INTERNATIONAL TELECOMMUNICATION UNION

CCITT I.413

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

OVERALL NETWORK ASPECTS AND FUNCTIONS, ISDN USER-NETWORK INTERFACES

B-ISDN USER-NETWORK INTERFACE

Recommendation I.413

Geneva, 1991

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation I.413 was prepared by Study Group XVIII and was approved under the Resolution No. 2 procedure on the 5th of April 1991.

CCITT NOTES

1) In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication Administration and a recognized private operating agency.

2) A list of abbreviations used in this Recommendation can be found in Annex A.

Preamble to B-ISDN Recommendations

In 1990, CCITT SG XVIII approved a first set of Recommendations on B-ISDN. These are:

I.113 – Vocabulary of terms for broadband aspects of ISDN

I.121 – Broadband aspects of ISDN

I.150 – B-ISDN asynchronous transfer mode functional characteristics

I.211 – B-ISDN service aspects

I.311 – B-ISDN general network aspects

I.321 – B-ISDN Protocol Reference Model and its application

I.327 – B-ISDN functional architecture

I.361 – B-ISDN ATM Layer specification

I.362 – B-ISDN ATM Adaptation Layer (AAL) functional description

I.363 – B-ISDN ATM Adaptation Layer (AAL) specification

I.413 – B-ISDN user-network interface

I.432 – B-ISDN user-network interface - Physical Layer specification

I.610 – Operation and maintenance principles of B-ISDN access

These Recommendations address general B-ISDN aspects as well as specific service- and network-oriented issues, the fundamental characteristics of the asynchronous transfer mode (ATM), a first set of relevant ATM oriented parameters and their application at the user-network interface as well as impact on operation and maintenance of the B-ISDN access. They are an integral part of the well established I-Series Recommendations. The set of Recommendations are intended to serve as a consolidated basis for ongoing work relative to B-ISDN both within CCITT and in other organizations. They may also be used as a first basis towards the development of network elements.

CCITT will continue to further develop and complete these Recommendations in areas where there are unresolved issues and develop additional Recommendations on B-ISDN in the I-Series and other series in the future.

Recommendation I.413

B-ISDN USER-NETWORK INTERFACE

1 Introduction

This Recommendation gives the reference configuration for the B-ISDN user-network interface (UNI) and examples of physical realizations. It describes Physical Layer information flows according to the B-ISDN Protocol Reference Model and identifies interface functions. It also addresses OAM issues as they relate to the reference configuration at the user access and to the interface specifications.

2 Reference configuration at the user-network interface

2.1 *Functional groups and reference points*

The reference configurations defined in Figure 1/I.411 for ISDN basic access and primary access are considered general enough to be applicable to all aspects of the B-ISDN accesses.

Figure 1/I.413 shows the B-ISDN reference configurations which contain the following:

– functional groups: B-NT1, B-NT2, B-TE1, TE2, B-TE2 and B-TA;

– reference points: T_B, S_B and R.

In order to clearly illustrate the broadband aspects, the notations for reference points and for functional groups with broadband capabilities are appended with the letter B (e.g., B-NT1, T_B). The broadband functional groups are equivalent to the functional groups defined in Recommendation I.411. Interfaces at the R reference point may or may not have broadband capabilities.

Interfaces at reference points S_B and T_B will be standardized. These interfaces will support all ISDN services.

