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SERIES Q: SWITCHING AND SIGNALLING

Digital subscriber Signalling System No. 1 – Stage 3 description for supplementary services using DSS 1

Stage 3 description for call completion supplementary services using DSS 1: Completion of Calls to Busy Subscribers (CCBS)

ITU-T Recommendation Q.953.3

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.953.3

STAGE 3 DESCRIPTION FOR CALL COMPLETION SUPPLEMENTARY SERVICES USING DSS 1: COMPLETION OF CALLS TO BUSY SUBSCRIBERS (CCBS)

Summary

This Recommendation specifies the stage three of the Completion of Calls to Busy Subscribers (CCBS) supplementary service for the Integrated Services Digital Network (ISDN) at the T reference point or coincident S and T reference point by means of the Digital Subscriber Signalling System No. 1 (DSS 1) protocol. Stage three identifies the protocol procedures and switching functions needed to support a telecommunication service.

The CCBS supplementary service enables a calling user A, encountering a busy destination B, to be notified when the busy destination B becomes not-busy and to have the service provider reinitiate the call to the specified destination B, if user A desires.

The CCBS supplementary service is applicable to all circuit-switched basic telecommunication services using one B-channel.

Source

ITU-T Recommendation Q.953.3 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 5th of June 1997.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

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

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

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As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Recommendation Q.953.3

STAGE 3 DESCRIPTION FOR CALL COMPLETION SUPPLEMENTARY SERVICES USING DSS 1: COMPLETION OF CALLS TO BUSY SUBSCRIBERS (CCBS)

(Geneva, 1997)

3.1 Scope

This Recommendation specifies the stage three of the Completion of Calls to Busy Subscribers (CCBS) supplementary service for the Integrated Services Digital Network (ISDN) at the T reference point or coincident S and T reference point (as defined in Recommendation I.411 [11]) by means of the Digital Subscriber Signalling System No. 1 (DSS 1) protocol. Stage three identifies the protocol procedures and switching functions needed to support a telecommunication service (see Recommendation I.130 [12]).

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

This Recommendation 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 CCBS supplementary service enables a calling user A, encountering a busy destination B, to be notified when the busy destination B becomes not-busy and to have the service provider reinitiate the call to the specified destination B, if user A desires.

The CCBS supplementary service is applicable to all circuit-switched basic telecommunication services using one B-channel.

Further parts of this Recommendation shall specify the method of testing required to identify conformance to this Recommendation.

This Recommendation is applicable to equipment, supporting CCBS supplementary service, 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.

3.2 References

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

[1] ITU-T Recommendation Q.931 (1993), *ISDN user-network interface layer 3 specification for basic call control.*

[2] ITU-T Recommendation Q.932 (1993), *Generic procedures for the control of ISDN supplementary services.*

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

[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 E.164 (1997), *The international public telecommunication numbering plan.*

[6] ITU-T Recommendation I.221 (1993), *Common specific characteristics of services.*

[7] CCITT Recommendation Q.9 (1988), *Vocabulary of switching and signalling terms.*

[8] CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1).*

[9] CCITT Recommendation X.219 (1988), *Remote operations: Model, notation and service definition.*

[10] ITU-T Recommendation Z.100 (1993), *CCITT Specification and Description Language (SDL).*

[11] ITU-T Recommendation I.411 (1993), *ISDN user-network interfaces – Reference configurations.*

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

3.3 Definitions

This Recommendation defines the following terms.

3.3.1 integrated services digital network (ISDN): See 2.3/I.112 [3], definition 308.

3.3.2 service; telecommunication service: See 2.2/I.112 [3], definition 201.

3.3.3 supplementary service: See 2.4/I.210 [4].

3.3.4 existing service: The basic telecommunication service associated with speech, 3.1 kHz audio and 64 kbit/s unrestricted bearer capabilities. In case of fallback, the lowest priority bearer capability shall count.

3.3.5 ISDN number: A number conforming to the numbering plan and structure specified in Recommendation E.164 [5].

3.3.6 busy: See clause 3/I.221 [6].

3.3.7 free: User B's condition when it is neither busy nor channels busy.

3.3.8 call: See 2.2/Q.9 [7], definition 2201.

3.3.9 CCBS call: A call which is established under the control of the CCBS supplementary service.

3.3.10 destination B: The entity addressed in the original call.

3.3.11 user: The DSS 1 protocol entity at the user side of the user-network interface.

3.3.12 user A: The user, at the coincident S and T reference point, who originated the call and to whom the CCBS supplementary service is provided.

3.3.13 user B: The remote user, at the coincident S and T reference point, which is identified as destination B.

3.3.14 network A: The network, at the coincident S and T reference point, to which user A is attached.

3.3.15 network B: The network, at the coincident S and T reference point, which is identified as destination B.

3.3.16 network: The DSS 1 protocol entity at the network side of the user-network interface.

3.3.17 public network: The DSS 1 protocol entity at the network side of the user-network interface at the T reference point.

3.3.18 private network: The DSS 1 protocol entity at the user side of the user-network interface at the T reference point.

3.3.19 originating network: The network at the served user.

3.3.20 destination network: The network at the remote user.

3.3.21 CCBS busy: Any one of the following conditions will cause a CCBS busy condition:

– maximum number of calls reached;

– interface information channels unavailable;

– CCBS recall pending on user A.

3.3.22 call state: A state as defined in 2.1/Q.931 [1], for either the user or the network as appropriate. A call state may exist for each call reference value (and for each additional responding CEI in the incoming call states).

3.3.23 CCBS recall: A network to user indication, informing user A that:

a) destination B is free; and

b) the network is ready to initiate a CCBS call to destination B and that the network is awaiting a response to this indication from user A.

3.3.24 CCBS request retention: If an attempt to establish a CCBS call fails because the destination is busy again, then the retention option defines whether the CCBS supplementary service shall continue or not, i.e. if the retention option is supported, the original CCBS request shall retain its position in the user B queue, and monitoring of user B shall continue. Note that retention option is performed only when both the originating network and the destination network support CCBS request retention.

3.3.25 invoke component: See 8.2.3.1.1/Q.932 [2]. 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".

3.3.26 return result component: See 8.2.3.1.1/Q.932 [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.

3.3.27 return error component: See 8.2.3.1.1/Q.932 [2]. Where reference is made to an "xxxx" return error component, a return error component is meant which is related to an "xxxx" invoke component.

3.3.28 reject component: See 8.2.3.1.1/Q.932 [2].

3.4 Abbreviations

This Recommendation uses the following abbreviations.

ASN.1 Abstract Syntax Notation One

CCBS Completion of Calls to Busy Subscriber

DCR Dummy Call Reference

DSS 1 Digital Subscriber Signalling System No. 1

ISDN Integrated Services Digital Network

3.5 Description

When user A encounters a busy destination B, user A can request the CCBS supplementary service. The network will then monitor the wanted destination B for becoming free.

When the wanted destination B becomes free, i.e. access resources (e.g. one B-channel) are free and a free and compatible terminal exists, and has not reused the access resources for making an outgoing call within a certain time, then the network will automatically recall user A.

When user A accepts the CCBS recall, then the network will automatically generate a CCBS call to destination B.

3.6 Operational requirements

3.6.1 Provision/withdrawal

The network shall select one of following network provider options. See Table 3.6-1.

Table 3.6-1/Q.953.3 – Network provider option

Option	Values	
Identical Call Check	Yes:	The network checks if requested CCBS is identical to a CCBS request which is already activated.
	No:	The network does not check if requested CCBS is identical to a CCBS request which is already activated.
CCBS Request Retention	Supported:	CCBS supplementary service shall continue if an attempt to establish a CCBS call fails because the destination is busy again.
	not Supported:	CCBS supplementary service shall not continue if an attempt to establish a CCBS call fails because the destination is busy again.
CCBS call on Call Forwarding Busy	Forwarded:	The CCBS call is forwarded as normal call to user C if user B has activated CFB and is busy upon the arrival of a CCBS call.
	not Forwarded:	The CCBS call is treated according to the exceptional procedures (destination B again busy) if user B has activated CFB and is busy upon the arrival of a CCBS call.

The CCBS supplementary service may be provided to user A after prior arrangement with the network provider or may be generally available.

The CCBS supplementary service may be withdrawn at the customer's request or for network provider reasons.

As a service provider option, the CCBS supplementary service can be offered with a subscription option which shall apply to the whole access of the served user (see Table 3.6-2):

Table 3.6-2/Q.953.3 – Subscription option

Subscription option	Values
Recall mode	CCBS recall offered to all compatible terminals on the access.
	CCBS recall offered to the terminal which has activated the CCBS supplementary service.

If the subscription option is not offered, one of the two values shall be chosen by the network provider.

3.6.2 Requirements on the originating network side

The originating network side shall register whether the CCBS supplementary service specific functions have to be performed in the originating network or in an attached private ISDN.

3.6.3 Requirements on the destination network side

The destination network side shall register whether the CCBS supplementary service specific functions have to be performed in the destination network or in an attached private ISDN.

3.7 Coding requirements

Tables 3.7-1 and 3.7-2 show the definition of the operations and errors required for the CCBS supplementary service using ASN.1 as defined in Recommendation X.208 [8] and using the OPERATION and ERROR macro as defined in Figure 4/X.219 [9].

The formal definition of the component types to encode these operations is provided in 8.2.3.1.1/Q.932 [2].

The inclusion of components in Facility information elements is defined in 8.2.3/Q.932 [2].

Table 3.7-1/Q.953.3 – ASN.1 description of CCBS-operations and errors

```
CCBS-Operation-and-Errors {itu-t recommendation q 953 ccbs (3) operations-and-errors (1)}

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

EXPORTS         CallInfoRetain,
                EraseCallLinkageID,
                CCBSRequest, CCBSDeactivate, CCBSInterrogate, CCBSErase,
                CCBSRemoteUserFree, CCBSCall, CCBSStatusRequest, CCBSBFree,
                CCBSStopAlerting,
                InvalidCallLinkageID, InvalidCCBSReference, LongTermDenial, ShortTermDenial,
                CCBSIsAlreadyActivated, AlreadyAccepted, OutgoingCCBSQueueFull,
                CallFailureReasonNotBusy, NotReadyForCall;

IMPORTS         OPERATION, ERROR
                FROM Remote-Operation-Notation
                        {joint-iso-itu-t remote-operations(4) notation(0)}
                userNotSubscribed, basicServiceNotProvided,
                supplementaryServiceInteractionNotAllowed
                FROM General-Error-List
                        {itu-t recommendation q 950 general-error-list(1)}
```

```
                    Address, PartyNumber, PartySubaddress
                    FROM addressing-data-elements
                        {itu-t recommendation q 932 addressing-data-elements(7)}

                    Q931InformationElement
                    FROM Embedded-Q931-Types
                        {itu-t recommendation q 932 embedded-q931-types(5)};

CallInfoRetain ::=  OPERATION
                        ARGUMENT callLinkageID      CallLinkageID

EraseCallLinkageID ::=  OPERATION
                        ARGUMENT callLinkageID      CallLinkageID

CCBSRequest ::=         OPERATION
                        ARGUMENT callLinkageID      CallLinkageID
                        RESULT SEQUENCE {RecallMode, CCBSReference}
                        ERRORS {userNotSubscribed, InvalidCallLinkageID, ShortTermDenial,
                            LongTermDenial, CCBSIsAlreadyActivated,
                            supplementaryServiceInteractionNotAllowed,
                            OutgoingCCBSQueueFull,
                            CallFailureReasonNotBusy}

CCBSInterrogate ::=     OPERATION
                        ARGUMENT SEQUENCE {
                            cCBSReference       CCBSReference OPTIONAL,
                            partyNumberOfA      PartyNumber OPTIONAL }
                        RESULT SEQUENCE {
                            recallMode          RecallMode,
                            callDetails         CallDetails OPTIONAL }
                        ERRORS {InvalidCCBSReference, userNotSubscribed}

CCBSDeactivate ::=      OPERATION
                        ARGUMENT cCBSReference CCBSReference
                        RESULT
                        ERRORS {IInvalidCCBSReference}

CallDetails ::=         SEQUENCE OF CallInformation (SIZE(1..5))

CallInformation ::=SEQUENCE {
                            addressOfB          Address,
                            q931InfoElement     Q931InformationElement,
                            cCBSReference       CCBSReference OPTIONAL,
                            subAddressOfA       PartySubaddress OPTIONAL }

-- The Bearer capability, High layer compatibility (optional) and Low layer compatibility (optional)
-- information elements shall be embedded in q931InfoElement.

CCBSErase ::=           OPERATION
                        ARGUMENT SEQUENCE {
                            recallMode          RecallMode,
                            cCBSReference       CCBSReference,
                            addressOfB          Address,
                            q931InfoElement     Q931InformationElement,
                            eraseReason         CCBSEraseReason,
                            subAddressOfA       PartySubaddress OPTIONAL }
-- The Bearer capability, High layer compatibility (optional) and Low layer compatibility (optional)
-- information elements shall be embedded in q931InfoElement.
```

```
CCBSRemoteUserFree ::= OPERATION
                       ARGUMENT SEQUENCE {
                            recallMode          RecallMode,
                            cCBSReference       CCBSReference,
                            addressOfB          Address,
                            q931InfoElement     Q931InformationElement,
                            subAddressOfA       PartySubaddress OPTIONAL }

CCBSBFree ::=          OPERATION
                       ARGUMENT SEQUENCE {
                            recallMode          RecallMode,
                            cCBSReference       CCBSReference,
                            addressOfB          Address,
                            q931InfoElement     Q931InformationElement,
                            subAddressOfA       PartySubaddress OPTIONAL}

CCBSCall ::=           OPERATION
                       ARGUMENT       cCBSReference      CCBSReference,
                       ERRORS { InvalidCCBSReference, AlreadyAccepted,
                            NotReadyForCall}

CCBSStatusRequest ::=  OPERATION
                       ARGUMENT SEQUENCE {
                            recallMode          RecallMode,
                            cCBSReference       CCBSReference,
                            q931InfoElement     Q931InformationElement,
                            subAddressOfA       PartySubaddress OPTIONAL }
                       RESULT BOOLEAN {free(TRUE), busy(FALSE)}

-- The Bearer capability, High layer compatibility (optional) and Low layer compatibility (optional)
-- information elements shall be embedded in q931InfoElement.

CCBSStopAlerting ::=   OPERATION
                       ARGUMENT       cCBSReference      CCBSReference
CallLinkageID ::=           INTEGER (0..127)
CCBSReference ::=           INTEGER (0..127)

CCBSEraseReason ::=         ENUMERATED {
                            normal-unspecified (0),
                            t-CCBS2-timeout (1),
                            t-CCBS3-timeout (2),
                            basic-call-failure (3)}

RecallMode ::=              ENUMERATED {
                            globalRecall (0),
                            specificRecall (1) }

callInfoRetain              CallInfoRetain          ::=  70
cCBSRequest                 CCBSRequest             ::=  71
cCBSDeactivate              CCBSDeactivate          ::=  72
cCBSInterrogate             CCBSInterrogate         ::=  73
cCBSErase                   CCBSErase               ::=  74
cCBSRemoteUserFree          CCBSRemoteUserFree      ::=  75
cCBSCall                    CCBSCall                ::=  76
cCBSStatusRequest           CCBSStatusRequest       ::=  77
cCBSBFree                   CCBSBFree               ::=  78
eraseCallLinkageID          EraseCallLinkageID      ::=  79
cCBSStopAlerting            CCBSStopAlerting        ::=  80
```

```
InvalidCallLinkageID            ::=  ERROR
InvalidCCBSReference            ::=  ERROR
LongTermDenial                  ::=  ERROR
ShortTermDenial                 ::=  ERROR
CCBSIsAlreadyActivated          ::=  ERROR
AlreadyAccepted                 ::=  ERROR
OutgoingCCBSQueueFull           ::=  ERROR
CallFailureReasonNotBusy        ::=  ERROR
NotReadyForCall                 ::=  ERROR

invalidCallLinkageID            InvalidCallLinkageID            ::=  50
invalidCCBSReference            InvalidCCBSReference            ::=  51
longTermDenial                  LongTermDenial                  ::=  52
    -- used at the user A coincident S and T reference point
shortTermDenial                 ShortTermDenial                 ::=  53
    -- used at the user A coincident S and T reference point
cCBSIsAlreadyActivated          CCBSIsAlreadyActivated          ::=  54
alreadyAccepted                 AlreadyAccepted                 ::=  55
outgoingCCBSQueueFull           OutgoingCCBSQueueFull           ::=  56
callFailureReasonNotBusy        CallFailureReasonNotBusy        ::=  57
notReadyForCall                 NotReadyForCall                 ::=  58

END -- of CCBS-Operation-and-Errors
```

Table 3.7-2/Q.953.3 – ASN.1 description of CCBS-private network operations and errors

```
CCBS-private-networks-operations-and-errors {itu-t recommendation q 953 ccbs (3)
private-networks-operations-and-errors (2)}

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

EXPORTS         CCBS-T-Request, CCBS-T-Call, CCBS-T-Suspend, CCBS-T-Resume,
                CCBS-T-RemoteUserFree, CCBS-T-Available, ShortTermDenial, LongTermDenial;

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

                userNotSubscribed
                FROM General-Error-List
                    {itu-t recommendation q 950 general-error-list(1)}

                Address
                FROM addressing-data-elements
                    {itu-t recommendation q 932 addressing-data-elements(7)}

                Q931InformationElement
                FROM Embedded-Q931-Types
                    {itu-t recommendation q 932 embedded-q931-types(5)};

CCBS-T-Request ::=      OPERATION
                        ARGUMENT SEQUENCE {
                            destinationAddress      Address,
                            q931InfoElement         Q931InformationElement,
                            -- contains HLC, LLC and BC information

                            retentionSupported [1] IMPLICIT BOOLEAN DEFAULT FALSE,
                            presentationAllowedIndicator [2] IMPLICIT BOOLEAN OPTIONAL,
                            originatingAddress Address OPTIONAL}
                        RESULT retentionSupported BOOLEAN DEFAULT FALSE}
                        ERRORS {ShortTermDenial, userNotSubscribed, LongTermDenial}

CCBS-T-Call ::=         OPERATION

CCBS-T-Suspend ::=      OPERATION

CCBS-T-Resume ::=       OPERATION

CCBS-T-RemoteUserFree ::=   OPERATION

CCBS-T-Available ::=    OPERATION

cCBS-T-Request              CCBS-T-Request              ::= 83
cCBS-T-Call                 CCBS-T-Call                 ::= 84
cCBS-T-Suspend              CCBS-T-Suspend              ::= 85
cCBS-T-Resume               CCBS-T-Resume               ::= 86
cCBS-T-RemoteUserFree       CCBS-T-RemoteUserFree       ::= 87
cCBS-T-Available            CCBS-T-Available            ::= 88

ShortTermDenial             ::=                         ERROR
LongTermDenial              ::=                         ERROR
```

```
shortTermDenial          ShortTermDenial          ::= 59
    --    used at the user A T reference point
longTermDenial           LongTermDenial           ::= 60
    --    used at the user A T reference point

END -- of CCBS-private-networks-operations-and-errors
```

3.8 State definitions

3.8.1 User states

The following states have been defined for the user:

CCBS Idle:	The CCBS supplementary service is not activated.
CCBS Requested:	The user has sent a CCBS request to the network and is waiting for a response.
CCBS Activated:	The CCBS supplementary service has been activated.
CCBS Free:	The user has received a B free indication.
CCBS Call Init:	The user has accepted the recall.
CCBS Interrogation Requested:	The user has requested interrogation and is waiting for a response.
CCBS Deactivation Requested:	The user has requested deactivation and is waiting for a response.

