Annex A

User side and network side SDL diagrams

(This annex forms an integral part of this Specification)

This annex includes overview and detailed SDL diagrams which show Q.931 protocol control for circuits-switched basic calls. In the event of conflict between these diagrams and the text of clause 5, the text should be the prime source. Similarly, in the event of conflict between overview SDL and detailed SDL diagrams, the detailed SDL diagrams should be the prime source.

SDL diagrams have not been reproduced. Refer to ITU-T Recommendation Q.931 for details.

Annex B
Compatibility and address checking

(This annex forms an integral part of this Specification)

B.1 Introduction

This annex describes the various compatibility and address checks which should be carried out to ensure that best match of user and network capabilities is achieved on a call within an ISDN.

This annex also covers interworking with existing networks.

Three different processes of checking shall be performed:

i) at the user-to-network interface on the calling side (see B.2);

ii) at the network-to-user interface on the called side (see B.3.2);

and iii) user-to-user (see B.3.3).

NOTE – In this context and throughout this annex the term "called user" is the endpoint entity which is explicitly addressed. This may be an addressed interworking unit (IWU); see the I.500-Series Recommendations. For details on the coding of the information required for compatibility checking see Annex I.

B.2 Calling side compatibility checking

At the calling side, the network shall check that the bearer service requested by the calling user in the Bearer capability information element matches with the bearer services provided to that user by the network. If a mismatch is detected, then the network shall reject the call using one of the causes listed in 5.1.5.2.

Network services are described in Recommendations I.230 [47] and I.240 [48] as bearer services and teleservices, respectively.

B.3 Called side compatibility and address checking

In this subclause, the word "check" means that the user examines the contents of the specified information element.

B.3.1 Checking of addressing information

If an incoming SETUP message is offered with addressing information (i.e. either DDI or sub-addressing or the appropriate part of the called party number), the following actions will occur:

a) If a number or sub-address is assigned to a user, then the information in a Called party number or Called party subaddress information element of the incoming call shall be checked by the user against the corresponding part of the number assigned to the user or the user's own sub-address. In case of a mismatch, the user shall ignore the call. In the case of match, the compatibility checking described in B.3.2 through B.3.3 will follow.

b) If a user has no assigned number or sub-address, then the Called party number and Called party subaddress information element shall be ignored. Then, compatibility checking described in B.3.2 and B.3.3 will follow.

NOTES

1 According to user's requirements, compatibility checking can be performed in various ways from the viewpoint of execution order and information to be checked, e.g. first assigned number/sub-address and then compatibility or vice versa.

2 If an incoming call, offered with addressing information, is always to be awarded to the addressed user, all users connected to the same passive bus should have an assigned number or sub-address.

B.3.2 Network-to-user compatibility checking

When the network is providing a bearer service at the called side, the user shall check that the bearer service offered by the network in the Bearer capability information element matches the bearer services that the user is able to support. If a mismatch is detected, then the user shall either ignore or reject the offered call using cause No. 88, *incompatible destination* (see 5.2.2).

B.3.3 User-to-user compatibility checking

The called side terminal equipment shall check that the content of the Low layer compatibility information element is compatible with the functions it supports.

The Low layer compatibility information element (if available) shall be used to check compatibility of low layers (e.g. from layer 1 to layer 3, if layered according to the OSI model).

NOTE – The Bearer capability information element is also checked (see B.3.2). Therefore, if any conflict from duplication of information in the Bearer capability and the Low layer compatibility information elements is detected, this conflict shall be resolved according to Annex I, e.g. the conflicting information in the Low layer compatibility information element shall be ignored.

If the Low layer compatibility information element is not included in an incoming SETUP message, the Bearer capability information element shall be used to check the compatibility of low layers.

The called terminal equipment may check the High layer compatibility information element (if present) as part of user-touser compatibility checking procedures, even if the network only supports bearer services.

If a mismatch is detected in checking any of the information elements above, then the terminal equipment shall either ignore or reject the offered call using cause No. 88, *incompatible destination* (see 5.2.2).

B.3.4 User action tables

Tables B.1/B, B.2/B and B.3/B show the action which shall be carried out as a result of compatibility checking with the calling user's request for a bearer service and/or teleservice.

TABLE B.1/B

Bearer capability compatibility checking

BC mandatory info element	Point-to-point data link (Note 1)	Broadcast data link (Note 1)	
Compatible	Proceed	Proceed	
Incompatible	Reject (5.2.5.1)	Ignore [5.2.5.1 a)] (Note 2)	Reject [5.2.5.1 b)] (Note 2)

TABLE B.2/B

Low layer and high layer compatibility checking – Compatibility assured with the available description of the call

LLC/HLC Compatibility assured	Point-to-point data link (Note 1)		Broadcast data link (Note 1)		
Compatible	Accept		Accept		
Incompatible	Reject (5.2.5.1)	Attempt low layer compatibility negotiation (Annex J)	Ignore [5.2.5.1 a)] (Note 2)	Reject [5.2.5.1 b)] (Note 2)	Attempt low layer compatibility negotiation (Annex J)

TABLE B.3/B

Low layer and high layer compatibility checking –
Compatibility not assured with the available description of the call

LLC/HLC Compatibility not assured	Point-to-point data link (Note 1)		Broadcast data link (Note 1)	
HLC or LLC Present	Accept or reject (Note 3)	Attempt low layer compatibility negotiation (Annex J)	Accept or reject (Note 3)	Attempt low layer compatibility negotiation (Annex J)

NOTES to Tables B.1/B, B.2/B and B.3/B

1 For broadcast data link terminal equipment which is explicitly addressed using sub-addressing or the appropriate part of the called party number, the point-to-point column in the above table shall be used.

2 When a terminal equipment on a broadcast data link is incompatible, an option of "ignore or reject" is permitted (see 5.2.2). 3 Some terminal equipment on this interface may understand the High layer compatibility or Low layer compatibility information elements and would reject the call if incompatible.

