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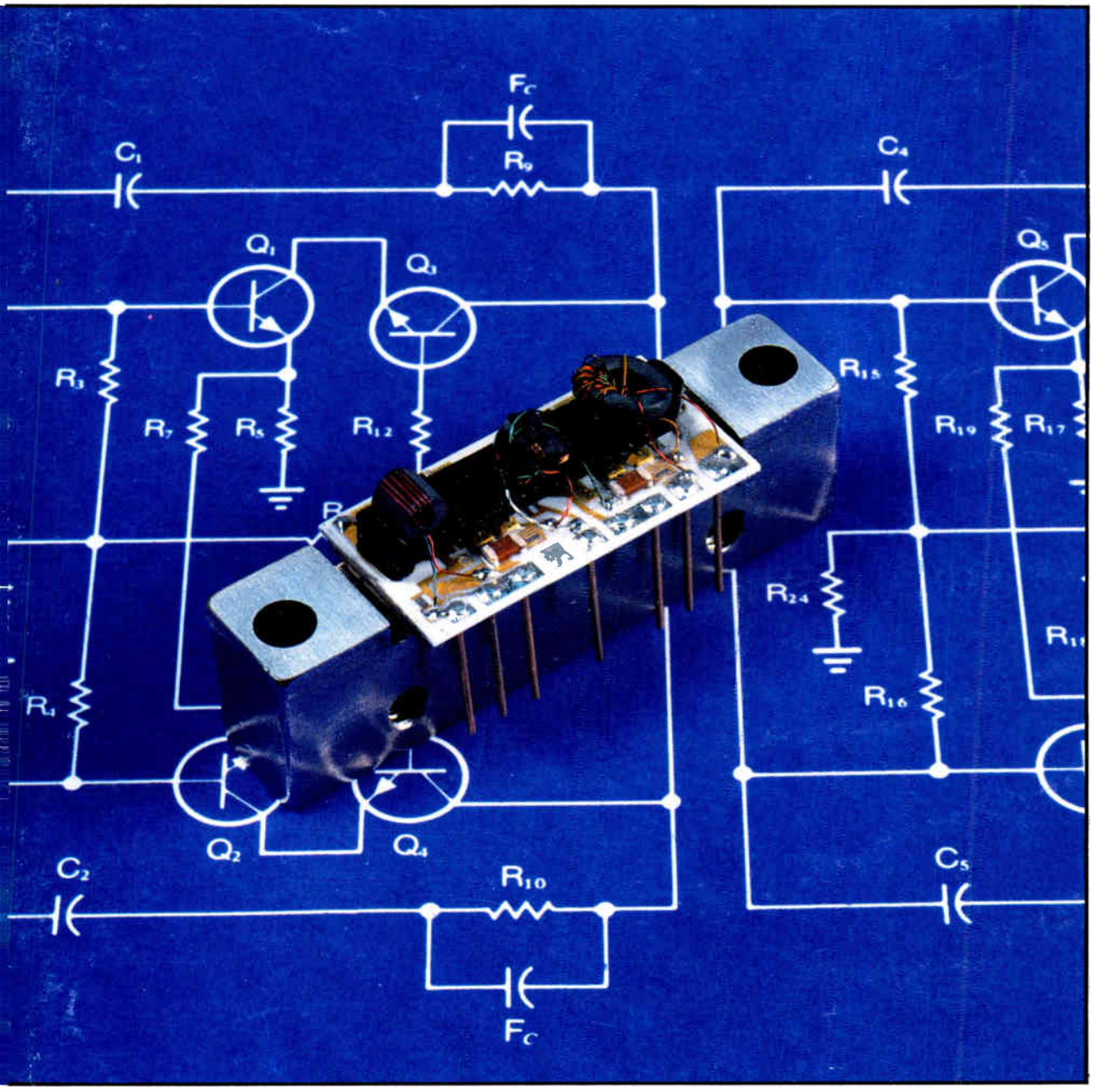

april, 1977
volume 3, no. 4

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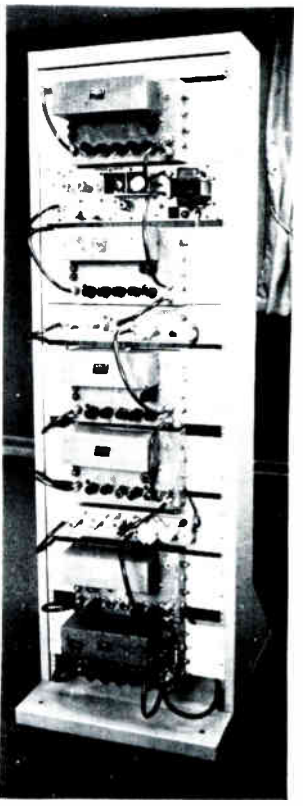

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FEATURES

TECH REVIEW

DEPARTMENTS

COVER: The cover design, created by Lou Arbolida of TRW RF Semiconductors, depicts the circuitry of the CA2600 hybrid amplifier for CATV applications.

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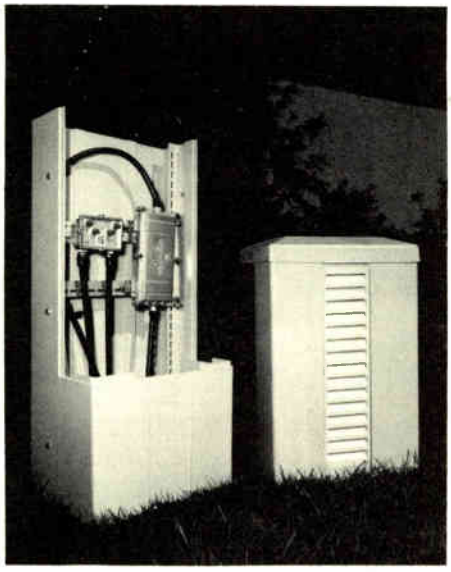

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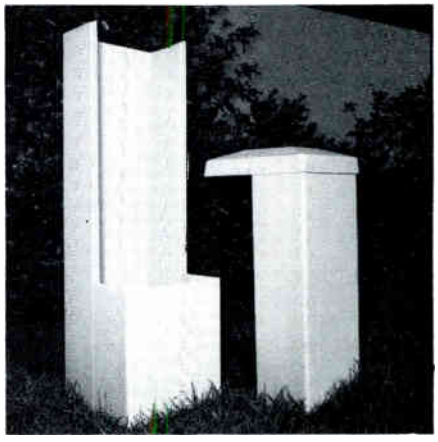

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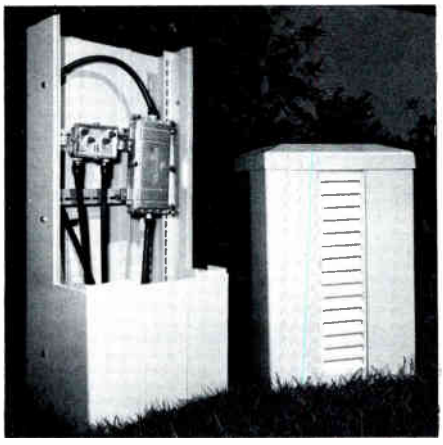

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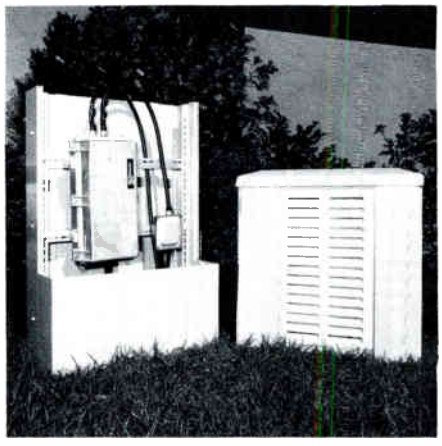

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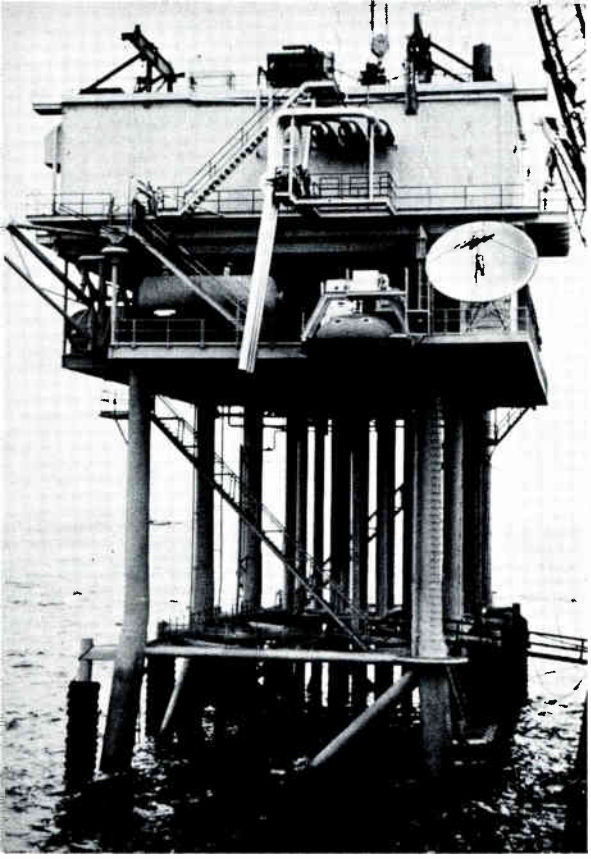

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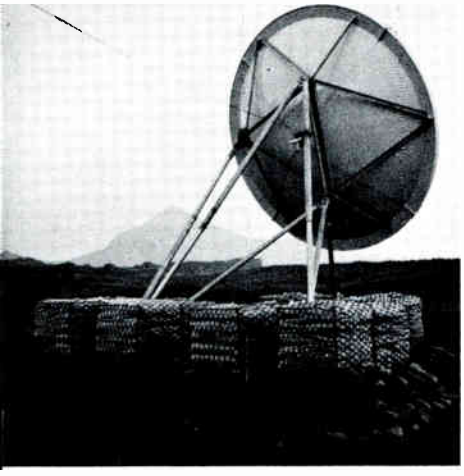

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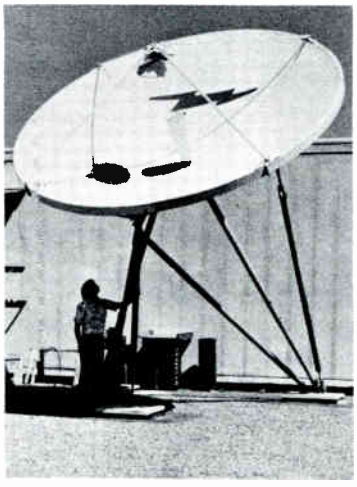

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Technical News at a Glance

. . . *The* **National Cable Television Association** *is going to have a* **new vice president for engineering** *soon. The announcement may come in time for the individual to be introduced at NCTA's convention in Chicago.*

. . . *The* **Office of Telecommunications Policy** *has written to* **FCC Chairman Dick Wiley** *reiterating its position on the potential for* **interference from cable systems** *and proposing some* **strong interim procedures** *pending further study.*

. . . *The* **U.S. Court of Appeals** *for the D.C. Circuit* **overturned all of the FCC's pay-cable rules** *on film and sports anti-siphoning, the 90% rule, and the advertising ban.* **Appeal is expected** *by film and broadcasting interests.*

. . . *The* **FCC** *has completed its rulemaking proceeding* **redefining cable television systems on a headend basis.** *And* **systems** *with* **less than 500 subscribers are exempt from FCC rules** *except for signal carriage and technical standards, though* **annual tests will not be required.** *These systems are also to be exempt from certificate of compliance requirements. Comments have been asked on extending the exemption to systems with 1,000 subscribers or less.*

. . . **NCTA** *and the* **National Association of Regulatory Utility Commissioners** *have reached an* **agreement on pole attachments.** *Lionel Van Deerlin, chairman of the House communications subcommittee, subsequently released draft legislation for comment. He was concerned about the NCTA-NARUC agreement not being entirely representative of the industry's interests.*

. . . **STV is off the ground,** *you might say, as the Corona, CA Oak-Perenchio operation is running as of this month. So too, is the Wometco operation in Newark, at least in a quasi-test and promotion mode.*

. . . *The* **National Cable Television Association** *is hoping for a* **record turnout in Chicago** *this month for its annual convention 17th thru the 20th. The show will be a star-studded affair including such personalities as columnist* **Art Buchwald,** *veteran journalist* **Robert Goralski** *(keynoting the technical sessions) and comedian* **David Steinberg.** *The* **technical sessions** *are reported to be the* **best yet:** *See page 26.*

. . . **SCTE's "Man of the Year"** *this year is Tele-Vue's* **Frank Bias.** *CPI's* **Jim Stilwell** *and Scientific Atlanta's* **Alex Best** *will be honored for their* **engineering achievements** *by the NCTA. The three will be honored at NCTA's convention in Chicago.*

. . . *New* **NCTA District Directors** *are:* **Harry Greenberg, Joe Benes, Lee Wallenhaupt. John Raines** *and* **Pat Nugent** *were re-elected. Running for at large seats on NCTA's Board are:* **Doug Dittrick, Jim Ackerman, Dick Loftus, John Gwin, Ken Gunter, Jerry Greene** *and* **Don Tykeson. Irving Faye** *is to become the senior associate director, while* **Ron Hansen** *is seeking the junior position. Meanwhile,* **Judy Baer, Frank Drendel, Sandy Sussman** *and* **Herb Pruzan** *are running for* **alternate seats.**

CCTA **canadian column**

Kenneth Hancock, Director Engineering

New Communications Legislation

Although it is without doubt that March 22, 1977, will be long remembered in the Canadian cable television circles, no one is too sure at this time as to what it will be remembered for. This was the date that the new Telecommunications Act was introduced into the House of Commons of Canada for its first reading.

The first reading of any bill in Canada is a long way from law—there is a total of three readings—of which the second is the perhaps the most important, as this is where the majority of new amendments are introduced. Nevertheless, the first reading of the new Bill C-43, "An Act Respecting Cable Communications in Canada" has caused a very great deal of consternation in cable television circles.

Very briefly, the Act does four things. First, it consolidates and clarifies an existing federal legislation relating to telecommunication which, as defined by this Act, means any transmission, emission or reception of signs, signals, writing images, sound, or intelligence of any nature by wire, radio, or other electromagnetic or by any optical or technical system. This definition in itself is obviously all-embracing—encompassing cable television as it is today, and also as it is likely to be in the future. The legislation that it replaces is the Broadcasting Act, the CRTC Act, The Radio Act, and the Telegraph Act, all in total, as well as telecommunications provisions of the Railway Act and National Transportation Act.

Second, the Act defines federal government telecommunications policy consisting of some 17 different clauses—a number of them being almost as sacred as "motherhood" and none of them particularly contentious.

In Canada, the jurisdiction of broadcasting, which includes cable television, has slid slowly under the jurisdiction of the federal government. While Bill 43 doesn't change this specifically, what it does do is give the right for the federal minister of communications to negotiate an agreement with the government of any province (equivalent to state) with regards to any of the provisions of the new Act. Conversely, it gives the right of the federal minister to exercise powers delegated to it by any provincial government.

This is a major departure from the current situation and permits federal and provincial governments to apparently indulge in the trading of the jurisdiction of any field of communications as a matter of political expediency. As in Canada, several of the provinces have previously attempted to gain control of cable television by several different means, this clause in the new Act gives rise to very considerable fears in the Canadian cable television industry.

Already in the week that has past since the first reading of Bill 43, it appears that these fears are well founded. On the 29th and 30th of March in Edmondton, a federal provincial communications ministers' meeting took place. Canadian federal communications minister Jeanne Sauve has been reported as saying that a consensus had been reached at the meeting to explore ways for the federal government to turn over the responsibility for regulating cable and pay-TV to the provinces.

(Continued on Page 24.)

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scte comments

Bob Bilodeau, President

David and Goliath Rematch

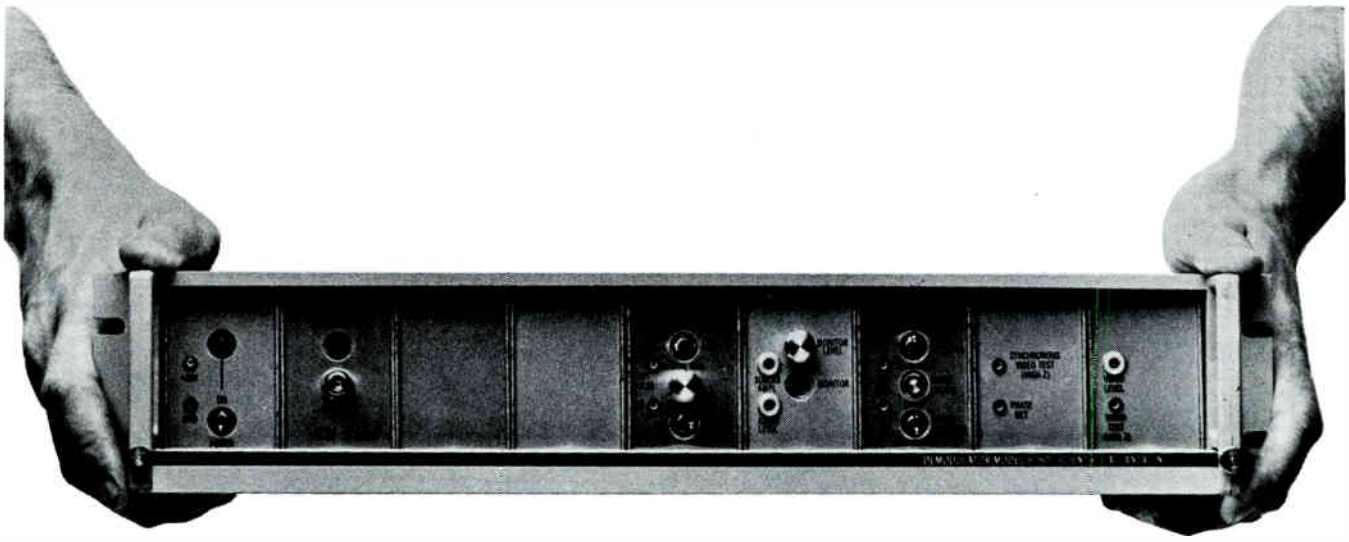
Their is a rumbling under foot. The Davids of the world will have sensed it by now. It is colloquially known as the Bell Bill. Couched in the otherwise more benign language as the Consumer Communications Reform Act. This act has had the support of a meaningful number of congressmen and senators, and is being "pressed" by AT&T and Bell affiliates. Like Goliath, they will push the things that appear to get in their way. In this instance, it appears to be the specter of cable and common carriers emerging as competitive forces in the market place that are now considered a special province of Ma Bell.

If enacted, in its more insidious forms, this bill would preclude cable from competing with other communications facilities or creating "redundant" circuits for services "already available" (on existing or proposed) parallel routes. One interpretation is that cable could be barred sometime in the future from offering such services as security, fire alarm, home banking, and library access. The Bell Bill rationale is that services could otherwise be offered by existing "Bell" facilities at a competitive rate, more consistent with the public interest.

In my estimation, the perennial argument that bigness is betterness is not applicable for this instance. An anti-competitive atmosphere designed to perpetuate a monopoly, for real or imaginative markets, is not necessarily in the public interest. It is reasonable to conclude otherwise, i.e., that cable will compete in these technologies, on a cost effective basis. That is more evident when viewed in the emerging illumination of fiber optics.

Laced through redundancy is not in the public interest spirit. However, the mere presence of *one* acceptable solution to a particular situation does not automatically preclude a second or third approach. Given a breath of life, others might find their place in the sun. Bell Bill proponents suggest that the Cunard Lines would have landed (in the public interest) at Plymouth Rock sooner than the pilgrims. Similar arguments were heard at the time of the first satellite launching period, however, private, commercial companies are now successful in this field.

There is an area where bigness has its significant advantage. It is the ability to pursue self-serving legislation. In this particular case, the cable industry should be alert to the fact that Goliath, always lurking over the Hill, has launched another salvo. It's called THE CONSUMER COMMUNICATIONS REFORM ACT—The Bell Bill.



