INTERNATIONAL STANDARD

ISO/IEC 17309

First edition
2000-09-15

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Mapping functions for the employment of a circuit mode basic service and the supplementary service user-to-user signalling as a pair of on-demand inter-PINX connections

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé avec intégration de services — Fonctions d'application pour l'emploi d'un service de base en mode circuit et de la signalisation utilisateur/utilisateur du service supplémentaire en tant que paire de connexions entre PINX sur demande

Reference number
ISO/IEC 17309:2000(E)

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Contents

Foreword iv

Introduction v

1 Scope 1

2 Conformance 1

3 Normative references 1

4 Definitions 2
4.1 External definitions 2
4.2 Special definitions 2
4.2.1 Calling PINX 2
4.2.2 Called PINX 2
4.2.3 Channel 2
4.2.4 Inter-PINX Connection 2
4.2.5 Inter-PINX Link 2

5 List of acronyms 2

6 Introduction 3

7 Capabilities at the Q reference point 3

8 Mapping functions 3
8.1 Physical adaptation 4
8.1.1 ISDN primary rate user-network Layer 1 interface (1544 kbit/s) 4
8.1.2 ISDN primary rate user-network Layer 1 interface (2048 kbit/s) 4
8.1.3 ISDN basic user-network Layer 1 interface 4
8.2 Mapping matrix 5
8.2.1 Channel allocation 5
8.2.2 Bearer conditioning for the D_Q-channel 5

9 IPC control functions 5
9.1 IPC establishment 5
9.2 IPC clearing 6

10 IPL control functions 6
10.1 Static pre-conditions for IPL establishment 6
10.2 IPL establishment 6
10.3 Transfer of inter-PINX signalling Layer 2 information 6
10.4 Use of message segmentation 6

Annex A Implementation Conformance Statement (ICS) Proforma 7

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 17309 was prepared by ECMA (as ECMA-244) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annex A forms a normative part of this International Standard.

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Introduction

This International Standard is one of a series of standards defining mapping functions in exchanges of Private Integrated Services Networks required for the utilization of intervening network scenarios. The series uses the ISDN concepts as developed by ITU-T (formerly CCITT) and is also within the framework of standards for open systems interconnection as defined by ISO/IEC.

This International Standard specifies mapping functions for the type of scenarios where two PINXs are interconnected via on-demand connections via the public ISDN using the supplementary service User-to-User Signalling for carrying signalling information.

This International Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

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Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Mapping functions for the employment of a circuit mode basic service and the supplementary service user-to-user signalling as a pair of on-demand inter-PINX connections

1 Scope

This International Standard specifies the mapping functions for a pair of on-demand inter-PINX connections using a circuit mode basic service and the supplementary service User-to-User Signalling (service 3) of a public ISDN at the same time.

In order to connect a Private Integrated Services Network Exchange (PINX) to another PINX, mapping functions are required to adapt the specific interfaces at the C reference point to the application at the Q reference point. As such, mapping functions provide for physical adaptation to the interface at the C reference point. Mapping functions also provide for the mapping of user channels and signalling information at the Q reference point to the appropriate channels or timeslots at the C reference point.

The C and Q reference points are defined in ISO/IEC 11579-1.

At the Q reference point the mappings provide a 64 kbit/s service for user channels and a packet mode service for the signalling channel. Bearer conditioning is outside the scope of this International Standard, except for providing the layer 2 for the signalling channel at the Q reference point.

Scenario management is outside the scope of this International Standard.

This International Standard is applicable to PINXs which can be interconnected to form a Private Integrated Services Network (PISN) and which support signalling protocols at the Q reference point.

