is surprising considering that many people sign up for cable in order to improve their picture. He thinks the recent FCC order concerning A/B switches will cause problems for operators because homeowners will be able to directly compare the pictures generated by cable and over-the-air broadcasts. "When the guy gets a chance to switch to his own antenna, he's going to find out how bad his cable pictures really are."

The former Jerrold employee believed in signal improvement over channel capacity strongly enough to try to talk Jerrold out of spending millions to develop a 54-channel system. "A cable system with a large number of channels eats up a tremendous amount of programming—far beyond the ability of anything I see to supply that kind of programming," he says. He often recommends that his clients build a 35-channel system instead of going to 40 or 54 channels. Thirty-five channels offer a reasonable amount of programming and is easy to maintain, says Ecker.

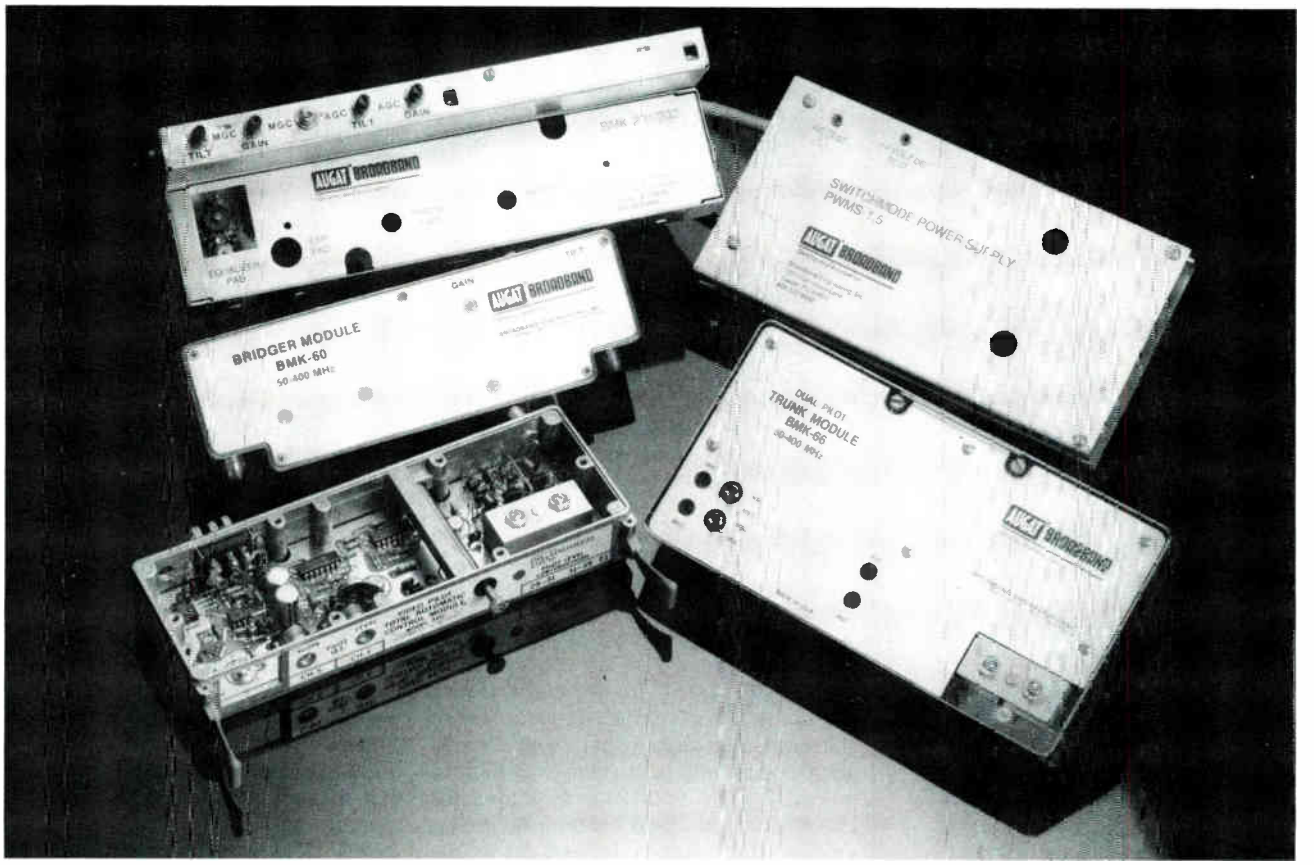


Ecker at a Jerrold training session.

What are we likely to see in the future? Ecker thinks that through consolidation, the number of MSOs will be significantly reduced. Over-the-air broadcast television will completely disappear, replaced totally by hardwire systems. And fiberoptic cable will largely replace coaxial types, bringing true interactive systems with it. Personally, he can't wait. "I just hope I'm around to see it," he says.

But until subscriber actions force it, the successful economic picture of CATV will continue to keep the industry from being truly innovative, says Ecker. "It's amazing how much of this industry talks in terms of what it calls 'blue sky' but does absolutely nothing in that particular area. Cable systems today are only more channels than they were 10 or 20 years ago. But other than that, they haven't changed, basically."

—Roger Brown



Broadband:
The leader in upgrade electronics

Upgrading rather than rebuilding has been the cost effective way of extending the life of cable systems by many years thus adding profits to the bottom line.

Broadband originated the concept of upgrading almost 9 years ago and we have continued our leadership ever since.

You can feel confident with the technical superiority and reliability that we have always been known for.

We don't look for quick fixes, we engineer long term solutions to your upgrading problems.

The result is electronics better than the original equipment that you are upgrading.

We stand behind our product too. Our upgrades have a one-year warranty and we are always there to discuss any immediate problems by phone.

For more information call Broadband Engineering at 800-327-6690 (in Florida 305-747-5000) or write us at 1311 Commerce Ln., Jupiter, Florida 33458.

For quality, performance and service, call Broadband

AUGAT® BROADBAND

Quality and Innovation

Reader Service Number 6

Forecasting the future

Forecasting is a hazardous profession. If any unclouded crystal ball actually exists anywhere, it must be a closely guarded secret. "Conventional wisdom" can just as easily miss the mark by underestimating the creativity of scientists, engineers, and entrepreneurs, as by overestimating the public demand and willingness to pay for technologically feasible services and products.

Think back for a moment. Remember the Picturephone™ that was going to make it possible to see grandma on the telephone, as well as to hear her. Remember the stories in *Popular Science* years ago about the flying automobiles with folding wings and retractable propellors that were going to enable us to bypass commuter traffic jams. Remember the Bensen personal mini-helicopter ads with the salesman carrying his briefcase on what looked like a flying bicycle with completely exposed cockpit. These were all technologically feasible. They represented attractive ideas; but, for a variety of practical reasons, they were not marketable.

Then, there was the Empire State Building, designed as a mooring mast for dirigibles in the heart of New York City to serve the anticipated new business activity using lighter-than-air airships for intercontinental transport of passengers and cargo. No such craft was ever moored to the Empire State Building, and the market forecast went down in flames with the Hindenburg in 1937, at Lakehurst, N.J. In hindsight, such a catastrophe was predictable, but largely ignored in designing the building. Fortunately for the investors, the Empire State Building was saved from economic loss by another unforeseen development.

Because of its great height above ground, and its location in the center of the city, the skyscraper later turned out to be an ideal platform on which to mount the transmitting antennas for the infant television broadcasting service. Only because it had been designed to withstand the enormous horizontal wind loading and dead weight of an attached dirigible was the tower structurally capable of supporting all those complex TV antennas.

Thus, two major forecasting errors cancelled each other, with a highly favorable but totally unexpected outcome.

In 1944, I told my boss, the chief engineer of a major radio broadcasting station, that I was highly skeptical about the prospects for television. I simply could not conceive of spending my evenings watching movies in my living room. I still don't do much of it, but millions of other people do. It is risky to attribute one's own attitudes and hunches to others.

There have been some excitingly successful forecasts. Some 15 years ago, we met with a couple of investment bankers who showed us the first Sharp hand calculator. At a cost of about $500, it could only add, subtract, multiply, and divide; nothing more. Who would want it? They were predicting that in five years it would be selling like hotcakes, at $25 a piece. They were too conservative; would you believe $4.95? Now, there is the Texas Instrument calculator (model 36 Solar) that provides more scientific and statistical calculating power for less than $20, no batteries required, than is available on calculators costing 10 or 20 times as much.

In my view, the technique used by the U.S. Weather Service for reporting its rain forecasts is a remarkably protective cover. Would you go ahead with picnic plans if the forecast was for 20 percent chance of rain? Would you move the wedding party indoors because of a 70 percent chance of rain? There could be a downpour in either case; or no rain at all.

The remarkable thing about this technique is that, while it does actually communicate a meaningful sense of probability, there is absolutely no way to compare the forecast with the actual occurrence. If the rain forecast was only 20 percent, but it rained heavily, was the forecast incorrect? What if the forecast was 70 percent, but only a light sprinkle occured? If the probability of rain is greater than zero, any amount of rainfall represents "success." The technique effectively prevents any determination as to the reliability of the forecasts with respect to intensity or duration of rainfall.

Financial decisions are being made every day on the basis of forecasts. Few businesses enjoy the luxury of decisions based on 100 percent reliable forecasts. In spite of extensive research and analysis, electric utilities have been faced with over-capacity as a consequence of the unexpected success of the energy conservation activity following the 1973 OPEC oil embargo. Automobile manufacturers believed the American family would not give up its "gas guzzlers." It is only now just beginning to recover from its error in forecasting public behavior.

So, what are the forecasts for cable TV in the next five to 10 years? Here I go, protected by the pseudo-statistical format used so successfully by the Weather Service.

Five to 10 year forecasts

- 80 percent chance that, by the mid-90s, cable TV will have found viable ways to coexist with *de facto* DBS (Ku band), MMDS, VCR and telco competition.
- 30 percent chance that overbuild franchises may be awarded to telcos, outside their normal service area, in direct competition with existing franchises.
- 90 percent chance that, by 1996,

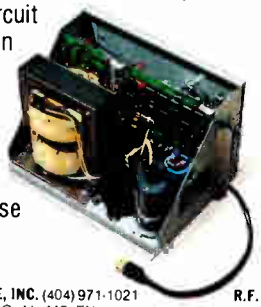
By Archer S. Taylor, Senior Vice President, Engineering, Malarkey-Taylor Associates Inc.

We Gave Standby Power A Good Name

Unlike some other choices, Alpha maintains the Good Name of Standby Power by offering a reliable and failsafe approach—as we have right from the start. We call it the **"single ferro transformer"** concept.

This design concept leaves the ferroresonant transformer always connected to your Cable plant, regardless of power failures or other disturbances, and does away with the need for a second transformer.

The battery driven inverter takes over from the downed line in the **primary** winding of the transformer, ensuring an unaltered output voltage and waveform. Overload and short-circuit handling characteristics remain unchanged. In addition this **same** transformer is used to charge the batteries, providing a **high** current recharge of the batteries after a power failure, a feature lacking in most competitive designs.



This concept needs fewer components which translates into **higher reliability**. Because the inverter cannot be activated, even with the line relay contact "stuck", this concept also gave us the fail-safe feature that helped us to obtain both **UL** and **CSA** approvals. And that gives a good product a good name.

Of course there are more reasons for Alpha's leadership and good name in Standby Power. Features such as **Temperature Compensated Charging** matched to the battery type and **Automatic Selftest** and **Equalizing**, to name just two.

Alpha was the **first** to offer **Remote Status Monitoring** for it's power supplies on a stand-alone basis.

And now Alpha has introduced two new State-of-the-Art Standby Power product lines. The **FT** series, a fast transfer type for critical loads up to 500VA, and the **APCG** series for true UPS performance up to 1500VA at Standby prices. Our ongoing efforts to give you the best engineered products will continue to give Standby Power a good name...**ALPHA.**

REPRESENTED IN YOUR AREA BY:

A & M COMMUNICATIONS (612) 920-5215
•MN, WI, ND, SD, IA
R. ALAN COMMUNICATIONS (317) 849-7572
•MI, IN, KY, IL, OH, MO, KS
BILL OONALOSON CO. (206) 745-3454
•WA, ID, MT, OR

MICRO-SAT S/E, INC. (404) 971-1021
•GA, FL, NC, SC, AL, MS, TN
MICRO-SAT S/W, INC. (800) 438-0812
•TX, OK, AR, LA
NCS INDUSTRIES (215) 657-4690
•PA, NJ, DE, MD, VA

R.F. TECHNOLOGIES (516) 867-2137
•NY, NH, ME, VT, CT, MA, RI
AOVANCE TELECOM (602) 998-4441 AZ, NM, UT, CO, WY, CA, NV
DISTRIBUTED BY:
ANIXTER COMMUNICATIONS 800-323-8166

YOUR BEST BUY IN THE LONG RUN

ALPHA TECHNOLOGIES • BELLINGHAM WA (206) 671-7703 (206) 647-2360 • BURNABY BC (604) 430-1476

Reader Service Number 7

Please see us at the Western Show Booth #865, 867

Rest assured, these predictions have been carefully considered.

telephone companies will have successfully demonstrated, in one or more pilot projects, the technical feasibility of using optical fiber residential service access connections to deliver sophisticated voice and data services, as well as leased one-way video channels for entertainment programming.

- 80 percent chance that such demonstrations will be limited to not more than 12 non-switched FDM/FM channels, nor more than three centrally switched, FDM/AM channels.
- 0 to 10 percent chance that the rate of installation of optical fiber residential service drops will threaten the viability of cable TV.
- 90 percent chance that optical fibers will be used increasingly in cable TV plants, for super-trunk and other point-to-point signal transportation purposes.
- 0 to 10 percent chance that optical fibers will be used in tree-and-branch distribution networks, complete with optical taps and fiber service drops.
- 90 percent chance that cable TV will abandon the converter interface in favor of IS-15 or other user-friendly technology compatible with modern TV receivers.
- 80 percent chance that a declining number of premium TV programs and an increasing number of PPV programs, will be marketed to subscribers.
- 90 percent chance that the use of addressability will decline for all purposes except PPV and multi-pay churn.
- 70 percent chance that cable TV economics will change in some or all of the following respects:
  — Useful life of outside plant extended to 20 to 25 years.
  — Typical channel capacity reduced to 40 to 50 channels.
  — Reduced capital investment per subscriber, with more costs shifted to the subscriber.
  — Increasingly automated maintenance, requiring fewer electronic technicians and engineers, but with higher levels of skill and training.
  — Restructured rate schedules.
  — Increased reliance on PPV and advertising revenues.
- 10 percent chance that cable TV will begin to generate new revenue from commercial data transmission on I-Nets, or equivalent mid-split networks.

Fortunately for me, no one will ever be able to prove whether these forecasts turn out to be right or wrong. Rest assured, however, that these predictions have been carefully considered. We try to be current with respect to new developments in economics and finance, as well as programming and technology.

I believe the forecasts are at least as reliable as the rain forecasts of the U.S. Weather Service. You can disagree, but you cannot prove that we are wrong.

HOW TO TALK THE POWER COMPANY INTO LOWERING YOUR BILL 10%.

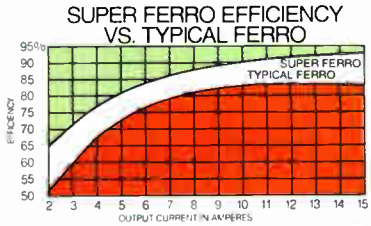
Introducing the first superferroresonant power supply–the new Lectro **Super Ferro.**

It's a radical improvement in power supply technology. It operates 10% more efficiently than most power supplies available until now.

For example, the **Super Ferro** is 93% efficient at normal load factor (see graph at right). Take that news to your power company, and you've got a powerful argument for a 10% saving in your power bill.

We've put together test results to help you prove the increased efficiency of the **Super Ferro** to even the most skeptical utility company.

Call **1-800-551-3790** or write today for complete details and test results. Because that 10% would look better on your bottom line than on your power line.



Super Ferro Outperforms The Average Power Supply At Every Load Factor.

THE NEW SUPER FERRO BY LECTRO

A Burnup & Sims Cable Products Group Company

Reader Service Number 9

The way I see it

Most immigrants to Denver came west. Mostly, they still do. Gold, oil and minerals attracted some. Adventure drew others. But, for most, a chance for a better life was what made the risk of the trip across the plains in a prairie schooner worthwhile. The ride's a whole lot easier now. About the only danger is losing your skis in transit to Stapleton Airport.

But the fabled Colorado "champagne powder" isn't the only reason people come to Denver. For lots of us, cable TV was what made Denver home. Unlike some others, I came east, not west, to Denver four years ago this month. I came looking for the cable TV industry and got lucky when Bob Titsch decided I'd do okay as an associate editor for *CableVision*. A breathtakingly short time later, I found myself here at *CED*. I've never regretted it.

I hope I've done more than "okay" at making *CED* a magazine worthy of your attention and deserving of your respect. It's been a central part of my life for most of the past four years. I've enjoyed the challenge, the friendships, even the anxiety at times; much as I've enjoyed learning to run moguls on Colorado's steepest slopes. It can be exhausting, frustrating and occasionally frightening. But on the best of days it's rewarding as few things in life are.

Construction forecast

And much as I train physically for the start of ski season, to be better each season, *CED* trains professionally for better performance as well. We believe we've brought you a better product each year. We hope you'll agree. In this issue, you'll find another new example: the first of four construction surveys we'll be running each year. Each survey will cover one or more regions of the country. This month, it'll be those states covered by the Ameritech and NYNEX Bell operating company regions.

We're asking about newbuild, rebuild, aerial and underground mileage, channel upgrade, addressability and pay-per-view plans. It's time-consuming, labor intensive and difficult. But it's one of the ways *CED* can be a better servant for the industry. We hope you'll find it useful.

A reality check

A recent confidential study we sponsored indicates that we're not too far off the mark among industry technical personnel. The study, commissioned by us and conducted by the Harvey Research Organization, polled respondents from two lists: vice presidents of engineering at the top 100 MSOs and chief technicians, chief engineers and managers at the system level drawn from our cable system data base. The idea was to poll the industry, not *CED* readers. And we made sure that SCTE members were represented: 51 percent of all the answers came from them.

Among the results: when asked "Which magazine do you consider to be the most influential in the industry?", 47 percent picked *CED*, 33 percent picked *Communications Technology* and 15 percent picked the *Community Antenna Television Journal*.

When asked "If you could receive only one magazine, which one would it be?", 45 pecent picked *CED*, 35 percent picked *CT*, and 15 percent picked *CATJ*.

Asked "Which one publication helps you most with your work?", 46 percent picked *CED*, 36 percent picked *CT* and 14 percent picked *CATJ*.

I'm proud of the results. I've always believed that high professional standards and quality journalism were important in trade magazines, and the survey indicates at least some of the effort is recognized. Thanks. "You ain't seen nothin' yet."

