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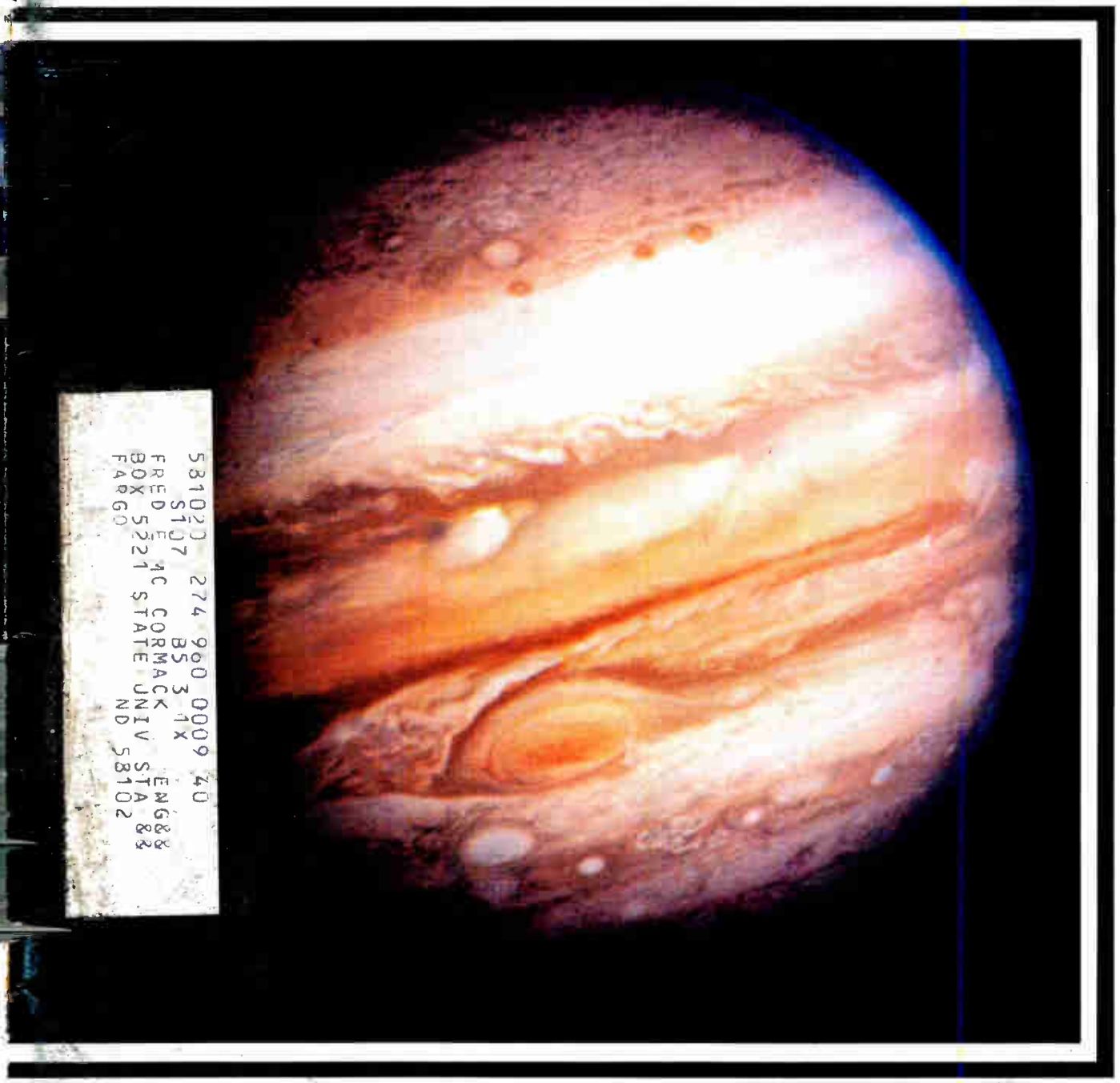

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Reporting the Technologies of Broadband Engineering

September 1979
Volume 5, No. 9

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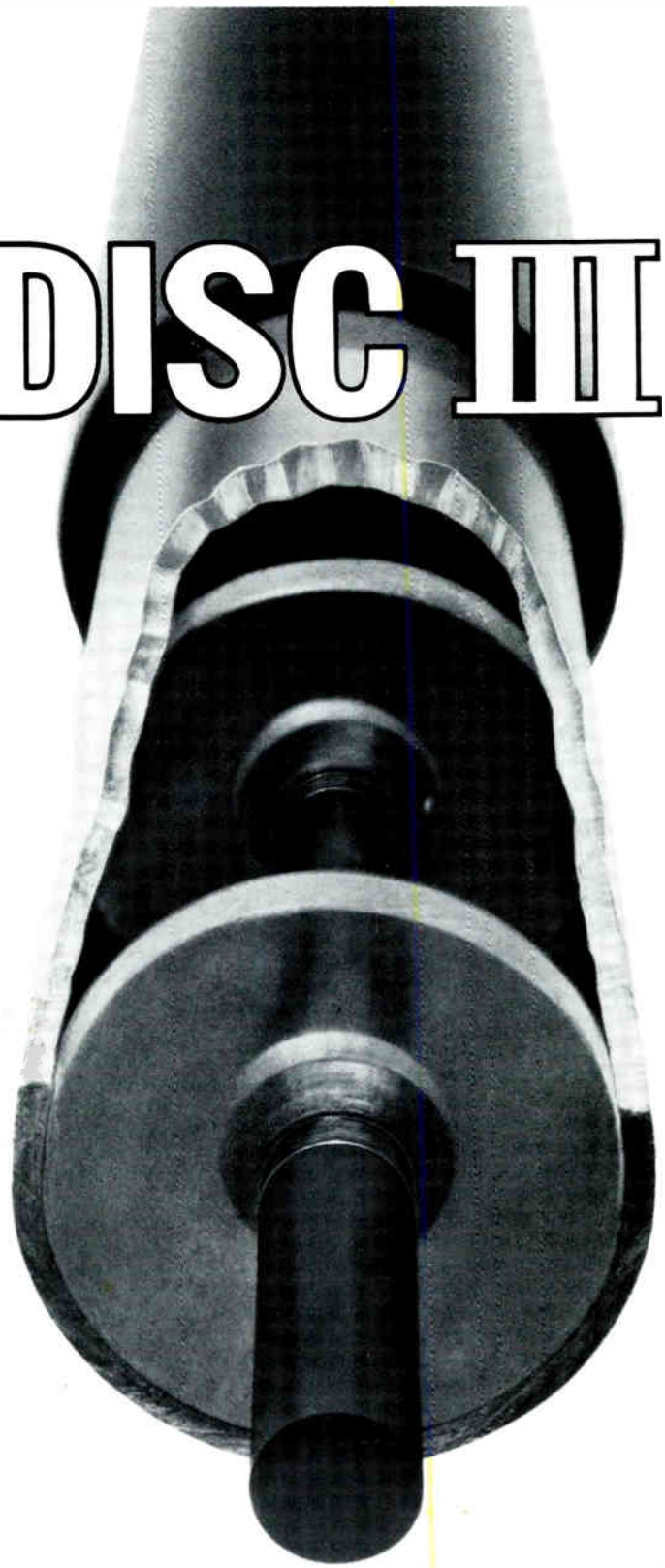

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C-ED News at a Glance

OKLAHOMA CITY, OKLAHOMA—**Bob Cooper,** the former editor-in-chief of *CATJ*, **recently found himself in court "telling it to the judge."** Attorneys for the **Common Carrier Association for Telecommunications (CCAT) and Movie Systems Inc. sought an injunction** in Federal District Court seeking **to block Cooper's Satellite Private Terminal Seminar** August 14-16. CCAT is the national trade association for MDS operators. Movie Systems leases time from the Oklahoma City MDS station to transmit pay programming. They **charged that Cooper would be disseminating information which would facilitate theft of service** in violation of Federal and state statutes, as well as infringe upon the Copyright Act. Only days before the seminar was scheduled to begin, Cooper defended himself against the charges and **the judge agreed to let the seminar be held as scheduled,** only after Cooper promised to cooperate in not divulging the type of information about which the plantiffs were concerned. **Cooper is not out of it yet,** however, since the judge left the case open and **petitions have now been filed** with the Federal Communications Commission **that Cooper's own developmental earth station license** (the subject of a controversial *TV Guide* article last year) **not be renewed** and that a show cause, cease and desist order be issued against him. The lengths to which the case is being taken is evidence of how serious concern is about the potential theft of premium service, according to one attorney for the plantiffs.

WASHINGTON, D.C.—Interest in **direct satellite-to-home delivery of pay-TV** has been generated further by the confirmation that **Comsat** has been **discussing** the possibility of **getting into the business** with several hardware and programming concerns. Comsat currently derives most of its revenues from common carriers which lease capacity on its Intelsat and Marisat systems. A subsidiary, Comsat General, leases capacity on its Comstar system to AT&T for domestic communications, and is a participant in Satellite Business Systems, a partnership formed by IBM and Aetna Life and Casualty. "The technology for such a system already exists, and we are investigating the business potential for satellite-to-home TV service," reported Dr. Joseph Charyk, president and chief operating officer of Comsat. He noted that **the new service could be introduced as early as 1983. Reaction** to Comsat's plans have **centered around the upcoming WARC,** which could see the current number of channels allocated for direct-to-home use, six, altered; and also, the technical difficulties presently inherent in serving the highly congested urban areas. (See page 37 for more input).

WASHINGTON, D.C.—National Cable Television Association President **Tom Wheeler** has **named Kathryn Hilton Creech and Robert W. Ross senior vice presidents** with responsibility for day-to-day management **of the association.** (See page 10.)

Creech has been with NCTA since 1972. She will have overall responsibility for NCTA's operator services, engineering and research, as well as overseeing the comptroller's office and convention planning staff.

Ross, who has represented Southern Pacific Communications Company since 1977, will direct the government relations, legal and public affairs departments. He is a former general counsel of the Office of Telecommunications Policy and was at one time with the FCC in the Broadcast Bureau and General Counsel's Office.

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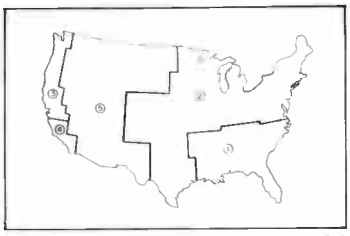
Inside C-ED



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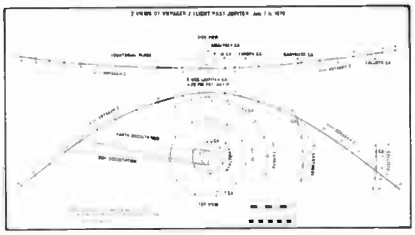

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Cover: This photograph of Jupiter, taken by Voyager I, is representative of the pictures seen by cable audiences on Satcom I, transponder 10. Slide courtesy of NASA.

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Editor's Letter

September will be a very important and active month for cable and satellite technology. On September 24, the World Administration Radio Conference (WARC) will convene in Geneva, Switzerland. During the subsequent ten-week period, delegates from 154 member nations will make decisions that will affect the use of the radio spectrum worldwide for the next 20 years. Some of the issues to be decided at WARC include: frequency increase for international shortwave broadcasting allocations, increase in allocations in the UHF band for land mobile services, and international computer-related data transmissions. Also to be decided at the conference is the highly politicized direct broadcast satellite issue.

Beginning on page 49 is a feature called "WARC '79: a Primer." This piece details the history of WARC and U.S. preparations for that conference. We think the article will provide some good insight on the conference.

In the past few weeks, the cable industry learned of Comsat's intent to initiate direct to home satellite broadcasts. The frequency allocations for this new service will be decided at WARC. Although Comsat's plan is still on the drawing board, we have asked several cable-related industry leaders for their reaction to Comsat's announcement. We believe that this piece, beginning on page 37, will be informative and useful.

Paul A. FitzPatrick

"Now I can reach population pockets without emptying my own."

"Loleta had 195 potential subscribers, Hydesville, 190. That's plenty if you can reach them economically." And that's exactly what Sam Shults, President of Redwood Cable Vision of Fortuna, California did. He serves several small communities profitably with a Hughes AML microwave system feeding 50¾ miles of aerial distribution.

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Satisfaction Is:

By Michael J. Gardner
Region 3 Director
Cox Cable of Oklahoma City

Satisfaction, as defined by Websters is: To gratify fully, to be content, to be free from doubt.

Satisfaction, as defined in cable terms is:

- A 1 dB peak to valley, twenty amplifiers in cascade, after you've worked two sleepless nights to get them there;
- Doing an installation so neatly, it's almost invisible to the subscriber;
- No non-pay disconnects due to a paper flow problem in your department; and
- Hearing a sincere "thanks" from a subscriber after you've just repaired that midnight outage.

Satisfaction is in many ways synonymous with pride in yourself and your job. Those few items mentioned above barely scratch the surface of things that separate a professional from someone simply going through the motions. An attitude of accomplishing just enough to get by seems to prevail when individuals are not presented with a proper challenge.

These challenges, presented in whatever form, must be accompanied by someone willing to help make them an attainable goal. This help must come from every one of us who've chosen cable as our profession. As our knowledge increases, so does the responsibility to pass that knowledge on to others.

An interesting theory I've run across in my travels is the notion that "Knowledge is job security; if too many people know my job, where would I be?" It's this type of attitude that's contributed greatly to the lack of qualified people in our industry.

In order to grow, we must all be educators. There's no greater satisfaction than having a trainee grasp the lessons you're trying to get across and be stimulated only if they're assured they'll get answers to their questions. The satisfaction they derive from the learning experience will be invaluable towards making them a good employee.

Michael J. Gardner

The rapidly changing technologies of today make training a two-fold process: first, and perhaps foremost, is continuing self-education—not being satisfied with your present level of knowledge. You cannot expect to teach material that you don't understand in the search for new knowledge. No one person knows everything.

The second step in effective training is making new materials available and easy to comprehend. Many training programs have faltered in the early stages because the material was just too hard for the trainee to grasp. (That unattainable goal.)

A comprehensive training program, to be truly effective, must be carried out religiously. It simply cannot be a function of whatever spare time is available today or tomorrow.

The training program must have a purpose, and it must present enough of a challenge to each person involved. The program must also be flexible enough to permit each trainee to progress at their own rate according to their abilities.

It's most satisfying to see a new dedication to training at all levels in large and small companies alike.

The Society of Cable Television Engineers has made great strides forward in educating companies and personnel and it will continue to do so; but remember, the SCTE is us. We must all be willing to put forth that extra effort needed to provide the industry with enough competent and qualified people in the years to come.

CATV and Fiberoptics is Topic of SCTE Fall Conference

MONTEREY, CALIFORNIA—The Society of Cable Television Engineers will host a Fall Engineering Conference on Emerging Technologies on November 7-8, 1979 at the Doubletree Inn in Monterey, California. The 1979 meeting will explore fiberoptics and its impact on cable television/broadband communications.

The program will be presented in three segments beginning on Wednesday morning, November 7. SCTE President Harold Null of Storer Cable TV will introduce 14 industry engineers who will discuss their decisions regarding this new technology. Participants will include Frank Baxter, GE Cablevision; Frank Bias, Viacom Communications; Robert Bilodeau, Suburban Cablevision; Hugh Bramble, UA-Columbia Cablevision; Edward Callahan, Jr., ATC; Henry Cicconi, Sammons Communications; Caywood Cooley, Milton J. Shapp CATV; Nick Hamilton-Pearcy, Cablesystems Engineering, Ltd.; Richard Hickman, MetroVision, Inc.; Richard Schneider, United Cable TV; Ronald Simon, Teleprompter; James Stilwell, CPI; Robert Sturm, Cablecom General.

Well-known writer and publisher Paul Kagan of Paul Kagan and Associates will be the featured luncheon speaker on Wednesday's program. Wednesday afternoon will include the second segment, moderated by SCTE Executive Vice President Judith Baer. This segment will feature a discussion on how fiberoptics interfaces with the billion dollar hardware investment already made by cable operators. Companies participating include AEL, Blonder-Tongue, Burnup and Sims, C-COR, Delta-Benco-Cascade, Gilbert Engineering, Jerrold Electronics, LRC, MCE Corp., Motorola, RCA Cablevision, RMS, Scientific-Atlanta, Sylvania CATV, Theta-Com and TOCOM.

The third segment begins Thursday morning and is devoted exclusively to answering the questions brought out during the first two portions of the conference.

Invited participating companies include Northern Telecom of Canada, Siecor Optical Cables, Times Fiber Communications, General Cable, Cerro Communication Products, Valtec Corp., Spectronics, Systems Wire and Cable, ITT, Harris Corp., Hitachi, Canstar and Belden Corp.

