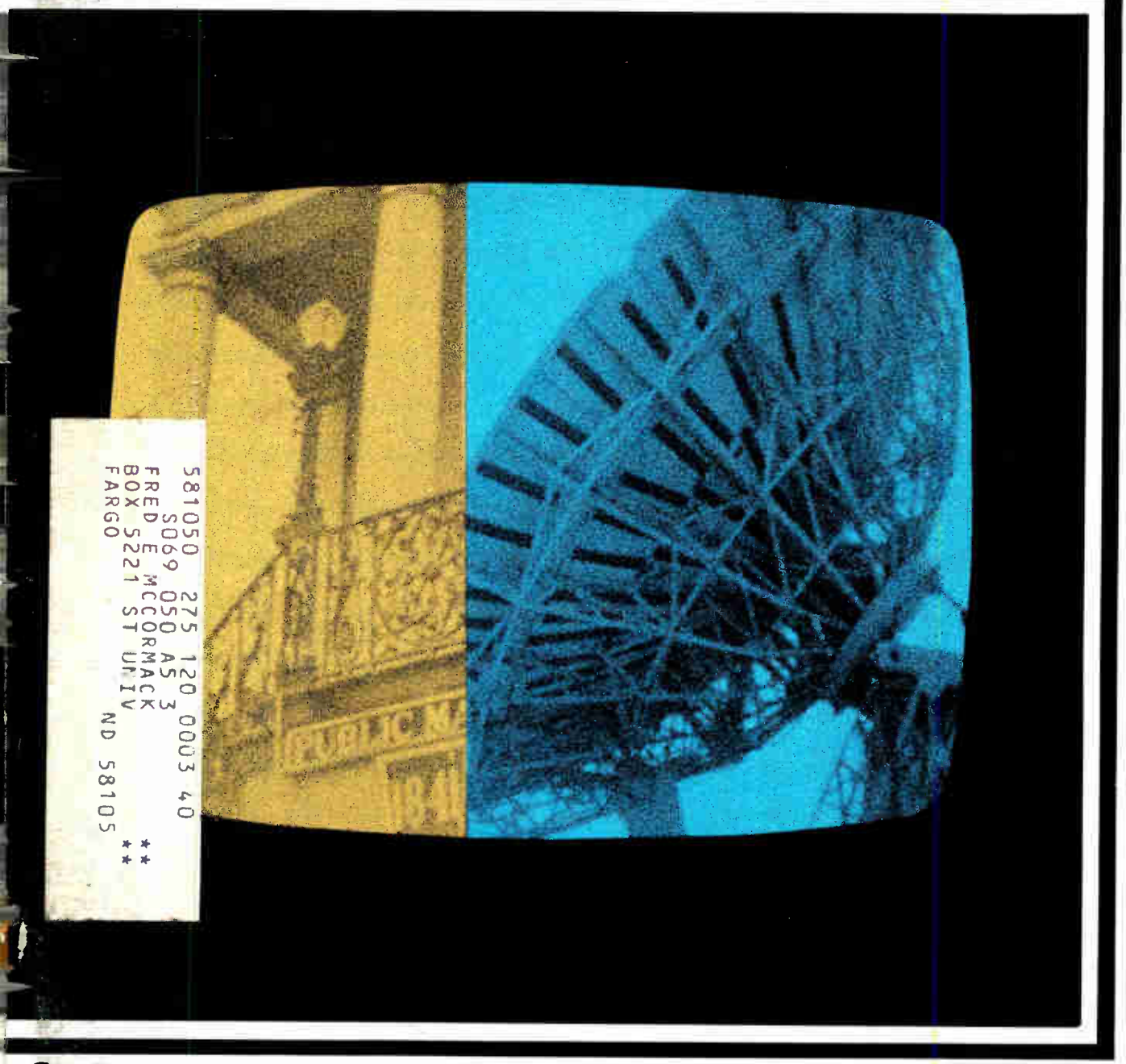
C-ED

Modulation Considerations
Slow Scan Teleconferencing
Time Base Correction in Cablecasting



Communications-Engineering Digest
Reporting the Technologies of Broadband Engineering

November 1979
Volume 5, No. 11

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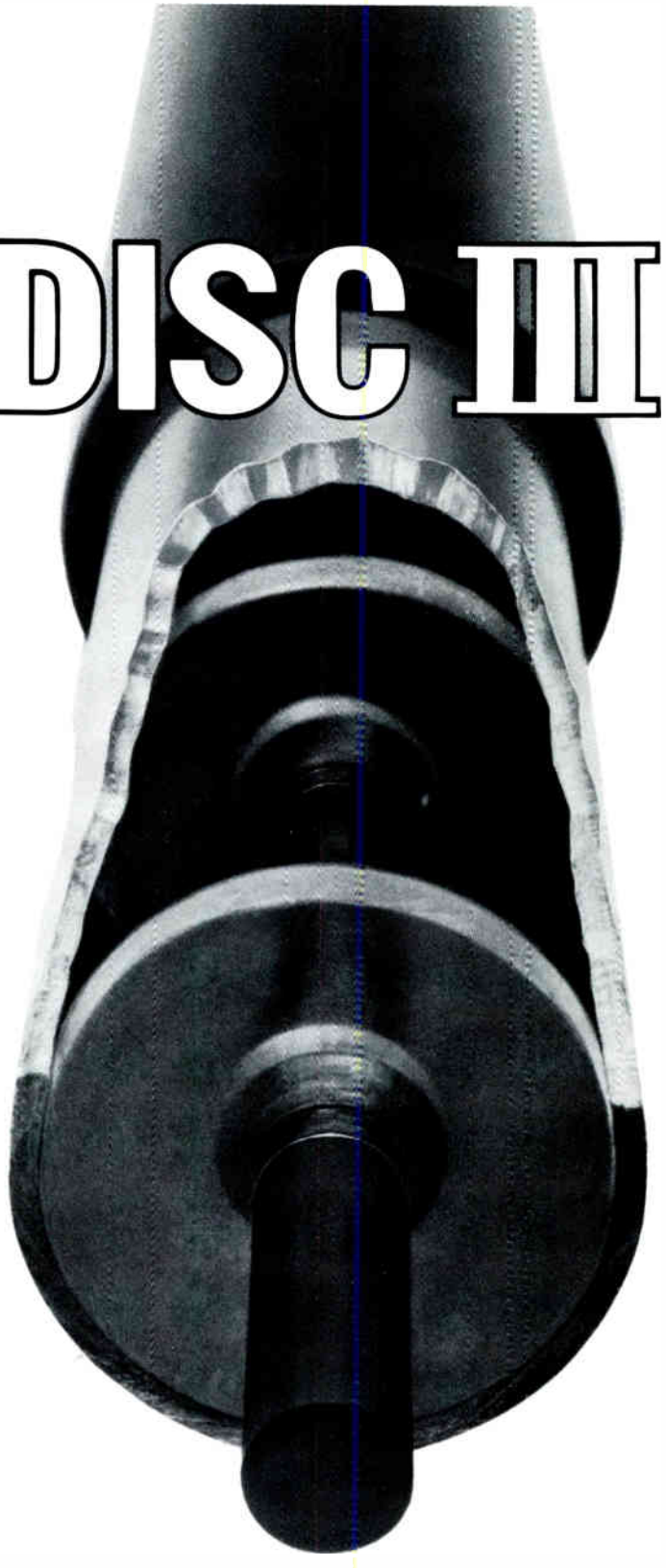

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C-ED News at a Glance

WASHINGTON, D.C.—The **Federal Communications Commission (FCC) has submitted a report to Congress in response to findings of** the General Accounting Office **(GAO)** which earlier this year filed recommendations on how to improve the agency in its report entitled *Organizing the Federal Communications Commission for Greater Management and Regulatory Effectiveness.*

The Commission concurred with GAO's basic findings and many of the specific recommendations, which covered the areas of planning, management information, program performance analysis and evaluation, staff utilization and development, data processing and contractural research. Charles Ferris, FCC chairman, noted when GAO's findings were first released that the problems identified were the same problems the staff had identified and had been working to correct since he became chairman. In his letter of transmittal to Senate Communications Subcommittee Chairman Ernest Hollings (D-SC), Ferris stated, "As the effectiveness of our management structure is vital to the overall efficiency and effectiveness of the agency, we welcome all suggestions for improvement in this area."

One of the GAO recommendations was that the FCC establish a planning process to include a long-range plan, a short-range plan, and a measurement and feedback process. The Commission's response was that the planning process of an organization is a function of its mandate. "At the FCC, we do not view the planning process as one in which we are able to develop master long-range plans for the course of telecommunications, but rather as a continuing process in which we attempt to determine the future trends of the telecommunications sector and determine what steps the commission should consider to minimize artificial barriers to growth and change in telecommunications, while always taking into account the public interest," the FCC stated. "Given the rapid pace of change both economically and technologically in communications, we believe that our approach is a reasonable one."

WASHINGTON, D.C.—**Noting that Comsat is engaging in and proposing to engage in** a number of **activities other than those required by its** original statuatory **mandate, the FCC has adopted** a first phase report of **a study on the structure and operating activities of the corporation. In addition, the FCC has instituted an inquiry to determine whether changes are needed to enable Comsat to carry on the functions and responsibilities for which it was established.** Satellite-to-home delivery of entertainment programming is one of the activities outside its mandate that Comsat is considering. The report stressed that any regulatory issues related to an expansion of Comsat's business would be better resolved as soon as possible, rather than after substantial commitments have been made by Comsat and other parties.

WASHINGTON, D.C.—**The National Cable Television Association has named Christopher S. Weaver as vice president of the** association's newly-created **science and technology department.** Weaver, 28, is currently manager of technology research for the American Broadcasting Company where he has been responsible for technology assessment and its interface with broadcasting. Weaver will join NCTA November 5. Bob Luff, NCTA vice president for engineering for nearly three years, plans to leave the association in December.

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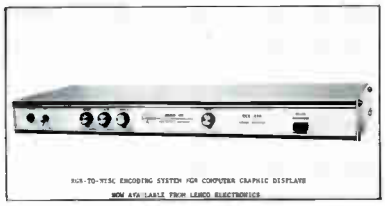

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OPINION

Cover: This photograph of a slow scan horizontal "wipe" is one type of frequency division, visual information display. Rendering by Brad Hamilton.

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Editor's Letter

This November issue of C-ED features several stories on video. The articles range from video tape and local origination to teleconferencing with single frame video. These articles as well as the other stories in this issue were expertly pulled together and edited by new managing editor Patricia Link who comes to us from Texas and Southwest Research Institute. Toni Barnett, C-ED's managing editor for the past two and one-half years, has recently left us to join Cablecom General. Toni will be based in Denver; however, she will be spending a lot of time on the road pursuing franchises for that MSO. We wish her the best.

We were pleased to learn of the Federal Communications Commission's decision regarding the deregulating of earth-receive stations. No longer, the commission noted, would operators be required to file certificates of compliance. However, a number of questions have been left unanswered by the commission's action. One of these administrative questions is whether or not the commission should institute a registration procedure similar to that of cable television systems in lieu of the old certificates of compliance. More on the FCC deregulation decision can be found in Washington Bureau Chief Pat Gushman's "From Washington" on page 21.

Paul A. FitzPatrick

Cable Boom Brings Delivery Delays

By Martin J. Moran
Sales Manager
Toner Cable Equipment Inc.

Marty Moran

All of us need to take the problem of delivery seriously in today's market. There is a boom going on in cable television and because of it, we are faced with the dilemma of getting equipment when we want it. What can we do to overcome this? How can we protect ourselves from the long deliveries and critical back orders that we face today? As a supplier who has been in this industry for the past 15 years, I can offer some suggestions.

Intelligent planning and smart purchasing are important. Plan ahead as much as possible. Don't order equipment on a routine basis just before it's needed. That's difficult at times under emergency situations, but in many cases there's no emergency, just lack of planning. You probably will know well in advance if you are going to extend your system or rebuild. Know also that sufficient spare equipment is available to take care of an emergency; one will arise once in awhile.

Consider blanket ordering with supplies. Set up scheduled delivery dates on these blanket orders. This will be an advantage and will be a helpful assistance to suppliers with their forecasting. They, in turn, can service your needs better. Forecasting is looking at the present trends as well as experience and hoping that we're making the right decisions for the future. When budgeting or planning, know that you will need equipment and cable, talk to suppliers and find out what items are critical and how much lead time is needed in ordering certain items. Last minute ordering and emergency shipments are expensive; in most cases they are shipped by air.

It would be helpful to advise suppliers how you want orders shipped. Also, it's important if you want your equipment and cable shipped to a warehouse, to be sure someone is there during regular working hours to accept shipments to avoid costly and unnecessary delays.

To some, this may seem an oversimplification of a difficult problem. Perhaps it is, but at times we overlook the simple and common sense approaches to solving our problems.

Yesterday's way of doing business is not necessarily the way we should be doing it today or in the future. Intelligent planning and smart purchasing make good business sense.

Cable Construction Workshop in Hartford

HARTFORD, CONNECTICUT—On November 26-27, the SCTE will sponsor the Northeast Technical Meeting and Workshop, an encore performance of "Cable System Construction," at the Hartford Hilton Hotel in Hartford, Connecticut. The seminar was first held in Nashville in October 1978.

Individual presentations will be made in the morning; breakout sessions, in the afternoon.

Specific topics and the featured speakers are as follows: "Make-ready: Planning, Communicating, Negotiating Your System Requirements," Mac Qurashi, AM Communications Corporation; "Mapping, Graphics and Good Drafting Practices," Vic Aeby, Aeby-Tomberlin and Associates; "Communicating Construction: Installations, Bonding, & Grounding," Mark Thomason, Sylvania CATV Transmission Systems; "Scheduling CATV System Construction: Lead Time Turnkey, Extensions, Rebuild," Robert Ford, Jerrold Electronics Corporation; "Program Management and Implementation: Making It All Go Together," Earnest Tunmann, Tele-Engineering Corporation; and "Balancing a CATV System: Now That We've Got One, How Do We Make It Work?" Robert Mauney, Scientific-Atlanta. Featured luncheon speakers will be Bill Kenny, New England Cable Television Association and Brian P. Lamb, C-SPAN.

The seminar is the first at which CEUs (continuing education units) will be offered by the SCTE in cooperation with the University of Alabama. A credit of 0.9 CEUs has been assigned to the seminar, and every participant in the SCTE event will receive a certificate of CEU award. Transcripts of CEUs earned in the university's cosponsored program are available from Dean, Continuing Education, P.O. Box 2967, University, Alabama 35486. A representative from the university will be present in Hartford to monitor the seminar and answer questions.

Advance registration for SCTE members is $100; for nonmembers, $150. On-site registration fees are $125 for SCTE members and $185 for nonmembers. Additional information may be obtained from the SCTE, 1100 17th Street, N.W., Washington, D.C. 20036, (202) 659-2131.

SCTE Members Qualify For Discount Car Rentals

WASHINGTON, D.C.—SCTE is pleased to announce another bonus for its members—National Car Rental service. This money-saving plan will entitle SCTE members to a 15-percent over-the-counter discount on all National Car rentals in the United States. Elsewhere throughout the world at Europcar and National international locations, a 10-percent discount is available.

SCTE Offers "Hands-On" Testing Experience

TALLAHASSEE, FLORIDA—"Show-and-tell" demonstrations by test equipment experts on practical "hands-on" testing experience will be offered to the cable television industry by SCTE in Tallahassee, Florida, next January 14-15.

SCTE's first technical session of 1980 will address "Measurements, Methods, and Test Equipment—Who Needs It?" The meeting will focus on the following testing areas: sweeping, radiation, signal and video analysis. Other topics to be covered in the two-day discussion are frequency measurements, computer-controlled test interfaces, nulling co-channel, and testing for cross-modulation and triple beat.

The program is divided into two parts to allow participants maximum benefits of textbook learning and practical experience. In the morning sessions, representatives from manufacturing companies will demonstrate various tests on their equipment. In the afternoon, participants will actually be able to try the testing equipment themselves in a "hands-on" session.

Continuing education units from the University of Alabama will be awarded to program participants. The meeting will be held at the Tallahassee Hilton. For more information, call SCTE, (202) 659-2131.

SCTE Announces Two 1980 Cable Conferences

WASHINGTON, D.C.—Harold Null, president of the Society of Cable Television Engineers, (SCTE) has announced dates and sites of two major cable/broadband industry conferences in 1980. SCTE's spring engineering conference, formerly cosponsored with the IEEE Broadcast, Cable, and Consumer Electronics Society and centered on cable system reliability, will be hosted solely by SCTE in 1980. The conference will be chaired by SCTE eastern Vice President, William H. Ellis, director of engineering at Evansville Cable TV. The two-day meeting will convene on February 5, 1980 at the Adams Hotel in Phoenix, Arizona.

Null has also announced that SCTE's Emerging Technologies Conference has been scheduled for October 15-16 at the Playboy Club Resort and Conference Center in Great Gorge, New Jersey. The topic of discussion at the 1980 meeting will be teletext and data.

For information on SCTE's regional meetings or conferences, please call (202) 659-2131.

FCC Eliminates Manatory Licensing of TVROs

WASHINGTON, D.C.—The Federal Communications Commission (FCC) has eliminated its requirement for the mandatory licensing of domestic satellite receive-only earth stations. However, the owner of an earth station must still receive permission from programmers in order to receive their transmission.

As a result of the Commission's action, those who choose to build and to operate an unlicensed receiver, whether private or commercial, no longer have to file an application, but they must still assume responsibility for interference problems. "We are advising our membership to continue to do coordination and get licenses," explains Steve Effros, executive director of the Community Antenna Television Association, who was instrumental in pushing for the deregulation. "But, there should still be substantial savings in time and money with, we expect, no noticeable loss in the quality of service to subscribers."