B.4 Interworking with existing networks

Limitations in network or distant user signalling (e.g. in the case of an incoming call from a PSTN or a call from an analogue terminal) may restrict the information available to the called user in the incoming SETUP message. A called user should accept limited compatibility checking (e.g. without the High layer compatibility information element) if a call is routed from an existing network which does not support High layer compatibility information element transfer.

In cases where the network cannot provide all incoming call information, or where the network is not aware of the existence or absence of some service information (such as a compatibility information), the incoming SETUP message includes a Progress indicator information element, containing progress indicator No. 1, *call is not end-to-end ISDN; further call progress information may be available in band*, or No. 3, *origination address is non-ISDN* (see Annex G). The terminal equipment receiving a SETUP with a Progress indicator information element shall modify its compatibility checking, the terminal equipment should regard the compatibility as successful if it is compatible with the included information, which as a minimum, will be the Bearer capability information element. A terminal equipment expecting information in addition to the Bearer capability information element in a full ISDN environment need not reject the call if such information is absent, but a Progress indicator information element is included.

Annex C
Transit network selection

(This annex forms an integral part of this Specification)

This annex describes the processing of the Transit network selection information element.

C.1 Selection not supported

Some networks may not support transit network selection. In this case, when a Transit network selection information element is received, that information element is processed according to the rules for unimplemented non-mandatory information elements (see 5.8.7.1).

C.2 Selection supported

When transit network selection is supported, the user identifies the selected transit network(s) in the SETUP message. One Transit network selection information element is used to convey a single network identification.

The user may specify more than one transit network. Each identification is placed in a separate information element. The call would then be routed through the specified transit networks in the order listed in the SETUP. For example, a user lists networks A and B, in that order, in two Transit network selection information elements within a SETUP message. The call is first routed to network A (either directly or indirectly), and then to network B (either directly or indirectly), before being
delivered.

As the call is delivered to each selected network, the corresponding transit selection may be stripped from the call establishment signalling, in accordance with the relevant internetwork signalling arrangement. The Transit network selection information element(s) is/are not delivered to the destination user.

Only one Transit network selection information element may be used in a single SETUP message.

When a network cannot route the call because the route is busy, the network shall initiate call clearing in accordance with 5.3 with cause No. 34, *no circuit/Bhannel available*.

If a network does not recognize the specified transit network, the network shall initiate call clearing in accordance with 5.3, with cause No. 2, *no route to specified transit network*. The diagnostic field shall contain a copy of the contents of the Transit network selection information element identifying the unreachable network.

A network may screen all remaining Transit network selection information elements to

a) avoid routing loops; or ensure an appropriate business relationship exists between selected networks; or

b) ensure compliance with national and local regulations.

If the transit network selection is of an incorrect format, or fails to meet criteria a), b) or c), the network shall initiate call clearing in accordance with 5.3, with cause No. 91, *invalid transit network selection*.

When a user includes the Transit network selection information element, pre-subscribed default Transit network selection information (if any) is overridden.

Annex D
Extensions for symmetric call operation

(This annex forms an integral part of this Specification)

Symmetric call procedures apply to private networks and are not currently implemented. This annex has not been reproduced.

Annex E
Network specific facility selection
(This annex forms an integral part of this Specification)

Symmetric call procedures are not currently implemented. This annex has not been reproduced.

Annex F
D-channel backup procedures

(This annex forms an integral part of this Specification)

F.0 Foreword

The procedure defined in this annex can be used when non-associated signalling is applied to multiple primary rate access arrangements. This feature can be provided on a subscription basis and is network dependent.

F.1 General

In associated signalling, the D-channel signalling entity can only assign calls to channels on the interface containing the D-channel. When the D-channel signalling entity can assign calls to channels on more than one interface (including the one containing the D-channel), this is called non-associated signalling. Figure F.1 is an example of associated signalling used on each of the three interfaces between a user (e.g. a PABX) and a network. Replacing associated signalling with non-associated signalling on these interfaces results in the example shown in Figure F.2.

When non-associated signalling is employed, the reliability of the signalling performance for the ISDN interfaces controlled by the D-channel may be unacceptable. To improve the reliability, a D-channel backup procedure employing a standby D-channel is necessary. The next subclause describes the backup procedure which is optional for end-points that use non-associated signalling.