Registration fees are $135.00 for SCTE members; $175.00 for non-members. Fees include admittance to the program, one lunch, one breakfast and a reception. For more information, contact SCTE, 1100 17th Street NW, Washington, D.C. 20036, (202) 659-2131.

Manpower Development Is Topic of SCTE Meeting

WASHINGTON, D.C.—The SCTE will host its sixth 1979 seminar on September 17-18 at the Marriott Twin Bridges Hotel at National Airport in Washington, D.C. The meeting will center on Manpower Development. Topics to be covered include *Making the Most of Available Manpower; Developing New Manpower Resources; Employee Motivation; Personnel Evaluation; Recruiting; Stress Management; Personal Leadership; Developing In-House Training Programs; Effective Communication;* and, *Management By Objectives.*

Invited panelists and participating organizations include the American Society for Engineering Education, Engineers Joint Council, University of Alabama, University of Wisconsin-Platteville, American Society for Training and Development, Pace Resources Institute, Society of Broadcast Engineers, U.S. Department of Labor—Comprehensive Education and Training Administration, Dakota County Area Vocational Technical Institute, New Jersey Cable Television Association, Arizona Cable Television Association, American Vocational Association, College Placement Council, and the Veterans Administration.

SCTE member registration is $75.00. Non-member registration is $125.00. Table top exhibits will be included at the meeting. The fee includes the sessions, workshops, two lunches and a Certificate of Completion for attendance.

For additional information, contact the Society of Cable Television Engineers, 1100 17th Street NW, Washington, D.C. 20036, (202) 659-2131.

The Society of Cable Television Engineers announces the release of its new publication:

Guidelines For Employee Management and Personnel Development

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Wheeler Ascends NCTA Presidency

WASHINGTON, D.C.—Thomas E. Wheeler is now the new president of the National Cable Television Association. Wheeler, formerly executive vice president, has succeeded Robert L. Schmidt who has resigned after nearly four years as head of the association. Schmidt will pursue business interests in cable television.

During his tenure as president of the association, Schmidt has been credited with playing a major role in developing and portraying a strong feeling of confidence within the industry. As executive vice president, Wheeler worked closely with Schmidt during most of those four years, and he now says that continuity is the name of the game.

In what is being looked ahead to as "the post rewrite era," Wheeler says, "I hope to see us home."

Wheeler came to NCTA from the Grocery Manufacturers of America in 1976. Since that time, he has had major responsibilities for the day-to-day operation of the association, as well as during its government affairs operation. This is the first time in the modern history of the association that the board of directors has been able to choose a president from within its ranks, according to one executive committee member.

It was during the association's annual convention last May that the board gave the go-ahead to Chairman Doug Dittrick to enter into negotiations with Wheeler after Schmidt announced he would leave at the end of his contract. Schmidt will continue in a consulting capacity with the association.

Wheeler decided to accept the position after also entertaining the possibility of leaving the association for private business. He reportedly received at least one lucrative offer from a major cable company. His contract is believed to be similar to Schmidt's with a salary in the $100,000 range, plus additional percs and benefits.

Wheeler says his plans are "to finish the job we started on, to help this industry further realize its potential, and then not become like the broadcasters have."

Not surprisingly, Wheeler is wasting no time in realigning NCTA's staff. According to the new association president, he "likes to fit jobs around people, not people around jobs." Wheeler has inked Bob Ross, formerly general counsel for the Office of Telecommunications Policy and currently counsel for Southern Pacific Communications. *C-ED* has also learned that overtures have been made to a well-traveled Senate aide, who has worked as counsel for the Commerce and Appropriations Committee, and until recently, for Senator Edward Kennedy's powerful Judiciary Committee. They would reportedly form a nucleus with one or two current staffers to make up a new order under Wheeler.

Revamped NCTA staff (left-to-right) are Tom Wheeler, president and senior vice presidents Bob Ross and Kathryn Creech.

Satcom IV Readied by RCA

PISCATAWAY, NEW JERSEY—After citing the need for a ground spare satellite to replace Satcom III, RCA American Communications, Inc., has received a waiver from the Federal Communications Commission to begin procurement of long-lead components for its Satcom IV communications satellite. The satellite is slated for launch in December.

"The availability of the ground spare is a key factor in RCA Americom's continuing ability to provide reliable service to our customers," stated Andrew F. Inglis, RCA Americom president. "A launch-ready ground spare is especially important," he emphasized, "because of the continuing high level of demand we project for satellite communications services."

RCA Americom's list of long-lead items submitted to the FCC for Satcom IV totaled approximately $7.7 million, and included components such as the basic structural forging, elements of the communications subsystem and the apogee motor.

Satcom IV is being built by the astro-electronics division of RCA Corporation.

Starscan Ready for Direct-to-Home Market

OKLAHOMA CITY, OKLAHOMA—Starscan, a division of Gardiner Communications announced at the SPTS '79 seminar in Oklahoma City, August 14-16, a new earth station home terminal equipment package especially for the "direct-to-the-home" market. The package is designed especially for ranches and home owners beyond the reach of quality television reception and cable TV services, according to Sanford M. Freeman, executive vice president and chief operating officer of Starscan.

Freeman said that Starscan will place all of its orders for programming services through the National Registration Bureau for Home Satellite Services, a central source through which all available programming on the satellite can be purchased at a package price. Earth station owners may also place orders through the National Registration Bureau for Home Satellite Services.

The new turnkey package for the individual buyer will be a ten-foot antenna, 24-channel receiver, LNA and all accessories in options from $9,900 to $11,900. The National Registration Bureau for Home Satellite Services, a national system for home terminal users, will supply the program needs

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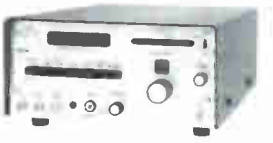

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for the home terminal market and will also benefit cable operators by providing a means by which cable operators can serve customers beyond the reach of the cable system plant.

It is estimated that over 300,000 homes and family units are receiving only marginal entertainment services because they are located 75 miles or more from TV transmitters. Starscan's position is that if it's economically feasible, these individuals should be entitled to both common carrier and premium services on the satellite.

By qualifying under the Compulsory Section of the Copyright Act, the same as a cable TV system, the National Registration Bureau for Home Satellite Services can not only be a direct, centrally located source of service for the TVRO subscriber in remote areas, but also can be responsible under the Copyright Act for payments. Freeman also pointed out that tightly controlled registration and sales records of terminal users, including programming orders, could have a positive effect resulting in more favorable attitudes toward the industry.

Under the Starscan plan, all reputable hardware suppliers would cooperate in the registration effort. Purchase records would identify earth station owners and viewers of programming available on the satellite—laying the groundwork for the first stage in protecting copyright interests. "We believe we understand the concerns regarding this means of security as compared to scrambling," Freeman remarked, "but for the time being, until there is an effective and cost efficient approach to scramble that would benefit cable TV operators and others concerned, the registration and licensing approach would be a much better alternative to stimulate a legal approach to bring satellite services to TVRO users."

Starscan and other earth station suppliers have had talks with several common carriers and premium services to ascertain the availability of programming. The National Registration Bureau will soon announce the specific line-up of programming available and the quarterly, semi-annual and annual package rates. The final package cost to the individual TVRO user will be based on the sum total of the contractual agreements. The religious channels are expected to continue as free channels.

Scientific-Atlanta's Earth Station Symposium

ATLANTA, GEORGIA—Scientific-Atlanta has announced its Fifth Earth Station Symposium to be held October 29-31, 1979 in Atlanta, Georgia. This symposium will be held at the Marriott Hotel-Downtown to accommodate the 500 guests expected to attend. The Fourth Earth Station Symposium was attended by 300 people, but because the satellite communications industry is exploding, S-A has made these new arrangements. As in the past, this symposium is free to invited guests. The agenda for the symposium and the announcement of the guest speakers will be available soon.

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Wrong Place—Wrong Time

By Pat Gushman
Washington Bureau Chief

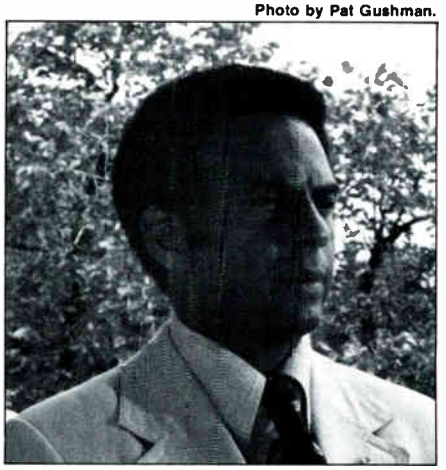
Too often a source of controversy and embarrassment to the President, it was said, Andrew Young would have to go. And, he did. Cries of indignation and outrage poured in when it first became known that the U.N. Ambassador had met with the U.N. representative from the Palestine Liberation Organization. More cries of outrage came in when it was learned that he had "misrepresented" the circumstances in which he had encountered the PLO official. Still more outcries were heard after the political realities of the situation forced Young to tender his resignation and that it be accepted by the White House.

The previous subject brings us to the subject of WARC, the World Administrative Radio Conference, which is set to get underway September 24 in Geneva, Switzerland. State Department sources say Young's influence with the Third World (this Geo-Political classification didn't even exist the last time the conference was held 20 years ago to allocate frequencies) had become remarkable since 1977. The very qualities which got him in trouble at home were those which endeared him to these new nations, many of them African.

It is this emerging Third World which only recently has begun to thirst for the technology and communications which WARC can bring to them. And, it is the one member, one vote, concept of WARC which has had those preparing for the conference this time around concerned. They reportedly are even more concerned in the wake of the Young incident as frequencies and satellite orbits are about to be brokered on the world market as would petroleum and grains.

One of the biggest complaints about WARC during the preparations for it has been about the preparations themselves. Critics have flatly accused many U.S. officials in the military, the State Department, and the Executive Branch of not taking WARC seriously. Republican Senators Goldwater and

Photo by Pat Gushman.



Andrew Young.

Schmitt, both members of the Senate Communications Subcommittee, called for an investigation into U.S. preparations after not liking what they were hearing in the course of their routine Congressional oversight. It seems there were too many low level diplomats and technicians involved in the process. No one was in a policy making position capable of developing strategy and fall back positions should we encounter a highly organized cooperative of nations willing to vote in a block. Schmitt introduced and succeeded in passing an amendment to the State Department's appropriations bill which would expand the role of private industry representatives to the WARC delegation. Also, a fire had to be lit under WARC ambassador and former FCC Commissioner Glen Robinson.

A second look at the Congressional delegation to WARC, however, gives new insight into how high the stakes in the game really are and for what talents the delegates were selected. At the top of the list is Senator Ernest Hollings (D-SC), chairman of the Senate Communications Subcommittee. Next is Goldwater (R-AZ) who is also the ranking minority member of the subcommittee. Of the two, it is likely that only Goldwater will make it to Geneva. In addition to Goldwater's interest in communications, he is also a member of the Armed Forces Intelligence Subcommittee and the special Select Intelligence Committee, of which he is vice chairman.

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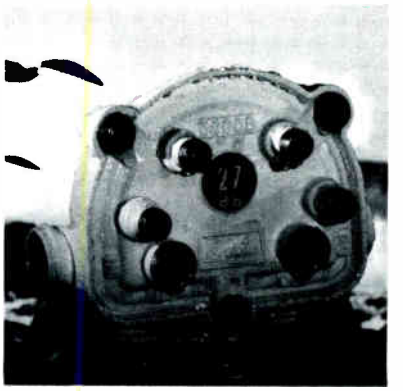

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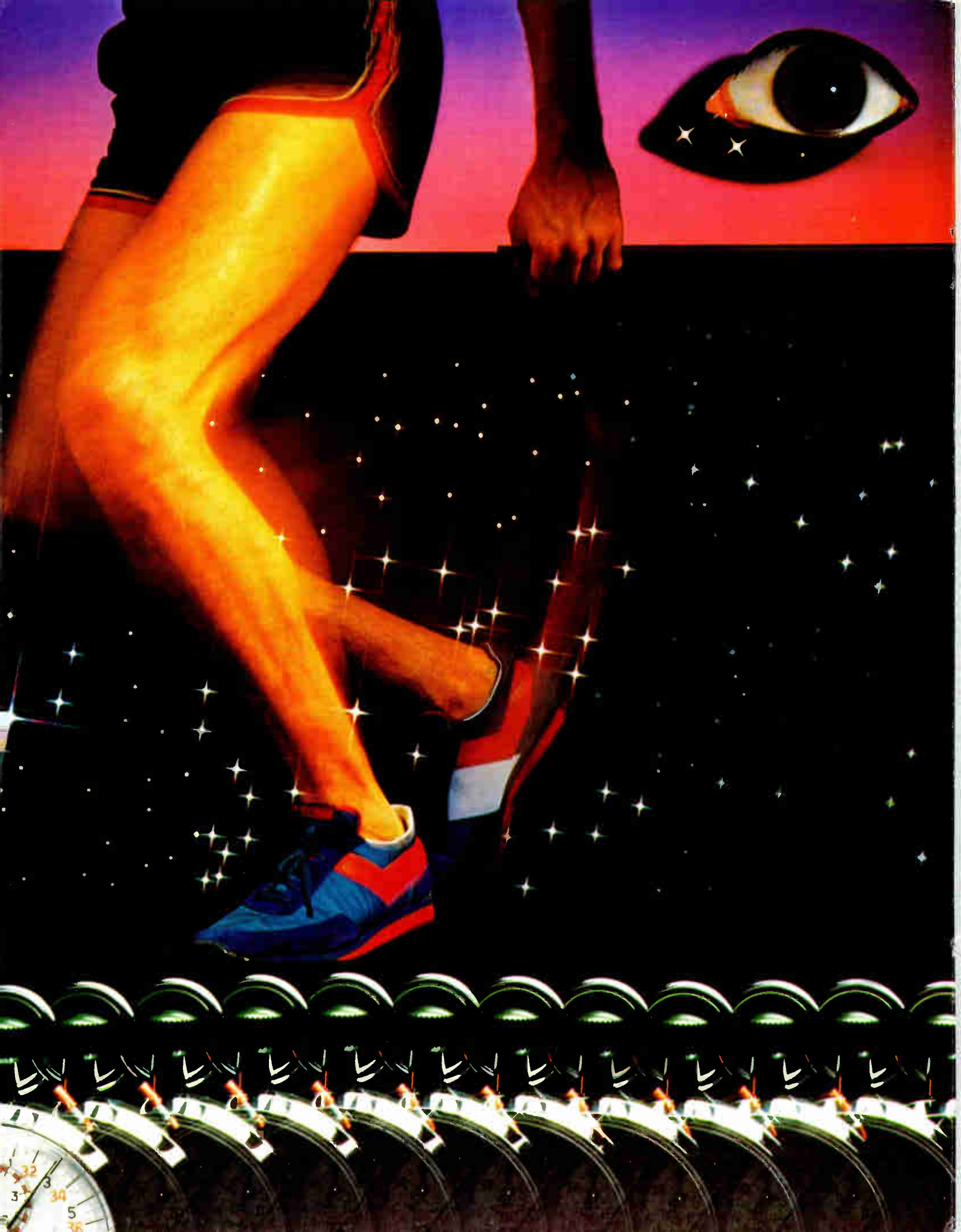

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Earth Stations and Frequency Coordination

By Dan Yost
Manager, Communications Engineering Services Group
Compucon, Inc.

The mutual sharing of the 3700-4200 MHz frequency band between terrestrial microwave routes and satellite earth station reception has inherently resulted in a potential harmful interference environment, requiring interference study and coordination between these services. The regulatory procedures established in FCC Parts 21 and 25 and subsequent Public Notices have promoted an orderly development of the satellite services in an environment already heavily developed with terrestrial microwave systems. The mutual showing and frequency protection provided within the Federal Communications Commission's frequency coordination and licensing regulations have required some time consumption and cost to achieve and maintain. Cost and time delay associated with deregulation of the receive-only earth station are substantial in comparison with the current process.

