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ETS 300 343

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Integrated Services Digital Network (ISDN);
Signalling interworking specification
for ISDN User Part (ISUP) version 1

ETSI

Contents

Foreword

This European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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1 Scope

This European Telecommunication Standard (ETS) specifies the interworking between the Signalling System No.7 Integrated Service Digital Network (ISDN) User Part (ISUP) version 1 (as specified in ETS 300 121 [1]) and the Signalling Systems No.5 (as specified in CCITT Recommendations Q.140 to Q.164 [4]), R2 (as specified in CCITT Recommendations Q.400 to Q.490 [5]), Telephone User Part (TUP) (as specified in CCITT Recommendations Q.721 to Q.724 [14]), and TUP+ (as specified in CEPT Recommendation T/S 43-02 E [15]).

This specification is applicable to international transit exchanges.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendments or revision. For undated references the latest edition of the publication referred to applies.

[1]   ETS 300 121 (1992): "Integrated Services Digital Network (ISDN); Application of the ISDN User Part (ISUP) of CCITT Signalling System No.7 for international ISDN interconnections (ISUP version 1)".

[2]   CCITT Recommendation Q.107 (1988): "Standard sending sequence of forward address information".

[3]   CCITT Recommendation Q.115 (1988): "Control of echo suppressors and echo cancellers by international switching centres".

[4]   CCITT Recommendations Q.140 to Q.164 (1988): "Specifications of Signalling System No.5".

[5]   CCITT Recommendations Q.400 to Q.490 (1988): "Specifications of Signalling System R2".

[6]   ITU-T Recommendation Q.617 (1993): "Logic procedures for incoming signalling system No.7 (ISUP)".

[7]   ITU-T Recommendation Q.627 (1993): "Logic procedures for outgoing signalling system No.7 (ISUP)".

[8]   ITU-T Recommendation Q.646 (1993): "Logic procedures for interworking of signalling system No.5 to No.7 (ISUP)".

[9]   ITU-T Recommendation Q.667 (1993): "Logic procedures for interworking of signalling system No.7 (TUP) to No.7 (ISUP)".

[10]   ITU-T Recommendation Q.686 (1993): "Logic procedures for interworking of signalling system R2 to No.7 (ISUP)".

[11]   ITU-T Recommendation Q.690 (1993): "Logic procedures for interworking of signalling system No.7 (ISUP) to No.5".

[12]   ITU-T Recommendation Q.692 (1993): "Logic procedures for interworking of signalling system No.7 (ISUP) to No.7 (TUP)".

[13]   ITU-T Recommendation Q.695 (1993): "Logic procedures for interworking of signalling system No.7 (ISUP) to R2".

[14]   CCITT Recommendations Q.721 to Q.724 (1988):   "Specifications   of   the
                        Signalling System No.7 Telephone User Part (TUP)".

[15]   CEPT Recommendation T/S 43-02 E (1988): "Signalling   System   Telephone
                        User Part "Plus" (TUP+)".

3   Abbreviations

For the purposes of this ETS, the following abbreviations apply:

ACB	ACcess Barred signal
ACM	Address Complete Message
ADC	ADdress complete, Charge
ADI	ADdress Incomplete signal
ADN	ADdress complete, No charge
ADX	ADdress complete, coin boX
AFC	Address complete, subscriber Free, Charge
AFN	Address complete, subscriber Free, No charge
AFX	Address complete, subscriber Free, coin boX
ANC	ANswer signal, Charge
ANM	ANswer Message
ANN	ANswer signal, No charge
BC	Bearer Capability
CCF	Continuity-Failure signal
CFL	Call FaiLure message
CGB	Circuit Group Blocking message
CGC	Circuit Group Congestion signal
CLB	CLear-Back signal
CLF	CLear-Forward signal
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	COnnected Line identification Presentation
COLR	COnnected Line identification Restriction
CON	CONnect message
CUG	Closed User Group
DPN	Digital Path Not provided signal
EUM	Extended Unsuccessful backward set-up Message indication
f1	frequency 1
f2	frequency 2
GRQ	General ReQuest message
GRS	circuit Group ReSet message
GSM	General forward Set-up information Message
HGB	Hardware failure oriented Group Blocking message
HLC	High Layer Compatibility
IAI	Initial Address message with additional Information
IAM	Initial Address Message
ISDN	Integrated Service Digital Network
ISUP	ISDN User Part
LLC	Low Layer Compatibility
LOS	Line Out of Service signal
NNC	National Network Congestion signal
NRU	Network Resource Unavailable signal
RSC	ReSet Circuit message
SDL	Specification and Description Language
SEC	Switching Equipment Congestion signal
SSB	SubScriber Busy signal
SST	Send Special information Tone signal
ST	end-of-pulsing Signal
SUS	SUSpend message
TMU	Transmission Medium Used

TMR	Transmission Medium Requirement
TUP	Telephone User Part
TUP+	Telephone User Part "Plus"
UNN	Unallocated National Number
USI	User Service Information
UUI	User-to-User Information
UUS	User-to-User Signalling
UUS1i	UUS service 1 implicit

4 General considerations

4.1 General

ITU-T Recommendations Q.617 [6], Q.627 [7], Q.646 [8], Q.667 [9], Q.686 [10], Q.690 [11], Q.692 [12] and Q.695 [13] provide interworking specifications for ISUP, using Specification and Description Language (SDL) diagrams.

However, for ISUP, some additional information which is relevant to interworking may be useful:

- the coding of the messages;

- considerations on supplementary services;

- supplementary information about the call failure handling;

- considerations on the sequencing of the received messages;

- handling of the access information.

This ETS shall be used as a complement to the ITU-T interworking SDL specifications ([6] to [13]) and not as an independent specification.

Only the information relevant for interworking is included. Hence, no information is given concerning the:

- national/international call indicator;

- end-to-end method indicator;

- end-to-end information indicator;

- signalling connection control part method indicator;

- continuity check indicator in interworking cases R2, No.5 to ISUP;

- continuity message in interworking cases R2, No.5 to ISUP;

- handling of the call, if only signalling systems having the capabilities of ISUP shall be used (e.g. the ISUP preference indicator received is set to "ISUP required").

4.2 Working assumptions

This ETS is based on the assumptions that:

- TUP does not support any supplementary service (e.g. calling line identification), but TUP supports the "digital connectivity";

- TUP only supporting the Initial Address Message (IAM) is described.

4.3   Miscellaneous interworking aspects

4.3.1   Interworking handling of the echo control device indicator (or the incoming half echo suppressor indicator) of the address complete message in ISUP (or TUP/TUP+)

In order to send more accurate information in the backward direction, the following interworking handling is proposed which can be used independently of the echo control procedures (described in ETS 300 121 [1], CCITT Recommendations Q.115 [3] and Q.724 [14], and CEPT Recommendation T/S 43-02 E [15]).

4.3.1.1   Interworking from ISUP to R2, No.5

a)   If bit E of the echo control device indicator received in the IAM is coded "0" (no outgoing half echo control device is included), then bit N of the echo control device indicator of the Address Complete Message (ACM) is coded "0".

>   IAM (E=0) --->
>   <--- ACM (N=0)

b)   If bit E of the echo control device indicator received in the IAM is coded "1" (an outgoing half echo control device is included):

    1)   if an incoming half echo control device is locally included or if it is known from the routeing data available in the exchange that an incoming half echo control device can be inserted beyond the interworking point, then bit N of the echo control device indicator of the ACM is coded "1";

    2)   if it is known from the routeing data available in the exchange that no incoming half echo control device can be included beyond the interworking point and no incoming half echo control device is locally available, then bit N of the echo control device indicator is coded "0".

4.3.1.2   Interworking from ISUP to TUP/TUP+/ISUP

a)   If bit E of the echo control device indicator received in the IAM is coded "0" (no outgoing half echo control device is included), bit N of the echo control device indicator in the ACM is coded as received in the address complete message (TUP, TUP+: bit D of the incoming half echo suppressor; ISUP: bit N of the echo control device indicator).

b)   If bit E of the echo control device indicator received in the IAM is coded "1" (an outgoing half echo control device is included):

    1)   if the incoming half echo control is locally included then bit N of the echo control device indicator of the ACM is coded "1";

    2)   if no incoming half echo control device is locally included, bit N of the echo control device indicator in the ACM is coded as received in the address complete message (TUP, TUP+: bit D of the incoming half echo suppressor indicator; ISUP: bit N of the echo control device indicator).

The same principles may be followed when the incoming signalling system is TUP or TUP+.

4.3.1.3   Interworking from TUP/TUP+ to ISUP

a)   If bit G of the message indicators received in the IAM/IAI (Initial Address message with additional Information) is coded "0" (outgoing half echo suppressor not included), bit D of the incoming half echo suppressor indicator in the address complete message is coded as received in the ACM (bit N of the echo control device indicator).

b)   If bit G of the message indicators received in the IAM/IAI is coded "1" (outgoing half echo suppressor included):

1)   if the incoming half echo control is locally included then bit D of the incoming half echo suppressor indicator of the address complete message is coded "1";

2)   if no incoming half echo control device is locally included, bit D of the incoming half echo suppressor indicator in the address complete message is coded as received in the ACM (bit N of the echo control device indicator).

