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**Integrated Services Digital Network (ISDN);
Signalling System No.7;
Signalling interworking specification
for ISDN User Part (ISUP) version 2**

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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).

This ETS specifies the interworking applicable to Signalling System No.7 Integrated Services Digital Network (ISDN) User Part (ISUP) version 2.

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1 Scope

This European Telecommunication Standard (ETS) specifies the interworking between the Signalling System No.7 Integrated Services Digital Network (ISDN) User Part (ISUP) version 2 (as specified in ETS 300 356-1 [2]) and the Signalling Systems No.5 (as specified in CCITT Recommendations Q.140 to Q.164 [7]), R2 (as specified in CCITT Recommendations Q.400 to Q.490 [8]), Telephone User Part (TUP) (as specified in CCITT Recommendations Q.721 to Q.725 [17]), and TUP+ (as specified in CEPT Recommendation T/S 43-02 E [18]).

ISUP version 2 (as specified in ETS 300 356-1 [2]) has been designed to allow peer-to-peer operation to a version 1 exchange (as specified in ETS 300 121 [1]) without requiring any knowledge of that situation. This means that different ISUP versions (like version 1 and version 2) cannot be considered as different signalling systems in an exchange. A specific interworking specification is not required, relevant information is contained in ETS 300 356-1 [2].

This specification is applicable to international transit exchanges, but may be used as a basis for the interworking in international gateway exchanges, because ISUP at the national side may also be based on ISUP version 2.

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 amendment 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] ETS 300 356-1 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1993), modified]".
- [3] ETS 300 356-8 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 8: User-to-User Signalling (UUS) supplementary service [ITU-T Recommendation Q.737, clause 1 (1993), modified]".
- [4] ETS 300 343 (1994): "Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling interworking specification for ISDN User Part (ISUP) version 1".
- [5] CCITT Recommendation Q.107 (1988): "Standard sending sequence of forward address information".
- [6] ITU-T Recommendation Q.115 (1993): "Control of echo suppressors and echo cancellers by international switching centres".
- [7] CCITT Recommendations Q.140 to Q.164 (1988): "Specifications of Signalling System No.5".
- [8] CCITT Recommendations Q.400 to Q.490 (1988): "Specifications of Signalling System R2".
- [9] ITU-T Recommendation Q.617 (1993): "Interworking of Signalling Systems - Logic procedures for incoming Signalling System No.7".

- [10] ITU-T Recommendation Q.627 (1993): "Interworking of Signalling Systems - Logic procedures for outgoing Signalling System No.7".
- [11] ITU-T Recommendation Q.646 (1993): "Interworking of Signalling Systems - Logic procedures for interworking of Signalling System No.5 to No.7 (ISUP)".
- [12] ITU-T Recommendation Q.667 (1993): "Interworking of Signalling Systems - Logic procedures for interworking of Signalling System No.7 (TUP) to No.7 (ISUP)".
- [13] ITU-T Recommendation Q.686 (1993): "Interworking of Signalling Systems - Logic procedures for interworking of Signalling System R2 to No.7 (ISUP)".
- [14] ITU-T Recommendation Q.690 (1993): "Interworking of Signalling Systems - Logic procedures for interworking of Signalling System No.7 (ISUP) to No.5".
- [15] ITU-T Recommendation Q.692 (1993): "Interworking of Signalling Systems - Logic procedures for interworking of Signalling System No.7 (ISUP) to No.7 (TUP)".
- [16] ITU-T Recommendation Q.695 (1993): "Interworking of Signalling Systems - Logic procedures for interworking of Signalling System No.7 (ISUP) to R2".
- [17] CCITT Recommendations Q.721 to Q.725 (1988): "Specifications of the Signalling System No.7 Telephone User Part (TUP)".
- [18] CEPT Recommendation T/S 43-02 E (1988): "Signalling System Telephone User Part "Plus" (TUP+)".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

backward direction: Means interworking in opposite direction to the call set-up.

forward direction: Means interworking in the call set-up direction.

"interworking from Signalling System X to Signalling System Y": Describes the signalling interworking for traffic which is routed (in call set-up direction) from an incoming Signalling System X trunk-group to an outgoing Signalling System Y trunk-group.

3.2 Symbols

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

<> "else", i.e. all other values

3.3 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
CBK	Clear-Back signal
CCF	Continuity-failure signal
CFL	Call-failure signal
CGB	Circuit Group Blocking message
CGB(H)	Circuit Group Blocking (Hardware) message
CGC	Circuit Group Congestion 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
FRJ	Facility Reject message
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
IHECD	Incoming Half Echo Control Device
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LLC	Low Layer Compatibility
LOS	Line-Out-of-Service signal
MCID	Malicious Call Identification
NNC	National Network Congestion signal
NRM	Network Resource Management message
NRU	Network Resource Unavailable signal
OHECD	Outgoing Half Echo Control Device
PRN	location indicator value "Private network serving the remote user"
REL	Release message
RES	Resume message
RN	location indicator value "Public network serving the remote user"
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
TMR	Transmission Medium Requirement
TMU	Transmission Medium Used
TUP	Telephone User Part
TUP+	Telephone User Part "Plus"

U	location indicator value "User"
UNN	Unallocated National Number
USI	User Service Information
UUI	User-to-User Information
UUS	User-to-User Signalling
UUS1/2/3	UUS service 1/2/3

4 General considerations

4.1 General

ITU-T Recommendations Q.617 [9], Q.627 [10], Q.646 [11], Q.667 [12], Q.686 [13], Q.690 [14], Q.692 [15] and Q.695 [16] provide interworking specifications for ISUP version 1 (as specified in ETS 300 121 [1]), 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 of the ITU-T interworking SDL specifications ([9] to [16]) 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 routing (e.g. analysis of the ISUP preference indicator and the transmission medium requirement parameter);
- compatibility procedure;
- parameters and messages that are discarded because of interworking when they have no impact on call processing.

Items which are valid for both ISUP version 1 (ETS 300 121 [1]) and ISUP version 2 (ETS 300 356-1 [2]) are identical in the interworking specification for ISUP version 1 (ETS 300 343 [4]) and this ETS.

4.2 Working assumptions

This ETS is based on the assumptions that:

- TUP does not support any supplementary service but the "digital connectivity";
- TUP only supporting the Initial Address Message (IAM), but not the Initial address message with Additional Information (IAI), is described.

5 Miscellaneous interworking aspects

5.1 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 300 356-1 [2], ITU-T Recommendation Q.115 [6], CCITT Recommendation Q.724 [17], and CEPT Recommendation T/S 43-02 E [18]).

5.1.1 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) and the delay value is lower than the allowed one or not available and the exchange has not sufficient information to determine whether echo control is required for the outgoing circuit, then bit N of the echo control device indicator of the Address Complete Message (ACM) is coded "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 routing 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 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 bit N of the echo control device indicator is coded "0".

For further information, refer to annex A.

5.1.2 Interworking from ISUP to TUP/TUP+

If bit E of the echo control device indicator received in the IAM is coded "0" (no outgoing half echo control device is included) and the delay value is lower than the allowed one or not available and the exchange has not sufficient information to determine whether echo control is required for the outgoing circuit, then bit N of the echo control device indicator of the ACM is coded as received in the address complete message (TUP, TUP+: bit D of the incoming half echo suppressor).

5.1.3 Interworking from TUP/TUP+ to ISUP

- a) If bit G of the message indicators received in the IAM/IAI 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).

5.2 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. |

5.3 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 ANM, an Answer signal, Charge (ANC) is sent;
- if "no charge" is received in the charge indicator in the ANM, an Answer signal, No charge (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 and the last significant information (unequal to "no indication") received in one of the ACM or CPG messages is "no charge", then ANN is sent;
- in all other cases, ANC is sent.

