

communications / engineering digest

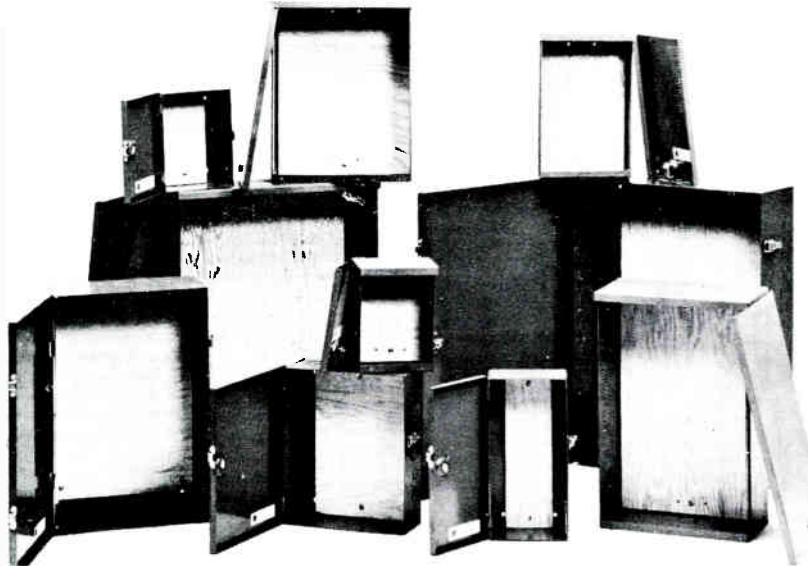
reporting the technologies of broadband communications



Technical
Regulatory Standards
federal/state/local

OCTOBER 1975
Volume 1, No. 1

the security blanket for your apartment equipment



TONER LOCKABLE CABINETS

Protect your apartment CATV system from illegal connections and your valuable distribution equipment from tampering and theft. Get security plus economy with Toner Lockable Cabinets. Your best buy for indoor CATV system protection.

- Ten sizes to fit your every need
- Standard cabinet uses your padlock
- Optional cylinder lock (Key Alike)
- Optional vending machine lock, non-reproducible key
- Ultimate mounting ease with 3/8 in. plywood backboard
- Phosphatized steel construction for durability
- Satin grey enamel finish, inside and out
- Storm proof galvanized cabinets for outdoor use, too

CALL OR WRITE FOR COMPLETE SPECIFICATIONS, ORDERING INFORMATION AND PRICES

TONER CABLE EQUIPMENT, INC.

(215)674-5510

418 CAREDEAN DRIVE

HORSHAM, PA. 19044

WHERE EXPERIENCED PEOPLE AND PROVEN PRODUCTS IN STOCK MAKE THE DIFFERENCE.

communications / engineering digest

OCTOBER 1975

Volume 1, No. 1

reporting the technologies of broadband communications

digest

Managing Editor
Judith Baer
Design and Layout
Barbara Hill
Circulation Manager
Lisa Kligman

C/ED Editorial Advisory Board

Stuart L. Bailey
Jansky & Bailey
Warren L. Braun
ComSonics Inc.
Glenn Chambers
American Television & Communications
Richard Covell
GTE Sylvania
Kenneth L. Foster
New York State Commission on Cable Television
Richard Jones
Suburban Cablevision
G. C. Kleykamp
UA - Columbia Cablevision
James Luksch
Texscan Corporation
Delmer Ports
National Cable Television Association
James Richardson
Plantation Cable
Keneth Simons
Simons & Wydro
Thomas D. Smith
Scientific-Atlanta
James Wright
CATV of Rockford

Editorial Offices
1300 Army Navy Drive
Arlington, VA 22202
Phone: 703-892-2450
Advertising Staff
Albert Leon
National Advertising Representative
Leon, Inc.
11105 Post House Court
Potomac, MD 20854
Phone: 301-299-7224

Articles

- 16 **The CTAC Report** *by Hubert J. Schlaflly*
Hubert Schlaflly, Chairman of the Cable Television Technical Advisory Committee writes on this report prepared by the cable industry at the request of the Federal Communications Commission.
- 22 **The Case for Picture Quality Standards** *by Victor Nicholson*
CTIC's Staff Engineer Vic Nicholson provides detailed background of this public interest group's dissent to the CTAC Steering Committee Report.
- 32 **A Philosophy of CATV Re-Regulation** *by Frank J. Bias*
Currently responsible for more than one-quarter million subscribers as Vice President of Engineering for a major MSO, Frank Bias offers a cable operator's view toward regulation and responsibility.
- 34 **The New York State Role in Federal/State/Local Technical Standards** *by Kenneth L. Foster*
Ken Foster, Chief of the Division of Telecommunications, New York State Commission on Cable Television provides a view of regulation at the State level.
- 38 **The Real World of CATV Technical Standards** *by Warren L. Braun*
Consultant Warren Braun presents thoughts on separating fact from fantasy regarding technical standards and regulation.
- 41 **The New Jersey Experience with State Regulation** *by Clifford H. Paul*
Cliff Paul tells of experiences in the field and reports efforts to assist operators in his state. A comparison of NJ State and FCC technical requirements is presented.
- 48 **A Common Set of Terms for Cable Television** *by A. M. Rutkowski*
FCC Cable TV Bureau Engineer A. M. Rutkowski has proposed some definitions concerning the cable industry—with a hope for common terminology.

Departments

- 4 **SCTE**
- 7 **NCTA Technical Topics**
- 9 **Dates & Publications**
- 11 **Bulletin Board**
- 13 **Proof of Performance Timetable**



COMMUNICATIONS/ENGINEERING DIGEST is published monthly for the Society of Cable Television Engineers by Communications/Engineering Services, 1300 Army Navy Drive, Arlington, Va. 22202. Reproduction is encouraged with acknowledgement of source. Copyright may be held by individual authors and is so noted. If individual copyright is noted, reproduction in whole or in part without permission of the author is prohibited. Subscription price \$12.00 a year in U.S. and possessions, \$15.00 per year elsewhere. C/ED is provided to SCTE members as membership service. Application to mail at Second Class Rate is pending at Arlington, VA 22202 with additional mailing offices. Address all subscription correspondence and change of address information to Communications/Engineering Digest, P.O. Box 2665, Arlington, VA 22202. Postmaster: Send Form 3579 to P.O. Box 2665, Arlington, VA 22202.



SOCIETY OF CABLE TELEVISION ENGINEERS

President

Robert D. Bilodeau
Suburban Cablevision
East Orange, NJ 07018

Eastern Vice President

Steven Dourdoufis
Vision Cable Communications
New York NY 10036

Western Vice President

James D. Hurd
Farinon Electric
San Carlos, CA 94070

Secretary-Treasurer

Charles S. Tepfer
C. S. Tepfer Publishing Co.
Ridgefield, CT 06877

Executive Director

Judith Baer
P.O. Box 2665
Arlington, VA 22202

COMMUNICATIONS/ENGINEERING DIGEST

One of the objectives of the Society of Cable Television Engineers is to foster an atmosphere of technical discourse in which members may interface with other members and other societies and organizations for the exchange of information relating to the cable television industry. It is most important for the integrity of the Society that this exchange be carried out in an impartial and non-commercial scientific way.

The Society is in its early formative years and directions taken now will give characteristics to the appearance of the Society in later years. If these directions are based on policy decisions not consistent with those of a professional society, we have not done justice to our objective and may cast images that are difficult to change in later years.

The leadership of the Society to date has been very careful to avoid activities, endorsements, statements, and associations that would place the Society in the role of an employment exchange, a vehicle for trade unions, an outlet for political expression, or a platform for special favors to manufacturers and industry suppliers. This is not a statement of paranoia; it is simply a converse way of illuminating the things that we *are* about. The structure and operation of the Society in this manner guarantees also that members will be free from proselytizing and loss of their rights to privacy.

Communications/Engineering Digest, the Society's most recent and bold step forward, is designed and styled with the same quality of purpose as is the Society itself. The *raison d'être* is that of serving the technical components of our industry with information to help make each cable day easier. (This task is further heightened by the fact that cable days appear longer than celestial days.) *C/ED* will be an outlet for technical exploration, examination, and problem solving. It will also be a communications vehicle between readers in the technical aspects of our industry. In addition, it will provide current information on our regulatory requirements relating to measurements, proof of performance and system operations as they relate to the every day system technician. In a broad sense, it will be an encyclopedia of personalities involved in technical and related aspects of the cable television industry. Our grandest hope, however, is that you, the audience, will make this a truly current publication, one that will meet the "77 Rebuild" requirements by having the upstream channels filled to capacity with your inputs.

A handwritten signature in black ink that reads "Bob".

Bob Bilodeau
President, SCTE

GAYHEART C. KLEYKAMP

G. C. Kleykamp, Director of Engineering, UA-Columbia Cablevision, San Angelo, Texas. BSEE (Electronics) Arizona State University. More than 30 years in communications. Systems serve nearly 200,000 subscribers. Experience includes manufacturing companies in product engineering and design; marketing; systems development.



WARREN L. BRAUN

Warren, L. Braun, P.E., President of Comsonics, Inc. and Warren Braun, Consulting Engineer, Harrisonburg, Virginia. Valparaise Technical Institute, 1941. Designed and operated several radio and TV stations. CATV and Broadcast Engineer since 1957. Chairman, D.C. Chapter SCTE, Fellow AES, Senior Member IEEE, SMPTE, Registered Professional Engineer, Virginia and South Carolina. More than 30 years in communications.



DELMER C. PORTS

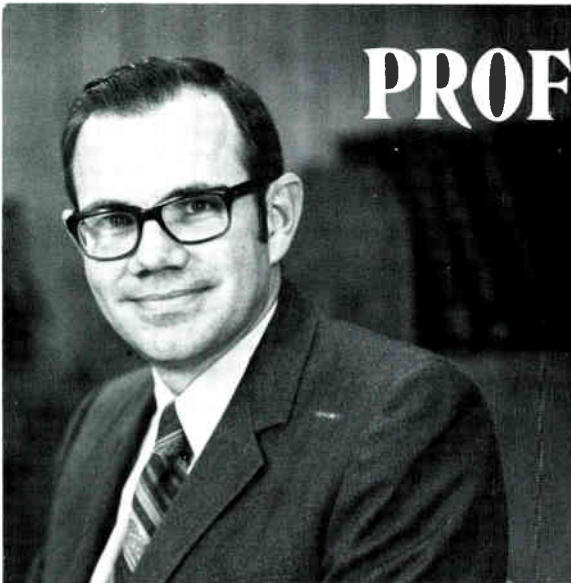
Delmer C. Ports, Vice President-Engineering, National Cable Television Association, Washington, D.C. BSEE With Distinction from George Washington University; MS degree from Ohio State University. Holds GWU Distinguished Engineer Alumnus Award (1962), Fellow of IEEE (1961), Director of IEEE 1969 and 1970. Approaching 40th year in electronics-communications industry.



KENETH SIMONS

Keneth Simons, Consultant, Simons and Wydro Associates, Hilltown, Pennsylvania. Formed firm in 1974 with Walter Wydro after 25 years with Jerrold Electronics. BSEE With Distinction, Moore School of Electrical Engineering, University of Pennsylvania. Holds 11 patents mostly in field of CATV. Author of handbooks and numerous articles and papers.

PROFILES



GLENN L. CHAMBERS

Glenn L. Chambers, Regional Engineer, ATC North Central Division, Appleton, Wisconsin. Technical Education: Draughton Institute. Charter Member SCTE; Member SBE and IEEE. Holds First Class Radio-telephone with Radar Endorsement. Responsible for technical operations in ATC systems in Wisconsin, Minnesota and Iowa. Nearly 20 years in cable industry, starting as a technician in 1957.

THOMAS D. SMITH

Thomas D. Smith, Division Manager-Security Division, Scientific-Atlanta, Atlanta, Georgia. BSEE, Mississippi State University; Graduate work at Southern Methodist University (1957-59); PMD Harvard Business School, 1974. Holds patent on Antenna Array for Minimizing Co-Channel Interference; Member IEEE, Broadcasting, Broadcast and Television Receivers, and Communications Technology Groups. Nearly 20 years in communications industry.

Farinon

Point-to-Point Microwave for Studio-Headend Links and Community-Antenna Relay Service (CARS)

AM and FM Subcarrier Channels

For Complete
Information:

Farinon

Farinon Electric
1691 Bayport,
San Carlos,
CA 94070
(415) 592-4120

**WORLD
ELECTRONICS, INC.**



WORLD FIGHTS INFLATION

World Electronics stocks the largest supply of CATV maintenance parts in the United States. Our brand new 1976 Parts Catalog is available and prices are lower than ever.

Call or write today for your free 1976 Parts Catalog.

World Electronics
5401 E. Evans Ave.
Denver, CO 80222
(303) 756-4820

Represented by:
Jerry Conn Associates, Inc.
550 Cleveland Avenue
Chambersburg, PA 17201
(717) 253-8258

Outstanding Technical Sessions



- Round Table Discussions
- Papers of Interest

**CALIFORNIA COMMUNITY
TELEVISION ASSOCIATION
NOV. 12-15, 1975
DISNEYLAND HOTEL
ANAHEIM, CALIFORNIA**

Call Spencer Kaitz for information
(415) 881-0211

NATIONAL CABLE TELEVISION ASSOCIATION, 918 16th Street, Washington, D.C. 20006 • (202) 466-8111
Delmer C. Ports, Vice President-Engineering • Hazel S. Dyson, Administrative Assistant

THE PATH TO SELF-REGULATION

Technical standards can be either imposed by law and enforced accordingly or generated cooperatively by industry associations, government agencies, and professional societies and implemented voluntarily. In electronics and communications, the great majority of technical standards are voluntary.

They perform three functions:

1. Protect others from harm.
2. Insure compatibility and interoperability.
3. Provide a means of judging quality and rating performance.

Any of the above three may be either legally imposed or voluntarily accepted. For realistic reasons, those involving protections are frequently regulated by law. The remaining two are most frequently generated by industry and voluntarily adopted in circumstances where they apply.

There is a tug of war between those favoring self-regulation and those for legally imposed regulation, and it is rather deeply rooted. Those for voluntary, industry-sponsored technical standards argue that arbitrary, legally imposed regulations preempt management. The opportunity to make choices in order to optimize tradeoffs are eliminated by the regulation. Those favoring legal regulations claim they are necessary to avoid

abuses and to compensate for incompetence. Both sides prove their points by specific examples.

The best solution is not to prove which side is correct but to minimize both of the above situations to the lowest possible profile.

Preemption of management and irritating abuses can both be reduced by effective use of comprehensive voluntary standards of good engineering practices. By being voluntary, they are adaptable and dynamic, and acceptance places the authority where the responsibility is—with company management. They are educational since they are specific creditable guidelines. They offer a means of rating oneself since they furnish a valid basis for comparison. They will work in the cable industry because there is a powerful motive pressuring almost all cable operations. The product sold by cable television is basically a service operating in a competitive market.

There is a new added impetus now for a technical standards development program. The FCC Cable Technical Advisory Committee has completed most of its work, and the reports of the 10 panels contain a wealth of partially digested information heretofore unavailable to any but very select groups. These standards can address the questions of compatibility, performance, and reliability.

Standards for cable systems present a special problem due to the extreme

variety of systems. One of the main attractions of cable TV—the fact that it can be adapted to an infinite variety of situations to fit each particular locale—creates a major difficulty in developing standards. A degree of perfection for some particular detail that just barely meets the requirements for one situation may be beyond practical realization for some other system. This automatically suggests having not one standard attempting to identify a compromise but grades of standards, each rated for a corresponding function to which they would apply. For example: premium TV carriage should meet different standards than a weather channel for time base stability.

Standards in any of these subjects implies an obligation to measure. Any technical standard, to be useful, must have a practical method of measuring the related quantities. For the measuring standards, emphasis must be on the objectives of the data to be obtained rather than on a specific detailed measuring procedure. Encouraging options for testing encourages development. These options can include visual testing and type acceptance tests at the source as well as the conventional measuring procedures now in use. Realism in the measuring and the ability to interpret the results are the most important characteristics. More measurements by simpler methods are more useful in many cases.

ncta call for papers

Technical Program
25TH ANNUAL
NATIONAL CABLE TELEVISION ASSOCIATION
CONVENTION & EXPOSITION
Dallas Convention Center
Dallas, Texas
April 4-7, 1976

Papers are especially solicited in subjects relevant to the following categories of interest in Cable TV Engineering:

- SATELLITE & DISTRIBUTION TECHNOLOGY
- DESIGNING RELIABLE SYSTEMS
- PRACTICAL ROUTINE MAINTENANCE
- RULES, TESTS & PROCEDURES
- ADVANCED TECHNIQUES
- PLUS: Other topics of special interest to cable technologists.

Theoretical, Experimental, and Operational papers are welcome

Persons interested in preparing a paper for the technical sessions are requested to express their interests by submission of a one-page (150 words) abstract *no later* than *November 1, 1975*.

If your paper is selected, you will be notified by *November 24, 1975*. Your complete paper will then be due *February 20, 1976*, for publication in the NCTA Official Convention Transcript.

Submit your abstracts to: Delmer C. Ports
Vice President—Engineering
NCTA
918 16th Street., N.W.
Washington, D.C. 20006

IF YOU ARE
SELLING TO THE
CATV MARKET
YOU SHOULD BE
ADVERTISING
IN C/ED

CALL AL LEON
PERSON-TO-PERSON
COLLECT
(301) 299-7224

FOR RESERVATIONS & RATES

dates & publications

MEETINGS, CONFERENCES AND IMPORTANT DATES

- October 13-14 New York State Cable Television Association
Annual Fall Meeting
Treadway Inn, Binghamton, NY
- 17 FCC Regional Meeting
Evening Public Session
New England Life Hall, Boston, MA
- 28-30 Mid America Cable Television Association
Annual Meeting
Sheraton Inn—Skyline East, Tulsa, OK
- November 1 Deadline for Abstracts
NCTA Call For Papers
25th Annual NCTA Convention
- 12-15 Western Cable Television Show
California Cable Television Association
Disneyland Hotel, Anaheim, CA
- 18 FCC Regional Meeting
Evening Public Session
Brown Palace Hotel, Denver, CO
- December 3-5 Third Annual Cable Communications Symposium
Texas Engineering Extension Service
Texas A&M Research & Extension Center, Renner, TX
- February 5-6 SCTE/IEEE Cable Television Reliability Conference
Society of Cable Television Engineers/Philadelphia
Chapter, IEEE
Philadelphia, PA
- April 4-7 NCTA 25th Annual Convention
National Cable Television Association
Dallas, TX

PUBLICATIONS

The Broadcast Industry: An Examination of Major Issues, Edited Proceedings of 1974 IRTS Seminar, \$13.50. Cable, broadcast, regulation, PTV sections included. Hastings House, 10 E 40th St., New York, NY 10016.