4.3.2   Handling of the called party's category and the charge indicator in case of interworking TUP/TUP+ to ISUP

When interworking from TUP or TUP+ to ISUP, the theoretical number of combinations of the ISUP backward call indicators (charge, called party's category) implies some choices since some information may be lost in TUP or TUP+.

It is proposed to transfer the charge and the called party's category indicators as follows:

-	payphone + no charge	->	ADdress complete, coin boX (ADX)/ Address complete, subscriber Free, coin boX (AFX);
-	payphone + charge	->	ADX/AFX;
-	ordinary + no charge	->	ADdress complete, No charge (ADN)/ Address complete subscriber Free, No charge (AFN);
-	ordinary + charge	->	ADdress complete, charge (ADC)/ ADdress complete, subscriber Free, Charge (AFC);
-	no indication + no charge	->	ADN/AFN;
-	no indication + charge	->	ADC/AFC;
-	payphone + no indication	->	ADX/AFX;
-	ordinary + no indication	->	ADC/AFC;
-	no indication + no indication	->	ADC/AFC.

4.3.3   Transfer of no charge or charge information in the answer message in case of interworking TUP/TUP+ to ISUP

The charge or no charge information may be received in the backward call indicators in the successive address complete message, call progress message and ANswer Message (ANM).

When interworking from TUP or TUP+ to ISUP, this information is transferred as follows:

-     if "charge" is received in the charge indicator in the answer message, an ANswer signal, Charge (ANC) is sent;

-     if "no charge" is received in the charge indicator in the answer message, an ANswer signal, No charge (ANN) is sent;

-     if "no indication" is received in the charge indicator in the answer message or no backward call indicators are received in the answer message, ANC is sent.

With this proposal, ANC may be sent for a call where an address complete, no charge message was previously sent. It is assumed that it does not result in charging the call.

5 Interworking

5.1 Interworking of Signalling System ISUP to Signalling System No.5

5.1.1 Successful call set-up

5.1.1.1 Circuit seizure

The seizure signal is sent when the following conditions are fulfilled:

- if the continuity check indicator received in the IAM indicates that continuity check is not required; or

- if this indicator indicates that it is "required on this circuit" or it is "performed on a previous circuit", on receipt of the continuity message (continuity check successful); and

- the end-of-pulsing condition is determined:

  - by receipt of the End-of-pulsing signal (ST); or
  - if the fixed or maximum of number length is reached; or
  - if the minimum number of digits has been received, at expiry of the timer (4 to 6 seconds specified in the CCITT Recommendation Q.152 [4]).

5.1.1.2 Address information sending sequence

The sending sequence of address information is specified in the CCITT Recommendation Q.107 [2].

The language or discriminating digit is coded according to the "calling party's category" received in the IAM as shown in table 1.

Table 1

IAM category		No.5 language or discriminating digit
0001	French	1
0010	English	2
0011	German	3
0100	Russian	4
0101	Spanish	5
0110	(NOTE 1)	6
0111	(NOTE 1)	(NOTE 2)
1000	(NOTE 1)	8
1010	ordinary	0
1011	priority	0
1100	data	0 (NOTE 3)
1101	test call	Not subject to interworking
1111	payphone	0
<>		0
NOTE 1:	Available to administrations for selecting a particular language by mutual agreement.	
NOTE 2:	The call is released by sending a release message with cause 31 on the ISUP signalling section.	
NOTE 3:	If a bilateral agreement on the use of D/L=9 exists for the No.5 section, code 9 should be used.	

5.1.1.3 Address complete

As soon as the proceed-to-send signal is received, the address complete message is sent coded as follows:

- backward call indicators:

| bits | B A: | charge indicator |
| | 1 0 | (charge) |

| bits | D C: | called party's status indicator |
| | 0 0 | (no indication) |

| bits | F E: | called party's category indicator |
| | 0 0 | (no indication) |

| bit | I: | interworking indicator |
| | 1 | (encountered) |

| bit | K: | ISUP indicator |
| | 0 | (not used all the way) |

| bit | M: | ISDN access indicator |
| | 0 | (terminating access non-ISDN) |

| bit | N: | echo control device indicator |
| | | see subclause 4.3 |

The speech condition is set-up when the ST is sent.

5.1.1.4 Answer

On receipt of the answer signal, the answer message is sent without backward call indicators.

5.1.1.5 Clear-back/re-answer sequence

On receipt of the clear-back signal, the suspend (network) message is sent.

After the receipt of the clear-back signal, on receipt of the answer signal (re-answer), the resume (network) message is sent.

The number of clear-back/answer (suspend/resume) sequences is not limited.

5.1.1.6 Forward transfer

After the sending of the address complete message and until the release of the call, on receipt of the forward transfer message, the forward transfer signal is sent (f2).

5.1.2 Call release and call failures

5.1.2.1 ISUP side

On receipt of a release message, a ReSet Circuit message (RSC), a circuit Group ReSet message (GRS), or a Circuit Group Blocking (Hardware) message (CGB(H)), the clear-forward signal is sent.

In case of failure due to the ISUP side, the clear-forward signal is sent.

5.1.2.2 No.5 side

On receipt of busy flash signal (f2), the release message is sent with the cause value 34 and the location "beyond an interworking point".

In case of failure due to the No.5 side (for example timer expiry) the release message is sent with the cause value 127 and the location "international network".

5.1.3 Reaction to supplementary services

5.1.3.1 User-to-User Signalling service 1 implicit (UUS1i)

The "interworking" protocol control information is sent in the address complete message.

5.1.3.2 Calling Line Identification Presentation (CLIP)/Calling Line Identification Restriction (CLIR)

If present, the calling party number is discarded.

5.1.3.3 Closed User Group (CUG)

If the CUG call indicator in the IAM is:

- CUG with outgoing access, the call is treated as an ordinary call;

- non-CUG, the call is treated as an ordinary call.

5.1.3.4 Connected Line identification Presentation (COLP)/Connected Line identification Restriction (COLR)

If a request for COLP is included in the received IAM (bit H=1 of connected line request indicator), the answer message is sent with the connected number parameter with indication address not available.

- connected number parameter:

    nature of address indicator
        0000000

    numbering plan indicator
        000

    address presentation restricted indicator
        10   (address not available)

    screening indicator
        11   (network provided)

5.1.3.5 Subaddressing

The subaddress is discarded.

5.1.3.6 Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.2 Interworking of Signalling System ISUP to Signalling System R2

5.2.1 Successful call set-up

5.2.1.1 Address information sending sequence

The sending sequence of address information is specified in the CCITT Recommendation Q.107 [2].

5.2.1.1.1 Language or discriminating digit

The coding of the language or discriminating digit is coded according to the "calling party's category" received in the IAM, as shown in table 2.

Table 2

IAM category		R2 language or discriminating digit
0001	French	I-1
0010	English	I-2
0011	German	I-3
0100	Russian	I-4
0101	Spanish	I-5
0110	(NOTE)	I-6
0111	(NOTE)	I-7
1000	(NOTE)	I-8
1010	ordinary	I-10
1011	priority	I-10
1100	data	I-10
1101	test call	not subject to interworking
1111	payphone	I-10
<>		I-10
NOTE: Available to administrations for selecting a particular language by mutual agreement.		

5.2.1.1.2 Calling party's category

On receipt of A-5 (category request), the category sent in R2 is according to the calling party's category received in the IAM as specified in table 3.

Table 3

IAM category		R2 category
0001	French	II-7
0010	English	II-7
0011	German	II-7
0100	Russian	II-7
0101	Spanish	II-7
1010	ordinary	II-7
1011	priority	II-9
1100	data	II-8
1101	test call	not subject to interworking
1111	payphone	II-7
<>		II-7

5.2.1.1.3   Satellite

On receipt of A-13:

-        I-13 is sent if the nature of connection indicator indicates that "no satellite circuit in the connection";

-        I-14 is sent if the nature of connection indicator is differently coded.

The I-12 signal may be sent (rejected request) (see CCITT Recommendation Q.480 [5]).

> NOTE: The response to A-13 is independent of the nature of the incoming or outgoing circuit because:
> -   on the incoming side, if the circuit is a satellite circuit, the satellite indicator should be different from "no satellite in the connection";
> -   on the outgoing side, if the circuit is a satellite circuit, the A-13 signal should not be received.

5.2.1.1.4   Continuity check

If the continuity check indicator received in the IAM indicates that it is "required on this circuit" or is "performed on a previous circuit", the last digit(s) shall be withheld until the receipt of continuity message (continuity check successful).

5.2.1.1.5   Echo control

In case of a transit call, country code indicators I-11, I-12 and I-14 are sent according to CCITT Recommendation Q.115 [3].

In case of a terminating call, A-14 is replied to according to CCITT Recommendation Q.115 [3].

