June 1968

TV Communications

The Professional Journal of Cable Television

In This Issue...

Door-to-Door Sales
Preventive Maintenance
Signal Interference

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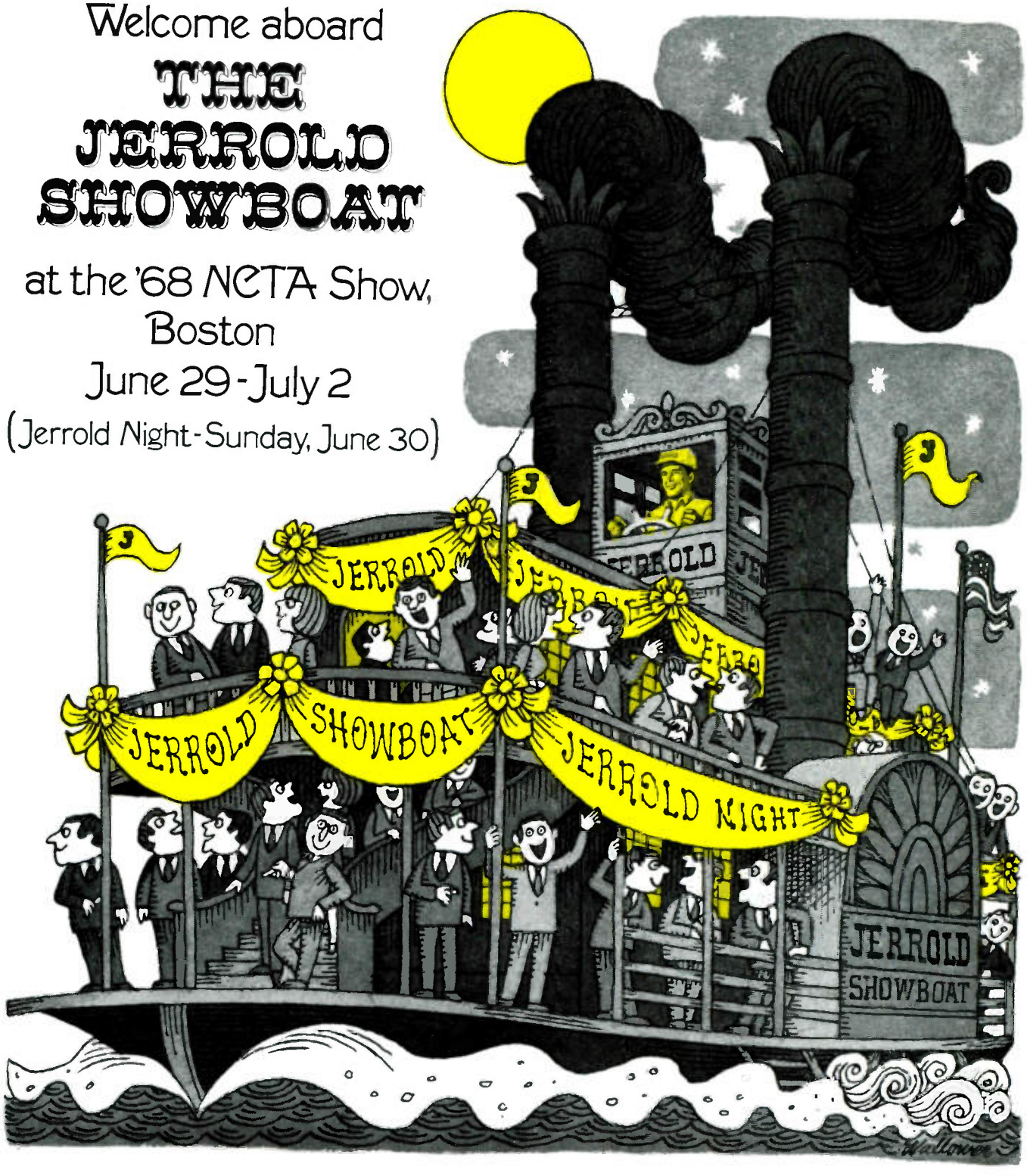
Boston
June 29-July 2
(Jerrold Night-Sunday, June 30)



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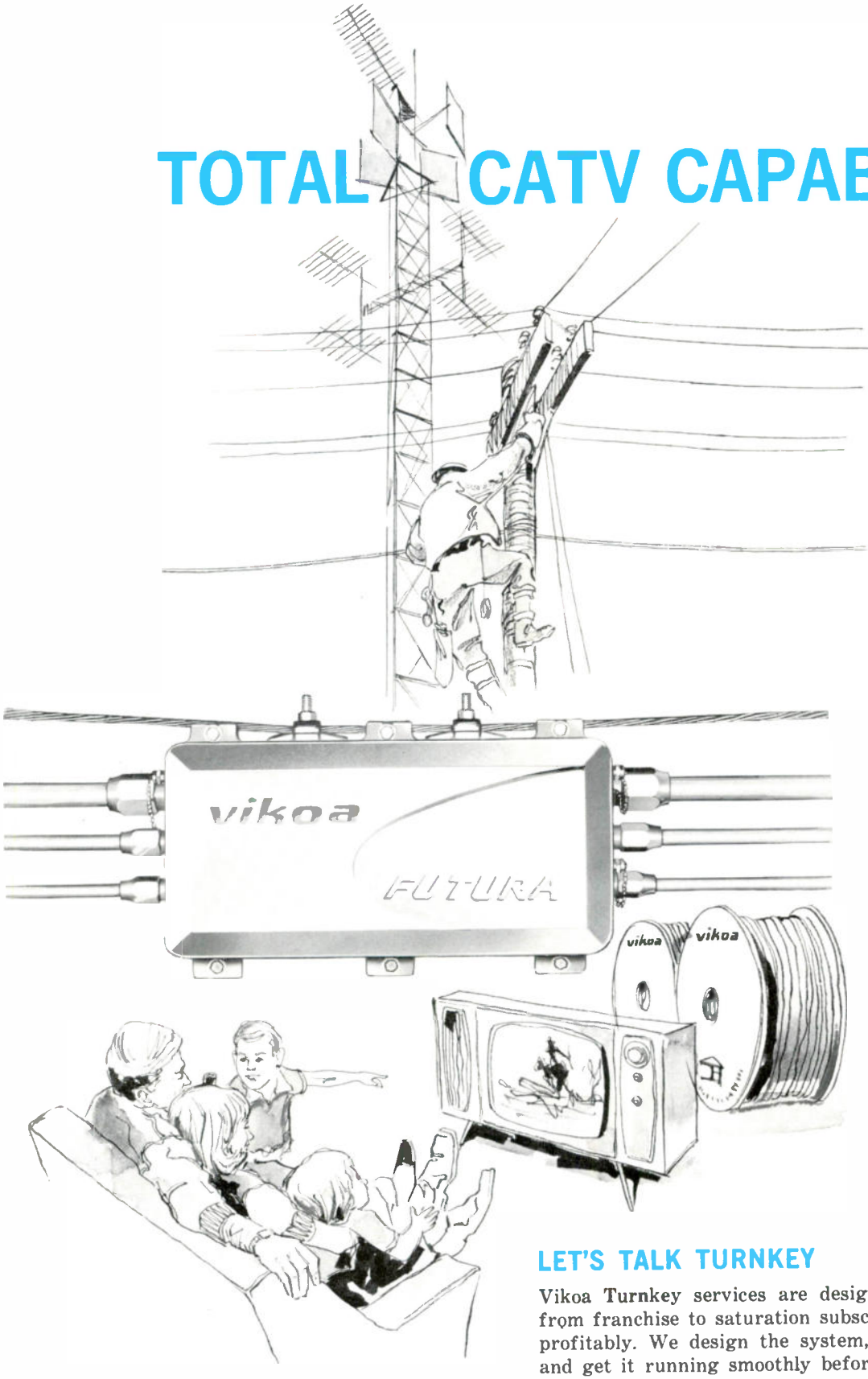

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IN THIS ISSUE

Our Cover: This month's front cover was provided by Mark Van Loucks, CATV Marketing, Inc. (see article beginning on page 42). (TV Communications pays $20 for color photos supplied by readers and selected for publication. Both transparencies, and glossy prints and negatives are accepted—materials returned on request.)

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TV Communications

The Professional Journal of Cable Television

CATV TECHNICIAN SECTION

DEPARTMENTS

BPA

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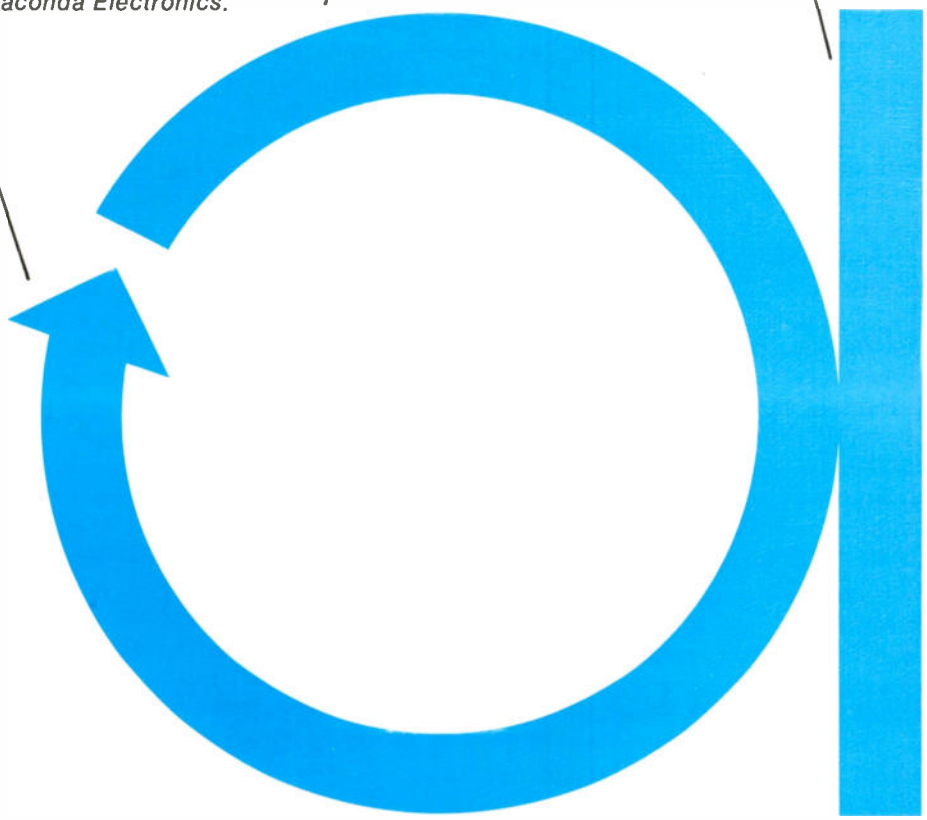
This is the new logo for Anaconda Electronics.

This straight line represents simplicity in product design. And it's one way of saying that we're pretty straightforward folks to do business with.

This feedback loop represents the total communications goals of Anaconda Electronics.



(Look again. It's a futuristic lower case "a.")

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Our business is electronic communications. CATV and Carrier, for example. It's a natural extension of Anaconda's years of leadership in cable transmission.

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The TVC Viewpoint

EDITORIAL

NCTA In Perspective

"I don't think NCTA does the job. Compared to the dues we pay, what do we get?"

"The association is our only hope. We should back the boys in the Washington office."

"It's run by a clique. Ever sit in on one of those board meetings?"

"Somebody has to represent us on copyright . . ."

. . . and so the comments continue. On and on, pro and con. But who is right?

Each of the authentic viewpoints expressed above is representative of substantial grassroots sentiment. Each, undoubtedly, has merit. But none of these statements encompasses the *whole truth* about NCTA.

There's more to the matter than just criticizing . . . or just "backing the boys in the Washington office." What is needed at this time is an association *membership* that is responsible enough to back NCTA programs to the hilt—while remaining objective enough to criticize and correct certain aspects of association management and direction.

The need of the hour is *not* for cable operators who only "back" the officers and staff with lip service loyalty. Rather, the urgent requirement is for association members whose interest is expressed in shoe leather. Those who observe that NCTA is largely run by many of the same people—or their associates—year after year, should ask a member of the nominating committee how difficult it is to find a qualified man who will undertake the obligations of an officer or director.

Is NCTA run by a "clique?" Sure it is, if that's what you want to call a handful of people who are willing to travel to meetings at their own expense . . . to spend several days each year and run up their own phone bills in service to the industry.

What's that? You say you know of men who are capable and fully prepared to handle such a job? Men who would be happy to bring some "new blood" and new ideas into the NCTA direction?

Are you interested enough to get them nominated by petition or on the floor of the annual meeting? If not, don't complain about NCTA—or about what may happen to your business if NCTA loses an important legal or legislative skirmish.

If you do care enough, then I say go to it. Express yourself; take a hand in the management of NCTA affairs. There are plenty of elective and appointive jobs to be filled.

Don't be simply "*for*" NCTA or "*against*" it. Instead, get involved. Do *your* part to make the association function as effectively as possible for the common good of all cable television operators.

The question is not *whether* NCTA will represent each operator's interests—but *how well* it does the job. You, of course, can help shape the answer to that question.

Stan Searle

Our request for information on CATV carriage of UHF signals has brought excellent response from most parts of the country. If you haven't written to tell us which UHF stations are carried on your system, please do so today. Briefly include information on the cooperation and attitude of the UHF stations toward the cable system. Please reply to CATV Weekly, 207 N.E. 38th, Oklahoma City, Oklahoma 73105.

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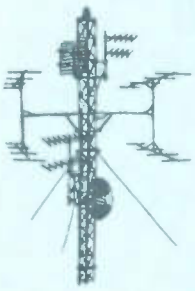

CATV Industry PERSPECTIVE

"Public service programming" will soon become a part of the cable operators' vocabulary. Not for direct financial gain--but to fully occupy his natural community service role, the cable system owner will increasingly seek opportunities to provide a service to his viewers. Live local originations, films and tapes will be used to make cable TV truly a means of "local expression." The principle results in most cases will be improved public image and, indirectly, added subscribers. However, other local media may respond competitively if good relations and understanding are not established first.

Cable business will change significantly during the next 3-4 years. Sale of advertising, live studio productions, political announcements, editorializing and equal time considerations will alter both the outward image and the internal management of cable systems.

The sale of advertising by CATV systems, which has been going on for years in a few locations, is steadliy increasing. If systems have to pay heavy copyright costs, they may be forced into selling advertising. Even a small cable operation can generate several hundred dollars per month by selling ad cards or slides on the weather display channel and through sponsorship of local news and special events. CATV operators who follow NCTA's suggestion to involve local radio stations in their local origination of news and other programs may find the transition into advertising sales a very easy one. Radio stations, of course, are commercially oriented and already have the salesmen on the street.

The relationship of cable systems to broadcasters, publishers and telephone companies will be the object of federal concern. A national communications policy will be formulated with respect to ownership of cable systems by broadcasters, in particular. The possibility of localized monopolies in mass communications is not being ignored by the FCC or the Justice Department. Within a year, two years at most, the Justice Department can be expected to critically examine situations where the cable system is owned by the local TV broadcaster--who may also own an AM radio station, possibly an FM station, and the local newspaper in many cases.

Cable industry relationship with Bell Telephone may be improved this year. At any rate, AT&T emissaries have opened the door to negotiation on two key issues. At NCTA-AT&T conference last month Bell's Vice President Ellinghause agreed, in principle, to bilateral negotiations on pole rental rates and opened the door to a new look at the restrictions which Bell pole attachment agreements have placed on the types of material which a CATV system can carry on a coaxial cable attached to a Bell pole. It is too early to verify the total intent of the Bell representatives. However, the prospects for improved treatment of cable systems by AT&T have apparently improved.

- accepts composite or noncomposite signals
- cut is standard on Mix, Effects, and Preset/Program Buses
- automatic inhibit of non-synchronous dissolve
- fade to black with automatic cut
- automatic sync insertion
- no mid-fade color drop when fading to monochrome
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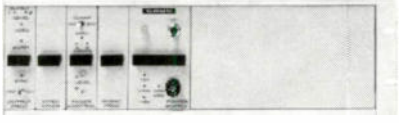

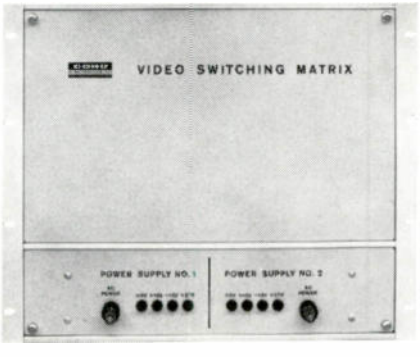

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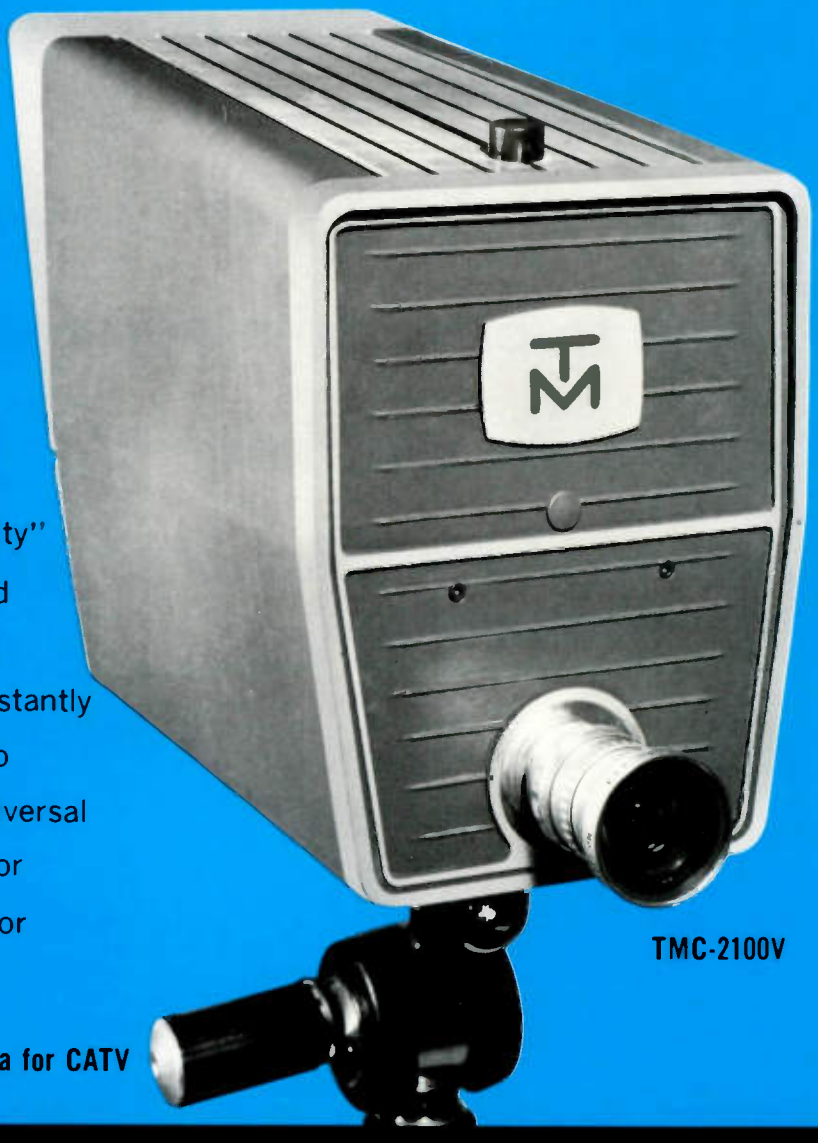
Designed to be the most reliable television camera for CATV



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TMC-2100

TMC 2100 (rear view)

Features:

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- 800-volt power supply and 60 gauss focus field — 800 lines resolution guaranteed — maximum performance from all vidicon tubes, including new separate-mesh tubes.

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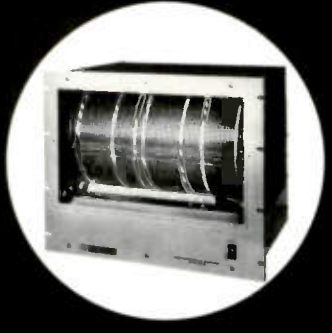

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LETTERS

• I want to congratulate you on associating Harry Lando with your publication's Washington bureau. I have known Harry for many years and he has covered a host of matters involving communications. I have observed the objectivity and keen analytical ability Harry has shown over the years, his fairness and integrity. He will make a fine contribution to your readers.

Fredrick W. Ford, president
National Cable Television Assoc.

• This is in reference to your February issue and your printing of my letter concerning the alleged policy of station KSTF, Scottsbluff, Nebraska in broadcasting uncredited items which it obtains from the local newspaper, the *Scottsbluff Star Herald.* The statements in this letter were based upon my own observations and do not reflect the opinions of Torrington Community TV System or its owners.

After checking, I have determined that the facts of the matter do not support the allegation and that it is inaccurate. Please consider this letter a retraction of my statement in that regard. I would appreciate publication of this retraction in the "letters" section of your magazine.

Ken Kluherz, Manager
Torrington Community TV System
Torrington, Wyoming

Ken, we do not mind printing your "retraction" letter. Although you have not said so, we assume your letter is the result of considerable coercive pressure from Frontier Broadcasting Co., parent company of KSTF. Of course, it's only natural for the broadcasters to be embarassed about your letter, which quoted the Denver Post *story about how KTVS, another Frontier Broadcasting station "steals" some of its "news coverage" from the Yuma, Colo. newspaper.*

• *The following letters are a few of those received in response to the editor's request for documentation of the role of cable television in helping UHF stations. Readers are invited to add their views and experiences. Copies of letters relating to UHF carriage will be forwarded by TVC to key legislators as well as the FCC.*

• I am happy to send you the enclosed information on some of GenCoE's UHF experiences, in accordance with your editorial and also with the request in the NCTA Bulletin.

I hope that this information can do the industry as well as our relationships with the UHF television station people in general some good.

Benjamin J. Conroy, Jr.
GenCoE, Inc.
Austin, Texas

• In regards to your request . . . our cable system carries three (3) UHF stations—21, 33, and 39 from the Dallas-Ft. Worth area. Two of these UHF stations advertise the fact that their stations are carried on our cable system. The same two stations are also advertised by our radio station.

Leo Hackney, president
Greenville Cablevision, Inc.
Greenville, Texas

• We here in Seattle carry KTPS Educational, a UHF station (62) on our systems in Seattle and Bellevue. We further distribute, at our cost, their program schedule as a stuffer in our billing envelopes.

Keep up the good work—you don't stand alone.

Richard L. Rokes, manager
Telecable, Inc.
Seattle, Wash.

• In this area (Burlington County, New Jersey) most UHF reception is substandard as compared with VHF.

As the enclosed sales literature from UHF Channel 17-Philadelphia states, CATV systems have added over 50,000 viewers to the Channel 17 audience. Can there be any greater proof that CATV is helping UHF in our area?

• In addition to adding people to the UHF audience that don't have UHF converters, CATV strengthens a UHF's competitive market position by putting them on the dial next to the VHF channels, with an equally strong signal.

The irony of this situation is the obvious fact that the VHF's apparently don't want the UHF's to compete with them.

Frank J. Keenan, president
General CATV Inc.
Delran, N.J.

• In response to Stan's fine editorial, I would like to forward the following information. We have two systems carrying UHF stations.

Houma (La.) Cablevision carries Ch. 26, WWOM-TV New Orleans. And Shenango Cable (Sharon, Pa.) carries Ch. 21 WFMJ-TV, Ch. 27 WKBN-TV and Ch. 33 WYTV-TV, all Youngstown, Ohio stations.

Shenango Cable has a request for non-duplication from all three UHF stations in Ohio and we are setting up switchers to comply. Compliance with this request will seriously endanger our subscriber retention and growth but we have no alternative due to Second Report and Order.

J. Phil Franklin
Director of Systems, Entron, Inc.

• In response to your request, Community Cablevision Company carries three UHF channels namely: KCET-28 an educational channel, KPOL-TV 22 a financial channel and KMEX 34 a spanish language channel.

A number of our subscribers have continually expressed interest in especially the financial and educational channels.

Wayne R. Hauser
Community Cablevision Co.
Irvine, California

• Five of the 12 stations we carry on our system are UHF stations . . . including Channel 22 in Springfield, Mass., operated by CATV's arch-enemy, William L. Putnam. Others are Channel 17, the educational station in Schenectady, N.Y.; Channel 24, the educational station in Hartford, Conn.; Channel 30 of New Britain, Conn.; and Channel 19 of North Adams, Mass. Rooftop reception of Channels 17 and 19 is spotty at best in this area; reception of the other three is virtually impossible.

I might also add that our system has made substantial financial contributions to both educational stations, and that both have gratefully acknowledged these contributions. I hope this information is helpful.

John W.P. Mooney, program director
High Fidelity Cable Television
Great Barrington, Mass. TVC

Calendar

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

June 4-6. The 2nd Annual Microwave exposition will be held at the San Francisco Hilton Hotel, San Francisco.

June 29 - July 2. The 17th Annual Convention of the NCTA will be held in Boston, Mass., at the Sheraton-Boston.

Aug. 9-10. The Rocky Mountain Cable Television Association will meet.

Sept. 29 - Oct. 2. Pacific Northwest CATV Association will hold its fall meeting at the Sheraton-Portland Motor Inn, Portland, Ore.

Nov. 10-13. The fall meeting of the California CATV Association will be held at the Del Coronado Hotel, Coronado Island. TVC

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CATV MANAGEMENT CORNER

Learn to Run Relaxed!

The person who constantly talks about how hard he works is bragging about his *bad habits*, not his good ones. He concentrates so intensely on how hard his job is, that instead of getting his sleep at night, he lies there thinking about how much there is to do the next day. After this goes on a few weeks, such a person is in a rut, a deep rut. And the work still has to be done, for he actually hasn't accomplished much.

Forget how hard the job is, organize it! Use some of those hours spent worrying at night to *plan* for the next day. Then relax and sleep.

Next day, check the plan against new circumstances which may have come up, revise it here and there and get going. With a plan set up, part of the difficulty is solved, and with the work under way, there will be time throughout the day to relax and plan the next operation.

Have you ever said to yourself, "Gosh, nothing but work, work, work. This job is killing me?"

Once in a while isn't too bad, but if you have formed the habit of saying this, or something similar frequently, you are really making your job hard work. You are building up mental resistance that actually results in *making* your work hard. Eventually you find yourself off balance. Every job is too hard; each day's work is too difficult; every problem is impossible.

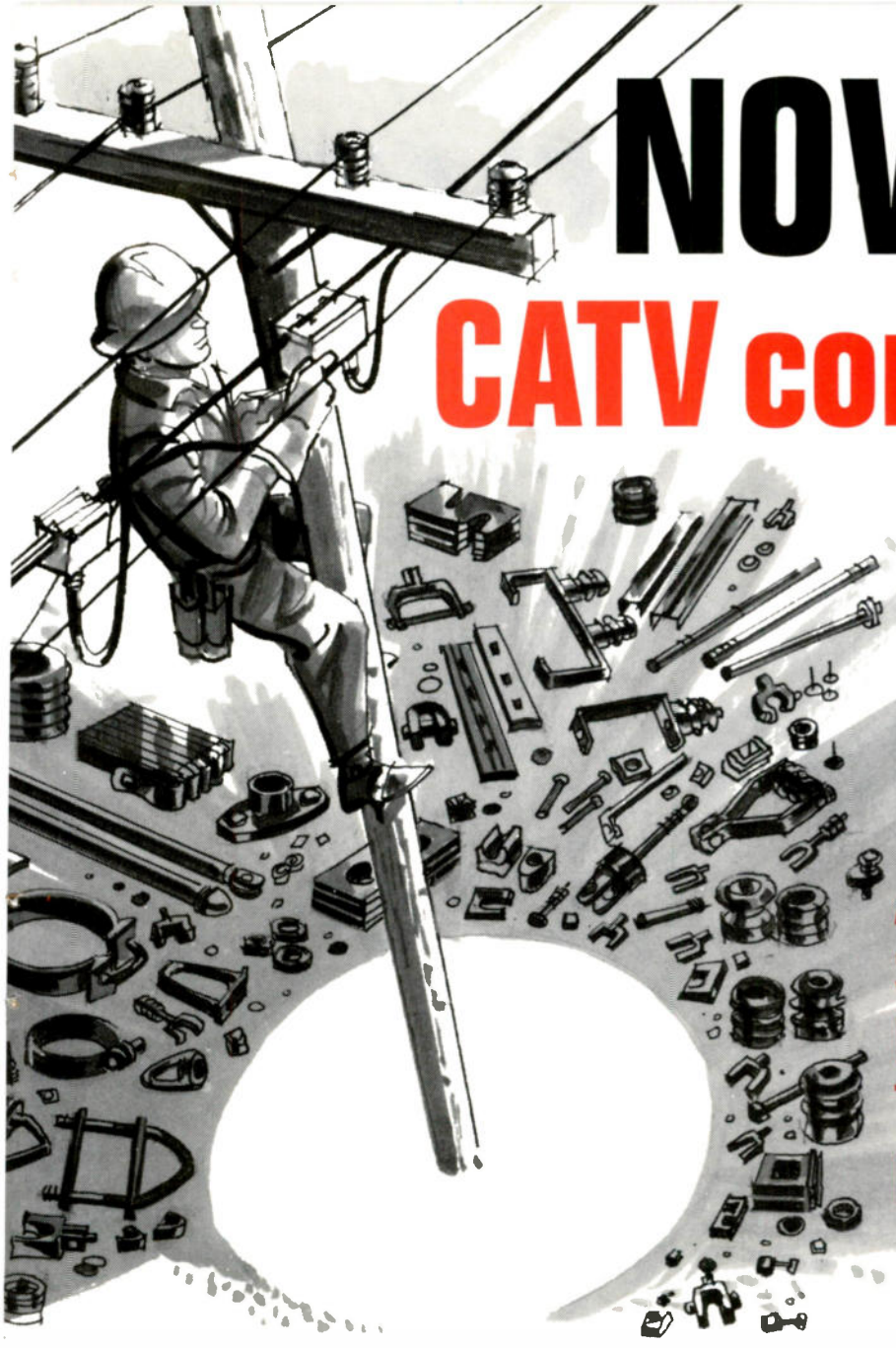
Such resistance tightens up a man, physically and mentally. It creates tension and that, in turn, creates habits which make work hard. It's a vicious circle. You think the job is hard, you set up resistance to the thought of it, you become tense, and presto, the job really *is* hard. You've come back in the circle to the starting point.

"Look fellow, take it easy," said a doctor to one of his patients. "When you sit at your desk, making notations on a paper, you're supposed to be working with your brains, not every muscle in your body."

The next move is to *delegate*. That's right. The CATV operator who cannot delegate some of his responsibilities is going to rush through every day, wondering how he can get everything done. And since he hasn't delegated, the others will sit on their hands and let him do it all. One of his primary jobs is that of developing others to handle responsibility and working through people.

One habit that makes work doubly hard is mulling over mistakes. Man is human and mistakes will occur. To lose energy stewing over every little mistake made in the complex job of managing a CATV system is to dissipate one's energies where they will do the least good. The manager who can understand and evaluate mistakes, consider them in proportion to the whole operation, and then charge them off to experience is conserving his energy for the entire day's work.

Most of your life is spent working. Try really enjoying it for a change! TVC



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Only fully automated analog/digital computer controlled CATV cable extrusion line in the world.

System designed and developed by Whitney Blake engineers for the ultimate sophistication in quality coaxial cable production. Continuous monitoring of diameter and capacitance for computer controlled adjustment of line speed, extruder speed, and extruder temperature profile to automatically maintain cable characteristics to preset standards. Built-in recording facilities provide constant monitoring of cable physical and electrical properties and operating conditions of the machine. Every length automatically identified on the recorder for in-process QA.

VISIT BOOTH NO. 126 NCTA CONVENTION

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Late News

THOMPSON ATTACKS "NICE GUYS"

NCTA vice chairman, Frank Thompson, launched an attack on what he termed the "nice guys" of CATV from the platform of the recent North Central CATV Association meeting. He called NCTA president Fred Ford "completely ineffective" and demanded a firmer stand by National organization officials on such issues as copyright and telco relations. The attitude of the current leaders, he said, "is reminiscent of our sale of scrap iron to Japan prior to World War II."

Nor did Thompson limit his biting criticism to members of the current "establishment." He called the slate of proposed officers "almost incredible," and warned that if Robert Beisswenger, head of Jerrold Electronics Corp., is elected chairman, a conflict of interest will ensue. Making it clear that his objections were not based on personalities, Thompson declared that a primary loyalty to stockholders of an equipment manufacturing company would compromise the effectiveness of an NCTA officer.

CABLE ENTERS SPORTS ARENA

A CATV system has been granted rights to televise a professional sport for the first time, according to William Pitney, General manager of Cleveland Area Television Inc. in Lakewood. The system serving the Cleveland suburb has been given permission to televise all 13 home matches of the Cleveland Stokers, a member of the North American Soccer League, and the first videotape was recorded May 11.

The sportscaster was Bob Buck, sports director for the system, assisted by Hubert Lieb who is a member of Cleveland's German Soccer Club and an expert on the game. The matches are all scheduled at the Cleveland Stadium, and since stadium rules prohibit use of a remote truck within the structure itself, a 350-foot camera cable run was necessary to extend from the camera positions to the remote truck parked outside. In order to protect gate receipts, Cleveland area TV is scheduling the videotaped matches one day after they're played. Pitney reports an enthusiastic response to the new programming.

CANADIAN OPERATORS ELECT OFFICERS

Omer Girard of Magog, Quebec was elected president of the National Community Antenna Television Association of Canada at the Annual Convention held in Victoria, B. C. John Loader, outgoing president, was named executive vice president, a newly-created position. Other officers are: Vice president, Claude Boucher; secretary, Lloyd Gartrell; treasurer, Louise Langlais.

The two issues dominating the convention were the right of operators to originate closed circuit programming and opposition to the granting of exclusive CATV licenses. Each issue was the subject of a resolution passed by the membership. Sessions on sales promotion, technical topics and the future of com-

Late News (Continued)

munications were chaired by I. Switzer, Don Paynter and Omer Girard; and Stan Searle, publisher of TV Communications, addressed operators on the subject of the cable service of the future. He warned cablemen to "be ready to reshape your business in the image dictated by technology, public demand and mature business judgment."

SPEAKERS SET FOR NCTA CONVENTION

Definitely scheduled as a featured speaker at the NCTA Boston Convention is West Virginia Democratic Senator Jennings Randolph. Others addressing the gathering will be association president Fred Ford and outgoing chairman Jack Crosby. Several panel sessions are planned, with a Future of Cable TV panel slated for Saturday afternoon and legal session on Monday morning. Leading CATV attorneys will discuss probable outcome of current Supreme Court cases as well as copyright legislation and various aspects of state regulation.

CCTA MARCHES ON CAPITOL

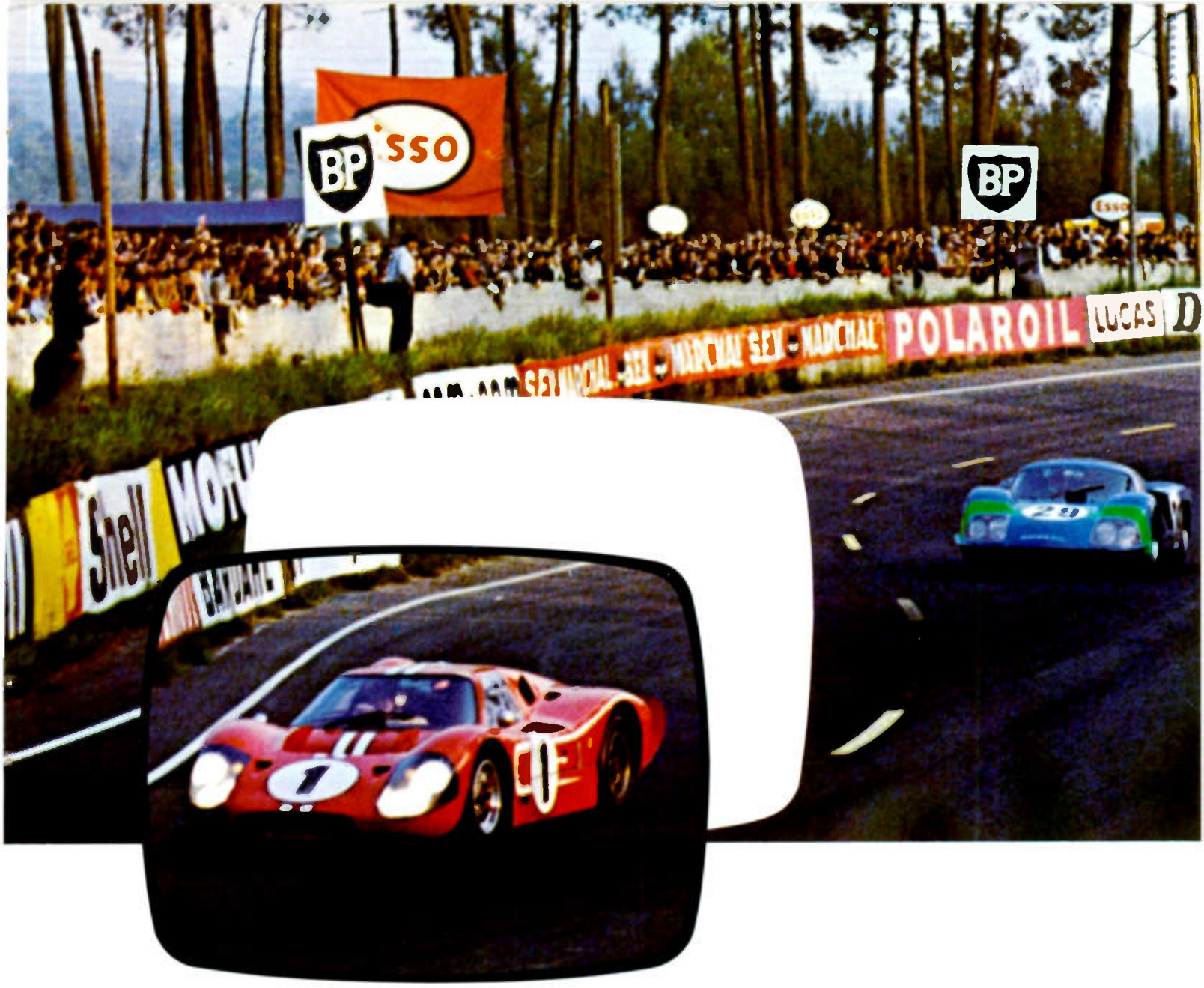
System operators attending the California Community Television Association spring meeting in Sacramento took time out from an opening session to visit the capitol for a scheduled hearing on state senator George Miller's bill to place CATV under PUC regulation. Although members were prepared to debate with Miller, according to general counsel Walter Kaitz, the bill was referred to interim study.

