DRAFT INTERNATIONAL STANDARD ISO/DIS 12024

ISO/TC **171**/SC **1** Secretariat: **BSI**

Voting begins on: **2004-07-16**

Voting terminates on: **2004-12-16**

Electronic imaging — Verification of information stored on CD media

Imagerie électronique — Contrôle des informations conservées sur CD

ICS 37.080

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electro technical Commission (IEC) on all matters of electro technical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 12024 was prepared by Technical Committee ISO/TC 171, *Document imaging applications*, Subcommittee SC 1, *Quality*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Introduction

Today many organisations, whether public or private, national or international, use compact disks for the storage of information. It is therefore important to be able to verify that data has been recorded accurately and that it remains readable over time.

This document proposes a non-destructive method for verifying information recorded on a CD. It can therefore be applied by any user who, on a regular basis, wants to verify the readability of recordings on a CD, without risk of damage to that information.

It is important to note that these tests cannot predict approaching failure but only provide evidence of readability of CD at time of the test.

The purpose of this document is not to:

- Redefined already existing standard or specifications;
- Give any warranty on life expectancy of CD-R;

Electronic imaging — Verification of information stored on CD media

1 Scope

This document provides recommendations, which allow users of storage systems that utilise CD-R media to establish quality levels for recordings and to control the quality of the whole recording process.

This document is not applicable to disks with analogue-recorded information (such as CD-video disks), to CD-RW disks, or to DVDs (Digital Versatile Discs).

2 Normative references

This document incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this document only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

IEC 908, *Audio recording – Compact disk digital audio system*

ISO 12651, *Electronic imaging – Vocabulary*

ISO 9660, *Information processing – Volume and file structure of CD-ROM for information interchange*

ISO 10149, *Information processing systems – Data interchange on read-only 120 mm optical data disks (CD-ROM)*

ISO 18921 - *Imaging materials – Compact discs (CD-ROM) - Method for estimating the life expectancy based on the effects of temperature and relative humidity*

ISO 18927 - *Imaging materials – Recordable compact disc systems -- Method for estimating the life expectancy based on the effects of temperature and relative humidity*

ISO 2859 - *Application of statistical methods – Sampling procedures for inspection by attributes – All parts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1
BLER (block error rate)
Ratio of number of blocks with at least one error, divided by number of blocks read during a period of time

3.2
CD (compact disk)
commercial brand for a digital disk with a diameter of 80 mm or 120 mm

3.3
CD-Audio (CD-A) (compact disc audio)
pre-recorded compact disk limited to sound applications

3.4
CD-ROM (compact disk - read only memory)
pre-recorded compact disk containing digital data and used only for reading

3.5
CD-R (compact disk - recordable)
WORM (write-once-read-many) type recordable digital compact disk used to record data in one of the above formats

3.6
Delamination
?

3.8
Dye
?

4 Management principle

In order to achieve data archival on CD-R media, this standard provides recommendations for:

- Specifying quality blank CD-Rs;
- Achieve quality control operations when recording data on those disks;
- Provide the proper storage environment for preservation of the disks;
- Periodically control the readability of the disks.

5 Specifying quality blank CD-Rs

To select CD-R intended to keep data for a long period of time, it is advisable to get from the manufacturer preferably all the following information. Choice should be made on the quality and the confidence level of that information:

- Insurance Quality Plan (such as ISO 9000 or equivalent);
- Result of accelerated aging tests, according to 18927 standard or other documented accelerated live expectancy tests;
- Production tracking (production batch identification, unique CD-R identification, …);
- Information on the quality of the components used to manufacture the disks (such as substrate, dye polymer, metal coating, protection varnish …).

6 Recording quality control

Recording on CD-R should be achieved according to the following principles:

- At a writing speed not exceeding the maximum writing speed such as specified by the media manufacturer;

- Environmental characteristics such as temperature and relative humidity should stay into the range specified by either the drive or the disk manufacturer; room should be as clean as possible (properly dusted, strictly no smoking area, no printing or paper manipulation allowed close to the recorder);

- Manipulation of the disks should be done very carefully, preferably with clean gloves; a visible inspection for dust, fingerprints and scratches should be done and disks rejected if defects are visible. Rejected disks may be cleaned in some cases by certified trained personnel.

Before any recording is done, the recording process should be calibrated and evaluated following the steps:

- Recording of at least one disk at full capacity and production speed;

- Bit to bit verification of recorded data by using specific software;

- Test measurement using a CD tester of any kind (either dedicated drive with test software or dedicated testing equipment);

- Validation of all the quality parameters of the recorded disc such as specified into the CD-R specifications using a third party testing equipment;

- If this final test indicates a good quality CD-R, validate the process and the in-house test measurement; If not, identify the cause of failure (improper recording speed, bad recording drive, defective disk, improper handling or environmental conditions, recording software bugs, …), correct it and redo the total validation tests until a good final test is achieved.

This validation procedure should be replayed after each change in:

- Recording equipment;

- Disk batch;

- Place of the production process.

After this preliminary validation, production recording should be controlled by:

- Using the verify after write of the recording software;

- Checking the readability on a CD-R reader, preferably of a brand different from the CD-R recorder;

- Testing the CD-R on the CD tester as defined above; test results should be comparable with those found on the validation discs. All testing should be done only on usable data areas.

If a BLER, E22, E32 method is used, the following should be always respected: maximum BLER less than 220, no E22 and no E32.

When sensitivity of the recorded data is very high, it is strongly recommended to make at least one copy of the CD-R, using:

- A different batch of disks;

- A different recorder.

Following information should be recorded for each CD-R for tracking purposes:

- Date and time of recording;

- Serial number of the CD-R;