INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

Annex B
Q.601-Q.695

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(03/93)

INTERWORKING OF SIGNALLING SYSTEMS

INTERWORKING OF SIGNALLING SYSTEMS – NARRATIVE PRESENTATION OF INTERWORKING

Annex B to ITU-T Recs. Q.601 to Q.695

(Previously "CCITT Recommendations")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

Annex B to ITU-T Recommendations Q.601 to Q.695 was revised by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Annex B

Interworking of signalling systems – Narrative presentation of interworking

(Helsinki, 1993)

(This annex forms an integral part of Recommendations Q.601-Q.695)

B.1 Introduction

B.1.1 Narrative presentation

Recommendation Q.601 explains the change from narrative to SDL presentation and that the SDL method facilitates the specification of interworking with future signalling system.

But, for ISUP, some additional information, that is relevant to interworking, may be useful:

- the coding of the messages;
- taking into account of supplementary services;
- supplementary informations about the call failure handling;
- taking into account of the sequencing of the received messages;
- handling of the access information.

This annex must be read and used as a complement of the CCITT interworking SDL specifications and not as an independent specification.

Only the information being a matter of interworking is described.

Hence, no information is given concerning the:

- national/international call indicator;
- end-to-end method indicator;
- end-to-end information indicator;
- SCCP method indicator;
- continuity check indicator in interworking cases R2, No. 5 to ISUP;
- COT 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. ISUP preference indicator received is set to "ISUP required").

B.1.2 Working assumptions

- TUP does not support any supplementary service (e.g. calling line identification). TUP supports the "digital connectivity".
- TUP only supporting IAM is described.

B.1.3 Miscellaneous interworking aspects

B.1.3.1 Interworking handling of the echo control device indicator (or the incoming half echo suppressor indicator) of ISUP ACM (or TUP) of the address complete message (ACM) in ISUP (or 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 Recommendation Q.724 or Q.767).

Interworking ISUP → R2, No. 5

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

IAM (E = 0)→

←ACM (N = 0)

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

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

b) if it is known from the routing 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 the bit N of the echo control device indicator is coded "0".

Interworking ISUP → TUP, ISUP

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

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

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

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

The same principles might be followed when the incoming signalling system is TUP.

Interworking TUP → ISUP

– If the bit G of the message indicators received in the IAM is coded "0" (outgoing half echo suppressor not included), the bit D of the incoming half echo suppressor indicator in the ACM is coded as received in the ACM (bit N of the echo control device indicator).

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

a) if the incoming half echo control is locally included, then the bit D of the incoming half echo suppressor indicator of the ACM is coded "1";

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

B.1.3.2 Handling of the called party's category and the charge indicator when interworking TUP to ISUP

When interworking from 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.

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

- payphone + no charge → ADX/AFX
- payphone + charge → ADX/AFX
- ordinary + no charge → ADN/AFN
- ordinary + charge → ADC/AFC
- no indic. + no charge → ADN/AFN
- no indic. + charge → ADC/AFC
- payphone + no indic. → ADX/AFX
- ordinary + no indic. → ADC/AFC
- no indic. + no indic. → ADC/AFC

B.1.3.3 Transfer of no charge or charge information in the Answer message when interworking TUP to ISUP

The charge or no charge information may be received in the backward call indicators in the successive Address complete message (ACM), Call progress message (CPG) and Answer message (ANM).

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

- If "charge" is received in the charge indicator in the ANM, ANC is sent.
- If "no charge" is received in the charge indicator in the ANM, ANN is sent.
- If "no indication" is received in the charge indicator in the ANM or no backward call indicators are received in the ANM, 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.

B.2 Narrative presentation of the various interworking cases

B.2.1 Interworking of Signalling System ISUP to No. 5

B.2.1.1 Successful call set-up

B.2.1.1.1 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 ST,

  or if the fixed or maximum of number length is reached,

  or at expiry of the timer (4-6 seconds specified in the Recommendation Q.152) if the minimum number of digits has been received.