There is a need, however, to consider specific modifications and improvements to the current regulatory scheme which will result in an overall increase in the efficiency and effectiveness of the regulation of domestic receive-only earth stations. The following specific proposals address five areas of possible improvement in the current regulatory control:

- Standardization Application Form—The current application process for domestic satellite receive-only earth stations is one of the few application processes without a standardized form and format for submission of an application to the commission. The use of the 403 and 430 forms, in conjunction with a list of content for the application, has inevitably led to a variety of application formats which result in confusion on data content, processing delay, and additional cost for the applicant in preparation of the application. Through time, some standardized formats have been developed by applicants which encourages a standardized application form to be prepared by the commission for all applicants. Such a form would potentially require less data, and result in less time delay and cost in preparing and filing an FCC application, as well as provide a better input document for the computer processing systems of the commission.
- Consolidation of the FCC Regulations for Domestic Satellite Receive-Only Earth Stations—With the rapid development of the satellite services, numerous guidelines and clarifications have been issued which effectively modify and supplement Part 25 regulations. A prospective earth station applicant must review a number of documents to be adequately informed before proceeding with his engineering and FCC application preparation.
- Permit Limited Construction of Receive-Only Earth Station Without Construction Permit—A significant time delay constraint could be removed by allowing the construction of a receive-only earth station's foundation prior to receiving either a construction permit or FCC license. Such pad construction would be done at the risk of the applicant if no construction permit or license were granted. The seasonal constraints affecting foundation preparation would thus be avoided. The short time periods required to erect the receive-only antenna and associated equipment could be handled after receiving the construction permit.
- Registration of Satellite Performance Parameters—The design of domestic satellite receive-only earth stations is directly influenced by a satellite's performance parameters. The illumination of geographic areas by the satellite EIRP footprint can determine the minimum size of the earth station antenna, selection of LNA, threshold of the microwave receivers and susceptibility to interference. Lack of registration or submission of comprehensive EIRP footprint data leads to inappropriate earth station configurations and added cost. Abrupt changes in satellite EIRP footprint patterns, due to changes in the satellite pointing orientation, may result in loss of C/N margins and increased susceptibility to interference from surrounding terrestrial microwave systems. Thus, the registration, or mandatory submission of EIRP footprint data and satellite performance parameters for all transponders on a satellite would provide protection to domestic satellite receive-only earth

Compucon's Dan Yost.

station users.

- Extension of Recoordination Requirements—The present guidelines for prior frequency coordination require an earth station or terrestrial microwave station to be filed with the FCC within six months of the end of the 30-day coordination period. Although a majority of coordinated microwave facilities meet this deadline, there is a need to extend the period for recoordination before filing to one year. The delays associated with land acquisition, zoning and other placement considerations often exceed the six months for submitting a filing. The paper work associated with obtaining an additional six-month extension of the coordination is an added burden which can be reduced by the change to a year period.

The Frequency Coordination Process

The frequency coordination process involves three major areas of effort and service:

- Interference Study
- Coordination Process (Part 25 and Part 21.100 (d))
- Frequency Protection

In order that the benefits of this process can be fully appreciated, and risks realistically evaluated, each step is discussed in this section.

It is worth noting that each step contributes to eliminating the possibility of either present or future harmful interference. Such interference would result in either severe degradation, resulting in the inability to establish service initially as planned, or an unplanned future service interruption.

The shared 3700-4200 MHz frequency band has been extensively utilized by microwave common carriers for point-to-point microwave communication. There is a high correlation between the concentrations of 4 GHz terrestrial microwave stations and the placement of satellite earth stations with a resulting increase in the potential for interference. The evaluation of existing and future interference conflicts requires an interference study following the technical procedures outlined in Part 25.

The interference study considers the potentially interfering signal levels of 4 GHz terrestrial transmitters into the proposed earth station. On an average, a typical interference cull will produce 11 (11.3) interference conflicts which must be examined. The interference study considers the factors of interference criteria, intervening terrain features between the earth station and each potential interfering station, and technical trade-offs in equipment selection to establish frequency clearance for the earth station.

When a proposed earth station location will not clear the interference study, further analysis is often undertaken to:

- Evaluate the effect of natural and man-made structures for shielding (primarily through on-site RFI intensity measurement).
- Evaluate and construct artificial site shielding.
- Select an alternate location and repeat the interference study for the new site location.

In addition to the resolution of present or future harmful interference conflicts, the interference study provides for some added flexibility to the satellite earth station, with several benefits perhaps not evident from a quick review.

The potential for changing of satellite orbital positions and the need for switching between satellites virtually demands that an earth station be planned with frequency clearance and visibility to the entire satellite arc. Specifically, this is accomplished in the interference study by simulating the movement of the earth station antenna through the appropriate range of elevation angles and pointing azimuths. The beam clearance over the terrain is verified and the worst case interference margins from each source of terrestrial interference are thus determined.

An interference study clears the earth station for the entire downlink spectrum of 3700-4200 MHz. In view of the continuing growth and changes in satellite programming services, plus the very nature of a non-restoration, limited life technology, the risks of not having this flexibility may well be significant.

While it may be technically possible to clear a station of interference for only a single or limited number of transponders, the wisdom of such a procedure may well be questioned.

During the interference study, proposed frequencies for future paths are analyzed. These future cases can only be considered by engineering studies. An on-site Radio Frequency Interference (RFI) measurement or the initial results of signal quality measurement in a new receive-only installation will not predict a future case.

It is not difficult to envision unpredicted interrupted service or severe degradation resulting in an environment of receive-only earth stations not enjoying the benefits of coordination.

From the preceding comments, the risks attendant upon one popular field demonstration technique should be evident. This technique employs the use of a transportable terminal to demonstrate programming and other services currently available. Such a technique is subjective at best, and if extrapolated to "prove" a site suitable for earth station service is dangerous if not misleading.

This technique might be juxtaposed to that of a more sound procedure of an on-site RFI measurement using calibrated equipment (antenna, LNA, spectrum analyzer). Such an on-site measurement determines interference sources and its level, so that accurate C/I (carrier-to-interference) calculations can be made, and quality of service predicted. Even this technique suffers from the inability to discover future cases and, in the absence of other engineering studies, is limited in its application.

As reflected in FCC Part 25.253, interference (actually the transmission loss incurred by interfering sources) is expected to exhibit a time dependence. As a matter of sound engineering practice, on-site measurements are typically adjusted to reflect this dependence.

In accordance with Part 25.203 (e) the coordination process calculates the interference margins where the antenna beam of a proposed earth station intersects the beam of any terrestrial antenna within specified parameters. From practice it has been found that a potential site cleared of great circle interference conflicts will likely not experience beam intersections of a serious nature. The process of evaluating alternate sites considering great circle conflicts, therefore, mitigates to some extent beam intersections. However, any time great circle conflicts are not satisfactorily resolved or considered, then beam intersections of a serious nature could well be experienced.

As stated in Part 25.203 (e), "Site and frequencies for earth stations operating in frequency bands shared with equal rights between terrestrial and space services, shall be

Cross-Polarization Degradation in Satellite Transmission

By Robert C. Tenten, Director of Engineering
Manhattan Cable TV

The RCA Satcom series of satellites uses the techniques of cross-polarization and transponder offset to gain a two-fold advantage in the amount of transponders that can be used. Since the bandwidth for each transponder is 40 MHz and the total band is 500 MHz, only 12 transponders occupying 480 MHz can normally be accommodated. With cross-polarization and offset the additional 12 transponders can be handled.

In order to gain this advantage, the signals are transmitted in both the vertical and horizontal polarization senses with the odd channels vertical and the even channels horizontal. (Figure 1.) The signals, if they were to behave in an ideal fashion, would be at a perfect right angle. In essence, the vector components of one polarization on the opposite polarization would be zero. Since no system can be perfect, some degradation in isolation between the two signals will occur.

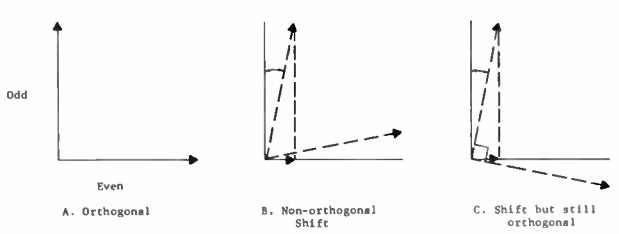

Figure 1

Polarization degradation begins with the antenna. The mechanical tolerances of the antenna itself set some limit on the actual amount of the cross-polarization isolation. This is true of the four antennae that are involved in the transmission and reception of the signal. These antennae are, of course, the uplink transmit antenna, the satellite uplink receive antenna, the satellite downlink transmit antenna, and the earth station receiving antenna. The overall polarization isolation of this chain can reasonably be expected to be in the neighborhood of 30 dB.

The major factors causing depolarization of the transmitted and received signal are rain and Faraday rotation.

The nature of the raindrop is non-spherical. When the geometrical orientation of the raindrop is misaligned with the polarization vectors of the incoming signal a differential phase shift and differential attenuation will occur. This shift causes the orthogonality of the polarization vectors to shift resulting in a component of one polarization falling into the other. (Figure 1.)

The amount of depolarization is affected by the rainfall rate in a given location, the elevation angle of the earth station and the angle and distribution of the raindrops as they fall. The United States is broken up into five rainfall areas. (Figure 2.) Each area has a rainfall rate versus time associated with it. (Figure 3.) As an example, the Southeast which is the highest rainfall rate area in the country, receives greater than 75 millimeters of rain per hour for .01 percent of the time. This equates to about 53 minutes per year.

The amount of depolarization caused by the various rain rates will be determined by the elevation angle of the antenna and the way in which the rain falls. (Figure 4.) The higher the elevation angle, the less effect rain has on polarization since the signal from the satellite at a higher elevation angle has passed through a shorter path than it would from a satellite at a lower elevation angle. The type of rain is also significant in that not all rain drops fall at exactly the same angle, nor does the average rainstorm always fall at the same angle. For example, we would not expect to see rain coming always from the same direction nor blown by the same wind velocity. In order to get some basis for estimating the depolarization that is most likely to occur, a distribution of raindrops is taken. From Figure 4, we can see that with an elevation angle of 20 degrees and a rainfall rate of 50 millimeters per hour, the polarization isolation is approximately 24.5 dB.

Faraday effect causes a rotation of the satellite signal as it passes through the ionosphere. The amount of signal rotation depends on the season of the year and the level of solar activity. With Faraday effect the the signal merely rotates; the orthogonality does not change. (Figure 1.) However, a vector component of one polarization still falls into the opposite polarization sense.

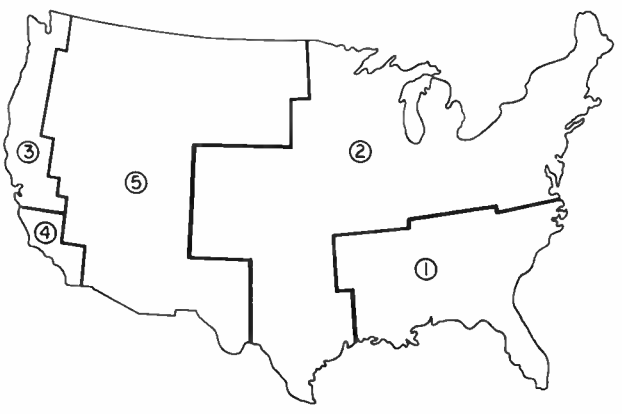

Figure 2

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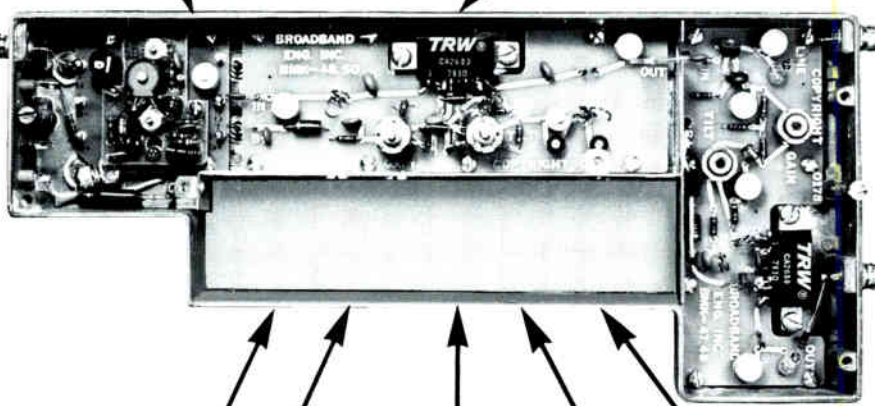

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Sunspot activity has a cycle of approximately 11 years. The amount of Faraday rotation for minimum and maximum years is shown in Figures 5 and 6. In the year of maximum activity the worst change in the angle of received signal is about 2.2 degrees. This is equivalent to a polarization isolation of about 28 dB due to Faraday effect alone. The period of maximum Faraday rotation occurs during the months of December and January. Minimum Faraday rotation occurs in the months of May and June.

Typical daily variations of Faraday rotation are shown in Figure 7. It can be seen that the middle of the daily variations in Faraday rotation occurs at approximately 9 a.m. local time. This mid-point occurs at 9 a.m. regardless of the location of the earth station. In order to determine the polarization isolation due to the Faraday rotation a calculation must be made using the formula: XPI (dB) = 20 log Sin θ.

Given the factors which contribute to polarization degradation, we can now look at the overall reduction in cross-polarization isolation.

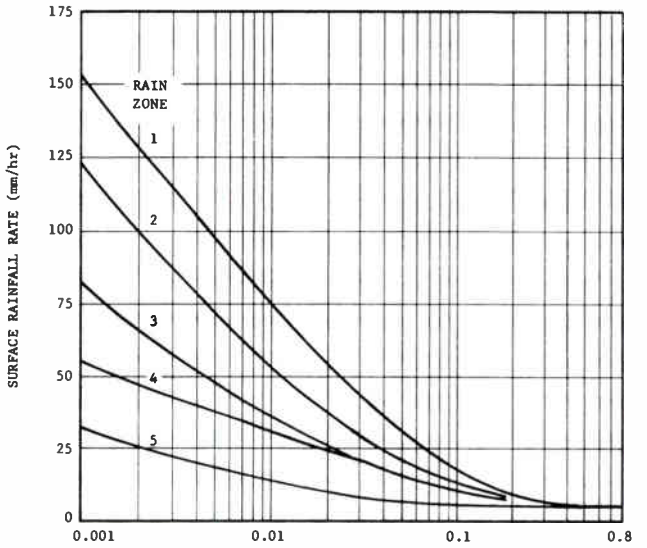

Figure 3

The minimum amount of cross-polarization isolation that will still allow an acceptable picture is approximately 20 dB. The probability of Faraday rotation causing this much degradation independent of any other degradation is unlikely. However, if the antenna feed is carelessly adjusted without regard to Faraday effect it is still possible for this amount of degradation to occur.

Rain in the extremely high rainfall rate and low elevation angle areas can cause interference for brief periods. As we will see, the combination of the two effects could cause some difficulties unless the proper steps are taken.

Since at the present time most earth stations do not have a simple means for adjusting receive antenna polarization during operation, there is no way to adjust for brief periods of heavy rain. If we look at the curves for Faraday rotation

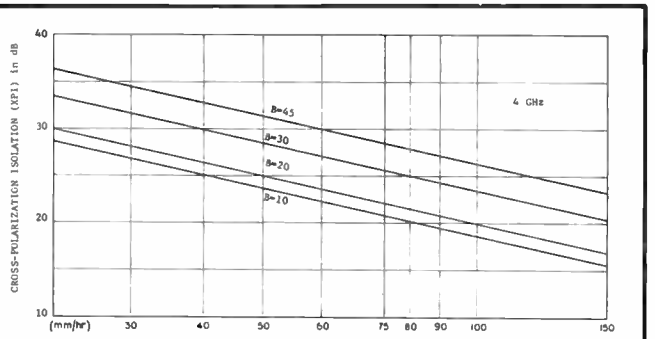

Figure 4

(Figure 7), we can see that the reduction of 50 percent can be achieved by setting the antenna feed at the proper time of day. For example, by setting the polarization at 9 a.m. local time in December of the year of maximum solar activity, we can reduce the total Faraday rotation from 2.2 degrees to 1.1 degrees. This change improves the polarization isolation due to Faraday rotation alone by 6 dB. If we combine the degradation due to Faraday rotation with the basic 30 dB polarization isolation of the total antenna system, we can see that at the higher levels of Faraday rotation there is very little polarization margin.

If we set our antenna feed at the proper time, we cut the effect of Faraday rotation in half.

In order to determine the effect of this improvement on system performance, we must refer back to Figure 3 which indicates the rainfall rates versus time, and Figure 4 which shows the depolarization isolation due to rainfall rate. Since we know the allowable polarization isolation due to rain, we can obtain the corresponding rainfall rates from Figure 4. If we use these rainfall rates with Figure 3, we can determine the amount of time that this polarization isolation is not met.

