ATIS-1000608.1991(R2012)

Integrated Services Digital Network (ISDN) – Signaling Specification of X.25 Packet-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)

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ATIS-1000608.1991(R2012), *Integrated Services Digital Network (ISDN) – Signaling Specification for X.25 Packet-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)*

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American National Standard
for Telecommunications –

Integrated Services Digital Network (ISDN) – Signaling Specification for X.25 Packet-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)

Secretariat

Exchange Carriers Standards Association

Approved November 6, 1991

American National Standards Institute, Inc.

Abstract

This interface standard was written to provide a set of requirements for user–network signaling to provide packetized data support by an ISDN, while conforming, wherever possible, with the I-Series Recommendations of the International Telegraph and Telephone Consultative Committee (CCITT), and while not compromising the principles of evolution expressed therein. Equipment may be implemented with additional functions and procedures.

This standard presents the procedures at the S, T, or U reference point for B-channel, and D-channel access connection on basic rate interfaces and primary rate interfaces to a Packet Handling (PH) function within the Integrated Services Digital Network (ISDN) to support ISDN virtual circuit service. Procedures at the S, T, or U reference point for B-channel access to a Packet-Switched Public Data Network (PSPDN) are also specified.

Contents

Foreword (This foreword is not part of American National Standard T1.608-1991.)

Digital Subscriber Signaling System No. 1 (DSS1) is a suite of protocols that provides the means for users to invoke the full range of services and capabilities available from the Integrated Services Digital Network (ISDN). The structure of DSS1 is consistent with the seven-layer model described in CCITT Recommendation I.320-1988, *ISDN protocol reference model.* The complete suite of layer 3 DSS1 protocols encompasses a set of several standards, each one addressing its own aspect of the suite. This standard specifies the procedures for establishing, maintaining, and clearing network connections at the ISDN user–network interface in support of X.25 packet-switched calls.

Manufacturers of ISDN user terminals and manufacturers of ISDN switching equipment can apply this standard to the design and development of their products.

This American National Standard was developed over the past several years by Working Group T1S1.2 of Accredited Standards Committee T1–Telecommunications. Many of T1S1.2's participants are also active participants in similar activities of the CCITT. Therefore, this standard is consistent with CCITT Recommendation Q.931-1988, *ISDN user–network interface layer 3 specification.*

This standard contains two annexes, both of which are informative and are not considered part of this standard.

This standard includes the supplement, ANSI T1.608a-1992. In the supplement, two normative annexes are added. (See annex A and annex B in the main standard for the relationship between the annexes in the main standard and those in the supplement.)

Suggestions for improvement of this standard will be welcome. They should be sent to the Exchange Carriers Standards Association, 1200 G Street, NW, Washington, DC 20005.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Telecommunications, T1. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, Accredited Standards Committee T1 had the following members:

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American National Standard
for Telecommunications –

Integrated Services Digital Network (ISDN)– Signaling Specification for X.25 Packet-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS1)

1 Scope, purpose, and application

1.1 Purpose

This interface standard was written to provide a set of requirements for user–network signaling for ISDN support of packetized data transfer, while conforming, wherever possible, with the I-Series Recommendations of the International Telegraph and Telephone Consultative Committee (CCITT), and while not compromising the principles of evolution expressed therein. Equipment may be implemented with additional functions and procedures.

This standard presents the procedures at the S, T, or U reference point for B-channel, and D-channel access connection on basic rate interfaces and primary rate interfaces to a Packet-Handling (PH) function within the Integrated Services Digital Network (ISDN) to support ISDN virtual circuit service. Procedures at the S, T, or U reference point for B-channel access to a Packet-Switched Public Data Network (PSPDN) are also specified.

1.2 Scope

The scope of this standard covers the following procedures at the S, T, or U reference point:

a) Circuit-switched access to Packet-Switched Public Data Network (PSPDN) services – case A.

This standard defines the use of the procedures of ANSI T1.602 and ANSI T1.607, when appropriate, on basic rate interfaces and primary rate interfaces for the establishment and release of circuit-switched calls through ISDN to the access port of PSPDN. These circuit-switched calls may be initiated by the user or the access port of PSPDN. Only the B-channel is used in this instance;

b) Packet-switched access to an ISDN virtual circuit service – case B.

This standard defines the use of the procedures of ANSI T1.602 and ANSI T1.607, when appropriate, on basic rate interfaces and primary rate interfaces for the establishment and release of packet-mode access connections to a packet-handling (PH) function provided within the ISDN. These packet-mode access connections may be initiated by the user or the PH function within the ISDN. B-channels and D-channels may be used in this instance;

c) X.25 LAPB procedures on the B-channel and LAPD procedures on the D-channel, as described in ANSI T1.602. X.25 LAP procedures are not supported in this standard;

d) X.25 packet level procedures on B-channels and D-channels.

NOTE – Alternative methods of access via any bearer channel to Packet-Switched Public Data Networks are for further study.

1.3 Structure

Clause 1 describes the purpose, scope, and structure of this document. Clause 2 lists reference documents. Clause 3 lists definitions helpful in interpreting the specifications. Clause 4 provides an overview of packet-mode call control and defines the control states for case A circuit-switched calls and case B packet-mode access connections. Clause 5 specifies the message functional definitions. Clause 6 specifies the message structure for case A circuit-switched calls and case B packet-mode access connections. Clause 7 specifies the procedures for packet communication at the S, T, or U reference point. Clause 8 specifies the system parameters.

2 Normative references [1)]

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI T1.601-1988, *Telecommunications – Integrated services digital network (ISDN) – ISDN basic access interface for use on metallic loops for application on the network side of NT (layer 1 specification)*

ANSI T1.602-1989, *Telecommunications – Integrated services digital network (ISDN) – Data-link layer signalling specification for application at the user–network interface*

ANSI T1.605-1989, *Telecommunications – Integrated services digital network (ISDN) – Basic access interface for S and T reference points (layer 1 specification)*

ANSI T1.607-1990, *Telecommunications – Integrated services digital network (ISDN) – Layer 3 signaling specification for circuit-switched bearer service for digital subscriber signaling system number 1 (DSS1)*

ANSI X3.4-1986, *Information systems – Coded character set – 7-bit American national standard code for information interchange (7-bit ASCII)*

CCITT Recommendation E.163, *Numbering plan for the international telephone service* [2), 3)]

CCITT Recommendation E.164, *Numbering plan for the ISDN era* [2), 3)]

CCITT Recommendation I.330, *ISDN numbering and addressing principles* [2), 3)]

CCITT Recommendation I.334, *Principles relating ISDN number/subaddresses to the OSI reference model network layer address* [2), 3)]

CCITT Recommendation I.412, *ISDN user–network interfaces – Interface structure and access capabilities* [2), 3)]

CCITT Recommendation I.431, *Primary rate user network interface – Layer 1 specification* [2), 3)]

CCITT Recommendation I.460, *Multiplexing, rate adaption and support of existing interfaces* [2), 3)]

CCITT Recommendation Q.931, *ISDN user–network interface layer 3 specification* [2), 3)]

CCITT Recommendation Q.932, *Generic procedures for the control of ISDN supplementary services* [2), 3)]

CCITT Recommendation T.50, *International alphabet no. 5* [2), 3)]

CCITT Recommendation V.6, *Standardization of data signaling rates for synchronous data transmission on leased telephone-type circuits* [2), 3)]

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1) For additional listings, see ANSI T1.608a-1992 (final pages of this standard).

2) Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

3) With the exception of CCITT Recommendations X.25 and X.200, all of the CCITT Recommendations referenced in this standard were published in the 1988 CCITT Blue Book. CCITT Recommendations X.25 and X.200, when referenced in this standard, refer to the versions that appeared in the 1984 CCITT Red Book. All CCITT Recommendations are available from ANSI.

CCITT Recommendation V.110, *Support of data terminal equipments (DTEs) and V-series type interfaces by an integrated services digital network (ISDN)* [2), 3)]

CCITT Recommendation V.120, *Support by an ISDN of data terminal equipment with V-series type interfaces with provision for statistical multiplexing* [2), 3)]

CCITT Recommendation X.1, *International user classes of services in public data networks and integrated services digital networks (ISDNs)* [2), 3)]

CCITT Recommendation X.25, *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit* [2), 3)]

CCITT Recommendation X.30, *Support of X.21, X.21 bis and X.20 bis based data terminal equipment (DTEs) by an integrated services digital network (ISDN)* [2), 3)]

CCITT Recommendation X.31, *Support of packet mode terminal equipment by an ISDN* [2), 3)]

CCITT Recommendation X.32, *Interface between DTE and DCE for terminals operating in the packet mode and accessing a packet-switched public data network through a public switched telephone network or an ISDN or a circuit-switched public data network* [2), 3)]

CCITT Recommendation X.121, *International numbering plan for public data networks* [2), 3)]

CCITT Recommendation X.200, *Reference model of open systems interconnection (OSI) for CCITT applications* [2), 3)]

CCITT Recommendation X.213, *Network service definition for open systems interconnection (OSI) for CCITT applications* [2), 3)]

CCITT Recommendation X.244, *Procedure for the exchange of protocol identification during virtual call establishment on packet-switched public data networks* [2), 3)]

ISO/IEC 646: 1991, *Information technology – ISO 7-bit coded character set for information interchange* [2)]

ISO 8348/Add. 2: 1987, *Information processing systems – Data communications – Network service definition – Addendum 2: 1988, Network layer addressing* [2)]

3 Definitions

In the context of this standard, the following definitions apply:

3.1 ASCII (American Standard Code for Information Interchange): A 7-bit code for 128 alphanumeric and control characters for the general interchange of information among information processing systems, communications systems, and associated equipment, defined in ANSI X3.4.

3.2 access connection: A connection (using either the B-channel or a logical link on the D-channel) established between the user equipment and a packet-mode handler function, over which packet-mode calls (incoming and outgoing) are established.

3.3 channels: A channel represents a specified portion of the information-carrying capacity of an interface.

3.3.1 B-channel: A 64-kbit/s channel accompanied by timing, intended to carry a wide variety of user information streams, such as voice encoded at 64 kbit/s, data information at bit rates less than or equal to 64 kbit/s, wideband voice encoded at 64 kbit/s, and voice encoded at bit rates less than 64 kbit/s alone or combined with other digital information streams.

3.3.2 D-channel: A 16- or 64-kbit/s channel carrying control and signalling information and, optionally, packetized information and telemetry.

3.3.3 H-channel: A 384-, 1472-, or 1536-kbit/s channel (H0, H10, and H11, respectively) accompanied by timing, intended to carry a wide variety of user information streams, such as fast facsimile, video, high-speed data, high-quality audio, information streams each at rates less than the respective H-channel bit rate which have been rate adapted or multiplexed together, and packet-switched information.

3.4 digital subscriber line: The physical line connecting the network and the user which allows for transmission of digital signals

in accordance with American National Standards. The digital subscriber line may be used, for example, to provide the basic rate interface between the network and user.

3.5 functional group: Sets of functions that may be needed in ISDN user access arrangements. In a particular access arrangement, specific functions in a functional group may or may not be present, and may be performed in one or more pieces of equipment.

3.5.1 network termination 1 (NT1): A functional group that includes functions broadly equivalent to layer 1 (physical) of the OSI reference model. These functions are associated with the proper physical and electromagnetic termination of the network, and include line transmission termination, layer 1 line maintenance functions and performance monitoring, timing, power transfer, layer 1 multiplexing, and interface termination.

3.5.2 network termination 2 (NT2): A functional group that includes functions broadly equivalent to layer 1 and higher layers of the reference model described in CCITT Recommendation X.200. PBXs, local area networks, and terminal controllers are examples of equipment or combinations of equipment that provide NT2 functions. These functions include layer 2 and layer 3 protocol handling, layer 2 and layer 3 multiplexing, switching, concentration, maintenance functions, and interface termination.

3.5.3 terminal endpoint (TE): A functional group that includes functions broadly equivalent to layer 1 and higher layers of the reference model described in CCITT Recommendation X.200. Digital telephones, data terminal equipment, and integrated work stations are examples of equipment (or combination of equipment) that provide these functions. These functions include protocol handling, maintenance functions, interface functions, and connection functions to other equipments.

3.5.4 terminal endpoint 1 (TE1): A functional group that includes functions belonging to the functional group TE, and with an interface that complies with the CCITT ISDN user–network interface recommendations.

3.5.5 terminal endpoint 2 (TE2): A functional group that includes functions belonging to the functional group TE, but with an interface that complies with recommendations other than the CCITT ISDN interface recommendations (e.g., the X-series interface recommendations), or an interface not included in CCITT recommendations.

3.5.6 terminal adapter (TA): A functional group that includes functions broadly belonging to layer 2 and higher layers of the reference model described in CCITT Recommendation X.200 that allow a TE2 terminal to be served by an ISDN user–network interface.

3.6 International Telegraph and Telephone Consultative Committee (CCITT): The CCITT is a permanent organ of the International Telecommunications Union (ITU), a specialized agency of the United Nations since 1948. As the oldest international treaty organization, the ITU traces its formal beginnings to 1865. The CCITT was founded in 1954 for the purpose of promoting and ensuring the operation of international telecommunication systems.

3.7 integrated services digital network (ISDN): Defined as a network, in general evolving from an existing telephony network, which provides end-to-end digital connectivity to support a wide range of both voice and non-voice services. User access to an ISDN is via a limited set of standard multi-purpose interfaces.

3.8 interfaces: A user–network physical interface structure at the S, T, or U reference points containing channels.

3.8.1 primary rate interface: An ISDN user–network interface where the interface structure is composed of multiple B-channels and one D-channel. The bit rate of the D-channel in this structure is 64 kbit/s. When a 1544 kbit/s primary rate interface is provided, the interface structure is 23B+D.

3.8.2 basic rate interface: An ISDN user–network interface where the interface structure is composed of two B-channels and one D-channel, 2B+D. The bit rate of the D-channel in this structure is 16 kbit/s.

3.9 network or network side: The system or equipment on one side of the ISDN user–network interface (basic rate or primary rate) that provides a port through which the user gains access to the telecommunication services offered by the ISDN.

3.10 user or user side: The call control in the user equipment that communicates to the network across the basic or primary rate interface.

3.11 reference point: A conceptual point dividing functional groups in an ISDN user access arrangement. In a specific access arrangement, a reference point may correspond to a physical interface between pieces of equipment, or there may not be any physical interface corresponding to the reference point.

3.11.1 R reference point: The conceptual reference point dividing the TE2 and the TA in a particular ISDN access arrangement.

3.11.2 S reference point: The conceptual reference point dividing the TE1 and the NT2 in a particular ISDN access arrangement.

3.11.3 S/T reference point: The conceptual reference point dividing the TE1 and the NT1 in a particular ISDN access arrangement (in the case where no NT2 functional group is delineated).

3.11.4 T reference point: The conceptual reference point dividing the NT2 and the NT1 in a particular ISDN access arrangement.

3.11.5 U reference point: A conceptual reference point on the network side of the NT1 in a particular ISDN access arrangement.

3.12 symmetry

3.12.1 unidirectional: The condition where the information flow of messages is provided only in one direction.

3.12.2 bidirectional symmetric: The condition where the information flow characteristics provided by the service are the same between two (or more) reference points in the forward and backward directions.

3.12.3 bidirectional asymmetric: The condition where the information flow characteristics provided by the service are different in the two directions.

3.13 outgoing access/incoming access: The ability of a user to originate/terminate data calls via an ISDN.

3.14 access unit (AU): A conceptual unit of an ISDN which provides an interworking function between circuit-switched data transmission services of an ISDN and the packet-switched data transmission services of a Packet-Switched Public Data Network (PSPDN) for both incoming and outgoing calls.

3.15 packet-handling (PH) function: A conceptual part of an ISDN which is used to interpret, process and switch packet-mode data calls. In some implementations, the PH functions logically belonging to the ISDN may reside physically in a node of the Packet-Switched Public Data Network (PSPDN).

3.16 cumulative transit delay: The total transit delay applicable for a data call obtained by summing the individual transit delays of all component portions of the data connection. For each portion involved in a packet-switched data connection, transit delay is defined as the estimated mean transit delay, in milliseconds, that should be matched or surpassed by default length data packets, e.g., 128 octets, when transferred over a virtual circuit.

4 Overview of packet-mode call control

This standard specifies the essential features, procedures, and messages for the establishing, maintaining, and clearing of network connections at the ISDN user–network interface used for packet communication. These procedures are defined in terms of messages exchanged over the D-channel of basic and primary rate interface structures.

The procedures currently described in this standard are for the control of:

a) Case A – circuit-switched calls through ISDN to or from a Packet-Switched Public Data Network (PSPDN) access unit (AU). Only the B-channel is used in this case;

b) Case B – packet-switched access connections to or from an X.25 packet-handling (PH) function provided within the ISDN. B-channels and D-channels may be used in this case.

The procedures specified in this standard apply only to on-demand case A circuit-

switched calls and to on-demand case B packet-mode access connections. Semipermanent case A circuit-switched calls and semipermanent case B packet-mode access connections are established, maintained and cleared via a service order process with the network administration and do not involve D-channel signalling.

NOTES

1 The term *access connection* is used instead of *call* for packet-mode connections because access connections, which exist between the user and the PH function, have local significance while individual virtual calls placed over the access connection have global significance.

2 The term *layer 3* is used for the functions and protocol described in this standard. The terms *data link layer* and *layer 2* are used interchangeably to refer to the layer immediately below layer 3.

The layer 3 procedures apply to the basic rate interface and the primary rate interface structures defined in CCITT Recommendation I.412. They use the functions and services provided by layer 2. The unacknowledged information transfer service is used by layer 3 to provide point-to-multipoint operation as described in 5.2 of ANSI T1.607. The layer 3 procedures request the services of layer 2 and receive information from layer 2 using the primitives defined in ANSI T1.602. These primitives are used to illustrate the communication between the protocol layers and are not intended to specify or constrain implementations.

In this standard, the terms *incoming* and *outgoing* are used to describe the access connection as viewed by the user side of the interface.

The following subclauses define the call states.

The basic call control states that individual case A circuit-switched calls may have are defined in 4.1. The basic access connection control states that individual case B packet-mode access connections may have are defined in 4.2. These definitions do not apply to the state of the interface itself, any attached equipment, the D-channel, the logical links used for signalling on the D channel or the X.25 virtual circuits. Because several connections may exist simultaneously at a user–network interface, and each connection may be in a different state, the state of the interface itself cannot be unambiguously defined. Finally, the global call reference states that may exist for the interface are defined in 4.3.

Detailed description of the procedures for control of case A circuit-switched calls and for control of case B packet-mode access connections are given in clause 7 in terms of:

a) The messages defined in clause 5 that are transferred across the user–network interface; and

b) The information processing and actions that take place at the user side and the network side.

Throughout this standard, references are made to B-channels. For services using H-channels, the references to B-channels should be taken to refer to the appropriate H-channel. Enhancements to support such service are for further study.

4.1 States for case A circuit-switched calls

This subclause defines the basic call control states for case A circuit-switched calls to or from a Packet-Switched Public Data Network (PSPDN) Access Unit (AU). The procedures for call control are given in clause 7.

4.1.1 Call states at the user side of the interface

The states that may exist on the user side of the user–network interface are defined in 2.1.1 of ANSI T1.607 and are identified in table 1.

4.1.2 Call states at the network side of the interface

The call states that may exist on the network side of the user–network interface are defined in 2.1.2 of ANSI T1.607 and are identified in table 1.

4.2 Case B packet-mode access connection states

This subclause defines the basic case B packet-mode access connection control states for access to the ISDN virtual circuit bearer service. The procedures for access connection control are given in clause 7.

Table 1 – Control states for case A and case B

State	State number	Case A	Case B	
		B-channel	D-channel	B-channel
At user side:				
Null state	U0	X	X	X
Call initiated	U1	X		X
Overlap sending	U2	X		
Outgoing call proceeding	U3	X		X
Call delivered	U4	X		
Call present	U6	X	X	X
Call received	U7	X	X	X
Connect request	U8	X	X	X
Incoming call proceeding	U9	X	X	X
Active	U10	X		X
Disconnect request	U11	X	X	X
Disconnect indication	U12	X	X	X
Release request	U19	X	X	X
At network side:				
Null state	N0	X	X	X
Call initiated	N1	X		X
Overlap sending	N2	X		
Outgoing call proceeding	N3	X		X
Call delivered	N4	X		
Call present	N6	X	X	X
Call received	N7	X	X	X
Connect request	N8	X	X	X
Incoming call proceeding	N9	X	X	X
Active	N10	X		X
Disconnect request	N11	X	X	X
Disconnect indication	N12	X	X	X
Release request	N19	X	X	X
Abort	N22	X	X	X
At user side and network side:				
Null	Rest 0	X	X	X
Restart request	Rest 1	X	X	X
Restart	Rest 2	X	X	X

4.2.1 Access connection states at the user side of the interface

The states that may exist on the user side of the user–network interface are defined in this clause.

4.2.1.1 Null state (U0)

No access connection exists.

4.2.1.2 Call initiated (U1)

This state exists for an outgoing access connection, when the user requests access connection establishment from the network.

4.2.1.3 Outgoing call proceeding (U3)

This state exists for an outgoing access connection when the user has received acknowledgment that the network has received all access connection information necessary to effect access connection establishment.

4.2.1.4 Call present (U6)

This state exists for an incoming access connection when the user has received an access connection establishment request but has not yet responded.

4.2.1.5 Call received (U7)

This state exists for an incoming access connection when the user has indicated alerting but has not yet answered.

4.2.1.6 Connect request (U8)

This state exists for an incoming access connection when the user has accepted the access connection and is waiting to be awarded the access connection.

4.2.1.7 Incoming call proceeding (U9)

This state exists for an incoming access connection when the user has sent acknowledgment that the user has received all access connection information necessary to effect access connection establishment.

4.2.1.8 Active (U10)

This state exists for an incoming access connection when the user has received an acknowledgment from the network that the user has been awarded the access connection. This state exists for an outgoing access connection when the user has received an indication that the local network has completed the access connection.

4.2.1.9 Disconnect request (U11)

This state exists when the user has requested the local network to clear the access connection and is waiting for a response.

4.2.1.10 Disconnect indication (U12)

This state exists when the user has received an invitation to disconnect because the network has disconnected the access connection (if any).

4.2.1.11 Release request (U19)

This state exists when the user has requested the network to release the access connection and is waiting for a response.

4.2.2 Access connection states at the network side of the interface

The states which may exist on the network side of the user–network interface are defined in this subclause.

4.2.2.1 Null state (N0)

No access connection exists.

4.2.2.2 Call initiated (N1)

This state exists for an outgoing access connection when the network has received an access connection establishment request but has not yet responded.

4.2.2.3 Outgoing call proceeding (N3)

This state exists for an outgoing access connection when the network has sent acknowledgment that the network has received all access connection information necessary to effect access connection establishment.

4.2.2.4 Call present (N6)

This state exists for an incoming access connection when the network has sent an access connection establishment request but has not yet received a satisfactory response.

4.2.2.5 Call received (N7)

This state exists for an incoming access connection when the network has received an indication that the user is alerting but has not yet received an answer.

4.2.2.6 Connect request (N8)

This state exists for an incoming access connection when the network has received an

answer but the network has not yet awarded the access connection.

4.2.2.7 Incoming call proceeding (N9)

This state exists for an incoming access connection when the network has received acknowledgment that the user has received all access connection information necessary to effect access connection establishment.

4.2.2.8 Active (N10)

This state exists for an incoming access connection when the network has awarded the access connection to the called user. This state exists for an outgoing access connection when the local network has indicated that the access connection has been completed.

4.2.2.9 Disconnect request (N11)

This state exists when the network has received a request from the user to clear the access connection.

4.2.2.10 Disconnect indication (N12)

This state exists when the network has sent an invitation to disconnect the user–network access connection.

4.2.2.11 Release request (N19)

This state exists when the network has requested the user to release the access connection and is waiting for a response.

4.2.2.12 Call abort (N22)

This state exists for an incoming access connection for the point-to-multipoint configuration when the access connection is being cleared before any user has been awarded the access connection.

4.3 States associated with the global call reference

This subclause defines the states that the protocol may adopt using the global call reference. The procedures for use of the global call reference for RESTART are contained in 5.5 of ANSI T1.607.

There is only one global call reference per interface.

4.3.1 Call states at the user side of the interface

The states that may exist on the user side of the user–network interface are defined in this subclause.

4.3.1.1 Null (Rest 0)

No transaction exists.

4.3.1.2 Restart request (Rest 1)

This state exists for a restart transaction when the user has sent a restart request but has not yet received an acknowledgment response from the network.

4.3.1.3 Restart (Rest 2)

This state exists when a request for a restart has been received from the network and responses have not yet been received from all locally active call references.

4.3.2 Call states at the network side of the interface

The states that may exist on the network side of the user–network interface are defined in this subclause.

4.3.2.1 Null (Rest 0)

No transaction exists.

4.3.2.2 Restart request (Rest 1)

This state exists for a restart transaction when the network has sent a restart request but has not yet received an acknowledgment response from the user.

4.3.2.3 Restart (Rest 2)

This state exists when a request for a restart has been received from the user and a response has not yet been received from all locally active call references.

4.4 Applicability of packet-mode call control states

The control states that may exist on the user side and the network side of the user–network interface for case A circuit-switched calls (only the B-channel is used in this case) and for case B packet-mode access connections (B-channels and D-channels may be used in this case) are identified in table 1.

5 Message functional definitions

This clause provides an overview of the message structure, which highlights the functional definition and information content (i.e., semantics) of each message. Each definition includes:

a) A brief description of the message direction and use, including whether the message has:

1) Local significance, i.e., relevant only in the originating or terminating access;

2) Access significance, i.e., relevant in the originating and terminating access, but not in the network;

3) Dual significance, i.e., relevant in either the originating or terminating access and in the network; or

4) Global significance, i.e., relevant in the originating and terminating access and in the network;

b) A table listing the codeset 0 information elements in the order of their appearance in the message (same relative order for all message types). For each information element, the table indicates:

1) The clause of this standard describing the information element;

2) The direction in which it may be sent, i.e., user to network ("u ➡ n"), network to user ("n ➡ u"), or both;

NOTE – The user–network terminology in clause 3 refers to the TE-TE, TE-NT2, and NT2-ET interface structures. Annex D of ANSI T1.607 contains a description of the information element usage for symmetric NT2-NT2 interfaces.

3) Whether inclusion is mandatory ("M") or optional ("O"), with a reference to notes explaining the circumstances under which the information element shall be included;

NOTE – Mandatory means that an information element is always present in a message. Optional information elements include a note specifying the conditions when the element is included.

4) The length of the information element (or permissible range of lengths), in octets, where '*' denotes an undefined maximum length, which may be network or service dependent.

NOTE – All messages may contain information elements for codesets 5, 6, and 7 and corresponding locking shift information elements which comply with the coding rules specified in 6.5.2 to 6.5.4. None of these information elements, however, is listed in any of the tables in clause 5.

c) Further explanatory notes, as necessary.

5.1 Messages for case A circuit-mode connections

Messages for case A circuit-mode connection control are identified in clause 3 of ANSI T1.607. The messages in that clause should be used for case A (circuit-switched access to Packet-Switched Public Data Network services).

5.2 Messages for packet-mode access connection control

Table 2 summarizes the messages for packet-mode access connection control.[4] The message tables in this subclause should be used for case B (packet-switched access to an ISDN virtual circuit service) as defined in clause 7.

Table 2 – Messages for packet-mode access connection control

Message	Reference	Message	Reference
Access connection establishment messages:		*Call clearing messages:*	
ALERTING	5.2.1	DISCONNECT	5.2.5
CALL PROCEEDING	5.2.2	RELEASE	5.2.7
CONNECT	5.2.3	RELEASE COMPLETE	5.2.8
CONNECT ACKNOWLEDGE	5.2.4	*Miscellaneous messages:*	
PROGRESS	5.2.6	STATUS	5.2.10
SETUP	5.2.9	STATUS ENQUIRY	5.2.11

5.2.1 ALERTING

This message is sent by the called user to the network to indicate that called user alerting has been initiated.

Message type: ALERTING Direction: user to network

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	u→n	M	1
Call reference	6.3	u→n	M	2-*
Message type	6.4	u→n	M	1
Channel identification	6.5.12	u→n	O[1]	2-*
Progress indicator	6.5.20	u→n	O[2]	2-4

[1] Mandatory if this message is the first message in response to SETUP, unless the user accepts the channel indicated in the SETUP message.

[2] Included in the event of interworking within a private network.

[4] For an additional listing for this table (INFORMATION message), see ANSI T1.608a-1992 (final pages of this standard).

5.2.2 CALL PROCEEDING

This message is sent by the called user to the network or by the network to the calling user to indicate that the requested access connection establishment has been initiated.

