

Methods of measurement for equipment used in digital microwave radio transmission systems —

Part 2: Measurements on terrestrial radio-relay systems —

Section 2.6 Protection switching

The European Standard EN 60835-2-6:1995 has the status of a
British Standard

ICS 33.060.30

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee EPL/12, Radio communication, upon which the following bodies were represented:

- British Broadcasting Corporation
- British Radio and Electronic Equipment Manufacturers' Association
- British Telecommunications plc
- ERA Technology Ltd.
- Institution of Electrical Engineers
- Radio, Electrical and Television Retailers' Association
- Radiocommunications Agency

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 February 1996

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The following BSI references relate to the work on this standard:
Committee reference EPL/12
Draft for comment 95/210407 DC

ISBN 0 580 25166 7

Amendments issued since publication

Amd. No.	Date	Comments

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National foreword

This British Standard has been prepared by Technical Committee EPL/12 and is the English language version of EN 60835-2-6:1995 *Methods of measurement for equipment used in digital microwave radio transmission systems*

— *Part 2: Measurements on terrestrial radio-relay systems — Section 6: Protection switching*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 835-2-6:1995, published by the International Electrotechnical Commission (IEC) and is part of a series.

BS EN 60835 is published in three Parts. The other Parts are:

— *Part 1: Measurements common to terrestrial radio-relay systems and satellite earth stations*;

— *Part 3: Measurements on satellite earth stations*.

This Section of BS EN 60835-2 covers measurement of terminal-to-terminal protection switching equipment associated with digital radio-relay systems.

The methods described are for an N+1 switching configuration but are also applicable to N+2 switching arrangements and to 1+1, twin-path and hot standby arrangements. The channel priority status tests described in clause 5 are applicable only to the N+1 and N+2 switching arrangements. In configurations where the protection switching equipment is physically separable from the radio terminal equipment (see Figure 1,) the interfaces at the input and output ports of the switching equipment shall be measured in accordance with BS EN 60835-2-5.

It is expected that other Sections of IEC Publication 835 will be published as identical British Standards, subject to their harmonization by CENELEC. Some Sections of this British Standard have already been published as Sections of BS 7573.

Cross-references

International Standard	Corresponding British Standard
	BS EN 60835 <i>Methods of measurement for equipment used in digital microwave radio transmission systems</i>
	Part 1: <i>Measurements common to terrestrial radio-relay systems and satellite earth stations</i>
EN 60835-1-3:1995 (IEC 835-1-3:1992)	Section 1.3:1995 <i>Transmission characteristics</i> ^a
EN 60835-2-5:1995 (IEC 835-2-5:1993)	Part 2: <i>Measurements on terrestrial radio-relay systems</i> Section 2.5:1995 <i>Digital signal processing sub-system</i>

^a In preparation.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 16, 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.

ICS 33.060.30

Descriptors: Radiocommunications, telecommunications, communication equipment, digital technics, radio-relay systems, microwave frequencies, measurements, switching, protection

English version

Methods of measurement for equipment used in digital
microwave radio transmission systems
Part 2: Measurements on terrestrial radio-relay systems
Section 6: Protection switching

(IEC 835-2-6:1995)

Méthodes de mesure applicables au matériel
utilisé pour les systèmes de transmission
numérique en hyperfréquence
Partie 2: Mesures applicables aux faisceaux
hertziens terrestres
Section 6: Commutation de protection
(CEI 835-2-6:1995)

Meßverfahren für Geräte in digitalen
Mikrowellen-Funkübertragungssystemen
Teil 2: Messungen an terrestrischen
Richtfunksystemen
Hauptabschnitt 6: Schutzschaltungen
(IEC 835-2-6:1995)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 12E(CO)168, future edition 1 of IEC 835-2-6, prepared by SC 12E, Radio relay and fixed satellite communication systems, of IEC TC 12, Radiocommunications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60835-2-6 on 1995-03-06.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-03-01

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

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Introduction

The CCIR Recommendation 753¹⁾ provides a general background to protection methods and characteristics. In particular, section 3 of the annex 1 of this recommendation outlines the methods of protection and gives an overview of the types of protection arrangements. The principal factors influencing the choice of switching criteria are also stated.

Classes of protection switching equipment

The main classes of automatic protection switching equipment are associated with digital radio-relay systems. In the first type, a no-break, slipless change-over is effected in conditions where the main channel performance degrades sufficiently slowly to allow a standby channel of equal transmission delay to be made ready and duly substituted. In the second type, switching to the standby path takes no account of transmission delay difference and consequently, the change-over generally results in a short break of transmission, accompanied by a delay difference in the transmission path. When this delay difference exceeds a certain threshold, this may result in a slip (i.e. the addition or loss of one or more bits) in the downstream equipment. A switching operation may be termed hit-less if the change-over is slipless, and is such that no errors are introduced when both the operating and standby channel have no errors, and the switching is effected without over-riding the switching logic.

A typical automatic slipless protection system in which a number of channels are protected for example by a single protection channel (N+1 system) is described in the following sub-clause. Protection systems using two protection channels (N+2 systems) operate in a similar manner.

For a given direction of transmission between two adjacent terminal equipments in a digital radio-relay system, one of a group of channels is dedicated to serve as a standby channel. Each channel to be protected may be assigned a priority rating in respect of its ability to command the use of the standby channel. Channels with equal priority status are protected on a "first come, first served" basis. When not used for protection, the standby channel may carry occasional traffic; in this case, the occasional traffic has no priority, and will be removed as soon as any operating channel needs the standby channel. The principal criteria for initiating a switchover between any one of the main channels and the standby channel are as follows:

- a) loss of signal, i.e. data missing or loss of synchronization;

- b) degradation of the operating channel, resulting in a BER in excess of a pre-determined value (within a range of 10^{-3} to 10^{-6} , for example);

- c) restoration of a previously failed main channel, i.e. an improvement of the BER to better than a predetermined value (typically one-to-two orders of magnitude better than in item b).

When protection is required at the receive terminal and when the protection channel is in normal condition and not occupied, the transmit terminal is instructed, via an associated control signal, to apply the traffic of the appropriate channel to the standby channel input. Traffic continues to be applied in parallel to the original channel so that both channels are carrying nominally identical traffic.

At the receive terminal, the signal of the standby channel (and in some implementations, the operating channel also) passes via a variable delay element. As the digital signal is present both at the output of the main channel and the standby channel, they are compared bit by bit, and the delay difference is systematically removed until an acceptable correlation is measured between the two inputs to the comparator. When this is achieved, the standby channel is switch-selected at the receive terminal in place of the main channel. The change-over is thus arranged to give only an acceptable number of errors.

The change-over is also called slipless if bit coincidence is achieved immediately prior to switching.

If loss of signal in a main channel occurs, no comparison can take place. In such cases, the receive terminal will automatically force a change-over after a given delay has occurred. Confirmation of successful change-over is exchanged via the supervisory control signal.

Once the performance of the main channel is deemed to be satisfactory, receive-end slipless switch-back from the standby channel to the appropriate main channel follows. In the case of N+1 or N+2 protection systems, confirmation of successful change-over is then passed, via the supervisory control signal, to the transmit terminal where switching is also restored to free the standby channel, and thus make it available for the protection of other channels.

¹⁾ CCIR Recommendation 753: *Preferred methods and characteristics for the supervision and protection of digital radio-relay systems*. (Geneva, 1992)