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opinion/editorial

Judith Baer, Executive Director, SCTE

If you're at the NCTA 26th Annual Convention in Chicago, you'll notice that the technical sessions feature more than 35 papers on everything from *"Advanced Techniques"* to *"Hands-On A to Z Daily System Operation."* That hands-on stuff is a first for NCTA and it's about time. Suffice it to say that SCTE had something to do with the fact that it's on the program.

You'll also notice tours for the first time—again an idea presented and followed through on, by SCTE. And, you can't miss the 1,000 SCTE yoyo's spinning around the convention with engineers, managers and suppliers "walking the dog," "sleeping," or whatever else people do with yoyo's. (I don't mean that 1,000 SCTE members are yoyo's—these are real live professional trick yoyo's used to promote SCTE!)

When you go to the Engineers' Reception on Monday night, you'll see FCC Chairman Richard Wiley presenting the NCTA Technical Achievement Awards to Alex Best of Scientific-Atlanta and James Stilwell of Communications Properties, Inc. Again, SCTE had a hand in the selection of the winners and the presentation by Wiley. And, for the first time in recorded history (or at least since the awards were founded five years ago), the Technical Achievement Awards will be announced at the NCTA banquet, finally reaching equal importance with the varied other awards that the trade association presents annually. It's a sure thing that SCTE had something to do with that! We've cajoled about it for years.

Also, to start off the whole technical program for the show, SCTE invited Robert Goralski, director of public affairs for Gulf Oil Corporation and veteran NBC newsman to be the Keynote Speaker on Monday morning, April 17. These Keynote Sessions were started in 1976 when SCTE proposed giving up one "Technical Eye-Opener" and NCTA giving up one "Sunrise Session," in order to bring speakers from outside the industry into the conventions, wake people up and sell the CATV industry. It worked well in 1976 with nearly 300 people hearing an ITT executive speak. This 1977 event with Goralski, a noted and controversial speaker, will be one of the highlights of the entire NCTA program in Chicago.

Why is all this "carnival spirit" necessary? Especially when "engineers don't have a sense of humor," or are considered "eccentric?" Seems simply a case of knowing that the "technical community" cannot function out of caves and expect to gain, and ultimately maintain respect, interest and support of system management. We cannot set ourselves aside, nor can we let anyone else propose that we do so.

I've said it so often that I'm tired myself of hearing it—"If there were no engineers and technicians, there'd be no CATV industry." You can buy all the sports and movies you wish, but without a delivery system you cannot get the stuff to your customer. The technical community (let's not call it that anymore for a start) has set itself "somewhere out in left field," in the CATV business and that's ridiculous. We must assimilate ourselves into the business of doing business and stop talking to ourselves. Sometimes, we're downright boring.

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CLIFF'S NOTES:

What's Cooking

The comments are in on Docket 21006, and the Office of Telecommunications policy has responded with its own recommendations. There were no real surprises. Comments were predictable, and I for one, found the whole exercise representative of a feeling I have nurtured for a long time. Rarely does anyone have an original thought. And, rarely does anyone in government say something representative of the true situation. I know this is true; I just don't know what to do about it.

Situation: The Federal Aviation Administration knows that cable television is not a real threat, but they ask for a total vacation of "their" frequencies. If the FAA proposed anything less they could be liable for, as they have in the past, for any accident occurring because they agreed to some reasonable solution. The sad part is the courts can lay the blame even when the FAA has done a good job of providing navigation systems.

The FAA is not to blame—instead it is the U.S. citizen and his propensity to lay blame on someone, or something, rather than admit that human error causes most accidents.

Jim Palmer, of C-Cor wrote an excellent commentary last week tying together the mass misunderstanding and the fact that the Aircraft Owners and Pilots Association and the Air Transport Association both play upon the emotions of the average American with their doomsday prophecies of disaster. We accept human error in other things, but not in air disasters.

Response to Docket 21006 from AOPA and ATA serve no useful or constructive purpose. It is obvious from their response that no one sat down and bothered to even try to understand both sides of the problem. Their response says just get off—don't bother me, I'm not concerned about anyone but myself. Their responses also say a lot about the people who wrote them. ("My job won't let me say anything but get off. I'm afraid any compromise might put me in jeopardy. I don't want to take time to study the problem.")

Actually, the National Association of Broadcasters' response was the most ridiculous. They jumped on the bandwagon and pleaded for protection for their off-air frequencies. Who are they kidding? TV, with 100 KW or 316 KW and cable with 1 mw highest level interfering. NAB's comments were not based upon fact or logic. Predictably, it was just "white noise" from NAB on any subject having to do with cable television.

Most of the other pro-cable comments involved frequency offsets, tighter monitoring, and record keeping. Many of the comments were similar. There were very few original ideas. Some of the cable comments said, "Yes, we believe in monitoring, but how can we monitor where there aren't any standards."

Summarizing the comments:

1) Most didn't study the situation.

2) One group plagiarizes another's comments.

3) Groups can't file accurate comments for fear of being wrong and sued.

4) Outsiders jump on the bandwagon and muddy the water with useless self-serving comments.

5) And, there were really no original thoughts.

Now that is the recipe that the Federal Communications Commission will have to work with. Don't expect a good-looking pineapple upside downcake.

Interim Measures

Until such time as adequate discipline standards and monitoring and enforcement procedures have been provided to ensure that interference is not caused to the Safety Services, the Federal Communications Commission will:

— Control the use of the specific carrier frequencies by cable systems in the bands 74.2-75.8. 108-136 and 225-399.9 MHz:

— In coordination with OTP develop procedures which will ensure that carrier frequencies used by cable systems are in conformance with the attached criteria.

— Require such CATV operator to maintain an accurate list of carrier frequencies used on his system. This list must also be available in the FCC, appropriate FCC District Field Offices, FAA and OTP.

— Will discourage additional use of the bands 108-118 and 328.6-335.4 MHz by CATV systems.

— Require adjustment of carrier frequencies now used by CATV systems based on the enclosed criteria by September 1, 1977 for the bands 108-118 MHz and 328.6-335.4 MHz and by January 1, 1978 for the bands 118-136 and 225-399.9 MHz. No adjustment will required in the 74.8-75.2 MHz band at this time.

— Require cable systems to change the specific carrier frequencies in the bands 108-136 and 225-399.9 MHz, at cable operators' expense, to meet the changing spectrum needs of the Safety Services. It should be noted that changes of these frequencies are made on short notice. Communication frequency changes may take place within a week or less, and navigation frequency changes may take place within a month. Frequency changes and time to make such changes will be dictated by essential operational requirements.

— Forbid cable systems the use of carrier frequencies on the emergency channels at 121.5 MHz ±100 kHz and 156.8 and 243 MHz ±50 kHz. It should be noted that the International Civil Aviation Organization requires ±100 kHz protection for 121.5 MHz.

— Require cable systems to immediately cease operations on the frequencies involved if interference is caused to the Safety Services.

— Require cable systems to maintain a carrier frequency tolerance of ±5 kHz in the bands 108-136 and 225-399.9 MHz.

— Continue to require cable operators to conform to the radiation limits of 20μ V/m at 10 ft.

— Enforce the radiation limit of 20μV/m at 10 ft.

Interim Frequency Offset Criteria

74.8-75.2 MHz

No adjustment to carrier frequencies required at this time.

108-118 and 328.6-335.4 MHz

CATV systems using frequencies in these bands within the service volume* of a VOR, ILS localizer or ILS glide slope facility must utilize carrier frequencies which are at least 50 kHz removed from the frequency used by the navigational facility providing service.

118-136, 225-328.6, and 335.4-339 MHz

CATV systems using frequencies in these bands within an Air Traffic Control Communications service volume** must utilize carrier frequencies which are at least 100 kHz removed from the frequency used by the communication facility providing this service.

108-136 and 225-399.9 MHz

In no case shall the level of field intensity exceed 10μ V/m in the useable aircraft flight environment.

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* Service volumes for navigation systems are defined in FAA Order 6050.5A March 12, 1969 (currently being revised).

** Service volumes for communications systems are defined in FAA Order 6050.4A June 3, 1965 (currently being revised).

news

OTP Seeks Cooperation, Interim Restrictions

WASHINGTON, D.C.—The Office of Telecommunications Policy has once again written to FCC Chairman Richard E. Wiley with regard to the "potential interference from cable systems to aeronautical and maritime systems". Concerns expressed were basically the same as those raised last fall, but with less of an hysterical tone.

Dated April 4, the letter was signed by the acting director of OTP, William Thayler. It stated that a permanent solution to the problem of cable television using certain frequencies would require a great deal more information about propagation mechanisms, enforcement and maintenance procedures, and monitoring techniques than is presently available.

Because of the amount of time necessary to develop that information, OTP recommended interim measures be implemented "which positively assure the safety of our citizens pending the development of a permanent solution." (See page 21.)

"Our investigation of this problem," OTP said, "has reaffirmed the difficulties inherent in safely allowing cable systems, which may have radiation leakage, to use the frequencies assigned to the safety services."

"Until such time that safe leakage limits can be established and enforced," OTP added, "it is proposed that on an interim basis control of the use of the specific carrier frequencies by cable systems in the bands 74.2-75.8, 108-136 and 225-339.9 MHz be exercized by the Commission in coordination with this office, based on the enclosed frequency offset criteria. Lists of carrier frequencies used by each cable system should be available at the Commission, this office, the appropriate Commission's District Field offices and the Federal Aviation Administration."

OTP said systems currently utilizing frequencies in the navigation bands 108-118 MHz and 328.6-335.4 MHz should adjust their operations to be in conformance with this criteria by September 1, 1977. Those systems currently using the communications bands 118-136, 225-328.6 and 335.6-399.9 MHz should make this adjustment by January 1, 1978.

OTP said that, at present, no adjustment is needed in the band 74.8-75.2 MHz. Be mindful that OTP's recommendations are merely that, recommendations. And, although the suggestions can be touted as coming from the White House since OTP serves in the Executive Branch, it remains to be seen how much weight they will carry at the FCC. One source said that the letter will be thrown in the hopper with the rest of the comments filed in '21006.

With respect to the emergency frequencies 121.5, 156.8 and 243 MHz, OTP proposed that no assignments be permitted +50 kHz from frequencies 156.8 and 243 MHz and +100 kHz from frequency 121.5 MHz. The International Civil Aviation Organization requires +100 kHz protection for 121.5.

Additionally, it was re-emphasized that the navigation bands are most critical from an interference standpoint. "The potential for interference with aeronautical safety of life communications, and the regulatory attention being paid by the government to this problem should provide a strong disincentive for the establishment of future CATV system operations in these bands and to this extent we are satisfied that any added use is naturally discouraged," it was stated.

"However, during the interim period the FCC should alert the CATV community to these problems and, in coordination with industry, discourage their additional use by suggesting alternative solutions to operations in these bands."

SCTE Annual Meeting Called in Chicago

Robert Bilodeau, president of the Society of Cable Televison Engineers, will convene the 1977 SCTE Annual Membership Meeting, Sunday, April 17 at 3:30 p.m. in the Wulliford Room of the Conrad Hilton Hotel in Chicago, Illinois.

The 1977 meeting being held during the 26th Annual National Cable Television Association Convention, will include reports on SCTE's accomplishments during the past year, budget and financial reports and an outline of plans for the coming year. The Society of Cable Television Engineers, founded by a handful of CATV technicians and engineers in the late sixties, has grown to be the largest individual membership organization in the cable television industry.

SCTE also will present its annual

Man of the Year Award to a well known and respected industry operating engineer. The award was presented in 1976 to Glenn Chambers of ATC-Fox Cities in Appleton, Wisconsin. The annual recognition goes to the person in the CATV industry who has contributed significantly both the benefit of the cable television industry and to the goals of the Society of Cable Television Engineers.

Members are encouraged to attend this meeting and guests are invited.

Frank Bias Named SCTE's Man of the Year for '77

Frank Bias, vice president of engineering for Tele-Vue Systems, Inc., has been selected by the Society of Cable Television Engineers as the organizations' "Man of the Year" for his outstanding contribution to the Society and the industry at large.

Bias has been with Tele-Vue Systems, Inc., a subsidiary of Viacom International since 1970. He has successfully held the positions of director, transmission engineering; director of engineering, and is now vice president of Tele-Vue.

He is a fellow of the Institute of Electrical and Electronics Engineers and is an active member of the Society of Motion Picture and Television Engineers. In addition he has been active on various technical committees of the Electronic Industries Association and the U.S. National Committee of the International Electro-technical Commission. And, he is a professional Engineer in both the states of California and New York.

Outstanding Engineering Achievement Awards

Alex B. Best, staff engineer with Scientific-Atlanta, Inc., and James W. Stilwell, vice president of engineering development for Communications Properties, Inc., have been named recipients of the Outstanding Engineering Achievement Awards of the National Cable Television Association. Best was honored for his contributions to development; Stilwell for his contributions to operations.

Best and Stilwell were chosen by the Society of Cable Television Engineers, who based their selection on the men's "lasting contributions to the cable television industry." This is the fifth year NCTA has made awards for technical achievement.

Frank Bias

Alex Best

Jim Stilwell

Gulf Oil Exec. Will Address Engineers

WASHINGTON, D.C.—Robert Goralski, director of Public Relations here for the Gulf Oil Corporation, will be the Keynote speaker starting the technical sessions during the 26th Annual National Cable Television Association Convention, April 17-20, at the Conrad Hilton Hotel in Chicago.

Mr. Goralski directs Gulf's communications programs in the capital area and is a veteran NBC news correspondent. He covered the State Department and Pentagon and was the NBC News White House correspondent during the Kennedy and Johnson administrations. He has traveled to more than 40 countries and covered five wars, with several tours of duty in Vietnam, which he first visited in 1953. He reported on the 1967 Middle-East war and covered the 1965 Dominican Republic revolution and the 1962 Laos conflict. A frequent contributor to the NBC Nightly News and to the Today program, Goralski also reviews books on current affairs and wrote the Encyclopedia Britannica Yearbook articles on Vietnam.

Selection Process Difficult

Efforts to fill the vacancy at the National Cable Television Association caused by the death of engineering vice president Delmer Ports continue.

NCTA president Bob Schmidt has indicated he is working to fill the spot as soon as possible, hopefully by the time the association's convention begins in Chicago this month. It is understood, however, the Schmidt does not intend to fill the post precipitously in order to be at full strength in Chicago.

A number of candidates have been interviewed, *C/Ed* has learned, but the selection process is not a simple as one might think considering the changing nature of the industry and the NCTA leadership's approach toward coping with that change.

NCTA officials and the selection advisory committee are desirous of recruiting not only an individual with the necessary engineering background and familiarity with the industry but also one who, if at least not familiar with the role of a trade association as part of the regulatory environment, can certainly adapt to it.

To date, most candidates for the engineering vice presidency have been either strong on industry experience but without, perhaps it is expected, the necessary understanding of what the position entails. Others with solid engineering backgrounds in communications or other industries have still been unable to give the impression they can instinctively grasp the subtleties of cable television politics.

In any event, the association appears to not be procrastinating. Schmidt recently informed the advisory committee that he is well aware of the significant role the engineering vice president plays in the association and the industry. All recommendations are being reviewed.

Meanwhile, members of various industry engineering organizations and committees are to be commended for their eagerness to take up the slack in

Canadian Legislation *(Continued from Page 14.)*

The Canadian cable television industry feels very strongly that any change in jurisdiction can only be disruptive to the industry; and, in addition, bring about the possibility of dual, and conflicting, regulations.

The final major concern of Bill C-43 is the apparent emasculation of the CRTC, the body currently regulating Canadian cable television. Specifically, the first reading of the Bill states that, in effect, the minister of communications may set aside any decision, or any portion of any decision, or refer the decision, or any portion of the decision back to the CRTC for reconsideration. Where a matter is referred back for reconsideration, the CRTC may rescind the decision or confirm it either with or without change. In the latter case, the decision may still be set aside by the minister.

This provision holds a major change in the manner in which Canadian government is carried out with respect to its semi-judiciary regulatory bodies. Again, the fear of the cable industry is that public hearings and decisions by the CRTC will become meaningless and will be rescinded at will by the government for political expediency.

Only time will tell just how much of Bill C-43 will eventually become Canadian law and what the effect of this law will be on the Canadian cable television industry. It need hardly be said that apparently the future is viewed with some trepidation.

dealing with important technical and regulatory issues since Ports' death.

Study Committee Formed For Deaf and Blind

WASHINGTON, D.C.—The National Cable Television Association is sponsoring a committee to study and promote the uses of cable television in serving the deaf and blind.

In making the announcement, it was noted that many services have been successfully provided by cable systems; however, it was said more could be gained by bringing together the experience already gained in each independent effort.

The goal of the committee will be to provide a focus point for all work being done for the deaf and blind by the cable industry. The committee also expects to provide consultation and promote these extra services.

The committee will address three immediate goals:

1) To compile a bibliography and guide book containing the necessary information on programming, local and national deaf and blind associations, technical considerations and financing opportunities.

2) To work with the deaf and blind communities so that they are aware of the services possible, both now and in the future.

3) To act as a working research committee to study the possibilities of new techniques and stimulate interest in such things as national satellite distribution of captioning material for the deaf and "Talking Books" for the blind. In addition to technical considerations, financing of day-to-day operations through grants and paid advertising as well as the legality of delayed cablecasting and copyright will be studied. Recommendations will ultimately be made within the industry in the hope that cable can serve these two minorities on a national basis.

The first meeting will be held during the NCTA convention in Chicago. Cliff Schrock will act as the committee's chairman.

Southeastern SCTE Chapter Forms

ATLANTA, GEORGIA—The Society of Cable Television Engineers has announced formation of the Southeastern Chapter, covering the states of South Carolina, Georgia, Alabama and Florida, to provide local meetings and programming for cable television industry technicians and engineers.

Twenty-six people met during the recent Georgia CATV Association meeting in Atlanta and developed the new SCTE Chapter. Richard Hickman of Cox Cable chaired a committee to nominate interim officers. Guy Lee of Georgia Cablevision was elected president; Josh Miller, Gainesville Cablevision, vice president; and, John Weeks, John Weeks & Associates, secretary-treasurer. They will serve until fall, when new officers will be elected at the Southern Cable Television Association meeting in Atlanta.

Cable industry technicians and engineers who are interested in attending upcoming meetings in the southeast, should contact Guy Lee at 404-892-2288 for details.

SCTE Central New York Chapter Elects Officers

The Central New York Chapter of the Society of Cable Television Engineers has elected officers for the coming year. James Emerson, Northern CATV, is the chapter's new president; John Morovich of Goodvue Cablevision in West Nyack, NY, will serve as vice president; and Leo Barr, Teleprompter CATV in Ilion, NY, is the new secretary-treasurer.

Law Firm Expands

WASHINGTON, D.C.—Robert A. Bernstein has joined the communications law firm of Brown & Effros. Bernstein, 32, comes to the firm from Pittman, Lovett, Ford and Henessey. At one time he was with the Federal Communications Commission's Cable Television Task Force, the forerunner of the Cable Television Bureau. Attorneys say the firm will be known as Brown, Bernstein & Effros. Among its many communications clients is the Community Antenna Television Association.

SCTE Promoting Membership Drive And Contest

Members of the Society of Cable Television Engineers are eligible to win $250 in cash during a current Membership Drive sponsored by the Society.

SCTE has realized its greatest period of growth as an organization during the past 18 months, according to Bob Bilodeau, president. "Local chapters are staging meetings and panels across the country every week," says Bilodeau, "and our membership rosters are growing. As the SCTE grows, so are our budget requirements, so we're promoting Sustaining Memberships in the group."

Members in good standing of SCTE may take part in the contest. A check in the amount of $250 will be presented to the SCTE member who signs up the highest number of Sustaining Members. An SCTE Sustaining Member can be a supplier of hardware or services to CATV operations; state or regional CATV associations; operating companies; or individuals. The annual Sustaining Membership fee is $100 minimum. The contest ends June 1.

If a member of SCTE encourages his company to sponsor five new individual memberships in the Society, that will count as one Sustaining Membership toward the award of the cash.

Applications for Sustaining Membership in the Society of Cable Television Engineers should be made on company letterhead and addressed to Robert Bilodeau, President, SCTE, 1523 O St. NW, Washington, D.C. 20005.