Cable Television Technical Advisory Committee (CTAC), Final Report to the FCC, Complete Vol. I Steering Committee Report plus excerpts of Vol. II Technical Panel Reports, May 1975, SCTE member \$8.50, Non-member \$11.00. SCTE c/o J. Baer, P.O. Box 2665, Arlington, VA 22202.

continued on page 10

CDI Services

A
NEW
concept
in
technical
support



Glen Shafer
General Manager,
13-years Manager
Western Regional
Technical Operations
for Jerrold

Joe E. Hale
President,
16-years in
CATV engineer-
ing, veteran
System Operator

Cable Dynamics Incorporated now offers rapid, high quality, low cost Repair Services for:

- HEADEND EQUIPMENT
- CATV DISTRIBUTION EQUIPMENT
- CONVERTER REFURBISHING
- MATV EQUIPMENT
- SIGNAL LEVEL METERS


Manufacturers, MSO's, Independent Operators . . . save time, save money, save aggravation. Put CDI SERVICES on your technical support team! Write or call today for complete information.



A Division of
**CABLE DYNAMICS
INCORPORATED**

SERVICES

501 Forbes Blvd., South San Francisco,
California 94080. Phone (415) 873-2906



coming in the
november
issue of c/ed

**Filters, Traps,
Scramblers &
Converters...**

**Everything
you need to
know about
Pay Security
Devices**



dates & publications (continued)

- Compliance Measurements Handbook*, 1974/1975, Tests and Forms, \$25.00. CATJ, 4209 NW 23rd St., Suite 106, Oklahoma City, OK 73107.
- Economics of Cable Television in Urban Markets: Baltimore City*, NSF Funded Study, July 1975, \$5.00. Johns Hopkins University Center for Metropolitan Planning and Research, Shriver Hall, Homewood Campus, Baltimore, MD 21228.
- The Use of Financial Analysis in Decision Making*, August 1975, \$3.50 plus postage and handling. Cable Television Information Center, 2100 M St. NW, Washington, D.C. 20037.
- Headend Wall Chart*, 25" X 38", 90 plus off-the-screen photos with interference sources, 1974, \$5.00. CATJ, 4209 NW 23rd St., Suite 106, Oklahoma City, OK 73107.
- Longitudinal Sheath Currents in CATV Systems*, J. Shekel and J. Herman, 1975 NCTA Convention paper, \$2.00. SCTE c/o J. Baer, P.O. Box 2665, Arlington, VA 22202.
- Municipal Service Applications of Cable for Baltimore City*, NSF Funded Study, July 1975, \$5.00. Johns Hopkins University Center for Metropolitan Planning and Research, Shriver Hall, Homewood Campus, Baltimore, MD 21218.
- Official Technical Records*, Canadian Cable Television Association 18th Annual Convention and Trade Show, May 1975, \$10.00. CCTA, Suite 405, 85 Albert St., Ottawa, CANADA K1P 6A4.
- Prize Papers*, Canadian Cable Television Association 1974/1975 Competition, \$10.00. CCTA, Suite 405, 85 Albert St., Ottawa, Canada K1P 6A4.
- Protecting CATV Equipment Against the Effects of Longitudinal Sheath Currents*, N. Everhart, 1975 NCTA Convention paper, \$2.00. SCTE c/o J. Baer, P.O. Box 2665, Arlington, VA 22202.
- Safety Manual*, 1974, \$3.00. NCTA, 918 16th St., NW, Washington, D.C. 20006.
- Signal Leakage Manual*, March 1975, \$5.00. NCTA Eng. Dept., 918 16th St., NW, Washington, D.C. 20006.
- Selecting a Cable System Operator*, August 1975, \$7.50 plus postage and handling. CTIC, 2100 M St., NW, Washington, D.C. 20037.
- State Regulations*, May 1975, Compiled by S. Briley, FCC Cable Television Bureau Staff. FCC, Cable Television Bureau, 2025 M St., NW, Washington, D.C. 20554.
- Technical Transcripts*, 22nd Annual NCTA Convention, 1973. SCTE Member \$4.00, Non-member \$6.00. SCTE c/o J. Baer, P.O. Box 2665, Arlington, VA 22202.
- Technical Transcripts*, 23rd Annual NCTA Convention, 1974, SCTE Member \$4.00, Non-member \$6.00. SCTE c/o J. Baer, P.O. Box 2665, Arlington, VA 22202.
- Technical Transcripts*, 24th Annual NCTA Convention, 1975, SCTE Member \$10.00, Non-members \$12.00. SCTE c/o J. Baer, P.O. Box 2665, Arlington, VA 22202.
- Television Systems Bulletin No. 2*, Cable Compatible Television Receiver and Cable System Technical Standards, EIA, March 1975, \$3.60. EIA Engineering Dept., 2001 Eye St., NW, Washington, D.C. 20006.

Publications listed have not necessarily been reviewed by SCTE and no endorsement whatsoever is implied.

bulletin board

POWERS TO HEAD CABLE BUREAU CTAC STUDY

Robert S. Powers, formerly Special Assistant for Urban Telecommunications with the U.S. Department of Commerce, Office of Telecommunications joined the FCC Cable Television Bureau Research Division September 29, 1975 as a Senior Engineer. Powers will head a newly developed Inter-Divisional Task Force to evaluate and discuss the Cable Television Technical Advisory Committee Report to the FCC. The task force, comprised of all Bureau engineers and various attorneys, is designed to derive the necessary information for all future Commission rulemakings on cable technical standards. Powers will coordinate the task force findings with all other Commission bureaus and the Office of the Chief Engineer.

Additionally, he will coordinate technically oriented rulemakings developed in the immediate future using the I-DTF, assist in evaluation of the Research Division's proposals concerning technical and non-technical matters and represent the Bureau before various outside groups.

Robert Ungar, Chief of the Bureau's Research Division has stated that the CTAC Report cannot be looked at in a void and that it is imperative that future findings from the nearly 1200 page document be evaluated with regard to their impact upon industries related to broadband/cable, as well as their impact on the future of cable.

Powers was with DOC/OT since its formation in 1970. His duties related primarily to communications systems designed for intra-urban use, including those providing local television and radio service both over-the-air or via

broadband cable; systems for urban governments; and new services to be provided via communications links.

He has chaired the Frequency Allocation Subcommittee of the IEEE/CCCCS, addressing standardization and other related technical and economic problems associated with maximum utilization of the frequency spectrum available of wideband cables. He served as Observer representing DOC to CTAC and has been Executive Secretary for the Interagency Committee on Telecommunications Applications, coordinating six federal agencies interested in telecommunications technology applications. He also served as Project Leader for the Community Communications Project in the Telecommunications Analysis Division.

His education includes a baccalaureate in chemistry and mathematics from Southern Methodist University and a Ph.D. in physical chemistry from the University of Wisconsin, in 1960. He held a National Bureau of Standards-National Research Council Postdoctoral Fellowship at NBS-Boulder during 1960.

Dr. Powers is the author of numerous papers and articles concerning telecommunications. In 1968 he led a team of professionals at NBS, Boulder Laboratories, in preparation of the report "The Digital Loop: One Approach to the Wired City." This technological forecast outlined future possibilities for broadband communications and was prepared for the President's Task Force on Telecommunications. He was instrumental in the planning phases leading to formation of the DOC/OT, serving on special assignment to the Office of the Assistant Secretary for Science and Technology in determining how the telecommunications research and engi-

neering facilities of the Department could be focused and organized. The findings led to the formation of the present Office of Telecommunications.

FRANK BAXTER PROMOTED

Frank Baxter was promoted to Manager of Engineering for the General Electric Cablevision Corporation. Mr. Baxter has been with GECCO since 1971 as a Field Engineer and System Engineer.

He received his Bachelor of Science Degree in Electrical Engineering from Penn State University and is a registered professional engineer. Mr. Baxter has authored articles for various trade publications.

Prior to his employment with General Electric Cablevision Corp., Mr. Baxter has held various engineering posts at Bell Aircraft Corp., Westinghouse, HRB Singer, Inc., C-COR Electronics and Centre Video Corp.

DRAKE FORMS NEW COMPANY

Edward E. Drake of Tulsa, Oklahoma has announced formation of a new cable television operating and managing company, Sooner Cable Services, Inc. The company will provide investment opportunities for individuals or corporations and will be involved in acquisition, management and operation of systems, as well as offering management and rate consulting services to cable operators and related communications operations.

Mr. Drake, former senior vice president of United Cable Television Corp., is currently president of the Mid-America CATV Association, and a

continued on page 12

STOP GETTING RIPPED-OFF.



Our new Security Shield stops people from stealing your CATV equipment and service.

Just slip it on and thieves can't remove the converter or bypass Pay TV trap connections.

Stop the rip off that costs you thousands of dollars. With our 16¢ part. Write or call us today. (607) 739-3844.

LRC

ELECTRONICS, INC.

901 South Avenue, Horseheads, New York 14845

ComSonics © Inc., The Leader in CATV Technical and Repair Services Offers:

- **Two (2) Week Turn-Around** repair service on *all* types of CATV equipment
- **Reliability**—Our Red and Blue services significantly increase reliability over simple repair.
- **Reasonable Rates**—Write for list of typical repair costs
- **Technical Seminars**—Write for latest information
- **For Other Technical Services**—Write or call Bill Edmonson at



COMSONICS[®] INC.

P.O. BOX 1106
HARRISONBURG, VIRGINIA 22801
Phone: (703) 434-5965

bulletin board (continued)

member of the Independent Operators Board of the NCTA.

CABLE IN NEW IEEE SOCIETY

IEEE has announced organization of the Broadcast, Cable and Consumer Electronics Society, replacing the Broadcasting Group, Consumer Electronics Group and the Coordinating Committee on Cable Communications Systems.

Individual administrative committees will be maintained for each area, managed by one governing body. IEEE anticipates membership in the new society to exceed 4,000.

NEW DIRECTORS TO CATA

The Community Antenna Television Association announced the election of three new district directors at its annual summer Board meeting. Jim Kimrey, Magnolia CATV, Inc. represents CATA District 5; Carl Schmauder of Lincoln TV Systems, Inc. serves District 7; and Ben V. Willie will act for District 8. Each was elected by their respective district to serve on the CATA board.

proof of performance timetable

when to do it — how to do it . . .

By March 31, 1976, all operating cable television systems must comply with section 76.605-1, 2 and 3 as apply to frequency measurements. This means that a system converting any incoming signals to a different outgoing frequency must measure the outgoing frequency. On-channel conversions do not require frequency measurements.

The one item absolutely necessary to frequency measurement is a good frequency counter. No matter which method you use, no other instrument in its price range will satisfy the FCC requirements. Some of you, particularly in the smaller systems, may not think you can afford a frequency counter. One way some systems are overcoming this is to go in partners with two or more systems in your part of the state. This way each system pays only a portion of the cost and shares the use. There are also companies who will rent you a counter.

The price for a good frequency counter can run from about \$800.00 to several thousand dollars, depending on the accuracy and options desired. Almost any counter that will work in the presence of modulation is so expensive that few systems will ever own one. With the addition of a few other pieces of common test equipment, any counter with a frequency range greater than the signals carried on the system will prove adequate. With proper care, the counter will last for years.

I occasionally hear of people who wait until the stations sign off the air and then measure the standby carrier frequency. This is not a valid measurement.

1. The standby oscillator relay cuts out the input oscillator (down converter), the I.F. circuits and most

THREE BASIC MEASUREMENT TECHNIQUES

Glenn Chambers
Regional Engineer
American Television & Communications
North Central Division
Appleton, Wisconsin

important, the incoming signal. Each of these help to determine the output frequency.

2. There is no intercarrier (audio) signal in the standby mode. All you measure here is noise.

3. Modulators have no standby mode. Most counters will not work if there is any modulation on the carrier, even noise modulation.

I will describe three methods of frequency measurement that are commonly used on cable systems. They are listed in order of increasing speed, ease and accuracy.

METHOD I: Aural zero beat

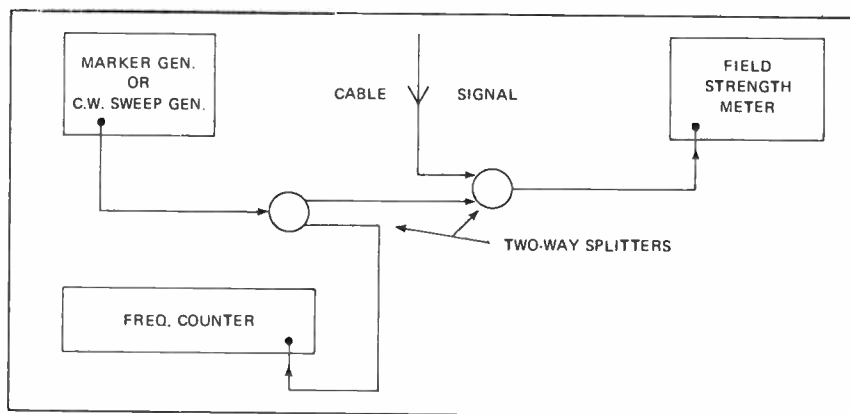
Equipment required: Frequency counter (any stable FSM with audio),

a variable C.W. (sweep or marker) generator, 2 two-way indoor splitters, misc. cable jumpers.

This method uses a C.W. signal beating against the cable signal, to create an audible beat for frequency location. When zero beat is achieved, the frequency of the C.W. signal is measured. *Drawing 1* shows the proper way to connect the test equipment.

The C.W. signal leaves the generator and is split. One output goes to the input of the frequency counter. The other output goes to an *output* port of the other splitter, which is used as a combiner. The cable signal is combined through the other output leg. The input port of the combining splitter is connected to the R.F. input on a field strength meter. The cable signals can be any value between -10 dBmV and +40 dBmV.

To measure frequency, turn on all equipment and allow at least an hour for warm-up. Longer warm-up may be necessary on some equipment to allow it to stabilize. Tune the FSM to the video carrier of the channel to be tested and peak it as accurately as possible. Read the signal level. DO NOT change or retune the FSM. Disconnect the cable signal from the



Drawing 1. Aural Zero Beat—Method I.

combiner and tune the C.W. generator to give an indication on the FSM meter. Adjust the output of the C.W. generator to approximately the same level that you had on the cable signal. Set the counter "gate" control to fast.

Reconnect the cable signal and turn the audio on the FSM wide open. Tune the C.W. generator slowly back and forth until you get the highest reading on the FSM. At exact zero beat, you will hear a whistle or shrill tone from the FSM speaker. Tune very carefully until this is heard. Immediately lock the frequency counter and read it. Log the reading and tune to the audio signal and unlock the generator. Aural carrier levels are lower, so the output of the C.W. generator must also be lowered. Be sure with audio signals that you tune for maximum (peak) indication, not for the best sound.

Each channel can be measured this way with very accurate results.

METHOD II: Visual zero beat

Equipment required: Frequency counter, any spectrum analyzer or visual signal meter, a variable C.W. (sweep or marker) generator, 2 two-way indoor splitters and misc. cable jumpers.

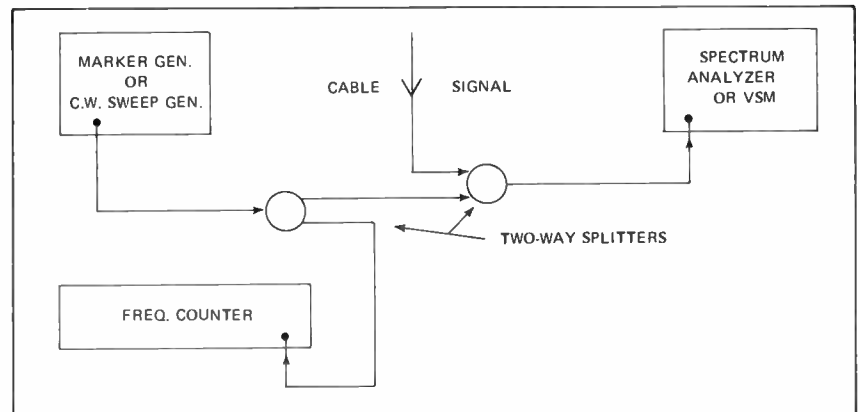
This method is exactly like Method I except that a visual zero beat indicator is used instead of an aural beat. *Drawing 2* shows how to connect the test equipment.

Allow the equipment to warm up. Tune in the video to be measured on the spectrum analyzer and center it on the screen. Adjust the vertical gain for about a 3/4 screen display. Tune the C.W. generator across this pattern and adjust the C.W. output until the two

levels are approximately the same height; see *photo 1*. Tune the generator slowly across the signal; see *photo 2*. When the exact zero beat is achieved, there will be a very noticeable jumping and moving of the pattern; see *photo 3*. Immediately lock

the counter and log the reading. Tune to the audio carrier, readjust for the lower signal level and proceed as for the video signal; see *photo 4*.

This is an extremely accurate measurement if you take your time. It is still much faster than Method I.



Drawing 2. Visual Zero Beat—Method II.

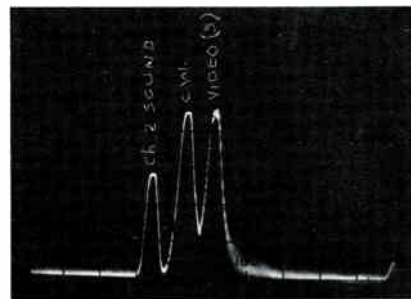


Photo 1.

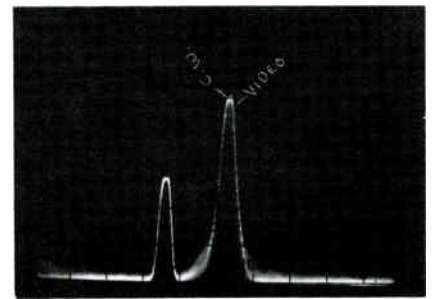


Photo 2.

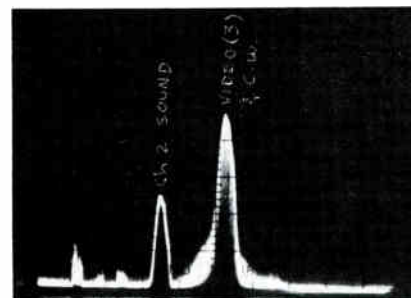


Photo 3.

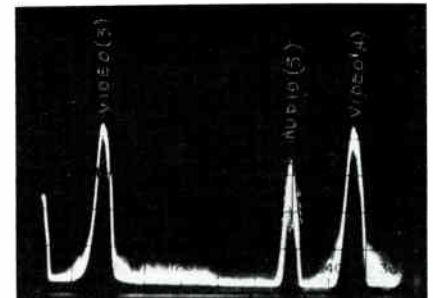


Photo 4.

The photos were taken with a Polaroid CR-9 Land Camera using Polaroid #107 film. The spectrum analyzer is an Avantek model CR-1000.