3.8.2 Network states

The following states have been defined for the network:

Originating network side

CCBS Idle:	The CCBS supplementary service is not activated.
CCBS Requested:	The originating network has sent a CCBS request to the destination network and is waiting for a response.
CCBS Activated:	The CCBS supplementary service has been activated.
CCBS Free:	The originating network has received a B free indication.
CCBS Suspended:	The CCBS supplementary service has been suspended.
CCBS Call Init:	The originating network has initiated the CCBS call.
CCBS Check A:	Waiting for user A response to the status request procedure.

Destination network side

CCBS Idle:	There are no outstanding requests.
CCBS Processing:	The request is in the queue, B is being monitored.
CCBS Await Status:	Idle Waiting for a response from users.
WAIT T_CCBS4:	Waiting for idle guard timer to expire.
CCBS Free:	User B is free, awaiting CCBS call.

3.9 Signalling procedures at the coincident S and T reference point

3.9.1 Procedures at the served user's interface

3.9.1.1 Activation

3.9.1.1.1 Normal operation

In order that a user A who has subscribed to the CCBS supplementary service may utilize the service when a busy destination B is encountered, it is necessary for the network to utilize the call information retention procedure.

The network shall provide the call information retention procedure, according to the procedures of 3.9.1.11, when the following set of conditions apply:

– CCBS is subscribed to;

– the call failure reason is "busy", i.e. cause value #17 (user busy) or #34 (no circuit/channel available);

– CCBS is available (as determined by the destination network);

NOTE 1– In some networks, UDUB may be a reason for the destination network to indicate CCBS not available.

– the user's outgoing CCBS queue limit has not been exceeded;

– CCBS has not been activated for an identical call (network option); and

– there are no supplementary service interactions that preclude CCBS.

However, these conditions shall not prevent the network from providing the call information retention procedure in other circumstances.

Call information retained by the network in support of CCBS shall be the following basic call information from the initial call, if available, in order to enable an identical basic call to be made:

– bearer capability information;

– high layer compatibility information;

– low layer compatibility information;

– calling party address information; and

– called party address information.

NOTE 2 – This information may be derived from user-provided information or may be network-provided, e.g. the calling party number may be user- or network-provided. For some basic services the information may be derived from more than one information element, e.g. for the 7 kHz telephony teleservice the bearer capability information may include information from two Bearer capability information elements and details on the priority of this information.

Furthermore, the network shall retain the following information, determined by the destination network, in order to decide whether CCBS is permitted:

– call failure reason; and

– CCBS available indication.

NOTE 3 – When interacting with other supplementary services, retention of further information may be mandatory. Furthermore, the retention of addresses is independent of any supplementary service, although the address information retained may be influenced by other supplementary services. Refer to 3.6 for details on supplementary service interactions.

User A can activate CCBS supplementary service when DISCONNECT message contains cause #17 or #34 and invoke component indicating that Call Information is retained.

To activate the CCBS supplementary service, user A shall send a CCBSRequest invoke component including the CallLinkageID to the network, according to the procedures of 6.3.2.2/Q.932 [2]. The CallLinkageID is determined according to the procedures of 3.9.1.11.

On receiving this invoke component, the network shall request activation of the CCBS supplementary service at the destination network.

On receiving confirmation that the CCBS supplementary service has been activated at the destination network, the network shall select a new value for the CCBSReference, send a CCBSRequest return result component to user A including the CCBSReference and RecallMode, according to the procedures of 6.3.2.2/Q.932 [2], and start timer T-CCBS2. The CCBSReference shall have significance on the whole access.

If the RecallMode indicates specificRecall, then user A, on receipt of the CCBSRequest return result component, shall retain the CCBSReference.

NOTE 4 – If the RecallMode parameter indicates globalRecall, then on receipt of the CCBSRequest return result component, user A may retain the CCBSReference, e.g. for the purpose of interrogation or deactivation.

3.9.1.1.2 Exceptional procedures

If the network cannot accept the CCBS request because user A does not subscribe to the CCBS supplementary service, then the network shall send a CCBSRequest return error component indicating "userNotSubscribed" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

If the network cannot accept the CCBS request because user A has provided an invalid CallLinkageID, then the network shall send a CCBSRequest return error component indicating "invalidCallLinkageID" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

If the network cannot accept the CCBS request because the call failure reason of the call identified by the CallLinkageID was not "busy", then the network shall send a CCBSRequest return error component indicating "callFailureReasonNotBusy" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

If the network cannot accept the CCBS request because user A's outgoing CCBS queue is full, then the network shall send a CCBSRequest return error component indicating "outgoingCCBSQueueFull" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

If the network cannot accept the CCBS request because user A has already activated the CCBS supplementary service for the call identified by the CallLinkageID, then the network shall send a CCBSRequest return error component indicating "cCBSIsAlreadyActivated" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

As a network option, if the network cannot accept the CCBS request because user A has already activated the CCBS supplementary service for an identical call, then the network shall send a CCBSRequest return error component indicating "cCBSIsAlreadyActivated" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

To determine if the call indicated by the CallLinkageID and a call in the outgoing CCBS queue are identical, the following basic call information shall be compared, if available:

– bearer capability information;
– high layer compatibility information;
– low layer compatibility information;
– called party address information; and
– calling party address information.

If the network cannot accept the CCBS request because there are invalid supplementary service interactions between the CCBS supplementary service and the call identified by the CallLinkageID, then the network shall send a CCBSRequest return error component indicating "supplementaryServiceInteractionNotAllowed" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

If the network cannot accept the CCBS request identified by the CallLinkageID because CCBS is not available to the destination, then the network shall send a CCBSRequest return error component indicating "longTermDenial" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

NOTE – This includes the case that the destination network did not indicate that CCBS was available when the call failed, and the case that the request for CCBS was rejected by the destination network.

If the network cannot accept the CCBS request identified by the CallLinkageID because the CCBS supplementary service is not available to the destination at this time, then the network shall send a CCBSRequest return error component indicating "shortTermDenial" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

If timer T-CCBS2 expires, the network shall deactivate the CCBS supplementary service activation according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "t-CCBS2-timeout".

On receipt of a CCBSRequest return error component indicating the error "invalidCallLinkageID", then user A shall remove knowledge of this CallLinkageID.

If the return error component indicates any other reason, then user A shall take no action.

If a reject component is received and the invoke identifier is included, the user shall ignore the received component.

3.9.1.2 Deactivation

3.9.1.2.1 Normal operation

To deactivate a CCBS supplementary service activation, user A shall send a CCBSDeactivate invoke component including the CCBSReference parameter to the network according to the procedures of 6.3.2.2/Q.932 [2].

On receipt of the CCBSDeactivate invoke component, the network shall send a CCBSDeactivate return result component to user A according to the procedures of 6.3.2.2/Q.932 [2], and the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "normal-unspecified".

On receipt of this return result component, user A shall take no protocol actions.

To deactivate all CCBS requests, user A shall perform a CCBS deactivation for each outstanding CCBS activation. The CCBSDeactivate invoke component may be repeated in a single message.

To deactivate the most recent CCBS activation, user A shall perform a CCBS deactivation indicating the CCBSReference of the most recent CCBS activation.

NOTE – The user can obtain details on active CCBS requests via the interrogation procedures of 3.9.1.3 and 3.9.1.4.

3.9.1.2.2 Exceptional procedures

If the network cannot accept the request because user A has provided an invalid CCBSReference, or user A has not subscribed to the CCBS supplementary service, then the network shall send a CCBSDeactivate return error component, indicating the error "invalidCCBSReference" to user A according to the procedures of 6.3.2.2/Q.932 [2].

On receipt of this return error component, user A shall remove knowledge of the CCBS request.

If a reject component is received and the invoke identifier is included, user A shall retain knowledge of the CCBS request.

3.9.1.3 General interrogation

3.9.1.3.1 Normal operation

To perform an interrogation of all active CCBS requests, user A shall send a CCBSInterrogate invoke component without a CCBSReference to the network according to the procedures of 6.3.2.2/Q.932 [2]. The user may provide the partyNumberOfA parameter in a CCBSInterrogate invoke component.

On receiving this invoke component, the network shall send a CCBSInterrogate return result component to user A according to the procedures defined in 6.3.2.2/Q.932 [2]. The return result component shall contain as arguments the RecallMode, and a list in chronological order of the currently active CCBS requests for this access, if any. For each active request the network shall provide the CCBSReference, and according to the procedures of 3.9.1.12, the addressOfB, q931InfoElement, and, if available, the subAddressOfA. The network shall ignore the partyNumberOfA parameter, if provided by the user.

NOTE 1 – Other uses of the partyNumberOfA parameter are specified in 3.12.14.

On receipt of this return result component, user A shall discard details of those active requests that are not compatible with the user's service compatibility information according to the procedure of 3.9.1.12.

NOTE 2 – In the case of globalRecall any CCBSReference may be retained by a user, e.g. for the purpose of deactivation.

3.9.1.3.2 Exceptional procedures

If the network cannot accept the request because user A has not subscribed to the CCBS supplementary service, then the network shall send a CCBSInterrogate return error component, indicating the error "userNotSubscribed" to user A according to the procedures of 6.3.2.2/Q.932 [2].

On receipt of this return error component, user A shall remove knowledge of all CCBS requests, if any.

If user A receives a reject component and the invoke identifier is included, then user A shall retain knowledge of all CCBS requests, if any.

3.9.1.4 Particular interrogation

3.9.1.4.1 Normal operation

To perform an interrogation of a particular active CCBS request, user A shall send a CCBSInterrogate invoke component with the CCBSReference of the request to be interrogated to the network according to the procedures of 6.3.2.2/Q.932 [2].

On receiving this invoke component, the network shall send a CCBSInterrogate return result component to user A according to the procedures defined in 6.3.2.2/Q.932 [2]. The return result component shall contain as arguments the RecallMode and details of the active CCBS request. The network shall provide, according to the procedures of 3.9.1.12 the addressOfB, q931InfoElement, and if available, the subAddressOfA.

3.9.1.4.2 Exceptional procedures

If the network cannot accept the request because user A has not subscribed to the CCBS supplementary service, then the network shall send a CCBSInterrogate return error component indicating the error "userNotSubscribed" to user A according to the procedures of 6.3.2.2/Q.932 [2].

On receipt of this return error component, user A shall remove knowledge of all CCBS requests.

If the network cannot accept the request because user A has provided an invalid CCBSReference, then the network shall send a CCBSInterrogate return error component indicating the error "invalidCCBSReference" to user A according to the procedures of 6.3.2.2/Q.932 [2].

On receipt of this return error component, user A shall remove knowledge of the CCBS request.

If user A receives a reject component and the invoke identifier is included, then the user shall retain knowledge of the CCBS request.

3.9.1.5 Recall indication

3.9.1.5.1 Normal operation

If the network is informed that the user B is free, the network shall determine whether user A is neither busy nor CCBS busy by using the procedures of 3.9.1.10.

NOTE – Some networks may not support the user A monitoring procedures of 3.9.1.10. In such networks, following procedures shall apply immediately when the network is informed that the destination B is free.

If user A is neither busy nor CCBS busy, then the network shall set timer T-CCBS3 and indicate that it is prepared for the establishment of the requested call, by sending a CCBSRemoteUserFree invoke component to user A. If the network knows that a point-to-point configuration exists at the user's access, the network shall send this invoke component according to the procedure of 6.3.2.2/Q.932 [2]. Otherwise the network shall send this invoke component according to the procedure of 6.3.2.3/Q.932 [2]. The invoke component shall contain as arguments the RecallMode, and details of the active CCBS request. The network shall provide, according to the procedures of 3.9.1.12, the addressOfB, q931InfoElement, and if available, the subaddressOfA.

If user A is busy or CCBS busy, then the network shall proceed according to 3.9.1.9.

On receipt of the CCBSRemoteUserFree invoke component, user A shall ignore the invoke component, unless the service it provides is compatible with the request as determined by the procedure of 3.9.1.12.

Users accepting this invoke component shall retain the CCBSReference and may proceed to establish a call using the procedures of 3.9.1.6.

3.9.1.5.2 Exceptional procedures

If timer T-CCBS3 expires, the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "t-CCBS3-timeout".

If a reject component is received and the invoke identifier is included, the network shall take no action.

3.9.1.6 CCBS call request

3.9.1.6.1 Normal operation

To establish the CCBS call, user A shall send a SETUP message to the network in accordance with 5.1/Q.931 [1]. The SETUP message shall contain the Bearer capability information element(s) from

the original call, and a Facility information element with a CCBSCall invoke component with the CCBSReference received in the CCBSRemoteUserFree invoke component.

NOTE 1 – In relation with other supplementary services, further (not retained) information elements may be present in the SETUP message (e.g. the User-user information element).

If the specific recall option applies, then user A shall retain the CCBSReference after having sent this SETUP message.

NOTE 2 – If the global recall option applies, then user A may retain the CCBSReference after having sent this SETUP message.

On receiving the SETUP message, the network shall stop timer T-CCBS3, discard any received call information and proceed with normal *en bloc* basic call procedures in accordance with 5.1.2/Q.931 and 5.1.5.1/Q.931 [1] using the retained call information. If any information elements which are not retained by the network (e.g. the User-user information element) are included in the SETUP message, the network uses those information elements to complete the call. Furthermore, if a multipoint configuration exists and the global recall option applies, then the network shall stop "CCBS alerting" for any non-responding users by sending a CCBSStopAlerting invoke component containing the CCBSReference to the user A, according to the procedures of 6.3.2.3/Q.932 [2].

If user A has acted upon a CCBSRemoteUserFree invoke component and has not yet requested call establishment with the CCBSCall invoke component, then, on receipt of the CCBSStopAlerting invoke component containing the same CCBSReference value, user A shall stop "CCBS alerting".

3.9.1.6.2 Exceptional procedures

If the network cannot accept the request because the user provided an invalid CCBSReference value, the network shall send a CCBSCall return error component, indicating the error "invalidCCBSReference" to user A in an appropriate clearing message according to the procedures of 6.3.1/Q.932 [2].

If the network cannot accept the request because the network has not sent the recall indication for the given CCBSReference (e.g. the network is still monitoring the remote user), then the network shall send a CCBSCall return error component indicating the error "notReadyForCall" to user A in an appropriate clearing message according to the procedures of 6.3.1/Q.932 [2].

If the network cannot accept the request because no B-channels can be selected, then the network shall proceed according to the procedures in 5.1.2/Q.931 [1]. Furthermore, the network shall suspend the CCBS request at the remote network and resume monitoring of the served user according to the procedures of 3.5.1.9. If a multipoint configuration exists and the global recall option applies, then the network shall stop "CCBS alerting" for any non-responding users by sending a CCBSStopAlerting invoke component containing the CCBSReference to the user A, according to the procedures of 6.3.2.3/Q.932 [2].

If a global recall was offered to user A, the network may receive more than one SETUP message with a CCBSCall invoke component and indicating all the same CCBSReference value. In this case the network shall respond to all subsequent SETUP messages by sending an appropriate clearing message containing a CCBSCall return error component indicating the error "alreadyAccepted" according to the procedures defined in 6.3.1/Q.932 [2].

On receipt of a CCBSCall return error component indicating "invalidCCBSReference", user A shall remove knowledge of the CCBSReference value.

