



February 1968

TV Communications

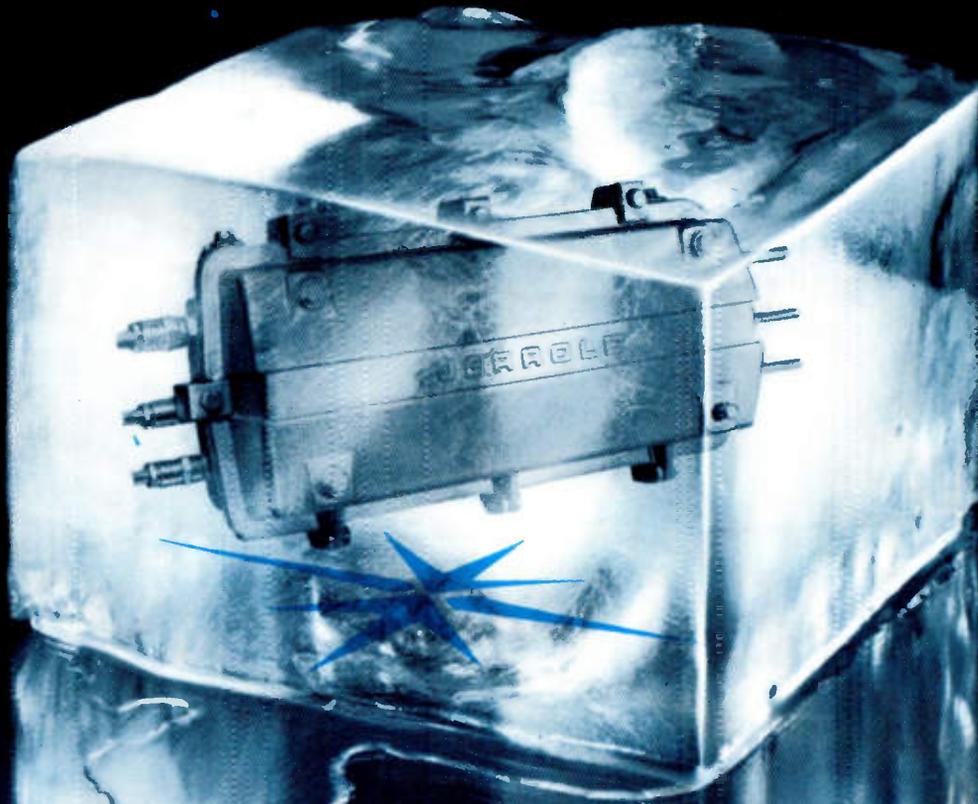
The Professional Journal of Cable Television



In This Issue . . .

Computerized Billing
CATV Election Coverage
Distortion Fundamentals

- Sandwiched printed circuit boards ■ 120 dB well for radiation suppression
- Aluminum thermal finger inserts ■ Integrated AGC circuitry



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OHIO CABLE SYSTEM WINS CASE AGAINST ILLEGAL HOUSE TAP

Portsmouth Cablevision, Inc., has won a suit against a Portsmouth, Ohio, homeowner who, for 33 months, tapped onto the firm's television cable without its knowledge.

According to the system's Manager, Herbert Spence, one of the cable company's door-to-door sales girls spotted an unauthorized tap onto the cable system. Spence and a city detective contacted the homeowner who admitted he had hooked up to the cable system after ordering a "disconnect" nearly three years ago.

Spence said he offered to settle out of court for \$50 but, when the homeowner refused to pay, he turned the case over to a collection agency which eventually took the case to court.

Spence said illegal taps "are a real problem" to the Portsmouth system and that he pursued the case to "set a precedent" in the community.

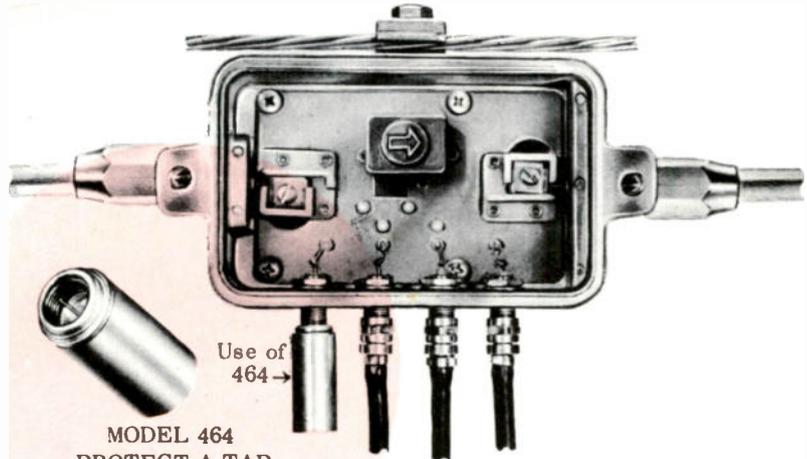
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* patent pending



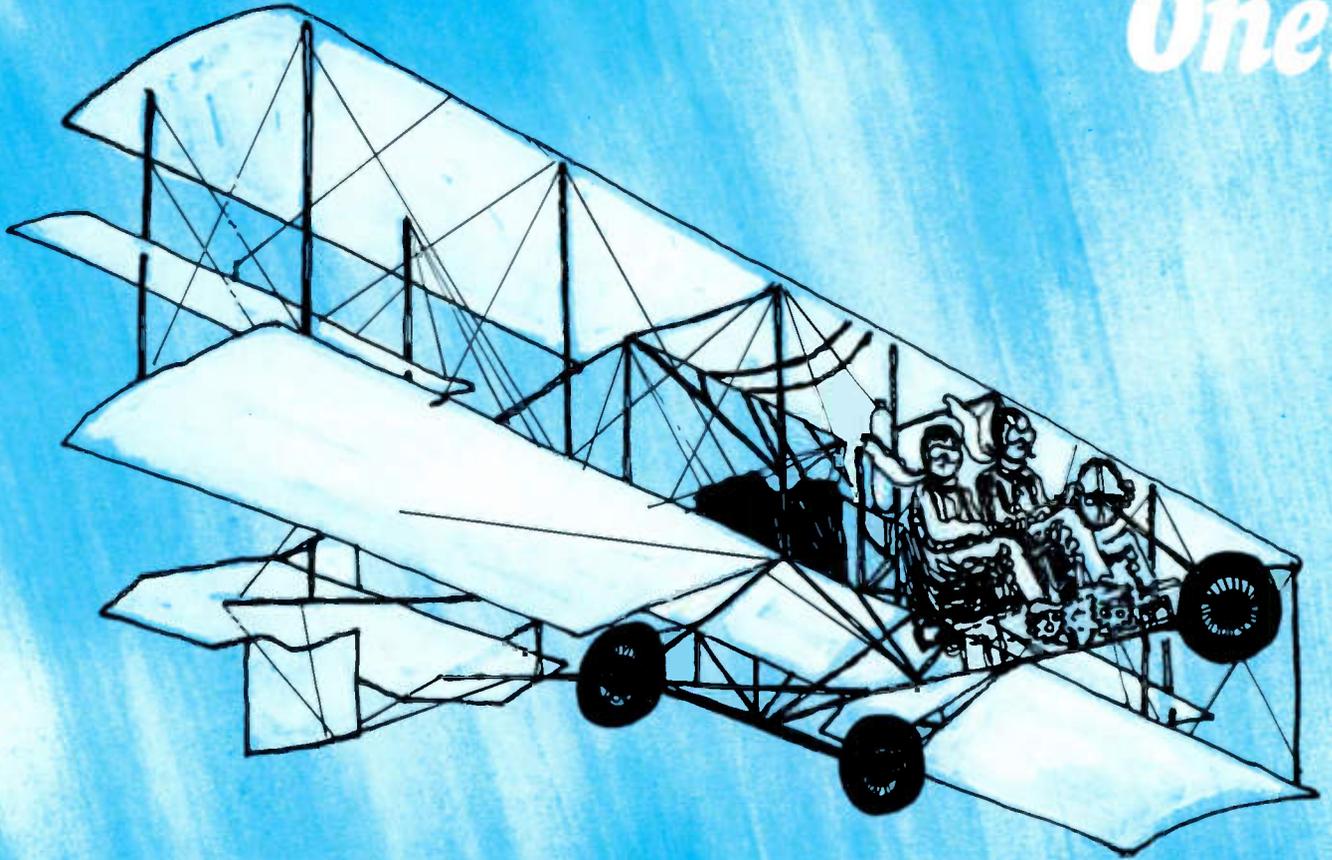
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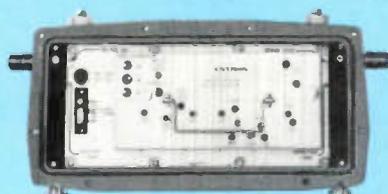
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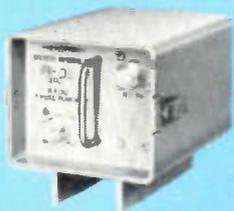


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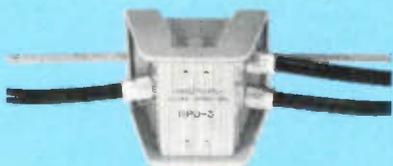
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The Most Respected Name in CATV

IN THIS ISSUE

Professional Programming

Many cable systems will originate coverage of local primaries and elections this coming fall, thus accomplishing a "first" in many communities. Planning and producing such a cablecast, especially for the first time, is no minor undertaking — a great deal can be learned from the experience of the Pittsfield-Dalton TV Cable Company, as related by Don Andersson (starting on page 40 of this issue). The election coverage cablecast which the Pittsfield system produced last fall involved careful planning and skilled execution. Mr. Andersson explains the entire operation in detail.

Why Consultants?

When should cable systems operators call in a management consultant? What sort of assistance should they expect him to provide? The answers to these questions, and other information on the role of a CATV management consultant, are found in the article by Charles Wigutow (beginning on page 47). A veteran CATV'er and consultant himself, Mr. Wigutow utilizes "composite case histories" to illustrate the advantages and limitations of such a consultant from the system operator's point of view.

Fundamentals of Distortion

Beginning on page 67 of this issue, Ken Simons presents a major technical article on distortion in CATV amplifiers. It is written as an elementary introduction to the nature and effects of the non-linear distortion in amplifiers; both second order and third order distortion being discussed in depth.

Our Cover: Featured this month is the videotape van used by Telecable in Olympia, Washington. Doug Turner is shown with the firm's Ampex VTR on the cart beside the van, and with the unit mounted inside the truck. (TVC pays \$20 for color photos submitted by readers and selected for publication — materials returned on request.)

TV Communications

The Professional Journal of Cable Television

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A Practical Approach to Collection Problems
Guidelines for keeping your accounts receivable in top shape 47

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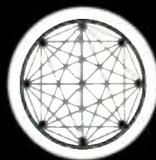
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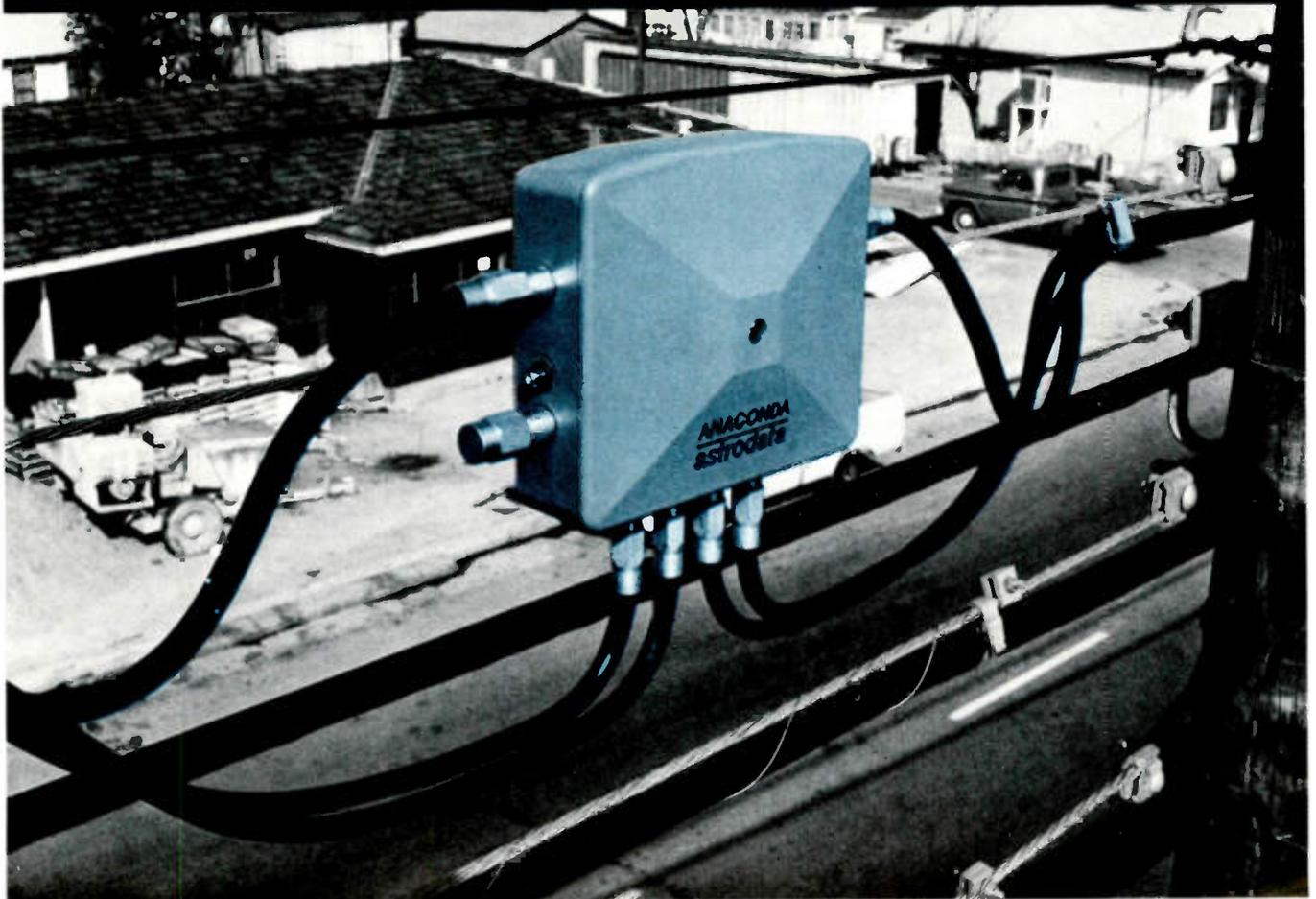
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The TVC Viewpoint

EDITORIAL



Participation Needed

Last month the President of the National Cable Television Association sent out a membership letter entitled "A Time For Greatness." In a three-page documentary that traced the history of trade associations from Biblical times, he called for "a degree of unity that transcends petty differences, selfish interests, regional conflicts and other disturbing influences." NCTA President Fred Ford admonished members to avoid "pointless bickering among ourselves." He asked for cooperation both from loyal NCTA supporters and from "those whose cooperation has left something to be desired."

Behind Mr. Ford's earnest plea for unified cable industry support of NCTA is an increasingly evident impatience among CATV owners. This understandable impatience is born of realistic fears relative to copyright liability and the FCC's intervention in cable system operation and expansion. These are not new worries. Nor can responsibility for either of these problems be laid at the door of NCTA.

Nonetheless, as the single organized national voice of CATV, the trade association is the focal point for both praise and criticism. Just as the NCTA staff is credited with a tactical victory in Supreme Court acceptance of the copyright case, so must NCTA leadership bear the brunt of complaints over continual setbacks at the FCC. NCTA officers and staff needn't invite criticism . . . or appreciate it, for that matter. But, realistically, they should expect a certain amount of it. If the National Cable Television Association is to represent its members effectively, it must take distinct positions on sensitive and complex issues. It is impossible to do this and still please everyone in the cable television industry all of the time . . . quite obviously.

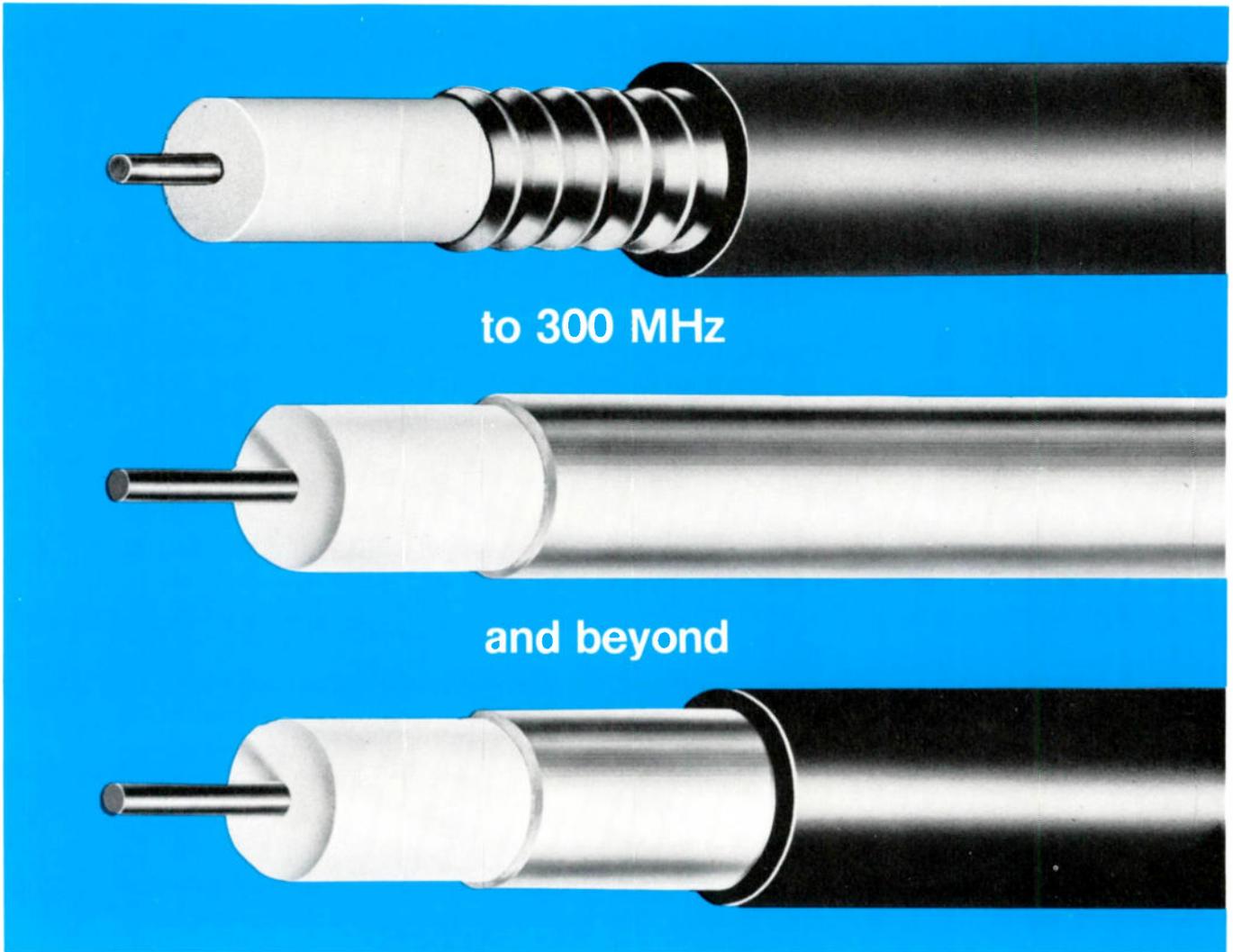
Mr. Ford's letter to members reflected a deep concern over possible disunity. We do not believe that his concern is fully justified. On the contrary, what sounds like discord and divisiveness may simply be the voice of healthy dissent. An aroused membership, anxiously seeking answers to serious problems, will inevitably question certain decisions being made by industry leaders. This is normal and healthy. So long as NCTA leaders can demonstrate the correctness of decisions being made and point to efficient and businesslike administration, the great majority of members will be satisfied.

It is, of course, incumbent upon Mr. Ford and his staff to be responsive to the questions, suggestions and viewpoints of the individual members. And, in the interests of a larger membership roll, the same receptiveness should be accorded the views of non-members. If cable system operators can be made to feel that their best interests are being represented by NCTA — *and such is the case* — pleas for unity should be unnecessary.

In fairness to the NCTA Chief Executive, it should be noted that he may be aware of some "petty differences, selfish interests, regional conflicts and . . . pointless bickering" with which we are not familiar. Our opinion remains, however, that the most urgent need of the cable television trade group is for more members. If Mr. Ford's comments are, in fact, a plea for new members we most heartily concur.

NCTA is working for the good of all cable system owners and deserves your support and constructive influence. Non-members should consider joining. Adding seventy-five new members won't make NCTA perfect; but it would make the association proportionately stronger and more representative of the businesses which make up the CATV industry.

Stan Searle



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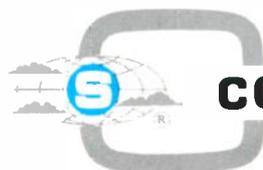
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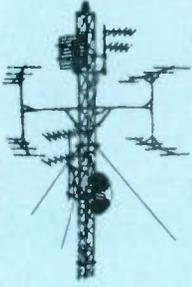
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CATV Industry PERSPECTIVE

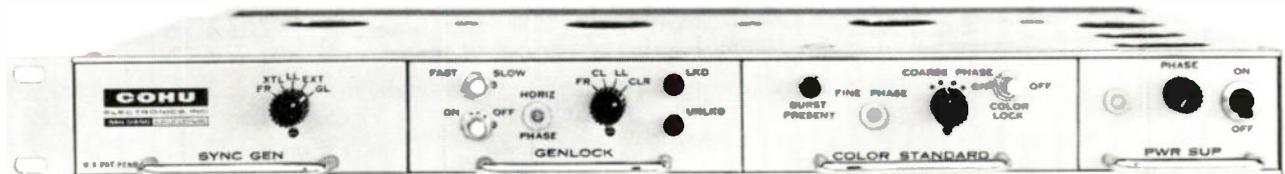
The annual attempts to regulate CATV at the state level will draw the attention of state and regional operator associations during '68. Growing stronger each year, many CATV associations now retain legal counsel; some employ full-time legislative liaison men and attorneys. Paid association secretaries and public relations counsel are another indication of sophistication in the cable television "corps de resistance." Well supported by cable operators, these state and regional groups are generally healthy and, thus far, have been able to ward off PUC-type regulation in all but two states. Several state-level battles will be fought--and won--by the CATV industry during '68.

Local origination is becoming more sophisticated as techniques and equipment become more widely understood. Cablecasting state-of-the-art is being rapidly advanced by the interest of many manufacturers such as Ampex, Sylvania, Sony, Raytheon, Concord, International Video, Packard Bell, TUC, Cohu, Shibaden, GBC America, Electra-Tronics, TV Presentations, and Vikoa. Telemation and R. H. Tyler, original pioneers in time/weather equipment, continue to expand lines and refine individual studio components. Programming and support services, such as feature film packages, free films, dubbing services and equipment leasing are on a fast upswing. Color cameras and color VTR's will be the next big cablecasting equipment breakthrough.

Importance of trend to color capability in cable system is underscored by color set sales. Based on EIA estimates, Americans will spend nearly \$4 billion on 6 million color receivers this year. This compares with 5.5 million sets last year and 5 million during 1966. Nearly one-third of all American homes will have color TV by the end of the year. Since one of the basic sales claims of CATV is its superior color quality, subscribers will expect locally originated programs to be in color, too.

Escalation of salaries for CATV technicians and engineers can be expected. Shortage of qualified men is aggravated by influx of new solid-state equipment and trend to all-band service. Advent of local program origination also calls for improved technical know-how. When color cablecasting commences on a broad scale within the next year or two, the operators' engineering and maintenance requirements will be even stiffer. Competition for qualified people will remain keen over the next several years--even with Penn State, the National Cable Television Institute, and possibly other organizations providing a new source of trained technical people. One solution--already in use by several system operators--is the payment of technicians' correspondence or night school tuition by employer, on the condition that employee agrees to remain with the firm for a certain period after technical training is completed. Even this approach, however, requires increased cost to employer in the form of tuition or wages--or both.

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LETTERS

STATION'S FINGERS BURNED

● I read and re-read your editorials and find them enlightening and hard-hitting. I was particularly impressed with the courage shown by you in your editorial in TV COMMUNICATIONS of December 1967 . . . and can only add "Amen, Amen"!

I am enclosing a news item from the front page of the *Denver Post* of Sunday, December 31st, 1967. The article is self-explanatory. It reads as follows:

FOOT IN MOUTH SHOWS UP ON VIDEO STATION

By Judith Brimberg
Denver Post Staff Writer

A Yuma, Colo., newspaper editor recently concocted a unique burglar alarm to put a stop to what he termed "thievery" by a neighboring television station. Roger Chance, editor of the 81-year-old *Yuma Pioneer*, said he became disgusted with misrepresentations to advertisers that KTVS, Sterling, Colo., was providing coverage in Yuma.

"Actually, what they were doing was clipping our stories and 'panning' our pictures in a way to suggest they had covered the news themselves," he said. Accordingly, Chance had a single copy of his weekly newspaper printed up. It carried a story that Swen Laetsi, a Chicago business tycoon, was planning a million-dollar motel and recreation center for Yuma. The copy was mailed to the television station, a regular subscriber.

KTVS, which serves seven counties in northeastern Colorado and three counties in southwestern Nebraska, swallowed the bait and broadcast Laetsi's plans. "We check 90 per cent of our stories," said KTVS Manager Carl Ocephinti. "We didn't in this case." The manager said news sources usually are credited if the material hasn't been altered by his staff.

In a subsequent editorial, Chance explained he had staged the prank because he objected to becoming a \$4-a-year reporter for the opposition. (The *Yuma Pioneer's* subscription rate is \$4 a year.)

"The planted story simply was used to clean up the game and keep it honest," Chance wrote, adding that KTVS could have tried to verify the story and check on Laetsi before going on the air.

The tip-off, of course, was the name of the millionaire. Swen Laetsi, spelled backward, is "I Steal News."

The Television Station in Sterling, Colorado is owned by Frontier Broadcasting Co., as is KSTF, Scottsbluff, Nebraska and KFBC, Cheyenne, Wyoming. As operators

of the Torrington, Wyoming cable system we are required under FCC rules to give non-duplication protection to an out-of-state TV station (KSTF). KSTF does exactly as their sister satellite in Sterling. The *Scottsbluff Daily Star Herald* is delivered in the early A.M. (even in Wyoming). KSTF at 10:00 P.M. that night unashamedly reads news items from the *Star Herald* without even bothering to edit, and claim they have a news gathering organization . . . when, in fact, they *duplicate* all area newspapers by "copping" the news for the price of a subscription. On the rare occasions when KSTF has a Wyoming news item they "cop" it from the *Torrington Telegram*. Yet we have to protect KSTF from competition by FCC edict!

History has shown countless thousands of times . . . when you take away competition, the protected industry or business gets sloppy and lazy, and fails to fulfill any function of "public service and interest" of which the FCC makes such a great issue. Under FCC terminology, KSTF-TV Scottsbluff, Nebraska is a *local* station with reference to Torrington, Wyoming. Yet the only time any of their staff puts in an appearance in Torrington, Wyoming it is for the purpose of soliciting advertising. In so doing, they burn Nebraska gasoline and come well stocked with Nebraska cigars. They spend not one penny in our trade territory. But the FCC says they are local and must be protected from Wyoming competition.

The ingenuity of a country editor in Sterling, Colorado should get national distribution . . . and I hope you will do your part to see that this is given proper publicity.

Ken Kluherz, Manager
Torrington Community
Television System
Torrington, Wyoming

WORDS OF ENCOURAGEMENT

● I think your publication continues to improve; and in my opinion, it is the outstanding industry journal that you hoped it would become. Keep up the good work!

George J. Barco, President
Meadville Master
Antenna, Inc.
Meadville, Pennsylvania

Thank you, George. It is especially encouraging to have the support of a widely recognized industry leader and pioneer such as yourself.

● Your fine magazine was sent to me in November by Mr. Sam Street of the National Cable Television Association in Washington. As a first-time reader of your truly professional magazine, TV COMMUNICATIONS, I was particularly interested in the editorial.

I have followed the CATV field for the past four years and am now actively seeking to enter it through management and promotion work . . . In the meantime I am enclosing my check covering two subscriptions.

Donn Iogha
Norwalk, Conn.

● I have been an avid reader of your fine journal, TV COMMUNICATIONS, since it started. I wish to express my gratitude to you and your staff for the publication of articles, which if read by the people they are intended to reach, upgrade the knowledge of CATV personnel immensely.

Having been in, and associated with, CATV as a manufacturer and now as an operator, since 1950, and having witnessed the phenomenal growth of our industry, I can honestly say that your publication has kept pace with this growth and is truly the Professional Journal of Cable Television.

A. E. Dworkin, Vice President
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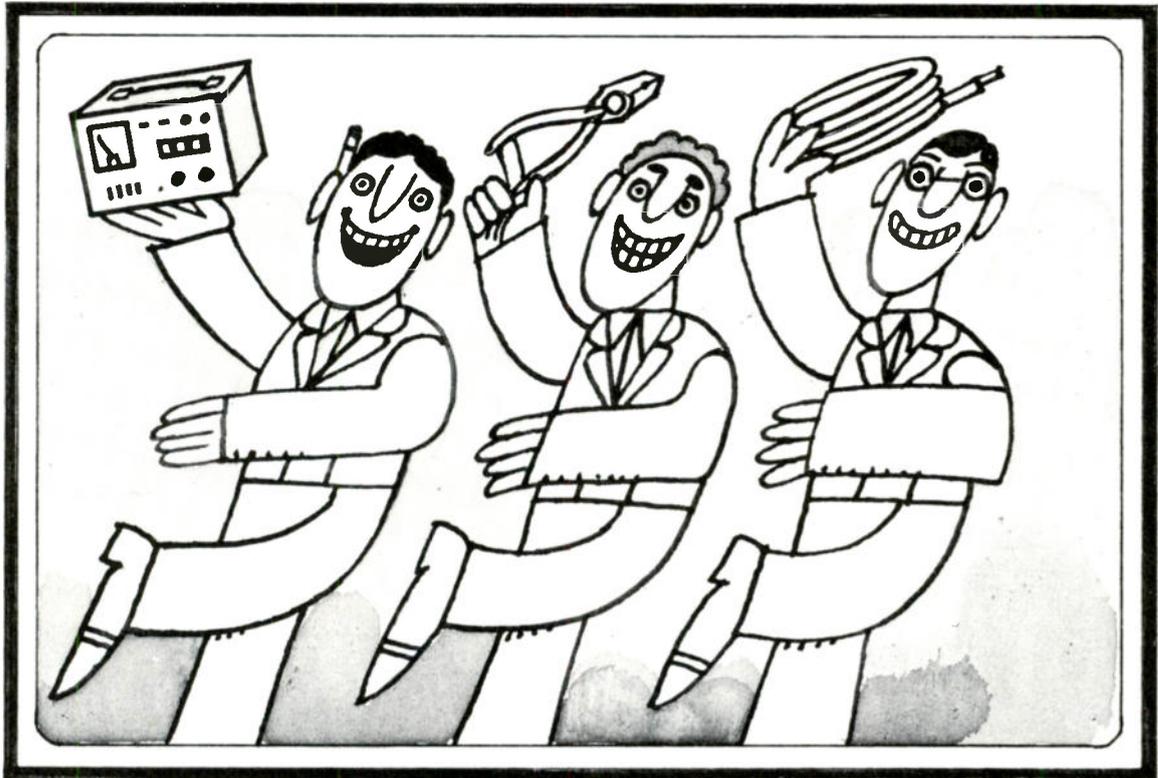
● The end of the year has rolled around and we have been enjoying the complimentary subscription to TV COMMUNICATIONS which Cascade Electronics Ltd. entered in our behalf. We wish to thank you and Cascade Electronics. This note is merely to express our appreciation for your interesting publication.

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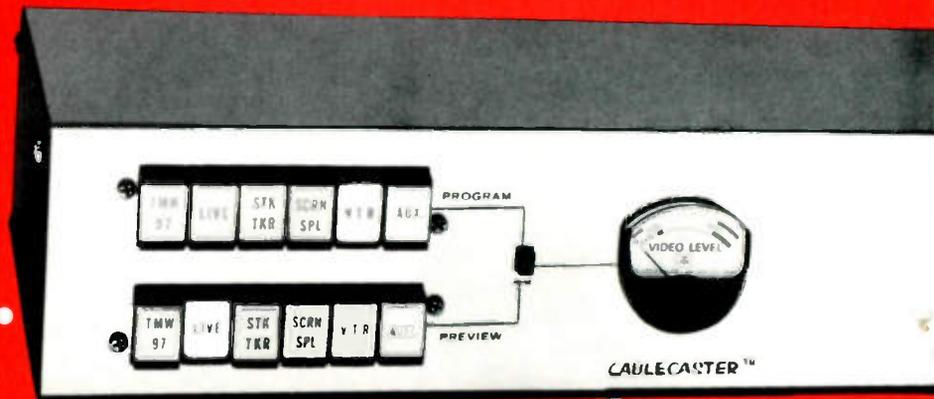
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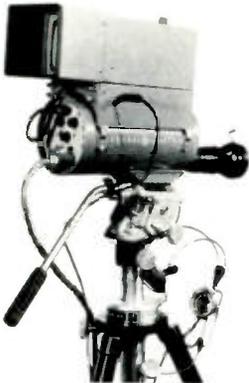
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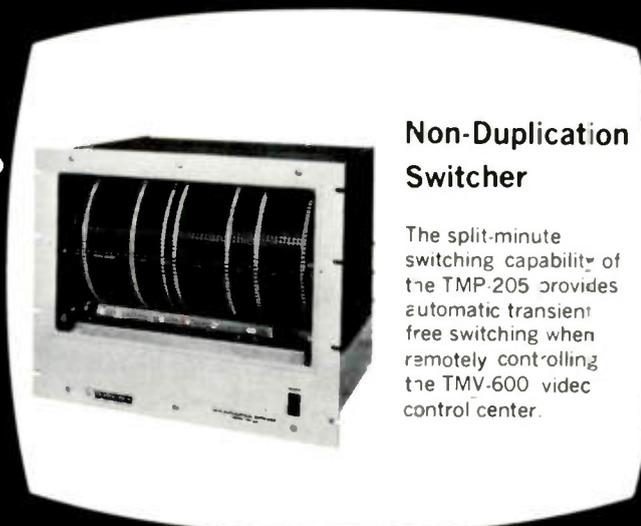


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CATV MANAGEMENT CORNER

Managing People

What is the main job of the CATV system manager? What are his administrative goals? Individual opinions vary, but most experts agree that, in general, a major part of a manager's job is to get things done through people and to keep them happy in the process.

Here are some practical ideas you can use in achieving these goals:

Know your people and try to determine what is important to each one of them. Well-timed praise may spur one person, but may only inflate another. A better method for him might be constructive criticism. A third worker may wilt under any kind of criticism. The skillful manager constantly hunts for that appropriate procedure.

Give your employees objectives and a sense of direction. Workers should know where they are going, what they're doing, and why they are doing it, in order to plan their time intelligently and work effectively. Direct in terms of suggestions or requests. Informal spoken explanations are often as good as or better than written ones; let the circumstances guide you.

Delegate responsibility for details. If you insist on keeping your hand in everything yourself, you prevent those under you from learning to make their own decisions. Ultimately you may have little time for the thinking and the planning that are the most important parts of your job.

Keep your subordinates informed. Bring them up to date constantly on new developments in your system and let them know well in advance whenever changes are coming. As members of a team, they are entitled to know what's going on. Give them sufficient information about conditions and events, not only in your firm, but also in the CATV industry as a whole to enable them to see themselves and their work in perspective.

Carefully consider ideas from those who work for you. There's no surer way to discourage a man's original thinking than to disparage or ridicule his suggestions. His next idea might well be the very one you need; make it easy for him to bring that next idea to you. Always tell the originator of an idea what action was taken on his suggestion, and why. If his idea is accepted, he will be encouraged by seeing the results of his thinking put into effect. If his idea is not adopted he will accept the rejection more readily if you explain the reasons clearly. Keep your employees constantly aware of your willingness to have them work out their own solutions to problems involving their own operating areas, whether technical or clerical.

