



ATIS-1000603.2014(R2019)

**Integrated Services Digital Network (ISDN) – Minimal Set of
Bearer Services for the Primary Rate Interface**

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ATIS-1000603.2014(R2019), *Integrated Services Digital Network (ISDN) – Minimal Set of Bearer Services for the Primary Rate Interface*

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American National Standard for Telecommunications

Integrated Services Digital Network (ISDN) – Minimal Set of Bearer Services for the Primary Rate Interface

Alliance for Telecommunications Industry Solutions

Approved June 2014

American National Standards Institute, Inc.

Abstract

This standard defines the minimal set of bearer services for the ISDN primary rate interface, which conforms closely to ITU-T architectural concepts and explicitly considers the service constraints in the telecommunications environment of the United States. The bearer services defined in this standard are the minimal set of bearer services that are to be supported by public networks for ISDN primary rate interfaces.

Foreword

The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

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Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, PTSC, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, PTSC, which was responsible for its development, had the following leadership:

- M. Dolly, PTSC Chair (AT&T)
- V. Shaikh, PTSC Vice-Chair (ACS)
- M. Dolly, PTSC SAC Chair (AT&T)

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ATIS Standard on –

Integrated Services Digital Network (ISDN) – Minimal Set of Bearer Services for the Primary Rate Interface

1 Scope

In this standard, the minimal set of bearer services for the primary rate interface for the integrated services digital network (ISDN) that conforms closely to the architectural concepts described by CCITT are defined. The telecommunications environment in the United States for the ISDN primary rate interface is explicitly considered.

The bearer services defined in this standard are the minimal set of services defined in Bearer Services Supported by an ISDN, ITU-T Recommendation I.211¹, which are to be supported by public networks for the primary rate interface.

The description method used by the ITU-T, which is called the "method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN," is summarized in Section 4, and the description of the essential bearer services that should be supported by a public ISDN in the United States follows in Section 5. The signaling procedures for these bearer services are defined in American National Standard for Telecommunications- Integrated Services Digital Network (ISDN)- Data-Link Layer Signaling Specification for Application at the User-Network Interface, ATIS-1000602, and American National Standard for Telecommunications- Integrated Services Digital Network (ISDN)- Layer-3 Signaling Specification for Circuit-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSSS1), ATIS-1000607 A standard for digital communications between the user and network equipments is currently under development.

1.1 *The Minimal Set of Bearer Services.*

The intent of this standard and its relationship to ATIS-1000602 and ATIS-1000607 are:

(1) The services defined in this standard are considered to be essential for provision by public networks. The availability of these services may depend on the subscription profile of the user. This core set of services is required as a solid foundation on which subsequent ISDN standards may be built. Subsequent standards can include nonessential bearer services and supplementary services.

(2) ATIS-1000602 and ATIS-1000607 include signaling procedures for those bearer services described in this standard.

(3) Customer premises equipment implementations, when viewed from the user-public-network interface, need only implement the procedures described in ATIS-1000602 and ATIS-1000607 that are associated with the minimal set of bearer service(s) supported by that equipment; for example, a voice-only terminal equipment (TE) could implement only the procedures for circuit-mode speech (bearer capability information element, and the like) and not implement those for circuit-mode digital.

(4) Devices that support the bearer services defined in this standard by implementing associated procedures described in other American National Standards and using the default parameters and other specified mandatory parameters are expected to inter-operate successfully. ("Successfully" means that they work together to obtain/provide the appropriate bearer service.)

¹ The designation numbers for the CCITT Recommendations that appear in this standard refer to the 1993 CCITT Red Book. Contact the secretariat for more recent information.

1.2 Relationship to Capabilities beyond the Minimal Set of Bearer Services.

It is likely that ISDN implementations will provide capabilities beyond those defined in this standard. Some of these capabilities will eventually be standardized while others will be specific to an implementation. The following guidelines define the relationship of these additional capabilities to this standard.

(1) The network, when viewed from the user-network interface, may also provide other additional services, capabilities, protocols, functions, and procedures not described in this standard or any American National Standard. These may or may not be evoked by a particular user at a particular user-public-network interface.