In regular session, CCTA members elected new officers: President, A. C. R. Stone, Storer Cable TV, Los Angeles; vice president, Keith Burcham, Coachella Valley, Palm Desert; technical vice president, Kester Krieg, Pacific Telescriptions Systems, Santa Cruz; secretary, Geoffrey Nathanson, Harriscope Cable Corp., Los Angeles; treasurer, Eugene Iacopi, Television Signal Corp., San Francisco.

CABLE VIEWERS GO FIRST-CLASS

U.S. Representative Samuel S. Stratton (D-N.Y.) told nearly 70 operators attending the New York State CATV Association meeting that "Your service has made it possible for smaller communities and rural residents to live like first-class citizens as far as television is concerned." The congressman, who was the featured luncheon speaker, said,"Congress ought to move swiftly to provide CATV the recognition and status your industry deserves."

The one-day Spring Meeting concentrated on "CATV and the Telephone Company--Cooperation or Confusion?" The panel of experts discussing cable/telco relations was chaired by Lewis I. Cohen, partner in Cohen and Berfield, Washington, D. C. Consensus was that, with growing interest on the part of telcos in entering CATV, problems will become increasingly complex as the two attempt to do business together.



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News SPECTRUM

Cable Wins Top-100 Victory in Galax, Virginia

FCC Hearing Examiner Chester A. Naumowicz, Jr. has given the CATV industry its first victory in a top-100 market. On the heels of his adverse ruling in Syracuse (see separate story, this issue), Naumowicz found that the rules forbidding importation of distant signals should be waived for the cable system in Galax, Va.

Naumowicz cited two surveys in support of his finding that the United Transmission, Inc. system would have "no measurable impact on any market stations." One survey indicated that off-the-air TV viewers in Galax constitute less than 1% of the total audience of any station received. The second survey showed that homes on the cable report a "substantial" increase in overall viewing.

In distinguishing the Galax case from the Syracuse case, Naumowicz said Galax is not "within the essential area on which UHF must rely." It is located in southwestern Virginia—7 miles from the North Carolina border. Although it is not within any standard metropolitan statistical or urbanized area, it is within the predicted Grade A contours of stations WSJS-TV, Winston-Salem, N.C. and WSLS-TV and WDBJ-TV, Roanoke, Va., and therefore under Commission Rules is part of the television markets served by those stations.

The system says it expects to serve about 60 percent of the community's approximately 1,900 homes within five years. It now carries signals of stations in Bristol and Roanoke, Va., Winston-Salem and High Point, N.C., and Bluefield, W. Va. It asked to import signals of stations in Charlotte, N.C., Oak Hill, W. Va., Greensboro, N.C. and Johnson City, Tenn.

FCC Spokesman Addresses Mid-America CATV Meeting

Robert V. Cahill, legal assistant to FCC Chairman Rosel Hyde, sketched CATV "as seen through the eyes of the Commission" at the recent meeting of the Mid-America CATV Association in Oklahoma City. To an audience of over 125 cable operators and broadcasters, Cahill attempted to explain the rationale of the Commission's regulation of cable television.

Nonetheless, Cahill contended, the FCC "is not committed to the status quo." He emphasized the challenge of changes occuring in the present world of communications and "re-issued" Chairman Hyde's call for "an accommodation of the mutual interests of broadcasters and CATV."

E. Stratford Smith, prominent Washington, D.C. cable attorney, brought operators up to date on the status of copyright litigation and legislation. While he pointed out that no one can predict with any degree of certainty the outcome of the copyright case currently before the Supreme Court, he did say that "for the first time in eight years of litigation" he feels the industry has "some chance" for an outright decision of no liability. In the event that liability is declared, he said, legislation will certainly be passed, probably in the form of a mandatory licensing act. Meanwhile, pending judicial and/or congressional action, efforts are being made to extend the present moratorium on copyright litigation.

Other highlights of the one-day meeting included an unexpected visit from Senator Fred Harris (D-Okla.), who spoke briefly to the operators, assuring them of his continuing interest in their problems. One such problem, the threat of cable TV being regulated as a public utility, was discussed by Stan Searle, editor of *TV Communications*. Current attempts to secure

Robert Cahill, administrative and legal assistant to FCC chairman Rosel Hyde, addresses Mid-America Association on regulatory role of FCC.

legislation to bring CATV under state controls in California and Massachusetts were described. The key figure, Searle said, in counteracting such efforts "is still the grass roots operator." The individual operator "can't afford to 'pass the ball' to NCTA," Searle declared. "You'll have to take your turn at carrying

CATV attorney E. Stratford Smith brings cable operators up to date on current copyright litigation, possible legislative developments.

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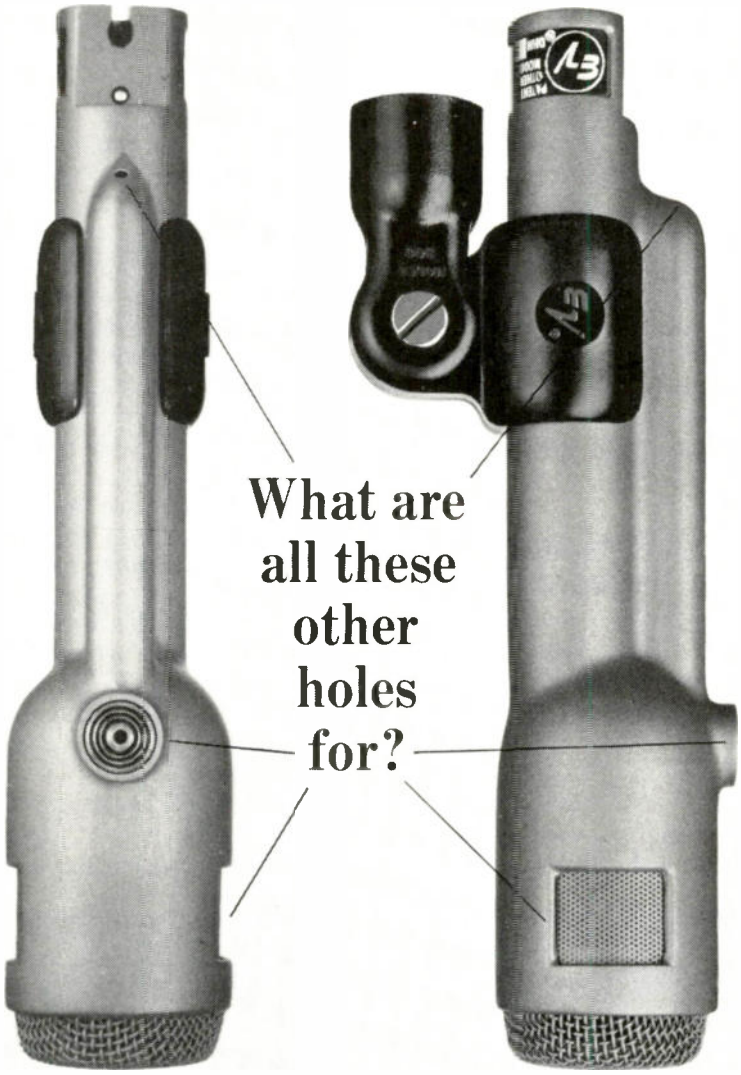

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it yourself, looking to the national, regional and state associations for leadership and guidance."

A half-day session on local program origination was presented by Galen O. Gilbert, president of KBTN Cable TV, Inc., Neosho, Mo.; Bill Bentley, manager of KBTN radio, Neosho, Mo.; Jack Hood, manager of Holdenville Cable Co., Holdenville, Okla.; and Ken Lawson, sales manager at TeleMation. An actual VTR demonstration was featured, and Ken Lawson also gave equipment cost and capability information to the group.

Michigan Operators Plan State, National Strategy

Of principal concern at the Michigan CATV Association meeting held recently in Petoskey was the State Highway Department policy of not allowing CATV systems to string cable parallel to state highways. Harold Moore, secretary for the MCATVA, said, "The highway department allows the telephone companies and other utilities to string cable parallel to state highways, but they won't let CATV cable go through."

Following the report on highway department policy given by Jack Bradshaw, association president Rich Bur appointed a committee which will meet with state officials to discuss easements for CATV cable. Members of the committee are: Jack Bradshaw, Gil Clark, Harold Moore and Dale Criswell.

Wally Briscoe, managing director of the NCTA, attended the two-day meeting. He asked the association to send two representatives to Washington to meet with NCTA and Michigan congressmen concerning cable problems in their state. Moore and Bur were selected as the group's spokesmen. Briscoe also brought with him a video taped report from NCTA general counsel Bruce Lovett who discussed Section 214 hearings and copyright developments.

Other speakers included Jack Jungroth of *TV Communications* who discussed the political role of the individual system operator and attorney Alan Raywid of Cole, Zylstra and Raywid, who reported on FCC jurisdiction and microwave problems. TeleMation sales manager Ken Lawson demonstrated local origination equipment and the group toured the studios of Colonial Communications Company.

Conferring on the state of the industry at the Michigan CATV Association meeting in Petoskey, Mich. are (l. to r.) Rick Bur, association president, Wally Briscoe, NCTA managing director, and Harold Moore, secretary-treasurer of the Michigan group. Briscoe invited members of the association to meet with NCTA and state congressmen in Washington to search for solutions to local problems.

Cable Attorney Condemns FCC Philadelphia Plan

Recent FCC action in consolidating 24 waiver requests for distant signal importation into the Philadelphia market has been condemned by NCTA General Counsel Bruce Lovett. "This approach," he said, "will exemplify what is wrong with the administrative process. When administrative law is used for delay, it will, by being perverted, fall of its own weight."

The hearing for the two dozen requests was set to include, among other issues, the extent of CATV service in the Philadelphia market, the effect of this service on existing and proposed television stations, the plans of the cable systems for services other than relay of TV signals and a determination as to whether carriage of signals from New York City television stations should be authorized.

Included as parties to the hearing will be certain copyright owners. They had asked to be made parties, stating that non-duplication provisions would not protect independent stations carrying syndicated and film programs. The Commission overruled cable objections that the copyright interests are currently under court test and that copyright owners lacked standing.

Cable/Bell Relations Worsen in Colorado

CATV-AT&T relations took a turn for the worse in late April when representatives of the Mountain States Telephone Company in essence told the Rocky Mountain CATV Association that bilateral negotiations between the telco and cable operators were not in consideration at the moment.

Only days earlier, a summit conference between the CATV industry and AT&T had been characterized as "very productive . . . a big step

toward problems between the cable television and telephone industries." Both parties had agreed to approach pole attachment contract restrictions and pole rate increases bilaterally.

Cable operators at the meeting expressed disappointment at the decision, "especially coming so soon after favorable meetings in Washington."

Present at the meeting in Denver was CATV attorney Jack Cole who said, "We met a rather cold reception relative to our suggested procedures for negotiating a fair and reasonable contract. We did not gain the impression from our meeting that Mountain States was going to proceed with bilateral negotiations."

Program Draws 250 At Annual Texas Meeting

Local origination, new sales techniques and the training of CATV technicians highlighted the program of the 8th Annual Convention of the Texas CATV

NCTA Chairman Jack Crosby welcomes operators to the Texas association meeting in Dallas.

Association held in Dallas, April 25-27. More than 250 system owners and operators from Texas and surrounding states attended.

Several program sessions were devoted to various aspects of local origination. These included a general look at where the industry stands today in local origination as well as discussions on the cost and availability of filmed material for local programming. An additional segment included case histories of cable systems using local origination.

The need for formal training of CATV technicians was covered in two sessions. A representative of Elkins Institute of Radio & Electronics discussed the feasibility of setting up a 12-week training course and Stan Searle, editor of *TV Communications*, told the group about correspondence courses presently available.

Wide-spread rumors that Texas governor John Connally would propose a sales tax extension that would include CATV were publi cized at the meeting. State senator Tom Creighton told the cablemen that the governor might also recommend a higher franchise tax for state CATV systems. Attorney Dick Craig asked operators to launch an all-out campaign to lobby against the tax increase proposal.

At the annual association banquet, members and their wives were entertained by a humorous speech by Cactus Pryor, Austin broadcaster and favorite comic of President Lyndon B. Johnson. For the speech, Pryor was billed as Sir Hans Christoffersen, Managing Director, Royal Danish Institute of Communications. His true identity was not revealed prior to his talk.

Texas association officers and directors for 1968-69 are: president, Mel A. Gilbert of Snyder; vice president, Jay O'Neal of Austin; executive secretary, Johnny Mankin of Tyler; executive director Glen Scallorn of Del Rio; associate director, Ed Dart of Dallas; and directors Ben J. Conroy, Jr. of Austin, Bob Eddins of Brownwood, Maurice Nixon of Mineral Wells, Don Patten of Port Lavaca and Bob Rogers of Tyler.

L'Heureux Asks Broadcasters Tough Questions on Anti-Trust

When various broadcaster groups began calling meetings to fight a feared "raid" of broadcast spectrum, noted cable attorney Robert D. L'Heureux raised the question of possible anti-trust implications. In a letter to NAB president Vincent T. Wasilewski, L'Heureux asked whether "a representative of the United States government had been invited to attend" the meetings held by NAB, AMST, the networks and the Station Representatives Association.

The broadcast conclaves were called to formulate strategy, including raising of funds, to counteract interest in the widely discussed national communications grid, the so-called "wired city concept" and to attack mobile radio industry efforts to get reallocation of certain UHF frequencies.

L'Heureux noted that reportedly "NAB has committed about $100,000 to this preliminary project, the AMST expects to raise substantially half that sum through special assessments and the networks,

Vincent Wasilewski

SRA and other groups involved in so-called 'spectrum protection' are being asked to back the project with at least equivalent funds."

In his letter, L'Heureux told Wasilewski that some of his clients had asked about the anti-trust implications and that he had informed them "that these meetings can take place without inviting an anti-trust suit if an authorized representative of the government is present at all of the meetings where strategy or plans are discussed. Otherwise, suspicions are apt to be aroused in the minds of mobile radio users of CATV operators that they may through some combination be restrained or restricted in their opportunity to pursue their legitimate business activities and serve the public."

Both Wasilewski and AMST executive director Lester Lindow rose to their own defense. Both stated that they had "been advised by counsel" that a government representative need not be present at the meetings. In response, L'Heureux said, "they are taking grave risks if they don't" invite a government man. "Here they had their own counsel testify that they didn't discuss anything that bordered on anti-trust," he continued. "That is just the point that I am making. If they are chal-

Ameco Holds Regional Seminar

William A. Rehinfelder, staff scientist for Ameco Engineering Corp., discusses system planning with technicians at Ameco's regional seminar. The seminar preceded the Mid-America CATV Association meeting held in Oklahoma City.

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lenged, they have to say they didn't discuss anything that bordered on anti-trust . . . you don't have to have a representative from the government present, but it has always been considered prudent when people with conflicting interests are involved."

L'Heureux concluded, "It would be surprising that these meetings wouldn't discuss anything of an anti-trust nature when their specific nature is to keep CATV from having microwave grants and to prevent land mobile from having low UHF bands."

Commission Hears Final Argument on San Diego

Though the wheels of administrative law grind slowly, they eventually do grind to a conclusion. The FCC, sitting *en banc*, has at last heard oral argument in the San Diego case (the same case which, in a different posture, is now under consideration by the United States Supreme Court). The Commission was urged during argument not to put off its decision pending the verdict of the Supreme Court on the Commission's regulatory authority over CATV.

Frank Fletcher, representing most of the CATV systems involved, told the Commission hearing that the Supreme Court might conceivably delay its final decision and that, in any event, the San Diego systems and the San Diego public have suffered from procedural delays long enough and are entitled to a quick answer.

Charles Miller, representing Midwest Television, and Arthur Schroeder, representing Western Telecasters, warned against effects on local TV stations of importation into San Diego of Los Angeles programs. Midwest is one of the VHFs in the market, the other not having participated in the objection to CATV operations, and Western operates the only present on-the-air UHF.

The two lawyers pleaded with the FCC to override an initial decision in which the Commission Hearing Examiner ruled that the local stations had not sustained their burden of proving adverse impact on them from CATV operations. Later Fletcher pointed out that the same Examiner in the Syracuse case had ruled that a CATV system had failed to prove it would not injure local UHF service. He said, "It seems a little burdensome to an industry for the decision to rest on who had the burden of proof."

Miller said advertisers will rely on Los Angeles stations to cover San Diego, and that the "dilution" and "fragmentation" of audiences will not be as great as the loss of revenues for the local stations. He said San Diego is not able to support 11 stations.

Commissioner Lee Loevinger broke in to ask him whether the Commission should outlaw motion picture theatres, because they also cut into audiences for TV stations. "What is the logic of the distinction?" he demanded.

The FCC's own Broadcast Bureau, said CATV "could change the viewing habits" in San Diego, that by 1972 there could be a 50% penetration of the market by CATV, and that UHF survival might therefore be impossible. Loevinger pressed him with a comment that what he was saying was that the viewers would really prefer other stations. As for the fact that Los Angeles stations already put inferior signals into San Diego, Loevinger said "you are suggesting that we use government power to insure that people in San Diego receive a poorer-quality signal."

The city of Escondido, 33 miles from San Diego, sent representatives to plead for an end to FCC bars against CATV service in that community, which they said doesn't in some places even receive San Diego. They said the retired people in most of that city want to continue to receive programs they got when they lived elsewhere.

Frank Fletcher, speaking for the CATV systems, said that the experience of UHF in even large VHF markets was "disastrous," and that CATV can't be blamed. He said CATV would increase the total audience in San Diego, thus augmenting rather than fragmenting it. If all restrictions against CATV are lifted, he added, "CATV homes will not increase as fast in the next 5 to 7 years as the total number of homes, TV homes and UHF-equipped homes in the market."

Jerrold Honors CATV Supervisor

Karl Daus, right, field supervisor in the construction department of the CATV Systems Division of Jerrold Electronics, is congratulated by Kip Fletcher, manager of the department, for being named "Supervisor of the Year." Award was presented for outstanding performance as a CATV system construction supervisor in Bismark, N.C., and Harrisburg, Pa.

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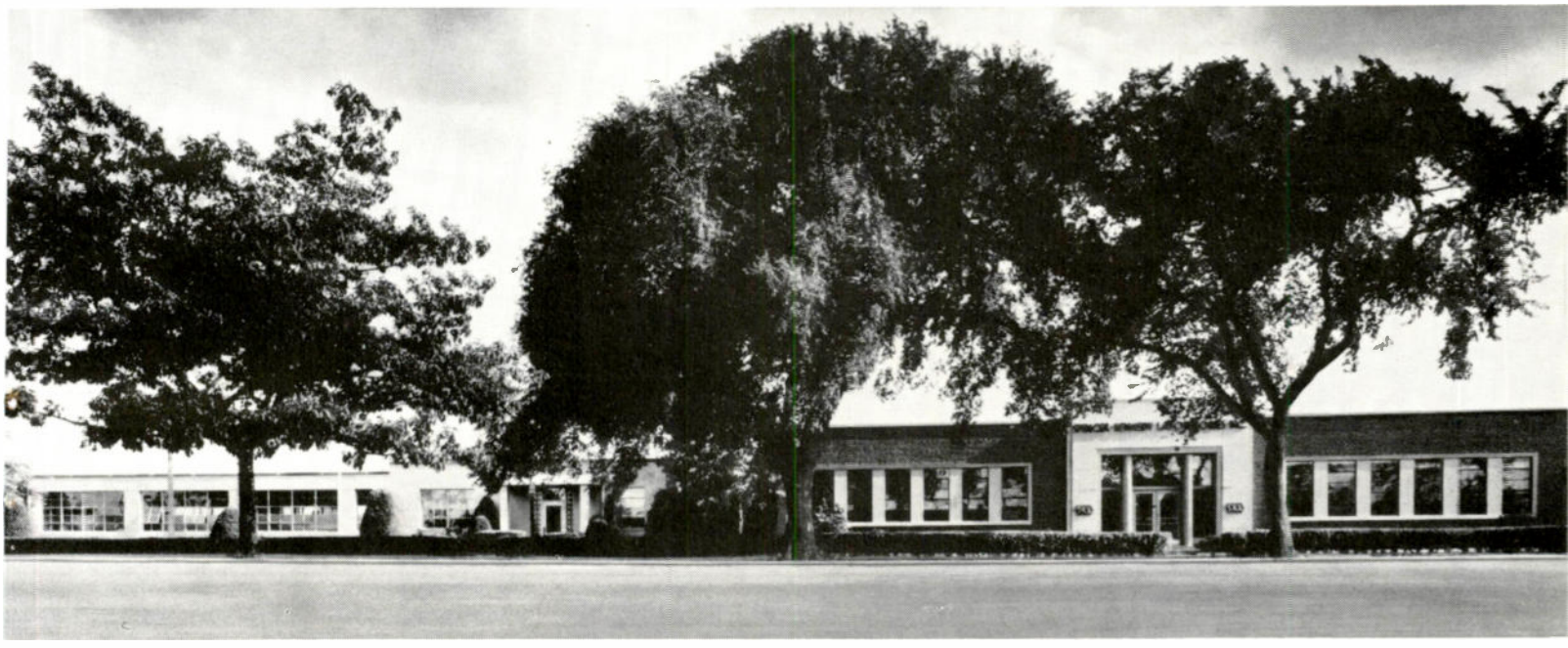

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The city of Escondido testimony made it plain that the residents of that town are angry with KFMB-TV for holding up their CATV service with their current protest. Fletcher added that it doesn't make sense for the station to be building up UHF competition unless the National Cable Television Association is correct in arguing that the powerful VHF stations want to preserve weak competition in order to keep strong competition from being approved by the Commission.

Schroeder, arguing for the UHF station, said that if the percentage which would watch Los Angeles on CATV "is lost to us, the station is lost." He argued that if the FCC doesn't intend to protect UHF from CATV, the Commission should make an official announcement right away so that people will not invest in UHF.

N.Y. Court Holds City Franchise Unnecessary

Justice Matthew M. Levy has ruled that cable systems leasing underground telephone lines to transmit signals in New York need not have a city franchise to operate. The ruling came in response to a suit by New York City seeking an injunction against Bell Television and its subsidiary Comtel, Inc. Comtel, operating on a leaseback basis and without a city franchise, provides some 2,000 subscribers with local station signals.

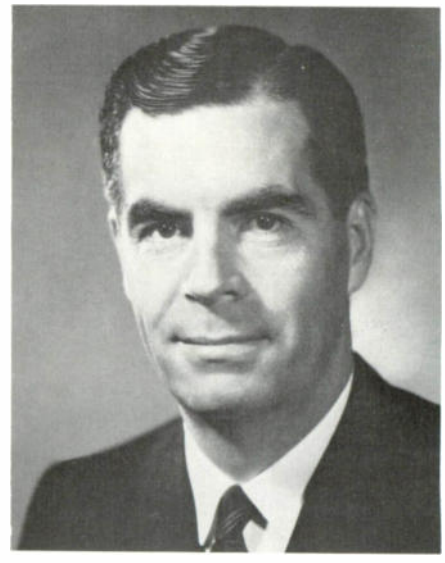
Levy denied the injunction and said that "the defendant is neither using nor occupying the city streets, as are the three CATV companies that have received franchises."

Morton E. David, chairman of Bell Television, pointed out the landmark nature of the decision when he noted that there are at least 80 similar cases in other courts in the country. Commenting on the decision, NCTA general counsel Bruce Lovett stressed that, in light of the verdict, "municipalities must now look to the FCC for protection of their municipal control in the CATV leaseback area . . . this may be the only forum in the country that municipalities can utilize to protect their CATV franchising powers from being overridden by the Bell System."

House Refuses CATV Raise, Criticizes FCC Attitude

Not only has the FCC failed in its bid for more money to finance its 1969 CATV operations—but its entire attitude toward the cable industry came into question during House Appropriations Committee hearings on the budget. The Commissioners became so involved in an argument among themselves concerning cable that Chairman Rosel Hyde remarked wryly, "I would almost say this has developed into a Commission meeting."

Congressman Burt L. Talcott (R-Calif.) told the Commission, "It seems to me that your announcements that you are going to study CATV or regulate CATV and that you are seriously concerned about many of the activities of CATV such as origination of programs, advertising, copyrights and others, has had a very serious dampening effect on CATV."



Congressman Burt L. Talcott says the FCC "has had a very serious dampening effect on CATV." He charged the Commission with protecting broadcasting at recent House budget hearings.

Hyde conceded this might be the case, but said the Commission is trying to "provide an accommodation between the two industries which have not been able to find accommodation themselves." Talcott retorted, "It appears to me that you are trying to protect the original industry, the broadcasting industry." Hyde said that is not "our attitude." He said the Commission is trying to preserve both services for the public.

Commissioner Lee Loevinger said flatly, "I do not agree. I think the concern could be much ameliorated if we did not regulate CATV . . . in the hundred largest markets we have effectively prohibited CATV and in all the lower markets we have established a system by which we normally permit it, and in fact permit anybody who wants to, in this particular market, come in and

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prohibit it by simply filing a paper without making any real showing at all."

Loevinger argued that the Commission has discouraged CATV, despite the shortage of spectrum space and the fact that CATV doesn't use any of that precious asset. "CATV is not a substitute for broadcasting, but it could be a very effective supplement that I think would enable many more people to get many more services without any increases in the amount of spectrum space that would otherwise be required," he told the subcommittee.

Commissioner Kenneth Cox stoutly defended Commission actions on CATV and denied that spectrum space could be saved short of going to an all-wire TV system. Loevinger conceded, "Whether or not we will reduce the number of local stations I think is highly questionable. . ."

He testified, "What we will be able to do is give everybody in the country very full service, the equivalent of broadcasting service. Today there are many cities that have one, two, three or four channels which could have as many channels as New York City. Every place can have the same number of channels as New York City without increasing the present use of the spectrum."

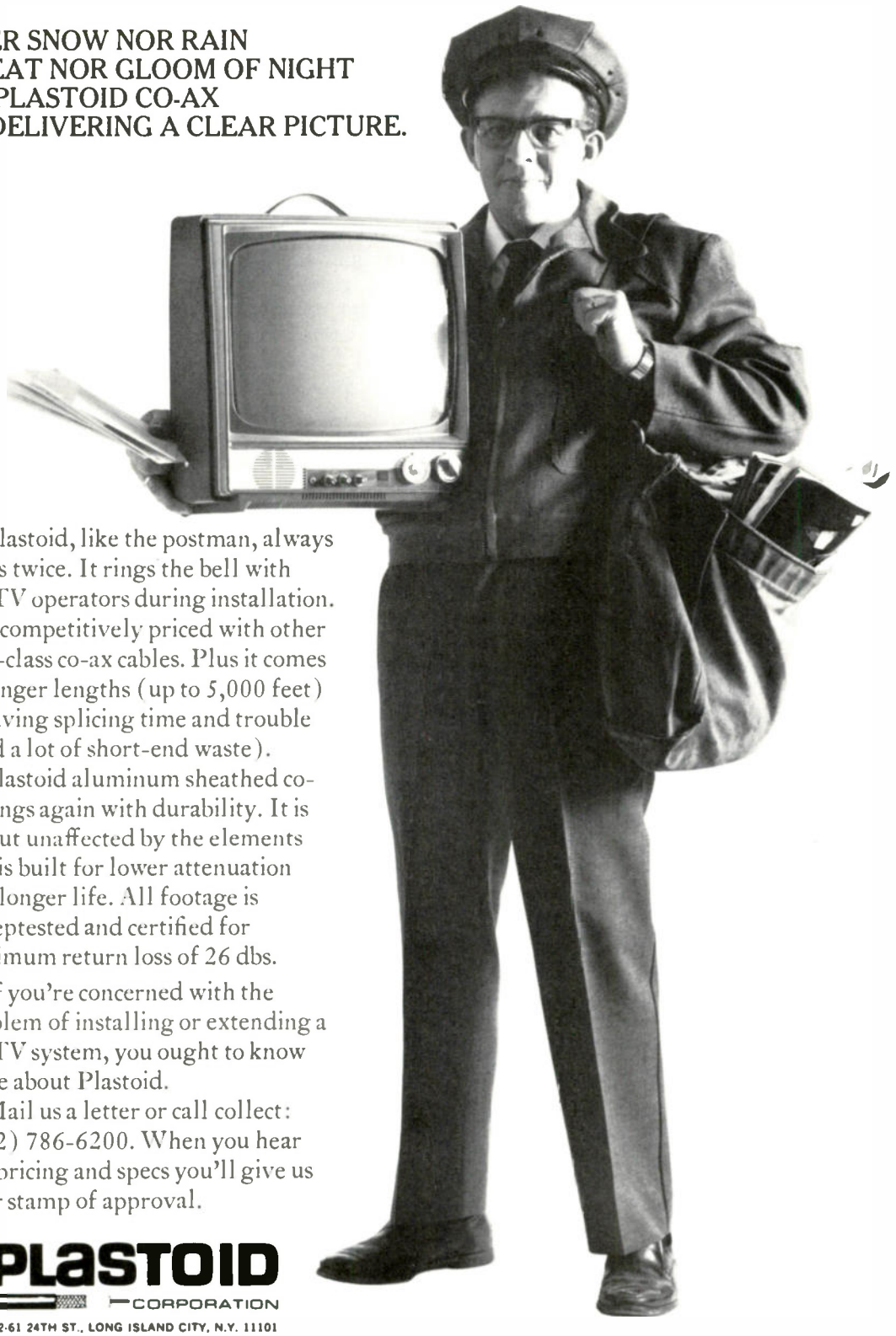
Hyde said the FCC idea is to equalize competition between CATV and broadcasting. "I will be very glad to have this matter settled in the market through competition at such time as we can have conditions of fair competition," he said, adding that he hoped the Supreme Court decision in the copyright case would solve most problems connected with CATV, thus hopefully reducing the regulatory chore to a minimum. In answer to a question, he said that if a Supreme Court decision would hold that the FCC doesn't have authority to regulate CATV, "there would be urgent need" for Congress to pass legislation providing such authority.

Subcommittee chairman Joe L. Evins (D-Tenn.) pointed out that the FCC's CATV activities have grown rapidly. He said that in 1967 there were 28 FCC employees working on CATV problems, that this number rose to 44 in 1968 and for 1969 the Commission is asking an increase of 13 to 57.

The Commission's official statement on its bid for CATV money for fiscal year 1969 was, "With the large number of franchises already granted or pending, it is inevitable that the Commission's workload will be exceedingly heavy in fiscal year 1969. Staff limitations in fiscal year 1968 will necessitate the carrying over of many applications and petitions into fiscal year 1969. We propose staff increases of 2.5 man-years for processing applications and petitions and 6 man-years for the heavy hearing workload.

While the Appropriations Committee, in its final report, made no comments about CATV, it refused the FCC request for an increase from $19,100,000 to $21,271,000. It said only that it would allow $19,750,000 an increase of $650,000, but with the increase dictated entirely by pay and other cost increases already determined.

NEITHER SNOW NOR RAIN NOR HEAT NOR GLOOM OF NIGHT KEEPS PLASTOID CO-AX FROM DELIVERING A CLEAR PICTURE.



Plastoid, like the postman, always rings twice. It rings the bell with CATV operators during installation. It is competitively priced with other first-class co-ax cables. Plus it comes in longer lengths (up to 5,000 feet) —saving splicing time and trouble (and a lot of short-end waste).

Plastoid aluminum sheathed co-ax rings again with durability. It is all but unaffected by the elements and is built for lower attenuation and longer life. All footage is sweeptested and certified for minimum return loss of 26 dbs.

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System Loses to Legal "Presumption" in Syracuse

Chester F. Naumowicz, Jr., the same FCC hearing examiner who ruled for CATV in the historic San Diego case, has denied importation of distant signals into the Syracuse, N.Y. market. The hearing examiner applied the FCC rules and their presumptions strictly in deciding the top-100 case. (Syracuse is 31 in ARB rankings.)

Naumowicz held that General Electric Cablevision Corp. and NewChannels Corp. failed to meet the burden of proof imposed by the rules as strengthened by the Commission late last year. There is automatically a presumption, he said, that "in the ordinary situation the importation of distant signals via CATV will have a deleterious effect on local television stations." To overcome this presumption, a cable system seeking a waiver of the rules must present "full and precise" facts on the probable audience, revenue, income, etc. of TV stations—both UHF and VHF, and both present and potential. Unless the cable operator can produce such data, the presumption of harm to broadcasting must govern the case.

It was shown, Naumowicz said, that CATV tends to benefit local TV, especially UHF, by making available a dependable, high-quality picture to TV homes within the stations' normal service area which would not receive such a signal off-the-air for some reason. However, he said, it was not shown to what extent that factor would be operative in the Syracuse market or to what extent improvement in picture quality in some CATV homes in the market might benefit a UHF station lacking the advantages of a network affiliation.

Syracuse currently has 55,000 subscribers to some 30 existing systems whith a potential of nearly 130,000 subscribers. Within the composite Grade B contour of the Syracuse stations, over 70 additional systems, with a potential of approximately 104,000 subscribers, have been franchised or have made application.

Stage Set for 17th Convention

The theme has been announced for the National Cable Television Association's 17th Annual Convention—"Exploring the New Dimensions of Cable Television."

June 29 through July 2, cable operators from across the nation will convene at the Boston-Sheraton Hotel, Boston, Mass. for the 1968 Convention.

Some 2,500 persons are expected to attend, and exhibitor booth space is nearly sold out. Panel discussions, seminars and meetings will be held at the Sheraton-Boston, and exhibits will be on display in the nearby War Memorial.

Sam Street, NCTA's director of convention and field services, has announced the following features of this year's convention:

Special "Travel-In." Low-cost jet charter flights, at savings of up to 50%, are available to members and their families. Cities to be served are Los Angeles, San Francisco and Dallas, with possible additional stops at Atlanta and a Pacific Northwest city depending on travel demands.

Future of Cable TV Panel. A panel composed of industry leaders will launch the convention at 1 p.m., Saturday, June 29.

Cablecasting Demonstration. Sunday afternoon, June 30, a local origination session will demonstrate how cablecasting can "achieve a new dimension in local service and community involvement."

Film: CATV, A Response to Public Demand. NCTA's new 16-mm, sound-color industry film will be shown continuously in a reserved area of Sheraton-Boston.

Project "X." The special NCTA exhibit will demonstrate for the first time some of the potential uses of cable television in American homes and businesses.

Exhibitors and NCTA members who have not yet made travel and accommodation reservations are urged to do so. Anyone desiring further information can contact Sam Street, NCTA, One Farragut Square, Washington, D.C.

New York Experiments With Quasi-Laser Link

Chromalloy American Corporation and Laser Link Corporation, New York City, have entered into an agreement whereby they will combine efforts in implementing broadband communication systems utilizing quasi-laser beams. The Quasi-Laser Link CATV System opens a wide spectrum of services for multiple dwelling residents whose TV sets will be coupled through space by electro-optical beams.

Chromalloy Chairman Joseph Friedman announced the use of quasi-laser beams to transmit through space 12 channels of TV broadband communications. The system is a proprietary technique developed by Laser Link scientists under the direction of Ira Kamen, well-known electronics designer, in cooperation with Dr. Joseph Vogelman, vice president of Chromalloy American.

The Quasi-Laser Link System eliminates many of the technical problems presently encountered in urban CATV systems, resulting in lower costs by avoiding high rental charges of underground systems.

Friedman added that his company will design and manufacture the system for CATV franchise holders. A prototype system will be evaluated in the Borough of Brooklyn utilizing Bartell Media Corporation's CATV franchise now pending before the New York Board of Franchises. Laser Link now has FCC approval for a mobile experimental license to conduct tests in the New York area. Friedman said that the system employs a wide range of unused franchises extending to the long wave infrared region and provides excellent TV reception. The quasi-laser beams will be transmitted directly to receiving points atop office and apartment buildings so that CATV subscribers may view 12 channels, where authorized, of perfect TV pictures. TVC

When we began, we concentrated on CATV.

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WEATHER-SCAN

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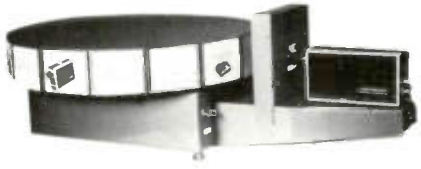
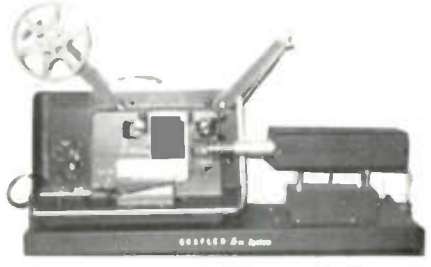


SERVICE SCANNER



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At Tyler, there is a low-cost equipment combination especially suited to your local-origination needs.

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FOCUS ...On People

Systems

Six appointments have been made in the staff of Cable Communications Systems, Inc.: **John A. Lawlor** has been appointed manager, operations and administration; **Serge Elian** has been named director of engineering; **Christian Ducret** will be the new systems engineer; **G. William Carter** will assume the position of manager, application engineering-communications systems; **Robert Kelley** has been named senior communications engineer; **Loren H. Hutchins** is the newly appointed technical advisor.

Recently named directors of the Downsville (N.Y.) Community Antenna System, Inc., are: **Albert Geasey**, president; **Sherman Armstrong**, vice president; **Nancy Campbell**, secretary-treasurer; **Glenn Watson; Commadore Jacobson; Roland Doig, Robert Knorr.**

TeleCable Corp., a subsidiary of Landmark Communications, Inc., has announced the appointment of **D. Alec Purcell, Jr.**, as vice president of the corporation. The election of **Richard D. Roberts** as vice president of operations was also announced. In his new

D. Alec Purcell, Jr.

Richard D. Roberts

position, Roberts will manage TeleCable's seven operating systems in Alabama, North Carolina and West Virginia.

Floyd Shelton has been named manager of TV Cable Service of Abilene (Tex.) a subsidiary of GenCoE Inc.

Robert Mack was elected board president of the Lima (Ohio) Cablevision Co., Inc. Also named were **Dr. Dwight Becker** and **Les C. Rau**, both vice presidents, and **Joseph Quatman**, secretary-treasurer.