These were precisely the sentiments of the commissioners, according to FCC Chairman Charles Ferris who said the benefits of deregulation are clear in that what could have become a massive administrative burden to the FCC has been eliminated.

"Many services, such as cable television systems and other television distributors may continue to apply for licenses," Ferris believes. "In any case the operator should be allowed to make the choice for himself. As to the voluntary licensing option, we have terminated the requirement for a construction permit and have eliminated all nontechnical submissions such as the financial and character qualifications of the operator from the licensing application. Receive-only stations cause no interference whatsoever," Ferris stated. "Thus, the goal of regulating could only be to avoid subjecting them to interference from others. But for the majority of earth stations, no interference is ever experienced."

Tom Wheeler, president of the National Cable Television Association (NCTA) said that NCTA applauded the deregulatory move as an example of regulations being structured to the needs of the market. NCTA Senior Vice President Kathryn Hilton-Creech, predicted that many operators would continue to go for licensing, particularly in the more congested areas.

The new procedures instituted by the commission include immediate waiver of the required construction permit, enabling operators to begin construction and unprotected operations at their discretion and risk, before being licensed (interference protection will be attained with grant of the license); all earth stations licenses, both transmit and receive-only, to be issued for five years instead of three; modifications of licenses for shared use no longer to be required, provided sharing is on a nonprofit basis in accordance with standards and rules pertaining to CARS service; current processing of applications unless applicants request otherwise; and optional renewal by station operators when current licenses expire; however, if the license is not renewed, the station acquires the status of an unlicensed facility. (For more information, see Pat Gushman's "From Washington" on page 21.)

And, as Chairman Ferris stated, it will no longer be necessary to include a financial or economic showing, including the articles of incorporation, balance sheets and forms 430 concerning character qualifications.

House Subcommittee Plans Oversight Hearings

WASHINGTON, D.C.—As promised by chairman Lionel Van Deerlin, the House Communications Subcommittee plans to begin another round of oversight hearings next month. Taking the place of the Communications Act rewrite, which has dominated the time of the staff and subcommittee, will be several days of testimony and questioning of the National Telecommunications and Information Administration and the Federal Communications Commission.

MDS Draws Interest at CCAT Convention

WASHINGTON, D.C.—Multipoint Distribution Service (MDS)—that roller-coaster industry which has drawn both the interest and disdain of cable TV and broadcasting—seems to be flailing its way upward once again. At least that was the general impression after a buoyant, biggest-ever convention of the MDS trade association, the Common Carrier Association for Telecommunications (CCAT) in Washington, October 15-16.

In a brief banquet speech, FCC Common Carrier Bureau Chief Phillip Verveer lauded the MDS industry for concentrating on pay-TV distribution during its formative years. Acknowledging that MDS was originally envisioned as a local microwave business/data service, Verveer pointed out that the industry had successfully identified another business—Pay-TV—as a focus for its activities. Such a move, noted Verveer, was in keeping with the "marketplace forces" philosophy of this commission.

MDS industry leaders later told us that such a view could be "a mixed blessing" since the role of MDS as a pay-TV middleman has been challenged by others. Indeed, one of Verveer's staff members, Rich Pullen, microwave branch official, who has been overseeing MDS' legal activities for the commission since the early '70s, questioned his bosses' stance at a "regulation" panel the following day. Pullen voiced skepticism that the pay-TV visage of MDS puts the service dangerously close to being a broadcast service—and in such a position, it is susceptible to challenges since a handful of companies have such extensive holdings in MDS.

Among the companies Pullen was referring to is Microband Corporation, which has long been the industry's leading, and largest, force. Microband made news at this year's CCAT convention by its very presence and by becoming a member of the association after an absence of nearly five years. Microband had been among the organizers of the original MDS trade association, but dropped out several years ago because of "certain procedural matters," according to Don Franco, Microband president. Microband's return to the CCAT membership roster was hailed by CCAT Director Richard Vega as a significant move.

An incredibly large nine-man panel kicked around MDS' role in pay-TV, and its competitive stance versus pay-cable and STV. Phil Merrill, of the Phoenix MDS firm Tele-Features, which was recently faced with STV competition, suggested that MDS pay-TV operators should round up pay-TV material before STV.

A recurring complaint of MDS pay-TV firms is that their pay-TV suppliers are treating them like second-class citizens. Steve Ross, a California MDS pay provider, commented, "I don't see any support from the common carrier," and "we're expected to embellish" the pay-TV company. Ross also lamented, "We're considered the bastard offspring of over-the-air pay-TV." Ross described how he helped recruit Sears to market MDS pay-TV to the private home market, which is the setup in several western cities. Separately, we learned that Sears, which has been examining a national role in selling over-the-air pay-TV, has moved its MDS research from the concessions department to the service department.

Perhaps the most provocative remarks, though, came from ATC's Chip Morris, who, when asked if MDS will survive in competition with STV, responded with a simple, "No." He did suggest that one package which MDS should consider adding is X-rated movies. Morris said that STV, as a broadcast licensee, will have trouble carrying X-fare, and cable can't get away with it because of local franchise flack.

Despite the generally jubilant mood at the CCAT convention, there are still significant problems facing the industry. Foremost among these is the log-jam at the Federal Communications Commission over processing of long-standing applications.

Verveer, in his remarks, promised prompt action to relieve the backlog which dates back in many cases, several years. Separately, the MDS industry itself seems on the verge of doing something itself. Corridor talk among competing applicants in some markets indicated that mergers and partnerships are being felt out. Such joint ventures, if accepted by the commission, would help put MDS on the air in many markets. Verveer said he was amenable to the applicants taking such action into their own hands, rather than waiting for commission hearings.

During convention week, the recently formed National Association of MDS Service Companies (marketers and suppliers of pay-TV service aboard local MDS carriers) firmed up its organization. Jim Kingsdale of Brooklyn Prime Time will be chairman of the group, which is now seeking a Washington executive director. Chuck Walsh has already been retained as legal counsel to the group. Kingsdale said the organization is modeled after NCTA and will probably participate in pay-TV issues at the FCC.

NCTA Engineering Committee Meets

ATLANTA, GEORGIA—The NCTA engineering committee met on September 10 in Atlanta. Topic discussion included shifting priorities away from paper writing toward legislative and regulatory concerns and the new emphasis on data technologies, such as teletext and videotext.

Liaison member, Bob Luff suggested that two representatives from the EIA be invited to become co-liaisons in order to provide interface with other communications industries. It was agreed that Pete Bennett from consumer-related affairs and Ed Tingley from the communications side of EIA be invited to become liaison members.

John Lopinto, a member of EIA's Task Force A, reported on teletext work. Lopinto reported that of the four committees Task Force A, is the most active and is concerned with the adoption of a system of standards for teletext.

In addition, it was decided that Bob Bilodeau should replace Stilwell as the NCTA representative to the National Electrical Safety Code. A letter stating this change will be sent.

Ken Gunter introduced the need for upgraded techniques for satellite cue-tone signalling. The committee concurred, after a lengthy discussion about cue-toning direction toward vertical blanking, that upgraded standards are needed in this area. Further suggestions will be proposed to the chairman for the next meeting's discussion.

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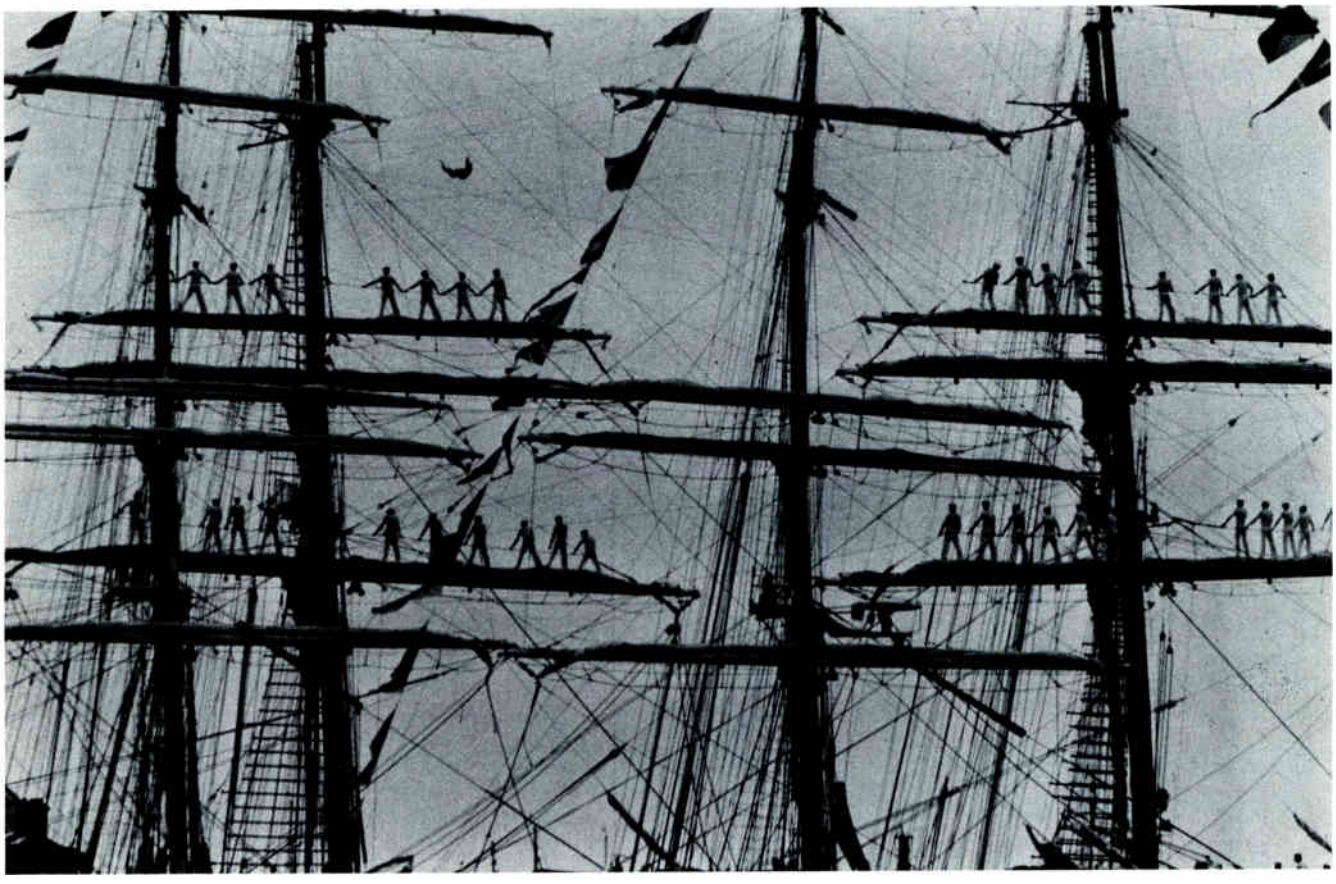

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TVRO Deregulation Raises Questions

By Pat Gushman
Washington Bureau Chief

As is often the case, it is not what they said, but what they did not say. So it seems with the FCC's recently announced deregulation of satellite receive-only earth stations. While almost everyone is applauding the Commission's decision to eliminate the sometimes costly and lengthy mandatory licensing requirement for dishes, more questions are being asked than have been answered.

The Commission's decision was made on October 18 to give operators the option of licensing their receivers or not, but at press time it was evident that we could be well into the month of November before the official decision signed by all necessary chieftains and commissioners. How it all will work won't be clear until then.

As it now stands, the commission has established procedures calling for:

- an immediate waiver of the required construction permit, which enables operators to begin construction and unprotected operation at their discretion and risk before being licensed (interference protection would be obtained with grant of the licenses);
- all earth station licenses, both transmit and receive-only to be issued for a term of five years instead of three;
- modifications of licenses for shared use no longer to be required, provided sharing is on a nonprofit basis in accordance with standards in rules pertaining to CARS service;
- continued processing of current licenses applications unless applicants request otherwise; and
- optional renewal by station operators when current licenses expire; however, if the license is not renewed, the station acquires the status of an unlicensed facility.

To reduce the administrative burden to the applicant, officials say, it will no longer be necessary to include a financial statement, including articles of incorporation, balance sheets and FCC forms 430 concerning character qualifications.

The details of the new procedures should be outlined when the actual rules are released, but, still to come, we are told, is another notice of proposed rulemaking in two or three months. This one would cover many of the questions which the initial deregulation did not resolve.

One of these administrative questions is whether or not the commission should institute a registration procedure similar to that of cable television systems in lieu of its old certificate of compliance.

Another question to be addressed relates to interference. As Chairman Ferris said, "For the majority of earth stations, no interference is ever experienced (because they are coordinated). It is often more costly to undertake FCC licensing and frequency coordination than to relocate an occasional earth station as the need arises."

Nevertheless, the commission is proud of this initial deregulatory step, Chairman Ferris states that it is an example of a government agency being able to abolish redundant regulation when the marketplace itself operates in the public interest. He is also pleased to be able to reallocate some internal resources.

Common Carrier Bureau Chief Phil Verveer, who was weaned on earth stations while chief of the Cable Bureau, believes that perhaps this latest move is a rare example of the commission being a little bit ahead of where things are." Accordingly, Verveer has stressed that the next step will just as important as the first.

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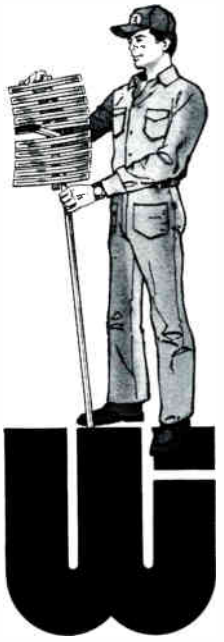

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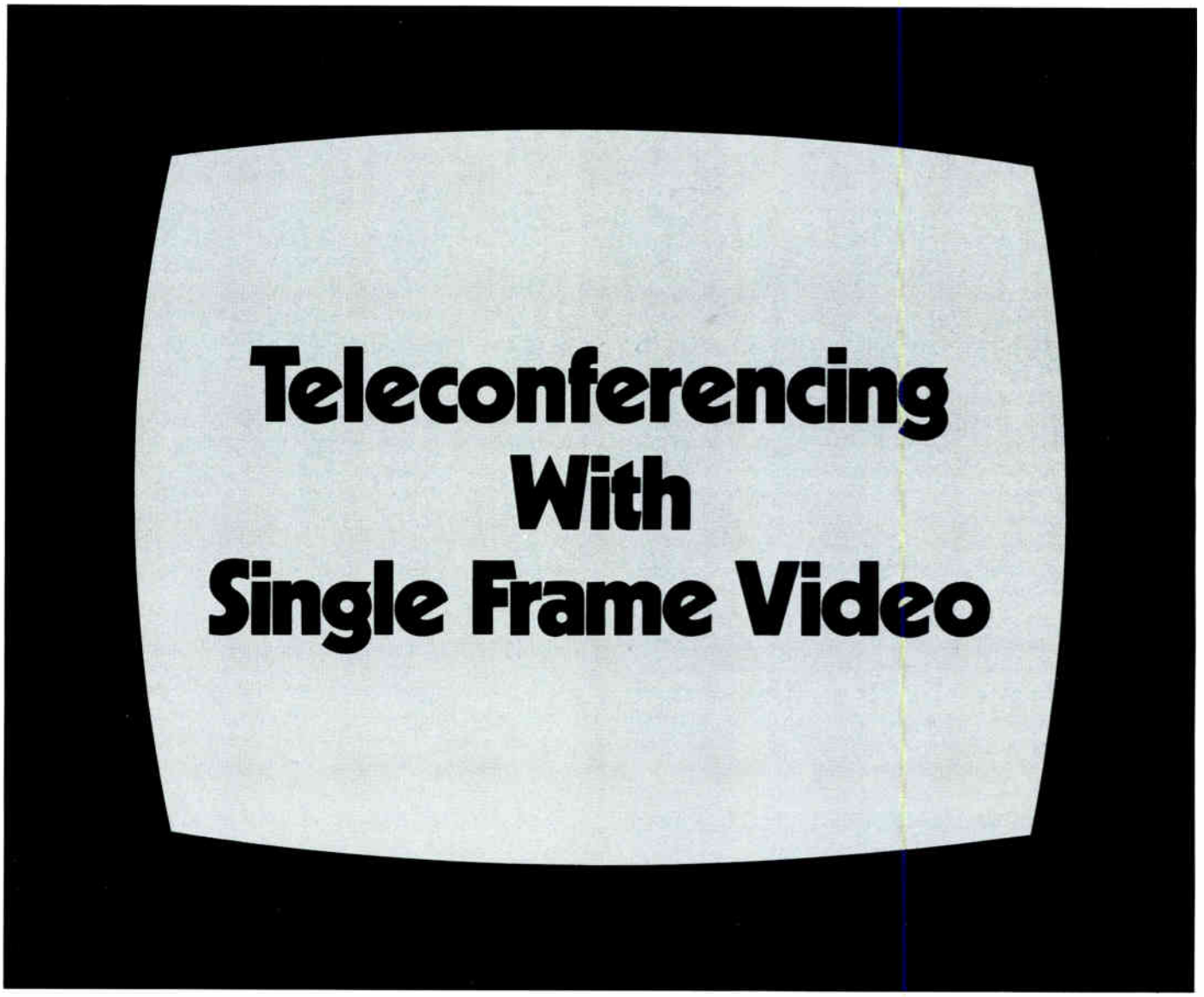

By Glen Southworth
Colorado Video, Inc.

One dollar per gallon gasoline and increased concern about industrial productivity are factors stimulating interest in the use of telecommunications instead of travel. The telephone still remains the primary form of electronic information transfer between individuals; however, more attention is being paid to the use of television for person-to-person exchange of information.

