C-ED

SCTE Reliability Conference

Grounding and Bonding
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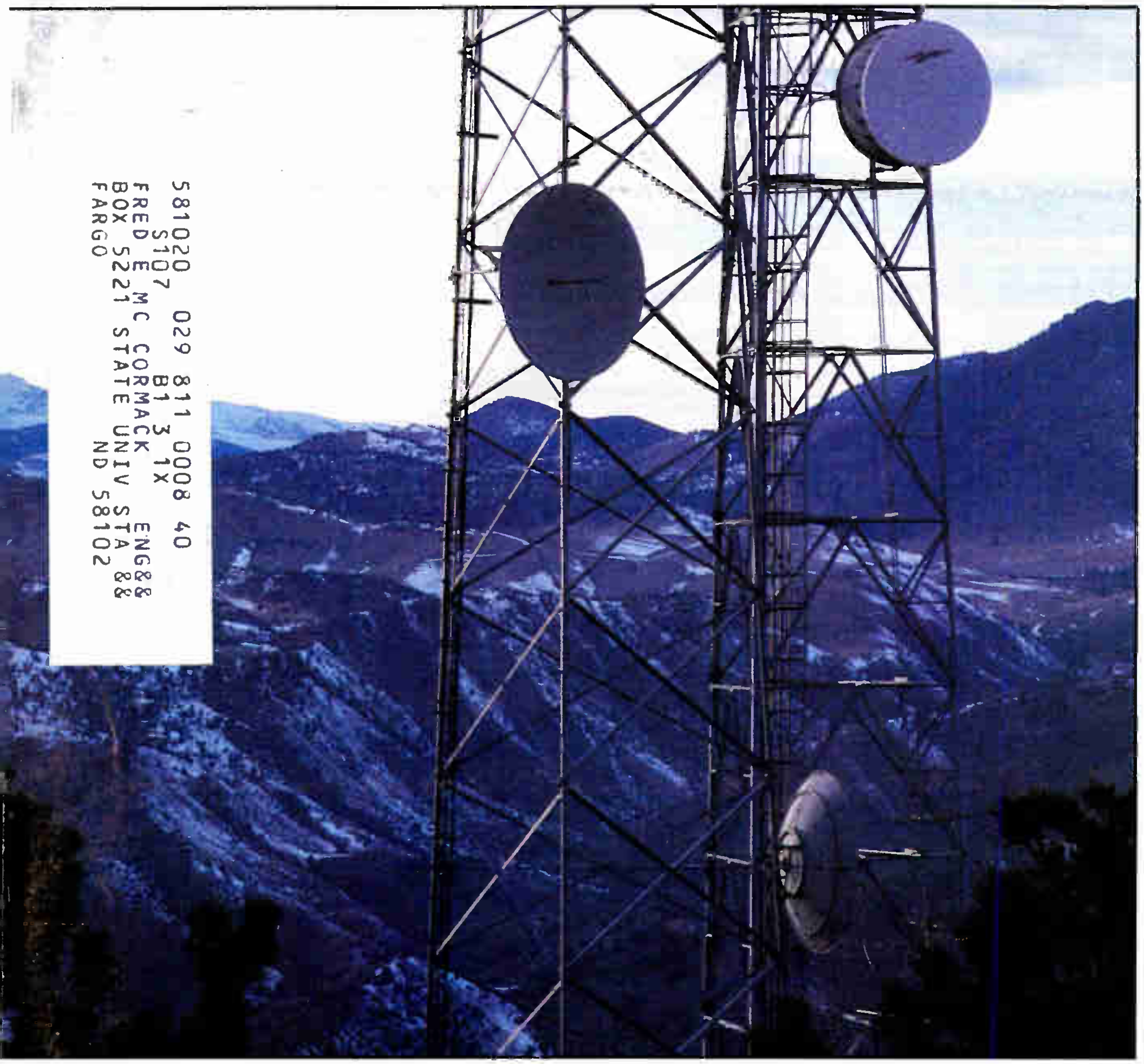
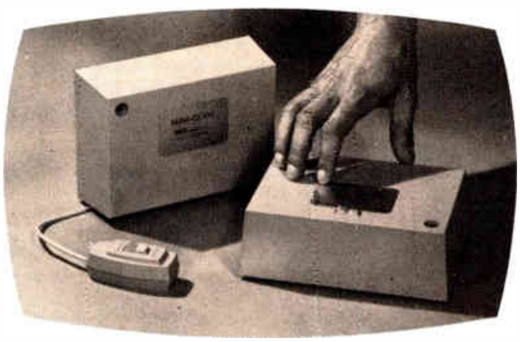


Communications-Engineering Digest
Reporting the Technologies of Broadband Engineering

March 1979
Volume 5, No. 3

OAK PRESENTS THE MINI-CODE NEWS

Oak CATV Division has announced the new Mini-Code—an effective and economical answer to CATV and MDS premium needs.



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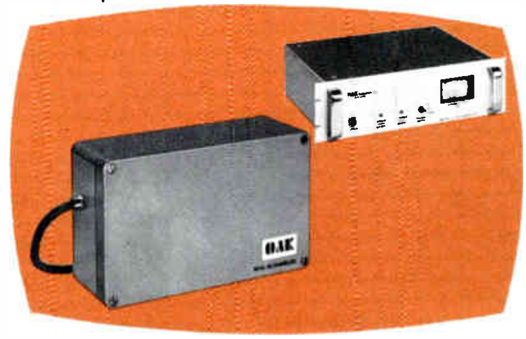

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C-ED News at a Glance

A SPECIAL UPDATE REPORT ON RULEMAKINGS AND INQUIRIES

AM Stereo. Proposal for standards for AM stereophonic broadcasting to consider, among other things, the effect of an AM stereo signal on adjacent channel protection ratios, skywave service, out-of-band emissions, directional antenna operation and the compatibility of AM stereo signals with existing monophonic receivers. Comments February 27, replies March 30. Docket No. 21313.

FM Quadraphonic. Further notice of inquiry on establishing standards for FM quadraphonic sound transmissions. Comments April 16, replies May 16. Docket No. 21320.

Improved UHF Television Service. Inquiry to analyze the many possibilities for improved UHF television service to determine which of several approaches for improving UHF television would best serve the consumer and the overall public interest by analyzing the costs and benefits of particular improvements. Comments April 2. Gen. Docket No. 78-391

TV Receiver Performance Standards. Inquiry into the need for incorporating television receiver performance standards into the rules. Comments June 1; replies September 1. Gen. Docket No. 78-393.

Improved UHF Television Service. Inquiry to analyze the many possibilities for improved UHF television service to determine which of several approaches for improving UHF television would best serve the consumer in the overall public interest by analyzing the cost and benefits of particular improvements. Comments April 2. Gen. Docket No. 78-391.

Expansion of Program Definitions. Inquiry to consider broadening the program definitions for commercial broadcast stations to include a new "community service" program category—noncommercial programs produced by or in conjunction with nonprofit organizations—and to expand public affairs programing to include dramatizations of local, national and international affairs produced on a noncommercial basis by nonprofit organizations. Comments February 28, replies March 28. Docket No. 78-335.

Deregulation of Domestic Earth Stations. Inquiry to examine costs and benefits of the domestic satellite receive-only earth station regulatory program to determine whether the present program can be improved or eliminated in light of the technical and policy changes that have been and will be occurring in satellite communications. Docket No. 78-374. Comments and reply dates will be announced later.

Reporting of Common Carrier Lobbying Expenses. Inquiry into whether the FCC should require common carriers to report lobbying expenses, in a response to a rulemaking petition filed April 1, 1977, by Common Cause, a Washington-based public interest group. Comments February 15, replies March 15. Docket No. 780373.

Electronic Computer Originated Mail. Inquiry to study the legal and policy issues posed by Electronic Computer Originated Mail (ECOM) as proposed by the U.S. Postal Service. Initial comments and briefs are due February 15; oppositions by March 11 and replies by March 18. Docket No. 79-6.

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SCTE Moves Forward

By Judith Baer
SCTE Executive Director

With this issue of *C-ED*, I'd like to take a moment to comment on the 1979 slate of officers who will assume their responsibilities at the SCTE membership meeting in Denver. The president's gavel will pass to the fourth president elected during SCTE's eleven year history. Bob Bilodeau, president since 1974, will serve as chairman for one year, but the responsibility for the next twelve months will rest in the hands of Harold Null, our incoming 1979 chief officer. Bilodeau will concentrate on his involvement with the New Jersey Cable Television Association, the IEEE and NCTA committees he serves on and his local Lions Club, so don't think he's out to pasture. If he brings one-half the enthusiasm and hard work to any one of these groups that he has shared with SCTE, he will have contributed more than most would ever be willing to. It's that sort of participation that rounds us out and makes us contributing citizens within an industry, a community, an organization and the world in general. Bilodeau has done it all and deserves the respect he has built throughout his tenure as president of SCTE.

So, what about the new officers? What can we expect from them? How do they view SCTE's involvement in the industry? Will things change drastically? Don't count on it. At least not during the immediate next year. The reasoning is sound.

Null, along with Frank Bias, Bill Ellis, Ken Gunter and Tom Olson, brings the experience of serving as a director on the SCTE board and each of these officers has actively participated in SCTE events and programs over the last year. Continuity is an important part of any organization and it is ensured with the promotion through the role of director and officer within this structure. Lines of communication may vary slightly and more new names and faces will surface in 1979. That is healthy for our organization and healthy for our industry. Larry Dolan, as chairman of the Nominations Committee for 1979, shared the following with me. "This has been a fantastic experience," says Dolan. "Two years ago we (SCTE) could have stood in the middle of the NCTA exhibit floor (45,000 square feet and 5,000 people) and begged for people to participate in SCTE. In 1979 my phone is ringing off the hook with people wanting to run for the board. Things have really changed for us and I didn't realize how much until working on these nominations."

Larry's observation is correct. Glenn Chambers wrote of new projects in last month's SCTE Comments on this page. An increasing willingness to be involved is noticeable from our membership. Harold Null expresses it, as do the rest of the officers in their acceptance of their roles as officers. And, every officer and candidate for the open director seats has the total support of their individual company management to participate within our guidelines. That is as important a note as the increasing numbers of members, programs or any other measuring device used to determine SCTE growth.

Somewhere within the nearly 800 new members who joined SCTE in 1978 is the SCTE president to be elected in 1982 or beyond. Among these enthusiastic engineers, technicians, managers, operators, marketing people and administrators there is the entire board of directors by 1985. There will be more new names and faces appearing as the younger people mature and prepare themselves to take the engineering and management decision-making positions. Our industry will evolve to interface with other broadband delivery systems and computer technologies, and SCTE will recruit from those groups as well as from the classic cable television systems. Membership in SCTE will be representative of our industry's evolution in telecommunications.

Your 1979 officers and board are dynamic. You are fortunate to have this group of men to move SCTE into its second decade. They look forward to knowing your thoughts. It is up to you to communicate with them at every opportunity. I look forward to working with them and expect exciting things to happen under their direction.

Gunter and Haimowitz Share Member-of-the Year Award

WASHINGTON, D.C.—Nineteen seventy-nine marks the first and possibly the only time in SCTE history when the Member-of-the-Year Award is a shared honor between two very dynamic and enthusiastic SCTE representatives. As SCTE moves into its second decade, it is appropriate that Ken Gunter, executive vice president of UA Columbia Cablevision and Ralph Haimowitz, general manager and chief engineer of Indian River Cablevision, share the spotlight. These men have spent countless hours of personal time and effort to promote the Society of Cable Television Engineers and to establish and maintain communications and understanding on behalf of the Society and the two cable television industry trade associations. Each is a member of the board of directors of the association. Each has moved up with the "ranks" of his company's management structure. Both have participated on committees, spoken on behalf of SCTE, attended numerous meetings and taken a responsibility to see that SCTE is properly understood within the usual bureaucracies and politics of each group. Both men are technically qualified and understand that sometimes engineers and technicians respond a little differently under given circumstances. These men believe that the cable television industry will go nowhere without sound engineering, much required training and improved understanding and communications, not only between the engineers and technicians, but between the engineering personnel and all other parts of this or any other business. Neither believes that "engineers are different" and neither assumes the "special" posture technical people are so often accused of showing. Both men are involved in community activities and both are special.

The SCTE Member-of-the-Year Award was originated in 1974 as an annual award to a member who had made a significant contribution toward the Society's goals and presence in the industry. Steven Dourdoufis was the first recipient. James Collins was the 1975 winner for his efforts in promoting SCTE in the southeastern part of the United States. Glenn Chambers received recognition in 1976 as the

Kenneth S. Gunter

Kenneth S. Gunter has been a lifetime resident of his birthplace, San Angelo, Texas. Following graduation from Rice University, Houston, Texas in 1958, Gunter joined his father in the organization of the original cable televison system serving San Angelo, a privately-owned company. In 1961, this company became one of two principal properties of International Cablevision Corporation, the first publicly-owned CATV company in the industry.

He presently is executive vice president and a director of UA-Columbia Cablevision, a parent corporation which resulted from the acquisition of UA Cablevision by Columbia Cable Systems in December 1972. He is a Senior Member of SCTE, has served as a member of the SCTE Board of Directors and will assume the office of Secretary at the SCTE/IEEE CATV Reliability Conference, February 27, 1979. Gunter is chairman of the National Cable Television Association Engineering Committee, a member of the NCTA Communications Act Rewrite Technical Subcommittee and a member of the NCTA Board of Directors.

Gunter has served SCTE through his participation as a member of the NCTA Board of Directors, successfully communicating SCTE's goals and philosophy to the association staff and to other board members. He has negotiated, lobbied, challenged and counseled both the NCTA board and the SCTE directors. He has encouraged cooperation, understanding, and communications between NCTA and SCTE. He does not take sole credit for any single accomplishment but rather shares each positive milestone with members of his committee and NCTA personnel participation. He is always mindful of SCTE's image and the requirement to encourage improved communications with management. He practices this philosophy with his own employees and demands excellence from them while promoting a sound engineering-management partnership. While Ken Gunter may not be able to attend every SCTE technical meeting around the country, he is called upon to attend numerous engineering meetings in his role as chairman of the NCTA Engineering Committee. His participation as an NCTA director requires much of his time and attention, while thinking about SCTE in all of these encounters.

Ralph A. Haimowitz

Ralph A. Haimowitz is the general manager and chief engineer for two cable television companies in central Florida: Indian River Cablevision in Sebastian and Palm Bay Cablevison in Palm Bay. He came to the cable industry in 1972 as chief engineer and was appointed general manager in April 1974. Before joining the CATV industry, Haimowitz served in the United States Air Force in various communications projects. His responsibilities now cover approximately 3,000 subscribers.

Haimowitz' philosophy is involvement. He has quickly established

Member-of-the-Year for his work in the Northcentral Chapter and for his contribution of many valuable pages of copy on the FCC proof-of-performance tests when this information was practically non-existent. In 1977, Frank Bias was honored for his participation in the all-important interference negotiations with the FAA, FCC and other imposing regulatory groups. Then, in SCTE's Tenth Anniversary year, Jim Grabenstein received the Member-of-the-Year Award for his work with the Mid-Atlantic Appalachian Chapter of SCTE and the state cable associations in his area. Grabenstein was instrumental in staging monthly technical meetings, the only regularly scheduled SCTE activity anywhere in the country. He had accomplished something no one anywhere had been able to do.

SCTE's Member-of-the-Year Award is presented for accomplishments rather than for promises of future performance. It in no way dilutes the honor for the 1979 award to be shared by two members. The likelihood of this happening again is not great, just as the likelihood of SCTE again going through the experiences of the past ten years is not great. Putting all events in perspective, these two members have provided a great boost to SCTE's maturity and position as an important part of the future of this industry.

himself as a known doer, and in the relatively short time he has spent in cable, he has participated in numerous projects in behalf of SCTE and the Community Antenna Television Association (CATA). As a member of the Board of Directors of CATA, Haimowitz has encouraged understanding and cooperation between SCTE and the industry trade association. He has championed SCTE throughout the southeast through the Florida Cable Television Association and the Southern Cable Televison Association. Haimowitz willingly agreed to chair a jointly sponsored SCTE-CATA technical meeting in January of 1978, the first such program. Again in 1979, he developed the program and was the SCTE local contact for the successful SCTE meeting on Towers, Lightning, Power and Surges in Melbourne, Florida this January. He was solely responsible for the SCTE technical program at the 1978 NCTA convention in New Orleans and hosted as panel moderator SCTE's program on Power and Surge Protection during the 1978 Southern Cable Television Association convention in Atlanta.

He was also instrumental in the installation of the 11-meter earth station at the 1978 CATA CCOS Show in Oklahoma. During that major effort, Haimowitz is a well-known amateur magician, story-teller and promoter of humor. When things seem their bleakest, he has a kind word and a laugh hidden somewhere. He has lobbied effectively for SCTE within the CATA board of directors to improve SCTE-CATA relationships. While active on CATA's board, Haimowitz maintains a dual membership for his system with NCTA, believing that each organization contributes to the future of this industry. As a candidate for the SCTE Region 5 seat in the 1979 elections, he won complete support of his company for his further participation in the Society and again, showed his willingness to be involved. He was promoted to Senior Member in 1978.

Dr. Barry Gordon, president of the Sebastian River Chamber of Commerce reflects on Haimowitz as a member of that board of directors. "One member of the board perhaps stands out above the rest in his dedication to the job. His name is Ralph Haimowitz. Mr. Haimowitz has, on every occasion, met all demands placed on him. His ability and desire to take hold of projects and see them through to complete perfection is uncanny." SCTE agrees. The Society sees Haimowitz in exactly the same way and cannot state it better.

SCTE Cable Engineers Announce Regional Meeting Date and Site Schedule Through 1981

WASHINGTON, D.C.—The SCTE plans a minimum of six regional technical meetings and workshops each year during 1979, 1980 and 1981. All meeting dates, sites and hotel arrangements have been negotiated during 1978 in order to insure the best possible rates for people attending these programs.

Topics planned for these meetings include CATV Towers, Lightning and Power; CARS Microwave; Test Equipment; Non-Entertainment Services; Earth Stations and Satellite Networking; Manpower, Personnel Evaluation and Management Development; CATV System Construction; Fiberoptics; New Services; CATV System Security; and Two-Way Cable Communications.

Sites and dates for the first series: March 5-6 at Del Webb's Townhouse in Phoenix, Arizona; April 23-24 at the Portland Hilton Inn in Portland, Oregon; June 18-19 at the Radisson South in Minneapolis; August 20-21 at the Logan Airport Hilton in Boston, Massachusetts; and September 17-18 at the Marriott Twin Bridges-National Airport in Arlington, Virginia.

SCTE's second round of meetings begins November 26-27, 1979 at the Hartford Hilton in Hartford, Connecticut. On January 14-15, 1980 the site is the Tallahassee Hilton, Tallahassee, Florida. March 24-25 are the dates for a technical meeting and workshop in Richmond, Virginia at the Hyatt House. The Rodeway Inn in Boise, Idaho is the site for the May 19-20 meeting. On July 14-15 SCTE meets at the Hilton Inn in Wichita, Kansas and on November 17-18 the series concludes at the Hyatt Hotel in Phoenix, Arizona.

The 1981 series of SCTE regional meetings and workshops begins on January 12-13 at the Hilton Inn-Bossier in Shreveport, Louisiana. May 4-5 are the dates for the technical meeting at the Holiday Inn-Downtown in Portland, Maine and on June 15-16, SCTE will hold a meeting at the Baltimore Hilton in Baltimore, Maryland. August 17-18 are the dates for the SCTE meeting at the Washington Plaza Hotel in Seattle, Washington. Louisville, Kentucky and the Executive Inn is the site for the October 19-20 technical meeting and workshop and the 1981 schedule ends November 16-17 in San Antonio, Texas at the Holiday Inn-Downtown. For further information, contact Mila Albertson, Director of Membership Services, SCTE, 1100 17th Street Northwest, Washington, D.C. 20036, (202) 659-2131.

New Membership Cards

WASHINGTON, D.C.—All SCTE members will have been issued a new plastic membership card by February 10. This new card will feature a member's name, address, membership classification and date of expiration.

The new card may be used to have suppliers forward brochures to a member, since SCTE will have supplied all the exhibitors with a local source for imprinters and a special card that will let the exhibitors know you're an SCTE member.


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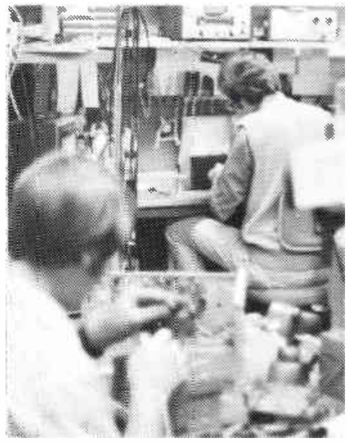

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Cable Copyright Hot Spot, Geller Speaks Up

WASHINGTON, D.C.—NTIA and the Department of Commerce have submitted a request for rulemaking to the Federal Communications Commission, seeking a two-tiered structure of cable television regulation.

The first tier, designed to preserve some continuity for existing systems, amounts to a grandfathering provision which would give systems the option of operating under regulations as they currently exist, and paying copyright under the scheme established by the Copyright Revision Act.

The second tier, however, would provide that new systems, as well as existing ones which so desire, receive substantial relief from existing regulations in exchange for competing for product in the open market—including all of the copyright and exclusivity negotiations such a step would unleash.

Program producers and owners would then have the opportunity to place their product on the market and determine the nature of its use and charge for it accordingly. A supplier would be free to determine if his product could be re-sold, or retransmitted, and would also be able to have more control over exclusivity.

NTIA is convinced that the Copyright Tribunal is not designed or equipped to deal with the economic complexities embodied in program distribution.

NTIA Chief Henry Geller asked that the rulemaking impose the requirement that cable operators obtain "retransmission consent" for non-network programming in return for being relieved of most federal regulations.

Another option would allow existing systems to choose to remain under the regulatory umbrella, including copyright liability which presently exists.

Geller's proposals are receiving mixed reactions in Washington. Other suggestions by Geller include continued limitation on distant signals with extensive non-network exclusivity rules, and retaining rules for local broadcast carriage and non-duplication of network signals.