And you've probably noticed more attention on our part to broadband local area networks. No mistake. Many engineers, technicians and hardware companies are moving in this direction as traditional CATV construction and hardware sales wind down.

Now, we have no illusions about the data communications marketplace. It's sophisticated, expensive and hard to reach. It's not, by any means, easy money for CATV suppliers. We don't think it's a plum ripe for the picking. But it does offer hope for companies and employees reeling from the currently slow hardware business.

Here's our view. *CED* always has been devoted to broadband technology. So long as our industry uses broadband, we'll do everything we can to promote it's intelligent, productive use. And we recognize that it isn't just CATV operators who are using broadband now, or will in the future. Hospitals, colleges and universities, military bases, government agencies, factories, research parks and large business firms already are using broadband, and many more will in the years ahead.

To the extent we can, *CED* will be an advocate for broadband as a LAN technology wherever it's the right technology. We recognize that twisted-pair, Ethernet and fiber optic media have their own champions—big, powerful champions at that.

So we hope our traditional CATV readers will bear with us. We remain committed to this industry and hope you'll appreciate the refinements we'll bring you in the days ahead. At the same time, we hope you'll profit from the cross-fertilization between CATV and the broadband LAN industry. We plan to support the suppliers who've given us the technology we work with every day. They need our aid as they do battle against the larger Goliaths of the communications world.

Micro-Beam™ The Cable Expansion Problem Solver

Channel Master® MICRO-BEAM™ is a flexible, cost-effective CARS-band microwave relay system designed to solve the cable expansion problem facing today's cable operators.

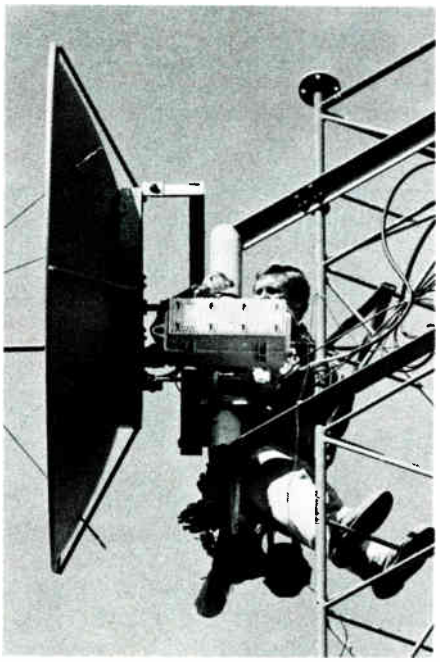
That's why some of the top MSO's like, United Cable, Newhouse Broadcasting, Centel Cable, Cable Entertainment, Sonic Communications and Telescripts, use MICRO-BEAM™ as an alternative to the more expensive systems on the market today.

MICRO-BEAM™ reaches isolated subscriber pockets and spans natural barriers without additional remote headends, adapting to your entire service including audio, video, data and addressability signals and commercial insertion capabilities. MICRO-BEAM™ also saves you that $500 per-channel descrambling cost by allowing you to descramble each channel at the main headend. In fact, MICRO-BEAM™ is so compact, it allows you to transmit from a weatherproof unit that mounts behind the antenna. It can even be mounted on water towers, and can be placed anywhere in your system, not just at the headend.

MICRO-BEAM™ is available in two affordable systems that can be configured in many ways to meet your systems needs. A 36-channel 300 MHz system available in 1 and 5 watts, allows many more receive sites and offers cost savings in smaller systems for as low as $46,965! The 1-watt system can transmit your signal fully loaded over 9 miles in each of four directions or 15 miles in each direction with the 5-watt system.

The 60-channel 450 MHz system also comes in 1 and 5 watts and provides the range and channel capacity larger systems demand.

For example, the 1-watt system can cover a path-distance fully loaded up to 7 miles in four directions or 14 miles in one direction. The 5-watt system can carry 60-channels up to 20 miles and allows up to 4 separate receivers fully loaded up to 12 miles in each direction.



In addition to extra power, the 5-watt system utilizes GaAs FET amplification, highly stable microwave oscillator and redundancy of key components to insure reliable operation and reduce maintenance. A Status Monitor Panel, included with the 5-watt transmitter, allows remote monitoring of all system functions by bringing all test points to the headend or tower base.

The rugged transmitter unit is housed in a heavy-duty weatherproof housing designed for pressurization. The transmitter is cable powered, and operates in temperatures ranging from -50°C to +60°C, with humidities up to 100%.

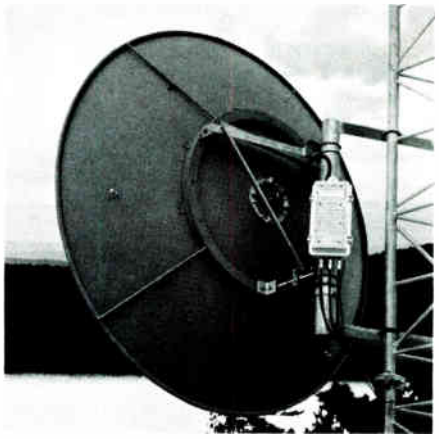
With MICRO-BEAM™ you can expand your system cost-effectively because there are no "hidden costs" for optional equipment and services, so you get more for your money!

450 MHz Transmitter
Microwave Receiver
LNA/Image Rejection Filter/AGC
Mounts, Waveguides, Connectors
Feasibility Study
Installation of MICRO-BEAM™ Electronics
F.C.C. Application Assistance
Alignment of Microwave Paths
1-Year Warranty on Parts and On-Site Service
24-Hour, 7-Days A Week, Technical and Warranty Service
(In Continental U.S. Only)

Because MICRO-BEAM™ is basically option free, the system you order is in stock, giving you the fastest lead time of any microwave product on the market.

Contact us today and let our staff of qualified specialists show you how really flexible and cost-efficient your cable system expansion can be with MICRO-BEAM™

Channel Master
Division of Avnet, Inc.
P.O. Box 1416
Smithfield, NC 27577
(919) 934-9711



Division of Avnet, Inc.
Industrial Park Drive, Smithfield, N.C. 27577

Reader Service Number 11

CATV distortion measurement techniques

The general industry acceptance of mid and superband channels heralds a new era in system maintenance. To meet the challenge one must understand the factors that contribute to the distortions and develop the techniques necessary to diagnose and remedy problems while in their infancy. The measurement of CATV distortions is not a difficult assignment, however it does require proper instrumentation.

One of the major points of this paper is to present one important fact: you cannot measure coherent distortions with a field strength meter. To attempt to measure a component 55 dB below carrier in the presence of a 40 dB carrier-to-noise ratio is like looking for the proverbial needle in a haystack. The methods described in this paper are based on two receiving devices, (a spectrum analyzer and a wave analyzer).

The spectrum analyzer is a swept receiver that provides a CRT display of amplitude vs. frequency. It shows how energy is distributed as a function of frequency, displaying the fourier components of a given waveform.

The wave analyzer can be thought of as a finite bandwidth window filter which can be tuned throughout a particular frequency range. Signals located on the frequency spectrum will be selectively measured as they are framed by the window.

Both of these units have one thing in common, narrow bandwidth. When the wave analyzer has a bandwidth of 25 cycles it will show an improvement over the 600 kc F.S.M. of 44 dB in regards to the measurement interference caused by system noise. A spectrum analyzer with 300 cycle bandwidth will offer a 33 dB improvement.

Basically this means you can measure a second order component 66 dB below carrier in the presence of a 40 dB carrier-to-noise ratio, with either instrument. The F.S.M. is limited to about -35 dB below carrier at the same carrier-to-noise ratio.

Jerald S. Crusan, Mgr. CATV Field Engineering, Jerrold Electronics Corp.

The measurement of CATV distortions is not a difficult assignment.

Second order

The mathematics that follow are not of any great importance to anyone other than a designer, however there are a few important aspects that the formulas clarify.

(1) Second order increases one dB for each dB increase of amplifier output level.

(2) Second harmonics are 6 dB less than sum and difference beats for the same output carrier levels.

Sum and difference levels in dBmV at amplifier output

$$Lab = K_2 + La + Lb \quad (\text{at } f_a \pm f_b)$$

$$Lbc = K_2 + Lb + Lc \quad (\text{at } f_b \pm f_c)$$

$$Lac = K_2 + La + Lc \quad (\text{at } f_a \pm f_c)$$

Second harmonics levels in dBmV at amplifier output

$$L2a = K_2 + 2La - 6, \text{ at } 2f_a$$

$$L2b = K_2 + 2Lb - 6, \text{ at } 2f_b$$

$$L2c = K_2 + 2Lc - 6, \text{ at } 2f_c$$

where

k_1 and k_2 are constants. They are complex numbers describing the first and second order gain, phase shift and distortion properties of the amplifier. To permit easy mathematical development consider them to be constant for all input signal frequencies. Measurement on practical amplifiers proves that in reality this is not the case and care must be exercised before drawing conclusions concerning real amplifiers from the mathematical considerations.

K_2 is a decibel constant characterizing second order distortion.

$$K_2 = 20 \text{ Log } \frac{\frac{k_2}{\sqrt{2}}}{\left(\frac{k_1}{\sqrt{2}}\right)^2}$$

expressed in dBmV

was recognized and with the exception of channel 6 sound carrier (the second harmonic in 175.5 or channel 7) the 12 channel systems do not fall prey to second order distortion.

The addition of the mid and superband channels increases the total number of beat products to a point of mass congestion.

Channel 13 – 2 = 156 MHz
Channel J – 3 = 156 MHz
Channel K – 4 = 156 MHz

The measurement of a singular second order product is increased in difficulty if you need to worry about additional product that may cloud the final

Cable Classics

Do you know where to look for a single comprehensive account of measurement techniques for second and third order system distortions, carrier-to-noise ratio, carrier-to-hum ratio, system frequency response, etc. The first and obvious answer is the "NCTA Recommended Practices for Measurements on Cable Television Systems" (available in loose-leaf book form from NCTA).

Take a closer look also at this thoughtful article by Jerry Crusan, first published in 1972. At a time when the field strength meter was applied to most measurement situations, this article heralded the necessity for the modern spectrum analyzer with the declaration "You cannot measure coherent distortions with a field-strength meter!"

To quote the introduction to this article, "The measurement of CATV distortions is not a difficult assignment, however it does require proper instrumentation."

Graham S. Stubbs, Consulting Engineer

Second order increases one dB for each dB increase of amplifier output level.

results. Remove all carriers from the system with the exception of the contributing carriers and system support carriers, i.e. slope and gain control carriers, plus carriers adjacent to support carriers if necessary due to slope or gain dependency resulting from inadequate pre-selection in the amplifier circuitry.

Figure 3 depicts some carriers that may be used for the measurement. The basic reason these carriers were selected was due to their position within the passband. There is one low, one mid and one high. The worst case condition for second order distortion is usually a high minus a low falling into a mid band channel.

Channel 13 – 2 = 156 MHz. The second order beat will usually fall within 20 kc of 156 MHz depending upon the exact frequencies of channels 2 and 13. The beat will be 1.25 MHz below channel G visual carrier plus or minus the above mentioned 20 kc and any channel G deviation from standard frequency.

Figure 3 is representative of the results you would obtain with a spectrum analyzer with 70 dB dynamic range. The spectrum analyzer reads peak amplitude and the readout is directly in dB. This figure illustrates a second order product at 156 MHz. The product is 50 dB below the G carrier peak amplitude. The product at 110.5 MHz is the second harmonic of channel 2. Second harmonics are typical six dB less than sum and difference beats.

Figure 4 outlines the equipment setup.

Lab, Lbc, Lac
= Sum and difference beats in dBmV

$L2_a$, $L2_b$, $L2_c$
= Second order harmonics in dBmV

La, Lb, Lc
= First order output levels in dBmV

f_a, f_b, f_c
= Corresponding frequencies

When you read an amplifier specification sheet the information you should be concerned with is listed in these terms: Second Order = –66 dB at

FIGURE 1

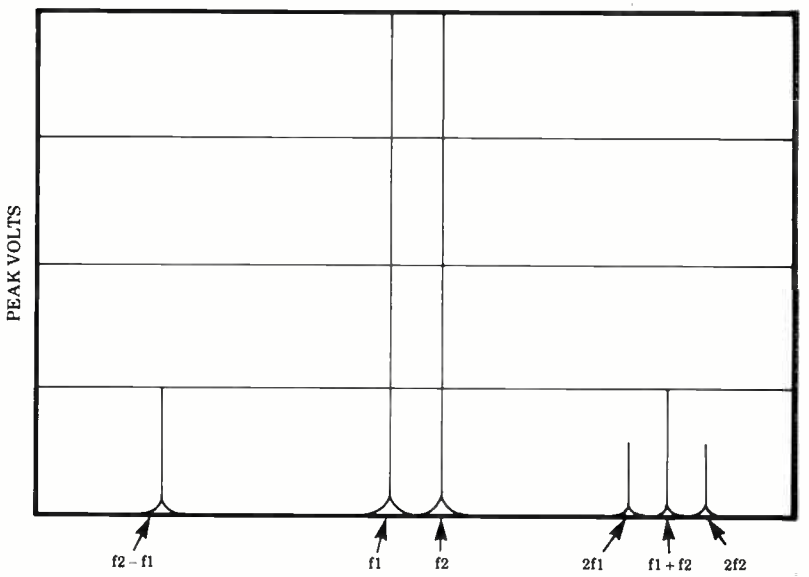
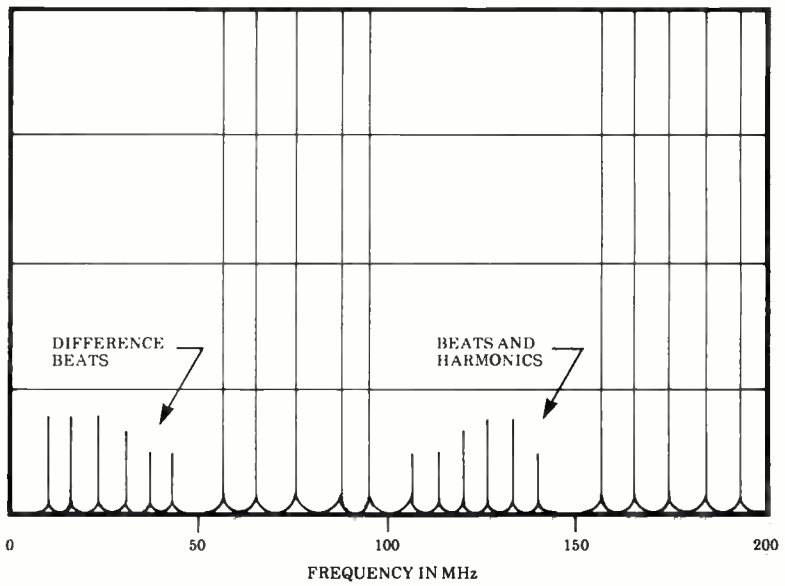


FIGURE 2



The worst case condition for second order distortion is a high minus a low falling to a mid band channel.

+ 50 dBmV output. The equipment supplier is saying the following, (at +50 dBmV output, when operated within the recommended operating parameters i.e. slope, gain, tilt, etc., this amplifier will not produce a second order component that will not be less than 66 dB below the nearest carrier).

The trunkline amplifier is typically not operated at +50 dBmV output. If you operate the amplifier at +30 dBmV output the amplifier deration for second order will be 50 − 30 = 20 dB, and −66 − 20 = − 86 dB second order for this amplifier. When you have a cascade of 32 amplifiers identical to this amplifier you can expect the second order to increase 3 dB each time you double the cascade of 1, 2, 4, 8, 16, 32 is equal to five doubles. The expected second order will then be −86 + 15 = 71 dB below the nearest carrier. When the amplifier station is not a direct double subtract (dB − 10 $Log_{10}N$), from −86 where N = the number of amplifiers in cascade.

FIGURE 3

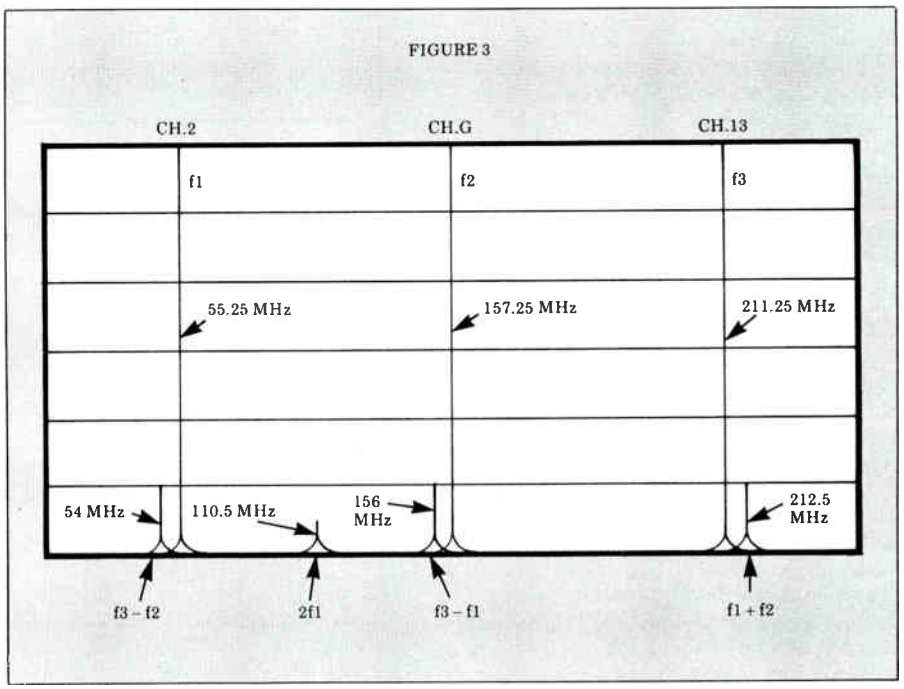


Figure 2 applies the basic knowledge of figure 1 to a CATV system.

The above information will allow you to determine the level of second order you should expect. The remainder of the article will clarify the methods of measurement and the analysis of the results.

Figure 1 is a spectrum analyzer view of the new sum and difference components generated when two first order components are introduced to an amplifier with second order distortion. Note that in addition to the two original carriers, there are four additional new components. These are the sum and difference beats of F_1 and F_2 plus the second harmonics of F_1 and F_2.

Figure 2 applies the basic knowledge of figure 1 to a CATV system. The difference of channel 2 carrier and channel 6 carrier is 28 MHz. The second harmonic of channel 4 carrier is 134.5 MHz or channel C in the midband. Channel 8 carrier minus channel 2 carrier = 126 MHz. When the VHF carrier frequencies were assigned the second order problem, the spectrum analyzer approach is the easiest method to measure second order. The three drawbacks to this approach are:

1. Cost
2. Portability
3. Measurement sensitivity

If you have ever priced a spectrum analyzer with a 70 dB dynamic range the first drawback is self-explanatory. If you plan to fly and check the unit as baggage, leave the office early, pack an extra tube of Ben Gay ointment and make sure your company carries insurance. This is due to the fact that the airlines will not accept liability in excess of $500.00 unless you ship it air freight.