(2) Customer premises equipment may implement additional services, capabilities, protocols, functions, and procedures not described in this standard or the American National Standard on signaling (ATIS-1000607). These may or may not be supported by a particular network at a particular user-network interface.

(3) The implementation of the additional aspects mentioned in the previous two points does not, therefore, make the user or network noncompliant with this standard or with ATIS-1000602 and ATIS-1000607

(4) Some or all of the additional aspects mentioned in 1.2(1) and 1.2(2) may be described in other standards; for example, standard signaling for a standard supplementary service.

2 Referenced & Related Standards

2.1 Referenced American National Standards.

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

ATIS-1000602.1996(R2014), Telecommunications- Integrated Services Digital Network (ISDN) - Data-Link Layer Signaling Specification for Application at the User-Network Interface²

ATIS-1000607.2000(R2009), Telecommunications- Integrated Services Digital Network (ISDN)-Layer-3 Signaling Specification for Circuit-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSSS1)³

2.2 Other Referenced Standards.

This standard is also intended to be used in conjunction with the following standards:

ITU-T Recommendation G.711, Pulse Code Modulation (PCM) of Voice Frequencies⁴

ITU-T Recommendation I.211, Bearer Services Supported by an ISDN⁴

ITU-T Recommendation I.460, Multiplexing, Rate Adaptation, and Support of Existing Interfaces⁴

² This document is available from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005 < <https://www.atis.org/docstore/product.aspx?id=24726> >

³ This document is available from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005 < <https://www.atis.org/docstore/product.aspx?id=24729> >

⁴ This document is available from the International Telecommunications Union. < <http://www.itu.int/ITU-T/> >

2.3 Related Standards.

The standards listed here are for information only and are not essential for completion of the requirements of this standard:

ITU-T Recommendation I.320, ISDN Protocol Reference Model⁴

ITU-T Recommendation X.2, International Data Transmission Services Optional Facilities in Public Data Networks⁴

ITU-T Recommendation X.21, Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Synchronous Operation on Public Data Networks⁴

CCITT Recommendation X.200, Reference Model of Open Systems Interconnection for ITU-T Applications⁴

ITU-T Recommendation X.210, Open .Systems Interconnection (OSI) Layer Service Definition Conventions⁴

3 Definitions

3.1 International Telegraph and Telephone Consultative Committee (ITU-T). The International Telegraph and Telephone Consultative Committee (ITU-T) is one of the seven organizations of the International Telecommunication Union (ITU), a specialized agency of the United Nations since 1948 and an international treaty organization. The ITU traces its formal beginnings to 1865. ITU-T has responsibility for the development of telecommunication standards in the ITU and consisted of fifteen study groups in the 1981-1984 study period. The general purpose of the ITU-T is to promote and ensure the operations of international telecommunications systems.

3.2 Integrated Services Digital Network (ISDN). A network, in general evolving from an existing telephony network, that 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 multipurpose interfaces.

3.3 D Channel. A 64-kbit/s channel carrying control or signaling information.

3.4 B Channel. A 64-kbit/s channel that carries user information such as voice calls or circuit-switched data (packetized or nonpacketized).

3.5 Layered Protocol. The protocol reference model is defined by layered structures based on and using the terminology of ITU-T Recommendations X.200 and X.210. The protocols referred to in this American National Standard conform to the reference model for ISDN specified in ITU-T Recommendation I.320. The ISDN reference model divides a protocol into seven layers; however, for the support of the minimal set of bearer services, only the first three layers are required. Layers 1 through 3 provide the following functions:

(1) *Layer 1 (The Physical Layer).* Layer 1 provides the mechanical, electrical, functional, and procedural characteristics to activate, maintain, and deactivate a physical circuit. Layer 1 allows for the transparent transmission of bits to the connecting medium.

(2) *Layer 2 (The Data Link Layer).* Layer 2 provides relatively error-free transmission of data between the ends of a physical link. Layer 2 defines the procedures required to establish, maintain, and disconnect the data link.

