

Digitization Specifications of Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences on Audio-visual Archives (Trial)

1. Scope

These Specifications specify the technical and management requirements for the digitization of analog audio-visual archives.

These Specifications apply to the management of the digitization process of audio-visual archives formed by analog signals.

2. Normative References

The following documents are indispensable for the application of this document. All referenced documents with dates are only applicable to this document with the dated version. All referenced documents without dates apply to the latest version (including all amendments).

GB/T2900.75-2008 Electrotechnical Terminology - Digital Recording Audio and Video Signals

GB/T20530-2006 *Guide for the Digitalize Processing of Document and Archives* DA/T1 *Basic Terminology of Archive Work*

ISO/TR13028 Information and Documentation - Implementation Guidelines for Digitization of Records

3. Terms and Definitions

The terms and definitions defined by GB/T20530-2006, DA/T1, DA/T18, and the following terms and definitions are applicable to this document.

3.1 Audio-visual Archives

Historical records directly formed by national institutions, social organizations, or individuals in social activities, primarily reflecting images or sounds recorded on physical media, and having preservation value.

3.2 Digitization

The process of converting analog signals into digital signals using computer technology.

3.3 Sampling

Extracting and forming discrete signals from continuous signals.

3.4 Quantize

Using integer scales to divide a continuous range of values into a certain number of discrete values. The quantized value can be restored to a value close to the original (using digital-to-analog conversion method), but cannot be exactly the same. Quantization is one of the basic techniques in analog-to-digital conversion.

[GB/T2900.75-2008, Definition A-01-62]

3.5 Encode

The process of processing data for storage or transmission of large amounts of data, usually using compression methods that eliminate redundancy or reduce complexity. Most compressions are based on one or more encoding methods.

[GB/T2900.75-2008, Definition A-01-27]

3.6 Capture

The process of converting analog audio and video signals into digital signals through sampling, quantization, and encoding.

3.7 Digitization of Audio-visual Archives

The process of digitizing analog audio-visual archives to convert them into digital audio files and video files stored on media such as tapes, disks, and CDs, and

establishing the relationship between catalog data and digital audio-video files according to the intrinsic connection of audio-visual files.

3.8 Bit rate

The rate at which digital signals are processed or transmitted by computers or communication systems, i.e., the amount of data processed or transmitted per unit time.

4. General

4.1 All units shall plan and carry out the digitization of audio-visual archives in a coordinated and scientific manner based on factors such as the rarity, openness, utilization rate, urgency of rescue, and digitization funds of the archives. The implementation of the digitization of audio-visual archives shall follow the requirements and suggestions proposed by ISO/TR13028 and GB/T20530-2006.

4.2 The basic stages of digitization of audio-visual archive include: pre-digitization processing, database establishment, information acquisition, audio-video processing, data linking, acceptance and handover of digitization results, etc.

4.3 Effective management and technical means shall be adopted to truly reflect the content of audio-visual archives and ensure the quality of digitization results.

4.4 During the digitization of audio-visual archives, metadata such as digitization project information, technical environment, and various digitization parameters shall be preserved. The determination of metadata elements shall comply with the requirements proposed by ISO/TR13028.

4.5 Safety management shall be strengthened at all stages of the digitization of audio-visual archives to ensure the security of physical archives and archive information and minimize or reduce the damage to physical archives caused by operations at various stages.

4.6 When processing classified archives, relevant national regulations shall be followed. If non-classified and classified archives are recorded on the same physical carrier, the physical carrier shall be handled according to the requirements of classified archives.

5. Organization and Management

5.1 Institutions and personnel

5.1.1 An organization specializing in the digitization of audio-visual archives shall be established to coordinate planning, organize implementation, coordinate management, ensure security, provide technical support, supervise inspection, and accept results to ensure the smooth progress of audio-visual archive digitization work.

