



**ATIS-1000609.2014(R2019)**

**Interworking between the ISDN User-Network Interface  
Protocol and Signalling System Number 7 ISDN User Part**

**AMERICAN NATIONAL STANDARD FOR TELECOMMUNICATIONS**



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## ATIS-1000609.2014(R2019), *Interworking between the ISDN User-Network Interface Protocol and Signalling System Number 7 ISDN User Part*

Is an American National Standard developed by the **Signaling, Architecture, and Control (SAC)** Subcommittee under the **ATIS Packet Technologies and Systems Committee (PTSC)**.

*Published by*  
**Alliance for Telecommunications Industry Solutions**  
**1200 G Street, NW, Suite 500**  
**Washington, DC 20005**

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**ATIS-1000609.2014(R2019)**

American National Standard for Telecommunications

# **Interworking between the ISDN User-Network Interface Protocol and Signalling System Number 7 ISDN User Part**

**Alliance for Telecommunications Industry Solutions**

Approved June 2014

**American National Standards Institute, Inc.**

## **Abstract**

This standard is aimed at defining the interworking relationship between the call control protocol of the ISDN User-Network Interface Protocol and the ISDN User Part of SS7. This standard defines in detail the relationship between signalling information conveyed via the User-Network Interface Protocol and similar signalling information conveyed via the ISDN User part of SS7. The above relationship is described within the context of supporting the establishment and clearing of call within an ISDN or mixed ISDN/non-ISDN environment.

## Foreword

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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)

The SAC Subcommittee was responsible for the development of this document.

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ATIS Standard on –

# Interworking between the ISDN User-Network Interface Protocol and the Signalling System Number 7 ISDN User Part

## 1 Scope, Purpose, & Application<sup>1</sup>

### 1.1 Introduction

This standard defines the interworking relationship between the D-channel layer-3 functions and protocol employed across an ISDN User-Network Interface and the ISDN User Part functions and protocol of Signalling System Number 7 (SS7).

The interworking between the above two signalling protocols typically may occur in an ISDN local exchange and is specified in the context of a typical call in a pure ISDN or mixed ISDN/non-ISDN environment.

### 1.2 Purpose

The purpose of this standard is

- 1) To define how the ISDN User-Network Interface Protocol and SS7 ISDN User Part protocols should be used in combination with call control functions, to support the circuit mode bearer service defined in ATIS-1000620;
- 2) To provide a logical bridge between the abstract signalling information flows, which are used in the description of ISDN services, and the corresponding messages and elements of procedure of the ISDN access and network signalling systems.

### 1.3 Scope

This standard is aimed at defining the interworking relationship between the call control protocol of the ISDN User-Network Interface Protocol and the ISDN User Part of SS7.

This standard defines in detail the relationship between signalling information conveyed via the User-Network Interface Protocol and similar signalling information conveyed via the ISDN User Part of SS7. The above relationship is described within the context of supporting the establishment and clearing of a call within an ISDN or mixed ISDN/non-ISDN environment.

NOTE - Although sufficient information is included in this standard to allow implementation of the interworking functionality, not all possible combinations of interworking scenarios are documented explicitly.

### 1.4 Relationship to Other American National Standards

This standard forms part of a set of interlocking ISDN service and signalling standards. Other members of this set include the following:

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<sup>1</sup> Due to the extensive changes in this document from the previous issue, ATIS-1000609, no change markings are provided

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American National Standard for Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part, ATIS-1000113.2005(R2010)<sup>2</sup>

American National Standard for Telecommunications - Integrated Services Digital Network (ISDN) - Minimal Set of Bearer Services for the Primary Rate Interface, ATIS-1000603.1993(R2009)<sup>3</sup>

American National Standard for Telecommunications - Integrated Services Digital Network (ISDN) - Minimal Set of Bearer Services for the Basic Rate Interface, ATIS-1000604.1990(R2009)<sup>4</sup>

American National Standard for Telecommunications - Integrated Services Digital Network (ISDN) - Layer-3 Signalling Specification for Circuit-Switched Bearer Service for Digital Subscriber Signaling System Number 1 (DSS 1), ATIS-1000607.2000(R2009)<sup>5</sup>.

American National Standard for Telecommunications - Integrated Services Digital Network (ISDN) - Integrated Services Digital Network (ISDN) Circuit-Mode Bearer Service Category Description, ATIS-1000620.1991(R2012)<sup>6</sup>

American National Standard for Telecommunications - Integrated Services Digital Network (ISDN) - Circuit-Mode Bearer Service Category Description, ATIS-1000620.a.1992(R2009)<sup>7</sup>

The signalling messages and elements of procedure of the User-Network Interface Protocol and the ISDN User Part of Signalling System Number 7 are defined in ATIS-1000607 and ATIS-1000113, respectively.

### **1.5 Normative References**

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.

ATIS-1000113.2005(R2010), Telecommunications - Signalling System Number 7 (SS7) - Integrated Services Digital Network (ISDN) User Part<sup>2</sup>

ATIS-1000603.1993(R2009) Telecommunications - Integrated Services Digital Network (ISDN) - Minimal Set of Bearer Services for the Primary Rate Interface<sup>3</sup>

ATIS-1000604.1990(R2009), Telecommunications - Integrated Services Digital Network (ISDN) - Minimal Set of Bearer Services for the Basic Rate Interface<sup>4</sup>

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 (DSS 1)<sup>5</sup>

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<sup>7</sup> 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=24745> >

## **ATIS-1000609.2014(R2019)**

ATIS-1000620.1991(R2012), Telecommunications - Integrated Services Digital Network (ISDN) - Circuit-Mode Bearer Service Category Description<sup>6</sup>

ATIS-1000620.a.1992(R2009), Telecommunications - Integrated Services Digital Network (ISDN) - Circuit-Mode Bearer Service Category Description<sup>7</sup>

ATIS-1000625.1993(R2013), Telecommunications - Integrated Services Digital Network (ISDN) - Calling Line Identification Presentation and Restriction Supplementary Service<sup>8</sup>

ATIS-1000650.1995(R2010), Telecommunications - Integrated Services Digital Network (ISDN) - Usage of the Cause Information Element in Digital Subscriber Signaling System Number 1 (DSS 1)<sup>9</sup>

### **1.6 Methodology**

Annex A provides, for information, a description used to model and define interworking between the DSS1 and the ISUP signalling systems.

The elements of information (parameters, information elements, and messages) that are of local significance only, i.e. are not mapped onto elements of information in the other signalling system, are not mentioned. Moreover, only the parameters and indicators being a matter of interworking are described. Hence, no information is given concerning e.g. the satellite indicator, the continuity check indicator, or the echo control device indicator.

#### **Nomenclature:**

Throughout this document, the ISUP message names are written in lower-case letters and the DSS1 message names in upper-case letters.

#### **ISUP segmentation:**

Some ISUP messages may be segmented. The actions described in this document on receipt of segmented messages take place only after the completion of the segmentation/reassembly procedure specified in 2.1 of chapter 4 of ATIS-1000113. ISUP messages which can be segmented are described in 2.1 of chapter 4 of ATIS-1000113.

#### **DSS1 segmentation:**

When it is said in the text that a specific DSS1 message is received, in case of segmentation the content of this message is received in SEGMENT messages. The actions described in this document then take place only after the completion of the DSS1 segmentation/reassembly procedure specified in Annex K of ATIS-1000607.

#### **Handling of the cause, location and progress indicator fields:**

When a cause parameter or information element has to be sent by the exchange, only the cause value is given in the text; the location indication is coded according to the procedures of ATIS-1000607 and ATIS-1000113 and using the encodings specified in ATIS-1000650 and ATIS-1000113.

When a progress indicator information element has to be sent by the exchange, only the progress description is given in the text; the location indication is coded according to the encodings and procedures of ATIS-1000607.

The handling of the diagnostic received in a cause parameter or in a cause information element is described in ATIS-1000607.

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<sup>8</sup> 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=27977>>

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**Services Interactions:**

Impacts of services interactions on interworking are not described in this standard.

## **1.7 Symbols & Abbreviations**

The following abbreviations are used:

ACM	Address complete message
ANM	Answer message
ATP	Access transport parameter
BC	Bearer capability information element
CGB	Circuit group blocking message
CON	Connect message
CPG	Call progress message
DSS1	Digital subscriber signaling system No.
GRS	Circuit group reset message
HLC	High layer compatibility information element
IE	Information element
IAM	Initial address message
ISDN	Integrated services digital network
ISUP	ISDN user part
PI	Progress indicator information element
PSTN	Public switched telephone network (non-ISUP)
REL	Release message
RES	Resume message
RSC	Reset circuit message
SUS	Suspend message
TNS	Transit network selection
TNS IE	Transit network selection information element

## **2 Outgoing Call**

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### **2.1 Interworking from DSS1 to ISUP**

#### **2.1.1 Basic Call**

##### **2.1.1.1 Sending of the Initial address message (IAM)**

When the exchange has received from the calling user in a SETUP message (possibly followed by INFORMATION messages) enough information to determine that the call is to be routed to another exchange, it shall select a suitable, free, inter-exchange circuit and send an initial address message (IAM).

The coding of the (IAM) according to the SETUP message is described hereafter.

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NOTE - The coding of the IAM message sent by a forwarding exchange is not mentioned here.

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### MANDATORY PARAMETERS

#### Forward call indicators

bit	A	Incoming international call indicator
	0	not an incoming international call
bit	D	Interworking indicator
	0	no interworking encountered (SS7 signalling all the way)
bit	F	ISDN user part indicator
	1	ISDN user part used all the way
bits	HG	ISDN user part preference indicator
	10	ISDN user part required all the way, if required by the invoked supplementary services
	00	ISDN user part preferred all the way, otherwise
bit	I	ISDN access indicator
	1	originating access ISDN

#### Calling party's category

Coded according to internal data of the originating exchange.

#### Called party number

Nature of address indicator:

Coded according either to the type of number field in the Called party number information element or based on internal data of the originating exchange.

Numbering plan indicator:

001 ISDN (telephony) numbering plan (Recommendation E.164)

Address signal:

Coded according to the called number information received in the SETUP or INFORMATION messages.

NOTE - The Keypad facility information element may be used to carry the called party number information in the user-network direction rather than the Called party number information element. This is then mapped to the Called party number parameter within the network.

#### User Service Information

The octets 1 through 5 of the User service information (USI) parameter are coded corresponding to the octets 3 through 7 of the Bearer capability information element.

**OPTIONAL PARAMETERS**

**Calling party number**

See ATIS-1000625, Calling Line Identification Presentation and Restriction Supplementary Service.

**Transit Network Selection**

The Transit Network Selection (TNS) parameter shall be coded in accordance with the received Transit network selection information element if it is present in the SETUP message. If there are multiple Transit network selection information elements in the SETUP message, only the first Transit network selection information element is used; the other Transit network selection information element(s) is (are) discarded. Whenever one or more TNS information element(s) is (are) discarded, a STATUS message shall be returned over the DSS1 interface coded with Cause #43, access information discarded, a location of public network serving the local user, and a diagnostic with the TNS IE identifier.

Alternatively, transit network selection information may be received from the user in the Keypad facility information element or in the Called party number information element (with type of number/numbering plan indicator coding of unknown number in unknown numbering plan). In these cases, the called party number is preceded by the prefix 10XXX/101XXXX, where XXX(X) is the carrier identification code. The network identification octets of the Transit network selection parameter shall be coded according to the XXX(X) carrier identification code<sup>10</sup>

**Access transport**

The Access transport parameter (ATP) is coded as shown in Table 1:

**Table 1 - Contents of the Access Transport Parameter**

SETUP→	IAM→
Content	Access transport parameter
Progress indicator	Progress indicator
High layer compatibility (Note 1)	High layer compatibility
Low layer compatibility	Low layer compatibility
Called party subaddress	Called party subaddress
Calling party subaddress	Calling party subaddress
Locking shift (Note 2)	Locking shift (Note 2)
Non-locking shift (Note 2)	Non-locking shift (Note 2)

Note 1: If two High layer compatibility (HLC) information elements are received in the SETUP message, they are transferred in the same order as received in the Access transport parameter of the Initial Address Message.

Note 2: Information elements in codeset 5, 6, or 7 requiring transport are carried in the ATP with the appropriate Locking shift information element.

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<sup>10</sup> At the conclusion of the Carrier Identification Code “permissive period” (as determined by the FCC), only four-digit carrier identification codes (XXXX) may be used in US networks.

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For outgoing International Calls, none of the codeset 5 and 6 information elements is allowed to be included in the Access Transport parameter. For inter-network calls, codeset 6 information elements shall not be included in the Access Transport parameter.

### User service information

The USI parameter is coded as shown in Table 2.

**Table 2 - Coding of the User Service Information parameter**

SETUP→	IAM→ (Notes 3 & 4)
Content	User service information parameter
<b>One BC received:</b> BC	BC (Note 2)
<b>Two BC received (Note 1):</b> BC 1 (speech or 3.1 kHz audio) BC 2 (unrestricted digital information with tones and an-	BC 1 (Note 2)

Note 1: BC 1 is the Bearer capability information element received in the first position in the SETUP message, BC 2 is the Bearer capability information element received in the second position of the SETUP message. Bearer capability information elements shall be received in ascending order of priority, as described in 3.1 of ATIS-1000607.

Note 2: Octet 1 (information element identifier) and 2 (length) of the Bearer capability information element are not included.

Note 3: Within this standard the only interworking specified for fallback procedure is the case where "UDI-TA" is received as the preferred bearer and speech or 3.1kHz is received as the fallback bearer. Fallback procedures are described in 2.9C of chapter 4 of ATIS-1000113.

Note 4: The procedures defined in Annex O of ATIS-1000607 for Bearer Service Change are not supported by this standard.

### User service information prime

This parameter is present only if two Bearer capability information elements are received and if no fallback occurs in the originating exchange. It is coded as shown in Table 3:

**Table 3 - Coding of the user service information prime parameter**

SETUP→	IAM→
Content	User service information prime parameter
<b>Two BC received (Note 1):</b> BC 1 (speech or 3.1 kHz audio) BC 2 (unrestricted digital information with tones and an-	BC 2 (Note 2)

Note 1: BC 1 is the Bearer capability information element received in the first position in the SETUP message, BC 2 in the second position. Bearer capability information elements shall be received in ascending order of priority as described in 3.1 of ATIS-1000607.