2 Conformance

In order to conform to this International Standard, a PINX shall satisfy the requirements identified in the Implementation Conformance Statement (ICS) proforma in annex A.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 11574:2000, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Circuit-mode 64 kbit/s bearer services — Service description, functional capabilities and information flows.*

ISO/IEC 11579-1:1994, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Part 1: Reference configuration for PISN exchanges (PINX).*

ITU-T Rec. I.112:1993, *Vocabulary of terms for ISDNs.*

IUT-T Rec. I.210:1993, *Principles of telecommunication services supported by an ISDN and the means to describe them.*

ITU-T Rec. I.411:1993, *ISDN user-network interfaces — Reference configurations.*

ITU-T Rec. I.430:1995, *Basic user-network interface — Layer 1 specification.*

ITU-T Rec. I.431:1993, *Primary rate user-network interface — Layer 1 specification.*

ITU-T Rec. Q.920:1993, *Digital Subscriber Signalling System No. 1 (DSS1) — ISDN user-network interface data link layer — General aspects.*

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ITU-T Rec. Q.920 Am. 1:2000, *Amendment 1 to ITU-T Recommendation Q.920*.

ITU-T Rec. Q.921:1997, *ISDN user-network interface — Data link layer specification*.

ITU-T Rec. Q.921 Am. 1:2000, *Amendment 1 to ITU-T Recommendation Q.921*.

ITU-T Rec. Q.931:1998, *ISDN user-network interface layer 3 specification for basic call control*.

ITU-T Rec. Q.957.1:1996, *Stage 3 description for additional information transfer supplementary services using DSS 1: User-to-User Signalling (UUS)*.

ETS 300 415:1994, *Private Telecommunication Network (PTN); Terms and definitions*.

4 Definitions

4.1 External definitions

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

- Basic Service (CCITT Rec. I.210)
- Call, Basic Call (ISO/IEC 11582)
- Integrated Services Digital Network (CCITT Rec. I.112)
- Private Integrated Services Network (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (ISO/IEC 11579-1)
- Public ISDN (ETS 300 415)
- Signalling (CCITT Rec. I.112)
- Supplementary Service (ISO/IEC 11582)

4.2 Special definitions

4.2.1 Calling PINX : The PINX which is at the originating interface of the public ISDN (IVN).

4.2.2 Called PINX : The PINX which is at the destination interface of the public ISDN (IVN).

4.2.3 Channel : A means of bi-directional transmission of user or signalling information between two points.

4.2.3.1 D_Q-Channel : A channel used to convey call control information between the Q reference points of two peer PINXs.

4.2.3.2 U_Q-Channel : A channel used to convey user information between the Q reference points of two PINXs.

4.2.4 Inter-PINX Connection : A connection provided by an IVN between two C reference points used to transport inter-PINX information from the PISN control plane and/or the PISN user plane.

4.2.5 Inter-PINX Link : A link between the Q reference points of two PINXs, comprising the totality of signalling transfer and user information transfer means.

5 List of acronyms

DSS1	Digital Subscriber Signalling System No. one
ICS	Implementation Conformance Statement
IPC	Inter-PINX Connection
IPL	Inter-PINX Link
ISDN	Integrated Services Digital Network
IVN	Intervening Network
PISN	Private Integrated Services Network
PINX	Private Integrated Services Network Exchange
UUS3	User-to-User Signalling service 3

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6 Introduction

The inter-PINX connection scenario using circuit mode basic services and the supplementary service User-to-User Signalling service 3 as defined for public ISDNs is an on-demand connection scenario.

This scenario creates an IPL from the connections established as a result of an ISDN call. The ISDN call is established by specifying the supplementary service UUS3. The signalling connection associated with the ISDN call in conjunction with the UUS3 information transfer capability is used to provide the inter-PINX signalling connection. The circuit mode ISDN connection is used to provide the inter-PINX user connection.

This scenario also includes procedures for sequence control and end-to-end flow control.

Connections of this scenario can be established and released at any time under the control of either PINX. In case of failure, the public ISDN may reject a call establishment request or release an already established call. In case of congestion, the sending PINX may inhibit temporarily the sending of USER INFORMATION signalling messages by means of an internal congestion mechanism.

