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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – ISDN
supplementary services

**Stage 3 description for call offering
supplementary services using signalling
system No. 7: Call diversion services**

Q.732.2 – Call Forwarding Busy (CFB)

Q.732.3 – Call Forwarding No Reply (CFNR)

Q.732.4 – Call Forwarding Unconditional (CFU)

Q.732.5 – Call Deflection (CD)

ITU-T Recommendation Q.732.2-5

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.732.2-5

STAGE 3 DESCRIPTION FOR CALL OFFERING SUPPLEMENTARY SERVICES USING SIGNALLING SYSTEM No. 7: CALL DIVERSION SERVICES

Summary

This Recommendation defines the essential functions, procedures and messages required for the transportation of call diversion information.

Source

ITU-T Recommendation Q.732.2-5 was revised by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 3 December 1999.

FOREWORD

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NOTE

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Recommendation Q.732.2-5

STAGE 3 DESCRIPTION FOR CALL OFFERING SUPPLEMENTARY SERVICES USING SIGNALLING SYSTEM No. 7: CALL DIVERSION SERVICES

(revised in 1999)

Q.732.2 Call forwarding busy

2.1 Introduction

This Recommendation describes the stage 3 of the call offering supplementary service for the Integrated Services Digital Network (ISDN), by means of the signalling system No. 7 ISDN user part (ISUP).

2.1.1 Scope

The **diversion supplementary service** comprises the following services:

- Call Forwarding Busy (CFB);
- Call Forwarding No Reply (CFNR);
- Call Forwarding Unconditional (CFU);
- Call Deflection (CD).

The **call forwarding busy (CFB) supplementary service** permits a served user to have the network send all incoming calls, or just those associated with a specific basic service, which meet busy condition and are addressed to the served user's ISDN number to another number. The served user's originating service is unaffected. The busy condition may be either network determined or user determined.

The **call forwarding no reply (CFNR) supplementary service** permits a served user to have the network send all incoming calls, or just those associated with a specific basic service, which meet no reply and are addressed to the served user's ISDN number to another number. The served user's originating service is unaffected.

The **call forwarding unconditional (CFU) supplementary service** permits a served user to have the network send all incoming calls, or just those associated with a specific basic service, addressed to the served user's ISDN number to another number. The served user's originating service is unaffected. If this service is activated, calls are forwarded no matter what the condition of the termination.

The **call deflection (CD) supplementary service** allows the served user to respond to an incoming call offered by the network by requesting redirection of that call to another number specified in the response. This redirection is only allowed before the called user has answered the call. It may occur immediately as a response to the DSS1 set-up message of the access or during the alerting phase.

2.1.2 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] ITU-T Recommendation I.112 (1993), *Vocabulary of terms for ISDNs*.

- [2] CCITT Recommendation I.130 (1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN.*
- [3] ITU-T Recommendation I.210 (1993), *Principles of telecommunication services supported by an ISDN and the means to describe them.*
- [4] CCITT Recommendation I.250 (1988), *Definition of supplementary services.*
- [5] CCITT Recommendation I.252 (1988), *Call offering supplementary services.*
- [6] CCITT Recommendation I.252.2 (1992), *Call offering supplementary services: Call forwarding busy.*
- [7] CCITT Recommendation I.252.3 (1992), *Call offering supplementary services: Call forwarding no reply.*
- [8] CCITT Recommendation I.252.4 (1992), *Call offering supplementary services: Call forwarding unconditional.*
- [9] CCITT Recommendation I.252.5 (1992), *Call offering supplementary services: Call deflection.*
- [10] CCITT Recommendation Q.80 (1988), *Introduction to stage 2 service descriptions for supplementary services.*
- [11] ITU-T Recommendation Q.82.2 (1993), *Stage 2 description for call offering supplementary services: Call forwarding.*
- [12] ITU-T Recommendation Q.730 (1999), *ISDN user part supplementary services.*
- [13] ITU-T Recommendations Q.731.3 to Q.731.5 (1993), *Stage 3 description for number identification supplementary services using signalling system No. 7.*
- [14] ITU-T Recommendation Q.761 (1999), *Signalling system No. 7 – ISDN user part – Functional description.*
- [15] ITU-T Recommendation Q.762 (1999), *Signalling system No. 7 – ISDN user part – General functions of messages and signals.*
- [16] ITU-T Recommendation Q.763 (1999), *Signalling system No. 7 – ISDN user part – Formats and codes.*
- [17] ITU-T Recommendation Q.764 (1999), *Signalling system No. 7 – ISDN user part – Signalling procedures.*
- [18] ITU-T Recommendation Q.952 (1993), *Stage 3 service description for call offering supplementary services using DSS 1 – Diversion supplementary services.*
- [19] ITU-T Recommendation Q.115 (1999), *Logic for the control of echo control devices.*

2.1.3 Terms and definitions

This Recommendation defines the following terms.

2.1.3.1 calling user: The user who initiated the call that is diverted. All procedures at the calling user are provided as part of the basic service; the calling user need not have subscribed to any specific diversion supplementary service.

2.1.3.2 call forwarding may occur indicator: Information sent in the backward direction indicating that call forwarding may occur, depending on the response received (or lack thereof) from the called party.

2.1.3.3 deflected-to user: The user, to which the call shall be deflected.

2.1.3.4 forwarded-to user: The user to which a call is to be forwarded. All procedures at the forwarded-to user are provided as part of the basic service; the forwarded-to user need not have subscribed to any specific call forwarding supplementary service (e.g. CFU, CFB, CFNR).

2.1.3.5 network determined user busy (NDUB) is specified (see 2.1.4/I.221):

- if all the appropriate user-network interface information channels are busy and either the network does not support the offering of additional calls beyond the number of appropriate channels, or the maximum number of such additional calls has been reached; or
- if the maximum number of total calls supported at the given subscriber's interface(s) has been reached.

2.1.3.6 notification subscription option: Information sent in the backward direction indicating that the diversion with or without redirection number can be presented to the calling user.

2.1.3.7 redirecting indicator: Information sent in either direction indicating whether the call has been diverted or rerouted and whether or not presentation of redirection information to the calling party is restricted.

2.1.3.8 redirecting number: Information sent in the forward direction when a call is diverted, indicating the number from which the call was last diverted.

2.1.3.9 redirecting reason: Information sent in either direction indicating, in the case of calls undergoing redirection, the reason why the call has been redirected.

2.1.3.10 redirection counter: Information sent in either direction indicating the number of redirections which have occurred on a call.

2.1.3.11 redirection number: Information sent in the backward direction indicating the number towards which the call must be redirected or has been forwarded.

2.1.3.12 redirection number restriction indicator: Information sent in the backward direction indicating whether the diverted-to user allows the presentation of his number.

2.1.3.13 served user: The user of a particular ISDN number requesting calls to that number to be diverted. This user may also be referred to as the forwarding, deflecting or diverting user, or the called user. This user shall have subscribed to the specific call diversion supplementary service requested.

2.1.3.14 user determined user busy (UDUB): Is specified for the case that the network offers the call to the subscriber and if no compatible terminal responds "positively" but one or more compatible terminal responds "user busy". This condition will be determined when the response-to-call offering time-out occurs.

2.1.4 Abbreviations

This Recommendation uses the following abbreviations:

ACM Address Complete Message

CD Call Deflection

CFB Call Forwarding Busy

CFNR Call Forwarding No Reply

CFU Call Forwarding Unconditional

CLIP Calling Line Identification Presentation

CLIR Calling Line Identification Restriction

COLP Connected Line Identification Presentation

COLR Connected Line Identification Restriction

CPG	Call Progress Message
DSS1	Digital Subscriber Signalling System No. 1
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
Nb	Number
REL	Release Message
RLC	Release Complete

2.2 Description

2.2.1 General description

For a given ISDN number, the diversion supplementary services (including options) may be subscribed to for each basic service to which the user(s) of the number subscribe(s), or collectively for all the basic services to which the user(s) subscribe(s).

The served user can request a different diverted-to number for each basic service subscription parameter value and call diversion supplementary service to which he has subscribed.

The deflection functions are implemented in the network and they are invoked by the terminal on a call-by-call basis.

A terminating exchange that determines that call diversion may occur will not discard the set-up information until the exchange determines that call diversion will not occur in this particular instance.

The served users' originating service is unaffected.

The stage 1 descriptions of the call diversion supplementary services are given in Recommendations I.252.2, I.252.3, I.252.4 and I.252.5. The stage 2 descriptions are given in Recommendations Q.82.2 and Q.82.3.

The stage 3 DSS1 description is given in clauses 2 to 5/Q.952. This stage 3 description of call diversion supplementary services uses the ISDN user part protocol as defined in Recommendations Q.761-Q.764 and Q.730.

2.2.2 Specific terminology

See 2.1.3, Terms and definitions.

2.2.3 Qualification on the applicability to telecommunication services

See Recommendations I.252.2, I.252.3, I.252.4 and I.252.5.

2.2.4 State definitions

No specific state definitions are required.

2.3 Operational requirements

2.3.1 Provision/withdrawal

Call forwarding unconditional, Call forwarding busy, Call forwarding no reply and Call deflection shall be provided after pre-arrangement with the service provider.

Each diversion supplementary service can be withdrawn separately by the service provider at the subscriber's request or for administrative reasons.

The four supplementary services can be offered separately with subscription options. Options apply separately to each basic service subscribed to on each ISDN number. For each subscription option, only one value can be selected. These subscription options form part of the call diversion profile for the served user.

- The subscription options for the CFU supplementary service are included in Recommendation I.252.4.
- The subscription options for the CFB supplementary service are included in Recommendation I.252.2.
- The subscription options for the CFNR supplementary service are included in Recommendation I.252.3.
- The subscription options for the CD supplementary service are included in Recommendation I.252.5.

These requirements are summarized in Table 2-1.

Table 2-1/Q.732.2 – Subscription options for call diversion supplementary services

Subscription options	Value	Applicability
Served user receives notification that a call has been forwarded	No _____	CFU
	Yes	CFB
		CFNR
Calling user receives notification that his call has been diverted (forwarded or deflected)	No _____	CFU
	Yes, with diverted-to user number _____	CFB
	Yes, without diverted-to user number	CFNR
		CD
Served user receives reminder notification on outgoing calls that forwarding is currently activated	No _____	CFU
	Yes	CFB
		CFNR
Served user releases his/her number to diverted-to user	Do not release diverting number information _____	CFU
	Release diverting number information	CFB
		CFNR
		CD

The following network provider options are available for the supplementary services:

- The network provider options for the CFU supplementary service are included in Recommendation I.252.4.
- The network provider options for the CFB supplementary service are included in Recommendation I.252.2.
- The network provider options for the CFNR supplementary service are included in Recommendation I.252.3.

- The network provider options for the CD supplementary service are included in Recommendation I.252.5.

These requirements are summarized in Table 2-2.

Table 2-2/Q.732.2 – Network provider options for call diversion supplementary services

Network provider option	Value	Applicability
Served user call retention on invocation of diversion (forwarding or deflection)	Retain call to the served user until alerting begins at the diverted-to user (option A)	CFNR CD
	Clear call to the served user on invocation of call diversion (option B)	
Served user call retention when forwarding is rejected at forwarded-to user	Continue to alert the forwarding user (Note 1)	CFNR
	No action at the forwarding user (Note 2)	
Served user call retention when deflection is rejected	Continue to alert the deflecting user (Note 3)	CD
	No action at the deflecting user (Note 4)	
Total number of all diversions for each call	Maximum number of diverted connections (with an upper limit of 5)	CFU CFB CFNR CD
Call forwarding on no reply timer	Timer duration shall be a service provider option	CFNR
NOTE 1 – This applies to the retention of the call at invocation of call forwarding.		
NOTE 2 – This applies to the clearing call option on invocation of call forwarding.		
NOTE 3 – This option shall only be used for deflection after alerting has began.		
NOTE 4 – This applies to the clearing call option on invocation of call deflection.		

2.3.2 Requirements on the originating network side

Not applicable.

2.3.3 Requirements in the network

No specific requirements are needed in the network.

