

Title: Private Personal Handy-Phone System : Interface between Public Cell Station and ISDN-based PHS Switching Center-Call Forwarding Supplementary Services-

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History of Revised Versions

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**PUBLIC PERSONAL HANDY-PHONE SYSTEM:INTERFACE BETWEEN PUBLIC CELL
STATION AND ISDN-BASED PHS SWITCHING CENTER
- Call Forwarding Supplementary Services -**

< Summary >

This specification is for the CS type 1 architecture in 3.1/B-NW1.00.

1. Relation with International Standards

This specification is based on ITU-T Recommendation Q.952.

2. Differences from ITU-T Recommendation Q.952

The differences between this specification and ITU-T Q.952 are summarized in the following.

(1) Service Specifications

- Call Forwarding on PS Not Reachable (CFNRc) supplementary service is added in this specifications.

- Call Deflection (CD) supplementary service is removed.

- Activation/deactivation/interrogation procedures

<ISDN> The served user uses the call unrelated connectionless transport mechanism for service activation/deactivation/interrogation procedures in ITU-T Q.952.

<PHS> The served CS uses the call related connection oriented transport mechanism for them in this document because of necessity of authentication procedure.

<ISDN> In the case of multi-point terminal configuration exits at the user-network interface, if the user requests activation/deactivation, the network sends to other users except "the activation/deactivation request user" the activationStatusNotificationDiv-invoke component.

<PHS> The multi-point terminal configuration does not exist at the CS-network interface, so the description of this procedure is removed in this document.

- Notification of call forwarding service

<ISDN> If a call to the served user is forwarded, the network notifies that occurrence to the served user. In the case of single-point terminal configuration exits at the user-network interface, the network sends to the served user the diversionInformation-invoke component, using call unrelated connectionless transport mechanism. In the case that multi-point terminal configuration exists at the user-network interface, the network uses the call unrelated broadcast connectionless transport mechanism.

<PHS> The multi-point terminal configuration does not exist at the CS-network interface, so only case of the single-point terminal configuration is described. There are two ideas in this case. One idea is that the PHS network requires authentication procedure and the other idea is that the PHS network does not require it. In the case of notification procedure with no authentication, the PHS network uses the call unrelated connectionless transport mechanism. In the case of notification procedure with authentication, the PHS network must use the call unrelated connection oriented transport mechanism. The notification procedure with authentication is described in the annex part of this document.

- COUP/COUR

The identification procedure of the forwarded-to PHS user to the calling PHS user is for further study, because there is no service specification of Connected PHS User identification Presentation (COUP) / Connected PHS user identification Restriction (COUR) supplementary services.

-Interaction with ISDNs

This document describes for PHS call forwarding supplementary services in the PHS network. Therefore, new chapter about interaction with ISDNs is added as the case that "calling-user/called-user" is ISDN terminal.

There is the description about the case that the served user is PABX in ITU-T Q.952. However, the CS does not have PABX capability, so this chapter is removed.

(2) Definitions

The following terms using ITU-T Recommendation Q.952 shall be replaced with those of this specification.

**Table Summary-1/B-IF2.52
Differences between this specification and ITU-T Recommendation Q.952**

ITU-T Recommendation Q.952	This specification terminology
Network	PHS network
User	public CS (cell station)
User	PHS user
served user	served public CS
served user	served PHS user
forwarded-to user	Forwarded-to public CS
forwarded-to user	Forwarded-to PHS user
calling user	calling public CS
calling user	calling PHS user
forwarded-to number	Forwarded-to PSN (Personal Service Number)
forwarding number	Forwarding PSN
activating user	Activating PHS user
Deactivating user	Deactivating PHS user

(3) Differences

**Table Summary-2/B-IF2.52
Differences from ITU-T Recommendation Q.952.**

Items	Differences	Reasons
1.1 Scope	<p>(1) "or coincident S and T reference point (as defined in Recommendation I.411 [1])" is deleted.</p> <p>(2) Call Forwarding on PS Not Reachable (CFNRc) supplementary service was added into this section.</p>	<p>IF2 specification is defined on only T reference point.</p> <p>(2) ITU-T Q.952 does not have the CFNRy supplementary service.</p> <p>(3) There is no description about the busy condition case by user determined on the B-SV2.01.</p>

(2) B-IF2.52-01-TS

		(3) The case of the busy condition by user determined is for further study.	
2.1	General description	“The deflection functions are implemented in the network and they are invoked by the terminal on a call by call basis.” Was deleted.	Call deflection supplementary service is for further study.
2.2	Definitions	See Table Summary-1/B-IF2.52	
3.1	Provision / withdrawal	The descriptions of call deflection (CD) are deleted.	Call deflection supplementary service is for further study.
Table 3-1/B-IF2.52		The descriptions of call deflection (CD) are deleted.	Call deflection supplementary service is for further study.
Table 3-2/B-IF2.52		The descriptions of call deflection (CD) are deleted.	Call deflection supplementary service is for further study.
Table 4-2/B-IF2.52		The descriptions of call forwarding on PS not reachable (CFNRc) is added.	CFNRc supplementary service is specified in B-SV2.52.
5.1.1 activation / 5.1.2 deactivation / 5.1.3 interrogation		Connectionless message protocol is changed to connection-oriented message protocol for authentication procedure of PHS terminal.	"Connectionless message protocol" can't be used for authenticating the PHS-terminal.
5.1.1 Activation 5.1.1.1 Normal operation NOTE ii).....		“all users” is changed to the public CS”.	PHS has no multiple configuration.
5.1.5 Status notification 5.1.5.1 Normal operation		“The status notification <u>...and all other users at the same interface</u> to receive ...” “all other user at the same interface” is deleted.	PHS has no multiple configuration.
5.2.2.1 Normal operation		The numbering plan identification field shall be coded either as “ISDN/telephony numbering plan” (see Recommendation E.164/E.163) or “unknown”. → The numbering plan ...(see Recommendation E.164/E.163) . The type of number shall be “national number” or “international number” or, as a network option, “unknown”. → The type of number shall be “national number” or “international number”.	PHS network does not use "unknown" as the code value of the numbering plan identification field.
5.2.3.1 Call Forwarding Unconditional procedures & 5.2.3.2 Call		Description of multipoint terminal configuration is deleted.	PHS system shall not have multipoint terminal configuration.

Forwarding on PS Busy (NDUB) procedures & 5.2.3.3 Call Forwarding on PS Busy (UDUB) procedures & 5.2.3.4 Call Forwarding on No Reply procedures		
5.2.3.5 Call Forwarding on PS Not Reachable procedures	This section is added newly.	CFNRc is special new supplementary service for only mobile service.
7.1 Interworking with public ISDNs	This section is added newly.	Specific procedures for interworking with public ISDNs are required.
	Q.931 is changed to B-IF2.02.	
	Q.932 is changed to B-IF2.01.	

3. References

ITU-T Recommendation Q.952

4. New Object identifier

“New Object identifier(s) to this PHS MoU Technical Specifications has not yet been assigned. At present PHS MoU Group itself has no right to assign Object identifiers to PHS MoU Technical Specifications and so PHS MoU Group is looking for organizations who are eligible and willing to assign Object identifiers to this PHS MoU Technical Specifications. ”

5. Items for Further study

The Call Deflection is for further study.

The served PHS user may receive notification of the call forwarding. This specification describes two procedures. One is a procedure without authentication, which is specified in 5.2.3. The other is a procedure with authentication, which is specified in Annex B.

Whether both of them are applied or not is for further study.

When the PHS network sends notification of the call forwarding to the served PHS user, the procedure how to interwork between IF2 and IF1 is for further study.

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- Call Forwarding Supplementary Services -**

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The stage 3 services described below correspond to those of stage 1 which appeared in the SV-Series of PHS MoU as follows:

- Call Forwarding Unconditional (CFU): B-SV2.10
- Call Forwarding on PS Busy (CFB): B-SV2.10
- Call Forwarding on No Reply (CFNRy): B-SV2.10
- Call Forwarding on PS Not Reachable (CFNRc): B-SV2.10

This Specification is for the CS type 1 architecture in 3.1/B-NW-1.00.

1. Definition

1.1 Scope

This Specification specifies the stage 3 of the diversion supplementary services for the Integrated Services Digital Network (ISDN) as provided by public telecommunications operators at the T reference point (as defined in ITU-T Recommendation I.411 [1]) by means of the Digital Subscriber Signalling System No. 1 (DSS 1). Stage 3 identifies the protocol procedures and switching functions needed to support a telecommunications service (see ITU-T Recommendation I.130 [2]).

This specification does not specify the additional protocol requirements where the service is provided to the PHS user via a telecommunications network that is not an ISDN/PHS network.

The diversion supplementary services comprise the following services:

- Call Forwarding Unconditional (CFU)
- Call Forwarding on PS Busy (CFB)
- Call Forwarding on No Reply (CFNRy)
- Call Forwarding on PS Not Reachable (CFNRc)

The Call Forwarding Unconditional (CFU) supplementary service permits a served PHS user to have the PHS network send all incoming calls, or just those associated with a specific basic service, addressed to the served PHS user's Personal Service Number (PSN) to another PSN. The served PHS user's originating service is unaffected. If this service is activated, calls are forwarded no matter what the condition of the termination.

The Call Forwarding on PS Busy (CFB) supplementary service permits a served PHS user to have the PHS network send all incoming calls, or just those associated with a specific basic service, which meet busy and are addressed to the served PHS user's PSN to another PSN. The served PHS user's originating service is unaffected. The busy condition may be either PHS network determined or user determined.

The Call Forwarding on No Reply (CFNRy) supplementary service permits a served PHS user to have the PHS network send all incoming calls, or just those associated with a specific basic service, which meet no reply and are addressed to the served PHS user's PSN to another PSN. The served PHS user's originating service is unaffected.

The Call Forwarding on PS Not Reachable (CFNRc) supplementary service permits a served PHS user to have the PHS network send all incoming calls, or just those associated with a specific basic service, which meet no reachable and are addressed to the served PHS user's PSN to another PSN. The served PHS user's originating service is unaffected. The call forwarding supplementary services are applicable to all telecommunication services.

2. Description

2.1 General description

For a given PSN, the diversion supplementary services (including options) may be subscribed to for each basic service to which the PHS user(s) of the number subscribes, or collectively for all the bearer service or/and teleservice to which the PHS user(s) subscribes.

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

An indication that a call forwarding service is activated on a PSN may, as subscription option, be given to the forwarding PHS user who has forwarding activated, each time an outgoing call is made.

The CFNRy supplementary service shall only apply when a SETUP message is sent by the PHS network and the PHS user responds with an ALERTING message, possibly subsequent to other valid call control message.

2.2 Definitions

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

integrated services digital network (ISDN): See ITU-T Recommendation 2.3/I.112 [5], definition 308.

PHS network: is ISDN which has PHS service capability. The PHS network has the PHS switching network and the PHS access network.

service: telecommunications service: See ITU-T Recommendation 2.2/I.112 [5], definition 201.

supplementary service: See ITU-T Recommendation 2.4/I.210 [17].

public Cell Station (CS): The DSS 1 protocol entity at the cell station side of the CS-‘PHS network’ interface.

network: The DSS 1 protocol entity at the network side of the CS-‘PHS network’ interface.

served PHS user: is a PHS user who subscribes to the specific diversion supplementary service; to register, to activate, to deactivate and the interrogate diversion supplementary services; to request and to control the diversion supplementary services.

forwarded-to PHS user: is a PHS user to which a call is to be forwarded. All procedures at the forwarded-to PHS user are provided as part of the basic service; the forwarded-to PHS user need not have subscribed to any specific call forwarding supplementary service.

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

served public CS: is the public CS which has the radio area where the served PHS user is visiting.

forwarded-to public CS: is the public CS which has the radio area where the forwarded-to PHS user is visiting.

calling public CS: is the public CS which has the radio area where the calling PHS user is visiting.

forwarded-to number: is the PSN of the forwarded-to PHS user.

forwarding number: is the PSN of the forwarding PHS user.

activating PHS user: is a PHS user on a served PHS user’s access that initiates the activation procedures for a call forwarding service.

deactivating PHS user: is a PHS user on a served user’s access that initiates the deactivation procedures for a call forwarding service.

call forwarding profile: is the set of data containing all the parameters pertaining to subscription and activation, involved in the decision process which leads to the forwarding of an incoming call.

ISDN number: a number conforming to the numbering plan and structure specified in ITU-T Recommendation E.164 [14].

ISDN address: it is an ISDN number, and uses a sub-address, as specified if provided by that.

network determined user busy (NDUB): See ITU-T Recommendation 3.1.4/I.210 [17].

user determined user busy (UDUB): is specified for the case that the network offers the call to the

subscriber and if PHS terminal respond “user busy”.

invoke component: See Specification B-IF2.01 (ITU-T Recommendation Q.932 [4]).

return result component: See Specification B-IF2.01 (ITU-T Recommendation Q.932 [4]).

return error component: See Specification B-IF2.01 (ITU-T Recommendation Q.932 [4]).

reject component: See Specification B-IF2.01 (ITU-T Recommendation Q.932 [4]).

2.3 Abbreviations

ISDN	Integrated Services Digital Network
DSS 1	Digital Subscriber Signalling System No. 1
CFU	Call Forwarding Unconditional
CFB	Call Forwarding Busy
CFNRy	Call Forwarding No Reply
CFNRc	Call Forwarding on PS Not Reachable
UDUB	User Determined User Busy
NDUB	Network Determined User Busy

2.4 State definitions

The following states are conceived for the call forwarding supplementary service management procedures at the served PHS user’s access and are applicable to the PHS network and optionally the PHS user:

- Idle state - The specific call forwarding supplementary service is idle for this PSN and/or particular basic service. This is the initial state on subscription of the particular call forwarding supplementary service.

- Activate Request state - The PHS user has requested that a supplementary service is activated for this PSN and/or particular basic service.

- Deactivate Request state - The PHS user has requested that an active supplementary service shall be deactivated for this PSN and/or particular basic service.

- Interrogate Request state - The PHS user has requested that a supplementary service be interrogated.

A state machine may exist for each specific instance of the following parameter values:

- procedure;
- served PHS user’s PSN;
- basic service.