NOTE – If a CCBSCall return error component is received indicating "alreadyAccepted" or "notReadyForCall", then the CCBSReference may be retained, e.g. for the purpose of interrogation and deactivation.

If a reject component is received and the invoke identifier is included, user A shall retain knowledge of the CCBSReference value.

3.9.1.7 CCBS call establishment

3.9.1.7.1 Normal operation

On accepting a CCBSCall invoke component, the network shall proceed to establish a call to user B.

On receiving an indication that user alerting has been initiated at the called address, the network shall proceed with basic call procedures as specified in 5.1.7/Q.931 [1]. Furthermore, the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "normal-unspecified".

On receiving an indication that the call has been accepted, without having first received an indication of user alerting, the network shall proceed with basic call procedures as specified in 5.1.8/Q.931 [1]. Furthermore, the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "normal-unspecified".

3.9.1.7.2 Exceptional procedures

If the network cannot establish the call because user B is busy again, and the CCBS request has not been deactivated, and the retention option is being used, then the network shall proceed with normal call clearing according to the procedures of 5.3.4/Q.931 [1] and resume monitoring user B for being neither busy nor CCBS busy. Note that retention option is performed only when both the originating network and the destination network support CCBS Request Retention.

If the network cannot establish the call because user B is busy again, and the CCBS request has not been deactivated, and the retention option is not being used, then the network shall proceed with normal call clearing according to the procedures of 5.3.4/Q.931 [1], and allow the user to invoke the CCBS supplementary service again using the procedures of 3.9.1.1. Furthermore, the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "basic-call-failure".

If the network cannot establish the call for any reason other than user B being busy again, then the network shall proceed with normal call clearing according to the procedures of 5.3.4/Q.931 [1]. Furthermore, if the CCBS request has not been deactivated, the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "basic-call-failure".

If on receipt of the CCBSRemoteUserFree invoke component user A does not want to accept the CCBS call, then user A shall either:

– ignore the CCBSRemoteUserFree invoke component; or

– shall initiate the deactivation procedure as described in 3.9.1.2.

If timer T-CCBS2 expires before sending the ALERTING or CONNECT message to user A, the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "t-CCBS2-timeout". Furthermore, the CCBS call shall be allowed to proceed according to the procedures of Recommendation Q.931 [1].

If clearing of the CCBS call is initiated by user A before the ALERTING or CONNECT message is sent to user A, the network shall proceed clearing according to the procedures of 5.3.3/Q.931 [1]. Furthermore the CCBS supplementary service shall be deactivated according to the procedures of 3.9.1.8. The CCBSEraseReason shall indicate "basic-call-failure".

If user A requests deactivation of a CCBS request while the CCBS call associated with that request is in the process of being established, then the procedures of 3.9.1.2 shall be followed and the

establishment of the CCBS call shall continue according to the procedures of Recommendation Q.931 [1].

3.9.1.8 Network deactivation procedures

3.9.1.8.1 Normal operation

Whenever the network deactivates the CCBS supplementary service, the network shall:

– stop timer T-CCBS2, if running;

– stop timer T-CCBS3, if running;

– send a CCBSErase invoke component to user A. If the network knows that a point-to-point configuration exists, the network shall send this invoke component according to the procedures defined in 6.3.2.2/Q.932 [2]; otherwise, the network shall send this invoke component according to the procedures in 6.3.2.3/Q.932 [2]. The invoke component shall contain as arguments the RecallMode, CCBSEraseReason, and details of the active CCBS request. The network shall provide, according to the procedures of 3.9.1.12, the addressOfB, q931InfoElement, and if available, the subAddressOfA. The CCBSEraseReason shall be set to "normal-unspecified", "t-CCBS2-timeout", "t-CCBS3-timeout", or "basic-call-failure";

– release the CCBSReference value and make it available for subsequent use;

– remove the request from the user's queue; and

– release all retained call information.

On receipt of the CCBSErase invoke component, user A shall act on the request depending on the RecallMode:

– if the RecallMode indicates specificRecall, then the user shall ignore requests that do not relate to a CCBSReference retained by the user; or

– if the RecallMode indicates globalRecall, then the user shall check the Bearer capability, High layer compatibility and Low layer compatibility information elements in determining whether this request is applicable to the user. In addition the user may check the subAddressOfA in determining whether requests are applicable to the user.

3.9.1.8.2 Exceptional procedures

Not applicable.

3.9.1.9 B free but A busy procedure

3.9.1.9.1 Normal operation

If the network of user A is informed that user B is free, and user A is either busy or CCBS busy (as determined using the procedures of 3.9.1.10), then the network shall inform user A by sending a CCBSBFree invoke component to user A, suspend CCBS processing and wait for clearing of a B-channel.

The network shall send the CCBSBFree invoke component to user A containing as argument the RecallMode, CCBSReference, and according to the procedure of 3.9.1.12, the addressOfB, q931InfoElement, and, if available, the subAddressOfA. If the network knows that a point-to-point configuration exists at user A's access, the network shall send this invoke component according to the procedure of 6.3.2.2/Q.932 [2]. Otherwise the network shall send this invoke component according to the procedure of 6.3.2.3/Q.932 [2].

On receipt of the CCBSBFree invoke component, user A shall ignore the invoke component unless it is compatible with the request as determined by the procedure of 3.9.1.12. Users accepting this invoke component shall treat it as an indication that user B is now free.

On a B-channel clearing or other network dependent events (e.g. periodical checking), and CCBS processing suspended, the network shall determine if user A is neither busy nor CCBS busy according to the procedures of 3.9.1.10. If user A is busy or CCBS busy, then the network shall continue to suspend CCBS processing. If user A is neither busy nor CCBS busy, then the network shall resume CCBS processing and await user B becoming free according to the procedures of 3.9.2.3.

3.9.1.9.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, then the network shall take no action.

3.9.1.10 User A monitoring procedure

3.9.1.10.1 Normal operation

The network shall decide if user A is CCBS busy.

In the case that user A is not CCBS busy, in order to determine if user A is not busy, the network shall start timer T-CCBS1 and send a CCBSStatusRequest invoke component to user A. The invoke component shall contain as arguments the CCBSReference, RecallMode, and according to the procedure of 3.9.1.12, the q931InfoElement, and if available, the subAddressOfA. The RecallMode shall be set to indicate the appropriate recall mode. If the network knows that a point-to-point configuration exists at user A's access, the network shall send this invoke component according to the procedure of 6.3.2.2/Q.932 [2]. Otherwise the network shall send this invoke component according to the procedure of 6.3.2.3/Q.932 [2].

On receiving this invoke component, user A shall ignore the invoke component unless the service it provides is compatible with the request as determined by the procedure of 3.9.1.12.

Users accepting this invoke component shall send a CCBSStatusRequest return result component to the network according to the procedures of 6.3.2.2/Q.932 [2]. The return result component shall indicate the user status for a call compatible with the request as determined by the q931InfoElement according to the procedure of 3.9.1.12.

On the receipt of the first CCBSStatusRequest return result component indicating "free" and provided user A is not CCBS busy, the network shall stop timer T-CCBS1 and determine user A to be not busy.

On receipt of a CCBSStatusRequest return result component indicating "busy" and the network has knowledge that a point-to-point configuration exists, then the network shall stop timer T-CCBS1 and determine user A to be busy.

If timer T-CCBS1 expires and only CCBSStatusRequest return result component(s) indicating "busy" are received, the network shall determine that user A is busy.

3.9.1.10.2 Exceptional procedures

If timer T-CCBS1 expires and no CCBSStatusRequest return result component has been received by the network, the network shall deactivate the CCBS supplementary service according to 3.9.1.2.

If a reject component is received and the invoke identifier is included, the user or the network shall ignore this component.

3.9.1.11 Call information retention

The call information retention procedure is used for a specific call if a supplementary service which needs the call information may be in operation for that call.

NOTE – The call information retention procedure shall be considered as generic. This implies that the retained information may be available for a number of supplementary services applicable to the specific call.

3.9.1.11.1 Normal operation

To provide the call information retention procedure, the network shall:

– select a new value for the CallLinkageID;

– retain the call information and the CallLinkageID;

– start timer T-RETENTION; and

– send a CallInfoRetain invoke component containing the CallLinkageID to user A in an appropriate call clearing message according to the procedures of 6.3.1/Q.932 [2].

A network may restrict the number of calls that can simultaneously be subject to the generic retention procedure.

The CallLinkageID is an identifier used to make reference to the retained call information. The CallLinkageID has significance on the whole access.

On receipt of the CallInfoRetain invoke component, the user may retain the CallLinkageID and use it to control a supplementary service(s).

On operation of a supplementary service that requires the call information, the network shall make the call information available for the supplementary service. The network may then release the retained call information if it has knowledge that no other supplementary service will need the information. Alternatively, the network shall retain the call information for other supplementary service until timer T-RETENTION expires.

If the network releases the call information on operation of a supplementary service, the network shall stop timer T-RETENTION, release the CallLinkageID and make the value available for subsequent use, release unwanted retained call information, and send an EraseCallLinkageID invoke component containing the CallLinkageID to user A. If the network knows that a point-to-point configuration exists at the served user's access, the network shall send this information according to the procedure of 6.3.2.2/Q.932 [2]. Otherwise the network shall send this information according to the procedure of 6.3.2.3/Q.932 [2].

If timer T-RETENTION expires, the network shall release the CallLinkageID value and make the value available for subsequent use, release all retained call information, and send an EraseCallLinkageID invoke component containing the CallLinkageID to user A. If the network knows that a point-to-point configuration exists at the served user's access, the network shall send this information according to the procedure of 6.3.2.2/Q.932 [2]. Otherwise the network shall send this information according to the procedure of 6.3.2.3/Q.932 [2].

On receipt of an EraseCallLinkageID invoke component, the user shall remove knowledge, if any, of the CallLinkageID value.

3.9.1.11.2 Exceptional procedures

If the network receives a reject component and the invoke identifier is included, then the network shall stop timer T-RETENTION, release the CallLinkageID value and make the value available for subsequent use, and release all retained call information.

3.9.1.12 Basic call information and compatibility checking

3.9.1.12.1 Normal operation

The network is required to send retained call information to the user in order to allow the user to determine whether it is compatible with a particular CCBS request, and to allow the user to identify the basic call information retained by the network for a given CCBS request. The following basic call information shall be provided to the user in the appropriate components:

– the q931InfoElement shall contain the bearer capability information in one or more Bearer capability information elements, and if available, the high layer compatibility information in one or more High layer compatibility information elements, and the low layer compatibility information in a Low layer compatibility information element;

– the addressOfB shall contain the called party address information; and

– the subAddressOfA shall contain the calling party subaddress information, if available.

On receipt of a component containing this information and:

– if the RecallMode indicates specificRecall, then the user is only compatible with CCBS requests that relate to a CCBSReference retained by the user; or

– if the RecallMode indicates globalRecall, then the user is only compatible with CCBS requests for which the user is compatible with all the indicated basic services as defined by the Bearer capability, High layer compatibility and Low layer compatibility information elements as follows:

  • if there are only single Bearer capability and High layer compatibility information elements, then compatibility checking is performed using the Bearer capability information element, and if available, the High layer compatibility and Low layer compatibility information elements according to B.3.2/Q.931 and B.3.3/Q.931 [1];

  • if there are multiple Bearer capability or High layer compatibility information elements, then compatibility checking is performed for each valid combination of Bearer capability and High layer compatibility information element;

– in addition the user may check the subAddressOfA in determining whether the user is compatible with the CCBS request.

3.9.1.12.2 Exceptional procedures

Not applicable.

3.9.2 Procedures at the remote user's network interface

3.9.2.1 Acceptance of a CCBS request

3.9.2.1.1 Normal operation

A request to activate CCBS to a given destination shall be accepted by the remote user's network and queued if:

– the remote user has subscribed to the given basic service;

– the limit on the number of CCBS requests to the given destination has not been exceeded (this limit is a network provider option with a maximum value of 5);

– the remote user has not invoked a supplementary service which prohibits the activation of the CCBS supplementary service against that destination; and

– at least one compatible user B exists.

NOTE – The procedures to determine if compatible terminal exists are network-dependent and some networks may not provide compatibility check procedures.

3.9.2.1.2 Exceptional procedures

If the remote user's network cannot accept the request to activate CCBS, then the remote user's network shall inform the served user's network that the CCBS request shall be rejected with the error indicating "shortTermDenial".

3.9.2.2 CCBS queue processing

3.9.2.2.1 Normal operation

The CCBS requests in the queue shall be processed in chronological order, although the actual mechanism for processing the queue is outside the scope of this Recommendation. During the processing of the CCBS queue, the CCBS requests which are currently suspended (refer to 3.9.2.4.2) shall be ignored.

If, for any reason, no CCBS call results from the processing of a CCBS request, then the next CCBS request against the user shall be selected for processing.

If the whole queue has been processed and no CCBS call results, processing is complete and shall only be restarted when the status of the user changes (e.g. a call is cleared), a served user's network requests that a CCBS request becomes not suspended, or a served user's network requests that a new CCBS request is added to the queue.

If the user B had invoked CCBS requests and those are suspended, those CCBS requests shall be processed prior to CCBS queue processing.

3.9.2.2.2 Exceptional procedures

Not applicable.

3.9.2.3 Determination of remote user free

3.9.2.3.1 Normal operation

In order to accept a given CCBS call, the following procedure is followed:

If:

– there is a free B-channel;

– at least one compatible user B exists;

NOTE 1 – The procedures to determine if compatible terminal exists are network-dependent and some networks may not provide compatibility check procedures. And

– the service is not an existing service,

then the network shall reserve a B-channel, determine if there is a compatible and free user present using the network-dependent compatibility check procedures, and, if there is, start timer T-CCBS4. If the network receives only an indication "compatible and busy", the network shall select the next CCBS request in the CCBS queue and continue processing as specified in 3.9.2.2, and cancel any B-channel reservation.

Reservation of a B-channel in this case means that the last free B-channel shall not be allocated to an incoming call. The reserved B-channel may be used for outgoing calls. Incoming calls shall be offered to user B only if they have service requirements and address information not identical to the CCBS request currently being processed. Identical calls shall be rejected with cause #34 (no

circuit/channel available). To determine if the incoming call and the CCBS request currently being processed are identical, the following basic call information shall be compared, if available:

– high layer compatibility information;

– low layer compatibility information;

– called party address information.

NOTE 2 – Further interactions with the call waiting supplementary service are specified in 3.12.1.

On expiry of timer T-CCBS4:

– there being a free B-channel;

– at least one compatible user B exists;

NOTE 3 – The procedures to determine if compatible terminal exists are network-dependent and some networks may not provide compatibility check procedures. And

– if the service is not an existing service,

then the network shall reserve a B-channel, determine if there is a compatible and free user present using the network-dependent compatibility check procedures, and, if there is, the network shall inform the served user's network that the remote user is free. If the network receives only an indication "compatible and busy", the network shall select the next CCBS request in the CCBS queue and continue processing as specified in 3.9.2.2, and cancel any B-channel reservation.

Reservation of a B-channel after the expiry of timer T-CCBS4 means that the last free B-channel shall not be allocated to an incoming call, except the CCBS call. Other incoming calls may still be permitted, according to the procedures of 5.2/Q.931 [1], provided that another B-channel is available. The reservation of the B-channel shall not prevent the use of the last free B-channel for an outgoing call.

3.9.2.3.2 Exceptional procedures

If there is no compatible user present, the network shall release the reservation and deactivate the CCBS supplementary service.

On expiry of timer T-CCBS4 and if there is no B-channel available, the network shall cancel any B-channel reservation and wait for a B-channel to become free.

3.9.2.4 CCBS call

3.9.2.4.1 Normal operation

If the served user establishes the CCBS call, then the network shall cancel the B-channel reservation and offer the call to user B according to the procedures of 5.2/Q.931 [1].

If the user accepts the call with either an ALERTING or a CONNECT message, the network shall deactivate the CCBS request and proceed according to the procedures of Recommendation Q.931 [1].

3.9.2.4.2 Exceptional procedures

If the served user establishes the CCBS call, and the remote user is determined to be busy again, then the network shall inform the served user's network, and, depending on the retention option being used, shall either maintain the CCBS request, or deactivate the CCBS request.

If the served user does not establish the CCBS call and the served user's network deactivates the CCBS request, then the network shall deactivate the CCBS request and cancel the B-channel reservation.

If the served user establishes the CCBS call and the remote user does not accept the call, or the call is rejected for any reason except busy, then the network shall deactivate the CCBS request and inform the served user's network.

If the served user's network indicates suspension of the CCBS request, then the network shall suspend the CCBS request and cancel the B-channel reservation.

3.9.2.5 Effects of CCBS on basic call offering

3.9.2.5.1 Normal operation

Whilst timer T-CCBS4 is running, and also whilst awaiting the CCBS call, the network shall offer a new incoming call to a user provided that a B-channel other than the reserved B-channel is available.

3.9.2.5.2 Exceptional procedures

Not applicable.

3.10 Procedures for interworking with private ISDNs

The following subclauses cover the procedures associated with the original call attempt, a signalling association to determine when the CCBS call can be established, and the establishment of the CCBS call. The protocols associated with these three procedures need not exist at the same interface.

3.10.1 Procedures for the originating T reference point

3.10.1.1 CCBS available indication

3.10.1.1.1 Normal operation

If on the attempt to establish a call according to the procedures of 5.1/Q.931 [1] the public network encounters a busy destination, and CCBS is available to the destination, then the public network shall send a CCBS-T-Available invoke component to the private network in an appropriate clearing message according to the procedures of 6.3.1/Q.932 [2].