2.3.4 Requirements on the terminating network side

Not applicable.

2.4 Coding requirements

Recommendation Q.763 defines the messages and parameters for this supplementary service. The following messages and parameters are used to support the call diversion supplementary service.

The generic notification indicator, the redirection number restriction indicator and the call diversion information parameter are accompanied by the parameter compatibility information parameter. The procedures for the compatibility are defined in Recommendation Q.764.

2.4.1 Messages

Address complete message

Optional backward call indicators

Generic notification indicators

Redirection number

Redirection number restriction indicator

Call diversion information

Answer message

Redirection number

Redirection number restriction indicator

Call progress message

Optional backward call indicators

Event indicator

Generic notification indicator

Call diversion information

Redirection number

Redirection number restriction indicator

Connect message

Redirection number restriction indicator

Initial address message

Redirecting number

Redirection information

Original called number

2.4.2 Parameters

The following parameter fields and codes are used to support the call diversion supplementary service.

H	G	F	E	D	C	B	A
---	---	---	---	---	---	---	---

Event information

Bits

G F E D C B A

0 0 0 0 0 0 1	ALERTING
0 0 0 0 0 1 0	PROGRESS
0 0 0 0 1 0 0	CFB (see Note)
0 0 0 0 1 0 1	CFNR (see Note)
0 0 0 0 1 1 0	CFU (see Note)

Bit

H

0	No indication
1	Presentation restricted (see Note)

NOTE – These codes are used in national networks and can be used on the international interface on bilateral agreement. If these codes are used and conflicting information is received compared to the generic notification indicator and the call diversion information parameter, the latter takes priority.

Forward call indicators

Bit

H G

0 0	ISDN user part preference indicator
0 0	ISDN user part preferred all the way

Optional backward call indicators

Bit

B

	<i>Call diversion indicator</i>
0	No indication
1	Call diversion may occur

Original called number

Redirection information

Bits

C B A

	<i>Redirecting indicator</i>
0 1 1	Call diverted
1 0 0	Call diverted, all redirection info presentation restricted

Bits

H G F E

	<i>Original redirection reasons</i>
0 0 0 0	Unknown

Bits

K J I

	<i>Redirection counter</i>
--	----------------------------

Bit

L

	<i>Reserved for national use</i>
--	----------------------------------

Bits

P O N M

	<i>Redirecting reason</i>
0 0 0 0	Unknown/not available
0 0 0 1	User busy
0 0 1 0	No reply
0 0 1 1	Unconditional
0 1 0 0	Deflection during alerting
0 1 0 1	Deflection immediate response
0 1 1 0	Mobile subscriber not reachable

Redirecting number

Redirection number

Redirection number restriction indicator

Bits	
<u>B A</u>	<i>Presentation restriction indicator</i>
0 0	Presentation allowed
0 1	Presentation restricted
1 0	Spare
1 1	Spare
Bits	
<u>H G F E D C</u>	<i>Spare</i>
<i>Generic notification indicator</i>	
Bits	
<u>G F E D C B A</u>	
1 1 1 1 0 1 1	Call is diverting
<i>Call diversion information</i>	
Bits	
<u>C B A</u>	<i>Notification subscription option</i>
0 0 0	Unknown
0 0 1	Presentation not allowed
0 1 0	Presentation allowed with redirection Nb
0 1 1	Presentation allowed without redirection Nb
Bits	
<u>G F E D</u>	<i>Redirecting reason</i>
0 0 0 0	Unknown/not available
0 0 0 1	User busy
0 0 1 0	No reply
0 0 1 1	Unconditional
0 1 0 0	Deflection during alerting
0 1 0 1	Deflection immediate response
0 1 1 0	Mobile subscriber not reachable

2.5 Signalling requirements

2.5.1 Activation/deactivation/registration

Not applicable.

2.5.2 Invocation and operation

2.5.2.1 Actions at the originating local exchange

2.5.2.1.1 Normal operation

When call diversion has occurred on the served user side, the originating local exchange will receive an ACM message containing the call diversion information, the generic notification indicator and the redirection number.

NOTE – As a national option, the CPG message may be received.

Call diversion may occur on the served user's side after the ACM has been sent in the following cases:

- Call forwarding on no reply;
- Call deflection during alerting;
- Call forwarding user determined user busy when the early ACM method is used;
- Call deflection immediate response when the early ACM method is used.

In these cases the ACM will contain an optional backward call indicator set to "call diversion may occur".

2.5.2.1.2 Exceptional procedures

No exceptional procedures are identified.

2.5.2.2 Actions at the transit exchange

2.5.2.2.1 Normal operation

A transit exchange shall pass all information related to call diversion to the preceding or succeeding exchange.

2.5.2.2.2 Exceptional procedures

No exceptional procedures are identified.

2.5.2.3 Actions at the outgoing international gateway exchange

2.5.2.3.1 Normal operation

An outgoing international gateway exchange checks the following number parameters received in the IAM:

- calling party number;
- original called number;
- redirecting number.

The procedures for the calling party number are as specified for the CLIP/CLIR services.

The same procedures are also applicable for the original called number and the redirecting number.

An outgoing international gateway exchange checks the redirection number parameter if contained in the ACM or CPG message according to the procedures for the connected number in the COLP/COLR services.

2.5.2.3.2 Exceptional procedures

No exceptional procedures are identified.

2.5.2.4 Actions at the incoming international gateway exchange

2.5.2.4.1 Normal operation

An incoming international gateway exchange checks the following number parameters received in the IAM:

- calling party number;
- original called number.

The procedures for the calling party number are as specified for the CLIP/CLIR services.

The same procedures are also applicable for the original called number.

An incoming international gateway exchange checks the redirection number parameter if contained in the ACM or CPG message according to the procedures for the connected number in the COLP/COLR services.

If a network supports the CPG as the first backward message, then the incoming international gateway exchange has to map the CPG into an ACM and the following ACM into CPG.

If the national network supports CPG with event information indicating CFB, CFNR or CFU (see Note in 2.4.2), then when the incoming international gateway exchange receives such a CPG without either the generic notification indicator or the call diversion information, it will generate the missing parameters using the event information. If the received CPG is then mapped into a CPG on the international side, then the event information will be set to indicate progress unless bilateral agreements exist permitting the call forwarding codes in event information to be passed (see Note in 2.4.2).

2.5.2.4.2 Exceptional procedures

No exceptional procedures are identified.

2.5.2.5 Actions at the destination local exchange

2.5.2.5.1 Normal operation

2.5.2.5.1.1 Action at the destination exchange where the diverted-to user is located

When a destination local exchange receives a diverted call, the destination exchange shall include in the Address Complete, Call Progress, Answer or Connect message the Redirection Number Restriction parameter set according to the COLR supplementary service of the called user.

2.5.2.5.1.2 Actions at the destination exchange performing the diversion

a) Checking of the diversion limits

When an exchange determines that it must divert a call, it first checks if diverting the call exceeds the number of diversions allowed within the network.

b) Setting of the diversion parameters

The second action that needs to be undertaken, given that the limit was not exceeded, is the setting of the parameters that would be used in an initial address message for the diverted call. Even if the diversion is intra-exchange, this parameter information is set and retained. The reason for the retention is that, if subsequent diversion occurs, the information is required to guarantee that the diversion completes correctly. Finally, the exchange attempts to set up the diverted call.

Table 2-3 shows which parameters are modified in a diversion exchange.

When this is the first diversion the call has undergone, there are five parameters to be set: the redirection information, the called party number, the original called number, the redirecting number and the ISUP preference indicator. Their values are set as follows:

- 1) The redirection information – The redirection counter is set to one. The redirecting reason and redirecting indicator are set according to the diversion conditions and notification subscription option.
- 2) The original called number – This is equal to the number that was called.
The Address presentation restricted indicator for the Original called number shall be set according to the subscription option "Served user releases his/her number to the diverted-to user".
- 3) The called party number – This is equal to the number that the call is to be diverted to.
- 4) The redirecting number – This is equal to the number that is doing the diversion and is in this case equal to the original called number.

The Address presentation restricted indicator for the Redirecting number shall be set according to the subscription option "Served user releases his/her number to the diverted-to user".

- 5) The ISUP preference indicator – If the value "ISDN user part not required all the way" was received, the ISUP preference indicator is modified to "ISUP preferred all the way". Otherwise the ISUP preference indicator is left unchanged.

When this is the second or greater diversion the call has undergone, there are three parameters to be set: the redirection information, the called party number and the redirecting number. Their values are set as follows:

- i) The redirection information – The redirection counter is increased by one. The redirecting reason and redirecting indicators are set according to the diversion conditions.
- ii) The redirecting number – This is equal to the number that is doing the redirection. The Address presentation restricted indicator for the Redirecting number shall be set according to the subscription option "Served user releases his/her number to the diverted-to user".
- iii) The called party number – This is equal to the number that the call is to be diverted to.

When multiple diversions occur, the parameters are set as in Table 2-3.

c) *Diversion procedures at the diverting exchange*

The diverting exchange continues the call depending on the service that is causing the diversion.

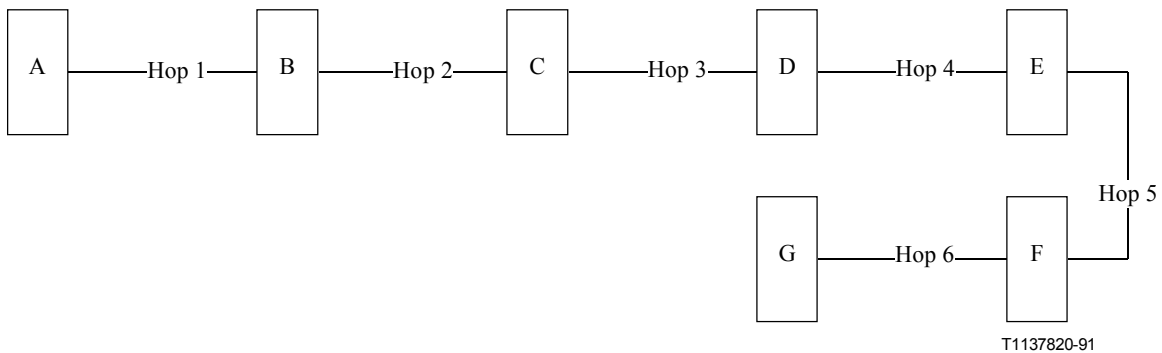
The echo control logic as defined in Recommendation Q.115 shall apply. The exchange shall also have the capability of storing propagation delay information received in the Initial Address message:

- i) *Call forwarding unconditional or network determined user busy*

The exchange continues in the following manner:

If the number that the call is to be diverted to resides at another exchange, an initial address message is sent to continue the call on to that exchange. The incoming circuit or line is connected to the chosen outgoing circuit in both directions immediately. The initial address message includes the parameter information as shown in Table 2-3.

Table 2-3/Q.732.2 – Parameter information for multiple redirection



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A originally calls B:

Information carried in the Initial Address Message:

	Hop 1	Hop 2	Hop 3	Hop 4	Hop 5	Hop 6
Number information						
Called party number	B	C	D	E	F	G
Redirecting number		B	C	D	E	F
Original called number		B	B	B	B	B
Redirection information						
Redirection counter		1	2	3	4	5
Redirecting indicator		V	V	V	V	V
Redirecting reason		W	W	W	W	W
V Value = (call diversion) or (call diversion all redirection info presentation restricted) W Value = (user busy) or (no reply) or (unconditional) or (deflection during alerting) or (deflection immediate response)						

ii) *Call forwarding no reply and call deflection during alerting*

When the no reply timer expires or when call deflection is invoked:

Option A: The exchange continues in the following manner:

If the number that the call is to be diverted to resides at another exchange, an Initial Address Message is sent. The incoming circuit or line is not connected to the chosen outgoing circuit yet as it could result in confusing sequences of in-band tones or announcements (e.g. ringing going to busy). The Initial Address Message includes the parameter information as shown in Table 2-3.