3. Operational requirements

3.1 Provision/withdrawal

The CFU, CFB, CFNRy and CFNRc supplementary services shall be provided after prior arrangement with the network.

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

The diversion supplementary services can be offered separately with subscription options. Options apply separately to each bearer service or/and teleservice subscribed to on each PSN. For each subscription option, only one value can be selected. These subscription options form part of the diversion profile for the served PHS user.

The subscription options for the CFU supplementary service are included in B-SV2.10.
The subscription options for the CFB supplementary service are included in B-SV2.10.
The subscription options for the CFNRy supplementary service are included in B-SV2.10.
The subscription options for the CFNRc supplementary service are included in B-SV2.10.
These requirements are summarized in Table 3-1.

Table 3-1/B-IF2.52 (Q.952)
Subscription options for diversion supplementary services

Subscription options	Value	Applicability
Served PHS user receives notification that a call has been forwarded	No	CFU
	Yes, with call offering information	CFB CFNRy CFNRc
Calling PHS user receives notification that his call has been forwarded	No	CFU
	Yes, with forwarded-to PSN	CFB CFNRy
	Yes, without forwarded-to PSN	CFNRc
Served PHS user receives reminder notification on outgoing calls that forwarding is currently activated	No	CFU CFB CFNRy
	Yes	CFNRc
Diverting PSN is released to forwarded-to PHS user	Do not release forwarding PSN information	CFU CFB CFNRy
	Release forwarding PSN information	CFNRc
Length of call forwarding on no reply timer	Timer duration shall be between 5 to 60 seconds in step of 5 seconds	CFNRy

The following network provider options are available for the supplementary services.
The network options for the CFU supplementary service are included in B-SV2.10.
The network options for the CFB supplementary service are included in B-SV2.10.
The network options for the CFNRy supplementary service are included in B-SV2.10.
The network options for the CFNRc supplementary service are included in B-SV2.10.
These requirements are summarized in Table 3-2.

3.2 Requirements on the originating network side

The procedures at the T reference point of 5.1/B-IF2.02 (ITU-T Recommendation 5.1/Q.931 [3]) and the notification procedures of 5.2.1 and 5.2.2 shall be applied.

3.3 Requirements on the destination network side

The procedures at the T reference point of 5.2/B-IF2.02 (ITU-T Recommendation 5.2/Q.931 [3]), the common element procedures of 5.2.3 and the notification procedures of 5.2.4 shall be applied.

Table 3-2/B-IF2.52 (Q.952)
Network options for diversion supplementary services

Network provider options	Values	Applicability
Served PHS user call retention cases: Served PHS user call retention on invocation of forwarding	Retain call until alerting begins at the forwarded-to PHS user	CFNRy
	Clear call on invocation of forwarding	
ii) Served PHS user call retention when forwarding is rejected at forwarded-to PHS user	Continue to alert the forwarding PHS user (Note 1)	CFNRy
	No action at the forwarding PHS user (Note 2)	
Total number of all diversions for each call	Maximum number of diverted connections (with maximum value between 3 and 5)	CFU CFB CFNRy CFNRc
Call forwarding on no reply timer	Timer duration shall be a service provider option	CFNRy
Call forwarding on PS Not Reachable timer	Timer duration shall be a service provider option	CFNRc
Notification to calling PHS user	Yes	CFU CFB CFNRy CFNRc
	No	
Served PHS user receives notification that a call has been forwarded	Yes	CFU CFB CFNRy CFNRc
	No	
Notes		
1 This applies to the retention of the call at invocation of call forwarding.		
2 This applies to the clearing call option on invocation of call forwarding.		

3.4 Other requirements

Transit network selection and network specific facility selection are for further study.

Table 3-2 bis/B-IF2.52 (Q.952)
Network options for basic call used for diversion supplementary services (Further study)

Network provider options	Value	Applications
Transit network selection supported (see Annex C/Q.931)	Yes	CFU
	No	CFB CFNRy CFNRc
Network Specific facility selection supported (see Annex E/Q.931)	Yes	CFU
	No	CFB CFNRy CFNRc

<MoU note>-There is a obvious mistake in the reference number of ITU-T Recommendation Q931. So it was made correct.

4. Coding requirements

4.1 Coding of the information elements

4.1.1 Coding of the Notification indicator information element

For the coding of the Notification indicator information element, see 4.5.22/B-IF2.02 (ITU-T Recommendation 4.5.22/Q.931 [3]).

The additional notification description for the operation of the diversion supplementary services shall be coded as shown in Table 4-1.

Table 4-1/B-IF2.52 (Q.952)
Additional notification description for the operation of diversion

Bits	Meaning
765 4321	
111 1011	Call is forwarding
110 1000	Call forwarding activated
NOTE - All other values reserved.	

4.1.2 Coding of the Redirecting number information element

The purpose of the Redirecting number information element is to identify the number from which diversion was invoked.

The Redirecting number information element shall be coded as shown in Figure 4-1. The maximum length of this information element is 25 octets.

8	7	6	5	4	3	2	1	Octet
Redirecting number								
0	1	1	1	0	1	0	0	1
Information element identifier								
Length of redirecting number information element contents								2
0/1 ext.	Type of number			Numbering plan identification				3
0/1 ext.	Presentation indicator	0	0	0	0	0	0	3a
	Spare		Spare			Spare		
1 ext.	0	0	0	Reason for diversion				3b
Spare		Number digits (IA5 characters)						4 etc.

Figure 4-1/B-IF2.52 (Q.952)
Redirecting number information element

<MoU note>-There is a obvious mistake in the description of number digit (bit 8 in octet 4) of ITU-T Recommendation. So it was made correct.

The various parts of the Redirecting number information element shall be coded as specified in 4.5.10/B-IF2.02 (ITU-T Recommendation 4.5.10/Q.931 [3]) (for Calling party number information element) except for octet 3b which is defined below.

The reason for diversion (octet 3b) values are summarized in Table 4-2.

Table 4-2/B-IF2.52 (Q.952)
Reason for diversion codepoints

Bits 4 3 2 1	Meaning
0 0 0 0	Unknown
0 0 0 1	Call forwarding busy or called DTE busy (circuit-mode and packet mode)
0 0 1 0	Call forwarding no reply
0 0 1 1	Call forwarding on PS not reachable
1 1 1 1	Call forwarding unconditional or systematic call redirection (circuit-mode and packet mode)
1 0 1 0	Call forwarding by the called DTE (circuit-mode and packet mode)
NOTE - All other values are reserved.	

4.1.3 Coding of Redirection number information element

The purpose of the Redirection number information element is to identify the number towards which diversion was invoked.

The Redirection number information element shall be coded as shown in Figure 4-2. The maximum length of this information element is 24 octets.

8	7	6	5	4	3	2	1	Octet
Redirection number								
0	1	1	1	0	1	1	0	1
Information element identifier								
Length of redirection number information element contents								2
0/1 ext.	Type of number			Numbering plan identification				3
1 ext.	Presentation indicator	0	0	0	0	0	0	3a
		Spare			Spare			
0	Number digits (IA5 characters)						4 etc.	

Figure 4-2/B-IF2.52 (Q.952)
Redirection number information element

<MoU note>-There is a obvious mistake in the description of number digit (bit 8 in octet 4) of ITU-T Recommendation. So it was made correct.

The various parts of the Redirection number information element shall be coded as specified in 4.5.10/B-IF2.02 (ITU-T Recommendation 4.5.10/Q.931 [3]).

4.2 Component coding for the Facility information element

Table 4-3 shows the definition of the operations and errors required for the diversion supplementary services using ASN.1 as specified in ITU-T Recommendation X.208 [12] and using the OPERATION and ERROR macro as defined in Figure 4/X.219.

“New Object identifier(s) to this PHS MoU Technical Specifications has not yet been assigned. At present PHS MoU Group itself has no right to assign Object identifiers to PHS MoU Technical Specifications and so PHS MoU Group is looking for organizations who are eligible and willing to assign Object identifiers to this PHS MoU Technical Specifications.”

5. Signalling procedures at the T reference point

Where the text in the following sections refers to an “XXX” invoke component, an invoke component is meant with the operation value set to the value of operation “XXX”.

5.1 Activation/deactivation/interrogation

The procedures for activation/deactivation and interrogation only apply to the call forwarding supplementary services.

5.1.1 Activation

5.1.1.1 Normal operation

Having subscribed to a specific call forwarding supplementary service (CFU, CFB, CFNRy, CFNRc), in order to activate that service, the served PHS user shall request activation of that service and the served public CS shall send an activationDiversion invoke component to the network, in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]) and shall start timer T (activate) and enter the Active Request state. Timer T (activate) is specified in 9. The network, on receiving such an activationDiversion invoke component shall enter the Activate Request state and shall send authenticationOperation invoke component to the served public CS in a FACILITY message. The served public CS shall send authenticationOperation return component to the PHS network.

Table 4-3/B-IF2.52 (sheet 1 of 4) (Q.952)

ASN

```

Call-Diversion-Operations { PHS MoU B-IF2.52 diversion operations-and-errors}

DEFINITIONS ::=

BEGIN

EXPORTS
    ActivationDiversionType,
    DeactivationDiversionType,
    InvokeStatusType,
    InterrogationDiversionType,
    InterrogationDiversion1Type,
    DiversionInformationType,

IMPORTS
    OPERATION, ERROR
        FROM Remote-Operation-Notation
            { joint-iso-ccitt remote-operations (4)
              notation (0) }

    PartyNumber, PartySubaddress,Address,PresentationAllowedIndicator,
    PresentedAddressScreened,PresentedAddressUnscreened,RoutingInformation,
    PresentedNumberUnscreened
        FROM Addressing-Data-Elements
            { ccitt recommendation q 932
              addressing-
              data-elements (7) }

    BasicService
        FROM Basic-Service-Elements;
            { PHS MoU B-IF2.52 diversion
              Basic-service-elements }

    userNotSubscribed, notAvailable, basicServiceNotProvided, invalidServedUserNr,
    resourceUnavailable,callFailure
        FROM General-Errors-List
            { ccitt recommendation q 950
              general-error-list(1) }

    Q931 InformationElement
        FROM Embedded-Q931-Types
            { ccitt recommendation q 932
              embedded-q931-types(7) }

ActivationDiversionType ::= OPERATION

ARGUMENT SEQUENCE {
    procedure          Procedure,
    basicService       BasicService,
    forwardedToAddress Address,
    servedUserNr       ServedUserNr }

RESULT

ERRORS
    { userNotSubscribed, notAvailable, invalidServedUserNr,
      basicServiceNotProvided, resourceUnavailable, invalidDivertedNr,
      operatorAccess, specialServiceNr, diversionToServedUserNr }

activationDiversion
    ActivationDiversionType ::= 7

-- End of activationDiversion operation definitions

```

Table 4-3/B-IF2.52 (sheet 2 of 4) (Q.952)

DeactivationDiversionType	::= OPERATION	
ARGUMENT SEQUENCE {		
procedure	Procedure,	
basicService	BasicService,	
servedUserNr	ServedUserNr }	
RESULT		
ERRORS { userNotSubscribed, notAvailable, invalidServedUserNr, notActivated }		
deactivationDiversion	deactivationDiversionType	::= 8
<i>-- End of activationDiversion operation definitions</i>		
InvokeStatusType	OPERATION	
ARGUMENT SEQUENCE {		
diversionReason	DiversionReason,	
basicService	BasicService,	
invokeFailure	InvokeFailure }	
invokeStatus	InvokeStatusType	::= 16
<i>-- End of InvokeStatus operation definitions</i>		
InterrogationDiversionType	OPERATION	
ARGUMENT SEQUENCE {		
procedure	Procedure,	
basicService	BasicService DEFAULT AllServices,	
servedUserNr	ServedUserNr }	
RESULT	IntResultList	
ERRORS { userNotSubscribed, notAvailable, invalidServedUserNr }		
interrogationDiversion	InterrogationDiversionType	::= 11
<i>-- End of interrogationDiversion operation definitions</i>		
InterrogationDiversion1Type	OPERATION	
RESULT	IntResultList1	
ERRORS	{ userNotSubscribed, notAvailable }	
interrogationDiversion1	InterrogationDiversion1Type	::= 17

Table 4-3/B-IF2.52 (sheet 3 of 4) (Q.952)

DiversionInformationType	OPERATION
ARGUMENT SEQUENCE {	
diversionReason	DiversionReason,
basicService	BasicService OPTIONAL,
servedUserSubaddress	PartySubaddress OPTIONAL,
callingAddress	PresentedAddressScreened OPTIONAL,
originalCalledNr	PresentedNumberUnscreened OPTIONAL,
lastForwardingNr	PresentedNumberUnscreened OPTIONAL,
lastForwardingReason	DiversionReason OPTIONAL ,
userInfo	Q931InformationElement OPTIONAL }
diversionInformation	DiversionInformationType ::= 12
<i>-- End of diversionInformation operation definitions</i>	

Table 4-3/B-IF2.52 (sheet 4 of 4) (Q.952)

InvokeFailure	::= ENUMERATED { UusReqAsEssential (0), InvalidForwardingInvocation (1), MaxNrOfForwardingsExceeded (2) }
IntResultList	::= SET OF Size (0..16) IntResult
IntResult	::= SEQUENCE {
servedUserNr	ServedUserNr,
basicService	BasicService,
procedure	Procedure,
forwardedToAddress	Address }
ServedUserNr	::= CHOICE { PartyNumber, AllNumbers }
AllServices	::= NULL
AllNumbers	::= NULL
DiversionCounter	::= INTEGER (0..127)
SubscriptionOption	::= ENUMERATED { noNotification (0), notificationWithoutDivertedToNr (1), notificationWithDivertedToNr (2) }
Procedure	::= ENUMERATED { cfu(0), cfb(1), cfny(2), cfnc(3) }
IntResultList1	::= SET OF Size (0..16) PartyNumber
DiversionReason	::= ENUMERATED { unknown(0), cfu(1), cfb(2), cfny(3),cfnc(6) }
invalidDivertedNr	ERROR ::= 12
operatorAccess	ERROR ::= 13
specialServiceNr	ERROR ::= 14
diversionToServedUserNr	ERROR ::= 15
notActivated	ERROR ::= 46
incomingCallAcceptedByOtherTerminal	ERROR ::= 23
numberOfDiversionCounterExceeded	ERROR ::= 24
uusReqAsEssential	ERROR ::= 47
<i>-- this is an error indication of call diversion failure due to the user to user supplementary</i>	
<i>-- service request as essential</i>	
END -- of Diversion operation definitions	

<MoU note> New Object identifiers are TBD.