NCTA TECH PROGRAM NEXT PAGE

TECHNICAL PROGRAM

26th ANNUAL NATIONAL CABLE TELEVISION ASSOCIATION

Convention & Exposition • Conrad Hilton Hotel • Chicago, IL • April 17-20, 1977

Monday, April 18

7:30 am to 6:00 pm **REGISTRATION**
Lower Lobby

ENGINEER'S LOUNGE
Williford Room, Parlor B

EYE OPENER SESSION
Williford Room, Parlor A

8:00 am to 9:30 am **Keynote Speaker**
Robert Goralski, Gulf Oil Corp.
Sponsored by the Society of Cable Television Engineers
Moderator/Organizer: Robert Bilodeau, Suburban Cablevision East Orange, NJ

9:00 am to 6:00 pm **EXHIBITS OPEN**

GENERAL TECHNICAL SESSIONS

11:00 am to 11:45 am **Advanced Techniques — I**
Williford Room, Parlor A
Chairman/Organizer: Robert V.C. Dickinson, E-Com Corporation, Berkeley Heights, NJ
CATV Application of Feedforward Techniques, Bert L. Henscheid, Theta-Com, Phoenix, AZ
The Ideal Modulator/Demodulator, Carl T. Johnson, Jerrold Electronics, Horsham, PA
Operational Fiber Optic System, Ronald Simon, TelePrompter Cable TV, New York, NY
Use of Automatic VIRS Correction and Automatic VITS Monitoring in a CATV Long Haul Microwave System, I. Switzer, Switzer Engineering Services, Mississauga, Ontario

10:00 am to 11:45 am **Human Reactions to TV Picture Impairment**
Williford Room, Parlor C
Chairman: Dr. Donald G. Fink, Executive Consultant, Institute of Electrical & Electronics Engineers, New York, NY
Organizer: James L. Lahey, Multipoint-Texas Inc., Houston, TX
Panelists: Archer S. Taylor, Malarkey, Taylor & Associates, Washington, DC; Robert E. Welch, University of Missouri, St. Louis, MO

12:00 n to 2:00 pm **LUNCHEON**
Grand Ballroom

6:00 pm to 8:00 pm **ENGINEERS' RECEPTION**
Waldorf Room
Presentation of Outstanding Engineering Achievement Awards

Tuesday, April 19

7:30 am to 6:00 pm **REGISTRATION**
Lower Lobby

EYE OPENER SESSION

8:00 am to 9:30 am **Special Displays and Services**
Williford Room, Parlor A
Moderator: Edward Horowitz, Home Box Office, New York, NY
An Investigation into the Problem of Character Generator Ringing or Second Image on Cable Systems, Alex Best, Scientific-Atlanta, Atlanta, GA
General Purpose Computers for Cable Television Systems, Raymond E. Daly, FCC, Washington, DC
Character Generator Program Techniques, Shirley Rohn, Cox Cable TV, Spokane, WA
Technical Description of an Automated TV Program Guide, R.E. Weiblen, Tele-Video Manufacturing, Towson, MD

SUNRISE SESSION

8:00 am to 9:30 am **Protection from Theft of Service**
Williford Room, Parlor C
Organizer: Ronald R. Simon, Teleprompter Cable TV, New York, NY
The Worth of Security, Dan Pike, United Cable Television Corp., Tulsa, OK
Addressable Control for Loop-Through Wiring, Joseph L. Stern, Stern Telecommunications Corp., New York, NY
Security of Equipment and Services —The Terminal Manufacturer's Role, Graham S. Stubbs, Oak Industries, Crystal Lake, IL

9:00 am to 6:00 pm **EXHIBITS OPEN**

GENERAL TECHNICAL SESSIONS

10:00 am to 11:45 am **Advanced Techniques—II**
Williford Room, Parlor A
Chairman: Joseph L. Stern, Stern Telecommunications, New York, NY
Systems Analysis and Design of an Optical Fiber System for CATV Applications, R. B. Chesler, F. W. Dabby and H. Berkowitz, Fiber Communications, Inc., Orange, NJ
Use of Low-Frequency Bi-Directional Digital Transmission on Cable, Michael L. Elis, International Cable Communications, San Diego, CA
Providing Life, Property and Fire Protection Through Cable Television: New Services Through Advanced Techniques, John D. Fannetti, Office of Electronic Communications, City of Syracuse, NY
A Frequency Modulation System for Cable Transmission of Video or Other Wideband Signals, Donald W. Lolli, CATEL, Mountain View, CA

10:00 am to 11:45 am **Everyday Operational Maintenance**
Williford Room, Parlor C
Organizer: Ken Walker, Magic Valley CableVision, Inc., Twin Falls, ID
Small System Trunking—A New Technique, John A. Hastings, C-COR Electronics, State College, PA
Reliable Design for Field Installation and Tests, A Lochanko, AEL, Inc., Lansdale, PA
Satellite Receive Earth Stations—A Practical Approach, Steven Rupp, Farinon Video, San Carlos, CA

12:00 n **LUNCHEON**
Grand Ballroom

2:00 pm to 5:00 pm **Hands-On Z to Z Daily System Operation**
Williford Room, Parlor B
(FCC Proof of Performance with Detailed Illustrations and the Use of Test Equipment)
Chairman: Ken Walker, Magic Valley CableVision, Twin Falls, ID
Engineers: Larry Dolan, Mid State Communications, Beech Grove, IN; Bob Welch, Wavetek, Beech Grove, IN

7:00 pm **NCTA ANNUAL BANQUET**
Grand Ballroom

Wednesday, April 20

7:30 am to 11:00 am **REGISTRATION**
Lower Lobby

9:00 am to 12:00 n **EXHIBITS OPEN**

EYE OPENER SESSION

8:00 am to 9:30 am **Small Earth Stations**
Williford Room, Parlor A
Moderator: Don Arndt, United Cable TV, Carpentersville, IL
Picture Impairments Analysis/Gray Scale Sync-Improvements of Small Earth Terminals, Jack Golin, Michael Kolcun and Marvin P. Sassler, ITT, Ramsey, NJ
Comparison of Performance Criteria of Five and Ten Meter Earth Terminals, Jim Hart, Scientific-Atlanta, Atlanta, GA
"Space 1999" and CATV, David Reiser, Microdyne Corp., Rockville, MD
Earth Stations in Smaller Packages, Carl Van Hecke, Andrew Corp., Orland Park, IL
Earth Station Frequency Coordination, Don Yost, Compucon, Dallas, TX

SUNRISE SESSION

8:00 am to 9:30 am **Pay Cable Functions and Related Problems**
Williford Room, Parlor C
Chairman/Organizer: Richard C. Hickman, Cox Cable Communications, Atlanta, GA
Information Services, Herman J. Moeller, Reuters, New York, NY
Video Tape Cassette Dubbing and Operational Improvements, Edward W. Stark, Cox Cable Communications, Atlanta, GA
Testing Video Signal to Noise Ratio Using a Modified Staircase Waveform, Robert Tenten, Home Box Office, New York, NY

GENERAL TECHNICAL SESSION

10:00 am to 11:45 am Testing and Maintenance
Williford Room, Parlor A
Chairman/Organizer: O.D. Page, P.E., Cable Consultant, Washington, DC
Stop Dig-Ups—One Call Concept, David Punches, Claude Gray and Mike Digon, AT&T, New York, NY
Signal Leakage and Interference with Over-The-Air Radio Services, Dr. Robert S. Powers, FCC, Washington, DC
Is Your System Paying Too Much for Plant Power, James K. Waldo, Teleprompter Corp., El Paso, TX

12:00 n to 2:00 pm **LUNCHEON**
Grand Ballroom

3:00 pm to 6:00 pm **ENGINEERING FIELD TRIPS**
Sponsored by the Society of Cable Television Engineers North Central Chapter
Red Tour Host: Andrew Corp. Tour of Plant and Earth Station Installation—approx. 3 hrs. Usher.
Blue Tour Host: Chicago Sears Tower. Tour to Broadcast & Television Installation. Usher. Limited to first 20 applicants.

NOTE: Sign up for the tours in the Engineer's Lounge, Williford Room, Parlor B, mornings only.

If the only thing your cable supplier gives you is cable, put him out to pasture.

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A great company.

April 17-20
CATV
See us at booth 815

NAB COVERAGE 1977

Washington, D.C. was the site of the National Association of Broadcasters annual convention last month. The show was the largest held in the nation's capital and it bulged at the seams because of the limited convention facilities. Held in three separate hotels, the logistics posed tremendous problems for many who attended, and the exhibitors were quoted as saying, "This was a nightmare to set up in Washington." One can certainly hope that NAB does not consider Washington again until adequate convention facilities are built.

But, in spite of the accomodations, this NAB was the biggest and best yet, drawing over 6,000 radio and television executives from around the country. The highest interest seemed to be in AM stereo and portable color camera systems for news coverage.

Many of the major transmitter and monitor manufacturers were showing AM stereo. So many, in fact, one complete room was set aside for these manufacturers to collectively show their wares.

The proposed AM stereo systems will use some variation of AM for the main channel and phase modulation of the carrier for the sub-channel. The systems appear to work well, however, there still is much concern over the performance in the fringe areas, or in the presence of reflected signals.

Phillips and RCA both showed live pictures from around the city throughout the show. And all camera manufacturers were demonstrating portable high performance color cameras for live news and sports. It is expected that the use of live "Action Cam" systems will continue to replace many of the film systems presently used by stations.

The four day assembly included keynote speeches and panel discussions by FCC officials, broadcasters and congressmen.

Some of the highlights:

- Congressman Lionel Van Deerlin, chairman of the House communications subcommittee, told a radio session of the convention that he's in favor of repealing the Fairness Doctrine which, he says, is unfair because "there is no basis for a first amendment distinction between broadcasting and the print media."
- NAB president Vincent T. Wasilewski warned that "unless broadcasting . . . gains its full First Amendment rights, all media will suffer, and the public will be the inevitable loser." Wasilewski added that broadcasting must end its "second class citizenship under the First Amendment."
- CBS commentator Eric Sevareid spoke to a large audience about the inconsistency of First Amendment rights between the electronic and print media. "I could never understand why so basic a right as the First Amendment could be diluted or abridged simply because of technological change in the dissemination and reception of information and ideas," he said. Sevareid said he would welcome more diversity in programming, even if that meant more than three major networks. "Four, or even five (networks) would be all right with me, and I think all right with most broadcast journalists, assuming they would be economically viable; and if they could provide the marvelously superior and different kinds of program fare that is supposed to be out there, somewhere, then everybody would be happy indeed."
- Senator Ernest F. Hollings, chairman of the Senate communications subcommittee, told television executives that an extension of the present three-year license term to five years should enhance the quality of programming offered the viewing public. Senator Hollings said that violence on television is strictly an industry problem that can be resolved without government regulation. He also predicted that the present session of Congress will not accomplish any "mammoth rewrite" of the Communications Act of 1934.
- Vincent T. Wasilewski, president of NAB, told the television assembly that he is opposed to the recent U.S. Circuit Court of Appeals decision.


HARRIS

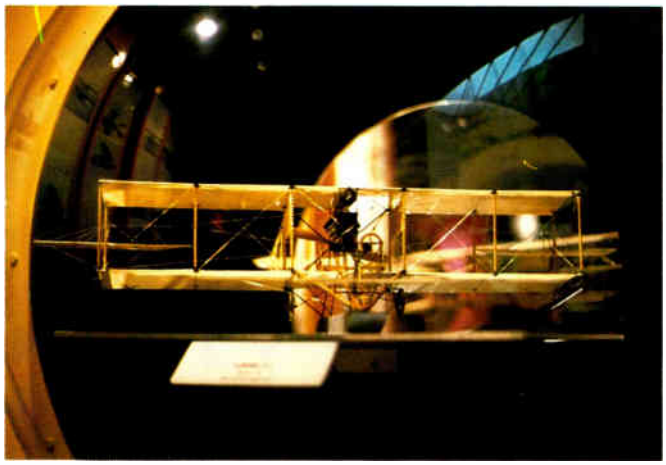

McCurdu


MICROWAVE ASSOCIATES

Smithsonian Institution

New Air and Space Museum

cable of the future



Top left: Early Army Air Service passenger and cargo plane; top right: One of the animated displays controlled by the cable-computer system; bottom: model of the first Wright Brothers first powered aeroplane.

The new Air and Space Museum is rapidly becoming the number one attraction in Washington, D.C. It contains more aviation and space travel artifacts than any other single location in the world. You can see the first Wright brothers' airplane, the Spirit of St. Louis, war planes, modern commercial aircraft, space capsules, launch rockets and satellites. Many of the space craft are either the actual machine used for the mission, or the backup unit.

The Air and Space Museum houses a special, although not obvious, attraction for cable people; the most sophisticated two-way cable system in the world. The entire museum audio-visual system is controlled via a computer operating on the cable system.

Traditional museums are plagued with maintenance problems. With hundreds of separate projectors and audio systems, maintenance men can easily be run ragged trying to get to each display and check for problems.

That is why Herman Otano decided to monitor each display with the computer system.

Most displays *do not* use TV monitors, rather, they are built around conventional motion picture and slide projectors. The cable system is used to monitor all the portions of each display, such as picture and sound synchronization, projection bulb failures, mechanical problems, etc. The system can also detect such things as tampering with displays, and might someday be used to control lighting, temperature, and security of the entire museum.

The cable system also has standard and midband channels that are used for

Top: Center gallery containing an actual Wright glider, The Spirit of St. Louis, and an actual space capsule used for an earth orbit mission; left: Full size painting of a military bomber in the War Aircraft Gallery; right: Dual computer system used to control exhibits via cable.

closed circuit special programming. Events such as a space launch could be watched live at many points around the museum, and video tapes are distributed and played to the meeting rooms surrounding the museum.

The idea of using cable initially came about when the museum staff realized that it would take thousands of telephone type wires to interconnect and control all the exhibits within the hall. Hughes Corporation supplied a universal terminal (MCTD) that contained 34 data points (the equivalent of 34 control lines between the exhibit and the computer). The universal terminal operates using a wideband FSK signal in the 108 to 112 MHz band, with a return signal in the 18-24 MHz band (T-9). The two-way cable runs throughout the exhibit halls and has a separate terminal (MCTU) at each exhibit. the MCTU contains eight A to D converters that monitor voltages at each exhibit plus 16 Off-On type inputs to check for switch closures and synchronization of achines. The MCTU's are presently used at 90 places in the in the museum.

The dual computer system checks each point in the museum 5 times per second, and provides a printout of any irregularities. At the beginning of each day, the museum is "turned on" and all the displays are activated by the computer. The computer checks and corrects audio and visual until all displays are in sync. The staff has found many interesting characteristics in the displays that leads to better overall operations. For instance, they noted that the current in the projection lamps rises slightly a couple of hours before failure. By programming the computer to printout this advanced warning, someone can change a lamp before failure.

An alarm system is instantly activated if any of the exhibits, such as the moon rocks display, are tampered with. A guard can be dispatched immediately.

Even the audio systems (over 100 continuous channels) is unique. Although not a part of the cable system, audio is delivered to the displays on a 16 channel multiplexed cable. Each exhibit or exhibit hall has only one audio cable coming from the computer center, however, each wire can handle up to 16 separate audio tracks.

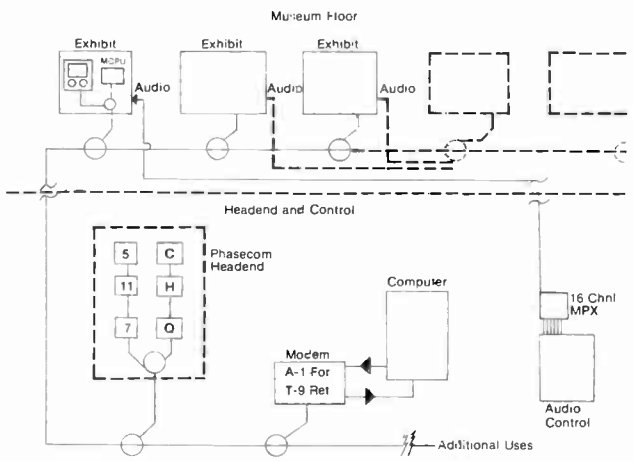
Paul Wargher of Hughes works continuously on site, improving and expanding the system. With the tremendous monitoring capability, the staff is experimenting with sensors to detect outside light, and after monitoring this for about six months, plans to start controlling the museum lighting to take advantage of the "free" natural light that illuminates much of the building. They ultimately plan to also control the temperature and humidity of the complex.□

The Air and Space Museum in Washington, D.C. has substituted modern cable and computer techniques for a system that would have been restrictive to build using conventional hardwire type techniques.

The 90 Hughes terminals provide 34 data points per terminal with 1000 terminal capability per 4 MHz bandwidth on the cable. This means that 34,000 data points could be provided by the present system.

The cost of each terminal (MCTU) is about $1,000. This means that each data point costs less than $30. The same data point would cost about $120 using conventional wiring. The interface translator between the computer and the MCTU plus a modem cost about $13,000.

The cable portion is a conventional two-way system using Phase-com headend processors and Theta-com amplifiers. The cable system uses midband channels for internal distribution, with Sony video tape machines at one location providing most of the video. Midband channels A through Q are available. In addition, the staff has off-air signals available for distributing special events live through the entire museum.



Top left: Rear projection exhibit; top right: Douglas DC-3; left: Hughes MCTU's; center: Paul Wargher-Hughes, Herman Otano-Smithsonian, and the system operator (girl); right: Launch vehicles; bottom: Otano showing Phasecom headend.

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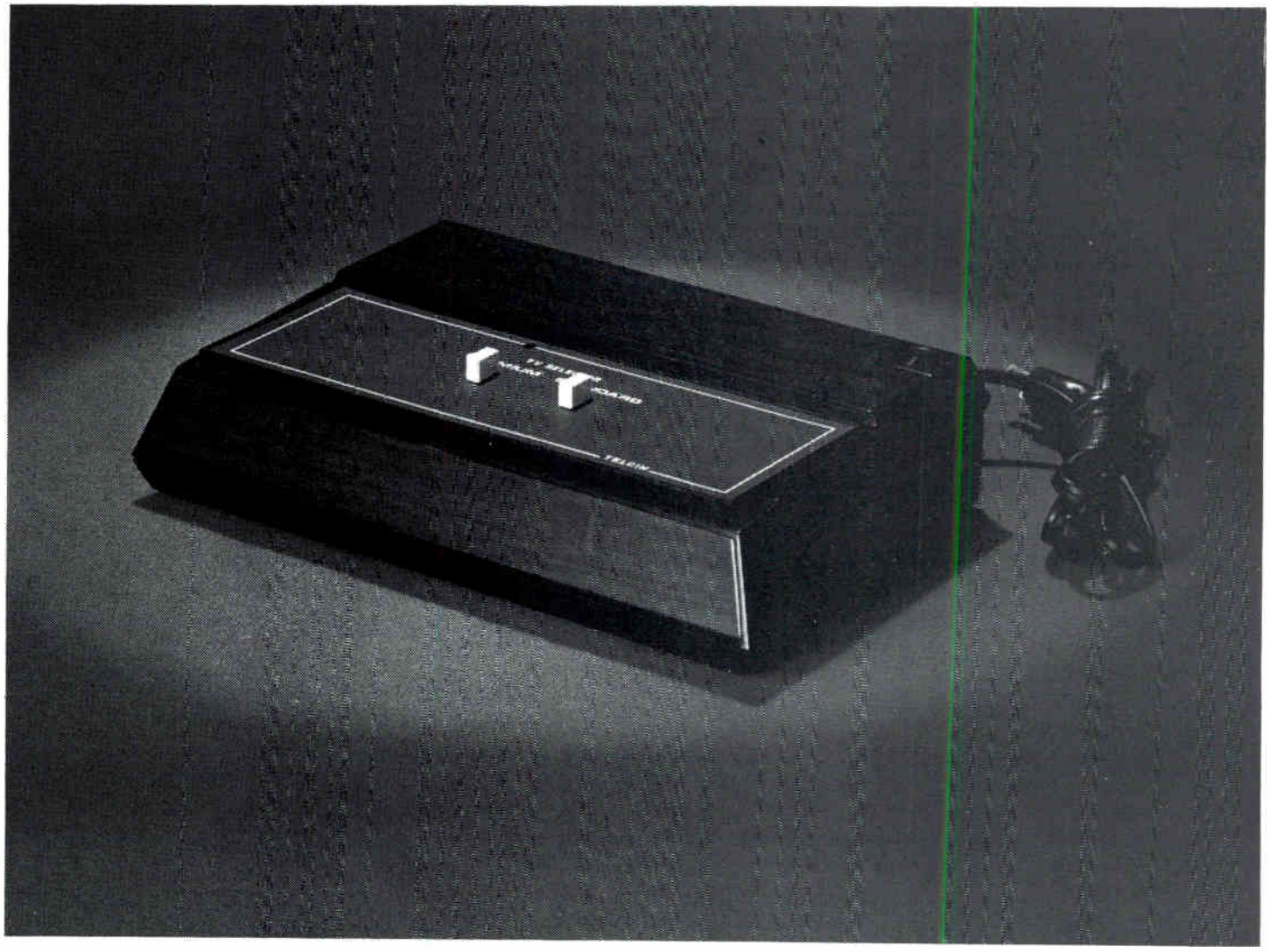

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The Applications of AGC/ASC Amplifiers

By Eric W. Chisholm, P. Eng., Jerrold Electronics Corp.

