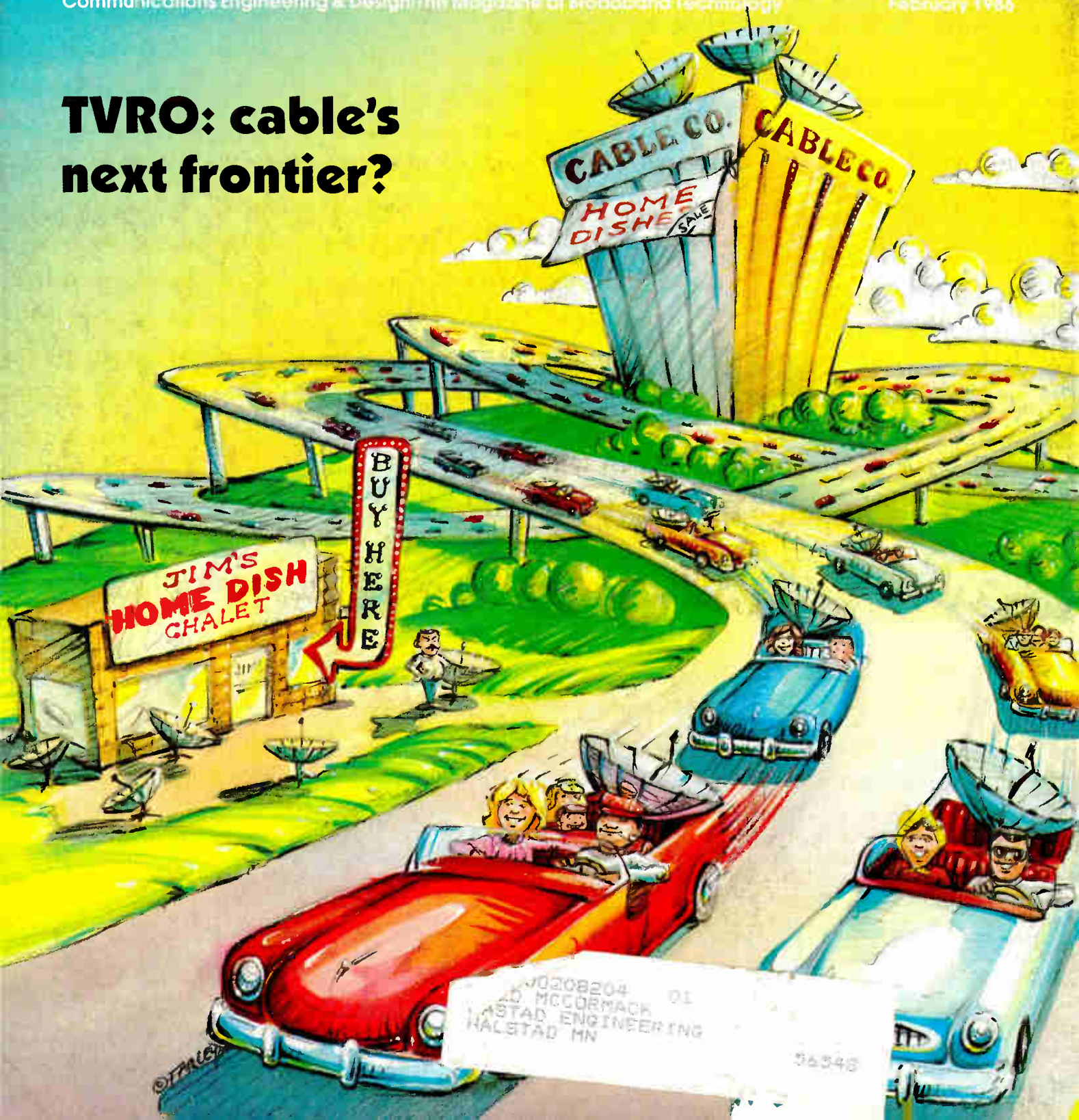
CED

Communications Engineering & Design/The Magazine of Broadband Technology February 1986

TVRO: cable's next frontier?



Presenting ISIS: Magnavox's 600 MHz Integrated Subscriber/Institutional System. It carries both subscriber signals *and* institutional services—all on one line.

Let's talk business.

It makes good sense to operate two services on one coaxial cable. ISIS lets you serve your subscribers while opening new markets: all local businesses interested in data communications and local area networks.

And if businesses in your area haven't been asking about LANs for their data traffic, they may be soon.

It'll be a pleasure.

Your subscribers will be pleased with a full range of video services. Your business customers will enjoy access to new services, wherever they're located within your franchise area. And you'll reap the benefits of operating two systems while maintaining only one.

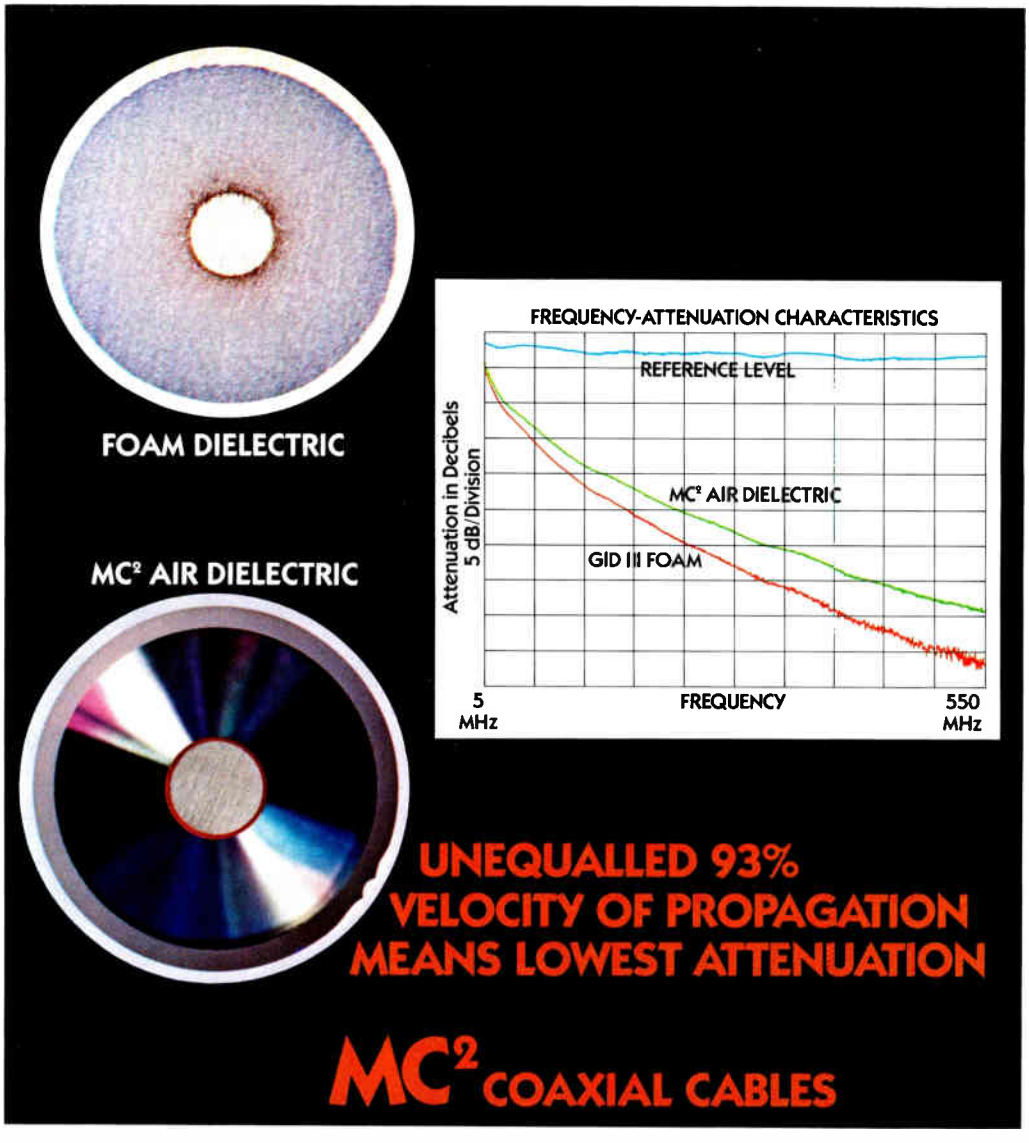
If you're building or rebuilding, ISIS makes sense. For today and tomorrow. Call your Magnavox sales representative for more information. It'll be a pleasure doing business with you.

Magnavox CATV SYSTEMS, INC.

A NORTH AMERICAN PHILIPS COMPANY
100 FAIRGROUNDS DR., MANLIUS, N.Y. 13104
TOLL-FREE 800-448-5171 (IN NY, 800-522-7464)
Reader Service Number 1

Magnavox's new 600 MHz System combines business with pleasure.

TRILOGY LEADS IN TECHNOLOGY:



You cannot find a lower loss coaxial cable than MC². The graph speaks for itself.

The harnessing of air as the dielectric for MC² Coaxial Cables is a unique achievement that assures the lowest attenuation over the longest distances. Particularly valuable for reducing the customary number of amplifiers in new installations, and for assuring a stronger signal in rebuilds and upgrades. The cost-effectiveness in all situations is considerable.

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.

Reader Service Number 2

Trilogy
COMMUNICATIONS INC.

Call or write for a free sample and brochure:
TRILOGY COMMUNICATIONS INC., 2910 Highway 80 East, Pearl, Mississippi 39208 800-874-5649
601-932-4461

CED

February 1986

(USPS 300-510) (ISSN 0191-5428) is published monthly by International Thomson Communications Inc., 600 Grant St., Denver, CO 80203. February 1986, Volume 12, Number 2. Subscriptionsfree to qualified industry readers. All other one-year subscriptions are $26, prepaid in U.S. funds only. Second-class postage paid at Denver, CO. *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.

BPA

Scientific Atlanta

WE KNOW WHEN TO BE TOUGH AND WHEN TO BEND A LITTLE.

NO MATTER WHAT THE JOB, SCIENTIFIC-ATLANTA HAS THE COAX.

Scientific-Atlanta isn't the only manufacturer of coaxial cable, but with single-souce CATV capability and 15 years of experience, we've got a lot more to offer. We know how competitive your business can be. That's why we're so tough on ourselves when it comes to setting quality standards. But when it comes to designing systems, we're very flexible. Because no operator's needs are exactly the same as another's. We listen first, and then help put together the system that's right for you. Right down to the coax.

THE RIGHT COAX AT THE RIGHT PRICE.

No matter what kind of coax you need, Scientific-Atlanta has it: full-line, quality coax at competitive prices. Our GID-3 trunk and distribution aluminum sheath coax gives superior performance in aerial and underground applications. We have a wide selection of RG-59, RG-6, RG-11 and flame-retardant bonded drop cables for all private and commercial uses. Plus a new headend cable for all headend components. And for applications where cable has to bend without compromising performance, Scientific-Atlanta Cableflex™ is the ideal choice.

DEPENDABILITY FROM START TO FINISH.

Even before our cable leaves the factory, each reel is quality tested and then tagged so it can be traced and identified. From there, fast delivery is ensured by our fleet of trucks and trailers, each equipped with an overhead lift for easier unloading. And should you have any questions, our trained staff of service representatives can be reached at the factory toll-free.

SINGLE-SOURCE RELIABILITY.

What could be simpler? The name you count on for major CATV equipment is also the best choice for coax. Scientific-Atlanta coax: the flexibilty to get you out of tight spots and the toughness to keep you in business. For more information, call 1-800-722-2009. Or mail the coupon below.

I know a good deal when I hear one. Tell me more about Scientific-Atlanta coaxial cable.

Name_____

Company_____

Title_____

Address_____

City_____ State_____

Zip_____ Phone ( )_____

☐ Please have a sales representative contact me.

Mail to: Scientific-Atlanta, Department AR, P.O. Box 105027, Atlanta, GA 30348

Reader Service Number 3

Bob Bilodeau

Bob Bilodeau is a gardener with a real green thumb. From broadway theatrical productions to cable systems to telecommunications system architecture, he's a cultivator; nurturing projects and businesses to fruition. "I'm pretty much the builder type. I like to take something and either resurrect it or grow it from one size to another." And grow he has. He's a founder of Telecable of North Adams, Mass. and Surburban Cable in N.J. He's been a consultant, designer and technical director at Jerrold. Now he's the quarterback behind RTK's move into total telecommunications.

He's also a past president of the Society of Cable Television Engineers (SCTE-6 year term) and former member of the NCTA Engineering Committee. He was president of the New Jersey Cable Television Association and is currently a member of IEEE, the Lions, the CATV Pioneers and the Board of C-Span. He received the 1978 NCTA Outstanding Engineering Achievement Award in CATV systems operations. "I felt good about receiving the award for several reasons," says Bilodeau. "When Delmer Ports was head of the engineering division of the NCTA, I made a recommendation to the NCTA to institute a technology award. So I felt good about being the recipient 4 or 5 years later and having been on the original selection committee for the first award given."

With his father, Bilodeau started Telecable in 1951. At the time, he was pursuing his engineering education and worked weekends, summers and vacations. After graduating, he took over full management of the system until he sold his interest in 1963. "Fundamentally," says Bilodeau, "there aren't any differences in the way things are done now compared to then. Even back in '51, people stole the service when they had an opportunity. I think the basic laws of the business are still the same—providing services for a fee.

In 1965, Bilodeau joined Jerrold Electronics Corp., where he became technical director of the CATV division. He remained with Jerrold five years before moving on as an independent CATV consultant in system engineering, frequently acting as the overall CATV system architect. In 1972, Bilodeau was one of several founders of Suburban Cablevision of New Jersey. He was a shareholder, general manager, vice president of engineering and executive vice president of Suburban until leaving in 1984 to head up RT/Katek.

"I've been an owner/operator throughout my cable career and I still own pieces of them here and there," says Bilodeau. "Being a principal founder and shareholder of Suburban Cablevision is the most significant business I've been involved with. After ten years with Suburban, I left for RT/Katek leaving behind 150,000 plus subscribers, 2600 miles of system and the best operating team in the business."

Now, with the marketplace opening to the sale of TVRO's and VCR's, Bilodeau sees new chances for growth within the industry. "I think including TVRO and VCR sales makes good business sense for some. It's typical of the entrepreneur spirit that built the industry to its present stature."

He's less sanguine about fiber optics. "Whether you use fiber, satellite or rope, you need some cost effective way to deliver the product to market. It's understandable that changes in technology will change the vehicle's appearance and speed, even the style and shape, but that vehicle basically delivers the same product—entertainment.

"It's true we need to focus more on customer service," adds Bilodeau. "When I said I think the basic premise of the business is still the same, it is, but it doesn't necessarily follow that we are doing a good job. We've focused more on quantity than quality—horsepower over performance. I think performance will prevail—and should."

But that doesn't mean Bilodeau isn't looking to the future and the possibilities at hand. The future of RT/Katek is in broadening its base in overall telecommunications. At this time, RT/Katek offers third-party IBM PC maintenance, is active in the LAN/WAN marketplace and is about to launch a telecommunications consulting service. "We hope to provide service in the telecommunications business from initial, conceptual thinking to construction, implementation and service, whether it's a cable system or a sophisticated communications/data based network," Bilodeau says.

Still, Bilodeau's heart and soul is with cable. "Cable has been very good to me over the years and I hope to continue being good to it."

—Kathy Berlin

HOW TO TAKE THE RECALL OUT OF THE INSTALL

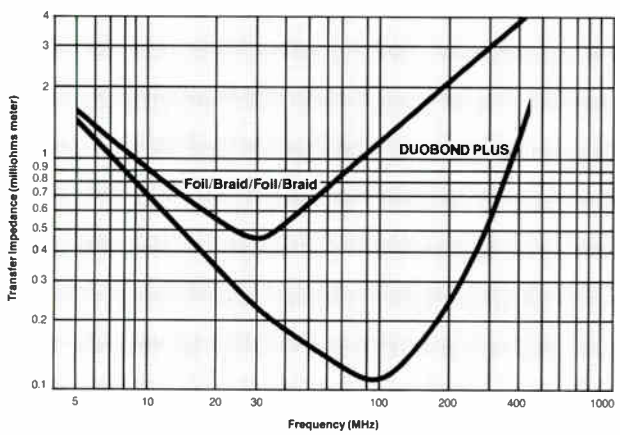
Belden's drop cable with DUOBOND PLUS™ shield helps you prevent costly call-backs. It's also the most shield-effective drop cable in the CATV industry.

Easier termination for maximum shielding integrity.

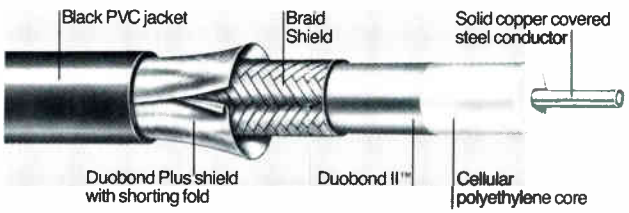
The DUOBOND PLUS shield features a foil/braid/foil construction with a shorting fold in the outermost foil which provides superior shielding effectiveness to typical 4-layer shield constructions. The transfer impedance graph demonstrates this effectiveness.

The added benefit is easier termination. This means less chance for error, resulting in greater shielding integrity and reliability. It also means fewer call-backs, lower operating expenses and more satisfied subscribers.

Cables with the DUOBOND PLUS shield require only half the steps for termination than 4-shield cables. Because it's less bulky, more flexible and its outer foil is bonded to the jacket, stripping and connectorizing are much simpler tasks. You can minimize your connector inventory to one size connector and one crimp tool.



Belden's unique shield protection.



The inner foil of the DUOBOND PLUS shield is bonded *directly* to the core. Foil pushback and signal leakage problems are eliminated. Protection from shielding degradation is eliminated during installation–where most shielding problems occur.

The unique shorting fold in the outer foil of the DUOBOND PLUS shield provides metal-to-metal contact for improved isolation. Traditional overlapping foils fail to reduce slot radiation as effectively.

Belden's exclusive shorting fold

Drop cables with the DUOBOND PLUS shield are available in RG59, RG6 and RG11 constructions—messengered, non-messengered, dual and flooded versions. All cables are 100% sweep tested from 5 to 450 MHz with a minimum return loss of 23db for RG59 and 26db for RG6.

When it comes to shielding effectiveness and ease of termination, there is no equal to Belden in the CATV industry. Take the recall out of your install. Call Belden today for more information and a free CATV catalog. Belden Electronic Wire and Cable, P.O. Box 1980, Richmond, IN 47375. Phone: **1-800-BELDEN-4**

There is no equal.

Reader Service Number 4

COOPER INDUSTRIES **BELDEN**

Which way the splits?

By Archer Taylor,
Malarkey-Taylor Associates Inc.

Sub-split, mid-split, high-split, super-split, hyper-split. What do they all mean? As most technicians in cable television know, these refer to the guard band frequencies for two-way duplex filters. As nearly everyone knows, forward transmissions usually are assigned to the frequency band *above* the split; reverse transmission, to the band *below* the split.

Why? When two-way cable was first conceived, 20 or 25 years ago, by Fitzroy Kennedy of SKL (Spencer Kennedy Laboratories), the only spectrum for which equipment might be available for reverse transmission was the so-called "sub-VHF," "sub-lo," or "low-sub" band 5.75-47.75 MHz, to which Jerrold had assigned "T-channel" numbers, T-7 to T-13, for block conversion to channels 7 to 13.

Jack Thompson and Don Chandler, of EIE (Electronic Industrial Engineering) and ATC, learned about upstream ingress on the T-channels the hard way, about 1971 at Orlando, Fla., and Overland Park, Kan. Since then, the industry has developed low transfer-impedance cables, RFI gaskets, sleeved RFI connectors, HPF balun transformers, bridger switching, divided trunks, special protocols and engineering frequency assignments. Although many of us knew at the time that return transmission conditions would be much better at higher frequencies, the drive to push the upper bandwidth to 260, 300, 320, 330 and 400 MHz simply forced us to stick with the 5-30 MHz upstream band as the only available spectrum. Guard bands would simply eat up too much

valuable channel capacity, we thought.

When the I-Net concept was introduced about 1976, we simply pushed the guard band up to the mid-band, 108-174 MHz, and stretched the return band to include low-band TV channels and the FM band, or 5-108 MHz. Then, in the late 1970s, Nick Worth of Telecable proposed an I-Net with the forward transmissions *below* the guard band and return transmissions *above*. That was a smart move, which still has not been generally adopted.

Consider these facts:

♦ Return transmission networks essentially are noise "collectors." Normally, only one return carrier is transmitted at a time on a particular frequency, but noise at that frequency is likely to be collected from everywhere at the same time. The term "noise," as used here, includes random (gaussian) noise, discrete carrier ingress, power line noise ingress and contact noise at the center conductor seizure—as well as all manner of unwanted things (such as Radio Moscow, for example) picked up by thousands of user terminals.

♦ There are many more carriers per MHz reading in the 5-54 MHz band, for international broadcasting, land mobile radio, amateur radio and CB, than in the TV and FM broadcasting band 54-108 MHz, or in the government band (mostly military) 225-400 MHz. Moreover, the noise spectrum from power line corona and sparking decreases rapidly at higher frequencies.