There is a obvious mistake in the description of ITU-T Recommendation. So it was made correct.

The activationDiversion operation is defined in 4.2.

NOTES

1 Verification of the forwarded-to PSN should be accomplished (if possible) before accepting the call forwarding request. This verification is done by a simple check of the forwarded-to PSN in the forwarding exchange to see if the number is within the allowed number range.

2 Although the activation request may succeed, there is no guarantee that the forwarded-to PSN is a valid ISDN number and that no other service problems exist with the number provided.

If the served PHS terminal is successfully authenticated and the call forwarding service is successfully activated the PHS network shall

- i) send an activationDiversion return result component to the public CS in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]). the served public CS shall send the appropriate information to the PS; and
- ii) shall enter the Activated state.

The served public CS, on receiving an activationDiversion return result component shall stop timer T (active) and enter the Activated state. The served public CS shall notify activation return result to the PHS terminal of the served PHS user. On expiration of timer T (activate) the state machine will move to the Idle state and the served public CS may repeat the activationDiversion invoke.

The PHS user may activate call forwarding supplementary service data for the specified basic service according to the procedures above, thus causing any previous activation for the call forwarding supplementary service to be overridden.

If the PHS user activates a call forwarding supplementary service for all basic services, then any activations for individual basic service for that call forwarding supplementary service, are altered accordingly.

If a diversion supplementary service was activated for all basic services, and subsequently a modifying activation is received for only one of those services, only that basic service specific data is changed.

5.1.1.2 Exceptional procedures

If the PHS network is unable to activate the call forwarding supplementary service the PHS network shall send an activationDiversion return error component to the served public CS in an appropriate bearer independent transport message as described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]). The served public CS, on receiving such an activationDiversion return error component shall stop timer T (active) and return to the Idle state. The served public CS notifies error result to the PHS terminal of the served PHS user.

5.1.2 Deactivation

5.1.2.1 Normal operation

In order to deactivate a call forwarding supplementary service, the served PHS user shall request deactivation to the public CS, and that public CS shall send a deactivationDiversion invoke component to the PHS network, in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.952 [4]), start timer T (deactivate) and enter the Deactivate Request state. Timer T (deactivate) is specified in clause 9.

The PHS network, on receiving such a deactivationDiversion invoke component shall enter the Deactivate Request state and shall send authenticationOperation invoke component to the served

public CS in a FACILITY message. The served public CS shall send authenticationOperation return component to the PHS network.

The deactivationDiversion operation is defined in 4.2.

If a call forwarding service was activated for all basic services, and a deactivationDiversion invoke component is provided for a single basic service, only that basic service speech data is deactivated, the other basic services remain activated.

If a call forwarding supplementary service was activated for a single basic service, and a deactivationDiversion invoke component is provided for all basic services, the deactivated service shall be deactivated; the other basic services remain unaffected.

If the served PHS terminal is successfully authenticated and the call forwarding service is successfully deactivated, the PHS network shall

- i) send a deactivationDiversion return result component to the public CS in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]). The served CS shall send the appropriate information to the PS; and
- ii) enter the Idle state.

The served public CS, on receiving such a deactivationDiversion return result component shall stop timer T (deactivate) and enter the Idle state. The served public CS shall notify deactivation return result to the PHS terminal of the served PHS user. On expiration of timer T (deactivate) the state machine enters the Idle state and the served public CS may repeat the deactivationDiversion invoke.

5.1.2.2 Exceptional procedures

If the PHS network is unable to deactivate the call forwarding supplementary service, the PHS network shall send a Facility information element containing a deactivationDiversion return error component to the served public CS in an appropriate bearer independent transport message, as described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]) and return to the Activated state. The PHS network shall retain the call forwarding supplementary service specific data as stored before the deactivation request in the case.

The served public CS, on receiving such a deactivationDiversion return error component shall stop timer T (deactivate) and return to the Activated state. The served public CS notifies error result to the PHS terminal of the served PHS user.

5.1.3 Interrogation

5.1.3.1 Normal procedures

If the PHS user wants to obtain the PSNs at his interface for which call forwarding has been activated, the served PHS user shall request interrogation to the served public CS and the served public CS shall send an interrogationDiversion1 invoke component to the PHS network, in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]); start timer T (interrogate) and enter the Interrogate Request state. Timer T (interrogate) is specified in 9.

The PHS network, on receiving such an interrogationDiversion1 invoke component shall enter the Interrogate Request state and shall send authenticationOperation invoke component to the served public CS in a FACILITY message. The served public CS shall send authenticationOperation return component to the PHS network.

The interrogationDiversion1 operation is defined in 4.2.

The PHS network, on receiving such an interrogationDiversion1 invoke component shall enter the

Interrogate Request state.

After the served public CS has requested this procedure, the PHS network shall return a list of served PSNs for which call forwarding has been activated at served user's interface.

This requested data shall be sent in an interrogationDiversio1 return result component to the served public CS in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]) and the served public CS shall send the appropriate information to the PS; and return to the previous state.

The served public CS, on receiving such an interrogationDiversio1 return result component shall stop timer T (interrogate) and the served public CS shall send the appropriate information to the PS; and return to the previous state.

In order to determine the current call forwardings, the served public CS shall send an interrogationDiversio invoke component to the PHS network, in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]); start timer T (interrogate) and enter the Interrogate Request state. Timer T (interrogate) is specified in clause 9.

The PHS network, on receiving such an interrogationDiversio invoke component shall enter the Interrogate Request state and shall send authenticationOperation invoke component to the served public CS in a FACILITY message. The served public CS shall send autehticationOperation return component to the PHS network.

The interrogation procedure enables the served PHS user to obtain information about the call forwarding data stored in the PHS network.

The interrogationDiversio operation is defined in 4.2.

If the PHS user wants to make a general data request, the served public CS shall set the basicService to AllServices into the interrogationDiversio invoke component.

If the PHS user wants to make a specific data request, the served public CS shall set the basicService to the bearer service or/and teleservice required into the interrogationDiversio invoke component.

For the procedures at the T reference point, the AllNumbers shall be specified in the interrogationDiversio invoke component addressing the whole interface.

The PHS network, on receiving such an interrogationDiversio invoke component shall enter the Interrogate Request state.

After the PHS user has requested this procedure, the PHS network shall return the following information:

- in response to a general data request, the served PHS user shall be given a list of all basic services for which call forwarding is active including the forwarded-to addresses (numbers and sub-addresses), the diversion procedure and the served user number; or
- in response to a specific request concerning one particular basic service, the served PHS user shall be informed whether or not call forwarding is active for that basic service, and if so, to what forwarded-to address including the diversion procedure and the served PHS user number.

If call forwarding is not active for a specific data request or call forwarding is not active for any of the basic services in a general data request, an empty list is returned.

This requested data shall be sent in an interrogationDiversio return result component to the served public CS in an appropriate bearer independent transport message as specified in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]) and the served public CS shall send the appropriate information to the PS; and return to the previous state.

The served public CS, on receiving such an interrogationDiversio return result component shall stop timer T (interrogate) and return to the previous state. The served public CS shall notify intrrogation result to the PHS terminal of the served PHS user.

5.1.4 Exceptional procedures

If the PHS network is unable to provide the information requested it shall send to the served public CS an interrogationDiversion return error component to the public CS in an appropriate bearer independent transport message as described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932 [4]) and return to the previous state.

The public CS, on receiving such an interrogationDiversion return error component, shall stop timer T (interrogate) and return to the state prior to the interrogation request. The served public CS notifies error result to the PHS terminal of the served PHS user.

5.1.5 Status notification

5.1.5.1 Normal operation

The status notification procedure enables the served PHS user to receive information about the present status of the access due to activation or deactivation of supplementary services (e.g. activation of call forwarding unconditional).

The status notification information is provided by the PHS network at the instant and with the information content as specified in the individual notification operation of the supplementary services concerned. For encoding of the Facility information element see 8.2.3/B-IF2.01 (Q.932) [4] and for treatment of existing B-IF2.02 (Q.931) information elements as parameters within a component see 8.2.3.1.2/B-IF2.01 (Q.932) [4].

<MoU note>-There is a obvious mistake in the reference number of ITU-T Recommendation Q931. So it was made correct.

For transport of bearer independent status notifications the procedures as specified in 6.3.2.1/B-IF2.01 (Q.932) [4] are applicable. .

5.1.5.2 Exceptional procedures

On receipt of an unrecognized Facility information element or on receipt of mistyped components, the receiving entity shall apply the normal error handling procedures.

5.2 Invocation and operation

If allowed by the served PHS user's subscriptions, the calling party, the served PHS user and the diverted-to PHS user may be informed of the diversion.

5.2.1 Notification of diversion to the calling PHS user

5.2.1.1 Normal operation

When diversion is invoked, the calling PHS user's network will (contingent on the PHS network's support of the option of sending notification to the calling PHS user) receive in one or more appropriate network messages, the following information:

- the "calling PHS user receives notification that his call has been diverted" subscription

option (see Table 3-1);

- the “diverting cause” set to either CFU, CFB, CFNRy, and CFNRc;
- the redirection number (diverted-to number) with presentation indicator always set to restricted.

The calling PHS user’s network on receipt of the subscription option shall respect the restriction requirements of all diverting PHS users currently in the diversion chain.

That is:

- i) “no notification” overrides all later requirements; and
- ii) “notification without the diverted-to PHS user’s PSN” overrides later requests to include the diverted-to PHS user’s PSN.

On receipt of the “diverting cause”, provided it is:

- the first diversion; or
- a subsequent diversion where the served public CS has reached the alerting [diverting cause is CFNRy]; and

provided the restriction requirements of all diverting PHS users currently in the diversion chain is not set to “calling PHS user does not receive notification”, the PHS network shall send an appropriate message to the calling public CS with the Notification Indicator information element coded to “call is diverting” and without the diverted-to PSN and presentation indicator parameters.

In the case of CFNRy an ALERTING message may be received from the forwarded-to public CS after an ALERTING message has been passed from the forwarding public CS to the calling public CS.

In this case, the calling user’s network shall not pass a second or subsequent ALERTING message to the calling public CS but shall include the message content and shall send as indicated by the restriction requirements the diversion notifications either

- in the PROGRESS message if the progress indicator information is also received; or
- in the NOTIFY message if the progress indicator information is not received.

5.2.1.2 Exceptional procedures

Exception procedures at the calling user’s interface shall be according to 5.8/B-IF2.02 (ITU-T Recommendation 5.8/Q.931 [3]).

5.2.2 Identification of the forwarded-to PHS user to the calling PHS user

This specification is for further study.

5.2.3 Operation at the served PHS user

How to interwork between IF2 and IF1 is for further study.

5.2.3.1 Call Forwarding Unconditional procedures

5.2.3.1.1 Normal operation

When an incoming call is forwarded without being offered to the served PHS user for call forwarding unconditional, the served PHS user, as a subscription option, may receive notification of the call forwarding (but will not be able to answer the incoming call).

If a call to the served PHS user is forwarded, the PHS network serving the served PHS user shall send the diversionInformation invoke component (class 5 operation) with the contents as described in 4.2 with the “Diversion reason” set to cfu using the call unrelated connectionless transport mechanism described in 6.3.2.2/B-IF2.01 (ITU-T Recommendation 6.3.2.2/Q.932 [4]) transmitted on a point-to-point data link. The served user PSN shall be included in the Called party number information element of the FACILITY message.

Since no SETUP message was sent to the served public CS, the diversionInformation invoke component will further contain:

- telecommunication or bearer service information indicated by basicService;
- user-to-user information in userInfo;
- served PHS user sub-address in servedUserSubaddress if the served PHS user has subscribed to SUB supplementary service;
- calling party address in callingAddress.

The callingAddress will have the PresentedAddressScreened type and depending on the following conditions will have the following type choices:

- AddressPresentationAllowedScreened - If the presentation of the calling address is not restricted and the served PHS user has subscribed to CUIP; or
- PresentationRestricted - If the presentation of the calling address is restricted and the served PHS user has subscribed to CUIP; or
- NumberNotAvailableDueToInterworking - If the calling address is not available due to interworking, and the served PHS user has subscribed to CUIP.

No callingAddress shall be included if the served PHS user has not subscribed to CUIP.

If multiple divertings have occurred, the served PHS user may also receive:

- originally called number in originalCalledNr;
- last forwarding number in lastForwardingNr;
- cause for last forwarding in lastForwardingReason set as received from the PHS network.

The originalCalledNr and lastForwardingNr will have the presentedNumberUnscreened type and depending on the following conditions will have the following type choices:

- NumberPresentationAllowedUnscreened - If the subscription option “Diverting number is released” indicates “release diverting number information”; or
- PresentationRestricted - If the subscription option “Diverting number is released” indicates “do not release diverting number information”; or
- NumberNotAvailableDueToInterworking - If the PSN is not available due to interworking.

NOTE - The served PHS user’s network will send the notification information to the calling PHS user’s network when the diversion operation to the diverted-to PHS user is invoked.

5.2.3.1.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an invokeStatus invoke component following the procedures for status notification as given in 5.1.5. The invokeStatus operation is defined in 4.2.

5.2.3.2 Call Forwarding on PS Busy “NDUB” procedures

5.2.3.2.1 Normal operation

When an incoming call is forwarded without being offered to the served PHS user for call forwarding

busy with PHS network determined user busy, the served PHS user, as a subscription option, may receive notification of the call forwarding (but will not be able to answer the incoming call). If a call to the served PHS user is forwarded, the PHS network serving the served PHS user shall send to an user identified by the served user's PSN the diversionInformation invoke component (class 5 operation) with contents as described in 4.2. with the "Diversion reason" set to cfb using the call unrelated connectionless transport mechanism described in 6.3.2.2/B-IF2.01 (ITU-T Recommendation 6.3.2.2/Q.932 [4]). The served PHS user PSN shall be included in the Called party number information element of the FACILITY message.