5.4 Simple segmentation

As far as the simple segmentation procedure is concerned, the interworking exchange should act as a local exchange as described in ETS 300 356-1 [2], if a message is received with the simple segmentation indicator set to indicate that additional information is available.

5.5 Handling an early ACM when interworking from TUP to ISUP

After receipt of an early ACM ("no indication") from a destination exchange, it has to be ensured that a correct indication is returned to the calling user when the called user is busy. Therefore, when an ACM has been sent on the TUP side and an ISUP Release (REL) message with cause #17 "subscriber busy" is subsequently received, busy tone shall be returned to the calling user.

NOTE: This procedure is not suitable for data applications, i.e. TUP bit J=1. It is recommended to use ISUP signalling instead of TUP signalling for this type of applications. However, if TUP signalling is used, then the delayed sending of ACM may be considered.

6 Interworking

6.1 Interworking from Signalling System ISUP to Signalling System No.5

6.1.1 Forward direction

6.1.1.1 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 according to CCITT Recommendation Q.152 [7]).

6.1.1.2 Address information sending sequence

The sending sequence of address information is specified in CCITT Recommendation Q.107 [5].

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.		

6.1.1.3 Forward transfer

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

6.1.1.4 Call release and call failures

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 (CLF) is sent.

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

6.1.2 Backward direction

6.1.2.1 Address complete

As soon as the proceed-to-send signal is received, the ACM 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 clause 5 of this ETS, ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

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

6.1.2.2 Answer

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

6.1.2.3 Clear-back/re-answer sequence

On receipt of the Clear-Back signal (CBK), 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.

6.1.2.4 Call release and call failures

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

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

6.1.2.5 Fallback

If the circuit controlled by ISUP is satisfying the connection type requirements of "64 kbit/s unrestricted preferred", the interworking exchange should initiate appropriate actions and procedures. The interworking exchange should include the Transmission Medium Used (TMU) parameter (which has been set according to the fallback connection type indicated in the Transmission Medium Requirement (TMR) prime parameter) in the ACM indicating that fallback has occurred for this call (refer to ETS 300 356-1 [2]).

6.1.2.6 Propagation delay

The interworking exchange shall store the propagation delay value accumulated up to this point until the call is released. If a delay value referring to the part of the connection where the procedure is not supported is available, this delay value shall be added to the stored one.

The interworking exchange shall include the call history information parameter, set to the stored delay value (refer to ETS 300 356-1 [2]), in the ANM.

6.1.3 Considerations on supplementary services

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

If a request of COLP is included in the received IAM (bit H=1 of connected line request indicator), the ANM is sent with the connected number parameter with indication "address not available". The call continues according to the basic call procedures.

- connected number parameter:
 - nature of address indicator
0000000
 - numbering plan indicator
000
 - address presentation restricted
10 (address not available)
 - screening indicator
11 (network provided)

6.1.3.2 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.

6.1.3.3 User-to-User Signalling (UUS)

6.1.3.3.1 UUS Service 1 (UUS1) implicit

The interworking indicator in the backward call indicators parameter in the ACM is set to "interworking encountered". The call continues according to the basic call procedures.

6.1.3.3.2 UUS1 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 1 not provided". The call continues according to the basic call procedures.

6.1.3.3.3 UUS Service 2 (UUS2) explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 2 not provided". The call continues according to the basic call procedures.

6.1.3.3.4 UUS Service 3 (UUS3) explicit, non-essential, requested during call set-up

The user-to-user indicators parameter in the ACM contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.1.3.3.5 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the Facility Reject message (FRJ) contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.2 Interworking from Signalling System ISUP to Signalling System R2

6.2.1 Forward direction

6.2.1.1 Address information sending sequence

The sending sequence of address information is specified in CCITT Recommendation Q.107 [5].

6.2.1.2 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.	

6.2.1.3 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

6.2.1.4 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 [8]).

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.

6.2.1.5 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).

6.2.1.6 Echo control

In case of a transit call, country code indicators I-11, I-12 and I-14 are sent according to ITU-T Recommendation Q.115 [6].

In case of a terminating call, A-14 is replied to according to ITU-T Recommendation Q.115 [6] (refer also to ETS 300 356-1 [2]).

6.2.1.7 Forward transfer

The forward transfer message is discarded.

6.2.1.8 Call release and call failure

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

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

6.2.2 Backward direction

6.2.2.1 Address complete

On receipt of an address complete signal on the R2 side, the ACM 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 clause 5 of this ETS, ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

The speech condition is set up when the ACM is sent (see also CCITT Recommendation Q.475 [8]).

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 6.2.1.3).

6.2.2.2 Answer

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

6.2.2.3 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/re-answer (suspend/resume) sequences is not limited.

6.2.2.4 Call release and call failures

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

Table 4

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 B-15

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

For the R2 line signalling analogue version, the handling of the interruption control shall be according to CCITT Recommendation Q.416 [8].

For the R2 line signalling digital version, the handling of the abnormal conditions shall be according to CCITT Recommendation Q.422 [8].

6.2.2.5 Fallback

If the circuit controlled by ISUP is satisfying the connection type requirements of "64 kbit/s unrestricted preferred", the interworking exchange should initiate appropriate actions and procedures. The interworking exchange should include the TMU parameter (which has been set according to the fallback connection type indicated in the TMR prime parameter) in the ACM, indicating that fallback has occurred for this call (refer to ETS 300 356-1 [2]).

6.2.2.6 Propagation delay

The interworking exchange shall store the propagation delay value accumulated up to this point until the call is released. If a delay value referring to the part of the connection where the procedure is not supported is available, this delay value shall be added to the stored one.

The interworking exchange shall include the call history information parameter, set to the stored delay value (refer to ETS 300 356-1 [2]), in the ANM.

6.2.3 Considerations on supplementary services

6.2.3.1 COLP/COLR

If a request of COLP is included in the received IAM (bit H=1 of connected line request indicator), ANM is sent with the connected number parameter with indication "address not available". The call continues according to the basic call procedures.

- connected number parameter:

nature of address indicator
0000000

numbering plan indicator
000

address presentation restricted
10 (address not available)

screening indicator
11 (network provided)

6.2.3.2 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.

6.2.3.3 UUS

6.2.3.3.1 UUS1 implicit

The interworking indicator in the backward call indicators parameter in the ACM is set to "interworking encountered". The call continues according to the basic call procedures.

6.2.3.3.2 UUS1 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 1 not provided". The call continues according to the basic call procedures.

6.2.3.3.3 UUS2 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 2 not provided". The call continues according to the basic call procedures.

6.2.3.3.4 UUS3 explicit, non-essential, requested during call set-up

The user-to-user indicators parameter in the ACM contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.2.3.3.5 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.3 Interworking from Signalling System ISUP to Signalling System TUP

6.3.1 Forward direction

6.3.1.1 Initial address message

The sent IAM of TUP is coded according to subclauses 6.3.1.1.1 and 6.3.1.1.2.

6.3.1.1.1 Calling party's 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.		

6.3.1.1.2 Message indicators

bits	B A:	nature of address indicator
	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 the 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 no continuity check has to be performed on the outgoing circuit and - the received continuity check indicator is coded "00"; or - the received continuity check indicator is coded "10" or "01" and COT is received before sending the IAM
	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 and the continuity check on the incoming or a previous circuit is not completed
bit	G:	echo suppressor indicator see ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]
bit	I:	redirected call indicator
	1	if the redirecting indicator in the redirection information parameter is set to "011" (call diverted)
	0	else

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)

NOTE: In case of fallback, the received TMR prime parameter is considered instead of the TMR parameter.

