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Identification cards — Test methods —

Part 5: Optical memory cards

Cartes d'identification — Méthodes d'essai —

Partie 5: Cartes à mémoire optique

Reference number
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Contents

Page

Foreword iv

1 Scope 1

2 Normative references 1

3 Terms and definitions 2

4 Default items applicable to the test methods 2
4.1 Test environment 2
4.2 Pre-conditioning 2
4.3 Selection of test methods 2
4.4 Default tolerance 3
4.5 Total measurement uncertainty 3

5 Test methods 3
5.1 Location of accessible optical area and reference track 3
5.1.1 Procedure 3
5.1.2 Test report 4
5.2 Skew 4
5.2.1 Apparatus for skew measurement 4
5.2.2 Procedure for skew measurement 4
5.2.3 Test report 5
5.3 Defects 5
5.3.1 Apparatus for defect measurement 5
5.3.2 Procedure for defect measurement 5
5.3.3 Test report 5
5.4 Optical properties of the media 6
5.4.1 Apparatus for testing optical cards 6
5.4.2 Optical properties measurement method 7

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 10373-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

This second edition cancels and replaces the first edition (ISO/IEC 10373-5:1998), which has been technically revised.

ISO/IEC 10373 consists of the following parts, under the general title *Identification cards — Test methods*:

— *Part 1: General characteristics tests*

— *Part 2: Cards with magnetic stripes*

— *Part 3: Integrated circuit(s) cards with contacts and related interface devices*

— *Part 5: Optical memory cards*

— *Part 6: Proximity cards*

— *Part 7: Vicinity cards*

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Identification cards — Test methods —

Part 5:
Optical memory cards

1 Scope

ISO/IEC 10373 defines test methods for characteristics of identification cards as defined in ISO/IEC 7810. Each test method is cross-referenced to one or more base standards, which may be ISO/IEC 7810 or one or more of the supplementary standards that define the information storage technologies employed in identification cards applications.

NOTE 1 Criteria for acceptability do not form part of ISO/IEC 10373 but will be found in the International Standards mentioned above.

NOTE 2 Test methods defined in ISO/IEC 10373 are intended to be performed separately. A given card is not required to pass through all the tests sequentially.

ISO/IEC 10373-1 deals with test methods which are common to one or more card technologies and other parts deal with other technology-specific tests.

This part of ISO/IEC 10373 deals with test methods which are specific to optical memory card technology.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7810, *Identification cards — Physical characteristics*

ISO/IEC 11693, *Identification cards — Optical memory cards — General characteristics*

ISO/IEC 11694-1, *Identification cards — Optical memory cards — Linear recording method — Part 1: Physical characteristics*

ISO/IEC 11694-2, *Identification cards — Optical memory cards — Linear recording method — Part 2: Dimensions and location of the accessible optical area*

ISO/IEC 11694-3, *Identification cards — Optical memory cards — Linear recording method — Part 3: Optical properties and characteristics*

ISO/IEC 11694-4:2001, *Identification cards — Optical memory cards — Linear recording method — Part 4: Logical data structures*

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3 Terms and definitions

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

3.1
test method
method for testing characteristics of identification cards for the purpose of confirming their compliance with International Standards

3.2
testably functional
surviving the action of some potentially destructive influence to the extent that

a) any magnetic stripe present on the card shows a relationship between signal amplitudes before and after exposure that is in accordance with the base standard;

b) any integrated circuit(s) present in the card continue(s) to show an Answer to Reset response [1)] which conforms to the base standard;

c) any contacts associated with any integrated circuit(s) present in the card continue to show electrical resistance and impedance which conform to the base standard;

d) any optical memory present in the card continues to show optical characteristics which conform to the base standard.

3.3
normal use
use as an identification card (as defined in ISO/IEC 7810), involving equipment processes appropriate to the card technology and storage as a personal document between equipment processes

4 Default items applicable to the test methods

4.1 Test environment

Unless otherwise specified, testing shall take place in an environment of temperature 23°C ± 3°C (73°F ± 5°F) and of relative humidity 40 % to 60 %.

4.2 Pre-conditioning

Where pre-conditioning is required by the test method, the identification cards to be tested shall be conditioned to the test environment for a period of 24 h before testing.

4.3 Selection of test methods

Unless otherwise specified, the tests in this part of ISO/IEC 10373 shall be applied exclusively to optical memory cards defined in ISO/IEC 11693 and ISO/IEC 11694.

1) This International Standard does not define any test to establish the complete functioning of integrated circuit(s) cards. The test methods require only that the minimum functionality (testably functional) be verified. This may, in appropriate circumstances, be supplemented by further, application specific functionality criteria which are not available in the general case.