If the exchange receives an alerting indication, it connects the incoming circuit or line to the outgoing circuit, in at least the backward direction. If the exchange receives an answer or connect indication, it connects in both directions. If the exchange receives a release indication – called party busy, for instance – the incoming connection is simply left intact, until awaiting answer timer expiry or calling user disconnect.

If the original called user answers prior to receipt of alerting indication from the diverted-to exchange, this user is awarded the call and the connection toward the diverted-to exchange is released.

Option B: The exchange continues in the following manner:

If the number that the call is to be diverted to resides at another exchange, an initial address message is sent. The connection to the diverting user is released immediately but the ringing tone continues to be sent on the incoming circuit or line. The incoming circuit or line is connected to the chosen outgoing circuit in both directions at the reception of either the ACM with subscriber free indication, CPG with alerting indication or ANM/CON message. The Initial Address Message includes the parameter information as shown in Table 2-3.

iii) *Call Forwarding User Determined Busy or Call deflection immediate response*

The call is offered to the served user. When the late ACM method is used, the exchange waits until the user responds.

When the early ACM method is used an Address Complete Message is returned to the originating exchange including:

- a Backward Call Indicator parameter with no indication of the called party's status field;
- an Optional Backward Call indicator with the indication "Call Diversion may occur".

The exchange continues in the following manner:

If the number that the call is to be diverted to resides at another exchange, an Initial Address Message is sent. The incoming circuit or line is connected to the chosen outgoing circuit in both directions immediately. The Initial Address Message includes the parameter information as shown in Table 2-3.

If the exchange receives a release indication from the diverted-to exchange – called party busy, for instance – a release message is sent on the incoming circuit.

d) *Notification procedures*

In case of:

- call forwarding unconditional (option B, immediate release);
- call forwarding network determined busy (option B, immediate release);
- call forwarding user determined user busy when the late ACM method is used;
- call deflection immediate response when the late ACM method is used,

when call diversion occurs, the diverting exchange shall send an address complete message containing the call diversion information and the redirection number in the backward direction. The call diversion information is set according to the notification subscription option of the served user and the redirecting reason. In addition, if the notification subscription option "calling user receives notification that the call has been diverted" of the served user is set to "yes", the generic notification parameter shall be included in the address complete message, with the notification indicator set to "call is diverting".

In case of:

- call forwarding on no reply (option A, late release);
- call deflection during alerting (option A, late release),

an address complete message is returned to the originating exchange with an optional backward call indicator with the indication "call diversion may occur".

When call diversion is initiated, the call diversion information and the redirection number parameters for the served user are stored until an alerting indication is received from the diverted-to exchange.

In case of:

- call forwarding on no reply;
- call deflection during alerting;
- call forwarding user determined user busy when the early ACM method is used;
- call deflection immediate response when the early ACM method is used,

an address complete message is returned to the originating exchange with an optional backward call indicator with the indication "call diversion may occur".

When call diversion occurs, the diverting exchange shall send a call progress message containing the call diversion information and the redirection number in the backward direction. The call diversion information is set according to the notification subscription option of the served user and the redirecting reason. In addition, if the notification subscription option "calling user receives notification that the call has been diverted" of the served user is set to "yes", the generic notification parameter shall be included in the call progress message, with the notification indicator set to "call is diverting".

e) *Handling of messages and parameters in a diverting exchange*

i) *Receipt of address complete message*

- 1) In case of CFU, CFB, CD immediate response, CFNR (option B) and CD during alerting (option B), the parameters of the received ACM are transferred in a call progress message. Table 2-4 shows the correct mapping of the information.
- 2) In case of CFNR (option A) and CD during alerting (option A), if an ACM (subscriber free) is received, the exchange shall send a CPG with the generic notification parameter and the previously stored call diversion information and redirection number parameters; the generic notification indicator shall be set to "call is diverting". If an ACM (no indication) is received, then any diversion information contained in the received ACM is not mapped into CPG but stored until a CPG (alerting) or ANM is received. The previously stored diversion information shall be overwritten with the received diversion information. The notification subscription option field shall be analysed and the most severe restriction retained.

Table 2-4/Q.732.2 – Mapping of information received in an ACM

ACM	CPG
Called party's status indicator "subscriber free"	Event information "alerting"
Optional backward call indicator "in-band information or an appropriate pattern is now available"	Event information "in-band information or an appropriate pattern is now available"
Called party's status indicator "no indication"	Event information "progress"
Other parameters are transferred transparently (Note)	
NOTE – The contents of the echo control information parameter may be changed by the echo control logic as defined in Recommendation Q.115.	

ii) *Receipt of call progress message*

If a call progress message is received in a diverting exchange, the action to be taken depends on the service causing the diversion:

- 1) In case of CFU, CFB, CD immediate response and in case of CFNR (option B) and CD during alerting (option B), the call progress message is passed on.
- 2) In case of CFNR (option A) and CD during alerting (option A), if a CPG (alerting) is received, the exchange shall send a CPG with the generic notification parameter and the previously stored call diversion information and redirection number parameters; the generic notification indicator shall be set to "call is diverting". If a CPG is received other than "alerting", then any diversion information contained in the received CPG is stored and not mapped into CPG. The previously stored diversion information shall be overwritten with the received diversion information. The notification subscription option field shall be analysed and the most severe restriction retained.

iii) *Receipt of answer message*

If an answer message is received in a diverting exchange, the action to be taken depends on the service causing the diversion:

- 1) In case of CFU, CFB, CD immediate response and in case of CFNR (option B) and CD during alerting (option B), the ANM message is passed on with the parameters transferred as received from the received ANM.
- 2) In case of CFNR (option A) and CD during alerting (option A), if an ACM (subscriber free) or CPG (alerting) has already been received, the ANM message is passed on with the parameters transferred as received from the received ANM. If an ACM (subscriber free) or CPG (alerting) has not been received, the exchange shall send a CPG with the generic notification parameter and the previously stored call diversion information and redirection number parameters; the generic notification indicator shall be set to "call is diverting". An ANM shall then be sent to the preceding exchange with the parameters transferred as received from the received ANM.

iv) *Receipt of connect message*

If a connect message is received in a diverting exchange, the action to be taken depends on the service causing the diversion:

- 1) In case of CFU, CFB, CD immediate response, CFNR (option B) and CD during alerting (option B), the CON message is mapped into answer message with the parameters transferred as received from the received CON.
- 2) In case of CFNR (option A) and CD during alerting (option A), the exchange shall send a CPG with the generic notification parameter and the previously stored call diversion information and redirection number parameters; the generic notification indicator shall be set to "call is diverting". An ANM shall then be sent to the preceding exchange with the parameters transferred as received from the received CON.

v) *Handling of received parameters*

If a diverting exchange receives information which is not supplementary services related, it is either passed on unchanged (e.g. interworking indicator, transmission medium requirement, cause indicators) or modified required as for the basic call in transit exchanges (e.g. continuity check indicator, satellite indicator, automatic congestion level). However, information dealing with supplementary services (e.g. call diversion related parameters) is not transferred transparently under all circumstances.

Table 2-5 lists the parameters and indicators which are handled differently in a diverting exchange compared to a normal transit exchange.

Table 2-5/Q.732.2 – Handling of parameters in a diverting exchange

Parameter – Sub-parameter or indicator	Handling in a diverting exchange on receipt
Access transport – Called party's sub-address	Discarded or replaced: see 2.6.17
Backward call indicator – Charge indicator	National matter
Called party's number – Odd/even indicator – Nature of address indicator – Internal network number indicator – Numbering plan indicator – Address signals	Generated: see 2.5.2.5.1.2 b)
Event information – Event indicator	Generated: 2.5.2.5.1.2 d) possibly modified: see 2.5.2.5.1.2 e)
Forward call indicators – ISUP preference indicator	Possibly modified: see 2.5.2.5.1.2 b)
Redirecting number – Odd/even indicator – Nature of address indicator – Numbering plan indicator – Address presentation restricted indicator – Address signals	Generated: see 2.5.2.5.1.2 b)
Generic notification indicator	Generated: see 2.5.2.5.1.2 d)
Call diversion information	Generated: see 2.5.2.5.1.2 d)
Redirection information – Redirecting indicator – Redirection counter – Redirection reason	Generated: see 2.5.2.5.1.2 b)
User-to-user information	Discarded or passed on: see Recommendation Q.737.1
Original called number	Generated: see 2.5.2.5.1.2 b)
Optional backward call indicator	Generated: see 2.5.2.5.1.2 d)
Redirection number	Generated: see 2.5.2.5.1.2 d)

2.5.2.5.2 Exceptional procedures

2.5.2.5.2.1 Actions at the destination exchange where the forwarded-to user is located

No exceptional procedures are identified.

2.5.2.5.2.2 Actions at the destination exchange performing the diversion

If the call has already undergone diversion, the redirection counter is examined to see if another diversion would take the counter above the network specified limit of five diversions.

In case of call forwarding unconditional, call forwarding (user or network determined busy) and call deflection immediate response the call is cleared.

In case of call forwarding no reply and call deflection during alerting, there are two options (as described in Table 2-2: Network provider options for call diversion supplementary services).

In Option A: If it did, the call is not cleared but ringing continues.

In Option B: If it did, the call is cleared.

The cause value used in the release message depends upon which of the call diversion supplementary services it is that would take the call over the limit.

The mapping is as follows:

- a) call forwarding busy, the cause value "user busy" is used;
- b) call forwarding no reply, the cause value "no answer from user" is used (option B only);
- c) call forwarding unconditional, the cause value "call rejected" is used;
- d) call deflection, the cause value "no user responding" is used (option B only).

2.6 Interactions with other supplementary services

2.6.1 Call Waiting (CW)

No impact on ISUP.

2.6.2 Call transfer services

No applicable interaction at this time.

2.6.3 Connected Line Identification Presentation (COLP)

A connected number parameter and the generic number (additional connected number, if present) received in a diverting exchange in either an answer or connect message is passed on unmodified. The originating exchange is responsible for the interpretation of the presentation restriction of the connected number.

The setting of the presentation indicator also applies to the redirection number.

2.6.4 Connected Line Identification Restriction (COLR)

A connected number parameter received in a diverting exchange in either an answer or connect message is passed on unmodified. The originating exchange is responsible for the interpretation of the presentation restriction of the connected number.

The setting of the presentation indicator also applies to the redirection number.

2.6.5 Calling Line Identification Presentation (CLIP)

No impact on ISUP.

NOTE – A diverting exchange shall divert the calling number and the generic number (additional calling party number, if present).

2.6.6 Calling Line Identification Restriction (CLIR)

No impact on ISUP.

2.6.7 Closed User Group (CUG)

Closed user group restrictions must be met between the calling user, the diverted-to user and every intermediate diverting user.

The closed user group information sent to the diverted-to destination is the same closed user group information that was sent from the originating exchange.

2.6.8 Conference calling (CONF)

No impact on ISUP.

2.6.9 Direct Dialling-In (DDI)

No impact on ISUP.

2.6.10 Call diversion services

Not applicable.

2.6.11 Line Hunting (LH)

No impact on ISUP.

2.6.12 Three Party Service (3PTY)

No impact on ISUP.

2.6.13 User-to-User Signalling (UUS)

2.6.13.1 User-to-User Signalling, Service 1 (UUS1)

See 1.1.6.10/Q.737.1 for the interaction between call diversion services and user-to-user signalling, service 1.

2.6.13.2 User-to-User Signalling, Service 2 (UUS2)

See 1.2.6.10/Q.737.1 for the interaction between call diversion services and user-to-user signalling, service 2.

2.6.13.3 User-to-User Signalling, Service 3 (UUS3)

See 1.3.6.10/Q.737.1 for the interaction between call diversion services and user-to-user signalling, service 3.

2.6.14 Multiple Subscriber Number (MSN)

No impact on ISUP.

2.6.15 Call hold (HOLD)

No impact on ISUP.

2.6.16 Advice of Charge (AOC)

No impact on ISUP.

2.6.17 Sub-addressing (SUB)

If a called party sub-address is included in the access transport parameter of the received IAM, the received called party sub-address is not diverted. If provided by the served user at call diversion activation, a new called party sub-address is included in the access transport parameter of the IAM.