Subject to implementation in the public ISDN, this scenario provides for the use of:

- up to 2 pairs of signalling and user information connections per ISDN basic access; and,
- up to 23 (1544 kbit/s primary rate) or 30 (2048 kbit/s primary rate) pairs of signalling and user information connections per ISDN primary rate access.

Multiple pairs of IPCs may exist at one or at more interfaces of a PINX. Each pair of IPCs can convey just one IPL. In the case of multiple pairs of IPCs (at one or more interfaces of a PINX), i.e. several calls with UUS3 are established at the same time from one PINX to one or more other PINXs, there is no mapping coordination necessary.

Provision of just one number for addressing a Called PINX is sufficient for establishment of any number of pairs of IPCs from a given Calling PINX.

7 Capabilities at the Q reference point

For each instance of the Q reference point:

- one signalling channel (D_Q) for carrying the inter-PINX Layer 3 signalling protocol, and
- one user channel (U_Q)

are provided.

Inter-PINX signalling information is not restricted to call control on this particular U_Q-channel.

For a U_Q-channel the following bearer capability shall be provided:

- information transfer rate: 64 kbit/s;
- other attributes shall be the same as at the C reference point.

NOTE - The provision of bearer conditioning can change these attributes. However, this is outside the scope of this International Standard.

For a D_Q-channel the following bearer capability shall be provided:

- Transfer mode: packet mode;
- Information transfer capability: unrestricted digital information;
- Information transfer rate: implementation-dependent;
- other attributes shall be the same as at the C reference point.

The functions to map D_Q and U_Q channels to an inter-PINX connection (IPC) at the C reference point are described in clause 8.

8 Mapping functions

The PINX mapping functions shall meet the requirements defined for physical adaptation (8.1), channel allocation (8.2.1) and bearer conditioning for the D_Q-channel (8.2.2).

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8.1 Physical adaptation

A PINX shall support at least one of the following physical adaptations.

8.1.1 ISDN primary rate user-network Layer 1 interface (1544 kbit/s)

Layer 1 termination for the 1544 kbit/s primary rate interface shall be in accordance with ITU-T Rec. I.431.

Timeslots 1 to 23 shall be used for up to 23 circuit mode 64 kbit/s IPCs for user information. Timeslot 24 (D-channel) carries signalling information for establishing and clearing the circuit mode 64 kbit/s IPCs and providing, for each one, a packet mode IPC for inter-PINX signalling information through the use of UUS3.

NOTE - UUS3 provides a packet mode service by virtue of allowing the transfer of User-to-User information in USER INFORMATION messages using the call reference of the circuit mode 64 kbit/s IPC. The circuit mode 64 kbit/s IPC will in general have different call references at the calling and called interfaces.

The Layer 2 protocol in timeslot 24 at the C reference point shall conform to:

- ITU-T Recs. Q.920 / Q.921 (Data link).

The Layer 3 protocol in timeslot 24 at the C reference point shall conform to:

- ITU-T Rec. Q.931 (Basic Call control) and
- ITU-T Rec. Q.957.1 (User-to-User Signalling supplementary service).

8.1.2 ISDN primary rate user-network Layer 1 interface (2048 kbit/s)

Layer 1 termination for the 2048 kbit/s primary rate interface shall be in accordance with ITU-T Rec. I.431.

Timeslots 1 to 15 and 17 to 31 shall be used for up to 30 circuit mode 64 kbit/s IPCs for user information. Timeslot 16 (D-channel) carries signalling information for establishing and clearing the circuit mode 64 kbit/s IPCs and providing, for each one, a packet mode IPC for inter-PINX signalling information through the use of UUS3.

NOTE - UUS3 provides a packet mode service by virtue of allowing the transfer of User-to-User information in USER INFORMATION messages using the call reference of the circuit mode 64 kbit/s IPC. The circuit mode 64 kbit/s IPC will in general have different call references at the calling and called interfaces.