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4.4 Default tolerance

Unless otherwise specified, a default tolerance of ± 5 % shall be applied to the quantity values given to specify the characteristics of the test equipment (e.g. linear dimensions) and the test method procedures (e.g. test equipment adjustments).

4.5 Total measurement uncertainty

The total measurement uncertainty for each quantity determined by these test methods shall be stated in the test report.

5 Test methods

5.1 Location of accessible optical area and reference track

The purpose of this test is to measure the location of the accessible optical area and the reference track in the card (see ISO/IEC 11694-2:2000).

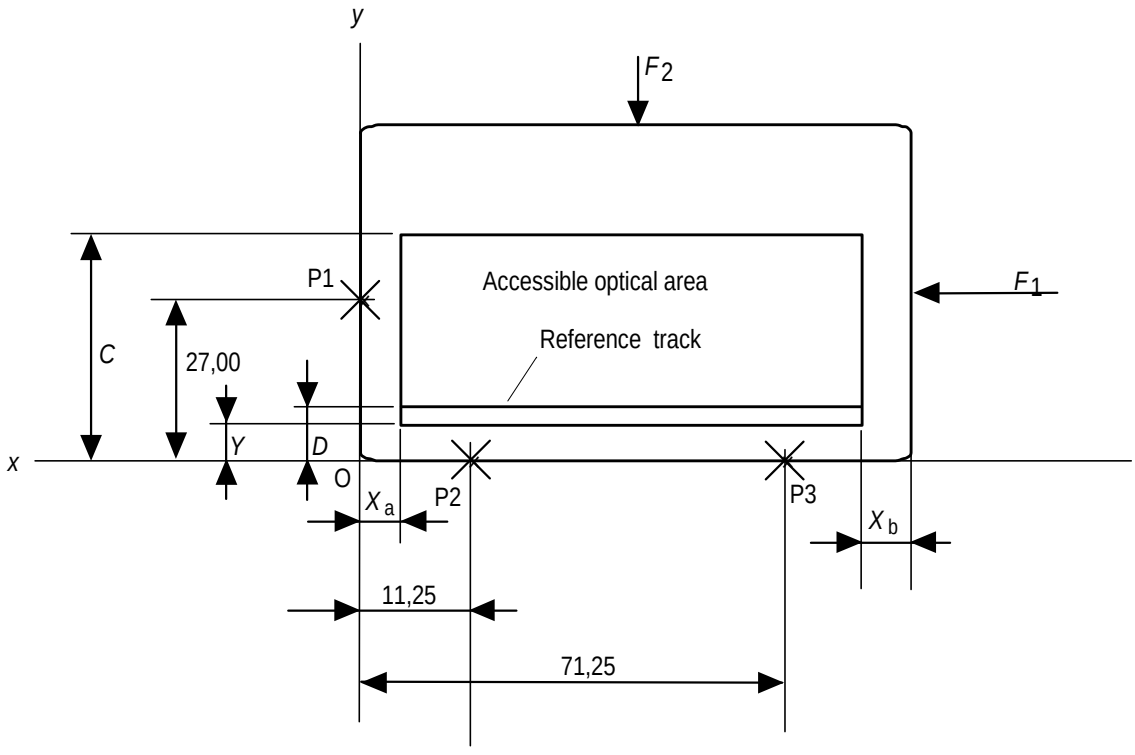
5.1.1 Procedure

Construct two perpendicular axes of reference x and y intersecting at O. Mark three reference points on the axes: points P2 and P3, measured 11,25 mm and 71,25 mm from O, are marked on the x axis and point P1, 27,00 mm from O, on the y axis. Place the card to be tested, accessible optical area side up, on a flat hard surface. The card shall be held down by a load of 2,2 ± 0,2 N.

Apply force F_1 (1 N to 2 N) and F_2 (2 N to 4 N) so that the reference edge of the card touches points P2 and P3 and the left edge touches at P1 (see Figure 1).

Measure dimensions X_a, X_b, Y, C and D with equipment having an accuracy of 0,05 mm.

Dimensions in millimetres



Not to scale.

Figure 1 — Location of accessible optical area and reference track

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5.1.2 Test report

The test report shall give the values of the dimensions measured.

5.2 Skew

The purpose of this test is to measure the skew of the reference track to the bottom edge of the optical memory card (see ISO/IEC 11694-2:2000).

5.2.1 Apparatus for skew measurement

The apparatus is shown in Figure 2. It comprises

a) an xy stage with an xy position indicator;

b) an optical microscope.