Last and possibly least is the measurement sensitivity. The sensitivity crossover point in a typical system is 16 to 20 amplifiers in cascade. Prior to this point, the distortion will be undetectable.

Wave analyzer approach

When you select an alternate assignment of measurement carriers, the equipment costs are reduced to a more acceptable pricetag. The change involved is related to the channel G carrier. The frequency is shifted from 157.25 MHz to 156.00 MHz. The exact carrier frequency is trimmed up or down the required amount to place the second order beat at G carrier ±5 kc. The second order beat will now become a channel G sideband displaced by 5 kc with an amplitude relationship to the G carrier equal to the differential in level.

The spectrum analyzer method allows a simultaneous view of the carrier amplitude and the second order beat

If you have ever priced a spectrum analyzer with a 70 dB dynamic range, the first drawback is self-explanatory.

amplitude which yields a simple interpretation of information. This advantage is not the case with the wave analyzer approach, which leads us to the calibrator that is necessary to establish the reference level required for the measurement by comparison technique.

The calibrator RF input is derived from a standard VHF signal generator tuned to 156 MHz. The switcher is driven by a variable rate generator. When the second order beat is 5 kc removed from the 156 MHz carrier the rate generator will then switch the RF carrier between the test and reference leg of the switcher at 5 kc rate. When you add 40 dB attenuation in the reference leg the switcher output will alternate between a test level and a reference level 40 dB down.

The output of the switcher is connected to a field strength meter. The field strength meter is tuned to the 156 MHz carrier and the manual gain of the meter is adjusted for +4 volts DC on the voltmeter.

Tune the wave analyzer to 5 kc. The indication on the meter at 5 kc will be the calibration reference. The reference will be 40 dB down from the 156 MHz carrier. Note the meter reading in terms of the number of dB's the indication deviates from full scale deflection.

When the above has been accomplished, the system second order may be measured by changing the F.S.M. input lead from the switcher to the channel G bandpass filter that is connected to the system testpoint.

Procedure:

1. Check F.S.M. tuning and retune to 156 MHz if necessary.
2. Adjust manual gain for +4 volts DC on the meter.
3. Remove 30 dB attenuation from the wave analyzer and tune for maximum indication. The beat may not be exactly 5 kc due to instability of the contributing carrier generator.
4. The sum total of the −40 dB reference plus the amount of attenuation removed from the analyzer plus or minus the meter reading deviation from reference, equals the level of the second order component.

The second method of calibration is more difficult but utilizes equipment that is common and readily available. Figure 6 illustrates the equipment and the procedure is as follows:

1. Remove the 40 dB pad.
2. Adjust the F.S.M. tuning to 156 MHz.
3. Remove output lead from Gen #2.
4. Tune Gen #1 to 156 MHz and adjust level to "0" dBmV.
5. Remove output lead from Gen #1.
6. Reconnect Gen #2 output lead.
7. Tune Gen #2 to 156.00 MHz and

With Harris/Blonder-Tongue SMATV systems from Midwest you make sales...

not repairs.

Since SMATV systems from Midwest use the same professional Harris and Blonder-Tongue components as many CATV systems, you'll spend more time on sales and less on service.

A Midwest SMATV system begins with the revolutionary Harris 3 Meter Delta Gain™ Antenna that has a C-Band gain of 41 dB. Add to that the new Harris 6529 Satellite Receiver to ensure strong, clear signal reception. Then Blonder-Tongue takes over for signal processing with MAVM Modulators and MCA Strip Amplifiers. The end result is a system that is reliable and cost effective. Because Midwest is one of the world's largest Harris stocking distributors and also a Blonder-Tongue stocking distributor, we can provide high quality SMATV systems for a cost comparable to consumer-grade equipment.

Whether you need a complete SMATV system or individual Blonder-Tongue or Harris components, contact Midwest for equipment that will allow you time to sell – not repair. (800) 543-1584.

MIDWEST
Communications Corp.

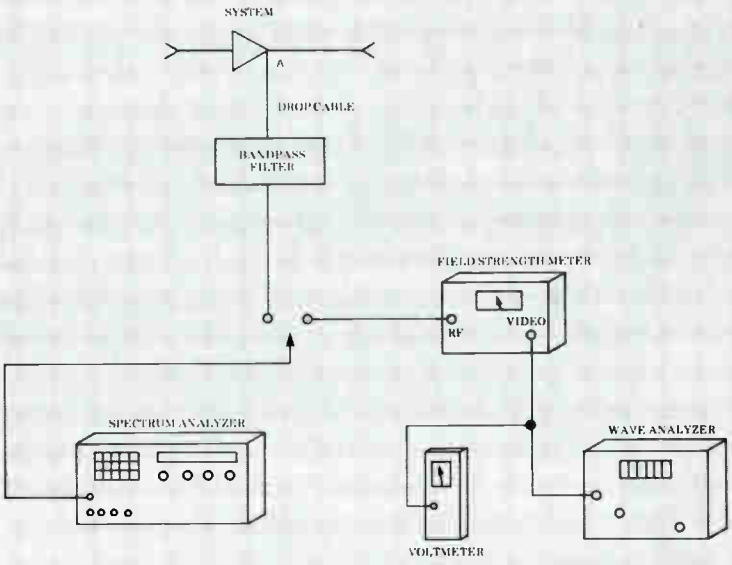
One Sperti Drive
Edgewood, KY 41017

Cincinnati, OH 606-331-8990	Grand Rapids, MI 616-796-5238	Kansas City, KS 913-469-6810	Washington, D.C. 301-577-4903
Columbus, OH 614-846-5552	Louisville, KY 502-491-2688	Atlanta GA 404-875-3753	Baltimore, MD 301-665-9323
Dayton, OH 513-435-3246	Lexington, KY 606-277-4994	Norfolk, VA 804-853-2600	Miami, FL 305-592-5355
Cleveland, OH 216-447-9745	Charleston, WV 304-768-1252	Richmond, VA 804-262-5788	Jacksonville, FL 904-642-8368
Toledo, OH 419-382-6860	Nashville, TN 615-255-2801	Roanoke, VA 703-980-2584	Tampa, FL 813-885-9308
Pittsburgh, PA 412-364-6780	Knoxville, TN 615-687-9515	Charlotte, NC 704-399-6336	Orlando, FL 305-898-1885
Indianapolis, IN 317-872-2327	Bristol, TN 615-968-2289	Raleigh, N.C. 919-850-9811	New Orleans, LA 504-542-5040
Detroit, MI 313-689-9730	St. Louis, MO 314-569-2240	Greenville, S.C. 803-226-9259	Seattle, WA 206-232-3550

Reader Service Number 16

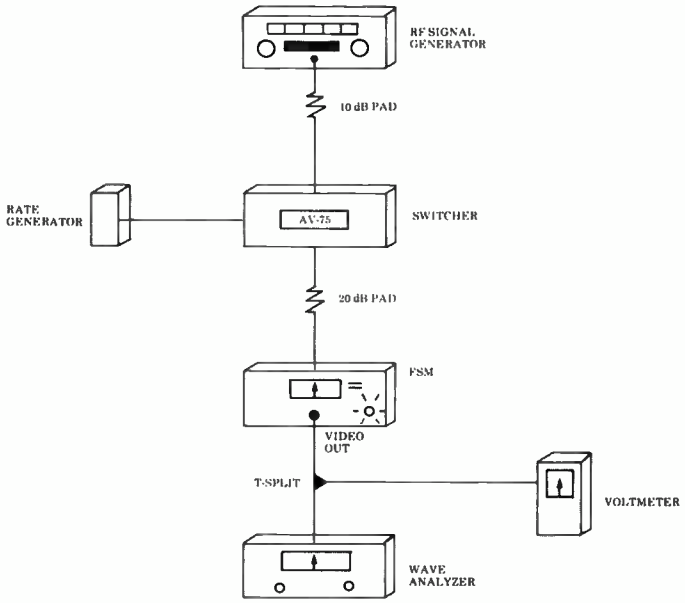
The calibrator RF input is derived from a standard UHF signal generator tuned to 156 MHz.

FIGURE 4



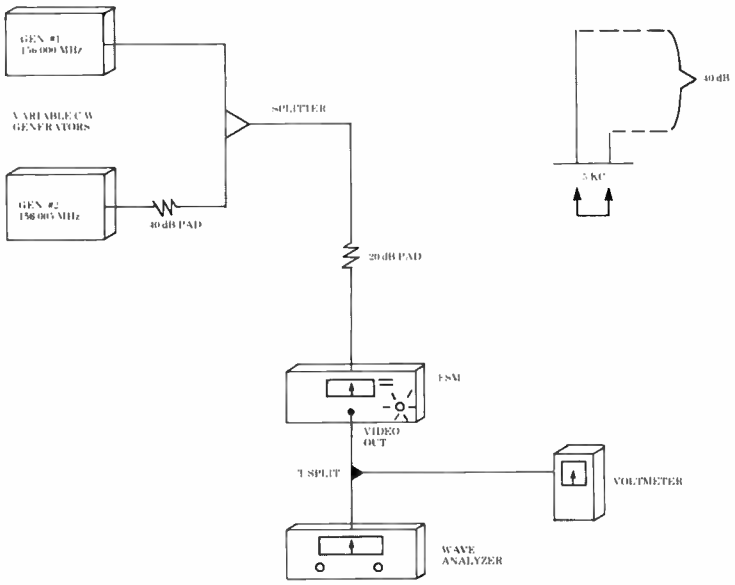
The output of the switcher is connected to a field strength meter.

FIGURE 5

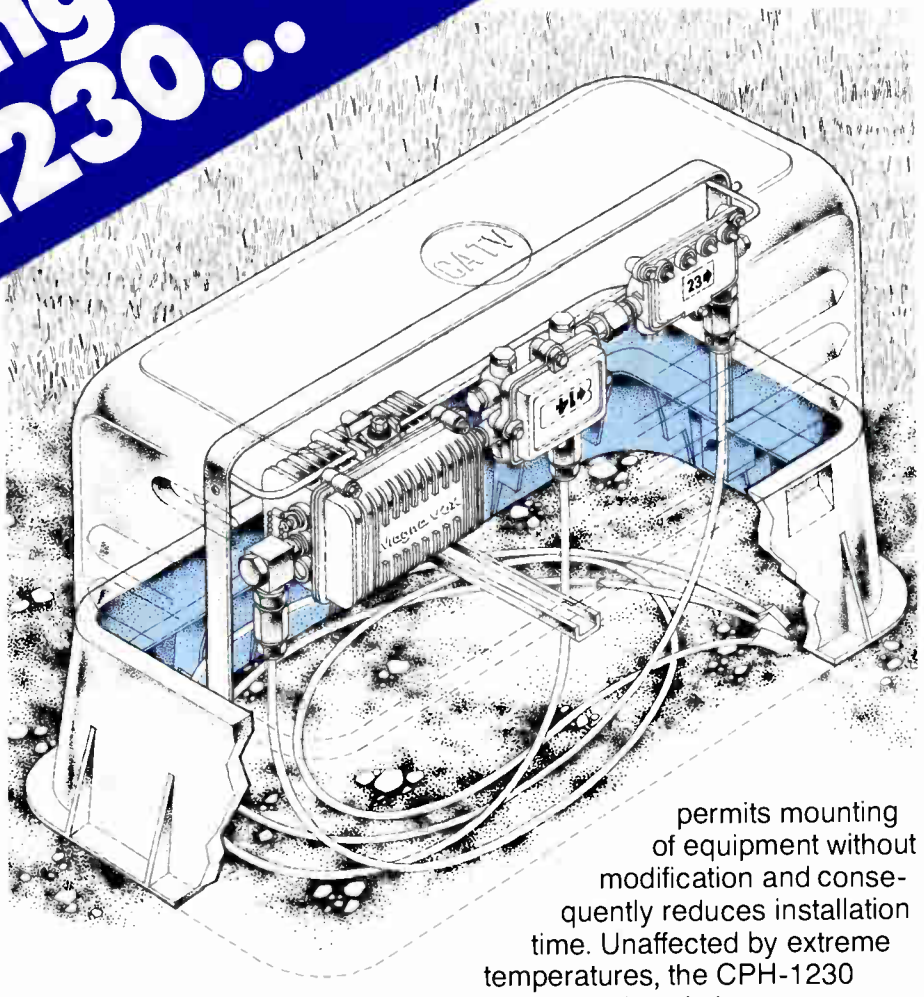


Remember to maintain a good match at the amplifier output port.

FIGURE 6



Introducing the CPH-1230...



Channell's new, low profile line extender enclosure!

Channell continues to meet the changing needs of the CATV industry with the introduction of the CPH-1230 — a new, ***low profile*** enclosure designed for housing line extender and tap/splitter combinations. Available in light green or beige, the aesthetically pleasing design of the CPH-1230 will assist in gaining system acceptance by community leaders.

Extending just 16-inches above grade, the CPH-1230 is a low profile alternative to Channell's CPH-1016 and CPH-1022, and to high profile 10″x10″ and 10″x16″ metal pedestals. Constructed of HDPE plastic, the CPH-1230 cover has louvers on both the sides and ends to assure maximum ventilation and minimize internal ambient temperature rise. Its design includes features found only in Channell products, including "CATV" identification permanently molded into the cover and rounded corners for public safety.

The CPH-1230 enclosure comes with a choice of high security locking systems, and a unique ground skirt developed to support the active equipment and for storage of excess cable. The uniquely-designed enclosure provides 360° of working access. Hot-dipped galvanized bracketry permits mounting of equipment without modification and consequently reduces installation time. Unaffected by extreme temperatures, the CPH-1230 never needs painting.

Call or write today for more information on Channell's new ***low profile*** enclosure, and the complete line of Channell above and below grade plastic enclosures, Integral's Cablecon® Cable-in-Conduit, and Carson Industries' grade level boxes.

CHANNELL COMMERCIAL CORPORATION
620 W. Foothill Boulevard
Glendora, CA 91740
Telex: 670-368
(800) 423-1863
Toll free outside California
(818) 963-1694 in California

Channell COMMERCIAL CORPORATION
Technology you can trust!

See us at the Western Show at Booth 267.
Reader Service #10

SINGLE PLANT ABOVE GRADE ENCLOSURES

(Also available — A complete line of dual plant above grade enclosures)

CPH-508

Designed to house small diameter taps and for above ground service wire applications.

Dimensions: 5″ diameter, 11″ - 15″ above grade.

Shipping: 12 per carton.

CPH-658

Houses all taps currently available in the CATV industry.

Dimensions: 6.5″ diameter, 11″ - 15″ above grade.

Shipping: 8 per carton.

CPH-6512

Designed for special applications such as high water thresholds. Houses taps and filters, or one equalizer.

Dimensions: 6.5″ diameter, 15″ - 19″ above grade.

Shipping: 8 per carton.

CPH-816

Houses tap and splitter combinations.

Dimensions: 8″ diameter, 20″ - 24″ above grade.

Shipping: 2 per carton.

CPH-1006

Designed for special tap locations such as multiple dwelling units.

Dimensions: 10″ diameter, 11″ - 14″ above grade.

Shipping: 2 per carton.

CPH-1016

Houses tap, splitter and line extender combinations, or small amplifiers.

Dimensions: 10″ diameter, 21″ - 25″ above grade.

Shipping: 2 per carton.

CPH-1022

Houses tap, splitter and line extender combinations, or amplifiers.

Dimensions: 10″ diameter, 27″ - 31″ above grade.

Shipping: 2 per carton.

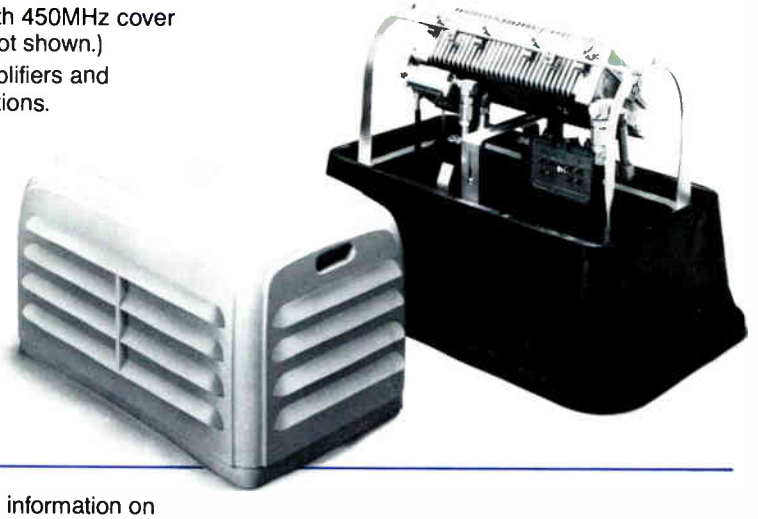
CPH-1730 with 450MHz cover

(550MHz cover not shown.)

Houses trunk amplifiers and passive combinations.

Dimensions: 17″ wide, 30″ long.

Shipping: 1 per carton.



Channell Commercial Corporation designs and manufactures the broadest selection of free-breathing above grade pedestals, and airtight and watertight below grade enclosures available anywhere. In addition, Channell is the exclusive representative for Integral Corporation's Cablecon® Cable-in-Conduit and Carson Industries grade level boxes and vaults.

For complete information on Channell's total packaging concept, call or write today.