The Layer 2 protocol in timeslot 16 at the C reference point shall conform to:

- ITU-T Recs. Q.920 / Q.921 (Data link).

The Layer 3 protocol in timeslot 16 at the C reference point shall conform to:

- ITU-T Rec. Q.931 (Basic Call control) and
- ITU-T Rec. Q.957.1 (User-to-User Signalling supplementary service).

8.1.3 ISDN basic user-network Layer 1 interface

Layer 1 termination shall be in accordance with ITU-T Rec. I.430, excluding application of the point-to-multipoint mode of operation.

B-channels B1 and B2 of the interface shall be used for up to two circuit mode 64 kbit/s IPCs for user information. The D-channel of the interface carries signalling information for establishing and clearing the circuit mode 64 kbit/s IPCs and providing, for each one, a packet mode IPC for inter-PINX signalling information through the use of UUS3.

NOTE - UUS3 provides a packet mode service by virtue of allowing the transfer of User-to-User information in USER INFORMATION messages using the call reference of the circuit mode 64 kbit/s IPC. The circuit mode 64 kbit/s IPC will in general have different call references at the calling and called interfaces.

The Layer 2 protocol in the D-channel at the C reference point shall conform to:

- ITU-T Recs. Q.920 / Q.921 (Data link).

The Layer 3 protocol in the D-channel at the C reference point shall conform to:

- ITU-T Rec. Q.931 (Basic Call control) and
- ITU-T Rec. Q.957.1 (User-to-User Signalling supplementary service).

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8.2 Mapping matrix

The mapping matrix provides for the mapping of channels at the Q reference point to the IPCs at the C reference point and, in the case of the D_Q-channel, bearer conditioning.

8.2.1 Channel allocation

Per instance of the Q reference point the mapping matrix shall provide for:

- one D_Q-channel. The D_Q-channel shall be mapped onto a packet mode IPC as provided by the physical adaptation function.
- one U_Q-channel. The U_Q-channel number ONE shall be mapped to the corresponding IPC with an information transfer rate of 64 kbit/s as provided by the physical adaptation function.

NOTE - A PINX may additionally support the mapping of a single instance of the Q reference point with more than one U_Q-channel onto a single interface at the C reference point. In this case channel allocation and the numbering of U_Q-channels are implementation matters and not specified in this International Standard.

8.2.2 Bearer conditioning for the D_Q-channel

The signalling carriage mechanism (Layer 2) on a D_Q-channel shall use a subset of the procedures of ITU-T Rec. Q.920 including annex A and ITU-T Rec. Q.921 including annex J (Data Link Layer procedures) within the user information field of UUS3. A single Data Link Layer frame shall be conveyed in a single User-User information element in a USER INFORMATION message.

The procedures in annex A of ITU-T Rec. Q.920 and annex J of ITU-T Rec. Q.921 shall apply with the following exceptions:

- The SM/SREJ option, defined in annex E of ITU-T Rec. Q.921, shall not apply.
- The Data Link Layer monitor function procedure shall not apply.
- The following Data Link Layer commands and responses shall not apply: Un-numbered Information command and Exchange Identification command/response. Following from this, only the following Data Link Layer commands and responses shall apply: Information command, Set Asynchronous Balanced Mode Extended command, Disconnect command, Receive Ready command/response, Reject command/response, Receive Not Ready command/response, and Un-numbered Acknowledgement response, Disconnect Mode response and Frame Reject response.
- The Data Link Layer frame shall neither contain a starting flag nor a closing flag. The length of a Data Link Layer frame can be calculated using the length indicator of the Layer 3 User-User information element in the USER INFORMATION message.
- The Data Link Layer frame shall not contain the FCS field.
- The maximum number of octets in an information field (N 201) shall have the value 125 octets.