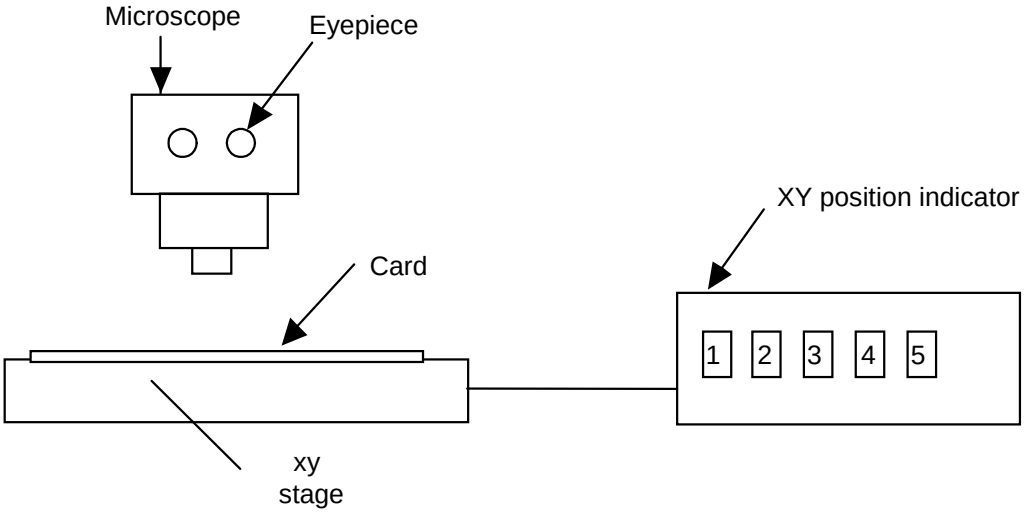


Figure 2 — Apparatus for the skew measurement

5.2.2 Procedure for skew measurement

Place the sample card to be tested, flat, accessible optical area side up, on the xy stage.

Look into the eyepiece of the microscope, move the xy stage so that the reference track on the left side of the card can be seen. (see Figure 3), and adjust the xy stage so that the xy cross-point in the eyepiece is on the reference track. Then record the xy coordinate value (X_0,Y_0).

Next, move the stage in the y direction so that the bottom edge of the card can be seen, adjust the stage and record the value (X_0,Y_2) similarly.

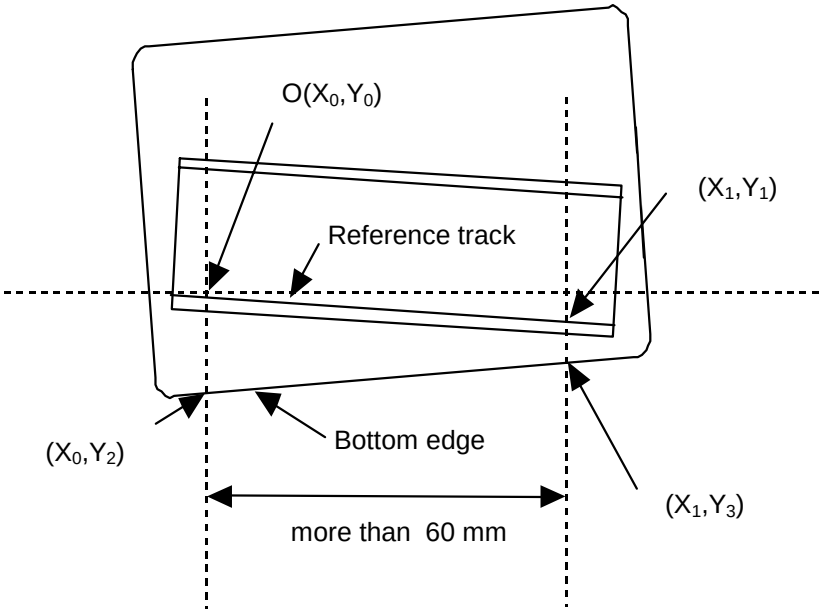
Then move the stage so that the reference track in the right part of the card can be seen, adjust the stage and record the coordinate value (X_1,Y_1). However, the value of $|X_0-X_1|$ shall be not less than 60 mm.

Lastly, move the stage in the y direction so that the bottom edge of the card can be seen, and record the value (X_1,Y_3) in the same way.

The skew is calculated by the expression as

$$\text{skew} = \text{ABS}[\arctan\{(Y_1-Y_0)/(X_1-X_0)\}-\arctan\{(Y_3-Y_2)/(X_1-X_0)\}]$$

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Not to scale.

Figure 3 — Procedure for the skew measurement

5.2.3 Test report

The test report shall give the value of the angle measured.

5.3 Defects

The purpose of this test is to measure defects of a card test sample (see ISO/IEC 11694-3).