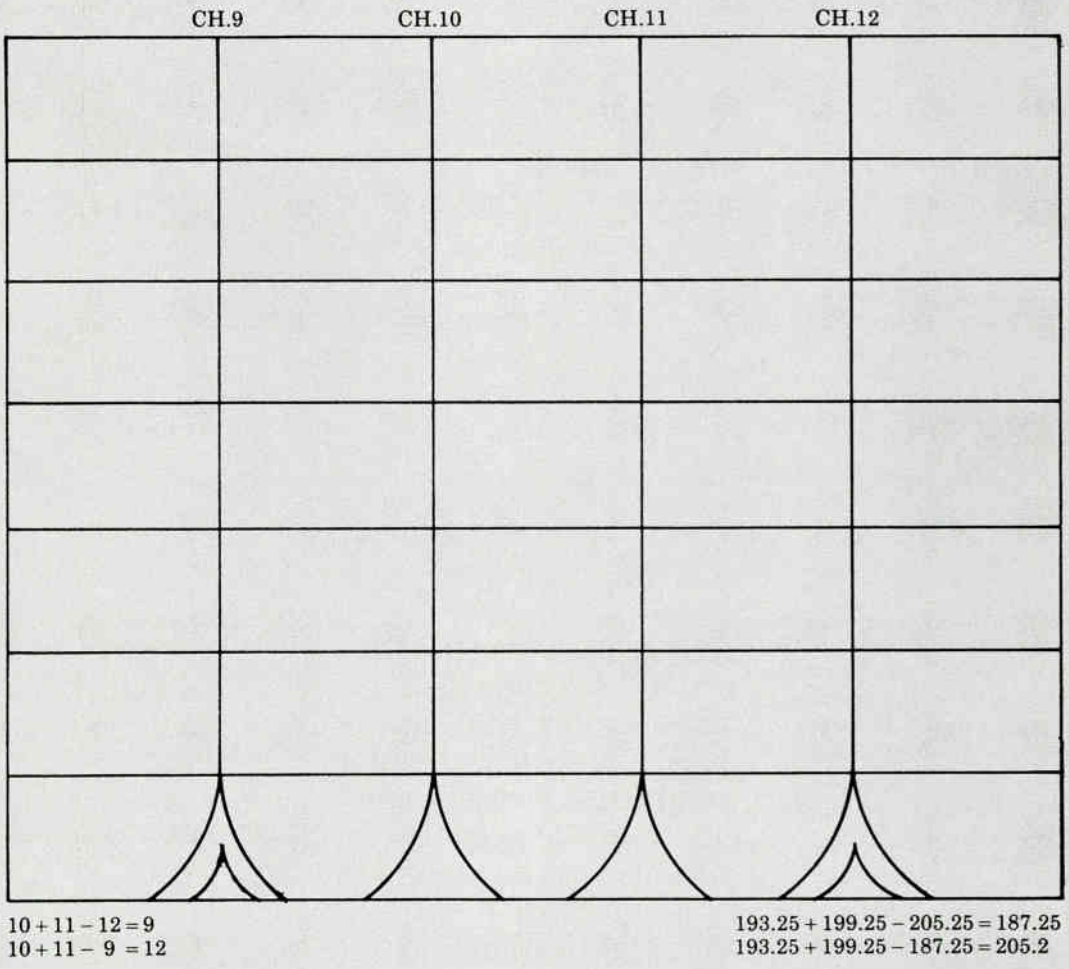
CHANNELL COMMERCIAL CORPORATION
620 W. Foothill Boulevard
Glendora, CA 91740 •Telex: 670-368
(800) 423-1863 Toll Free outside California
(818) 963-1694 in California

Channell COMMERCIAL CORPORATION
Technology you can trust!

See us at the Western Show at Booth 267.
Reader Service #10

The measurement theory is sound and the procedures lend themselves readily to field application.

FIGURE 7



adjust level to "0" dBmV.

8. Reconnect Gen #1 output load.

9. Tune wave analyzer to 5 kc and make a fine adjustment on the frequency of Gen #2 until the wave analyzer reading peaks, indicating a 5 kc difference between the two signals.

10. Add the 40 dB pad to the output lead of Gen #2.

11. Retune the F.S.M. for peak reading on voltmeter.

The above results in a 5 kc sideband 40 dB down. The remainder of the procedure follows the outline presented for the first calibration and measurement method.

This measurement of second order distortion is not difficult when you have proper instrumentation, however I will list a few of the areas that may introduce errors in the reading.

A. Remember to maintain a good match at the amplifier output port. Never let the amplifier look directly into a field strength meter. When the measurement is made on equipment that does not utilize an attenuation test probe, or last least a 10 dB down testpoint, be sure to isolate the output match by installing a 10 dB pad directly on the output of the amplifier.

B. The bandpass filter at the input to the field strength meter or spectrum analyzer will prevent the generation of second order in the measurement receivers.

C. The calibration procedure at 5 kc is not correct for any other frequency unless you are sure the wave analyzer has a flat response to all frequencies. Check the response periodically with an audio oscillator of known flatness across the measurement frequencies.

The measurement techniques outlined on the preceeding pages have been tried and proven. The theory is sound and the procedures lend themselves readily to field application. With a few minor changes in calibration, the wave analyzer can measure any coherent product such as triple beat, intermodulation and cross modulation.

Continued on page 52

Construction survey

Operators hustle to upgrade

With a keen eye turned toward the revenue producing opportunities available from pay-per-view, home shopping and other specialty programming channels, operators faced with rebuild or upgrade plans are deciding that now is the time to add channel capacity.

Rebuild and upgrade activity promises to be strong in the Northeast and Midwest, according to the results of a survey recently completed by CableFile research. The survey is the first of four regional surveys that will be done and summarily published in *CED* on a quarterly basis.

Faced with competition from neighboring systems, increased demands from a more educated audience and the traditional age and franchise renewal motives, operators in major metropolitan areas are looking to upgrade their systems to provide relief to already crowded channel offerings. But what is even more significant is that smaller rural and suburban systems are following much the same course laid down by their urban brethren.

Systems with fewer than 40 channels seem the most ripe for upgrades, with many operators expressing a desire to build out to 42 channels or, in some cases, 54 channels. That way, they can offer a healthy package of about 30 basic channels and a full complement of pays and still hold some channels in reserve for future programming needs.

Operators faced with rebuild or upgrade plans are deciding that now is the time to add channel capacity. Rebuild and upgrade activity promises to be strong in the Northeast and Midwest.

In Grand Rapids, Mich., the United Artists system there presently can accommodate 30 channels, but every channel is full, according to Chris Rollins, the system's marketing manager. The system is presently involved in an extensive year-long upgrade that will take capacity up to 40 channels. After the upgrade work is completed, between four and six channels will be fired up immediately, including two public access channels, said Rollins.

"Forty (channels) gives us a comfortable level," Rollins said, adding that "30 channels of basic is a good product to sell." Although some other now-popular programming will be added, the situation bears close scrutiny, Rollins said, warning that some services that offer only marginal programming are likely to die on the vine because they require high license fees that operators may not be willing to pay. In addition, Rollins' upgrade is relatively easy—the system can use existing electronics and avoid a major headend retrofit.

The need for increased capacity is playing a major role in the rebuild of Colonial Cablevision's Revere, Mass., system. Originally built to handle 26 channels, the system has been electronically pushed to accommodate 32 channels, which the system presently offers, said George Duffy, president. The entire system—cable, electronics, etc.—is being replaced and will max out at 80 channels. However, Duffy says only about 41 or 42 channels will be activated following construction.

Duffy says he uses customer surveys to gauge subscriber programming interests. Services likely to be added after the rebuild is completed include more basic and pay services, including at least one home shopping channel.

"The plant was originally built in

Continued on page 34

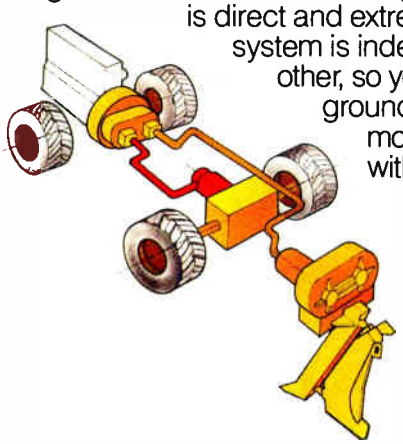
Your next trencher.

If it isn't a Case,

here's what you'll be missing.

Total control.

Case offers you standard dual hydrostatic drive — one to power attachments, one for ground drive. Power metering for both functions is direct and extremely precise. Each system is independent of the other, so you can vary ground speed to accommodate soil conditions without disturbing your plow or chainline speed — or vice versa.

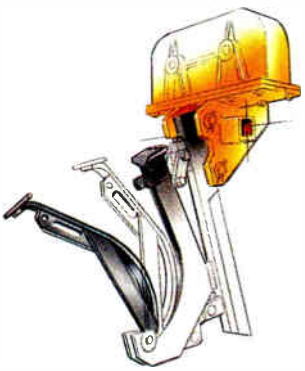


Hydraulically articulated steering lets you maneuver easily, too.

The other half of the warranty.

Most manufacturers back their trenchers with a ninety-day warranty on parts only. But the warranty on Case trenchers covers both parts *and* labor for six months. Your Case dealer also offers one-stop service.

Isolated plow vibration.



Our unique eight-point suspension and hinged drop chute with removable gate isolate vibration from the machine and cable. Service loops can be restrung without cutting or splicing. And only Case offers a front trencher, rear plow combination.

Underground versatility.

Your Case trencher is more than just a trencher with our backhoe, Hydra-borer® or cable layer attachments. Case versatility also lets you mount most of these primary tools front or back.

Maneuverability. Warranty. Faster restringing. Attachments. Four Case advantages.

See your Case dealer today and get the trenching edge that comes with a Case.

Reader Service Number 21

J I Case
A Tenneco Company

TENNECO

700 State Street Racine, WI 53404 U.S.A.

Building On Quality™

760

DH4B

TL100

TF300

case®

CED construction survey of the Midwest and New England

As a service to the industry, *CED* recently conducted a comprehensive construction survey of CATV systems in the Midwest and New England. And, over the course of a year, we'll continue to survey the entire United States, region by region, providing you with a quarterly snapshot of CATV construction activity.

The results are based on a phenomenal 95 percent response rate from cable systems in the states of Illinois, Indiana, Michigan, Ohio, Wisconsin (Midwest region) and Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont (New England). The research was conducted at the CATV system level by our own personnel, using questionaires and follow-up telephone interviews.

The information we gathered includes newbuild and rebuild activity, including aerial and underground plant. We've also gathered data on upgrade activity, pay-per-view and addressable status. Furthermore, we've asked about plans for addressability and PPV activity in the future.

The numbers are conservative. Fifty-one systems say they plan newbuild or rebuild activity in 1987 but can't say how many miles are involved. Also, 40 systems are upgrading, but didn't say what channel capacity will result. Subscriber counts also are conservative. We also couldn't verify subscriber counts for 69 addressable systems. Nevertheless, the numbers are instructive.

Most newbuild jobs in these two regions are small: fewer than 20 miles. On the other hand, there is a sizable number of large, 100-miles-plus rebuilds, primarily aerial. At least 473 systems will be building or rebuilding next year. In the upgrade area, at least 220 systems will be active in 1987. Also, at least 42 new systems will go addressable next year (a few of these will be addressable extensions). Pay-per-view experiments will continue at a pretty good clip, doubling the existing 1986 base.

Construction Activity

Summary:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	189	149	61	56
21-50	38	15	30	20
51-100	16	12	21	13
100+	12	8	55	21

Channel upgrades # of systems
10-34 channels = 73
35-37 channels = 51
40-47 channels = 28
50-56 channels = 22
60-80 channels = 6

Currently addressable systems
# of systems = 293
# of subs = 3,252,770

Systems going addressable in 1987
# of systems = 39
Anticipated new subs = 497,289

Pay-per-view
# of systems now offering PPV = 108
Additional systems to offer PPV in 1987 = 110
Additional systems to offer PPV in 1988 = 65

Connecticut:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	5	3	3	4
21-50	3	0	1	0
51-100	0	0	0	0
100+	1	0	1	1

Channel upgrades # of systems
10-34 channels = 0
35-37 channels = 1
40-47 channels = 2
50-56 channels = 0
60-80 channels = 0

Currently addressable systems
# of systems = 7
# of subs = 149,920

Systems going addressable in 1987
# of systems = 3
Anticipated new subs = 39,100

Pay-per-view
# of systems now offering PPV = 4
Additional systems to offer PPV in 1987 = 7
Additional systems to offer PPV in 1988 = 7

Illinois:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	13	13	5	3
21-50	3	1	3	2
51-100	0	0	0	0
100+	4	3	5	2

Channel upgrades # of systems
10-34 channels = 8
35-37 channels = 4
40-47 channels = 8
50-56 channels = 4
60-80 channels = 0

Currently addressable systems
# of systems = 52
# of subs = 460,121

Systems going addressable in 1987
# of systems = 2
Anticipated new subs = 13,000

Pay-per-view
# of systems now offering PPV = 18
Additional systems to offer PPV in 1987 = 18
Additional systems to offer PPV in 1988 = 15

Indiana:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	24	12	2	4
21-50	6	3	1	0
51-100	10	10	8	8
100+	0	0	7	1

Channel upgrades
# of systems

10-34 channels	=	13
35-37 channels	=	5
40-47 channels	=	1
50-56 channels	=	4
60-80 channels	=	0

Currently addressable systems
# of systems = 30
# of subs = 642,571

Systems going addressable in 1987
# of systems = 2
Anticipated new subs = 15,250

Pay-per-view

# of systems now offering PPV	=	7
Additional systems to offer PPV in 1987	=	10
Additional systems to offer PPV in 1988	=	6

Maine:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	8	2	5	1
21-50	1	1	1	0
51-100	1	0	0	0
100+	1	0	0	0

Channel upgrades
# of systems

10-34 channels	=	3
35-37 channels	=	0
40-47 channels	=	0
50-56 channels	=	0
60-80 channels	=	0

Currently addressable systems
# of systems = 3
# of subs = 7,274

Systems going addressable in 1987
# of systems = 0
Anticipated new subs = 0

Pay-per-view

# of systems now offering PPV	=	0
Additional systems to offer PPV in 1987	=	2
Additional systems to offer PPV in 1988	=	0

Massachusetts:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	22	21	3	5
21-50	2	1	0	2
51-100	3	0	3	1
100+	0	0	9	2

Channel upgrades
# of systems

10-34 channels	=	0
35-37 channels	=	2
40-47 channels	=	4
50-56 channels	=	1
60-80 channels	=	4

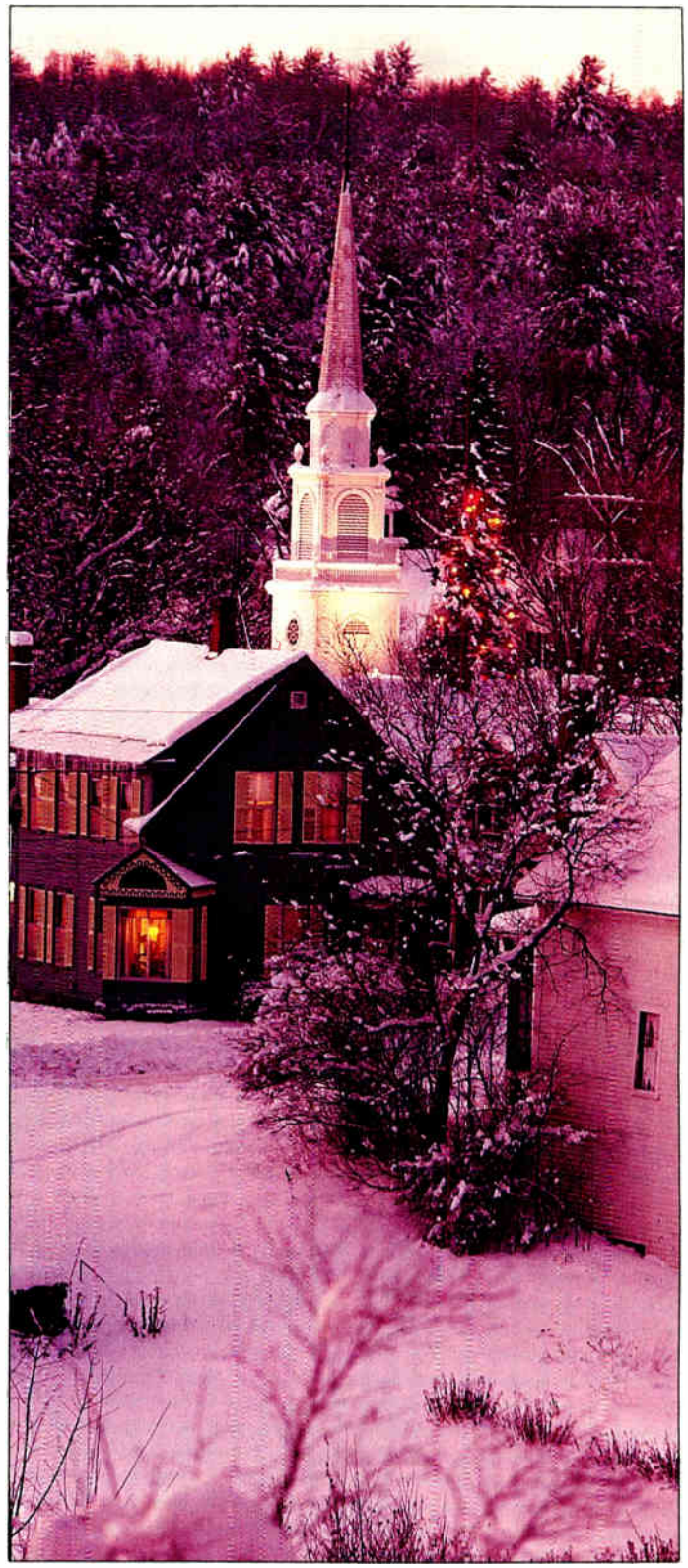
Currently addressable systems
# of systems = 43
# of subs = 480,831

Systems going addressable in 1987
# of systems = 6
Anticipated new subs = 67,120

Pay-per-view

# of systems now offering PPV	=	16
Additional systems to offer PPV in 1987	=	10
Additional systems to offer PPV in 1988	=	1

Continued on page 38



Age of plant played the biggest role in United's decision to rebuild its Carpentersville system.

Continued from page 30

1971-1972 with 270 MHz gear," Duffy said, "and I never thought we'd fill those (channels). But we kept adding more and more channels because our customers kept asking for more."

Age of plant played the biggest role in the decision to rebuild United Cable's 15-year-old Carpentersville, Ill., system, according to Susan Dean, system manager. The 410-mile plant presently offers 28 channels, but is being rebuilt to 54 channels, 36 of which will be activated immediately. The system, located near Chicago, must carry 12 to 14 off-air channels "so that doesn't leave much room on a 28-channel system," said Dean. Already offering a full complement of pays, the additional channels will all be basic fare, including two off-airs, The Weather Channel, VH-1, The Nashville Network and Arts and Entertainment Network.

In New Milford, Conn., the old dyna-foam cable in that system has to be replaced because "it absorbs water like a sponge," said Paul Hancock, system president. Along with the rebuild, five new channels will be included in the line-up, including CNN Headline News, VH-1, The Weather Channel and, perhaps, the Discovery Channel. In addition, one channel will be used to show Madison Square Garden sports at night and Cable Value Network during the daytime.

Time-sharing of channels has led United's Hammond, Ind., system to expand channel capacity from a very full 36 to 54, said Pat Taylor, marketing manager. Because some channels are sharing programming now, somewhere between 40 and 45 channels will be offered after the upgrade work is completed, Taylor speculated.

Beginning in mid-1987, Continental Cablevision's Westfield, Mass., system will start a massive rebuild in which its channel capacity will climb from 30 to 60 channels. Probably "all but about 10 or so" will be activated, said J. Martin Schuler, system manager.