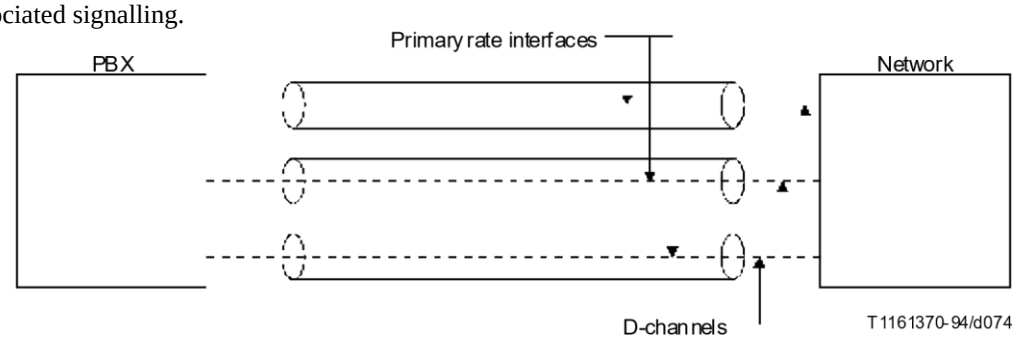


FIGURE F.1/Q.931

Example of associated signalling on each of the three primary rate interfaces

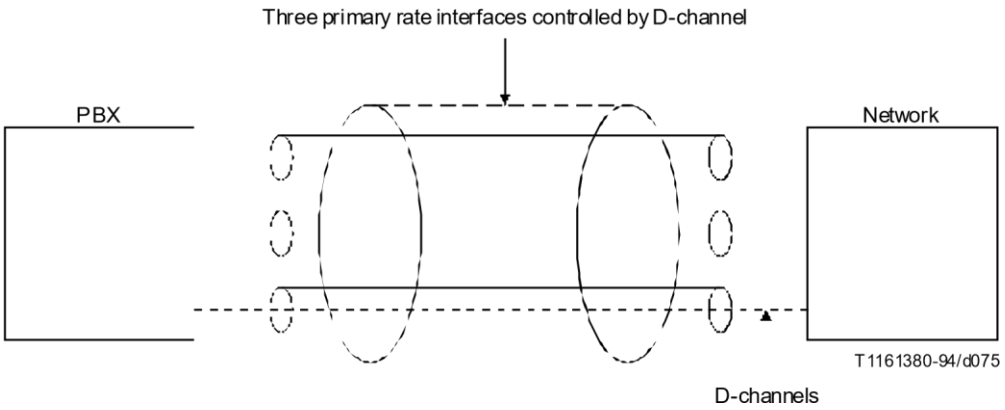


FIGURE F.2/Q.931

Example of non-associated signalling controlling three primary rate interfaces

F.2 D-channel backup procedure

F.2.1 Role of each D-channel

When two or more interfaces connect a network and a user, a primary D-channel (labelled “one”) is always present on one interface. On a different interface, a secondary D-channel (labelled “two”) is present that can also send signalling packets. Figure F.3 shows the addition of a secondary (i.e. backup) D-channel to the arrangement shown in Figure F.2. D-channel one is used to send signalling packets across the user-network interface for multiple interfaces including the interface containing D-channel two. D-channel two is in a standby role and is active at layer 2 only. All SAPI groups (e.g. 0, 16 and 63) are alive and can send packets. At periodic intervals determined by the appropriate layer 2 timer associated with SAPI 0, a link audit frame will be sent on the point-to-point signalling link with DLCI = 0 of D-channel two. Under normal conditions, unless blocked by a maintenance command, the network will attempt to maintain D-channel two in the Link Established state.

Since D-channel two is in a standby role, load sharing between D-channels one and two is not possible. Furthermore, D-channel two can not serve as a B-channel when it is in a standby role. Lastly, D-channel two can only back up the signalling functions provided by D-channel one and not some other D-channel on a different interface.

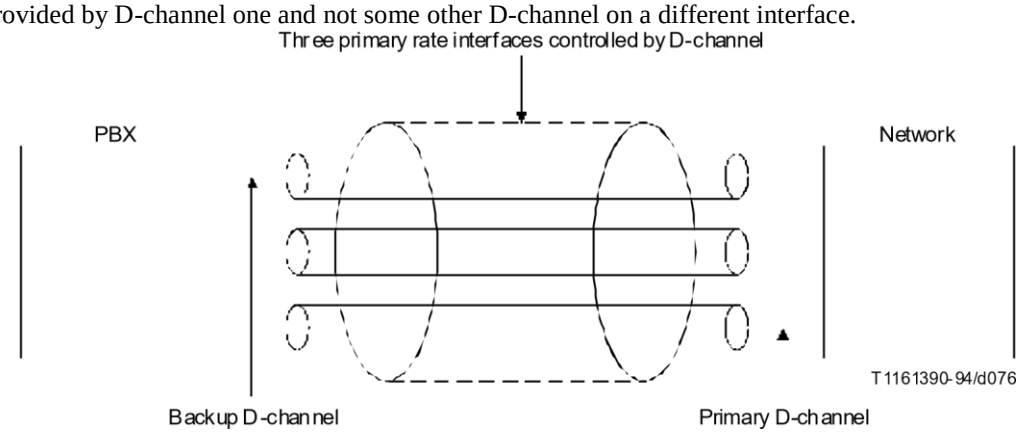


FIGURE F.3/Q.931

Example of non-associated signalling with backup D-channel controlling three primary rate interfaces

F.2.2 Switchover of D-channels

Failure of D-channel one is determined by the receipt of a DL-RELEASE indication primitive from the data link layer. Changeover is initiated immediately. There are no retries. Otherwise, it is assumed that D-channel one has failed.

Two states are defined for any D-channel in a backup arrangement. A D-channel is termed out-of-service when layer 2 remains in the TEI-assigned state, after being periodically requested by layer 3 to establish multiple-frame operation. A D-channel is termed maintenance busy when layer 2 is held in the TEI-assigned state by layer 3. While in the maintenance busy condition, the response to an invitation for link establishment is met with the transmission of a DM (Disconnected Mode).

The standby D-channel can be manually blocked by a maintenance command in the network. It will be in an out-of service state until unblocked.

When the D-channel one has failed and if D-channel two is not in an out-of-service condition, the layer 3 shall place D-channel one in a maintenance busy condition, start timer T321 and then issue a DL-ESTABLISH request primitive to re-initialize SAPI 0 link 0 of D-channel two. D-channel one remains in maintenance busy condition until D-channel two becomes the active channel. While in th is state, an invitation for link establishment will be responded to with the transmission of a DM (Disconnected Mode). Upon receipt of this primitive, the data link layer issues an SABME command. Timer T200 is started. The end receiving the SABME command on D-channel two follows the remainder of the Q.921 procedures for establishing logical link with DLCI = 0. The link is reinitialised even though it may already be in the Link Established state.

Once the logical link with DLCI = 0 in D-channel two is in the Link Established state, the procedure to establish layer 3 call control signalling can begin on the link.