Message type: CALL PROCEEDING Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Channel identification	6.5.12	both	O[1]	2-*
Progress indicator	6.5.20	u→n	O[2]	2-4
Display	6.5.13	n→u	O[3]	2-82 [4]

[1] Mandatory in the network-to-user direction if this message is the first message in response to SETUP. Mandatory in the user-to-network direction if this message is the first message in response to SETUP, unless the user accepts the channel indicated in the SETUP message.

[2] Included in the event of interworking within a private network.

[3] Included if the network provides information that can be presented to the user.

[4] *The minimum length is 2 octets; the maximum length is 82 octets.*

5.2.3 CONNECT

This message is sent by the called user to the network and by the network to the calling user to indicate acceptance of the access connection.

Message type: CONNECT Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Channel identification	6.5.12	u→n	O[1]	2-*
Progress indicator	6.5.20	u→n	O[2]	2-4
Display	6.5.13	n→u	O[3]	2-82 [4]

[1] Mandatory if this message is the first message in response to SETUP, unless the user accepts the channel indicated in the SETUP message.

[2] Included in the event of interworking within a private network.

[3] Included if the network provides information that can be presented to the user.

[4] The minimum length is 2 octets; the maximum length is 82 octets.

5.2.4 CONNECT ACKNOWLEDGE

This message is sent by the network to the called user to indicate the user has been awarded the access connection. It may also be sent by the calling user to the network to allow symmetrical access connection control procedures.

Message type: CONNECT ACKNOWLEDGE Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Display	6.5.13	n→u	O[1]	2-82 [2]

[1] Included if the network provides information that can be presented to the user.

[2] The minimum length is 2 octets; the maximum length is 82 octets.

5.2.5 DISCONNECT

This message is sent by the user to request the network to clear an access connection or is sent by the network to the user to indicate that the access connection has been cleared.

Message type: DISCONECT Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Cause	6.5.11	both	M	4-32
Display	6.5.13	n→u	O[1]	2-82 [2]
User-user	6.5.25	u→n	O[3]	2-131[4]

[1] Included if the network provides information that can be presented to the user.

[2] The minimum length is 2 octets; the maximum length is 82 octets.

[3] May be sent if the access connection has not yet reached the active state. However, user-user information is not sent after the access connection has reached the active state since X.25 procedures would be used for this information transfer.

[4] The minimum length is 2 octets; the standard default maximum length is 131 octets.

5.2.6 PROGRESS

This message is sent by the called user to indicate the progress of an access connection establishment in the event of interworking within a private network.

Message type: PROGRESS Direction: user to network

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	u→n	M	1
Call reference	6.3	u→n	M	2-*
Message type	6.4	u→n	M	1
Cause	6.5.11	u→n	O[1]	2-32
Progress indicator	6.5.20	u→n	M	4

[1] Included by the called user to provide additional information.

5.2.7 RELEASE

This message is sent by the user or the network to indicate that the equipment sending the message has disconnected the channel (if any) and intends to release the channel and the call reference, and that the receiving equipment should release the channel and prepare to release the call reference after sending RELEASE COMPLETE. This message is sent by the network to the user to indicate that the access connection is awarded on either the D-channel or an existing channel and that the network intends to release the call reference.

Message type: RELEASE Direction: both

Significance: local[1]

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Cause	6.5.11	both	O[2]	2-32
Display	6.5.13	n→u	O[3]	2-82 [4]
User-user	6.5.25	u→n	O[5]	2-131[6]

[1] This message has local significance; however, it may carry information of global significance when used as the first access connection clearing message.

[2] Mandatory in the first clearing message, including when the RELEASE message is sent as a result of an error handling condition.

[3] Included if the network provides information that can be presented to the user.

[4] The minimum length is 2 octets; the maximum length is 82 octets.

[5] User-user information may be sent if RELEASE is the first clearing message and the access connection has not yet reached the active state and DSS1/X.25 mapping service, as defined in this standard, is provided by the network. However, user-user information is not sent if the access connection has reached the active state since X.25 procedures would be used for this information transfer.

[6] The minimum length is 2 octets; the standard default maximum length is 131 octets.

5.2.8 RELEASE COMPLETE

This message is sent by the user or the network to indicate that the equipment sending the message has released the channel (if any) and call reference, the channel is available for reuse, and the receiving equipment shall release the call reference.

Message type: RELEASE COMPLETE Direction: both

Significance: local[1)]

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Cause	6.5.11	both	O[2)]	2-32
Display	6.5.13	n→u	O[3)]	2-82 [4)]
User-user	6.5.25	u→n	O[5)]	2-131[6)]

[1)] This message has local significance; however, it may carry information of global significance when used as the first access connection clearing message.

[2)] Mandatory in the first clearing message, including when the RELEASE COMPLETE message is sent as a result of an error handling condition.

[3)] Included if the network provides information that can be presented to the user.

[4)] The minimum length is 2 octets; the maximum length is 82 octets.

[5)] User-user information may be sent if RELEASE COMPLETE is the first clearing message and the access connection has not yet reached the active state and DSS1/X.25 mapping service, as defined in this standard, is provided by the network. However, user-user information is not sent if the access connection has reached the active state since X.25 procedures would be used for this information transfer.

[6)] The minimum length is 2 octets; the standard default maximum length is 131 octets.

5.2.9 SETUP [5)]

This message is sent by the calling user to the network and by the network to the called user to initiate access connection establishment.

Message type: SETUP Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Bearer capability	6.5.5	both	M	4-11
Channel identification	6.5.12	both	O[1)]	2-*
Progress indicator	6.5.20	u→n	O[2)]	2-5
Display	6.5.13	n→u	O[3)]	2-82 [4)]
Information rate	6.5.15	n→u	O[5)]	2-4
End-to-end transit delay	6.5.14	n→u	O[6)]	2-11
Transit delay selection and indication	6.5.24	n→u	O[7)]	2-5
Packet layer binary parameters	6.5.17	n→u	O[8)]	2-3
Packet layer window size	6.5.18	n→u	O[9)]	2-4
Packet size	6.5.19	n→u	O[10)]	2-4
Calling party number	6.5.9	n→u	O[11)]	2-*
Calling party subaddress	6.5.10	n→u	O[12)]	2-23
Called party number	6.5.7	n→u	O[13)]	2-*
Called party subaddress	6.5.8	n→u	O[14)]	2-23
Redirecting number	6.5.21	n→u	O[15)]	2-*
User-user	6.5.25	n→u	O[16)]	2-131[17)]

[5)] For additional information on this message, see ANSI T1.608a-1992 (final pages of this standard).

[1] Mandatory in the network-to-user direction. Included in the user-to-network direction when the user wants to indicate a channel. If not included, its absence is interpreted as "any channel acceptable."

[2] Included in the event of interworking within a private network.

[3] Included if the network provides information that can be presented to the user.

[4] The minimum length is 2 octets; the maximum length is 82 octets.

[5] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the information rate for the call.

[6] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the end-to-end transit delay for the call.

[7] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the maximum permissible transit delay for the call.

[8] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the packet layer binary parameters for the call.

[9] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the packet layer window size for the call.

[10] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the packet size for the call.

[11] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the calling party number.

[12] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the calling party subaddress.

[13] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the called party number.

[14] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the called party subaddress.

[15] Included in the network-to-user direction if the network implements X.25/DSS1 information element mapping and provides indication to the called user of the number from which a call diversion or transfer was invoked.

[16] Included in the network-to-user direction if the calling user included user information and the network implements X.25/DSS1 information element mapping.

[17] The minimum length is 2 octets; the standard default maximum length is 131 octets.

5.2.10 STATUS

This message is sent by the user or the network in response to a STATUS ENQUIRY message or at any time to report certain error conditions listed in 5.8 of ANSI T1.607.

Message type: STATUS Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Cause	6.5.11	both	M	4-32
Call state	6.5.6	both	M	3
Display	6.5.13	n→u	O[1]	2-82 [2]

[1] Included if the network provides information that can be presented to the user.

[2] The minimum length is 2 octets; the maximum length is 82 octets.

5.2.11 STATUS ENQUIRY

This message is sent by the user or the network at any time to solicit a STATUS message from the peer layer 3 entity. Sending a STATUS message in response to a STATUS ENQUIRY message is mandatory.

Message type: STATUS ENQUIRY Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M	2-*
Message type	6.4	both	M	1
Display	6.5.13	n→u	O[1]	2-82 [2]

[1] Included if the network provides information that can be presented to the user.

[2] The minimum length is 2 octets; the maximum length is 82 octets.

REVISION NOTE – See ANSI T1.608a-1992 (final pages of this standard) for new subclause 5.2.12, INFORMATION.

5.3 Messages used with the global call reference

Table 3 summarizes the messages which may use the global call reference defined in 6.3.

Table 3 – Messages used with the global call reference

Message	Reference
Messages:	
RESTART	5.3.1
RESTART ACKNOWLEDGE	5.3.2
STATUS	5.3.3

5.3.1 RESTART

This message is sent by the user or the network to request the recipient to restart (i.e., return to an idle condition) the indicated channel(s) or interface.

Message type: RESTART Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M[1)]	2-*
Message type	6.4	both	M	1
Channel identification	6.5.12	both	O[2)]	2-*
Display	6.5.13	n→u	O[3)]	2-82 [4)]
Restart indicator	6.5.23	both	M	3

[1)] This message is sent with the global call reference defined in 6.3.

[2)] Included when necessary to indicate the particular channel(s) to be restarted.

[3)] Included if the network provides information that can be presented to the user.

[4)] The minimum length is 2 octets; the maximum length is 82 octets.

5.3.2 RESTART ACKNOWLEDGE

This message is sent to acknowledge the receipt of the RESTART message and to indicate that the requested restart is complete.

Message type: RESTART ACKNOWLEDGE Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M[1]	2-*
Message type	6.4	both	M	1
Channel identification	6.5.12	both	O[2]	2-*
Display	6.5.13	n→u	O[3]	2-82 [4]
Restart indicator	6.5.23	both	M	3

[1] This message is sent with the global call reference defined in 6.3.

[2] Included when necessary to indicate the particular channel(s) that have been restarted.

[3] Included if the network provides information that can be presented to the user.

[4] The minimum length is 2 octets; the maximum length is 82 octets.

5.3.3 STATUS

This message is sent by the user or the network at any time during an access connection to report certain error conditions listed in 5.8 of ANSI T1.607.

Message type: STATUS Direction: both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3	both	M[1]	2-*
Message type	6.4	both	M	1
Cause	6.5.11	both	M	4-32
Call state	6.5.6	both	M	3
Display	6.5.13	n→u	O[2]	2-82 [3]

[1] This message may be sent with the global call reference defined in 6.3.

[2] Included if the network provides information that can be presented to the user.

[3] The minimum length is 2 octets; the maximum length is 82 octets.

6 General message format and information elements coding

The figures and text in this clause describe message contents. Within each octet, the bit designated "bit 1" is transmitted first, followed by bits 2, 3, 4, etc. Similarly, the octet shown at the top of each figure is sent first.

6.1 Overview

Within this protocol, every message shall consist of the following parts:

a) Protocol discriminator;

b) Call reference;

c) Message type;

d) Other information elements, as required.

Information elements (a), (b), and (c) are common to all the messages and shall always be present, while information element (d) is specific to each message type.

This organization is illustrated in the example shown in figure 1.

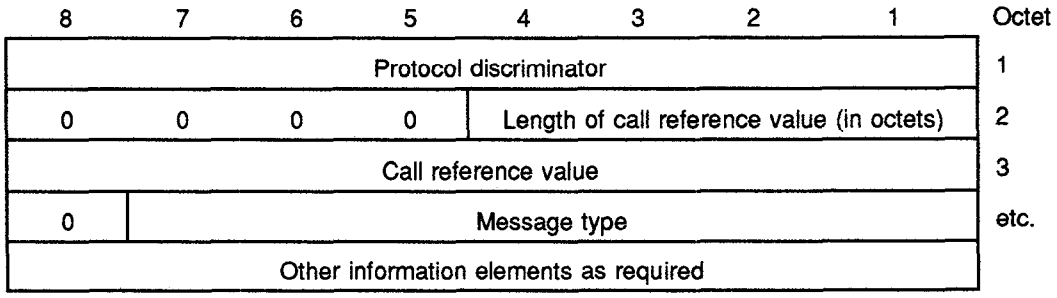


Figure 1 – General message organization example

A particular message may contain more information than a particular (user or network) equipment needs or can understand. All equipment should be able to ignore any extra information, present in any message, which is not required for the proper operation of that equipment. For example, a user may ignore the calling party number if that number is of no interest to the user when a SETUP message is received.

Unless specified otherwise, a particular information element may be present only once in a given message.

The term, *default,* implies that the value defined should be used in the absence of any assignment, or the negotiation of alternative values.

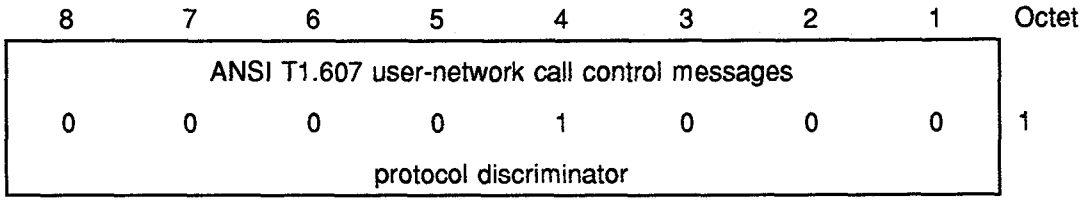
When a field, such as the call reference value, extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest-numbered bit of the highest-numbered octet of the field.

6.2 Protocol discriminator

The purpose of the protocol discriminator is to distinguish messages for user–network call control from other messages (to be defined) within this standard. It also distinguishes messages of this standard from those OSI network layer protocol units that are coded to other standards.

NOTE – A protocol discriminator field is also included in the user-user information element to indicate the user protocol within the user information; however, the coding of the protocol discriminator in this case is shown in 6.5.25.

The protocol discriminator is the first part of every message and is coded as shown in figure 2.



Codes

Bits

8765 4321

0000 0000 through 0000 0111 — Assigned in user–user information element (see 6.5.25); not available for use in the message protocol discriminator

0000 1000 — User–network call control messages (see ANSI T1.607)

0001 0000 through 0011 1111 — Reserved for other network layer or layer 3 protocols, including CCITT Recommendation X.25 (see note)

0100 0000 through 0100 1111 — Reserved for national use

0101 0000 through 1111 1110 — Reserved for other network layer or layer 3 protocols, including CCITT Recommendation X.25 (see note)

All other values are reserved.

NOTE – The values are reserved to discriminate these protocol discriminators from the first octet of an X.25 packet including general format identifier.

Figure 2 – Protocol discriminator

6.3 Call reference

The purpose of the call reference is to identify the call request at the local user–network interface to which the particular message applies. The call reference does not have end-to-end significance across ISDNs.

The call reference is the second part of every message. The call reference is coded as shown in figure 3. The length of the call reference value is indicated in octet 1, bits 1–4. The default maximum length of the call reference information element is three octets long. The actions taken by the receiver are based on the numerical value of the call reference and are independent of the length of the call reference information element.

At a minimum, all networks and users must be able to support a call reference value of one octet for a basic user–network interface, and a call reference value of two octets for a primary rate interface.

As a network option for a primary rate interface, the call reference value may be one octet also. In this case, a call reference value up to 127 may be sent in one or two octets.

The call reference information element includes the length of the call reference value, the call reference value itself and the call reference flag.

Call reference values are assigned by the originating side of the interface for a call. These values are unique to the originating side only within a particular D-channel layer 2 logical link connection. The call reference value is assigned at the beginning of a call and remains fixed for the lifetime of a call. After a call ends, the associated call reference value may be reassigned to a later call. Two identical call reference values on the same D-channel layer 2 logical link connection may be used when each value pertains to a call originated at opposite ends of the link.

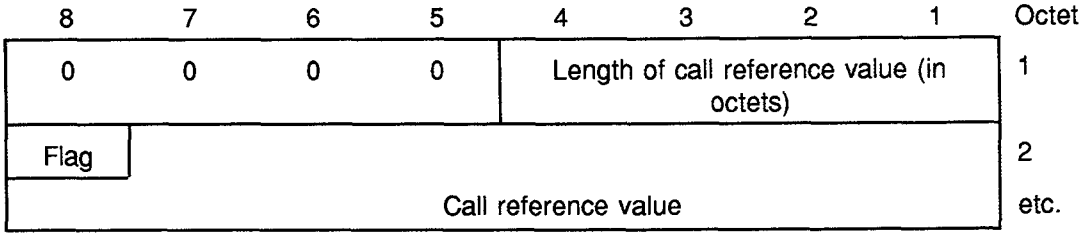
The call reference flag can take the values "0" or "1". The call reference flag is used to identify which end of the layer 2 logical link originated a call reference. The origination side always sets the call reference flag to "0". The destination side always sets the call reference flag to "1".

Hence, the call reference flag identifies who allocated the call reference value for this call and the only purpose of the call reference flag is to resolve simultaneous attempts to allocate the same call reference value.

NOTES

1 The call reference information element containing a dummy call reference is one octet long and is coded "0000 0000" (see figure 4). The use of the dummy call reference is specified in CCITT Recommendation Q.932.

2 The numerical value of the global call reference is zero. The equipment receiving a message containing the global call reference should interpret the message as pertaining to all call references associated with the appropriate data link connection identifier (see figure 5). The messages that can use global call reference are defined in 5.3



Call reference flag (octet 2)

Bit

8

0 the message is sent *from* the side that originates the call reference

1 the message is sent *to* the side that originates the call reference

Figure 3 – Call reference information element

8	7	6	5	4	3	2	1	Octet
				Length of call				
0	0	0	0	0	0	0	0	1
				reference value				

Figure 4 – Dummy call reference

8	7	6	5	4	3	2	1	Octet
				Length of call				
0	0	0	0	0	0	0	1	1
				reference value				
0/1	0	0	0	0	0	0	0	2
flag	Call reference value							

a) One-octet call reference value

8	7	6	5	4	3	2	1	Octet
				Length of call				
0	0	0	0	0	0	1	0	1
				reference value				
0/1	0	0	0	0	0	0	0	2
flag	Call reference value							
0	0	0	0	0	0	0	0	3

b) Two-octet call reference value

Figure 5 – Examples of the encoding for global call reference

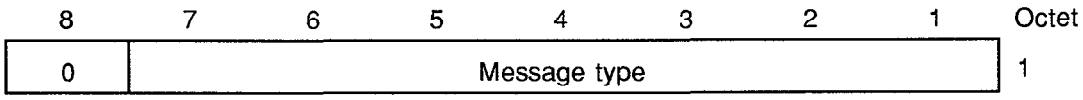
6.4 Message type

The purpose of the message type is to identify the function of the message being sent.

The message type is the third part of every message. The message type is coded as shown in figure 6. [6)]

Bit 8 is reserved for possible future use as an extension bit.

[6)] For additional changes to figure 6, see ANSI T1.608a-1992 (final pages of this standard).



Message types

bits 8765	4321	
0000	0000	Escape to nationally specific message types (note 1)
000–	----	**Call establishment messages:**
0	0001	ALERTING
0	0010	CALL PROCEEDING
0	0111	CONNECT
0	1111	CONNECT ACKNOWLEDGE
0	0011	PROGRESS
0	0101	SETUP
0	1101	SETUP ACKNOWLEDGE (note 2)
010–	----	**Call clearing messages:**
0	0101	DISCONNECT
0	1101	RELEASE
1	1010	RELEASE COMPLETE
0	0110	RESTART
0	1110	RESTART ACKNOWLEDGE
011–	----	**Miscellaneous messages:**
1	1011	INFORMATION (note 2)
0	1110	NOTIFY (note 2)
1	1101	STATUS
1	0101	STATUS ENQUIRY

NOTES
1 Reserved for future use in American National Standards. The message type is defined in the following octet(s). The extension mechanism (bit 8 of the message type) is independent of the escape mechanism for the message type.
2 This message type is used only in case A (access to PSPDN services).

Figure 6 – Message type

6.5 Other information elements

6.5.1 Coding rules

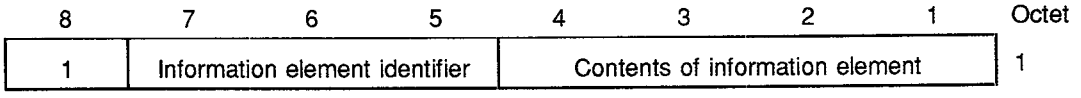
The coding of other information elements follows the coding rules described below. These rules are formulated to allow each equipment which processes a message to find information elements important to it, and to ignore information elements not important to that equipment.

Two categories of information elements are defined:

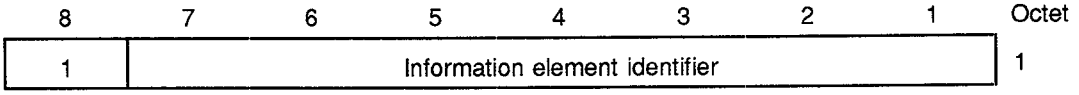
a) Single octet information elements (see figures 7(a) and 7(b));

b) Variable length information elements (see figure 7(c)).

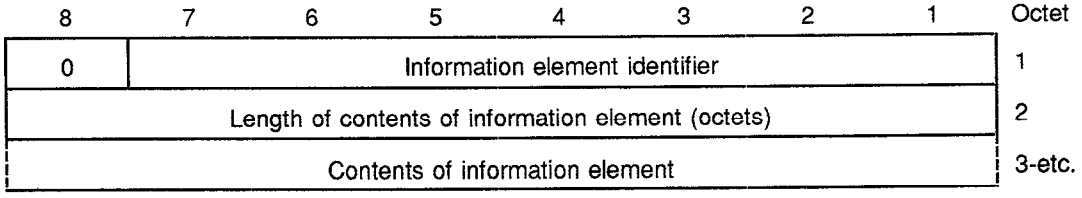
For the information elements listed in 6.5.5–6.5.27, the coding of the information element identifier bits is summarized in table 4. [7)]



a) Single-octet information element format (type 1)



b) Single-octet information element (type 2)



c) Variable-length information element format

Figure 7 – Formats of information elements

[7)] For changes and additions to table 4, see ANSI T1.608a-1992, (final pages of this standard).

Table 4 – Information element identifier coding

8 7 6 5 4 3 2 1		Section reference	Maximum length (octets) (note 1)	Maximum number of occurrences (note 9)
1 : : : - - -	*Single octet information elements:*			
0 0 0 - - -	reserved			
0 0 1 - - -	Shift (note 2)	6.5.3 - 6.5.4	1	
1 0 1 - - -	Repeat indicator (note 7)	6.5.23	1	
0 : : : : : : :	*Codeset 0 variable length information elements:*			
0 0 0 0 1 0 0	Bearer capability (notes 6, 8)	6.5.5	11	
0 0 0 1 0 0 0	Cause (note 2)	6.5.11	32	3
0 0 1 0 1 0 0	Call state	6.5.6	3	
0 0 1 1 0 0 0	Channel identification	6.5.12	Note 4	
0 0 0 1 1 0 0	Connected number (note 7)	4.5.13 of T1.607	2-19	
0 0 0 1 1 0 1	Connected subaddress (note 7)	4.5.14 of T1.607	2-23	
0 0 1 1 1 1 0	Progress indicator (note 6)	6.5.21	4	2
0 1 0 0 0 0 0	Network specific facilities (notes 2, 7)	4.5.19 of T1.607	Note 4	4
0 1 0 0 1 1 1	Notification indicator (note 7)	4.5.20 of T1.607	3	
0 1 0 1 0 0 0	Display	6.5.14	82	
0 1 0 1 1 0 0	Keypad facility (note 7)	4.5.17 of T1.607	34	
1 0 0 0 0 0 0	Information rate	6.5.16	6	
1 0 0 0 0 1 0	End-to-end transit delay	6.5.15	11	
1 0 0 0 0 1 1	Transit delay selection and indication	6.5.26	5	
1 0 0 0 1 0 0	Packet layer binary parameters	6.5.18	3	
1 0 0 0 1 0 1	Packet layer window size	6.5.19	4	
1 0 0 0 1 1 0	Packet size	6.5.20	4	
1 0 0 0 1 1 1	Closed User Group	6.5.13		
1 0 0 1 0 1 0	Reverse Charging Indication	6.5.25		
1 1 0 1 1 0 0	Calling party number	6.5.9	Note 4	
1 1 0 1 1 0 1	Calling party subaddress	6.5.10	23	
1 1 1 0 0 0 0	Called party number	6.5.7	Note 4	
1 1 1 0 0 0 1	Called party subaddress	6.5.8	23	
1 1 1 1 0 0 0	Transit network selection (notes 2, 7)	4.5.25 of T1.607	Note 4	4
1 1 1 0 1 0 0	Redirecting number	6.5.22	Note 4	
1 1 1 1 0 0 1	Restart indicator	6.5.24	3	
1 1 1 1 1 0 0	Low layer compatibility (note 7)	6.5.17	12	
1 1 1 1 1 1 0	User-user	6.5.27	131	
1 1 1 1 1 1 1	Escape for extension (note 3)			
All other values are reserved (note 5)				

NOTES

1 The length limits described for the variable length information elements below take into account only the present CCITT standardized coding values.

2 This information element may be repeated.

3 This escape mechanism is limited to codesets 5, 6, and 7 (see 6.5.2). When the escape for extension is used, the information element identifier is contained in octet-group 3 and the content of the information element follows in the subsequent octets as shown in figure 8.

4 The maximum length is network dependent.

5 The reserved values with bits 5-8 coded "0000" are for future information elements for which comprehension by the receiver is required (see 5.8.7.1 of ANSI T1.607).

6 This information element may be repeated only in case A (access to PSPDN services).

7 This information element may be used only in case A (access to PSPDN services).

8 This information element may be repeated in conjunction with the repeat indicator information element.

9 Maximum number of occurrences allowed for variable length information elements.

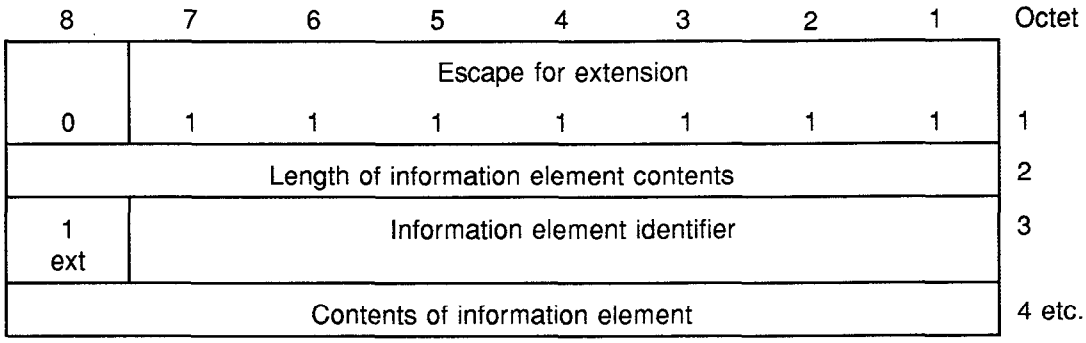


Figure 8 – Information element format using escape for extension

The descriptions of the information elements in 6.5.5–6.5.27 are organized in alphabetical order. However, there is a particular order of appearance for each information element in a message within each codeset (see 6.5.2). The code values of the information element identifier for the variable length formats are assigned in ascending numerical order, according to the actual order of appearance of each information element in a message. This allows the receiving equipment to detect the presence or absence of a particular information element without scanning through an entire message.

Single octet information elements may appear at any point in the message. Two types of single octet information elements have been defined. Type 1 elements provide the information element identification in bit positions 7, 6, 5. The value "010" in these bit positions are reserved for type 2 single octet elements.

Where the description of information elements in this standard contains spare bits, these bits are indicated as being set to "0". In order to allow compatibility with future implementation, messages should not be rejected simply because a spare bit is set to "1".

The second octet of a variable length information element indicates the total length of the contents of that information element regardless of the coding of the first octet (i.e., the length starting with octet 3). The second octet is a binary coding of the number of octets of the contents, with bit 1 as the least significant bit (2^0).

An optional variable-length information element may be present, but empty. For example, a SETUP message may contain a called party number information element, the content of which is of zero length. This should be interpreted by the receiver as equivalent to that information element being absent. Similarly, an absent information element should be interpreted by the receiver as equivalent to that information element being empty.

The following rules apply for the coding of variable length information elements (octets 3, etc.):

a) The first digit in the octet number identifies one octet or a group of octets;

b) Each octet group is a self-contained entity. The internal structure of an octet group may be defined in alternative ways;

c) An octet group is formed by using an extension mechanism. The preferred extension mechanism is to extend an octet (N) through the next octet(s) (Na, Nb, etc.) by using bit 8 in each octet as an extension bit. The bit value "0" indicates that the octet group continues through the next octet. The bit value "1" indicates that this octet is the last octet. If one octet (Nb) is present, then the preceding octets (N and Na) must be present.