G'TEC Cable TV, has announced the appointment of **Robert N. Stanley** as the new manager for the three Georgia G'TEC cable systems at McRae, Hazlehurst and Eastman.

Gil Poese has been appointed manager of Telemaster Cable Co., O'Neill, Neb. He will also continue in his position as manager of KBRX radio station in O'Neill.

Keokuk (Ia.) Cablevision has announced the appointment of **William Hinton** as chief technician for the system. Hinton has previously worked for cable systems in Minnesota and Michigan. He succeeds **James Barger** who has been transferred to Findley, Ohio as chief technician for Continental Cablevision.

Suppliers

Craftsman Electronic Products has announced the promotion of **S. W. Pai**, to the new post of

S. W. Pai

Roy B. Moffitt

vice president-advanced technical planning. Pai joined the firm in 1965, and has been vice president-engineering for the firm.

Moses Shapiro, who has been president of General Instrument Corp., was recently named chief executive officer of the company and vice-chairman of the board. **William C. Hittinger** succeeds Shapiro as president. Shapiro will be responsible for the direction and growth of the company. Hittinger will control supervision and results of all divisions.

Superior Continental Corporation has announced several personnel shifts. **Warner T. Smith** has been named executive vice president of the corporation. He will be responsible for general corporate administration and will continue his duties as vice president in charge of research and engineering. Smith joined Superior in 1960 as chief engineer, was named vice president of research and engineering a year later, and in 1965 was elected to the board of directors. **Roy B. Moffitt** has been named patent activities coordinator. He will be responsible for patent activities and licensing arrangements for all corporate divisions. **Joseph P. Walters**, new product design and application engineer, will assume engineering responsibilities for the design, development and application of cable equipment and products. **Jac N. Johnson**, former assistant to the president of Inter-County Telephone and Telegraph Co., Fla., has been appointed general product manager. **Charles J. Schwidde** has been appointed manager of cost accounting. He joined the company last year as corporate planning analyst.

Joseph P. Walters

Jac N. Johnson

Ralph O'Brien has been named to the position of Product Manager-CATV Cable and Connectors for Ameco Cable, Inc., Phoenix. O'Brien will be responsible for all marketing functions for the company's line of cable and connectors.

The Comm/Scope Division of Superior has also announced several appointments. **Roy W. Jacobi** has been named project coordinator. In his new post, Jacobi will be in charge of logistical support for the division's construction projects. His background in communications includes positions

as managing engineer of cable systems in Russellville, Clarksville, Paris and Booneville, Ark. **Chester A. Hale** has been appointed project supervisor and will provide assistance in franchise acquisitions and pole line agreements. **Roy A. Tester** has joined the division as field technician.

Robert N. Vendeland has been named general manager of Conrac Division of Conrac Corp. Vendeland has been assistant general manager and general sales manager for the corporation. He holds a B.S. in electrical engineering from Princeton University and is currently serving his second term as chairman of the Industrial Electronics Division of the Electronics Industries Association.

Avco Corp., Cincinnati, has named vice Presidents **John Mihalic** and **James R. Dempsey** group executives. Mihalic will head the Commercial and Industrial group. Dempsey becomes group executive of Government Products.

James H. Kogen has been elected vice president of development and design engineering for Shure Brothers, Inc., Evanston, Ill., manufacturer of microphones, high fidelity components and related products.

Professional

B. Jay Baraff is now associated with the Washington, D.C. law firm of Cole, Zylstra and Raywid.

B. Jay Baraff

Walter K. Gilbride

Baraff was formerly with the Common Carrier Bureau of the FCC.

Barash Advertising, State College, Pa., has announced the appointment of **Walter K. Gilbride** as account executive with the agency. In his new position, Gilbride will be responsible for maintaining relations and developing advertising programs with the Barash CATV accounts.

TV Communications recently announced several promotions in its editorial staff. **B. Milton Bryan** has been named as managing editor of the publication, suceeding **Robert A Searle**, now executive editor for *TVC* and managing editor for *CATV Weekly*. Replacing

B. Milton Bryan

Jacqueline Morse

Bryan as assistant editor of the publication is **Jacqueline Morse**, formerly associate editor. Also named was **Phillip C. Baum**, now an associate editor.

Winfield Advertising has been appointed to handle the advertising and public relations program for St. Louis County Cablevision. **Bill Hardwick** will be account executive.

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- **TAPE OF WORLD'S FIRST LOCAL COLOR CABLECAST**
- **LIVE DEMONSTRATION OF IVC-100 NTSC COLOR CAMERA**
- **LIVE DEMONSTRATION OF IVC-800 NTSC COLOR RECORDER**

IVC

WORLD'S FIRST LOCAL COLOR CABLECAST

History was made on April 18, 1968, 6:30 PM, Palm Desert, California. The world's first locally originated public service program* was cablecast in color to 10,000 subscribers of the Coachella Valley CATV system. Cable management and subscribers alike were enthusiastic about the results. Color quality was as good or better than any color programming previously rebroadcast from Los Angeles. According to Bill Daniels, President of Daniels Management Co., Denver:

"Outstanding local color will be part of our service in Coachella Valley because of recently purchased IVC color cameras and recorders. IVC's equipment mates well with cable systems . . . and IVC's price breakthrough now brings local color within reach for nearly any cable operation. I sincerely urge other cable operators to consider color equipment so they can take advantage of rapidly increasing color set saturation."

To see how IVC can add color to your cable operation, turn the page.

* World's first local color cablecast was originated April 17, 1968. An IVC-100 color camera was set up in the auditorium at College of the Desert, Palm Desert. At a stage lighting level of 400 ft. candles, a one and one-half hour program of the Riverside County Industrial Development Council was taped in color on an IVC-810. This tape was played back the following evening (via the IVC-810) over the Coachella Valley cable system. Photo above is off-the-set image of actual cablecast seen by subscribers.

IVC

LOCAL COLOR WITHIN REACH FOR CABLE SYSTEMS

IVC-100 COLOR CAMERA offers full broadcast-quality color at low cost. It is as easy to operate and maintain as standard monochrome cameras. The IVC-100 features: three-tube vidicon design, integral viewfinder, simplified controls, built-in sync generator and encoder. Options allow camera operation of a remote recorder, remote control of multiple cameras from a control room, use of external encoder and sync generator. Using the built-in sync generator and encoder, the IVC-100 requires only two wires (power in, video out) to produce NTSC-type pictures for input to the IVC-810 or cable system. A film chain version of the IVC-100 is also available.

IVC-810 COLOR RECORDER
(IVC-800 monochrome version available for only $4,200) offers accepted 1″ IVC Format* that allows one full hour of recording on small-sized 8″ NAB reel of tape. Uses 30% less tape than other formats . . . at an average saving of $15 per hour. Provides outstanding high-resolution NTSC-type color pictures with bandwidth exceeding 4.2MHz . . . with 400 lines of picture information. Electrical pushbutton controls make operation a breeze. "Alpha" tape path minimizes dropouts. Can be operated in portable case or fixed rack mount. Stop motion is standard; slow motion and electronic editing are available at extra cost.

* Accepted format by Bell & Howell, GPL and RCA

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FINANCIAL REPORTS

William Randolph Tucker, chief executive officer of **Cypress Communications Corporation** (formerly United Cablevision, Inc.), has announced the public offering of common stock in the corporation. Hornblower & Weeks-Hemphill, Noyes, of New York is the underwriting firm for the offering of 208,333 new common shares. Proceeds will be applied to the acquisition of additional CATV systems, although Cypress has no purchase commitments at the time. The Connecticut-based firm is engaged principally in the cable business and owns and operates systems in Florida, New Hampshire, Ohio, Pennsylvania, Vermont and Washington. During the year ended Sept. 30, 1967, Cypress derived approximately 96% of its revenues from cable, the balance being obtained from microwave relay services.

Maclean-Hunter Publishing Co. reports per share earnings of $2.97 for the year 1967. This compares with $2.15 for the preceding year. Earnings figures are based on net profits of $2,967,000 and $2,145,877 for the two periods respectively.

Cox Broadcasting Corp. reports per share earnings of $.51 for the quarter ending March 31. This compares with $.56 earnings for the same period last year. Earnings figures are based on net income of $1,462,016 and $1,570,438 for the two periods respectively. Operating revenues in 1968 were $13,660,917, and $11,244,494 for the corresponding period in 1967. Commenting on the first quarter, Cox Broadcasting president J. Leonard Reinsch pointed out an upswing in the broadcasting division and steady progress in the CATV division.

Scientific-Atlanta, Inc. reports per share earnings of $.75 for the year 1967. This compares with $.72 for the preceding year. Earnings figures are based on net incomes of $591,000 and $549,000 for the two periods respectively. Sales for 1967 totaled $12,717,000 and $11,516,000 for 1966. The company, headquartered in Atlanta, Ga., manufactures solid-state head-end units and antennas for the cable television industry.

Ampex Corp. reports sales of $112,081,000 for the first six months of fiscal 1968. This figure is up 11% from $101,265,000 a year earlier. Net earnings were $5,074,000 or $.53 per share as compared with $4,453,000 and $.47 per share for the same period last year.

TelePrompTer Corp. reports per share earnings of $1.19 for the year 1967. This compares with earnings of $.96 for the preceding year. Earnings figures are based on net earnings of $1,050,102 and $794,190 for the two periods respectively. 1967 gross revenues totaled $6,557,127 as compared with $6,432,366 for 1966. The audited figures reported for 1967 reflect all time highs according to company president, Irving B. Kahn. The company's position, he noted, was strengthened during the year by growth in existing systems and by acquisitions of new cable franchises.

Lamb Communications Inc. reported a net loss for 1967 of $111,960. In its annual report to stockholders, the company outlined recent steps taken to focus all corporate interests within the communications field. The name of the firm has been changed from Lamb Enterprises, Inc. to Lamb Communications to reflect this shift more accurately. In line with new corporate goals, several acquisitions were announced early this year, including a Michigan cable television firm, Wonderland Ventures, Inc. Through this acquisition, Lamb now has an operating cable system in Flint, Michigan. The 12-channel system is expected to total 400 miles of plant eventually. In a potential market of 35,000 subscribers, the system presently serves 3,000.

North American Communications Corp. has announced a 22% increase in earnings for 1967. Per share earnings for the year were $.50, based on an earnings figure of $753,000. Sales and revenues increased 23%, to $5.1 million. During the past year, North American acquired Suttle Equipment Corp., a CATV and telephone supply company, and Fergus Cablevision, a CATV firm in Fergus Falls, Minn. North American's operations include 21 telephone companies, 7 of which were acquired in 1967.

Rust Craft Greeting Cards, Inc. of Dedham, Mass., which holds several cable franchises, has been approved for listing on the American Stock Exchange. The Exchange's Board of Governors approved listing 789,176 shares of stock in the company which manufactures greeting cards and related products. It has been in business since 1906 and was incorporated in 1929. The company holds franchises in three Mass. cities and one in western Pa. Through a subsidiary, Rust Craft operates CATV systems in Martins Ferry, Steubenville and Moundsville, W. Va. The company reported net income of $2,186,110 for the year ending Feb. 26. This compares with $3,287,372 for the same period last year.

Columbia Broadcasting System reports per share earnings of $2.14 for fiscal 1967. This compares with per share earnings of $2.92 for the same period the preceding year. Earnings figures are based on net incomes of $52,952,000 and $70,667,000 respectively. Sales totaled $904,181,000 for 1967 and $884,782,000 for 1966. The company reports that its new CBS-Comtec Group (research and development, CATV and EVR) is still in the developmental stage. TVC

Nobody Likes a Door-to-Door Salesman

Attaining high saturation in larger CATV communities has become a sophisticated marketing function, utilizing a variety of promotional techniques. Selling the "hard ones" usually requires direct sales methods such as the successful approach described below.

All of us in the CATV industry certainly agree that we have a very fine service to provide the consumer. The only problem in selling our service is bringing the potential subscribers to the same conclusion. A main issue, then, in this, a service industry, is one related to marketing. There are various ways of exposing the consumer to our service. One of these ways is newspaper advertising. While it is true that a full page ad in the newspaper looks very dramatic and is very emphatic, it is paramount that we give due consideration to all the factors involved in newspaper advertising. We must ask ourselves questions such as the following: What is the reader circulation of the newspaper? Is our message reaching the entire potential?—½ the potential? What type of newspaper is it? How is it received by the consumer? An obvious limitation of newspaper ads is that they cannot relate our message *specifically* to the varying types of socio-economic groupings within the community. Marketing stimuli should vary as do these social groupings; and we should speak *directly* and *specifically* to each group when possible. A newspaper ad generally lacks this flexibility. It relates one message for all groups.

Another method of exposing the community to our service is radio and television advertising. Here again, we find *one* message related to the whole community without specific tailoring to the varying characteristics of each socio-economic group within the com-

Service representatives in training become familiar with GE Cablevision antenna array as part of their orientation to the CATV system. Thorough presales training is given each sales representative so he will be able to answer most of the basic questions about CATV potential subscribers might ask.

munity. Additional means of marketing communication are direct mail, fliers, give aways, telephone solicitations, etc. While there may be some success with these means, that success is usually limited by the means itself.

There remains one other means of approaching the consumer with your marketing message, and that is by *direct contact*—door-to-door solicitation.

The terms "door-to-door solicitation" and "door-to-door salesmen" put most people on the denfensive. Door-to-door salesmen usually employ the "get 'em quick by any means and move on" method of selling. In their wake is left a housewife who was promised a 250 volume set of encyclopedia for the price of a candy bar. When the bill comes much to her dismay, she finds that she is left with a candy bar and one mad husband at the price of a 250 volume set of encyclopedia. If we can overcome the image of this type of door-to-door sales, and can present the consumer with a well mannered, well informed, intelligent and presentable service representative, who will represent himself and his cable company in a respectable fashion, our chances for success will be the greatest.

An example of such a sales program is that designed for cable systems by CATV-Marketing, Incorporated, headquartered in Pleasanton, California. Mark L. Van Loucks, president of the firm, says, "This company was formed and is maintained daily with one basic assumption in mind: 'Nobody likes a door-to-door salesman.' If we can overcome the historic image here and present the consumer with a program that is refreshing in its honest and sincere approach, we will have done the consumer and the cable TV industry a good service. We must seek to build complete customer satisfaction with cable TV if we are to attain the high degrees of saturation befitting this industry. The first opportunity that the cable company has to create this confidence and satisfaction with the consumer is through the service representative at the door. This requires a highly specialized, sophisticated, and direct advertising program to be followed up by a well-informed and presentable service representative."

Van Loucks' firm starts its sales program with a detailed premarketing survey. This survey, according to Van Loucks, attempts

Door-to-Door "salesman" Sherri Raap (former Miss Oakland and Miss California) meets potential subscribers with an effective CATV sales approach.

Part of CATV Marketing Inc.'s services include an aerial study of the area to be marketed. Mark Van Loucks, president of the firm, looks over an area map prior to take-off, while Miss Raap and cameraman look on.

Orientation of service reps to basic selling techniques is accomplished in a classroom setting (right). Here, common objections to cable TV are discussed in detail, along with specific replies to those objections. Below, sales rep in training Dean Boatright gets some individual pointers from Mark Van Loucks.

to ascertain what kinds of socio-economic groups there are in an area; what kinds of marketing stimuli are necessary to assure the best response; and the marketability of cable television subscriptions in the given community.

The first step involves an aerial study. A full set of aerial photographs serves to expose the general terrain, some indication of socio-economic groups, population density, etc. Once this is done, the pre-marketing survey then moves to the field and service representatives contact a large sample of each particular socio-economic group and ask a number of general questions. The home owner is told that the service representative is not attempting to make a sale here, but only trying to ascertain what is or what would be the feasibility of a cable TV service in this area. Off-the-air reception, local interference, number and types of television receivers, apparent economic bracket to which the consumer belongs, television viewing habits, the reputation, if any, of cable television in the area, and many more questions are relative in this initial contact.

With these results, at hand, a comparison is then made between the study findings and the service to be offered by the cable company. Such questions as off-the-air competition, density problems, saturation estimates, sales and collection problems, etc. become evident here. This type of survey can be done not only for the new cable TV system, but also for the system that has been built for many years, or the system that has recently undergone a reconstruction phase and wants to re-market the service.

From the results of this pre-marketing survey, the marketing company then presents its suggestions to the cable company as to the means to be used in approaching the potential subscriber about cable TV. Van Loucks says, "Usually the most effective means for the first exposure of the consumer is through a set of letters. The basic intent here is to gradually increase the knowledge of the consumer with regard to cable TV and, therefore, his interest in the service through a very crucially timed maturation process. So, the letters should follow a slow and deliberate educational program. If we are using a set of three letters, the first ought

to do nothing more than tease—indicate merely that something special is in the air and to watch for it. The second letter ought to explain in *general* terms what cable television is and how it works. The third and final letter has two purposes. The first is to explain in *specific* terms what the local cable company will do for this particular home owner, and the second is to introduce by word and by picture the service representative who will be calling upon the homeowner."

The approach used in these letters is designed to vary with each socio-economic group within the community, and by this means, the program is made specific to the consumer. The letters are to be hand typed, hand stamped — not metered, and sent first class, addressed personally to the consumer and not to "occupant." They are on quality paper stock, and are designed to be short and to the point. In some cases, Van Loucks has used humor in the design of the letters. In one area, San Carlos, California, the third letter included an introduction card showing the pictures of two service representatives. One of the service representatives happened to be Miss California, and under her picture her various titles were listed. Under the picture of the male representative was the phrase "beauty titles pending." The male service representative would be met at the door with remarks from the consumer such as, "send the girl around," or "did you get your beauty titles yet?" The female representative was met with such remarks as, "don't worry, you are well ahead of that other picture," etc. "The point here," says Van Loucks, "is that a dialogue was begun between the service representative and the potential subscriber, and that it started with a humorous tone. It is the nature of the cable TV service that once a dialogue is started at the door, a sale should be made. Anything we can do in this initial program to make it easier for the service representative to open the door and begin this dialogue will be rewarded in terms of high and immediate saturation."

In another area, South San Francisco, California, where the name of the cable company is Western TV Cable, a set of letters was designed around a cowboy and western theme. The service representatives wore string ties and cowboy hats when they met the consumer at the door. Mr. Chuck Whitlock, vice president and general manager of Western TV Cable, says of this approach, "The use of this kind of carefully controlled humor in our marketing program is quite effective and makes a good impression with our customers."

"While it is dangerous," says Van Loucks, "to use humor in selling something; if it can be done effectively the results will be highly successful. Timing is critical, as well as content."

Finally, the letters are designed to gradually educate and interest the potential subscriber in cable TV, but not give him all the answers to all the questions. "There should be a temper and tone created with the consumer," says Van Loucks, "so that interest in cable TV will build to a peak. Again, if the timing is correct here — and this relates directly to socio-economic group characteristics — the service representative will knock on the door at the peak of this interest."

"Now what is required," says Van Loucks, "is a well informed and intelligent service representative with a high degree of training and exposure to the service." The first step in this training is a trip to the head-end sight. Here, the service representative is educated as to how the antennas receive the television signals and from where they originate; the purpose of the equipment in the head-end building, etc. From here, the service representative is shown the trunk lines, feeder cables and the distribution lines of the system. In this manner, his training takes him from the antenna site to the house drop.

The final step in this portion of the service representative's training, then, is his exposure to an actual house installation. For this, he or she rides along on a number of installation trips with an installer. This type of training is done so that the service representative can explain in *layman's* terms what cable TV is, how it works, and how it is installed.

The final step in the training of

Dressed in casual street clothes, Lisa Best meets the potential subscriber with a smile and a clipboard on which is a set of pictures showing the CATV system from the antenna site to the connection on the back of the television set.

service representatives is orientation to the various selling techniques. According to Van Loucks, his firm does not use experienced, hard-sell door-to-door sales people, but rather ordinary people who have the degree of intelligence that is necessary to acquire the training for the job. This eliminates the use of the door-to-door salesman who is set in his hard sell, shoe-in-the-door methods. Service representatives are told not to push for a sales close if, for instance, the home owner comes to the door and it is obvious that he or she is having dinner.

It is emphasized to the service representative that while this "soft-sell" approach may take more time, in the long run, the cable company will be left with more satisfied customers, and this, of course, will result in additional sales in the future.

Regarding this type of approach, Mr. C. M. Kirkeeng, vice president and general manager of Concord TV Cable Company in California has stated: "We have used Mr. Van Loucks' service in three cable systems. This type of 'soft-sell' approach achieved percentages far exceeding the average . . . It is one thing to simply make a sale. It is quite another thing to have those subscribers sold completely satisfied with the service and the manner in which it was sold to them.

"Service representatives are also told that the prime selling time is in the evening or on the weekend when the husband and the wife can both take part in the discussion. Further, the common objections to cable TV and their specific replies are discussed in detail so the service representative is adequately prepared.

"A further necessity of a successful door-to-door campaign," says Van Loucks, "is the communication between the engineering department and the service representative so that the latter knows exactly where to sell, when, and at what pace. The sales crew should not work too far ahead of the construction crews. Ours sales crews sell an entire area and entire streets before turning them over to installation crews, so that the productivity of the latter is maximized. Obviously, if one installer and one truck can stay on the same street all day, the marginal costs of installation will be greatly reduced. An effective marketing program can be used to achieve this end."

Mr. Doug Dittrick, manager of operations for General Electric Cablevision Corporation, New York, says, "Installation capacities in our Walnut Creek, California, system have been increased from approximately 7 per day to 9-10 per day *per man* by this means."

The marketing company attempts to maintain a high degree of communication between the engineering staff and the sales staff by creating a progress map. This is a map of the entire area that is to be served by the cable company, the original of which designates trunk areas. A first acetate overlay indicates those streets that are not at present "hot" and thereby those that are. This data is kept current by the engineering department. This first overlay, then, indicates engineering progress as it relates to the whole community. A second acetate overlay indicates marketing progress as it relates to that of engineering by showing which streets have been, or are being marketed. Thus, at a moment's glance, the engineers, the sales manager, or the system manager can see the progress of both departments, and can judge their pace accordingly.

Further control methods used by the marketing company include completed sales reports, which show the name, address and phone number of each sale made; progress reports which indicate service representatives' saturation percentages on a daily basis; and a sales card. Van Loucks says, "The sales card is probably the most important selling tool for the service representative. On the front of the card the name, address, and phone number of the potential subscriber is shown; and on the reverse the current and final dispositions of the contact is indicated. If kept accurate and up-to-date on a daily basis, the service representative can see the history of his former calls at the particular address and their results. This will allow him to be very specific to the consumer and impress the latter with remembering the smallest of details occuring at previous visits. Of course, this also gives the cable manager a means by which he can audit, on a daily basis, the results of his service representatives. The sales cards are first typed from the reversible phone book which lists telephones by streets, rather than by names. With this initial set of cards, which

A straight forward, low-pressure approach is utilized by the Marketing firm. The service representative simply presents the facts about cable TV and lets the facts speak for themselves.

obviously is incomplete, the service representatives then walk the streets and fill in cards for those homes which were not listed in the phone book. From this source, then, all letters are addressed. In this way, high exposure to the marketing message and the followup program is assured. Finally, by adding additional lines on the face of the sales card, information such as billing, tap and module type, amplifier location, pole location, installation materials used, etc., can be recorded. The sales cards are then filed by street and by number and kept in this order as they are made into subscriber records. "By this system," says Van Loucks, "90% of all the information regarding a house drop can be gotten from this one source."

Mr. Ed Allen, president of County TV Cable Company in San Carlos, California, says, "This system of cards has given our office staff a single source for most of the information regarding an installation. This greatly increases productivity and savings in time and errors."

Equipped with the results of a full pre-marketing survey, a sophisticated and specific set of letters, highly specialized exposure to the service, sales training and tools such as the sales card and a set of pictures of the service, the representative then goes out into the community to represent the cable TV system.

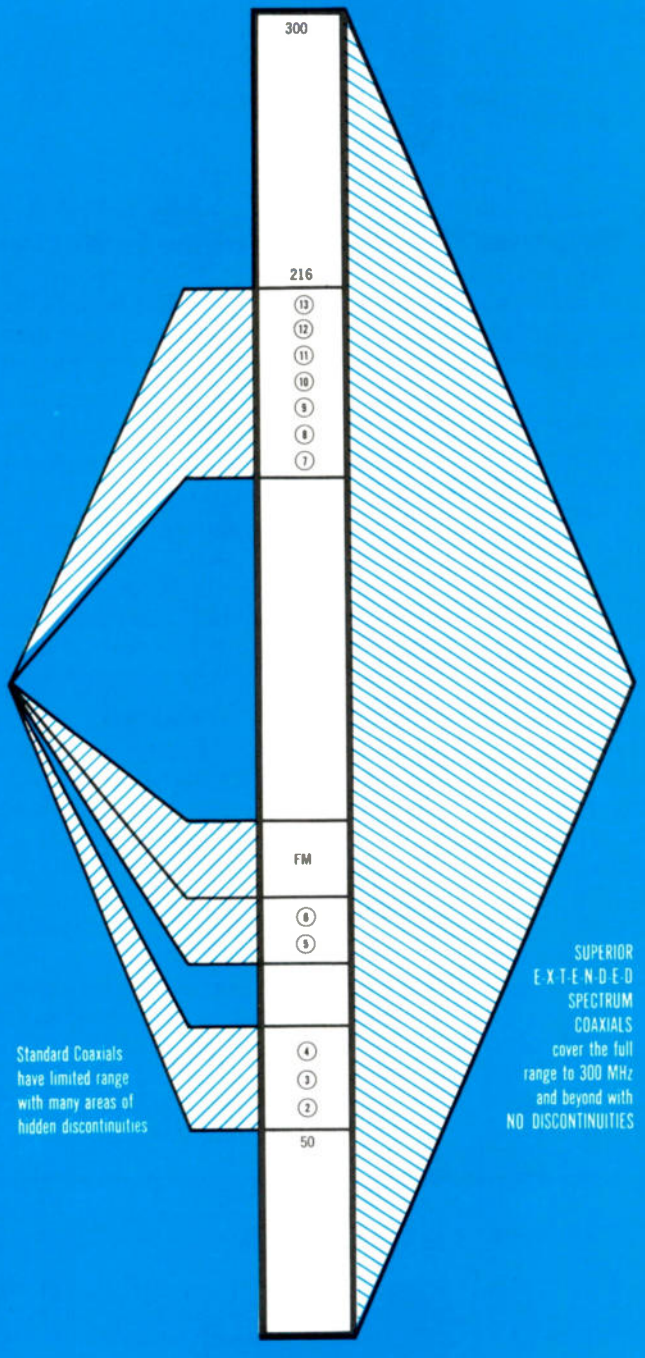
"Perhaps the most important aspect of the marketing program," says Van Loucks, "is the *image* the service representative presents at the door. We can do everything possible in terms of educating and maturing the potential subscriber regarding cable TV, and we can do our utmost to fully train our service representatives, but in the final analysis, the service representative is the key to the whole program. He or she must first sell himself and his manner at the door before he can begin to effectively discuss a cable television subscription. It is here that we meet the final challenge in attempting to overcome the historic image of door-to-door selling. What the consumer sees at his door is not someone with a briefcase wearing a dark suit, dark tie and suede shoes. Instead, he is met with a college-age boy (or girl) who usually does not wear a tie or formal clothing but who is neat and clean in his or her dress and personal appearance. He or she does not have a briefcase, but rather a clipboard on which is a set of pictures showing the system from the antenna site itself to the connection on the back of the TV set. This set of pictures and the sequence in which they are arranged, provides the service representative with a built-in outline for his sales presentation. Perhaps the most effective door opener is indeed the first picture, that of the antenna site itself. From there, the pictures key certain remarks from the service representative in an outlined, structured form."

Van Loucks says he does not believe in 'canned pitches,' but rather in intelligently speaking individuals who can follow a basic outline and digress with the consumer's questions. In this manner, the sales approach can also be directed *specifically* to each individual consumer.

"In sum," says Van Loucks, "if we will meet the potential subscriber with the marketing program and service representatives that will gain his respect and his interest, we will be successful in maintaining a high degree of saturation.

"I think we are all aware," he continued, "that within the next few years there will be a lot of significant legislative decisions made regarding the relationships between the cable TV industry, the FCC, the phone companies and various other Federal and state agencies. What will be crucially at issue here is public opinion. This will be true then, and is just as true now as it relates to the image of the cable company within the community and its success in terms of net connects. We must approach the consumer not only for the purpose of making a sale, but also to build and maintain good will. Nothing sells cable TV better than satisfied subscribers. This 'selling' by the public, can be directed to another potential subscriber, a city council awarding a franchise, or a government agency considering the industry's public image. In order to 'sell' cable TV, the subscriber must be sold on it himself." TVC

Instead– Buy Superior Coaxials



Superior Continental's Extended Spectrum Coaxials have no discontinuities to 300 MHz and beyond.

Now you're no longer limited to spotty coverage to 216 MHz. With Superior Continental's new Extended Spectrum Coaxials, you can use the full, continuous range to 300 MHz and higher. That's an additional 84 MHz segment at the top. And as a bonus, complete frequency utilization from 216 MHz down. With no holes.

With this additional transmission space, you can install Superior Continental's Extended Spectrum Coaxials now and have room to grow in the future. With new CATV channels. Broader ETV and ITV programming. More CCTV for business and industry. Data transmission. Remote control telemetering. Alert and alarm systems. Traffic and highway control networks.

Of course, you can specify Extended Spectrum Coaxials in the right construction for every application. With exclusive Coppergard® or Alumagard® shielding. In aerial or direct burial types.

Extend your services tomorrow by closing the gaps today. Install Extended Spectrum Coaxials. By Superior Continental.

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Superior Sales and Service Division
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Phone 704/328-2171

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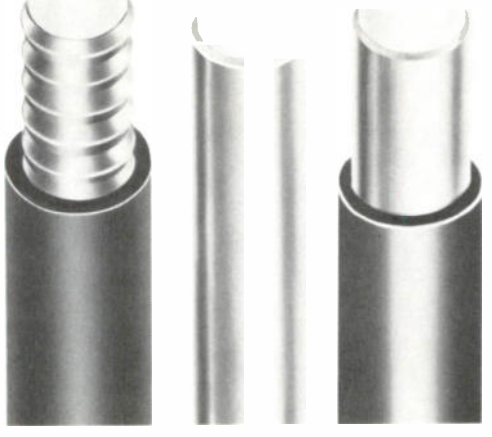


300-Channel Cable TV with PCM Technique

Waveguide could replace coax for cable TV trunk lines, with pulse code modulated signals spanning great distances. Substantially increased channel capacity with superior picture quality would be possible.

By Leo G. Sands
Electronic Consultant

Twenty-channel CATV is the big thing today. But, in the relatively near future, 300-channel capability, in color to boot, is expected to be practicable. It will be made possible by using waveguide as the transmission medium for pulse code modulated (PCM) signals. According to J. S. Mayo in an article in the March 1968 issue of **Scientific American**, up to 180,000 telephone conversations or 300 color television channels can be transmitted through two-inch diameter, circular waveguide. Repeaters would be required only at 20-mile intervals.

It's quite likely that future CATV systems will employ PCM and waveguide instead of coaxial cable for feeding TV signals from the head-end to the point where distribution begins. Where lower channel capacity will suffice, coaxial cable can be used as the transmission medium in lieu of waveguide.

Regenerated Signals

The significant change will be from analog to digital transmission. The significant improvement will be in signal quality. The picture can be just as good at the end of the trunk as it is at the head-end because the repeaters regenerate the signals instead of contributing distortion and noise.

In PCM, the analog picture and sound signals are converted into coded digital pulse trains. In existing analog CATV systems, line amplifiers amplify noise as well as the signals and, in addition, contribute noise and distortion. But, in a digital system, the amplifiers are actually regenerative repeaters. They sense the presence or absence of a pulse and recreate it with noise removed. Even when an incoming pulse is almost obscured by noise, the repeater will amplify and clean it up as long as it can sense that the pulse is there, as illustrated in Fig. 1. Thus, the signals are essentially as clean at the end of the system as at the beginning, regardless of the number of repeaters used.

In existing analog CATV systems, all channels are transmitted simultaneously but at different frequencies. But, in a PCM system the pulse trains representing each channel are interleaved with those of other channels, as shown in Fig. 2. At the receiving end of the circuit, the channels are separated by their respective framing pulses.

PCM, however, is extravagant with band space. Whereas in analog CATV, each video channel requires 4 MHz of spectrum space, almost 60 MHz of space is required to transmit the same information. But, picture quality is far superior. Since transmission is not over the air, band occupancy is not critical.

PCM Signals Converted

Future CATV systems will probably consist of a conventional head-end where the signals are digitized and coded and transmitted as pulses through a coaxial cable or waveguide (hollow pipe) trunk line to the point where signal distribution begins. At that point, the PCM signals are converted back into analog form for distribution to subscribers through feeder cables. This will continue to be necessary for economical reasons. Otherwise, PCM could be used all the way by

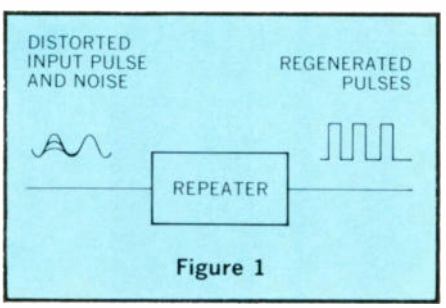


Figure 1

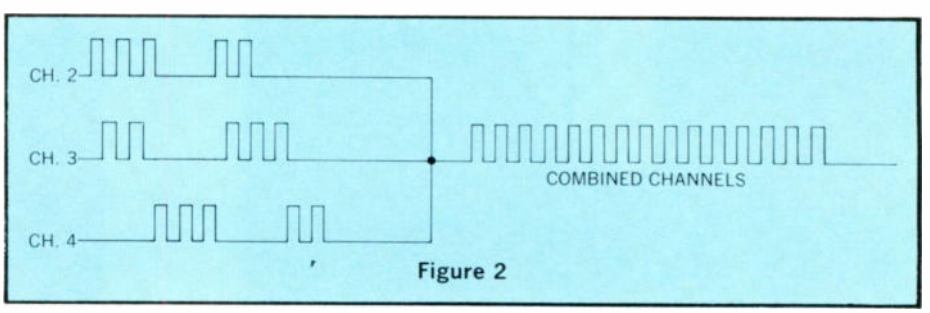


Figure 2

FORT WORTH TOWER CO.

STILL LEADER IN CATV TOWERS

For two decades Fort Worth Tower Co., Inc., has been building high quality communications towers. This experience, coupled with state-of-the-art-design and manufacturing techniques, is your assurance that a Fort Worth tower is the most reliable tower you can buy. Since the early days of CATV, Fort Worth Tower Co., has specialized in CATV towers and support equipment. Every tower is individually engineered to fit each system's unique requirements—and at economical prices.

Fort Worth Tower Co. offers a complete array of support equipment, including head-end buildings, microwave reflectors, equipment lifts, and many other related items. You get maximum performance with a perfect match of equipment and accessories.

Mobilt HEAD-END BUILDINGS

Designed expressly to house CATV and microwave electronic equipment, Fort Worth Mobilt Head-End Buildings withstand any climate or location problem . . . house electronic equipment according to the most rigid standards. Your building comes with supporting I-beams. Simply drop on your site, connect the service inlet, and you're in business. Mobilts save you time and money because complete wiring is installed at the factory. Many options are available in size, outside finish, wiring and ventilation. You'll find a Mobilt exactly suited to your needs . . . at an economical price. Write us for full information on all Fort Worth quality CATV products.

SEE US AT NCTA! BOOTHS 185-186

Fort Worth Tower Co., Inc.

P.O. BOX 8597 / 5201 BRIDGE STREET / FORT WORTH, TEXAS 76112
FORT WORTH PH. (817) JE 6-5676 • DALLAS PH. (214) AN 4-2822

providing a PCM decoder at each subscriber location.

PCM is the answer to many existing CATV problems. Trunk line length can be almost limitless. Cable temperature variations will have negligible effect. Amplifiers will not introduce distortion and noise and concern about signal level adjustments will be a problem that can be forgotten. The term "cascadability" will no longer have meaning. Picture quality will be far superior.

If PCM is so good, why isn't it being used in CATV systems now? To answer that, we have to go back to the origins of CATV. At the beginning, the most straightforward techniques were used It was the wrong way, but once it got started, when and how do we take a better route?

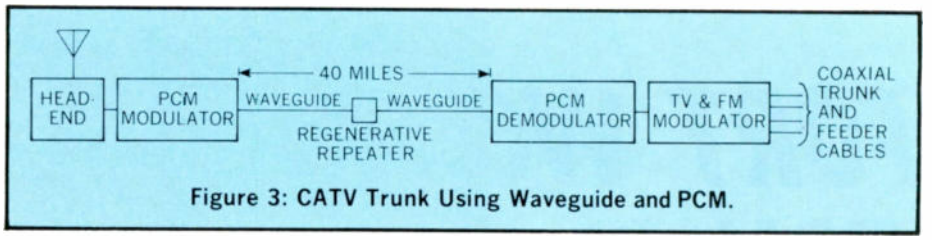


Figure 3: CATV Trunk Using Waveguide and PCM.

The idea was simply to feed TV signals from a distant antenna system to large numbers of subscribers by the most direct means. The technique is obvious and forthright. But, the attenuation losses through coaxial cable at VHF require the use of numerous amplifiers. Cable slope and temperature sensitivity compound the problems. When trunk lines are extra long, the situation has been improved by using sub-VHF channels.

3000 Mile Trunk?

If CATV were to start now, more sophisticated techniques would undoubtedly be used. But, it grew the way it was.

PCM offers a way out without affecting distribution techniques. While PCM requires transmission at much higher frequencies than in existing CATV system, this problem can be solved by using waveguide instead of coaxial cable for trunk lines. Using PCM, the trunk-line can extend from community to community, even from coast to coast. It can be tapped at each community for local distribution.

PCM equipment for CATV is not yet available off the shelf, but it undoubtedly will be because it makes sense. PCM is already being used for conveying 96 telephone channels over a telephone pair and up to 3000 channels through coaxial cable. By using a two-inch pipe, PCM can handle up to 300 color TV channels. Of course, nobody knows how to provide that many TV programs on a continuing basis. But, it isn't necessary to utilize the total capability of PCM to take advantage of its other virtues.

At present, PCM modulators and demodulators for CATV are not available. But, they undoubtedly will be. PCM offers CATV new scope and dimension and room for expansion beyond our present hopes. TVC

MEET THE COAXIALS

SEE AND HEAR
THE COAXIALS IN ACTION
AT THE N.C.T.A. SHOW.

