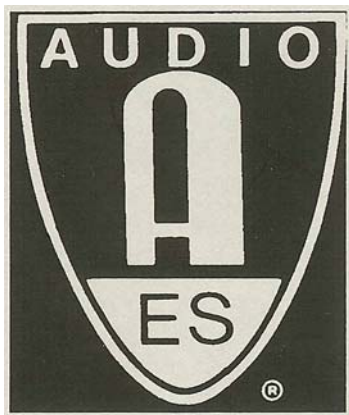


STANDARDS AND INFORMATION DOCUMENTS



AES standard for forensic purposes Criteria for the authentication of analog audio tape recordings

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AES standard for forensic purposes

Criteria for the authentication of analog audio tape recordings

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Abstract

The purpose of this standard is to formulate a standard scientific procedure for the authentication of audio tape recordings intended to be offered as evidence or otherwise utilized in civil, criminal, or other fact finding proceedings.

An AES standard implies a consensus of those directly and materially affected by its scope and provisions and is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an AES standard does not in any respect preclude anyone, whether or not he or she has approved the document, from manufacturing, marketing, purchasing, or using products, processes, or procedures not in agreement with the standard. Prior to approval, all parties were provided opportunities to comment or object to any provision. Approval does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the standards document. This document is subject to periodic review and users are cautioned to obtain the latest edition.

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Foreword

[This foreword is not a part of AES standard for forensic purposes — criteria for the authentication of analog audio tape recordings, AES43-2000.]

This document was developed by a writing group, headed by A. Pellicano, of the SC-03-12 Working Group on Forensic Audio of the SC-03 Subcommittee on the Preservation and Restoration of Audio Recordings. The writing group was formed to execute project AES-X48.

It results from an international consensus and is not intended to reflect the practice of any single nation. As an AES standard, it is an international professional society's statement of technical good practice, but its use is entirely voluntary and it does not have the status of a governmental regulation. Nevertheless, any claim to voluntary compliance with the standard implies acceptance of its mandatory clauses.

In 1991, SC-03-12 was organized as AESSC WG-12 at the request of a community of engineers from the ABS, the Acoustical Society of America, various law enforcement agencies, and groups concerned with testimony. The group concerns itself with the handling, authentication, and enhancement of audio recorded materials basing itself on methodologies such as developed from those described in Bolt, Cooper, Flanagan, McKnight, Stockham, and Weiss, Report on a Technical Investigation Conducted for the U.S. District Court for the District of Columbia by the Advisory Panel on the White House Tapes. May 31, 1974.

This document results from one of the projects set out at the early meetings of the working group.

Tom Owen, Chair of SC-03-12
Michael McDermott, Vice-Chair of SC-03-12

1999-09-03

AES standard for forensic purposes — Criteria for the authentication of analog audio tape recordings

1 Scope

This standard specifies the minimum procedure for the authentication of analog audio tape recordings intended to be offered as evidence or otherwise utilized in civil, criminal, or other fact finding proceedings. It does not specify or restrict additional testing procedures that can be used.

These methodologies are suggested to any and all individuals and groups who hold themselves out to be or are recognized as forensic tape analysts or experts.

This standard is a set of procedures set forth to inform attorneys, courts, and other interested parties. It also serves to aid interested parties who are attempting to determine whether or not the procedures and methodologies of potential, chosen, or opposing experts are of a scientific nature and would withstand objective scrutiny.

2 Normative references

The following standard contains provisions that, through reference in this text, constitute provisions of this document. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the indicated standards.

AES27- 1996, AES recommended practice for forensic purposes — Managing recorded audio materials intended for examination.

3 Definitions

3.1

authentication

authentic recording and authenticity analysis as defined in AES27

3.2

forensic tape analyst

FTA

entity performing authentication according to this standard

3.3

designated original recording

DOR

original recording as defined in AES27

3.4

designated originating recording device

DORD

original recorder as defined in AES27

3.5

employer

engaging party

entity engaging the services of an FTA

3.6

cassette

device composed of a case containing two coplanar or superimposed hubs or reels on which a magnetic tape is wound, so that the tape can move from hub (reel) to hub (reel) during recording, reproduction, a fast forward movement, or rewinding, and can be easily and instantaneously inserted in a recording-reproducing equipment or in a reproducer designed for this purpose, without handling the magnetic tape

3.7

memorialization

legally acceptable documentation of evidence

3.8

test recording

recording made by the FTA, using the designated originating recording device and a non-evidence blank tape, for the purpose of determining certain performance characteristics of the recording device

3.9

signature

waveform or microscopic visualization (or demonstration) of record events either located on the DOR or created on a test recording, or both, utilizing the DORD or any tape recording device examined by the FTA for the purpose of identification or comparison during an examination

4 Verification of authenticity

4.1 Criteria

Verification is predicated upon two sets of criteria:

- a) that a person, whether a law enforcement official or any individual stated, if called upon, could or would testify under penalty of perjury, that the tape recorded evidence presented as the DOR is, in fact, the tape material utilized to create the recording at the exact time that the occurrence, interview, interrogation, or recorded content actually took place;
- b) that by a comprehensive examination procedure and scientific means the FTA was able to determine that it is the original.