Let your workers know where they stand. A formal rating system may be worthwhile, but it's not always necessary if the manager talks regularly with each of his people about their current performances. If in doing this, you do find it necessary to be critical, never criticize or reprove in public. Reprimands in the presence of others often create humiliation and resentment instead of a desire for improvement. Criticizing a subordinate when others are present undermines his authority, his morale, and his enthusiasm to do his best.

The success of a CATV operation, like any other small business, is highly dependent upon the work of the individual people who make it up; and the quality of their work is, in turn, largely dependent upon the quality of their management. It is your responsibility to give them top quality management.

TVC

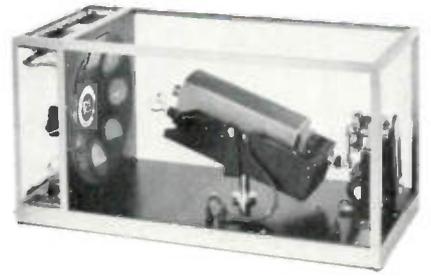
When we began, we concentrated on CATV.



WEATHER-SCAN II



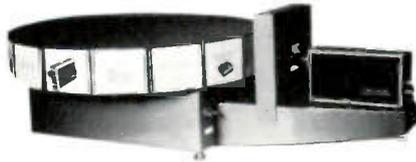
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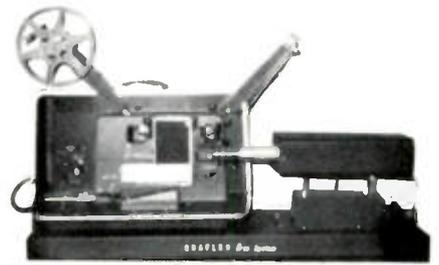
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Late News

BUFFALO HEARING VINDICATES CATV

A second FCC Hearing Examiner has ruled CATV not harmful to UHF's in a top-100 market. In what is only the second full evidentiary hearing on CATV impact in top-100 markets, the initial decision reads very much like the decision in the first case to be heard, the San Diego case. Examiner Herbert Sharfman concluded "no impact." Summing up, he wrote, "It is concluded that it was not proved that the expansion of Courier's CATV system will prevent the profitable operation of UHF television in Buffalo."

The hearing was ordered in October, 1966 on a petition by a Buffalo UHF applicant and a UHF permittee who pleaded economic injury if Courier Cable Co. were allowed to expand. Referring to the UHF's inability to sustain the burden of proof on economic harm, Sharfman spoke of "the dearth of any cogent testimony by the UHF's from which their downfall can be assuredly predicted . . . If all that was necessary was for the UHF's to plead that they will have it tougher to compete with eleven other program choices than with three, a hearing was superfluous."

Under Sharfman's decision, Courier would be allowed to carry out its plans to expand in its home county of Erie and in Niagara County. The decision, however, is subject to exceptions and review, and it will not take effect until review machinery runs a course that can take from months to years.

BOARD OKAYS NEW CONTRACT FOR FORD

In their latest meeting in Dallas, the NCTA board of directors approved a new three-year contract for NCTA president Frederick W. Ford. Terms of the contract, retroactive to January 1, 1967, remain substantially unchanged from those previously in effect. At the meeting, the board heard reports on various industry problems, and also considered a proposal by trade journal editors Robert Huston and Stanley Searle for establishment of a Hall of Fame for industry leaders.

FCC VOTES AGAINST IMPACT TESTS



Lee Loevinger

Two proposed CATV impact tests have gone down to final defeat at the hands of the FCC. Although there was little hope from the outset for the Philadelphia plan which had been proposed by Triangle Publications, Inc., test enthusiasts were more optimistic about the second plan which would have allowed three Fort Wayne stations to conduct a study in the Goshen, Ind. markets.

Voting had been erratic in previous ballots on Goshen. At one point it had only one vote; at another point, four Commissioners supported it. Various reasons were given for the ultimate defeat, including Chairman Rosel Hyde's position of waiting for a copyright decision. The plan had been generally considered an imperfect one since the primary test concern is CATV impact on independent UHF's and Goshen has none.

Commissioner Lee Loevinger, in a vehement dissent from the Commission's decision, defended the plan: "When we are confronted with the necessity of acting, as we are in this field, any data is better than no data. Even in carefully designed and rigorously controlled scientific experiments, conditions are seldom perfect and the results are seldom unequivocal."

To the copyright argument, he answered, "The objection that we should wait for a change in legal or political conditions before seeking data in this field is not persuasive in view of the Commission record of refusing to seek

Late News (Continued)

empirical data over the years. Furthermore, even if judicial or legislative action does establish different conditions than the present ones, there is no reason to anticipate that the Commission will not continue to confront many of the same questions it now faces. If its jurisdiction is established, limited or expanded by legislative or judicial action, its need for information will be greater than it is now."

NCTA BRIEF FILED ON COPYRIGHT

The National Cable Television Association, in a friend-of-the-court brief filed with the Supreme Court, predicts "disastrous effects upon the CATV industry and the public" if a copyright infringement verdict is sustained against Fortnightly Corporation.

Both policy and practical considerations are touched on in the brief. The court is urged to give "great weight" to the policy of the Communications Act which secures the "right of the public to receive television broadcasts for enjoyment in their homes once the broadcast has occurred." The Association also points out the inequity of requiring the CATV subscriber—"who has paid his share . . . in the economic system that supports television"—to pay to the copyright proprietor a second time through his CATV subscription.

According to the brief, "serious anti-competitive consequences" would follow copyright liability. Given the relatively meager expense funds of most systems, and the difficulty of bargaining with 25 major syndicators, 3 TV networks, and music societies, the system operator would be at a severe disadvantage. In addition, with no machinery for advance clearances, negotiation would usually *follow* reception and the CATV operator would be forced to either accede to the copyright holder's demands or litigate damages. "It is easy to see," says NCTA, "how the larger copyright proprietors and networks would end up owning the CATV industry."

Briefs have been filed by the opposing parties in the case, as well as one by Solicitor General Erwin Griswold for the United States. The National Association of Broadcasters is expected to file also as a friend of the court.

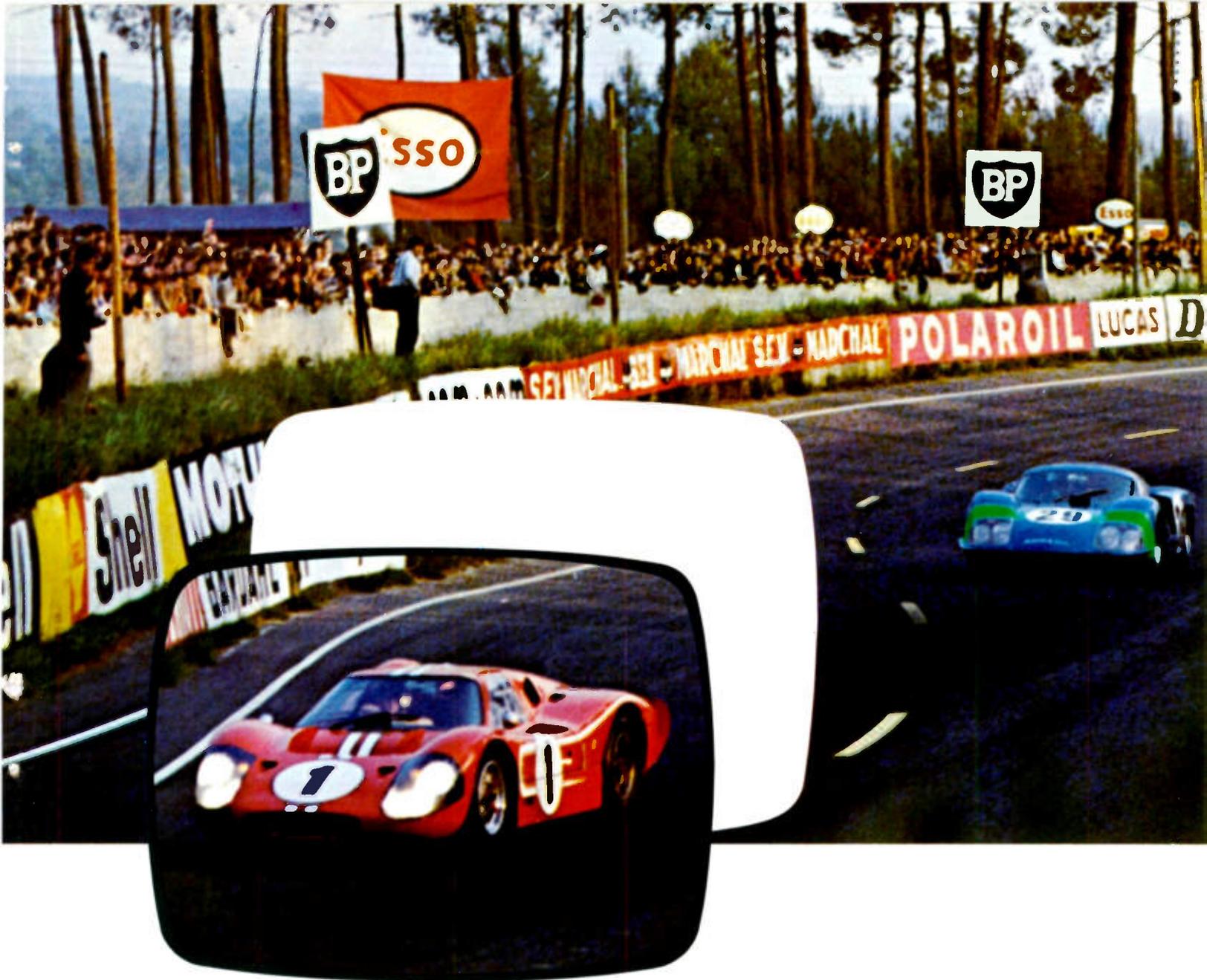
COPYRIGHT NEGOTIATION PACE QUICKENS

Spurred by upcoming Senate Subcommittee consideration of copyright, negotiations between cablemen and opposing groups are gaining momentum. Cable-broadcaster talks are scheduled to get under way in Washington on March 7, the first meeting since submission of a preliminary report by an ad hoc group from the two camps. And in New York, talks are progressing between the NCTA team and motion picture owners.

NCTA negotiators appointed by chairman Jack Crosby are led by Alfred R. Stern of Television Communications Corporation, New York. Other members are: Robert Beisswenger of Jerrold Corporation, Philadelphia; Ralph Demgen of Willmar (Minn.) Video Inc.; Irving B. Kahn of TelePrompTer Corporation, New York; and ex officio member Jack Crosby.

NAB committeemen are: Robert W. Ferguson, WTRF-TV, Wheeling, W. Va.; John T. Murphy, Avco Broadcasting Corporation, Cincinnati; Charles H. Tower, Corinthian Broadcasting Corporation, New York; Willard E. Walbridge, KTRK-TV, Houston; John F. Dille, Jr., Communicana group, Elkhart, Ind.; and Richard D. Dudley, WSAU, Wausau, Wisconsin.

The NCTA is charting CATV signals market-by-market to determine impact of copyright legislative proposals. The study, according to general counsel Bruce Lovett, is a new computer breakout of data on file at the FCC. It will be used to allow negotiators to have before them model situations on which to discuss copyright possibilities and conflicts.



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COMMUNICATION / COMPUTATION / CONTROL



Copyright Hearing Set for March 8th

Friday, March 8, is still the most important date on CATV's spring calendar. On that day, despite attempts by Solicitor General Erwin Griswold to shelve the copyright issue, the Supreme Court has scheduled oral arguments in Case No. 618, *Fortnightly Corporation v. United Artists Television Inc.*

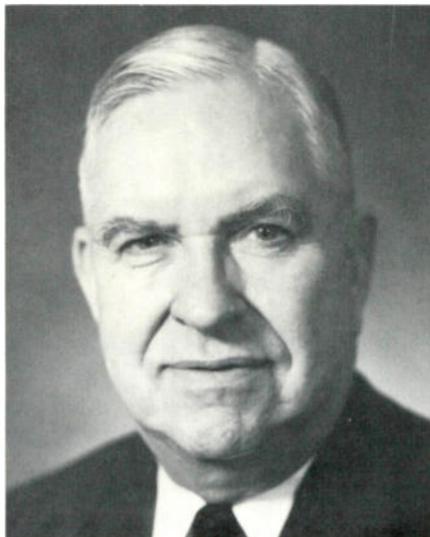
The Court agreed in December to consider the cable company's appeal of a copyright infringement decision which had been affirmed by U.S. Court of Appeals in New York. At the same time, the Supreme Court invited the Solicitor General to file a brief expressing the views of the United States government. In a memorandum which shocked the CATV industry, Griswold deferred responding on the merits and instead urged the Court to hold the case on the docket pending legislative developments during the next session of Congress.

The lawyer for the U.S. suggested that a judicial decision at this time would hamper negotiations currently taking place between CATV operators and broadcasters, and between CATV operators and copyright owners (now completed). "The decision here," Griswold said, "would serve only to upset the existing balance, delaying and perhaps impeding Congressional resolution of the problem."

Both *Fortnightly* and *United Artists* opposed the move to delay the decision. *Fortnightly* said: "There can be no doubt this rule of abstention would be novel, for the Court has decided many cases, including labor and civil rights cases in recent years, while legislation was pending. There is no assurance when or if Congress will act." *United Artists Television* said the Solicitor General's suggestion would leave the law "in

limbo" while Congress considers general copyright law revision; they asked the Court either to proceed as announced or to revoke its acceptance of the case.

Just before Christmas, the Supreme Court ruled against the Solicitor General. The terse "Motion denied" was stated barely, with only an added note that Associate Justice Thurgood Marshall, former Solicitor General, did not take part in considering the motion. Although they would say little for publication because of professional considerations, attorneys for both parties to the litigation indicated satisfaction that argument would proceed as scheduled.



Solicitor General Erwin Griswold

Observers agree that the Solicitor General, who is still expected to file a brief on the merits of the case, has a hard job reconciling conflicting government views. The FCC and the Copyright Office are considered to favor lower-court liability decisions, while the Justice Department Anti-Trust Division fears that copyright liability may mean a cable take-over by copyright.

Commission Restates Pleading Standards

Responding to directives in recent court decisions, the FCC has restated "pleading standards" both for waiver petitions in the top-100 markets and for special relief requests in other markets. While the standards are not appreciably stricter, they do call for considerable research.

On general pleading standards, the FCC said no recent developments warrant changing previous actions. For the future, petitioners were reminded that when seeking special relief (Section 74.1109 of the rules) they must "state fully and precisely all pertinent facts and considerations relied upon to demonstrate the need for relief."

Distant signal (Section 74.1107) waiver petitions require "full and precise facts" to show that a waiver would be consistent with healthy TV service. This includes presentation of available data on all systems similarly located in regard to Grade A TV service in order to analyze the cumulative effect on existing stations and prospects for activating channels not yet on the air. According to the Commission, this means such factors as probable audience, revenue and program service, including the likelihood of network affiliation.

Similar considerations apply to broadcasters seeking special relief below the top-100 markets, the FCC said. They will be required to give specifics on financial condition and impact of CATV. "It is obvious that some demonstration along these lines must be made if the request for special relief is to be viewed as more than mere speculation. Similarly we believe it reasonable that a network-affiliated station, arguing that it will not be adequately protected . . . make some factual showing."

The occasion of the Commission's statement "clarifying" standards was the affirmation of a contested distant signal waiver. The waiver was given last March to *Newchannels Corp.* to bring distant signals to *Syracuse*. *Channel 9 Syracuse Inc.*, interim operator of *WNYS*, asked for reconsideration and hearing in April. This petition has now been denied.

(News continued on page 24)



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Ad Hoc Group Finishes Report

The report from the ad hoc committee of cablemen and broadcasters working to resolve copyright differences is now in the hands of the NAB and the NCTA. What the two associations do with it may well determine whether or not there is copyright legislation on CATV during this session of Congress.

The ad hoc group, working on a congressional request to submit joint suggestions for a new law, came to agreement on ten areas (some minor ones specifying more work needed) and left two big ones open. The two knotty issues are: (1) Program origination and its effect on copyright obligations in respect to carriage of station signals, and (2) Exclusivity—whether carriage of outside signals in underserved areas, pursuant to compulsory copyright license, should be subject to broadcaster-copyright contract restrictions.

The ten points of agreement include recommendations on: the circumstances under which CATV systems inside and outside Grade B areas should or should not pay copyright fees; common carrier liability for copyright fees; past forgiveness of statutory fees; clarification of liability for radio signals on CATV; necessity of dealing with restrictions in broadcaster-copyright contracts; review of proposals to give live broadcasts copyright protection; the need for further study of UHF exclusivity and carriage problems.



Co-chairman Alfred R. Stern

Co-chairmen of the ad hoc group were broadcaster-cable operator George C. Hatch, president of KUTV, Salt Lake City, and cableman Alfred R. Stern, president of Television Communications Corp., New York.



Co-chairman George C. Hatch

The NCTA board of directors at a meeting in Dallas, Texas, January 22-23, approved the ad hoc report and moved to strengthen the industry's position in copyright negotiations by deciding to retain the New York firm of Katz, Mozell and Schier to assist in copyright negotiations with film producers and other copyright holders.

The Future of Television Committee of the NAB went over the report point by point and generally agreed that "the areas where daylight shows on possible agreement" probably could be negotiated. According to William Carlisle, NAB vice president for television, broadcasters consider the report a significant contribution and "certainly want to sit down with the NCTA and try to find the answers to heretofore insoluble differences of opinion." Carlisle is not optimistic about a final resolution of problems through negotiation. "The best we can do," he said, "is to reach some common ground so we can go to Congress and say, 'at least we agree on these things, even though we can't agree on other things.'"

"Long Delays" Kill ITT/ABC Merger

Directors of International Telephone & Telegraph Corp. met last month in New York to call off the proposed ITT-American Broadcasting Co. merger. They blamed "long delays that have ensued since the announcement of the merger in December 1965—delays over which neither company could exercise control—and the indication of continued delays in the future."

The merger plan had been approved by the FCC but the Justice Dept. took it to the D. C. Circuit U. S. Court of Appeals in an anti-trust action. The Court has not ruled. One Justice Department fear was that the merger might affect ITT plans in CATV.

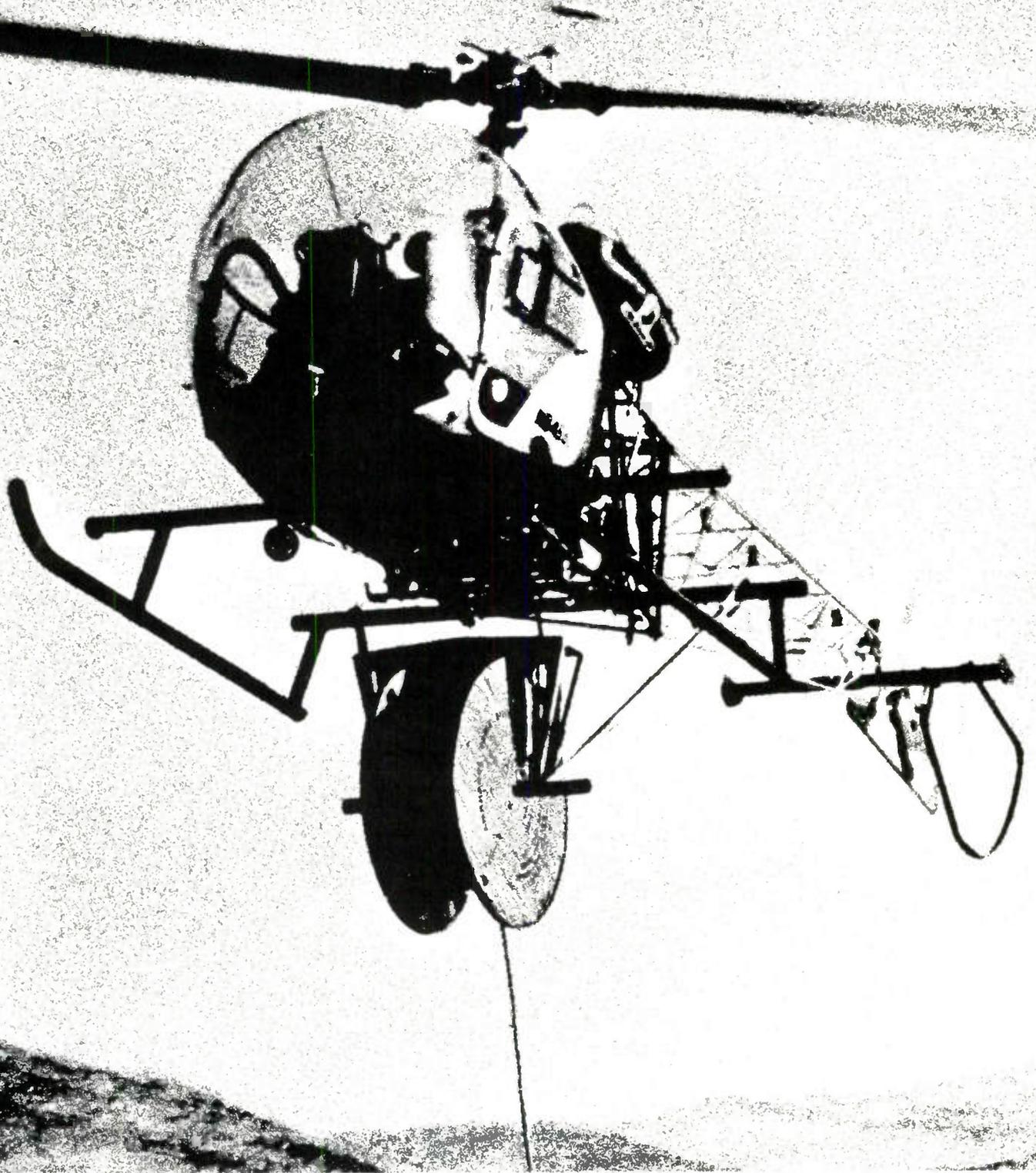
ITT public relations men in Washington were uncertain what cable TV interests the company has at present. They say there were minor equity and debt interests through the Federal Electric Corporation subsidiary in perhaps a half-dozen systems, not controlling interests in any case. During FCC hearings on the proposed ABC merger, management testified it had explored the possibility of expanding in CATV, but did not do so. The Washington office had no knowledge of a substantial interest the company is reported to have in Texas franchises of Southwest CATV Inc., Houston.

While the two parties waited on first the FCC, then the Court, to act, ITT stock went up more than 50 percent. The agreement would have cost ITT around \$620,000,000 under the originally planned exchange of stock.

The Commission was divided on approving the transaction and reopened the case after the Justice Dept. protested approval. After long hearings last spring, the FCC again approved the merger.

After ITT terminated the agreement, the FCC, ITT, ABC and the ABC Affiliate Association filed a motion in court to dismiss as "moot" the Justice Department's appeal of the Commission's decision authorizing the merger.

In other merger action, ITT has announced that the firm's board of directors has approved a pre-



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AMPHENOL

liminary agreement with the board of directors of Sheraton Corporation of America by which Sheraton would join the ITT system. The merger plans call for Sheraton Corporation to function as a subsidiary of ITT and to operate as an entity under its present management and to continue its existing operating policies.

Bartley Plan Rejected By FCC

A plan advanced months ago by Commissioner Robert T. Bartley to ease the backlog of cable applications for top-100 TV markets came to an FCC vote in January. It was defeated 4-3.

The result, as pointed out by an observer upon learning of the vote: an undeclared freeze is on CATV. The question remaining is what will the Commission do about more than 200 applications waiting for authority to go ahead with construction in big markets. An answer volunteered was "nothing."

The Bartley plan would have delegated to the CATV Task Force authority to handle applications to operate on the fringe of top-100 markets, using a criterion of mileage from the central city. One Commissioner voting in favor of the idea argued in vain that it would affect no more than two percent of the homes in the country.

Another, Nicholas Johnson, asked about the consequences of "doing nothing" about the backlog, and the enervating effect on the cable industry.

Although it was a UHF group, the All-Channel Television Society, that spoke loudly against the Bartley plan, the real victor was an organization made up primarily of powerful VHF, the Association of Maximum Service Telecasters, according to the observer's assessment. AMST has been regarded by cable men as a formidable opponent since a meeting with the Commission last year after which some operators charged ex parte dealings, a charge dismissed by the Commission.

U. S. Files Supreme Court Brief in Southwestern Cable Case

The U. S. Government has filed its brief in the Supreme Court, appealing the Ninth Circuit decision favoring Southwestern Cable Co. and other San Diego operators. At issue is the jurisdiction of the FCC over cable TV. In an attempt to justify the FCC's regulatory actions in San Diego, the Solicitor General, with other Justice Department officials and FCC General Counsel, reviewed in their brief the basic "policies" on which the Commission has founded its authority over CATV.

Explaining a policy of UHF protection, the brief said that the All-Channel Receiver Act was passed in 1962 "at the Commission's suggestion" to promote UHF development. FCC concern over possible losses to "free" TV from cabled distant signals was also detailed in the brief, as was programming. "The Commission," the brief said, "took into account the fact that CATV systems ordinarily originate no local programming and thus do not afford an outlet for the expression of local views or the dissemination of news and information of local interest—useful services provided by local stations."

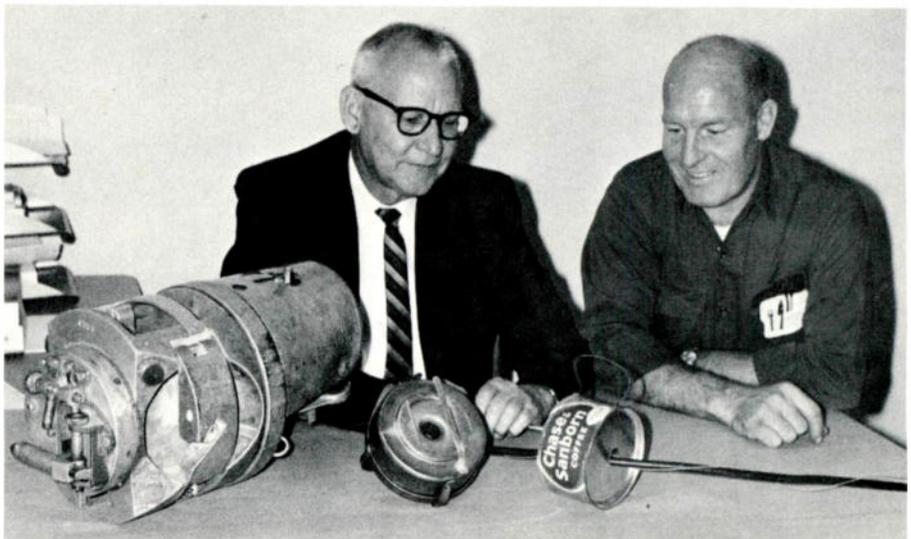
On the question of whether or not the Commission was within its authority to halt San Diego CATV expansion while it determined impact on broadcasting, the government brief said the Commission

was exercising "flexibility in the choice of remedies" rather than "freeze" CATV everywhere.

CATV partisan reaction to the brief included a comment that the UHF protection policy is a "fake" to cover protection of VHF operators, and that the policy does not in reality foster UHF as indicated. Also, U. S. counsel took no account of program origination in CATV (an estimated 10 percent of all systems have some type of program origination, according to the National Cable Television Associa-

tion), nor of encouragement by individual Commissioners of program origination.

A point at issue over "temporary" orders that last for years is illustrated as the San Diego case moves through Commission machinery. The original FCC order was issued in July, 1966, shortly after the cable rules were announced. A full evidentiary hearing resulted in an initial decision by Examiner Chester F. Naumowicz, Jr. in the fall of 1967 that restraints should be lifted because CATV was having no effect on local broadcasting. The Commission decided to by-pass normal proce-



Ameco Inc. physical properties director Ed Furman and maintenance man Bob Hewitt compare Antennavision's "Chase and Sanborn" lasher with a hand lasher circa 1960 and a modern cable lasher. Ameco (originally Antennavision) celebrated its fifteenth anniversary of incorporation in December.

duce and remove the case from the Review Board's consideration and review the decision itself. One knowledgeable observer looks for the Commission to call for oral argument since the case is unprecedented, and this would probably add 30 days to the timetable.

The case is scheduled before the Supreme Court March 8, immediately preceding the Fortnightly-United Artists copyright case.

FCC To Reverse Naumowicz Order?

FCC watchers are gloomy about chances that the FCC will go along with the decision by Hearing Examiner Chester F. Naumowicz, Jr. in October that "temporary" restraints should be lifted from cable systems in San Diego.

After this decision, Southwestern Cable Co. and other operators petitioned the Commission to lift the lid put on their expansion at the beginning of this historic proceeding in July, 1966. The Commission turned them down. A Commission Memorandum Opin-

ion & Order, released Nov. 14, refused to dissolve the stay against expansion of the system despite Examiner Naumowicz's favorable decision.

These orders are usually written for the Commission by the Office of Opinions & Review, but at least one observer has spotted the hand of General Counsel Henry Geller on this one. Since Geller was responsible for instituting proceedings in the San Diego CATV case, his role in writing the order would violate the general rule that those who prosecute a case may not participate in any part of the decision-making. Although his signature does not, of course, appear on the formal order, it does appear on the record in the court version of this case, which the FCC took to the Supreme Court after a setback in the 9th Circuit U.S. Court of Appeals in San Francisco. This, combined with the fact that the Commission, on recommendation of its general counsel, has removed consideration of the San Diego case from its own review board, leads

observers to predict that the Commission will reverse its examiner when the case is considered formally.

NAB Chairman Cobb Challenges CATV

The National Association of Broadcasters' position on controversial issues like CATV and pay-TV is determined by the public interest as well as economics, Grover C. Cobb, chairman of NAB, told the Federal Communications Bar Association in a recent speech. The vice president of KVGB, Great Bend, Kan., who also has cable property, said that NAB wants to integrate CATV into the broadcasting system "so that it will be a legitimate part of it, and will not displace it or destroy it."

CATV origination of programs and commercials will lead to pay-TV, Cobb told the lawyers, and this "might be in the interest of the few who could pay but not in the interest of the many who could not." Cable originations should not be permitted, he said.

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CATV
Weekly News Service of Cable Television
207 N.E. 38th Street • Oklahoma City, Okla. 73105

TO SUBSCRIBE TURN TO PAGE 87.

NCTA Advances Industry Interests

Committees of the National Cable Television Association are moving to advance cable industry interests on several fronts—financial, advertising, and congressional public relations.

NCTA's Executive Committee, meeting in Washington, has instructed the association's staff to develop plans for three financial seminars to be held early this year, probably this month and next. Possible sites include New York, Chicago and San Francisco. The seminars would be the first sponsored by NCTA since January, 1966.

The availability of 50-second radio commercials created espe-



Mel Blanc 50-second radio spots for CATV are now available from NCTA.

cially for the cable television industry by Mel Blanc Associates, Hollywood, Calif., has also been announced by the NCTA. The commercials, available on 1/4-inch audio tape, are designed to promote the sale of cable television service to potential subscribers through the use of whimsy, humor and facts. Each commercial runs 50 seconds, permitting a "live" or recorded 10-second identification of the sponsoring cable system. All three commercials emphasize the principal advantages of cable television—clearer pictures, a wider choice of programs, truer color and elimination of unsightly rooftop antennas. Cost of the three-commercial set is \$55. Purchasers may use the tapes for up to 32 weeks in all markets except New York City, Chicago and Los Angeles.

In another move to promote the industry, association president Fred Ford has sent every member of Congress a set of materials designed to help them gain a better idea of what cable television is doing to bring more and better television to more Americans.

First Circuit Reprimands FCC

The First Circuit U.S. Court of Appeals, sitting in Boston, recently handed down one of the most significant decisions to date for CATV operators. In deciding *Presque Isle TV Company, Inc. vs. FCC*, the court reversed and remanded an FCC order which required the northern Maine CATV systems to give WAGM-TV (Presque Isle) carriage and 15-day delay non-duplication protection against Bon Accord, New Brunswick station CHSJ-1.

In response to the original WAGM petition, the CATV systems had sought a complete waiver of non-duplication rules from the Commission on the grounds that the Canadian signals were as strong or stronger than WAGM's

signal, that requiring protection would cause economic injury to the systems, and that it would create an artificial reception situation. Nevertheless, the FCC granted WAGM's request.

The court criticized the Commission for ignoring the CATV firms' allegations, and for refusing to articulate the reasons for granting WAGM's petition in the face of those allegations. The language of the court indicates that the FCC may not rely solely on its "expertise" and "policy-making" functions to justify an order: "Within broad limits the Commission may make policy determinations, but if review is to have any meaning the Commission cannot, in effect, back into them without openly making them, by ignoring the facts presented."

The appealing systems were Presque Isle TV Co., Johnston TV Co., Caribou TV Inc., and Van Buren TV Cable Co. Lee G. Lovett of Booth & Lovett, Washington, argued the case before Chief Judge Bailey Aldrich, Judge Richard M. McEntee and Judge Frank M. Coffin.



Mr. and Mrs. Clarence Ross receive the Jerrold President's Award at a recent seminar held by Jerrold's community operations division in the Bahama Islands. Presenting the award is Joel P. Smith, assistant to Jerrold president, Robert H. Beisswenger. Ross, manager of the Ottawa (Ill.) TV Cable Co., Inc., was cited for the recent successful conversion of the Ottawa CATV system from low-band to all-band operation without interruption of service.

Cablecasting Seminar To Be Held

The second annual NCTA cablecasting seminar will be held this year from February 28 through March 1 in Salt Lake City, Utah. The seminar will be hosted by TeleMation, Inc. and will be for Western members of NCTA. Lectures on various aspects of cablecasting will cover such topics as lighting, programming, cost evaluation, and program production. Trips to Salt Lake City's nearby ski areas and other scenic points are also planned. Registration will be limited to 75. The fee will be \$50 for seminar material and banquet.

200 Reply to FCC Survey

Over 200 replies to the FCC survey on the effects of carriage-exclusivity rules reflect dissatisfaction on the part of both cable operators and broadcasters. The former, representing some 80% of total respondents, hold that the rules are oppressive; the latter feel the rules are not strict enough.

CATV firms cite, among other complaints, the cost of switching equipment necessary to provide non-duplication, the burden of cross-checking station schedules, and the additional personnel needed to comply with Commission rules. By consensus, industry respondents would recommend that: systems be required to protect stations only to the extent of primary network affiliation; single-channel requirements be abandoned; exclusivity be waived for programs that cannot be controlled with time clocks (such as sports events); simultaneous protection be substituted for same-day protection; and requirements be eased in the case of stations giving inadequate notice of changes.

Broadcasters asked for stricter, more far-reaching rules. Protection during equipment breakdown, specifying spare equipment or manual protection, and relief from the duty of notifying CATV systems of the date and time of duplicating programs were requested.

CATV Weekly Summarizes 1967

In a unique report called "Critique/67" the cable television weekly news magazine, *CATV*, digested and analyzed significant industry news events for the past year. *CATV* Editor Bob Huston compressed dozens of crucial developments—from the FCC's January reaffirmation of the Second Report & Order to the Supreme Court's acceptance of the United Artists-Fortnightly copyright case—into a special 16-page report in

the January 1 edition.

CATV, the "Weekly News Service of Cable Television," has been published in magazine form since last August. Previously, it had been published for more than two years in newsletter format as "*Cable Television Review*." A limited number of copies of the special report, "Critique/67" are available gratis from *CATV* magazine, 207 N.E. 38th Street, Oklahoma City, Oklahoma 73105 for anyone who would care to write on company letterhead.

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Don't wait. Start today on a plan from NCTI that can mold a most profitable future for you in cable television. Write for complete information including catalog and course descriptions.

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Ten Systems in One Community?

Under a new ordinance approved by the Columbia, Mo. city council, any CATV firm can obtain a business license to operate in Columbia if it has a contract with General Telephone and posts a fee of \$20,000 or 5% of its earnings, whichever is greater.

