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SERIES Q: SWITCHING AND SIGNALLING

Interworking of Signalling Systems – Logic procedures

Interworking between the Signalling System No. 7 ISDN User Part (ISUP) and Signalling Systems No. 5, R2 and Signalling System No. 7 TUP

ITU-T Recommendation Q.696

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.696

INTERWORKING BETWEEN THE SIGNALLING SYSTEM No. 7 ISDN USER PART (ISUP) AND SIGNALLING SYSTEMS No. 5, R2 AND SIGNALLING SYSTEM No. 7 TUP

Summary

This Recommendation defines the interworking between the Signalling System No. 7 ISDN User Part 92 (ISUP) and the Signalling Systems No. 5, R2, TUP.

ISDN UP 92 has been designed to allow peer-to-peer operation to a Q.767 exchange without requiring any knowledge of that situation. This means that different ISUP versions (like Q.767 and ISUP'92) cannot be considered as different signalling systems in an exchange.

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'92.

Source

ITU-T Recommendation Q.696 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 5th of June 1997.

FOREWORD

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The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

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NOTE

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

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Recommendation Q.696

INTERWORKING BETWEEN THE SIGNALLING SYSTEM No. 7 ISDN USER PART (ISUP) AND SIGNALLING SYSTEMS No. 5, R2 AND SIGNALLING SYSTEM No. 7 TUP

(Geneva, 1997)

1 Scope

This Recommendation defines the interworking between the Signalling System No. 7 ISDN User Part 92 (ISUP) [1] and the Signalling Systems No. 5, R2, TUP, [4, 5 and 2].

ISDN UP 92 has been designed to allow peer-to-peer operation to a Q.767 exchange without requiring any knowledge of that situation. This means that different ISUP versions (like Q.767 and ISUP'92) cannot be considered as different signalling systems in an exchange. A specific interworking specification is not required, relevant information is contained in [1].

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'92.

2 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] CCITT Recommendation Q.767 (1991), *Application of the ISDN user part of CCITT Signalling System No. 7 for international ISDN interconnections.*
- [2] ITU-T Recommendations Q.761 to Q.764 (1993), *ISDN user part.*
- [3] CCITT Recommendations Q.721 to 724 (1988), *Telephone User Part (TUP).*
- [4] CCITT Recommendation Q.107 (1988), *Standard sending sequence of forward address information.*
- [5] ITU-T Recommendation Q.115 (1993), *Control of echo suppressors – Control of echo suppressors and echo cancellers.*
- [6] CCITT Recommendations Q.140 to Q.164 (1988), *Specifications of Signalling System No. 5.*
- [7] CCITT Recommendations Q.400 to Q.490 (1988), *Specifications of Signalling System R2.*
- [8] ITU-T Recommendation Q.617 (1993), *Logic procedures for incoming Signalling System No. 7 (ISUP).*
- [9] ITU-T Recommendation Q.627 (1993), *Logic procedures for outgoing Signalling System No. 7.*
- [10] ITU-T Recommendation Q.646 (1993), *Logic procedures for interworking of Signalling System No. 5 to No. 7 (ISUP).*

- [11] ITU-T Recommendation Q.667 (1993), *Logic procedures for interworking of Signalling System No. 7 (TUP) to No. 7 (ISUP)*.
- [12] ITU-T Recommendation Q.686 (1993), *Logic procedures for interworking of Signalling System R2 to Signalling System No. 7 (ISUP)*.
- [13] ITU-T Recommendation Q.690 (1993), *Logic procedures for interworking of Signalling System No. 7 (ISUP) to No. 5*.
- [14] ITU-T Recommendation Q.692 (1993), *Logic procedures for interworking of Signalling System No. 7 (ISUP) to No. 7 (TUP)*.
- [15] ITU-T Recommendation Q.695 (1993), *Logic procedures for interworking of Signalling System No. 7 (ISUP) to R2*.

3 Definitions, symbols and abbreviations

3.1 Definitions

This Recommendation defines the following terms:

3.1.1 "call originating from SS X to SS Y" describes the signalling interworking for traffic which is routed (in call set-up direction) from an incoming SS X trunk-group to an outgoing SS Y trunk-group.

3.1.2 forward direction means interworking in call set-up direction.

3.1.3 Backward direction means interworking in opposite call set-up direction.

3.2 Abbreviations

This Recommendation uses the following abbreviations:

CDIV	Call Diversion
COLP	Connected Line Identification Presentation
COLR	Connected Line Identification Restriction
CUG	Closed User Group
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
SDL	Specification and Description Language
SS	Signalling System
ST	End-of-pulsing signal
TUP	Telephone User Part
UUS	User-to-User Signalling

The meaning of abbreviations specific for a signalling system (e.g. IAM and ADX) can be found in the specification of the signalling system concerned (see clause 2).

4 General considerations

4.1 General

Recommendations Q.617 [8], Q.627 [9], Q.646 [10], Q.667 [11], Q.686 [12], Q.690 [13], Q.692 [14] and Q.695 [15] provide interworking specifications for Q.767 using SDL.

However, for ISUP, some additional information that is relevant to interworking is useful such as:

- 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 Recommendation can be used as a complement of the ITU-T interworking SDL specifications ([8] to [15]) and not as an independent specification.

Only the information being a matter of interworking are described. 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 Q.767 and ISUP'92 are identical in the interworking specification for Recommendation Q.767 and this Recommendation.

