

communications/engineering digest

reporting the technologies of broadband communications



july 1976
volume 2, no. 7

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Although you may not yet be familiar with our products and services in the CATV industry, we have delivered over two dozen INTELSAT and Domsat 11 meter satellite earth station antennas in the United States and seven foreign countries in the past two years. Our customers for these antennas have been American Satellite Corp., Cable and Wireless Ltd., Comtech Corp., Fairchild Space and Electronics Co., Harris Corp., RCA Global Communications Co. and RCA Ltd.

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Circle 35 on Reader Service Card

Thank you

To say that the Canadian Cable Television Association Convention was enjoyable hardly seems enough. To say that the Canadians showed a hospitality does not seem enough of a compliment.

Thank you to my new friends in Canada.
I will see you next year in Calgary.

Dire que le congrès de l'Association Canadienne de Télévision par câble fut simplement agréable, est loin d'être suffisant. Dire que les Canadiens sont bons hôtes, serait moindre que la vérité.

Pour ma visite a votre congrès, merci à mes amis du Canada. *Je vous verrai l'an à Calgary.*

Merci

Judith Baer, Publisher
Communications/Engineering Digest

**A MESSAGE TO ALL THOSE PEOPLE
WHO
CAN'T REMEMBER THE NAME OF
THIS MAGAZINE!**

The circulation of this magazine has doubled in ten months. We started with 5,000 and as of this issue we're circulating more than 10,000 copies on a controlled basis, to the engineers, managers, system owners and operators, technicians, government agencies, libraries and schools, all with an interest in the cable television industry.

NOBODY ELSE CAN SAY THAT!

Within eight months, this magazine's Reader Service Card has produced more than 1,100 contacts for advertisers and suppliers to the cable television industry.

NOBODY ELSE CAN SAY THAT!

Within five months, this magazine has introduced more than 100 new products and news items to its readers, and invited inquiry for more information. It has reviewed books, introduced new departments, addressed engineering management and provided publications listings.

NOBODY ELSE CAN SAY THAT!

The name of this magazine is

**communications/engineering
digest**

You may call it

c/ed

for short!

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communications/engineering digest

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COVER: The Liberty Bell seemed to be the right form of communication to display on the cover of this July 1976 issue of c/ed. It is one of the most complete forms of communication ever designed.

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opinion/editorial

Judith Baer, Publisher

c/ed goes international

This tenth issue of C/ED accomplishes another important goal set for the publication. With the July issue the involvement and coverage of the Canadian cable television industry is being expanded to the point of this issue being almost totally devoted to the Canadian Cable Television Association's Nineteenth Annual Convention in Toronto. I attended that event and I am impressed!

Ken Hancock, the director of engineering for CCTA has contributed a column each month to the magazine and has told you of some of the accomplishments of the Canadian cable industry. That feature will continue. Along with Ken's involvement you will be seeing a number of papers reporting on the technologies evolving in Canada from some well experienced and competent engineering and technical people. The Canadians have been pioneers and not enough has been published about their accomplishments.

Since Canadian participation in the magazine is increasing, I am increasing circulation throughout Canada. C/ED has many readers and friends outside of the United States, the majority being Canadian. Now C/ED is reaching the leaders in the broadband/cable television industry in two countries. It is being introduced to other nations in well planned steps.

It has always seemed logical to me to circulate this particular publication internationally. The Society of Cable Television Engineers in the U.S. has members around the world. SCTE in the United Kingdom is not directly affiliated with the U.S. organization but the intent and direction of both groups are parallel. The Canadian members of SCTE are serious about their industry and are very active. SCTE in Canada is well respected and carries the support of operators, the CCTA, manufacturers. The group has no problem receiving coverage in the Canadian trade publications, thanks to the interest of Bill Pryde, publisher and editor of *Cable Communications*.

More to the point though, with the advent of satellite communication technology the world continues to shrink. Engineers and technicians in all countries have an interest in what their counterparts world-wide are achieving.

I might be scalped for using the July 1976 issue of C/ED to report on the CCTA convention and talk of international terms for the magazine. This is the 200th Birthday of the United States as a country and I should talk about something with a Bicentennial flavor and perhaps hold up announcing this growth. However, when I think about it, 200 years would appear to be about time to start looking outside our own country and communicating with others. Certainly those of us in the communications industry should at least consider the thought.



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scte comments

Bob Bilodeau, President

line of sight

In deference to the various levels of jurisdiction that prescribe technical standards for our industry and, in spite of advances in technology, there remains a major technical difficulty that has yet to be fully appreciated. The "condition" I am referring to is the prevalence of multi-path in off-air television reception.

Broadcasters have firm control on the performance of studio and transmitting equipment. Receiver manufacturers have followed suit. However, in more than just a political and economic sense, the "link" between broadcasting and CATV is incomplete.

On a demographic basis, the majority of viewers are concentrated in large metropolitan areas and likewise within the A or B contours of the TV stations in these areas. The largest cities, however, have a significant multi-path problem. These are primarily cities characterized by high rise buildings that provide excellent reflection surfaces for TV signals; ergo, the classic market for CATV in Manhattan. Even with cable's proliferation, there remains this serious multi-path problem for many off-air viewers with home antenna systems. In areas beyond B contours, there remain conditions of power line noise, co-channel and other TVI that add to the second class viewing statistics. It remains that in far too many cases, the public, whether on cable or

off-air, is not receiving a fair representation of the transmitted picture.

Interested parties have been circulating about these particular degradations for years—like moths around a burned-out lamp. The impairments from multi-path and other "link" contributions to the total system overshadow many other technical parameters, that are given undue attention (by comparison).

The lamp may be relit. The FCC has issued Docket 20802 proposing to amend the television broadcast transmission technical rules to permit the use of elliptical and circular polarization. Studies to date indicate that this can help; which accrues to the CATV entrepreneur whose technical quality is limited by the quality of his off-air pick-ups. In addition, the NCTA has petitioned the FCC to allow cable rights to direct video feeds from broadcast stations. An extension of this concept is to allow for the carriage of direct feed video/audio signals over CARS and broadcast auxiliary links.

The polarization rule change may help the entire population of viewers, including cable viewers. Rule changes allowing direct video feed will benefit the expanding class of cable subscribers, where concerned operators opt for this method of delivery.

SCTE and industry support should be given to these efforts and others leading to an improved total television delivery system.

Bob Bilodeau

THE SOUTH WILL RISE AGAIN!

Sept 12-14, 1976



SOUTHERN CABLE
TELEVISION ASSOCIATION
ANNUAL MEETING
Fairmont Hotel, Atlanta, GA

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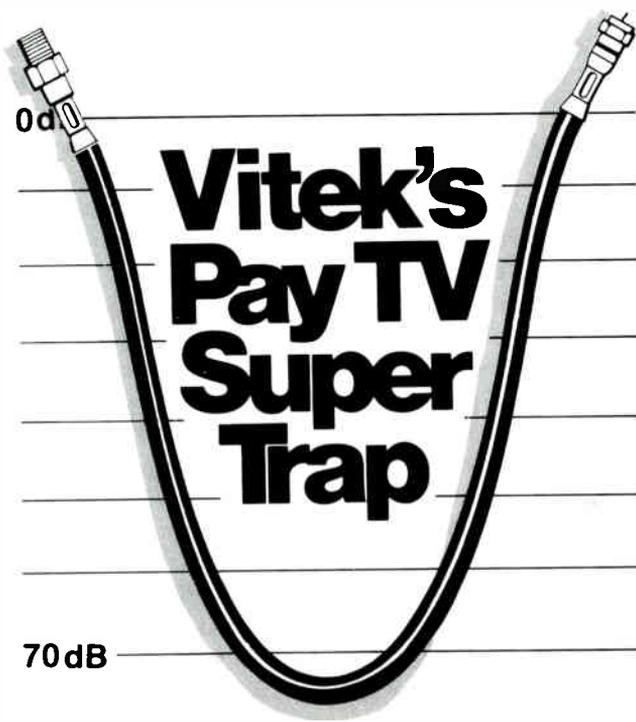
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*Patent Applied For

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CCTA **canadian column**

Kenneth Hancock, Director Engineering

communications technology satellite

On May 20, 1976, a ceremony took place in Canada's Capital city, Ottawa, that could have far reaching effects on the cable television industry, both in the United States and in Canada.

The ceremony was the official inauguration of the Communications Technology Satellite (CTS), officially designated "Hermes", launched on January 17, 1976 from Cape Kennedy Space Centre.

A joint project between Canada and the U.S., some of the primary objectives of the CTS Program are to demonstrate high powered television transmission to small, low-cost earth stations; to flight test high powered transponders and; to further develop and demonstrate subsystems and components for the space communication systems of tomorrow.

"Hermes" is being orbited under a continuing program of Canada-U.S. collaboration in the peaceful uses of outer space that began with the 1962 launch of Alouette-1, our first satellite and the first of any nation other than the two super powers.

Canada designed and built the spacecraft; the U.S., after providing its high-powered transmitting tube and pre-launch test support, carried out the launch. No funds will cross the border because each side is fully responsible for its own parts of the program.

Hermes is the first satellite to operate in the 12 and 14 GHz satellite bands allocated by the International Telecommunications Union. The satellite will be used for a large number of sociological and technical experiments and some of these have already commenced. Canadians and Americans share the use of the spacecraft on a 50-50 alternate day basis.

In these days of Pay-TV via satellite, the three Canadian domestic ANIK satellites and the day-to-day use of Intelsat satellites for TV news, it is easy to become blasé and question the importance of yet another communications satellite. The significance of CTS to our industry is in its primary objective, that is, to demonstrate the feasibility of high powered television transmission at the 12 GHz to small portable low-cost ground stations.

Today's communications satellites generally require comparatively large, expensive ground stations to adequately capture space signals. This is because signals from those satellites are relatively weak, to avoid interference with ground-based microwave systems employing the same (4 to 6 GHz) frequencies.

But CTS, a forerunner of tomorrow's direct broadcast-ing satellite, is pioneering use of new space frequencies that

have no power limitations imposed on them: Build a more powerful satellite; operate it at high frequencies and you can use small earth stations.

The CTS system will employ ground station antenna's as small as one metre in diameter, with others of two and three metres. It will be capable of providing a full range of communications services, including colour TV, FM radio, telephony and data. For given signal-to-noise the antenna diameter depends upon the bandwidth of the service being carried. TV can however, be received with fully acceptable quality on the one metre antenna.

It is this aspect of course that can have important ramifications for our industry. If ground stations can be smaller, less expensive and portable, many more can be economically built and we could see the coming of the domestic satellite ground station as a consumer item. One could conceive of a small roof-top dish with a simple transistor down-converter feeding to a standard VHF/UHF domestic television set.

This would overcome the problems of off-air reception in remote areas and in semi-mobile situations such as for prospecting and drilling crews, together with many of the urban reception problems encountered by highrise apartment dwellers. One can also envisage the use of such satellites for the direct reception of Pay-TV on a nationwide basis to reception standards that can currently only be guaranteed by cable TV systems.

There is certainly therefore the possibility that future high-powered communications satellites operating in 12 GHz band would provide severe competition for cable television systems in both Canada and the United States. Let us look at how realistic this fear of competition is.

At the World Administrative Radio Conference next year, the subject of frequency allocations for broadcasting satellite services will be pursued, and there is every likelihood that the 12 GHz allocation will be approved on a world-wide basis. The standards stemming from this decision, may or may not include limits on satellite transmitter power. Regardless of whether it does or not, there is a current limitation on power from the technology viewpoint. The 200 watt transmitter in the CTS satellite employs an experimental travelling wave tube and will set the standard for future commercial satellites. Assuming for the moment that 200 watts is the order of magnitude satellite power at this frequency band for the first generation of commercial broadcast satellite, and assuming satellite antenna beamwidth that will cover approximately half of the United States and Canada for good quality reception of TV we are looking at a ballpark diameter of ground station antenna of about one metre. This being so, we are still looking at a fairly sophisticated and expensive piece of equipment, even when produced in large quantities. While the prediction of the future costs of electronic equipment has proven to be one of the most hazardous of occupations, it will be surprising if, within the framework of the first

continued on page 34

IEEE

CALL FOR PAPERS

The Cable AdCom of the Broadcast, Cable and Consumer Electronics Society is calling for technical papers for the new *IEEE Transactions on Cable Television*. The *Transactions* will be published in October 1976 and quarterly thereafter.

Papers are invited on new technology, new technical developments, or tutorial papers, which are of interest and instructive to engineers and technicians engaged in the various aspects of broadband/cable television, satellite and community antenna television service.

Papers will be printed from camera-ready copy provided by the author. Detailed instructions will be provided upon receipt of an Abstract of the proposed paper, not to exceed 200 words.

Send Abstracts to:

**Editor, IEEE TRANSACTIONS
on Cable Television (CATV)
P. O. Box 2665
Arlington, VA 22202**

SBE CALL FOR PAPERS

The Society of Broadcast Engineers is calling for technical papers for presentation during the SBE 1976 Third Annual New York Convention, November 7 and 8 in Hempstead, NY. The Society of Cable Television Engineers has been invited to participate in this meeting and will host a panel.

SBE invites papers on topics such as audio, video, RF and control engineering; specific areas such as digital audio and video, satellite communications, electronics news gathering, circular polarization, dynamic range compression, noise reduction, stereo discrete and matrixed quadrasonic FM, and operating practices and techniques.