4.2 Equipment

The FTA shall examine the DOR along with and utilizing the DORD. The FTA shall render findings that would scientifically evince that the DORD recorded the designated original recording, and found no conclusive evidence of tampering, unauthorized editing, or any form of intentional deletions, material or otherwise, within the recorded content.

4.3 Reporting

The FTA may then render an opinion that the recording has passed the procedure or standard for authentication and that the questioned tape recording is authentic in physical state and in content.

5 Examination and analysis

5.1 Evidence management

Except where otherwise specified in this standard, evidence management practices shall comply with AES27.

5.1.1 Physical examination

5.1.1.1 Record-prevention punch-out tabs

If the audio evidence is contained in a tape cassette that features record-prevention punch-out tabs, the FTA should try to obtain permission to remove them or the FTA may remove the tabs at its discretion. If the tabs are removed, the FTA shall attach the removed record-prevention tabs to a suitable carrier such as a file card by means of a nondestructive and removable adhesive such as transparent adhesive tape. The carrier shall be placed inside a sealed envelope, with the date and time that the envelope was sealed and the signature of the FTA written across the seal. The cassettes shall be comprehensively photographed or videotaped before and after the removal of the punch-out tabs.

5.1.1.2 Operating condition

When the tape recorded evidence is contained in a cassette, the cassette shall be carefully examined to determine that it is operable. The FTA shall inspect the cassette, making sure that there is no obstruction to the tape. The FTA shall also look for apparent tears or splices on the tape material itself that could possibly obstruct or deter playback. The FTA shall carefully rotate the tape hubs in both directions to detect any hidden obstruction that could hinder playback.

When examining a reel of tape, the same care and caution shall be executed.

NOTE Playback of a damaged tape can produce further damage to the tape.

5.1.1.2.1 Notification of damage

If during the physical examination, the FTA finds evidence of physical tampering or damage to the cassette or the tape material, the FTA shall immediately inform its employer that the submitting party shall be notified. If the cassette or tape material can be repaired, then the FTA shall obtain written permission from the submitting party prior to proceeding with any repairs or modifications. Whether or not the FTA receives permission to repair the damage or remove the tape material and place it in a new cassette or otherwise prepare the DOR to be available for playback, the FTA shall photograph or videotape the evidence for reference to memorialize the discovery. If the tape or cassette is repaired, the videotape or photographs shall comprehensively depict the repair.

5.1.1.2.2 Splices

If a physical splice is located, the splice shall be noted and photographed or videotaped at the time of the observation.

5.1.1.3 DORD condition

The DORD and any accompanying apparatus such as separate microphones, switching devices, and similar accessories shall be inspected and examined to determine that they are operational. After the FTA concludes the visual inspection, a compatible tape shall be placed in the DORD and the functions of the DORD shall be tested to ensure that it can play back the DOR without damage to the DOR or the DORD.

5.1.1.3.1 Notification

If the DORD is not functional, the FTA shall inform its employer that the submitting party shall be notified. If the DORD can be repaired, then the FTA shall obtain written permission to do so. If the repair necessitates the replacement of the record-playback head, the erase head or both, the FTA shall indicate to the employer that the replacement of the head or heads negates an authentication procedure and that the FTA report of findings relates only to the examination of the DOR. All repairs shall be comprehensively memorialized including who repaired the recorder and at what facility. All replaced parts shall be maintained as evidence by the FTA.

5.1.2 Verification

Compliance with 5.1 shall be verified and attested to by the FTA before proceeding further with the evidence.

5.2 Critical listening and waveform examination

The critical listening and waveform examination procedures can assist an FTA in attempting to determine whether or not any anomalies are present on the questioned recording.

5.2.1 The FTA shall produce a first test recording containing known exemplars of the functions of the DORD. It should include a minimum of ten start recording signatures, ten stop recording signatures, ten stop-start recording signatures, ten pause signatures (assuming that the recording device has this feature), and if the DORD is so equipped, ten voice activation signatures. Other test recordings may be produced which should include over-recordings and other variations of the record functions of the recording device if necessary or appropriate.