4.2 Working assumptions

This Recommendation is based on the assumption that:

- TUP [2] does not support any supplementary service but the "digital connectivity";
- TUP supporting IAM (Initial Address Message) only, not IAI (Initial Address Message with Additional Information), 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 (ACM) in ISUP (or TUP)

In order to send more accurate information in the backward direction, the following interworking handling is proposed which can be used independently of the echo control procedures (described in Recommendations Q.724 [3], Q.764 [2] and Q.115 [5]).

5.1.1 Call originating from ISUP to R2, No. 5

- a) If the bit E of the echo control device indicator received in the IAM is coded "0" (no outgoing half-echo control device is included) and the delay value is lower than the allowed one or not available and the exchange has not sufficient information to determine that echo control is required for the outgoing circuit, then bit N of the echo control device indicator of the ACM is coded "0".
- b) If the bit E of the echo control device indicator received in the IAM is coded "1" (an outgoing half-echo control device is included):
 - 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 the 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 the bit N of the echo control device indicator is coded "0".

For further information, refer to Appendix I.

5.1.2 Call originating from ISUP to TUP

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

5.1.3 Call originating from TUP to ISUP

- a) If the bit G of the message indicators received in the IAM is coded "0" (outgoing half-echo suppressor not included), the bit D of the incoming half-echo suppressor indicator in the ACM is coded as received in the ACM (bit N of the echo control device indicator).
- b) If the bit G of the message indicators received in the IAM is coded "1" (outgoing half-echo suppressor included):
 - 1) if the incoming half-echo control is locally included, then the bit D of the incoming half-echo suppressor indicator of the ACM is coded "1";
 - 2) if no incoming half-echo control device is locally included, the bit D of the incoming half echo suppressor indicator in the ACM is coded as received in the ACM (bit N of the echo control device indicator).

5.2 Handling of the called party's category and the charge indicator in case of a call originating from TUP to ISUP

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

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

- payphone + no charge → ADX/AFX;
- payphone + charge → ADX/AFX;
- ordinary + no charge → ADN/AFN;

- ordinary + charge → ADC/AFC;
- no 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 a call originating from TUP to ISUP

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

When a call is originating from TUP to ISUP, this information is transferred as follows:

- If "charge" is received in the charge indicator in the ANM, ANC is sent.
- If "no charge" is received in the charge indicator in the ANM, ANN is sent.
- If "no indication" is received in the charge indicator in the ANM or no backward call indicators are received in the ANM, and the last significant information (charge or no charge) received in one of ACM or CPG messages is "no charge", then ANN is sent. Otherwise, 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 [2], if a message is received with the simple segmentation indicator set to indicate additional information is available.

6 Interworking

6.1 Call originating from SS 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 ST;
 - or if the fixed or maximum of number length is reached;
 - or at expiry of the timer (4-6 seconds specified in Recommendation Q.152 [6]) if the minimum number of digits has been received.

6.1.1.2 Address information sending sequence

The sending sequence of address information is specified in Recommendation Q.107 [4].

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

IAM category		No. 5 language or discriminating digit
0001	French	1
0010	English	2
0011	German	3
0100	Russian	4
0101	Spanish	5
0110	(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 (FOT), the Forward transfer signal is sent (F2).

6.1.1.4 Call Release and Call Failures

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

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

6.1.2 Backward direction

6.1.2.1 Address complete

As soon as the Proceed to send signal is received, the Address complete message is sent coded as follows:

- Backward call indicators:
 - bits BA: charge indicator
10 (charge)
 - bits DC: Called party's status indicator
00 (no indication)

bits	FE: Called party's category indicator 00 (no indication)
bit	I: Interworking indicator 1 (encountered)
bit	K: ISUP indicator 0 (not used all the way)
bit	M: ISDN access indicator 0 (terminating access non-ISDN)
bit	N: Echo control device indicator See clause 5, Recommendations Q.115 [5] and Q.764 [2].

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

6.1.2.2 Answer

On receipt of the Answer signal, the Answer message (ANM) is sent without the Backward Call Indicators parameter.

6.1.2.3 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/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 the cause value 34 and the location "beyond an interworking point".

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

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 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 [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 in the ANM the Call History Information parameter set to the stored delay value. (Refer to [2].)

6.1.3 Considerations on supplementary services

6.1.3.1 COLP/COLR

If a request of COLP is included in the received IAM (bit H = 1 of Connected line request indicator), the Answer message (ANM) is sent with the Connected number parameter with indication "address not available". 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 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 UUS

6.1.3.3.1 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.

6.1.3.3.2 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 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 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 FRJ contains the indication "service 3 not provided". The call continues according to the basic call procedures.

6.2 Call originating from SS ISUP to SS R2

6.2.1 Forward direction

6.2.1.1 Address information sending sequence

The sending sequence of address information is specified in the Recommendation Q.107 [4].

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:

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:

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

The I-12 signal may be sent (rejected request) (see Recommendation Q.480 [7]).

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

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

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

6.2.1.6 Echo control

Transit call: country code indicator I.11, I.12, I.14 sent according to Recommendation Q.115 [5].

Terminating call: reply to A-14 according to Recommendation Q.115 [5].

Refer also to Recommendation Q.764 [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 (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB) or Continuity message (COT, failed), the Clear-forward signal is sent.

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

6.2.2 Backward direction

6.2.2.1 Address complete

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

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

- bit I: Interworking indicator
1 (encountered)
- bit K: ISUP indicator
0 (not used all the way)
- bit M: ISDN access indicator
0 (terminating access non-ISDN)
- bit N: Echo control device indicator
See clause 5 and Recommendations Q.115 [5] and Q.764 [2].

The speech condition is set up when the ACM is sent (see also Q.475 [7]).

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 6.2.1.3, "Calling party's category").