Unfortunately, in real life, wide band video circuits are frequently expensive and difficult to obtain. Even with the advances in cable and satellite technology, video channel capacity is limited, and costs generally preclude usage even by major corporations. Consequently, an increasing amount of attention is being paid to techniques of reducing video bandwidth requirements in order to provide effective, yet reasonably priced, interactive visual communications for business, government, or the institutional user.

To date, narrow band video systems have fallen into two general categories: real time or near real time systems that may use techniques such as low resolution, reduced frame rates, digital processing, or a combination of these factors and still frame TV systems which are based on the thesis that motion is not required in 99 percent of serious visual information display.

Single frame systems may be divided into two categories: time division, or frame grabbing, and frequency division, or slow scan. In the past, a number of experiments have been made with time division multiplexing which allows many users access to a single real time video channel. At the sending location, a simple one-frame gate is used in conjunction with conventional video sources, and some kind of address code is inserted into the vertical blanking interval directly preceding the transmitted image. At the receiver, a decoder identifies the wanted address and then triggers a video memory which freezes the following frame of information.

Unfortunately, frame grabbing has several disadvantages. First, a high quality, wide band circuit to all subscribers is required. Second, all data origination points must usually be synchronized at a central transmission location. Third, audio multiplexing may be relatively complicated and expensive. Fourth, the communication channel is essentially limited to fixed format video.

Frequency division or slow scan, on the other hand, has

advantages in that the resultant narrow video bandwidths are usable with virtually any transmission media from the dial-up telephone network on up through the satellite transponder. Origination of multiple program sources is simplified, as there is no need for a common time base. Image resolution is easily varied to meet specific requirements and may include systems with greater than 1000-line resolution. Further, the channels employed are readily usable for other services such as audio, facsimile, and high speed data when needed.

In single frame system design, three basic considerations are the bandwidth available, the picture resolution required, and image access time. These factors directly interrelate, with larger bandwidths allowing more rapid information access times and/or higher resolution. For example:

Bandwidth = 1 kiloHertz
(effective data rate for a typical voice grade circuit)

Resolution = 256 × 256 picture elements
(65,536 pixels or about one-fourth the resolution of a normal broadcast image)

Access time = approximately 35 seconds
(allowing for blanking, etc.)

Increasing transmission bandwidth to eight kiloHertz will allow the same picture to be transmitted in slightly more than four seconds or would permit the transmission of a 512 × 1024 pixel image, an image similar to a photographic dot pattern, in the original 35-second period. Transmission by means of a slow horizontal "wipe" is shown in Figure 1.

Figure 1. One form of single frame picture update—a slow horizontal "wipe."

In practice, a 256 × 256 image is useful in a number of applications such as looking at people, simple diagrams, text with large letters, and other imagery without much detail. At a viewing distance of 15 feet or more from a 17 inch or 21 inch monitor, higher resolution imagery is frequently of marginal usefulness to viewers with normal visual acuity. Figure 2 shows a simple slow scan teleconferencing system.

Figure 2. A simple slow scan teleconferencing system.

A 256 × 512 pixel format provides superior readability of typewritten text and will allow reproduction of approximately one half of a standard 8½-inch by 11-inch page. In this case, picture elements may by organized as a single field of 256 vertical and 512 horizontal elements, or as two separate fields of 256 × 256 pixels. In the second case, information in the two fields may be slightly staggered (half pixel) horizontally to provide subjective picture quality resembling a 512 × 512 format.

Five-hundred twelve × 512, 512 × 768, and higher resolution images may be used; however, several considerations must be kept in mind. Longer picture transmission times will be required for a given channel bandwidth. Also, viewers must be relatively close to the TV display in order to take advantage of improved resolution. Video input signals to the system generally need to be of higher quality, and equipment costs will be higher, particularly in regard to the memory requirements of the scan conversion equipment used.

Most single frame communication systems are black and white, but color is an available option. On the negative side, color means increased equipment costs, generally longer transmission times, more expensive maintenance, and careful operation if accurate hues are to be reproduced. On the positive side, color certainly has some emotional appeal and in certain specific instances, such as the review of advertising materials or new product designs, it may be an important factor.

The most obvious application of single frame teleconferencing is long distance usage. The conventional telephone system may be used but intriguing opportunities arise with the use of cracks in the frequency spectrum or microwave, satellite, or cable circuits. The improved picture access time with, for example, a 10- or 20-kHz channel, provides an information flow much more acceptable to a busy executive.

It would first seem that the major reason for teleconferencing would be to save travel costs. The price of airplane tickets is certainly escalating, as is the price of car rental, hotel rooms, and other expenses associated with travel. However, some secondary factors may be of greater significance than simple savings in transportation expense. These involve savings such as greater speed in making critical decisions or solving problems, as well as minimizing the wear and tear on key people who do the travelling.

Wasted executive time is a significant cost factor and in some cases might amount to as much as three days of lost productivity for a one- or two-hour conference. Further advantages are that additional resource people are readily available to attend a teleconference and critical papers or drawings are more easily accessed. In many instances only one or two people are sent on trips to represent an entire group. With teleconferencing, everyone seriously interested can attend. This results in more comprehensive communications and a better consensus on action to be taken.

Single frame teleconferencing hardware can be as simple or complex as desired. Shown in Figure 3 is a block diagram of a basic, two-way, slow scan system. In some instances a small, inexpensive, industrial CCTV camera can be used with a compact, low-cost scan converter for one-way picture transmission to a remote location with a second scan converter and TV monitor. In conjunction with a normal two-way telephone conversation, this configuration can be an effective means of solving problems. For example, in getting advice on manufacturing problems; pictures of schematics, drawings, blueprints, graphs, charts, and actual assemblies or subassemblies can be transmitted.

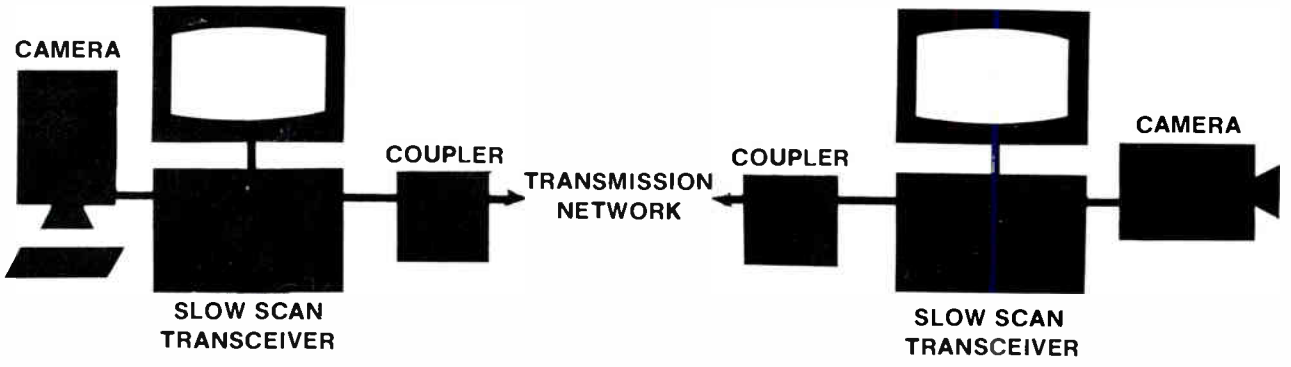

Figure 3. Basic, two-way, slow scan TV teleconferencing system.

More elaborate installations may incorporate two or three cameras, a video disc, a video tape recorder, multiple monitors, additional frame storage units so that several slow scan TV pictures may be displayed simultaneously, recording equipment for later viewing and listening to the teleconference, and other bells and whistles such as large screen projection and/or distribution of the conference via cable to other locations in a building complex. High-quality audio circuits with microphone or speaker phone configurations may also be used, and a separate facsimile machine may be added to the equipment complement for the transmission of documents or other hard copy.

An advantage of single frame video is the ease of operation by untrained personnel. The problems associated with obtaining a pleasing real time production are non-existent in the single frame mode. All pictures may be previewed before transmission and this reduces the possibility of embarrassing situations in which you're caught straightening your tie or scratching an ear. Pictures of the individuals in a teleconference may be exchanged at the beginning in order to provide a sense of rapport and orientation. Flip charts or typewritten text may be transmitted to reinforce key concepts, and some users have felt it advisable to start and stop the conference with a company logo or other identifying design.

In some cases, the problem of communications security will arise. For example, the board chairman may be uncomfortable at the thought of a competitor possibly eavesdropping on sensitive company information. In this situation, single frame video adapts well, as the signals are easily digitized (in fact, many scan converters already do this) for subsequent computer encryption. Again, access time will depend upon transmission bit rate, and 40.8 kbps or faster circuits are desirable. If you are serious about security, there is more to it than simply scrambling the audio and digital signals. Make sure that your teleconferencing locations, themselves, can't be compromised. This essentially means shielding and careful attention to RFI. Otherwise, you may find that the bad guys have pulled a van up next to your building and are recording radiation directly from the terminal equipment.

Single frame video teleconferencing is still in its infancy but is presently being used by a number of large corporations, including IBM, Ford Motor Company, Sperry Univac, and Caterpiller, as well as various government agencies. A typical group conference is demonstrated in Figure 4. Growth in the area of teleconferencing is to be expected as the advantages and economies of this form of communication become more widely known. C-ED

Figure 4. Typical group teleconference.

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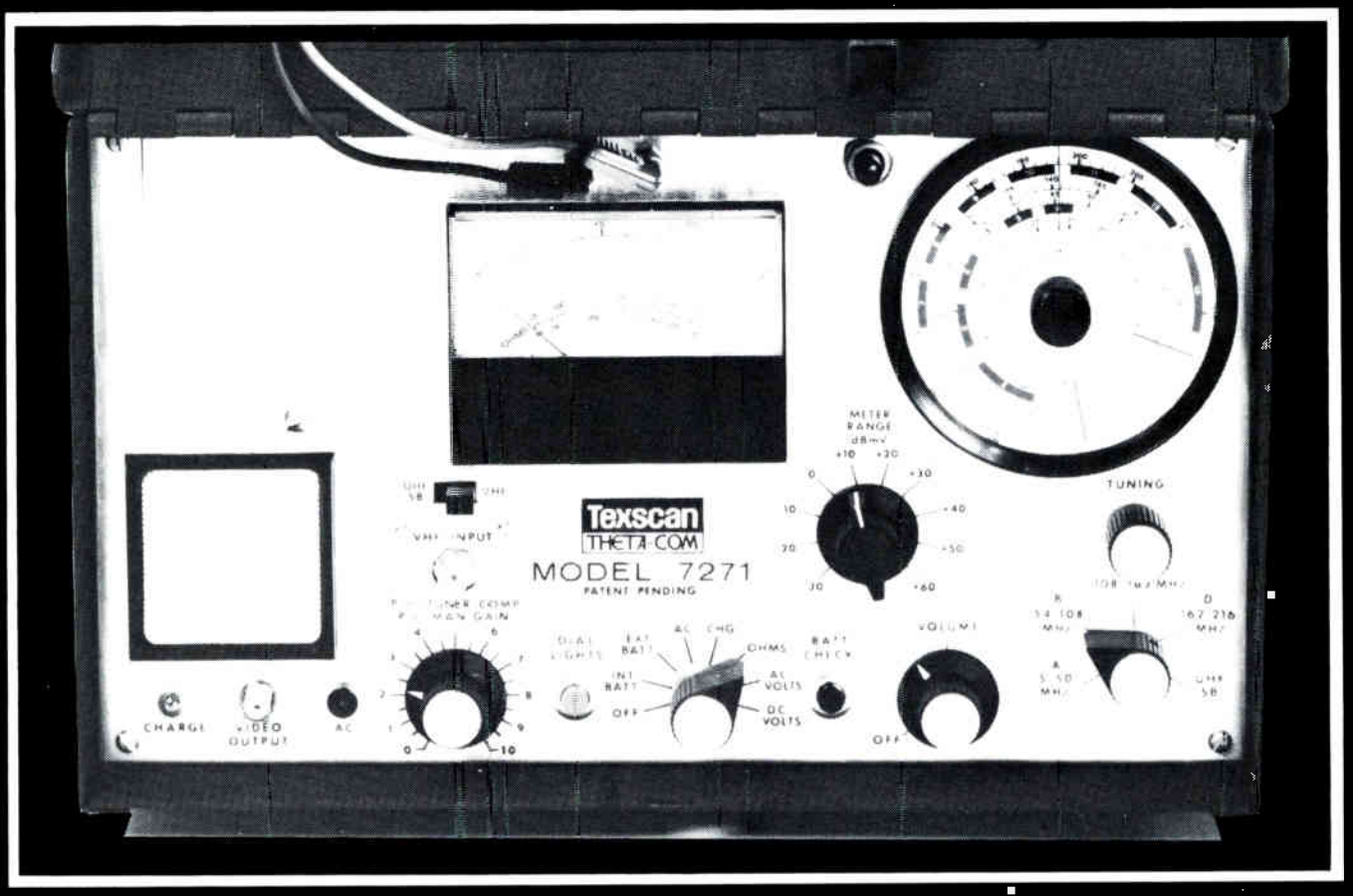

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Setting And Maintaining Modulation Levels

By James O. Farmer
Scientific Atlanta, Inc.

There are several problems faced by the user of television modulators: the problem of initially setting modulation and the problem of maintaining it over a long period of time. Actually, the same problems exist for both audio and video. Failure to maintain correct video modulation may result in loss of sync, a washed-out picture, and weak color in the case of undermodulation. Overmodulation can result in poor detector, amplifier, and kinescope linearity, causing problems with the intensity and tint of picture highlights and can cause excessive sync buzz in the audio channel. Undermodulation in the audio channel results in weak audio and poor signal-to-noise ratio. Overmodulation of the audio can result in distortion. Any errors in setting modulation levels are annoying when changing from one channel to another. Signal processors will generally not alter the modulation level of off-air stations, although frequency response errors will cause an apparent change in video modulation depth at higher video frequencies.

Measurement of Video Modulation

Video is transmitted by amplitude modulation onto an RF carrier. After modulation, one sideband is partially eliminated in order to conserve spectrum. The modulation format is such that sync tips correspond to the maximum carrier. Because of this arrangement, depth of video modulation, defined as the percentage of the total amplitude change of the carrier, is referred to as the signal progresses from sync tip to white. Standard video modulation requires that 87½ percent of the total range of the carrier envelope, from full carrier to no carrier, contains the signal. That is, during sync tips, the carrier is at maximum amplitude, and when a white portion of the scene is encountered, the carrier amplitude is reduced to 100 - 87½ percent or 12 percent of the maximum.

The simplest method of determining video depth of modulation is to display the modulator output on a TV set and adjust the modulation control until the picture looks good. Comparison with an off-the-air signal helps provide a reference. Unfortunately, this method is very subjective and will not yield very accurate results. It should only be used in an emergency, when no other method is available.

A second method of measuring depth of modulation is to connect a high frequency oscilloscope to the modulated IF signal and view the RF envelope directly. Under certain conditions, this yields a reasonably accurate measurement, but several circumstances can lead to wrong conclusions. Unfortunately, if harmonics of the IF signal are present at the point of measurement, these can render the oscilloscope display meaningless. Another drawback to the IF monitor approach is that the display presented is relatively difficult to interpret, especially for a color signal. Also, this requires a rather expensive oscilloscope to obtain the required 50-MHz flat response.

The method of measuring video depth of modulation, often found in cable television, is the use of a modulation meter. This is a meter that measures the peak-to-peak amplitude of a video signal and expresses the result as depth of modulation. The video signal may be obtained prior to being applied to the modulation circuit, or it may be obtained by demodulating a sample of the modulator output. The latter approach is preferred because accuracy will not be affected by variations in modulation sensitivity. Also, by demodulating the signal for metering purposes, a failure in the modulation circuit would be seen.

A modulation meter is good for routine checks, but it has several drawbacks that limit its usefulness. For example, the frequency reponse of the metering circuit may not be flat over the entire range of video spectrum. The meter depends upon the operation of a peak detector which must accurately detect very short peaks and must hold that peak over at least one field of the picture. A fairly complex circuit is required to do this. Another drawback of using a meter to measure video modulation is that some types of distortion which may accompany the modulation process, are masked. These include sync compression and incorrect operation of the peak white clipper.

A satisfactory method of measuring video modulation depth is through use of a demodulator having a zero chopper. The zero chopper periodically switches off the picture carrier to simulate 100-percent modulation. This level and the sync tip level, representing zero-percent modulation, provide the scaling required to measure depth of modulation. Figure 1 shows the output of a demodulator with a zero chop pulse generated during the vertical interval. A waveform monitor with a modulation depth graticule is used to display the output. By setting the sync tip on the zero-percent line and the chop pulse on the 100-percent line, the actual depth of modulation can be read directly from the scale. If such a graticule is not available, a regular oscilloscope may be used. If the sync pulse and the zero chop pulse are set eight units apart, then each unit will represent a modulation depth of 12½ percent. Normal modulation depth will then be represented by seven divisions.

By measuring depth of modulation with a demodulator, other modulation faults, such as sync compression and improper operation of the peak white clipper, are apparent. The demodulator is also available to make other measurements of modulator performance, as well as of off air signals.