Streamlined Promotions Compliments of NCTA

Among the many benefits of membership in the National Cable Television Association is the opportunity to utilize a variety of truly professional promotional aids. From static office display pieces to proven radio spots, these materials will sell CATV for you.

Benefits of membership in NCTA run the gamut from legal protection to convention services—with a wide range of membership services in between.

This pre-convention issue of TVC provides an excellent opportunity for a brief survey of a few of the many advertising and promotion services available to the individual cableman at very low cost. Most of the packages offered would be impossible to duplicate, professionally and economically, for smaller systems. By producing large quantities of ad mats, buttons, posters, informative booklets, slide programs, outdoor signs and indoor clocks, the national association can help you trim your advertising budget—and get more subscribers for less money.

In addition, NCTA aids (because they are produced by one group with only CATV in mind) offer you the coordinated program necessary to your overall advertising campaign. If each individual system were to try to produce such an ad program, production and personnel costs would be prohibitive. Dollar for dollar, NCTA members get more for their money in membership services alone.

Whether you're just building and need everything, or thinking of new promotions to add subscribers, you'll find the following NCTA promotional aids of value.

Identification for your trucks, personnel and office can be easily handled by use of the decals, posters and patches produced at NCTA. Featuring Abel Cable, they are your symbols of superior CATV Service.

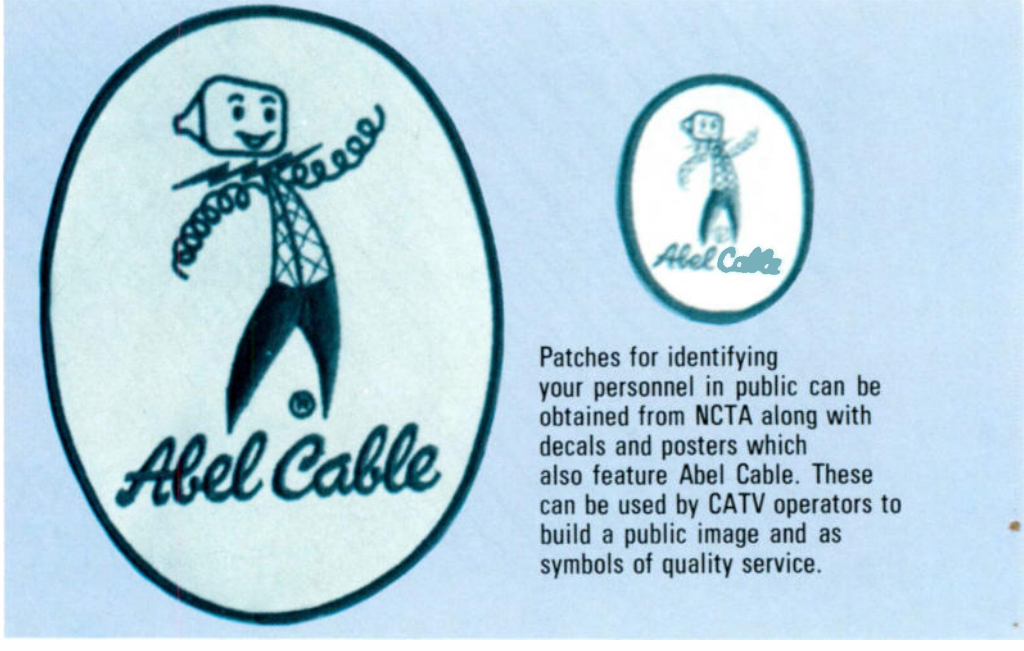
For Greater Profits—Identify!

You'll want something to identify your cable office, and there's nothing better than the illuminated outdoor sign.

You can put your name in lights with this double face, outdoor illuminated sign—4′ x 6′ overall. Uses four 72″ high output fluorescent lamps, available for center pole, swing mount or wall iron installation from NCTA at $175.00. Your system name imprinted at bottom is included.

It's Cable TV Time!

Complementing your Cable TV Outdoor Sign, the indoor illuminated clock is a real attention-getter. Put it on the counter . . . mount it on the wall . . . hang it by a chain. Three-color copy is screen printed on white translucent plastic in fade-resistant enamel. Illuminated by one 24″ fluorescent lamp and encased in gleaming aluminum, this clock will stop passersby . . . alert them to the unique service you sell!



Patches for identifying your personnel in public can be obtained from NCTA along with decals and posters which also feature Abel Cable. These can be used by CATV operators to build a public image and as symbols of quality service.

This clock doubles as a night light and many systems give them to participating TV dealers. Available at $22.00 to members of NCTA.

Ad Mats for all Seasons

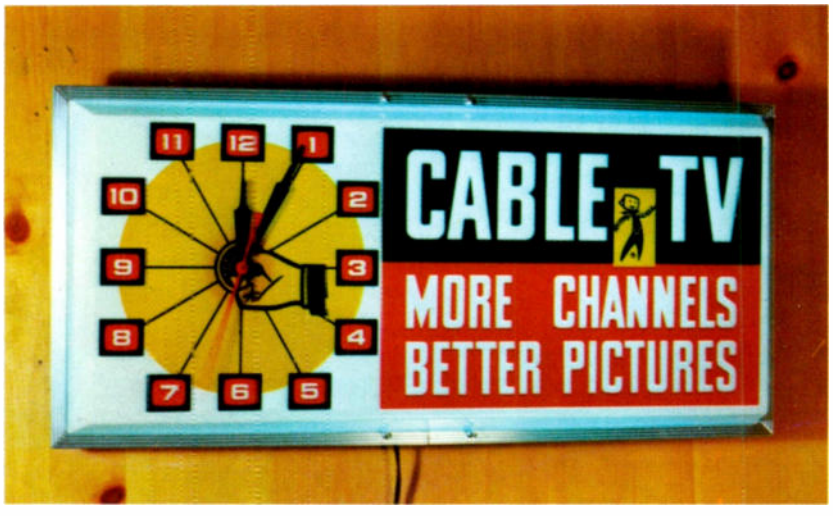
Preparation of a good, continuing newspaper campaign can be exhausting, time consuming, — and costly. Here's a "subscriber-proven" ad mat package produced by NCTA to meet just about every situation, and at a price you can afford.

Originated by Telecable Corporation, a group owner in Norfolk, Virginia, this sophisticated, "fun" approach increased subscribers by 52%. Professionally produced first by Telecable, these ads can sell for *you* at a fraction of the original cost!

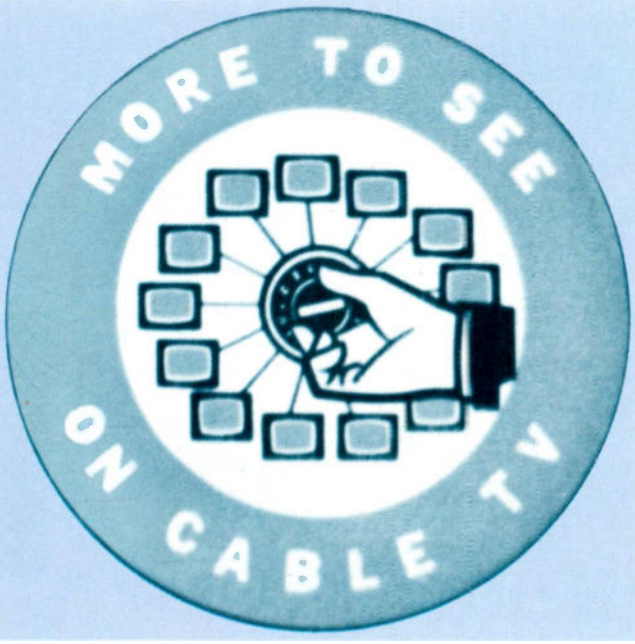
Mats come complete with repro proofs for either offset or letterpress reproduction. Alter the copy to fit your particular situation and with a little time spent on the copy, plus $20.00, you've got seven ads ready to go!

Information, Please, A CATV Best Seller

Part of our job as cablemen entails educating the public to the "how and why" of Cable TV. Use of the "Wonderful World of Cable TV" booklet is one of the best methods of accomplishing our public education objective. Prepared by the NCTA for its members, this booklet has sold over a half-million copies to date—it's literally the "best seller" of the cable industry. Invaluable in franchising work, it's also used as an advertising tool in direct sales and direct mail campaigns.



The double-face outdoor illuminated sign (top) measures four feet by six feet overall and can be purchased from NCTA for $175.00. The system name is imprinted at the bottom. The indoor clock is also illuminated and can be purchased by NCTA members for $22.00. Both sign and clock utilize flourescent lighting.



Other NCTA promotional aids include cable TV buttons which can be worn by system personnel or handed out to subscribers. Also available are newspaper ad mats, literature on CATV, slide programs and top quality radio spots.

Visual Aides

As an educational and selling tool, slide programs are a necessity for cable TV. Yet the production techniques and professional skills required make it quite an undertaking for the individual system owner. That's why we think you'll like the new, 35mm slide presentation recently produced by NCTA.

This flexible, full color slide program shows cable television at work, describes problems of color reception and stresses the many benefits of cable TV in language

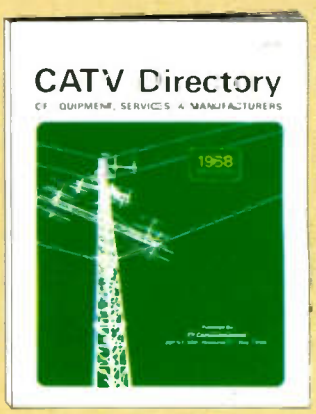
"Miss Brooks, please bring me the 1968 CATV Equipment Directory"

With this ultra-convenient reference book at your elbow, you're an authority. Instantly available: Complete information on every CATV equipment manufacturer's *entire line* . . . plus hundreds of components, materials, tools, accessories and services required to build and maintain a cable television system. There is only one *CATV Directory of Equipment, Services & Manufacturers.* No other source provides even a fraction of the data included in this big 182 page edition (more than 3,000 products and services). This Directory will be indispensable to you if your job requires a general knowledge of the CATV state-of-the-art. Or specific knowledge of new cable television services . . . equipment manufacturers and the names of their principal administrative and sales executives. For equipment specification or cost estimates this new Directory is *obviously a necessity.*

Important people (like you) . . .

. . . don't have time to search for data sheets, names, addresses and phone numbers of suppliers. Nor can you afford the days or weeks required to collect needed data by writing to suppliers.

Save your valuable time. Order your personal copy of the 1968 **CATV Directory of Equipment, Services & Manufacturers.** For just $6.95 you will have facts at your fingertips — when you need them. (Fully indexed for your convenience). And this handsomely bound volume will make an attractive addition to your personal reference bookshelf.



Use the handy Order Card provided on page 115. Order Today!

your audience can understand.

Accompanied by its own nine-page script, this 58-slide program allows you to adapt your story to the group viewing it—school children, city council, TV Servicemen or community service groups.

If you like, you can personalize the slide program here and there by inserting 35mm slides of local personnel at work. Just a few additions will give this presentation the "local" feel you want, while saving you hundreds of dollars in production costs.

NCTA, by spreading the cost over a large number of systems, offers this slide package—58 slides and script—for just $30.00.

Award-Winning Radio Spots

Not long ago, NCTA approached Mel Blanc Associates, Inc. (MBA) requesting that they prepare three radio spots exclusively for cablemen. Working with the NCTA's director of field services, Sam Street, MBA came up with top-notch, hard hitting, attention getting spots. They were so good in fact, that they were entered in the finals of International Radio Spot competition and were selected as the top six commercials out of 8,000 entries! CATV is getting more sophisticated—technically and artistically.

The NCTA tapes are just 50 seconds long, allowing you to "trail" with your specific sales pitch. In effect, you have a custom-made radio spot, produced by one of the greatest humorists in entertainment today.

With some 47,584,000 radios in use each day; with the audience (potential customers all), accustomed to sophisticated selling, these NCTA spots can enable you to compete with the best. To make a good deal better, cost of all three: $55.00.

If you're impressed, as we are, with the significant contributions NCTA makes to this industry's advertising and promotional efforts—think of the shot in the arm they can give your system.

All promotions described here are available now from NCTA, for members only. Wouldn't the profits from these coordinated promotional packages more than pay for your membership? TVC

Preventive Maintenance Means Satisfied Subscribers

A well-organized preventive maintenance program, from pre-construction component testing to the scheduled testing and replacement of operating equipment, can solve many problems before they become grounds for customer dissatisfaction.

By Hilmer Taxdahl

Fortunately, preventive maintenance programs started with me back more years than I care to remember. During World War II as an electronic technician aboard a cruiser in the South Pacific, I was faced with maintaining communication equipment, that for long periods of time was under radio silence. This meant that the equipment had to operate when turned on under the most adverse conditions. A most stringent preventive maintenance program was in existence by which various sections and stages were tested periodically for certain conditions without actually having the equipment transmit a radiated signal. I think after seeing the benefits of this program in a few emergencies that I became a real believer in *preventive maintenance.*

I think we all have to be believers in it, but in order to do this we must be sold on the benefits derived from it. When I first started in CATV, in a system that was one of the first in the country that grew from bush to bush and house-top to house-top, we had little or no time to be concerned with a preventive maintenance program, because we were too busy with pure maintenance. As our industry has advanced through the years with methods and technology, so have our market areas changed, and last but not least, our subscribers' requirements have come to be, rightfully, more demanding.

With the advent of cable television into the major metropolitan cities where people can receive six or more channels on rabbit ears, we don't have any choice but to deliver more consistent and better quality than they already receive. It was to the advancement of my education that I recently had the experience to build such a system. Prior to building a new system, I feel, is the time and place to successfully start and ultimately achieve a good preventive maintenance program. With the perimeters of the operational specifications carefully decided upon and the specific manufacturers equipment chosen, you can start your preventive maintenance.

I'm sure you have all heard or read about various system operators that have utilized many equipment evaluation techniques, but most of these were for the sole purpose of determining the best available equipment at that time for their system's use. Some of these same techniques can be utilized in a simplified fashion to assure you of a tight system operation. I feel it is of utmost importance that each piece of equipment (regardless of manufacturer) be completely tested for as many perimeters of its operation as can be successfully achieved with a minimum of time. Such specifications as minimum full gain, response, match, noise figure, output capability, AGC action, insertion and isolation values are all important to insuring yourself of good system performance.

All of these perimeters of operation can be tested for the most part by the use of standard well accepted CATV test practices. The problem is achieving all this in a minimum of time and this can be easily accomplished by building simplified test jigs to accept various pieces of equipment to be tested. Having the test equipment set up so as to be able to switch from one test mode to another in rapid fashion is another time saver.

I mentioned that most of these tests can be conducted with standard equipment found in most

ABOUT THE AUTHOR

Hilmer Taxdahl started his career in electronics in 1938 with interests in amateur radio; then attended electronics schools in the U.S. Navy during World War II while serving as an Electronic Technician. After the war, he went into radio and television servicing fields and became Chief Service Technician for a large Sears outlet. He then spent a period of time in the 2-way radio communications field, and in 1960 became employed by Telecable as its Chief Engineer. In 1965 he became responsible for the re-building of the Bellingham, Washington system which consists of 160 miles of plant with cascades of 44 transistorized amplifiers. Two years ago, he became Corporate Electronic Engineer for Total Telecable.

No modifications to existing hardware. No adaptations of earlier designs. These are the *rules* of *Total Design*. These are the rules that helped create the Conductron C701 line extender.

C701—First of a family Conductron started "from scratch", put to work the skills that developed the first modulator to soft-land on the moon, and designed a family of amplifiers that meets the most rigid specifications of the Cable Television industry. Just another example of what we mean by *Total Design*

Reduce time and maintenance costs Snap-in and snap-out service is provided by quick disconnects. In fact, it is possible to replace the entire module by merely loosening four captive screws. The case itself still stays on-line and new modules are installed in a matter of minutes.

Reach more subscribers . . . deliver a better signal The C701 allows you to now make longer runs with fewer units, reach more subscribers and deliver "cleaner" signals to each set. In addition, it gives a higher output, less noise and better stability over wider temperature ranges than "modified" line extenders can provide.

- Minimum Full Gain—25db
- Return Loss Rel to 75 ohms in—17 db Min.
- Return Loss Rel to 75 ohms out—17 db Min.
- 12 db cable equalization ± ¼ db
- Maximum Noise Fig. CH 13—10 db
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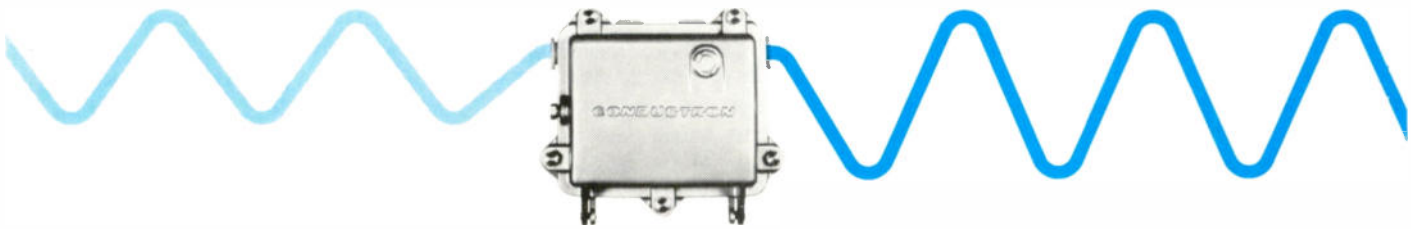

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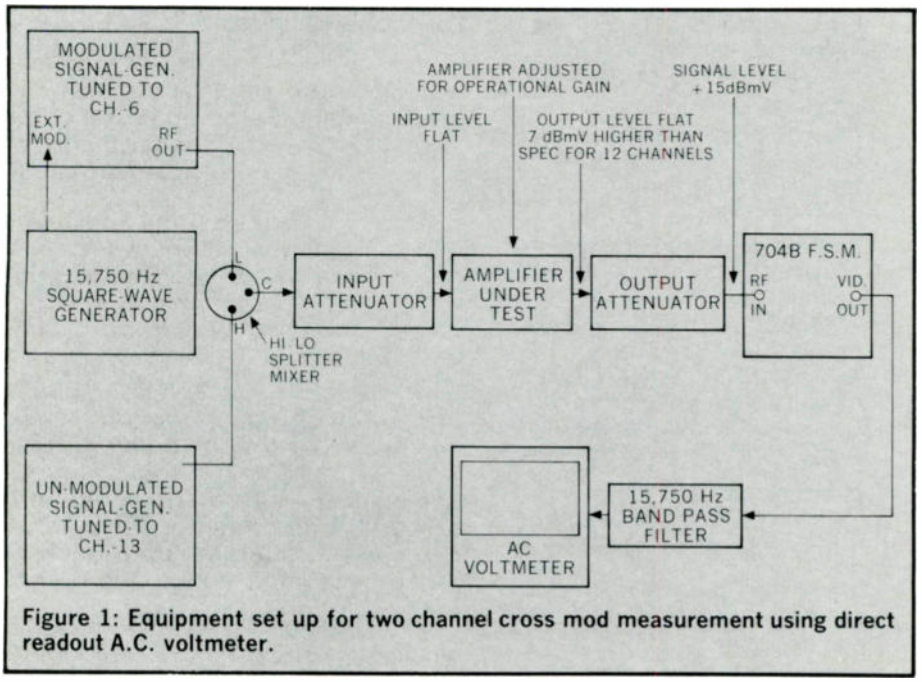

Figure 1: Equipment set up for two channel cross mod measurement using direct readout A.C. voltmeter.

CATV operations. The output capability of amplifiers is probably the most difficult test and will possibly require a couple of pieces of equipment you don't have on your shelf. But don't be discouraged by this as it isn't all that difficult or costly. It can be accomplished by the use of two signal generators (one with the capability of being modulated) and a 15,750 Hz square wave generator as the modulation source, and the use of a garden variety of 704B with its detector output fed into a 15,750 Hz band pass filter which is directly coupled to an AC voltmeter used as the read-out device (see Figure 1.). The calibration procedures for this test set-up are the key to its success of accuracy, and repeatability. It is very important to achieve numbers that can be correlated directly to the manufacturers specifications.

Most manufacturers list an output capability based on a 12 channel operation. For a two-channel test setup, it is required to increase the operational output level by 7 dB to achieve a correlation factor. Due to time limitations, I will not try to cover the exact calibration methods I have used because it depends on variables such as the band-pass filter load impedance, modulation percentages, AC voltmeter input impedance, etc.

I will cover, later in this article, the use of a portion of this test set-up that can be used for running cross-mod tests in an operational system.

I have found that the use of proper test points located in strategic areas of the system with easy access, plays a very important part in implementing the preventive maintenance program. Test points have to be convenient to get to or they will not be used.

Test points may be located at the head-end, on the inputs of your head-end equipment, monitoring signal level variations or used with a monitor to visibly test for quality degradation before going thru your equipment. The important point being that you do not have to shut off an individual channel or possibly the entire system to make tests.

A test point at the output of the head-end equipment is mandatory, not only from the standpoint of setting levels but also for analyzing performance of the various pieces of head-end equipment. I would like to stress that each device used for a test point (directional couplers, splitters, etc.) be tested before being installed to determine the actual tap loss, insertion loss and match of the device to insure accurate measurements and good system performance. In the system itself, I feel the more test points you have, the better job you can do of keeping the system operating to good standards — and in the case of a system problem, they become even more useful as a trouble shooting tool. Through the use of high quality, low through-loss directional couplers, even systems that have been in operation for a long time can install convenient test points and still not greatly impair system operation. In newer systems, where all amplifiers are strand mounted, it becomes very inconvenient and time consuming to rely only on the use of test points located in the amplifier housing itself. Most operators building systems today install a certain percentage of feeder line pre-loading, and taps from these directional couplers, located at the output of a bridger amp, become excellent test points.

The output of one of these taps can be routed down the pole to eye level and terminated for future use. Another location that is very important for a test point is the output of the last trunk amp in all cascaded runs. Here the use of a line splitting directional coupler works very well and these locations will provide good monitoring of the system trunks. In systems using tube equipment, a slightly different approach has to be taken to preventive maintenance. First, we can assume that as soon as a tube amplifier is installed and fired-up that its operating efficiency will be degraded over a period of months. Involved are such conditions as inter-electrode capacity, changes in tubes over a period of time, causing amplifier response problems, and inter-element shorts or partial shorts, which either cause component failure or changes in characteristic amplifier operation. (It is possible to invest more money in system maintenance by so called multi-thousand hour tubes and heat dissipating tube shields which may give a few more operating hours from the amplifiers.) In maintaining tube equipment, it is necessary to program the preventive maintenance so that each amplifier is serviced after so many hours of operation.

If all amplifiers are operated at maximum or near maximum conditions, you had best plan to use a much shorter interval between the routine preventive maintenance. From my experience, I think somewhere in the range of six to nine months is the interval that will de-

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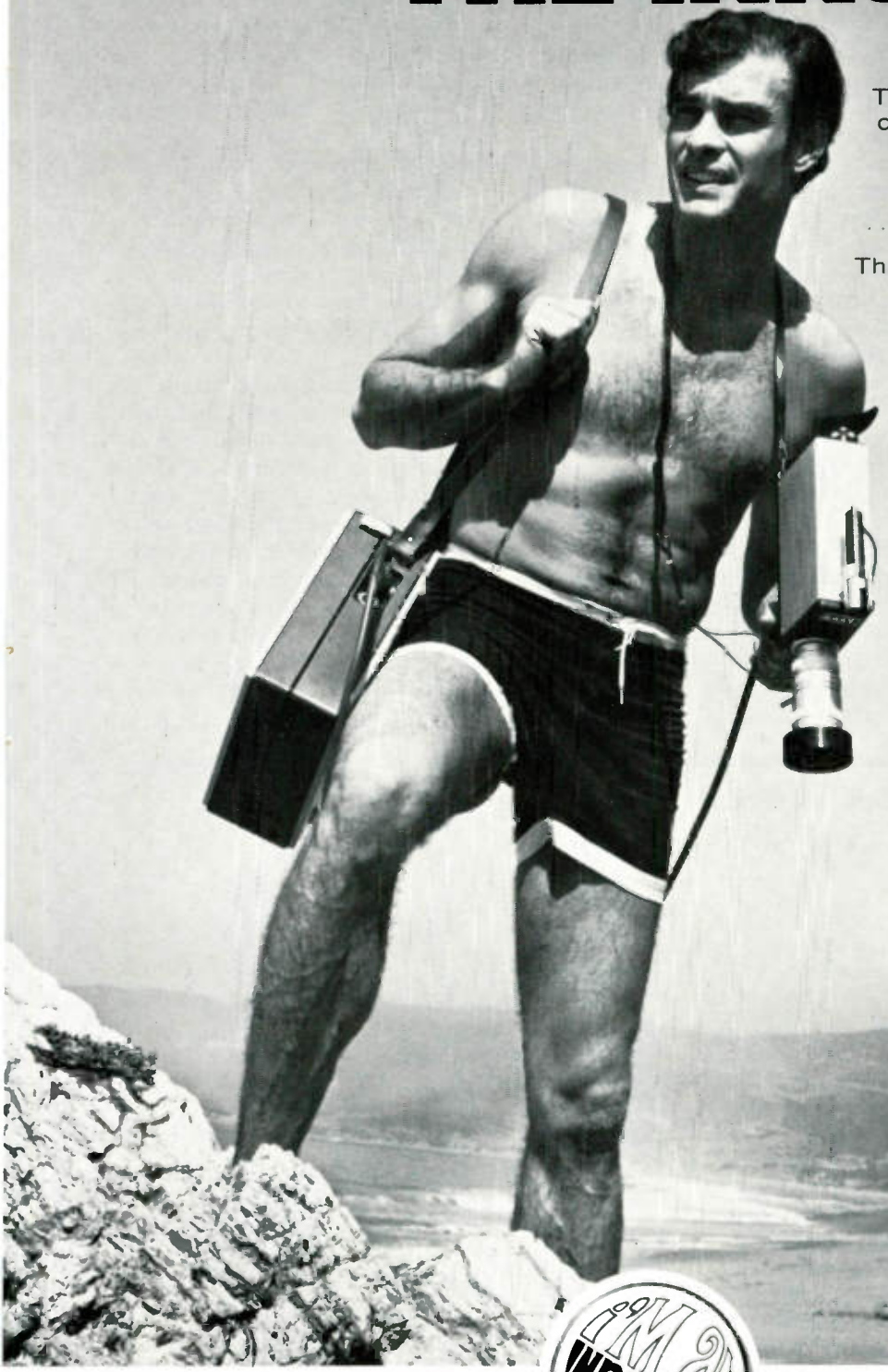

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TV-68

liver consistency and good operation.

A simple way to program this maintenance is to take your system map and divide it into areas (this may have been done already if it were used for marketing). By having a somewhat equal number of amps per area, you then can program intervals of time and *your* work load — I'm sure management will buy that!

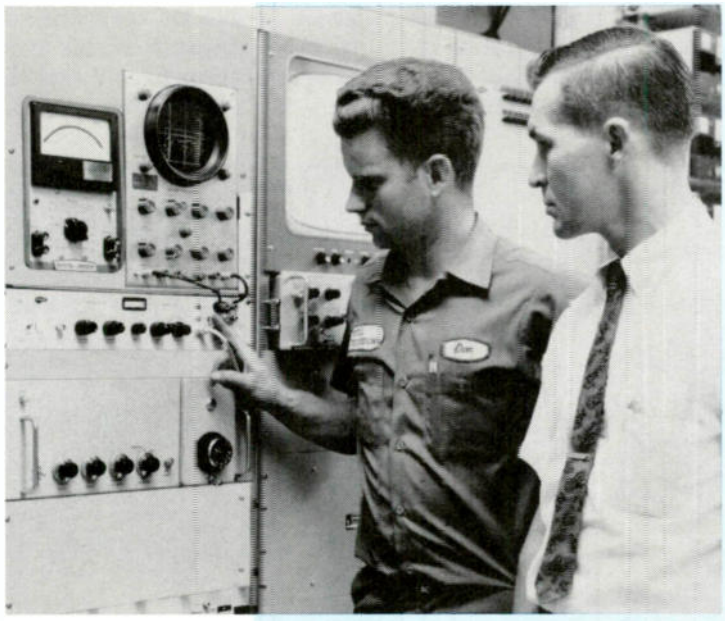
Unfortunately, I'm afraid many people were sold on the theory that with the advancement into the CATV industry of solid-state equipment, all of our troubles would be over and such things as maintenance and/or preventive maintenance would be a thing of the past. Such statements as "low gain," "varying tilt," "excessive cross/mod" are still being heard. As I mentioned previously, I firmly believe that you have to know that each piece of equipment in the system is operating at or near its specifications. In the case of tube equipment, you can say that in six months amplifier A will be serviced. But in solid state equipment, you really don't know if amplifier B will require repair in three days or three years. Because of this unpredictability, it becomes even more reasonable to use preventive maintenance as a tool to monitor your system's performance.

Signal-to-noise ratios and cross/mod are probably, at this time, the two outer limits of your system's operation. By periodically recording these numbers, we can project operational characteristics of our amplifiers and system, and also, spot significant changes that may ultimately result in amplifier failures. Through the use of existing formulas, we can calculate signal-to-noise ratios and cross/mod figures for any amplifier location in the system. By recording these calculated figures, we now have a base of comparison for our actual readings. Signal-to-noise ratios, as measured using standard field strength meter techniques, may not be considered accurate, but they do serve as a comparison and guide to needed corrections. Cross/mod being our other limitation of operation can likewise be read at various test locations in the system. Various methods described in the past have utilized an oscilloscope as the read-out device. I have felt this left a lot to be desired both in ease of operation and accuracy of readings. Because in an operational system, cross/mod levels vary with station modulation levels and the sync information as read on an oscilloscope becomes very hard to calculate with repeatable accuracy.

After spending time using the simplified two channel cross-mod test set up, I mentioned earlier, I decided to experiment using the read-out portion of the test equipment for measuring cross/mod in an operating system. First calculations were made to coincide to various system test points. I wanted to be able to conduct these tests without disturbing the system operation in any way, so I de-

"EVERY CABLE TV SYSTEM USING MODULATORS NEEDS A SIDEBAND ANALYZER,"

says Don Cantrell of TOTAL TV, Santa Rosa, California



Don Cantrell, Chief Technician, demonstrates operation of TS-100B Sideband Analyzer to Jim Monroe, Mgr. of TOTAL TV.

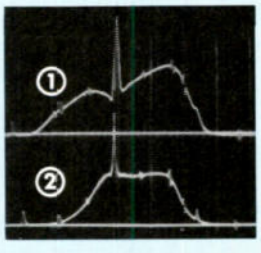
TOTAL TV of Santa Rosa, California has been using a DYNAIR TS-100B Sideband Analyzer for over a year. Here's the way they feel about it . . .

"The DYNAIR sideband analyzer allows us to check modulator operation at any time—precisely and in just a matter of minutes. It also greatly shortens the time required for modulator alignment."

Yes, cable TV operators everywhere have discovered what broadcasters have known for years . . . *the only practical way to check transmitter operation is with a sideband-response analyzer.*

The DYNAIR TS-100B Sideband Analyzer is designed especially for the needs of the CATV operator. It is completely solid state and has a self-contained regulated power supply. It is extremely compact. And it is priced at only $1250 . . . a small price to pay for the savings in time and the increased system performance that are immediately realized. (And an *especially* small price when compared with the $8500-odd worth of standard precision test equipment you would have to assemble to do a roughly equivalent—but many times slower—job!)

These units are available for immediate delivery. Give us a call and place your order today. (If you're still not convinced, ask the man who has one . . . or see it in operation at the NCTA convention, booths 69, 71 and 73 along with the RX4000A Demodulator and the TX4A Modulator.)



Actual Sideband Analyzer waveforms indicating (1) poor modulator response and (2) Proper response.

The Dynair TS-100B generates a video sweep signal which is applied to the video input of the modulator under test. The RF output of the modulator is then directed back through the TS-100B, where the RF spectrum is analyzed and then applied to an oscilloscope for display. The display is a precise representation of the sideband response curve, showing both the visual and aural carriers. Markers for frequency measurement are provided at 0.2, 0.5, 1.5, 3.6 and 4.5 mHz to allow exact frequency determination.

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cided to utilize the pilot carrier which in this system was operating at 73.5 MHz. I first had to be sure that I had a high degree of signal purity out of the pilot carrier itself, to insure a large enough dynamic range for my readings. This dynamic range is limited by noise and/or cross-mod in the 704B itself so a signal level into the 704B between + 5 and + 20 dBmV is required. I have since found that this varies between 704B meters and apparently detector outputs based on input signals vary because of field strength meter condition. It is important to calibrate the read-out device by comparing a fully modulated carrier using a constant level of modulation versus an unmodulated RF carrier with a high degree of signal purity.

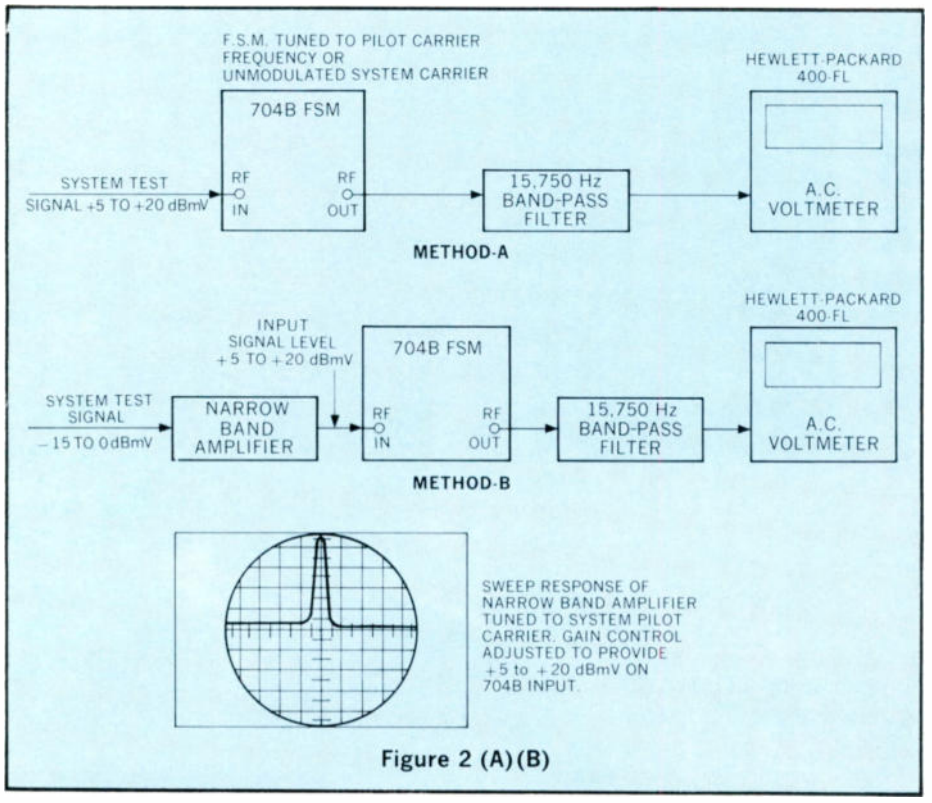

Figure 2 (A)(B)

The basic equipment set-up for this test is shown in Figure 2a. Because of noise limitations in the 704B, test point levels below + 5 dBmV cannot be read with any degree of accuracy. It was decided to re-vamp a low gain, narrow bandwidth amplifier so it would increase the gain of the pilot carrier and have a high level of rejection to the adjacent channels. A gain control was installed so the desired input to the 704B could be maintained at all times. This set up is shown under Figure 2b. It is important when using method (b) that you know the narrow band amplifier is not significantly contributing to your cross/mod readings. Tests were conducted using a high band pilot carrier and comparable results were obtained. Another test was conducted using a systems program modulator and removing the sound carrier and video modulation. This carrier at the test location was of the same signal level as the adjacent channels in its band. This also proved to be comparable to the results obtained while using the high and low band pilot carriers.

After the input signal from the test channel is established at the 704B, the 704B is switched to manual position and the manual gain control is adjusted for full scale deflection to establish a reference point. The meter that I have used for the read-out is a Hewlett-Packard (400 FL) AC Voltmeter that has a linear dB scale and a logarithmic AC scale with an accuracy of ± 1% in region of our readings. For the past three months, on a routine basis, I have been utilizing this procedure at calculated test points in many systems and have recorded that data on a record form (Figure 3).

SYSTEM PERFORMANCE RECORD

SYSTEM_____ DATE_____

D—DESIGN M—MEASURED T.C.—TOTAL CASCADE LB—LOW BAND HB—HIGH BAND C./M.—CROSS MOD.

TEMP._____ ENGINEER._____

T.C.	TEST LOCATION		SIGNAL LEVELS 2 3 4 PC 5 6 FM 7 8 9 10 11 12 13	SIG./NO. HIGH BAND	C./M. CHAN.__	TIME	PICTURE QUALITY NOTES
		D					
		M					
		D					
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REMARKS:

Figure 3

I feel it is proving very successful in determining system performance and making system corrections before they actually show up as large scale problems. The methods and procedures that I have mentioned have many variations that can be adapted to future techniques with food for thought to create better system preventive maintenance. TVC

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Television Interference And Its Elimination

The increase in man-made interference in the radio spectrum can be a threat to the "studio quality" reception provided by coax as well as to off-the-air viewing. Elimination of such interference is essential to complete subscriber satisfaction.

By Edwin H. Schuler
Interference Consultant

Since the early days of radio and television, reception has been hampered by the amount of interference in ratio to the strength of the signal of the station being received. The interference is divided into two categories, atmospheric and man-made.

Limitation of atmospheric interference has been helped greatly by the modern design of transmitters and receivers. The man-made interference, however, has been complicated by the advent of more electrical devices and additional power sources to serve them. There has also been additional interference caused by the multiplicity of radio and television transmitters. Some interference appears on the viewing screen as bright specks or short bright lines. This interference may also be in broad, triple patterns when located near three phase power lines, especially during rain or snow on high voltage lines. This condition may affect only color, spoiling the viewing.

Although the field strength meter may not register many microvolts of extraneous noise, a volt meter across the audio output of a meter, with a speaker, will allow you to become familiar with, and identify various types of noise and their sources. A beam antenna that can be carried and also mounted on your vehicle is your most important piece of interference fighting equipment. Incidentally, a well grounded shield over the entire ignition system is almost a necessity if you want to drive while looking for interference. The equipment must be light enough in weight for carrying when following power lines on foot.