To establish the backup D-channel for carrying call control signalling, layer 3 should issue an appropriate layer 3 message (e.g. a STATUS ENQUIRY on stable call reference numbers). A STATUS ENQUIRY message will be sent immediately for all calls in the active state. If there are no active calls a RESTART is sent. Once a response to that layer 3 message is received, D-channel two is declared to be the active D-channel, normal layer 3 call control signalling may proceed, timer T321 is stopped, and D-channel one is moved to the out-of-service condition. If the maintenance busy timer T321 expires before a response is received to the layer 3 message, D-channel one is moved to the out-of-service condition and an attempt is made to establish the logical link with DLCI = 0 on D-channel one and D-channel two.

When moved to the out-of-service condition after a changeover the network will attempt to establish the link by periodically sending an SABME. When the link is re-established the new D-channel two is placed in the standby state.

If the logical link with DLCI = 0 of both D-channel one and D-channel two are initialized simultaneously, the designated primary shall be chosen as the D-channel for carrying call control signalling. The designated primary D-channel is agreed upon at subscription time by both sides of the interface.

After a switchover, old D-channel two becomes the new D-channel one and old D-channel one becomes the new D-channel two.

Upon completion of appropriate maintenance activity to D-channel two, the logical links for SAPI = 0 and 63 are made active at layer 2 and the D-channel is removed from the out-of-service condition.

D-channels may only be switched again by a failure of D-channel one or a routing or maintenance request from a peer entity.

Annex G
Use of progress indicators
(This annex forms an integral part of this Specification)

This annex describes the use of the different progress indicator values defined in 4.5.22. Examples of use are given.

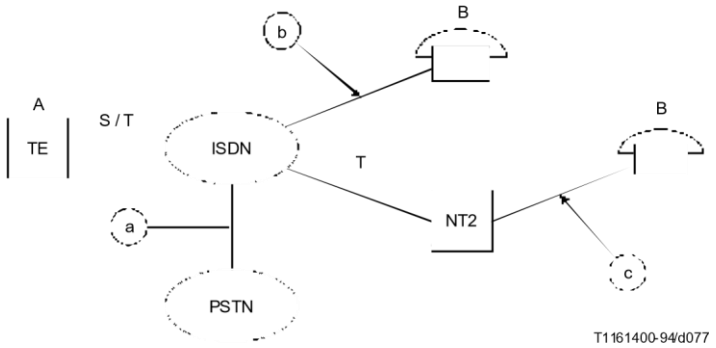
- **Progress indicator No. 1** – Indicates that interworking with a non-ISDN has occurred within the network or networks through which the call has traversed.
- **Progress indicator No. 2** – Indicates that the destination user is not ISDN.
- **Progress indicator No. 3** – Indicates that the origination user is not ISDN.
- **Progress indicator No. 4** – Indicates that a call which had left the ISDN has returned to the ISDN at the same point it had left due to redirection within the non-ISDN. This progress indicator would be employed when a prior Q.931 message resulted in a progress indicator No. 1 (*call is not end-to-end ISDN*), being delivered to the calling user.

The use of progress indicators Nos. 1, 2 and 3 is exemplified in the following. Three interworking situations are identified in the figure below:

a) interworking with another network;

b) interworking with a non-ISDN user connected to ISDN;

c) interworking with non-ISDN equipment within the calling or called user's premises.



As regards calls from A the following applies: case a) – progress indicator No. 1 sent to A;

case b) – progress indicator No. 2 sent to A; case c) – progress indicator No. 2 sent to A

(location sub-field = private network). As regards calls towards A the following applies:

case a) – progress indicator No. 1 sent to A; case b) – progress indicator No. 3 sent to A;

case c) – progress indicator No. 3 sent to A (location sub-field = private network).

The use of progress indicator No. 4 is exemplified in the following scenarios associated with the Call Forwarding supplementary service. If a call is originated from user A to user B, then as stated above, in the interworking cases b) and c) (see figure), progress indicator No. 2 shall be sent to user A to indicate that interworking has occurred. If subsequently the call is forwarded from user B to user C, and user C is an ISDN user, progress indicator No. 4 shall be sent to user A. The use of progress indicator No. 8, *in-band information or appropriate pattern now available*, is described in clause 5.

Annex H
Message segmentation procedures

(This annex forms an integral part of this Specification)

Message segmentation is not currently implemented. This annex has not been reproduced.

Annex I
Low layer information coding principles

(This annex forms an integral part of this Specification)

I.1 Purpose

This annex describes principles that shall be used when the calling user specifies information during call set-up regarding low layer capabilities required in the network and by the destination terminal.

NOTE – In this context and throughout this annex the term "called user" is the endpoint entity which is explicitly addressed. This may be an addressed interworking unit (IWU) (see I.500-Series Recommendations [51] and Recommendation X.31 [14] case A).

I.2 Principles

I.2.1 Definitions of types of information

There are three different types of information that the calling ISDN user may specify during call set-up to identify low layer capabilities needed in the network and by the destination terminal:

a) **type I information** is information about the calling terminal which is only used at the destination end to allow a decision regarding terminal compatibility. An example would be modem type. This information is encoded in octets 5 to 7 of the Low layer compatibility information element;

b) **type II information** is the selection of bearer service from the choices of bearer services offered by the network to which the calling user is connected. This type of information is present even if no interworking occurs. An example is unrestricted digital information (UDI). This information is coded in

   i) octets 3 and 4 of the Bearer capability information element when the transfer mode required by the calling user is circuit mode;

   ii) octets 3, 4, 6 and 7 of the Bearer capability information element when the transfer mode required by the calling user is packet mode;

c) **type III information** is information about the terminal or intended call which is used to decide destination terminal compatibility and possibly to facilitate interworking with other ISDNs or other dedicated networks. An example is A-law encoding. This information is encoded in octet 5 of the Bearer capability information element.

I.2.2 Examination by network

Type I information is user-to-user (i.e. not examined by network) while both types II and III should be available for examination by the destination user and the network. The Low layer compatibility information element is an information element which is not examined by the network while the Bearer capability information element is an information element which is examined by the user and the network.