In the format description appearing in 6.5.5, etc., bit 8 is marked "0/1 ext" if another octet follows. Bit 8 is marked "1 ext" if this is the last octet in the extension domain.

Additional octets may be defined later ("1 ext" changed to "0/1 ext") and equipments shall be prepared to receive such additional octets although the equipment need not be able to interpret or act upon the content of these octets;

d) In addition to the extension mechanism defined above, an octet (N) may be extended through the next octet(s) (N.1, N.2, etc.) by indications in bits 7-1 (of octet N);

e) The mechanism in (c) and (d) may be combined;

f) Optional octets are marked with asterisks (*).

6.5.2 Extensions of codesets

There is a certain number of possible information element identifier values using the formatting rules described in 6.5.1; 128 from the variable length information element format and at least 8 from the single octet information element format.

One value in the single octet format is specified for shift operations described below. One other value in both the single octet and variable format is reserved. This leaves at least 133 information element identifier values available for assignment.

It is possible to expand this structure to eight codesets of at least 133 information element identifier values each. One common value in the single octet format is employed in each codeset to facilitate shifting from one codeset to another. The contents of this shift information element identifies the codeset to be used for the next information element or elements. The codeset in use at any given time is referred to as the "active codeset". By convention, codeset 0 is the initially active codeset.

Two codeset shifting procedures are supported: locking shift (see 6.5.3) and nonlocking shift (see 6.5.4).

Codeset 5 is reserved for information elements used in this standard, in ANSI T1.607, and in future American National Standards.

Codeset 6 is reserved for information elements specific to the local network (either public or private).

Codeset 7 is reserved for user-specific information elements.

The coding rules specified in 6.5.1 shall apply for information elements belonging to any active codeset.

Transitions from one active codeset to another (i.e., by means of the locking shift procedure) may only be made to a codeset with a higher numerical value than the codeset being left.

An information element belonging to codesets 5, 6, or 7 may be received together with information elements belonging to codeset 0 (the active codeset) by using the nonlocking shift procedure. However, this standard does not support the sending of a nonlocking shift information element (see 6.5.4).

A user or network equipment shall have the capability to recognize a shift information element and to determine the length of the following information element, although the equipment need not be able to interpret and act upon the content of the information element. This enables the equipment to determine the start of a subsequent information element.

Codeset 7 information elements shall be handled according to the procedures for unrecognized information elements (see 5.8.7.1 of ANSI T1.607) by the first exchange in the local network, unless allowed by a future service definition, bilateral agreement, or provision is made to support this across the local network for a specific user.

Codeset 6 is reserved for information elements specific to the local network (either public or private). As such, they do not have significance across the boundaries between local networks, or

across a national, or international boundary. Therefore, codeset 6 information elements shall be handled according to the procedures for unrecognized information elements (see 5.8.7.1 of ANSI T1.607), beyond a local network boundary, unless allowed by bilateral agreement.

Codeset 5 is reserved for information elements reserved for national use. As such, they do not have significance across an international boundary. Therefore, codeset 5 information elements shall be handled according to the procedures for unrecognized information elements (see 5.8.7.1 of ANSI T1.607) at the first exchange beyond the international boundary, unless there are bilateral agreements to the contrary.

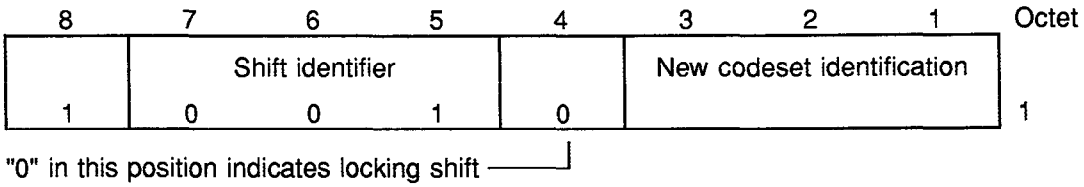
6.5.3 Locking shift procedure

The locking shift procedure employs an information element to indicate the new active codeset. The specified codeset remains active until another locking shift information element is encountered which specifies the use of another codeset. For example, codeset 0 is active at the start of message content analysis. If a locking shift to codeset 5 is encountered, the next information elements will be interpreted according to the information element identifiers assigned in codeset 5, until another shift information element is encountered.

This procedure is used only to shift to a higher order codeset than the one being left.

The locking shift is valid only within that message which contains the locking shift information element. At the start of every message content analysis, the active codeset is codeset 0.

The locking shift information element uses the single octet information element and coding shown in figure 9.



Codeset identification (bits 3 to 1):

3 2 1

0 0 0 Not applicable

0 0 1

to Reserved

1 0 0

1 0 1 Codeset 5: information elements used in this standard, in ANSI T1.607, and in future American National Standards

1 1 0 Codeset 6: information elements specific to the local network (either public or private)

1 1 1 Codeset 7: user-specific information elements

Figure 9 – Locking shift information element

6.5.4 Nonlocking shift procedure

The nonlocking shift procedure provides a temporary shift to the specified lower or higher codeset.

Sending of nonlocking shift information element is not recommended in this standard. A user or network receiving a message containing the nonlocking shift information element shall follow two options:

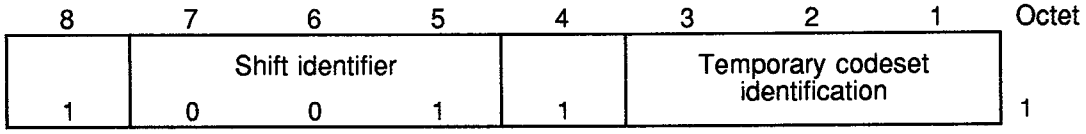
a) Process the nonlocking shift information element and the information element following it as described below;

b) Recognize the nonlocking shift information element and ignore the information element following it. The nonlocking shift information element and the information element following it are discarded and procedures for unrecognized information elements shall be followed for the information element following the nonlocking shift.

The nonlocking shift procedure uses a single octet information element to indicate the codeset to be used to interpret the next single information element. After the interpretation of the next single information element, the active codeset is again used for interpreting any following information elements. For example, codeset 0 is active at the beginning of message content analysis. If a nonlocking shift to codeset 6 is encountered, only the next information element is interpreted according to the information element identifiers assigned in codeset 6. After this information element is interpreted, codeset 0 will again be used to interpret the following information elements. A nonlocking shift information element indicating the current codeset shall not be regarded as an error.

A locking shift information element shall not follow directly on a nonlocking shift information element. If this combination is received, it shall be interpreted as though a locking shift information element only had been received.

The nonlocking shift information element uses the single octet information element format and coding shown in figure 10.



Codeset identification (bits 3 to 1):

3 2 1

0 0 0 Codeset 0 (initially active): ANSI T1.607 information elements

0 0 1 to 1 0 0 Reserved

1 0 1 Codeset 5: information elements used in this standard, in ANSI T1.607, and in future American National Standards

1 1 0 Codeset 6: information elements specific to the local network (either public or private)

1 1 1 Codeset 7: user-specific information elements

Figure 10 – Nonlocking shift information element

6.5.5 Bearer capability

The purpose of the bearer capability information element is to indicate a requested bearer service described in CCITT Recommendation I.231 to be provided by the network. It contains only information that *may* be used by the network (see annex L of ANSI T1.607). The use of the bearer capability information element in relation to compatibility checking is described in annex B of ANSI T1.607.

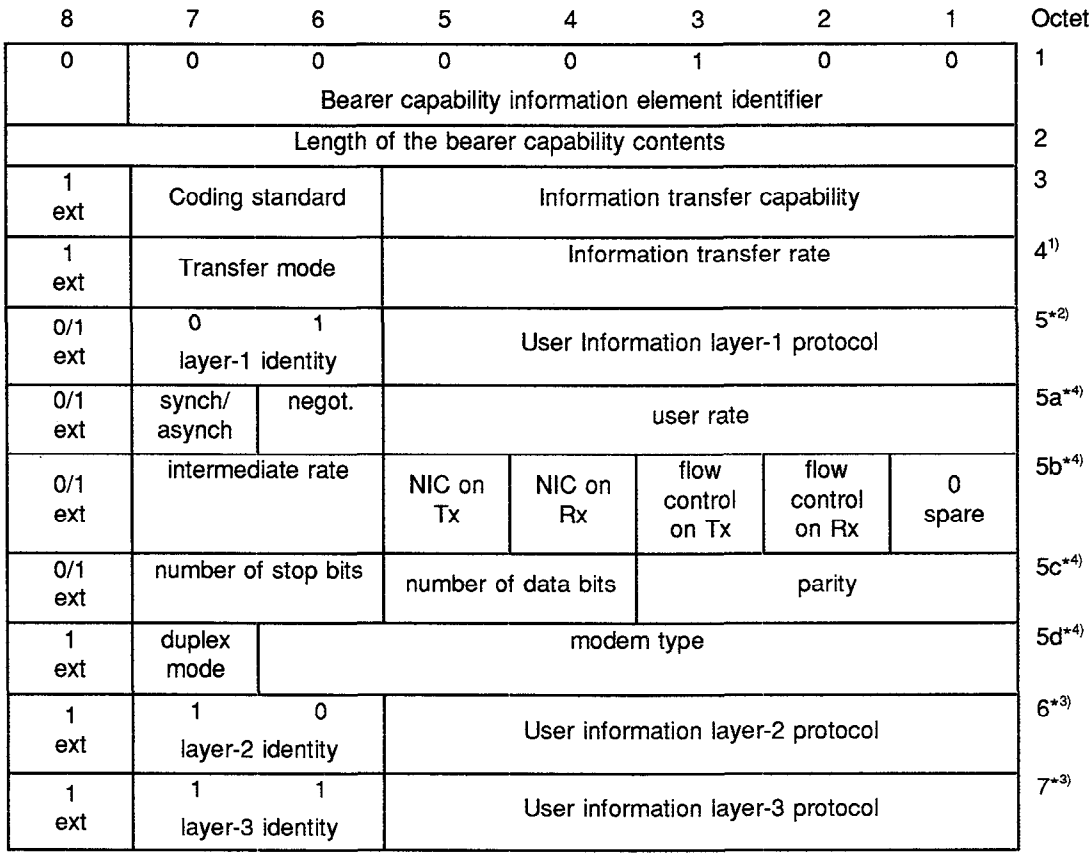
The bearer capability information element is coded as shown in figure 11.

Examples of the coding of the bearer capability information element are shown in annex H of ANSI T1.607.

No default bearer capability may be assumed by the absence of this information element.

The maximum length of this information element is 11 octets when CCITT standard coding is used as described below.

NOTE – Future extensions to the codings of the bearer capability information element should not be in conflict with the currently defined coding of the low layer compatibility information element (see 6.5.16).



[1)] For case A (access to PSPDN services, see 4.1), the bearer capability is bidirectional symmetric and the structure attribute is "8 kHz integrity". The configuration is assumed to be point-to-point and the establishment is assumed to be "demand". For case B (ISDN virtual circuit service, see 4.2), the bearer capability is bidirectional symmetric and the structure attribute is "service data unit integrity". The configuration is assumed to be point-to-point and the method of establishment is assumed to be "demand".

[2)] For case A, this octet is omitted. The user information layer-1 protocol may be specified in the low layer compatibility information element. For case B, this octet is omitted since only the default value is used for octet 5.

[3)] For case A, this octet is omitted.

[4)] This octet may be present if octet 5 indicates CCITT rate adaption V.110/X.30.

Figure 11 – Bearer capability information element

Coding standard (octet 3)

Bits

7 6

0 0 CCITT standardized coding (see note)

1 0 National standard as described below

NOTE – The coding described below is the CCITT coding except those codepoints indicated as national standard.

Information transfer capability (octet 3)

Bits

5 4 3 2 1

0 1 0 0 0 unrestricted digital information

0 1 0 0 1 restricted digital information

Transfer mode (octet 4)

Bits

7 6

0 0 circuit mode – case A (access to PSPDN services)

1 0 packet mode – case B (ISDN virtual circuit service)

All other values are reserved.

Information transfer rate (octet 4)

Bits

5 4 3 2 1	*Circuit mode*	*Packet mode*
0 0 0 0 0		This code shall be used for packet-mode calls (case B)
1 0 0 0 0	64 kbit/s	
1 0 0 1 1	384 kbit/s	
1 0 1 0 0	1472 kbit/s (see note)	
1 0 1 0 1	1536 kbit/s	

All other values are reserved.

NOTE – This is an American national codepoint and can be used only with national standard "1 0".

User information layer 1 protocol (octet 5)

Bits

5 4 3 2 1

0 0 0 0 1 CCITT standardized rate adaption V.110/X.30. This implies the presence of octets 5a and optionally octets 5b, 5c, and 5d as defined below

0 1 0 0 1 CCITT standardized rate adaption X.31 HDLC flag stuffing
All other values are reserved.

NOTE – If the transfer mode is "circuit mode", and if the information transfer capability is "unrestricted digital information" or "restricted digital information", and if the user information layer 1 protocol is not to be identified to the network, octet 5 shall be omitted. Otherwise, octet 5 shall be present.

Synchronous/asynchronous (octet 5a)

Bit

7

0 synchronous

1 asynchronous

NOTE – The protocol synchronous/asynchronous refers to R interface. In case of synchronous user rate except for half duplex operation, octets 5c to 5d may be omitted for CCITT Recommendation V.110. In certain circumstances, octet 5b may be omitted for CCITT Recommendation V.110.

Negotiation (octet 5a)

Bit

6

0 in-band negotiation not possible

1 in-band negotiation possible

NOTE – Applicable to CCITT Recommendations V.110/X.30; otherwise, reserved.

User rate (octet 5a)

Bits

5 4 3 2 1

0 0 0 0 0 rate is indicated by E-bits specified in CCITT Recommendation I.460

0 0 0 0 1 0.6 kbit/s CCITT Recommendations V.6 and X.1

0 0 0 1 0 1.2 kbit/s CCITT Recommendation V.6

0 0 0 1 1 2.4 kbit/s CCITT Recommendations V.6 and X.1

0 0 1 0 0 3.6 kbit/s CCITT Recommendation V.6

0 0 1 0 1 4.8 kbit/s CCITT Recommendations V.6 and X.1

0 0 1 1 0 7.2 kbit/s CCITT Recommendation V.6

0 0 1 1 1 8 kbit/s CCITT Recommendation I.460

0 1 0 0 0 9.6 kbit/s CCITT Recommendations V.6 and X.1

0 1 0 0 1 14.4 kbit/s CCITT Recommendation V.6

0 1 0 1 0 16 kbit/s CCITT Recommendation I.460

Figure 11 *(continued)*

0 1 0 1 1	19.2 kbit/s CCITT Recommendation V.6
0 1 1 0 0	32 kbit/s CCITT Recommendation I.460
0 1 1 0 1	48 kbit/s CCITT Recommendations V.6 and X.1
0 1 1 1 1	56 kbit/s CCITT Recommendation V.6
1 0 1 0 1	0.1345 kbit/s CCITT Recommendation X.1
1 0 1 1 0	0.100 kbit/s CCITT Recommendation X.1
1 0 1 1 1	0.075/1.2 kbit/s CCITT Recommendations V.6 and X.1 (see note)
1 1 0 0 0	1.2/0.075 kbit/s CCITT Recommendations V.6 and X.1 (see note)
1 1 0 0 1	0.050 kbit/s CCITT Recommendations V.6 and X.1
1 1 0 1 0	0.075 kbit/s CCITT Recommendations V.6 and X.1
1 1 0 1 1	0.110 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 0 0	0.150 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 0 1	0.200 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 1 0	0.300 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 1 1	12 kbit/s CCITT Recommendation V.6

All other values are reserved.

NOTE – The first rate is the transmit rate in the forward direction of the call. The second rate is the transmit rate in the backward direction of the call.

Octet 5b for V.110/X.30 rate adaption

Intermediate rate (octet 5b)

Bits

7 6

0 0	not used
0 1	8 kbit/s
1 0	16 kbit/s
1 1	32 kbit/s

Network Independent Clock (NIC) on transmission (Tx) (octet 5b) (note 1)

Bit

5

0 not required to send data with Network Independent Clock

1 required to send data with Network Independent Clock

NOTES

1 Refers to the transmission in the forward direction of the call.
2 See CCITT Recommendations V.110 and X.30.

Network Independent Clock (NIC) on reception (Rx) (octet 5b) (note 1)

Bit

4

0 cannot accept data with Network Independent Clock (i.e., sender does not support this optional procedure)

1 can accept data with Network Independent Clock (i.e., sender does support this optional procedure)

NOTES

1 Refers to transmission in the backward direction of the call.
2 See CCITT Recommendations V.110 and X.30.

Flow control on transmission (Tx) (octet 5b) (note 1)

Bit

3

0 not required to send data with flow control mechanism

1 required to send data with flow control mechanism

NOTES

1 Refers to transmission in the forward direction of the call.
2 See CCITT Recommendations V.110 and X.30.

Flow control on reception (Rx) (octet 5b) (note 1)

Bit

2

0 cannot accept data with flow control mechanism (i.e., sender does not support this optional procedure)

1 can accept data with flow control mechanism (i.e., sender does support this optional procedure)

NOTES

1 Refers to transmission in the backward direction of the call.
2 See CCITT Recommendations V.110 and X.30.

Figure 11 *(continued)*

Number of stop bits (octet 5c)

Bits

7 6

0 0 not used

0 1 1 bit

1 0 1.5 bits

1 1 2 bits

NOTE – If bit 7 of octet 5a is "0", then these bits, when present, are set to "0" on transmission and ignored on reception.

Number of data bits excluding parity bit (octet 5c)

Bits

5 4

0 0 not used

0 1 5 bits

1 0 7 bits

1 1 8 bits

NOTE – If bit 7 of octet 5a is "0", then these bits, when present, are set to "0" on transmission and ignored on reception.

Parity information (octet 5c)

Bits

3 2 1

0 0 0 odd

0 1 0 even

0 1 1 none

1 0 0 forced to 0

1 0 1 forced to 1

All other values are reserved.

NOTE – If bit 7 of octet 5a is "0", then these bits, when present, are set to "0" on transmission and ignored on reception.

Duplex mode (octet 5d)

Bit

7

0 half duplex

1 full duplex

Modem type (octet 5d)

Bits 6-1 coded according to network-specific rules

User information layer 2 protocol (octet 6)

Bits

5 4 3 2 1

0 0 0 1 0 ANSI T1.602

0 0 1 1 0 CCITT Recommendation X.25, link level

NOTE – If the transfer mode is "packet mode" (case B), octet 6 shall be present. If the transfer mode is "circuit mode" (case A), octet 6 is omitted.

User information layer 3 protocol (octet 7)

Bits

5 4 3 2 1

0 0 1 1 0 CCITT Recommendation X.25, packet layer

NOTE – If the transfer mode is "packet mode" (case B), octet 7 shall be present. If the transfer mode is "circuit mode" (case A), octet 7 is omitted.

Figure 11 *(concluded)*

6.5.6 Call state

The purpose of the call state information element is to describe the current status of a case A circuit-switched call (see 4.1), or a case B packet-mode access connection (see 4.2), or a global interface state (see 4.3).

The call state information element is coded as shown in figure 12.

The maximum length of this information element is three octets when CCITT standard coding is used as described below.

8	7	6	5	4	3	2	1	Octet
	Call state information element identifier							
0	0	0	1	0	1	0	0	1
Length of call state contents								2
Coding standard	Call state value/Global interface state value (state value is coded in binary)							3

Coding standard (octet 3)

Bits

8 7

0 0 CCITT standardized coding, as described below

Call state value (octet 3)

Bits

6 5 4 3 2 1	*User state*			*Network state*		
0 0 0 0 0 0	U0	–	null	N0	–	null
0 0 0 0 0 1	U1	–	call initiated	N1	–	call initiated
0 0 0 0 1 0	U2	–	overlap sending (see note)	N2	–	overlap sending (see note)
0 0 0 0 1 1	U3	–	outgoing call proceeding	N3	–	outgoing call proceeding
0 0 0 1 0 0	U4	–	call delivered (see note)	N4	–	call delivered (see note)
0 0 0 1 1 0	U6	–	call present	N6	–	call present
0 0 0 1 1 1	U7	–	call received	N7	–	call received
0 0 1 0 0 0	U8	–	connect request	N8	–	connect request
0 0 1 0 0 1	U9	–	incoming call proceeding	N9	–	incoming call proceeding
0 0 1 0 1 0	U10	–	active	N10	–	active
0 0 1 0 1 1	U11	–	disconnect request	N11	–	disconnect request
0 0 1 1 0 0	U12	–	disconnect indication	N12	–	disconnect indication
0 1 0 0 1 1	U19	–	release request	N19	–	release request
0 1 0 1 1 0	–		–	N22	–	call abort

NOTE – These call state values can only be present in case A (access to PSPDN services).

Global interface state value (octet 3)

Bits

6 5 4 3 2 1	*state*		
0 0 0 0 0 0	REST0	–	null
1 1 1 1 0 1	REST1	–	restart request
1 1 1 1 1 0	REST2	–	restart

All other values are reserved.

Figure 12 – Call state information element

6.5.7 Called party number

The purpose of the called party number information element is to identify the called party of a call.

The called party number information element is coded as shown in figure 13.

The maximum length of this information element is network dependent.

8	7	6	5	4	3	2	1	Octet
	Called party number information element identifier							
0	1	1	1	0	0	0	0	1
Length of called party number contents								2
1 ext	Type of number			Numbering plan identification				3
0	Number digits (ASCII characters[1])							4 etc.

[1] The number digits appear in multiple octet 4's in the same order in which they would be entered, that is, the number that would be entered first is located in the first octet 4.

Type of number (octet 3) (note 1)

Bits

7 6 5

0 0 0 unknown (note 2)

0 0 1 international number (note 3)

0 1 0 national number (notes 3, 5, 6, 7)

0 1 1 network specific number (note 4)

1 0 0 subscriber number (notes 3, 7)

1 1 0 abbreviated number

1 1 1 reserved for extension

All other values are reserved.

NOTES

1 For the definition of international, national and subscriber number, see CCITT Recommendation I.330.

2 This codepoint is not applicable for case B. When this codepoint is used:

a) the number digits beginning in octet 4 can provide the same type of information as is supported in the keypad facility information element;

b) the called party number is provided en bloc; and

c) this information element cannot be used in combination with keypad facility, operator system access, or transit network selection information elements.

3 Prefix or escape digits shall not be included.

4 The type of number "network specific number" is used to indicate administration/service number specific to the serving network.

5 For calls between the United States of America and other countries within World Zone 1 (see CCITT Recommendation E.163 for assignment of country codes) where the Numbering Plan Identification is "ISDN/Telephony numbering plan", "type of number" is coded as "national number".

6 For numbers which contain service access codes (e.g., "700", "800", "900"), "type of number" is coded as "national number".

7 Service codes in the N11 format (e.g., 911, 411) are unique and may be sent using either the "subscriber number" or "national number" codepoints.

Numbering plan identification (octet 3)

Numbering plan (applies for type of number = 000, 001, 010, and 100)

Bits

4 3 2 1

0 0 0 0 unknown (notes 1, 2)

0 0 0 1 ISDN/Telephony numbering plan (CCITT Recommendation E.164/E.163)

1 1 1 1 reserved for extension

All other values are reserved.

NOTES

1 When this codepoint is used:

a) the number digits beginning in octet 4 can provide the same type of information as is supported in the keypad facility information element;

b) the called party number is provided en bloc; and

c) this information element cannot be used in combination with keypad facility, operator system access, or transit network selection information elements.

2 This codepoint is not applicable for case B.

Numbering digits (octets 4, etc.)

This field is coded with ASCII characters, according to the formats specified in the appropriate numbering/dialing plan.

Figure 13 – Called party number information element

6.5.8 Called party subaddress

The purpose of the called party subaddress information element is to identify the subaddress of the called party of a call. For the definition of subaddress, see CCITT Recommendations I.330 and I.334.

The called party subaddress is coded as shown in figure 14.

The maximum length of this information element is 23 octets.

8	7	6	5	4	3	2	1	Octet
	Called party subaddress information element identifier							
0	1	1	1	0	0	0	1	1
Length of called party subaddress contents								2
1 ext	Type of number			Odd/ even indic- ator	0	0 spare	0	3
Subaddress information								4 etc.

NOTE – The network need not screen the information contained within this information element beyond octet 2.

Type of subaddress (octet 3)

Bits

7 6 5

0 0 0 NSAP (X.213/ISO 8348/Add. 2)

0 1 0 user specified

All other values are reserved.

Odd/even indicator (octet 3)

Bit

4

0 even number of address signals

1 odd number of address signals

NOTE – The odd/even indicator is used when the type of subaddress is "user specified" and the coding is BCD.

Subaddress information (octet 4, etc.)

The NSAP address shall be encoded using the preferred binary encoding specified in CCITT Recommendation X.213/ISO 8348/Add. 2.

When the Authority and Format Identifier (AFI) = 50 (encoded in BCD as 0101 0000), IA5 characters are encoded as specified in table 11 of CCITT Recommendation T.50/ISO 646 with the eighth bit set to zero. When AFI = 51 (encoded in BCD as 0101 0001), ASCII characters are encoded as specified in ANSI X3.4 with the eighth bit set to zero. Examples of encoding OSI and non-OSI NSAP addresses are included in annex H of ANSI T1.607.

For a user-specified subaddress, the field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 networks, BCD coding should be applied.

Figure 14 – Called party subaddress information element

6.5.9 Calling party number [8)]

The purpose of the calling party number information element is to identify the origin of a call.

The calling party number information element is coded as shown in figure 15.

The maximum length of this information element is network dependent.

8	7	6	5	4	3	2	1	Octet
	Calling party number information element identifier							
0	1	1	0	1	1	0	0	1
Length of calling party number contents								2
0/1 ext	Type of number			Numbering plan identification				3
1 ext	Presentation indicator		0	0 spare	0	Screening indicator		3a*
0	Number digits (ASCII characters)							4 etc.

Type of number (octet 3) (note 1)

Bits

7 6 5

0 0 0 unknown (note 2)

0 0 1 international number (note 3)

0 1 0 national number (notes 3, 5)

0 1 1 network specific number (note 4)

1 0 0 subscriber number (note 3)

1 1 0 abbreviated number

1 1 1 reserved for extension

All other values are reserved.

NOTES

1 For the definition of international, national, and subscriber number, see CCITT Recommendation I.330.

2 The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g., international number, national number, etc. In this case the number digits field is organized according to the network dialing plan; e.g., prefix or escape digits might be present.

3 Prefix or escape digits shall not be included.

4 The type of number "network specific number" is used to indicate administration/service number specific to the serving network.

5 For calls between the United States of America and other countries within World Zone 1 (see CCITT Recommendation E.163 for assignment of country codes) where the Numbering Plan Identification is "ISDN/Telephony numbering plan", "type of number" is coded as "national number".

Numbering plan identification (octet 3)

Numbering plan (applies for type of number = 000, 001, 010, and 100)

Bits

4 3 2 1

0 0 0 0 unknown (see note)

0 0 0 1 ISDN/Telephony numbering plan (CCITT Recommendation E.164/E.163)

0 0 1 1 data numbering plan (CCITT Recommendation X.121)

1 1 1 1 reserved for extension

All other values are reserved.

NOTE – The numbering plan "unknown" is used when the user or the network has no knowledge of the numbering plan. In this case the number digits field is organized according to the network dialing plan; e.g., prefix or escape digits might be present.

Presentation indicator (octet 3a)

Bits

7 6

0 0 presentation allowed

0 1 presentation restricted

Figure 15 – Calling party number information element

8) For revisions to this subclause, see ANSI T1.608a-1992 (final pages of this standard).

1 0 number not available

1 1 reserved

NOTE – At the originating user–network interface, the presentation indicator is used for indicating the intention of the calling user for the presentation of the calling party number to the called user. This may also be requested on a subscription basis. If octet 3a is omitted, and the network does not support subscription information for the calling party number information restrictions, the value "00 – presentation allowed" is assumed.

Screening indicator (octet 3a) (note 1)

Bits

2 1

0 0 user-provided, not screened

0 1 user-provided, verified and passed (note 2)

1 0 user-provided, verified and failed

1 1 network provided (note 2)

NOTES

1 If octet 3a is omitted, "0 0 – user-provided, not screened" is assumed.

2 This coding is used in case B at the terminating network–user interface.

Number digits (octets 4, etc.)

This field is coded with ASCII characters, according to the formats specified in the appropriate numbering/dialing plan.

Figure 15 *(concluded)*

6.5.10 Calling party subaddress

The purpose of the calling party subaddress is to identify a subaddress associated with the origin of a call. For the definition of subaddress, see CCITT Recommendations I.330 and I.334.

The calling party subaddress information element is coded as shown in figure 16.

The maximum length of this information element is 23 octets.

8	7	6	5	4	3	2	1	Octet
	Calling party subaddress information element identifier							
0	1	1	0	1	1	0	1	1
Length of calling party subaddress contents								2
1 ext	Type of subaddress			Odd/ even indicator	0	0 spare	0	3
Subaddress information								4 etc.