5.1.2 It shall be equipped with personnel with corresponding capabilities, including management personnel familiar with archive business and possessing a high level of investigative research and good organizational leadership abilities, technical personnel familiar with relevant standards and able to provide technical support for various links of the digitization of audio-visual archives, and operators who have a certain knowledge of digitization and are familiar with their job duties. Standardized management of personnel shall be carried out through scientific and normative management systems. To enhance the security of digitization work, external contracted personnel shall undergo rigorous review.

5.2 Infrastructure

5.2.1 Dedicated processing sites for the digitization of audio-visual archives should be equipped and reasonably laid out to form work areas for archive storage, pre-digitization processing, archive recording, information acquisition, audio-video processing, quality inspection, etc.

5.2.2 The selection of processing areas and the control of environmental factors such as temperature and humidity shall not be detrimental to the protection of archive entities. Facilities and equipment for fire prevention, waterproofing, prevention of harmful organisms, anti-theft alarm, video surveillance, and other safety management system shall be provided to cover the entire area.

5.2.3 Facilities and equipment for audio-visual archives digitization shall be reasonably planned, equipped, and managed to ensure safety, advancement, and the ability to meet the needs of audio-visual archive digitization work.

5.3 Work plan

5.3.1 Based on thorough research, we shall develop scientifically reasonable work plans to ensure that the digitization of audio-visual archives achieves the intended goals.

5.3.2 The work plan shall include digitization targets, work objectives, work content, cost accounting, digitization technology methods and major technical indicators, acceptance criteria, personnel arrangement, division of responsibilities, schedule arrangement, safety management measures, etc. The determination of digitization targets shall consider factors such as the rarity, openness, utilization rate, urgency for rescue, and digitization funds of the archives.

5.3.3 We shall have the work plan reviewed by experts to ensure its scientific, standardized, and reasonable nature.

5.3.4 The work plan shall be strictly enforced after approval. The results of work plan approval shall be kept together with other documents generated during the audio-visual archive digitization process.

5.4 Management system

5.4.1 A scientific and standardized management system for digitizing audio-visual archives shall be established and strictly implemented throughout the digitization process to effectively ensure archive safety and the quality of digitization work.

5.4.2 The management system for digitization of audio-visual archives shall include position management, personnel management, site management, equipment management, data management, archive entity management, etc. The position management system mainly specifies the work objectives and responsibilities of various positions involved in digitization work, forming clear position business process norms, assessment standards, reward and punishment methods, etc.; the personnel management system mainly standardizes personnel's safety responsibilities, daily behaviors, verification and management of externally hired personnel information, registration of non-employees' visits, etc.; the site management system

mainly standardizes the management of personnel access and working environment, infrastructure, network, monitoring facilities, on-site items, documents, etc.; the equipment management system mainly standardizes the management of all equipment involved in digitization work at various stages; the data management system mainly standardizes the management of data generated in various stages of digitization; the archive entity management system mainly standardizes the handling, management, and storage of archive entities during the digitization process.

5.5 Workflow control

5.5.1 According to relevant laws, regulations, and technical standards, relevant work processes and operational specifications of each stage shall be formulated to effectively control the entire process of audio-visual archive digitization and ensure the quality of digitization results. See Appendix for the audio-visual archive digitization process.

5.5.2 Strict safety management shall be carried out for the entire process of digitizing audio-visual archives, and data generated at various stages such as information acquisition and audio-video processing shall be backed up in a timely manner.

5.5.3 A comprehensive feedback mechanism shall be established to provide timely feedback and corrections for issues identified in the backend stages of the audio-visual archive digitization process.

5.6 Work document management

5.6.1 Management of audio-visual archive digitization shall be formulated according to actual requirements. It mainly includes documents such as audio-visual archive digitization work plans, digitization approval documents, digitization process forms, data acceptance forms, project appraisal and acceptance reports, handover lists of digitization results, etc. When outsourcing is implemented, it shall include project tender documents, bidding documents, notification of winning bids, project contracts, confidentiality agreements, etc. Examples of some work documents are provided in Appendix B.