I.2.3 Location of type I information

Type I information (i.e. terminal information only significant to the called user) shall, when used, be included in the Low layer compatibility information element.

I.2.4 Location of type II and III information

Type II (i.e. bearer selection) information shall be included in the Bearer capability information element. Type III information, when used, is included in the Bearer capability information element. The network may use and modify the information (e.g. to provide interworking). The rationale for the user including some terminal related information in the type III information (interworking related) is shown by the following example.

Normally with UDI, the rate adaption technique chosen is related to the terminal. The specification of a particular rate adaption scheme with a UDI bearer service could allow a compatibility decision by the destination terminal in a purely ISDN situation. However, it could also conceivably be used to allow interworking with a PSTN, assuming that the appropriate functions (i.e. data extraction, modem pool) are available at the interworking unit.

If the rate adaption information is carried in the Low layer compatibility information element, and not in the Bearer capability information element, then interworking by the network providing the bearer capability would not be possible. However, if the rate adaption information is carried in the Bearer capability information element, interworking would be possible.

Hence, there is some terminal related information which may be considered interworking related. The consequence for the calling user of not including such terminal related information in the Bearer capability information element is that the call may not be completed if an interworking situation is encountered.

I.2.5 Relationship between Bearer capability and Low layer capability information elements

There shall be no contradiction of information between the Low layer compatibility and the Bearer capability at the originating side. However, as some Bearer capability code points may be modified during the transport of the call, this principle implies that there should be minimal duplication of information between Bearer capability information element and Low layer compatibility information element.

NOTE – If as a result of duplication, a contradiction occurs between the Bearer capability information element and the Low layer compatibility information element at the terminating side, the receiving entity shall ignore the conflicting information in the Low layer compatibility information element.

The following example, dealing with the specification of the encoding scheme used by the terminal for the speech or 3.1 kHz audio bearer services, shows the consequences of duplication.

It is expected that some ISDNs will support only A-law and some only μ-law, with conversion provided by the μ-law network. (See Recommendation G.711.) If the encoding scheme is specified in both the Bearer capability information element and the Low layer compatibility information element, interworking between two ISDNs might require a change of the user information layer 1 protocol in the Bearer capability information element (e.g. from A-law to μ-law), while the encoding scheme specified in the Low layer compatibility information element would presumably be forwarded to the destination unchanged. Since, to determine compatibility, the destination terminal examines both the Bearer capability information element and the Low layer compatibility information element, it would receive conflicting information regarding the encoding scheme used.

I.3 Information classification

The following are the examples of classifying low layer information currently identified. This information is provided to facilitate understanding of the characteristics of types II and III information.

I.3.1 Examples for speech and 3.1 kHz audio bearer services

a) *Type II information (common to all applications using these bearer services):*

- information transfer capability = speech or 3.1 kHz audio;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s;
- user information layer 1 protocol = A/μ-law.

b) *Type III information for interworking with CSPDN (3.1 kHz audio applications are assumed) – Figure I.1:*

- user information layer 1 protocol = rate adaption + user rate (see Note);

NOTE – Only those profiles conforming to CCITT standardized rate adaption are allowed when only the above information is provided.

c) *Type III information for interworking with PSTN:*

i) voice applications – Figure I.2:

- user information layer 1 protocol = A/μ-law; ii) voice band

data applications – Figure I.3:

- user information layer 1 protocol = A/μ-law.

I.3.2 Examples for 64 kbit/s UDI circuit mode bearer service

a) *Type II information (common):*

- information transfer capability = unrestricted digital information;

– information transfer mode = circuit;

– information transfer rate = 64 kbit/s.

b) *Type III information for interworking with PSPDN (packet applications) – Figure I.4:*

– no type III information is required.

c) *Type III information for interworking with PSTN:*

i) voice applications – Figure I.5:

– no type III information is required;

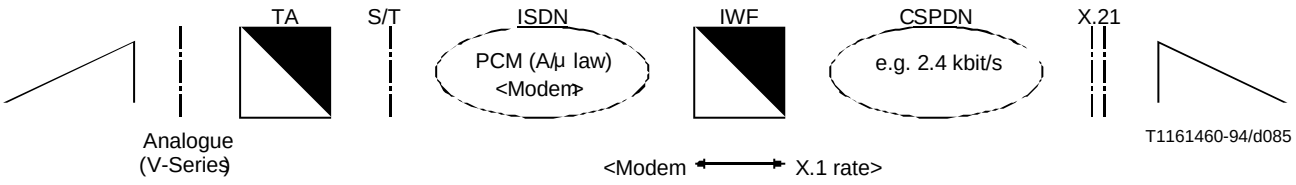
ii) rate-adapted data applications – Figure I.6:

– no type III information is required.

d) Type III information for interworking with PSTN with end-to-end digital connectivity (data applications) – Figure I.7:

– user information layer 1 protocol = rate adaption + user rate (see Note).

NOTE – The profile described in Recommendation I.463 [52] is allowed.



NOTE – Is user rate sufficient to specify the type of modem at IWF?