Thus, we use that part of the spectrum with the largest number of interfering sources for return transmissions that are necessarily vulnerable to the accumulation of noise from all sources. Yet, we use the quietest parts of the spectrum for forward transmissions that are interfered with only by the few noise sources in the forward transmission path.

We have got it just backward!

Would it not be better to use the higher portion of the spectrum for return transmissions, where there are so many fewer sources of ingress interference? Forward transmission in the crowded lower portion would only be interfered with by ingress along the particular transmission path, not by the noise accumulated from every point in the system.

It is relatively easy to turn an I-Net around. It was actually done in Kansas City, Mo., and it worked well. In another system, special duplexing filters were designed for a guard band at 300-375 MHz. The normal 35 channels were carried forward in the band 54-300 MHz; and 25 MHz for return transmission in the band 375-400 MHz. Of course, the forward amplifier stations had to be spaced for 400 MHz but could carry only 35 channels. It worked and with much less ingress problem than is usually experienced in the customary 5-30 MHz band.

Perhaps it is too late to change, since the I-Net shows little signs of life and the promise of two-way services seems gradually to be dying off. CED

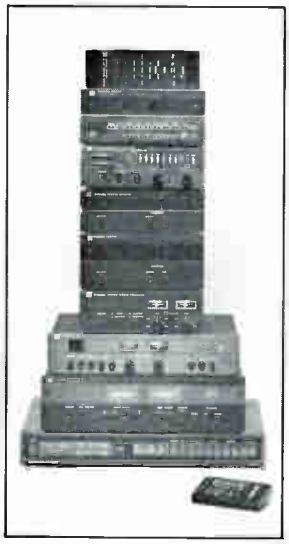
Expand your profit WITHOUT expanding your plant.

Satellite TVRO Marketing: The Opportunity is Now.

Channel Master® would like to introduce an idea that helps you reach new subscribers within and beyond your current service area **without plant expansion:** satellite TVRO marketing.

The sale of satellite TV programming subscriptions and receiving hardware promises to be a profitable enterprise for the cable industry—but only for those operators and MSOs who move decisively in the immediate future.

The Channel Master® Cable Products Group brings the strength, resources and satellite TV marketing experience of Channel Master® directly to your system. We're the one partner you need to take full advantage of your market's potential.



Find out how Channel Master® Cable Products Group can help make the transition to TVRO marketing simple and profitable for your system. Mail the coupon below to get the facts from Channel Master®: The **POWER** in TVRO Marketing.

See us at the NCTA Show, Booth 2309

Channel Master®
Industrial Park Drive, Smithfield, N.C., 27577

YOUR NAME

COMPANY NAME

ADDRESS

CITY

STATE ZIP PHONE ( )

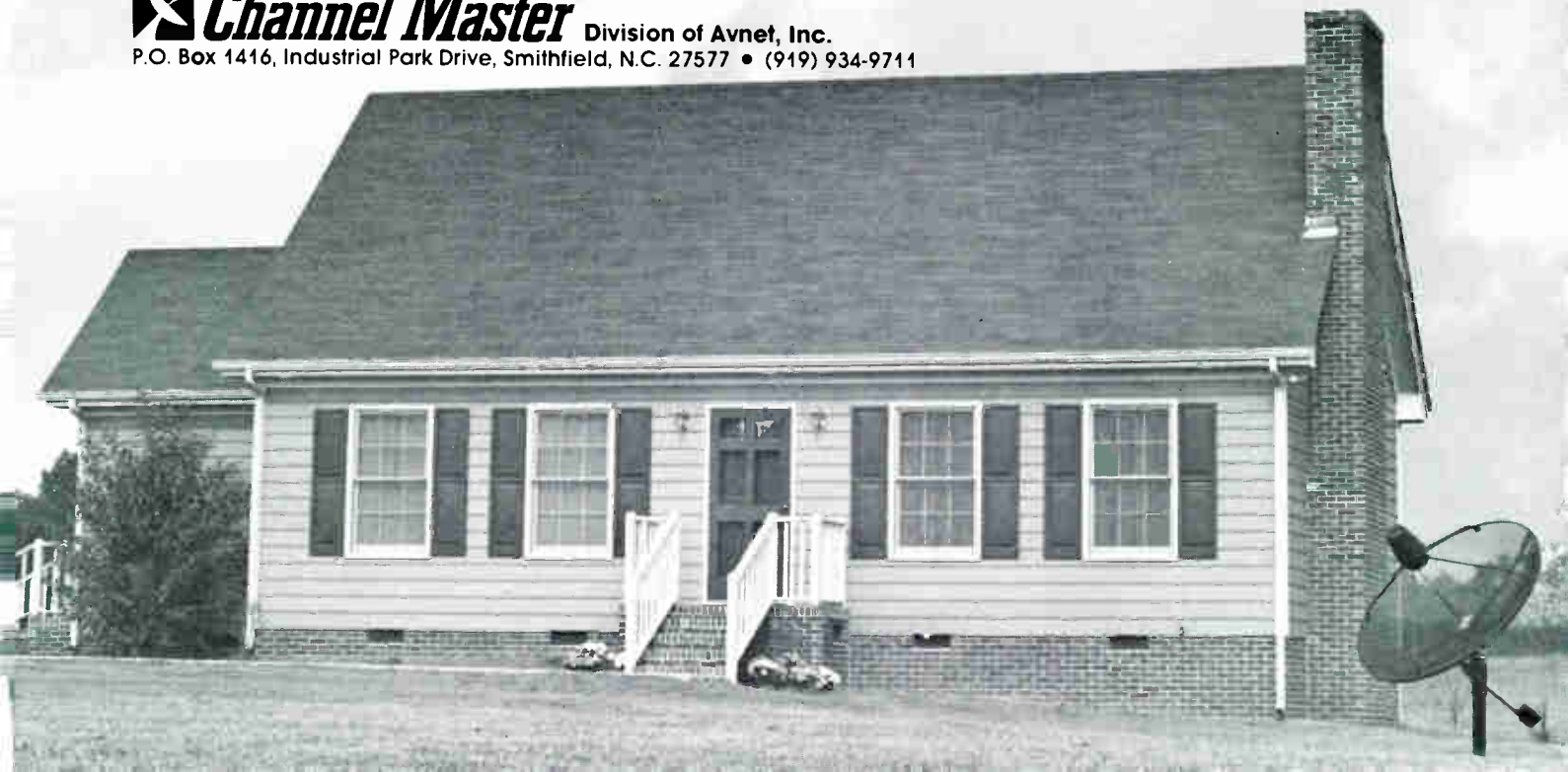
☐ Send me more information on TVRO Marketing

☐ Owner ☐ Manager ☐ Engineer
☐ MSO ☐ Independent

Return To: David Waddington, National Sales Manager
Cable Products Group
CED26

Reader Service Number 5

Channel Master Division of Avnet, Inc.
P.O. Box 1416, Industrial Park Drive, Smithfield, N.C. 27577 • (919) 934-9711



Return Path

Cover letter

Your June 1985 edition of **CED** had an interesting fold-out cover of a theater and caricatures of many personalities. I recognized the names of the magazine's staff in the orchestra pit and was surprised to find my husband on the first row aisle. Marvelous caricature!

We would really like to know the significance of the cover. Also, is there any reason for people in the rear having their backs turned?

Mrs. Paul B. Miller

The covers are our way of recognizing the people who make up the technical side of cable TV. Sometimes we feature system operators or MSO engineers. In the past we've spotlighted members of the NCTA Engineering Committee or speakers at the technical sessions at the national convention. If we can't get someone's photo, the result is an engineer showing his back.

Survival of the fittest

I agree with Nick Worth's concern that quality needs to be an issue in the forthcoming years; however, Nick's comments seem to suggest that quality is necessary in a consumer electronics sense. The issue of quality is coming to transcend more than just the issue of converters and other electronics equipment. Within the next couple of years, DBS satellites will be launched which will make it possible to deliver 20 or more high quality television pictures to all cities in this country. Those DBS pictures will not only be high quality, but they will not suffer outages as many of our cable systems do.

In the newest big city builds, it is not uncommon to find the investment exceeding $1,200/subscriber. If you believe, as I do, that a 30-inch dish can be placed on a roof and the receiver installed in a home for $600 to $700, then one can quickly appreciate the threat that DBS could pose for the cable industry. If they offer programming at a lower price than cable, one has to ask why anyone would have cable when the pictures are better, the price is lower and the service is more reliable on DBS.

To that end, our industry must begin to learn efficiency and put greater emphasis on quality in the upcoming years so we are prepared to effectively compete with new technologies when DBS becomes a reality. Our very survival could depend on how well we learn these lessons in the next two or three years.

On another issue, the monthly cable bill includes $1 to $3 to cover the cost of placing the converter in the home, while the DBS viewer will more than likely own his equipment. He will soon forget he paid $600 for it and won't consider depreciation when reviewing his monthly cost of viewing DBS. In fact, he will be reluctant to cancel his DBS service because he has made an investment in equipment.

The cable industry, I believe, needs to migrate in that direction, too, so that the consumer owns the terminal equipment. Our bills can be lowered correspondingly to reflect the savings of not having to own and maintain a converter in every subscriber's home; subscribers could even own the descrambler. The industry needs to support the EIA/NCTA committee activity developing the decoder interface standard by encouraging our converter manufacturers to provide products which are compatible with those interfaces and by encouraging our customers to purchase sets which incorporate the interface.

The cost of the interface is expected to be less than $3 per television. This cost is far less than the converter currently provided by the cable operator and will eliminate duplication of the tuning function for the customer. This will have the accompanying advantage of solving the many complicated problems facing our customers today when they attempt to use the features on their TV sets and their VCRs with cable TV.

VCRs represent another form of competition for the cable industry. Persons wishing to view a rented cassette only have to insert the cassette, push "play" and tune the TV set to channel 3, while anyone wishing to make the VCR work with cable faces a complicated menagerie of switches, wires and converters and a very complicated set of instructions that, in general, cannot be operated by mere morals. We must make video cassette recorders easier to use with cable. So far, each solution posed only makes the process more complicated. Manufacturers recently introduced timers to be used with converters to solve the problem of changing channels on the converter according to a pre-set program; however, I have found few, if any, persons who can easily use these devices.

Again, I believe that we must work with the EIA in making VCRs more compatible with cable. Unless we can deal with these user-friendliness and service issues in a timely way, the very survival of the cable industry may be at risk, especially in the big cities which cannot afford to lose any percentage of their customers and still maintain any measure of profitability.

Joseph Van Loan
Vice President, Engineering
Viacom Cable

'My Turn' correx

Several critical typographic errors occurred in "My Turn" in the October 1985 issue of **CED**.

Equations 2 and 3, about halfway down the middle column, should read:

$$Po = E^2/120\pi = E^2/377 \text{ watts} \quad \text{Eq. 2}$$

$$A = G(300/f)^2/4\pi \text{ square meters} \quad \text{Eq. 3}$$

The first line after "where" for Equation 5 should read:

$$10 \log p(rec) = dBm$$

In the "Example" at the end, a typographic error converted the gain of the Wavetek RD-1 to 10 dB. The correct value of 16 dB was, obviously, used in the example.

Also, in the January 1986 issue of *CED*, on page 8, the square root sign was inadvertently omitted (in my own shop, unfortunately). The last formula in the center column should read:

$$I = \sqrt{(EP/R)} = k(OP)$$

$$EP = Rk^2(OP)^2$$

I regret these errors, and hope they did not confuse your readers.

Archer S. Taylor
Malarkey-Taylor Associates

Kudos

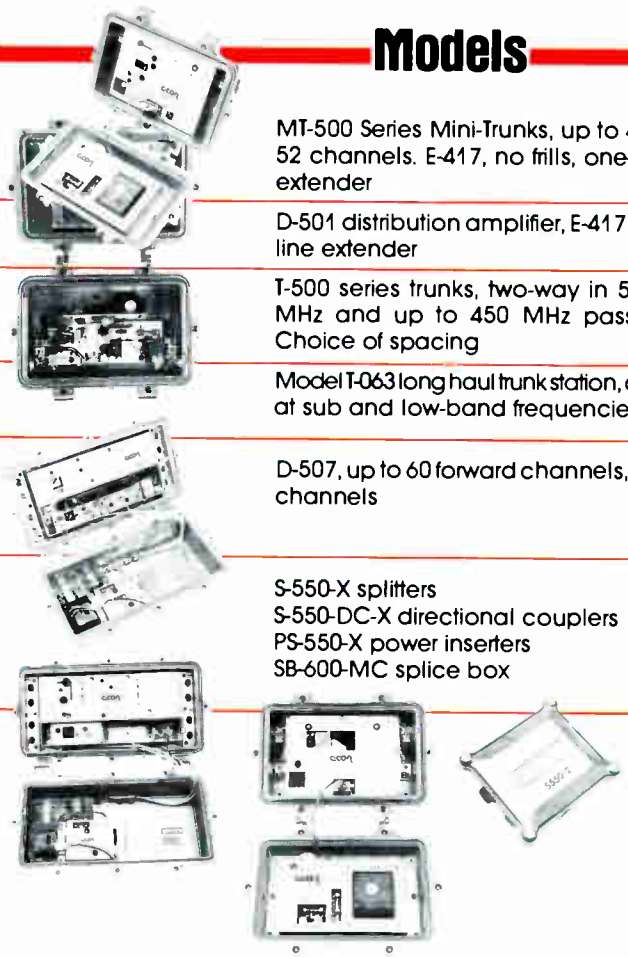
After reading your editorial on truth in advertising (December 1985), I am convinced that, except for the genuine crooks, the vast majority of us in the marketplace applaud you!

George Jackson
Micro Computer Service
Orlando Industrial Electronics Service Corp.

C-COR's Quick-Ship List

You Get Fast Delivery of the World's Best-Made Cable TV Amplifiers

Application	Models
Economy products for rural systems	MT-500 Series Mini-Trunks, up to 400 MHz, 52 channels. E-417, no frills, one-way line extender
117V apartment house amplifiers	D-501 distribution amplifier, E-417 one-way line extender
Standard 60/30VAC trunk stations for system rebuild, upgrade, expansion	T-500 series trunks, two-way in 54 to 220 MHz and up to 450 MHz pass bands. Choice of spacing
Long distance transport of signals from antenna site to hub, between hubs	Model T-063 long haul trunk station, operates at sub and low-band frequencies
Two-way distribution amplifier with the flexibility needed for today's and tomorrow's requirements	D-507, up to 60 forward channels, 4 reverse channels
Main line passives for sub-low operation down to 5 MHz	S-550-X splitters S-550-DC-X directional couplers PS-550-X power inserters SB-600-MC splice box



These products are covered by C-COR's 3-year warranty.

C-COR® ELECTRONICS INC

Call toll-free 1-800-233-2267

60 DECIBEL ROAD • STATE COLLEGE, PA 16801 • 814-238-2461

Call toll free in continental U.S. (except PA) 1-800-233-2267 • Telex: 510-670-3513

C-COR ELECTRONICS, INC., OREGON GRADUATE CENTER, 1400 N.W. COMPTON DRIVE, BEAVERTON, OR 97006 TEL: 503-645-0345
C-COR EUROPE BV. P.O. BOX 3000, 1300 EA ALMERE-STAD, THE NETHERLANDS 31-3240-32945 TELEX 70277 NMBOMNL DATACABLE

Reader Service Number 6

Volume 12, No. 2

In Perspective

A good skipper at the helm

In a calm sea, every man is a pilot. In rougher waters, most of us would prefer a little help. And these days, most cable personnel have gotten used to the pitch, yaw and roll caused by the successive poundings of waves of consumer devices hooked up, with varying degrees of success, to their systems.

Unfortunately, just when it looks like the ship's trimmed, another new wave smashes amidships. To mix metaphors a bit, it's almost as if the cable industry and consumer electronics industries were playing a game of leapfrog. Cable-compatible tuners, remote proliferation, stereo, VCRs. Multiple sets, PC and videodisc attachments. Solve one problem. Get another.

As might be suspected, relations between the cable and consumer electronics industries have been somewhat less than any of the parties might like. Fortunately, things seem to be on the mend. One obvious sign is the continuing work by the Electronic Industries Association's Consumer Electronics Group.

The group's proposed Interim Standard No. 23 sets specifications for the RF interface between the CATV system and subscriber devices like TVs. Among problems the standard addresses are image distortion and local oscillator leakage from the input of a cable-ready set into a cable system.

Jerrold's Vice President, Engineering, Mike Jeffers gave a tutorial on these issues at a recent EIA/NCTA workshop at the Winter Consumer Electronics Show. The nearly full-day session may not have settled all issues separating the industries. But there's no question a dialogue, a mutual give-and-take, is under way.

At the same workshop, ATC's Walter Colquitt talked about the EIA's proposed Interim Standard No. 15, which specifies an audio and video baseband interface for television receivers and VCRs. It's designed to solve a couple of problems, among them the loss of remote tuning or other features of a TV receiver when a converter/descrambler is used. The specification also addresses the multiple remote issue that arises when TV receiver and converter have separate controls. The standard also avoids tuner, IF and remote control system duplication.

Standard No. 15 would specify a baseband interface on the TV receiver that accepts a compatible decoder. Result? One tuner, one remote, one IF system. And a cheaper decoder. Also, inevitably, a loss of cable's revenue stream from remote rentals.

It will take some time for the interface to appear on all TVs, and then some additional time before all non-interface-equipped sets are replaced. So remote control revenues won't disappear soon. But neither will they last forever.

The seas will heave for some time to come. But it's nice to know good skippers are at the helm.

On the subject of good skippers, we'd like your advice. *CED* is considering setting up an electronic bulletin board, and we need to know what menu items you'd find most useful. We suspect many of you have favorite programs you've written for CATV applications and might like to share them with your colleagues. Beyond that, we aren't sure.

You can help us by writing and letting us know what you want. Send along your favorite program, a problem you'd like to solve or have solved. If there's interest, we'll put it all up on the system; and you can take it from there. Send your letters to the editor now. We can't do it without you.

Gary Y. Kim

DI-TECH'S COMSERT 1000

The Automatic Commercial Insertion System That Brings Your Operation Back Down-To-Earth

Comsert is user friendly, flexible, expandable, affordable and puts a whole new world of programming at your command.

The Comsert 1000 can locate any spot on any tape on any VCR! Our video detectors and tally circuits will accurately verify that the spot has been played!

The Comsert 1000 also features: ■ Random Access---The system can assign any VCR or groups of VCR's to any single program or multiple program sources. ■ User defined preroll time for each program source. ■ Insert commercials on more than 10 program sources, that is: USA, ESPN, CNN, MTV, etc. ■ Ability to control more than 50 VCR machines. ■ Commercials can be inserted into the schedule, up to 15 minutes before air time. ■ Complete VCR status, that is, cued, running, played, etc. ■ Future programming well beyond a one year period. ■ 10, 15, 30, 60, 90 second spots, or any other lengths, can be programmed to run on an individual basis or linked together on multiple machines. You are not limited to 1 or 2 minute blocks of time. ■ V.I. switching. ■ System capacity is over 10,000 commercials per week. ■ System can be supplied with optional time base correctors and audio compression units. ■ Multi-user capability. Up to 3 terminals can be added to the system. ■ Simple to use editing system with continuous prompting for inserting the required codes for each spot. ■ Complete open avail listings for each program source. ■ Variable window for cue tones. ■ Stereo Audio.

Call, write or telex for more information on the Comsert 1000, or request our free catalog today. Whether it be for radio, television, mobile vans or production studios, explore Di-Tech's high quality, reliable, easy-to-operate answer, to your present and future needs!

Reader Service Number 7

di-tech

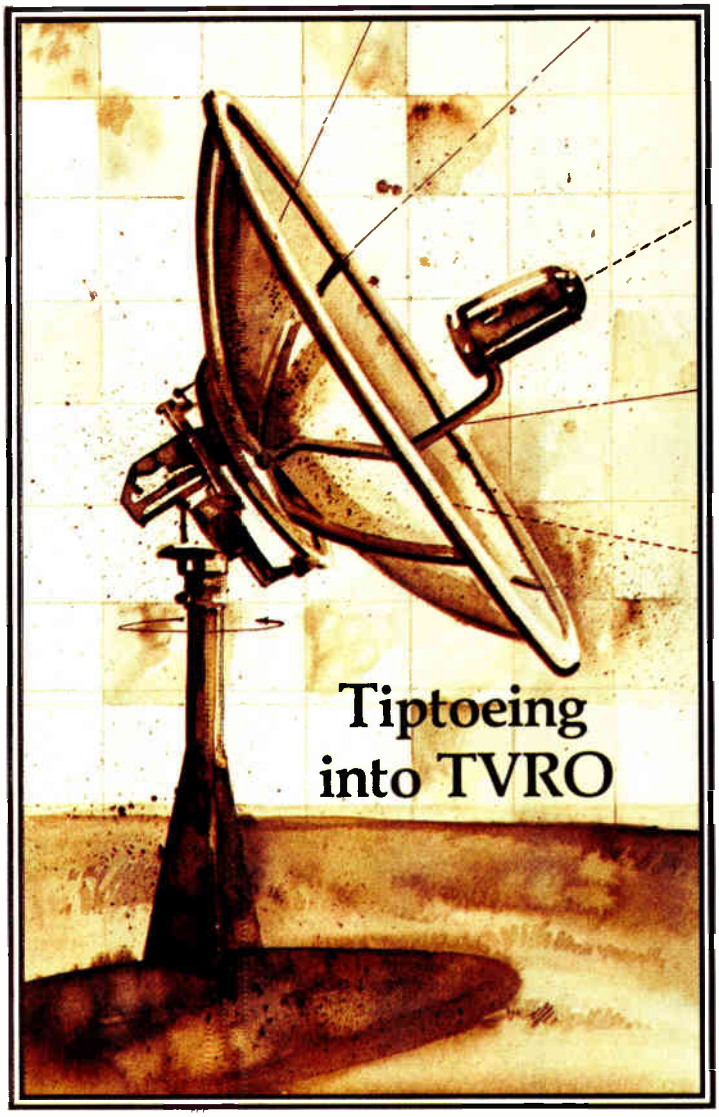
48 JEFRYN BOULEVARD DEER PARK, N.Y. 11729

TEL. #(516) 667-6300 TELEX #971806

Tiptoeing into TVRO

A steady stream of pilgrims—upwards of 400 at last count—has been making its way to Danville Cablevision Co. in recent months. Among the visitors to the new Mecca are top MSOs, medium and small cable systems all across the country. The object of their quest? Details on Bill Laughinghouse's TVRO business.