On receipt of the CCBS-T-Available invoke component, the private network may invoke CCBS according to the procedures of 3.10.1.2.

3.10.1.1.2 Exceptional procedures

Not applicable.

3.10.1.2 CCBS supplementary service request

3.10.1.2.1 Normal operation

To set up the signalling association with the public network and to request the activation of CCBS, the private network shall send a CCBS-T-Request invoke component to the public network according to the procedures defined in 6.3.2.1.1/Q.932 [2]. The CCBS-T-Request invoke component shall contain as parameters the Bearer capability information element, destinationAddress, retentionSupported, and if available the High layer compatibility information element and Low layer compatibility information element. The retentionSupported parameter shall be set to TRUE if the private network supports the retention option. The retentionSupported parameter shall be set to FALSE if the private network does not support the retention option.

The call reference established as part of the procedures of 6.3.2.1.1/Q.932 [2] shall be used in all subsequent messages using the signalling association to identify this instance of the CCBS supplementary service.

On receipt of the CCBS-T-Request invoke component the public network shall start monitoring the destination for being free and send a CCBS-T-Request return result component to the private network according to the procedures defined in 6.3.2.1.2/Q.932 [2]. The CCBS-T-Request return result component shall contain the parameter retentionSupported. The retentionSupported parameter in the return result component shall be set to TRUE if the retentionSupported parameter value in the invoke component was set to TRUE and the network supports the retention option. The retentionSupported parameter shall be set to FALSE if the retentionSupported parameter value in the invoke component was set to TRUE and the network does not support the retention option. If the retentionSupported parameter value in the invoke component was set to FALSE, then the retentionSupported parameter in the return result component is not significant. In addition the public network shall start the timer T-CCBS6.

On receipt of the CCBS-T-Request return result component, the private network shall await an indication that the destination is free according to the procedures of 3.10.1.3.

If both the private network and the public network support the retention option, then the retention option shall be used in the subsequent procedures. If either or both the private network and the public network do not support the retention option, then the retention option shall not be used in the subsequent procedures.

3.10.1.2.2 Exceptional procedures

If the public network receives a request for establishment of the signalling association indicating a CCBS-related invoke component different from CCBS-T-Request, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2] with cause #29 "facility rejected".

If the public network cannot accept the CCBS request because the CCBS supplementary service is not subscribed to, then the public network shall send a CCBS-T-Request return error component indicating "userNotSubscribed" to the private network and clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If the public network cannot accept the CCBS request because CCBS is not available to the destination (e.g. interworking with a non-CCBS network), then the public network shall send a CCBS-T-Request return error component indicating "longTermDenial" to the private network and clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If the public network cannot accept the CCBS request because CCBS cannot be provided to the destination at this time (e.g. due to queue congestion or supplementary service interaction), then the public network shall send a CCBS-T-Request return error component indicating "shortTermDenial" to the private network and clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If a reject component is received and the invoke identifier is included, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.1.3 Remote user free indication

3.10.1.3.1 Normal operation

When the destination becomes free, and the public network is ready to accept the CCBS call, the public network shall send a CCBS-T-RemoteUserFree invoke component to the private network using the signalling association according to the procedures defined in 6.3.2.1.2/Q.932 [2].

After receiving a CCBS-T-RemoteUserFree invoke component, if the private network does not need to suspend CCBS and becomes ready to establish the CCBS call, the private network shall request the CCBS call establishment according to the procedures of 3.10.1.6.

After receiving a CCBS-T-RemoteUserFree invoke component, if the private network needs to suspend CCBS, the private network shall proceed according to the procedures of 3.10.1.4.

3.10.1.3.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.1.4 Suspend request

3.10.1.4.1 Normal operation

To request suspension of the CCBS request, the private network shall send a CCBS-T-Suspend invoke component to the public network using the signalling association according to the procedures of 6.3.2.1.2/Q.932 [2].

On receipt of the CCBS-T-Suspend invoke component, the public network shall await resumption of the CCBS request according to the procedures of 3.10.1.5.

3.10.1.4.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.1.5 Resume request

3.10.1.5.1 Normal operation

To request resumption of the CCBS request, the private network shall send a CCBS-T-Resume invoke component to the public network using the signalling association according to the procedures of 6.3.2.1.2/Q.932 [2].

On receipt of the CCBS-T-Resume request, the public network shall resume monitoring of the destination for being free.

3.10.1.5.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.1.6 CCBS call establishment

3.10.1.6.1 Normal operation

To initiate establishment of the CCBS call, the private network shall send a SETUP message to the public network according to the procedures of 5.1/Q.931 [1] using the call establishment information used in the original call attempt. In addition, the private network shall include a CCBS-T-Call invoke component in a Facility information element to indicate that this message is used to establish a CCBS call.

On receipt of the CCBS-T-Call invoke component the public network shall proceed to establish the call to the destination.

On successful establishment of the CCBS call, resulting in an ALERTING or CONNECT message being sent to the private network, the public network shall clear the signalling association according to the procedures in 6.3.2.1.3/Q.932 [2] and stop timer T-CCBS6.

3.10.1.6.2 Exceptional procedures

If establishment of the CCBS call fails because user B is busy again and if the retention option is being used, then the destination network shall resume monitoring the destination for being free, and the public network shall send an appropriate clearing message to the private network according to the procedures defined in 5.3.4/Q.931 [1].

On receipt of this clearing message and the retention option being used, the private network shall await an indication that the destination is free according to the procedures of 3.10.1.3.

If establishment of the CCBS call fails because user B is busy again, and if the retention option is not being used, then the public network shall send an appropriate clearing message to the private network according to the procedures defined in 5.3.4/Q.931 [1]. This clearing message shall also include a CCBS-T-Available invoke component according to the procedures of 3.10.1.1. Furthermore, the public network shall clear the signalling association according to the procedures in 6.3.2.1.3/Q.932 [2] and shall stop timer T-CCBS6.

If establishment of the CCBS call fails due to any other reason at the destination, then the public network shall send an appropriate clearing message to the private network according to the procedures defined in 5.3.4/Q.931 [1]. Furthermore, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2] and shall stop T-CCBS6.

If establishment of the CCBS call fails before reaching the destination, then basic call procedures according to 5.3.4/Q.931 [1] apply and the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If a reject component is received and the invoke identifier is included, the private network shall clear the CCBS call according to the procedures of 5.3/Q.931 [1]. Furthermore, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

On expiry of the timer T-CCBS6, the public network shall clear the signalling association according to the procedures in 6.3.2.1.3/Q.932 [2].

3.10.1.7 Deactivation

3.10.1.7.1 Normal operation

If the private network or the public network want to deactivate the CCBS request, then the private or public network shall clear the signalling association according to the procedures of 6.3.2.1.3/Q.932 [2].

3.10.1.7.2 Exceptional procedures

Not applicable.

3.10.2 Procedures for the destination T reference point

3.10.2.1 CCBS available indication

3.10.2.1.1 Normal operation

If on the attempt to establish a call according to the procedures of 5.2/Q.931 [1] the private network encounters a busy destination, and CCBS is available to the destination, then the private network shall send a CCBS-T-Available invoke component to the public network in an appropriate clearing message according to the procedures of 6.3.1.1/Q.932 [2].

On receipt of the CCBS-T-Available invoke component, the public network may invoke CCBS according to the procedures of 3.10.2.2.

3.10.2.1.2 Exceptional procedures

Not applicable.

3.10.2.2 CCBS supplementary service request

3.10.2.2.1 Normal operation

To set up the signalling association with the private network and to request the activation of CCBS, the public network shall send a CCBS-T-Request invoke component to the private network according to the procedures defined in 6.3.2.1.1/Q.932 [2]. The CCBS-T-Request invoke component shall contain as parameters the Bearer capability information element, destinationAddress, retentionSupported, and if available the High layer compatibility information element and Low layer compatibility information element. The retentionSupported parameter shall be set to TRUE if the public network supports the retention option. The retentionSupported parameter shall be set to FALSE if the public network does not support the retention option.

The call reference established as part of the procedures of 6.3.2.1.1/Q.932 [2] shall be used in all subsequent messages using the signalling association to identify this instance of the CCBS supplementary service.

On receipt of the CCBS-T-Request invoke component, the private network shall start monitoring the destination for being free and send a CCBS-T-Request return result component to the public network according to the procedures defined in 6.3.2.1.2/Q.932 [2]. The CCBS-T-Request return result component shall contain the parameter retentionSupported. The retentionSupported parameter in the return result component shall be set to TRUE if the retentionSupported parameter value in the invoke component was set to TRUE and the network supports the retention option. The retentionSupported parameter shall be set to FALSE if the retentionSupported parameter value in the invoke component was set to TRUE and the network does not support the retention option. If the retentionSupported parameter value in the invoke component was set to FALSE, then the retentionSupported parameter in the return result component is not significant.

On receipt of the CCBS-T-Request return result component, the public network shall await an indication that the destination is free according to the procedures of 3.10.2.3. In addition the public network shall start timer T-CCBS5.

If both the public network and the private network support the retention option, then the retention option shall be used in the subsequent procedures. If either or both the public network and the private network do not support the retention option, then the retention option shall not be used in the subsequent procedures.

3.10.2.2.2 Exceptional procedures

If the private network receives a request for establishment of the signalling association indicating a CCBS-related invoke component different from CCBS-T-Request, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2] with cause #29 "facility rejected".

If the private network cannot accept the CCBS request because CCBS is not available to the destination (e.g. interworking with a non-CCBS network), then the private network shall send a CCBS-T-Request return error component indicating "longTermDenial" to the public network and clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If the private network cannot accept the CCBS request because CCBS cannot be provided to the destination at this time (e.g. due to queue congestion, or supplementary service interaction), then the private network shall send a CCBS-T-Request return error component indicating "shortTermDenial"

to the public network and clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If the public network receives a CCBS-T-Request return error component indicating "userNotSubscribed", it shall be treated as "longTermDenial".

If a reject component is received and the invoke identifier is included, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.2.3 Remote user free indication

3.10.2.3.1 Normal operation

When the destination becomes free, and the private network is ready to accept the CCBS call, the private network shall send a CCBS-T-RemoteUserFree invoke component to the public network using the signalling association according to the procedures defined in 6.3.2.1.2/Q.932 [2].

After receiving a CCBS-T-RemoteUserFree invoke component, if the public network does not need to suspend CCBS and becomes ready to establish the CCBS call, the public network shall request the CCBS call establishment according to the procedures of 3.10.2.6.

After receiving a CCBS-T-RemoteUserFree invoke component, if the public network needs to suspend CCBS, the public network shall proceed according to the procedures of 3.10.2.4.

3.10.2.3.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.2.4 Suspend request

3.10.2.4.1 Normal operation

To request suspension of the CCBS request, the public network shall send a CCBS-T-Suspend invoke component to the private network using the signalling association according to the procedures of 6.3.2.1.2/Q.932 [2].

On receipt of the CCBS-T-Suspend invoke component, the private network shall await resumption of the CCBS request according to the procedures of 3.10.2.5.

3.10.2.4.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.2.5 Resume request

3.10.2.5.1 Normal operation

To request resumption of the CCBS request, the public network shall send a CCBS-T-Resume invoke component to the private network using the signalling association according to the procedures of 6.3.2.1.2/Q.932 [2].

On receipt of the CCBS-T-Resume request, the private network shall resume monitoring of the destination for being free.

3.10.2.5.2 Exceptional procedures

If a reject component is received and the invoke identifier is included, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

3.10.2.6 CCBS call establishment

3.10.2.6.1 Normal operation

To initiate establishment of the CCBS call, the public network shall send a SETUP message to the private network according to the procedures of 5.2/Q.931 [1] using the call establishment information used in the original call attempt. In addition, the public network shall include a CCBS-T-Call invoke component in a Facility information element to indicate that this message is used to establish a CCBS call.

On receipt of the CCBS-T-Call invoke component, the private network shall proceed to establish the call to the destination.

On successful establishment of the CCBS call, resulting in an ALERTING or CONNECT message being sent to the public network, the private network shall clear the signalling association according to the procedures in 6.3.2.1.3/Q.932 [2].

3.10.2.6.2 Exceptional procedures

If establishment of the CCBS call fails because user B is busy again and if the retention option is being used, then the destination network shall resume monitoring the destination for being free, and the private network shall send an appropriate clearing message to the public network according to the procedures defined in 5.3.4/Q.931 [1].

If the public network receives an indication that the CCBS call failed due to a busy condition and the retention option is being used, the public network shall await an indication that the destination is free according to the procedures of 3.10.2.3.

If establishment of the CCBS call fails because user B is busy again, and if the retention option is not being used, then the private network shall send an appropriate clearing message to the public network according to the procedures of 5.3.4/Q.931 [1]. This clearing message shall also include a CCBS-T-Available invoke component according to the procedures of 3.10.1.1. Furthermore, the private network shall clear the signalling association according to the procedures in 6.3.2.1.3/Q.932 [2].

If establishment of the CCBS call fails due to any other reason at the destination, then the private network shall clear the CCBS call according to the procedures of 5.3.4/Q.931 [1]. Furthermore, the private network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If establishment of the CCBS call fails before reaching the destination, then basic call procedures according to 5.3/Q.931 [1] apply and the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

If a reject component is received and the invoke identifier is included, the public network shall clear the CCBS call according to the procedures of 5.3/Q.931 [1]. Furthermore, the public network shall clear the signalling association according to the procedures defined in 6.3.2.1.3/Q.932 [2].

On expiry of the timer T-CCBS5 and if the signalling association is still established, the public network shall clear the signalling association according to the procedures in 6.3.2.1.3/Q.932 [2].

3.10.2.7 Deactivation

3.10.2.7.1 Normal operation

If the private network or the public network want to deactivate the CCBS request, then the public or private network shall clear the signalling association according to the procedures of 6.3.2.1.3/Q.932 [2].

3.10.2.7.2 Exceptional procedures

Not applicable.

3.11 Interactions with other networks

3.11.1 Interactions with non-ISDNs

When a call set-up is requested to another network which can determine busy/free status, the user shall not perceive any different in procedure. In particular, it should be possible to activate CCBS on a call meeting busy between an ISDN and a non-ISDN user and vice versa if CCBS is supported for the non-ISDN user.

NOTE – The procedures in user B's non-ISDN may be deferent, and ISDN user A may perceive a difference in performance (e.g. probability of the CCBS call encountering busy again may be higher). Additionally, in some networks, which cannot distinguish between a normal incoming call and a CCBS call, the CCBS call may not succeed.

When the call set-up is requested to another network which cannot determine busy/free status, the network shall send a CCBSRequest return error component including "longTermDenial" to user A against the CCBSRequest invoke component.

3.12 Interactions with other supplementary services

3.12.1 Call Waiting (CW)

3.12.1.1 Coding requirements

No impact.

3.12.1.2 Signalling procedures at the coincident S and T reference point

3.12.1.2.1 Normal operation

CCBS requests in the destination CCBS queue shall only be processed if there are no calls waiting and destination B is free.

When an incoming CCBS call arrives at the access of destination B and encounters the channels busy condition and a network determined user busy condition does not result, network B shall offer the CCBS call as a waiting call.

3.12.1.2.2 Exceptional procedures

If the CCBS call cannot be offered as a waiting call (e.g. a network determined user busy condition would result), destination B shall be considered busy again.

3.12.2 Explicit Call Transfer (ECT)

No impact.

3.12.3 Connected Line Identification Presentation (COLP)

No impact.

3.12.4 Connected Line Identification Restriction (COLR)

No impact.

3.12.5 Calling Line Identification Presentation (CLIP)

3.12.5.1 Coding requirements

No impact.

3.12.5.2 Procedures at the coincident S and T reference point

3.12.5.2.1 Normal operation

The calling line identity, whether network provided, user provided and screened, or user provided and not screened (i.e. the special arrangement) from the original call shall be retained by the originating network and used when the CCBS call is completed. Furthermore the calling line identity shall be used by the network to determine duplicate calls as specified in 3.9.1.1.2.

3.12.5.2.2 Exceptional procedures

Not applicable.

3.12.5.3 Procedures for interworking with private ISDNs

3.12.5.3.1 Procedures for the originating T reference point

3.12.5.3.1.1 Normal operation

If the private network provides an originatingAddress in the CCBS-T-Request invoke component, and the public network supports the originatingAddress, and the user is not provided with the special arrangement, then the network shall subject the number to appropriate screening.

If the private network provides an originatingAddress in the CCBS-T-Request invoke component, and the network supports the originatingAddress, and the user is provided with the special arrangement, then the number shall not be subject to screening.

3.12.5.3.1.2 Exceptional procedures

Not applicable.

3.12.5.3.2 Procedures for the destination T reference point

3.12.5.3.2.1 Normal operation

If a calling party address is available, and the network supports the originatingAddress in the CCBS-T-Request invoke component, and the user subscribes to the CLIP supplementary service, then the network shall include the originatingAddress in the CCBS-T-Request invoke component, subject to any CLIR supplementary service restriction.

3.12.5.3.2.2 Exceptional procedures

Not applicable.

3.12.6 Calling Line Identification Restriction (CLIR)

3.12.6.1 Coding requirements

No impact.

3.12.6.2 Procedures at the coincident S and T reference point

3.12.6.2.1 Normal operation

The CLIR supplementary service requirements from the original call shall be retained by the originating network and used when the CCBS call is completed.

3.12.6.2.2 Exceptional procedures

Not applicable.

