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INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

ISDN USER-NETWORK INTERFACES

B-ISDN USER-NETWORK INTERFACE

ITU-T Recommendation I.413

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T 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 World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation I.413 was revised by the ITU-T Study Group XVIII (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation I.413

B-ISDN USER-NETWORK INTERFACE

(Geneva, 1991; revised at Helsinki, 1993)

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 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.

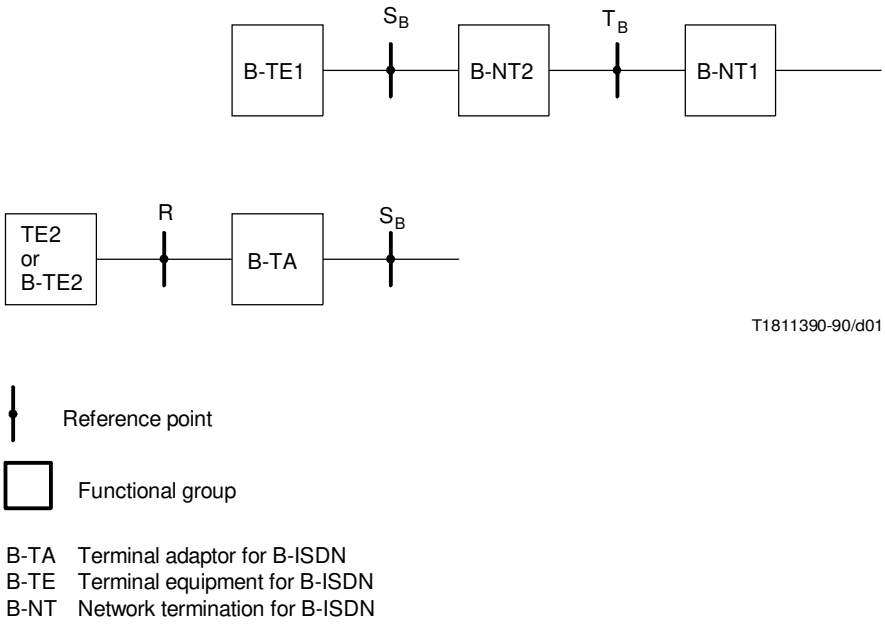


FIGURE 1/I.413

B-ISDN reference configurations

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.

2.2 Examples of physical realizations

Figure 2 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 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 is for further study.

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

Additionally, Figures 2b), 2d), 2f), 2h) and 2j) 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

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 both options.

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.

2.3.1.3 Relationship between interfaces at S_B and T_B

Configurations described in Figures 2i) and 2j) 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.