B.2.1.1.2 Address information sending sequence

The sending sequence of address information is specified in the Recommendation Q.107.

The language or discriminating digit is coded according to the "calling party's category" received in the IAM:

IAM category		No. 5 language or discriminating digit
0001	French	1
0010	English	2
0011	German	3
0100	Russian	4
0101	Spanish	5
0110	*	6
0111	*	(Note 2)
1000	*	8
1010	ordinary	0
1011	priority	0
1100	data	0 (Note 1)
1101	test call	not subject to interworking
1111	payphone	0
< >		0

* Available to Administrations for selecting a particular language by mutual agreement.

NOTES

1 If a bilateral agreement on the use of D/L = 9 exists for the No. 5 section, code 9 should be used.

2 The call is released by sending a Release message with cause 31 on the ISUP signalling section.

B.2.1.1.3 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 BA: charge indicator
10 (charge)
bits DC: Called party's status indicator
00 (no indication)
bits FE: Called party's category indicator
00 (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 introduction, subclause B.1.3.1

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

B.2.1.1.4 Answer

On receipt of the Answer signal, the Answer message (ANM) is sent (without backward call indicators).

B.2.1.1.5 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.

B.2.1.1.6 Forward transfer

After the sending of the ACM and until the release of the call, on receipt of the Forward transfer message (FOT), the Forward transfer signal is sent (F2).

B.2.1.2 Call release and call failures

B.2.1.2.1 ISUP side

On receipt of a Release message (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB), the Clear-forward signal is sent.

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

B.2.1.2.2 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".

B.2.1.3 Reaction for Supplementary Services

B.2.1.3.1 UUS1 implicit

The "interworking" protocol control information is sent in the ACM.

B.2.1.3.2 CLIP/CLIR

The Calling party number is discarded, if present.

B.2.1.3.3 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.

B.2.1.3.4 COLP/COLR

If a request of COLP is included in the received IAM (bit H = 1 of Connected line request indicator), the Answer message (ANM) 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)

B.2.1.3.5 Sub-address

The Sub-address is discarded.

B.2.1.3.6 Terminal portability

The Suspend/Resume (User initiated) messages are discarded.

B.2.2 Interworking of Signalling System ISUP to R2

B.2.2.1 Successful call set-up

B.2.2.1.1 Address information sending sequence

The sending sequence of address information is specified in the Recommendation Q.107.

B.2.2.1.1.1 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:

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	*	I.6
0111	*	I.7
1000	*	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

* Available to Administrations for selecting a particular language by mutual agreement.

B.2.2.1.1.2 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:

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

B.2.2.1.1.3 Satellite

On receipt of A-13,

- I-13 is sent if the Nature of the connection indicator indicates that "no satellite circuit in the connection".
- I-14 is sent if the Nature of the connection indicator is differently coded.

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

NOTE – The response to A-13 is independent of the nature of the incoming or outgoing circuit because:

- on incoming side, if the circuit is a satellite circuit, the satellite indicator should be different from "no satellite in the connection";
- on outgoing side, if the circuit is a satellite circuit, the A-13 signal should not be received.

B.2.2.1.1.4 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) have to be withheld until the receipt of Continuity message (continuity check successful).

B.2.2.1.1.5 Echo control

Transit call: country code indicator I.11, I.12, I.14 sent according to Recommendation Q.115.

Terminating call: reply to A-14 according to Recommendation Q.115.

B.2.2.1.2 Address complete

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

– backward-call indicators

bits BA: charge indicator
10 (charge) if A-6 or B-1 or B-6 is received
01 (no charge) if B-7 is received
bits DC: Called party's status indicator
00 (no indication) if A-6 is received
01 (subscriber free) if B-1 or B-6 or B-7 is received
bits FE: Called party's category indicator
00 (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 introduction, subclause B.1.3.1

The speech condition is set up when the ACM is sent (see also Recommendation Q.475).