"That will give us a healthy line-up," said Schuler, who said his research showed that people want more channels, but not as many as 80 or 100 of them. "Many people are saying they don't want that many—they want a tight channel line-up with good programming fare."

Taking a more conservative approach to channel capacity is Acton Corp.'s Benton Harbor, Mich., system, where 24 channels are presently being offered. The system is being rebuilt with 330 MHz gear and programming will be added until 30 channels are lit up, said Tim Olmstead, system manager. Services to be added include Arts and Entertainment, BET, Nashville Network and The Disney Channel.

As much as Olmstead would like to implement addressability into his system, "Addressability wouldn't work here," he said. With about 6,000 subscribers, it's not that there aren't enough customers to make the capital

expense worth it, it's because the community is highly migratory, he said. "I already suffer from a high rate of converter losses to theft, I wouldn't want to lose even moreexpensive boxes."

Although the industry as a whole continues to give mixed signals about its intentions to implement addressability (*CED, Sept. '86, p. 16*), citing the consumer electronics interface problem and debate about cost savings, some systems are, nevertheless, deciding to go addressable in order to take advantage of pay-per-view. Additionally, operators who are installing addressability cite faster and easier connects/disconnects and subscriber data management through billing software as motives.

Pat Taylor's system in Hammond, Ind., became addressable last March, with remote control converters going to multi-pay customers who requested them first. But as the system completes its upgrade agenda, addressability will go out to 100 percent of the subscriber base. And the additional revenue potential of PPV is the reason why.

Taylor said the system will begin PPV events in 1987, when the system becomes two-way addressable. For that reason, Jerrold's Cable Video Store is being examined as the programming source and delivery system. "United (the MSO which owns the system) is bullish on PPV and addressability," said Taylor.

United is doing the same thing in Dean's Carpentersville, Ill., system. Addressability was implemented in mid-August, and so far, there are about 1,200 converters in the field. The boxes are being offered with a rental remote that can be purchased.

The system is considering using Cable Video Store to deliver PPV after two-way addressability becomes a reality in the system early next year, Dean said. Addressability was added because United expects PPV to become a significant revenue source, operational savings are expected, and because the system was concerned about signal theft, Dean added.

Duffy's Revere, Mass., system plans to get over the addressability hurdle first before jumping headlong into the PPV arena. However, Duffy did say that PPV's potential was a factor in

Now that systems are expanding channel capacities, PPV is an option where before it wasn't.

the addressability decision.

"There is a market out there" for PPV, Duffy said. But going to addressability is difficult enough, so the system will get into PPV offerings "in a soft way" initially, he said. The method of delivery is still a decision yet to be made, said Duffy, who added that two-way addressability remains a viable option.

Others who have had problems with addressability in the past remain convinced of its ability to lower rates of theft and operational costs. Addressability in Paul Hancock's system in Connecticut "has not entirely lived up to our expectations," he said, because of problems encountered by having both dual-decoding converters in the field.

But addressability will allow the system to get into PPV, said Hancock, who is looking at Viewer's Choice, which offers one movie per week, as a delivery vehicle. "That (one movie per week) can be promoted easily without confusing the customer and we can concentrate on the blockbusters," said Hancock.

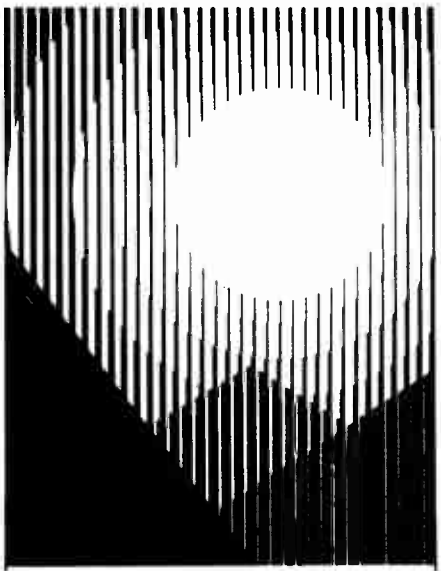
Continental's rebuild in Westfield, Mass., will likely go addressable because of the savings that can be realized on operational costs, especially through fewer truck rolls, said Schuler. But Schuler acknowledged he does have second thoughts about addressability because of the electronics interface difficulties. "It does cause inconveniences to customers," which is why addressability, when it is rolled out, won't be over 100 percent of the sub base. "We're hearing from some of our subscribers that they don't want it (addressable converter) in the house," said Schuler. But Schuler agrees that PPV is a natural outgrowth of addressability. "Certainly when you have addressability, PPV makes sense," said Schuler, who added that Continental's regional division is keeping a close eye on the progress of PPV.

Rollins in Grand Rapids remains doubtful that PPV will deliver all it has promised until programming improves. Noting that live sports and entertainment specials seem to bring higher buy rates than movies, Rollins said he hopes more effort will be placed on providing quality sports/entertainment packages.

But now that the system is expanding channel capacity, PPV is an option where before it wasn't, because with 25 channels of basic and five pays, the 30-channel system had nowhere to put it, said Rollins.

So, it's clear that although diverging opinions exist about the future of addressability and PPV, interest in both is high enough to convince some operators it's the way to go. And even operators who express doubts are indirectly showing their optimism by making provisions for new programming with higher channel capacities as they hurry to upgrade and provide the services customers want.

—Roger Brown



CED welcomes
Editorial Board Members
Jim Chiddix
and
Bob Luff
to Colorado!

OUR CUSTOMERS DESERVE THE BEST. AND THEN SOME.

When you purchase broadband distribution electronics from C-COR, you expect the best value in the industry. But we want you to know you can expect even more. Which is why we give you access to a C-COR Sales Engineer.

We also give you fast answers to your questions. A 24-hour hotline to help you day or night. A 48-hour emergency repair service for equipment. And a variety of professional technical services to support you as you plan, construct and maintain your system.

Add the fact that C-COR provides high quality, highly reliable products backed by a 3-year warranty, and you can see we mean it when we say you deserve the best.

For more information call our Data Group 1-800-233-2267. Or write to us at 60 Decibel Road, State College, PA 16801-9990. **Reader Service Number 25**

C-COR ELECTRONICS INC **WE GIVE YOU MORE.**

construction survey

Continued from page 33

Michigan:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	24	18	4	7
21-50	2	1	4	2
51-100	0	0	3	0
100 +	3	2	5	1

Channel upgrades
# of systems
10-34 channels = 6
35-37 channels = 9
40-47 channels = 5
50-56 channels = 2
60-80 channels = 0

Currently addressable systems
# of systems = 28
# of subs = 389,742

Systems going addressable in 1987
# of systems = 6
Anticipated new subs = 42,000

Pay-per-view
# of systems now offering PPV = 11
Additional systems to offer PPV in 1987 = 15
Additional systems to offer PPV in 1988 = 18

New Hampshire:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	2	3	2	1
21-50	2	2	1	1
51-100	0	0	1	0
100 +	1	1	2	2

Channel upgrades
# of systems
10-34 channels = 0
35-37 channels = 1
40-47 channels = 2
50-56 channels = 0
60-80 channels = 0

Currently addressable systems
# of systems = 8
# of subs = 56,568

Systems going addressable in 1987
# of systems = 3
Anticipated new subs = 16,000

Pay-per-view
# of systems now offering PPV = 2
Additional systems to offer PPV in 1987 = 0
Additional systems to offer PPV in 1988 = 3

New York:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	36	26	16	10
21-50	6	5	6	5
51-100	1	1	3	1
100 +	2	2	15	10

Channel upgrades
# of systems
10-34 channels = 16
35-37 channels = 14
40-47 channels = 3
50-56 channels = 3
60-80 channels = 1

Currently addressable systems
# of systems = 51
# of subs = 417,721

Systems going addressable in 1987
# of systems = 12
Anticipated new subs = 278,463

Pay-per-view
# of systems now offering PPV = 22
Additional systems to offer PPV in 1987 = 21
Additional systems to offer PPV in 1988 = 8

Ohio:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	36	21	9	9
21-50	9	1	5	6
51-100	1	1	2	0
100 +	0	0	5	0

Channel upgrades
# of systems
10-34 channels = 17
35-37 channels = 5
40-47 channels = 3
50-56 channels = 5
60-80 channels = 1

Currently addressable systems
# of systems = 39
# of subs = 368,209

Systems going addressable in 1987
# of systems = 2
Anticipated new subs = 15,413

Pay-per-view
# of systems now offering PPV = 11
Additional systems to offer PPV in 1987 = 19
Additional systems to offer PPV in 1988 = 4

Rhode Island:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	0	0	0	1
21-50	0	0	1	0
51-100	0	0	0	0
100 +	0	0	1	0

Channel upgrades
# of systems
10-34 channels = 0
35-37 channels = 0
40-47 channels = 0
50-56 channels = 0
60-80 channels = 0

Currently addressable systems
# of systems = 3
# of subs = 73,990

Systems going addressable in 1987
# of systems = 1
Anticipated new subs = 3,330

Pay-per-view
# of systems now offering PPV = 2
Additional systems to offer PPV in 1987 = 2
Additional systems to offer PPV in 1988 = 0

Introducing The NEXUS SD-5 Audio Subcarrier Demodulator

The Newest Performer In The Nexus Line Of Stereo Products.

The New SD-5 Subcarrier Demodulator: A Great Little Performer in the Nexus Tradition.

Whether it's the SD-5 wideband or narrowband model, your CATV or private cable system can now have the sound it deserves—at a price you can easily afford.

We Never Play Second Fiddle

The SD-5 demodulates all subcarrier audio signals. It introduces less than 1% total harmonic distortion and maintains a signal-to-noise ratio of greater than 60dB, assuring excellent sound quality.

Treble Benefit

While the SD-5 can solo with other makes of headend equipment, it really makes beautiful music with the other stars in the Nexus stereo line. Combined with the SG-5 stereo generator and FM-5 audio frequency modulator, popular stereo services can be easily added on your FM band, giving your subs more choices—you more income.

Our three great performers fit into just one standard rack space!

The Grand Finale

You can buy the SD-5 for a song. Compare its price, performance and our 2 year limited warranty, and we know you'll be impressed.

Find out more about the Nexus line of audio products. Send in the coupon or call for our free product catalogue.

Reader Service Number 26

YES! *Send me more on the Nexus line of audio products.*

Name: _____

Title: _____

Company: _____

Address: _____ Tel: _____

11/86 CED SD86-1

TELEPHONE:
(206) 644-2371
Bellevue, Wash.
(604) 420-5322
Burnaby, B.C.

OR WRITE:
7000 Lougheed Hwy.
Burnaby, B.C.
V5A 4K4

FAX NO. (604) 420-5941

NEXUS
ENGINEERING CORP.

PERFORMANCE YOU CAN SEE.

Hear

Is the U.S. Postal Service the only company responding to your direct mail efforts?

No matter how good your material, it can't generate a response unless the right person at the right address receives it. Are you tired of paying for lists full of duplicate or incorrect names and addresses? Do you need accurate personnel names and addresses for system managers, programming directors, chief engineers and marketing directors at virtually every cable system in the U.S.? Do you need lists by region for your specific territories? **CableFile Research** has the lists you need. Call today for more information. Together we'll put your next direct mail project directly into the hands of the buyers you need to reach.

CED

600 Grant Street, Suite 600
Denver, Colorado 80203
(303) 860-0111

construction survey

Wisconsin:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.
0-20	15	27
21-50	3	0
51-100	0	0
100+	0	0

Miles	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	11	10
21-50	6	2
51-100	1	3
100+	4	2

Channel upgrades
# of systems
10-34 channels = 7
35-37 channels = 9
40-47 channels = 0
50-56 channels = 3
60-80 channels = 0

Currently addressable systems
# of systems = 24
# of subs = 174,493

Systems going addressable in 1987
# of systems = 2
Anticipated new subs = 7,613

Pay-per-view
# of systems now offering PPV = 14
Additional systems to offer PPV in 1987 = 2
Additional systems to offer PPV in 1988 = 1

Vermont:

Miles	Newbuild (aerial) # of sys.	Newbuild (underground) # of sys.
0-20	4	3
21-50	1	0
51-100	0	0
100+	0	0

Miles	Rebuild (aerial) # of sys.	Rebuild (underground) # of sys.
0-20	1	1
21-50	1	0
51-100	0	0
100+	1	0

Channel upgrades
# of systems
10-34 channels = 3
35-37 channels = 1
40-47 channels = 0
50-56 channels = 0
60-80 channels = 0

Currently addressable systems
# of systems = 5
# of subs = 31,330

Systems going addressable in 1987
# of systems = 0
Anticipated new subs = 0

Pay-per-view
# of systems now offering PPV = 1
Additional systems to offer PPV in 1987 = 4
Additional systems to offer PPV in 1988 = 2

Headend problems: an engineer's nightmare

The greatest fear any cable engineer can have is a problem, especially an intermittent one, that affects his entire system and begins with the heart of his system—the headend.

Headend ingress can be an extremely frustrating and irritating condition; one that can be very difficult to find and more difficult to correct. In the United Artists Cablesystems Corp. franchise in Brookhaven, L.I., N.Y., an ongoing ingress problem existed that resulted in technical problems with the New York State Cable Commission and in-house technical operating procedures on channels E and F.

Since the Brookhaven system is an urban/suburban build with a large number of microwave, two meter, UHF, VHF, etc., transmitters surrounding it, finding the source of the interfering carrier(s) was nearly impossible, so the only solution was self-defense.

One possible fix was to adequately shield and protect the entire headend, but this was not feasible due to the large amount of capital expenditure necessary. It was then agreed among the local engineering staff that the best plan of attack would be to cure the ingress that caused the non-compliance on channels E and F only, since they were the only channels in violation of the New York State Cable Commission's operating procedures, and because there was a point in the headend where the channels were good (i.e., at the modulator output and prior to the AML insertion point, see Figure 1). Therefore, it became necessary for us to achieve a 54dB down from video of all spurious beats at the trunk-out test point.

To begin with, the accurate determination of, perhaps many, points of ingress into the headend facility is difficult because the amplitude of these local off-air carriers migrate into the test equipment used in the varied testing procedures, which mask and influence test findings. It then became apparent that the need to overcome this effect should take priority.

We felt it necessary to fabricate a device that would assist us in this matter by obtaining the following requirements:

Headend ingress can be an extremely frustrating and irritating condition.

1. Good isolation—the total shielding from all off-air carriers, to the source being tested.

2. Amplification—the ability to amplify the signals being tested; particularly very low system carrier to beat ratios, as incurred by the normal reduction of levels through the headend lash-up.

3. Compatibility—the ability of this test device; which having signal amplification, can be compatible with the required spectrum analyzer, that inherently overloads with strong or multiple carriers.

Previously, Headend Engineer Ken Metzler had assembled a test jig for the purpose of trouble-shooting low level beats at the headend. This became a concern after the last New York State Cable Commission inspection.

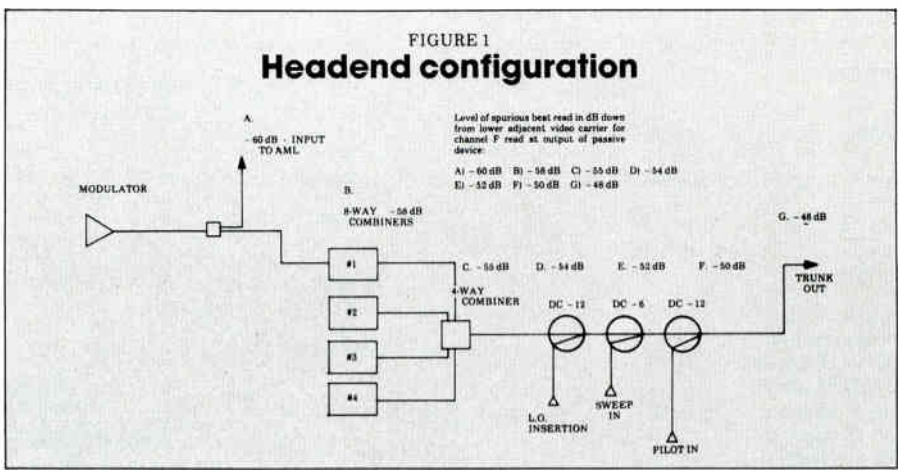
The test device consisted of a basic set-top converter, connected to a modified remote type power supply (Jerrold Model 407P) and this connected in a series with a standard line extender (Jerrold SLR300). All items were provided by in-house materials. The function of these items together is basically simple; the converter provides the narrow bandpass, which protects the spectrum analyzer from front-end overload. The line extender gives adequate amplification for low level beat detection and the power supply, which operates at 30 VAC, was modified to pass AC in one direction only, to feed the line extender.

At this point, it was a simple matter of enclosing the equipment within an RF shield type container for the needed purpose of eliminating intrusion of all off-air interference into our test equipment. This was achieved by the application of an apartment house (metal) tap box, which was obtained from stock, and then adapting the equipment within this enclosure.

Once assembled, having grounded both input and output RF barrel connectors and securing the box closed with the cover, Metzler then terminated the input connector and checked the output. To our amazement and frustration, the interference was still present from within the complete metal containment; keeping in mind, the spectrum analyzer and test cord being used were clean of any ingress. We realized that the only possible migration into this metal box was from the power cord, which had been meticulously tucked under the box's cover and grounded.

Metzler then purchased an AC RF filter (model Archer Cat. #273-103) from Radio Shack for $7. This device was mounted within the container in series with the AC line. A great reduction of ingress was then achieved. However, further improvement was desired and obtained by shielding the exposed length of power cord going into the box. Metzler then utilized an

FIGURE 1
Headend configuration



By Dan McKay, District Engineer, Continental Cablevision of Southern Massachusetts.

An individual channel, then can be maintained cleanly from the modulator output.

old Klystron power cord that incorporated a flexible mesh aluminum sleeve around its power lines. The results were favorable as follows:

With a dipole connected to the input of the RF box and channel F selected on the converter, the interference carrier measured at the output of the box was +52dBmV. This includes the line extender gain. After removing the dipole and terminating the input, measurements again checked at the output revealed levels undetectable. The spectrum analyzer setting was such as to display a noise floor at −84dBmV, with no beat visible! This correlates to a −35dBmV, an isolation of greater than 87dB.

It must be noted that once this ingress was realized on our part as having some migration through the power line, and then eliminating that path of entry, Metzler was able to determine the effectiveness of his RF containment by simply removing the cover and observing the full return of the nuisance carriers.

This experience of building the RF test box and trouble-shooting the problems mentioned, provided Metzler with technical direction and further assurance regarding an approach in adapting a similar enclosure to the active system.