(3) *Layer 3 (The Network Layer).* Layer 3 provides the means to establish, maintain, and release network connections between application entities. Layer 3 provides the procedures for the exchange of messages between the user and its serving network equipment over the D-channel.

3.6 Information Transfer Mode. This attribute describes the operational mode for transferring (transportation and switching) user information through the ISDN.

It can be used to characterize a telecommunication service or a connection in the network.

Values associated with this attribute are circuit mode and packet mode.

3.7 Information Transfer Rate. This attribute describes either the bit rate (circuit mode) or the throughput (packet mode). It refers to the transfer of digital information between two access points or reference points.

Values associated with this attribute are appropriate bit rate and throughput rate.

3.8 Information Transfer Capability. This attribute describes the capability associated with the transfer of different types of information through the ISDN.

It can be used to characterize a telecommunication service or connection.

Values associated with this attribute are unrestricted digital, speech, 3.1-kHz audio, 7-kHz audio, 15-kHz audio, and video.

3.9 Communication Configuration. This attribute describes the special arrangement for transferring information between two or more access points. It completes the structure associated with a telecommunication service as it associates the relationship between the access points involved and the flow of information between these access points.

Values associated with this attribute are point-to-point, multipoint, and broadcast.

3.10 Structure. This attribute refers to the capability of the ISDN to deliver the information to the destination access point or reference point in a structure (for example, time interval for the circuit mode, service data unit for the packet mode) that was presented in a corresponding signal structured at the origin (access point or reference point).

Values associated with this attribute are 8-kHz-integrity, service data unit integrity, and unstructured.

3.11 Establishment of Communication. This attribute associated with a telecommunication service describes the mode of establishment used to establish and release a given communication.

Values associated with this attribute are demand, reserved, and permanent.

3.12 Symmetry. This attribute describes the relationship of information flow between two (or more) access points or reference points involved in a communication.

It characterizes the structure associated with a telecommunication service or a connection.

Values associated with this attribute are unidirectional, bidirectional symmetric, and bidirectional asymmetric.

4 Background

ITU-T Recommendation I.211 defines bearer services in terms of three categories of attributes: information transfer attributes, access attributes, and general attributes. Each attribute has a defined set of possible attribute values.

The information transfer attributes define the transmission characteristics of connections between ISDN users at S/T reference points or between an ISDN user at an S/T reference point and an interworking point to another network. The information transfer attributes and values related to the minimal set of bearer services in this document are summarized in Table 1.

The access attributes describe the means for accessing network functions or facilities as seen at one S/T reference point. The access attributes and values related to the minimal set of bearer services in this document are summarized in Table 2.

The general attributes deal with the service in general. The general attributes and values related to the minimal set of bearer services in this document are summarized in Table 3.

5 Minimal Set of Bearer Services Appropriate to the United States

The following bearer services should be provided by a public ISDN in the United States. In addition to the attribute values, explanatory statements are given for fuller understanding of each bearer service.

5.1 *Circuit-Mode Digital (CMD).*

Tables 4 through 6 summarize the information transfer attributes, access attributes, and general attributes associated with this bearer service.

For this circuit-mode digital bearer service with capability attribute value "unrestricted," the essential characteristic is that the received bit stream is identical (within performance limitations) to the transmitted stream including network-provided octet framing at the user-network interface. μ -law to A-law conversion would not be provided at the internetwork points between μ -law and A-law countries. The actual application is controlled by user equipment at each end and could thus, in principle, transport voice, rate-adapted and non-rate-adapted circuit-mode data, packet-mode data, and the like. In the United States, the need for a minimum "ones" density to maintain repeater synchronization may prohibit the offering of this bearer service on other than an intra-switching-system basis by some networks for migration period. The introduction of new transmission techniques will remove this limitation.

Requests for this bearer service that result in interworking with other ISDNs, a CSPDN, a PSPDN, a CSPDN access line, or a PSPDN access line will be accepted. The interworking function includes signaling protocol interfacing.

To interwork with digital networks having a maximum of 56-kbit/s transport capability, ISDNs may require selection of a 56-kbit/s rate adaptation by the user in the call request.