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 section "calling party's category").

B.2.2.1.3 Answer

On receipt of the Answer signal, the Answer message (ANM) is sent (without backward call indicators).

B.2.2.1.4 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.

B.2.2.1.5 Forward transfer

The Forward transfer message is discarded.

B.2.2.2 Call release and call failures

B.2.2.2.1 ISUP side

On receipt of a Release message (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB) or Continuity message (COT, failed) …, the Clear-forward signal is sent.

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

B.2.2.2.2 R2 side

On receipt of a call unsuccessful signal, the Release message is sent with the location “beyond an interworking point” and the following cause values:

Cause #	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) the Release message is sent with the cause value 127 and the location “international network”.

R2 line signalling analogue version: the handling of the interruption control is in accordance with Recommendation Q.416.

R2 line signalling digital version: the handling of the abnormal conditions is in accordance with Recommendation Q.422.

B.2.2.3 Reaction for Supplementary Services

B.2.2.3.1 UUS1 implicit

The “interworking” protocol control information is sent in the ACM.

B.2.2.3.2 CLIP/CLIR

The Calling party number is discarded, if present.

B.2.2.3.3 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.

B.2.2.3.4 COLP/COLR

If a request of COLP is included in the received IAM (bit H = 1 of Connected line request indicator), the Answer message (ANM) 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)

B.2.2.3.5 Sub-address

The Sub-address is discarded.

B.2.2.3.6 Terminal portability

The Suspend/Resume (User initiated) messages are discarded.

B.2.3 Interworking of Signalling System ISUP to TUP

B.2.3.1 Successful call set-up

B.2.3.1.1 Initial address message

The sent Initial address message of TUP is coded as follows:

B.2.3.1.1.1 Calling party category

The calling party's category is coded according to the calling party's category received in the IAM.

ISUP category		TUP category
0001	French	0001
0010	English	0010
0011	German	0011
0100	Russian	0100
0101	Spanish	0101
0110	*	0110
0111	*	0111
1000	*	1000
1010	ordinary	1010
1011	priority	1011
1100	data	1100
1101	test call	not subject to interworking
1111	payphone	1111
< >		1010

* Available to Administrations for selecting a particular language by mutual agreement.

B.2.3.1.1.2 Message indicators

bits BA: nature of address indicator
10 if terminating call
11 if transit call
bits DC: nature of circuit indicator
00 (no satellite circuit in the connection) if the received nature of the connection indicator is coded "00" (no satellite circuit in the connection) and the incoming and outgoing circuits are not satellite circuits
01 (one satellite circuit in the connection) in the other cases
bits FE: continuity check indicator
00 if the received continuity check indicator is coded "00" and a continuity check is not performed on the outgoing circuit
01 if a continuity check is performed on the outgoing circuit
10 if the received continuity check indicator is coded "10" or "01" and a continuity check is not performed on the outgoing circuit
bit G: echo suppressor indicator
see Recommendation Q.115
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 parameter is coded "00000000" or "00000011" (speech or 3.1 kHz audio)

1 if the received Transmission medium requirement 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)

B.2.3.1.2 Continuity message

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

- the continuity check performed on the outgoing circuit, if it is to be made, is completed;
- the speech path across the exchange has been checked and found correct (see 1.4/Q.724); 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 as follows:

- if continuity check is not required on the incoming circuit and on outgoing circuit and is not performed on previous circuit, 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 Recommendation Q.724).

B.2.3.1.3 General request message

B.2.3.1.3.1 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 "Initial address message").