Inquiry Initiated on TV Receiver Performance Standards

WASHINGTON, D.C.—The Federal Communications Commission has initiated an inquiry into the need for incorporating television receiver performance standards into its rules.

The FCC stated that UHF noise figure and peak picture sensitivity are the only requirements now present in its rules that give some measure of the picture quality produced by the receiver.

The commission pointed out that noise figure is only one of many parameters that affects receiver performance.

Based on data from a recent study which suggested that noise figure did not consistently predict the apparent sensitivity of the receivers tested, the FCC said it would look into other available or technically feasible weak signal performance to identify alternative measures that could supersede present requirements.

Because of concern that reducing the noise figure might lead to certain design changes that would degrade other receiver performance characteristics—selectivity, front and dynamic range, etc.—the commission said it would also consider additional performance standards complimentary to noise figure.

FCC Establishes UHF Comparability Task Force

WASHINGTON, D.C.—The commission has established a UHF Comparability Task Force and initiated an inquiry to analyze the many possibilities for improved UHF television service.

The FCC stated that parity between UHF (channels 14-83) and VHF (channels 2-13) television was not an end in itself, but a means for accomplishing other goals such as increasing the number of UHF TV viewers.

The commission said larger UHF audiences should cause an increase in the revenues and profits of existing

(Cont'd on page 23)

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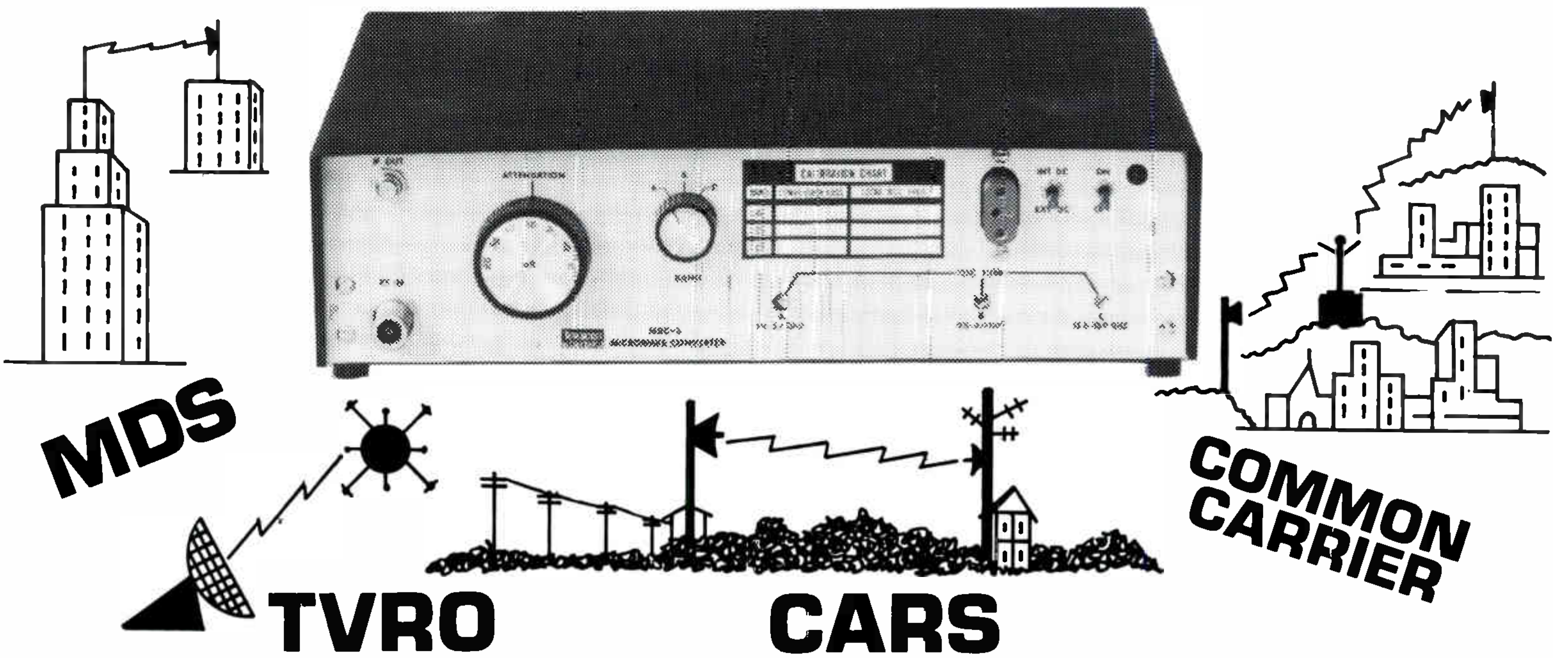

Texscan's microwave down converter permits measurement in the MDS (2.1 GHZ) TVRO (3.7 GHZ) and CARS (12.7 GHZ) band with existing VHF test equipment. Spectrum analysis, signal strength and even microwave sweeping are possible with the MDC-3.

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Has CPB Pulled A Fast One?

By Pat Gushman,
Washington Bureau Chief

At one fell swoop, the FCC has approved nearly 200 earth stations for use by noncommercial radio. Do CPB and NPR know something cable doesn't, or will this industry soon be getting the same kind of treatment?

Following a plan formulated by the Corporation for Public Broadcasting and National Public Radio, the Federal Communications Commission has authorized construction and operation of domestic satellite earth stations as a part of a system to interconnect approximately 192 noncommercial radio stations throughout the United States, Puerto Rico and the U.S. Virgin Islands. The necessary channels of service will be provided by Westar.

When fully implemented, the system will incorporate about 177 receive-only earth stations. Each earth station will be equipped to receive four audio program channels of 15 kHz bandwidth, a pair of which can be made to distribute stereophonic channels. The system will have the capacity to distribute 12 audio channels simultaneously and four of which can then be selected by the earth station operator.

The earth stations will be licensed to the individual operators with the exception of the main origination terminal (MOT) licensed to the Public Broadcasting Service and located adjacent to the uplink built by the Cable Satellite Public Affairs Network near Washington, D.C. In addition to the MOT, up to 15 transmit/receive 4.5-meter antennas also will be included to provide regional origination. The remaining receive locations will be served through the cooperative use of existing ten-meter earth stations now authorized as part of the PBS/CPB television program distribution system, or by means of the newly constructed receive only stations.

The MOT (WD35) will be modified with additional transmitters, receivers, monitors and associated equipment to enable NPR to use the existing 11-meter antennas now licensed to PBS. NPR also plans to construct a transmit/receive 4.5-meter antenna for additional flexibility. The costs for implementing the plan are estimated at approximately $16.6 million.

Officials at NPR and its members across the country are extremely excited about the prospects. And, it has been suggested that the aggressiveness of noncommercial radio might provide greater impetus to the cable industry to go along with a marriage of cable and public broadcasting sought after by the Administration, NTIA and some CPB directors.

FCC Commissioner Joseph R. Fogarty referred to the multiple grant of licenses for the project, though similar to what happened with respect to public television stations, a "milestone in telecommunications."

"The commission's disposition of these applications also demonstrates," Fogarty said, "meritorious flexibility in its use of streamlined regulatory procedures to allow review of the CPB/NPR proposal without the unnecessary requirement of repetitive financial and technical showings for each of the 192 earth station applications."

When this got around, *C-ED* heard from callers wondering if CPB had pulled a fast one. Granted radio is not television. And when was the last time a single entity filed on behalf of 177 applicants at one whack? The answer again is CPB which had accomplished basically the same thing with its receivers for the noncommercial television stations carrying PBS. But, rather than "pulling a fast one," CPB and NPR have done only what some MSO's have been doing; filing composite corporate financial and supporting materials with their individual applications and saving time and money on paperwork.

So, rather than stretch this CPB/NPR thing to the limit, let's just hope the rhetoric applied to the creation of this new radio network is indicative of what is to come from the commission's new inquiry into the general deregulation of earth stations (CC Docket 78-374). By the way, March 23 is the deadline for filing initial comments in this proceeding.

(Cont'd from page 20)
UHF stations, encourage the establishment of additional new stations, increase the number, quality and diversity of television programs available, and encourage other goals such as local programming and minority ownership and operation.

The FCC said a fundamental assumption of the inquiry was that viewers considered the technical aspects of UHF reception to be inferior to VHF reception. A second assumption was that UHF viewer satisfaction would rise and the audience for UHF programs would increase if UHF picture quality were equal to VHF quality.

In evaluating the cost versus benefit of improvements to UHF reception, the Task Force will develop information for a wide range of criteria, including:

- Technical feasibility of the improvement.
- Increased viewer satisfaction.
- Effect on immediate and long-term licensee viability.
- Cost to manufacturers and consumers.
- Impact on utilization of the spectrum and on innovation.
- Cost of administering the improvements.

FCC Extends Life of Two Federal Advisory Committees

WASHINGTON, D.C.—The commission has extended the life of the Advisory Committee for Cable Signal Leakage (ACCSL) for an additional two years—until February 1981—and the Radio Technical Commission for Marine Services (RTCM) for nine months—until October 1979.

The ACCSL was established by the Cable Television Bureau last February as part of a cooperative research program to explore propagation mechanisms for leakage signals, maintenance and enforcement procedures and monitoring techniques.

The FCC, in cooperation with the Federal Aviation Administration, the National Telecommunications and Information Administration of the Department of Commerce and the National Cable Television Association, carries out research to provide the necessary basis for rules to prevent harmful interference to aeronautical navigation and safety radio services while, at the same time, permitting cable systems to make maximum use of the aeronautical radio bands. The

ACCSL assists in designing the research plan, monitoring progress of the research and recommending areas for additional study.

The RTCM serves as a national forum for the exchange of views and technical information between government and industry representatives involved in marine telecommunications. It presently is involved in studying future frequency requirements for the Maritime Mobile Service, standards for measuring Loran-C receiving equipment, automated radio telephone systems, numerical identification of stations in the marine telecommunication systems and minimum performance standards for marine omega receiving equipment.

Cable Systems of North Jersey Networking Together For Fund-Raising Cablethon

EAST ORANGE, NEW JERSEY—On February 24th and 25th, the cable television systems in the North Jersey area will be networking together to carry an important event to 180,000 cable households. The event is called, "PANORAMA '79" and will be presented by the Lions Clubs of northern New Jersey and the Electronic Information and Education Service of New Jersey (EIES) to support blind persons through blind assistance programs.

This exciting Cablethon will begin following the Madison Square Garden New Jersey Nets/New York Knickerbocker's cablecast on Saturday. February 24th and will continue for 21 hours to the beginning of the Madison Square Garden New York Islanders/New York Rangers game on Sunday, February 25th. Throughout the course of this Cablethon, show personalities, sports figures, labor representatives and politicians will be appearing to help project the PANORAMA '79 message to the audience. Lion members of District 16A and 16F clubs will be seeking participation, contributions, etc. on behalf of this cause.

The systems participating in the networking of the event are also providing funds, equipment and personnel to the extent of approximately $40,000 collectively, to support the tele-production costs.

The systems involved are: UA-Columbia Cablevision, Morris Cablevision, Sammons Communications, Elizabeth CATV, Cablevision of New Jersey (Bergenfield), Cablevision of New Jersey (Hoboken & North Bergen), Plainfield Cablevision, Cross Country Cable, Vision Cable, Middlesex Cable, CATV Service Company and Suburban Cablevision.

State of Alaska and Robert Wold Company Sign Agreement

LOS ANGELES, CALIFORNIA—An agreement with Robert Wold Company, Inc. to manage Alaska's publicly-funded Television Network Project was signed recently by officials of the company and the state of Alaska, announced company President Robert N. Wold.

Wold also announced the establishment of an Alaska office at 3201 C Street, Suite 201, Anchorage, Alaska 99503. A staff headed by Wold as acting director will include two Anchorage residents.

The agreement embraces several functions vital to the state's unique TV Network Project. Wold will organize and implement the TV Network's program schedule, coordinating with broadcasting stations, cable systems, educational institutions and rural representatives plus national networks and other program distributors.

Wold will also administrate the state's satellite facilities contract with RCA Alascom and provide traffic operations instructions to RCA and to the operator of the Network's program origination center, Alaska Public Broadcasting Commission.

Wold Company will be responsible to Governor Hammond's Office of Telecommunications which has been administrating the TV Project since its inception.

Alaska's TV Network Project, the only such program in the United States, was spawned by a state-funded satellite telecommunications plan begun in 1975 with installation of 100 small earth stations in remote communities and villages, most of which had no telephone service and were badly in need of voice communications. About 40 of the earth stations subsequently have been equipped to receive TV as well as message traffic.

A single channel of TV programming is delivered 12 hours daily via the RCA Satcom II satellite, and this signal is broadcast at each location by specially-licensed ten-watt transmitters known as "mini-TV stations."

Minimum Number of Tuning Positions for a TV Receiver

WASHINGTON, D.C.—The Communications Act of 1934, as amended, requires each TV receiver to be capable of adequately receiving all the 82 channels that the commission has allocated for television broadcasting. [47 U.S.C. 303(s). 330] This legal requirement is carried over into Section 15.65 of the FCC Rules.

Preferably, all-channel reception capability should be accomplished with a tuning mechanism providing either an accurately tuned detented tuning position for each of channels 2-83 inclusive, or pushbuttons making it possible to select each of the channels 2-83 inclusive without adjustment.

This requirement is commonly satisfied with two rotary dials with detents—one for the 12 VHF channels, the other for the 70 UHF channels.

The FCC recognizes that all 82 tuning positions are never required in any one locality and it has accordingly accepted and certified as meeting the all-channel requirement, receivers with less than 82 tuning positions. The commission uses the phrase "tuning positions" to encompass all types of tuning mechanisms—the rotary dial, the pushbutton or a combination of the two.

The VHF dial commonly provides a tuning position for each of the 12 VHF TV channels. If the UHF dial provides less than 70 tuning positions (one for each of the 70 allocated UHF channels), it must provide a minimum of six tuning positions. [47 CFR 15.68(b)(1)] If 12 or fewer UHF tuning positions are provided, each position shall be readily adjustable to any UHF channel by the user without the use of tools. The resetability shall be sufficiently accurate to avoid the need for fine tuning. If more than 12 but less than 70 tuning positions are provided, each position may be arranged to cover part of the 70 UHF channels. However, sufficient overlap should be provided so that a receiver can be set up to receive all the channels that may be available.

PART III

Interfacing Cable Television and Broadcast Subscription Television

By Early D. Monroe, Jr.
Federal Communications Commission
Cable Television Bureau
Policy Review and Development

Parts I and II of Early Monroe's "Interfacing Cable Television and Broadcast Subscription Television" appeared in the 1978 November and December issues of C-ED, *respectively. The first two sections of the article addressed some of the technical, compatibility problems between various types of cable systems; specific hypothetical encoding and decoding techniques which could be proposed by broadcast subscription television; and how interfacing can be accomplished. The last part of this article discusses the circumstances under which piracy can occur, and what can be done to minimize piracy.*

Converter-Cable-System (C-C-S)

As can be seen from Figure 1, the C-C-S system utilizes a set top converter as an input to the subscriber television receiver. The cable converter is a well-shielded unit, containing a tuner which is utilized in place of the receiver's tuner. The Converter-Cable-System is utilized primarily in areas requiring cable systems with large channel capacities, and/or in areas where a number of television broadcast stations furnish strong off-air signals which can be picked up by the television receiver absent the receiver's own antenna. There may be a few C-C-S systems providing subscribers with converters capable of receiving a premium channel, but not yet providing that programming. In such cases the C-C-S operator could simply unscramble the signal at the headend and deliver the signal to interested subscribers on a vacant premium channel. If the system is already offering a premium program service, adding the BSTV premium signal would involve the most difficult interfacing problems and the greatest equipment expense. Additional or modified equipment at both the headend and the subscriber's receiver would be necessary because of the type of decoders and converters currently in use. Most converters now in use only have circuitry capable of decoding one scrambled channel. Therefore, the addition of a BSTV premium signal would necessitate the addition of more unscrambling equipment at the headend and a second piece of equipment, the decoder, at the subscriber's terminal (see Figure 2).

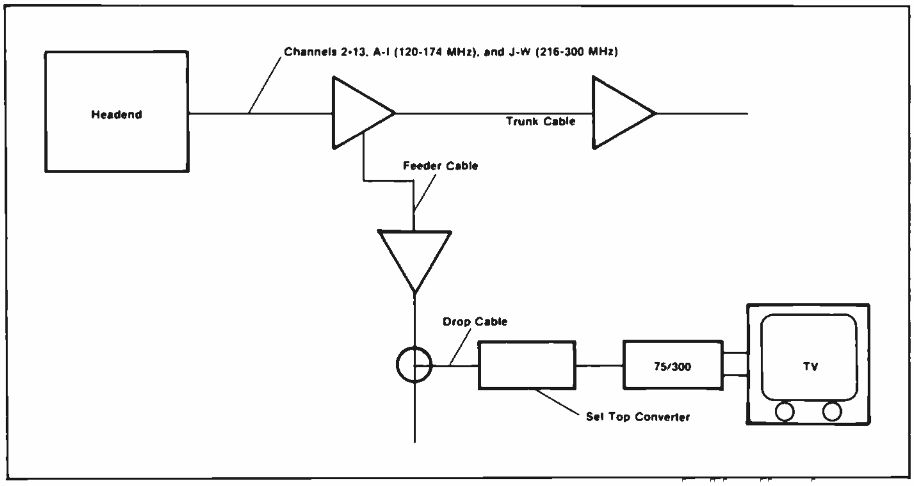


Figure 1

Converter-Cable-System

Carriage and unscrambling of a BSTV premium signal on a C-C-S system can be accomplished by unscrambling at the headend or at the subscriber's terminal. Unscrambling at the C-C-S headend can be accomplished by either: 1) distributing the unscrambled BSTV premium signal on a mid- or super-band channel and furnishing interested subscribers with a special converter on a key and/or card which allows the subscriber to access the mid- or super-band channel containing the BSTV programming; or 2) unscrambling the BSTV premium

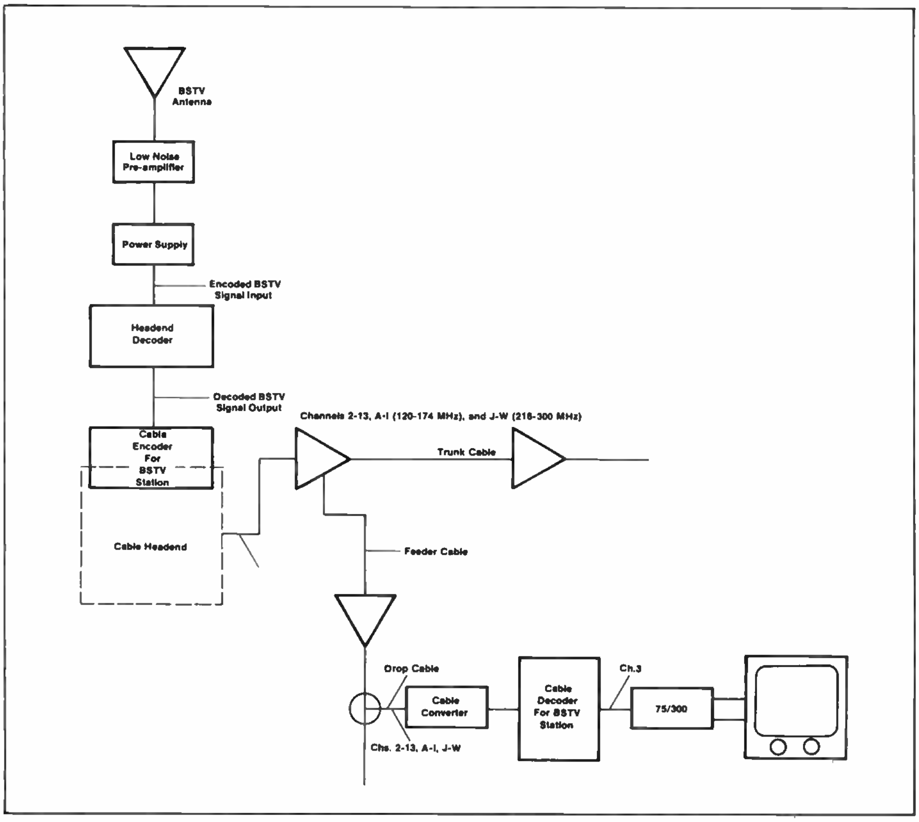


Figure 2

Converter-Cable-System and BSTV Premium Decoder

signal and then rescrambling the BSTV station's premium signal at the cable headend for distribution to subscribers equipped with a BSTV decoder in addition to the cable converter.

Figure 2 indicates how the latter unscrambling method can be accomplished. The BSTV decoder must be placed in series with the cable converter, and the cable subscriber now becomes functionally dependent on the cable converter and the BSTV decoder. The BSTV decoder is transparent and activated only when the decoder switch is tuned to the premium channel. It simply acts as a non-active passive device for all other channels distributed over the cable system. However, the subscriber's access to all television could depend on whether this BSTV decoder operates free of any malfunctions.

The BSTV decoder, installed as depicted in Figure 2 will increase the possibility of signal leakage from all channels, including the BSTV channel, passing through this decoder. While the typical decoder does not contain an oscillator capable of radiating a signal, it must be well shielded to preclude the cable signal from radiating, and simultaneously prevent off-air signals from infiltrating the cable signals to cause interference. Therefore, the problem facing the S-C-N-C and M-C-S-S operators in adhering to the cable technical standard specified in Section 76.605(a)(12) will also face the C-C-S operator. The decoder is equipped with 75 ohm input and output leads similar to the cable converter. The 75 ohm output of the cable converter is attached to the 75 ohm input of the decoder, and the 75 ohm output of the decoder must be connected to a matching transformer which interfaces the 75 ohm decoder to the 300 ohm antenna terminal of the television receiver. A cable subscriber wishing to view the BSTV premium program would tune the cable converter to the channel on which the BSTV signal is being distributed by the cable system, thereby viewing a scrambled signal until the decoder is activated to unscramble the signal.

Off-Air Reception of BSTV Signal by Cable Subscriber

Another alternate way to interface the BSTV premium signal with the cable system is to install a separate BSTV station antenna at the cable subscriber's terminal (see Figure 3). This technique involves installing a UHF antenna at the subscriber terminal where the antenna output lead consists of a 75 ohm coaxial cable attached to a converter/decoder input jack. The converter/decoder unit converts the BSTV, UHF signal to a vacant VHF channel, using Channel 3. The signal is unscrambled by the decoder in this unit and sent through the VHF output terminal.