INTRODUCTION

Automatic gain/slope control amplifiers have been used in CATV systems for many years. These amplifiers are used to maintain signal levels when the levels attempt to change for any reason. Unlike the thermally controlled amplifier, the AGCASC amplifier senses the level of two reference carriers and adjusts the gain and slope of the amplifier to compensate for any change. The sensing of carrier levels avoids the accumulation of errors in amplitude that occur with thermal compensation. Unfortunately, it is possible that the immoderate use of this type of amplifier will degrade certain system performance parameters. The result of these degradations will be manifested by periodic variations in system levels and flicker on television screens.

An alarming number of system design proposals using long cascades of AGC/ASC amplifiers have been noted during the last few years. The practical realization of these system designs may well feature unexpected behavior, and in some cases, unacceptable performance; depending upon the characteristics of the particular amplifiers employed. These contiguous AGC/ASC amplifier system designs have been suggested in order to compensate for the insufficient thermal cntrol provided by the associated manual trunk amplifiers.

The first section of this article describes the transient behavior of AGC amplifier cascades. The second section will examine some of the more undesirable effects on system performance and the final section will summarize measures both the system and equipment designers must take in order to reduce this undesirable behavior.

Section I
Characterization of AGC Amplifier Cascade Behavior

1. The Transfer of an AGC Amplifier

The block diagram of a typical automatic gain control amplifier is shown in Figure 1. The output of the amplifier is sampled by the directional coupler, and a single carrier, selected by the bandpass filter, is amplified and detected. The output of the detector is compared to a DC reference voltage. If there is a difference between the two voltages, the attenuation of the gain control is adjusted in such a manner as to make the detector output and the reference voltages equal. A low pass filter is provided to reject any low frequency signals present on the voltage applied to the gain control circuit.

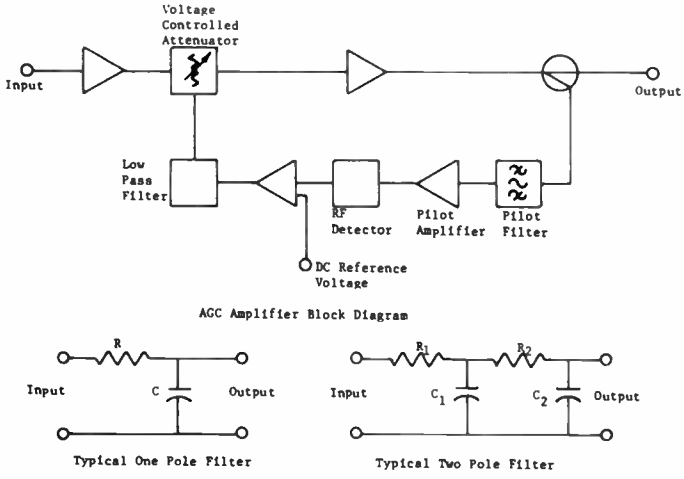

Figure 1

Typical AGC Amplifier and Loop Filters

The low pass filter contributes the dominant poles, establishes in large part the loop frequency response, and determines the stability of the AGC loop. The slope of the open loop AGC frequency response must be less than 12 dB/octave at the unity gain frequency or the closed loop AGC system will be unstable. If the open loop slope is 6 dB/octave the AGC amplifier will be unconditionally stable [1]. Two types of loop filters have been used in AGC amplifiers—the one pole (6 dB/octave slope) and the two pole (12 dB/octave slope) types. AGC amplifiers that employ two pole loop filters are marginally stable and will possibly exhibit overshoot in the step response.

Consider an AGC amplifier that is subject to a step change in the pilot carrier input level as shown in Figure 2a. The output response will generally approximate that shown in Figure 2b. Since the voltage across the capacitor in the loop filter cannot change instantaneously, the leading edge of the output response is not affected. As the voltage across the capacitor begins to change towards the new voltage, the increasing loss of the gain control circuit reduces the voltage to which the capacitor is charging. As time progresses, the RF amplifier output will approach its pre-transient level. Any difference between the final output and the initial output level constitutes the AGC loop steady state error. The error results from the finite gain of the overall AGC loop.

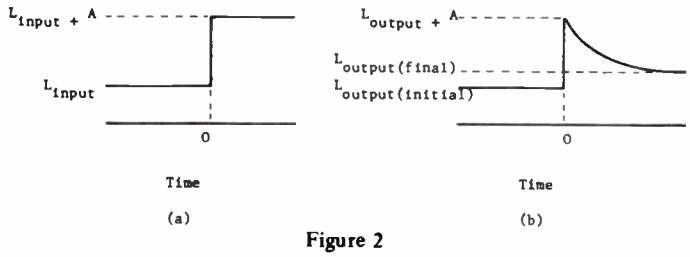

Figure 2

Input and Output Waveforms

Although the voltage-attenuation coefficient of the gain control and the RF detector conversion factor are not constant, it has been shown that the AGC loop is linear if the input level change and the change in amplifier gain are decibel functions, and the input level change is 3 dB or less [2].

When the loop filter is a single pole type, the change in the RF output level may be represented by a simple exponential decay. The step response of the AGC amplifier can accordingly be expressed as:

$$c(t) = A\left[\frac{1}{G} + \left(1 - \frac{1}{G}\right)e^{-at}\right] + L_o,\ t \geqslant o \qquad \text{(i)}$$

where

$c(t)$ = output level of the amplifier (dBmV)

A = amplitude of input step (dB)

G = loop gain (ratio)

a = reciprocal of the AGC loop time constant (sec^{-1})

t = time (sec)

L_o = initial output level (dBmV)

Since the steady state error is usually quite small and its effect on the transient response is to reduce the amplitude of the input level step, equation (i) can be approximated by:

$$c(t) \cong Ae^{-at} + L_o \quad , t \geqslant o \qquad \text{(ii)}$$

2. Theory of AGC Amplifier Cascades

So far, we have considered only the step response of a single amplifier. In order to determine the step response of a cascade of AGC amplifiers we can proceed as follows:

From Laplace transform theory it is known that:

$$C(s) = H(s)R(s) \qquad \text{(iii)}$$

where

$R(s)$ = Laplace transform of the input function

$H(s)$ = Laplace transform of the impulse response of the AGC amplifier

$C(s)$ = Laplace transform of the output function

By rearranging (iii) we obtain:

$$H(s) = \frac{C(s)}{R(s)} \qquad \text{(iv)}$$

From a Table of Laplace transforms the transform of a step function is:

$$R(s) = \frac{A}{s} \qquad \text{(v)}$$

The Laplace transform of the expoential function in (ii) is:

$$C(s) = \frac{A}{s+a} \qquad \text{(vi)}$$

Substituting (v) and (vi) in (iv) gives:

$$H(s) = \frac{s}{s+a} \qquad \text{(vii)}$$

Consider a cascade of n AGC amplifiers where n is the number of amplifiers employed. If the delay introduced by the cable is negligible, it follows from (iii) that:

$$C_n(s) = H_n(s)C_{n-1}(s)$$

$$= H_n(s)H_{n-1}(s)C_{n-2}(s)$$

$$= H_n(s)H_{n-1}(s)H_{n-2}(s) \ldots\ldots H_1(s)R(s) \qquad \text{(viii)}$$

If all the amplifiers are identical, then equation (vii) reduces to:

$$C_n(s) = H^n(s)R(s) \qquad \text{(ix)}$$

Substituting (v) and (vii) in (ix) the equation becomes:

$$C_n(s) = \frac{As^{n-1}}{(s+a)^n} \qquad \text{(x)}$$

Appendix I shows that the inverse Laplace transform of (x) is:

$$c_n(t) = Ae^{-at}\left\{\sum_{i=1}^{n} \frac{(n-1)!}{(n-i)!\ [(i-1)!]^2}(-at)^{i-1}\right\} + L_o \qquad \text{(xi)}$$

Since the above equation is obviously difficult to evaluate manually, a digital computer was employed to obtain the results presented in Figure 3 for several values of n, with A equal to 1 dB. Examination of the resulting family of curves reveals that:

1. The initial rate of change of the output of the nth amplifier is n times greater than the rate of change of the output of the first amplifier.
2. Overshoot and ringing are evident at the output of the nth amplifier, even though the output of the first amplifier does not exhibit any ringing or overshoot. (This is only true for the single pole case discussed here.)
3. The magnitude of the overshoot is directly proportional to n.
4. The time required for the output of the nth amplifier to settle – +2% of the final value is approximately constant with n.

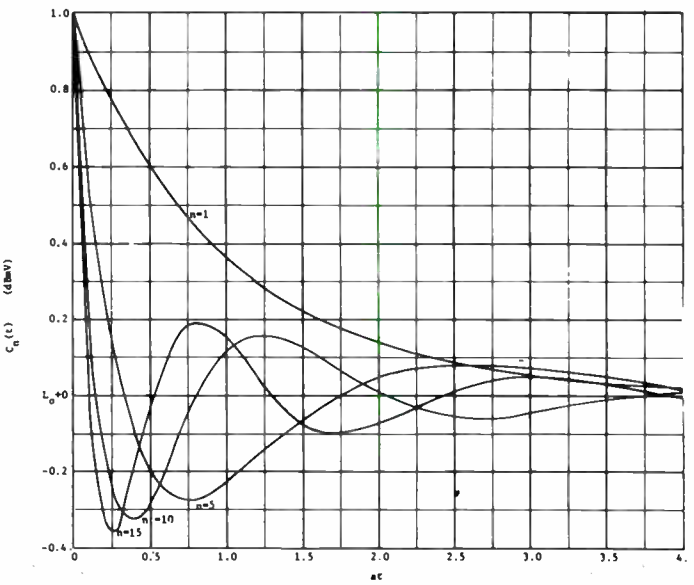

Figure 3
Theoretical Step Response of an AGC Amplifier Cascade (A = 1 dB)

In actual practice, the AGC loop time constant of each amplifier differs due to the tolerance on component values. An analysis similar to the preceding was made with the assumption that the time constants were uniformly distributed and that none of the amplifiers had the same time constant. The resulting equation for cn(t), although different in form from equation (xi),


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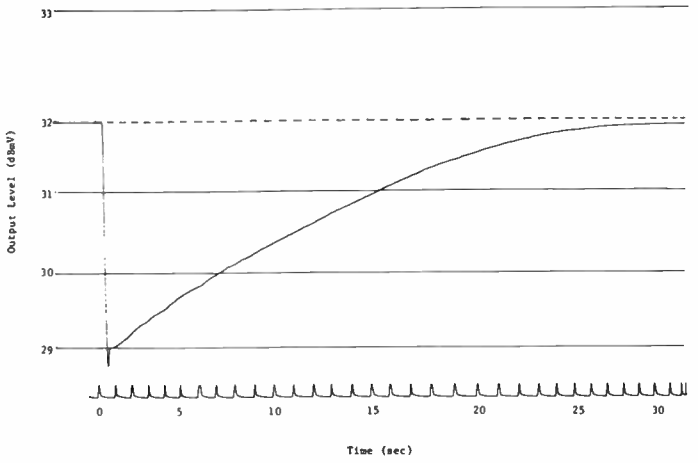

Figure 4
Step Response of 1 Amplifier

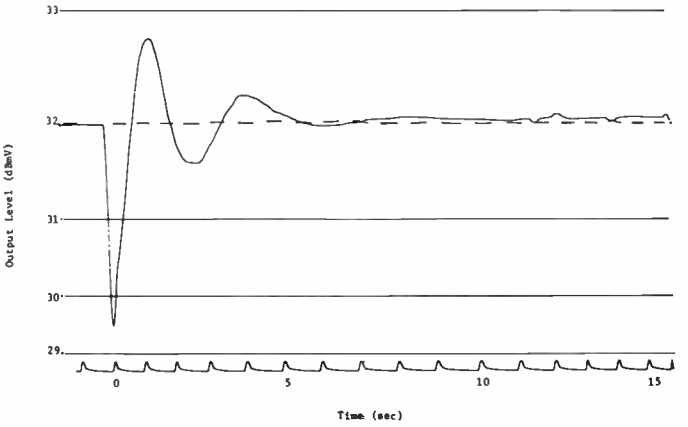

Figure 7
Step Response of 15 Amplifiers

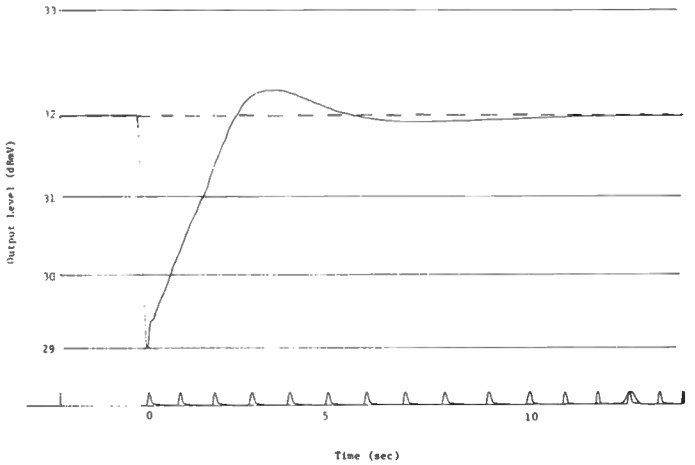

Figure 5
Step Response of 5 Amplifiers

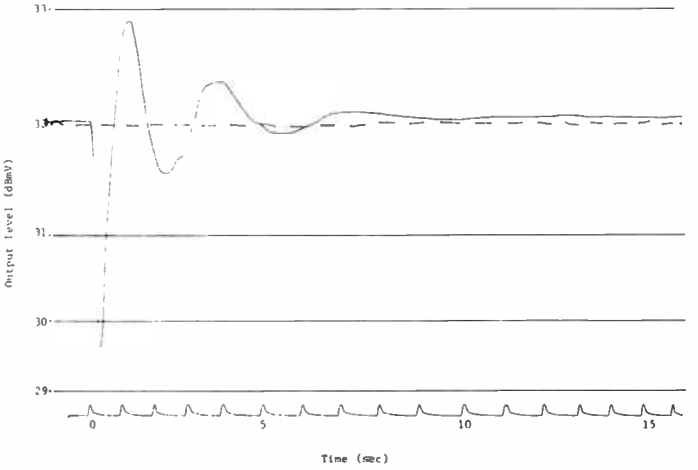

Figure 8
Step Response of 20 Amplifiers

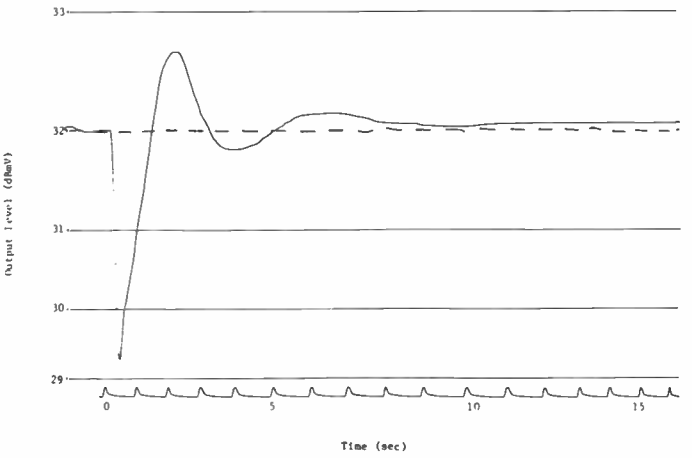

Figure 6
Step Response of 10 Amplifiers

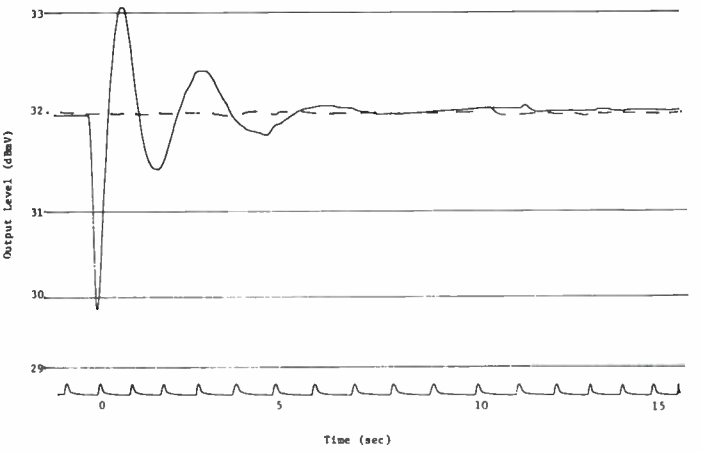

Figure 9
Step Response of 25 Amplifiers

yielded values within 15% of those produced by (xi).

The above analysis has been based on an AGC amplifier controlled by a single pilot carrier. The transient response of a dual pilot gain/slope controlled amplifier will be similar to that of a single pilot AGC amplifier, except that greater overshoot and ringing due to interaction between the two pilot carrier control loops may be anticipated.

3. Cascade Tests

In order to verify the behavior predicted by equation (xi), a cascade of standard Jerrold SAM-PT amplifiers was established. The step response of this cascade to a 3 dB decrease in the pilot level is shown in Figures 4 through 9.

The responses are quite similar to those predicted by theory. Again, component tolerances invalidate the assumption that the time constants are equal for all amplifiers. The major effect of this time constant variation is to reduce the amplitude of the overshoot.

It may be noted that some of the illustrations do now show the initial 3 dB step. This is due to the slew rate limitations of the x-y recorder used to obtain the plots.

4. Analog Simulation

Equation (ii) shows that the step response of an AGC amplifier is identical to that of a high pass filter. It was decided that the response of an AGC amplifier with a two pole filter could be equally modeled with two cascade high pass filters. This would allow the convenient evaluation of the time-amplitude response.