Note 2: Octet 1 (information element identifier) and 2 (length) of the bearer capability information element are not included.

### 2.1.1.2 Receipt of the Address Complete Message (ACM)

#### 2.1.1.2.1 ACM with a Cause Parameter

On receipt of an Address complete message with a Cause parameter, the originating exchange sends a PROGRESS message coded as shown in Table 4 over the DSS1 interface.

**Table 4 - Receipt of ACM with a Cause parameter**

→PROGRESS (Note 3)	→ACM
Cause information element (Note 1)	Cause parameter
Progress indicator No. 8 inband information or appropriate pattern now available	Optional backward call indicators parameter with in-band information indicator

Note 1: If the cause value received in the Address complete message (ACM) is unknown in DSS1, the unspecified cause value of the class is sent.

Note 2: Progress indicator No. 8 (in-band information or an appropriate pattern is now available) is only sent if the BC received in the SETUP message is coded speech, 3.1kHz audio or unrestricted digital information with tones/announcements.

Note 3: When tones and announcements are provided by the ACM initiator as part of call clearing, the PROGRESS message is used. The option of using the DISCONNECT message is not supported by this standard for clearing with tones or announcements as the initial call clearing message. When the network sends a DISCONNECT message, the B-channel clearing process is initiated; the network may not connect the user to tones and announcements.

#### 2.1.1.2.2 ACM without the Cause Parameter

Upon receiving an ACM, without a Cause parameter, the exchange shall send a message across the user-network interface to the calling user, as described in Table 5.

**Table 5 -Message sent over the DSS1 interface upon receipt of ACM**

→Message sent to the DSS1	→ACM
	Backward call indicators parameter Called party's status indicator.
PROGRESS if a Progress indicator information element is to be sent (Note 2)  No message if no Progress indicator information element is to be sent (Note 2)	00 (no indication) (Note 1) or 11 (excessive delay)
ALERTING	01 (Subscriber free)

Note 1: For networks supporting ISUP overlap signalling, the receipt from the network of an ACM without the subscriber free indication is interpreted by the network as a sending complete indication, in the case where the network couldn't determine it before.

Note 2: The sending of a Progress indicator information element is described below.

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The DSS1 message sent to the calling user (ALERTING or PROGRESS message) may include the Bearer capability information element, Progress information elements, and High layer compatibility information element as described below:

**Bearer capability**

If the transmission medium used parameter or the Bearer capability information element in the access transport parameter is present in the ACM received, see “handling of fallback information” at the end of this subclause.

**Progress indicator**

Progress indicator information elements possibly present in the access transport parameter of the ACM are transferred into the message sent to the calling user.

In addition, progress indicator information elements are created by the originating exchange according to the coding of the address complete message (ACM). Table 6 shows the sending criteria of each value.

Every DSS1 message sent to the calling user (ALERTING or PROGRESS) may contain up to two Progress indicator information elements. When more than two Progress indicator information elements need to be sent, the supplementary Progress indicator information elements are sent in a PROGRESS message.

**Table 6 - Sending criteria of the progress indicator information elements created by the originating exchange**

→Message sent over the DSS1:	→ACM
Progress indicator information element	Content
No. 1 (Call is not end-to-end ISDN: further progress information may be available in-band)	Backward call indicators parameter ISDN user part indicator 0 ISDN user part not used all the way
No. 2 (Note 1) (Destination address is non-ISDN)	Backward call indicators parameter ISDN user part indicator 1 ISDN user part used all the way ISDN access indicator 0 terminating access non-
No. 8 (Note 2) (In-band information or appropriate pattern now available)	Optional backward call indicators parameter In-band information indicator 1 In-band information available

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No. 10 (Delay at called interface)	Backward call indicators parameter Called party status indicator  11 excessive delay
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Note 1: As it is possible for diversion (e.g., call forwarding on no reply for a non-ISDN user) to occur on the call, the progress indicator No. 2 (Destination address is non-ISDN) may be withheld from ALERTING or PROGRESS messages and later sent over the DSS1 interface in a CONNECT message.

Note 2: The progress indicator No. 8 (in-band information or an appropriate pattern is now available) is only sent if the BC received in the SETUP message is coded speech, 3.1kHz audio or unrestricted digital information with tones/announcement.

**High layer compatibility**

If a high layer compatibility information element is present in the ATP of ACM, see the text following Table 7.

**Handling of fallback information:**

If the bearer capability information is present in the ATP of the ACM, then the Bearer capability information element is included in the message sent over the DSS1 interface along with a Progress information element with progress indicator No. 5 (interworking has occurred and has resulted in a telecommunication service change.)

If the transmission medium used parameter (TMU) is present in the ACM, and if no progress indicator

No. 1 (call is not end-to-end ISDN) or progress indicator No. 2 (destination address is non ISDN) has to be sent, Table 7 is applicable:

**Table 7 - Sending of BC fallback information**

→Message sent over the DSS1	→ACM
BC = speech progress indicator No. 5 (interworking has occurred)	TMU speech ATP: no BC
BC = 3.1 kHz audio progress indicator No. 5 (interworking has occurred)	TMU 3.1 kHz audio ATP: no BC
BC received in the ATP (speech or 3.1 kHz audio) progress indicator No. 5 (interworking has occurred)	TMU speech or 3.1 kHz audio ATP: BC (speech or 3.1 kHz audio)

If a High layer compatibility information element is present in the ATP of the ACM, and if no progress indicator No. 1 (call is not end-to-end ISDN) or progress indicator No. 2 (destination address is non ISDN) has to be sent, Table 8 is applicable:

**Table 8 - Sending of HLC fallback information**

→Message sent over the DSS1	→ACM
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Content	access transport parameter
HLC Progress indicator No. 5 (interworking has occurred)	HLC Progress indicator No. 5 (interworking has occurred)

NOTE - If procedures of BC fallback and HLC fallback both require the sending of the Progress indicator information element No. 5 (interworking has occurred), only one Progress indicator information element No. 5 (interworking has occurred) is sent.

### **2.1.1.3 Receipt of the Call Progress Message (CPG)**

#### **2.1.1.3.1 CPG with a Cause Parameter**

Upon receiving a CPG message with a cause parameter, the originating exchange shall send a PROGRESS message over the DSS1 interface coded as described in Table 9. Additional Progress indicator information elements described in Table 10 may also be included:

**Table 9 - Receipt of CPG with a Cause parameter**

→PROGRESS	→CPG
Cause information element (Note 1)	Cause parameter
Progress indicator No. 8 (inband information or appropriate pattern now available) (Note 2)	Optional backward call indicators parameter  In-band information indicator  1 In-band information available

Note 1: If the cause value received in the CPG is unknown in DSS1, the unspecified cause value of the class is sent.

Note 2: The progress indicator No. 8 (in-band information or an appropriate pattern is now available) is only sent if the BC received in the SETUP message is coded speech, 3.1kHz audio or unrestricted digital information with tones/announcements.

Note 3: The Event indicator may be included in the CPG, but does not affect the signalling to the DSS1 interface.

**2.1.1.3.2 CPG without a Cause Parameter**

Upon receiving a CPG without a Cause parameter, the exchange shall send a message across the user-network interface to the calling user, as described in Table 10. If a Cause value is received, Table 9 also applies.

**Table 10 - Message sent to the DSS1 upon receipt of CPG**

→Message sent over the DSS1	→CPG
	Event information parameter Event indicator
ALERTING if not sent before, otherwise:  - PROGRESS if a Progress indicator information element is to be sent (Note), - No message if no Progress indicator information element is to be sent (Note)	000 0001  (Alerting)
- PROGRESS if a progress indicator information element is to be sent (Note),  - No message if no progress indicator information element is to be sent (Note)	000 0010  (Progress)  or  000 0011  (In-band information or an appropriate pattern is now available)

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NOTE - The sending of a Progress indicator information element is described below.

The DSS1 message sent to the calling user (ALERTING or PROGRESS message) is coded as follows:

**Bearer capability**

If either the Transmission medium used parameter or the Bearer capability information element in the ATP is present in the CPG received, see "handling of fallback information" in 2.1.1.2.2.

**Progress indicator**

Any Progress indicator information elements present in the ATP of the CPG are transferred into the DSS1 message sent to the calling user.

In addition, Progress indicator information elements may be created by the originating exchange according to the coding of the CPG. Table 11 shows the sending criteria for each value.

In case of fallback, a progress indicator No. 5 (interworking has occurred and has resulted in a telecommunication service change) is sent as well, see Table 7 and Table 8.

Every DSS1 message sent to the calling user (ALERTING or PROGRESS) may contain up to two Progress indicator information elements. When more than two Progress indicator information elements need to be sent, the supplementary Progress indicator information elements are sent in a PROGRESS message.

**Table 11 - Sending criteria of the progress indicator information elements created by the originating exchange**

→Message sent over the DSS1:	→CPG
Progress indicator information element	Content (Note 1)
Progress indicator No. 1 (Call is not end-to-end ISDN: further progress information may be available in-band)	Backward call indicators parameter ISDN user part indicator  0 ISDN user part
Progress indicator No. 2 (Note 2) (Destination address is non-ISDN)	Backward call indicators parameter ISDN user part indicator  1 ISDN user part used all the way ISDN access indicator  0 terminating access non-ISDN

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<p align="center">Progress indicator No. 4 (Call has returned to the ISDN)</p>	<p>Backward call indicators parameter</p> <p>ISDN user part indicator</p> <p>1 ISDN user part used all the way</p> <p>ISDN access indicator</p> <p>1 terminating access ISDN whereas the last indication received was "0" terminating access non-ISDN</p>
<p align="center">Progress indicator No. 8 (In-band information or appropriate pattern now available)</p>	<p>Event information parameter Event indicator</p> <p>000 0011</p>
<p align="center">Progress indicator No. 8 (In-band information or appropriate pattern now available)</p>	<p>Optional backward call indicators parameter</p> <p>In-band information indicator</p> <p>1 In-band information available</p>

Note 1: The mapping of the contents in the CPG message is only relevant if the information received in the message is different compared to earlier received information, e.g. in the ACM message or a CPG message received prior to this message.

Note 2: As it is possible for diversion (e.g., call forwarding on no reply for a non-ISDN user) to occur on the call, the progress indicator No. 2 (Destination address is non-ISDN) may be withheld from ALERTING or PROGRESS messages and later sent over the DSS1 interface in a CONNECT message.

**High layer compatibility**

If a High layer compatibility information element is present in the ATP of the CPG, see "handling of fallback information" in 2.1.1.2.2.

**2.1.1.4 Receipt of the Answer Message (ANM)**

Upon receipt of an answer message (ANM), the exchange shall send a CONNECT message across the user-network interface to the calling user.

The DSS1 CONNECT message is coded as follows:

**Bearer capability**

See "handling of fallback information" at the end of this section.

**Progress indicator**

When one or more Progress indicator information elements are present in the ATP of the ANM they are transferred into the CONNECT message sent to the calling user.

In addition, Progress indicator information elements may be created by the originating exchange according to the coding of any backward call indicators parameter received in the ANM. Table 12 shows the criteria for sending each value.

In case of fallback, a progress indicator No. 5 (interworking has occurred and has resulted in a telecommunication service change) is sent as well: See Table 13 and Table 14.

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**Table 12 -Sending criteria of the progress indicator information elements created by the originating exchange**

→CONNECT	→ANM
Progress indicator information element	Content
Progress indicator No. 1 (Call is not end-to-end ISDN: further progress information may be available in-band)	Backward call indicators parameter ISDN user part indicator 0 ISDN user part not used all the way
Progress indicator No. 2 (Destination address is non-ISDN)	Backward call indicators parameter ISDN user part indicator 1 ISDN user part used all the way ISDN access indicator 0 terminating access non-ISDN
Progress indicator No. 4 (Call has returned to the ISDN)	Backward call indicators parameter ISDN user part indicator 1 ISDN user part used all the way ISDN access indicator 1 terminating access ISDN whereas the last indication received was "0" terminating access non- ISDN

**High layer compatibility**

If a High layer compatibility information element is present in the ATP of the ANM, see “handling of fallback information” at the end of this section.

**Low layer compatibility**

If the Low layer compatibility information element is present in the ATP of the ANM it is passed on unchanged.

**Handling of fallback information:**

If the transmission medium used parameter (TMU) is present in the ANM, or if a Bearer capability information element is present in the ATP of the ANM, and if no progress indicator No. 1 (call is not end-to-end ISDN) or progress indicator No. 2 (destination address is non ISDN) has to be sent, Table 13 is applicable:

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**Table 13 - Sending of BC fallback information**

→CONNECT	→ANM
BC (unrestricted digital information with	no TMU ATP BC (unrestricted digital information with tones and announcements)
BC = speech Progress indicator No. 5 (interworking has occurred)	TMU speech ATP no BC
BC = 3.1 kHz audio Progress indicator No. 5 (interworking has occurred)	TMU 3.1 kHz audio ATP no BC
BC received in the ATP (speech or 3.1 kHz audio)	TMU speech or 3.1 kHz audio ATP BC (speech or 3.1 kHz audio)
BC received in the ATP (speech or 3.1 kHz audio)  Progress indicator No. 5 (interworking has occurred)	TMU speech or 3.1 kHz audio ATP BC (speech or 3.1 kHz audio) Progress indicator No. 5 (interworking has occurred)

If a High layer compatibility information element is present in the ATP of the ANM, and if neither progress indicator No. 1 (call is not end-to-end ISDN) nor progress indicator No. 2 (destination address is non ISDN) has to be sent, Table 14 is applicable:

**Table 14 - Sending of HLC fallback information**

→CONNECT	→ANM
Content	Access transport parameter
HLC	HLC
HLC Progress indicator No. 5 (interworking has occurred)	HLC Progress indicator No. 5 (interworking has occurred)
no HLC	no HLC

NOTE - If procedures of BC fallback and HLC fallback both require the sending of the progress indicator No. 5, only one Progress indicator information element containing progress indicator No. 5 (interworking has occurred) is sent.

**2.1.1.5 Receipt of the Release Message (REL)**

Upon receipt of a release message with a cause parameter from the network, the originating exchange shall send a DISCONNECT message over the DSS1 interface as shown in Table 15.

**Table 15 - Receipt of the Release message**

<b>→DISCONNECT</b>	<b>→REL</b>
cause information element	cause parameter
cause value No. x (Note)	cause value No. x

NOTE - If the cause value received in the release message (REL) is unknown in DSS1, the unspecified cause value of the class is sent.