5.3.1 Apparatus for defect measurement

Defects at the accessible optical area shall be measured by optical microscope.

5.3.2 Procedure for defect measurement

Count the number of defects whose cross-section exceeds 2,5 µm at the optical layer of accessible optical area and calculate the total defect area of these defects. Divide the total defect area by the total area of the accessible optical area to obtain the density of the raw uncorrected defect ratio within the accessible optical area.

At the transparent layer of the accessible optical area, the presence of defects whose cross-section exceeds 100 µm shall be noted.

5.3.3 Test report

The test report shall give the density of defects at the optical layer of the accessible optical area and the existence of defects at the transparent layer.

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5.4 Optical properties of the media

5.4.1 Apparatus for testing optical cards

5.4.1.1 Apparatus for testing optical cards conforming to ISO/IEC 11694-4:2001, Annex B

The optical card tester is based upon a commercially available optical card drive modified for the purpose.[2] The illumination source of the card tester shall be a semiconductor laser diode having a wavelength of 830 ± 15 nm and shall deliver a focussed elliptic spot of 1,8 μm ± 2 % × 2,25 μm ± 2 % ($1/e^2$) at the surface of the optical layer. The major axis of the beam shall be 90 degrees ± 30 minutes of arc to the track direction. When not writing, the beam power (read power) is 200 μW at the card surface and is controlled via detector external to the laser. A data bit is written with a write pulse of 13 mW power and 2 μs ± 0,2 μs duration at a 1 m/s ± 10 % scan rate. This results in a circular data bit of 2,5 μm ± 0,25 μm diameter on the calibration card [3]. Calibration cards shall conform to ISO/IEC 11694-4.

An additional port is installed as a modification to the commercial drive to provide trigger signals and an external tracking drive signal into the tracking actuator. This additional port is the major departure of the test drive from a standard commercial drive. The drive is controlled via a test jig interface, which is connected to the digital output port of a low-speed data acquisition board via a control box. Analogue signals such as the focus error signal are routed to the analogue-to-digital converter of the low-speed data acquisition board, and the RF signal is routed to the high-speed data acquisition board. See Figure 4. The high-speed data acquisition board is used to capture the RF signal waveforms while the low-speed data acquisition board captures the focus error signal and provides analogue signals for focus offset control and objective lens scanning.

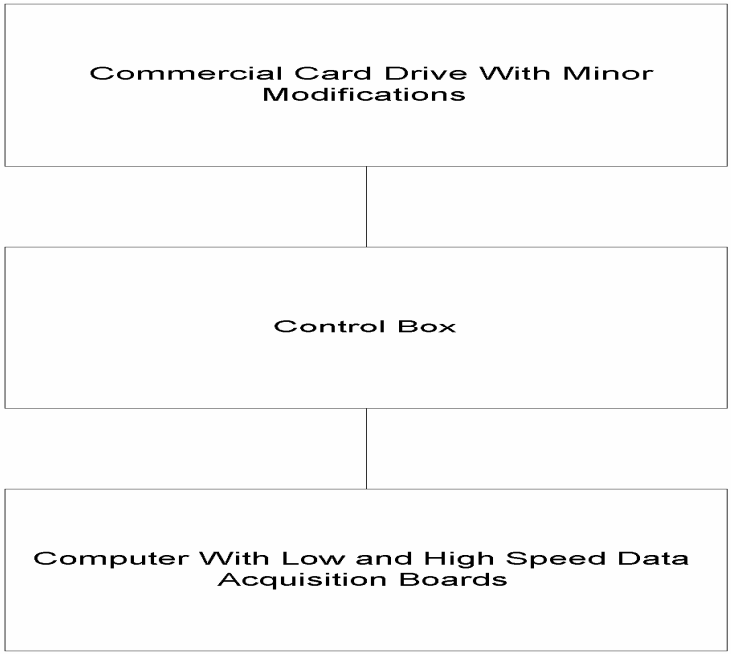


Figure 4 — Card tester block diagram

2) A suitable optical card tester can be ordered from Lasercard Systems Corporation, 2644 Bayshore Parkway, Mountain View, CA 94043 USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO/IEC of the product named.

3) Calibration cards can be ordered from Lasercard Systems Corporation, 2644 Bayshore Parkway, Mountain View, CA 94043 USA. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO/IEC of the product named.

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5.4.2 Optical properties measurement method

The figures below, which illustrate the measurement algorithms, all show the RF signal level with the same oscilloscope gain and offset.