METHOD III: Processing

Equipment required: Frequency counter, Mid-State SP-2 Signal Processor.¹

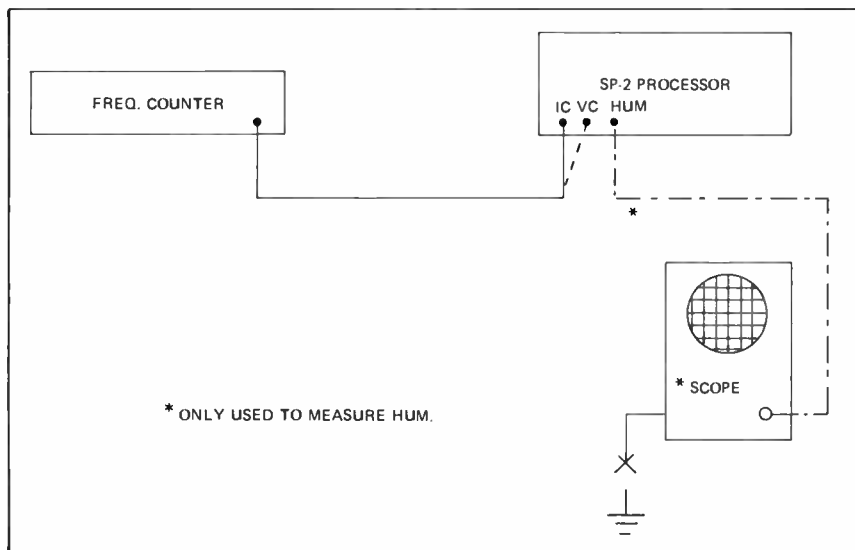
This is the lazy man's way of doing frequency measurements. It is fast, simple and as accurate as your counter. It can be used in the headend, on the test bench or in the field. By using this method, frequency checks could be made a part of your weekly headend checks. *Drawing 3* shows the equipment hookup.

The SP-2 Signal Processor takes a cable signal, selects the channel desired and suppresses its modulation. There

are three outputs: intercarrier output, video carrier output and an output with detected, amplified video output.

Operation is very simple. Connect the cable signals to the R.F. input jack, select the channel desired and measure the frequency at the video carrier and intercarrier outputs and log the results. The "Hum Mod" output provides a low noise video signal at more than 2 volts.

There are probably many other ways that frequency measurements may be made. These 3 will give you some insight into HOW TO DO IT. WHEN TO DO IT? As soon as possible and certainly prior to March 31, 1976.



Drawing 3. Processing—Method III.

¹Full information on the SP-2 signal processor may be obtained from Mid-State Communications, Inc., 59 N. Second Ave., Beech Grove, Indiana, 46107.

The CTAC Report

Hubert J. Schlafly
TransCommunications Corporation
Greenwich, Connecticut

A favorite whipping boy of any industry, particularly those that are government regulated, is the subject of Technical Standards. Complaints range from “not enough” to “too many.” Lack of regulatory standards has been used as an excuse not to invest in an operating cable system because “we don’t know what’s going to happen”; imposition of regulatory standards provides an excuse because “they are too demanding.”

Sensible Approach Needed

A sensible way to approach technical standardization is to examine and coordinate multiple points of view and technologies with operational experience. Regulatory agencies must have access to such a base of information—including sound engineering facts *and* practical operational economics. Furthermore, it is always beneficial to review from time to time, what types of regulatory standards are needed, how they might best be drafted in operational form and where to draw the line between need and unnecessary limitations of growth or innovation.

It is rare that industry is invited to review its own and related technologies, present and future and to provide an integrated study of these factors to a government agency. The broadband communications industry was given that invitation by the Federal Communications Commission when the FCC released its *Cable Television Report and Order* and implemented Part 76 of its *Rules and Regulations* in March 1972. Here was an opportunity to be critical of existing regulations and offer advice on new regulation.

Formation of CTAC

The Cable Television Technical Advisory Committee, more conveniently known as CTAC, was conceived by the 1972 *Report and Order*. After numerous public announcements and invitations to participate, CTAC was born at an organizational meeting called by former FCC Chairman Dean Burch, at the 1972 NCTA Convention in Chicago. The mission of the committee was deceptively simple. A few specific instructions listed in paragraph 170 of the *Report and Order* covered a broad scope of interrelated

technology and included requests for advice on practical economics of operation, as well as on pure engineering.

From time to time, during the life of CTAC, the Commission amplified or indicated priority with regard to some of these specifics. The Committee itself sometimes found it necessary to expand portions of the investigation. But essentially, paragraph 170 contained the thrust of the charge. Carrying out that charge required almost three years of intensive work by approximately 180 engineering professionals who volunteered their own time and talent—at their own expense, frequently but not always supported by their employers in terms of assignment approval and expenses.

The final report was formally presented to the Commission on May 21, 1975. Intended not only for study by the Federal government and by State and Local regulatory agencies, it is a reference for all who are interested in the technology of cable television. It does not set standards but provides technical information upon which knowledgeable standards can be based. In addition to basic information the report suggests where standards are appropriate or where practical changes might be made in existing standards. And just as important, the report comments on standards that are not (or are not yet) appropriate. It points out where additional information or field experience is needed before standards can be considered.

Coordinating with State and Local Regulators

Although some believe that a task assigned by a Federal bureau or commission necessarily negates the possibility of State and Local participation, this was not true of CTAC. State and local level participation was actively sought by the Committee. Dean Burch personally advised each State Governor of the work of the Committee and invited participation. Representatives of State and local governments served on the Steering Committee and on working panels. Reports on the work of the Committee were distributed to individuals designated by the Governors. In spring 1974 a Committee-sponsored seminar for State and Local representatives was held in Washington, D.C. At this meeting each Panel Chairman personally reported on matters being considered by his group.

Who Should Regulate?

The final report did not consider the question of what governmental body should set technical standards or how such responsibility should be divided. Even so, some choose this platform to voice disapproval—and their objections are duly included in Volume I Part VI “Comments and Replies.” In summer 1974 however, the Committee did address a letter to the FCC Cable Television Bureau, reminding them that the CTAC Report was in preparation. It suggested that new standards by any regulatory body or any action on Federal preemption be postponed until the report was released and evaluated. The Commission chose to disregard that suggestion and adopted Federal preemption in the fall of 1974. The CTAC letter did point out the benefits of national coordination of standards and “one set of rules and record keeping requirements” but urged ample provision for recognition of special local considerations which were not in conflict with the national pattern.

Identifying the Issues

The Steering Committee prepared and approved release of Volume I. This portion of the report is advisory and interpretative. It addresses issues that were identified by the Commission as specific areas where “more technical and economic information” was desired. These specific issues are identified in Table I. The Steering Committee treatment of the issues benefited primarily from the work and reports of the Working Panels. In addition, outside reports and professional papers as well as personal experience and professional expertise of individual Steering Committee members helped to structure these comments.

Did CTAC Do Its Job?

Those who charge that the Committee overstepped the area of pure engineering responsibility overlook the fact that economic information contains elements of operational practicality and timeliness. Those who charge that the Committee did not go far enough in its consideration of public and social interests overlook the fact that there are

many dedicated advocates, including the Commission itself, who have that responsibility. Others have long been considering the non-technical ingredients of any official ruling. Since these and other contrary opinions were an essential part of the report and needed to be presented for proper evaluation, the Steering Committee wisely made provision for presentation of all such individual points of view in the section on Comments and Replies.

Volume II contains the complete and unabridged Working Panel reports. The Working Panels were created by the Steering Committee and given assignments which would

provide information necessary to address the specific issues. These panel reports contain far greater engineering detail and consideration of alternatives and contributing factors than could be included in the advisory report. Volume II provides valuable basic report information, including working papers and studies, background and conclusions. The organization chart of CTAC (Figure 1.) identifies assignments of the panels. A comparison of these assignments with the specific issues of Table I identifies the primary and interrelated sources of panel information used for Volume I comments.

TABLE I

Issues

Cable Television Technical Advisory Committee

Designation	Description	Source*
A.	Standards for Cable Television Receivers	1
B.	Frequency Allocation within Cable	1
C.	Standards for Local Original Channels (Class II)	1
D.	Standards for Non-Television Channels (Class III)	1
E.	Standards for Response Channels (Class IV)	1
F.	Standards for Picture Quality	1
G.	Standards for Carriage of Aural Broadcast Signals	1
H.	Clarification of Subparagraphs 76.605 (a) (9) and (a) (10)	2
I.	General Considerations	3
J.	Visual Test Methods	2
K.	Procedure for Annual Performance Tests	4

*Source Reference:

1. *Cable Television Report and Order, supra*, and *Reconsideration, supra* at 204.
2. *Report and Order*, 47 FCC 2d 769 (1973).
3. Cable Television Technical Advisory Committee—Committee Deliberation
4. *Public Notice Regarding Acceptance Testing Procedures for Annual Performance Tests*, 45 FCC 2d 1045 (1974).

CTAC's Complex Structure

Before going into a summary of the conclusions, an understanding of the complexity of the CTAC organization requires a further look at Figure 1. The Commission provided the direction and authority for the Committee under a succession of official Chairmen—Dean Burch, Richard Wiley and James Quello. The chief of the Cable Television Bureau, originally Sol Schildhouse and then David Kinley, provided detailed assistance. The Bureau coordinated the work of the Committee with the FCC General Counsel and Executive Director. It provided or helped to arrange meeting locations and the facilities to accommodate the voluminous demands for document reproduction necessary to coordinate the work and publish the report. Although the Commission provided the "Government Presiding Officer" for each meeting, it did not contribute to nor influence the output of the Committee.

Day-to-day coordination, scheduling of the many panel and committee meetings, establishment and follow-up of deadlines and distribution of interim and final reports, far exceeded the capabilities of the part-time volunteers who were members of the Committee. CTAC was particularly fortunate to obtain the full-time services of Dr. Armig G. Kandoian as the Executive Secretary of the Committee. Dr. Kandoian's administrative and technical skills are well known in the professional world. He has not only served the government as Director of the Office of Telecommunications for the U.S. Department of Commerce, but has served industry as an executive of ITT and president of one ITT communications subsidiary. The good fortune of the Committee continued with the addition of Judith Baer as Dr. Kandoian's administrative assistant. The organizational and diplomatic application of pressures where needed by these two people kept a highly diverse and individualistic committee on target and on schedule.

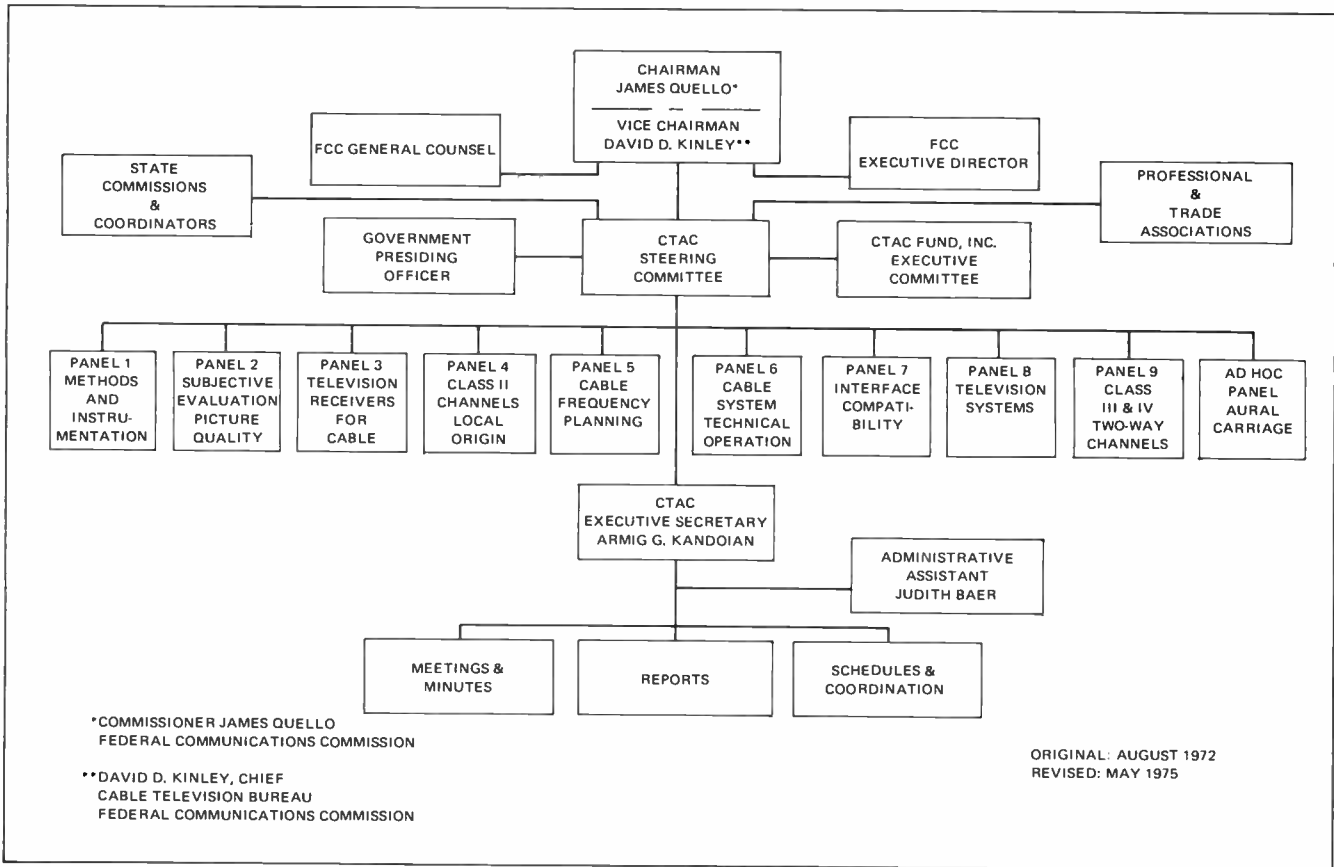


Figure 1. Cable Television Technical Advisory Committee Organization Chart

Diverse Industry Support

This CTAC Office and many administrative expenses were funded by contributions of interested groups acting in a spirit of public and industry service. The list of contributors, published with the report, included twenty-one manufacturers of which nine were major electronics firms—some of who have no direct interest in cable television. The NCTA, representing many cable interests, was an important contributor as well as two broadcaster trade associations and the Institute of Electrical and Electronic Engineers. Nine cable operating companies, (only two are major MSO's) and one broadcasting group contributed individually. One program supplier and two consulting firms completed the list. Solicitation of funds, totalling just over \$100,000 was organized and administered by two Steering Committee members, Robert Peters

of Stanford Research Institute and the late Arthur O'Neil of the South Bend Tribune. Administration and fund raising was performed through a nonprofit corporation, CTAC Fund, Inc. in accord with procedures reviewed by the FCC, Office of Management and Budget and Department of Justice.

A listing of people who made CTAC possible is far too long to be included here. The names and affiliations are gratefully acknowledged in the CTAC Report. The many diverse interests and broad geographic distribution of these members was an important factor in the preparation of a meaningful document. Special mention should be made of two men, Archer Taylor of Malarkey Taylor & Associates and Howard Head, A.D. Ring prepared the organizational structure of CTAC. They served on the Executive Committee, the Steering Committee and were Chairmen of two Working Panels.

Three Types of Standards Identified

For its own perspective and guidance as well as for others, CTAC reviewed the nature of standards, particularly those which require enforcement through regulatory action. The need for such standards is well recognized but caution is given to avoid over-regulation. Indeed, the subject of regulatory excesses beyond actual need is a matter of much concern in Washington today. CTAC identified three areas where regulatory standards seem necessary or desirable:

INTERFERENCE AND HARM—to prevent technical or physical harm to others.

COMPATIBILITY AND INTEROPERABILITY—to provide a compatible structure, including definition and terms, for national utilization of signals where public investment in terminal equipment or lower cost of services rendered is involved.

SYSTEM PERFORMANCE—to assure a reasonable means for judging technical performance by which the consumer or the community served can measure fair value.

The report notes that "most technical standards of industries such as the broadcast and telephone industries simply result from development of good engineering practices through the mutual work of professional, trade, corporate and educational institutions. Such standards promote operating efficiencies, expand market opportunities, reduce costs and increase access and usage. They are noted for flexibility, ease of modification and voluntary acceptance based upon demonstratable value."

Critics ask why such non-regulatory sources have not been more productive in the field of cable television? That question involves a matter of time and industry maturity. When many independent, geographically separated entities are involved and where such a broad scope of interrelated technologies are to be coordinated, it takes time and skill to recognize need and optimize solutions. Operational experience in the marketplace often produces better standards than regulatory agencies—at least for those subjects that do not demonstrate need under the above listed regulatory categories.

Addressing the Issues

The best way to know the content of the CTAC Report is to read the report itself. Volume II contains a wealth of basic information, Volume I is responsive to the Commission's inquiry, addresses issues, describes related factors in

layman language and makes specific suggestions for consideration and possible action.

As noted before, Table I lists the specific issues that were treated in the report. Each item is presented in Part IV of Volume I in accord with the following format:

- a discussion or identification of the issue involved
- comment on the type of technical standards that may apply
- a presentation of engineering, economic and operational factors that are related to the issue
- suggestions or recommendations for consideration or positive action
- identification of areas which require further study

At the May 21 meeting with the Commissioners, the report content was very briefly summarized.

1. It is now time for the Commission to officially *identify* channels and spectrum bands for a cable which distributes television signals to the public. It urges retention of the position of the present VHF broadcast channels and the FM band and recommends further consideration of tighter tolerances for television signal carriers. It does *not*, as some have mistakenly viewed with alarm, recommend changes in any of the VHF broadcast channels or a foreshortening of the FM broadcast band. Such a possibility was considered, and properly so, by Panel 5, on purely engineering grounds, but there are powerful economic and operational deterrents for any such change.

In a broadband system, cables which do *not* carry channels intended for public distribution as part of the basic cable service (special interest, dedicated signals such as Class III or IV) should *not* have channel assignment regulations.

2. As a companion to the point described above, an allocation plan which suggests *use-categories* of the specified cable channels or bands is identified and a recommendation is made for a priority which the cable operator should follow in assigning regular subscriber signals in those bands.

3. Both of the above items then make possible specification of a *cable compatible television receiver* in accord with EIA Engineering Report recommendations. Such a receiver is to be compatible with off-the-air as well as cable signals.

4. The synchronizing wave form—that is, the shape and position of vertical, horizontal, equalizing and blanking pulses which are specified for television broadcast signals. These synchronizing wave forms have long been compromised in low cost equipment such as is used in schools and industry. But the cost of such synchronizing generator circuits has greatly decreased in recent months. Therefore,

for new or replacement cable studio equipment it would be well, on a reasonable time-table, to have cable conform to broadcast standard practice. It is *not* suggested that existing equipment be changed out or that low-budget productions where mechanical timing equipment (such as the porta-pack tape recorder) is vital to the economic viability of such programming, be prohibited.

5. A different attitude however was taken on television programs which involve *interstate or satellite transmission* of video signals. Such programs, intended for multiple outlet carriage as distinguished from strictly local origination, should conform to Class I signal standards.

6. The Committee feels that one and two-way transmission of *special purpose signals* is still in the experimental and developmental category and would only be hindered by attempts to impose standards other than those necessary to protect against interference to other services. The present regulation requiring "return communication" is judged premature, in view of the high cost of the technology, lack of production hardware and uncertainty with regard to performance requirements and economic viability.

7. Judgments of *picture quality* are subjective and statistical and involve consideration, in a multi-system process, of who is responsible for what. Panel 2 presents a series of charts which have been transformed and coordinated for cable usage from existing literature. These charts, (contained in Volume II) relate the subjective evaluation of percentages of viewers to measurable characteristics of picture defects. New areas of evaluation, not yet examined professionally, have been identified. Panel 2 is attempting to encourage National Science Foundation funding of an IEEE study involving university level analysis of these additional contributions to picture degradation.