To avoid the necessity of purchasing input converters for each channel to be monitored, the demodulator may be configured to accept an IF signal. The modulator IF output,

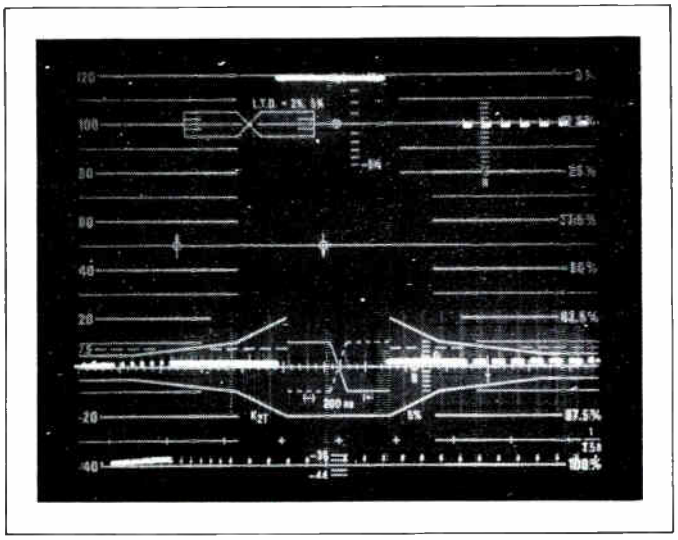

Figure 1. Output of a demodulator with a zero chop pulse generated during the vertical interval.

taken just before the output converter, may be used for demodulator input.

Unfortunately, the zero chopper may itself exhibit errors in measuring depth of modulation. These errors are related to the non ideal transfer function of the detector diode in an envelope detector. Designers have used several techniques to overcome this problem, including operating the diode at a very high signal level, switching a calibrating signal to the video amplifier during a chop, and biasing the detector diode. Detector problems may be overcome by using a synchronous detector. Here the injected carrier is used to overcome problems with the diode response. If an envelope detector demodulator is used for measuring modulation, then its response should be first calibrated using an alternate measurement.

Another question is the one of whether or not the normal 87½-percent modulation depth should include the color subcarrier. Often this is a moot point because most objects of high luminance have relatively little color saturation, resulting in little color subcarrier at the white level.

Broadcast engineers do not agree about whether or not to limit chroma peaks to 87½-percent modulation depth. Limiting modulation to 87½ percent minimizes TV set differential gain and phase problems and avoids having chroma amplitude reduced, with a corresponding drop in luminance level, by the modulator peak white clipper.

Maintenance of Video Modulation

If the amplitude of the incoming video signal remains fixed and if the modulator is stable, then no problem in maintaining modulation exists. However, video levels may vary from time to time. The broadcast industry has developed several techniques for dealing with this problem. If the problem is one of maintaining constant output from one or more cameras in the studio, then it is desired to monitor both the black and white signal levels, forcing them to be consistent. This may be done with a video clamp to maintain a constant black level and to vary the white level. White level adjustment may be accomplished at the camera by varying the iris or it may be done electronically by varying video gain. The above signal must not include sync, and the sync must be added after adjustment. This technique is best left as a studio tool, because it is inappropriate for some programs. For example, if automatic level correction was used on a night scene, the circuitry would attempt to make it a day scene.

If the ratio of video to sync has been properly established and this ratio has not been altered by subsequent video processing, then another technique can be used. The sync pulse amplitude is examined, and the amplitude of the composite video signal is adjusted to maintain proper sync amplitude. This will assure that the video modulation depth remains as intended, regardless of the maximum or minimum luminance level in a particular scene. This technique is sometimes used at a modulator following a microwave link used to import a distant signal. If the video amplitude provided at the output of the microwave receiver varies, consistent modulation depth can be restored.

A third method of control being used at some broadcast installations involves tagging the program with a reference signal at the point of origination. This vertical interval reference signal (VIRS) is theoretically transmitted through the entire transmission path, receiving the same alterations as the video signal. It may then be used to control several parameters of the transmitting equipment, including depth of modulation. The video amplitude, however, may not always be established correctly at the point of origin and some points in the transmission path may inadvertently strip off incoming VIRS and retransmit a second VIRS not necessarily related to the first.

Measurement of Audio Deviation

The audio problem is one of holding as close as possible to an established standard; the FM deviation of 25 kHz should not be exceeded at any frequency.

If this deviation is exceeded, the signal will sound excessively loud and distorted. In addition, excess deviation can cause the sound carrier to rise out of the video path sound trap in the receiver. This, in turn, can cause the generation of 920-kHz beats in the picture, which will appear with every excess modulation peak. Underdeviation of the audio subcarrier will result in weak audio and a poorer audio signal-to-noise ratio.

Several requirements are placed on the meter used to measure audio deviation. The first requirement is that the meter must have good static accuracy: i.e., when a single tone is applied to the modulator input and the modulator is adjusted for an indication of 25-kHz deviation, the carrier must actually be deviated 25 kHz. This can be established by measuring the sound subcarrier with a calibrated deviation meter. An alternate technique uses a spectrum analyzer. The modulator is supplied with a tone of known frequency, and the deviation control is adjusted until the spectrum analyzer indicates that the carrier amplitude has dropped to zero. The lowest analyzer indicates that the carrier amplitude has dropped to zero. The lowest deviation at which this happens is that for which the modulation index (ratio of peak deviation to modulating frequency) is 2.4. Since the modulating frequency is known, the deviation may be calculated.

As in the case of video metering, the signal for deviation metering may be taken either before the modulation process or may be obtained by demodulating the audio subcarrier. The latter technique would be preferred, as variations in modulation sensitivity will not affect accuracy. In either case, though, the signal used for metering the audio should receive the same pre-emphasis that the signal supplied to the modulated stage receives. Failure to do so will result in loss of accuracy if the highest amplitude signal component has a frequency greater than about 2 kHz. (With the 75 μs pre-emphasis time constant used in North America, the signal gain is raised by 3 dB at 2.122 kHz and is raised by about 17 dB at 15 kHz.)

The dynamic properties of the meter are also important. Considerable effort has been expended toward the goal of measuring audio signal level in such a manner that all audio sources that measure the same, will sound equally loud to

the listener. The conventional VU meter, widely used today, is one such attempt. In measuring the deviation of the audio modulator, the goal is not only to meter sound for consistent loudness, but also to achieve the maximum possible deviation without exceeding 25 kHz. This requires a meter whose dynamics are such that the peak level will be displayed.

One additional requirement placed on the dynamics of the audio modulation meter is that the overshoot exhibited be low. That is, when the meter reaches the final reading, it should stop quickly. All meter movements will exhibit some overshoot, but the amount should be minimized by proper meter selection and by proper matching of the electronic driver.

The above dynamic properties may be explored on a given modulator by supplying the output of an audio signal generator (usually set to 400 Hz) to the audio input on the modulator, with a telegraph key in series. The key may be one of a number of hand keys used by amateur radio operators for code transmission. When the audio is chopped into a series of short bursts (*dits*), the meter should read the same as when the key is held down. If the key is suddenly depressed and held for a few seconds, the overshoot exhibited by the meter may be studied.

Another test was performed on several modulators sold to the cable industry and also on a distortion analyzer whose meter dynamics agreed with the standard VU characteristic. All modulator inputs were connected in parallel. An oscilloscope and the distortion analyzer were supplied audio through a pre-emphasis network. Tapes used were recorded from commercial radio broadcasts in Atlanta and were spliced into endless loops so that the same segment could be studied on each indicator. First a 400-Hz tone from an audio oscillator was supplied to all indicators, and levels were adjusted so that all modulators indicated 25-kHz deviation, the distortion analyzer indicated zero dBm, and a reference trace was established on the oscilloscope.

The output of the tape recorder was then substituted for the oscillator. Only the recorder output level was adjusted in the tests below, so all indicators received the same peak signal. For every test tape, the recorder output was adjusted for the same peak output, as indicated on the oscilloscope. On subsequent passes of the tape, each modulator meter and the distortion analyzer (with VU meter characteristics), were checked to see what deviations were indicated. The results are tabulated in Table 1. Errors in deviation have been translated to decibels.

Note first the inconsistency in peak reading provided by the VU characteristic. This inconsistency would probably have been greater had not all test tapes been recorded from processed audio. Often it is assumed that a VU characteristic meter will read about 8 dB below peak level on voice, with a somewhat lower error on music. Note next that modulators A and B both read low on all tests. In neither case was the meter movement driven by a peak detecting circuit. The meter movement in modulator A was sluggish but exhibited overshoot, which tended to make the readings look closer to what they should. However, the overshoot can cause misleading indications in the opposite direction. In a preliminary test, this modulator indicated too high at times when the audio input was a female voice on a soap opera. The meter on modulator B exhibited less overshoot, but it too was sluggish and failed to indicate true peaks. In addition, the audio signal supplied to the meter circuit did not include pre-emphasis, as indicated by test 6. Either of these meters would be satisfactory if used only to set levels using a reference tone, with program level set elsewhere. However, only modulators C and D contained meters that would permit the correct deviation to be set using normal program material.

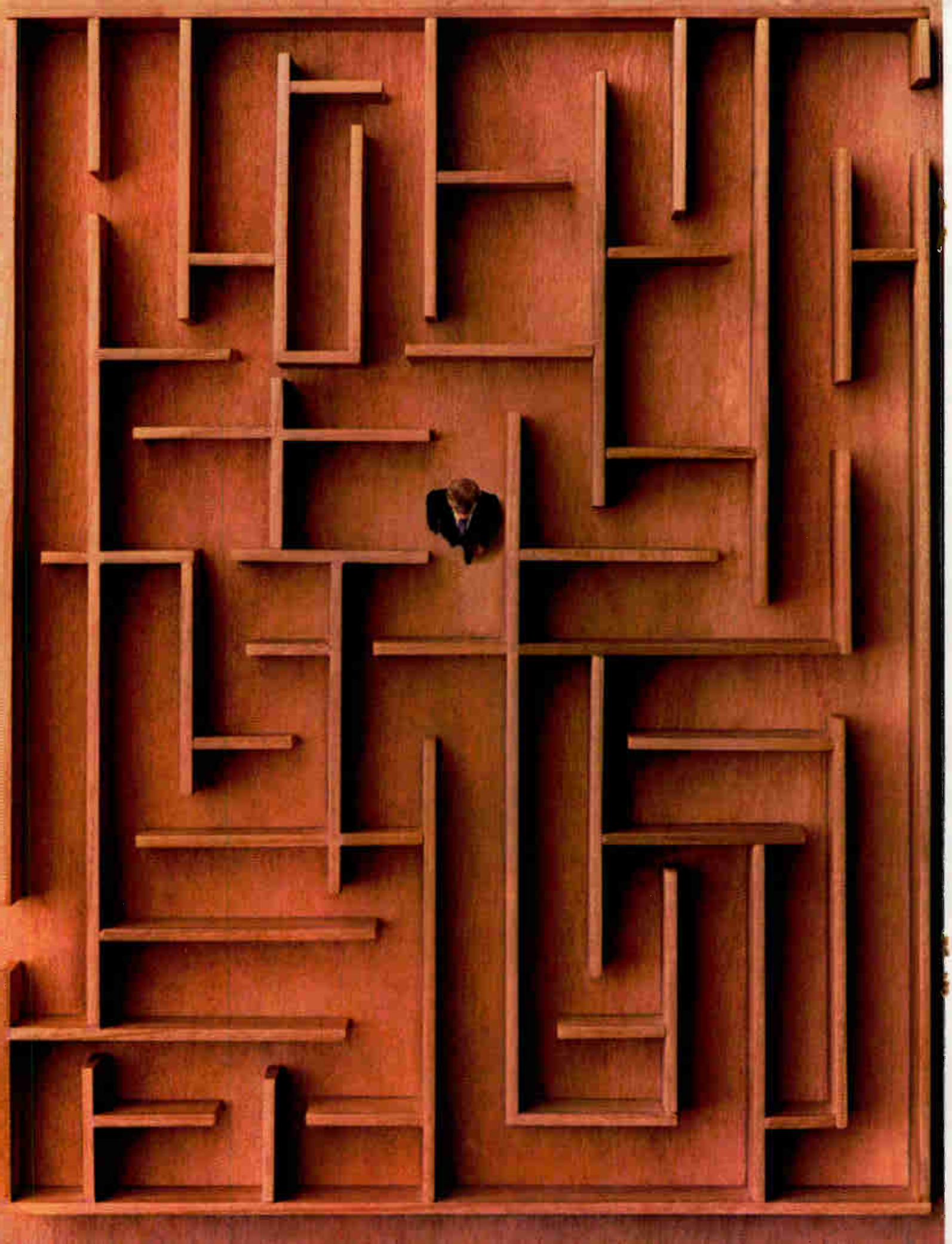

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Table 1. Meter Response to Various Tests

Test	Modulator —A—	Modulator —B—	Modulator —C—	Modulator —D—	VU Meter
1	-2.8	- 7.5	0	0	-7
2	-1.9	- 5.7	+0.7	0	-6
3	-1.9	- 5.7	0	-0.2	-4
4	-0.7	- 7.0	0	0	-5
5	-1.5	- 5.0	+1.3	0	-4
6	+1.9	-18.0	-6.4	-1.1	

The material on each tape is briefly described as follows:

Test 1 — Male voice PSA, easy listening style.

Test 2 — Heavy, explosive sound effects (from movie advertisement).

Test 3 — Strong male voice.

Test 4 — Male newscaster.

Test 5 — Piano solo in higher octaves — fast notes with sustain pedal.

Test 6 — Not really a tape, but included for comparison. This is a test of meter frequency response at 15 kHz. The signal level was reduced to take into account the pre-emphasis.

Maintenance of Audio Deviation

If the object is to maintain the highest possible deviation without exceeding 25 kHz, then automatic modulation adjusting equipment must take into account the pre-emphasis of the modulator. When audio processing equipment is designated for FM, this is usually the reason: the equipment first pre-emphasizes the signal, processes it, then de-emphasizes. Thus, the signal is processed with the same pre-emphasis that it will receive at the modulator.

Another precaution which must be observed when using audio processing equipment that is separate from the modulator is the introduction of group delay between the processor and modulator. Group delay can shift the relative phase of different frequency components of a complex waveform, so that the peak amplitude of the signal could be changed after processing. This is of concern primarily to the stereophonic FM broadcaster who employs a 19-kHz trap in the input to the stereo exciter. However, it is mentioned as a precaution should a selective filter ever be necessary between an audio processor and a modulator.

Audio processing generally falls into one of three classifications: compression, modulation limiting, and clipping. Within each of the first two categories, there are several variations. These techniques and variations appear to comprise the various audio processing approaches available.

Compression is the term generally applied to the reduction of the entire dynamic range of the program material, i.e., "riding the gain" automatically. The object is to maintain either a reduced dynamic range, or no dynamic range, in the output level. This technique is proper and popular for processing speech, it can reduce such problems as level changes when a speaker turns away from a microphone or when a new speaker begins talking. Compression is also used with rock music and other music formats in which dynamics are not a part of the art. However in applying compression to classical music, caution is necessary as dynamics are important. Compression is generally specified by a ratio of N:1, meaning that N dB of input level change will result in 1 dB of output level change. A compression ratio of 2:1 would represent fairly small "meddling" with the dynamic range, while 10:1 would be a fair amount of compression.

Other criteria appropos to compression include attack and release times and a related decision of whether the output peak amplitude shall be monitored or whether output rms or average level (taken over some time span) is to be maintained. A variation available appears to involve equipment that separates the audio spectrum into two or more bands, compressing them individually.

Modulation limiting is the second technique for audio processing. Unlike a compressor, a modulation limiter does nothing to the audio level until a threshold (25-kHz peak in TV audio) is reached. Above this threshold, the limiter acts as a compressor with a high (greater than 20:1) compression ratio. Thus, dynamic range is unaffected until a peak attempts to overdeviate the carrier. At this time, the gain is reduced until the modulation returns to a lower level. Modulation limiting is not to be confused with RF limiting, which clips the RF peaks, generating distortion. Modulation limiting is an automatic turning down of the gain if the level gets too high. This technique is often used as protection at a transmitter, to prevent overmodulation without introducing distortion.

If the modulation limiter is overdriven, it acts as a compressor with very high compression ratio. This may be desirable where a limiter is intentionally overdriven by a modest amount (8 dB seems to be a common figure) during normal programming. This permits minor drops in level, and increases in level, to be compensated, without masking the normal dynamic range of the material.

When using either a compressor or limiter, levels cannot be set arbitrarily. There always exists a maximum level that can be accommodated by circuits prior to the gain adjustment stage. The difference in level between normal operation and the maximum signal that can be handled without distortion, is called the *headroom*. Headroom is specified for a constant sinusoidal tone, not for complex program material. If the rise in input exceeds the headroom for the particular equipment, then distortion will occur even if the output level does remain constant.

Another type of audio processing is *clipping*, a process which does cut off the extreme levels of signal voltage. Clipping introduces distortion, and thus would not be used during normal programming. A clipper is normally set to act at some deviation greater than normal (e.g., 40 kHz for TV sound). It prevents gross overdeviation. If the signal were allowed to deviate too far, then the sound carrier would begin riding out of the sound trap preceeding the video detector in the receiver, giving rise to 920-kHz beats in the picture.

A compressor is useful for a range of audio problems but if misapplied can be detrimental to the overall effort. Because the right amount of compression is a function of the type of programming, this is best left as a studio technique. The engineer concerned with signal modulation and transmission should concentrate on application of a modulation limiter to prevent overdeviation while not appreciably affecting normal program audio. As a final clean-up measure, a clipper may be used to prevent accidental gross overmodulation, but it should not affect normal program audio. When using a modulation limiter, a clipper is not as important as when no protection is supplied. However, since modulation limiters have finite attack times, a clipper could occassionally be needed to clip one or a few cycles of the audio, before the limiter acts.

While financial and operating situations may exclude some of the techniques discussed, the ideas presented should be considered when problems arise or equipment upgrading is contemplated. Fortunately, no amount of electronic wizzardry will replace a sharp technical person, who knows techniques to apply in situations. **C-ED**

A BULLETIN FROM EASTERN MICROWAVE...