The converter/decoder VHF output terminal is a 75 ohm coaxial cable. This output lead can then be interfaced with the cable subscriber's receiver through an "A" and "B" switch connected to a 75/300 ohm matching transformer attached to the receiver antenna terminal. This technique allows the subscriber to receive both the cable system service which may include a pay cable channel and also receive the BSTV station premium programming over the same receiver. It does, however, call for a specific installation, maintenance, and service agreement

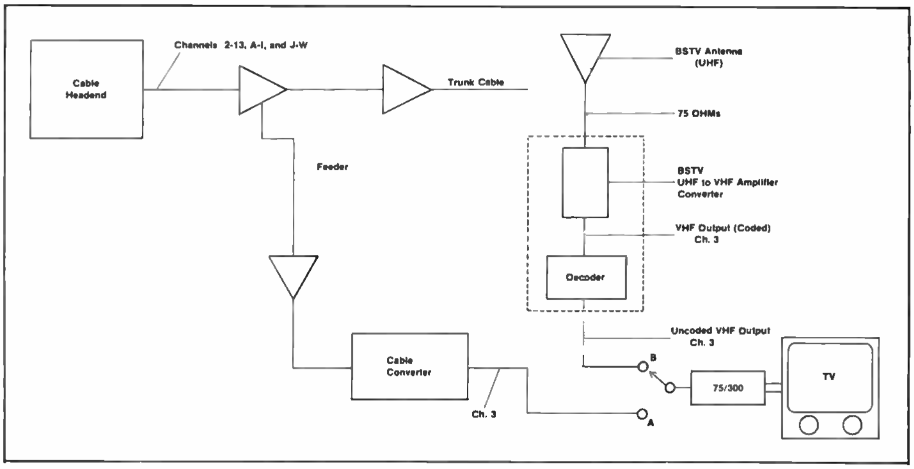


Figure 3

Off-Air Reception of BSTV Signal by Cable Subscriber

between the cable operator and the BSTV station to avoid the possibility of having service delays or conflicts between the two services. The subscriber should in no way be caught between the two services when there is a malfunction or a complaint from a subscriber terminal.

Since both services are using a converter, the converter's output channels may be identical depending on what off-air channel is vacant in the area. Therefore, the BSTV converter/decoder unit must furnish sufficient isolation to prevent reflections caused by open circuited or short-circuited subscriber terminals from producing visible picture impairments on the cable signals.

It is suggested, because of the close proximity of the two terminals, that the isolation be in the vicinity of 50-60 dB for the off-air BSTV system at the cable subscriber's terminal. In addition, the BSTV system radiation must be substantially reduced so as not to cause interference to the cable system or any other receiver off-air reception. The cable system, as indicated above, must not radiate in excess of 20 microvolts per meter at a distance of ten feet from the cable when utilizing channels between 54 and 216 MHz to distribute its programming. It should be pointed out that once this switch is installed and a complaint from an off-air, non-cable subscriber alleges interference, it would be virtually impossible to determine which one of the systems is at fault.

This further demonstrates the necessity for a service agreement between the systems. This BSTV off-air system appears to be compatible with all three types of cable systems regardless of the STV-Model system utilized by the BSTV station. However, in the M-C-S-S system a three-way selector switch would have to be used with a dual cable system.

Multiple BSTV Station In the Cable Community

While the technical compatibility problems of interfacing cable with a single BSTV station are major, these problems become more unclear when two or more BSTV stations placing Grade B signals over the cable community may require carriage on the cable system. The commission on December 15, 1977 adopted a Notice of Proposed Rule Making in Docket 21502 in which it was stated: "Because of the significant interest presently being shown by broadcasters and the public in the operation of BSTV stations and the development of the industry since . . . 1969, we are proposing to consider a change in the 'one-to-a-community' requirement specified in Section 73.642(a)(3) . . ."

Regardless of whether or not the commission amends the "one-to-a-community" rule, cable systems may be receiving two or more BSTV stations with at least Grade A contour signals over their cable communities under the present rule. If the commission decides that cable systems must carry BSTV station's premium programs, additional equipment will be needed at both the cable headend and subscriber's terminal. Since the premium encoding/decoding system discussed herein, as well as those already approved by the commission are not compatible, the subscriber's terminal would have to be modified by either: 1) a decoder, whether connected to the drop cable or connected to a separate BSTV reception antenna for each BSTV station carried on the system

(Cont. on page 31)

ɪm page 28)
ɹested by a subscriber; 2) 3) a new unscrambling unit ıave to be developed and ɔn the market replacing the BSTV decoder as well as the ɔnverter. This multiple pre- ɡnal converter must be capable ving and decoding multiple n program channels at the ɔer's terminal.

ently, the cable converter is pable of decoding one premium d channel. When other premium d channels are carried on the , either: 1) a decoder is added in with the cable converter; 2) a s used to weaken this extra m signal on the non-premium iber's receiver who is not inter- in paying for and/or receiving tra premium signal, or 3) off-air ıa(s) with the appropriated con- /decoder must be installed.

ble systems should assume that re is a potential market for ɔle premium program channels, of their cable subscribers may be g to invest an additional $7.87 per h above their average $7.50 per h basic cable subscription fee $7.87 for the premium cable ram. (This fee was extracted from A's Pay Cable Fact Sheet Informa- Bulletin and represents a "Typical Cable Rate.") This would involve a monthly fee of approximately 24 from those cable subscribers ıing to view at least two premium ɡrams. At this monthly rate, one ıld not expect to have very many tiple premium channel cable sub- bers. However, if the monthly cost premium channel starts to decline a rate where there could be a ential market for multiple premium ɔgram channels from cable sub- ibers, the need for a new converter/ coder unit capable of handling ıltiple premium program channels comes more pressing. In this regard, In this regard, there presently exists number of premium program com- nies attempting to make their prod- ɔt available to subscribers by using, addition to cable systems, other istribution systems, [e.g., Multipoint istribution Service (MDS), Master

29 ntenna Television (MATV) systems, ommon Carrier Satellites and Point- ɔ-Point Microwave, and BSTV sta- ions]. It is conceivable that all the above distribution systems could be offering different premium programming in the cable community and some cable subscribers may request one or more additional premium channels from the abundance of premium channels available.

MDS stations can utilize two adjacent channels in the top fifty markets. The band 2150-2156 MHz is designated Channel 1 and is available in all markets. The band 2156-2162 MHz is designated Channel 2 and is available in the top 50 markets. Therefore, it is conceivable that many cable communities within a 25-30 mile radius of the top 50 markets could be receiving at least two MDS stations offering different programs on each station. As of February 14, 1978 the FCC had granted 169 MDS construction permits throughout the country for Channel 1. There are approximately 360 pending construction permit applications on file and 51 MDS stations licensed around the country.

It appears that a major market area could have the following compliment of premium programs: two MDS stations; two satellite premium program channels (HBO and Viacom are two of the largest national premium program suppliers using satellite); and MATV systems in large apartments, hotels and motels are presently offering premium programming.

With little or no government interference cable systems operating in such diverse premium programming markets are not presently encountering any difficult compatibility/interface problems which are not being handled.

Piracy

Piracy is the curse of any premium program subscription service. Manufacturers are constantly examining new encoding/decoding techniques for their systems to minimize piracy. Nevertheless, piracy continues to occur. It is possible for a BSTV station signal utilizing either the STV Model-1, 2 or 3 system to be pirated. However, pirating may be easier and faster on the STV Model-3 system and much more difficult to virtually impossible on the STV Model-1 and 2 systems, respectively. In any event, pirating the BSTV station's signal by breaking the code used by any of the hypothetical models would involve varying degrees of sophisticated electronic equipment. The equipment involved would probably be beyond the means of even the most competent TV repairman. [Blonder-Tongue in an information brochure entitled *How to Secure Your Pay TV Investment*, estimates that the technician would probably need more than $15,000 of laboratory test equipment and a master's degree in electrical engineering to unscramble an encoded audio and video system using integrated circuits.] Pirating the signal is further complicated when the premium signal encoding is varied from program to program as in the STV Model-1 and 2 systems.

Unscrambling the STV Model-3 system involves the least knowledge of electronics and/or electrical engineering. In the STV Model-3 system, if the interference signal impressed on the normal composite video signal and the intercarrier audio signal can be duplicated, the system can be defeated.

In the STV Model-1 system, which appears to be more secure than the STV Model-3 system, more knowledge of electronics is required to defeat this system. Since this system uses an inversion of the video raster in a fixed pattern, the pattern for the entire vertical frame appears to be during the vertical sync interval and/or is keyed into the horizontal sync period. Therefore, it appears that the circuitry to duplicate the decoder can be constructed by a competent electronic/electrical engineer. If duplication of the decoder and the coded program select ticket can take place, the Model-1 system can be defeated.

The STV Model-2 system appears to be the most secure although it is more expensive. This system provides, simultaneously, features that the Model-1 and 3 systems cannot. The Model-2 system provides the following features simultaneously:

- Scrambling via inversion of some of the horizontal scan lines, producing a fuzzy picture which is unpleasant to watch. This method is undetectable by electrical means. This is not true for the Model-1 and 3 systems.
- Specific program control of video and audio scrambling at the station. This allows the BSTV station to "turn on" or "turn off" a large number of subscribers' decoders every minute.
- Two-way communication is provided by telephone lines. This allows service requests from the subscriber to travel, by telephone interface, to the BSTV station, eliminating the need to make service requests well in advance of premium program transmission.
- The functional dependence of the decoder on the BSTV station's control signal. The absence of a command signal directed at the decoder automatically causes the decoder to become disabled. Therefore, theft of the decoder or failure to pay for service can be countered with a quick disabling of the decoder. This eliminates the need to physically travel to the decoder site.

It appears that unscrambling the Model-2 system can only occur by obtaining a decoder surrepetitiously and then duplicating the command signal from the BSTV station. However, as indicated in the beginning of this section, the BSTV premium signal can be pirated even though the STV Model-2 system furnishes the most security. It appears that individuals who surreptitiously obtain a decoder for the Model-1 and 3 systems would have access to the unscrambled premium programming. In the Model-1 system, it is not difficult to duplicate the insert card. This form of piracy appears to be the primary way BSTV stations premium signals are being pirated. When a BSTV premium program subscriber using a STV Model-1 or 3 decoder moves from one location to another within the station's service area and illegally takes the decoder, these decoders can easily be reconnected at the new location. Therefore, this former subscriber is now able to view the BSTV decoder premium programming without the knowledge of the BSTV station. Illegally securing a STV Model-2 decoder would not automatically allow the person to view the decoded premium programming. It appears, therfore, that pirating can be virtually eliminated when the STV Model-2 system is utilized.

What problem would a mandatory carriage rule have on the cable systems ability to receive a good quality BSTV station signal?

The proposed commission rules regarding carriage of the BSTV station's signal by cable systems have been directed at the station's predicted Grade B contour. On March 21, 1966, the FCC adopted a Further Notice of Proposed Rulemaking and Notice of Inquiry in Docket No. 11279, and invited comments on the question: Would the rules on carriage of signals of local stations over cable systems apply to carriage of BSTV premium programs? Moreover, in a Third Further Notice adopted on December 12, 1968, the commission proposed that cable systems operating within a BSTV station's Grade B contour carry both the coded and uncoded programming of the BSTV station, exclusive of decoding the coded signal at the cable system headend. This Notice also invited comments on a proposed rule which stated that cable systems may not extend the BSTV station's premium programming beyond the station's Grade B contour.

The BSTV station predicted that a Grade B contour is simply that, a predicted contour. It is a statistical tool used by the FCC to define an area where 50 percent of the viewers, having an outdoor antenna 30 feet high, can expect satisfactory reception 90 percent of the time. The Grade B contour reveals nothing regarding the actual availability of a television station's signal in a given area. Actual field strength measurements and/or visual observation are techniques utilized by the commission in the past to determine the actual availability and quality of a television station's signal in a given area. Because of the terrain in certain of situations where communities located only a few miles from television stations have been unable to receive these stations' off-air signals even though the community was well within the station's predicted Grade A and B contours.

In addition, there is no way, absent actual field tests, to determine whether the BSTV station premium signal coverage extends as far as the non-premium signal of a BSTV station. Under Section 73.644(b)(4), the BSTV station is precluded from transmitting its premium and non-premium programs at different signal strengths. The rule states:

> The technical system shall enable stations transmitting subscription television programs to produce visual and aural signal coverage and receive program quality not significantly inferior, in the judgment of the commission, to that produced by stations using the normal . . . transmission standards . . . without employing additional effective radiated power for either the visual and aural signals.

Moreover, the quality of the STV

signal must not be degraded as referenced in Section 73.644(b)(5) as follows:

> The encoded visual and aural programs shall be recoverable without perceptible degradation as compared to the same programs transmitted in accordance with commission monochrome and color standards.

With the diversity of encoding/decoding systems on the market, and since there are only two operating BSTV stations in the country, the commission should probably allow ample time to elapse to assess the practical feasibility of BSTV stations' compliance with Sections 73.644(b)(4) and (5) of the Rules. Therefore, it would be premature without additional research for the commission to formulate rules on cable carriage of BSTV premium programming based on the station's present Grade A and B contours.

Translator

When 100 watt television translator stations are used to rebroadcast a BSTV station signal, problems regarding the formulation of mandatory carriage rules become more complex. Presently, cable systems are required to carry 100 watt translators licensed to the cable community. One problem confronting cable systems is the translator frequency tolerance. Section 74.761(a) of the commission's Rules states that a transmitter rated at not more than 100 watts peak visual power shall maintain the output frequency within 0.02 percent of the visual carrier and the aural carrier center frequencies for the assigned translator channel. This translator tolerance has been especially troublesome to cable television systems.

On April 20, 1977, the commission in the Report and Order of Docket 20765, 64 FCC 2d 743, 746 (1977) relaxed certain frequency control standards for cable systems in receiving and retransmitting TV translator signals because these signals "in some cases are not required to have such close frequency control." Responding to comments of New York and New Jersey cable regulators that translator standards ought to be tightened, the commission said "we do expect to examine the question of frequency tolerances for low power translator stations, but we believe this matter should be dealt with in a separate proceeding."

Cable systems re-transmitting television translator stations must maintain the visual carrier frequency 1.25 MHz ± 25 kHz above the lower frequency boundary of the cable television channel when the first adjacent cable channels to the channel carrying the translator are used. [Section 76.605(a)(2) affords some relief to cable systems when the cable: 1) signal is received by means of a translator and 2) does not carry signal on either of the first adjacent channels in frequency to the channel on which the translator signal is carried. In this case the visual carrier frequency shall be maintained 1.25 MHz + (25 + T) kHz above the lower frequency boundary of the cable television channel where T is the frequency tolerance in kHz allowed the television broadcast translator pursuant to 74.761 of the Rules.] Because the 100 watt translator's frequency tolerance can vary as much as ± 178 kHz for Channel 83, cable operators are required to capture this ± 178 frequency tolerance signal in a ± 25 kHz window and thereafter, deliver this translator signal to the subscriber's terminal with the visual carriage frequency 1.25 MHz ± 25 kHz.

With the commission adoption on December 8, 1977 of the Report and Order in Docket 20539, FCC 77-836, 67 FCC 2d Pamphlet 3, 43 F.R. 1943 allowing translators to use modulation when a television signal is transported to a translator by FM microwave, the quality of the BSTV station signal traveling via translator becomes a critical issue for cable systems. Each demodulation/remodulation step in a television system affects the quality of the signal. Therefore, cable systems that receive a BSTV station signal via a 100-watt translator, demodulate the translator signal at the cable headend and then remodulate the signal for distribution over the cable system, may be delivering such a poor quality BSTV premium signal that no cable subscribers would be willing to subscribe to this premium programming.

These are potential problems that only experience under actual operating conditions in the marketplace can solve.

I have attempted to provide an overview of the interfacing problems that could occur if the commission were to require mandatory carriage of the premium programming from BSTV stations. It should be evident from this paper that any attempt to formulate policy and/or a set of rules at this time may result in curtailing the technological developments occuring in both the BSTV premium system and the cable system markets. I believe that it would be premature, without further research, for the commission to get involved at this time. With technology changing at such a rapid pace, it is not unreasonable to assume that a reasonably priced, multiple premium signal unit at the subscriber's terminal could be available within a few years.

Cable operators should monitor closely any attempt by the commission to: 1) standardize BSTV premium systems; 2) formulate additional or modified technical standards for BSTV premium encoder/decoder systems, and 3) establish a policy and/or specific rules regarding mandatory carriage of BSTV station premium signals over cable systems. Moreover, cable systems should also: 1) monitor attempts by new and existing operating stations to interface their premium programming with cable subscribers within their service area, 2) comment on, and furnish technical data in, any proceeding from, or submitted to the commission regarding cable carriage of a BSTV station premium programming, and 3) assist equipment manufacturers of both encoding/decoding and cable equipment in developing a multiple premium signal unit for the cable subscriber's terminal.

Note: Statements which have appeared in this paper are those of the author alone, and do not necessarily represent the position of the Federal Communications Commission. C-ED

References

1. Baer, Walter S., Carl Pilnick (1974), *Pay TV at the Crossroads*, The Rand Paper Series.
2. National Cable Television Association, *Pay Cable Television Developments* - Information Bulletin.
3. Paul Kagan Associates, Inc., *The Pay TV Newsletter*, No. 105, August 23, 1977.
4. Blonder-Tongue Laboratories, Inc., *How to Secure Your Pay TV Investment*, One Jake Brown Rd., Old Bridge, New Jersey 08857.
5. Feature Film Services, *Abstract*, 7855 B Gross Point Rd., Skokie, Illinois 60076.
6. Panko, Raymond Robert, *Pay T.V. and Free T.V.: A Policy Assessment Based upon a Projection of Future Consumer Demand for Pay T.V.*

Grounding and Bonding-Why and How

By James W. Stilwell, vice president of Engineering Development, Communications Properties, Inc./TM

CATV system construction is required to conform with various applicable safety codes, as specified by federal state, county or local municipal agencies. A CATV franchise ordinance usually lists both the National Electrical Safety Code (NESC), and the National Electrical Code (NEC).

The National Electrical Safety Code applies generally to construction along public rights-of-way or thoroughfares. Pole attachment agreements with local power and telephone utilities incorporate NESC requirements in their pole line construction drawing exhibits. The CATV operator is automatically guided by this means.

The National Electrical Code, however, may not be as well understood by the CATV system personnel. This code is prepared under the auspices of the National Fire Protection Association, and is, in itself, only an advisory set of rules. It becomes an applicable law when adopted by a regulatory body, such as a state, county or local municipal agency. Administration of this code s usually handled by the local electrical inspector.

It is important to realize that CATV insurance coverage assumes conformance with all applicable safety codes, regardless of a lack of local administration or monitoring of the NEC requirements.

CATV was recognized, initially, in the 1968 NEC code, under a new separate Section 820, because its use of coaxial conductors did not fall under Section 800, Communications, or 810, Radio and Antenna Systems.

It should be understood that various portions of CATV systems fall under other NEC code sections:

- Towers with their grounding requirements and building roof attachments come under Section 10, covering antennas exposed to lightning.
- Electrical installations in our headend buildings, standby generators, etc., are covered elsewhere in the National Electrical Code sections.
- The NEC, Section 820, relates specifically to our coaxial transmission cables entering and serving buildings.

The 1968 NEC code included the first listing of grounding requirements for CATV house drops. Initially, the CATV industry practice had been to interpret the grounding of house drops to be adequately covered to the use of separate driven ground rods. A close examination of the NEC Section 820 Priority Listing of Grounding Methods, however, indicates that ground rods are to be considered last and then a bond is to be installed to connect the ground rod to the building ground electrode system.

The intent of the code requirements for grounding of house drops was to protect the TD receiver end of the aerial drop cable from hazardous voltages caused by lightning or contact with primary power lines (over 300 volts), by connection or bonding to a common building grounding electrode. No potential voltage would then exist between the house drop fieid and the power neutral.

During the past several years, CATV systems have begun to follow the code specifications of grounding to the common building system electrode waterpipe, such as headed the grounding priority list in the 1978 NEC Code.

It was such systems that began to experience cases of overheated drop cables, causing scorching of the house wall to which the cable was attached. Some fires were also reported to have been started by this condition.

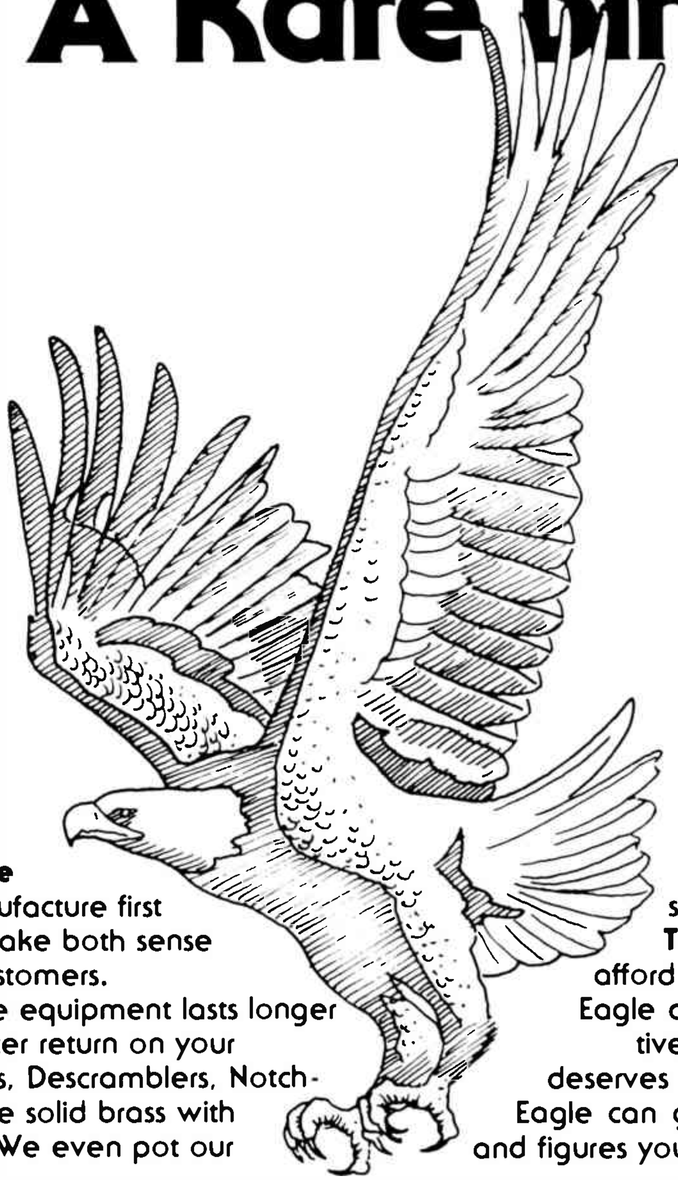
The cause of this overheating was attributed to fault currents resulting from high resistance or open in the power service neutral connection. The use of aluminum service

Frank Bias on Grounding and Bonding

The method of using a fusable element in the CATV drop describes one of several ways residential neutral currents may be kept off of CATV drop cable. This method is comparatively expensive in that a new component must be developed by manufacturers and installed by the CATV operators. Experience in many high lightning areas has shown that a simple ground rod, not interconnected to any other grounding system, provides adequate lightning protection with neutral current limitations.