All measurements are based on the processing of the read (RF) signal. It is assumed that the amplitude of the signal is linearly proportional to the power of the laser light reflected off the card and transmitted to the read photo-detector and a gain and offset factor can be applied to the RF voltage level to give a reflectance value. The offset factor is determined by measuring the RF level with the laser turned off (**RF_off**) and the gain factor (**RF_gain**) is determined by measuring the RF level when focused on a calibration card in the unformatted test region of the card (see Figure 5). The calibration card has a known reflectance in this region. Specifically

RF_gain = calibration card reflectance (%) / (RF level focused on calibration card - RF_off)

The reflectance values used in the formulas which follow (**Ref xxx**) are derived from the RF signal level and the gain and offset factors:

Ref xxx = RF_gain * (RF level xxx - RF_off)

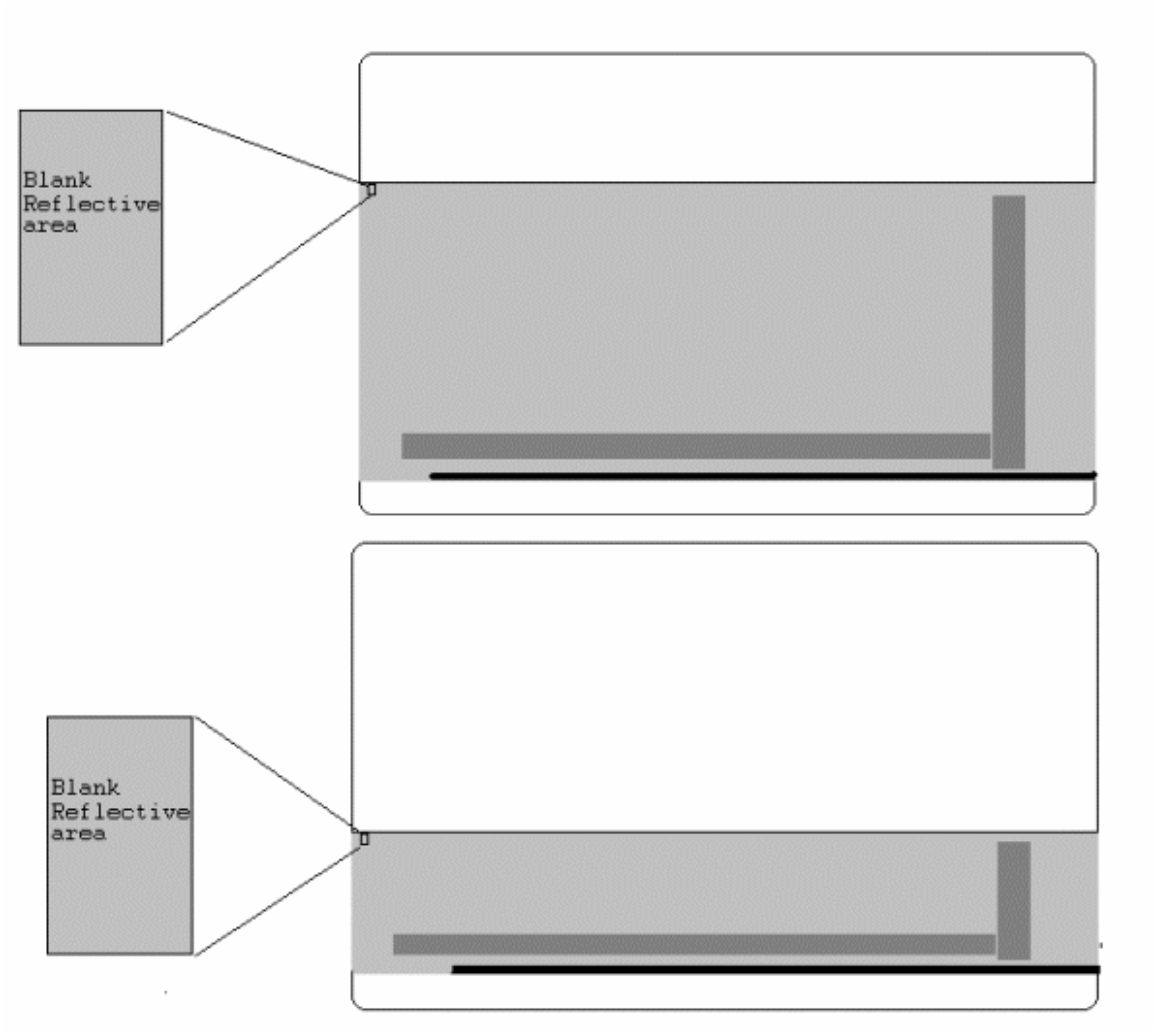


Figure 5 — Unformatted media test regions

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5.4.2.1 Focus sweep (card surface reflectance)

This test is performed by positioning the head over the unformatted test region, sweeping the objective lens in the focus direction and capturing the RF and focus error (FES) signals. Figure 6 shows the two signals. The FES signal shows sharp transitions at times Tsurface and Tmedia. This corresponds to the objective lens being at the best focus positions for the card surface and media plane, respectively. The RF signal level is measured at these times to provide a measure of card surface reflectance and media unformatted reflectance.