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)

6.3.1.2 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 [17], § 1.4); and
- the receipt of a continuity message (continuity check successful) from the preceding exchange, if the continuity check indicator in the received IAM indicates that continuity check is being (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 IAM;
- in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [17]).

6.3.1.3 Forward transfer

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

6.3.1.4 Call release and call failures

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

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

6.3.2 Backward direction

6.3.2.1 General request message

6.3.2.1.1 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 IAM (see subclause 6.3.1.1).

6.3.2.1.2 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 signals:

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

6.3.2.2 Address complete

On receipt of an address complete message on the TUP side, the ACM 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 clause 5 of this ETS and ETS 300 356-1 [2]

6.3.2.3 Answer

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

- without backward call indicators, if answer signal, unqualified, is received;

- 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

6.3.2.4 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 re-answer signal, the resume (network) message is sent.

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

6.3.2.5 Call release and call failures

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 cause values as specified in table 6.

Table 6

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 (note)
31	GRS (note)
31	HGB (note)
NOTE: Received after receipt of any backward signal.	

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

6.3.2.6 Fallback

If the circuit controlled by ISUP is satisfying the connection type requirements of "64 kbit/s unrestricted preferred", the interworking exchange should initiate appropriate actions and procedures. The interworking exchange should include the TMU parameter (which has been set according to the fallback connection type indicated in the TMR prime parameter) in the ACM, indicating that fallback has occurred for this call (refer to ETS 300 356-1 [2]).

6.3.2.7 Propagation delay

The interworking exchange shall store the propagation delay value accumulated up to this point until the call is released. If a delay value referring to the part of the connection where the procedure is not supported is available, this delay value shall be added to the stored one.

The interworking exchange shall include the call history information parameter, set to the stored delay value (refer to ETS 300 356-1 [2]), in the ANM.

6.3.3 Considerations on supplementary services

6.3.3.1 COLP/COLR

If a request of COLP is included in the received IAM (bit H=1 of connected line request indicator), the ANM is sent with the connected number parameter with indication "address not available". The call continues according to the basic call procedures.

- connected number parameter:
 - nature of address indicator
0000000
 - numbering plan indicator
000
 - address presentation restricted
10 (address not available)
 - screening indicator
11 (network provided)

6.3.3.2 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.

6.3.3.3 UUS

6.3.3.3.1 UUS1 implicit

The ISUP indicator in the backward call indicators parameter in the ACM is set to "ISUP not used all the way". The call continues according to the basic call procedures.

6.3.3.3.2 UUS1 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 1 not provided". The call continues according to the basic call procedures.

6.3.3.3.3 UUS2 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 2 not provided". The call continues according to the basic call procedures.

6.3.3.3.4 UUS3 explicit, non-essential, requested during call set-up

The user-to-user indicators parameter in the ACM contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.3.3.3.5 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

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

6.4.1 Forward direction

6.4.1.1 Initial address message

The sent IAM of ISUP is coded according to subclauses 6.4.1.1.1 to 6.4.1.1.6.

6.4.1.1.1 Called party number

nature of address indicator

0000011 (national number) if terminating 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

6.4.1.1.2 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.		

6.4.1.1.3 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)

6.4.1.1.4 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 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 ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

6.4.1.1.5 Transmission medium requirement

00000011 (3,1 kHz)

6.4.1.1.6 Propagation delay

Because the signalling systems not supporting the procedure do not include the propagation delay counter, the interworking exchange shall insert the propagation delay counter in the IAM, setting it to 0 ms. If a delay value referring to the part of the connection where the procedure is not supported is available, the propagation delay counter shall be set to this delay value.

The calculated delay value in the interworking exchange shall reflect the delay incurred on the preceding circuit(s). This includes delay values corresponding to satellite delays, if applicable.

Prior to sending the IAM, the propagation delay counter shall be increased according to the value of the outgoing circuit chosen (refer to ETS 300 356-1 [2]).

6.4.1.2 Forward transfer

After the receipt of the ACM or a Connect message (CON) and until the release of the call, on receipt of the forward transfer signal (f2), the forward transfer message is sent.

6.4.1.3 Call release and call failures

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

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

6.4.2 Backward direction

6.4.2.1 Address complete

On receipt of an ACM, the state of the call is "waiting for answer".

6.4.2.2 Answer

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

6.4.2.3 Connect

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

6.4.2.4 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/re-answer) sequences is not limited.

6.4.2.5 Call release and call failures

On receipt of a release message, a reset circuit message, a circuit group reset message, or a 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 (#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 (network initiated)	
f2+Tone	#Z
f2+Tone	RSC
f2+Tone	GRS
f2+Tone	CGB
after SUS (network initiated)	
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.

6.4.3 Considerations on supplementary services

6.4.3.1 Malicious Call Identification (MCID)

On receipt of the identification request message with bit A of the MCID request indicator set to 1 "MCID requested", an identification response message is returned with bit A of the MCID response indicator set to 0 "not included".

6.4.3.2 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.5 Interworking from Signalling System R2 to Signalling System ISUP

6.5.1 Forward direction

6.5.1.1 Initial address message

The sent IAM of ISUP is coded as follows:

6.5.1.1.1 Called party number

nature of address indicator
000011 (national number) if terminating 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

6.5.1.1.2 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 A-5 (if sent) on the R2 side, as specified in table 9.

Table 9

R2		IAM category	
L or D	II		
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.

6.5.1.1.3 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)

6.5.1.1.4 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 ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

6.5.1.1.5 Transmission medium requirement

00000011 (3,1 kHz)

6.5.1.1.6 Propagation delay

Because the signalling systems not supporting the procedure do not include the propagation delay counter, the interworking exchange shall insert the propagation delay counter in the IAM, setting it to 0 ms. If a delay value referring to the part of the connection where the procedure is not supported is available, the propagation delay counter shall be set to this delay value.

The calculated delay value in the interworking exchange shall reflect the delay incurred on the preceding circuit(s). This includes delay values corresponding to satellite delays, if applicable.

Prior to sending the IAM, the propagation delay counter shall be increased according to the value of the outgoing circuit chosen (refer to ETS 300 356-1 [2]).

6.5.1.2 Call release and call failures

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

In case of failure due to the R2 side (e.g. example timer expiry) the release message is sent with 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 [8].

For the R2 line signalling digital version, the handling of the abnormal conditions is in accordance with CCITT Recommendation Q.422 [8].

6.5.2 Backward direction

6.5.2.1 Address complete

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

- if the charge indicator of the backward call indicators parameter is coded "01" (no charge), B-7 is sent;
- if the called party's status indicator of the backward call indicators parameter is coded "01" (subscriber free) and if the charge indicator of the backward call 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 [8]).

6.5.2.2 Answer

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

6.5.2.3 Connect

On receipt of CON, an address complete signal is sent according to the backward call indicators parameter (as described in subclause 6.5.2.1), followed by an answer signal.

Through connection should occur after sending of the address complete signal (see CCITT Recommendation Q.475 [8]).

6.5.2.4 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/re-answer) sequences is not limited.

6.5.2.5 Call release and call failures

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 (#Z)
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 initiated)	
CBK+Tone	#Z
CBK+Tone	RSC
CBK+Tone	GRS
CBK+Tone	CGB
after SUS (network initiated)	
Tone	#Z
Tone	RSC
Tone	GRS
Tone	CGB

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

6.5.3 Considerations on supplementary services

6.5.3.1 MCID

On receipt of the identification request message with bit A of the MCID request indicator set to 1 "MCID requested", an identification response message is returned with bit A of the MCID response indicator set to 0 "not included".