The calling party sub-address in the initial address message and the connected party sub-address in the answer or connect message are transferred transparently in the diverting exchange.

2.6.18 Terminal Portability (TP)

No impact on ISUP.

2.6.19 Completion of Calls to Busy Subscriber (CCBS)

No applicable interaction at this time.

2.6.20 Malicious Call Identification (MCID)

No impact on ISUP.

2.6.21 Reverse charging (REV)

No applicable interaction at this time.

2.6.22 Multi-level Precedence and Preemption (MLPP)

No impact on ISUP.

2.6.23 Private Numbering Plan (PNP)

No applicable interaction at this time.

2.6.24 International telecommunication charge card

No applicable interaction at this time.

2.7 Interactions with other networks

2.7.1 Interactions with networks not providing any call diversion information

In case of interaction with networks which do not provide any notification of the call diversion or call redirection information (e.g. redirection counter) in the signalling system, the call continues according to the basic call procedures.

2.7.2 Interactions with private ISDNs

Interactions are for further study.

2.8 Signalling flows

Figures 2-1 to 2-8 give successful diversion scenarios in case of late ACM procedures.

Figures 2-9 to 2-16 give the scenarios for unsuccessful diversion with late ACM.

Figures 2-17 to 2-24 give successful diversion scenarios in case of early ACM procedures.

Figures 2-25 to 2-32 give the scenarios for unsuccessful diversion with early ACM.

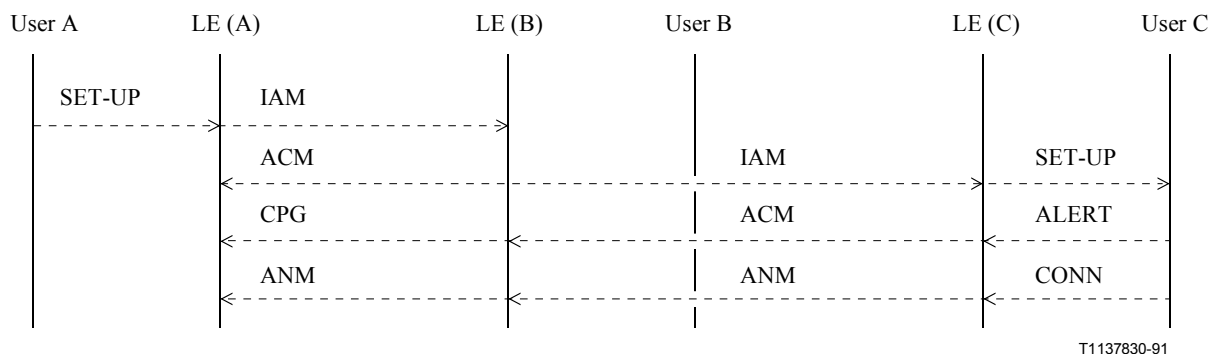
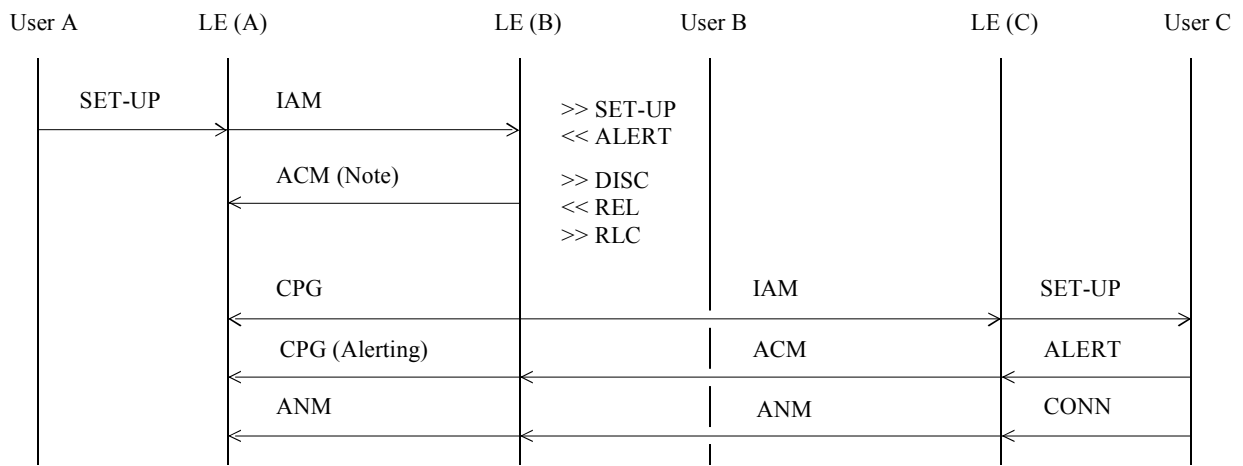


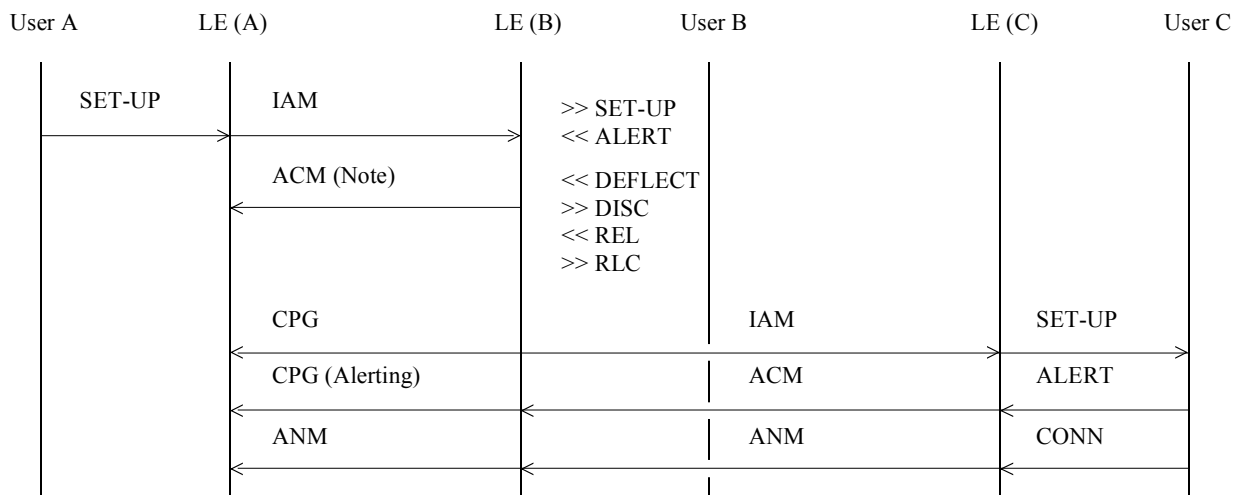
Figure 2-1/Q.732.2 – Call forwarding unconditional



NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

T1137870-91

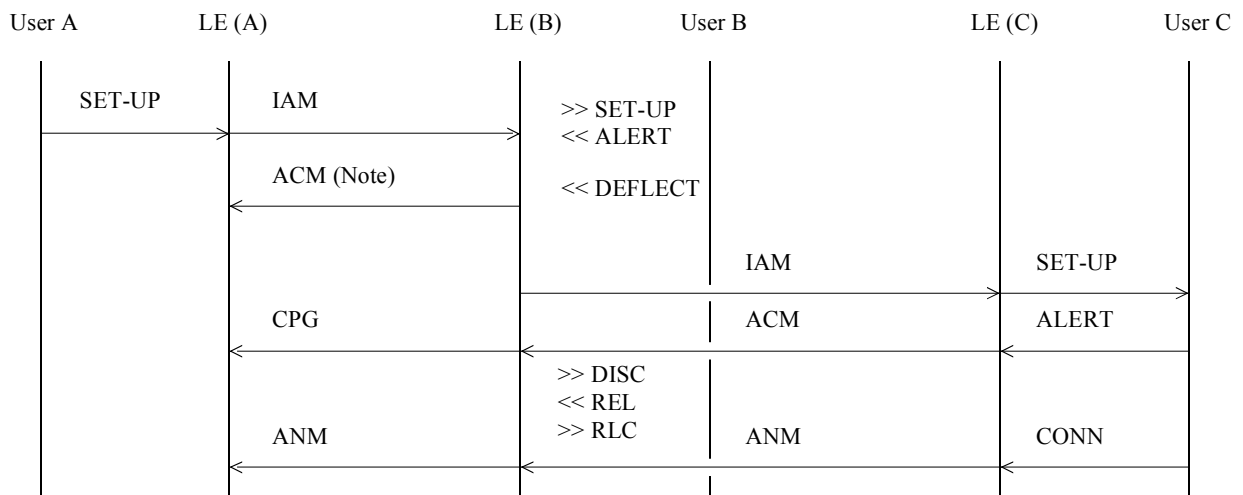
Figure 2-5/Q.732.2 – Call forwarding no reply (option B, immediate release)



NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

T1137880-91

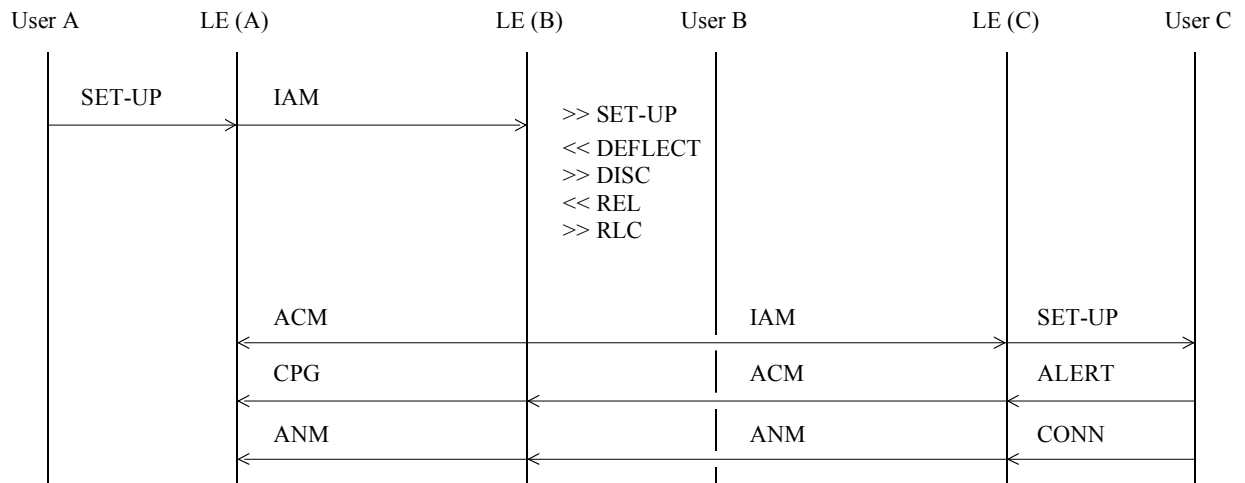
Figure 2-6/Q.732.2 – Call deflection during alerting (option B, immediate release)



T1137890-91

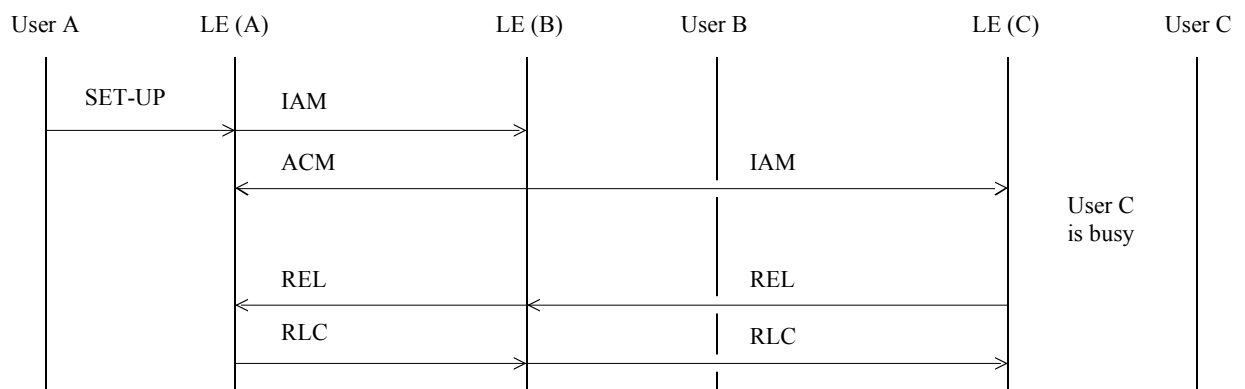
NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

