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Foreword

This European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS is part 1 of a multi-part standard covering the Digital Subscriber Signalling System No. one (DSS1) protocol specification for the Integrated Services Digital Network (ISDN) diversion supplementary services, as described below:

Part 1: "Protocol specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma";

Part 3: "Test Suite Structure and Test Purposes (TSS&TP) for the user";

Part 4: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma for the user";

Part 5: "TSS&TP for the network";

Part 6: "ATS and partial PIXIT proforma for the network".

In accordance with CCITT Recommendation I.130, the following three level structure is used to describe the supplementary telecommunication services as provided by European public telecommunications operators under the pan-European ISDN:

- Stage 1: is an overall service description, from the user's standpoint;

- Stage 2: identifies the functional capabilities and information flows needed to support the service described in stage 1; and

- Stage 3: defines the signalling system protocols and switching functions needed to implement the service described in stage 1.

This ETS details the stage 3 aspects (signalling system protocols and switching functions) needed to support the diversion supplementary services. The stage 1 aspects are detailed in ETS 300 199 (1994), ETS 300 200 (1994), ETS 300 201 (1994) and ETS 300 202 (1994). The stage 2 aspects are detailed in ETS 300 203 (1994), ETS 300 204 (1994), ETS 300 205 (1994) and ETS 300 206 (1994).

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1 Scope

This first part of ETS 300 207 specifies the stage three of the diversion supplementary services for the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications operators at the T reference point or coincident S and T reference point (as defined in ITU-T Recommendation I.411 [6]) by means of the Digital Subscriber Signalling System No. one (DSS1). Stage three identifies the protocol procedures and switching functions needed to support a telecommunication service (see CCITT Recommendation I.130 [3]).

In addition, this ETS specifies the protocol requirements at the T reference point where the service is provided to the user via an intermediate private ISDN.

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

The diversion supplementary services comprise the following services:

- Call Forwarding Busy (CFB) supplementary service;

- Call Forwarding Unconditional (CFU) supplementary service;

- Call Forwarding No Reply (CFNR) supplementary service;

- Call Deflection (CD) supplementary service.

The CFU supplementary service enables a served user to have the network redirect to another user calls which are addressed to the served user's ISDN number. The CFU supplementary service may operate on all calls, or just those associated with specified basic services. The served user's ability to originate calls is unaffected by the CFU supplementary service. After the CFU supplementary service has been activated, calls are forwarded independent of the status of the served user.

The CFB supplementary service enables a served user to have the network redirect to another user calls which are addressed to the served user's ISDN number and meet busy. The CFB supplementary service may operate on all calls, or just those associated with specified basic services. The served user's ability to originate calls is unaffected by the CFB supplementary service.

The CFNR supplementary service enables a served user to have the network redirect to another user calls which are addressed to the served user's ISDN number, and for which the connection is not established within a defined period of time. The CFNR supplementary service may operate on all calls, or just those associated with specified basic services. The served user's ability to originate calls is unaffected by the CFNR supplementary service.

The CD supplementary service enables the served user to respond to an incoming call by requesting redirection of that call to another user. The CD supplementary service can only be invoked before the connection is established by the served user, i.e. in response to the offered call, or during the period that the served user is being informed of the call. The served user's ability to originate calls is unaffected by the CD supplementary service.

The diversion supplementary services are applicable to all circuit-switched telecommunication services.

Further parts of ETS 300 207 specify the method of testing required to identify conformance to this ETS.

This ETS is applicable to equipment supporting at least one of the diversion supplementary services, to be attached at either side of a T reference point or coincident S and T reference point when used as an access to the public ISDN.

2 Normative references

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

[1] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".

[2] ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".

[3] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[4] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[5] ITU-T Recommendation I.221 (1993): "Common specific characteristics of services".

[6] ITU-T Recommendation I.411 (1993): "ISDN user-network interfaces - Reference configurations".

[7] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".

[8] CCITT Recommendation X.219 (1988): "Remote operations: Model, notation and service definitions".

[9] CCITT Recommendation Z.100 (1988): "Specification and Description Language (SDL)".

[10] ENV 41007-1 (1991): "Definition of terms in private telecommunication networks; Part 1: Definition of general terms".

[11] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".

[12] ETS 300 195-1: "Integrated Services Digital Network (ISDN); Supplementary service interactions; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

[13] ETS 300 196-1 (1993): "Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

[14] ETS 300 199 (1994): "Integrated Services Digital Network (ISDN); Call Forwarding Busy (CFB) supplementary service; Service description".

[15] ETS 300 200 (1994): "Integrated Services Digital Network (ISDN); Call Forwarding Unconditional (CFU) supplementary service; Service description".

[16] ETS 300 201 (1994): "Integrated Services Digital Network (ISDN); Call Forwarding No Reply (CFNR) supplementary service; Service description".

[17] ETS 300 202 (1994): "Integrated Services Digital Network (ISDN); Call Deflection (CD) supplementary service; Service description".

3 Definitions

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

address: An address is an ISDN number, with optionally an associated subaddress.

alerting phase: The period where the connection at the remote access is such that if it is an ISDN interface, it is in call state N7, Call Received, and if it is an analogue interface, an alerting indication is being provided.

all numbers: If for the control of the call forwarding supplementary services the parameter servedUserNr is set to "allNumbers", then all the ISDN numbers are affected that the user is subscribed to and for which the call forwarding supplementary service is subscribed to, at the point in time that the request is received in the network.

all services: If for the control of the call forwarding supplementary services the parameter basicService is set to "allServices" then all basic services are affected that the user is subscribed to, and for which the call forwarding supplementary service applies and is subscribed to, at the point in time that the request is received in the network.

basic service: A bearer service or teleservice. When used in this ETS it refers only to circuit-switched basic services.

bearer service: See ITU-T Recommendation I.112 [2], definition 202.

call control message: A message as defined in ETS 300 102-1 [11], subclause 3.1, which on sending or receipt causes a change of the call state at either the network or the user. Call control messages also include the INFORMATION message and the PROGRESS message.

call reference: See ETS 300 196-1 [13], subclause 3.1.

call state: A state as defined in ETS 300 102-1 [11], for either the user or the network as appropriate. A call state may exist for each call reference value (and for each additional responding Connection Endpoint Identifier (CEI) in the incoming call states).

calling network: The network to which the calling user is attached.

calling user: A user who initiated a call that has been diverted.

data link connection endpoint identifier; Connection Endpoint Identifier (CEI): See ETS 300 196-1 [13], subclause 3.1.

deflected-to number: The ISDN number of the deflected-to user.

deflected-to user: A user to which the call is redirected as a result of deflection.

deflecting number: The ISDN number of the deflecting user.

diverted-to user: Refers either to the forwarded-to user or to the deflected-to user.

diverted-to network: The network to which the diverted-to user is attached.

diverted-to number: The ISDN number of the forwarded-to or the deflected-to user.

diverting network: The network to which the served user (diverting user) is attached.

diverting number: The ISDN number of the forwarding/deflecting user.

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

dummy call reference: See ETS 300 196-1 [13], subclause 3.1.

forwarded-to address: The address of the forwarded-to user.

forwarded-to network: The network to which the forwarded-to user is attached.

forwarded-to number: The ISDN number of the forwarded-to user.

forwarded-to user: A user to which the call is redirected as a result of forwarding.

forwarding network: The network to which the served user (forwarding user) is attached.

forwarding number: The ISDN number of the forwarding user.

Integrated Services Digital Network (ISDN): See ITU-T Recommendation I.112 [2], definition 308.

invoke component: See ETS 300 196-1 [13], subclause 8.2.2.1. Where reference is made to an "xxxx" invoke component, an invoke component is meant with its operation value set to the value of the operation "xxxx".

ISDN number: A number conforming to the numbering plan and structure specified in CCITT Recommendation E.164 [1].

network: The DSS1 protocol entity at the network side of the user-network interface.

Network Determined User Busy (NDUB): See ITU-T Recommendation I.221 [5].

private network: The DSS1 protocol entity at the user-side of the user-network interface when a T reference point applies.

Private Telecommunication Network eXchange (PTNX): See ENV 41007-1 [10], subclause 4.4.

point-to-point terminal configuration: A terminal configuration in which there is one user signalling entity.

reject component: See ETS 300 196-1 [13], subclause 8.2.2.4.

return error component: See ETS 300 196-1 [13], subclause 8.2.2.3. Where reference is made to an "xxxx" return error component, a return error component is meant which is related to an "xxxx" invoke component.

return result component: See ETS 300 196-1 [13], subclause 8.2.2.2. Where reference is made to an "xxxx" return result component, a return result component is meant which is related to an "xxxx" invoke component.

served user: The user which activates, deactivates or interrogates the CFU, CFB or CFNR supplementary services or invokes the CD supplementary service.

service; telecommunication service: See ITU-T Recommendation I.112 [2], definition 201.

subaddress: See CCITT Recommendation E.164 [1], subclause 12.2.

supplementary service: See ITU-T Recommendation I.210 [4], subclause 2.4.

teleservice: See ITU-T Recommendation I.112 [2], definition 203.

user: The DSS1 protocol entity at the user side of the user-network interface when a coincident S and T reference point applies.

User Determined User Busy (UDUB): Is specified for the case that the network offers the call to the user and if no compatible terminal responds "positively" but one or more compatible terminal respond "user busy".

4 Abbreviations

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

ASN.1	Abstract Syntax Notation one
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
COLR	Connected Line Identification Restriction
DSS1	Digital Subscriber Signalling System No. one
DTN	Diverted-To Number
ISDN	Integrated Services Digital Network
LE	Local Exchange
MSN	Multiple Subscriber Number
NDUB	Network Determined User Busy
PTNX	Private Telecommunication Network eXchange
SDL	Specification and Description Language
UDUB	User Determined User Busy

5 Description

As a network provider option the diversion supplementary services can be provided on a per ISDN number basis or can apply to the whole access. In addition, and as a network provider option, the call forwarding supplementary services (including options) may be subscribed to for each basic service to which the user(s) of the number subscribes, or collectively for all the basic services to which the user(s) subscribes.

The CD supplementary service shall apply to all of the basic services subscribed to by the user.

The served user can register a different forwarded-to address for each basic service subscription parameter value and call forwarding supplementary service to which he has subscribed.

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

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

The functions of the CD supplementary service are implemented in the network and they are invoked by the terminal on a call by call basis.

6 Operational requirements

6.1 Provision and withdrawal

The CFU, CFB, CFNR and/or CD supplementary services shall be provided after prior arrangement with the network provider.

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

The diversion supplementary services can be offered separately with subscription options.

The subscription options for the CFB supplementary service are given in ETS 300 199 [14], subclause 6.1.

The subscription options for the CFU supplementary service are given in ETS 300 200 [15], subclause 6.1.

The subscription options for the CFNR supplementary service are given in ETS 300 201 [16], subclause 6.1.

The subscription options for the CD supplementary service are given in ETS 300 202 [17], subclause 6.1.

Each subscription option can be provided as a network provider option. For each subscription option, only one value can be selected. Subscription options having impact on the protocol are summarized in table 1.

Table 1: Subscription options for the diversion supplementary services

Subscription option	Value	Applicability
Served user receives notification that a call has been forwarded (note 1)	No	CFU CFB
	Yes, with call offering information	CFNR
Calling user is notified of diversion (forwarded or deflected) (note 1)	No	CFU CFB
	Yes, with diverted-to number	CFNR CD
	Yes, without diverted-to number	
Served user receives reminder notification on outgoing calls that forwarding is currently activated (note 1)	No	CFU CFB
	Yes	CFNR
Diverting number is released to the diverted-to user (note 1)	No	CFU CFB
	Yes	CFNR CD
Activation, deactivation and interrogation for ISDN-numbers on the same access (in case of subscription on a per ISDN number basis) (note 2)	No	CFU CFB
	Yes	CFNR

NOTE 1: These options apply separately to each instance of the supplementary service that the user has subscribed to.
NOTE 2: This option applies to all the instances subscribed to on the access of the served user for the related supplementary service.

The following network provider options are available for the diversion supplementary services.

The network provider options for the CFB supplementary service are given in ETS 300 199 [14].

The network provider options for the CFU supplementary service are given in ETS 300 200 [15].

The network provider options for the CFNR supplementary service are given in ETS 300 201 [16].

The network provider options for the CD supplementary service are given in ETS 300 202 [17].

These network provider options are summarized in table 2.

Table 2: Network provider options for diversion supplementary services

Network provider option	Value	Applicability
Served user call retention on invocation of diversion (forwarding or deflection)	Retain call until alerting begins at the diverted-to user	CFNR CD
	Clear call on invocation of diversion	
The maximum number of diversions for a single 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 network provider option	CFNR
Partial rerouteing provided at the T reference point (note)	Yes	CFU CFB CFNR CD
	No	
The call-by-call indication overrides the value of the subscription option "Diverting number is released to the diverted-to user"	Yes	CD
	No	
NOTE: Partial rerouteing can be invoked by the private network towards the public network when the CFU, CFB, CFNR or CD supplementary services are invoked in the private network.		

6.2 Requirements on the calling user's network side

The procedures at the coincident S and T reference point in ETS 300 102-1 [11], subclause 5.1 and the procedures of subclauses 9.2.1, 9.2.2 and 9.2.3 in this ETS shall apply.

6.3 Requirements on the served user's network side

The procedures at the coincident S and T reference point in ETS 300 102-1 [11], subclause 5.2 and the procedures of subclauses 9.1, 9.2.4 and 9.3 in this ETS shall apply.

6.4 Requirements on the diverted-to user's network side

The procedures at the coincident S and T reference point in ETS 300 102-1 [11], subclause 5.2 and the procedures of subclause 9.2.5 in this ETS shall apply.

7 Coding requirements

7.1 Coding of the Facility information element components

Table 3 shows the definitions of the operations and errors required for the diversion supplementary services using ASN.1 as specified in CCITT Recommendation X.208 [7] and using the OPERATION and ERROR macro as defined in figure 4/X.219 of CCITT Recommendation X.219 [8].

The formal definition of the component types to encode these operations and errors is provided in ETS 300 196-1 [13], clause D.1.

The inclusion of components in Facility information elements is defined in ETS 300 196-1 [13], subclause 11.2.2.1.

All components (invoke, return result, return error and reject) shall be included within a Facility information element. This Facility information element may be included in any appropriate message as specified in ETS 300 196-1 [13], subclause 8.3.1.1, unless a more restrictive specification is given in clause 9.

Table 3: Definition of operations and errors

```
Diversion-Operations {ccitt identified-organization etsi(0) 207 operations-and-errors(1)}

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

EXPORTS             ActivationDiversion,
                    DeactivationDiversion,
                    ActivationStatusNotificationDiv,
                    DeactivationStatusNotificationDiv,
                    InterrogationDiversion,
                    InterrogateServedUserNumbers,
                    DiversionInformation,
                    CallDeflection,
                    CallRerouteing,
                    DivertingLegInformation1,
                    DivertingLegInformation2,
                    DivertingLegInformation3,
                    InvalidDivertedToNr,
                    SpecialServiceNr,
                    DiversionToServedUserNr,
                    IncomingCallAccepted,
                    NumberOfDiversionsExceeded,
                    NotActivated,
                    RequestAlreadyAccepted,
                    invalidDivertedToNr,
                    specialServiceNr,
                    diversionToServedUserNr,
                    incomingCallAccepted,
                    numberOfDiversionsExceeded,
                    notActivated,
                    requestAlreadyAccepted;

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

                    notSubscribed,
                    notAvailable,
                    invalidServedUserNr,
                    basicServiceNotProvided,
                    supplementaryServiceInteractionNotAllowed,
                    resourceUnavailable
                    FROM General-Errors
                        {ccitt identified-organization etsi(0) 196 general-errors(2)}

                    PresentedAddressScreened,
                    PresentedNumberUnscreened,
                    Address,
                    PartyNumber,
                    PartySubaddress,
                    PresentationAllowedIndicator
                    FROM Addressing-Data-Elements
                        {ccitt identified-organization etsi(0) 196 addressing-data-elements(6)}
```

Table 3 (continued): Definition of operations and errors

```
                    BasicService
                    FROM Basic-Service-Elements
                        {ccitt identified-organization etsi(0) 196 basic-service-elements(8)}

                    Q931InformationElement
                    FROM Embedded-Q931-Types
                        {ccitt identified-organization etsi(0) 196 embedded-q931-types(7)};

ActivationDiversion ::= OPERATION

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

                            RESULT

                            ERRORS {
                                notSubscribed,
                                notAvailable,
                                invalidServedUserNr,
                                supplementaryServiceInteractionNotAllowed,
                                basicServiceNotProvided,
                                resourceUnavailable,
                                InvalidDivertedToNr,
                                SpecialServiceNr,
                                DiversionToServedUserNr}

-- End of ActivationDiversion operation definition

DeactivationDiversion   ::= OPERATION

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

                            RESULT

                            ERRORS {
                                notSubscribed,
                                notAvailable,
                                invalidServedUserNr,
                                NotActivated}

-- End of DeactivationDiversion operation definition

ActivationStatusNotificationDiv ::= OPERATION

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

-- End of ActivationStatusNotificationDiv operation definition

DeactivationStatusNotificationDiv   ::= OPERATION

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

-- End of DeactivationStatusNotificationDiv operation definition

InterrogationDiversion  ::= OPERATION

                            ARGUMENT SEQUENCE {
                                procedure               Procedure,
                                basicService            BasicService DEFAULT allServices,
                                servedUserNr            ServedUserNr}

                            RESULT  IntResultList

                            ERRORS {
                                notSubscribed,
                                notAvailable,
                                invalidServedUserNr}

-- End of InterrogationDiversion operation definition
```

Table 3 (continued): Definition of operations and errors

```
InterrogateServedUserNumbers    ::= OPERATION

                            RESULT  ServedUserNumberList

                            ERRORS {
                                notSubscribed,
                                notAvailable}

-- End of InterrogateServedUserNumbers operation definition

DiversionInformation    ::= OPERATION

                            ARGUMENT SEQUENCE {
                                diversionReason         DiversionReason,
                                basicService            BasicService,
                                servedUserSubaddress    PartySubaddress OPTIONAL,
                                callingAddress          [0] PresentedAddressScreened OPTIONAL,
                                originalCalledNr        [1] PresentedNumberUnscreened OPTIONAL,
                                lastDivertingNr         [2] PresentedNumberUnscreened OPTIONAL,
                                lastDivertingReason     [3] DiversionReason OPTIONAL,
                                userInfo                Q931InformationElement OPTIONAL}

-- The User-user information element, as specified in ETS 300 102-1 [11], subclause 4.5.29, shall
-- be embedded in the userInfo parameter.

-- End of DiversionInformation operation definition

CallDeflection  ::= OPERATION

                            ARGUMENT SEQUENCE {
                                deflectionAddress                   Address,
                                presentationAllowedDivertedToUser   PresentationAllowedIndicator
                                                                    OPTIONAL}

                            RESULT

                            ERRORS {
                                notSubscribed,
                                notAvailable,
                                InvalidDivertedToNr,
                                SpecialServiceNr,
                                DiversionToServedUserNr,
                                IncomingCallAccepted,
                                NumberOfDiversionsExceeded,
                                supplementaryServiceInteractionNotAllowed,
                                RequestAlreadyAccepted}

-- End of CallDeflection operation definition

CallRerouteing  ::= OPERATION

                            ARGUMENT SEQUENCE {
                                rerouteingReason        DiversionReason,
                                calledAddress           Address,
                                rerouteingCounter       DiversionCounter,
                                q931InfoElement         Q931InformationElement,
                                lastRerouteingNr        [1] PresentedNumberUnscreened,
                                subscriptionOption      [2] SubscriptionOption
                                                            DEFAULT noNotification,
                                callingPartySubaddress  [3] PartySubaddress OPTIONAL}

-- The User-user information element (optional), High layer compatibility information element
-- (optional), Bearer capability information element and Low layer compatibility information
-- element (optional) as specified in ETS 300 102-1 [11] subclause 4.5 shall be embedded in the
-- q931InfoElement.

                            RESULT

                            ERRORS {
                                notSubscribed,
                                notAvailable,
                                supplementaryServiceInteractionNotAllowed,
                                resourceUnavailable,
                                InvalidDivertedToNr,
                                SpecialServiceNr,
                                DiversionToServedUserNr,
                                NumberOfDiversionsExceeded}

-- End of CallRerouteing operation definition
```

Table 3 (concluded): Definition of operations and errors

```
DivertingLegInformation1    ::= OPERATION

                            ARGUMENT SEQUENCE {
                                diversionReason         DiversionReason,
                                subscriptionOption      SubscriptionOption,
                                divertedToNumber        PresentedNumberUnscreened OPTIONAL}

-- End of DivertingLegInformation1 operation definition

DivertingLegInformation2    ::= OPERATION

                            ARGUMENT SEQUENCE {
                                diversionCounter        DiversionCounter,
                                diversionReason         DiversionReason,
                                divertingNr             [1] PresentedNumberUnscreened OPTIONAL,
                                originalCalledNr        [2] PresentedNumberUnscreened OPTIONAL}

-- End of DivertingLegInformation2 operation definition

DivertingLegInformation3    ::= OPERATION

                            ARGUMENT
                                presentationAllowedIndicator      PresentationAllowedIndicator

-- End of DivertingLegInformation3 operation definition

IntResultList               ::= SET SIZE (0..29) OF IntResult

IntResult                   ::= SEQUENCE   {servedUserNr          ServedUserNr,
                                            basicService          BasicService,
                                            procedure             Procedure,
                                            forwardedToAddress    Address}

ServedUserNr                ::= CHOICE     {individualNumber      PartyNumber,
                                            allNumbers            NULL}

DiversionCounter            ::= INTEGER (1..5)

SubscriptionOption          ::= ENUMERATED {noNotification                    (0),
                                            notificationWithoutDivertedToNr   (1),
                                            notificationWithDivertedToNr      (2)}

Procedure                   ::= ENUMERATED {cfu         (0),
                                            cfb         (1),
                                            cfnr        (2)}

ServedUserNumberList        ::= SET SIZE (0..99) OF PartyNumber

DiversionReason             ::= ENUMERATED {unknown     (0),
                                            cfu         (1),
                                            cfb         (2),
                                            cfnr        (3),
                                            cdAlerting  (4),
                                            cdImmediate (5)}

InvalidDivertedToNr         ::= ERROR
SpecialServiceNr            ::= ERROR
DiversionToServedUserNr     ::= ERROR
IncomingCallAccepted        ::= ERROR
NumberOfDiversionsExceeded  ::= ERROR
NotActivated                ::= ERROR
RequestAlreadyAccepted      ::= ERROR

activationDiversion                 ActivationDiversion                 ::= localValue  7
deactivationDiversion               DeactivationDiversion               ::= localValue  8
activationStatusNotificationDiv     ActivationStatusNotificationDiv     ::= localValue  9
deactivationStatusNotificationDiv   DeactivationStatusNotificationDiv   ::= localValue 10
interrogationDiversion              InterrogationDiversion              ::= localValue 11
interrogateServedUserNumbers        InterrogateServedUserNumbers        ::= localValue 17
diversionInformation                DiversionInformation                ::= localValue 12
callDeflection                      CallDeflection                      ::= localValue 13
callRerouteing                      CallRerouteing                      ::= localValue 14
divertingLegInformation1            DivertingLegInformation1            ::= localValue 18
divertingLegInformation3            DivertingLegInformation3            ::= localValue 19
divertingLegInformation2            DivertingLegInformation2            ::= localValue 15
invalidDivertedToNr                 InvalidDivertedToNr                 ::= localValue 12
specialServiceNr                    SpecialServiceNr                    ::= localValue 14
diversionToServedUserNr             DiversionToServedUserNr             ::= localValue 15
incomingCallAccepted                IncomingCallAccepted                ::= localValue 23
numberOfDiversionsExceeded          NumberOfDiversionsExceeded          ::= localValue 24
notActivated                        NotActivated                        ::= localValue 46
requestAlreadyAccepted              RequestAlreadyAccepted              ::= localValue 48

END -- of Diversion-Operations
```

7.2 Coding of the information elements

7.2.1 Coding of the Notification indicator information element

For the coding of the Notification indicator information element, see ETS 300 196-1 [13], subclause 11.2.2.2.