Accordingly, a cascade of AGC amplifiers was simulated using resistor-capacitor networks isolated by unity gain operational amplifiers. Since the worst case situation occurs when R1 equals R2 and C1 equals C2 (see Figure 1), these

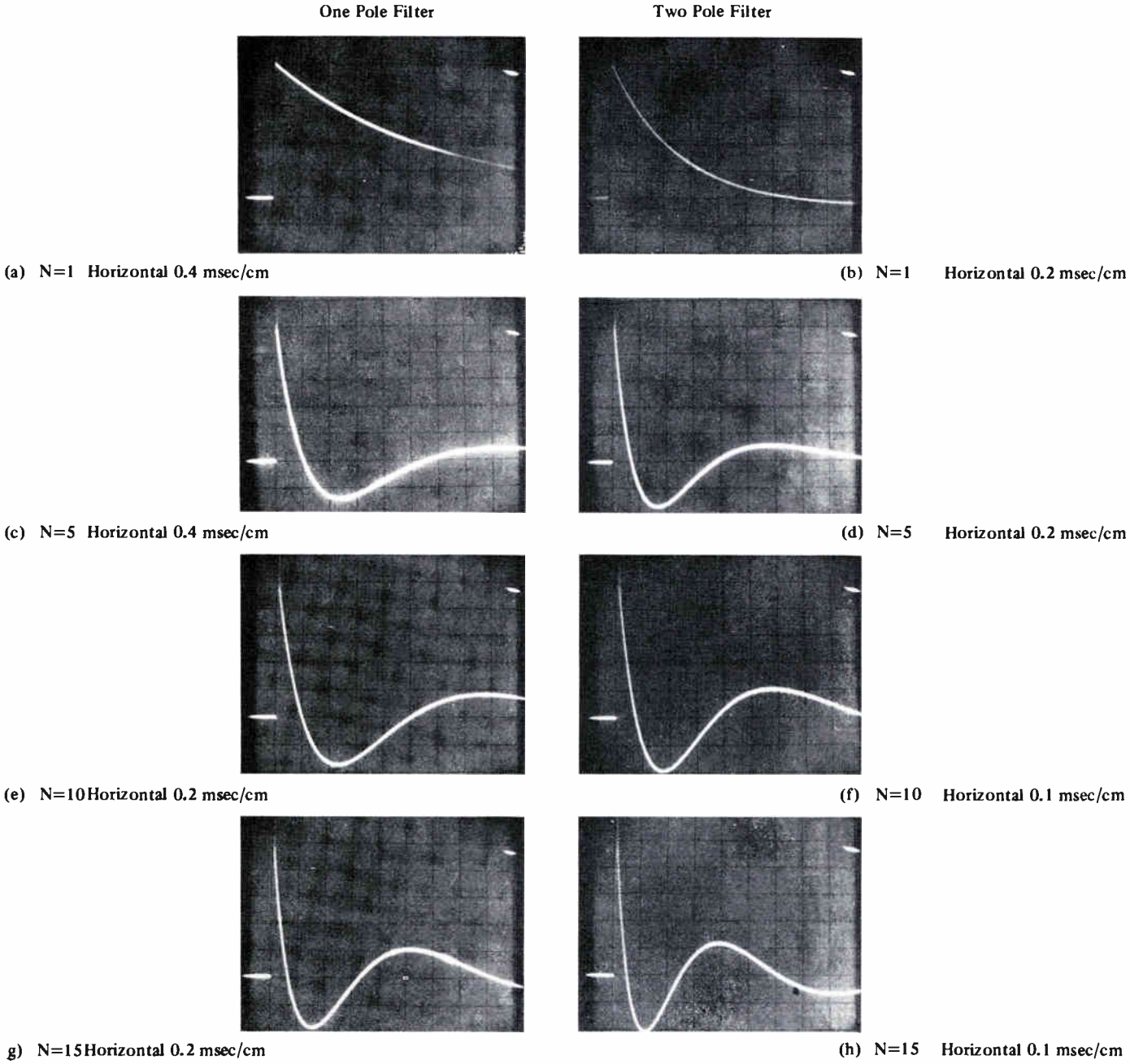

Figure 10
Simulated Step Response

component constraints were used.

Examination of the results of the simulation demonstrated in Figure 10 indicates that the one and two pole loop filter cases produce similar responses; as expected, the over-shoot is somewhat greater for the two pole case than for the one pole case.

Section II
Potential System Problems

1. Cascade Instability

Examination of Figure 3 reveals that the magnitude of the overshoot increases with n. This implies that the stability of the cascade decreases as the number of AGC/ASC amplifiers used increases. Any small level instabilities are accentuated by succeeding AGC/ASC amplifiers.

Connector interfaces, "shot" noise in the amplifier control loop, common band distortion, high level simultaneous sweep signals; and amplifier power supply transients resulting from longitudinal sheath currents [3], are some of the sources of small pilot level variations.

As a result of the above, signal levels at the end of a cascade will exhibit random fluctuations. Transients that are to some degree repetitive will cause periodic variations in levels.

2. High Level Transients

Consider the situation where the first amplifier in a cascade of n AGC amplifiers fails or, alternatively, AC power to the amplifier is cut off. The succeeding amplifiers will respond to the absence of the pilot carrier by increasng their respective gains. When the defective amplifier is replaced or power is restored, the peak transient output level of the last amplifier is:

$$L_p = ng_r + L_o \qquad \text{(xii)}$$

where

L_p = instantaneous peak output level of the n^{th} amplifier (dBmV)

g_r = reserve gain of each AGC amplifier (dB)

L_o = normal output level (dBmV)

The following table illustrates the amplitude of this type of transient:

n	L_p (dBmV)
7	59
10	71
20	111

where $g_r = 4$ dB and $L_o = 31$ dBmV

The above equation is not valid if Lp is large, since any practical amplifier has an output power Imitation beyond which compression occurs. This level is typically 80 dBmV or 10 volts with present day amplifiers [4].

Although this transient exceeds 3 dB in amplitude and, consequently, equation (xi) cannot be used, it has been observed

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that this transient collapses exponentially on a 25 amplifier cascade (Figure 11).

The transient that occurs when 25 AGC amplifiers in cascade are re-powered is different from the single amplifier situation. From Figure 12, the transient is approximately 8 times the duration of the transient generated by the repowering of one amplifier.

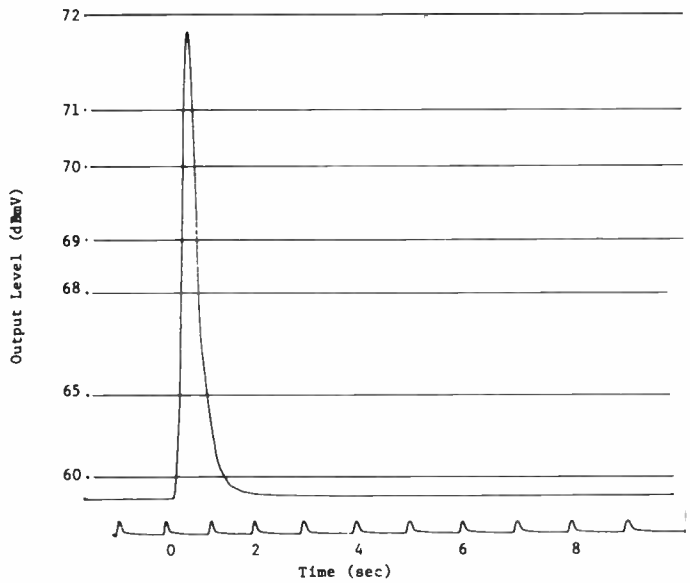


Figure 11

High Level Transient

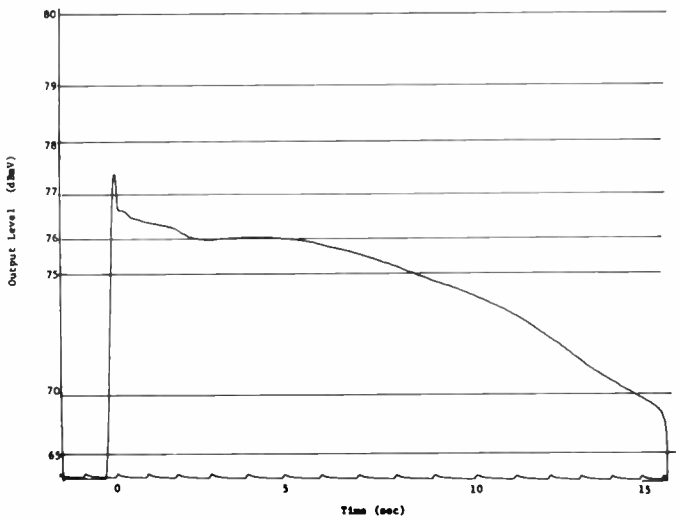


Figure 12

High Level Transient

These high level transients will have an effect on station reliability since the transistors used in the amplifier are not expected to operate at elevated RF voltages. Possible failure mechanisms are second breakdown and avalanche breakdown [5]. Fortunately, the second breakdown mode, which is a local "hot" spot phenomenon, is less likely to occur at low ambient temperatures where the reserve gain of the cascade is the greatest. A literature search by the author revealed that the effect of elevated drive levels on the MTBF of CATV devices has apparently not been fully explored.

Another possible result of the exposure of an amplifier to these transients is a "softening" of the semiconductor characteristics. The distortion produced by a transistor after it has been subjected to "excessive" RF levels has occasionally been observed to increase considerably.

3. Transfer Modulation

Any low frequency components within the passband of the AGC loop will be present at the DC input to the RF gain control network in the amplifier. This will cause the gain to vary, thereby amplitude modulating all RF amplifier signals.

Transfer modulaton is a form of signal distortion with characteristics similar to hum modulation.

If each amplifier generates the same amount of transfer modulation, and if the source of the low frequency components is the same, then the transfer modulation will add on a voltage basis:

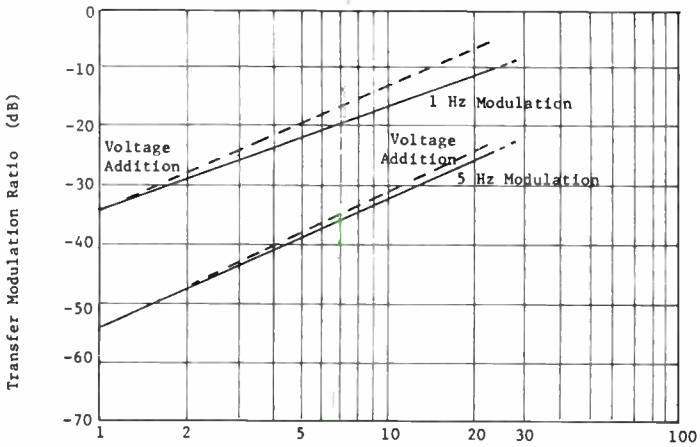
$$TM_n = TM_a + 20 \log_{10} n \qquad \text{(xiii)}$$

where

TM_n = transfer modulation radio of the cascade (dB)

TM_a = transfer modulation ratio of a single amplifier (dB)

Measurements were made on an AGC amplifier cascade in order to determine the validity of the above equation. The results are plotted in Figure 13. Since the control loop is designed to reduce the output level when it attempts to increase, the modulation present on the pilot carrier will be reduced. For this reason, equation (xiii) is an approximation and will give a worst case TMn figure.



It can be seen that, if the amplifier non-linear distortion is insignificant, the length of an AGC/ASC amplifier cascade may be limited by the amount of transfer modulation that can be tolerated. The use of video carriers as the reference signals aggravates this problem, unless steps are taken, because of the presence of 60 Hz pulses in the video signal.

Section III
Avoiding Potential System Problems

Today's high performance amplifiers tend to accentuate the undesirable effects of AGC/ASC amplifiers when they are employed in long cascades. This is particularly true when these systems are operated in the extremes of climate endemic to

many parts of Canada. Since transients are inherent, and it is impossible to construct an AGC/ASC amplifier which can predict the occurrence of a transient; both system and equipment designers alike should endeavor to improve the behavior of these large systems.

1. Overall Considerations

The single, most important means of reducing the problems outlined in this paper is to use an absolute minimum number of AGC/ASC amplifiers in the system. The responsibility thus lies with the system designer to select both manual and automatic trunk amplifiers that provide accurate thermal compensation for both cable loss and amplifier gain changes.

To adopt the design philosophy that if the use of some AGC/ASC amplifiers in a system is beneficial, then the use of AGC/ASC amplifiers at every station adds even greater benefits, is not only uneconomical, but imprudent.

2. Additional Design Considerations

Regardless of the design philosophy employed, consideration should be given to the effects of transients on the system. For convenience, Table I summarizes steps that can be taken to further analyze and improve system behavior.

Examination of the summary shows that there are conflicting constraints on the AGC/ASC amplifier loop time constant. In order to minimize transfer modulation, the time constant should be as long as possible. However, ease of field setup, minimization of the system settling time, and reduction of the duration of high level transients dictate a short time constant.

Parameter	System Planner Action	Equipment Designer Action
Cascade Stability	Require assurance from the equipment manufacturer that the use of the proposed number of AGC/ASC amplifiers will provide stable levels over the expected range of operating temperatures.	Cascade tests to validate the design.
Settling Time	Determine that the time constant of the AGC/ASC amplifier is fast enough to permit levels to settle after responding to an initial change in level caused by continuously changing ambient temperatures.	Use special circuit techniques to allow the use of short time constants in the AGC/ASC amplifier control loops.
High Level Transients	Use standby power at the headend and on system AC power supplies. Employ LSC over-voltage protected power supplies at all amplifier stations. Use the maximum cable spacing possible in order to reduce the amplifier reserve gain, provided that other system parameters are not degraded.	Protect power supplies from LSC voltages. Use short time constants in order to reduce the duration of transients. Design for a reasonably small variation in the amplifier maximum gain. When economically feasible, provide circuitry to protect the amplifier.
Transfer Modulation	Check that the transfer modulation ratio at the extremities of the system is within acceptable limits.	Use long time constants to reduce the AGC/ASC amplifier transfer modulation ratio.
Reliability	Since the additional components required to implement the AGC/ASC function will generally degrade the amplifier MTBF, the reduced system reliability must be determined to be acceptable.	Ensure that the AGC/ASE components are sufficiently reliable to have only a minor effect on the amplifier failure rate.

These conflicting requirements can be met by using a peak detector in the control loop after the RF detector. The peak detector, by responding only to the peak voltage generated by the RF detector, effectively rejects any modulation frequencies present, permitting the loop time constant to be made substantially smaller.

The above considerations, adequate thermal compensation, improved AGC/ASC amplifier circuitry, and LSC over-voltage protection have been incorporated in the latest generation of Jerrold trunk amplifiers.

Another approach, beyond the scope of this paper, to reduce some of the effects of automatic amplifiers on system behavior is to use different reference carriers on different amplifiers. Numbering AGC/ASC amplifiers sequentially, all odd numbered amplifiers use one set of carriers, for example channels 4 and 12; all even numbered amplifiers use another set of carriers, for example channels 3 and 11. When the channel 4 input level to an odd numbered amplifier changes in a step-like manner, the channel 3 output level of the same amplifier changes in the opposite direction and without the sudden change shown in Figure 2. For this reason it can be expected that the inherent cascade transient will be reduced. This is a suggested technique which has not been evaluated to determine any improvements that are obtained.

Conclusion

It has been shown that long cascades of AGC/ASC amplifiers degrade the performance of a CATV system in certain respects. The length of a cascade may be limited by the amount of transfer modulation and transient amplification that can be tolerated. The occurrence of system outages may damage succeeding amplifiers when the system is restored to operation.

In order to maintain system stability, due regard should be given to the prevention or reduction of transients; the use of amplifiers designed with adequate open loop thermal compensation will allow the system designer to minimize the number of AGC/ASC amplifiers required in the system.

Acknowledgements

I would like to express appreciation of the assistance of Dr. Jacob Shekel of the Jerrold, Horsham facility, in providing a computer evaluation of equation (xi); John Anderson in obtaining the cascade data presented; and my thanks to Peter Ward for assisting in the preparation of this article.

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Appendix I

The inverse Laplace transform of Dn(s), equation (x), is determined in this appendix.

The partial fraction expansion of Cn(s) is (see [6]):

$$c_n(t) = A_1 e^{-at} + A_2 te^{-at} + A_3 \frac{t^2}{2!} e^{-at} + \ldots$$

$$\ldots + A_n \frac{t^{n-1}}{(n-1)!} e^{-at} \qquad \text{(A-i)}$$

where

$$A_i = \frac{A}{(n-i)!} \frac{d^{n-i}}{ds^{n-i}} \left[s^{n-1} \right]_{s=-a}$$

$$i = 1, 2, \ldots, n \qquad \text{(A-ii)}$$

Manipulation of (A-ii) reveals that

$$A_{i-1} = \frac{1}{n-i+1} \frac{d}{ds} \left[A_i \right]_{s=-a} \qquad \text{(A-iii)}$$

This fact is important and will be used later in the derivation.

Evaluating Aj for several values of n:

$$A_n = A(-a)^{n-1}$$

$$A_{n-1} = A(n-1)(-a)^{n-2}$$

$$A_{n-2} = \frac{A}{2}(n-1)(n-2)(-a)^{n-3}$$

$$A_{n-3} = \frac{A}{3!}(n-1)(n-2)(n-3)(-a)^{n-4}$$

The above suggests that the following formula holds:

$$A_j = \frac{A(n-1)!}{(n-j)!\,(j-1)!} (s)^{j-1} \Big|_{s=-a} \qquad \text{(A-iv)}$$

In order to prove that (A-iv) is valid for all j, mathematical induction will be used (see [7] for details). If (A-iv) is valid for j = k, then we must show that the equationholds for j = k - 1. This is done by using (A-iii):

$$A_{k-1} = \frac{1}{n-k+1} \frac{d}{ds} \left[A_k \right]_{s=-a} \qquad \text{(A-v)}$$

However, Ak is given by (A-iv) with j = k; so the above becomes:

$$A_{k-1} = \frac{1}{n-k+1} \frac{d}{ds} \left[\frac{A(n-1)!}{(n-k)!\,(k-1)!} (s)^{k-1} \right]_{s=-a} \qquad \text{(A-vi)}$$

Taking the derivative:

$$A_{k-1} = \frac{A(n-1)!\,(k-1)}{(n-k+1)(n-k)!\,(k-1)!} (s)^{k-2} \Big|_{s=-a}$$

$$= \frac{A(n-1)!}{(n-k+1)!\,(k-2)!} (s)^{k-2} \Big|_{s=-a} \qquad \text{(A-vii)}$$

Substituting j = k − 1 in (A-iv):

$$A_{k-1} = \frac{A(n-1)!}{(n-k+1)!\,(k-2)!} (s)^{k-2} \Big|_{s=-a} \qquad \text{(A-viii)}$$

Since equations (A-vii) and (A-viii) are identical, the validity of Aj imples that of Aj - 1. To complete the proof we need only show the correctness of An; that is, that:

$$\frac{A(n-1)!}{(n-n)!\,(n-1)!} (s)^{n-1} \Big|_{s=-a} = A(s)^{n-1} \Big|_{s=-a} \qquad \text{(A-ix)}$$

The above is true when use is made of the fact that 0! = 1. Therefore, equation (A-iv) holds for all j.

Substituting (A-iii) in (A-i) and collecting terms:

$$c_n(t) = Ae^{-at} \left\{ \sum_{i=1}^{n} \frac{(n-1)!}{(n-i)!\,[(i-1)!]^2} (-at)^{i-1} \right\}$$

$$+ c_o \qquad \text{(A-x)}$$

where co is a constant, namely the steady state output level. The inverse Laplace transform of Cn(s) has now been determined.

feed forward

By Charles Evans
Triple Crown Electronics, Inc.

Editor's Note: Newcomer, Triple Crown Electronics Inc., of Ontario, Canada, promote fully push-pull 50-300 MHz, bi-directional distribution amplifiers featuring trunk quality integrated circuits. No less than 21 models are currently available with new designs planned to be shown at the Chicago convention. Most models have inter-stage manual and/or automatic level controls for best signal to noise ratio performance, and are recommended for distribution and main line applications.

Discussion on amplifiers with the principals of Triple Crown, Jan Spisar and Charlie Evans will inevitably focus on distortion characteristic. Their company commenced operations a little over 3 years ago and has established a place in our industry which they attribute to their continuous attention to distortion improvement in broadband amplifiers. It should be no surprise, therefore, that this young company has asserted itself as a leader in the application of feed-forward circuitry, a technique recently applied to CATV amplifier design for improving distortion.

There is nothing new about the principle of feed-forward. The technique originates in a 1917 patent—some 11 years prior to the first feed-back patent. What is new is its broadband application, particularly across the full CATV spectrum of 50-300 MHz. Feed-forward amplifiers effectively open the CATV "window" available to systems for use either as increased gain, or increased operating levels, or to improve signal quality.

Feed-forward derives its name from the method used to separate and cancel distortion added to the processed signals during amplification. A sample of the incoming signals is extracted and compared with a sample of the signals after amplification. The difference between the two samples is the distortion added by the amplifier. The function of the first part of feed-forward amplifier is to isolate this distortion for separate processing and subsequent coupling with the main amplifier output in opposite phase, to achieve cancellation of the distortion components. A simplified diagram of the Triple Crown feed-forward gain block is shown in Figure 1.

A sample of the incoming signal is obtained via coupler (DC 1) and is routed to coupler (DC 3) via delay line (L 1) to compensate for time delay occuring to the main amplifier (A 1). A sample of the amplified signals (and added distortion) is obtained at coupler (DC 2) and is routed to coupler (DC 3) via attenuator (X 1). At DC 3, the signals, at the same level and time as the input sample, are coupled in opposite phase to separate, at the output of this coupler, the distortion components only added by the main amplifier (A 1). This completes the first stage of cancellation. In the remaining part of the circuitry, the distortion signals are amplified in error amplifier (A 2) to be the same level as the distortion contained in main amplifier output. These signals are added in opposite phase at coupler (DC 4) to obtain cancellation of the distortion components at the amplifier output.

