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Part 2: Storage oscilloscopes

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPRESSION OF THE PROPERTIES OF CATHODE-RAY OSCILLOSCOPES
Part 2: Storage oscilloscopes

FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.

3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This publication has been prepared by Sub-Committee 66B, Oscilloscopes, of IEC Technical Committee No. 66, Electronic Measuring Equipment.

Drafts were discussed at the meetings held in Baden-Baden in 1972 and in The Hague in 1973. As a result of this latter meeting, a draft, Document 66B(Central Office)10, was submitted to the National Committees for approval under the Six Months' Rule in August 1974.

The following countries voted explicitly in favour of publication:

Belgium	Poland
Denmark	Romania
Egypt	Spain
Finland	Sweden
France	Turkey
Hungary	Union of Soviet Socialist Republics
Italy	United Kingdom
Japan	United States of America
Netherlands	

Other IEC publication quoted in this publication:
Publication 351-1: Expression of the Properties of Cathode-ray Oscilloscopes, Part 1: General.

EXPRESSION OF THE PROPERTIES OF CATHODE-RAY OSCILLOSCOPES
Part 2: Storage oscilloscopes

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1. General

This standard should be used in conjunction with IEC Publication 351-1, Expression of the Properties of Cathode-ray Oscilloscopes, Part 1: General.

1.1 *Scope*

1.1.1 This standard applies to storage oscilloscopes with special devices incorporated in the cathode-ray tube permitting the recording of a signal in another way than by the ability of the screen coating to ensure persistence of the display of information.

1.1.2 This standard does not apply to oscilloscopes with a normal tube and storage devices external to the tube. However, some clauses of the standard may be applied with agreement between the manufacturer and the user.

1.1.3 This standard does not apply to oscilloscopes which have a cathode-ray tube having a screen with long persistence which temporarily retains the display.

1.1.4 Certain types of storage oscilloscopes are capable of operation without storage. When so operated, Publication 351-1 applies directly. In this standard, it is assumed that the oscilloscope is operated, unless otherwise stated, as a storage oscilloscope.

1.2 *Object*

The object of this standard is the standardization of methods of expression of the properties of storage oscilloscopes and particularly:

— the definition of special terminology and catalogue data related to these types of apparatus;

— the specification of conditions and methods for testing these types of apparatus in order to verify compliance with properties claimed or specified by the manufacturer.

2. Terminology

For the purpose of this standard, it has been agreed that the special meanings contained in the following clauses shall apply. Definitions taken from the International Electrotechnical Vocabulary (I.E.V.) are shown by the reference to I.E.V. Group 07 or 45.

2.1 *Storage oscilloscope*

An oscilloscope using a storage cathode-ray tube, called a storage tube.

2.2 *Persistence*

The ability of the cathode-ray tube screen to retain information temporarily after the spot has moved on, with the luminance of the display gradually fading away.

2.3 *Storage tube*

A cathode-ray tube which retains information by means of a process other than normal persistence of the screen.

2.3.1 *Bistable storage cathode-ray tube*

A cathode-ray tube, the elementary storage cells of which can cause the screen to have only two values of luminance.

2.3.2 *Half-tone storage cathode-ray tube*

A cathode-ray tube, the elementary storage cells of which can cause the screen to have a range of luminance values between zero and a maximum value.

2.3.3 *Mesh storage cathode-ray tube*

A cathode-ray tube using a storage mesh (see Sub-clause 2.4.2.1).

2.3.4 *Screen storage cathode-ray tube*

A cathode-ray tube using a special screen as a storage unit.

2.4 *Parts of the cathode-ray tube*

2.4.1 *Screen*

The surface of the tube upon which the visible pattern is produced (I.E.V. 07-30-145).

2.4.2 *Storage target*

A target made of a great number of elementary cells, the electrostatic state of which is modified by the impact of the electron beam from the writing gun.

Note. — The secondary electrons emitted by the storage target are collected by a collector mesh, by the walls of the tube or by a conductive transparent coating on the face plate.

2.4.2.1 *Storage mesh*

A particular kind of storage target consisting of a metallic mesh with a dielectric coating.