Laughinghouse is manager for the 22,500-subscriber Danville, Va., system, and he's got 200 backyard TVROs in the field now. He continues to install about 10 new systems a month, month, but, "I could push that up to about 20 or 30 a month if I really pushed the advertising hard," Laughinghouse says.



On Jan. 14 this year he turned on his first subscriber who's equipped with a VideoCipher descrambler. And he finished 35 more VC installs the next day. In all, about 15 percent of his TVRO subs already have called and asked for descramblers.

He's been installing the backyard systems for about a year now and found the business a logical extension of his CATV efforts. But this isn't the first time he's ventured into a business often times considered a mortal opponent of CATV. It is the first time he's done so in the glare of so many spotlights, however.

A bit of history: about two years ago, he decided to turn his front office into a VCR showroom and rental center. His thinking? The old front office was a cost of doing business; not a revenue generator.

Today, Danville Cablevision has the largest selection of rental tapes in the local market. "We rent about 60 tapes a month and carry 2500 titles," Laughinghouse says. And he's found that his pay subscribers who belong to the tape movie club have dramatically lower churn rates.

In fact, single-pay subs in the club have a 0.004-per-month churn rate, while single-pay subs not in the club turn over at 3.5 percent a month. About a third of the movie club members live outside his franchise area, the rest inside. And about 45 percent of the customers who buy a TVRO system from him also have VCRs. To make life easier for everybody, he also sells switcher boxes, splitters and A/B switches.

That he's dominant in VCR tape rentals and CATV would be interesting enough. But what's drawn such active interest recently is the move into TVRO, which positions Laughinghouse as a "full-service" video entertainment provider. And despite the worries some have about cannibalization of a system's cabled subscriber base, he's found the various businesses to be complementary.

Most of the TVRO customers live outside the franchise area, and 95 percent of them are on a system lease/purchase plan—although an outright sale option is available. And one trend already is clear: TVRO customers show less churn than cabled customers. Monthly CATV churn in this system runs about 2.3 percent. TVRO churn runs about 1.8 percent, "probably because they have equity building in the system," Laughinghouse thinks.

Service calls? "They run about 2 percent a month." Failing receivers? "They're replaced at no cost to the subscriber."

So far, about 20 percent of TVRO subscribers have upgraded from a $39.95-a-month, eight-foot dish looking only at Galaxy to a $56.95-a-month, 10-foot dish looking at the whole satellite arc.

Customers are billed monthly, and those wanting descramblers have two options: spend $395 to buy a VCII unit outright or rent one for $14.95 a month. HBO and Cinemax are available for $9.95 each or $17.95 in combination.

Laughinghouse offers a few tips for operators looking to get into the business: "Service is the name of the game. Customers want to know that you're going to be around for a while." Other operators doing TVRO sales echo this bit of advice. They say many consumers just don't have confidence in the new dealers who've recently gone into business. Cable has the recognition, the perceived financial stability, the image of knowledgeability. It's a definite plus to consider.

Laughinghouse also recommends that "you stay within a 75-mile radius of your headend. That way the longest drive distance is 30 miles." One thing you don't need is trucks driving for hours each way to an install.

A display in the front office also is required so customers can look at the gear, check out the remotes and so forth. At least one other CATV op has gone so far as to open three free-standing sales locations.

Another plus for most operators is their greater familiarity with advertising, marketing and promotion. Laughinghouse traditionally has run radio and TV ads, and is toying with the idea of running spots on his ad-supported channels, perhaps offering incentives for cabled subs who offer sales leads outside the franchise area.

In addition, Laughinghouse has begun a door-to-door campaign using a half-inch sales tape in a portable VCR. "The point is to get people over the high-tech fear."

Staffing hasn't been a headache. One CSR has been designated signated a satellite specialist and two installers have taken special training on the Channel Master system Laughinghouse is using.

Surprisingly, local TVRO dealers welcomed Bill's move into the market. "We educated people so dish sales in general went up." The advent of scrambling dried up everyone's sales in December, though, and Laughinghouse hopes to get a VCII education program rolling soon.

Before Buying Your Next Converter System, Read Our Fortune.

There are many things to consider before investing millions of dollars in a converter system. And, after all the facts and figures and engineering analyses have been scrutinized one important question always remains: "Will my supplier be around 10 years from now to support me?"

That's when it's reassuring to know that M/A-COM's addressable converter systems are backed by one of the strongest industrial organizations in the United States.

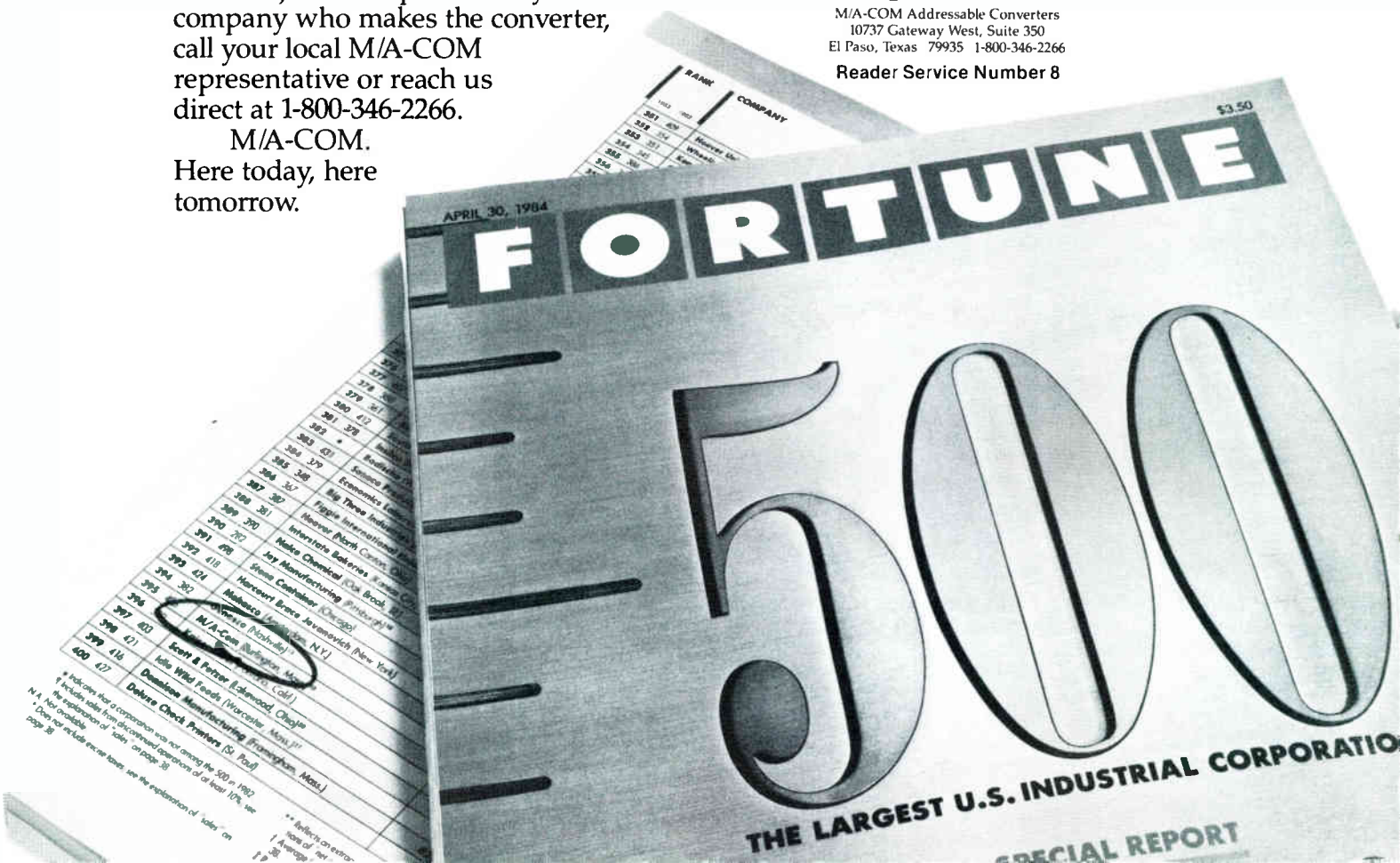
Perhaps that's only one small point to keep in mind when comparing the many systems available but we think it's one worth remembering. So—if the company that stands behind the converter is just as important to you as the company who makes the converter, call your local M/A-COM representative or reach us direct at 1-800-346-2266.

M/A-COM. Here today, here tomorrow.

M/A-COM

M/A-COM Addressable Converters
10737 Gateway West, Suite 350
El Paso, Texas 79935 1-800-346-2266

Reader Service Number 8



TVRO subscribers on his lease/purchase plan are on a 60-month pay-off period, and "that scares many operators." Bill says he gets his money back in the first year-and-a-half on a cash basis, and the balance of the contract is revenue. He does qualify his buyers: all must be homeowners.

One important caution was mentioned by several operators: "You need to find a reputable supplier." Given the financial instability of many players in the home TVRO market, you want some assurance that spare parts, training and service will continue to be available to your TVRO customers.

Laughinghouse says it's not a terribly complex business, and there's reason to believe that from this tiny acorn a mighty oak can grow. He points out that of the 20 million uncabled homes, perhaps 1.5 million (or about 7.5 percent) have home TVRO systems. That still leaves a whale of a potential market.

Of course, nobody ever claimed an oak can grow just anywhere. Carl Rossetti, president of Portland, Maine's, Public Cable Co., can attest to that. About six or seven months ago, he began to get calls from residents outside the franchise area. They wanted receiving systems and didn't feel comfortable buying from area home TVRO outlets. Most were willing to pay cash to buy systems outright.

The referrals were word-of-mouth, and some of the calls came from people who'd already bought systems but couldn't see anything. And there's the rub. The "look angle" up in Portland is about 9 to 11 degrees. Just about enough to give anybody a clear shot at lots of trees—and no birds at all.

Rossetti had 22 customers lined up, but not a single one could get an unobstructed view of the satellite arc. So the company has backed away from TVRO sales, although the market appears eager to buy.

And some operators may find that an eager market needs some financing help to satisfy that urge to buy. Steve Gingery certainly thinks so. He's the operations manager with Eastern Telecom Corp., a Pennsylvania-based MSO. ETC has been selling TVRO systems since 1982, and got into the business because "there are people who never will be reached with, or satisfied by, cable and who are going to get a TVRO system from somebody," Gingery says.

But not all those potential customers can pay cash. So ETC works with several local consumer finance agencies to help buyers arrange credit. Only in the last few years have the finance companies been willing to do so, and that should help broaden the market.

Most of ETC's 300 or so buyers have come from outside the franchise area, and mesh dishes represent about half the business. Early on, the solid reflectors seemed to be favored.

Like other operators, Gingery suggests that you go with a reputable manufacturer and stress service. He's got descramblers on order and has found out that 5-foot dishes will work in his area.

A definite strong point for ETC, compared to retail TVRO dealers, is customer concern about their equipment. "They worry about things breaking and know we're established. Also, we guarantee a picture or refund a customer's money," Gingery points out. The company has opted to carry a variety of systems and components, among them: Uniden, Drake, M/A-Com, Channel Master and Raydx.

So far, the purchase option seems most popular, although a lease program is available for systems ranging from $43 to $76 a month.

Not content to remodel an existing front offfice, ETC built a whole new building with a showroom, then added a second on a main thoroughfare and will soon open a third. The company also has separated its sales and installation force from the CATV operation.

Supposing, however, that an opera-

tor has no present interest in TVRO. What's the risk? According to Kim Johnson, ATC director of operations for Consumer Satellite Services, systems at greatest risk are those with real limited offerings. "So we're upgrading channel capacity everyplace we think that's a problem," he says. So where are the big TVRO markets? Areas where cable is deficient in providing service. Areas scheduled to be wired—but not yet. And areas where cable won't ever reach, he argues.

But while there's potential here, pitfalls await the unwary. Channel Master's Dave Waddington, for example, cautions that "there's not a lot of carryover of knowledge to the consumer side. The quality of your product is important, but many operators may be thinking in terms of broadcast standards for equipment, and that can put you at a disadvantage in the home market."

Which isn't to say quality isn't important. "A cable operator can't just fold the tent and walk away, like some retailers can," Waddington says. When you're in business for the long haul, you have to be more careful.

And while the cable industry, as a whole, enjoys marketing experience beyond that of the typical retail dealer, some ops may be a bit complacent or lethargic on the marketing end. "You've got to advertise to TVRO consumers," Waddington says. Furthermore, retail marketing methods, such as point-of-purchase displays, are important.

So what about pay "take" rates? Waddington is sanguine: "Generally, cable subscribers with a dish all keep basic but drop pays." And a host of potential new business awaits: TVRO hardware sales, hardware leases, programming and decoder sales.

Channel Master also sees C-band direct as a stepping-stone to Ku-band DBS, which is the "delivery system of the future," Waddington adds. So it's a smart investment to gain the distribution and sales experience now, he emphasizes. In fact, many manufacturers, Channel Master among them, point out the advantages of a system that is Ku-, as well as C-band, compatible.

So how far away is serious Ku-band service? "We see growth in C-band direct over the next few years, then C/Ku combines for a few years, then Ku-only 5 years after that."

And for those of you who are convinced that the FCC will move orbital spacing to 2 degrees, Channel Master certifies that all its antennas will deliver adequate reception at 2-degree satellite spacing.

Making sure an equipment supplier is reputable and solvent and can offer C/Ku compatibility or performance at 2-degree spacing are some of the considerations operators may need to consider before jumping into the home TVRO business.

There are others. Not all manufacturers have the means, even when they have the desire, to test surface accuracy of reflectors. Not all have test ranges. Not all can give you reasonable assurance today that three years from now spare parts will be readily available for their equipment.

Some manufacturers will offer a single system for the home, while others will mix-and-match components. Scientific-Atlanta, for example, takes the bundled system approach; Channel Master can put together 40 configurations. It's a matter of opinion which approach works best.

A possible problem may await some customers who want to hook up VideoCipher descramblers. It isn't clear that the units will work on every receiver in the field now. So VC compatibility is a real consideration. Surprisingly few vendors, incidentally, have signed licensing agreements with M/A-COM for VideoCipher units. Channel Master has committed $20 million or so, and Standard Communications is working now on a new home TVRO system incorpo-

rating an internal VC descrambler board.

The new system, to be offered exclusively to CATV ops, should be ready by June of this year. It will be C/Ku-compatible and come in 2 models: a version that looks only at Galaxy, as well as a system with polar mount that tracks the full arc. The system uses solid reflectors.

In urban areas, especially, TI may be a problem. So an important consideration for reflectors is sidelobe performance. Pico's KID, for example, has the first sidelobes down 26 dB.

Reliability also seems high on operator and vendor do-and-don't lists. And some of the companies marketing TVRO systems are familiar: Channel Master, Scientific-Atlanta, Pico, Cable TV Supply, General Instrument, M/A-COM, Winegard, Zenith, Standard Communications. CATV ops have done business with them for years. About the worst you could do in buying a system from them is pay a bit more than you need to.

Some of the names you might not recognize immediately: Uniden, KLM, Drake, Janeil. But knowing a company like Raydx is staffed by experienced, ex-Microdyne receiver designers gives you more information to go on. Bob Hooper, for example, is vice president and director of engineering for the firm, and brings some 25 years of satellite electronics experience to Raydx. He's used to designing commercial quality systems and "QC-ing the heck out of everything."

In any case, "today, the home market is a 5- to 6-foot reflector business, not a 12-foot business," Channel Master's Waddington says. "Some operators have a tendency to go on the high side, equipment-wise. But you don't need to pump the signal through 30 miles of plant." Of course, viewers on the southern tip of Florida, the California border with Mexico and some other locations may need the gain provided by a 12-foot antenna.

That's providing the reflectors have surface accuracies of plus or minus 0.100 inches, according to Harry Greenberg, Channel Master's director of antenna development. "Only 25 percent of reflectors sold in the home market fit those specs," he says. At C-band, signal loss at 0.100 accuracy is about 1 dB. At Ku-band, though, that same degree of parabolic accuracy results in a whooping 6.5 dB of loss, he adds.

And vendors are offering CATV operators many types of assistance. Channel Master, for example, is setting up a training program for installers of home TVRO systems. The company also will explain how to do mailings, set up a showroom or custom-print sales support materials. Other support includes training for troubleshooting and retail selling tips.

Drawing on the company's 35 years in consumer TV, Waddington suggests that most retail formats for equipment are good at three options: good, better and best. "It's too confusing, otherwise." He also cautions against handling more than one brand in a showroom, because "It's too difficult for your sales staff to be really familiar with the gear."

Operators also will need to create a realistic display showing the actual goods and recognize that many customers won't know how to use the equipment without help, Waddington says. "Use a common-sense approach. You have to be able to fill your orders. Have the forms ready, your staff trained, site survey and installation procedures set."

Cable TV Supply's Home Satellite Systems Division offers home TVRO system training for a fee. HSS also can mix and match components across a wide product line. Also, in most states, the company will put an operator in touch with a consumer financing representative like CIT Financial Services, a Manufacturers Hanover affiliate. Forms, promotional support, consumer

finance workshops and co-op advertising services can also be worked out with CIT, the company says.

A variety of distribution channels for TVRO equipment now exist, and some of those channels change as CATV operators size up the market. RF Systems, for example, has historically sold purely through distributors. KLM uses distributors as a first choice, but will go dealer direct if it must. Winegard's equipment has been distributed through Cable TV Supply for over a year. And Scientific-Atlanta is lining up the last of 500 dealer direct outlets.

Of course, most of these companies, and others you'd recognize, have thought about, or are approaching, cable operators on a direct basis. And some clearly aim to step up their efforts. It can be delicate in a few cases. Scientific-Atlanta already has moved to support certain dealers nationwide. But the company also made it clear to the dealers that where CATV operators are interested in TVRO, S-A cannot refuse to do business.

And both companies believe there are situations where a cable op and retail dealers can work together. In some cases, CATV might prefer to handle programming distribution while local dealers handle the hardware. In other cases, cable involvement might extend to descrambler sales as well. The precise arrangements will be worked out over time and may take still other forms. The point is to see beyond the heated rhetoric and size up the market.

What about benchmarks for component quality? To get an answer, *CED* spent some time talking with Greg Baer, systems engineer with M/A-COM. He recently walked through system features as a way of highlighting design elements many operators may wish to consider.

The main differences between systems will occur in three areas: fiberglass versus mesh reflectors, reflector size and receiver features," Baer says. A 6-foot dish works fine if Galaxy is the only bird looked at. An 8- to 10-foot antenna and a positioner are needed for more than that. M/A-COM offers both mesh and sheet molding compound (SMC) dishes, Az/El as well as polar mounts with linear actuators. The feed on 6-foot dishes is a tripod; on the 8- and 10-foot dishes a monopod feed is used, so no guy wires are necessary.

Some consumers want to feed multiple receivers, and the new company's new dual polarized block downconverter does so. It converts both odd and even signals and sends them to a video matrix switch.

Also, many consumers seem to prefer the mesh dishes. Technology probably isn't the point; attractiveness is. Then again, the mesh versions are petalized and can be shipped UPS.

Baer periodically tests both the SMC and mesh antennas on the range, for draft, and one advantage for the SMC is the repeatability of the mold. That means good retention of the parabola. Also, "Some people mistakenly believe that a mesh antenna acts like a solid reflector above wind speeds of 40 mph. I tested some dishes in Lockheed's wind tunnel, and it's not true," Baer says.

Some other features might be worth looking at: plated hardware to withstand salt, number of hub bolts to tighten, pre-drilling of declination holes or pre-set focal lengths for the feed. Another set-up headache is getting the mesh panels into the ribbing. If an installer has to flex the ribs to slide the mesh in, the previously-inserted panels can slide out. No fun. Electrostatically-bonded paint helps. Accuracy in the horizon-to-horizon drives also is important.

And remember the system will need to be consumer-friendly. Stereo, remotes and prompts will be desired features in receivers. Internal descrambler and positioner circuits will reduce equipment clutter, while channel recall, fine-tuning and parental control will appeal to many. CED

Defining S/N

By T.M. Straus,
Chief Scientist,
Microwave Products Division,
Hughes Aircraft

Cable Classics

A series of reprints of definitive papers and articles on the technology of broadband communications.