3.12.6.3 Procedures for interworking with private ISDNs

3.12.6.3.1 Procedures for the originating T reference point

3.12.6.3.1.1 Normal operation

If the public network supports the originatingAddress parameter, then the following procedures shall apply:

– If CLIR is not provided, then the network shall ignore any PresentationAllowedIndicator in the CCBS-T-Request invoke component and shall not apply restriction to the transfer of the calling address.

– If the CLIR supplementary service is provided in permanent mode, then the network shall ignore any PresentationAllowedIndicator in the CCBS-T-Request invoke component and shall apply the appropriate restriction to the transfer of the calling address.

– If the CLIR supplementary service is provided in temporary mode and the PresentationAllowedIndicator is provided in the CCBS-T-Request invoke component and set to "true", then the network shall not apply restriction to the transfer of the calling address.

– If the CLIR supplementary service is provided in temporary mode and the PresentationAllowedIndicator is provided in the CCBS-T-Request invoke component and set to "false", then the network shall apply the appropriate restriction to the transfer of the calling address.

– If the CLIR supplementary service is provided in temporary mode and the PresentationAllowedIndicator is not provided in the CCBS-T-Request invoke component and the default is "presentation restricted", then the network shall apply the appropriate restriction to the transfer of the calling address.

– If the CLIR supplementary service is provided in temporary mode and the PresentationAllowedIndicator is not provided in the CCBS-T-Request invoke component and the default is "presentation allowed", then the network shall not apply restriction to the transfer of the calling address.

3.12.6.3.1.2 Exceptional procedures

Not applicable.

3.12.6.3.2 Procedures for the destination T reference point

3.12.6.3.2.1 Normal operation

If a calling party address is available in the public network and the network supports the originatingAddress in the CCBS-T-Request invoke component, and presentation is allowed, then the network shall include the originatingAddress and PresentationAllowedIndicator set to "true" in the CCBS-T-Request invoke component.

If a calling party address is available in the public network and the network supports the originatingAddress in the CCBS-T-Request invoke component, and presentation is not allowed, then the network shall not include the originatingAddress and PresentationAllowedIndicator in the CCBS-T-Request invoke component.

3.12.6.3.2.2 Exceptional procedures

Not applicable.

3.12.7 Closed User Group (CUG)

3.12.7.1 Coding requirements

No impact.

3.12.7.2 Procedures at the coincident S and T reference point

3.12.7.2.1 Normal operation

If the user subscribes to the CUG supplementary service, then the CUG requirements from the original call shall be retained by the served user's network and used when the call is completed.

The user shall not include a CUGCall invoke component in the SETUP message used to establish the CCBS call.

3.12.7.2.2 Exceptional procedures

If the SETUP message used to establish the CCBS call contains a CUGCall invoke component, this component shall be processed by the served user's network:

– if the CUG requirements of the original call and the CCBS call are identical, the CCBS call shall be established using the CUG supplementary service related information;

– if the CUG requirements of the original call and the CCBS are not identical, the CCBS call shall be released. The first clearing message sent to the served user shall contain a Facility information element containing a return error component indicating "invalidOrUnregisteredCUGIndex" and a Cause information element indicating cause #29 "facility rejected".

3.12.7.3 Procedures for interworking with private networks

3.12.7.3.1 Procedure for the originating T reference point

3.12.7.3.1.1 Normal operation

If the original call was subject to CUG requirements, then the private network shall include the CUGCall invoke component in the SETUP message used to establish the CCBS call.

On receipt of this invoke component the public network shall follow CUG procedures according to Recommendation Q.955.1.

3.12.7.3.1.2 Exceptional procedures

Not applicable.

3.12.7.3.2 Procedures for the destination T reference point

No impact.

3.12.8 Conference calling (CONF)

No impact.

3.12.9 Direct-Dialling-In (DDI)

No impact.

3.12.10 Call diversion (call forwarding) services

3.12.10.1 Call Forwarding Busy (CFB)

No impact.

3.12.10.2 Call Forwarding No Reply (CFNR)

No impact.

3.12.10.3 Call Forwarding Unconditional (CFU)

No impact.

3.12.10.4 Call Deflection (CD)

3.12.10.4.1 Coding requirements

No impact.

3.12.10.4.2 Procedures at the coincident S and T reference point

3.12.10.4.2.1 Procedures for the originating network

####### 3.12.10.4.2.1.1 Normal operation

If user A calls destination B and the call is deflected to user C by the call deflection supplementary service and user C is busy, then a request by user A to activate the CCBS supplementary service shall be applied to destination B.

In the case of call deflection before alerting, the request from destination B to deflect a CCBS call shall be rejected. Note that the Return Error value for this rejection will be defined in the Recommendation for stage 3 description of Call Deflection.

In the case of call deflection after alerting, the request from destination B to deflect a CCBS call shall be accepted. The CCBS call shall be deflected as a normal call.

####### 3.12.10.4.2.1.2 Exceptional procedures

Not applicable.

3.12.11 Line Hunting (LH)

No impact.

3.12.12 Three-Party service (3PTY)

No impact.

3.12.13 User-to-User Signalling (UUS)

3.12.13.1 Coding requirements

No impact.

3.12.13.2 Procedures at the coincident S and T reference point

3.12.13.2.1 Normal operation

The network shall not store any information related to the UUS supplementary service provided by the calling user in the original call, neither the request(s) for activation nor the user-to-user information for UUS service 1.

If the SETUP message received from user A for invocation of the CCBS call contains information related to the UUS supplementary service, this shall be treated as normal handling of the UUS supplementary service procedures.

3.12.13.2.2 Exceptional procedures

Not applicable.

3.12.14 Multiple Subscriber Number (MSN)

3.12.14.1 Coding requirements

No impact.

3.12.14.2 Procedures at the coincident S and T reference point

3.12.14.2.1 Procedures for the originating network

3.12.14.2.1.1 Normal operation

The CCBS supplementary service may be provided to a user on a per Multiple Subscriber Number (MSN).

If user A subscribes to the MSN supplementary service, and the user provides a valid multiple subscriber number in the Calling party number information element of the original call, then the network shall include the calling user's identity in a Called party number information element in the FACILITY message containing the CCBSErase, CCBSRemoteUserFree, CCBSBFree, and CCBSStatusRequest invoke components. Users not addressed by the calling user's identity shall ignore the FACILITY messages.

If user A subscribes to the MSN supplementary service, and has not provided a MSN or has provided an invalid multiple subscriber number in the Calling party number information element of the original call, then the network shall include the calling user's identity as used for the original call in a Called party number information element in the FACILITY message containing the CCBSErase, CCBSRemoteUserFree, CCBSBFree, and CCBSStatusRequest invoke components. Users not addressed by the calling user's identity shall ignore the FACILITY messages.

If user A subscribes to the MSN supplementary service and interrogates the CCBS supplementary service related to a specific multiple subscriber number, then the user shall include the appropriate number in the "partyNumberOfA" parameter in the CCBSInterrogate invoke component. The CCBSInterrogate invoke component shall be included in the Facility information element, within the FACILITY message. The network shall only provide information on CCBS activation related to the number provided in the partyNumberOfA parameter.

NOTE – The information provided relates to the A queue to which CCBS activations are assigned which contained that calling party number in the original set-up request or were assigned to that number by default because no calling party number was provided.

3.12.14.2.1.2 Exceptional procedures

If the partyNumberOfA parameter is not provided, or if the partyNumberOfA parameter is not valid in the CCBSInterrogate invoke component, then the information provided shall relate to the A queue to which also CCBS activations are assigned where the original SETUP contained no calling party number.

3.12.14.2.2 Procedures for the remote network

3.12.14.2.2.1 Normal operation

If user B subscribes to the MSN supplementary service, then the network shall provide an incoming CCBS queue per multiple subscriber, but the maximum number of the CCBS requests may be on a per-access basis.

3.12.14.2.2.2 Exceptional procedures

Not applicable.

3.12.15 Call Hold (HOLD)

No impact.

3.12.16 Advice of Charge (AOC)

3.12.16.1 Coding requirements

No impact.

3.12.16.2 Procedures at the coincident S and T reference point

3.12.16.2.1 Normal operation

The network shall store the accepted request for the AOC supplementary service for the original call and apply it to the CCBS call established by this particular CCBS instance as identified for this user.

3.12.16.2.2 Exceptional procedures

Not applicable.

3.12.17 Sub-addressing (SUB)

3.12.17.1 Coding requirements

No impact.

3.12.17.2 Procedures at the coincident S and T reference point

3.12.17.2.1 Normal operation

If user B subscribes to the SUB supplementary service, and Called party sub-addresses in the incoming call and the queued CCBS requests are available, then the network shall use the sub-addresses in determining whether an incoming call and a queued CCBS request have identical destination selection information as given in 3.9.2.

3.12.17.2.2 Exceptional procedures

Not applicable.

3.12.17.3 Procedures at the T reference point

The procedures described in 3.12.17.2 shall apply.

3.12.18 Terminal Portability (TP)

No impact.

3.12.19 Completion of Calls to Busy Subscribers (CCBS)

No impact.

3.12.20 Malicious Call Identification (MCID)

No impact.

3.12.21 Reverse charging (REV)

No impact.

3.12.22 Multi-level Precedence and Preemption (MLPP)

If the CCBS request is received during an MLPP call, then the network shall send a CCBSRequest return error component indicating "supplementaryServiceInteractionNotAllowed" to user A, according to the procedures in 6.3.2.2/Q.932 [2].

3.12.23 Support of Private Numbering Plan (SPNP)

No impact.

3.12.24 International Telecommunication Charge Card (ITCC)

Not applicable at this time.

3.12.25 Global Virtual Network Service (GVNS)

Not applicable at this time.

3.13 Parameter values (Timers)

Retention timer T-RETENTION

This timer is started by the network after sending a CallInfoRetain invoke component to the user. The user shall send the CCBSRequest invoke component to the network before expiry of this timer. The network stores relevant information only for the duration of this timer.

The duration of this timer shall have a minimum of 15 seconds.

Status check timer T-CCBS1

The maximum time the network will wait for response for checking for compatible terminals. The value of this timer is 4 seconds.

CCBS service duration timer T-CCBS2

The maximum time the service will be active within the network. The value is a network option, typically 15-45 minutes.

Recall timer T-CCBS3

The maximum time the network will wait for user A response to a CCBS recall. The value is typically 10-20 seconds.

Destination B idle guard timer T-CCBS4

The time the network will wait after destination B has become free before indicating a "CCBS recall" or " indication of B idle" to user A. The value of this timer is typically 0-15 seconds.

Service lifetime supervision timer T-CCBS5

This timer supervises the lifetime of the signalling association at the destination public network. The value is 60 minutes.

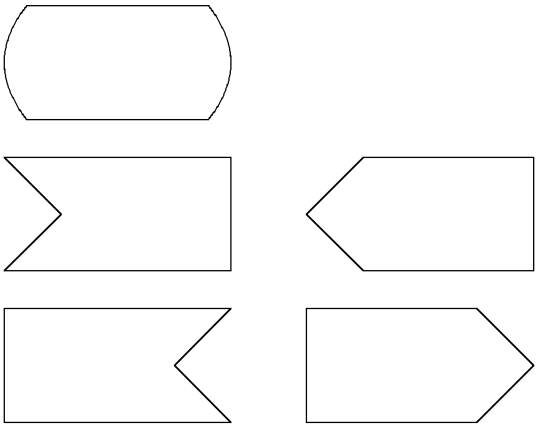
Service lifetime supervision timer T-CCBS6

This timer supervises the lifetime of the signalling association at the originating public network. The value is 60 minutes.

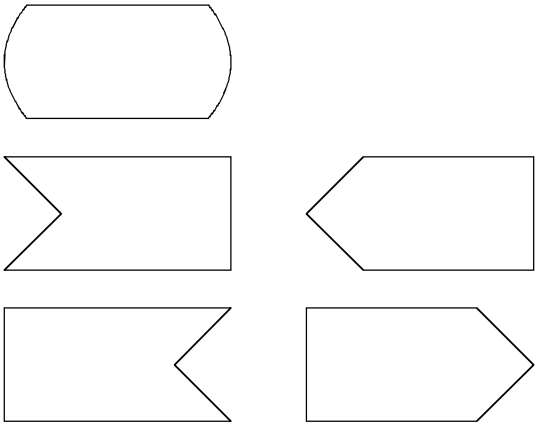
3.14 Dynamic description (SDLs)

The dynamic descriptions are shown in Figure 3.14-1 according to Recommendation Z.100 [10].