Since no setup message was sent to the served public CS, the diversionInformation invoke component will further contain:

- telecommunications service information indicated by basicService;
- user-to-user information in userInfo;
- served PHS user sub-address in servedUserSubaddress if subscribed;
- calling party address in callingAddress.

The callingAddress will have the PresentedAddressScreened type and depending on the following conditions will have the following type choices:

- AddressPresentationAllowedScreened - If the presentation of the calling address is not restricted and the served PHS user has subscribed to CUIP; or
- PresentationRestricted - If the presentation of the calling address is restricted and the served PHS user has subscribed to CUIP; or
- NumberNotAvailableDueToInterworking - If the calling address is not available due to interworking, and the served PHS user has subscribed to CUIP.

No callingAddress shall be included if the served PHS user has not subscribed to CUIP.

If multiple forwardings have occurred, the served PHS user may also receive:

- originally called number in originalCalledNr;
- last forwarding number in lastForwardingNr;
- cause for last forwarding in lastForwardingReason set as received from the PHS network.

The originalCalledNr and lastForwardingNr will have the presentedNumberUnscreened type and depending on the following conditions will have the following type choices:

- NumberPresentationAllowedUnscreened - If the subscription option "Diverting number is released" indicates "release diverting number information"; or
- PresentationRestricted - If the subscription option "Diverting number is released" indicates "do not release diverting number information"; or
- NumberNotAvailableDueToInterworking - If the PSN is not available due to interworking.

NOTE - The served PHS user's network will sent the notification information to the calling PHS user's network when the diversion operation to the diverted-to PHS user is invoked.

5.2.3.2.2 Exceptional Procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an invokeStatus invoke component following the procedures for status notification as given in 5.1.5. The invokeStatus operation is defined in 4.2.

5.2.3.3 Call Forwarding on PS Busy "UDUB" procedures

5.2.3.3.1 Normal operation

As part of the basic call procedures specified in 5.2/B-IF2.02 (ITU-T Recommendation 5.2/Q.931 [3]), an incoming call shall be offered to the served public CS in a SETUP message.

If a single-point configuration is known to exist at the interface, a point-to-point data link shall be used to carry the SETUP message. The PHS network shall receive a CALLPROC message, and execute authentication procedure of the served PHS user. If the authentication of the served PHS user succeeds, the call forwarding busy “PHS user determined PHS user busy” procedures will be initiated in the case where the public CS rejects the call by sending a RELEASE COMPLETE message, specifying cause # 17 “user busy”.

Then the call to the served PHS user shall be forwarded. If the served PHS user has subscribed to “served PHS user receives notification that the call has been forwarded”, then the PHS network shall also send to the served PHS user the diversionInformation invoke component with the “Diversion reason” set to cfb using the call unrelated connectionless transport mechanism described in 6.3.2.2/B-IF2.01 (ITU-T Recommendation 6.3.2.2/Q.932 [4]) using a point-to-point data link. The served PHS user PSN shall be included in the Called party number information element of the FACILITY message.

NOTE - The served PHS user’s network will send the notification information to the calling PHS users network when the diversion operation to the diverted-to PHS user is invoked.

5.2.3.3.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an invokeStatus invoke component following the procedures for status notification as given in 5.1.5. The invokeStatus operation is defined in 4.2.

5.2.3.4 Call Forwarding on No Reply procedures

5.2.3.4.1 Normal operation

As part of the basic call procedures specified in 5.2/B-IF2.02 (ITU-T Recommendation 5.2/Q.931 [3]), an incoming call shall be offered to the served PHS user. If call forwarding no reply is active for the basic service requested by this call, the PHS network, on receiving the first ALERTING message from a responding public CS, shall start timer T (cfnry). The value of T (cfnry) is a PHS network option.

The PHS network shall stop timer T (cfnry) on receiving a CONNECT message from a public CS and shall not forward the call.

If the calling public CS initiates clearing of the call while T (cfnry) is running, the PHS network shall stop T (cfnry) and shall not forward the call. The PHS network shall proceed with call clearing as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 16.

If a single-point configuration is known to exist and a served public CS initiates clearing of the call while T (cfnry) is running, the PHS network shall stop T (cfnry) and shall not forward the call. The PHS network shall proceed with call clearing to the calling public CS as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 16.

If T (cfnry) expires before the PHS network receives a CONNECT message, the PHS network shall redirect the call to the forwarded-to address. The PHS network shall then take the following actions:

- If the served PHS user has subscribed to “served PHS user receives notification that the call has been forwarded”, then the PHS network shall send to an user identified by the served PHS

user's PSN a diversionInformation invoke component with contents as described in 4.2, with the DiversionReason set to the cfny value using the appropriate call unrelated connectionless transport mechanism as described in 6.3.2.2/B-IF2.01 (ITU-T Recommendation 6.3.2.2/Q.932). The served PHS user PSN shall be included in the Called party number information element of the FACILITY message. Since setup information will already have been provided to the served public CS, the "Diversion reason" information will only be given.

- If the PHS network provider option "Served PHS User call retention on invocation of diversion" is "Clear call on invocation", the PHS network shall clear the call to the served public CS following the call clearing procedures as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 31 with location set to "public network serving the local user".

NOTE 1 - The served PHS user's network will send the notification information to the calling PHS user's network when the diversion operation to the diverted-to public CS is invoked.

- If the PHS network provider option "Served PHS User call retention on invocation of diversion" is "Retain call until alerting begins at diverted-to public CS", the PHS network shall continue to offer the call to the served public CS. If the served PHS user's network receives a CONNECT message from the served public CS before receiving an indication that the call is in the Call Received (N7), Connect Request (N8) or Active (N10) states at the forwarded-to PHS user's network, the PHS network shall award the call to the served public CS and proceed as defined in 5/B-IF2.02 (ITU-T Recommendation 5/Q.931 [3]). The PHS network shall initiate clearing toward the forwarded-to user as defined in 5.3/B-IF2.02 (ITU-T Recommendation 5.3/Q.931 [3]) with cause # 31 with location set to "public network serving the local user".

NOTE 2 - The served PHS user's network will send the notification information to the calling PHS user's network when it receives an alerting indication from the diverted-to PHS user's network. When the served PHS user's network receives an indication that the forwarded call is in the Call Received (N7) or Connect Request (N8) or Active (N10) states at the forwarded-to PHS user's network, the served PHS user's network shall, if not done previously, initiate call clearing to the served public CS as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 31 with location set to "public network serving the local user"

5.2.3.4.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an invokeStatus invoke component following the procedures for status notification as given in 5.1.5. The invokeStatus operation is defined in 4.2.

If the forwarded call is not offered to the forwarded-to public CS (for example, the call may not be offered to the forwarded-to public CS because of NDUB, PHS network congestion or when the maximum number of call forwardings has been reached), the PHS network shall take the following actions:

- If the PHS network offered the call to the served public CS while the call was forwarded, the network shall continue the call offering procedures defined in Specification B-IF2.02 (ITU-T Recommendation Q.931 [3]).

NOTE 1 - This applies to the retention of the call on invocation of call forwarding.

- If the PHS network already cleared the served public CS, no action shall be taken.

NOTE 2 - This applies to the clearing call option on invocation of call forwarding.

5.2.3.5 Call Forwarding on PS Not Reachable procedures

5.2.3.5.1 Normal operation

As part of the basic call procedures specified in 5.2/B-IF2.02 (ITU-T Recommendation 5.2/Q.931 [3]), an incoming call shall be offered to the served PHS user by a SEUP message. If call forwarding on PS not reachable is active for the basic service requested by this call, the PHS network shall start timer T (cfnrc). The value of T (cfnrc) is a PHS network option.

The PHS network shall stop timer T (cfnrc) on receiving an ALERT message from a public CS and shall not forward the call.

If the calling public CS initiates clearing of the call while T (cfnrc) is running, the PHS network shall stop T (cfnrc) and shall not forward the call. The PHS network shall proceed with call clearing as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 16.

If a single-point configuration is known to exist and a served public CS initiates clearing of the call while T (cfnrc) is running, the PHS network shall stop T (cfnrc) and shall not forward the call. The PHS network shall proceed with call clearing to the calling public CS as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 16.

If T (cfnrc) expires before the PHS network receives a ALERT message, the PHS network shall redirect the call to the forwarded-to address and shall clear the call to the served public CS following the call clearing procedures as defined in 5.3.4/B-IF2.02 (ITU-T Recommendation 5.3.4/Q.931 [3]) with cause # 31 with location set to “public network serving the local user”.

5.2.3.5.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall clear the call to the served public CS.

5.2.3.6 Call deflection procedures

CD supplementary service is for further study.

5.2.4 Operation at the diverted-to public CS

5.2.4.1 Normal operation

When single diversion has occurred, the Redirecting number information element shall contain details of the last diversion.

When multiple diversions have occurred, the PHS network shall repeat the Redirecting number information element only once. These information elements shall not be preceded by the Repeat indicator information element.

The PHS network shall code the first Redirecting number information element with details of the last diversion.

The PHS network shall code the last Redirecting number information element with details of the first diversion, if the subscription option “Diverting Number is released” is set to “Release diverting number information” for the last diversion, then the PHS network shall include in the SETUP message the served user PSN in the last Redirecting number with the presentation indicator set to “presentation allowed” and the diversion cause included in the “reason for diversion” field.

The “type of number” shall be set to international or national and the numbering plan identification set to “ISDN numbering plan, (see Recommendation E.164/E.163) .

For both subscription options when multiple diversions occur, the last Redirecting number of the SETUP message will contain the information applicable for the first diversion with the “reason for

diversion” field set to “unknown”.

The reason for diversion shall be:

- “Unknown” - If redirecting number information is available but the reason for diversion is not known by the PHS network.
- “Call forwarding on PS busy” - If the PHS network forwarded a call using the CFB supplementary service.
- “Call forwarding no reply” - If the PHS network forwarded a call using the CFNRy supplementary service.
- “Call forwarding unconditional” - If the PHS network forwarded a call using the CFU supplementary service.
- “Call forwarding on PS not reachable” - If the PHS network forwarded a call using the CFNRc supplementary service.

5.2.4.2 Exceptional procedures

Exception procedures at the diverted-to PHS user’s interface shall be according to 5.8/B-IF2.02 (ITU-T Recommendation 5.8/Q.931 [3]).

5.3 Reminder notification to the served PHS user

5.3.1 Normal operation

If the served PHS user has activated a call forwarding supplementary service and an outgoing call with the same PHS number, and with the same bearer service or teleservice, is initiated at that served PHS user’s interface, the PHS network, as a subscription option, shall send a Notification indicator information element with a notification description value of “diversion activated” in the first call control message for that call sent from network to the PHS user.

6 Interaction with other supplementary services

6.1 Number identification services

6.1.1 Calling User Identification Presentation (CUIP)

No impact on protocol.

6.1.2 Calling User Identification Restriction (CUIR)

No impact on protocol.

6.2 Call Forwarding

6.2.1 Call Forwarding Unconditional (CFU)

The invocation of CFU takes precedence over CFB, CFNRy, and CFNRc.

6.2.2 Call Forwarding on PS Busy (CFB)

Neither CFB or CFNRc affects the operation of the other supplementary services.
Neither CFB or CFNRy affects the operation of the other supplementary services.
The invocation of CFU takes precedence over CFB.

6.2.3 Call Forwarding on No Reply (CFNRy)

Neither CFNRy or CFNRc affects the operation of the other supplementary services.
Neither CFB or CFNRy affects the operation of the other supplementary services.
The invocation of CFU takes precedence over CFNRy.

6.2.4 Call Forwarding on PS Not Reachable (CFNRc)

Neither CFB or CFNRc affects the operation of the other supplementary services.
Neither CFNRy or CFNRc affects the operation of the other supplementary services.
The invocation of CFU takes precedence over CFNRc.

6.3 Call Barring

6.3.1 Barring of All Outgoing Calls (BAOC)

When Call Forwarding services have been activated prior to the activation of BAOB, the calls are forwarded regardless of BAOB that has been activated, i.e. in this case there exists no interaction between two services.

After BAOB has been activated, calls can only be forwarded to destinations which are within the limitation of BAOB, that has been activated.

6.3.2 Barring of Outgoing International Calls (BOIC)

When Call Forwarding services have been activated prior to the activation of BOIC, the calls are forwarded regardless of BOIC that has been activated, i.e. in this case there exists no interaction between two services.

After BOIC has been activated, calls can only be forwarded to destinations which are within the limitation of BOIC, that has been activated.

6.3.3 Barring of Outgoing International Calls except call to Home Country (BOIC-exHC)

When Call Forwarding services have been activated prior to the activation of BOIC-exHC, the calls are forwarded regardless of BOIC-exHC that has been activated, i.e. in this case there exists no interaction between two services.

After BOIC-exHC has been activated, calls can only be forwarded to destinations which are within the limitation of BOIC-exHC, that has been activated.

6.3.4 Barring of All Incoming Calls (BAIC)

When Call Forwarding services have been activated prior to the activation of BAIC, the calls are forwarded regardless of BAIC that has been activated, i.e. in this case there exists no interaction between two services.

After BAIC has been activated, calls can only be forwarded to destinations which are within the

limitation of BAIC, that has been activated.

6.3.5 Barring of Incoming Calls on Roaming outside Home Country (BIC-raom)

No impact on protocol.

6.4 DTMF Transmission

No impact, i.e. neither supplementary service affects the operation of the other supplementary service.

6.5 Handover

No impact, i.e. neither supplementary service affects the operation of the other supplementary service.

6.6 User scrambling

No impact, i.e. neither supplementary service affects the operation of the other supplementary service.

6.7 Sub-addressing (SUB)

The sub-address associated with the called party number shall not be forwarded if the call is forwarded.

6.8 PHS User-to-user signalling (PHS-UUS)

To be provided.

6.9 Call Transfer

See B-SV3.00 1.6.3.

6.10 Duplex PHS numbers

No impact, i.e. neither supplementary service affects the operation of the other supplementary service.

6.11 Message Waiting Indication

No impact, i.e. neither supplementary service affects the operation of the other supplementary service.

7 Interactions with other networks

7.1 Interactions with ISDNs

7.1.1 Procedure when the calling user is an ISDN user

When diversion is invoked, the calling ISDN will receive in one or more appropriate network messages from PHS network.