Can you define signal-to-noise ratio? Did you know that there are multiple definitions depending upon whether signals are RF or baseband video and that noise power bandwidth, signal definition and weighing factors all make a difference? Do you know how to convert from an RF carrier-to-noise ratio number to baseband video signal-to-noise ratio?

This paper by Tom Strauss explores the mathematical relationships between the different signal-to-noise ratio definitions and presents conversion tables enabling the engineer to calculate signal-to-noise ratio according to any one definition given a specification or measurement according to any other definition.

The concept of noise figure and calculation of RF carrier-to-noise ratio are familiar to most cable engineers. With more and more baseband techniques being used in both headend and subscriber equipment, it has become more important to convert readily between RF specifications and measurements made with baseband video signals.

This paper, together with work by M. Jeffers and J.J. Gibson, provided a firm theoretical foundation for understanding the relationships between the different signal-to-noise ratio definitions.

Graham S. Stubbs,
Vice President,
Science & Technology
OAK Communications Inc.

One might think that such a common term as signal-to-noise ratio has only one definition, but this, unfortunately, is not the case. The definition depends upon what is meant by "signal" and what is meant by "noise," and these meanings determine how the measurement is made. To compare an NCTA S/N measurement made at VHF with an EIA or CCIR S/N measurement made at video baseband, one must follow the vestigial sideband television signal through an ideal vestigial sideband demodulator. The resulting relationships show that there is only a small difference between the various definitions. Experimental results which back up the theoretical findings are described.

Definitions

The following are some of the definitions commonly used to define TV signal quality:

1. NCTA: Signal—rms power of the VHF signal during the synch pulse.
   Noise—rms noise power in a 4 MHz wide VHF channel.

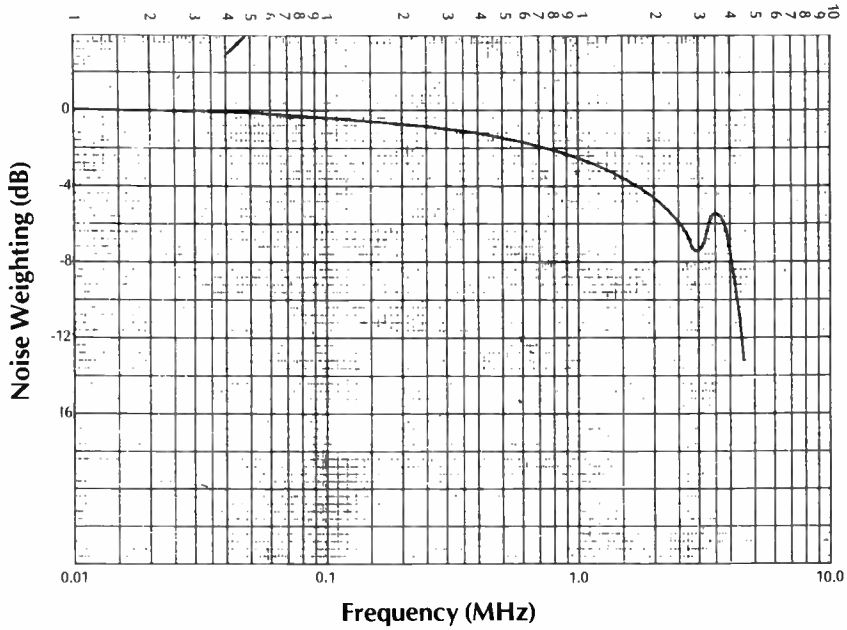


Figure 1
EIA noise weighting

General Instrument Is The Name That Guarantees You A Better Reception In the TVRO Market

When you sell a Satellite TV System from General Instrument you're selling over 30 years' experience in manufacturing quality TV reception products.

General Instrument's industry leadership is your customer's guarantee of superior performance from high quality products... and all at popular prices!

The General Instrument mesh dish offers outstanding performance, simplified installation and durable, yet lightweight construction...and it's UPS shippable.

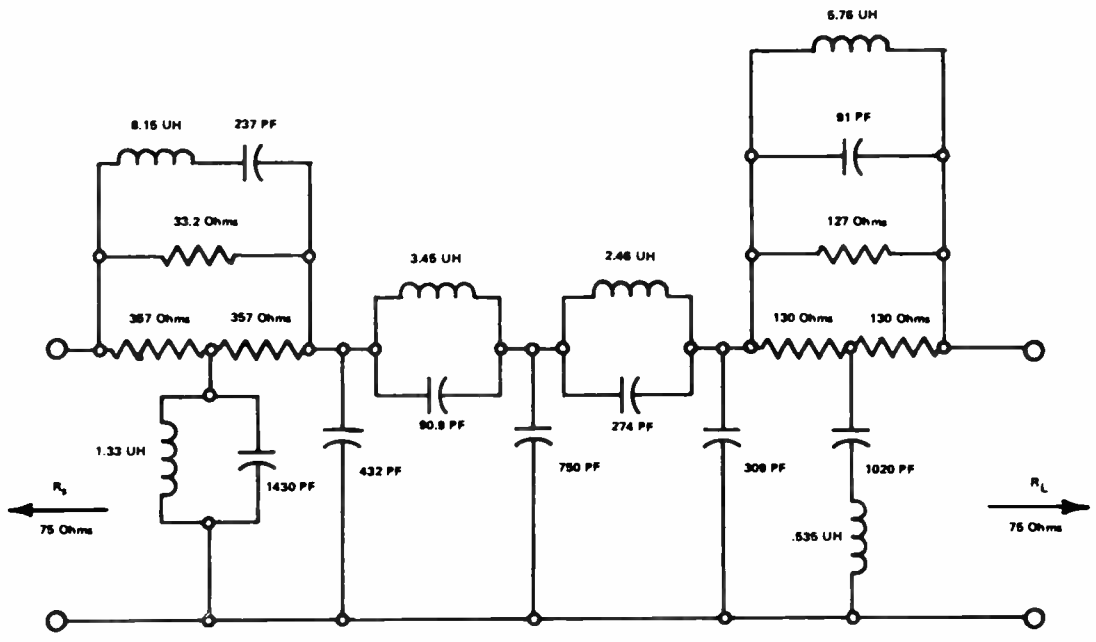
SYSTEM 1000...Full featured block downconversion receiver for independent channel selection from a single dish antenna in multiple receiver installations. Complete with infrared remote control.

GENERAL INSTRUMENT

Write for complete product data:
General Instrument Corporation
RF Systems Division
TVRO Department
2200 Byberry Road
Hatboro, PA 19040
(215) 674-4800

SYSTEM 960...Block downconversion technology in an attractively styled low cost package.

Reader Service Number 13



Flat Loss 3.7 dB
Nominal Impedance 75 ohms

Figure 2
EIA noise weighting network

The measurement is necessarily made at VHF and generally with a field strength meter. Signal power is read directly from the field strength meter. Noise power also is read off the meter after the signal is removed, but a correction factor of 3.9 dB, (at +5 needle reading) which accounts for the fact that the meter bandwidth is less than 4 MHz and also that the meter attempts to read noise peaks rather than rms value, is added to the reading.

Alternatively, a VHF spectrum analyzer may be used to make the measurement. The sweep speed must be sufficiently lowered, and the sweep width decreased so as to ensure that one sees the true synch pulse peak. For the noise measurement, video filtering can help establish the rms value, but the true noise bandwidth also must be carefully established.

2. TASO: Signal—rms power of VHF signal during the synch pulse.
   Noise—rms noise power is a 6 MHz wide VHF channel.

Note that this is exactly the NCTA definition except for the different noise bandwidth. Thus, the TASO and NCTA definitions are related to each other by a simple bandwidth correction factor. On the other hand, they are distinctly

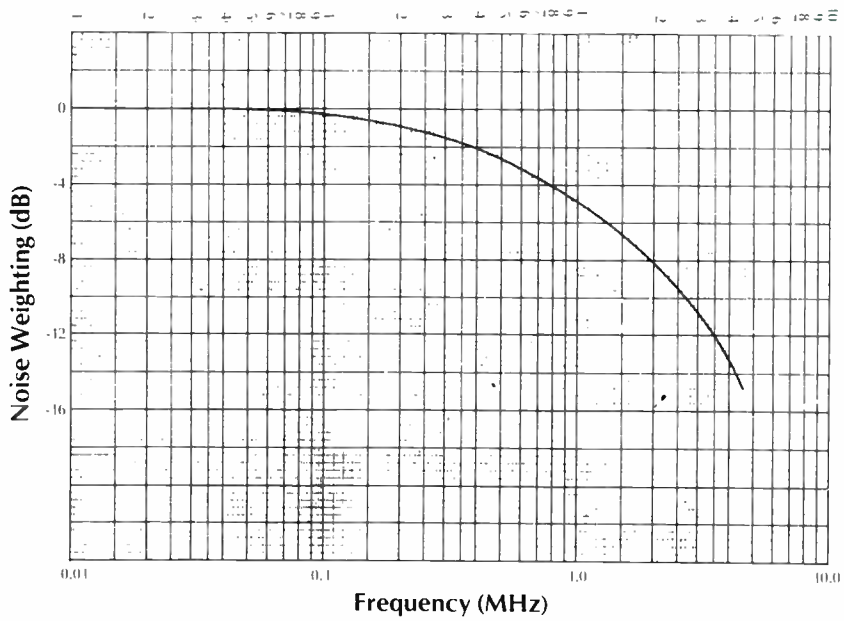


Figure 3
CCIR noise weighting (Canada and USA)

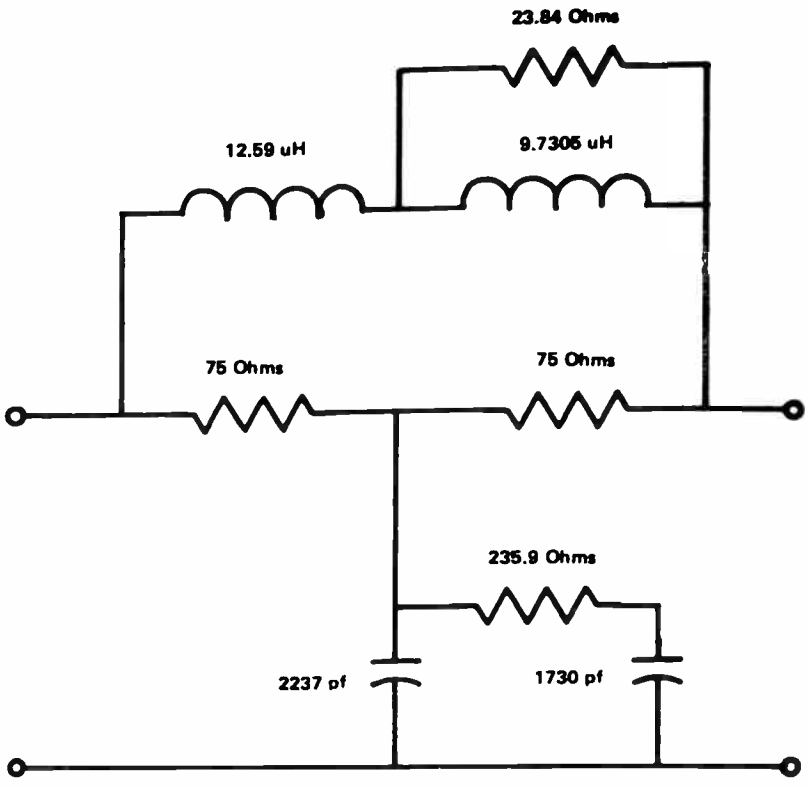


Figure 4 CCIR noise weighting network

different from the definitions which follow.

3. EIA: Signal—difference in voltage between the synch tip and the reference white.
   Noise—rms noise voltage (nominally between 10 kHz and 4 MHz) weighted by the curve shown in Figure 1.

The measurement is necessarily made at baseband frequencies. A wideband oscilloscope is used to measure the peak-to-peak volts at the output of the weighting network shown in Figure 2. An rms indication meter then is used to measure the noise voltage with the signal removed. Low frequency noise due to hum is excluded.

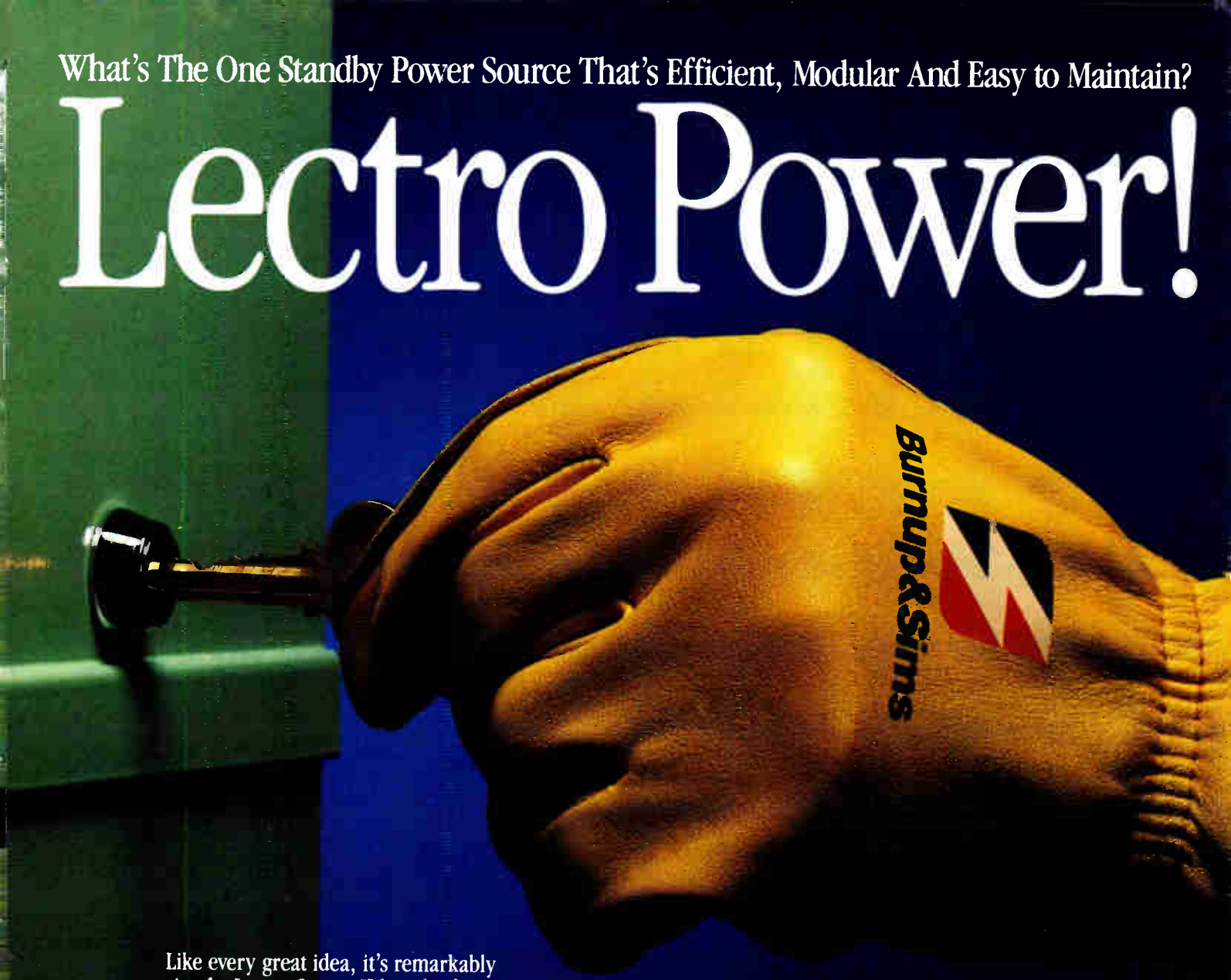
4. CCIR: Signal—difference in voltage between the blanking pulse and the reference white.
   Noise—rms noise voltage weighted by the curve shown in Figure 3.

The measurement is made as for EIA except that the signal is defined as above and the weighting network shown in Figure 4 is used.

To be more precise, this definition applies only to the CCIR Norm M television signals used in Canada and the

What's The One Standby Power Source That's Efficient, Modular And Easy to Maintain?

Lectro Power!



Like every great idea, it's remarkably simple. Lectro Sentry II has the fewest components of any comparable standby power unit–so it's no surprise that Sentry II consistently delivers the longest mean time between failures. That's reliability.

Sentry II simplicity also means that maintenance takes only minutes. Because Sentry II is the only standby power source with modular plug-in design, the only service tool you need is a key to open the cabinet, then slide one module out and simply plug a new module in. So it not only reduces service costs, but helps to ensure customer satisfaction and subscriber retention.

No wonder more cable systems use Lectro for standby power than any other source. It pays off on the power line. And it pays off on your bottom line. Call Lectro at (404) 543-1904, or toll free (800) 551-3790. Now in stock at all Anixter distribution centers.

LECTRO

A Burnup & Sims Cable Products Group Company

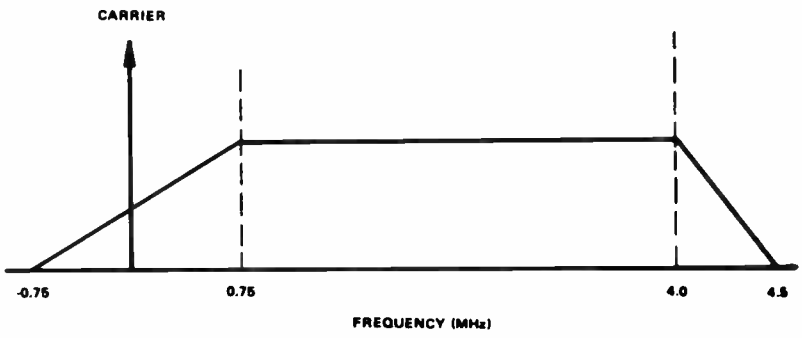


Figure 5
Receiver transfer characteristic

United States. In other countries, different weighting networks are applied.

In addition, one often hears reference to an unweighted CCIR signal to noise ratio. One could view the "unweighted" case as one where the weighting network has a flat frequency response.

5. BTL: Signal—difference in voltage between the synch tip and the reference white.
   Noise—rms noise voltage weighted by curve shown in Figure 3.

This is clearly a hybrid description in which signal is defined as in EIA, but the CCIR noise weighting is used. Here, also, the "unweighted" definition exists. The unweighted and weighted ratios are simply related by the appropriate weighting factors, which are given later. The relation is such that the weighted signal-to-noise is always larger than the unweighted signal-to-noise ratio.

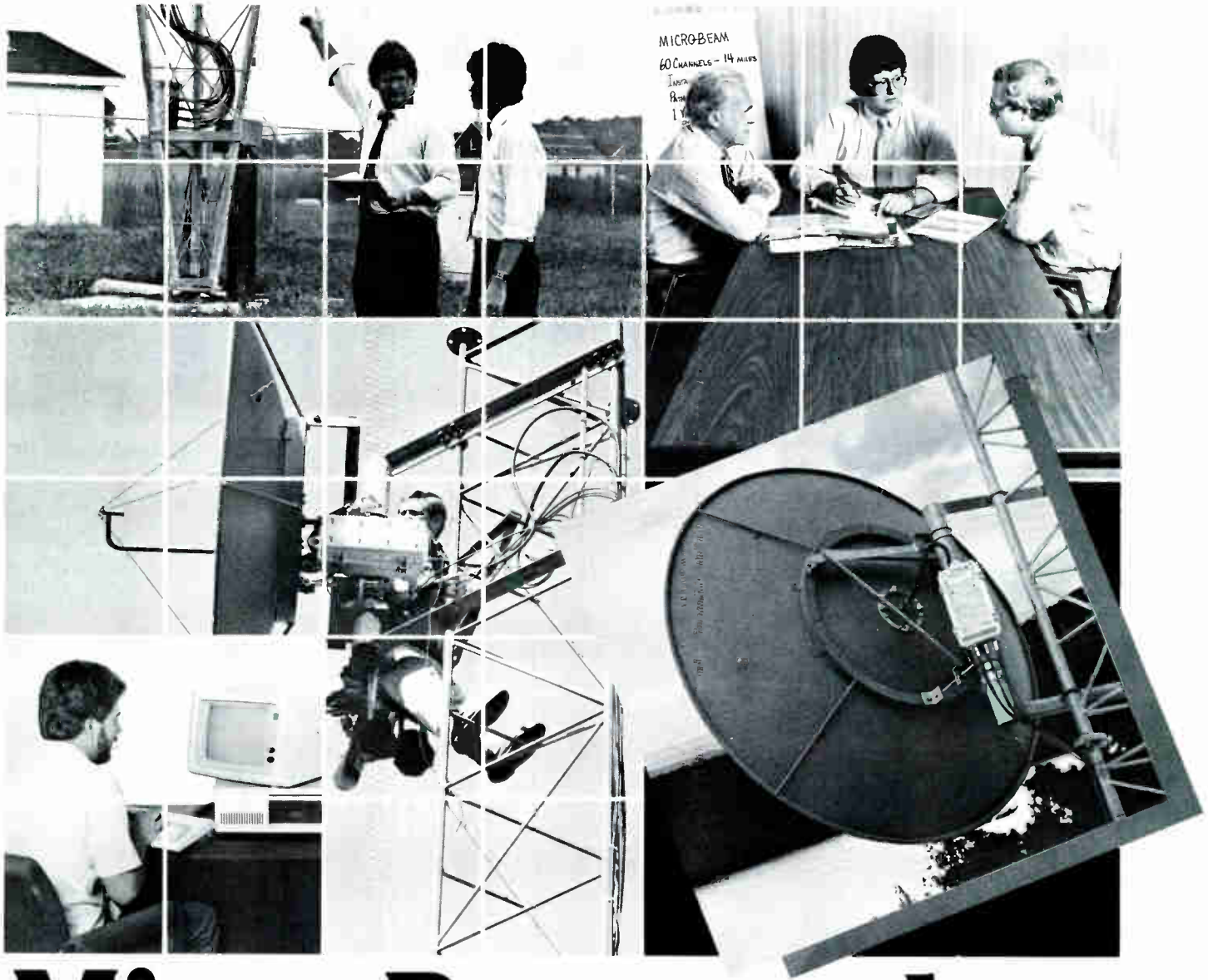
RF S/N and baseband S/N

Within the definitions given above, there are obviously two classes of S/N, i.e. measurements made at VHF and measurements made at video baseband. For the latter type measurements, a noise weighting is applied which attempts to take into account the variation in subjective evaluation to interference at various baseband frequencies. In that sense, the latter definitions are more nearly a measure of the true quality of the TV picture delivered to the customer. Both EIA and CCIR noise weighting shows that, in general, noise at high baseband frequencies is less objectionable than noise at low video baseband frequencies. The difference between the two is that the EIA applies to color TV while the CCIR is applicable only to black and white. The greatest confusion arises from imprecision in stating which baseband definition, whether weighted or unweighted, is to be compared to the NCTA definition.