FIGURE I.1/Q.931

BC = 3.1 kHz audio – Voice fi CSPDN

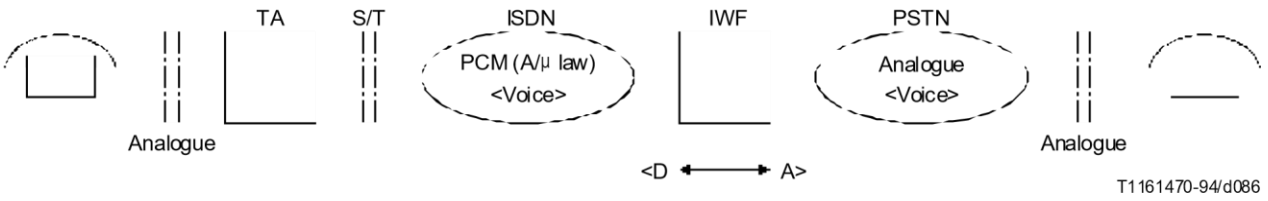


FIGURE I.2/Q.931

BC = 3.1 kHz audio – Voice fi PSTN

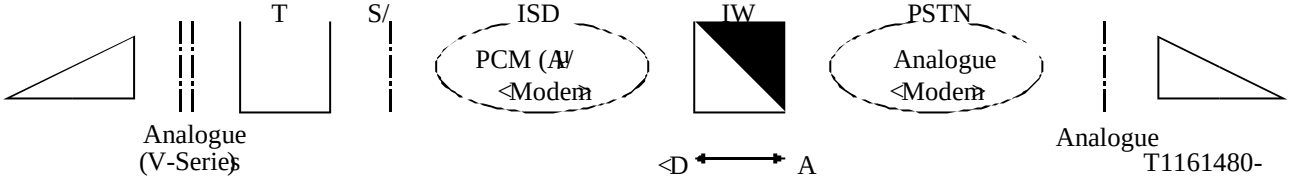


FIGURE I.3/Q.931

BC = 3.1 kHz audio – Voice fi PSTN

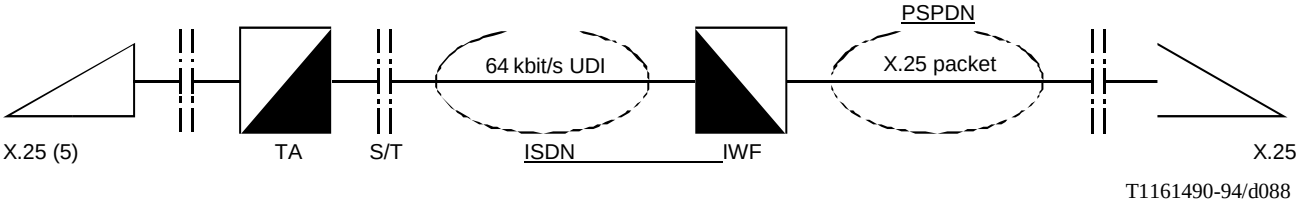


FIGURE I.4/Q.931

BC = 64 kbit/s UDI – Packet application fi PSPDN

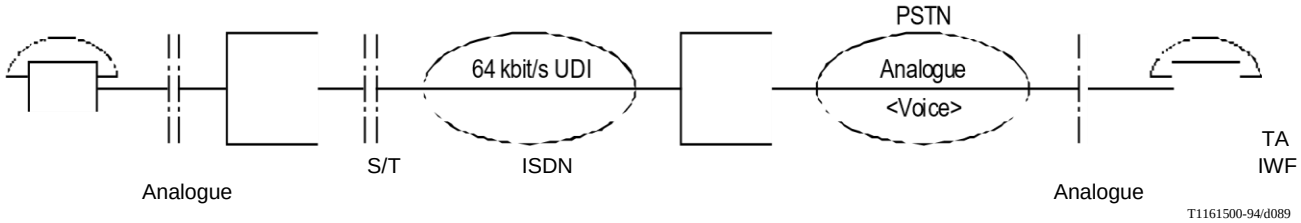


FIGURE I.5/Q.931

BC = 64 kbit/s UDI – Voice fi PSTN

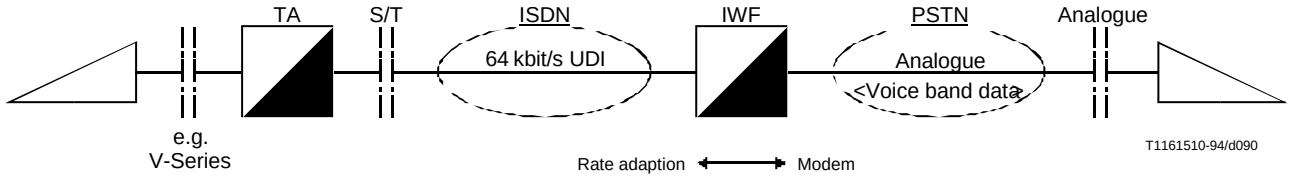


FIGURE I.6/Q.931

BC = 64 kbit/s UDI – Rate adapter data fi PSTN

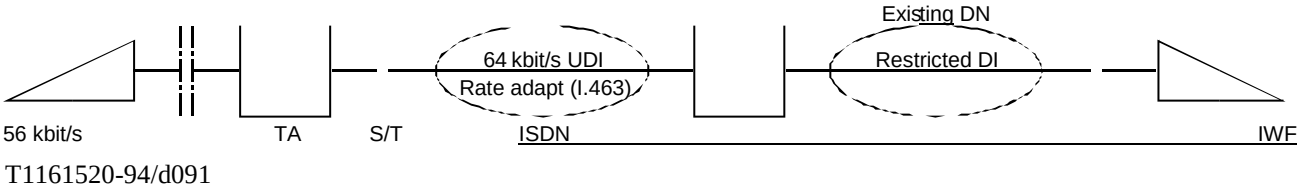


FIGURE I.7/Q.931

BC = 64 kbit/s UDI – Existing digital network

I.3.3 Examples for ISDN virtual-circuit bearer service

a) *Type II information (common):*

- information transfer capability = unrestricted digital information;
- information transfer mode = packet;
- information transfer rate = -- -- --;
- user information layer 1 protocol = rate adaption + user rate (see Note 1);
- user information layer 2 protocol = LAPB (see Note 2);
- user information layer 3 protocol = X.25 [5] packet layer protocol (see Note 2).

NOTES

1 This parameter is included only when user packet information flow is rate adapted. Only those profiles conforming to Recommendation X.31 are allowed when only the above information is provided for layer 1 protocol.

2 Only those profiles conforming to Recommendation X.31 are used. See Figures I.8 to I.10.

b) *Type III information for interworking with PSPDN, CSPDN, PSTN:*

- no type III information is necessary.