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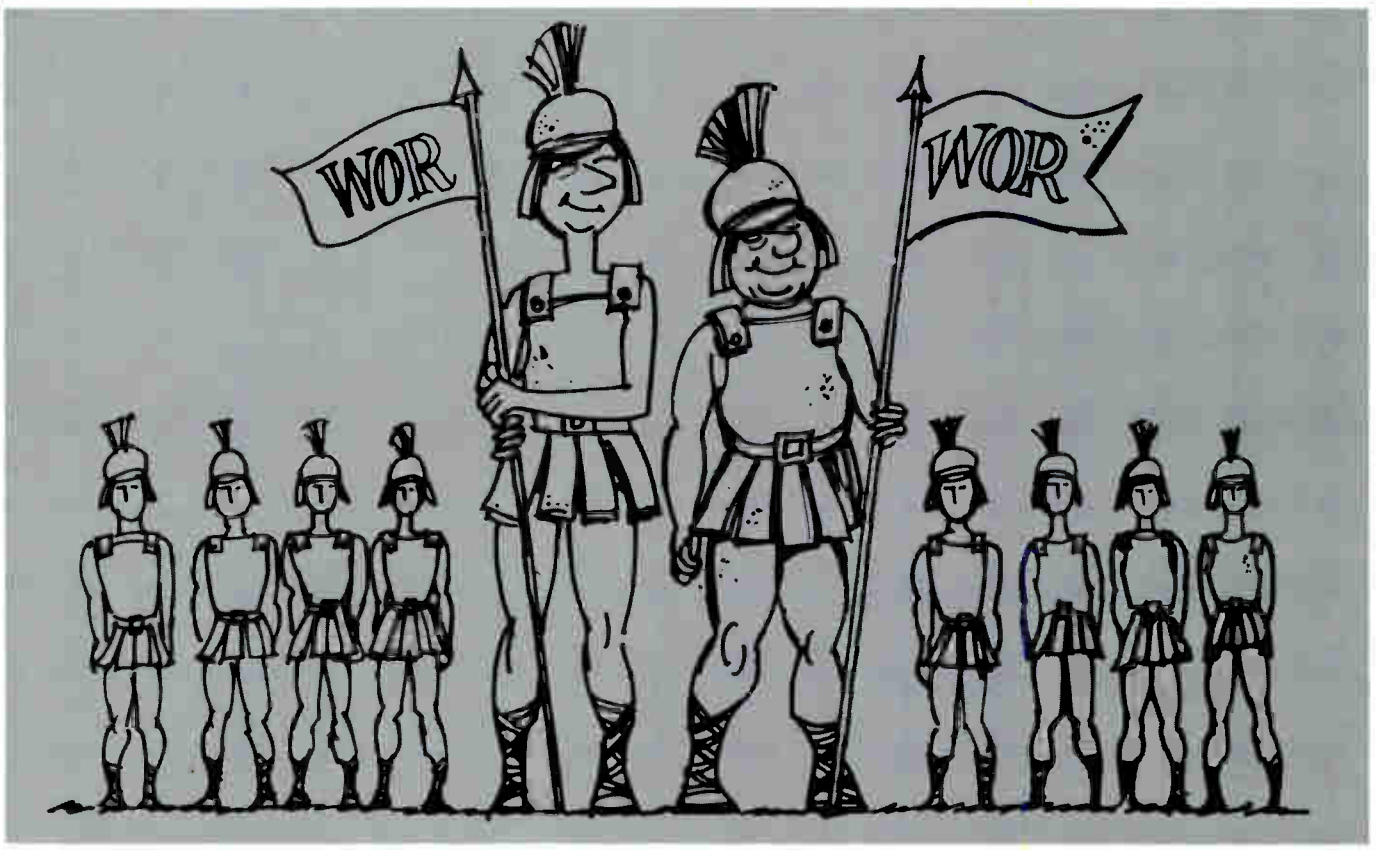

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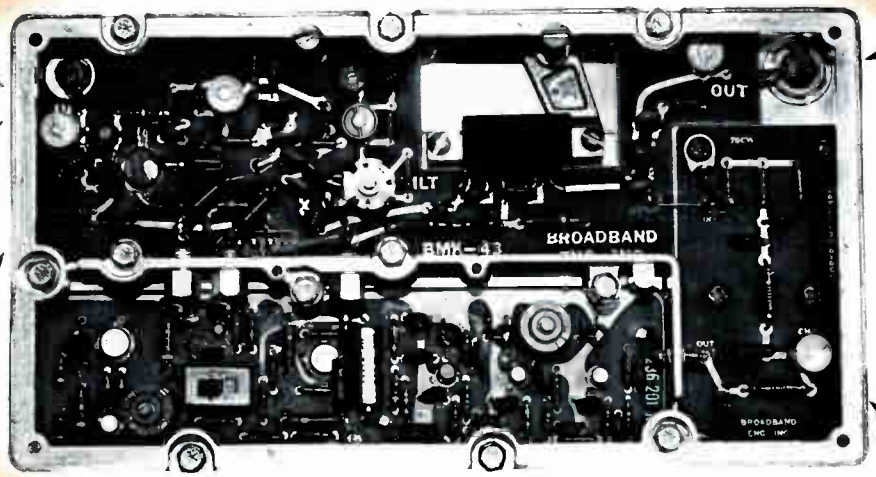

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Some Video Tape Considerations For Cablecasting

by David L. Gaylor
Chief Engineer
Theta Cable Television

"The subscriber will never see the difference" is one of the recurrent phrases in cable origination, as well as other areas of cable operation. And, it is this same phrase that can spell disaster for any origination attempt in pay-TV as well as public access requirements or local origination.

Cable origination has been plagued since its beginning with several problems. One of these is that most operations have been handicapped by purchasing low-cost video tape equipment. A second problem is the lack of adequate processing equipment to produce a technically acceptable picture.

Many factors determine the level of equipment that is used; however, in most cases, budgetary limitation is the determining factor. However, cost should not be the only criteria in deciding what origination equipment to buy. It is fact that to deliver a good product to a subscriber, a good product must be originated. If poor equipment is used, a poor product will result. Poor equipment may be in a state of disrepair, or it may be inadequate to do the necessary processing, such as time base correction on video tape.

The decision of what level of equipment to buy should not be based solely on expense. Analyze the needs of the system. Be aware that the subscriber can see the difference between one-half-inch video tape and two-inch video tape. And, he will also be able to tell the difference between a $3,000 camera and a $10,000 camera or the un-time base corrected signals of any format.

Often one can look at a video tape played directly into a monitor, and it looks good. Even many home units look good when viewed directly. However, it is often forgotten that there may be one to 35 amplifiers through which that signal must pass. What may look acceptable at the point of origination may have deteriorated at a subscriber's set, 30 amplifiers away. Although the system may be in good working order, every amplifier in the cascade adds noise and other degradation.

At best, most low-cost video tape units offer only marginal signal-to-noise performance. Any signal will look its best at the originating point and will not improve. If an adequate signal is accepted at the origination point, what will Mr. Doe see at the end of the line? He is the one paying the bill and the one who should be pleased with the product he has purchased.

Sometimes it is necessary to utilize lower cost equipment. But, be prepared

David Gaylor

David Lee Gaylor is manager of program operations at Theta Cable Television of California. A veteran of the television industry, Gaylor, after working on radar systems in the Air Force, began in cable with Teleprompter in Farmington, New Mexico, in 1972 as an installer and then as a studio technician in the local origination program. He transferred to El Paso, Texas, as a studio technician in 1973, and in 1974 joined Daniels in Colorado Springs, Colorado, as a studio technician/line repairman. In Baton Rouge, Louisiana, at Total CATV, Inc., Gaylor was employed as chief engineer of local origination. He joined Theta Cable in January, 1978, as manager of program operations.

to answer for it. For example, much of the video tape played back on cable systems around the country is played without the use of a time base corrector.

"What is a time base corrector (TBC) needed for? The picture looks good on the monitor" is a statement often used to justify not using or purchasing a TBC. They are not inexpensive; however, what happens when subscribers complain about pictures that jitter or hook or bend at the top? Is this shrugged off with "only a few sets do that," or is a different attitude taken to try to keep subscribers and keep them satisfied? This situation means that additional equipment is needed to produce a better product.

If a television station delivered an un-time base corrected signal, it could be fined by the FCC. FCC regulations are meant to keep television signals within a normal range so that television sets on the market will lock up to them reliably. This is what a time base corrector does. It can work miracles in stabilizing video from tape machines. But it cannot produce a great product if one did not exist originally.

Time base correction should be a priority in any video tape replay. Figure 1 demonstrates the difference that time

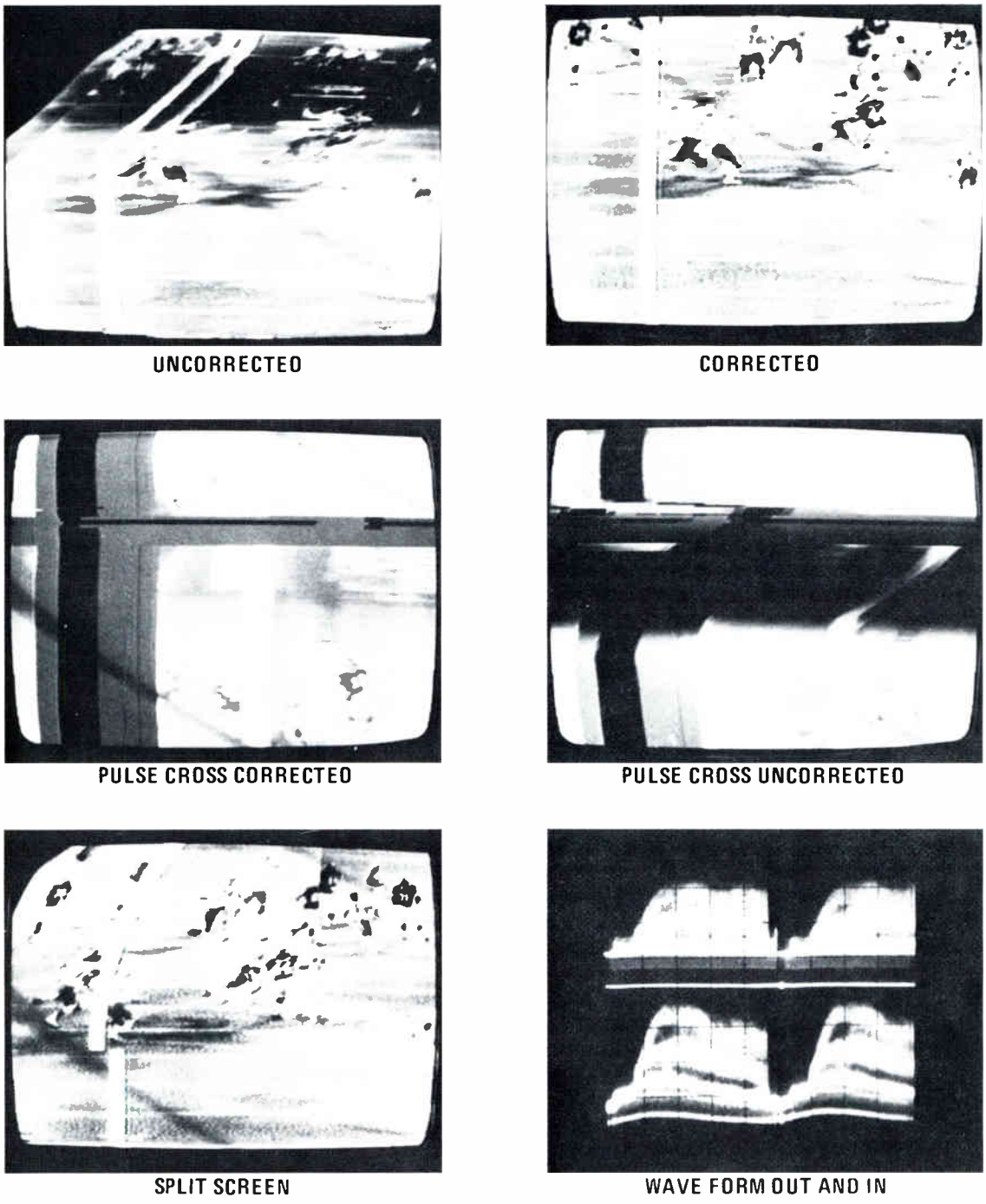


Figure 1. Examples of time base corrected and uncorrected video display.

base correction can make. Not only will it reduce the hooking and skewing seen on some sets, but it will also stop horizontal jitter on some sets. The result will be fewer service calls and happier customers. An advantage to some time base correctors is an actual reduction of the noise on a tape. Signal-to-noise improvements of three to nine dB are possible and can mean an improvement at the end of a system.

Assume that time base correction will be applied to a video tape playback. The next step is to know what kind of video tape recording is going to be put through the TBC, so the tape must be examined. It should be scrutinized (1) for the physical condition of the video tape, (2) for minimal acceptance standards (i.e., does it fulfill basic video level requirements, such as proper sync/video ratios on a wave form monitor, etc.), and (3) is it a multi-generation dub? Then, a quality check should be run on the entire tape by reviewing it all the way through. This is not only a check of technical quality but also a check of program content as well. If any of the above areas do not meet basic requirements, either a new tape should be obtained or the tape should not be run at all. Most cablecasting operations do not need any added surprises. A tape that has not been carefully screened for both content and basic technical standards should not be played.

The only situation in which content should take precedence over technical quality is that of a crucial news story or pressing current event. A lesser quality is fine for the six p.m. news but not for an interview program or a movie intended for entertainment. After all, the viewer should be able to enjoy watching a program instead of wondering whether or not he will get to watch it all before the "technical difficulty" flag is raised. Always bear in mind that the subscriber is accustomed to high-quality television signals. To compete for a viewer's time, the origination signal must be of a reasonable quality—a quality that the viewer can tolerate. A signal that is too good cannot be produced.

There must be a constant effort to improve the signal sent to viewers if a cablecaster expects to turn the viewer's attention from other products from which they could choose. If standards are lowered and adequate quality is accepted over excellent, the viewer will notice and react to the difference. **C-ED**

Ad Index

Command Options and Restoration Procedures For RCA Americom's Satellite System

by Paul Farmer
Administrator, News and Information
RCA American Communications, Inc.

Satellite communications systems such as the one operated by RCA American Communications, Inc., require well-engineered work-around procedures in order to ensure continuous operation of overall service in the event of unanticipated problems. RCA Americom's Satcom system provides satellites with on-board redundancy for all critical functions, and two identical Tracking, Telemetry and Command centers (Vernon Valley, New Jersey and South Mountain, California), each capable of monitoring and controlling the orbiting satellites. This type of multi-control system provides operations technicians back-up choices to solve functional problems.

Also, as an alternative to automatic on-board attitude control options of the Satcom satellites, manual control may be exercised from either of the TT&C centers. When dual time slot requests or overlapping occurs, there are a number of pre-emptible transponders on the Satcom system—five of these on Satcom I and one on Satcom II. Should more extreme time commitment problems arise, RCA Americom can utilize an additional eleven pre-emptible transponders on Telesat Canada's 24-transponder spacecraft Anik II. These restoration procedures are built into the system to provide alternative back-up options if RCA Americom customers experience malfunction in dedicated transponder service.

Spacecraft Features

RCA Americom's domestic satellite system utilizes spacecraft with certain technological features. Cross-polarized antenna, graphite fiber epoxy composite materials, and solid state travelling wave tube driver amplifiers provide a weight-saving advantage. The lightweight features of the module enabled use of an upgraded launch vehicle to put the 24-transponder Satcom satellite into orbit. This enables RCA Americom to provide a larger choice of transponder space to companies wishing to utilize satellite communications in their business affairs.

These satellites feature other advances in space communications technology: a three-axis attitude control and a design which permits continuous full-power operation of the RF channels throughout the minimum eight-year life cycle of the satellite. In contrast to dual-spin satellites, which expose less than half their on-board solar cells to the sun at

A view inside RCA's command center.

any given time while the body is spinning, the three-axis Satcom satellites have silicon solar cells mounted on extended flat panels (totalling 75 square feet) that continuously face the sun, thereby collecting a maximum amount of solar energy. The solar arrays can produce up to 740 watts of power, sufficient to power 24 transponders, and charge the batteries, as well as driving housekeeping functions.

A feature of the three-axis attitude control is the automatic roll-control system which is comprised of both a primary and a spare on each satellite. These systems automatically maintain the pointing of the satellite in a north-south direction within a tolerance of ±0.15 degrees, using the interaction of a current-carrying coil with earth's magnetic field as the control mechanism, and with jet thruster control as a back-up. The automatic roll-control mechanism differs from other satellite control systems inasmuch as it operates as a closed loop system on the spacecraft itself. This compares with control systems that are manually activated from the ground on a scheduled basis using jet thrusters as the primary control mechanism. Although the ground-activated system is used by other satellite companies, the tolerance factor of the on-board system is more precise and is largely self-correctional.

Attitude Control Anomaly

RCA Americom recently experienced some problems with the automatic roll-control mechanism on board the spacecraft which resulted in loss of pitch lock. Attempts to correct the loss of pitch lock included switching to the backup attitude control electronics, then switching from the primary momentum wheel to the spare wheel. Results from these tests, plus analysis of other data, indicated that these elements were not the cause of this problem. This resulted in a decision to convert to ground control or the manual method using the jet thrusters to effect the stabilizing necessary for maintaining communications.

John Christopher, RCA Americom's vice president of technical operations, and his team of engineers, worked round the clock to correct the problem, minimize the outage situation, and restore attitude control to acceptable limits. In Christopher's words, "The problem began at 6:43 a.m. on September 5 when the Satcom II spacecraft experienced a loss of pitch lock just after receiving a command from Vernon Valley to the magnetic roll controller. At that time there was no obvious connection between the original command and the spacecraft difficulty. Correction of the roll imbalance on board the module was effected by ground control signals and everything appeared to be functioning correctly."