**2.1.1.6 Sending of the Release Message (REL)**

When the call is cleared by the originating caller, upon receipt of a DSS1 call clearing message the originating exchange shall send a Release message to the network coded as shown in Table 16.

**Table 16 - Call clearing from the user**

<b>DISCONNECT, RELEASE RELEASE COMPLETE→</b>	<b>REL→</b>
Cause information element	cause parameter
cause value No. x	cause value No. x (Note)

NOTE - If the cause value received in the DSS1 message is unknown in ISUP, the unspecified cause value of the class is sent.

**2.1.1.7 Receipt of Reset Circuit Message (RSC), Circuit Group Reset Message (GRS) or Circuit Group Blocking Message (CGB) with the Indication Hardware Failure Oriented**

Table 17 shows the message sent to the calling user upon receipt of either a RSC message, GRS message or CGB message with the indication hardware failure oriented, when at least one backward message relating to the call has already been received.

**Table 17 - Receipt of RSC, GRS, or CGB messages**

<b>→DISCONNECT</b>	<b>→Message received from ISUP</b>
Cause information element	
cause value No. 41 (Note) temporary failure	reset circuit message (RSC)
cause value No. 41 (Note) temporary failure	circuit group reset message (GRS)

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cause value No. 31 normal, unspecified	circuit group blocking message (CGB)  with the type indicator of  the circuit group supervision message type indicator parameter  coded 01
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NOTE - Sending cause value No. 41 is consistent with ATIS-1000113, chapter 4 procedures. ITU-T Q.699 uses cause value No. 31.

**2.1.1.8 DSS1 Data link reset and Data link failure procedures**

The data link reset and data link failure procedures summarized in Table 18 are described in ATIS-1000607.

**Table 18 - DSS1 Data link reset and Data link failure procedures**

→DISCONNECT	Trigger event	REL→
Cause information element		cause parameter
cause value No. 41 (temporary failure)	Data link reset in overlap sending state	cause value No. 41 (temporary failure)
(Note)	Data link failure in another state than active state	cause value No. 27 (destination out of order)
(Note)	Failure of the data link reestablishment procedure after a data link failure in active state	cause value No. 27 (destination out of order)

NOTE - The call is cleared internally. No DISCONNECT message is sent.

**2.1.1.9 Receipt of the Suspend Message (SUS) Network Initiated<sup>11</sup>**

The actions taken by the network upon receipt of the suspend message (SUS) are described in 2.5 of chapter 4 of ATIS-1000113. No interworking with DSS1 is required.

**2.1.1.10 Receipt of the Resume message (RES) Network Initiated<sup>12</sup>**

The actions taken by the network upon receipt of the resume message (RES) are described in 2.5 of chapter 4 of ATIS-1000113. No interworking with DSS1 is required.

<sup>11</sup> User-initiated Suspend is not supported in U.S. Networks.

<sup>12</sup> User-initiated Suspend is not supported in U.S. Networks.

#### **2.1.1.11 Release by the Exchange**

When the call is cleared by the originating exchange due to an abnormal event, the call clearing messages sent to both the network and over the DSS1 interface are shown in Table 19.

**Table 19 - Release from the originating exchange**

→DISCONNECT	Trigger event	REL→
Cause information element		cause parameter
cause value No. 31 normal, unspecified	Failure of the automatic repeat attempt procedure	no action
cause value No. 97 message type non- existent or not implemented  or cause value No. 99 parameter non-existent or not implemented - discarded	Call release due to the ISUP compatibility procedure	cause value No. 97 message type non- existent or not implemented  or cause value No. 99 parameter non-existent or not implemented - discarded
same cause value as in the REL message (Note 2)	other cases of failure on the ISUP side	cause value coded according to ATIS- 1000113, chapter 3
cause value coded according to ATIS- 1000650	other cases of failure on the DSS1 side	same cause value as in the DISCONNECT message (Note 3)

Note 1: T6 is the awaiting resume message (RES) timer. T6 start, stop, and expiry are described in 2.5 of chapter 4 of ATIS-1000113.

Note 2: If the cause value sent in the REL message is unknown in DSS1, the unspecified cause value of the class is sent.

Note 3: If the cause value sent in the DISCONNECT message is unknown in ISUP, the unspecified cause value of the class is sent.

## 2.1.2 Other Call Types

For further study.

## 2.2 Interworking from Non-ISDN Access to ISUP

### 2.2.1 Basic Call

#### 2.2.1.1 Sending of the Initial Address Message (IAM)

When the exchange has received enough information from the calling user in the address signals to determine that the call is to be routed to another exchange after detection of the off-hook condition, it shall select a suitable, free, inter-exchange circuit and send an Initial address message (IAM).

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The coding of the Initial address message (IAM) is described hereafter.

NOTE - The coding of the IAM message sent by a forwarding exchange is not mentioned here.

### 2.2.1.1.1 Coding of the Initial Address Message (IAM)

#### MANDATORY PARAMETERS

##### Forward call indicators

bit	A	Incoming international call indicator
	0	not an incoming international call
bit	D	Interworking indicator
	0	no interworking encountered (SS7 signalling all the way)
bit	F	ISDN user part indicator
	1	ISDN user part used all the way
bits	HG	ISDN user part preference indicator
	00	ISDN user part preferred all the way (default)
	01	ISDN user part not required all the way
	10	ISDN user part required all the way
bit	I	ISDN access indicator
	0	originating access non-ISDN

##### Calling party's category

Coded according to internal data of the originating exchange.

##### User Service Information

This parameter is coded to 3.1 kHz audio.

##### Called party number

Nature of address indicator:

According to the internal data of the originating exchange.

Numbering plan indicator:

001 *ISDN (telephony) numbering plan (Recommendation E.164)*

### 2.2.1.2 Receipt of the Address Complete Message (ACM)

Upon receiving the ACM, no mapping is taken on the non-ISDN side. Connection should be made to the calling user to permit reception of in-band tones or announcements.

### 2.2.1.3 Receipt of the Call Progress Message (CPG)

Upon receiving the call progress message (CPG), no mapping is done on the non-ISDN side.

#### 2.2.1.4 Receipt of the Answer Message (ANM)

Upon receiving the answer message (ANM) in the exchange, it may be mapped into an appropriate signal, e.g., answer signal on the non-ISDN side.

#### 2.2.1.5 Receipt of the Release Message (REL)

Upon receiving the release message (REL) in the exchange, it may be mapped into an appropriate backward signal, e.g., clear-backward signal, on the non-ISDN side.

#### 2.2.1.6 Sending of the Release Message (REL)

If the exchange detects the on-hook condition or receives an appropriate signal to indicate release procedures, e.g. clear-forward signal, it shall send a release message (REL) with a mandatory Cause Indicators parameter coded with cause value No. 16 "normal clearing".

#### 2.2.1.7 Receipt of the Suspend Message (SUS) Network Initiated

The action taken on the ISUP side upon receipt of the suspend message (SUS) are described in 2.5 of chapter 4 of ATIS-1000113.

#### 2.2.1.8 Receipt of the Resume Message (RES) Network Initiated

The action taken on the ISUP side upon receipt of the resume message (RES) are described in 2.5 of chapter 4 of ATIS-1000113.

No action is taken on the non-ISDN side.

#### 2.2.1.9 Release by the Exchange

The actions taken by the originating exchange to release the call upon failure or abnormal event detection are shown in Table 20.

**Table 20 - Release from the originating exchange**

Trigger event	REL→ cause parameter
Failure of the automatic repeat attempt procedure	no action
Call release due to the ISUP compatibility procedure	cause value No. 97 message type non-existent or not implemented  or cause value No. 99 parameter non-existent or not implemented - discarded

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other cases of failure on the ISUP side	cause value coded according to ATIS-1000113, chapter 3
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Note 1: T6 is the awaiting resume message (RES) timer. T6 start, stop, and expiry are described in 2.5 of chapter 4 of ATIS-1000113.

## 2.2.2 Other Call Types

For further study.

# 3 Incoming Call

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## 3.1 Interworking from ISUP to DSS1

### 3.1.1 Basic Call

#### 3.1.1.1 Sending of the SETUP Message

The call information is received in the Initial address message (IAM).

If the continuity check indicator of the nature of connection indicators is coded 01, continuity check required on this circuit, or 10, continuity check required on a previous circuit, the setting-up of the call must be prevented until the receipt of the result of the continuity check procedure.

When the exchange has received all the information required to go on with the call, and performed the various checks to determine that the call is allowed, a SETUP message is sent to the called user.

The information elements carried in the access transport parameter of the IAM are taken into account whatever the order of receipt, except when two high layer compatibility information elements are received: the order of these two information elements is then significant.

The sending of some information elements (like the calling party number, the calling or called party subaddress) may depend on checks by supplementary services.

Only the information elements involved in the interworking are described hereafter.

#### Bearer capability

Upon receipt of an IAM from the network the destination exchange shall code the Bearer capability information element in the DSS1 SETUP message as shown in Table 21.

**Table 21 - Coding of the bearer capability information element**

IAM→	SETUP→
Content	Bearer capability information element
USI present No USI prime	BC = USI (Note 1)

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USI (speech, or 3.1 kHz audio)	BC 1 = USI (Note 1, 2)
USI prime (unrestricted digital information with tones and announcements)	BC 2 = USI prime(Note 1, 2)

Note 1: Octet 1 (information element identifier) and octet 2 (length) are recreated.

Note 2: BC 1 is the Bearer capability information element positioned first in the SETUP message, BC 2 is the Bearer capability information element positioned second in the SETUP message. Bearer capability information elements shall be sent in ascending order of priority as described in 5.11 of ATIS-1000607.

**Progress indicator**

**Table 22 - Coding of the progress indicator information element**

IAM→		Access transport parameter	SET UP→
Forward call indicators parameter			Progress indicator information element
ISDN user part indicator	ISDN access indicator		
0 (ISDN user part not used all the way)	(Note)	(Note)	progress indicator No. 1 call is not end-to-end ISDN: further information may be
1 (ISDN user part used all the way)	0 (originating access non-ISDN)	(Note)	progress indicator No. 3 origination address is non-ISDN
1 (ISDN user part used all the way)	1 (originating access ISDN)	progress indicator No. x	progress indicator No. x

NOTE - A dark, gray colored cell means that the value is not significant.

**Calling party number**

See ATIS-1000625.

**Calling party subaddress**

See ATIS-1000625.

**Called party number**

See ATIS-1000607.

**Called party subaddress**

See ATIS-1000607.

**Low layer compatibility**

If the Low layer compatibility information element is present in the access transport parameter of the IAM, it is passed on unchanged in the SETUP message.

**High layer compatibility**

If the High layer compatibility information element is present in the access transport parameter of the IAM, it is passed on unchanged in the SETUP message.

If two High layer compatibility information elements are received in the access transport parameter of the IAM, they are passed on unchanged in the same order in the SETUP message (the meaning of HLC order is described in 4.5.16 of ATIS-1000607).

### 3.1.1.2 Sending of the Address Complete Message (ACM)

The following cases are possible trigger conditions of sending the ACM:

- a) the destination exchange has determined independently of access indications that the complete called party number has been received;
- b) en-bloc receiving is used on the DSS1 side and a progress indicator information element [except with value No. 3 (originating address is non-ISDN) or No. 4 (call has returned to the ISDN)] is received in a CALL PROCEEDING message or in a PROGRESS message;
- c) the first ALERTING message is received;
- d) it has been determined, in case of call failure, that a special in-band tone or announcement has to be returned to the calling party from the destination exchange;
- e) DSS1 timer T303 has expired for the first time.

On speech or 3.1 kHz audio calls, the awaiting answer indication (e.g., ring tone) is sent to the calling party upon receipt of the first ALERTING message.

NOTE - In all cases, it is assumed that no ACM has already been sent.

#### MANDATORY PARAMETERS

##### Backward call indicators

bits	DC	Called party's status indicator
	01	subscriber free if the ALERTING message has been received
	11	excessive delay if T303 has expired
	00	no indication otherwise
bits	FE	Called party's category indicator
	00	no indication if the user's characteristics (internal data) have not been analyzed
	01	ordinary subscriber
	10	payphone according to the user's characteristics
bit	I	Interworking indicator
	0	no interworking encountered
bit	K	ISDN user part indicator
	1	ISDN user part used all the way
bit	M	ISDN access indicator
	1	terminating access ISDN

#### OPTIONAL PARAMETERS

##### Optional backward call indicators

bit	A	In-band information indicator
	1	in-band information or an appropriate pattern is now available if it has been determined, in case of call failure, that a special in-band tone or announcement has to be returned to the calling party from the destination exchange
	0	no indication otherwise

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**Access transport**

This parameter carries the Progress indicator information element possibly received from the called user (except the progress indicator value No. 8). It may carry other information elements as well.

**Transmission medium used**

See “handling of fallback information” at the end of this section.

**Handling of fallback information (applicable when interworking with a private network)**

When the terminating exchange

- has knowledge that the fallback capability was requested in the IAM and
- if no Progress indicator information element containing progress indicator No. 1 ( call is not end-to-end ISDN further information may be available in-band) or No. 2 (destination address is non-ISDN) has been received from the DSS1 side and
- when fallback is requested by the called user sending a progress indicator No. 5 (interworking has occurred and has resulted in a telecommunication service change) and the fallback bearer capability in the access message received from the DSS1 interface,

the interworking shown in Table 23 and Table 24 is applicable.

**Table 23 - Handling of BC fallback information**

→ACM		→Message received from the access
Transmission medium used parameter	Access transport parameter	Content
value received in the USI prime of the IAM message (speech or 3.1kHz audio)	BC low (speech or 3.1kHz audio) progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change	BC low (speech or 3.1kHz audio) progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change

**Table 24 - Handling of HLC fallback information**

→ACM	→Message received from the access
Access transport parameter	Content
HLC Progress indicator No. 5	HLC Progress indicator No. 5

**3.1.1.3 Sending of the Call Progress Message (CPG)**

If the ACM has already been sent, the following cases are possible trigger conditions for sending the CPG:

- a) it has been determined that an in-band tone or announcement has to be returned to the calling party from the destination exchange.