5.6.2 Enhanced management of work documents for digitization shall clarify the requirements for organizing, archiving, and transferring work documents generated during the digitization process.

5.7 Outsourcing of archive digitization

5.7.1 If audio-visual archive digitization needs to be outsourced, archives departments shall rigorously review the relevant qualifications of digitization processing companies in terms of company nature, shareholder composition, security and confidentiality, enterprise scale, registered capital, etc.; evaluate the technical capabilities of digital processing companies according to the requirements of Chapter 5 of GB/T20530-2006; examine the management capabilities of processing companies from aspects such as the establishment and completeness of regulations and systems. If it is necessary to review the confidentiality qualifications of digitization companies, archives departments shall carry out in accordance with the requirements of documents such as Management Measures for Printing Qualifications of National Secret Carriers (GBF [2012] No. 7).

5.7.2 During project implementation, strict safety management requirements shall be implemented from various aspects such as the archives departments, digital service agencies, digital processing sites, digital processing equipment, archive entities, acceptance and reception of digitization results, and equipment handling, according to the Regulations on Safety Management of Archive Digitization Outsourcing (DBF [2014] No. 7).

5.7.3 Archives department shall assign dedicated personnel to supervise and guide the outsourcing of archive digitization, completing tasks such as quality control, progress monitoring, investment monitoring, safety monitoring, and coordination and communication.

6. Archive Delivery

6.1 In accordance with the audio-visual archive digitization work plan, the Archives storage departments shall conduct preliminary preparations such as archive retrieval, inventory, and registration for the digitization objects. After obtaining approval from the relevant responsible person, relevant procedures for retrieving archives are strictly carried out in accordance with the regulations of archive storeroom management. After jointly verifying the accuracy with the digital department, the archives are handed over for delivery.

6.2 During the digitization process, a storage warehouse located close to the digital processing site shall be set up to temporarily store audio-visual archives, effectively control environmental factors such as temperature and humidity, strictly manage the receiving and return of archives, and carefully carry out inspection, inventory, registration, etc., to ensure the safety of archives.

7 Pre-digitization Processing

7.1 Determine the scope of information collection

In principle, all information of audio-visual archives identified for digitization shall be collected without selective gathering. Objects that genuinely do not require collection shall be clearly marked.

7.2 Archive inspection

7.2.1 Conduct visual inspection of the carriers of audio-visual archives. If the following conditions occur, appropriate cleaning or technical treatment such as repair shall be applied to the carriers:

- a) Physical deformities such as curling, distortion, scratches, brittleness, adhesion, magnetic powder detachment, occur on the carriers.
- b) Visible micro-spots, discoloration, mold growth, etc., appear on the archive carriers.
- c) Moisture, dust accumulation, etc., are observed on the archive carriers.
- d) Other factors affecting the digitization of audio-visual archives.

7.2.2 Check the quality of sound and image, and record any identified issues.

7.2.3 Record information such as the number and type of carriers of audio-visual archives.

7.2.4 Any items that require marking in the catalog database shall be marked accordingly.

8. Establishment of Database

8.1 Data rules for the catalog database shall be formulated, including data field type, field length, field content requirements, etc. The establishment of catalog database data rules shall comply with the requirements of DA/T18 for archive recording. Strict adherence to these rules shall be observed during the preparation of audio-visual archive catalogs and the establishment of catalog databases.

8.2 Database selection shall consider compatibility with universal data formats for ease of data exchange.

8.3 The design of database structure shall pay special attention to maintaining the internal connections of archives, facilitating the management and utilization of digitization results.

8.4 During the digitization process of audio-visual archives, information such as digitization project details, audio-visual production environment, various digitization technology parameters, etc., shall be documented.