I believe this method should have more serious consideration by the code committee since it is more cost-effective and represents present successful practice. Regardless of what method is adopted for drop grounding, there should be more definite and stringent requirements for the common bonding of the CATV strand, the telcos strand, and the power company neutral at the utility pole to ensure the safety of personnel climbing the pole.

Frank Bias, director of engineering for Tele-Vue Systems.



Tony Esposito on Grounding and Bonding

In New York State, the commission on cable television has been particularly aggressive in enforcing the provisions of the National Electrical Code. Specifically, I believe its communications sections as required under Section 820-7—CATV coaxial cable must be grounded at the building premises as close to the point of cable entry as is practical.

The commission ordered all cable companies to be 100 percent grounded two years ago. In Watertown, N.Y., a situation developed where a cable operator who was having a difficult time entering homes began to ground at the outside of the meter box. We ran into a major obstacle with Niagra-Mohawk, the power company servicing the area, which did not want the cable company to continue grounding in this manner. We had several meetings with the power company, with the commission on cable television, with GE and several up-state cable companies who were also grounding to the outside of a meter box. We all thought it was a pretty good idea. While we were meeting and discussing the power company's position, the cable commission issued a stay on the order to be 100 percent grounded. What we did was to petition the NEC for an interpretation of the particular grounding method we were using. What they said was yes and no. They believed our grounding was proper, but they didn't believe our mechanical connections were adequate or designed to be used for grounds. So, they turned us down. The power company's feeling were that they really didn't want us anywhere near that meter box. That's their gold mine, and anybody coming near that meter is tampering with their revenue source.

After that we were faced with the commission, which had a standing order which was stayed and extended for an additional 90-day period, which took us through June 30, 1978. Presumably, all companies by that time had a policy of 100 percent grounding all new installs. Systematically, as a technician went out he was also told to check the house to the left and right to make sure there was a ground in place. We then asked the commission to join us in petitioning the national code for a change, a revision. They wouldn't go quite that far. In October, 1978, they decided to cite six cable systems located throughout New York state,

drop neutral conductors has resulted in problems at splicing points:

- At secondary attachment.
- At service head at house.
- Within service equipment enclosure at ground terminals.

Unbalanced neutral current can flow back through the grounding conductors to the CATV grounding block and then through the drop-cable sheath to the grounded tap and strand, which is bonded to the power neutral.

The present NEC Section 820-22 specifies a grounding conductor from the CATV ground block to be a minimum of 18-gauge copper or a capacity equal to that of the outer conductor of the coaxial house-drop cable. It is under these relatively low capacity conditions that the overheating has occurred due to excessive neutral fault currents.

some small, some part of larger MSOs, for grounding safety violations. They imposed financial penalties of from $100 to $1,000 on these six systems. Their action was immediately enjoined by the association as well as each of these companies which filed a petition to reconsider. That's still up-in-the-air.

At the same time, the association developed a proposal for a grounding change in the NEC. Our problem is that the changes that had to be submitted last October, will only be considered as part of the 1981 code because they [the NEC] go on a three-year cycle. What we decided to do was propose a change to amend Section 250-80 by changing the existing title to Bonding of Piping System and Communications Systems, and adding a new sub-paragraph C which we entitled Communications Systems.

The new sub-paragraph C reads as follows: "Communications systems shall be bonded to the grounded power service conductor on the external communications bonding terminal. This communications bonding terminal shall be located at the outside of the building premises or on an external service equipment enclosure as close to the point of power service entry as practical."

Tony Esposito, executive director for the New York State CATV Association.

We're hoping that we can still get access to the outside meter box. The telephone companies, both N.Y. Telephone and AT&T, are supportive of our concepts. We had the Pennsylvania state association join us and make a similar request of the NEC people to change the code. We're hoping that our proposal and the reasons for grounding will be used favorably and we'll get some code change, but we're not sure.

The NEC has a very elaborate schedule for reviewing the proposals (the proposals had to be in last October). In January, 1979, the NEC reorganized its panels; in February they're establishing a correlating committee to review preliminary reports; in April each of the code-making panels is going to prepare final reports; and in June, they vote on it. Through August the NEC take comments, and November seems to be a closing date for comments. In February, 1980, they take a final vote. In March, they print and distribute the proposed 1981 code. That's reviewed in May, and then in September they publish the 1981 code.

What we've tried to do was make a very comprehensive change which impacted several committees.

We think we have a heck of a problem. Others disagreed with our proposal, they wanted to focus more on problems of fire. I think as a whole we just felt so frustrated here in New York because we have an aggressive cable commission that was enforcing the then-existing national code which requires grounding very clearly at all subscriber drops. We were trying to comply in an innovative way. We felt we had no choice except to ask the code people to officially change and adopt the policy that we were following. Right now what the commission normally does each week is, they have a technical testing van that visits, on a random basis, various systems. One very major important part of the van's visit to your system is to review very carefully where you are in grounding. To help them because they can't cover the whole state, just recently the commission issued an order requiring all cable companies to report precisely where they are in grounding.

Other states probably aren't nearly as well grounded as New York because they haven't had the attention placed on it.

This potential condition has resulted in serious discussions and variation of opinions within the CATV industry as to the best grounding procedures. It seems undesirable to forego the overall safety advantages of the common grounding electrode approach, though action is being taken as follows:

1) Work is underway within the NEC Code-making panel number 16, having jurisdiction over Section 820. This will encompass the acceptance in the 1981 Code revision of an improved protector device that would fuse under conditions of excessive neutral fault currents. Safety requirements of continued surge protection and failure indication to assure proper placement will be required to obtain code adoption.
2) A further education of the CATV industry to ensure that the need for common ground is more important than simply obtaining a ground. Note that a typical ground rod, ground resistance of 25 volts, could result in a 25,000 volt potential to the power neutral under 1,000 ampere lightning surge conditions on the drop-cable.
3) Further analysis of the required cable shield or grounding conductor capacities should be carried out. Consideration may be given to supporting the cable away from combustible surfaces.

In summary, we should realize that the advantage to be gained from adherence to the various safety codes is as follows:

- Overall safety to our employees, subscribers, and others.
- Reliability of our system services should be improved.
- Lower cost of system operations due to lower maintenance requirements. C-ED

The Total Quality Program Concept

By Gene Lawrence, Manager
Quality Assurance
McDonnell Aircraft Company
St. Louis, Missouri

Gene Lawrence was the featured luncheon speaker at the 1978 SCTE/IEEE CATV Reliability Conference. He has been in the field of quality control for 31 years, working in both commercial and government-type industries. He has held positions as an inspector; inspection supervisor; quality engineer; quality auditor; manager of quality audit; manager of quality engineering; and, his present position with the McDonnell Aircraft Company as manager, Quality Assurance, F-18 Program. He has been with McDonnell Aircraft Company for more than 20 years.

Lawrence has served as a lecturer and teacher in the quality field covering a wide array of subject matter. He received his higher education at Washington University and the University of Missouri.

We are all, regardless of the industry we are involved in, pursuing the objective of reliability. Every new program that McDonnell Aircraft latches on to, such as the F-18 program, which is the naval fighter attack aircraft we are presently designing and building, demands reliability. This program demands reliability beyond any contract we have previously been involved in—with tremendous mean-time-between-failures in the terms of hours of hoped-for and achieved reliability.

Every industry imaginable is looking for that higher degree of reliability. Certainly, the cable television industry is looking for it. And cable, as in all other industries, cannot achieve reliability without quality and quality without reliability. The two go hand-in-hand.

It is unfortunate that in some industries, companies have separated these two topics—quality and reliability. If you ask for a show of hands of "reliability experts" you'll see hands raised with a pride in their own field of endeavor. "Quality experts" will do the same. Both groups remain at a stand-off with each other. I'd like to trace the evolution of quality for you here. Perhaps, by revealing and reviewing this part of industrial history, we might understand why today we do have product reliability problems in all industries and why it is so difficult to achieve reliability.

Take a step back to the year 1900 and we find that in all industries we stressed what was called "operator" quality. There was no such thing as an organized force of people safeguarding product quality. The individual operator was responsible for the quality of the products produced.

Then in the next few years, prior to World War I, industry blossomed and the personal operator responsibility for quality was shifted to "foreman" quality. For the first time, we found a supervisor placed over the individual operators and that supervisor was made responsible for the quality of the products produced. That was the second phase of the evolution of quality. As mass production requirements came about from the pressures of World War I, a so-called inspector was introduced to the production scene.

The inspector was placed on the scene to do what? To service that foreman's quality because the foreman got to the point where he could not be made liable or responsible for the work of the operators. It progressed in such a fashion so that the individual operator quality—craftsmanship—departed to some extent and the layers of foreman assumed the responsibility.

The job got too big. The inspection phase flourished during the 1920's and 1930's. World War II demanded such high level masses of production that even the inspector couldn't cope with the task assigned. Statistical quality control was introduced. This involved sampling inspections and the use of charting techniques. These were tools for the inspector and further divorced the individual from the responsibility of producing quality work and again, the individual pride of craftsmanship.

In the early 1960's a new phase of product quality was introduced. The government's involvement in the aerospace industry caused it. In 1963, the Department of Defense introduced a MILQ9858A to the marketplace. The title of this military specification is "Quality Program Requirements." It introduced to all contracts with companies dealing with government involvement: total involvement of all work disciplines within a given company. That military specification recognized that the responsibility for quality cannot be lent to a small group of people but is held by the entire company of people involved in the various activities required to complete the end item product.

Where Does Quality Start?

Where does quality start? Where does reliability start? It starts on the drawing board with the engineer. You must give that right of recognition to that starting point. That engineer plays a tremendous role in product quality leading to reliability. MILQ9858A recognized that. It introduced the necessity for recognizing procurement-type people and the role that they play in product quality lending to reliability.

Think about that for a second. Think of the sources procurement people explore to get the piece-parts that you need to produce the end product. For many years, nobody recognized the intricate and massive responsibility of this group of "operator" personnel within a company structure.

What about the manufacturer? In the early 1900's, when that foreman was relieved of the responsibility for product

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quality and inspectors were brought onto the scene to assist him, he was initially quite relieved. Anyone would have been. It was a burden off his back. The inspector was on the scene to find the errors.

MILQ9858A brought respect and recognition back to industry. It recognized that within every company, no matter how small or large, every person is involved in the company's operation.

But, was this military specification the panacea? Not totally. Even in 1979 we are not there yet. Craftsmanship still requires encouragement and the system breaking down over more than 70 years cannot be put back together overnight. It may be 14 more years before industry overall completely gets in tune with the set of requirements in MILQ9858A. Certainly the cable television industry could make good use of the document as a guideline for individual company reliability programs. The specification is applicable to service industries as well as to manufacturing companies. Write to the Department of Defense and request a copy of the specification. This MIL spec was written with everyone in mind, regardless of the division or department within companies, whether design engineering, purchasing, manufacturing, marketing, or contracts—there isn't a person or a job function in any given company that is not included in the document.

Quality and reliability bring back the old "teamwork" spirit between people in a given company or organization. Recognizing individual worth and craftsmanship, signing your name to your work as it were, is the name of the game of reliability. Recognizing engineering as the primary starting point for reliability and quality within your company is a sound beginning.

Questions From the Cable Engineers About Quality and Reliability.

Q. How can we differentiate between the emphasis on quality and the cost of quality?

A. In our company we have established a system that lends itself to charting and graphing cost related to effort but it is based upon the ficticious dollar. For example, we might put a dollar value on every non-conforming document issued throughout a program. It gains our attention as we watch the plotting of this graph. If we're on the upswing, we know that we have an increase in non-conforming items, lending to the need for better analysis, more corrective action or more effective correction action. We get as much good out of that as if we would put the true dollar of that non-conforming cost on that chart. This is permitted by the government, by the way. Some people do not understand that. Quality cost is a contractual obligation. Some companies feel that they've got to put the absolute finite cost in front of the government. That is not true.

Q. Is there a MIL spec less severe than 9858A? One that is more applicable to the equipment we use where human life is not being affected?

A. That's MIL14520A. That's called "Inspection System Requirements." It contains much of the same requirements as 9858A and is usually employed on less complex hardware. Yet companies can still practice the philosophy of the quality program concept in 9858A and still have a very successful 4520A system.

Recognizing that smaller companies, less complex hardware usage or production as opposed to what my company might be involved in—the idea of getting total involvement on the part of all of your personnel as to their rightful role in product (or service) quality and reliability is an absolute must. You see, you and I caused this problem and we're the ones that moved the responsibilities from one person to another. People liked that. They thought it was job security.

But it's not job security. We have suffered in the marketplace. That is why foreign companies are making inroads into our economy. Look at Japan. Japan has got a quality set-up and reliability set-up second to none. They have surpassed the United States and yet they got the idea originally from us. They have just expanded on our idea, and they've got it. They've put it to work for them.

Q. I get the idea that if you're building for the military it must "work" at any cost. If you're building for the private marketplace, cost is the most important factor and whether it works or not is secondary. That may be a harsh assessment of the two differences, but could you comment on the American buying public to the extent that they are willing to put quality second to price?

A. I will speculate and offer this comment. I have recently read an article advising the American public that just because something costs $2.98 instead of 98 cents doesn't assure you of any better quality. So the price tag we're affixing to the commodity purchased is a misnomer. I don't see any difference in the cost placed on the commercial product versus the military product. At one time, yes, there was a difference. It is no longer that way. We are operating on a very strict budget. We are under the same constraints of any other business.

Q. How can you get people back to the idea of craftsmanship?

A. By getting the word to all of the various disciplines on the rightful role that they play in product quality and reliability. Once that is established, then we maintain a continuous campaign to bring this in front of people. We did it also through evening study classes offered by our company. We taught our people. We run audits lending them to various divisions as to their role in reliability. We keep the topic of reliability in front of our personnel.

Q. What percentage of your work force is dedicated to quality?

A. I'd like to say 100 percent and that's what we're striving for. But we do have an organized work force of quality-minded, focalized people and we represent six percent of our total work force.

But, we can go out and hire another six percent and that's not going to ensure any greater quality. The idea I want to get across to managers, engineers and manufacturers, operators and procurement people, is to get in flow with me and together we'll achieve the product quality leading to reliability.

Q. Are your quality assurance people the same people as your inspection people?

A. Yes. The inspection people are part of the quality assurance group.

Q. Do you have a specific method to turn people's attitudes around and make a guy dig deeper and to get his participation in quality and reliability programs?

A. Personal recognition. That is something we have all overlooked. If I can put you in the limelight or understanding the role you play as an individual and you are recognized, that will turn you on and convert you immediately. You've got to tell people that their job is important. **C-ED**

Cable Television Inspection By FOB Field Engineers

By John R. Hudak
Field Operations Bureau Staff
Federal Communications Commission

Engineers with the Federal Communications Commission's Field Operations Bureau have responsibility for inspecting cable television systems. This paper discusses the considerations of selecting a system for inspection, the organization and responsibilities of FCC field units, some of the general technical procedures followed, recent inspection findings and inspection follow-up. Also, the cable operator's responsibilities in assisting with the inspection are outlined.

The FCC Field Operations Bureau (FOB) is responsible for commission engineering activities performed in the field, including enforcement, interference suppression and communications user liaison. Working with CATV systems is nothing new to the bureau. Our first experience was obtained in the fifties in radiation leakage complaints involving TV interference to nonsubscribers. At that time, restrictions were specified in Part 15 of the FCC Rules and Regulations (Radio Frequency Devices).

After the adoption of signal quality specifications, Part 74 and later Part 76 of the Rules and Regulations, our FM/TV Enforcement Units routinely began making complete system performance measurements. Other field facilities began random inspections for a one-year period during 1975, gathering data from performance measurements conducted by system operators and also began and have continued, making other inspections for cause. More recently, several select field facilities have concluded a survey to determine the extent of cable television radiation leakage. The findings of this survey will be used to assist in analyzing cable TV's potential interference to aircraft radio systems.

FOB Organization

The Field Operations Bureau is composed of six regions, consisting of 31 district and limited offices, 13 monitoring stations and five special enforcement facilities, each staffed with electronic engineers and technicians. The regional boundaries and location of individual facilities are shown on Illustration 1.

There are also four FM/TV/CATV enforcement units that specialize in technical analysis of FM broadcast, television broadcast and cable television systems. The home bases of these units are as follows:

Eastern FM/TV/CATV Unit - Norfolk District Office

Southern FM/TV/CATV Unit - Powder Springs, Georgia Monitoring Station

Central FM/TV/CATV Unit - Kansas City District Office

Western FM/TV/CATV Unit - San Francisco District Office

Each of the FM/TV/CATV units is approximately a $100,000.00 package consisting of a 2.5-ton truck, sophisticated test equipment and trained engineer specialists.

An average FOB inspector begins his career with the commission soon after receiving a BS degree in Electrical Engineering. Others are hired after working in related fields in private industry. The first assignment is a six-month comprehensive training course that provides a broad overview of the bureau's responsibilities and methods of accomplishing those responsibilities. A duty station is next assigned and career development continues through on-the-job training until journeyman level is obtained, usually in three years. The inspector is a generalist working with marine, land mobile, broadcast, aviation, citizens, cable television and other services. After obtaining journeyman status, a specialty such as an FM/TV/CATV unit might be selected or a senior engineer classification obtained.

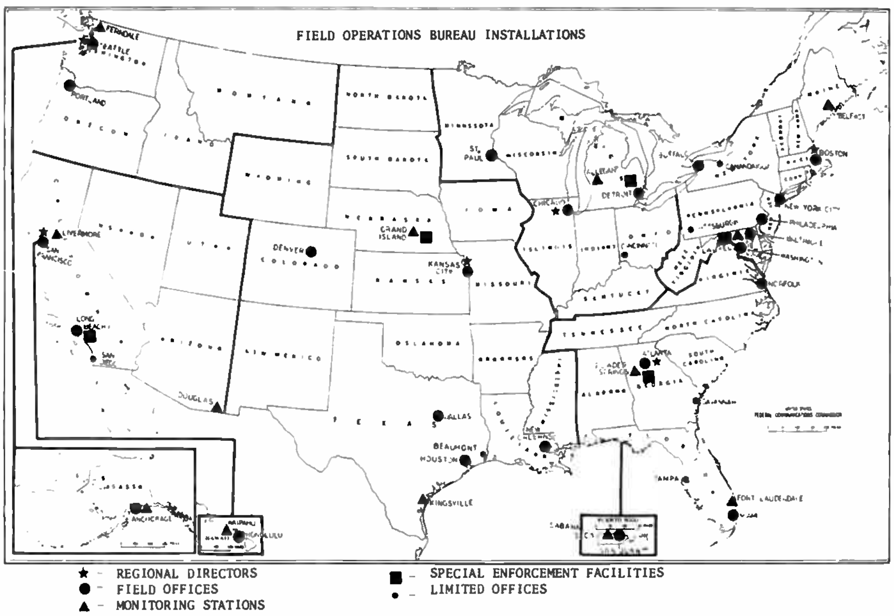

Illustration 1: Map showing location of FOB field installations.

Low Cost CARS Band Microwave Systems

By Dana W. Archley, Jr. and Edmond J. Forbes
Microwave Associates, Inc.
Burlington, Massachusetts

Traditionally, CATV operators have been using microwaves to import channels from other areas by locating a directional TV antenna at some strategic high point, and bringing in its received signals by as many as five hops of either private or common carrier microwave to the cable headend. This particular use of microwaves remains important but it is also now possible to bring in channels considered high quality from both a technical and entertainment point of view via a satellite receive-only terminal for a relatively modest investment.

The typical 1978 CATV network may well be a hybrid one combining perhaps four imported channels using up to two hops of microwave such as the low cost units to be described in this paper, a TVRO terminal located in a site which may or may not use some low cost microwave to transport say three satellite-receive channels to the operator's headend and possibly up to two hops to couple the TVRO output to other headends either owned by the operator or cost-shared by operators in readily accessible adjacent towns. Figure 1 is one possible arrangement. The typical 1978 network will also have up to three channels involving local origin of some sort. For all the above uses, the selection of microwave vs. cable vs. common carrier will be particularly sensitive to the cost trade-offs involved. If lakes, rivers, expensive real estate, or any area with a high political/red tape content must be

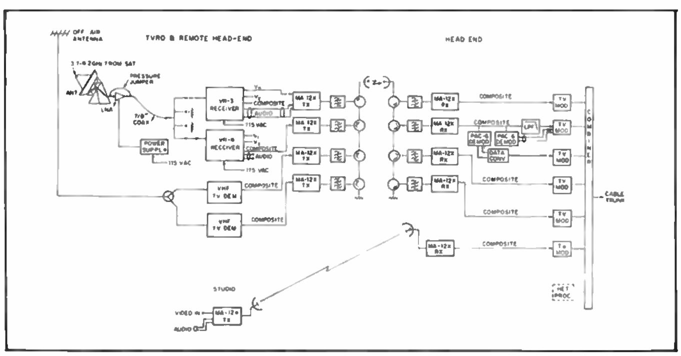

Figure 1: A typical 1978 CATV network.

bridged, the low cost microwave system will probably win out. Cables over short distances, where a large number of channels are involved, will probably be the method of choice in flat farmland or its equivalent.