During an interim period when domestic networks may have a restriction against transmission of the all-zero octet, the capability attribute value "restricted" identifies that service constraint.

Circuit-mode rate adaptation by user equipment from a lower rate (e.g., 4.8, 56 kbit/s) to 64 kbit/s is defined in ITU-T Recommendation I.460 and ensures that the all-zero octet is not transmitted by requiring at least one bit of each octet to be a binary one.

To guard against inadvertent transmission of the all-zero octet by user equipment, the network may continuously monitor for this condition. When the all-zero octet is detected, it may be altered. Eventually, the universal availability of new transmission methods will eliminate this restriction and these restricted bearer capabilities could be eliminated.

5.2 *Circuit-Mode Speech (CV).*

Tables 7 through 9 summarize the information transfer attributes, access attributes, and general attributes associated with this bearer service.

For the speech-bearer service, the network assumes that μ -law-encoded speech, as described in ITU-T Recommendation G.711, is present at the user-network interface. The network provides octet-framing at the user-network interface. The essential characteristic here is that the ISDN may employ processing techniques appropriate for speech that do not assure bit integrity. μ -law to A-law conversion would be provided, as appropriate, between networks. Performance of voiceband modems is not guaranteed. When connections involving ISDN trunks are required, means for guarding against inadvertent transmission of the all-zero octet by user equipment may be provided by the network.

Requests for this bearer service will be accepted both between ISDN users and for interworking with another ISDN, a PSTN, or a PSTN access line. The interworking function includes signaling protocol interfacing.

5.3 Circuit-Mode Voiceband Data (CVBD).

Information transfer attribute values are identical to circuit-mode speech except that the capability attribute value is "3.1-kHz audio information."

Access attribute values are identical to circuit- mode speech.

General attribute values are identical to circuit-mode speech.

For the 3.1-kHz audio bearer service, the network assumes that μ -law-encoded, band-limited, audio information is present at the user-network interface. The use of voiceband modems, including those specified in the V Series, and group I, II, and III facsimile is intended. The network provides octet framing at the user-network interface. In the ISDN, some transmission processes specific to speech, may be prohibited; however, analog transmission may be permitted.

μ -law to A-law conversion may be provided as appropriate between networks. Thus, bit integrity is not assured. When connections involving ISDN trunks are required, means for guarding against inadvertent transmission of the all-zero octet by user equipment may be provided by the network.

Requests for this bearer service will be accepted both between ISDN users and for interworking with another ISDN, a PSTN, or a PSTN access line. The interworking function includes signaling protocol interfacing.

Table 1 - Information Transfer Attributes and Values

Attribute Name	Attribute Values
Information transfer mode	Circuit
Information transfer rate	64 kbit/s
Information transfer capability	Unrestricted digital, speech, 3.1-kHz audio
Structure	8-kHz integrity
Establishment of communication	Demand
Communication configuration	Point-to-point
Symmetry	Bidirectional symmetric

Table 2 - Access Attributes and Values

Attribute Name	Attribute Values
<i>Signaling</i>	
Channel and rate	D channel at 64 kbit/s
Protocol:	
Layer 1	See Note 1
Layer 2	LAPD, as specified in ANSI T1.602-1989
Layer 3	D channel Layer 3, as specified in ANSI T1.607
<i>Information Transfer</i>	
Channel and rate	B channel at 64 kbit/s
Protocol—Speech encoding	μ -Law PCM, as specified in CCITT Recommendation G.711, transparent (Note 2)

NOTES:

(1) The Layer-1 protocol and format that provides for these channels is currently under development.

(2) The application is controlled by user equipment and could thus, in principle, transport voice, high- or low-bit-rate data, packet-mode data, and the like.

Table 3 –General Attributes

Attribute Name	Attribute Values
Supplementary services	To be the subject of other American National Standards
Quality of service	To be the subject of other American National Standards
Interworking possibilities with other networks	Notes 1 and 2
Operational aspects	Operational aspects are to be the subject of other American National Standards.
Commercial aspects	Commercial aspects are not within the scope of this standard.