Most telephone companies' policies prevent putting more than one cable system on existing poles. But General Telephone Co., in a statement issued by general manager E. W. Kahl, said: "Now that the ordinance has been enacted by the City of Columbia, the General Telephone Company of Missouri will provide CATV distribution service under the appropriate filed tariff to any and all applicants." Conceivably, more than 10 firms which have expressed interest in providing service to Columbia could make such a contract.

"If we find it feasible and practicable to construct systems for all applicants simultaneously, we will do so, as we would prefer to give equal service opportunity to each applicant," Kahl said. Thus far, Commonwealth Theatres Inc. and International Telemeter have filed applications accompanied by the

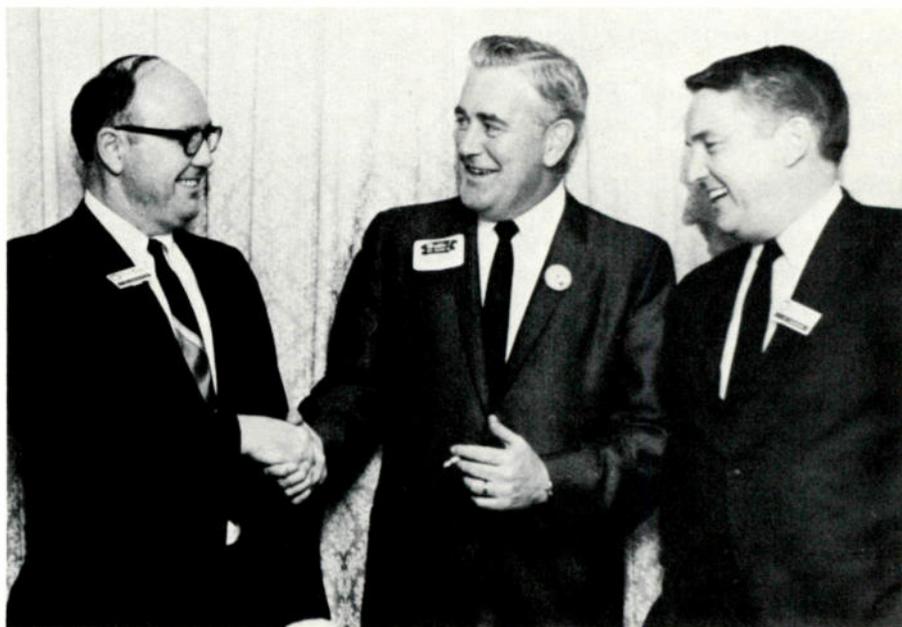
\$20,000 fee. GT&E Electronics has filed only the application. And another interested firm, Columbia Master Video, Inc. has mailed questionnaires to 5,000 Columbia residents to determine what they want in expanded television service.

Rohn, Universal Settle Suit

Rohn Manufacturing Co. has settled its suit for unfair competition and trademark infringement against Universal Tower Company. The suit was instituted because of an alleged appropriation and copying of trademarks and advertising literature of Rohn. Settlement sum was undisclosed.

An injunction has been entered against the defendants in the United States District Court for the Southern District of Indiana, and the defendants have agreed to destroy all documents using the trademarks and designations complained of, and have also agreed to destroy all infringing copies and all plates, molds, and other matter for making such infringements. As a part of the settlement, the defendants have agreed to reimburse the plaintiff in the amount of the legal fees and costs incurred.

(News continued on page 32)



Receiving congratulations from Jerry Hastings, manager of CATV systems division of Jerrold Electronics Corporation, is Malcolm Ferguson (left), vice president and chief engineer of Philadelphia Community Television Company (and author of January TV Communications article on the 24-channel system). Looking on is vice president and general manager Harvey Ingham. The occasion is a recent dinner of cable personnel and civic leaders in Levittown, Pa., to kick off the subscriber campaign for the system.

Utility offers you a wide variety of proven CATV tower designs — more than a dozen. But the tower needs of every CATV system are unique. That's where Utility can help you most. Every Utility Tower is individually engineered (and standard designs altered if necessary) to fit your exact requirements. Every tower is fabricated and erected by experts who **know** CATV. The finest materials and professional skills guarantee top performance.

Every Utility Tower is Custom Engineered For You

Result: Nine out of ten customers select Utility repeatedly for all future tower needs. Put this custom-built quality to work in your system . . . call us today.



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Jerrold President Makes 1968 Forecast

"The year 1968 will be the most important in the 18-year history of the CATV industry," predicted Robert H. Beisswenger, president of the Jerrold Corporation. Beiss-



Jerrold president Robert Beisswenger

wenger cited "accelerated technological advances and closer cooperation between broadcasters and CATV operators" as two key developments. He emphasized, however, that of greatest importance

will be the outcome of governmental rulings involving jurisdiction of CATV by the FCC, and the question of copyright liability.

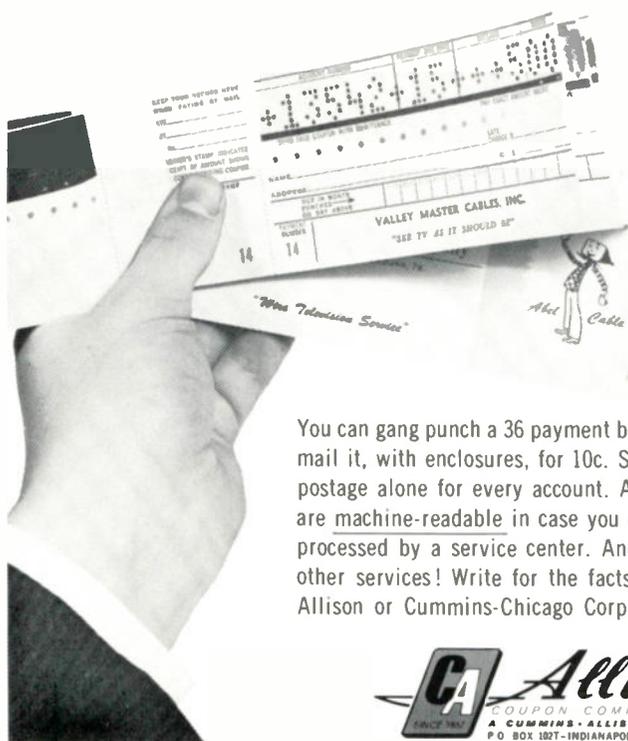
The Supreme Court case on FCC jurisdiction over CATV will be heard in March, with a decision expected in June. The verdict should "settle the question of whether the FCC has the right to regulate the CATV industry," Mr. Beisswenger pointed out. "This then should open the way for the expansion of CATV systems in key markets." He described the copyright problem as "equally important in the coming year."

Beisswenger anticipates greater understanding between cable operators and broadcasters in 1968. "First," he explained, "the broadcasting industry is coming to realize that CATV does not hurt television stations. And, second, with more and more broadcasters joining the ranks of CATV operators, the TV stations seem to have concluded that CATV is an economically viable investment for them." Beisswenger also forecast 1968 as the year of big-city CATV.



Robert E. Brockway, vice president of Manhattan Cable TV, holds one of the winning tickets in the Manhattan Cable Television Contest. Trans World Airline hostesses, Pauline Morris (on the left) and Ellen Kotula selected the eleven prize winners. First prize was a pair of round-trip tickets, via TWA, to London, and the other prizes were five Sylvania and five RCA color television sets.

Bill 3 year's service for 10¢ postage by using coupons



You can gang punch a 36 payment book in less than a minute, mail it, with enclosures, for 10c. Saves over 55c per year in postage alone for every account. And the payment coupons are machine-readable in case you ever want your payments processed by a service center. And the books can promote other services! Write for the facts—or phone your nearest Allison or Cummins-Chicago Corp. office.



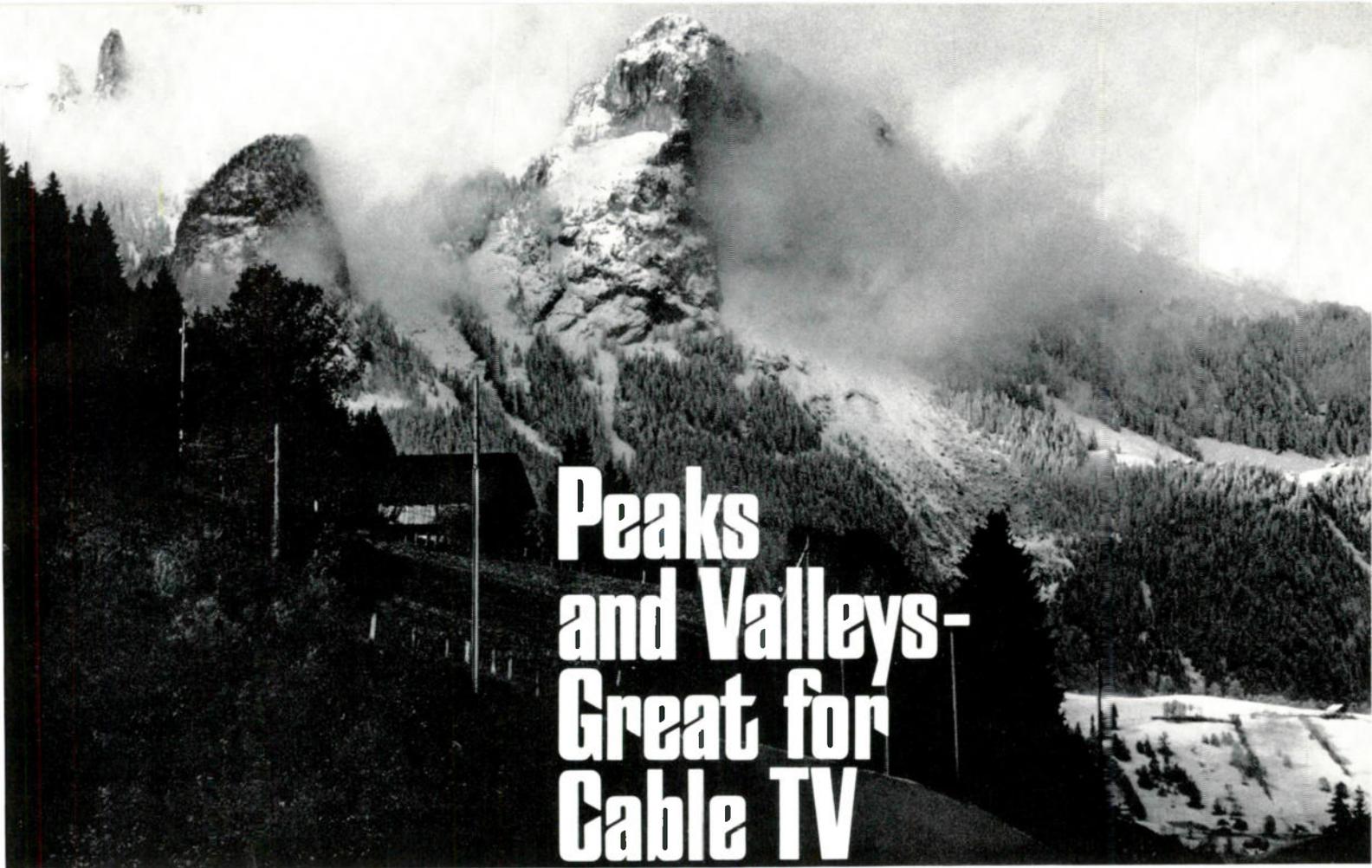
Task Force Budget Cut

In the latest capitol economy move, the FCC CATV Task Force budget was trimmed by \$400,000 and talk of doubling the manpower has ceased. Early proposals submitted to the Bureau of the Budget specified 58 people for the Task Force and asked for nearly \$26,000,000 for the fiscal year beginning July 1. Now the budget figure is between 18 and 19 million and speculation is that only a few men might be added to the 26-man team.

UHF interests and others have suggested that the Task Force be eliminated altogether, and that its work be incorporated in the Broadcast Bureau, but there is no evidence of such a plan actually being considered.

N. Y. Renews Old Franchises; Considers New Ones

Although three cable franchises in New York City were renewed just before Thanksgiving, Morris Tarshis, director of franchises, said his office is still considering pending applications. He also expects to receive some new applications before the Mayor's Advisory Task Force on CATV and Telecommunications makes its recom-



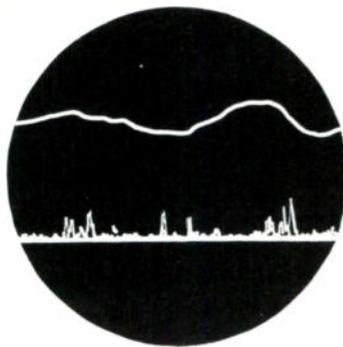
Peaks and Valleys— Great for Cable TV

Terrible in a CATV Cable

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Times Alumifoam® (the trade name for our seamless aluminum tube sheathed coaxial cable) flattens out the topography in your return-loss sweep generator with a calm uniformity that's making believers out of everyone in the CATV business. We can guarantee a 30 db worst point for this cable and back it to the hilt. That means first-quality cable every time, and smooth functioning

transmission right from the start. No costly ship-backs. No costly re-installation. There are fewer splices—fewer trouble points, less maintenance and less labor costs with Alumifoam because it's made in continuous seamless lengths up to ½ mile. Because it's seamless, it's waterproof and vapor-proof. And Alumifoam's long life is a real bonus—continuous high-performance quality for years and years. Be sure of the cable in your Cable TV. Get in touch with Times, Times Wire and Cable/a division of The International Silver Company/Wallingford/Conn.




TIMES
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mentations on CATV franchise standards to the Board of Estimate. This has been promised by March.

TelePrompter Corp. and Manhattan Cable TV have two-year renewals for Manhattan through 1969, and CATV Enterprises, the Ted Granik-Westinghouse company in Riverdale (Bronx Borough), got a nine-month renewal.

Vikoa Now in Canada

Vikoa Incorporated has announced the establishment of Vikoa of Canada Ltd., Montreal, Quebec. The new firm will act as exclusive distributor of Vikoa CATV cable and equipment throughout Canada. Vikoa of Canada Ltd. will be managed by Sam Salvin, Leslie Halsey and E. Page, pioneers in the Canadian CATV industry.

Calendar

February 20-21. The Louisiana Association of Cable TV Operators will hold its convention in New Orleans at the Monteleone Hotel. Registration begins at 9:00 A.M.

February 28-March 1. The 2nd Annual NCTA Cablecasting Seminar will be held for Western members of NCTA in Salt Lake City at the Hotel Utah Motor Lodge.

March 4-5. The Illinois-Indiana CATV Association will hold its annual convention at the Holiday Inn East, Springfield, Ill.

March 18-20. The NCTA board of directors meeting will be held. Meeting place to be announced.

March 24-26. The Southern CATV Association will hold its spring meeting in Atlanta, Ga., at the Callaway Gardens.

April 25-27. The 8th annual convention of the Texas CATV Association will be held at the Marriott Motor Hotel, Dallas.

May 7-8. The NCTA executive committee will hold a meeting in Washington, D.C.

May 15-18. The 12th annual convention and trade show of the National Community Antenna Television Association of Canada will be held at the Empress Hotel, Victoria, British Columbia.

June 3-5. The NCTA board of directors will meet—place to be announced.

June 30-July 3. The 17th annual convention of the NCTA will be held in Boston, Mass., at the Sheraton-Boston. (NCTA)

Lower Court Awaits Jurisdiction Decision

Total Telecable Inc., Bellingham, Wash., obtained a stay on an FCC non-duplication order from the Ninth Circuit U. S. Court of Appeals because of the jurisdictional question pending before the Supreme Court. After losing a waiver last spring, Total Telecable had been affording non-duplication protection to KVOS-TV, Bellingham-Vancouver, B.C. Now it can quit.

The order said the Court had received briefs, heard oral arguments, and found that "non-duplication will cause irreparable harm to petitioner through loss of actual and potential subscribers." Continuing, "There is a substantial likelihood that the petitioner will prevail upon the merits."

Telcos Want Control Says NCTA Brief

Telephone companies want "iron fist control" of wire communications, the National Cable Television Assn. said in a reply brief in the FCC proceeding to determine if phone companies must get Federal certificates to offer lease-back CATV service.

NCTA said phone companies already were violating Section 214 of the Communications Act by not getting the certificates. Answering a Bell system argument that they were not required because the leased facilities were subject to state law, NCTA said there was not a single instance of a state body exercising authority over construction of leaseback facilities, only over tariffs, which were not an issue in the case. NCTA said the Commission should order phone companies either to certificate leaseback facilities or stop charging for them.

Telephone leaseback investment was estimated at some \$50,000,000 by NCTA. The New York State CATV Association and the Community TV Association of New England, in another reply brief, jointly said, "It is clear that the respondents have failed to sustain their burden of establishing that construction of CATV systems for leaseback purposes should be exempt from FCC regulation."

Bell system parties in their reply argued their position under the Communications Act, saying all lines furnished for CATV are local lines and that the proceeding should be dropped.

Shapp Invests in Pa. System

FCC approval has been obtained for Milton J. Shapp's \$300,000 cash purchase of a 37.8% interest in WHJB Inc., Greensburg, Pa. radio-CATV company. Under an agreement reached last fall, the former president of Jerrold Corp. will share control with Melvin A. Goldberg, president of WHJB, who will vote 30.5% worth of stock.

Nevada Plans ETV Complex

A major educational TV system, capable of transmitting five programs simultaneously to 86 schools, was projected by Clark County (Nevada) School District with awarding of \$680,000 in broadcast equipment contracts to RCA.

The contracts cover studio and transmitting plants, including equipment for originating color programs from film and tape, for KLVX-TV, a new Channel 10 station in Las Vegas, that is scheduled to go on the air early in 1968.

TV Set Sales Hit New Highs

Factory sales of TV receivers will exceed 11,000,000 units for 1967 with a value exceeding \$2.5 billion, according to an Electronic Industries Association forecast. The projected 1967 total includes more than 5,300,000 color TV sets, for a 10-15% increase in color over 1966. More than 25% of U. S. homes have two or more TV sets, EIA said, and color TV is in 20%.

Craftsman Expands

Craftsman Electronic Products Inc. reports another major expansion in the company's headquarters complex near Syracuse, New York. Work is nearing completion on a two level 10,000 foot addition to house general management, finance, and marketing departments. The move coincides closely with a new data processing program to streamline order processing, purchasing, and production control. (NCTA)

NOW! BE READY FOR 20 CHANNELS with the New COLORVUE TRUNK EXTENDER AMPLIFIER!

More-than-twelve-channels is a reality . . . and now is the time for you to get ready—by specifying AEL's new 50 to 270MHz bandwidth Trunk Extender Amplifier. Here's the unit that features hybrid micro-circuitry for greater reliability and stability . . . plug-in modularity . . . high output capability, high operating gain, and a $\pm 0.5\text{db}$ response flatness. And there's a great deal more. Just send in the coupon, or call 215/822-2929.

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No complications. Easy access—with only two bolts to open housing.

VARIABLE SLOPE CONTROL

24db range with hybrid plug-in equalizer.

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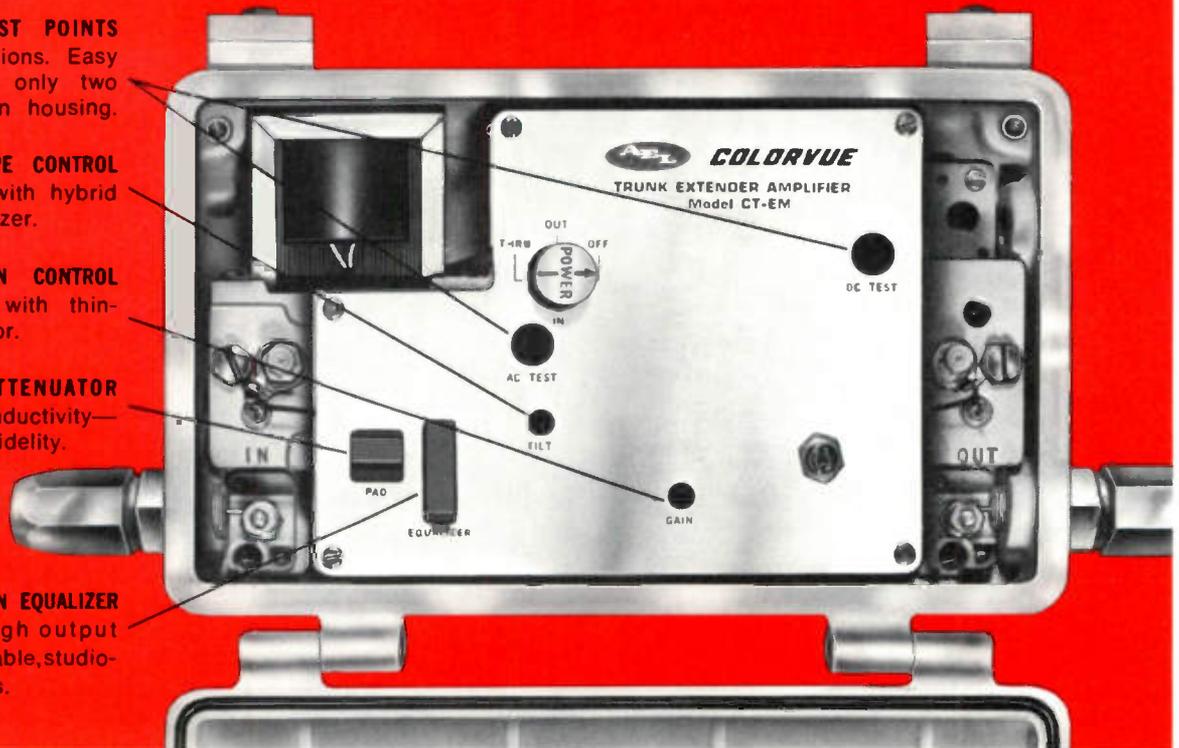
19db range with thin-film attenuator.

THIN-FILM ATTENUATOR

for high conductivity—color signal fidelity.

HYBRID PLUG-IN EQUALIZER

maintains high output stability—reliable, studio-quality signals.



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Systems

William Goff of Staples, Minn. has been appointed area manager of Minnesota All-Channel Cablevision, Inc. of Alexandria. His responsibilities will include operations at both Staples and Wadena.

James B. Crouse has been appointed system manager of Great Falls Community TV Cable Co., TelePrompter Corporation's system in Great Falls, Montana. Crouse replaces **Robert Morrison** who was promoted to system manager of TelePrompter of Oregon, in Eugene, Oregon. Crouse has had 12 years experience in CATV in Wyoming and Texas.



James B. Crouse Frank N. Cooper

The Jerrold Corporation has named **Frank N. Cooper** manager of CATV system development. In this post, he is responsible for all aspects of Jerrold's CATV municipal franchises, including joint venture relations with franchise holders, legal details, and community relations.

James A. Hirshfield has been named vice president—operations for Telecable, Inc. Hirshfield has been with Telecable since his graduation from Harvard Business School.

The appointment of **John Gauchione** as technical supervisor of Pittsfield-Dalton TV Cable (Mass.) was announced by the parent company, TeleVision Communications Corporation. Gauchione will have overall responsibility for technical operation, including supervisory authority over construction, and maintenance.

James Vaughn is the new manager of TV Cable Company, Commerce, Texas. He comes to Commerce from Menard where he also managed a cable company.

Better TV Inc., Hyde Park, New York has promoted **Elliot C. Roskow** to the position of chief technician and manager.

George E. Martin has been appointed manager of Gettysburg (Pa.) TV Cable, Inc. He has held positions with Chambersburg TV Antenna Service, Inc. and Ameco, Inc.

William Burdick has accepted responsibility for operations of Telecable of Bremerton (Wash.).

Jack Chaney of Junction City, Kansas has accepted a position as manager of Mid-West Cablevision, Inc. in Joplin, Mo. He has previously held positions with Jerrold Electronics Corporation and Junction City-Fort Riley TV Cable Companies.

David Brody has been appointed manager of Jerrold's community operations division. Brody, who previously served as operations manager, is responsible for supervision of the building and operation of all CATV systems managed by Jerrold. Reporting to Brody is



David Brody Stanley Ogen

Stanley Ogen, new promotion manager for the division. Ogen is responsible for CATV system advertising and sales promotion.

Ronald A. Mahon is new vice president in charge of all CATV operations of Dynamic Cablevision, a subsidiary of Dynamic Broadcasting.

Claire Feldman has been appointed to the new position of manager of administrative and purchasing control of the CATV Division of TelePrompter Corporation. Mrs. Feldman has been with the firm since 1961.

John Puckett is the new manager of Telecable of Thurston County, Olympia, Washington.

Suppliers

Daniel N. Mezzalingua recently assumed the presidency of Production Products Co., Inc., manufacturer of custom screw machine components. He succeeds **John Mezzalingua**, founder of the company, who becomes board chairman. Mezzalingua is also president of Craftsman Electronic Products, Inc.



Daniel Mezzalingua William Robinson

Anaconda Astrodata has named **William Robinson** southeast regional sales manager, with headquarters in Atlanta, Ga. Robinson's background includes sales engineering and management experience with Jerrold Corporation, Gray Manufacturing and the Edwards Company.

Raymond L. Kelley has been appointed to the executive staff of Shure Brothers, Inc. in the position of vice president—finance and treasurer. Kelley returned to Shure, where he was formerly vice president and controller, after 7 years as an officer of the Continental Bank.

Electra-Tronics, Inc., CATV equipment manufacturer, has named **Lyle Paris** director of sales for their new closed circuit TV division. Paris, who has had 15 years experience in the field, has served as TV sales manager for Trans-Lux Corp. The automated TV products division will handle the design, engineering and sale of CATV and CCTV equipment and systems.

Preformed Line Products Company has announced five manage-

ment promotions. **Frank L. Irvin** has been named new general manager of sales. Reporting to him will be **Max A. Lekson**, manager of sales, general industries; **Raymond A. Bell**, manager of sales, power distribution products; and **Thomas E. Sherman**, manager of sales, power transmission products. **James G. Thomas**, former chief coordinator—sales office functions, was promoted to manager of marketing administration.

Gene Francis has been appointed western division sales manager for Rohn Manufacturing Company, with responsibility for the entire West Coast including Alaska and Hawaii. The main offices and warehouse serving this area are located in Reno, Nevada.



Gene Francis

Bruce K. Frazier

Bruce K. Frazier is the new southwestern regional manager of Entron, Inc., in charge of sales and services in Texas, Oklahoma, New Mexico, Louisiana, Arkansas, Missouri and Kansas. He will headquarter in Ft. Worth, Texas. Prior to coming with Entron, Frazier was technical representative with Ameco, Inc. and, most recently, district sales manager for Spencer-Kennedy Laboratories.

Joseph T. Loscalzo has been appointed product manager, antennas, by the CATV systems division of Jerrold Corporation.

Craftsman Electronic Products, Inc. has announced the appointment of **Richard C. Steinbach** as supervisor of quality control and the promotion of **Robert A. Munroe** to western regional sales manager. Steinbach spent six years with General Electric before joining Craftsman. Munroe has been with Craftsman as sales representative since 1966.

Jack Ross has been appointed supervisor for the entire field show-room program of Pruzan Company. As supervisor of van sales, Ross will be responsible for all direct field sales activities. He will also

assist in sales market research and field training. Pruzan has also announced the appointment of new van salesman **Ray Wicks** who will handle sales and service in Oregon.

Richard O. Bender has been named manager of distributor and contractor sales, communications division, Anaconda Wire and Cable Company. In this newly created post, he will be located at the Communication Products Center, Sycamore, Ill. Bender is presently product manager—CATV products.

Clifford T. Boettcher has joined Midwest Utility Plow & Equipment Corporation as its chief of manufacturing, engineering and design. He has been senior design engineer for a farm equipment manufacturer.

Jack S. Goldner has been appointed Southern California district sales manager for Consumer Products Division, Concord Electronics Corporation. Goldner will supervise area sales and merchandising activities for the line of audio tape recorders.

Philip Colone, Jr. has rejoined Ameco, Inc. as CATV equipment salesman in a 7-state area including New York, Vermont, New Hampshire, Maine, Massachusetts, Connecticut and Rhode Island. He was an Ameco salesman in 1965-66 and more recently with Cascade.



Philip Colone, Jr.

George S. Bahue

Blonder-Tongue Laboratories, Inc. has announced that **George S. Bahue** will assume the duties of advertising manager in addition to his responsibilities as head of the technical writing department. A member of the Society of Technical Writers, Editors and Publishers, Bahue has won several of the society's awards. He also collaborated in the writing of an annotated bibliography of technical writing published in 1965.

The appointment of **Ray Hillebrand** to a staff marketing position was announced recently by Concord Electronics Corp. Hillebrand

has served as Western regional sales manager for the firm's Consumer Products Division since 1964. Announced at the same time was the appointment of **William B. Minkin, Jr.** to the position formerly held by Hillebrand. As Western regional sales manager, Minkin will be responsible for sales of the Concord line of audio tape recorders.

ITT Wire & Cable Division of International Telephone and Telegraph Corporation recently announced appointment of **Jack Grubbs** as western regional sales manager. Grubbs, formerly branch manager of the warehouse and sales office in Burbank, California, will now also be responsible for the branch sales office and warehouse in San Francisco. The company also announced the appointment of the **James D. Hataway Company**, Kansas City, Missouri, as sales representatives. Hataway salesmen **George W. Fossell** and **William W. Green** will represent ITT Wire & Cable in Missouri, Kansas, and Southern Illinois.

Four senior Ampex Corporation executives have been named group vice-presidents of the company. Newly appointed are **Thomas E. Davis**, formerly vice-president-general manager, audio/video communications division and **John N. Latter**, formerly vice-president-general manager, consumer and educational products division. Also appointed were **Byron A. Olerich**, formerly vice-president, international operations, and **Robert L. Pappas**, formerly vice-president-general manager, instrumentation division.

Professional

Jacqueline Morse has joined the staff of *TV Communications* as editorial assistant. She holds a Ph.D. degree from the University of Detroit and was formerly editorial staff assistant at Florez Inc., Detroit.

John B. Summers was recently appointed assistant general counsel to the National Association of Broadcasters. The Washington attorney will assist **Douglas A. Anello**, NAB's general counsel, in handling Association legal affairs. Summers comes to NAB from the Federal Communications Commission where he has served for the past 7 years as a staff member of the general counsel's office. rv

FINANCIAL REPORTS

Plastoid Cable Corp. of America reports per share earnings of \$.61 for the 9 months ending Aug. 31, 1967. Earnings figure is based on a net income of \$1,468,118. Sales were \$11,638,451 for the period.

American Electronic Labs, Inc. reports per share earnings of \$.50 for the fiscal year ending Nov. 30, 1967. This compares with per share earnings of \$.87 for the previous fiscal year. Sales were \$21,000,000 for 1967 and \$17,400,000 for 1966. (The fiscal 1966 results are adjusted for a 3-for-2 stock split in October, 1967.)

Sony Corp. announced an estimate that consolidated net income in the fiscal year ended Oct. 31 equaled \$1.75 per American Depositary Receipt, up from \$1.18 per ADR in fiscal 1966. The estimate gives effect to a 20 percent stock dividend in November and is based on 6,480,000 ADRs outstanding. Sony estimated that consolidated sales rose 24 percent to \$162,000,000 from \$130,389,000 in the prior year.

Collins Radio Co. reports per share earnings of \$.81 for the quarter ending Nov. 3, 1967. This compares with per share earnings of \$1.06 for the same period last year. Per share figures are based on earnings of \$2,300,000 and \$2,900,000 for the two periods respectively. Sales were \$112,000,000 for 1967 and \$99,000,000 for 1966. For fiscal 1967, the company reported sales of \$439,000,000 and earnings of \$4.42 per share, based on 2,738,753 average shares outstanding. In other action, Collins' board of directors declared a quarterly cash dividend of \$.20 per share of common stock payable January 15, 1968, to stockholders of record on December 26, 1967.

Cox Broadcasting Corporation has declared a regular quarterly cash dividend of 12-1/2 cents a share

on the common stock, payable January 15, 1968 to stockholders of record of December 22, 1967.

Famous Players Canadian reports per share earnings of \$.61 for the quarter Sept. 30, 1967. This compares with per share earnings of \$.55 for the same period last year. Earnings figures are based on net incomes of \$1,069,024 and \$958,000 for the two periods respectively. Also reported were figures for the 9-month period ending Sept. 30, 1967. Per share earnings for this period were given as \$1.50 as compared with \$1.33 for the same period last year. Net incomes for the two periods respectively were \$2,613,015 and \$2,315,300.

Gulf & Western Industries reports per share earnings of \$1.08 for the quarter ending Oct. 31, 1967. This compares with per share earnings of \$.94 for the same period in 1966. Earnings figures are based on net incomes of \$14,025,000 and \$10,410,000 for the two periods respectively. Sales were \$167,394,000 for 1967 and \$129,283,000 for 1966. Per share earnings are adjusted to reflect 3 percent stock dividends paid or payable in 1966 or 1967.

C & U Communications Corp. reports per share earnings of \$.14 for the quarter ending Sept. 30, 1967. This compares with per share earnings of \$.12 for the same period in 1966. Earnings figures are based on net incomes of \$150,812 and \$138,811 for the two periods respectively. Operations revenues were given as \$1,444,684 and \$1,347,160 for the two periods. Also reported were figures for the 9-month period ending Sept. 30, 1967. Per share earnings for this period were given as \$.38 as compared with \$.28 for the same period in 1966. Net incomes for the two periods respectively were \$428,313 and \$333,445. Operating revenues were given as

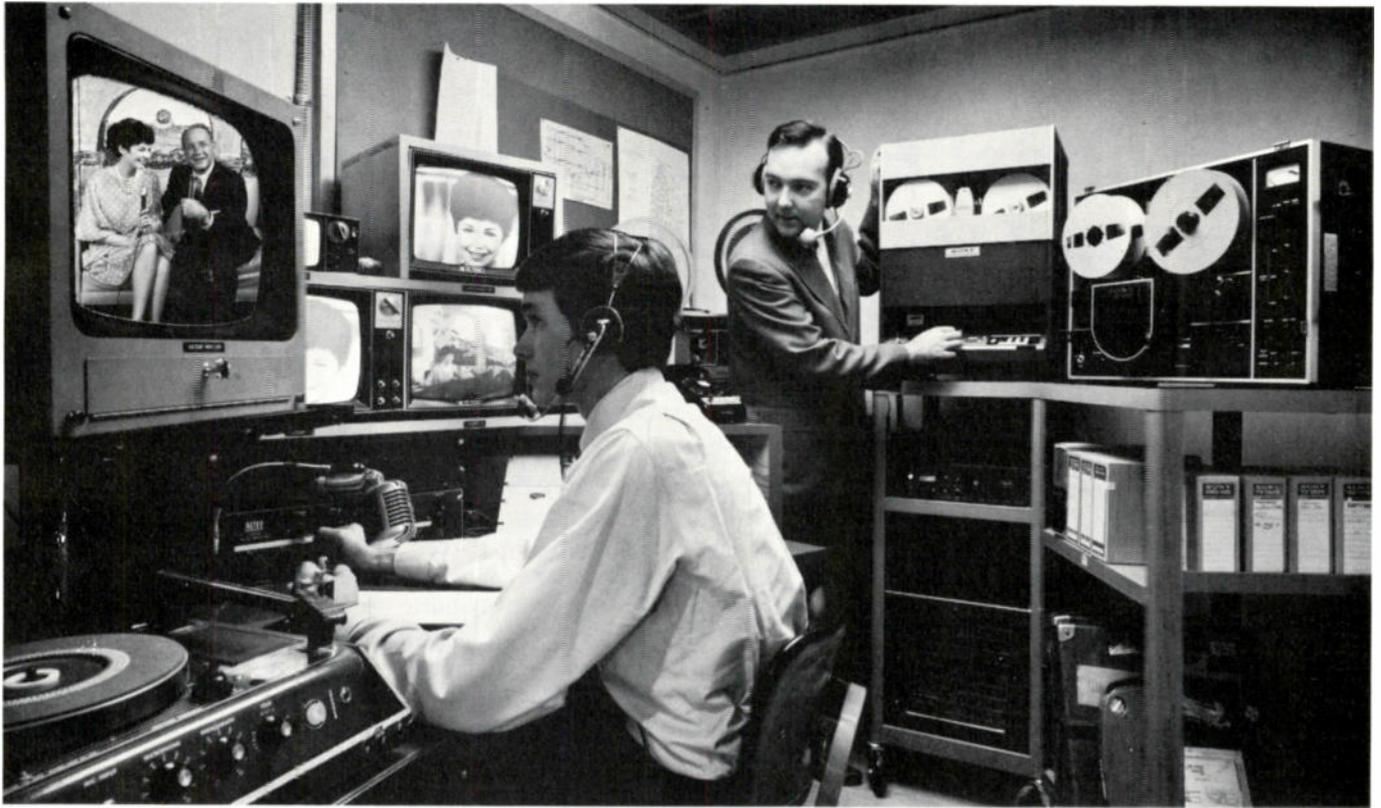
\$4,230,129 for 1967 and \$3,959,232 for 1966.