Figure 2-7/Q.732.2 – Call deflection during alerting (option A, late release)



T1137900-91

Figure 2-8/Q.732.2 – Call deflection immediate response (option B, immediate release)



T1137910-91

Figure 2-9/Q.732.2 – Call forwarding unconditional – unsuccessful

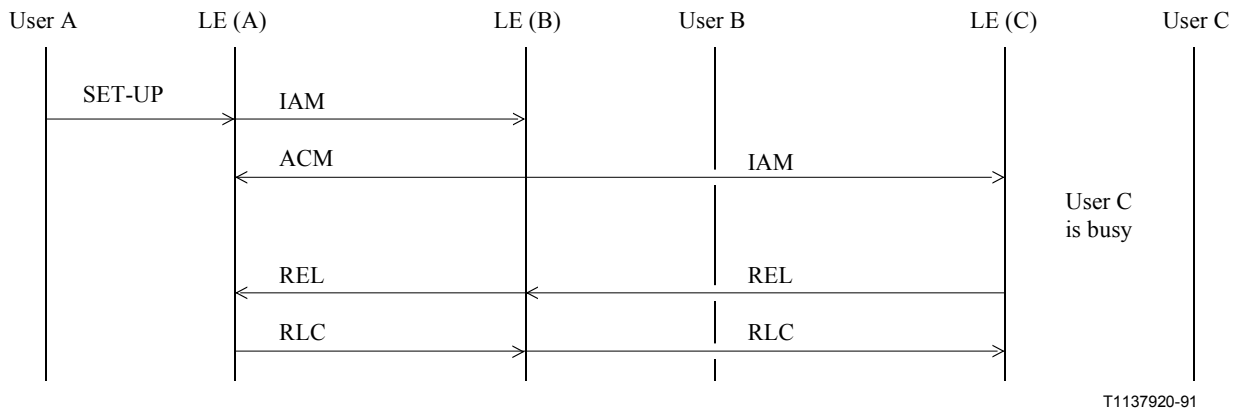


Figure 2-10/Q.732.2 – Call forwarding (network determined) busy – unsuccessful

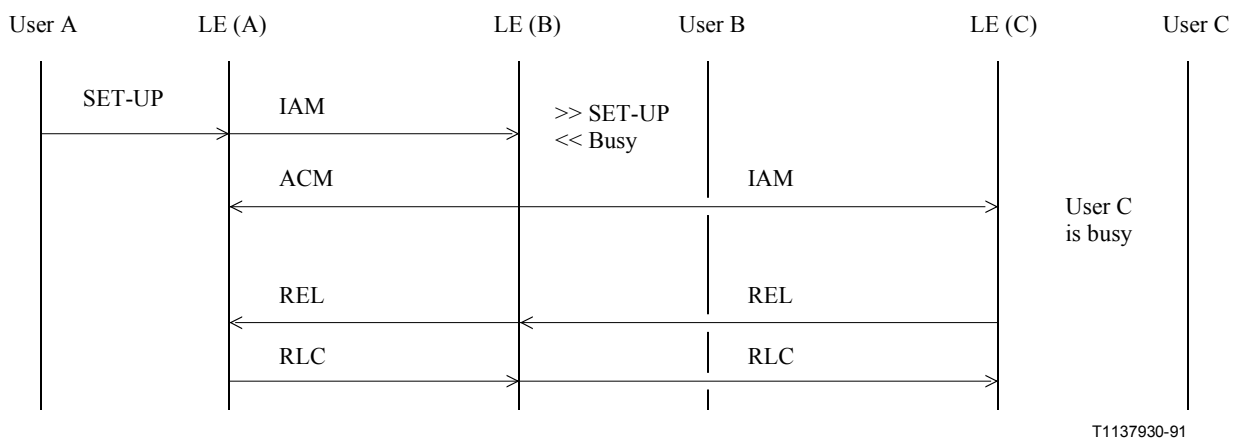


Figure 2-11/Q.732.2 – Call forwarding (user determined) busy – unsuccessful

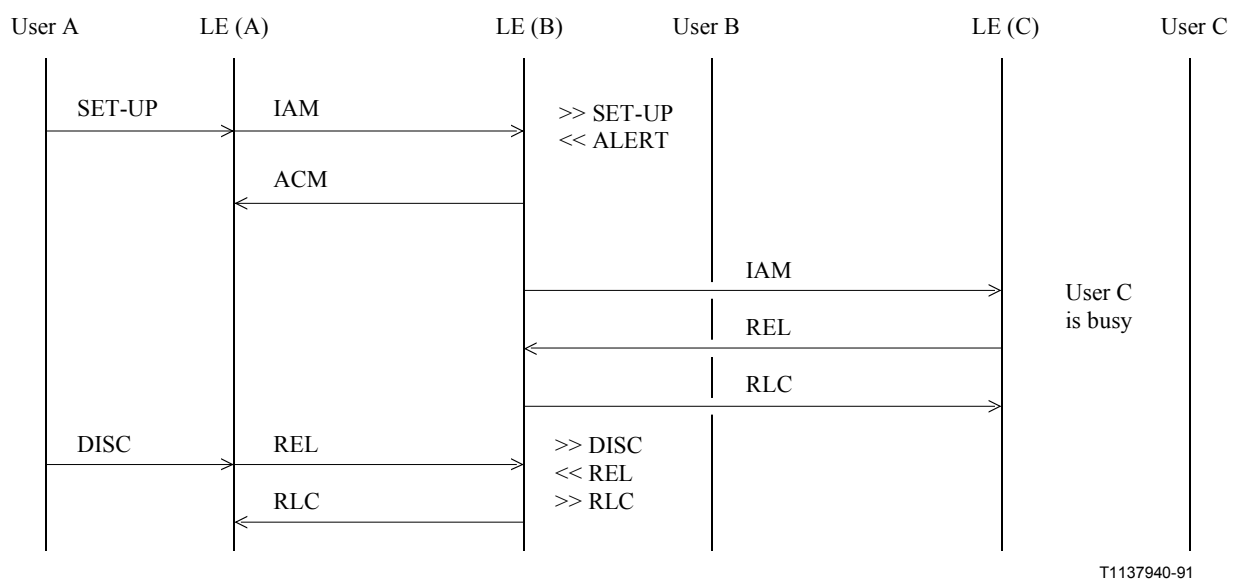
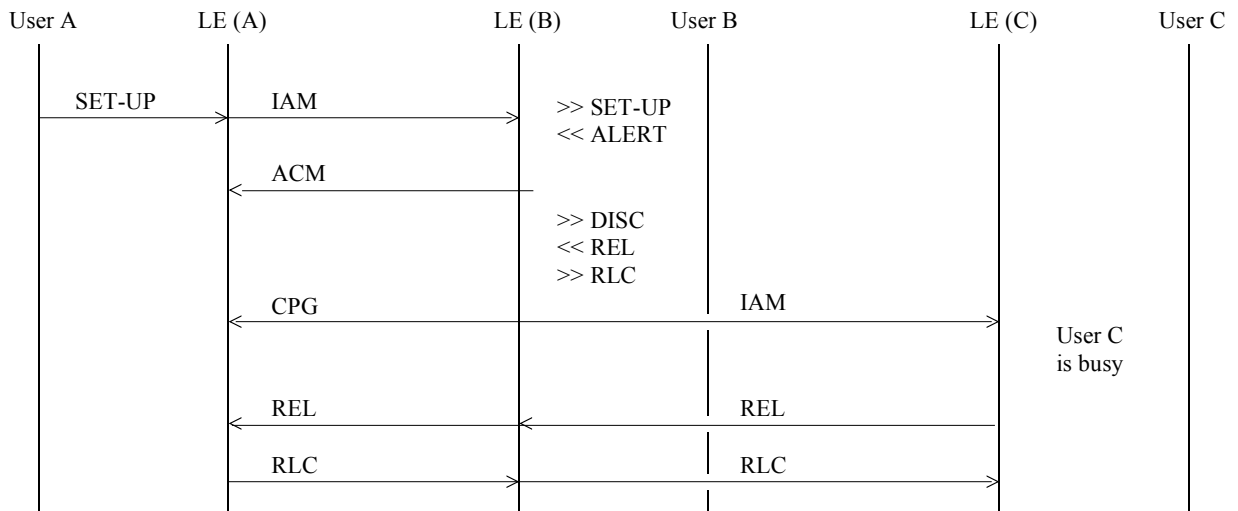
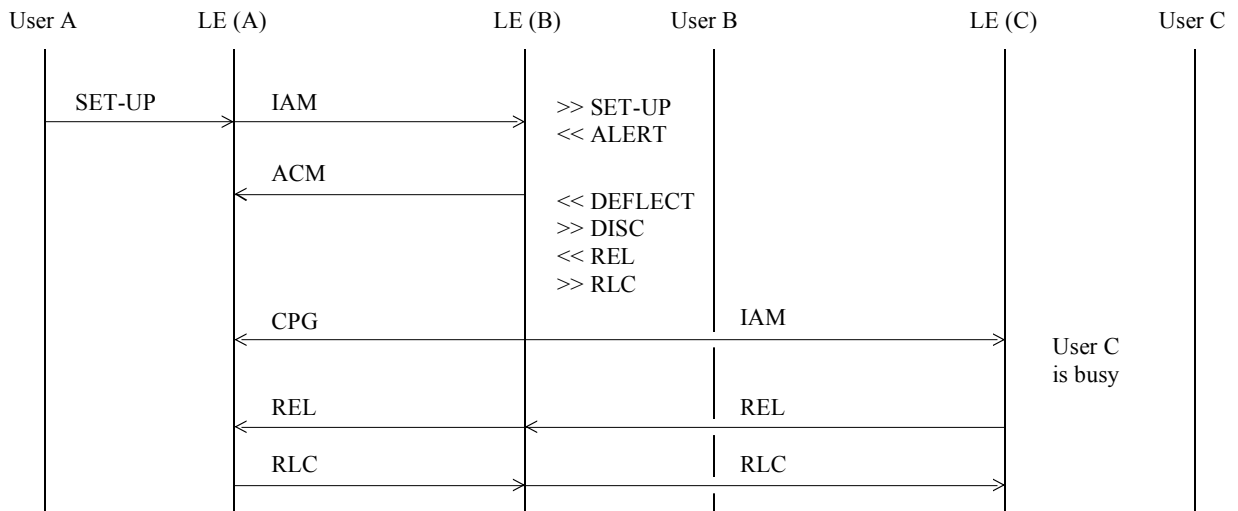


Figure 2-12/Q.732.2 – Call forwarding no reply (option A, late release) – unsuccessful