B.2.3.1.3.2 Calling line identity request

On receipt of a calling line identity request received in a General request message (GRQ), the calling line identity sent in the General forward set-up information message (GSM) is as follows:

- address indicators:

  bits BA: nature of address indicator
  11 (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 DCBA
  0000 calling line identity not available indicator

B.2.3.1.4 Address complete

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

- backward-call indicators

  bits BA: charge indicator
  10 (charge) if ADC, ADX, AFC or AFX is received
  01 (no charge) if ADN or AFN is received
  bits DC: Called party's status indicator
  00 (no indication) if ADC, ADN, ADX is received
  01 (subscriber free) if AFC, AFN or AFX is received

bits FE: Called party's category indicator
00 (no indication) if ADC, ADN, AFC, AFN is received
10 (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 introduction, subclause B.1.3.1

B.2.3.1.5 Forward transfer

After the sending of the ACM and until the release of the call, on receipt of the Forward transfer message (FOT), the Forward transfer signal is sent (FOT).

B.2.3.1.6 Answer

On receipt of an Answer signal, the Answer message (ANM) is sent, coded as follows:

– without backward call indicators if Answer signal, unqualified, is received;

– with backward call indicators:

bits BA: charge indicator
10 (charge) if ANC is received
01 (no charge) if ANN is received
bits DC: Called party's status indicator
01 (subscriber free)
bits FE: Called party's category indicator
00 (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

B.2.3.1.7 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.

B.2.3.2 Call release and call failures

B.2.3.2.1 ISUP side

On receipt of a Release message (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB) or a Continuity message (COT, failed) …, the Clear-forward signal is sent.

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

B.2.3.2.2 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 following cause values:

Cause #	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[a)]
31	GRS[a)]
31	HGB[a)]

[a)] RSC, GRS or HGB received after receipt of any backward signal.

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

B.2.3.3 Reaction for Supplementary Services

B.2.3.3.1 UUS1 implicit

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

B.2.3.3.2 CLIP/CLIR

The Calling party number is discarded, if present.

B.2.3.3.3 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.

B.2.3.3.4 COLP/COLR

If a request of COLP is included in the received IAM (bit H = 1 of Connected line request indicator), the Answer message (ANM) 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
  0 (address not available)
  screening indicator
  11 (network provided)

B.2.3.3.5 Sub-address

The Sub-address is discarded.

B.2.3.3.6 Terminal portability

The Suspend/Resume (User initiated) messages are discarded.

B.2.4 Interworking of Signalling System No. 5 to ISUP

B.2.4.1 Successful call set-up

B.2.4.1.1 Initial address message

The sent initial address message of ISUP is coded as follows:

B.2.4.1.1.1 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 signal

  according to received digits and digits analysis

B.2.4.1.1.2 Calling party's category

The calling party's category is coded according to the the language (L) or discriminating (D) digit received on No. 5 side.

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	*
7	not subject to interworking	
8	1000	*
9	1010	(Note)

* Available to Administrations for selecting a particular language by mutual agreement.

NOTE – If a bilateral agreement on the use of D/L = 9 exists for the No. 5 section, 1010 should be used.

B.2.4.1.1.3 Forward call indicators

bit D: interworking indicator

1 (encountered)

bit F: ISUP indicator

0 (not used all the way)

bits HG: ISUP preference indicator

01 (not required all the way)

bit I: ISDN access indicator

0 (non-ISDN)

B.2.4.1.1.4 Nature of connection

bits BA: satellite indicator

00 (no satellite circuit) if the incoming and outgoing circuits are not satellite circuits

01 (one satellite circuit) if one circuit involved in the call is a satellite circuit

10 (two satellite circuits) if the incoming and outgoing circuit are satellite circuits

bits DC: continuity check indicator

00 (not required) if no continuity check is to be made on the outgoing circuit

01 (required) if a continuity check is to be made on the outgoing circuit

bit E: echo control indicator

see Recommendation Q.115

B.2.4.1.1.5 Transmission Medium Requirement

00000011 (3.1 kHz)

B.2.4.1.2 Address complete

On receipt of an Address complete message, the state of the call is “waiting for answer”.

B.2.4.1.3 Forward transfer

After the receipt of the ACM or CON and until the release of the call, on receipt of the Forward transfer signal (F2), the Forward transfer message is sent (FOT).

B.2.4.1.4 Call progress

No particular action.