8. A special group was formed to consider the problems of *aural carriage* signals for the FM broadcast band. This issue presents complex and generally unappreciated problems. While the report does not attempt to say what may or must be carried, it did define technical limitations and recommend standards for certain types of signals.

9. through 12—The remaining items relate to a *review* of present technical standards, methods of measurement and performance tests. Substantive recommendations are made—some point out a few minor errors, others eliminate unnecessary burdens and most provide operable and technically adequate means for determining compliance with the intent of the Commission's regulations for cable.

The above summary is intended only to indicate the flavor and not the substance of the report. A detailed study is necessary to understand the interrelationships and the

relative values of the information and the recommendations. It is believed that the Cable Bureau staff is making such a review of the report at the present time and has begun to assign a priority for follow-up action.

Conclusion

Quotations from portions of the Volume I text provide an appropriate closing. "The Steering Committee appreciates the fact that while information in this report constitutes a collection of relevant facts and committee advice, final decisions will include consideration of many non-technical factors which were not appropriate for CTAC study. This broader viewpoint may modify or assign different values to conclusions or alternatives contained herein." It is noted that any use of the material will be "... subject to well established procedures the Commission employs for public comment and reply. Final determination of standards or technical guidelines will be made after due consideration of all factors that the proper regulatory agency considers necessary and pertinent." The text further states, "It is obvious that a dynamic industry providing useful services will continue to expand. Technical knowledge and innovative applications continue to increase. Goals and priorities change as needs of society develop and as devices and techniques improve. A report such as this therefore is only a milestone, a reckoning which tells where we are as a guide but not a limitation to where we will go."

The Case for Picture Quality Standards

Victor Nicholson
Staff Engineer
Cable Television Information Center
Washington, D.C.

Introduction

Two years after proposing technical standards for operation of cable television systems, the Federal Communications Commission adopted technical standards in the 1972 *Cable Television Report and Order*.¹ Established after extensive hearings, the 1972 standards were intended to provide "... much needed uniformity on a nationwide basis yet still allow sufficient flexibility for further technical change."² Concluding its discussion of technical standards in the *Report and Order*, the Commission stated:

We are of the view that the technical standards we have adopted are minimal and should be augmented as soon as possible . . . We intend to initiate a new proceeding to deal with these matters. But we see the need for tapping a larger body of expertise in order to develop more technical and economic information than is ordinarily available through the rulemaking process. Therefore, we will also establish a task force of experts to advise us in specifically designated areas.³

Accordingly, the Cable Television Technical Advisory Committee (CTAC) was appointed in February 1972 by the FCC. A Steering Committee was first appointed by the FCC, and nine panels were organized to explore areas defined by the Steering Committee (a tenth panel was added in 1974). Each panel was chaired by a member of the Steering Committee with expertise in that area, and the 170 members of the panels were recruited from interested persons recognized as leaders and engineers in telecommunications.

CTAC's final report was completed and presented to the Commission in May 1975, supported by a 15-4 vote by the Steering Committee. Briefly, the report recommended that the FCC should:

- encourage manufacturers to produce television receivers compatible either with cable channels and off-the-air signals, but with design specifications which limit feedback of interference into the cable system
- adopt a plan for designating cable spectrum channels which included spectrum above and below broadcast channel assignments and which suggested tighter tolerances on broadcast visual carrier frequencies

- require local origination signals to conform to National Television System Committee standards after a reasonable time
- not yet adopt standards for special purpose signals (data, pay TV) because they have not become enough standardized
- delete the present requirement for two-way capacity in cable systems because it is premature
- adopt methods of “visual testing” for some types of picture defects until suitable instruments are developed and proven
- adopt revisions of performance tests.

The four dissenters to the main report were consultant Howard T. Head, A.D. Ring & Associates; George Bartlett, Vice President-Engineering, National Association of Broadcasters; Leonard Cohen, Office of Telecommunications Policy of the City of New York; and the author of this paper.

Head’s dissent, joined by Bartlett and Cohen, centered on the proposal for adopting revised frequency allocations, and concluded that CTAC had exceeded its mandate for “technical study, fact-finding and investigation and interpretation of technical data and economic factors related thereto.”⁴

In the paper which follows, I will discuss my own dissent with the CTAC Final Report, making the following emphases:

1. I will contrast the *need* for technical standards with what CTAC viewed as the *problem* of technical standards
2. I will suggest a distinction between standards and measurement procedures
3. I will suggest that transfer characteristics should apply to all cable systems, and that the present FCC regulations (Sec. 76.605(a)) should remain the basis for these standards
4. I will recommend additional picture impairment standards for locally broadcast channels from which the cable operator can receive satisfactory reception, but not for fringe channels over which the operator has little control and for which reception may be poor though marketable
5. I will recommend use of Picture Quality Distribution Charts as compiled by CTAC Panel 2 (Subjective Evaluation of Picture Quality) from Bell Telephone Laboratories

studies as standards for picture impairment for local channels

6. I will discuss other aspects of the CTAC Final Report to which I dissented.

The Need for Standards

My basic disagreement with the *Final Report* of the CTAC Steering Committee arises from CTAC’s emphasis on the *problem* of setting federal technical standards. The *Final Report* devoted one of its first chapters to the “Problem of Standards,” asking how it can be decided what standards the FCC must set to protect the public interest, and what standards can best be left to industry practice. Here is CTAC’s strongest argument against standards: that forces of the industry and the marketplace will ensure that operators themselves will adhere to an adequate standard. The CTAC chapter on “problems” states:

Standards of good engineering practice are developed by industry and market demands of the people or the local communities being served. Bulletins, advisories and standards of engineering societies and associations such as IEEE and EIA help simplify equipment, establish practical techniques and more efficient methods and encourage field testing of innovative developments.⁵

I disagree with CTAC’s relegation of system technical performance standards to good engineering practice. If such practice had governed the industry until now, then the imposition of high standards would prove no burden—and the industry would not need to lobby for preemption. If forces of the marketplace are in fact inadequate, and the motive of the industry spokesmen is to ensure that there is no effective intervention, then all the more reason for a vigorous program of regulation—to correct the shortcomings of the market.

I agree with Howard Head, who in his dissent noted:

... Part III of the Report, entitled “Problem of Standards,” seeks to convey the wholly incorrect impression that cable standards developed by professional organizations for industry guidance on technical matters are “prolific.” Report, p. 12. The truth of the matter is that NCTA, in its more than 20 years of

existence, has developed only a handful of technical standards covering minor points; the IEEE CCCCS did not agree on any standard covering consequential points (although an attempt is now being made to set up an IEEE entity to develop cable standards); EIA has developed only its Engineering Bulletin covering cable compatible receivers; and SCTE has developed no standards whatsoever.⁶

The report's advocacy of self-regulation also proceeds from an incorrect perception of CTAC's function: that CTAC should be providing encouragement for "further growth and development" for the broadband communications industry.⁷ The report is therefore replete with subjective judgments about the adverse economic impact some particular regulation may have on cable operators, and these judgments lie at the heart of recommendations that many matters be left to be regulated as questions of "good engineering practice."

Subtle inferences that technical standards are bad for the industry point to a basic philosophical difference I have with CTAC. The *Final Report* perpetrates a distorted image of technical standards by presenting them to the industry:

- as an economic burden, rather than a source of increased income
- as a threat to the least competent engineers and technicians, rather than a tool to upgrade the status of those who are competent
- as requirements to be ignored (except for proof-of-performance tests), rather than being used as a basis for improving the quality of maintenance at reduced cost.

Ultimately, when technical standards are neglected, the result is that many subscribers with modern color television receivers find they can get better pictures directly off-the-air.

I can find in the report no instance where CTAC has documented its inferences that government regulation of technical standards will interfere with the public interest. It is, after all, the public interest in cable television which the FCC sought to further: the public is entitled to receive local broadcast signals of acceptable and uniform quality via cable TV, and originating broadcasters are entitled to expect that their signals will be so received, without reliance solely on cable industry judgment.

Therefore, I conclude that there is indeed a need for federal technical standards for cable television. Standards are not only beneficial, they are mandatory for an industry which has heretofore shown little inclination to regulate itself.

Separation of Standards from Measurement Procedures

As I have noted above, there have been many misconceptions of the problems of technical standards in the cable industry. I believe these misconceptions have their roots in the failure to separate standards themselves from methods of measurement. The cable industry has overreacted to the idea of standards, when it should have limited its concern to those methods of measurement which *can* have undue economic impact.

Ken Simons proposed an innovative solution to this problem when he suggested a complete revision of the Commission's regulations, with two primary objectives:

- i) To state in the clearest possible terms the quality of the television picture (in terms of all the various significant parameters whether they be numerical or descriptive) which the Commission, with no regard for the restrictions imposed by the measurement difficulties encountered by present system, would like to see delivered to the U.S. cable subscriber.
- ii) To set up very specific procedures which, recognizing the aforementioned limitations, will have the effect of controlling the quality of this picture to the extent possible under the conditions now existing.⁸

He further suggests that where the economic situation allows, it is obviously preferred that all parameters be measured; that subjective tests can be used in some circumstances and manufacturers' specifications can be accepted for others.

This innovative approach would allow a regulatory agency to clearly define the picture quality desired and to do so with minimum economic impact on the cable operator. An operator would be allowed to use manufacturer's specifications for equipment, visual testing and quantitative testing for various factors; precise measurements would be required only in the case of a dispute over whether standards were actually being met.

Cable System Transfer Characteristics

Technical standards are normally applied to what engineers call the transfer function of a cable system, i.e., the accuracy with which the system delivers to the subscriber's terminal a broadcast TV signal it obtained as an input. At present, the FCC's rules apply primarily to the cable's distribution system, or signal delivery transfer. Even though one of the standards, Sec 76.605(a) (9) seems to deal with off-air parameters (such as co-channel and signal-to-noise of

Grade B contour signals), the Commission has suspended compliance with the co-channel and intermodulation standards⁹ and the signal-to-noise standard appears to be subverted by the measuring procedure set forth in Sec. 76.609(e). This calls for a properly matched resistive termination to be substituted for the antenna and therefore eliminates measurement of the off-air signal itself.

Thus, the present technical standards are primarily involved in signal delivery, including the headend, transportation and distribution. I feel the FCC is correct in recognizing that cable systems do have control over the quality of these functions and can reasonably be expected to meet minimal standards.

The Need for Additional Picture Quality Standards for Local Channels¹⁰

As I stated above, I think the FCC correctly expects cable systems to meet standards in areas where the systems can control quality. Yet the regulations now cover only quality of signal delivery. Performance of the system in obtaining local off-air signals is currently unregulated, yet it has been my experience that this area represents a significant cause of overall subscriber complaint.

The Steering Committee's report does not even raise this as an issue for the Commission. Local signal acquisition is discussed only indirectly during a section on the overall TV system.¹¹ There the report makes a lengthy recital of all the difficulties involved in receiving television signals off-air, suggesting that while standards are desirable as a public safeguard, setting precise numerical standards would be extremely complicated. What the report does not specify—and what is vital to the FCC's concern for the nation's overall communications system—is that almost all of the serious problems listed by CTAC pertain primarily to the reception of signals over long distances. In reality, it is entirely reasonable to set standards that include the acquisition of local off-air television signals.

I think CTAC should have faced the issue of whether the Commission should continue to regulate only the delivery portion of a cable system or expand the standards to include picture quality of local stations, thus embracing the complete cable system. Otherwise, neither cable subscribers¹² nor local broadcast stations will have protection against the delivery of poor quality signals by cable systems. If the local cable system has a poor antenna design or location, the present FCC standards will only limit the amount of further degradation with which the poor quality

picture is delivered to the subscriber. As long as the standards exclude off-air signal acquisition, they cannot ensure good quality pictures. This is the area in which I have my major disagreement with the *CTAC Final Report*.

I propose that to ensure high quality cable service without unduly burdening the cable system, the Commission adopt a dual set of standards. For local television signals, it should set picture quality standards that hold the cable operator responsible for delivering to the subscriber the picture transmitted by the broadcaster, with added distortions kept within the limits of these technical standards.¹³ In the case of nonlocal signals, it should be made clear that only the performance of cable system signal delivery is included within the scope of the present FCC technical standards.

Among the many reasons that support my suggestion that picture quality standards are needed for local channels, the following are especially important:

- To prevent undue degradation of locally broadcast signals
- To encourage the use of modern color television receivers with improved definition.

First, I think local picture quality standards are needed to prevent undue degradation of local TV signals. Because increased subscriber penetration depends upon the delivery of satisfactory pictures—especially of local channels for which a direct comparison can often be made—it is advantageous not only to the subscriber but also the cable operator to maintain high standards for the reception and delivery of local channels.

The additional standards I have proposed include standards for the picture quality of these signals as delivered to the subscribers. Thus, the cable operator would have a reasonable responsibility to: 1) Select a satisfactory antenna site; 2) Design antenna arrays to optimize picture quality; and 3) Trap out interfering signals at the headend. If difficulty occurs in delivering pictures of satisfactory quality to subscribers on one of these channels, measurements can be made at the headend to determine whether reception difficulties lie with the broadcast signal or cable operator. On the other hand, we all recognize the difficulty in securing this same quality of television reception from distant stations, and I think standards dealing with this could be intolerable and should not be recommended.

Second, I think local picture quality standards would encourage the use of modern color television receivers with improved definition. There have been complaints that modern color television receivers are providing noisier pictures through a cable television system than with

reception directly off air. These complaints have centered primarily on the RCA XL-100 receivers of the past three years, but also include GE and other high definition receivers. The same problem exists in cable systems when a subscriber replaces an older low resolution TV receiver with one of these modern sets and complains that the pictures on one or more local channels are much noisier than before.

Ironically, the factors that allow modern TV sets to provide superior reception for off-air signals also cause degraded cable reception. These factors include improved noise figure, sharper optical picture resolution, improved electronic signal definition and automatic color control. The larger size of many receivers also contributes to the problem; the subscriber is often at a shorter viewing distance with respect to the size of the picture, and defects in picture become much more noticeable.

Some of these causes of noise are as follows:

1. Kinescope definition

There has been greatly improved optical definition of kinescopes in the past few years. The 25" Delta guns, for example, use higher voltages for anodes and high beam currents, producing a smaller, sharper spot on the picture tube. The functional signal-to-noise ratio observable is now 50 dB versus 43 dB previously and is one reason degraded signal-to-noise ratios are more visible.

2. Video response

The improved definition of the picture tube has encouraged comparable improvement in the I.F. and video response characteristics. Alignment in the I.F. is broader and has additional video peaking—as much as 10 dB at 1½ to 2 MHz. This provides sharper high frequency resolution with all possible bandwidths. A video peaking switch is incorporated into every TV set.

3. Tuner noise figure

Present RCA receivers have a 3 to 4 dB noise figure, as compared to previous tuners of 7 dB and higher, and include adjustable R.F. delay. This delay corrects for changes in input levels such that minimum noise figure and poorest overload capabilities occur with weak fringe signals and the converse with local signals. This works fine for off-air reception of relatively few channels as the noise figure is optimized up to input levels of 0 dBmV.

Unfortunately, the present IC circuit devices used for R.F. and mixer of the tuner have a wide frequency response

and are subject to total energy of incoming channels in a cable system, causing the R.F. delay circuit to protect against overload interference by degrading the noise figure. This is a second source of poorer picture quality being noticed on a multi-channel cable system as contrasted to limited channel off-air reception.

4. Automatic chroma control

Present TV receivers have automatic chroma control that maintains the color saturation irrespective of the level of luminance vs. chrominance. This control is extremely sensitive and makes changes in chroma gain control in order to keep constant the intensity of the color. However, increasing the chroma gain directly increases the chroma noise. Reduced chroma level in a cable system directly results in a degraded signal-to-noise ratio since, if the amplitude response of the 3.58 MHz chrominance is low with respect to the video carrier, the Automatic Chroma Control (RCA-Accumatic Color Monitor) increases the chroma gain and simultaneously increases the high frequency noise in the picture. Correction of reduced chrominance-to-luminance in a given channel can be easily accomplished at the headend by realigning a signal processor I.F. response such that the high frequencies are increased in amplitude. As a positive side effect, this will also tend to correct for reduced high frequency definition.

I suggest that there be a channel response standard similar to Sec. 76.605(a) (8) but that it should include ± 2 dB as the *total* acceptable response deviation for local broadcast channels, not just for the distribution system. This reduced chroma level often occurs in a single local channel and can be introduced into a cable system by:

- a. Improper stacking of single channel yagi antennas, causing a loss of high frequency response
- b. Reflections due to mismatched antenna arrays and poorly matched signal processors
- c. Response variations due to structural steel of tower changing antenna characteristics
- d. Multiple sources of antenna signal with different delays
- e. Response variations within the headend processors
- f. Cumulative response variations throughout the distribution system
- g. Sound traps, intended to reduce aural carrier to 15 to 20 dB below visual carrier, but also reducing chroma level—especially after becoming detuned due to temperature variations

h. Reflections and other sources of response variations—a major reason for noisy pictures. This explains why a subscriber often complains that one local channel is very noisy and the others are satisfactory. The reflections cause this variation in response by introducing frequency differential additions and subtractions of signals within the desired channel.

Several cable operators have dealt with the problems of modern color TV receivers by degrading the resolution of these receivers. In this instance, the TV set is modified by realignment, reduction of voltages or adjustment of the “sharpness” control.¹⁴ This removes excess noise but it simultaneously reduces the fine detail in the picture. Correcting chroma noise in this way is obviously not satisfactory to a manufacturer which markets receivers based on finer picture quality.

A better answer is to increase the cable system carrier-to-noise ratio. Jim Grabenstein reaches the same conclusion:¹⁵ that a 36 dB carrier-to-noise standard is far too low for modern color television receivers.

The inescapable conclusion is that CTAC’s continued acceptance of a 36 dB carrier-to-noise standard is a major disservice to the cable industry for subscriber satisfaction and penetration, for serving urban areas and for making other broadband telecommunications services profitable on cable. The cable industry will not benefit from cable systems designed according to low standards; rather the slight increased costs of better standards, when local channels are available, will be amply repaid.

Levels of Picture Quality

After showing the need for standards dealing with picture quality, I turn to the question of which parameters are important and what numerical value of signal impairment should be applied to each parameter. Presumably the commission wished CTAC to address both the question of additional parameters and the question of levels for standards.

The Steering Committee response to the Commission in this instance is ambiguous. Under “Issue H, Co-channel and Intermodulation,” the report appears to recommend no improvement in picture quality beyond the current set of standards now in the rules. But under “Issue F, Picture Fidelity,” the report suggests the following:

The CTAC Steering Committee recommends the Commission review in detail the Picture Quality Distribution Charts provided by Panel 2, for assist-

ance in understanding and for judgements relating to determination of cable television performance standards (regulatory standard Type 3).¹⁶

The “Picture Quality Distribution Charts provided by Panel 2” are the results of tests by Bell Telephone Laboratories.¹⁷ While investigating the literature of subjective evaluation of picture impairment, CTAC Panel 2 discovered that Bell Telephone Laboratories has been conducting a series of tests on television picture impairment over the last 20 years. This high quality work has consistently used the same techniques for evaluating seven of the primary types of picture impairment.¹⁸ Using a panel of observers and statistically analyzing the data, the studies report the percentage of observers agreeing with each of seven verbal descriptions¹⁹ for each numerical value of signal impairment.

