

CATV TECHNICAL STANDARDS

Session Chairman:  
Hubert J. Schafly

Participants:  
John B. Damonte  
"The Role of the IEEE in the CATV Industry"

G. Norman Penwell  
"The NCTA Standards Program"

Guest Panalist:  
Sydney R. Lines

(Papers received after material  
sent to printer.)

JOHN B. DAMONTE

I have been asked to speak to you this morning about the IEEE and how it might interface with the cable TV industry.

First of all, let me define for you what IEEE is all about. The IEEE stands for the Institute of Electrical and Electronics Engineers. It's a group of about 158,000 engineers located throughout the world who are interested in the electrical and electronics business. The organization is relatively new in one sense, in that it is a merger of two former organizations, the American Institute of Electrical Engineers and the Institute of Radio Engineers.

The 158,000 membership represents the largest engineering society in the world by a factor of about 2. What do we do? We are a scientific, literary and educational organization. We are scientific in the sense that we are interested in the development of new systems devices and proponents in the electrical and electronic area.

We are literary in the sense that we publish papers and serve as a forum for the discussion of these papers. We are educational in the sense that we sponsor conventions, conferences, symposia and other gatherings, locally as well as internationally, to disseminate the latest engineering information available to the various facets of electrical and electronic engineering.

How do we operate? Basically, we are divided into what are called regionals, and there are ten regions throughout the world. Six of these regions make up the United States. San Francisco is located in region 6 and incidentally happens to be the largest single section in the world. The seventh region is Canada. The eighth region is the western European land mass.

Region 9 is central and southern South America, and region 10 is Asia and the eastern portion of Europe.

We have approximately 200 sections, and that is the basic building block of the IEEE. The sections are responsible for establishing the local programs, meetings, local conferences and this sort of thing. In addition to the sections, we have a technical organization which is called the "Group" and this particular technical group is interested in a particular phase of electrical engineering.

For example, it might be audio or television, antennas, microwave theory and techniques, aerospace engineering -- there are 31 of these various segments (groups).

We also publish a lot of material. The IEEE has some 42 different publications covering the various technical areas of interest.

JOHN B. DAMONTE AND G. NORMAN PENWELL

When IEEE was first formed as a merger of the IRE and IEE, there were at that time three publications. And in 1947 we published some 3,000 pages of technical material. I ask you to think in your own minds what you think we might be publishing today. Today we have some 42 publications and we publish 30,000 pages of technical matter. So there is a tenfold increase in the very short period of time.

I think one thing that we are working with that might be of interest to you is the fact that we are all becoming saturated with paper. It must be true in your industry as well as in all of the others.

To try to get at the meat of the kind of material that you want requires that you go through a lot of different magazines and journals. There should be some systematic way in which you can derive the kind of information that you need to do your particular job. I think this is probably one of the reasons that you have formed your particular organization, to specialize in a particular area, to make that kind of information available to you.

In addition to our periodicals, IEEE publishes standards. These are standards set up by committees of IEEE working in conjunction with other agencies such as FCC and other regulatory bodies. These committees establish the particular limits of acceptability for various kinds of devices, operations.

And I see, just listening to the last speaker, that you too have standards for your own industry and operations in that industry. In short, IEEE is a forum for the discussion of technical problems, and I think this is where it has its greatest value. It brings together people who have common problems and gives them the opportunity to discuss these problems with the experts in the field.

We at IEEE are pleased to see the emergence of the cable TV industry, and we stand ready and willing to help you in any way that we can. I think that is the formal part of my talk, and later on, if you have questions, I will be glad to answer those that I can.

G. NORMAN PENWELL

I would like to discuss very briefly this morning the NCTA standards program and what it means to you as a CATV systems operator. Over the past few years, we have approved several standards and

recommended them to the membership of this organization. We have one standing committee, that is, the NCTA Standards Committee, which meets several times a year or as is necessary to discuss standards.

This committee relies heavily on the analysis and recommendations of an engineering subcommittee. While these two groups work jointly, the functions and charges to these two committee groups are different. I would like to emphasize the distinction between these two functions.

Membership in the Engineering Subcommittee is open to NCTA members and associates who have indicated an interest and a capability in CATV engineering analysis. It is made up largely of representatives from the engineering staffs of the manufacturers and the engineering consultants serving the industry.

It serves as the work-horse for the Standards Committee in developing the basic data and the analysis necessary for the formulation of good engineering practices and standards.

On the other hand, the Standards Committee is made up largely of representatives from the engineering staffs of CATV system operators, and it is the Standards Committee that recommends standards to the NCTA Board of Directors for final approval. There are two kinds of standards that can be developed, (1) standards that specify common methods of measurement for equipment and system parameters and (2) minimum performance standards that recommend minimum requirements for equipment or systems such as Walt has been speaking about this morning.