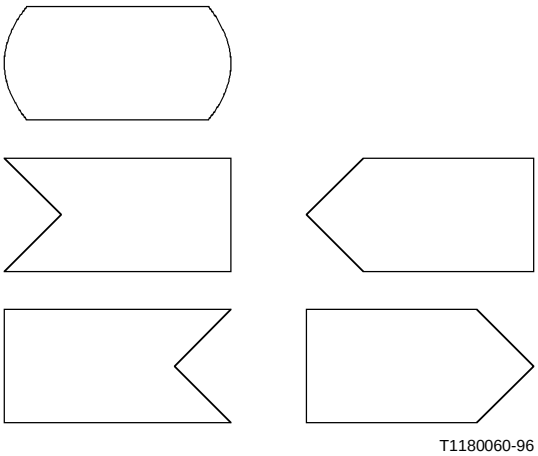
CCBS user side process SDL diagrams



CCBS network A side process SDL diagrams



CCBS destination network side process SDL diagrams



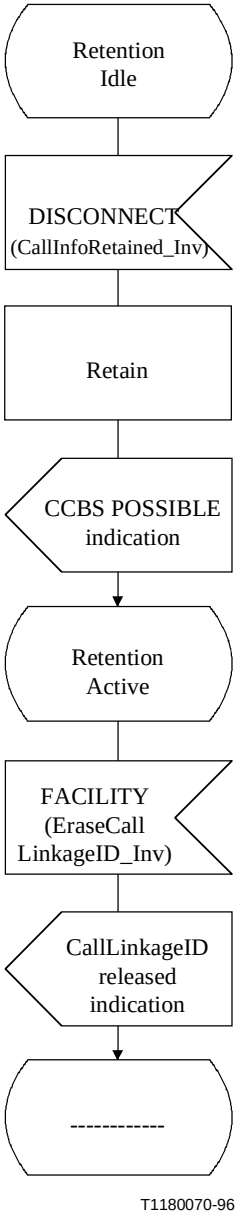


Figure 3.14-1/Q.953.3 (sheet 1 of 38) – Dynamic descriptions

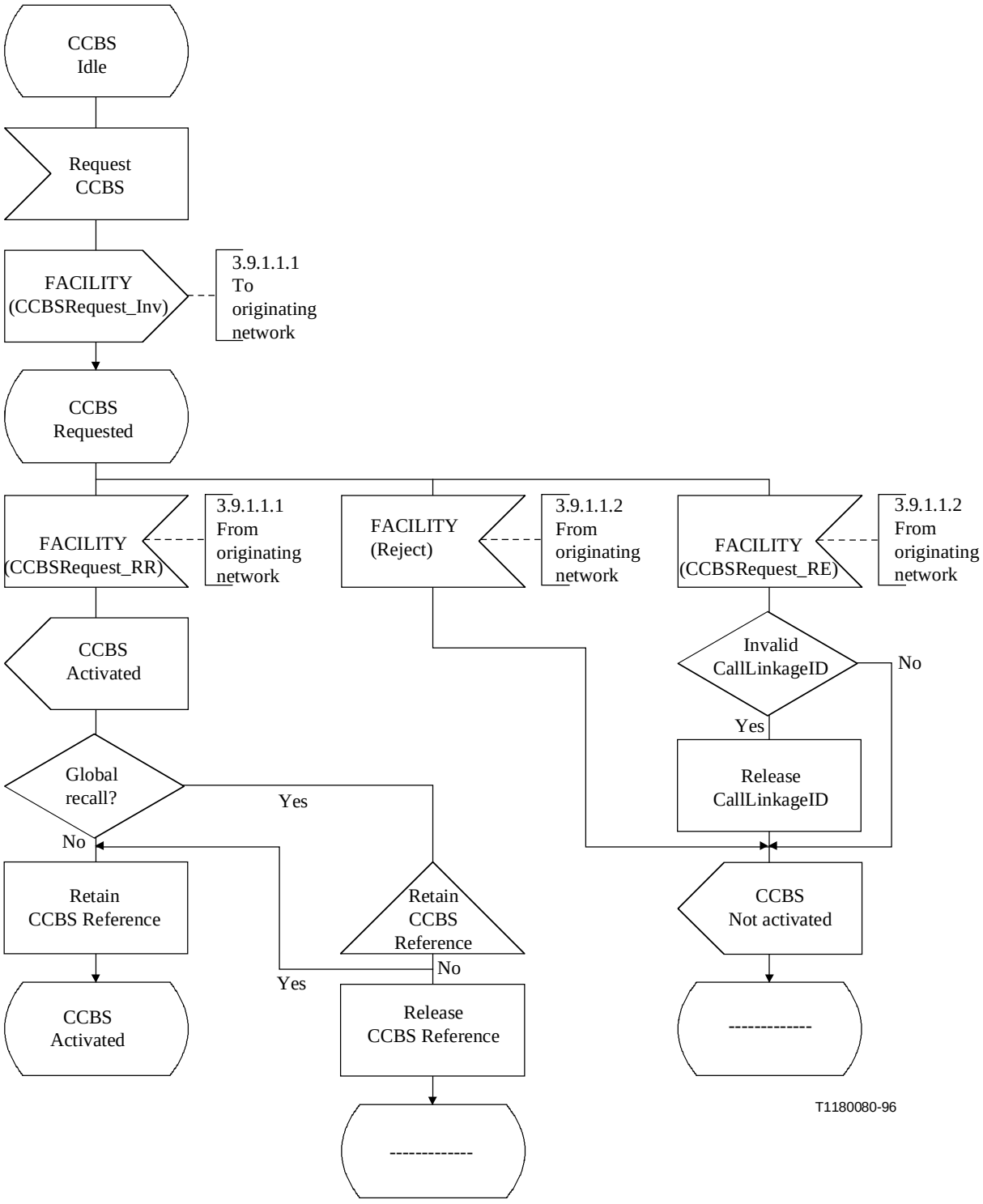


Figure 3.14-1/Q.953.3 (sheet 2 of 38) – Dynamic descriptions

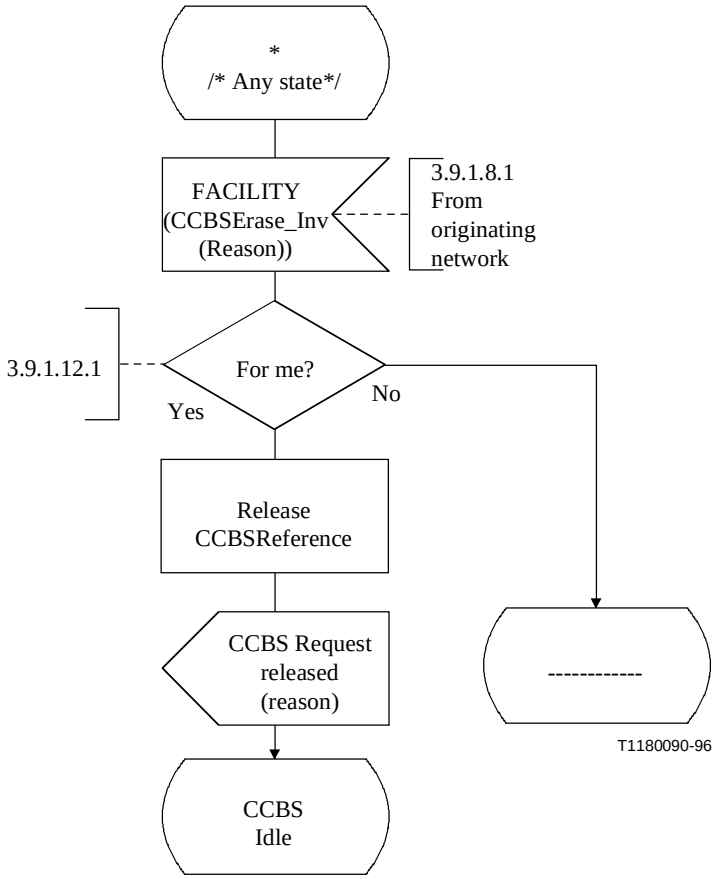


Figure 3.14-1/Q.953.3 (sheet 3 of 38) – Dynamic descriptions

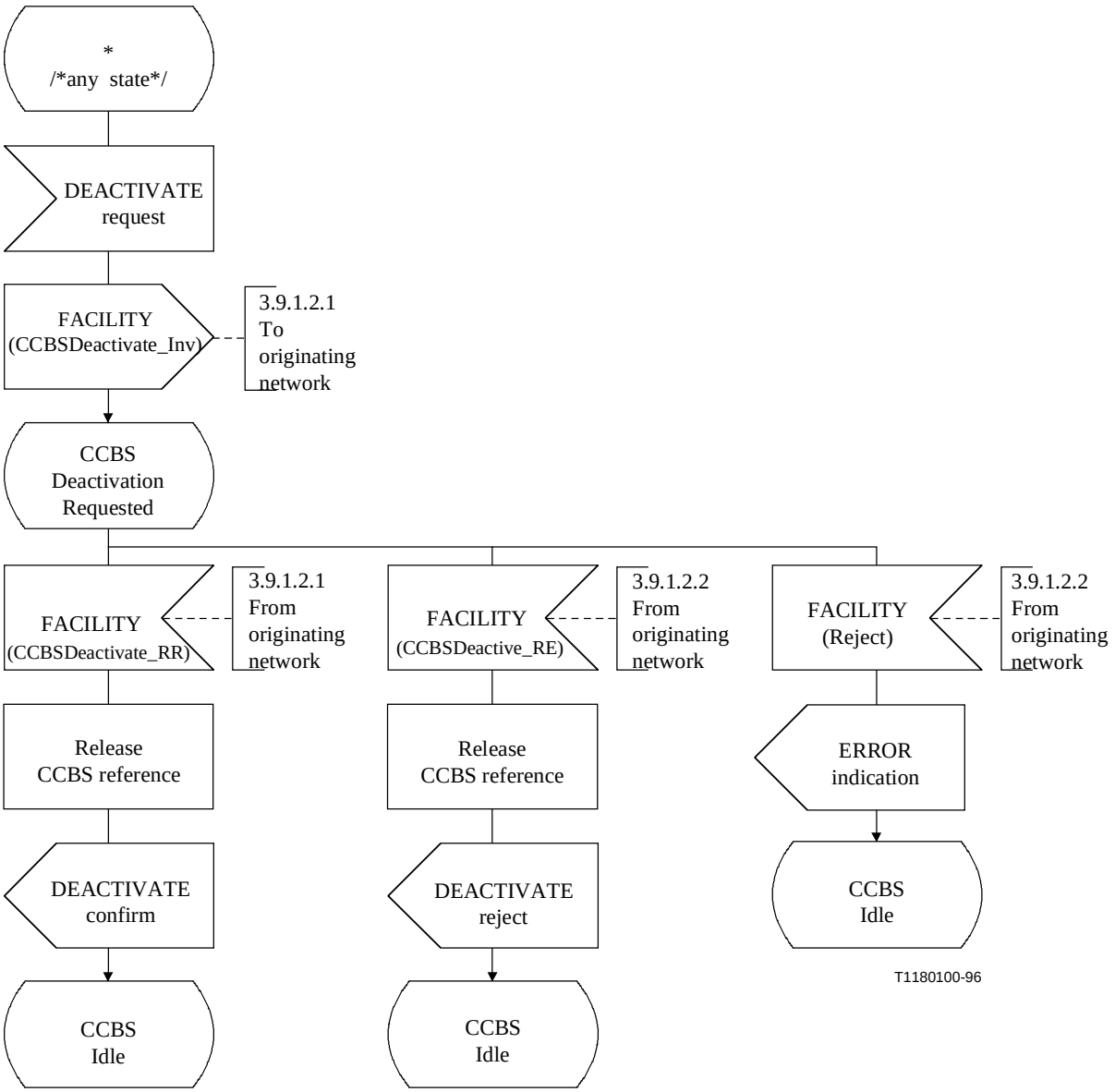


Figure 3.14-1/Q.953.3 (sheet 4 of 38) – Dynamic descriptions

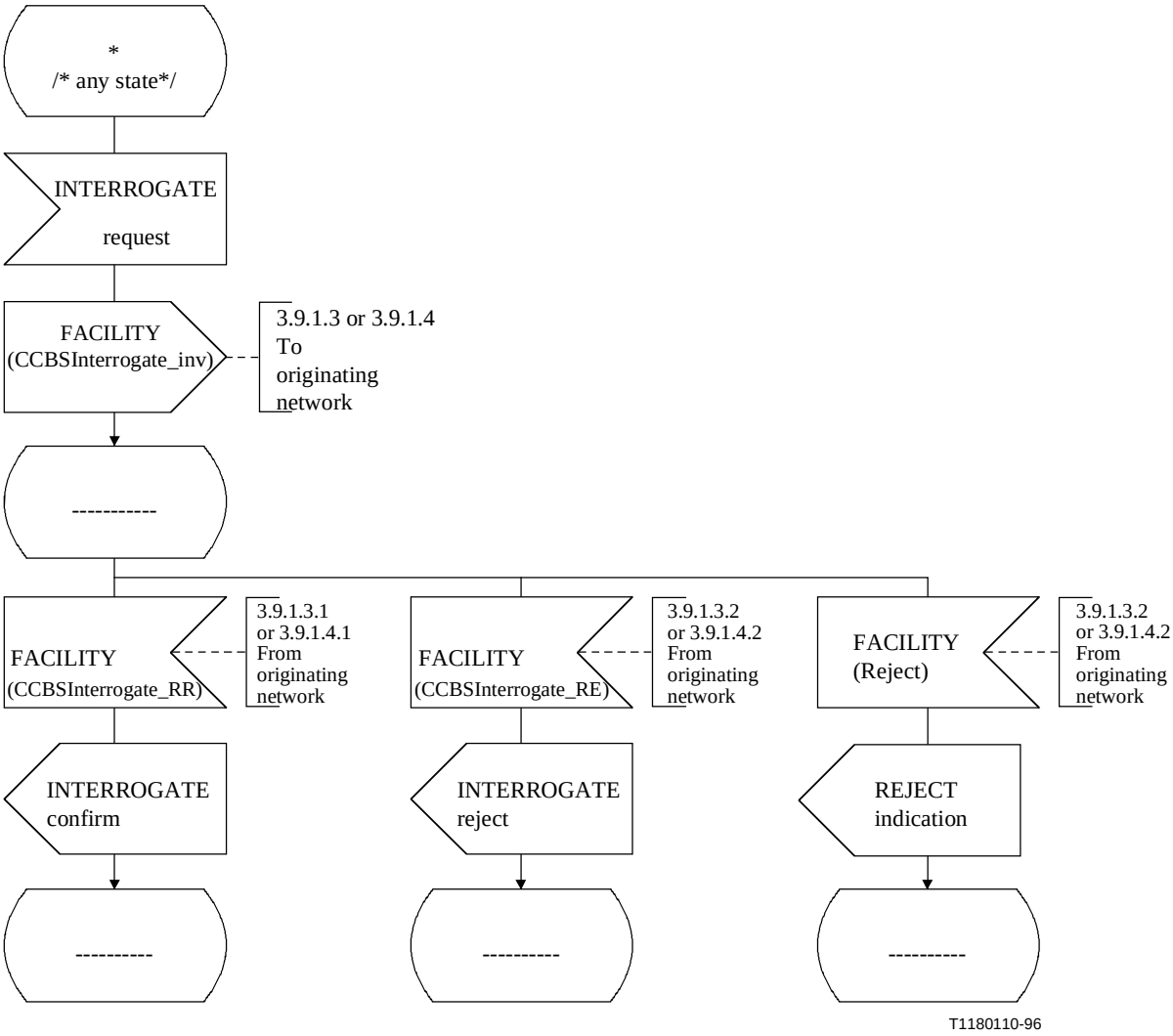


Figure 3.14-1/Q.953.3 (sheet 5 of 38) – Dynamic descriptions

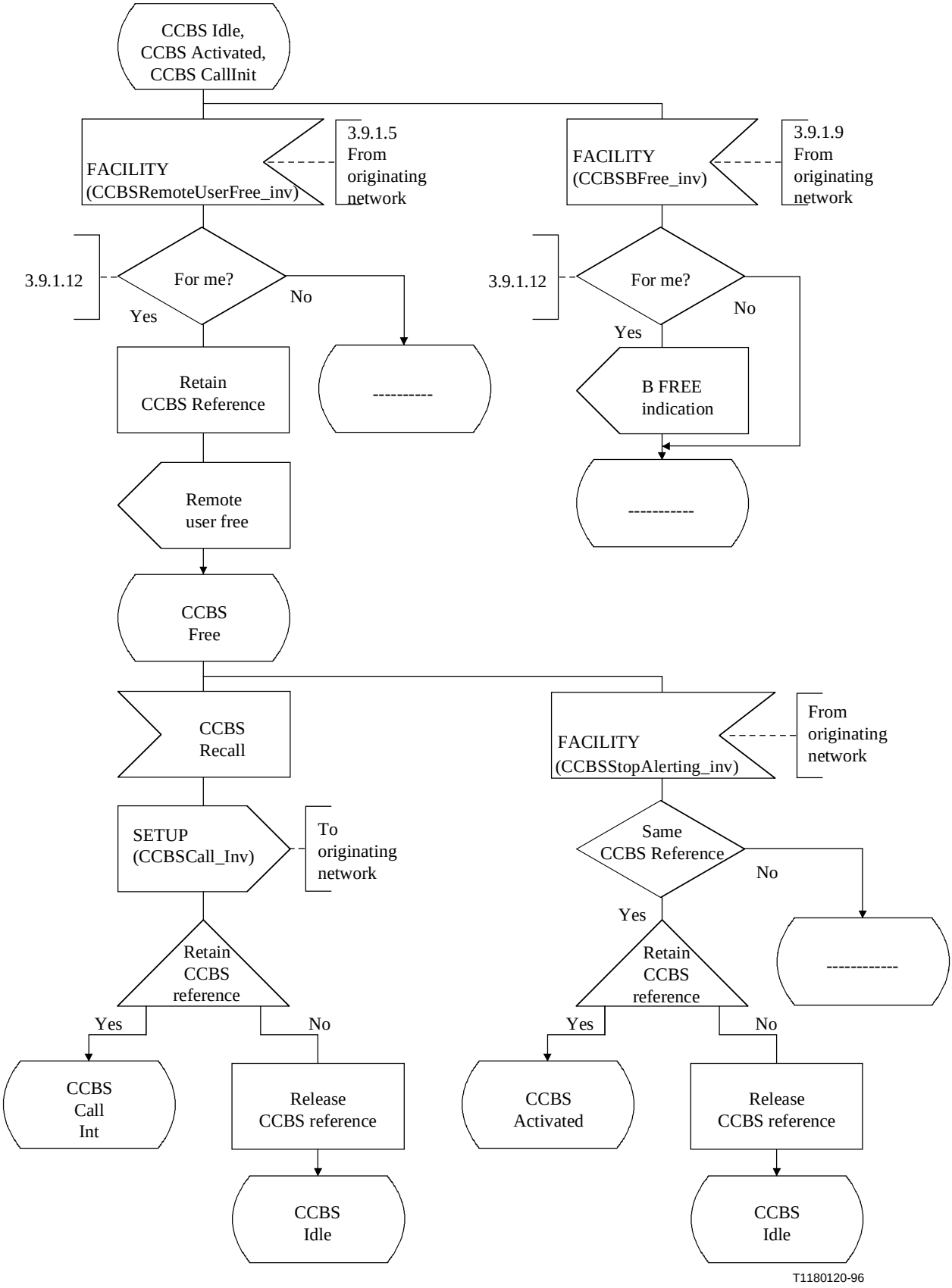