2.4.3 *Writing gun*

An electron gun (analogous to the gun of a tube without storage) used to modify the state of the storage target by recording on it the display to be observed,

2.4.4 *Flood gun*

An electron gun used to deliver a broad electron beam covering uniformly the entire storage target.

2.4.5 *Split screen*

A storage screen with two (or more) areas which can be separately controlled (for example, one zone being used for storage, the other zone for observation without storage).

2.5 *Terms concerning storage*

2.5.1 *Storage*

An operation in which the representation of the signal can be preserved by the storage tube, with or without display, until it is erased.

2.5.2 *Writing*

A storage process in which the movement of the electron beam from the writing gun is recorded.

2.5.3 *Capabilities of storage and display*

2.5.3.1 *Retention (save) time*

The period of time after writing during which the recorded information is preserved without display and at the end of which it may be displayed without deterioration beyond the limits specified.

2.5.3.2 *Display time*

The period of time during which the quality of the displayed trace is maintained without deterioration beyond the limits specified.

2.5.3.3 *Storage time*

The total period of time during which the recorded information is retained and displayed.

Note. — Storage time is not the sum of retention time and display time as determined in Sub-clauses 3.4 and 3.5.

2.5.3.4 *Variable persistence*

Persistence, the duration of which can be adjusted by means of a control at the user's disposal.

2.5.4 *Integration*

A process in which repetitive writing is used in order to increase the charges laid on the storage target and, consequently, the luminance of the display.

2.5.5 *Writing time*

The period of time needed to charge the cells of the storage target swept by the writing beam sufficiently to produce a display of specified luminance.

2.5.6 *Writing speed of a storage oscilloscope*

2.5.6.1 *Normal stored writing speed*

The speed of the writing beam at which it will record information under stated conditions of operation.

2.5.6.2 *Enhanced (fast) stored writing speed*

A writing speed, higher than the normal stored writing speed, at which it is still possible to store and to display a signal, but with reduced storage time and contrast.

Note. — See Clause 3, Item 2).

2.5.6.3 *Ratio of writing speeds*

(Under consideration.)

2.5.7 *Erase*

The operation of changing suitable electrode potentials in such a manner that previously stored information is removed.

Note. — Erasure can be carried out manually or automatically.

2.5.7.1 *Erase time*

The period of time between the start of erasure and the instant at which the luminance of the display reaches 10% of its initial value.

2.5.7.2 *Recycle time*

The period of time between the start of erasure and the instant at which writing can next commence.

2.6 *Terms concerning the appearance of the display*

2.6.1 *Luminance of a cathode-ray tube*

The quotient of the luminous intensity, in the direction perpendicular to the screen, of an infinitesimal element surrounding the considered point by the area of that element (I.E.V. 45-10-060 modified). The luminance is expressed in candelas per square metre (cd/m^2).

Note. — Only luminance is determinable. The term "luminosity", which is sometimes confused with "luminance", refers only to a visual sensation (I.E.V. 45-25-210).

2.6.1.1 *Photometer — Luminance meter*

A photo-electric device having an overall response approximating to the CIE standard photometric observer (according to Sub-clause 3.1.1 of CIE Publication 154-1).

2.6.1.2 *CIE standard photometric observer*

A receiver of radiation whose relative spectral sensitivity curve conforms to the $V(\lambda)$ curve (I.E.V. 45-10-016).

Note. — The curve $V(\lambda)$ is given in Table I of IEC Publication 50 (45) (I.E.V. 45-10-135).

2.6.2 *Background luminance*

The luminance measured on the surface of the screen outside the trace.

2.6.3 *Storage contrast ratio*

The ratio between the luminance of the trace and the luminance of the background.

2.6.4 *Luminance uniformity ratio*

The ratio between the maximum and minimum luminances of the trace or the background of a storage tube.

2.6.5 *Residual display*

A bright or dark display which is visible after erasure but which disappears after continued operation.

2.6.6 *Screen burn*

A local permanent destruction of the screen due to prolonged operation with an excessively bright stationary display.

2.6.7 *Target burn*

A local permanent destruction of the target coating due to uninterrupted operation with a writing beam.

2.6.8 *Resolution*

The maximum number of discrete vertical (horizontal) lines per centimetre which can be resolved in the stored display.