In practical application, the feed forward gain block will be the final stage of a two or three stage amplifier. To obtain maximum benefit, the driver stage must be of the highest quality. Lower quality driver will directly limit the performance of an amplifier with feed-forward output stage. The distortion contributed by the driver stage and received at the input of feed-forward stage is not affected by the cancellation network. Typical signal levels of the fundamentals and samples, likely to be present in operating feed-forward network are shown in Figure 2.

*The incoming distortion level indicated in Figure 2 is related to specific types of distortion selected for purposes of illustration only.

Figure 1
Simplified Block Diagram of Feed-Forward Amplifier

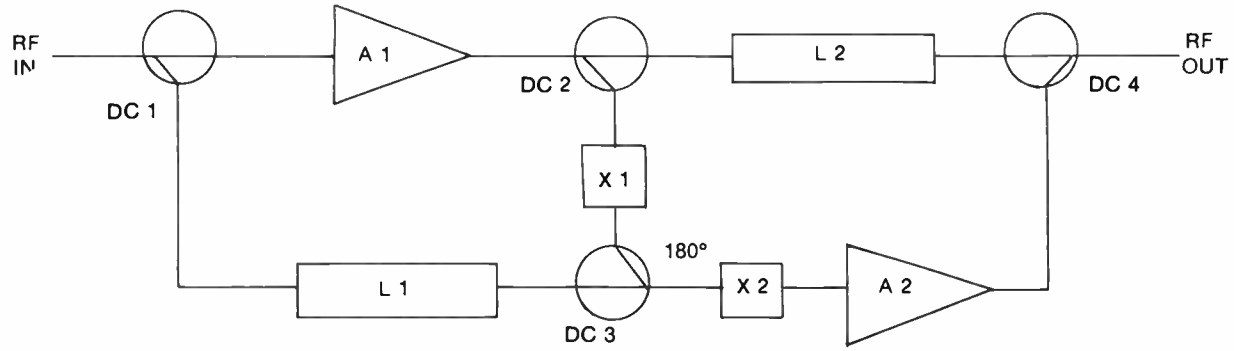

Figure 2
Typical Signal Level Distribution in Feed-Forward Amplifier

	Fundamentals (dBmV)	Incoming Distortion* (dB down)	Distortion Produced by Main Amplifier (A 1) (dBmV)
Fundamentals			
Input to DC 1	+35	-108	-
Input to A 1	+32.5	-108	-
Output of A 1	+48	-108	-34
Input to DC 4	+47	-108	-35**
Output of DC 4	+46	-108	-
Error Cancellation Network			
Sample of Input			
Input to DC 1			
Input to DC 1	+35	-108	-
Input to DC 3	+29	-108	-
Output of DC 3	-	-	-
Sample of A 1 output			
Input to DC 3	+32.5	-108	-49.5
Output of DC 3	-	-	-55.5
Output of A 2	-	-	-24.5**
Output of DC 4	+46	-108	-

**The distortion level present at the output of A 2, is precisely adjusted on final alignment to be equal (after coupling through DC 4) to the level of distortion present at the output. By this means perfect cancellation is obtained.

That's the theory. In practice, a 20 dB improvement can be expected and maintained over a reasonable period of time. The overall performance of feed-forward amplifier is directly related to the stability of the amplitude and phase characteristic of the directional couplers and the amplifiers. Directional couplers are known to be stable throughout extremes of environmental conditions and the aging process. Their directional stability through years of application in CATV systems is unquestioned. The main source of malfunction is therefore restricted to the stability of the broadband amplifiers and marginal changes in gain characteristic with temperature will result in imperfect cancellation.

What are the effects of a catastrophic failure? Suppose main amplifier (A 1) failed. There will be no output from A 1 and consequently no cancellation at coupler DC 3. The output of DC 3 will be the sample of incoming fundamentals at a level of +26.5 dBmV (See Figure 2, Input to DC 3—typically +29 dBmV -2½ dB coupler loss) and this will be amplified to +57.5 dBmV. This signal will be supplied to amplifier output via directional coupler (DC 4). Again there will be no cancellation and the amplifier will continue to operate in redundancy mode with derated performance at an output level of +46 dBmV. The effect of failure of amplifier A 2 is similar. Cancellation will take place at coupler DC 3 but there will be no output from A 2 and therefore no distortion cancellation at coupler DC 4. The main amplifier will provide signal in redundancy mode at +46 dBmV with distortion at -82 dB instead of -108 dB. What about changes in gain of A 1 and A 2? Gain reduction in A 1 will result in less distortion to be processed by error amplifier which will continue to successfully cancel distortion at coupler DC 4. The damaging effect of a change in gain of amplifier A 1, however, is that the level of the wanted signals reaching coupler DC 3 will not be equal and only partial cancellation will result. Fundamentals will be processed by error amplifier A 2 for which the cancellation network at DC 4 will compensate. However, the presence of the wanted signals in error amplifier will generate some new distortion which will be added to the output. An increase in gain of A 1 will similarly result in only partial cancellation of the wanted signals with overall degradation of the output signal quality. An increase, or decrease, in gain of A 2 will also result in imperfect cancellation of distortion at DC 4 and will limit the benefit obtainable under ideal operating conditions.

The block diagram shown in Figure 1 provides the amplifier designer with some choice in gain stages and coupler values. The gain of the error amplifier is virtually fixed. The signal losses in the path of the samples force selection of the "30" dB gain block. However, the values of the couplers can be varied aso as to enable use of the "30" dB gain stage for A 1 also. Since the feed-forward amplifier cancels only the distortion generated in A 1, it would appear that a higher gain A 1 has greater potential for obtaining best performance. While this is true, the potential for loss of cancellation is also greater, since the characteristics of the high gain block are prone to change more than in the simple 16 dB gain stage. For this reason, Triple Crown has standardized on 16 dB gain stage for A 1 and 32 dB gain stage for A 2.

Feed-forward amplifiers are recommended for operation at output levels between +42 dBmV and +58 dBmV for up to 30 channels. The lower limit is dictated by signal to noise ratio requirements. The upper limit is dictated by the absolute level handling capability of main amplifier, A 1. At levels in excess of 58 dBmV for 30 channels, A 1 begins to operate with some gain compression. With further signal level increases, it will cease to operate as a linear amplifier resulting in gradual loss of cancellation and consequent loss of the benefit of the feed-forward amplifier. When operating close to these elevated levels, automatic gain control is essential. A minimum increase in input level can have serious effects if overload protection has not been provided by AGC. □

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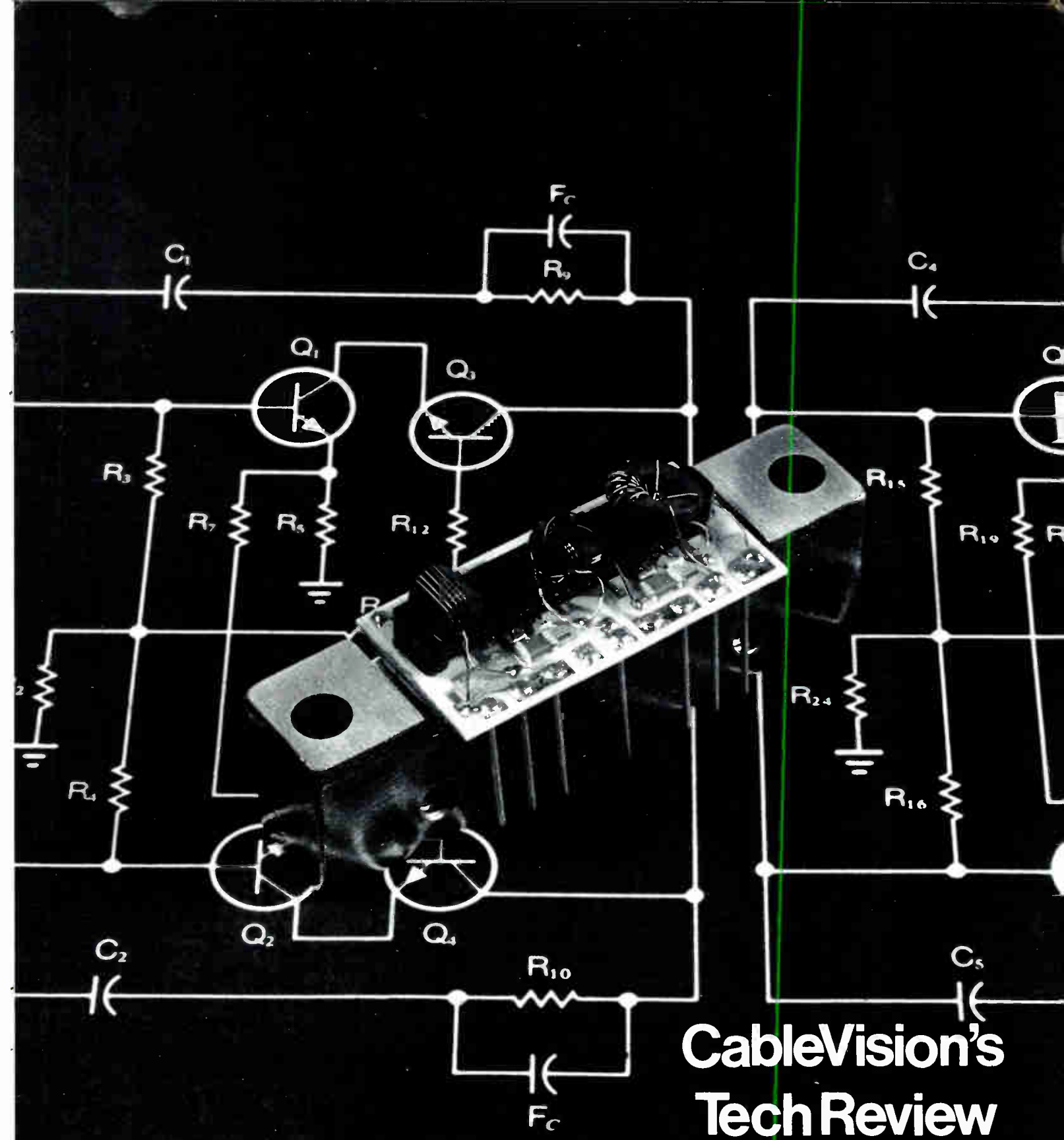


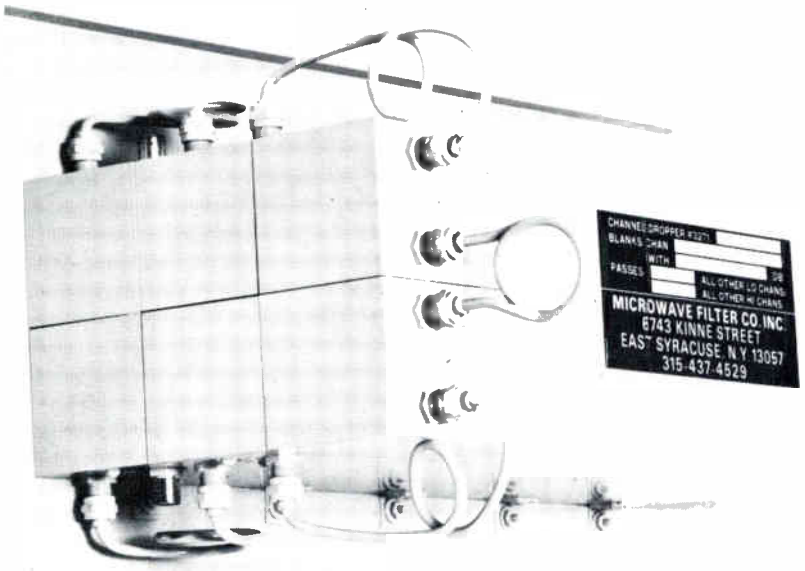
CableVision's Tech Review Spring

LINE AND HEADEND EQUIPMENT

Microwave Filter Co.

Microwave Filter offers two new filters for cable uses. One is a UHF unit for use in receiving converters to suppress adjacent signals. The other is a channel notch filter that reduces the picture, sound, and color carriers in excess of 50 dB.

Circle Reader Service #51



RCA/Modulator

The RCA CTM10 line is a new generation of cable television modulators developed as companion to the RCA HSP1 signal processor and designed for maximum interface capatibility with the processor. Common functions such as IF switching options, operating levels, phase lock capability, and DC auxiliary are available.

Circle Reader Service #56

Broadband

Broadband now stocks replacement components for all Coral and Vikoa amplifiers. In addition, Broadband offers Mod-kits to upgrade most older amplifiers. For more information, contact Bob Savard, 305/747-5000.

Circle Reader Service #57

Belden/Shielded Cords

Two versions of new, UL-listed shielded power cords and cord sets have been introduced by the Electronic Division of Belden Corporation. The cords are designed to minimize electronic interference in the power supplies of business machines, and test equipment.

The shielded cords reduce the need for filtering devices on sensitive electronic test equipment and office machines such as microprocessors. The shielding eliminates some of the potential electronic interference at greatly reduced costs when compared with filter traps.

Circle Reader Service #58

Theta Com/Amplifiers

The Phoenician II Amplifiers represent the second generation of the earlier highly successful Phoenician series. The amplifiers feature extra headroom, surge protection, reverse feed capability, and improved cross-modulation and triple-beat.

Circle Reader Service #52

Digicode/Remote Controls

Digicode offers a complete line of remote control equipment for unmanned headends using "touch tone" controls. Headend switching, standby processor activation and duplication can be performed from one central location.

Circle Reader Service #55

Comm/Scope

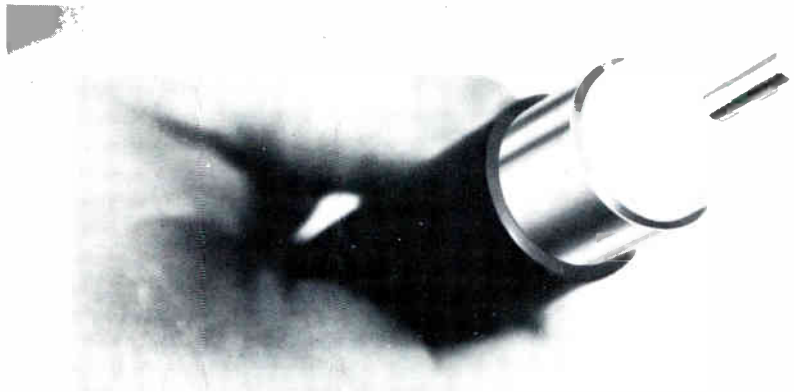
What can you say about a company whose old products are still "new" in terms of performance. Comm/Scope makes coaxial trunk and distribution cable in both the Gas Expanded Foam and Second Generation G.E. Foam.

Circle Reader Service #53

Cerro Cerrofoam GX

Gas expanded polyethulene trunk and distribution cable with an attenuation that's 10% lower than conventional polyethylene cable but with comparable physical and temperature characteristics—and which also sells for about the same as conventional polyethylene cable—is now being marketed by Cerro Communication Products.

Circle Reader Service #59



Lindsay/Amplifiers

Lindsay Specialty Products has announced a new line of cable TV amplifiers. These will feature better specifications for improved performance reserve, higher channel capability, and higher reliability.

Circle Reader Service #54

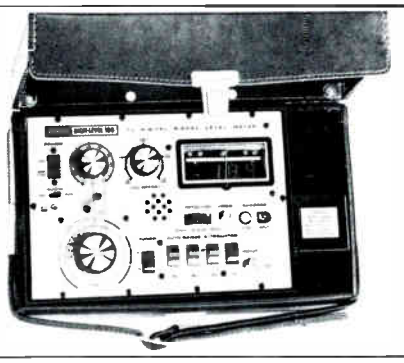
Be sure to use the cards on page 59 to find out more about any product that interests you.

TEST EQUIPMENT

Sadelco/SLM

Harry Sadel has done it again! This time he is introducing an improved digital readout SLM. Featuring 3 digit readout, and 0.1 dB resolution, this compact meter will impress many field technicians. The meter has a special detecting circuit so that foolproof Signal to Noise measurements can be made. The meter tunes from 5-300 MHz and comes with a built-in speaker.

Circle Reader Service #60



PECA/Trans-A-Drop

The new Trans-A-Drop™ transparent test-drop adapter from PECA, Inc. simplifies measurements where test instruments are fed by a drop cable from the signal source. Applicable for 40-300 MHz signals, the adapter makes the drop cable "transparent" so the signal at the test set is identical to the signal at the test drop input.

The technician simply adjusts the Trans-A-Drop adapter when he begins work, eliminating the need for time-consuming calculations to compensate for measurement errors caused by the drop cable.

The Trans-A-Drop transparent test-drop adapter can be used with sweep receivers, spectrum analyzers, signal-level meters and other test instruments. It provides new accuracy in test-van alignment of amplifiers, long-term signal level monitoring, and many other applications.

Circle Reader Service #61

R & S/Demodulator

Rohde & Schwarz has announced the availability of the BARCO VSD2 demodulator in the U.S.A. This TV demmodulator is used for monitoring a remotely operated broadcast transmitter; for relaying; for remodulating well-defined carriers—for example, HF-wired TV networks and CATV antenna sites; for accurate videotape recordings; as a reliable signal source for CATV studios, etc. The VSD2 frequency coverage is 47-860 MHz. It features .1 mv sensitivity, has a separate input for UHF/VHF, 2 video and 2 sound outputs, and a video and sound level meter. It also provides monostandard multichannel overall gain independent of the picture content. It is a solid state and modular design with very good K rating on 2T and 12½T pulses. The AFC-action on the local oscillator provides tuning stability and a constant video output.

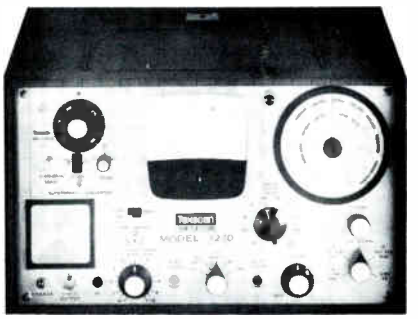
The BARCO TV demodulator VSD2 sells for $1,800.

Circle Reader Service #62

Texscan

There probably isn't a technician in the industry that hasn't used the old reliable 727 Field Strength Meter. Improving on the old design, Texscan now has a 7270 with an improved attenuator, longer battery life, and an accurate new peak detector. The meter covers 5 to 216 MHz and a super-band plug-in is available to cover 210 to 300 MHz.

Circle Reader Service #63



Wavetek/Sweep System

Wavetek, traditionally known for their sweepers, has mated two products to form a sweep system that compensates for TILT. The 1067 sweeper and the 1075 Comparitor are mated to form a 1-400 MHz sweep system with better than +25 dB flatness. Tilt compensation controls are provided on the 1075. In addition Wavetek has large screen oscilliscope type monitors, signal sources, and sweepers for every occasion.

Circle Reader Service #64

Katek/Programmer

Katek, Inc., of Bound Brook, NJ, has introduced a digital programmer designed to provide foot-switch control of the Wavetek Model 1402A sweep generator. The Model JOP-3 enables the 1402A user to more than double converter alignment speed. Katek's main business is converter repair for cable systems. The JOP-3 was developed for their own use, and now is being made available to other users of the 1402A. The programmer provides a visual display of the selected channel, allows both up and down switching, and is field programmable for any channel order, including channels A-1 and A-2.

Circle Reader Service #65

Avantek/SLM

Avantek announces the addition of the Model SL-300 signal level meter to its line of instruments specifically designed for the CATV industry. The unit is portable, extremely dependable and incorporates innovative design features providing fast and accurate readings under both bench and field conditions.

The SL-300 operates over the standard 4.5 tc 300 MHz CATV frequency spectrum. The frequency of the aural or visual carrier being measured is indicated on a large three-digit LED readout with 1 MHz resolution and +1 MHz accuracy. Desired signals are selected easily without interpolation or the possibility of error.