6.2.2.2 Answer

On receipt of the Answer signal, the Answer message (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/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 the following cause values:

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

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

For the R2 line signalling analogue version: the handling of the interruption control is in accordance with Recommendation Q.416 [7].

For the R2 line signalling digital version: the handling of the abnormal conditions is in accordance with Recommendation Q.422 [7].

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 [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 in the ANM the Call History Information parameter set to the stored delay value. (Refer to [2].)

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), the Answer message (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 Call originating from SS ISUP to SS TUP

6.3.1 Forward direction

6.3.1.1 Initial address message

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

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.

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 BA: nature of address indicator
10 if terminating call
11 if transit call

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

- bits FE: continuity check indicator
 00 (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.
 01 (required) if a continuity check is performed on the outgoing circuit
 10 (performed on a previous circuit) if the received continuity check indicator is coded "10" or "01" and a continuity check is not performed on the outgoing circuit and the continuity check on the incoming or a previous circuit is not completed.
- bit G: echo suppressor indicator
 See Recommendations Q.115 [7] and Q.764 [1].
- 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).
- 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)

NOTE – In case of fallback, the received TMR Prime parameter is considered instead of the TMR parameter.

6.3.1.2 Continuity message

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

- the continuity check performed on the outgoing circuit, if it is to be made, is completed;
- the speech path across the exchange has been checked and found correct (see 1.4/Q.724 [3]); and
- if the continuity check indicator in the received Initial address message indicates that continuity check is being (has been) performed on previous circuit(s), receipt of a continuity message (continuity check successful) from the preceding exchange.

The completion of the transmission path occurs, as follows:

- if continuity check is not required on the incoming circuit and on outgoing circuit and is not performed on previous circuit, through connection should occur after sending the Initial address message;
- in the other cases, through connection should occur when the continuity signal is sent (see Recommendation Q.724 [3]).

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 (FOT), the Forward transfer signal is sent (FOT).

6.3.1.4 Call Release and Call Failures

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

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

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 Initial address message (see 6.3.1.1, "Initial address message").

6.3.2.1.2 Calling line identity request

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

- Address indicators:
 - bits BA: nature of address indicator
11 (international number)
 - bit C: calling line identity presentation indicator
1 (restricted)
 - bit D: incomplete calling line identity indicator
0 (no indication)
- Number of address signals:
 - bits DCBA
0000 calling line identity not available indicator

6.3.2.2 Address complete

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

- Backward call indicators:
 - bits BA: charge indicator
10 (charge) if ADC, ADX, AFC or AFX is received
01 (no charge) if ADN or AFN is received
 - bits DC: Called party's status indicator
00 (no indication) if ADC, ADN, ADX is received
01 (subscriber free) if AFC, AFN or AFX is received
 - bits FE: Called party's category indicator
00 (no indication) if ADC, ADN, AFC, AFN is received
10 (payphone) if ADX or AFX is received
 - bit I: Interworking indicator
0 (no interworking encountered) if the received signalling path indicator is coded "1" (all Signalling System No. 7 path)
1 (interworking encountered) if the received signalling path indicator is coded "0" (any path)

- bit K: ISUP indicator
0 (not used all the way)
- bit M: ISDN access indicator
0 (terminating access non-ISDN)
- bit N: Echo control device indicator
See clause 5 and Recommendation Q.764 [2].

6.3.2.3 Answer

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

- without backward call indicators if Answer signal, unqualified, is received;
- with backward call indicators:

- bits BA: charge indicator
10 (charge) if ANC is received
01 (no charge) if ANN is received
- bits DC: Called party's status indicator
01 (subscriber free)
- bits FE: Called party's category indicator
00 (no indication)
- bit I: Interworking indicator
as in the ACM
- bit K: ISUP indicator
0 (not used all the way)
- bit M: ISDN access indicator
0 (terminating access non-ISDN)
- bit N: Echo control device indicator
as in the ACM

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 ISUP side with the location "beyond an interworking point" and the following cause values:

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

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

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 [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 in the ANM the Call History Information parameter set to the stored delay value. (Refer to [2].)

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 Answer message (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 ISDN UP 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 Call originating from Signalling System No. 5 to SS ISUP

6.4.1 Forward direction

6.4.1.1 Initial address message

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

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 signal
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 No. 5 side.

No. 5 L or D		IAM category
0	1010	Ordinary
1	0001	French
2	0010	English
3	0011	German
4	0100	Russian
5	0101	Spanish
6	0110	(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	HG: ISUP preference indicator 01 (not required all the way)
bit	I: ISDN access indicator 0 (non-ISDN)

6.4.1.1.4 Nature of connection

bits	BA: satellite indicator 00 (no satellite circuit) if the incoming and outgoing circuits are not satellite circuits 01 (one satellite circuit) if one circuit involved in the call is a satellite circuit 10 (two satellite circuits) if the incoming and outgoing circuits are satellite circuits
bits	DC: continuity check indicator 00 (not required) if no continuity check is to be made on the outgoing circuit 01 (required) if a continuity check is to be made on the outgoing circuit
bit	E: echo control indicator See Recommendations Q.115 [5] and Q.764 [2].

6.4.1.1.5 Transmission medium requirement

00000011 (3.1 kHz)

6.4.1.1.6 Propagation delay

Because signalling systems which do not support 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 [2].)

6.4.1.2 Forward transfer

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

6.4.1.3 Call Release and Call Failures

On receipt of Clear-forward signal (F1 + F2), the Release message is sent with the cause value 16 and the location "beyond an interworking point".