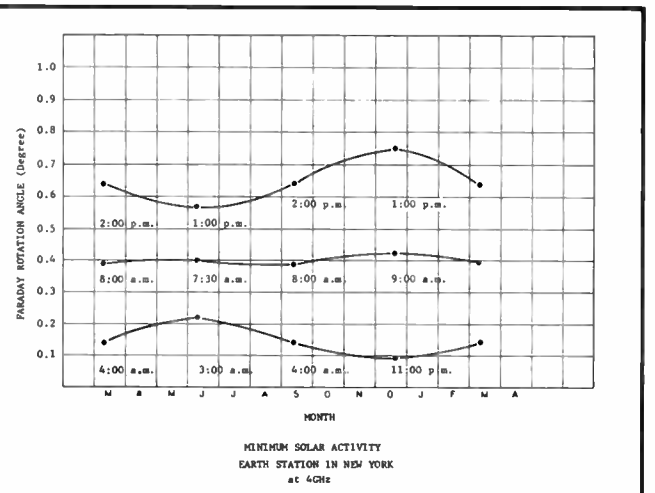

Figure 5

In order to adjust for Faraday rotation the feed must be aligned at 9 a.m. local time. This means that if test signals are put on the satellite they must be generated for a three-hour time period to allow for complete coast to coast adjustment. To achieve the most precise alignment the antenna should be perfectly aligned with the satellite. This requires that the

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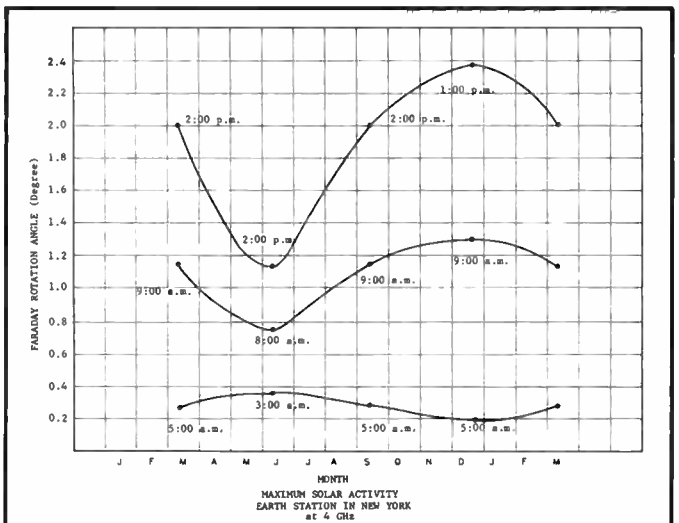

Figure 6

antenna be pointed at the satellite when the satellite is at the center of its orbital box. The entire procedure requires adjustment on two successive days. The first day is used to align the antenna to the satellite since the satellite is generally in the center of its box at a time other than 9 a.m. In addition, the satellite would not stay in position for this three-hour period. It should be noted that the entire country would aim at the satellite simultaneously. Adjustments during times of high solar activity should be done seasonally, while adjustments during years of low solar activity should be made twice a year.

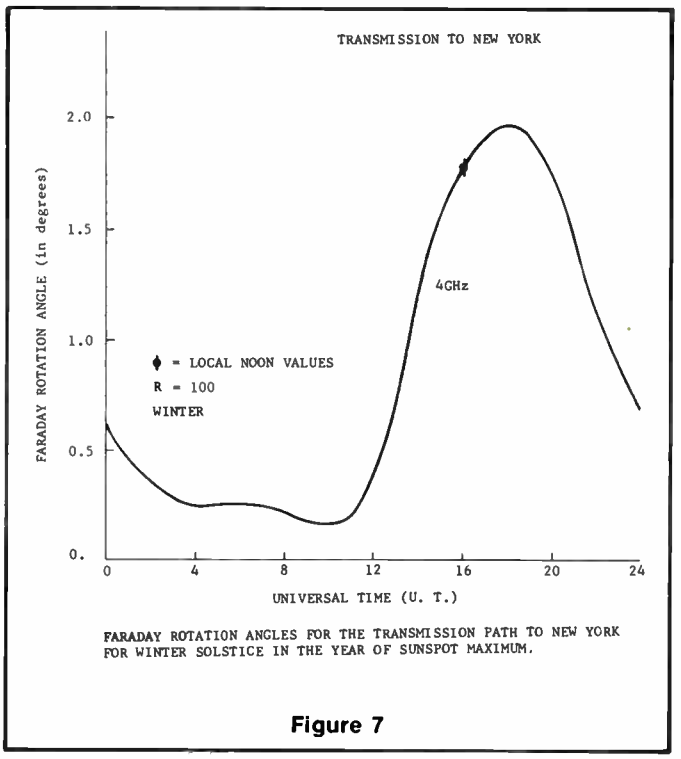

Figure 7

This analysis of polarization isolation does not take into account degradations in the uplink due to rain and Faraday rotation. While these effects are greater in the 6 GHz transmit band than in the 4 GHz receive band, it is expected that the transmit station adjusts the antenna feed rotation to compensate for these effects. **C-ED**

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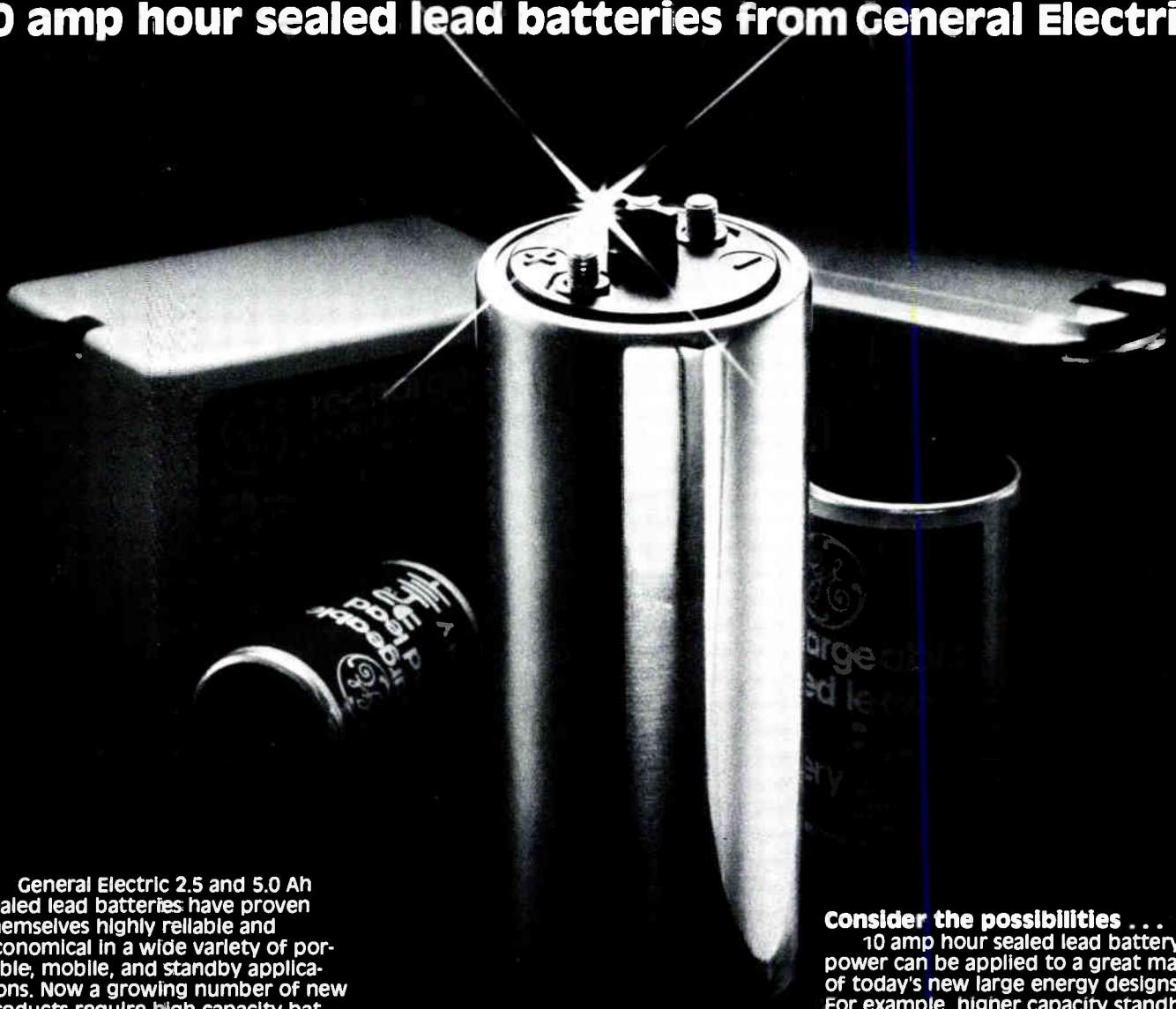

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A CATV System Update Or Rebuild In Your Future

By Fred Rogers
General Manager
Broadband Engineering, Inc.
Jupiter, Florida

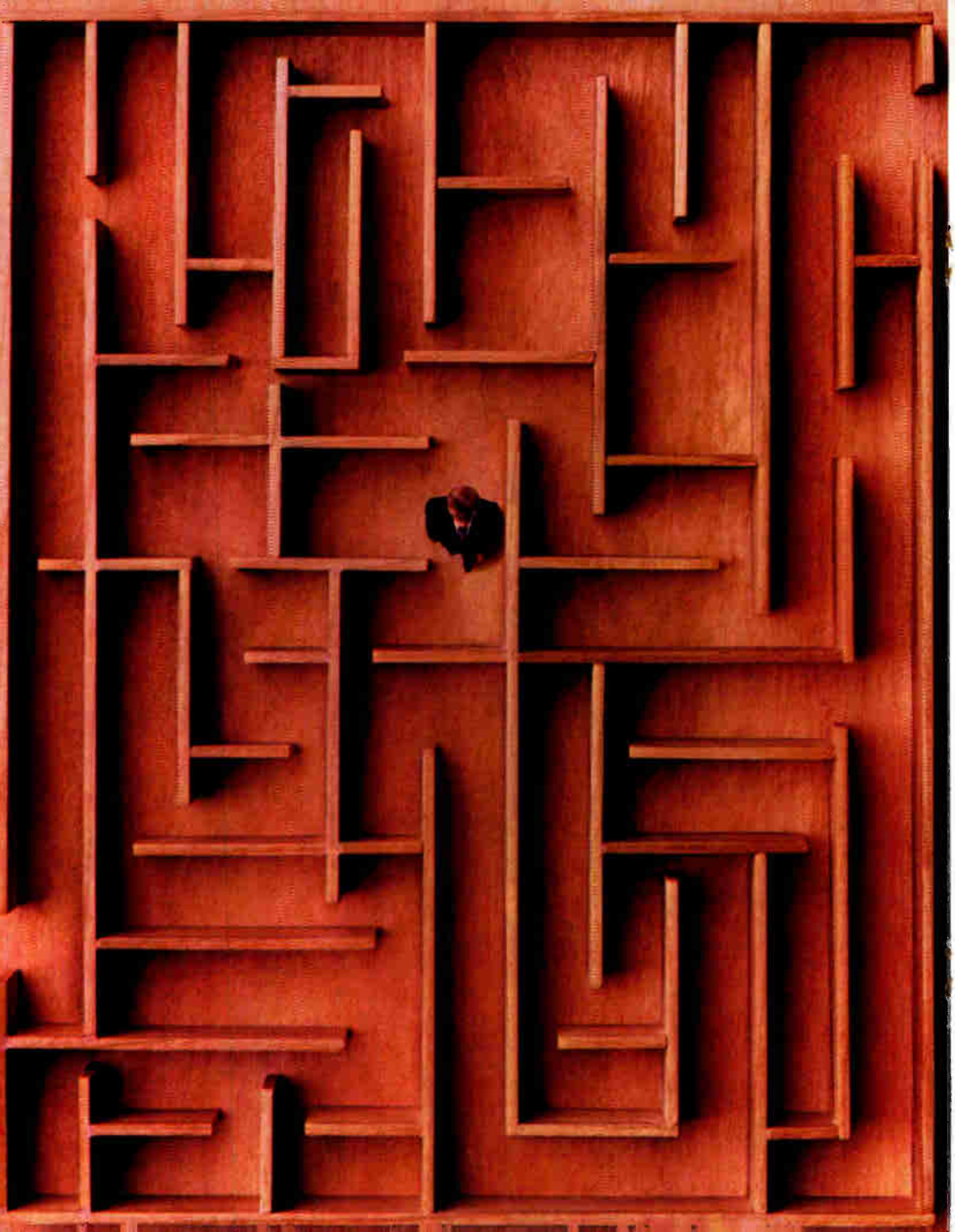
The need for improved picture quality for pay channels and extra competition from adjacent systems has put pressure on the cable industry to deliver better quality reception. The question is, "What is the most viable and cost-effective method of enhancing picture quality?" There are several alternatives.

The most obvious choice for overall system improvement is a total rebuild. Replacing the cables, connectors, amplifiers and passives solves the problems, or does it? The state-of-the-art equipment that's now available just *has* to give you the picture quality you need to please even the most demanding subscriber standards. Of course, the advantages will be less maintenance, better picture quality and satisfied customers.

But, now there are several problems that one encounters in trying to rebuild a system. The obvious problem is a huge capital outlay. Secondly, and not quite as obvious, is that the labor and technical force available to the market today is in very short supply. Third, and probably even more importantly, is the lack of availability of the equipment needed (cable, connectors, amplifiers, etc.) Presently many items are becoming hard to acquire, and this problem will increase as the year progresses.

The building of new systems for franchising has escalated the demand upon manufacturers to supply all products needed for new CATV plant. Since the advent of pay-cable, systems that in the past were not economical to build, such as in large metropolitan areas, are now becoming viable. And, these systems are being built. The average new system size is much larger than the original plants that were started in Pennsylvania in the 1950s and 1960s. Therefore, not many manufacturers could project the growth that has taken place today. Even the ones

Fred Rogers, general manager for Broadband Engineering.



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that did properly project the boom were apprehensive, remembering the severe recession in 1973.

The cable TV market is really starting to boom and meet the potential that was forecast years ago. However, even though orders have been rolling in for the past year or so, manufacturers have not been able to increase their supply of goods to meet present market demands. Even worse, the market looks as if it is going to intensify even more this year and next. For example, one major MSO is now dedicating $100 million to building new franchises. It has also been rumored that this MSO plans to invest $300 million over the next few years in new franchises. Another major MSO plans to build several thousand miles of new plant in the upcoming year. These examples are not uncommon in the cable television industry today. All of the MSOs are planning extra miles of brand new cable systems.

If the supply of connectors, cable and amplifiers is thinly spread now, what is going to happen over the next few years if all of these potentials really come through? These potential systems are very real. The money has been allocated already, and the franchises have been awarded. They will be built.

To stress the point that supplies are short, certain types of low-loss coaxial cable now have an eight-nine month delivery time as quoted by the manufacturer. Connector, trap and amplifier suppliers are all quoting many more weeks or months delivery than was their track record a year ago. This short supply will intensify. Manufacturers are reacting now by increasing their production capabilities and adding new plants, but in most cases, it is too little, too late. The most foresighted of these manufacturers will have extra production capabilities, but, remember, if just that one MSO dedicates $100 million to new franchising and builds those systems in the next year, there will be a supply crunch no matter how hard the manufacturers work.

If this scenario is starting to draw a bleak picture for your system rebuild, then maybe there is an alternative. Often, the cable, passive devices and many of the other pieces of equipment in the system itself are basically sound. The main objectives should be increased system performance and improved system reliability. This will allow additional channels so that the system can become more profitable. An inexpensive way to expand a system is by updating the modules in the system to 25 or 30 channel capability without replacing anything but the actual amplifier modules themselves. It is an established fact that the majority of system reliability is in the amplifier modules, and if you have a good solid amplifier module with state-of-the-art performance capability, excellent picture quality can be delivered. What if these modules could be easily installed in the original housings so that cable would not have to be kinked or housings replaced? The labor force wouldn't have to be out in the field earning overtime wages while exerting wear and tear on existing bucket trucks and other construction equipment. Additionally, the purchase of equipment also has to be considered in a major rebuild. In other words, there's a lot of cost involved and lots of headaches to overhaul a cable plant.