6.5.3.2 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.6 Interworking from Signalling System TUP to Signalling System ISUP

6.6.1 Forward direction

6.6.1.1 Initial address message

The sent IAM of ISUP is coded as specified in subclauses 6.6.1.1.1 to 6.6.1.1.6.

6.6.1.1.1 Called party number

nature of address indicator:

0000011 (national number) if terminating 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

6.6.1.1.2 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.	

6.6.1.1.3 Forward call indicators

bit	D:	interworking indicator
	0	(no 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)

6.6.1.1.4 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 supposed 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 no continuity check has to be performed on the outgoing circuit and - the received continuity check indicator is coded "00"; or - the received continuity check indicator is coded "10" or "01" and COT is received before sending the IAM
	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 a continuity check is not performed on the outgoing circuit and the continuity check on the incoming or a previous circuit is not completed
bit	E:	echo control indicator see ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

6.6.1.1.5 Transmission medium requirement

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

6.6.1.1.6 Redirection information

If the redirected call indicator in the message indicators is set to 1 "redirected call", then the redirection information parameter is coded as follows:

bits	C B A:	
	0 1 1	(call diverted)
bits	H G F E:	
	0 0 0 0	(unknown)
bits	K J I:	
	1 0 1	(five)
bit	L:	
	0	(reserved for national use)
bits	P O N M:	
	0 0 0 0	(unknown/not available)

6.6.1.1.7 Propagation delay

Because the signalling systems not supporting the procedure do not include the propagation delay counter, the interworking exchange shall insert the propagation delay counter in the IAM, setting it to 0 ms. If a delay value referring to the part of the connection where the procedure is not supported is available, the propagation delay counter shall be set to this delay value.

The calculated delay value in the interworking exchange shall reflect the delay incurred on the preceding circuit(s). This includes delay values corresponding to satellite delays, if applicable.

Prior to sending the IAM, the propagation delay counter shall be increased according to the value of the outgoing circuit chosen (refer to ETS 300 356-1 [2]).

6.6.1.2 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 CCITT Recommendation Q.724 [17] § 1.4); and
- if the continuity check indicator in the received IAM 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 IAM;
- in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [17]).

6.6.1.3 Forward transfer

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

6.6.1.4 Call release and call failures

On receipt of a clear-forward signal, 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 cause values 16, 31, 31, 31, 31, respectively, and the location "beyond an interworking point".

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

Table 12 summarises the possible cause values.

Table 12

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

6.6.2 Backward direction

6.6.2.1 Address complete

On receipt of an ACM, 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 clause 5 of this ETS and ETS 300 356-1 [2]
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)

6.6.2.2 Answer

On receipt of an ANM, the answer signal is sent according to 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 coded "10" (charge), ANC is sent;

- if the charge indicator of the backward call indicators received in the ANM is coded "00" (no indication) or no backward call indicators are included in the ANM, then ANN is sent if a previous charge indicator of the backward call indicators received in the ACM or CPG is coded "01" (no charge);
- in all other cases, ANC is sent.

6.6.2.3 Connect

On receipt of CON, 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 clause 5 of this ETS and ETS 300 356-1 [2]
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.

6.6.2.4 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.

6.6.2.5 Call release and call failures

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 13.

Table 13

TUP reaction	ISUP 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	87
ACB	88
DPN	65
CFL	<>
after ACM (subscriber not free) and before ANM	
CGC	34
CFL	31
(note)	17
CFL	<>
CFL	RSC
CFL	GRS
CFL	CGB(H)
after ACM (subscriber free) and before ANM	
CFL	#Z
CFL	RSC
CFL	GRS
CFL	CGB(H)
after ANM or CON	
CBK+Tone	16
CBK+Tone	<>
CBK+Tone	RSC
CBK+Tone	GRS
CBK+Tone	CGB(H)
after SUS (network initiated)	
Tone	#Z
Tone	RSC
Tone	GRS
Tone	CGB(H)
NOTE:	See subclause 5.5.

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

6.6.3 Considerations on supplementary services

6.6.3.1 MCID

On receipt of the identification request message with bit A of the MCID request indicator set to 1 "MCID requested", an identification response message is returned with bit A of the MCID response indicator set to 0 "not included".

6.6.3.2 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.7 Interworking from Signalling System ISUP to Signalling System TUP+

6.7.1 Forward direction

6.7.1.1 Initial address message with additional information

The sent IAM/IAI of TUP+ is coded as follows:

6.7.1.1.1 Calling party's 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.

6.7.1.1.2 Calling access signalling capability

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

6.7.1.1.3 Message indicators

bits B A: nature of address indicator
 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 the 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 no continuity check has to be performed on the outgoing circuit and - the received continuity check indicator is coded "00"; or - the received continuity check indicator is coded "10" or "01" and COT is received before sending the IAM.
	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 a continuity check is not performed on the outgoing circuit and the continuity check on the incoming or a previous circuit is not completed.
bit	G:	echo suppressor indicator see ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]
bit	I:	redirected call indicator
	1	if the redirection information parameter is received
	0	else
bit	L:	TUP+ signalling path indicator
	0	or
	1	coded as the received ISDN user part indicator in the forward call indicators

6.7.1.1.4 First indicator octet

bit	B:	CUG information indicator
	1	if the optional forward indicators parameter and the CUG 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 routing information indicator
	1	
bit	E:	calling line identity indicator
	1	

6.7.1.1.5 Closed user group information

See subclause 6.7.3.3.

6.7.1.1.6 Additional calling party information

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

See subclause 6.7.4.

6.7.1.1.6.2 Calling party subaddress

See subclause 6.7.3.2.

6.7.1.1.6.3 Called party subaddress

See subclause 6.7.3.5.

6.7.1.1.6.4 User-to-user information

See subclause 6.7.3.1.1.

6.7.1.1.7 Additional routing 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" (speech)
	0 1 0 0 0	(64 kbit/s) if the received TMR parameter is coded "00000010" (64 kbit/s unrestricted)
	1 0 0 0 0	(3,1 kHz audio) if the received TMR parameter is coded "00000011" (3,1 kHz audio)

NOTE: In case of fallback, the received TMR prime parameter is considered instead of the TMR parameter.

- 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)

6.7.1.1.8 Calling line identity

See subclause 6.7.3.2.

6.7.1.2 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 CCITT Recommendation Q.724 [17] § 1.4); and
- if the continuity check indicator in the received IAM 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 IAM;
- in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [17]).

6.7.1.3 Forward transfer

The forward transfer message is discarded.

6.7.1.4 Call release and call failures

On receipt of a release message, a reset circuit message, a circuit group reset message, a circuit group blocking (hardware) message, or a continuity (failed) message, 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 6.7.3.1.

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

6.7.2 Backward direction

6.7.2.1 General request message

6.7.2.1.1 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.

6.7.2.2 Address complete

On receipt of a address complete message on the TUP+ side, the ACM 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" (Q.931 called access)
bit	N:	echo control device indicator
		see clause 5 of this ETS, ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

- user-to-user information:

if present, the user-to-user information is transferred as received (see subclause 6.7.3.1.1).

6.7.2.3 Answer

On receipt of an Answer signal, the ANM 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	DC:	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 6.7.3.1.1).

6.7.2.4 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 the TUP+ side and a release message is sent on the ISUP side with the location "beyond an interworking point" and 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 6.7.3.1.1).

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.

6.7.2.5 Call release and call failures

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 specified in table 15.

Table 15

Cause #	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 6.7.3.1.1).

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

6.7.2.6 Fallback

If the circuit controlled by ISUP is satisfying the connection type requirements of "64 kbit/s unrestricted preferred", the interworking exchange should initiate appropriate actions and procedures. The interworking exchange should include the TMU parameter (which has been set according to the fallback connection type indicated in the TMR prime parameter) in the ACM, indicating that fallback has occurred for this call (refer to ETS 300 356-1 [2]).