When the ISDN receives these messages from the PHS network, information elements in these

messages shall be changed into appropriate information elements.
The object ID of CallDiversionOperation for PHS MoU shall be changed into the object ID of ccitt.
The diversion reason shall be also changed as follows.

Table 7-1/B-IF2.52 (Q.952)

PHS network		ISDN	
Bits 4 3 2 1	Meaning	Bits 4 3 2 1	Meaning
0 0 0 0	Unknown	0 0 0 0	Unknown
0 0 0 1	Call forwarding on PS busy	0 0 0 1	Call forwarding busy
0 0 1 0	Call forwarding on PS no reply	0 0 1 0	Call forwarding no reply
0 0 1 1	Call forwarding PS not reachable	0 0 0 0	Unknown
1 1 1 1	Call forwarding unconditional	1 1 1 1	Call forwarding unconditional

7.1.2 Procedure when the served user is an ISDN user

When diversion is invoked, the forwarded-to PHS network receives in one or more appropriate network messages from ISDN.

When the PHS network receives these messages from the ISDN, information elements in these messages shall be changed into appropriate information elements.

The object ID of CallDiversionOperation for ISDN shall be changed into the object ID of PHS MoU.

The diversion reason shall be also changed as table 7-1.

Table 7-2/B-IF2.52 (Q.952)

ISDN		PHS network	
Bits 4 3 2 1	Meaning	Bits 4 3 2 1	Meaning
0 0 0 0	Unknown	0 0 0 0	Unknown
0 0 0 1	Call forwarding busy	0 0 0 1	Call forwarding on PS busy
0 0 1 0	Call forwarding no reply	0 0 1 0	Call forwarding on PS no reply
1 1 1 1	Call forwarding unconditional	1 1 1 1	Call forwarding unconditional

7.1.3 Procedure when the diverted-to user is an ISDN user

When diversion is invoked, the forwarded-to ISDN will receive in one or more appropriate network messages from PHS network.

When the ISDN receives these messages from the PHS network, information elements in these messages shall be changed into appropriate information elements.

The object ID of CallDiversionOperation for PHS MoU shall be changed into the object ID of ccitt.

The diversion reason shall be also changed as table 7-1.

7.2 Interactions with non-ISDNs

If a call that has been forwarded encounters interworking, an indication of interworking shall be sent to the calling user. The notification of interworking shall be returned as defined in 5/ ITU-T Recommendation Q.931 [3].

NOTE 1 - In the case of CFNRy, the calling user may receive an indication of interworking after alerting has begun.

If a call has been forwarded using the CFNRy supplementary service and the forwarded portion of the call encounters interworking, then in-band tones and announcements shall be passed on to the calling user. If alerting was continued at the served public CS, the PHS network shall clear the call to the served public CS by sending a DISCONNECT message with cause # 16: "normal clearing" (location: public network serving the local user).

NOTE 2 - A non-ISDN calling user should not receive any notification that a call is forwarded.

7.3 Procedures for interworking with private PHS networks

This specification is for further study.

8 Signalling flow

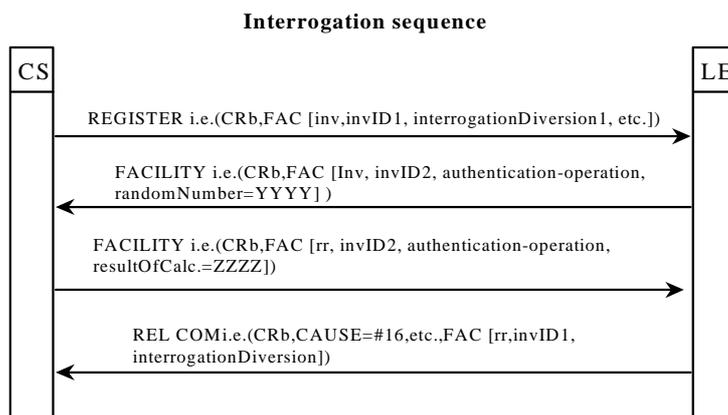
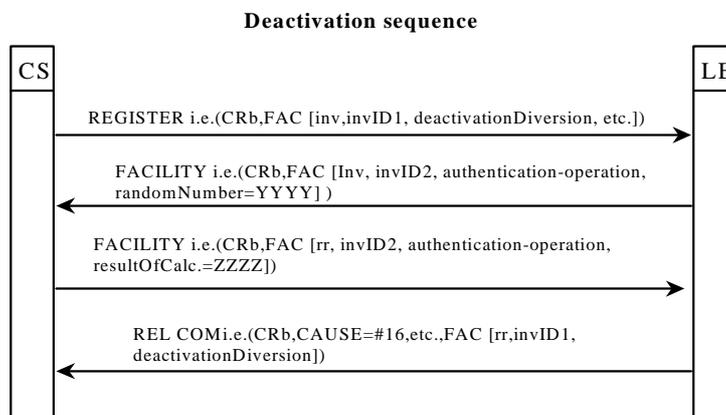
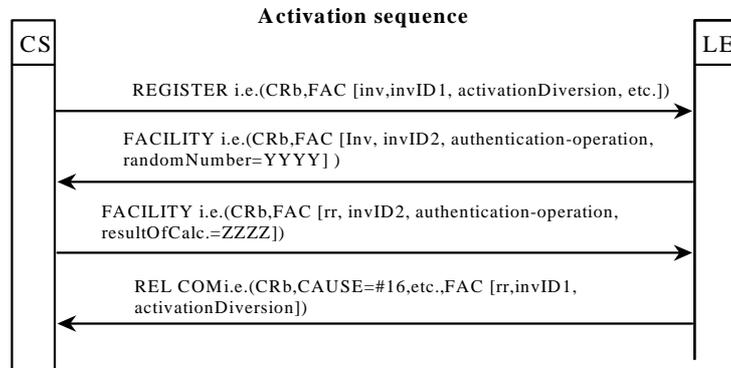


Figure 8-1/B-IF2.52
Activation/Deactivation/Interrogation sequence of call diversion supplementary services

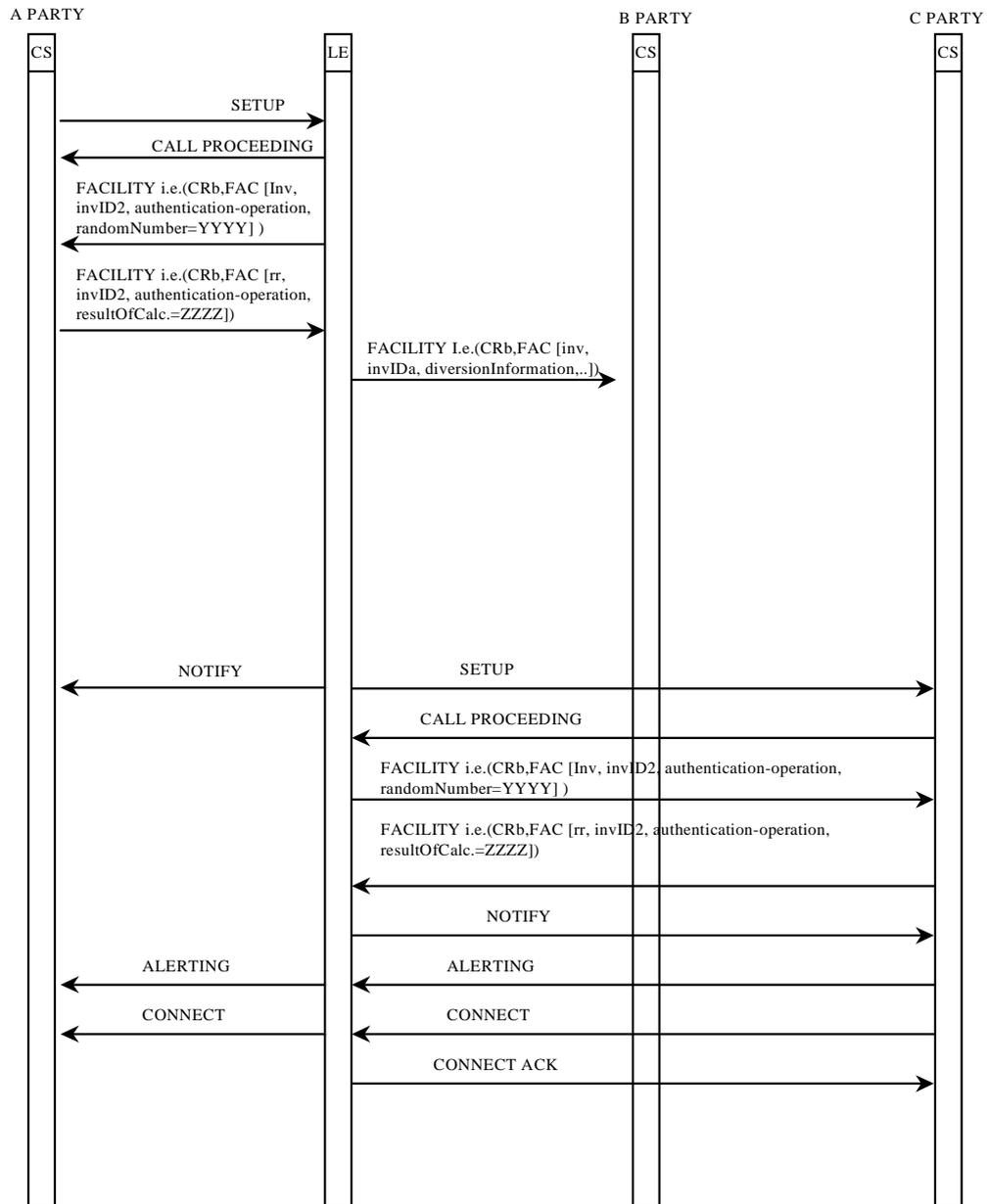


Figure 8-2/B-IF2.52
Call Forwarding Unconditional

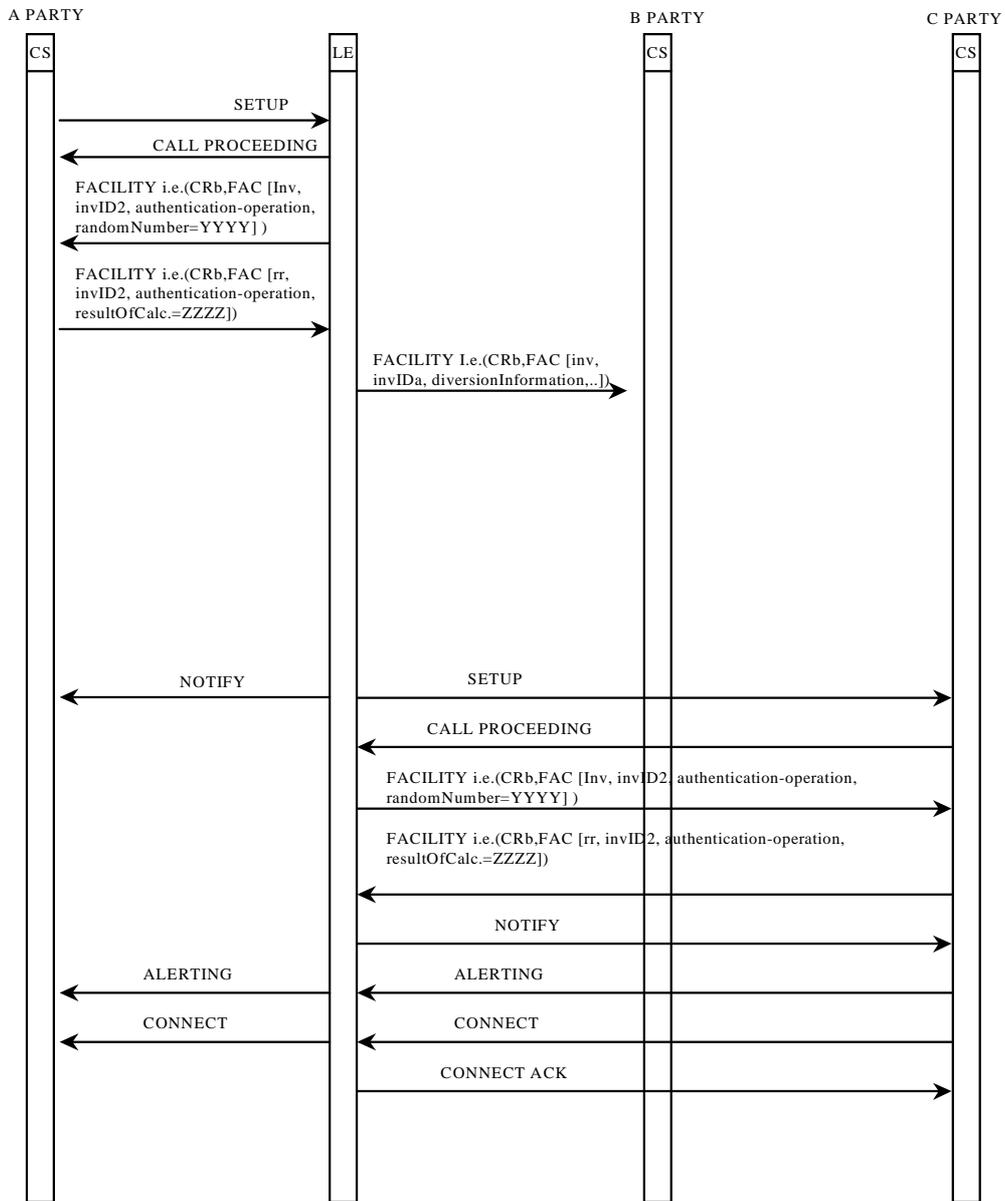


Figure 8-3/B-IF2.52
Call Forwarding on PS busy
(network determined user busy)