If you could substantially save your capital investment in system updating, that money probably could be used in the future to take advantage of the technological advancements that are

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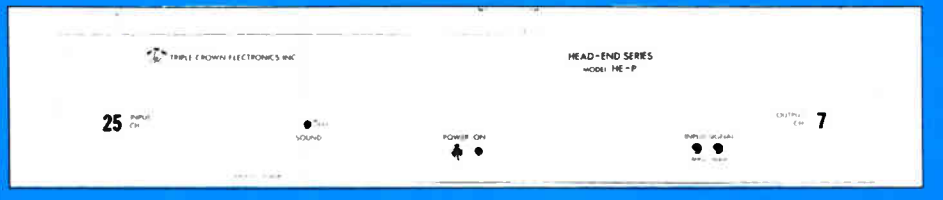

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commonplace in the CATV market. Just think back 20 years ago when tube-type gear was commonly used. Suddenly, transistorized equipment became available, and that equipment soon made tube-type equipment almost obsolete. Then, another five years down the road, another piece of transistorized equipment was developed that made the original units obsolete. After that came the push-pull/discrete amplifier and then the hybrid amplifier. It has become obvious that another step in the life of cable technology is about to unfold, at least within the next five years or so. It may be fiberoptics or it may be some other form of communications.

Hopefully, it is becoming obvious that modules that would plug directly into housings would provide extra channel capability and improved specifications. These devices would be the perfect answer to many rebuild problems in existing systems. What should you look for in these units? There are several different options. You may buy the complete module that plugs into your housing, or you may buy an update board that plugs into the original module. If you're taking either action, you should consider several things. One consideration is that the reliability of the unit must be extremely high. Reliability can be ensured by having excellent surge protection, good transfer of heat from the semiconductor or hybrid technology used in the unit, and proven methods of design in the module itself.

One does not have to be an engineering expert to evaluate some key considerations in the purchase of any amplifier module. A series regulator-type power supply has a much better reliability track record than a switching power supply. Also, the units using power transformers have higher isolation from overvoltage conditions that are often found in cable systems. Incorporation of different types of surge protection have increased reliability by many magnitudes, but not all surge protection is effective. A track record of reliable surge protection and design concept is almost a must.

There are other considerations when evaluating this drop-in modification: are the parts readily available from sources other than the manufacturer; are the parts themselves addressed in common terms so that they can be ordered from any supply house; do the hybrids used in the units have more than one source or more than one manufacturer; are the printed circuit boards double sided; and are they constructed of fiberglass for long reliability? The advantage of the double sided circuit board is ease of maintenance for repairs when it does become a necessity. Finally, is there only one hybrid used for the trunk application and one hybrid for the bridger application? Usage of more than one hybrid results in extra power consumption and also extra costs down the road if a replacement of a hybrid is required. The basic cost of one hybrid as compared to two is essentially the same. Therefore, the trunk unit using two hybrids may cost you up to twice as much to repair if hybrid replacement is required.

Armed with this information, contact all of the sources available for drop-in modifications and weigh the advantages and disadvantages. Ask all of the key questions. You may find that you will save up to 75 percent of the cost of revamping your system, and you will have 21 channels of excellent picture quality with reliability that is state-of-the-art. **C-ED**

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Comsat's Direct-to-Home Satellite Service

By Pat Gushman,
Washington Bureau Chief and
Toni Barnett, Managing Editor

Recently, Communications Satellite Systems (Comsat) has announced its intentions to provide direct satellite-to-home broadcast service. Although the technology already exists for implementing this type of transmission, several factors that affect transmission frequencies, programming content, WARC, the FCC, etc., have not been decided.

Although there is no formal game plan as of yet, C-ED *has asked various cable industry leaders for their reactions to Comsat's announcement.*

Dan Yost
Vice President/Development
Compucon, Inc.

The biggest problem that I have with Comsat at the moment is that they didn't say how they were going to broadcast or on what frequency band they're going to use. The WARC preparations switched the allocations from the 11.7-12.2 band to the 12.2-12.7 band for broadcast satellites, and that band is already occupied by the 12 GHz private microwave users. So, as it currently stands, broadcast satellites are sharing a band in a similar situation as is occurring right now in the 4 GHz band.

Comsat needs a high powered type satellite because of the small (one-to-three-meter) antenna. With the higher powered satellite they've got to go to the 12 GHz band. It's the only band that's authorized for that type of high powered application.

Interestingly, Comsat didn't mention how they were going to do these broadcasts. They didn't say who's satellite, or what band they were going to be in. And then you get back to the problem that broadcasters now have input in the 12 GHz band where it is also being used for private microwave users. The impact of that is that now you're

More Questions Than Answers

Following the announcement that the Communications Satellite Corporation was actively considering the development of a system to deliver pay TV direct-to-home via satellite, it became evident that there were still many more questions than answers about how to go about it. "As a result of just making the announcement, Comsat is probably getting advice from about 100 consultants free-of-charge," an NTIA official pointed out. There are a lot of ways to go about this type of service, and it will probably be some time before Comsat really tips its hand.

In addition to the technical questions raised about the feasibility of satellite-to-home transmission already being explored on a number of fronts in terms of both technology and software, there are some tremendous policy issues wedded to the technical which have tremendous ramifications. Their resolution, however, probably won't come until after Comsat or someone else actually files an application for authorization with the FCC. Whether or not authorization is filed for a common carrier or a broadcast service will have much to tell about what the potential of the service might be and how the regulators will respond to it.

"I'm glad to see it out in the open, finally," said Phil Rubin, director of engineering research for the Corporation for Public Broadcasting. "Everyone has been talking about it for a long time, but only behind closed doors. Technically, I would agree about it being possible to do right now. But in reality there would be problems, particularly with interference terrestrially."

Under the present system of regulations and allocations 11.7-12.2 GHz are shared by broadcast and common carrier. With the even wider frequency range of terrestrial microwave frequencies which overlap, there is increasing potential for interference, experts say, which the cable industry is already experiencing as a result of its rapid expansion into the satellite field. The U.S. proposals for the upcoming WARC include a split and a shift of these services so that, eventually, protected allocations could be available for the types of services Comsat has described. These services would conceivably be less susceptible to interference.

Whether they apply for broadcast authorization or common carrier authorization will have a great deal to do with how they will be treated by the FCC and the type of services they will be able to provide. As presently suggested by Comsat, its interest in providing programming, transmission, and the home receiver as well, has the potential for being the most vertically integrated nonprivate communications system yet devised. However, the technology and the frequency allocations could force Comsat to go the common carrier route if they are not at all serious about getting a piece of the action. In all likelihood they would then be precluded from the business of programming.

Comsat has indicated the service could be ready by 1983. "You can bet," one FCC official told *C-ED*, "it will take the lawyers a lot longer than two years to figure this one out, and I don't mean just ours. We'll have to get an application first, before we even start trying."

going to have the same load as is on the 4 and 6 GHz bands, and all the private microwave use that may affect it.

I don't think the home terminal use will interfere with the cable systems. I would have to wonder, though, why somebody would want to go on the satellite, unless there's some kind of different programming. In the end, you get down to the programming; how good is it, and does it justify the communications means to get it. I look at Comsat—are they experienced in the programming area? I don't see that they are. My only real problem with direct-to-home broadcast is that from a programming sense it has a great deal of competition and it's starting late. Once it's on the television set, does the subscriber really care how it got there? Let's face it, cable and over-the-air broadcasting are pretty cheap deals at the moment so that means that satellite-to-home is going to have to be terribly cheap in order to be attractive.

Kenneth Gunter
Executive Vice President
UA-Columbia Cablevision

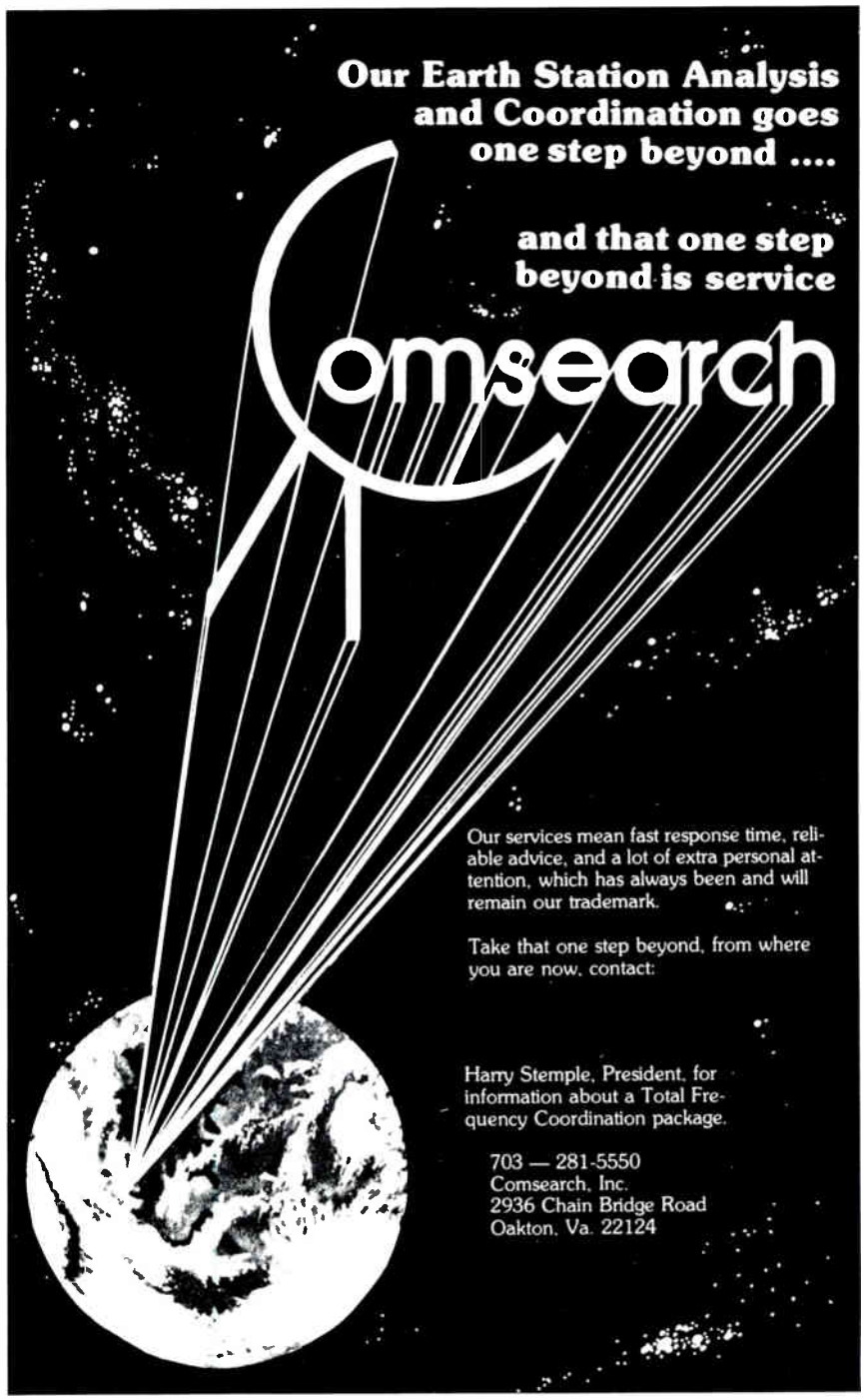
We've all been alerted to the possibilities of satellite-to-home broadcasting. It's being tested in Japan right now and has been for the past year. In fact, CTS, the Canadian Television Satellite, is running two high powered cnannels in this hemisphere and has been for a year or so.

My reaction to Comsat's announcement is that it's not anything unheard of or unknown. The technology is here and now, but the same old questions prevail: what are they going to use for programming, and how will they find enough spectrum to put channels in the sky at a power level to be meaningful in terms of capturing a lot of viewers?

I don't see how Comsat could be awarded frequencies at WARC because everyone is fighting like mad dogs for spectrum in every phase of communications, be it land mobile, land microwave or satellite. And, if there were spectrum available, why don't they take our existing conventional domestic satellites out of the 6 and 4 GHz bands where we're sharing them with the terrestrial users, and stop having to coordinate every time we look around, or worry about the bell running into one of the new paths? If there's that much spectrum, let's use it there.

There are political problems. I don't think it's so neat that we have a government chartered corporation taking government backing, running around competing with private corporations, networks, broadcasters, cablecasters, STV and MDS operators.

There are marketing problems. I don't believe Comsat can compete



with us very well. I've got 35-channel systems right now—what are they going to do to me with six channels? Besides, Comsat doesn't know with whom to compete. Do they compete with cable directly or broadcasters head-on?

What are these people going to do for software? Once they light up the whole sky with high powered direct-to-home satellite channels, what will the copyright people say about that? Who will want retransmission consent for those programs? Old movies can only be stretched so far; they are already heavily into reruns on commercial and public television. We're straining at the gills and fighting retransmission consent for what few super stations we have to fill our dial. How many earth stations are we going to put in just so we can jump from bird to bird to get the maximum programs? We thought we were getting into a two earth station era last fall when the new RCA bird was announced. Will we now have multiple earth stations pointed at Westar, F1 and F4?

Robert Bilodeau
Vice President/Engineering
Suburban Cablevision

In my market, Comsat doesn't represent any more or less of a threat than STV; we have one station operating and another planning to operate. I'm not concerned about it as a competitive threat to cable. Comsat has some of the overtones of an SST Concord type of adventure to me. It's an advanced use of the technology when, in fact, the marketplace doesn't justify it.

The problem of interference to cable systems with direct-to-home satellite broadcasts would be like it is now with earth stations from existing CARS. The amount of energy that would be picked up by a receiving antenna focused horizontally on the ground wouldn't be very high, but you'd have to do a lot of frequency coordination to protect the home antennas from existing land lines, the same as you do in earth stations.

I don't know what frequencies Comsat is planning to use, but of course there are frequency spectrum problems that they'll have to get around somehow. I'm not sure about the success of going into the 12 or 13 GHz band because of rain problems. Rain fades in that band are pretty severe.

From a software standpoint, I don't know that it's any competitive threat any more than STV or any other form of entertainment. I think that the limitation is going to be software, not hardware. If the movie

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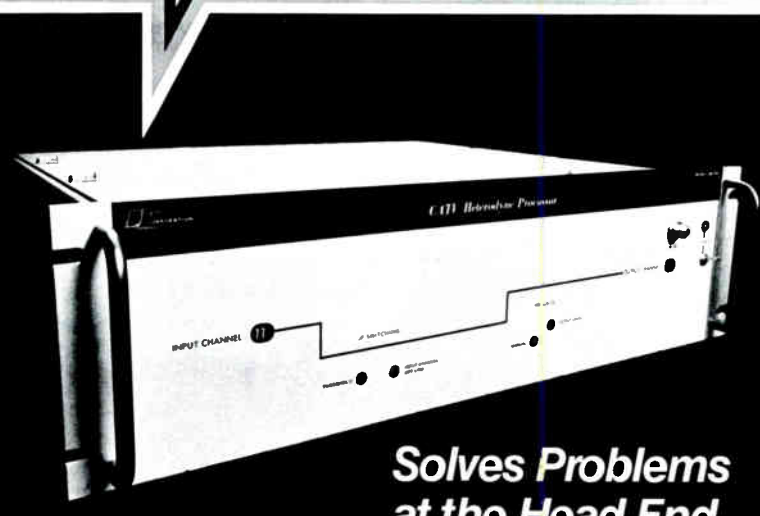

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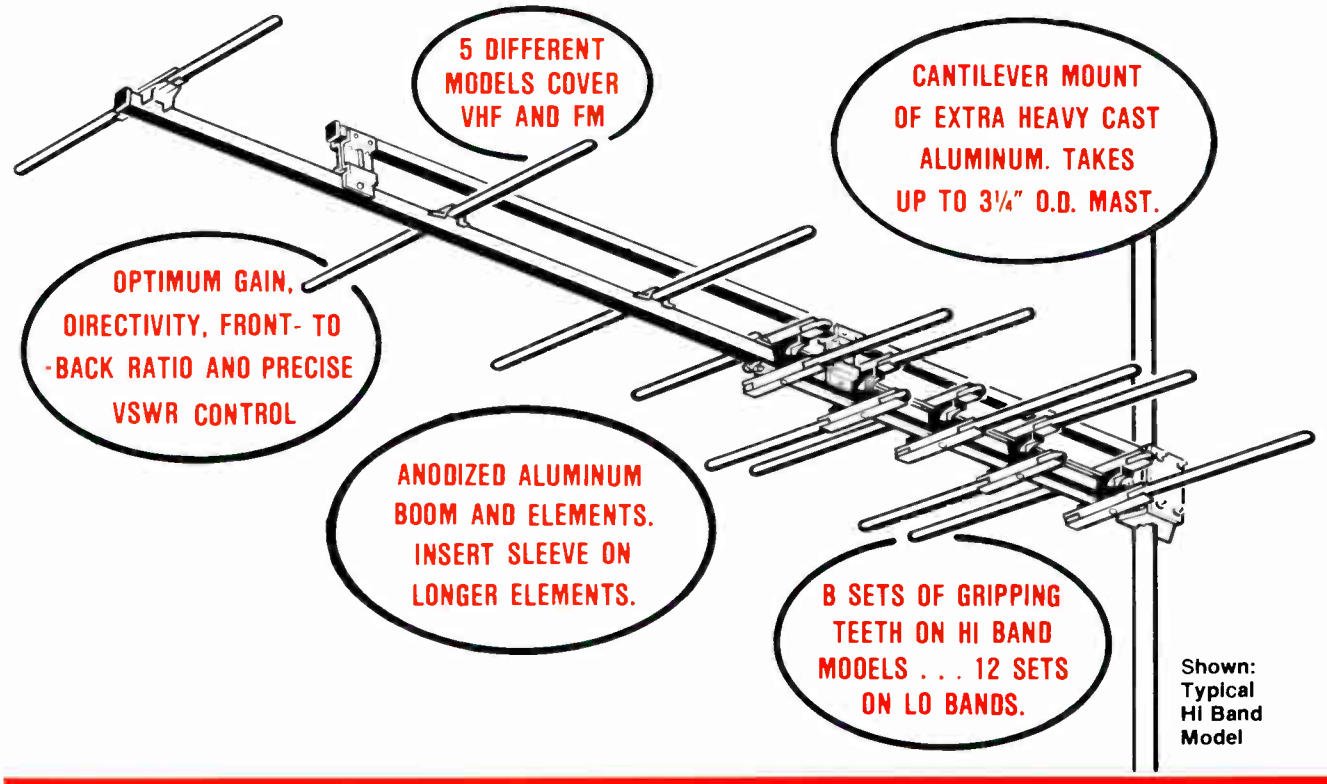

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industry makes 150-200 movies a year, that's it. A movie product is a movie product. The contents are pretty much the same from service to service.