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

6.4.2 Backward direction

6.4.2.1 Address complete

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

6.4.2.2 Answer

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

6.4.2.3 Connect

On receipt of a Connect message, 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/Answer) sequences is not limited.

6.4.2.5 Call Release and Call Failures

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

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 (net.)	
F2 + Tone	Z
F2 + Tone	RSC
F2 + Tone	GRS
F2 + Tone	CGB
After SUS (net.)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB

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

6.4.3 Considerations on supplementary services

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

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

6.5 Call originating from SS R2 to SS ISUP

6.5.1 Forward direction

6.5.1.1 Initial address message

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

6.5.1.1.1 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

6.5.1.1.2 Calling party's category

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

R2 L or D	II	IAM category	
0	–	1010	Ordinary
0	II-7	1010	Ordinary
0	II-8	1100	Data
0	II-9	1011	Priority
0	II-10	1010	Ordinary
1	(Note)	0001	French
2	(Note)	0010	English
3	(Note)	0011	German
4	(Note)	0100	Russian
5	(Note)	0101	Spanish
6	(Note)	0110	
7	(Note)	0111	
8	(Note)	1000	
9	(Note)	1010	
13	Not subject to interworking		

NOTE – The possible receipt of group II signal does not affect the setting of the category.

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 HG: ISUP preference indicator
01 (not required all the way)
- bit I: ISDN access indicator
0 (non-ISDN)

6.5.1.1.4 Nature of connection

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

bit E: echo control indicator
See Recommendations Q.115 [5] and Q.764 [2].

6.5.1.1.5 Transmission medium requirement

00000011 (3.1 kHz)

6.5.1.1.6 Propagation delay

Because signalling systems which do not support 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 [2].)

6.5.1.2 Call Release and Call Failures

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

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

For the R2 line signalling analogue version: the handling of the interruption control is in accordance with Recommendation Q.416 [7].

For the R2 line signalling digital version: the handling of the abnormal conditions is in accordance with Recommendation Q.422 [7].

6.5.2 Backward direction

6.5.2.1 Address complete

On receipt of an Address complete message, 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 Recommendation Q.475 [7]).

6.5.2.2 Answer

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

6.5.2.3 Connect

On receipt of a Connect message, an Address complete signal is sent according to the Backward Call Indicators parameter (described in 6.5.2.1, "Address complete"), then an answer signal is sent.

Through connection should occur after sending of the Address complete signal (see Recommendation Q.475 [7]).

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/Answer) sequences is not limited.

6.5.2.5 Call Release and Call Failures

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

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

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

6.5.3 Considerations on supplementary services

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

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

6.6 Call originating from SS TUP to SS ISUP

6.6.1 Forward direction

6.6.1.1 Initial address message

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

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 TUP side.

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 HG: ISUP preference indicator
01 (not required all the way)
- bit I: ISDN access indicator
0 (non-ISDN)

6.6.1.1.4 Nature of connection

- bits BA: satellite indicator
00 (no satellite circuit) if the outgoing circuit is not a satellite circuit and the nature of circuit indicator received in the IAM is coded "00" (no satellite circuit).
10 (two satellite circuits) if the outgoing circuit is a satellite circuit and the nature of circuit indicator received in the IAM is coded "01" (one satellite circuit).
01 (one satellite circuit) in the other cases.

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

- bits DC: continuity check indicator
00 (not required) if 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.
01 (required) if a continuity check is performed on the outgoing circuit
10 (performed on a previous circuit) if the received continuity check indicator is coded "10" or "01" and a continuity check is not performed on the outgoing circuit and the continuity check on the incoming or a previous circuit is not completed.
- bit E: echo control indicator
See Recommendations Q.115 [5] and Q.764 [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 CBA
011 (call diverted)
- bits HGFE
0000 (unknown)
- bits KJI
101 (five)

bit L
0 (reserved for national use)

bits PONM
0000 (unknown / not available)

6.6.1.1.7 Propagation delay

Because signalling systems which do not support 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 [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 1.4/Q.724 [3]); and
- if the continuity check indicator in the received Initial address message indicates that continuity check is being (has been) performed on previous circuit(s), receipt of a continuity message (continuity check successful) from the preceding exchange.

The completion of the transmission path occurs, as follows:

- if continuity check is not required on the incoming circuit and on outgoing circuit and is not performed on previous circuit, through connection should occur after sending the Initial address message;
- in the other cases, through connection should occur when the continuity signal is sent (see Q.724 [3]).

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 (FOT).

6.6.1.4 Call Release and Call Failures

On receipt of a Clear-forward signal (CLF) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Hardware failure oriented group blocking message (HGB) or a Continuity failure signal (CCF), a Release message is sent with the cause value 16, 31, 31, 31, 31, respectively and the location "beyond an interworking point".

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

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

6.6.2 Backward direction

6.6.2.1 Address complete

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

- bits BA: type of address complete signal indicators
- 10 (address complete, no charge) if the charge indicator of the backward call indicators received in the ACM is coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone).
 - 01 (address complete, charge) if the charge indicator of the backward call indicators received in the ACM is not coded "01" (no charge) and the called party's category indicator is not coded "10" (payphone).
 - 11 (address complete, payphone) if the called party's category indicator of the backward call indicators received in the ACM is coded "10" (payphone).
- bit C: subscriber free indicator
- 1 (subscriber free) if the called party's status indicator of the backward call indicators is coded "1" (subscriber free).
 - 0 (no indication) in the other cases.
- bit D: incoming echo suppressor indicator
- See clause 5 and Recommendation Q.764 [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 Answer message, the answer signal is sent with the following rules:

- if the charge indicator of the backward call indicators received in the ANM is coded "01" (no charge), ANN is sent;
- if the charge indicator of the backward call indicators received in the ANM is coded "10" (charge), ANC is sent;
- if the charge indicator of the backward call indicators received in the IAM 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).