There is a need for both kinds of standards, but primarily and firstly, our NCTA committee has been interested in developing common methods of measurement. To the extent that NCTA standards specify methods of measurement, it is in your interest to ask that your manufacturer report equipment capability in accordance with the recommended standards.

By so doing, you are going to be able to make a meaningful one-to-one comparison between equipment from different manufacturers. The NCTA Standards Committee has five standards, and they are available in booklet form here at the convention in two boxes at the rear of the room. If you have not received a set of these, you are certainly welcome to them.

You will note, for example, that the first standard is a minimum performance recommendation for subscriber carrier level, but note that this standard was withdrawn recently for revision in the face of new data on color receiver performance on CATV systems, and it is in the process of being redrafted to reflect the current thinking in best engineering practices.

To give you an example of the kind of consideration that is going into the development of the standards, consider minimum subscriber level. For example, what might be a desirable minimum level for a metropolitan area with a rather high level of industrial and man-made noise would not necessarily be a desirable minimum level for a CATV system operating in a quiet area remote from man-made noise.

Another factor for consideration is that a CATV system is really statistical in nature. For example, is it realistic to insist that all subscriber drops be above a minimum level at all times?

Other standards include one on distortion characteristics, one on graphic systems, one on our numbering system, and most recently, one on noise measurement, which has been approved for recommendation to the NCTA Board for final approval. Apart from the subscriber carrier level standards, you will note that the standards describe common methods of measurement.

Other standards are in the process of being developed. One engineering panel, for example, is working on the relationship of subjective receiver picture quality to various types of interference, relating picture quality to an engineering measurement.

Another panel is working on the development of a set of common parameters to describe coaxial cable characteristics. A program is underway to develop a 75 ohm standard. We CATV system owners have been buying coaxial cable that is ostensibly of 75 ohm impedance. The manufacturer or system operator can not guarantee that it really is a 75 ohm coaxial cable, since there is no common standard traceable to the National Bureau of Standards.

In fact, the differences in return loss on coaxial cable that is sometimes discovered between a reported return loss and the measured return loss may in part be blamed on a lack of a common standard of reference. Therefore, the Engineering Subcommittee is working with the National Bureau of Standards with the intent of developing, under the voluntary standards program of the Department of Commerce, a 75 ohm coaxial air-line standard.

Each manufacturer or system owner would then be able to purchase an air-line standard which could then be sent to the Bureau for certification within a specified tolerance. There are needs for development of other standards too.

For example, with many systems on the threshold of expanding beyond the 12-channel cable, we are faced with the dilemma of where to allocate the non-standard channels. Are we as an industry to wait until one large manufacturer or system owner established the non-standard assignment by virtue of being the first to fully implement a workable assignment, or do we perform an in-depth study of the problem, analyze the various trade-offs involved and the various proposals, and then made a recommendation to the industry about where to allocate non-standard channels?

G. NORMAN PENWELL AND SYDNEY R. LINES

There is a further need for technical guidelines that can be used by municipalities and cities who grant franchises. As many of you are aware, we have been experiencing, as Walt mentioned, a rash of situations where cities and municipalities across the country have been granting franchises that do not properly address the problem of how to best protect the public interest.

I recall one recent franchise, for example, that specified the kind of cable to be used, the voltage to be used to power the cable amplifiers and the distortion minimums for individual amplifiers. Overlooked entirely was the fact that equipment is put together as a system and if specifications are required they ought to be on the system as a whole.

For those of you who are interested in technical guidelines, the Association had prepared several years ago a filing on an FCC Docket, Number 15971, in which technical guidelines regarding technical aspects of CATV were discussed.

That document is several years old now, and the Engineering Subcommittee is in the process of rewriting these guidelines. When you pick up your copy of the NCTA Engineering Standards in the back of the room, you will note on the back page a leaf that says, "these technical guidelines are in the process of being rewritten." I would like for you to note the future issues of the NCTA Membership Bulletin, because these guidelines will shortly be available in the Bulletin and I would like you to pick them up and insert them into your NCTA Engineering Standards. This will be the guideline that we will recommend as an association that you present to the people who are your franchisers.

SYDNEY R. LINES

It was suggested when Norm Penwell first contacted me about appearing on the panel, that I contribute a few words about the Commission's viewpoints on technical standards. But what I have to say here today represents no commission viewpoint but simply my own comment.

What the Commission ultimately may do in the way of adopting technical standards for cable systems is not yet clear. I think the best indicator of this thinking is set forth in paragraph 29 and 30 of the Notice of Inquiry and the Notice of Proposed Rulemaking in Docket 18397, which was released last December and which has since occasioned considerable comment.