Table 4 contains the additional codepoints for the diversion supplementary services which shall be employed in octet 3 of the Notification indicator information element.

Table 4: Additional codepoints in the Notification indicator information element

Bits 87654321	
11111011	Call is diverting
11101000	Diversion activated

7.2.2 Coding of the Redirecting number information element

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

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

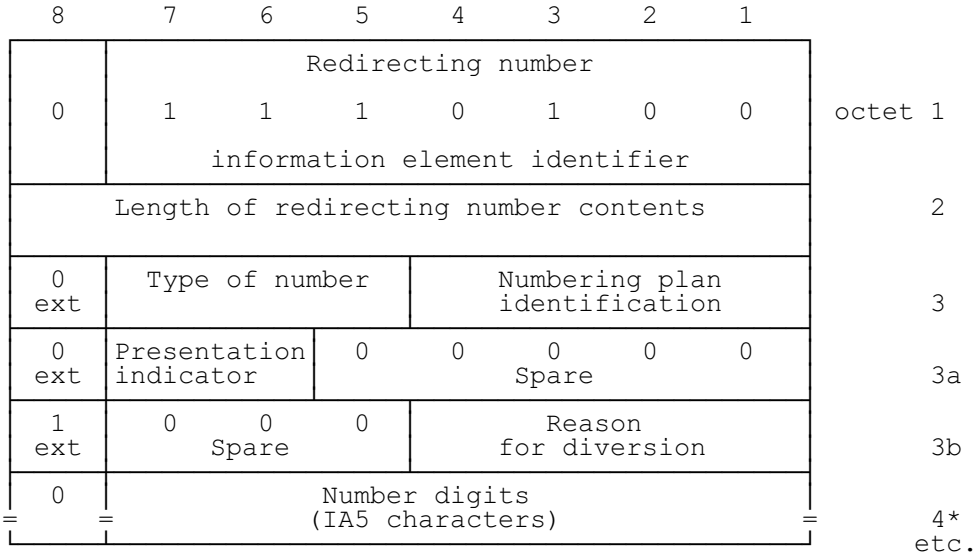

Figure 1: Redirecting number information element

The various parts of the Redirecting number information element shall be coded as specified in ETS 300 102-1 [11], subclause 4.5.10 (for the Calling party number information element) except for octet 3b which is defined below.

The reason for diversion (octet 3b) values are specified in table 5.

Table 5: Reason for diversion codepoints

Bits 4321	
0000	Unknown
0001	Call forwarding busy
0010	Call forwarding no reply
1111	Call forwarding unconditional
1010	Call deflection
NOTE:	All other values are reserved.

7.2.3 Coding of the Redirection number information element

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

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

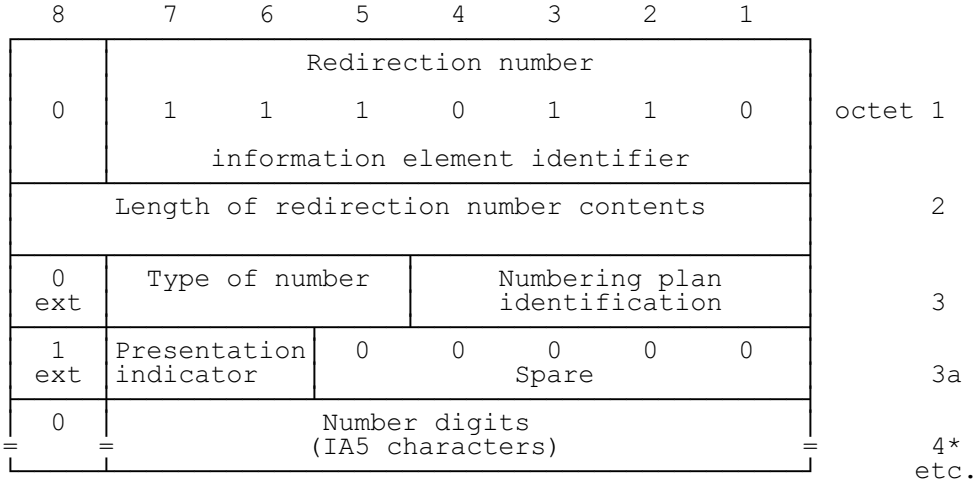

Figure 2: Redirection number information element

The various parts of the Redirection number information element shall be coded as specified for the equivalent fields in ETS 300 102-1 [11], subclause 4.5.10 (for the Calling party number information element).

8 State definitions

Table 6 defines the states for the diversion supplementary services.

Table 6: States for the diversion supplementary services

User states	
Idle	The diversion supplementary service is idle.
Wait Activation	The user has requested activation and is waiting for a response.
Wait Deactivation	The user has requested deactivation and is waiting for a response.
Wait Number Interrogation	The user has requested number interrogation and is waiting for a response.
Wait Interrogation	The user has requested interrogation and is waiting for a response.
Deflecting	The user has requested call deflection and is waiting for a response.
Private Network Diverting	The user has sent a DivertingLegInformation2 invoke component.
Public Network Diverting	The user has received a DivertingLegInformation2 invoke component.
Wait Route	The user has requested call rerouteing and is waiting for a response.
Network states	
Idle	The diversion supplementary service is idle.
Wait Activation	The network has received an activation request.
Wait Deactivation	The network has received a deactivation request.
Wait Number Interrogation	The network has received a number interrogation request.
Wait Interrogation	The network has received an interrogation request.
Deflecting	The network has received a call deflection request.
Private Network Diverting	The network has received a DivertingLegInformation2 invoke component.
Public Network Diverting	The network has sent a DivertingLegInformation2 invoke component.
Wait Route	The network has received a call rerouteing request.

9 Signalling procedures at the coincident S and T reference point

9.1 Activation, deactivation and interrogation

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

Within the network, the CD supplementary service is activated for the whole subscription period, no activation, deactivation and interrogation procedures are defined for the user-network interface.

9.1.1 Activation

9.1.1.1 Normal operation

Having subscribed to a specific call forwarding supplementary service (CFU, CFB, CFNR), in order to activate that service, the served user shall send an ActivationDiversion invoke component to the network using the procedure described in subclause 10.2.2.1 of ETS 300 196-1 [13].

The served user shall indicate the instance(s) of the supplementary service by use of the following parameters:

- in the procedure parameter, the type of call forwarding supplementary service to be activated, i.e. the CFU (value "cfu"), CFNR (value "cfnr") or CFB (value "cfb") supplementary service;

- in the basicService parameter, the basic service for which the activation applies. If call forwarding is subscribed to for only one basic service then the user shall set the parameter to either "allServices" or indicate that basic service. If the activation applies to all basic services for which call forwarding is subscribed to and call forwarding is subscribed to for more than one basic service, the user shall set the parameter to "allServices", to activate multiple instances of the supplementary service;

- in the servedUserNr parameter, the ISDN number(s) for which the activation applies. This can either be an individual ISDN number (specified by choosing the "individualNumber") or all numbers for which the supplementary service has been subscribed to on the access (specified by choosing "allNumbers").

The served user shall indicate the supplementary service data in the forwardedToAddress parameter which shall indicate the forwarded-to address of the instance(s) of the supplementary service.

As a network provider option, the network shall verify the forwarded-to number before accepting the call forwarding request. This verification is done by a check of the forwarded-to number in the forwarding exchange.

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

To activate an instance of the call forwarding supplementary service, the network shall use the procedure parameter, the basicService parameter, and the servedUserNr parameter.

If the subscription is to the whole access, the network shall ignore the value of the servedUserNr parameter and activate the call forwarding supplementary service for the whole access.

If the subscription is on a per number basis and the Multiple Subscriber Number (MSN) supplementary service is not provided to the access, the network shall ignore the value of the servedUserNr parameter and activate the call forwarding supplementary service for the single number.

If the subscription is on a per number basis and the MSN supplementary service is provided to the access, the network shall act dependant on the subscription option "activation, deactivation and interrogation for all ISDN numbers on the same access":

a) if the value of the subscription option is "no" and:

   - the servedUserNr parameter is set to "individualNumber", the network shall activate the instance(s) of the call forwarding supplementary service relating to the single number; or

   - the servedUserNr parameter is set to "allNumbers", the network shall reject the activation and send an ActivationDiversion return error component indicating "invalidServedUserNr" to the served user.

b) if the value of the subscription option is "yes" and:

   - the servedUserNr parameter is set to "individualNumber", the network shall activate the instance(s) of the call forwarding supplementary service relating to the single number; or

   - the servedUserNr parameter is set to "allNumbers", the network shall activate the instance(s) of the call forwarding supplementary service relating to the number(s) which are subscribed to this supplementary service.

For each number, or for the whole access, the network shall activate multiple instances of the call forwarding supplementary service if the basicService parameter is set to "allServices" and the call forwarding has been subscribed for several basic services.

If one or more instances are successfully activated, the network shall:

- send an ActivationDiversion return result component as described in subclause 10.2.2.1 of ETS 300 196-1 [13]; and

- unless a point-to-point terminal configuration is known to exist at the user-network interface, send to all users (the Called party number information element shall not be included) at the access an ActivationStatusNotificationDiv invoke component using the procedures for status notification described in subclause 10.2.5 of ETS 300 196-1 [13].

  The network shall indicate the instance(s) of the supplementary service by use of the following parameters:

  - in the procedure parameter, the type of call forwarding supplementary service activated, i.e. the CFU (value "cfu"), CFNR (value "cfnr") or CFB (value "cfb") supplementary service;

  - in the basicService parameter, the basic service as indicated in the ActivationDiversion invoke component;

  - in the servedUserNr parameter, the ISDN number(s) for which the activation applies. This can either be an individual ISDN number (specified by choosing the "individualNumber") or all numbers on the access (specified by choosing "allNumbers").

  The network shall indicate the supplementary service data in the forwardedToAddress parameter which shall indicate the forwarded-to address of this instance of the supplementary service.

Subsequent procedures are as specified in subclause 10.2.2.1 of ETS 300 196-1 [13] for terminating the transaction.

An activation can be modified by a subsequent activation (reactivation) procedure.

The basicService parameter set to "allServices" or the servedUserNr parameter set to "allNumbers" within the ActivationDiversion invoke component indicates one or multiple instances of the supplementary service. A single ActivationDiversion return result indicates the result no matter how many instances can be activated. Only if all requested instances can be activated, or reactivated, an ActivationDiversion return result component shall be given.

An activation request covering multiple instances shall apply even if each instance was previously deactivated with a single deactivation request. An activation request covering a single instance shall apply even if that instance was previously deactivated with a multiple deactivation request.

When the served user receives a correctly encoded ActivationDiversion return result component, and delivered as specified in ETS 300 196-1 [13], subclause 10.2.2.1, then the served user shall accept the provided information and not respond to the network.

9.1.1.2 Exceptional procedures

If the network is unable to activate the call forwarding supplementary service, the network shall send an ActivationDiversion return error component to the served user within a Facility information element, using the procedure in subclause 10.2.2.2 of ETS 300 196-1 [13], indicating one of the following error values:

- "notSubscribed", if (for a given ISDN number or for the whole access) the requested call forwarding supplementary service has not been subscribed to for the indicated basic service;

- "notAvailable", if the requested call forwarding supplementary service is not available for the indicated basic service;

- "invalidServedUserNr", if the ISDN number provided to identify the served user is not a valid number;

- "supplementaryServiceInteractionNotAllowed", if the provision of the call forwarding supplementary service activation is precluded by a procedure within clause 5 of ETS 300 195-1 [12];

- "basicServiceNotProvided", if the served user has not subscribed to the basic service for which the call forwarding supplementary service was requested;

- "resourceUnavailable", if the resources required to perform adequately the requested call forwarding supplementary service are not available;

- "InvalidDivertedToNr", if the indicated forwarded-to number cannot be accepted;

- "SpecialServiceNr", if the indicated forwarded-to number identifies a special service number (e.g. police, emergency, operator) and forwarding is prohibited to this special service number;

- "DiversionToServedUserNr", if the indicated forwarded-to number is identical to the ISDN number identifying the served user.

On expiration of timer T-ACTIVATE and the served user not having received any response to the ActivationDiversion invoke component, the served user shall consider that this attempt to activate the call forwarding supplementary service has failed.

Subsequent procedures for the network and the user are as specified in subclause 10.2.2.2 of ETS 300 196-1 [13] for terminating the transaction.

When activation of multiple instances of a call forwarding supplementary service is requested, and if any instance cannot be activated, or reactivated, then none of the requested instances shall be activated. The error value shall be related to an instance that could not be activated or reactivated.

The served user, on receiving a reject component, shall take no action, and remain in the same state as before the ActivationDiversion invoke component was sent.

If the network receives a reject component from the served user, it need not correlate it to the procedure in this subclause but it shall have no impact on the call forwarding supplementary service.

9.1.2 Deactivation

9.1.2.1 Normal operation

In order to deactivate a call forwarding supplementary service, the served user shall send a DeactivationDiversion invoke component to the network using the procedure described in subclause 10.2.3.1 of ETS 300 196-1 [13].

The served user shall indicate the instance(s) of the supplementary service by use of the following parameters:

- in the procedure parameter, the type of call forwarding supplementary service to be deactivated, i.e. the CFU (value "cfu"), CFNR (value "cfnr") or CFB (value "cfb") supplementary service;

- in the basicService parameter, the basic service for which the deactivation applies. If call forwarding is subscribed to for only one basic service then the user shall set the parameter to either "allServices" or indicate that basic service. If the deactivation applies to all basic services for which call forwarding is subscribed to and call forwarding is subscribed to for more than one basic service, the user shall set the parameter to "allServices", to deactivate multiple instances of the supplementary service;

- in the servedUserNr parameter, the ISDN number(s) for which the deactivation applies. This can either be an individual ISDN number (specified by choosing the "individualNumber") or all numbers for which the supplementary service has been activated on the access (specified by choosing "allNumbers").

To deactivate an instance of the call forwarding supplementary service, the network shall use the procedure parameter, the basicService parameter, and the servedUserNr parameter.

If the subscription is to the whole access, the network shall ignore the value of the servedUserNr parameter and deactivate the call forwarding supplementary service for the whole access.

If the subscription is on a per number basis and the MSN supplementary service is not provided to the access, the network shall ignore the value of the servedUserNr parameter and deactivate the call forwarding supplementary service for the single number.

If the subscription is on a per number basis and the MSN supplementary service is provided to the access, the network shall act dependant on the subscription option "activation, deactivation and interrogation for all ISDN numbers on the same access":

a) if the value of the subscription option is "no" and:

- the servedUserNr parameter is set to "individualNumber", the network shall deactivate the instance(s) of the call forwarding supplementary service relating to the single number; or

- the servedUserNr parameter is set to "allNumbers", the network shall reject the deactivation and send a DeactivationDiversion return error component indicating "invalidServedUserNr" to the served user.

b) if the value of the subscription option is "yes" and:

- the servedUserNr parameter is set to "individualNumber", the network shall deactivate the instance(s) of the call forwarding supplementary service relating to the single number; or

- the servedUserNr parameter is set to "allNumbers", the network shall deactivate the instance(s) of the call forwarding supplementary service which have been activated for all the number(s) which are subscribed to this supplementary service.

For each number, or for the whole access, the network shall deactivate multiple instances of the call forwarding supplementary service if the basicService parameter is set to "allServices" and the call forwarding has been activated for several basic services.

If one or more instances are successfully deactivated, the network shall:

- send a DeactivationDiversion return result component using the procedure in subclause 10.2.3.1 of ETS 300 196-1 [13]; and

- unless a point-to-point terminal configuration is known to exist at the user-network interface, send to all users (the Called party number information element shall not be included) at the access a DeactivationStatusNotificationDiv invoke component using the procedures for status notification described in subclause 10.2.5 of ETS 300 196-1 [13].

  The network shall indicate the instance(s) of the supplementary service by use of the following parameters:

  - in the procedure parameter, the type of call forwarding supplementary service deactivated, i.e. the CFU (value "cfu"), CFNR (value "cfnr") or CFB (value "cfb") supplementary service;

  - in the basicService parameter, the basic service as indicated in the DeactivationDiversion invoke component;

  - in the servedUserNr parameter, the ISDN number(s) for which the deactivation applies. This can either be an individual ISDN number (specified by choosing the "individualNumber") or all numbers on the access (specified by choosing "allNumbers").

Subsequent procedures are as specified in subclause 10.2.3.1 of ETS 300 196-1 [13] for terminating the transaction.

The basicService parameter set to "allServices" or the servedUserNr parameter set to "allNumbers" within the DeactivationDiversion invoke component indicates one or multiple instances of the supplementary service. A single DeactivationDiversion return result indicates the result no matter how many instances can be deactivated. Only if all requested instances can be deactivated a DeactivationDiversion return result component shall be given.

A deactivation request covering multiple instances shall apply even if each instance was previously activated with a single activation request. A deactivation request covering a single instance shall apply even if that instance was previously activated with a multiple activation request.

When the served user receives a correctly encoded DeactivationDiversion return result component, and delivered as specified in ETS 300 196-1 [13], subclause 10.2.3.1, then the served user shall accept the provided information and not respond to the network.

9.1.2.2 Exceptional procedures

If the network is unable to deactivate the call forwarding supplementary service, the network shall send a DeactivationDiversion return error component to the served user within a Facility information element, using the procedure described in subclause 10.2.3.2 of ETS 300 196-1 [13], indicating one of the following error values:

- "notSubscribed", if (for a given ISDN number or for the whole access) the requested call forwarding supplementary service has not been subscribed to for the indicated basic service;

- "notAvailable", if the requested call forwarding supplementary service is not available for the indicated basic service;

- "invalidServedUserNr", if the ISDN number provided to identify the served user is not a valid number;

- "NotActivated", if none of the requested instances of the supplementary service is activated.

On expiration of timer T-DEACTIVATE and the served user not having received any response to the DeactivationDiversion invoke component, the served user shall consider that this attempt to deactivate the call forwarding supplementary service has failed and that the call forwarding supplementary service may still be activated.

Subsequent procedures for the network and the user are as specified in subclause 10.2.3.2 of ETS 300 196-1 [13] for terminating the transaction.

When deactivation of multiple instances of a call forwarding supplementary service is requested, and if any instance cannot be deactivated, then none of the requested instances shall be deactivated. The error value shall be related to an instance that could not be deactivated.

The served user, on receiving a reject component, shall take no action, and remain in the same state as before the DeactivationDiversion invoke component was sent.

If the network receives a reject component from the served user, it need not correlate it to the procedure in this subclause but it shall have no impact on the call forwarding supplementary service.

9.1.3 Interrogation of the served user numbers

9.1.3.1 Normal procedures

In order to obtain the numbers at an interface for which any call forwarding supplementary service has been activated, the served user shall send an InterrogateServedUserNumbers invoke component to the network using the procedure described in subclause 10.2.4.1 of ETS 300 196-1 [13].

On receiving an InterrogateServedUserNumbers invoke component, the network shall, if the value of the subscription option "activation, deactivation and interrogation for all ISDN numbers on the same access" is "yes", send an InterrogateServedUserNumbers return result component to the served user using the procedure described in subclause 10.2.4.1 of ETS 300 196-1 [13]. This component shall specify, within the ServedUserNumberList parameter, each ISDN number that has any instance of a call forwarding supplementary service associated with it. An ISDN number shall occur only once. If no activation exists, the ServedUserNumberList parameter shall have size zero.

Subsequent procedures are as specified in subclause 10.2.4.1 of ETS 300 196-1 [13] for terminating the transaction.

When the served user receives a correctly encoded InterrogateServedUserNumbers return result component, and delivered as specified in ETS 300 196-1 [13], subclause 10.2.4.1, then the user shall accept the provided information and not respond to the network.