5.2.2 The designated recording device shall be utilized to play back the test recording. The playback should be rehearsed to ensure that the level of playback is appropriate. That setting should be fixed by either carefully applying tape across the volume control of the recorder or exacting some form of measurement that would ensure that the playback output level can be reasonably reproduced.

5.2.3 The first test recording should be played back into a configuration of either a computerized method of storing the playback on a hard disk, or some form of memory device that would allow repetitive playback. Many programs are now available to digitize the playback and store that information on hard drives. They further allow an array of playback functions, and most have features that would enable the FTA to view the waveform.

5.2.4 Once the signal or audio from the test recording has been stored, playback of the digitized recording can take place to enable the FTA to listen to the recording while viewing the waveform. The FTA can then be informed as to how the record functions of the designated recording device sound (assuming that the functions generate a discernible audible sound when played back) and are visually demonstrated or appear in the waveform domain. The FTA should then study and scrutinize the signatures so that it can be reasonably acquainted with how the function signatures of the designated recording device sound and are seen or demonstrated in the waveform domain.

5.2.5 The DOR shall be played back with as close to the exact output level and through the exact configuration as the test recording. The output volume control of the DORD may be adhesive-taped to fixed position until all of the test recordings are created and subsequently stored. Once the signal or audio from the DOR is stored, then the FTA shall critically listen to the content while viewing the waveform.

5.2.6 The FTA should then produce, by the safest and best means possible, at least two first-generation copies of the DOR for reference and to evince the state of the recorded content at or about the time of receipt. If the FTA is asked for copies, then copies should be provided appropriately labeled and marked.

5.2.7 The critical listening and waveform examination should occur as often as the FTA deems it necessary in order to answer the following questions.

a) Was the content consistent and uninterrupted throughout the entirety of the questioned tape recording? If not, then the location of the gaps, dropouts, over-recordings, or any other form of disruption should be delineated for further examination and analysis. If there are other apparent unrelated recordings, they should be cataloged for reference and/or possible further examination and analysis.

b) Were there any identifiable record function signatures detected and located in the content? If so, are they consistent with the test recording exemplars? If not, they should be designated as possible anomalies. In either case, they should be labeled or otherwise delineated for further analysis.

c) Was there any form of anomalous or otherwise perceptible aural or visible indications in the playback or waveform display? If so, their presence should be labeled or otherwise delineated for further analysis. This question would include level changes, apparent or obvious differences in background content, or any other form of aurally perceptible variances.

d) Were there background conversations or content? For example, were there radio communications or other perceptible speech, or repetitive noise that would aid in determining authentication? If so, they should be labeled or otherwise delineated for reference and further analysis.

e) If (a) through (d) render any form of anomaly or evident difference, then further test recordings utilizing the DORD should be produced in an attempt to recreate or mimic the differences or anomalies detected and located. If the further tests can or cannot do so, that revelation should be reported.

5.2.8 These and other findings should be reported upon, verified in the waveform, and their precise location noted for future reference. Once these procedures have been accomplished, then the next step shall be to perform the photo-microscopic examination and analysis.

5.3 Photo-microscopic analysis

5.3.1 Test recordings for the specific purpose of photo-microscopic analysis should be produced. These test recordings should include all of the record function signatures of the DORD.

5.3.2 The test recordings should be examined under the microscope, in a scientific manner, which would allow the

PTA to view the magnetic domain (Bitter patterns) of the record function signatures of the test recording examined.

See annex A for informative references.

5.3.3 The known exemplars produced, viewed, and examined can familiarize the FTA with how the function signatures of the DORD appear. The FTA can now be enabled to make measurements, take photographs, videotape, and otherwise memorialize the procedure and the resulting findings.

5.3.4 The FTA can now perform the same examination and analysis upon the designated original recording. This procedure, when performed in a scientific manner, can enable the FTA to attempt to identify the signatures located on the questioned recording. The FTA can now make comparisons and other forms of tests resolving the issue of authenticity as it pertains to the recording that the FTA is examining. It further allows the opportunity to demonstrate the findings by means of measurements, photographs, videotapes, or any other form of demonstrative means that could be reviewed by the employers, the courts, or juries and other experts, opposing or consulting.

5.3.5 An FTA can now draw conclusions from these findings, including whether or not the DORD actually recorded the designated original recording. An FTA's finding could either validate this fact or disprove it. In some cases no definitive solution can be made.