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- b) receipt of a Progress indicator information element in a CALL PROCEEDING message (except with progress indicator values No. 3 originating address is non-ISDN or No. 4 call has returned to the ISDN) or in a PROGRESS message (except with progress indicator value No. 3 originating address is non-ISDN);
- c) receipt of the first ALERTING message.

**MANDATORY PARAMETERS**

**Event information**

bits G-A Event indicator

0000001 alerting in case c (see Note)

0000010 progress in case b

0000011 in-band information or an appropriate pattern is now available in case a (see Note)

NOTE - If cases a and c occur simultaneously, the event indicator of the event information parameter is coded alerting and the in-band information indicator of the optional backward call indicators parameter is coded in-band information or an appropriate pattern is now available.

**OPTIONAL PARAMETERS**

**Other parameters**

The other parameters may have already been sent in a previous backward message. In this case they are not repeated unless new information is now available. The coding of these parameters is described in 3.1.1.2 *Sending of the Address complete message (ACM)*.

**3.1.1.4 Sending of the Answer Message (ANM) with Address Complete Message (ACM) Already Sent**

Upon receipt of the first CONNECT message, if the address complete message has already been sent, the destination exchange shall:

- stop the sending of the awaiting answer indication (e.g. ring-tone), if any,
- send the answer message (ANM) to the preceding exchange.

The answer message (ANM) is coded as follows:

**OPTIONAL PARAMETERS**

**Access transport**

**Table 25 - Contents of the access transport parameter**

→ANM	→Message received from the DSS1 interface
Access transport parameter	Information elements
Progress indicator	Progress indicator
Low layer compatibility	Low layer compatibility
Connected number	Connected number
Connected subaddress	Connected subaddress

The ATP may carry other information elements as well.

**Transmission medium used**

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This parameter is only present in cases where fallback occurs (see the end of this section).

**Other parameters**

The other parameters may have already been sent in a previous backward message. In this case they are not repeated unless new information is now available. The coding of these parameters is described in 3.1.1.2 *Sending of the Address complete message (ACM)*.

**Handling of fallback information**

When the terminating exchange has knowledge that the fallback capability was requested in the initial address message (IAM), and if no progress indicator information element containing progress indicator No. 1, *call is not end-to-end ISDN; further information may be available in-band*, or No. 2, *destination address is non-ISDN, has been received from the DSS1 interface*, tables 26 through 29 are applicable:

U reference point [See ATIS-1000607] (without interworking to a private network):

**Table 26 - Handling of BC fallback information at a U reference point (without interworking to a private network)**

→ANM		→CONNECT
Transmission medium used parameter	Access transport parameter	Content
no TMU	BC (unrestricted digital information with tones and announcements)	BC (unrestricted digital information with tones and announcements)
value received in the USI prime of the IAM message (speech or 3.1 kHz audio)	BC (speech or 3.1 kHz audio)	BC (speech or 3.1 kHz audio)
value received in the USI prime of the IAM message (speech, or 3.1 kHz audio)	BC received in the USI of the IAM message	no BC

**Table 27 - Handling of HLC fallback information at a U reference point (without interworking to a private network)**

→ANM	→CONNECT
Access transport parameter	Content
HLC	HLC
received HLC positioned first in the ATP of the IAM message	no HLC

U reference point (with interworking to a private network)

**Table 28 - Handling of BC fallback information at a U reference point (with interworking to a private network)**

→ANM	→CONNECT
------	----------

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Transmission medium used parameter	Access transport parameter	Content
no TMU	BC (unrestricted digital information with tones and announcements)	BC (unrestricted digital information with tones and announcements)
value received in the USI prime of the IAM message (speech or 3.1kHz audio)	BC (speech or 3.1 kHz audio)	BC (speech or 3.1 kHz audio)
value received in the USI prime of the IAM message (speech or 3.1kHz audio)	BC (speech or 3.1 kHz audio) progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change	BC (speech or 3.1 kHz audio) progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change
value received in the USI prime of the IAM message (speech, or 3.1 kHz audio)	BC received in the USI of the IAM message (speech or 3.1 kHz audio) progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change	no BC (Note)

NOTE - In this case, the fallback information coded in the transmission medium used and access transport parameters are not repeated if already sent in a previous backward message.

**Table 29 - Handling of HLC fallback information at a U reference point (with interworking to a private network)**

→ANM	→CONNECT
Access transport parameter	Content
HLC	HLC
HLC Progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change	HLC Progress indicator No. 5 interworking has occurred and has resulted in a telecommunication service change
no HLC	no HLC

**3.1.1.5 Sending of the Answer Message (ANM) on the Receipt of the CONNECT Message**

Upon receipt of the first CONNECT message from an automatic-answering terminal, if the address complete message (ACM) has not yet been sent, the destination exchange shall send the answer message (ANM) to the preceding exchange.

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The answer message (ANM) is coded as described in 3.1.1.4 *Sending of the Answer message (ANM) with Address Complete Message (ACM) already sent.*

#### **3.1.1.6 Receipt of the Release Message (REL)**

When a release message is received an appropriately coded call clearing message is sent over the DSS1 interface as shown in Table 30:

**Table 30 - Receipt of the Release message**

REL→	DISCONNECT or RELEASE→ (Note 1)
cause parameter	cause information element
cause value No. x	cause value No. x (Note 2)

Note 1: The RELEASE message is sent over a DSS1 interface if the release message (REL) is received during the call establishment as described in 5.3 of ATIS-1000607.

Otherwise a DISCONNECT message is sent.

Note 2: If the cause value received in the release message (REL) is unknown in DSS1, the unspecified cause value of the class is sent.

### 3.1.1.7 Sending of the Release Message (REL)

When a call clearing message is received over the DSS1 interface (e.g. DISCONNECT, RELEASE, or RELEASE COMPLETE), an appropriately coded release message is sent as shown in Table 31:

**Table 31 - Call clearing during call establishment**

→REL	→DISCONNECT RELEASE RELEASE COMPLETE
cause parameter	cause information element
cause value No. x (Note 2)	cause value No. x

Note 1: Clause 5.3 of ATIS-1000607 describes how these messages are taken into account when they are received during call establishment at a DSS1 interface.

Note 2: If the cause value received in the DSS1 message is unknown in ISUP, the unspecified cause value of the class is sent.

### 3.1.1.8 Receipt of the Reset Circuit Message (RSC), Circuit Group Reset Message (GRS) or Circuit Group Blocking Message (CGB) with the Indication Hardware Failure Oriented

Handling of circuit reset messages is shown in Table 32:

**Table 32 - Receipt of RSC, GRS, or CGB messages**

Message received from ISUP→	Message sent to DSS1→
	DISCONNECT→
	cause information element

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reset circuit message (RSC)	cause value No. 41 (Note) temporary failure
circuit group reset message (GRS)	cause value No. 41 (Note) temporary failure
circuit group blocking message (CGB)  with the type indicator of the circuit group supervision mes- sage type indicator parameter  coded 01  block with immediate release	cause value No. 31 normal, unspecified

NOTE - Sending cause value No. 41 is consistent with ATIS-1000113, chapter 4 procedures. ITU-T Q.699 uses cause value No. 31.

### 3.1.1.9 DSS1 Data Link Reset & Data Link Failure Procedures

The data link reset and data link failure procedures are respectively described in 5.8.8 and 5.8.9 of ATIS-1000607 Interworking for data link reset and failures is shown in Table 33:

**Table 33 - DSS1 Data link reset and Data link failure procedures.**

→REL cause parameter	Trigger event	DISCONNECT→ cause information element
cause value No. 41 (temporary failure)	Data link reset in overlap receiving state	cause value No. 41 (temporary failure)
cause value No. 27 (destination out of order)	Data link failure in another state than active state	(Note)
cause value No. 27 (destination out of order)	Failure of the data link reestablishment procedure after a data link failure in active state	(Note)

NOTE - The call is cleared internally. No DISCONNECT message is sent.

### 3.1.1.10 Release by the Exchange

When a call is released by the exchange serving the DSS1 interface, the interworkings shown in Table 34 shall be applied:

**Table 34 - Release from the destination exchange**

Message sent to the ISUP	Trigger event	Message sent over the DSS1 interface →
-----------------------------	---------------	--

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→		Point-to-point data link	Broadcast data link
REL cause value No. 18	No response to the SETUP message (T303 expiry)	DISCONNECT cause value No. 102	no action
REL cause value No. 18 no user responding	no ALERTING, CONNECT or DISCONNECT after CALL PROCEEDING (T310 expiry)	DISCONNECT cause value No. 102 recovery on timer expiry	RELEASE cause value No. 102 recovery on timer expiry
REL cause value No. 19 user alerting, no answer	no CONNECT or DISCONNECT after ALERTING (T301 expiry)	DISCONNECT cause value No. 102 recovery on timer expiry	RELEASE cause value No. 102 recovery on timer expiry
REL cause value No. 31	unsuccessful termination of the B-channel selection procedure	RELEASE cause value No. 6	
REL cause value No. 97 message type non-existent or not implemented  or cause value No. 99 message type non-existent or not implemented, discarded	Call release due to the ISUP compatibility procedure	DISCONNECT cause value No. 97 message type non-existent or not implemented  or cause value No. 99 message type non-existent or not implemented, discarded	
REL cause value coded according to ATIS-1000113, chapter 3	other cases of failure on the ISUP side	DISCONNECT same cause value as in the REL message  (Note 1)	
REL same cause value as in the DISCONNECT message	other cases of failure on the DSS1 side	DISCONNECT cause value coded according to ATIS-1000650	

Note 1: If the cause value sent in the REL message is unknown in DSS1, the unspecified cause value of the class is sent.

Note 2: If the cause value sent in the DISCONNECT message is unknown in ISUP, the unspecified cause value of the class is sent.

### 3.1.2 Other Call Types

For further study.

## 3.2 Interworking from ISUP to Non-ISDN Access

### 3.2.1 Basic Call

#### 3.2.1.1 Sending of the Ringing

The call information are received in the initial address message (IAM).

If the continuity check indicator of the nature of connection indicators is coded 01, continuity check required on this circuit, or 10, continuity check required on a previous circuit, the setting-up of the call must be prevented until the receipt of the result of the continuity check procedure.

When the exchange has received all the information required to go on with the call, and performed the various checks to determine that the call is allowed, the call setup indication, e.g. ringing, is passed to the called user.

#### 3.2.1.2 Sending of the Address Complete Message (ACM)

The following cases are possible trigger conditions of sending the address complete message (ACM):

- a) the destination exchange has determined independently of line conditions that the complete called party number has been received;
- b) the destination exchange has determined that the subscriber is free;
- c) it has been determined, in case of call failure, that a special in-band tone or announcement has to be returned to the calling party from the destination exchange.

## MANDATORY PARAMETERS

### Backward call indicators

bits	DC	Called party's status indicator
	01	subscriber free if the exchange recognizes that the access line condition is free
	00	no indication otherwise
bits	FE	Called party's category indicator
	00	no indication if the user's characteristics (internal data) have not been analyzed, or
	01	ordinary subscriber
	10	pay-phone according to the user's characteristics
bit	I	Interworking indicator
	0	no interworking encountered
bit	K	ISDN user part indicator
	1	ISDN user part used all the way
bit	M	ISDN access indicator
	1	terminating access non-ISDN

## OPTIONAL PARAMETERS

### Optional backward call indicators

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bit	A	In-band information indicator
	1	in-band information or an appropriate pattern is now available if it has been determined, in case of call failure, that a special in-band tone or announcement has to be returned to the calling party from the destination exchange
	0	no indication otherwise

### 3.2.1.3 Sending of the Call Progress Message (CPG)

If the address complete message (ACM) has already been sent, the following cases are possible trigger conditions of sending the call progress message (CPG):

- the destination exchange has determined that the subscriber is free;
- it has been determined that an in-band tone or announcement has to be returned to the calling party from the destination exchange.

#### MANDATORY PARAMETERS

##### Event information

bits                    G-A    Event indicator

0000001 *alerting*

0000011 *in-band information or an appropriate pattern is now available in case a (see Note)*

NOTE - If cases a and c occur simultaneously, the event indicator of the event information parameter is coded alerting and the in-band information indicator of the optional backward call indicators parameter is coded in- band information or an appropriate pattern is now available.

#### OPTIONAL PARAMETERS

##### Other parameters

The other parameters may have already been sent in a previous backward message. In this case they are not repeated unless new information is now available. The coding of these parameters is described in 3.1.1.2 *Sending of the Address complete message (ACM)*.

### 3.2.1.4 Sending of the Answer Message (ANM)

If the exchange detects the off-hook condition on the non-ISDN side, it shall send an answer message (ANM).

### 3.2.1.5 Receipt of the Release Message (REL)

Upon receiving the release message (REL) in the exchange, it may be mapped into an appropriate forward signal, e.g. Clear-forward signal, on the non-ISDN side.

### 3.2.1.6 Sending of the Suspend Message (SUS) Network Initiated

The action taken on the ISUP side upon receipt of the on-hook condition are described in 2.5 of chapter 4 of ATIS-1000113.

### **3.2.1.7 Sending of the Resume Message (RES) Network Initiated**

The action taken on the ISUP side upon receipt of the off-hook condition are described in 2.5 of chapter 4 of ATIS-1000113.

### **3.2.1.8 Release by the Exchange**

When a call to a non-ISDN destination is released by the serving exchange, the following shall apply:

**Table 35 - Release from the destination exchange**

<b>Message sent to the ISUP</b> →	<b>Trigger event</b>
REL cause value No. 97 message type non-existent or not implemented or cause value No. 99 message type non-existent or non implemented - discarded	Call release due to the ISUP compatibility procedure
REL cause value coded according to ATIS-1000113, chapter 3	other cases of failure on the ISUP side
REL cause value coded according to ATIS-1000113, chapter 3	other cases of failure on the non-ISDN side (Note)

NOTE - The destination exchange has determined line conditions, e.g. subscriber busy, during call setup.

### 3.2.2 Other Call Types

For further study.

# Annex A: Interworking scenarios between subscriber access types and SS7 ISDN-User Part

(Informative)

## Methodology

### A.1 General

This annex describes the methodology used to model and define interworking between the ISDN user part and the user-network interface protocol. The methodology is based on the layer service concepts prescribed by the Reference Model of Open Systems Interconnection (OSI) for ITU-T Applications (Recommendation X.200) and uses the terms and conventions defined in Recommendation X.210 (OSI Layer Service Definition Conventions).