Surface reflectance = RF_gain * (Vsurface - RF_off)

Unformatted media reflectance = RF_gain * (Vmedia - RF_off)

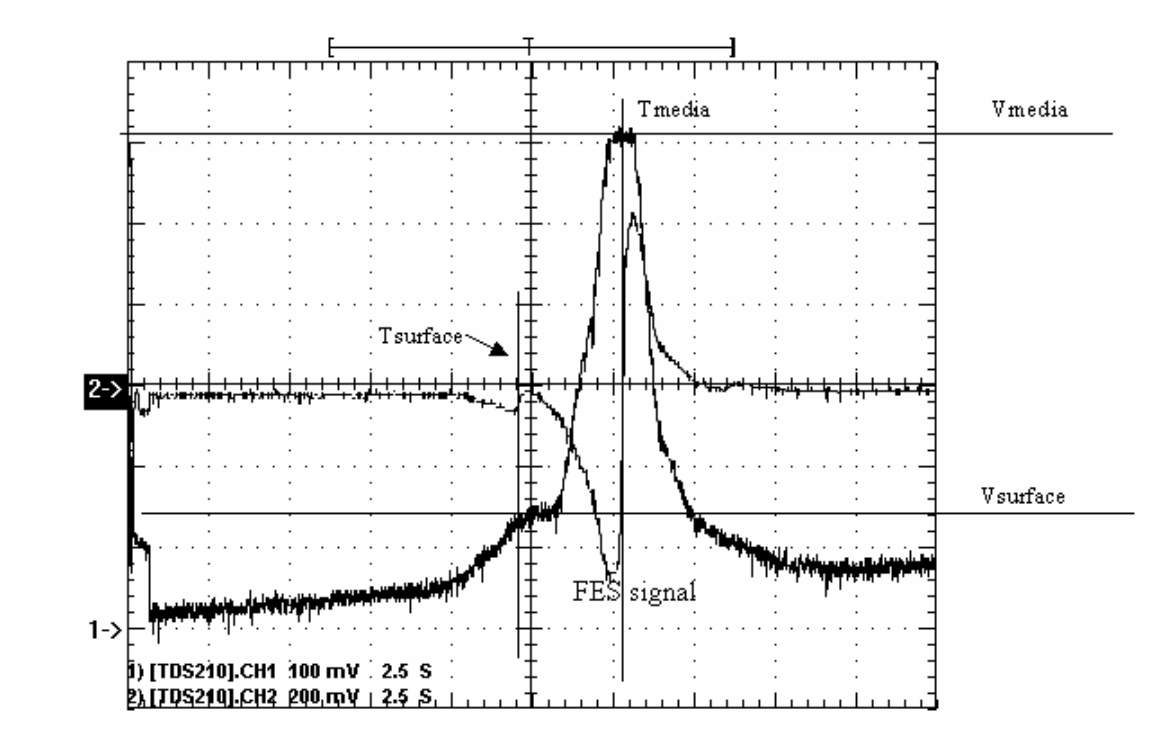


Figure 6 — Focus sweep waveforms

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5.4.2.2 Background reflectance measurement

This test is performed by sweeping the length of an unrecorded track. The RF signal waveform is shown in Figure 7. Also shown is the laser-off RF level.

Background reflectance = RF_gain * (Vunrecorded - RF_off)