6.6.2.3 Connect

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

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

- bit C: subscriber free indicator
1 (subscriber free) if the called party's status indicator of the backward call indicators received in the CON is coded "1" (subscriber free).
0 (no indication) in the other cases.
- bit D: incoming echo suppressor indicator
see clause 5 and Recommendation Q.764 [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 (REL) or a Reset circuit message (RSC) or a Circuit group reset message (GRS) or a Circuit group blocking message (hardware) (CGB), the TUP action is depending on the state of the call, as described below:

TUP 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	≠

TUP reaction	ISUP CAUSE (#Z) or Received message
After ACM (SUB ≠ free) and before ANM	
CGC	34
CFL	31
CFL	≠
CFL	RSC
CFL	GRS
CFL	CGB (H)
CGC	34
CFL	31
CFL	≠
CFL	RSC
CFL	GRS
CFL	CGB (H)
Tone (Note)	17
NOTE – Alternative solutions to this interworking case exist whereby the mapping of TUP ACM at the interworking point is delayed until receipt of a subsequent backward ISUP message.	

After ACM (SUB 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 (net.)	
Tone	Z
Tone	RSC
Tone	GRS
Tone	CGB (H)

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

6.6.3 Considerations on Supplementary Services

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

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

APPENDIX I

Echo control procedure in case of interworking

I.1 Call originating from No. 5, R2 to ISUP

I.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:
- i) 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 is reserved provided the exchange does not know that the succeeding exchange will include an IHECD;
 - any outgoing half echo control device is disabled.
 - ii) 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 en R2), the action depends on the delay value or the routing data.
- i) 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 incoming half echo control device (IHECD) is reserved provided the exchange does not know that the succeeding exchange will include an IHECD;
 - an outgoing half echo control device 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;
 - ii) 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 action occur:
 - the echo control device indicator of the nature of the connection indicators parameter is not set.

I.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

parameter in the ACM, CON and NRM messages and if there are any echo control devices available and if an outgoing half echo control device 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 or not there is a reserved incoming half echo control device for the call.

If there is a reserved incoming half echo control device for the call, the following action is taken:

- the reserved incoming half echo control device is included.

If there is no incoming half echo control device, no special action is taken.

- b) If the echo control device indicator in the ACM, CON is set, or the echo control parameter in the NRM message indicates that an incoming half echo control device is included, the actions depend on whether there is a reserved incoming half echo control device for the call or not.

- If the exchange has reserved or included an incoming half echo control device, it shall release the incoming half echo control device.
- If the exchange has not reserved or included an incoming half echo control device, no special action is taken.

- c) If the echo control parameter in the ACM, CON and NRM messages is indicating that an incoming half echo control device is requested, the actions are independent on whether or not the echo control device indicator in the backward call indicators is set or the NRM indicates that an incoming half echo control device is included or not.

If there is an available half echo control device in the exchange:

- an incoming half echo control device is included.

If no incoming half echo control device is available, no special action is taken.

- d) If the echo control parameter in the ACM, CON and NRM messages is indicating that an outgoing half echo control device is requested, the actions depend on whether or not an outgoing half echo control device is available and if there is or not an outgoing half echo control device reserved in the preceding network.

- i) If there is not an outgoing half echo control device 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 outgoing half echo control device is included;
- if the received echo control device parameter indicates that an outgoing half echo control device (OHECD) has been included at the succeeding exchange, an NRM message is sent in the forward direction indicating in the echo control device information parameter that an outgoing half echo control device is included.

If there is no echo control device available:

- if the received echo control device parameter indicates that an outgoing half echo control device has been included at the succeeding exchange, an NRM message is sent in the forward direction indicating in the echo control device information parameter that an outgoing half echo control device is not included.

- ii) If there is an outgoing half echo control device reserved in the preceding network (nature of the incoming circuit or receipt of I-14), no special action is taken.

I.2 Call originating from 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 or cannot be located 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 if an incoming half echo control can be included in the succeeding network.

i) If the exchange knows that an incoming half echo control can be included in the succeeding network, the following actions occur:

- the request for outgoing half echo control device is included in the echo control 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 reponse to signal A-14.

ii) 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 outgoing half echo control device is included in the echo control 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 reponse 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 outgoing half echo control device is included in the echo control parameter in the ACM;
- the request for incoming half echo control device is included in the echo control 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 reponse 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.

- i) 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 outgoing half echo control device is included in the echo control 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 outgoing half echo control device is included is indicated in the echo control 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 outgoing half echo control device is included in the echo control 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 outgoing half echo control device is included is indicated in the echo control 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 outgoing half echo control device is included in the echo control parameter in the ACM;
- the request for incoming half echo control device is included in the echo control parameter in the ACM;
- the echo control device indicator of the backward call indicators in the ACM is not set;
- an indication that an outgoing half echo control device is not included is indicated in the echo control 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).

- ii) 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 parameter in an NRM message an indication that an outgoing half echo control device is included, T37 is stopped and the reserved outgoing half echo control device is released.
- If the exchange receives in the echo control parameter in an NRM message an indication that an outgoing half echo control device is not included, T37 is stopped and the reserved outgoing half echo control device is enabled.
- If the timer T37 elapses, the reserved outgoing half echo control device is enabled.