Photo 1 shows a case of interference where 240 volts is stepped up to 2400 volts and carried to the cable head-end, then stepped back down to 240 volts. The 13kV line at the point pictured was very noisy from hardware and was carrying the noise to the head-end of the cable system via this line and two pairs of phone lines running parallel to the noisy line.

Photos 2, 3, 4 and 5 show power lines directly in front of two antenna systems that were checked for interference. Noise at the points shown in Photos 2, 3 and 4 was

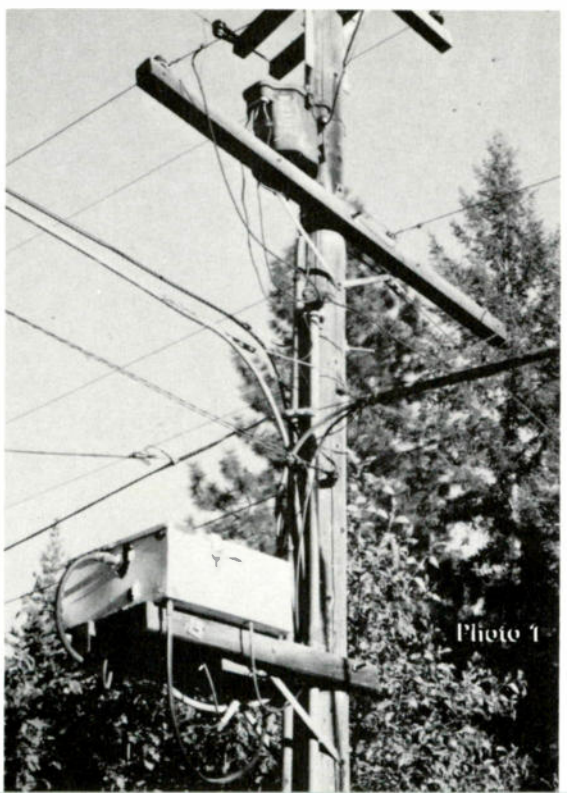


Photo 1

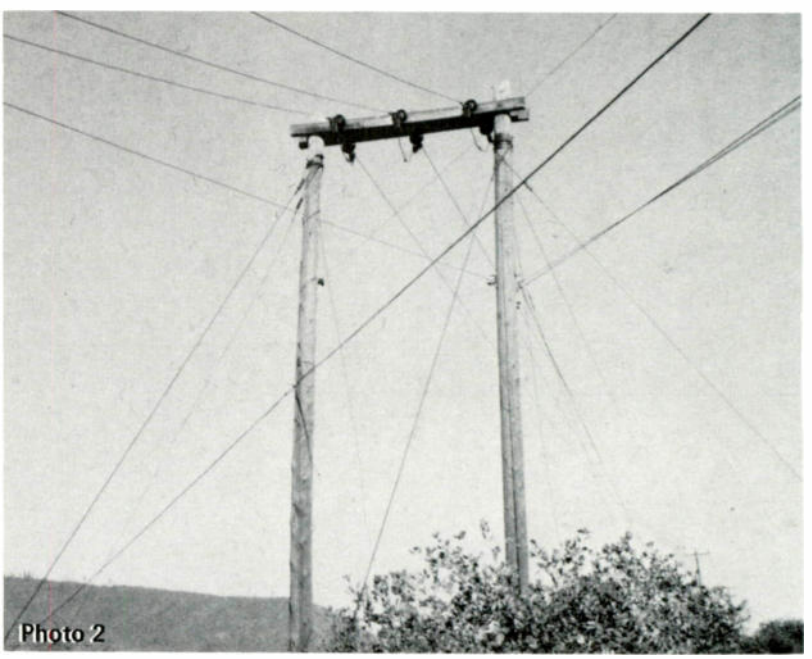


Photo 2

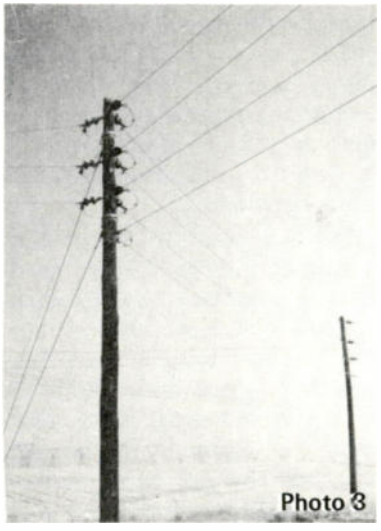


Photo 3

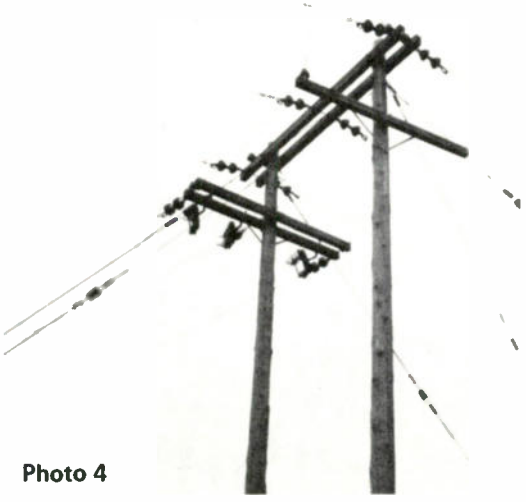


Photo 4

caused by dead ends on the 13kV insulators and slack guy cables. These are in an area of high corrosion near a smelter which also causes harmonics from the rectified arcing.

The particular pole shown in Photo 5 radiated a very high level of noise in the area of channels 2-3-4-5-6 and the FM bands. This was caused by the cross arm braces being loose where they are lagged to the pole. Some power companies have corrected this problem by using a bolt through the pole and with two nuts to keep the two short cross arm braces solidly contacted at all times. This eliminates the continual loosening of these braces from rain or high humidity with alternate drying. When trying to locate this type of interference with broadcast receiving equipment, frequently no noise can be heard, and the cable operator may wish he hadn't reported the suspected interference to the power company. It is important to always remain on the same frequency of the interference or you may not get results.

Photo 6 shows what are known as wishbone braces. The one on top seldom causes trouble because the weight is always on one side; therefore, the hardware (bolts) will always be tight. The second arm down has balanced weight, thereby allowing this arm to move—slightly turning on the bolt or lag in the pole. The bolts in the arm may become loose from rain and drying, alternately. Each time they do not make contact with the brace there is an arc which, in this type of

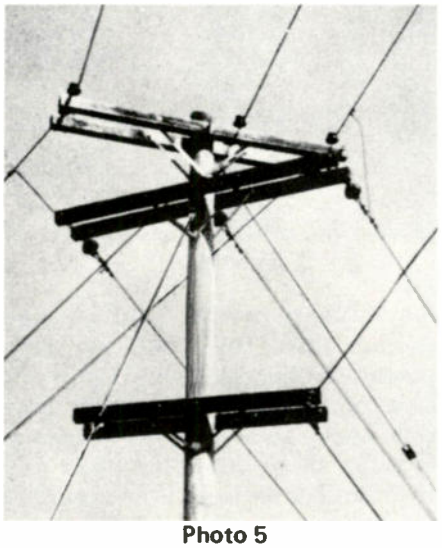


Photo 5

brace, radiates a very strong signal in the VHF band due to the length of the brace. By replacing the lag in the pole with a bolt and a nut on both sides, the brace is made solid. This same thing can be done with the bolts on the arm.

Referring again to Photo 4, guys that have insulators in them will have induced voltage in the upper part. Consequently, if a neutral or a span guy that is between poles is near enough to touch this upper part, there will be an arcing noise. In the case of a neutral the noise produced is very severe. *Important: An insulated wire in the field of the high voltage is not dead from the standpoint of electrical interference.*

In Photo 7 notice insulators in the span guys (arrows). They normally are not grounded or bonded at the pole, but in many cases come close to a ground wire running down the pole and arc to the ground. This produces a se-

vere case of interference. The same thing is true when they are near bolts or washers in dead ends close to them. The top guy is exceptionally long, nearly three hundred

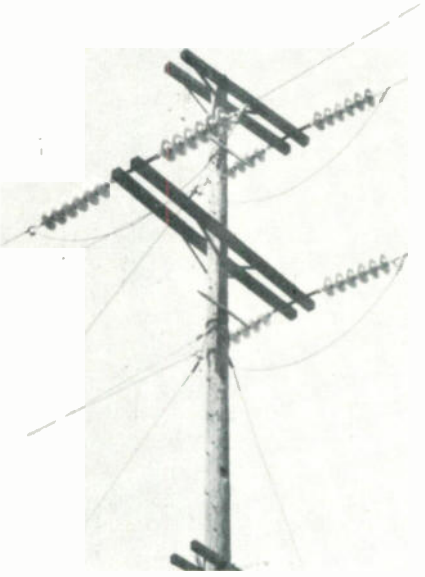


Photo 6

feet. When in the field of high tension lines this could be very potent to the man working in the area of the particular span guy. One could receive a very uncomfortable shock from the span guy to ground or between it and another unterminated wire. These same

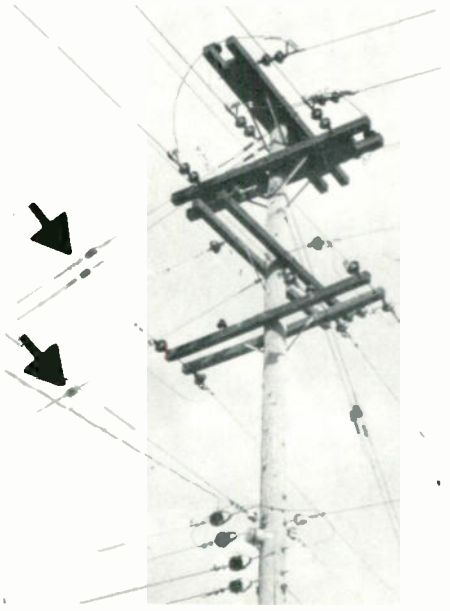


Photo 7

guys coming in contact with the cable system by touching the bare shield of the cable will also cause induced interference in the system. This contact, when ahead of the amplifier, can be a source of trouble, especially near the head-end.

Tedious searches can occur in areas where corrosion is a problem or where a strong signal from a nearly radio station radiates numerous harmonics.

In Photo 8 you can observe at (A) a jumper pulling up and back in such a manner as to create slack. This causes electrical interference, especially in windy weather, because these dead end insulators lose contact and each time they do an arc is formed. If the gap is such that the arc can continue it will sound like a short buzz until a solid contact is again restored. In a light breeze this can be very serious and at calm periods it can stop and make a continuous buzz.

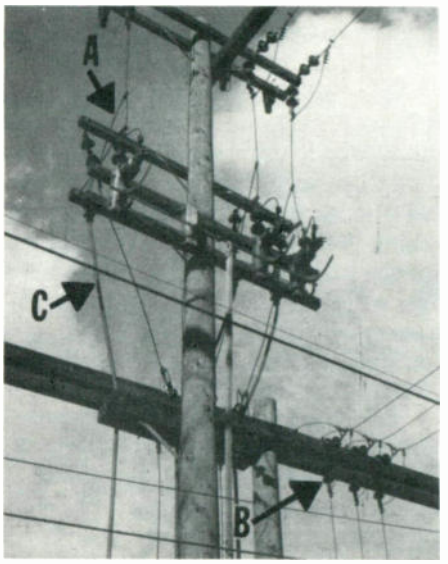


Photo 8

At (B) this is not true because there is a continuous strain and usually the movement keeps this point rubbed smooth. At (C) we are dealing with high voltage cable. Here, if we have an ungrounded circuit, we can have a leaky insulator, a cracked insulator or an arc to ground on one leg which produces a great deal of interference, although the circuit power output will still operate normally.

Photo 9 shows high voltage disconnects (arrow). If they are not securely closed, these can cause a continuous frying sound and numerous spots continuously on the television screen. This is a very serious problem which is often hard to locate—especially in areas that are hard to patrol. This is also

Somebody had to make a coaxial cable like this.

A coax CATV engineers could really bend. And rebend. Form drip loops, expansion loops and spirals. All without mandrels or straighteners. All without kinking, cracking or rupturing the sheath.

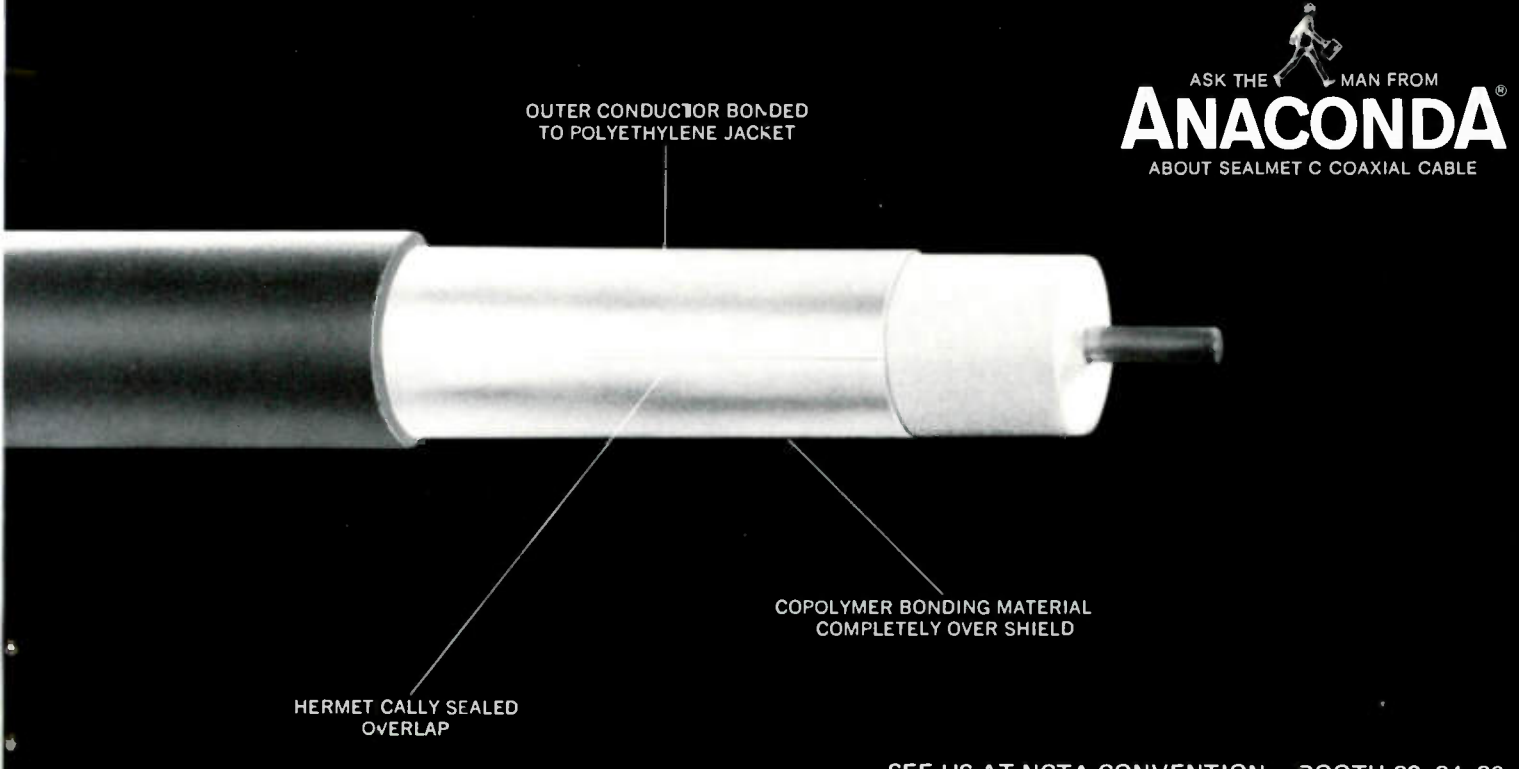
Somebody had to make a coax so flexible and easy to install, it's practically foolproof.

But a coaxial cable that was also moistureproof. Absolutely. And Anaconda did it, with a special sealing and bonding design called "Sealmetic®." This special Anaconda construction hermetically seals the cable sheath at the shield overlap. It also bonds the entire outer conductor to the polyethylene jacket to form a unitized sheath. A sheath so strong the cable core is completely protected from moisture and humidity.

A sheath so strong it guarantees permanent electrical excellence: signal integrity, low attenuation. And a structural return loss of 26 dB or better.

Somebody had to make a coaxial cable like this: exceptionally flexible, electrically excellent. Anaconda did: Sealmetic Coaxial Cable.

Anaconda Wire & Cable Co., 605 Third Ave., N.Y., N.Y. 10016.



ASK THE MAN FROM
ANACONDA®
ABOUT SEALMET C COAXIAL CABLE

SEE US AT NCTA CONVENTION – BOOTH 32, 34, 36.

a type of circuit that can cause much trouble if the bolts in the disconnects get loose, allowing the washers to get loose thereby taking the necessary pressure off the contacts.

The bases of the disconnects are usually grounded by a heavy copper wire running from station ground which is often connected by means of a connector or clamp with a bolt through the hole in the base. These

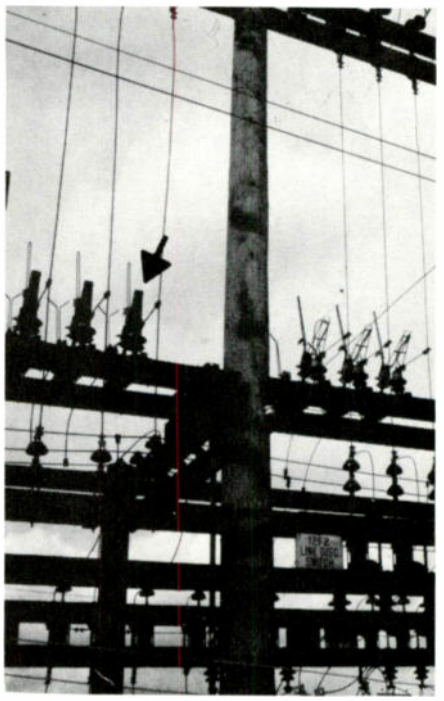


Photo 9

frequently get loose and cause arcing which produces considerable interference in the vicinity.

With the new aluminum shielded cable the systems can often get trouble from other wires rubbing on the shield or slapping into it in the wind. Crews stringing power line and crews installing open telephone or messenger can cause this, especially near high potential lines. If such a situation is left over the week-end, the cable people may be in for a hectic week-end of complaint calls from subscribers. A similar bugaboo can assail operators during plant rebuild. When replacing cable, a ghost in the new system can be caused by the old cable paralleling the new, if it is still energized but not terminated.

Photo 10 shows a type of spring washer used to keep hardware tight for longer periods. On the right in the picture is a type of spring brush used through the eyes of slack dead ends to eliminate the continual scratching, popping noise from movement caused by wind—and even some cases found to be caused by large vehicles passing and causing enough air movement to create trouble.

In homes that may be close to your head-ends you may find heating pad thermostats that cause severe interference. Interference can also be produced by electric motors, especially motors of the small series brush type. Thermostats on electric hot water tanks and electric heaters can cause severe trouble where current is high. Electric fences are sometimes found to be the source of trouble when grounded by plants.

Having examined a number of causes of trouble and also some cures, it should be emphasized that most of these interference sources can only be corrected by people experienced and familiar in the field of high voltages. Where power or phone lines are generating interference woes for your cable system, the solution involves two absolutely essential steps. First,

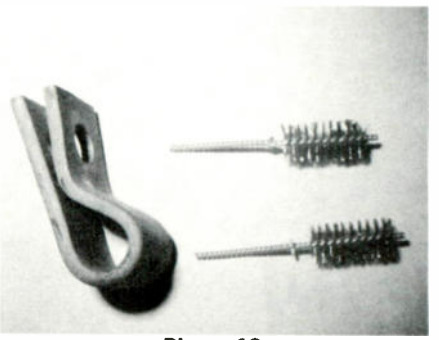


Photo 10

be sure of the noise source; if you're only guessing be sure to say so when contacting the utility company. Second, *always* rely on the utility company to do the de-noising work. Don't attempt to work on any portion of the utility plant; it's always bad utility relations—and could be fatal, as well.

For tracking down elusive interference sources or dealing with sticky utility relations problems you may find it quite expedient to call upon a specialist in interference work. This will speed location of the noise and the consultant will also probably rate a more receptive audience at the telephone or power company. TVC

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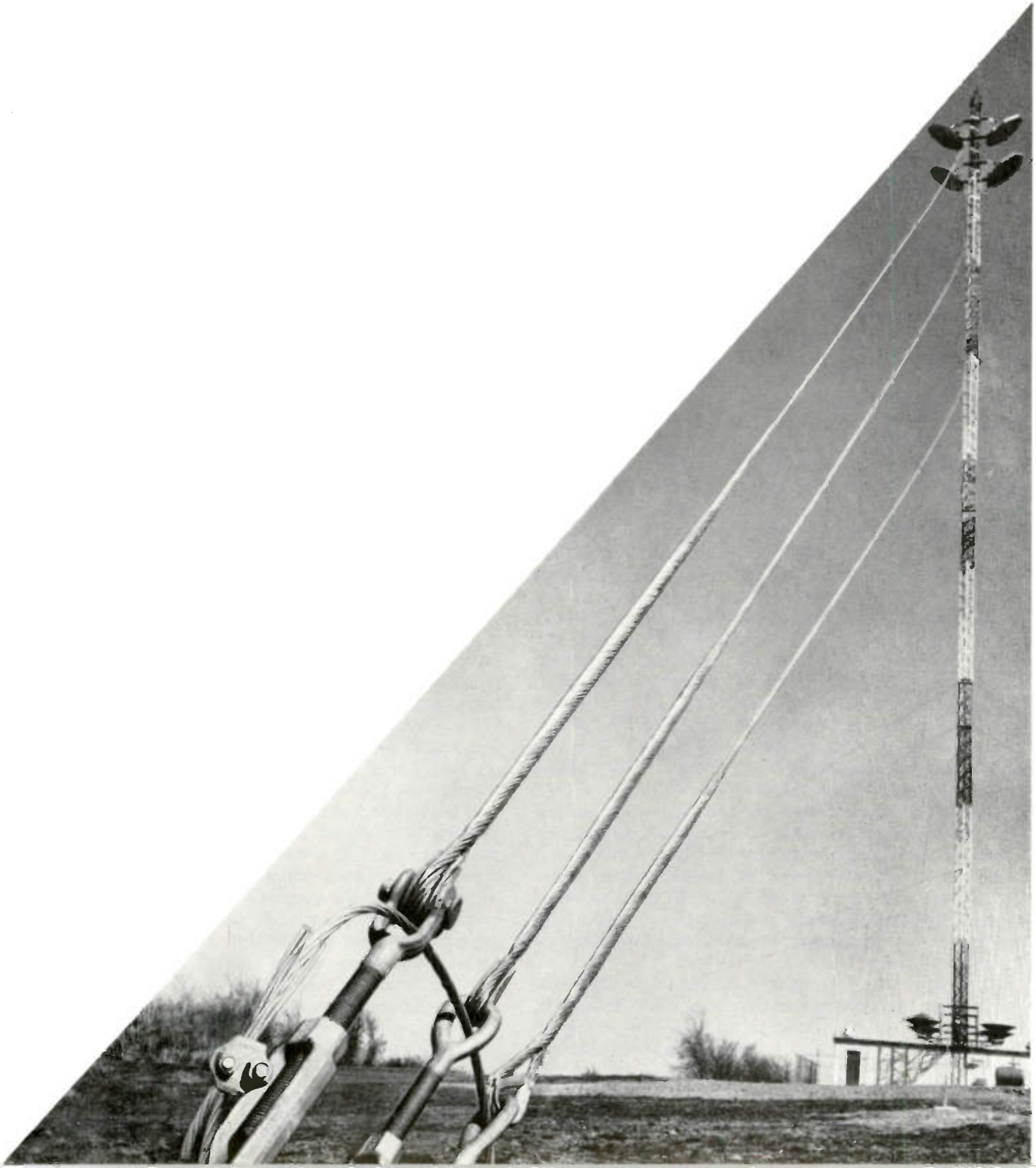

Emergency Storm Warnings– A Valued Public Service

In many areas, spring and summer months bring severe, but localized weather conditions which cannot be adequately reported to outlying communities by broadcasters in the urban centers. Here's how CATV can fill the gap.

By John Monroe

Some time ago community antenna television systems realized the need for some method of alerting their subscribers when they were threatened by the elements or some man-made danger. Some of these methods were rather crude but they served a purpose. Radio stations and television stations have been doing a good job of this for years, but many of these outlets are at some distance from the CATV operation and many of their alerts do not include the area of the cable system. Also, many of the cable systems are located in towns where the local radio station only operates during the daylight hours, leaving the populace without any kind of local warning facilities.

Realizing the need for a cable system warning device, our engineers went about the job of devising some such system. We built audio amplifiers and remote switching so that some official in the town could push a switch and put the warning out over all the cable channels at the same time. Since these early efforts, available equipment has become much more sophisticated and is readily available on the open market. There are systems for all kinds of operations and they work equally well.

In most of our operations we use the audio-only type, but we do use both sound and picture in a few locations. If the head-end is located downtown or near the center of the system, the combination picture and sound models have very obvious advantages. With a mike and camera available, the cable operator can punch up slides or cards on one or all channels whenever the need arises. We find this kind of device very handy when we have trouble on one or two channels. This loss of service could be caused by microwave failure or a preamp outage with the loss of signal being confined to one or two channels. When this happens we insert a card informing our subscribers of the trouble and requesting that they change channels. They appreciate this information and it lets them know that the trouble is not with their set. This also keeps the telephone from jumping off the hook in the cable office. In most of these cases we don't use the audio portion but we could utilize the mike or, perhaps insert the output of a tape machine if the need arises.

The other types of equipment, in use where the head-end is out in the country some distance from the start of the system, usually consist of an audio model. With this type equipment we are able to insert voice announcements on all channels with the visual portion remaining on the set. With both types of set-up, we place a red telephone in the City Hall or some place designated by the selected official. When a tornado or storm is threatening, the city official picks up the mike or handset, pushes a button and informs the people of the danger. If the danger is severe, additional bulletins are aired.

Most towns and cities lose electric power when tornados strike and any kind of warning device is of little use. Of course if the local radio station operates full time and has standby power then transistor radios are a must. The great value of the CATV warning system is its ability to give warning early enough for the people to take proper steps to protect themselves. The cable operator has a choice of methods for his warning device but all must perform the same function.

The "red" telephone we use for the remote operation contains a solid-state audio amplifier and the required encoder. This encoder goes into operation when the button is pressed. This starts a beep generator which is designed to get the attention of the viewer. Following the "beep," the spoken message is given. With the audio-only model we use an FM modulator to operate our heterodyne processing equipment. This must operate at 41.25 MHz which is the sound IF frequency. If picture and sound modulators are used as with microwave fed systems, then an FM 4.5 MHz modulator must be used. Most head-ends use a combination of both, so the two types of FM modulators are necessary. The switching from normal television sound to the alert warning audio is done with coaxial relays. These relays get their operating voltage from a master relay which is triggered by the remote phone.

If both sound and picture is desired, then additional expense is involved. A camera and lighting must be provided as well as a visual modulator. If the head-end location is manned, then the matter of turning the camera on and off is relatively minor, but if this operation must be done remotely, the use of complicated keying equipment is called for. For this reason we prefer to use the sound-only approach for the emergency warning function, keeping the visual operation for our own use. Both types of equipment are available and the cost is reasonable. When you consider the public welfare and good will, in fact, it becomes a bargain! TVC

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Construction Reports

Tuckerman, Ark. — Dwayne Millikin, manager of Davco's Newport TV Cable System, has announced that construction has begun on the 10-mile trunkline between Tuckerman and Newport. Tuckerman will be fed from the Newport system and is expected to be in operation this month.

Ladysmith, B.C. — The L & C Cablevision system has been energized and 400 subscribers are now receiving 7-channel programming. B. C. Cable Contractors Ltd. of Vancouver handled construction of the project.

Cross City, Fla. — Micanopy Cable TV Inc. has announced beginning of system construction. When completed the system will cary signals from Jacksonville, Gainesville, Tallahassee and Tampa stations.

Momence, Ill. — An open house marked the official arrival of cable service here recently. More than 15 miles of aerial and underground cable have been installed thus far and subscribers are receiving programming from Chicago, Champaign and Danville.

Mexico City, Mex. — A 6-channel system is scheduled to start operation late this spring. Under authorization from the Ministry of Communications and Transport, the operating company, Cablevision S. A., has agreed to supply subscribers with all broadcasts that can be picked up in its area. Rates are expected to be $5.50 a month.

Endicott, Endwell, Maine, N.Y. — Lawrence Flynn, president of Tri Town Video, Inc. and Vestal Video, Inc. (which has taken over operation of Tri Town) announced that the system serving these three communities is now completed. Over 90 miles of plant have been installed and the firm's 3,300 subscribers are receiving 10 video channels from New York City, Syracuse, Scranton and Wilkes-Barre.

Lawton, Okla. — The first subscribers have been connected and the first 50 miles of plant installed for the Lawton system. Paul Goode, managing director of Lawton Cablevision, announced that 8 channels will be programmed initially, with a Dallas-Ft. Worth independent to be added later. A feature of the local weather service will be a continuous radar scan during tornado season. The system has 16-channel capability.

Smiths Falls, Ont. — Cable service will be available to Smiths Falls residents this month according to C. W. Warner, president of Smiths Falls Cablevision Ltd. Tower construction is under way and contracts have been negotiated with the Bell Telephone Co. The system will carry 8 channels, with an FM service planned to be added later.

Athens, Tex. — Ray Barnes, who was recently awarded the Athens cable franchise, has announced that construction will get under way immediately. The 40-mile system construction contract has been awarded to CAS Manufacturing Co., Irving, Tex.

Jacksboro, Tex. — Owners of the Jacksboro Cable TV Co. have signed a contract with CAS Equipment Co. for construction of a 9-channel, 16-mile cable system. The system will use transistorized equipment exclusively, including solid-state CAS Channel Control head-end units. Strand and hardware are being installed and Fort Worth Tower Co. is erecting the tower. The completion target is June. Jacksboro Cable holds a 10-year franchise. TVC

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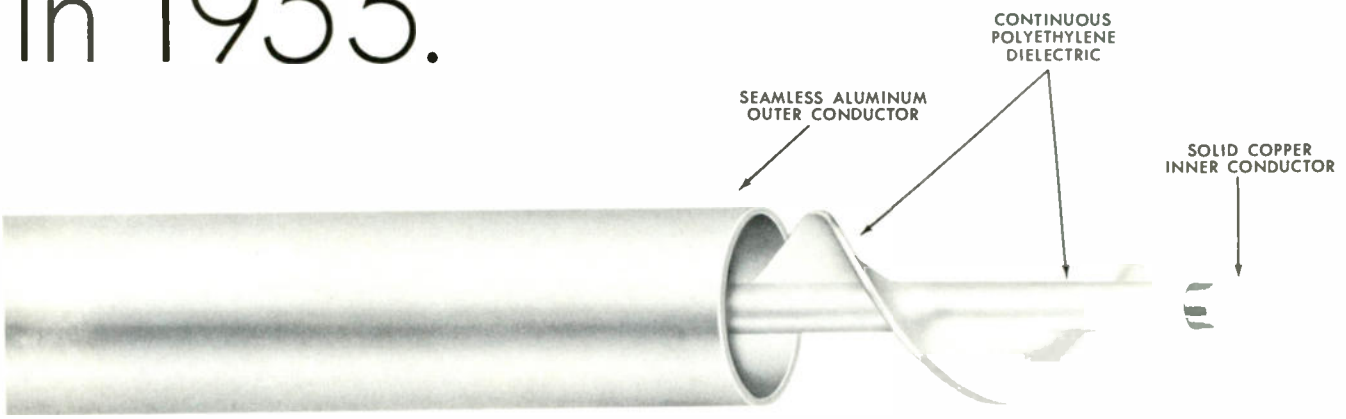

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June 1968

TV Communications

CATV Technician

CATV Technician photo courtesy of Vikoa, Inc

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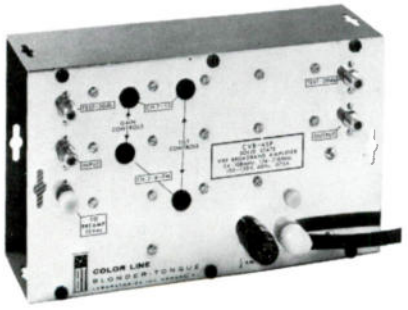
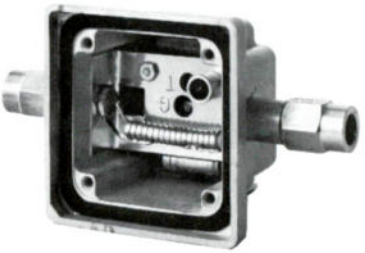
SIGNAL TRANSMISSION PROBLEM SOLVERS



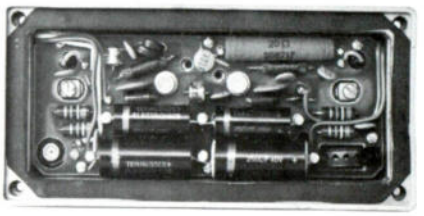
Blonder-Tongue Model CVB-45P

A new, solid-state VHF/FM broad band indoor amplifier with an extremely flat bandpass for best color signal transmission. Tilt and gain controls for low and high bands for more accurate signal balancing. A direct replacement for B-T's MLA-FM and other tube type models, the CVB-45P is designed for continuous use in distribution systems. Specifications: **Bandpass:** 54-108 and 174-216 MHz ±0.5 db. **Gain:** 43 db minimum, channels 2-13 and FM. **Maximum Output:** +56 dbmv (7 channels) for —57 dbmv cross modulation. **Power Requirements:** 117 VAC.



Craftsman Model MAT-18

This modular amplifier tap overcomes signal losses in long drop cables and eliminates the need for additional booster amplifiers. It provides 18 db gain for one output with low insertion loss from the through feeder line. All-channel solid state circuitry provides for one, two, three, or four modular tap outputs. Tap changes are quick and foolproof. .412 through fittings and pole or strand mountings are standard. AM or .500 fittings are available on special order. Specifications: **Gain:** 18 db with one-way module plate; 14 db with two-way module plate; 11 db with three or four-way module plate. **Bandwidth:** 50 MHz to 220 MHz. **Output Capability:** 40 db minimum.



SKL 7300 Line Extender

Use this model for quality color transmission. This sophisticated unit comes housed in a waterproof cast aluminum box. It mounts easily on the messenger and comes equipped with seized-center connectorless fittings for direct insertion of the distribution cable—an installation that takes only minutes. The extraordinary flexibility of the SKL 7300 is facilitated with fixed plug-in pad and wide-range manual gain and tilt controls for precise adjustments. Specifications: **Bandwidth:** 50-220 MHz. **Response Flatness:** +1.0 db. **Gain at 216 MHz:** 24 db minimum.

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Troubleshooting Your Head-end Problems

Operator demands for optimum picture quality, especially on twelve or even more channels, require head-end operation at the full capability of the latest equipment available. Here are procedures ensuring such performance.

By John Dolan

All cable television operators share the common goal of providing the best quality pictures possible in their respective markets. For those of us who are faced with off-the-air competition on several channels, high quality pictures are an *absolute necessity.*

To build a head-end capable of producing twelve channels with studio quality pictures is the present goal of system operators, with the eventual goal of twenty or more channels. However, very few of the head-ends where good quality pictures are available off-the-air are processing these signals and feeding them into the trunk line without visible degradation and without producing stray signals, beats and ghosts.

Present day head-end processing equipment is, for the most part, capable of handling the antenna signals with little or no difficulty *provided* the equipment is properly chosen and is operating at least as well as the designer intended. These are two extremely important factors. Ten year old strip amplifiers will not function in an adjacent channel environment. Nor will a poorly aligned heterodyne receiver produce good color response or signal-to-noise ratio. The equipment must be properly chosen and optimized by careful alignment and testing to insure that its performance meets the high quality requirements of adjacent channel operation, color performance and freedom from stray outputs which can degrade another channel or complicate the beat production problems in long trunk cascades.

Perhaps you are thinking now that you don't have any head-end problems, that your pictures are great and you have plenty of satisfied customers. Unless you have achieved 100% saturation of your real potential, you don't have plenty of customers. Now, on to that nebulous thing called picture quality.

Critical Test Procedure

If you have a ten or twelve channel head-end with no visible degradation, no strays or funnies and all your pictures are excellent, you are definitely in the minority. (I haven't seen a head-end like this in the field yet!) This then leads us to think of a sufficiently accurate and critical test procedure to evaluate our existing systems to determine how well they are working and whether we have done everything possible to produce an "invisible" head-end.

A test program to meet the requirements of optimum performance is a dire necessity for all of us. I propose a test program roughly similar to the broadcaster's proof-of-performance tests. This will be limited for some systems by budget considerations, I'm sure. But, as a minimum, the tests should:

(1.) Measure and record *all* signal levels on each antenna.

(2.) Verify antenna frequency response on channel.

(3.) Verify receiver alignment accuracy, signal-to-noise ratio, gain, AGC capability and input and output match.

(4.) Receiver output level — not trunk level. If the receiver is designed for +57 dBmV out, run it that way — then pad the output if it's too high for the trunk requirements.

(5.) Photograph the Vertical Interval Test signals at the receiver input and trunk output. There must be no degradation.

Now, I've suggested some test items with which a chief technician should be familiar. And perhaps many of you know how to measure antenna frequency response. And what about the Vertical Interval Test signals? They can tell you quite a lot about the performance of your head-end on the channels where they appear.

If we compare our antenna site problems and hardware with the broadcaster's we can draw some very interesting comparisons. After all, the broadcaster sends it *up* and we bring it *down* a transmission line. But at the present state of the art, his transmission line system is far better than ours because it's required to be by regulation.

But we can do one thing the broadcaster can't do. We can, level permitting, insert a pad between our receiver and the antenna feeder. Sure does fix up the apparent match at the tuner and helps keep the downlead from ringing. It's a better termination for filters than a tuner, too.

Ghosts, Noise, Fading

Several very real and very troublesome problems remain for us in the antenna area and don't adapt themselves to any convenient measurement technique. These are the old familiar multipath (ghosts), noise, and

fading. I've seen cases where all the above problems existed on several channels, and perhaps you can clear one up pretty good, help another a little and fail miserably on the third. After all, you can't amplify *nothing*, and *nearly nothing* is just a teaser. If you can't measure multipath in dB or shot noise in severity, what remains? Only a competent technician with good judgment and the basic rule has to be, "If you can see it, it's too much."