5.4 The formulation of an opinion and conclusion

5.4.1 Once an FTA has performed all of the testing procedures and rendered scientific findings, it should be sure to have:

a) performed all of the tests and examinations in a scientific manner, that if recreated or duplicated by another expert would render the exact same findings; for example, if the FTA has found and identified a stop/start recording signature at a specific location on the questioned recording, another expert or analyst could or would find and identify that same signature at the same location;

b) produced comprehensible and repeatable graphic waveform displays, printouts, or any other form of graphic rendering that would demonstrate the FTA's findings in the waveform domain, so that another expert or any other individual could view them in an effort to determine whether the FTA's findings exist and are valid;

c) produced sufficient photographs, videotapes, or any other form of definitive renderings that would demonstrate the FTA's findings in the magnetic domain, so that another expert or any other individual could view them in an effort to determine whether the FTA's findings exist and are valid.

5.4.2 If asked, an FTA should render a comprehensive report that would effectively demonstrate all of the procedures and findings, in a scientific manner, that would survive objective scrutiny and lend credence to its opinion and conclusion.

5.4.3 As to what an FTA hears or perceives in the playback of the DOR that is not demonstrable, that information would be categorized as subjective and left to the courts, juries, or other parties to determine its relevance, validity, or both. It may, however, be reported thereon.

5.4.4 After an FTA has completed all of the tests and examinations, has analyzed and memorialized all of the findings, and has either rendered a comprehensive written report or rendered an oral report to the employers regarding this opinion and conclusion, based on a high degree of scientific certainty, an FTA may be permitted to testify as to its opinion and conclusion.

6 Testimony

Once an FTA has finalized its examination and analysis and reached a definitive conclusion and opinion, the FTA may be available for testimony if called upon to do so.

6.1 Preparation

6.1.1 To adequately prepare for testimony, an FTA shall attend to its files so that notes, correspondence, data, and other written or otherwise demonstrable information are in a comprehensive form. This requirement includes the cataloging of all the evidence submitted, the test recordings produced, and any and all demonstrative renderings that may be requested to be viewed by the opposing parties, their experts, and the engaging party.

6.1.2 Once the files are in order, then an FTA should review all findings in a comprehensive fashion to determine that all of the calculations, demonstrative renderings, reports, and supporting information are complete and, most importantly, accurate. The FTA should thoroughly review its deposition, if one had occurred, and any and all forms of reports it may have previously rendered.

6.1.3 When an FTA is reasonably assured that it is prepared, then the FTA shall proceed to prepare its employer and first, and at the very least, demonstrate the following:

- a) that the FTA followed the criteria for authentication as strictly as possible;
- b) that the FTA had attained a high degree of scientific certainty as to its findings, opinion, and conclusion;
- c) that all of the FTA's demonstrative waveform or spectral renderings are accurate and truthfully demonstrate all of the findings which it claims are located on the questioned recording; further, that if any other competent expert or party examined the FTA's waveforms, it can locate the signatures, events, edits, or anomalies that are graphically demonstrated in the FTA's depictions at or about the same location as did the FTA presenting the findings;
- d) that all of the FTA's photographs or other forms of visual magnetic domain renderings are accurate and truthfully demonstrate its findings located on the questioned recording; further that if any other competent expert or party examined the magnetic domain, that party could and would locate the signatures, events, edits, or anomalies that are demonstrated in the FTA's depictions at or about the same location as did the FTA when presenting the findings;
- e) that the FTA has performed its examination in the utmost unbiased ethical manner and that it believes the findings, opinion, and conclusion would withstand the scrutiny of peers and the legal process;
- f) that the FTA should submit or make available to its employer all reference materials, instrumentation manuals, literature or any other form of documentation or data that the FTA has relied upon during its examination and analysis, in rendering its opinion, or both. Further, the FTA should attempt to familiarize its employer in the syntax, nomenclatures, or terminology utilized in their field;

g) that the FTA should assert that its employer can rely upon the FTA to professionally and truthfully testify as to the findings with the utmost assurance within its capabilities and competence.

6.1.4 At this point the engaging party may further interview or mock cross examine an FTA in an attempt to ascertain any issues relating to the findings, opinions and conclusions rendered or any issues relating to prior testimony given by an FTA.

6.2 Problems

6.2.1 From time to time there are problems educating or relating findings to the engaging party. The FTA should avail itself in an effort to clearly address the issues caused by its findings or the engaging party's apprehensions if any exist.

6.2.2 If an FTA senses or is otherwise led to believe that the engaging party has difficulty in comprehending the issues, or its findings, opinions, and conclusions, the FTA may suggest further preparation or offer the services of another expert to further clarify the issues or perform an independent examination and analysis of the questioned recording, in an attempt to satisfy the doubt of the engaging party or otherwise assure it of the testimony to be presented.