The authors have chosen to identify the term "low cost microwave" with the rather large grouping of commercial microwave components and subsystems which have mushroomed in volume in the past five years and are generally asssociated with police radar, intrusion alarms, sensors for door openers, etc. All of these subsystems have one common technology in that they rely on the use of one or more small gallium arsenide Gunn diodes.

J.B. Gunn, a member of the IBM technical staff, invented the diode that bears his name in the middle sixties. This tiny device has the property that when mounted in a small resonant cavity and powered by approximately 10 volts of DC, the DC is converted directly into useful readily modulated microwave energy. For several years, these Gunn diode oscillators have been also used as local oscillators in microwave superheterodyne receiver in more sophisticated systems. Their use in communications systems up until a year ago has been somewhat limited due to their general tendency to drift downward in frequency with increase in temperature, thus requiring an oven for stable performance.

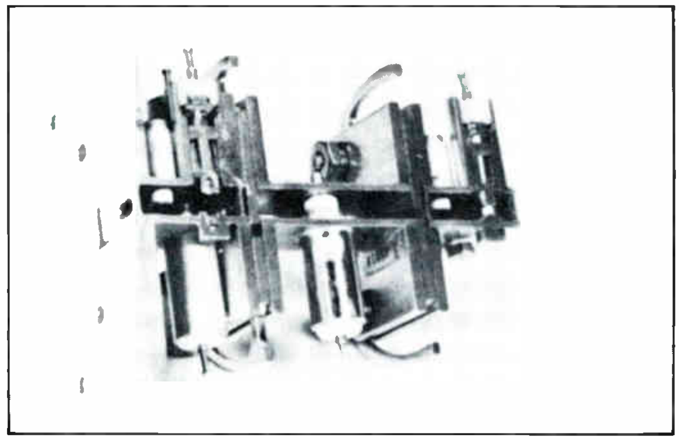

Figure 2: Cutaway of 12XC Gunn oscillator/AFC assembly.

During the past year, economical phase-locked Gunn oscillator circuits have been developed. Figure 2 shows a cutaway of a Gunn oscillator from an MA-12XC transmitter suitable for FM video modulation. Using cheap external circuits, this unit can be phase-locked to a crystal to achieve stability over wide temperature ranges.

As can be seen, the cutaway shows three separate resonant cavities interconnected by variable iris couplers. The left hand cavity with a large flange contains the basic Gunn oscillator and a gallium arsenide tuning varactor accessible electrically from both sides. All interconnections to the diodes are through cylindrical RF chokes with the ability to pass DC and modulating voltage but presenting a high impedance, hence isolation to microwave energy. The small white ceramic cylinders seen in the upper portion of the left and right hand cavities are used for mechanical tuning. In this unit, while most of the oscillator energy is coupled to the load (antenna) through the flange/iris combination on the extreme left, the smaller iris in the back of the oscillator cavity feeds a fraction of the energy to a Schottky mixer diode in the center cavity. The third cavity on the right hand containing a multiplier-type varactor diode is coupled to the right hand end of the mixer cavity. This varactor diode is driven by approximately 15 milliwatts at 200 MHz. The 200 MHz is generated by 100 MHz overtone crystal oscillator which drives a transistor doubler. When this 200 MHz energy impacts the varactor, a spectrum of microwave energy is generated with comb lines separated by 200 MHz. The oscillator cavity is mechanically adjusted to provide a signal (12.75 GHz) which when mixed with one of these lines, for instance 12.8 GHz, produces heterodyne signal at approximately 50 MHz. This 50 MHz signal passes through a limiter-preamplifier and then is divided down to 6.5 kHz by several very economical integrated circuit divider circuits. Similarly, an 8 MHz "reference" crystal is subdivided to 6.5 kHz. The two 6.5 kHz signals are then applied to a low cost IC which performs as a phase comparator. The DC error output of the comparator is fed back to the gallium arsenide tuning varactor in the Gunn diode oscillator which varies the VCO frequency until the oscillator "locks up" at 12.75 GHz. The low comparison frequency has been selected to allow the tuning varactor to receive simultaneously video modulation, the AFC error voltage and an adjustable DC voltage for manually tuning the oscillator. This phase-locking technique, standard for years at lower frequencies, can now be accomplished at microwaves since all of the components used have been produced in large quantities to serve other non-microwave markets, thus greatly decreasing their cost even before applying the incremental volume leverage which must accrue when more of these oscillators are used in microwave communications systems and for CATV.

The frequency stability in the 12.7-12.95 GHz region using the phase-locking technique described, provides better than ±.005 percent frequency stability. The stability is primarily a function of the drift with temperature of the reference crystal and the 100 MHz overtone crystal used in the multiplier driver. Without subjecting the audience to all the technical details, Microwave Associates is now developing techniques which will greatly decrease the inherent temperature drift by introducing into the cavity materials with compensating properties. Further, a new family of hyperabrupt, low loss gallium arsenide tuning varactors is in the advanced stage of development which will greatly increase the linearity of these oscillators under modulation, even when subjected to the type of temperature excursions experienced in outdoor mounting of the transmitter.

Figure 3 is a block diagram of the current production model MA-12XC transmitter. In addition to showing the schematic information just described, it shows how the output of the oscillator is coupled through an isolator/filter combination to the antenna feed providing a minimum output of +13 dBm. The digital AFC/video block illustrates the interconnections with the AFC module. The unit is powered by 110 V 60 Hz supply consuming approximately 30 watts of power providing +18 V, +9.5 V and +5 V DC for the operating circuits. This particular block shows video with 525 line pre-emphasis. The MA-12EU model operates on 220 V/50 Hz mains and provides pre-emphasis for the European 625 line system. The video modulating amplifier uses readily available linear ICs. There is an optional input for 600 ohm balanced audio to provide 4.5 MHz aural subcarrier with the same modulation characteristics as broadcast TV plant. Other subcarrier frequency options are also available with the flexibility of operation with the new MA PAC-6 subcarrier demodulator.

In the past, the cable operator has always brought in TV signals formatted in NTSC vestigial sideband AM with FM audio, and he was only faced with the problem of converting the received AM channel to the desired AM cable channel; however, today's FM satellite signals present a different problem. Here the satellite receiver such as the low cost VR-3 and VR-4 demodulates the FM microwave carrier and

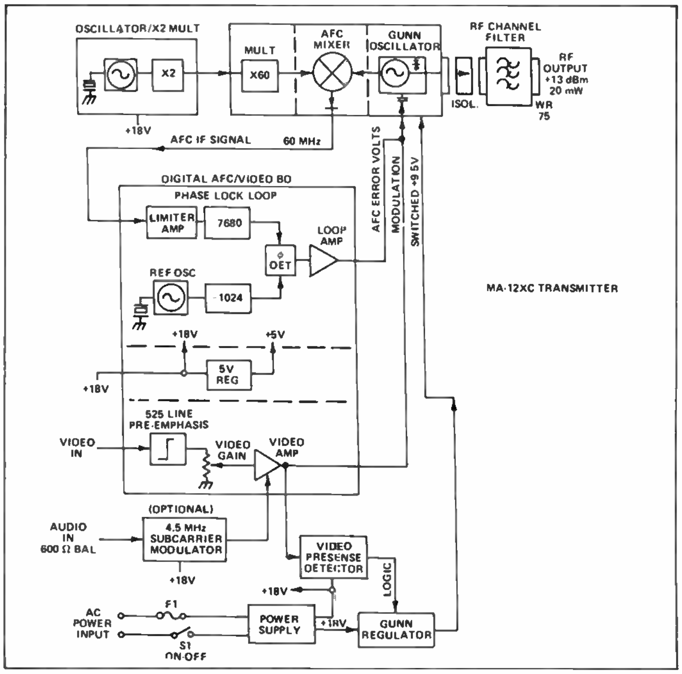

Figure 3

provides either a composite base band or separate video and audio outputs. Composite base band, in this case, is a combination of the standard video signal plus a 6.8 MHz FM subscarrier which is carrying the audio program information as opposed to the traditional 4.5 MHz subcarrier. When interfacing with a standard TV cable modulator, the separate audio and video outputs from the microwave receiver should be used. When interfacing with an FM microwave terrestrial link, then the composite output from the satellite receiver may be fed directly into the microwave transmitter, provided that video and audio components are separated at the FM receiver terminal before they are fed to the cable modulator.

The Receiver

Figure 4 shows the block diagram of the low cost 12XC CARS band receiver which has had wide market acceptance. Referring to the left upper side of the block diagram, the microwave signal from the antenna is connected by waveguide to the receiver mixer-VCO module via a bandpass filter/ferrite isolator combination. For most U.S. CATV systems, the RF pass band is 25 MHz. The mixer-VCO assembly is similar in construction to the cutaway of the RF assembly shown for the 12XC transmitter but is less complex since two rather than three cavities are involved. The received signal is mixed in a Schottky diode operated at approximately 1 milliwatt of energy derived through a variable iris at the rear of the mixer from the Gunn VCO. The VCO is mechanically tuned to provide an IF output from the

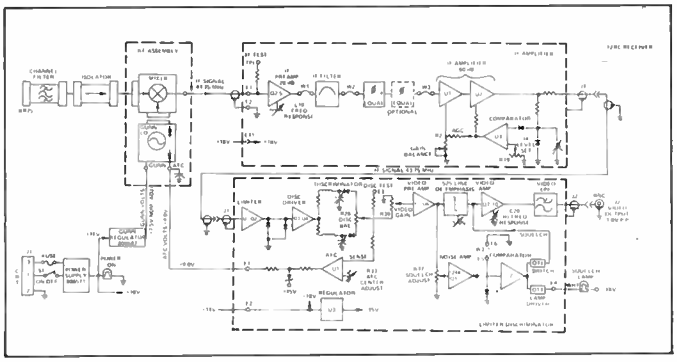

Figure 4.

mixer at 43.75 MHz. The intermediate frequency of 43.75 MHz is compatible both to the current availability of very low cost IC linear amplifiers (which become more expensive at higher frequencies) and with the elimination of possible "birdies" which could occur when multiple 12XC receivers are interconnected by branching networks. The IF signal is coupled to the IF amplifier module through a low noise FET preamplifier. In the IF module, the IF signal is shaped by an IF filter which defines the noise bandwidth and provides additional adjacent channel rejection, then undergoes at least one stage of group delay equalization before entering two stages of IF IC amplification providing 60 dB of gain, controlled by a comparator/AGC IC.

The output of the IF amplifier is fed to the limiter/discriminator module. Here, two stages of hard limiting are provided which drive a discriminator which demodulates the FM signal and provides a base band output. Either 525 or 625 line de-emphasis and a compatible band pass filter are provided as part of the IF amplifier assembly.

Because of the inherent stability of the transmitter, the receiver needs only to provide a simple analog AFC which is derived from the discriminator output passed through a DC amplifier to the tuning varactor in the VCO assembly. This module also contains the necessary circuitry to squelch the receiver output if no carrier is present. The receiver can be powered by either 110 V AC 60 Hz, or in the case of the 12EU, 220 V 50 Hz. Regulators provide +18 V DC and adjustable 7.5 V DC. The AFC bus operates at + 9 V DC.

The 12XC transmitters and receivers were initially offered in compact cast aluminum housings, 8" x 4.5" x 4.7", weighing 6 lbs. Although this package format meets the requirements of many users, we are also planning to offer a radio for the CARS and certain other markets packaged for rack mounting as shown in Figure 5. This arrangement will provide additional accessory circuit flexibility.

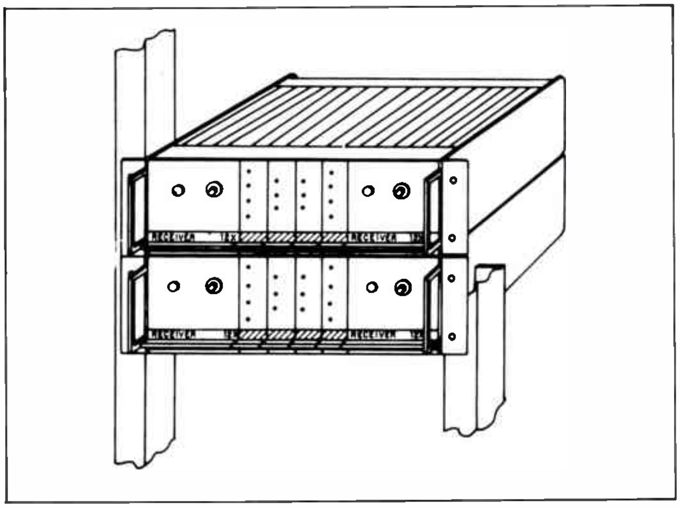

Figure 5

The 12XC receiver provides high quality reliable video when used to receive any video modulated stable FM microwave transmitter tuned to the proper frequency. Although many MA-12XC receivers have been sold paired with MA-12XC transmitters, considerably more have been delivered into systems using other transmitters. Frequently, the paths are such that higher power than the 12XC's +13 dBm is required. In this case, the 12XC receiver is often used in systems which rely on the +28 dBm output MA-12G as a primary transmitter source. The CATV operator should always consider the 12XC receiver and transmitter, each for their individual merits, rather than only as a paired 12XC system. It should be noted that as currently manufactured, the MA-12XC receiver provides only a composite video output. Video base band and audio outputs are not provided, hence the interfacing cable modulator must be capable of accepting composite video.

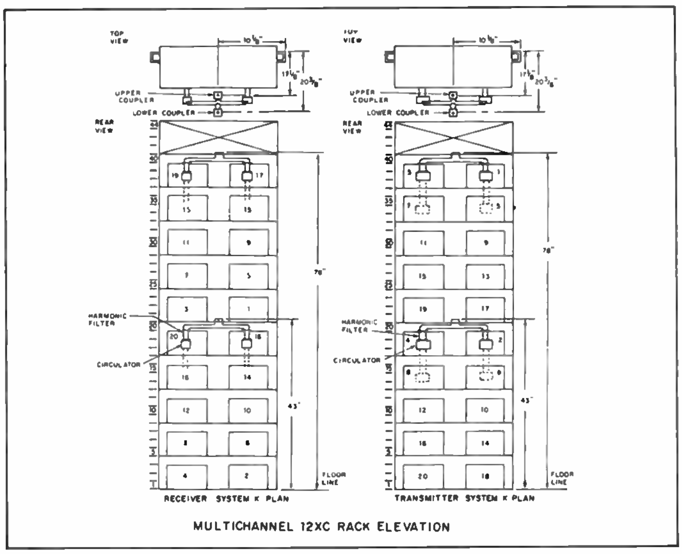

Figure 6.

System Arrangement

As stated before, this product was launched for the CARS band market and obviously it must provide cost and space effective support for up to twenty channels, as that is the limit under Part 78 of the FCC rules as they apply to FM service. The modular design of the 12XC offered an opportunity to equip 20 go (or return) channels in a single 7'6" (44 unit) rack and still have a few inches to spare. Figure 6 shows the general arrangement for 20-channel terminals.

Since in the 20 channel (K) Plan both vertical and horizontal polarizations are employed, a convenient and economical branching system was adopted with the upper and lower half of the rack disposed to a common polarization. The problem of combining adjacent off (or even) channels with their 25 MHz separation was solved with hybrid couplers at a slight loss penalty. However, this was offset by lower branching filter losses with negligible adjacent channel group delay (hence differential phase) contribution. The conventional three port circulator combining method was used with waveguide low pass filters in each bus bar (for the ultimate protection against wandering harmonic power). With this arrangement radio equipment can be installed, new channels added, and maintenance spares lit up without any on-line "tweeking" for system performance. This is an essential merit for a product of this type, since rarely will the user be equipped with sophisticated microwave line maintenance equipment.

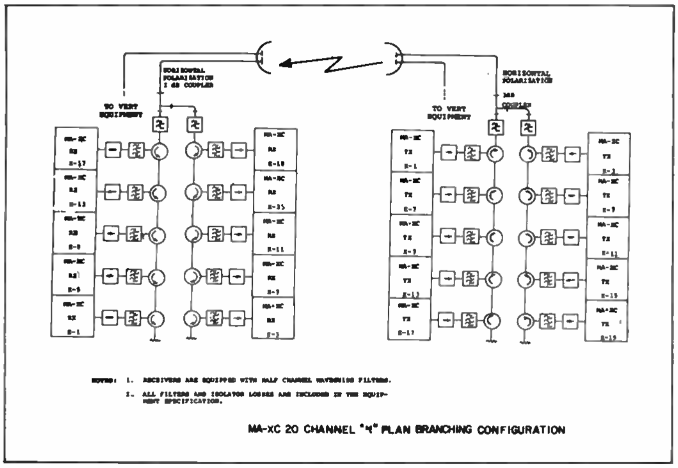

Figure 7.

To minimize the system-gain losses, equipment branching position assignments are "flipped" for transmitters and receivers. Figure 7 shows one polarization of a 20 channel hop. Lowest channel transmitters are positioned closest to the antenna port and the mating receiver is the furthest. The worse case total component losses for transmitter and receiver branching add up to 7.4 dB for a four channel assembly and 9.8 dB for a 20 channel assembly, all in K Plan. Of course, an additional transmitter rack output port is available for a "free split."

In the CARS band with precipitation effects, the name of the game is fade margin to assure system availability. With the advent of such real time revenue bearers as HBO, repeated circuit outages in the rain belt routes must be avoided. Fade margins of 40 dB (or more) are possible with a complete 12XC system. Recalling the work of Hathaway and Evans, that would set the range of path lengths from about 15 miles in the Mississippi Delta area to about 40 miles in the "L" shaped line joining San Francisco and Montana for a seven hour annual accrued outage. I'm sure we're all familiar with the curves in the Lenkurt Manual.

What does this mean as to outside plant with the 12XC? Figure 8 shows a handy fade margin-distance guide for a four channel system, and that a pair of ten-foot dishes will support the 40 dB objective at about eight miles. Considering that the 12XC receiver sells for about one third the price of conventional receivers, it is only an elementary lesson in economics to consider longer paths, and/or smaller dishes with higher power M/A transmitters (or somebody else's, as the 12XC receiver is a very good listener). Just shift the curves vertically by about 13 dB . . . or expect 40 dB margin at 25 miles with 10-foot dishes.

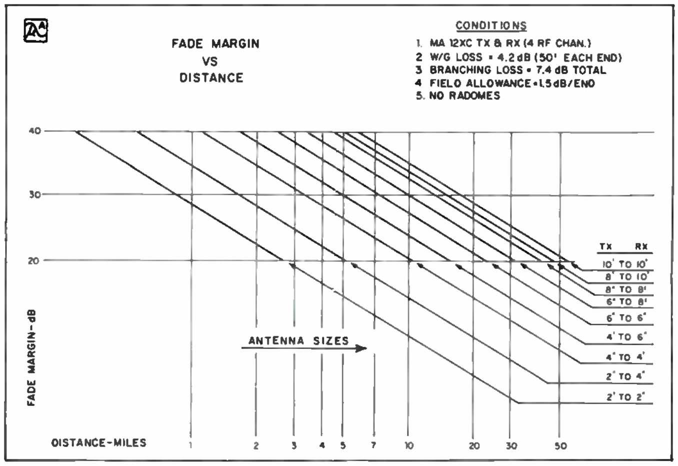

Figure 8.

The MA-12XC system performance is shown in summary in Figure 9. This clearly indicates that the 12XC system offers a cost effective solution to many of the CATV operators' microwave problems. **C-ED**

BACK-TO-BACK PERFORMANCE ASSUMING STANDARD CCIR WEIGHTING, A RECEIVER CARRIER LEVEL OF −40 dBm, AND USING 525 LINE TV EMPHASIS

Video Signal-to-Noise P-P to RMS, 4 KHz to 4.5 MHz	55 dB, Minimum
Video Signal-to-Hum P-P to RMS, 10 Hz to 10 KHz	55 dB, Minimum
Differential Gain, 10/50/90% APL	1 dB, Maximum
Differential Phase, 10/50/90% APL	3°, Maximum
2T Pulse "K" Factor	2%, Maximum
Video Frequency Response, 10 KHz to 4.2 MHz	±5 IRE Units
Field Squarewave	3 IRE Units, Maximum
Luminance Chrominance Gain Inequality	6%, Maximum
Luminance Chrominance Phase Inequality	50 ns, Maximum

Figure 9: 12XC system specifications.

References:

1. "Solid-State Microwave RF Generators"—Ham Radio Magazine, April 1977.
2. "Microwaves for the Masses"—Harlan Howe, Jr., Microwave Systems News, August 1977.
3. "Engineering Considerations for Microwave Communications Systems"—GTE Lenkurt Incorporated.

See our card on page 51.