Tower Antennas, Inc., reported gains in sales and earnings for the first nine months of 1967, compared with a year earlier. The sales of the firm totaled \$1,430,375 for the three quarters ending Sept. 30. Earnings were \$185,766.

General Instrument Corp., Newark N.J., registered with the Securities and Exchange Commission a secondary offering of 716,709 outstanding common shares issued in connection with its acquisition of Jerrold Corp. The stock may be offered from time to time on the New York Stock Exchange at prices prevailing at the time of sale. General Instrument, a diversified maker of electronic products, has 5,651,282 shares outstanding.

Sterling Electronics reports per share earnings of \$.26 for the 13 weeks ending Sept. 30, 1967. This compares with per share earnings of \$.22 for the same period in 1966. Earnings figures are based on net incomes of \$223,726 and \$179,995 for the two periods respectively. Sales were \$6,956,892 for 1967 and \$5,682,292 for 1966. Also reported were figures for the 26-week period ending Sept. 30, 1967. Per share earnings for this period were given as \$.45 as compared with \$.33 for the same period of the previous year. Net incomes for the two periods respectively were \$391,353 and \$276,620 with sales at \$12,359,343 and \$10,217,453.

Time Inc. reports per share earnings of \$.31 for the quarter ending Sept. 30, 1967. This compares with per share earnings of \$1.02 for the same period in 1966. Earnings figures are based on net incomes of \$2,166,000 and \$7,039,000 for the two periods respectively. Revenues were given as \$114,773,000 and \$112,052,000 for the two periods. Also reported were figures for the 9-month period ending Sept. 30, 1967. Per share earnings for this period were given as \$2.52 as compared with \$3.60 for the same period in 1966. Net incomes for the two periods respectively were \$17,549,000 and \$24,769,000, with revenues given as \$367,665,000 and \$361,264,000. TVC



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Local Election Coverage: What We Did—How We Did It

By Don Andersson
Director of Research and Promotion
Television Communications Corporation

"Tonight . . . exclusive television coverage of election returns . . . 6:45 to conclusion . . . Cable Channel 2." These words in big, bold letters headlined our 5-column advertisement in the November 7, 1967, edition of the Pittsfield (Mass.) *Berkshire Eagle*, announcing to subscribers of the Pittsfield cable system the first complete televised report of city elections.

And if you weren't a cable subscriber, you were invited to "be a sidewalk viewer. The entire cable TV front office, facing on North Street, has been turned into a television studio for the night. Our curtains will be pulled back so that passersby can see the actual show in progress or view the results as they will be seen by cable subscribers on television sets placed in the windows of the cable office."

We don't know how many viewers we had that night — although telephone calls and office visits by pleased subscribers in the days that followed indicated we had a sizeable share of our 12-channel audience. But we do know that at its peak, a crowd of nearly 200 stood outside our windows in the cold, peering in through snow flurries at the frantic but ordered activity in our election studio.

When the show ended at 8:45 p.m., two hours after it had begun, with the words that "the preceding program has been brought to you as a public service through the cablecasting facilities of Pittsfield-Dalton TV Cable," viewers had been apprised of the final unofficial results of the city-wide election, had seen the newly-elected Mayor make his victory statement

in our studios, had witnessed the appearance of other successful candidates, and in short, had been spectators to the most ambitious effort to date of Cablecasting Channel 2 in Pittsfield.

In a way, it was a dress rehearsal . . . for that big election night coming up in November, 1968. We found, pleasantly, that we'll need very little improvement in our next performance. Our four pre-show conditions, which we imposed upon ourselves, worked nearly flawlessly: (1) Compilation of full and accurate election returns at each polling place, (2) immediate reporting of returns from polls to studio, (3) fast and accurate tabulation at our election headquarters, and (4) up-to-the-minute visual and oral reports on the returns to our viewers.

Because many of the readers of *TV Communications* will be looking ahead to cablecasting their own reports on national, state and local electoral races in November, we offer our experience as a possible guideline to your own efforts. To the four conditions set forth above, we also offer one more basic ingredient upon which to build your election report: Advance planning. Detailed below is how we did it:

System Data — Political Divisions — Electoral Races

The Pittsfield system is a 12-channel operation, serving 7,000 subscribers. Politically, the city's 65,000 residents reside in 24 precincts in 7 wards. The elective offices involved (1) the Mayor, with two candidates vying for the office; (2) Ward Councilman, with contests between two candidates in each of three wards, with four wards uncontested; (3) Councilman-at-Large, eight candidates for four positions; (4) School Committee — 4 year term, six candidates for three positions; and (5) School Committee — 2 year term, six candidates for three positions.

In addition to the contests in each of the races, a lively issue arose during the pre-election campaign which promised to have an effect on one of the mayoralty candidates. The issue was a matter of a debate between a candidate in the Council-at-Large race and a candidate in one of the School Committee races. Thus, the key campaign issue was anticipated to have repercussions in three significant races, offering us an element of suspense in our planned precinct-by-precinct report. Voter turnout was anticipated to be about 21,000 — almost exactly the number of voters who actually did go to the polls.



Newly elected mayor is shown being interviewed by Channel 2 anchorman Milton R. Bass after the last election results had been posted. System manager Fred Schwab is at left.

Pre-Show Planning — Tabulation of Votes

In order to meet our self-imposed conditions for accuracy in the recording and reporting of election results, our first concern was to obtain 24 Channel 2 correspondents to represent us at each of the polling places. Jon Lash, TVC's Director of Cablecasting, in charge of the production, solved this easily through an appearance before a meeting of the city's Jaycees organization. The civic-minded Jaycees and their distaff group, the Jaycee-Ettes, volunteered to staff not only the polls but also our studio election desks. Permission was obtained from the city clerk to permit the Jaycees to be present when the election results were formally announced at each polling place.

Recognizing the scarcity of public telephone facilities at the polls — most locations being school buildings — and having been informed that what telephones as were available were generally tied up by the staffs of the two local radio stations, we made arrangements with subscribers living close to 14 polling places to permit the use of their telephones by our Jaycees.

Because machine voting was installed at each precinct, we knew that precinct results would be announced almost simultaneously in each of the 24 polling places not too long after the polls were closed at 7 p.m. Not wishing to overload our three telephone lines excessively, we also used four company vehicles equipped with two-way radio as precinct reporting points for Jaycees at 10 precincts, to call in results to a radio operator at the studio.

Each of the precinct correspondents would be furnished with a single sheet listing of all races and

the names of candidates in each race, together with identification as to the ward and precinct to which he was assigned.

At the cable company office — the "studio" from which the election show would originate — three Jaycee-Ettes would handle all incoming telephone calls from the precinct correspondents. A fourth girl would receive the results reported in via two-way radio.

Five "desks" were assigned for the tabulation of results in each of the five electoral race categories: Two girls would man each desk, except the Ward Councilman desk which would be staffed by only one person, this being so because only three of the seven wards were contested; thus, activity would be considerably less at this desk when the vote tabulation would be in progress. One girl at each of the desks would serve as an adding machine operator, and her partner would be responsible for entering vote totals for each candidate by precinct on a cumulative vote master form prepared for each desk. The machine operator would be responsible for the cumulative vote for each candidate as the precincts reported in.

The cumulative votes for candidates in each race, representing "X" number of precincts at any given time, would then be entered on a simple form by the second girl at each desk, who, in turn, would hand it to the girl assigned to post the results on a particular race on large 4-foot by 8-foot boards which would be used to keep viewers informed visually of election returns as they were posted, and from which the Channel 2 anchorman would read and interpret trends.

A four-part form (one original and three carbon

WARD <u>5</u>	PRECINCT <u>A</u>
<u>MAYOR</u>	
DEL GALLO <u>212</u>	
BUTLER <u>331</u>	
<u>COUNCILMAN-AT-LARGE</u>	
PRENTISS <u>307</u>	
PURNELL <u>272</u>	
RICE <u>296</u>	
BROWN <u>305</u>	
DUBISKI <u>116</u>	
MINAFRA <u>114</u>	
PAUL <u>240</u>	
WARNER <u>184</u>	
<u>SCHOOL COMMITTEE - FOUR YEARS</u>	
COLLINS <u>327</u>	
SCULLARY <u>219</u>	
ARLOS <u>138</u>	
HENRIQUES <u>164</u>	
MASSIMIANO <u>233</u>	
WOJTKOWSKI <u>301</u>	
<u>SCHOOL COMMITTEE - TWO YEARS</u>	
CLARY <u>292</u>	
HARRIS <u>176</u>	
CLEMENT <u>245</u>	
CRANE <u>177</u>	
ROSS <u>215</u>	
RYAN <u>284</u>	
<u>COUNCILMAN (WRITE IN NAME)</u>	
<u>McDonald</u> <u>237</u>	
<u>Sattile</u> <u>287</u>	

Form A: Master Forms for Use by Precinct Correspondents and Telephone/Radio Receptionists.

COUNCILMAN-AT-LARGE								
WARD	PRECINCT	A	B	C	D	E	F	G
3	C	716	669	709	706	253	344	665
2	A	411	471	398	393	160	155	375
	CV	1127	1140	1107	1099	413	499	1040
2	B	285	338	328	358	358	159	325
	CV	1412	1478	1435	1457	771	658	1365
IDENTICAL FORM ABOVE USED FOR TABULATING THE 2 SCHOOL COMMITTEE RACES.								
MAYOR - CUMULATIVE VOTE								
DEL GALLO				BUTLER				
WARD 3	PRECINCT C			WARD 3	PRECINCT C			
561				677				
WARD 2	PRECINCT A			WARD 2	PRECINCT A			
274				480				
CV	835			CV	1157			
MAYOR VOTE BY PRECINCTS AND WARDS								
		PRECINCTS						
	WARD	A	B	C	D	TOTALS		
DEL GALLO	1							
BUTLER								
DEL GALLO	2	274						
BUTLER		480						
DEL GALLO	3			561				
BUTLER				677				
WARD COUNCILMEN								
		PRECINCTS						
	WARD	A	B	C	D	TOTALS		
W	1	378		458				
Z		535		319				

Form B: Master Forms for Use at Election Desk. Data Compiled from "A" Forms.

MAYOR		COUNCILMAN-AT-LARGE	
PRECINCT RESULTS		CUMULATIVE VOTE	
WARD	<u>5</u>	A	<u>11,301</u>
PRECINCT	<u>D</u>	B	<u>10,860</u>
DEL GALLO	<u>374</u>	C	<u>14,402</u>
BUTLER	<u>682</u>	D	<u>11,040</u>
		E	<u>3,263</u>
		F	<u>5,123</u>
		G	<u>9,175</u>
			<u>24</u> OF 24 PRECINCTS

MAYOR	
CUMULATIVE VOTE	
DEL GALLO	<u>8,654</u>
BUTLER	<u>10,113</u>
	<u>21</u> OF 24 PRECINCTS

FORMS IDENTICAL TO COUNCILMAN-AT-LARGE FORM USE D FOR COMPILING INFORMATION ON CUMULATIVE VOTE IN THE 2 SCHOOL COMMITTEE RACES.

Form C: Summary Forms Prepared at Desks for Posters' Use in Posting Results on Tote Boards. Data Compiled from "B" Forms.

Council-at-Large totals for a given precinct were entered on the cumulative vote master form at the at-large desk.

As data from each precinct form were entered on the cumulative vote master forms at each desk, the precinct form would be X-ed out to prevent accidental dual reporting of a precinct.

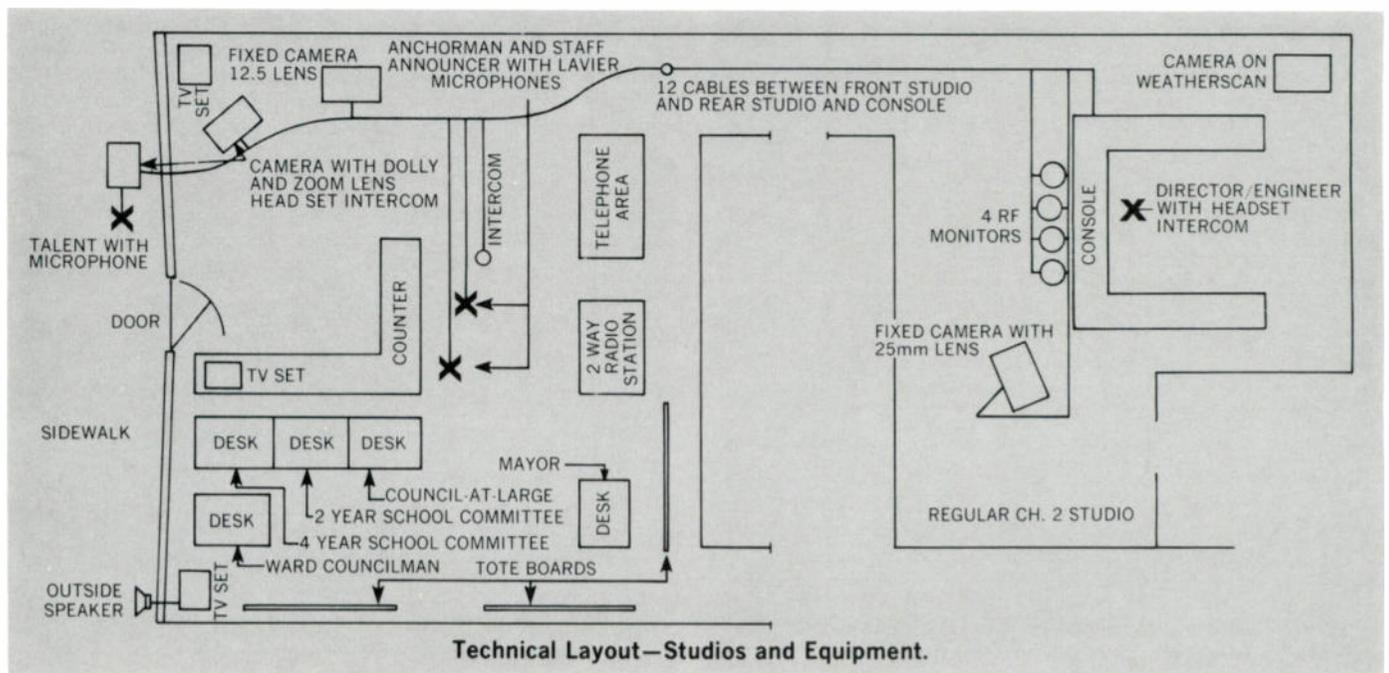
The cumulative vote master forms listed the names of candidates in each race and provided space for the tabulator to write in the ward and precinct number of the precinct for which votes were to be recorded. Not knowing in advance which precincts would be reporting in first, and in order to make it easy to maintain a continuous cumulative vote total, precincts were listed one below another as totals came in. (See accompanying illustrations depicting data recording forms described above and their sequence of use.)

Although vote totals for each precinct in each ward would be available for posting on the tote boards, it was decided to post individual precinct totals for the Mayoralty race only, since this was the single most important race. Returns from all races, including that for Mayor, would be posted on a cumulative basis; i.e., total votes for each candidate in a race, showing the number of precincts reporting in at any given time. It was felt that posting of individual precinct totals in all races would serve only to confuse viewers with an unnecessary morass of statistics. Also, space in which to display such totals on tote boards was at a premium, although this was a lesser factor in our decision.

Three tote boards were to be employed: (1) for the Mayoralty contest, divided into two sections, (a) reporting total cumulative vote for both candidates for "X" number of precincts at any given time, and (b) reporting actual vote in each precinct; (2) for the Council-at-Large race and both School Committee contests, divided into three sections (to report each of the three contests), reporting cumulative vote totals for the candidates for "X" number of precincts at a

copies) exactly like the form used by the precinct correspondents, would be used by the radio and telephone operators, who would enter the ward and precinct number of the correspondent calling in and the results he would report for his assigned precinct.

These forms when filled out would then be handed to the statistical coordinator, the sole link between the tabulation desks and the telephone and radio operators. She would separate the four copies, presenting one copy to the Mayor desk, one to the Council-at-Large desk, one to the 4-year term School Committee desk, and one to the 2-year term School Committee desk. The copy given to the Council-at-Large desk would be passed on to the Ward Councilman desk when the



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PRICE EACH \$1995.00

2 — STUDIO PEDESTALS with counter-balanced pan/tilt heads
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MONITOR ASSEMBLY — two five inch transistorized Camera Monitors on 19 inch rack panel
PRICE COMPLETE \$675.00

WAVEFORM MONITOR (not shown)
PRICE \$550.00

DUO CAMERA CONTROLS — including Pedestal, Gain, Beam, Target and Focus as well as intercom jack and Master Power Switch
 (Price included in camera price)

EIA RS170 SYNC GENERATOR—drives entire system with broadcast quality sync
PRICE \$975.00

EIA SWITCHER-FADER — SPECIAL EFFECTS GENERATOR with vertical interval switching, professional type fader arms, 9 special effects
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given time; and (3) for reporting final ward results in the three wards wherein the office of Ward Councilman was contested.

The first two boards were prepared on 4-foot by 8-foot sheets of celutex, while the third "board" consisted of a 3-foot by 5-foot map of the city showing its divisions into wards. Names of candidates were posted on cards glued to the map within the appropriate ward boundaries.

The cumulative vote section of the Mayoralty board, and the like areas of the second board listed the names



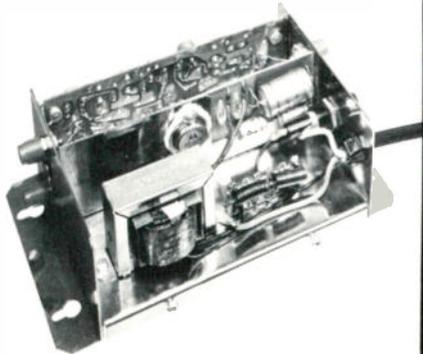
The bustle of activity at Channel 2 election headquarters added to viewer interest as totals were constantly being posted on the tote boards.

of candidates, beside each of which was affixed a pad of white paper on which vote totals could be entered; previously posted totals could easily be removed by merely tearing off sheets from the pad. Another pad was placed at the top of the boards for use in posting the number of precincts (of a total of 24) reporting at the time a posting of results was to be made (see accompanying photo).

As mentioned earlier, there were to be three races wherein the effect of the major campaign issue could be felt: the Mayoralty race, the Council-at-Large race and the 4-year term School Committee Contest. Because it was anticipated that returns from certain key precincts and key wards could show any developing trends in regard to the effect of the issue, it was arranged with Channel 2's election reporter (our anchor-man) that he would receive from the statistical coordinator precinct and ward data on these races as he may request it. Precinct and ward data for the Mayoralty race was, of course, available to him on the tote board.

Pre-Show Planning — Production

We were fortunate in our planning to create a truly professional show that we had three valuable talents to draw upon: One of our system managers, Mike Arnold, in Olean, N.Y. (within easy travel distance to Pittsfield) was a former radio personality and experienced in talk shows. He would be our show M.C. Milton R. Bass, formerly engaged in educational television in New York state, and a long-time and widely read area



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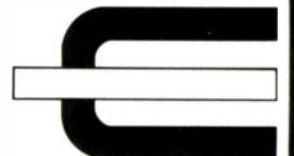
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newspaper columnist knowledgeable in Pittsfield politics, agreed to serve as anchorman, reporting and analyzing election results for our television audience. And, Jon Lash, full-time director of cablecasting at Pittsfield Channel 2, would serve as producer and director.

Twenty-two of the 28 candidates in the contested races agreed to a telephone request to appear at the Channel 2 studios in advance of election night to videotape a one minute statement about their aims assuming they were elected to office. In this way, the statements could be used as filler during the progress of the show or as statements by victorious candidates after final election results were in.

In addition, the two candidates engaged in the debate on the previously mentioned campaign issue were interviewed by Mr. Bass prior to the show. The two resulting 5-minute videotape segments would be used in the opening portion of the show, which we anticipated would last for about half an hour before the first precinct reported in.

Other opening show elements planned included a general opening by Mr. Arnold describing how election results would be obtained from the polls, relayed to the studio and reported to the viewers. Personal data on all candidates were prepared by Mr. Bass, together with data on previous elections and voting patterns, to be used as background material. And Mr. Arnold would interview the 18 Jaycee-Ettes and cable system employees staffing the election desks.

Depending upon the frequency with which returns

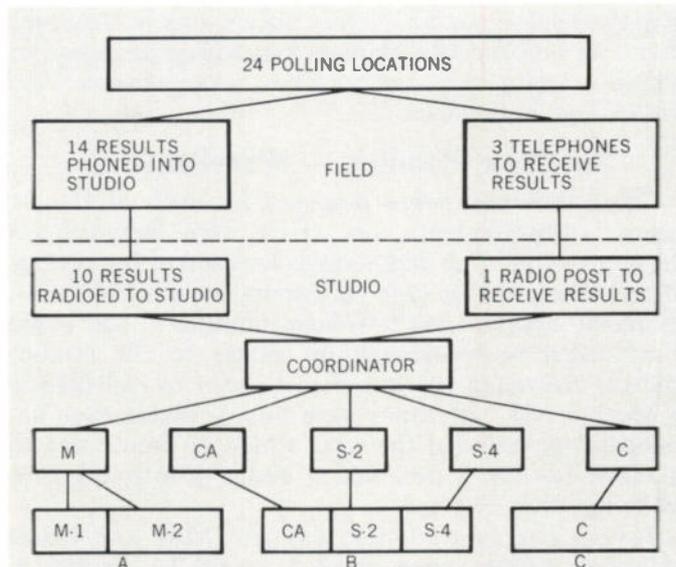


Chart A: Flow of Data from Polls to Tote Boards.

Legend: M = Mayor's Desk; CA = Council-At-Large Desk; S-2 = School Committee Desk, 2-Yr. term; S-4 = School Committee Desk 4-Yr. term; C = Ward Councilman Desk. A = tote board for posting cumulative vote for Mayor (M-1) and precinct and ward totals for Mayor (M-2); B = tote board for posting cumulative vote for Council-At-Large (CA), 2-Yr. School Committee race (S-2) and 4-Yr. School Committee race (S-4); C = map for posting final results in contested races for councilmen.

would be posted and reported to viewers, some of the backgrounding on candidates and their pre-taped statements would be interspersed throughout the show.

Finally, all candidates were invited by telephone to

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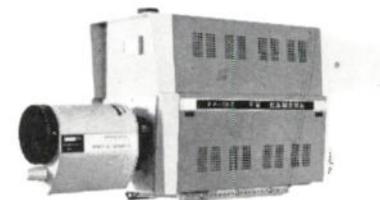
- Video Tape Recording Equipment
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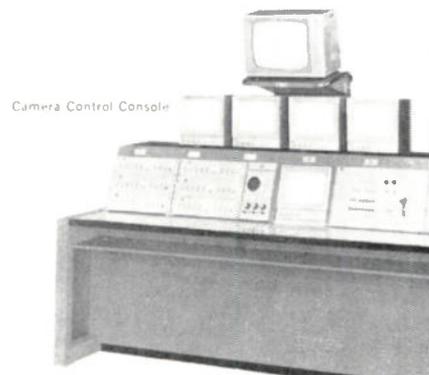
Executive/Sales Offices: 58-25 Brooklyn-Queens Expressway, Woodside, N. Y. 11377, (212) 898-1261. Regional Offices: Chicago, Ill., and Los Angeles, Calif.



Viewfinder Camera



HV-14 Camera



Camera Control Console

visit the studio to make victory statements in the event they won and the two mayoral candidates promised to appear — for which transportation arrangements were worked out in advance.

Pre-Show Planning — Miscellaneous

Large envelopes were prepared for each of the 24 Jaycee correspondents, on which were included (1) the name of building and address location of the polling place in the precinct each correspondent would handle; (2) name, address and telephone number of the home from which he would call in results to the studio; and (3) the telephone numbers he was to call (choice of three in case any lines were busy). Inside each envelope were included the form which he would use to tabulate results, a pen, and a badge identifying him as being with Channel 2.

Jaycee correspondents, Jaycee-Ettes and other volunteer staffers were asked to report to the studio at 6 p.m. — one hour before the polls closed, and 45 minutes before show time. Jaycees reporting in by two-way radio would be driven to the polling locations in the trucks from which they would call so that they would know in advance where the trucks were to be parked. And two additional volunteers agreed to serve coffee and cake to the studio staff and the Jaycee correspondents who wished to return to the studio after reporting in their precinct results.

Pre-Show Planning — Technical

Five cameras were to be used in the production — two of our own, three borrowed. Two were set up with zoom lenses, on tripods with dollies, to be used in the



Pittsfield Channel 2 cameraman focuses on election night activities. Another of the five cameras in use during the program is shown in the background.

special election studio in the cable system office for scanning the election tote boards, for picking up general action in the studio, and for interviews with sidewalk viewers. One camera was set in fixed position focused on the reporting desk where our anchorman and staff announcer would be stationed.

A fourth camera, in fixed position, was set up in Channel 2's regular studio, for post-election interviews with the winning Mayorality candidate and other victorious candidates. The fifth camera was in fixed position on the weather-scan for billboarding use. Two cameramen were assigned to handle the five-camera set-up: one cameraman to work the interviews, the other cameraman to operate the fixed election studio camera and the camera assigned to roam over the tote boards.



Director of Cablecasting in Pittsfield, Jon Lash, is shown at the Channel 2 console during the election returns program. He performed the triple functions of producer-director-engineer for the cablecast.

Four small screen TV sets were set up on the control console so that each camera could be monitored at all times. In addition, three television sets were placed in the windows for sidewalk viewers, with one wired to an outside speaker.

Three microphones were to be used, two lavier mikes and one hand mike. Staff announcer and anchorman were equipped with the lavier microphones; a third reporter, who would conduct sidewalk interviews, held the hand mike. Intercommunications between the cameramen and the one-man producer—director—engineer were handled through the use of three headsets.

Pre-taped interviews were placed on a single reel of video-tape, for which a cue sheet was prepared so that the engineer could quickly select the proper tape when called for by the anchorman. A third inter com connection was available to the anchorman for voice contact with the engineer so that advance requests could be made for the tape selections (see illustration of technical layout of studios).

Pre-Show — Warm-up

All personnel connected with the cablecast arrived on or before 6 p.m. as requested. The 24 Jaycee correspondents received their instructions and reporting kits and drove off to their assigned polling places; the 10 who were to report in by radio were driven to the locations by system technicians in the company's radio-equipped vehicles.

Jaycee-Ettes and cable office personnel were assigned their studio functions and were briefed quickly on the overall procedures for reporting and recording data. Then, girls assigned to each individual desk were given separate instructions on their separate functions. The instructing of the girls was timed to run into the actual program so that an aura of activity was created even before the first precincts reported in.

The staff announcer and anchorman, who had previously spent several hours together in roughing out their duties, arrived with a basic show format to share responsibilities. Additionally, the anchorman came equipped with numerous cards on which he had prepared much background data on candidates, issues, key precincts, previous elections and other items of possible interest to viewers.

An equipment run-through found all TV sets, monitors, microphones, intercom units, video tape recorder and cameras in working order, and, at 6:45 p.m. the show began.

Showtime: 6:45 - 8:45 p.m.

From the moment the program began, the advance planning proved itself. With the exception of one adding machine which broke down in the middle of reporting results (necessitating manual addition to arrive at cumulative vote totals) the tabulation of results was made with amazing accuracy in most races (we hit the exact official vote count, released the next day, on more than 75 percent of our tabulations). In the only two instances where we were more than 100 votes off a total, manual tabulations were made.

The first reports came in at 7:10 and others were received continuously until 8:15 which made it necessary to make constant changes on our tote boards. At times the workload became so heavy that board changes in vote totals were made only after several more precincts reported in, in order to report results quickly to viewers — i.e., rather than post results as each precinct reported, the girls were told to postpone cumulative vote totals until a backlog of reports was absorbed; thus, a first posting may have shown vote totals in three of 24 precincts in a given race, while the next posting may have accounted for eight of the 24 precincts, and so on until all 24 precincts reported.

By the time we signed-off, all results were in and reported to our viewers, the new mayor showed up in our studios and was interviewed, and several other winning candidates had also appeared.

Cost versus Results

Pre-show newspaper and radio advertising, contributions to the Jaycees and Jaycee-Ettes organizations, materials and supplies absorbed about \$1,000 — an amount we deemed to be a worthwhile investment in public service and good will. Subsequent subscriber comments and new subscriber gain proved to us that in Pittsfield, Massachusetts, there is indeed a large public awareness in local elections, an awareness that should be the concern of all cable operators who have the facilities to provide televised election coverage.

Cablecasting Channel 2 in Pittsfield came of age on November 7, 1967, and on election day 1968 we hope to grow taller in the eyes of the community we serve. 

A Practical Approach To Collection Problems

As presented during the Annual "Managers' Meeting" of National Trans-Video in Dallas, Texas, week of January 8, 1968, by Lew "Uncle Corny" Preston, Manager, TV Cable of Clinton (Oklahoma), a Division of National Trans-Video, Inc.

Good collections are reflections of confidence and satisfaction among customers — confidence in local management; confidence in business operation; satisfaction with product and service.

This condition is *not* automatic with business operation, but is an accomplishment achieved through careful planning in establishing a basic formula or policy for doing business, and continuous effort with plenty of "follow-through."

There are several prerequisites which I believe to be elementary and necessary to enjoying a healthy "collection performance" when doing business with the public. Here are some of these conditions in the order of importance: (1) Is my rate structure equitable as related to value and quality of product and service; (2) Are my charges compatible with the economic structure of the community and earning power of the clientele; (3) Are my billing and collection procedures convenient, simple, and free of pitfalls of confusion among customers; (4) Do I have a rate and charge policy that can be protected and defended by the management, compatible with good and fair business practices, against misunderstanding among customers due to fragmentation, horse-trading, special deals, concessions on charges, just for sake of expedient results; and (5) Do I have an effective administrative policy for "follow-through" on stubborn accounts. If these ideal requirements are met in the basic business structure and operations policy, then a manager's worries should be few. This, however, is not to say that there will be no delinquents.

Even though we all possess what appears to be a natural resistance to paying bills, in our free enterprise system there is a personal pride in paying for a job-well-done, service-well-rendered, product-well-produced, that overrides this resistance in a large majority of the public. It is the small percentage of people who use poor judgement in budgeting their personal affairs, and that even smaller minority who feel that the world owes them a living and will not pay their bills unless persuasive measures are applied, who can play havoc with a collection record. This is where diligence in administrative follow-through and cautious judgment on the part of the local manager pay off.

Delinquent accounts, loose ends left dangling in collection procedures, are cancerous and a serious detriment to the health of any business enterprise.

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Gamut 25 can be quickly and inexpensively installed between your existing cable and the

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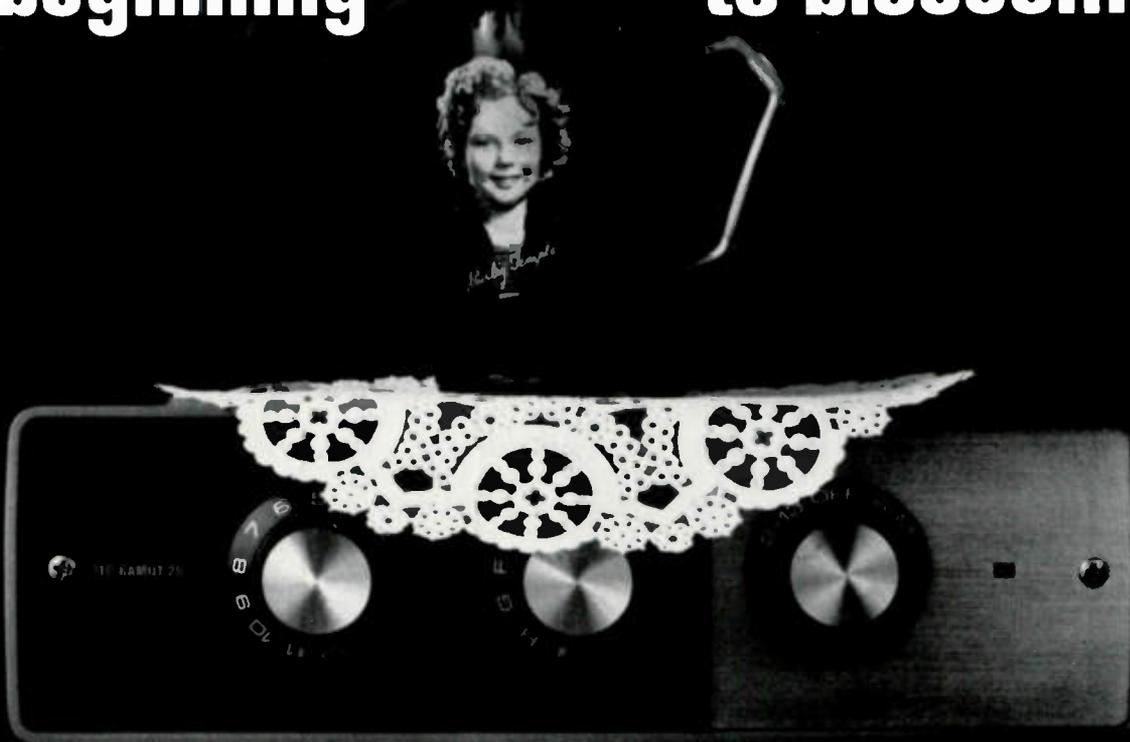
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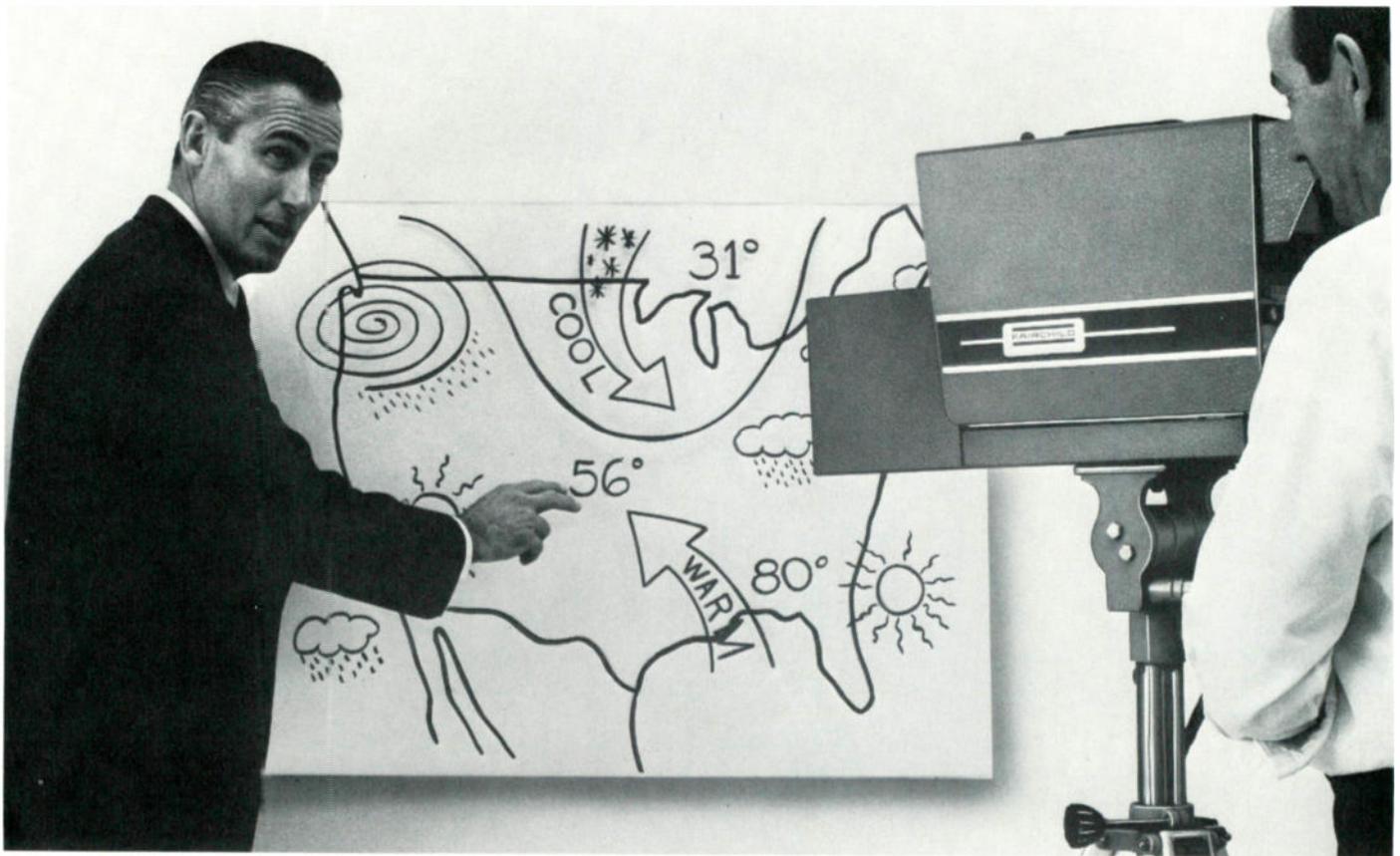
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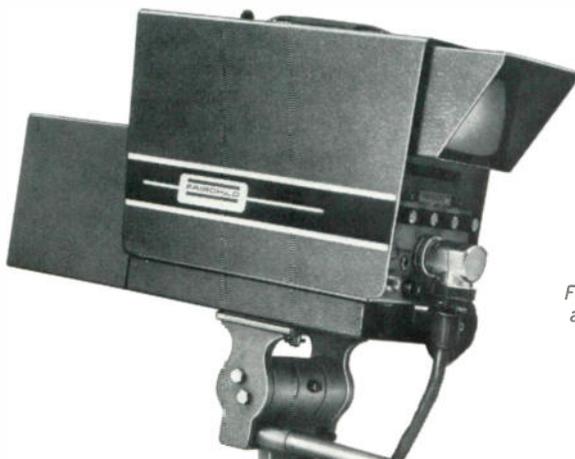


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CATV Management Consultants... What They Can Do For Your System

By Charles Wigutow
Contributing Editor

A management consultant may be called in by an ownership new to the cable television business in order to learn more about the property it has acquired and what to do with it. Or, a new cable system is scheduled to be built and the inexperienced owners are besieged by different manufacturers who present competing and conflicting approaches on how to do the job. Another and more likely reason is that potential subscribers haven't responded in anticipated numbers to the persuasive efforts of a sales campaign.