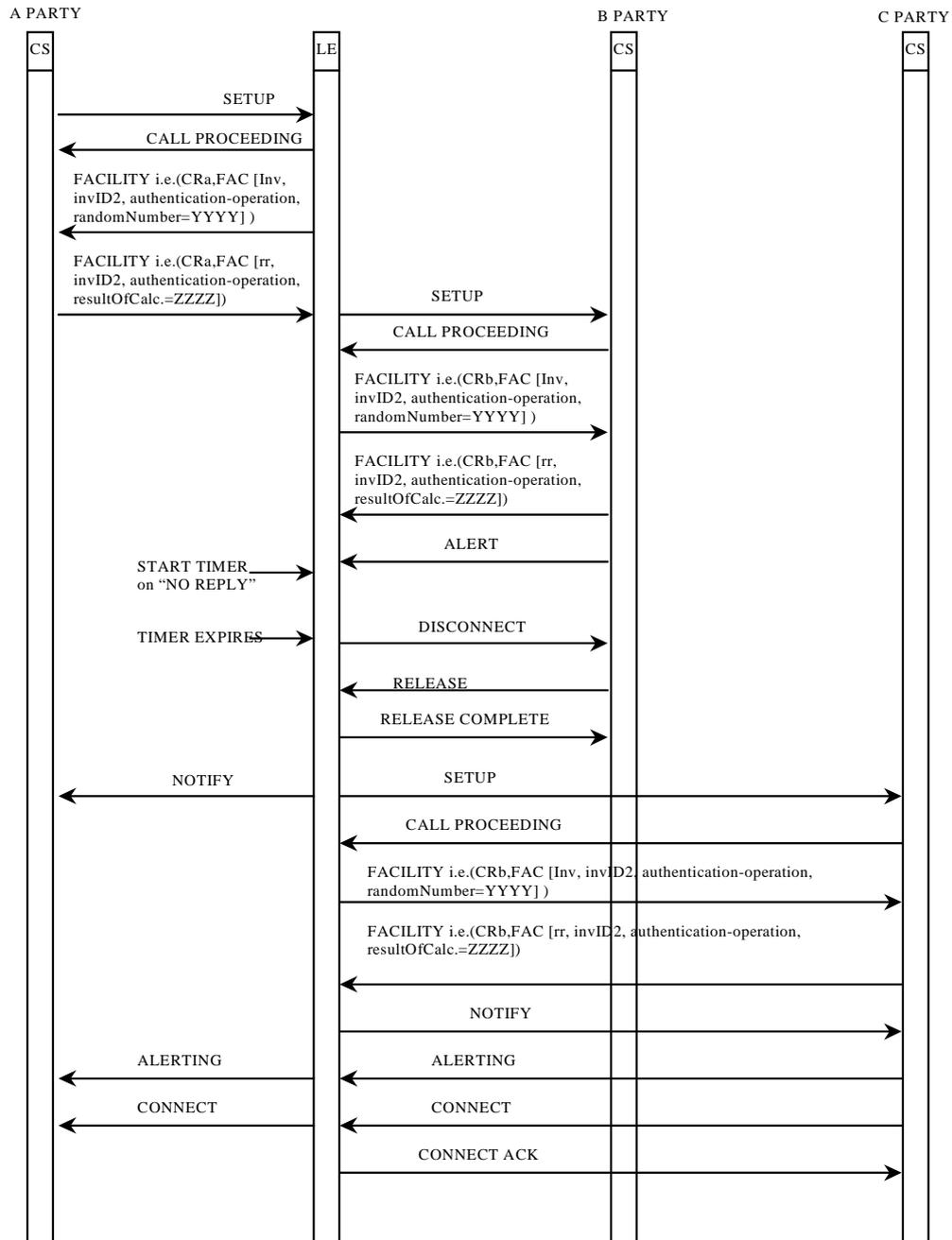


Figure 8-4/B-IF2.52
Call Forwarding on No Reply - Early release

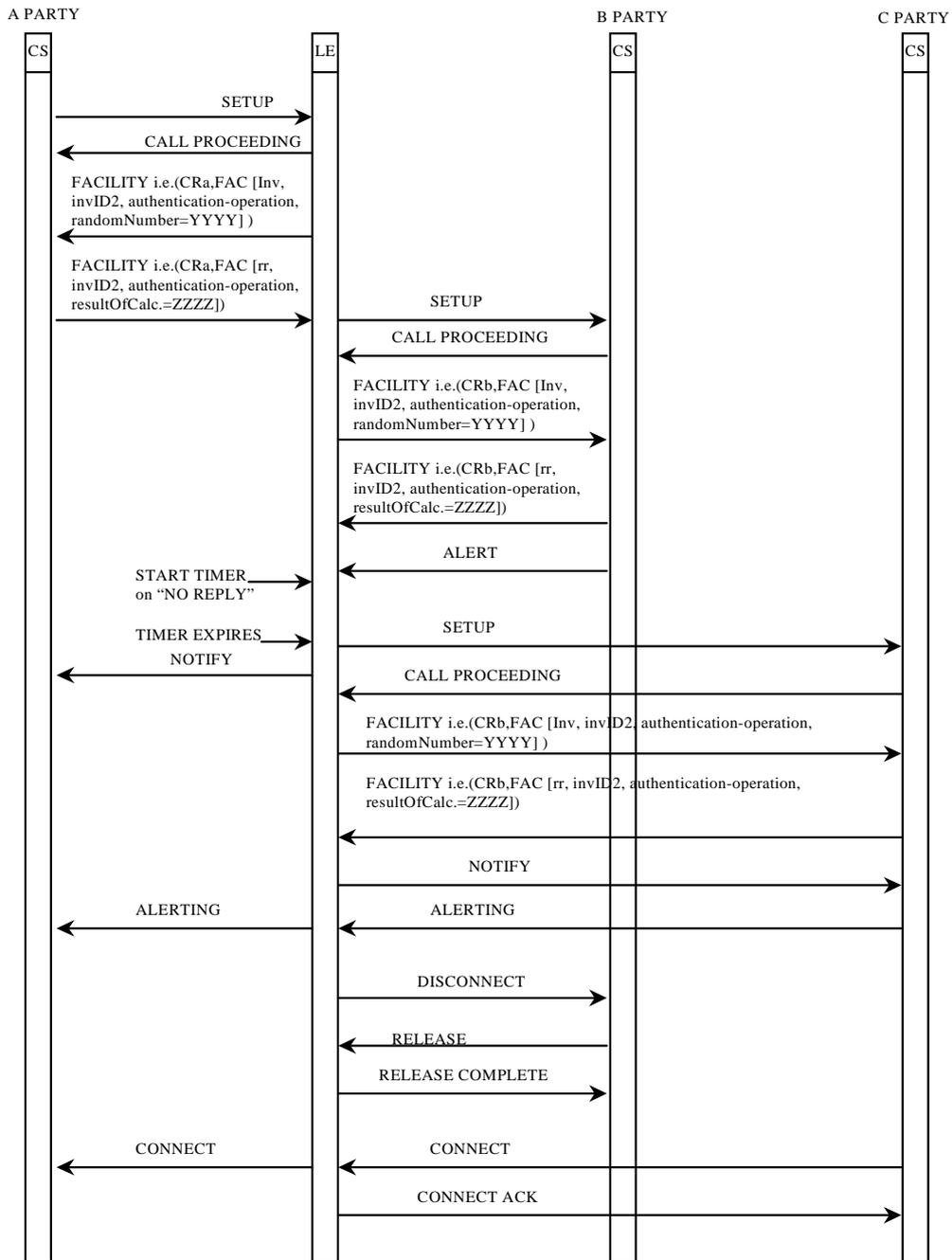


Figure 8-5/B-IF2.52
Call Forwarding on No Reply - Late release

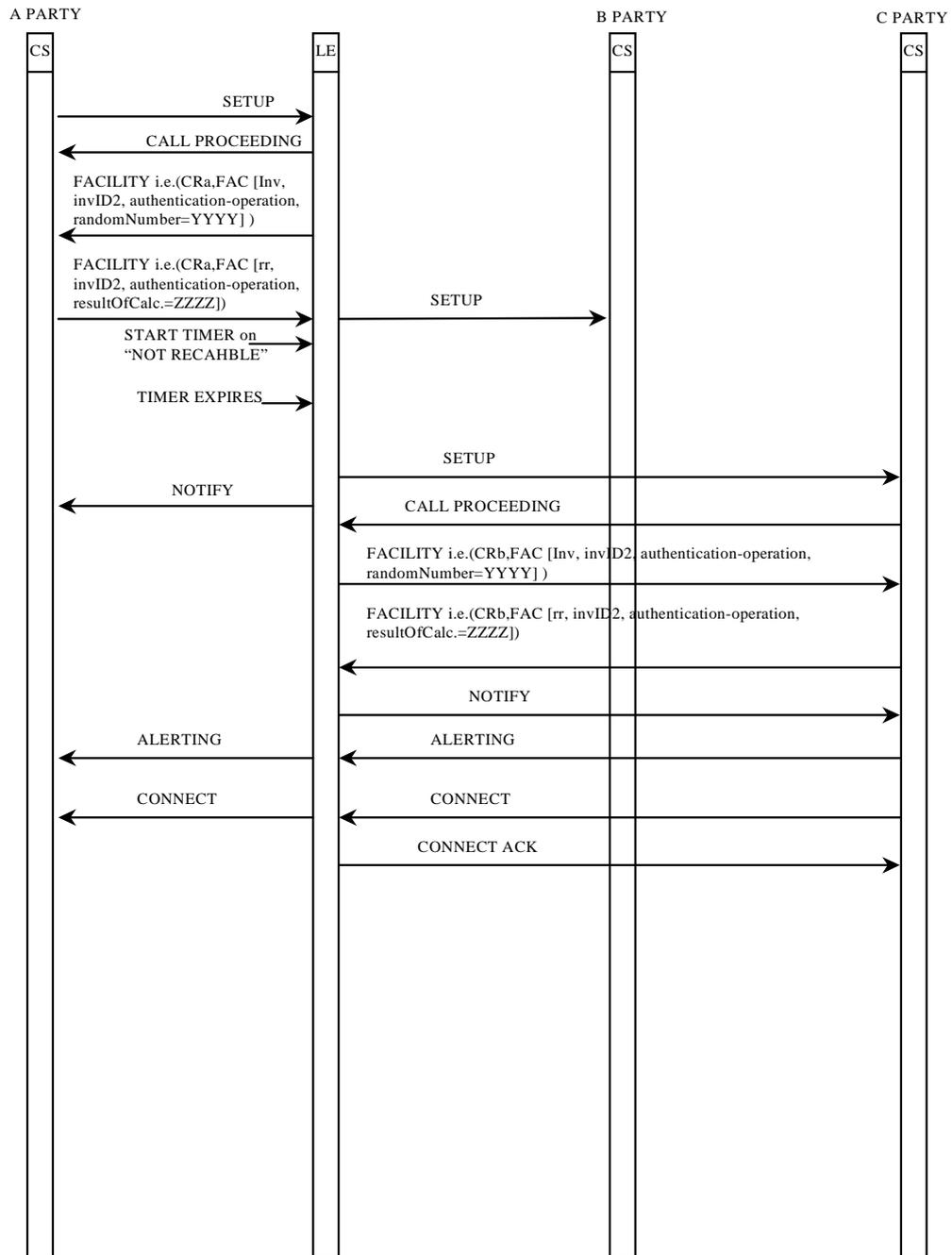


Figure 8-6/B-IF2.52
Call Forwarding on PS Not Reachable

9 Parameter values (timer)

The following timer has been identified in the procedure's text for invocation and operation:

- Network timer T (cfnr) - This timer shall be started when the alerting message is received from the served public CS. This timer shall be stopped when a connect message is received. On expiry, call forwarding is initiated. The duration of the timer shall be a service provider option.

- Network timer T (cfnrc) - This timer shall be started when the setup message is sent from the PHS network. This timer shall be stopped when an alert message is received. On expiry, call forwarding is initiated. The duration of the timer shall be a service provider option.

The following states are conceived for the call forwarding supplementary service management procedures at the served PHS user's access and are applicable to the PHS network and optionally the PHS user:

- Idle state - The specific call forwarding supplementary service is idle for this PHS number and/or particular basic service. This is the initial state on subscription of the particular call forwarding supplementary service.

- Activate Request state - The PHS user has requested that a supplementary service is activated for this PHS number and/or particular basic service.

- Deactivate Request state - The PHS user has requested that an active supplementary service shall be deactivated for this PHS number and/or particular basic service.

- Interrogate Request state - The PHS user has requested that a supplementary service be interrogated.

A state machine may exist for each specific instance of the following parameter values:

- procedure;
- served PHS user number;
- basic service.

Table 9-1 shows the timers used for the call forwarding supplementary service management procedures.

Table 9-1/B-IF2.52 (Q.952)

Timer value	Time out value	Cause for start	Normal stop	At the first expiry
T (activate)	4 seconds	Activation invoke sent	Activation return result received	Return to idle
T (deactivate)	4 seconds	Deactivation invoke sent	Deactivation return result received	Remain in Activated state
T (interrogate)	4 seconds	Interrogation invoke sent	Interrogation return result received	Remain in the state prior to the invoke

10 Dynamic description (SDLS)

None

References

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

- [1] CCITT Recommendation | ISDN user-network interfaces - Reference configurations, Rec. I.411, 1988.
- [2] CCITT Recommendation | Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN, Rec. I.130, 1988.
- [3] CCITT Recommendation | ISDN user-network interface layer 3 specification for basic call control, Rec. Q.931, 1990.
- [4] CCITT Recommendation | Generic Procedures for the control of ISDN supplementary services, Rec. Q.932.
- [5] CCITT Recommendation | Vocabulary of terms for ISDNs, Rec. I.112, 1988.
- [6] CCITT Recommendation | ISDN user-network interface layer 3 specification for basic call control - SDL diagrams, Rec. Q.931.
- [7] CCITT Recommendation | Integrated Services Digital Network (ISDN), Call Forwarding Unconditional (CFU) supplementary service, service description, Rec. I.252.4.
- [8] CCITT Recommendation | Integrated Services Digital Network (ISDN), Call Forwarding Busy (CFB) supplementary service, service description, Rec. I.252.2.
- [9] CCITT Recommendation | Integrated Services Digital Network (ISDN), Call Forwarding No Reply (CFNR) supplementary service, service description, Rec. I.252.3.
- [10] CCITT Recommendation | Integrated Services Digital Network (ISDN), Call Detection (CD) supplementary service, service description, Rec. I.252.5.
- [11] CCITT Recommendation | Common Specific Characteristics of Services, Rec. I.211, 1988.
- [12] CCITT Recommendation | Specification of Abstract Syntax Notation One (ASN.1), Rec. X.208, 1988.
- [13] CCITT Recommendation | Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1), Rec. X.209, 1988.
- [14] CCITT Recommendation | Numbering plan for the ISDN era, Rec. E.164, 1988.
- [15] CCITT Recommendation | Numbering plan for the international telephone service, Rec. E.163, 1988.
- [16] CCITT Recommendation | SDL Specification Description Language, Rec. Z.100, 1988.
- [17] CCITT Recommendation | Principles of Telecommunication Services supported by an ISDN and the means to describe them, Rec. I.210, 1988.