Charts showing these relationships are found in the Panel 2 report.²⁰ Unfortunately, the Steering Committee *Final Report* fails to articulate a basis on which the FCC may use these charts to make a decision. The closest CTAC comes to providing a set of alternative levels of service is found in Table 1 from the Panel 2 report (page 28), where four different levels of services are defined from “barely acceptable” (column A) to “almost perfect” (column D). There is, however, no substantive discussion of the arguments in favor or against the various alternatives.

Thus the Commission still has before it the question of what level of signal quality it will require and which parameters of the seven in the Bell Lab charts not currently subject to standards will be covered.

My opinion is that appropriate standards fall where 50 per cent of Bell Labs’ observers felt that a TV picture impairment was “not objectionable.” This recommendation avoids “objectionable” pictures and is reasonable, falling well within the range in which modern cable systems are designed and built.

As to which parameters should be set, I recommend all that are materially applicable to the cable television system. This will eliminate “Chrominance Delay (flat),” a type of distortion which occurs in the processing of the color signals in TV cameras, receivers and other video processing equipment. The recommendation includes all factors that significantly affect the television picture quality irrespective of the measurement difficulties involved. To prevent undue hardships on cable operators, the FCC should develop various types of test procedures. For equipment-originated distortions, such as differential gain and phase distortion, manufacturers’ equipment specifications should suffice. For other factors, such as echoes, subjective testing is satisfac-

TABLE 1²¹

Bell Telephone Laboratory Picture Quality Ratings

	A	B	C	D
	50% Comment 5 or Better	50% Comment 4 or Better	90% Comment 4 or Better	90% Comment 2 or Better
CNR (FCC Definition)	36 dB	41 dB	45 dB	54 dB
Differential Gain	8.9 dB	6.4 dB	4.4 dB	1.1 dB
Differential Phase	18°	13.3°	9°	5°
Chrominance Delay (flat)	384 n. secs.	256 n. secs.	171 n. secs.	44 n. secs.
Chrominance Delay (shaped)	657 n. secs.	477 n. secs.	334 n. secs.	86 n. secs.
SER (0.5 μsec.)	14 dB	18 dB	22 dB	32 dB
SER (10 μsec.)	21 dB	25 dB	29 dB	39 dB
C(xM)R (non-sync.)	47 dB	51 dB	56 dB	63 dB
SHR (p/p)	30 dB	32 dB	39 dB	45 dB
Key: CNR—carrier-to-noise ratio SNR—signal-to-noise ratio SER—signal-to-echo ratio C(xM)R—carrier-to-cross-modulation ratio SHR—signal-to-hum ratio				

tory until complaints occur; at that time, quantitative measurements are needed. Thus, technical standards can be used as a basis for ensuring satisfactory picture quality for local broadcast channels with minimal economic burden on the cable operator.

Other Areas of Dissent

Now that I have made clear where my major disagreements are with the CTAC *Final Report*, I will briefly review some of the other areas in which I also dissented.

Issue B, Channel Planning

I concur with the Steering Committee recommendation for the immediate adoption of the Panel 5 Frequency Channeling Plan 1A. This can be briefly described as using "augmented FCC assignments with standard tolerances and offsets," for a total of 35 channels.

I disagree with the recommendation for the use of 108-120 MHz band of frequencies for experimental services as listed in the Frequency Allocation Plan,²² because the 180-112 MHz band is presently being used for Instrument Landing Systems and the 108-118 MHz band is used for Visual Omnidirectional Range. The FCC showed concern about "Potential Interference to Aeronautical Radio Services Using the Band 108-136 MHz from Cable Television Systems."²³ I feel that catastrophic failures could result from interference with aircraft landing controls in the 108-118 MHz band; but that possible occasional interference in the 118-136 MHz band would be less of a problem in that it only affects communications.

Issues D and E, Down and Upstream Signals

Both of these sections in the *Final Report* contain the following recommendations:

Until terminal equipment performance can be defined well enough so that standards can be determined to enforce satisfactory interference protection, a cable

operator whose system complies with the Rules and Regulations should have the *responsibility* and *full authority* to either approve the type of terminal connected to the system or to specify operational characteristics that will provide proper protection against degradation of system performance.”²⁴

To prevent economic protectionism from masquerading as legitimate engineering concern, I recommend that cable operators’ refusal to connect because of foreign attachments be subject to FCC review.

Issue H, Co-Channel and Intermodulation

Although the title of this section includes only co-channel and intermodulation, the Steering Committee has greatly expanded this issue to include an examination of the entire Section 76.605, “Technical Standards.”

The Steering Committee recommended a study of the Panel 1 Report “to see if it is appropriate at this time.” I concur but I feel that some of the factors—such as separation of standards and measurement, visual testing by use of qualified personnel and definitions of terms—should be implemented as soon as possible.

I also disagree with the following recommendations based on the Panel 6 report:

1. That predicted Grade B contour should serve as a reference for a picture quality standard. While a 36 dB requirement may be satisfactory for a Grade B contour which could be more than 75 miles distant, the primary concern should be with local channel degradation for which a higher standard is needed.

It is difficult to believe that Panel 6 really accepts a 36 dB carrier-to-noise standard for “signals provided by direct video feed from a television broadcast station.”²⁵

2. That manufacturer’s specification of isolation should suffice and that physical measurement requirements should be eliminated. I am in agreement with Panel 6 use of manufacturers’ specifications to justify compliance with this 18 dB terminal isolation requirement. However, the FCC quite knowledgeably stated that, in addition, the isolation should be sufficient to prevent reflections and therefore physical measurements must be made when a problem arises.

I think another modification should be made to 76.605(a)(11) in order to provide sufficient isolation to prevent *interference* (not just reflections) due to oscillator or other in-band interference signals from cable receivers, set converters or other terminal devices.

3. That system noise be limited to thermal noise only. This is reasonable only if the present measurement procedures are continued; it is unreasonable if these procedures are to incorporate visual testing or picture quality standards. The broader concept of Sec. 76.5(ff) is more valid when it includes modulation, thermal and other noise-producing effects.

Issue I, Overall Television System

My dissent here deals not so much with the recommendations, since the first three are merely an apologia for the cable operator based upon the discussion emphasizing propagation problems; I agree that technical regulation should only include items over which the operator does have control. However, I think CTAC ignored the fact that propagation factors are only minimally applicable to distribution standards or to local broadcast picture quality standards.

I feel that the FCC requirements pertaining to location of performance tests, Sec. 76.601(c), are more definitive and of at least equal value to the Steering Committee’s recommendation that “performance measurements should be made at a location in the system where the most appropriate evaluation is possible.”²⁶

Issue J, Visual Test Methods

I concur with the recommendation that visual tests should be permitted in the evaluation of picture quality standards. However, as pointed out in Section III of the Panel 1 report, certain performance factors may be evaluated by subjective testing, but certain other factors must be measured.

It must be recognized that subjective testing can be imprecise and that inaccurate subjective evaluations are not an acceptable excuse for not complying with the FCC’s rules. It is not easy to properly make realistic subjective evaluations; therefore Panel 1 suggested training of “certified viewers.” Among many factors leading to inaccuracies in subjective tests is the need for precise adjustment of the fine tuner for each channel of the TV set, since a slight misadjustment can disguise reflections and interference.

I am concerned with the recommendation that the certified viewer status be conferred by either a designated industry association or a professional society. All too often this type of certification is used to protect existing

personnel, by making it difficult for minorities to qualify. I do not think this problem would arise if certified viewer status could be earned from a recognized educational institution or a federal agency.

Conclusion

The intention of the FCC was that CTAC provide technical and economic expertise to augment existing technical standards. After three years of deliberation, CTAC unhesitatingly recommended added standards for television broadcasters, television receiver manufacturers and local origination equipment manufacturers—in short, everyone but cable television operators and engineers. Instead of applying the same rigorous analysis to cable television, CTAC's Steering Committee chose to select data and viewpoints leading to minimizations of regulatory standards affecting cable television.

My criticism does not lie with the material generated by CTAC. In fact, I believe that the panel reports present in-depth discussion of many important issues and serve as an excellent primary source for the present technical aspects of cable television.

I contend that CTAC has assumed the role of protector for the cable industry status quo by making a selective presentation of facts and by avoiding opportunities to upgrade cable television service by recommending additional standards. Here I will briefly note further evidence.

First, CTAC was funded by contributions from the following sources, most of which are involved in some way with the cable industry:

CTAC FUND CONTRIBUTORS	
June 1, 1974 ²⁷	
Ampex Corporation	\$1,000
Anaconda Electronics	\$5,000
Blonder-Tongue Laboratories	\$ 300
Cable Dynamics	\$ 500
Cerro Wire & Cable Company	\$1,000
General Cable Corporation	\$1,500
GTE Sylvania, Inc.	\$5,000
IBM Corporation	\$5,000
ITT	\$5,000
Jerrold Electronics Corporation	\$5,000
Magnavox Company	\$2,000
National Association of Broadcasters	\$2,000
National Cable Television Association	\$4,000

Phelps Dodge Communications Co.	\$1,000
Raycom, Division of Raychem Corp.	\$1,000
RCA, Sarnoff Research Center	\$5,000
Sarkes Tarzian Inc.	\$1,000
Hubert J. Schafly (Personal)	\$2,000
Scientific-Atlanta, Inc.	\$2,000
Sony Corporation	\$7,500
Standard Components; Stancomp, Inc.	\$1,000
Storer Broadcasting Co.	\$1,500
TeleCable Corp.	\$1,000
TelePrompTer Corp.	\$2,000
Theta-Com of California	\$7,000
Time, Inc.	\$5,000
The TM Communications Co.	\$ 750
Viacom Communications	\$5,000
Western Communications	\$1,000
Zenith Radio Corp.	\$4,000
TOTAL	\$84,000

Second, the Steering Committee recommended federal preemption and later a moratorium on technical standards. The Committee voted in June 1973 to endorse federal preemption of technical standards to the Federal/State-Local Advisory Committee which was then preparing its report to the FCC. Later, in August 1974, the Committee recommended a moratorium on new technical standards for cable TV until the FCC could have time to review, evaluate and make regulatory judgments about CTAC's *Final Report*.

Third, CTAC has not recommended improved picture quality standards for cable systems—in spite of the fact that such standards are not only needed, but may be imposed without adverse economic consequence.

I conclude that the *CTAC Final Report* does nothing to ease an unhappy situation for all concerned: for the cable subscriber, who had hoped for better reception with a new receiver or for service at least as good as off-air signals; for the cable industry, which had hoped to open additional urban markets and can only do so by providing high quality service; for local broadcasters, who are dissatisfied with degradation of broadcast signals by cable systems; and for television manufacturers who dislike having their new sets perform poorly on cable systems.

I dissent to the *CTAC Final Report* because I know the cable industry has a worthwhile product to offer—a product which could have been assured of consistently high quality only if CTAC had responded to its charter instead of attempting to justify industry self-regulation.

¹*Cable Television Report and Order*, 36 FCC 2d 143 (1972).

²*Report and Order*, para. 149.

³*Report and Order*, para. 170.

⁴*Cable Television Technical Advisory Committee Report to the Federal Communications Commission, Volume I: Steering Committee Summarization of Basic Report*, May 1975, p. 124.

⁵*CTAC Final Report*, Vol. I, p. 13.

⁶*CTAC Final Report*, Vol. I, pp. 124-125.

⁷*CTAC Final Report*, Vol. I, p. 15.

⁸Keneth A. Simons, "Personal Statement to the Members of the CTAC Steering Committee, by Keneth A. Simons, Chairman Panel 1 in regard to Summary Report," Panel 1 Report, p. 2, contained in *CTAC Final Report*, Vol. II.

⁹*Report and Order*, Sec. 76.605(a) (9) and (a) (10).

¹⁰In defining "local" signals, the Commission might choose either the 35-mile limit used in other portions of the cable rules or to use the Grade A contour of the broadcast station, since the latter would be more directly related to the cable operators' ease of acquiring high quality signals.

¹¹*CTAC Final Report*, Vol. I, pp. 71-76.

¹²The report repeatedly points out that subscribers dissatisfied with picture quality have the option of dropping cable service. From the FCC's viewpoint, this reliance on subscriber's dropping service to enforce technical standards has severe disadvantages. First, few local signals may be available to the subscriber and cable service would be the only way in which the households can fully benefit from the national television broadcast system. Second, cable service is the only way in which the subscriber can benefit from the new services the FCC anticipates from telecommunications.

¹³Of course, appropriate administrative safeguards, such as delegated waiver authority, should provide for those unusual local conditions which prevent the cable system operator, despite his best efforts, from acquiring high quality pictures.

¹⁴Jack L. Huffman, *RCA Cable Technician Handbook*, 1973, p. 6. "SHARPNESS—This control is often misadjusted. In the extreme left position (counterclockwise) it will remove the effects of excess transmission noise (smooth the picture). In the extreme right position (clockwise), it will enhance the fine detail in the picture. (This position will also emphasize any grain (noise) present in the picture.) This sharpness control should normally be set near mid-range."

¹⁵James B. Grabenstein, "Operational Experience of Feed-Forward High Level Amplifiers," *24th Annual NCTA Official Transcript*, p. 42.

¹⁶*CTAC Final Report*, Vol. I, p. 58.

¹⁷See picture quality distribution charts, based upon studies using a seven-point comment scale numbered from 1 (no perceptible impairment) to 7 (extremely objectionable) carried out by Bell Telephone Laboratories by J.R. Cavanaugh, A.D. Fowler and A.M. Lessman in Panel 2 Report, pp. 35-41, contained in *CTAC Final Report*, Vol. II.

¹⁸According to the Panel 2 report, the effects of three other types of picture impairment "will be studied under the proposed sponsorship of the Institute of Electrical and Electronics Engineers (IEEE), with funds which have been requested from the National Science Foundation."

¹⁹The seven verbal descriptions are as follows:

1. Not perceptible
2. Just perceptible

3. Definitely perceptible but only slight impairment to picture

4. Impairment to picture, but not objectionable

5. Somewhat objectionable

6. Definitely objectionable

7. Extremely objectionable

²⁰Panel 2 report, pp. 35-41, contained in *CTAC Final Report*, Vol. II.

²¹Panel 2 report, p. 10, contained in *CTAC Final Report*, Vol. II.

²²Panel 5 report, pp. C-8 and D-2, contained in *CTAC Final Report*, Vol. II.

²³"Potential Interference to Aeronautical Radio Services Using the Band 108-136 MHz from Cable Television System," FCC Public Notice, FCC 75-103, January 31, 1975.

²⁴*CTAC Final Report*, Vol. I, p. 47. See also p. 52.

²⁵*CTAC Final Report*, Vol. I, p. 67.

²⁶*CTAC Final Report*, Vol. I, p. 76.

²⁷"CTAC: 'Fox in the Chicken Coop?'" *Access*, May 5, 1975, p. 14.

A Philosophy of CATV Re-Regulation

Frank J. Bias
Vice President, Engineering
Tele-Vue Systems, Inc.
Subsidiary of Viacom International, Inc.
Pleasanton, California

When the FCC and other government entities undertook the regulation of the technical aspects of CATV in 1972, they followed the existing model of tight broadcast television type technical regulation. Three years of experience with the resulting rules have brought forth questions regarding the applicability of broadcast type technical regulation to CATV. If re-regulation is to be sincere and effective, the applicability must be restudied.

Important objectives of the technical regulation of television broadcasting are:

- (1) The promotion of public safety.
- (2) The elimination of interference between stations.
- (3) The formalization of the lock and key relation between the transmitter and the receiver.
- (4) The assurance that the television receiver is the limitation to the ultimate quality of the image in the viewer's home.

The objective that gives the most mischief when carried over into CATV regulation is the fourth. But let us give brief consideration to the first three.

Public safety in CATV systems is adequately covered by the FCC specification on radiation 76.605(a)(12), the provisions of the National Electrical Safety Code, the National Electrical Code, pole attachment agreements, and franchise regulations.

Rule 76.605(a)(12) also controls interference between CATV systems and between CATV systems and any other communication service.

A Look at the Numbers

Technical regulation of television broadcast stations to assure the consumer that the receivers they bought would work with any transmitter anywhere in the country was required in 1945 when the television broadcast service emerged from a number of experimental operations having different standards. In 1975, with approximately 70 million television receivers in use, no rational CATV operator will attempt a system not compatible with the television receiver of today.

The fourth objective of broadcast television technical regulation is to assure that the television receiver and its antenna is the limitation on the quality of the system. In

broadcasting, there are several justifications for this objective, the most important is economics. For example: if there are in the nation 70,000,000 television receivers being serviced from 1,000 television plants, it is reasonable to believe that it is better to add \$70,000 to each transmitting plant than \$1 to each receiver. A second justification is that the consumer has some quality versus cost choice. The television receiver industry can (and has) manipulated such quality determining factors as frequency response, picture tube phosphors and construction, color matrixing parameters, etc., to create a range of cost versus performance choices. The consumer can buy the model suiting his desires.

The tight technical regulation of broadcast television transmitters should not be applied by analogy to CATV transmission systems because of fundamental differences between the entities. A major difference is economics. In the CATV system there are many components (transformers, connectors, drop cable, taps, etc.) which are required for each subscriber (receiver). Thus, the overall cost of whether a dollar is added to a television receiver or to a CATV component approaches equality.

A second difference between the broadcast and the CATV system is that the CATV system embraces all the links between the signal source and the receiver—the broadcast system does not. Once the broadcast signal leaves the transmitting antenna there is no control over the condition it arrives at the receiver—if it does. The consumer can influence the quality of reception depending upon his individual cost versus performance evaluation by erecting a large outdoor antenna or by using indoor “rabbit ears.” Present regulation requires the CATV system to meet broadcast television transmitter quality standards at every receiver terminal without regard to cost, to what quality is available “off-air,” or to what the subscriber’s cost versus performance judgement might be.

The Real Regulator is the Consumer

Further compounding this regulatory injustice is the fact that this stringently specified signal is delivered to a receiver on which there are no quality performance specifications. Even such a simple technical rule as minimum subscriber

signal level becomes superfluous when there are no specifications on the device to which it is delivered. Realistically, CATV operators are finding that systems designed within the last two years to supply adequate signal level for the then existing receivers cause overload on receivers being introduced today. The same effect is being observed relative to other technical requirements.

What type of technical regulation is appropriate to CATV transmission? Certainly safety requires some form of Rule 76.605(a)(12) controlling radiation from CATV systems. Hopefully, the radiation measurement requirement can be implemented in a manner which will allow inexpensive measurements, but in a manner as to meet the interference to television reception and safety to life objectives.

Is any other technical regulation appropriate? All other present or proposed technical regulation substitutes the quality versus cost judgement of the regulator for that of the consumer. It would appear that this judgement should be left to that most effective regulator of them all—the marketplace. This has worked well for years with television receivers.

The New York State Role in Federal/State/Local Technical Standards

Kenneth L. Foster
Chief, Division of Telecommunications
New York State Commission on Cable Television
Albany, New York

An Act of the 1972 New York State Legislature created Article 28 of the Executive Law and the New York State Commission on Cable Television. The Commission formally began operation on January 1, 1973.