In this section, we derive a general relation between the baseband and RF signal-to-noise ratio.[1] As a starting point, we begin with the familiar equation for a double sideband amplitude modulated wave:

$$g(t) = A_C(1 + mf(t))\cos\omega_C t \quad (1)$$

where m = modulation ratio
ω_C = carrier frequency
A_C = carrier amplitude
f(t) = modulation function



Micro-Beam™ solves the profit puzzle

Total Customer Service:

• 1 Year Parts/Labor Warranty	NO CHARGE
• Installation of Micro-Beam™ Equipment	NO CHARGE
• Path Alignment	NO CHARGE
• F.C.C. Application Help	NO CHARGE
• Feasibility Study	NO CHARGE

The Puzzle: How to generate more revenue while minimizing capital expenditures, and still ensure subscriber satisfaction.

The Solution: Cost-effective plant expansion using Micro-Beam™ broadband microwave relay systems from Channel Master®.

Channel Master® makes CARS-band microwave technology affordable AND SIMPLE for systems of any size. Micro-Beam™ specialists offer more customer services at no charge than anyone in the business.

Compare Micro-Beam™: the SIMPLE choice in CARS-band microwave.

Channel Master®

Division of Avnet, Inc. P.O. Box 1416, Industrial Park Drive, Smithfield, N.C. 27577 • (919) 934-9711

Reader Service Number 21

ONLY SUPERTRU
A SMILE TH

New QR Supertrunk™ is one of the toughest trunk cables ever developed. Even with a full 1⅛ inch OD it's still flexible enough to bend around those tight corners to go up fast with no special handling.

It's available now with a band width of 550 MHz and any amplifier spacing you're likely to need. And, with a return loss of 30 dB or better and very competitive pricing, you'll earn big dB/$, mile after mile.

JNK™ CAN WEAR IIS SMALL.

If other big cables have been giving you big headaches, call your local M/A-COM rep for data and samples. You'll see why, around here anyway, everybody's smiling.

M/A-COM

M/A-COM Cable Home Group, PO Box 1729, Hickory, NC 28603, 800-438-3331, in NC 800-222-6808, telex 802-166

Reader Service Number 22

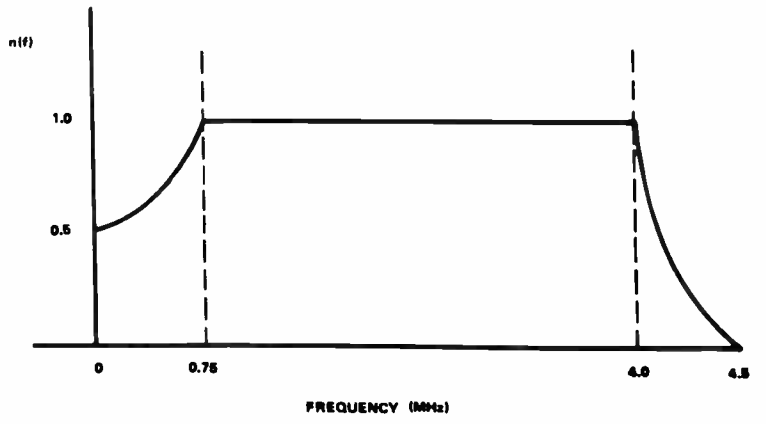


Figure 6 Detected noise spectral density

The carrier envelope varies from A_C $(1+m)$ to A_C $(1-m)$ because $|f(t)| \leq 1$. The detected peak-to-peak signal voltage is, therefore, proportional to $2mA_C$.

This signal is accompanied by noise assumed to have a uniform spectral power density, η, over the full 2B RF bandwidth of the receiver. B is the spectral width of the video modulating signal. If the noise on one side of the carrier is uncorrelated with noise on the other side of the carrier, the noise voltages from the two "sidebands" add in an rms fashion upon detection. This is the case when the predominant noise is generated at RF as in most CATV systems. The ratio of the detected peak-to-peak signal power to the detected rms noise power is then:

$$(S/N)_{AM} = \left(\frac{2mA_C}{2B\eta}\right)^2 \quad (2)$$

The rms carrier power during the peak of the modulating cycle is given by:

$$C_p = (1+m)^2(A_C^2/2) \quad (3)$$

Substituting this into (2), one obtains:

$$(S/N)_{AM} = \left(\frac{2m}{1+m}\right)^2 \left(\frac{C_p}{\eta B}\right) \quad (4)$$

The factor $2m/(1+m)$ represents the envelope variation relative to the peak envelope. Clearly, if the definition of peak-to-peak signal changes, as between CCIR and EIA, then we would accordingly adjust the modulation factor. The second factor in equation (4) could be the NCTA definition of carrier to noise.

In ideal vestigial sideband receivers, the signal and noise are first passed through a filter having the characteristics shown in Figure 5 and only then detected. The filter serves to just compensate for the extra low frequency ($f \leq 0.75$ MHz) vestigial sideband which is transmitted. The detected signal output then is a nearly undistorted replica of the modulation waveform applied at the transmitter. This is achieved by adjusting the filter so that the voltage response at the carrier frequency is just one-half of the response at frequencies above 0.75 MHz. Since the two sidebands of the signal are correlated, the voltages on either side of the carrier are added, and the post detection signal voltage characteristic is independent of frequency up to the upper limit of the receiver response.

The receiver filter effectively eliminates half the sideband voltage. However, since the carrier voltage is also reduced by one-half, the envelope variation as a fraction of the peak carrier remains the same as it was immediately following the double sideband AM process in the transmitter. Thus, the factor $[2m/(1+m]^2$ retains its validity and meaning for vestigial sideband.

Consider now the effect on noise of the receiver filter. Because the two noise sidebands are uncorrelated, they add in rms fashion in the detection process. The resultant noise spectral density is shown in Figure 6. It is 3 dB down at zero frequency and increases quadratically to 0.75 MHz when it becomes flat. The equivalent noise power bandwidth is given by:

$$B_N = \int_0^{f_m} n(f)df \quad (5)$$

where n(f) represents the distribution of baseband noise with frequency and f_m is the maximum frequency of the receiver response.

By rewriting the second factor in equation (4) as $(2\ C_p/2B\eta)$, one now can modify this factor for the vestigial sideband case. In particular, the equivalent noise bandwidth, 2B, for double sideband is replaced in vestigial sideband by B_N. Also, the carrier power is reduced by a factor of 4. Thus, the second factor becomes $(0.5C_p/B_N\eta)$.

Consider now the possibility of noise weighting. Let the weighting filter be characterized by a frequency response w(f). Then the weighting factor is defined by:

$$K_w = \frac{\int_0^{f_m} n(f)\,df}{\int_0^{f_m} n(f)w(f)\,df} \quad (6)$$

The general equation relating baseband signal-to-noise with vestigial sideband RF peak rms carrier-to-noise is then:

$$(S/N) = 0.5\left(\frac{2m}{1+m}\right)^2 \left(\frac{C_p}{\eta B}\right)_{rf} \left(\frac{B_{rf}}{B_N}\right) \frac{B_N}{\int_0^{f_m} n(f)w(f)\,df} \quad (7)$$

Alternatively,

$$(S/N) = 0.5\left(\frac{2m}{1+m}\right)^2 \left(\frac{C_p}{\eta B}\right)_{rf} \left(\frac{B_{rf}}{B_{NW}}\right) \quad (8)$$

Where B_{NW} is the equivalent weighted noise bandwidth given by:

$$B_{NW} = \int_0^{f_m} n(f)w(f)\,df \quad (9)$$

Equation (8) is the simpler form since it involves only one integral. However, it is most useful to express equation (7) in logarithmic form since weighting factors generally are given in dB and defined as in equation (6).

$$(S/N)_{\text{baseband}} = 10 \log \{0.5\left(\frac{2m}{1+m}\right)^2 \left(\frac{C_p}{\eta B}\right)_{rf} \left(\frac{B_{rf}}{B_N}\right) K_w\}\text{dB} \quad (10)$$

Tabular Results

Equation (6) is a very general form for the weighting function. If n(f) has the form shown in Figure 6, the weighting applies to vestigial sideband. If n(f) is "flat," then the weighting applies to double sideband AM. If $n(f) \sim f^2$, it is because the RF noise spectrum is triangular, as in FM systems. Table 1 summarizes the noise weighting, in dB, for each of these cases for both CCIR and EIA weighting curves.

In any one of the three types of systems, deviations from the "ideal" noise spectrum (in particular excess noise at low detected baseband frequencies) would reduce the actual improvement factor obtained from noise weighting and correspondingly result in degraded picture quality.

Table II shows the relationship between the NCTA signal-to-noise ratio and the various other signal-to-noise ratios defined above.

Table I
Noise Weighting (dB)

	"White" Noise (AM)	"Triangular" Noise (FM)	Vestigial Sideband Noise
EIA (color)	4.0	6.4	4.1
CCIR (monochrome)	6.1	10.2	6.7

As an example, consider the relationship between $(S/N)_{EIA}$ and $(S/N)_{NCTA}$. The synch tip to reference white voltage is 0.875 of the peak signal. The NCTA bandwidth is 4 MHz and B_N obtained from integration of Figure 6 is 3.8 MHz. Rewriting equation (10), we have:

$$(S/N)_{EIA} = 10 \log\{1/2(0.875)^2(S/N)_{NCTA} \left(\frac{4}{3.8}\right) K_w\}\text{dB}$$

$$= [-3.0 - 1.2 + (S/N)_{NCTA} + 0.2 + 4.1]\text{dB}$$

$$= (S/N)_{NCTA} + 0.1\ \text{dB}$$

Note that the relation between unweighted baseband signal-to-noise and the NCTA signal-to-noise can be readily determined from the two tables. Thus, for instance, unweighted BTL is given by:

$$(S/N)_{BTL,\ \text{unweighted}} = [(S/N)_{NCTA} + 2.7 - 6.7]\text{dB}$$

$$= [(S/N)_{NCTA} - 4]\text{dB}$$

Table II
S/N Relationships

$(S/N)_{TASO}$	= $(S/N)_{NCTA}$	− 1.8 dB
$(S/N)_{EIA}$	= $(S/N)_{NCTA}$	+ 0.1 dB
$(S/N)_{CCIR}$	= $(S/N)_{NCTA}$	− 0.2 dB
$(S/N)_{BTL}$	= $(S/N)_{NCTA}$	+ 2.7 dB

Even the Soviets couldn't break Sigma's code.

We don't care how good they are, it's virtually impossible to crack Sigma's security system. It's that good. And without getting into a laundry list of technical data, suffice it to say that Sigma's addressable cable system is based on the same technologies developed for the Pentagon to keep America's most important secrets out of the wrong hands.

Considering the cable industry is losing over half-a-billion dollars a year from box and signal theft, this kind of security should be more than a consideration in your choice of addressable systems. It should be the highest priority.

In addition to security, Sigma also offers audio mute, remote on/off, volume control, last channel recall, favorite channel memory and electronic parental control. All things considered, Sigma becomes the ideal system for pay-per-view events and other pay services.

We want to tell you more about Sigma and how it can help you eliminate signal theft and increase your system revenues. Call your nearest Oak representative or contact us directly by calling 619-451-1500.

Sigma. From America with love.

SIGMA

HereToday.HereTomorrow.

A development of Oak Communications Inc 16516 Via Esprillo Rancho Bernardo, CA 92127 (619) 451-1500

Reader Service Number 25

Television Allocations Study Organization

TEST NO._____ TV SET_____ OBSERVER

EXCELLENT. The picture is of extremely high quality—as good as could be desired.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

FINE. The picture is of high quality providing enjoyable viewing. Interference is perceptible.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

PASSABLE. The picture is of acceptable quality. Interference is not objectionable.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

MARGINAL. The picture is poor in quality and you wish you could improve it. Interface is somewhat objectionable.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

INFERIOR. The picture is very poor but you could watch it. Definitely objectionable interference is present.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

UNUSABLE. The picture is so bad that you could not watch it.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

DATE_____ TAB_____

Figure 7 TASO observer scoring sheet

Experimental verification

The experimental verification of the theoretical relationships obtained are not as easy to come by as one might think. Aside from the normal instrument calibration problems, one is faced with the fact that vestigial sideband demodulators are only rarely a good approximation to the ideal assumed in the theory. Other factors enter in as well. For instance, the RF noise generator does require a fairly high output level without clipping the thermal noise peaks. This is best done by bandlimiting the noise before bringing it to full power in an output amplifier.

Nevertheless, verification of the theoretical expectations has been obtained. The most thorough experiment was carried out recently at a working session of the CTAC working group on noise.[2] This work, performed in February 1974, did verify, within ± 1dB experimental error, the predicted relationship between CCIR and NCTA signal to noise.

TASO revisited

Although only peripherally related to the foregoing discussion, the following information may be of particular interest to CATV. The question concerns the subjective quality of television pictures as the S/N is varied over a wide range of values. The most extensive work along this line is, of course, the TASO study.

Some 14 years ago, the Television Allocations Study Organization undertook a comprehensive study of the subjective effect of random noise at various interference levels on the quality of the TV picture. The experimental program first established a set of optimum psychological definitions which were printed on the observer's scoring sheet, reproduced in Figure 7.[3]

Several still scenes were viewed on good quality black and white and color

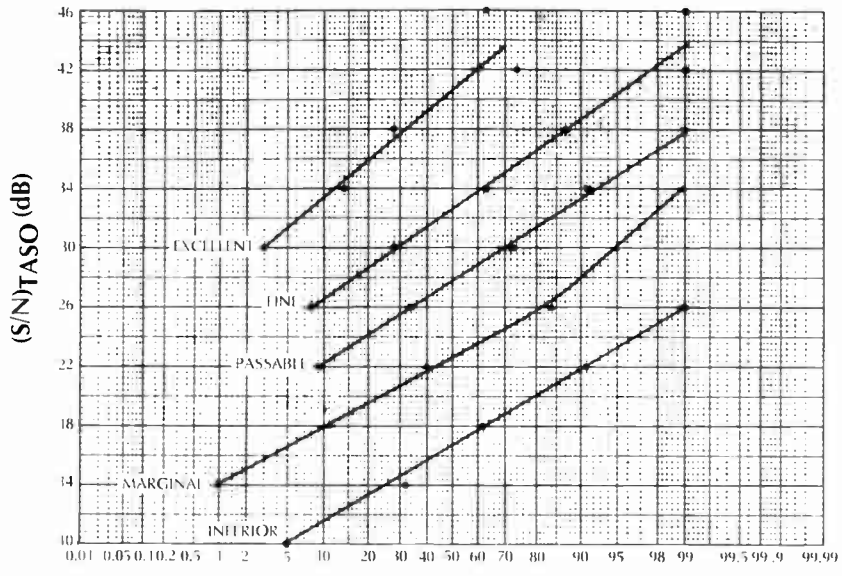


Figure 8
TASO results for random noise interference

21-inch receivers. Viewing distance was between 90 and 126 inches, and the average room illustration was 0.6 footcandles. A 40 dB range of interfering noise ranging from not perceptible to completely masking was employed. Test results varied very little with the scene used. For the most extensive tests with the "Miss TASO picture," a total of 76 observers were asked to rate 20 showings of the subject with 10 different signal-to-interference ratios each repeated twice in a random order. The results are tabulated in Figure 8.[4] Note that this data presentation is in a percentile form. For instance, at a $(S/N)_{TASO}$ of 27.5 dB, 50% of the viewers considered the picture "passable" or better, but also the most critical 10% of the viewers considered the picture "inferior." This lies 4 dB below the EIA recommendation of 33 dB[5] which is to be considered as an "outage" for microwave propagation fades.

In order to see if the TASO results could be used as a guide to the application of LDS microwave in CATV, a brief experiment was conducted at Theta-Com during one of the AML technical training seminars. The idea was to repeat the TASO type evaluation—although necessarily under quite different conditions. As off-the-air television signal was processed through an AML microwave system and displayed on a 17-inch Sony television receiver. The $(S/N)_{NCTA}$ was varied from 50 dB down to 14 dB in 4 dB steps. This was controlled by a microwave attenuator placed between the AML transmitter and receiver. In all, 20 scenes were shown, 2 each at the same S/N, but in a completely random sequence.

The 24 students were mostly CATV technicians and engineers. They were each given a copy of the TASO Scoring Sheet and asked to evaluate the pictures on a personal rather than professional basis. The students were arranged in 4 rows of seats, the furthest being some 18 feet from the television screen. The room light was extinguished but enough illumination was available to permit the score sheets to be filled out. An A/B switch was used to switch the signal directly to the headend during the intervals when the microwave attenuation was reset.

Figure 9 summarizes the results of these tests. It is seen that the results are quite similar to the TASO results. As might be expected, the viewers in the front row were slightly more critical than those furthest from the screen. On the average, the CATV technicians and engineers were about 2 dB more critical than the TASO volunteers were back in 1960. Perhaps this is more a reflection of our rising expectations for good signal quality rather than any other factor which impacted these experiments.

MORE FOR LE$$

(When WE say PROFIT BUILDER - WE mean YOUR PROFIT!)

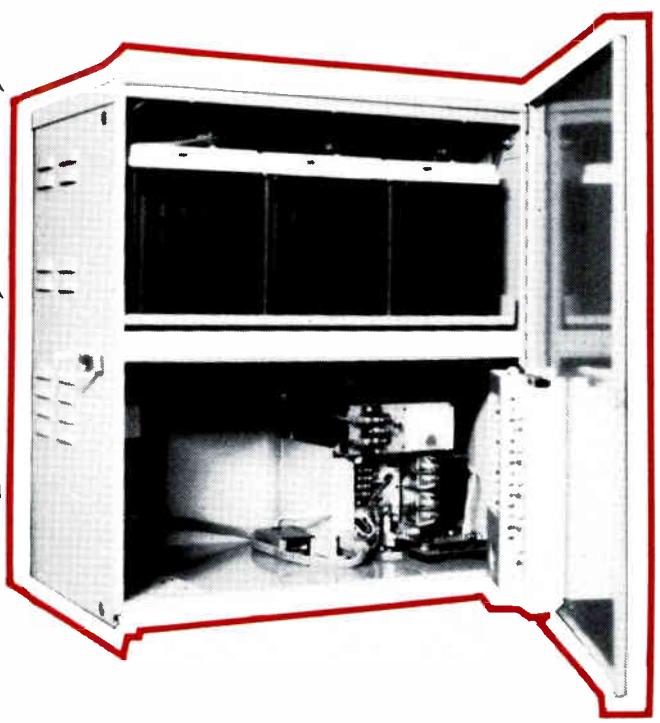
CABLE POWER CL 737 XCELLENCE

- ENGINEERING EXCELLENCE
- FIELD PROVEN RELIABILITY
- REALISTIC PRICE

CALL CABLE POWER CUSTOMER SERVICE AT (206) 882-2304 FOR FURTHER INFORMATION

- Hinged lid
- Easy access battery location
- Spill-guard battery trays (available)
- Insulated shelf for battery protection
- Modular construction
- Lightning arrestor
- Bottom indicator lights and entries

15 OPTIONS including
- Remote Status Monitor
- Automatic Performance Monitor
- Vandal and corrosion resistant galvanized steel pedestal enclosure



STANDBY POWER SUPPLY
Model CL 737XL

UL LISTED

Factory and Customer Service:
14860 N.E. 95th
Redmond, WA 98052
(206) 882-2304

Service:
Redmond, WA
(206) 882-2304
Deerfield Beach, FL
(305) 429-0870
Ontario, CANADA
(416) 629-1111

Reader Service No.