Annex A

(This annex forms an integral part of this Specification)

ASN.1 definition of basic services in call forwarding supplementary service procedures

Basic-Service-Elements { PHS MoU B-IF2.52 diversion basic-service-elements}

DEFINITIONS ::=

BEGIN

EXPORTS **BasicService;**

BasicService ::= **ENUMERATED {**
 allServices (0),
 unrestrictedDigitalInformation (2),
 audio3100Hz (3),
 telephony (32) }

END – of basic service elements

<MoU note> New Object identifiers are TBD.

“New Object identifier(s) to this PHS MoU Technical Specifications has not yet been assigned. At present PHS MoU Group itself has no right to assign Object identifiers to PHS MoU Technical Specifications and so PHS MoU Group is looking for organizations who are eligible and willing to assign Object identifiers to this PHS MoU Technical Specifications. ”

Annex B
(to B-IF2.52)
Public Personal Handy-Phone System: INTERFACE BETWEEN PUBLIC CELL STATION
AND ISDN-BASED PHS SWITCHING CENTER
- Call Forwarding Services -

B.1 General

The PHS call forwarding services permits a “served PHS user” to have PHS network send to another number incoming calls for the served PHS user’s PHS number.

B.2 Scope

The purpose of this annex is to describe the notification procedure of PHS call forwarding supplementary services with authentication operation.

B.3 Operation at the served PHS user

How to interwork between IF2 and IF1 is for further study.

B.3.1 Call Forwarding Unconditional procedures

B.3.1.1 Normal operation

When an incoming call is forwarded without being offered to the served PHS user for call forwarding unconditional, the served PHS user, as a subscription option, may receive notification of the call forwarding.

If a call to the served is forwarded, the PHS network serving the served PHS user shall send the **authenticationOperation** invoke component using the call unrelated connection oriented transport mechanism described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932).

The served public CS send an **authenticationOperation** return result component to the PHS network in an appropriate bearer independent transport message.

If the served PHS terminal is successfully authenticated and the call forwarding service is successfully invoked, the PHS network send the **diversionInformation** invoke component with the contents as described in 4.2 with the “Diversion reason” set to cfu.

B.3.1.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an **invokeStatus** invoke component following the procedures for status notification as given in 5.1.5. The **invokeStatus** operation is defined in 4.2.

If the notification of call forwarding service is unsuccessfully invoked, the PHS network shall release the call unrelated connection.

B.3.2 Call Forwarding on PS Busy “NDUB” procedures

B.3.2.1 Normal operation

When an incoming call is forwarded without being offered to the served PHS user for call forwarding on PS busy “NDUB”, the served PHS user, as a subscription option, may receive notification of the call forwarding.

If a call to the served is forwarded, the PHS network serving the served PHS user shall send the **authenticationOperation** invoke component using the call unrelated connection oriented transport mechanism described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932).

The served public CS send an **authenticationOperation** return result component to the PHS network in an appropriate bearer independent transport message.

If the served PHS terminal is successfully authenticated and the call forwarding service is successfully invoked, the PHS network send the **diversionInformation** invoke component with the contents as described in 4.2 with the “Diversion reason” set to cfb.

B.3.2.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an **invokeStatus** invoke component following the procedures for status notification as given in 5.1.5. The **invokeStatus** operation is defined in 4.2.

If the notification of call forwarding service is unsuccessfully invoked, the PHS network shall release the call unrelated connection.

B.3.3 Call Forwarding on No Reply procedures

B.3.3.1 Normal operation

When an incoming call is forwarded without being offered to the served PHS user for call forwarding no reply, the served PHS user, as a subscription option, may receive notification of the call forwarding.

If a call to the served is forwarded, the PHS network serving the served PHS user shall send the **authenticationOperation** invoke component using the call unrelated connection oriented transport mechanism described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932).

The served public CS send an **authenticationOperation** return result component to the PHS network in an appropriate bearer independent transport message.

If the served PHS terminal is successfully authenticated and the call forwarding service is successfully invoked, the PHS network send the **diversionInformation** invoke component with the contents as described in 4.2 with the “Diversion reason” set to cfnry.

B.3.3.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an **invokeStatus** invoke component following the procedures for status notification as given in 5.1.5. The **invokeStatus** operation is defined in 4.2.

If the notification of call forwarding service is unsuccessfully invoked, the PHS network shall release the call unrelated connection.

B.3.4 Call Forwarding on PS Not Reachable procedures

B.3.4.1 Normal operation

When an incoming call is forwarded without being offered to the served PHS user for call forwarding on PS not reachable, the served PHS user, as a subscription option, may receive notification of the call forwarding.

If a call to the served is forwarded, the PHS network serving the served PHS user shall send the **authenticationOperation** invoke component using the call unrelated connection oriented transport mechanism described in 6.3.2.1/B-IF2.01 (ITU-T Recommendation 6.3.2.1/Q.932).

The served public CS send an **authenticationOperation** return result component to the PHS network in an appropriate bearer independent transport message.

If the served PHS terminal is successfully authenticated and the call forwarding service is successfully invoked, the PHS network send the **diversionInformation** invoke component with the contents as described in 4.2 with the “Diversion reason” set to cfnrc.

B.3.4.2 Exceptional procedures

If the call forwarding service is unsuccessfully invoked, the PHS network shall send to an user identified by the served PHS user PSN an **invokeStatus** invoke component following the procedures for status notification as given in 5.1.5. The **invokeStatus** operation is defined in 4.2.

If the notification of call forwarding service is unsuccessfully invoked, the PHS network shall release the call unrelated connection.

B.4 Signalling flow

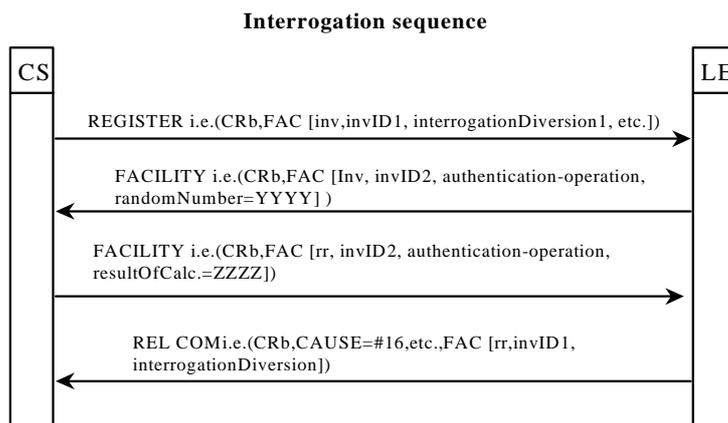
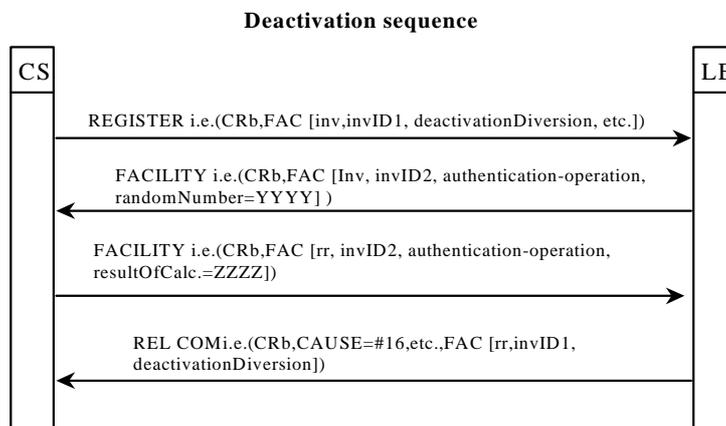
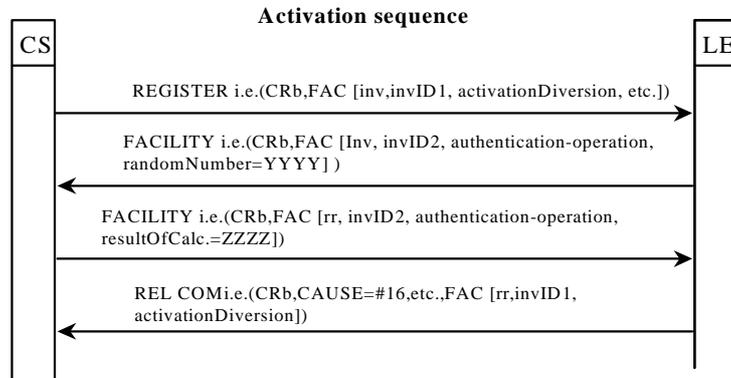
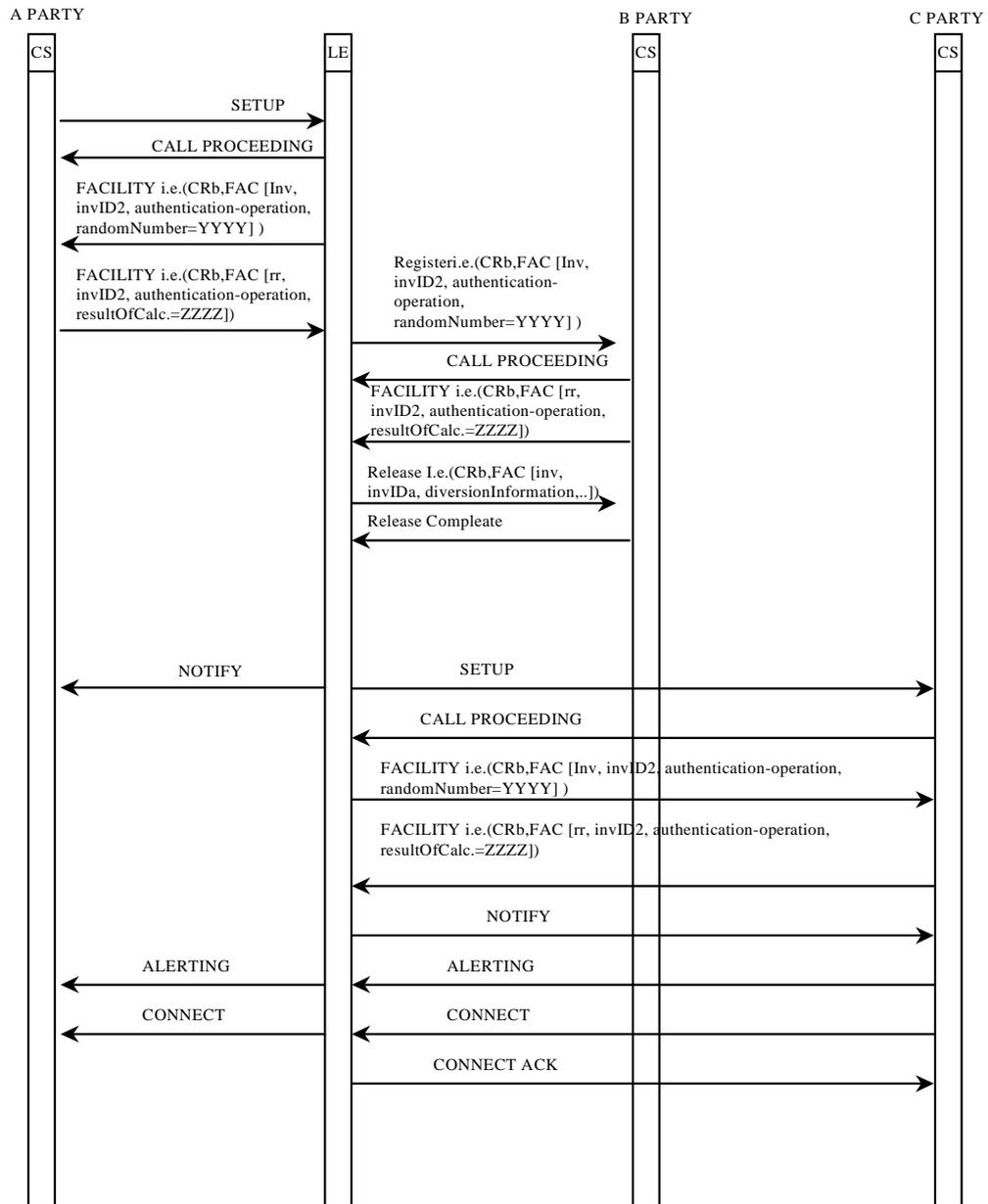


Figure Annex B-1/B-IF2.52
Activation/Deactivation/Interrogation sequence of call diversion supplementary services