In review of previous tests performed through the headend lash-up, measurements had indicated the source of migration was cumulative. The interference was increasing in magnitude through the combining network as additional channels were added. Two specific tests of particular importance were included:

1. A measurement taken at the output of the channel F modulator revealed ingress of greater than 60dB down from the video carrier. This test verified the ability of the modulator basket to reject off-air ingress, and the power supply to filter out the migration through the power line.

2. The second test required adding a 25 foot length of RG-59 to the modulator output, and on the opposite end of this cable, in series with a 30dB attenuator pad to simulate lash-up loss, Metzler connected the RF test box for reamplification. The interference carriers, as measured at the output of the RF box, were maintained at greater than 60dB down from the video carrier, proving the ability of the duobond II cable, to shield against strong localized off-air carriers.

An individual channel then, can be maintained cleanly from the modulator output to some other location; it can be easily realized that isolating channel E and F from the existing combining network would reduce the multiple exposure points to ingress, as experienced by our 35 channel lash-up.

This channel isolation approach, incorporating a metal box to house the output lash-up proved to be effective as the tests indicated, largely due to the fact that we greatly reduced the system exposure to migration, for E and F, to just a single modulator and one cable length, prior to entering the RF shielded housing. This will also prove to be a great time savings in future trouble-shooting if one of these two channels decides to "spring a leak" requiring attention again.

All directional couplers and both channel traps are housed within the metal enclosure. All entry and exit connectors are commonly grounded by the housing. System in, representing all channels (minus channels E and F) and the insertion of pilot, are filtered for any interference through the E and F traps. Channel E and F maintained clean of ingress, along with sweep, is then inserted after the traps. The test point, representing the final system out, will be the accurate point of monitoring for quality control. The headend test point and the trunk system, barring no trunk system ingress, will now be free of problems.

In conclusion, it should be pointed out that it is extremely important to use properly shielded passives and that all connectors and cable be of the proper type to match the local environment; but, more importantly, a great deal of consideration must be put into the headend combining and lash-up itself: which channels go where and next to what other channels, and to what extent the entire bandpass is allocated to be either combined or split.

It is comforting to know that these particularly irritating problems can be addressed on a specific demand basis, and that with a qualified and creative staff the nearly impossible becomes quite possible. ■

Chipcom = Ethernet over broadband

In the crowded data communications market, a unique product niche and easily understood company mission can add up to a formula for success. For Waltham, Mass.,-based Chipcom, the equation is quite simple: Chipcom = Ethernet over broadband.

Since its August 1983 founding by Dr. Yoseph Linde and James Montrose, the firm has been in the business of RF modems. Credit good marketing research and, perhaps, a bit of luck, that Chipcom never pursued one of its early ideas: 2400 dial-up telephone modems.

The company also has achieved early success as an international supplier of high-speed RF components. Its European distribution network, for example, is more advanced than its U.S. value-added reseller net.

But that could change soon. Acknowledging Chipcom's technological prowess, Digital Equipment Corp., itself a giant in the Ethernet over broadband field, has been recommending Chipcom's products since Aug. 11, 1986. Why? In part, astute frequency planning. Although multiple services by different vendors run over a single cable is an advantage of broadband, lack of standardization has been a bother.

If an end-user wants to run MAP, Ethernet and Sytek, for example, frequency conflicts quickly erupt. Chipcom's answer is simple. "We see our product as a secondary or tertiary reason to go broadband," says Bruce Cohen, marketing and sales vice president. "But our product also avoids conflicts with priority services like MAP, the IBM PC Network, Ungermann-Bass or Sytek." Using Chipcom, Ethernet and MAP, for example, can coexist.

The company has a simple formula for success

So the company knows what it wants to do. It also knows what it doesn't want to do. Build bridges, token ring or token bus products, for instance. So doing, it stays out of the stampede to token ring (IBM) or token bus (MAP) products. Chipcom also knows how it will market it's products. It will not mount an end-user sales effort and instead will focus on a strong VAR network and sales to big OEMs.

For customers who really want Ethernet on their broadband nets, Chipcom offers "plug-and-play" compatibility with DEC. The current product line includes Ethermodems in 2-port and 8-port versions, both single and dual cable. All are IEEE 802.3 and AUI compliant, run at 10 Mbps with 100 percent collision enforcement and are transparent to DECnet, TCP/IP and XNS protocols.

Five frequency ranges are available for single cable networks that avoid conflict with the IBM PC Network, Sytek's LocalNet 20, TOP and MAP. Ethermodems can operate concurrently with all three authorized MAP channels. Four frequency ranges are available for dual cable configured networks. Coverage without repeaters is 5,500 meters. Mid-split or high-split systems are supported.

Also, each modem contains built-in digital and RF loopback diagnostics. Prices range from $4,250 for the 2-port single cable version to $5,250 and the 8-port version runs $5,350.

Yoseph Linde

An Ethermodem Repeater is available that allows attachment of Ethernet systems running standard or "thin" coaxial cable to broadband. The repeater is available in several frequency ranges. It costs $6,250. The company also has an Ethermodem Remodulator, a 10 Mbps headend remodulator, also available in five frequency ranges and costing $5,900.

The firm currently has about 50 employees and all manufacturing is done in Waltham. Consistent with its marketing strategy, Chipcom will focus on supporting its VARs, and might, over the next half year or so, be looking for a half dozen firms like Clover Electronics in Detroit: companies that can competently design an Ethernet broadband system.

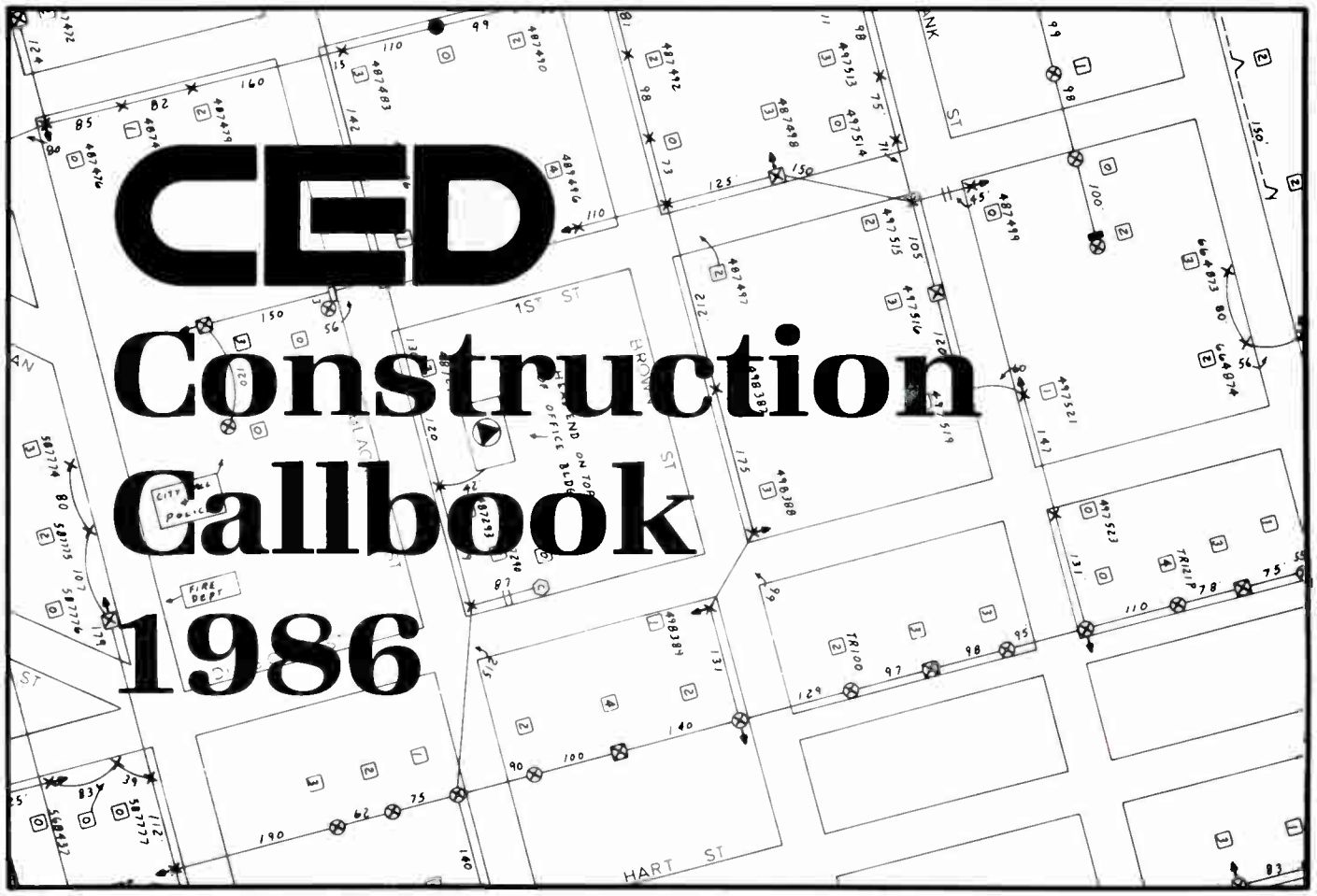
Comfortable with its Ethernet over broadband niche, Chipcom also emphasizes four "softer," yet important, aspects of its company culture.

It's a small company and has to be nimble; responsive to customer need. It also "has to be a company that people like doing business with," Cohen says. And it's a company "that listens and does what it says it will do," Linde adds. Perhaps so. Having gotten a big nod from DEC, the company's formula ought to work.

—Gary Kim

Ethermodem transmit/receive frequencies

Single Cable	Transmit	Receive
L	35.75-53.75 MHz	228.0-246.0 MHz
A	41.75-59.75	234.0-252.0
B	47.75-65.75	240.0-258.0
C	53.75-71.75	246.0-264.0
D	59.75-77.75	252.0-270.0
Dual Cable	**Transmit**	**Receive**
A	234.0-252.0 MHz	234.0-252.0 MHz
B	240.0-258.0	240.0-258.0
C	246.0-264.0	246.0-264.0
D	252.0-272.0	252.0-270.0



construction callbook

AM Cable TV Ind. Inc.

AM Cable TV Ind. Inc.
P.O. Box 505
Quakertown, Pa. 18951
(215) 536-1354

Abcon Associates Inc.
45 Executive Drive
Plainview, N.Y. 11803
(516) 349-7760

Advanced Comm. Ind. Inc.
4206 W. Osborne
Tampa, Fla. 33614
(813) 873-0660

Allied Data Comm. Group Inc.
5375 Oakbrook Pkwy.
Norcross, Ga. 30093
(404) 923-4866

American Cable Contractors
1700 Jasper St., Suite C
Aurora, Colo. 80011
(303) 340-4620

American TV Systems Inc.
1955 Midway Dr. #C
Twinsburg, Ohio 44087
(216) 425-7000

American Utility Construction Inc.
LA Hwy. 1 N, P.O. Box 300
Boyce, La. 71409
(318) 793-2935

B & W CATV Construction
730 Mrytle Court
Sandwich, Ill. 60548
(815) 498-3505

B-Con Construction Co. Inc.
361 Mt. Zion Road
Shreveport, La. 71136
(318) 688-5200

Barker CATV Construction Inc.
145 N. Wilson
Burleson, Texas 76028
(817) 295-0454

Bigham Cable Construction Inc.
P.O. Box 903
Gulf Breeze, Fla. 32561
(904) 932-6869

Border Cable Construction Co.
730 Montclair Drive
El Paso, Texas 79932
(915) 581-9724

BURNUP & SIMS CABLE PRODUCTS GROUP COMPANY

Burnup & Sims
Cable Communications Inc.
6440 Hillandale Drive
Lithonia, Ga. 30058
(404) 482-7612

C & S Construction Inc.
P.O. Box 260, Northgate Drive
Warrendale, Pa. 15086
(412) 935-1553

CAN-AM Construction Inc.
1265 W. Brooks St., P.O. Box 1532
Ontario, Calif. 91762
(714) 988-5507

CATECH Co. Inc.
5132 W. 26th Ave.
Denver, Colo. 80212-1312
(303) 433-0877

CATV Subscriber Services, Inc.

CATV Subscriber Services Inc.
108 State St. #102
Greensboro, N.C. 27408
(919) 273-5553

Cable TV Installations Inc.

Cable Constructors Inc.
105 Kent St.
Iron Mountain, Mich. 49801
(906) 774-6621

CABLE ENGINEERING, INC.
P.O. Box 4086, Louisville, KY 40204

Cable Engineering Inc.
1615 Mellwood Ave.
Louisville, Ky. 40206
(502) 589-2848
(800) 626-2715

Cable Man Inc.
P.O. Box 393
Biloxi, Miss. 39533
(601) 374-5832

Cable Services Company Inc.

Cable Services Co. Inc.
2113 Marydale Ave.
Williamsport, Pa. 17701-1498
(717) 323-8518

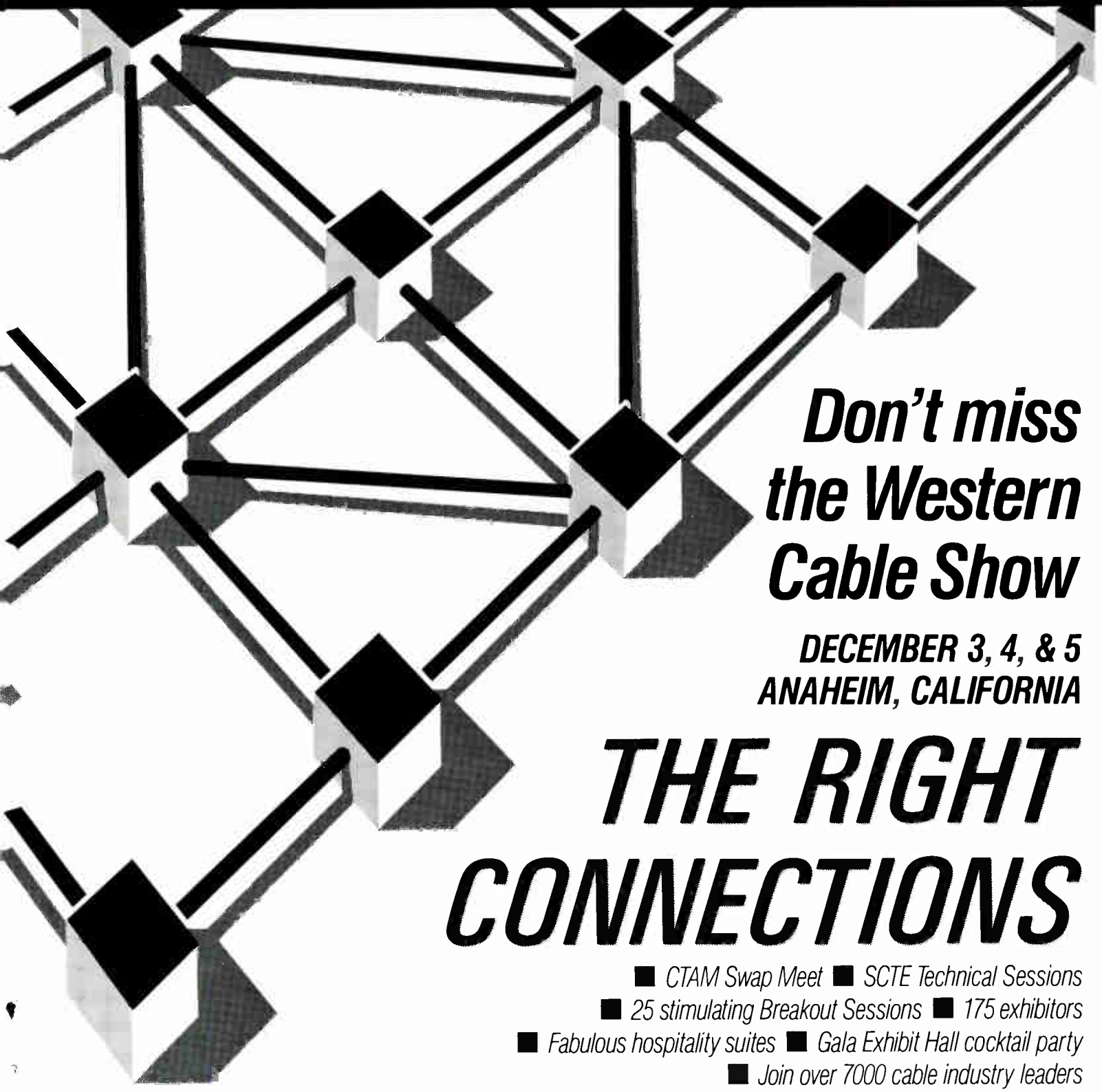
Cable Technical Services

Cable Technical Services
3500 S. Congress Ave.
Austin, Texas 78704
(512) 441-1556

Cable TV Contracting
9321 Fairwood Dr.
Kansas City, Mo. 64138
(816) 966-1736

Cable TV Installations Inc.
5891 W. 34th St.
Houston, Texas 77092
(713) 686-6880

The 1986 Western Show for the National Cable TV Industry



Don't miss the Western Cable Show

DECEMBER 3, 4, & 5
ANAHEIM, CALIFORNIA

THE RIGHT CONNECTIONS

- *CTAM Swap Meet*
- *SCTE Technical Sessions*
- *25 stimulating Breakout Sessions*
- *175 exhibitors*
- *Fabulous hospitality suites*
- *Gala Exhibit Hall cocktail party*
- *Join over 7000 cable industry leaders*

■ ***Act Now!***
Deadline for Advance Registration is November 14, 1986.
For registration and housing forms call:
The California Cable Television Association (415) 428-2225, extension 7

THE 1986 WESTERN SHOW

construction callbook

Cablemasters Corp.

Cablemasters Corp.
2184 Rice Ave.
Lake City, Pa. 16423
(814) 774-2616

Cablevision Services Inc.
1064 S. Center St.
Mesa, Ariz. 85202
(602) 833-2214

CaVision COMMUNICATIONS INC

Cavision Communications
P.O. Box 308
Tipp City, Ohio 45371
(513) 667-4416

CECON, INC.

Cecon Inc.
P.O. Box 125
Berlin, Pa. 15530
(814) 445-8921

Clear Vision Cable Constructors Inc.
9321 Fairwood Dr.
Kansas City, Mo. 64138
(816) 966-1736

Clover Cable Systems
P.O. Box 2246
South Vineland, N.J. 08360
(609) 696-5997

Coaxial Constuction Corp.
4582 S. Ulster St. Pkwy., Suite 1301
Denver, Colo. 80237
(303) 770-7700

Communications Construction Group Inc

Communications Construction Group Inc.
235 E. Gay St., P.O. Box 561
West Chester, Pa. 19380
(215) 696-1800

CT CATV Construction & Maintenance
14 Brownstone Ave.
Portland, Conn. 06480
(203) 342-1805

Cooper Construction Co. Inc.
Star Rte. Box 87-C
Graysville, Tenn. 37338
(615) 554-3624

Cra-Mac Cable Services Inc.
P.O. Box 420
Welcome, N.C. 27374
(919) 764-2764

DLM Enterprises
P.O. Box 1207
Marietta, Ga. 30061
(404) 426-6852

Dinsmore Communications Corp.
600 State St., P.O. Box 4253
Portsmouth, N.H. 03801
(603) 436-6344

Dunklebarger Construction Inc.
R.R. 14, P.O. Box 132
Bedford, Ind. 47421
(812) 275-5656

THE INSTALL PEOPLE.
ENGLISH ENTERPRIZES
Serving the industry since 1974

English Enterprizes
Box 6494
Orlando, Fla. 32853
(305) 841-7210

construction callbook

MAI Communications Inc.