5.2.1.2   Address complete

On receipt of a address complete signal on the R2 side, the address complete message is sent coded as follows:

-        backward call indicators:

bits	B A:	charge indicator
	1 0	(charge) if A-6 or B-1 or B-6 is received
	0 1	(no charge) if B-7 is received

bits	D C:	called party's status indicator
	0 0	(no indication) if A-6 is received
	0 1	(subscriber free) if B-1 or B-6 or B-7 is received

| bits | F E: | called party's category indicator |
| | 0 0 | (no indication) |

| bit | I: | interworking indicator |
| | 1 | (encountered) |

| bit | K: | ISUP indicator |
| | 0 | (not used all the way) |

| bit | M: | ISDN access indicator |
| | 0 | (terminating access non-ISDN) |

| bit | N: | echo control device indicator |
| | | see subclause 4.3 |

The speech condition is set-up when the address complete message is sent (see also CCITT Recommendation Q.475 [5]).

On receipt of the A-3 signal, the R2 category to be sent is the same as in response to the A-5 signal (see subclause 5.2.1.1.2).

5.2.1.3 Answer

On receipt of the answer signal, the answer message is sent without backward call indicators.

5.2.1.4 Clear-back/re-answer sequence

On receipt of the clear-back signal, the suspend (network) message is sent.

After the receipt of the clear-back signal, on receipt of the answer signal (re-answer), the resume (network) message is sent.

The number of clear-back/answer (suspend/resume) sequences is not limited.

5.2.1.5 Forward transfer

The forward transfer message is discarded.

5.2.2 Call release and call failures

5.2.2.1 ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, a circuit group blocking (hardware) message or a continuity message (failed), the clear-forward signal is sent.

In case of failure due to the ISUP side, the clear-forward signal is sent.

5.2.2.2 R2 side

On receipt of a call unsuccessful signal, the release message is sent with the location "beyond an interworking point" and with the cause values as specified in table 4.

Table 4

Cause value	R2
34	A-4
34	A-15
4	B-2
17	B-3
34	B-4
1	B-5
27	B-8
4	B-9
4	B-10
34	B-11 to 15

In case of failure due to the R2 side (for example timer expiry, unexpected signal, etc.) the release message is sent with the cause value 127 and the location "international network".

For the R2 line signalling analogue version, the handling of the interruption control is in accordance with CCITT Recommendation Q.416 [5].

For the R2 line signalling digital version, the handling of the abnormal conditions is in accordance with CCITT Recommendation Q.422 [5].

5.2.3   Reaction to supplementary services

5.2.3.1   UUS1i

The "interworking" protocol control information is sent in the address complete message.

5.2.3.2   CLIP/CLIR

If present, the calling party number is discarded.

5.2.3.3   CUG

If the CUG call indicator in the IAM is:

-        CUG with outgoing access, the call is treated as an ordinary call;

-        non-CUG, the call is treated as an ordinary call.

5.2.3.4   COLP/COLR

If a request for COLP is included in the received IAM (bit H=1 of connected line request indicator), the answer message is sent with the connected number parameter with indication address not available.

-        connected number parameter:

        nature of address indicator
                0000000

        numbering plan indicator
                000

        address presentation restricted indicator
                10   (address not available)

        screening indicator
                11   (network provided)

5.2.3.5   Subaddressing

The subaddress is discarded.

5.2.3.6   Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.3   Interworking of Signalling System ISUP to Signalling System TUP

5.3.1   Successful call set-up

5.3.1.1   Initial address message

The sent initial address message of TUP is coded according to subclauses 5.3.1.1.1 and 5.3.1.1.2.

5.3.1.1.1 Calling party category

The calling party's category is coded according to the calling party's category received in the IAM as specified in table 5.

Table 5

ISUP category		TUP category
0001	French	0001
0010	English	0010
0011	German	0011
0100	Russian	0100
0101	Spanish	0101
0110	(NOTE)	0110
0111	(NOTE)	0111
1000	(NOTE)	1000
1010	ordinary	1010
1011	priority	1011
1100	data	1100
1101	test call	not subject to interworking
1111	payphone	1111
<>		1010
NOTE: Available to administrations for selecting a particular language by mutual agreement.		

5.3.1.1.2 Message indicators

bits   B A: nature of address indictor
      1 0   if terminating call
      1 1   if transit call

bits   D C: nature of circuit indicator
      0 0   (no satellite circuit in the connection) if the received nature of connection indicator is coded "00" (no satellite circuit in the connection) and the incoming and outgoing circuits are not satellite circuits
      0 1   (one satellite circuit in the connection) in the other cases

bits   F E: continuity check indicator
      0 0   if the received continuity check indicator is coded "00" and no continuity check is performed on the outgoing circuit
      0 1   if a continuity check is performed on the outgoing circuit
      1 0   if the received continuity check indicator is coded "10" or "01" and no continuity check is performed on the outgoing circuit

bit   G: echo suppressor indicator
            see CCITT Recommendation Q.115 [3]

bit   H: incoming international call indicator
      0

bit   I: redirected call indicator
      0

bit J: all digital path required indicator
0 if the received Transmission Medium Requirement (TMR) parameter is coded "00000000" or "00000011" (speech or 3,1 kHz audio)
1 if the received TMR parameter is coded "00000010" (64 kbit/s unrestricted)

bit K: signalling path indicator
0 (any path) if the received Interworking indicator is coded "1" (interworking encountered)
1 (all signalling system No.7 path) if the received Interworking indicator is coded "0" (no interworking encountered)

5.3.1.2 Continuity message

The continuity signal is sent after completion of all of the following actions:

- if it is to be made, the continuity check performed on the outgoing circuit is completed;

- the speech path across the exchange has been checked and found correct (see CCITT Recommendation Q.724 [14], § 1.4); and

- the receipt of a continuity message (continuity check successful) from the preceding exchange, if the continuity check indicator in the received initial address message indicates that a continuity check is being (or has been) performed on previous circuit(s).

The completion of the transmission path occurs as follows:

- if no continuity check is required on the incoming and outgoing circuits and no continuity check is performed on previous circuit(s), through connection should occur after sending the initial address message;

- in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [14]).

5.3.1.3 General request message

5.3.1.3.1 Calling party category request

On receipt of a calling party category request received in a General ReQuest message (GRQ), the calling party category sent in the General forward Set-up information Message (GSM) is the same as in the sent initial address message (see subclause 5.3.1.1).

5.3.1.3.2 Calling line identity request

On receipt of a calling line identity request received in a GRQ, the calling line identity sent in the GSM is coded as follows:

- address indicators:

bits B A: nature of address indicator
1 1 (international number)

bit C: calling line identity presentation indicator
1 (restricted)

bit D: incomplete calling line identity indicator
0 (no indication)

- number of address indicator:

bits D C B A:
    0 0 0 0   (calling line identity not available indicator)

5.3.1.4 Address complete

On receipt of an address complete message on the TUP side, the address complete message is sent, coded as follows:

- backward call indicators:

bits B A: charge indicator
    1 0   (charge) if ADC, ADX, AFC or AFX is received
    0 1   (no charge) if ADN or AFN is received

bits D C: called party's status indicator
    0 0   (no indication) if ADC, ADN, ADX is received
    0 1   (subscriber free) if AFC, AFN or AFX is received

bits F E: called party's category indicator
    0 0   (no indication) if ADC, ADN, AFC, AFN is received
    1 0   (payphone) if ADX or AFX is received

bit I: interworking indicator
    0   (no interworking encountered) if the received signalling path indicator is coded "1" (all signalling system No.7 path)
    1   (interworking encountered) if the received signalling path indicator is coded "0" (any path)

bit K: ISUP indicator
    0   (not used all the way)

bit M: ISDN access indicator
    0   (terminating access non-ISDN)

bit N: echo control device indicator
                      see subclause 4.3

5.3.1.5 Forward transfer

After the sending of the address complete message and until the release of the call, on receipt of the forward transfer message, the forward transfer signal is sent.

5.3.1.6 Answer

On receipt of an answer signal, the answer message is sent, coded as follows:

- with backward call indicators:

bits B A: charge indicator
    1 0   (charge) if ANC is received
    0 1   (no charge) if ANN is received

bits D C: called party's status indicator
    0 1   (subscriber free)

bits F E: called party's category indicator
    0 0   (no indication)

      bit   I: interworking indicator
                              as in the ACM

      bit   K: ISUP indicator
              0   (not used all the way)

      bit   M: ISDN access indicator
              0   (terminating access non-ISDN)

      bit   N: echo control device indicator
                              as in the ACM

5.3.1.7 Clear-back/re-answer sequence

On receipt of the clear-back signal, the suspend (network) message is sent.

After the receipt of the clear-back signal, on receipt of the re-answer signal, the resume (network) message is sent.

The number of clear-back/re-answer (suspend/resume) sequences is not limited.

5.3.2 Call release and call failures

5.3.2.1 ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, a Circuit group blocking (hardware) message, or a continuity message (failed), the clear-forward signal is sent.

In case of failure due to the ISUP side, the clear-forward signal is sent.

5.3.2.2 TUP side

On receipt of a simple unsuccessful set-up information message, the release message is sent on the ISUP side with the location "beyond an interworking point" and the cause values as specified in table 6.