A completely new concept in video peak sync detectors is used in the SL-300. The design uses the sample and hold technique commonly found in complex digital instrumentation to actually hold the peak sync level without the problems of time constant or capacitor leakage of compromise peak detector designs. Thus, the meter actually indicates the peak sync level of video signals without being affected by the continuously varying video information. It is equally as effective on the non-varying amplitude of CW or FM carriers.

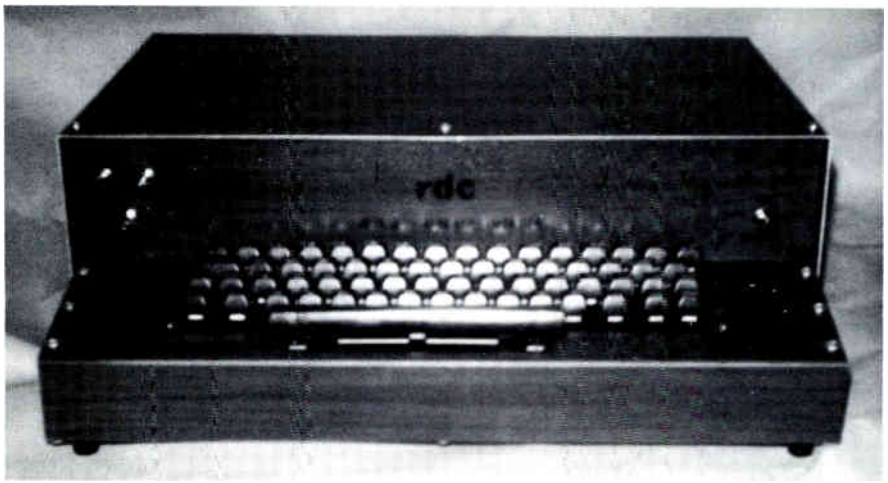
Circle Reader Service #66

LOCAL ORIGINATION AND PAY ORIGINATION

Richey/Message Monitor

Richey Development Corp. of Oklahoma City has a new "digital message monitor." The low cost ($850.00) character generator including modulator is designed for the small system operator where cost is a major factor. The "digital message monitor" has two pages of memory as a standard feature. Each page will contain 16 lines of 32 characters. Color is another standard feature. Page one will have white letters on a blue background while page two will have white letters on a green background.

Circle Reader Service #67



Cable Instrument Co./ Duplication Switcher

Cable Instrument Co. has been producing programmers to eliminate program duplication for quite some time and their Model 2D has kept the best of the old while adding some new features to make it one of the smartest programmers on the market.

Non-duplication switching is loaded with headaches, such that you almost need a full time person standing by in your headend . . . or one of Frank Hensley's Model 2D's. Just to give you an idea of the power of this device, we will list some of its logic. First it detects simultaneous programs by looking at the sync. When programming goes to local, a time delay prevents premature switching except during half hour program changes. A sense and release is activated after ten seconds if a station goes off the air. Overrides are provided for manual control.

The new Model 2D uses plug-in modules instead of the old hard wired ones, an electronic clock, and has a built-in battery to keep the clock going in case of a power failure.

Circle Reader Service #68

Microtime/TBC

A new low cost Time Base Corrector will be available from Microtime to satisfy the requirements of the many new pay programming options available on video cassettes. The 1500 TBC will first be shown at the NCTA show in Chicago along with Microtime's other products including skew correctors, image processors, and other devices to improve video cassette systems.

Circle Reader Service #69

Arvin/Echo

The Arvin Echo system, recently shown at the NAB show in Washington, D.C., is a low cost still storage device. This "frame freezer" uses a "Discassette™" record as a storage medium. Major applications include: reduction of graphics storage, protection of slides, still storage, special effects, and widespread use in news and program production.

Circle Reader Service #70

AKAI/B&W System

Akai American, Ltd., has a new ½ inch cassette-format black-and-white video system, the compact, lightweight VT-300.

The VT-300 is the least expensive, lightest weight, most compact ½ inch portable system on the market.

The result is an easy-to-operate, versatile system designed for almost any office, school, home or in-the-field application.

The VT-300 system consists of the VC-300 high-resolution camera, weighing only 2 pounds, 2 ounces, and the 14-pound VT-300 recorder with a detachable three-inch monitor.

The camera features C-mount, 16mm lens, detachable optical view-finder and a build-in omni-directional microphone that automatically adjusts volume levels during taping. The camera also compensates for a wide range of light levels, making it possible to shoot with existing light both indoors and outdoors.

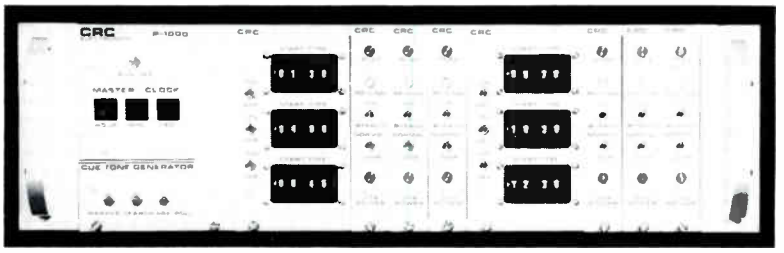
Circle Reader Service #94

LOCAL ORIGINATION AND PAY ORIGINATION

CRC/Programmer

CRC Electronics Inc., announces the introduction of the P-1000 videocassette programmer for CATV and pay-TV markets. The P-1000, which can operate up to nine Sony Type II videocassette machines, is modular in construction to meet a variety of programming needs. The digital 24-hour clock and cosmos IC control logic have built-in battery standby power in case of AC line failure. The P-1000 mounts in a standard 19" rack and is supplied with VCR interconnect cables. The VCR's do not need to be modified.

Circle Reader Service #72



System Concepts/ Character Generator

The System Concepts Quantum II character generator was designed to handle all of your extra channel requirements. With the capability of handling multi-color displays and a variety of different character fonts, the microprocessor controlled unit can be programmed for just about any normal or special programming your system may require.

Circle Reader Service #73

LINE EQUIPMENT/MISCELLANEOUS

RMS/Splice Box

The new Model #CA-3500/3501FBP universal splice box can be used for either aerial or underground installation and will fit into a 4" pedestal enclosure. The power passing network features a single "air-coil." In case of lightning or surge damage, the network can be replaced within 10 minutes. All four entry ports have a tapered counterbore so that the entry connector's sealing gasket sets inside the entry port. This protects the gasket from climatic deterioration as well as allowing the metal shoulder of the connector to make 100% metal to metal contact with the entry port, thus providing 100% RFI integrity. The positive sized center conductor post are mounted to an exceptionally strong fiber glass plate and can withstand over 100 lbs. of thermal contraction stress. All electrical contact points are either silver or nickel plated to prevent corrosion.

Circle Reader Service #74

RMS/High Pass Filter

RMS announces the availability of the new Model #CA-2600F high pass filter 75 to 300 ohm matching transformer. The #CA-2600F blocks interference caused by citizen band, ham radio, two-way communications, x-ray equipment, nearby industrial plant equipment, automobile ignition noise, etc., that interfere with TV reception. The new product features a miniaturized printed circuitry with totally schielded network and housing. A special made heavy duty twisted and tinned coated 300 ohm twin lead with an oval separation "cut-out" provides greater tensile strength to significantly reduce spade-lug and wire breakage.

Circle Reader Service #77

STT/Cablephonic™

The Cablephonic sound processor accepts the IF from your processor to give customers spectacular TV sound through their FM radios or stereos. Now you can offer customers more than just TV service. The TVSP-1 can be easily installed in any cable system.

Circle Reader Service #75

LRC/Sealed "F" Fitting

A sealed series of "F" style connectors has been announced by LRC Electronics.

The units when properly installed on their corresponding cable are totally moisture proof from the jacket to the "F" connector and also to "F" female connector. Laboratory testing has shown the seal effective at over 20 PSI.

Circle Reader Service #78

Gilbert/Surge Protector

The Gilbert G-TA/SP is the unique problem solver. Installed into any equipment port you can provide surge suppression with a variety of surge protectors. Replace or inspect surge protectors with minimum time and effort. No interruption of service or abuse of amplifiers. With the surge protector removed, the vacant port allows external insertion of a test adapter to monitor input or output RF signal level and level voltage with ease and accuracy.

Circle Reader Service #76

LRC/Sealed Feed Thru Connector

LRC Electronics Inc. announces a newly designed sealed feed thru aluminum connector. This design eliminates the need for an expensive, more complex pin style connector for moisture barrier, by providing a seal around the cable center conductor.

Designed for all 3 size cables, it provides a 40 psi positive seal from housing to cable. This has been added to LRC's standard feed through connectors as an optional feature.

Circle Reader Service #79

LRC/New Test Point Adapter

LRC Electronics announces a new test point adaptor for the Entron test point. When used with the LRC Housing Splice Block (HSB) no service interruption is required. Simply install the Entron test point (also available from LRC) into the adaptor and then into LRC's HSB and check borh AC and RF. Another innovative idea from LRC.

Circle Reader Service #80

SATELLITE EARTH STATIONS

Microdyne/Receiver

Microdyne Corporation has a satellite TV receiver design that insures a demodulator threshold of less than 7 dB carrier to noise. This Microdyne feature, utilizing patented techniques, is achieved by special electronic threshhold extension circuitry that automatically provides the extra operating margin important to so many small aperture antenna installations.

Microdyne's new Model 1100- -TER(VT) receiver includes improved threshold extension as standard equipment. As with other Microdyne TV receivers, the Model 1100-TER(VT) is a complete down link receiver in one compact unit and includes 12 or 24 channels, locally or remotely selectable. Synthesized, frequency agile RF tuners covering 3.7 to 4.2 GHz are available with Microdyne's Model 1100--SYN(VT) receivers.

Circle Reader Service #81

RF Systems 5-Meter Dish

RF Systems, Inc. of Orlando, Florida, has a new 5-meter satellite earth terminal. A few of the advantages of its system are: Polar Mount, aluminum construction, low shipping weight and cube, economic installation. Another feature is that there is no single piece that cannot be carried to a roof for a roof-top installation in a standard elevator. This feature results in a savings in crane costs. RF Systems, the only earth terminal supplier providing the Polar Mount, is using this technique in the 5-meter system as it did in its 10-meter terminals. The single axis movement when changing satellites is only possible with the Polar Mount. Specification sheets available on request.

Circle Reader Service #82

Hughes/4.5 Terminal

Lower cost earth terminals with smaller size antennas are key features of a new satellite video receiving terminal being offered by Hughes Aircraft Company's microwave communications products.

The completely integrated system uses a dish antenna roughly half the size of present ground station antennas.

The new earth station is designed to enable the user, such as a cable TV operator, to provide quality video and audio signals using an antenna only 4.5 meters in diameter. Hughes claims the cost of the new terminal will be 1/2 to 1/3 that of the larger terminal.

Circle Reader Service #83

LNR/Receiver-Preamp

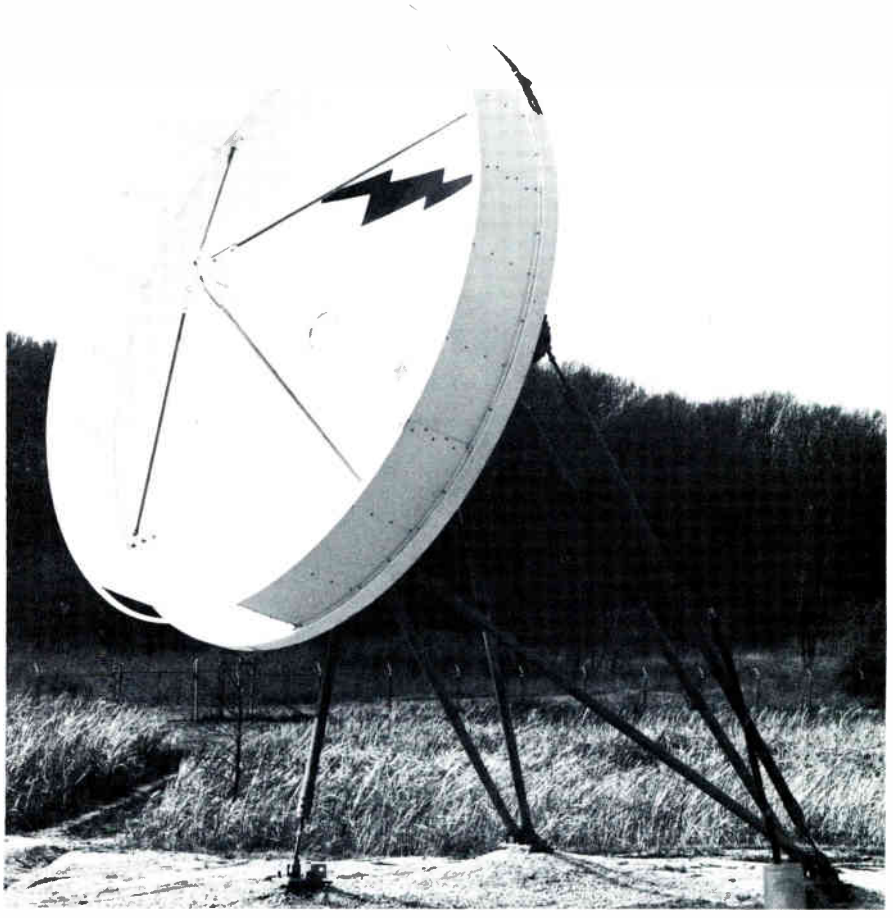
A completely interfaced combination of Low Noise Amplifier (LNA) and Satellite TV Receiver for CATV earth stations is available from LNR Communications. The company is a major supplier of earth station equipments worldwide.

Circle Reader Service #84

Andrews/4.5m Antenna

Andrew introduces a new, high performance, 4.5-meter earth station antenna for TV receive-only applications. The antenna features the highest efficiency available in a 4.5-meter antennna (44 dBi gain at 4 GHz) while retaining excellent pattern control in the wide and back angle regions. The higher efficiency provides improved carrier-to-noise ratio. All appropriate FCC requirements are met.

Circle Reader Service #85



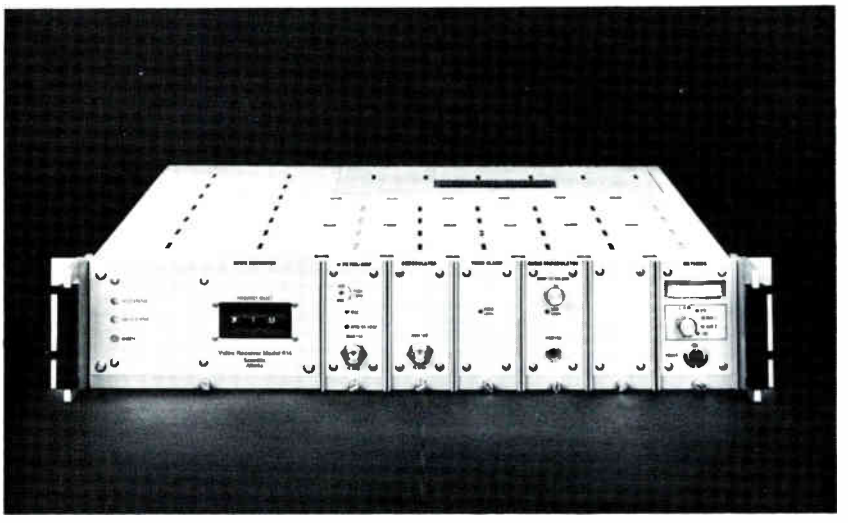
SATELLITE EARTH STATIONS

SA/Receiver

Scientific-Atlanta has a new video receiver for application in domestic and international satellite communication earth stations. The Model 414 Receiver offers communications companies better performance through the use of plug-in modules to select bandwidths.

The Model 414 receiver has unique features such as a synthesizer-tuned down converter to provide complete frequency agility (standard) and video threshhold extension (optional). The input frequency band is 3.7-4.2 MHz, input noise figure is 15 dB maximum and input dynamic range is 40 dB. IF bandwidth is determined by plug-in modules; and standard bandwidths from 17.5 MHz to 36 MHz are available. The frequency synthesizer provides input tuning in 2.5 MHz or 0.25 MHz increments.

Circle Reader Service #86



Larson Electronics/ Closures

A complete line of closures for underground cable systems is available through Larson. Five sizes are offered, and the housings are high impact virgin polyvinyl chloride. The closures are available in light green and the adjustable mounting hardware fits all amplifiers. Larson also makes standby power supplies.

Circle Reader Service #87

Anixter-Pruzan/ Torch

The Liberty Torch, a new pocket-sized, refillable torch, is now available nationally from Anixter-Pruzan.

The versatile mini-torch refills in seconds from either standard propane or MAPP gas cylinders, and operates without a gas cylinder attached. It goes on the job in a pocket or tool box, without awkward bulk or weight, yet its 3000° capacity is more than enough to handle the heat-shrink tubing and "TAT" jobs encountered by installers and repairmen.

Circle Reader Service #88

COMPANIES

GTE/New Products

Sylvania is expanding its product base. They have announced: a midband-to-UHF converter, an economical way to add more channels and pay programs; a flexible line extender, with up to three programmable outputs; a programmable converter, putting up to 40 channels at your command; and a new standby power supply, for up to 19 hours of operation during power outages.

Circle Reader Service #89

Texscan/Theta Com

It has been a little over six months since the Texscan Corporation acquired the CATV product line business from Hughes Aircraft Company.

For the first time in over 7 years presence in the CATV market, the Texscan CATV test equipment line is being directly sold and serviced by Theta-Com/Texscan salesmen.

At the Western Cable Television Association meeting, they announced that they have become the exclusive marketing representative organization for Phase-Com headend line.

Circle Reader Service #90

Toner/New Lines

Toner has announced that they will be representing the Dana line of frequency counters and digital multimeters. They will also represent Sadelco and their new digital SLM. Toner also sells Blonder-Tongue equipment including audio-video scramblers, headend processors including audio controls, and the Cen-tap system.

Circle Reader Service #91

MICROWAVE

Microwave Associates

A system for extending cable television into more remote geographical areas at much lower cost and for improving the quality of the television reception has been introduced by Microwave Associates.

The new system is FML (Frequency Modulation Link). It is a microwave relay system that will overcome present limitations imposed by conventional cable. With the new system, cable TV operators will now have the capability of transmitting high quality pictures to an extended network using up to 20 channels.

Television signals carried by cable trunk lines experience signal degradation over long distances. Microwave's FML system will allow for much greater coverage (up to several hundred miles) without compromising quality.

Circle Reader Service #92

Internat'l. Microwave Corp.

A solid state portable microwave system is available from International Microwave. The suitcase sized unit is powered with batteries and comes with a small transmitting antenna. The unit is ideal for live video news and events transmissions.

Circle Reader Service #93

It happened every time I did a "measurement by comparison" check on the Test Bench. I'd hook together the most expensive gear in the lab, put the display on a scope, and there it'd be... tilt, notches and lumps! Generally about .5 to 1 dB worth.

Then I learned that Wavetek has put together a complete system for making measurements by comparison. It costs less than $1,250, plus another $545 for the 12" scope. But the best news is that Wavetek's system lets me eliminate enough RF tilt to get a correlation of 0.1 dB.

If you're interested, you really should call collect, write, or circle the reader service number, but I can tell you this much: The system has two parts, a Model 1067 Sweeper and a Model 1075 Comparator. The sweeper goes from 1 to 400 MHz with flatness better than 0.25 dB, and RF output calibrated from +57 to −13 dBmV. The comparator accepts power and timing signals from the sweeper so the known and unknown ports are always phased properly. Controls to adjust tilt for Channel A and tilt plus gain for Channel B compensate for most loss and tilt errors of the test bench cables and terminations. (That's the part I like.) There is also a function to introduce "tilt loss" and "flat loss" to simulate cable.

To sum it up, next time you're running into problems with tilt, notches and lumps...I'd lean towards Wavetek.

WAVETEK Indiana Incorporated, 66 North First Ave., Beech Grove, Indiana, P.O. Box 190, Beech Grove, Indiana 46107, Tel. (317) 783-3221, TWX 810-341-3226.