An experienced management that is overloaded may want an outside recognized expert for relief from some of the strain. Perhaps the experienced CATV executive seeks an independent evaluation before authorizing the outlay of a huge sum of money. Or a financial institution needs the seal of an objective observer to justify the granting of a loan. These are some of the many

reasons that bring a CATV consultant to the scene. And occasionally the outside professional is called upon to solve a genuine management crisis.

In the same manner that many so-called fiction books state that names and places do not represent actual persons or communities despite any apparent resemblance, the following case history does not apply to any one system. It does, however, represent a composite of typical conditions found in cable systems calling for the services of a consultant.

Let us call the subject city "Cabletown." It has a population of 25,000 and is located in a mid-western state. The Cabletown system is just short of seven years old and has reached a saturation of approximately 50%.

It delivers five television channels, the full capacity of its low band equipment. In addition, two FM stations are provided on a one time hook-up charge with no monthly fee for the extra service.

Two of the television stations, 45 miles away, can be received on ordinary roof top antennas with ten or twenty foot masts. One of these is an ABC network affiliate; the other channel is a "cherry picker" carrying both ABC and CBS programs.

Another channel 65 air miles distant is an NBC network station, receivable off-the-air with a sometimes poor to fair signal. The cable company carries these channels plus two others: a CBS and an educational station, both located 90 miles from Cabletown.

A subscriber record of growth shows the following numbers have been accumulated in the last six

years from the 7,000 dwelling units exposed to cable plant.

At the end of year 1	1,000
At the end of year 2	1,600
At the end of year 3	2,200
At the end of year 4	2,600
At the end of year 5	3,000
At the end of year 6	3,300

Now, midway into the seventh year, the number of subscribers was a little over 3,400.

The original owner had personally managed the system during the first years of operation. But in time, as the company seemed to be running normally without his full-time direction, he began spending more and more time away from the business. Finally he moved out of town leaving the routine handling to the Chief Technician and his long-time office manager.

The system had moved on its own momentum; the indication was that it was reasonable to keep it that way, especially since the rate of growth was steady. Employing a manager seemed to be an unnecessary expense. The owner felt free to vacation or spend his full time on other interests. In the seventh year of operation he decided to sell the cable company.

New ownership had found a mature system, not burdened with extra staff; a growing company throwing off a satisfactory profit. This prospect of continued calm operation by the new owners came to a sudden halt.

One of the city councilmen dropped a bomb at the meeting following the announcement of the sale. He claimed the transfer of ownership was a violation of franchise because permission of the city council had not been



Charles Wigutow

sought. Fortunately, city council approval of assignment of franchise was not required because the new owners had purchased the stock, the corporation remaining unchanged in name.

But the bomb did contain three explosive ingredients. (1) The company had been warned that in some areas reception was bad and often interrupted. (This was the result of allowing the system to run down through lack of proper attention and equipment replacement.) Unknown to the system purchaser, an ultimatum had been delivered at an earlier city council meeting that the condition be remedied by the present time. (2) Some areas had not been cabled although the franchise called for service to be available to all dwellings within the city boundaries. (3) Advertisements dating years back — even prior to the system opening — were brought up listing an independent station some 130 miles away as one of the channels to be carried on the cable. A councilman claimed subscribers had been defrauded into thinking they were to get this channel.

That's when the cry for help went out.

It may be trite to say that there is no substitute for experience but it is especially true in the cable television business. The problems are many. And they change so fast

that management has to be equipped with applicable answers even before the challenges develop.

Had a qualified person been employed to evaluate the Cabletown system before the purchase was made chances are he would have sampled opinions of subscribers and non-subscribers. He would have talked to city officials and probably to some of the more influential residents. At least he would have been fore-warned of the attitudes facing the incoming ownership. This would have been accomplished in addition to a study of the town's economy, its direction and population trends. An experienced CATV consultant has encountered many such surprises at one time or another and knows what to anticipate.

What did the consultant look for when the alarmed owners called him in? To be on solid ground, he started by reading the franchise. In this case he verified the fact that all residents were to be served. He read the minutes of the meeting in which the cable company had been censured. A deadline for correction of system problems had been set, and time was running out very rapidly. As for promises of a channel not now on cable, he looked through old newspaper files. There it was; the listing of a channel that could only be brought in by microwave. All this was corroborated by the company's oldest employees.

The consultant called on the city clerk. He explained that he had been hired by the owners to report on the status of the system, what had to be done to meet commitments and what made good business sense in the way of improvements. There would be no question of the company doing the right thing, he said, because it had too much investment at stake. The company wanted a satisfied public to deal with he explained, since that was the only sound business approach.

As a result of these preliminary steps he recommended to the new owners that a responsible official from the home office attend the next council meeting and that this official continue the theme he had started with the city

officials: that they were finding out through the services of an industry consultant what they were required to do, along with the attendant costs and methods. Such an inquiry would be expected before the incoming ownership could commit itself to extremely large expenditures.

A reprieve of six months was earned by this approach. Council members do generally respect the public trust placed in their positions and at the same time are fair with people who show good intentions. A program of keeping in close touch with the local governing body was started; the city clerk would be made aware of each step taken to improve service.

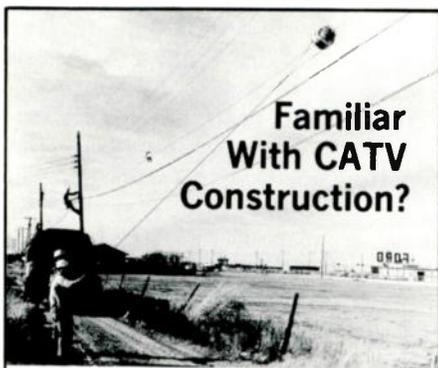
Meanwhile a technical survey by an independent consulting engineer of the condition of amplifiers, cable, and other equipment was ordered. The object was to determine how much of the system had to be replaced, to determine the equipment which would be required, and to find out which equipment could still be used if the system went all-band.

The costs of microwaving one or more channels were also studied. Since this would mean going all-band, other channels that could be picked up economically by microwave or off-the-air were explored.

Pro forma statements were prepared to show expenses and subscriber income to be anticipated for varying conditions of system improvement and enlargement of channel capacity. Thus, the decision to build, rebuild, or patch up the old system would not have to be made on hunch or pressure alone. Action could be based on a reasonable projection of growth, income, expenses, and profit.

The employees were not neglected. It was natural that they would feel uneasy at the change and view with some suspicion the entry of an outside advisor. However, they were reassured that no drastic changes were in the making; that new people were not going to displace them.

Heretofore the employees had felt no urge to push for more rapid growth. They were comfortably adjusted to the demands of the



TV Communications is now planning the contents of its special Spring Construction and Maintenance issue, with top editorial rates paid for high-quality articles on any phase of CATV plant installation or maintenance. Case histories of interest to other operators are welcomed, as well as "how to" and conceptual articles. Address inquiries or materials to Bob Searle, Managing Editor, TV Communications, 207 N.E. 38th, Oklahoma City, Oklahoma 73105.

present number of subscribers. They felt the town was pretty well saturated. Weren't half the homes on the system? Everybody knew what the cable was, and if they wanted cable service they would have ordered it by this time, it was felt.

They thought that special offers of installation at lower prices would only cheapen the company image.

However, a question was raised by the consultant. If one half of the families subscribed to cable television, what was so different about the other half that they shouldn't also be on the cable? Perhaps it was an extra push that was needed. A bargain installation offer might be just the thing if the standard installation charge had become the barrier to selling installations. Change of ownership would be a good public reason to change the basic sales policy.

The cost of a promotion campaign was minor compared to the immediate return of \$60 a year from each of the new subscribers.

An additional advantage was to be gained in addition to the immediate financial benefit. With a broader subscriber base in the community, the company would be more secure politically. With almost everybody in town on the cable, critics of the cable system would have that much less chance of affecting its position in the community.

Of course, the American characteristic of "keeping up with the Joneses" was not overlooked. When almost everyone is a cable subscriber, those not on, feel left out of things. Instead of 50, 60, or 70% saturation being considered impenetrable, going beyond such a ceiling is normal for systems like the one in Cabletown, provided service is good — and well promoted.

The sales campaign was begun. The results soon became evident.

The act of acquiring more subscribers set a beneficial cycle in operation. With more subscribers and greater revenue, the money to justify improvements and additions to cable service was available. And because these improvements were being instituted the cable system became even more attractive to the more

stubborn holdouts among potential subscribers.

The employees, too, responded to a resurgence in activity. On the whole, they were no longer trying to hold the organization down to a comfortable pace. With the introduction of a group incentive plan for their help with the sales promotion efforts they began to share an enthusiasm for growth.

This increase in subscriber numbers helped the system weather the obstacles facing it. Growth itself was a demonstration to the

city council that the company and its policies were supported and well regarded by the community. The job of appeasing critical members of the city council was not over by any means, but the way to normal relations was made much easier.

Community relations work is a continuous requirement for every cable system. But the process can be greatly expedited, and the long-range prospects dramatically improved, by a professional CATV management consultant. 

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Our engineers can help you make cablecasting more effective with complete equipment and programming packages tailored to your individual requirements. Arizona Factors, Inc., program packages are custom-designed specifically for cablecasting. Film features covering a wide variety of subjects are available in any combination. Several money-saving options enable you to fit optimum quality to your budget. For complete information on more effective, more profitable cablecasting for your system, contact us. We'd like to tell you about it.

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Successful Programming On Selden, New York System

By Arthur Gusow
Director of Marketing
Broadway Maintenance CATV Corp.

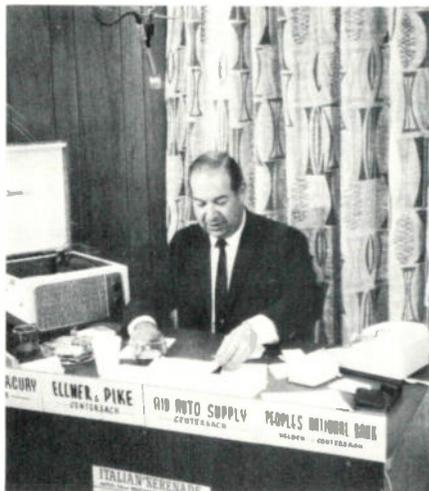
Our system in Selden, New York has initiated a local origination schedule which includes four live and taped shows weekly, as well as special events coverage and a continuous automatic message board. This writer is responsible for program production and handles the master of ceremonies duties, while technical operations are in the province of our system engineer, Stew Helmig. In establishing the format and goals of our cablecasting operations, it was necessary to take into consideration the fact that the area we serve is located only 50 miles from New York City — giving residents a choice of six to eight off-the-air channels. And more importantly, very little community identity is evidenced by the population.

The first show we produced was "What's the Answer?" done live Wednesday evenings from 6:30 to 7:30. From our subscriber list we select names and phone numbers, and call those chosen. We ask them rather easy questions and if they answer correctly, award them prizes — all donated by local businessmen for mentioning the name of their products and services. The subscriber called is then asked to identify a mystery singer or orchestra whose record was being played, and is awarded a \$25 savings bond if he guesses correctly. The popularity of this program can be attested to by the fact that over 75% of the people called during the program are tuned in to Channel 6, our local origination channel.

Our second show is a children's clown show, "Beep-Beep" the clown, which is cablecast on Saturday mornings from 10:30 to 11:30. Subscribers are invited to write in or call us for tickets so that their children can be on the show. The

only tickets now available are for six to seven months from now — clearly indicating the interest in this particular type of program.

On Tuesday evenings, 6:30 to 7:30, we have added a show called the "Beef Box." This program is



Arthur Gusow on-camera during "What's the Answer" program. Popular with local sponsors, the show is watched by about 57% of the system's subscribers.

divided into two parts. The first half of the show is made up of videotaped interviews with community residents at various locations around town such as banks, supermarkets, department stores, etc. During the interviews, people are asked to give their opinions on various topics of general interest. The second half of the program is done live in our studio with a guest — usually someone involved in work of special interest to viewers, such as representing the Better Business Bureau, entertaining, or selling insurance. We utilize a speaker phone and give subscribers an opportunity to call in and ask questions relating to our guest's specific field.

On Thursday evenings, 6:30 to 8:00, we cablecast what we think is probably our most ambitious show. It's "The Sal Richards Show," featuring a local singer and comedian. The format is similar to a Johnny Carson or Merv Griffin show. We have a guest quartet each week and four or five other talented guests who all donate their time in exchange for being showcased.

All of our shows are sponsored by prominent businessmen around town — in fact, we have a waiting list for those who wish to be sponsors.

As you will note, the programs are scheduled between 6:30 and 8:00 p.m. not to interfere with most prime network viewing. The rest of the time we utilize a Trans-Lux message drum on which we feature weather, birthdays, local public service announcements, and contest information.

From our experience, we conclude that, in a metropolitan area, a cable system operator must remember that people like to feel they are part of a community, knit together by common interests. Our local programming has served to create a general interest in community affairs which was previously nonexistent. This factor has helped substantially in adding subscribers. The local people have begun to identify with our cable system as their own exclusive "club" and, as a result, have become our most effective sales representatives. In addition, we have found that our programming has also been very successful in keeping old subscribers happy.

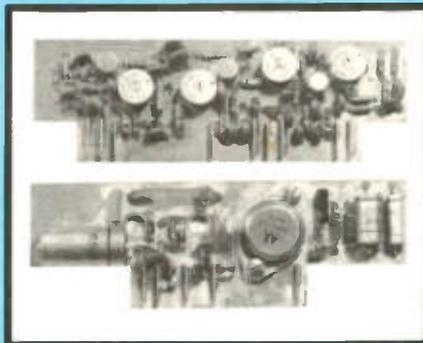
In sum, the locally originated programs have proven more successful than we anticipated, both as a sales tool and an additional source of income. TVC

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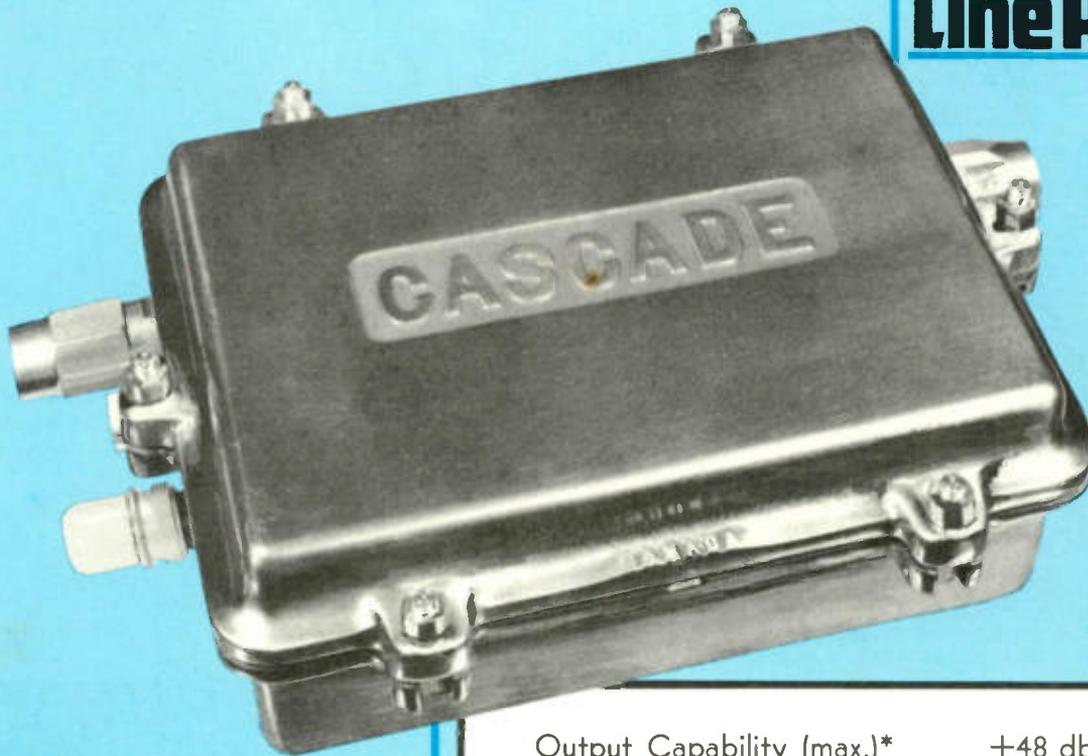
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(Average @ 65°F.)	210 ma @ 32 VAC(max)
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—Ch 13	+10 dbmv
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LITHO IN CANADA



Computerized Billing for Profitable System Operation

By Robert C. Hilliard, Partner
Co-Axial Systems Engineering Company
Palos Verdes Peninsula, California

Operating a company by "seat of the pants" decisions is equivalent to trying to run a cable television company using a country store approach. Both can prove successful but rest assured it's like taking the long trek home.

Our firm, Co-Axial Systems Engineering Company, has gone both routes. Originally formed in 1956 by two electrical engineers, Vern Gill and this writer, the company started out as a family operation. Cable hookups for subscribers were often made on weekends by a pair of brothers-in-law assisted by some friendly neighbors. Quick decisions based on how much could be done in the shortest possible time without hurting the quality of our product were commonplace. Surprisingly enough, we grew and grew until in 1964 the business became too big and the company reorganized the following year.

Today we have five fully operative, separate systems in several communities of Southern California. We also have franchises for additional systems in Los Angeles, Orange and San Diego Counties. At this writing, we have more than 3,000 subscribers and are averaging 65 new subscribers a month. (Of these, 1,900 have secondary outlets.)

While there are many reasons we can point to for our successful growth, one of the contributing factors was the installation of an automated billing system. This modernized billing system means more to Co-Axial Systems Engineering Company than just the low costs of billing our subscribers monthly. For less than \$350 per month, we not only have our collections, deposits and payment registers prepared but, more important, we are now able to have absolute standard costing informa-

tion available immediately. Today, we can now predict our costs to the cent as we hook up new subscribers. As a result, we have improved each flow and better control over delinquent accounts.

All of this is accomplished using a computer we don't own. Actually we "hire" a computer as part of Bank of America's "Billing Service Plan." Under this system, B of A's Business Services Center handles the billing of our subscribers from start to finish for a nominal charge.

Our end of billing preparation couldn't be simpler. All we do is fill out an entry card for the new subscriber listing his name, address and the monthly charges, and the bank's Business Services Center does the rest.

Each month the bank mails out to our subscribers a bill-payment card, a record of the bill and a return envelope. As payments are received at the bank's post office box the bank then handles the deposits and credits our account. Each day we receive a payments register by service area (services go into different cities and counties) from the bank along

with a control register listing the new accounts, closeouts, address changes and a daily payment control.

Under the old system, all of this was done manually. Even though coupon books were sent to subscribers, the real work in our office was in making deposits, crediting accounts, registering checks, making out deposit slips, preparing the payment register and maintaining a delinquency list.

If we had retained our manual system with our current number of subscribers, we would have had to add another employee to handle this workload. Now, however, one person has complete responsibility for maintaining control over our 3,000 accounts. Furthermore, she still has time to handle new account scheduling, change of addresses and scheduling of new installations.

Each month we receive a balance due report which enables us to put our finger on delinquent accounts. Every 60 days the computer provides us with a bill register giving total year-to-date figures and basic rates. Thus, we are now able to forecast future costs from

Supervisor Bob Hubert is kept busy adding 65 new drops per month.

Well over half of the homes served have second sets.



our current financial picture more accurately.

With the billing problem under control and with current and accurate information now available, management is able to devote its full energies to providing better service to our subscribers as well as promote new business.

Currently we have an energetic

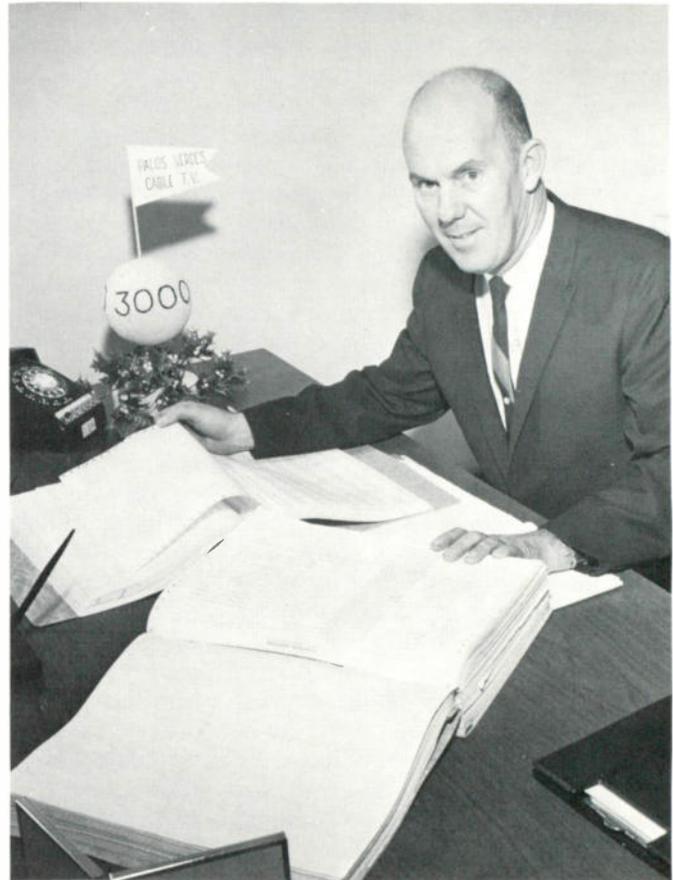
wait for potential subscribers to come to us. We must solicit them.

Along these lines, promotional literature has been prepared and sent out to potential subscribers. In it we compared such items as a pack of cigarettes, a quart of milk, a gallon of gas or a couple cans of soda pop a day to what it costs for having cable television service

activity, etc. In this vein, it is worthwhile to point out that by using the B of A billing service a fixed cost per subscriber is the only added expense for billing, tabulating, and depositing, etc. that the system operator incurs. Most of the intrinsic responsibilities can easily be carried by the existing staff, thus a large share



With computerized billing, the cable system bookkeeper simply fills out an entry card for new subscribers, listing name, address and monthly charges. The automated billing system does the rest—including collections and deposits.



Robert C. Hilliard, one of the firm's founders, is shown checking the daily payments register he receives from the billing service, along with a register of new accounts, closeouts and address changes, and a payment control.

promotional program underway with television dealers in our areas. Under this plan, a customer purchasing a new color television from these dealers is given a gold certificate entitling him to free installation costs up to \$25. Furthermore, this certificate is transferable and may be used as a gift certificate, if he so desires, allowing one of his "un-cabled" friends to be hooked up.

While the advent of color television has been like a transfusion to the cable television business, our philosophy has been we cannot

each day. Since we provide 12 full channels to our subscribers — including two from San Diego located 110 miles away and three UHF channels in Los Angeles — we feel the product we offer is well worth the effort.

Our results thus far have been very gratifying. Over the months to come, new promotions are planned and we expect our subscriber list to continue to grow. Along with a high rate of growth comes the natural increase in operating costs such as technical services to the system, increased office

of this increased income can go into the profit column.

The idea of going back to any form of in-house billing is a frightening prospect. Knowing exactly what it will cost us to set up the basic bookkeeping on a new account is a very valuable tool of management. Without it, I think it is safe to say we would still be making seat-of-the-pants decisions in the most sensitive area of managerial concern and probably be guilty of running a major function of a space age business like a country store. TVC



“I recommend **KAISER**”

I recommend Kaiser right from the ground up. We opened our CATV operation here in Gainesville last year. Our system is a Kaiser “Turnkey” Operation. We found our system levels were so stable that they were not touched for over 6 months.

After we had been in operation for about one year, a decision was made to expand our area of service. We chose Kaiser for this extension because we have seen the quality of product in the field, and felt that we could depend upon it in all our future systems.

Mr. John Jacobs
President
Gainesville Cable Vision Co.
Gainesville, Georgia

FOR DELIVERY, SERVICE, PERFORMANCE YOU CAN COUNT ON . . .

KAISER
CATV

KAISER CATV CORPORATION / P.O. Box 9728, Phoenix, Ariz., 85020, Phone (602) 944-4411
member, world famous team of Kaiser Affiliated Companies

Classification Codes For CATV Coaxial Cables

By S. A. Mills, Engineering
And Production Vice President
Ameco Cable, Incorporated

"Cable for the Birds"
"Horsing Around with Cable"
"Our Cable's Gone Fishin' "
"Mr. Cable Goes to College"

Eye-catching phrases for some of today's advertisements? Possibly — but, in reality, a much greater significance is involved.

For many years, manufacturers of electrical wire and cable recognized the need for a simplified method of identifying their products in catalogs, sales orders, invoices, production records, etc. A series of "code" words was developed and assigned to many of the different sizes and types of cable constructions used in the overhead transmission of electrical power. Since a large percentage of the cables classified employed the use of aluminum or aluminum alloys in their construction, the Subcommittee on Electrical Conductors of the Aluminum Association's Technical Committee undertook in 1960 the task of systematizing the code words to be used in their product classifications.

At the present time, there are over 1400 "code" designations categorized by the Aluminum Association to identify cable configurations and constructions used for the overhead transmission of electrical power.

Under their system of identification, various species of prominent subjects such as "birds", "horses", "flowers", "fish", etc. are utilized. For example — No. 2 AWG bare ACSR conductor composed of six strands of aluminum and one strand of steel is simply, quickly

and accurately identified by the name "Sparrow". Similarly, a more complex four conductor quadruplex cable consisting of No. 2 AWG polyethylene insulated phase conductors and a No. 2 AWG, 6/1 ACSR neutral conductor, is easily identified and classified by the name "Palamino".

During the past few years, the tremendous growth of underground distribution of electrical power has created a whole new generation of cable configurations. As with overhead cables, a simplified identification system has been developed using the names of colleges. Today, "Sweetbriar" and "Vassar" refer not only to the residency for pretty girls but they are also the means for quickly identifying the constructional details of two underground residential distribution power cables.

Utilization of a simplified code

identification system such as these to identify individual cable configurations, minimizes the confusion and errors that can arise between the manufacturer and the consumer.

During the past few years, the CATV industry has grown in size and complexity. With it, there has been a corresponding increase in the variety of cables developed or adapted to serve its needs. Varying installation conditions, system demands, personal preferences, and manufacturing techniques have expanded the number of cable configurations available for use to well over 150 different types. It is unlikely that this trend will subside. On the contrary, new demands and new advances in technology will most certainly increase the number of available cable constructions.

Recognizing that confusion can

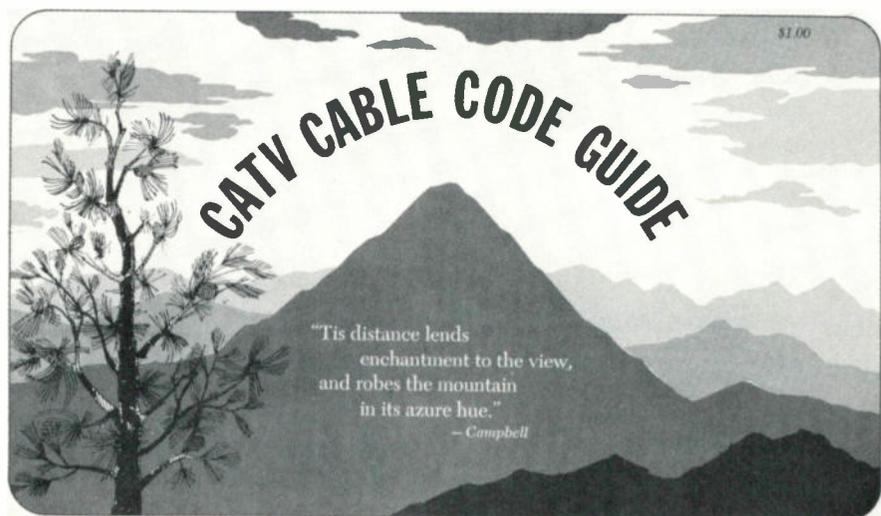
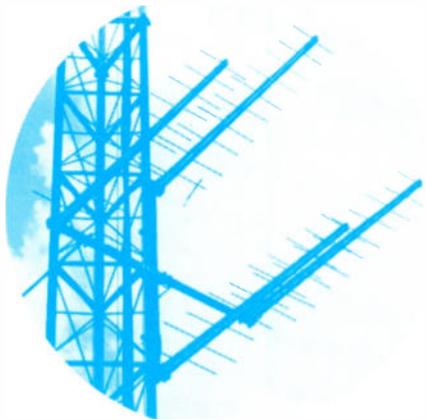


Figure A. Ameco Cable's "CATV Cable Code Guide", shown here at about 60% scale, is available to all interested parties from that firm.

IMPROVE YOUR IMAGE...



TOP

QUADRATE CHANNELER ANTENNAS

-eliminate co-channel interference with high gain, wide band, narrow beamwidth design. Standard configurations available for VHF, UHF, and long distance applications.

TO

PREAMPLIFIERS

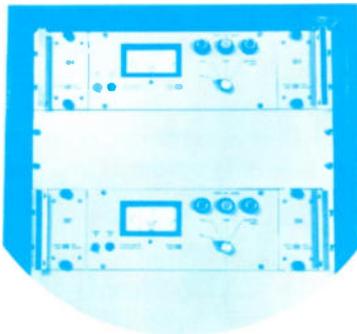
-minimize adjacent channel interference with reliable solid state construction. Field-effect-transistor front ends can accept 10 to 20 dB higher unwanted signal levels than ordinary bi-polar transistor preamplifiers.



BOTTOM

RECEIVERS

-optimize head-end performance with low-noise modular units. Separate AGC systems eliminate the effects of selective fading. Field-effect-transistor RF amplifiers minimize spurious responses and cross modulation. Compatible with existing commercial equipment.



For further information, contact
Tom Smith, Marketing Manager,
CATV

SCIENTIFIC-ATLANTA, INC.

Box 13654, Atlanta, Ga. 30324

Tel. 404-938-2930, TWX 810-766-4912.

and does exist from such a large variety of constructions, and, as a service to the CATV industry, Ameco Cable, Inc., has devised a simplified reference system whereby cables used for CATV and associated fields can be identified and referred to by a single "code" name.

a 53-page *CATV Cable Code Guide* manual has been prepared (see Figure A). For ease of handling, the various cable configurations have been classified into five categories:

- (1) Aluminum sheathed CATV cables.
- (2) Polyethylene jacketed cables.

If a polyethylene jacketed .412" cabled manufactured with a seamless aluminum sheath is required, use the code name "Columbia". Likewise, in the drop cables classification, "Etna" quickly identifies the standard drop cable having an .0253" copper-clad steel conductor, solid polyethylene in-

CODE NAME	PART NO.	DESCRIPTION	APPLICATION
PANTHER		0.114" Solid Copper Conductor; Cellular Polyethylene Dielectric; .005" Corrugated Copper Shield; Longitudinally applied, .134" Solid Galvanized, Grade 190, High Tensile Steel Support Wire; High Molecular Weight Polyethylene Jacket, Integral Messenger Extrusion. Nom. Overall Diameter: .650" x .965"	Trunk Cable. Self-supporting cable for overhead installation. Suitable for installation in areas of salt spray, salt fog, or where exposed to industrial contaminants. Min. Breaking Strength of Messenger: 2680 lbs. Generally considered suitable for "light" loading districts. Follow manufacturer's recommendations for messenger size suitable for your area.
PERKINS		0.114" Solid Copper Conductor; Cellular Polyethylene Dielectric; .005" Corrugated Copper Shield; Longitudinally applied; .148" Solid Galvanized Grade 190 High Tensile Steel Support Wire; High Molecular Weight Polyethylene Jacket, Integral Messenger Extrusion. Nom. Overall Diameter: .650" x .980"	Trunk Cable. Self-supporting cable for overhead installation. Suitable for installation in areas of salt spray, salt fog, or where exposed to industrial contaminants. Min. Breaking Strength of Messenger: 3260 lbs. Generally considered suitable for "medium" loading districts. Follow manufacturer's recommendations for messenger size suitable for your area.
PIKE'S PEAK		0.114" Solid Copper Conductor; Cellular Polyethylene Dielectric; .005" Corrugated Copper Shield; Longitudinally applied; 1/4", 7/.080" Extra High Strength Grade, Class "A", Galvanized Steel Stranded Support Wire; High Molecular Weight Polyethylene Jacket, Integral Messenger Extrusion. Nom. Overall Diameter: .650" x 1.085"	Trunk Cable. Self-supporting cable for overhead installation. Suitable for installation in areas of salt spray, salt fog, or where exposed to industrial contaminants. Min. Breaking Strength of Messenger: 6650 lbs. Generally considered suitable for "heavy" loading districts. Follow manufacturer's recommendations for messenger size suitable for your area.

Figure B. Pages of the code booklet are laid out as shown, with space provided for manufacturer's part number.

Since the CATV industry was born and bred upon the concept of capturing and relaying television signals from areas of higher elevation, it would seem appropriate that the names of "Mountains" be used as the basic reference system.