Table 6

Cause value	TUP
42	SEC
34	CGC
34	NNC
28	ADI
31	CFL
17	SSB
1	UNN
27	LOS
4	SST
88	ACB
65	DPN
31	RSC (NOTE)
31	GRS (NOTE)
31	HGB (NOTE)
NOTE: Received after receipt of any backward signal.	

In case of failure due to the TUP side (for example timer expiry, unexpected signal, etc.) the release message is sent with the cause value 127 and the location "international network".

5.3.3   Reaction to supplementary services

5.3.3.1   UUS1i

The discard of user-to-user information by the network is explicitly notified by the ISDN access indicator in the sent address complete message (see subclause 5.3.1.4).

5.3.3.2   CLIP/CLIR

If present, the calling party number is discarded.

5.3.3.3   CUG

If the CUG call indicator in the IAM is:

- CUG with outgoing access, the call is treated as an ordinary call;

- non-CUG, the call is treated as an ordinary call.

5.3.3.4   COLP/COLR

If a request for COLP is included in the received IAM (bit H=1 of connected line request indicator), the answer message is sent with the connected number parameter with indication address not available.

- connected number parameter:

    nature of address indicator
        0000000

    numbering plan indicator
        000

    address presentation restricted indicator
        10   (address not available)

    screening indicator
        11   (network provided)

5.3.3.5   Subaddressing

The subaddress is discarded.

5.3.3.6   Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.4   Interworking of Signalling System No.5 to Signalling System ISUP

5.4.1   Successful call set-up

5.4.1.1   Initial address message

The sent initial address message of ISUP is coded as specified in subclauses 5.4.1.1.1 to 5.4.1.1.5.

5.4.1.1.1   Called party number

   nature of address indicator
         0000011   (national number) if terminal call
         0000100   (international number) if transit call

   internal network number indicator
         1   (not allowed)

   numbering plan indicator
         001   (ISDN)

   address signals
         according to received digits and digits analysis

5.4.1.1.2   Calling party's category

The calling party's category is coded according to the Language (L) or Discriminating (D) digit received on the No.5 side, as specified in table 7.

Table 7

No.5 L or D	IAM	category
0	1010	ordinary
1	0001	French
2	0010	English
3	0011	German
4	0100	Russian
5	0101	Spanish
6	0110	(NOTE 1)
7		not subject to interworking
8	1000	(NOTE 1)
9	1010	(NOTE 2)
NOTE 1:	Available to administrations for selecting a particular language by mutual agreement.	
NOTE 2:	If a bilateral agreement on the use of D/L=9 exists for the No.5 section, 1010 should be used.	

5.4.1.1.3   Forward call indicators

   bit   D: interworking indicator
          1   (encountered)

   bit   F: ISUP indicator
          0   (not used all the way)

   bits   H G: ISUP preference indicator
          0 1   (not required all the way)

   bit   I: ISDN access indicator
          0   (non-ISDN)

5.4.1.1.4 Nature of connection

bits B A: satellite indicator
0 0   (no satellite circuit) if the incoming and outgoing circuits are not satellite circuits
0 1   (one satellite circuit) if one circuit involved in the call is a satellite circuit
1 0   (two satellite circuits) if both the incoming and outgoing circuits are satellite circuits

bits D C: continuity check indicator
0 0   (not required) if no continuity check is to be made on the outgoing circuit
0 1   (required) if a continuity check is to be made on the outgoing circuit

bit E: echo control indicator
see CCITT Recommendation Q.115 [3]

5.4.1.1.5 Transmission medium requirement

00000011   (3,1 kHz)

5.4.1.2 Address complete

On receipt of an address complete message, the state of the call is "waiting for answer".

5.4.1.3 Forward transfer

After the receipt of the address complete message or CONnect message (CON) and until the release of the call, on receipt of the forward transfer signal (f2), the forward transfer message is sent.

5.4.1.4 Call progress

No particular action.

5.4.1.5 Answer

On receipt of an answer message, the answer signal is sent (f1).

5.4.1.6 Connect

On receipt of a connect message, the answer signal is sent (f1).

5.4.1.7 Clear-back/re-answer sequence

On receipt of the suspend (network) message, the clear-back signal is sent (f2).

On receipt of the resume (network) message, the answer signal (re-answer) is sent (f1).

The number of suspend/resume (clear-back/answer) sequences is not limited.

5.4.2 Call release and call failures

5.4.2.1 ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, circuit group blocking (hardware) message, the No.5 action is depending on the state of the call, as specified in table 8.

Table 8

No.5 reaction	ISUP cause (value Z) or received message
before ACM	
f2	Z
after ACM and before ANM	
f2	Z
f2	RSC
f2	GRS
f2	CGB
after ANM or CON or RES (net.)	
f2+Tone	Z
f2+Tone	RSC
f2+Tone	GRS
f2+Tone	CGB
after SUS (net.)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB

In other cases of failure due to the ISUP side, the same rules as given in table 8 are applied.

5.4.2.2 No.5 side

On receipt of clear-forward signal (f1+f2), the release message is sent with the cause value 16 and the location "beyond an interworking point".

In case of failure due to the No.5 side (for example timer expiry) the release message is sent with the cause value 127 and the location "international network".

5.4.3 Reaction to supplementary services

5.4.3.1 UUS1i

No impact.

5.4.3.2 CLIP/CLIR

No impact.

5.4.3.3 CUG

No impact.

5.4.3.4 COLP/COLR

No impact.

5.4.3.5 Subaddressing

No impact.

5.4.3.6 Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.5 Interworking of Signalling System R2 to Signalling System ISUP

5.5.1 Successful call set-up

5.5.1.1 Initial address message

The sent initial address message of ISUP is coded as specified in subclauses 5.5.1.1.1 to 5.5.1.1.5.

5.5.1.1.1 Called party number

nature of address indicator
0000011 (national number) if terminal call
0000100 (international number) if transit call

internal network number indicator
1 (not allowed)

numbering plan indicator
001 (ISDN)

address signals
according to received digits and digits analysis

5.5.1.1.2 Calling party's category

The calling party's category is coded according to the language (L) or the discriminating (D) digit received or the category received in response to A-5 (if sent) on the R2 side, as specified in table 9.

Table 9

R2		IAM	
L or D	II		category
0	--	1010	ordinary
0	II-7	1010	ordinary
0	II-8	1100	data
0	II-9	1011	priority
0	II-10	1010	ordinary
1	(NOTE)	0001	French
2	(NOTE)	0010	English
3	(NOTE)	0011	German
4	(NOTE)	0100	Russian
5	(NOTE)	0101	Spanish
6	(NOTE)	0110	
7	(NOTE)	0111	
8	(NOTE)	1000	
9	(NOTE)	1010	
13			not subject to interworking
NOTE: The possible receipt of group II signal does not affect the setting of the category.			

5.5.1.1.3 Forward call indicators

bit	D:	interworking indicator
	1	(encountered)

bit	F:	ISUP indicator
	0	(not used all the way)

bits	H G:	ISUP preference indicator
	0 1	(not required all the way)

bit	I:	ISDN access indicator
	0	(non-ISDN)

5.5.1.1.4 Nature of connection

bits	B A:	satellite indicator
	0 0	(no satellite circuit) if the incoming and outgoing circuits are not satellite circuits and I-14 is not received in response to A-13 (if sent)
	1 0	(two satellite circuits) if the outgoing circuit is a satellite circuit and I-14 is received in response to A-13 (if sent) or if the two circuits involved in the call are satellite circuits
	0 1	(one satellite circuit) in the other cases

bit	E:	echo control indicator
		see CCITT Recommendation Q.115 [3]

5.5.1.1.5 Transmission medium requirement

00000011 (3,1 kHz)

5.5.1.2 Address complete

On receipt of an address complete message, an address complete signal is sent:

- if the charge indicator of the backward indicators parameter is coded "01" (no charge), B-7 is sent;

- if the called party's status indicator of the backward indicators parameter is coded "01" (subscriber free) and if the charge indicator of the backward indicators parameter is not coded "01" (no charge), B-6 is sent;

- in the other cases, A-6 is sent.

Through connection should occur after sending of the address complete signal (see CCITT Recommendation Q.475 [5]).

5.5.1.3 Call progress

No particular action.

5.5.1.4 Answer

On receipt of an answer message, the answer signal is sent.

5.5.1.5 Connect

On receipt of a connect message an address complete signal is sent according to the backward call indicators parameter (see subclause 5.5.1.2), then an answer signal is sent.

Through connection should occur after sending of the address complete signal (see CCITT Recommendation Q.475 [5]).

5.5.1.6 Clear-back/re-answer sequence

On receipt of the suspend (network) message, the clear-back signal is sent.

On receipt of the resume (network) message, the answer signal (re-answer) is sent.

The number of suspend/resume (clear-back/answer) sequences is not limited.

5.5.2 Call release and call failures

5.5.2.1 ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, or a circuit group blocking (hardware) message, the R2 action is depending on the state of the call, as specified in table 10.

Table 10

R2 sent signal	ISUP received cause
before ACM	
A-15	34
B-2	28
B-5	1
B-3	17
B-8	27
A-15	31
B-2	4
A-4	88
A-4	65
A-4	<>
after ACM and before ANM	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB
after ANM or CON or RES (net.)	
CLB+Tone	Z
CLB+Tone	RSC
CLB+Tone	GRS
CLB+Tone	CGB
after SUS (net.)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB

In other cases of failure due to the ISUP side (for example timer expiry), the same rules as given in table 10 are applied.