The Commission was preceded by Governor Rockefeller's Task Force on Cable Television, a group of persons appointed by then Governor Rockefeller to draft specific standards for presentation to the Commission for its consideration. The draft standards included, among others, procedural rules, franchising standards and technical standards.

The Commission adopted the Rules and Regulations after staff changes and recommendations as interim rules during the pendency of a rule making proceeding. The rule making proceeding was a time-consuming process of receiving and evaluating comments. In all, over 1200 pages of comments were carefully reviewed before staff recommendations were presented to the Commission.

The rules which were of greatest concern to the industry were those applicable to technical operation of cable systems. As might be expected, the comments on our interim technical standards ranged from "not tough enough" to "harsh, onerous, economically disastrous" and several degrees between. These interim rules were repealed and replaced by Part 596—Technical Standards of the Commission.

There were some who believed that the technical standards had been drafted and subsequently amended without the handicap of knowledge. Such was not the case. The rules were amended after consideration of all the comments and evaluation of a volume of data accumulated as a result of the operation of the Commission mobile monitor van.

The monitor van was the first vehicle of its kind specifically designed for testing cable system performance. It remains the only vehicle of its type operated by a state cable agency. I believe that no other agency has in its files a greater collection of test data than has the New York Commission. Most important, the data are compiled from operating cable systems throughout the state under widely varying conditions of temperature and humidity. The van is operated on a year round basis, thus temperatures at test times have been as low as -20°F and as high as 95°F .

The technical standards that are most discussed by operators are those that apply to the large Urban systems. The New York State rules are graduated by system size and location. Small systems of 1000 subscribers or less are subject only to FCC rules and to minimal record keeping. Systems above 1000 subscribers in the more rural areas of the state are subject only to FCC rules, but with more comprehensive record keeping and testing requirements. Urbanized Area systems are required to maintain higher performance levels within the system and to maintain logs of performance and of subscriber complaints.

The rules applicable to the large, or potentially large, Urban systems require a 40 dB carrier-to-noise ratio; the maintenance of FM Radio carriers at least 10 dB below the level of the channel six visual carrier where channel six is carried on the system; a visual carrier to cross-modulation, or cross-picture interference, ratio of 46 dB; and, visual carrier to single intermodulation beat product ratio of 30 to 57 dB, dependent upon its frequency within the channel.

Initial performance testing of new systems is required by our rules. If we were to rescind that requirement those tests would be made, since no responsible operator would be willing to complete payment of a turnkey contract without assurance that the system actually performed in accordance with the contract specifications.

What We're Learning

The testing of over 140 systems with a minimum of four test points each has resulted in an accumulation of data that support a requirement for higher performance in all cable systems. Individual tests for carrier-to-noise ratios, cross-modulation and intermodulation now number in the thousands and point conclusively to the premise that current system design is very conservative.

The 40 dB carrier-to-noise ratio requirement has been said to lead only to economic disaster in that systems would require a rebuild in order to comply. Our tests of systems indicates that carrier-to-noise ratios in excess of 40 dB are common in the day-to-day operation of grandfathered systems as well as newly constructed systems. Systems exhibiting 40 dB or better carrier-to-noise ratios

are not confined to small distribution plants. Our measurements have been made on systems of 300 to 400 miles of outside plant as well as the "Mom and Pop" systems. By and large, systems throughout the State employ single-ended amplifiers, since relatively few new systems have come on line utilizing push-pull equipment. Where new systems are tested, noise performance is just short of spectacular. For example, the system in Troy, New York was designed for thirty downstream channels. There are 16 active channels and the carrier-to-noise ratios at trunk extremities exceeds 46 dB, while cross-modulation and intermodulation is un-measurable with the Commission spectrum analyzer. Feeder extremities have been tested with essentially the same result: no measurable distortions and carrier-to-noise ratios exceeding 45 dB.

Tests by independent contractors have borne out my contention that current system designs can be modified to a significant degree without adversely affecting performance at subscriber terminals. It has been, and continues to be, my contention that systems can be extended well beyond that which is considered to be the theoretical limit of cascadability. This approach requires a modification of the existing cascade formulac to account for certain phenomena that are exhibited in virtually every test.

Carrier-to-noise ratios and cross-modulation distortions do not increase at 3 dB and 6 dB respectively per doubling of an amplifier cascade. Therefore, the cascade is not restricted to lengths that do not exceed $10 \log_{10} n = 17$ for a 36 dB carrier-to-noise ratio, or approximately 50 amplifiers. Cross-modulation specifically is most unpredictable and is not a limiting factor in cascades. In integrated circuit amplifiers, it is likely that due to some not yet explained phase cancellation, the cross-modulation performance is significantly better at bridger outputs than it is on the trunk system.

The conclusions I have drawn from our accumulated data have not been voiced by any manufacturer of CATV equipment to date, yet I am aware of at least two manufacturers that have demonstrated similar phenomena in test chambers. The FCC has not, to date, accumulated sufficient data on operational cable systems to draw any conclusions. However, as data are accumulated through use of the mobile testing facilities that became operational

recently, I believe that additional support for my theories will be forthcoming.

The State Commission has been investigating the theoretical hazards to air navigation systems from cable system signal leakage. We have searched for signal leakage in systems utilizing those mid-band channels most likely to cause interference. We have been aided in our search by FAA air controllers and pilots from the State Conservation Department, both report localities where air navigation instrumentation has been affected by unknown RF sources. We have now completed studies of 20 systems and found no measurable leakage from cable systems on air navigation frequencies. We did find one source of interference near a major airport that required immediate action. It was spurious radiation from a commercial FM broadcast station. With our assistance, the radiation was promptly eliminated. No local governmental cable agency could have been helpful in that instance.

One Authority Versus Thousands

Rex Bradley, NCTA Chairman, said in a recent published interview,¹ "We should eliminate the state regulatory authorities as far as cable is concerned. Some people will disagree with me, but I think the regulation of cable by the Federal agency and the local franchising authority is all that's needed."

New York State has over 1600 municipalities with authority to issue franchises for cable TV operation. Each also has authority to impose specific terms on the franchise, including technical standards for construction and operation of the cable system. However, most municipalities do not impose technical standards since the local government does not have the technical expertise with which to draft reasonable standards. I have seen franchises containing very specific requirements which are so unrealistic as to be unenforceable. The authors of those franchises lacked the technical expertise properly to define performance parameters.

Complaints against cable system operators of poor picture quality, lack of service, failure or refusal to extend service, and poor response to complaints continue to increase. The complaints filed with our Commission have increased more than 80% in the first six months of this year compared to 1974. It is clear that local government cannot cope with complaints of this nature. Equally clear is that local governments cannot maintain cable television technical experts and sophisticated test equipment in 1600

municipalities in this state. The magnitude of the problem nationally staggers the imagination. Should municipalities develop and maintain such an office, there is no question that the local franchising fee would be adjusted upwards by a rather large percentage. It is obvious that a centralized agency is significantly more cost effective.

The intended beneficiaries of technical standards are the subscribers to the system. However, the scheme of Federal and local regulation seems to enure to the benefit of the cable operator—not the subscriber. The FCC field offices are hard pressed to control the broadcast spectrum. It is well known that certain classes of radio operators are undisciplined and have created a situation which is virtually out of control. The addition of hundreds of operational CATV systems and the potential of many additional thousands to an already heavy work load is encouraging.

Being "There"

In Docket 20561, the FCC noted that it sought certain simplifications of its rules, relieving the Commission of "the administrative burden of regulating systems of smaller size . . ." and allowing an appropriate allocation of its limited administrative and enforcement resources. Absent a state agency, this action would place the burden of enforcement of franchising standards squarely on the local authorities who are, at best, ill equipped to respond.

It is easily demonstrable that local governments, by and large, cannot write reasonable standards, or having somehow written them, cannot insure compliance; nor can they enforce Federally imposed standards. It can be shown from our records that local governments abdicate the responsibility to enforce franchise standards generally and technical standards specifically. Increasingly we are called upon by local governments to resolve technical problems. Where the only CATV technical expert available is the cable operator, the Town, or Village, Board is at a distinct disadvantage with regard to equitable solutions to subscriber complaints. As a practical matter, in this state the regulation of CATV operations with respect to technical standards is not a three-tier ogre, but has evolved into only Federal and State regulation.

The Benefits Are Valid

A state cable agency can provide valuable technical assistance to CATV operators. The services of our mobile

monitor van, once called the "snoop coupe," has been requested by CATV operators in fully 50% of the requests for its use. The Commission sponsored a cable television technical seminar at which eight very practical topics were presented in two days of intensive effort. Over 135 CATV technicians attended representing cable systems located in 12 states. The seminar was prompted by the obvious need for the upgrading of technical skills in the industry. In addition to our observations, that need was voiced by CTAC, NCTA and SCTE. A second seminar is now being planned for early 1976.

The New York State Commission has demonstrated that a state agency regulating cable can promulgate reasonable technical standards which benefit subscriber and CATV operator alike. The technical standards are enforced in a reasonable manner; cable system operators benefit directly from the technical test and evaluation capability of the Commission, which is quite apart from enforcement; seminars are sponsored to upgrade technical skills at minimal cost to participants; system design assistance is available to operators, specifically for the smaller systems; and, equipment evaluations are performed in the field and in the Commission offices.

In conclusion I would emphasize that state cable regulatory agencies can provide many valuable services that cannot be provided by the uncoordinated efforts of a multitude of local governments. A state agency can be significantly more swift in responding to service related complaints and can have the technical expertise and equipment not normally a part of local government with which to resolve those complaints. A state cable agency can provide a valuable research service which is not available through local governments. In the case of the New York Commission this is not supposition, but is recent history and current practice. The cable industry and subscribers benefit from the direct involvement of this state agency.

¹*Where is the Commission Going on Cable Regulation?* TV Communications, July 1975.

The Real World of

Warren L. Braun, P.E.

President

ComSonics,® Inc. and Warren Braun Consulting Engineers
Harrisonburg, Virginia

Technical standards for CATV have been subject to much discussion, review, redrafting and even litigation. A recitation of the applicable history probably would serve no really useful purpose to this article, hence, none is provided except where it bears on the present state of regulation.

From the inception of CATV standards, there has been no single consistent rationale for the adoption of CATV technical standards. It has been argued that the CATV system is not a required public service, that it operates in a free marketplace, therefore, subscriber acceptance should determine the viability of any self-imposed system standard. Others argue an opposing view that a public right has been transferred to the system operator in the instrument of authorization which compels the authorizing agency to assure that this "right of the public" be used in a fashion ensuring the greater public weal.

There are still others who will argue that technical standards are necessary to the future development of CATV systems, particularly for purposes of program interchange.

While any point of view may have its own merit, it is not the purpose of this article to determine which view has the greater merit.

Preserving Signal Quality

If one considers CATV a major viewer factor in top 100 markets under the signal umbrella of technically superior signals, then there is merit in minimum technical standards to preserve the signal quality of the broadcaster, and the CATV system most certainly has no moral right to seriously degrade the broadcaster's signal by technically deficient or inept carriage. While this view may raise the hackles of many CATV operators, it is a fact that many older CATV systems did degrade broadcast signal carriage, particularly with regard to chrominance noise, luminance group delay, and visible spurious signals. Not all of these distortions are created solely by the CATV operator. It is a fact, not well known to all, that the receiver interface presents a most difficult obstacle to excellent CATV reception, since most receiver designs do not marry well with the CATV multi-channel-adjacent channel signal format peculiar to CATV carriage. It would appear, therefore, that suitable Federal standards *should* be applied to CATV signal carriage within the various grades of station signal contours. From this then, the present FCC regulations appear to be

CATV Technical Standards

philosophically correct, although deficient in the areas of specificity, especially with regard to luminance group delay errors, cumulative luminance to chrominance errors, and recognition of the receiver performance requirements for CATV reception. While it is clearly understood that the latter area is not within the present purview of the FCC, it is most certainly an area of concern for joint industry committees, particularly the EIA. When one considers that some current receivers produce visible chrominance noise at a 60 dB signal to noise ratio, due to noise foldback in the IF design, it is clearly time to have a meeting of the minds among the television industry factions so that the real life of CATV technology might be sandwiched between the transmitter/receiver interface in an *economically realistic model*. Simply ignoring the need for this accommodation can only hurt all three factors and CATV is in great danger of finding itself at the bottom of the heap due to its smaller economic strength.

If there is reason to consider technical standardization at the Federal level for the reasons just given, there is equal reason to impose additional criteria at the local level, particularly as they relate to public safety. Beyond this, all other technical criteria relating to in-channel technical performance of CATV signals should be left to the operator, *except* as these would influence the performance of the system with regard to the broadcast signal carriage. Where local level regulation has been preempted by the state, the same technical constraints logically can be employed at the state level.

Promises and Performance

Most technical standards drawn for localities have been drawn from FCC guidelines, tightened up a bit in critical performance areas from television broadcast technology, or from a combination of the two. Very few CATV operators question the validity of tighter standards than the FCC proposes for new systems in any market. However, many operators will argue the merits of standards which approach "state of the art" limits. Most of these reservations come from the very real fear that such technical standards will be difficult and expensive to maintain. While there may be some merit to this point of view, it ignores one of the very real facts of CATV consumer life in large markets, i.e., the system must produce a TV picture better than the

subscriber had before attaching to the cable, or the CATV operator will lose a subscriber. Obviously, a subscriber will be unhappy if he sees as many ghosts on the CATV system as he did with his antenna. When this situation is compounded with the introduction of his unfamiliarity with the manipulation of the receiver converter, many subscribers just return to the old method of viewing off the air. Well drawn technical standards can assist in reducing the possible qualitative signal degradation. If these are coupled with a franchising procedure which requires detailed response by the franchise applicant on how the system would be designed to meet such standards, the gap between promise and performance is narrowed. Another method of accomplishing the same end of technical excellence is to require a detailed proposal to be submitted by the franchise applicant without the requirement of specific technical standards by the franchising agency. The author has found this approach to have substantial merit although the analysis and evaluation of bids becomes considerably more difficult and expensive.

Performance testing of standards should be required at each level by the system to insure system performance within the constraints directed by these standards, much as is required of AM & FM broadcasting facilities on an annual basis. It is probably correct philosophically and economically to limit these performance measurements to systems above a certain size, but even the smallest system should be capable of making a minimal measurement (perhaps a critical observation) or should have them done. Our personal experience has shown that minimum proof measurements and subsequent remedial work usually produces a pleasantly surprising improvement in picture quality, clearly visible to and appreciated by most subscribers. This has proven true in a substantial number of systems with which we have worked.

Questions to be Answered

Beyond the realm of "legal" standardization, there is a dire need for fact finding and standardization *within* the CATV industry. For instance—what is the *real* tolerable limit of luminance group delay error permissible within the headend and system? (Not to be confused with chrominance/luminance errors which tolerance is reasonably well documented.) What is the real life minimum signal to noise

ratio permissible with present color receivers? What is the system performance degradation produced by the "average" color receiver? What is the true visibility of spurious signals? With regard to the latter, it is known that single spectral line spurious signals have a wide range of visibility within one element of the video sideband signal comb, therefore, very precise measurements must be made when determining the visibility of spurious signals. To the author's knowledge, no published test data taken to date has been conducted with this precision, and yet the data is sorely needed.

The time has come for the industry to recognize the need to establish a data pool, following on from which "Guidelines of Recommended Engineering Practice" could be drawn. This could follow the Bell system internal practice guidelines concept. It is quite probable that many of these standards would be tutorial in nature as to methods, practices, guidelines, etc.

It is quite likely that hammering these into shape within the CATV industry would bring less hammering from without.

What are the contaminants about which too little is known? With some repetition, here are a few:

1. Luminance group delay error visibility, together with non-visibility criteria.
2. Single line spurious summation with system loading, especially with usual transmitter and processor frequency drift.
3. Required signal-to-noise ratio for acceptable color noise, particularly at high modulation levels, i.e., saturated, bright colors.
4. Equivalent in-band and adjacent channel intermodulation. Contribution of "typical" CATV receiver in current use, and separately those of current manufacture.
5. The true "post distortion" characteristics of the "typical" receiver of (4) previous. It is well known that knowledgeable TV broadcasters do not use the FCC specified predistortion since it is not complementary to the present color receivers, nor has it been in quite some time. Optimum CATV pictures cannot be produced with the FCC predistortion. Unfortunately, most CATV modulators are in error on this predistortion, following the FCC specification, yet there is no authoritative study which can identify what the correct number is.

This list could go on for several pages. It is not the intent of this article to explore the limit of what is not known, simply to point out the wisdom of finding out, and establishing engineering criteria based on current knowledge. CTAC panels were charged with the responsibility to delineate many system performance criteria. It is unfortu-

nate that there was neither the time nor the funding to determine many of these *unknown* factors, with much of their final reporting based on existing data, much of which was insufficient in scope, archaic, or actually in error when originally taken.

It is significant that the CATV industry has not really addressed itself to the signal improvement technology known to broadcasters and a few CATV engineers. It is possible and economically realistic for most larger CATV systems to consider signal improvement for various qualitative signal errors even to some which have originated with the broadcaster. No major market telecaster would do without such techniques. It is beyond the scope of this article to deal with the detail of such technology, however, a few areas of signal improvement which are realistic are tabulated as follows:

1. Ghost reduction
2. Signal enhancement
3. Luminance delay error correction
4. Time base error correction

Future Hopes

Viewing surveys demonstrate that the majority of TV viewing is with the three basic network signals. While the CATV viewer may have originally connected to the system due to the diversity of programming available via CATV, it is strongly suspected that his continued satisfaction with signal quality of the basic network signals may bear heavily on his remaining a subscriber. Discussions of this topic with many CATV operators leads the author to the conclusion that this may be a larger factor in retaining the viewer in major markets than has been appreciated in the past.

It may be quite instructive to tour *your* system in the next few weeks making a qualitative TV receiver check of your CATV signal v. that available off the air. If your signals are degraded by comparison to the air signals over your service area, you may have found the source of a larger system problem than you might suspect.

In all this, there is no intent to relegate the many questions of software product and its impact on subscriber saturation to the back seat. It is quite likely that no CATV system can succeed without some software superiority over that available from the air. It is unfortunate that the fact of software sensitivity to subscriber saturation has caused many CATV operators to lose perspective to the signal qualitative factors in the subscriber situation model. It is hoped that this article may provide the basis of a better understanding of this latter factor in subscriber retention.

The New Jersey Experience with State Regulation

Clifford H. Paul
Principal Engineer
Office of Cable Television
Public Utilities Commission
Newark, New Jersey

[The writer wishes to state that the opinions in this article are his own and do not necessarily represent those of the Office of Cable Television nor that of the Board of Public Utility Commissioners of the State of New Jersey.]

What is so awful about State regulation? The answer is simple—FEAR OF THE UNKNOWN. How many times has the reader stood at the edge of a swimming pool and debated about diving in—because it would be COLD. When you did it, it was cold, but after a few minutes you decided it wasn't really cold and you enjoyed the swim. After almost two years of talking with representatives of the CATV industry, this is the attitude I have found in New Jersey. Responsible cable people who have taken time to study the *Cable Television Act*, the regulations promulgated by the Office of Cable Television, and asked questions, will find being regulated works considerably more *for* than against them.