The methodology used is for description purposes only. It does not imply that this type of layering is essential in a real implementation.

The interworking model is described in A.2. Subsequent clauses identify and review the diagrams and tables used in describing the model, its functions, and the signalling information transfers between the call control functional entities.

### A.2 Interworking Model

The interworking model encompasses three functional entities, including call control, the incoming signalling system, and the outgoing signalling system, where incoming or outgoing refers to the direction of call set-up. The signalling system entities may represent either the ISDN User Part or the User-Network Interface Protocol.

The call control entity acts as an intermediary between the DSS1 access and network signalling protocols. It typically invokes local call processing decisions/actions as a result of receiving a primitive from one signalling system (e.g., incoming access). As a result of that processing, it may send a primitive to the same signalling system or another signalling system (e.g., outgoing network). Local call processing decisions/actions (e.g., routing and through-connection) are independent of the type of signalling system used by call control entities to communicate with each other.

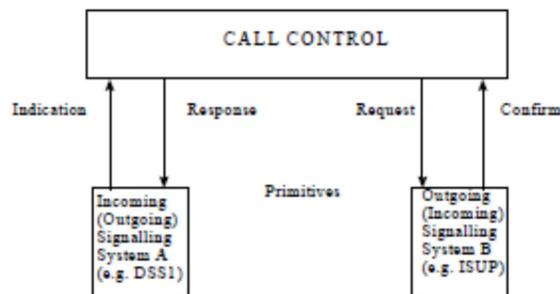


Figure A. 1 - Model for Signalling Protocol Interworking

There are four types of primitives:

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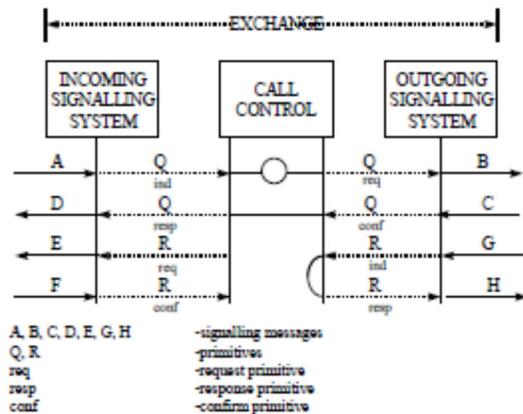
- 1) Request. A primitive issued by a call control entity to invoke a signalling procedure and thereby transfer information to a peer entity.
- 2) Indication. A primitive issued by the signalling protocol to invoke a call control procedure or indicate that the procedure has been invoked by the peer call control entity.
- 3) Response. A primitive issued by call control (if required) to indicate completion of a procedure previously invoked by an indication.
- 4) Confirm. A primitive issued by the signalling protocol to call control (if required) to indicate completion of a procedure previously invoked by a request from the same call control entity.

The descriptions of the incoming and outgoing signalling system functional entities are not part of this specification but are provided in ATIS-1000607 for the user-network interface protocol and in ATIS-1000113 for the ISDN user part.

**A.3 Time Sequence Diagrams**

Time sequence or "arrow" diagrams are provided to show the permitted temporal relationships between two primitives or between primitives and signalling messages, and the time sequence of these relationships during the process of executing a call control procedure. The general format of an arrow diagram is shown in Figure 2.

Due to the multiplicity of optional possibilities in both the ISDN user part and the ISDN user-network interface protocols, not all possible cases are shown in the arrow diagrams. The diagrams that are included represent a sample of typical situations.



**Figure A. 2 - Example of a Time Sequence or Arrow Diagram**

Sequences of interactions are shown along vertical lines, which represent increasing time in the downward direction.

Broken line arrows represent individual primitives and indicate their direction of propagation, i.e., to or from call control.

Solid line arrows represent signalling messages and indicate their direction of propagation, i.e., to or from the incoming or outgoing signalling system.

Wavy line arrows (~>), if present, represent tones or announcements sent inband.

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For call control the following symbols are used between vertical lines to indicate the relationship between the incoming and outgoing primitives (e.g., between Q indication and Q request in Figure 2/ATIS-1000609) and possibly a call control action taken, where it is necessary to indicate clearly a particular function that is invoked by a received primitive.

Solid Line (  $\rightarrow$  ). The incoming and outgoing primitives are unconditionally related, i.e., the incoming primitive always triggers the sending of the outgoing primitive independent of the service context in which the incoming primitive is received.

Broken Line (  $\dots$  ). The incoming and outgoing primitives are related only in the service context considered. In a different service context this relationship may not exist.

Squiggly Line (  $\sim$  ). The reception of the incoming primitive and the transmission of the outgoing primitive are unrelated. This is to indicate that although these primitives are shown as adjacent in the arrow diagram, the generation of the outgoing primitive is unrelated to the receipt of the incoming primitive.

-  Tone generation
-  Through connection of the path in the backward direction
-  Through connection of the path in the forward direction
-  Through connection of the path in both directions
-  Disconnection of the path through the exchange
-  Reservation of the incoming/outgoing circuit channel without through connection
-  Disassociation of incoming and outgoing signalling systems

Where it is necessary to indicate the signalling system function performed on transmission or reception of a signalling message, the following symbols are shown below the concerned message:

X Release of the channel

 Disconnection of channel from the user terminal

 Release of the call reference (ISUP or DSS1 call reference)

## A.4 Interworking Specification for Successful Set-Up Procedures

### A.4.1 Arrow Diagrams

This clause contains the interworking arrow diagrams for successful call set-up procedures.

### **A.4.2 En-Bloc, No Automatic-Answering Terminal**

Figure A.3 shows the sequence of messages for successful call set-up where en-bloc address signaling is used, the address complete message (ACM) is delayed until receipt of an alerting indication from the access, and the called party is not an automatic answering terminal.

### **A.4.3 En-Bloc, Automatic-Answering Terminal**

Figure A.4 shows a successful call setup with enbloc address signalling and the address complete indication delayed until receipt of connect indication from an automatic answering terminal. In this case, the address complete indication and connect indication are combined in the answer message (ANM) in the network.

### **A.4.4 Overlap Addressing, Originating Access**

Figure A.5 shows the sequence of messages when overlap addressing is used between the calling party and the originating local exchange, and en-bloc addressing is used within the network. A non-automatic answering terminal is assumed in this case. Variations are possible as in Figure A.5.

### **A.4.5 ISDN to Analog Subscriber**

Figure A.6 shows the sequence of messages for a call from an ISDN subscriber to an analog subscriber. The arrows between the local exchange and non-ISDN user indicate signals generated by analog subscriber signalling systems.

### **A.4.6 Analog Subscriber to ISDN**

Figure A.7 shows the sequence of messages for a call from an analog subscriber to an ISDN subscriber. Again the arrows between non-ISDN user and local exchange indicate signals generated by analog subscriber signalling systems. Procedures for ACM and ANM may vary as in Figure A.7.

### **A.4.7 ISDN-PSTN Interworking**

Figure A.8 shows the interworking between ISDN and PSTN (Public Switched Telephone Network), in the case where the PSTN does not provide out-of-band address complete indication. More detailed interworking between ISDN and PSTN is given in the ITU-T Q.600 Recommendations.

### **A.4.8 PSTN-ISDN Interworking**

Figure A.9 shows interworking in a call originating in the PSTN, where the PSTN does not provide out-of-band address complete indications.

### **A.4.9 PROGRESS Message**

Figure A.10 shows the case in which a PROGRESS message is used in the user network interface protocol to indicate interworking beyond the public network. In order to support the return of tones and announcements from the called user, the terminating exchange may provide through-connect in the backward direction on receipt of the PROGRESS message as a service.

Notes for Figures A.3 to A.10

The following note applies to all interworking diagrams in this section:

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- If continuity check occurs in the network, the setup request primitive in the terminating local exchange is not passed to the called user until continuity is verified.

The remaining notes apply where referenced in particular figures:

Note 1: This message may be sent by the user to achieve symmetrical working or to avoid timer expiry on response to SETUP.

Note 2: This message may be sent by the protocol handler described in ATIS-1000607 to achieve symmetrical working (see 5.1.8 of ATIS-1000607).

Note 3: Called party's status indicator of subscriber free; Interworking indicator of no interworking encountered; and an ISDN Access indicator of ISDN Access.

Note 4: The number of INFORMATION messages and primitives shown is for example only. In practice, the number may be zero or more; more detail is contained in 5.1.5.2 of ATIS-1000607.

Note 5: Called party's status indicator of subscriber free; ISDN User Part indicator of ISDN User Part used all the way; Interworking indicator of no interworking encountered; and an ISDN Access indicator of non- ISDN Access.

Note 6: Progress Indicator value No. 2 - destination address is non-ISDN.

Note 7: ISDN User Part indicator of ISDN User Part used all the way; ISDN Access indicator of non-ISDN Access.

Note 8: Conditional on type of access.

Note 9: Progress indicator value No. 1 - call is not end-to-end ISDN.

Note 10: Completion of transmission path timing is described in 2.1.7 of ATIS-1000113.

Note 11: Called party's status indicator of no indication; ISDN UP indicator of ISUP not used all the way; Interworking indicator of interworking encountered; and an ISDN Access indicator of terminating access non-ISDN.

Note 12: ISDN Access indicator of non-ISDN; and an ISDN UP indicator of not ISUP-all-the-way.

Note 13: Called party's status indicator of no indication; Interworking indicator of no interworking encountered; and an ISDN Access indicator of ISDN Access; Access Transport parameter contains Progress indicator.

Note 14: Through connection performed upon receipt of PROGRESS message only if allowed by special arrangement (e.g., subscription). Otherwise through connection is on acceptance of CONNECT message.

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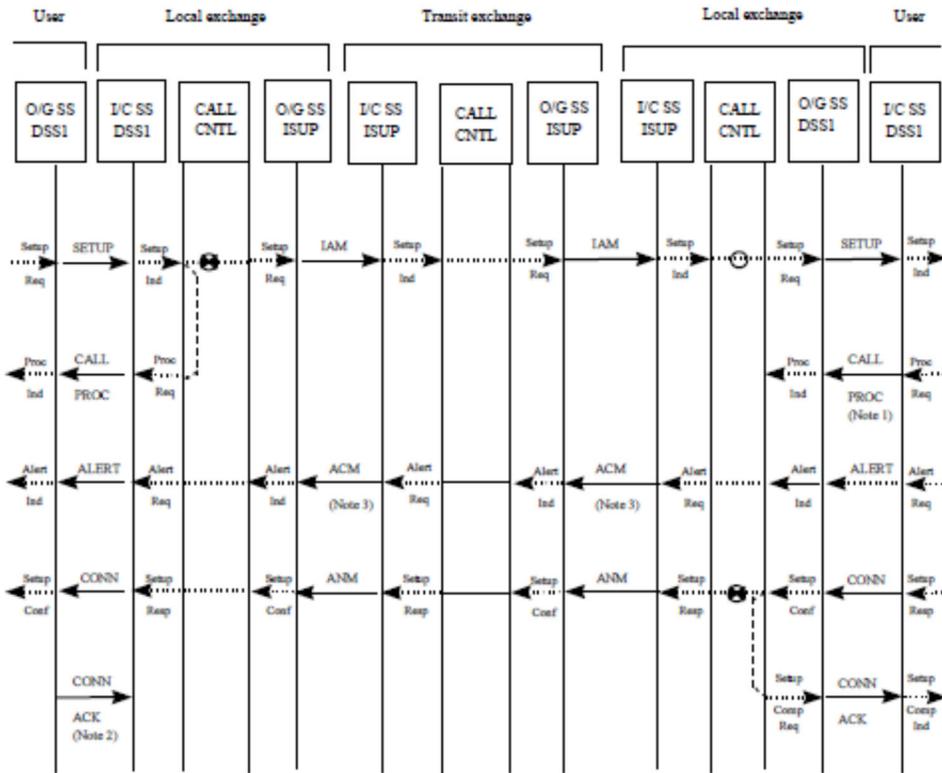