**Figure Annex B-2/B-IF2.52
Call Forwarding Unconditional**

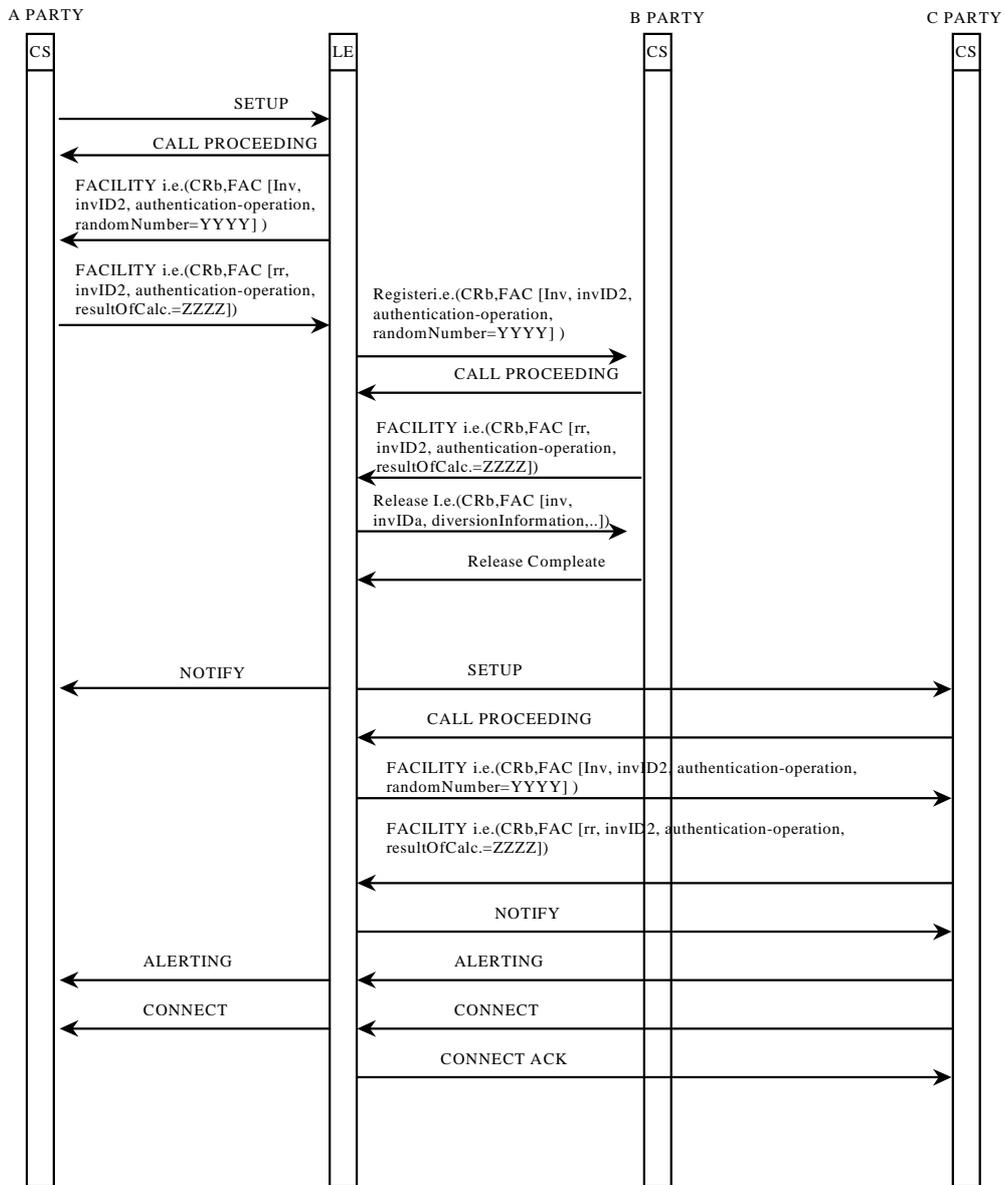


Figure Annex B-3/B-IF2.52
Call Forwarding on PS busy
(network determined user busy)

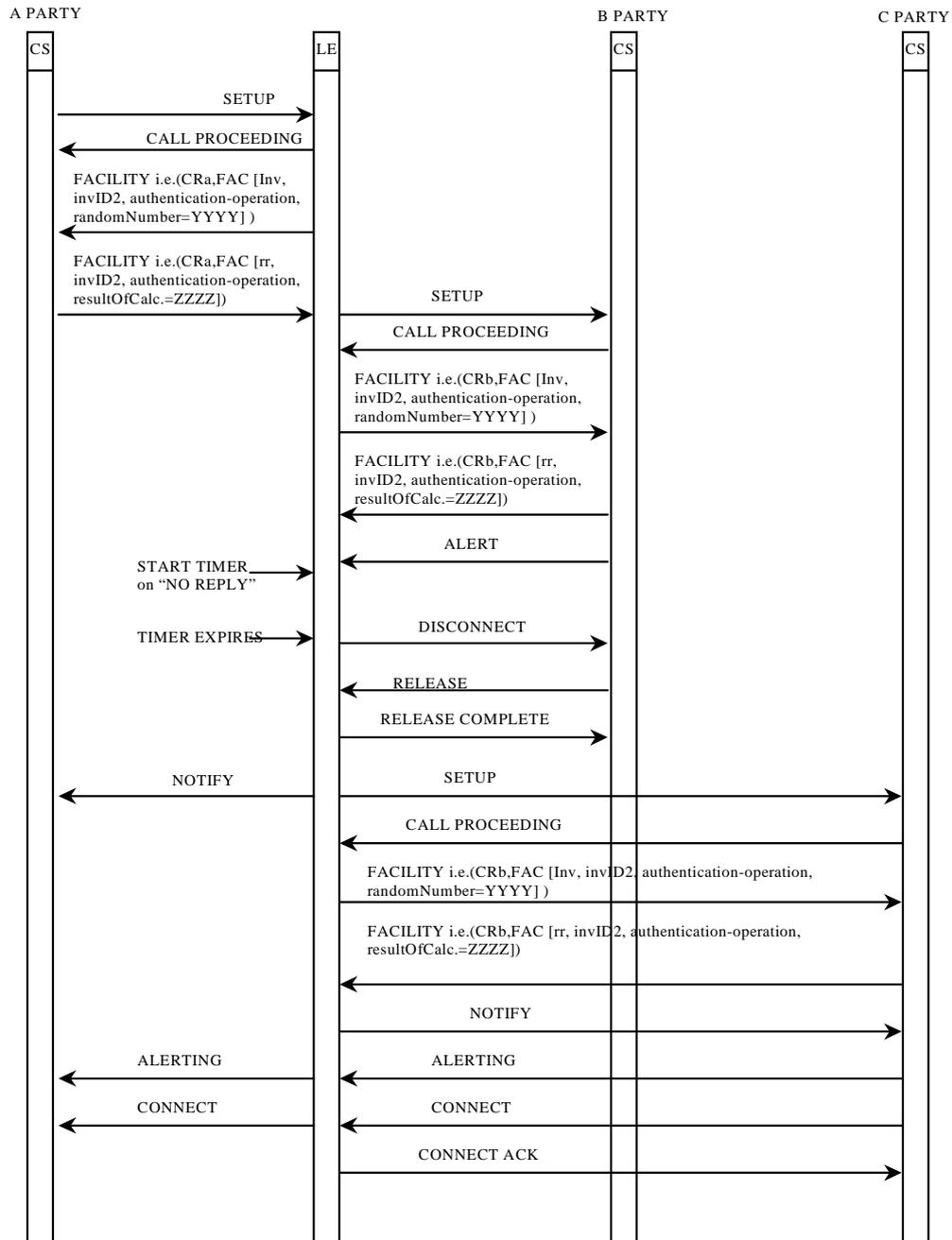


Figure Annex B-4/B-IF2.52
Call Forwarding on No Reply - Early release

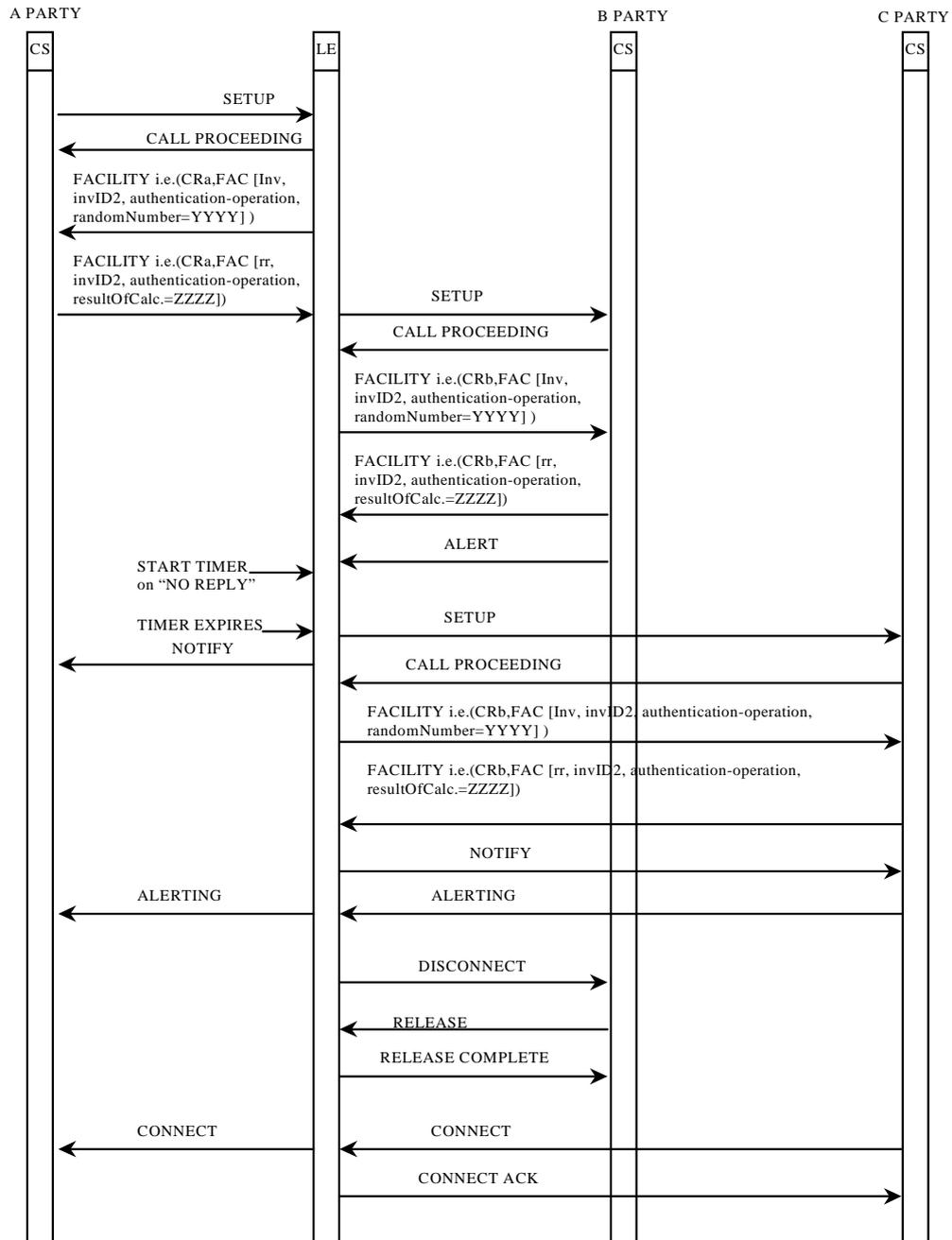


Figure Annex B-5/B-IF2.52
Call Forwarding on No Reply - Late release

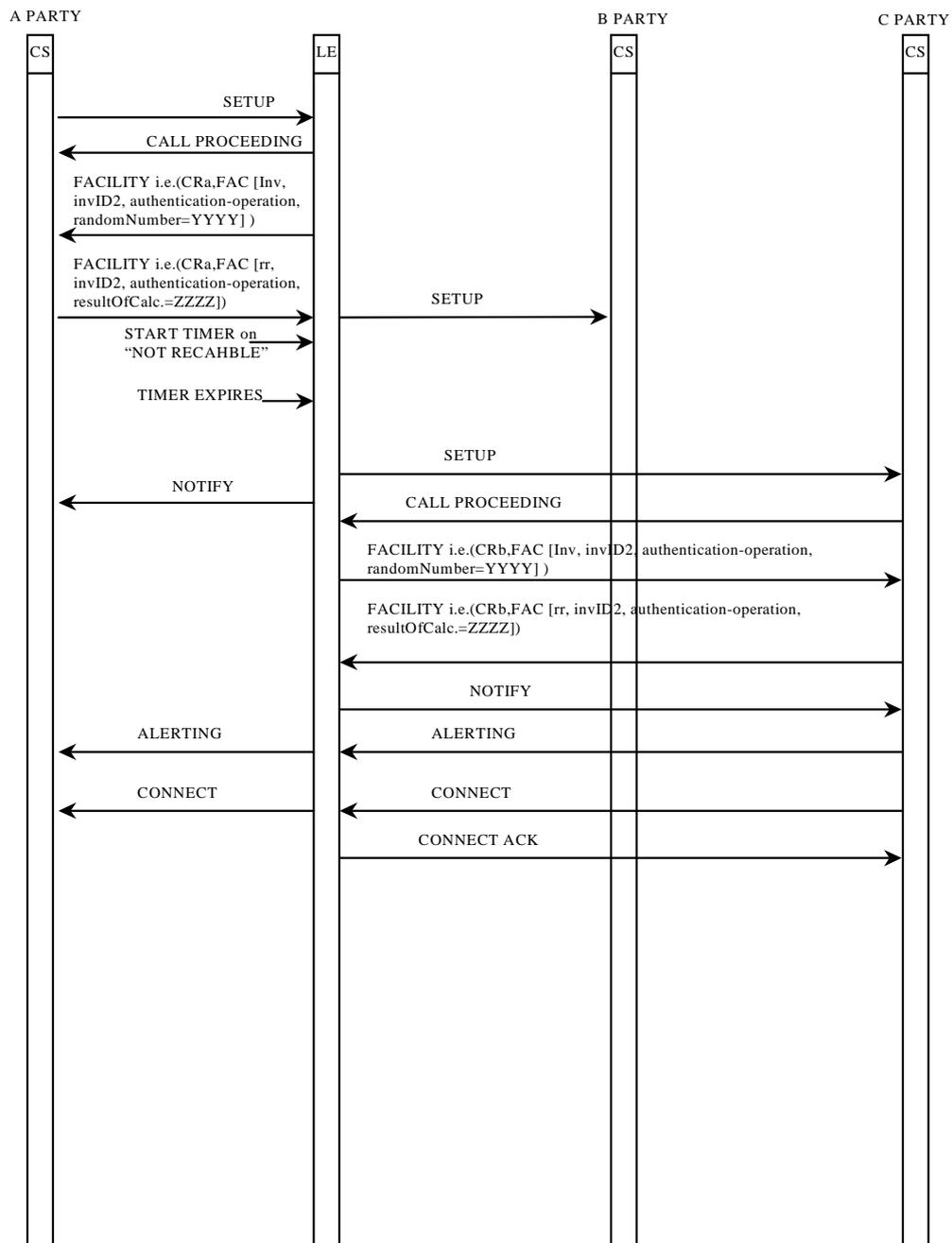


Figure Annex B-6/B-IF2.52
Call Forwarding on PS Not Reachable