As for using the Vertical Test signals, they are probably the handiest tool available to the system technician to help him evaluate the response of an antenna, receiver and any filters he may have to use. The validity of this test is limited by the quality of the available demods, but the special oscilloscope required is an excellent performer. You should record the information with a scope camera for future comparisons and reference. Now, if you have the demod and buy the special scope, you might as well buy a good video monitor. No sense having half a TV set—and what's the point in evaluating a head-end worth upwards of $25,000 with a four year old, hundred buck TV set?

What should we measure with this fancy set-up of demod, scope, monitor and scope camera? You can, for the stations carrying appropriate test signals, determine if any serious defects exist in frequency response, ringing, ghosting, linearity, differential gain and low frequency video defects such as bounce, tilt and hum. You can't usually cure these problems if your input signal isn't good, but you can sure see whether it's your problem or not . . . and fix it if it is yours.

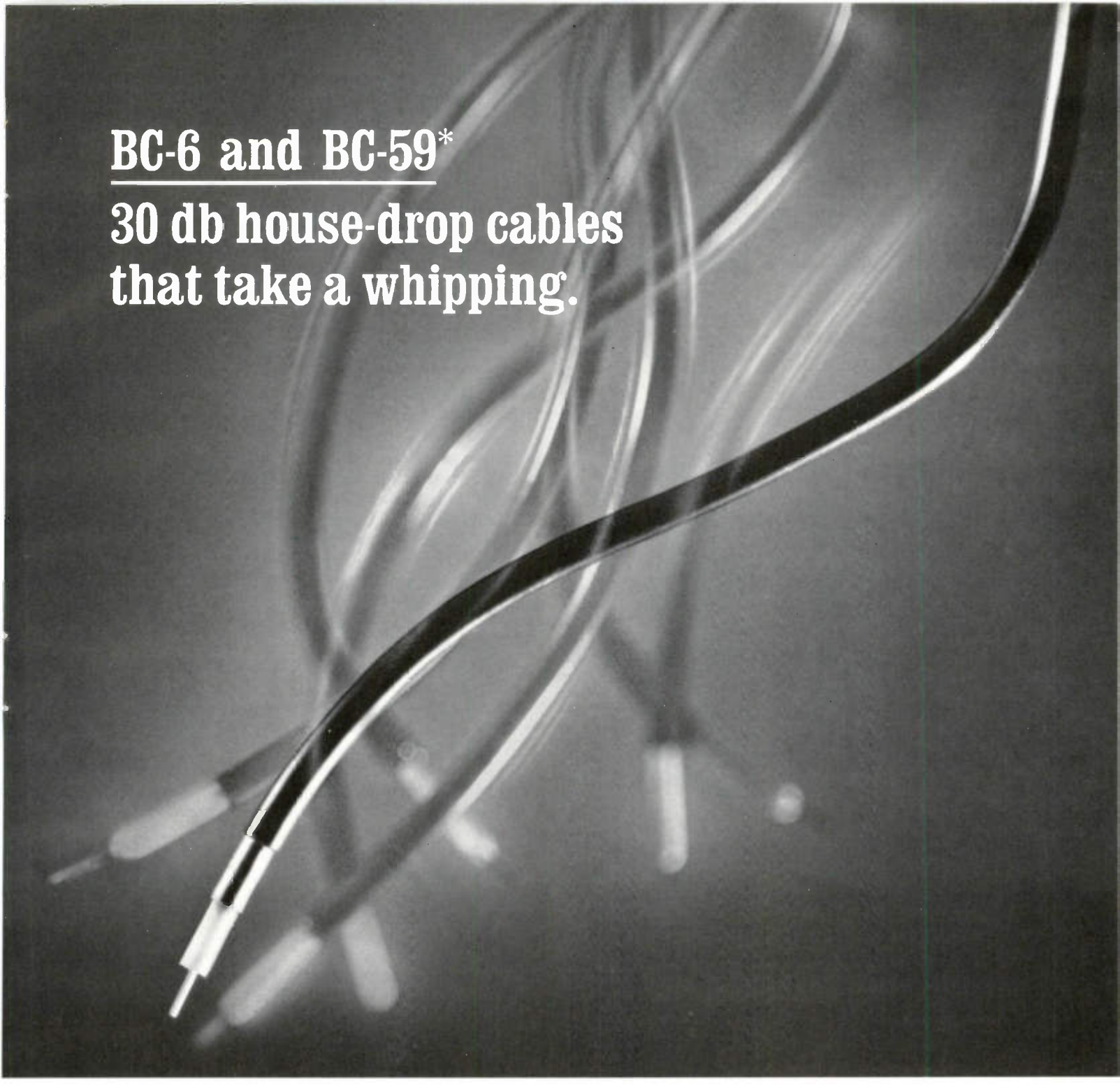
Spectrum Analyzer

The next item that is invaluable for head-end trouble-shooting is a spectrum analyzer. You will be amazed at the ease with which most problems related to beats, interference and other frequency dependent situations can be identified with this uncommon (for CATV) instrument.

Remember when trying to solve beats that you can't trap out the spurious emission from a two-way radio outfit or FM harmonic, etc., that falls in the pass band of the TV channel and is actually coming down your antenna lead. If you can't get rid of one of these problems with antenna directivity, you are simply going to have to track it down. This is where the spectrum analyzer really proves its worth.

In all this discourse so far, I haven't mentioned sweep gear. If you don't have a stable, reliable, idiot-proof sweep lash-up capable of accurate, repeatable measurements of gain, response, loss, and return loss at least to 40 dB, you aren't even current with *last year's* standards!

The value of waveform and spectrum analysis is only as high as the skill with which the instruments are used. If your systems do not have the technical skill to properly utilize these tools, then perhaps a better solution would be to periodically utilize the services of a specialist who has the equipment and the skill to properly utilize it. From the standpoint of simple business economics, it is unreasonable to expect the small single system operator to willingly expend a large amount of capital for test equipment he has operated without for many years. For this amount of



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*Amphenol Bonded Cable

	Attenuation (db/ft.) nom.		V.P. NOM.
BC-59	2.35 (Ch. 6)	4.5 (Ch. 13)	67%
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money, the technical department must make a very effective presentation, and assure themselves that the purchase of the necessary equipment is a wiser choice than contracting for the services.

Head-end Problems

Let's discuss now some of the more common problems related to head-end performance and how they tie in to the test procedures I've already outlined.

(1.) *Poor color on one or more channels.* This usually is a high frequency video response or RF transmission defect. Among the most common causes for this situation are poorly aligned receiving equipment, traps, filters and poor antenna bandwidth. Don't neglect the unusual factor of a broadcast related problem, however. While today's broadcast color quality is usually very good, occasionally an individual broadcaster will have problems in this area, too. You can't cure a broadcaster defect in your head-end, but contacting the engineer for the TV station and intelligently presenting the problem for his consideration will bring a prompt and courteous reply and usually a solution to your problem.

(2) *Adjacent channel interference* is usually in the customer's TV set, but you can create this problem in your head-end very easily. All you need is to try to operate adjacent channels with strips on high band or use a poorly aligned heterodyne receiver. Tunable UHF converters are a dandy way to do this too.

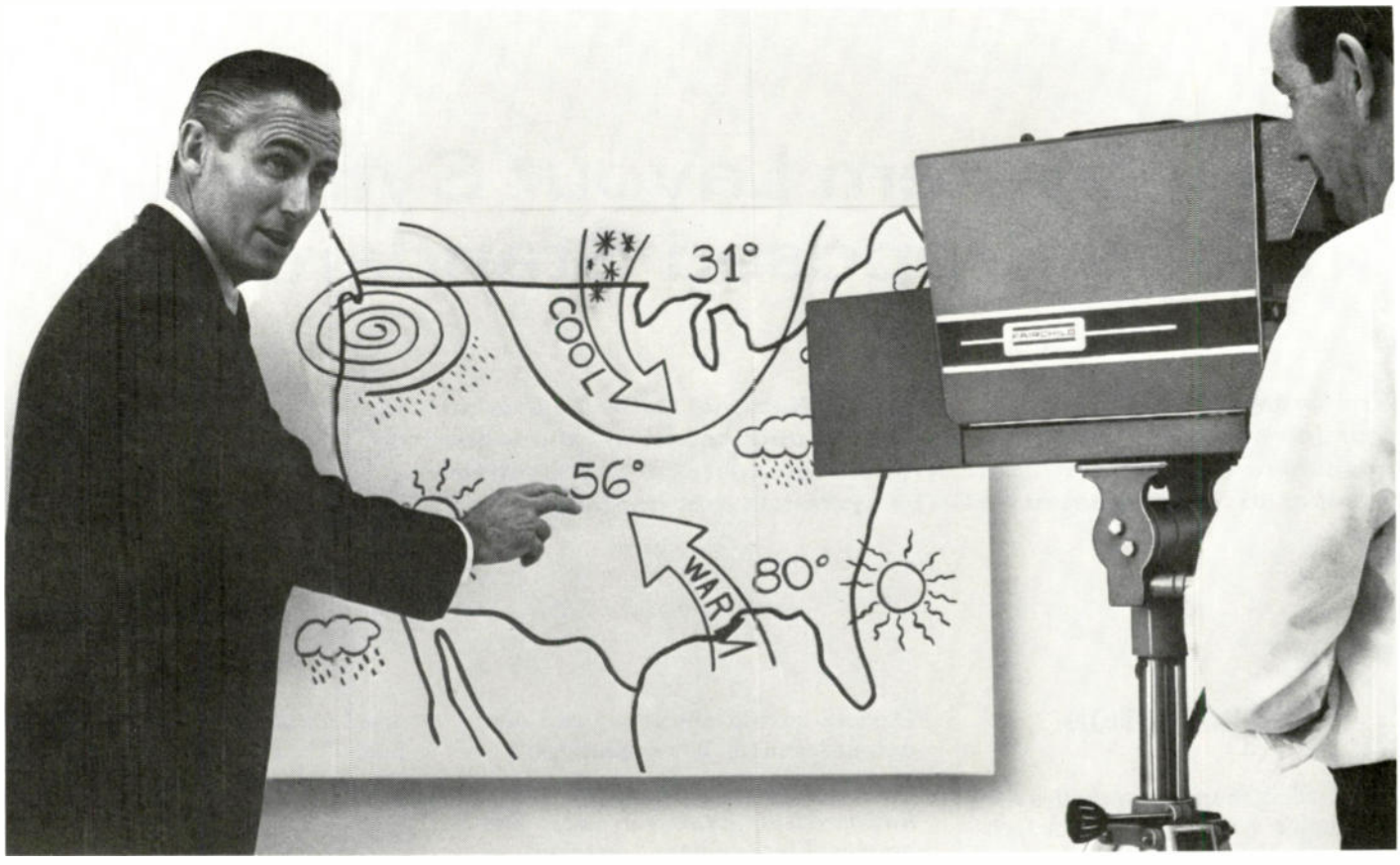
(3.) *Ghosting, or multipath* is usually an antenna or site problem. You may not be able to completely eliminate this problem, but by proper choice of the antenna and careful placement, considerable improvement can usually be made.

(4.) *Power line noise* can usually be reduced or eliminated by the power company. It may be coming up on your head-end service line or radiated from a line several miles away and picked up on your antennas.

(5.) *Poor workmanship* in installing jumper leads is also a very common head-end problem and contributes greatly to the creation of strays, beats and regenerative type defects. All head-end interconnecting cables from the antennas to the trunk, including any chassis jumpers, should be solid sheath aluminum routed in such a manner that low level antenna lines are well separated from high level output lines.

Some of the most common beat problems generated in the head-end are the injection oscillators from Channel 2 and 3 heterodyne receivers appearing in the FM band at 101 MC and 107 MC and second harmonic products generated in an improperly set up FM strip amplifier appearing in the high band. Filtering and proper set up of the FM strip will remove these. Spurious subchannel outputs from heterodyne receivers often are of considerable magnitude and can be easily removed by proper receiver setup and installation of a subchannel suppression filter. Principally this type of stray is from direct IF output from a receiver leaking through the up-converter.

In this discussion, we have not attempted to solve everyone's head-end problems but by covering the most common ones and suggesting an evaluation or "proofing" procedure to help identify the less common problems, you *can* then take the necessary steps to produce that "invisible head-end." TVC

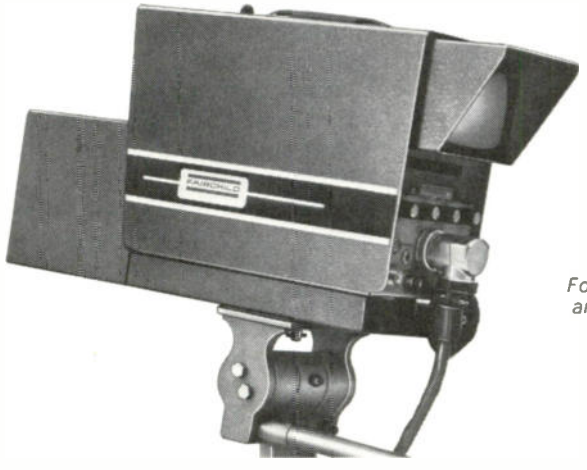


Fairchild's TVF-177 Camera gives this program a network look.

Fairchild TVF-177 viewfinder television camera is the result of recent advances in engineering and Micrologic® circuitry. It produces remarkably stable, crisp, high-contrast pictures—the kind of images that give your programming a network look.

You also get a choice of valuable options with the TVF-177. Its modular design permits you to select from various sync options: random interlace, self-contained 2:1 interlace, externally driven 2:1 interlace or EIA external drive. Other options include a high-resolution module for 8507A vidicons, self-contained R.F. output for standard receiver operations and integrated zoom lens control.

The most remarkable thing about the TVF-177 viewfinder television camera is its price. You'll find it is much lower than any camera that even comes close to its performance.



For specifications and performance data, contact

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CATV System Layout Symbols; NCTA's Proposed Standard

The Engineering Sub-Committee of the National Cable Television Association has issued, and requested publication of, the following revised proposals for graphic symbols for electrical and electronic devices to be designated on CATV system layout drawings.

INTRODUCTION

Scope

0.1 This Standard provides a list of graphic symbols for the designation of electrical and electronic devices on layout drawings of community antenna television systems.

Basic Considerations

0.2 It is the purpose of this Standard to provide graphic symbols which are easy to draw, easy to interpret, and which are in agreement with similar Standards in use within the electrical and electronic industry. In particular, the basic considerations of the American Standard Y32.2-1962 have been followed.

0.3 The symbols for electrical and electronic devices do not indicate a certain type or model number of any manufacturer; they represent the function of a device in a system. The symbols permit the easy addition of model or type numbers within their outline. If such model or type designations are used, an explanation of these designations shall be explained in the legend of the drawing on which the symbols appear.

Organization of the Standard

0.4 The Standard has been divided into the following six parts:

Lines; Example: Cables.

In-line equipment; Examples: Devices having one input and one output terminal, power supplies.

Equipment having single input and mulitple equal outputs; Example: Line splitter, distribution amplifier.

Equipment having a single input and multiple unequal outputs; Example: Multiple tap, bridging amplifier.

Terminators.

Head-end; Example: Complete head-end station.

Drafting Practices Applicable To Graphic Symbols

0.5.1 The orientation of a symbol on a drawing, including a mirror image presentation, does not alter the meaning of the symbol.

0.5.2 The width of a line does not affect the meaning of a symbol. In specific cases a wider line may be used for emphasis.

0.5.3 The symbols shown in this Standard are in their correct relative size. This relationship shall be maintained as nearly as possible on any particular drawing regardless of the size of the symbol used.

0.5.4 A symbol may be drawn to any proportional size that suits a particular drawing, depending on reduction or enlargement anticipated. If essential for purposes of contrast, some symbols may be drawn relatively smaller than the other symbols on a drawing. It is recommended that only two sizes be used on any one drawing.

0.5.5 The arrowhead of a symbol may be closed or open unless otherwise noted in this Standard.

0.5.6 For simplification or clarification of a drawing, parts of a symbol for devices, such as amplifiers, may be separated. If this is done, suitable designations to show proper correlation of the parts shall be provided.

LIST OF SYMBOLS

Lines

1.1 The symbols used shall indicate the purpose for which the lines are to be used.

1.2 The terms describing the symbols *1.A* and *1.B* are defined as follows:

1.2.1 Trunkline: In a cable television system the primary function of the trunkline is to carry electrical energy which may be modulated or otherwise encoded for the purpose of conveying communication, control, or similar intelligence from an originating location (sometimes referred to as "Head-End" or "Antenna-Site") to remotely located distribution hubs. Trunklines are not intended to directly feed terminal equipment connecting devices such as subscriber taps.

1.2.2 Feeder Line: In a cable television system the primary function of the feeder line is to carry electrical energy as described in

paragraph *1.2.1* from a feeder line originating location (sometimes referred to as "Bridging Amplifier" or "Distribution Amplifier") to terminal equipment connecting devices such as subscriber taps.

1.3 The legend of the drawing shall contain the identifier for the cables used.

A. Coaxial cable, for trunklines.

B. Coaxial cable, for feeder lines.

C. Coaxial cable, for which the drawings' legend shall contain an explanation describing purpose and type of the cable.

D. Coaxial cable, for which the drawings' legend shall contain an explanation describing purpose and type of the cable.

E. Optional Symbols:

E.1 Cable carrying 60 Hz power. If used, one symbol per cable section between any two equipment terminals shall be used.

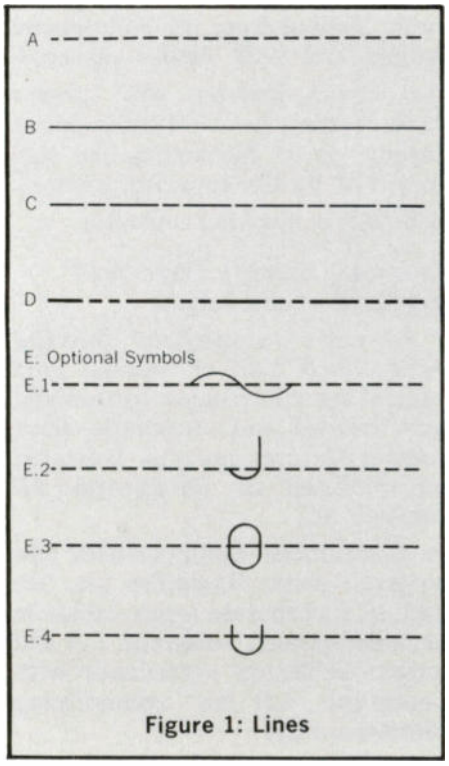


Figure 1: Lines

E.2 Cable jacket, for solid shield cables only.

E.3 Symbol for cable installed in conduit.

E.4 Symbol for buried cable.

In-line Equipment

2.1 To conform to American Standards Association Standard

"Y32.2-1962" paragraph *2.1* "Graphic Symbols for Electric and Electronic Diagrams" the triangle symbol shall be used as the basic symbol for amplifiers. The area within the triangle remains free of standard symbols to permit insertion of manufacturers' designations which shall be explained in the legend of the drawing.

2.2 The triangle is pointed in the direction of transmission.

2.3 The physical location of the amplifier shall be indicated by the output point of the triangle symbol.

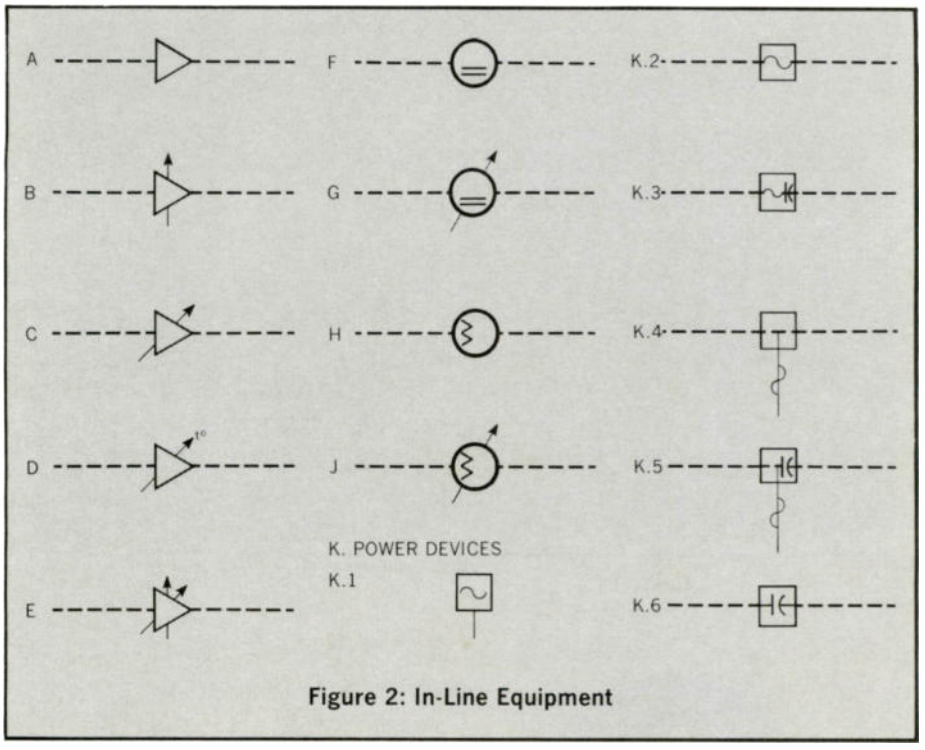


Figure 2: In-Line Equipment

2.4 Power supplies and power inserters shall be represented by symbols having a square outline.

2.5 Passive equipment shall be represented by symbols having a circular outline.

A. Amplifier having a gain and slope characteristic which is either fixed or manually variable. Note: This and the following examples of paragraph *2* incorporate cables according to *1.A* connected to the equipment.

B. An arrow placed across the triangle in a direction perpendicular to that of the line signifies an automatic control by a single parameter which primarily affects the gain of the amplifier.

C. An arrow placed across the triangle at 45° to the direction of the line signifies an automatic control which affects the slope of the amplifier, with or without an accompanying change of its gain. If not otherwise indicated (see *2.5D*) the controlling parameter is assumed to be the level of one or more carriers on the system.

D. A letter "t" with a degree sign (t°) placed at the apex of an arrow indicates that the ambient temperature is the control parameter.

E. The two symbols of B and C when used on the same amplifier symbol indicate a two parameter automatic control of gain and slope.

F. Equalizer, fixed. The value or type designation of the device may be indicated within the circle.

G. Equalizer, variable. The value or type designation of the device may be indicated within the circle.

H. Attenuator, fixed. The value or type designation of the device may be indicated within the circle.

J. Attenuator, variable. The value or type designation of the device may be indicated within the circle.

K. Power Devices

K.1 Off-cable power supply, with cable leading to power inserter.

K.2 In-cable power supply, both cables powered.

K.3 In-cable power supply, power blocked to the side indicated by the capacitor symbol.

K.4 Power inserter, with power cable leading from off-cable power supply and both cables powered.

K.5 Power inserter with power cable leading from off-cable power supply, power blocked to the side indicated by the capacitor symbol.

K.6 Power blocking capacitor.

Equipment Having a Single Input and Multiple Equal Outputs

3.1 Only amplifiers having either fixed gain or manual gain control are shown below. Automatic gain control and automatic slope control features may be indicated as outlined in paragraph *2B* through *2E*.

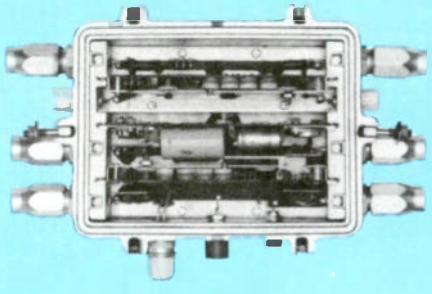
A. Distribution amplifier with two outputs. Note: Examples 3A, 3B, and 3C incorporate input cables in accordance with paragraph *1.A* and output cables in accordance with paragraph *1.B* for exemplifying purposes only.

B. Distribution amplifier with three outputs. Equipment incorporating odd numbered splitters are known to have one output terminal delivering a higher output level than the remainder of the output terminals. The terminal with the highest output level shall be indicated by a dot "•".

C. Distribution amplifier with four outputs.

CASCADE 1968 PRODUCT DIRECTORY

CETA·2/25
CEBA·2/19
CEBA·2/27
CETC·2/25
CETD·2/35



Universal housing and interchangeable plug-in modules function as high-quality Trunk Amplifier, high-gain Bridger Amplifier, low-gain Bridger Amplifier, Trunk Combination amplifier or Terminal Distribution amplifier. Housings accommodate any 5/8-24 connectors with or without seizing of center conductor.

Glass-epoxy circuit boards slip into guide slots in cast aluminum heat sinks. Trunk amplifiers feature Temperature Level Control (TLC) which senses ambient temperature and adjusts gain to compensate for changes in cable attenuation. High-efficiency "switching mode" power supply module extends cable-powering range. Warranted two full years against defects in materials and workmanship.

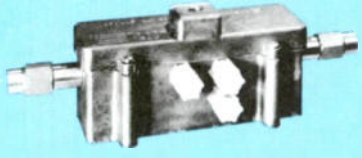
CETA-2/25:

Maximum output:	+50dbmv
Maximum Gain:	28db
Gain Control (Ch. 13)	6db tilt comp.
Tilt Control (Ch. 2)	5db
Input pad	0-3db
Return loss, in/out	18/15db
Noise figure, max.:	10db
Powering	22-32 VAC.
Test points	-20db, ±1db

CELA·2/22

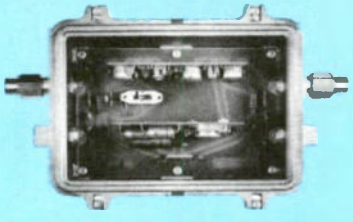
All-new 22db line amplifier, suited to both trunk and feeder application. Features modular construction, full-wave power supply and Cascade Temperature Level Control. Thermistor probe monitors temperature and adjusts amplifier gain to compensate for changes in cable attenuation. Operational gain is 22db (25 max.), and 12-channel output capability is +48dbmv. As a trunk amplifier, suggested operation (Channel 13) is +10dbmv input and +32-dnmv output. In feeder applications, recommended levels are +20 and +40 dbmv.

CELX·1/15



Low-cost line extender features 2-stage circuit and full-wave power supply on glass-epoxy board. 12-channel output capability is +38dbmv, and operational gain is 15db at Ch. 13 (18db max.). Suggested operating levels are +20-dbmv in and +35dbmv out at Ch. 13. External 8db Gain and 5db Tilt controls allow compensation range from 15db of cable to 5db cable and 10db flat loss. Frequency response is ±1db, 50-220 MHz, and maximum noise figure is 12db.

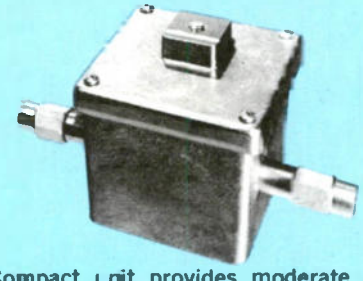
CELE·1/20



Cable-powered line extender in compact cast aluminum housing. Separate RF and power supply modules allow instant replacement. Features high output, low noise figure and wide control ranges. Bandwidth 50-220 MHz, ±.5db. Suggested operating levels are +40-db mv out @ Channel 13.

Maximum output:	+49dbmv
Maximum Gain:	20db
Gain Control (Ch. 13)	8db tilt comp.
Tilt Control (Ch. 2)	3db
Input pad	0-3-6db
Return loss, in/out	17/15db
Noise figure, max.:	14db
Powering @ 22-30 VAC	220-250 ma
Test points	-20db, ±1db

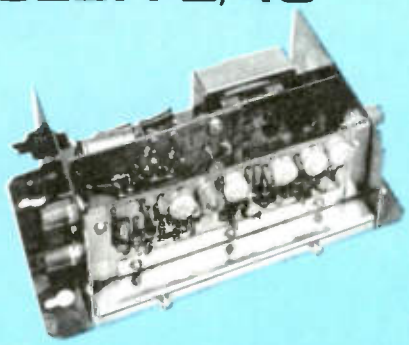
CAT·2/5



Compact unit provides moderate gain (or loss) at feeder tapoff, and supplies amplified signal to four outputs. Gain may be adjusted over a 13db range, from-8 to +5db with respect to input. Maximum input is +20dbmv at 5db gain, and +33dbmv at-8db gain, and through-line insertion loss is less than 1db. Return loss at input, output and taps is 16db. Frequency range is 50-220 MHz, ±.5db, and output capability is +25dbmv.

TEAR OUT

CEDA·2/40



Self-powered four-stage distribution amplifier, equally suited to trunk/feeder application and MATV type distribution within hotel and apartment buildings. Offers 40db gain and +50dbmv output capability. Gain and tilt controls provide compensation for 30db of cable and 10db flat loss to 40db flat loss. Requires only 11.7 watts at 117 VAC. Ideal replacement for older tube-type equipment.

CEDW·2

New wallplate coupler features high isolation and directivity, and accurate impedence match to eliminate ghosts and beats in multiple dwellings. Maximum peak to valley response deviation over 40-250 MHz bandwidth is .50db. Circuitry is on etched glass-epoxy board, mounted on metal outlet cover. Tap values from 8 to 28db (±1db) are available.

Model	Tap Slope (max)	Loss (max)	Return Line	Loss Tap	Directivity (min)
CEDW-2/8	.5db	1db	20	12	14db
CEDW-2/12	.5db	.5db	22	16	18db
CEDW-2/16	.5db	.5db	22	18	18db
CEDW-2/20	1db	.5db	22	18	16db
CEDW-2/24	1db	.5db	22	20	16db
CEDW-2/28	1db	.5db	22	20	16db

CEDT·2

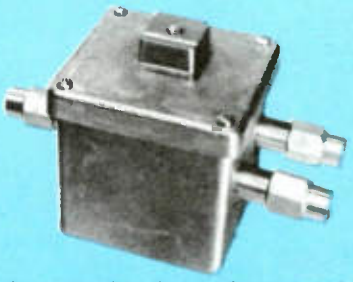
Available in tap values from 12 to 36db, the CEDT provides four output taps with high directivity and isolation. The waterproof housing is of corrosion-resistant aluminum alloy.

Model	Tap value	Insertion Loss (max)	Isolation (min.)	Directivity (min.)
CEDT-1/12	±1db	3db	19db	19db
CEDT-1/16	±1.5db	1.5db	19db	11db
CEDT-1/20	±1.5db	1db	19db	12db
CEDT-1/24	±2db	1db	17db	10db
CEDT-1/28	±2db	1db	16db	8db
CEDT-1/32	±1.5db	.5db	22db	5db
CEDT-1/36	±1.5db	.5db	35db	3.5db

CEDC·1

For insertion in trunk and feeder lines where an unequal split is needed, two models, CEDC-⅛ and CEDC-1/12 provide tap values of 8 and 12db, ±1db. Through-line insertion loss is 1.5 and 1db, respectively. Input, output and tap return loss is 20db over the 5-240 MHz bandwidth, and tap-to-tap isolation is a minimum of 18db. Circuit board may be positioned to use any of the three connectors as input, the other two becoming output and tap connections.

CELS·1

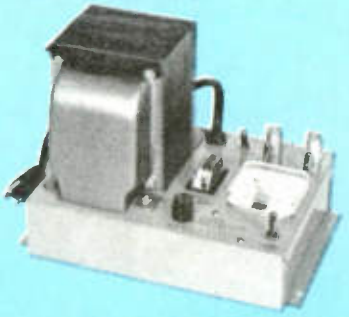


CELS is a passive line splitter, providing equal output to two trunk or feeder lines. Unique construction allows circuit board to be positioned to use any of the three connectors as input, and other two as outputs. Input and output return loss is 18db over 5-240 MHz range, and tap-to-tap isolation is 18db. Splitter loss is 3db at Ch. 2, and 3.5db at Ch. 13.

CESP·1

Convenient splice box to connect cable ends and provide separate AC and RF test points.
AC test point is marked in red as a reminder that FSM is not to be connected. RF test point is -30db, ±1db. Return loss is maintained at 25db, and insertion loss is .25db. Optionally, insertion loss may be reduced to .1db by removing RF test point components.

CEPS·3



This is a heavy-duty 30-volt AC power supply which provides surge and overload protection for itself and for the system which it powers. A fuse, self-resetting thermal breaker, neon transient suppressor and self-healing Thyrite lightning suppressor afford protection to both primary and secondary circuit. Output current is read on the built-in ammeter. Primary circuit includes RF filtering and double-pole switch. 5- and 10-amp models are offered, and may be had complete with either of the following housings.

CEPH·1

Weatherproof power supply housing of welded sheet aluminum. Supplied complete with externally-operated primary switch/circuit breaker, internal duplex receptacle and crossarm mounting bracket. 14½ x 13¼ x 11¼ ins. 11 lbs.

CEPH·2

Weatherproof power supply housing of cast aluminum alloy for pole, cross-arm or underground installation. Clam-shell design and silicon rubber sealing gasket provide complete sealing and radiation protection. Includes primary switch/breaker and AC convenience outlet. 12 x 12 x 7¾ inches. 17.5 lbs.

all specifications subject to change without notice.

CASCADE

CASCADE ELECTRONICS LTD. PORT MOODY, B.C.

D. Passive splitter with two outputs. Note (1) *2.5* and *3.2* apply. (2) Cables in accordance with paragraph *1.A* for exemplifying purposes only.

E. Passive splitter with three outputs. Note: (1) *2.5* and *3.2* apply. (2) Cables in accordance with paragraph *1.B* for exemplifying purposes only.

F. Passive splitter with four outputs. Note: (1) *2.5* and *3.2* apply. (2) Cables in accordance with paragraph *1.B* for exemplifying purposes only.

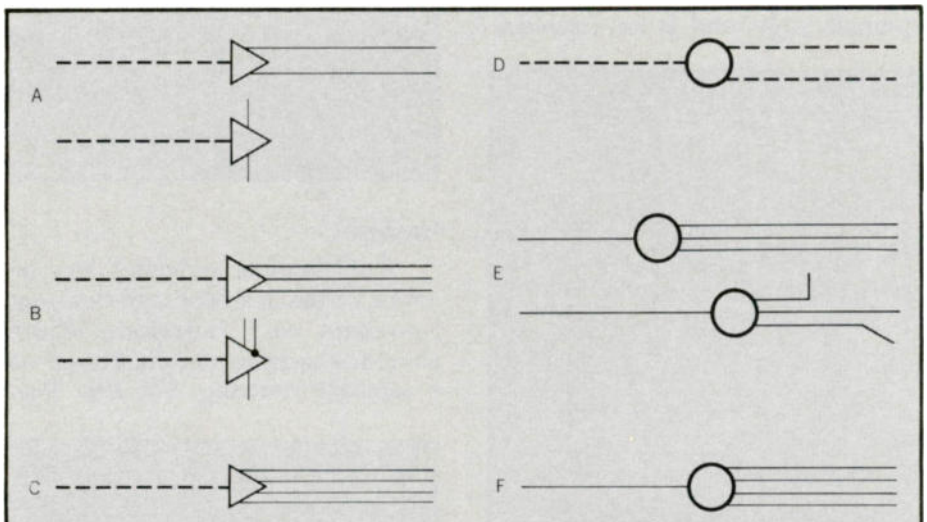


Figure 3: Equipment Having a Single Input and Multiple Equal Outputs

3.2 No output line shall emerge from the circular symbol spaced closer than 90° from the input line. In connection with circular symbols only all output lines shall be drawn parallel to the input line. If change of line direction is desired, refer to the second example shown under *3.E.*

Equipment Having a Single Input and Multiple Unequal Outputs

4.1 The physical location of the following devices shall be indicated by the output terminal of the through line.

A. Amplifier having one passive through line section from which the signal is tapped off, fed through an amplifier and made available at 1, 2, 3, or 4 output terminals. Paragraph *3.2* applies. This amplifier is commonly known as a "Bridging Amplifier" or an "Intermediate Bridge."

B. Amplifier having one amplified through-line section, the output of which is made available at an output terminal and a part of the signal is tapped off from the output terminal, fed through an amplifier and made available at 1, 2, 3, or 4 output terminals. This ampli-

fier is commonly known as "Trunk Bridger Combination." Symbols for control functions as listed under *2.B* — E may be added. If the legibility of the drawing suffers from adding control symbols, drafting practices as described in paragraph *0.5.6* shall be used.

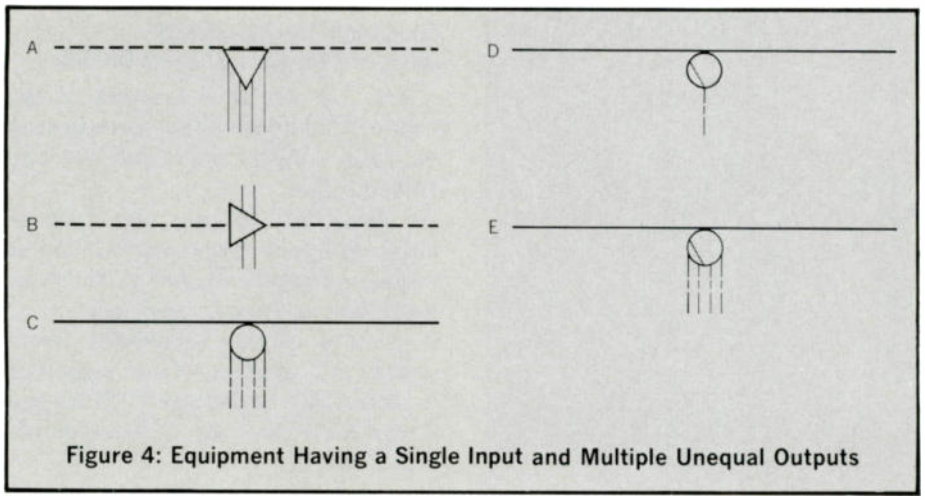


Figure 4: Equipment Having a Single Input and Multiple Unequal Outputs

C. Line tap having one passive throughline section and 1 to 4 tapped outputs. Example shows four outputs.

D. Directional tap, single (see note under *4.E.*)

E. Directional tap, multiple. Note: In a directional coupler, the line drawn at 45° to the throughline is symbolic only, and is not intended as a continuation of any of the tap outlines.