9.1.3.2 Exceptional procedures

If the network is unable to provide the information requested, the network shall send an InterrogateServedUserNumbers return error component to the user within a Facility information element, using the procedure described in subclause 10.2.4.2 of ETS 300 196-1 [13], indicating one of the following error values:

- "notSubscribed", if (for a given ISDN number or for the whole access) none of the call forwarding supplementary services have been subscribed to, or if the value of the subscription option "activation, deactivation and interrogation for all ISDN numbers on the same access" is "no";

- "notAvailable", if the requested information is not available or if the data provided by the network exceeds the maximum length allowed for a message.

On expiration of timer T-INTERROGATE and the served user not having received any response to the InterrogateServedUserNumbers invoke component, the served user shall consider that this attempt to interrogate the call forwarding supplementary service has failed.

Subsequent procedures for the network and the user are as specified in subclause 10.2.4.2 of ETS 300 196-1 [13] for terminating the transaction.

The served user, on receiving a reject component, shall take no action, and remain in the same state as before the InterrogateServedUserNumbers invoke component was sent.

If the network receives a reject component from the served user, it need not correlate it to the procedure in this subclause but it shall have no impact on the call forwarding supplementary service.

9.1.4 Interrogation of a single or multiple instances of the supplementary service

9.1.4.1 Normal operation

In order to obtain the details of the instance(s) of a call forwarding supplementary service, the served user shall send an InterrogationDiversion invoke component to the network using the procedure described in subclause 10.2.4.1 of ETS 300 196-1 [13].

The served user shall indicate the instance(s) of the supplementary service by use of the following parameters:

- in the procedure parameter, the type of call forwarding supplementary service to be interrogated, i.e. the CFU (value "cfu"), CFNR (value "cfnr") or CFB (value "cfb") supplementary service;

- in the basicService parameter, the value "allServices" or an individual basic service;

- in the servedUserNr parameter, the ISDN number(s) for which the interrogation applies. This can either be an individual ISDN number (specified by choosing the "individualNumber") or all numbers on the access (specified by choosing "allNumbers").

Multiple instances may be addressed when at least one of the values "allServices" or "allNumbers" is used in the interrogation request.

On receiving such an InterrogationDiversion invoke component, the network shall collect data for the instance(s) of the call forwarding supplementary service by use of the procedure parameter, the basicService parameter, and the servedUserNr parameter.

If subscription is to the whole access, the network shall ignore the value of the servedUserNr parameter and collect data of the call forwarding supplementary service for the whole access.

If subscription is on a per number basis and the MSN supplementary service is not provided to the access, the network shall ignore the value of the servedUserNr and collect data of the call forwarding supplementary service for the single number.

If subscription is on a per number basis and the MSN supplementary service is provided to the access, the network shall act dependant on the subscription option "activation, deactivation and interrogation for all ISDN numbers on the same access":

a) if the value of the subscription option is set to "no" and:

   - if the servedUserNr parameter is set to "individualNumber", the network shall collect data of the instance(s) of the call forwarding supplementary service relating to the single number; or

   - the servedUserNr parameter is set to "allNumbers", the network shall reject the interrogation and send an InterrogationDiversion return error component indicating "invalidServedUserNr" to the served user.

b) if the value of the subscription option is set to "yes" and:

   - if the servedUserNr parameter is set to "individualNumber", the network shall collect data of the instance(s) of the call forwarding supplementary service relating to the single number; or

   - the servedUserNr parameter is set to "allNumbers", the network shall collect data of the instance(s) of the call forwarding supplementary service which have been activated for all the number(s) which are subscribed to this supplementary service.

For each number, or for the whole access, the network shall collect data of multiple instances of the call forwarding supplementary service if the basicService parameter is set to "allServices" and the call forwarding has been activated for several basic services.

The collected data shall be included within one or more IntResult parameters of the InterrogationDiversion return result component sent to the served user using the procedure described in subclause 10.2.4.1 of ETS 300 196-1 [13].

For each activation that exists, the IntResult parameter shall be provided, containing:

- the procedure parameter which shall be identical to those contained in the invoke component;

- the servedUserNr parameter which shall indicate the number for which the instance applies. Its value shall be identical to the value contained in the invoke component unless:

   - the value "allNumbers" has been received and the call forwarding supplementary service has been subscribed on a per ISDN number basis. In this case, the related individual number is provided;

   - this value has been ignored by the network (subscription applies for the whole access or the MSN supplementary service is not provided to the access). In these cases, the value "allNumbers" is systematically used;

- the basicService parameter which shall indicate the basic service for which the instance applies;

- the forwardedToAddress parameter which shall indicate the forwarded-to address of this instance of the supplementary service.

If no activation exists, the IntResultList parameter shall have size zero.

Subsequent procedures are as specified in subclause 10.2.4.1 of ETS 300 196-1 [13] for terminating the transaction.

When the served user receives a correctly encoded InterrogationDiversion return result component, and delivered as specified in ETS 300 196-1 [13], subclause 10.2.4.1, then the user shall accept the provided information and not respond to the network.

9.1.4.2 Exceptional procedures

If the network is unable to provide the information requested, the network shall send an InterrogationDiversion return error component to the user within a Facility information element, according to the procedures described in subclause 10.2.4.2 of ETS 300 196-1 [13], indicating one of the following error values:

- "notSubscribed", if (for a given ISDN number or for the whole access) the requested call forwarding supplementary service has not been subscribed to for any basic service;

- "notAvailable", if the requested call forwarding supplementary service is not available for any basic service or if the data provided by the network exceeds the maximum length allowed for a message;

- "invalidServedUserNr", if the ISDN number provided to identify the served user is not a valid number.

On expiration of timer T-INTERROGATE and the served user not having received any response to the InterrogationDiversion invoke component, the served user shall consider that this attempt to interrogate the call forwarding supplementary service has failed.

Subsequent procedures for the network and the user are as specified in subclause 10.2.4.2 of ETS 300 196-1 [13] for terminating the transaction.

The served user, on receiving a reject component, shall take no action, and enter the state that existed before the InterrogationDiversion invoke component was sent.

If the network receives a reject component from the served user, it need not correlate it to the procedure in this subclause but it shall have no impact on the call forwarding supplementary service.

9.2 Invocation and operation

9.2.1 Collection and analysis of diversion information at the calling network

All procedures at the calling user are provided as part of the basic call control and subscription to any specific diversion supplementary services is not required.

9.2.1.1 Normal operation

When diversion is invoked, and for each subsequent diversion, the calling network will receive the following information from the diverting network:

- the value of the subscription option "calling user is notified of diversion";

- the diverting cause;

- the diverted-to number.

The calling network shall summarize the information received of each diversion as it occurs for the subscription option "calling user is notified of diversion" to produce the summary condition "calling user is notified of diversion". This summary condition shall take one of the following values:

a) "no", if any subscription option "calling user is notified of diversion" received so far contained the value "no";

b) "yes, without diverted-to number", if case a) does not apply, and if any subscription option "calling user is notified of diversion" received so far contained the value "yes, without diverted-to number";

c) "yes, with diverted-to number", if neither case a) nor case b) apply.

9.2.1.2 Exceptional procedures

Not applicable.

9.2.2 Notification of diversion to the calling user

All the procedures at the calling user are provided as part of the basic call control and subscription to any specific diversion supplementary services is not required.

9.2.2.1 Normal operation

When the first diversion after the call is requested is indicated to the calling network, and if the summary condition "calling user is notified of diversion" has a value other than "no" (in this case the summary condition is equivalent to the received subscription option) then the calling network shall send an appropriate message to the calling user with the Notification indicator information element coded "call is diverting". No other information concerning the diversion shall be included at this time.

When a subsequent diversion is indicated to the calling network with the diverting cause diversion due to either the CFNR or the CD alerting supplementary services (i.e. the served user has reached the alerting phase), and if the summary condition "calling user is notified of diversion" has a value other than "no" then the calling network shall send an appropriate message to the calling user with the Notification indicator information element coded "call is diverting". No other information concerning the diversion shall be included at this time.

If one of the diversions is due to either the CFNR or the CD alerting supplementary services, an indication of diversion may be received from the diverted-to user after an ALERTING message has been passed from the diverting user to the calling user. In this case the calling network shall not pass a second or subsequent ALERTING message to the calling user, but shall include the applicable message content and shall send the diversion notifications as indicated by the restriction requirements 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.

9.2.2.2 Exceptional procedures

Exceptional procedures at the calling user's interface shall be according to ETS 300 102-1 [11], subclause 5.8.

9.2.3 Identification of the diverted-to user to the calling user

All procedures at the calling user are provided as part of the basic call control and subscription to any specific diversion supplementary services is not required.

9.2.3.1 Normal operation

When a call reaches the diverted-to user (i.e. alerting commences or at call acceptance by the user), the calling network may receive in an appropriate network message a presentation indicator set to allowed or not allowed in accordance with the Connected Line Identification Restriction (COLR) supplementary service of the diverted-to user. When this presentation indicator is not received, the calling network shall assume that presentation is not allowed.

At this time, the calling network will take the following actions depending on the restriction requirements of all diverting users currently in the diversion chain:

- if the value of the summary condition "calling user is notified of diversion" is "no" or "yes, without diverted-to number" no information is given to the calling user and the operation is as described in ETS 300 102-1 [11], subclause 5.1;

- if the value of the summary condition "calling user is notified of diversion" is "yes, with diverted-to number", the following applies:

    - if the diverted-to number is available and presentation is allowed according to the presentation indicator received from the diverted-to network, the network shall include the Redirection number information element in the ALERTING, CONNECT or other appropriate message at the time that permission to present is determined. The presentation indicator in the Redirection number information element shall be set to "presentation allowed". The numbering plan identification field in the Redirection number information element shall either be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The redirection number information shall be indicated in the number digits field.

      The type of number shall be set to "national number", "international number" or, as a network provider option, "unknown";

    NOTE: As a network provider option, the type of number may be set to "unknown", in which case, the number is organized according to the network dialling plan, i.e. prefixes, or the absence of a prefix, shall be used to distinguish international numbers and national numbers from each other.

    - if the diverted-to number is available, but presentation is not allowed according to the presentation indicator received from the diverted-to network, the network shall include the Redirection number information element in an ALERTING, CONNECT or other appropriate message at the time that restriction is determined. The presentation indicator in the Redirection number information element shall be set to "presentation restricted". The type of number and the numbering plan identification in the Redirection number information element shall be set to "unknown" and the number digits field shall not be included;

    - if the diverted-to number is not available, the network shall include the Redirection number information element in the ALERTING, CONNECT or other appropriate message at the time that restriction is determined sent to the calling user. The presentation indicator in the Redirection number information element shall be set to "number not available due to interworking". The type of number and the numbering plan identification in the Redirection number information element shall be set to "unknown" and the number digits field shall not be included.

9.2.3.2 Exceptional procedures

Exceptional procedures at the calling user's interface shall be according to ETS 300 102-1 [11], subclause 5.8.

9.2.4 Operation at the served user

9.2.4.1 Procedures for the CFU supplementary service

9.2.4.1.1 Normal operation

If a call to the served user is forwarded unconditionally and the served user's subscription option "served user receives notification that a call has been forwarded" has the value "yes, with call offering information" then, if a point-to-point terminal configuration is known to exist at the user-network interface, the forwarding network shall send to the served user the DiversionInformation invoke component using the procedures as described in ETS 300 196-1 [13], subclause 8.3.2.2, otherwise, the forwarding network shall send the DiversionInformation invoke component to the users using the procedures as described in ETS 300 196-1 [13], subclause 8.3.2.4.

If the forwarding user has subscribed to the multiple subscriber number supplementary service, the forwarding network shall include the Called party number information element containing the called user's number in the FACILITY message. In the Called party number information element the type of number shall be set to "international", "national", "subscriber" or "unknown", and the numbering plan identification shall be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The called party number information shall be indicated in the number digits field.

The DiversionInformation invoke component shall contain the diversionReason parameter set to "cfu" and the basicService parameter indicating the basic service applicable for the call.

The DiversionInformation invoke component shall include:

- in the userInfo parameter, the user-user information, if present;

- in the servedUserSubaddress parameter, the served user's subaddress as provided by the calling user in the Called party subaddress information element, if present and if the subaddressing supplementary service is subscribed to by the served user;

- in the callingAddress parameter, the calling party address, if the calling line identification presentation supplementary service is subscribed to by the served user.

The callingAddress parameter shall be one of the following choices:

- "presentationAllowedAddress", if the presentation of the calling address is allowed; or

- "presentationRestricted", if the presentation of the calling address is restricted; or

- "numberNotAvailableDueToInterworking", if the calling address is not available due to interworking.

If previous diversions have occurred, the DiversionInformation invoke component shall include:

- in the originalCalledNr parameter, the originally called number;

- in the lastDivertingNr parameter, the last diverting number; and

- in the lastDivertingReason parameter, the cause for the last diversion set as received from the network.

  NOTE: In the case that only one diversion has previously occurred, the originally called number and the last diverting number will be identical.

The originalCalledNr parameter shall be one of the following choices:

- "presentationAllowedNumber", if the presentation indicator sent together with the original called number indicates that presentation is allowed; or

- "presentationRestricted", if the presentation indicator sent together with the original called number indicates that presentation is restricted; or

- "numberNotAvailableDueToInterworking", if the number is not available due to interworking.

The lastDivertingNr parameter shall be one of the following choices:

- "presentationAllowedNumber", if the presentation indicator sent together with the last diverting number indicates that presentation is allowed; or

- "presentationRestricted", if the presentation indicator sent together with the last diverting number indicates that presentation is restricted; or

- "numberNotAvailableDueToInterworking", if the number is not available due to interworking.

When the served user receives a correctly encoded DiversionInformation invoke component, and delivered as specified in ETS 300 196-1 [13], subclauses 8.3.2.2 or 8.3.2.4, then the served user shall accept the provided information and not respond to the network.

9.2.4.1.2 Exceptional procedures

If the network receives a reject component from the served user, it need not correlate it to the procedure in subclause 9.2.4.1.1 but it shall have no impact on the call forwarding supplementary service.

9.2.4.2 Network Determined User Busy (NDUB) procedures for the CFB supplementary service

9.2.4.2.1 Normal operation

If a call to the served user is forwarded on network determined user busy and the served user subscription option "served user receives notification that a call has been forwarded" has the value "yes, with call offering information" then, if a point-to-point terminal configuration is known to exist at the user-network interface, the forwarding network shall send to the served user the DiversionInformation invoke component using the procedures as described in ETS 300 196-1 [13], subclause 8.3.2.2, otherwise, the forwarding network shall send the DiversionInformation invoke component to the users using the procedures as described in ETS 300 196-1 [13], subclause 8.3.2.4.

If the forwarding user has subscribed to the MSN supplementary service, the forwarding network shall include the Called party number information element containing the called user's number in the FACILITY message. In the Called party number information element the type of number shall be set to "international", "national", "subscriber" or "unknown", and the numbering plan identification shall be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The called party number information shall be indicated in the number digits field.

The DiversionInformation invoke component shall contain the diversionReason parameter set to "cfb" and the basicService parameter indicating the basic service applicable for the call.

The DiversionInformation invoke component shall include:

- in the userInfo parameter, the user-user information, if present;

- in the servedUserSubaddress parameter, the served user's subaddress, if present and if the subaddressing supplementary service is subscribed to by the served user;

- in the callingAddress parameter, the calling party address, if the calling line identification presentation supplementary service is subscribed to by the served user.

The callingAddress parameter shall be one of the following choices:

- "presentationAllowedAddress", if the presentation of the calling address is allowed; or

- "presentationRestricted", if the presentation of the calling address is restricted; or

- "numberNotAvailableDueToInterworking", if the calling address is not available due to interworking.

If previous diversions have occurred, the DiversionInformation invoke component shall include:

- in the originalCalledNr parameter, the originally called number;

- in the lastDivertingNr parameter, the last diverting number; and

- in the lastDivertingReason parameter, the cause for the last diversion set as received from the network.

  NOTE: In the case that only one diversion has previously occurred, the originally called number and the last diverting number will be identical.

The originalCalledNr parameter shall be one of the following choices:

- "presentationAllowedNumber", if the presentation indicator sent together with the original called number indicates that presentation is allowed; or

- "presentationRestricted", if the presentation indicator sent together with the original called number indicates that presentation is restricted; or

- "numberNotAvailableDueToInterworking", if the number is not available due to interworking.

The lastDivertingNr parameter shall be one of the following choices:

- "presentationAllowedNumber", if the presentation indicator sent together with the last diverting number indicates that presentation is allowed; or

- "presentationRestricted", if the presentation indicator sent together with the last diverting number indicates that presentation is restricted; or

- "numberNotAvailableDueToInterworking", if the number is not available due to interworking.

When the served user receives a correctly encoded DiversionInformation invoke component, and delivered as specified in ETS 300 196-1 [13], subclauses 8.3.2.2 or 8.3.2.4, then the served user shall accept the provided information and not respond to the network.

9.2.4.2.2 Exceptional procedures

If the network receives a reject component from the served user, it need not correlate it to the procedure in subclause 9.2.4.2.1 but it shall have no impact on the call forwarding supplementary service.

9.2.4.3 User Determined User Busy (UDUB) procedures for the CFB supplementary service

9.2.4.3.1 Normal operation

If a condition exists such that in subclause 5.2.5.3 of ETS 300 102-1 [11] the call would be cleared to the calling user with cause #17 "user busy" or #34 "no circuit/channel available", then the network shall identify the user as UDUB.

If a call to the served user is forwarded on UDUB and the served user subscription option "served user receives notification that a call has been forwarded" has the value "yes, with call offering information" then, if a point-to-point terminal configuration is known to exist at the user-network interface, the forwarding network shall send to the served user the DiversionInformation invoke component using the procedure as described in ETS 300 196-1 [13], subclause 8.3.2.2, otherwise, the forwarding network shall send the DiversionInformation invoke component to the users using the procedure as described in ETS 300 196-1 [13], subclause 8.3.2.4.

If the forwarding user has subscribed to the MSN supplementary service, the forwarding network shall include the Called party number information element containing the called user's number in the FACILITY message. In the Called party number information element the type of number shall be set to "international", "national", "subscriber" or "unknown", and the numbering plan identification shall be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The called party number information shall be indicated in the number digits field.

The DiversionInformation invoke component shall contain the diversionReason parameter set to "cfb" and the basicService parameter indicating the basic service applicable for the call. No other parameters shall be contained in the DiversionInformation invoke component.

When the served user receives a correctly encoded DiversionInformation invoke component, and delivered as specified in ETS 300 196-1 [13], subclauses 8.3.2.2 or 8.3.2.4, then the served user shall accept the provided information and not respond to the network.

9.2.4.3.2 Exceptional procedures

If the network receives a reject component from the served user, it need not correlate it to the procedure in subclause 9.2.4.3.1 but it shall have no impact on the call forwarding supplementary service.

9.2.4.4 Procedures for the CFNR supplementary service

9.2.4.4.1 Normal operation

If the CFNR supplementary service is active for the basic service requested by this call, then the network shall start timer T-CFNR on receipt of the first ALERTING message. The value of T-CFNR is a network provider option. The network shall stop timer T-CFNR on receiving a CONNECT message from a user and shall not forward the call.

If call clearing is initiated while T-CFNR is running, the network shall stop timer T-CFNR and shall not forward the call and proceed with the normal clearing procedures according to subclause 5.3 of ETS 300 102-1 [11].

If T-CFNR expires before the network receives a CONNECT message, the network shall forward the call to the forwarded-to address.

If a call to the served user is forwarded on no reply and the served user subscription option "served user receives notification that a call has been forwarded" has the value "yes, with call offering information" then, if a point-to-point terminal configuration is known to exist at the user-network interface, the diverting network shall send to the served user the DiversionInformation invoke component using the procedure as described in ETS 300 196-1 [13], subclause 8.3.2.2, otherwise, the diverting network shall send the DiversionInformation invoke component to the users using the procedure as described in ETS 300 196-1 [13], subclause 8.3.2.4.

If the forwarding user has subscribed to the MSN supplementary service the forwarding network shall include the Called party number information element containing the called user's number in the FACILITY message. In the Called party number information element the type of number shall be set to "international", "national", "subscriber" or "unknown", and the numbering plan identification shall be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The called party number information shall be indicated in the number digits field.

The DiversionInformation invoke component shall contain the diversionReason parameter set to "cfnr" and the basicService parameter indicating the basic service applicable for the call. No other parameters shall be contained in the DiversionInformation invoke component.

When the served user receives a correctly encoded DiversionInformation invoke component, and delivered as specified in ETS 300 196-1 [13], subclauses 8.3.2.2 or 8.3.2.4, then the served user shall accept the provided information and not respond to the network.

If the network provider option "served user call retention on invocation of diversion" is "clear call on invocation", the network shall clear the call to the served user following the call clearing procedures as defined in subclause 5.3 of ETS 300 102-1 [11], with cause #31 "normal, unspecified".

NOTE 1: The forwarding network will send the notification information to the calling network when the forwarding operation to the forwarded-to network is invoked.

If the network provider option "served user call retention on invocation of diversion" is "retain call until alerting begins at diverted-to user", the network shall continue to offer the call to the served user. If the forwarding network receives a CONNECT message from the served user before receiving an indication that the call is in the Call Received (N7), Connect Request (N8) or Active (N10) states at the forwarded-to network, the forwarding network shall award the call to the served user and proceed as defined in subclauses 5.2.8 and 5.2.9 of ETS 300 102-1 [11]. The forwarding network shall initiate clearing towards the forwarded-to network, with cause #31 "normal, unspecified".

NOTE 2: The forwarding network will send the notification information to the calling network when it receives an alerting indication from the forwarded-to network.

If the forwarded call is not offered to the forwarded-to user, e.g. due to NDUB, network congestion or the maximum number of forwarding has been reached, then alerting continues at the served user in the case of the network provider option "served user call retention on invocation of diversion" is "retain call until alerting begins at the diverted-to user".