NOTES:

(1) With regard to “interworking,” it should be noted that the user does not specifically request interworking. The network identifies an interworking situation with another network in the process of establishing a call based on the specified bearer service, or the called party number, or both. At that time, the call may be rejected because of incompatible transmission or signaling characteristics. The transmission characteristics of an interworking call depend on the transmission characteristics of the ISDN and of the connected network.

(2) Interworking possibilities are listed for this attribute. The listing of an interworking possibility does not necessarily mean every public ISDN has operational interworking arrangements of these types. Rather, such interworking is a technical possibility that should not be precluded by this or related standards. The existence of an actual interworking capability between two particular networks is also dependent on other factors (e.g., technical, business, and regulatory) that are beyond the scope of this standard.

(3) Additional attribute values are under study.

Table 4 - Information Transfer Attributes – Circuit Mode Digital

Attribute Name	Attribute Value
Information transfer mode	Circuit
Information transfer rate	64 kbit/s
Information transfer capability	Unrestricted digital (see Note)
Structure	8-kHz integrity
Establishment of communication	Demand
Communication configuration	Point-to-point
Symmetry	Bidirectional symmetric

NOTE: During a migration period, some networks may only support “restricted” 64-kbit/s digital information transfer capability, i.e., information transfer capability solely restricted by the requirement that the all-zero octet is not allowed.

Table 5 - Access Attributes- Circuit-Mode Digital

Attribute Name	Attribute Values
<i>Signaling</i>	
Channel and rate	D channel at 64 kbit/s
Protocol:	
Layer 2	LAPD, as specified in ANSI T1.602-1989
Layer 3	D-channel layer 3, as specified in ANSI T1.607
<i>Information Transfer</i>	
Channel and rate	B channel at 64 kbit/s
Protocol	Transparent (see Note)

NOTE: The application is controlled by user equipment and could thus, in principle, transport voice, rate-adapted or non-rate-adapted circuit-mode data, packet-mode data, and the like.

Table 6 - General Attributes- Circuit-Mode Digital

Attribute Name	Attribute Value
Supplementary services	None included in this standard
Interworking possibilities with other networks	Other Integrated Services Digital Networks (ISDNs) Public Switched Telephone Network(s) (PSTN) for interworking Rate Adapted Data on the ISDN Packet-Switched Public Data Network(s) (PSPDN) Circuit-Switched Public Data Network(s) (CSPDN – see Note) including those which provide 56-kbit/s transmission Private Networks with compatible signaling and information transfer attributes

NOTE: The term, CSPDN, as used here does not necessarily correspond to the definition used by CCITT. A CSPDN in the United States, provides a user with a circuit-switched digital connection. Some key differences between a US CSPDN and that defined by CCITT are that (1) the numbering plan for PSTNs is used by the US CSPDNs, and (2) CCITT Recommendations X.2 and X.21 are not supported by the US CSPDNs.

Table 7 - Information Transfer Attributes-Circuit Mode Speech

Attribute Name	Attribute Values
Information transfer mode	Circuit
Information transfer rate	64 kbit/s
Information transfer capability	Speech
Structure	8-kHz integrity
Establishment of communication	Demand
Communication configuration	Point-to-point
Symmetry	Bidirectional symmetric

Table 8 - Access Attributes- Circuit-Mode Speech

Attribute Name	Attribute Values
<i>Signaling</i>	
Channel and rate	D channel at 64 kbit/s
Protocol:	
Layer 2	LAPD, as specified in ANSI T1.602-1989
Layer 3	D-channel Layer 3, as specified in ANSI T1.607
<i>Information Transfer</i>	
Channel and rate	B channel at 64 kbit/s
Protocol	μ-Law PCM, as specified in CCITT Recommendation G.711

Table 9 - General Attributes- Circuit-Mode Speech

Attribute Name	Attribute Value
Supplementary services	None included in this issue
Interworking possibilities with other networks	Other Integrated Services Digital Networks (ISDNs) Public Switched Telephone Network(s) (PSTN) Private Networks with compatible signaling and information transfer attributes