B.2.4.1.5 Answer

On receipt of an Answer message, the Answer signal is sent (F1).

B.2.4.1.6 Connect

On receipt of a Connect message, the Answer signal is sent (F1).

B.2.4.1.7 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.

B.2.4.2 Call release and call failures

B.2.4.2.1 ISUP side

On receipt of a Release message (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB), the No. 5 action is depending on the state of the call, as described below:

No. 5	ISUP
Reaction	Cause (# Z) or received message
Before ACM	
F2	Z
After ACM and before ANM	
F2 F2 F2 F2	Z RSC GRS CGB
After ANM or CON or RES (network)	
F2 + Tone F2 + Tone F2 + Tone F2 + Tone	Z RSC GRS CGB
After SUS (network)	
Tone Tone Tone Tone	Z RSC GRS CGB

In other cases of failure due to ISUP side, the same rules as above are applied.

B.2.4.2.2 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".

B.2.4.3 Reaction for Supplementary Services

B.2.4.3.1 UUS1 implicit

No impact.

B.2.4.3.2 CLIP/CLIR

No impact.

B.2.4.3.3 CUG

No impact.

B.2.4.3.4 COLP/COLR

No impact.

B.2.4.3.5 Sub-address

No impact.

B.2.4.3.6 Terminal portability

The Suspend/Resume (User initiated) messages are discarded.

B.2.5 Interworking of Signalling System R2 to ISUP

B.2.5.1 Successful call set-up

B.2.5.1.1 Initial address message

The sent Initial address message of ISUP is coded as follows:

B.2.5.1.1.1 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 signal
  according to received digits and digits analysis

B.2.5.1.1.2 Calling party's category

The calling party's category is coded according to the language (L) or discriminating (D) digit received or the category received in response to A5 (if sent) on R2 side.

R2 L or D	II	IAM 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.

B.2.5.1.1.3 Forward call indicators

bit D: interworking indicator

1 (encountered)

bit F: ISUP indicator

0 (not used all the way)

bits HG: ISUP preference indicator

01 (not required all the way)

bit I: ISDN access indicator

0 (non-ISDN)

B.2.5.1.1.4 Nature of connection

bits BA: satellite indicator

00 (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)

10 (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

01 (one satellite circuit) in the other cases

bit E: echo control indicator

see Recommendation Q.115

B.2.5.1.1.5 Transmission Medium Requirement

00000011 (3.1 kHz)

B.2.5.1.2 Address complete

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

- 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 Recommendation Q.475).

B.2.5.1.3 Call progress

No particular action.

B.2.5.1.4 Answer

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

B.2.5.1.5 Connect

On receipt of a Connect message, an address complete signal is sent according to the backward call indicators parameter (described in B.2.5.1.2 "Address complete"), then an answer signal is sent.

Through connection should occur after sending of the Address complete signal (see Recommendation Q.475).

B.2.5.1.6 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.

B.2.5.2 Call release and call failures

B.2.5.2.1 ISUP side

On receipt of a Release message (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB), the R2 action is depending on the state of the call, as described below:

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 (network)	
CLB + Tone	Z
CLB + Tone	RSC
CLB + Tone	GRS
CLB + Tone	CGB
After SUS (network)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB

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

B.2.5.2.2 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”.

R2 line signalling analogue version: the handling of the interruption control is in accordance with Recommendation Q.416.

R2 line signalling digital version: the handling of the abnormal conditions is in accordance with Recommendation Q.422.

B.2.5.3 Reaction for Supplementary Services

B.2.5.3.1 UUS1 implicit

No impact.

B.2.5.3.2 CLIP/CLIR

No impact.

B.2.5.3.3 CUG

No impact.

B.2.5.3.4 COLP/COLR

No impact.

B.2.5.3.5 Sub-address

No impact.

B.2.5.3.6 Terminal portability

The Suspend/Resume (User initiated) messages are discarded.