In this initial analysis, some 125 of the more widely used CATV cable constructions have been selected and assigned "code" identifying names. As an aid in its usage, certain constructional types have been assembled and classified as a group. For example, solid aluminum sheathed cables are identified by mountains starting with the letter "C"; seam-welded aluminum sheathed by mountains starting with the letter "S"; and sealed aluminum tape constructions by mountains having "M" as their starting letter.

To implement this code identification system by the industry,

- (3) Integral messenger supported cables.
- (4) CATV drop cables.
- (5) Integral messenger supported drop cables.

As shown in Figure B, each item has been listed in a four column arrangement as follows:

- (1) *Code Name* — The assigned code designation.
- (2) *Part Number* — A column for listing manufacturer's part numbers for the item.
- (3) *Description* — A brief description of the cable listing its basic constructional details.
- (4) *Application* — A brief summary of the areas of intended use.

To put this manual to use, simply look up the description of the cable under consideration and use its assigned code designation. For example, standard unjacketed .421" cable manufactured with a seamless aluminum sheath is identified by the code name "Camelback".

80%-84% shield braid coverage and an overall polyvinyl chloride (PVC) jacket. The similar construction having 95%-98% shield braid coverage, is identified by the code name "Evans".

It is hoped that through widespread use of code names, the cable manufacturers and the consumers will find a common reliable means of precisely identifying the cable items required for the applications intended.

The anticipated continual growth of the CATV industry will most likely introduce additional cable constructions. As these cable configurations are generated, it is hoped that corresponding code names will be assigned.

Copies of the *CATV Cable Code Guide* manual are readily available to all interested parties upon written request to Ameco Cable, Inc., P. O. Box 6760, Phoenix, Arizona 85005. TVC

The CAS TRA-217 line extender amplifier



... designed for the cable system that doesn't need everything (and wants to pocket some big savings!)

*This reliable CAS line extender amplifier
does everything everyone else's line extenders do,
yet costs considerably less!*

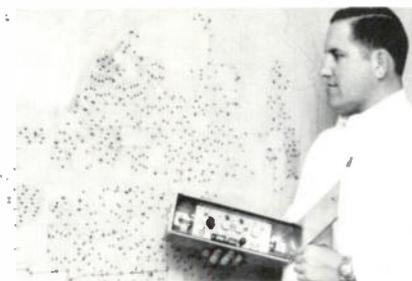
Here's some plain talk about amplifiers.

CAS line extender amplifiers are weatherproof, not waterproof. As a matter of fact, they won't float either. They install cover down on the cable, operate reliably during blowing rains, snow, hail, and sleet. When the sun comes out they keep right on operating.

CAS has nothing against modular construction. But plug-in replacement *does* cost you more. It's a nice feature when and *if* you need maintenance.

Quite frankly, CAS feels its TRA-217 amplifier maintenance history *doesn't* justify the additional cost of modular construction, so it builds a minimum maintenance unit and passes the savings on to you.

If a CAS amplifier ever does require maintenance, there are



only six screws between you and disassembly.

Here's what Mr. Dale Mathis, (above) chief engineer of TV Cable of Abilene, Inc., says about the reliability of CAS amplifiers:

"We now have 670 CAS TRA-217 amplifiers in over 250 miles of system. Most of these amplifiers have been in operation since 1964.

In the past 12 months we have had only 7 failures from all causes."

If your system doesn't really demand the additional cost of hermetic seals, modular construction and other design frills, you're missing a good buy.

There's a CAS low or all band transistorized amplifier to fill your requirements... from a short run down the alley to a 250-plus mile system.

All you save is money.



P. O. BOX 47066 • DALLAS, TEXAS 75247
214/BL 3-3661

Construction Reports

Melbourne, Fla. — 1,600 government employees and service personnel at Patrick Air Force Base are now being served by Florida TV Cable Co., Inc. The system, which is jointly owned and operated by Jerrold Electronic Corp. and Meredith-Avco, carries nine channels from Daytona Beach, Tampa, Orlando and West Palm Beach. The equipment used is Jerrold-manufactured. Construction is both aerial and underground.

Palatka, Fla. — Entron, Inc. was awarded the contract for installation of a 12-channel cable system which is to serve a potential 5,000 customers of General Cablevision of Palatka, Inc. The turnkey installation will involve design, engineering, cable and equipment installation. Construction is supervised by Systems Construction Corp., an Entron subsidiary.

Waterville, Maine — The Waterville Cable-TV Co. has announced that the 25-mile system under construction by

the New England Telephone and Telegraph Company is nearing completion.

South Haven, Mich. — About 350 trial customers have been on the system in South Haven for 3 months and service is now available to all residents. General Telephone & Electronics Communications, Inc., was the installer.

Cookeville, Tenn. — System engineering has been completed and construction is under way for the Putnam County CATV, Inc. System at Cookeville.

Brownwood, Tex. — The Brownwood Television Cable Service is in the final stages of completely overhauling its distribution system in all areas of Brownwood. The system also has new office facilities which are soon to be occupied.

Fairfield, Tex. — Cen-Tex Cable TV Company, a subsidiary of Texas Telephone and Telegraph, has let a contract for the purchase of system equipment. The system will be installed in Fairfield and Teague and the company plans to provide eight channels, background music, and a weather information channel. TVC

System Sales

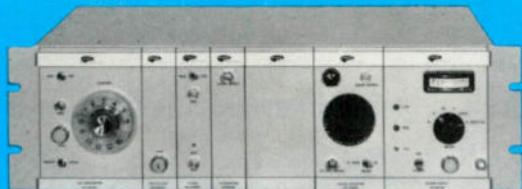
Sinclair TV Association, cable television system in Sinclair, Wyoming, has been purchased by the **Tele-Prompter Corporation**. Sinclair was owned by the Sinclair Employees Association, made up of employees of the Sinclair Oil Company, which founded the town of Sinclair.

Cable systems located in **McGehee, Dermott, and Lake Village, Arkansas** have been purchased by pioneer CATV operator **Jim Davidson** from Philip Farr, Jr.

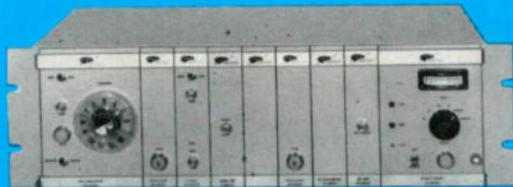
The Berks TV Cable Company, CATV system operating in Reading, Pennsylvania and several surrounding communities, has been sold today by Mr. Fred Correale of Hazleton, Pennsylvania to a group headed by **Milton J. Shapp** of Philadelphia. Purchase price was not disclosed. Shapp has also received FCC approval for the cash purchase of 37.8% interest in a **Greensburg, Pa.** radio-CATV firm, **WHJB, Inc.** Control of the firm will be shared with **Melvin A. Goldberg**, WHJB president, who will vote 30.5% worth of stock. TVC

WHEN IT COMES TO HEAD-ENDS

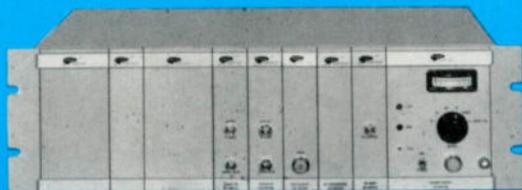
... can you afford anything but the very best?



TELEVISION DEMODULATOR



HETERODYNE CONVERTER



AUDIO/VIDEO MODULATOR

The most critical part of any CATV system is the head-end and, so far, not even the best has been good enough. But now, DYN AIR can supply a completely solid-state head-end package — to your specifications — that will perform with broadcast precision.

DYN AIR head-end equipment includes all three basic signal-processing units, with interchangeable modules used to minimize maintenance problems. Sophisticated military-type RF shielding on each module eliminates interference common to equipment using standard commercial packaging. Precise frequency control and AGC circuitry assures interference-free full-color pictures.

Not just another head-end, but truly professional equipment designed by a company with years of experience with broadcast television transmission and solid-state CATV head-end equipment.

WE DIDN'T CUT CORNERS . . . SHOULD YOU?

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TELEPHONE (714) 582-9211



The experienced manufacturer of solid-state head-end equipment.

February 1968

TV Communications

CATV Technician



Plant construction. Community Aerial Inc., Mineral Wells, Texas. Photo courtesy Clifton Machine Works.

Fundamentals of Distortion • Report on "Expo" Antenna • Latest CATV Products

Get higher performance at lower cost

You'll find Blonder-Tongue specifications are among the industry's highest. More important, extensive tests by independent laboratories verify that B-T equipment actually meets or exceeds these specifications. And, B-T's rigid quality control standards assure you of top performance from every unit.

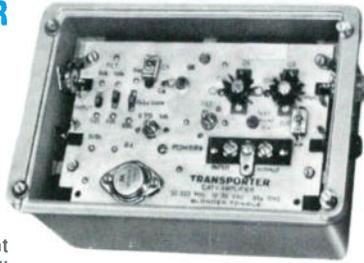
Durable, too. All components operate well below rated parameters for longest life. Each unit is designed

for optimum results to provide the highest performance over a wide range of operating conditions.

That's not all. You'll find that Blonder-Tongue equipment is priced to offer you exceptionally low cost per dB. The result: Optimum system performance and economy.

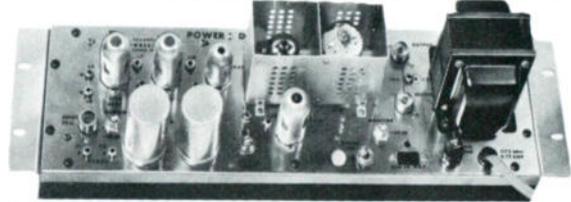
We are pleased to show here just a few of the many money-saving Blonder-Tongue units in stock at Pruzan Company.

TRANSPORTER



A solid state, high output, extremely flat VHF trunkline amplifier.

Features variable gain and tilt controls which permit adaptation of unit to all types and lengths of cable normally used. Power links enable unit to be powered from line input or line output with power stop provision. Specifications: **Bandpass:** 50 to 220 MHz \pm 0.25 dB maximum; **Gain:** 24.5 dB minimum; **Output Capability:** 51 dBmV for each of 12 channels, 1 amplifier, for -57 dB cross modulation.



POWERDRIVE

A single channel VHF amplifier.

This high gain, high output amplifier has exceptional stability. Less than 1 dB change for 20% line voltage change. No change in output due to line surges and no external voltage regulator is needed. Specifications: **Gain:** 58 dB minimum; **AGC:** 40 dB range with less than \pm 1/2 dB output change for 40 dB input change; **Output:** 6 Vac for amplifier station operations. Modified to 1 Vac for CATV headend use. Backmatched; **Bandpass Flatness:** 6 MHz \pm 1/2 dB.



COURIER

A solid state VHF trunkline amplifier with the highest output capabilities in the industry.

AGC controlled, this very flat, high gain, low noise amplifier has a zener diode-referenced transistor regulated power that permits operation with cable voltage from 18 to 30 Vac. No hum bars appear for power inputs below 18 Vac.

TRUNKETTE



Perfect for use as a line extender or for short trunklines. Built like the larger trunkline amplifiers, the Trunkette is extremely rugged in design. It features high output, wide power supply voltage range, and variable gain and tilt control. Will accept cable power from either end. Specifications: **Bandpass:** 50 to 220 MHz \pm 1 dB; **Gain:** 18 dB minimum; **Output Capability:** 48 dBmV for each of 12 channels for -57 dB cross modulation.

CATV, Communication & Power Line Supplies **PRUZAN COMPANY**

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Please send me more information on Blonder-Tongue's:

Trunk and distribution equipment Lab Line

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The Fundamentals of Distortion In CATV Amplifiers

By Ken Simons
Vice President — Research and Development
The Jerrold Electronics Corporation

This article presents an elementary introduction to the nature and effects of the non-linear distortion in CATV amplifiers. Two forms of distortion are important: second order distortion which results, in extreme cases, in the compression of one peak of a sine-wave and the expansion of the other; and third order distortion which results, in the extreme case, in compression (or expansion) of both peaks. It is shown that the effects of second order distortion may be analyzed by an equation involving a linear term and a term proportional to the input voltage squared, while the effects of third order distortion can be analyzed by an equation including a linear term and a term involving the input voltage cubed.

In present CATV systems, second order distortion is generally not considered because it results in distortion products at frequencies which are either sums, differences, or second harmonics of the carriers present and, with the standard frequency assignments, these products fall outside of the channels used.

Third order distortion is the limiting factor in determining permissible output levels in most CATV amplifiers since it results in cross-modulation between channels, and beats between carriers which fall inside the channels being used.

Introduction

Distortion in sound reproducing equipment is familiar to anyone who has heard a worn-out juke box, or an overloaded public address system. This harsh, unpleasant sound presents the essential nature of all distortion: What comes out of the system is different from what went in! In CATV, distortion does not show up in the same way, but it is present, and it places restrictions on amplifier operation which must be understood if a system is to be intelligently planned and operated.

The amplifiers used in CATV have only one intended function: to increase the signal levels. The other things they do, the differences they generate between the outgoing signals and the incoming signals, are distortion. What forms does this distortion take? Several effects properly called distortion, such as the addition of noise to the signal, hum modulation and variations in amplifier frequency

response are NOT the subject of this article. It is concerned with only one kind of distortion: effects due to the same causes that create "harmonic distortion" in audio amplifiers.

This distortion is due entirely to non-linearity in the transfer characteristics of the transistors. Its worst aspect is cross-modulation, crossing over of the modulation from one channel to another, which causes "windshield wiper" effects in the picture. Other effects include harmonics, where an unwanted signal is generated at a frequency which is some multiple of the frequency of a wanted one; and beats, where two or more wanted signals combine to generate an interfering one. These harmonics and beats can combine with the carrier on the channel in use to cause "herringbone" patterns in the picture. A study of distortion will help in understanding how CATV amplifiers can be operated to avoid these problems.

Distortionless Amplification

Perhaps the simplest way to describe amplitude distortion is to say what it is NOT. A distortionless amplifier would

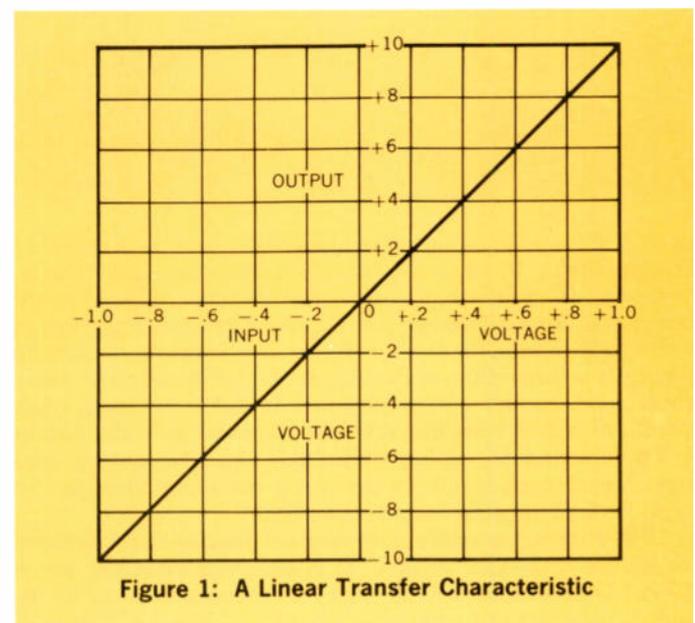


Figure 1: A Linear Transfer Characteristic

be one which increased the amplitude (voltage swing) of the input signal without changing its waveform. Suppose, for

example, an amplifier could be built so that the output voltage, at each instant, was exactly 10 times the input voltage. A graph showing the output voltage plotted against the input voltage would be a straight line, as illustrated in Figure 1. Such a graph is called the "transfer characteristic" or "input-output curve," for the amplifier. A transfer characteristic which is a straight line is called a "linear transfer characteristic."

Mathematically, the performance of this amplifier would be described by the equation: $e_{out} = 10 e_{in}$; where e_{out} is the instantaneous output voltage, and e_{in} is the instantaneous input voltage. Calculating for particular voltages would give us Table A. This is the table from which the characteristic of Figure 1 is plotted.

The way in which such a linear transfer characteristic results in an undistorted output is shown in Figure 2. A plot

e_{in}	$e_{out} (= 10 e_{in})$	e_{in}	$e_{out} (= 10 e_{in})$
0	0	0	0
-0.2	-2	+0.2	+2
-0.4	-4	+0.4	+4
-0.6	-6	+0.6	+6
-0.8	-8	+0.8	+8
-1.0	-10	+1.0	+10

Table A

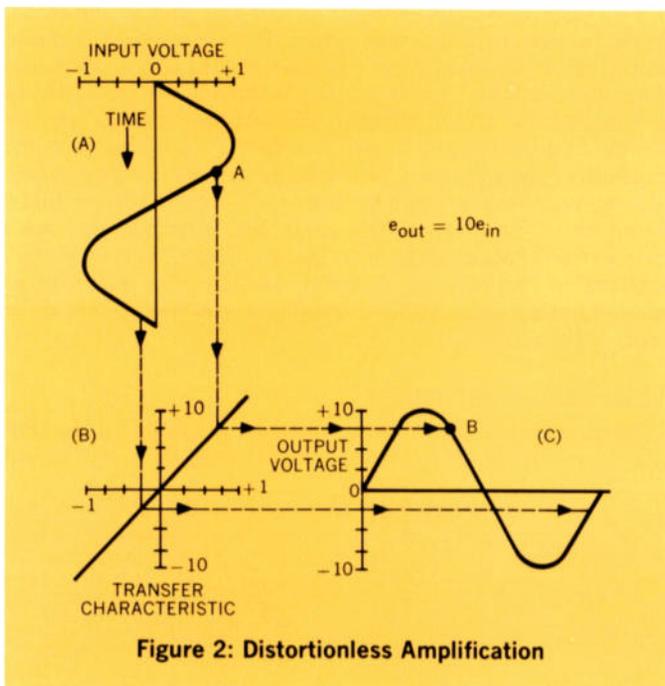


Figure 2: Distortionless Amplification

of the sinusoidal input voltage against time is illustrated [Figure 2(a)]. If, at each point along the time scale, the instantaneous input voltage is projected downward to the transfer characteristic [Figure 2(b)], the corresponding output voltage is found. Projecting this to the right, and plotting against the same time scale constructs graphically the waveform of the output voltage [Figure 2(c)]. For example, when the input is 0.75 volts and decreasing (point "A"), the output is 7.5 volts and decreasing (point "B"). Since the output voltage at each time is simply ten times the input voltage, the output duplicates the input waveform.

Distortionless amplification does not require that the input be a pure sinusoidal voltage. It is achieved when the waveform of the output voltage precisely duplicates that of the input, regardless of what that waveform may be. Figure 3, for example, presents a diagram similar to Figure 2 except with a pyramidal input, showing how an identically-shaped pyramidal output results.

Amplification with Distortion

Unfortunately, amplifiers that can be built using real-life transistors do not have a linear relationship between the input voltage and output voltage. Figure 4 illustrates a non-linear transfer characteristic which might be found in a real amplifier. As the input voltage swings either way from 0,

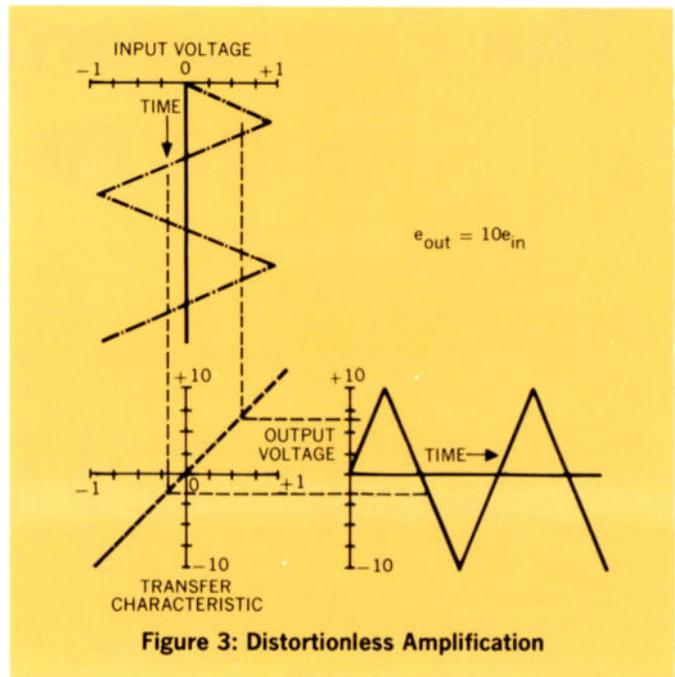


Figure 3: Distortionless Amplification

the output changes along a curve which produces less and less change in output voltage as the input swings further and further from 0. In the example illustrated, were the output to continue increasing along a straight line at the same rate

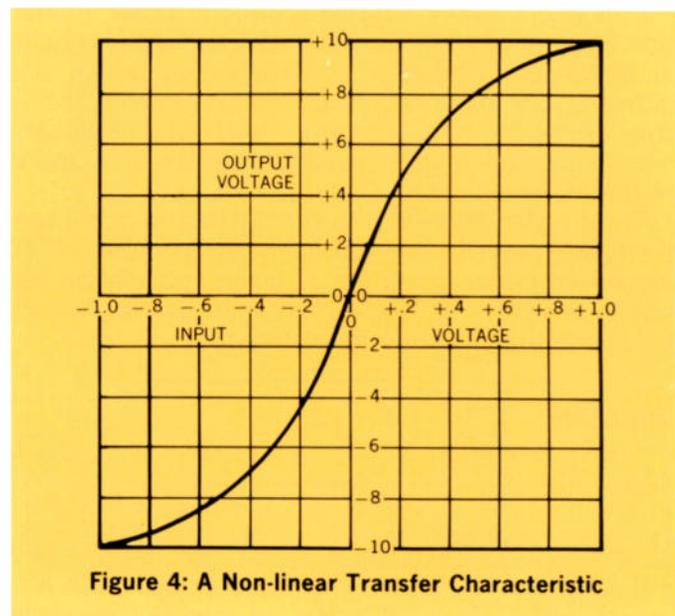
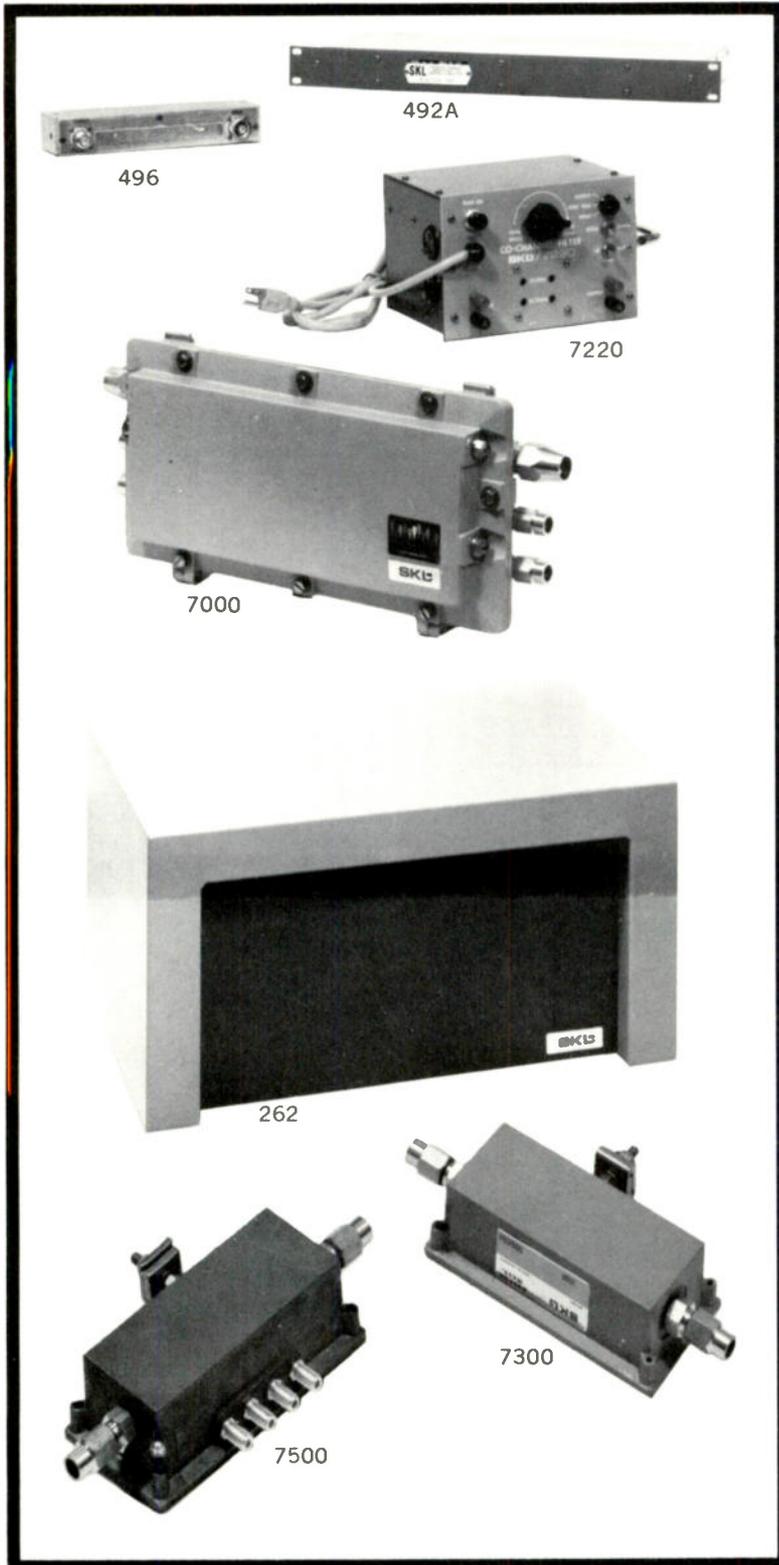


Figure 4: A Non-linear Transfer Characteristic

it follows near 0, it would reach about +20 volts when the input was +1 instead of reaching +10 as it actually does.

When a varying voltage is applied to an amplifier with a characteristic of this sort, the output voltage has a different waveform from the input voltage. Consider the examples shown in Figure 5. Figure 5(a) illustrates the output voltage waveform obtained when a sinusoidal voltage with a voltage swing between +1 and -1 volts is applied to the

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amplifier whose characteristic is illustrated in Figure 4. Since the transfer characteristic is symmetrical, both peaks of the output voltage are flattened by the non-linearity, giving the waveform illustrated.

A 1.0 volt peak-to-peak sinusoidal voltage applied to the input of the same amplifier and biased at -0.5 volts so that it varies between 0 and -1 volts produces an output varying between 0 and -10 volts with the waveform illustrated in Figure 5(b). The lower peak is flattened because the transfer characteristic bends over at -1 volts input; the upper peak is faithfully reproduced because the characteristic is very nearly a straight line near 0.

Reducing the amplitude of the input voltage to 0.2 volts peak-to-peak and biasing it at 0 so that it varies between $+0.1$ and -0.1 volts gives the output voltage shown in Figure 5(c). Because the signal varies along a nearly linear part of the characteristic, this is almost an undistorted reproduction of the sinusoidal input.

It should be clear from these examples that the nature as well as the degree of distortion is dependent not only on the shape of the transfer characteristic of the amplifier but also on the amplitude of the input signal and on the operating point (bias). Two very different and significant kinds of distortion are illustrated: one where the peaks are flattened symmetrically [Figure 5(a)] and the other where only one peak is flattened [Figure 5(b)]. In what follows these two cases will be explored more thoroughly.

Second Order Distortion

In the section on distortionless amplification, it was shown that a linear transfer characteristic could be expressed in very simple mathematical terms. The equation " $e_{out} = 10 e_{in}$ " says very clearly that the amplifier in question has a gain of ten times and no distortion. Since all practical ampli-

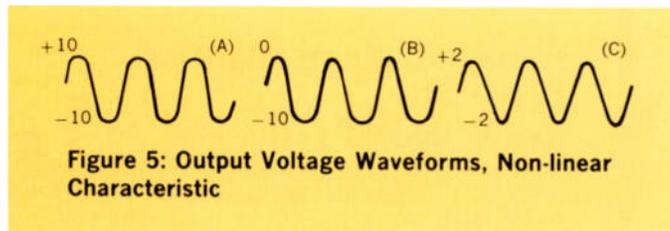


Figure 5: Output Voltage Waveforms, Non-linear Characteristic

fiers cause distortion, a sensible question is: "Can the transfer characteristic of a practical amplifier be expressed in some simple mathematical way which will allow analysis of the distortion generated?" The answer is that the transfer characteristic of a practical amplifier can be approximated by a simple mathematical expression and the subject of what follows is how this is done.

First, consider an amplifier which generates the kind of distortion illustrated in Figure 5(b). The transfer characteristic causing this kind of distortion can be approximated by an equation having the form " (e_{out}) equals (some number times e_{in}) plus (some other number times e_{in}^2)."

The following may help to understand how this works. Consider first the curve that results when e^2 is plotted against e . The numbers come out as shown in Table B.

This curve is plotted in Figure 6. Notice that it is symmetrical around the vertical axis, curving up smoothly for both positive and negative values of e .

Next consider an example of what happens when a curve of this sort is added to a linear transfer characteristic. The output voltage is separated into two parts:

$$\begin{aligned} \text{for the linear part:} & e_1 = 10 e_{in} \\ \text{for the "squared" part:} & e_2 = 5 e_{in}^2 \\ \text{and for the total:} & e_{out} = e_1 + e_2 \\ & = 10 e_{in} + 5 e_{in}^2 \end{aligned}$$

The transfer characteristic described by an equation having a linear term (one involving "e") and a "squared" term (one

e	e ²	e	e ²
-1.0	+1.0	+1.0	+1.0
-.8	+.64	+.8	+.64
-.6	+.36	+.6	+.36
-.4	+.16	+.4	+.16
-.2	+.04	+.2	+.04
0	0	0	0

Table B

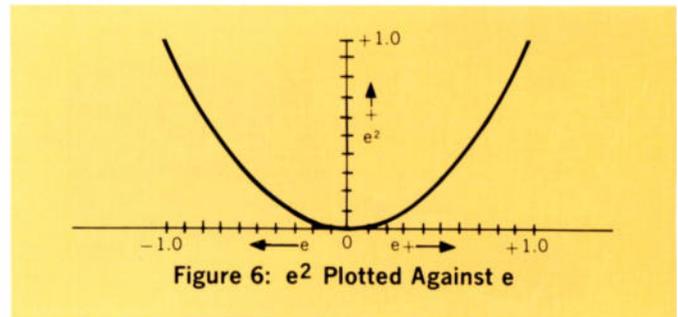


Figure 6: e² Plotted Against e

e _{in}	10 e _{in}	e _{in} ²	5 e _{in} ²	10 e _{in} + 5 e _{in} ²
-1	-10	+1	+5	-5
-0.8	-8	+0.64	+3.2	-4.8
-0.6	-6	+0.36	+1.8	-4.2
-0.4	-4	+0.16	+.8	-3.2
-0.2	-2	+0.04	+.2	-1.8
0	0	0	0	0
+0.2	+2	+0.04	+.2	+2.2
+0.4	+4	+0.16	+.8	+4.8
+0.6	+6	+0.36	+1.8	+7.8
+0.8	+8	+0.64	+3.2	+11.2
+1.0	+10	+1.00	+5	+15

Table C

involving " e^2 ") is known as a "square-law" transfer characteristic. The numbers come out as shown in Table C.

Figure 7 shows the two curves plotted separately (a and b) and the total (c). Notice the similarity between this total curve [Figure 7(c)], the plot of a simple mathematical equa-

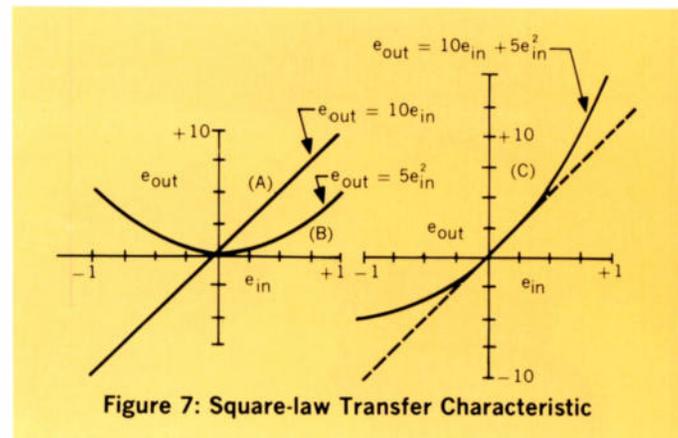


Figure 7: Square-law Transfer Characteristic

tion, and the lower half of a particular non-linear transfer characteristic (Figure 4).

Figure 8 illustrates graphically how the introduction of a sinusoidal voltage into an amplifier having a square-law transfer characteristic results in an output of the one-peak-stretched, one-peak-flattened variety. Since this kind of distortion results from the addition to the linear characteristic of a quantity involving e^2 , it is called "second order" distortion. In these terms it is said that Figure 8 shows that "a

square-law transfer characteristic (or a characteristic having second-order curvature) causes second-order distortion of the output." Observe that not only is the upper peak of the output voltage stretched by the action of the second-order distortion and the lower peak flattened, but also the entire curve is shifted upward so that its average is above 0.

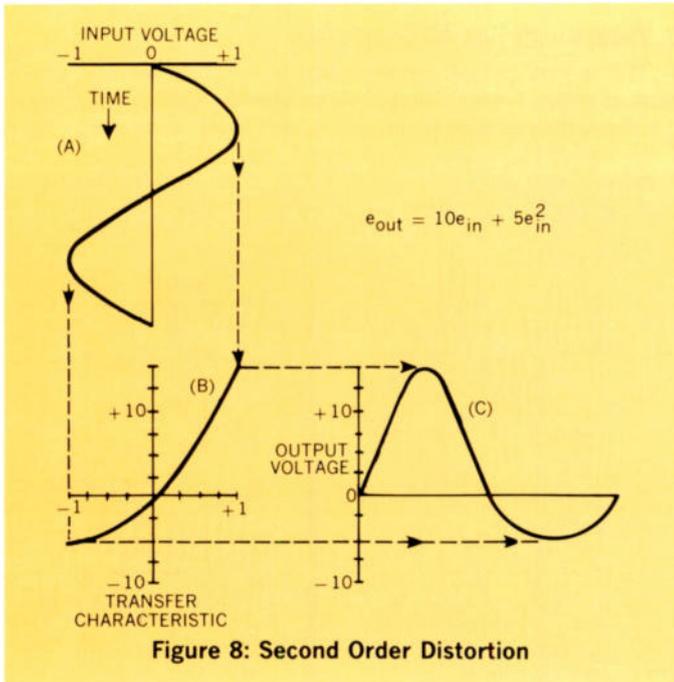


Figure 8: Second Order Distortion

It has been shown that one way to study the effects of second-order distortion mathematically is to use a square-law equation. There is a second approach which is also very useful. This involves the addition of DC and AC component voltages to produce a distorted total. Before this is presented it might be well to review the meaning of the three terms "DC," "AC" and "component."

"AC" and "DC"

The idea of "DC" is familiar. A DC voltage is typified by the voltage between the terminals of a battery (Figure 9

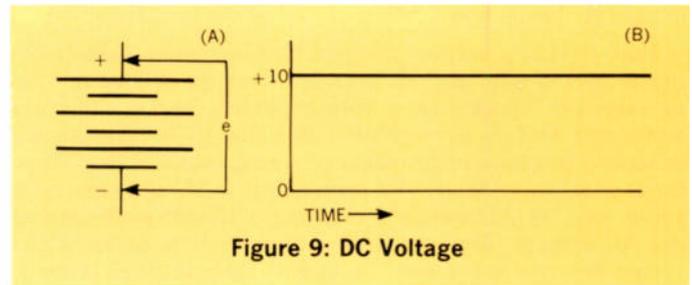


Figure 9: DC Voltage

(a). It does not vary either in magnitude or polarity. The plot of a DC voltage is a straight line parallel to the time axis [Figure 9(b)].

"AC" is almost equally familiar. To qualify as "AC" a quantity must vary above and below zero in such a way that its average is zero. A periodic "AC" voltage is one that goes through identical cycles of change over and over again, and its average over any one cycle is zero. Another way of saying this is to say that the area enclosed by the plot is the same on the positive half-cycles as it is on the negative ones.