Abstracts must be received prior to August 1, 1976 and should not exceed 300 words.

Send Abstracts to:

Mark Shubin
Society of Broadcast Engineers
P. O. Box 607
Radio City Station
New York, NY 10019

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news/new products

GENERAL CABLE ADDS TO FUSED DISC LINE

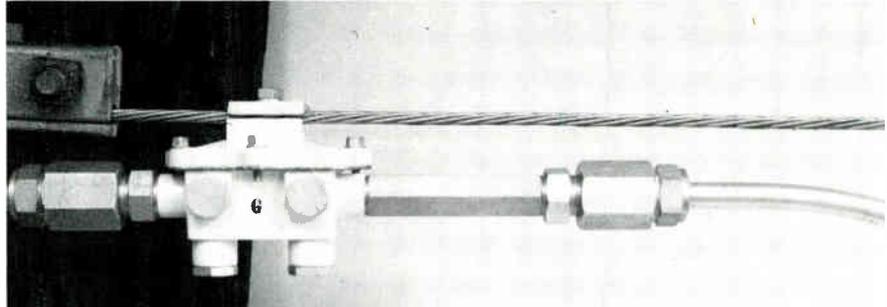
General Cable Corp. has announced availability of Fused Disc Coaxial Cable in one-inch diameter as well as .412", .500" and .750" sizes. The company states that the new one-inch cable offers the same high levels of quality and electrical uniformity as the smaller sizes which have been installed in many systems in the U.S., Canada, Mexico and various European countries. "They also provide the user with savings in systems costs, both initially and over the long haul. Lower attenuation means less electronics to buy and install, less connectors and fewer connections, lower power requirement and less powering and maintenance" states A. L. Torpie of General Cable. (Circle Reader Service Card No. 160)

AMECO MARKETING ANNOUNCEMENT

Ivan H. Bigelow has joined AMECO, Inc. as Vice President for Marketing. In making the announcement, R. W. Behringer, President, stated that Mr. Bigelow would be responsible for National Sales, Advertising, Public Relations and other functions normally related to Marketing. Ray Perez, formerly National Sales Manager will report to Mr. Bigelow as Manager of Sales and Service and in-house telephone sales.

GILBERT EXTENSION CONNECTORS

Gilbert Engineering is introducing a series of extension connectors for coaxial cable for the CATV industry. This product solves the problem of too short cable length when a cable is accidentally cut to an incorrect length, when a "large" piece of equipment is replaced by a "small" piece of equipment, to create enough cable for expansion loops in messengered feeder



Gilbert Extension Connector

cable, or for replacement of pressure taps with conventional taps. (Circle Reader Service Card No. 161)

CABLE OPERATOR SEMINAR

Three days of intensive "hands-on" training will be sponsored by the Community Antenna Television Association during their CATA CABLE OPERATORS SEMINAR, August 9-11, 1976. The seminar will be held in Sequoyah State Park, Western Hills Lodge in Wagoner, Oklahoma. Topics covered will include signal propagation, antenna design, headend equipment maintenance, FCC Proof Testing, rate increases, signal leakage and CB interference. Included also are '77 compliance, spectrum analyzers and various other subjects. Contact CATA, 4209 NW 23rd, Suite 106, Oklahoma City, OK, 73107 for information on rates and reservations.

CANADIANS FORM PAY-TV CORPORATION

Pay Television Network Limited is the name of the newly formed Canadian corporation formed June 4 during the Canadian Cable Television Association Trade Show and Convention. The new group has the total endorsement of the CCTA and will be comprised of cable television operating companies and other interested parties looking to the future of pay television in the Canadian marketplace. Colin Watson

of Metro Cable Ltd. will serve as president of the new corporation and has stated that interests other than those representative of the cable television industry are invited to participate. The company will hold no assets and 60 percent of its revenues will be used for program development for the pay television industry in Canada.

NCTA CHAIRMAN NAMES COMMITTEE HEADS

NCTA Chairman Burt Harris has names the following to serve as chairmen on NCTA Committees: Polly Dunn, Columbus TV Cable, Columbus, MS, Elections Committee; Patrick Nugent, Karnack Corp., Austin, TX, Political Action Committee; Robert Clasen, Continental Cable Vision, Ohio, Cable Services Committee; Bill Daniels, Daniels Properties, Denver, CO, Membership Committee.

NCTI COURSE CATALOG AVAILABLE

The National Cable Television Institute has published its 7th catalog describing course material offered by the company. NCTI states that it has trained over 1,000 technicians in the fundamentals of electronics and CATV technology since its introduction in 1968. NCTI offers both individual and group training enrollments. The courses are home-study and are not held in classroom environments. (Circle Reader Service Card No. 162)

news continued

AVANTEK TRANSISTOR AMPLIFIERS

Avantek, Inc. announces availability of new AM-4230 Series of 3.7 to 4.2 GHz transistor amplifiers with 4.5 dB max noise figures and +12 to +15 dBm linear power output (at 1 dB gain compression). Five gain levels (18 to 47dB) with ± 0.25 dB gain flatness and 0.1 dB/MHz gain slope are available. The amplifiers are designed for use as Post-Amplifiers for satellite earth station PARAMPS and can be used in other applications such as stand-alone receiver amplifiers in light terminals and point-to-point microwave systems. A similar AM-4220 Series with 3.0 dB maximum NF is also available for these applications if lower noise figures are required. AM 4230 and 4220 amplifiers are packaged in compact cases and designed and constructed to withstand the environments of surface, vehicle and aerospace military applications. Applicable MIL specifications include MIL-E-5400, -4158, -26600, -6181 and units can be manufactured to meet MIL-E-16400 when required. (Circle Reader Service Card No. 163)

BIDDLE POTENTIOMETERS AND OHMMETERS

New improvements such as improved stability, elimination of standardizing, reduced measurement time, simplified operation and more rugged construction have been announced by the James G. Biddle Co. describing their portable potentiometers. New features include a Reliavolt battery powered, solid-state, constant voltage source to replace the standard cell as a reference voltage and use of readily available carbon-zinc batteries instead of mercury batteries. The units can be operated over a range of -30°C to 60°C and feature a new 10% minus range to



Biddle Potentiometer



Biddle Ohmmeter

the scale creating a "Live Zero" feature. (Circle Reader Service Card No. 164)

Two models of a new four terminal, direct reading low resistance ohmmeter with LED 4-digit readout and unique ratio circuit are available from Biddle. The instruments measure from 1 microhm to 20 ohms in 5 ranges with a resolution to 1 microhm. The unit features a three position switch for easy use. Display is continuous when the switch is closed. The unit can be self-contained with internal batteries and separate charger with connecting cable or another model operates from dry cells contained in a separate module. (Circle Reader Service Card No. 165)

BROADCAST TELEVISION SHORT FORM CATALOG

Cohu, Inc. announces availability of Catalog No. 6-545 which describes the company's current line of broadcast television products. The catalog includes photographs and descriptions of all equipment. (Circle Reader Service Card No. 166)

DITCH WITCH PUBLICATION

Full color photographs and complete equipment specifications and options are outlined in *Ditch Witch Modularmatics*, a readable and informative addition to the Ditch Witch equipment line publications. The brochure describes the modularmatic concept for the R-30, R-40, R-65 and R-100 vehicles and working module attachments are included. (Circle Reader Service Card No. 167)

OAK APPOINTS NEW AD AGENCY

Oak Industries, Inc., Crystal Lake, IL has appointed Stral Advertising Company as agency for its CATV Division supplementing the agency's assignment with the Oak Switch Division.

CATV DEVELOPMENT APPOINTS SINGER PREXY

Robert S. Libauer, Chairman and Chief Executive Office of CATV Development Corp. announced election of Jonathon I. Singer as President of the company. Singer has been Assistant to the President of National Cable Communications Corp. since 1973. Prior to his appointment with National Cable, he was employed by Anaconda Electronics as market design engineer. He holds a M.B.A. from the University of Connecticut and a Bachelor of Electrical Engineering degree from City College of New York. CATV Development Corporation is involved in acquisition, financing, construction and operation of cable television properties.

EAGLE COMTRONICS CATALOG SHEET

A new catalog sheet from EAGLE Com-Tronics on their second generation Model 2-NF Notch Filter Traps for pay television has just been issued. The 2-NF trap and security shield, installation and removal tools are shown together with actual 'scope photos of the guaranteed specifications. All major features are outlined and a typical installation is pictured. (Circle Reader Service Card No. 168)

**QRK ANNOUNCES NEW
RIAA PREAMP**

A compact unit sized to fit in a pocket has been designed by QRK Electronics in Fresno, California. QRK has been active in electronics for 30 years. The "Alpha" Equalized Preamplifier is built to RIAA and NAB specifications, offers a full range output level control without degradation of response, noise or distortion, maximum dynamic range and is designed for use with all popular variable reluctance and magnetic tape cartridges. Two independent channels (stereo) is a feature with balanced outputs. (Circle Reader Service Card No. 169)

COPPERWELD HAS NEW BOOKLET

Copperweld Bimetallics Division of Copperweld Corp. offers a booklet

entitled *Methods and Materials for Grounding Systems* that describes and illustrates practical grounding principles. Numerous charts and graphs are included dealing with the electrical characteristics and specifications of Copperweld's bimetallic DSA ground strand, counterpoise wire, ground rods and wire mesh. (Circle Reader Service Card No. 170)

MICROWAVE FERRITE CATALOG

Junction Devices announces publication of their new microwave ferrite devices catalog, describing a full line of coaxial and waveguide circulators, isolators, switches, multijunction devices and integrated assemblies covering the frequency spectrum from 375 MHz through 40GHz (Circle Reader Service Card No. 171)

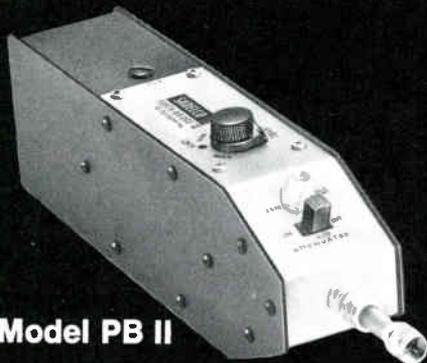
**MIAMI-DAYTON JOB TRAINING
CENTER HOLDS OPEN HOUSE**

Representatives of federal/state and local manpower training programs, communications agencies and industry and trade association personnel attended an Open House at the Garfield Skills Center/Roosevelt High School CATV Training Center in Dayton, OH on June 8. A complete tour of the facility and display of classroom techniques and texts were presented.

**1ST ANNUAL
INTERNATIONAL VIDEODISC
CONFERENCE PLANNED**

The Visiondisc Corp. and United Business Publications will stage the event November 15-17 in New York City. Seminars, panels and lectures will investigate types of software likely to be

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PORTA-BRIDGE II
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BRIDGE BALANCE: 40 dB**



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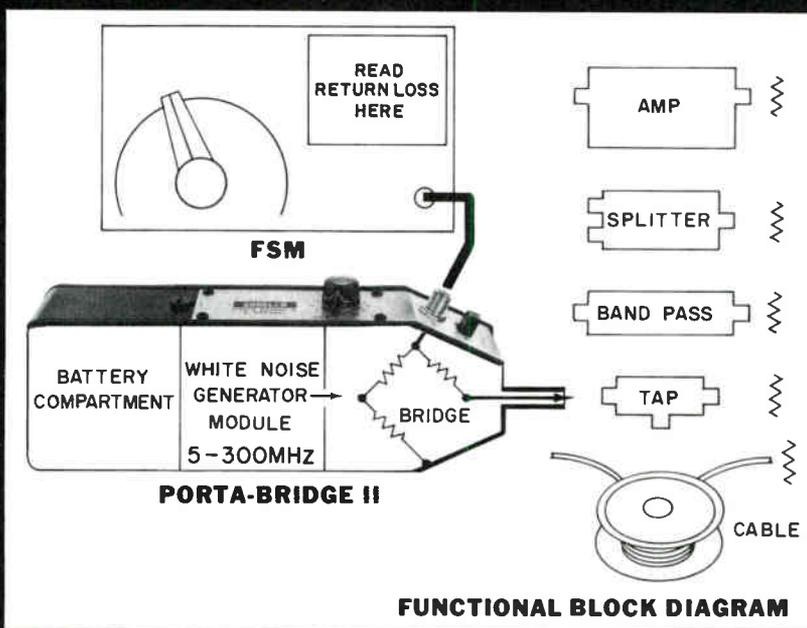
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splitters, filters and cables.



FUNCTIONAL BLOCK DIAGRAM

Circle Reader Service Card No. 25

news continued

distributed on the new videodisc formats. Executives of major hardware manufacturers, program producers and distributors, union representatives and economic and legal analysts will participate.

MAGNAVOX NAMES POLIS INTERNATIONAL SALES MANAGER

Magnavox CATV Division announced the promotion of Thomas J. Polis to the position of International Sales Manager. Polis has a background in systems design and field engineering, and will organize field training seminars throughout the U.S. Tom has been in the cable industry for 10 years and is a graduate of the RCA Technical Institute.

SCIENTIFIC ATLANTA CONFERENCE

Scientific-Altana will host an Earth Station Technology Conference July 14-16 in Atlanta, GA. The event is scheduled with panel presentations and is by invitation only. Approximately 125 industry technical personnel, both current users and planned future users will attend.