Abe Sonnenschein
Manager/AML
Hughes Microwave Communications Products

There are certainly no technical problems with direct-to-home satellite broadcasts as far as I'm concerned. Broadcast satellites are well within the state-of-the-art, and have been for a number of years. The complications are all semi-political, legislative and business competitive. Obviously, people such as the broadcasters would be vehemently opposed.

Technologically, it's feasible. It's been demonstrated. For cable people, it's a natural fear of the unknown. I really don't think that in the areas where cable can prosper that the direct broadcast satellites present much of a threat to cable operators. Cable can deliver many more channels. The only limitations are that since all these geostationary satellites must go over the equator and there's only one arc that they can go on, they can't be spaced one on top of the other. There has to be reasonable spacing.

Every country in the world wants a piece of this pie for all these reasons. Although there are various users competing for the valuable spectrum and orbital space, there are a limited number of channels that can be accommodated.

I'm all for technological competition. We (Hughes) are active in that field. My hunch is that because of all the entrenched opposition, not excluding the fear of many people to have a single nationally centralized control over mass communications, it's just going to drag out in the regulatory arena, congress and in the courts.

There's no precedence for this new type of service altogether. As a matter of fact, there's a big argument at the commission as to who should even have jurisdiction, should it be the Common Carrier Bureau or the Broadcast Bureau. Comsat's going to have a satellite up there broadcasting their own programming. They're really not a common carrier, they're a broadcaster, so even the mechanism for regulating them is up in the air—not to speak of the fact that it would take a few years to design and build such a high powered satellite. There are no satellites lying around that they can launch tomorrow for this purpose.

If I were living in a city where I could get 30 channels of cable, there's no benefit in satellite-to-home broadcasts. If I were in a very remote area where I could not get cable, it would be a great benefit.

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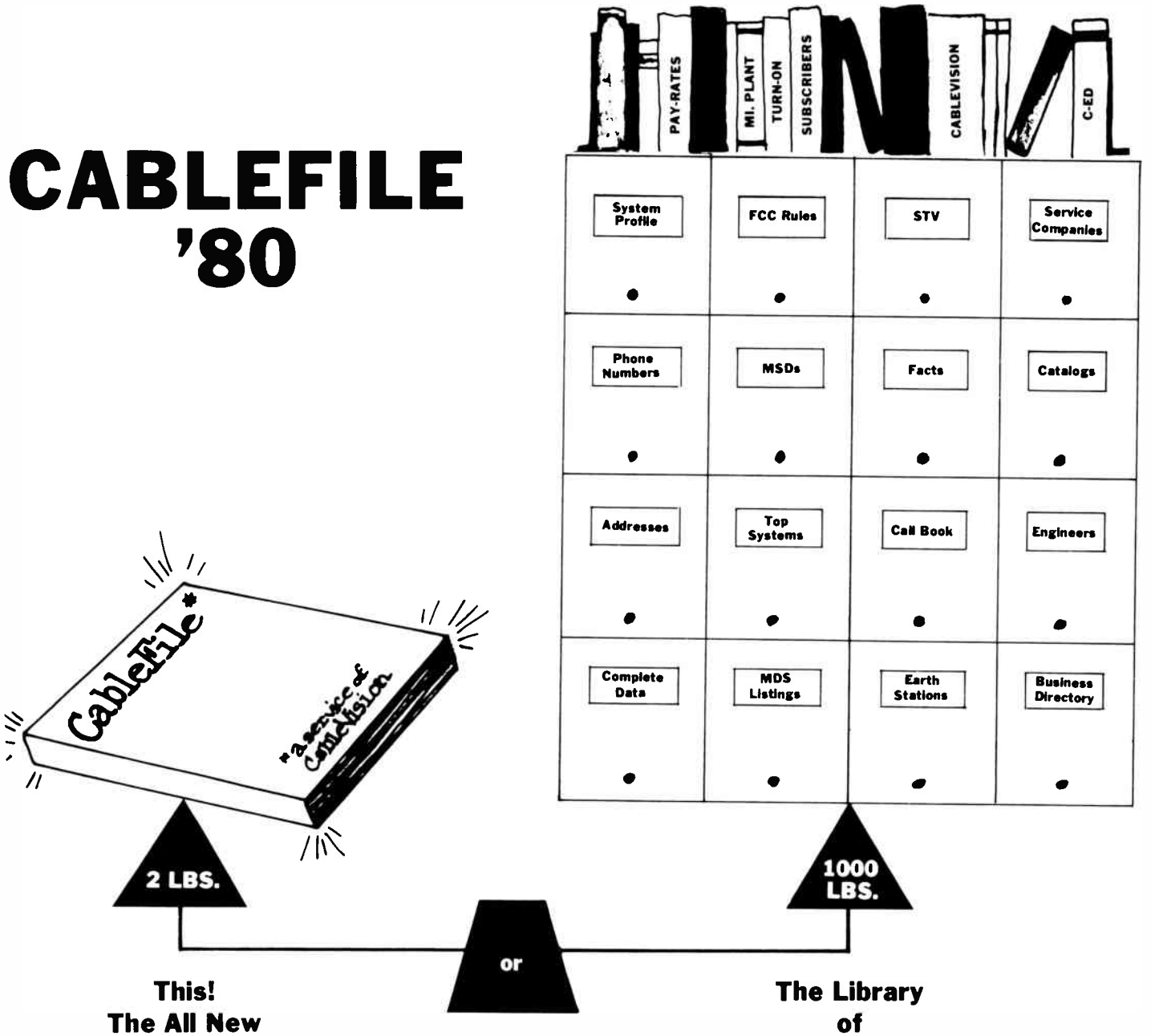

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Jupiter Discovers Cable

By Toni Barnett, Managing Editor

Just four months after Voyager I's startling discoveries about Jupiter, its major satellites and the complex Jovian environment, a twin NASA spacecraft, Voyager II, provided a televised close encounter with the giant planet on July 9. This encounter was picked up by 900 earth stations and transmitted into cabled homes via RCA Americom's Satcom I, transponder 10.

Voyager I began a seven-month-long Jupiter surveillance on January 6, concluding its encounter activities on April 13. Voyager II opened its observatory phase on April 25 and monitored the Jovian system until August 28, 1979. Both spacecraft will continue on to Saturn, and Voyager II may be retargeted there for Uranus. The dual-spacecraft expedition could span a decade and will produce a wealth of new information on as many as 15 major bodies of the solar system.

Voyager II, first of the two Jupiter and Saturn-bound spacecraft launched during 1977, lifted off complex 14 at Cape Canaveral, Florida, aboard a Titan Centaur launch vehicle at 10:29 a.m. EDT on August 20. Liftoff occurred less than five minutes into the "window" on the first day of the 30-day launch period.

Each Voyager uses ten instruments and the spacecraft radio system to study the planets, their principal satellites, Saturn's rings, the magnetic and radiation regions surrounding the planets and the interplanetary medium.

Both spacecraft are carrying telescope-equipped slow-scan TV cameras, cosmic ray detectors, infrared spectrometer-radiometers, low-energy charged-particle detectors, magnetometers, photo-polarimeters, planetary radio astronomy receivers, plasma detectors, plasma wave instruments and ultra-violet spectrometers.

Space-to-Ground Transmission

The rare televised event, which was made available free of charge to the entire cable industry, was made possible by NASA and RCA Americom. As Voyager II entered the phase of its orbit closest to Jupiter, the on-board communications system sent electrical impulses back to NASA headquarters—the Jet Propulsion Laboratory (JPL) in Pasadena, California.

C-ED spoke with several NASA officials concerning the spacecraft's transmission. According to Robert MacMillan, public information officer for NASA's JPL, "Voyager II uses the X-band (high speed data transmission) downlink to send signals to NASA t acking stations around the world. The signal is 115 kbps (kilobits per second), and it's entirely digital."

In July, Voyage II took 14,000-15,000 wide band photographs with two slow-scan cameras. One of the cameras is a "narrow-angle" slow-scan TV system with a 115mm Cassegrain telescope. The other camera has basically identical electronics but utilizes a wide-angle 200mm telescope.

"There are all sorts of editing and formatting we can do to get the data back," explained MacMillan. "We can put it [data] on the tape recorder or have the downlink to the ground directly through a buffer system. The latter method," he added, "is done without the tape recorder. That's the way the bulk of the pictures are taken because of the relatively short amount of time that we're in the Jovian system. In addition," MacMillan stated, "we need to receive more data than the tape recorder can handle."

The tape recorder on-board has the capacity of 100 frames that can be played back at a number of different rates depending on the quality of the downlink between the spacecraft and the tracking stations.

"The way the scan works," MacMillan said, "is that the normal standard full resolution picture takes 48 seconds. We open the shutter for the proper milliseconds and then the readoff time is 48 seconds. That's the fastest rate we can scan."

The time it takes the photos to get back using the downlink is real-time. As the picture is being scanned off of the vidicon phase, the downlink at 115 kbps provides the picture in that same amount of time. The amount of time it takes to scan before the next picture is shuttered is the downlink time—48 seconds.

Also aboard the Voyager II is a computer which changes the camera's pictures into a checkerboard pattern of tiny squares, each with an assigned degree of brightness. That checkerboard pattern can be likened to the dots that comprise a common black-and-white photograph. Each tiny square is known to NASA scientists as a "pixel" or picture element. One entire picture of Jupiter is made up of 640,000 pixels or 800 lines of 800 pixels per line. The computer processed 800 lines—one at a time—in 48 seconds.

"We have an X-band (downlink) and S-band (uplink) communications system," stated MacMillan. The X-band operates at 8.2 GHz or 8200 MHz, and the S-band frequency is 2300 MHz. The S-band is microwave and uses a much lower frequency than the X-band. "A few years ago we were only using the X-band experimentally," MacMillan explained, "but now we're using it operationally."

The X-band is used only for imaging and other scientific data that can be multiplexed in. The downlink will handle about six-and-a-half million bits of information per 48

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*Nielsen Station Index, Chicago, May, 1979, Sunday-Saturday [illegible] a.m. Data subject to [illegible] variations within report.

seconds of frame time. Since one picture contains just over five million bits, there is room for multiplexing in other data.

NASA's JPL designed a sophisticated tracking system on Voyager II. The ground communications system (a phase-locked loop FM system) transmits a signal from the ground at a known frequency that's received at the spacecraft. There the signal is multiplied in the receiver by a known factor of $\frac{241}{220}$, a precise multiplication of that frequency. The signal is then converted and transmitted back to Earth. That signal is then modulated by the telemetry NASA extracts from the spacecraft, whether it's engineering data, scientific measurements, etc.

In addition to extracting the telemetry from the signal received back on Earth, NASA scientists can predict precisely the velocity and the exact position of the spacecraft because of the known time that the signal left the spacecraft at a certain frequency and what the frequency was when it was received on the ground.

"The entire signal leaving the spacecraft is not determined by an oscillator on-board the ship but by the transmitter on the ground," noted MacMillan. He further explained, "The transmitter on the ground can measure the exact frequency out to about eight decimal points and then transmit it up to the spacecraft, multiply it and transmit it back. When it's received on the ground," he added, "we then note the position of the spacecraft to within less than the actual size of the spacecraft. Over a distance of hundreds of millions of miles, we know the exact position and velocity of the spacecraft to an error of about five meters."

On April 5, 1978, Voyager II's primary radio receiver failed, and the spacecraft's computer command subsystem automatically switched in the backup receiver. (This is the first spacecraft that JPL has ever launched with more than one receiver on-board.) "Within a couple of days of that switching event," MacMillan stated, "we lost a circuit in the second receiver due to some type of unidentified transient."

A spacecraft receiver has scanning discrimination circuitry that slides it across the receiving band. Because the spacecraft and the Earth are always being separated by continually greater distances, the shifting changes the frequencies. The spacecraft receives the frequency of the ground transmission, and the scanner has to lock-up with the receive signal. Because the existing receiver can no longer follow a changing signal frequency, NASA's telecommunications engineers developed a technique of determining the frequency at which the Deep Space Network station must transmit commands.

NASA has Deep Space probe communications systems in Goldstone, California; Madrid, Spain; and Canberra, Australia. The main subnet (dishes) are 65 meters (210 feet in diameter). The dishes, designed and built by NASA, are equipped with S- and X-band cones that can operate simultaneously. The digital signals received by these tracking stations are sent via microwave to JPL in Pasadena, California.

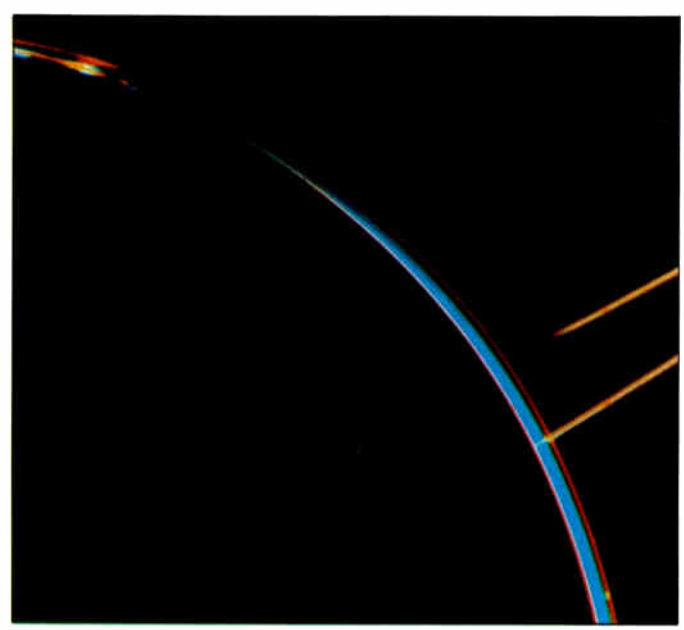
The computer on the ground in Pasadena receives each whole picture and functions like a darkroom in photography, adjusting contrast and balancing the color of each picture. The ground computer then feeds the pictures as regular video signals up to Satcom I for primary distribution to NASA.

At JPL, the signals are converted from digital-to-analog form to provide an image. These images are transmitted to RCA Americom's Los Angeles television operations center. From the center, the signals are sent to RCA's earth station at South Mountain, California, which transmits the signals to the center frequency of transponder 10 on Satcom I.

Transponder 10 receives the signal and converts it to the downlink frequency which is beamed to RCA's receiving station in Vernon Valley, New Jersey. From the Vernon Valley earth station, the signals are relayed via microwave to RCA's New York City television operations center. The signal is then sent via land-line to NASA's headquarters in Washington, D.C.

All photos in this feature were provided courtesy of the National Aeronautics and Space Administration.

This Voyager II picture shows the Great Spot and the south equatorial belt extending into the equatorial region (at right in an interchange of material between the south equatorial belt and the equatorial zone).