Figures 10(a), (b) and (c) all represent periodic AC voltages, since in each case the variation is repeated in identical cycles and the average is zero. To see how the average is zero, imagine a DC voltmeter reading each of these voltages. Assuming the change to be faster than the needle can follow, it would be pushed equally in both directions, so would read zero.

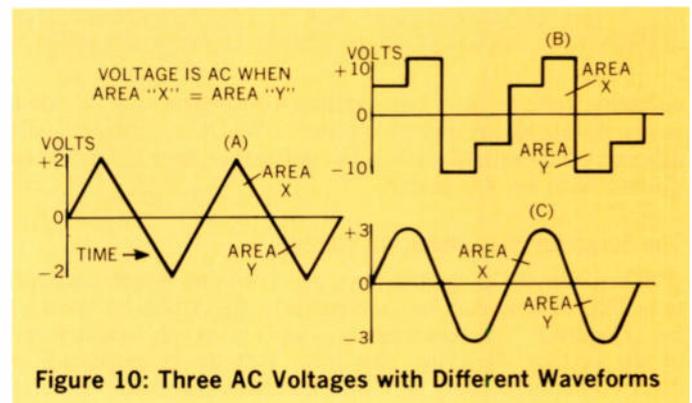


Figure 10: Three AC Voltages with Different Waveforms

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AC and DC Components

How then is a voltage described which varies periodically but in such a way that its average is not zero? Figure 11(a) for example, illustrates a voltage which has a sinusoidal waveform, and an average of +10 volts. It is conveniently described in terms of its parts or "components." This waveform could be obtained by connecting a 10-volt battery in series with an AC source generating a 10-volt peak sinusoidal AC voltage [Figure 11(b)]. Although it is actually generated in some other way (it might, for example, occur at the collector of a transistor amplifier), it is still convenient to describe it in terms of these components. In these terms it is called a "composite AC and DC voltage, its AC component being a 10-volt peak voltage with sinusoidal waveform, and its DC component +10 volts." By breaking this

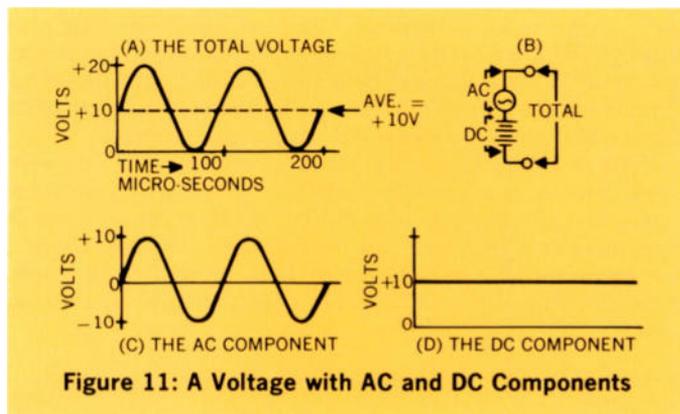


Figure 11: A Voltage with AC and DC Components

complex voltage into two simpler components, it is made easier to talk about and to measure. The DC component voltage can be measured with a DC voltmeter, and the AC component with an AC meter.

The Spectrum of a Composite Voltage

When a periodic varying voltage contains several components like this, it can be conveniently described by plotting its "spectrum." A spectrum is simply a graph which plots, in the vertical direction, the peak voltage or amplitude of each component, and in the horizontal direction, the frequency at which each of these components exists. Its im-

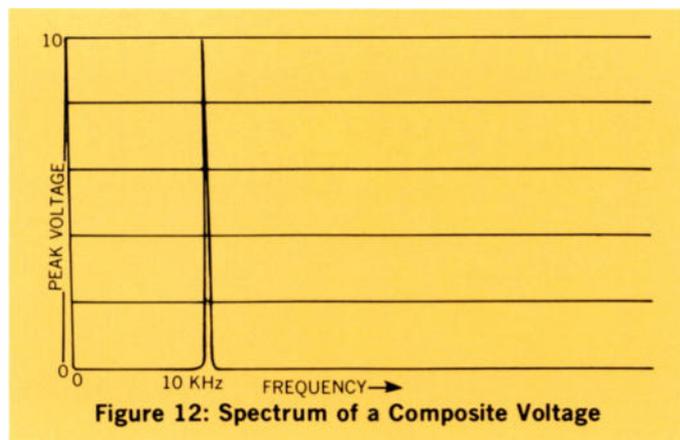


Figure 12: Spectrum of a Composite Voltage

portance rests on the fact that "spectrum analyzers" are available which plot these diagrams automatically, providing tremendously useful tools for distortion analysis.

The spectrum of a sinusoidal voltage is a single spike showing the amplitude and frequency of that voltage.

Figure 12 shows the spectrum of the composite voltage

whose waveform is plotted in Figure 11(a). The spectrum contains the same information as the time plot. It says that this voltage consists of two components, a DC component of 10 volts (represented by the 10-volt spike at 0 frequency) and a sinusoidal component of 10 volts peak amplitude at a frequency of 10 kHz (represented by the 10-volt spike at 10 kHz).

A Voltage with Two AC Components

This technique of representing a varying voltage as the sum of several components has very wide application. Figure 13 illustrates a second situation where it is useful. Figure

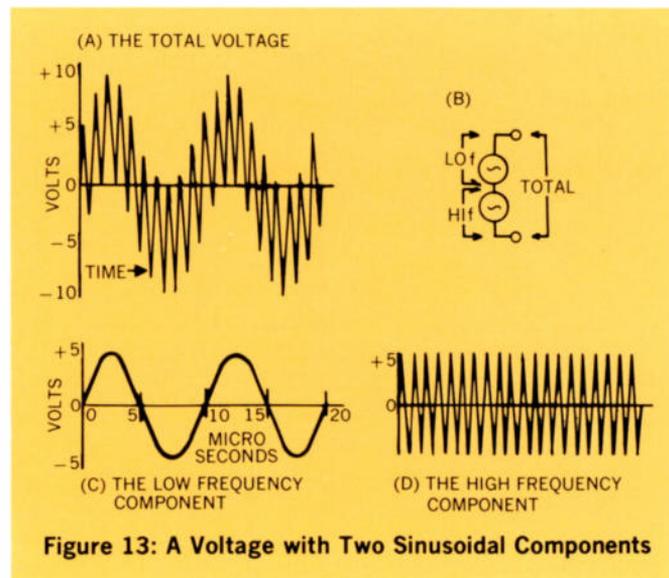


Figure 13: A Voltage with Two Sinusoidal Components

13(a) shows a composite voltage which quite obviously contains a high-frequency variation (causing the rapid oscillation) and a low-frequency one (causing the slow oscillation). It is the sum of two equal sinusoidal voltages; one having a frequency of 100 kHz (one cycle in 10 microseconds) shown in Figure 13(c); the other higher frequency component, Figure 13(d), completes 10 cycles in 10 microseconds so its frequency is ten times higher, or 1 MHz.

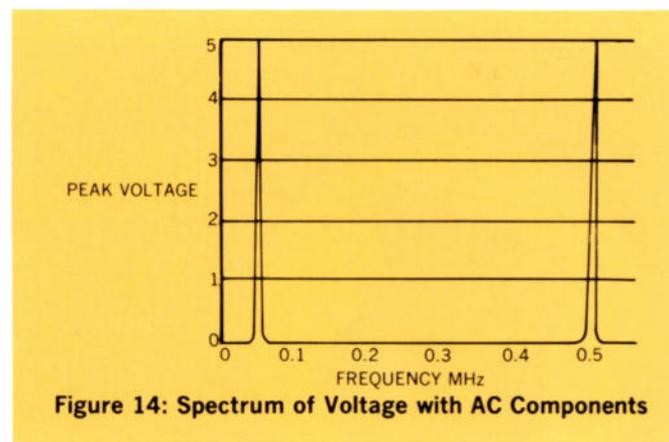


Figure 14: Spectrum of Voltage with AC Components

Figure 14 shows the spectrum of this composite voltage. The spectrum indicates two 5-volt sinusoidal components, one at 0.1 and one at 1.0 MHz.

Second Order Distortion by Addition of Components

The use of sinusoidal components to represent a non-sinusoidal varying voltage has its most important applica-

tion in the study of distortion. In an earlier section the distortion produced when a sinusoidal input is applied to an amplifier with second order distortion was discussed.

The waveform resulting from this distortion is plotted in Figure 8(c). Identically the same distorted waveform can be formed by adding sinusoidal components (or, what is saying the same thing, this waveform can be separated into sinusoidal components). Figure 15 illustrates the process.

This diagram shows how a distorted output can be generated by adding together three components: the FUNDAMENTAL component, a sinusoidal voltage having a frequency of 1 MHz (1 cycle in 1 microsecond) in this example; the SECOND HARMONIC component, a sinusoidal voltage having twice this frequency, 2 MHz (2 cycles in 1 microsecond); and a positive DC component.

Notice first that the total voltage has a waveform identical with that shown in Figure 8(c) (the one produced when a sinusoidal voltage is passed through an amplifier with a square-law characteristic). Now see how the three components add together in Figure 15: At 0 time on the diagram, the

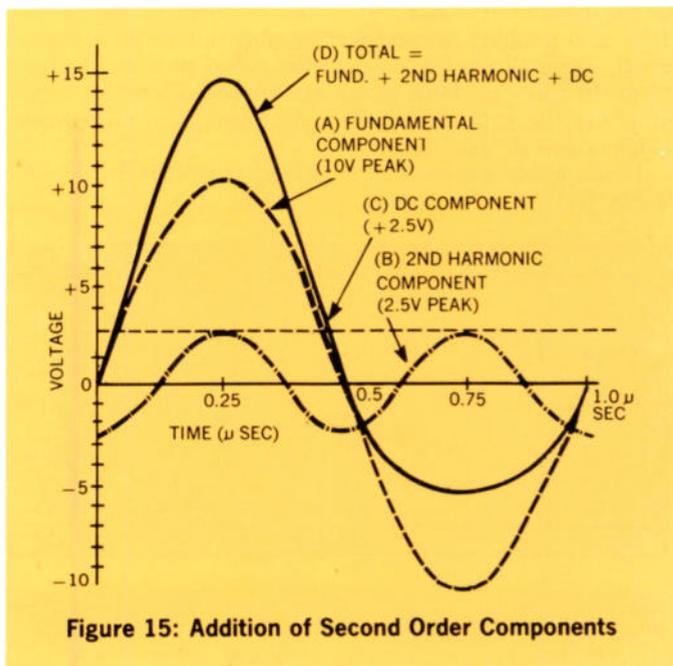


Figure 15: Addition of Second Order Components

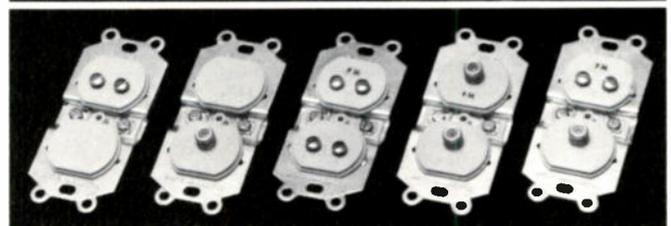
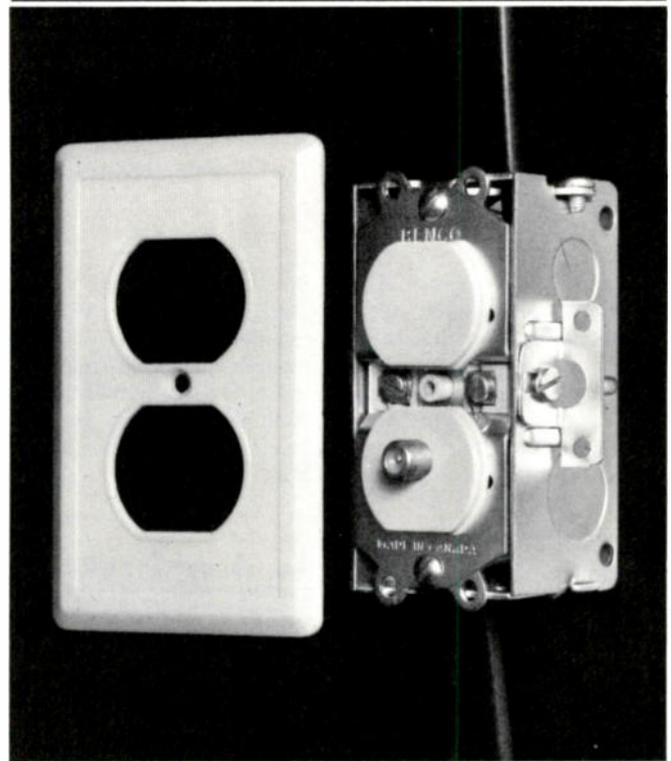
fundamental component is 0, the second harmonic is at its negative peak (-2.5 volts) and the DC component is at +2.5 volts. Adding the three together gives the total voltage which is 0. At 0.25 microseconds the fundamental has gone through one-quarter cycle to its positive maximum (+10 volts), the second harmonic component has gone through one-half cycle to its positive maximum (2.5 volts) so the three add together to produce the stretched peak of the total (+15 = 2.5 + 2.5 + 10). At 0.75 microseconds the second harmonic and the DC are at +2.5 volts so they subtract from the -10 volt peak of the fundamental to flatten the peak of the total (-5 = -10 + 2.5 + 2.5).

Figure 15 illustrates one case of a very important general principle: *Any non-sinusoidal periodic waveform can be produced by adding together an appropriate combination of DC and sinusoidal components.*

The Spectrum of a Voltage with Second Order Distortion

The distorted voltage of Figure 8(c) and Figure 15(d) can also be represented by the spectrum diagram shown in Figure 16. This shows the three components that make it up: a 2.5 volt DC component, a 10 volt peak 1 MHz component (the fundamental) and a 2.5 volt 2 MHz component (the second

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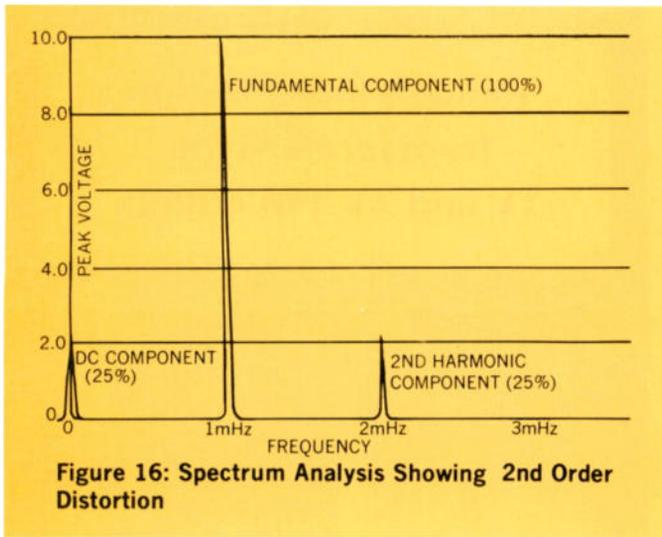
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harmonic). Two points should be noted in regard to these diagrams. Each spike on a spectrum diagram ALWAYS represents a pure sinusoidal component.

If a periodic voltage is non-sinusoidal, its spectrum shows more than one component. When a DC component exists, it does not appear on the spectrum displayed by the usual spectrum analyzer. The input circuits of most analyzers respond only to the AC components.

Third Order Distortion

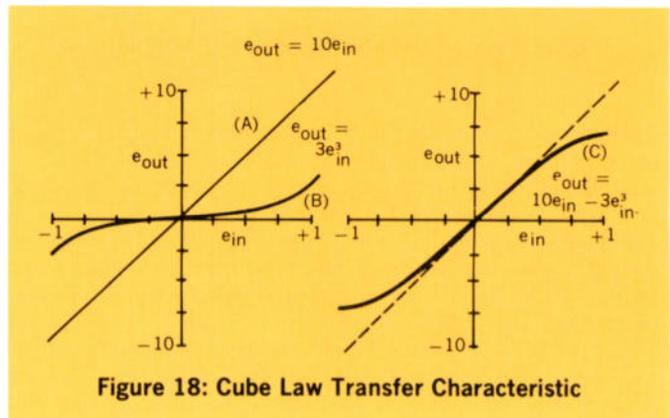
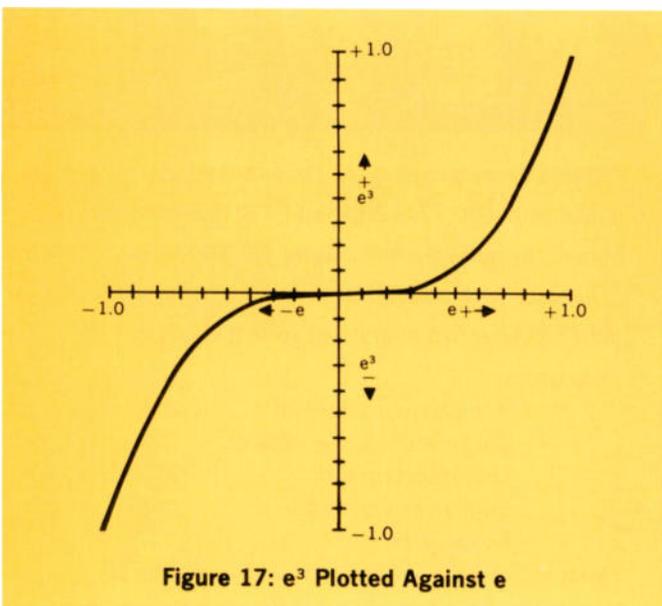
In a previous section it has been shown that the kind of non-linearity which results in the "one-peak-flattened" kind

e	e ³	e	e ³
-1.0	-1.000	+1.0	+1.000
-.8	-0.512	+.8	+0.512
-.6	-0.216	+.6	+0.216
-.4	-0.064	+.4	+0.064
-.2	-0.008	+.2	+0.008
0	0	0	0

Table D

e _{in}	10 e _{in}	e _{in} ³	3 e _{in} ³	10 e _{in} - 3 e _{in} ³
-1	-10	-1.000	-3.000	-7.000
-0.8	-8	-0.512	-1.536	-6.464
-0.6	-6	-0.216	-0.648	-5.352
-0.4	-4	-0.064	-0.192	-3.808
-0.2	-2	-0.008	-0.024	-1.976
0	0	0	0	0
+0.2	+2	+0.008	+0.024	+1.976
+0.4	+4	+0.064	+0.192	+3.808
+0.6	+6	+0.216	+0.648	+5.352
+0.8	+8	+0.512	+1.536	+6.464
+1.0	+10	+1.000	+3.000	+7.000

Table E



form: $(e_{out}) = (\text{some number} \times e_{in}) - (\text{some other number} \times e_{in}^3)$. It approximates the transfer characteristic which results in a waveform with both peaks flattened, as illustrated in Figure 5(a).

Consider the curve that results when e^3 is plotted against e . The numbers come out as shown in Table D.

This curve is plotted in Figure 17. It is "skew symmetrical"; that is, the curve for negative values of e has the same shape as for positive values, but is upside down.

When this curve is added to a linear transfer characteristic, it affects both extremes in the same way, since the linear part and the "cubed" part go positive together and negative together. Consider an example:

For the linear part of the characteristic take: $e_1 = 10 e_{in}$

for the "cubed" part take: $e_3 = 3 e_{in}^3$

to get a curve which flattens the peaks, the cubed part is subtracted from the linear part, so the total is:

$$e_{out} = e_1 - e_3 = 10 e_{in} - 3 e_{in}^3$$

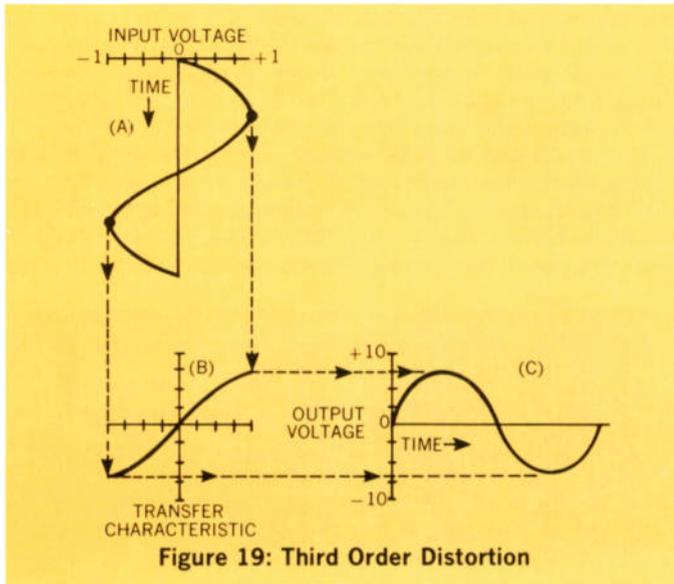
In this example, the cubed term is subtracted from the linear term to give a characteristic which flattens the peaks. In an amplifier with such a characteristic, the gain decreases as the input level is increased. (This is called "compression.") It is also possible to construct amplifiers having a characteristic approximated by adding the cubed term to the linear term. In this case both peaks are stretched, and in such an amplifier the gain increases as the input level is increased. (This is called "expansion.")

In the above example the numbers come out as shown in Table E.

of distortion can be expressed by a simple square-law mathematical equation. In very much the same way, the kind of distortion which results in both peaks being flattened can be expressed by a cube-law equation. This equation has the

Figure 18 shows the two component curves plotted separately (a and b) and the total (c). Notice the similarity between this total curve, the plot of a simple equation, and the non-linear transfer characteristic shown in Figure 4.

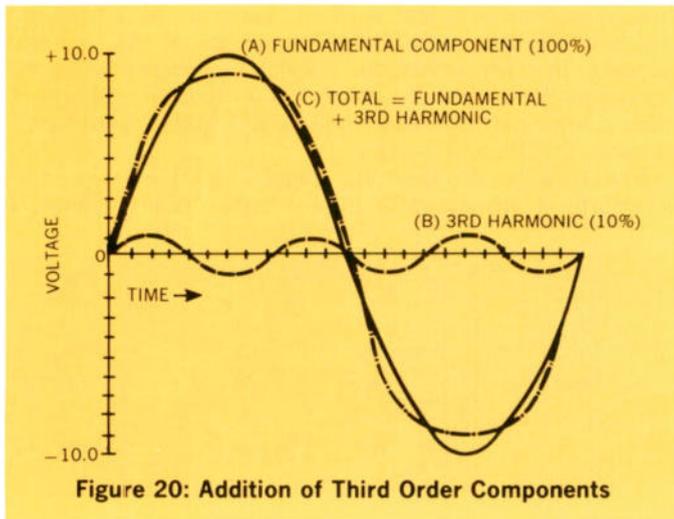
Figure 19 illustrates graphically the way in which the introduction of a sinusoidal voltage into an amplifier having a "cube-law" transfer characteristic results in an output of the "both-peaks-flattened" variety. Since this kind of distortion results when a signal is passed through a transfer characteristic having an equation with a term containing e^3 , it is called "third order" distortion. In these terms it is



said that Figure 19 shows that "a cube-law transfer characteristic (or a characteristic having third order curvature) causes third order distortion of the output."

Third Order Distortion by Addition of Components

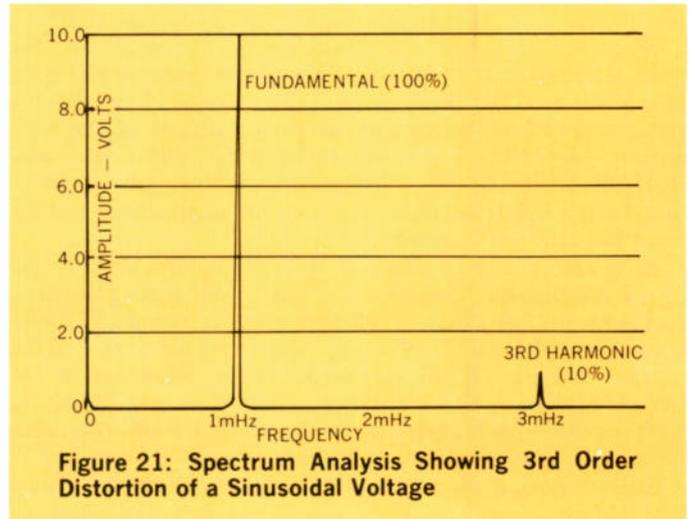
In the foregoing it was found possible to duplicate the effects of second order distortion by adding sinusoidal components. In a similar way, the effects of third order distortion can be obtained. Figure 20 illustrates the addition of a 10



volt peak, 1 megacycle fundamental component (a) and a 1 volt peak, 3 megacycle third harmonic component (b) to produce a distorted total (c) having the same waveform as that generated by the cube-law equation illustrated in Figure 19 (c). Because of the 3:1 frequency relationship, the third harmonic voltage is opposite in phase to the fundamental at its positive peak with the result that the peak of the total is flattened and is again opposite in phase at its negative peak so the peak of the total is also flattened at that time.

Spectrum of a Voltage with Third Order Distortion

Figure 21 illustrates the spectrum of this distorted voltage. Since the distorted waveform is duplicated by the sum of two components, the spectrum shows only these two: a 10-volt-peak fundamental component at 1 MHz and a 1-volt-peak third harmonic at 3 MHz.



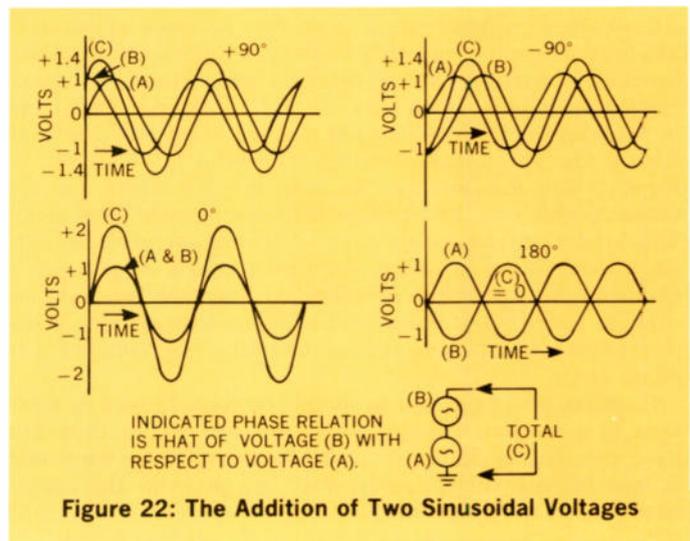
The Sum of Two Sinusoidal Voltages Having Slightly Different Frequencies

Since a major object of this article is to explain the distortion that occurs in broadband amplifiers when many "channels" are handled simultaneously, it is necessarily concerned with what happens in an amplifier when more than one sinusoidal voltage is introduced into it. Although the picture carrier on each channel is not a constant-amplitude sine-wave (since it is modulated with the picture information), a great deal can be learned about the nature of distortion in this case by temporarily pretending that it is.

The first question then is: What is the waveform resulting when two sine-waves having slightly different frequencies are added? The two television carriers are said to have SLIGHTLY different frequencies because in general their frequency separation is small compared with their frequencies. (Compare with the case illustrated in Figure 13 where one frequency is ten times the other.)

To answer this question it is helpful first to consider the way in which two sinusoidal voltages add when each has the same frequency and amplitude, but they have various phase relationships. Figure 22 illustrates several cases showing each voltage separately (a and b) and the resulting total voltage (c).

When each voltage is sinusoidal, the frequencies are identical, and the voltages are exactly in phase, the two reach their peaks at the same instant and at that time they add directly (e.g. $1.0 + 1.0 = 2.0$) so the peak voltage of the total is the



sum of the two components (shown as the 0° condition).

When there is a 90° phase difference between the two, the total reaches its maximum at a time when each of the components is at 0.7 of peak, so the peak voltage of the total is reduced to 0.7 of the sum of the peak voltages of the components [e.g. $+0.7 + 0.7 = 1.4$ (the $+90^\circ$ and -90° conditions)]. When the two voltages have opposite phase (180° out of phase), they are equal and opposite at all times, and the total is 0 (the 180° condition).

Next consider two sinusoidal voltages having slightly different frequencies. Figures 23(a and b) illustrate the waveforms of two particular voltages. Each is sinusoidal, with a peak amplitude of 2 volts. One has a frequency of 5 MHz, a time-per-cycle of $1/5$ microsecond; the other has a frequency of 6 MHz, and a time-per-cycle of $1/6$ sec. Thus, the former completes 5 cycles in a microsecond while the latter is completing 6 cycles.

Superimposing the two waveforms on each other [Figure 23(c)] shows clearly a highly significant fact, the phase relation between them is changing constantly. Initially they are in phase (both at positive peak). After $1/4$ microsecond

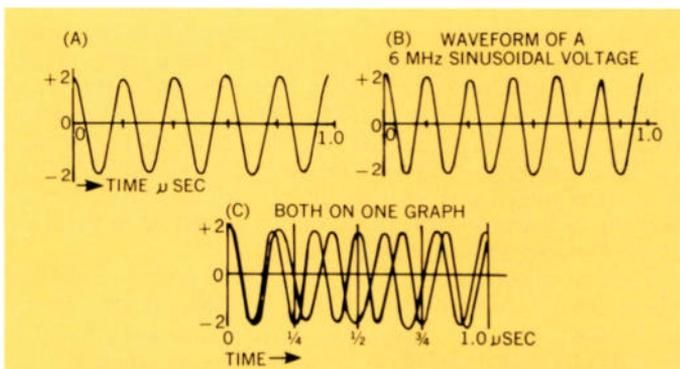


Figure 23: Waveform of a 5 MHz and of a 6 MHz Sinusoidal Voltage

the 5 MHz voltage has gone through $1/4$ cycles and is 0, going negative, while the other has gone through three half-cycles and is at its negative peak. They differ in phase by 90° . After $1/2$ microsecond the 5 MHz one is at its negative peak, while the 6 MHz one is at its positive peak, and they are 180° out of phase. As time goes on, they go through all possible phase relations, coming back to the "in phase" condition once each microsecond. It is true in general that when signals have different frequencies their phase relation changes constantly.

Now what happens when these two voltages are added? The total follows the principles illustrated in Figure 22. When the two components are in phase, they add to produce a maximum peak voltage, when they are 180° out they cancel, and in between the peak amplitude changes from one condition toward the other. The resulting waveform is illustrated in Figure 24(a), showing the two component voltages and the total superimposed, and Figure 24(b), showing the total alone. The total voltage reaches a 4-volt maximum peak initially when the two are in phase, the peaks reduce on successive cycles reaching 0 after $1/2$ microsecond when the two components are 180° out of phase, and building up again to a 4-volt maximum peak after one microsecond when they come back in phase again.

Care must be exercised in using the term "peak" in reference to a varying voltage with a waveform like this. The basic meaning of the word "peak" for any periodic waveform is "the highest voltage reached at any point in the cycle." In this sense the peak voltage of this waveform is 4 volts, and it is reached once each microsecond. In another sense this

voltage reaches a 4-volt positive peak at 0 on the time scale, then goes to a slightly lower (-3.5 volt) negative peak, then to a 3-volt positive peak and so on. If two lines are drawn through these peaks, as illustrated in Figure 24(b), they are said to outline the "envelope" of the waveform.

The two kinds of peak voltage can be distinguished by calling the former the "peak of the envelope" and the latter the "high-frequency" peak. In reference to Figure 24(b), it would be correct to say that the envelope peak voltage is four volts, and the envelope frequency is 1 MHz. It could

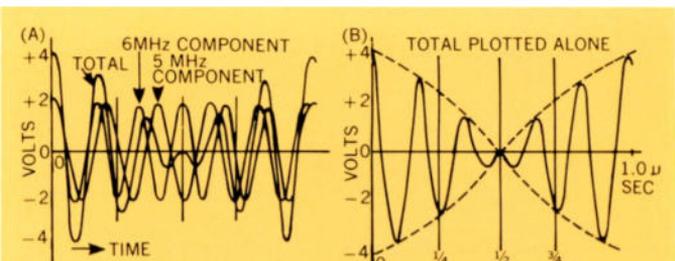


Figure 24: The Sum of Two Equal 5 MHz and 6 MHz Voltages

be said further that the high frequency peak voltage varies from a maximum of 4 volts down to a minimum of zero.

This sum of two particular sinusoidal voltages demonstrates several characteristics common to all sums of two such voltages without regard to their frequencies. One characteristic is the variation in the amplitude of the high frequency peak. For the sum of two equal voltages with ANY frequencies, the amplitude of the high frequency peak varies from maximum to 0 and back to maximum at a frequency which is the difference of the frequencies of the two components. In other words, the envelope frequency is the difference of the frequencies of the two component voltages. In this example the envelope frequency is 1 MHz, the difference between 6 MHz and 5 MHz.

Next consider the spectrum diagram of the voltage whose waveform is illustrated in Figure 24(b). This is shown in

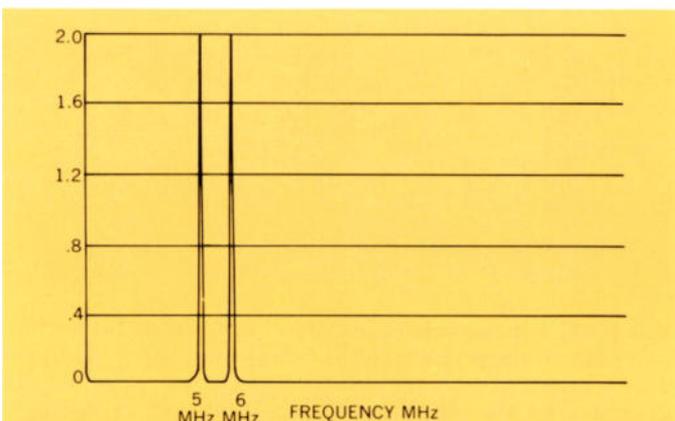


Figure 25: Spectrum of the Sum of Two Sinusoidal Voltages

Figure 25. It shows two components, one at 5 MHz and one at 6 MHz, each having an amplitude of two volts. There is no component at 1 MHz, nor at any frequencies other than 5 and 6 MHz. This should not be surprising since this voltage is initially defined as the sum of two, and only two, sinusoidal components.

In discussing AC voltage it was clear that, to say that the "DC component is zero" does not say "there is no voltage

present." Any AC voltage averages zero, and thus has no DC component, when the area above zero and that below are equal over one cycle (see Figure 10). Similar reasoning applied to the waveform of Figure 24(b) shows how it can be true that "the amplitude of the high frequency peaks varies at a 1 MHz rate" and yet "there is no 1 MHz component present." Since the peaks above zero have higher amplitudes at the same time as those below zero and lower amplitudes at the same time, they cancel each other and there is no average variation at the 1 MHz frequency.

The statement "this voltage has components only at 5 MHz and 6 MHz" means that the waveform shown is duplicated precisely by adding together equal 5 and 6 MHz sinusoidal voltages. As long as this waveform is duplicated WITHOUT ANY DISTORTION no additional components are necessary to reproduce it. A general principle relating to amplifiers can be stated: *Only when an amplifier distorts does the output signal contain components at frequencies differing from the frequencies of the input signal components.*

Two Sinusoidal Input Voltages with Second Order Distortion

It has been shown that, when two sinusoidal components are fed into a distortionless amplifier, the output contains only the two original components, or saying the same thing, the output waveform is the same as that of the input. Figure 26 illustrates again the waveform and spectrum in this case,

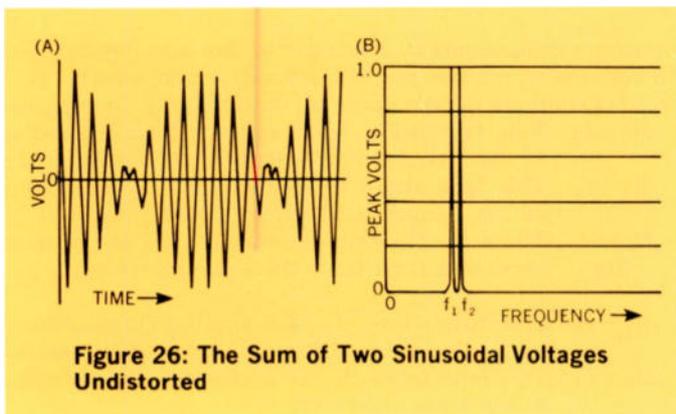


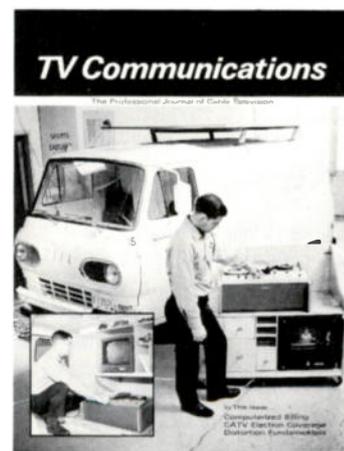
Figure 26: The Sum of Two Sinusoidal Voltages Undistorted

showing how the high-frequency peak voltage varies at the difference frequency ($f_2 - f_1$) as the phase relation between the components changes.