Type of subaddress (octet 3)

Bits

7 6 5

0 0 0 NSAP (X.213/ISO 8348/Add.2)

0 1 0 user specified

All other values are reserved.

Odd/even indicator (octet 3)

Bit

4

0 even number of address signals

1 odd number of address signals

NOTE – The odd/even indicator is used when the type of subaddress is "user specified" and the coding is BCD.

Subaddress information (octet 4, etc.)

The NSAP address shall be encoded using the preferred binary encoding specified in CCITT Recommendation X.213/ISO 8348/Add.2.

When the AFI = 50 (encoded in BCD as 0101 0000), IA5 characters are encoded as specified in table 11 of CCITT Recommendation T.50/ISO 646 with the eighth bit set to zero. When AFI = 51 (encoded in BCD as 0101 0001), ASCII characters are encoded as specified in ANSI X3.4 with the eighth bit set to zero. Examples of encoding OSI and non-OSI NSAP addresses are included in annex H of ANSI T1.607.

For a user-specified subaddress, the field is encoded according to the user specification, subject to a maximum length of 20 octets. When interworking with X.25 networks, BCD coding should be applied.

Figure 16 – Calling party subaddress information element

6.5.11 Cause

The purpose of the cause information element is to describe the reason for generating certain messages, to provide diagnostic information in the event of procedural errors and to indicate the location of the cause originator.

The cause information element is coded as shown in figure 17. The maximum length of this information element is 32 octets.

The cause information element and diagnostic may be repeated in a message, e.g., to report multiple errors associated with a single call but only one cause value is transferred to the remote user through the network.

8	7	6	5	4	3	2	1	Octet
	Cause information element identifier							
0	0	0	0	1	0	0	0	1
Length of cause contents								2
0/1 ext	Coding standard		0 spare	Location				3
1 ext	Recommendation							3a*[1]
1 ext	Cause value							4
Diagnostic(s) (if any)								5*

[1] If the default value applies for the Recommendation field, octet 3a shall be omitted.

Coding standard (octet 3)

Bits

7 6

0 0 CCITT standardized coding (see note)

1 0 National standard as described below

NOTE – The coding described below is the CCITT coding except those codepoints indicated as national standard.

Location (octet 3)

Bits

4 3 2 1

0 0 0 0 user

0 0 0 1 private network serving the local user

0 0 1 0 public network serving the local user

0 0 1 1 transit network

0 1 0 0 public network serving the remote user

0 1 0 1 private network serving the remote user

0 1 1 1 international network

1 0 1 0 network beyond interworking point

All other values are reserved.

NOTES

1 Depending on the location of the users, the local public network and remote public network may be the same network.

2 Examples of location values to be used for various busy/congestion conditions appear in annex J of ANSI T1.607.

Recommendation (octet 3a) (note 1)

Bits

7 6 5 4 3 2 1

0 0 0 0 0 0 0 ANSI T1.607 (note 2)

0 0 0 0 1 0 0 CCITT Recommendation X.25

All other values are reserved.

Figure 17 – Cause information element

NOTES

1 If octet 3a is omitted, ANSI T1.607 is assumed.

2 This value is used only when octet 3a is extended and the cause in octet 4 is from table 5.

Cause value (octet 4)

The cause value is divided in two fields, a class (bits 5 through 7) and a value within the class (bits 1 through 4). The class indicates the general nature of the event.

Class (000): normal event

Class (001) : normal event

Class (010) : resource unavailable

Class (011) : service or option not available

Class (100) : service or option not implemented

Class (101) : invalid message (e.g., parameter out of range)

Class (110) : protocol error (e.g., unknown message)

Class (111) : interworking

The cause values are listed in table 5, and defined in annex G of ANSI T1.607.

Diagnostics (octet 5)

Diagnostic information is not available for every cause, see table 5. The inclusion of diagnostics is optional. When available the coding of diagnostic(s) is the same as for the corresponding information element in clause 6.

Attribute number (octet 5)

Bits *7 6 5 4 3 2 1*	*No.*	
0 1 1 0 0 0 1	1	Information transfer capability
0 1 1 0 0 1 0	2	Information transfer mode
0 1 1 0 0 1 1	3	Information transfer rate
0 1 1 1 0 0 1	9	Layer identification

Figure 17 *(concluded)*

Table 5 – Cause information element

Cause value		Cause number	Cause	Diagnostics
Class 7 6 5	Value 4 3 2 1			
0 0 0	0 0 0 1	1	Unallocated (unassigned) number	(note 11)
0 0 0	0 0 1 0	2	No route to specified transit network	Transit network identity (note 10)
0 0 0	0 0 1 1	3	No route to destination	(note 11)
0 0 0	0 1 1 0	6	Channel unacceptable	—
0 0 0	0 1 1 1	7	Call awarded and being delivered in an established channel	—
0 0 1	0 0 0 0	16	Normal call clearing	(note 11)
0 0 1	0 0 0 1	17	User busy	—
0 0 1	0 0 1 0	18	No user responding	—
0 0 1	0 0 1 1	19	No answer from user (user alerted)	—
0 0 1	0 1 0 1	21	Call rejected	User-supplied diagnostics (note 11) (note 4)
0 0 1	0 1 1 0	22	Number changed	New destination (note 5)
0 0 1	1 0 1 0	26	Non-selected user clearing	—
0 0 1	1 0 1 1	27	Destination out of order	—
0 0 1	1 1 0 0	28	Invalid number format	—
0 0 1	1 1 0 1	29	Facility rejected	Facility identification (note 1)
0 0 1	1 1 1 0	30	Response to STATUS ENQUIRY	—
0 0 1	1 1 1 1	31	Normal, unspecified	—
0 1 0	0 0 1 0	34	No circuit/channel available	—
0 1 0	0 1 1 0	38	Network out of order	—
0 1 0	1 0 0 1	41	Temporary failure	—
0 1 0	1 0 1 0	42	Switching equipment congestion	—
0 1 0	1 0 1 1	43	Access information discarded	Discarded information element identifier(s) (note 6)
0 1 0	1 1 0 0	44	Requested circuit/channel not available	—
0 1 0	1 1 0 1	45	Preemption (note 12)	—
0 1 0	1 1 1 1	47	Resources unavailable, unspecified	—
0 1 1	0 0 0 1	49	Quality of service unavailable	(note 11)
0 1 1	0 0 1 0	50	Requested facility not subscribed	Facility identification (note 1)
0 1 1	1 0 0 1	57	Bearer capability not authorized	(note 3)
0 1 1	1 0 1 0	58	Bearer capability not presently available	(note 3)
0 1 1	1 1 1 1	63	Service or option not available, unspecified	—
1 0 0	0 0 0 1	65	Bearer capability not implemented	(note 3)
1 0 0	0 0 1 0	66	Channel type not implemented	Channel type (note 7)
1 0 0	0 1 0 1	69	Requested facility not implemented	Facility identification
1 0 0	0 1 1 0	70	Only restricted digital information bearer capability is available	—
1 0 0	1 1 1 1	79	Service or option not implemented, unspecified	—
1 0 1	0 0 0 1	81	Invalid call reference value	—
1 0 1	0 0 1 0	82	Identified channel does not exist	Channel identity
1 0 1	1 0 0 0	88	Incompatible destination	Incompatible parameter (note 2)
1 0 1	1 0 1 1	91	Invalid transit network selection	—
1 0 1	1 1 1 1	95	Invalid message, unspecified	—

(continued)

Table 5 – *(concluded)*

Cause value		Cause number	Cause	Diagnostics
Class 7 6 5	Value 4 3 2 1			
1 1 0	0 0 0 0	96	Mandatory information element is missing	Information element identifier(s) (note 6)
1 1 0	0 0 0 1	97	Message type non-existent or not implemented	Message type
1 1 0	0 0 1 0	98	Message not compatible with call state or message type non-existent or not implemented	Message type
1 1 0	0 0 1 1	99	Information element non-existent or not implemented	Information element identifier(s) (notes 6, 8)
1 1 0	0 1 0 0	100	Invalid information element contents	Information element identifier(s) (note 6)
1 1 0	0 1 0 1	101	Message not compatible with call state	Message type
1 1 0	0 1 1 0	102	Recovery on timer expiry	Timer number (note 9)
1 1 0	1 1 1 1	111	Protocol error, unspecified	—
1 1 1	1 1 1 1	127	Interworking, unspecified	—

All other values are reserved.

NOTES

1 The coding of the facility identification is network dependent.

2 Incompatible parameter is composed of incompatible information element identifier.

3 The format of the diagnostics field for causes number 57, 58, and 65 is as shown in figure 18.

4 User supplied diagnostics field is encoded according to the user specification, subject to the maximum length of the cause information element. The coding of user supplied diagnostics should be made in such a way that it does not conflict with the coding described in note 11 below.

5 New destination is formatted as the called party number information element, including information element identifier. Transit network selection may also be included.

6 Locking and nonlocking shift procedures described in 6.5.3 and 6.5.4, respectively, are applied. In principle, information element identifiers are ordered in the same order as the information elements in the received message.

7 The following coding is used:
- Bit 8: extension bit;
- Bit 7-5: spare;
- Bit 4-1: according to the channel identification information element octet 3.2, channel type.

8 When only the locking shift information element is included and no variable length information element identifier follows, it means that the codeset in the locking shift itself is not implemented.

9 The timer number is coded in ASCII characters, e.g., T308 is coded as "3" "0" "8". The following coding is used in each octet:
- Bit 8: Spare "0";
- Bit 7-1: ASCII character.

10 The diagnostics field contains the entire transit network selection or network specific facilities information element, as applicable.

11 The following coding is used:
- Bit 8: 1;
- Bit 7-3: 0 0 0 0 0;
- Bit 2-1: condition as follows:
  0 0 – unknown;
  0 1 – permanent;
  1 0 – transient.

12 This is an American national codepoint and can be used only if bits 6 and 7 of octet 3 are coded as national standard (i.e., "1 0").

13 Examples of cause values to be used for various busy/congestion conditions appear in annex J of ANSI T1.607.

8	7	6	5	4	3	2	1	Octet
0/1 ext	Attribute number							5
0/1 ext	Rejected attribute							5a
1 ext	Available attribute							5b*

NOTES

1 When diagnostics information is provided, octets 5 and 5a shall be present. Octet 5b is optional.

2 Octets 5 through 5b may be repeated to report multiple rejected attributes.

Rejected attribute (octet 5a)

Attribute no.

1. *Information transfer capability*

   Bits 7-6: 00

   Bits 5-1: according to bearer capability information element, octet 3

2. *Information transfer mode*

   Bits 7-6: according to bearer capability information element, octet 4

   Bits 5-1: 00000

3. *Information transfer rate*

   Bits 7-6: 00

   Bits 5-1: according to bearer capability information element, octet 4

4. *Layer identification*

   Bits

   7 6

   0 1 (layer 1) Bits 5-1 according to bearer capability information element, octet 5

   1 0 (layer 2) Bits 5-1 according to bearer capability information element, octet 6

   1 1 (layer 3) Bits 5-1 according to bearer capability information element, octet 7

Available attributes (octet 5b)

The same coding as octet 5a.

Figure 18 – Coding of the diagnostics field for cause numbers 57, 58, and 65

6.5.12 Channel identification

The purpose of the channel identification information element is to identify a channel within the interface(s) controlled by these signalling procedures.

The channel identification information element is coded as shown in figure 19.

Examples of the coding of the channel identification information element is shown in annex H of ANSI T1.607.

The default maximum length for this information element is network dependent.

8	7	6	5	4	3	2	1	Octet
	Channel identification information element identifier							
0	0	0	1	1	0	0	0	1
Length of channel identification contents								2
1 ext	Int. Id. present	Int. type	0 spare	Pref/ Excl	D-chan Ind.	Info channel selection		3
0/1 ext	Interface identifier							3.1* etc.[1]
1 ext	Coding standard		Nbr/ Map	Channel type/Map element type				3.2*[2]
Channel number/Slot map [3]								3.3*[2][4]

[1] When the "interface identifier present" field in octet 3 indicates "interface implicitly identified", octet 3.1 is omitted. When octet 3.1 is present it may be extended by using the extension bit (bit 8).

[2] When the "interfact type" field in octet 3 indicates "basic interface", octets 3.2 and 3.3 are functionally replaced by the "information channel selection" field in octet 3, and thus ommitted.

[3] When channel number is used, bit 8 is reserved for use as an extension bit and is thus set to "1".

[4] When channel number is used, this octet may be repeated to indicate multiple channels.

Interface identifier present (octet 3)

Bit

7

0 interface implicitly identified (see note)

1 interface explicitly identified in one or more octets, beginning with octet 3.1

NOTE – The interface which includes the D-channel carrying this information element is indicated.

Interface type (octet 3)

Bit

6

0 basic interface

1 other interface; e.g., primary rate (see note)

NOTE – The type of interface should be understood because the interface is identified by the "interface identifier present" field (octet 3, bit 7) and the interface identifier field (octet 3.1), if any.

Preferred/Exclusive (octet 3)

Bit

4

0 indicated channel is preferred

1 exclusive; only the indicated channel is acceptable

NOTE – Preferred/exclusive has significance only for B-channel selection.

D-channel indicator (octet 3)

Bit

3

0 the channel identified is not the D-channel

1 the channel identified is the D-channel

NOTE – D-channel indication has significance in D-channel use. No other information affects D-channel use.

Figure 19 – Channel identification information element

Information channel selection (octet 3) (note 1)

	Basic interface	*Other interfaces*
Bits		
2 1		
0 0	no channel (note 2)	no channel (note 2)
0 1	B1 channel	as indicated in following octets
1 0	B2 channel	reserved
1 1	any channel (note 3)	any channel (note 3)

NOTES

1 The information channel selection does not apply to the D-channel.

2 This codepoint should not be used for case A circuit-switched calls.

3 This codepoint should not be used in the network–user direction for case A circuit-switched calls in a point-to-multipoint configuration.

Interface identifier (octet 3.1)

Binary code assigned to the interface at subscription time. At subscription time, the binary code for the interface identifier will specify the number of octets to be used and the content of each octet.

NOTE – When the interface is implicitly identified, octet 3.1 is omitted.

Coding standard (octet 3.2)

Bits

7 6

0 0 CCITT standardized coding (see note)

1 0 National standard as described below

NOTE – The coding described below is the CCITT coding except those codepoints indicated as national standard.

Number/Map (octet 3.2)

Bit

5

0 channel is indicated by the number in the following octet

1 channel is indicated by the slot map (map) in the following octet(s)

Channel type/Map element type (octet 3.2)

Bits

4 3 2 1

0 0 1 1 B-channel units

0 1 1 0 H_0-channel units

0 1 1 1 H_{10}-channel units (see note)

1 0 0 0 H_{11}-channel units

All other values are reserved.

NOTE – This is an American national codepoint and can be used only with national standard "1 0".

Channel number (octet 3.3)

Binary number assigned to the channel. For B-channels, the channel number equals the time slot number. See CCITT Recommendation I.431.

NOTE – Either "channel number" or "slot map" is used exclusively, depending on the "number/map" information.

Slot map (octet 3.3)

Bit position(s) in slot map corresponding to time slot(s) used by the channel is set to 1. Some examples are listed in figure 20.

NOTE – Length of the slot map is decided by combination of channel unit size on which the slot map is mapped (e.g., B-channel) and map element.

Figure 19 *(concluded)*

8	7	6	5	4	3	2	1	Octet
24	23	22	21	20	19	18	17	3.3.1
16	15	14	13	12	11	10	9	3.3.2
8	7	6	5	4	3	2	1	3.3.3

a) Primary rate interface, map element = B-channel

8	7	6	5	4	3	2	1	Octet
				d(4)	c(3)	b(2)	a(1)	3.3

NOTES

1 See CCITT Recommendation I.431, annex A, concerning the meaning of (a) through (d).

2 Number within () indicates the associated H_0-channel number used when corresponding H_0-channel is represented by channel number in octet 3.3.

b) Primary rate interface, map element = H_0-channel

8	7	6	5	4	3	2	1	Octet
							H_{10}(1)	3.3

NOTES

1 This is an American national codepoint and can be used only with national standard "1 0".

2 Number within () indicates the associated H_{10}-channel number used when corresponding H_{10}-channel is represented by channel number in octet 3.3.

c) Primary rate interface, map element = H_{10}-channel

8	7	6	5	4	3	2	1	Octet
							H_{11}(1)	3.3

NOTE – Number within () indicates the associated H_{11}-channel number used when corresponding H_{11}-channel is represented by channel number in octet 3.3.

d) Primary rate interface, map element = H_{11}-channel

Figure 20 – Slot map field

6.5.13 Closed user group

The purpose of the closed user group (CUG) information element is to indicate a closed user group. It is used for packet-mode calls when either an X.25 CUG selection facility or a CUG with outgoing access selection facility is received in the incoming X.25 call request packet and unconditional notification applies.

The closed user group information element is coded as shown in figure 21.

8	7	6	5	4	3	2	1	Octet
	Closed user group information element identifier							
0	1	0	0	0	1	1	1	1
Length of closed user group information								2
1 ext	0	0	0	0	CUG identification			3
	spare							
0 spare	CUG index code (ASCII characters)							4 etc.

CUG indication (octet 3)

Bits

7 6 5

0 0 1 closed user group selection

0 1 0 closed user group with outgoing access selection and indication

All other values are reserved.

CUG index code (octets 4, etc.)

Bits

7 6 5 4 3 2 1

0 1 1 0 0 0 0 0

0 1 1 0 0 0 1 1

0 1 1 0 0 1 0 2

0 1 1 0 0 1 1 3

0 1 1 0 1 0 0 4

0 1 1 0 1 0 1 5

0 1 1 0 1 1 0 6

0 1 1 0 1 1 1 7

0 1 1 1 0 0 0 8

0 1 1 1 0 0 1 9

All other values are reserved.

Coding at originating party interface

The CUG information element should not be used at the originating party interface.

Coding at terminating party interface

When the user subscribes to unconditional notification and an X.25 CUG facility is included in the X.25 call request packet, the network should include the CUG information element in a SETUP message for a packet-mode call. The CUG indication field (octet 3) should be coded to "closed user group selection" if the X.25 facility is the CUG selection facility. It should be coded to "closed user group with outgoing access selection and indication" if the X.25 facility is the CUG with outgoing access facility. The digits in the index field of the X.25 CUG facility should be translated from binary-coded decimal to ASCII characters.

Figure 21 – Closed user group information element

6.5.14 Display

The purpose of the display information element is to supply display information that may be displayed by the user. The information contained in this element is coded in ASCII characters.

The display information element is coded as shown in figure 22.

The display information element has a default maximum length of 82 octets. If a user receives a display information element with a length exceeding the maximum length that the user can handle, the information element should be truncated by the user.

8	7	6	5	4	3	2	1	Octet
	Display information element identifier							
0	0	1	0	1	0	0	0	1
Length of display contents								2
0	Display information (ASCII characters)							3 etc.

Figure 22 – Display information element

6.5.15 End-to-end transit delay

The purpose of the end-to-end transit delay information element is to request and indicate the nominal maximum permissible transit delay applicable on a per call basis to that virtual call.

The end-to-end transit delay is coded as shown in figure 23.

The maximum length of this information element is 11 octets.

8	7	6	5	4	3	2	1	Octet
0	1	0	0	0	0	1	0	1
	End-to-end transit delay information element identifier							
Length of end-to-end transit delay contents								2
0 ext	0	0	0	0	0	Cumulative transit delay value		3
	spare							
0 ext	Cumulative transit delay value (continued)							3a
1 ext	Cumulative transit delay value (final)							3b
0 ext	0	0	0	0	0	Requested end-to-end transit delay value		4*[1]
	spare							
0 ext	Requested end-to-end transit delay value (continued)							4a*
1 ext	Requested end-to-end transit delay value (final)							4b*
0 ext	0	0	0	0	0	Maximum end-to-end transit delay value		5*[2]
	spare							
0 ext	Maximum end-to-end transit delay value (continued)							5a*
1 ext	Maximum end-to-end transit delay value (final)							5b*

[1] Octets 4, 4a, and 4b are optional. If present, these octets are always interpreted as requested end-to-end transit delay.

[2] Octets 5, 5a, and 5b are optional. If present, octets 4, 4a, and 4b must also be present.

Cumulative transit delay value (octet 3 (bits 1-2), octets 3a and 3b)

Cumulative transit delay value binary encoded in milliseconds. Bit 2 of octet 3 is the highest order bit and bit 1 of octet 3b is the lowest order bit. The cumulative transit delay value occupies 16 bits total.

Requested end-to-end transit delay value (octet 4 (bits 1-2), octets 4a and 4b)

Requested end-to-end transit delay value binary encoded in milliseconds. Bit 2 of octet 4 is the highest order bit and bit 1 of octet 4b is the lowest order bit. The requested end-to-end transit delay value occupies 16 bits total.

Maximum end-to-end transit delay value (octet 5 (bits 1-2), octets 5a and 5b)

Maximum end-to-end transit delay value binary encoded in milliseconds. Bit 2 of octet 5 is the highest order bit and bit 1 of octet 5b is the lowest order bit. The maximum end-to-end transit delay value occupies 16 bits total.

NOTE – The procedures only apply in the notification phase at the terminating exchange. At the terminating exchange, if the end-to-end transit delay facility is present in the X.25 incoming call request packet, the contents should be copied into end-to-end transit delay information element as follows:

Figure 23 – End-to-end transit delay information element

a) The cumulative transit delay field (octets 3 and 4) of the X.25 end-to-end transit delay facility should be copied into octets 3, 3a, and 3b. The bit order should be preserved as described above in the description;

b) If octets 5 and 6 are present in the X.25 end-to-end transit delay facility, they should be interpreted as the requested end-to-end transit delay value. The value present should be copied into octets 4, 4a, and 4b. The bit order should be preserved as described above in the description;

c) If octets 7 and 8 are present in the X.25 end-to-end transit delay facility, the value present is the minimum end-to-end transit delay allowed. Octets 7 and 8 should be copied into octets 5, 5a, and 5b. The bit order should be preserved as described above in the description.

Figure 23 *(concluded)*

6.5.16 Information rate

The purpose of this information rate information element is to notify the terminating user of the throughput indicated by the incoming X.25 call request packet.

The Information rate information element is coded as shown in figure 24.

The maximum length of this information element is 6 octets.

8	7	6	5	4	3	2	1	Octet
	Information rate information element identifier							
0	1	0	0	0	0	0	0	1
Length of information rate contents								2
1 ext	0 spare		0	Incoming information rate				3
1 ext	0 spare		0	Outgoing information rate				4
1 ext	0 spare		0	Minimum incoming information rate				5
1 ext	0 spare		0	Minimum outgoing information rate				6

NOTE – This information element applies only in the notification phase at the terminating exchange. If the throughput class facility or minimum throughput class facility is present in the X.25 incoming call packet, the contents may be copied into the information rate information element. The information rate information element for the direction of data transmission from the calling user is copied into octets 3 through 5. The information rate for the direction of data transmission from the called user is copied into octets 4 through 6. The bit order should be present as described in table 6.

Incoming/outgoing information rate (octets 3 and 4)

The incoming/outgoing information rate fields are used to indicate the information rate in the direction network to user and user to network, respectively.

The information rate for the direction of data transmission from the calling DTE is indicated in bits 5, 4, 3, 2, and 1 of octet 3. The information rate for the direction of data transmission from the called DTE is indicated in bits 5, 4, 3, 2, and 1 of octet 4. The bits are coded as specified in table 6.

Minimum incoming/outgoing information rate (octets 5 and 6)

The minimum information rate for the direction of data transmission from the calling DTE is indicated in bits 5, 4, 3, 2, and 1 of octet 5. The minimum information rate for the direction of data transmission from the called DTE is indicated in bits 5, 4, 3, 2, and 1 of octet 6. The bits are encoded as specified in table 6.

Figure 24 – Information rate information element

Table 6 – Throughput class coding

Bits 5 4 3 2 1	Throughput class (bits/s)	Bits 5 4 3 2 1	Throughput class (bits/s)
0 0 0 0 0	Reserved	0 1 0 0 0	2400
0 0 0 0 1	Reserved	0 1 0 0 1	4800
0 0 0 1 0	Reserved	0 1 0 1 0	9600
0 0 0 1 1	75	0 1 0 1 1	19200
0 0 1 0 0	150	0 1 1 0 0	48000
0 0 1 0 1	300	0 1 1 0 1	Reserved
0 0 1 1 0	600	0 1 1 1 0	Reserved
0 0 1 1 1	1200	0 1 1 1 1	Reserved

6.5.17 Low layer compatibility

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 a 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 (see annex B and annex L of ANSI T1.607).

If low layer compatibility negotiation is allowed by the network (see annex M of ANSI T1.607), the low layer compatibility information element is also passed transparently from the addressed entity to the originating entity.

The low layer compatibility information element is used only for case A (access to PSPDN services, see 4.1 of this standard).

The low layer compatibility information element is coded as shown in figure 25. The maximum length of this information element is 12 octets for case A access to PSPDN services as described in this standard.

8	7	6	5	4	3	2	1	Octet
0	1	1	1	1	1	0	0	1
	Low layer compatibility information element identifier							
Length of the low layer compatibility contents								2
0/1 ext	Coding standard		Information transfer capability					3
0/1 ext	Negot. indic.	0	0	0	0	0	0	3a*
		spare						
1 ext	0	0	1	0	0	0	0	4[1]
	Transfer mode		Information transfer rate					
0/1 ext	0	1	User information layer-1 protocol					5*
	Layer-1 identification							
0/1 ext	Synch/ Asynch	Negot.	User rate					5a*[4]
0/1 ext	Intermediate rate		NIC on Tx	NIC on Rx	Flow control on Tx	Flow control on Rx	0 spare	5b*[2]
0/1 ext	Header/ No header	Multi-frame support	Mode	LLI negot.	Assignor/ assignee	Inband/ Outband negot.	0 spare	5b*[3]
0/1 ext	Number of stop bits		Number of data bits		Parity			5c*[4]
1 ext	Duplex mode	Modem type						5d*[4]
1 ext	1	0	User information layer-2 protocol					6*
	Layer-2 ident.							
1 ext	1	1	User information layer-3 protocol					7*
	Layer 3 ident.							

[1] The low layer compatibility is bidirectional symmetric and the structure attribute is "8 kHz integrity". The configuration is assumed to be point-to-point and the method of establishment is assumed to be "demand".

[2] This octet may be present only if octet 5 indicates CCITT standardized rate adaption V.110/X.30.

[3] This octet is present only if octet 5 indicates CCITT standardized rate adaption V.120.

[4] This octet may be present if octet 5 indicates either of the CCITT standardized rate adaptions V.110/X.30 or V.120.

Figure 25 – Low layer compatibility information element

Coding standard (octet 3)

Bits

7 6

0 0 CCITT standardized coding (see note)

1 0 National standard as described below

NOTE – The coding described below is the CCITT coding except those codepoints indicated as national standard.

Information transfer capability (octet 3)

Bits

5 4 3 2 1

0 1 0 0 0 unrestricted digital information

0 1 0 0 1 restricted digital information

All other values are reserved.

Negotiation indicator (octet 3a)

Bit

7

0 out-band negotiation not possible

1 out-band negotiation possible

NOTES

1 See annex M of ANSI T1.607 for description of low layer compatibility negotiation.

2 When octet 3a is omitted, "out-band negotiation not possible" shall be assumed.

Transfer mode (octet 4)

Bits

7 6

0 0 circuit mode

All other values are reserved.

Information transfer rate (octet 4) (note 1)

Bits

5 4 3 2 1 circuit mode

1 0 0 0 0 64 kbit/s (note 1)

1 0 0 1 1 384 kbit/s

1 0 1 0 0 1472 kbit/s (note 2)

1 0 1 0 1 1536 kbit/s

All other values are reserved.

NOTES

1 The low layer compatibility is bidirectional symmetric and the value of the structure attribute is "8 kHz integrity". The configuration is assumed to be point-to-point and the method of establishment is assumed to be "demand".

2 This is an American national codepoint and can be used only with national standard "1 0".

User information layer 1 protocol (octet 5)

Bits

5 4 3 2 1

0 0 0 0 1 CCITT standardized rate adaption V.110/X.30. This implies the presence of octets 5a and optionally octets 5b, 5c, and 5d as defined below

0 0 1 1 1 non-CCITT standardized rate adaption. This implies the presence of octet 5a and, optionally octets 5b, 5c, and 5d. The use of this codepoint indicates that the user rate specified in octet 5a is defined by the user. Additionally, octets 5b, 5c, and 5d, if present, are defined consistent with the user specified rate adaption

0 1 0 0 0 CCITT standardized rate adaption V.120. This implies the presence of octets 5a and 5b as defined below, and optionally octets 5c and 5d

0 1 0 0 1 CCITT standardized rate adaption X.31 HDLC flag stuffing

All other values are reserved.