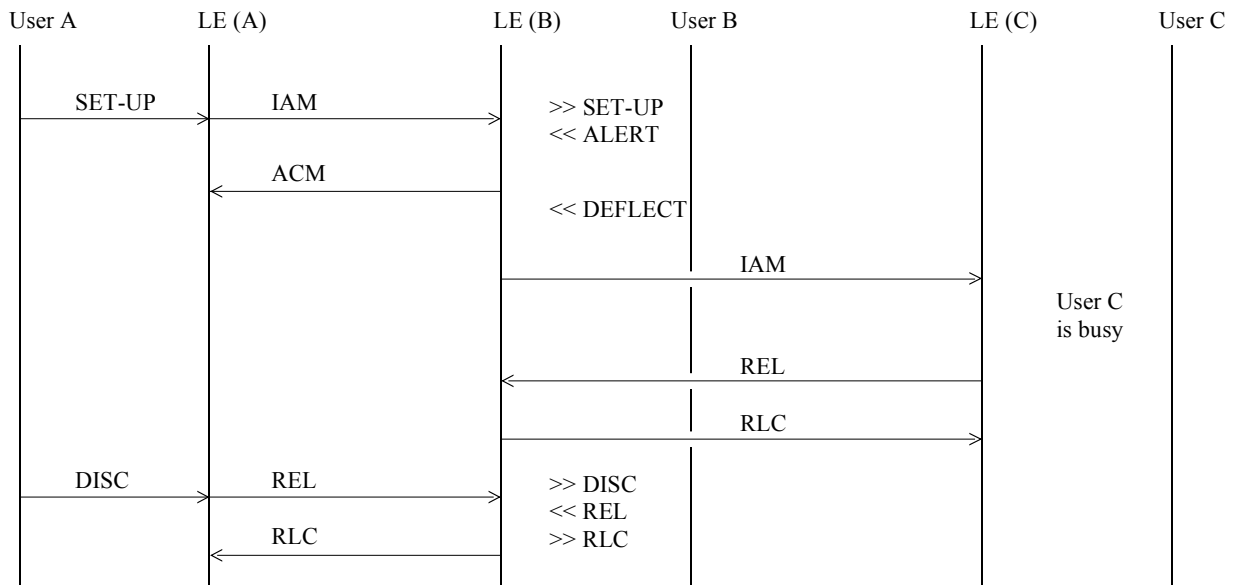
T1137950-91

Figure 2-13/Q.732.2 – Call forwarding no reply (option B, immediate release) – unsuccessful



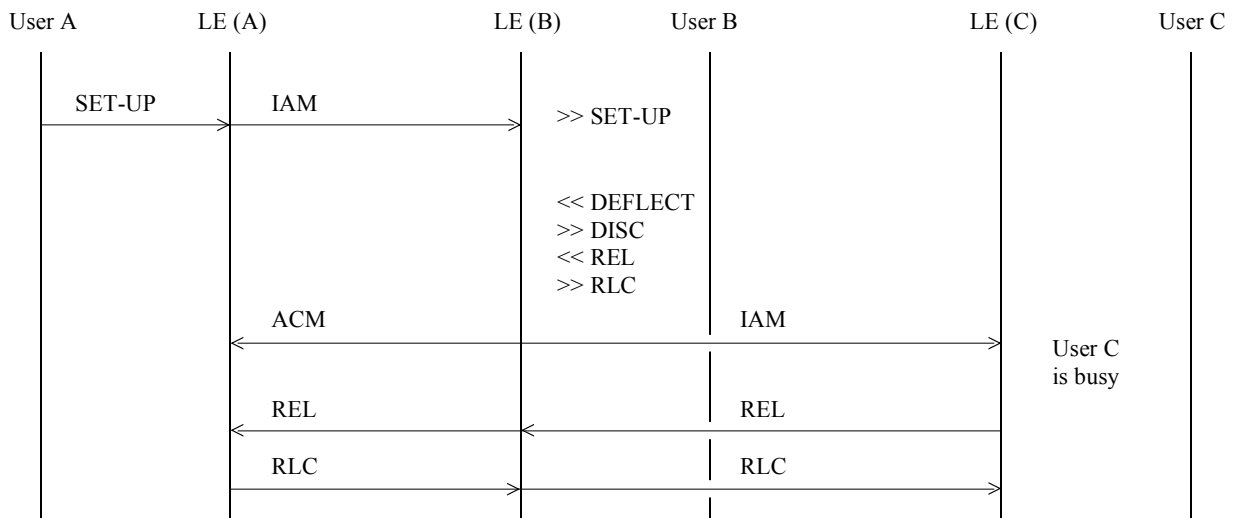
T1137960-91

Figure 2-14/Q.732.2 – Call deflection during alerting (option B, immediate release) – unsuccessful



T1137970-91

Figure 2-15/Q.732.2 – Call deflection during alerting (option A, late release) – unsuccessful



T1137980-91

Figure 2-16/Q.732.2 – Call deflection immediate response (option B, immediate release) – unsuccessful

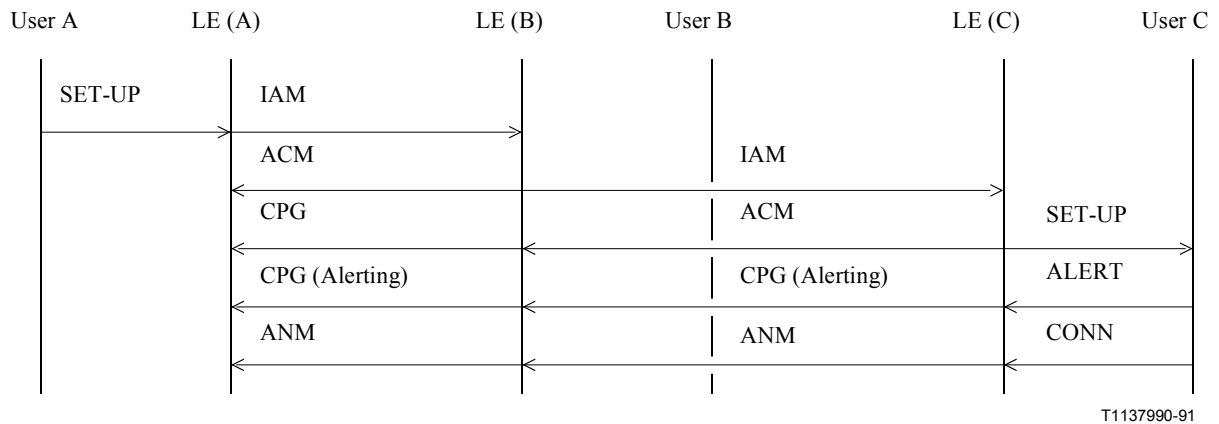


Figure 2-17/Q.732.2 – Call forwarding unconditional

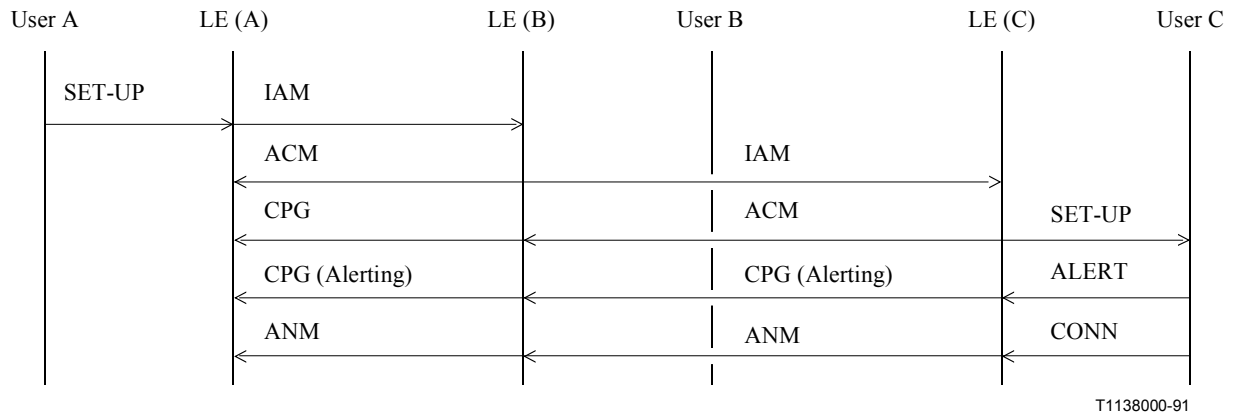
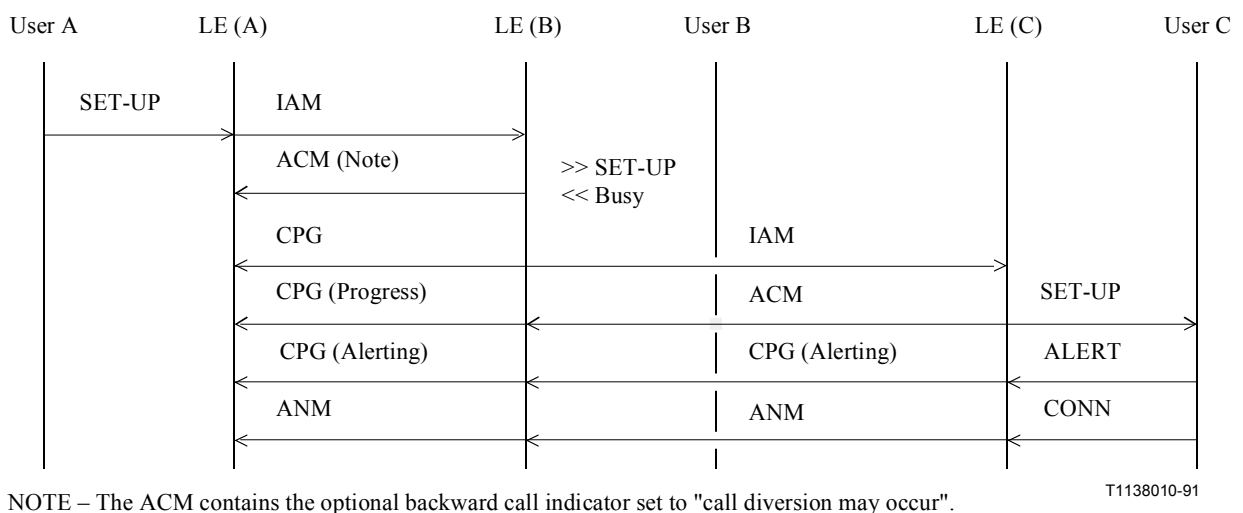
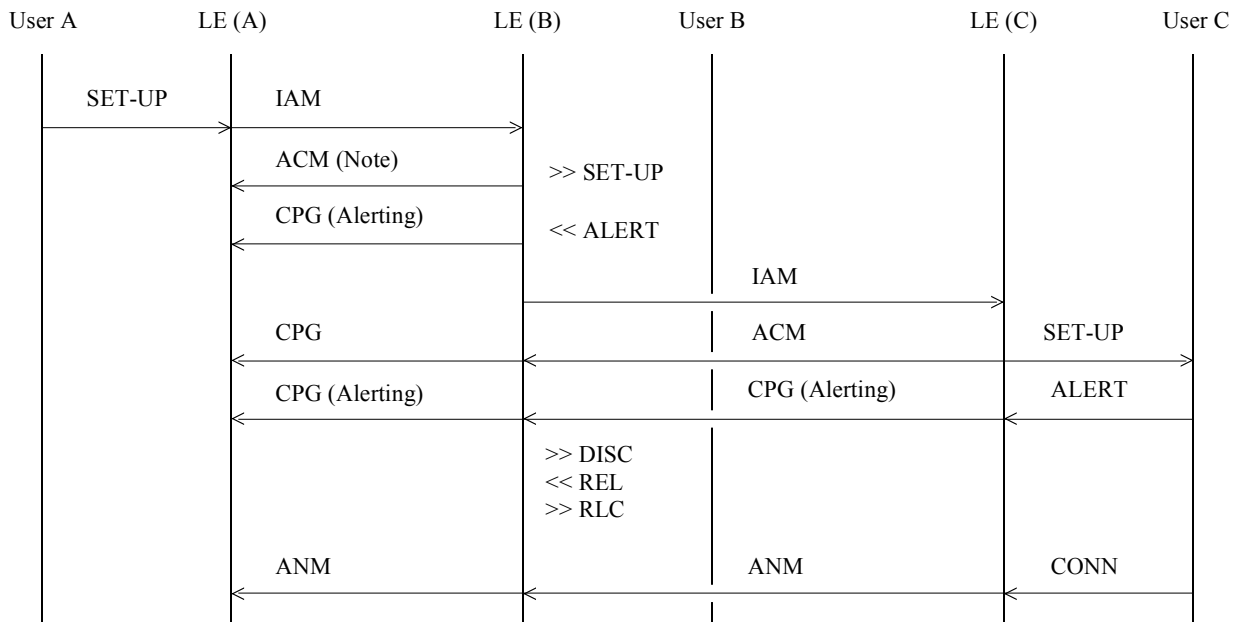