5.5.2.2 R2 side

On receipt of clear-forward signal, the release message is sent with the cause value 16 and the location "beyond an interworking point".

In case of failure due to the R2 side (for example timer expiry) the release message is sent with the cause value 127 and the location "international network".

For the R2 line signalling analogue version, the handling of the interruption control is in accordance with CCITT Recommendation Q.416 [5].

For the R2 line signalling digital version, the handling of the abnormal conditions is in accordance with CCITT Recommendation Q.422 [5].

5.5.3 Reaction to supplementary services

5.5.3.1 UUS1i

No impact.

5.5.3.2 CLIP/CLIR

No impact.

5.5.3.3 CUG

No impact.

5.5.3.4 COLP/COLR

No impact.

5.5.3.5 Subaddressing

No impact.

5.5.3.6 Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.6 Interworking of Signalling System TUP to Signalling System ISUP

5.6.1 Successful call set-up

5.6.1.1 Initial address message

The sent initial address message of ISUP is coded as specified in subclauses 5.6.1.1.1 to 5.6.1.1.5.

5.6.1.1.1 Called party number

nature of address indicator
0000011 (national number) if terminal call
0000100 (international number) if transit call

internal network number indicator
1 (not allowed)

numbering plan indicator
001 (ISDN)

address signals
according to received digits and digits analysis

5.6.1.1.2 **Calling party's category**

The calling party's category is coded according to the calling party's category received on the TUP side, as specified in table 11.

Table 11

TUP category		ISUP category
0001	French	0001
0010	English	0010
0011	German	0011
0100	Russian	0100
0101	Spanish	0101
0110	(NOTE)	0110
0111	(NOTE)	0111
1000	(NOTE)	1000
1010	ordinary	1010
1011	priority	1011
1100	data	1100
1101	test call	not subject to interworking
1111	payphone	1111
<>		1010
NOTE: Available to administrations for selecting a particular language by mutual agreement.		

5.6.1.1.3 **Forward call indicators**

bit D: interworking indicator
0 (not encountered) if the received signalling path indicator is coded "1" (all signalling system No.7 path)
1 (encountered) if the received signalling path indicator is coded "0" (any path)

bit F: ISUP indicator
0 (not used all the way)

bits H G: ISUP preference indicator
0 1 (not required all the way)

bit I: ISDN access indicator
0 (non-ISDN)

5.6.1.1.4 **Nature of connection**

bits B A: satellite indicator
0 0 (no satellite circuit) if the outgoing circuit is not a satellite circuit and the nature of circuit indicator received in the IAM is coded "00" (no satellite circuit)
1 0 (two satellite circuits) if the outgoing circuit is a satellite circuit and the nature of circuit indicator received in the IAM is coded "01" (one satellite circuit)
0 1 (one satellite circuit) in the other cases

NOTE: It is assumed that the nature of circuit indicator received in the IAM is coded "01" if the incoming circuit is a satellite circuit.

bits   D C: continuity check indicator
        0 0   (not required) if the received continuity check indicator is coded "00" and no continuity check is performed on the outgoing circuit
        0 1   (required) if a continuity check is performed on the outgoing circuit
        1 0   (performed on a previous circuit) if the received continuity check indicator is coded "10" or "01" and no continuity check is performed on the outgoing circuit

bit   E: echo control indicator
                        see CCITT Recommendation Q.115 [3]

5.6.1.1.5   Transmission medium requirement

00000011   (3,1 kHz) or
00000010   (64 kbit/s) if the all digital path required indicator is coded "1" (bit J)

5.6.1.2   Continuity message

The continuity signal is sent after completion of all the following actions:

-       if it is to be made, the continuity check performed on the outgoing circuit is completed;

-       the speech path across the exchange has been checked and found correct (see CCITT Recommendation Q.724 [14], § 1.4); and

-       if the continuity check indicator in the received initial address message indicates that continuity check is being (has been) performed on previous circuit(s), receipt of a continuity message (continuity check successful) from the preceding exchange.

The completion of the transmission path occurs:

-       if no continuity check is required on the incoming and on the outgoing circuits and no continuity check is performed on previous circuit(s), through connection should occur after sending the initial address message;

-       in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [14]).

5.6.1.3   Address complete

On receipt of an address complete message, an address complete message is sent, as follows:

bits   B A: type of address complete signal indicators
        1 0   (address complete, no charge) if the charge indicator of the backward call indicators received in the ACM is coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone)
        0 1   (address complete, charge) if the charge indicator of the backward call indicators received in the ACM is not coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone)
        1 1   (address complete, payphone) if the called party's category indicator of the backward call indicators received in the ACM is coded "10" (payphone)

bit   C: subscriber free indicator
        1   (subscriber free) if the called party's status indicator of the backward call indicators is coded "1" (subscriber free)
        0   (no indication) in the other cases

bit   D: incoming echo suppressor indicator
                        see subclause 4.3

bit   F: signalling path indicator
       0   (any path) if the received interworking indicator is coded "1" (encountered)
       1   (all signalling system No.7 path) if the received interworking indicator is coded "0" (no interworking encountered)

5.6.1.4   Forward transfer

After the receipt of the address complete message or CON and until the release of the call, on receipt of the forward transfer signal, the forward transfer message is sent.

5.6.1.5   Call progress

See subclause 5.6.1.6.

5.6.1.6   Answer

On receipt of an answer message, the answer signal is sent:

-       if the charge indicator of the backward call indicators received in the answer message is coded "01" (no charge), ANN is sent;

-       if the charge indicator of the backward call indicators received in the answer message is not coded "01" (no charge) or is not included in the answer message, ANC is sent.

5.6.1.7   Connect

On receipt of a connect message an address complete signal is sent according to the backward call indicators parameter:

bits   B A: type of address complete signal indicators
       1 0   (address complete, no charge) if the charge indicator of the backward call indicators received in the CON is coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone)
       0 1   (address complete, charge) if the charge indicator of the backward call indicators received in the CON is not coded "01 (no charge) and the called party's category indicator is not coded "10" (payphone)
       1 1   (address complete, payphone) if the called party's category indicator of the backward call indicators received in the CON is coded "10" (payphone)

bit   C: subscriber free indicator
       1   (subscriber free) if the called party's status indicator of the backward call indicators received in the CON is coded "1" (subscriber free)
       0   (no indication) in the other cases

bit   D: incoming echo suppressor indicator
                 see subclause 5.6.1.3

bit   F: signalling path indicator
       0   (any path) if the received interworking indicator is coded "1" (encountered)
       1   (all signalling system No.7 path) if the received interworking indicator is coded "0" (no interworking encountered)

Then an answer signal is sent:

-       ANN is sent, if the charge indicator of the backward call indicators received in the CON is coded "01" (no charge); or

-       ANC is sent in the other cases.

5.6.1.8   Clear-back/re-answer sequence

On receipt of the suspend (network) message, the clear-back signal is sent.

On receipt of the resume (network) message, the re-answer signal is sent.

The number of suspend/resume (clear-back/re-answer) sequences is not limited.

5.6.2   Call release and call failures

5.6.2.1   ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, or a circuit group blocking (hardware) message, the TUP action is depending on the state of the call, as specified in table 12.

Table 12

TUP reaction	ISUP cause (value Z) or received message
before ACM	
SEC	42
CGC	34
ADI	28
UNN	1
SSB	17
LOS	27
CFL	31
SST	4
ACB	55
ACB	87
ACB	88
DPN	65
CFL	<>
after ACM (SUB not free) and before ANM	
CGC	34
CFL	31
CFL	<>
CFL	RSC
CFL	GRS
CFL	CGB(H)
after ACM (SUB free) and before ANM	
CFL	Z
CFL	RSC
CFL	GRS
CFL	CGB(H)
(continued)	

Table 12 (concluded)

TUP reaction	ISUP cause (value Z) or received message
after ANM or CON	
CLB+Tone	16
CLB+Tone	<>
CLB+Tone	RSC
CLB+Tone	GRS
CLB+Tone	CGB(H)
after SUS (net.)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB(H)

In other cases of failure due to the ISUP side, the Call Failure message (CFL) is sent.

5.6.2.2 TUP side

On receipt of a CLear-Forward signal (CLF), a reset circuit message, a circuit group reset message, a Hardware failure oriented Group Blocking message (HGB), or a Continuity-Failure signal (CCF), a release message is sent with the cause value 16, 31, 31, 31, 31 respectively, and the location "beyond an interworking point".

In case of failure due to the TUP side (for example timer expiry) the release message is sent with the cause value 127 and the location "international network".

Table 13 summarizes the possible cause values.

Table 13

TUP	Cause sent
CLF	16
RSC, GRS, HGB, CCF	31
failure	127

5.6.3 Reaction to supplementary services

5.6.3.1 UUS1i

No impact.

5.6.3.2 CLIP/CLIR

No impact.

5.6.3.3 CUG

No impact.

