

Technical Committee Reports

REPORT OF THE MEETING OF THE DIGITAL AUDIO TECHNICAL COMMITTEE

Date: 1982 October 22

Time: 0945 hours

*Place: El Camino Room, Disneyland Hotel,
Anaheim, California*

Present: Bart Locanthi, Chairman (PNA, Inc.), B. Blüthgen (Polygram), P. K. Burkowitz (Polygram), A. Clegg (Matsushita/Panasonic), K. Dauphinee (ABC), T. Doi (Sony), R. Ely (M.C.I.), F. Fiola (M.C.I.), H. Ford (Consultant), J. Gibson (RCA/SMPTE), D. Gravereaux (CBS), T. Griffiths (Polygram), A. Heaslett (Ampex), J. P. Jenkins (ITC/3M), H. J. Kawada (JVC), S. Krampf (Otari), R. Lagadec (Studer), T. Mori (JVC), B. V. Pisha (Audio Electronics Lab.), L. G. Schuweiler (3M), T. Staros (M.C.I.), T. Stockham (Soundstream), H. Tanabe (NHK), K. Tanaka (Mitsubishi), H. Tendeloo (Polygram), G. Uloth (3M), A. Weisser (TDF/EBU), B. Whyte (Audio Magazine), R. Youngquist (3M).

1 A report of the meeting of the Working Group on Sampling Frequency recommendations was given by Bart Locanthi who chaired the group in the absence of Emil Torick.

Mr. Torick had submitted a draft sampling frequency recommendation to the group for consideration. This was discussed and slightly modified by the working group:

- a) A sampling frequency of 48 kHz is recommended for the origination, processing, and interchange of program material;
- b) For certain consumer digital audio applications the use of a 44.1-kHz sampling frequency is recognized; and
- c) For transmission-related applications, CCIR documents (to be defined¹) recommending a 32-kHz sampling are recognized.

The group discussed the possibility of attaching a

rider to the document which stated that, although the committee recognized and recommended three sampling frequencies, the committee wished to see the industry working for a single sampling frequency for professional digital audio applications in the future. Most people present felt that 48 kHz should be that frequency. Then the group considered the possibility of writing a rider which did not include a specific frequency. There was not a consensus in favor of this proposal, but because the majority did support it the matter would be pursued by the group.

Some editorial changes were made to the proposed sampling frequency recommendation, and the hope was expressed that the document would be distributed to the committee for comment by 1982 December 31, so that a "final" document would be on hand for the committee's next meeting in Eindhoven, The Netherlands, in 1983 March.

2 Alastair Heaslett, chairman of the Working Group on Digital Input/Output Interfacing, reported on the meeting of the group which took place on 1982 October 21 (see following report).

3 The first meeting of the Working Group on Digital Measurement Techniques was reported by Roger Lagadec, chairman of the group (see following report).

4 Then the committee heard reports on the present status of digital audio technology, including: a review of the converters available for converting analog audio signals to digital audio signals in a video format for recording on video cassettes; the status of hardware and software for the Compact Disc in Japan and Europe; the availability of a new 3-speed video cassette recorder; development of an adaptive delta-modulation recording system; the work being done on compact cassette digital audio fixed-head machines; the introduction of a new randomly oriented magnetic tape; and a description of the 3-inch audio file card or pocket record now under development.

5 Jim Gibson indicated that this committee should pay particular attention to the possible relation of digital audio to the visual display of material, i.e., television associated with digital audio, direct broadcast satellites, stereofilm, sound-with-TV, etc. Independent standards

¹ By documents to be supplied by A. Weisser, TDF/EBU.

are being developed worldwide and this committee should have inputs from television, satellite distributors and digital, i.e., CCIR, SMPTE, etc.

6 Jack Jenkins, IEC representative, indicated that this committee should take its work to the IEC. He pointed out that several people at this meeting would be at the upcoming IEC meeting in Tokyo. Since the AES Digital Audio Technical Committee membership is obviously international, the coordination with the IEC should be easy but our direct connection to the IEC is through the ANSI S4 Committee in the USA. Other AES committee members can, of course, connect to the IEC through their own national committees.