Reader Service Number 28

A Triple Crown Corporation

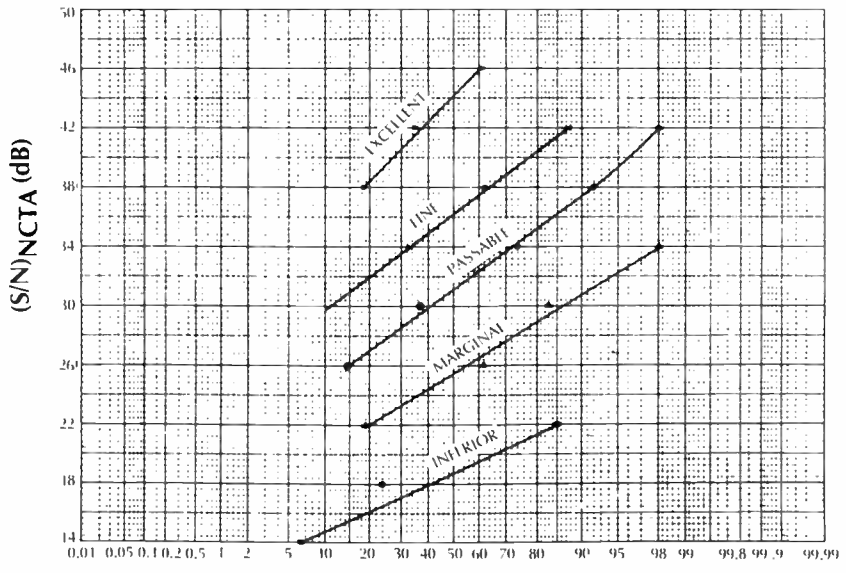


Figure 9
Evaluation of picture quality at AML training seminar

Author's note

In 1978 the CCIR adopted a unified weighting network which is applicable to both color and black and white television signals. The VSBAM noise weighting factor for the unified weighting is then 1.4 dB greater than that shown in Table I for CCIR weighting. Therefore, the S/N value shown in Table II will increase by 1.4 dB for the CCIR and BTL definitions. CED

References

1. Similar arguments are given in an unpublished memorandum by J. J. Bisaga. Other workers, notably J. J. Gibson, have followed slightly different lines but with essentially the same results.
2. J. J. Gibson, private communication.
3. G.L. Fredendall and W. L. Behrend, "Picture Quality Procedures for Evaluating Subjective Effects of Interference," PROC IRE 48, pp.1030-1034, June 1960.
4. C. E. Dean, "Measurements of the Subjective Effects of Interference in Television Reception" PROC IRE 48, pp. 1035-1049, June 1960.
5. EIA Standard RS-250A, February 1967.

For further reading

★ *NCTA Recommended Practices for measurements on cable television systems*, M. Jeffers, editor, NCTA.

★ "Noise Figure Measurements on Distribution Systems," D.E. Groff, *NCTA Convention Record*, 1984, pp. 34.

★ "Thermal Noise Revisited," H.W. Katz, *NCTA Convention Record*, 1983, pp. 111.

★ *Tektronix 1430 Random Noise Measuring Set Instruction Manual*, revised February 1982.

OUR INDUSTRY IS GOING THROUGH A PERIOD OF RAPID TECHNOLOGICAL EVOLUTION!

You can either take advantage of the new technologies or go the way of the dinosaur. Construction and maintenance costs are skyrocketing. Competition for TV delivery to hotels, motels, apartments, small communities and unwired urban areas is increasing.

Fortunately, headend costs are dropping.

Your answer? Large numbers of innovatively applied headends. Call it cherry picking, bundling, restricted access or SMATV . . . the result is more profit and a stronger competitive position.

Profit from the evolution.

Call NEXUS for the know-how and the best low-cost headend equipment.

12 Channel Headend

NEXUS
ENGINEERING CORP.
PERFORMANCE YOU CAN SEE.

Call (206) 644-2371, Bellevue, Washington
(604) 420-5322, Burnaby, B.C.
Or Write NEXUS Engineering Corp.
4181 McConnell Drive
Burnaby, B.C. V5A 3J7

profit from

NEXUS — DEFINITELY AHEAD OF OUR TIME

Reader Service Number 38

Broadband LANs

By Robert Patrick,
President,
Atlanta Technologies Inc.

One of the thorniest problems facing a communications manager today is managing his organization's intrafacility communications. Approximately 80 percent of the typical organization's communications do not leave the immediate premises. In most organizations these intrafacility communications are beginning to be converted from paper and spoken voice to impulses manipulated and stored on electronic media—personal computers, storage devices, minicomputers, terminals and a wide variety of printers and plotters. This means that the communications manager increasingly will be called upon to find methods of supporting those intrafacility communications via electronic pathways. He must specifically solve the following problems:

- The M to N problem, where N = a growing number of often-specialized host computers, storage devices and minicomputers; and M = a number of dumb terminals, data entry devices and personal computers which are increasing faster than anyone can keep track of.
- The problem of being able to quickly and economically support the growth in those terminals, data entry devices and dumb terminals; and the problem of supporting the moves and reconfigurations common in a growing or changing organization.
- The problem of accommodating the burgeoning requirements of new transmission services, as more and more of the old communications methods are converted to electronics.

For many situations a local area network (LAN) option is becoming the preferred solution to the problems just noted. LANs have made great strides over the past several years in terms of reliability, standardization and functionality and can now literally offer a plug-in solution to most data and video communications needs.

A well-constructed LAN allows the user to attach all of his data and video communicating devices to the nearest point on the LAN—usually within 50 feet—and make connections to any other device on the network. This eliminates the necessity of pulling wires for rearrangements and makes the adding of new services or new subnetworks as simple as plugging in other types of equipment.

Broadband LANs are probably the best LAN solution for organizations with one or more of the following characterics:

- the need to span cable distances over 1,500 meters;
- the need to support more than one M to N network, like an asynchronous terminal-to-host computer network and a personal computer network, or multiples of either or both networks;
- the need to connect and integrate established department networks;
- the need to support many attached devices and/or high transmission speeds;
- the need to support a great number of moves and changes;
- the need for video; and last (but definitely not least),
- the need for a network to support future growth that is not well defined.

Broadband coaxial cable is a well-established networking solution, having its genesis in cable television applications, where it has been used successfully for almost 40 years. This means that all networking components are mass produced, off the shelf, generally available and reasonable in price. The networking standards are becoming well established, allowing LAN users to choose from a wide variety of equipment that can connect to their LANs. This is in contrast to the PBX environment with which telecommunications users are most familiar. The same handsets, baluns, data interfaces, line cards and, sometimes, the wiring itself cannot be used by different types of voice switches.

Broadband LANs have the following characteristics:

Distance Insensitivity. Whereas baseband LANs are limited to cable runs of approximately 1,500 meters, broadband LANs have been used to provide data and video transmission services to an entire city.

Large capacity. A typical broadband LAN gives the user the use of over 27 two-way 6 megahertz channels of useable spectrum, plus 10 or more one-way channels of useable spectrum. Each channel is capable of supporting the following:

- over 2,000 asynchronous communicating devices
- 225 personal computers in a P.C. network
- 120 9.6 to 19.2 kilobit/second data circuits
- up to 6 T-1 (1.544 megabit/second) channels, each of which can carry up to 48 digitized voice channels
- one full motion analog video channel
- up to 40 full motion digital video channels

Another attribute related to capacity is support of higher speeds. A user choosing a broadband LAN today has the assurance that it will be able to support the future high speeds required in CAD applications, retrieval and display of digital images, and communications between

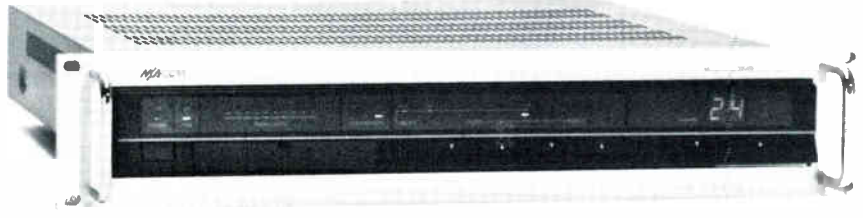
$545.00

That's right! For a limited time M/A-COM is offering their Model CSR-T1001 commercial receiver for only $545.00 for orders of 10 or more. This is the same receiver that a major satellite carrier just chose when compared to models costing thousands more. And, it's completely compatible with M/A-COM's VideoCipher® satellite descrambler systems. All units are shipped from stock and carry M/A-COM's standard warranty.

So, if you're updating your headend, why not go state-of-the-art? In fact, at these prices you can even afford to stock a spare.

Compare these features:

- VideoCipher® compatible
- One-year limited warranty
- UL, CSA approved
- Tuneable channel assignments for non-standard satellite configurations
- Voltage synthesized tuning
- Automatic polarization selection
- Two independently tuneable audio modulators (5.0 - 8.5 MH_z)
- Dual IF inputs
- LNB block down conversion
- Receiver power source for LNB



VIDEOCIPHER® READY RECEIVERS

Prices: One unit **$645.00** Each

Two - Nine **$595.00** Each

Ten or more **$545.00** Each

Use with an LNA requires a block down converter available from M/A-COM for $85.00

☐ Please ship _____ model CSR-T1001 receivers at $ _____ each, plus $8.00 each UPS shipping and handling.

☐ Please ship _____ block down converters at $85.00 each.

☐ Enclosed is my check for $ _____ .

☐ Enclosed is my purchase order. Bill me later.

This offer ends May 1, 1986.

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

Mail to: M/A-COM Cable Home Group, P. O. Box 1729, Dept. 1001, Hickory, NC 28603

For faster service, call 1-800-438-3331.

CED

M/A-COM

LIMITED OFFER

Reader Service Number 31

superprocessing personal computers and intelligent workstations.

Noise immunity. Broadband LANs allow noise-resistant tapping of devices into the network, using standard cable television components. This becomes very important if a large number of devices are planned to be attached or a large number of subsequent moves and changes are planned. The attachment method of a baseband LAN will not be able to support this high level of attachments and moves.

With its large capacity, virtually unlimited range and ability to support large numbers of devices and many types of signals on the same network, a broadband LAN is a very useful alternative for those organizations with sizeable data and potential video communications needs.

A major issue in the minds of communications managers is cost. The broadband LAN also excells in this category. The cost of a LAN can be broken into three components:

- the cost of the cabling
- the cost of headend or central "switching" equipment
- the cost of the communications interface units that connect the individual terminals, computers, printers and video monitors to the network

The cabling cost covers the installed-and-working price of the broadband cable. Although this varies with each situation and depends largely on the difficulty of the installation and the extent of built-in access "ports," the usual planning range is from $5 to $7 per foot. An average size building of 80,000 to 100,000 square feet might require from 3,000 to 5,000 feet of cable to serve all locations. This modest cost creates a network capable of accommodating thousands of data and video devices.

The second cost component is the headend cost. Because the LAN is primarily a distributed intelligence medium, these costs are trivial. For example, a $2,400 translator is capable of switching the signals of over 2,000 asynchronous devices and over 1,000 personal computers. Video switching devices for broadcast video are similarly modest in cost.

The third component is the cost of the communications interface units. These units are installed at the user locations, and they control access to the broadband transmission medium. The data interface units also can provide buffering and flow control, speed conversion, implement security and capture network operating statistics. The typical per-port installed and marking cost is from $300 to $700—less than the cost of adding data switching capabilities to a PBX. (Wiring costs for additions, moves and changes are about $30 per station. Try that on a PBX!) The per-station costs for receiving full-motion broadcast video can be as little as $50.

How does one get a network installed? There are basically four steps: the feasibility study, the engineering walkout/design and equipment specification, network contruction and equipment installation/cutover.

Feasibility Study. The purpose of this step is to identify all of the present and future local communications requirements and to describe them in terms of hierarchies of networks, protocols, device types and uses, throughput and peak traffic patterns. Requirements like security, priorities for service implementation and speed of construction also are identified. A typical feasibility study will take about 25 manhours and costs from $1,500 to $2,000. The information gathered will be inputs to the next step, the engineering walkout and design of the cable network and the specification of the communications interface units. A very rough idea of eventual network costs can be proposed at the end of this step.

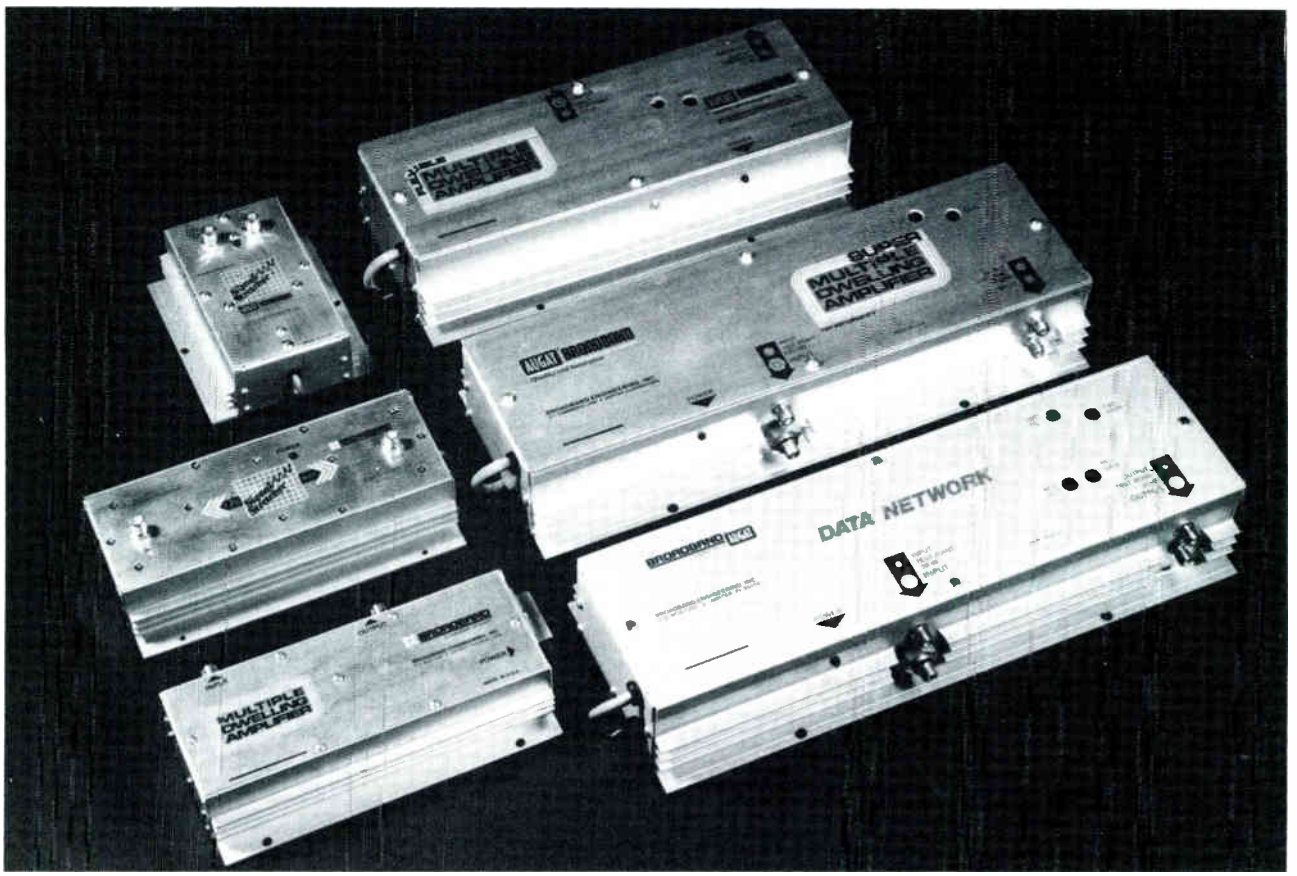
Walkout and Design, Equipment Specification. During this stage, another purpose of a good flexibility study is uncovered—to minimize costs by guiding the creation of the minimum network to serve the actual needs. The network site is walked out, and information is gathered on the placement possibilities for amplifiers, cable, power supplies and other devices—as well as the availability of existing access points. This information is combined with the feasibility study's requirements list, and the entire network is designed. Information on the communications requirements now is used to determine the numbers and types of communications units best suited to provide the desired results.

The exact network specifications (routing, material, hardware and communications equipment) are known at the end of this step. From this a very accurate network cost can be calculated. This is the best time for the user to meet with the contractor and review the requirements in light of 'discovered' costs. Negotiation and review may be necessary to defer or modify the construction of some segments of the network, to postpone some service or to add to the scope of the network. At the end of this step, both the user and the contractor should have a very clear idea of what will be done, how long it will take and the exact costs associated.

Network Construction. This step involves the construction, splicing and proof of performance testing of the cable network and the construction of the headend "switching" facilities. At the conclusion of this step, the user should have a network fully capable of operating within specifications and of supporting a host of communicating devices.

Equipment Installation/Cutover. In this step the contractor installs the initial suite of communications interface units, connects the user's data processing and video equipment and verifies that the system runs within specifications from end to end. At the end of this last step, the contractor trains the user's people on the operation of the network, performs final documentation of the system and turns over the network to the user.

In summary, the choice of a broadband LAN is the right decision for many growing organizations. It's supportive of high growth and heavy communications usage situations and can carry data, video and voice communications very well. The LAN can be implemented very economically —and often saves the organization sizeable amounts of time and money over the traditional alternatives of point-to-point wiring or cabling. The LAN can be implemented easily, logically and with the active involvement of the potential user by processing through the four logical implementation steps. CED



Broadband: For the best in distribution amplifiers

Broadband Engineering offers a distribution amplifier for every application from the lowest cost to the highest performance CATV, MATV and SMATV installation.

Flexibility to meet demanding system requirements is our goal with:

- Bandwidths up to 550 MHz
- Gains from 14 to 50 dB
- One and two-way operation
- Sub, mid and high-split options
- Standard or power doubler hybrids

Extruded aluminum housings insure excellent heat transfer from active devices for long life and reliable service.

And we don't forget maintenance either. Our hybrids are installed in sockets so that replacement is quick and easy and down time short.

We don't cut corners in design. we engineer the best.

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

For quality, performance and service, call Broadband

AUGAT® BROADBAND

Quality and Innovation

Reader Service Number 32

People

Kent Lewis joined Commercial Cable Inc. as national sales manager. Lewis, formerly, was regional sales manager for Eagle Comtronics. He is also serving as associate director for the Eastern Cable Television Association for 1986/87.

Cable TV Supply Co. appointed **Bob Foote** operations manager of its Woburn, Mass., facility. Foote is in charge of operations and sales in the New England region for Cable TV Supply and Home Satellite Systems—both subsidiaries of Cable TV Industries.

Frank Winship joins Foote in Woburn as New England sales representative for the Home Satellite Systems unit. Winship's 13 years experience in cable includes the design and installation of dual and two-way systems and headends.

Trilogy Communications announced the appointment of two new regional sales managers. **Kevin Dunckel** will serve the North Central region; and **Richard Bussemer**, the Northeast region.

Catel Telecommunications Inc. announced the appointment of **Dr. Mircho Davidov** to the position of vice president, engineering. In this role, Davidov is responsible for all research, development, continuity engineering and documentation support activities of the company. Prior to joining Catel, Davidov was director of the Advanced Technology Group for Oak Industries.

John VanIngen

Daniel French

John VanIngen was named manufacturing engineer at Microwave Filter Co. Inc. VanIngen will design new parts and perform cost/operational analyses. Prior to joining Microwave Filter, he was a design drafter at Ingersoll-Rand.

Also at MFC, **Daniel French** was appointed quality control engineer. French was formerly with Glomac Plastics Inc.

Regency Cable Products welcomed **Charles Knowland** to the position of design engineer, digital systems. Knowland's duties will include circuit design, analysis, and broadband and prototype development.

Jim Emerson announced his resignation from AM Cable TV Industries Inc. to pursue other business interests. Emerson remains on the NCTA Engineering Committee and is running for a third term on the SCTE's Board of Directors.

First Data Resources announced the appointment of **Mike Parks** as president of the cable system services division. Parks most recently served FDR as vice president of transaction services. He replaces Matt Gates, who was appointed corporate vice president of operations at FDR.

Signal Vision announced the appointment of **Skip Aduddel** to the position of sales representative for the entire Southwest region. Aduddel brings 12 years experience in sales/marketing to the firm.

UPTOWN, DOWNTOWN AND ALL AROUND TOWN.

the "little dish" that's the talk of the town

That's right! Just imagine a home satellite TV dish small enough to fit in your own backyard, patio, or apartment balcony. A superior dish capable of bringing you crystal clear TV reception at an affordable price. A dish built like no other with a patent pending design everyone else wishes they'd thought of.

RAYDX™
SATELLITE SYSTEMS, LTD.

The "SOUTHERN STAR" home satellite TV dish from Raydx is revolutionary - fits in just about anywhere and features stronger-than-steel extruded aluminum construction, long-life weather guard finish, stainless steel hardware see-thru aluminum mesh design and special horizon-to-horizon polar or patio mount.