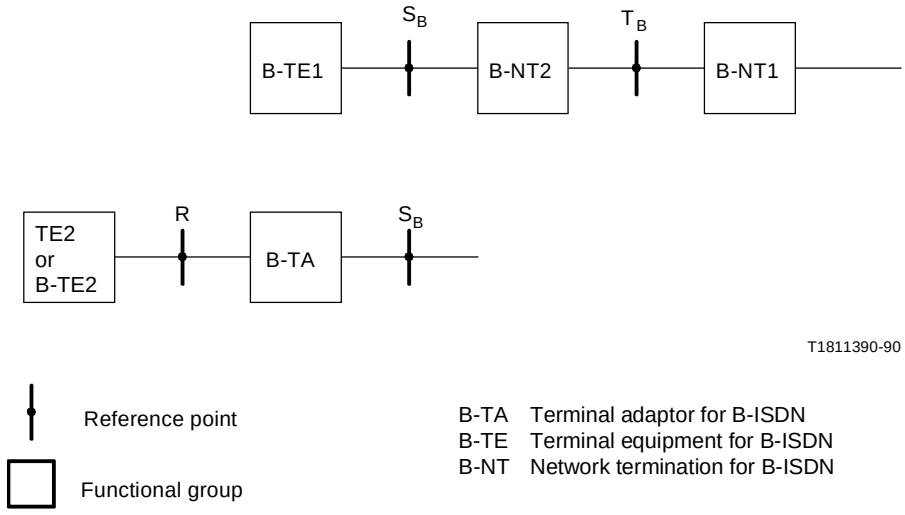


FIGURE 1/I.413

B-ISDN reference configurations

2.2 *Examples of physical realizations*

Figure 2/I.413 gives examples of physical configurations illustrating combinations of physical interfaces at various reference points. The examples cover configurations that could be supported by standardized interfaces at reference points S_B and T_B. Other configurations may also exist. For example, physical configurations of B-NT2 may be distributed or use shared medium to support local area network (LAN) emulation and other applications.

Figure 3/I.413 illustrates possible physical configurations, but does not preclude alternative configurations. Whether a single interface at the S_B reference point can cover different configurations as illustrated on Figure 3/I.413 is for further study.

Figures 2a/I.413 and 2b/I.413 show separate interfaces at the S_B and T_B reference points; Figures 2c/I.413 and 2d/I.413 show an interface at S_B but not at T_B; Figures 2e/I.413 and 2f/I.413 show an interface at T_B but not at S_B; Figures 2g/I.413 and 2h/I.413 show separate interfaces at S, S_B and T_B; Figures 2i/I.413 and 2j/I.413 show interfaces at S_B and T_B which are coincident.

Additionally, Figures 2b/I.413, 2d/I.413, 2f/I.413, 2h/I.413 and 2j/I.413 show an interface at reference point R.

2.3 *Basic characteristics of the interfaces at T_B and S_B reference points*

2.3.1 *Characteristics of the interfaces at 155.520 Mbit/s*

2.3.1.1 *Interface at T_B reference point*

There are two options for the interface at the physical layer: a cell-based physical layer and an SDH-based physical layer. The ATM layer is common to these two options.

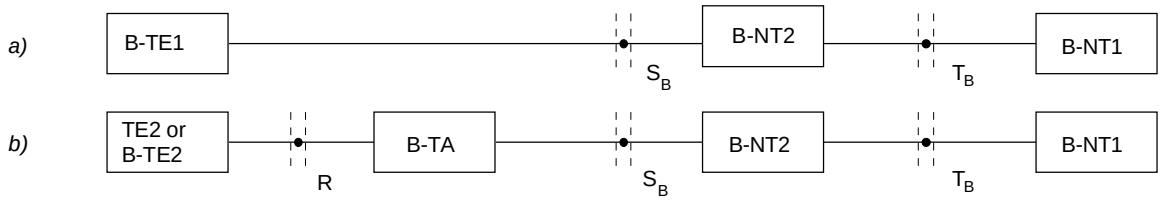
There is only one interface per B-NT1 at the T_B reference point. The operation of the physical medium is point-to-point in the sense that there is one sink (receiver) in front of one source (transmitter).

When point-to-multipoint configurations at T_B are used as an option at ATM and higher layers, their implications at these layers and the physical layer have to be studied.

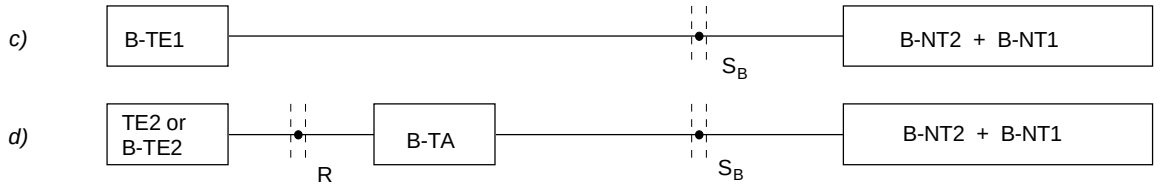
2.3.1.2 *Interface at the S_B reference point*

One or more S_B interfaces per B-NT2 are present. The interface at the S_B reference point is point-to-point at the physical layer in the sense that there is only one sink (receiver) in front of one source (transmitter) and may be point-to-multipoint at the other layers.