When the forwarding network receives an indication that the forwarded call is in the Call Received (N7), Connect Request (N8) or Active (N10) states at the forwarded-to network, the forwarding network shall, if not done previously, initiate call clearing to the served user as defined in subclause 5.3 of ETS 300 102-1 [11], with cause #31 "normal, unspecified".

9.2.4.4.2 Exceptional procedures

If the network receives a reject component from the served user, it need not correlate it to the procedure in subclause 9.2.4.4.1 but it shall have no impact on the call forwarding supplementary service.

9.2.4.5 Procedures for the CD supplementary service

9.2.4.5.1 Normal operation

Incoming calls shall be offered to the served user using the basic call procedures as described in subclause 5.2 of ETS 300 102-1 [11].

Users which are compatible with the incoming call can request that the call to be deflected to another user provided that the served user has subscribed to the CD supplementary service.

To invoke the CD supplementary service the served user shall send a CallDeflection invoke component in a FACILITY message to the network using the procedure as described in subclause 8.3.1.1 of ETS 300 196-1 [13].

The user shall send the CallDeflection invoke component while in the Call Received call state (U7), in the Incoming Call Proceeding call state (U9) or in the Overlap Receiving call state (U25).

The CallDeflection invoke component shall contain:

- in the deflectionAddress parameter, the address of the deflected-to user.

The CallDeflection invoke component may contain:

- in the presentationAllowedDivertedToUser parameter, an indication of whether the presentation is allowed to the diverted-to user.

If the network provider option "the call-by-call indication overrides the value of the subscription option "The diverting number is released to the diverted-to user"" applies, then the network shall use this indication in order to present the diverting number to the diverted-to user.

If the network provider option "the call-by-call indication overrides the value of the subscription option "The diverting number is released to the diverted-to user"" does not apply, then the network shall not use this indication in order to present the diverting number to the diverted-to user. In this case, the network shall use the value of the subscription option "diverting number is released to the diverted-to user".

If a point-to-multipoint terminal configuration is known to exist at the user-network interface, the acceptance of the call deflection invocation request shall depend on the reaction of other users to the same call. Two cases can be distinguished:

- when the user sends an invocation request for the CD supplementary service before sending an ALERTING message then the network shall act immediately on the call deflection invocation request and deflect the call towards the indicated address, provided no other user has previously responded with ALERTING or CONNECT;

- when the user sends an invocation request for the CD supplementary service after sending an ALERTING message the network shall act immediately on the call deflection invocation request and deflect the call towards the indicated address, provided no other user has previously responded with CONNECT.

If a point-to-point terminal configuration is known to exist at the user-network interface, the network shall act immediately on the invocation request for the CD supplementary service and deflect the call towards the indicated address.

If the network provider option "served user call retention on invocation of diversion" is "clear call on invocation", then the network shall clear the call towards the served user when the CD supplementary service is being invoked by sending a DISCONNECT message containing a Facility information element with a CallDeflection return result component and with cause #31 "normal, unspecified". When the call to the served user is cleared, the other responding users shall be cleared using the procedure as described in subclause 5.2.9 of ETS 300 102-1 [11].

NOTE 1: The deflecting network will send the notification information to the calling network when the deflection operation to the deflected-to network is invoked.

If the network provider option "served user call retention on invocation of diversion" is "retain call until alerting begins at the deflected-to user", then the network shall inform the served user that the CD supplementary service is being invoked by sending a FACILITY message containing a Facility information element with a CallDeflection return result component and shall continue to offer the call to the served user. Subsequent actions are as follows:

a) if the deflecting network receives a ALERTING message before receiving an indication that the deflected call is in the Call Received (N7) call state, Connect Request (N8) call state or Active (N10) call state at the deflected-to network, the deflecting network shall proceed as defined in subclause 5.2 of ETS 300 102-1 [11] (i.e. enter the correct call state and perform the associated basic call actions). The network shall continue to respond according to the subsequent actions;

b) if the deflecting network receives a CONNECT message before receiving an indication that the deflected call is in the Call Received (N7) call state, Connect Request (N8) call state or Active (N10) call state at the deflected-to network, the deflecting network shall award the call to the served user and proceed as defined in subclause 5.2 of ETS 300 102-1 [11]. The deflecting network shall initiate clearing towards the deflected-to network, with cause #31 "normal, unspecified";

NOTE 2: The deflecting network will send the notification information to the calling network when it receives an alerting indication from the deflected-to network.

c) if the deflecting network receives an indication that the deflected call is in the Call Received (N7) call state, Connect Request (N8) call state or Active (N10) call state at the deflected-to network (even if case a) has previously occurred), then the deflecting network shall, if not done previously, initiate call clearing to the served user that invoked the CD supplementary service using the procedure as described in subclause 5.3.4 of ETS 300 102-1 [11] using cause #31 "normal, unspecified", and to other responding users according to subclause 5.2.9 of ETS 300 102-1 [11].

9.2.4.5.2 Exceptional procedures

If the network cannot accept the call deflection invocation request from the user, the network shall send a Facility information element, with a CallDeflection return error component in the FACILITY message and release the invoke identifier. The network shall proceed as defined in subclause 5.2 of ETS 300 102-1 [11] and continue to respond according to the other messages received from the access. In particular, if a previous ALERTING message has been sent by the related terminal, this terminal shall stay in the alerting state. The error value indicated in the CallDeflection return error component shall be one of the following:

- "notSubscribed", if (for a given ISDN number or for the whole access) the CD supplementary service has not been subscribed to;

- "notAvailable", if the CD supplementary service is not available for the indicated basic service;

- "supplementaryServiceInteractionNotAllowed", if the provision of the CD supplementary service activation is precluded by a procedure within clause 5 of ETS 300 195-1 [12];

- "InvalidDivertedToNr", if the indicated deflected-to number received from the served user cannot be accepted;

  NOTE: This error value cannot be used if the deflected-to number is identified as an invalid ISDN number at the diverted-to user's network.

- "SpecialServiceNr", if the indicated deflected-to number identifies a special service number (e.g. police, emergency, operator) and deflection is prohibited to this special service number;

- "DiversionToServedUserNr", if the indicated deflected-to number is identical to the ISDN number identifying the served user;

- "NumberOfDiversionsExceeded", if the limit on the number of diversions has already been reached;

- "IncomingCallAccepted", if a request to invoke the CD supplementary service is overruled by the normal basic call procedures, i.e.:

  - another user has previously responded with a CONNECT message; or

  - the served user invoked the CD supplementary service before sending an ALERTING message but another user has previously responded with an ALERTING message.

- "RequestAlreadyAccepted", if a request to invoke the CD supplementary service is received whilst another request is being processed.

If the network provider option "served user call retention on invocation of diversion" is "retain call until alerting begins at the deflected-to user", and if the call to the deflected-to user fails (e.g. due to NDUB), no specific protocol action shall be taken towards the served user.

9.2.5 Operation at the diverted-to user

All procedures at the diverted-to user are provided as part of the basic call control and subscription to any specific diversion supplementary services is not required.

9.2.5.1 Normal operation

Call offering at the diverted-to user shall be as specified in ETS 300 102-1 [11], subclause 5.2. The call diversion specific information shall be transferred in the SETUP message.

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

When multiple diversions have occurred, the network shall repeat the Redirecting number information element only once. These information elements shall not be preceded by the Repeat indicator information element. The network shall include in the first Redirecting number information element the information of the first diversion and in the second Redirecting number information element the information of the last diversion.

For both numbers, if presentation is allowed according to the presentation indicator supplied together with the number information, the diverted-to network shall include the Redirecting number information element in the SETUP message sent to the diverted-to user. In the Redirecting number information element the presentation indicator shall be set to "presentation allowed". The type of number shall be set to "international", "national" or "unknown". The numbering plan identification shall be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The redirecting number information shall be indicated in the number digits field.

NOTE: As a network provider option the prefix is added to the number. In this case the diverted-to number is coded "unknown".

For both numbers, if presentation is not allowed according to the presentation indicator supplied together with the number information, the diverted-to network shall include the Redirecting number information element in the SETUP message sent to the diverted-to user. In the Redirecting number information element the presentation indicator shall be set to "presentation restricted". The type of number and numbering plan identification shall be set to "unknown" and the number digits field shall not be included.

If the number is not available due to interworking, the diverted-to network shall include the Redirecting number information element in the SETUP message sent to the diverted-to user. In the Redirecting number information element the presentation indicator shall be set to "number not available due to interworking". The type of number and numbering plan identification shall be set to "unknown".

In all cases the reason for diversion shall be indicated only for the last diversion, i.e.:

- if only one diversion occurred, the diversion reason shall be indicated in the reason for diversion field of the Redirecting number information element;

- if more than one diversion occurred, the diversion reason for the last diversion shall be indicated in the reason for diversion field of the second Redirecting number information element. The reason for diversion field in the first Redirecting number information element shall be set to "unknown".

The reason for diversion shall be:

- "unknown", if the redirecting number information is available but the reason for diversion is not known by the network;

- "call forwarding busy", if the network forwarded a call using the CFB supplementary service;

- "call forwarding no reply", if the network forwarded a call using the CFNR supplementary service;

- "call forwarding unconditional", if the network forwarded a call using the CFU supplementary service; or

- "call deflection", if the network deflected a call using the CD supplementary service.

9.2.5.2 Exceptional procedures

Exceptional procedures at the diverted-to user's interface shall be according to ETS 300 102-1 [11], subclause 5.8.

9.3 Reminder notification to the served user

9.3.1 Normal operation

If the served user has activated a call forwarding supplementary service and an outgoing call is made, the network shall, as a subscription option, include a Notification indicator information element with a notification description value of "diversion activated" in the first call control message for that call sent from the network to the served user, if the following conditions are fulfilled:

- the number given in the Calling party number information element, if provided, is identical to the served user number; and,

- the Bearer capability information element, and the High layer compatibility information element, if provided, indicate the same basic service as call forwarding is activated for.

If the Calling party number information element is not included in the SETUP message, or the number is invalid, the network may use a default number of the access if provided when making the comparison. If the subscription is on a per ISDN number basis and if neither the Calling party number information element is provided nor a default number is available at the network, then no reminder notification can be provided for the access of the served user. If the subscription is for the whole access or if the MSN supplementary service does not apply and if subscribed to the reminder notification, then the reminder notification shall always be provided.

9.3.2 Exceptional procedures

Not applicable.

10 Procedures for interworking with private ISDNs

10.1 Procedures where a call from the public ISDN is diverted within or beyond the private ISDN

10.1.1 Normal operation

Where a call offered by the public network to the private network is diverted within or beyond the private network, the private network shall send a DivertingLegInformation1 invoke component, to the public network in a FACILITY, PROGRESS or ALERTING message using the procedure described in subclause 8.3.1.1 of ETS 300 196-1 [13]. The DivertingLegInformation1 invoke component shall contain:

- the diversionReason parameter indicating the reason for diversion;

- the subscriptionOption parameter indicating the value of the subscription option "calling user is notified of diversion" of the diverting user;

- the divertedToNumber parameter indicating the diverted-to number, if provided.

This information is used by the public network to provide notification to the calling user.

In addition, when the private network has determined whether presentation of the diverted-to number is allowed or not, the private network shall send a DivertingLegInformation3 invoke component in a FACILITY, ALERTING or CONNECT message in order to convey the presentationAllowedIndicator parameter.

If the public network receives a correctly encoded DivertingLegInformation1 invoke component, the public network shall forward the information towards the calling network and not respond to the private network.

If the public network receives a correctly encoded DivertingLegInformation3 invoke component, the public network shall forward the information towards the calling network and not respond to the private network.

10.1.2 Exceptional procedures

If a DivertingLegInformation1 invoke component has been received and if the public network receives a CONNECT message and has not yet received a DivertingLegInformation3 invoke component, then the public network shall assume that presentation of the diverted-to number is not allowed and indicate that presentation is not allowed towards the calling network and continue call establishment.

If the private network receives a reject component, the private network shall accept this information and continue with call establishment.

10.2 Presentation of a diverted call from a public ISDN to the private ISDN

10.2.1 Normal operation

If a diverted call is presented from a public ISDN to the private ISDN, then the SETUP message sent from the public network to the private network shall contain a Facility information element including a DivertingLegInformation2 invoke component using the procedure described in subclause 8.3.1.1 of ETS 300 196-1 [13]. This invoke component shall indicate:

- in the diversionCounter parameter, the number of diversions that the call has experienced so far;

- in the diversionReason parameter, the reason for the last diversion;

- in the divertingNr parameter, the ISDN number of the last diverting user; and

- in the originalCalledNr parameter, the ISDN number of the first diverting user if multiple diversions occurred. This parameter shall not be included if only one diversion occurred.

The divertingNr parameter and originalCalledNr parameter shall be one of the following choices:

- "presentationAllowedNumber", if the presentation is allowed according to the presentation indicator supplied together with the number information; or

- "presentationRestricted", if the presentation is restricted according to the presentation indicator supplied together with the number information; or

- "numberNotAvailableDueToInterworking", if the number is not available due to interworking.

In response to the DivertingLegInformation2 invoke component, and when the private network has determined whether presentation of the diverted-to number is allowed or not, the private network shall include a DivertingLegInformation3 invoke component in the FACILITY, ALERTING or CONNECT message sent to the public network. The presentationAllowedIndicator parameter shall indicate whether or not presentation of the diverted-to user's ISDN number is allowed to the calling user.

If the public network receives a correctly encoded DivertingLegInformation3 invoke component, the public network shall forward the information towards the calling network and not respond to the private network.

10.2.2 Exceptional procedures

If the public network receives a CONNECT message and has not yet received a DivertingLegInformation3 invoke component, the public network shall assume that presentation of the diverted-to number is not allowed and indicate that presentation is not allowed towards the calling network and continue call establishment.

If the private/public network receives a reject component, the private/public network shall accept this information and continue with call establishment.

10.3 Procedures where a call from the private ISDN is diverted within or beyond the public ISDN

The procedures as stated in subclauses 9.2.1, 9.2.2 and 9.2.3 shall apply.

10.4 Presentation of a diverted call from a private ISDN to the public ISDN

10.4.1 Normal operation

If a diverted call is presented from a private ISDN to the public ISDN, then the SETUP message sent from the private network to the public network shall contain a Facility information element including a DivertingLegInformation2 invoke component using the procedure described in subclause 8.3.1.1 of ETS 300 196-1 [13]. This invoke component shall indicate:

- in the diversionCounter parameter, the number of diversions that the call has experienced so far;

- in the diversionReason parameter, the reason for the last diversion;

- in the divertingNr parameter, the ISDN number of the last diverting user; and

- in the originalCalledNr parameter, the ISDN number of the first diverting user if multiple diversions occurred. This parameter shall not be included if only one diversion occurred.

The divertingNr parameter and originalCalledNr parameter shall be one of the following choices:

- "presentationAllowedNumber", when the private network allows to release the diverting number to the diverted-to user;

- "presentationRestricted", when the private network restricts the release the diverting number to the diverted-to user;

  NOTE: The condition "when the private network allows to release the diverting number to the diverted-to user" is controlled by the equivalent within the private ISDN of the subscription option "diverting number is released to diverted-to user" and, in case of the CD supplementary service, by an override provided on a per-call basis.

- "numberNotAvailableDueToInterworking", if the number is not available due to interworking.

In response to the DivertingLegInformation2 invoke component, and when it receives from the diverted-to network the presentation indicator (in accordance with the COLR supplementary service of the diverted-to user), the public network shall include a DivertingLegInformation3 invoke component in the FACILITY, ALERTING or CONNECT message sent to the private network. The presentationAllowedIndicator parameter shall indicate whether or not presentation of the diverted-to user's ISDN number is allowed to the calling user.

If the private network receives a correctly encoded DivertingLegInformation3 invoke component, the private network shall accept the information and not respond to the public network.

10.4.2 Exceptional procedures

If the private network does not receive a DivertingLegInformation3 invoke component, the private network shall assume that presentation of the diverted-to number is not allowed and continue with call establishment.

If the private/public network receives a reject component, the private/public network shall accept this information and continue with call establishment.

10.5 Procedures where a call from the public ISDN is diverted within or beyond the private ISDN and partial rerouteing takes place in the public ISDN

10.5.1 Normal operation

If a SETUP message is sent from a public network to a private network, and a subsequent partial rerouteing request can be allowed for that call, then the public network shall:

- store any information that is not included in the SETUP message but which is available to the network at that time, (e.g. a restricted calling party subaddress);

- store any information that is guaranteed by the public network for regulatory purposes and which is available to the network at that time, (i.e. calling party number, original called number).

The public network shall retain this information until a CONNECT message, or a clearing message is received for this call reference.

To request diversion by partial rerouteing, for a call presented from the public network to the private network, the private network shall send a CallRerouteing invoke component to the public network in a FACILITY message using the procedure described in subclause 8.3.1 of ETS 300 196-1 [13]. The private network shall send the Facility information element in a FACILITY message to the public network while in the Call Received call state (U7), in the Incoming Call Proceeding call state (U9) or in the Overlap Receiving call state (U25).

The CallRerouteing invoke component shall contain:

a) in the rerouteingReason parameter, the call rerouteing reason. If multiple diversions have occurred, the rerouteingReason parameter shall contain the reason of the last diversion;

b) in the calledAddress parameter, the diverted-to address;

c) in the rerouteingCounter parameter, the number of diversions which shall be the sum of the number of diversions indicated in the SETUP message, if any, and the number of diversions recognized by the private network;

d) in the q931InfoElement parameter, the Bearer capability information element with contents compatible with the SETUP message that established the call reference;

e) in the q931InfoElement parameter, Low layer compatibility and High layer compatibility information elements, if available and with contents compatible with the SETUP message that established the call reference;

f) in the q931InfoElement parameter, the User-user information element for the implicit service 1 request of the user-to-user signalling supplementary service, if available and with contents compatible with the SETUP message that established the call reference. For the explicit request of the user-to-user signalling supplementary service, see ETS 300 195-1 [12];

g) in the lastRerouteingNr parameter, the last forwarding number.

The lastRerouteingNr shall be one of the following choices:

1) "presentationAllowedNumber", when the private network allows to release the diverting number to the diverted-to user in which case the following information is included:

- unknownPartyNumber parameter, if the numbering plan is unknown and where the last rerouteing number information is included within this parameter; or

- publicPartyNumber parameter, if the numbering plan is according to the ISDN numbering plan (CCITT Recommendation E.164), indicating in the publicTypeOfNumber parameter either "internationalNumber", "nationalNumber", or as a network provider option the value "unknown". The publicNumberDigits parameter shall contain the last rerouteing number information.

2) "presentationRestricted", when the private network does not allow to release the diverting number to the diverted-to user; or

3) "numberNotAvailableDueToInterworking", if the number is not available due to interworking; or

4) "presentationRestrictedNumber", when the private network does not allow to release the diverting number to the diverted-to user, in which case the following information is included:

- unknownPartyNumber parameter, if the numbering plan is unknown and where the last rerouteing number information is included within this parameter; or,

- publicPartyNumber parameter, if the numbering plan is according to the ISDN numbering plan (CCITT Recommendation E.164 [1]), indicating in the publicTypeOfNumber parameter either "internationalNumber", "nationalNumber", or as a network provider option the value "unknown". The publicNumberDigits parameter shall contain the last rerouteing number information.

NOTE 1: The condition "when the private network allows to release the diverting number to the diverted-to user" is controlled by the equivalent within the private ISDN of the subscription option "diverting number is released to the diverted-to user" and in the case of the CD supplementary service, by an override provided on a per-call basis.

h) in the callingPartySubaddress parameter, the calling party subaddress, if available, and with contents compatible with the SETUP message that established the call reference.

NOTE 2: "If available" in the above text means "if the information was actually received from the public network", signifying that it has not been removed by a DSS1 protocol procedure within the private network and that the provision is not precluded by an option of the supplementary service in the private network.

NOTE 3: "Compatible" in the above text means that the contents are identical, unless a DSS1 protocol procedure has occurred that alters this information, e.g. fallback within either the bearer capability or high layer compatibility selection.

In addition, the CallRerouteing invoke component may contain in the subscriptionOption parameter, the value of subscription option "calling user is notified of diversion". If this parameter is not included the network shall assume "noNotification".

The public network shall act immediately on the call rerouteing invocation request and shall perform call rerouteing towards the indicated address.

The public network shall use the information received in the CallRerouteing invoke component, and the information stored in the network in order to generate the forwarding call.

Depending on a network provider option, two cases exist:

- the public network shall retain the call to the private network until the diverted-to user is alerting or has answered (i.e. alerting has not been indicated). The network shall inform the served user that call rerouteing is being invoked by sending a FACILITY message containing a Facility information element with the CallRerouteing return result component and shall continue to offer the call to the served user. When an alerting or answer indication has been received from the diverted-to network, the public network shall clear the call towards the private network by sending a DISCONNECT message with the Cause information element indicating cause #31 "normal, unspecified".

  NOTE 4: The rerouteing network will send the notification information to the calling network when it receives an alerting indication from the forwarded-to network.

- the public network shall clear the call towards the private network on acceptance of the call rerouteing request by sending a DISCONNECT message containing a Facility information element with a CallRerouteing return result component and with the Cause information element indicating cause #31 "normal, unspecified".

  NOTE 5: The rerouteing network will send the notification information to the calling network when the forwarding operation to the forwarded-to network is invoked.