6.7.2.7 Propagation delay

The interworking exchange shall store the propagation delay value accumulated up to this point until the call is released. If a delay value referring to the part of the connection where the procedure is not supported is available, this delay value shall be added to the stored one.

The interworking exchange shall include in the ANM the call history information parameter set to the stored delay value (refer to ETS 300 356-1 [2]).

6.7.3 Considerations on supplementary services

6.7.3.1 UUS

6.7.3.1.1 UUS1 implicit

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

The UUI received on the TUP+ side is transferred transparently.

6.7.3.1.2 UUS1 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 1 not provided". In case of UUI discarded from IAM (or a segmentation message), the user-to-user indicators parameter contains the indication "UUI discarded by the network". The call continues according to the basic call procedures.

6.7.3.1.3 UUS2 explicit, non-essential

The user-to-user indicators parameter in the ACM contains the indication "service 2 not provided". The call continues according to the basic call procedures.

6.7.3.1.4 UUS3 explicit, non-essential, requested during call set-up

The user-to-user indicators parameter in the ACM contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.7.3.1.5 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.7.3.1.6 UUS2, explicit, essential

The call is released. The REL message is sent with the cause value 29 and the diagnostic field set according to the stage 3 description of the UUS service (ETS 300 356-8 [3]).

6.7.3.1.7 UUS3 explicit, essential, requested during call set-up

The call is released. The REL message is sent with the cause value 29 and the diagnostic field set according to the stage 3 description of the UUS service (ETS 300 356-8 [3]).

6.7.3.2 CLIP/CLIR

If no calling party number parameter is received in the IAM, 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 IAM, 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

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

The generic number parameter is discarded.

6.7.3.3 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.

- interlock code:

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

6.7.3.4 COLP/COLR

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

6.7.3.5 Subaddressing

Up to 7 octets, the called party subaddress is transferred as received without any check of the content. Otherwise, the whole subaddress information element is discarded. The call continues according to the basic call procedures.

6.7.4 Coding of bearer capability and high layer compatibility

6.7.4.1 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:
- the octet 1 (identifier) is created;
 - the octet 2 (length) is calculated;
 - starting with octet 3, the USI (BC) is transferred as received;
- b) If a BC is received in the USI parameter and the 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:
- the octet 1 (identifier) is created;
 - the 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 USI parameter and the 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:
- the octet 1 (identifier) is created;
 - the octet 2 (length) is calculated;
 - starting with octet 3, the USI (BC) is transferred as received.

6.7.4.2 High layer compatibility

The HLC information is transferred as received.

6.8 Interworking of Signalling System TUP+ to Signalling System ISUP

6.8.1 Forward direction

6.8.1.1 Initial address message

The sent IAM of ISUP is coded as follows:

6.8.1.1.1 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 signal

according to received digits and digits analysis

6.8.1.1.2 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 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.	

6.8.1.1.3 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 routing information is coded "00" (any signalling system)
	0 0	(preferred all the way) if the signalling capability requested in the additional routing information is coded "10" (TUP+ preferred)
	1 0	(required all the way) if the signalling capability requested in the additional routing information is coded "11" (TUP+ mandatory)
bit	I:	ISDN access indicator
	0	(non-ISDN) or
	1	(ISDN) as coded the access signalling capabilities indicator

6.8.1.1.4 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 supposed 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 no continuity check has to be performed on the outgoing circuit
		and
		- the received continuity check indicator is coded "00"; or
		- the received continuity check indicator is coded "10" or "01" and COT is received before sending the IAM
	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 a continuity check is not performed on the outgoing circuit and the continuity check on the incoming or a previous circuit is not completed
bit	E:	echo control indicator
		see ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

6.8.1.1.5 Transmission medium requirement

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

6.8.1.1.6 Access transport

See subclauses 6.8.3.3 and 6.8.4.

6.8.1.1.7 Optional forward call indicators

bits	B A:	CUG call indicator
		see subclause 6.8.3.4
bit	H:	connected line requested indicator
	0	(not requested)

6.8.1.1.8 Closed user group interlock code

6.8.1.1.9 User-to-user information

If present, the user-to-user information is transferred as received according to subclause 6.8.3.1.

6.8.1.1.10 User service information

See subclause 6.8.4.

6.8.1.1.11 Redirection information

If the redirected call indicator in the message indicators is set to "1" (redirected call), then the redirection information parameter is coded as follows:

bits	C B A:	
	0 1 1	(call diverted)
bits	H G F E:	
	0 0 0 0	(unknown)

bits K J I:
1 0 1 (five)

bit L:
0 (reserved for national use)

bits P O N M:
0 0 0 0 (unknown/not available)

6.8.1.1.12 Propagation delay

Because the signalling systems not supporting the procedure do not include the propagation delay counter, the interworking exchange shall insert the propagation delay counter in the IAM, setting it to 0 ms. If a delay value referring to the part of the connection where the procedure is not supported is available, the propagation delay counter shall be set to this delay value.

The calculated delay value in the interworking exchange shall reflect the delay incurred on the preceding circuit(s). This includes delay values corresponding to satellite delays, if applicable.

Prior to sending the IAM, the propagation delay counter shall be increased according to the value of the outgoing circuit chosen (refer to ETS 300 356-1 [2]).

6.8.1.2 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 CCITT Recommendation Q.724 [17] § 1.4); and
- if the continuity check indicator in the received IAM 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 IAM;
- in the other cases, through connection should occur when the continuity signal is sent (see CCITT Recommendation Q.724 [17]).

6.8.1.3 Call release and call failures

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 cause values 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 6.8.3.1).

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

Table 17 summarises the possible cause values.

Table 17

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

6.8.2 Backward direction

6.8.2.1 Address complete

On receipt of an ACM, 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 clause 5 of this ETS, ITU-T Recommendation Q.115 [6] and ETS 300 356-1 [2]

- 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 (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 6.8.3.1.

6.8.2.2 Answer

On receipt of an ANM, 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 coded "10" (charge), ANC is sent;

- if the charge indicator of the backward call indicators received in the ANM is coded "00" (no indication) or no backward call indicators are included in the ANM, then ANN is sent if a previous charge indicator of the backward call indicators received in the ACM or CPG is coded "01" (no charge);
- in all other cases, ANC is sent.
- user-to-user information:
if present in the ANM, the user-to-user information is transferred according to subclause 6.8.3.1.

6.8.2.3 Connect

On receipt of CON, 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 6.8.2.1
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	(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 6.8.3.1.

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.

6.8.2.4 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.

6.8.2.5 Call release and call failures

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 18.

Table 18

TUP+ reaction	ISUP cause (#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	87
ACB	88
ACB	55
NRU	65, 29
CFL	<>
after ACM (subscriber 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)
after ACM (subscriber 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)
(continued)	

Table 18 (concluded)

TUP+ reaction	ISUP cause (#Z + location) or received message
after ANM or CON	
CBK+Tone	16
CBK+Tone	<>
CBK+Tone	RSC
CBK+Tone	GRS
CBK+Tone	CGB(H)
after SUS (network initiated)	
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 6.8.3.1, if the message sent on the TUP+ side can transport it (e.g. EUM, CBK).

6.8.3 Considerations on supplementary services

6.8.3.1 UUS1 implicit

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

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 UUI is discarded.

A possible "UUI discarded by the network" information is lost.