Next consider what happens when two sinusoidal voltages are added and introduced into an amplifier with second order distortion. Figure 27(a) shows a plot of the distorted waveform that results. Since the output waveform has a decidedly different shape from the input [compare Figure 27(a) and Figure 26(a)], it is clear that there must be components at frequencies other than the two original ones. Figure 27(b) illustrates the five new frequency components that are added to the output voltage by second order distortion. Since the positive peaks in the output are stretched, and the negative peaks flattened, there is a general shift in level in the positive DC direction, and there must be a corresponding positive DC component. Since the peaks above 0 no longer average out with the peaks below 0, there is also a component at the difference frequency ($f_2 - f_1$). For a similar reason, there is a component at a frequency which is the sum of the frequencies of the two original signals ($f_1 + f_2$). And, of course, each of the original signals generates a second harmonic (at $2f_1$ and $2f_2$). Thus, the spectrum of the output signal looks like Figure 27(b) with components at the two original frequencies as well as at the five new ones.

An important conclusion can be drawn from this one ex-

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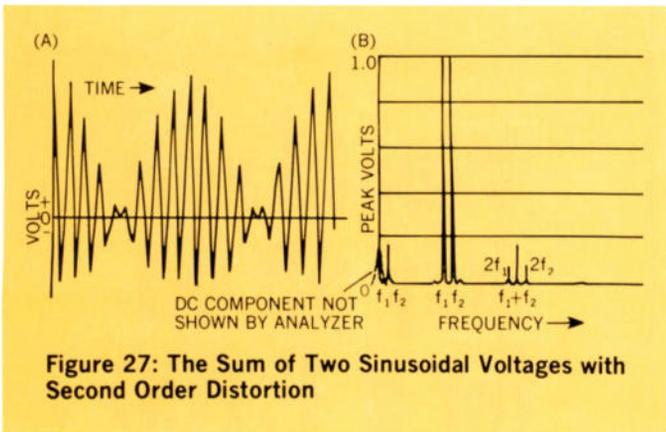


Figure 27: The Sum of Two Sinusoidal Voltages with Second Order Distortion

ample: Whenever more than one sinusoidal voltage (that is, when more than one signal) is introduced into an amplifier which has second order distortion, the output will include signals at certain frequencies differing from those of the input signals. There will be a DC component, a shift in the average collector current of the distorting stage (which does not show up in the output when AC coupling is used), a component at a frequency which is the difference of the two original frequencies, a component at a frequency which is the sum of the original frequencies, and components at twice each of the original frequencies.

When the original signals are modulated with picture information, each of these spurious signals will carry the modulation of both of the original signals from which it comes.

Why Second Order Distortion Is Unimportant in Present CATV Systems

Anyone who has worked with CATV equipment in the past recognizes the fact that very little attention has been paid to the problem of second order distortion. The usual amplifier specification states the noise figure, gain and cross-modulation but does not mention sum or difference frequency beats or second harmonics. The reason for this has to do with the standard channel frequency assignments established by the FCC. If one takes any pair of picture carrier frequencies in the standard 12-channel assignments, their sum or difference does not fall in any of those channels. Similarly, with one minor exception (channel 6 sound carrier), the second harmonics of all lowband carriers fall between the two bands.

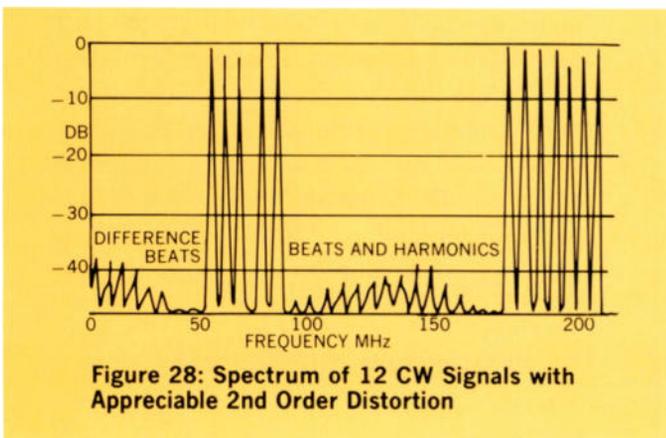


Figure 28: Spectrum of 12 CW Signals with Appreciable 2nd Order Distortion

Figure 28 shows the spectrum obtained when 12 CW signals on the normal picture carrier frequencies were introduced into a CATV amplifier at levels somewhat higher than normal operating level.

This shows the spurious signals resulting from second order

distortion, illustrating how they fall below and between the bands, but not within the channel limits. Since this is true, second order distortion has no bad effects on an amplifier carrying up to twelve standard TV channels and it is not normally considered in this case.

Two Sinusoidal Input Voltages with Third Order Distortion

Figure 29(a) illustrates the appearance of the output voltage of an amplifier having third order distortion when the sum of two sinusoidal voltages similar to Figure 26(a) is introduced into the input. The flattening of the larger vertical peaks is clearly evident. A spectrum diagram showing the

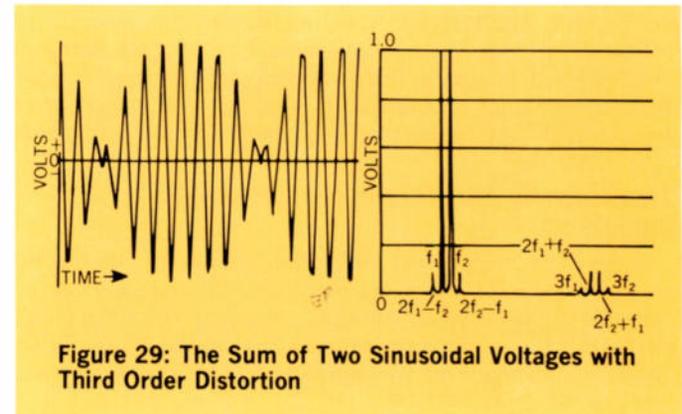


Figure 29: The Sum of Two Sinusoidal Voltages with Third Order Distortion

frequency components in the output is shown in Figure 29(b). In addition to the two original sinusoidal components (at f_1 and f_2) spurious signals occur at the following frequencies:

- $2f_1 - f_2$ This falls below f_1 at a spacing corresponding to the frequency difference between f_1 and f_2 .
- $2f_2 - f_1$ This falls above f_2 at a spacing corresponding to the frequency difference between f_1 and f_2 .
- $3f_1$ and $3f_2$ These are the third harmonics and the spacing between is three times the spacing between f_1 and f_2 .
- $2f_1 + f_2$ This falls above $3f_1$ at a spacing corresponding to the frequency difference between f_1 and f_2 .
- $2f_2 + f_1$ This falls below $3f_2$ at a spacing corresponding to the same difference.

Cross-Modulation and Compression

The spurious signals generated by third order distortion can give trouble in any multi-channel system since it is possible for them to fall within some of the channels. In present CATV systems they do not generally cause as much trouble as another effect of third order distortion, "cross-modulation." This is one of the two important aspects of third order distortion which do not result in components at new frequencies. (The other being "compression." Each of these effects represents a change in gain at the channel frequencies rather than the generation of new frequency components. Figure 30 illustrates these effects. The upper spectrum diagrams illustrate the input signal components in an amplifier which has severe third order distortion, the lower diagrams illustrate the resulting output signal components. The amplifier voltage gain, for small signal input, is 10 times. Thus, as illustrated in Figure 30(a), an input of 2 millivolts gives an output of approximately 20 millivolts.

The transfer characteristic of this amplifier can be approximated by an equation where a "cubed" term is subtracted from a "linear" term, with a shape resembling Figure 18(c). With such a characteristic the effective gain decreases as the input signal amplitude increases. Thus, as shown in Figure 30(b), increasing the input signal of this amplifier to 10 millivolts results in an output of 90 millivolts, rather than 100

millivolts which would be obtained if the gain were not reduced by the effects of third order distortion. This effect, the reduction in gain at a single frequency as the signal amplitude increases, is called *compression* and results in the distortion of the modulation envelope on any modulated signal going through such an amplifier. When this effect occurs in an amplifier carrying a single TV-modulated signal, it results in a flattening of the sync peaks which is called "sync compression."

Figure 30(c) shows what happens when a signal is introduced at low level on another frequency. Several effects can be seen: The output level on the new frequency is somewhat below the 20 millivolt point it would reach if the strong signal were not present; the strong signal output is slightly reduced by the presence of the new signal [compare with (b)], and a spurious component at $2f_1 - f_2$ can be seen.

As shown in Figure 30(d), increasing the second input signal to full amplitude results in a further reduction in gain so that both output signals at the original frequencies are below 60 millivolts and the spurious signals increase in amplitude. The most significant effect here is that the gain on each channel is reduced not only by an increase in level on that

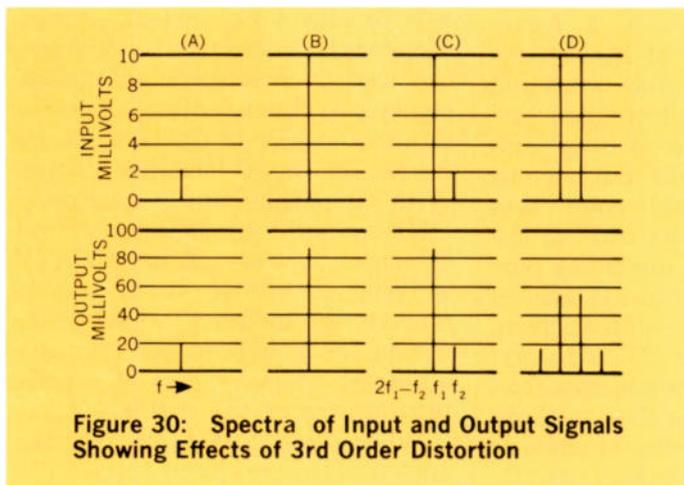


Figure 30: Spectra of Input and Output Signals Showing Effects of 3rd Order Distortion

channel but also by the increase in level on the other channel. This results in a transfer of any variation, or modulation, on one carrier to any other carriers going through the same

amplifier. This transfer is called cross-modulation and represents the worst effect of non-linearity in present-day CATV amplifiers.

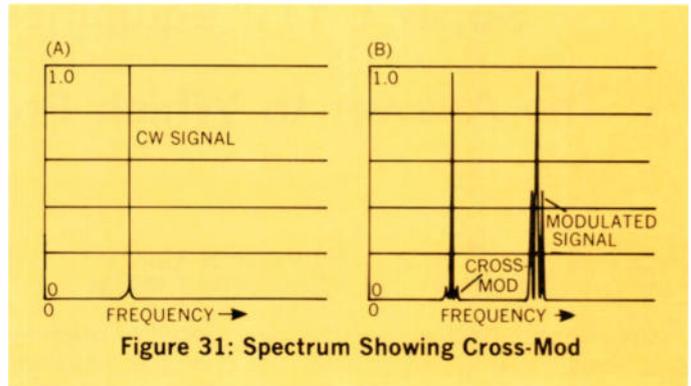
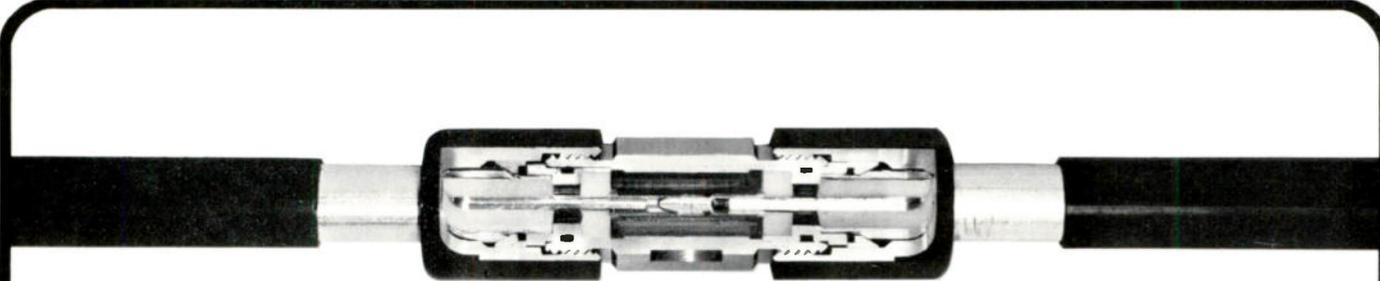


Figure 31: Spectrum Showing Cross-Mod

This effect is further illustrated in Figure 31. Figure 31(a) shows the output signal obtained when a sinusoidal input is applied to an amplifier with a small amount of third order distortion. Figure 30(b) shows what happens when a second signal, fully modulated, is fed through the same amplifier, simultaneously with the original CW signal. The output includes the modulated signal (which shows up in the frequency spectrum as a carrier with smaller sidebands on each side), the output at the frequency of the original CW signal, and two spurious sideband components which show up adjacent to the CW signal frequency as a result of third order distortion. It is clear how this distortion results in a transfer of modulation from one signal to the other.

Conclusion

This article has attempted to describe all of the effects which result from the simplest kinds of non-linearity, second order and third order distortion, in amplifiers of the type used for CATV systems. It has shown that second order effects are generally unimportant with present-day frequency assignments and that, of all the third order effects, cross-modulation is the most important, representing the factor which limits the output level at which the amplifiers in these systems may be operated without causing disturbance to the customer's reception. TVC



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Super CATV Equipment— The Answer to Which Problem?

By Peter S. Carr
St. Mary's (Pa.) TV Co.

CATV manufacturers have begun production of equipment for the processing and distribution of twenty television channels. Logically, these firms must have found a promising market need which this new line of equipment will fill. Since each system operator must justify his monthly subscriber rate to the public on the basis of the number and quality of his TV signals, his product, consideration of this "SUPER CATV" equipment would seem warranted. The manufacturers' approach is to provide the means by which the operator may fulfill the public's desire for more channels, provided that said operator is so blessed with usable signals that the normal VHF band is the only limiting factor.

Assuming that due to the increase in UHF, Educational and

locally originated channels the twelve channel spectrum proves too small. Technically, a third or "midband" mode of operation seems to show promise. The operator sees those eight extra slots as easy rate justification — but all the viewer sees is a funny looking box on top of his set. At present the viewer has mastered the relatively easy techniques required to produce good black and white pictures. With the advent of reasonably priced color sets he is now just getting used to the various fine tuning gimmicks plus hue and level adjustments needed to keep purple people off his screen. Now we, the cable TV industry, propose to add a whole new box of tuning troubles to those already mentioned. The question of whether the average subscriber will literally buy it will soon be answered.

As of several years ago the FCC made it mandatory that new sets be equipped with UHF tuners. One of the prime reasons given for the present signal importation restrictions is that distant signal carriage might restrict the growth of UHF stations. In light of these two facts it could be assumed that the FCC is pushing UHF. How might we profit from these facts? For one thing, the generally superior picture quality and reduced interference inherent in UHF transmission frequencies are to our benefit even if their coverage areas are less. Also, the more stations we have, the easier it is to justify our rates. Now if it were possible to use the UHF spectrum in cable we would have seventy extra channels to play with, instead of just those eight in the midband. From the system operator's viewpoint, eighty-two channel cable TV is the ultimate answer to the subscriber's desire for more channel choice. With the phasing out of older non-UHF equipped sets, the theoretical transition to truly all band CATV is being completed. It, of course, remains for industry scientists to design the gear that won't require a booster on every pole or a price tag the size of the national debt.

While there is no doubt that the advent of twenty channel capability

(Continued on page 86)

The Day of the Accident

By Jack F. Sanders
Tru-Vu Community TV, Woodward, Okla.

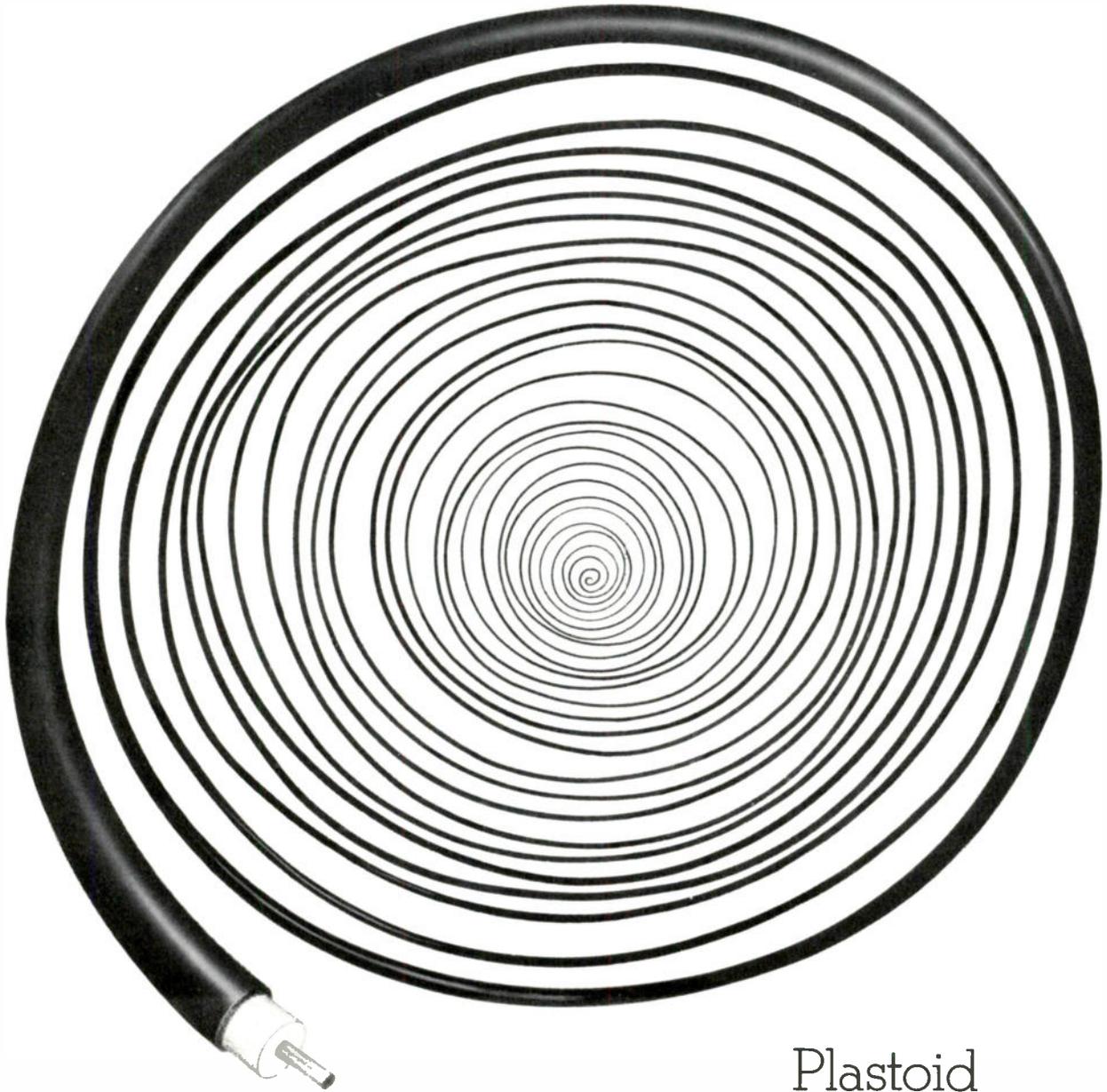
It was 3:47 pm when the call came in. It was the Oklahoma Gas and Electric dispatcher and his voice sounded urgent. He had received a report of an accident for us to cover on South 22nd Street. I took a deep breath, let it out slowly and was hurrying through the hallway buckling my service belt as I climbed aboard the old clunker, which had already covered more of these calls than it should have.

I lost no time after I finally managed to clear the side street,

and swerving onto Oklahoma Avenue, I made my way out to 22nd Street, turning in a tight arc and heading south. I had traveled only a few blocks when I noticed the traffic up ahead was unusually heavy, then remembering the time, I thought, "Why do all those mothers think their Johnny and Jane simply can't walk the few blocks home from school on such a sunny afternoon?" Finally on open road I began to feel the anxiety of what lay ahead of me.

I reached the scene and rolled to a stop thinking somehow that this was no ordinary call. With the door open now I caught the familiar smell of diesel fuel and gasoline which seemed to just hang in the air marking the spot of the tragedy.

I had walked only a few yards when the terrible truth hit me like lightning which had struck a giant oak. For there at the bottom of a deep ditch lay the distorted and twisted remains of what was once a masterpiece of design, the jacket ripped to shreds, the once smooth contour of the body with a gaping six-inch gash. Yes, there lay "my baby," my beautiful CATV aluminum cable, felled by the sting of that terrible ditching machine.



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A Report on Hosken's New "Expo" Curved Antenna

Stanley Hosken, of Hosken Cable TV Antennas Ltd., has recently completed his application for a patent, both in Canada and the United States, on his exponential curved boom CATV antenna. Through research and experiments Hosken, an experienced CATV antenna designer, developed the formula for the exact placement of the elements on the boom and for strengthening the signal by simplifying the antenna design to eliminate the loss of signal strength by doing away with the connecting harnesses.



H-frame mounted Expo antennas are said to provide optimum reception. Two antennas can be tower-mounted, as well.

The "exponential flair," he states, affords superior match over a very wide range of frequencies and, by extending the length of the boom, directivity and gain are increased without losing any of the broad band characteristics. "The slow exponential curve of the twin booms allows a high antenna impedance at the

rear, to arrive at exactly 75-ohm impedance at the front end of the antenna at virtually all frequencies received," he explains, "and the shape and structure of the exponential boom allow for a greater number of productive elements, a greater capture area, and hence a stronger signal."

It was not until 1967 that the final breakthrough for good color TV reception in the exponential curved antenna was discovered. Color television requires a flat response across the entire spectrum of the channels received. But the straight elements used up to this time, having a very high Q, individually covered only part of the TV spectrum. Many elements with slight variations of length were used to give a fairly flat response, and each element was designed to favor the video carrier. Hosken experimented with a variety of elements on his testing towers, and reported findings that looped elements have a much lower Q, and at the same time cover six channels instead of part of only one. He utilized this factor to his advantage and found that many elements were actually helping one another on each channel, and the actual capture area of the antenna was increased by 300% on the ends of the elements. The lower Q elements improved color television reception by giving a much flatter response across the desired channels, he states, and through additional tests and the installation of additional elements, the high band gain on the all-channel antenna was further increased.

The features of his firm's Expo '67 antenna model which resulted from his research include: "very high front-to-back ratio, excellent gain, flatness of response, and high immunity to potential interference from the nearby metal towers and the close spacing of the antennas themselves." Also, parasitic elements added to any channel at the front can increase the gain an additional 3 dB where required for a specific channel.

Victoria Cablevision (with more than 20,000 subscribers in Victoria, British Columbia) has tested two Hosken Expo '67 antennas and found they outperformed quad stack arrays of yagis (most of which were the 10-element type). Pittsfield (Massachusetts) Cablevision is using two special design Expo '67's with 22-foot booms to receive a Boston signal 150 miles distant, reporting that reception — although only fair — is superior to that of other element-type antennas. Hosken points out that the location of these antennas is of the greatest importance. "They will only do the job intended when installed in an ideal location, and such locations are not always possible to obtain," he states. TVC

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PRODUCT REVIEW

NEW COMPONENTS FOR CABLE TELEVISION SYSTEMS

NEW SET TOP CONVERTER

A new set top converter has been announced by the Hamlin Corporation. The unit is said to be capable of expanding CATV system potential from 12 to 36 channels by converting any signal from 5 to 240 Mcs to Channel 5 or 6. According to the manufacturer, conversion is accomplished by compressing the 5-1/4 "octaves"



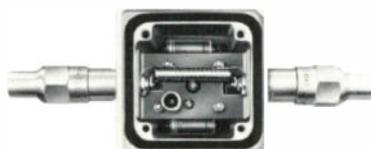
from 5 to 240 Mcs into half an octave. The 120 to 240 "octave" is used for 20 channels, with 11 other channels inserted between the FM band and Channel 7. Minimum input for the unit for 46 dB S/N ratio is given as ± 3 dB with an input range tolerance of -5 dB to $+15$ dB. Eighteen channel maximum input for -51 dB cross modulation is $+15$ dB. The noise figure for all channels is said to be better than 17 dB. Output match return loss is given as 12 dB with input match return loss at a selected channel at 12 dB. The unit tolerates a 100-130 volt power change without degradation of picture or sound, according to the manufacturer.

For further information on this new product contact Hamlin Corporation, 2128 Third Ave., Seattle, Wash. 98121.



CRAFTSMAN AMPLIFIER TAP

A modular amplifier tap with wide-band response from 50-250 MHz and up to 18 dB gain is now available from Craftsman Electronic Products, Inc. The new Model MAT-18 features all solid-state circuitry, separate gain and tilt controls, "Sure-Grip" 22 fittings, and interchangeable outlet plates for 1, 2, 3 or 4 drop lines. Output is rated over 40 dB and through line insertion loss is below 1.5 dB. According to the manufacturer, the MAT-18 is designed to complement passive directional taps to overcome losses in long drop lines and multiple outlet systems. It operates from remote 18-30 VAC power and is said to



be stable over the full band regardless of ambient changes from -40 F to 150 F. The amplifier tap is enclosed in a shielded aluminum cast housing suitable for strand or pole mounting. System net price for the unit with "Sure-Grip" 412 fittings is \$42.50. Module plates are priced from \$1.58 to \$5.80.

For further information on this new product contact Craftsman Electronic Products, Inc., 133 West Seneca St., Manlius, N. Y. 13104.

VTR FROM DIAMOND POWER

A new solid-state video tape recorder, the DP-1, has been announced by Diamond Power. The unit is capable of recording both video and sound either simultaneously or separately and features single-frame display for stop motion viewing. A rotary recording system is utilized with two crystal ferrite recording heads. Scan rate is given as 525 TV lines with resolution at 220 lines. Half-inch tape is utilized and provides 63 minutes recording time with an 8-inch reel at 9.45 IPS. The DP-1 measures approximately $11\text{-}1/2$ " x 21 " x $17\text{-}1/2$ ", weighs 66 lbs., and sells for around \$1,000. Either black and white or color

taping can be done when an optional adapter is utilized.

For further information on this new product contact Diamond Power, P.O. Box 415, Lancaster, Ohio 43130.

AERIAL STRINGING ACCESSORY

Telsta Corporation has announced the availability of an aerial stringing accessory, the Telsta Swivel Fairlead. The new product features a self-adjusting set of two rollers that pro-



vides protection to cable being strung by dividing the angle of the cable. The Fairlead can also be rotated to assure proper positioning of the rollers with respect to the material being placed at all elevations.

For further information on this new product contact Telsta Corporation, 1700 Industrial Road, San Carlos, Calif. 94070.

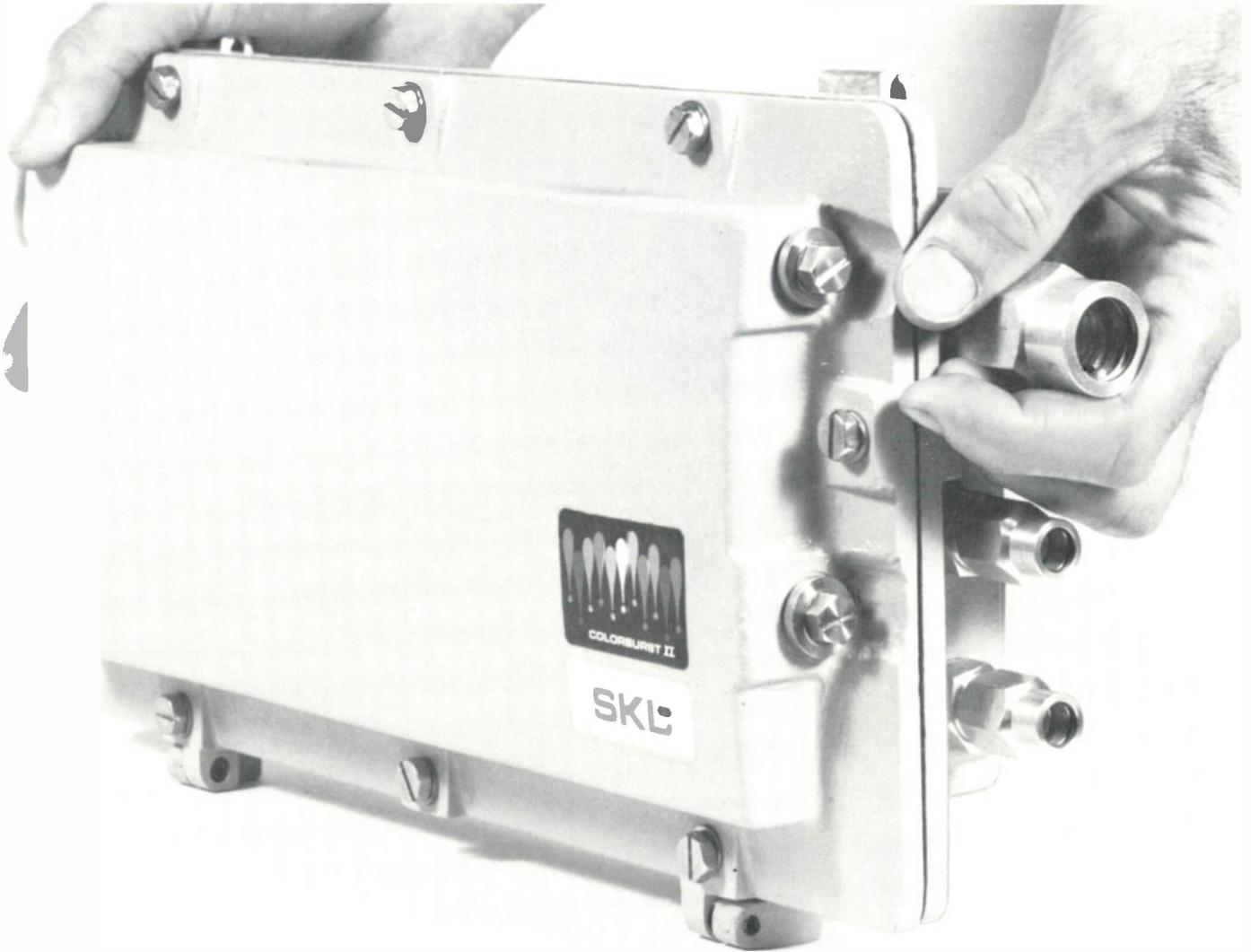
16MM PROJECTOR

A new projector, designated Model 16N/TV, is now available from Traid Corporation. The unit features instan-



taneous stop-action, frame-by-frame slow motion, flickerless operation and damage-free safety to film, according to the manufacturer. A synchronous motor maintains the 24 frames per second speed with AC line synchron-

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ization. The 16N/TV features a special shutter designed to provide exact synchronization in television chains and to eliminate "shutter-bar" effect.

For further information on this new product contact the Traid Corporation, 777 Flower Street, Glendale, Calif. 91201.

NEW PLP PRODUCTS

New dead-ends and splices designed for use with "Glastran" fiberglass strand for guying towers and antennas have been developed by Preformed Line Products Company. The Glas-Grip dead-ends for fiberglass strand and Glas-Splices for fiberglass strand develop a minimum of 90% of the actual breaking strength of the specific strand to which they are applied, according to the manufacturer.

For further information on these new products contact Preformed Line Products Company, 5349 St. Clair Avenue, Cleveland, Ohio 44103.

PACKARD BELL TV CAMERA

A new camera with positive 2:1 interlace and separate mesh vidicon has been announced by Packard Bell. The unit, designated PB-940, has two mod-



els offerings either 525 or 875 scan lines. It can also be operated crystal-controlled random interlace at 525, 625, 675, 735 and 875 scan rates or driven with an external EIA sync generator for full EIA compliance.

For further information on this new product contact Packard Bell, P.O. Box 337, Newbury Park, Calif. 91330.

NEW GE VTR SYSTEM

The General Electric Company has announced an expansion of its line of video-tape recorders with introduction of a series of new low-cost, half-inch VTR systems called Value-Pack. The basic system comprises a transistorized video camera with 25mm (f 1.9) lens, a record-playback

unit, and a monitor-receiver, available either with 11 or 22-inch screens. In addition to the table-top Value-Pack, General Electric's line of video-tape recorders includes a luggage-style portable package called



"Tri-Pack" and a roll-about mobile console. The manufacturer states that the new VTR line is compatible with other GE half-inch systems. Suggested manufacturer's selling prices start at \$1,350 for the complete recording system, and \$949 for playback systems.

For further information on these new products, contact the General Electric Corporation, Syracuse, N.Y.

DROP CABLE CONDUIT

Availability of "drop cable size" flexible underground conduit has been announced by United States Extruded Vinyl Products, Inc. According to the manufacturer, the 5/8" corrugated profile insures maximum flexibility and ease of handling in cold weather, follows the contour of uneven trenching without danger of kinking, and offers the same crush-resistance as in current available sizes.

For further information on this new product contact United States Extruded Vinyl Products, Inc., 13336 Ventura Blvd., Sherman Oaks, Calif. 91403.

MECHANICAL SPLICE

A new mechanical splice for RG 59/U coaxial cable has been developed by Preformed Line Products Company. The device, called the Telesplice, can be wrapped on by hand, and is said to be able to hold the full published rated breaking strength of the RG 59/U cable even under wind or icing conditions. In addition, the galvanized Telesplice can be used for reclaiming odd lengths of 59/U coaxial cable when changeovers are made or for use in making emergency repairs.

For further information on this new product contact Preformed Line Products Company, 5349 St. Clair Avenue, Cleveland, Ohio 44103.

(Continued from page 80)

is a breakthrough from the technical standpoint, its use is limited to those who receive more channels than they can carry. At present this problem exists in only a few locations but will become more widespread as more stations go on the air. It is also possible that today's "Stock Market" channel may be the beginning of a whole new data distribution service for home and industry. This new service alone could eat up those seventy extra channels of UHF in spite of the greatly reduced bandwidths involved. And this is but one of the diversified fields into which CATV may venture in the future. The need for more cable "space" has been recognized and an intermediate solution developed. It now remains for the industry to increase and diversify the scope of its public service and for the equipment manufacturers to pace their needs.

(TVC)

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An excellent opportunity exists for technician whose experience covers areas of equipment installation and maintenance, minor head-end and amplifier repairs and general system check out. System location Southeast; chance to grow in multiple system operation. Send resume in confidence to Dept. T24, TV Communications.

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Ohio town of 35,000. Construction starting now. CATV experience preferred, but good TV technician willing to be first CATV Chief with fast growing broadcasting company may qualify. Reply to Dept. T212, TV Communications.

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CASH FOR CATV PHOTOS

TV Communications pays \$20 for color photos used on the magazine's front cover. Any CATV-related subject matter considered; send color transparencies (2 1/4" square or larger) or color prints (with negative if possible). All materials returned on request. Send to Milt Bryan, Assistant Editor, TV Communications, 207 N.E. 38th, Oklahoma City, Oklahoma 73105.

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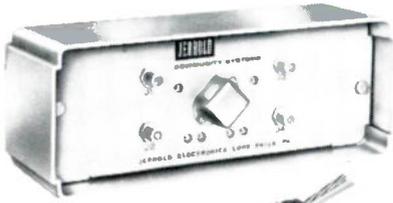
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