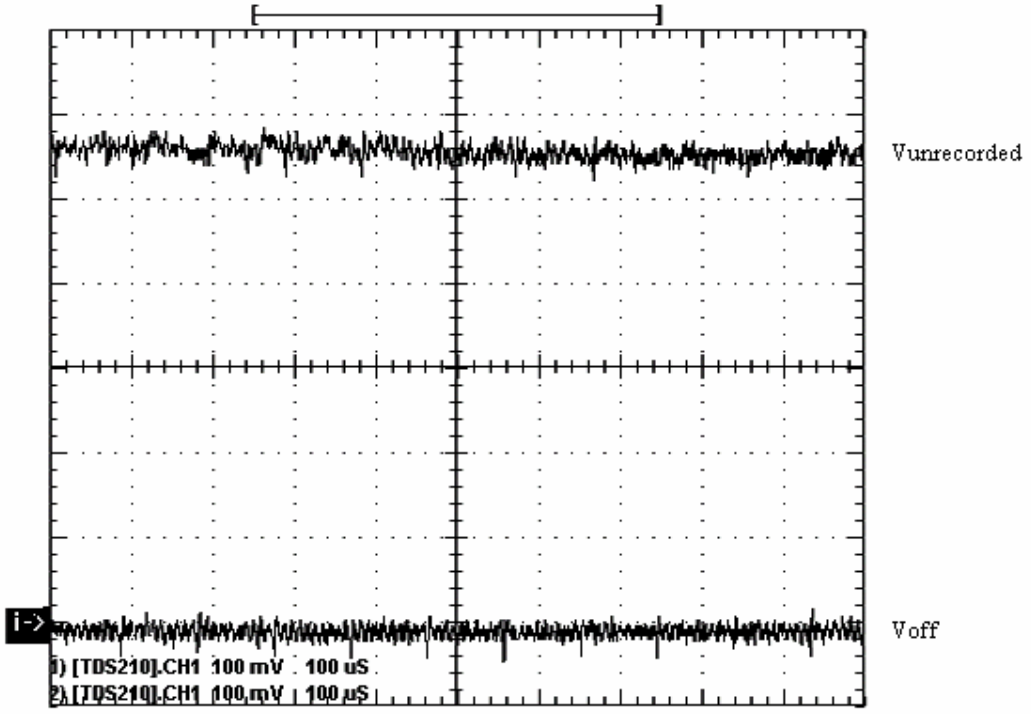


Figure 7 — Unrecorded and laser-off RF levels

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5.4.2.3 Track guide contrast

This test is performed by focusing on a card and sweeping the optical head rapidly across tracks in an unrecorded region of the card. The RF signal waveform is shown in Figure 8.

Track guide contrast = (Vbase - Vgroove) / (Vbase - RF_off)

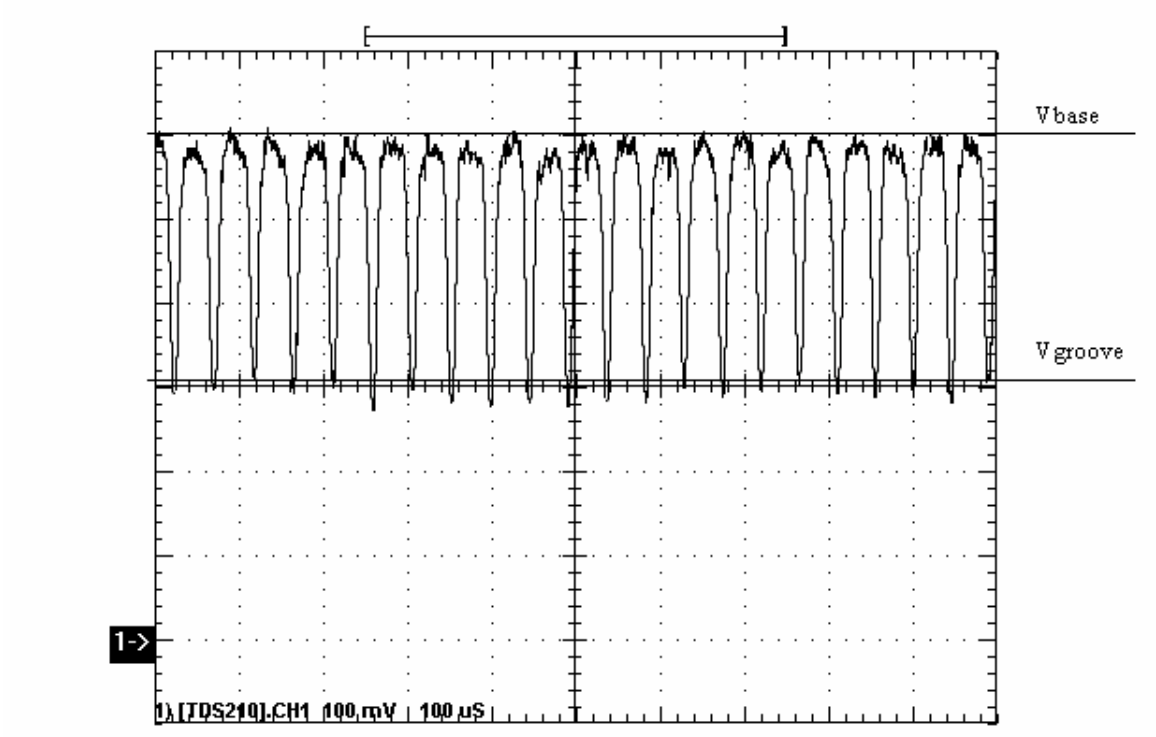


Figure 8 — Track guide contrast

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5.4.2.4 Preformatted and written contrast parameters

The preformatted contrast test is performed by sweeping the preformat region of a track. A portion of RF signal waveform is shown in Figure 9. The lines show the approximate level of the average of the positive and negative peaks for high- and low-frequency pulse trains. These average values are determined by processing the waveform for each individual peak level and selecting those in consecutive low-frequency (2T) and high-frequency (1T) sequences. The two pulses at the end of each sequence are rejected. The amplitudes of the remaining pulses are averaged to provide the four average levels shown.