Get the best built dish in America

RAYDX SATELLITE SYSTEMS LTD. • 9 OAK RD SILVER SPRINGS SHORES INDUSTRIAL PARK • OCALA, FLORIDA 32678
(904) 687-2003

Reader Service Number 34

ALL ITEMS PRICED SEPARATELY

TVRO equipment

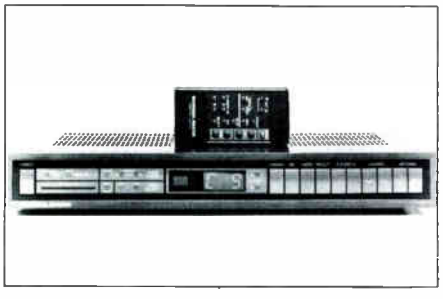
Amplica

From Amplica Inc. come three advanced satellite receivers. The CSR-300 features a full-function hand-held remote, stereo sound, programmable memories for both satellite and individual transponders, Dolby noise reduction, tuning and signal strength meters and scan function. The CSR-200 receiver functions include: transponder tuning and memory, audio mode for three mono frequencies, stereo processor capability, wide/narrow audio bandwidth, scan function and a full-function infra-red remote handset. Amplica's CSR-100 includes a transponder tuner, AFC selector, polarity switch, mono audio control and stereo processor capability.

Amplica also offers three antennas—the System 306, System 308 and the System 310—six, eight and ten feet, respectively. Low noise amplifiers are also available from Amplica featuring: five noise options, noise rejection output filter, standard +15 +25 VCD bias via RF cable, reverse bias protection and internal voltage regulator, and a cast aluminum housing with an integrated isolator.

Line drivers, providing an additional 30 dB of signal gain, and the Mini-Amplifier for multiple receiver systems are also available from Amplica.

For more information, contact Amplica Inc., 950 Lawrence Drive, Newbury Park, Calif. 91320, 805/499-2621.



The Model 6144 satellite receiver from Channel Master features integrated stereo processing.

Channel Master

Channel Master offers a selection of complete TVRO systems for marketing through cable operators. A line of 6-, 8- and 10-foot antennas in either solid SMC fiberglass or perforated solid aluminum is available. All antennas feature a multi-leg feedhorn support for increased focal point stability.

Receivers include the microprocessor-controlled Model 6144 with built-in stereo processing, antenna controller interface, parental lock and remote control; the Model 6135 with multi-component infrared remote control; and the pushbutton Model 6137. All feature block conversion and an unclamped video output for descramblers.

Satscan antenna drives are available in three versions: Model 6253 with up-down pushbutton operation; Model 6252, which adds infra-red remote operation capability; and Model 6254, a programmable unit allowing direct access to satellite positions.

Accessories available from Channel Master include the VideoCipher II satellite descrambler, which offers access to subscription channels encrypted using the VideoCipher system. Two stereo audio processors are also available, one featuring infra-red remote operation capability.

Channel Master's Cable Products Group also offers a complete TVRO marketing assistance package—including special cable operator sales literature, sales and technical training, and technical service assistance.

For more information, contact Dave Waddington, National Sales Manager, Cable Products Group, Channel Master, Industrial Park Drive, Smithfield, N.C. 27577, 919/934-9711.

Conifer

Conifer Corp. offers TVRO systems featuring three different antenna sizes and two receiver models. The Paraceptor antennas come in three models—8-, 10- and 12-foot. The 8- and 10-foot antennas are constructed of perforated aluminum, whereas the 12-foot antenna is designed with aluminum mesh. All Conifer Paraceptors are designed around "Delta Drive," a drive system which features machined steel gears, built-in limit switches, horizon-to-horizon polar mounts, heavy-duty 36 volt DC motors and a choice of reed sensor or portentiometer.

Conifer's basic receiver, the Model XT-100, features block down conversion at 950-1,450 MHz, automatic polarity control, LED digital display, and comes scrambler compatible. The Model XT-200 is a stereo receiver with remote control offering all of the features of the XT-100, plus rapid scan tuning and automatic built-in antenna positioner.

For more information, contact Conifer Corp., 1400 North Roosevelt, P.O. Box 1025, Burlington, Iowa 52601, 800/358-3058.

General Instrument

The General Instrument System 960 satellite receiver features a low noise blockdownconverter (Model LNB208B) or a remote blockdownconverter (Model RBDC-4) and a standard LNA. An internal A/B switch allows automatic switching to off-air TV signals when the unit is turned off. Features include block conversion input (950-1,450 MHz), multiple installation compatibility, auto-polarity, switchable (3/4) RF modulator and 6.8/6.2 preset and continuously variable audio tuning.

The 1000 satellite receiver features infra-red remote plus an integral receiver keypad, block conversion input (950-1,450 MHz), multiple installation compatibility, auto-polarity, integral A/B switch, switchable (3/4) RF modulator, signal strength meter, synthesized audio and video tuning and two programmable audio subcarriers for discrete stereo capability.

General Instrument also offers mesh antennas available in 10-foot (Model No. ANT-232) and 8-foot diameters (Model No. ANT-226). Both models are available in natural aluminum or black finish. Features include wedge-lock center hub design, flexible plastic locking strip for mesh attachment, stainless steel hardware and an optional LNB weather pod.

For more information, contact General Instrument Corp., RF Systems Division, 2350 West River Park Drive, Suite 500, Tucson, Ariz. 85745, 602/575-5611.

KLM Electronics

A TVRO system—complete in one shippable box—is available from KLM Electronics. The system includes your choice of KLM's mesh antenna in 6-, 8- or 11-foot sizes. Additional equipment includes an antenna mount, feedhorn and amplifying assembly, and 120 feet of weatherproof cable with prewired plug-in connectors.

The system may be ordered with either the SBR-6100 or the Sky Eye X receiver. The SBR-6100 will access any sat-

ellite/transponder combination automatically from memory and selects dish position, channel, skew, polarity, audio bandwidth and stereo selection—all from a single remote control. The Sky Eye X is available in either block down- or single-conversion models.

For more information, contact KLM Electronics Inc., P.O. Box 816, Morgan Hill, Calif. 95037, 408/779-7363.

M/A-COM's Spectra-Sat T6 combines receiver and positioner into a single integrated component.

M/A-COM

Available from M/A-COM is the Spectrum T-1 satellite receiver. Its microprocessor-controlled operating system eliminates the need for re-tuning and reprogramming each time the receiver is turned on. The receiver is a block downconversion-type, which allows viewing of different channels with additional receivers. Features include remote control, VideoCiper II compatibility, Spectra-Sat Stereo and parental supervision.

M/A-COM's 10-foot mesh antenna combines weather resistance and signal pulling power. The antenna gives a complete sweep of the satellite belt with its horizon-to-horizon mount and drive system. Also offered is the monopad feed system and a 2-piece clamping rim.

New for M/A-COM's Command Center Systems is the T-125 antenna positioner. The T-125 can store up to 24 satellite positions in memory. Polarity adjustments, once set, also are retained for future recall. Other features include non-volatile memory, built-in message codes, parental supervision, remote control operation with M/A-COM satellite receivers, electronic pre-limits to prevent over-travel of the antenna and full UL approval.

Also new from M/A-COM are two satellite signal amplifiers. Both are low noise block downconversion amplifiers and designed for use with M/A-COM's Unipod feed mount. The LNSB 7003-13 contains scaler, solid-state polarizer and a high gain/low noise amplifier in a single preassembled unit. The DPLNB 7003-12 incorporates the functions of scaler and two high gain/low noise amplifiers in one unit. This allows simultaneous conversion of both odd and even polarity signals.

For more information, contact Rusty Galbreath, M/A-COM Cable Home Group, 1375 Lenoir Rhyne Boulevard, Hickory, N.C. 28603, 800/438-3331 or 704/324-2200.

McCullough

McCullough Satellite Equipment offers a line of antennas for home satellite reception. The UFI fiberglass dish is available in 6-, 8-, 10- and 12-foot diameter sizes. The Wagon Wheel is a high gain aluminum mesh parabolic dish supported by a steel ring mount available in 6-, 8-, 10-, 12- and 16-foot diameter sizes.

Other TVRO equipment from McCullough includes single-conversion and block-conversion receivers, LNAs, feedhorns and rotors.

For more information, contact McCullough Satellite Equipment Inc., Route 5, Box 97, Salem, Ark. 72576, 501/895-3167.

Microdyne

Microdyne offers 5- and 7-meter antennas, with respective gains of 44 dB and 47 dB (4 GHz). Both the 5- and 7-meter antennas incorporates a prime focus feed system and low noise temperature. The azimuth over elevation antenna mount consists of a welded steel frame mounted on a circular ring rotatable 360°. Struts enable the elevation to be set anywhere between 10° and 65°.

Microdyne's 10- and 12-foot parabolic antennas also feature precision molded fiberglass reflections, prime focus feeds, azimuth and elevation adjustments and are available for 4 to 12 GHz.

For more information, contact Microdyne Corp., P.O. Box 7213, 491 Oak Road, Oscala, Fla. 32672-0213, 904/687-4633.

Pico

Pico's TVRO line includes the HR-1000 home satellite receiver. Features of the HR-1000 include audio/stereo selection and fine tuning, skew control, an AFC system for improved performance in a terrestrial interference environment and an infra-red remote control unit which performs all receiver functions. The HR-1000 is descrambler compatible and uses RCA connector outputs for video monitor and stereo hook-ups.

Also from Pico is the Pico KID, a 4- by 7-foot rectangular offset feed TVRO antenna. Officially recognized by the Consumer Electronics Design and Engineering Exhibition as "one of the most innovative consumer electronics products of 1985," the KID's design improves efficiency performance by limiting the effects of signal interference sources. The KID's offset feed is almost 11 inches below the bottom of the reflector, thereby eliminating shadows and blockage.

For use with the HR-1000 and the KID is Pico's PAC-1000 programmable actuator/controller. The PAC-1000 is a microprocessor-controlled antenna drive system that automatically programs up to 24 satellite positions and polarity selections with a 10-year power loss memory retention. The PAC-1000 also can be programmed for automatic format changes and to correct skew angles.

For more information, contact Pico Products, Home Satellite Division, Product Information Department, 103 Commerce Boulevard, Liverpool, N.Y. 13088, 800/336-3363.

Raydx

The home satellite line from Raydx includes the Raydish, a deep-dish see-through antenna, available in 6-, 8½- and 10½-foot sizes. The Raydish's double-curvature mesh design provides a true parabolic shape, and no drilling is required for installation. Features include: high gain, low side lobes and survivability of winds in excess of 120 mph.

Also from Raydx is the RX 1 satellite receiver. This microprocessor-controlled unit is quartz-locked synthesized and features a built-in antenna positioner and a parental lockout feature.

For more information, contact Raydx Satellite Systems Ltd., Nine Oak Drive, Silver Springs Shores Industrial Park, P.O. Box 4078, Oscala, Fla. 32678-4078, 904/687-2003.

Scientific-Atlanta

Scientific-Atlanta introduced a complete system for home satellite reception. The HOMESAT line includes the Model 8000 perforated antenna, the Model 9000 solid antenna, the Model 800 receiver and related accessories.

The 2.8-meter HOMESAT 8000 and 9000 antennas are constructed of galvanized reflector panels and offer optional motorization with a "swing arm," which permits horizon-to-horizon

Continued on page 58

Semina

February

4-5: The 1986 **Arizona Cable Television Association** meeting will be held at the Phoenix Hilton, Phoenix, Ariz. Contact: Susan Bittersmith, (602) 257-9338.

4-5: A **Blonder-Tongue SMATV/MATV/CATV/TVRO Technical Seminar** will be held at the Holiday Inn Woodlawn, Charlotte, N.C., in conjunction with Adams and Associates. Contact: Tom Adams, (919) 272-6838 or Sharon Leight, (201) 679-4000 ext. 265.

5-7: The **Magnavox Mobile Training Center** will be at the Holiday Inn, Concord, Calif. Additional dates: Feb. 10-11. Contact Bill Bostick, (315) 682-9105.

6-7: **"Pay-Per-View Idea Exchange: Let's Do It Right,"** sponsored by EventTeleVision, Denver, Colo. Contact: Sid Amira, (303) 771-0888.

12-14: The **Georgia Cable Television Association Convention** will be held at the Omni International Hotel, Atlanta. Ga. Contact: Nancy Horne, (404) 252-4371.

13: A **Pay-Per-View Seminar,** sponsored by the New York State Cable Association, will be held at the Business Council Conference Room, Albany, N.Y. Contact: Gwenn Bellcourt, (518) 463-6676.

25-27: **C-COR Electronics Inc.** will hold a technical seminar in Kansas City, Mo. Contact: Debra Cree, (800) 233-2267. In Pa. call (814) 238-2461.

March

15-18: The **National Cable Television Association** will hold its annual convention in Dallas. Ten technical sessions will be presented on the following dates:

16: Stereo Television: Delivering Its Full Potential; Moderator, Walter Ciciora.

Data Delivery Techniques; Moderator, Ed Milner.

17: FM Audio Quality—Can It Be Improved?; Moderator, Joseph Van Loan.

Cable Distribution Design—Variations of the Standard Techniques; Moderator, Joe Preschutti.

Impulse Pay-Per-View—The Technology is Here; Moderator, David Archer.

Monitoring System Performance; Moderator, Brian James.

18: Consumer Products—Making Them Work With Cable; Moderator, Eb Tingley.

Signal Leakage Monitoring—Airborne Techniques; Moderator, Roy Ehman.

Improving Signal Security; Moderator, William Riker.

Operations Considerations; Moderator, Scott Tipton.

20-21: **Fiber Optic Technologies and Applications,** Marriott Marquis, New York, N.Y. Contact: Telestrategies, (703) 734-7050.

April

15-17: **C-COR Electronics Inc.** will hold a technical seminar in Indianapolis, Ind. Contact: Debra Cree, (800) 233-2267. In Pa. call (814) 238-2461.

16-18: **VSAT Satellite Conference,** Hyatt Regency, Wash. D.C. Contact: Telestrategies, (703) 734-7050.

30-May 2: The **Magnavox Mobile Training Center** will be in Denver, Colo. Additional dates: May 5-7. Contact: Bill Bostick, (315) 682-9105.

DYNAMIC DUO

THE DRAKE PROFESSIONALS

Thousands of CATV, SMATV, and broadcast operators everywhere have placed their trust in DRAKE's professional equipment — and for good reason. Our name has been synonymous with excellence and reliability in the communications field for many, many years.

And this proud tradition continues with our professional VM2410 Modulator and ESR2240 Earth Station Receiver. Operated together or separately, the VM2410 and ESR2240 are an unbeatable choice for solid dependability and performance.

The DRAKE VM2410 Modulator

With the Drake VM2410 a single modulator provides 60 channel frequency agility. A simple push of a button will set the VM2410 output to any VHF Broadcast, Mid-Band, Super-Band and Ultra-Band channel up to 400 MHz.The VM2410 also features video low pass and IF SAW filtering for reliable operation in the most crowded systems. A full 57 dBmV output ensures maximum performance.

The DRAKE ESR2240 Earth Station Receiver

A true step ahead in design technology. Some of the ESR2240's outstanding features include fully synthesized transponder and subcarrier selection, block down conversion with our BDC-24 Block Converter or LNB, IF loop-through for easy multiple receiver installation, SAW filtering for maximum interference rejection and adjacent channel performance, full signal metering on front panel — and much more.

When the bottom line is reliability, long-term service, and simple peace of mind — demand a DRAKE!

Call or write us today for more information.

R. L. DRAKE COMPANY

DRAKE

540 Richard St., Miamisburg, Ohio 45342. USA
Phone: (513) 866-2421 • Telex: 288-017

Reader Service Number 36

HELP WANTED

CABLE SEARCH ASSOCIATES
Professional Search and Placement

Engineering **Sales**
Management **Marketing**
Technicians **Construction**

Call or Write
WICK KIRBY
(312) 369-2620
Telex: 720-462
P.O. Box 2347, Naperville, IL 60565

MEDIA GENERAL CABLE OF FAIRFAX

SYSTEM TECHNICIANS AND OTHER EXPERIENCED CABLE INDIVIDUALS— GROWING CATV SYSTEM IN SUBURBAN D.C. AREA

Fairfax county represents a quarter million homes in one of the wealthiest counties in the country. Ideal opportunity for financial success and an enjoyable lifestyle near the nation's capitol. Are you ready for the challenge of a 120 channel system which has grown from 7,000 subscribers to 80,000 subscribers in 73 wks! If so, send a resume to:

Media General Cable of Fairfax
14650 Lee Road Chantilly, Va. 22021
or call, (703) 378-3912 to schedule an interview.

You will learn more with us in the next year than in three on your present job.
EOE

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

CHIEF TECHNICIAN/ LEAD TECHNICIAN

Virginia system with 1000 miles of plant plus microwave. Electronics background with 5-7 years experience preferred. Job requires excellent communication skills. This will be a take-charge supervisory position. EOE. Contact:

Walter O. Gerber
Technical Manager
Storer Cable Communications
6510 Iron Bridge Rd.
Richmond, Va. 23234

EXPERIENCED LEAD BENCH TECHNICIAN NEEDED

Must be able to instruct other technicians in radio frequency amplifiers and associated equipment. Associates degree or equivalent experience minimum. Send resume to: RF Analysts, 1255 Boston Ave., West Columbia, S.C. 29169

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

CABLE OPPORTUNITIES, TECHNICAL

WARNER AMEX CABLE COMMUNICATIONS is a progressive and fast-moving leader in the cable communications industry. Recent enhancements have created immediate technical opportunities for skilled individuals in a variety of locations across the country.

CHIEF TECH
East Coast, Deep South
Our national division seeks technical managers with proven supervisory skills for work in medium and large systems with standard technology and one-way addressability.

PROJECT ADMINISTRATORS, Q. C. TECHNICIANS
California, Ohio, Florida, Massachusetts
We have major rebuilds now underway in many locations. Project administration and quality control opportunities are available for all levels of salaried and hourly personnel.

WARNER AMEX CABLE offers a competitive salary and benefits program as well as opportunity for continued growth and advancement. For confidential consideration, send your resume, including salary history, to: MICHAEL R. DANIELS, DIRECTOR, HUMAN RESOURCES, WARNER AMEX CABLE COMMUNICATIONS, 425 METRO PLACE NORTH, #500, DUBLIN, OHIO 43017.

Warner Amex Cable Communications Inc.
An Equal Opportunity Employer M/F/H

BUSINESS DIRECTORY

NEMAL STOCKS:
• SPLITTERS • SWITCHES
• TRANSFORMERS
• ADAPTERS • CONVERTERS
Immediate Delivery!!!
• TRUNK CABLE
• DROP CABLE • AMPLIFIERS
• SATELLITE CABLE
Call or write for Cable Systems Pricing
WE EXPORT WORLDWIDE
NEMAL ELECTRONICS, INC.
12240 N.E. 14th Avenue
North Miami, FL 33161
(305) 893-3924

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

Advertiser's Index

Regency's non-volatile intelligent data controller.

A non-volatile intelligent data controller which interfaces with a tiering or billing computer to an addressable converter is available from **Regency Cable Products.** Designed to act as a modem, the NIDC takes decoder address and tiering authorization information from the control computer via a Regency RS232 serial data link. The tiering authorization is stored in stable static CMOS memory and formatted by the NIDC's microcomputer to the Regency addressable format and modulated on a frequency synthesized FSK carrier.

The NIDC's CPU is programmed for fully automated operation and requires no operator intervention at the NIDC, thus, preventing any changes of service —except those authorized by the billing or tiering computer.

For more information, contact Regency Cable Products at P.O. Box 116, East Syracuse, N.Y. 13057-0116, 800/292-0220 or 315/437-4405.

Macom Industries added a new 19-inch rack-mounted UHF to VHF crystal stabilized channel converter to its headend line. The unit XUV-H,L utilizes synthesizer circuitry to allow the immediate change of conversions while maintaining crystal frequency accuracy. In order to change or set the UHF to VHF conversion, the user needs only to adjust a UHF BPF, VHF BPF and set a switch for the right conversion.

For more information, contact Macom Industries, 8230 Haskell Avenue, Van Nuys, Calif. 91406, 800/421-6511 or 818/786-1335.

Scientific-Atlanta announced that it has extended the parts and service warranty covering its Models 8520, 8525, 8526, 8530, 8550 and 8555 set-top terminals to three years from date of shipment. This extended warranty period covers all such units—even those purchased prior to the announcement.

For more information, contact J. Larry Bradner, General Manager, Broadband Communications Division, Scientific-Atlanta, 404/925-5517.

Vitek Electronics Inc. has released a new security shield designed for use on Vitek's molded trap strain relief. Upon installation, the security shield becomes an integral part of the trap, yet can be easily removed using a special tool.

Both the shield and the strain relief are manufactured of high-impact, U.V. resistant plastic, and strain reliefs are available in seven colors for coding purposes.

For more information, contact Vitek Electronics, 901 South Avenue, Horseheads, N.Y. 14845, 607/796-2611.

A new catalog containing complete information of **Hughes Aircraft Co.**'s microwave products for the CATV industry is available. The catalog features descriptions of the full Hughes line of AML microwave equipment for local signal distribution—including transmitters, receivers, systems and accessories. Also included is an overview of microwave communications products made by Hughes, a set of application notes with information on specific installation and maintenance problems and service bulletins.

For more information, contact Hughes Microwave Products Division, P.O. Box 2940, Torrance, Calif. 90509-2940, 213/414-6307.

The Commander IV agile phaselock converter from Jerrold.

The **Jerrold Division** of General Instrument introduced a new headend phaselock output converter that is frequency agile and operates to 550 MHz. The Model C4APC agile Phaselock converter features "all-channel" output, operates in the harmonically related carrier format and uses standard IF signal inputs from any headend modulator or processor.