Terminators

5.1 Reference paragraph *82.6* of American Standard Y32.2-1962.

A. Terminating resistor.

B. Terminating resistor with power blocking capacitor.

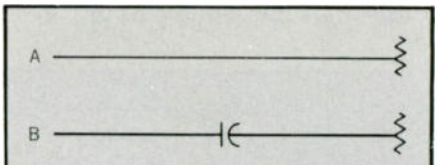


Figure 5: Terminators

Head-end

A. This symbol indicates the location of the head-end and does not represent any functions which should be graphically illustrated on a separate drawing. The line shall leave the head-end symbol at that triangle point which indicates the physical location of the head-end. TVC

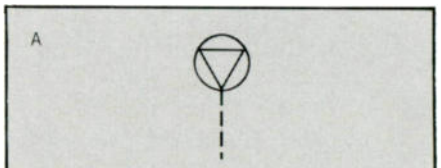


Figure 6: Head-End

ALPHAMATIC NEWS
gives CATV "news power"

...at home, at work, on the go, wherever people are within reach or range of the television screen, Alphamatic News reaches their special interests—through CATV. Alphamatic News is the unique news-carrying system designed especially for CATV origination.

It brings subscribers an additional value—instantaneous, 24-hour news. You can originate every important announcement of news as it's happening—around the world or around the corner. United Press International news flashes as they come off the wire. New York and American Stock Exchange quotations on a fifteen-minute delayed basis. Your own locally originated messages—all are available to you for your subscribers.

And, as additional selling strength, Alphamatic News keyboard input gives you the potential of paid sponsorship—local advertising with no additional costs to you.

Put this uniquely flexible CATV selling tool, the "news power" of a custom Alphamatic News System, to work for you. Write for details and a complete Alphamatic News selling kit that helps you sell more CATV subscribers.

ALPHAMATIC NEWS LOOKS LIKE THIS ON CATV SUBSCRIBERS' SCREENS –BRINGING NEWS AS IT HAPPENS FROM UPI TO THE NEW YORK STOCK EXCHANGE TO YOUR OWN LOCALLY ORIGINATED MESSAGES.

NYSE–PRICES DELAYED FIFTEEN MINUTES

T	ZE	CBS	N	RCA	PEP
523	3,554	527	2,1122	60	382

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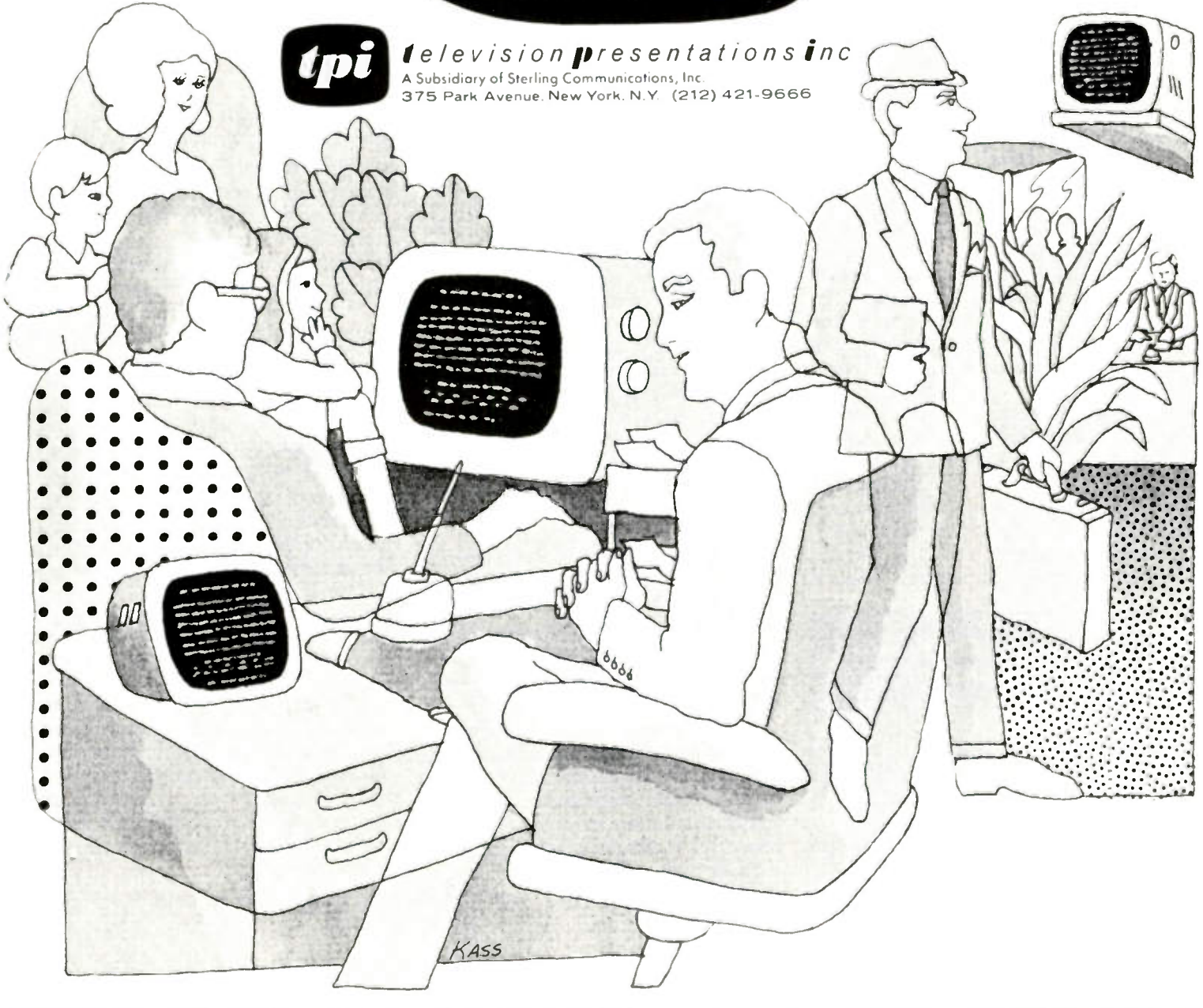


The Arithmetic of In-the-Home Converters

Substantial controversy has developed over the best means of expanding cable distribution beyond the standard twelve VHF channels, even as the first more-than-twelve channel systems are becoming operational. Here is the approach of one manufacturer to "polychannel" CATV.

By Philip D. Hamlin
The Hamlin Corporation

As we all know, the 54 to 88 and 174 to 216 MHz bands were chosen in deference to the second harmonics of TV stations. The highest low band cannot double into the lowest TV channel. This leaves only the evil of local oscillator radiation in TV sets.

The twelve channels thus carved out of the spectrum probably appeared ample at the time. For contemporary CATV, they are simply inadequate and need to be doubled or squared.

Remote control convertors can do this. New tuners, built into new receivers, will also solve the problem and continue to give the viewer exercise in changing channels.

Present convertors offer from 12 to 32 channels and have almost unlimited expansion capability. They operate by heterodyning the incoming frequencies to a single VHF channel position on the consumer's receiver.

Although increasing channel capability is an important feature, the elimination of "direct pickup" is even more important. Direct pickup is evidenced by a leading "echo" or "ghost" caused by the 980 foot-per-microsecond air speed of a powerful direct signal entering the set and competing with the 660 foot-per-microsecond cable speed of the CATV Signal. The extremely powerful air signal received in Manhattan, Seattle, and other metropolitan areas with the TV stations centered within them can frequently reach or exceed 40 to 50 dB directly across the twin lead connecting the back of the set terminals to the tuner. In such cases, even wiring coax directly to the tuner will not eliminate the pickup, although it does buy lifetime maintenance responsibility for the customer's set which "never had any trouble until *you* took the back off and soldered that *thing* in there."

Figure 1. MCC-71 Hamlin Converter (as manufactured for TelePrompter) sits astride Hamlin MCC-81, dramatizing size difference between designs.

The only solution to "direct pickup" is conversion. This can be done at the head-end, or at the set.

At the head-end, if one has air signals of 4,5,7,9,11 and 13, he can convert them to offset carriers such as 4-3,5-6, 7-8,9-10,11-12 and 13-2.

The greatest disadvantage is the channel limitation. Six channels become the maximum limit of the system, and sophisticated metropolitan customers will not buy six CATV channels when up to 10 are available off the air.

Remote control convertors become the only answer. Relieving the head-end of conversion responsibility, they convert the on-channel distribution to a single unused channel position for the area.

The Arithmetic Involved In Convertors

Television sets in North America use 41.25, 42.17 and 45.75 for sound, color, and video IF carriers. This dictates tuners with oscillators above the incoming signal. Air signals are transmitted with the video signals below color and sound. In the case of Channel 2, video is 55.25 and sound is 59.75. To convert this to the proper IF, the oscillator must therefore be 101 MHz. The heterodyned difference frequency between 101 MHz and 55.75 therefore becomes 45.75 and the heterodyned difference frequency between 101 MHz and 59.75 becomes 41.25, placing sound below video after conversion to IF.

The input relationship demanded by the TV set dictates one of the parameters involved in convertors and renders them more difficult to produce "beat free." If the set would only accept the air signals inverted, one oscillator operating above the TV air signal could easily convert it with a single heterodyne. The necessity for maintaining the picture below sound at the set's input makes double conversion mandatory.

The first convertors were built in

1954 and operated on the Channel Commander principle. Signals were received with a conventional tuner, heterodyned to IF, then heterodyned back to the desired output channel. Although inverted when at IF, they were restored to pix below sound when converted back up.

The basic principle of the CC design is the use of a TV tuner to convert to IF, then conversion back to the desired VHF channel for delivery to the set. In the Hamlin MCC-81, which is also based upon the Channel Commander, the arithmetic looks like that shown in the Table I for a 24 channel convertor, video carriers only.

It is apparent from a glance at this table that this CC type convertor has real "beat" problems and that extreme care must be taken to shield tuner from IF and "up" convertor. In spite of precautions, some of the first oscillator will leak into the IF strip, be present at the second oscillator, and appear in the outputs as the sum and difference. Since the "sums" all fall above the band of interest, only the differences are shown.

On the low band, the difference frequencies fall directly into midband, and cause real concern. Looking at a Channel 2 input, for example, we have present in the output 205.25, 209.75 (sound not shown), 101.00, and 257, plus all of the sum and difference frequencies produced in the first and second conversions, including the IF.

The rather strong and hard to suppress difference frequency of 156 will beat with 205.25 to produce 49.25 which can beat with 45.75 to produce 3.5 and get the 3.58 color burst into real trouble, if not carefully suppressed at the convertor's output. As you look further there appear infinite combinations to cause trouble. As we progress into the mid-band and finally, the super-high band, the problem gets worse before it gets better.

Is there a better approach? Earlier we discussed conversion of the channels at the head-end and its limitations regarding the number of possible channels. We then progressed to the double superheterodyne, Channel Commander type convertor, which makes a TV set a triple superheterodyne. There is a third possibility: using conversion at the head-end as well as in a remote control, multichannel convertor.

Suppose we accept the octave concept of 20 carriers, from 120 to 240 MHz. Normally these would have video carriers at 121.25 and sound at 125.75, with each successive channel jumping six MHz.

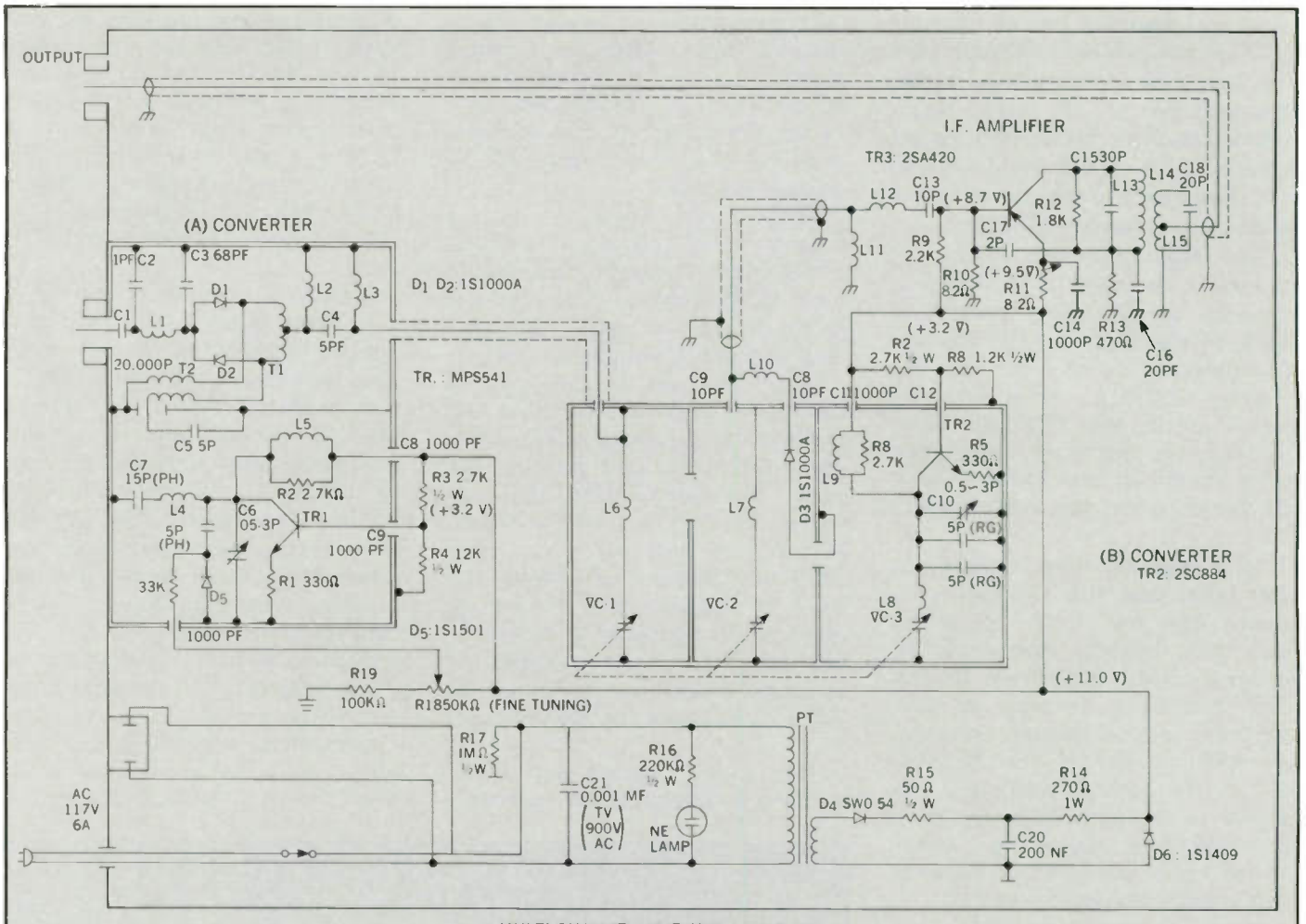
Since the off the air carriers have to be converted to these mid and super high band positions, why not invert them and put the pix *above* the sound? Now the convertor can become a *single* superheterodyne and have but one oscillator, placed high above the band of interest and eliminating much of the spurious. A convertor for such an inverted series of channels would be as shown in Table II, if the output were Channel 12.

This highly logical and likely solution awaits only the ingenuity of a head-end design that will convert current Channel Commander IF's to the inverted 20 channels, preferably, although a completely new system may be required. A CCV type convertor, as can readily be seen, would require oscillators underneath the IF frequencies, to lift them up to the 120 to 240 MHz band.

Finally, let us look at an entirely different approach, using the double superheterodyne approach, but going from VHF to a UHF/IF, then back to VHF. The Hamlin MCC-71 circuit diagram appears in Figure 2, with the block diagram in Figure 3. Channel changing is by "click stops" that put the three gang UHF tuning condensor within the "target range" and fine tuning is accomplished with a varicap across the "up" or "A" convertor. Many combinations of this arrangement are possible. Some of those now in use have a Channel 6 output with a 560 MHz "A" convertor and Channel 6 output. In cities having a local Channel 6, 5

Channel #2		Channel #5		Channel #8		Channel #11	
In	55.25	In	77.25	In	181.25	In	199.25
Osc	101.00	Osc	123.00	Osc	227.00	Osc	245.00
IF	45.75	IF	45.75	IF	45.75	IF	45.75
Osc	257.00	Osc	257.00	Osc	257.00	Osc	257.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	156.00	Diff	134.00	Diff	30.00	Diff	12.00
Channel #3		Channel #6		Channel #9		Channel #12	
In	61.25	In	83.25	In	187.25	In	205.25
Osc	107.00	Osc	129.00	Osc	233.00	Osc	251.00
IF	45.75	IF	45.75	IF	45.75	IF	45.75
Osc	257.00	Osc	257.00	Osc	257.00	Osc	251.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	150.00	Diff	128.00	Diff	24.00	Diff	6.00
Channel #4		Channel #7		Channel #10		Channel #13	
In	67.25	In	175.25	In	193.25	In	211.25
Osc	113.00	Osc	221.00	Osc	239.00	Osc	257.00
IF	45.75	IF	45.75	IF	45.75	IF	45.75
Osc	257.00	Osc	257.00	Osc	257.00	Osc	257.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	144.00	Diff	36.00	Diff	18.00	Diff	(we hope) 0.00
MID BAND CHANNELS							
Channel A		Channel D		Channel G		Channel J	
In	109.25	In	127.25	In	145.25	In	163.25
Osc	155.00	Osc	173.00	Osc	191.00	Osc	209.00
IF	45.75	IF	45.75	IF	45.75	IF	45.75
Osc	257.00	Osc	257.00	Osc	257.00	Osc	257.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	102.00	Diff	84.00	Diff	66.00	Diff	48.00
Channel B		Channel E		Channel H		Channel K	
In	115.25	In	133.25	In	151.25	In	169.25
Osc	161.00	Osc	179.00	Osc	197.00	Osc	215.00
IF	45.75	IF	45.75	IF	45.75	IF	45.75
Osc	257.00	Osc	257.00	Osc	257.00	Osc	257.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	96.00	Diff	78.00	Diff	60.00	Diff	42.00
Channel C		Channel F		Channel I		Channel L	
In	121.25	In	139.25	In	157.25	In	217.25
Osc	167.00	Osc	185.00	Osc	203.00	Osc	221.00
IF	45.75	IF	45.75	IF	45.75	IF	45.75
Osc	257.00	Osc	257.00	Osc	257.00	Osc	257.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	90.00	Diff	72.00	Diff	54.00	Diff	36.00

Table I



MULTI-CHANNEL, VHF/UHF/VHF, CATV
CONVERTER WITH VARICAP FINE TUNING

Figure 2: MCC-71-6 Circuit Diagram

is used for the output. Arithmetically, Channel 12, with the same 560 MHz "A" convertor would appear better, but the noise figure suffers due to the set tuner. Efforts are now being made to transistorize the VC-1/VC/2 cavities with an RF stage and a mixer with gain. These would eliminate the IF strip and hit the set hard enough at Channel 12 to overcome the noise figure problem.

The convertor as produced has a noise figure of 17 average, which is unfortunately high for CATV purposes. The active stages in the UHF section may well improve this by 5 dB, since the second conversion is adding nearly a third of the total.

Table III shows the arithmetic for inputs, IF's, outputs, and oscillators, and differences for both Channels 6 and Channel 12 outputs.

=1 In	125.75	=6 In	155.75	=11 In	185.75	=16 In	215.75
Osc	331.00	Osc	361.00	Osc	391.00	Osc	421.00
Out	205.25	Dif Out	205.25	Dif Out	205.25	Dif Out	205.25
Diff	205.25						
=2 In	131.75	=7 In	161.75	=12 In	191.75	=17 In	221.75
Osc	337.00	Osc	367.00	Osc	397.00	Osc	427.00
Out	205.25	Dif Out	205.25	Dif Out	205.25	Dif Out	205.25
Diff	205.25						
=3 In	137.75	=8 In	167.75	=13 In	197.75	=18 In	227.75
Osc	343.00	Osc	373.00	Osc	403.00	Osc	433.00
Dif Out	205.25	Dif Out	205.25	Dif Out	205.25	Dif Out	205.25
=4 In	143.75	=9 In	173.75	=14 In	203.75	=19 In	233.75
Osc	349.00	Osc	379.00	Osc	409.00	Osc	439.00
Dif Out	205.25	Dif Out	205.25	Dif Out	205.25	Dif Out	205.25
=5 In	149.75	=10 In	179.75	=15 In	209.75	=20 In	239.75
Osc	355.00	Osc	385.00	Osc	415.00	Osc	439.00
Dif Out	205.25	Dif Out	205.25	Dif Out	205.25	Dif Out	205.25

Table II (picture frequencies only are used)

Disadvantages of the Hamlin MCC-71 Convertor

(1) Poor noise figure. This necessitates delivery of +6 dB at the set transformer for a TASO "excellent" picture. Systems laid out for a "0 dB target" frequently realize considerably less with aging. Use of this convertor on systems delivering relatively snow free pictures at -8 to 0 dB is therefore not recommended, since noise degradation is inevitable. Newer systems, particularly in "direct pickup" problem areas, are generally laid out "hot" with not less than 30 dB available at the ends of

feeder lines. With these systems, maintenance of levels to the convertor input of +6 to +15 is no problem and noise contribution is undetectable.

(2) "A" oscillator leakage into line. Tests with two MCC-71's connected via short jumpers to a standard splitter, with 25 or more dB isolation at *VHF* between legs reveals that varying the fine tuning of one 560 MHz "A" oscillator with the varicap will produce a beat in the TV picture of the set connected to its mate. Fortunately, this leakage, which averages 300 microvolts in current models, "washes out" when the RG59 drop line is 50 feet or more from each convertor to the common splitter. For lesser lengths, it can be a problem. Correction of this defect is contemplated by placing the low pass, input filter in a separate section. Coupling between this filter, the mixer, and the high pass output results from placing them in the same chamber.

(3) "B" oscillator leakage back to the "A" mixer. Please note frequencies for the Channel 6 MCC-71. The "Diff" beats vary from -28 through 0 to +152 MHz. (Minus is used to show the difference decreases to 0 then rises to 152.) Actual measurement of these frequencies with a Jerrold 727 FSM shows their level to vary from 0 to -5.5 in a typical convertor. Serial #1010 measurements results are shown below in Table IV.

Amazingly, this beat produced by the down convertor oscillator marriage to the up convertor oscillator in the mixer does not seem. to interfere with the convertor in which it originates, except when the input frequency is approximately one channel below Channel 7. With an input of 169.25, the A and B oscillators produce an 86 MHz beat which then passes back through the convertor, is amplified thru the IF strip, and blanks out the TV set through sheer signal strength.

Undoubtedly, leakage of these spurious frequencies through the 1401 type apartment house couplers would produce serious consequences in neighbors' sets. With CATV type directional couplers, plus drop line losses, it has not been a problem. Elimination of this "feedback" is planned in future models by using active stages in the "down" convertor and by better isolation. Using Channel 12 as the output places the "B" oscillator far enough from the "A" to eliminate it almost entirely, and both methods may be employed.

(4) Sensitivity to widely varying signal levels. Systems in which signals vary 8 dB or more within high band or low band will cause severe beats. Since this is poor system design, the newer systems are less prone to this problem.

CHANNEL NUMBER SIX																					
In	55.25	In	77.25	In	115.25	In	133.25	In	151.25	In	169.25	In	187.25	In	205.25	In	223.25
Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00
IF	615.25	IF	637.25	IF	675.25	IF	693.25	IF	711.25	IF	729.25	IF	747.25	IF	765.25	IF	783.25
Osc	532.00	Osc	554.00	Osc	592.00	Osc	610.00	Osc	628.00	Osc	646.00	Osc	664.00	Osc	682.00	Osc	700.00
Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25
Diff	28.00	Diff	6.00	Diff	32.00	Diff	50.00	Diff	68.00	Diff	86.00	Diff	104.00	Diff	122.00	Diff	140.00
In	61.25	In	83.25	In	121.25	In	139.25	In	157.25	In	175.25	In	193.25	In	211.25	In	229.25
Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00
IF	621.25	IF	643.25	IF	681.25	IF	699.25	IF	717.25	IF	735.25	IF	753.25	IF	771.25	IF	789.25
Osc	538.00	Osc	560.00	Osc	598.00	Osc	616.00	Osc	634.00	Osc	652.00	Osc	670.00	Osc	688.00	Osc	706.00
Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25
Diff	22.00	Diff	0.00	Diff	38.00	Diff	56.00	Diff	74.00	Diff	92.00	Diff	110.00	Diff	128.00	Diff	146.00
In	67.25	In	109.25	In	127.25	In	145.25	In	163.25	In	181.25	In	199.25	In	217.25	In	235.25
Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00
IF	627.25	IF	669.25	IF	687.25	IF	705.25	IF	723.25	IF	741.25	IF	759.25	IF	777.25	IF	795.25
Osc	544.00	Osc	586.00	Osc	604.00	Osc	622.00	Osc	640.00	Osc	658.00	Osc	676.00	Osc	694.00	Osc	712.00
Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25	Out	83.25
Diff	16.00	Diff	26.00	Diff	44.00	Diff	62.00	Diff	80.00	Diff	98.00	Diff	116.00	Diff	134.00	Diff	152.00
CHANNEL NUMBER TWELVE																					
In	55.25	In	77.25	In	115.25	In	133.25	In	151.25	In	169.25	In	187.25	In	205.25	In	223.25
Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00
IF	615.25	IF	637.25	IF	675.25	IF	693.25	IF	711.25	IF	729.25	IF	747.25	IF	765.25	IF	783.25
Osc	410.00	Osc	432.00	Osc	470.00	Osc	488.00	Osc	506.00	Osc	524.00	Osc	542.00	Osc	560.00	Osc	578.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	150.00	Diff	128.00	Diff	102.00	Diff	72.00	Diff	54.00	Diff	36.00	Diff	18.00	Diff	0.00	Diff	18.00
In	61.25	In	83.25	In	121.25	In	139.25	In	157.25	In	175.25	In	193.25	In	211.25	In	229.25
Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00
IF	621.25	IF	643.25	IF	681.25	IF	699.25	IF	717.25	IF	735.25	IF	753.25	IF	771.25	IF	789.25
Osc	416.00	Osc	438.00	Osc	476.00	Osc	494.00	Osc	512.00	Osc	530.00	Osc	548.00	Osc	566.00	Osc	584.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	144.00	Diff	122.00	Diff	84.00	Diff	66.00	Diff	48.00	Diff	30.00	Diff	12.00	Diff	6.00	Diff	24.00
In	67.25	In	109.25	In	127.25	In	145.25	In	163.25	In	181.25	In	199.25	In	217.25	In	235.25
Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00	Osc	560.00
IF	627.25	IF	669.25	IF	687.25	IF	705.25	IF	723.25	IF	741.25	IF	759.25	IF	777.25	IF	795.25
Osc	422.00	Osc	464.00	Osc	482.00	Osc	500.00	Osc	518.00	Osc	536.00	Osc	554.00	Osc	572.00	Osc	590.00
Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25	Out	205.25
Diff	128.00	Diff	96.00	Diff	78.00	Diff	60.00	Diff	42.00	Diff	24.00	Diff	6.00	Diff	12.00	Diff	30.00

Table III

Advantages of The Hamlin MCC-71

(1) Excellent shielding from "direct pickup" fields. Use of cavities for "A" oscillator, mixer, and "B" down convertor, with coaxial input and output, entirely eliminates contamination.

(2) Compression of octaves. This convertor will successfully convert sub, low band, mid band, and super high band channels with equal ease. In effect, by moving the 5-1/4 octaves up to UHF, they are compressed and occupy less than 2/5ths of an octave. Tuning and tracking over such a narrow range becomes greatly simplified. as does design of the VC1/VC2/VC3 ganged condensor.

Placing a varicap across the tuned line of the "A" oscillator

makes smooth, vernier fine tuning control. Notching the channel selector permits + or - 100 KC resettability and even the "little old ladies" see the picture instantly when switching from channel to channel. The varicap then permits exact tuning for color and when cameras are switched or color saturation changes for station reasons, minor corrections are effortless. Using the unit remotely enhances these features.

(3) Exceptional stability. Although both oscillators drift, each shares a common environment and temperature changes, voltage changes, and other factors affecting short term drift move each in the same direction. The net result is drift of less than 200 KHz in 24 hours and even color pictures show no noticeable change over a period of several hours.

Comparison of UHF/VHF/ UHF to VHF & IF/VHF (CC) Convertors

(1) *Weight, size, and aesthetics.* The smaller and lighter UHF wins hands down.

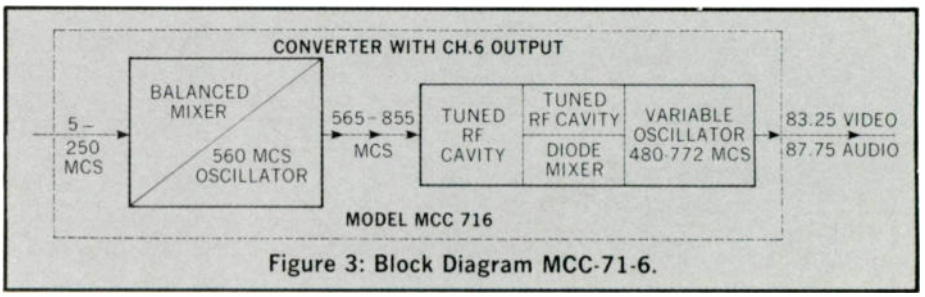


Figure 3: Block Diagram MCC-71-6.

(2) Consumer acceptability as a "top of the set convertor." The VHF type wins this one. Using a standard TV Tuner, it tunes exactly like the TV set and there is nothing for the consumer to learn.

(3) *Acceptability as a remote control.* Back to the UHF. Fitting easily on a table and requiring minimum torque to switch, consumers like it after learning how to find and tune channels.

(4) *Fine Tuning.* Most VHF's are made without fine tuning, on the theory they won't drift. Unfortunately, they do, so the consumer goes to the set and tunes the input channel. This completely upsets the bandpass of the set and brings a CATV technician to reset the whole thing. Some VHF users are putting on the fine tuning rings to correct this.

MHz			
5	0 dB	70	−4.75 dB
10	−3 dB	80	−4 dB
15	−2.5 dB	90	−5.5 dB
20	−2 dB	100	−3 dB
30	−2 dB	110	−4 dB
40	−2.5 dB	120	−3 dB
50	−7 dB	130	−2 dB
60	−5 dB		

Table IV

(5) *Noise Figure.* The VHF's, having six MHz bandwidth in any input position, have considerably lower noise and/or better noise figure. This permits use on systems delivering from 0 to -10 dB. The VHF's win this one beyond question.

(6) *Adjacent channel trapping.* Both have trapping but the lower IF of the VHF unit versus the UHF (45.75 versus 83.25 or 205.25) permits high Q trapping and limits the UHF unit to about 6 dB, while the VHF's can offer as much as 18 dB. In this area, it must be remembered that the CATV headend has provided 50 dB trapping in "processing" the signal, that the adjacent channel levels are presumably within a dB of each other, and that the TV set has some "built in" trapping, the amount varying with its cost and make. Even 6dB will eliminate marginal adjacent channel interference resulting from a poor TV set.

Conclusion

Convertors are a positive asset and should be sold positively, as a remote control, channel expander, direct pickup "killer"!

The arithmetic of "beats" is a genuine problem and has not been solved either internally or externally in any existing convertors. All VHF convertors interfere with each other as much or more than TV sets coupled to the same system, due to the cascading of heterodyning by adding two conversions in front of the set. This must be eliminated.

The best system is obviously the single superheterodyne at the convertor, with carriers turned upside down at the head-end. It is predicted this will come very shortly.

Of the two methods currently employed, each has its weakness. The author manufactures both types, but prefers the UHF/VHF UHF. TVC

Down to earth ideas dept.

Underground Antenna Arrays for CATV

By Albert W. Carey, Sr.

With all the fuss and furor, claims and counter claims by various antenna manufacturers, I decided to attempt construction of *the* ultimate antenna for CATV applications. I must allow history to record my success.

After careful consideration of all factors involved, quite a bit of midnight oil, reams of paper, innumerable pencils and a worn out slide rule, I arrived at what I believe to be *the* best receiving antenna ever devised for any service.

Starting with the familiar formula:

$$\text{Length (feet)} = \frac{492}{\text{Freq (MC)}},$$

I found this much too broad to fit at TV frequencies. After much time and effort I finally used the formula:

$$\text{Length (inches)} = \frac{5905 \times K}{\text{Freq (MC)}}.$$

K is the effect of antenna diameter length for half-wave resonance, shown as a multiplying factor, determined by resistance at resonance, and ratio of half wavelength to conductor diameter. K is conductor diameter.

I also came up with some interesting formulae for determining the depth at which an array should be buried, for maximum efficiency, signal to noise, co-channel rejection, etc. These formulae must be adhered to, since an antenna, once buried, tends to be stationary. There is no raising or lowering it or "swinging" it, as would be the term if it were mounted on a tower.

Naturally the type of soil the array is being buried in enters the picture and I have worked this out also. Sand (dry) has a resistance of approximately 7 ohms (give or take a few ohms, depending on the geographical location). Loam has a resistance (again give or take) of 14 ohms, while sandy loam or blackland gumbo will vary greatly depending upon the distance from the nearest body of water. Therefore, to find the depth a quad for Channel 5 should be burried in loam, use the formula:

$$\text{Depth (feet)} = \frac{72.88 \times L}{\text{Freq (mc)}}$$

L is resistance for loam.

It would seem that a Channel 2 array would have to be buried deepest just as a Channel 2 antenna is the largest of all TV antennas, but quite the reverse is true. Channel 6 in most types of soil is buried deeper, usually about 14 feet, while Channel 2 only requires about 2½ to 3 feet above it for maximum results. The high band channels vary greatly, however for quad arrays, care should be taken to have exact stacking measurements, just as when mounting on a tower.

It seems the most beneficial effect realized from buried antennas is the periods of the year when signals are weakest, all one needs do to increase signal strength by at least 5 dB(J) is to set out a sprinkler. Naturally with a 20 to 21 channel system, one would need a New Mexico irrigation system to water his antenna farm.

While using a Channel 5 antenna of my own design, buried 14.6 feet in sandy loam, 187 feet from a creek 6 feet deep with approximately 3.9 feet of water, I received KLID-TV from 327 miles with a strength reading of PLUS 16 dB(J) with no fading and very little airplane flutter. A station 28 miles, 180 degrees from KLID-TV could not be seen or measured. This I believe, proves the underground theory.

Breaking the Twelve Channel Barrier

Although there is still more discussion than construction, the move beyond twelve channels is very much with us. There remains, however, much controversy about the best approach to more-than-twelve channel construction, and the following represents one school of thought.

By Abe Reiter

The continuing trend toward increasing the number of channels carried in CATV systems has now reached the point where the magic number 12 can no longer be considered as adequate. However, many cable system operators are frightened when they face the prospect of going beyond what they feel is an inpenetrable barrier — 12 channels.

The purpose of this article is to show that there are no fundamental problems in expanding CATV systems to 20 channels and more. It can be done with equipment that is available today, provided that the system engineering is properly done.

12 Channel Myth

The CATV industry in the United States, from the very beginning, accepted the idea that television receivers that were developed for broadcasting service should be used in CATV services as well. The reasons were entirely economic and not necessarily in accord with good engineering practice. As a result, the CATV industry found that it was limited to only 12 channels because television receivers could accept only 12 VHF channels, and only VHF channels could be transmitted over the cable.

This course of forced events has led to the "myth" that 12 channel transmission can be accomplished with relative ease, but any attempt to go beyond that range is doomed by fundamental problems. However, in fact, such assumptions are erroneous on both counts.

Admittedly, there are good reasons for reserving transmission to the 12 VHF channels. The frequencies were chosen so that all second order distortion (second harmonics and sums or differences between pairs) falls outside all of the channels. (Still, the set is not free of harmonics distortion; the second harmonic of channel 6 sound is 250 KHz above channel 7 video and channel 6 sound is 250 KHz below channel 6 sound.)

However, notwithstanding the fact that the VHF channel assignments were chosen with great care, it does not follow that cable systems carrying 12 channels or less are therefore inherently free of trouble. To the contrary, there may be serious system problems irrespective of the number of channels carried.

One of the more common problems is direct pick-up by television receivers of broadcast signals that are also carried on the cable. The usual "solution" is to abandon the channel on the cable and convert to another channel at the head-end. This is no solution at all if a 12 channel system is required.

Secondly, as the number of cable channels increases, problems arise in relation to the adjacent channel sufficiency of the subscriber's set. Many television receivers do not perform satisfactorily if adjacent channels are present, and in all cases the fine tuning adjustment becomes very critical. Moreover, the combination of color signals and adjacent channel operation create a difficult operational situation. The usual solution is to reduce the levels of the sound carriers and, when there is spectrum space, offset the channel frequencies.

The point which I am trying to make is that there are difficulties in the transmission of cable signals, irrespective of the number of channels carried. There is no more magic in the number 12 than, say, 20. However, there is one fundamental question that must be answered when considering systems of more than 12 channels — how to communicate with the end device, the television receiver.

The Role of The Converter

One solution to the problem of communicating more VHF channels to the television receiver is to carry nonstandard VHF channels on the cable and install a VHF converter at each receiver location. The output channel of the converter is a standard VHF channel that is entirely acceptable to the television receiver.

The converter can be built to handle all the channels

ABOUT THE AUTHOR

Abe Reiter has been a Senior Staff Engineer for International Telemeter Corporation, a subsidiary of Gulf & Western Industries, Inc., for twelve years. He holds the degrees of B.S.E.E. from Cooper Union, New York, and M.S.E.E. from U.C.L.A. He is a Senior member of the I.E.E.E., and has been in CATV for over ten years.

on the cable or only the non-standard ones. In the latter case, a by-pass switch on the converter connects the receiver directly to the cable to receive the standard channels.

The all-channel converter, however, although slightly more expensive, offers many important advantages:

First, problems caused by direct pick-up of broadcast signals are eliminated because the converter is completely shielded, and the output channel is clear.

Problems caused by inadequate adjacent-channel rejection of many television receivers are minimized because the converter attenuates adjacent channel frequencies.

Thirdly, the converter is, in effect, a remote control unit for channel selection and fine tuning.

Frequency Plans

A number of frequency plans have been proposed to accommodate the non-standard channels. From the standpoint of the converter it doesn't make any difference what the frequency assignments are.