10.5.2 Exceptional procedures

If the public network cannot accept the call rerouteing invocation request from the private network, it shall send a Facility information element, with a CallRerouteing return error component in the FACILITY message and release the invoke identifier. The error value indicated in the CallRerouteing return error component shall be one of the following:

- "notSubscribed", if (for a given ISDN number or for the whole access) the requested call forwarding supplementary service has not been subscribed to for the indicated basic service;

- "notAvailable", if the requested call forwarding supplementary service is not available for the indicated basic service;

- "supplementaryServiceInteractionNotAllowed", if the provision of the call forwarding supplementary service activation is precluded by a procedure within clause 5 of ETS 300 195-1 [12];

- "resourceUnavailable", if the resources required to perform adequately the requested call forwarding supplementary service are not available;

- "InvalidDivertedToNr", if the indicated forwarded-to number cannot be accepted;

- "SpecialServiceNr", if the indicated forwarded-to number identifies a special service number (e.g. police, emergency, operator) and forwarding is prohibited to this special service number;

- "DiversionToServedUserNr", if the indicated forwarded-to number is identical to the ISDN number identifying the served user;

- "NumberOfDiversionsExceeded", if the limit on the number of diversions has already been reached.

Subsequent procedures for the public and private network are according to normal call handling procedures as described in clause 5 of ETS 300 102-1 [11].

The private network, on receiving a reject component, shall take no action, and remain in the same state as before the CallRerouteing invoke component was sent.

If the public network receives a reject component from the private network, it shall take no protocol action.

If the network provider option "served user call retention on invocation of diversion" is "retain call until alerting begins at the diverted-to user" and if the call to the diverted-to user fails (e.g. due to NDUB), no specific protocol action shall be taken towards the private network. Normal call clearing procedures towards the diverted-to user shall continue.

10.6 Procedures where a call from the public ISDN to the private ISDN is diverted by the public ISDN

These procedures are applied where the private network wishes to divert all incoming calls, or all incoming calls for a specific basic service, for that private network to an alternative destination.

For activation, deactivation and interrogation of the call forwarding supplementary services at the T reference point, the procedures of subclause 9.1 shall apply except that the activation and deactivation shall only be applicable for the whole private network. All activation and deactivation requests not containing the indication "for all numbers" shall be rejected by sending an appropriate return error component to the private ISDN as specified in subclause 10.2.2.2 of ETS 300 196-1 [13].

For invocation and operation of the call forwarding supplementary services at the T reference point, the procedures of subclause 9.2.4 shall apply except that, if the forwarding user has subscribed to the direct dialling in supplementary service the diverting network shall include the Called party number information element containing the called user's number in the FACILITY message. In the Called party number information element the type of number shall be set to "international", "national", "subscriber" or "unknown", and the numbering plan identification shall be set to "ISDN numbering plan (CCITT Recommendation E.164)" or "unknown". The called party number information shall be indicated in the number digits field.

11 Interactions with other networks

If a call that has been diverted encounters interworking, an indication of interworking shall be sent to the calling user. The notification of interworking shall be returned as defined in clause 5 of ETS 300 102-1 [11].

NOTE 1: In the case of the CFNR supplementary service, the calling user may receive an indication of interworking after alerting has begun.

If a call has been forwarded using the CFNR 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 user, the network shall clear the call to the served user by sending a DISCONNECT message with cause #16: "normal clearing" (location set to "public network serving the local user").

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

12 Interaction with other supplementary services

The interaction of the diversion supplementary services with other supplementary services shall be as specified in ETS 300 195-1 [12].

13 Parameter values (timers)

The following timer has been identified in the procedures text:

Network timer T-CFNR: this timer shall be started when the first ALERTING message is received from the served user. 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 network provider option.

The following values of timers shall be used by this application when using the procedures of subclause 10.2 of ETS 300 196-1 [13].

T-ACTIVATE: The duration of the timer shall be 4 seconds.

T-DEACTIVATE: The duration of the timer shall be 4 seconds.

T-INTERROGATE: The duration of the timer shall be 4 seconds.

14 Dynamic description (SDL diagrams)

The following SDL diagrams show the stage 2 and stage 3 interactions, and the resulting protocol message exchange.

SDL input and output symbols with direction entering and leaving to the left indicate a stage 2 interaction.

NOTE 1: Corresponding interactions are found in ETS 300 203, ETS 300 204, ETS 300 205 and ETS 300 206, respectively, for the stage 2 of the CFU, CFB, CFNR and CD supplementary services.

NOTE 2: Reminder notification to the served user is not shown in the SDL diagrams.

NOTE 3: Reject components are not shown in the SDL diagrams.

SDL input and output symbols with direction entering and leaving to the right indicate a protocol message exchange.

The SDL diagrams are specified according to CCITT Recommendation Z.100 [9].

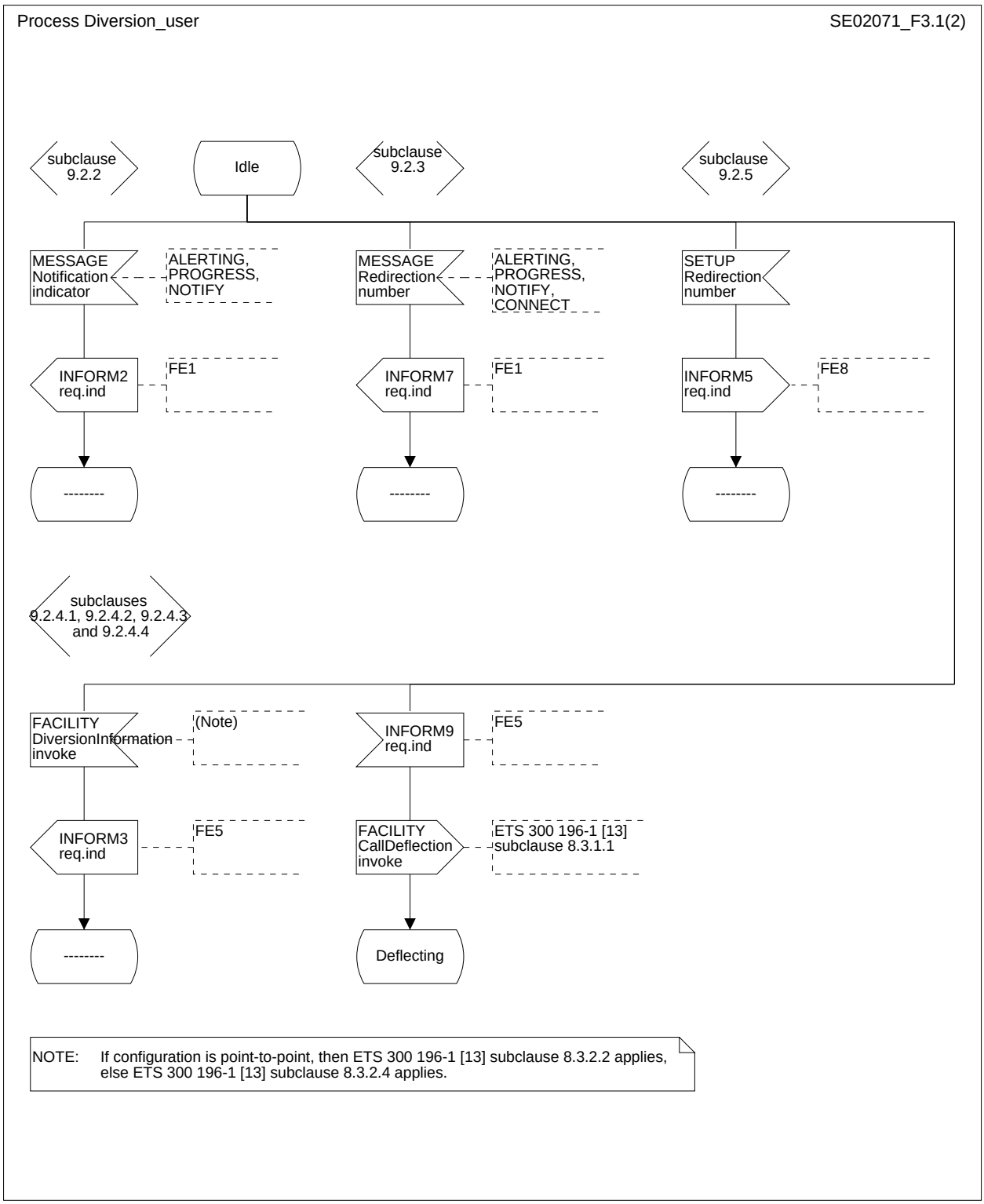

Figure 3 (sheet 1 of 2): User at the coincident S and T reference point

Process Diversion_user SE02071_F3.2(2)