I will quote quite briefly from that document. Paragraph 29: "It has been repeatedly suggested that the Commission should undertake to prescribe uniform technical standards to further high quality service to the public in both broadcast signals and CATV-originated material and compatibility among systems for purposes of interconnection. We think the time has come to start in this direction. Accordingly, interested persons are invited to make concrete and detailed suggestions as to what technical criteria might appropriately be prescribed. After consideration of the comments, the Commission may establish a committee to assist in the formulation of specific proposed criteria. In any event, it is contemplated that a further notice will be issued, proposing specific criteria prior to the adoption of any rules prescribed for technical standards."

I would like to emphasize here that the Commission is talking about technical standards to encourage, 1, high quality service to the public, and to provide for, 2, compatibility among systems for purposes of interconnection. What I will comment on here is simply standards for service to the public.

The Commission's concern for high quality service is, I think, an amplification of that concern which was originally expressed about picture degradation, and which appears in the rules in Section 74.1103(d). And that section says, "The signal shall be carried without material degradation in quality within the limitations imposed by the technical state of the art."

Now, Section 74.1103(d) was an attempt to respond to the many allegations at that time that cable systems were deliberately degrading the signals of local or competitive signals. It has been criticized as an attempt to provide a benefit for television broadcasters rather than for the viewing public.

The Commission, in Docket 18397 is now saying specifically that it has a concern for the quality of service rendered the public and that it intends to take steps to protect the cable system viewers.

I think that an evaluation of your industry, what it presently is, what it has been and what it appears soon to be suggests that here is an industry whose initiative, whose ingenuity and contribution to the public welfare has caused it to mushroom from a small and scattered and rather insignificant number of undertakings to a phenomenon which has inserted itself very squarely into the national picture and can no longer be ignored.

This same ingenuity and initiative and enthusiasm which has propelled the growth of cable television probably also is responsible for the fact that your industry has failed to establish widespread standards which might benefit you as well as your customers. In short, you have been too busy with your business.

It is true that NCTA has a functioning standards committee and it's true that the manufacturing segment of your industry, through the IEEE and also through EIA, have committees set up for generating technical standards.

But I think it is also reasonable to say that the output from these tentative efforts is relatively small. Only those who have participated in standards work can appreciate the amount of time and the effort that goes into generating just one acceptable standard.

So at this day and hour, there aren't very many acceptable technical standards already in being which the Commission might draft or draw upon for its regulation of cable systems.

In response to the Notice of Proposed Rulemaking in 18397, we received several detailed discussions which will be considered in due course. These are all public information and can be reviewed from the filing in Washington.

I should not discuss these particular things here, but I think that the first reaction that one will get from reading them is that although they originate from authorities, their approaches are different, as different as night is from day. Some suggest that the Commission should promulgate performance characteristics for each amplifier or each unit in the system.

Others suggest that with appropriate modification, we might adopt the existing television broadcast standards which were written for transmitters, and these should be applied to the cable system. Then there have been suggestions that we accept or type approve the individual units in a system. And we have also looked at what the Canadians have done with respect to technical standards.

As early as 1956 they had standards for signal levels delivered to subscribers, and they had standards for channel bandwidth, also linearity and gray scale picture characteristics, and even picture degradation. They measured these characteristics on a calibrated receiver.

The calibrated receiver, of course, they might connect at various points of the cable system. But the point I'm trying to make here is that the technical practice in the cable television industry and the actual plants that are now in existence are so diverse that early formulation of a universe of technical standards applicability to all systems is going to be very difficult.

My own opinion is that cable television is not ready for the application of universal technical standards, but that a growing segment of the viewing public is. The viewers are ready for technical standards and so are the communities who franchise your operations.

So, assuming that the Commission decides to push forward and adopt technical standards and requirements for CATV systems, what might they adopt and how might they be applied? I would like to suggest that one of the first items which might contribute toward standardization is an early adoption of a uniform set of definitions.

How does one define a "subscriber"? For example, what is a "drop cable"? How does "slope" differ from "tilt"? What is the bandwidth of an amplifier? How is signal-to-noise ratio defined and measured?

A list of these terms which are so used everyday and so simple in concept is very long, but in the cable industry there really has not been an adequate formulation of a list of these. I think that we need some central and authoritative body such as NCTA to provide the official backing that such a list requires.

Now I would like to suggest a possible approach to future Commission action with regard to technical standards. This is what I would call the "Black Box" approach. This would consider the cable system, including the antennas with the headend, simply as a "black box" which is connected between the subscriber's receiver at one end and the television broadcasting station on the other.