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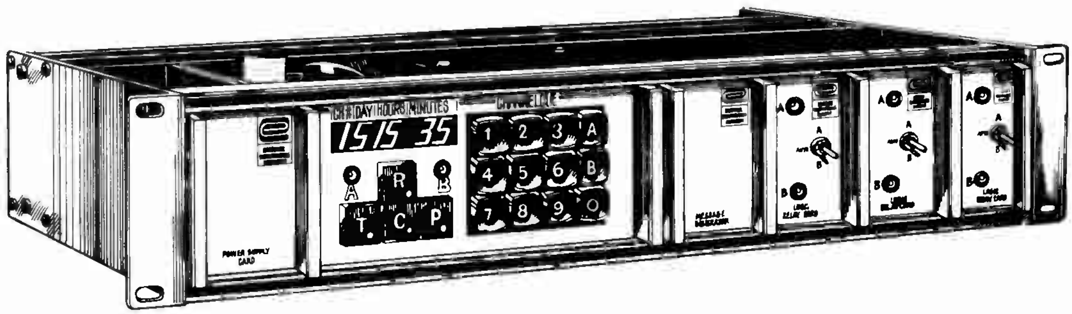

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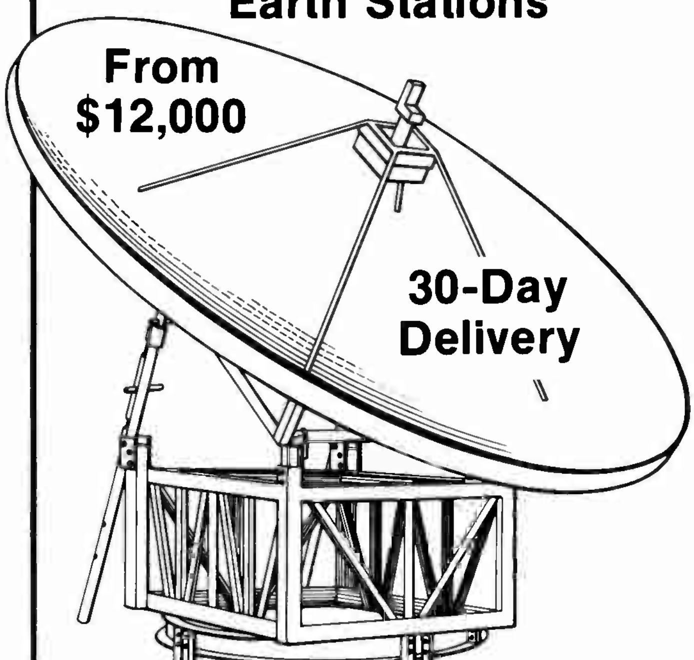

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See our card on opposite page

Optimum Earth Station Antenna Alignment

By Archie T. Miller
Manager, Spacecraft Operations
RCA American Communciations

A clear line of sight to the Satcom satellite is necessary to receive communications at your earth station antenna. That fact is well known, but all too often earth station owner/operators miss the boat on optimum performance. Alignment of the dish when the satellite is dead center in its assigned station "box" will ensure the best possible signal level.

Paying no attention to your earth station antenna—as long as picture quality is satisfactory—doesn't pay.

Even when experts install your antenna, they cannot achieve perfect alignment with the spacecraft unless they happen to do the job when the bird is in the center of the box. When the antenna is aligned on the bird in the center of the box, it should not require further alignment unless it has been accidentally moved. Spacecraft stationkeeping will maintain the bird within the beam of your antenna.

Since your dish is stationary while the bird's position in space varies, it's important to coordinate antenna alignment with spacecraft stationkeeping. Since some drift is the normal situation for orbiting bodies in space, RCA Americom's spacecraft operations staff constantly monitors Satcom's position from two tracking, telemetry and command earth stations at South Mountain, California, east of Los Angeles, and at Vernon Valley, New Jersey, north of New York City. Skilled satellite engineers determine exactly when and how long to fire tiny hydrazine jets to perform a maneuver to correct orbital position.

RCA Americom also determines, based on those maneuvers, the time when the Satcom spacecraft will be in the center of the assigned stationkeeping box. This information is provided regularly to RCA Americom's customers, including the many distributors of television programming to the cable satellite network. The purpose of this information is to allow earth station operators to align their antennas in azimuth, elevation and polarization when the spacecraft is precisely in the center of the box.

Satellite users may provide center of the box information to cable systems, but the information would have little value to anyone who doesn't know how to use it. In the interest of more effective satellite reception for the cable television industry, I'd like to offer this short course on spacecraft stationkeeping, alignment and box center notification.

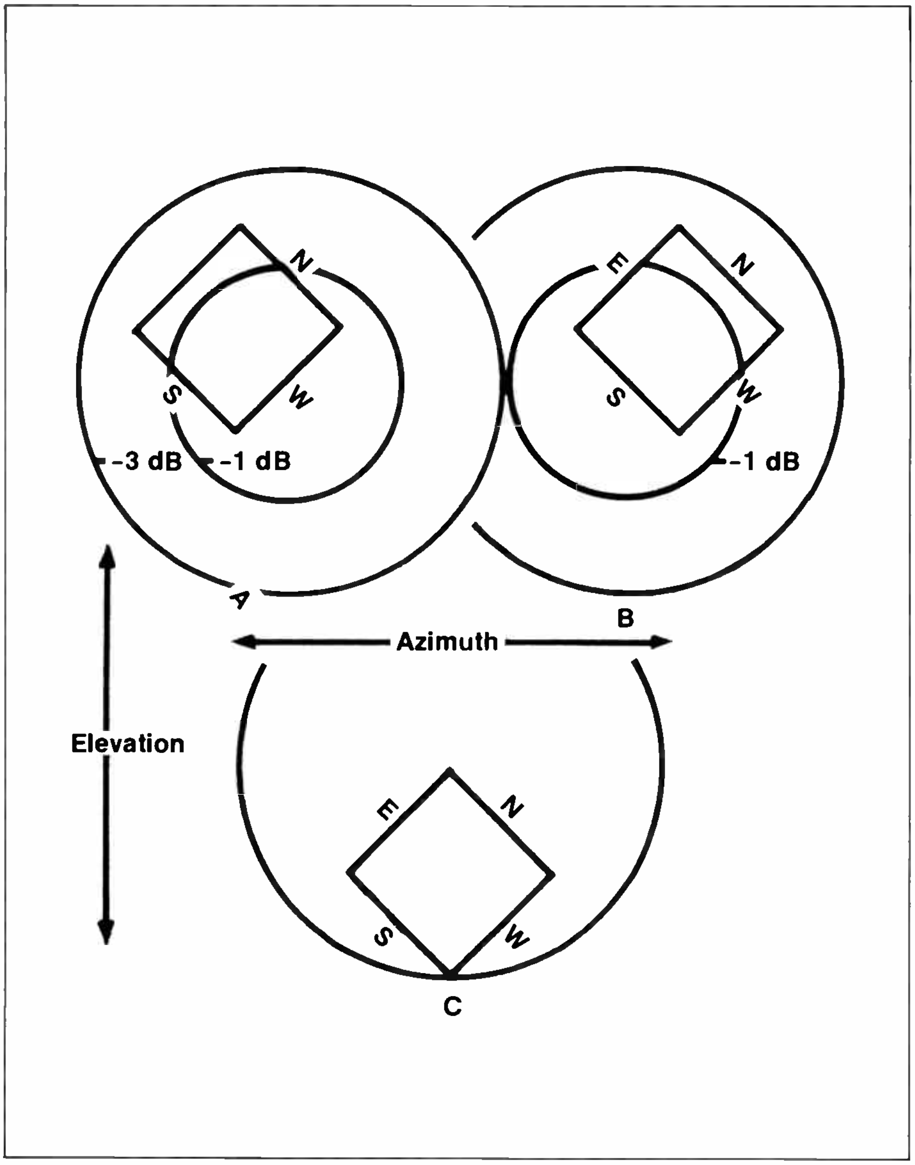
Spacecraft Stationkeeping

The nominal stationkeeping box for the Satcom spacecraft is filed with the FCC as ± 1 degree in east/west and north/south position. In practice, the spacecraft is kept within ± .07 degrees. At the longitudes assigned for our two spacecraft (135.0W for F1 and 119.OW for F2, the spacecraft tend to drift eastward.

About every three to four weeks, a maneuver is performed when the spacecraft is at the eastern edge of the box to push it westward. It is propelled westward toward the western edge of the box, turns around and drifts back eastward; a maneuver is performed near the eastern edge of the box and the cycle is repeated.

About every 30 to 90 days, depending on the time of year, a north/south maneuver is performed. When the daily north/south excursion gets to be approximately ± .07 degrees, a maneuver is performed which effectively inverts this motion to ± .07 in the opposite phase. In other words, if the spacecraft were at its maximum northward point at noon before the maneuver, it will be at maximum southward point at noon after the maneuver. This inclination or daily excursion in the north/south direction about the equator slowly collapses towards zero, and then expands in the opposite direction. When it reaches .07, another north/south maneuver is performed.

The information contained in the



Antenna Azimuth and Elevation Alignment

center of the box message sent to satellite users by RCA Americom indicates the day on which the spacecraft is in the center of the box in the east/west axis and the time of day that it will cross the equator in the north/south direction. As we shall see, it is important not only to perform antenna alignment on the proper day for east/west alignment, but also at the proper time for north/south alignment.

Azimuth and Elevation Alignment

The attached diagrams show the effect of antenna azimuth and elevation alignment on receive signals for two different sized antennas. These diagrams depict an idealized view of the stationkeeping box for a spacecraft at about 135 degrees west as viewed from the east coast of the United States. The horizontal axis of the diagrams correlates to the antenna azimuth axis, and the vertical correlates to the elevation axis. It can be seen from these diagrams that even if the alignment is only off in the east/west direction, both an azimuth and elevation adjustment will be required to correct the problem.

Diagram A shows the case where a ten-meter antenna was aligned on the spacecraft when it was at the western edge of the box and crossing the equator. The large circle is the 3 dB beam width and the small circle is the 1 dB beam width. It is obvious that as the spacecraft crosses toward the eastern edge of the box, there is going to be substantial degradation of the signal.

Diagram B shows the beam pattern for a ten-meter antenna that was aligned on the spacecraft when it was in the east/west center of the box, but at a time during the day when the spacecraft was at its southernmost excursion. The conditions shown in Diagrams A and B indicate the importance of not only aligning the antenna on the day the spacecraft is in the center of the box in longitude, but also at the time of that day when it is crossing the equator.

Diagram C shows the circle for the 1 dB beam width of a 4½ meter dish misaligned in both north/south and east/west. While it is apparent from the diagram that the 1 dB beam width still covers the entire box, it is very important that it be aligned at the center of the box because most 4½ meter antenna systems have less margin to compensate for signal degradation than do larger antennas.

Polarization Alignment

Although it is easy to see the effect of satellite motion through the antenna beam width in terms of signal levels, the polarization isolation is also affected. As the satellite moves out of the center of the beam, the cross-polarization isolation is reduced, primarily because of variations in sidelobe polarization. In the Satcom system, using the orthogonal polarization frequency reuse system, it is important that non-autotrack antennas be aligned accurately and that antenna azimuth, elevation and polarization be aligned when the spacecraft is in the center of the box.

Box Center Notification

The center of the box information is usually disseminated after an east/west maneuver. Because it usually takes about three days after a maneuver to obtain a definite orbit and ephemeris, the spacecraft may have passed the center of the box on its westward trajectory. In that case, the information will be supplied for its center of the box crossing on the eastward trajectory. This should normally provide a week to ten days advance notice.

If an orbit is completed prior to the center of the box crossing on the westward path, it will probably be distributed only a day or so before the crossing; however, information on the eastward crossing will also be included. Because of various reasons, primarily the effect of the moon on the orbit, the spacecraft may hang in the western portion of the box for some time or may turn around rapidly and return eastward. C-ED

C-ED's Glossary of Satellite Terms

C-ED's *Glossary of Satellite Terms is provided courtesy of Scientific-Atlanta, Inc.*

BER — *Bit Error Rate.* In data transmission parlance, this is the measure of the number of errors expected in a data link. For example, a BER of 1×10^{-6} means one error in each one million bits transmitted.

C/N — *Carrier-to-Noise Ratio.* The ratio of the received carrier power and the noise power in a given bandwidth, expressed in dB. This figure is directly related to G/T and S/N; and in a video signal the higher the C/N, the better the received picture will be (not to be confused with C/N_o).

C/N_o — *Carrier-to-Noise Density Ratio.* Similar to C/N except that N_o is related to the noise in one hertz of bandwidth.

dB — *Decibel.* A term that expresses the ratio of two power levels used to indicate gains or losses in a system. Also used to express absolute power levels such as dBm or dBW.

The formula for determining the ratio in dB is

$$\text{Power ratio} = 10 \log^{10} \left(\frac{P_1}{P_2} \right) \text{dB}$$

where P_1 and P_2 are the power levels

10 dB = a power ratio of 10
20 dB = a power ratio of 100
30 dB = a power ratio of 1,000
40 dB = a power ratio of 10,000

A power ratio expressed as a negative value, e.g., -10 dB, indicates a loss rather than a gain.

dBm and dBW express absolute power levels above one milliwatt (dBm) and above one watt (dBW).

0 dBm = 0.001 watt or one milliwatt
10 dBm = 0.01 watt or ten milliwatts
20 dBm = 0.1 watt or one hundred milliwatts

0 dBW = one watt
10 dBW = ten watts
20 dBW = one hundred watts

downlink — The circuit between the satellite and receiving earth station.

E_b/N_o — *Energy-per-Bit-to-Noise Density Ratio.* In digital data work, this unit is an indication of the quality of the received signal and is directly related to BER or bit error rate. E_b/N_o of about 12.5 dB, uncoded, yields a bit error rate of about 1×10^{-6} or one error in one million bits. Usually data systems employ forward error correction encoding which improves the BER by a factor of 1,000 or more. For example, 7/8 forward-error-correction encoding yields BER of 1 in 10^{-7}, with an E_b/N_o of 10.7 dB in some systems.

EIRP — *Effective Isotropic Radiated Power.* This term describes the strength of the signal leaving the satellite antenna or the transmitting earth station antenna, and is used in determining the C/N and S/N. When related to the satellite, it describes the strength of the satellite signal at any particular place on the earth's surface. Domestic satellite EIRP at any point in the contiguous 48 states ranges between 30 and 37 dBW.

For transmitting video earth stations, a minimum EIRP is required to properly excite the satellite and is of the order of 80 dBW.

EIRP may be increased either by increasing the transmitter power, or by using a larger and higher gain transmitting antenna.

FDM — *Frequency-Division Multiplex.* A method of multiplexing or combining many voice data channels for transmission on a single RF carrier. The channels are separated in frequency and are carried on subcarriers.

FEC — *Forward Error Correction.* An encoding scheme to improve the BER in a data system. In a typical Rate 3/4 FEC system, the BER may be improved by as much as 10^4 or by a factor of ten thousand.

frequency reuse — See *polarization.*

GCE — *Ground Communications Equipment.* Relates to the earth station electronic equipment, such as receivers and exciters.

G/T — A figure of merit of an antenna and low-noise amplifier combination expressed in dB. *"G"* is the net gain of the system; and *"T"* is the noise temperature of the system. The higher the number, the better the system.

HPA — *High-Power Amplifier.* In a transmitting station, this is the final RF amplifier between the modulator/exciter and the antenna. For video use, this amplifier typically has a power output of 1000 to 3000 watts.

°K — *Degrees Kelvin.* Temperature of a device measured in degrees Kelvin. 0°K equals -273°C or -459°F. The scale is the same as centigrade except that 0°K is -273°C.

LNA — *Low-Noise Amplifier.* This is the preamplifier between the antenna and the earth station receiver. For maximum effectiveness, it must be located as near the antenna as possible, and is usually attached directly to the antenna receive port.

The LNA is especially designed to contribute the least amount of thermal noise to the received signal.

LNAs are generally of three types as follows:

a. *GaAs FET* (Usually pronounced "gas fet"). A transistor amplifier using gallium arsenide, field-effect transistors. These are the lowest cost LNAs and those currently used have noise figures from 1.2 dB to 2.6 dB. These are highly reliable units.

b. *Uncooled Parametric Amplifiers.* This is a much higher priced amplifier that has less noise contribution than GaAs FETs, thus, may be required in areas that have lower signal strengths (EIRP) from the satellite being used. These LNAs are also known as electronically cooled paramps and non-cryogenically cooled paramps.

c. *Cryogenically Cooled Parametric Amplifiers.* These are parametric amplifiers that are actually cooled to near 0°K (-459°F) by refrigeration equipment and which contribute the least amount of thermal noise. These are used in earth stations where the received signal is too weak to use the simpler and lower cost LNAs. Such LNAs are very expensive and require considerable attention.

MATV — *Master Antenna Television.* These systems are utilized in hotels, motels and apartment complexes for television signal distribution.

modem — A contraction of modulator/demodulator. Usually a device that combines the modulation and demodulation functions in a single unit.

MTBF — *Mean Time Between Failure.* A statistical determination of the time in hours of use between failures. This is an indication of the reliability of the item described (subsystem or system).

NF — *Noise Figure* or *Noise Factor.* A term which is a figure of merit of a device, such as an LNA or receiver, expressed in dB, which compares the device with a perfect device. The lower the number, the better the unit. For example, a 1.5-dB LNA has better noise characteristics than a 2.6-dB LNA.

The figure of merit of a device may also be expressed as noise temperature in degrees Kelvin or °K. Again the lower the number, the better the unit. GaAs FETs typically have noise temperatures of 120°K (1.5-dB NF) to 238°K (2.6-dB NF), while uncooled parametric amplifiers typically have a noise temperature of 55°K.

OMT — *Orthomode Transducer.* A device attached to the antenna feed that permits using the antenna for simultaneous transmission and reception without mutual interference. The device is polarization selective; thus, the transmit and receive signals must be on different polarizations, usually orthogonally (90°) related.

polarization — A characteristic of the electric field of an electromagnetic wave in space. Four senses of polarization are used in satellite work: horizontal linear, vertical linear, and RH and LH circular. The satellite and earth station polarizations must match, and an antenna feed adjustment is made at the time of installation to match the horizontal or vertical polarization of the satellite antenna. No adjustment is required for circular, except that both antennas must be for right-hand circular or left-hand circular.

Two signals in space on the same frequency can be separated by having a 90° (orthogonal) difference in their polarization, e.g., by vertically polarizing one and horizontally polarizing the other. This technique, which essentially doubles the capacity of a satellite, is used on several Domsats. Since two signals use the same frequency, but with orthogonal polarization, the technique is known as frequency reuse.

A special antenna feed known as a frequency reuse feed is required in systems using this technique.

protection See *redundant.*

redundant In satellite parlance, this means that extra subsystems are included that are used to automatically and almost instantaneously replace a failed or degraded subsystem. For example, LNAs are almost always supplied in pairs with a switchover system. Should the on-line LNA fail, sensors detect the failure causing the standby or redundant LNA to be switched online. Generally this takes place in less than one third of a second.

The term "protection" is also used in this context. The standby LNA, in this case, protects the on-line LNA.

Redundancy or protection may be of the 1:1 or 1:N type. Where one standby subsystem is provided for each on-line unit, the protection afforded is 1:1 or one for one.

Where several identical on-line subsystems are involved; e.g., four video receivers receiving four different programs, one additional subsystem may be provided to automatically replace any one of the on-line subsystems that may have failed. This is 1:N, or one for a number (N), protection.

The 1:N protection switches are rather complex and are more expensive than 1:1, but reduce the number of standby subsystems required in a system involving several identical on-line subsystems.

RF *Radio Frequency*

RX *Receive* or *Receiver.*

SCPC *Single Channel Per Carrier.* A satellite transmission system that employs a separate carrier for each channel. Generally this method is used at earth stations that have a low volume of traffic that can be handled by considerably fewer channels than is used in a typical frequency-division multiplex system that can multiplex up to near two-thousand voice channels on a single RF carrier.

S/N *Signal-to-Noise Ratio.* The ratio of the signal power and noise power. A video S/N (Signal-to-Noise Ratio) of 54 to 56 dB is considered to be an excellent S/N, that is, of best broadcast quality. A video S/N of 48 to 52 dB is considered to be a good S/N at the headend for cable TV.

TED *Threshold Extension Demodulator.* A scheme for lowering the threshold of FM (frequency-modulated) demodulators, permitting operation of the system with a lower C/N without impulse noise showing on the picture. This device is used when the C/N is below 13 dB, and is generally used in small antenna (5-meter) receive-only earth stations.

TX *Transmit* or *Transmitter.*

TVRO *Television Receive-Only* earth station.

UPLINK The circuit between the transmitting earth station and the satellite.

Cable Programming for April

Signal	Day	Start/Stop	Alert Times	Satellite/ Transponders
C-SPAN **(times approx.)**		12 pm-6 (6:30) pm (Mon., Tues., & Fri.) 10 am-6:30 (7:30) pm (Wed. & Thurs.)	No	F1, #9
Caliope		6:30 pm-7:30 pm (Mon., Tues., & Thurs.)	No	F1, #9
CBN		24 hrs.	No	F1, #8
Fanfare		Schedule unavailable at press time.	No	F1, #16
Front Row		2:30 pm-2:30 am		E,C F1, #12 P,M F1, #10
HBO (East)	1	3 pm-2:15 am	Before & after	F1, #24
(West)	2	5:30 pm-1:15 am	programming &	F1, #22
(TAKE 2)	3	6 pm-2 am	promos.	F1, #23
(Back-up)	4	6:30 pm-1:02 am		F1, #20
		P 5:30 pm-12:02 am		
	5	6 pm-12:59 am		
	6	6:30 pm-2 am		
		P 5:30 pm-1 am		
	7	2:30 pm-3:03 am		
	8	1 pm-1:56 am		
	9	5:30 pm-1:45 am		
		P 5 pm-1:15 am		
	10	5 pm-1:29 am		
	11	6 pm-12:59 am		
	12	5:30 pm-3:15 am		
	13	6 pm-2 am		
	14	2:30 pm-2:30 am		
	15	1:30 pm-1:20 am		
	16	5:30 pm-1:59 am		
	17	6 pm-1:26 am		
	18	5 pm-1:04 am		
	19	6:30 pm-1:48 am		
		P 5 pm-12:18 am		
	20	6 pm-2:15 am		
	21	2:30 pm-1:29 am		
	22	2:30 pm-2 am		
	23	5:30 pm-2:20 am		
	24	5:30 pm-1:05 am		
	25	6:30 pm-2:26 am		
		P 5 pm-12:56 am		
	26	5 pm-1:34 am		
	27	6:30 pm-2:55 am		
		P 5 pm-1:25 am		
	28	3:30 pm-1:20 am		
	29	3:30 pm-2:05 am		
	30	6 pm-2:15 am		
HTN		8 pm-10 (11) pm	No	F1, #1
KPIX (time permitting)		2-4 hrs. per day	No	F1, #1
KTVU		7 am-10 am (Mon.-Fri.) 7 am-2 pm (weekends)	No	F1, #1
MSG Sports	2	8 pm-10:30 pm	No	F1, #9
	3	7:30 pm-9:45 pm		
	4	7:30 pm-10 pm		
	5	7:30 pm-9:45 pm		
	8	7:30 pm-10 pm Play-offs from the NHL and NBA have not yet been announced.		
Newstime		24 hrs.	No (tones only for local adv.)	F1, #6
Nickelodean		10 am-11 pm (weekdays) 9 am-11 pm (weekends)	No	F1, #11
PTL		24 hrs.	No	F1, #2
Reuters		Not in use yet.	No	will use F1, #18
SPN		7 am-10 am (weekdays) 7 am-12 pm (weekends)	No	F1, #1
Showtime		E 5:30 pm-1:30 am (weekdays) 2 pm-1:30 am (weekends)	1 minute before and after programming.	F1, #12
		C 4:30 pm-12:30 am (weekdays) 1 pm-12:30 am (weekends)		F1, #12
		M 6:30 pm-2:30 am (weekdays) 3 pm-2:30 am (weekends)		F1, #10
		P 5:30 pm-1:30 am (weekdays) 2 pm-1:30 am (weekends)		F1, #10
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 am-2 am	No	F1, #11
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	Westar II, #3
WOR		6:55 am-2:30 am	No	Westar II, #1
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.