TELEMATION TITLING/ GRAPHICS SYSTEM

TeleMation, Inc. Compositor I Titling/Graphics System uses a single disk for storage of computer programs and font library as well as 800 composed pages which eliminates the need for disk changing. Several different fonts may be mixed on a page, within a row or within a word. Compositor I provides camera quality characters incorporating line-by-line vertical resolution and horizontal elements of only 29 nsec width. Twenty-eight colors, plus black and white and two shades of gray are optionally available for characters and background. Background



Thomas J. Polis
Magnavox CATV Division

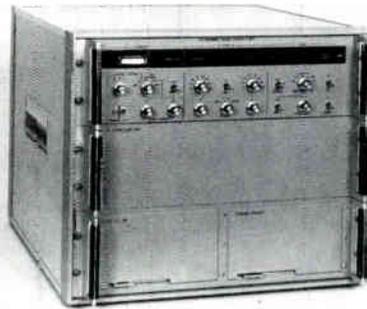
colors can be changed every four scan lines as can character colors. (Circle Reader Service Card No. 172)

10 WATT FIXED ATTENUATOR PADS

Texscan Corp. introduces Model HFP-50 series of 10 watt CW fixed attenuators available in standard off-the-shelf values of 10, 20 and 30 dB. Attenuation values between 1 and 30 dB are available on special order. (Circle Reader Service Card No. 173)

ANTENNAS FOR COMMUNICATIONS RELOCATES

Antennas for Communications will be relocated as of July 1, 1976 from Plymouth, MA to Ocala, FL. AFC manufactures earth station antenna



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A four day program will be held at the University of Wisconsin July 12-16 on DESIGN AND IMPLEMENTATION OF CABLE TV SYSTEMS. Speakers include Robert Bilodeau, President of SCTE and Vice President, Engineering, Suburban Cablevision; Joel A. Goldblatt, Marketing Associate, Malarkey, Taylor & Associates; Robert L. Schoenbeck, Staff Technical Advisor, EIE; Barry L. Kenyon, CATV Product Manager, TeleMation Inc.; Abe Sonnenschein, Director of Engineering,

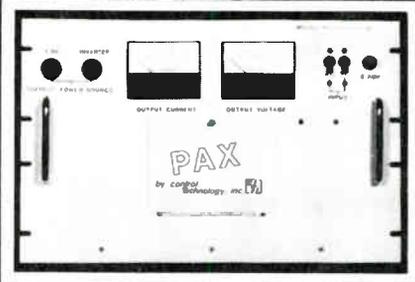
Theta-Com; Frank J. Rigone, Director of Engineering, Jerrold; Ivan T. Frisch, Vice President, Sales, Network Analysis Corp.; Maqbool A. Quarashi, President, AM Communications; Alex Azelickis, Vice President, Technical Relations, Oak Industries; Wiley Steakley, Regional Sales Manager, Blonder Tongue; and Bernard J. Lechner, Head-Color Television Research, RCA Labs. Program registration is \$395. Call John T. Snedeker, Program Director at (608)262-1299 to enroll.

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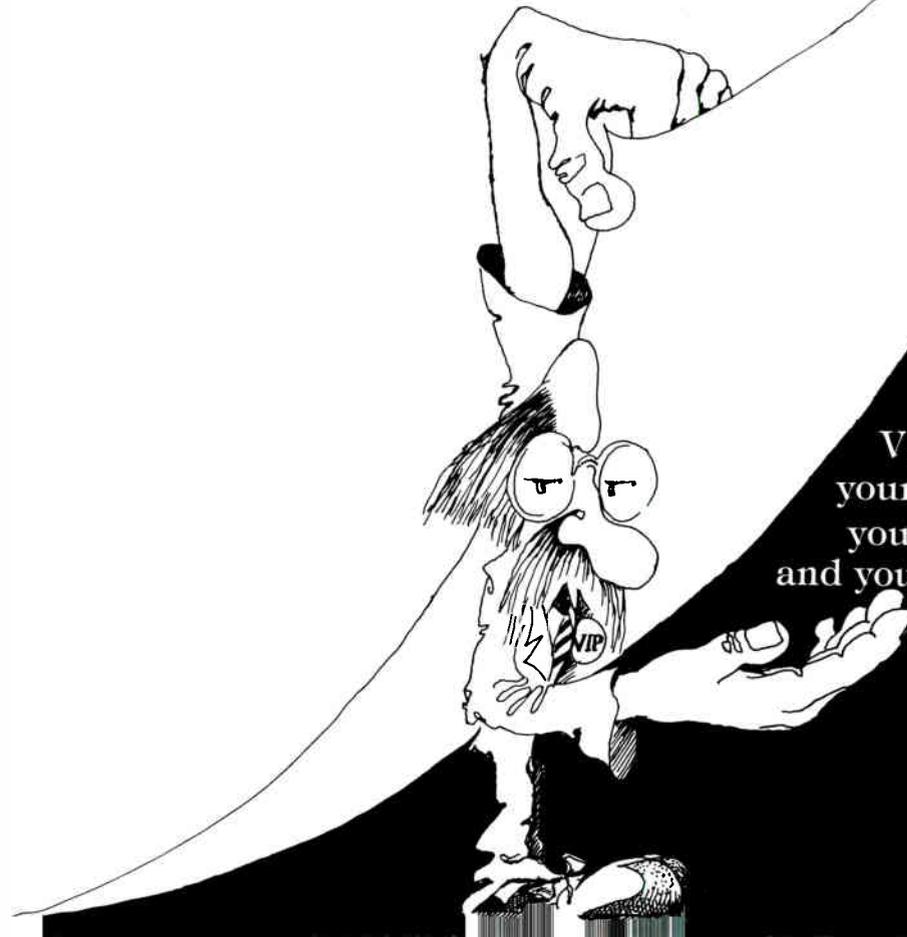
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ncta technical topics

Delmer C. Ports, Vice President
Hazel S. Dyson, Administrative Assistant

more developments in the satellite/cable syndrome

The Syndrome

We have felt for a long time that the combination of satellites and cables are a natural. Both are basically and inherently distribution services—from one point to many. Satellites perform the national distribution link and cable performs the local distribution function. Neither are as yet limited in channel capacity. Both are capable of distributing high-quality signals; and the economic tradeoffs in bandwidth; national, regional and local distribution; and potential numbers of individual locations are very attractive.

Current Events

The growth of Home Box Office's national distribution system has been almost dramatic in its first year of operation. The 42 operating receiving installations that it now serves make it a major satellite user.

Inevitably, other services are beginning to evolve. Some are in an embryonic planning stage but even now look intriguing, and others are in the advanced planning stages with contract-signing and ribbon-cutting ceremonies in the not too distant future. One of the more ambitious plans is the Public Broadcasting System operating under the auspices of the Corporation of Public Broadcasting. This is to be a nationwide system distributing public broadcasting system programming on three channels with an option on a fourth. There are expected to be 165 receiving locations. It is hoped that some of these can be dual with cable operations. Optical Systems has also announced their intention of distributing pay cable programming via satellites to cable systems.

New Things Coming Up

In the more novel, new applications now being generated, the so-called distribution of distant signals to cable systems is in the offing. Channel 17 in Atlanta, Georgia, is proposing to make its programs available through satellite and terrestrial distribution. This UHF independent station now reaches a number of cable systems in the South East by terrestrial microwave. This new approach offers a means of extending the services of UHF stations to a significantly larger market area. In addition to the public service this offers, it also is a means of equalizing the UHF/VHF disparity in coverage.

The National Weather Service is investigating the feasibility of a plan for a rather sophisticated weather distribution service that would be of specific interest to those whose daily activities are affected by weather. These include private pilots, boaters, fishermen, farmers, and others who need specific detailed weather data. This, in effect, is a grown-up version of the cable weather channel. One attractive system format for this application is national distribution by satellites on a narrow data channel with regional and local distribution using line graphics and video overlay.

The Public Service Satellite Consortium has recently announced plans for a satellite-based national network for continuing education. This operation is a natural satellite-cable combination since it involves restricted audiences with such specific subject matter being distributed according to the restricted audience entitled to that particular subject. This function duplicates exactly the operational functions used in pay program distribution.

Joint Canada US Explorations

A very interesting exploratory set of meetings is under way between Canada and the United States. These meetings involve representatives from the Canadian Cable Television Association and the National Cable Television Association who are exploring ways and means of jointly developing additional satellite-cable operations.

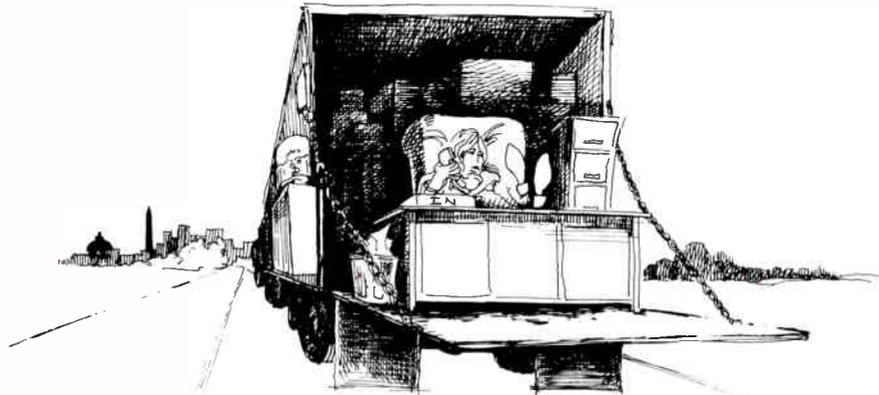
Small Low-Cost Earth Terminals

And finally, but of very critical importance, are developments that might lead to the use of more economical earth terminals as additional options to cable operators in their installations. New technical developments are making it more than ever feasible to consider them as reasonable options, and efforts are underway to get them accepted as legal alternatives.

The use of a lower cost terminal should not be considered as a general panacea because they must be considered from many critical points of view before reaching a decision. Factors such as obsolescence in a competitive market, performance in relation to a specific location in the satellite footprint, additional uses anticipated that might require higher degrees of performance, etc., all must be weighed before making a decision if and when the regulatory rules are adjusted so that they may be authorized. The added flexibility will be a boon to many operators.

This all adds up to what we believe are a number of real strong pluses.

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c/ed showcase: CCTA 19th Annual Convention

The Canadian Cable Television Association hosted its Nineteenth Annual Convention and Trade Show in Toronto June 1 through 4, 1976. Two things were very obvious about this group and the event: A great sense of humor and a perfect job of programming. Sessions started on time and stopped within short minutes of scheduled times. Questions and answers were invited and were well handled during the sessions but the sessions were not allowed to run over and the questioning periods were brought to a halt when scheduled.

The Canadian cable television operators appear to have a cohesiveness that operators in the United States have lost due to disagreements among the rank and file of the industry. This is not to say that there are no politics within the Canadian association nor is it to say that everyone agrees with everyone else. That would be a naive observation. But, it does make a difference to attend an industry event that is sponsored *by* the industry. They put their very best forward and present a united front to outsiders.

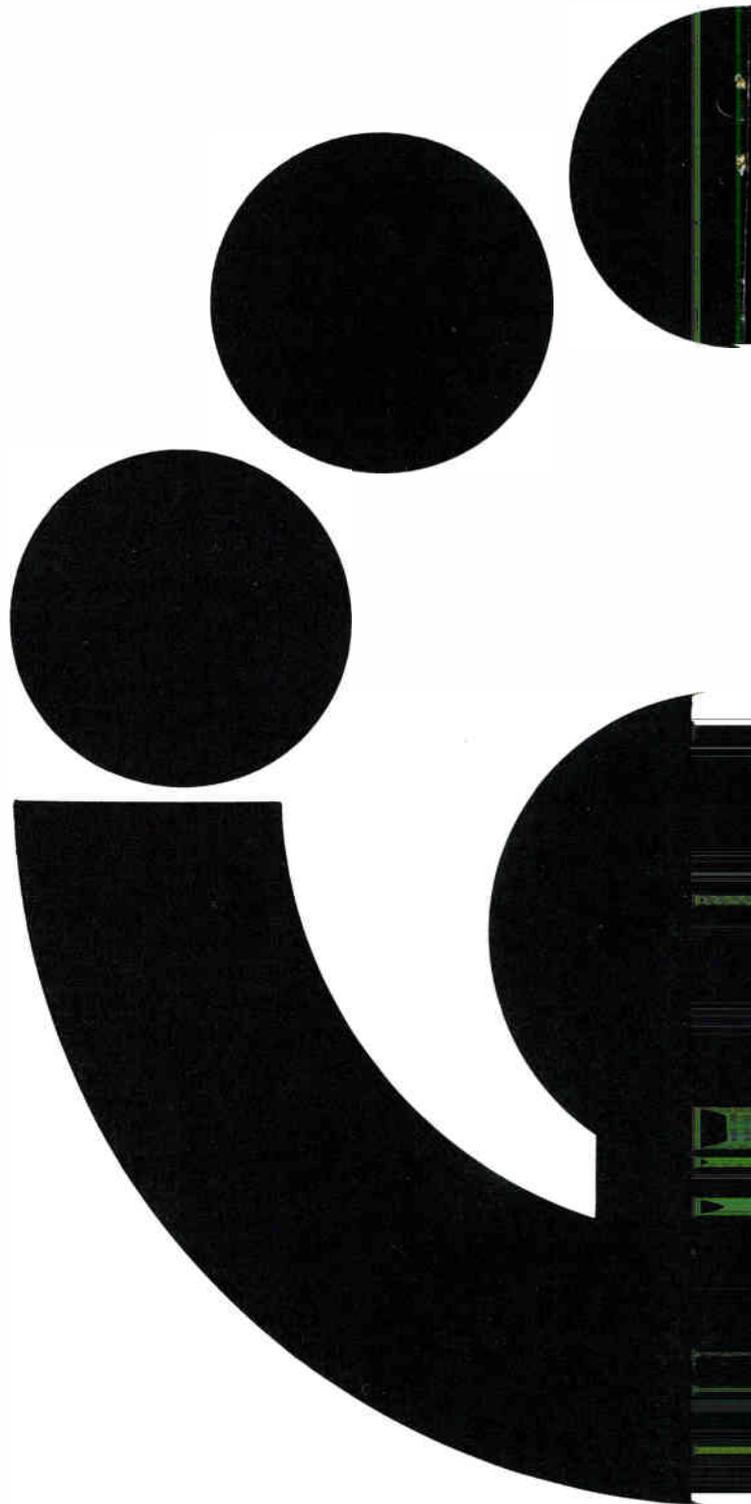
Exhibitors were pleased. The facility was good and the trade show received good attendance and attention. Some mentioned that it was the best show ever, some qualified their remarks that it was the best in the past three to five years.

