AS/NZS 4138:1995
ISO/IEC 11573:1994

Australian/New Zealand Standard

Information technology—Telecommunications and information exchange between systems—Synchronization methods and technical requirements for private integrated services networks

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee IT/16, Private Telecommunications Networking. It was approved on behalf of the Council of Standards Australia on 18 May 1995 and on behalf of the Council of Standards New Zealand on 24 July 1995. It was published on 5 August 1995.

The following interests are represented on Committee IT/16:

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New Zealand Standards Committee SC605 WG1
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Suggestions for improvements to Joint Standards, addressed to the head office of either Standards Australia or Standards New Zealand, are welcomed. Notification of any inaccuracy or ambiguity found in a Joint Australian/New Zealand Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT/16 on Private Telecommunications Networking to supersede AS 4138(Int)—1993.

This Standard is identical with, and has been reproduced from, ISO/IEC 11573:1994, *Information technology—Telecommunications and information exchange between systems—Synchronization methods and technical requirements for Private Integrated Services Networks.*

The objective of this Standard is to provide private integrated services network (PISN) designers and users with the requirements necessary for the synchronization of PISNs in order to not unduly affect the performance of voice or non-voice services within PISNs and between PISNs and public switched networks.

The Standard is one of a series of emerging ISO/IEC Standards applicable to private integrated services networking. The series uses the ISDN concepts as developed by ITU-T and is also within the framework of Standards for Open Systems Interconnection (OSI) as defined by ISO/IEC JTC 1.

Statements expressed in mandatory terms in notes to figures or clauses are deemed to be requirements of this Standard.

Users of this Standard are advised by Standards Australia and Standards New Zealand, under arrangements made with ISO and IEC, as well as certain other Standards organizations, that the number of this Standard is not reproduced on each page; its identity is shown only on the cover, inside cover and title pages.

The term 'informative' has been used in this Standard to define the application of the annexes to which it applies. An 'informative' annex is only for information and guidance.

For the purpose of this Joint Standard, the ISO/IEC text should be modified as follows:

(a) *Terminology* The words 'this Australian/New Zealand Standard' should replace the words 'this International Standard' wherever they appear.

(b) *References* The references to international Standards should be replaced by references, where appropriate, to the following Australian/New Zealand Standards:

Reference to International Standard or other Publication		*Australian/New Zealand Standard*
ANSI IEA/TIA		AS/NZS
594	Digital Private Network synchronization	—
ETS		
300 011	Integrated Services Digital Network (ISDN); Primary rate user-network interface layer 1 specification and test principles	—
300 012	Integrated Services Digital Network (ISDN); Basic user-network interface layer 1 specification and test principles	—
ITU-T		—
G.812	Timing requirements at the outputs of slave clocks suitable for plesiochronous operation of international digital links	
G.822	Controlled slip rate objectives on an international digital connection	—

During the preparation of ISO/IEC 11573, information was gathered on patents upon which application of the Standard might depend. Relevant patents were identified as belonging to ALCATEL Business Systems. However, ISO and IEC cannot give authoritative or comprehensive information about evidence, validity or scope of patent and like rights. The patent-holder has stated that licences will be granted under reasonable terms and conditions and communications on this subject should be addressed to:

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Originated in Australia as AS 4138(Int)—1993.
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INTRODUCTION

When synchronous digital signals are being transported over a communications link, the receiving end must operate at the same average frequency as the transmitting end to prevent loss of information. This is referred to as link synchronization. When digital signals traverse a network of digital communications links, switching nodes, multiplexers, and transmission interfaces, the task of keeping all the entities operating at the same average frequency is referred to as network synchronization.

The design of a PISN requires specification of the timing sources and receivers for the synchronization network. Proper design requires that timing loops in the synchronization network be avoided. A timing loop occurs when a clock is using as its reference frequency a signal that is itself traceable to the output of that clock. The formation of such a closed timing loop leads to frequency instability and is not permitted. While it is relatively straightforward to ensure against timing loops in the primary synchronization reference network, care should be taken that timing loops do not occur during failure or error conditions when various timing references are rearranged.

When a PISN is not connected to the public digital network, synchronization can be achieved by having all PISN equipment derive timing from a single source. This source should be the highest quality clock available. Alternatively, if timing is derived from more than one class I clock, or public clock traceable source, the network is said to be operating *plesiochronously.*

If a PISN is connected to the public network at one or more nodes, the private network designer can coordinate with the public network provider to derive class I clock, or public clock traceable timing from the public digital network. More information is available in Annex A.

AUSTRALIAN/NEW ZEALAND STANDARD

Information technology — Telecommunications and information exchange between systems — Synchronization methods and technical requirements for Private Integrated Services Networks

Section 1: General

1.1 Scope

This International Standard contains requirements necessary for the synchronization of PISNs. Timing within a digital private network needs to be controlled carefully to ensure that the rate of occurrence of slips between PINXs within the PISN, and the public switched networks is sufficiently low not to affect unduly the performance of voice transmissions, or the accuracy or throughput (if errored data require re-transmission) of non-voice services.

Requirements are also based upon the interconnection of digital private telecommunication networks via digital facilities in the public (switched or not) telecommunication networks.

This International Standard is one of a series of technical standards on telecommunications networks. This International Standard with its companion standards fills a recognized need in the telecommunications industry brought about by the increasing use of digital equipment and facilities in private networks. It is useful to anyone engaged in the manufacture of digital customer premises equipment (CPE) for private network applications, and to those purchasing, operating or applying digital CPE to digital facilities for Private Integrated Services Networks (PISN).

This International Standard establishes technical criteria necessary in the design of a synchronization plan for a PISN. Compliance with these requirements would be expected to result in a quality PISN synchronization design.

1.2 Definitions

For the purposes of this International Standard, the following definitions apply:

1.2.1 Accuracy

A measure of the maximum departure from the nominal clock rate over a 24 h period, made anytime in the lifetime of the clock, during a defined period of time, within the declared environmental conditions. Frequency deviation may be constrained to the specific accuracy by clock operation in the free running or hold over modes, as defined below.

1.2.2 Asynchronous signals

Signals having not the same nominal rate.

1.2.3 Clock free running mode

In such a mode, the PINX works with its own clock source which is not locked to an external reference and is not using storage techniques to maintain its accuracy.

1.2.4 Clock hold over mode

An operating condition of a clock in which it is not locked to an external reference clock, but uses storage techniques to maintain during a limited period of time its accuracy with respects to the last known reference clock.

1.2.5 Controlled Slip

It consists of the repetition or deletion of an integer number of octets caused by the elastic buffer mechanism used at the interface of a non-synchronous bit stream (a plesiochronous or asynchronous one). Slips and controlled slips shall be considered synonymous in this International Standard.

1.2.6 Jitter

Short-term non-cumulative variations of the significant instants of a digital signal from their ideal positions in time.