Channel selection on the Model C4APC is controlled by a thumbwheel on the front of the unit and diagnostic LEDs indicate status for power, signal presence, phaselock reference presence and internal signal locking.

For more information, contact Jerrold, 2200 Byberry Road, Hatboro, Pa. 19040, 800/523-6678 or 800/562-6965.

Channel Master unveiled the MicroBeam transmitter, Model 6610, which allows the transmission of up to 60 channels as far as 20 miles in one direction, 18 miles in two directions or 12 miles in each of four directions. Less channel loading will result in increased range.

The new five-watt system utilizes GaAs FET amplification, highly stable microwave oscillator and redundancy of key components to ensure reliable operation. A status monitor panel allows remote monitoring of all system functions. The transmitter unit is designed for outdoor tower mounting and operates at temperatures from −50°C to +60°C at humidities up to 100 percent.

For more information, contact Steve Dozier, Channel Master Division of Avnet Inc., 919/934-9711.

The V-450 from Vermeer.

Vermeer unleashed a new rubber-tired, rigid frame trencher for high production underground service work. The V-450 trencher is a 60 hp., four-wheel-drive unit featuring super terra-grip high-floating tires, a 32-gallon fuel tank and hydraulic controls grouped near the operator seat for easy access.

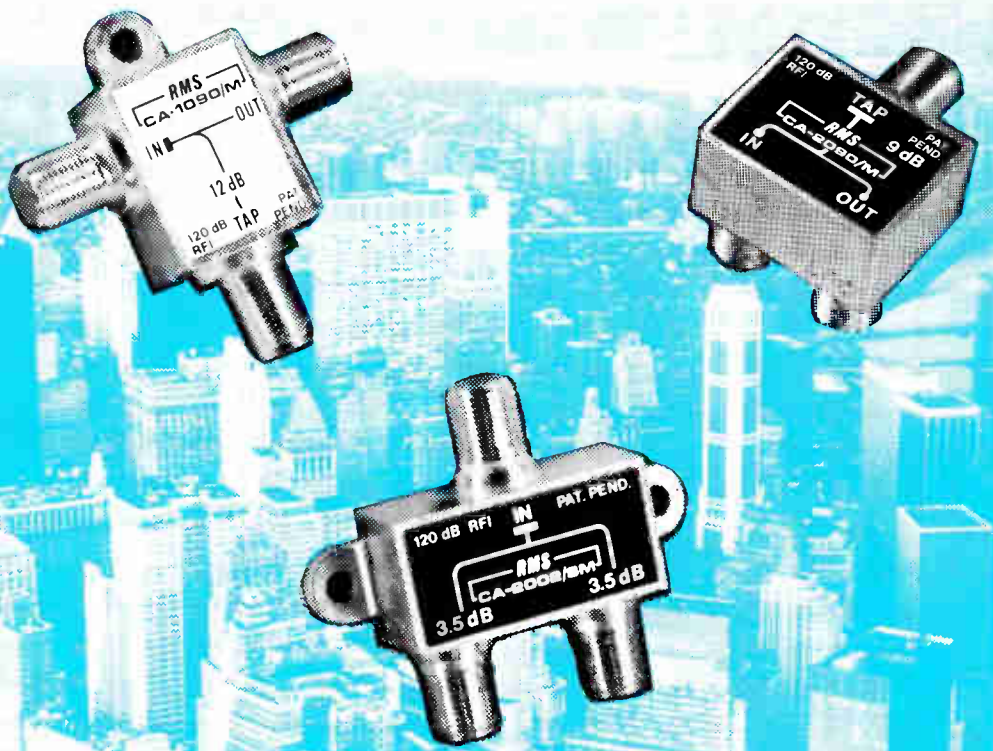
The V-450 is capable of digging a ditch up to 18 inches wide and down to 84 inches deep. The digging assembly comes equipped with a standard 20 inch end idler on a heavy-duty frost boom. The unit also can be equipped with a 64 inch wide backfill blade, backhoe, vibratory plow, offset trencher and combination trencher-plow attachments.

For more information, contact Thom Summit, Vermeer Manufacturing, Dept. F, Pella, Iowa 50219, 515/628-3141.

Avcom announced a 12-volt DC power supply option for most of its line of satellite receivers—including the COM-2, COM-3, COM-20, COM-60 and COM-90. The option DDC-12 also is available factory installed on newly manufactured receivers for an additional charge.

The typical current drain of a receiver equipped with the optional power supply is 1.5 amperes at 12 volts input. Provision is made for a +18 VDC output to power LNAs and downconverters.

RMS GUARANTEES -120 dB RFI!



Only RMS guarantees -120 dB RFI in its CA-1090/M and CA-2090/M directional couplers, and CA-2002/SM silver plated two-way hybrid splitter. No one else comes close. These products are especially useful at the headend, in systems in metropolitan areas, and in LAN systems where RF integrity is essential.

RMS — "Built with the technician in mind"

RMS ELECTRONICS, INC.
50 Antin Place, Bronx, N.Y., 10462
CALL COLLECT: (212) 892-1000 (New York State)
TOLL FREE: (800) 223-8312 (Continental U.S.A., Puerto Rico, U.S. Virgin Islands)

Reader Service Number 37

For more information, contact Avcom of Virginia Inc., 500 Southlake Boulevard, Richmond, Va. 23236, 804/794-2500.

The Moore Corp. has released the Moore Double Box to provide maximum security against unauthorized CATV hook-ups. Constructed of heavy gauge steel, the MDB features a recessed lock, a perforated steel back, two lock options and two knockouts in the bottom to facilitate conduit and riser guard entry.

For more information, contact Moore Corp., P.O. Box 12250, 653 New Circle Road, Lexington, Ky. 40582, 513/777-2029.

The Model 5063 audio substitution switch for CATV modulators is available from **Microwave Filter Co.** This switch-operated trap deletes the standard audio signal at the modulator IF to allow insertion of a substitute audio. The Model 5063 deletes the original audio with a voltage-operated trap and incorporates a directional coupler for inserting the new audio data. The 20 dB trap is activated with 12 VDC (130 MA) applied to the switch through pin terminals. Notch frequency is 41.25 MHz (IF band audio) and 3 dB bandwidth is approximately 2.5 MHz. RF connectors are type F and through loss is 1 dB.

For more information, contact Microwave Filter Co. Inc., 6743 Kinne Street, East Syracuse, N.Y. 13057, 800/448-1666 or 315/437-3953.

Reliable Electric has released coaxial protector units to prevent damage to sensitive electronic equipment. The protector units are available in a range of voltages and connector types that may be inserted directly into a coaxial cable system.

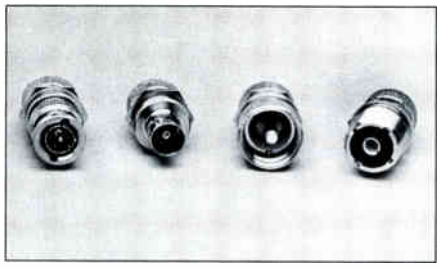
For more information, contact Tim Hill, Reliable Electric/Utility Products, 11333 Addison Street, Franklin Park, Ill. 60131, 312/455-8010.

Baird Satellite Supporting Systems has introduced a new combination flat roof/display base for satellite dishes. The unit sets up in 10 minutes for indoor or outdoor shows or demonstrations. The P-2 is designed for flat roof installations and requires no drilling or anchors.

For more information, contact Baird Satellite Supporting Systems, Highway 63N, Box 2366, Waterloo, Iowa 50704, 319/233-3561.

The Servo Master II from **Teknasat** allows two satellite receivers independent control of the feedhorn servo motor on a satellite antenna. Servo Master IIs can be wired in parallel to accommodate any number of satellite receivers working off of a single dish. The unit is compatible with all feedhorn servo motors, including those with a built-in heater.

For more information, contact Teknasat, 843 East Weber Avenue, Stockton, Calif. 95202, 209/464-5870.



AMP's tool-less coaxial connectors.

A new line of coaxial connectors is available from **AMP Products.** Accommodating cable sizes RG58, RG59 and RG62 through RG6U, the connectors can be reused at least 25 times. The connectors are: BNC plug and jack, UHF plug and jack and push-on F plug.

For more information, contact AMP Products Corp., P.O. Box 1776, Southeastern, Pa. 19399, 215/647-1000.

Pico has introduced a multi-receiver satellite switch that allows any home satellite system to include as many as four receivers. The matrix switch can access any transponder from any receiver in the system and is available in two models for connection with any manufacturer's receiver. The unit is self-contained and features two high-frequency amplifiers, two 4-way power dividers, four pin diode A/B switches and internal RF cables.

For more information, contact Pico Products, Home Satellite Division, Product Information Department, 103 Commerce Boulevard, Liverpool, N.Y. 13088, 800/336-3363.

A low-loss switching unit is available from **Elkay Electrical** which provides instant selection of one of three inputs to a television set. The 3-way video switch measures 4- by 2- by 1-inch and weighs 2.8 oz. The switch also can be used for closed-circuit operations and linking studio monitors. Frequency range is 40-960 MHz.

For more information, contact Elkay Electrical Manufacturing Co. Ltd., Mochdre Industrial Estate, Newtown, Powys SY16 4LF Wales, 686/27000.

RF Industries introduced 10 new coaxial adaptors comprised of four male and four female mini-UHF devices, which will adapt to either male or female UHF, N, BNC or TNC connectors. Male/male and female/female adaptors also are available. All adaptors are finished in nickel-plated brass and feature silver-plated center conductors and Teflon dielectric insulation.

For more information, contact RF Industries, 690 West 28 Street, Hialeah, Fla. 33010-1293, 305/888-1676.

Signal Vision has a new line of cable-in-conduit, which is manufactured from high-density, black, virgin polyethylene resin. All brands of cable can be extruded into the conduit for immediate shipment.

Also from Signal Vision is a new directional tap featuring 500 MHz bandwidth, brass F ports and a new R.F.I. gasket.

For more information, contact Signal Vision Inc., 22732-B Granite Way, Laguna Hills, Calif. 92653, 714/586-3196.

LanTel's 168 central retransmission unit.

LanTel introduced the 168 central retransmission unit (CRU), a single-channel frequency translator which allows an IBM PC network to expand from the current maximum of 72 PCs up to 1,000 PCs. The LanTel 168 also increases the distance a network can serve from 800 feet to almost three miles, on a standard broadband cable system. Designed specifically for the IBM PC network, the 168 CRU uses 168.25 MHz as a translation frequency and can support the entire network within a single standard 6 MHz channel.

LanTel also announced the 500T and 500DC voice modems, which allow broadband LAN operators to add telephone capability to their networks. Dedicated voice ringdown circuits can be installed using two 500T modems to interface two standard single-line telephones with the broadband cable network. Pairing the 500T with the 500DC allows a standard single-line telephone to be connected to a PBX system. The broadband link between the 500T and 500DC replaces twisted pair connec-

tions and allows standard DTMF services provided by the PBX to be accessed over the broadband cable system.

The 500T-to-500DC circuit can be set up anywhere on an existing broadband cable system. Once a line is set up, the extension can be moved anywhere on the network by relocating the 500T modem, thereby eliminating the need for expensive rewiring.

The 500T and the 500DC use the same audio bandwidth as all standard telephone sets (300-3,400 Hz). Frequency-agile, narrowband operation allows up to 800 voice subchannels to be selected over each modem's 32 MHz range.

For more information, contact LanTel Corp., 3100 Northwoods Place, Norcross, Ga. 30071, 404/446-6000.

Regency Cable Products introduced an enhanced version of its RE-1 set-top converter. The RE-2 is equipped with parental control, favorite-channel and last-channel recall and a wall-mount power supply featuring 115V relay-controlled auxiliary output to power the subscriber's television.

AB cable operation is available as an option, with the roll-over programmable via the IR programming capability of the portable programming test unit.

For more information, contact John Shaw, Regency Cable Products, 7707 Records Street, Indianapolis, Ind. 46226-9989, 800/428-5000.

A new rack-mounted headend scrambler is available from **Regency Cable Products**. The HES002 headend scrambler features TOGAL, Regency's new intelligent switching circuit which ensures smooth transitions between single- and dual-level scrambling modes when the average picture level function switch is activated.

The new TOGAL circuit includes a 16/32 bit digital signal processor and high-speed video A/D converter and allows analysis of hundreds of samples per video frame to compute the optimum points for mode switching. Each of the four mail algorithms in the digital signal processor automatically adapts to the characteristics of the incoming program video, thereby providing a variable "contour" mapping of the scrambling modes to the program material.

Other features of the HES002 include: local remote or optional addressable control modes and LED indicators.

For more information, contact Regency Cable Products, P.O. Box 116, East Syracuse, N.Y. 13057-0116, 800/292-0220 or 315/437-4405.

W&S VCM 2001 Switcher

The VCM 2001 Video Control Module made by W&S Systems was accidentally omitted from the January issue listings of video switchers. We apologize for the mistake.

Designed with the casual VCR-user in mind, the VCM has a front-panel display giving prompts for three taping operations: 1) record any channel and watch basic, 2) record basic and watch any other channel and 3) record the channel you're watching or play tapes on the VCR. In each case, LEDs indicate how to tune the TV, VCR and converter to accomplish the task.

For more information, contact W&S Systems, Westinghouse Building, Room 1880, 11 Stanwix Street, Pittsburgh, Pa. 15222, 800/323-9935.

Continued from page 47
tracking. Also available are single- or dual-polarity feed options.

The HOMESAT 800 block downconversion receiver operates in the 950-1,450 MHz range. The unit is microprocessor controlled and features a built-in antenna positioner and both matrix and discrete stereo output capability with Dynamic Noise Reduction. The receiver is descrambler compatible and includes a full-function infra-red remote control.

Accessories for the HOMESAT system include standard 80° K LNBs, actuators, H-V switches, splitters and multipurpose cable.

For more information, contact David Chance, Product Marketing Manager, Video Products Division, Scientific-Atlanta Inc., 404/925-5308.

Standard

Standard Communications plans a June 1986 unveiling of its new home TVRO system. The solid-reflector system will come in two versions: a small dish system that looks only at Galaxy; and a polar-mount system that tracks the full arc. The receiver will incorporate a VideoCipher descrambler board internally and will be C- as well as Ku-band compatible. The system will be offered for sale only to CATV operators.

For more information, contact Standard Communications Corp., P.O. Box 92151, Los Angeles, Calif. 90009, 213/532-5300.

Uniden

Uniden offers a complete line of TVRO receivers, antenna positioners and system components. The UST 2000 single-conversion, 70 MHz satellite receiver includes soft-touch channel up/down, polarity and scan controls. The unit's front panel features 2-digit channel readout, audio tune control, skew control, video fine tune and on/off power with indicator. The UST 2000 also includes vertical and horizontal polarity indicators and is decoder compatible. Other Uniden TVRO receivers include the UST 7000, the UST 6000 and the UST 5000, all of which use block downconversion to provide stable reception and enable multiple TV viewers in one home to access different channels from a common antenna.

The UST 7000 features infra-red remote control of all receiver functions and built-in programmable antenna control accommodating up to 81 satellite positions in memory.

The UST 6000 also incorporates infra-red hand-held remote control of polarity and power functions.

The UST 5000 includes a front panel with touch controls, adjustable audio and channel up and down.

Also in Uniden's TVRO line are the UST 730 and UST 710 antenna positioners. The UST 730 features infra-red hand-held remote capabilities with built-in programmable antenna control accommodating up to 81 satellite positions in memory, an 18-inch stroke actuator and "opto-interrupt" circuitry. The UST 710 also features infra-red remote control, with an LED antenna position indicator, manual east/west controls and a power button on its front panel.

Uniden also offers a full line of system components—including the UST 441 low noise amplifier, the UST 900 low noise block converter and the new UST 524 dual horizontal/vertical splitter.

For more information, contact Uniden Corp. of America, 6345 Castleway Court, Indianapolis, Ind. 46250, 317/842-0280.

USS

United Satellite Systems' line of home satellite equipment includes the SR-3 receiver and actuator control package. The SR-3 offers block down conversion, on-screen display of operating functions, total programming capabilities, selective parental lockout, UHF full-function remote control, "prima" picture quality and complete descrambler compatability.

Also in United's TVRO line are the SR-4 satellite receiver, the SSP-1 stereo receiver and the SR-2D receiver, which utilizes a linear phase lock loop demodulation circuit and features automatic gain control. United also offers fiberglass satellite antennas in 7-, 10- and 12-foot sizes and a 10-foot mesh antenna. Each features a prime focus feed with high gain and low sidelobes for narrow satellite spacing.

For more information, contact United Satellite Systems, St. Hilaire, Minn. 56754, 218/681-5616 or 800/328-7733.

Vidare

A variety of TVRO antennas are available from Vidare Manufacturing Inc. including the Super Eight Fiberglass, an 8-foot dish designed for rapid installation. Four- and 8-foot fiberglass antennas are also available in four-piece assemblies. The Little Hot Shot from Vidare is six feet in diameter with a 27-inch focal length. A spun aluminum antenna, five feet in diameter, is also available featuring a patio mount. Vidare's 10-foot, 5-inch aluminum mesh antenna features 46 7/8-inch focal length, replaceable panels and a self-aligning ring mount with adjustable declination.

For more information, contact Vidare Manufacturing Inc., P.O. Box Q, Ten Sturgis Road, Conway, Ariz. 72032, 501/327-0510 or 501/327-6591.

Wilson

Wilson Microwave Systems Inc. offers two antennas for home reception: the Big Wil, a 7-foot, 4-inch spun aluminum dish; and the Little Wil, a 5-foot dish with its own mounting ring for added stability. For use with either antenna is Wilson's YM450 receiver, featuring separate controls for video and audio quality and a channel selector for the maximum 24 channels per satellite.

For more information, contact Wilson Microwave Systems Inc. One Sunset Way, Henderson, Nev. 89015, 800/634-6898.

Zenith

Zenith has entered the TVRO market with a new home satellite receiving system. Components of the system include a perforated aluminum deep-dish antenna—available in 6-, 8- and 10-foot diameter sizes. The deep-dish design of Zenith's antennas provides high gain and improved interference rejection.

A low-noise block downconverter and feed provides flexibility when adding additional receivers. For 6-foot systems, a high-performance LNB is available; for 8- and 10-foot systems, a standard LNB.

Zenith's microprocessor-controlled satellite receiver tunes up to 24 channels per satellite and features internal A/B switching to automatically pass all local UHF and VHF channels through to either a television or VCR. The Space Command remote control operates channel selection, audio tuning, parental security and can be used to change antenna position.

A programmable electronic antenna positioner featuring an alpha-numeric satellite indicator permits pre-programming of antenna positions to receive signals from up to 24 satellites.

An array of output signal jacks to connect the satellite receiver to a television receiver, video monitor, VCR and/or an audio amplifier system is also available from Zenith.

For more information, contact Zenith Electronics Corp., 1000 Milwaukee Avenue, Glenview, Ill. 60025, 312/391-8181.

BOB ZEQUEIRA, JR., PURCHASING & CONTRACTS ADMINISTRATOR, SELKIRK COMMUNICATIONS, INC.

Like many cable operators, Bob Zequeira found his system the victim of extensive cable theft. Cable thieves were connecting their own service by gaining illegal entry into the cable enclosures. Selkirk Communications' only recourse was to find a high security enclosure capable of restricting unauthorized entry.

But security wasn't Selkirk's only problem. The harsh South Florida coastal environment was another factor to be dealt with, since constant exposure to salt air can be highly corrosive.

Their choice for security and durability; Utility Products' Super Safe. "We chose the Super Safe because of its unique locking mechanism. We had already established the box would last for many, many years." said Bob.

Corrosion-resistance has been a major factor in the purchase of cable enclosures since Selkirk established its system seven years ago. "We have used your apartment box for many years. We realized it was a very good product because of its finish. We tested it and installed it in buildings and areas where the salt concentration is the heaviest. We found it to last without any problems."

Super Safe, like all Utility Products' enclosures, features heavy-gauge, mill galvanized steel coated with a corrosion resistant nine step finishing process. It's interlocking cap and variety of locking mechanisms fortify the security of the unit.

So if security and durability are important in your system, rely on proven quality; Utility Products pedestals and enclosures. Built to last.

For further product information, phone or write us.

Reliable Electric/Utility Products 11333 Addison Street/Franklin Park, Illinois 60131 312-455-8010/Telex 728393

RELIANCE COMM/TEC

Reader Service Number 40

R E L I A B I L I T Y !

Parental Control On All 66 Channels
STEREO COMPATIBLE

Hamlin®

66 Channel Full Feature Cordless Remote Convertor

Model CR-6600 66 Channel cordless remote, with handheld control unit.

As always, Hamlin's best. Superb quality with all new important features and world famous Hamlin reliability.

1 Barker Channels. **2** Self test diagnostics. **3** Unit configuration routine.

4 5 digit parental guidance access code. **5** Tune-to-Barker on unauthorized services.

6 EEROM options available for additional features including:

channel allocation tables and lockout capability for any channel.

Call our toll-free "Hot Line" 1 (800) 323-0436

ANIXTER® COMMUNICATIONS

Corporate offices: Anixter Bros., Inc.
4711 Golf Road, Skokie, IL 60076
(312) 677-2600

 Reader Service Number 41