Han Tendeloo suggested that the U.S. should make their recommendations direct to the IEC and then later adopt the IEC standards as national standards. Heaslett responded that he agreed with Han in principle but the regulations require inputs to the IEC via the respective national committees.

7 Tom Stockham noted that since the technical projects are now being handled by the working groups, and the purpose of the general meeting is to hear the reports from these groups, perhaps the committee should consider other matters. In particular, he referred to the problems concerning the commercial counterfeiting and home copying of recordings and how digital recording affects such problems, considering that, for example, the compact audio disk might indeed be the equal of the original master. Mr. Heaslett mentioned the expenditures made by the record industry to prevent home copying and pirating, most of which he thought were doomed to failure, and expressed the belief that when the cost of the software is so low that copying is not worthwhile, the force for copying will drop to zero.

The chairman noted that taxes on blank tapes to cover royalties to performers have not been successful. Mr. Blüthgen stated that when such a tax was about to be added to blank tapes in Germany, the government changed and the tax never materialized. Mr. Tendeloo said that in Sweden when such a tax was imposed, tape sales rose just before the tax became effective and dropped to nearly zero after the tax. In Austria, there is a tax on blank tapes. In France, there is a tax on viewing for television sets and video recorders. So far, in the USA there is no specific tax on blank tapes.

On the technical side, Tom Stockham indicated his concern for the possibility of the output of a digital compact audio disk being connected directly to a digital compact cassette recorder, since a digital-to-digital recording is a verbatim copy of the original master tape. This technical possibility is of great concern to the record industry.

For cable distribution of digital audio programs, it has been proposed to charge the user a fee (as a royalty) every time he listens to a program. This money would be returned to the owner of the software, i.e., the record company.

Toshi Doi indicated that Sony tried unsuccessfully to invent a good method to prevent digital-to-digital copying of CDs. It did not make sense economically to copy

a compact audio disk onto a Beta or VHS cassette because the cost of the blank cassette was much higher than the disk. When digital compact cassette recorders become economically practical, digital-to-digital copying may be a problem. At the moment, players are not available with digital outputs. Now, Philips and Sony are going to make players available with digital outputs. By including an additional inhibiting bit to block recording, they hope to discourage home copying.

Mr. Blüthgen said that a box to eliminate the inhibiting bit could be manufactured. He suggested that by making "inexpensive" compact digital audio recorders operate on a different sampling frequency from the Compact Disc, say at 32 kHz, digital-to-digital home copying would be difficult and expensive.

Roger Lagadec suggested that it would be beneficial if the thoughts expressed by Tom Stockham were published in the *AES Journal*. Dr. Stockham felt that the statement should be collectively prepared; he might write a draft statement which could be improved upon by a working group.

Peter Burkowitz commented that it might be helpful to the industry if a group of international engineers, such as those present, made a statement that the only guarantee against home copying is to make the signal unreadable. Such a statement could perhaps end the fruitless discussions and activities related to anti-piracy devices which have been going on for the past ten years.

Dr. Doi indicated that presently the designers of compact cassette digital audio equipment are too busy designing their hardware to also be concerned about the piracy problem.

Jim Gibson offered the solution that the recorded medium should be made cheaper than the copying medium.

Tom Stockham noted that the recorded medium and the artists' royalties together must be of less cost than that of the copying medium.

Han Tendeloo echoed the same concern of Stockham that unlimited home copying can hurt the record business severely, and anything that can be done to inhibit such practices would be helpful to the record industry.

In the short term, purchases of professional equipment will also drop if the record industry suffers. Eventually, everyone could suffer, even those making home recordings, because there may be nothing to copy if the record business were to collapse.

Almon Clegg suggested a working group on the issue of piracy, even if only to make a positive statement that there is no way technically to stop pirating.