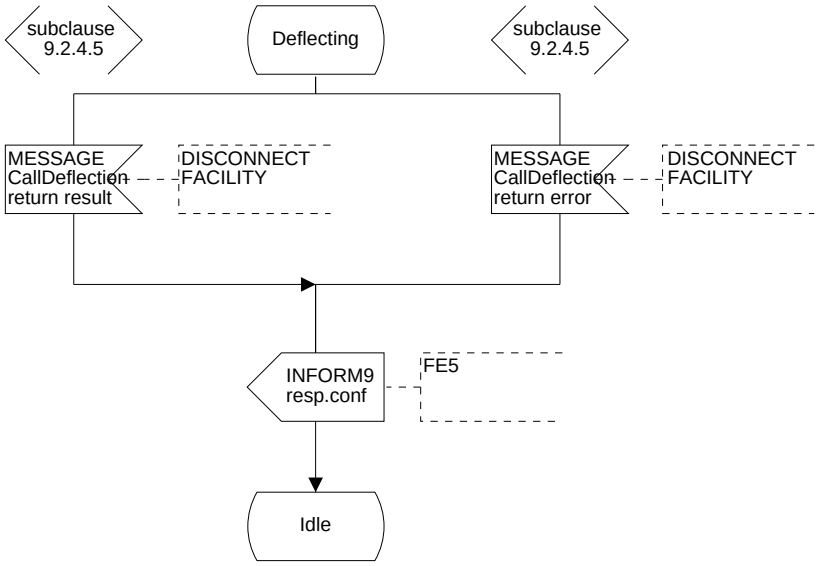

Figure 3 (sheet 2 of 2): User at the coincident S and T reference point

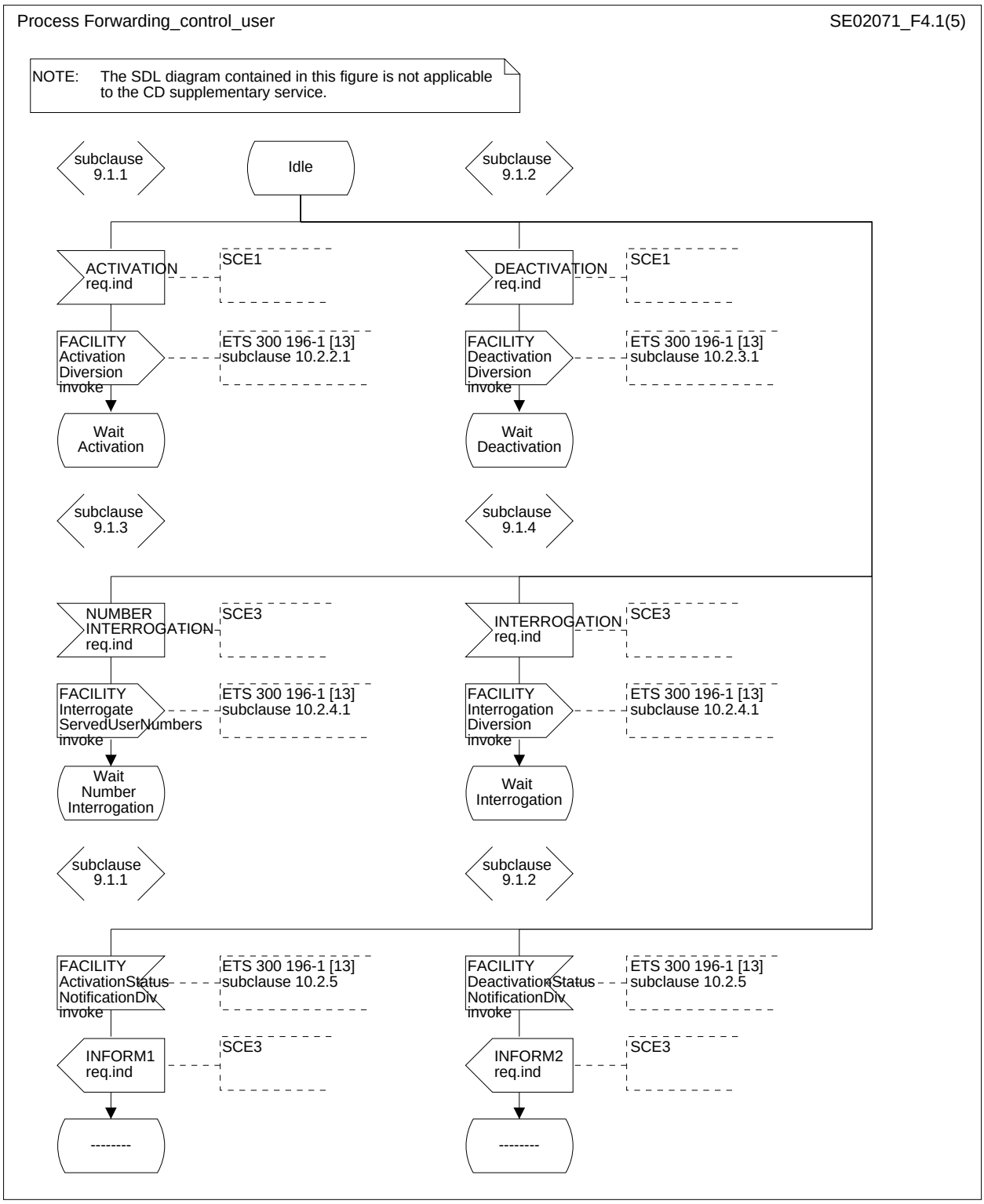

Figure 4 (sheet 1 of 5): User at the coincident S and T reference point

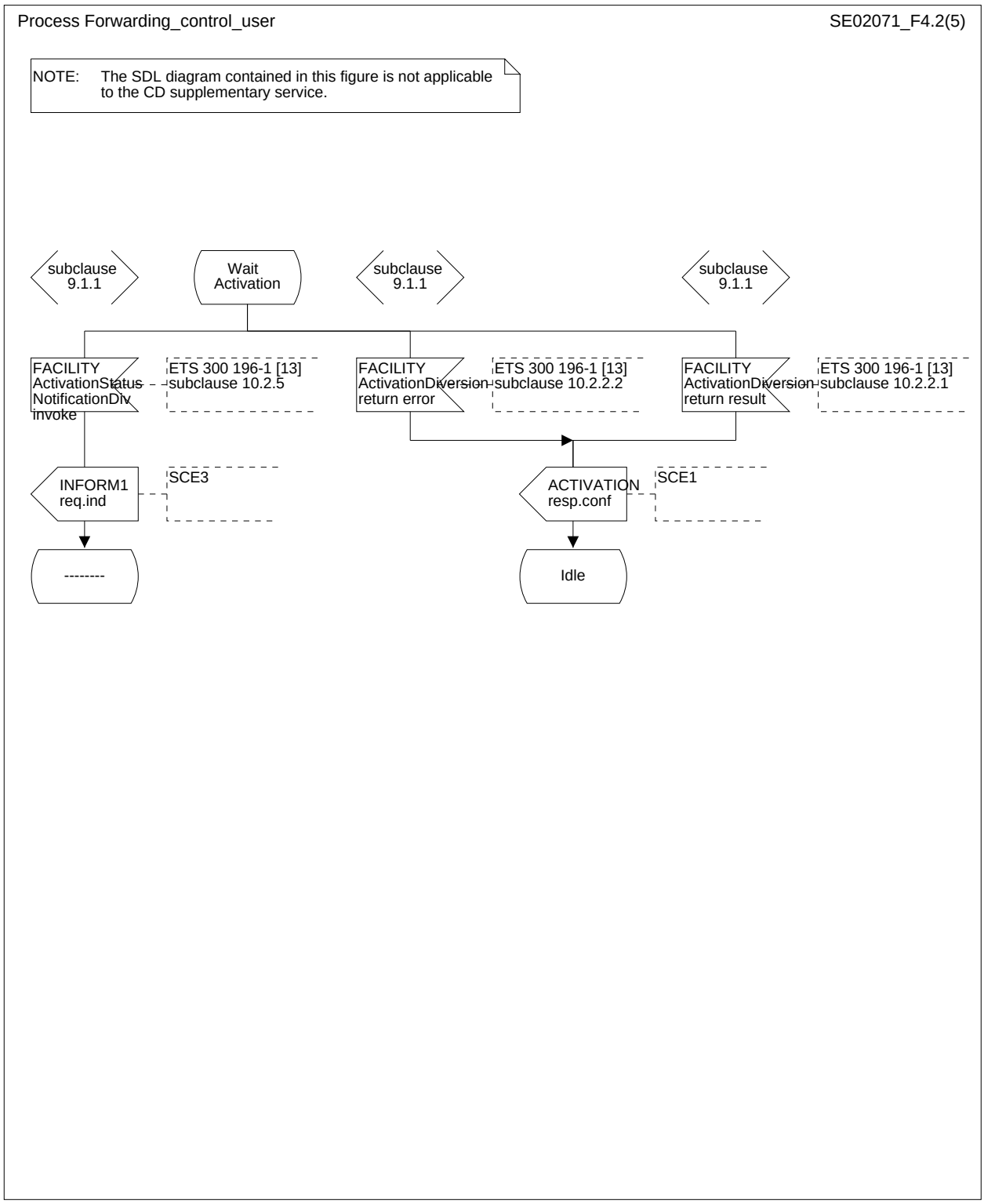

Figure 4 (sheet 2 of 5): User at the coincident S and T reference point

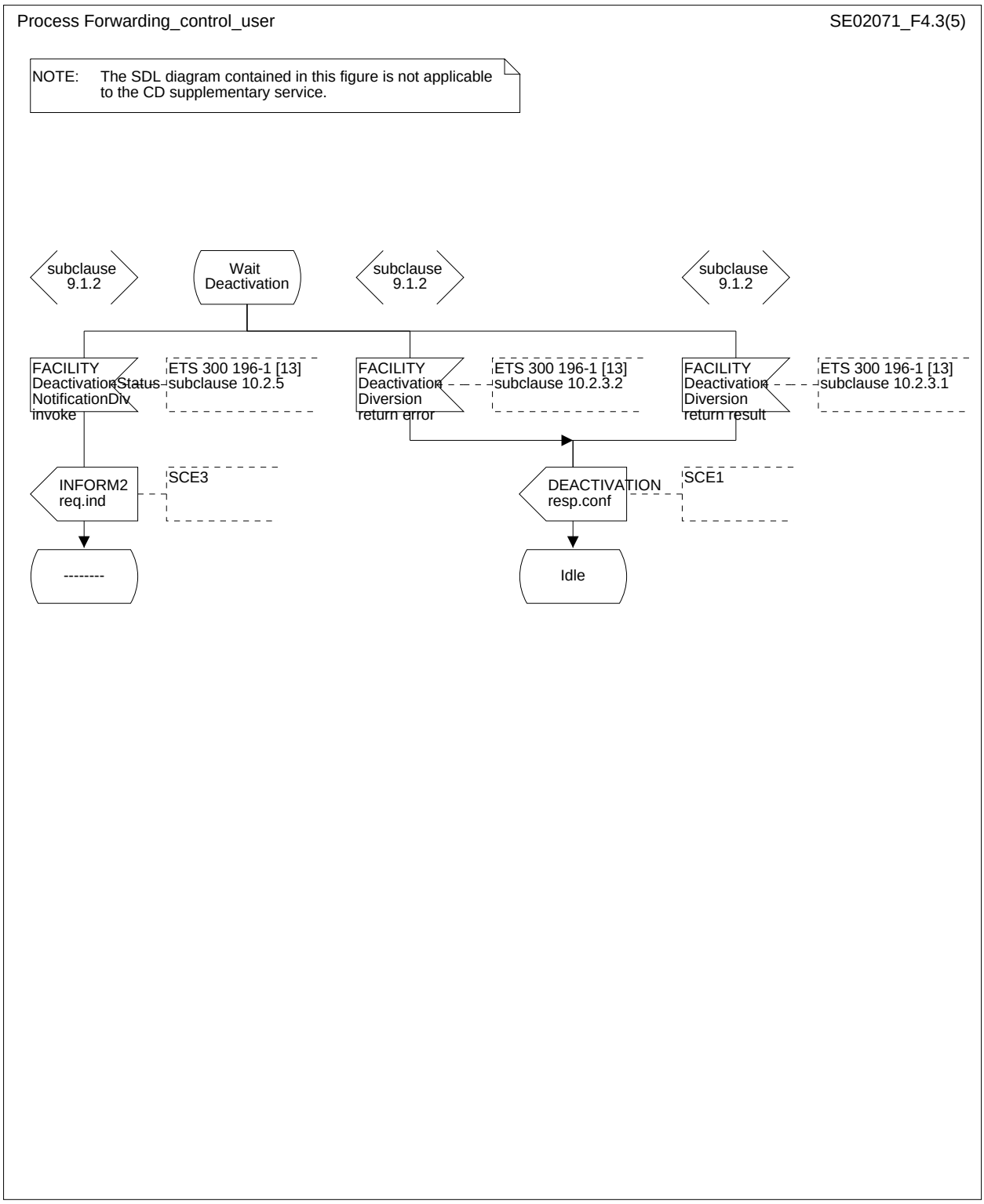

Figure 4 (sheet 3 of 5): User at the coincident S and T reference point

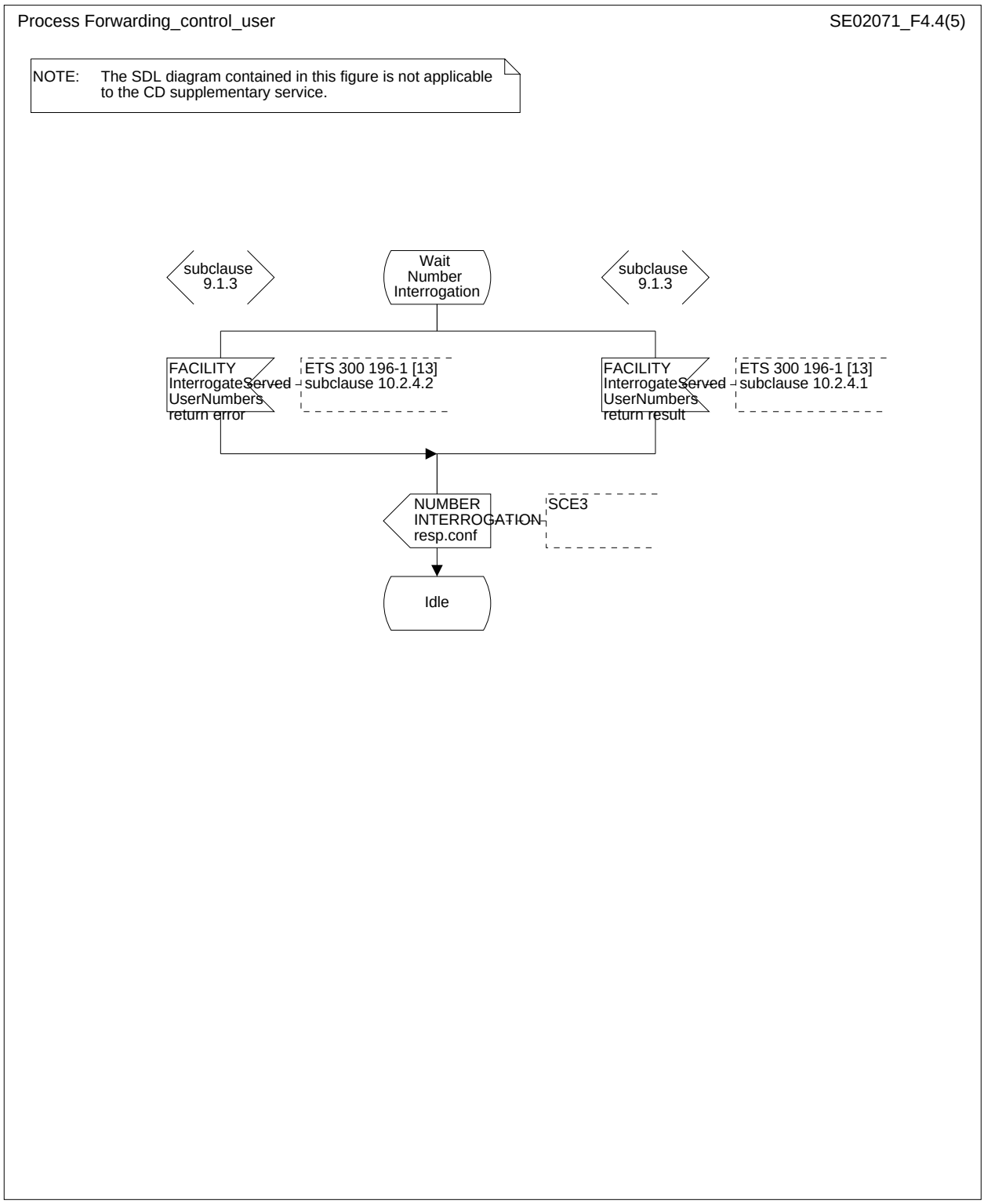

Figure 4 (sheet 4 of 5): User at the coincident S and T reference point

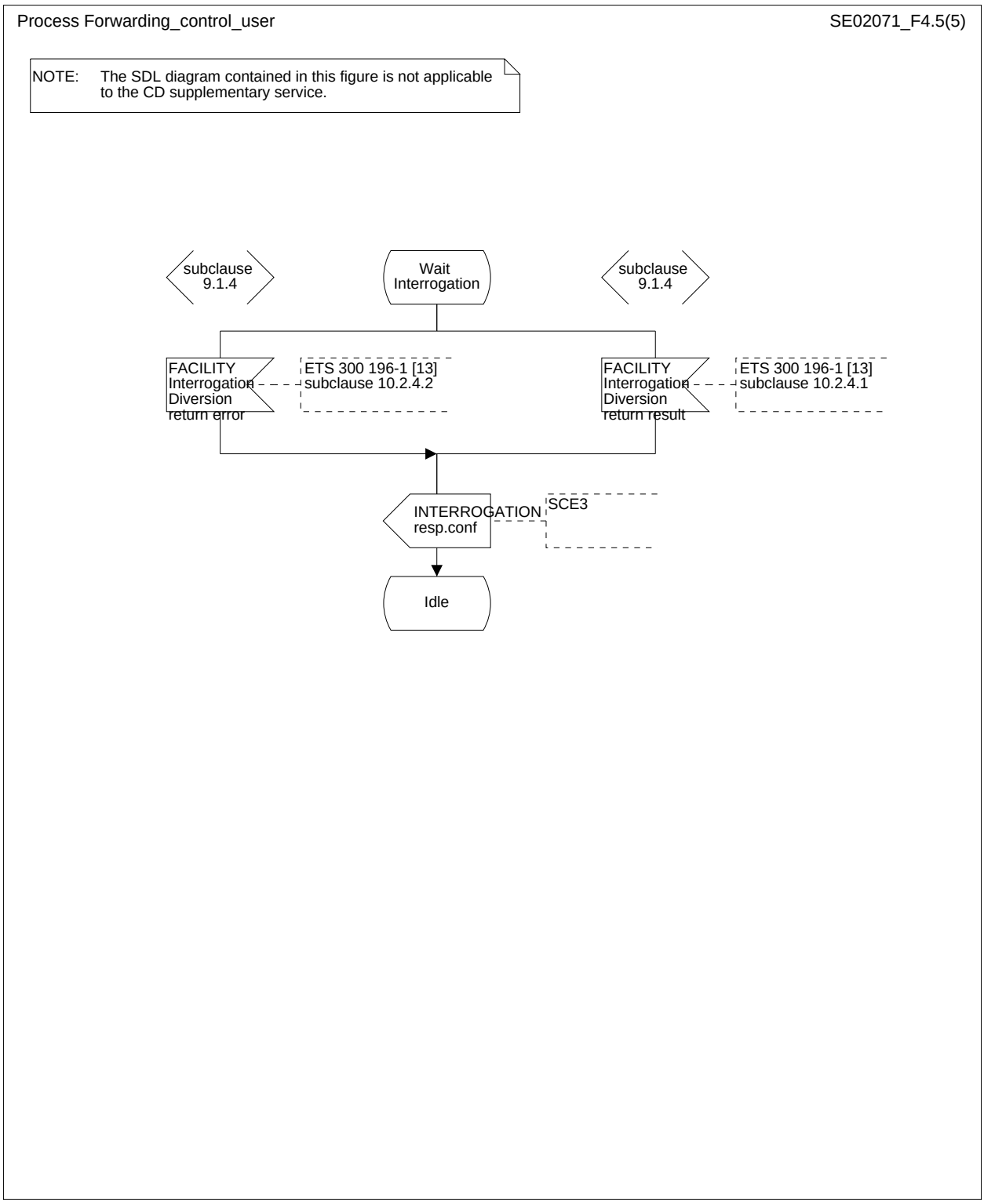

Figure 4 (sheet 5 of 5): User at the coincident S and T reference point

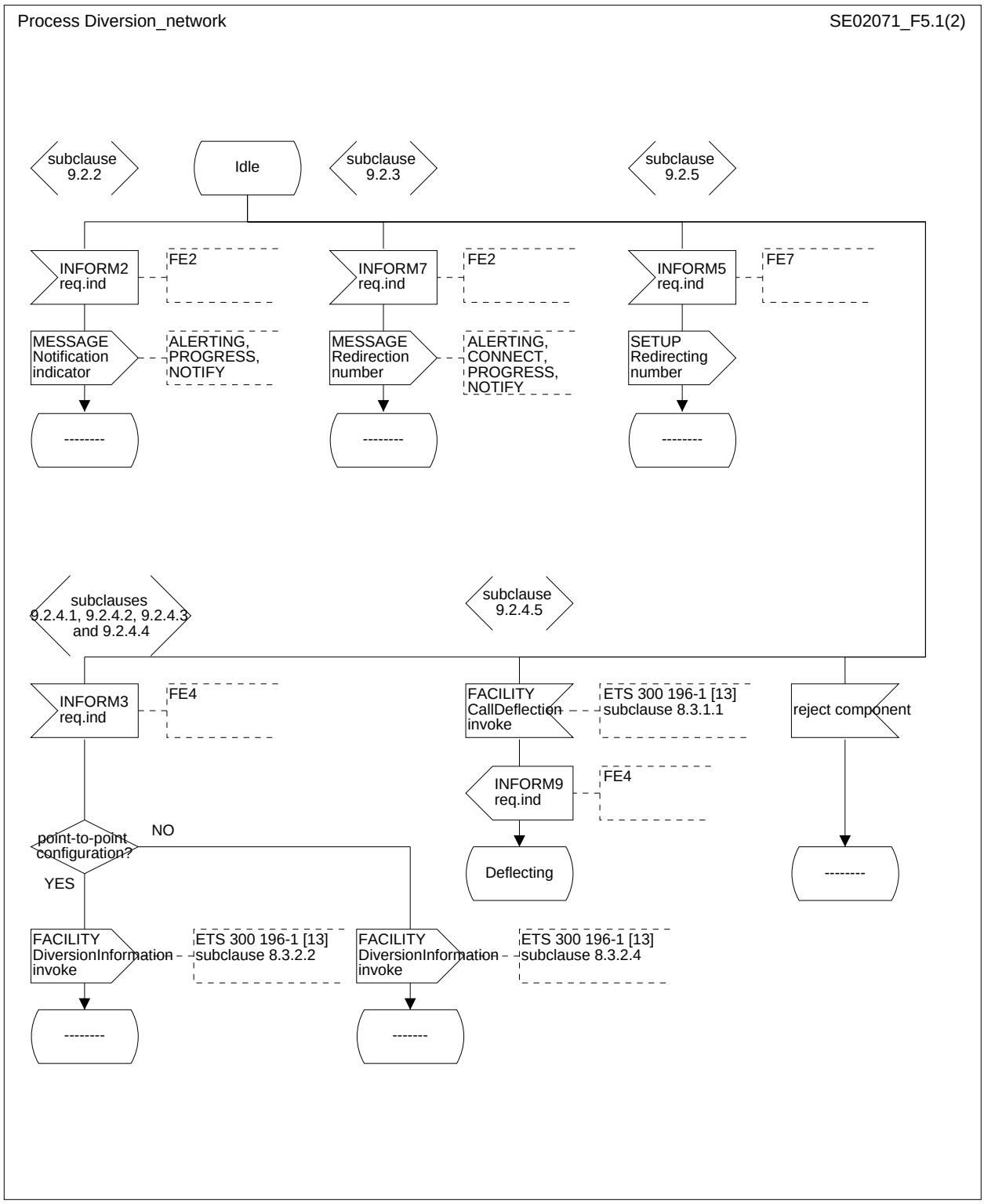

Figure 5 (sheet 1 of 2): Network at the coincident S and T reference point

Process Diversion_network SE02071_F5.2(2)

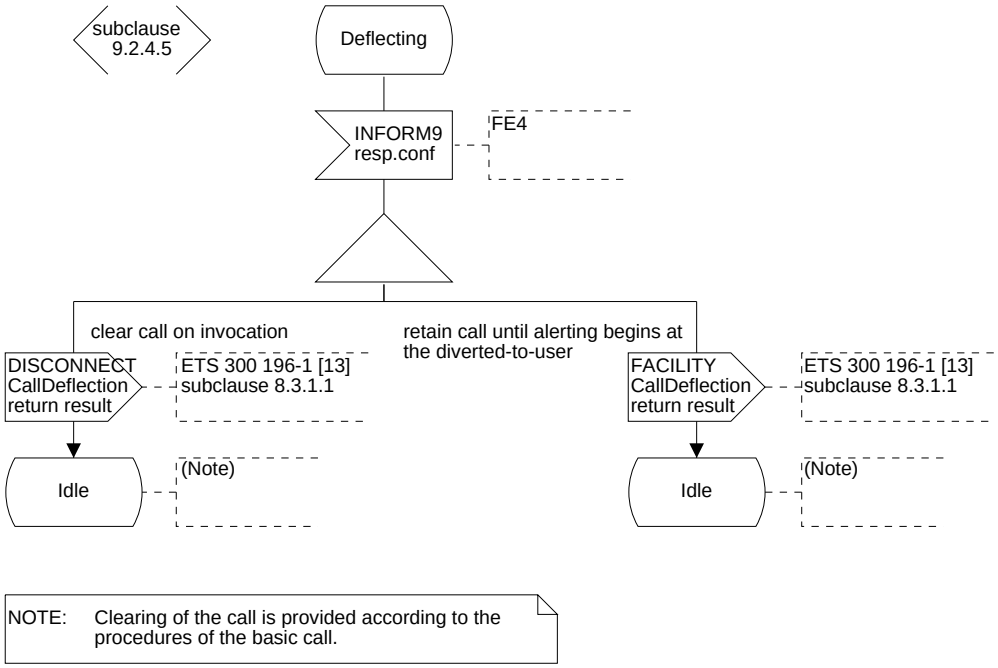

Figure 5 (sheet 2 of 2): Network at the coincident S and T reference point

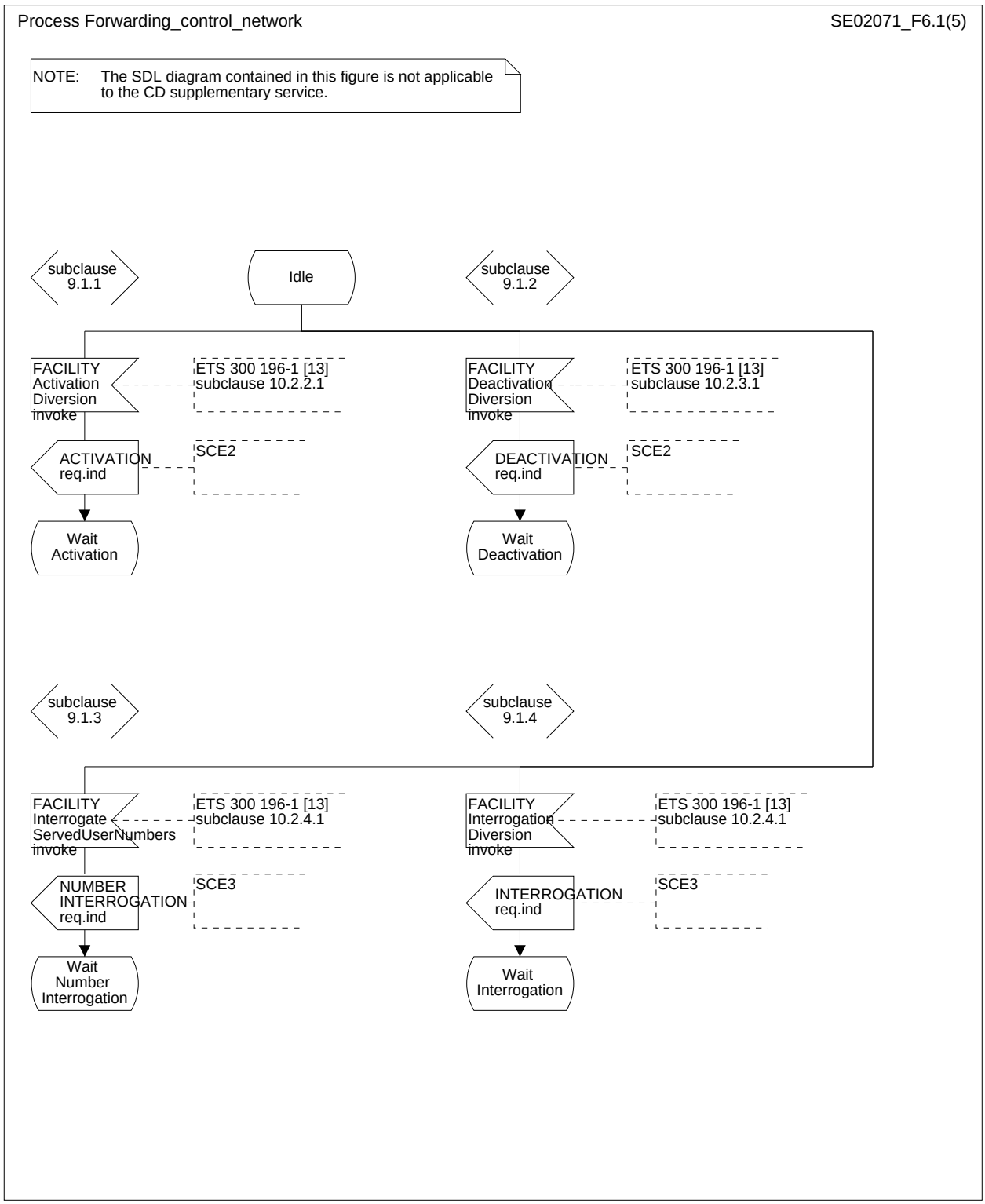

Figure 6 (sheet 1 of 5): Network at the coincident S and T reference point

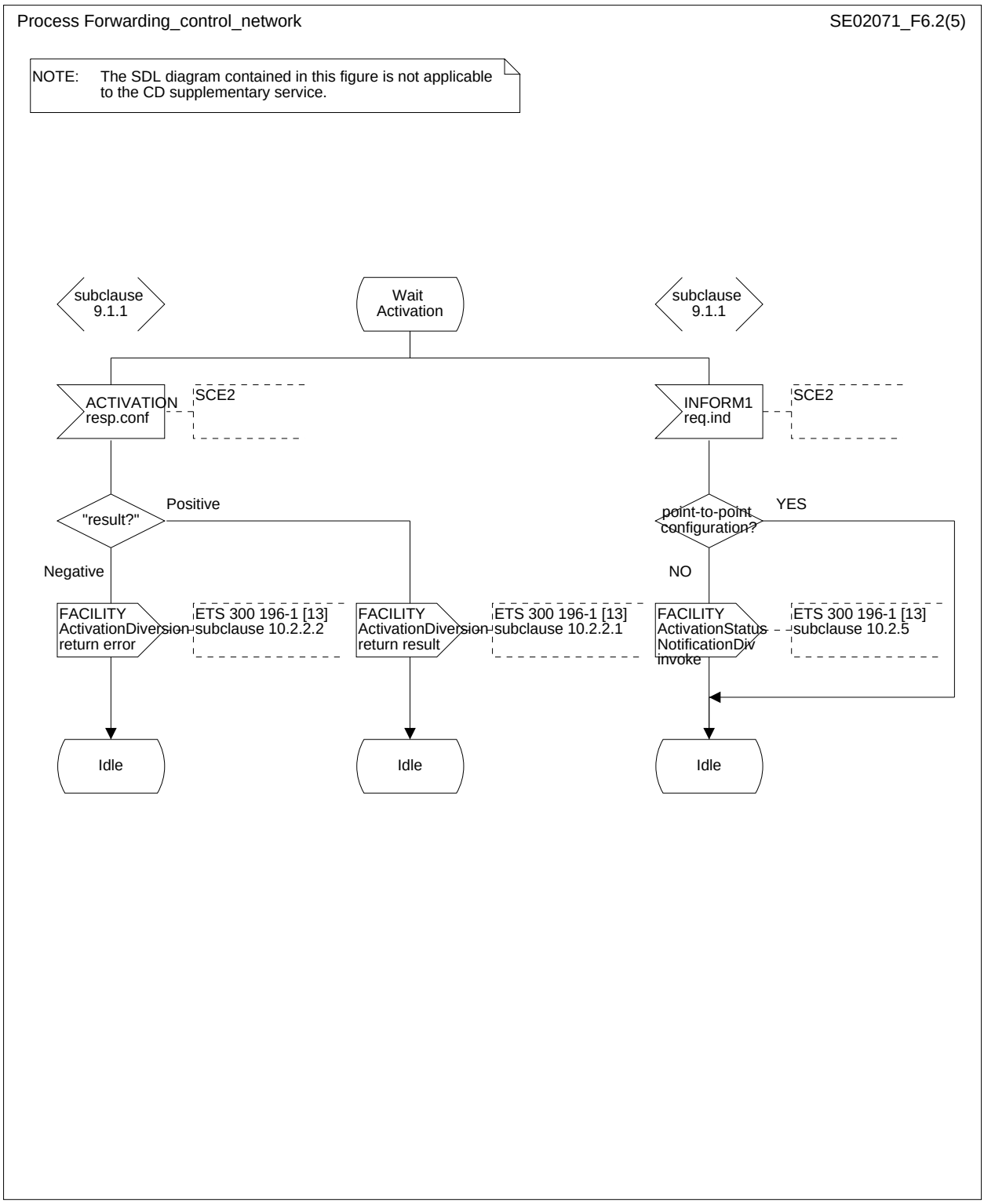

Figure 6 (sheet 2 of 5): Network at the coincident S and T reference point

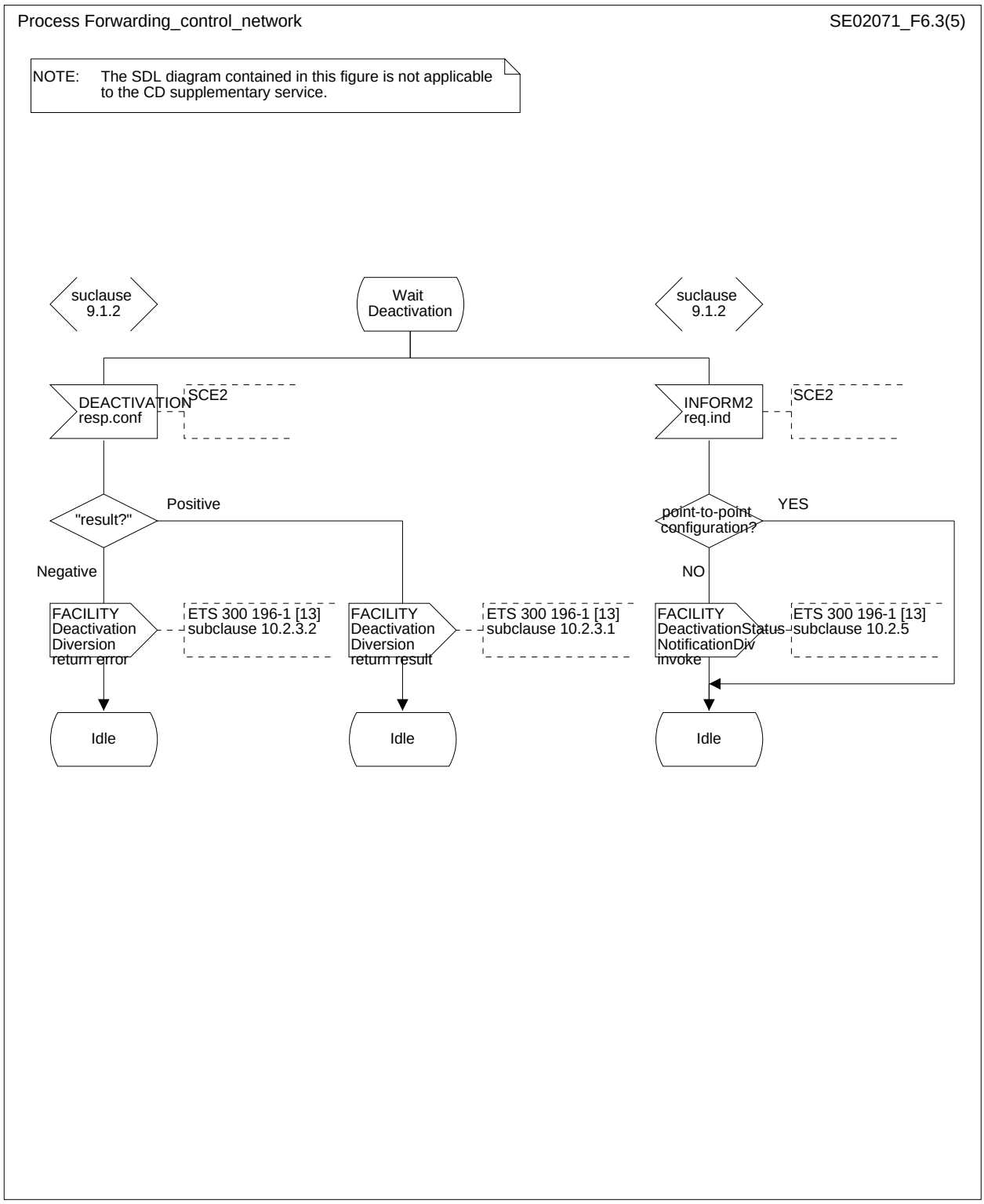

Figure 6 (sheet 3 of 5): Network at the coincident S and T reference point

Process Forwarding_control_network SE02071_F6.4(5)

NOTE: The SDL diagram contained in this figure is not applicable to the CD supplementary service.