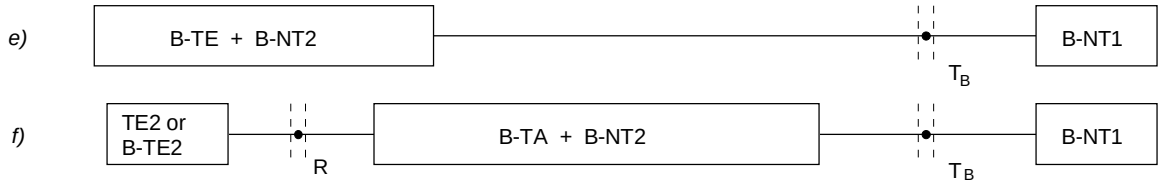
Further study is required to determine whether it is feasible to have a unique interface at the S_B reference point to achieve terminal interchangeability.



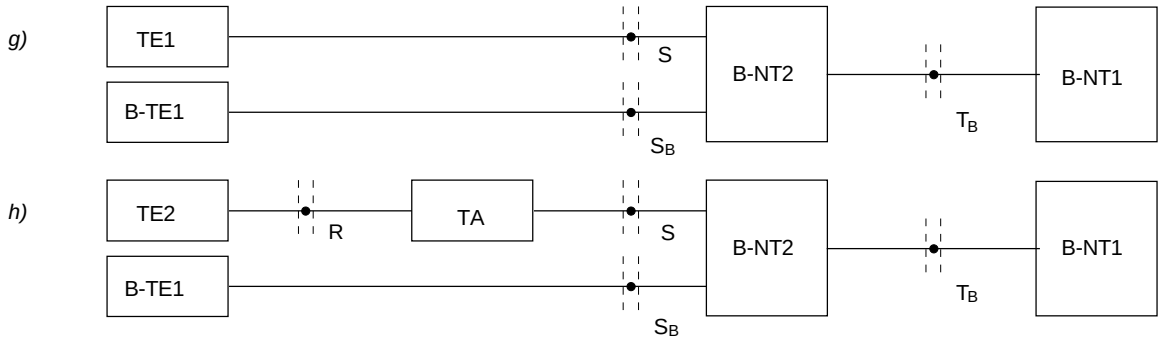
Configurations where B-ISDN physical interfaces occur at reference points S_B and T_B .



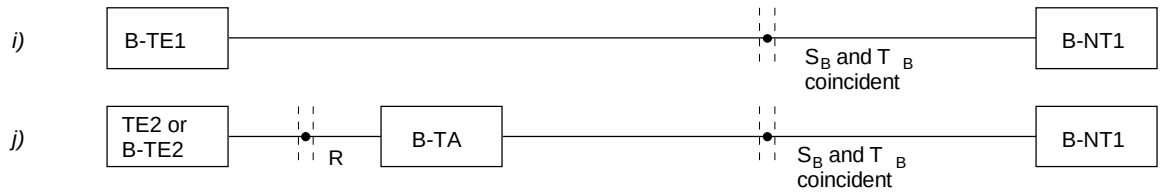
Configurations where B-ISDN physical interfaces occur at reference point S_B only.



Configurations where B-ISDN physical interfaces occur at reference point T_B only.



Configurations where B-ISDN and ISDN physical interfaces occur at reference points S, S_B and T_B .



Configurations where a single B-ISDN physical interface occurs at a location where both reference points S_B and T_B coincide.