NOTE – If the transfer mode is "circuit mode", and if the information transfer capability is "unrestricted digital information" or "restricted digital information", and if the user information layer 1 protocol is not to be identified to the network, octet 5 shall be omitted. Otherwise, octet 5 shall be present.

Synchronous/asynchronous (octet 5a)

Bit

7

0 synchronous

1 asynchronous

NOTE – The protocol synchronous/asynchronous refers to R interface. In case of synchronous user rate except for half duplex operation, octets 5c and 5d may be omitted for CCITT Recommendation V.110 or V.120. In certain circumstances, octet 5b may be omitted for CCITT Recommendation V.110.

Negotiation (octet 5a)

Bit

6

0 in-band negotiation not possible

1 in-band negotiation possible

NOTE – Applicable to CCITT Recommendations V.110 and X.30, otherwise reserved.

Figure 25 *(continued)*

User rate (octet 5a)

Bits *5 4 3 2 1*	
0 0 0 0 0	rate is indicated by E-bits specified in CCITT Recommendation I.460
0 0 0 0 1	0.6 kbit/s CCITT Recommendations V.6 and X.1
0 0 0 1 0	1.2 kbit/s CCITT Recommendation V.6
0 0 0 1 1	2.4 kbit/s CCITT Recommendations V.6 and X.1
0 0 1 0 0	3.6 kbit/s CCITT Recommendation V.6
0 0 1 0 1	4.8 kbit/s CCITT Recommendations V.6 and X.1
0 0 1 1 0	7.2 kbit/s CCITT Recommendation V.6
0 0 1 1 1	8 kbit/s CCITT Recommendation I.460
0 1 0 0 0	9.6 kbit/s CCITT Recommendations V.6 and X.1
0 1 0 0 1	14.4 kbit/s CCITT Recommendation V.6
0 1 0 1 0	16 kbit/s CCITT Recommendation I.460
0 1 0 1 1	19.2 kbit/s CCITT Recommendation V.6
0 1 1 0 0	32 kbit/s CCITT Recommendation I.460
0 1 1 0 1	48 kbit/s CCITT Recommendations V.6 and X.1
0 1 1 1 1	56 kbit/s CCITT Recommendation V.6
1 0 1 0 1	0.1345 kbit/s CCITT Recommendation X.1
1 0 1 1 0	0.100 kbit/s CCITT Recommendation X.1
1 0 1 1 1	0.075/1.2 kbit/s CCITT Recommendations V.6 and X.1 (see note)
1 1 0 0 0	1.2/0.075 kbit/s CCITT Recommendations V.6 and X.1 (see note)
1 1 0 0 1	0.050 kbit/s CCITT Recommendations V.6 and X.1
1 1 0 1 0	0.075 kbit/s CCITT Recommendations V.6 and X.1
1 1 0 1 1	0.110 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 0 0	0.150 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 0 1	0.200 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 1 0	0.300 kbit/s CCITT Recommendations V.6 and X.1
1 1 1 1 1	12 kbit/s CCITT Recommendation V.6

All other values are reserved.

NOTE – The first rate is the transmit rate in the forward direction of the call. The second rate is the transmit rate in the backward direction of the call.

Octet 5b for V.110/X.30 rate adaption

Intermediate rate (octet 5b)

Bits *7 6*	
0 0	not used
0 1	8 kbit/s
1 0	16 kbit/s
1 1	32 kbit/s

Network Independent Clock (NIC) on transmission (Tx) (octet 5b) (note 1)

Bit

5

0 not required to send data with Network Independent Clock

1 required to send data with Network Independent Clock

NOTES

1 Refers to the transmission in the forward direction of the call.

2 See CCITT Recommendations V.110 and X.30.

Network Independent Clock (NIC) on reception (Rx) (octet 5b) (note 1)

Bit

4

0 cannot accept data with Network Independent Clock (i.e., sender does not support this optional procedure)

1 can accept data with Network Independent Clock (i.e., sender does support this optional procedure)

NOTES

1 Refers to transmission in the backward direction of the call.

2 See CCITT Recommendations V.110 and X.30.

Figure 25 *(continued)*

Flow control on transmission (Tx) (octet 5b) (note 1)

Bit

3

0 not required to send data with flow control mechanism

1 required to send data with flow control mechanism

NOTES

1 Refers to transmission in the forward direction of the call.

2 See CCITT Recommendations V.110 and X.30.

Flow control on reception (Rx) (octet 5b) (note 1)

Bit

2

0 cannot accept data with flow control mechanism (i.e., sender does not support this optional procedure)

1 can accept data with flow control mechanism (i.e., sender does support this optional procedure)

NOTES

1 Refers to transmission in the backward direction of the call.

2 See CCITT Recommendations V.110 and X.30.

Octet 5b for V.120 rate adaption Rate adaption header/no header (octet 5b)

Bit

7

0 rate adaption header not included

1 rate adaption header included

Multiple frame establishment support in data link (octet 5b)

Bit

6

0 multiple frame establishment not supported, only UI frames allowed

1 multiple frame establishment supported

Mode of operation (octet 5b)

Bit

5

0 bit transparent mode of operation

1 protocol sensitive mode of operation

Logical link identifier (LLI) negotiation (octet 5b)

Bit

4

0 default, LLI = 256 only

1 LLI negotiation

NOTE – A connection over which LLI negotiation will be executed is indicated in bit 2 of octet 5b.

Assignor/Assignee (octet 5b)

Bit

3

0 message originator is "default assigned"

1 message originator is "assigner only"

In-band/out-band negotiation (octet 5b)

Bit

2

0 not applicable to this standard

1 negotiation is done in-band using LLI = 0

Number of stop bits (octet 5c)

Bits

7 6

0 0 not used

0 1 1 bit

1 0 1.5 bits

1 1 2 bits

NOTE – If bit 7 of octet 5a is "0", then these bits, when present, are set to "0" on transmission and ignored on reception.

Number of data bits excluding parity bit (octet 5c)

Bits

5 4

0 0 not used

0 1 5 bits

1 0 7 bits

1 1 8 bits

NOTE – If bit 7 of octet 5a is "0", then these bits, when present, are set to "0" on transmission and ignored on reception.

Parity information (octet 5c)

Bits

3 2 1

0 0 0 odd

0 1 0 even

0 1 1 none

Figure 25 *(continued)*

1 0 0 *forced to 0*

1 0 1 forced to 1

All other values are reserved.

NOTE – If bit 7 of octet 5a is "0", then these bits, when present, are set to "0" on transmission and ignored on reception.

Duplex mode (octet 5d)

Bit

7

0 half duplex

1 full duplex

Modem type (octet 5d)

Bits 6-1 coded according to network specific rules.

User information layer 2 protocol (octet 6)

Bits

5 4 3 2 1

0 0 1 1 0 CCITT Recommendation X.25, link level

0 0 1 1 1 CCITT Recommendation X.25 multilink

All other values are reserved.

User information layer 3 protocol (octet 7)

Bits

5 4 3 2 1

0 0 1 1 0 CCITT Recommendation X.25, packet layer

All other values are reserved.

Figure 25 *(concluded)*

6.5.18 Packet layer binary parameters

The purpose of the packet layer binary parameters information element is to indicate requested layer 3 parameters values to be used for the call.

The packet layer binary parameters information element is coded as shown in figure 26.

The maximum length of this information element is 3 octets.

8	7	6	5	4	3	2	1	Octet
0	1	0	0	0	1	0	0	1
	Packet layer binary parameters information element identifier							
Length of packet layer binary parameter contents								2
1 ext	0	0	Spare	Fast select	Expe-dited data	Delivery Conf.	Modulus	3

Fast select (octet 3)

Bit

5 4

0 0 } fast select not requested

0 1 }

1 0 fast select requested with no restriction of response

1 1 fast select requested with restrictions of response

Expedited data (octet 3)

Bit

3

0 no request/request denied

1 request indicated/request accepted

Figure 26 – Packet layer binary parameters information element

Delivery confirmation (octet 3)

Bit

2

0 link-by-link confirmation

1 end-to-end confirmation

Modulus (octet 3)

Bit

1

0 modulus 8 sequencing

1 modulus 128 sequencing

Figure 26 *(concluded)*

6.5.19 Packet layer window size

The purpose of the packet layer window size information element is to indicate requested layer 3 window size value to be used for the call. The values are binary-encoded.

The packet layer window size is coded as shown in figure 27.

The maximum length of this information element is 4 octets.

8	7	6	5	4	3	2	1	Octet
	Packet layer window size information element identifier							
0	1	0	0	0	1	0	1	1
Length of packet layer window size contents								2
1 ext	Forward value							3
1 ext	Backward value							4*[1]

[1] This octet may be omitted. When omitted it indicates a request for the default value.

Figure 27 – Packet layer window size information element

6.5.20 Packet size

The purpose of the packet size information element is to indicate the requested packet size values to be used for the call. The values are encoded $\log_2$.

The packet size information element is coded as shown in figure 28.

The maximum length of this information element is 4 octets.

8	7	6	5	4	3	2	1	Octet
	Packet size information element identifier							
0	1	0	0	0	1	1	0	1
Length of packet size contents								2
1 ext	Forward value[2]							3
1 ext	Backward value[2]							4*[1]

[1] This octet may be omitted. When omitted it indicates a request for the default value.

[2] 0000 0000 is reserved.

Figure 28 – Packet size information element

6.5.21 Progress indicator

The purpose of the progress indicator information element is to describe an event that has occurred during the establishment of a case A circuit-switched call or during the establishment of a case B packet-switched access connection. The information element may occur two times in a message.

The progress indicator information element is coded as shown in figure 29. The default maximum length of this information element is 4 octets.

8	7	6	5	4	3	2	1	Octet
	Progress indicator information element identifier							
0	0	0	1	1	1	1	0	1
Length of progress indicator contents								2
1 ext	Coding standard		0 spare	Location				3
1 ext	Progress description							4

Coding standard (octet 3)

Bits

7 6

0 0 CCITT standardized coding (see note)

1 0 National standard as described below

All other values are reserved.

NOTE – The coding described below is the CCITT coding except those codepoints indicated as national standard.

Location (octet 3) (note 1)

Bits

4 3 2 1

0 0 0 0 user

0 0 0 1 private network serving the local user

0 0 1 0 public network serving the local user

0 0 1 1 transit network (note 2)

0 1 0 0 public network serving the remote user

0 1 0 1 private network serving the remote user

1 0 1 0 network beyond interworking point

All other values are reserved.

NOTES

1 Depending on the location of the users, the local public network and remote public network may be the same network.

2 This is an American national codepoint and can be used only with national standard "1 0".

Figure 29 – Progress indicator information element

Progress description (octet 4) (note 1)

Bits

7 6 5 4 3 2 1 *No.*

0 0 0 0 0 1 0 2 Destination address is non-ISDN

0 0 0 0 0 1 1 3 Origination address is non-ISDN

0 0 0 0 1 0 0 4 Call has returned to the ISDN

0 0 0 1 0 1 0 10 Delay in response at the called interface (note 2)

All other values are reserved.

NOTES

1 The use of the different progress descriptions is further explained in annex I of ANSI T1.607.

2 This is an American national codepoint and can be used only with national standard "1 0".

Figure 29 *(concluded)*

6.5.22 Redirecting number

The purpose of the redirecting number information element is to identify the number from which a call diversion or transfer was invoked.

The redirecting number information element is coded as shown in figure 30.

The maximum length of this information element is network dependent.

8	7	6	5	4	3	2	1	Octet
	Redirecting number information element identifier							
0	1	1	1	0	1	0	0	1
Length of redirecting number contents								2
0/1 ext	Type of number			Numbering plan identification				3
0/1 ext	Presentation indicator		0	0 Spare	0	Screening indicator		3a
1 ext	0	0 Spare	0	Reason for redirection				3b*
0 Spare	Number digits (ASCII characters)							4

Type of number (octet 3) (note 1)

Bits

7 6 5

0 0 0 unknown (note 2)

0 0 1 international number (note 3)

0 1 0 national number (notes 3, 5)

0 1 1 network specific number (note 4)

1 0 0 subscriber number (note 3)

1 1 0 abbreviated number

1 1 1 reserved for extension

All other values are reserved.

NOTES

1 For the definition of international, national and subscriber number, see CCITT Recommendation I.330.

Figure 30 – Redirecting number information element

2 The type of number "unknown" is used when the user or the network has no knowledge of the type of number, e.g., international number, national number, etc. In this case the number digits field is organized according to the network dialing plan; e.g., prefix or escape digits might be present.

3 Prefix or escape digits shall not be included.

4 The type of number "network specific number" is used to indicate administration/service number specific to the serving network.

5 For calls between the United States of America and other countries within World Zone 1 (see CCITT Recommendation E.163 for assignment of country codes) where the Numbering Plan Identification is "ISDN/Telephony numbering plan", "type of number" is coded as "national number".

Numbering plan identification (octet 3)

Numbering plan (applies for type of number = 000, 001, 010, and 100)

Bits

4 3 2 1

0 0 0 0	unknown (see note)
0 0 0 1	ISDN/Telephony numbering plan (CCITT Recommendation E.164/E.163)
0 0 1 1	data numbering plan (CCITT Recommendation X.121)
1 1 1 1	reserved for extension

All other values are reserved.

NOTE – The numbering plan "unknown" is used when the user or the network has no knowledge of the numbering plan. In this case the number digits field is organized according to the network dialing plan; e.g., prefix or escape digits might be present.

Presentation indicator (octet 3a)

Bits

7 6

0 0	presentation allowed

NOTE – At the redirecting user–network interface, the presentation indicator is used for indicating the intention of the redirecting user for the presentation of the redirecting party number to the called user. This may also be requested on a subscription basis. If octet 3a is omitted, and the network does not support subscription information for the redirecting party number information restrictions, the value "00 – presentation allowed" is assumed.

Screening indicator (octet 3a)

Bits

2 1

0 0	user-provided, not screened
0 1	user-provided, verified and passed
1 0	user-provided, verified and failed
1 1	network-provided

NOTE – If octet 3a is omitted, "0 0 – user-provided, not screened" is assumed.

Reason for redirection (octet 3b)

Bits

4 3 2 1

0 0 0 1	call forwarding busy or called DTE busy
0 0 1 0	call forwarding no reply
1 0 0 1	called DTE out of order
1 0 1 0	call forwarding by the called DTE
1 1 1 1	call forwarding unconditional or systematic call redirection

All other values are reserved.

Number digits (octets 4, etc.)

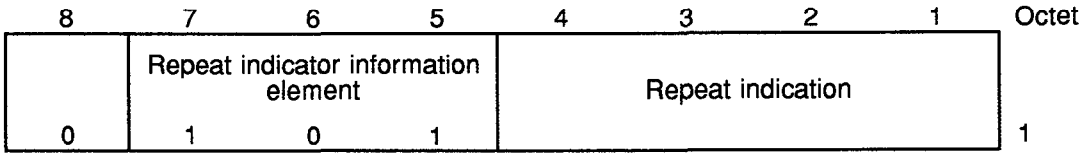
This field is coded with ASCII characters, according to the formats specified in the appropriate numbering/dialing plan.

Figure 30 *(concluded)*

6.5.23 Repeat indicator

The purpose of the repeat indicator information element is to indicate how repeated information elements shall be interpreted, when included in a message. The repeat indicator information element is included before the first occurrence of the information element which will be repeated in a message. The repeat indicator information element is coded as shown in figure 31.

NOTE – Use of the repeat indicator information element in conjunction with an information element that occurs only once in a message shall not of itself constitute an error.



Repeat indication (octet 1)

Bits

4 3 2 1

0 0 0 0 prioritized list for selecting one possibility (see note)

All other values are reserved.

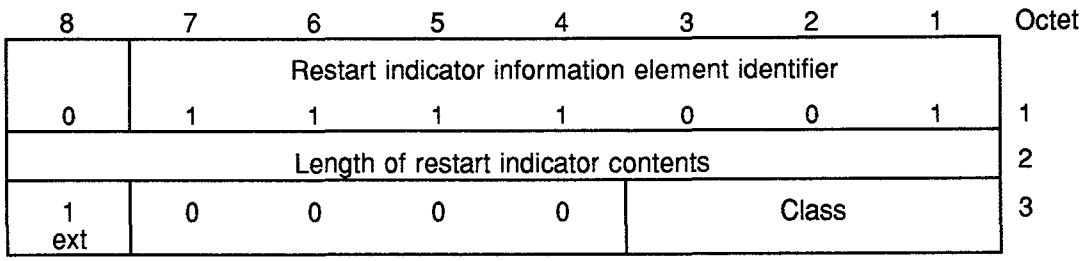
NOTE – Used for bearer service change procedures (see annex O of ANSI T1.607).

Figure 31 – Repeat indicator information element

6.5.24 Restart indicator

The purpose of the restart indicator information element is to identify the class of the facility (i.e., channel or interface) to be restarted.

The restart indicator information element is coded as shown in figure 32. The maximum length of this information element is three octets.



Class (octet 3)

3 2 1

0 0 0 indicated channels (note 1)

1 1 0 single interface (note 2)

1 1 1 all interfaces

All other values are reserved.

NOTES

1 The channel identification information element must be included and indicates which channels are to be restarted.

2 If non-associated signalling is used, the channel identification information element must be included to indicate the interface to be restarted if it is other than the one on which the D-channel is present.

Figure 32 – Restart indicator information element

6.5.25 Reverse charging indication

The purpose of the reverse charging indication information element is to indicate that an incoming packet call is reverse charged. It is used for packet-mode calls when X.25 reverse charging facility is received in the X.25 incoming call packet and unconditional notification applies.

The reverse charging indication information element is coded as shown in figure 33.

8	7	6	5	4	3	2	1	Octet
	Reverse charging indication information element identifier							
0	1	0	0	1	0	1	0	1
Length of reverse charging indication information								2
1 ext	0	0	0	0	Reverse charging indication			3
	Spare							

Reverse charging indication (octet 3)

Bits

3 2 1

0 0 1 reverse charging requested

All other values are reserved.

Coding at originating party interface

The reverse charging indication information element should not be used at the originating party interface.

Coding at terminating party interface

The network should include the reverse charging indication information element in a SETUP message for a packet-mode call when the user subscribes to unconditional notification and an X.25 reverse charging facility is included in the X.25 incoming call packet. The reverse charging indication field (octet 3) should be coded to "reverse charging requested" in this case.

Figure 33 – Reverse charging indication information element

6.5.26 Transit delay selection and indication

The purpose of the transit delay selection and indication information element is to request and indicate the nominal maximum permissible transit delay applicable on a per call basis to that virtual call.

The transit delay selection and indication information element is coded as shown in figure 34.

The maximum length of this information element is 5 octets.

8	7	6	5	4	3	2	1	Octet
	Transit delay selection and indication information element identifier							
0	1	0	0	0	0	1	1	1
Length of transit delay selection and indication information element								2
0 ext	0	0	0 Spare	0	0	Transit delay selection and indication value		3
0 ext	Transit delay selection and indication value (continued)							3a
1 ext	Transit delay selection and indication value (continued)							3b

Transit delay selection and indication value (octet 3 (bits 1-2), octets 3a and 3b)

Transit delay value binary encoded in milliseconds. Bit 2 of octet 3 is the highest order bit and bit 1 of octet 3b is the lowest order bit. The transit delay value occupies 16 bits total.

NOTE – The procedures only apply in the notification phase at the terminating exchange. At the terminating exchange, if the transit delay selection and indication facility is present in the X.25 incoming call request packet, the two octet value should be copied into octets 3, 3a, and 3b with the highest order bit contained in bit 2 of octet 3 and the lowest order bit contained in bit 1 of octet 3b.

Figure 34 – Transit delay selection and indication information element

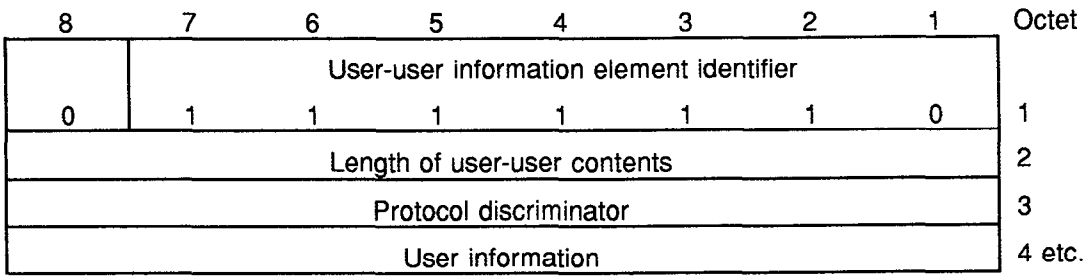
6.5.27 User–user

The purpose of the user–user information element is to convey information between ISDN users. This information is not interpreted by the network, but rather is carried transparently and delivered to the remote user(s).

The user–user information element is coded as shown in figure 35. There are no restrictions on content of the user information field.

In SETUP, ALERTING, CONNECT, DISCONNECT, RELEASE and RELEASE COMPLETE message, the user–user information element has a maximum size of 131 octets.

NOTE – The user–user information element is transported transparently by an ISDN between a call originating entity, e.g., a calling user and the addressed entity, e.g., a remote user or a high layer function network node addressed by the call originating entity.



Protocol discriminator (octet 3)

Bits

8 7 6 5 4 3 2 1

0 0 0 0 0 0 0 0 user-specific protocol (note 1)

0 0 0 0 0 0 0 1 OSI high layer protocols

0 0 0 0 0 0 1 0 CCITT Recommendation X.244 (note 2)

0 0 0 0 0 0 1 1 reserved for system management convergence function

0 0 0 0 0 1 0 0 ASCII characters (note 3)

0 0 0 0 1 0 0 0 ANSI T1.607 user–network call control messages

All other values are reserved.

NOTES

1 The user information is structured according to user needs.

2 The user information is structured according to CCITT Recommendation X.244, which specifies the structure of X.25 call user data.

3 The user information consists of ASCII characters.

Figure 35 – User–user information element

REVISION NOTE – See ANSI T1.608a-1992 (final pages of this standard) for new subclauses 6.5.28 – 6.5.30.

7 Packet communication procedures

According to CCITT Recommendation X.31, the user may access packet facilities by means of one of the following alternatives:

a) Circuit-switched access to PSPDN services (case A) by establishing a transparent circuit-switched access connection through the ISDN to the access port of a public network (e.g., PSPDN) referred to as "access unit (AU)" in the following subclauses. This connection may be initiated by the user or the AU. From the ISDN point of view, the circuit-switched call control procedures of clause 5 of ANSI T1.607 apply. Only the B-channel is used in this case;

b) Packet-switched access to an ISDN virtual circuit service (case B) by establishing a packet-mode access connection to the packet handler (PH) of an ISDN. This connection may be initiated by the user or the ISDN. Both B- and D-channels may be used in this case.

The term, *user*, refers to the user equipment which may consist of an ISDN packet-mode terminal (TE1) or a combination of an existing data terminating equipment (DTE/TE2) attached to a terminal adaptor (TA). A DTE may not receive all of the information provided in DSS1 signalling messages at the user–network interface.

The ISDN TA/TE1 presents an S, T, or U interface towards the network and therefore the TA/TE1 implementation should embody the procedures described in ANSI T1.602, ANSI T1.607, and this standard for B- and D-channel connection establishment and control.

For demand access connections, 7.1 through 7.5 apply. Example message flows for demand access connections are shown in annex A.

Two types of semipermanent connections on B- and D-channels are covered in this clause:

a) Physical layer semipermanently established between the terminal and the PH/AU, i.e., the T1.605/I.431 physical layer remains activated and the physical path through the ISDN is connected semipermanently; and

b) Data link and physical layers semipermanently established between the terminal and the PH/AU (in this type, the network shall keep the data link layer in the established state). Specific procedures for maintaining the data link layer in the established state are for further study.

When a permanent virtual circuit (PVC) is used, there must exist a type 2 semipermanent connection.

In semipermanent connection type (1), the procedures of 7.3 are followed for call establishment and release.

In semipermanent connection type (2), only the procedures of 7.3.2 are followed for call establishment and release.

When semipermanent connection type (2) is used for PVCs, none of the following procedures apply.

Semipermanent connections are established via a provisioning process without DSS1 procedures.

7.1 Outgoing access

If the user selects an already established channel for the outgoing virtual call, then the procedures described in 7.3 apply. If the selected channel is not established to the AU/PH, then the procedures for activating a channel described in the following subclauses are to be used before establishing the virtual call using the procedures of 7.3.

For outgoing data calls, the user first must decide whether circuit-switched (case A) or packet-switched services (case B) are desired from the network. For outgoing circuit calls, the user follows the procedures of 7.1.1. For outgoing packet calls, a user decides whether B-channel or D-channel is to be used for the packet call. If the user decides to use the B-channel, then the procedures described in 7.1.2.1 are used. If the user decides to use the D-channel, then the procedures described in 7.1.2.2 are used.

NOTE – Some networks may not support every type of access. In the case of B-channel access, the network will clear a request for unsupported services by sending a RELEASE COMPLETE message with cause #65, "bearer service not implemented". In the case of a request for D-channel access (a SABME with SAPI = 16) on a network port which does not support the service, no response is required of the network.

Table 7 – User-requested channel and network response outgoing access to either an AU or PH

Channel indicated in the SETUP message user to network direction			Allowable network response
Channel indication	Preferred or exclusive	D-channel indication	Network–user
Bi	exclusive	no	Bi
	preferred	no	Bi, Bi′
any	(ignore)	no	Bi′
absent			Bi′

KEY
Bi = the indicated (idle) B-channel
Bi′ = any (other) idle B-channel

NOTES

1 All other encodings are invalid

2 All columns under the heading "Channel indicated in the SETUP message" indicate possible user codings of the channel identification information element contained in the SETUP message sent by the user to the network requesting a connection to an AU or PH (see 4.5.12 of ANSI T1.607). The column under "Allowable network response" refers to the allowable responses by the network to the user.

7.1.1 Circuit-switched access to PSPDN services (case A)

The B-channel connection between the user and the AU shall be controlled using the D-channel signalling procedures for call establishment described in 5.1 of ANSI T1.607 using information elements defined in clause 6 of this standard. The specific B-channel to be used as a switched connection is selected using the channel selection procedures described in 5.1.2 of ANSI T1.607 and summarized in table 7.

On the basis of the call setup information (e.g., called party number identifying an AU, transit network selection, etc.) and a subscription time agreement, or both; the network provides a connection to the appropriate AU. The bearer capability information element included in the SETUP message shall be coded with:

a) Information transfer capability set to either:

1) "Unrestricted digital information";

or

2) "Restricted digital information";

b) Transfer mode set to "circuit mode";

c) Information rate set to "64 kbit/s".

NOTE – Bearer capability information element octets 4a and 4b shall not be included.

The user may also specify the layer 1 (e.g., rate adaptation), layer 2 (i.e., LAPB) and layer 3 (i.e., X.25) information transfer protocols in the low layer compatibility information element in the message (see annex L of ANSI T1.607).

7.1.2 Access to the ISDN virtual circuit service (case B)

7.1.2.1 B-channel

Demand access B-channel connections are controlled using the D-channel signalling procedures for call establishment described in

5.1 of ANSI T1.607 using the messages defined in 5.2 of this standard with the following exceptions:

a) The procedures for overlap sending specified in 5.1.3 of ANSI T1.607 do not apply;

b) The procedures for call proceeding, overlap sending specified in 5.1.5.2 of ANSI T1.607 do not apply;

c) The procedures for notification of interworking at the originating interface specified in 5.1.6 of ANSI T1.607 do not apply;

d) The procedures for call confirmation indication specified in 5.1.7 of ANSI T1.607 do not apply;

e) The procedures for call connected specified in 5.1.8 of ANSI T1.607 apply as follows:

1) Upon accepting the access connection, the network shall send a CONNECT message across the user–network interface to the calling user and enter the Active state;

2) This message indicates to the calling user that an access connection to the packet handler has been established;

3) On receipt of the CONNECT message, the calling user may optionally send a CONNECT ACKNOWLEDGE message, and shall enter the Active state;

f) The procedures for call rejection specified in 5.1.9 of ANSI T1.607 apply. When unable to accept the access connection, the network shall initiate call clearing at the originating user–network interface as described in 5.3 of ANSI T1.607;

g) The procedures for transit network selection specified in 5.1.10 of ANSI T1.607 do not apply. If transit network selection is needed, the X.25 Recognized Private Operating Agency (RPOA) Selection facility is used.

The specific B-channel to be used as a demand connection is selected using the channel negotiation procedures described in 5.1.2 of ANSI T1.607 and summarized in table 7.

For a demand connection to an ISDN PH, the bearer capability information element included in the SETUP message shall be coded with:

- Information transfer capability set to "unrestricted digital information";
- Transfer mode set to "packet mode";
- Information transfer rate set to "00000";
- User information layer 2 protocol set to "Recommendation X.25, link layer";
- User information layer 3 protocol set to "Recommendation X.25, packet layer".