8.5 A combination of computerized automatic proofreading and manual proofreading shall be employed to check the quality of daily recorded data, including the completeness, standardization, and accuracy of recorded items. Any discrepancies found shall be promptly corrected.

9. Information Collection

9.1 Basic requirements

9.1.1 Select appropriate information collection equipment based on the actual conditions of archive originals, digitization purposes, digitization scale, computer network, and storage conditions, and set and adjust relevant parameters accordingly. The settings and adjustments of parameters shall ensure that the collected digital audio-visual information is clear, complete, and undistorted, with sound and image effects closest to the original archives.

9.1.2 Audio-visual archives shall undergo temperature and humidity balance adjustment before information collection, as per relevant regulations for archives called from storeroom.

9.2 Information collection equipment

9.2.1 The selection of information collection equipment shall pay special attention to the protection of archive entities, preferably using information collection equipment with minimal damage to archive entities for digitization.

9.2.2 Before information collection, the corresponding collection equipment shall be cleaned, inspected, adjusted, and set with correct parameters.

9.2.3 Regular maintenance and upkeep of equipment shall be conducted following the relevant usage regulations.

9.3 Technical parameters

9.3.1 Technical parameters for digitizing audio archives shall meet the following requirements:

- a) Sampling rate: not less than 44.1kHz. For valuable or special-purpose audio archives, the sampling rate shall be no less than 96kHz.
- b) Quantization bit depth: 24bits.
- c) Sound channel: recorded with the original number of channels.
- d) File format: WAVEformat.

9.3.2 Technical parameters for digitizing video archives shall meet the following requirements:

- a) Video encoding format: H.264 or MPEG-2IBP. For valuable or special-purpose video archives, uncompressed formats can be used.
- b) Frame rate: same as the original archives.
- c) Aspect ratio: same as the original archives.
- d) Resolution: for capturing standard-definition video, the resolution shall be 720×576 (for PAL and SECAM formats); 720×480 (for NTSC format); for capturing high-definition video, the resolution shall be no less than 1920×1080.

e) Chroma sampling rate: for standard-definition video, no less than 4:2:0; for high-definition video, no less than 4:2:2.

f) Video quantization bit depth: not less than 8bits. For valuable or special-purpose video archives, the video quantization bit depth shall be no less than 10bits.

g) Video bit rate: for capturing standard-definition video, not less than 8Mbit/s; for capturing high-definition video, not less than 16Mbit/s.

h) Audio encoding format: PCM.

i) Audio sampling rate: not less than 48kHz.

j) Audio quantization bit depth: not less than 16bits. For valuable or special-purpose audio archives, a bit depth of 24bits can be used.

k) Sound channel: recorded with the original number of channels.

l) File format: AVI or MXF format.

9.4 File splitting and recording

9.4.1 For physical carriers containing multiple audio-visual archives on different subjects, splitting shall be performed during collection based on the start and end times of each subject. Each subject shall be recorded according to the requirements of DA/T18, with detailed recording based on the characteristics of the audio-visual archives

The in-depth recording results shall be entered into the database to form accurate and complete catalog data. The compilation method of file No. shall comply with the file No. compilation rules of SIAT for audio-visual archives: FX (1 for photos, 2 for audio-video and discs) + classification No. + date + year + serial number.

9.4.2 If the blank parts at the beginning and end of audio-visual files contain no content for an extended period, appropriate trimming can be applied, leaving approximately 5s of blank space before and after the start of sound or image.

9.5 File naming

9.5.1 Audio-visual files shall be named based on the file No., ensuring uniqueness.

9.5.2 When one catalog data corresponds to multiple audio-visual files, the audio-visual files can be named based on a combination of file No. and sequence number.

9.5.3 Scientifically establish the storage path for audio-visual files to ensure accurate data mounting.

9.6 Quality inspection

After information collection is completed, quality inspection shall be conducted through methods such as playback and comparison between original archives and collected audio-visual files. In case of audio errors such as unclear sound or synchronization issues that do not meet the quality requirements of audio-video, the affected archives shall be re-collected.