Excalibur Cable Comm. Ltd.
6 Loudon St. SW
Leesburg, Va. 22075
(703) 777-5905

Fishel Co., The
1170 Kinnear Road
Columbus, Ohio 43212
(614) 486-5211

G & L General Contractors Inc.
P.O. Box 1232
Auburn, Ala. 36830
(205) 821-7407

Global Cable Inc.
324 W. Cherry St.
Milwaukee, Wis. 53212
(414) 272-7716

Harrell Enterprises of Illinois
2033 W. Walnut St.
Chicago, Ill. 60612
(312) 226-0533

Henkels & McCoy Inc.
Jolly Road
Blue Bell, Pa. 19422
(215) 283-7600

Ingersoll Industries Inc.
P.O. Box 425
Muskego, Wisc. 53150
(414) 422-1700

Irwin Utilities
P.O. Box 30
New Port Riche, Fla. 33552
(813) 376-1587

K & B Contractors
Box 4498
Tulsa, Okla. 74159
(918) 744-0844

KENNEDY CABLE CONSTRUCTION INC. R

Kennedy Cable Construction Inc.
Hwy. 280 W, P.O. Box 760
Reidsville, Ga. 30453
(912) 557-4751
(800) 841-4361

Knight Construction Co.
1931 Austin Ave.
Troy, Mich. 48083
(313) 689-4030

Lightning Technology Group
Road 1, Box 148-B
Hershey, Pa. 17033
(717) 533-4983

Lightning Electric of PA Inc.
Road 1, Box 148-B
Hershey, Pa. 17033
(717) 533-4983

MAI Communications Inc.
141 Shreve Ave.

construction callbook

Mecum Enterprises Inc.

Barrington, N.J. 08007
(609) 547-1600

Mecum Enterprises, Inc.

MECUM Enterprises Inc.
1135 Centre Drive, Unit F
Walnut, Calif. 91789
(714) 598-1182

MUC Tele-A-Cable Comm. Inc.
P.O. Box 127
Anoka, Minn. 55303
(612) 421-5111

Midwest Comm. Construction Co., Inc.
2405 Maysville Ave.
Zanesville, Ohio 43701
(614) 452-7514

Mucip Cable TV Services
57 North St., Ste. 222

Danbury, Conn. 06810
(203) 797-9464

NaCom Construction Corp.
1900 E. Dublin - Granville Rd.
Columbus, Ohio 43229
(614) 895-1313
(800) 848-3998
(800) 848-0447

Nacom Corp.

NaCom Corp.
1900 E. Dublin - Granville Rd.

Columbus, Ohio 43229
(614) 895-1313
(800) 848-3998
(800) 848-0447

Network Technologies
(Div/AM Cable)
P.O. Box 505
Quakertown, Pa. 18951
(215) 536-1354

New England Cable Contractors
219 Ludlow St., P.O. Box 2474
Worchester, Mass. 01613
(617) 754-6537

Professional Line Construction
3250 Van Wagoner Ave.
Fremont, Mich 49412
(616) 924-6405

Pyramid Cable Services Inc.
7805 Ellis Road
West Melbourne, Fla. 32904
(305) 729-8803

RCH Cable Marketing & Installation
119 River Road
Riverside, N.J. 08075
(609) 461-5640

RT/Katek Communication
Seven Glenwood Ave.
East Orange, N.J. 07017
(201) 678-2083

Schenck construction

Schenck Construction
P.O. Box 3029
Kirkland, Wash. 98083
(206) 827-4884

Southeast Cable Construction Corp.
P.O. Box 177
Callahan, Fla. 32011
(904) 879-1311

construction callbook

Worrell, JM Comm. Construction Co.

Southland Underground CATV Inc.
#28 Industrial Loop Ste. 176
Orange Park, Fla. 32073
(904) 264-1003

Stark & Associates
490 Buford Dr.
Lawrenceville, Ga. 30245
(404) 962-4800

TVM Systems Inc.
P.O. Box 1526
Hurst, Texas 76053
(817) 268-6061

Taylor Telecommunications Inc.
2040 E. Market
Akron, Ohio 44312
(216) 784-2960

Technetronics Inc.

Technetronics Inc.
192 Rte. 9W
New Windsor, N.Y. 12550
(914) 561-7880

TeleCom Systems Inc.
P.O. Box 5214
Charlotte, N.C. 28225
(704) 332-6064

Tele-Engineering
Two Central St.
Framingham, Mass. 01701
(617) 877-6494
(800) 832-8353

Terra Link Corp.
11600 Manchaca, Ste. 112
P.O. Box 783
Manchaca, Texas 78652
(512) 282-8430

Tru-Level Inc.
925 N. Stapley, Ste. C
Mesa, Ariz. 85203
(602) 898-9636

Turner Cable Construction Co.
P.O. Box 576
Salem, Mo. 65560
(314) 729-3119

U.S. Antenna Inc.
2096 Clove Road
Staten Island, N.Y. 10305
(718) 442-4772

U.S. Cable Inc.
2911 N. Ballard Road
Appleton, Wis. 54913
(414) 733-3321

U.S. Television Systems Inc.
914 Banyon St.
Austin, Texas 78757
(512) 454-5779

Videophile Inc.
4582 S. Ulster St. Pkwy., Ste. 1300
Denver, Colo. 80237
(303) 770-7000

WP Telectronics Ltd.
#5 2215 27th Ave. NE
Calagary, ALTA T2E 7M4
(403) 250-8888

Ward Enterprises
157 Seneca Creek
Buffalo, N.Y. 14224
(716) 675-6661

Wavecom
7345 Draper Ave., P.O. Box 8495
La Jolla, Calif. 92038
(619) 456-0042

Williams, L.W. Contractor Inc.
Rte. 3 Box 46-A
Glasgow, Ky. 42141
(502) 651-5638

Worrell, JM Comm. Construction Co.
38 Haynes St. NW
Atlanta, Ga. 30313
(404) 586-9152

Triple beat may be measured with the same procedure as second order measurements.

Continued from page 29

Triple beat

Triple beat may be measured by using the same procedure that was used for second order measurements. Figure 7 illustrates the measurement carriers. Since all the visual carriers are separated by 6 MHz the triple beat component will fall back on the carrier plus or minus the offset in frequency due to instability of the carrier generators.

U.S. Postal Service

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

Required by 39 U.S.C. 3685)

1A. TITLE OF PUBLICATION	1B. PUBLICATION NO.	2. DATE OF FILING
Communications Engineering & Design (CED)	3 0 0 - 5 1 0	9/15/86
3. FREQUENCY OF ISSUE	3A. NO. OF ISSUES PUBLISHED ANNUALLY	3B. ANNUAL SUBSCRIPTION PRICE
Monthly	12	$26

4. COMPLETE MAILING ADDRESS OF KNOWN OFFICE OF PUBLICATION *(Street, City, County, State and ZIP+4 Code) (Not printers)*

P.O. Box 5208 T.A. Denver, Colorado 80203

5. COMPLETE MAILING ADDRESS OF THE HEADQUARTERS OF GENERAL BUSINESS OFFICES OF THE PUBLISHER *(Not printer)*

P.O. Box 5208 T.A. Denver, Colorado 80203

6. FULL NAMES AND COMPLETE MAILING ADDRESS OF PUBLISHER, EDITOR, AND MANAGING EDITOR *(This item MUST NOT be blank)*

PUBLISHER *(Name and Complete Mailing Address)*

Gary Y. Kim P.O. Box 5208 T.A. Denver, Colorado 80203

EDITOR *(Name and Complete Mailing Address)*

Gary Y. Kim P.O. Box 5208 T.A. Denver, Colorado 80203

MANAGING EDITOR *(Name and Complete Mailing Address)*

Linda Johnson P.O. Box 5208 T.A. Denver, Colorado 80203

7. OWNER *(If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) (Item must be completed.)*

FULL NAME	COMPLETE MAILING ADDRESS
International Thomson Business Press	Glenpointe Centre West 500 Frank W. Burr Blvd Teaneck, NJ, 07666-6891

8. KNOWN BONDHOLDERS, MORTGAGEES, AND OTHER SECURITY HOLDERS OWNING OR HOLDING 1 PERCENT OR MORE OF TOTAL AMOUNT OF BONDS, MORTGAGES OR OTHER SECURITIES *(If there are none, so state)*

FULL NAME	COMPLETE MAILING ADDRESS
NONE	

9. FOR COMPLETION BY NONPROFIT ORGANIZATIONS AUTHORIZED TO MAIL AT SPECIAL RATES *(Section 423.12 DMM only)*
The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes *(Check one)*

☐ (1) HAS NOT CHANGED DURING PRECEDING 12 MONTHS ☐ (2) HAS CHANGED DURING PRECEDING 12 MONTHS *(If changed, publisher must submit explanation of change with this statement.)*

10. EXTENT AND NATURE OF CIRCULATION *(See instructions on reverse side)*	AVERAGE NO. COPIES EACH ISSUE DURING PRECEDING 12 MONTHS	ACTUAL NO. COPIES OF SINGLE ISSUE PUBLISHED NEAREST TO FILING DATE
A. TOTAL NO. COPIES *(Net Press Run)*	12,487	12,850
B. PAID AND/OR REQUESTED CIRCULATION 1. Sales through dealers and carriers, street vendors and counter sales	- 0 -	- 0 -
2. Mail Subscription *(Paid and/or requested)*	11,135	12,386
C. TOTAL PAID AND/OR REQUESTED CIRCULATION *(Sum of 10B1 and 10B2)*	11,135	12,386
D. FREE DISTRIBUTION BY MAIL, CARRIER OR OTHER MEANS SAMPLES, COMPLIMENTARY, AND OTHER FREE COPIES	429	413
E. TOTAL DISTRIBUTION *(Sum of C and D)*	11,564	12,799
F. COPIES NOT DISTRIBUTED 1. Office use, left over, unaccounted, spoiled after printing	923	51
2. Return from News Agents	- 0 -	- 0 -
G. TOTAL *(Sum of E, F1 and 2 - should equal net press run shown in A)*	12,487	12,850

11. I certify that the statements made by me above are correct and complete

SIGNATURE AND TITLE OF EDITOR, PUBLISHER, BUSINESS MANAGER, OR OWNER

PUBLISHER

PS Form 3526, Dec. 1985 *(See instruction on reverse)*

The calibration procedure is the same as was used to calibrate for second order. The frequency of the RF source is not important because the front end of the F.S.M. does not require calibration. It is only the detector and the associated linearity that is a variable.

When you have completed the 40 dB down calibration you may proceed with the measurement.

1. Remove all carriers from the system except channels 9, 10, 11, 12 and pilot carriers.

2. Connect the receiver to the system via a channel 9 bandpass filter.

3. Tune the F.S.M. to channel 9 and adjust the manual gain to +4 volts at the F.S.M. video output.

4. Remove 40 dB of attenuation from the wave analyzer and tune the analyzer for maximum indication.

There will be two beat components (1) triple beat (2) inter-mod. The inter-mod will be 6 dB lower in level than the triple beat. The inter-mod is due to 2 x 10 – 11 and will be at a different frequency because channel 12 is not involved. Tune for the component that is higher in level.

5. The sum total of the –40 dB reference plus the amount of attenuation removed from the analyzer plus or minus the meter reading deviation from reference, equals the level of the triple beat.

It may be desireable to perform a reference test at the headend. This will yield an indication of the probable beat frequency and prove the validity of the field measurements.

Remove all carriers except 9, 10, 11, 12 and pilot carriers. Connect the headend trunk cable to a line extender, adjust the output level to +50 dBmV. Insert a variable attenuator on the output and reduce the level to "0" dBmV. Connect the receiver to the variable attenuator via a bandpass filter tuned to the measurement frequency.

The reference measurement may now be made. Alternately removing carriers will verify that you are measuring the desired triple beat component. The field measurement will be at approximately the same frequency but will vary as a function of processor stability.

To be continued in December issue.

classifieds

HELP WANTED

IMMEDIATE OPENINGS FOR TECHNICAL/ CONSTRUCTION PERSONNEL

Rapidly expanding system in Washington/Baltimore metropolitan area has immediate openings for Service Technicians, System Line Technicians, Construction Linepersons and Construction Project Coordinators. Send Resume to:

Prime Cable of Maryland
9609 Annapolis Road
Lanham, MD 20706
EOE

GENERAL MANAGER/ CHIEF ENGINEER

For large state-of-the-art Midwest cable system with excellent growth prospects. Applicant must be an achiever and motivator with an employment record of increasing responsibilities in the CATV industry.

Respond in confidence to:

CED: 1101-01

NATIONAL DIRECTOR OF MARKETING

Rapidly growing full-service communications firm has an executive position available with unlimited growth potential. Candidate must have a degree with at least three years of marketing and advertising experience preferably in communications with a background in Broadband and a good working knowledge of Local Area Networking. Organizational skills and outstanding leadership traits are a must.

Please respond to this challenging opportunity if you possess the perseverance, motivation and energy to meet our goals of excellence and growth in the industry: **P.O. Box 37378, Oak Park, MI 48237.**

MAILING LISTS AVAILABLE

For more information, call Christina Panczyk at (303) 860-0111

Baker Scott & Co. EXECUTIVE SEARCH
1259 Route 46 Parsippany, NJ 07054 201 263-3355
Specialists in the COMMUNICATIONS INDUSTRY
CABLE TV/BROADCAST DIVISION TELECOMMUNICATIONS DIVISION
POSITIONS AVAILABLE AT ALL LEVELS OF MANAGEMENT, COAST TO COAST
Call or write in CONFIDENCE
FEE PAID
"WE DON'T TALK CABLE, WE KNOW CABLE"
PRINCIPALS DAVID ALLEN & JUDY BOUER

SPLICERS WANTED

Experience necessary. New York area. 700 mile new build. Send resume to: Superior Splicing, 21 O'Connor Ave., Staten Island, N.Y. 10314, (718) 442-0281.

How to respond to a blind box ad:

Box CED (Box Number) c/o CED Magazine, P.O. Box 5208 T.A., Denver, CO 80217.

Advertisers' Index

EQUIPMENT FOR SALE/WANTED

Licensed

AUTOMATION TECHNIQUES INC.

GLR 500 CH New Commercial Satellite Receiver

Crystal Stability Affordable Price $329.00

★ Descrambler Ready ★ Crystal Synthesized ★ Made in USA ★ Quality Video with Crystal Stability

1839 North 105th East Avenue • Tulsa, OK 74116 • (918) 836-2584

WANT TO BUY USED EQUIPMENT

If you have any of the following RCA line distribution gear, please notify with list of particulars to: Television Enterprises; c/o Dr. Jim Francks, P.O. Box 3508, San Angelo, Texas 76902.

(1) Part #151496-4 Hybrid Bi-Directional Bridger Amplifier.
(2) Part #151246-2/4H Power Supply
(3) Part #151854-3 Hybrid Trunk Amplifier One-Way, Model 170
(4) 4-Way Feeder Maker for Bridger
(5) 220 MHZ Equalizers
(6) Pads.

NEMAL TAP SALE

$2.49 Ea. (1000 Lot)

2/4 Port • While Supply Lasts!
ASSTD. VALUES — MOST 400 MHZ

25 Pcs. @ $4.29 ea. 500 Pcs. @ $2.99 ea.
100 Pcs. @ $3.79 ea. 1000 Pcs. @ $2.49 ea.

– ALSO IN STOCK –
• Trunk/Drop Cable • Connectors
• Splitters • BT Modulators

ORDER TOLL FREE:
U.S.: 1-800-327-5999
FL: 1-800-52-CABLE

NEMAL
ELECTRONICS INTERNATIONAL, INC.
12240 N.E. 14 Ave., North Miami, FL 33161
(305) 893-3924 • Telex: 6975377

WANTED: L.O. VAN/CONTROL ROOM

3 complete color camera chains, dollies, control console, monitors, scopes, character generator, ¾" VCR, editing facility, microphones, audio console w/ playback, air conditioning, motor-generator to carry full load including air cond. Group W Cable, Box 25990, Los Angeles, CA 90025, or call Roger Wilson, (213) 315-4420.

SATELLITE RECEIVING ANTENNA

Model 8010 PF 7 meter SA prime focus antenna. Brand new-still in crate located in Alaska. For information, call Jan Rearick (605) 352-4014.

BUSINESS DIRECTORY

REVERSE SPIRAL FOR CATV DROP WIRE

Westay Reverse Spiral Grips Are Guaranteed to Resist Rust and Corrosion

WESTAY COMPANY
P.O. Box 1450
Oakdale, CA 95361 (209) 847-6660

CATV EQUIPMENT REPAIRS

- Line & Distr. Amplifiers
- Field Strength Meters
- Headend & CCTV Gear
- Fast Turnaround
- Quality Workmanship
- Reasonable Rates

VideoTech Service Inc.
CATV • MATV • CCTV

All repairs unconditionally guaranteed.
For more information call collect

VIDEO TECH SERVICES, Inc.
4505 D W ROSENCRANS AVENUE
HAWTHORNE, CALIFORNIA 90250
213-970-9012

AERIAL BUCKET TRUCKS

Large selection geared for CATV
STANDARD TRUCK & EQUIPMENT CO.
1155 Hill St. S.E.
Atlanta, GA 30315
Phone 1 800 241 9357

THE SOURCE

- SALES: Converters, CATV Equipment and Parts
- SERVICE: Converters and CATV Equipment
- JERROLD Qualified Warranty Service Centers

WE BUY USED AND EXCESS EQUIPMENT

1-800-382-BRAD
IN NY 1-518-382-8000

BRAD — THE CONVERTER MARKETPLACE

Cherokee, N.C. 28719
Schenectady, NY 12301
Tampa, FL 33610 Fife, WA 98424

For your classified advertising needs, Call (303) 860-0111

METRODATA and BEI

Character Generators
Repaired and serviced.
Call: C.A.B. DIGITAL SERVICE
(516) 286-5822, L.I., N.Y.