NOTE – Octets 4a, 4b and 5a, 5b, 5c, and 5d shall not be included.

The demand access connection can then be used to support packet communications according to X.25 link layer and X.25 packet layer procedures as specified in 7.3 of this standard.

7.1.2.2 D-channel

The D-channel provides a connection which enables the ISDN user terminal to access a PH function within the ISDN by establishing a link layer connection (SAPI = 16) to that function which can then be used to support packet communications according to X.25 layer 3 procedures as defined in 7.3. The X.25 packet layer uses the acknowledged information transfer service (i.e., I-frames) provided by LAPD (see ANSI T1.602). Consequently, DSS1 procedures are not required to provide D-channel access.

A number of packet-mode user equipment can operate simultaneously over the D-channel, each using a separate layer 2 data link identified by an appropriate address (see ANSI T1.602) in frames transferred between the user and PH.

7.2 Incoming access

7.2.1 Access from PSPDN services (case A)

The ISDN signals the establishment of the circuit-mode connection using the procedures described in 5.2 of ANSI T1.607 using information elements defined in clause 6. The virtual calls are signalled between the user and the AU using the procedures described in 7.3.

Table 8 – Network-requested channel and user response incoming access from an AU

Channel indicated in the SETUP message network to user direction			Allowable user response
Channel indication	Preferred or exclusive	D-channel indication	User–network
Bi	exclusive	no	Bi
Bi	preferred	no	Bi, Bi′ (note 1)

KEY
Bi = the indicated (idle) B-channel
Bi′ = any (other) idle B-channel (not permitted for broadcast call offering)

NOTES

1 This encoding is not used for broadcast call offering.

2 All other encodings are invalid.

7.2.1.1 General

The general procedures performed by the AU are those defined in CCITT Recommendation X.32.

7.2.1.2 Channel selection

If the physical circuit desired by the AU does not exist between the terminal and the AU, the procedures for physical channel establishment described in the following subclauses apply.

The format of the SETUP message sent by the network to the user is in accordance with 3.1.11 of ANSI T1.607. The bearer capability information element included in the SETUP message shall be coded with:

a) Information transfer capability set to either:

1) "Unrestricted digital information";

or

2) "Restricted digital information";

b) Transfer mode set to "circuit mode";

c) Information rate set to "64 kbit/s".

NOTE - Bearer capability information element octets 4a and 4b shall not be included.

The channel identification information element shall be coded according to table 8.

The AU may also specify the layer 1 (e.g., rate adaption), layer 2 (i.e., LAPB), and layer 3 (i.e., X.25) information transfer protocols in the low layer compatibility information in the message.

The B-channel connection to the called user shall be established by the network using the signalling procedures described in 5.2 of ANSI T1.607. The call is offered by sending the SETUP message on either a point-to-point data link or on the broadcast data link.

The user responds to the SETUP as specified in clause 5 of ANSI T1.607.

7.2.1.3 Notification classes for incoming calls

There are two classes in terms of DSS1 procedures for the AU to notify the user of incoming calls: no notification class and conditional notification class. These two classes may be provided on a subscription basis by the AU. AUs shall provide either one or both of the two classes. These two classes are defined in 7.2.2.1.1 and 7.2.2.1.2 with the following exceptions:

a) The terms used in 7.2.2.1.1 apply by replacing "PH" with "AU";

b) Only the B-channel will be used in this case;

c) Mapping of information in the conditional case is restricted to the information elements available for end-to-end transfer of information (e.g., calling address/subaddress, called address/subaddress);

d) Mapping of called address in the X.25 incoming call packet into the DSS1 SETUP message is as follows:

1) If the called address in the X.25 incoming call packet represents an E.164 ISDN number, then the called address and subaddress (if present) from that packet should be mapped into the called party number and called party subaddress information elements in the DSS1 SETUP message. This mapping of E.164 address from X.25 to DSS1 should be done by the AU and should not be done by the ISDN;

2) If the called address in the X.25 incoming call packet represents an X.121 PSPDN number, then the PSPDN/AU should determine the E.164 address of the TA/DTE associated with the X.121 number. That E.164 called address should be used by the AU as the called party number in the called party number information element in the DSS1 SETUP message. This mapping from X.121 number to E.164 number should be done by the AU and should not be done by the ISDN.

7.2.2 Access from the ISDN virtual circuit service (case B)

To offer an incoming call, the network must perform the following steps in sequence:

a) *Channel selection:* The physical channel/logical link to be used for the incoming call must be identified. The network may use customer profile information, network resources, etc., to choose the channel or the procedures in step (b) below;

b) *Physical channel/logical link establishment:* If the physical B-channel or the logical link of the D-channel have not been determined by step (a), the network may use the procedures in 7.2.2.4. The network may then proceed with step (c);

c) *Virtual call establishment:* The network establishes the virtual call using the procedures described in 7.3.

In the configuration for the ISDN virtual circuit service, the choice of channel type to be used for the delivery of a new incoming call packet shall be made by the network as described below:

1) A new incoming call packet may be indicated to the ISDN customer by a call offering procedure between the network and all user packet-mode terminals (see 7.2.2.1.2 and 7.2.2.1.3);

2) An incoming virtual call directed to a terminal with an established access connection to the PH may be offered directly to the terminal over the established access connection without the use of DSS1 call offering procedures (see 7.2.2.1.1 and 7.2.2.1.2).

7.2.2.1 Notification classes for incoming calls

There are three classes in terms of DSS1 procedures to notify the user of incoming calls. These classes may be provided on a subscription basis. Networks shall provide one or more of these classes.

7.2.2.1.1 No notification class

The network shall allocate incoming calls to a channel (D/B) using a network implemented algorithm. No DSS1 procedures are used to notify the user of incoming calls. Two subclasses are recognized:

a) *Semipermanent (nailed-up) connections to the PH:* An incoming call packet will be directly delivered over the semipermanent connection;

b) *User-initiated demand connections (at the called side):* The user is responsible for initiating channels to the PH using DSS1 procedures. If the user has not initiated channels to the PH, the PH shall clear incoming calls.

7.2.2.1.2 Conditional notification class

DSS1 procedures are only used by the network to activate a channel for delivery of an incoming call when there is no available channel in the active state as defined in 4.2.2.8. Subsequent incoming calls to the same ISDN number will be delivered over this channel using procedures defined in this standard.

Table 9 – Information mapping requirements for notification classes

Notification class	Information mapping
Conditional	Called address M Called subaddress M Any others O
Unconditional	All (see note) M

KEY
M: Mandatory
O: Network option

NOTE – "All" means as many as possible using available information elements shown in table 11 and the procedures described in 7.2.2.1.3.

Some networks may have the ability to maintain information related to the state of the user's packet-access channel. The network may apply an algorithm to determine that no additional calls should be added to the active packet-access channel. The network may then reject the call immediately or use DSS1 procedures in an attempt to activate another channel for the purpose of delivering additional calls.

NOTE – Some networks may also use DSS1 procedures in an attempt to activate another channel for the purpose of delivering additional calls when the ISDN address differs from the ISDN address of the active packet-access channel. Additional criteria for activating additional access channels may be network-specific.

7.2.2.1.3 Unconditional notification class

DSS1 procedures are used by the network to notify the user of each X.25 incoming call. As table 9 notes, all of the information that is able to be copied from the X.25 incoming call packet to the DSS1 SETUP message is copied. This service is provided in order to aid the terminal equipment in the management of the interface (e.g., compatibility checking, channel selection).

Mapping of X.25 facilities to DSS1 information elements may be restricted by length limitations of the SETUP message in ANSI T1.608 and the information frame in ANSI T1.602. In the case of mandatory mapping (see table 9) and length limitation violation, the treatment to be applied shall depend on network support of the message segmentation mechanism in CCITT Recommendation Q.931. If Q.931 message segmentation is used by the network, the mapping should be performed and the call should not be cleared. If Q.931 message segmentation is not used, the network should be capable of selecting individual information elements to be mapped and of selecting other information elements which will not be mapped (e.g., user–user, display). This action should be taken to avoid exceeding the maximum length of the SETUP message/information frame, and should not result in clearing of the call.

In the case of optional mapping (see table 9), the network shall also be capable of selecting individual information elements to be mapped and of selecting other information elements which will not be mapped. The exact criteria for selection of information elements to be mapped or not mapped shall be network dependent.

7.2.2.1.4 Information mapping from the X.25 incoming call packet to the DSS1 message

In the case of conditional notification and unconditional notification classes, some of the information present in the X.25 incoming call packet should be mapped into the DSS1 SETUP message (see 5.2.9) as indicated in table 9 and defined in table 11.

7.2.2.2 B-channel

When calls are to be offered on the B-channels without channel negotiation, the procedures described in 5.2 of ANSI T1.607 using the messages of 5.2 of this standard apply with the following exceptions:

a) The procedures for receipt of CALL PROCEEDING and ALERTING specified in 5.2.5.2 of ANSI T1.607 apply with the exception that the receipt of an ALERTING message shall not cause the network to send a corresponding ALERTING message to the calling user;

b) The procedures for called user clearing during incoming call establishment specified in 5.2.5.3 of ANSI T1.607 apply noting that the network clears the incoming X.25 virtual call towards the calling X.25 DTE using the appropriate cause from table 13;

c) The procedures for call failure specified in 5.2.5.4 of ANSI T1.607 apply noting that the network clears the incoming X.25 virtual call towards the calling X.25 DTE using the appropriate cause from table 13;

d) The procedures for notification of interworking at the terminating interface specified in 5.2.6 of ANSI T1.607 apply with the following exceptions:

1) The case of the call entering an ISDN environment during call establishment is not applicable;

2) In the case of a call leaving the ISDN environment within the called user's premises, no notification is sent to the calling party;

3) The case of in-band information/patterns is not applicable;

e) The procedures for active indication specified in 5.2.8 of ANSI T1.607 apply with the exception that the network shall not initiate procedures to send a CONNECT message towards the calling user.

Where an established B-channel connection is to be used, the incoming call packet will be delivered in accordance with 7.3.

Where a new B-channel connection is to be established, the identity of the selected user will be associated with the Connection Endpoint Suffix (CES) (see ANSI T1.601) from which the first CONNECT message has been received.

7.2.2.3 D-channel

The D-channel provides a connection which enables the ISDN PH to access an ISDN user terminal or vice versa. This access is accomplished by establishing a link layer connection (SAPI = 16) to the terminal or network which can then be used to support packet communication according to X.25 layer 3 procedures as defined in 7.3.

The layer 2 procedures shall be in accordance with ANSI T1.602. The D-channel provides a semipermanent connection for packet access since all layer 2 frames containing a packet-mode SAPI (16) are routed automatically between the user and the PH function.

When an incoming call is offered to packet-mode user equipment at the user interface, the channel selection procedures described in 7.2.2.4 shall be used.

A number of packet-mode terminals can operate simultaneously over the D-channel, each using a separate layer 2 link identified by an appropriate TEI (see ANSI T1.602) in frames transferred between the terminal and the network.

7.2.2.4 Call offering

7.2.2.4.1 Channel selection through call offering

The call offering procedure is performed using the layer 3 messages and procedures of clause 5 of ANSI T1.607. The call offering procedure is integrated into the circuit-switched call control procedures, signalled on the D-channel, with the channel selection being accomplished by means of the channel selection procedure if offered as a network option.

As described in clause 5 of ANSI T1.607, the network selects the first user which responds to the call offering with a CONNECT message. When the selected user has requested that the X.25 call be set up over a new B-channel, the network will indicate that the channel is acceptable by returning a CONNECT ACKNOWLEDGE message to the user. If multiple terminals have responded positively to the SETUP message, the network shall clear each of the non-selected terminals with a RELEASE message containing cause #26, "non-selected user clearing".

When the selected user has requested that the X.25 call be set up over an established B-channel or the D-channel, the network shall respond to the CONNECT message with a RELEASE message containing cause #7, "call awarded and being delivered in an established channel". The network shall also return a RELEASE message containing cause #26, "non-selected user clearing" to any other positively responding terminals. The network will then deliver the X.25 virtual call over the selected channel.

NOTES

1 There is no time significance between the delivery of the RELEASE message and the incoming call packet, i.e., either may occur first.

2 The network shall send the RELEASE message(s) and the user(s) shall respond with RELEASE COMPLETE.

If the channel indicated by the first positively responding user is not available, the network will use DSS1 call clearing procedures to clear the call with cause #6, "channel unacceptable". If the channel indicated in the SETUP message is not acceptable to the user, the user will clear the call with a RELEASE message containing cause #34, "no circuit/channel available" or cause #44, "requested circuit/channel not available".

On the basis of a network option or subscription agreement, the network may choose the access channel or access channel type (e.g., B or D) for a particular incoming packet call.

When the channel identification information element indicates channel identification = no channel, exclusive, and D-channel indication = yes, then the bearer capability information element should be encoded as follows:

- Information transfer capability set to: unrestricted digital information;
- Transfer mode set to: packet mode;
- Information rate set to: packet mode (00000);
- Layer 2 protocol set to: ANSI T1.602;
- Layer 3 protocol set to: Recommendation X.25, packet layer.

In all other cases, the bearer capability information element should be encoded as follows:

- Information transfer capability set to: unrestricted digital information;
- Transfer mode set to: packet mode;
- Information rate set to: packet mode (00000);
- Layer 2 protocol set to: Recommendation X.25, link layer;
- Layer 3 protocol set to: Recommendation X.25, packet layer.

There exists an understanding that if the terminal responds with D-channel indication set (see table 10), the layer 2 protocol to be used is ANSI T1.602 (LAPD). The channel selection procedure for incoming calls is independent of the type of channel selected at the calling end. In this respect, any combination of channel type used at each end is possible, provided the user rates and available bandwidth are compatible.

The channel selection principle to be used in the procedure is shown in table 10.

NOTE – When the incoming SETUP message is sent on a broadcast data link with a channel identification information element which indicates an idle B-channel and "preferred," the called user is not permitted to respond with a different idle B-channel in the response (although a response with a different B-channel already in use by the responding terminal for packet mode communication is allowed). The option to respond with a different idle channel is restricted to point-to-point call offerings.

7.2.2.4.2 Information element mapping

Some networks may choose to provide a service of mapping some or all of the information from the incoming call packet into the SETUP message (see 7.2.2.1.3). Table 11 shows the mapping of the X.25 incoming call elements to subclause 5.2 information elements. The incoming call packet will still contain these fields when it is delivered. See 7.2.2.1.3 for mapping requirements.

7.2.2.4.3 Channel selection without call offering

Where the network and user have agreed beforehand, the network may route an incoming call to the called user over an established B-channel connection or D-channel link without the need for any signalling for channel selection.

7.3 Virtual call establishment and release

In all cases, once the physical channel has been selected and, if necessary, connected to the PH or AU, the virtual call is established according to the procedures below. In case A, some networks may require some of the DTE identification procedures and DCE identification procedures of CCITT Recommendation X.32 as well.

7.3.1 Link layer establishment and release

Link layer (LAPB on the B-channel or LAPD on the D-channel) establishment shall be initiated by:

a) The calling terminal in the case of outgoing calls;

Table 10 – Network-requested channel and user response incoming access for packet-mode

Channel indicated in the SETUP message network to user direction			Allowable user response
Channel indication	**Preferred or exclusive**	**D-channel indication**	**User–network**
Bi	exclusive	no	Bi
		yes	Bi, D
Bi	preferred	no	Bi, Bi′, Bj
		yes	Bi, Bi′, Bj, D
No channel	preferred	no	Bj
		yes	Bj, D
	exclusive	yes	D

KEY
Bi – indicated (idle) B-channel
Bi′ – any (other) idle B-channel (not permitted in response to broadcast call offering)
Bj – an established B-channel under the user's control
D – the D-channel

NOTE – All other encodings are invalid.

Table 11 – Mapping of X.25 information elements to corresponding DSS1 SETUP message information elements in packet-mode incoming call

	Information elements in X.25 incoming call packet	**Corresponding information element in DSS1 SETUP message (see 5.2.9)**
	Calling address	Calling party number
	Called address	Called party number
	User data (UD)	User–user information (note 2)
	A-bit (note 3)	For further study
	D-bit	Packet layer binary parameters
	Modulus	Packet layer binary parameters
X.25 user facility	Flow control parameter negotiation	Packet size, packet layer window size
	Throughput class negotiation	Information rate
	Fast select	Packet layer binary parameters
	Reverse charging	Reverse charging indication
	Closed user group selection	Closed user group
	Closed user group with outgoing access selection	Closed user group
	Bilateral closed user group	For further study
	Transit delay selection and indication	Transit delay selection and indication
	Call redirection and deflection notification	Redirecting number
DTE facility	Calling address extension	Calling party subaddress
	Called address extension	Called party subaddress
	End-to-end transit delay	End-to-end transit delay
	Minimum throughput class	Information rate
	Expedited data negotiation	Packet layer binary parameters

NOTES

1 Mapping is optional or required as indicated in 7.2.2.4.2.

2 The maximum length of the user data within the user–user information element is 128 octets.

3 The need and procedures for A-bit mapping is for further study.

b) The AU in the case of incoming calls in case A; or

c) The PH in the case of incoming calls in case B.

Link layer release may be initiated by:

a) The terminal;

b) The AU in case A; or

c) The PH in case B.

In case A, the link layer address assignment mechanism employed should be in accordance with the specifications in CCITT Recommendation X.32.

7.3.2 Packet-layer virtual call setup and release

The packet-layer procedures of X.25 will be used for layer 3 call setup and release. The packet-layer procedures will additionally be able to control and monitor the established or released state of the link layer.

In case B, the PH may maintain a timer T320 (defined in 8.3.1). T320, if implemented, is started:

a) Upon clearance of the last virtual call; or

b) Upon transmission of a CONNECT message by the network in the case of an outgoing B-channel access connection; or

c) Upon transmission of a CONNECT ACKNOWLEDGE message by the network in the case of an incoming B-channel access connection; or

d) Upon establishment of the link layer for D-channel access connections.

T320 is cancelled upon:

a) Establishment of the first (next) virtual call; or

b) Receipt of a DSS1 clearing message from the user; or

c) Disconnection of the SAPI =16 link on the D-channel.

Upon expiry of timer T320, the PH will release the link layer and, in the case of B-channel access, initiate clearing of the B-channel.

X.25 logical channels are associated with their underlying logical link. Specifically, in the case of the use of the B-channel for packet communication there is an association between the logical channels and the LAPB logical link below them. Thus the same logical channel number may be used simultaneously on each different B-channel.

7.4 Call clearing

7.4.1 B-channel

The clearing of the switched connection shall be effected by using the D-channel signalling procedures for call clearing as specified in 5.3 of ANSI T1.607. For access to PSPDN services, no exceptions apply. For the ISDN virtual circuit service, the messages of 5.2 are used, and the following exceptions apply:

a) The terms defined in 5.3.1 of ANSI T1.607, "Terminology", apply by replacing "circuit-switched ISDN connection" with "demand packet-mode access connection";

b) The procedures for clearing with tones and announcements provided in 5.3.4.1 of ANSI T1.607 do not apply.

The B-channel may be cleared at any time by the user though, in general, it will be cleared following the clearing of the last virtual call over that B-channel. In the ISDN virtual circuit service, if the user clears the B-channel access connection using a DSS1 clearing message while X.25 virtual calls still exist on the B-channel, the network shall clear the X.25 virtual call(s) with cause #17, "remote procedure error", and diagnostic #64, "call setup, call clearing, or registration problem". In case B, if a DSS1 RESTART message is received by the PH during the X.25 data transfer phase, the X.25 virtual calls shall be treated as follows:

a) For switched virtual circuits, an X.25 clear indication packet shall be sent with cause #9, "out of order" and diagnostic #0, "no additional information";

b) For permanent virtual circuits, an X.25 reset packet shall be sent containing cause #9, "out of order" and diagnostic #0, "no additional information".

At the expiration of timer T320, the network may disconnect the X.25 link layer and the access connection. B-channel clearing is as described in 5.3 of ANSI T1.607 with the

exceptions above, with cause #102, "recovery on timer expiry".

NOTE – The restart procedures apply only to the bearer channel(s). The restart procedures that are defined in ANSI T1.607 are used.

7.4.2 D-channel

D-channel access connections are cleared using the disconnect procedures as defined in 7.3.

7.4.3 Additional error handling information

7.4.3.1 Access to/from PSPDN services (case A)

The AU may choose to follow the procedures in 7.4.3.2 when call failure occurs, or the X.25 virtual call is cleared prematurely with the following exceptions:

a) The terms used in 7.4.3.2 apply by replacing "PH" with "AU" and "access connection" with "case A circuit-switched call";

b) The unconditional notification class of service does not apply.

7.4.3.2 Access to/from the ISDN virtual circuit service (case B)

When call failure occurs, or the X.25 virtual call is cleared prematurely, the rules of 5.8 of ANSI T1.607 shall apply. In addition, the following rules for determining the appropriate cause to be used shall apply in order of decreasing priority:

a) If a DSS1 clearing message or RESTART message is received by the PH during the X.25 data transfer phase, 7.4.1 applies;

b) If a call is rejected by the destination user using DSS1 messages, the X.25 virtual call shall be cleared using a clear indication packet and the appropriate cause from table 12;

c) If a condition exists that prevents the DSS1 SETUP message from being delivered at the user–network interface, the X.25 virtual call shall be cleared using a clear indication packet and a cause shall be selected appropriate to the condition;

Table 12 shall serve as a guide to selecting an appropriate cause, i.e., the X.25 mapping of the DSS1 cause describing the interface condition shall be used;

d) If the DSS1 SETUP message is sent across the user–network interface, but no response is received prior to the second expiry of timer T303, rule #3 applies;

e) If the DSS1 SETUP message is sent across the user–network interface, and a response is received from a user which results in the clearing of the call at the user–network interface, the X.25 virtual call shall be cleared using a clear indication packet containing the appropriate cause from table 12 relative to the cause received/sent in the DSS1 clearing message;

f) If an X.25 clear request packet is received from the originating user prior to the delivery of the X.25 incoming call packet to the called user (premature clearing), the PH shall send a clear confirmation packet to the calling user and the access connection shall be treated as follows:

1) If the DSS1 SETUP message was associated with the unconditional notification class of service (see 7.2.2.1.3), the access connection, when and if established, shall be cleared. The DSS1 clearing message shall contain the appropriate cause as described in table 13;

2) If the DSS1 SETUP message was associated with the conditional notification class of service (see 7.2.2.1.2) and there exists at least one terminal which responds positively to the DSS1 SETUP message, then two options are allowed:

i) The access connection is cleared as described for the unconditional class of service; or

ii) The access connection is established and timer T320 is started. Upon expiry of timer T320, the access connection is cleared with cause #102, "recovery on timer expiry" and diagnostic indicating timer T320.

Table 12 – Mapping of DSS1 cause fields to X.25 cause field

Item	DSS1 cause	Code	DSS1 diagnostics	X.25 cause	Code	X.25 diagnostics	Code
1	Unallocated (unassigned) number	1	Condition: unknown, transient, permanent	Not obtainable	13	Invalid called address	67
2	No route to destination	3	Condition: unknown, transient, permanent	Not obtainable	13	invalid called address	67
3	Channel unacceptable	6	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
4	Normal call clearing	16	Condition: unknown, transient, permanent	DTE originated	0	No additional information	0
5	User busy	17	(none)	number busy	1	No logical channel available	71
6	No user responding	18	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
7	No answer from user (user alerted)	19	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
8	Call rejected	21	Condition: unknown, transient, permanent + user supplied diagnostics	DTE originated	0	No additional information	0
9	Number changed	22	New destination address	Not obtainable	13	Invalid called address	67
10	Destination out of order	27	(none)	Out of order	9	No additional information	0
11	Invalid number format (incomplete number)	28	(none)	Local procedure error	19	Invalid called address	67
12	Normal, unspecified	31	(none)	DTE originated	0	No additional information	0
13	No circuit/ channel available	34	(none)	Number busy	1	No logical channel available	71
14	Network out of order	38	(none)	Out of order	9	No additional information	0

(continued)

Table 12 *(continued)*

Item	DSS1 cause	Code	DSS1 diagnostics	X.25 cause	Code	X.25 diagnostics	Code
15	Temporary failure	41	Network identity	Out of order	9	No additional information	0
16	Switching equipment congestion	42	Network identity	Network congestion	5	No additional information	0
17	Requested circuit or channel not available	44	(none)	Number busy	1	No logical channel available	71
18	Resources unavailable unspecified	47	(none)	Network congestion	5	No additional information	0
19	Quality of service unavailable	49	Condition: unknown, transient, permanent	Network congestion	5	No additional information	0
20	Bearer capability not authorized	57	Bearer capability information element identifier	Incompatible destination	33	No additional information	0
21	Bearer capability not presently available	58	Bearer capability information element identifier	Remote procedure error	17	Call setup, call clearing or registration problem	64
22	Service or option not available, unspecified	63	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
23	Bearer service not implemented	65	Attribute numbers	Incompatible destination	33	No additional information	0
24	Channel type not implemented	66	Channel type	Remote procedure error	17	Call setup, call clearing or registration problem	64
25	Service or option not implemented, unspecified	79	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
26	Invalid call reference value	81	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
27	Identified channel does not exist	82	Channel identity	Remote procedure error	17	Call setup, call clearing or registration problem	64

(continued)

Table 12 *(concluded)*

Item	DSS1 cause	Code	DSS1 diagnostics	X.25 cause	Code	X.25 diagnostics	Code
28	Incompatible destination	88	Incompatible parameter	Incompatible destination	33	No additional information	0
29	Invalid message, unspecified	95	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
30	Mandatory information element is missing	96	Information element identifier(s)	Remote procedure error	17	Call setup, call clearing or registration problem	64
31	Message type non-existent or not implemented	97	Message type	Remote procedure error	17	Call setup, call clearing or registration problem	64
32	Message not compatible with call state or message type non-existent or not implemented	98	Message type	Remote procedure error	17	Call setup, call clearing or registration problem	64
33	Information element non-existent or not implemented	99	Information element identifier(s)	Remote procedure error	17	Call setup, call clearing or registration problem	64
34	Invalid information element contents	100	Information element identifier(s)	Remote procedure error	17	Call setup, call clearing or registration problem	64
35	Message not compatible with call state	101	Message type	Remote procedure error	17	Call setup, call clearing or registration problem	64
36	Recovery on timer expiry	102	Timer number	Remote procedure error	17	Call setup, call clearing or registration problem	64
37	Protocol error, unspecified	111	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64
38	Interworking, unspecified	127	(none)	Remote procedure error	17	Call setup, call clearing or registration problem	64

NOTES

1 When clearing occurs during the X.25 data transfer phase, the procedures described in 7.4.1 of this standard should be used.

2 When a DSS1 RESTART message is received during the X.25 data transfer phase, switched virtual circuits shall be cleared with a Clear Indication packet containing cause #9 "out of order" and diagnostics #0 "no additional information". Permanent virtual circuits shall have an X.25 reset packet sent with the same cause and diagnostics.

Table 13 – Mapping of X.25 cause to DSS1 cause for premature clearing of the incoming call

	X.25 cause in clear indication packet				DSS1 error condition		
Item	X.25/X.96 cause	Code	Diagnostics	Code	DSS1 cause	Code	Diagnostics
1	DTE originated	0	No additional information	0	Normal call clearing	16	(none)
		1XX	DTE specified	XX			
2	Network congestion	5	No additional information	0	Switching equipment congestion	42	(none)
3	Out of order	9	No additional information	0	Destination out of order	27	(none)
4	Remote procedure error	17	(any allowable)		Protocol error, unspecified	111	(none)

NOTE – Instead of providing the above mapping of X.25 to DSS1, the PH, as a network option, may code the DSS1 cause information element to indicate "CCITT coding standard" in octet 3, "X.25" in octet 3a, and code octets 4 and 5 according to CCITT Recommendation X.25, copying the cause from the X.25 clear indication packet rather than mapping it to a DSS1 cause.

7.4.4 Cause mappings

7.4.4.1 Access to/from PSPDN services (case A)

The AU may choose to follow the procedures in 7.4.4.2 when mapping between causes delivered by the ISDN or the PSPDN.

7.4.4.2 Access to/from the ISDN virtual circuit service (case B)

There are several cases where it is necessary to map causes between DSS1 and X.25. Networks shall use table 12 and table 13 to map the causes between DSS1 and X.25 messages. The figures in annex A describe some example situations.

7.5 Access collision

For case A (access to PSPDN services), see 5.7 of ANSI T1.607. For case B (ISDN virtual circuit service) when the network offers a packet-mode access connection at the interface simultaneously with the user requesting a packet-mode access connection, the network shall give priority to the completion of the incoming access connection. If the user determines that accepting the incoming access connection would meet the needs of its own outgoing access connection request, the user may clear the access connection request and accept the incoming access connection.

8 List of system parameters

The description of timers in the following tables should be considered a brief summary. The precise details are found in clause 7 of this standard and clause 5 of ANSI T1.607, which should be considered as the definitive descriptions.