5.6.3.4   COLP/COLR

No impact.

5.6.3.5   Subaddressing

No impact.

5.6.3.6   Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.7   Interworking of Signalling System ISUP to Signalling System TUP+

5.7.1   Successful call set-up

5.7.1.1   Initial address message

The sent initial address message of TUP+ is coded as specified in subclauses 5.7.1.1.1 to 5.7.1.1.8.

5.7.1.1.1   Calling party category

The calling party's category is coded according to the calling party's category received in the IAM, as specified in table 14.

Table 14

ISUP category		TUP+ category
0001	French	0001
0010	English	0010
0011	German	0011
0100	Russian	0100
0101	Spanish	0101
0110	(NOTE)	0110
0111	(NOTE)	0111
1000	(NOTE)	1000
1010	ordinary	1010
1011	priority	1010
1100	data	1010
1101	test call	not subject to interworking
1111	payphone	1111
<>		1010
NOTE: Available to administrations for selecting a particular language by mutual agreement.		

5.7.1.1.2   Calling access signalling capability

bit   A: access signalling capabilities indicator
         0   (unknown)
         1   (CCITT Recommendation Q.931) as coded in the received ISDN access indicator in the forward call indicators

5.7.1.1.3   **Message indicators**

    bits B A: nature of address indictor
          1 0   if terminating call
          1 1   if transit call.

    bits D C: nature of circuit indicator
          0 0   (no satellite circuit in the connection) if the received nature of connection indicator is coded "00" (no satellite circuit in the connection) and the incoming and outgoing circuits are not satellite circuits
          0 1   (one satellite circuit in the connection) in the other cases

    bits F E: continuity check indicator
          0 0   if the received continuity check indicator is coded "00" and no continuity check is performed on the outgoing circuit
          0 1   if a continuity check is performed on the outgoing circuit
          1 0   if the received continuity check indicator is coded "10" or "01" and no continuity check is performed on the outgoing circuit

    bit   G: echo suppressor indicator
                     see CCITT Recommendation Q.115 [3]

    bit   H: incoming international call indicator
          0

    bit   I: redirected call indicator
          0

    bit   L: TUP+ signalling path indicator
          0   or
          1   coded as the received ISDN user part indicator in the forward call indicators

5.7.1.1.4   **First indicator octet**

    bit   B: closed user group information indicator
          1   if the optional forward indicators parameter and the closed user group interlock code parameter are received

    bit   C: additional calling party information indicator
          1   if the access transport parameter or the user service information is present in the IAM

    bit   D: additional routeing information indicator
          1

    bit   E: calling line identity indicator
          1

5.7.1.1.5   **Closed user group information**

See subclause 5.7.3.3.

5.7.1.1.6   Additional calling party information

5.7.1.1.6.1   Bearer Capability (BC) and High Layer Compatibility (HLC)

See subclause 5.7.4.

5.7.1.1.6.2   Calling/called party subaddress

See subclause 5.7.3.5.

5.7.1.1.6.3   User-to-user information

If present, the user-to-user information is transferred according to subclause 5.7.3.1.

5.7.1.1.7   Additional routeing information

-          information transfer capability requested:

bits   E D C B A: information transfer capability requested
          0 0 0 0 0   (speech) if the received TMR parameter is coded "00000000"
          0 1 0 0 0   (64 kbit/s) if the received TMR parameter is coded "00000010"
          1 0 0 0 0   (3,1 kHz audio) if the received TMR parameter is coded "00000011"

-          signalling capability requested:

bits   G F: signalling capability requested
          0 0   (any signalling system) if the received ISUP preference indicator is coded "01" (not required all the way)
          1 0   (TUP+ preferred) if the received ISUP preference indicator is coded "00" (preferred all the way)
          1 1   (TUP+ mandatory) if the received ISUP preference indicator is coded "10" (required all the way)

5.7.1.1.8   Calling line identity

See subclause 5.7.3.2.

5.7.1.2   Continuity message

The continuity signal is sent after completion of all the following actions:

-          if it is to be made, the continuity check performed on the outgoing circuit is completed;

-          the speech path across the exchange has been checked and found correct (see CCITT Recommendation Q.724 [14], § 1.4); and

-          if the continuity check indicator in the received initial address message indicates that continuity check is being (has been) performed on previous circuit(s), receipt of a continuity message (continuity check successful) from the preceding exchange.

The completion of the transmission path occurs:

-          if no continuity check is required on the incoming and outgoing circuits and no continuity check is performed on previous circuit(s), through connection should occur after sending the initial address message;

-          in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [14]).

5.7.1.3 General request message

5.7.1.3.1 Calling line identity request

On receipt of a calling line identity request received in a GRQ, the calling line identity sent in the GSM is coded as the calling line identity contained in the IAI.

5.7.1.4 Address complete

On receipt of an address complete message on the TUP+ side, the address complete message is sent, coded as follows:

- backward call indicators:

bits	B A:	charge indicator
	1 0	(charge) if ADC, ADX, AFC or AFX is received
	0 1	(no charge) if ADN or AFN is received
bits	D C:	called party's status indicator
	0 0	(no indication) if ADC, ADN or ADX is received
	0 1	(subscriber free) if AFC, AFN or AFX is received
bits	F E:	called party's category indicator
	0 0	(no indication, if ADC, ADN, AFC or AFN is received
	1 0	(payphone) if ADX or AFX is received
bit	I:	interworking indicator
	0	(no interworking encountered) if the received TUP+ signalling path indicator is coded "1" (capabilities of TUP+ exist to the called subscriber)
	1	(interworking encountered) if the received TUP+ signalling path indicator is coded "0" (any path)
bit	K:	ISUP indicator
	0	(not used all the way) if the received TUP+ signalling path indicator is coded "0" (any path)
	1	(used all the way) if the received TUP+ signalling path indicator is coded "1" (capabilities of TUP+ exist to the called subscriber)
bit	M:	ISDN access indicator
	0	(terminating access non-ISDN) if the called access signalling capabilities indicator is coded "0" (unknown)
	1	(terminating access ISDN) if the called access signalling capabilities indicator is coded "1" (CCITT Recommendation Q.931 called access)
bit	N:	echo control device indicator
		see subclause 4.3

- user-to-user information:

    if present, the user-to-user information is transferred as received (see subclause 5.7.3.1).

5.7.1.5 Forward transfer

The forward transfer message is discarded.

5.7.1.6   Answer

On receipt of an answer signal, the answer message is sent, coded as follows:

- with backward call indicators:

bits	B A:	charge indicator
	1 0	(charge) if ANC is received
	0 1	(no charge) if ANN is received

bits	D C:	called party's status indicator
	0 1	(subscriber free)

bits	F E:	called party's category indicator
	0 0	(no indication)

bit	I:	interworking indicator as in the ACM

bit	K:	ISUP indicator as in the ACM

bit	M:	ISDN access indicator as in the ACM

bit	N:	echo control device indicator as in the ACM

- user-to-user information:

  if present, the user-to-user information is transferred as received (see subclause 5.7.3.1).

5.7.1.7   Clear-back/re-answer sequence

In the case of a call to an ISDN subscriber:

- on receipt of the clear-back signal, a call to an ISDN subscriber is released immediately, then a clear-forward signal is sent on TUP+ side and a release message is sent on the ISUP side with the location "beyond an interworking point" and the cause value 16;

- if present in the clear-back signal, the user-to-user information is transferred in the release message as received (see subclause 5.7.3.1).

In the case of a call to a non-ISDN subscriber:

- on receipt of the clear-back signal, the suspend (network) message is sent;

- after the receipt of the clear-back signal, on receipt of the re-answer signal, the resume (network) message is sent;

- the number of clear-back/re-answer (suspend/resume) sequences is not limited.

5.7.2   Call release and call failures

5.7.2.1   ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, a circuit group blocking (hardware) message, or a continuity message (failed), the clear-forward signal is sent.

If present in the release message, the user-to-user information is transferred in the clear-forward signal according to subclause 5.7.3.1.

In case of failure due to the ISUP side, the clear-forward signal is sent.

5.7.2.2   TUP+ side

On receipt of a simple unsuccessful set-up information message, the release message is sent on ISUP side with the location "beyond an interworking point" and the cause values specified in table 15.

Table 15

Cause value	TUP+
42	SEC
34	CGC
34	NNC
28	ADI
31	CFL
17	SSB
1	UNN
27	LOS
4	SST
88	ACB
65	NRU
31	RSC (NOTE)
31	GRS (NOTE)
31	HGB (NOTE)
NOTE: Received after receipt of any backward signal.	

On receipt of the Extended Unsuccessful backward set-up information Message (EUM), a release message is sent with location "beyond an interworking point" and with the same cause value as the received one.

If present in the EUM, the user-to-user information is transferred in the release message as received (see subclause 5.7.3.1).

In case of failure due to the TUP+ side (for example timer expiry, unexpected signal, etc.) the release message is sent with the cause value 127 and the location "international network".

5.7.3   Reaction to supplementary services

5.7.3.1   UUS1i

Up to 35 octets of user information element, the user-to-user information element received on the ISUP side is transferred as received without any check of the content. Otherwise, the whole user-to-user information is discarded and the bit H of the user-to-user indicator parameter is coded "UUI discarded by the network" in the appropriate backward message.