The service primitives between the Data Link Layer and the Physical Layer shall be interpreted as follows:

- The Physical Layer condition “connected” shall apply when the pair of IPCs has been successfully established. The Physical Layer condition “disconnected” shall apply when no IPC is available for use.
- The activate-request/indication primitives and deactivate-request/indication primitives shall be mapped to the establishment and clearing of pairs of IPCs.
- The data-request/indication primitives shall be mapped to the request for sending a USER INFORMATION message and to the indication that a USER INFORMATION message has arrived.

9 IPC control functions

9.1 IPC establishment

A call request for establishment of a pair of IPCs is initiated by a Scenario Management. A request for establishment of a pair of IPCs shall result in a Basic Call request according to ITU-T Rec. Q.931 and a UUS3 request according to ITU-T Rec. Q.957.1 from the Calling PINX to the public ISDN.

NOTE 1 - The use of UUS3 with a maximum length of only 32 octets user information is outside the scope of this International Standard.

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NOTE 2 - Any supplementary service of the intervening ISDN affecting the continuity of the pair of IPCs should not be used.

Selection of appropriate codepoints for the bearer capability, high layer compatibility and low layer compatibility information elements is an implementation matter. However, the selection shall use codepoints that provide a bearer capability suitable for the support of PISN basic services as specified in ISO/IEC 11574.

9.2 IPC clearing

Clearing of an established pair of IPCs shall be performed according to ITU-T Rec. Q.931 and may be initiated by the PINXs on either side of the pair of IPCs. Clearing shall only occur when the related PISN call(s) and/or inter-PINX Layer 3 signalling connection(s) have been cleared already.

NOTE - Whether the pair of IPCs is cleared should be determined taking into account, among other criteria, the delay time for an IPC re-establishment.

10 IPL control functions

10.1 Static pre-conditions for IPL establishment

Each PINX has at least to know:

- that its peer exists and the corresponding PISN number used for IPC establishment;
- that UUS3 scenario applies.

10.2 IPL establishment

IPL establishment is accomplished by establishing a pair of IPCs in accordance with 9.1 and allocating channels at the Q reference point in accordance with 8.2.1.

10.3 Transfer of inter-PINX signalling Layer 2 information

After the pair of IPCs has been established, i.e. after the public ISDN call is in state Active and a UUS3 request has been accepted, the Calling and Called PINXs shall be able to exchange inter-PINX Layer 2 signalling information. The inter-PINX Layer 2 frames shall be embedded in User-User information elements of USER INFORMATION messages. The protocol discriminator of the User-User information element shall be set to value ”User-specific protocol”.

After answer, in each direction, a burst capability of sending N USER INFORMATION messages is immediately available, where N initially equals the value of the burst parameter X. The value of N shall be decremented by the sending PINX by one for every USER INFORMATION message and incremented by Y at regular intervals of T. The value of N shall be limited to a maximum of X.

The values of T, X and Y are defined in ITU-T Rec. Q.957.1.

10.4 Use of message segmentation

The maximum size of the user information field inside the User-User information element is 128 octets.

NOTE - The signalling protocol used in the D_Q-channel may need to employ segmentation and reassembly in order to be accommodated in the user information field of a Layer 2 frame conveyed in the User-User information element.

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Annex A

(normative)

Implementation Conformance Statement (ICS) Proforma

A.1 Introduction

The supplier of an implementation which is claimed to conform to this International Standard shall complete the Implementation Conformance Statement (ICS) proforma in clause A.3.

A completed ICS proforma is the ICS for the implementation in question. The ICS is a statement of which capabilities and options of the protocol have been implemented. The ICS can have a number of uses, including use:

- by a protocol implementor, as a check-list to reduce the risk of failure to conform to the standard through oversight;
- by the supplier and acquirer (or potential acquirer) of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard ICS proforma;
- by the user (or potential user) of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking cannot be guaranteed, failure to interwork can often be predicted from incompatible ICS);
- by a protocol tester, as the basis for selecting appropriate tests against which to asses the claim for conformance of the implementation.