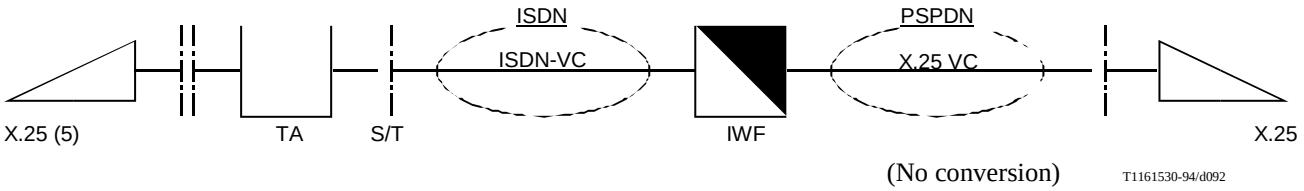


FIGURE I.8/Q.931

BC = ISDN virtual circuit (VC) fi PSPDN

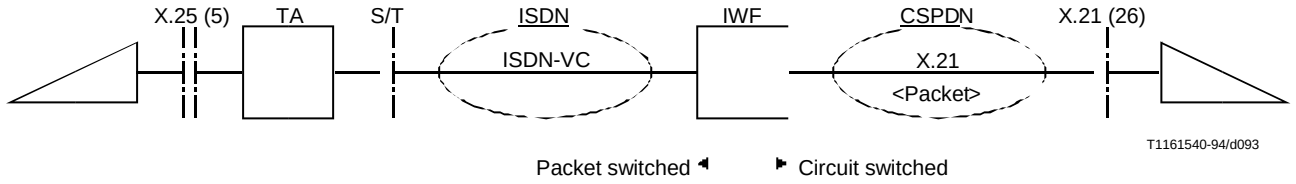


FIGURE I.9/Q.931

BC = ISDN virtual circuit (VC) fi CSPDN

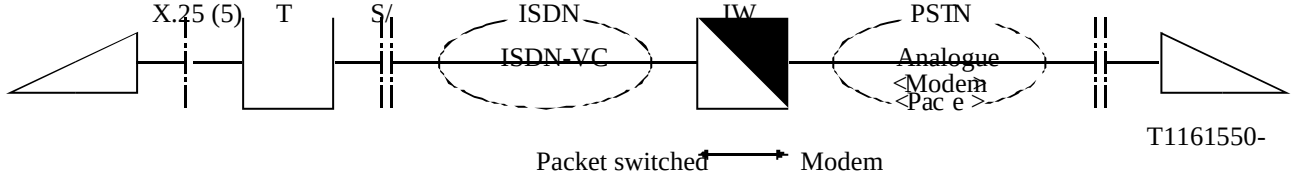


FIGURE I.10/Q.931

BC = ISDN virtual circuit (VC) fi PSTN

I.4 Scenarios outside the scope of ISDN standardization

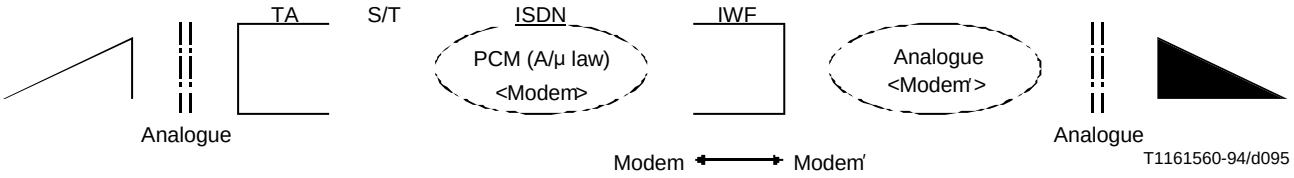
I.4.1 Examples for speech and 3.1 kHz audio bearer services

a) *Type II information (common):*

- information transfer capability = speech or 3.1 kHz audio;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s;
- user information layer 1 protocol = A/μ-law.

b) *Type III information for interworking with PSTN – Voice band data applications – Modem type conversion occurs – Figure I.11:*

- user information layer 1 protocol = rate adaption + user rate + other attributes (if required).



NOTE – This scenario seems to be a part of PSTN services.

FIGURE I.11/Q.931

BC = 3.1 kHz audio – Voice band fi PSTN

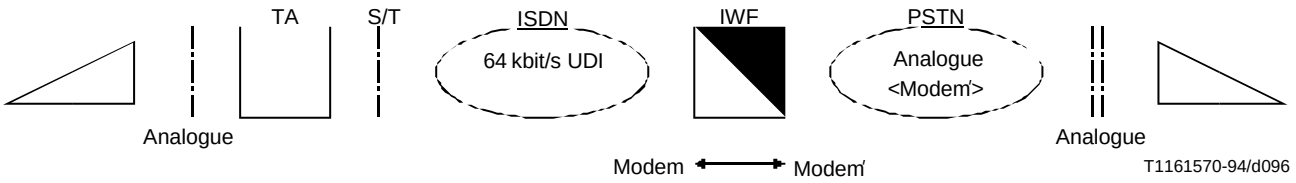
I.4.2 Examples for 64 kbit/s UDI circuit mode bearer services

a) *Type II information (common):*

- information transfer capability = unrestricted digital information;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s.

b) *Type III information for interworking with PSTN – Voice band data applications – Figure I.12:*

- no type III information is required.



NOTE – This scenario seems to be a combination of interworking with PSTN and a part of PSTN services.

FIGURE I.12/Q.931

BC = 64 kbit/s UDI – Voice-band data fi PSTN

Annex J
Low layer compatibility negotiation

(This annex forms an integral part of this Specification)

This annex describes an additional low layer compatibility checking procedure that may be applied by the user.