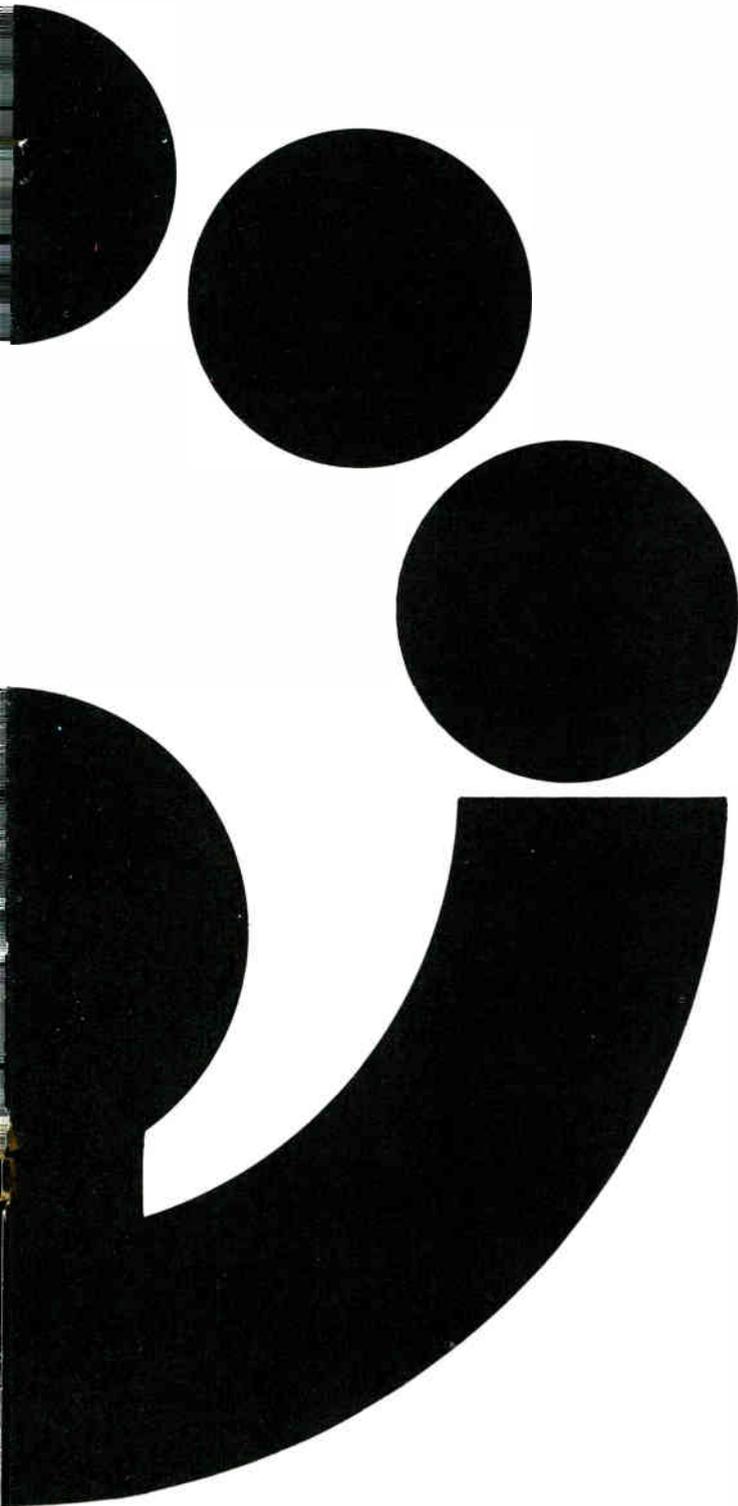
One exhibitor mentioned the appearance of more manufacturers from the U.S. and expressed skepticism as to the motives of the companies. It was said that these U.S. firms are having troubles selling in the American market and are really only temporary in their interest in the Canadian cable industry. The consensus seemed that if the U.S. cable industry picked up, the Canadians would be left in the lurch after being exploited for a short length of time.

That is not to say that U.S. manufacturing firms are not invited and might indeed be encouraged to participate in the Canadian market. But to do so requires a real commitment on the part of the company and not a temporary one if the company is to succeed with the Canadians. The operators are as dismayed about being thought of in a second hand manner as Canadian manufacturers and representatives. Again, a spirit of cohesiveness.

Highlights, Tuesday June 1

On Tuesday, the CCTA and NCTA held a joint Satellite Committee Meeting to "investigate areas of mutual interest





on the use of satellites by the cable industry." Delmer Ports, NCTA Vice President of Engineering said that the meeting was very successful and that the group intends to meet again within the very near future.

CCTA spent most of this first day of the convention with business affairs such as their Board of Directors' Meeting and Luncheon and regional meetings of the five districts within CCTA held during the afternoon. The official opening of the Trade Show started at 6:30 P.M. with opening remarks of Colin J. O'Brien of Jerrold Electronics and the introduction of The Honorable William G. Davis, Premier of Ontario. Again, a sense of humor was apparent and Davis' remarks were lighthearted and well received.

Local origination cameras were all around throughout the opening and continued to provide coverage to interested viewers throughout the convention. This is a feature that has not prevailed at the National Cable Television Association conventions, largely due to the fact that NCTA hasn't held a convention in a city with a cable television system. The Canadians would be hard pressed to find a city that doesn't have cable television and are able to further showcase the technology and service.

Getting Down to Business

Wednesday started off sessions on Business, Programming and Technical topics. Programming is an important part of Canadian cable television and, the operators are totally involved. Product is important to the Canadians and the cable industry produces a great amount of local origination, public access and community programming.

Business sessions covered *Diversification and Cable Television, Utility or Not*. Programming sessions addressed *Staffing—Paid or Volunteer and Utilizing Energy, Minds and Resources*. Law Session 1 covered *Legal and Practical Aspects of the New Cable Television Regulations* while the second Law session spoke to *Commission Policies on Ownership and Financing*. The Technical programs included *Equipment Design and Modern Equipment Design Considerations*.

Luncheon on Wednesday had been anticipated as a newsmaking event. The speaker was The Honorable Jeanne Sauvé, P.C., M.P., Minister of Communications, Ottawa. Federal Communications Minister Sauvé opened the door to pay-television in Canada, stating that the federal govern-

CCTA President Michael Hind-Smith (right) introduces Wednesday's luncheon speaker. NCTA President, Bob Schmidt (left) thanked CCTA and commented on Shooshan's Thursday luncheon address.



Standing room only at some of the sessions.



ment will take steps to ensure that pay-TV, when introduced will provide a range of programming which does not duplicate that now offered by broadcasters and that revenue from pay-TV will be used to produce high-quality Canadian programs.

Freedom to Choose was the title of Plenary Session I and hosted Gerald M. Levin, Chairman, Home Box Office; Russell Karp, President, TelePrompTer; Alan Greenstadt, President, Optical Systems and; Robert Weisberg, President, Telemation Program Services. The session was chaired by J. Barry Gage, Vice President and General Manager of Maclean-Hunter Cable TV Ltd. and Vice President of Suburban Cable which serves Essex County in New Jersey. The audience was interested in the figures presented by these spokesmen for the U.S. Pay Cable Television market. At Plenary Session II, **Premium for Canada, A Partnership for Production**, CRTC Chairman Harry Boyle applauded Madame Sauvé's statement, saying that the introduction of pay-TV to Canada is an important first step toward the repossession of a Canadian broadcasting system.

Confirming again the Canadian sense of humor, CCTA staged a PROGRAMMERS' MOCK HEARING. Set as a hearing with the Canadian Radio-Television and Telecommunications Commission, the counterpart to the Federal Communications Commission in the U.S., the half hour presented a satirical look at the process of license applications in Canada. The program was prepared and presented

by programmers and received a warm reception and was mentioned as one of the best events of the convention.

Traveling Distances to Receive Messages

Sessions continued throughout Thursday morning on such topics as *Job Design and Employee Motivation*, *Print Advertising (what not to do with \$80,000)*, *Considerations for Pole Access Agreements, Broadcasting and Cable Television Copyright and Compensation*, *New Subscriber Services as a Means to New Revenue Sources*, *Red Tape or Video Tape and Systems Operation*.

The speaker for the Thursday luncheon was Harry M. "Chip" Shooshan, III, Chief Counsel to the Subcommittee of the Committee on Interstate and Foreign Commerce of the United States House of Representatives. Operators in the U.S. know Shooshan well as the mind behind *Cable Television: Promise Versus Regulatory Performance* published in January 1976. The text of Mr. Shooshan's remarks appears in this issue of C/ED and operators in Canada and the United States are encouraged to read it and respond. Thursday luncheon included a presentation to Robert Schmidt, President, National Cable Television Association, of an advance copy of the Canadian Bicentennial Gift to the U.S., to be presented to President Gerald R. Ford later this month by Canada's Prime Minister Trudeau. Canada commissioned a photographic tribute to the common border of both countries titled *Between Friends/Entre Amis*. The book contains a collection of dramatic color photographs of the longest undefended border in the world.

Thursday afternoon included more sessions on topics of *Customer Relations*, *The Marketing and Selling of Additional Services*, a Law Session on *New Developments in Communications Technology*, *Cable for Kids*, *The Technical Side of Programming and Information Services* and *Problems and Aspects of the New CRTC*.

More than 1,900 attended the sessions, meetings and toured the exhibit area.



Many key sessions were covered by Canadian system programming personnel.



Friday Winding Down

Again, probably because there were a lot of programming people active in the plans for the CCTA Convention, they were smart enough to know that after two full days of sessions, luncheons and events, Friday would be a good time to start to slow down a little. That is not to say that nothing happened on Friday but it is to say that not so many sessions were staged. A Plenary Session IV in the morning, at a reasonable time of 9:00 a.m., was held on *New Concepts in Broadcaster/Cable Relationships*. This was perhaps the first time that any session did not have the feeling of cohesiveness felt throughout the convention. The reason is simple in that this session included the cable television industry represented by Pierre Levasseur, President, National Cablevision Limited; the broadcasting industry represented by Allan Waters, President, CHUM Ltd. and Chairman of the Canadian Association of Broadcasters and: John D. Hylton, Commissioner, CRTC. A universal problem appears to be the ability of broadcast, cable television and regulation people to agree on much of anything, at least publicly.

Friday included technical seminars and plant tours. *The Care and Feeding of Converters* was hosted at Jerrold's facility and *The Intelligent Tap* was held at Delta-Benco-Cascade. Servicing requirements, quality control, security for converter storage, subscriber marketing techniques, review of major media campaign for the sale of converters as a consumer item, lunch and a general plant tour were part of the trip to Jerrold. As the group moved on to DBC they were addressed on the uses and economics of programmable taps, quality assurance procedures and system operation.

The last Programming Session covered *Community Programming* and was held in a workshop setting while the final Business Session was held on *An Overview of the*

Anti-Inflation Program. There was no luncheon held for the entire convention on Friday but the Programmers' Luncheon, the Directors' Luncheon Meeting and a Media Reception were held.

Friday also saw the Annual General Meeting of CCTA and the election of directors and a new chairman, Philip B. Lind, Vice President, Programming, Rogers Cable TV Limited. An announcement was made Friday also on the formation of a new corporation, Pay Television Network, Ltd. to represent cable television interests in the development of pay-cable in Canada.

Generally . . .

It is apparent that the Canadian cable operators feel a responsibility to their subscribers. It is obvious that programming is a vital part of the Canadian cable industry and that local origination works in Canada. The viewers take an active part in the production of product and the operators provide studios and assistance. They encourage participation.

Another observation: There are many more women involved in cable television in Canada than in the U.S. Sales, marketing, management of systems, and programming all include women. The managers are not tokens and they are not the result of family holdings. They are active, knowledgeable and involved.

continued on page 34

Cable Television: Promise vs. Regulatory Performance

**Luncheon Presentation,
Canadian Cable Television Association,
19th Annual Convention, June 3, 1976, Toronto, Canada.**

Harry M. Shooshan, III

Mr. Stanley, Mr. Graham, Ladies and Gentlemen. I bring you greetings from Washington, DC, where Toronto is known as the city that first deleted our commercials and then stole our baseball team. Actually, coming through Customs this morning, I had the inevitable feeling of being in a foreign country. However, I was reassured by something which had happened when I was here last fall.