6.8.3.2 UUS3 explicit, non-essential, requested after call set-up

The user-to-user indicators parameter in the FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.8.3.3 CLIP/CLIR

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

- 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
 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

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

6.8.3.4 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;

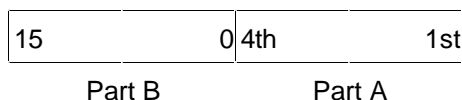


Figure 3: Receipt of the interlock code

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

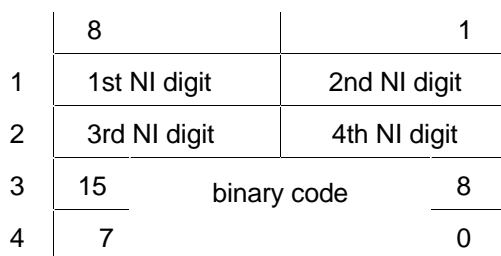


Figure 4: Transmission of the interlock code

6.8.3.5 Subaddressing

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

6.8.3.6 MCID

On receipt of the identification request message with bit A of the MCID request indicator set to 1 "MCID requested" and:

- if the calling party number is available, an identification response message is returned with bit A of the MCID response indicator set to 1 "included". The calling party number is included in the calling party number parameter;
- if the calling party number is not available, an identification response message is returned with bit A of the MCID response indicator set to 0 "not included".

6.8.4 Coding of bearer capability and high layer compatibility

6.8.4.1 Bearer capability

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

6.8.4.2 High layer compatibility

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

Annex A (informative): Echo control procedure in case of interworking

A.1 Interworking from Signalling System No.5/R2 to ISUP

A.1.1 Forward direction

The echo control procedure invoked at the interworking exchange is based on:

- the knowledge that an outgoing echo control device is located or not closer to the call source;
 - the calculated delay value for the connection at the exchange;
 - the routing data.
- a) If the exchange knows that an outgoing echo control device is located closer to the call source (nature of the incoming circuit or receipt of I-14 en R2), the following actions occur:
- 1) the exchange has echo control devices available:
 - the echo control device indicator of the nature of the connection indicators parameter is set;
 - an Incoming Half Echo Control Device (IHECD) is reserved, provided the exchange does not know that the succeeding exchange will include an IHECD;
 - any Outgoing Half Echo Control Device (OHECD) is disabled;
 - 2) the exchange does not have echo control devices available:
 - the echo control device indicator of the nature of the connection indicators parameter is set.
- b) If the exchange knows that an outgoing echo control device is not located closer to the call source (nature of the incoming circuit or receipt of I-12 or I-11 in R2), the action depends on the delay value or the routing data:
- 1) if the delay value is higher than the allowed value or if the exchange knows by routing data that echo control is necessary or I-11 is received, the following actions occur:
 - the exchange has echo control devices available:
 - the echo control device indicator of the nature of the connection indicators parameter is set;
 - an IHECD is reserved, provided the exchange does not know that the succeeding exchange will include an IHECD;
 - an OHECD is reserved;
 - the exchange does not have echo control devices available:
 - the echo control device indicator of the nature of the connection indicators parameter is not set;
 - 2) if the delay value is lower than the allowed value or if the exchange knows by routing data that echo control is not necessary the following actions occur:
 - the echo control device indicator of the nature of the connection indicators parameter is not set.

A.1.2 Backward direction

The actions at the interworking exchange depends on the information received in the echo control device indicator in the backward call indicators in the ACM and CON and the echo control information parameter in the ACM, CON and Network Resource Management (NRM) messages and if there are any echo control devices available and if an OHECD has been included in the preceding network:

- a) If the echo control device indicator in the ACM, CON is not set, the actions depend on whether there is a reserved IHECD for the call or not:
 - 1) if there is a reserved IHECD for the call the following actions are taken:
 - the reserved IHECD is included;
 - 2) if there is no IHECD, no special action is taken.
- b) If the echo control device indicator in the ACM, CON is set, or the echo control information parameter in the NRM message indicates that an IHECD is included the actions depend on whether there is a reserved IHECD for the call or not.
 - 1) if the exchange has reserved or included an IHECD, it shall release the IHECD;
 - 2) if the exchange has not reserved or included an IHECD, no special action is taken.
- c) If the echo control information parameter in the ACM, CON and NRM messages is indicating that an IHECD is requested, the actions are independent on whether the echo control device indicator in the backward call indicators is set or not or the NRM indicates that an IHECD is included or not:
 - 1) if there is an available half echo control device in the exchange:
 - an IHECD is included;
 - 2) if no IHECD is available, no special action is taken.
- d) If the echo control information parameter in the ACM, CON and NRM messages is indicating that an OHECD is requested, the actions depend on whether an OHECD is available or not and if there is or not an OHECD reserved in the preceding network:
 - 1) if there is no OHECD reserved in the preceding network (nature of the incoming circuit or receipt of I-12, I-11), the following actions are taken:
 - if there are echo control devices available:
 - an OHECD is included;
 - if the received echo control device parameter indicates that an OHECD has been included at the succeeding exchange, a NRM message is sent in the forward direction indicating in the echo control information parameter that an OHECD is included;
 - if there is no echo control device available:
 - if the received echo control device parameter indicates that an OHECD has been included at the succeeding exchange, a NRM message is sent in the forward direction indicating in the echo control information parameter that no OHECD is included;
 - 2) if there is an OHECD reserved in the preceding network (nature of the incoming circuit or receipt of I-14), no special action is taken.

A.2 Interworking from Signalling System ISUP to No.5/R2

The echo control procedure invoked at the interworking exchange is based on:

- the knowledge that an incoming echo control device can be located or not nearer to the called party;
 - the calculated delay value for the connection at the exchange;
 - the routing data;
 - the signalling information received.
- a) When the nature of connection indicators parameter field in the IAM indicates that an outgoing echo control device is included, the actions depend on whether an incoming half echo control can be included in the succeeding network:
- 1) if the exchange knows that an incoming half echo control can be included in the succeeding network, the following actions occur:
 - the request for an OHECD is included in the echo control information parameter in the ACM;
 - the echo control device indicator of the backward call indicators in the ACM is set;
 - any IHECD is disabled;
 - any OHECD is disabled;
 - if the outgoing signalling system is R2, I-14 is sent as country code indicator or I-14 will be sent in response to signal A-14;
 - 2) if the exchange knows that an incoming half echo control cannot be included in the succeeding network, the following actions occur:
 - if the exchange has echo control devices available:
 - the request for an OHECD is included in the echo control information parameter in the ACM;
 - the echo control device indicator of the backward call indicators in the ACM is set;
 - an IHECD is enabled;
 - any OHECD is disabled;
 - if the outgoing signalling system is R2, I-12 is sent as country code indicator or the first digit of the national (significant) number will be sent in response to signal A-14 (signal A-14 should only be returned where an IHECD can be inserted);
 - if the exchange does not have echo control devices available:
 - the request for an OHECD is included in the echo control information parameter in the ACM;
 - the request for an IHECD is included in the echo control information parameter in the ACM;
 - the echo control device indicator of the backward call indicators in the ACM is not set;
 - if the outgoing signalling system is R2, I-12 is sent as country code indicator or the first digit of the national (significant) number will be sent in response to signal A-14 (signal A-14 should only be returned where an IHECD can be inserted).