I.3 Examples

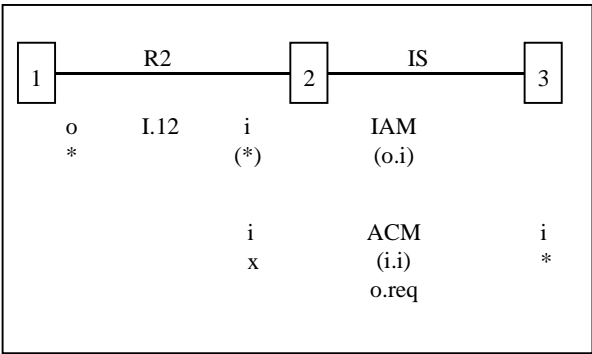
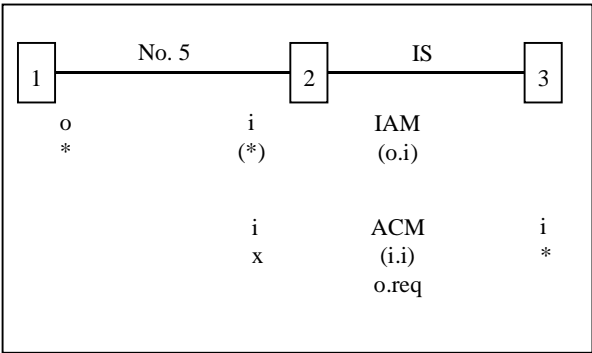
The following notations are used in the examples:

- (o.ni) Outgoing half echo control device not included
- (o.i) Outgoing half echo control device included
- (i.ni) Incoming half echo control device not included
- (i.i) Incoming half echo control device included
- o.req Outgoing half echo control device requested
- i.req Incoming half echo control device requested
- (*) Echo control device note in memory
- * Echo control device included
- x Echo control device released
- i Incoming
- o Outgoing

Call originating from No. 5/R2 to ISUP'92

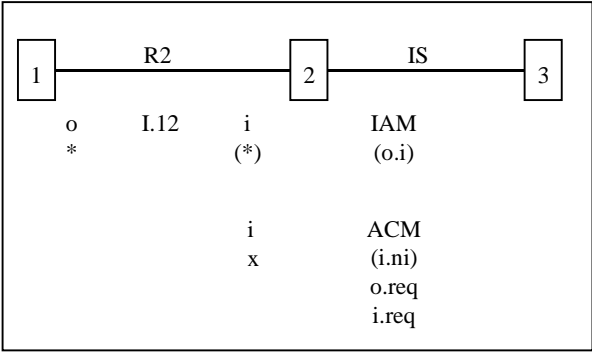
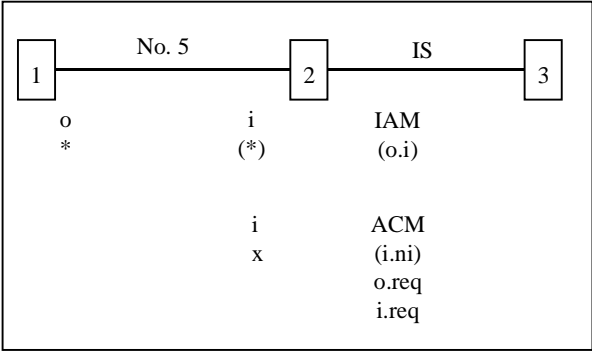
- 1 The exchange 2 knows that an outgoing echo control device is located closer to the call source (nature of the incoming circuit, IHECD on the incoming circuit ...).

1.1



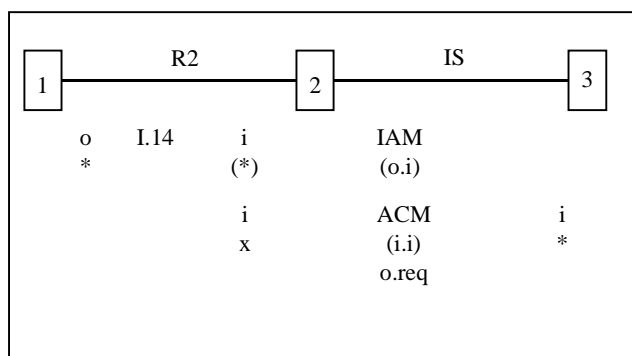
T1180950-96

1.2



T1180960-96

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

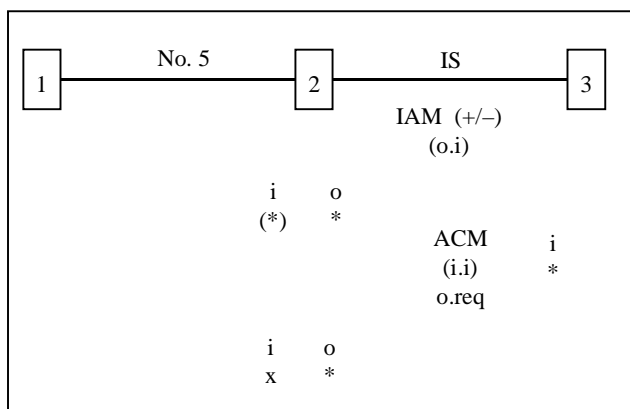


El OHECD se puede insertar en una central precedente.

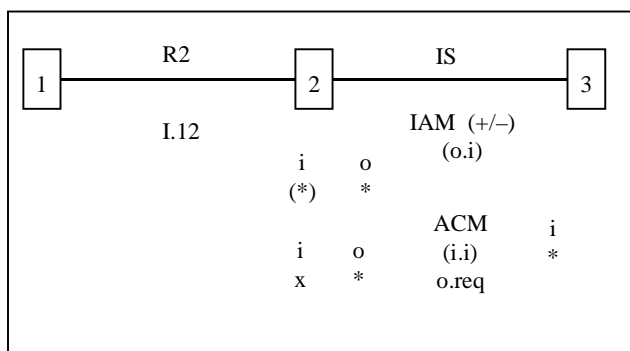
T1180970-96

2 The exchange 2 knows that an outgoing echo control device is not located closer to the call source (nature of the incoming circuit).