The recorded contrast test is essentially the same. In this case a waveform is recorded with a laser pulse with an amplitude and duration as described in 5.4.1.1, and then captured and processed as described above.

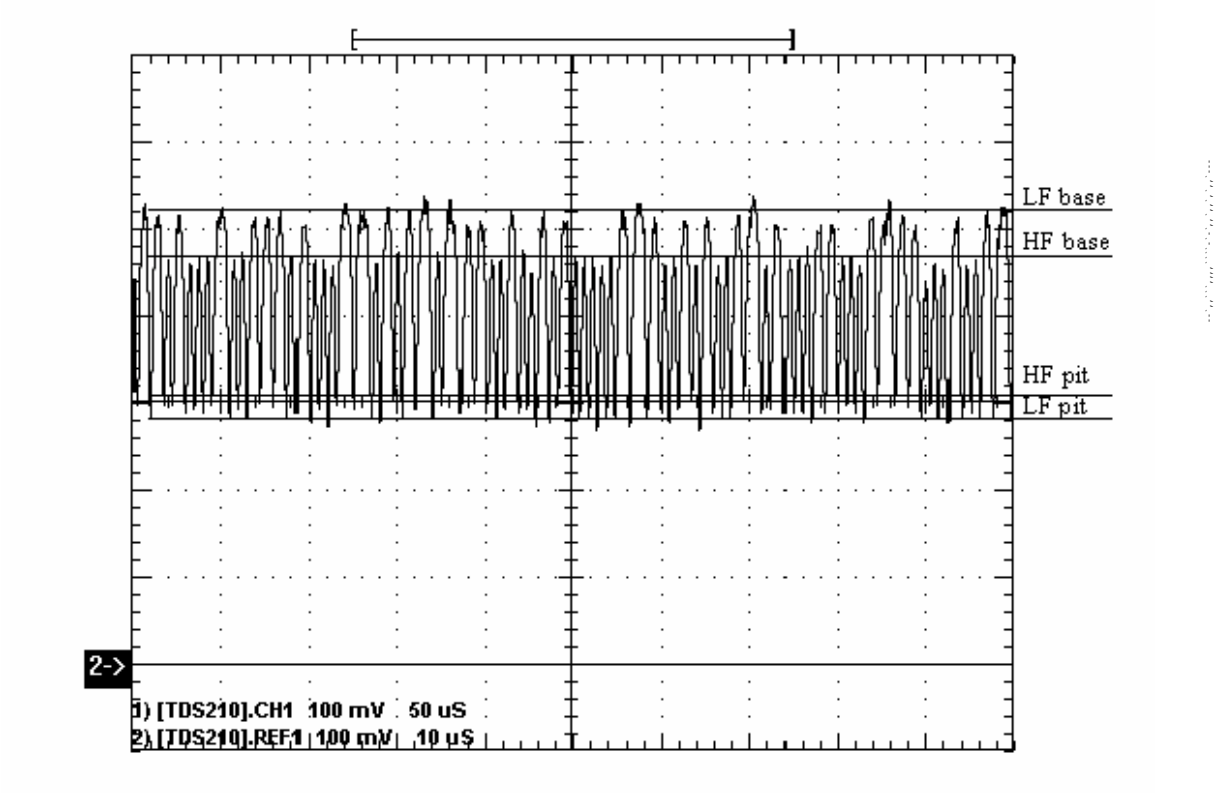


Figure 9 — Preformat contrast measurement waveform

The following results are reported:

Written data contrast = (Lfbase - Lfpit) / (Lfbase - RF_off)

Low frequency recovery = (LFbase - RF_off) / (Vunrecorded - RF_off)

See Figure 8 for Vunrecorded

Amplitude comparison = (HFbase - HFpit) / (LFbase - LFpit)

High frequency amplitude = RF_gain * (HFbase - HFpit)

Low frequency amplitude = RF_gain * (LFbase - LFpit)

Signal overlap = RF_gain * (HFbase - LFpit)

5.4.3 Test report

The test report shall give the measured values of the parameters defined by the base standard.

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