Figure 3.14-1/Q.953.3 (sheet 6 of 38) – Dynamic descriptions

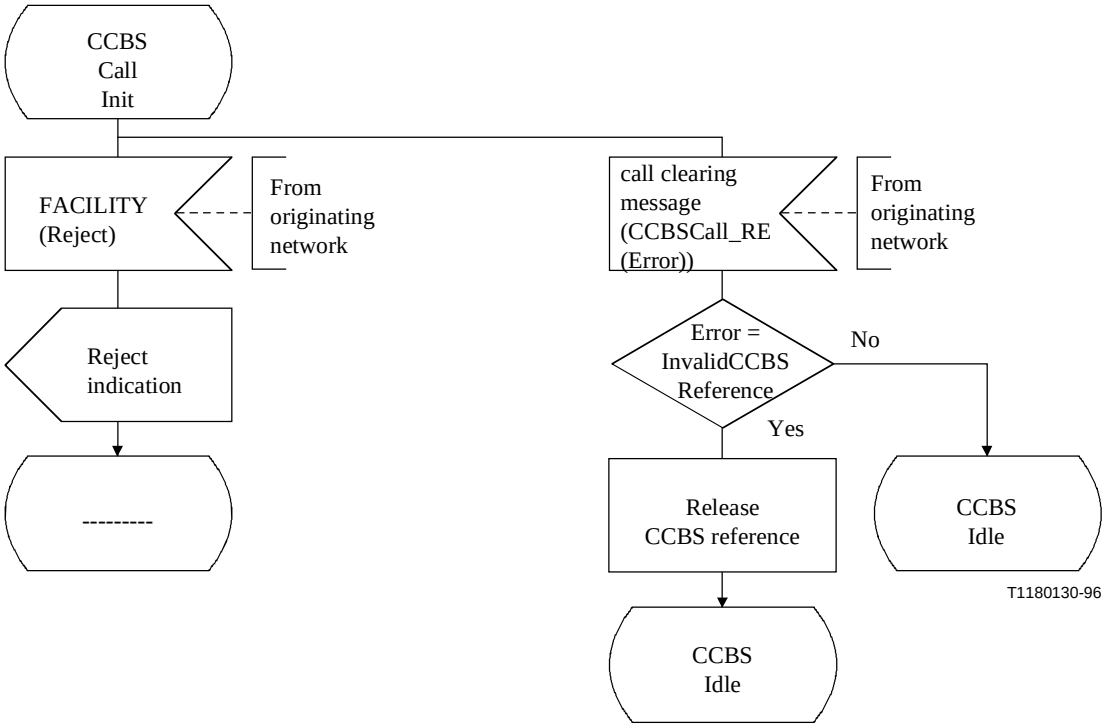


Figure 3.14-1/Q.953.3 (sheet 7 of 38) – Dynamic descriptions

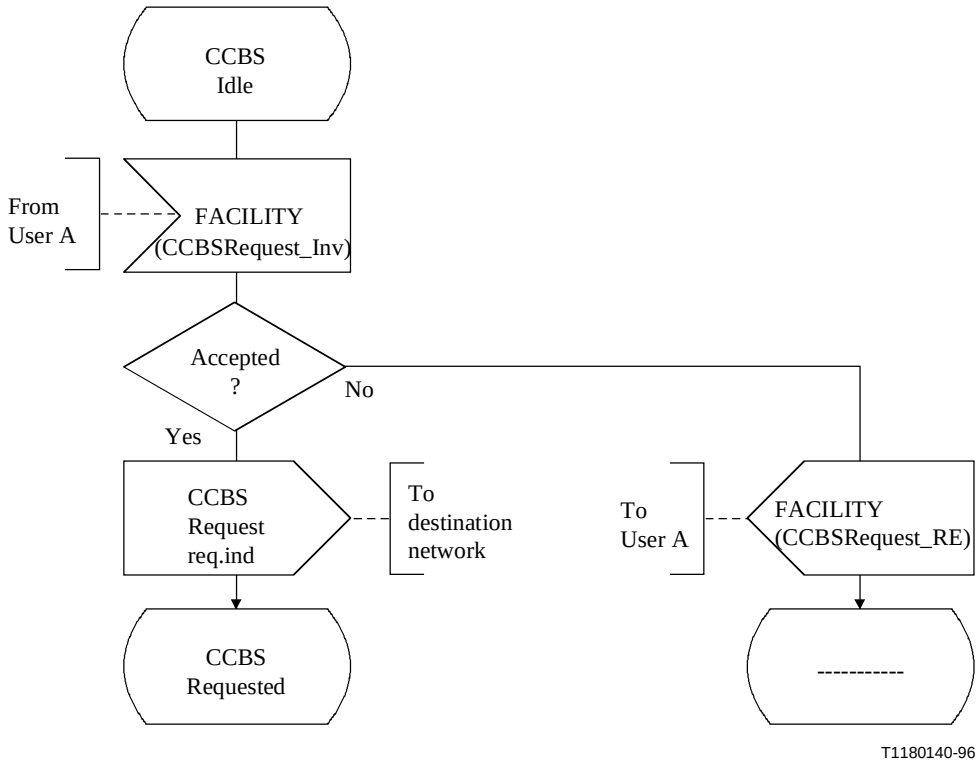


Figure 3.14-1/Q.953.3 (sheet 8 of 38) – Dynamic descriptions

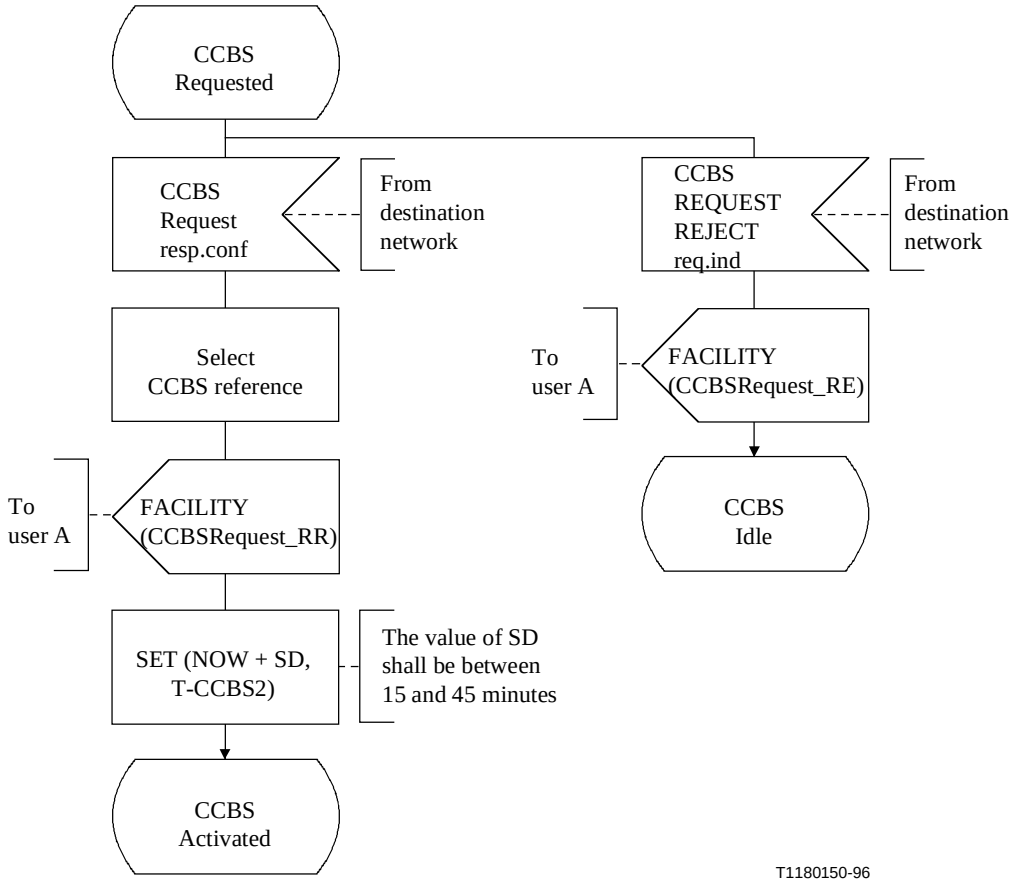


Figure 3.14-1/Q.953.3 (sheet 9 of 38) – Dynamic descriptions

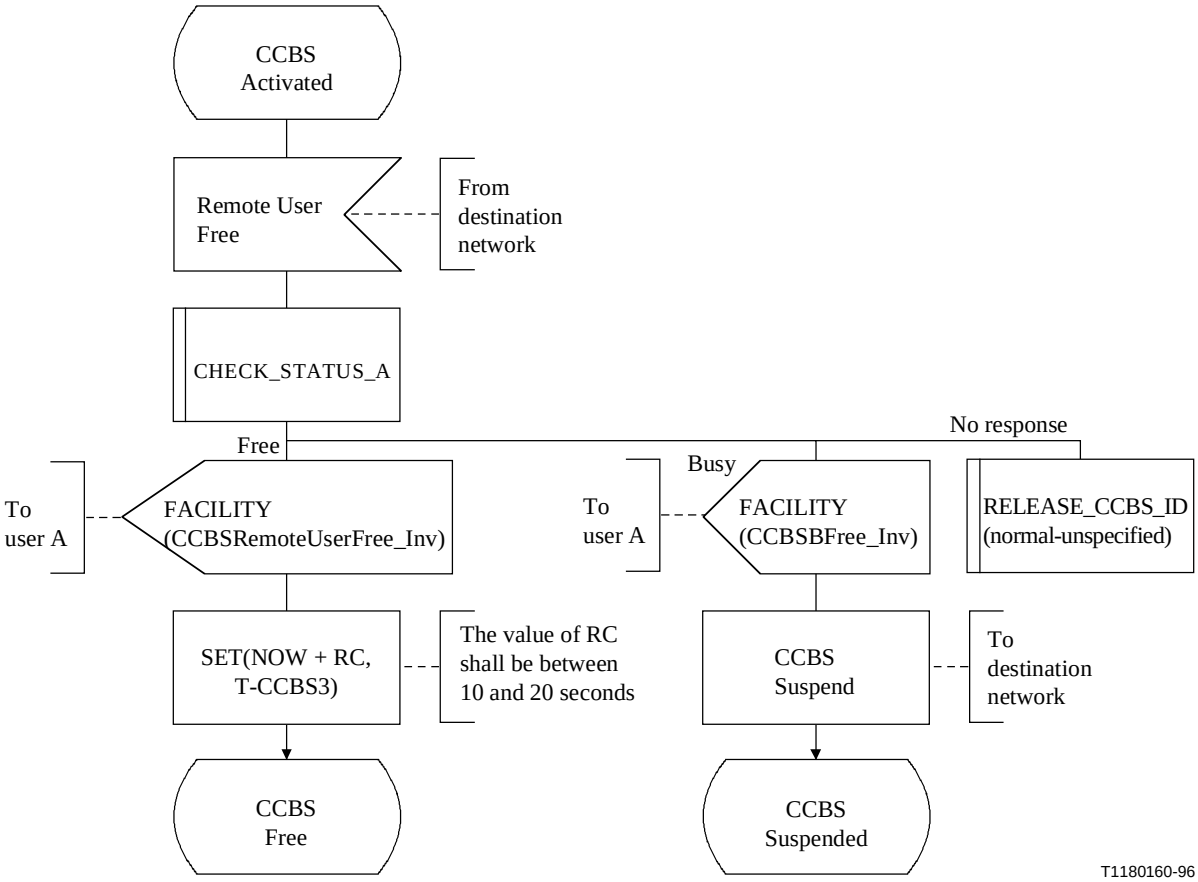


Figure 3.14-1/Q.953.3 (sheet 10 of 38) – Dynamic descriptions

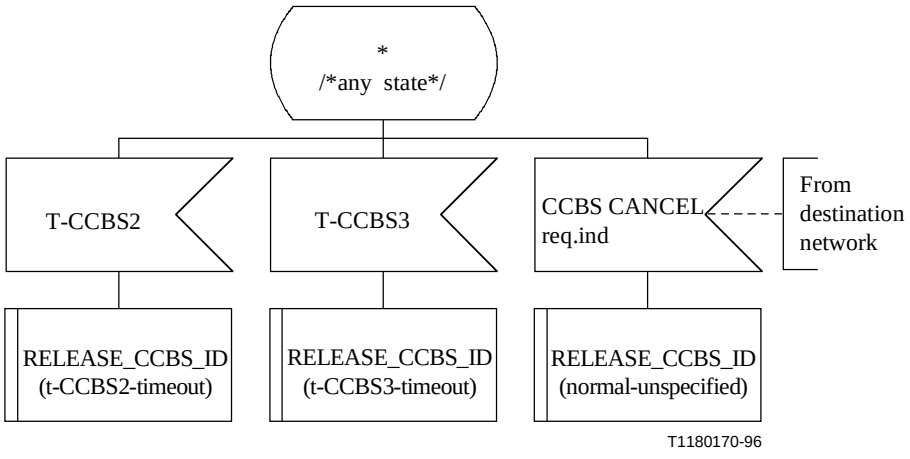


Figure 3.14-1/Q.953.3 (sheet 11 of 38) – Dynamic descriptions

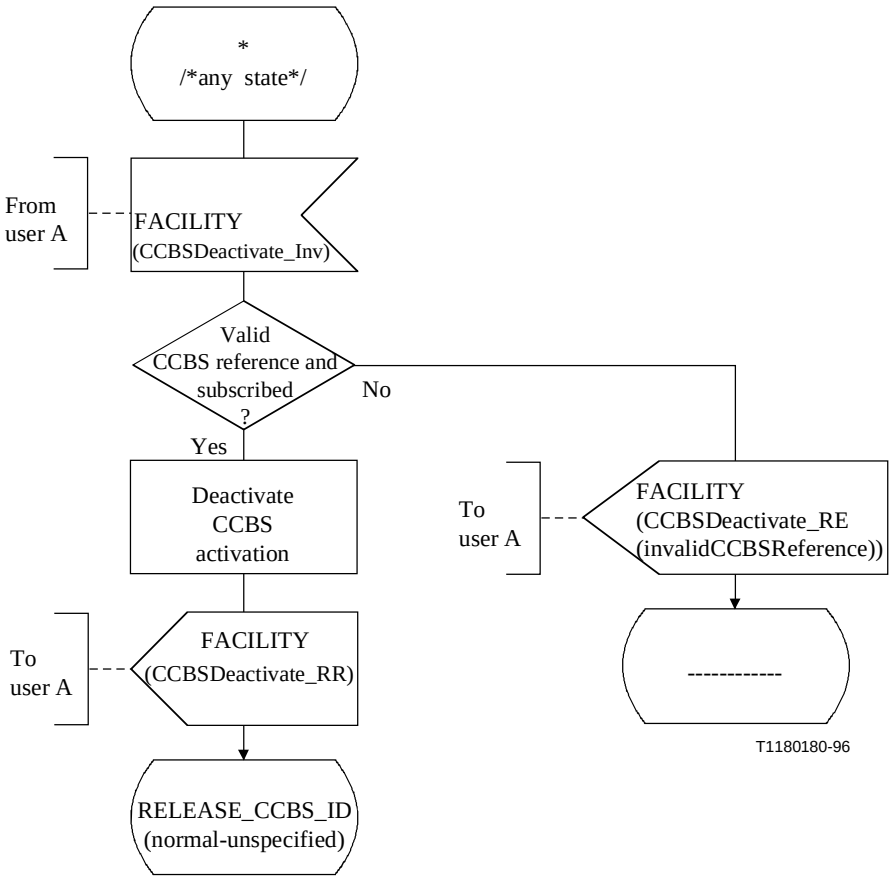


Figure 3.14-1/Q.953.3 (sheet 12 of 38) – Dynamic descriptions

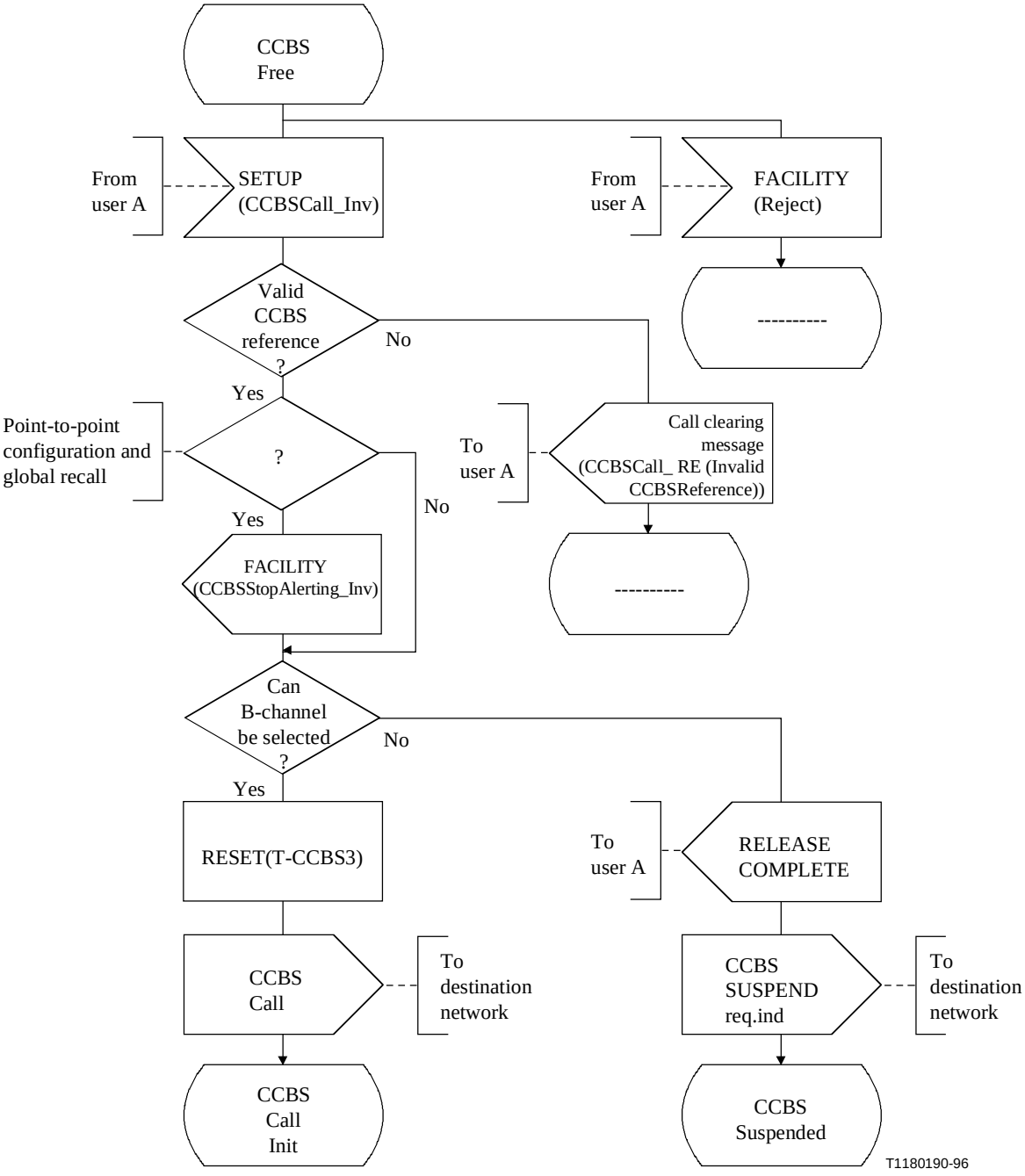


Figure 3.14-1/Q.953.3 (sheet 13 of 38) – Dynamic descriptions