Jupiter's faint ring system is shown in this color composite as two light orange lines protruding from the right. This picture was taken in Jupiter's shadow through orange and violet filters.

Cable Programming for September

Signal	Day	Start/Stop	Alert Tones	Satellite/ Transponders
C-SPAN (times approx.)		12 pm-6 pm (Mon. & Tues.) 10 am-6 pm (Wed.-Fri.)	195°/#	F1, #9
Calliope		6:30 pm-7:30 pm (Mon., Tues., & Thurs.)	168°/#	F1, #9
CBN		24 hrs.	No	F1, #8
ESPN		7 pm-6 am (Fri.-Mon.) 6 pm-4 am (Mon.-Fri.)		F1, #7
Front Row		2:30 pm-2:30 am	481°/#	E,C F1, #12 P,M F1, #10
HBO (East)	1	3 pm-2:08 am	Program	F1, #24
(West)	2	3 pm-2:16 am	729°/#	F1, #22
(TAKE-2)	3	2:30 pm-1:22 am	Scramble	F1, #23
(Back-up)	4	5:30 pm-1 am	835°/#	F1, #20
	5	6:30 pm-1:15 am	Duplication	
	6	5:30 pm-1:44 am	940°/#	
	7	6:30 pm-2:45 am	Take-2 E.	
	8	3 pm-2:17 am	592°/#	
	9	2:30 pm-1:45 am	Take 2 W.	
	10	6 pm-1:09 am	681°/#	
	11	5:30 pm-1:37 am		
	12	6 pm-1:44 am		
	13	6:30 pm-2:23 am		
	14	6:30 pm-2:27 am		
	15	3 pm-1:22 am		
	16	3 pm-2:29 am		
	17	5 pm-2:02 am		
	18	5:30 pm-1:12 am		
	19	6 pm-1:46 am		
	20	6 pm-1:29 am		
	21	5 pm-2:11 am		
	22	3 pm-2:30 am		
	23	2:30 pm-1:45 am		
	24	6 pm- 1:57 am		
	25	6 pm-2:18 am		
	26	5:30 pm-1:45 am		
	27	5 pm-1:47 am		
	28	5 pm-2:33 am		
	29	3 pm-2:09 am		
	30	2:30 pm-1:32 am		
HTN		8 pm-10 (11) pm	207°/#	F1, #21
KPIX (time permitting)		2-4 hrs. per day	No	F1, #1
KTVU		7 am-1 am (weekdays) 7 am-4 am (weekends)	No	F1, #1
MSG Sports	8	11:30 pm	438°/#†	F1, #9
	15	11:30 pm		
	19	8:30 pm		
	22	7 pm & 11:30 p.m.		
	23	9 pm		
	24	8:30 pm		
	26	7:30 pm		
	29	11:30 pm		
Modern Talking Pictures		12 pm-5 pm (weekdays) 7 am-12 pm (weekends)	048°/#	F1, #22
Newstime		24 hrs.	276°/#	F1, #6
Nickelodeon		10 am-11 pm (weekdays) 9 am-11 pm (weekends)	749°/#	F1, #11
PTL		24 hrs.	No	F1, #2
Reuters		Not in use yet.	No	will use F1, #18
SPN		10 pm-8 pm (Mon.-Sat.) 24 hrs. (Sun.)	429°/#	F1, #21
Showtime	1	2 pm-1:30 am	576°/#††	E, C, F1, #12;
	2	2 pm-1:06 am		P, M, F1,
	3	3 pm-1:04 am		
	4	5:30 pm-12:55 am		
	5	6 pm-1:54 am		
	6	5:30 pm-1:06 am		
	7	6 pm-1:30 am (approx.)		
	8	2:30 pm-2:20 am		
	9	3 pm-1:00 am		
	10	5:30 pm-12:55 am		
	11	6 pm-1:35 am		
	12	6 pm-1:04 am		
	13	5 pm-1:18 am		
	14	6 pm-1:47 am		
	15	3 pm-2:30 am (approx.)		
	16	3 pm-12:37 am		
	17	5:30 pm-1:30 am		
	18	5:30 pm-12:32 am		
	19	5:30 pm-1:45 am		
	20	6:30 pm-1:10 am		
	21	5:30 pm-1:54 am		
	22	3 pm-2:10 am		
	23	3 pm-1:18 am		
	24	6 pm-12:32 am		
	25	5:30 pm-1:39 am		
	26	5:45 pm-12:30 am (approx.)		
	27	5 pm-1:30 am (approx.)		
	28	6 pm-1:42 am		
	29	3 pm-1:57 am		
	30	3:30 pm-1:17 am		
SIN		2:30 pm-1 am (weekdays) 4 pm-12 am (Sat.) 11 am-11:15 pm (Sun.)	No	Westar II, #7
Star Channel		9:30 am-2:20 am	311°/#E. 519°/#W.	F1, #5
Trinity (KTBN)		24 hrs.	No	F1, #14
WGN		5:42 am-3 (3:30) am (Mon.-Thurs.) 24 hrs. Sat. & Sun. Ends 3 am on Sun.	No	F1, #3
WOR		6:30 am-1:30 am		F1, #17
WTCG		24 hrs.	No	F1, #6

E = eastern
C = central
M = mountain
P = pacific

All program times are listed for the eastern time zone, unless otherwise noted.

† Commercial substitution 601°/#; Thurs. baseball 706°/#.
†† On-line 679°/#; off-line 753°/#; access 843°/#.

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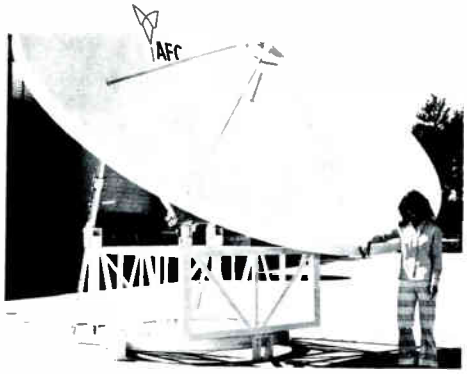

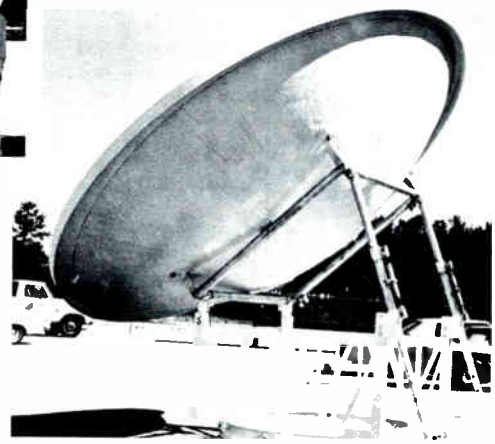

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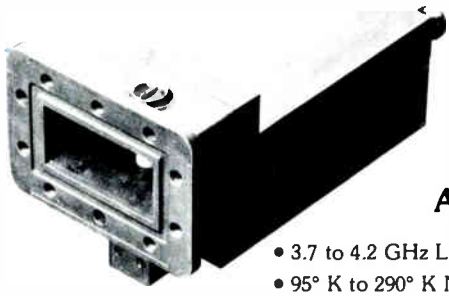

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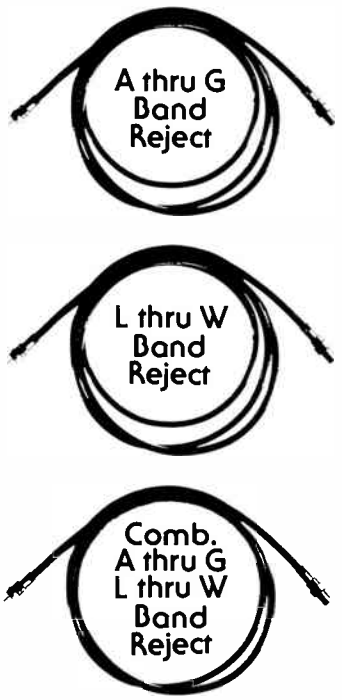

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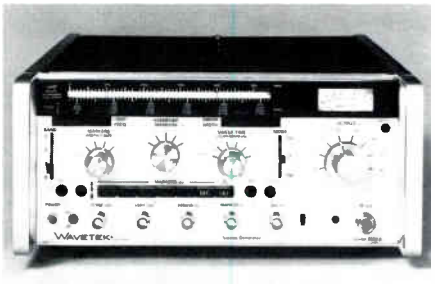
Wavetek's New Sweep Generator

The Wavetek model 2002A is a broadband frequency generator which can sweep any portion of the 1 to 2500 MHz frequency band in a single sweep. Four frequency bands (1 to 500 MHz; 500 to 1500 MHz; 1500 to 2500 MHz; and 1 to 2500 MHz) ensure flexibility plus optimum accuracy and resolution for both narrow and wide band operation.

This programmable instrument can be operated in any of three modes — Start/Stop, ΔF or CW. The 2002A will sweep any portion of any one or more bands, in either direction, at any rate from 50 sweeps per second to 1 sweep every 100 seconds. Standard features include an output meter calibrated in dBm, a 1 KHz square wave modulator, a slope control which compensates for frequency dependent variations in the external circuitry, and sweep delay capability. A complete crystal-controlled birdy bypass marker system is available. Markers may be at discrete frequencies or at harmonically related frequencies. Remote programming of center frequency, sweep width, band selection, and output level is standard.

For more data, contact Wavetek Indiana, Inc., 66 N. First Avenue, P.O. Box 190, Beech Grove, Indiana 46107, (317) 783-3221.



Fiberoptics

Fiberoptic Data Link Experimenter's Kit

Designed to provide an introduction to the basic characteristics of electro-optical systems, the AMP Experimenter's Kit for fiberoptic data links contains all the necessary semiconductor devices and PC boards, along with optical connectors and cables, to build six TTL or CMOs compatible fiberoptic data links.

The 12 pre-drilled PC boards allow construction of six transmitters, two 10-kilobit receivers, two 100-kilobit/1-kilobit receivers, and two megabit receivers, capable of operation at distances of up to 44 meters at the lower data rates. Optical interconnection components include a preterminated optical cable assembly with measured loss, along with three meters of unterminated cable and sufficient AMP Optimate fiberoptic terminating components to produce ten optical cable assemblies using most common sizes and types of cables.

Data sheets are provided for all kit components and an experimenter's guide and instruction sheets covering information on basic experimental fiberoptic systems complete the package.

Additional information concerning this new kit is available from AMP Special Industries, Valley Forge, Pennsylvania 19482.

Miscellaneous

Conrac Video Monitors at The New York Stock Exchange

Almost 600 Conrac video monitors will provide information for the crowd on the trading floor when the first phase of the New York Stock Exchange's facilities upgrading program is completed next year.

This project is designed to increase efficiency of the trading process and position the exchange to compete more effectively in the evolving national market system.

The familiar U-shaped trading posts that have been in use since 1930 do not have enough room for the electronic support equipment necessary in today's markets. They will be replaced by newly-designed, expanded trading posts built in the shape of adjoining cogwheels.

Up to 22 specialists will be assigned to each of the new posts. Current information on prices, dividends and other news that might affect buying or selling decisions on the stocks handled by these specialists will be displayed to the crowd around the post on large-screen Conrac monitors. A pair of monitors is assigned to the stocks handled by each specialist, and as many as 44 displays will ring the larger posts.

The monitors at each trading post will be fed by two identical controllers. If any failure occurs on a controller-monitor circuit, another circuit can be activated in a matter of seconds to display the data on the specialist's stocks.

Hughes Boosts AML Capability To 80 Channels

Hughes Aircraft Company's microwave communications products is now offering 80-channel capability on its AML local distribution systems.

The new FCC ruling, expanding CARS from 12.7-13.2 GHz, has been described as providing greater flexibility for television services in areas served by CATV systems. By doubling the spectrum allocation, additional channel capacity will be made available both for a wider variety of incoming signals and for a second 40-channel CATV system in the same geographic area.

The new equipment is designed to meet the needs of many CATV system operators who are currently building plants with a planned downstream capability of 34 to 40 channels, and who must still accommodate the increased number of upstream services. Among the additional upstream video signals are satellite ground stations, public access channels, plant maintenance data, remote pickups and studio-to-headend links.

Because the AML modulation technique uses only 6 MHz per TV channel, it permits spectrum conservation and therefore greater flexibility in system design. In addition, AML provides two to four times the TV channel capacity of conventional FM modulation within the allocated frequency band, thus permitting more than one CATV operator to transmit within the same area.

For additional information, contact Hughes Aircraft Company's Microwave Products, P.O. Box 2999, Torrance, California 90509.

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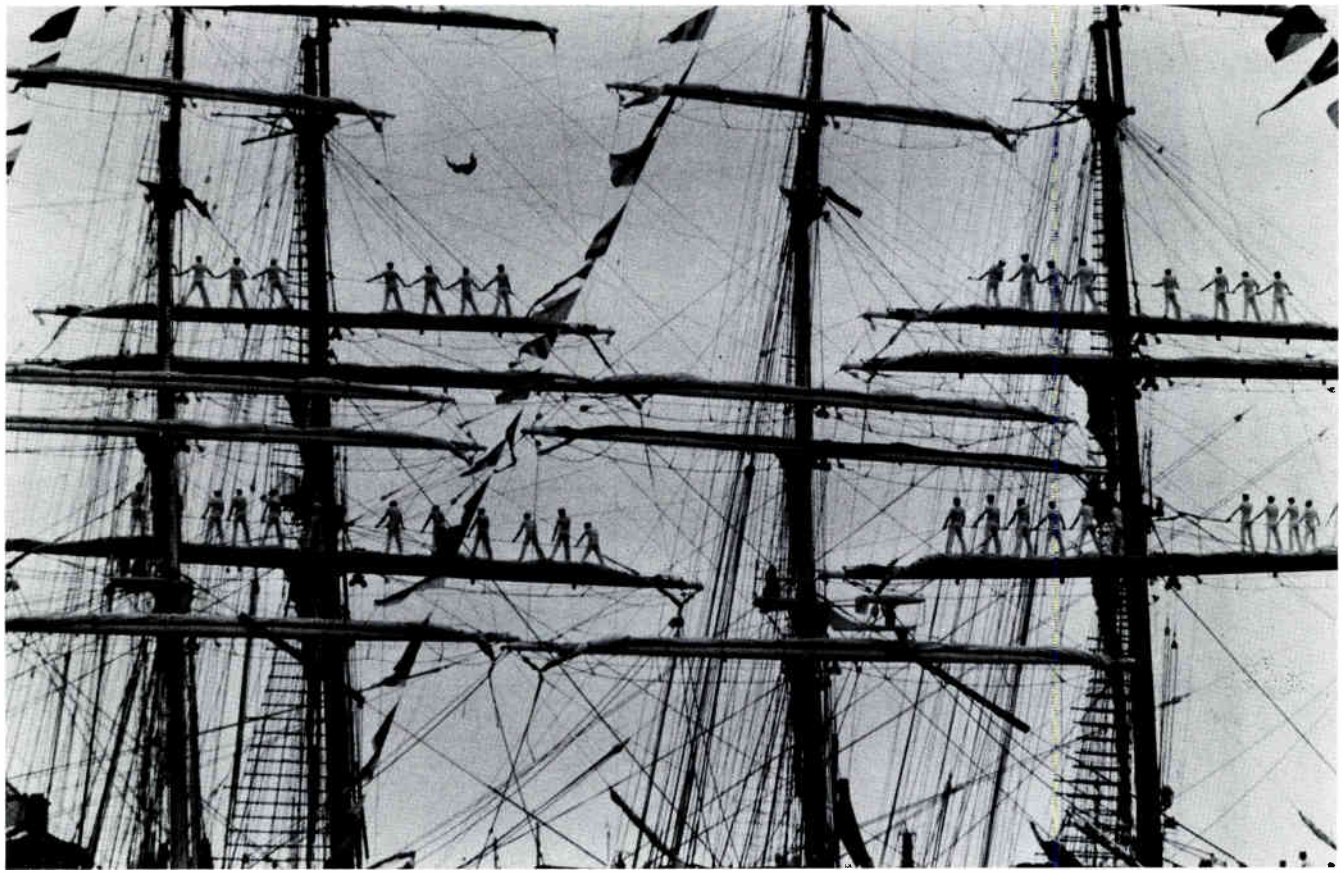

When the risks are high and large profits are clearly on the horizon, you need the security of a Baseline™ market report. A baseline is a standard that you can confirm. From a set of such baselines, we have calculated market size and component prices and volume for 11 industries soon to be pervaded by fiber-optic communications. This detailed, 343-page study will clarify your assessment of product entry, price, volume and competition. The 96 tables keyed to specific trends in each industry will show you the significance of growth patterns in these industries over the next 10 years.