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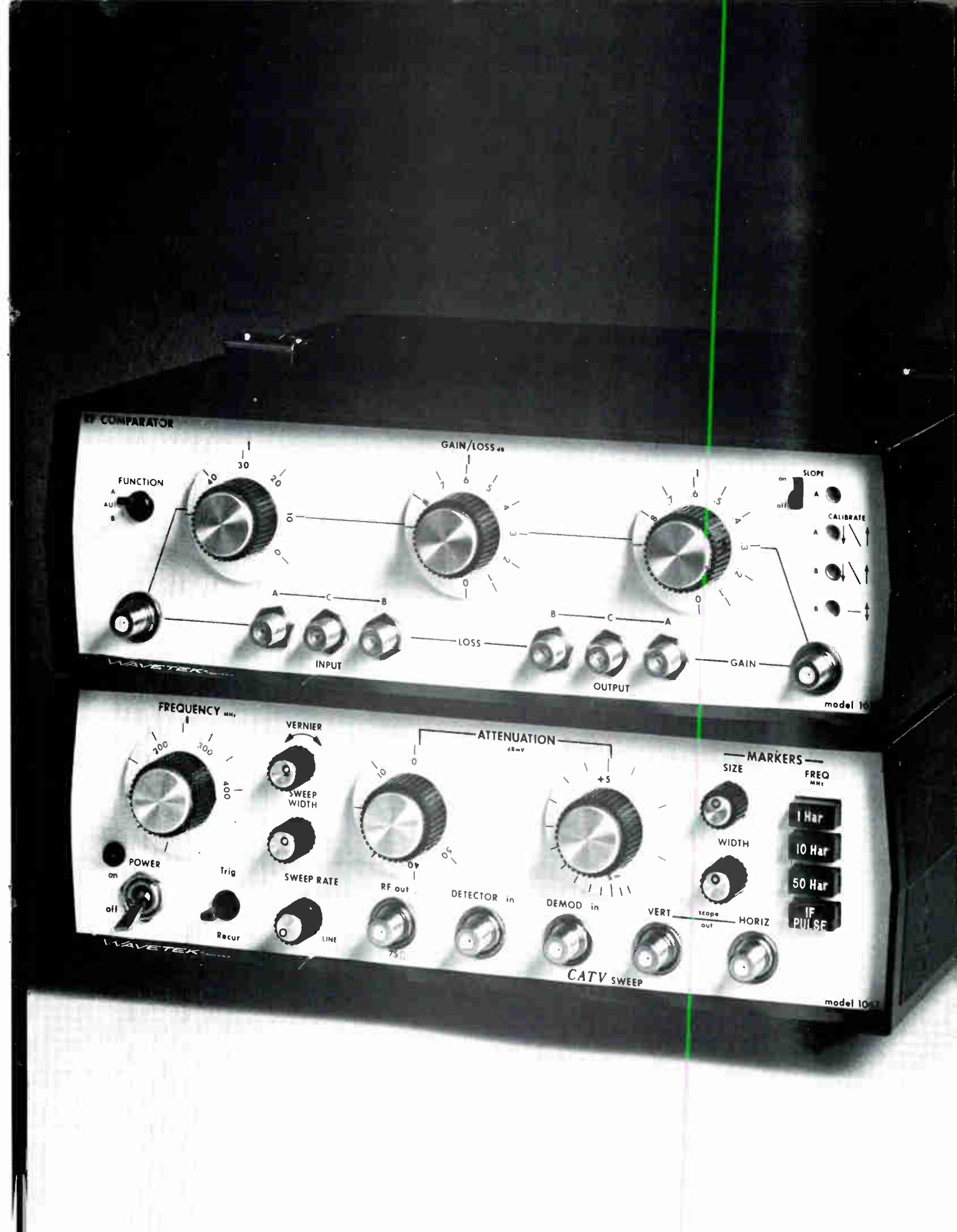
Harvey Smith, CATV technician

Before

After


RF COMPARATOR
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GAIN/LOSS dB
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GAIN
INPUT
OUTPUT
WAVETEK
model 10
FREQUENCY MHz
VERNIER
SWEEP WIDTH
SWEEP RATE
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on
off
Trig
Recur
LINE
RF out
DETECTOR in
DEMOD in
VERT
scope out
HORIZ
CATV SWEEP
WAVETEK
model 10

SECURITY

Oak/Complete Line

Oak's complete line of traps and converters gives you these choices:

Multi-Code—Varactor converter decoding specified channels for subscription pay-TV.

Econo-Code—Single channel mid-band converter-decoder.

Toggle Switch Converter—Designed for European cable systems.

Trimline II AFC Converter—Remote control, 31 or 35 channels.

Econobloc II Converter—Conversion of 11 mid-band frequencies for 23-channel capacity.

Mini-Code—Single channel low-band decoder.

SCC Single Channel Converter—Adds a mid-band channel to 12-channel systems.

Gamut 26 Converter—26-channel, electromechanical set-top converter.

Circle Reader Service #95

T.E.S.T. Decoder/Encoder

"Don't call it a trap!" says Paul Rebeles, the v.p. of T.E.S.T. The encoder/decoder system represents one of the most ingenious systems ever devised to protect a pay channel. Instead of using a trap to remove the pay channel, the T.E.S.T. people have come up with a passive gadget you have to insert to get the channel.

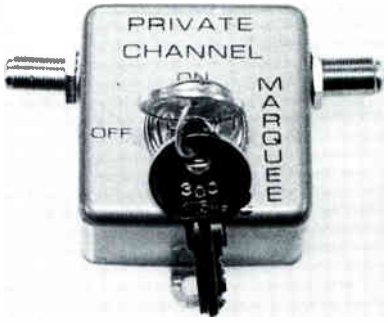
T.E.S.T. is now delivering this system which works with a modulated carrier inserted at the headend at about 2.58 MHz above the picture carrier. This carrier makes a mess of the pictures until the companion "trap" is inserted at the customers home. Once the modulated carrier has been eliminated, the pictures are restored to perfect condition. The little gadget that is used at the subscribers home is passive, so in theory it should pose few problems, should not age, will not blow fuses, etc.

Circle Reader Service #96

GAMCO

How do you handle complaints that the children can watch R and X-rated programs just by switching on the TV? Install Gamco's new key controlled single channel trap. The trap is also available with a magnetic release for hotel applications.

Circle Reader Service #97



Vitek/Jump-Trap

Many TV sets are overloaded by adjacent channels present on converter outputs. Since the upper adjacent video carrier level is higher than that of the lower adjacent audio, it is the primary factor causing TV set overload.

Until now, the only economical solution was the brute force reduction of all signal levels with an attenuator. This technique went in the direction of degrading the S/N ratio which was so carefully preserved thru out the rest of the system.

Now, using the CABLE-TRAP technique used so successfully in Pay-TV, Vitek offers the JUMPER-TRAP which is a combination jumper cable and upper adjacent carrier notch filter available for use between all low band output set converters and subscriber's TV set.

Rejection of the interfering video carrier is 10 dB min. with less than 2 dB at the desired channel audio output. The JT-2 and JT-3 are available for channel 2 and 3 converter outputs respectively. Connectors are F-59 male.

Circle Reader Service #98

Telcin/Remote Converter

Telcin's ROTC systems feature a keyboard with pressure keys and no mechanical switches. The converter covers 36 channels and is completely wireless. A built-in AFC circuit fine tunes each channel automatically.

Circle Reader Service #99

ad index

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H. Educational TV Stations, Schools and Libraries
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7	29	51	73	95
8	30	52	74	96
9	31	53	75	97
10	32	54	76	98
11	33	55	77	99
12	34	56	78	100
13	35	57	79	101
14	36	58	80	102
15	37	59	81	103
16	38	60	82	104
17	39	61	83	105
18	40	62	84	106
19	41	63	85	107
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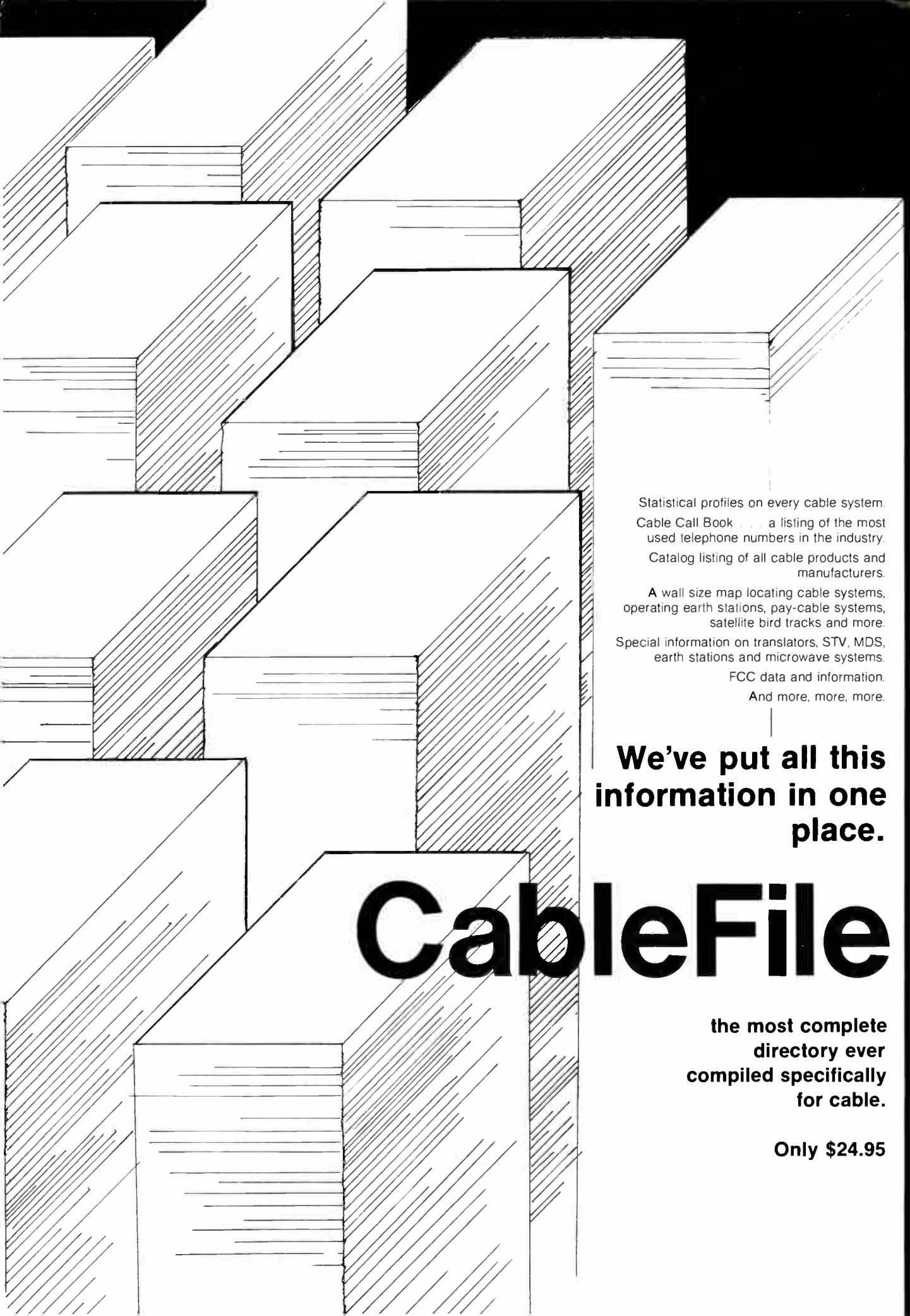

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The DC TV Decoder is TEST's success story. In only 12 months, with over 400 systems sold, it has captured over one third of the PAY-TV market. Easy installation by the salesmen, competitive price and high quality are the reasons why.

Model ECC

The ECC TV Encoder/Generator is an integral part of the Scramble Guard System. Designed for CATV, MDS, STV and MATV, the unit is available for any VHF channel.

For additional information, contact:

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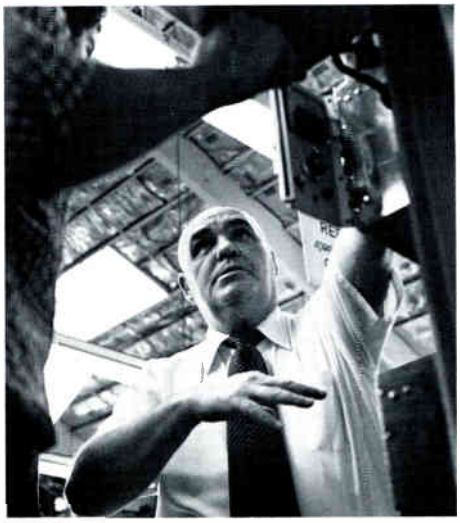


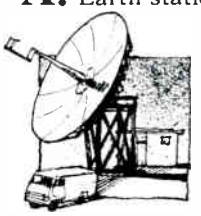
Questions and answers about

Microwave for CATV

Jim Hurd, Farinon's resident expert on the microwave problems of CATV operators, answers a few questions about the use of microwave in the cable television industry.

Q. Where do you see CATV operators using microwave transmission systems, Jim?

A. Earth station backhaul and CARS are the applications. Our SS12000 remodulating radio is providing operators with a good clean way to bring video information into their headends.



Q. Couldn't most CATV operators use cable for that?

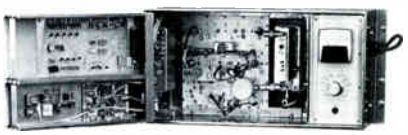
A. Most used to. Many still do. But in the past three years there has been a big move to CARS microwave. Farinon alone has supplied at least 20 Farinon-type SS12000 microwave systems for HBO backhaul. Cable requires constant maintenance—a steadily escalating labor cost that never goes away.

Q. Money! Speaking of which, I've always assumed that microwave radio costs would be out of the question.

A. Again proving you don't want to assume anything. Sure, microwave represents a sizeable investment in plant. May take some financing. But there are offsetting investment tax credits and operating cost reductions that make microwave attractive, even from an economic standpoint. Plus the additional factors of security, independence and *control* that are often decisive in choosing to go to microwave.

Q. What about maintenance of your SS12000 microwave systems? Will I need a lot of exotic gear?

A. No, sir. The same counter you now use to meet proof of performance on your cable system will do for the annual proof. Our built-in metering takes care of all routine maintenance.



Q. What kind of signal will I deliver with microwave?

A. You're well aware that color TV is vulnerable to differential phase and gain problems. System operators tell us that our microwave system is virtually transparent, even over several hops. Of course, our FV13F heterodyne radio is what you would probably use for a multi-hop system.

Q. I've got a couple of special questions about our system, and I would like some names of Farinon users. Mind if I give you a call?

A. Not a bit. Glad to help and give you references. Give me a shout at (415) 592-4120.

See us at NCTA booth #830

Farinon Electric, 1691 Bayport, San Carlos, CA 94070.
Phone (415) 592-4120. Telex: 34-8491.
In Canada: Farinon Electric of Canada, Ltd.
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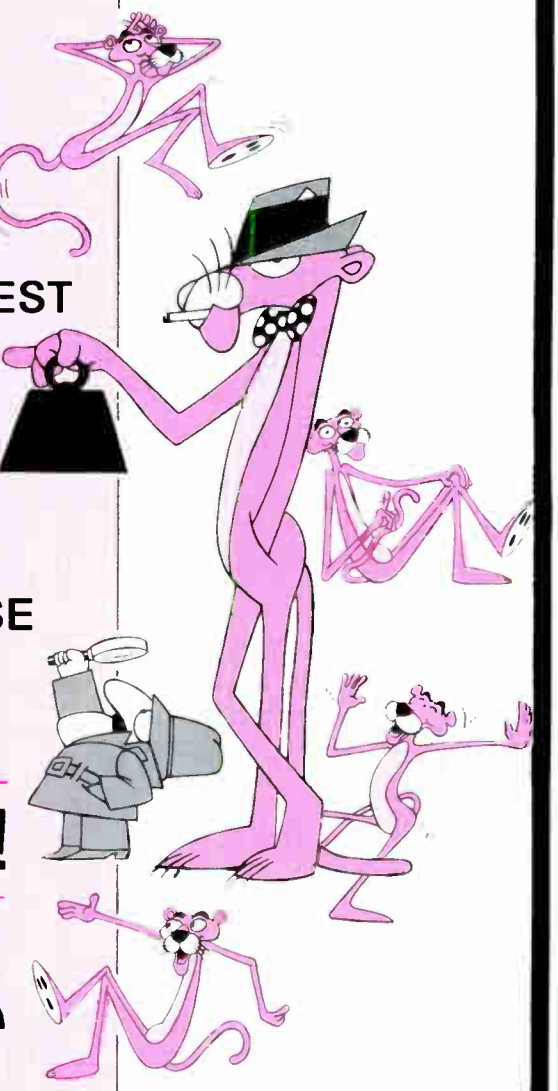

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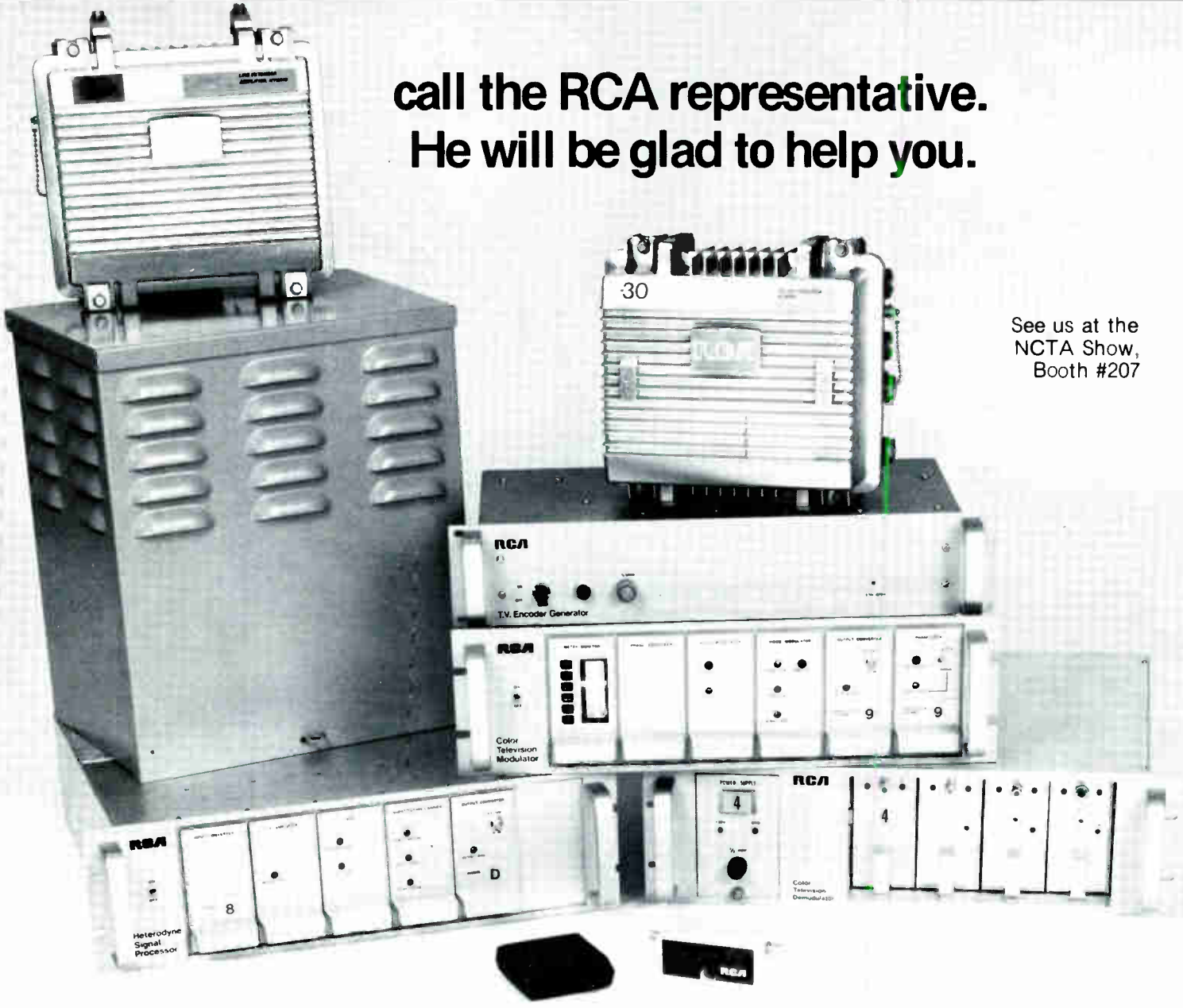

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