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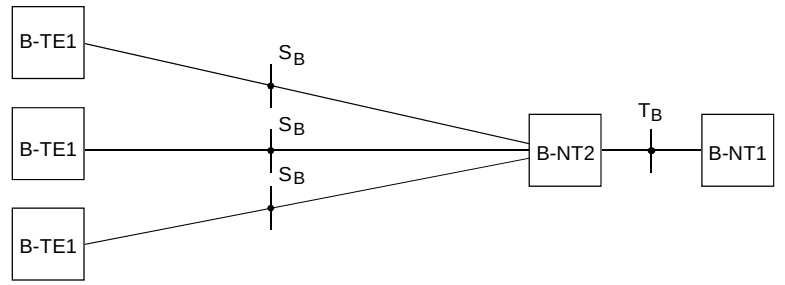
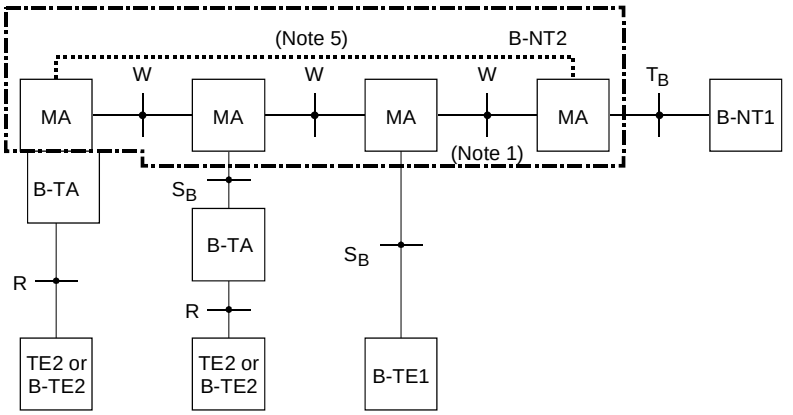
FIGURE 2/I.413

Examples of physical configurations for broadband user applications

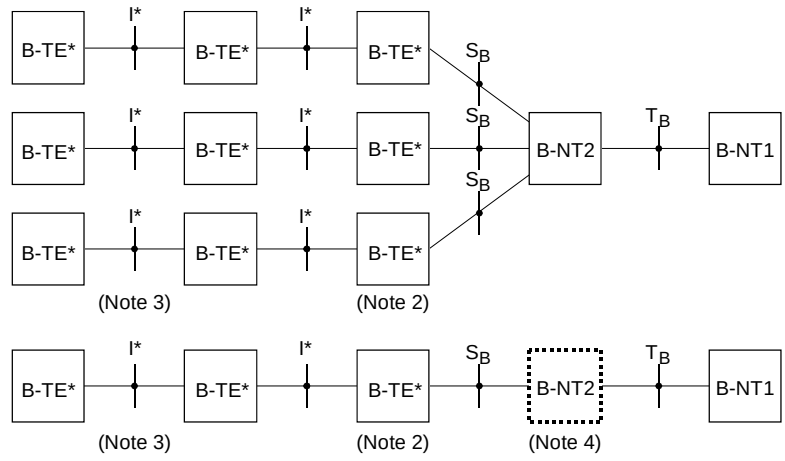


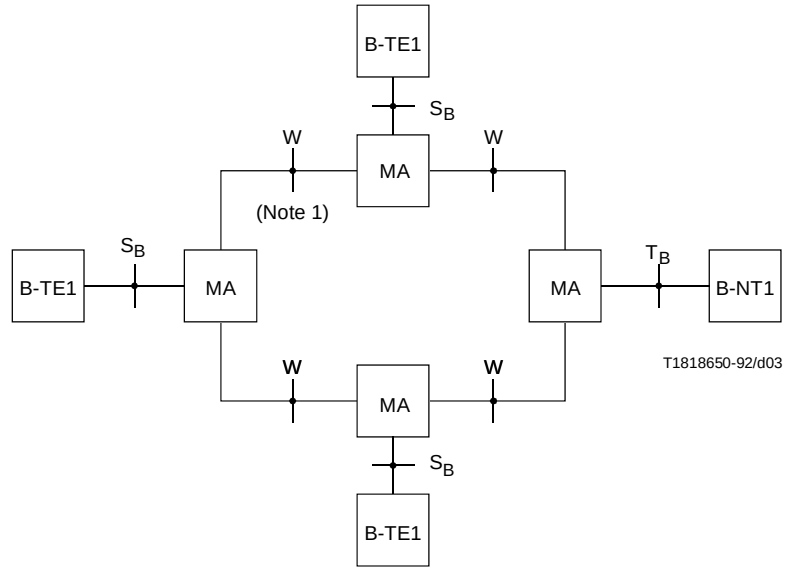
b) Distributed B-NT2 configurations

b1) Generic configuration



b2) Physical configurations





Note 1 – MA, medium adaptor: Accomodates the specific topology of the distributed B-NT2. The interface at W may include topology dependant elements; it may be a non-standardized interface; it may be in some implementations identical to the interface at S_B.