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KESSLER MARKETING INTELLIGENCE

Telemedicine Via Satellite

By Toni Barnett, Managing Editor

The Canadian Province of Newfoundland and Labrador have become intensely involved in exploring the use of satellites due to the Province's geographical location. Newfoundland and Labrador have a total area of approximately 143,000 square miles and a population of about 550,000; the Labrador portion has 50,000 people scattered over 103,000 miles.

Due to the geographical problems, travel is difficult (some areas are only accessible by boat or plane.) Many towns are without hospitals and doctors, and there is a major lack of medical communication. In addition to the lack of available medical personnel throughout the Province, doctors are not able to leave their patients to be able to take advantage of courses and seminars offered by the university at St. John's.

To help alleviate this problem, Memorial University of Newfoundland explored the potential of using the Hermes satellite to deliver professional education to a variety of health care officials. The system was also used for community health education, a limited series of patient consultations and transmissions of X-rays via slow scan equipment.

The telemedicine project in Newfoundland was a Memorial University research effort sponsored jointly by the ETV center and the Faculty of Medicine. Although the project's main focus was to use the Hermes satellite for continuing education, it also involved limited testing of the system for consultations. The principal activity, however, related to slow scan transmission of X-rays from Labrador City to St. John's.

ETV devised a computer program to handle the technical, production and content details related to each program. Printouts could be generated to include all or only specified segments of the program material. Twenty percent of the available hours were left unscheduled to permit last-minute insertion of consultations as well as "anticipated-unanticipated" problems that might require program rescheduling.

The System

A three-meter terminal was located on the Memorial Campus parking lot next to the ETV center. The terminal permitted an audio and video signal to be sent from St. John's Hospital to hospitals in Stephenville, St. Anthony, Goose Bay and Labrador City.

Each of these institutions has a two-meter terminal

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AD INDEX

mounted on the roof. These earth stations could receive programming from St. John's and transmit a return audio signal. The three-meter terminal (at St. John's) was cabled to the ETV center, which used one of its two studios as the main telemedicine switching and control center. The two-meter terminals were cabled to a room set aside by each hospital for viewing purposes. The two-meter terminal in Labrador City had an extra audio channel which allowed slow scan transmissions simultaneous with and independent of the course programming.

In St. John's, programs originated in one of three places: the ETV studio which was the telemedicine control center; the medical audio visual service (MAVS) studio located in the Health Science Center and linked to the ETV control room via coaxial cable; and a classroom in the General Hospital which was linked to the campus via microwave. The entire system had only black-and-white capability.

Both video and audio were transmitted via the Hermes satellite to the receiving stations. These stations had an audio link, also via Hermes, to St. John's. This combination of satellite transmitted signals provided an interactive television system.

A major feature of the transmissions was the use of a Darome bar. During the transmission, physicians and other participants at all four receiving stations could interrupt a presentation to ask questions by pressing the Darome bar. This device sounded a tone over the whole system and flashed a light in the studio, indicating an interruption.

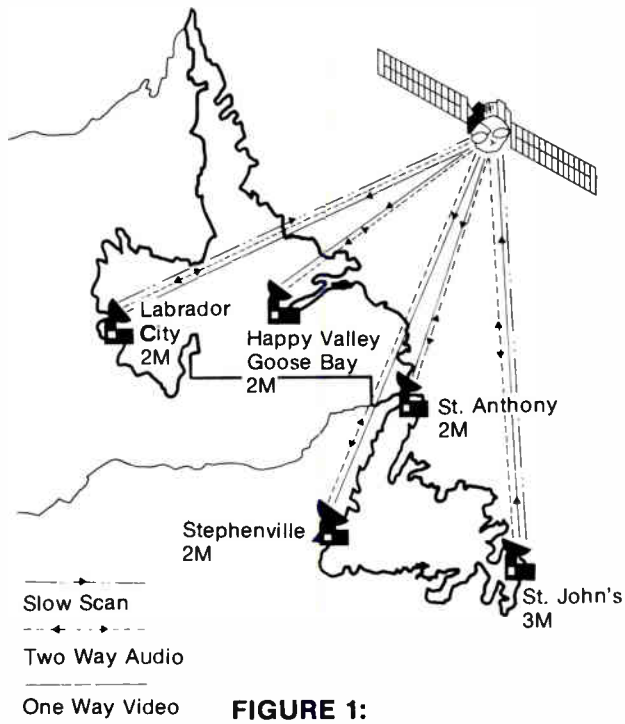

FIGURE 1:

Map of Newfoundland and Labrador showing Broadcast Configuration for Telemedicine Project.

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Q During discussions about cross-modulation distortion in CATV systems, the impact of horizontal oscillator stability in the local origination equipment has been mentioned. How can that affect cross-modulation distortion?

A The horizontal oscillator stability in local origination equipment does not have any effect on the amplitude of the cross-modulation distortion. It can, however, make the distortion more or less perceptible. If the interfering channel sync rates are steady as compared to the viewed channel, then the resultant interference is stationary and not readily perceptible. If the interfering sync rates are varying, then the resultant distortion appears as a moving interference in the form of windshield wiper or flicker and is more perceptible, even though the amplitude of the distortion is equal in both cases.

Q In my system, the cable channel levels vary in amplitude while the pilot carriers are very stable. What is the problem?

A Check or monitor the pilot carriers at the headend. If they are not stable and varying, the corrective action of the automatic amplifier will result in opposite charges in the cable channels. For example, if only the pilot channel fades 1 dB, the first automatic station will compensate by increasing the station gain by 1 dB to maintain a constant pilot carrier output level. The cable channels will then increase in level by 1 dBmV.

Q What is composite triple beat?

A We traditionally think of cross-modulation distortion as the limit on the output ratings of amplifiers. However, in systems of 21 or more channels, another form of distortion limits the output ratings of the amplifier and the systems. Consider a distortion product generated by three carriers, $f_1 + f_2 - f_3$. In a 35-channel system, there are 334 individual distortion products generated at or near the picture carrier of channel 10. The sum or composite distortion products produce a more visible or stronger interference than the cross-modulation interference. This form of distortion is commonly called "composite triple beat."

Q I have been told that the installation and adjustment of an amplifier is dependent on temperature. Can you elaborate on this statement?

A The basic layout and operational levels of a CATV system are based on data referenced to 70 degrees F. The system is designed to offset signal changes resulting from temperature changes. Automatic stations, in particular, are employed to compensate for expected changes.

If a manual station with no corrective thermal circuitry is installed, the gain shall be set as per 70 degrees F layout. If the temperature is 100 degrees F and the 70 degrees F gain is used, the output levels will be reduced accordingly. This is required to maintain a predictable signal variation range at the automatic station. Improper manual station settings can upset this range.

If a manual station with corrective thermal compensation is employed, consult with the manufacturer for level setting versus temperature procedure.

If an automatic station is installed, then the output levels must be identical to 70 degrees F settings—the reserve gain setting is the critical item. At 100 degrees F, the reserve gain is less than at 70 degrees F. At 0 degrees F, the reserve gain is more than at 70 degrees F. Consult the manufacturer for gain setting versus temperature information.

Q Is the gain of an amplifier related to its cross-modulation rating?

A Only casually! This common misconception was started and carried on because normally higher gain amplifiers are operated at higher levels. The final stage of a properly designed and operating amplifier will be the primary contributor to all the odd harmonic distortions.

This is true because the intermediate and input stages are operated at significantly lower levels. Therefore, even if they have lower output capabilities, their contribution to the overall distortion will be low. This does not mean that a low level input stage cannot fail in a way to cause distortion or that replacing a preamp stage with an improper part cannot cause a problem.

The ideal situation is to fully test any amplifier that has been repaired before returning it to service. If this cannot be done, be sure to use parts supplied by or recommended by the original manufacturer or one of the qualified repair houses. If the equipment is fairly old, parts are usually available that can actually improve performance, but they are usually not at your local electronics hobby shop.

Q What is the proper way to test the return loss on CATV equipment?

A It depends on what is being tested and what the test is supposed to show. There are actually two separate tests which are run in the same way but have different meanings. The "fixed bridge" test actually measures return loss or reflected power relative to a fixed impedance (for CATV this is usually 75 ohms, but not always.) This test measures the device's ability to absorb power from, or launch power into, a system that has an impedance equal to the desired value.

The other test is structural return loss. This test is intended to measure a component's ability to maintain its own characteristic impedance across all frequencies to be used. This test is a very sensitive way to measure the small periodic problems in coaxial cable which can cause very narrow bandwidths to be lost. The important thing to remember is that the tests are different and whichever test is appropriate for the equipment being tested should be used.

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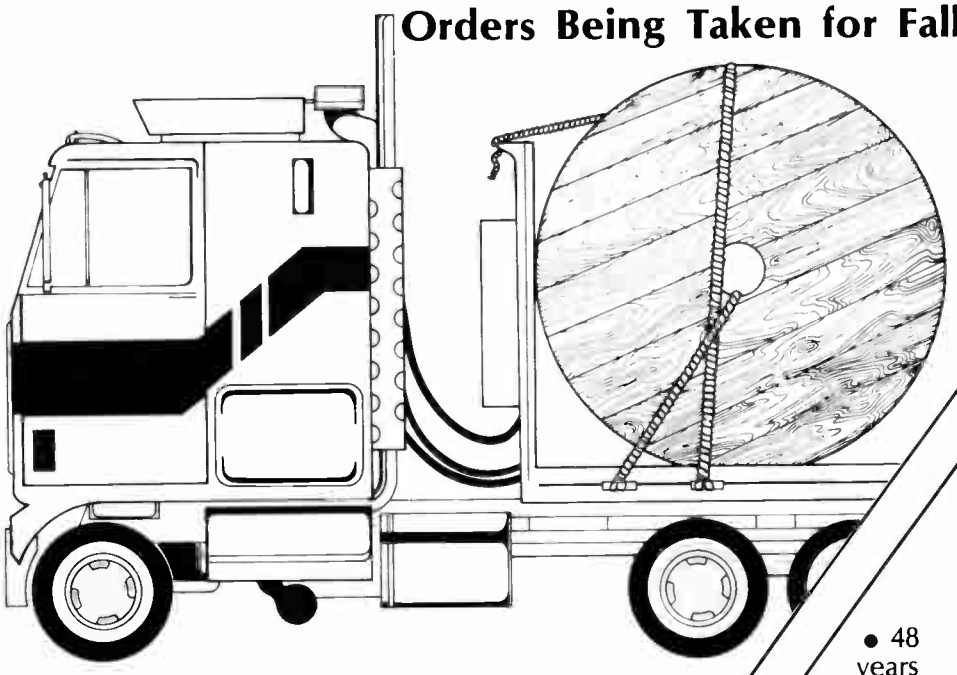

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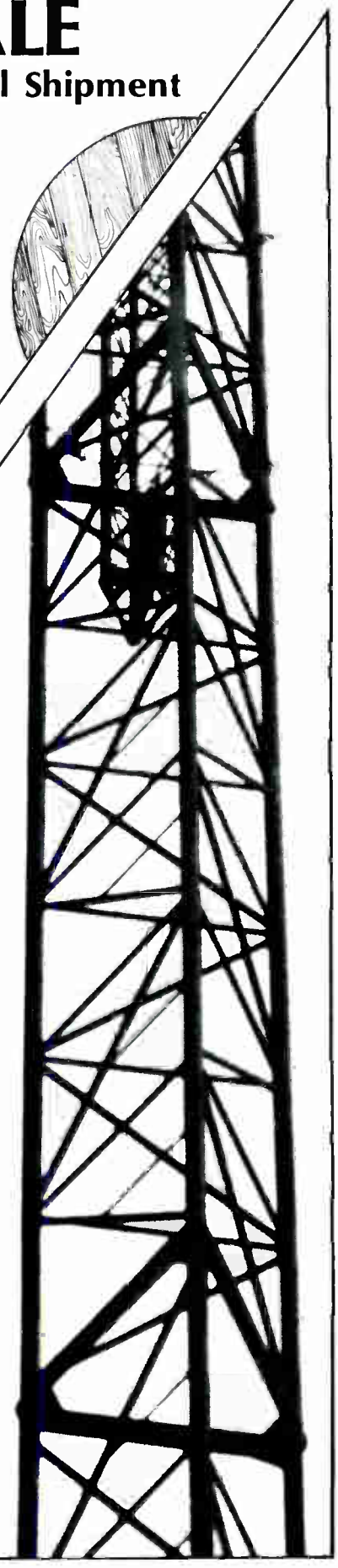

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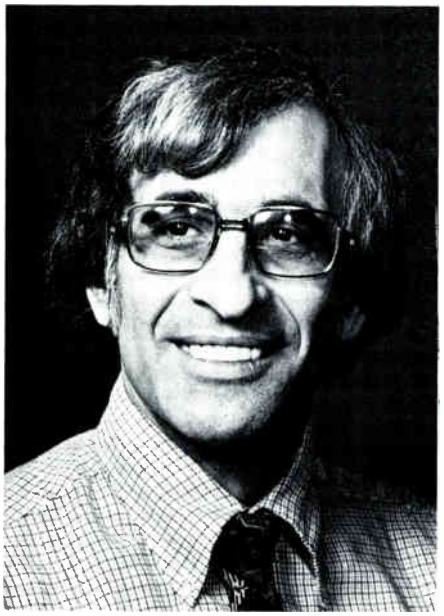
★ **Joseph J. Proietto** has been named manufacturing engineer at **Magnavox CATV Systems, Inc.** Proietto, who has been with Magnavox since 1971, formerly served as a foreman.



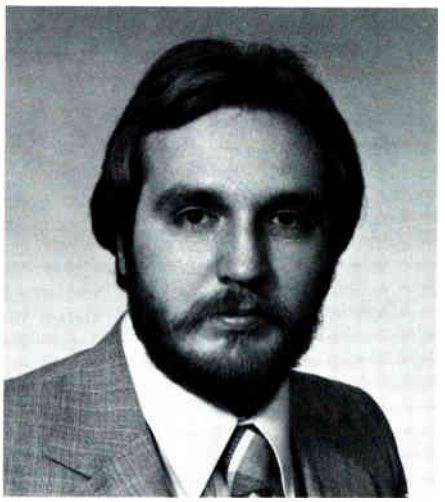
Joseph J. Proietto.

★ **Michael McKeown** has joined **Liberty Communications, Inc.,** as operations manager of the Portland, Oregon cable system now under construction. McKeown, who joined Liberty in April, was formerly on the corporate engineering staff of Cox Cable in Atlanta, Georgia. His new activities will include management responsibility for new construction, plant operations and engineering.

★ **Daniels & Associates, Inc.**, nationally operating cable television firm, headquartered in Denver, recently announced the appointment of **Christopher Barker** as vice president — Engineering and the promotion of **Charles Jenkins** to the newly created position vice president — Engineering for Daniels Cablevision, Inc. Jenkins will be headquartered at Carlsbad, California, and will supervise construction of the new Carlsbad system and the engineering and design of the company's expanding southern California operations. Barker, who will be located at the company's Denver corporate headquarters, will assume engineering and construction responsibilities for all systems outside of California.

★ **Patrick G. Kindred** has been appointed operations manager for CATV Operations, **GTE Sylvania Incorporated.** Kindred, in the newly-created position, will be responsible for planning, coordination and control of the company's manufacturing facilities. He will be stationed at the company's El Paso headquarters, and will report directly to David Cowden, general manager. Prior to joining the CATV Operations, Kindred was associated with GTE Lenkurt for eight years. He was production control manager of that company's Albuquerque manufacturing plant until this appointment.

★ **Robert Montplaisir** has been appointed regional engineer covering **Continental Cablevision**'s Dayton area, North and South systems. Montplaisir's responsibilities include overseeing all engineering aspects of the Miami Valley Region. Prior to Montplaisir's promotion, he has been a chief technician for several of Continental's New England systems, as well as an area general manager for New England Cablevision.



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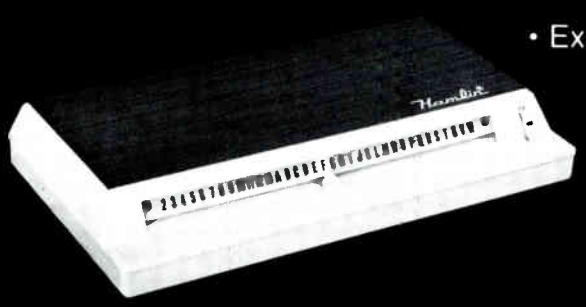

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