B.2.6 Interworking of Signalling System TUP to ISUP

B.2.6.1 Successful call set-up

B.2.6.1.1 Initial address message

The sent Initial address message of ISUP is coded as follows:

B.2.6.1.1.1 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 signal
  according to received digits and digits analysis

6.1.1.2 Calling party's category

The calling party's category is coded according to the calling party's category received on TUP side.

TUP category		ISUP category
0001	French	0001
0010	English	0010
0011	German	0011
0100	Russian	0100
0101	Spanish	0101
0110	*	0110
0111	*	0111
1000	*	1000
1010	ordinary	1010
1011	priority	1011
1100	data	1100
1101	test call	not subject to interworking
1111	payphone	1111
< >		1010

* Available to Administrations for selecting a particular language by mutual agreement.

B.2.6.1.1.3 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 HG: ISUP preference indicator

01 (not required all the way)

bit I: ISDN access indicator

0 (non-ISDN)

B.2.6.1.1.4 Nature of connection

bits BA: satellite indicator

00 (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)

10 (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)

01 (one satellite circuit) in the other cases

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

bits DC: continuity check indicator

00 (not required) if the received continuity check indicator is coded "00" and a continuity check is not performed on the outgoing circuit

01 (required) if a continuity check is performed on the outgoing circuit

10 (performed on a previous circuit) if the received continuity check indicator is coded "10" or "01" and a continuity check is not performed on the outgoing circuit

bit E: echo control indicator

see Recommendation Q.115

B.2.6.1.1.5 Transmission Medium Requirement

00000011 (3.1 kHz)

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

B.2.6.1.2 Continuity message

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

- the continuity check performed on the outgoing circuit, if it is to be made, is completed;
- the speech path across the exchange has been checked and found correct (see 1.4/Q.724); 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 as follows:

- if continuity check is not required on the incoming circuit and on outgoing circuit and is not performed on previous circuit, through connection should occur after sending the Initial address message;
- in the other cases, through connection should occur when the continuity signal is sent (5.6/Q.724).

B.2.6.1.3 Address complete

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

bits BA: type of address complete signal indicators

10 (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)

01 (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)

11 (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 introduction, subclause B.1.3.1

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)

B.2.6.1.4 Forward transfer

After the receipt of the ACM or CON and until the release of the call, on receipt of the Forward transfer signal, the Forward transfer message is sent (FOT).

B.2.6.1.5 Call progress

See "Answer" subclause.

B.2.6.1.6 Answer

On receipt of an Answer message, the answer signal is sent with the following rules:

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

B.2.6.1.7 Connect

On receipt of a Connect message, an Address complete signal is sent according to the backward call indicators parameter:

bits BA: type of address complete signal indicators

10 (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)

01 (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)

11 (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 "address complete" subclause

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 as follows:

- ANN if the charge indicator of the backward call indicators received in the CON is coded "01" (no charge).
- ANC in the other cases.

B.2.6.1.8 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.

B.2.6.2 Call release and call failures

B.2.6.2.1 ISUP side

On receipt of a Release message (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB), the TUP action is depending on the state of the call, as described below:

TUP	ISUP
Reaction	Cause (# 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	88
DPN	65
CFL	< >
After ACM (SUB < > 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)
After ANM or CON	
CLB + Tone	16
CLB + Tone	< >
CLB + Tone	RSC
CLB + Tone	GRS
CLB + Tone	CGB(H)
After SUS (network)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB(H)

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

B.2.6.2.2 TUP side

On receipt of a Clear-forward signal (CLF) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or 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".

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

B.2.6.3 Reaction for Supplementary Services

B.2.6.3.1 UUS1 implicit

No impact.

B.2.6.3.2 CLIP/CLIR

No impact.

B.2.6.3.3 CUG

No impact.

B.2.6.3.4 COLP/COLR

No impact.

B.2.6.3.5 Sub-address

No impact.

B.2.6.3.6 Terminal portability

The Suspend/Resume (User initiated) messages are discarded.