Note 2 – B-TE*: includes shared medium access functions.

Note 3 – I*: Interface identical to the interface at the S_B reference point.

Note 4 – The B-NT2 may be null in the case of commonality between S_B and T_B.

Note 5 – There will be a physical link between these two medium adaptors in the case of ring configurations.

FIGURE 3/I.413

Examples of physical configurations for shared medium applications

2.3.1.3 *Relationship between interfaces at S_B and T_B*

Configurations described in Figures 2i/I.413 and 2j/I.413 require that the interface specifications at T_B and S_B have a high degree of commonality, in order to ensure that a simple broadband terminal may be connected directly to the T_B interface.

The feasibility of achieving the needed commonality requires further study.

2.3.2 *Characteristics of the interfaces at 622.080 Mbit/s*

For further study.

2.4 *Relationship between ISDN interfaces*

Figures 2g/I.413 and 2h/I.413 show configurations where B-ISDN and ISDN interfaces may occur at S_B and S respectively. In this case B-NT2 functionalities have to ensure the interface capabilities for both S and S_B. Other configurations for supporting terminals at the interface at the S reference point may exist.

2.5 *Application of B-ISDN model to functional groups*

2.5.1 *General*

Lists of functions for each functional group are given below. Each particular function is not necessarily restricted to a single functional group. For example, "interface termination" functions are included in the function lists of B-NT1, BNT2 and B-TE. The function lists for B-NT1, B-NT2, B-TE and B-TA are not exhaustive. Not all specific functions in a functional group need to be present in all implementations.

A complete description of the functional groups remains for further study.

2.5.2 *Network termination 1 (B-NT1) for B-ISDN*

This functional group includes functions broadly equivalent to layer 1 of the OSI reference model. Examples of B-NT1 functions are:

– line transmission termination;

– transmission interface handling;

– OAM functions.

Additional functions specific to the transmission system may be required. The means of powering of implementations of the B-NT1 is for further study. When the B-NT1 terminates cell-based OAM flows, cell delineation is required.

2.5.3 *Network termination 2 (B-NT2) for B-ISDN*

This functional group includes functions broadly equivalent to layer 1 and higher layers of the Recommendation X.200 reference model. B-NT2 can be null in the case of commonality between T_B and S_B.

Examples of B-NT2 functions are:

– adaptation functions for different media and topologies (MA functions);

– functions of a distributed B-NT2;

– cell delineation;

– concentration;

– buffering;

– multiplexing/demultiplexing;

– resource allocation;

– usage parameter control;

– adaptation layer functions for signalling (for internal traffic);

– interface handling (for the T_B and S_B interfaces);

– OAM functions;

– signalling protocol handling;

– switching of internal connections.

B-NT2 implementations may be concentrated or distributed. In a specific access arrangement, the B-NT2 may consist only of physical connections. When present, implementations of the B-NT2 are locally powered.

2.5.4 *Terminal equipment (B-TE) for B-ISDN*

This functional group includes functions broadly belonging to layer 1 and higher layers of the Recommendation X.200 reference model.

Examples of B-TE functions are:

– user/user-and-user/machine dialogue and protocol;

– interface termination and other layer 1 functions;

– protocol handling for signalling;

– connection handling to other equipments;

– OAM functions.

The possibility of powering the B-TE via the S_B interface is for further study.

2.5.4.1 *Terminal equipment type 1 (B-TE1) for B-ISDN*

This functional group includes functions belonging to the B-TE functional group with an interface that complies with the B-ISDN S_B and/or T_B interface Recommendations.

2.5.4.2 *Terminal equipment type 2 (B-TE2) for B-ISDN*

This functional group includes functions belonging to the functional group B-TE but with a broadband interface that complies with interface Recommendations other than the B-ISDN interface Recommendations or interfaces not included in CCITT Recommendations.

2.5.5 *Terminal adaptor (B-TA) for B-ISDN*

This functional group includes functions broadly belonging to layer 1 and higher layers of the Recommendation X.200 reference model that allow a TE2 or a B-TE2 terminal to be served by a B-ISDN user-network interface.