See our card on page 68.

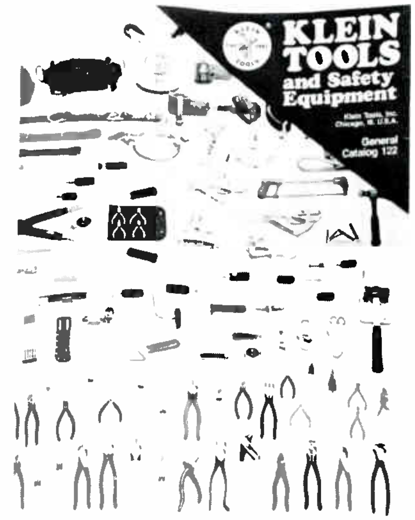
New 84-Page Catalog from Klein Tools, Inc.

Catalog #122, signifying the 122 years the company has been producing top quality tools for professional tradesmen, is now available from Klein Tools, Inc.

The new 84-page, two-color catalog covers Klein's broad product line which includes a wide selection of pliers, screwdrivers, hammers, measuring tapes, knives, levels, tool pouches, wrenches, chisels, saws, cable cutters, fish tapes, work gloves, etc., plus a full line of occupational safety equipment.

All tools and equipment are illustrated with large, clear photographs and detailed drawings. Product descriptions are concise and the catalog is organized for easy reference. Information on OSHA and ANSI regulations on safety equipment and tips on the proper use and care of hand tools make this an important reference guide.

For a copy of this catalog, contact Klein Tools, Inc., 7200 McCormick Road, Chicago, Illinois 60645, (312) 677-9500.



New 84-page catalog from Klein Tools.

Gandalf Literature on Synchronous Modem

Gandalf Data Inc., has released product literature on the Model LDS 404B Synchronous Modem. LDM 404B transmits data in full duplex at 4800 bps over a 4 wire telephone 3002 tariffed loaded line at distances up to 50 miles. Other advantages include remote and local digital loopback, internal or external clock and EIA RS 232 interface to name a few.

Request Data Sheet LDM 404B from Gandalf Data, Inc., 1019 S. Noel, Wheeling, IL 60090, (312) 541-6060.

New Video Products Catalog from Anixter-Pruzan

Anixter-Pruzan has recently published a 16-page Video Products Catalog describing all of the items required to equip a video studio.

The free catalog is available from Anixter-Pruzan regional offices in Seattle, New Jersey, Los Angeles, Atlanta, St. Louis and Salt Lake City. In the West phone toll free (800) 426-4948; In the East, call (800) 631-1166.

Anixter-Pruzan publishes 16-page catalog.

Microwave Homodyne Systems

Homodyne (coherent) detection admits to a second generation of microwave systems which are finding use in a wide variety of measurement, monitoring and control problems. This book is the third in the IEEE Electromagnetic Wave Series and considers homodyne detection for various types of modulation.

The literature applies these principles to the measurement of transmission or reflection parameters of devices, the measurement of E or H fields in open or closed structures, automated homodyne systems, automatic frequency stabilization of microwave sources and coherent transponding systems. In addition, a comprehensive treatment of the theory of modulated scattering antennas is given, along with methods of modulating them.

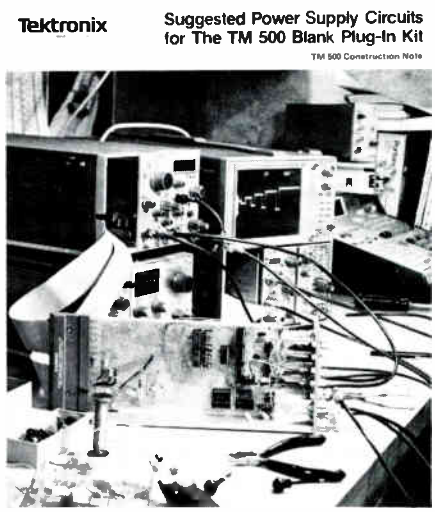
The advantages of homodyne detection are that the phase as well as the amplitude information is preserved, the detection process is highly sensitive and linear over a wide dynamic range, and the systems are readily automated to give phase and amplitude information simultaneously and independently.

The catalogs may be ordered from International Scholarly Book Services, Inc., P.O. Box 555, Forest Grove, Oregon 97116, (503) 357-7192.

Power Supplies Customized for Specific Applications

A 16-page booklet from Tektronix, Inc., provides a discussion of technical considerations for power supplies for different applications, plus schematics and descriptions of more than 35 power supply circuits. Both bipolar and MOS applications are covered. Positive, negative, and dual supplies are described. Supplies are offered for both digital and linear applications.

Readers may obtain a free copy from Tektronix, Inc., P.O. Box 500, Beaverton, Oregon 97077, or by calling the nearest Tektronix field office.



Free 16-page booklet from Tektronix.

Test Equipment

Surge Test Module from KeyTek Simulates EMP, Transients

A plug-in network designed to generate transient power surges that simulate the effects of both nuclear Electromagnetic Pulse and close-proximity lightning strikes has been introduced by KeyTek Instrument Corporation.

The new model PN 253 programmer network operates with the KeyTek model 424 surge generator/monitor. It generates 100 kV/usec surges, with selectable open-circuit voltage wave durations of from 20 to 1,000 usec, and short-circuit current waves from 20 to 320 usec. Voltage peaks from 0 to 2 kV are available, with either + or - polarity. Maximum output current is 150A and maximum delivered energy varies with wave duration from approximately one joule or more than 20 joules.

Peak current values are indicated directly, with both digital and go/no go displays, by the model 424 surge generator. Peak voltages are read by a suitable oscilloscope, measuring directly at the driven load.

For further data, call or write KeyTek Instrument Corporation, 220 Grove Street, Waltham, Massachusetts 02154, (617) 899-6200.

Microwave

Earth Station Antennas from Prodelin

Prodelin offers earth station antennas in diameters of 6 feet (1.83 meters), 10-feet (3 meters), and 15-ft. (4.57 meters). Frequencies: single polarization; 2.2-2.3 GHz and 2.25-2.69 GHz. Dual frequencies: 3.7-4.2/5.925-6.425 GHz and 11.6-12.2/14.0-14.3 GHz.

The standard antenna system consists of a fiberglass reinforced parabolic reflector, a feed system and a manually adjusted ground mount.

The 6-foot (1.83 m) and 10-foot (3 m) reflectors are one-piece construction. The 15-foot (4.57 m) reflector is supplied in two segments for ease of shipment and bolted together in the field. No alignment is necessary because of a self-aligning rear ring support and all reflectors are supplied with a white-optically scattering finish.

For additional information, contact Prodelin Inc., P.O. Box 131, Hightstown, New Jersey 08520, (408) 244-4720.

Hughes Offers New Manually Agile Satellite Receiver

A new 24-channel satellite video receiver, featuring manual frequency agility to permit simple channel switchover in the field, is offered by Hughes Aircraft Company's microwave communications products.

The new receiver, model SVR-462, is designed for use in multiple-channel, receive-only CATV terminals. It provides full 24-transponder coverage, accepting a frequency-modulated video signal, with audio program subcarriers, in the 3700 to 4200 MHz frequency range.

A special feature of the new unit extends the FM threshold to considerably lower than conventional receivers. This is accomplished by means of the same patented phase-lock demodulation and threshold extension as on the Hughes SVR-461 electronically-tunable receiver.

Model SVR-462 also includes a down converter, video processor, audio subcarrier demodulator, and associated power supplies and control circuitry. Additional program or cueing demodulators can be included for special applications.

For further information, contact Hughes Microwave Communications Products, P.O. Box 2999, Torrance, California 90509, (213) 534-2146.

Compact Wide Bandwidth WR62 Microwave Isolator

A compact microwave isolator with a wide bandwidth has been introduced by Microwave Development Laboratories, Inc.

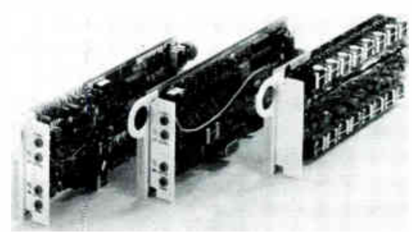
The MDL Ku-Band mini-isolator is a WR62 wave guide, microwave isolating device that provides a wide bandwidth of 15.5 to 17.5 GHz and is easily integrated into system packages. It measures 0.5-inch L x 1.55-inch W x 1.34-inch H, weighs two ounces and provides an isolation of greater than 15 dB.

The mini-isolator provides a VSWR of less than 1.4 for both ports (typically 1.3). At narrower bandwidths, VSWR's as low as 1.2 are attainable. Insertion loss of the unit is less than 0.4 dB and average power rating is 10 watts. These devices are suitable for any application requiring efficient microwave isolation.

For more information, contact Microwave Development Laboratories, Inc., 87 Crescent Road, Needham Heights, Massachusetts 02194, (617) 449-0700.

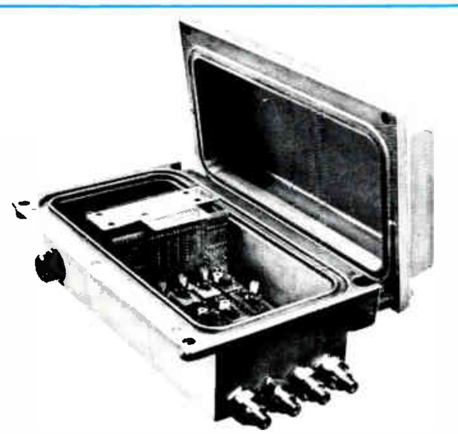
Microwave Channel Modem Equipment

Dantel, Inc. has announced a new product line of channel modem equipment for users of microwave service channels and multiplex telephone systems. Intended primarily for high frequency-single-side-band service channel applications, the channel modem components can be used in any application requiring interface of a voice channel to multiplex channel frequencies.



The channel modem consists of a model 90570 modulator/transmitter and a model 90571 demodulator/receiver interconnected with a dual bandpass filter. These components are available installed in a factory wired, one-and-three-fourth-inch rack-mount shelf, the 8M701 channel modem assembly. They can also be installed in any Dantel 90000 series equipment shelf along with Dantel order wire modules, alarm system components, speech-plus combiners, FSK data equipment and baseband interface components to make a complete service channel package.

(Cont. on page 69)



The pinnacle of 25 years of CATV knowhow.

MCE's New Nova CAP-TAP®
Will Cut Maintenance Costs and Increase Profitability.

You get complete control over any number of subscribers with the all-new 5—300 MHz NOVA CAP TAP (Controlled Access Point and Tap), both standard and premium TV service, from a single, central location!

More than 25 years of engineering knowhow went into designing this advanced system, the most innovative in the industry. Among its features:

— Useable with new or existing systems
— No system equipment changes needed*
— Subscriber access time — 50 Ms.
— Flexible identity code — extra control bits reserved for future use
— Security outside the home for standard service and two premium television channels
— Addressed status of TAP not affected by power failure
— Simple to program
— Modular plug in construction

*assumes dedicated system

See a demonstration of all of the NOVA state-of-the-art one-and two-way trunk and distribution equipment. It continues to be your best buy i. and rebuilt systems!

See our card on page 65

mce

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P.O. Box 13741
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(602) 271-9181

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(Cont. from page 63)

The new channel modem is particularly useful for the microwave system operator who wishes to utilize the MUX channels in the 12 to 60 KHz region for service channel or control applications without going to the expense of installing a complete multiplex shelf. It is also practical for single channel translation and party-line order wire applications.

For further information, contact Dantel, Inc., 1922 N. Helm Avenue, Fresno, California 93727, (209) 252-1651.

features of larger splitters that can be used both indoors and outdoors—is now being marketed by Cerro Communication Products.

The S-250M mini two-way splitter, used for hooking up extra TV sets in subscriber dwellings, features side mounted connectors, and a heavy duty corrosion resistant, die cast housing plated for added corrosion resistance to withstand extreme environmental conditions and eliminate signal ingress and loss.

Other features of the device include: "F" type connectors that are sealed to protect internal components from moisture; precision machined connector threads (not cast) to insure burr-free threading; a sealed cover, and silver plated contacts.

The splitter also offers a 5-300 MHz response; a low insertion loss and excellent matching characteristics.

For additional product information, contact Cerro Communication Products, Member of The Marmon Group, Halls Mill Road, Freehold, New Jersey 07728.

Miscellaneous

Economy Hand Tool Crimps Belden 8281 Cable

AMP Special Industries' Coax Economy Stamped Hand Tool line has been expanded to include Belden 8281 cable, a popular 75 ohm video cable used by television studios, broadcasting systems and test equipment. Designed to crimp UHF and BNC connectors on the Belden 8281 cable,

this quality Super Champ hand tool is lightweight and economical. It's features include a guide on the tool body for strip dimensions in all Coax Series—standard, economy, single or dual crimp.

For more information contact AMP Special Industries, Valley Forge, Pennsylvania 19482, (215) 647-1000.

New Miniature Two-Way Splitter Offers Features of Larger Splitters

A new miniature size two-way splitter that's particularly well suited for installation in very small spaces—with electrical characteristics and design

See our card on page 68.

How to Wire A House

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

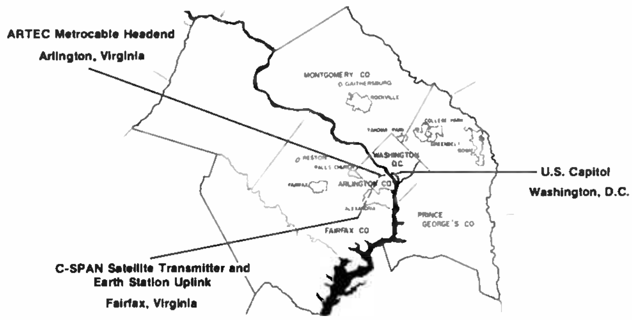
In March, hundreds of thousands of Americans will have the opportunity to "live" a civics lesson as the U.S. House of Representatives initiates its historic gavel-to-gavel telecasting of its proceedings via the Cable Satellite Public Affairs Network (C-SPAN).

C-SPAN is the non-profit news and public affairs programming service created by and for the cable television industry. This service will be taking the feed from the House, and via cable and microwave link, will beam the signal to cable systems off transponder 9 on Satcom I.

Initially, the new network will confine itself to delivering the House proceedings. Later, if the Senate allows cameras into its chambers, C-SPAN will have the option of adding sessions to its service. And, C-SPAN's plans include incorporating other public affairs and news programming "unique to cable" in the future.

"The impetus for C-SPAN came from the decision made last October by the U.S. House of Representatives to open its proceedings to television cameras," explains C-SPAN president and chief executive officer Brian Lamb, who had been anticipating the inevitable decision for some time.

C-SPAN Satellite Transmission System



5 miles from Capitol to ARTEC headend
7 miles from ARTEC headend to transmitter/uplink site

"Because of the advent of the domestic satellite system and the growing channel capacity of cable television systems, for the first time in the industry's history it is now possible to contemplate carrying such programming."

The House of Representatives delivers, via its own cable system, a baseband video signal to room B364 in the Rayburn Office Building. That room is where all of the electronic news media literally pick up their feed. C-SPAN will also be set up in that room, and will have a character generator (Video Data Systems), titler and an operations director stationed there.

The operations director will take the feed and superimpose the appropriate information on the screen. From this point, coaxial cable will be run from the Rayburn Building through the steam tunnels that go to the House and Senate power plant, located about a half-mile from the pick up point. The coaxial cable will be pulled through a chill water tunnel over the power plant. C-SPAN will also mount a four-foot microwave dish atop the power plant.

This will be a two-channel system. One is a Microwave Associates' 12G high-powered system, and the other is that company's low-powered 12XE system. C-SPAN will be operating in the CARS band microwave 12 GHz spectrum.

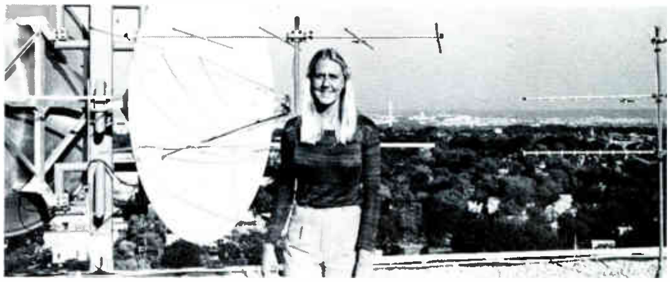
A signal will be sent approximately five miles to the top of the Tower Villa apartment house in Arlington, Virginia, which also serves as the headend for the ARTEC cable system in Arlington. At that point, C-SPAN will retransmit the signal via another seven-mile microwave hop to its transmit facility in Fairfax County, Virginia. This facility is adjacent to the uplink for the Public Broadcasting Service.

At the Fairfax County facility, C-SPAN is erecting a ten-meter Scientific-Atlanta redundant satellite transmitter. The satellite transmitter site will be located on 1.4 acres of land. On that site will be a 120-foot Rohn microwave tower, being constructed by U.S. Tower of Rockville, Maryland. In addition, a four-foot dish on top will be "looking back" to the Tower Villa apartment house in Arlington, Virginia.

The Fairfax County site will also incorporate an 18-foot by ten-foot microvan that will contain the transmit equipment and the microwave radio receive gear.

C-SPAN's operations includes a staff of four, including Lamb. Lamb was formerly National Affairs Editor for Titsch Publishing. His chief engineer is Don Houle, formerly with Western Union. For the last two years, Houle had been supervising 25 technicians who maintain the communications systems to and from the Washington, D.C. area for Western Union. Brian Lockman is C-SPAN's operations director. He will be the man on-site at Capitol Hill who will turn on the system daily. Jana Dabrowski is director of Network Services and serves as C-SPAN's affiliate-relations person.

According to Lamb, "This will be the first CARS microwave link in Washington, D.C., and the first commercial satellite transmitter in this area that will be able to transmit to the RCA satellite."



C-SPAN's Director of Network Services Jana Dabrowski.

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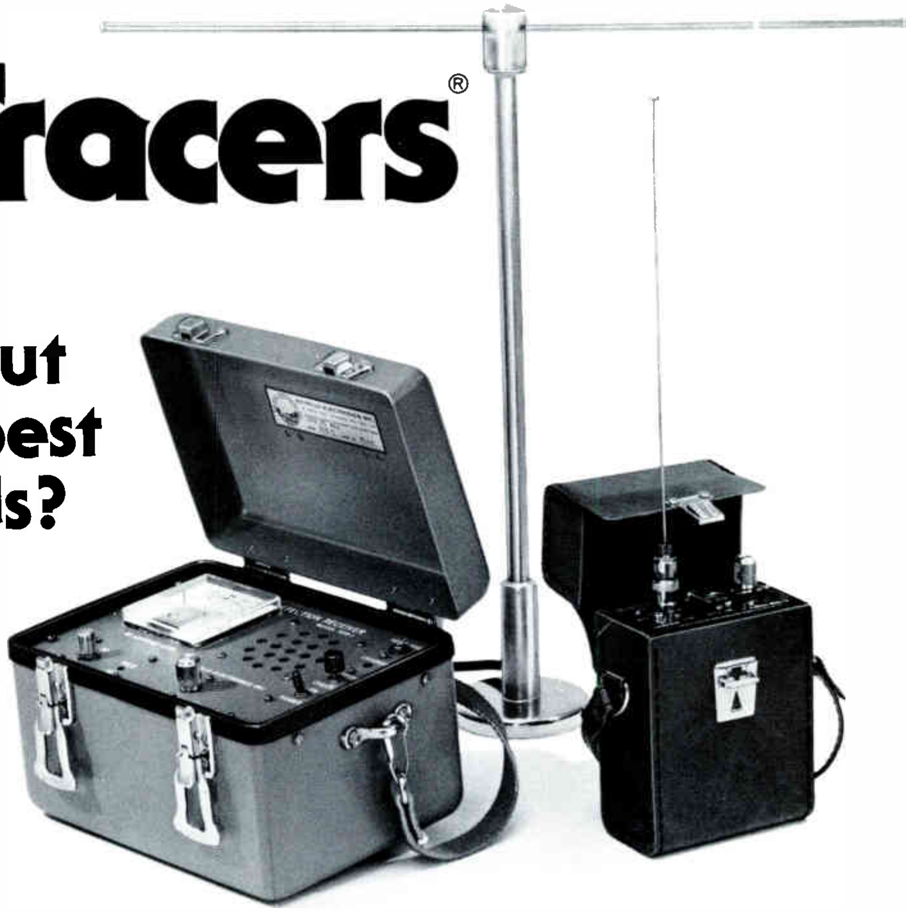

Is RF leakage in your CATV cable system exceeding FCC limits? Is it an indication of present or potential mechanical failure which could result in costly repairs or FCC violations?

Get the answers promptly with VITEK's compact Tracer* (TR-1) or Tracer* (TR-2) RF Detection Receivers. Both locate and measure leakage and determine whether radiation exceeds FCC limits. They provide early warning of hairline cracks in expansion loops, loose connectors, leakage from electrical equipment housings, trunks and feeders due to loose covers or corrosion . . . typical leakage problems.

No separate transmitter required. Both receivers operate with any cable TV video or pilot carrier.

Both are rugged, self-contained, powered by rechargeable batteries, offer a crystal controlled local oscillator with front panel frequency trim adjustment and many other features.

The "Tracer" Model TR-1

is a calibrated receiver system which assures absolute compliance with FCC regulated radiation limits. Its 40 dB logged scale is accurate to ±1 dB.

The system includes tuned dipole antenna with magnetic base, head phones and AC adapter/charger. Gell Cell batteries provide up to 50 hours of operation on a single charge. Weight: only 5 lbs.