While waiting for my room at the Royal York to be made up, I was talking with one of the maids. She told me that she had been born and raised in Toronto. One thing led to another, and I explained that I had just arrived from Ottawa where I had been discussing cable television with government officials. Her eyes flashed, her mouth tightened, and she warned me to take what I had heard in Ottawa with a grain of salt. "You know, the government's trying to take away **our** television programs," she declared. "Oh, no," I reassured her, "your government is very concerned about seeing to it that there is more Canadian programming."

"I'm not talking about those programs" she said, "I'm concerned about **our** programs—you know—Kojak, All in the Family—Those are what we Canadians want to see."

While that incident overcame any concern I had about being in another country, it provided me with an uneasy insight into some of the policy problems with which Canadians are faced because of the influence of your neighbor to the south. It is for this reason that I enter this disclaimer at the outset of my remarks. I am here today to share with you some of our experiences in dealing with cable television. Perhaps, I can provide some perspective but I do not pretend to offer any answers—not to our problems, and certainly not to yours.

As two countries dealing with many of the same concerns, we can study each other's strengths and learn from each other's mistakes. But each of us will have to develop our own solutions.

Having said that—let me now try to do what Phil Lind invited me here to do—that is, bring you up to date on what is happening to cable in the United States.

First, let's step back a year. Last June, Washington was alive with the promise of deregulation for cable television. The President's Council of Economic Advisers was involved in a major effort to develop cable legislation; the Federal Communications Commission was working on legislation; and the Staff of the House Communications Subcommittee was beginning its study. For the first time in fifteen years, regulatory policy governing cable was getting a thorough review. It appeared that serious questions were being raised about the wisdom of regulating a new technology merely to protect an existing technology without first having made specific findings as to whether or not the public interest was being served.

Now, a year later, what has become of these efforts? The White House decided that deregulation was fine for planes and trucks, but not for cable television. The efforts of Paul McAvoy ended with a whimper instead of the anticipated bang. The FCC decided cable legislation was too

"As two countries dealing with many of the same concerns, we can study each other's strengths and learn from each other's mistakes."



controversial. On the other hand, the House Communications Subcommittee staff study was completed on schedule and released in January. The study has been followed by comprehensive hearings before the Subcommittee. On the first day of those hearings, Subcommittee Chairman Lionel Van Deerlin said:

We will be interested in gaining a general perspective on how new communications technologies can be integrated into the existing communications system in such a way as to insure that the public interest is served, I believe we have already seen how new technologies have been needlessly held back.

The first half of these hearings have been completed, and while an assessment of their impact cannot properly be made until they are concluded later this summer, a consensus on some points is emerging.

First, there seems to be general agreement that the FCC's pay-cable rules are unnecessarily complex and that

"The cable industry in the United States has not made very much of the opportunities which it had a year ago."

their effect goes far beyond the purpose of protecting against siphoning. Dean Burch told the Subcommittee that the movie rules in pay cable were incomprehensible, and spokesmen for the networks refused to defend them.

Second, doubts have been raised as to the degree of cable's negative impact on broadcast stations. While the broadcasters continue to point to lost viewers (fractionalization is the term of art), they were unable or unwilling to

point to lost revenues. Several Subcommittee members have expressed interest in shifting the burden of proof to broadcasters to demonstrate that the public interest requires that the FCC protect them from cable's impact.

Third, there has been extended discussion of the separations principle which would prevent cable system

". . . perhaps it is because the industry is capable of fighting only one battle at a time and has been preoccupied with the copyright issues."

owners from having any control over programming. As you may be aware, this was a key recommendation of the staff study. Implementation of such a policy could obviate the need for many of the FCC's regulations, especially those dealing with cross-ownership.

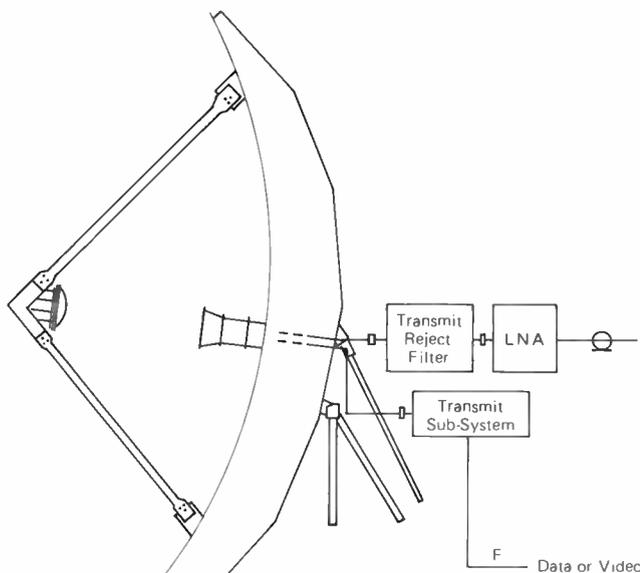
Fourth, the Subcommittee has been adamant about the cable industry accepting copyright liability and has supported Chairman Van Deerlin's hopes to avoid a jurisdictional squabble with the Judiciary Committee which is now nearing the end of its deliberations on a new copyright bill.

In sum, the staff study, while serving as a lightning rod for dissent, has helped to focus attention on the issues. These are complex and controversial issues, and their resolution may involve a lengthy process—a road to which no end is yet in sight.

However, this much is clear. The cable industry in the United States has not made very much of the opportunities

continued on page 33

CATV Video Earth Stations



Rx/Tx Antenna Front End

DAVID HERSHBERG
Communication Systems Consultant
Radio Mechanical Structures, Inc.
Kilgore, TX

INTRODUCTION

Relatively few system design features must be considered in developing a successful receive-only video earth station for use with a domestic satellite. Simply stated, a carrier-to-noise ratio must be maintained for all possible conditions of operation, achieving a receive signal that will insure picture quality while avoiding all possible interference sources. The other criterion is to provide a system that will receive the transmitted video and audio programming services for distribution to cable customers with minimum distortion. This article describes some additional factors that should be considered in an earth station designed for other revenue producing transmission services.

USES OF A CATV TERMINAL

Simplex Data: The receive-only video terminal in conjunction with a CATV distribution system offers an extremely cost-effective means of data transmission. The basic earth station investment is first justified by the pay television revenues. For a relatively small additional investment in hardware, the earth terminal can receive narrow band or wideband data and distribute it over the existing cable system on an un-used channel. (Data rates up to 5MB/second)¹

The type of data that are candidates for this service are wideband data distribution systems for news, stock exchange, bank data, type setting, facsimile, and computer data updating.

There are three methods of data transmission shown in Figure 1. A typical receive-only earth station can be equipped with multiple downlinks by a simple expansion of the existing divider. Each additional divider output port costs approximately \$75.

Data Above Video: A typical video downlink is connected to Port A for pay TV service. The video downlink

¹ Cable Television ... Its Role in Commercial Data Transmission by Alan C. Maltz, Bankers Trust Co. N.Y.C. Communications News

for Multiple Use

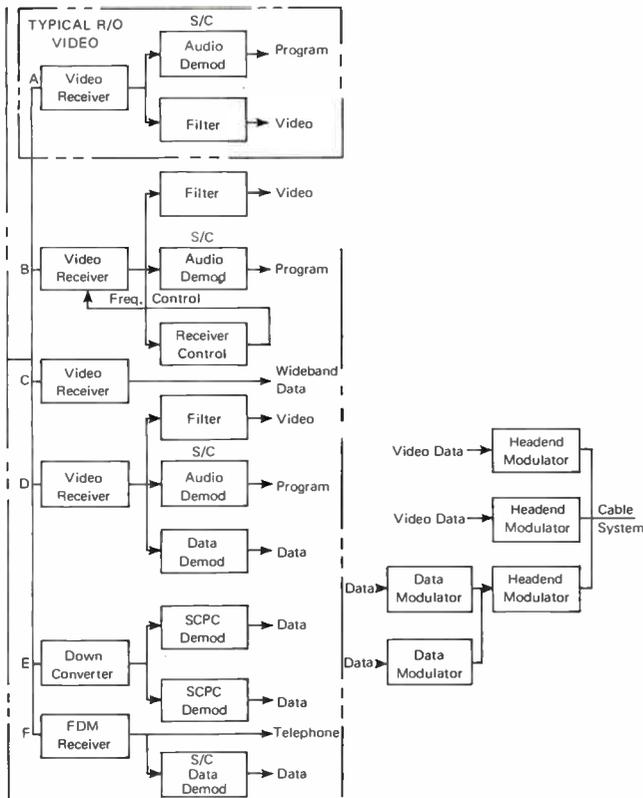


Figure 1. Configuration for Multiple Uses of CATV Earth Terminal

connected to Port D has a data modem connected at baseband. This method of data transmission is illustrated in Figure 2 and represents the least cost approach of adding a data capability to a receive-only terminal. The video baseband spectrum occupies the lower 4.2 MHz of the baseband and the audio carrier 6.6 to 7.0 MHz. The spectrum in between can be used for low speed data up to 56KB/second total with negligible effect on video parameters. Multiple data carriers can be spaced at the bit rate. As an example, three 9.6 KB/second data channels will occupy only 28.8 kHz out of the full 7 MHz baseband. The data can then be transmitted over the cable network using similar modems. The additional earth station cost is only in the data demodulator (about \$1500/channel).

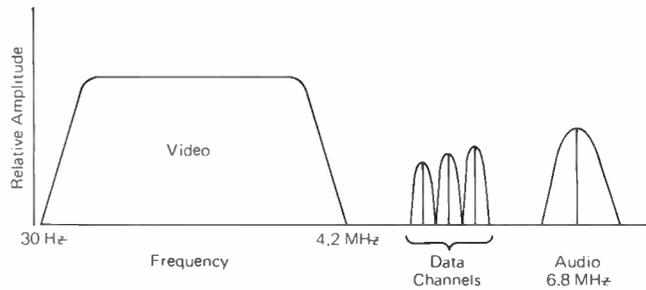


Figure 2. Video Baseband Spectrum Utilized for Data Transmission

Signal Channel per Carrier: Another method of data transmission is using a single data channel on a separate RF carrier. This method requires a broadband down converter, shown connected to Port E in Figure 1, tuneable over the satellite receive band with multiple data demodulators operating at different frequencies across the RF bandwidth. This method does not require a video baseband to transmit the data, thus, allowing the data to be originated at multiple points independent of the video carrier. The cost for implementing this system is considerably more expensive (about \$5000 for a high stability, low-noise down converter and \$2500 per data demodulator). Because of the frequency instability in the spacecraft, a pilot control system is also required.

Video Data: A video receiver, shown connected to Port C in Figure 1, can also be used to receive wideband data transmission transmitted with a video format. The data is then transmitted over the cable network using a full video channel.

Data Above Voice: The major use of domestic satellite systems is the transmission of multiplexed telephone. Most of the operational transponders on the RCA and Westar satellites are being used for this purpose. The same type of data modems used in the data over video system can be used above the multiplexed telephone baseband. This method allows for the origination of data transmission at many locations other than those originating video programming.

Receive Transponder Selection: The data-over-video mode is an ideal method of sending information used to select video receive frequencies. A receiver operating in this mode

is shown connected to Port B of Figure 1. The selection of receive frequency from a remote location allows the pay TV originator to package programming for each cable TV operator.

Radio Distribution: Satellite broadcasting provides radio networks a method of distributing high quality stereo programming at reasonable cost. Programs can be transmitted on a subcarrier on a video baseband (program over video) or as a single channel per carrier system. The radio program can be distributed to the broadcaster by using a subcarrier system on the cable system.

Private Line Video: These services include:

- Conferences between locations of large corporations.
- Sales promotion from company headquarters to field sales personnel.
- Stockholder meeting proceedings.
- Medical education and diagnosis.
- Remote video pickups.
- General education.

These types of services may be offered in the future using split transponder transmission to reduce spacecraft cost.

Duplex Services: The data services mentioned above can be expanded to duplex service by adding an uplink. The required transmit power for an 11-meter dish is less than one watt for an SCPC 4-phase 56KB/second uplink. A solid state one watt transmitter and uplink can be added for approximately \$25,000. With a two-way cable, systems data can be carried both ways from the headend.

Video transmission requires a 1.5 kw klystron amplifier and video exciter. The uplink could be operated up to 200 feet from the antenna. The cost for a total video uplink is approximately \$75,000.

SYSTEM DESIGN

Antenna Gain and System Performance Considerations:

The present domestic satellite video systems utilize a full satellite transponder bandwidth and power. The RCA Satcom F II and Westar have a 36 dBW EIRP at beam center and a 34 dBW EIRP over 85% of the continental United States. Figure 3 contains a plot of the expected receive signal-to-noise (S/N) performance and margin above FM threshold using a typical transistor amplifier with 10- to 40-foot diameter dishes. The values of S/N ratio and margin can be improved by using a lower noise amplifier.

Threshold is defined as the point where impulse noise is first observed. As can be seen by the curve, satisfactory performance can be achieved (with little or no margin) for many locations with dish sizes down to 15-foot diameter. Margin above threshold should be designed into the system for the following reasons:

- Snow and ice on the main reflector degrades the system up to 6 dB or more for some locations (if reflector de-icing is not provided).
- Satellite motion and wind loading produces a signal degradation of .7 dB with an 11-meter dish.