9.7 Archive restoration

After digitization work is completed, audio-visual archives shall be organized and restored. For tape archives, rewinding shall be performed after digitization.

10. Audio-video Processing

Before providing audio-visual files for use, copy files of the original audio-visual files can be converted into formats with higher compression ratios. Additionally, noise reduction, amplitude standardization, and other processing techniques can be applied to suppress and remove noise and peaks in sound. For visual images, dust removal, scratch removal, color correction, and image stabilization can be performed.

11. Data Mounting

11.1 Use relevant software to mount the catalog data in the database to its corresponding audio-visual archive digitization audio-visual files to establish the association between catalog data and audio-visual files. Additionally, the software

shall establish the association between audio files and archival originals using file No. or original media index numbers.

11.2 Check the mounting results item by item, including the accuracy of the association between catalog data and audio-visual files, consistency between mounted audio-visual files and the actual digitization quantity, whether audio-video files can be opened normally, etc. Correct errors promptly when found.

Consistency in quantity, whether audio-visual files can be opened normally, etc., shall be promptly corrected if errors are found.

12. Digitization Results Acceptance and Handover

12.1 Acceptance method

12.1.1 A dedicated team shall be established to accept and inspect the digitization results.

12.1.2 A combination of computer automatic inspection and manual inspection shall be used to accept the audio-visual archive digitization results.

12.2 Acceptance content

12.2.1 The results of audio-visual archive digitization results include audio-visual files, catalog data, metadata, work files generated during digitization, storage media, etc.

12.2.2 Acceptance of catalog data shall mainly include the accuracy and completeness of the content and format of each item in the database, whether mandatory items are filled in.

12.2.3 Acceptance of metadata shall mainly include the completeness and normativeness of metadata, etc.

12.2.4 Acceptance of audio-video files shall be conducted, focusing on the accuracy of technical parameters, storage paths, naming, arrangement order, integrity and clarity of audio-visual files, and whether issues such as synchronization and distortion occur.

12.2.5 Acceptance of data mounting shall mainly include the accuracy of the association between catalog data and audio-visual files, etc.

12.2.6 Acceptance of work files shall mainly include the completeness and normativeness of work files.

12.2.7 Acceptance of storage media shall mainly include the usability and absence of viruses.

12.3 Acceptance criteria

12.3.1 Projects that can be automatically inspected by computers shall undergo 100% inspection using computer automatic inspection methods, and the acceptance rate shall be 100%.

12.3.2 Each audio-visual file shall undergo inspection and acceptance procedures, with segmentation into front, middle, and back parts for playback. The total playback duration shall not be less than 10% of the duration of the audio-visual files.

12.3.3 Sampling inspection of digitization results shall be conducted, with complete playback of the sampled audio-visual files. The number and total duration of sampled audio-visual files shall not be less than 5% of the batch. The pass rate for the accuracy of catalog data and their corresponding audio-visual files shall be 100%, while for other aspects, the pass rate shall not be less than 95%.

12.4 Acceptance conclusion

12.4.1 Each batch of audio-visual archive digitization shall meet the requirements of Sections 12.2 and 12.3 for quality inspection, and be accepted as "pass". If acceptance is not passed, rework or modifications shall be made as necessary, and then re-accepted.

12.4.2 After acceptance is completed, it must be signed by members of the acceptance team. The conclusion of "pass" acceptance must be reviewed and signed by relevant leaders to be valid.

12.5 Handover

Data that has passed acceptance shall be handed over in a timely manner according to the audio-visual archive digitization plan, and handover procedures shall be completed.

13. Return to Archive Storage

The original audio-visual archives that have undergone digitization processing shall be handled and counted according to the relevant requirements for archiving of audio-visual archive, and archival storage procedures shall be followed.