Attract the kind of readers you want with a classified ad in CED at the Western Show December 3-5

★ ★ ★ Bonus Distribution ★ ★ ★ at the show

Western Show Issue:
December 1986
Deadline for ad copy:
November 8th

For more information, call Christina Panczyk at (303) 860-0111 or write: Classified Sales Dept., P.O. Box 5208 T.A., Denver, CO 80217.

in the news

It's not officially sanctioned now, but a fiber optic physical layer specification for MAP may someday be a reality. In the meantime, Concord Communications and AT&T are teaming to test MAP using fiber. Under terms of an agreement announced during the Sept. 16 MAP/TOP Users Group meeting in Ann Arbor, Mich., Concord will supply MAP-compatible hardware, software and engineering support while AT&T provides a prototype fiber modem, fiber engineering and project management. An AT&T manufacturing plant is the test site.

Computrol also has developed a fiber modem designed to run MAP. Again, neither effort has been formally sanctioned by the MAP/TOP Users Group.

Jim Chiddix

Chiddix to Denver

Jim Chiddix, ATC senior vice president, has accepted a position as ATC vice president for engineering and technology. Now based in Honolulu, Chiddix will be taking up residence near Evergreen, Colo., a mountain community west of Denver. Congratulations to the newest member of *CED*'s Board of Consulting Engineers.

At General Instrument, Geoffrey Roman has been promoted to the post of vice president, marketing for the Jerrold Distribution Systems Division. Roman was previously vice president, sales and marketing for LAN and satellite systems.

At EFData Corp., Alan Potter is now national sales manager, while at R.L. Drake, Rich Renken is new international sales manager and Jim Brown is new national sales manager.

New analyzer

Hewlett-Packard's new portable spectrum analyzer, priced at $9,500, is available for shipping two weeks ARO beginning in November. The low-cost device is intended for bench applications and remote on-site measurements. The HP 8590A has nearly all the features of the significantly more expensive HP 8568B, which sells for $34,600. For more information, contact the H-P sales office listed in local telephone directories.

Also, a portable oscilloscope priced at $995 is now available from Tektronix. The model 2225 is designed for field service, production test and educational use. It features a 50 MHz bandwidth, alternate magnification, 500 microvolt sensitivity and high/low frequency filtering.

Nexus Engineering has a new narrow-band subcarrier demodulator, the SD-5/N, designed for reception of satellite data. It accepts two high or low level, narrow deviation audio subcarriers from the output of satellite receivers. Contact: (604) 420-5322.

Sadelco reports that its Super 600 model performs with an accuracy of plus/minus 0.3 dB, better than the published spec of plus/minus 0.5 dB. Contact: (201) 569-3323.

Cable Exchange has started a company, ABC Cable Products, to market a new line of remotes compatible with the Jerrold DRX, LCC, DRZ and Starcom VI converters. Custom faceplates and case colors are available to quantity buyers. Contact: Harold Bjorklund, (303) 694-6789.

In the test area, Lanca Instruments is introducing a portable, digital TDR selling for $1,695. Contact: (512) 388-1195.

A.W. Sperry Instruments has released a new volt-ohm ammeter, the model DSA-2003. It is priced at $319.95. Contact: (516) 231-7050.

Riser-Bond, meanwhile, has a 30-minute videotape covering the theory and use of TDRs and the Riser-Bond model 2901B in particular. The tape is available in Beta or VHS formats and costs $35 pre-paid, $50 if billed. Contact: (402) 694-5201.

Free software

EFData Corp. has a free management data base running on the IBM PC or compatibles. It tracks all signals carried on CATV systems, and is free to cable system operators. Write on company letterhead for a free copy: Director, Marketing, EFData Corp., 1030 North Stadem Drive, Tempe, Ariz. 85281.

EFData also announces a new frequency range for its BCM-101 broadband modem. It operates from 5 MHz to 400 MHz in 50 kHz steps and is available now at a cost of $3,950. Contact: (602) 968-0447.

ChannelPlus has SMATV-type fre-

Proposals due

Interested in presenting a technical paper at the May 17 and 18, 1987, National Cable Television Association convention? If so, send a 250-word summary to Katherine Rutkowski, technical program coordinator, NCTA, 1724 Massachusetts Ave. N.W., Washington, D.C. 20036. All entries must be received by Dec. 19, 1986. NCTA is looking for original, unpublished and non-commercial technical papers on topics of interest to the cable television industry.

Papers will be presented as part of the convention's technical program, and will be published in the 1987 volume of the *NCTA Technical Papers*. If accepted, camera-ready manuscripts will be due six week after the abstract due date. Manuscripts can run between three and 15 pages in length. For more information, call (202) 775-3637.

Here's the information NCTA needs:

1. Title of your paper
2. 250-word abstract
3. Author's complete name
4. Author's job title
5. Address
6. Phone number
7. Name, title, address and phone number for all co-authors, if any.

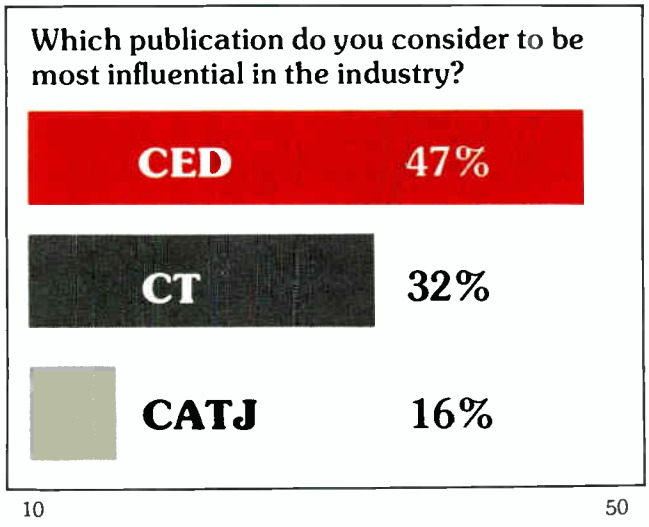
The votes are in

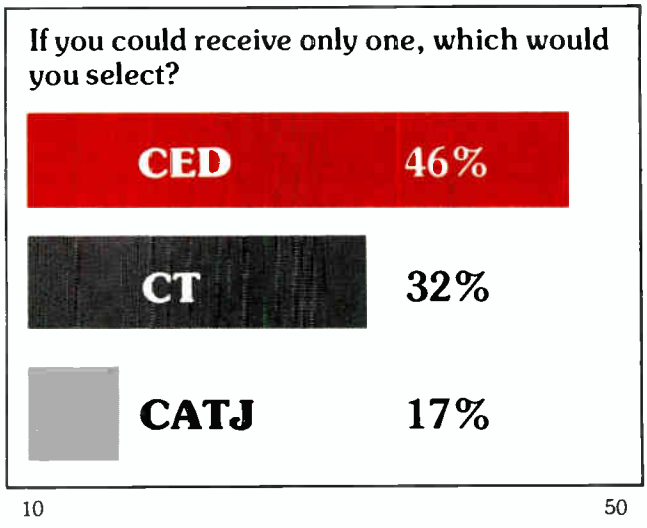
- ☑ Most influential
- ☑ Most helpful
- ☑ Best read

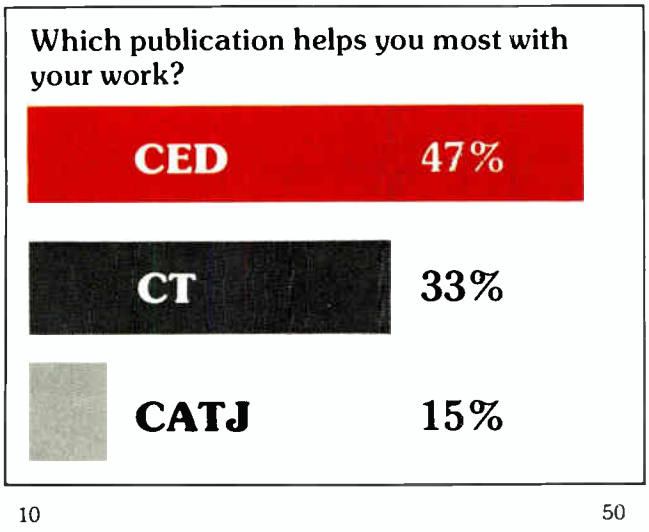
In a confidential industry-wide survey, CATV system managers, engineers and chief technicians were asked to choose the most helpful, most influential, best read technical magazine in the industry.

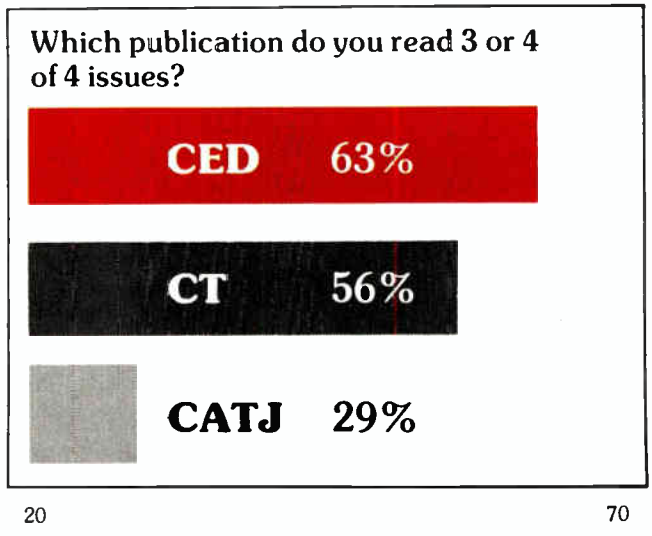
The study, which used **no** magazine subscriber lists, was conducted by the Harvey Research Organization. Fifty-one percent of the respondents are members of the Society of Cable Television Engineers (SCTE). All were selected on a random basis.

The results:









CED The industry's choice

P.O. Box 5208 T.A.
Denver, CO 80217
(303) 860-0111

The MAP marketplace is going to be the scene of a dogfight.

quency agile modulators combining up to 24 video sources at a cost per channel of $180. Contact: (800) 423-0584.

Jensen Tools has a new catalog of test equipment and tools. Contact: (602) 968-6241.

CableTek Center has a new aerial tap enclosure. Contact: (800) 562-9378.

Leaming Industries is introducing a new automatic gain control amplifier, the model AGC622, designed to control monaural or stereo audio level on satellite feeds and local insertion channels. It's designed to maintain average program levels within reasonable ranges without reducing dynamic range. Contact: (714) 979-4511.

Pico Products has a new MS-4P multi-receiver satellite switch, allowing independent viewing of channels from a single dual polarity TVRO antenna. Contact: (800) 336-3363.

Microwave Filter has a new backup filter for processors operating in the aviation bands. Also new: multi-receiver block TI filters and a bandpass filter for FM and data channels. Contact: (315) 437-3953.

PTS Inc. now is stocking and selling Jerrold SMATV and MATV equipment, including modulators, converters, headend and distribution gear and passives. Contact: (812) 824-9331.

Cable Communications Scientific now is a distributor for the Siber Hegner North America product line of digital multimeters. (317) 326- 2601.

MAP/TOP

If the snarls a few vendors displayed at the last MAP/TOP Users Group meeting are any indication, the MAP marketplace is going to be the scene of a dogfight. It's a fight that has the contestants picking partners for protection.

Concord Communications is working with AT&T, supplying modems and remodulators to Sytek and remodulators to Motorola's microcomputer division.

Industrial Networking Inc., the Ungermann-Bass/GE tie-up, is working with IBM.

Data General is working with Allen-Bradley, both for MAP networks and connection of DG processors to A-B proprietary nets.

Fairchild Data Corp., meanwhile is supplying Motorola Microsystems with modems. And Simpact Associates, a factory automation firm, says it will link DEC hardware to MAP networks using INI interfaces.

And carrierband products are on the way. Allen-Bradley has a modem under testing now, with projected 1987 introduction. INI and Motorola Semiconductor also say they are working on carrierband chips.

At the meeting, a MAP controller card for IBM PCs was announced by Concord, selling for $2,695 in single quantities, while Intel, IBM and Motorola Semiconductor announced they now have MAP starter kits.

—Gary Kim

TRAP YOUR PROFITS.

New! Economical canister traps from Vitek.

Stop security losses that lead to profit losses. And do it economically with our new Vitek VT-X Single Channel Rejection Traps.

Available for channels 2 through 6 and (A-2) through I, these traps are weather resistant and stable in temperatures of – 40°F to 140°F.

They feature a high quality, injected molded P.C. board, not foam or urethane-filled, so they last. They are backed by an unbeatable warranty—two full years on parts and one year on labor.

Each model has superb R.F. shielding characteristics and is stamped with a product identification code. HRC, PRIME, IRC and other offsets are available.

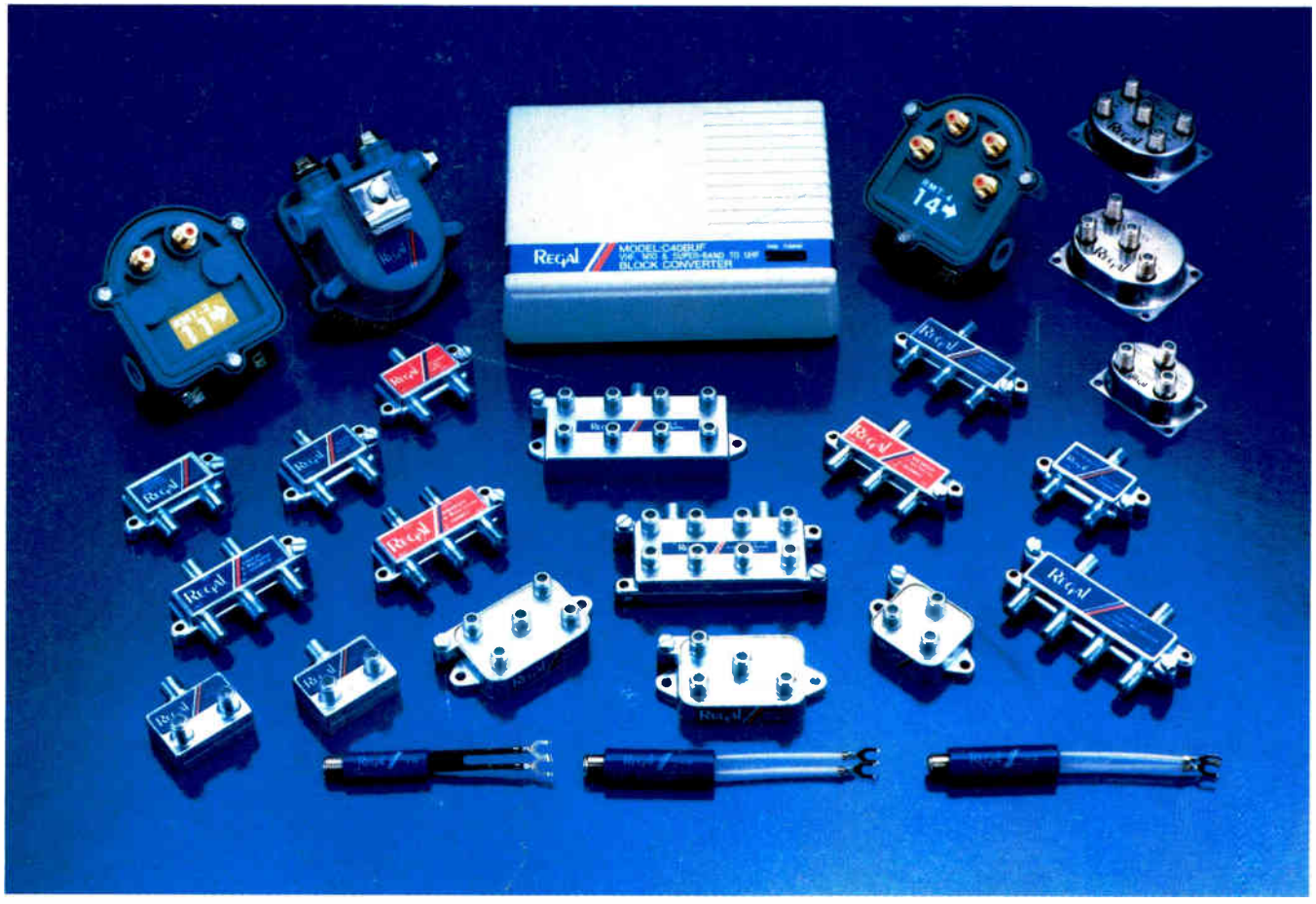
We'll send you a free sample. Just write or call LRC/VITEK Electronics. Trap your signal. Trap your profits.

AUGAT® LRC VITEK
Quality and Innovation

LRC Electronics, Inc.
901 South Avenue, Box 111
Horseheads, New York 14845
Phone: 607/739-3844

Reader Service Number 12

Only ANIXTER delivers REGAL.



Regal is the quality name in Cable-TV ground blocks with high pass filters, FM matching transformers, dual 2-way and 4-way splitters, vertical and horizontal mount splitters, 2-way and 4-way multi-taps, VHF to UHF block connectors, directional couplers, stainless steel splitters, and 100 db RFI shielded splitters.

- Threads are machined to insure a perfect "F" connector fit.
- RFI Shielding (110 db Typical) for 2, 3, and 4-way horizontal splitters
- "F" ports are machined brass
- Full 500 mhz bandwidth
- Full use of P.C. boards to insure electrical and mechanical consistency from unit to unit.
- Brass "F" Ports are "Cadmium" plated to minimize Galvanic corrosion.

Whatever your passive Cable-TV needs, call ANIXTER COMMUNICATIONS, your exclusive distributor for all Regal products.

ANIXTER® COMMUNICATIONS

For immediate delivery

Call our ACTION-LINES toll-free or collect.

WEST-ANAHEIM: (714) 778-4414, (800) 854-0443; **ANCHORAGE:** (907) 274-8525; **DENVER:** (303) 373-9200,(800) 841-1531; **SEATTLE:** (206) 251-6760, (800) 426-7665; **MIDWEST-CHICAGO:** (312) 364-7000, (800) 544-5368; **DALLAS:** (214) 484-2933, (800) 231-5006; **SKOKIE, IL HDQTRS:** (312) 677-2600; **ST. LOUIS:** (314) 423-9555, (800) 325-8058, **EAST-ATLANTA:** (404) 449-6533, (800) 241-5790; **CINCINNATI:** (513) 733-9100, (800) 543-7183; **WHARTON:** (201) 328-0980, (800) 631-9603; **TAMPA:** (813) 626-7115, (800) 237-6466; **CANADA-CALGARY:** (403) 250-9646; **MONTREAL:** (514) 637-3511; **TORONTO:** (416) 625-5110.

In an emergency, weekends and holidays or after 5 P.M. call toll free 1-(800) 323-8167.

CORPORATE OFFICES, ANIXTER BROS., INC., 4711 Golf Road, Skokie, IL 60076, (312) 677-2600

Reader Service Number 38