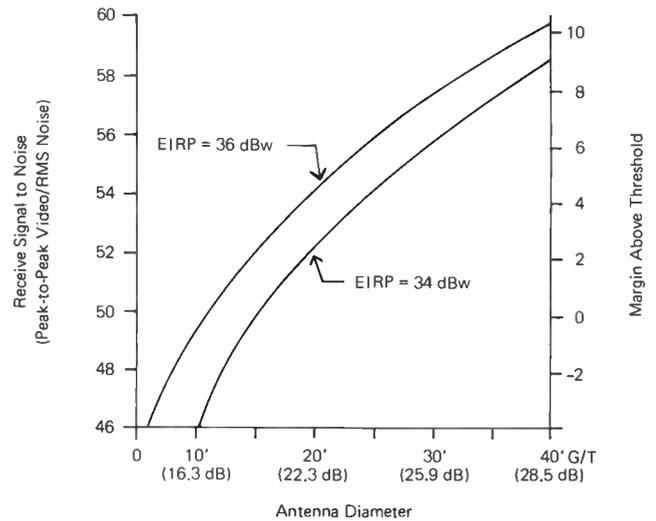


Figure 3. Signal to Noise and Margin Versus Antenna Diameter and G/T (For 210° K Receiver and 20° Elevation Angle)

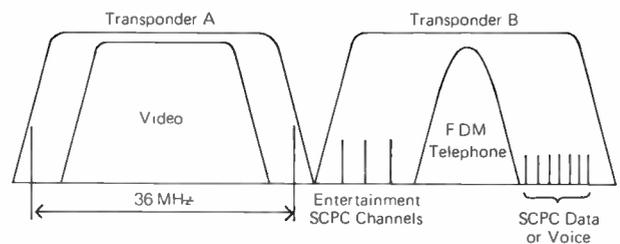


Figure 4. RF Spectrum

- Satellite degradation over its operational life is approximately 1 dB.
- Atmospheric rain or snow in the local weather environment can degrade the S/N by 0.5 dB. (This margin should be increased when using lower noise temperature receivers.)

If the signal degradation of the system that is primarily used for video approaches the threshold point, the subjective effect on the receive picture is minimal and the service is usable. If a data link is combined with the video, however, operation at threshold will result in an unacceptable error rate due to impulse noise. The satellite EIRP and the local weather conditions for the specific earth station location are paramount when specifying the antenna gain and system noise performance. Margin of approximately 3 dB plus additional allowance for snow coverage is sufficient.

Since satellites providing video distribution services operate with a fully saturated transponder as indicated in Figure 4 transponder A, there is little economic incentive to provide excessive operating margins as provided by larger antennas for this mode of operation. For other modes of

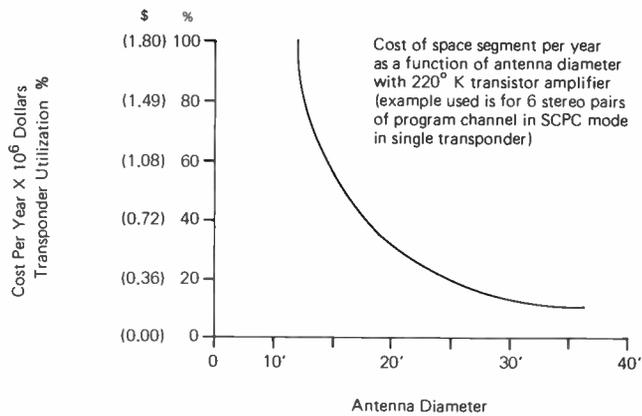


Figure 5. Cost of Space Segment

operation such as radio and SCPC data transmission which share the use of a transponder with some other service (Figure 4 transponder B), the cost of the space segment is directly proportional to the power utilized in the transmission from the satellite. As an example, Figure 5 is a plot of the yearly cost to transmit six stereo program channels versus antenna size. In this case significant cost savings for a typical system operation can be achieved with larger antenna sizes and higher G/T ratios.

If receive-only earth stations are used in a data distribution network or for a dedicated point-to-point link, higher G/T terminals will offer a distinct economic advantage.

Private line video distribution may utilize two video channels per transponder to reduce space segment cost. Typical resulting parameters will be 17 1/2 MHz bandwidth with a satellite EIRP reduction of 7 dB per channel, and carrier-to-noise reduced 4 dB per channel. Therefore, systems without 4 dB margin will not be able to participate in this service.

Interference Considerations: Since a video carrier uses the full power available from the satellite, it has the highest immunity from interfering carriers. Considering the case with satellite spacings of 3° and antennas that meet the FCC requirement (32-25 log₁₀θ dB gain above isotropic) without averaging, the interference as a function of antenna size for three different types of transmission are shown in Figure 6. Based upon a criterion of 21 dB C/I being just noticeable picture impairment, antennas with diameters down to 10 feet are usable for video service, but could be totally unacceptable for other types of transmission.

If a service is used that shares transponder power such as radio or data distribution and an adjacent satellite has video services in the same transponder, it can be seen that unacceptable carrier-to-interference ratios result for anten-

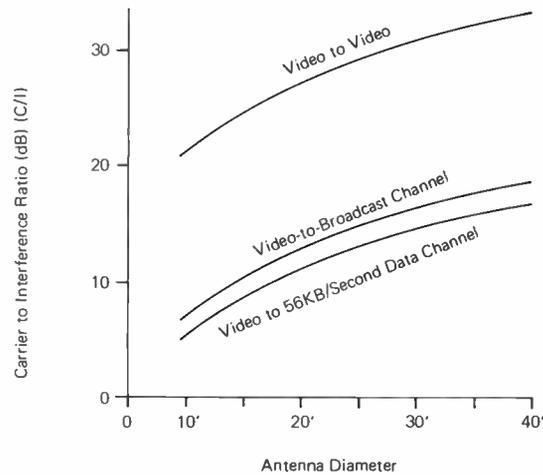


Figure 6. Carrier to Interference Ratio

na sizes less than 30 feet in diameter for a reasonable satellite operational EIRP.

For transmit services from smaller dishes, the same interference condition exists from the transmitted carriers into adjacent satellites.

The effect of interference from terrestrial sources on the earth station is also magnified by the same ratios; however, this will be different for each case depending on local weather conditions.

Several remedies can be employed to reduce this interference effect such as:

- Use frequency re-use satellite transponders with orthogonal polarization to adjacent satellites.
- Select frequencies on the edge of transponders outside the video bandwidth.

These solutions will tend to help the interference problem but not eliminate it.

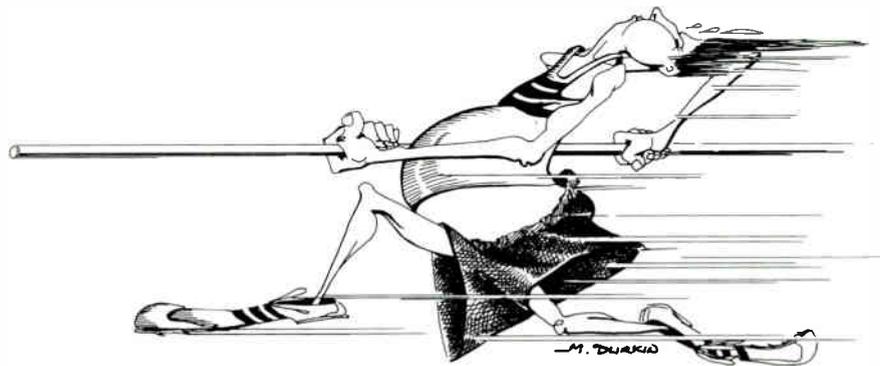
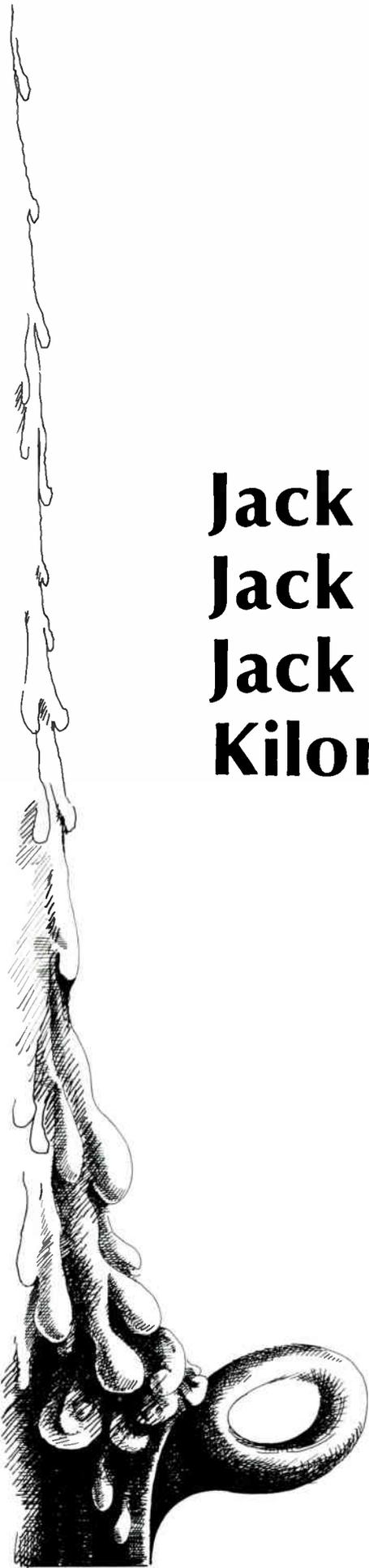
Antenna Pointing and Surface Accuracy: Operation at 4 GHz with an 11-meter dish requires a pointing accuracy with wind loading of ±0.1° (wind gusting to 45 mph) and a surface accuracy of 0.08 inches rms to result in a net operational loss of 1.0 dB. The same antenna operated at 6 GHz (domsat transmit band) would result in losses of 2.5 dB and would be unusable; i.e., losses of 7 dB at 12 GHz (future Domsat band). The additional small expense of providing an antenna with 0.04 inch rms and 0.05° pointing accuracy with wind loading would assure operational performance at 4 GHz (0.25 dB loss) 6 GHz (0.6 dB loss) and 12 GHz (2.0 dB loss). Satellite motion was not considered in the losses shown above.

CONCLUSION

The advantages of satellite communications for the distribution of pay TV are well documented and understood. The

continued on page 34

**Jack be nimble
Jack be quick
Jack jump over the 56.315
Kilometer Radius**



[It is with apologies to Brumley Prunk (April cled, **Cable Fables**) that we come up with such a limerick. All we wanted was your immediate attention to a problem that is NOT going to get any smaller (obviously), nor go away.—JUDITH BAER, editor]

The United States is the only major nation not generally using the worldwide Metric standards of measurement; there are less than a dozen other countries, ranging from very small to tiny, not yet converted. Since the 1940's, every other major nation has standardized their measurements to Metric, if this was not already their standard.

Recently, the number of U.S. firms doing business with the rest of the world has increased tremendously. These firms have had to labor, expensively, under a dual standard of measurement; the obsolete, conventional one in the U.S. and Metric elsewhere. In fact, nearly any U.S. firm currently exporting will find conversion or "Metrication" to be a documentation cost-saving, excepting the re-education of domestic plant personnel.

Training our people to use the Metric system is more a matter of constant self-practice than one of conventional "teaching." Once adequate Metric training aids are obtained then total-immersion, similar to methods used in learning a new spoken language quickly, will accomplish initial "metrication." Only practice will enable a person to feel "at home" with the Metric system. The longer we delay this inevitable process as a Nation, the more expensive it will become.

Why Metric in CATV?

Cable television is currently a small branch of the broad Communications-Electronics field, which, like most other broad scientific and engineering disciplines, has been on the road to metrication (internally) for many years. This is most evident in the context of transcripts and other formal documentation from the internationally recognized Professional Societies, such as the Institute of Electrical and Electronics Engineers (IEEE).

Domestic growth of CATV has been estimated at service to 43,000,000 subscribers by 1985. The world-wide market for U.S. CATV technology will expand greatly in the 1980's. Most suppliers and some operating companies will be forced to maintain dual measurement standards, as some do even now. Since total U.S. metrication appears inevitable, it behooves these companies to immediately begin training their personnel, in order to avoid wasteful and inefficient conversion over a shorter period of time later on. In March, President Ford signed the Metric

Conversion Bill of 1975 providing for a national program to make the international metric system predominant as a system in the U.S. The Bill does not make metrics the exclusive method of measurement but it would appear that the place of the United States in the world market does make metrics the system that should be used. And, while the law establishes the U.S. Metric Board to coordinate voluntary conversion, the law does not provide for any federal funds nor incentives to ease the cost of such changes. The costs are borne exclusively by industry, which makes it even more worthwhile to DO IT NOW instead of later.

Since some CATV operating companies will most likely become multi-national, and since our engineering discipline is becoming more professional and more widely recognized, both academically and professionally, we can enhance our leadership position by adopting this means to improve our dialogue worldwide; namely, metrication.