In general the non-standard channels are located in the mid-band (between channels 6 and 7) and above channel 13. Broadly speaking the plans fall into two classes—those that are limited to a single octave and those that exceed an octave. The main advantage of the single octave system is that second order distortion is not a problem. The main disadvantage is that channels 2 through 6 must be abandoned.

A typical single octave plan for 20 channels is from 120 to 240 MHz. This includes 13 non-standard channels and 7 standard. A different plan for 24 channels is the octave from 144 to 288 MHz. This includes 17 non-standard and 7 standard channels.

Regardless of which frequency plan is chosen it is necessary for the amplifiers in the distribution system to handle more channels. What is the effect of adding these channels? In a single octave system only 3rd order distortion (cross-modulation and triple beats) is of importance but in systems that exceed an octave both 2nd and 3rd order distortion are of importance. It is for this reason that some manufacturers favor the single octave system. The choice is not so clear cut. The nature of 3rd order distortion is such that cross modulation on every channel is increased in proportion to the number of channels that are added. In the case of 2nd order distortion each added channel may affect only 1 or 2 of the other channels.

As a result, it is possible that the 3rd order distortion is the real limiting factor. For this reason some manufacturers favor the plan to keep channels 2 through 5 and span more than an octave. This approach is founded upon the argument that if the amplifier has sufficiently low 3rd order distortion it will automatically have sufficiently low 2nd order distortion.

There is every reason to believe that both approaches are valid. The choice in any particular case will depend on such factors as the condition of the existing plant, the number of channels to be added and the importance that is attached to keeping the low VHF channels.

A Potential Problem

When a converter is used for non-standard channels it is necessary to pay attention to local oscillator signals from converters and from television receivers because there are cases where these signals fall within a channel. For example, suppose a system is carrying mid-band channels from 120 MHz to 174 MHz and the 12 standard VHF channels. A receiver that is tuned to channel 6 (local oscillator 129 MHz) would be a potential source of interference with the non-standard channel that extends from 126 to 132 MHz. There are other cases where the oscillator frequency corresponding to a non-standard channel falls within a standard channel. The problem exists even if a single octave system is used.

If an all-channel converter is used at every receiver the problem disappears. For example, the design of the International Telemeter converter is such that the oscillator output level is kept low enough to prevent any interference. The oscillator signal from the television receiver cannot cause any trouble because it is isolated by the converter.

If a television receiver is connected directly to the cable then its oscillator output signal must be considered. Suppose there are 21 channels 9 mid-band from 120 MHz to 174 MHz plus the 12 standard channels. There are just 2 possible sources of interference from television receiver oscillators. When the receiver is tuned to channel 5 or 6 the oscillator frequency falls in one or the other of the 2 lower mid-band channels. If the signal is strong enough a beat could result on those channels as they are received over the converter. In such a situation, where each leg is not terminated in a converter, one of three solutions is possible: isolating the television receiver from the cable by means of a trap, a simple amplifier, or taps with improved isolation.

Conclusion

In conclusion, one basic fact is asserted. Multiple channel transmission is entirely possible with today's technology and equipment, and insoluble technical problems do not suddenly appear with the addition of the 13th channel. What is required, however, is careful equipment analysis, attention to engineering detail, and a professional approach to system design. TVC

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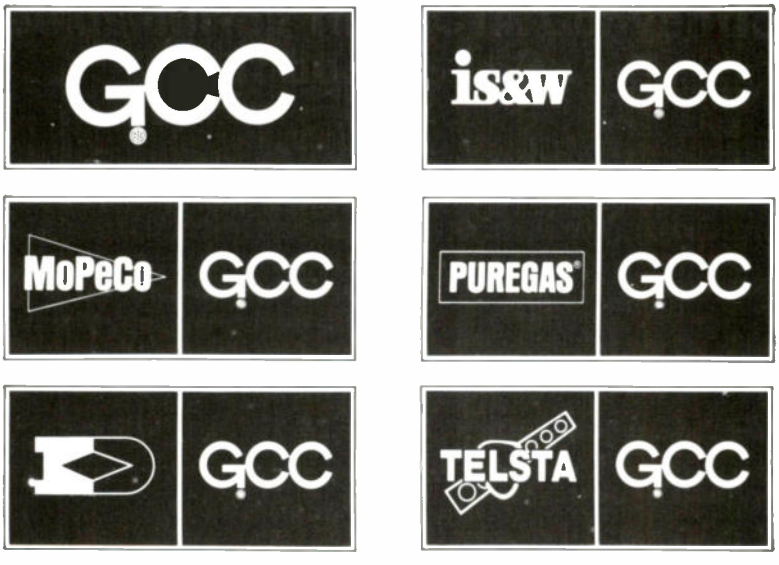

General Cable Corporation Trunk (Foam- or disc-insulated), Distribution and Drop Cables. Aerial, conduit or duct and direct buried constructions. Armored types for submarine installation. **Indiana Steel & Wire Company** Messenger Strand, Guy Wire, Lashing Wire and Terminal Housings for buried CATV plant. **MoPeCo** Portable ventilating and heating equipment for underground work areas, Blowers, Aerial tent heaters, High-level traffic warning lights and signs. **Puregas Equipment Corporation** Refrigeration and heatless air dryers and meter panels. **Diamond Expansion Bolt Company, Inc.** Communications hardware for supporting CATV lines—figure 8- or messenger-supported. **Telsta Corporation** Aerial lifts for overhead cable installation and maintenance. General Cable Corporation, 730 Third Avenue, New York, New York 10017.

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Recognizing Cross Mod Cross-ups in CATV Amplifiers

Considerable difficulty is involved in measuring distortion in CATV equipment, partlcularly in arriving at figures which can be compared to manufacturers' specifications or the test results of other operators. This article points out some of the pitfalls in making such measurements.

By A.W. Bridgett
Manager, Design Engineering
Spencer-Kennedy Labs, Inc.

Author's note: This paper is not intended to cover all the problems involved in measurement of distortion in CATV amplifiers. The subject is too large for a single paper. It is merely intended to point out a few of the more important pitfalls. There are many others. It also makes no attempt to relate these measurements to the quality of the pictures which will be obtained. This is another problem with even more pitfalls.

Anyone who has attempted to measure distortion (cross-modulation or beat levels) on CATV equipment has undoubtedly run into the problem of obtaining results which agree with neither the published specifications nor measurements which have been made by someone else.

If the "blank screen" test is being used, this situation is of course easy to understand and explain. Wide differences occur among observers and among contrast ranges of the TV sets or monitors being used in the test. The thing that tends to bug most people is that, after accumulating a considerable amount of fairly sophisticated test equipment, large differences still occur.

The NCTA Standards Committee's published Standards on Output Capability has helped the situation to some degree, but it is still possible for two people to attempt measurements in accordance with these standards and not agree unless a great deal of care is taken. This is in no way a criticism of the work of the Committee. Their published Standard defines clearly and unambiguously what is to be measured, but for good and obvious reasons does not specify equipment and procedures. If we are to see where the measurement differences can occur and estimate their effects, it will be necessary to take a good look at both the effects of calibration procedures and the definitions in common use. Often a calibration or test procedure implies a different meaning for a measured quantity than is assumed in making the final measurements.

A "modulation index" m can be defined in numerous ways; three of the most common definitions are treated in this article. For each definition modulation can equivalently be expressed as a "percentage" or a "level."

Percent modulation = m × 100

M = modulation level = 20 log m

and m = modulation index (whatever that means)

Now, let us consider 3 common definitions of "modulation index" and see what effects at least two of these definitions can have on cross-modulation measurements.

Figure 1 shows the waveform of a signal which is modulated by a sine wave signal. The conventional definition of modulation index in this case is:

$$m_c = B/A$$

where the subscript c stands for "conventional."

On the right hand side of Figure 1 is shown the standard trapezoid pattern obtained from this signal, when RF envelope is plotted against modulating voltage. Frequently, the modulation index is

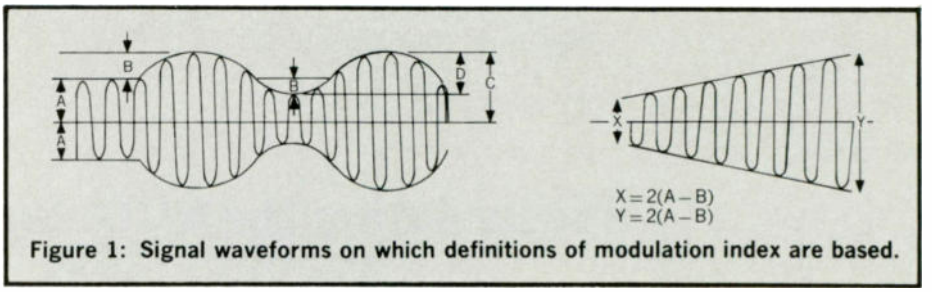

Figure 1: Signal waveforms on which definitions of modulation index are based.

defined from this pattern as $(Y-X)/(Y+X)$ which can be shown in the sine wave case to be equal to B/A or m c. However, if the modulating signal is not symmetrical as would be the case for an "off air" signal, $(Y-X)/(Y+X)$ will not, in general, be equal to m c.

There is still another definition, which is common in the television industry and is used in the new "Standards on Output Capability." This defines a "modulation index" which is quantitatively different from the conventional modulation index:

$$m_t = D/C$$

where the subscript t stands for "television" and D and C are as shown in Figure 1. When the modulation index is defined this way, the modulation is commonly referred to as "downward modulation."

These two definitions represent modulation indices which are equal at zero and 100% modulation but are not equal at any other modulation *level*. (There we go mixing up the terms "modulation index," "percent modulation" and "modulation level" all in one statement which usually should not be done. However, in this case it is safe as long as we stick to our original definitions relating these three quantities.) The important thing here is to note that the relation between m_t and m_c is:

$$m_t = (2m_c)/(1+m_c) \text{ or}$$
$$m_c = (m_t)/(2-m_t)$$

A graph of this relation is shown in Figure 2. Expressed as a modulation level, we obtain from the expression for m_t above:

$$20 \log m_t = 20 \log m_c + 6 - \log (1+m_c) \text{ or } M_t = M_c + K$$

where

$$K = 6 - 20 \log (1+m_c)$$

is a correction factor equal to 0 dB at 100% modulation and practically equal to 6 dB at low modulation levels (less than −40 dB). The relation between K and m_t is plotted in Figure 3.

A quick look at Figure 3 shows that, if you calibrate a test setup to read cross-modulation level according to the standard conventional definition and a second person tests for cross-modulation using equipment calibrated according to the NCTA "television" definition, the second person will find 6 dB more cross-modulation than you will at any given signal level (as long as the cross-modulation is useably low).

Another area in which differences can occur is in calibrating the test equipment. There are many pitfalls possible here. Some calibration errors have very little effect; others can be quite severe.

In one situation nature is good to us. As long as we are specifying and measuring signal levels at peak modulation level, it is not important to provide exactly 100% modulation on the modulated carriers in the test. Anything over 80% will provide a cross-modulation reading well within ½ dB of that which would be obtained at 100% modulation.

However, if we are measuring true "carrier" level (that is, if we use a tuneable voltmeter with narrow enough bandwidth to be unaffected by modulation sidebands, or if the detector in our voltmeter reads the *average* value of the output of a "linear" detector, rather than the peak value) this is no longer true. In these cases, it would be necessary to have 95% modulation or higher to provide an output reading within ½ dB of that which would be obtained at 100% modulation.

One method which is frequently suggested for calibration is to observe the DC output of a detector on an oscilloscope with no modulation on the carrier, and use this as a reference for measuring modulation index for the carrier with modulation (either intentionally produced or produced by cross-modulation). This method of calibration is not recommended for precise measurement but is useful for rough measurement in the field where precise measuring equipment is often not available. The reason for this is easily discovered. If we use this method of calibrating our equipment, we are assuming that our detector has a characteristic as shown in Figure 4a. In this case the DC output of the detector is directly proportional to the RF input and will follow changes accurately. However, a practical detector will have a characteristic more like that shown in Figure 4b.

If we were to calibrate this detector with an unmodulated carrier whose level caused it to operate at point A, then a signal which was modulated at approximately 50% ("television" definition) would appear to be 90% to 100% modulated when observed on the scope. The readings at low percentages of modulation would be subject to corresponding errors. If we calibrate our detector and scope at higher input levels, it is easily seen that the errors will reduce until we start operating at levels where the characteristic curve has a reverse bend. Above these levels we will find a reverse error. If we could guarantee operation at point D (the point where a line from the curve to the origin is tangent to the curve), our calibration would be accurate for all low modulation levels. However, operation on

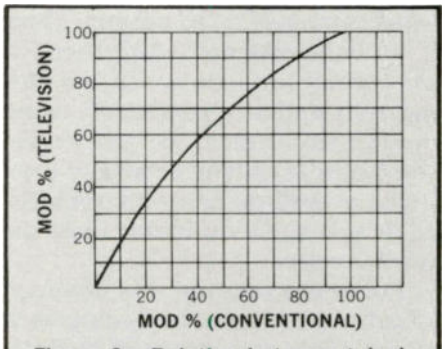

Figure 2: Relation between television and conventional definitions of percent modulation.

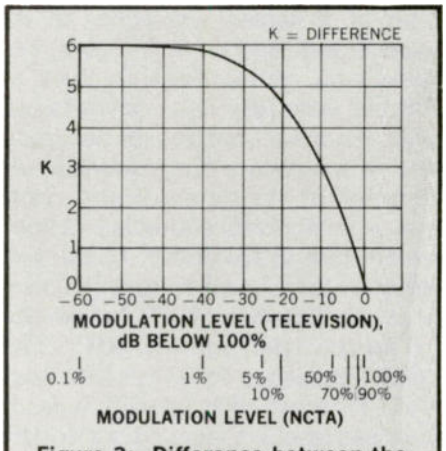

Figure 3: Difference between the two definitions of modulation level vs. modulation level.

either side of this point would cause errors. We can easily see that, unless we know the detector characteristics quite accurately, use of this technique will practically guarantee errors in the final results.

However, there is usually a considerable range of RF input levels where *changes* in input level will produce accurately proportional *changes* in output levels. Even in the regions of slight curvature *small changes* in RF input will produce accurately proportional *small changes* in DC output. Thus, if we calibrate our equipment *at the carrier* level we are to use during tests and at a *sufficiently small* modulation index, we can expect to obtain excellent accuracy even if the overall detector characteristic is not suitably linear over the whole range.

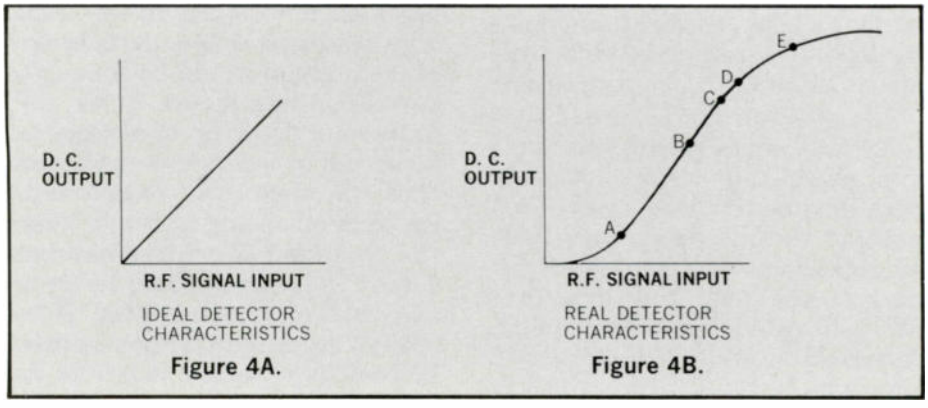

Figure 4A. Figure 4B.

For these reasons it is common to calibrate the readout equipment at some low percentage of modulation. There are several ways by which this can be achieved. One method is to rely on the calibration of a signal generator in its modulated mode. In this case, the definition of modulation used is almost certainly the conventional one. Another method in common use which allows fairly precise calibration of the detector and readout is to introduce another carrier quite close in frequency to the reference carrier and reduce its level a given number of dB below the reference (perhaps 57 dB). The beat frequency level is then read out. This will also provide a readout calibration according to the conventional definition of modulation. If a readout according to the television definition (negative modulation only) is required, the introduced carrier must be reduced according to Figure 3 (6 dB for the −57 case, or −63 dB).

The NCTA standards also specify that the modulating signal shall be a square wave. This can introduce another error in calibration, depending on the equipment used. When very low levels of modulation are being measured, noise levels make it difficult to obtain a sufficient degree of accuracy with any broad-band measurements (whether by scope observation or broad-band voltmeter). It is therefore usual to read out the modulation level either through a narrow-band filter or with a sharply tuned voltmeter (wave analyser). It can be easily proven that the ratio of the peak value of the fundamental sinusoidal component of a square wave to the peak value of the square wave is $4/\pi$. Thus, if the equipment is calibrated by either of the two methods described in the preceding paragraph and square-wave cross-modulation is measured, the equipment will read high by 2 dB. This 2 dB difference, however, disappears if the equipment is calibrated using square-wave modulation, and square-wave modulation is used in measurement.

If a sufficiently sharply tuned voltmeter is used in the readout, it is possible to simulate actual system conditions a little more closely by modulating the test carrier or "acceptor" with a signal at a different frequency than is used on the signals causing the cross-modulation (or "donor" signals) and still read the level of cross-modulation because the selectivity of the voltmeter will reject the other modulation frequency. However, when this is done, another effect can occur to change our readings. If we are using the level at peak modulation as our reference and the test carrier is 100% modulated (either definition, since they are the same at 100% modulation), we will read cross-modulation 6 dB lower than if the test carrier were unmodulated.

Because of these differences in definitions, calibration, and test procedures alone, we can see that it is possible for two tests to provide results up to 14 dB apart for cross-modulation levels, which (if the cross-modulation is caused by 3rd order distortion only) can provide output capability ratings up to 7 dB apart.

The moral of this story is threefold:

1. Before measuring cross-modulation, decide on the definitions you intend to use.
2. Check carefully that your equipment measures what you intend it to.
3. If you are going to compare your results with someone else's results, check their definitions and calibrations.

SUMMARY

1. $M_t = M_c + K$
2. FOR LOW MODULATION LEVELS (such as are obtained in cross-modulation measurement)

$$M_t = M_c + 6\ dB$$

or, measurements obtained in accordance with NCTA standards will show 6 dB more cross-modulation than if the conventional definition is used.
3. Equipment calibrated with sine wave modulation or its equivalent will (if tests are run using square wave modulation) read 2 dB more cross-modulation than if calibrated with square wave modulation.
4. If the "clean" carrier is 100% modulated with a different frequency than the "modulated" signals, the cross-modulation will be read as 6 dB lower than if the clean signal is unmodulated or only modulated a small percentage.
5. Detection and readout equipment (as well as modulators) can give false answers unless calibrated at levels near those used in final measurement. TVC

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PRODUCT REVIEW

NEW COMPONENTS FOR CABLE TELEVISION SYSTEMS

NEW AMECO LINE SPLITTER

A new low-cost line splitter has been made available by Ameco, Inc. Designated MLS-II Midget line splitter, the device is designed to split the incoming signal to feed two television sets from a single house drop. Manufacturer's specifications of the unit are 1 dB peak-to-valley sweep response; 4 dB

maximum insertion loss with typical insertion loss of 3.75 dB, and an input return loss of 16 dB. The device accepts F-59 connectors and is available for immediate delivery. Price of the MLS-II is $2.50.

For further information about this new product contact Ameco, Inc., 2949 West Osborn Road, P.O. Box 13741, Phoenix, Arizona 85002. Ph. (602) 262-5500.

RF MIXER FROM ARC

A new RF mixer has been announced by Advance Research Corp. The unit, Model M-1600, will permit single channel input combining of up to 16 channels of television, FM, broadband FM and control carriers. According to the manufacturer, the solid-state unit has very high isolation between inputs, without the use of supplemental splitters, couplers, etc. Manufacturer's specifications list input and output impedance at 75 ohms; input and output VSWR as 1.2:1; frequency response for 54 to 220 MHz at +2.0 dB, and for each channel at +0.5 dB; insertion loss, 54 to 220 MHz at 10 db +2 dB; channel bandwidth as 54 to 220 MHz; maximum input level at +60 dBmV; typical isolation between inputs at 50 dB. The unit's dimensions are 5¼ "H X 7¾ "D X 19"W. ARC also has a 24-channel model, designated M-2400, and a 36-channel model, designated M-3600.

For further information contact Advance Research Corporation, 715 Miami Circle, N.E., Atlanta, Georgia 30324.

TV DEALER PROMO PACKAGE

Barash Advertising of State College, Pa., has announced an addition to their CATV prepared promotion materials line. Barash is now offering a plan for enlisting television dealers' aid in the promotion of a new cable television system. The Barash package gives a step-by-step plan of activity for TV dealer involvement and includes samples of all necessary invitations, news releases, signs, premiums and banners needed. Cost for the Dealer Plan and the kit of samples is $25.

For further information on this new service contact Barash Advertising 403 S. Allen Street, State College, Pa. 16801.

BENCO CLIPPER LINE

Benco's new Clipper Line offers a range of weatherproof housed clip-in multi-tap and line extender plates, said to provide maximum flexibility in system planning, preloading and extension. Clip-in plates are available in 6 attenuation values from 10 dB to 35 dB. The Clipper Line has full bandwidth, passes 10 amperes AC, and has color coded plates. Clipper housings mount four ways, including the new Clipper "P" for pedestal mounting.

For further information on this new product, contact Benco Television Corporation, P.O. Box 10068, Jacksonville, Florida 32207.

OSCILLOSCOPE FOR FIELD USE

Texscan Technical Products Division has announced the addition of the model 101 solid-state battery operated portable oscilloscope to its line of test equipment. The Texscan model 101 is a 20 MHz bandwidth, general purpose oscilloscope said to be ideally suited for CATV applications. The combination of 50 mV/cm sensitivity and DC to 20 MHz bandwidth results in a unit which fits most applications for a portable oscilloscope, according to the manufacturer. When used with the internal battery pack the unit provides over one and one-half hours of continuous operation. A built-in charger is included. The 101 can also operate from a DC external 12 Volt

battery and 115 Vac. The unit measures 9" x 8½ " x 15" and weighs 17 pounds. The price of the model 101 is $665.

For further information on this new product, contact Texscan Technical Products Division, 4610 North Franklin Road, Indianapolis, Indiana 46226. Ph. (317) 454-6481.

BECKER DAVISON INDOOR SPLITTERS

Becker Davison Corp. has introduced a new line of low loss, 75 ohm indoor splitters that are said to feature good return loss and response linearity to 240 MHz. The "F" type connectors accept either RG-59U or JT-207 type center conductors. The model #772 two-way features a response of ±5dB (50-240 MHz). Isolation between taps is 24dB with an insertion loss of 3dB at each tap. Input and output match is given as 20dB. The model #774 four-way features an isolation between taps of 27dB and an insertion loss of 7dB at any tap. Input match is 20dB. Output taps have a match of 26dB. "F" connectors accept RG-59U or JT-207 type center conductors. F-59 connectors are supplied with all units and have captive type rings. Price for the model #772 ranges from $2.60 to $1.95, depending on the quantity purchased. Price for the model #774 ranges from $3.75 to $3.20.

For further information on these

new products contact the Becker Davison Corporation, 307 3rd Avenue South, Seattle, Washington 98104. Ph. (206) 682-5078.

PRUZAN CONNECTION SLEEVE AND FEED-THRU BUSHING

Pruzan Company has been selected as supplier for the newly designed "Slip-on" sleeve. According to the company, the sleeve provides a fast and economical method for effectively waterproofing bulkhead connections. No tools are needed to install the sleeves, which are reusable and re-enterable. For application, a generous amount of silicone grease is squeezed into the "Slip-on" and kneaded in the hand several times. The sleeve is then glided onto the cable and the connection is made. Next, it is slid back over the fitting and butted against bulkhead. For re-entrance, the sleeve is pulled back over fitting, necessary adjustments are made, and the sleeve is slipped back against the bulkhead. The "Slip-on" comes in two sizes: .412 and .500.

Pruzan has also just finished the design on a new feed-thru bushing. The new design is said to offer better protection and neater installations of drop cables through stucco and masonry walls. The new bushing features an extra wide flange to hide all drill damage, and tapered ridges on the shank that hold the feed-thru in place. The bushing is available for either RG-59U (#260) or JT-207 (#287) cable.

For further information on these new products, contact Pruzan Company, 1963 First Avenue South, Seattle, Washington 98134. Ph.(206) 624-6505.

WEATHER RECEIVER FOR CATV

The availability of a new FM monitor receiver has been announced by Kaar Electronics Corp. The unit, designated QJ75, may be used by CATV system operators for receiving weather information from U.S. Weather Bureau stations transmitting on 162.55 MHz. The receiver's 600-ohm audio output can be fed to a CATV FM modulator. Since the new solid-state receiver is operable on one to six channels within the 137.5-174 MHz frequency range, it can be used for remote audio pick-ups and monitoring of land mobile

radio transmissions. The unit is operable from a 12-Volt DC or 115-230-Volt AC source. It delivers 4 watts audio output to a built-in loudspeaker. Sensitivity is rated at 0.3 microvolt SINAD, -85 dB selectivity at ±30 KHz, -90 dB spurious and image rejection, and -60 dB EIA intermodulation. Frequency stability is given as 0.0005% and AFC is employed.

For further information on this new product, contact Kaar Electronics Corp., 1203 West St. Georges Avenue, Linden, New Jersey 07036.

NEW CONCORD PRODUCTS

A new solid-state television camera, the MTC-18, has been designed by Concord Communications Systems for applications where fixed (2:1) interlace is desired. The MTC-18 provides its own sync and operates as a sync generator for other MTC-18 cameras, or will accept sync from an external sync generator. A light control selector on the camera permits either automatic or manual adjustment for varying light conditions. Video resolution of the unit is 550 lines. It comes equipped with a 25mm adjustable iris lens. Price is $450.

Concord has also introduced a new television control panel (for creating special effects); an interlaced sync generator; and video switcher for use with video tape recording and closed circuit television systems. Use of the new TCP-2 control panel permits the operator to monitor multiple camera combinations from remote locations and to select several optical effects

CATV CONSTRUCTION CONTRACTOR LISTING

American Electronic Laboratories, Inc.; P.O. Box 552CA, Lansdale, Pennsylvania 19446. Ph. (215) 822-2929; Offering complete turn-key services including feasibility studies, preliminary cost estimates, franchise assistance, application engineering, system design, construction, and financing.

for video tape recording or monitor viewing. Titling, superimposing, dissolves, fades, wipes, and horizontal, vertical and corner split screen effects can be accomplished with the push-button panel. With the new VS 3 video switcher and the SG-12 sync generator, the user can employ two or more cameras and select a variety of subject material to be recorded by switching from camera to camera. Price of the TCP-2 television control panel is less than $500; the SG-2 sync generator, less than $400.

For further information on these new products contact Concord Communications Systems Division of Concord Electronics Corporation, 1935 Armacost Avenue, Los Angeles, Calif. 90025 or Program Origination Corporation of America, 2650 East Broadway, Tucson, Ariz. 85716.

EMI/RFI SHEILDING TAPE

A steel tape providing EMI/RFI shielding for cable harnesses and cable splices is now available from Technical Wire Products Inc. The multi-strand tape is knitted from 37 gauge tin-coated, copper-clad steel wire. It is 1 inch wide and is available in rolls of 25 and 100 feet. According to the manufacturer, the tape is flexible, and will easily maintain the contour of cables or splices. It is pretinned, and can readily be soldered or wiped. Application is accomplished by wrapping the shielding tape as a bandage, advancing one-half layer per turn, giving four layers of single knit over a splice. Technical Wire Products also produces RFI gasket material, and a new combination EMI/RFI gasket and fastener.

For further information on these new products, contact Technical Wire Products Inc., 129 Dermody Street, Cranford, New Jersey 07016.

PITMAN AERIAL BUCKET

A new personnel bucket, has been developed by Pitman Mfg. Co. for their Pelican II aerial device. The fiberglass bucket features a fold-down chair so personnel can sit down while performing lengthy operations. The chair is hinged to the inside wall of the bucket and swings up out of the way when crewmen must work standing up. For further comfort, a footrest can be lowered from the bucket wall. A large 39 x 18 in. sidewall door provides easy access to the bucket and eliminates crawling over the bucket lip to enter or exit.

For further information on this new product, contact Pitman Mfg. Co., Division of A. B. Chance Co., Grandview, Missouri 64030.

PLP DEAD-END AND SPLICE

A new dead-end and splice for fiberglas rod used in guying antennas and towers has been developed by Preformed Line Products Company. Called the Glas-Grip dead-end and Glas-Splice for fiberglas rod, the companion products are said to be easily applied in the field without tools. Both products are made of steel. Absence of nuts, bolts or other fittings that can be loosened by vibration and other motion assures reduced maintenance, according to the manufacturer, and since there are no points of concentrated stress, the possibility or rod failures at termination points is said to be sharply reduced. The new grips and splices will fit rods in sizes ranging from ¼inch to ⅝ inch in diameter.

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

NEW TOWER FROM ANDREWS

Andrews Towers, Inc. has introduced a new type of tower which is built with solid round steel. The 700-foot structure is triangular in shape and is constructed entirely of solid steel round, using ASTM #A-36 steel. The tower is being manufactured in only one size, a triangular 36-inch cross section. It is being constructed in sections of 20-foot lengths on pre-engineered jigs. Only three large bolts are required to hold sections together, and only one bolt is utilized at the leg joint. The guyed tower is designed to support normal CATV antenna loading at wind velocity of up to 120 miles per hour. According to the manufacturer, the new design reduces wind load and provides more strength per pound of material, than other types of pipe tower construction. The tower can be built in sections from 20 feet to 700 feet.

For further information on these new products contact Andrews Towers, Inc., 1420 Layton Avenue, Fort Worth, Texas.

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Rate for classifieds is 25 cents per word for advertising obviously of a non-commercial nature. Add $1.00 for Box Number and reply service, per issue. Advance payment is required; minimum order is $10.00. Classified rate to commercial advertisers is $30.00 per column inch (2¼" col.). Deadline for all classifieds is 1st of preceding month.

CATV FIELD ENGINEERS

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Year old system, seven stations off air, FM/weather, 5,000 population, 1250 homes in front of 18 mile system on own poles, 75 miles nearest station. Ahead of all projections, $225,000 by owner. Reply to Dept. T5-4, TV Communications, 207 N.E. 38th, Okla. City, Okla. 73105.

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TV Communications pays $20 for color photos used on the magazine's front cover. Any CATV-related subject matter considered. send color transparencies (2¼" square or larger) or color prints (with negative if possible). All materials returned on request. Send to Milt Bryan, Managing Editor, TV Communications, 207 N.E. 38th, Oklahoma City, Oklahoma 73105.

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Leading CATV manufacturer has openings for R. F. circuit designers skilled in designing broadband, solid-state amplifiers and other CATV active devices. Reply to Dept. T5-3, TV Communications, 207 N.E. 38th, Okla. City, Okla. 73105.

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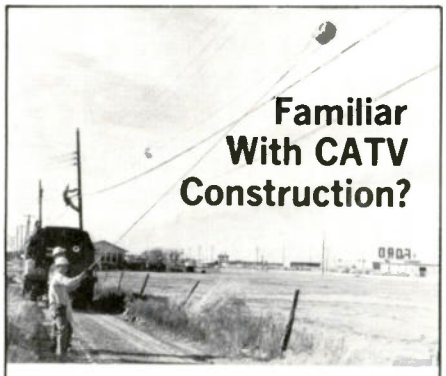

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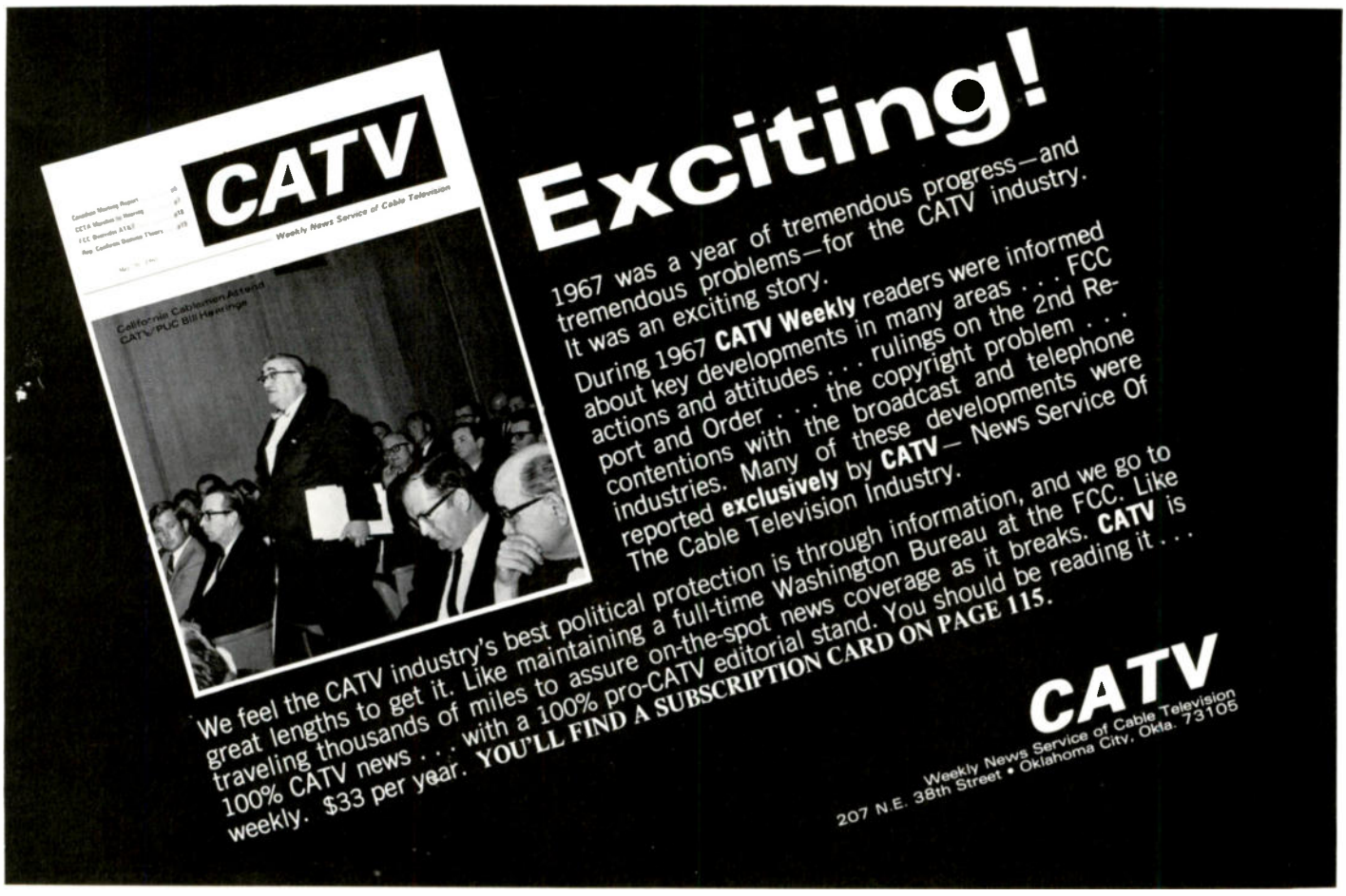

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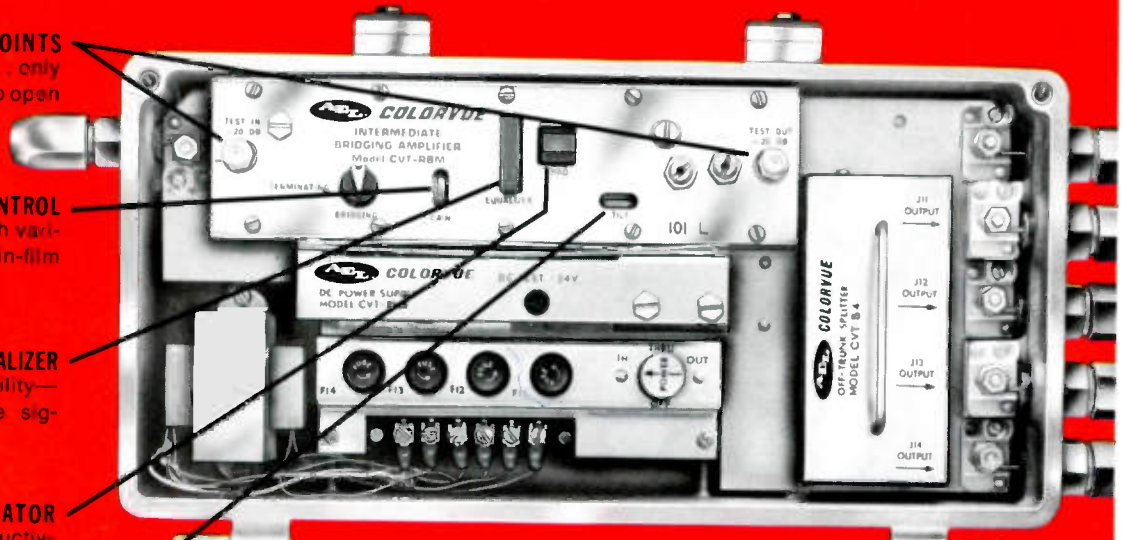

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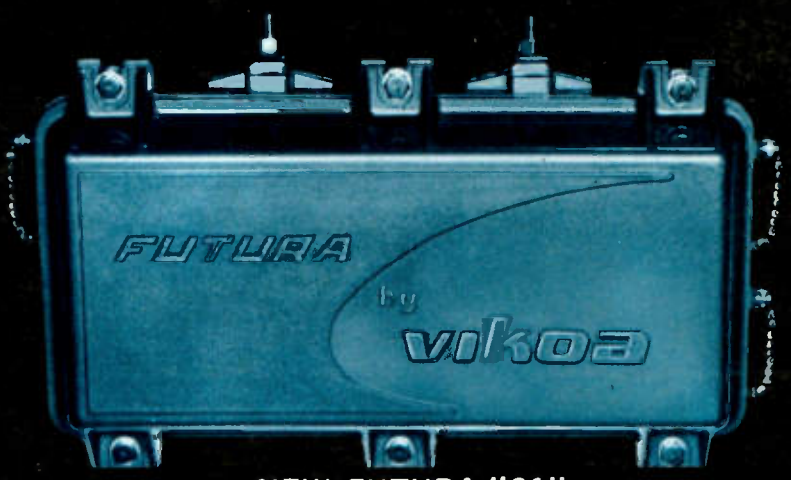

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