- b) When the nature of connection indicators parameter field in the IAM indicates that an outgoing echo control device is not included the actions depend on the delay value or the routing data and if an incoming half echo control can be included in the succeeding network:
- 1) if the delay value is higher than the allowed value or if the exchange knows by routing data that echo control is necessary, the following actions occur:
 - if the exchange knows that an incoming half echo control can be included in the succeeding network:
 - the request for an OHECD is included in the echo control information parameter in the ACM;
 - the echo control device indicator of the backward call indicators in the ACM is set;
 - any IHECD is disabled;
 - an OHECD is reserved and timer T37 is started;
 - an indication that an OHECD is included is indicated in the echo control information parameter in the ACM;
 - if the outgoing signalling system is R2, I-14 is sent as country code indicator or I-14 will be sent in response to signal A-14;
 - if the exchange knows that an incoming half echo control cannot be included in the succeeding network:
 - if the exchange has echo control devices available:
 - the request for an OHECD is included in the echo control information parameter in the ACM;
 - the echo control device indicator of the backward call indicators in the ACM is set;
 - an IHECD is enabled;
 - an OHECD is reserved and timer T37 is started;
 - an indication that an OHECD is included is indicated in the echo control information parameter in the ACM;
 - if the outgoing signalling system is R2, I-12 is sent as country code indicator or the first digit of the national (significant) number will be sent in response to signal A-14 (signal A-14 should only be returned where an IHECD can be inserted);
 - if the exchange does not have echo control devices available:
 - the request for an OHECD is included in the echo control information parameter in the ACM;
 - the request for an IHECD is included in the echo control information parameter in the ACM;
 - the echo control device indicator of the backward call indicators in the ACM is not set;
 - an indication that an OHECD is not included is indicated in the echo control information parameter in the ACM;
 - if the outgoing signalling system is R2, I-12 is sent as country code indicator or the first digit of the national (significant) number will be sent in response to signal A-14 (signal A-14 should only be returned where an IHECD can be inserted);

- 2) if the delay value is lower than the allowed value or if the exchange knows by routing data that echo control is not necessary, the following actions occur:
- the echo control device indicator of the backward call indicators in the ACM is not set;
 - any IHECD is disabled;
 - any OHECD is disabled;
 - if the outgoing signalling system is R2, I-12 is sent as country code indicator or the first digit of the national (significant) number will be sent in response to signal A-14 (signal A-14 should only be returned where an IHECD can be inserted).

c) If the exchange receives in the echo control information parameter in an NRM message an indication that an OHECD is included, T37 is stopped and the reserved OHECD is released.

If the exchange receives in the echo control information parameter in an NRM message an indication that no OHECD is included, T37 is stopped and the reserved OHECD is enabled.

If the timer T37 elapses, the reserved OHECD is enabled.

A.3 Interworking from No.5/R2 to ISUP version 2

A.3.1 Closer located outgoing echo control device

Exchange 2 has knowledge that an outgoing echo control device is located closer to the call source (nature of the incoming circuit, IHECD on the incoming circuit, etc.).

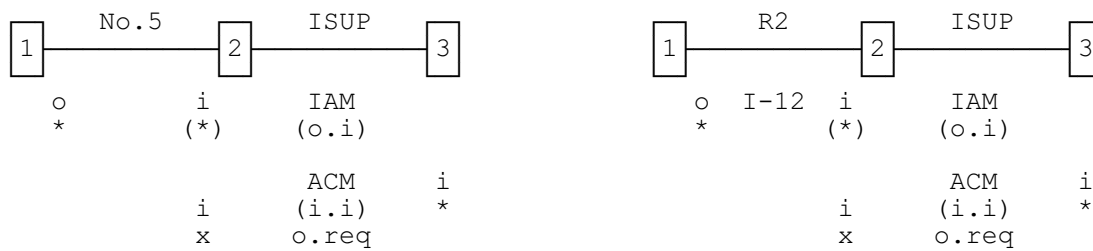


Figure A.1

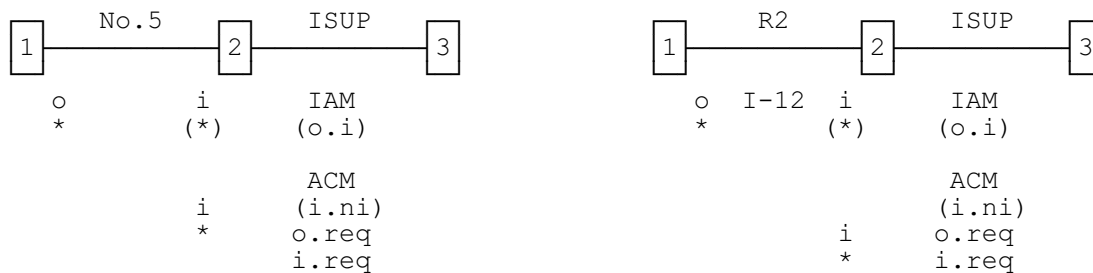
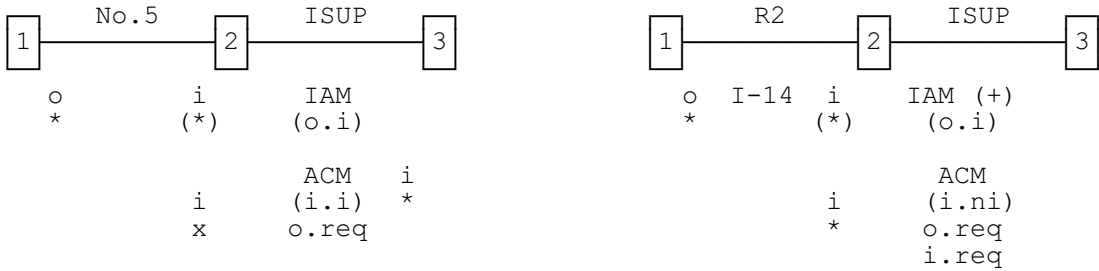


Figure A.2

I-14 is received whatever the data of the incoming trunk.



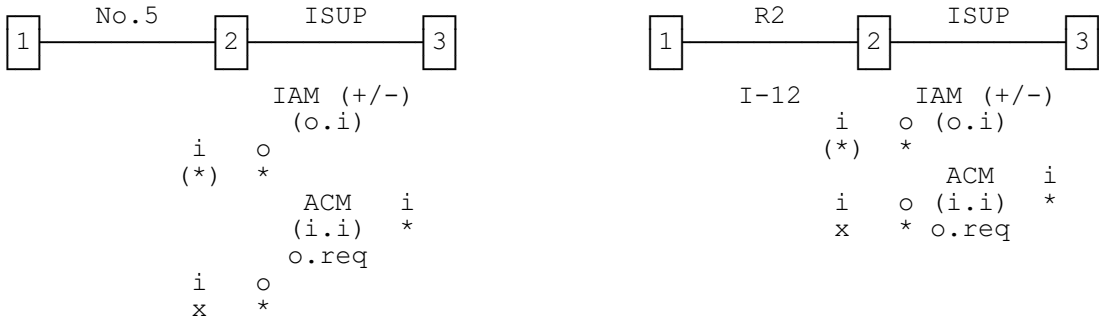
NOTE: The OHECD can be located on a preceding exchange.

Figure A.3

A.3.2 Farther located outgoing echo control device

Exchange 2 has knowledge that no outgoing echo control device is located closer to the call source (nature of the incoming circuit).

Exchange 2 determines by routing data or by the calculated delay value that echo control is necessary.



IAM (-): delay value is lower than the allowed one and the routing data determine the need of echo control.

Figure A.4

Exchange 3 determines by routing data or by the calculated delay value that echo control is necessary.