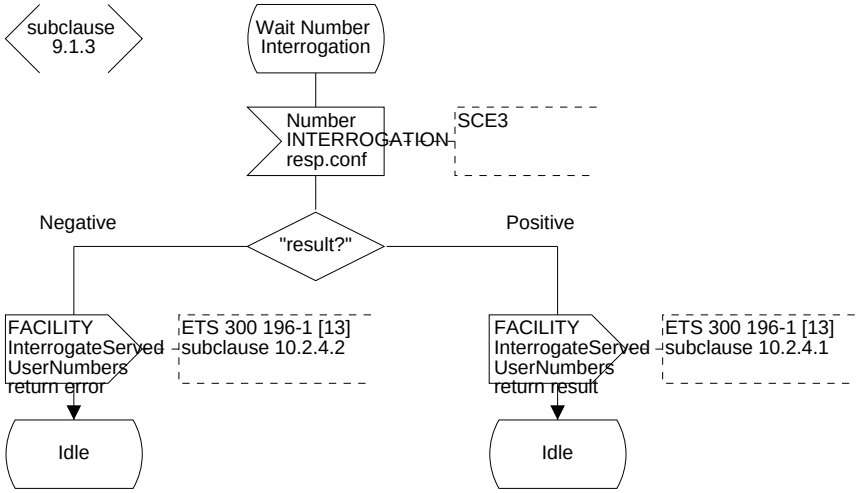

Figure 6 (sheet 4 of 5): Network at the coincident S and T reference point

Process Forwarding_control_network SE02071_F6.5(5)

NOTE: The SDL diagram contained in this figure is not applicable to the CD supplementary service.

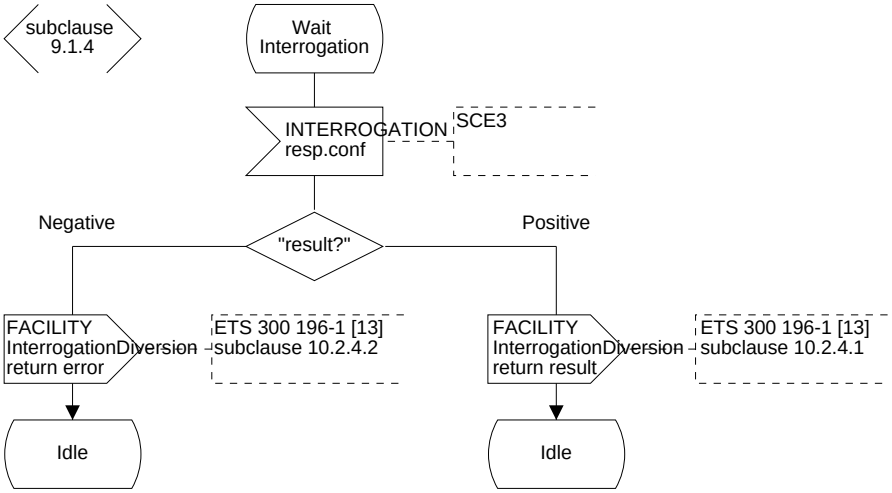

Figure 6 (sheet 5 of 5): Network at the coincident S and T reference point

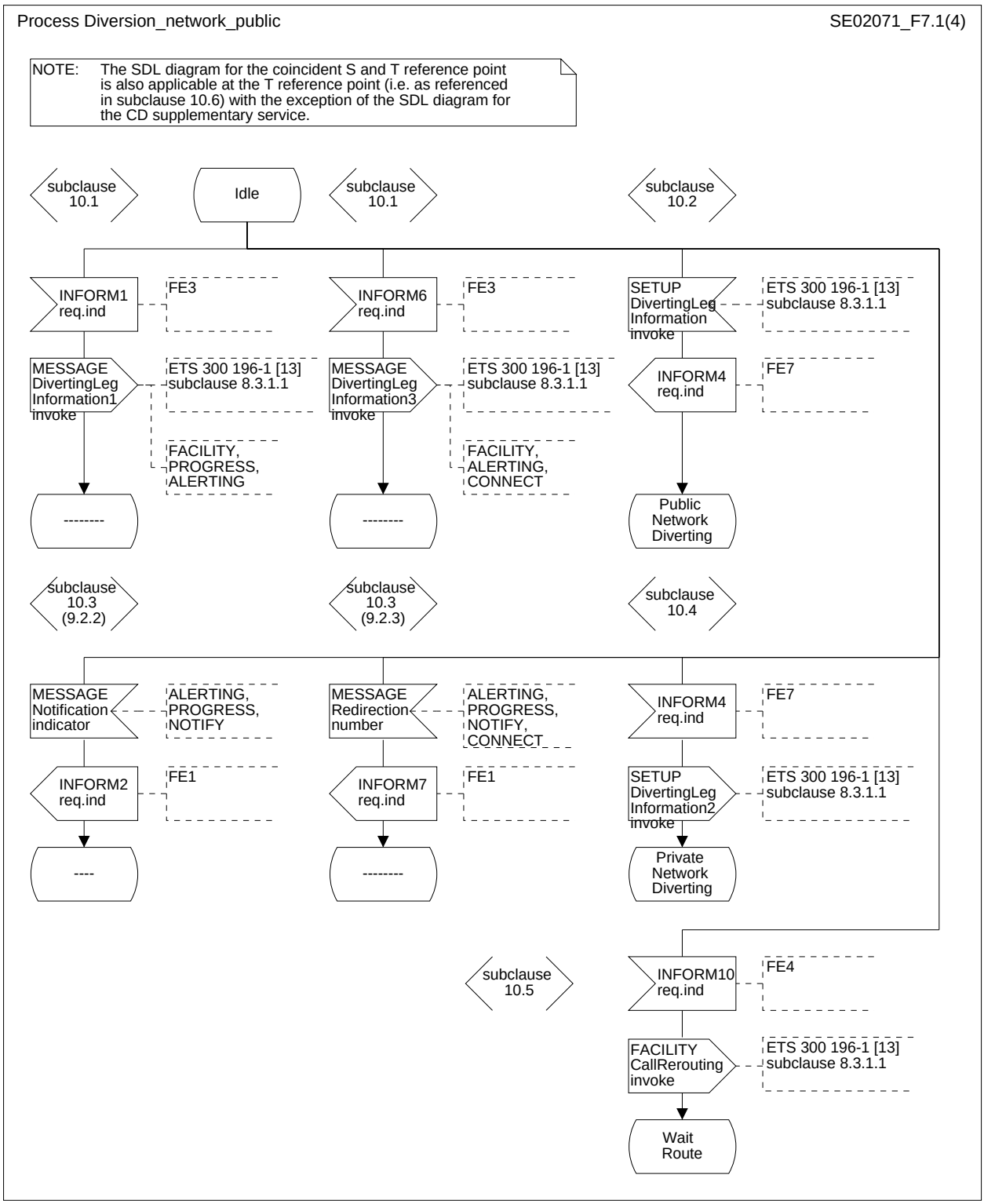

Figure 7 (sheet 1 of 4): User at the T reference point

Process Diversion_network_public SE02071_F7.2(4)

NOTE: The SDL diagram for the coincident S and T reference point is also applicable at the T reference point (i.e. as referenced in subclause 10.6) with the exception of the SDL diagram for the CD supplementary service.

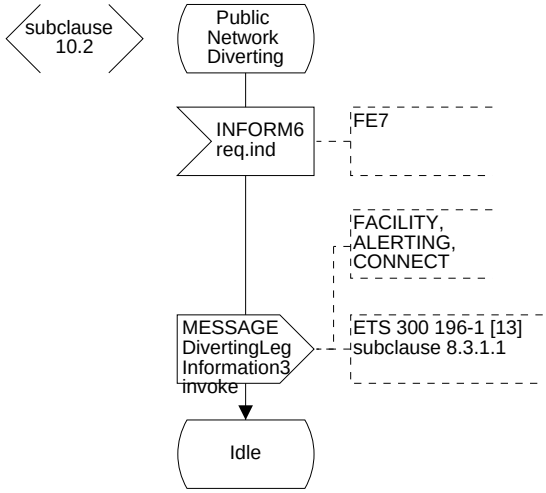

Figure 7 (sheet 2 of 4): User at the T reference point

Process Diversion_network_public SE02071_F7.3(4)

NOTE: The SDL diagram for the coincident S and T reference point is also applicable at the T reference point (i.e. as referenced in subclause 10.6) with the exception of the SDL diagram for the CD supplementary service.

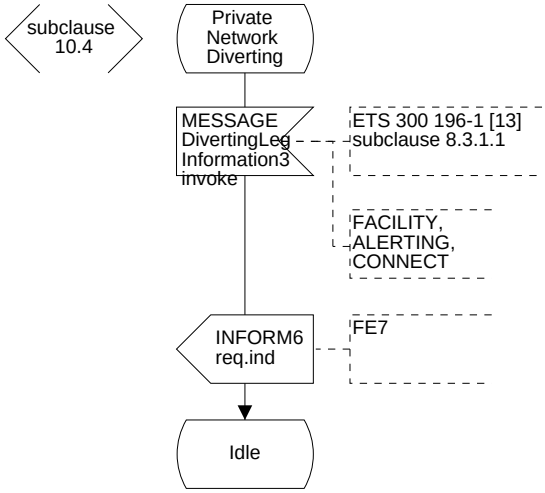

Figure 7 (sheet 3 of 4): User at the T reference point

Process Diversion_network_public SE02071_F7.4(4)

NOTE: The SDL diagram for the coincident S and T reference point is also applicable at the T reference point (i.e. as referenced in subclause 10.6) with the exception of the SDL diagram for the CD supplementary service.

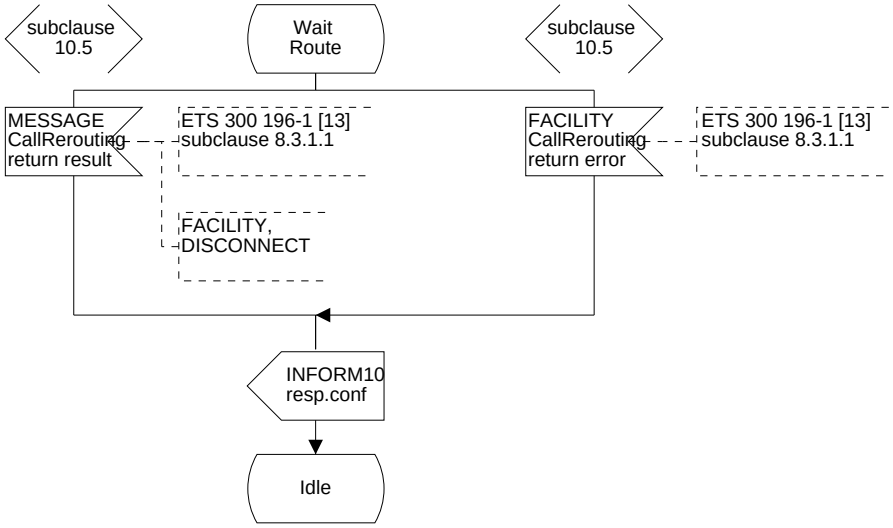

Figure 7 (sheet 4 of 4): User at the T reference point

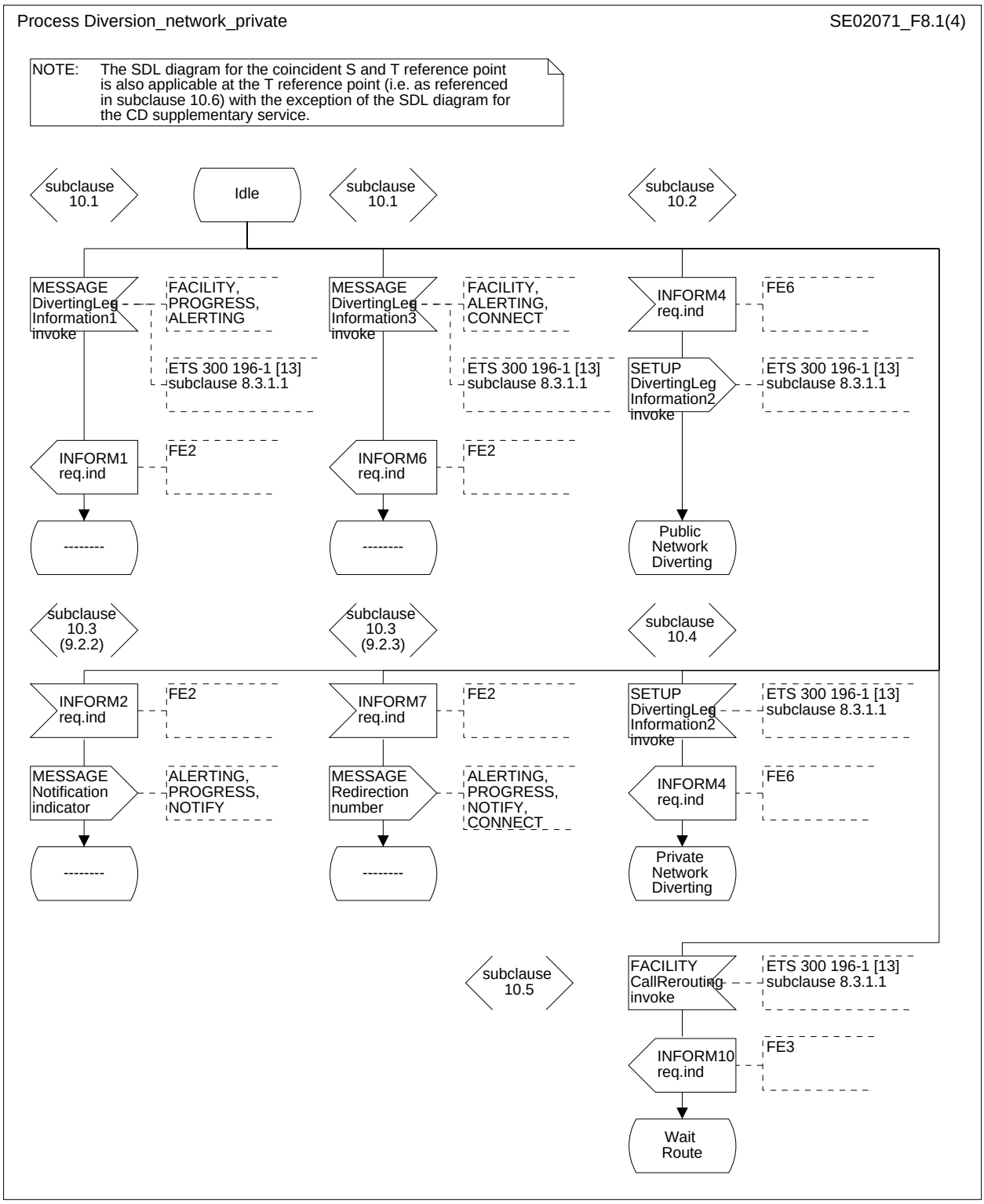

Figure 8 (sheet 1 of 4): Network at the T reference point

Process Diversion_network_private SE02071_F8.2(4)

NOTE: The SDL diagram for the coincident S and T reference point is also applicable at the T reference point (i.e. as referenced in subclause 10.6) with the exception of the SDL diagram for the CD supplementary service.

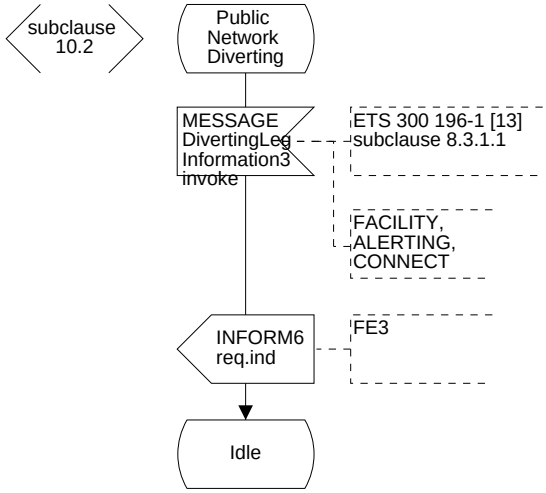

Figure 8 (sheet 2 of 4): Network at the T reference point

Process Diversion_network_private SE02071_F8.3(4)

NOTE: The SDL diagram for the coincident S and T reference point is also applicable at the T reference point (i.e. as referenced in subclause 10.6) with the exception of the SDL diagram for the CD supplementary service.

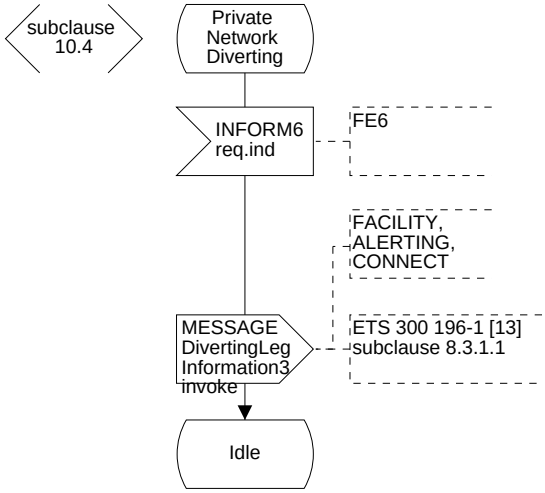

Figure 8 (sheet 3 of 4): Network at the T reference point

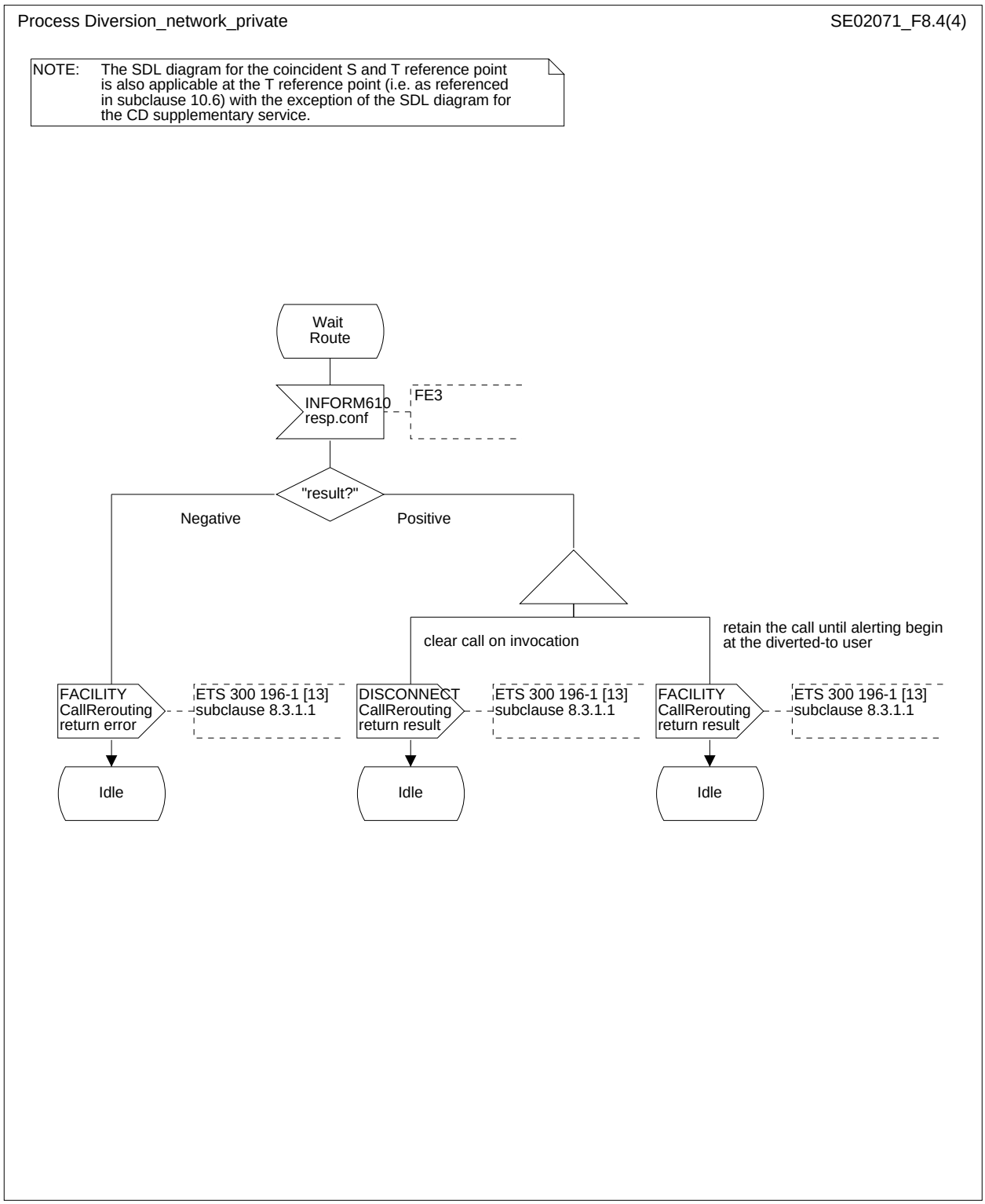

Figure 8 (sheet 4 of 4): Network at the T reference point

Annex A (informative) : Signalling flows

The signalling flows concentrate on partial rerouteing rather than the call forwarding supplementary service.