8.1 Timers in the network side

The timers specified in 9.1 of ANSI T1.607 are maintained in the network side of the interface. In addition, the timer indicated in table 14 shall be maintained in the network side of the interface for case B packet-mode operation.

8.2 Timers in the user side

The timers specified in 9.2 of ANSI T1.607 are maintained in the user side of the interface.

Table 14 – Timers on the network side

Timer number	Default time-out value	State of call	Cause for start	Normal stop	At the first expiry	At the second expiry
T320	30 s. (see note)	a) For B-channel access: Active b) For D-channel access: NULL	a) For B-channel access: CONNECT sent b) For D-channel access: DL_ESTABLISH_CONFIRM or DL_ESTABLISH_IND. received c) Last logical channel cleared	Call Request packet received; or incoming call packet delivered; or, for D-channel access, DL_RELEASE_IND. received	a) For B-channel access: disconnect link layer and initiate clearing b) For D-channel access: send DL_RELEASE_REQ.	Timer is not restarted
NOTE – This value may vary by user–network agreement.						

Annex A [9]
(informative)

Example message flow diagrams and example conditions for cause mapping

A.1 Example message flow diagrams

Examples of the procedures for the use of the B- and D-channel network connection types and the selection of the appropriate channel types are summarized in figures A.1 to A.7. These figures are intended to complement the description in the preceding text and do not illustrate all possible situations.

NOTE – Not all frames that may be sent across the Terminal Adaptor (TA) interface may be represented in the following figures.

A.1.1 Key to the figures

DSS1 messages

[ ]	–	Layer 3
C	–	CONNECT
CA	–	CONNECT ACKNOWLEDGE
CP	–	CALL PROCEEDING
D	–	DISCONNECT
R	–	RELEASE
RC	–	RELEASE COMPLETE
S	–	SETUP

X.25 layer 3 messages

Any layer 3 messages preceded by X.25 indicates an X.25 layer 3 packet (e.g., X.25 CR means X.25 Call Request)

CA	–	Call Accepted
CC	–	Call Connected
CLC	–	Clear Confirmation
CLI	–	Clear Indication
CLR	–	Clear Request
CR	–	Call Request
IC	–	Incoming Call

Layer 2 frames

( )	–	Layer 2
GTEI	–	Group TEI (127)
A,B	–	X.25 layer 2 addresses (includes command and response)
SABM	–	Set asynchronous balance mode
SABME	–	Set asynchronous balance mode extended
UA	–	Unnumbered acknowledgment frame
UI	–	Unnumbered information frame (i.e., using unacknowledged information transfer at layer 2)
I	–	Information frame
DISC	–	Disconnect frame

Layer 2 addresses marked (x,p) indicates that the SAPI element of the frame address is coded for packet type (SAPI = 16) information as described in ANSI T1.602. Layer 2 addresses marked (x,s) refer to signalling type (SAPI = 0) information.

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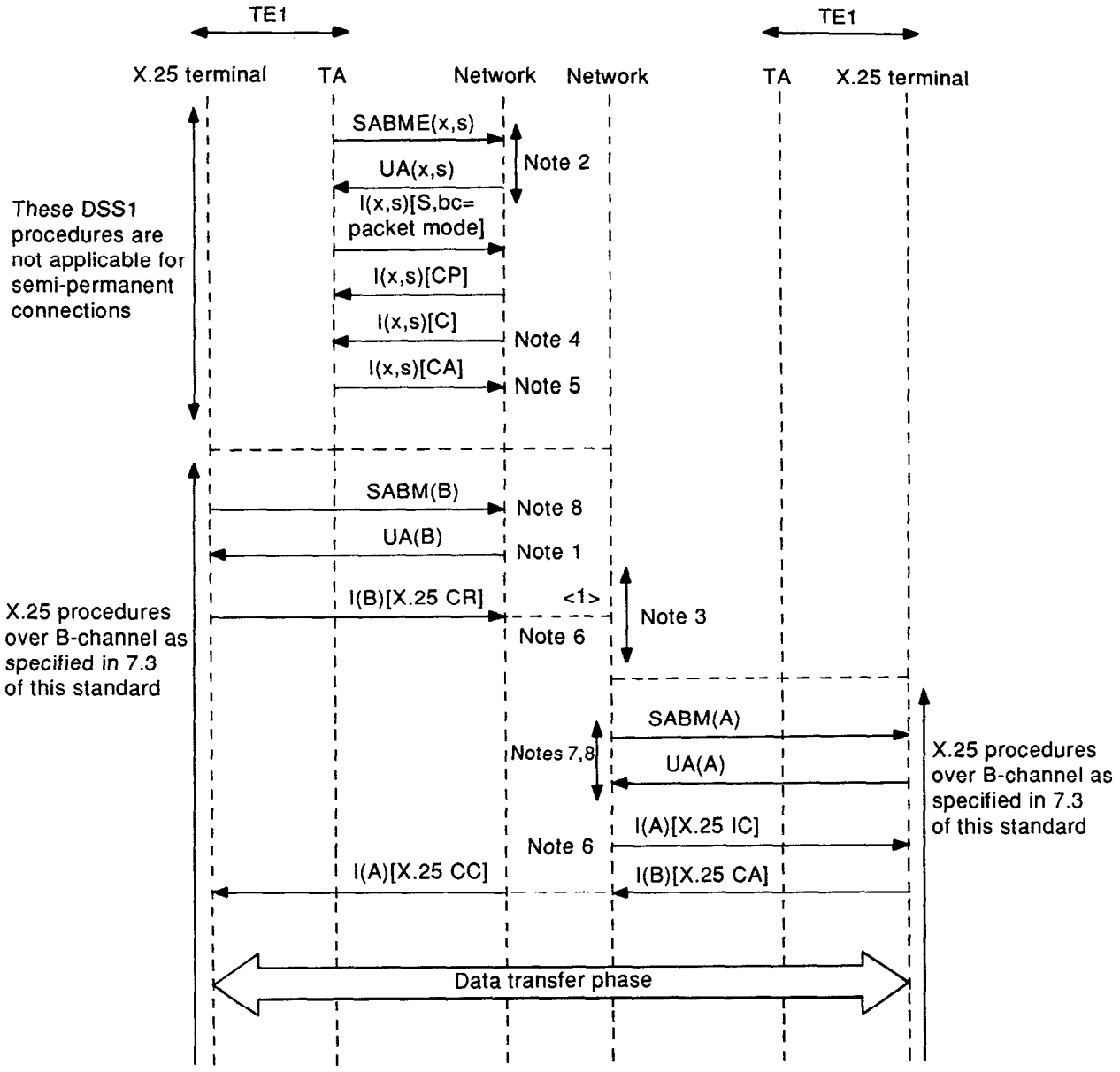
[9] In ANSI T1.608a-1992, two new normative annexes are added. Since, under ANSI style rules, normative annexes must precede informative annexes, future revisions of this standard will include the two normative annexes as annex A and annex B. The current annex A will become annex C. The prefix letters on all clauses, subclauses, and figures in this annex will change from A to C. (See ANSI T1.608a-1992, final pages of this standard, for the text of the new annexes.)

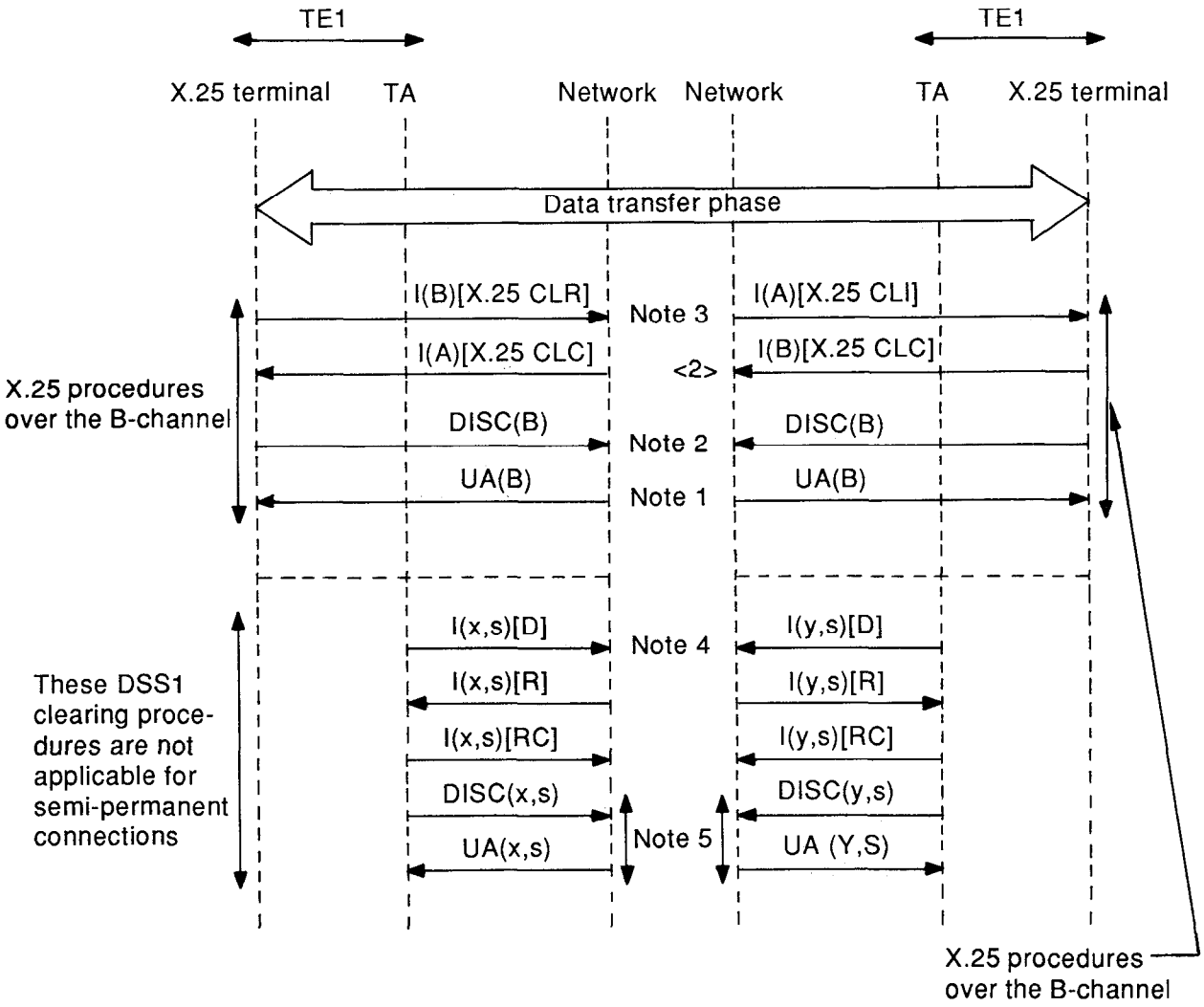
A.1.2 Example message flow diagrams



NOTES
1 When the called side establishes the call using D-channel access, the message sequence will continue as from point<3> in figure A.3.
2 If signalling link is not already established.
3 For packet call offering, the incoming call may be offered to the TA and a B-channel established using the procedures shown in figures A.5 and A.6.
4 The network starts timer T320, if implemented.
5 This message is optional.
6 The network cancels timer T320, if implemented and running.
7 The network establishes the link layer on the B-channel, if it is not already established as specified in 7.3.
8 Not shown in the diagram is a possible X.25 restart procedure performed after link setup.[10)]

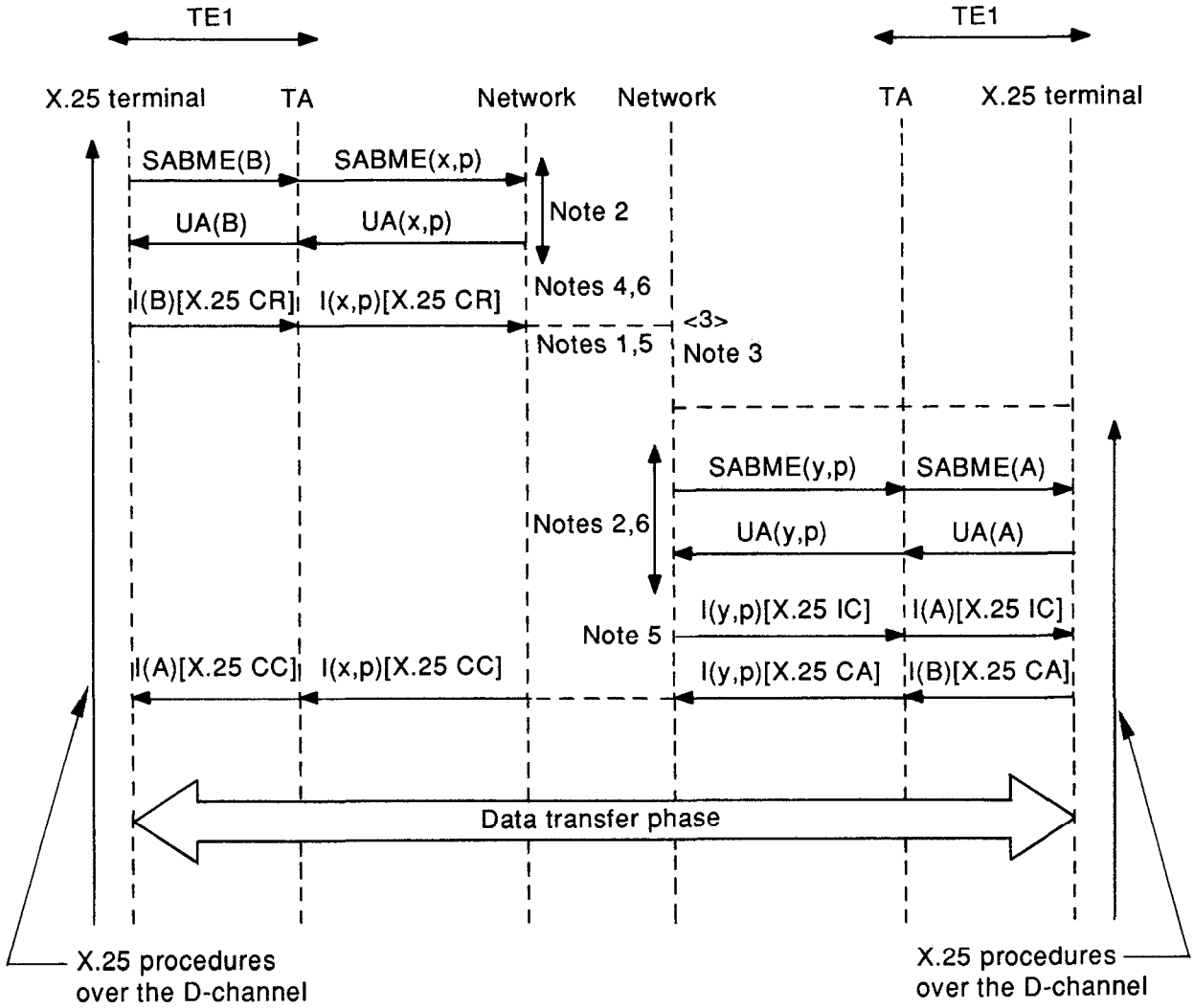
Figure A.1 – Example message sequence for the ISDN virtual circuit service B-channel access first virtual call setup in this channel

10) For a revision of this note, see ANSI T1.608a-1992 (final pages of this standard).



NOTES
1 When the cleared side has set up the call using D-channel access, the message sequence at the cleared side will be as from point<4> in figure 4.
2 Clearing of the B-channel may be initiated by the network upon expiry of timer T320, if implemented (see 7.6).
3 The network starts timer T320, if implemented.
4 The network cancels timer T320, if implemented and running.
5 This sequence is only required if the terminal does not wish to continue with further communications.

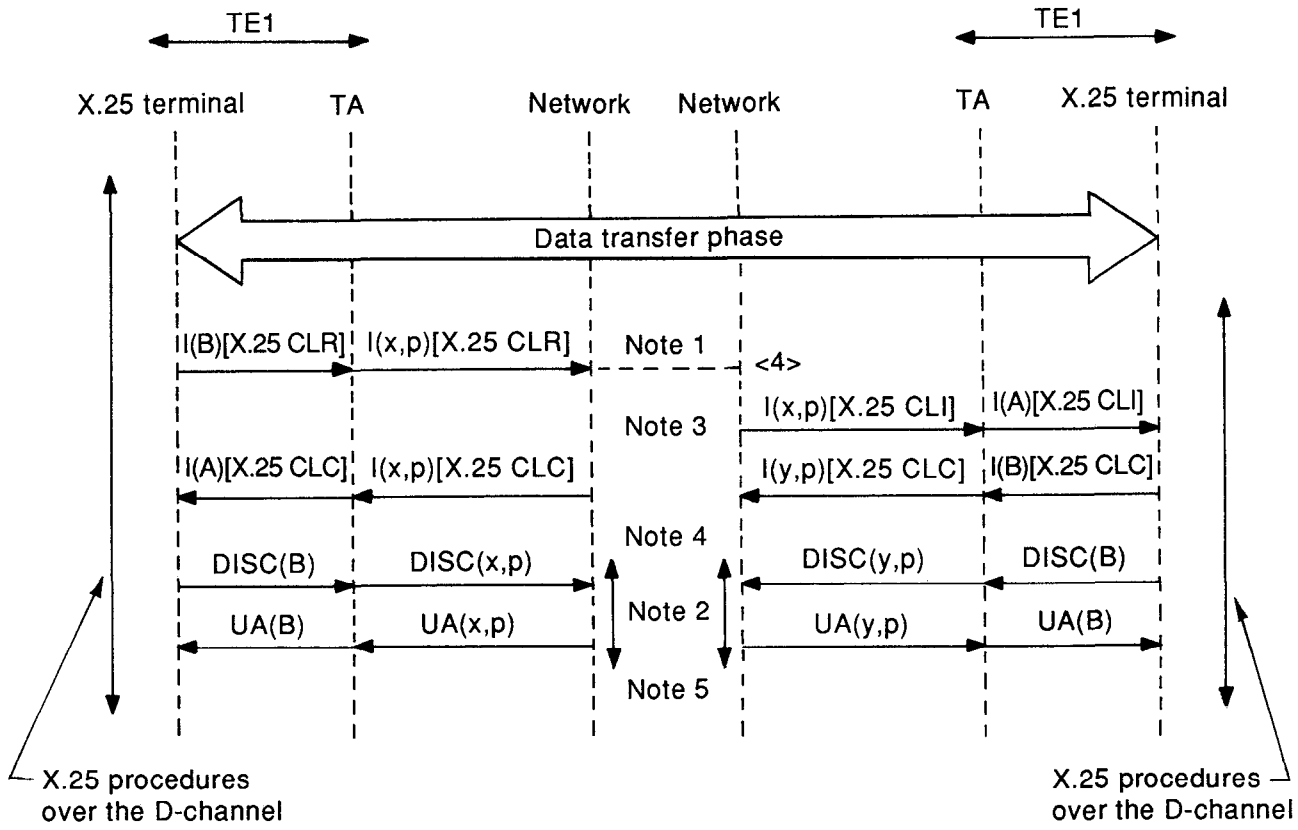
Figure A.2 – Example message sequence for the ISDN virtual circuit service B-channel access last virtual call cleared in this channel



NOTES
1 When the called side establishes the call using B-channel access, the message sequence will continue as from point <1> in figure A.1.
2 If SAPI = 16 link is not already established.
3 The incoming call may be offered to the TA using the procedures shown in figure A.7.
4 The network starts timer T320, if implemented.
5 The network cancels timer T320, if implemented and running.
6 Not shown in the diagram is a possible X.25 restart procedure performed after link setup.[11)]

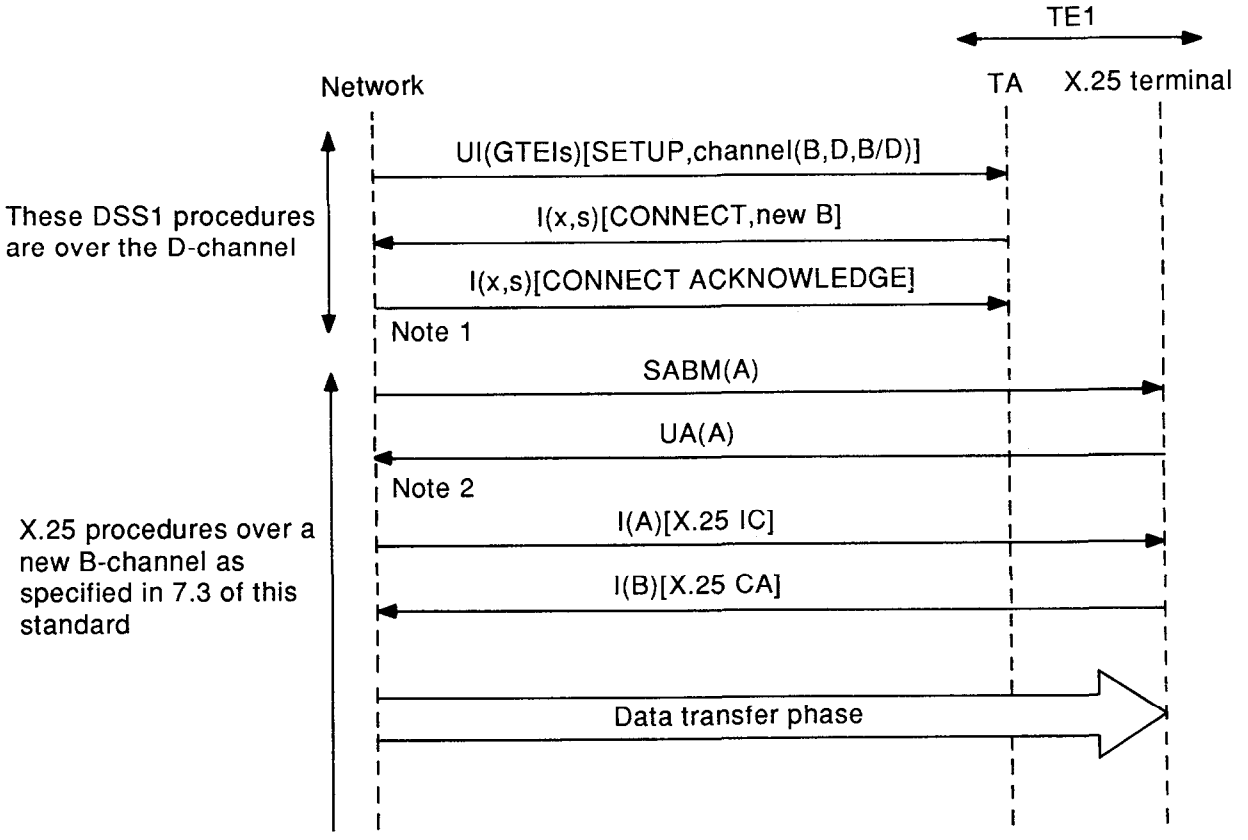
Figure A.3 – Example message sequence for the ISDN virtual circuit service D-channel access first virtual call setup in this SAPI = 16 link

11) For a revision of this note, see ANSI T1.608a-1992 (final pages of this standard).



NOTES
1 When the cleared side has set up the call using B-channel access, the message sequence at the cleared side will be as from point <2> in figure A.2.
2 This sequence is only required if the X.25 DTE does not wish to continue with further communications.
3 The network starts timer T320, if implemented.
4 The network cancels timer T320, if implemented and running.
5 Link layer may be initiated by the network upon expiry of timer T320, if implemented (see 7.4).

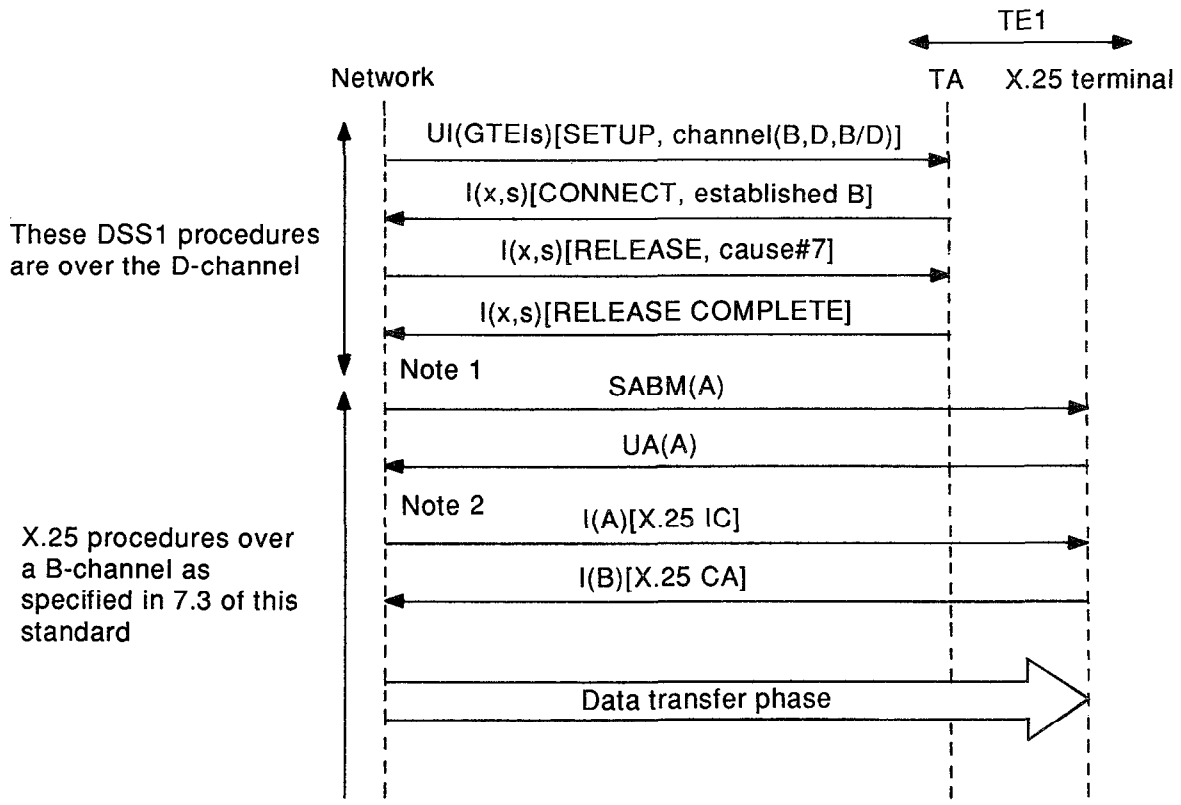
Figure A.4 – Example message sequence for the ISDN virtual circuit service D-channel access last virtual call cleared in this SAPI = 16 link



NOTES
1 The network starts timer T320, if implemented.
2 The network cancels timer T320, if implemented and running.

Figure A.5 – Example of incoming call offering using signalling on SAPI = 0 link terminal accepts call on a new B-channel[12)]

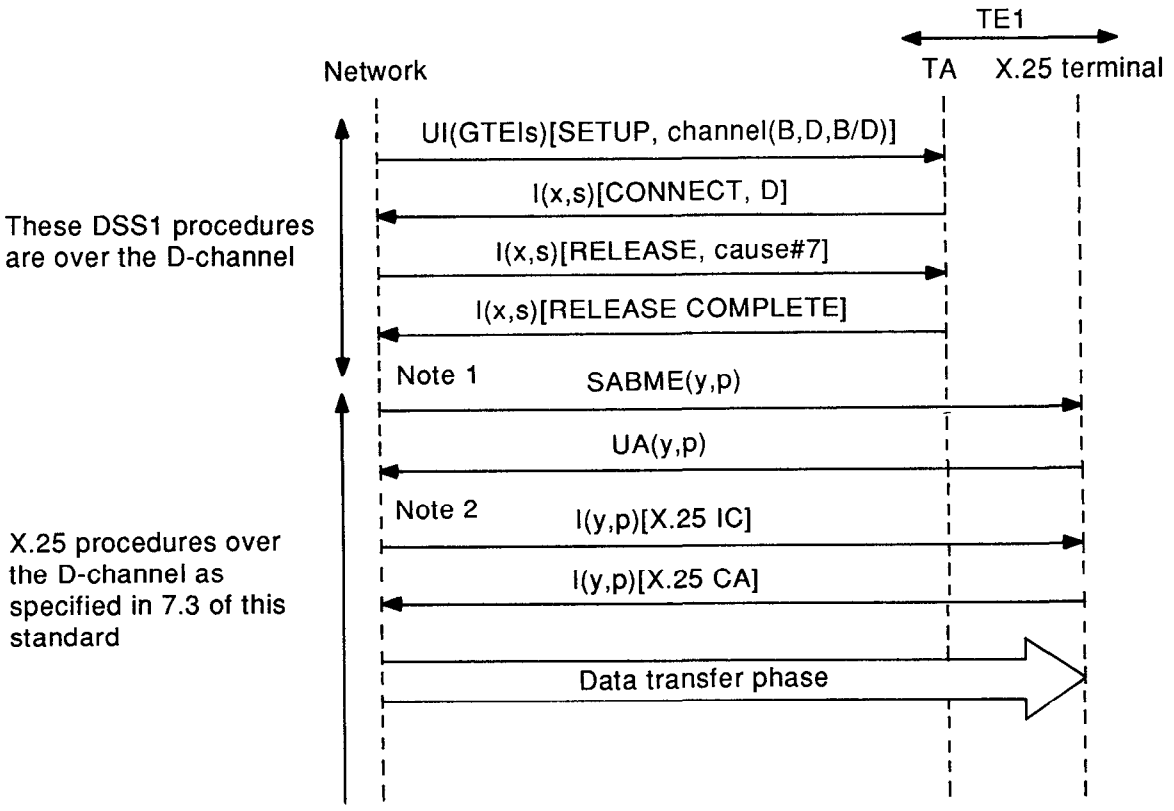
12) For an additional note and further changes to the figure, see ANSI T1.608a-1992 (final pages of this standard).