Figure 2-18/Q.732.2 – Call forwarding (network determined) busy



NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

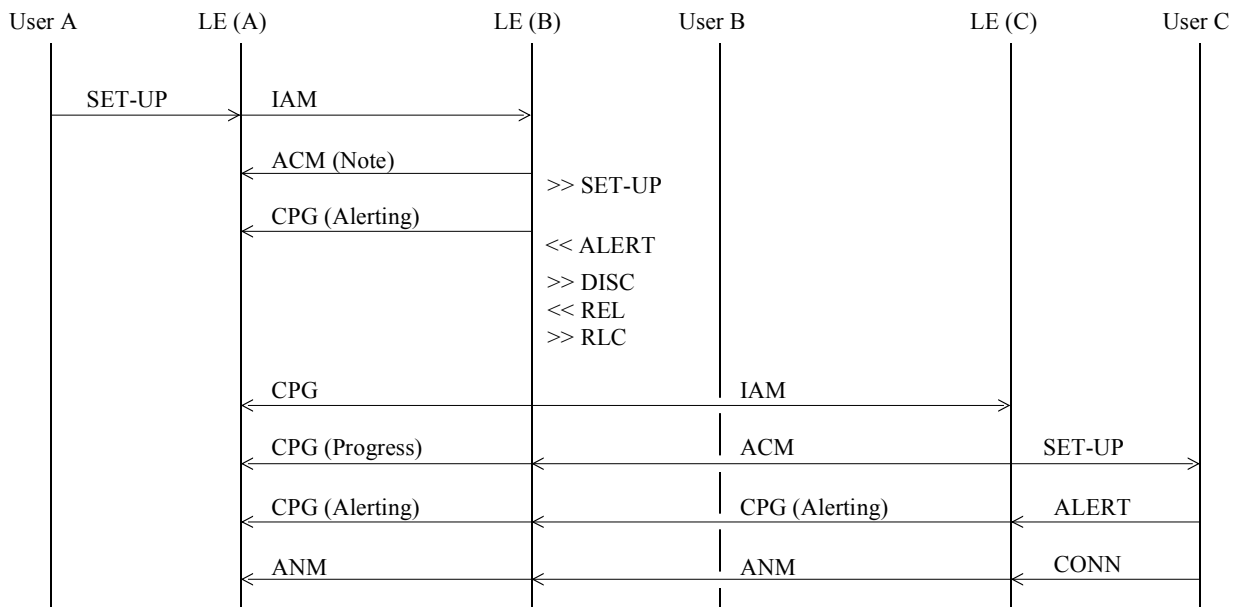
Figure 2-19/Q.732.2 – Call forwarding (user determined) busy



T1138020-91

NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

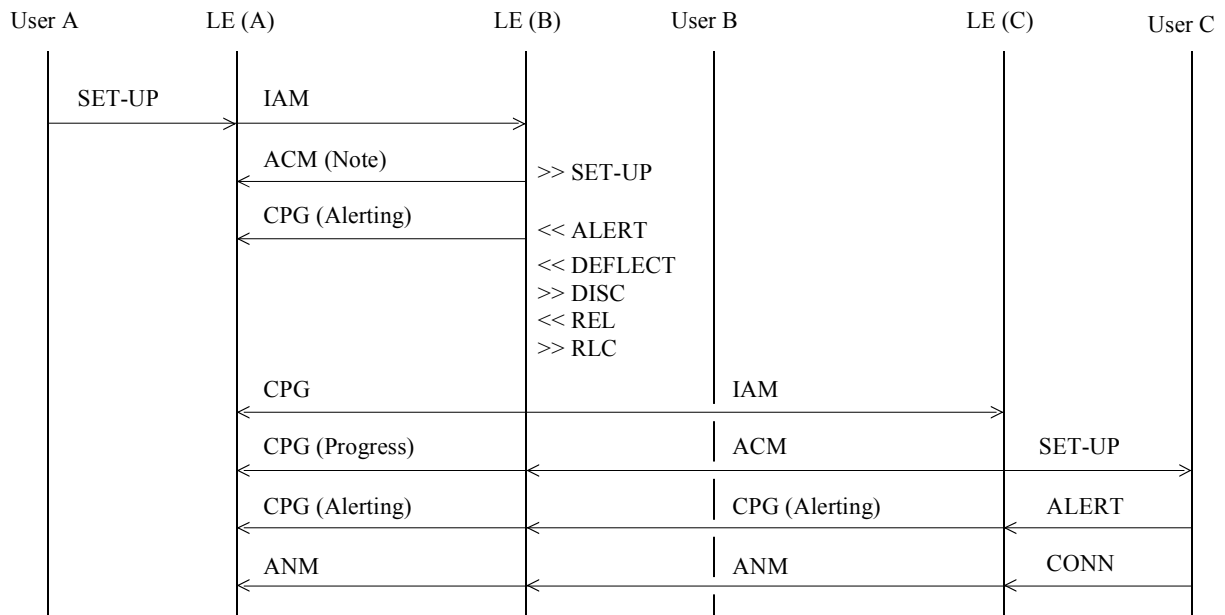
Figure 2-20/Q.732.2 – Call forwarding no reply (option A, late release)



T1138030-91

NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

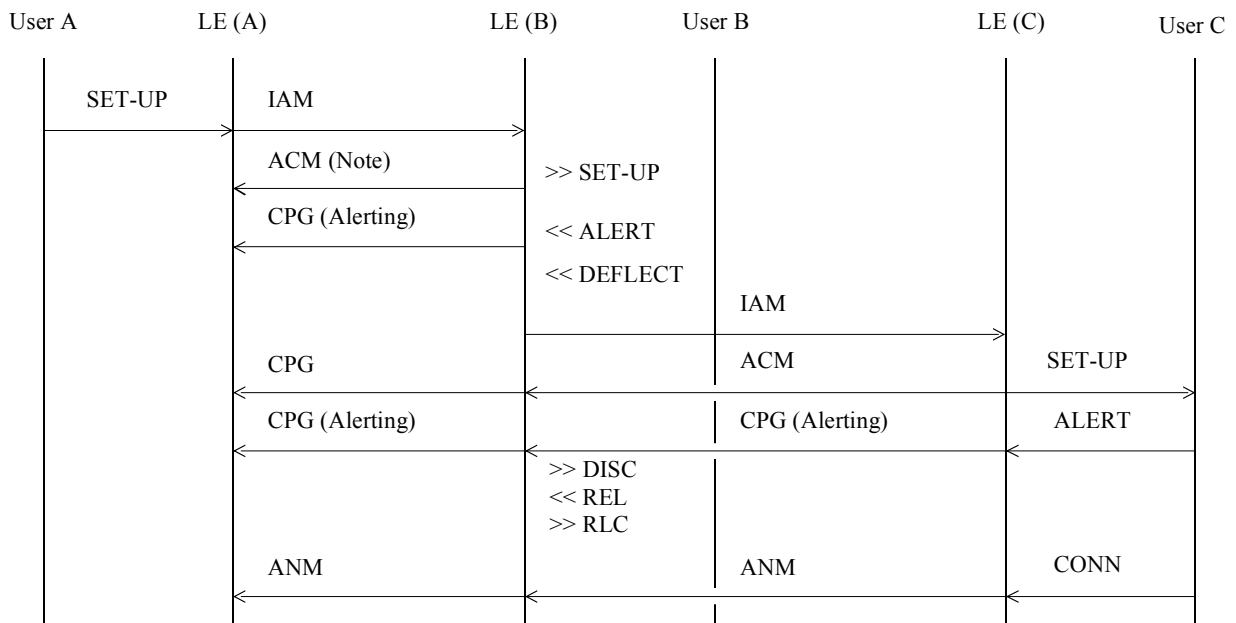
Figure 2-21/Q.732.2 – Call forwarding no reply (option B, immediate release)



T1138040-91

NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

Figure 2-22/Q.732.2 – Call deflection during alerting (option B, immediate release)



T1138050-91

NOTE – The ACM contains the optional backward call indicator set to "call diversion may occur".

Figure 2-23/Q.732.2 – Call deflection during alerting (option A, late release)

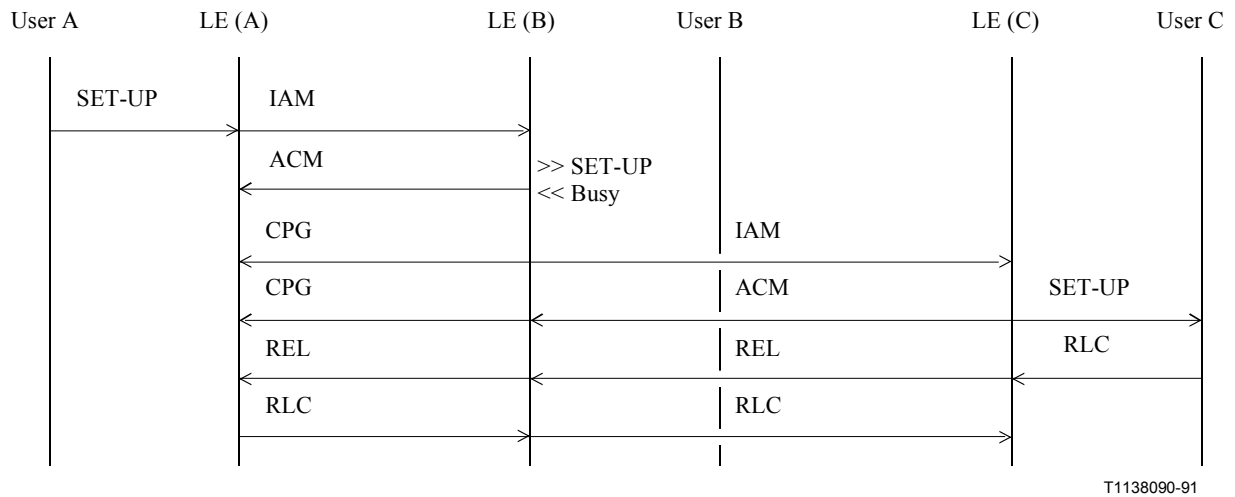


Figure 2-27/Q.732.2 – Call forwarding (user determined) busy – unsuccessful

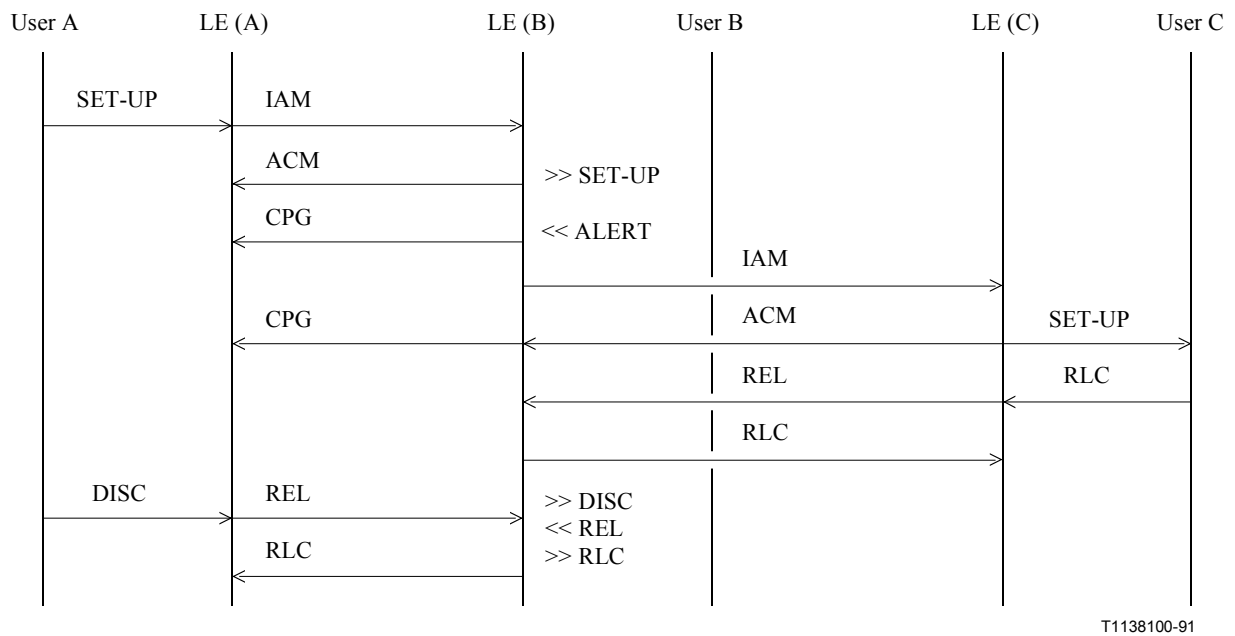


Figure 2-28/Q.732.2 – Call forwarding no reply (option A, late release) – unsuccessful