A Definition of Metrics

Webster's New Twentieth Century Dictionary, Unabridged, Second Edition provides us with a definition of *metric system*: a decimal system of weights and measures in which the gram (.0022046 pound), the meter (39.37 inches), and the liter (61.025 cubic inches) are the basic units of weight, length, and capacity, respectively: most names for the various other units are formed by the addition of the following prefixes:

deca- or *deka-* (ten), as, 1 decameter = 10 meters

hecto- (one hundred), as, 1 hectometer = 100 meters

kilo- (one thousand), as, 1 kilometer = 1,000 meters

deci- (one tenth), as, 1 decimeter = 1/10 meter

centi- (one hundredth), as, 1 centimeter = 1/100 meter

milli- (one thousandth), as, 1 millimeter = 1/1000 meter

Other prefixes sometimes are used, such as *myria-* (ten thousand), *mega-* (one million), and *micro-* (one millionth). *Mega-*, *Micro-*, and *Kilo-* should be quite familiar to anyone within the disciplines of communications engineering. There also is the standard *Metric thread* which is a type of screw thread recognized in 1898 as standard for machinery. It is on the metric system, but is otherwise similar to the American standard.

It should not prove surprising that the word *metric* is derived from both Latin (*metricus*) and Greek (*metrikos*) and pertains to measure, from *metron*, measure.

Metrics Is Not New

During the 16th century, people were quite confused with various units of weights and measures and it was during that period that the decimal system was conceived. In 1790, the French National Assembly requested that the French Academy of Sciences produce a system of units that would be suitable for adoption by the entire world. I have not been able to determine why the French decided to take the initiative other than to reason that their position in world trade at that time was one of great importance.

The system adopted was based on the meter as a unit of length and the gram as a unit of mass and it seemed that things would be just fine if everyone agreed to use it, world-wide. The measure was deemed practical and beneficial to both industry and commerce and scientists; particularly physicists soon realized its advantages. So, the scientists of the world adopted it in scientific and technical circles.

Where Was the United States?

America was not asleep during this time, but we were rather busy exercising our independence. Weights and measures were recognized in Article 1, Section 8, of the United States Constitution in 1787, but the metric system was not legalized in the United States until 1866. Presumably, things had started to quiet down on the independence front, but it would appear that it was already too late. Americans have a way of doing things, and even though the international meter and kilogram became the fundamental standards of length and mass in the United States, both for customary weights and measures, in 1893, we still commonly used feet, yards, inches, pounds, etc., etc., etc.

There is a group known as the General Conference on Weights and Measures (CGPM) that meets every six years in Paris and controls the International Bureau of Weights and Measures, which preserves the metric standards, compares national standards with them, and conducts research to establish new standards. The United States is represented by the National Bureau of Standards in these activities. CGPM started off from a meeting of 15 countries in 1870 that led to a meeting in 1875 called the International Metric Convention and the establishment of the permanent International Bureau of Weights and Measures.

Around 1900 things began to change and practical measurements in metric units began to be based on the meter-kilogram-second (MKS) system. In 1935, the International Electrotechnical Commission approved a proposal recommending that the MKS system of mechanics be linked with the electro magnetic system of units by adoption of one of the units—ampere, coulomb, ohm, or volt, for a fourth base unit. Ultimately, the ampere, the unit of electric current was selected as a base unit, and thus was

developed the MKSA system. (If that seems difficult, just go back to meter-kilogram-second and add ampere.)

Just about the time they were going to adopt another initial at the end of MKSA making it totally impossible to pronounce, the 10th CGPM (in 1954) adopted a "rationalized and coherent system of units based on the four MKSA units, plus the degree Kelvin as the unit of temperature, and the candela as the unit of luminous intensity." What would we have done with MKSAKC? Lo' and behold—the 11th CGPM held in 1960 formally adopted a new full title, International System of Units, which is abbreviated "SI" in all languages. Do not call it ISU, that's not right! We don't know why because we're not from Europe, but we presume that with a continental accent it might become "System International" or some such phrase.

No one has been able to explain exactly why the United States, which has been at every conference, and was certainly at the 1960 meeting, has not told us before about this mystery that the rest of the world has not kept to itself and we have not participated in. Thirty-six countries were in Paris for the 1960 get-together. They met 4 years later for the 12th Conference and made more refinements, and then met in 1967 and made more refinements. It probably was about that time that we started to suspicion that as a country, the United States should fall into step with the rest of the world. Especially since the last two meetings added more refinements, renamed Kelvin, added a seventh base unit, the mole, and approved the pascal (Pa) as a special name for the SI unit of pressure or stress, the newton per square meter, and the siemens (S) as a special name for the reciprocal ohm or the ampere per volt unit of electric conductance. They changed and added more in the last two meetings than the previous 93 years had produced all together.

It Is Better

It is stated that SI has great advantages. It would appear that whether it has advantages or not, America had best get

continued on page 34

COMMUNICATIONS ENGINEERING SERVICES, publisher of *cled*, has introduced a book titled **Metrication for Cable Television**. The book includes a history of the development of the International System of Units (SI), complete lists of the metric units and extensive tables of equivalents covering such items as inch-millimeter equivalents; wrench-span equivalents; cable diameter equivalents; fractions and decimal equivalents and lists of the most common metric conversions, U.S. to metric and metric to U.S. The book includes instructions for conversion, a list of metric conversion factors and metrication aids. **Metrication for Cable Television** is available for \$6.95 a copy from Communications/Engineering Services, P.O. Box 2665, Arlington, VA 22202.

cable television: promise vs. regulatory performance

"It is no wonder that so few people in Washington are excited about cable, when the industry doesn't seem very excited about itself."

which it had a year ago. It was outlobbied at the White House by the broadcasters and was out-argued overall during the recent hearings by the broadcasters. The broadcasters have many compelling arguments, and they have been making them in compelling fashion. No convincing effort has been made by the cable industry. Perhaps, this is because there are internal divisions within the industry, or perhaps it is because the industry is capable of fighting only one battle at a time and has been preoccupied with the copyright issues. Or possibly it is because the industry has already reached its potential and is about to be left behind by even more exciting technologies such as videodiscs.

Whatever the reason, the end result is apparent. Cable's opportunity to add significantly to the communications system which Chairman Van Deerlin spoke of is slipping away because the industry, as a whole, has become complacent in the U.S. and has lost its sense of commitment.

One problem which I suspect your industry shares with its counterpart in the U.S. is a failure to broaden your constituency. Cable, as a technology, is capable of providing a range of new and exciting services as we saw during our recent hearings. We heard of cable providing health care to prisoners in Dade County, Florida; of cable bringing health services to children in East Harlem; of cable serving the special needs of senior citizens in Reading, Pennsylvania; and of cable turning private homes into day care centers in Spartenburg, South Carolina. Yet, all of these programs are being underwritten by government or foundation funds—and the interest of cable, as an industry, in seeing them develop or continue is virtually non-existent. No, say most small cable system operators, give us our distant signals and our copyright exemption. No, say most big MSO's, give us our sports and movies and let us alone.

This is not intended, nor should it be taken, as an indictment of every cable operator. A few are doing a remarkable and responsible job despite almost impossible regulatory burdens—**but too few.**

The point is that the cable industry is not making its own best case for deregulation. There are few legislators or regulators in Washington who feel that deregulating cable will make much difference in terms of service to the public.

That is why the separations principle and common carrier status for cable look like an appealing alternative to the present regulatory posture. At least under those conditions, the public might be able to reap some benefits from this amazing technology.

There are technological alternatives to cable—translator stations, direct broadcast satellites, and eventually videodiscs. Maybe the pendulum is already swinging in those directions and away from cable. If so, it is due in part to

"Government should stand aside and leave this determination to the marketplace. Your industry should demand nothing less."

regulatory mistakes, but in even larger part to the continuing inability of the cable industry to live up to the promise and potential of the technology.

It is no wonder that so few people in Washington are excited about cable, when the industry doesn't seem very excited about itself.

By comparison, the cable industry here in Canada has some significant advantages. Cable is more of a factor in the Communications system here than in the United States. Cities, such as Toronto, are substantially wired already, and thus you have a base to build on which your colleagues in the U.S. may never achieve. However, I suggest to you that as long as cable here remains basically a conduit for broadcast programming, you will find yourself ultimately facing many of the same regulatory dilemmas.

"The point is that the cable industry is not making its own best case for deregulation."

I urge you not to lose sight of cable's potential for providing a broadband highway into the home. If cable becomes an attractive service with the ability to stand on its own merit, the public will demand that service. Government should stand aside and leave this determination to the marketplace. Your industry should demand nothing less.

canadian column continued

generation of 12 GHz broadcasting satellites, the cost of a rooftop receive-only ground station would go much below the range of \$500 to \$1000. What we are looking at therefore is equipment that would be inexpensive for cable television operators and enhance greatly the service that operators in remote areas can provide, at the same time providing inexpensive additions to the offerings of more urban systems. The price however is likely to be sufficient to deter the purchase of ground station equipment by non-cable TV subscribers in urban areas, merely to receive an additional channel or so. Conversely for people in very sparsely populated areas which are uneconomic to wire under any circumstances, and which are not served by conventional off-air broadcasters, the broadcast satellite will now provide a way, albeit at a premium, of receiving good quality television.

In summary therefore, certainly for the first generation of broadcast satellites, the 12 GHz band being developed by the CTS experimental satellite is likely to prove a major advantage to cable television operators. In addition to the obvious use to be made of it, a major spinoff advantage will be that it will enable them to consolidate their market prior to the second and third generation broadcast satellites which are likely to make true home owner roof-top satellite ground stations viable. By that time, hopefully the vast majority of potential subscribers will be actual subscribers, and providing the viewpower quality high, there will be little incentive for them to set up their own roof-top stations.

It can be truly said therefore, that the latest Canadian-U.S. joint venture, the CTS satellite is really building in the future for our industry, and given the right sort of approach by us can pay major dividends in the future.

catv video earth stations for multiple use

extension of these advantages to other types of services thereby increasing revenues to the earth station owner can be assured if some minimal planning is done in the initial design of the earth station. There are many obstacles to overcome with regard to regulatory aspects of using pay TV earth terminals for other services; however, the combination of a high quality earth station with an excess cable capacity distribution network makes this possibility difficult to ignore. This combination must seriously be considered by the specialized common carriers to complement the distribution systems now being installed.

CCTA 19th annual convention

Saying that the show was enjoyable just because it was not what might be called one of the "killer" shows in the U.S. is not telling the entire story. Being honest, it is nice to be a guest and it is nice to receive the consideration of members of the Board of Directors and the staff of CCTA. The CCTA convention hosted approximately 1,900 people, about the size of the Western Cable Television Convention held in the states. The programming was just as full as the programming at the NCTA event in Dallas, and on a percentage basis, the attendance was better throughout every session at CCTA. The programming was well thought out and everyone took something home that could be used. Management was addressed and that was refreshing. There is little programming during U.S. shows that teaches management how to do their jobs better. It was NOT the same old papers being presented, nor was it the same old topics being addressed. Again, the Canadians are to be congratulated on the success of the Nineteenth Annual Convention and Trade Show. Those from the U.S. should think seriously about attending the 1977 event to be held in Calgary.

converting to the metric system

into step with the balance of the world when it comes to measures. SI provides one and only one unit for each physical quantity. From such elemental units as meter for length or kilogram for mass, units for all other mechanical quantities are derived. The derived units are merely simple equations. There are some units with only generic names such as meter per second for velocity. Others have special names such as joule (J) for work or energy, or watt (W) for power. SI symbols when properly used eliminate confusion that might arise from current practices in different disciplines. But, probably the best part of SI is its retention of the decimal relation between multiples and submultiples of the base units. SI conforms to the system of Arabic numerals.