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



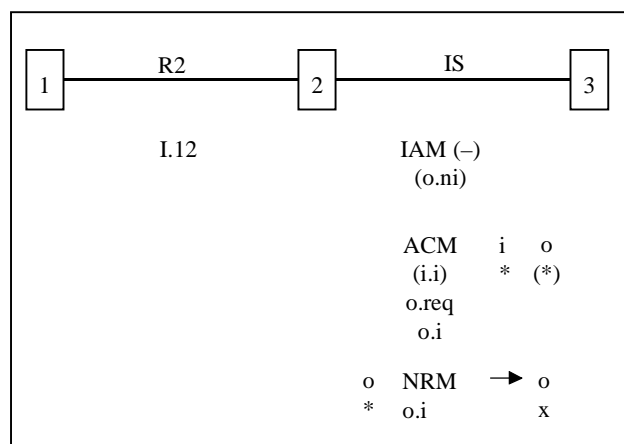
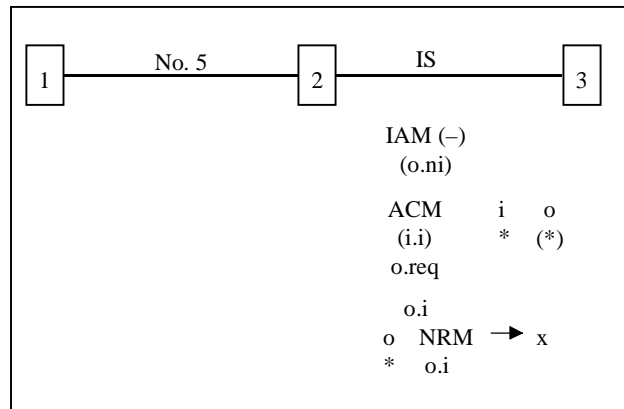
IAM (-): Delay value is lower than the allowed one and the routing data determine the need of echo control.



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

T1180980-96

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

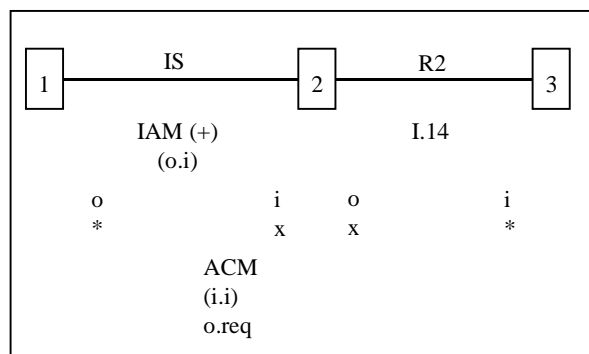
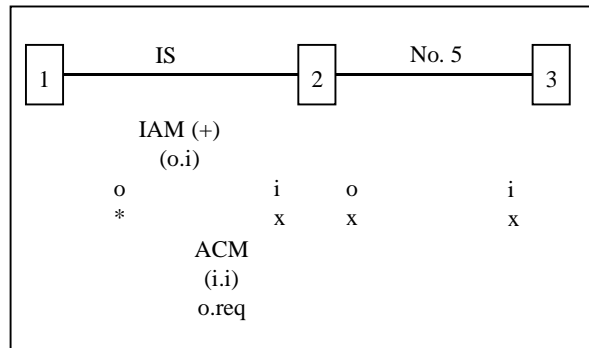


T1180990-96

Call originating from ISUP 92 to No. 5/R2

3 The exchange 2 knows 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 ...).

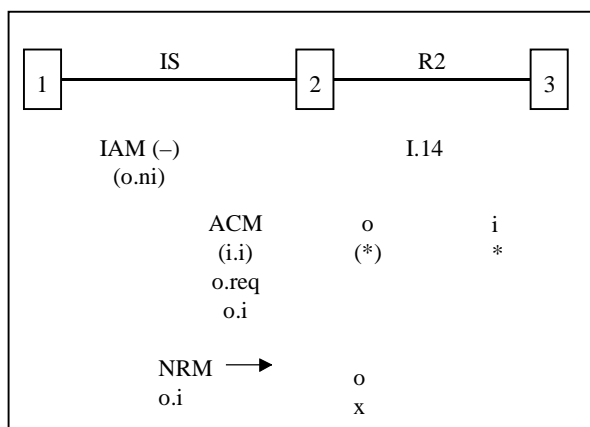
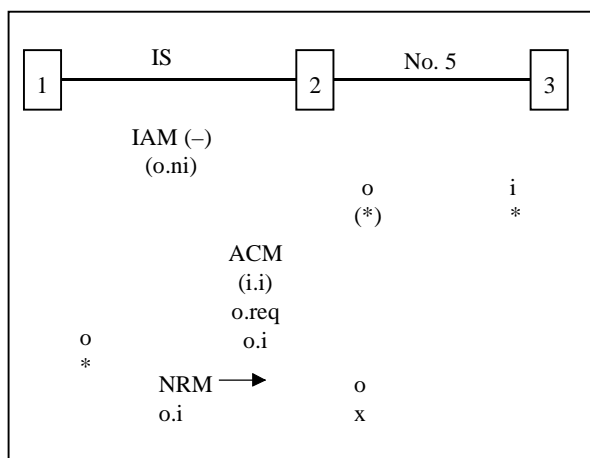
3.1