On September 6, the spacecraft again lost pitch lock, this time for ten minutes. Unlike the first time, there had been no prior commands to trigger the anomalies on the spacecraft.

"Probable cause and effect was becoming more involved; our options were becoming more widespread," said Christopher. "At the time of the first outage on September 5, we began a complete data and circuit analysis of the system. The initial indication was that the probable source of the problem was within the primary attitude control electronics, with a remote possibility of the momentum wheel being the source. We decided to switch to the redundant (secondary) ACE system."

Complete computer data printouts were obtained for the September 5 and 6 outages. Engineers from both Americom and Astro-Electronics (designers and manufacturers of the spacecraft), reviewed the findings in detail.

"All systems appeared to be operating normally for a while," continues Christopher. "It seemed that the bug, whatever it was, had righted itself. "However, we were not out of the woods yet. On September 13, at 2:10 EDT, pitch lock was again lost. After several unsuccessful attempts to right the situation by ground command from Vernon Valley, we finally had South Mountain attempt the transmittal and the trouble was rectified."

Due to the loss of pitch lock, and the resultant misalignment of the solar array to the sun, the batteries which supported the loads during this time became partially depleted. The timing was such that the spacecraft was about to enter the eclipse period, and there was no time to recharge the batteries. To avoid total loss of spacecraft power during the eclipse period in the small hours of the morning, 20 of the 24 transponders were turned off. Twenty-four minutes later, when the eclipse period was over the transponders were again turned on. One transponder, No. 17, failed to attain full power.

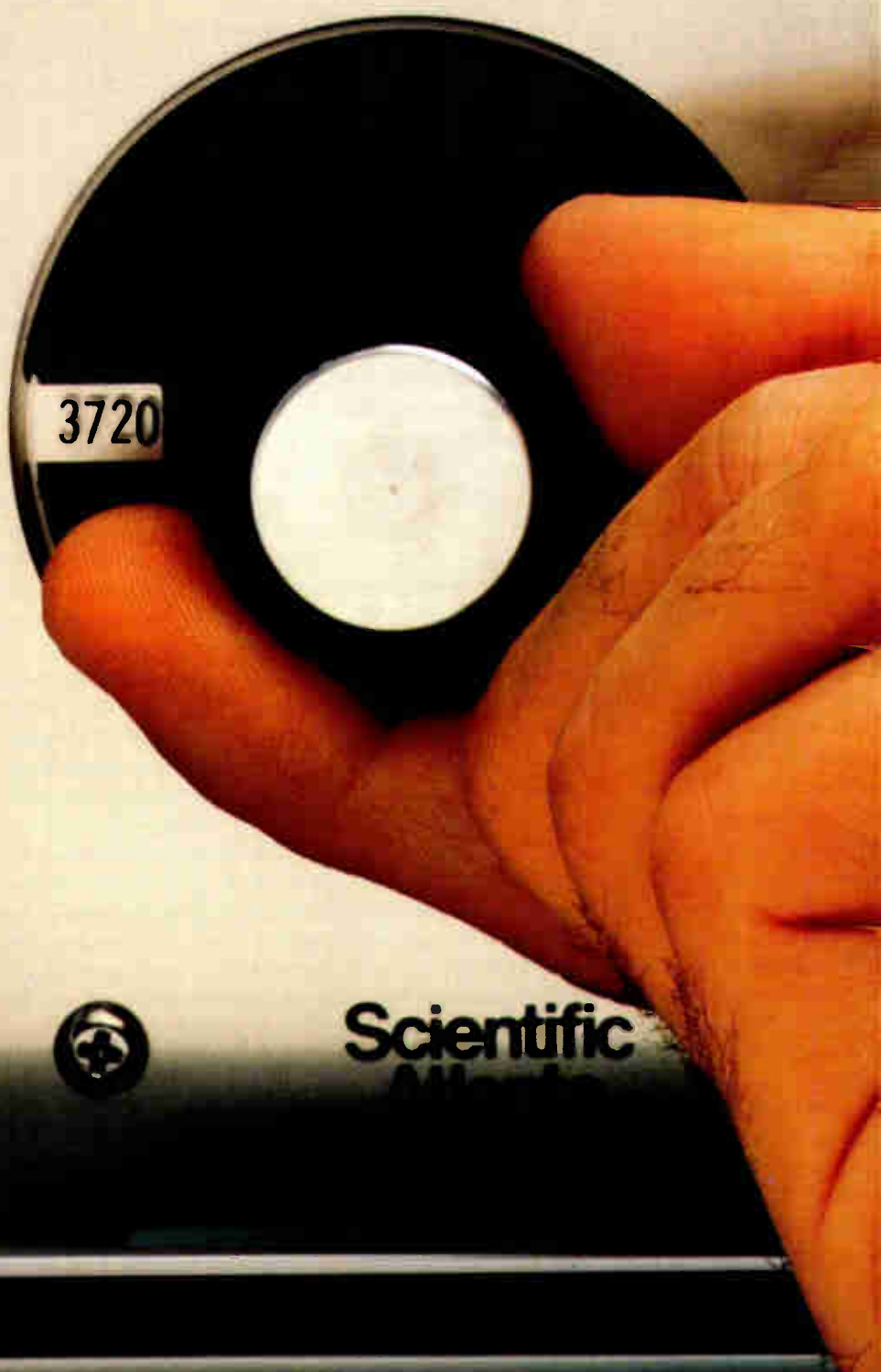
That same morning, commands were once more sent out over the computer to try to correct the wobble, and pitch lock was lost once more. Both pitch lock and wobble were corrected in roughly one hour.

"Meanwhile," says Christopher, "our analysis was still being worked on. As our switching to the back-up attitude control electronics had not eliminated the problem, we decided to switch to the reserve momentum wheel. We were able to re-acquire normal spacecraft functioning after about two hours. At this time, we discovered that loss of pitch occurred only when the magnetic roll control circuitry in the attitude control electronics was turned on. This meant that the basic automatic circuitry controlling roll excursions, (both magnetic and thruster control) was intermittently causing serious attitude disturbances."

Now that the main problem area had been isolated, the correctional decisions were a lot easier. "The automatic on-board system was obviously malfunctioning, and I decided we would be better off if we switched our operation back to the manual ground control," said Christopher. "This meant we would have to utilize our thruster control system with milli-second firing periods. Spacecraft pointing would be slightly less precise, but not sufficient to cause problems with the function of the total system. The problem was with a circuit that was not critical to the operation of the spacecraft. The interruptions to PLC traffic were generally of a minor character, and the outages in the video product line were for pre-emptible traffic."

Andrew F. Inglis, president of RCA American Communications, Inc., said "The use of jet thrusters for roll control may mean a temporary loss of precision by about .020 degrees in north-south attitude, but this should in no way affect the function of the spacecraft. Our teams managed to react with speed and held the outages to a minimum."

FREQUENCY AGILE DOWN CONVERTER



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Cable Programming for November

Signal	Day	Start/Stop	Alert Tones	Satellite/ Transponders
C-SPAN (times approx.)		12 pm-6 pm (Mon. & Tues.) 10 am-6 pm (Wed.-Fri.)	195°/#	F1, #9
Calliope		6:30 pm-7:30 pm (Mon., Tues., & Thurs.)	168°/#	F1, #9
CBN		24 hrs.	No	F1, #8
ESPN		7 pm-6 am (Fri.-Mon.) 6 pm-4 am (Mon.-Fri.)		F1, #7
Front Row		2:30 pm-2:30 am	481°/#	E,C F1, #12 P,M F1, #10
HBO	1	6:30 pm- 1:26 am	Program	F1, #24
	2	6:00 pm- 2:05 am	729°/#	F1, #22
	3	3:30 pm- 1:31 am	Scramble	F1, #23
	4	2:00 pm- 2:16 am	835°/#	F1, #20
	5	6:00 pm-12:45 am	Duplication	
	6	5:30 pm- 1:39 am	940°/#	
	7	6:00 pm- 2:05 am	Take-2 E.	
	8	6:00 pm- 1:00 am	592°/#	
	9	5:30 pm- 1:37 am	Take 2 W.	
	10	2:30 pm- 1:29 am	681°/#	
	11	2:30 pm- 1:43 am		
	12	5:30 pm- 2:27 am		
	13	6:00 pm- 2:22 am		
	14	5:30 pm- 1:39 am		
	15	6:00 pm- 1:30 am		
	16	5:00 pm- 2:39 am		
	17	3:00 pm- 1:23 am		
	18	2:00 pm- 2:12 am		
	19	5:00 pm- 2:05 am		
	20	5:30 pm- 1:14 am		
	21	6:00 pm- 2:34 am		
	22	2:00 pm- 1:37 am		
	23	4:30 pm- 1:35 am		
	24	3:00 pm- 1:22 am		
	25	2:00 pm- 1:38 am		
	26	6:00 pm- 1:40 am		
	27	5:00 pm- 1:35 am		
	28	6:00 pm- 1:13 am		
	29	5:30 pm- 1:38 am		
	30	6:00 pm- 1:59 am		
HTN		8 pm-10 (11) pm	207°/#	F1, #21
KPIX (time permitting)		2-4 hrs. per day	No	F1, #1
KTVU		7 am-1 am (weekdays) 7 am-4 am (weekends)	No	F1, #1
MSG Sports	1	8:00 pm-10:30 pm	438°/#†	F1, #9
	2	8:30 pm-		
	3	11:30 pm- 2:20 am		
	4	7:30 pm-10:30 pm		
	7	7:30 pm-		
	8	8:00 pm-10:30 pm		
	10	1:30 pm-		
	11	7:30 pm-		
	14	7:30 pm-		
	15	8:00 pm-1:00 am		
	18	7:30 pm-		
	21	7:30 pm-		
	22	8:00 pm-10:30 pm		
	23	8:30 pm-		
	24	11:30 pm- 2:30 pm		
	25	7:30 pm-		
	28	7:30 pm-		
	29	8:00 pm-10:30 pm		
	30	8:00 pm-10:30 pm		

Signal	Day	Start/Stop	Alert Tones	Satellite/ Transponders
Modern Talking Pictures		12 pm-5 pm (weekdays) 7 am-12 pm (weekends)	048°/#	F1, #22
Newstime		24 hrs.	276°/#	F1, #6
Nickelodeon		10 am-11 pm (weekdays) 9 am-11 pm (weekends)	749°/#	F1, #11
PTL		24 hrs.	No	F1, #2
Reuters		Not in use yet.	No	will use F1, #18
SPN		10 pm-8 pm (Mon.-Sat.) 24 hrs. (Sun.)	429°/#	F1, #21
Showtime	1	5:30 pm- 1:15 am	576°/#††	E, C, F1, #12; P, M, F1,
	2	6:30 pm- 2:17 am		
	3	3:30 pm- 1:41 am		
	4	3:30 pm- 1:06 am		
	5	6:30 pm- 1:20 am		
	6	5:30 pm- 1:22 am		
	7	6:00 pm- 1:06 am		
	8	6:30 pm- 1:29 am		
	9	5:30 pm- 1:41 am		
	10	3:00 pm- 2:02 am		
	11	3:00 pm- 1:28 am		
	12	6:00 pm- 1:19 am		
	13	6:30 pm- 1:02 am		
	14	6:00 pm-12:02 am		
	15	6:00 pm- 1:22 am		
	16	6:30 pm- 2:06 am		
	17	3:45 pm- 1:55 am		
	18	3:30 pm-12:08 am		
	19	5:30 pm- 1:24 am		
	20	6:00 pm-12:02 am		
	21	5:30 pm-12:38 am		
	22	4:00 pm-12:50 am		
	23	3:00 pm- 2:04 am		
	24	3:00 pm- 2:00 am		
	25	3:30 pm- 2:24 am		
	26	6:30 pm- 1:49 am		
	27	6:00 pm- 1:37 am		
	28	6:00 pm- 1:30 am		
	29	6:20 pm- 2:13 am		
	30	6:00 pm- 2:24 am		
SIN		2:30 pm-1 am (weekdays) 4 pm-12 am (Sat.) 11 am-11:15 pm (Sun.)	No	Westar II, #7
Star Channel		9:30 am-2:20 am	311°/#E. 519°/#W.	F1, #5
Trinity (KTBN)		24 hrs.	No	F1, #14
WGN		5:42 am-3 (3:30) am (Mon.-Thurs.) 24 hrs. Sat. & Sun. Ends 3 am on Sun.	No	F1, #3
WOR		6:30 am-1:30 am		F1, #17
WTBS		24 hrs.	No	F1, #6

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

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

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

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We don't shuffle you from department to department. When you talk to Toner about an earth station package—as with everything else in cable TV—you talk to an informed expert.

We stock everything but the dish: Microdyne receivers, AFC antennas, Avantek LNA's, Blonder-Tongue modulators, power supplies and accessories. The dish is shipped direct to your pad by our supplier.

We bring it all together into a smoothly functioning turn-key project, with Toner project management: Single source responsibility, with one very accessible expert in charge. What on earth could be better?

Before you do more than think about an earth station, make a toll-free phone call to Toner. Find out how much nicer it can be without buck-passing and finger-pointing. Call toll-free: 800-523-5947. In Pennsylvania 800-492-2512.

Toner
cable equipment, inc.
969 horsham road
horsham, PA 19044

SEE FOR YOURSELF. THE MOST RADIATION-PROOF CABLES IN THE INDUSTRY.

Today, when radiation from drop cable has become a serious concern to many people, Times has taken action to alleviate the problem significantly.

Tc begin with, we've developed an instrument called the Radiometer which, for the first time, measures radiation definitively. Until now it was anyone's guess. Radiation characteristics were based on relative ratings and not always accurate. But the Radiometer measures capacitive coupling and transfer impedance. The characteristics of the test sample and the test chambers are measured separately. So now we have radiation data that's absolute, accurate and dependable.

Number two and more important, we've used the Radiometer in Research and Development to bring you improved drop cable. How good is the cable? Thanks to the Radiometer, you can see for yourself in the comparative tests shown on the right.

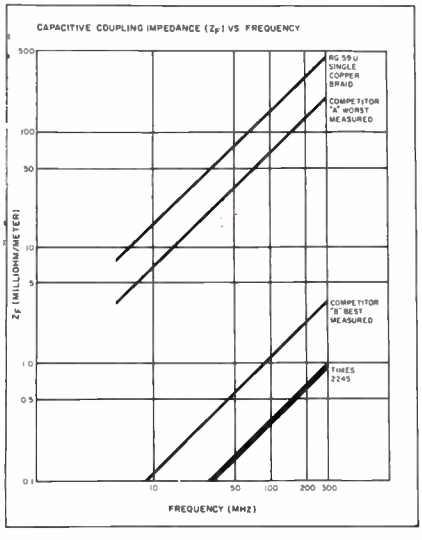
Times 2245, with its sealed foil/double braid construction, is proven to be far superior to every other cable on the market. The best competitive cable (a sealed foil type) was higher in transfer impedance and capacitive coupling. The worst competitive sample we tested was a dry foil construction. And just as a point of reference, we included standard MIL SPEC RG59U, the original CATV drop cable.

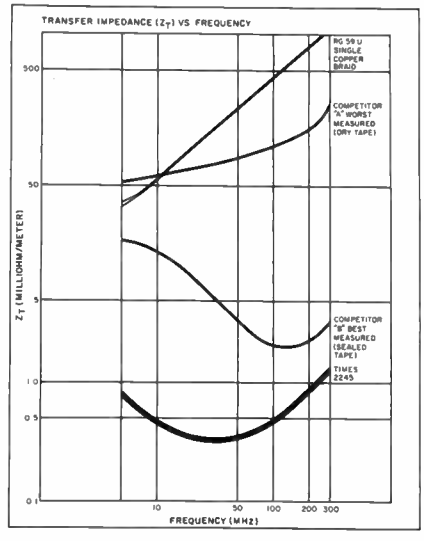
Not shown but also vital is data taken after flexure testing. After many hours of being subjected to simulated severe wind conditions the radiation from one competitor's cable increased by a factor of 40. But the tough construction of Times 2245 kept it from degrading one iota. What's more, we've improved all of our drop cables. Times can offer you cable with the lowest radiation in every price range construction. And this is no idle boast. Radiometer tests prove it.

The Radiometer, however, isn't limited to duty at the manufacturing level alone. CATV operators can utilizes its unique ability to check quality of every reel of drop cable purchased. That's why Times is making the Radiometer Model TNX-247 on a production basis. Selling price: $975.00 including three different size test chambers to cover all RG-59, RG-6 and RG-11 cable.

So now that radiation is such an important issue, there's never been a better time for Times—our Radiometer and our drop cable.

Times Wire & Cable, 358 Hall Avenue, Wallingford, Ct., 06492. 800-243-6904.





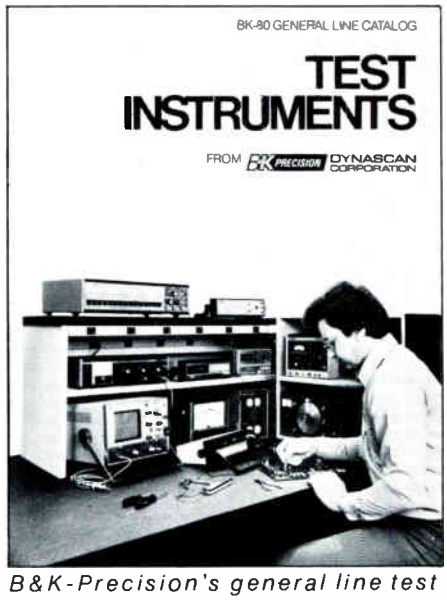
Times Wire & Cable
The #1 Cable Company
DIVISION OF TIMES FIBER COMMUNICATIONS, INC.