Figure A. 3 - En-Bloc Addressing, Non-Automatic-Answering Terminal

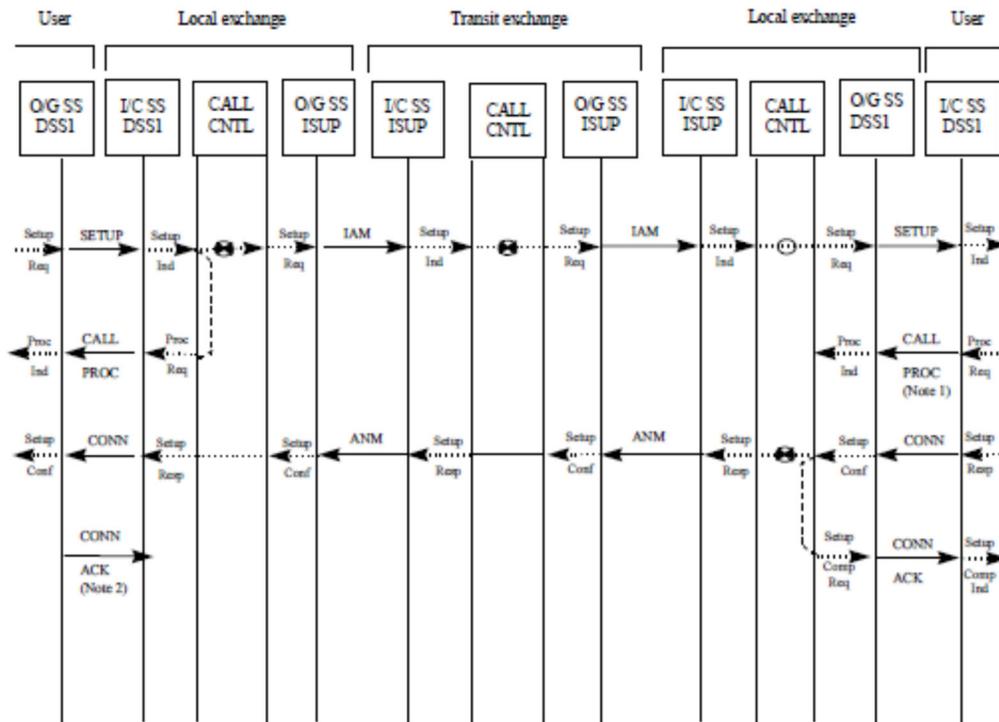


Figure A. 4 - En-bloc Addressing, Automatic-Answering Terminal

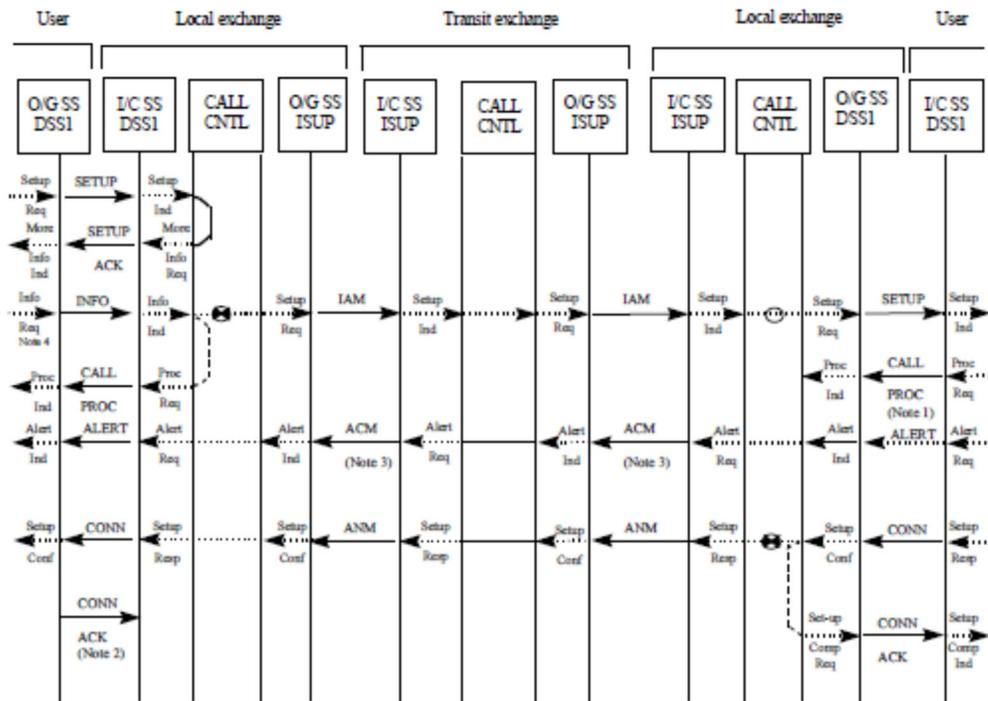


Figure A. 5 - Overlap Addressing, Originating Access Only, Non-Automatic Answering Terminal

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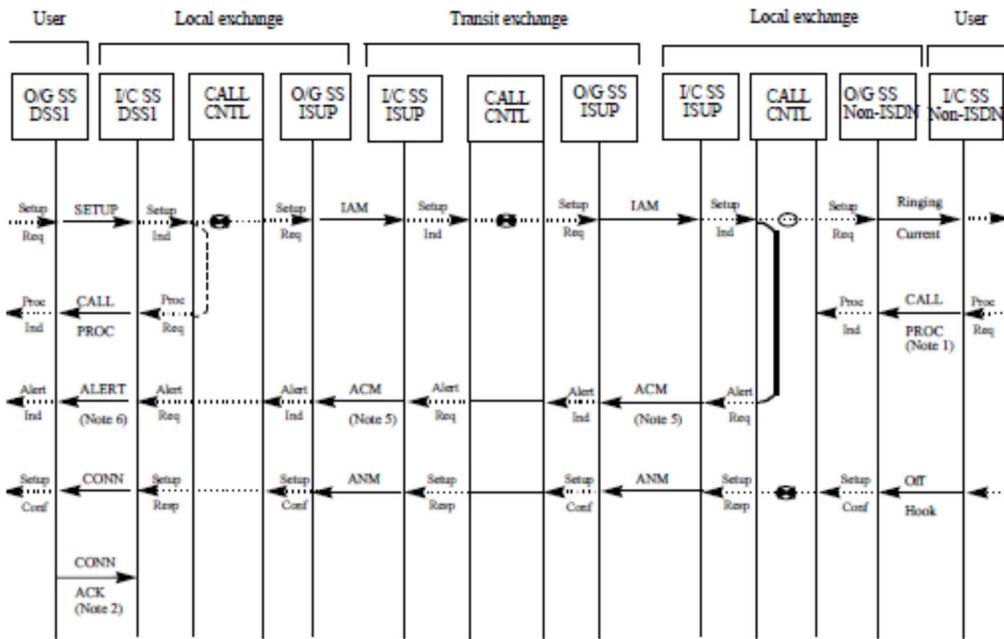


Figure A. 6 - ISDN to Analog Subscriber

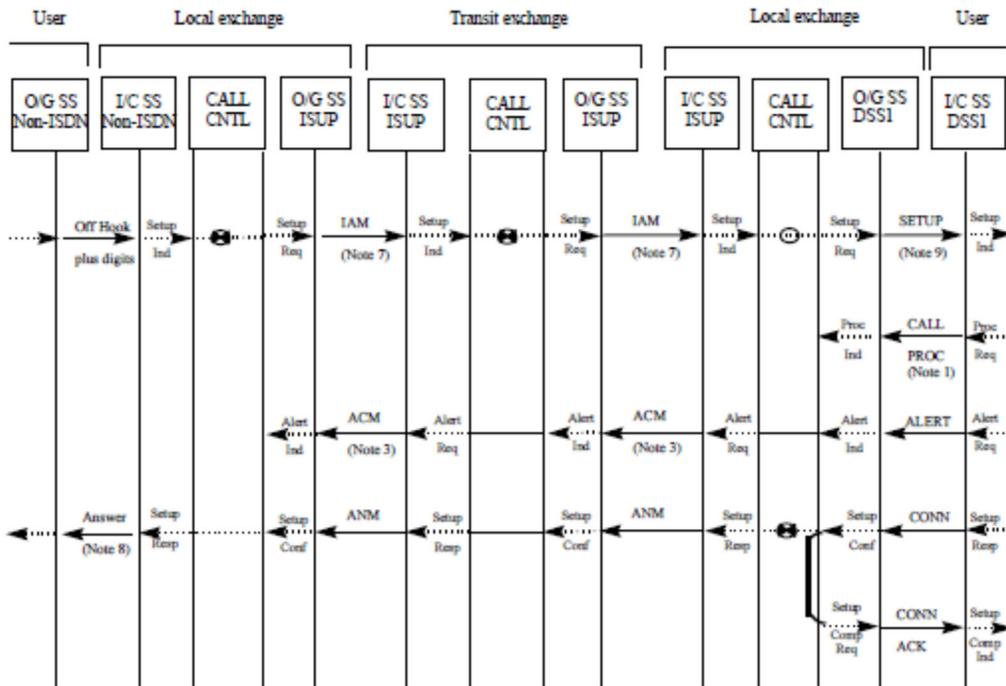


Figure A. 7 - Analog Subscriber to ISDN

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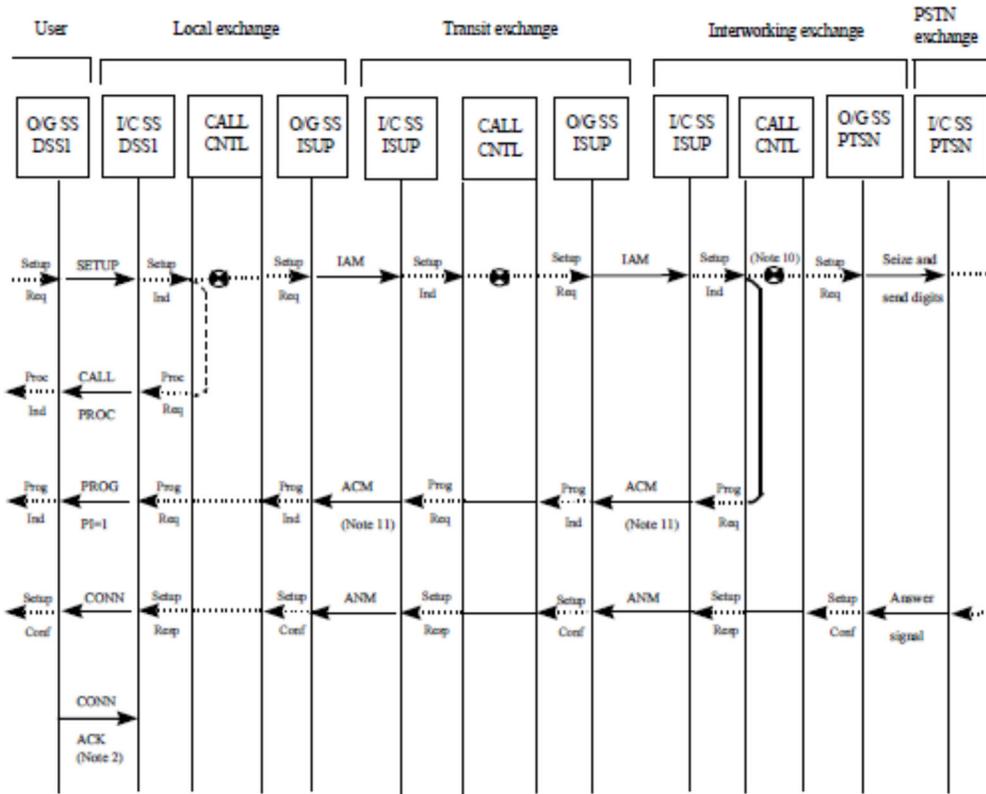


Figure A. 8 - ISDN-PSTN Interworking

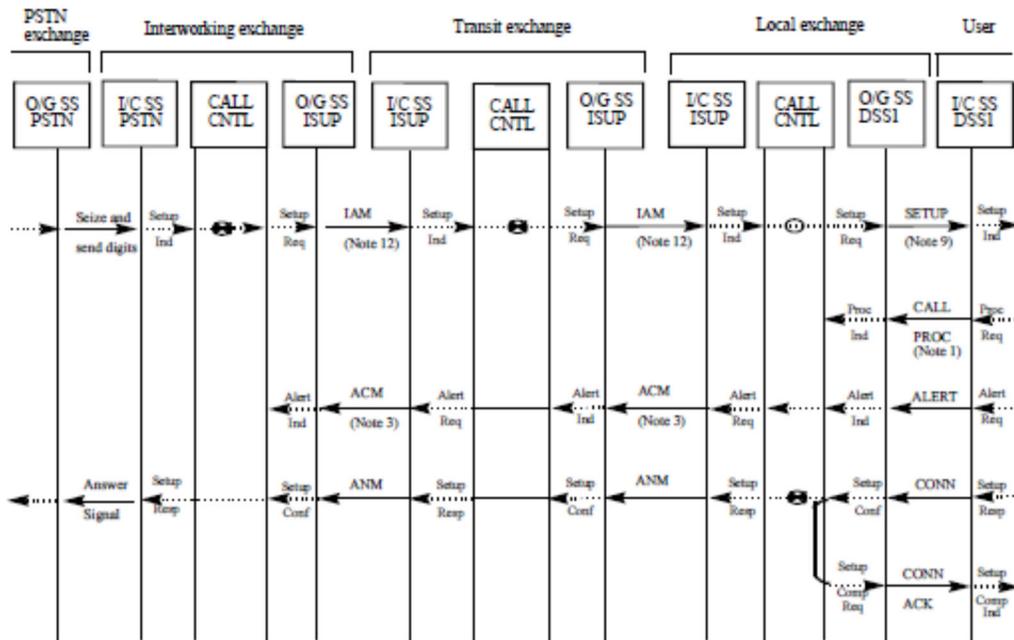


Figure A. 9 - PSTN-ISDN Interworking

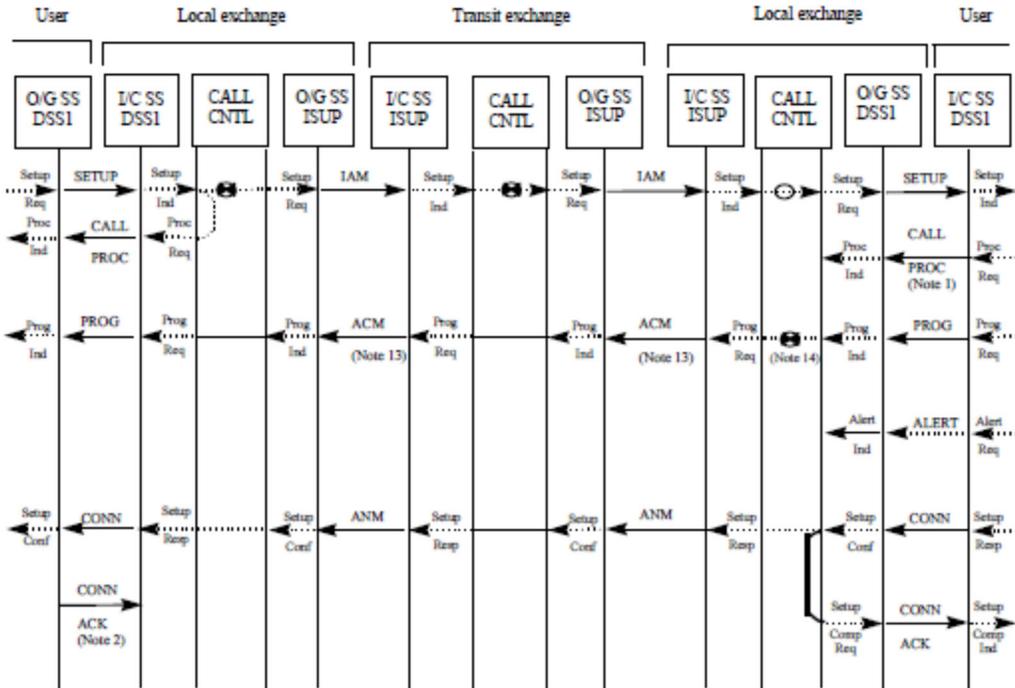


Figure A. 10 - PROGRESS Message Returned from Access

## A.5 Interworking Specification for Call Release Procedures

### A.5.1 Arrow Diagrams.

This clause contains the arrow diagrams for the interworking of call release procedures. DSS1 access release procedures are described in 5.3 of ATIS-1000607. SS7 Release procedures are described in 2.3 of ATIS-1000113.

#### A.5.1.1 End-to-end ISDN scenario

Figure A.1 shows the normal call release procedure when DSS1 signaling is available from end-to-end of the call.