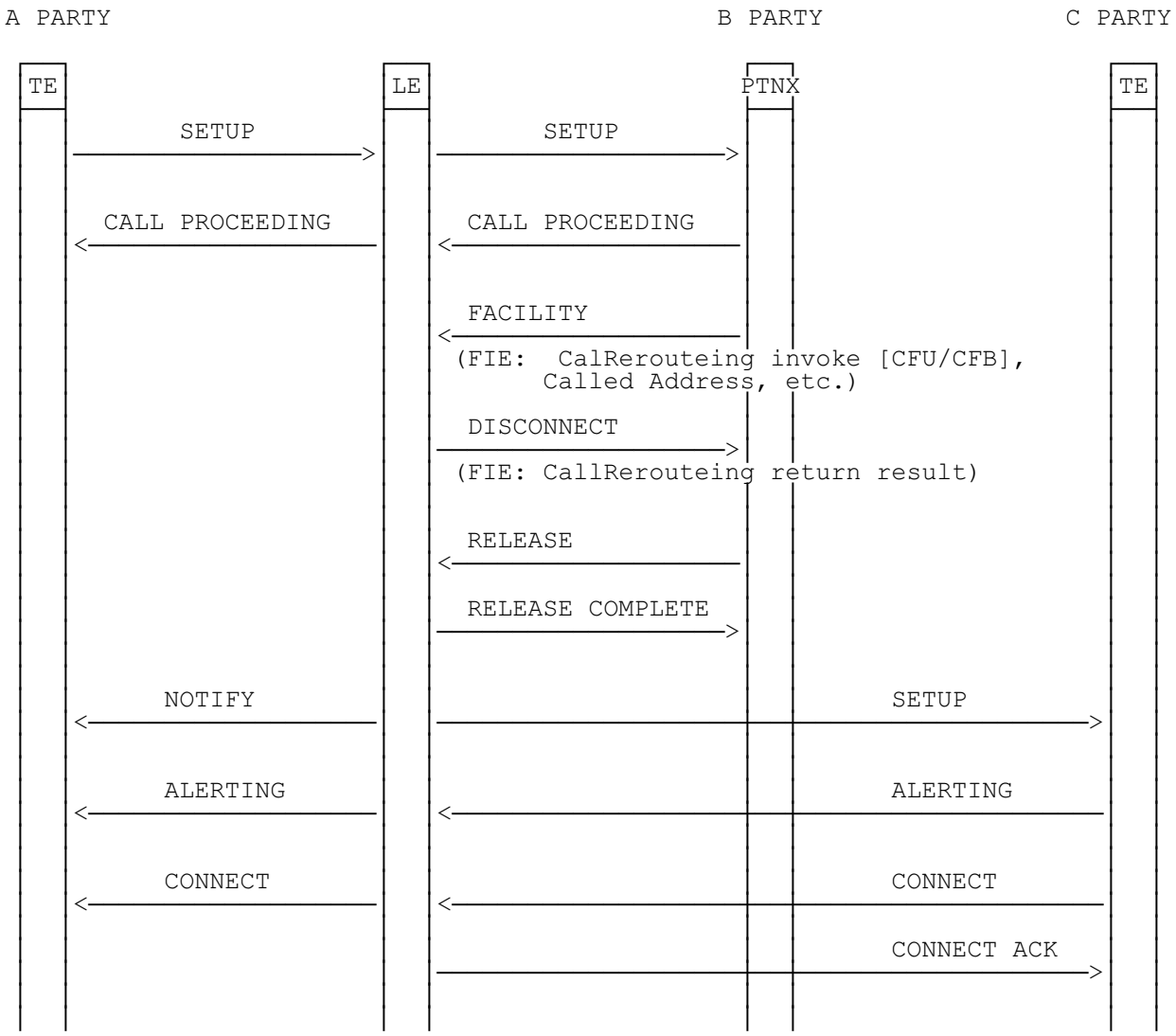

Figure A.1: Partial rerouteing requested by the PTNX triggered in case of CFU, CFB and CD immediate in the PTNX

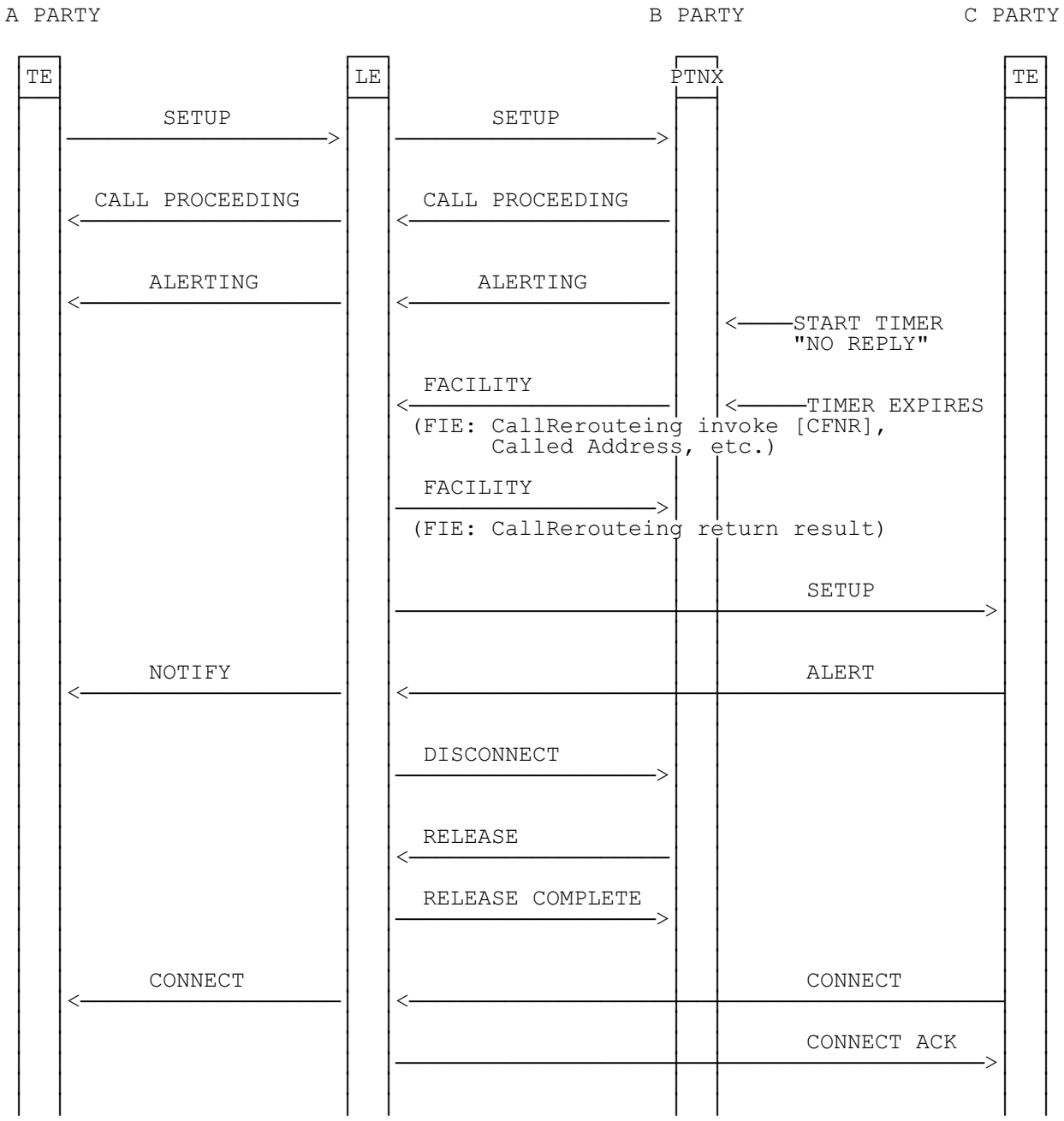

Figure A.2: Partial rerouteing requested by the PTNX triggered by CFNR, late release, in the PTNX

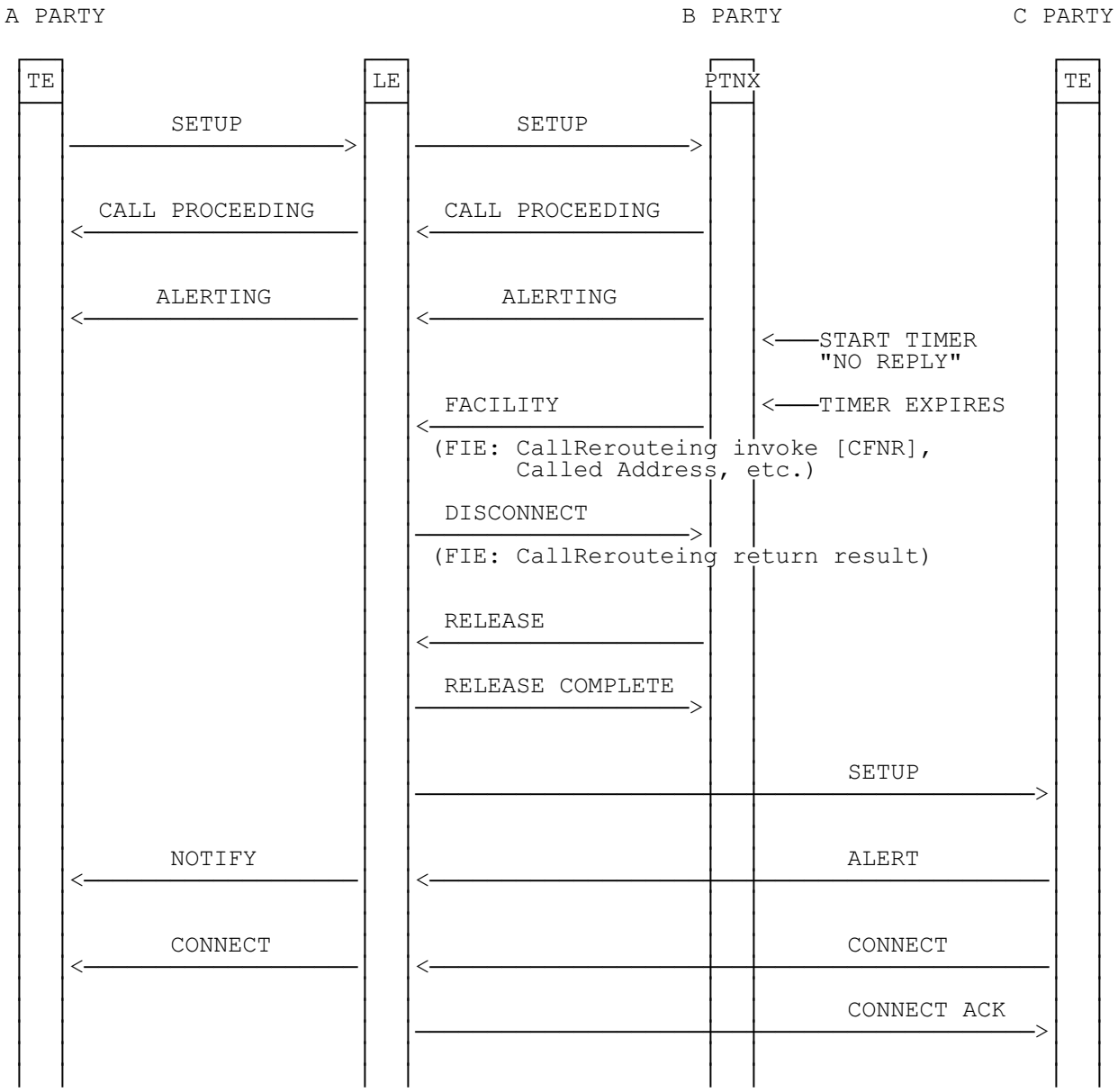

Figure A.3: Partial rerouteing requested by the PTNX triggered by CFNR, early release, in the PTNX

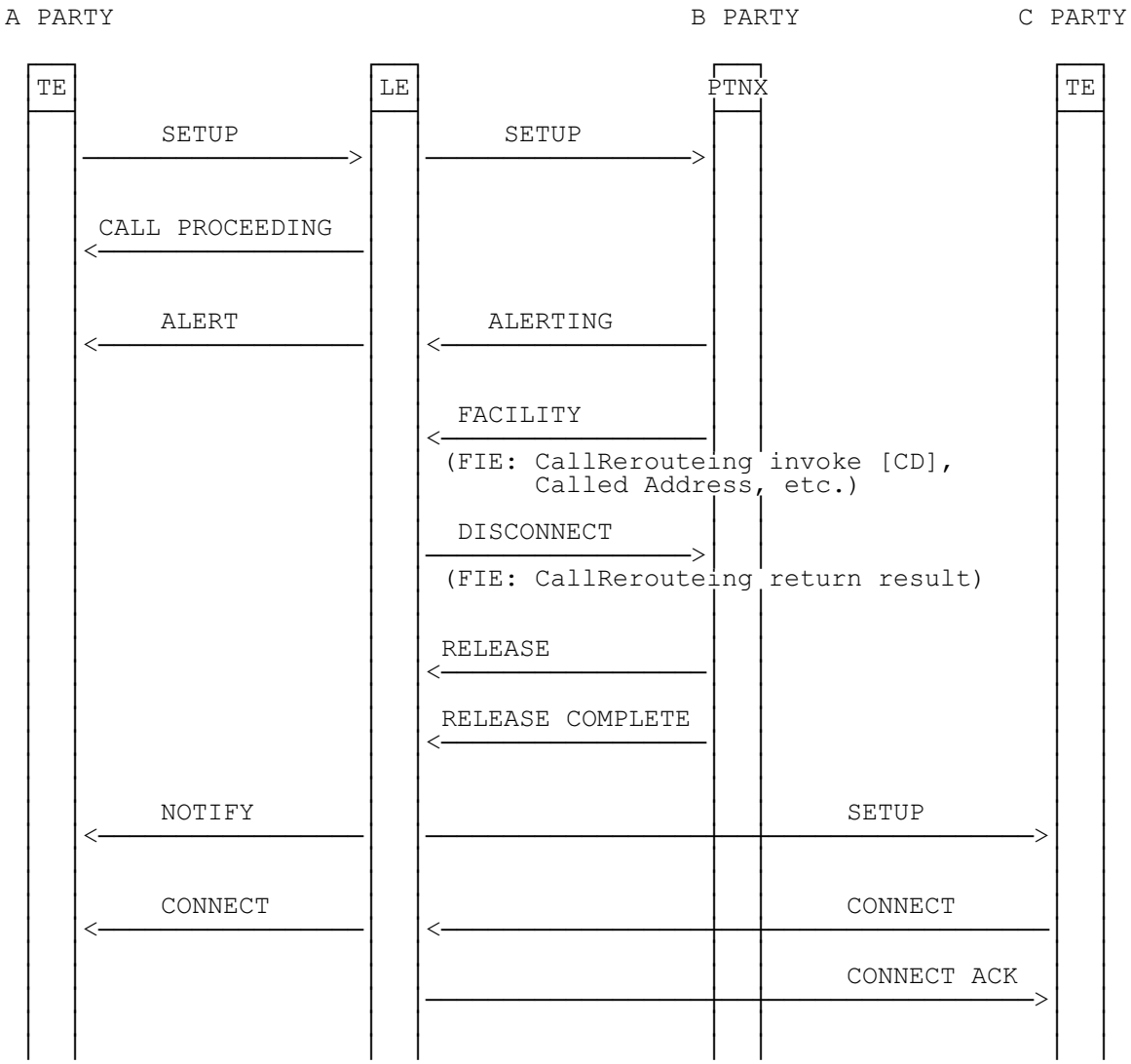

Figure A.4: Partial rerouteing requested by the PTNX, triggered in case of CD alerting, early release, in the PTNX

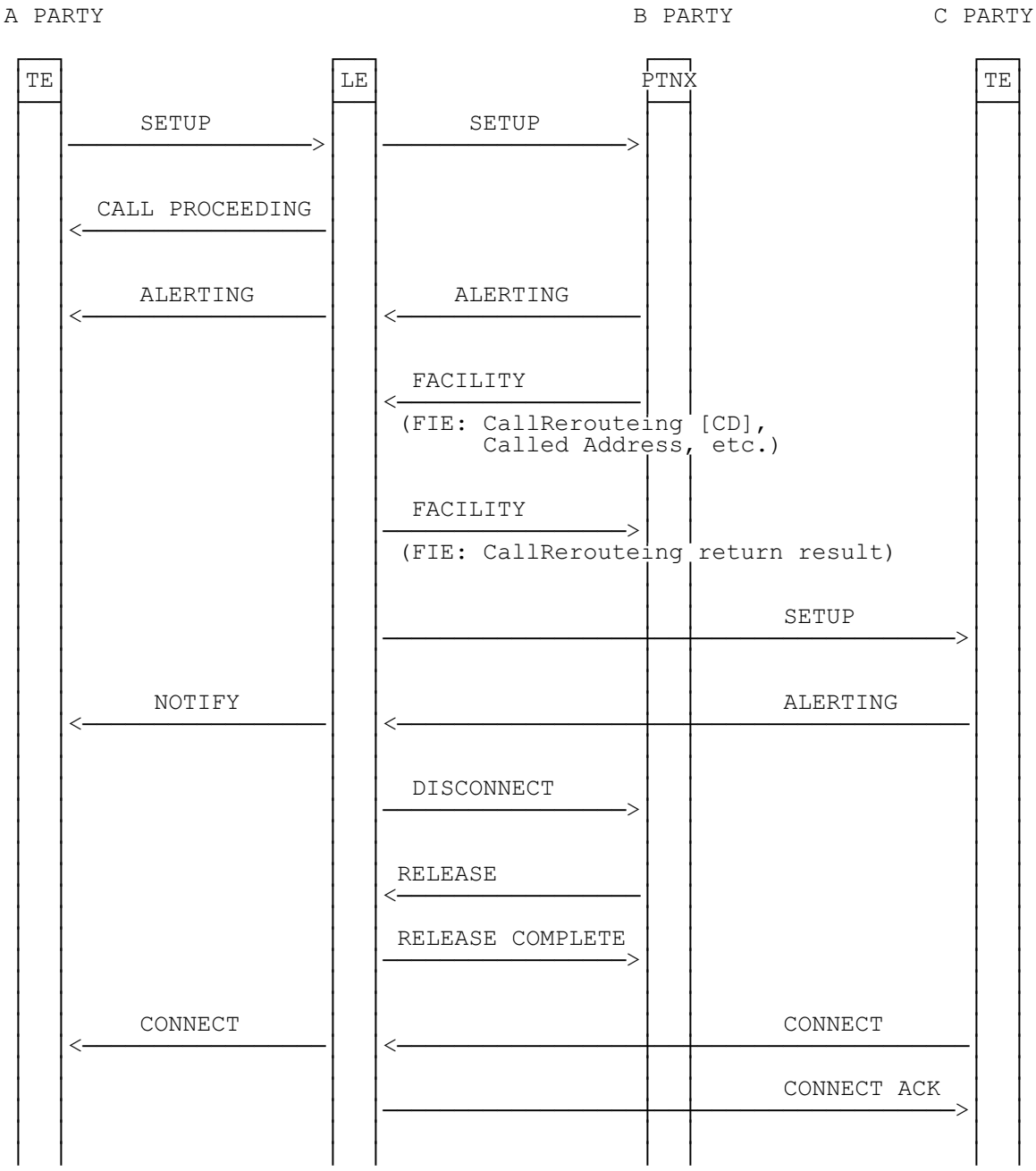

Figure A.5: Partial rerouteing requested by the PTNX, triggered in case of CD alerting, late release, in the PTNX

History

Document history	
December 1994	First Edition
March 1996	Converted into Adobe Acrobat Portable Document Format (PDF)