NOTES
1 The network establishes the link layer on the B-channel if it is not already established (see 7.3).
2 The network cancels timer T320, if implemented and running.

Figure A.6 – Example of incoming call offering using signalling on SAPI = 0 link terminal accepts call on the established B-channel[13)]

13) For an additional note and further changes to the figure, see ANSI T1.608a-1992 (final pages of this standard).



NOTES
1 The network establishes the link layer on the D-channel if it is not already established (see 7.3).
2 The network cancels timer T320, if implemented and running.

Figure A.7 – Example of incoming call offering using signalling on SAPI = 0 link terminal accepts call on the D-channel[14)]

A.2 Example conditions for cause mapping

Figures A.8 through A.16 show example conditions when cause mappings would be utilized between DSS1 and X.25 messages and utilize the specific mappings of table 12 and table 13 as shown below.

DSS1 failure during call establishment

Figure	Reference table	Note
43 44 45 46 47	Table 12	

14) For an additional note and further changes to the figure, see ANSI T1.608a-1992 (final pages of this standard).

User side failure during X.25 data transfer phase

Figure	Reference table	Note
48	Table 12	1
49	Table 12	2

Network side premature clearing

Figure	Reference table	Note
50	Table 13	
51	Table 13	

NOTES

1 This mapping is only needed in the case of the DSS1 message arriving prior to the clearing of the last virtual circuit.

2 This situation always results in either an X.25 clear indication packet with cause #9 "out of order" for switched virtual circuits, or an X.25 reset packet with cause #9 "out of order" for permanent virtual circuits.

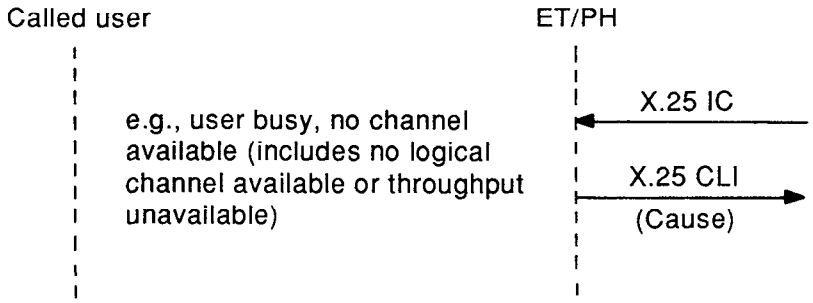
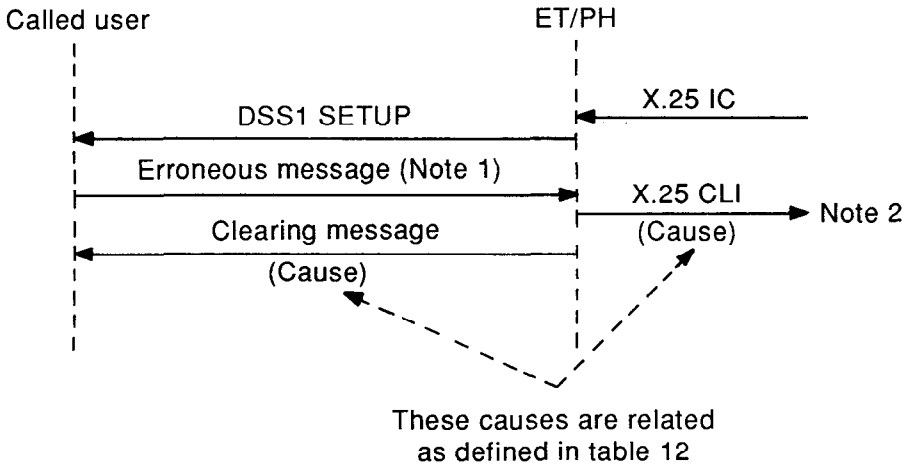
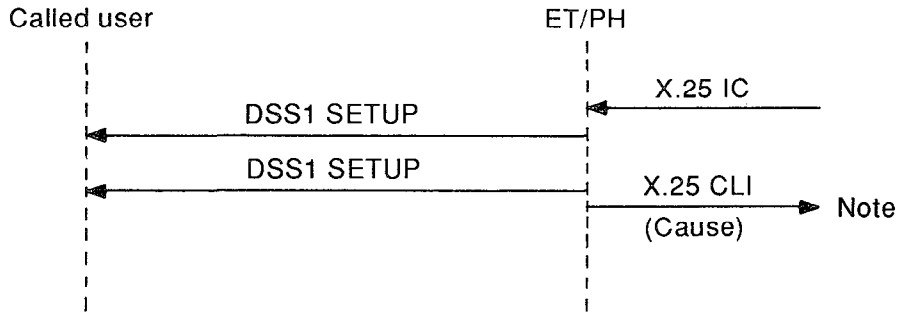


Figure A.8 – Undeliverable call



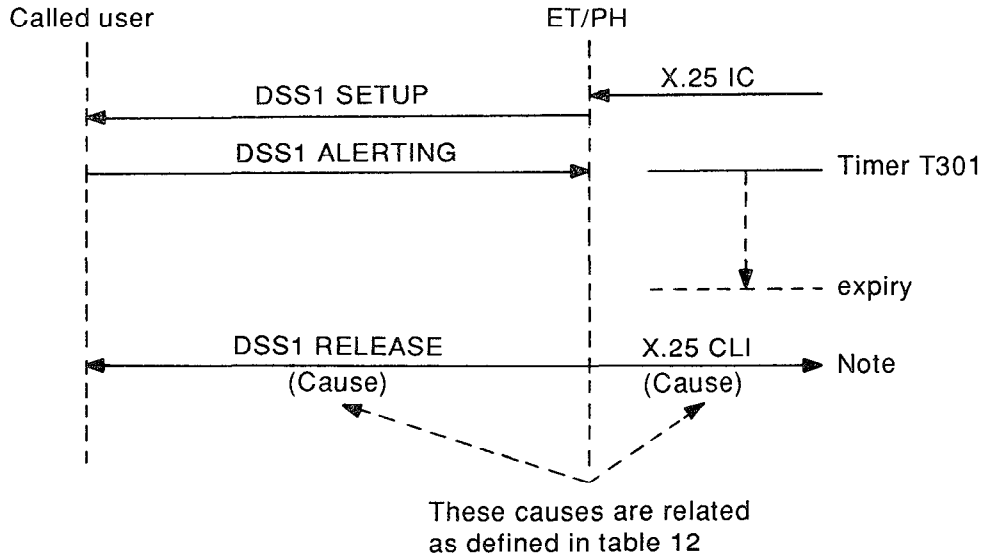
NOTES
1 This figure applies to the case where the erroneous message results in a DSS1 clearing message (see 7.4.3 for further information).
2 This message would be sent after the expiry of timer T303 on a multipoint interface.

Figure A.9 – Erroneous message (e.g., format error)



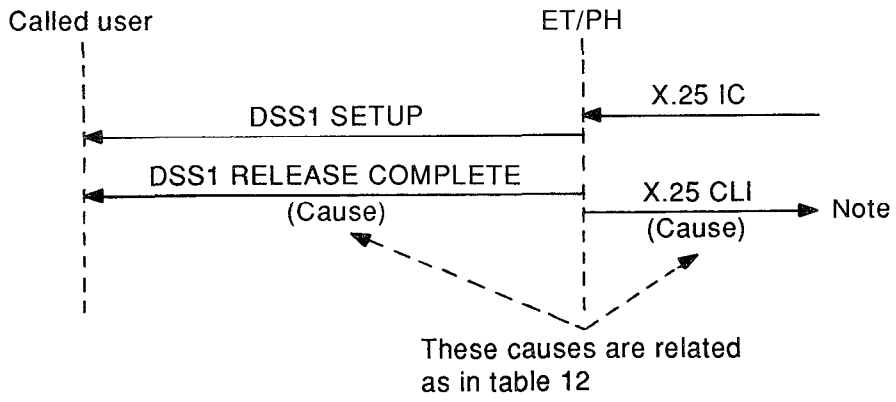
NOTE – This message is sent after the expiry of timer T303 defined in ANSI T1.607.

Figure A.10 – No responding user



NOTE – This message is sent after the expiry of timer T301 defined in ANSI T1.607.

Figure A.11 – Expiry of timer T301



NOTE – This message is sent after the expiry of timer T303 when on a multipoint interface.

Figure A.12 – Call rejection by the called party

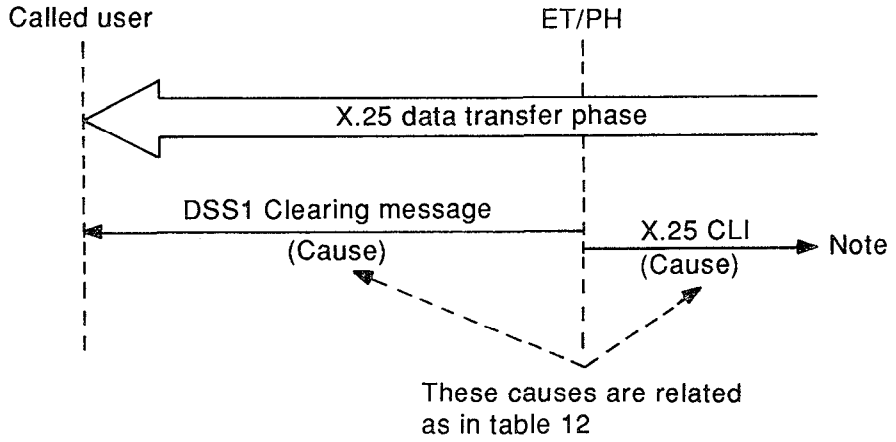
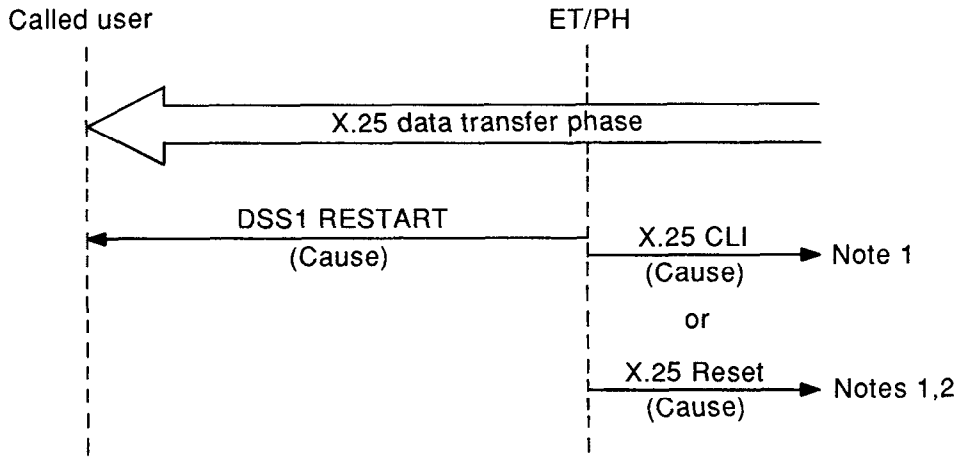


Figure A.13 – DSS1 clearing during X.25 data transfer phase



NOTES
1 The cause parameter in the X.25 clear indication (CLI) will indicate "out of order" with diagnostics value "0".
2 For permanent virtual circuits only.

Figure A.14 – DSS1 restart during X.25 data transfer phase

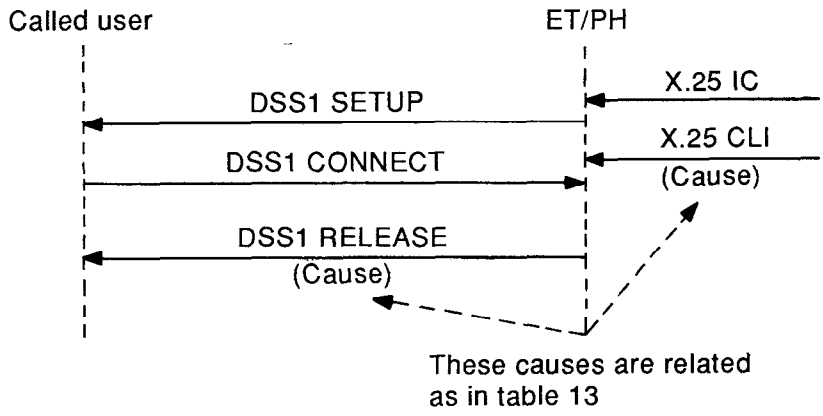
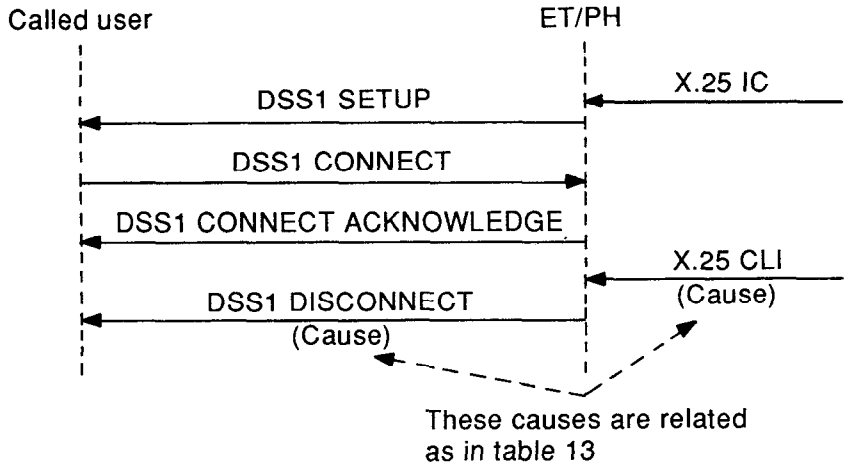


Figure A.15 – Premature clearing of the virtual circuit (e.g., expiry of X.25 timer T21)



NOTE – This is the case when X.25 incoming call packet has not been delivered.

Figure A.16 – Premature clearing of the virtual circuit

Annex B [15]
(informative)

Bibliography

ANSI T1.603-1990, *Telecommunications – Integrated services digital network (ISDN) – Minimal set of bearer services for ISDN primary rate interface*

ANSI T1.604-1990, *Telecommunications – Integrated services digital network (ISDN) – Minimal set of bearer services for ISDN basic rate interface*

ANSI T1.609-1990, *Telecommunications – Integrated services digital network (ISDN) – Interworking between the ISDN user–network interface protocol and the signalling system number 7 ISDN user part*

ANSI T1.614-1991, *Telecommunications – Integrated services digital network (ISDN) – Packet-mode bearer service category description*

ANSI X3.100-1989, *Information systems – Interface between data terminal equipment (DTE) and data-circuit terminating equipment (DCE) for operation with packet-switched data networks (PSDN), or between two DTEs, by dedicated circuit*

CCITT Recommendation E.166, *Numbering plan interworking in the ISDN era* [2), 3)]

CCITT Recommendation I.122, *Framework for providing additional packet-mode bearer services* [2), 3)]

CCITT Recommendation I.231, *Circuit-mode bearer service categories* [2), 3)]

CCITT Recommendation I.232, *Packet-mode bearer service categories* [2), 3)]

CCITT Recommendation I.320, *ISDN protocol reference model* [2), 3)]

CCITT Recommendation I.430, *Basic user–network interface layer 1 specification* [2), 3)]

CCITT Recommendation Q.920, *ISDN user–network data link layer – General aspects* [2), 3)]

CCITT Recommendation Q.921, *ISDN user–network data link specification* [2), 3)]

CCITT Recommendation Q.930, *ISDN user–network interface layer 3 – General aspects* [2), 3)]

CCITT Recommendation X.122, *Numbering plan interworking between a packet-switched public data network (PSPDN) and an integrated services digital network (ISDN) or public-switched telephone network (PSTN) in the short-term* [2), 3)]

CCITT Recommendation X.210, *OSI layer service conventions* [2), 16)]

ISO/IEC 9574: 1989, *Information technology – Telecommunications and information exchange between systems – Provision of the OSI connection-mode network service by packet-mode terminal equipment connected to an integrated services digital network (ISDN)* [2)]

[15)] In ANSI T1.608a-1992, two new normative annexes are added. Since, under ANSI style rules, normative annexes must precede informative annexes, future revisions of this standard will include the two normative annexes as annex A and annex B. The current annex B will become annex D. (See ANSI T1.608a-1992, final pages of this standard, for the text of the new annexes.)

[16)] This CCITT Recommendation was published in the 1984 CCITT Red Book.

American National Standard

for telecommunications –

integrated services digital network (ISDN) – signaling specification for X.25 packet-switched bearer service for digital subscriber signaling system number 1 (DSS1) (terminal initialization procedures for packet-mode data)

Approved June 2, 1992

Secretariat: Exchange Carriers Standards Association

Add the following listing to clause 2, Normative references:

ANSI T1.610-1990, *Telecommunications – Digital subscriber signaling system number 1 (DSS1) – Generic procedures for the control of ISDN supplementary services*

In table 2, add the following material on the INFORMATION message as the first listing under "Miscellaneous messages":

INFORMATION 5.2.12

In the table in 5.2.9, add the following material on the Endpoint identifier information element between the listings for the Display information element and the Information rate information element:

Endpoint identifier	6.5.30	n → u	O[18)]	3–4

Add the following note to the table in 5.2.9:

[18)] Included in the network-to-user direction if the network implements the terminal identification procedures in annex A of ANSI T1.608a-1992, and selects a specific terminal on the multipoint interface using network layer terminal addressing.

Insert the following text as the last subclause in 5.2:

5.2.12 INFORMATION

This message is sent by the user or the network at any time, in conjunction with the terminal initialization and information request procedures described in annex A and annex B of ANSI T1.608a-1992.

Message type: INFORMATION Direction: Both

Significance: local

Information element	Reference	Direction	Type	Length
Protocol discriminator	6.2	both	M	1
Call reference	6.3[1)]	both	M	1-*
Message type	6.4	both	M	1
Cause	6.5.11	n → u	O [2)]	2-32
Information request	6.5.28	n → u	O [2), 3)]	3
Service profile identification	6.5.29	u → n	O [3)]	3-32
Endpoint identifier	6.5.30	both	O [3)]	3-4

[1)] Terminal initialization only uses the *null call reference* value (also known as the *dummy call reference* value), consistent with the procedures in annex A of ANSI T1.608a-1992.

[2)] Used in conjunction with the Information request procedures described in annex B of ANSI T1.608a-1992.

[3)] Used in conjunction with the Terminal initialization procedures described in annex A of ANSI T1.608a-1992.

In the table that appears in Figure 6, delete the words "(Note 2)" from the listing for the INFORMATION message. This message type is now permissible for both case A and case B.

Make the following changes and additions to table 4 to incorporate the information elements for terminal identification and to align these listings with the corresponding table in ANSI T1.607-1990 (Table 21, Information element identifier coding):

a) Add the following listings to the table between the listings for the Keypad facility information element and the Information rate information element:

0110010	Information request	6.5.28	3	
0110100	Signal (note 7)	4.5.24 of T1.607	3	
0111010	Service profile identifier	6.5.29	32	
0111011	Endpoint identifier	6.5.30	4	

(NOTE – The last column of the table (Maximum number of occurrences) is blank for these new listings.)

b) Replace the listing for the Calling party number information element with the following listing:

1101100	Calling party number (notes 6, 10)	6.5.9	Note 4	2

c) Insert new Note 10 at end of table, to read as follows:

10 For case A, circuit-mode calls, this information element is included and possibly repeated in conjunction with called user subscription to the Calling Line Identification Presentation (CLIP) supplementary service.

d) See revised table 4 on next two pages. (Italics are used to highlight changes and additions.)

Table 4 – Information element identifier coding

8 7 6 5 4 3 2 1		Section reference	Maximum length (octets) (note 1)	Maximum number of occurrences (note 9)
1 : :: - - - -	*Single octet information elements:*			
0 0 0 - - - -	reserved			
0 0 1 - - - -	Shift (note 2)	6.5.3 - 6.5.4	1	
1 0 1 - - - -	Repeat indicator (note 7)	6.5.23	1	
0 : : : : :: :	*Codeset 0 variable length information elements:*			
0 0 0 0 1 0 0	Bearer capability (notes 6, 8)	6.5.5	11	
0 0 0 1 0 0 0	Cause (note 2)	6.5.11	32	3
0 0 1 0 1 0 0	Call state	6.5.6	3	
0 0 1 1 0 0 0	Channel identification	6.5.12	Note 4	
0 0 0 1 1 0 0	Connected number (note 7)	4.5.13 of T1.607	2-19	
0 0 0 1 1 0 1	Connected subaddress (note 7)	4.5.14 of T1.607	2-23	
0 0 1 1 1 1 0	Progress indicator (note 6)	6.5.21	4	2
0 1 0 0 0 0 0	Network specific facilities (notes 2, 7)	4.5.19 of T1.607	Note 4	4
0 1 0 0 1 1 1	Notification indicator (note 7)	4.5.20 of T1.607	3	
0 1 0 1 0 0 0	Display	6.5.14	82	
0 1 0 1 1 0 0	Keypad facility (note 7)	4.5.17 of T1.607	34	
0 1 1 0 0 1 0	*Information request*	*6.5.28*	*3*	
0 1 1 0 1 0 0	*Signal (note 7)*	*4.5.24 of T1.607*	*3*	
0 1 1 1 0 1 0	*Service profile identifier*	*6.5.29*	*32*	
0 1 1 1 0 1 1	*Endpoint identifier*	*6.5.30*	*4*	
1 0 0 0 0 0 0	Information rate	6.5.16	6	
1 0 0 0 0 1 0	End-to-end transit delay	6.5.15	11	
1 0 0 0 0 1 1	Transit delay selection and indication	6.5.26	5	
1 0 0 0 1 0 0	Packet layer binary parameters	6.5.18	3	
1 0 0 0 1 0 1	Packet layer window size	6.5.19	4	
1 0 0 0 1 1 0	Packet size	6.5.20	4	
1 0 0 0 1 1 1	Closed User Group	6.5.13		
1 0 0 1 0 1 0	Reverse Charging Indication	6.5.25		
1 1 0 1 1 0 0	*Calling party number (notes 6,10)*	*6.5.9*	*Note 4*	*2*
1 1 0 1 1 0 1	Calling party subaddress	6.5.10	23	
1 1 1 0 0 0 0	Called party number	6.5.7	Note 4	
1 1 1 0 0 0 1	Called party subaddress	6.5.8	23	
1 1 1 1 0 0 0	Transit network selection (notes 2, 7)	4.5.25 of T1.607	Note 4	4
1 1 1 0 1 0 0	Redirecting number	6.5.22	Note 4	
1 1 1 1 0 0 1	Restart indicator	6.5.24	3	
1 1 1 1 1 0 0	Low layer compatibility (note 7)	6.5.17	12	
1 1 1 1 1 1 0	User-user	6.5.27	131	
1 1 1 1 1 1 1	Escape for extension (note 3)			
All other values are reserved (note 5)				

(continued)

Table 4 *(concluded)*

NOTES

1 The length limits described for the variable length information elements below take into account only the present CCITT standardized coding values.

2 This information element may be repeated.

3 This escape mechanism is limited to codesets 5, 6, and 7 (see 6.5.2). When the escape for extension is used, the information element identifier is contained in octet-group 3 and the content of the information element follows in the subsequent octets as shown in figure 8.

4 The maximum length is network dependent.

5 The reserved values with bits 5-8 coded "0000" are for future information elements for which comprehension by the receiver is required (see 5.8.7.1 of ANSI T1.607).

6 This information element may be repeated only in case A (access to PSPDN services).

7 This information element may be used only in case A (access to PSPDN services).

8 This information element may be repeated in conjunction with the repeat indicator information element.

9 Maximum number of occurrences allowed for variable length information elements.

10 For case A, circuit-mode calls, this information element is included and possibly repeated in conjunction with called user subscription to the Calling Line Identification Presentation (CLIP) supplementary service.

Replace the first paragraph of 6.5.9 with the following text:

The purpose of the Calling party number information element is to identify the origin of a call. The information element may occur two times in a message for case A, circuit-mode calls, in conjunction with called user subscription to the Calling Line Identification Presentation (CLIP) supplementary service.

Add the following new subclauses after 6.5.27:

6.5.28 Information request

The purpose of the Information request information element is to provide the capability for requesting additional information and for signaling completion of the information request (see annex B of ANSI T1.608a-1992).

See clause 3 of ANSI T1.610 (specifically, Section 8.2.5. of CCITT Recommendation Q.932) for the coding of the Information request information element.

6.5.29 Service profile identification

The purpose of the Service profile identification information element is to allow the user to initiate automatic assignment of the user service identifier and terminal identifier (see annex A of ANSI T1.608a-1992).

See clause 3 of ANSI T1.610 (specifically, Section 8.2.6 of CCITT Recommendation Q.932) for the coding of the Service profile identification information element.

6.5.30 Endpoint identifier

The purpose of the Endpoint identifier information element is

- to indicate the user service identifier and terminal identifier for the purpose of terminal identification;
- to indicate a specific terminal for the purpose of terminal selection.

(See annex A of ANSI T1.608a-1992 for the associated procedures.)

See clause 3 of ANSI T1.610 (specifically, Section 8.2.1 of CCITT Recommendation Q.932) for the coding of the Endpoint identifier information element.

Insert the following normative annexes as annexes A and B of this standard. Redesignate the current annexes A and B (both of which are informative) as annexes C and D, respectively.

Annex A
(normative)

User service profiles and terminal identification

This annex is identical to annex A of CCITT Recommendation Q.932, as referenced and modified by clause 3 of ANSI T1.610.

Annex B
(normative)

Information request procedures

This annex is identical to annex B of CCITT Recommendation Q.932, as referenced and modified by clause 3 of ANSI T1.610, with the following qualifications:

a) The material on the Overlap Sending and Call Delivered call states shall be applicable to case A access only;

b) The statement that "This capability is intended for use with the Keypad and Feature Key Management protocols" shall be applicable to case A access only;

c) The statement that "The network will restart timer T302...if the requested information is not complete" shall be applicable to case A access only;

d) The material on the Keypad facility and Called party number information elements shall be applicable to case A access only;

e) The material on "Normal procedures" for the call-associated case (e.g., use of a CALL PROCEEDING message, initiation of call clearing) shall be applicable to case A access only. The material on "Normal procedures" for the non-call-associated case shall be applicable to both case A access and case B access;

f) The condition that "...if the information received is incomplete upon expiry of timer T302" shall be applicable to case A access only;

g) The material on "Abnormal procedures" for the call-associated case (e.g., initiation of call clearing) shall be applicable to case A access only. The material on "Abnormal procedures" for the non-call-associated case shall be applicable to both case A access and case B access.

All other material in annex B, which is not covered by qualifications (a) – (g), shall be applicable to both case A access and case B access. In addition, all references to "CCITT Q.931" within annex B of CCITT Recommendation Q.932, i.e., references to "ANSI T1.607" based on the modifications in Section 3 of ANSI T1.610, should be extended to read "ANSI T1.607 and ANSI T1.608".

The following changes pertain to figures that appear in annex A of the main document, ANSI T1.608-1991. In future revisions, when the information in ANSI T1.608-1991 and ANSI T1.608a-1992 are merged, this annex will be redesignated as annex C and the prefix letters of these figures will change from A to C.

In figure A.1, replace Note 8 with the following:

8 Not shown in the diagram is the X.25 restart procedure performed after link setup.

In figure A.3, replace Note 6 with the following:

6 Not shown in the diagram is the X.25 restart procedure performed after link setup.

In figure A.5, replace the "Note 2" tag under the line representing the UA frame with a tag that reads "Notes 2,3". Add the following note to the list of notes at the bottom of the figure:

3 Not shown in the diagram is the X.25 restart procedure performed after link setup.

In figures A.6 and A.7, replace the "Note 2" tag under the line representing the UA frame with a tag that reads "Notes 2,3". Add the following note to the lists of notes at the bottom of each figure:

3 The X.25 Restart procedure should follow the link setup, if that link was not already established.