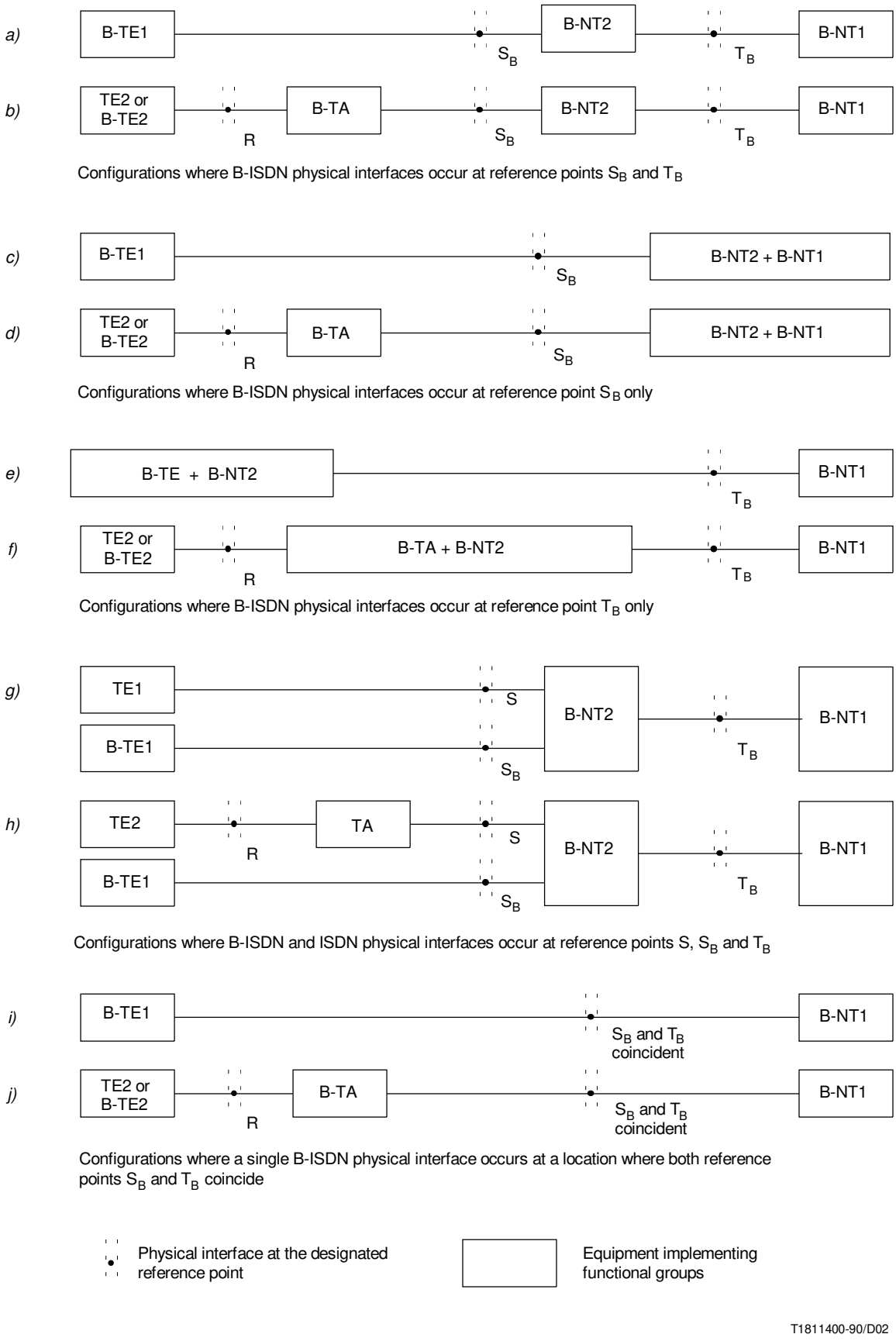
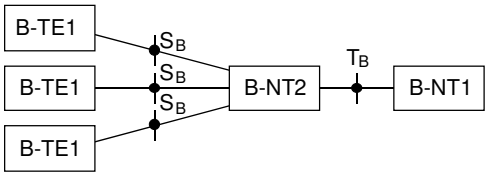