The User-to-User Information (UUI) received on TUP+ side is transferred transparently.

5.7.3.2 CLIP/CLIR

If no calling party number parameter is received in the initial address message, the calling line identity field in the IAI is coded as follows:

- screening indicator:

    bits B A:
    1 1   (network provided)

- address indicators:

    bits B A: nature of address indicator
    1 1   (international number)

    bit   C: calling line identity presentation indicator
    1   (calling line identity presentation restricted)

    bit   D: incomplete calling line identity indicator
    0   (no indication)

- number of address signals:

    bits D C B A:
    0 0 0 0   (calling line identity not available indicator)

If a calling party number parameter is received in the initial address message, the calling line identity field in the IAI is coded as follows:

- screening indicator:

    bits B A:
    0 1   (user provided, verified and passed) if the screening indicator received in the calling party number is coded "01"
    1 1   (network provided) if the screening indicator received in the calling party number is coded "11"

- address indicators:

    bits B A: nature of address indicator
    1 1   (international number)

    bit   C: calling line identity presentation indicator
    coded as the address presentation restricted indicator received in the calling party number parameter.

    bit   D: incomplete calling line identity indicator
    0   (no indication)

- number of address signals:

    bits D C B A:
    according to received address signals

- calling number:

    coded as the received address signals

5.7.3.3 CUG

The CUG information field is coded as follows:

bits   B A: CUG call indicator
coded 00, 10 or 11 as the CUG call indicator received in the optional forward call indicators.

- CUG interlock code parameter:

- the interlock code is received on the ISUP side in the order specified in figure 1;

```
        8                         1
     ┌─────────────┬─────────────┐
  1  │ 1st NI digit│ 2nd NI digit│
     ├─────────────┼─────────────┤
  2  │ 3rd NI digit│ 4th NI digit│
     ├─────────────┴─────────────┤
  3  │15                        8│
     │        binary code        │
  4  │7                         0│
     └───────────────────────────┘
```

Figure 1: Receipt of the interlock code

- the interlock code is transferred on the TUP+ side in the order specified in figure 2.

```
     ┌──────────────┬──────────────┐
     │15           0│4th        1st│
     └──────────────┴──────────────┘
          Part B         Part A
```

Figure 2: Transfer of the interlock code

5.7.3.4 COLP/COLR

If a request for COLP is included in the received IAM (bit H=1 of connected line request indicator), the answer message is sent with the connected number parameter with indication address not available.

- connected number parameter:

nature of address indicator
0000000

numbering plan indicator
000

address presentation restricted
10   (address not available)

screening indicator
11   (network provided)

5.7.3.5 Subaddressing

Up to a length of 7 octets, the calling/called party subaddress is transferred as received without any check of the content. Otherwise, the whole subaddress information element is discarded.

5.7.3.6 Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.7.4 Coding of bearer capability and high layer compatibility

5.7.4.1 Bearer capability

a) If a BC is received in the User Service Information (USI) parameter but no Low Layer Compatibility (LLC) is received in the access transport parameter, then the BC information element sent in the additional calling party information of the IAI is coded as follows:
- octet 1 (identifier) is created;
- octet 2 (length) is calculated;
- starting with octet 3, the USI (BC) is transferred as received;

b) if a BC is received in the user service information parameter and octet 5 of the LLC received in the access transport parameter is coded "Recommendation G.711 A law" or "CCITT standardized rate adaption V.110/X.30", then the BC information element sent in the additional calling party information of the IAI is coded as follows:
- octet 1 (identifier) is created;
- octet 2 (length) is calculated;
- starting with octet 3, octets 3 to 5d (if present) of the LLC are transferred as received;

c) if a BC is received in the user service information parameter and octet 5 of the LLC received in the access transport parameter is not coded "Recommendation G.711 A law" or "CCITT standardized rate adaption V.110/X.30", then the LLC is discarded and the BC information element sent in the additional calling party information of the IAI is coded as follows:
- octet 1 (identifier) is created;
- octet 2 (length) is calculated;
- starting with octet 3, the USI (BC) is transferred as received.

5.7.4.2 High layer compatibility

The HLC information is transferred as received.

5.8 Interworking of Signalling System TUP+ to Signalling System ISUP

5.8.1 Successful call set-up

5.8.1.1 Initial address message

The sent initial address message of ISUP is coded as specified in subclauses 5.8.1.1.1 to 5.8.1.1.10.

5.8.1.1.1 Called party number

nature of address indicator
0000011 (national number) if terminal call
0000100 (international number) if transit call

internal network number indicator
1 (not allowed)
numbering plan indicator:
001 (ISDN)

address signals
according to received digits and digits analysis

5.8.1.1.2 Calling party's category

The calling party's category is coded according to the calling party's category received on TUP+ side, as specified in table 16.

Table 16

TUP+ category	ISUP category	
0000	1010	ordinary
0001	0001	French
0010	0010	English
0011	0011	German
0100	0100	Russian
0101	0101	Spanish
0110	0110	(NOTE)
0111	0111	(NOTE)
1000	1000	(NOTE)
1010	1010	ordinary
1101	test call	not subject to interworking
1111	1111	payphone
<>	1010	ordinary
NOTE:	Available to administrations for selecting a particular language by mutual agreement.	

5.8.1.1.3 Forward call indicators

bit	D:	interworking indicator
	0	(no encountered) if the received TUP+ signalling path indicator is coded "1"
	1	(encountered) if the received TUP+ signalling path indicator is coded "0" (any path)

bit	F:	ISUP indicator
	0	or
	1	as the received TUP+ signalling path indicator

bits	H G:	ISUP preference indicator
	0 1	(not required all the way) if the signalling capability requested in the additional routeing information is coded "00" (any signalling system)
	0 0	(preferred all the way) if the signalling capability requested in the additional routeing information is coded "10" (TUP+ preferred)
	1 0	(required all the way) if the signalling capability requested in the additional routeing information is coded "11" (TUP+ mandatory)

bit	I:	ISDN access indicator
	0	(non-ISDN) or
	1	(ISDN) as coded the access signalling capabilities indicator

5.8.1.1.4   **Nature of connection**

bits   B A: satellite indicator
         0 0   (no satellite circuit) if the outgoing circuit is not a satellite circuit and the nature of circuit indicator received in the IAI is coded "00" (no satellite circuit)
         1 0   (two satellite circuits) if the outgoing circuit is a satellite circuit and the nature of circuit indicator received in the IAI is coded "01" (one satellite circuit)
         0 1   (one satellite circuit) in the other cases

NOTE: It is assumed that the nature of circuit indicator received in the IAI is coded "01" if the incoming circuit is a satellite circuit.

bits   D C: continuity check indicator
         0 0   (not required) if the received continuity check indicator is coded "00" and no continuity check is performed on the outgoing circuit
         0 1   (required) if a continuity check is performed on the outgoing circuit
         1 0   (performed on a previous circuit) if the received continuity check indicator is coded "10" or "01" and no continuity check is performed on the outgoing circuit

bit   E: echo control indicator
                            see CCITT Recommendation Q.115 [3]

5.8.1.1.5   **Transmission medium requirement**

00000000   (speech) if the information transfer capability requested received in the additional routeing information is coded "00000"
00000011   (3,1 kHz) if the information transfer capability requested received in the additional routeing information is coded "10000"
00000010   (64 kbit/s) if the information transfer capability requested received in the additional routeing information is coded "01000"

5.8.1.1.6   **Access transport**

See subclauses 5.8.4 and 5.8.3.5.

5.8.1.1.7   **Optional forward call indicators**

bits   B A: closed user group call indicator
                   see subclause 5.8.3.3

bit   H: connected line requested indicator
        0   (no requested)

5.8.1.1.8   **Closed user group interlock code**

See subclause 5.8.3.3.

5.8.1.1.9   **User-to-user information**

If present, the user-to-user information is transferred as received according to subclause 5.8.3.1.

5.8.1.1.10   **User service information**

See subclause 5.8.4.

5.8.1.2 Continuity message

The continuity signal is sent after completion of all the following actions:

- if it is to be made, the continuity check performed on the outgoing circuit is completed;

- the speech path across the exchange has been checked and found correct (see CCITT Recommendation Q.724 [14], § 1.4); and

- if the continuity check indicator in the received initial address message indicates that continuity check is being (has been) performed on previous circuit(s), receipt of a continuity message (continuity check successful) from the preceding exchange.

The completion of the transmission path occurs:

- if no continuity check is required on the incoming and outgoing circuits and no continuity check is performed on previous circuit(s), through connection should occur after sending the initial address message;

- in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [14]).