A.2 Instructions for completing the ICS proforma

A.2.1 General structure of the ICS proforma

The ICS proforma is a fixed-format questionnaire divided into subclauses each containing a group of individual items. Each item is identified by an item number, the name of the item (question to be answered) and the reference(s) to the clause(s) that specifies (specify) the item in the main body of this International Standard.

The ”Status” column indicates whether an item is applicable and, if so, whether support is mandatory or optional. The following terms are used:

m	mandatory (the capability is required for conformance to the protocol);
o	optional (the capability is not required for conformance to the protocol, but if the capability is implemented, it is required to conform to the protocol specifications);
o.<n>	optional, but support of at least one of the group of options labelled by the same numeral <n> is required;
x	prohibited;
c.<cond>	conditional requirement, depending on support for the item or items listed in condition <cond>;
<item>:m	simple conditional requirement, the capability being mandatory if item number <item> is supported, otherwise not applicable;
<item>:o	simple conditional requirement, the capability being optional if item number <item> is supported, otherwise not applicable.

Answers to the questionnaire items are to be provided either in the “Support” column, by simply marking an answer to indicate a restricted choice (Yes or No) or in the “Not Applicable” column (N/A).

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A.2.2 Additional information

Items of additional information allow a supplier to provide further information intended to assist the interpretation of the ICS. It is not intended or expected that a large quantity will be supplied, and a ICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations.

References to items of additional information may be entered next to any answer in the questionnaire, and may be included in items of exception information.

A.2.3 Exception information

It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirements. No pre-printed answer will be found in the Support column for this. Instead, the supplier is required to write into the Support column an x.<i> reference to an item of exception information, and to provide the appropriate rationale in the exception item itself.

An implementation for which an exception item is required in this way does not conform to this International Standard. A possible reason for the situation described above is that a defect in the Standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

A.3 ICS Proforma for PINX implementation

A.3.1 Implementation identification

Supplier	
Contact point for queries about the ICS	
Implementation name(s) and version(s)	
Other information necessary for full identification, e.g. name(s) and version(s) for machines and/or operating systems; system name(s)	

Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

The terms name and version should be interpreted appropriately to correspond with a supplier's terminology (e.g. type, series, model).

A.3.2 Implementation summary

Protocol version	1.0
Addenda implemented (if applicable)	
Amendments implemented	
Have any exception items been required (see A.2.3)?	No [ ] Yes [ ] (The answer Yes means that the implementation does not conform to this International Standard)

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A.3.3 Procedures

Item	Name of item	Reference	Status	N/A	Support
A1	Support of ISDN primary rate access interface (1544 kbit/s)	8.1	o.1		Yes [ ] No [ ]
A2	Support of ISDN primary rate access interface (2048 kbit/s)	8.1	o.1		Yes [ ] No [ ]
A3	Support of ISDN basic access interface	8.1	o.1		Yes [ ] No [ ]
A4	Support of ITU-T Recs. Q.920 / Q.921, Q.931 and Q.957.1	8.1	m		Yes [ ]
A5	Support of physical adaptation for ISDN primary rate access interface (1544 kbit/s)	8.1.1	A1:m	[ ]	Yes [ ]
A6	Support of physical adaptation for ISDN primary rate access interface (2048 kbit/s)	8.1.2	A2:m	[ ]	Yes [ ]
A7	Support of physical adaptation for ISDN basic access interface	8.1.3	A3:m	[ ]	Yes [ ]
A8	Support of channel allocation	8.2.1	m		Yes [ ]
A9	Support of bearer conditioning for the D_Q-channel	8.2.2	m		Yes [ ]
A10	IPC control functions	9	m		Yes [ ]
A11	IPL control functions	10	m		Yes [ ]

A.3.4 Coding

Item	Name of item	Reference	Status	N/A	Support
B1	Sending of protocol discriminator value 0 of the User-User information element	10.3	m		Yes [ ]
B2	Receipt of protocol discriminator value 0 of the User-User information element	10.3	m		Yes [ ]

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