General Line Instrument Catalog Available From B&K-Precision

A 48-page BK-80 general line test instrument catalog, from B&K-Precision Dynascan Corporation, features a broad range of test instruments including oscilloscopes, frequency counters, digital and analog multimeters, function and RF signal generators, capacitance meter, digital and pulser probes, semiconductor testers, power supplies, and two-way radio and television test instruments. Each product description includes a detailed specification section and suggested popular applications. Also included is a complete line of instrument probes, connecting cables, carrying cases and other accessories.

Products include four new five-inch and two new three-inch oscilloscopes: a 30 MHz dual-trace triggered scope with a signal delay, a 15 MHz dual-trace triggered sweep scope, a 10 MHz triggered scope, a 10 MHz dual-trace triggered scope, a 15 MHz portable dual-trace three-inch scope and a 5 MHz solid-state three-inch scope. Other new products featured are a variable output isolation transformer, a digital pulser probe, a 3½ digit DMM with LCD readout and a 0.1 percent accuracy, and a full-feature NTSC color pattern generator.

The catalog BK-80 is available without charge from B&K-Precision, Dynascan Corporation, 6460 West Cortland Street, Chicago, Illinois 60635, (312) 889-9087.



B&K-Precision's general line test instrument catalog.

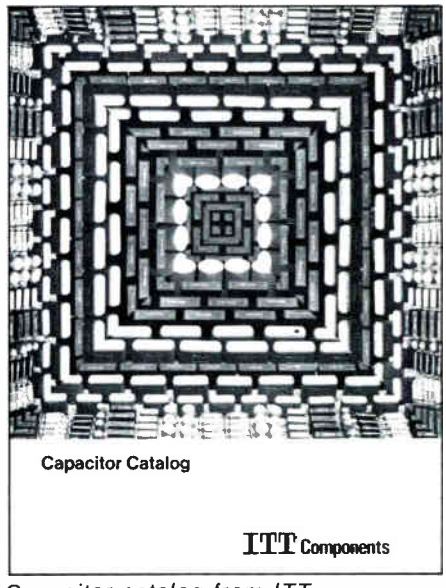
Eleven Capacitor Series Offered by ITT Components Group

A catalog describing a broad range of solid tantalum and metalized film capacitors has been offered by ITT Components Group of North Andover, Massachusetts.

The ITT 1979 Capacitor Catalog is a comprehensive guide to eleven series of capacitors. Solid tantalum types range from 0.1 to 680 uF with voltages from 3 to 50 V dc; metalized polyester and polycarbonate film types, from 0.1 to 10 uF with voltages up to 630 V dc. Included is a line of power electronic capacitors.

The 33-page catalog provides rating charts, performance curves, dimensional drawings, and application notes for each capacitor series described. A glossary of definitions and complete ordering instructions are also included.

The catalog is available free from ITT Components Group, 1551 Osgood Street, North Andover, Massachusetts 01845, (617) 686-1110.



Capacitor catalog from ITT.

Antenna Accessories Catalog from Microwave Filter

Microwave Filter Company has introduced a new catalog, PC-80, which lists over 72 antenna accessories for home TV innovators, ham and CB operators. Included in the catalog are baluns, traps, insulators, CB invisible antennas, filters and home TV hook-up accessories.

For a free copy of PC-80, write to Microwave Filter Company, Inc., Unadilla/Reyco Division, 6743 Kinne Street, East Syracuse, New York 13057.

Microwave Filter Company's PC-80 catalog.

Industrial and Home Video Equipment

The 64-page Adwar Video catalog offers a selection of industrial and home video equipment, and includes several sections on such subjects as how to plan a video studio, a closed circuit TV system, or a videocassette network. Other sections provide tips about video lighting, portable battery use and care, microphone recording techniques and pre-editing preparation.

The catalog references such major video brands as Sony, JVC, Panasonic, Ikegami and others, in addition to several Adwar innovations. Other sections offer comprehensive listings and rates of video equipment rentals, three quarter inch and one half inch videotape editing, film-to-tape transfer and duplication, as well as available choices of modifications for video cameras, recorders and monitors.

For a copy of this catalog, write or phone Adwar Video Corporation, 100 Fifth Avenue, New York 10011, (212) 691-0976.

Monroe Electronics Brochure of Cue Tone Receivers

A new brochure from Monroe Electronics, Inc., illustrates and describes cue tone receivers and specialized instruments to allow unattended operation of cable television channel switching functions. Included in the brochure are an emergency telephone-operated alert system, an earth station receiver channel controller, and a broadcast transmitter or cable TV headend.

Photographs of any of the instruments are available upon request. For more information, contact Monroe Electronics, Inc., 4367 Harlem road, Buffalo, New York 14226, (716) 839-0801.

Monroe Electronics cue tone receiver brochure.

New Handbook Presents Analyses of the Oscilloscope

Electronics technicians and service-repair persons can find step-by-step techniques for using the oscilloscope in a book entitled *Practical Oscilloscope Handbook* by John Douglas-Young, published by Parker Publishing Company.

The book's coverage includes servicing, operation, maintenance, and repair of the oscilloscope and detailed analyses of principal waveshapes. Deviations from the ideal shape and measurement of frequency and amplitude of the fundamental and harmonic components are explained. Including over 100 illustrations, photographs, and fault-finding tables, the book shows how to fully utilize such oscilloscope features as the triggered sweep, calibrated time bases, the vertical sweep attenuator, the dual trace function, and delay lines.

Emphasis is placed on such subjects as calibration and maintenance of the scope; using the oscilloscope for signal tracing in TV, radio, audio, and logic circuits; and using the oscilloscope for the alignment of TV and FM amplifiers and receivers.

Contact Parker Publishing Company, Inc., West Nyack, New York, (201) 592-2489.

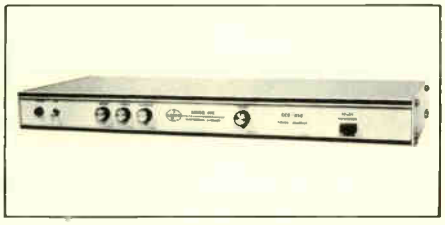
Video

Lenco Electronics Offers RGB-to-NTSC Encoding System

An RGB-to-NTSC color encoding system that enables computer graphics or alphanumeric information to be displayed on standard commercial color television monitors has been introduced by Lenco, Inc., Electronics Division.

According to the company, the CCE-850 encoder is specifically designed to encode high-resolution RGB colorgraphic computer displays, regardless of scan rates.

The CCE-850 encoder may be used with any computer graphics system when NTSC video is required for video taping and/or distribution. An additional feature includes a color reference test pattern to allow for proper NTSC color monitor alignment.



Complete technical information is available from Robert N. Henson, Lenco, Inc., Electronics Division, 300 N. Maryland Street, Jackson, Missouri 63755, (314) 243-3147.

Automation Techniques' New Time Base Corrector

New design concepts for time base correction have been utilized on an advanced, low cost TBC developed for the closed circuit and cable television markets by Automation Techniques, Inc.

The device, called a Time Error Corrector, is the TEL-TEC 210, specifically designed for cable television, closed circuit distribution, editing and dubbing. TEL-TEC has been designed to exclusively correct the various time errors without problems common to many devices.

Automation utilizes a "Sync Extractor" instead of standard sync separators which reference a video signal back to itself instead of clamped DC levels. The result is TEL-TEC corrects tapes that other TBC's cannot correct without picture breakup. A positional noise compensator reduces or eliminates the problem of "positional noise" on sync which is often converted to picture jitter, especially on dubs.

Varying video amplitude is stabilized by effective automatic gain control. Instead of controlling gain from sync amplitude, TEL-TEC AGC samples the level of the video signal between blanking and peak white after all processing. Control voltage is fed back to gain control circuits at the input of TEL-TEC.

Other features that are standard for user convenience include a switchable pulse-cross that allows viewing of sync and blanking characteristics on standard television screens to check pulses and time error correction simultaneously. Signal levels are automatically adjusted for proper brightness levels during pulse-cross.

More information is available from

Automation Techniques, Inc., 1846 No. 106th East Avenue, Tulsa, Oklahoma 74116, (918) 836-2584.

Test Equipment

Viz Offers Two New Multimeters

With a choice of either LCD or LED displays, two new 3-½ DMMs from Viz Manufacturing provide an accuracy of 0.1 percent (DCV) with an input impedance of ten megohms.

The LCD model, WD-759, offers the advantage of a visual indication of function (DC or AC volts, ohms or amperes) in the display window as well as the measurement value. Measurement ranges are from 100 microvolts to 1,000V DC and up to 600V AC; from 0.1 ohm to 20 megohms and from 0.1 microamp to 1A, DC and AC.

The LED model, WD-758, is identical in electrical performance except that it doesn't provide function indication in the display.

The units also provide for measurement of either high or low power ohms in all ranges—switch selectable. This assures accurate readings when making measurements either in or out of circuits.

The instruments are designed with accuracy, simplicity and long term reliability as primary objectives. They are housed in tough, impact-resistant cases. The raised guard edge on the front protects the selector switches from impact if the unit is dropped face down—reducing the risk of fracturing the PC board.

For additional details, contact Robert Liska, Viz Manufacturing Company, 335 E. Price Street, Philadelphia, Pennsylvania 19144, (215) 844-2626.

Wiltron's Automated Scalar Network Analyzer

The Wiltron 5610 automated scalar network analyzer is designed to provide microwave measurements over the 10-MHz to 18-GHz range. Under desktop computer control, the system makes automated measurements of transmission loss or gain, return loss (SWR), and absolute power A preprogrammed cartridge accompanies each system.

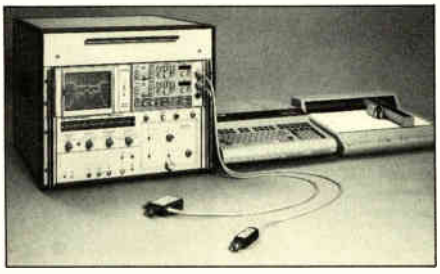
By entering several inputs, the operator obtains hard-copy test data over a 66-dB (+16-dBm to -50-dBm) dynamic range. Special versions are available for operatio up to 40 GHz.

The system offers 0.01-dB resolu-

tion, SWR measurments with more than 40-dB directivity from 10 MHz to 18 GHz, a one sweep generator covering the 10-MHz to 18.5-GHz range, WSMA (SMA compatible) connector with return loss measurement accuracy, digital memory techniques with measurement accuracy, calibration techniques which correct for variations caused by frequency response variations and test port mismatch errors, and refreshed display of memory-corrected measurement results.

Required inputs are limited to frequency range limits and step size, name and serial number of the DUT, and types of measurements to be made. Software is structured to make automated measurements with hard-copy output and to provide a CRT display of memory-corrected measurement results. This visual display allows adjustment or calibration of the device under test (DUT) and assures the operator that the test setup is functioning properly. Upon completion of the DUT adjustments, an automated data-taking sequence produces hard-copy output in either tabular and/or graphical form.

Tabulated data and/or curves of transmission loss or gain, power and return loss are prepared for any portion of the 10-MHz to 18-GHz range. The Y-axis scale divisions and range limits in dB or dBm are printed without operator assistance. Similarly, the X-axis scale units in GHz show the range over which measurements were made.



The 5610 makes measurements without interruption. Because the sweeper, SWR Autotester, Detector and programming all cover the 10 MHz to 18 GHz range, it is unnecessary to halt tests to change plug-ins or measurement components. The operator's role is limited to selecting the test parameters, connecting the test device, initiating the test sequence.

For more information, contact the Wiltron Company, 825 East Middlefield Road, Mountain View, California 94043, (415) 969-6500.

Miscellaneous

Micro Device Electronics Introduces Line of A/B Switches

Micro Device Electronics has introduced a line of A/B coaxial switches which offer modular construction for quick removal of the electronic circuitry, isolation in excess of 85 dB in most cases and an output resistance of 75 ohm.

For more information, contact Micro Device Electronics, 2751 E. Chapman Avenue, Suite 204, Fullerton, California 92631, (714) 879-4630.

Tiering In Alamagordo

By Pat Link, Managing Editor

A cable system in Alamagordo, New Mexico, is offering its subscribers a unique combination of services through tiering of basic services and pay programming. Previously, subscribers had been offered a basic 12-channel package, which included four stations from Los Angeles. In January of this year, TV Cable of Space City, Inc., expanded its basic service and added pay programming.

A seven-channel, reversed video converter was introduced so that the first six channels, "A" through "F", could be used for the second tier of basic programming and the seventh channel, "G", could be used for the pay channel. The second tier of programming and the pay service are both offered in the mid-band frequency range, leaving the entire super-band open for additional services in the future. Three different traps are utilized for security to remove the separate bands. One trap is used if the customer only wants the first tier of the basic 12 channels. In this case, the A through G trap is used to cut out the mid-band channels. If the subscriber wants only the first and second tiers of basic, the G trap is used to block out the pay channel, and if the subscriber wants pay and the first tier of basic, a third rejection trap is used to block out the second level of basic.

Security methods vary from system to system depending upon expansion plans, the percentage of subscriber penetration and the cost of equipment. In a typical example, the first level of basic programming uses a negative trap. In most cases, the percentage of penetration is heavy enough that it is more economical to use a fairly inexpensive item to keep those who are not taking the service from getting it. If, however, the percentage of penetration is very low, ten to fifteen percent, then traps may become more expensive than descrambling equipment.

In the case of Alamagordo, traps proved the best investment. Out of about 9,500 homes passed, approximately 7,800 subscribe to the first tier of basic programming. The percentage of subscriber penetration in the second tier of basic is approximately 21 percent, and the percent purchasing pay programming has risen to 39 percent. According to Homer Harmon, divisional manager of UA-Columbia for this area, "a seven-channel descrambler would have been necessary to do the job, and we felt we could do it cheaper this way."

TV Cable of Space City, Inc., offers a first tier of 12 basic channels, which includes four Los Angeles stations. Offered in the second tier of basic programming are six channels, promoted as "Super Channels": WTBS from Atlanta, KTVU from Oakland, WGN from Chicago, Madison Square Garden, Calliope, Thursday Night Baseball, C-SPAN, CBN, and an independent station from Mexico City. The pay channel offered is Home Box Office.

Subscribers may buy any part of the cable package that they want; however, they must purchase the first tier of basic before they can obtain the others. Then they may purchase the second tier of basic or the pay or both. Subscribers must buy the converter which can be used for the basic and/or pay. A discount on the installation is offered to the subscriber if he takes both the second tier of basic and the pay.

Motels subscribing to TV Cable purchase a slightly different configuration than other subscribers. One of the 12 lower channels is removed from the cable system in the motel itself, and HBO is converted back into that channel so that the need for a converter is eliminated. Harmon points out that there has been a problem with converters staying in the motels.

Because the operation in Alamagordo has been so successful, Harmon is planning a similar system change in Yuma, Arizona, in January. Here, however, he will use the super-band for the second tier of basic programming. Eight channels in total will be added to the basic programming already offered. Four of the channels will be offered from the newspaper. These will include local news in print, UPI news, and other programming such as shopping comparisons, classified ads and real estate advertising. The other four channels will offer Madison Square Garden, Calliope, C-SPAN, Nickelodeon, and ESPN. No additional amount will be charged for these channels; however, the basic rate will be increased by a small amount to offset the additional cost. Converters will be sold to subscribers to enable them to receive any further type of service offered. In this case, the mid-band is being left open for future services.

Harmon points out that various combinations of services are being offered "to see what will work and what we can do with promoting other services."

Pat Link, replacing Toni Barnett who joined Cablecom General, has recently been appointed managing editor of C-ED. Pat joins TPI from Southwest Research Institute, where she was technical editor. Anyone having unique applications or systems which would be of interest to C-ED readers, please contact Pat, (303) 573-1433.

Get Your "Hands On" High Technology

Fiberoptics. Microwave transmission. Earth stations. Addressable taps. Broadband communications technology is ever-changing and increasingly complex. In fact, sometimes it's hard for a busy technical person to get a handle on just what's happening.

