

Measurement techniques and operational adjustments of broadcast VTRs —

**Part 2: Guide to special mechanical
measurements and alignments**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Equipment Standards Policy Committee (EEL/-) to Technical Committee EEL/22, upon which the following bodies were represented:

- Association of Professional Recording Services Ltd.
- Audio Engineering Society
- British Broadcasting Corporation
- British Kinematograph, Sound and Television Society
- British Tape Industry Association
- Independent Broadcasting Authority
- Independent Television Association
- National Council for Educational Technology (NCET)
- Royal Photographic Society
- Royal Television Society
- Sound and Communication Industries Federation

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Section 0. General	
0.1 Scope	1
Section 1. Transverse-track VTRs	
1.1 Mechanical adjustments of headwheels	1
1.2 Special mechanical measurements	2
Section 2. B format VTRs	
2.1 Special mechanical measurements	5
Section 3. C format VTRs	
3.1 Mechanical measurements and adjustments	5
3.2 Special mechanical measurements	7
Section 4. U-matic H format VTRs	9
Annex A (informative) Bibliography	10
Figure 1 — Positions of the tracks on television magnetic tapes. The magnetic coating of the tape faces the observer	4
Figure 2 — Measurement of track straightness	8
Figure 3 — Graph of peak deviation against track number	8
Publication(s) referred to	Inside back cover

National foreword

This Part of BS 7537 has been prepared under the direction of the Electronic Equipment Standards Policy Committee and is identical with IEC 1055-2:1991 “*Measurement techniques and operational adjustments of broadcast VTRs — Part 2: Special mechanical measurements and alignments*”, published by the International Electrotechnical Commission (IEC).

This British Standard describes the mechanical adjustments and special mechanical measurements which are peculiar to the types of VTRs used in television production and ENG, and are recommended for adoption within the European Broadcasting Union (EBU). It is important for these machines to be adjusted and measurements checked to be within the recommended standards to avoid compatibility problems during international programme exchanges. These recommendations were based on the results of investigations conducted by EBU Sub-group G2 (Television tape recording) and were published by the EBU in document Tech. 3219-4 “*Special mechanical measurements for television tape recorders*”.

Section 1, concerning transverse track VTRs, comprises the corresponding passages of EBU document Tech. 3219 (1976) suitably updated.

Sections 2 and 3 are concerned with B format and C format VTRs using 25.4 mm tape.

Section 4 is concerned with U-matic H-format using 19 mm tape. This type of format is not recommended for international exchanges, but it is in widespread use for ENG.

For the purposes of this British Standard, any reference to IEC page numbers in the text should be ignored.

Cross references

International Standard	Corresponding British Standard
IEC 1055-1:1991	BS 7537 <i>Measurement techniques and operational adjustments of broadcast VTRs</i> Part 1:1991 <i>Guide to operational adjustments on analogue composite broadcast VTRs</i> (Identical)

Copies of EBU documents may be purchased from the Technical Centre of the European Broadcasting Union, Cas Postale 67, CH-1218 Grand-Saconnex, Geneva, Switzerland. Telephone + 4122 717 2111 Telefax + 4122 798 5897.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 0. General

0.1 Scope

This technical report defines the special mechanical measurements for television tape recorders.

Section 1. Transverse-track VTRs

1.1 Mechanical adjustments of headwheels

When a new headwheel is accepted and installed on the machine, the mechanical adjustments should be checked. This concerns three main points:

- a) mutual position of headwheel and vacuum guide;
- b) headwheel tachometer phase;
- c) position of control-track head.

The first point should be frequently checked during the life of the headwheel; this should, in fact, be a routine operational check. On the other hand, the second and third points should be checked only when a new headwheel is accepted.

1.1 a) *Relative positions of the headwheel and vacuum guide*

If, on replay, any of the geometrical factors is incorrect, the precise relationship between the video heads and the tape that existed during the recording of the alignment tape cannot be reproduced.

The most common errors are quadrature, skew and scallop [1, 2]¹⁾. These take the form of time base errors which are caused by the video heads being incorrectly positioned. If the penetration of the head is incorrect, "skew error" is produced; the vertical elements of the image are distorted so as to form a series of saw-teeth, each of which corresponds to a head sweep. "Scallop error" is caused by incorrect setting of the guide height and the vertical elements are distorted so as to form a series of parabolic arcs. If the heads are not exactly at an angle of 90° to one another, equal horizontal displacements occur for each line associated with a head sweep and the defect is called "quadrature error".

It should be mentioned here that it is quite common for the guide height to be adjusted to give maximum flatness of the oscilloscope display of the FM amplitude. If the machine is being aligned to play a particular tape and this method produces the most acceptable pictures when playing that tape, then obviously discretion is used in adopting a compromise.

All modern recorders have time base correctors which correct for these errors and generally the oscilloscope error display provided by the machine provides the most sensitive means of optimization. Before attempting the following adjustments, the machine and heads should be at their normal operating temperature. The guide position should be in the fixed condition during the adjustment and the fixed guide-position and guide-height screw controls adjusted until skew and scallop errors have been eliminated as seen on a picture monitor displaying the demodulator output (i.e. before monochrome timing correction) and on the oscilloscope monochrome timing-error display.

There should be no visible timing error once these adjustments have been made, but occasionally quadrature errors may be discerned. On some equipment the relative positions of the heads may be changed to minimize this.

The guide height and position should preferably not be changed until the next alignment (this is feasible on machines equipped with velocity compensators).

The presence of co-planarity errors can also be checked at this stage. This is done by replaying the alignment tape and examining the amplitude of the FM output on the oscilloscope display, while rocking the tracking control. If the amplitudes of the FM signals produced by the four video heads do not change simultaneously in the same way, co-planarity errors are present. They can be measured by making the video tracks visible on the tape by means of a magnetic developing powder, lifting the pattern off the tape by means of a transparent adhesive tape and transferring it to a glass slide which is optically projected on a large screen.

¹⁾ The figures in square brackets refer to the bibliography, Annex A, page 10.