The Commission would not attempt to regulate specifically what goes into that black box, but the Commission would concern itself instead with the signal which comes out of it. We would insist that the signal be delivered, for example, at such and such a level. It would be adequately free of noise and distortion, and that the isolation between various subscribers is such that the subscriber does not disturb his neighbors.

So to use the "Black Box" approach, I suggest that the following parameters might be the subject of standardization for cable systems. Number 1, the minimum input signal delivered to each subscriber; Number 2, the equality of signal levels as between channels; Number 3, the isolation between any two subscriber outlets; Number 4, the frequency response on any channel; Number 5, the signal-to-noise ratio at a subscribers outlet; Number 6, the permissible compression of the sync pulse; Number 7, the radiation from a cable system.

There are several other parameters which also might be on the list; for example, one is cross-modulation or, as they say in Europe, cross-view. And NCTA already has developed a procedure for measuring and specifying this for an amplifier. But I am not certain how this would apply to a system.

During the question and answer period, if there are any questions, we possibly can elaborate on these for you.

## DISCUSSION

MR. SCHAFELY: I will open the floor for questioning or rebuttals. Does anyone wish to speak? Yes. Come to the microphone, please and state your name and association.

MR. DONALD LEVENSON: Mr. Lines, I would like to know who, in the "Black Box" approach, you consider is going to be responsible for the path between the transmitting antenna and the CATV receiving. There's a problem in there. I was wanting you to comment on that.

MR. LINES: I quite think that you can't ignore the propagation problem, and I wouldn't know who could be responsible for that, who is responsible for there being a propagation problem. In the application in the administration of any technical standards, there has to be a certain amount of good faith exercised by the regulating authority as well as the regulated.

I really don't think that the propagation problem is something that prevents the adoption of technical standards applicable to CATV systems.

MR. LYLE EARN: The thing I wanted to ask is that the broadcaster has never had, as I know of, a control on the original quality. Now a drove of performers have their equipment that you can start out with, a very noisy film, a very poor resolution camera, etc., but now we are talking about CATV, not degrading a picture.

Is there any work towards improving this for the broadcasters?

MR. LINES: There are no technical standards applicable to the picture. That is transmitted by the television station. The Commission does not regulate the picture interval. The Commission applies its standards to the performance of the transmitting chain, the equipment, and it does have requirements regarding the synchronizing signal of television, but not of the picture interval.

MEMBER: I just wanted to mention, I am an old broadcaster and have been in the television business for a long time. There is a very fine committee active at the present time, which has various sections which has to do with improving film quality and transmission quality in every direction.

They have network representatives on it and others, so they are very aware of the problems, and work is going ahead on this.

MR. SCHAFELY: I would like to emphasize what these gentlemen have indicated. There are really three areas of so-called standards. There are terms and definitions, most important. I

know that the ones that Mr. Lines has indicated being desirable, at least as the first priority, and I am happy to say that some of those have at least been treated in some of our existing standards.

The second method is of measurement, approached methods of measurement using practical available test equipment.

The third is performance specifications. Now these get to be extremely touchy and almost out of the realm of a standards committee who is treating itself towards terms, definitions and measurements. I know in the IEEE, a CATV task force has been mentioned frequently, and that the IEEE as a professional society, does not want to say what is good and bad in terms of absolute numbers and attach it to something, but rather how do you measure?

I think the program of your Standards Committee, in attempting to obtain better subjective evaluation of good and bad in terms of visual perception, is an indication of our modality in that direction.

MR. KENNETH SIMMONS: I simply wanted to comment as to perhaps a word to our own standards group and also to Mr. Lines. I think it's important to underline the uniqueness of the CATV standards problem.

The specifications that fit our situation are not necessarily, and in fact, seldom are the same as those that fit the broadcast system. In Mr. Ragone's paper this morning, for example, he mentioned the required selectivity on the transmitter in a CATV system, where you have all signals at equal levels on adjacent channels as contrasted with the Buckeye situation, where you may want to receive an adjacent channel from the local town under the antenna of a local transmitter.

The requirements are not the same, and one mistake that we can make, and one that we have tried very hard to recognize in our standards work, is to assume that any of the former standards apply directly and without thought to the CATV situation.

Another example, perhaps, is the problem of direct pickup, whereas radiation from a cable system is of great interest to the FCC in the protection of the consumers who are using the radiated signals. There are diverse problems on the pickup. The CATV system is of great interest to the cable operator also and to his customers, and these matters require consideration of each standard which might be adopted and might be applied to the cable system situation, to see that we are controlling, in fact, the service delivered to the customer and not arbitrarily applying some standard which comes down to us from some other situation.