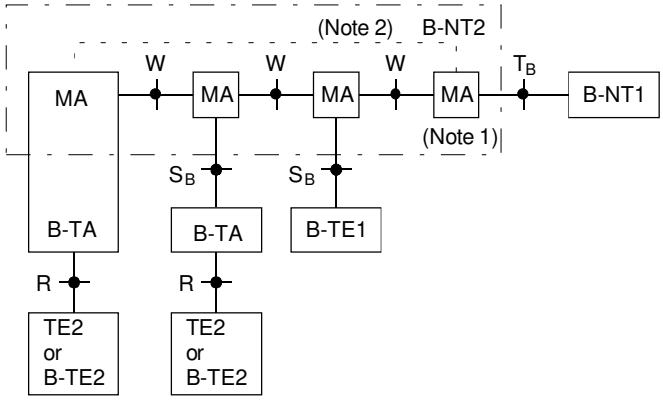
FIGURE 2/I.413

Examples of physical configurations for broadband user applications

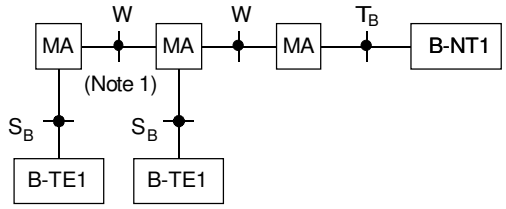
a) Centralized B-NT2 configuration

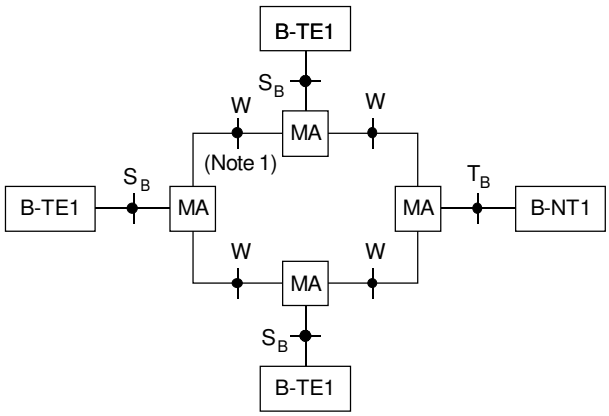


b) Distributed B-NT2 configurations
b1) Generic configuration



b2) Physical configurations





c) Multiaccess B-TE configurations
c1) Generic configurations (Note 7)

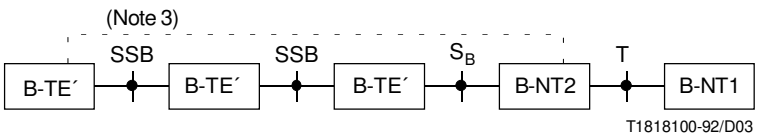
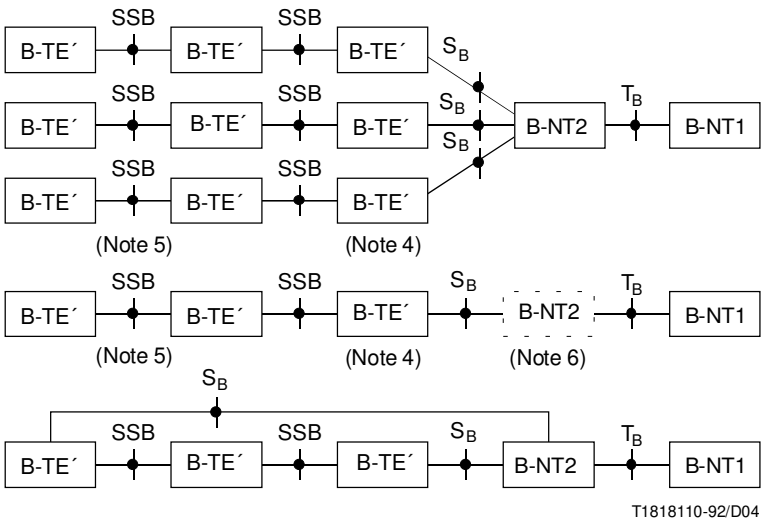


FIGURE 3/I.413 (sheet 1 of 2)

Examples of physical configurations for multipoint applications

c2) Physical configurations



NOTES

1 MA: Medium adaptor; accommodates the specific topology of the distributed B-NT2. The interface at W may include topology-dependent elements; it may be a non-standardized interface.

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

3 There will be a physical link between B-TE´ and B-NT2 in the case of ring configurations.

4 The B-TE´ includes shared medium access functions.

5 The measureable physical characteristics of the SSB interface are identical to those of the S_B interface. The functional characteristics of the interface, however, may be a superset of those at the S_B interface.

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

7 Additional termination functions (e.g. loopback in bus configuration) and OAM functions may be necessary for multiaccess B-TE configurations. Requirements and implementations of these functions require study.

FIGURE 3/I.413 (sheet 2 of 2)

Examples of physical configurations for multipoint applications

2.3.2 Characteristics of the interfaces at 622.080 Mbit/s

2.3.2.1 Interface at the 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 both 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.

2.4 Relationship between ISDN interfaces

Figures 2g) and 2h) 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, B-NT2 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 4.2/I.321. The present clause 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 clause may not be exhaustive.

3.1 Relation with other sublayers or entities

The information flows specified in the following subclauses 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 is for further study.

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

For further study.

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.

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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.

3.3.4 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

Alphabetical list of abbreviations used in this Recommendation

(This annex forms an integral part of 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