The writer, at this early stage, does not want to bore his fellow cable engineers and technicians with a great deal of historical background, however it is important to know the "Why" and "Wherefore" of the New Jersey Office of Cable Television.

After full public hearings, part of the legislative findings were "... that after careful investigation it appears that the rates, service and operations of cable television companies in this State are affected with a public interest ...". And, "... [it] is hereby declared, the policy of this State to provide fair regulation of cable television companies in the interest of the public ...". Thus the New Jersey State legislature signed into law on December 15, 1972, the *Cable Television Act*.

The Act created the Office of Cable Television as a separate entity of the New Jersey Department of Public Utilities to "... secure a reasonable degree of uniformity in the practices and operations of cable television companies in those jurisdictions ...".

The Act sets forth "... nothing in this Act shall be construed as declaring or defining cable television to be a public utility or subjecting it to the application of any of the provisions of Title 48 of the Revised Statutes, except as otherwise specifically provided in this Act." Title 48 being what is commonly called "Utility Regulation."

The Act also sets forth, "The director with the approval of the board shall establish, for the purpose of assuring safe, adequate and proper cable television service ... rules and regulations governing: Technical standards of performance for CATV systems and equipment and facilities thereof,

including standards of maintenance and safety not inconsistent with applicable Federal regulations.”

Pursuant to the Act, hearings were held on the proposed regulations. Representatives of the State CATV Association and other interested parties were heard during these hearings. The Board of Public Utility Commissioners then adopted the present regulations.

Two facets of the Act will be of interest to readers. First, cable television in New Jersey is a regulated industry but *not* a utility. Secondly, the Act created a two step process of franchising within the State. The first step is the role of the municipality, limited to granting consent in the form of an ordinance. The second step, the Board of Public Utility Commissioners through the Office of Cable Television has the responsibility for certifying the franchising process. Thus, the Board of Public Utility Commissioners (Board), through the Office of Cable Television (Office) has sole authority to regulate cable systems in New Jersey under the Act.

The Office, under the Director, John P. Cleary, has prepared and the Board has approved applications of thirty-five systems for certification in 156 municipalities. This represents 200,000 subscribers with 3,500 miles of plant. New construction in the next year is estimated to be near 2,500 miles.

Comparisons to Federal Regulation Citations

The writer has wrestled on a method of presenting a comparison of the FCC and State technical standards, since most readers do not have copies of the State regulations. Therefore, it was decided to use FCC Subpart K as the reference in all comparisons. It will be easier to follow if it is kept in mind that the State technical standards include, in addition to technical, operational and compliance requirements. Numbers in parentheses are sections of the State standards for those who have copies of New Jersey State regulations. (See Table I)

With regard to technical standards two additional specifications have been added which deserve explanation.

First: The State includes Class II channels. From a purely technical standpoint it is specifically directed toward interference with Class I signals. Cable systems in New Jersey are using or will be using three or more Class II channels per the average system. It is the intent to give the operator the widest latitude in selection of Class II equipment so long as it does not materially impair reception of Class I signals at the subscriber's terminal.

Second: FM Signals are covered under 14:510-2a, “*FM Broadcasting Signal Level* between 88 and 108 MHz shall be maintained between 100 microvolts and 500 microvolts across 75 Ohms (-20 to -6 dBmV) except that if the system carries TV Channel 6, FM Radio carriers transmitted between 88 MHz and 90 MHz shall be maintained at least 10 dB below the level of the Channel 6 visual carrier.”

Because of the large concentration of FM signals which may be received in New Jersey due to its geographical location between New York and Philadelphia, and the use of Channel 6 by most systems, we feel it is good engineering practice to have a specification with regard to FM signals. In reading the CTAC Steering Committee Report, it appears our standard is within the recommendations of the Ad-Hoc panel.

Future Goals

Before joining the staff of the Office of Cable Television, John P. Cleary, the Director, asked me “If you were in charge of the engineering area, what would you try to accomplish?” My answer then, and now, is “to strive to improve the picture quality and system reliability of the systems within the State, increase the number of municipalities receiving CATV service and while growing, effectuate a degree of standardization between systems, without undue economic hardship on the system operators.”

Upon joining the staff I asked myself the question, objectively, how should regulations be implemented? Because of fiscal restraint we were faced with limited manpower and funds for equipment. Therefore, we decided to concentrate efforts on:

- Review and approval of applications for certification (technical portions)
- System inspection
- Monitoring new system construction
- Initial performance test checks
- Build-up of technical files on each system to the point where we have on file: (1) a block diagram of the system (trunk only), (2) engineering data, (3) Monitor Test points and Annual Test data
- Securing a modest amount of equipment in a van with portable power. Our testing at present is mostly subjective. I have strong feelings on this subject, solidified after reading reports of CTAC Panels 1 and 2 and discussing the subject with consultants Keneth Simons, Simons & Wydro; Steve Biro, Biro Associates; and O.D. Page, Cable Dynamics.

When funds become available, we plan to increase our inspection, engineering and field testing capabilities.

Workable Forms Required

Soon after the engineering staff was formed, we found that few system operators knew what was expected of them, both in our system inspections and their applications for certification. To assist the operator the staff prepared several forms to standardize the information required. I will discuss some of these forms now.

What the Inspector Looks for When Making an Inspection:

This is in the form of an information letter to each operating system. It contains a list of areas in the regulations which directly affect their operation and will be checked. Each subject is spelled out and the specific regulation cited.

Technical areas include:

- Reporting of injuries
- Identification of employees
- Identification of company property and buildings
- Records of major interruptions
- Copy of Annual Tests
- Log of Monitor Test Points
- Log or record of subscriber complaints
- Subscriber Complaint Service Forms

Technical Information Required By the Office:

A standardized form has been prepared with minor variations dependent on whether the information required is for a grandfathered system, extension of a grandfathered system or an application for new certification. Information requested on this form includes:

- Office, Tower and Headend addresses and telephone numbers
- Description of Tower and, is FAA approval required
- Signal Survey Data of Proposed Receiving Site
- Use of Microwave
- Information on Headend Equipment
- System Plant Data
- System Parameters
- Block Diagram of System
- Location of Monitor Test Points

Another form is used for Local Origination which requests data on:

- Hours of Local Origination being Programmed

- Hours of Public Access
- Breakdown of Cablecasting Equipment
- Studios, Size and Location
- Type of Information Channel Equipment

From the above, the Office engineering staff is able to review, evaluate and make recommendations much quicker and more efficiently than by hunting through page after page of "blah" data found in most applications. The Office probably has more technical spec sheets on manufacturer's equipment than the manufacturers.

New Construction

The Office is responsible for approval, construction and operation of all cable systems. As such, the Office must keep a monitoring program on all construction. The Office therefore, drafted a letter of information which is sent to each system having construction requirements, outlining areas the Office requires information about. These include:

- Board approval of pole attachment agreements
- Submission of electronics layouts
- Block diagram of system to be built
- Schedule of construction by phases
- Notification of all system proofs. (Note: the Office participates as an observer in these proofs.)
- Submission of "as built" when available.

From this input of technical information we have been able to compile technical files on each system. These files help immeasurably in answering subscriber complaints, discussing a problem with a chief technician, monitoring system performance or answering a question posed by other members of the Office, i.e., the Director, accounting or legal.

Inspection Experience

Readers might find interesting what the Office has found during system inspection, the certification process of new franchises and my comments related thereto. System Inspection breaks down into:

- Office Procedures
- Subscriber Complaints
- Annual Test Data
- Monitor Test Point Data
- Plant Integrity
- System Evaluation (*What the subscriber sees*).

Most of these subjects are self-explanatory, therefore the following comments deal with what we have found after forty-plus system inspections.

Office procedures are generally good. Most frequent violations include no identification of employees and Tower/Headend not being identified. Some operators have said that identification of employees is not needed since "everyone" knows the cable TV truck. That might be true, but just suppose the truck is stolen and a house is robbed—or worse?

Subscriber complaints!!! This area beats them all. In a majority of systems inspected data available on handling subscriber complaints leaves *much* to be desired.

For most municipalities in New Jersey, the Office is the Complaint Officer. We therefore must have a means of tracing the complaint(s). Some systems do not maintain a complaint log and complaint forms are rarely filled out correctly. Comments such as "fixed," "completed" and "set trouble" are often found with no explanations or even a mention that pictures were observed. In some cases complaint forms were non-existent, or in the technician's van under the driver's seat.

It can't be coincidental but systems where excellent and accurate records are found to exist, there have been almost no complaints about. I'd like to mention a few, but like "Murphy's Law," if I did, tomorrow the Office would be flooded with complaints, from subscribers in "you know who's" systems.

The Office finds the minimum information required to be recorded in a log includes name, address, telephone and account numbers of the subscriber; date and time the complaint is received; nature of the complaint; what person the complaint was assigned to; and disposition or resolution of the complaint.

With reference to subscriber complaint service forms the following information is required:

- Signal readings of sufficient channels to give a reliable representation of system performance.
- If the subscriber is not at home and where feasible, sufficient readings should be taken at the ground block or tap to determine status at that point.
- Complete explanation of the problem the service technician finds.
- A description of corrective action taken. Again, "completed," "fixed" or "set trouble" are not acceptable explanations.
- Name of the technician, date and time when the problem was corrected.

This may seem "old hat" to most technicians reading this, but I have met many a chief engineer, technician or manager who agreed that this is the most difficult problem they have.

To date all systems have been most cooperative on the Annual Tests and setting up Monitoring Test points. In reviewing this data, it is interesting to note, that all older systems meet or exceed State specifications, except two.

Plant integrity, or the physical condition of the plant in most cases is very good. Headends are another story. It is surprising to see the variations, arrangement of and condition of equipment.

With regard to system evaluation, as indicated earlier, I believe in using the TV set as a valuable piece of test equipment for subjective testing. To date, evaluation has been done on this basis, if you include a SLM. We have not found, using this procedure, where system performance as viewed at the subscriber terminals was of such a quality that we required further testing.

We did find some reception problems worth mentioning. Co-channel is the most prevalent.

In the grandfathered systems there is not much that can be done, although several systems have reworked their receiving antennas with varied results. New applications appear to recognize this problem and many, especially in the middle to south part of the State, have proposed using microwave to bring two "wild cards," Channels 9 and 11 from New York City. There are other reasons why microwave is required but co-channel appears to be the most serious.

Electrical interference problems also appear more prevalent in older systems. This may be due to operators not having experience we now have. In addition, during earlier days, site selection was not that critical. The large preponderance of electrical generating sources of interference may not have been present, nor was there a demand for the "perfect" picture.

Ghosting is a very serious problem in the New York City area. One of the comments made to the FCC by the Office was directed to this problem. It was suggested that cable systems, upon request to the FCC, be allowed to take direct feeds from broadcasters.

Certification of New Franchises

Before a system may commence operation it must obtain (1) Municipal consent; (2) State Certificate of Approval; and (3) FCC Certificate of Compliance.

For municipal consent, present regulations are very encompassing, requiring detailed information on manpower, equipment and system design. Hearings on this subject have been held by the Office, and it is expected that the technical information required of an applicant will be simplified.

State certification requires (1) stating the technical background, operating experience and key personnel of the applicant; (2) a complete description of on-the-job technical personnel qualifications; (3) a detailed description of the proposed system. (Here, use of forms described earlier available from the Office eliminate over half of the work.) Additionally, (4) a map indicating distribution center/headend, hubs and trunk routes; (5) the construction schedule and (6) construction practices are required.

A comment on headend site selection. The Office will not accept computer readouts in determining or justifying a particular site. We require an actual site survey. It is

suggested that site selection has too often been governed by geo-political, financial or other interests. The CTAC Report comments on this subject.

After certification by the Board, the applicant now must obtain FCC approval. Construction may not begin in the State of New Jersey until after the applicant has been certified by the Board.

In closing may I say, in New Jersey we are not out to "get" anyone. When deficiencies are found, the operator is given a letter asking that they be corrected. Continued disregard in correcting the deficiency could result in the operator receiving a show cause order.

We realize that transition to State regulation takes time. We are conscious of the fact that portions of the technical standards may become burdensome. Approaching these problems on the basis of "reasonableness" and "the public interest," the writer is confident that before long all parties will find that "the water's fine." Take the plunge and come on in!

TABLE I
COMPARISON

FCC Subpart K and New Jersey State Technical Standards for System Operations (14:510)

FCC	Subject	Remarks
§76.601		
(a)	Design, Install and Operate in Compliance with Rules	See Note (1)
(b)	Listing of Class I Channels carried. Minimum signal levels of Visual Carriers	Required as part of application for certification. Use FCC Spec. (14:510-1)
(c)	Annual Performance Tests towards compliance with 76.605.	Use FCC Spec plus additional specs. See Note (2). (14:510-6)
(d)	Assurance that all subscriber terminals meet technical standards.	Initial performance procedures detailed. See Note (3). (14:510-5) Monthly tests at monitor test points to determine system stability. See Note (4). (14:510-7)
(e)	Effective Date 3/31/72.	Conforms with FCC time requirements. 12/15/72 Effective date all systems became regulated in State. 4/15/73 Effective date all systems had to apply for "Grandfathering."

continued on next page

COMPARISON—Continued

§76.605		
(a) (1)	Frequency boundaries.	Use FCC Spec. (14:510-1)
(a) (2)	Visual Carrier 1.25 MHz ±25 kHz above lower boundary of channel. With converter 1.25 Mhz ±250 kHz	Use FCC Spec. (14:510-1) See Note (5). (14:510-2d,3a,3b)
(a) (3)	Aural Carrier 4.5 MHz ±1 kHz above Visual Carrier	Use FCC Spec. (14:510-1)
(a) (4)	Minimum Visual Carrier level -0 dBmV	Use FCC Spec. (14:510-1)
(a) (5)	Visual Signal Variations	Use FCC Spec. (14:510-1)
(a) (6)	Aural Signal between 13 to 17 dB below Visual Signal	Use FCC Spec. (14:510-1)
(a) (7)	Hum Level	Use FCC Spec. (14:510-1)
(a) (8)	Channel Frequency response	Use FCC Spec. (14:510-1)
(a) (9)	Visual Signal to System Noise 36 dB Visual Signal to Co-channel 36 dB	40 dB, See Note (6). (14:510-2b) Use FCC Spec. (14:510-1)
(a) (10)	Ratio Visual Signal to Coher- ent Disturbances (46 dB)	See Note (7). (14:510-2c)
(a) (11)	Terminal Isolation	Use FCC Spec. (14:510-1)
(a) (12)	(a) Radiation (b) Use of Special Distribu- tion or Receiving techniques (c) Effective dates: Grandfathered 3/31/77 New 3/31/72	Use FCC Spec. (14:510-1) Use FCC Spec. (14:510-1) Use own dates but conforms with FCC. (14:510-1) Grandfathered systems have 5 yrs. from date of certification or renewal date whichever comes first to conform with additional State specs.
§76.609	Measurement Methods	Any methods consistent with FCC and State regulations. (14:510-1)

continued on next page

COMPARISON--Continued

§76.613	Interference to reception of other authorized service	Use FCC Spec. (14:510-1)
§76.617	Receiver Interference	Use FCC plus converter leakage spec. See Note (5).

Note (1): The Office requires of each applicant a detailed description of the system proposed, the substance of which is covered later in this article. In addition, the requirements for the initial performance tests (See Note (3)) are detailed.

Note (2): The annual performance tests as required by the FCC are incorporated into the State standards. In addition four more requirements have been included which either refine the FCC definitions or add additional technical requirements. These will be covered in later notes. Please note that (1) the graduated increase in FCC requirements leading up to 1977 are incorporated into the State standards for "grandfathered" systems and (2) the additional requirements imposed by the State standards become effective for "grandfathered" systems five years after certification or when the franchise expires, whichever comes first, and (3) for new systems or re-certified systems all standards are required upon certification.

Note (3): The State regulations in section (14:510-5) detail the requirements for Initial Performance Tests.

1. Test must be conducted within 60 days after any portion of a new system or extension of a new system or rebuild or extension of a system which began operations after April 15, 1973.
2. Schedule of Test Locations: For a dedicated system, 50 subscriber terminals or 5% of potential subscriber terminals. Subscriber taps may be used if data can be produced which will give the system performance at the subscriber terminal (Or) for an undedicated system—at or near the end of each branch trunk of equivalent cascade plus extremities of at least one feeder line for each 50 strand miles but in no case fewer than 5 feeders in each system or hub area.
3. Converters. 1% of all converters shall be tested in laboratory before installation.
4. Failure of Tests—Describes method by which if 10% or more of test locations fail, system testing must continue until compliance is met.
5. Methods to be used in Testing. The technician or person performing the tests may determine method provided they are consistent with FCC and State regulations.

Regarding Annual Tests, the annual measurements shall be filed with the Office.

Note (4): Monitor Test Points (14:510-7) shall be designated by new system upon commencement of operations. Grandfathered systems must designate monitor test points within one year of certification. The minimum number is three for each distribution hub plus one additional for each 100 strand miles. One shall be located at or near the output of the last amplifier in the longest feeder line on the longest trunk cascade. Other test points should be at or near extremities of the longest trunk lines.

Readings shall be taken once a month and shall include (1) Signal levels of all Class I and II channels and all pilot carriers; (2) not fewer than three C/N must be tested and always in the same manner; (3) Subjective observations of picture quality are recorded and the log is to be kept on file for 5 years at the local office.

Special provisions for older systems and for small systems (14:510-8) cover systems who were legally operating, constructing or extending their systems prior to December 15, 1972, (enactment of the Act). Such systems will comply with the following: (1) Additional state standards five years from date of certification; (2) Initial performance tests as set forth in "C" above; (3) Monitor check points shall be designated and observations started before one year after certification, and (4) the Office may request certain specific tests when necessary or may order compliance with specific technical standards at an earlier date.

Note (5): The Office feels the present definition in Section 76.605 (a) (2) as it pertains to converter tolerances is ambiguous. We therefore clarified it as follows.

- (a) Section 76.605 (a) (2) of the FCC Rules shall be interpreted to require that in those systems that supply subscribers with a converter, the *specified* visual carrier frequency be maintained at the input to such converter (14:510-2d).
- (b) The difference between input and output frequency shall not vary more than ± 250 kHz between 30 seconds and one hour after first turn on in an ambient temperature of about 70°F, (14:510-3a).
- (c) No converter shall develop more than 25 microvolts (-32 dBmV) signal level at the input terminal when properly matched, with the output terminated at any frequency between 50 MHz and 300 MHz due to local oscillator leakage, (14:510-3b).

The latter (c) above, was felt necessary due to the large number of converters being used or planned for use by systems within the State. The Office believes this specification is required but it is so written that it does not place undue economic burden on system operators in the selection of converters.

Note (6): "System Carrier to Noise Ratio for each Class I channel on which a signal is delivered to subscribers within the signal's Grade B contour, or which was originally received within its Grade B contour, and for each Class II channel shall be not less than 40 dB," (14:510-2b).