Tom Stockham commented: a) there is no technically infallible method of preventing copying; b) it is not easy to convince business executives that there is technically no way to prevent copying; and c) if we could devise a way to inhibit copying, it might eliminate a large percentage of copiers. The best way to discourage copying is to make the original so good that the copy would be poor in relation to the original. But, a digital-to-digital copy is by definition perfect. If the copy had a 32-kHz sampling frequency and the original was 44.1

kHz and if the copy is made by a D/A and A/D operation, the copy would be inferior to the original but still excellent by present analog tape standards.

Tom Stockham agreed to chair a working group to research the copying/piracy problem, provided that it is understood that he would delegate the responsibility to someone of his choosing. He also agreed to chair a working group on definitions and terms, and to report on it in Eindhoven.

There are now the following working groups:

Working groups	Chairmen
Sampling frequency considerations	Emil Torick
Input/output interface	Alastair Heaslett
Measurement techniques	Roger Lagadec
Piracy and copying inhibitors	Tom Stockham
Definitions and terms	Tom Stockham

The next meeting of the Digital Audio Technical Committee will be 1983 March 14, Monday, at 2:00 p.m. in Eindhoven, The Netherlands. The working groups will meet on March 13, Sunday, and March 14, Monday.

BART N. LOCANTHI
Chairman

Digital Audio Technical Committee

REPORT OF THE MEETING OF THE WORKING GROUP ON INPUT/OUTPUT INTERFACING

Date: 1982 October 21

Time: 1415 hours

Place: Disneyland Hotel, Anaheim, California

Present: Alastair Heaslett, Chairman (Ampex); B. Blüthgen (Polygram); A. Clegg (Matsushita/Panasonic); T. Doi (Sony); A. Griffiths (Polygram); D. Haynes (Ampex); C. Heyser, J. Jenkins (3M/ITC); R. Lagadec (Studer); B. Locanthi (Pioneer); S. Pramanik (BTO); T. Stockham (Soundstream); K. Tanaka (Mitsubishi); H. Tendeloo (Polygram); A. Weisser (EBU/TDF); H. Yamauchi (Sony); T. Yazawa (Sony); R. Youngquist (3M).

1 After approval of minutes of Rye Town meeting, there was a short discussion of connectors. Bart Locanthi had contacted Cannon in the U.S.A. Their reaction was that color was no problem on a special order basis, nor was a special clamp. But they referred him to the XLB series, which is compatible with the XLR series.

K. Tanaka reported similar results from discussions with Japanese manufacturers, plus comments about special finishes. After further discussion, it was agreed by all that this need not be an issue, except for those cases where a special clamp was required to accommodate large diameter low-loss cables.

A short discussion followed on the subject of any

special nomenclature to be used for panel connectors. This will be an agenda item for the next meeting. The chairman asked the members of the committee to think about this subject and submit suggestions.

2 After a short review of the intent of the draft document on testing procedure, prepared by Ken Davies and A. Griffiths et al., there were contributions of experiences with serial transmission schemes from T. Stockham, A. Griffiths, R. Youngquist, T. Doi, K. Tanaka, and R. Lagadec.

The uniform experience was of a total lack of problems with lengths typically up to 25–30 meters using coaxial and twisted pairs, and even up to 200 meters using single-ended 75-ohm coaxial cable systems.

R. Lagadec stated that all the tests by Studer indicated that for 2-channel systems up to approximately 100 meters, no problems were encountered. With lengths much beyond this, results were far more dependent on cable types and shielding terminations, etc., than on differences in loads, and that specific receiver equalization would probably be needed for lengths of more than 200 meters.

The EBU representative, A. Weisser, noted that these distances were not inflexibly defined. K. Tanaka noted that the Mitsubishi proposal using Miller code was based on the previous 500-meter requirement, and if this were relaxed to approximately 200 meters, his company would have little or no problem with a biphasic code.

As a result of this, a consensus was expressed that the complexity and time required to make the tests proposed on a meaningful range of cables, etc., was unwarranted at this time.

The chairman thanked the members who had provided the draft, noting that their work had stimulated others.

3 On the issue of time codes, it was agreed that there was great complexity in encompassing and accommodating all types of time codes (SMPTE, EBU, etc.) for all F_s rates. Suggestions were made that a regular binary code depicting real time or blocks of samples, might be useful.