T1181000-96

3.2 The exchange 2 determine by routing data or by the calculated delay value that echo control is necessary.

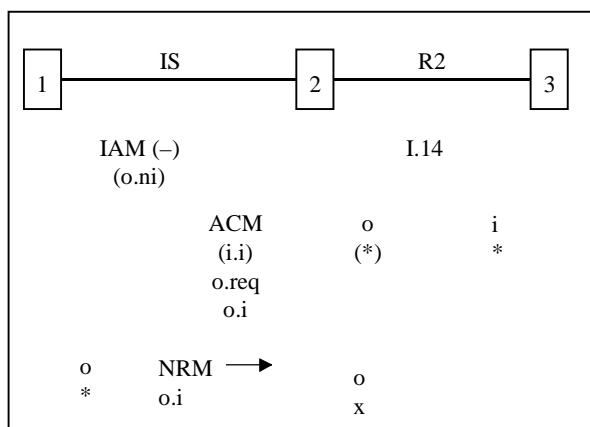
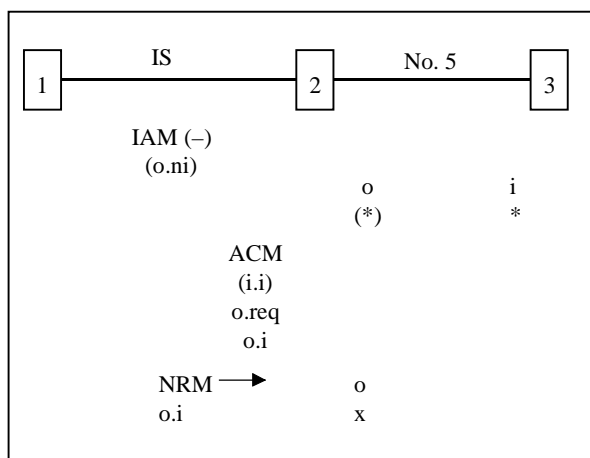
The exchange 1 has echo control device available.



T1181010-96

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

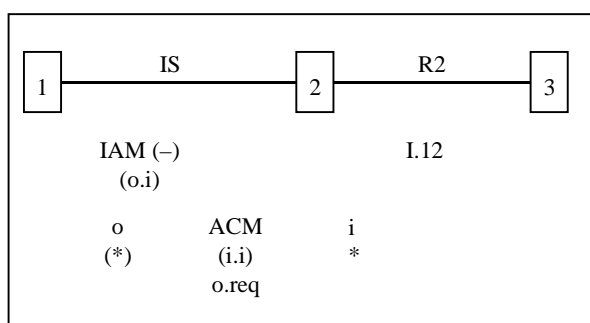
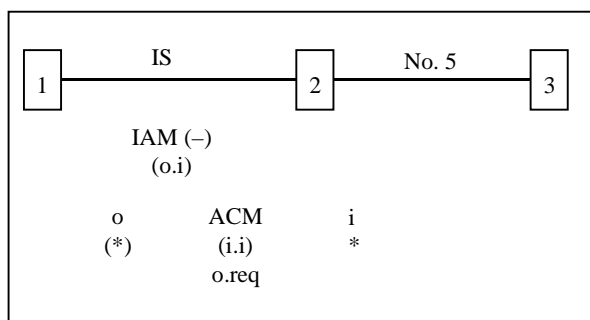
The exchange 1 has not any echo control device available.



T1181020-96

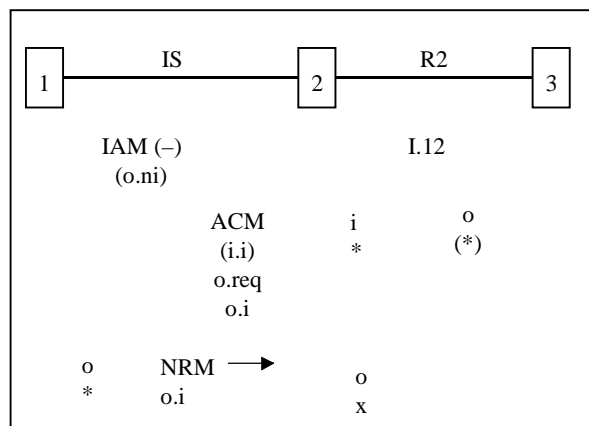
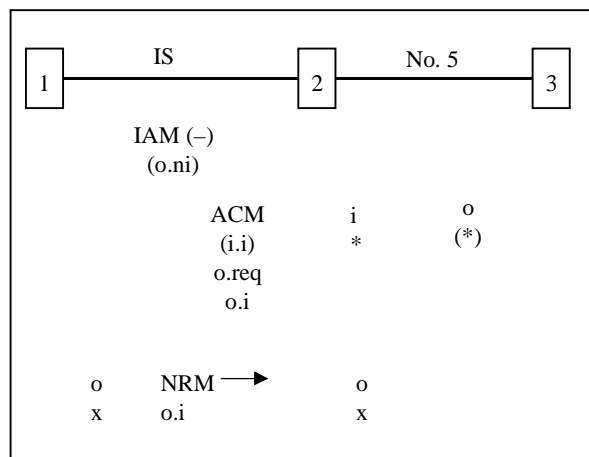
4 The exchange 2 knows that an incoming echo control device is not located nearer to the called party (nature of the outgoing circuit, OHECD on the outgoing circuit, routing data ...).

4.1



T1181030-96

4.2 The exchange 2 determines by the calculated delay value that echo control is necessary.



T1181040-96

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