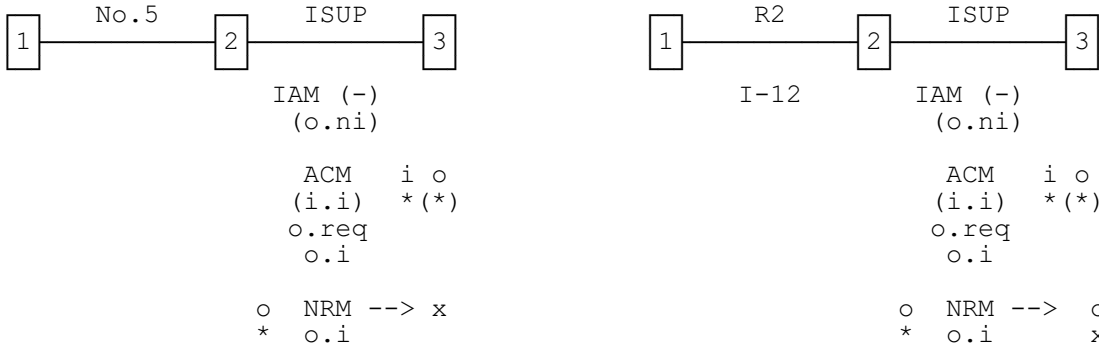


Figure A.5

A.4 Interworking from ISUP version 2 to No.5/R2

A.4.1 Closer located incoming echo control device

Exchange 2 has knowledge that an incoming echo control device is located nearer to the called party (nature of the outgoing circuit, OHECD on the outgoing circuit, routing data, etc.).

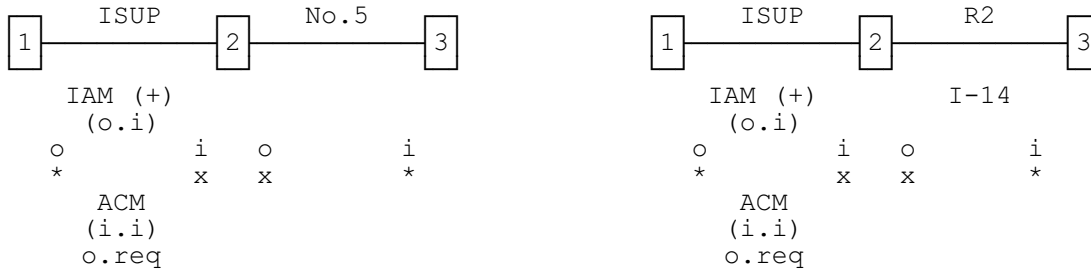


Figure A.6

Exchange 2 determines by routing data or by the calculated delay value that echo control is necessary.

Case 1: Exchange 1 has echo control devices available.

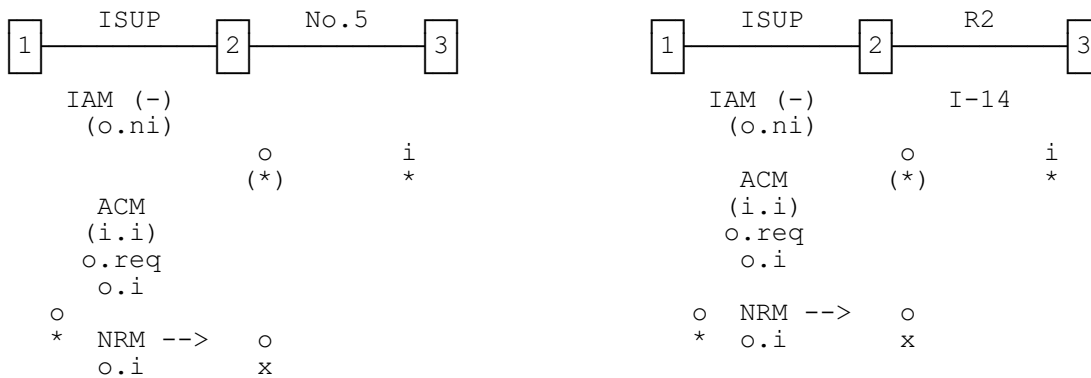


Figure A.7

Case 2: Exchange 1 has no echo control devices available.

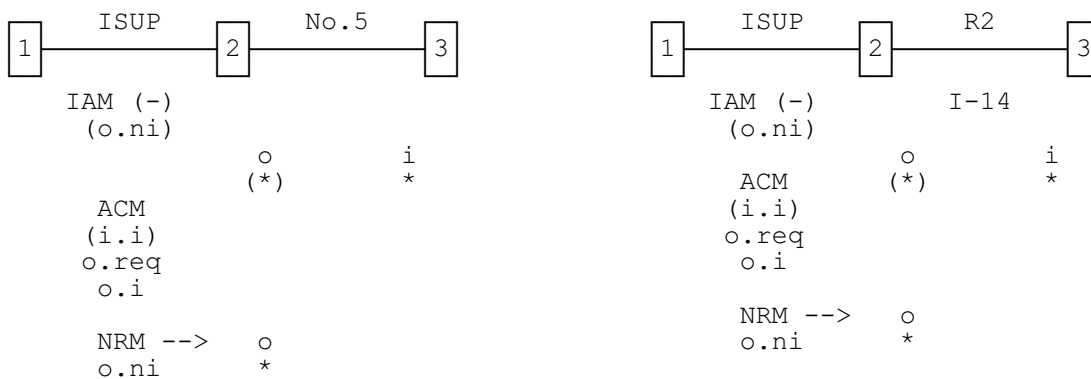


Figure A.8

A.4.2 Farther located incoming echo control device

Exchange 2 has knowledge that no incoming echo control device is located nearer to the called party (nature of the outgoing circuit, OHECD on the outgoing circuit, routing data, etc.).

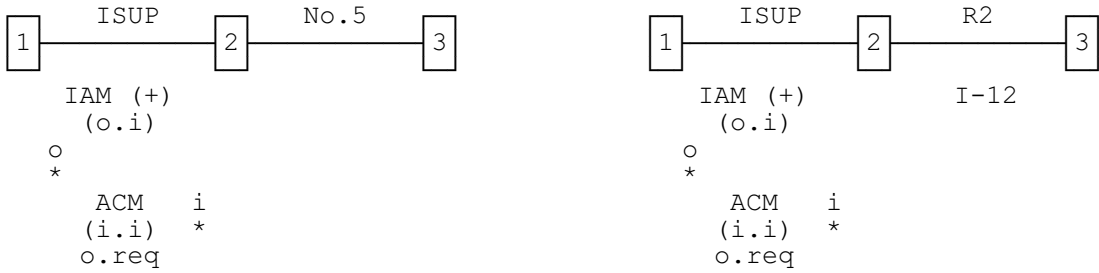


Figure A.9

Exchange 2 determines by the calculated delay value that echo control is necessary.

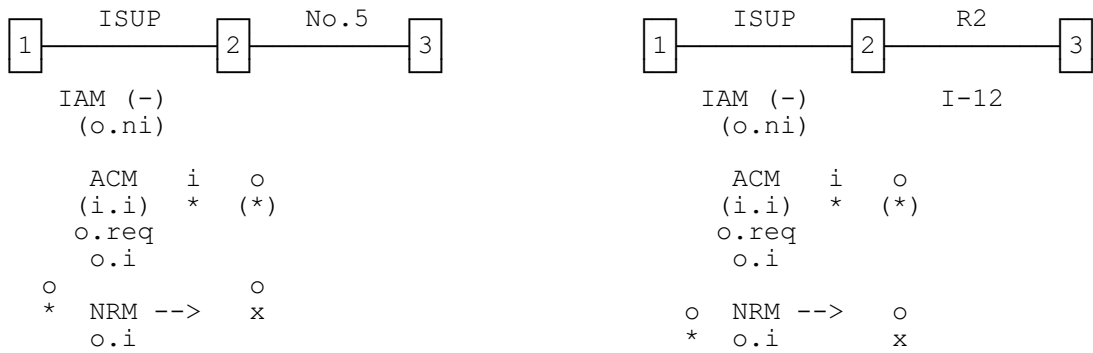


Figure A.10

History

Document history	
February 1995	First Edition
January 1996	Converted into Adobe Acrobat Portable Document Format (PDF)