In the local exchange of the user who initiated the release procedure, the user's DSS1 DISCONNECT message is mapped into an ISUP release message (using the disconnect indicator and release request interworking primitives). This procedure is mirrored in the other local exchange.

#### A.5.1.2 PSTN-to-ISDN Interworking Scenario

The following normal release procedures are illustrated for calls that originate in a non-ISDN public switched telephone network (PSTN) and terminate to a DSS1 interface. DSS1 signaling is not available from end-to-end of the call.

Case 1: Clear Backward. Figure A.11, Case 1 shows the normal call release procedure being initiated at the terminating (DSS1) user by means of the DISCONNECT message. At the PSTN-ISDN interworking exchange, the ISUP release message is mapped into the appropriate backward signal in the PSTN.

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Case 2: Clear Forward. Figure A.12, Case 2 shows the normal call release procedure being initiated at the originating (PSTN) user by means of the Clear Forward signal. At the PSTN-ISDN interworking exchange, the clear forward signal is mapped into an ISUP release message to the ISDN exchange, which sends a DSS1 DISCONNECT message to the ISDN user.

### **A.5.1.3 ISDN-to-PSTN Interworking Scenario**

The following normal release procedures are illustrated for calls that originate at a DSS1 and terminate in a PSTN. ISDN signalling is not available from end-to-end of the call.

Case 1: Clear Forward. Figure A.13, Case 1 shows the normal call release procedure being initiated at the originating (DSS1) user by means of the DISCONNECT message. At the ISDN-PSTN interworking exchange, the ISUP release message is mapped into the appropriate forward signal in PSTN.

Case 2: Clear Backward. Figure A.13, Case 2 shows the normal call release procedure being initiated at the terminating (PSTN) user by means of a clear back signal. At the ISDN-PSTN interworking exchange, the clear back signal is mapped into the ISUP suspend message with the suspend/resume indicator set to network initiated.

The controlling ISDN exchange starts Timer T13 (see 2.5.1.3 of ATIS-1000607). Upon expiry of the timer, if the controlling exchange has not received an ISUP resume message, the controlling exchange initiates Clearing by sending a DISCONNECT message to the DSS1 user and sending an ISUP release message to the preceding exchange.

Note for Figures A.11 to A.13

Note 1: This message is sent by the signalling system described in ATIS-1000607 on receipt of the DSS1 RELEASE message.



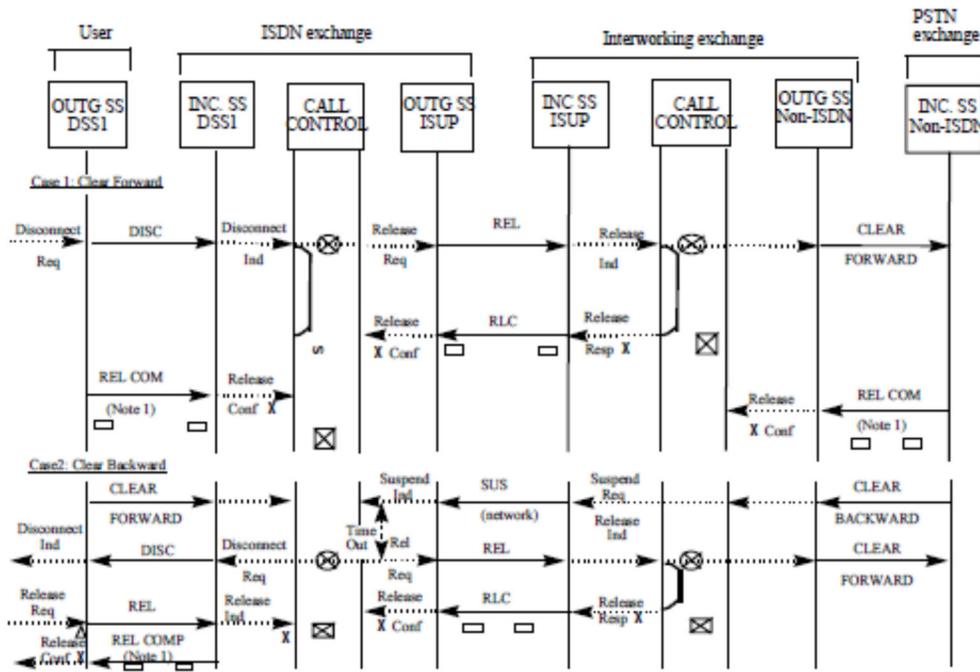


Figure A. 13 - Normal Call Release Procedure, ISDN-to-PSTN Interworking

## A.6 Interworking Specification for Unsuccessful Call Set-Up Procedures

### A.6.1 Arrow Diagrams

This clause contains arrow diagrams for unsuccessful call set-up procedures. The conventions applicable to arrow diagrams in this clause are given in A.3.

#### A.6.1.1 Unsuccessful Call Set-Up - Point-to-Point Data Link

Figure A.14 shows the unsuccessful call setup procedure in which in-band tones/announcements are not provided (for example, 64 kbit/s unrestricted bearer service). The DSS1 RELEASE COMPLETE message at the destination exchange is mapped into the ISUP release message via the reject indication and release request primitives. At the originating exchange, the ISUP release message is mapped via the release indicator and disconnect request primitives into the DSS1 DISCONNECT message.

#### A.6.1.2 Unsuccessful Call Set-Up - Broadcast Data Link

Figure A.15 shows the unsuccessful call setup procedure in which in-band tones/announcements are not provided (for example, 64 kbit/s unrestricted bearer service), in the case where the called party is addressed via a broadcast data link. The returning of the RELEASE COMPLETE message via a Broadcast Data Link is optional. In the case shown, the cause value is retained at the destination exchange on receipt of the RELEASE COMPLETE message, and the reject indication primitive is not generated until the expiry of Timer T303 (see Table 6 in ATIS-1000607) in order to allow for the possibility of another terminal accepting the call.

NOTE - Where the network does not receive any response to the initial SETUP message before the expiry of Timer T303, the SETUP message is retransmitted and T303 is restarted. If no further response is received by

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the network on the second expiry of Timer T303, the reject indication primitive is generated. The ISUP release message is then mapped from the reject indicator and release request primitives. At the originating exchange, the ISUP release message is mapped via the RELEASE indicator and disconnect request primitives into the DSS1 DISCONNECT message.

### **A.6.1.3 Unsuccessful Call Set-Up - Tone/Announcement Applied at Originating Exchange**

Figure A.16 shows the unsuccessful setup procedure in which tones or announcements are generated in the originating exchange towards the DSS1 user as a result of receiving an ISUP release message. The cause field in the release message determines the tone or announcement to be applied. This could be, for example, a busy indication, network congestion, or number unallocated.

The figure shows the case in which the originating ISDN user releases prior to the tone/announcement expiring. If the tone/announcement is completed prior to the originating ISDN user releasing, then the network initiates release using the DSS1 DISCONNECT message.

### **A.6.1.4 Unsuccessful Call Set-Up - Tone/Announcements Applied by Terminating Exchange**

Figure A.17 shows an unsuccessful call in which certain tones and announcements can only be generated in the terminating exchange (or transit exchange) during call establishment. This is a typical case, for example, for a changed number announcement where the changed number information is only available at the terminating local exchange. Alternatively, a specific announcement may be applied at a transit exchange to indicate, for example, that all circuits to a particular destination are busy.

The originating exchange sends a PROGRESS message to the calling user with Progress Indicator #1, thus indicating that inband information is available. Normal release procedures apply after the inband information has been connected.

### **A.6.1.5 ISDN-PSTN Interworking - Tone Applied by Terminating Exchange within the PSTN**

Figure A.18 shows an unsuccessful call in which the sending of tones and announcements is generated by the PSTN exchange during the call set-up phase. In this case, an address complete message is returned from the interworking point with indicators set as shown in Note 5. This is mapped to a PROGRESS message at the originating local exchange, with the progress indicator set to value No. 1, to indicate that inband information is expected. The sequence applies to failure occurring at any point within the PSTN.

### **A.6.1.6 Premature Release - Point-to-Point Data Link**

Figure A.19 shows a premature release situation in which an ISUP release message is received at the terminating local exchange prior to any terminal response. In this situation, a DISCONNECT message is sent to the called user and the normal clearing procedure is initiated.

*Notes relating to Figures A.14 through A.19*

Note 1: This procedure is applicable in those cases where in-band tones/announcements are not provided, for example, 64 kbit/s unrestricted bearer service.

Note 2: This message is delivered by a point-to-point data link.

Note 3: This message is sent by a broadcast data link.

Note 4: Customized announcement can only be provided by this exchange.

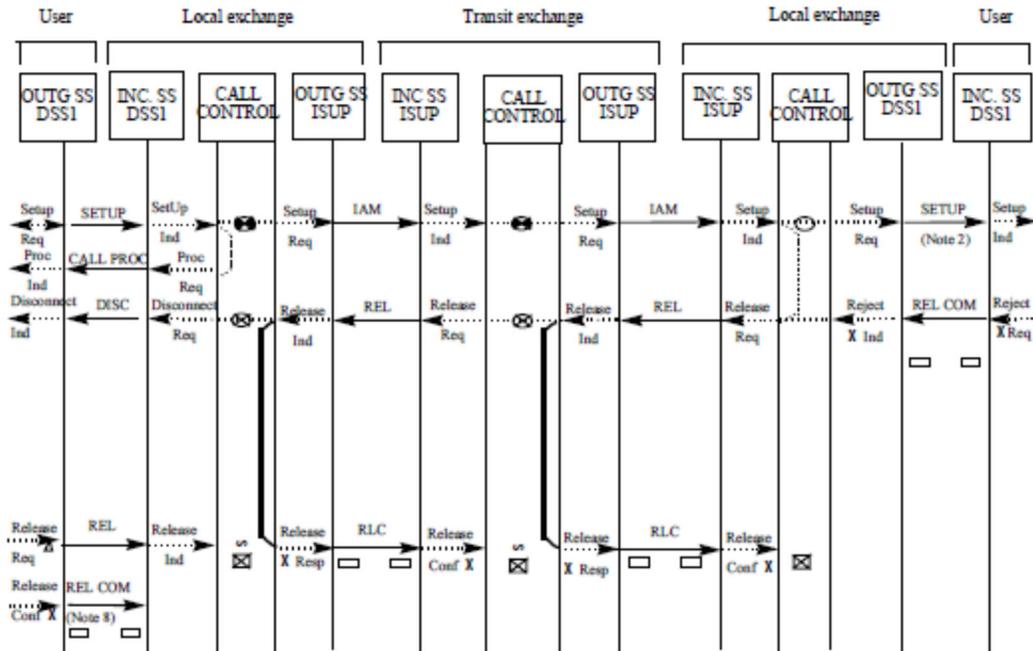
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Note 5: Called party's status indicator of no indication; ISDN UP indicator of ISUP not used all the way; Interworking indicator of interworking encountered; and an ISDN Access indicator of terminating access non-ISDN.

Note 6: See 2.1.7 in ATIS-1000113 for through-connect timing.

Note 7: In the case of point-to-multi-point, the DISCONNECT message is not sent. Terminals are re-leased as they respond.

Note 8: This message is sent by the signalling system described in ATIS-1000607 on receipt of the DSS1 RELEASE message.



**Figure A. 14 - Unsuccessful Call Set-Up, Point-to-Point Data Link (Note 1)**

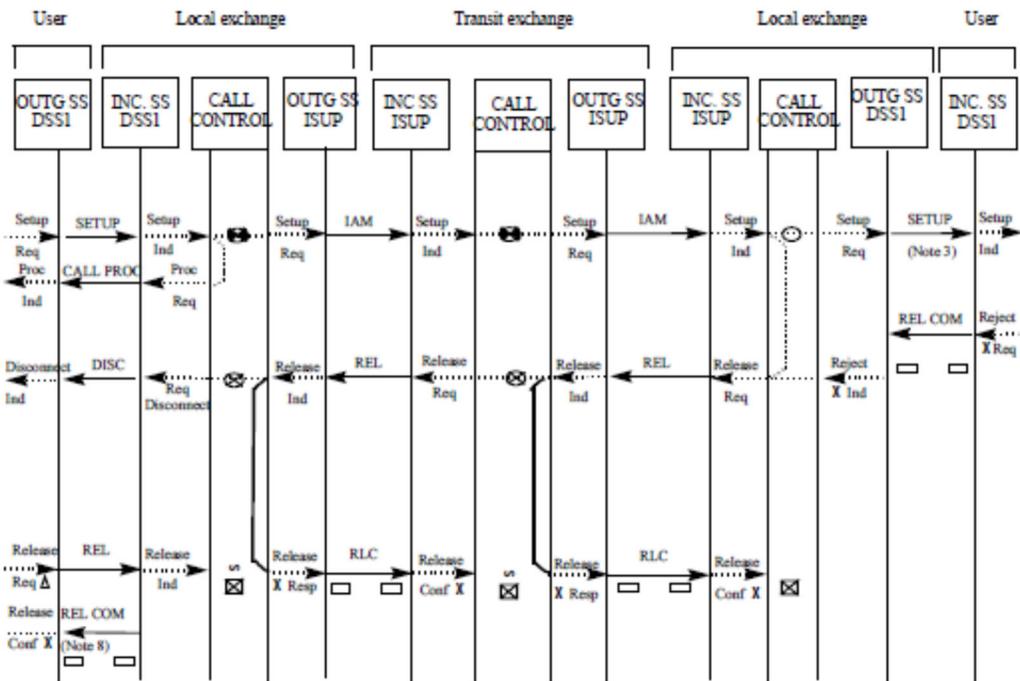


Figure A. 15 - Unsuccessful Call Set-Up, Broadband Data Link (Note 1)