3 Physical layer information flows and interface functions

Physical layer functions and physical layer primitives are defined in Recommendation I.321, § 4.2. The present section defines the information flows between the physical medium (PM), the transmission convergence sublayer (TC) and their adjacent entities (ATM layer and management plane). The information flows identified here do not imply any physical realization. Information flows identified in this section may not be exhaustive.

3.1 *Relation with other sublayers or entities*

The information flows specified in the following subsections will be provided in Recommendation I.321 by primitives. Further study is required to specify these primitives.

3.1.1 *Information exchanged between the PM and the TC sublayers*

a) *From the PM sublayer to the TC sublayer:*

The PM sublayer provides at least the following information to the TC sublayer:

– a flow of logical symbols (e.g., bits),

– associated timing information.

b) *From the TC sublayer to the PM sublayer:*

The TC sublayer provides at least the following information to the PM sublayer:

– a flow of logical symbols (e.g., bits),

– associated timing information.

3.1.2 *Information exchanged between the physical layer and the ATM layer*

a) *From the physical layer to the ATM layer* [1] *:*

The physical layer provides at least the following information to the ATM layer:

– valid cells (excluding idle cells and physical layer OAM cells),

– associated timing (e.g., presence of data and clock information).

b) *From the ATM layer to the physical layer:*

– assigned and unassigned cells if any available,

– associated timing (e.g., presence of data and clock information).

In case no cells are available, no data are transferred and the physical layer inserts idle cells to build up the data flow to be transmitted.

3.1.3 *Information exchanged between the physical layer and the management plane*

a) *From the physical layer to the management plane:*

– loss of incoming signal,

– indication of received errors or indication of degraded error performance.

Detection of bit errors may be based on received unexpected code violations or other bit error detecting schemes.

In addition, other information may be provided to the management plane. This if for further study.

b) *From the management plane to the physical layer:*

For further study.

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[1] The physical layer will provide a clock to the ATM layer. This clock is derived from the line rate of the physical layer (e.g. a bit clock at 155.52 Mbit/s for the user-network interface standardized in Recommendation I.432).

For certain applications, there may be a need to indicate to the ATM layer that an idle cell has been discarded by the physical layer. Two possible applications are generic flow control (GFC) and the shaping of traffic flows.

3.2 *Modes of operation*

Normal mode: "fully active".

Other modes, e.g., emergency mode in case of power failure or deactivated mode in order to save power are for further study.

3.3 *Interface function*

3.3.1 *Data transfer*

The user information together with the information for connection related functions (e.g., signalling) are carried in ATM cells. OAM information related to the physical layer is carried in transmission overheads or PL-OAM cells, depending on the transmission structure used (SDH-based or cell-based) and on the functional entity concerned.

3.3.2 *Timing*

Bit timing has to be provided according to Recommendation I.432.

3.3.3 *Bit sequence independence*

The PM and the associated transmission system payload have to provide bit sequence independence.

3.3.4 *Provision of power feeding*

For further study.

3.3.5 *Activation/deactivation*

For further study.

4 UNI related OAM functions

The following OAM functions associated with the UNI have been identified and are described in Recommendation I.610:

1) transmission and reception of maintenance signals (e.g., alarm indication signal (AIS) and far end receive failure (FERF));

2) performance monitoring;

3) control communication provisions.

Some overhead capacity has to be allocated to these functions, but the exact implementation depends on the physical layer option selected, i.e. whether it is SDH-based or cell-based. Implementation of these maintenance functions is described in Recommendation I.432. The definition of maintenance signals required for the supervision of cell delineation and header error performance is for further study.

ANNEX A

(to Recommendation I.413)

Alphabetical list of abbreviations used in this Recommendation

AIS	Alarm indication signal
B-NT	Network termination for B-ISDN
B-NT1	Network termination 1 for B-ISDN
B-NT2	Network termination 2 for B-ISDN
B-TA	Terminal adaptor for B-ISDN
B-TE	Terminal equipment for B-ISDN
FERF	Far end receive failure
LAN	Local area network
MA	Medium adaptor
TA	Terminal adaptor
TC	Transmission convergence sublayer
UNI	User-network interface

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