The chairman noted a letter and proposal received from J. J. Gibson on the subject of time codes, which will be circulated. A second report from J. J. Gibson on cable equalization will also be circulated.

The chairman then proposed that a subgroup be appointed to draft an AES recommended format to include up to 2 channels only. The format would be considered at the next meeting, in Eindhoven, The Netherlands. There was unanimous agreement on this.

R. Lagadec, T. Doi, A. Weisser, and K. Tanaka agreed to prepare such a draft. (Note: R. Youngquist also agreed to be part of this group.)

Under any other business, R. Lagadec reported an agreement between Studer, Sony, and Neve on an 8-, 16-, 24-, and 32-channel serially multiplexed format using a single optical fiber. Details would be released in Eindhoven. The format would be an extension of the present proposals.

The next meeting will be held in conjunction with the

73rd Convention in Eindhoven (1983 March 15-16). The date, time, and agenda will be announced.

ALASTAIR HEASLETT
Chairman
*Working Group on Input/
 Output Interfacing*

REPORT OF THE MEETING OF THE WORKING GROUP ON DIGITAL MEASUREMENT TECHNIQUES

Date: 1982 October 21

Time: 1900 hours

Place: Disneyland Hotel, Anaheim, California

Present: Roger Lagadec, Chairman (Studer); K. Altmann (IRT); B. Blüthgen (Polygram); R. Cabot (Tektronix); A. Clegg (Matsushita/Panasonic); K. Dauphinee (ABC); T. Doi (Sony); E. Foster (EIA/OSL); D. Graveriaux (CBS); D. Haynes (Ampex); M. H. Jones (Neve); B. Locanthi (Pioneer); M. Kosaka (Matsushita); L. Martin (AEG Telefunken); T. Mori (JVC); W. Shelton (BBC); T. Stockham (Soundstream); T. Takegawa (NHK); K. Tanaka (Mitsubishi); A. Weisser (TDF); B. Youngquist (3M); unnamed (Philips).

At its first meeting, the working group agreed on a definition of its objective as follows: "The objective of the Working Group on Digital Audio Measurement Techniques is to submit to the AES Digital Audio Technical Committee recommendations on the measurement of audio-related parameters of signals and equipment. The recommendations may include both a set of definitions and a description of measurement procedures. The scope of the working group's tasks is limited by engineering practice in digital audio."

The working group agreed to adopt the same working practices as, for example, the working group on digital interfacing, both with reference to membership and to the distribution and use of documents.

The tasks of the working group were defined as follows:

Task 1: Conversion from a digital audio signal to an analog audio signal, including possible digital preprocessing, digital-to-analog converters, and analog post-processing and filtering.

Task 2: Conversion from an analog audio signal to a digital audio signal, including analog filtering and sampling, analog-to-digital converters, and possibly digital postprocessing.

Task 3: The data recorder, including its error behavior (error rates and error correction), and the long-time behavior of its recorded data.

Task 4: Error concealment, its definition and the measurement of the effect of error-concealment methods.

Task 5: Digital audio signal-processing equipment.

Task 6: Clock signals and their effect on digital audio signals.

In parallel, the issue of digital audio equipment specification will be addressed.

The next activities were decided as follows: This first short report will be submitted to the AES. The chairman will distribute to the members an article by T. Stockham on mechanisms of imperfection in analog-to-digital and digital-to-analog conversion. The members will respond by reporting to the chairman for distribution their own experience on the issue of effects impairing the sound quality of digital audio. The members will also submit in writing suggestions for digital audio equipment specifications, and contributions on digital audio measurement techniques.

The first tasks to be addressed by the working group will be tasks one through three, in parallel with a discussion on digital audio equipment specifications.

The next step for the members is to await a message from the working group's chairman, asking for the abovementioned contributions.

The next meeting is scheduled to take place shortly before the 73rd AES Convention in Eindhoven.

ROGER LAGADEC
Chairman
*Working Group on Digital
 Measurement Techniques*