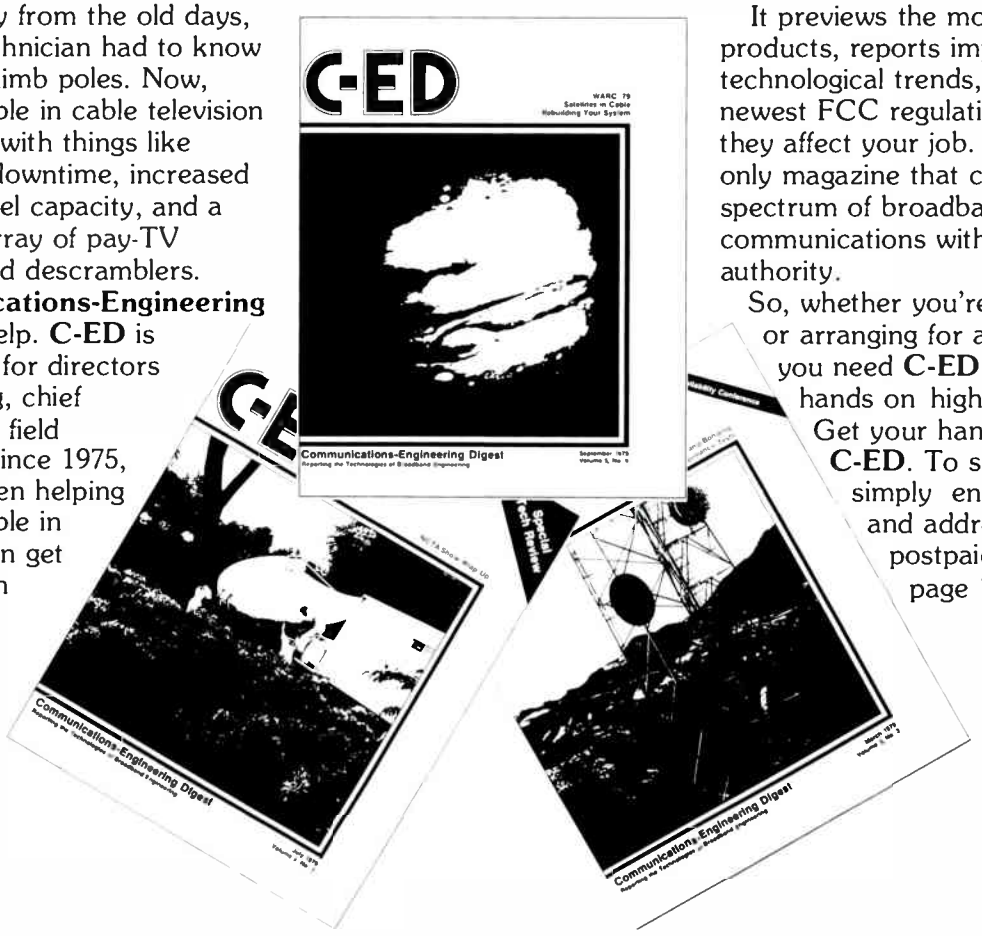
It's a far cry from the old days, when all a technician had to know was how to climb poles. Now, technical people in cable television have to cope with things like transponder downtime, increased system channel capacity, and a bewildering array of pay-TV converters and descramblers.

Communications-Engineering Digest can help. **C-ED** is *the* magazine for directors of engineering, chief engineers and field technicians. Since 1975, **C-ED** has been helping technical people in cable television get their hands on high technology. In fact, **C-ED** is the official publication of the Society of Cable Television Engineers. **C-ED** covers it all: from blue sky to-technology to down-to-earth daily maintenance.

C-ED explains hardware usage in your own technical language.

It previews the most promising products, reports important technological trends, and covers the newest FCC regulations and how they affect your job. **C-ED** is the only magazine that covers the whole spectrum of broadband communications with originality and authority.

So, whether you're installing taps or arranging for a satellite uplink, you need **C-ED**. Get your hands on high technology. Get your hands on **C-ED**. To subscribe, simply enter your name and address on the postpaid card on page 14.



Get Your Hands On C-ED

Q I have had numerous complaints that our system is leaking. The signals that I have provided on the cable are now being broadcast throughout the neighborhood. I don't have a lot of money to spend on expensive test gear. Is there any other way?

A You are still obligated under the FCC rules and regulations to maintain a tight system, especially near airports and when using frequencies in the aeronautical communications bands. Equipment to measure the leakage on your system should be able to sense 20uv/m at 3M. Keep records of your measurement for two years.

While you are waiting for your measuring equipment to arrive from the factory (assuming you have ordered it), borrow a signal strength meter and attach a tuned dipole antenna cut for a known and identifiable signal within your system. Take a reference reading at a now tight area, and then drive around the system looking for hot spots.

Granted, this is not a calibrated measurement system, but it will detect relative differences from one area to the next. When your new equipment arrives, you can then go to town. but it will detect relative differences from one area to the next. When your new equipment arrives, you can then go to town.

Q As you know, conduits come in many different sizes, and the "mice" used in these underground installations to get a rope and then the cable through a conduit don't always fit well inside them. Is there an easier way to get a rope through a conduit?

A Donald Robinson, district engineer of Six Star Cablevision's Tigard, Oregon, office has come up with a unique way of solving this problem. How do you get the rope through the conduit? "You blow it through with an air compressor. You talk a secretary out of one of her nylon socks and blow a balloon up inside of one so that it fits just inside of the pipe, tie a string off on that (that's called jet lag, put a compressor behind it, and that thing goes whizzing through the conduit and comes up at the other end. Then, tie a rope on that, pull it through, and you're done. There are many different methods, but we've found this one the cheapest way to go. It doesn't cost much: a ten-cent bag of balloons and some pantyhose. It works well."

"Out of Sync" is a forum for and by technicians and engineers. If you have a problem, simple or sophisticated, please do not hesitate to submit your questions and/or solutions to C-ED, in care of Pat Link. We'll do our best to provide as much assistance as possible.

Lenco's VNM-428 Video Noise Meter . . . Only if You *Really* Care About Noise.

Some people think that video noise is a bore. They just couldn't care less about it. They figure that if they ignore it, it'll go away.

On the other hand, there are some forward-thinking, dedicated video engineers who are vitally concerned about their signal quality.

If you belong to the former group, you can stop reading this ad.

However, if you're interested in making fast, accurate signal-to-noise measurements of *any* composite video signal—no matter what the source—check out our VNM-428 Video Noise Meter.

The VNM-428 is specifically designed for the video S/N measurement requirements of TV studios, CATV, satellite or microwave systems. It utilizes a tangential noise measurement technique which overcomes the problems associated with oscilloscope measurement of Gaussian noise in video waveforms.

It's a small, rugged and stable unit, with a built-in calibrator that ensures an accuracy of ± 0.5 dB throughout the range of 20-55 dB. Three precision filters, conforming to EIA/CCIR standards, are built in. The large, easy-to-read LED display can be seen from across the room. And it's priced at a comfortable $1,495.

So if you're *really* concerned about video noise, call your nearest Lenco sales rep today. We'll be happy to give you a non-obligation demonstration.

Texscan announces that the Theta-Com sales force will market the Lenco Video Noise Meter and provide sales to the CATV market.

THETA-COM CATV
a division of Texscan corporation

Texscan

Theta-Com: 2960 Grand, Phoenix, Arizona 85017. P.O. Box 27548, 85061, (602) 252-5021, (800) 528-4066 TWX: 910-951-1399.

Texscan Corp: 2446 N. Shadeland, Indianapolis, Indiana 46219, (317) 357-8781, TWX: 810-341-3184.

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Want to know more about noise measurement? Write on your letterhead for a FREE copy of "Television Signal-To-Noise Measurement—A NEW APPROACH".

MacDonald Stresses Decisiveness In First Communications Speech

by Pat Link, Managing Editor

David MacDonald, a United Church of Canada minister and member of Parliament for the P.C.'s, is the new secretary of state and minister of communications. In a speech before the Canadian Film and Television Association and in a subsequent news conference, MacDonald emphasized decisiveness and resolve in regard to communications policy.

In his speech MacDonald stated that he will introduce a revised telecommunications bill "which will consolidate and rationalize the regulation of telecommunications in Canada." Its purpose will be to "adapt federal law to the realities of the 1980s in a way which is responsive to provincial concerns."

MacDonald stated further, "If we are to set up our own satellite broadcasting system, we shall have to proceed quickly, particularly to ensure that the reception of American satellite signals do not undermine our own systems. At the Federal-Provincial Conference of Communications Ministers October 16-17, I shall be presenting for discussion a proposal on how best to proceed toward the establishment of a Canadian satellite broadcasting system."

A possible stimulus for Canadian production is pay-TV. In his speech, MacDonald stated that current proposals do not meet the needs of all interested parties adequately, but firmly feels that "a solution is required. I shall propose to provincial ministers a process of public consultation in resolving the issue of pay-TV in Canada." The minister has formed an "interdepartmental committee on cultural industries" which has as its purpose to recommend "specific incentives" which could increase the level of private investments in, and marketing of, Canadian television production. We are attempting to adjust the 100-percent capital post allowance on investment in certified Canadian film or video productions to this end." In conjunction with this, the roles of NFB and CFDC will be looked at with renewed interest.

At the news conference which followed his speech, MacDonald answered questions concerning the future role of pay-TV in Canada and expressed his hope that pay-TV licenses will be issued within the next year. He added that there is an urgency to implant a pay-TV system. "We are in danger of being pre-empted and pay-TV could provide a sensible and enjoyable alternative for Canadians."

He noted, "CRTC structure will change in the foreseeable future. Regulatory authority, over time, must be re-evaluated. The government must assume its political responsibility for policy. The regulators should not be in the unpalatable role of acting in policy." This will be clearly stated in a revised telecommunications bill.

In both his speech and at the news conference, MacDonald emphasized his desire to "solicit the suggestions, comments and proposals of members of the broadcast and telecommunications industries, creative people, interested Canadians, and the general public. We shall also consult extensively with provincial governments and make every effort to be responsive to their interests." MacDonald displayed a desire to be expedient and decisive and indicated that his ability to be so will depend largely upon the cooperation that he gets from interested and involved parties.

DOC Broadcast Satellite Experiment

On a related topic, MacDonald announced a new DOC experimental program aimed at testing the feasability of direct-to-home TV broadcasting satellites.

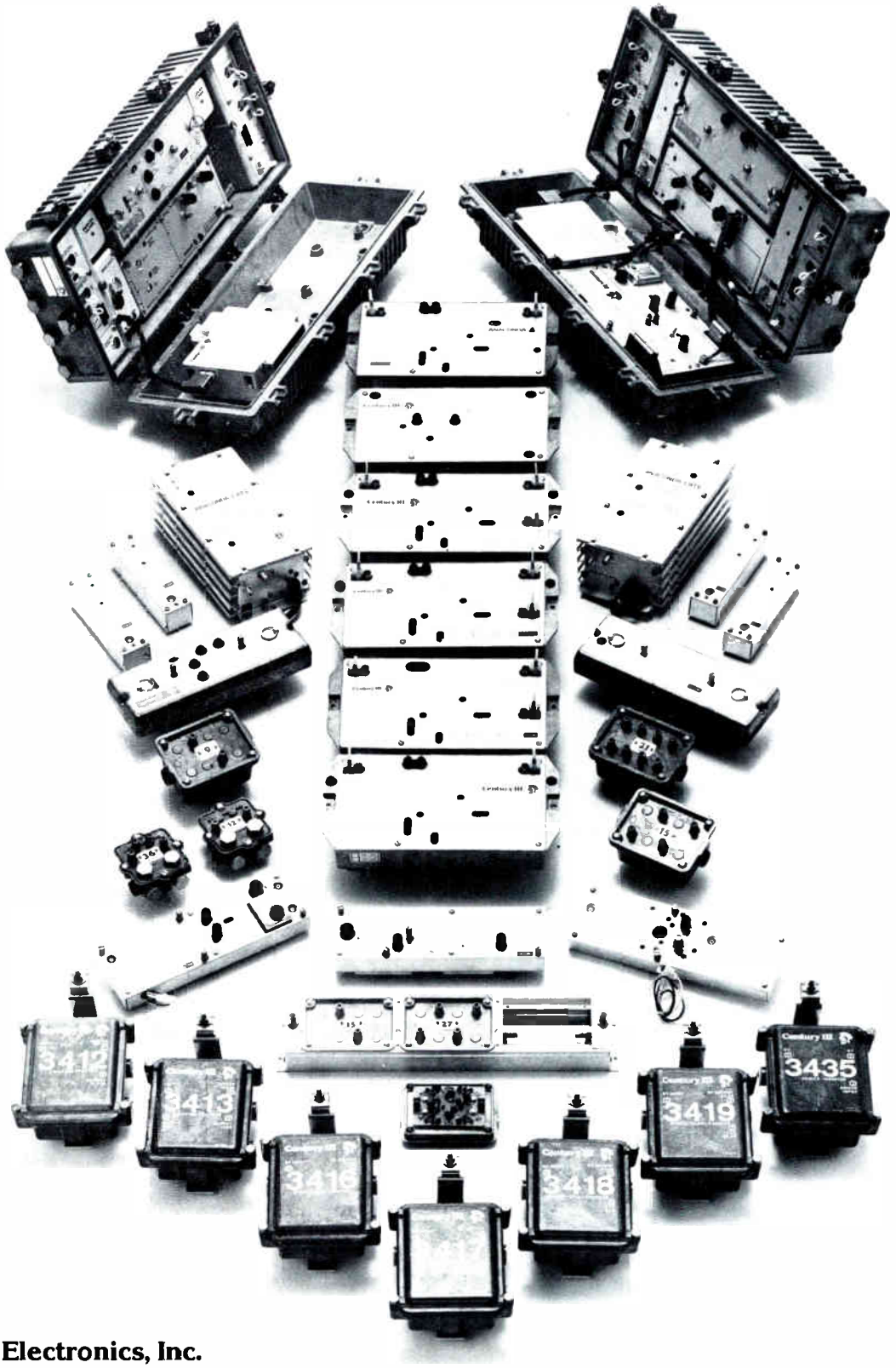
The program, which uses the 14-GHz/12-GHz transponders of the Anik B satellite, began transmitting TV programming directly to rural cable television systems, community centers, and homes on September 25. Signals are being received by 1.2-meter and 1.8-meter ground stations loaned by DOC. The department has purchased 100 earth stations from SED Ltd. of Saskatoon to be used in the project. The project will continue at least until spring, 1980.

The dishes are being distributed now to users in Ontario, and there are plans to extend the project to British Columbia and possibly the Yukon and Northwest Territories. More than 12 hours per day of TV programming will be available over the satellite. Programming in Ontario will be provided by TV Ontario while those in British Columbia and the North will have access to CBC and CTV programming.

TV Ontario and DOC have defined two classes of cable television company in Ontario eligible for the project. The first includes rural cable systems already distributing OECA programming via tapes. These will be the first in operation. Generally, 1.8-meter terminals will be used, while very small rural systems will use 1.2-meter dishes. The second classification is cable systems not currently authorized for distribution of TV Ontario programming. It is foreseen that these will be serviced at a later date when authorization has been received from the CRTC.

The project is aimed at transmitting TV programming to homes and community centers in remote areas of Canada unlikely at any time to be able to support a cable television system, together with assisting the more remote cable TV systems to improve their programming. The programming carried on both beams will only be that which is generally available in the contiguous urban areas.

If you could see FIVE YEARS into the future you would install this equipment today.



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★ The board of directors of **TEST, Inc.** has elected **William J. Kommers**, president of the Van Nuys, California, pay cable TV and MDS equipment manufacturing company. He will replace William David Lawry, who will continue his association with TEST as an active management consultant. Kommers was also elected as a member of the board of directors. Also, **Marlene Tanner**, vice president of Finance, has been elected as a member of the board of directors.

★ **Richard J. Borini** has been named regional manager of technical services for **TOCOM**'s Florida network of two-way cable TV entertainment and security systems. Borini will manage TOCOM's service center which will provide installation, technical support and on-going services for TOCOM's Florida customer base. A native of Pennsylvania, Borini has served in virtually every technical capacity in the CATV industry. He was cable TV technician, chief technician, technical advisor, program manager and assistant system manager for National Trans Video of Pennsylvania. He has also been a system manager for Unicon, Inc. in New Jersey and TelePrompter Corporation in Florida.

Richard J. Borini.

★ Norman Hurd, regional manager for **American Cablesystems of Virginia, Inc.**, a subsidiary of American Cablesystems Corporation, has appointed **James Millikin** as chief engineer for the company's regional operations. Millikin is responsible for the technical activities of 13 cable systems serving more than 11,000 subscribers. Millikin has more than eight years experience in the construction and maintenance of cable television systems. He was previously with American Television and Communications.

James Millikin.

★ **Thomas Heiser** has joined **Merrill Cable Equipment Corporation** as director of Marketing. Prior to joining MCE, Heiser was the national sales service manager for Phoenix in the CATV division of Hatfield Communication Products. He was responsible for inside sales for the U.S.A. and international market, sales coordination and planning, and production scheduling. Heiser received his Bachelor of Science degree in management and marketing from Florida State University. He also has an Associate of Arts degree in Psychology.

★ **Carlen DeJong, PTS Electronics, Inc.** regional manager and supervisor of the PTS-Denver Service Center, has been promoted to regional vice-president. DeJong joined PTS in 1971 when the Turner company, Tel-Tron, merged with the Bloomington, Indiana based electronic firm. He managed the Denver Service Center and was named regional manager in 1973. As regional head, DeJong supervises PTS branches in Denver, Colorado; Kansas City, Kansas; Milwaukee, Wisconsin; Davenport, Iowa; Omaha, Nebraska; Salt Lake City, Utah; and Phoenix, Arizona. He graduated from the Electronic Technical Institute of Denver and has continued his electronics and management studies at the Community College of Denver.

★ **Donald T. Heckel** has been named president of **Javelin Electronics, Inc.**, which was recently acquired from Apollo Lasers, Inc. by Walker Kidde & Company, Inc., headquartered in Clifton, New Jersey. Formerly a vice president and general manager of Javelin and a member of the Board of Directors of Apollo Lasers, Inc., Heckel will direct the worldwide activities of Javelin, which since 1968 has been one of the world's leading suppliers of closed circuit television security and surveillance systems and of night viewing devices. Heckel joined Javelin as general manager in 1972. Prior to that he had been product manager at GTE Sylvania in Mountain View, California, and with the Systems Design Group of Hughes Aircraft in El Segundo, California. While at Hughes he headed the Systems Designs Group which designed the spacecraft television system for Surveyor, the first spacecraft to soft land on the moon.

Donald T. Heckel.

★ **William T. Godfrey** has been promoted to the position of manager of Marketing for the **Copperweld Bimetallics Group.** In his new position, Godfrey will be responsible for applications engineering, product and market development, and marketing communications. Before joining Copperweld in October 1978 as manager of Marketing Planning, he was associated with Pirelli Cable in Union, New Jersey, where he was manager of Marketing Research and Planning. Godfrey holds a Bachelor of Arts degree from Gettysburg College and an MBA from Rutgers University. He will continue to be headquartered in Pittsburgh.

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