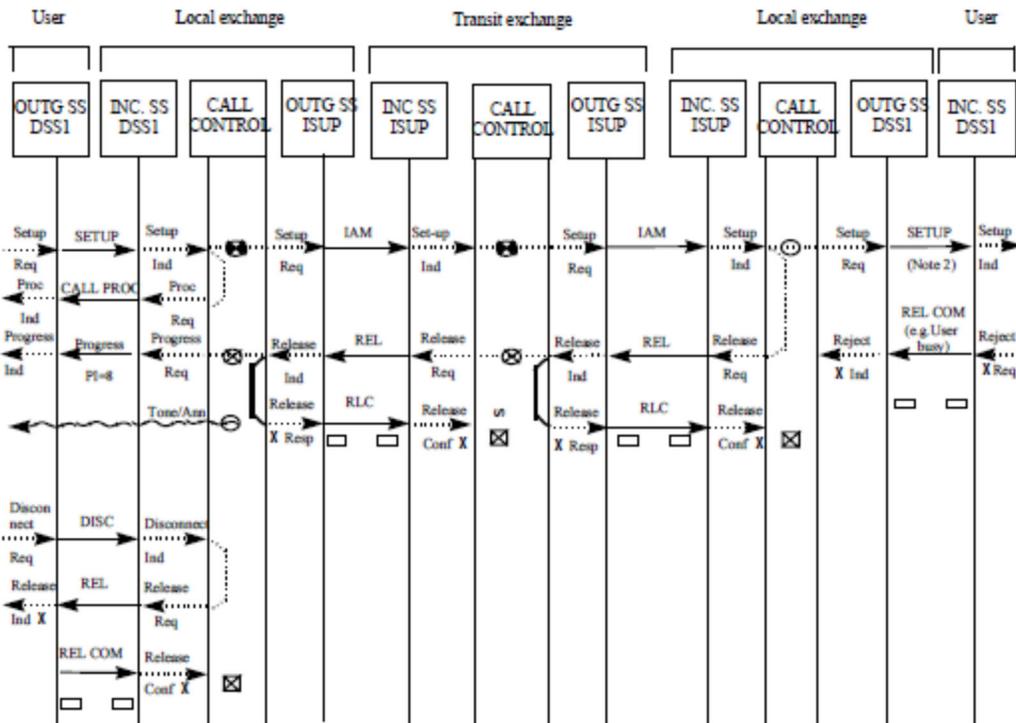


Figure A. 16 - Unsuccessful Call Set-Up, Tone/Announcement Applied at the Originating Exchange



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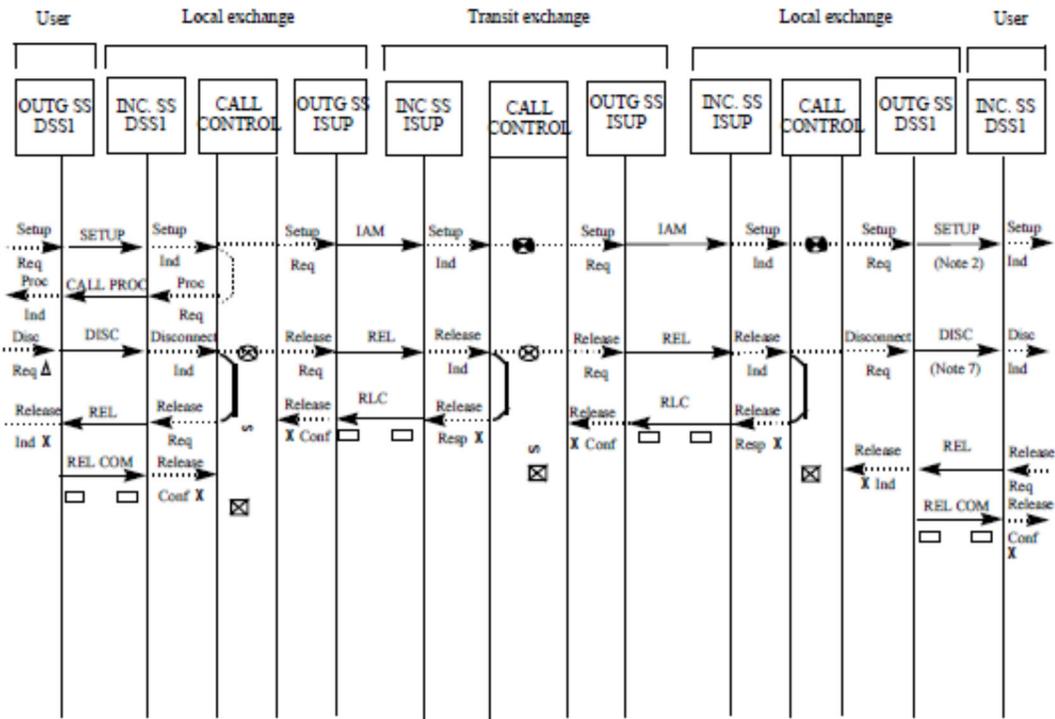


Figure A. 19 - Premature Release

## Annex B: Mapping of Parameter Fields

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(Informative)

### ***B.1 Mapping of parameter fields***

This annex contains sample scenarios for the mapping of parameter sub-fields and values for the progress indicator of DSS1 and the associated fields in ISDN-User Part.

The following notes apply to all mapping tables in this annex:

1. The mapping of the backward call indicator in the answer message only applies when this indicator is included in the answer message.
2. For simplicity, these diagrams assume the case where the Address complete message (ACM) is not sent out independently, and the called party is not an automatic-answering terminal. Other configurations are possible as shown in the arrow diagrams of Annex A, but will not affect the parameter mapping rules.
3. In these sample scenarios, if the PROGRESS message is returned by the called user in place of an ALERTING message, it is mapped to an ACM with the called party's status set to "no indication" rather than to "subscriber free". Other indicator values are unchanged, and the Progress indicator information element is mapped to the Access transport parameter (ATP). At the calling access, the ACM with status of "no indication" and information in the ATP is mapped to a PROGRESS message.
4. The progress indicator is not necessarily repeated in the CONNECT message if it has already appeared in the ALERTING message.

The following sample scenarios are described:

Table B.1 - Scenario 1: Parameter Fields Mapping for DSS1-ISUP-DSS1

Table B.2 - Scenario 2: Parameter Fields Mapping for DSS1-ISUP-PSTN

Table B.3 - Scenario 3: Parameter Fields Mapping for PSTN-ISUP-DSS1

Table B.4 - Scenario 4: Parameter Fields Mapping for DSS1-ISUP-Analog User

Table B.5 - Scenario 5: Parameter Fields Mapping for Analog User-ISUP-DSS1

Table B.6 - Scenario 6: Parameter Fields Mapping for DSS1-ISUP-DSS1-Analog User

Table B.7 - Scenario 7: Parameter Fields Mapping for Analog User-DSS1-ISUP-DSS1

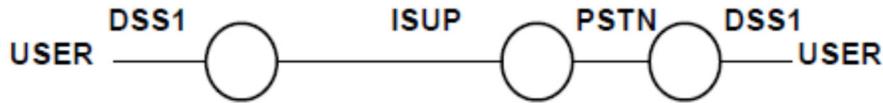
Table B.8 - Scenario 8: Parameter Fields Mapping for DSS1-ISUP-DSS1-Analog Network

Table B. 1 - Scenario 1: Parameter Fields Mapping for DSS1-ISUP-DSS1



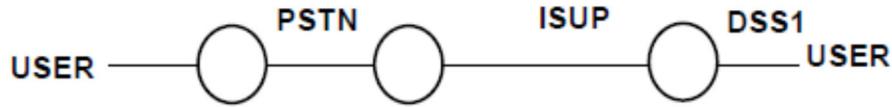
	Calling User/Network	Network	Called User/Network
Message	SETUP	IAM	SETUP
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.
Message	ALERTING	ACM	ALERTING
Content	no Progress ind.	Backward call ind. Bits DC = 01, subscriber free I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	CONNECT	ANM	CONNECT
Content	no Progress ind.	Access transport	no Progress ind.
	Connected number	-Connected number	Connected number
	Connected subaddress	-Connected subaddress	Connected subaddress

Table B. 2 - Scenario 2: Parameter Fields Mapping for DSS1-ISUP-PSTN



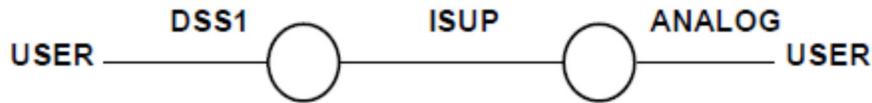
	Calling User/Network	Network	non-ISDN PSTN	Called User/Network
Message	SETUP	IAM	trunk seizure/ digits out-pulsed	alerting
Content	no progress indicator	Forward call indicators Bit D = 0, no interworking encountered  F = 1, ISUP used all the way I = 1, originating access ISDN		
Message	ALERTING	ACM		audible tone
Content	Progress indicator No. 1 <i>call is not end-to-end ISDN</i>	Backward Call indicators Bits DC = 00, no indication I = 1, interworking encountered K = 0, ISUP not used all the way M = 0, terminating access non-ISDN		
Message	CONNECT	ANM	answer	answer
Content	no progress indicator			

Table B. 3 - Scenario 3: Parameter Fields Mapping for PSTN-ISUP-DSS1



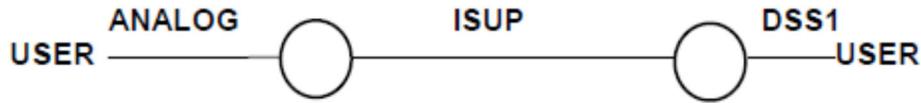
	Calling User/ Network	non-ISDN PSTN	Network	Called User/Network
Message	off-hook/ dialing	trunk seizure/ outpulsing	IAM	SETUP
Content	digits	digits	Info. transfer capability = 3.1kHz audio Forward call ind. Bit D = 1, interworking encountered F = 0, ISUP not used all the way I = 0, originating access non-ISDN	Progress indicator No. 1, call is not end-to-end ISDN
Message	cut-through voice path	audible tone	ACM	ALERTING
Content			Backward call ind. Bits DC = 01, subscriber free I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	N/A	answer	ANM	CONNECT
Content				no Progress ind.

Table B. 4 - Scenario 4: Parameter Fields Mapping for DSS1-ISUP-Analog User



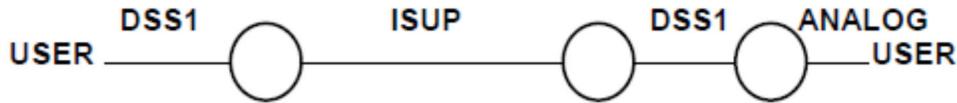
	Calling User/Network	Network	Called User/Network
Message	SETUP	IAM	alerting
Content	no progress indicator	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	
Message	ALERTING	ACM	audible tone to caller
Content	Progress indicator No.2, destination address is non-ISDN	Backward call ind. Bits DC = 01, subscriber free I = 0, no interworking encountered K = 1, ISUP used all the way M = 0, terminating access non-ISDN	
Message	CONNECT	ANM	off-hook
Content	no progress indicator		

Table B. 5 - Scenario 5: Parameter Fields Mapping for Analog User-ISUP-DSS1



	Calling User/Network	Network	Called User/Network
Message	off-hook	IAM	SETUP
Content		Info. transfer capability = 3.1kHz audio Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 0, originating access non-ISDN	Progress indicator No. 3, originating address is non-ISDN
Message	out-through path	ACM	ALERTING
Content		Backward call ind. Bits DC = 01, subscriber free I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	NA	ANM	CONNECT
Content			no Progress ind.

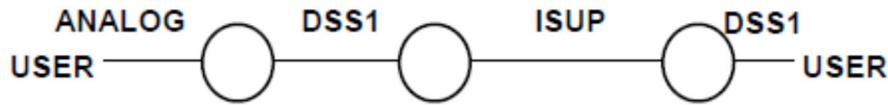
Table B. 6 - Scenario 6: Parameter Fields Mapping for DSS1-ISUP-DSS1-Analog User



	Calling User/Network	Network	Called User/Network	Called User/Network
Message	SETUP	IAM	SETUP	alerting
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.	
Message	ALERTING	ACM	ALERTING	audible tone
Content	Progress indicator No.2, destination address is non-ISDN, received in ATP	Backward call ind. Bits DC = 01, subscriber free I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN ATP carries Progress indicator	Progress indicator No.2, destination address is non-ISDN, location = private network	
Message	CONNECT	ANM	CONNECT	off-hook
Content			no Progress ind.	

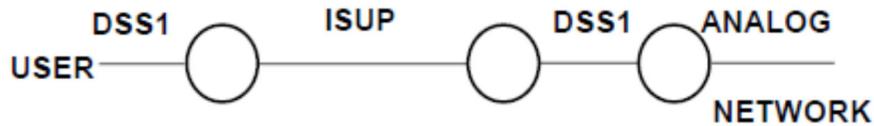
NOTE - The Progress indicator is not necessarily repeated in the CONNECT message if it has already appeared in the ALERTING message.

Table B. 7 - Scenario 7: Parameter Fields Mapping for Analog User-DSS1-ISUP-DSS1



	Calling User	Calling Network	Network	Called User/Network
Message	off-hook	SETUP	IAM	SETUP
Content		Progress indicator No. 3, originating address is non-ISDN, location = private network	Info. transfer capability = 3.1kHz audio Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN Access transport carries Progress ind.	Progress indicator No. 3, as received in the Access Transport parameter
Message	audible tone	ALERTING	ACM	ALERTING
Content		no Progress ind.	Backward call ind. Bits DC = 01, subscriber free I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN	no Progress ind.
Message	N/A	CONNECT	ANM	CONNECT
Content		no Progress ind.		no Progress ind.

Table B. 8 - Scenario 8: Parameter Fields Mapping for DSS1-ISUP-DSS1-Analog Network



	Calling User/Network	Network	Network	Called Network
Message	SETUP	IAM	SETUP	alerting
Content	no Progress ind.	Forward call ind. Bit D = 0, no interworking encountered F = 1, ISUP used all the way I = 1, originating access ISDN	no Progress ind.	
Message	ALERTING	ACM	PROGRESS	audible tone
Content	Progress indicator No.2, destination address is non-ISDN, received in ATP	Backward call ind. Bits DC = 00, no indication I = 0, no interworking encountered K = 1, ISUP used all the way M = 1, terminating access ISDN Access transport carries Progress indicator	Progress indicator No.2, destination address is non-ISDN, location = private network	
Message	CONNECT	ANM	CONNECT	off-hook
Content			no Progress ind.	

## Annex C: Bibliography

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(Informative)

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

ITU-T Recommendation X.200, Reference Model of Open Systems Interconnection for ITU-T Applications<sup>13</sup>

ITU-T Recommendation X.210, Open Systems Interconnection (OSI) Layer Service Definition Conventions<sup>13</sup>

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<sup>13</sup> This document is available from the International Telecommunications Union. < <http://www.itu.int/ITU-T/> >