Indeed, if the broadband/cable television industry continues to grow world-wide, we've got to become acquainted with the metric system, and we should learn to know it well. Satellites are bringing us closer together all the time. Communications are with neighbors thousands of miles away each day. We're reaching over borders—we're buying and selling in an international market. We should take the time now to learn the language.

wrap up

Phil Lind, Vice Pres., Programming, Rogers Cable TV Ltd. has been elected Chairman of Canadian Cable Television Association. The EEO Committee for NCTA includes Chairman, J. Richard Munro, Time Life; J. Cantor, Warner Cable; C. Blanco, Jr., UA-Columbia; S. Cooper, Cohen & Marks; S. Kaitz, California Community Television Association; M. Kleinhandler, Suburban Cablevision; D. Shuler, Viacom of Dayton; D. Anderson, HBO; D. Aaron, Comcast; Charlotte Schiff Jones, Manhattan Cable Television; A. Sculthorpe, TelePrompTer and Dr. W. Douglas, Gary Communications Group. NCTA Staff K. Hilton and R. Johnson will serve as NCTA committee liaison. C-COR has new product information on Model TS-60 Transient Suppressor ready for distribution. Jerrold says new edition of Signals is available and free for the asking. The Arizona Cable Television Association will host the Honorable John J. Rhodes, Representative from Arizona's 1st congressional district and Minority Leader of the U.S. House of Representatives as featured speaker during the Western Cable Television Show and Convention, December 1-4 in Anaheim, CA. Rhodes will speak on Friday, Dec. 3 as luncheon feature. George J. Panek, previously manager-engineering for ITT Cannon Electric has been named manager-marketing of this Phoenix based manufacturing firm. New Jersey Governor Brendan Byrne opened the first domestic satellite receiving terminal built in that state, May 27. The facility is located in Manahawkin, NJ and is owned by Cable Haven TV. The May 1976 issue of Videography has Irving Kahn speaking his mind in interview format with the magazine. E. Thayer Bigelow, Executive Vice President of Manhattan Cable Television has been appointed President of Manhattan Cable a subsidiary of Time Inc. Charlotte Schiff Jones, a vice president of Manhattan Cable was elected



Executive Vice President and a member of the board of Manhattan Cable. Home Box Office name Gerald M. Levin, president of HBO since March 1973, as its chairman and N.J. Nicholas Jr., who has been president of Manhattan Cable as president of HBO. Levin will continue as chief executive officer of HBO, Time Inc.'s pay television subsidiary. GE Cablevision chose Theta-Com to provide electronic equipment for a new Grand Rapids, MI system. Comcast will use Theta-Com equipment for major extensions in the firm's CATV systems in the Flint, MI area. Rollins Cablevue, parent company of Community Television Systems serving Wallingford, North Haven, Guilford and Madison, CT initiated HBO programming by satellite May 18. Richard Hubbell is manager of the Wallingford CTS system. Harris Corp. authorized \$3¼ million for expansion of the company's Broad-

Pictured (left-to-right) at a formal announcement of Viacom's decision to use Jerrold's DST-1C converter/descramblers for pay-TV are: Al Micheli, western regional manager for Jerrold's CATV Systems Division; John Goddard, president of Televue Systems; Doug Dittrick, president of Viacom Communications; Bob Eisenhardt, president of Jerrold Electronics; and John Sie, general manager of Jerrold's Terminal Products Division.

cast Products Division located in Quincy, IL. Gene T. Whicker, vice pres.-general manager of the division says the expansion will add about 85,000 feet of additional space, an increase of about 30 percent. Staff changes at NCTA include Bob Johnson, formerly press aide to Walter E. Fauntroy, District of Columbia Delegate to the U.S. House of Representatives appointed as Vice President for Subscription Cablecasting as of June 7. Three leave NCTA staff on July 1: Josh Lanier, John Kenny and Frances

Pollak. Pollak will join *Communications/Engineering Services* as Vice President of Business Development, Kenny goes to railroad industry and Lanier joins *Communications Publishing Corp.* NCTA pres. Robert Schmidt was profiled in *Broadcasting* magazine during June and became father of fourth child, a girl, born June 11. *Community Antenna Television Association* (CATA) activities continue in copyright battle; Gridley, KS fight with courts and planning for August CCOS event in Oklahoma. Regarding Taxation of Revenue from Trade Shows, Wally Briscoe reported to Associates of NCTA that the Senate Finance Committee unanimously approved amendment exempting revenue from convention trade shows from the category of "unrelated revenue" thereby closing question of affiliation of exhibitors/associates with trade association. Briscoe thanked those who responded quickly and effectively to his earlier memo, and expressed thanks to the NCTA Associates Committee for their support. Comments on May 1976 Opinion/Editorial on Raisin Toast and Standards in CIED ranged from "get an electric toaster oven" to "you sure have a strange way of delivering messages." Included in the remarks and observations received was a loaf of unsliced raisin bread all the way from California. Thank you Jim Hurd of Farinon. The Arizona Cable Television Association has suggested that the FCC immediately institute a moratorium on regulation of cable television's basic subscriber rates. ACTA filed to the inquiry on Docket 20767. NCTA called for legislative action on cable television in the remarks of Pres. Schmidt, May 20 before the Subcommittee on Communications, Committee on Interstate and Foreign Commerce. The Convention Technical Program Transcripts from the Canadian show are available from CCTA. David Kinley, ex-Chief of FCC Cable Television Bureau started with ATC in Denver on June 7 as vice president-planning and development. Commissioner Charlotte Reid left FCC on July 1 making two vacancies, Glenn Robinson and Reid. Arthur and

Robert Baum, pioneers of Vikoa, announced formation of *CableEquities Corp.* for services of system brokerage and management. Robert Baum says "we have the capability of purchasing new cable franchises and financing systems or we will finance and manage existing systems." They will be located in New Jersey and Florida. *Cable Television: Strategy for Penetrating Key Urban Markets* is available from University of Michigan. Text will be reviewed in August CIED. *Jerrold Electronics Corporation* has announced the following contracts: 40,000 set converters for *Suburban Cablevision* of Essex, NJ; 15,000 set converters for *Oceanic Cablevision*, Honolulu, Hawaii; a turnkey contract for Clinton, SC, *Clinton Cablevision*; 5,000 DST-1 descramblers for *Times Mirror* system in Riverhead, NY; a *Commander III Head-end* for Valley Cottage, NY *Cable Information Systems* property; 160 miles of construction for Cleveland, TX system owned by *Southeast Cable*; a turnkey for *Tower Communications*, Newark, OH; another turnkey for *Delaware County Cable TV* (Telesystems Corp.) and finally—8,000 DST-1C converter/descramblers for *Viacom/Televue* in the East Bay System in Northern California. Wrapping things up, the *California Community Television Association* elected Ted W. Hughett as president of the association. Hughett is president of *Monterey Peninsula TV Cable*, Monterey, CA.

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critique/letters

Dear Bob:

I was very interested in your "SCTE Comments" in the May issue of *Communications/Engineering Digest*.

I certainly agree with you that local origination is vitally important to the continued development of cable television both in terms of community service and profitability.

I do want to point out, however, that Anixter-Pruzan didn't ignore local origination at the NCTA Convention in Dallas. Our entire convention booth was built around a demonstration of Sony video equipment and, in fact, our sales of Sony local origination products at the Show alone were substantial.

We taped the golf tournament (in the rain) using a Sony color portable unit and showed the convention participants just how they did with the VTRs and monitors installed in our booth.

So, even though many of the manufacturers and other suppliers have not stayed active in the CATV origination picture, we are very much there with the full Sony line, all other studio requirements, and a sales force that's suggesting local origination opportunities to systems all over the country.

Yours very truly
ANIXTER-PRUZAN, INC.
Gordon Halverson
CATV Marketing Manager

Obviously your approach is wrong, and you **should** be regulated!

You should **not** use a pop-up toaster for raisin bread. Since it should, as everyone knows, be buttered before toasting, only an oven type toaster should be used.

That should solve your problem.

Sincerely,
Wally Briscoe
Senior Vice President
for Association Affairs
NCTA

Editor:

I have read this article and do **not** agree with the conclusion that Local Program Origination (L.O.) provides a unique element of longevity in our cable TV lives.

The prospect of Local Program Origination on Cable, providing a local TV station on all substantial size cable systems scared the shirts off of the TV station owners. However, after some period of sober consideration of the comparative number of potential viewers, the cost of producing competitive programming and the availability of commercial advertising support most TV station owners set aside their sleeping pills and relaxed. The prospect of being forced to provide L.O. has scared many knowledgeable cable operators and they still use their sleeping pills.

Local program origination must be done professionally in order to compete successfully with commercial TV programming, is very expensive and requires a very substantial amount of local commercial advertising support. The value of the commercial impact for radio, television and cable L.O. is measured on a cost per thousand scale. (listeners or viewers) Realistically only the larger cable systems can be successful.

Short of the large L.O. operations L.O. is like a home movie, interesting and sometimes productive but not a matter of longevity for cable TV.

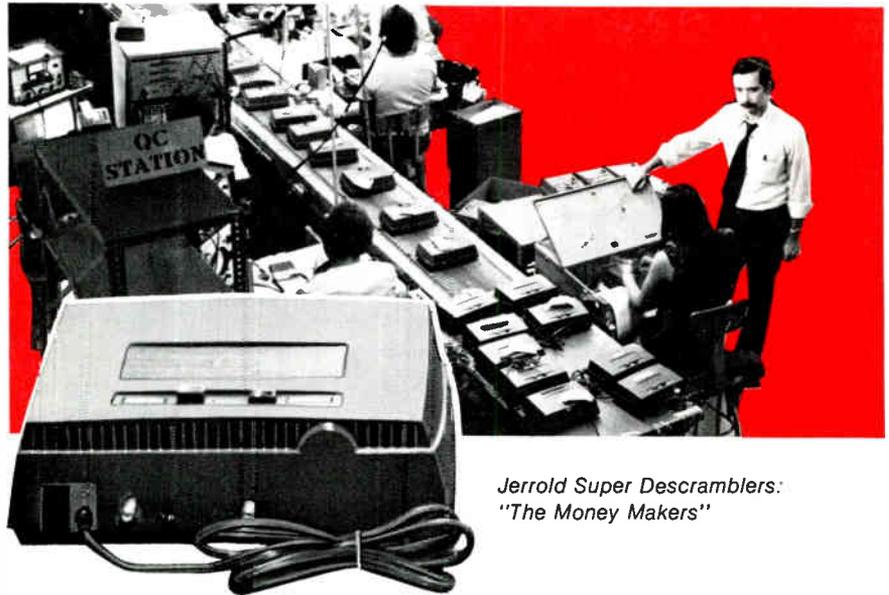
Yes, I have seen L.O. and it is like a UHF television station without a network in a small market.

I compliment you on your Opinion/Editorial about raisin toast. It was artfully done and perhaps it will "prick the mental attitudes (slightly revised) of the Committees and the Sub-Committees", and may result in some sound practical observations.

Personally, I go for the Cheese on the English Muffin, but it will not fit into the toaster. Perhaps this should be reported to the sub-committee.

E. H. Clark

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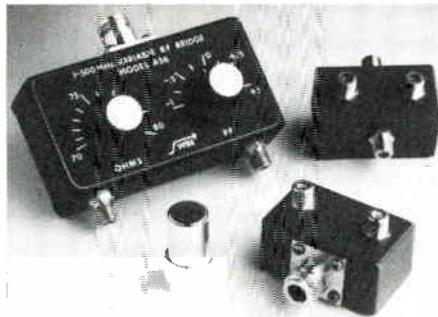
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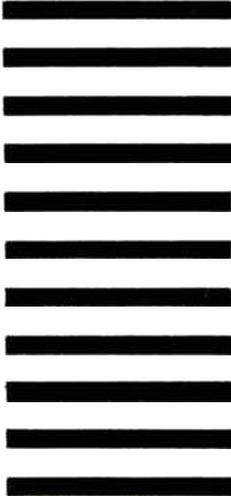
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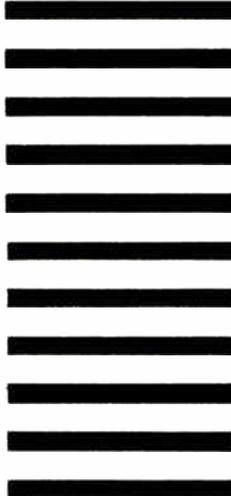
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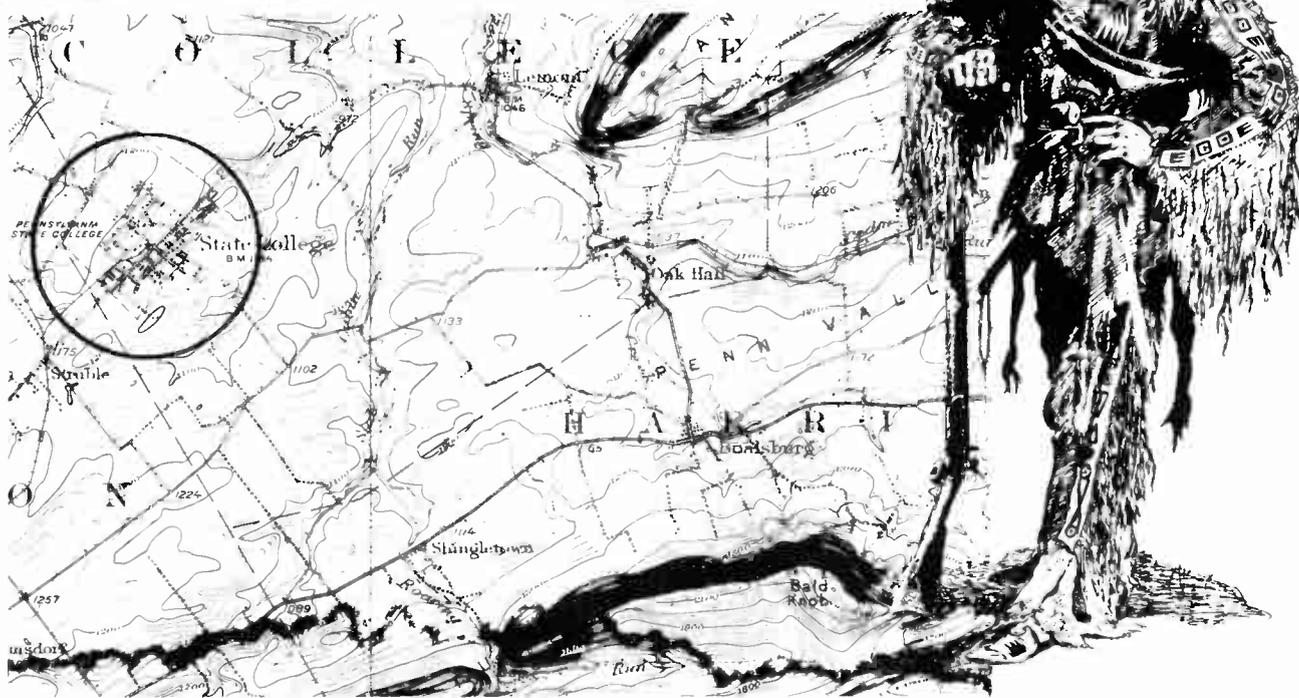
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