5.8.1.3 Address complete

On receipt of an address complete message, an address complete message is sent, as follows:

- message indicators:

    bits   B A: type of address complete signal indicators
           1 0   (address complete, no charge) if the charge indicator of the backward call indicators received in the ACM is coded "01" (no charge) and the called party's category indicator is not code "10" (payphone)
           0 1   (address complete, charge) if the charge indicator of the backward call indicators received in the ACM is not coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone)
           1 1   (address complete, payphone) if the called party's category indicator of the backward call indicators received in the ACM is coded "10" (payphone)

    bit   C: subscriber free indicator
          1   (subscriber free) if the called party's status indicator of the backward call indicators is coded "1" (subscriber free)
          0   (no indication) in the other cases

    bit   D: incoming echo suppressor indicator
              see subclause 4.3

    bit   G: TUP+ signalling path indicator
          0   (any path) if the received ISUP indicator is coded "0" (not used all the way)
          1   (capabilities of TUP+ exist to the called subscriber) if the received ISUP indicator is coded "1" (used all the way)

    bit   H: called access signalling capabilities indicator
          0   (unknown) or
          1   (CCITT Recommendation Q.931 called access) as the received ISDN access indicator of the backward call indicators

- user-to-user information:

    if present, the user-to-user information is transferred according to subclause 5.8.3.1.

5.8.1.4 Call progress

See subclause 5.8.1.5.

5.8.1.5 Answer

On receipt of an answer message, the answer signal is sent:

- if the charge indicator of the backward call indicators received in the answer message is coded "01" (no charge), ANN is sent;

- if the charge indicator of the backward call indicators received in the answer message is not coded "01" (no charge) or is not included in the answer message, ANC is sent.

- user-to-user information:

    if present in the answer message, the user-to-user information is transferred according to subclause 5.8.3.1.

5.8.1.6 Connect

On receipt of a connect message an address complete signal is sent according to the backward call indicators parameter:

- message indicators:

bits	B A:	type of address complete signal indicators
	1 0	(address complete, no charge) if the charge indicator of the backward call indicators received in the CON is coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone)
	0 1	(address complete, charge) if the charge indicator of the backward call indicators received in the CON is not coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone)
	1 1	(address complete, payphone) if the called party's category indicator of the backward call indicators received in the CON is coded "10" (payphone)

bit	C:	subscriber free indicator
	1	(subscriber free) if the called party's status indicator of the backward call indicators received in the CON is coded "1" (subscriber free)
	0	(no indication) in the other cases

bit	D:	incoming echo suppressor indicator see subclause 5.8.1.3

bit	G:	TUP+ signalling path indicator
	0	(any path) if the received ISUP indicator is coded "0" (not used all the way)
	1	(capabilities of TUP+ exist to the called subscriber) if the received ISUP indicator is coded "1" (used all the way)

bit	H:	called access signalling capabilities indicator
	0	(unknown) or
	1	(CCITT Recommendation Q.931 called access) as the received ISDN access indicator of the backward call indicators.

- user-to-user information:

    if present, the user-to-user information is transferred according to subclause 5.8.3.1.

Then an answer signal is sent:

- ANN is sent, if the charge indicator of the backward call indicators received in the CON is coded "01" (no charge);

- ANC is sent in the other cases.

5.8.1.7 Clear-back/re-answer sequence

On receipt of the suspend (network) message, the clear-back signal is sent.

On receipt of the resume (network) message, the re-answer signal is sent.

The number of suspend/resume (clear-back/re-answer) sequences is not limited.

5.8.2 Call release and call failures

5.8.2.1 ISUP side

On receipt of a release message, a reset circuit message, a circuit group reset message, or a circuit group blocking (hardware) message, the TUP+ action is depending on the state of the call, as specified in table 17.

Table 17

TUP+ reaction	ISUP cause(value Z+location) or received message
before ACM	
EUM(Z)	Z+ U, PRN
EUM(18)	18+ RN, PRN
SEC	42
CGC	34
ADI	28
UNN	1
SSB	17
LOS	27
CFL	31
SST	4
ACB	55
ACB	87
ACB	88
NRU	65, 29
CFL	<>
after ACM (SUB not free) and before ANM	
EUM(Z)	Z+ U, PRN
EUM(18)	18+ RN, PRN
EUM(19)	19+ RN, PRN
CGC	34
CFL	31
CFL	<>
CFL	RSC
CFL	GRS
CFL	CGB(H)
(continued)	

Table 17 (concluded)

TUP+ reaction	ISUP cause(value Z+location) or received message
after ACM (SUB free) and before ANM	
EUM(Z)	Z+ U, PRN
EUM(18)	18+ RN, PRN
EUM(19)	19+ RN, PRN
CFL	<>
CFL	RSC
CFL	GRS
CFL	CGB(H)
after ANM or CON	
CLB+Tone	16
CLB+Tone	<>
CLB+Tone	RSC
CLB+Tone	GRS
CLB+Tone	CGB(H)
after SUS (net.)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB(H)

In other cases of failure due to the ISUP side, CFL is sent.

If present in the release message, the user-to-user information is transferred according to subclause 5.8.3.1 if the message sent on the TUP+ side can transport it (e.g. EUM, CLB).

5.8.2.2 TUP+ side

On receipt of a clear-forward signal, a reset circuit message, a circuit group reset message, a hardware failure oriented group blocking message, or a continuity failure signal, a release message is sent with the cause value 16, 31, 31, 31, 31 respectively, and the location "beyond an interworking point".

If present in the clear-forward signal, the user-to-user information is transferred as received (see subclause 5.8.3.1).

In case of failure due to the TUP+ side (for example timer expiry) the release message is sent with the cause value 127 and the location "international network".

Table 18 summarizes the possible cause values.

Table 18

TUP+	Cause sent
CLF	16
RSC, GRS, HGB, CCF	31
failure	127

5.8.3 Reaction to supplementary services

5.8.3.1 UUS1i

The user-to-user information element is transferred from TUP+ to ISUP as received, without any check of the contents.

Up to a length of 35 octets of user information element, the user-to-user information element is transferred from ISUP to TUP+ as received, without any check of the content. Otherwise, the whole user-to-user information is discarded.

The "UUI discarded by the network" information is lost.

5.8.3.2 CLIP/CLIR

The calling party number parameter is not included in the IAM:

- if the calling line identity is not included (bit E=0) in the received IAM/IAI;

- if the screening indicator received in the calling line identity field is coded "00" (user provided, not screened) or "10" (user provided, verified and failed);

- if the calling line identity indicator is coded "1" (incomplete);

- if the received number of address signals is coded "0000" (not available).

In the other cases, the calling party number parameter is coded as follows:

nature of address indicator
     0000100   (international number)

calling party number incomplete indicator:
     0   (complete)

numbering plan indicator
     001   (ISDN)

address presentation restricted indicator:
     00   (presentation allowed) if the received calling line identity presentation indicator is coded "0" (not restricted)
     01   (presentation restricted) if the received calling line identity presentation indicator is coded "1" (restricted)

screening indicator
     01   (user provided, verified and passed) if the received screening indicator is coded "01"
     11   (network provided) if the received screening indicator is coded "11"

address signals
   coded according to the received calling number

5.8.3.3   CUG

If the CUG information indicator in the first indicator octet in the IAM/IAI is coded "1" (included), the CUG call indicator sent in the optional forward call indicators and the CUG interlock code parameter in the IAM are coded as follows:

-    optional forward call indicators:

　　bits B A:　　CUG call indicator
　　　　　　　coded 00, 10 or 11 as received in the CUG call indicator of the CUG information field.
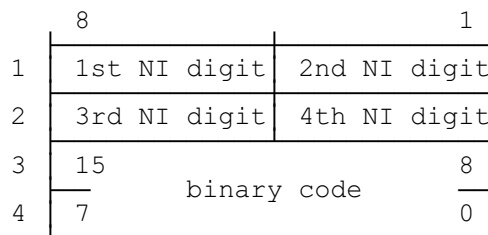
-    CUG interlock code parameter:

　-　the interlock code is received on the TUP+ side in the order specified in figure 3;

```
┌─────────────────┬─────────────────┐
│15            0  │4th          1st │
└─────────────────┴─────────────────┘
      Part B            Part A
```
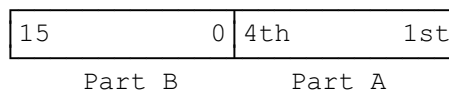
Figure 3: Receipt of the interlock code

　-　the interlock code is sent on the ISUP side in the order specified in figure 4.

```
      8                           1
    ┌─────────────────┬─────────────────┐
  1 │  1st NI digit   │  2nd NI digit   │
    ├─────────────────┼─────────────────┤
  2 │  3rd NI digit   │  4th NI digit   │
    ├─────────────────┴─────────────────┤
  3 │ 15                             8  │
    │            binary code            │
  4 │ 7                              0  │
    └───────────────────────────────────┘
```

Figure 4: Transmission of the interlock code

5.8.3.4   COLP/COLR

No impact.

5.8.3.5   Subaddressing

The calling/called party subaddress is transferred as received in the additional calling party information field without any check of the content.

5.8.3.6   Terminal portability

The suspend/resume (user initiated) messages are discarded.

5.8.4 Coding of bearer capability and high layer compatibility

5.8.4.1 Bearer capability

Starting from octet 3 (octets 1 and 2 are discarded), the bearer capability field is transferred in the USI parameter as received.

5.8.4.2 High layer compatibility

The HLC is transferred in the access transport parameter as received.

History

Document history	
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