The "Tracer" Model TR-2

is an economical field unit that can detect and locate RF leakage and can measure radiation with sufficient accuracy for general trouble shooting. Ni-Cad batteries provide up to 15 hours of use on a single charge. Includes AC adapter/charger. Weighs only 1.5 lbs.

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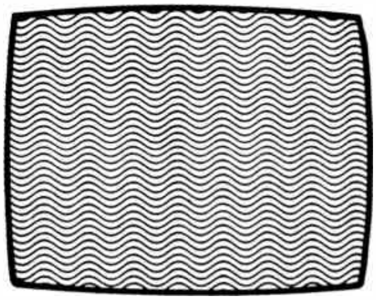

Q I am new in the CATV industry and although I'm not a technical type, I do consider myself to be an astute businessman. I have recently acquired a small franchise and plan to built it soon. As a "greenhorn" coming into the industry, what in particular should I look for technically in order to take advantage of past experience and avoid costly mistakes?

A The singular most important aspect of your system in a technical sense is the system engineering plan. The majority of system technical problems that later come back to haunt you and cost you money are the result of improper engineering during the design stage and not matching the construction procedures to the situation. Of course, the absence of quality control during construction and initial installation phases puts the icing on the cake. You may now prepare for early rebuilds, increased technical labor requirements and lower subscriber penetration than the market might otherwise support because of subscriber dissatisfaction.

Other technological industries have learned long ago that good planning and sound engineering are basic to developing a successful business. Our industry is learning this lesson now, and while we have matured considerably in the last few years, there are still many people around who view the engineering aspect of cable with less than appropriate regard. And a few of these people are even successful in spite of this self-defeating attitude. You will find many good ol' boys who will "git her done" and many manufacturers who will design your system for "free."

My advice is to recognize that nothing is free and that the best intentions do not necessarily guarantee a good job or a profitable business. You are entering into a high technology business that requires large capital outlays and has high risks. It should be viewed as such. You should familiarize yourself with CATV technology, buy equipment and services from people that you have confidence in, and view free advice with a healthy sense of skepticism.

Specifically, the following areas have created problems time after time:

- Improperly determined amplifier output levels. Each system is different, and in order to fully utilize the amplification equipments' capabilities in terms of gain and output levels, an analysis should be done.
- Improperly calculated tap output levels. This has continued to be a problem even though its calculations are simple and straightforward.
- Poor planning of trunk routes. Trunk routing needs to be determined based on several criteria including: cascade, pole line availability, cost of construction and geographical distribution of the population.
- Inappropriate utilization of system components. The selection of cable sizes, amplifier gains, and various other component specifications requires a system evaluation to determine which choice gives the best performance per dollar invested.
- Inadequate grounding and surge protection. Knowledge and techniques for dealing with lightning and transients have improved. Each system needs to be looked at individually to determine what makes sense in terms of protection in this area.
- Inadequate working system design plans. A universal problem has been the lack of adequate working prints for the system. Much time will be saved if each field person has a reduced set of up-to-date system design maps. Another problem in this regard has been the lack of updating system maps when modifications and extensions have been made. As a result, much of the industry relies on field personnel memory for troubleshooting the system. At best, this is a terribly inefficient mode of operation.
- Misjudgment of makeready costs. If you are not familiar with pole line rearrangement requirements and costs, find someone who is to help get a handle on this subject. These costs can vary over a wide range and will certainly affect the cost of the system and the rate at which it can be built.
- Misjudgment of underground construction costs. The same principle as above applies. Both rearrangement cost estimates and underground construction cost estimates require an on-site evaluation to predict expenses with any degree of reliability.

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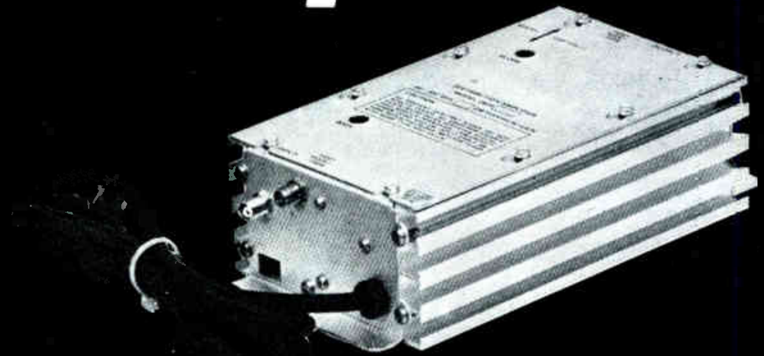

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"Battlestar Gallactica"

By Terrence McLaughlin
Canadian Cable Television Association

Rogers Cable TV Limited, of Toronto, an innovator in the cable television field and one of Canada's largest operators, recently opened its new videocenter at Rogers' downtown business offices.

The videocenter, nicknamed "Battlestar Gallactica" by one of Toronto's journalists because of its impressive design, transmits 27 different programming channels (15 off-air and 12 cable originated).

The complex also includes a "hub" and "signal routing" center for community programming networks of other Toronto cable companies and the Rogers hotel pay-TV system.

The shopping list for this new center is an impressive one: 45 VTR machines—21 Sony three-quarter-inch cassettes and 15 IVC 900 and 960 series; 15 time base correctors—nine Ampex and six TVS; 16 character generators—for everything from a digital tele-viewers' guide to news, weather, sports, financial news, airport information, programming and public affairs notes.

The ten consoles were designed by Rogers and custom-built to fit on the front of the equipment racks.

There are 56 Sony color receivers for monitoring the system, and another 30 assorted black-and-white monitors. All this equipment makes for quite a show in the playback center.

In the adjacent community or public access studio, two Ampex BC 230 B cameras are used; the community channel also uses two mobile Phillips VO80 systems and three additional Sony portable color cameras.

The headend for the system was recently installed a few blocks away from the videocenter atop a major bank building.

Rogers has always placed a strong emphasis on community, or public access, programming. In fact, the Rogers community channel is actually five potentially different channels. Transmission has been decentralized completely so that different programs can be transmitted to the city of Toronto and four adjacent municipalities at the same time or in any combination.

The community channel master control room also contains the switching "hub" for programs of other Toronto-area cable systems so that programs originating with those companies can be used by Rogers or other interconnected programming departments.

Rogers Cable TV Ltd., has a sophisticated production facility: the switcher provides fully synchronized production capability with full effects and chroma key selection; the audio mixer was custom-designed by McCurdy of Canada and handles 24 inputs with total level control through two active sub-channels and independently activated cue circuits; and an equalizer allows tone adjustment while a compressor/limiter regulates output.

On the control panel, a remote lighting control allows individual activation and dimmer control of each studio light. In addition, a 16-page character generator provides instant digital identification or communication for the program. The wall in front of the control console holds the heart of the system—the camera control units for the two BC230B Ampex broadcast color cameras plus a vectorscope for color control. The central color monitor, the output monitor, is a $6,000 20-inch Barco unit.

Rogers' programming philosophy leans heavily towards mobility and the ability to do television programming when and where an event in the community may occur. Affectionately named "The Wiener" by the programming staff, the Rogers Mobile Caravan provides the community channel with the ability to perform sophisticated multi-camera programs on location.

A bi-directional programming grid throughout downtown Toronto allows "live" programming possibilities from City Hall, Queen's Park and most of the downtown hotels and convention centers. A portable "live eye" microwave unit is on order and will extend this capacity to all licensed areas. Also, a second smaller "Wiener" is being built for Rogers' Brampton cable system based on the Phillips Video-80 system.

An application of the "live" coverage capability of this operation will be "live" coverage of the Canadian Cable Television Association's 22nd annual convention, April 2-5, 1979, at the Sheraton-Center Hotel in Toronto.

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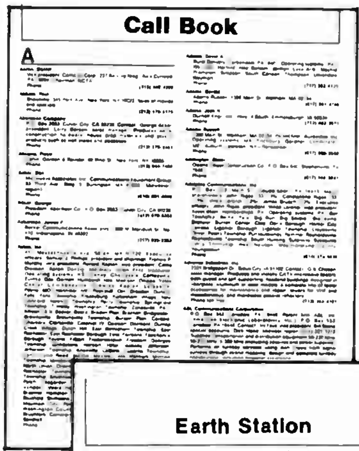

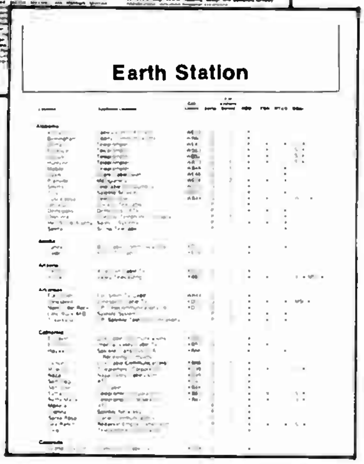

- Calendar
- FCC Rules, Regulations and Forms
- Copyright
- FCC Organization Flow Chart
- Call Book
- Bell System Representatives
- Cable Associations
- Catalog of Equipment and Services
- Earth Station Report
- CATV Off Air Interference Chart
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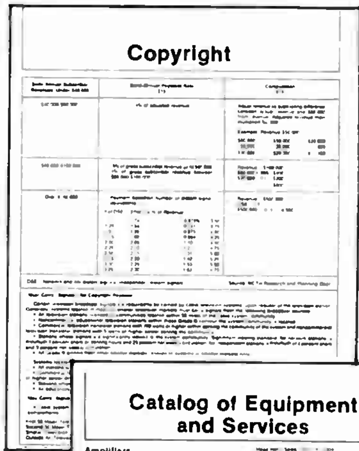

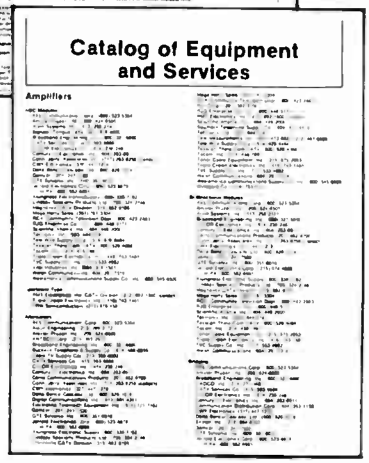

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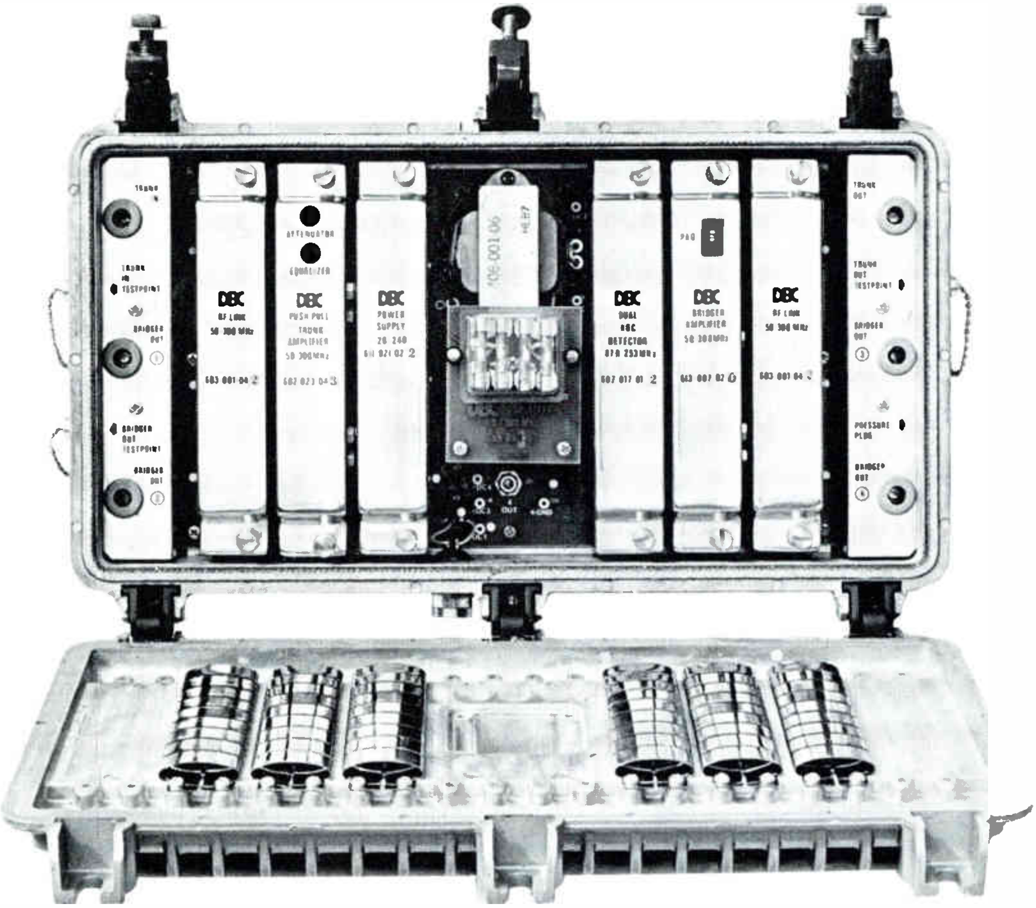

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In USA Wats ☎ 800-828-1016

★The board of directors of Comm/Scope Company recently elected **Larry W. Nelson** to the position of vice president, engineering. Prior to his employment with Comm/Scope Company, Nelson held various engineering and quality control positions with Pratt and Whitney at Hartford, Connecticut, and with Superior Continental Corporation at Hickory, North Carolina, where he was manager, Quality Control, for the Superior Cable Division. In 1976 he assumed the position of product engineering manager at Comm/Scope and was named director, Coax Engineering, in November 1977.

Larry W. Nelson

★The appointment of **Gail Bondurant** as senior sales representative for the Sylvania CATV Equipment & Electronics Corporation. Bondurant is responsible for sales of Sylvania CATV products in the southern region which includes Alabama, Arkansas, Eastern Texas, Louisiana, Mississippi and Oklahoma. Prior to joining the company, she held a sales position with Video Data Systems.

★UA-Columbia Cablevision has announced the appointment of **Maryann Eardley** of Riverdale to the position of community service director. In her new role Eardley will investigate municipal need and desire for the access channels in areas not yet serviced by UA-Columbia. Eardley brings to UA-Columbia experience in marketing, sales and customer service acquired at Thomas A. Edison College in Princeton.

Maryann Eardley

★Heller-Oak Communications Finance Corporation has announced the appointment of **Lester J. Golbeck** as assistant vice president. Golbeck joined the Heller-Oak organization as a financial analyst in 1975. Previously he was involved in commercial financing with Walter E. Heller International Corporation.

★**William (Will) G. O'Brien** has been appointed director, Customer Services at Data Printer Corporation, manufacturers of ChainTrain® Printers. O'Brien will be responsible for several aspects of customer service including technical support, technical training, spares ordering and planning and logistics. He will report directly to the president.

William G. O'Brien

Employment Oppt.

Help Wanted

CHIEF ENGINEER
Washington D.C. area

Small MSO in the Washington D.C. area requires a chief engineer in Gaithersburg, Maryland, a D.C. suburb. The CATV system requires a hands-on individual with a strong background in construction and plant electronics. We are planning a ground station, operational in 6 months, and a 2-way security system. We expect rapid expansion of this system.

Good salary and excellent growth potential both in this cable system or the parent MSO. We are looking for one good person to lead our 3-man field team which will expand. Latest construction and electronics equipment available. Send resume and salary history to William V. Murphy, Gaithersburg CATV, 807 S. Frederick Avenue, Gaithersburg, MD 20760 or call collect (301) 645-4440.

PLANT MANAGERS

To supervise and administrate all plant personnel in repair, maintenance, construction and installation. Must know system design and be able to train other plant employees in their jobs. Systems available are located in Southern New Jersey. Send resumes to Mr. Ed Shaman, Teleprompter District Office, 6820 Ventnor Avenue, Ventnor, New Jersey 08406.

EOE/M-F

ENGINEER

Engineer needed with 1st Class FCC license with microwave experience. Should be interested in operating satellite transmitter. Work in the Nation's Capital for Cable Satellite Public Affairs Network. Contact Brian Lamb.

C-SPAN
Suite 308
1745 Jefferson-Davis Highway
Arlington, VA 22202
703-892-4200

CHALLENGING OPPORTUNITIES AVAILABLE

Young and very aggressive MSO located in Tennessee, Kentucky and Virginia area has positions for aggressive self-starters desiring career advancement.

***SYSTEM TECHS**-Responsibilities to include customer services, trunk and distribution operations, some tower and small in-house extensions. Craftsmanship a must.

***SALES PERSONNEL**-Individuals needed for new builds, multi-tier services with HBO and FM. Large bonuses for above average percentages.

***INSTALLERS**-Contract and permanent positions available. Detail and thoroughness a must. Consistent and coordinated work.

Excellent benefits and quality working conditions. Opportunity for excellent compensation based on your contribution to company growth. Send resume with salary history, call today:

DAVID NORCUTT
VICE-PRESIDENT, OPERATIONS
MATRIX ENTERPRISES, INC.
P.O. BOX 2000
FRANKLIN, TN 37064
615-373-2794

TWO CHIEF TECHNICIANS NEEDED

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Two Chief Techs needed in charge of 100 mile systems in Ames and Newton, Iowa.

Construction knowledge important. Ames system includes microwave.

Contact:
Terry Rich 515-752-3691
1201 Industrial Blvd.
Marshalltown, Iowa 50158
E.O.E./Heritage Communications, Inc.

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CHIEF TECHNICIANS
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Ground floor opportunity with a rapidly expanding company for individuals with all purpose: manager technician, chief technician, installer technician, installation cable TV background. Advance your career with a progressive company. Positions immediately available in CA, UT, MI, CO, MD, SC, GA and FL. Many company benefits. Send resume to:

P.O. Box 59
Wilton, CT 06897

MICROWAVE/MAINTENANCE TECH WANTED

Need experience person to maintain (2) headends and perform preventive maintenance on 280 mile system. FCC 2nd class license a must. Contact:

Elliot C. Roskow
Coastal Cable TV
791 Long Hill Road
Groton, CT 06340
203-445-8116

Ad Index

C-ED'S CLASSIFIED RATES AND INFORMATION

Payable in advance Check or money order only (Billing charge $1 00 additional)

When placing an ad, indicate the exact category desired Help Wanted, Position Wanted, Professional Services, Business Directory, etc If this information is omitted, we will determine the appropriate category according to the copy

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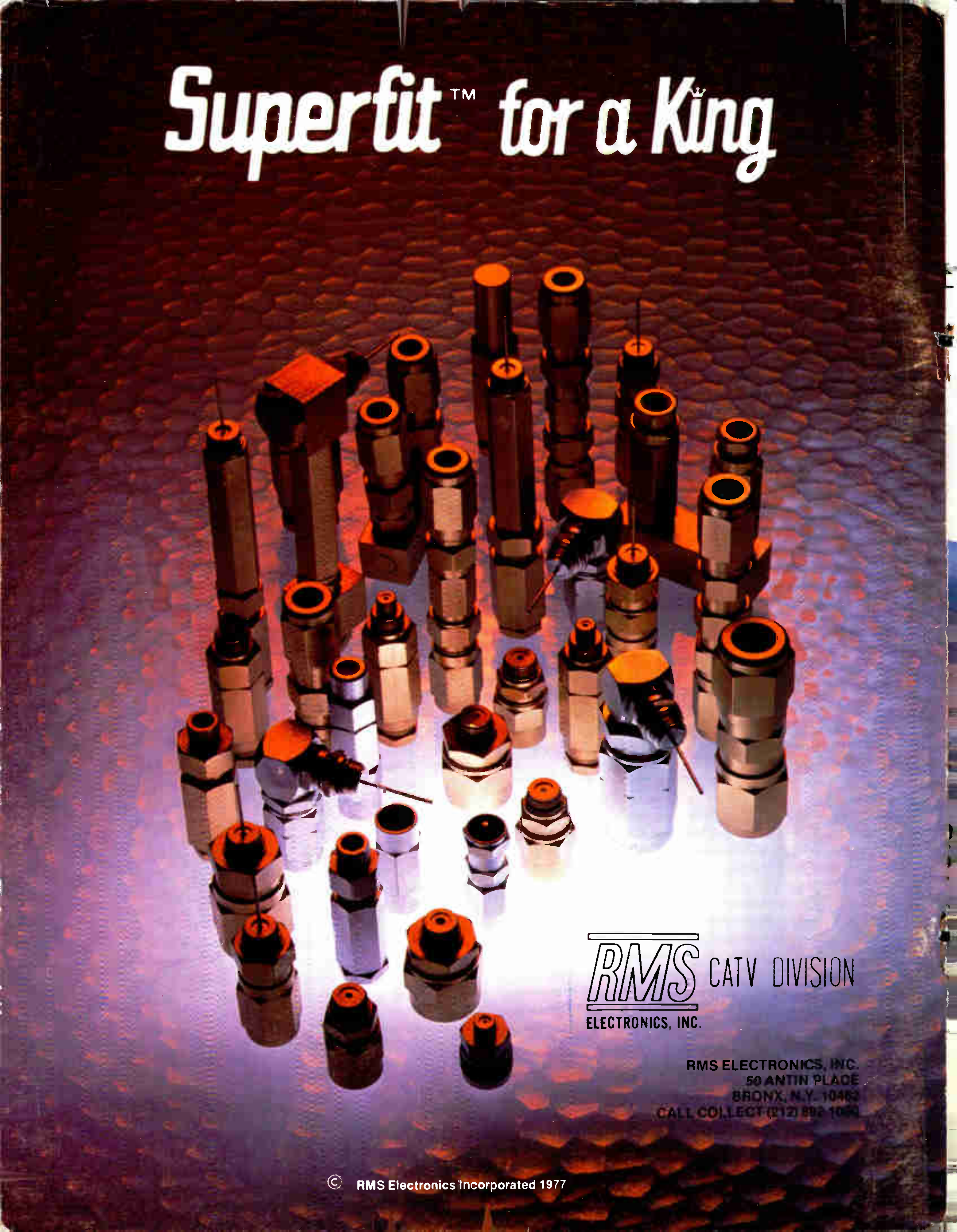
For further information or to place your classified advertisement, contact Joyce Hemmen at 303-573-1433.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