Note (7): Ratio Visual Signal to Coherent Disturbances. "Section 76.605 (a) (10) shall be construed to mean that *cross modulation* as defined and measured in accordance with NCTA-002-0267 shall be at least 46 decibels below the desired visual carrier level in each Class I or Class II channel." (14:510-2c).

A Common Set of Terms for Cable Television

A. M. Rutkowski
Research Division
Cable Television Bureau Federal Communications Commission
Washington, D.C.

Concepts expressed are the author's alone, and do not constitute any official or unofficial expression of the Federal Communications Commission.

Cable television systems as they presently exist in the United States are radio-frequency broadband¹ transmission systems which are configured to distribute a common spectrum of signal information (usually television broadcast signals) by wire to individual household terminal devices (usually television receivers). Because several professional disciplines (economic, engineering, legal) simultaneously exert their control over these distribution networks, and little communication has occurred among the disciplines, a veritable babble of terms and definitions has arisen. This article suggests a method of bringing order to the chaos. It examines the concepts and concerns of each discipline, relates them to the actual physical structure, and develops a common set of terms and definitions. Such a common reference is essential for any multidisciplinary activity that may occur, whether it be the establishment of information systems or government regulatory activity.

Physical Organization

The physical organizational characteristics of cable television systems are presently rather amorphous. They consist of three major components: (1) manifold (one input, multiple outputs) wire networks, (2) signal processing equipment locations, and (3) auxiliary microwave radio or wire transmission equipment. The third component is not mandatory. Typically, several manifold wire networks are clustered around a signal processing location. The configuration can be made more complex by adding other signal processing locations and/or manifold wire networks and interconnecting them with radio or wire transmission equipment. See Figure 1.

Electrical Organization

The electrical organizational characteristics of these systems are similar to the physical. The engineering discipline reduces electrical networks to the defined concepts of transmission paths and signal sources. Thus, the manifold wire network becomes one broadband transmission path with one input terminal and multiple output

terminals. The signal processing equipment locations devolve into a combination of the following: (a) the location of the input terminal of manifold transmission paths, (b) the location of the input terminal of terrestrial microwave or wire transmission paths, (c) the location of the output terminal of a space microwave transmission path, (d) the location of the output terminal of a terrestrial microwave

or wire transmission path, or (c) the location of the output terminal of local signal generating equipment. The radio or wire auxiliary transmission equipment become associated with separate transmission paths. In the engineering domain, the above conceptual entities can be used to configure any cable television system and establish performance specifications. See Figure 2.

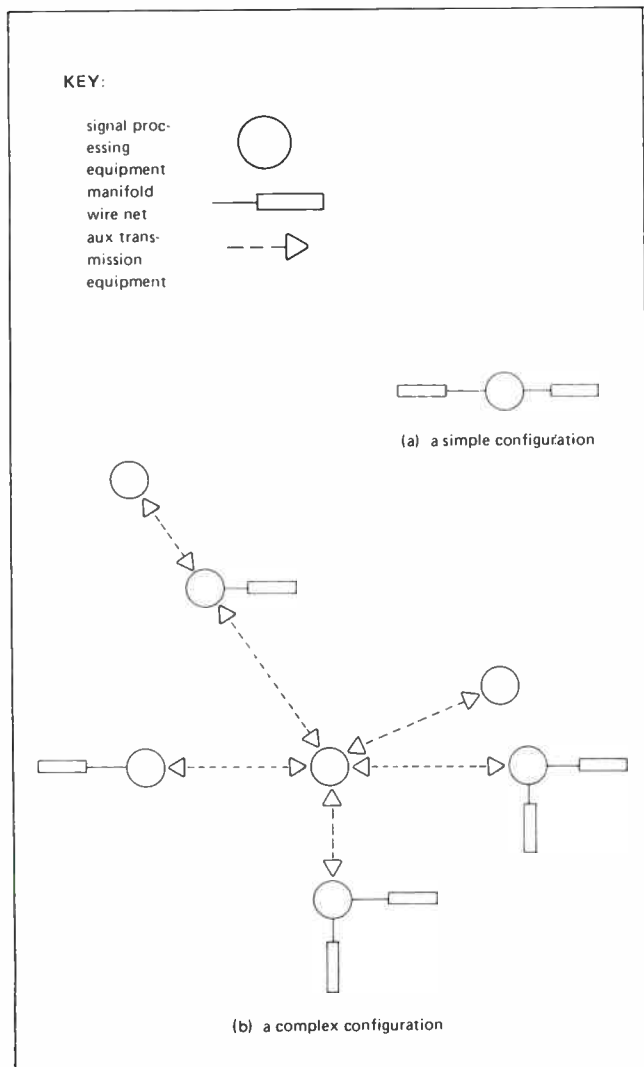


Figure 1. Physical Organizations

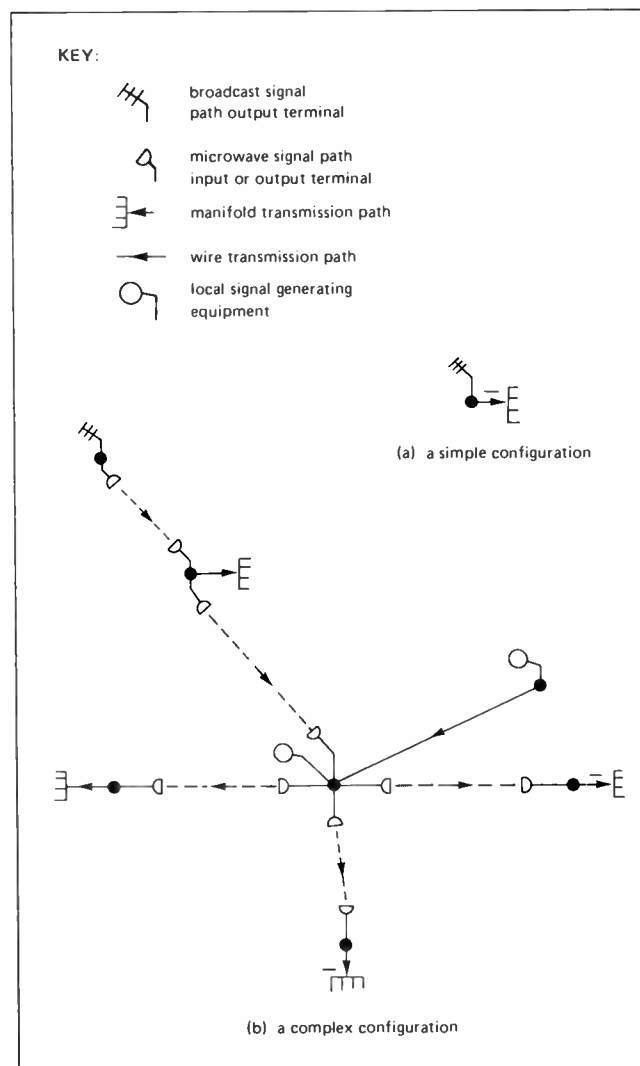


Figure 2. Electrical Organizations

Economic Organization

The economic organizational characteristics are derived from business practice. The physical components of the cable television system can be owned by a single real person, a single artificial person (incorporated), or any combination of the two (partnership or unincorporated association). Corporations can have complicated superstructures or substructures of additional corporate ownership. In addition, the service provided by the physical components can be managed by the same types of simple or complicated structures described for physical ownership. Many business configurations can exist. Financial records, employment units, and administrative offices can independently encompass a mixture of different owners and managers. In the economic frame of reference, the conceptual entities may not relate well to the actual physical structure. It is possible, however, to discern basic local units which generally encompass common financial records, administration, and employment units which utilize physical components within a defined geographical area.

Legal Organization

In the present legal domain only one unit is significant. It is artificial and has virtually no relationship to the physical or electrical or economic structures. Because the physical plant can be simultaneously located in several political jurisdictions, each such jurisdiction has the potential of exercising independent control over the facility—irrespective of the fact that the jurisdiction may be one of many provided service by the same integral network. The Federal Communications Commission (FCC) has chosen to go one step further—it deals with each facility on a “community” basis—each separate and distinct settlement within each political jurisdiction.² There is no organization of these units effected by regulatory entities—the units remain discrete.

Fundamental Organizational Units

Table I sets forth five base units. Three are physical units (signal source, broadband distribution system, relay). The remaining two are geographical/business units (community, financial).

A signal source unit is essentially a “headend.” The word headend has been avoided because of the multiplicity of

meanings of the word. The definition was worded to encompass not only an aggregate of processing equipment, but also an interface location between units. For example, when a relay unit is interconnected directly with a broadband distribution unit, the signal source unit is a mere interface. This is done to allow the term to be synonymous with “node” in network theory. Attendant information collected can be configured by data automation systems to present a complex variety of transmission network configurations.

A broadband distribution unit is essentially one trunk and its associated feeders and drops. It is a manifold wire network. The “unique broadband input terminal” is always located at a signal source unit. It is possible, of course, to have several non-unique input terminals at which a limited spectrum of signal information might be added.

A relay unit can encompass a number of services. It may be a link provided by terrestrial microwave in the Cable Television Relay Service, or a common carrier interconnection, or a broadband transmission path provided by cable or by fiber optics.

A community unit is the entity which the FCC presently addresses in its rules.

A financial unit is generally the local business entity. Geographical bounds have been specified to assure the entity remains localized and capable of being expressed in terms of adjacent community units and/or signal source/broadband distribution unit configurations which do not utilize lengthy relay unit paths.

The base units set forth were derived by considering the structure of present and anticipated cable television facilities in the United States and seeking lowest common denominator units which can be utilized by all professional disciplines. The units were required to be real and bounded as well as consistent among themselves.

Conclusion

The adoption of a set of fundamental terms and definitions by those active in the cable television field will allow the professional disciplines to communicate effectively. It will also enable a single information system to be established in a manner which allows for the configuration of elaborate networks and flexible aggregates of data. The fundamental base units set forth in this paper should fulfill these needs.

TABLE I

Cable Television Fundamental Organizational Units

BASE UNITS

Signal source units. A facility at a specific geographical location which furnishes signal information directly to one or more broadband distribution units, and/or furnishes signal information to a relay unit.

Broadband distribution unit. An integral broadband wire transmission system which has one unique broadband input terminal and multiple broadband output terminals, which is used to distribute a common spectrum of signal information from a signal source unit.

Relay unit. A wire or radio transmission system with one input terminal and one output terminal which is used to deliver signal information to a signal source unit directly interconnecting with a broadband distribution unit.

Community unit. The broadband distribution units or segments of broadband distribution units under the control of one operator and located within each separate and distinct community or municipal entity (including single, discrete, and unincorporated areas) serving 50 or more subscribers.

Financial unit. An operationally integrated financial enterprise consisting of a unique operator providing broadband distribution service within a circular area having a maximum diameter of 130 km. Operational integration exists under a common administration, maintenance personnel, and financial records.

SUPPLEMENTARY UNITS

Operator. The natural or artificial (incorporated) person or persons (partnership or unincorporated association) who provide a broadband signal distribution service by means of a broadband distribution unit.

OTHER UNITS

FCC jurisdictional unit. A facility that, in whole or in part, receives via free-space radiation or other means of transmission, the signal information emanating from one or more television or radio broadcast stations, and distributes such signals by wire to subscribing members of the public who pay for such a service. Except, the term shall not include any such facility that serves only the residents of one or more apartment dwellings under common ownership, control, or management, and commercial establishments located on the premises of such an apartment house. [The FCC jurisdictional unit is not a true unit but rather an abstract concept because it is unbounded. It is included for reference only.]

¹For the purpose of cable television systems, "broadband" means "capable of transmitting a portion of the electromagnetic spectrum which exceeds 6 MHz bandwidth."

²However, the Commission is considering other approaches. See *Notice of Proposed Rule Making*, FCC 75-896, 40 Fed. Reg. 34155 (Aug. 13, 1975).

All of a sudden, the sky is the limit

The Home Box Office pay TV network opens a bright new world of feature films... on-the-spot sports coverage... unique special interest programs... by domestic satellite or microwave.

It's a world of opportunity for cable operators. To learn about HBO's affiliation arrangement call National Sales, (212) 556-2433.

HOME BOX OFFICE
HBO
Time & Life Building
Rockefeller Center
New York, N.Y. 10020

coming in the
november
issue of c/ed

**Filters, Traps,
Scramblers &
Converters...**

**Everything
you need to
know about
Pay Security
Devices**

IF YOU ARE
SELLING TO THE
CATV MARKET
YOU SHOULD BE
ADVERTISING
IN C/ED

CALL AL LEON
PERSON-TO-PERSON
COLLECT
(301) 299-7224

FOR RESERVATIONS & RATES

GENERAL INFORMATION

SOCIETY OF CABLE TELEVISION ENGINEERS

PROGRAMS

SCTE programs technical sessions on a regional basis for members to attend and participate in. The Society encourages attendance at these conferences by all interested parties, programming each event with top industry personnel.

While the technical disciplines are of prime importance to the career growth of members, SCTE does not overlook the importance of learning good overall business management practices and also provides programming in business principles and management techniques.

Membership in SCTE ensures you of advance announcement of industry events and attendance at membership discount prices.

PUBLICATIONS

COMMUNICATIONS/ENGINEERING DIGEST is the official journal of SCTE and is published monthly. C/ED is mailed to members of the Society as one of the membership features.

In addition, SCTE publishes a monthly membership newsletter, THE INTERVAL, which is specifically designed to report what the chapters throughout the organization are doing, their accomplishments and news. Included in THE INTERVAL are Publication Listings noting reports and papers of interest to SCTE membership which are published by other organizations; news of important FCC regulatory actions; and announcements of membership activities from a national level.

SCTE continues to publish periodic bulletins informing you of activities of the Society and of other engineering and business groups within the industry. The Society also publishes papers of interest to the membership which are available for a nominal cost.

A Membership Directory updated annually listing all members of SCTE will prove to be a handy reference when locating technical personnel in the industry. It is available at a reasonable cost.

STRUCTURE

SCTE relies on active regional chapters throughout the United States. There are also chapters located in foreign countries. The Society will continue to encourage development of chapters wherever broadband and cable communications become a part of the day-to-day living pattern. New domestic chapters are encouraged as membership growth demands.

MEMBERSHIP

SCTE is a non-profit organization with five member grades: Senior Member; Member; Student Member; Associate Member and Sustaining Member. Senior Member is reserved for those who have made significant contributions to their field. Qualification for Member Grade is a minimum of three years of active experience as an engineer or chief technician in cable television. The requirement for Associate Member is either active experience as a technician in cable television or engineering, or technician experience in allied communication fields. Student Membership is by application but limited to those attending recognized technical schools. Sustaining Members include companies involved with cable television or other fields of communications which actively support the Society.

HOW DO I JOIN?

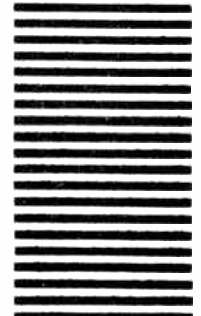
Fill in the application form and mail it today. Dues for Senior Member and Member Grade are \$20.00 per year; Associate Member is \$15.00 per year; Student Member is \$6.00 per year. Sustaining Memberships are available for a minimum of \$100.00 per year. Do not enclose payment with this application form. You will be notified upon acceptance to the SCTE and invoiced for dues. Your membership card and certificate, along with an issue of THE INTERVAL and the latest issue of COMMUNICATIONS/ENGINEERING DIGEST will be forwarded immediately.



SOCIETY OF CABLE TELEVISION ENGINEERS
P. O. BOX 2665
ARLINGTON, VIRGINIA 22202

ATTENTION: J. BAER

FOLD AND STAPLE





SOCIETY OF CABLE TELEVISION ENGINEERS

MEMBERSHIP APPLICATION

DO NOT FILL IN SHADED MARGINS.

1. LAST NAME FIRST INITIAL TITLE DATE

2. COMPANY DEPARTMENT/DIVISION

3. COMPANY STREET ADDRESS CITY STATE ZIP

4. CHECK APPLICABLE: OPERATING COMPANY MANUFACTURER SERVICE CONSTRUCTION
 CONSULTANT EDUCATIONAL GOVERNMENT

5. OTHER: _____

6. _____

7. PROFESSIONAL EXPERIENCE: BEGIN WITH CURRENT EMPLOYMENT

8. COMPANY NAME CITY AND STATE HOW LONG

9. POSITION BRIEF DESCRIPTION OF DUTIES

10. COMPANY NAME CITY AND STATE HOW LONG

11. POSITION BRIEF DESCRIPTION OF DUTIES

14. EDUCATION:

15. SCHOOL DEGREE/CERTIFICATE YEAR

16. SCHOOL DEGREE/CERTIFICATE YEAR

17. PROFESSIONAL REFERENCES: (SCTE MEMBERS REQUIRED FOR MEMBER GRADE)

18. NAME COMPANY TITLE

19. STREET ADDRESS CITY STATE ZIP

20. NAME COMPANY TITLE

21. STREET ADDRESS CITY STATE ZIP

22. HOME ADDRESS: STREET CITY STATE ZIP

23. DIRECT MAIL TO: BUSINESS ADDRESS HOME ADDRESS

24. REFERRED TO SCTE BY: NAME COMPANY

25. I AGREE TO ABIDE BY THE CONSTITUTION AND BY-LAWS OF THE SOCIETY IF ADMITTED:

26. SIGNATURE DATE

A. LAST NAME FIRST INITIAL CHAPTER EXPIRATION DATE ZIP CODE

B. MEMBERSHIP GRADE MO YR DATE ADMITTED INVOICE NO. AMOUNT DUE DATE RECEIVED CHECK NO.

C. ORIGINAL MEMBERSHIP CARD CERTIFICATE RENEWALS: INVOICE DATE INVOICE DATE INVOICE NO. DATE

D. ADDRESS CHANGE: _____ DATE: _____

CHAPTER: _____ DATE _____ DATE COPY TO CHAPTER _____

ADMISSION COMMITTEE ACTION: _____

MEMBERSHIP GRADE: SENIOR MEMBER ASSOCIATE MEMBER SUSTAINING MEMBER
 STUDENT MEMBER



The local Cable TV Company doesn't want an arm and a leg...

only a foot.

One foot of surplus space.

One foot of otherwise useless space. That's what Cable TV rents on poles owned completely by PG&E. At rates that return to PG&E profits far in excess of 100%. The California Public Utilities Commission has refused to regulate these rates by PG&E.

Cable TV wants rates set at a reasonable level. More importantly, Cable TV wants PG&E to make more poles available (only about 10% are now). *Most* importantly, Cable TV wants to compromise.

We have to if we are to survive. PG&E doesn't want to compromise. And PG&E is PG&E.

No, the local Cable TV company isn't asking for an arm and a leg. But we know someone who is.

Western Pole Committee



Every time a technician drives out on a trouble call it costs money.

Trouble calls gobble away at profits.

Call or write Avantek and find out how our CR/CT-2000 Test System



can improve your CATV system's performance and dramatically reduce those trouble calls.

Avantek...years ahead today.

3175 Bowers Avenue, Santa Clara, California 95051. Phone (408) 249-0700.



INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
345 EAST 47TH STREET
NEW YORK, N.Y. 10017

Non-Profit Organization
U. S. Postage
PAID
Phillipsburg, N. J.
Permit No. 187