J.1 General

The purpose of the Low layer compatibility information element is to provide a means which should be used for compatibility checking by an addressed entity (e.g. a remote user or an interworking unit or high layer function network node addressed by the calling user). The Low layer compatibility information element is transferred transparently by an ISDN between the call originating entity (e.g. the calling user) and the addressed entity.

The user information protocol fields of the Low layer compatibility information element indicate the low layer attributes at the call originating entity and the addressed entity. This information is not interpreted by the ISDN and therefore the bearer capability provided by the ISDN is not affected by this information. The call originating entity and the addressed entity may modify the low layer attributes by the negotiation described below if that can be supported by the bearer capability actually provided by the ISDN.

The Low layer compatibility information element is coded according to 4.5.19.

J.2 Low layer capability notification to the called user

When the calling user wishes to notify the called user of its information transfer attributes (type II information – octets 3 and 4) or any low layer protocol (type I information - octets 5 to 7) to be used during the call and not already identified in the Bearer capability information element, then the calling user shall include a Low layer compatibility information element in the SETUP message; this element is conveyed by the network and delivered to the called user. However, if the network is unable to convey this information element, it shall act as described in 5.8.7.1 (unrecognized information element).

J.3 Low layer compatibility negotiation between users

If the negotiation indicator (see 4.5) of the Low layer compatibility information element included in the SETUP message is set to "Out-band negotiation is possible (octet 3a, bit 7)", then one or more of the low layer protocol attribute(s) may be negotiated. In this case, the called user responding positively to the call may include a Low layer compatibility information element in the CONNECT message. This element will be conveyed transparently by the network and delivered to the calling user in the CONNECT message.

NOTE – Only the low layer protocol attributes may be negotiated and therefore the information transfer attributes (octets 3 to 4), if returned by the called user in the CONNECT message, will be identical to the ones received in the Low layer compatibility information element contained in the SETUP message.

If, for any reason, the network is unable to convey this information element, it shall act as described in 5.8.7.1 (unrecognized information element). Users are advised not to include in the Low layer compatibility information element sent from the called user to the calling user, attributes which would have the same value as the ones contained in the Low layer compatibility information element received from the calling party.

J.4 Low layer compatibility negotiation options

The Low layer compatibility information element contains a negotiation indicator which may have one of the following values:

a) *Out-band negotiation not possible (default)* – Then the called user shall not invoke negotiation, according to J.3.

b) *Out-band negotiation possible* – The called user may then invoke low layer compatibility negotiation, as needed, according to J.3.

c) *In-band negotiation possible* – The called user may then invoke low layer compatibility negotiation using the supported in-band negotiation, according to service or application requirements.

d) *Either in-band or out-band negotiation allowed* – The called user may invoke one or the other low layer compatibility negotiation procedures according to its requirements. If the call is end-to-end ISDN, and the out-band low layer compatibility negotiation is supported by both parties, then this method of negotiation is preferred.

J.5 Alternate requested values

If the user wishes to indicate alternative values of low layer compatibility parameters (e.g. alternative protocol suites or protocol parameters), the Low layer compatibility information element is repeated in the SETUP message. Up to four Low layer compatibility information elements may be included in a SETUP message. The first Low layer compatibility information element in the message is preceded by the Repeat indicator information element specifying “priority list for selection”. The order of appearance of the Low layer compatibility information elements indicates the order of preference of end-to-end low layer parameters.

Alternatively, the network may discard the lower priority Low layer compatibility information element(s) depending on the signalling capability of the network.

If the network or called user does not support repeating of the Low layer compatibility information element, and therefore discards the Repeat indicator information element and the subsequent Low layer compatibility information elements, only the first Low layer compatibility information element is used in the negotiation.

The called user indicates a single choice from among the options offered in the SETUP message by including the Low layer compatibility information element in the CONNECT message. Absence of a Low layer compatibility information element in the CONNECT message indicates acceptance of the first Low layer compatibility information element in the SETUP message.

Annex K
Procedures for establishment of bearer connection prior to call acceptance

(This annex forms an integral part of this Specification)

K.1 General

For some applications, it is desirable to allow the completion of the transmission path associated with a bearer service prior to receiving call acceptance. In particular, the completion of the backward direction of the transmission path prior to receipt of a CONNECT message from the called user may be desirable to

a) allow the called user to provide internally-generated tones and announcements that are sent in-band to the calling user prior to answer by the called user; or

b) avoid speech clipping on connections involving an NT2 where delays may occur in relaying the answer indication within the called user equipment.

The procedures described in this annex are only applicable to the speech and 3.1 kHz audio bearer services.

NOTE – The definition of necessary mechanisms (if any) with Signalling System No. 7 to avoid any potential undesirable charging implications remains for further study.

K.2 Procedures

As a network option, completion of the transmission path prior to receipt of a call acceptance indication may be provided in one of three ways:

a) on completion of successful channel negotiation at the destination interface; or

b) on receipt of a message containing an indication that in-band information is being provided; or

c) not at all, i.e. this option is not supported by the network.

When criteria a) is used to determine that transmission path should be established, the network shall connect, as a minimum, the backward side of the transmission path upon receipt of either a CALL PROCEEDING message or an ALERTING message containing an acceptable B-channel indication.

When criteria b) is used to establish the transmission path, the network shall connect, as a minimum, the backward side of the transmission path upon receipt of either an ALERTING message or a PROGRESS message containing progress indicator No. 8, *in-band information or appropriate pattern now available*, or progress indicator No. 1, *call is not end-to-end ISDN; further call progress information may be available in-band*, respectively.

The network providing the early completion of the transmission path in the backward direction may choose to support only one of methods a) or b) above. The network may choose to further restrict which message(s) will result in establishment of the transmission path. These restrictions may be imposed on a per interface basis to provide an administrative means for limiting potential misuse of the early connection capabilities.

Annex L
Optional procedures for bearer service change

(This annex forms an integral part of this Specification)

Bearer service change procedures are not currently implemented. This annex has not been reproduced.