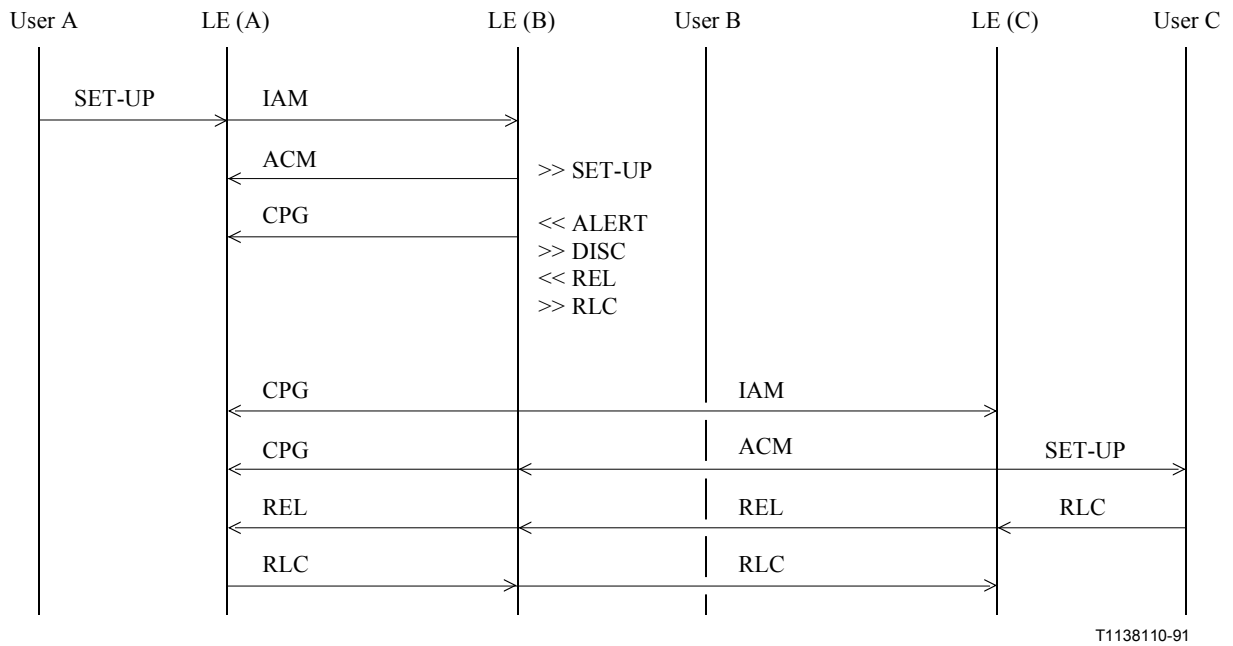


Figure 2-29/Q.732.2 – Call forwarding no reply (option B, immediate release) – unsuccessful

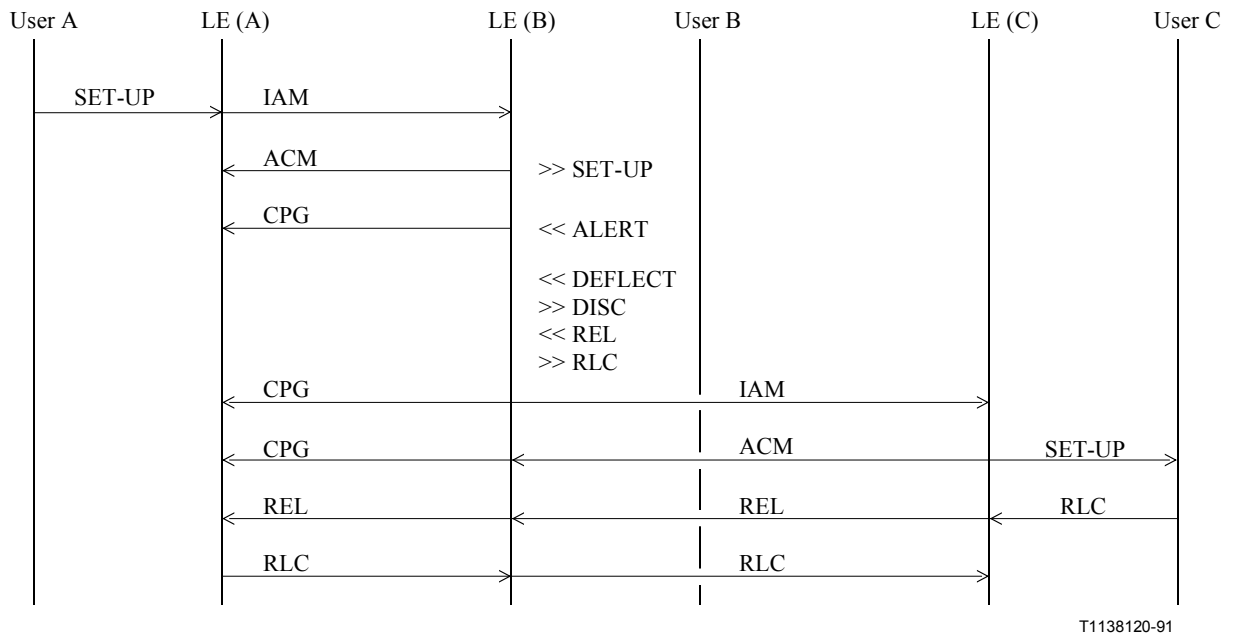


Figure 2-30/Q.732.2 – Call deflection during alerting (option B, immediate release) – unsuccessful

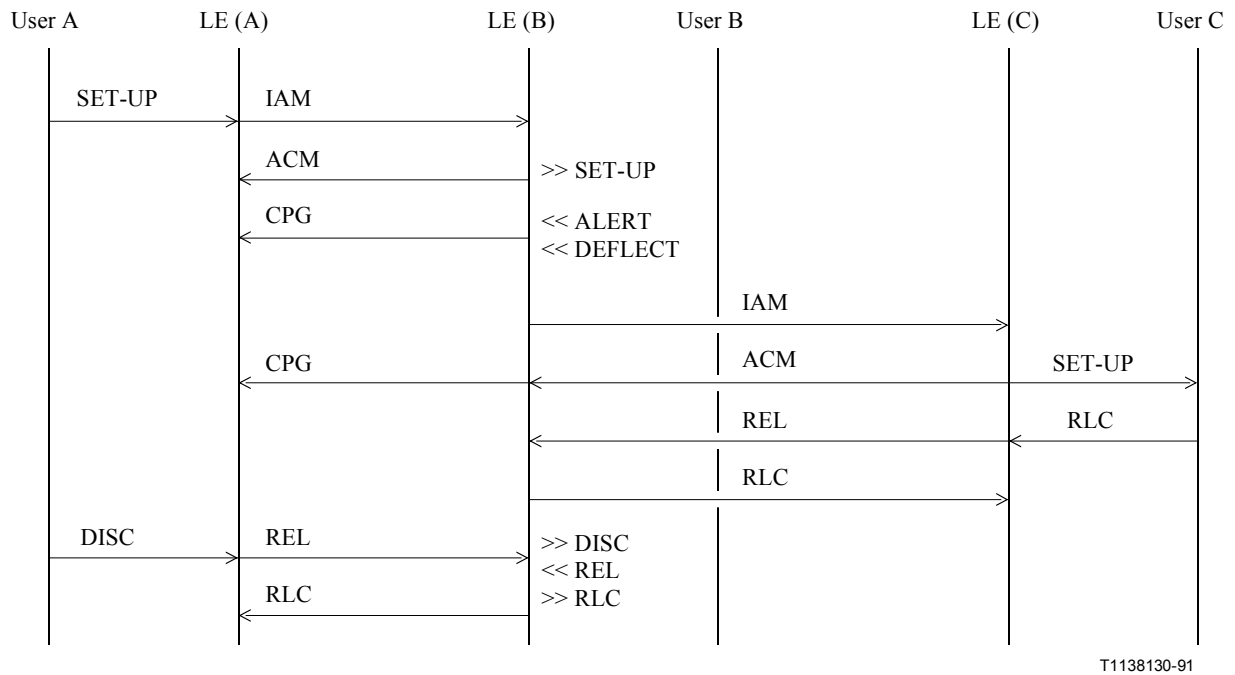


Figure 2-31/Q.732.2 – Call deflection during alerting (option A, late release) – unsuccessful

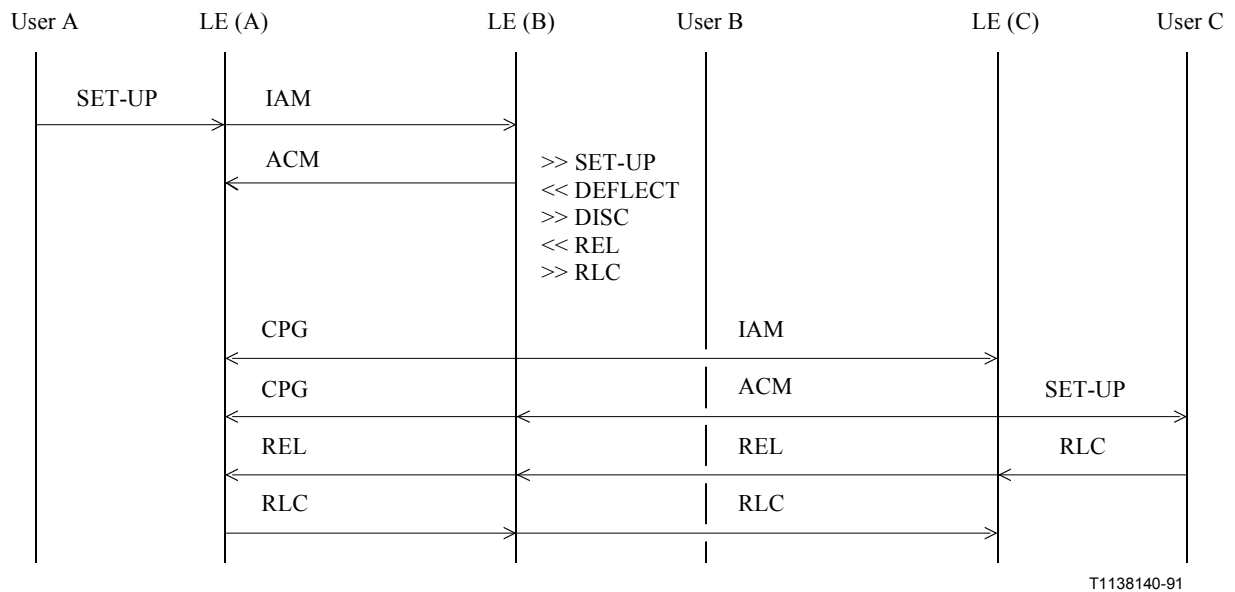


Figure 2-32/Q.732.2 – Call deflection immediate response (option B, immediate release) – unsuccessful

2.9 Parameter values (timers)

No new timers identified.

2.10 Dynamic description

No dynamic description is required.

Q.732.3 Call Forwarding No Reply (CFNR)

Refer to 2.1 to 2.10.

Q.732.4 Call Forwarding Unconditional (CFU)

Refer to 2.1 to 2.10.

Q.732.5 Call Deflection (CD)

Refer to 2.1 to 2.10.

ITU-T RECOMMENDATIONS SERIES

Series A	Organization of the work of the ITU-T
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Series D	General tariff principles
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