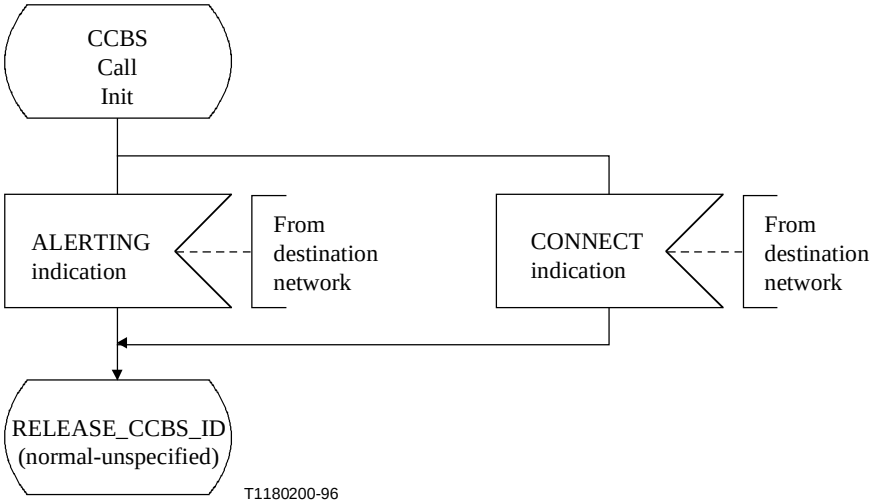


Figure 3.14-1/Q.953.3 (sheet 14 of 38) – Dynamic descriptions

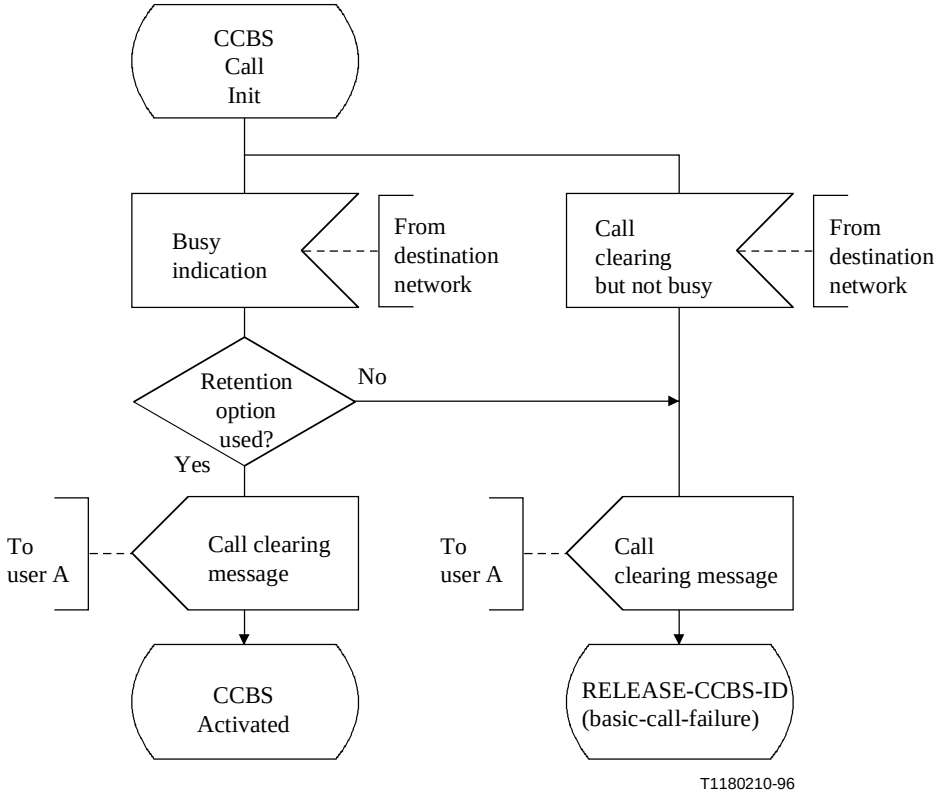


Figure 3.14-1/Q.953.3 (sheet 15 of 38) – Dynamic descriptions

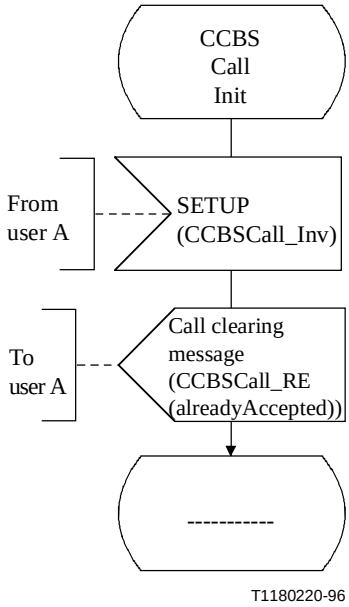


Figure 3.14-1/Q.953.3 (sheet 16 of 38) – Dynamic descriptions

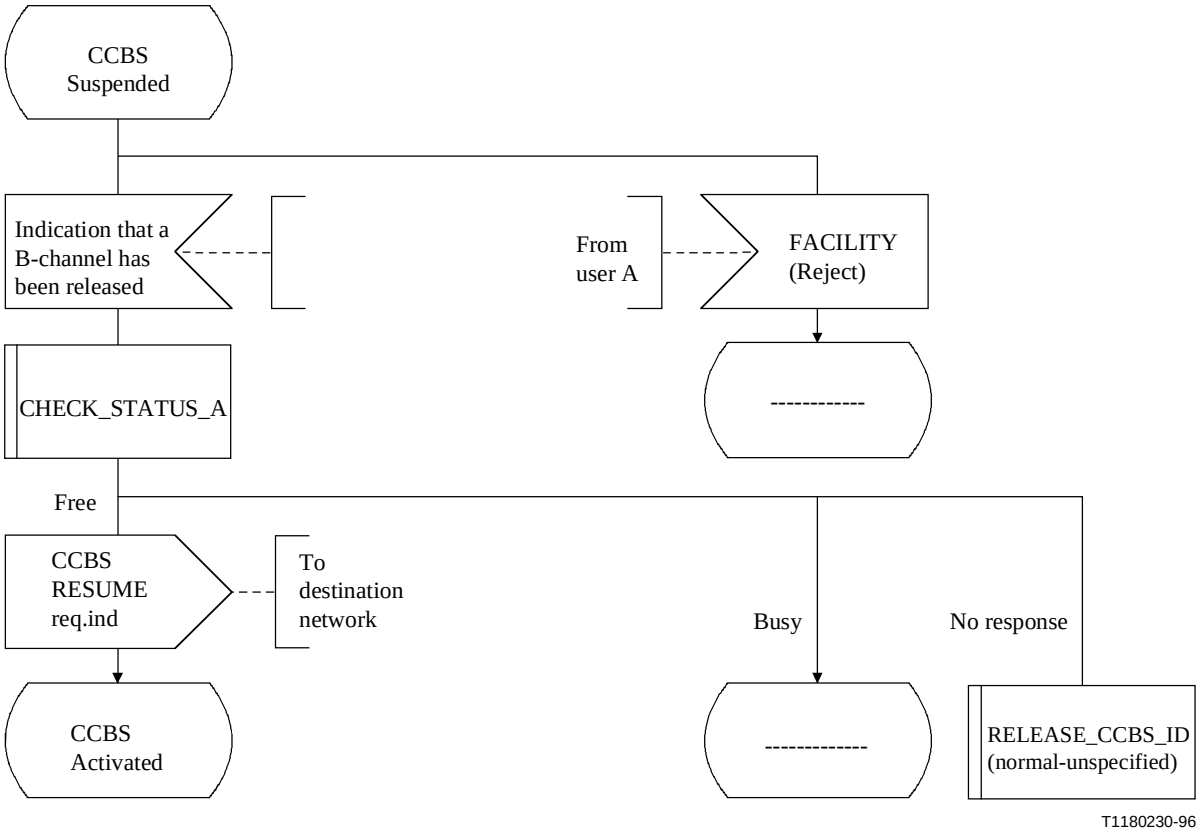


Figure 3.14-1/Q.953.3 (sheet 17 of 38) – Dynamic descriptions

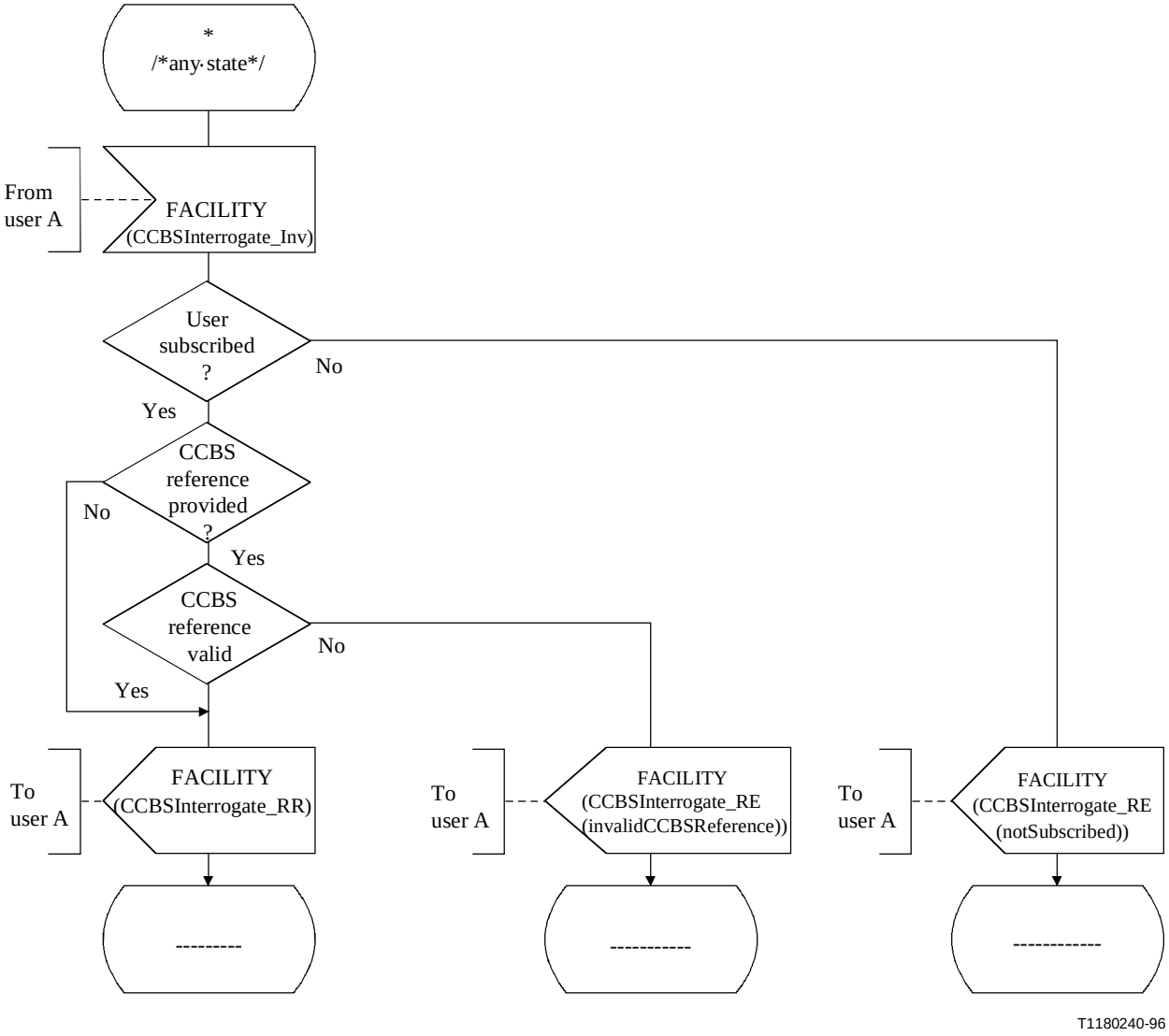


Figure 3.14-1/Q.953.3 (sheet 18 of 38) – Dynamic descriptions

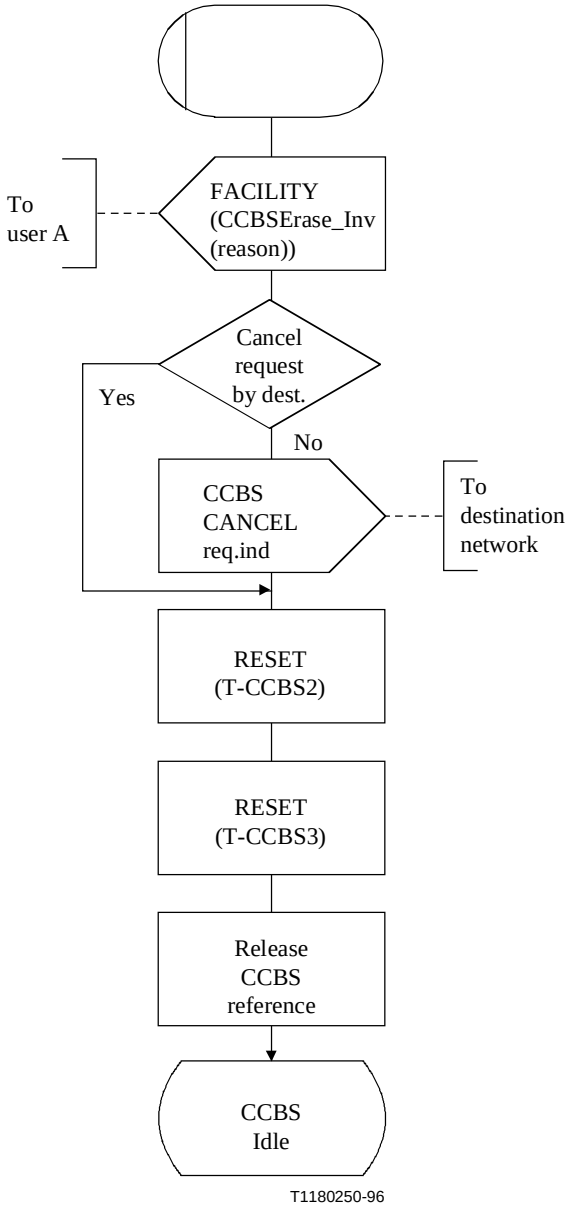


Figure 3.14-1/Q.953.3 (sheet 19 of 38) – Dynamic descriptions

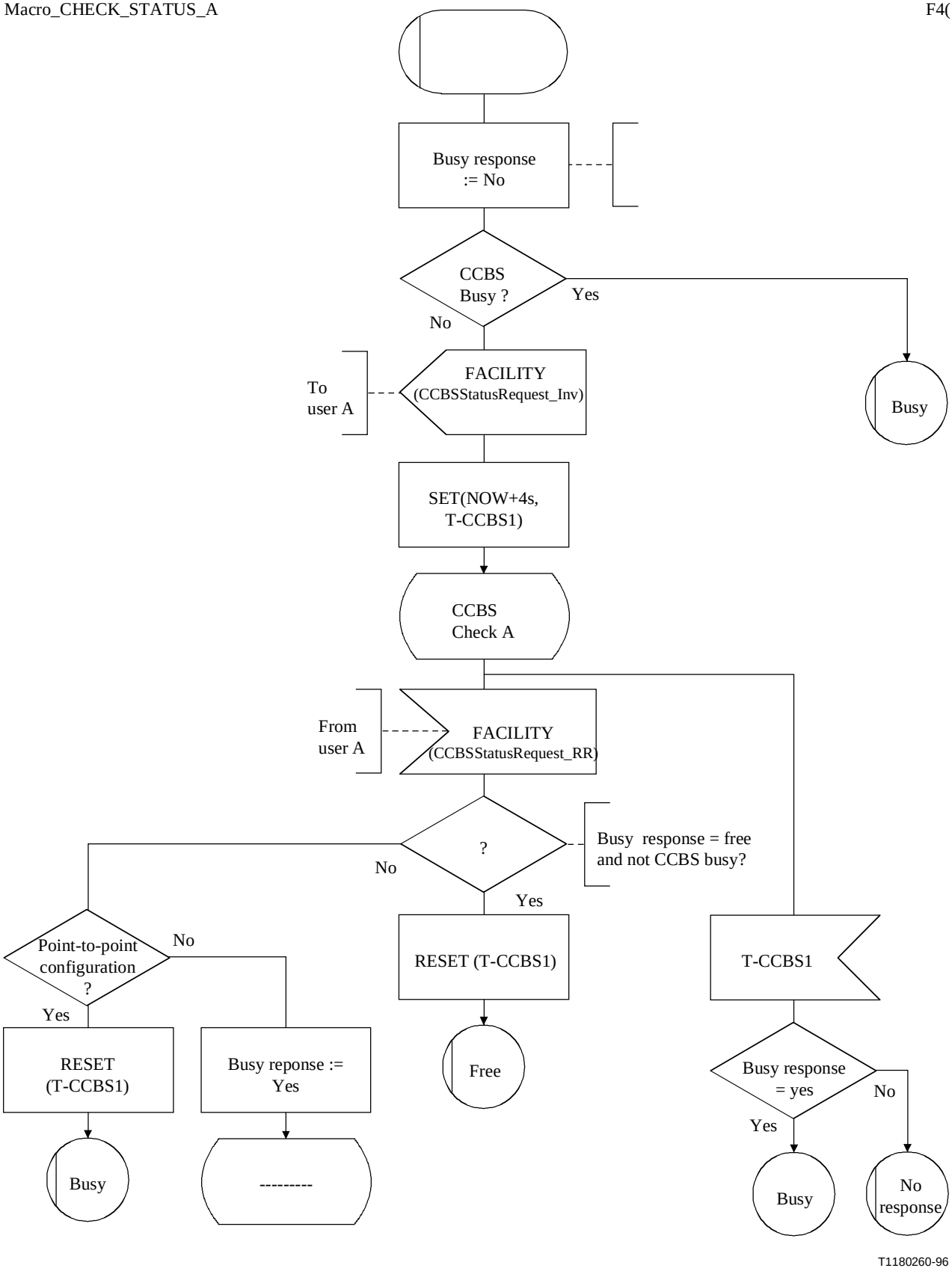


Figure 3.14-1/Q.953.3 (sheet 20 of 38) – Dynamic descriptions

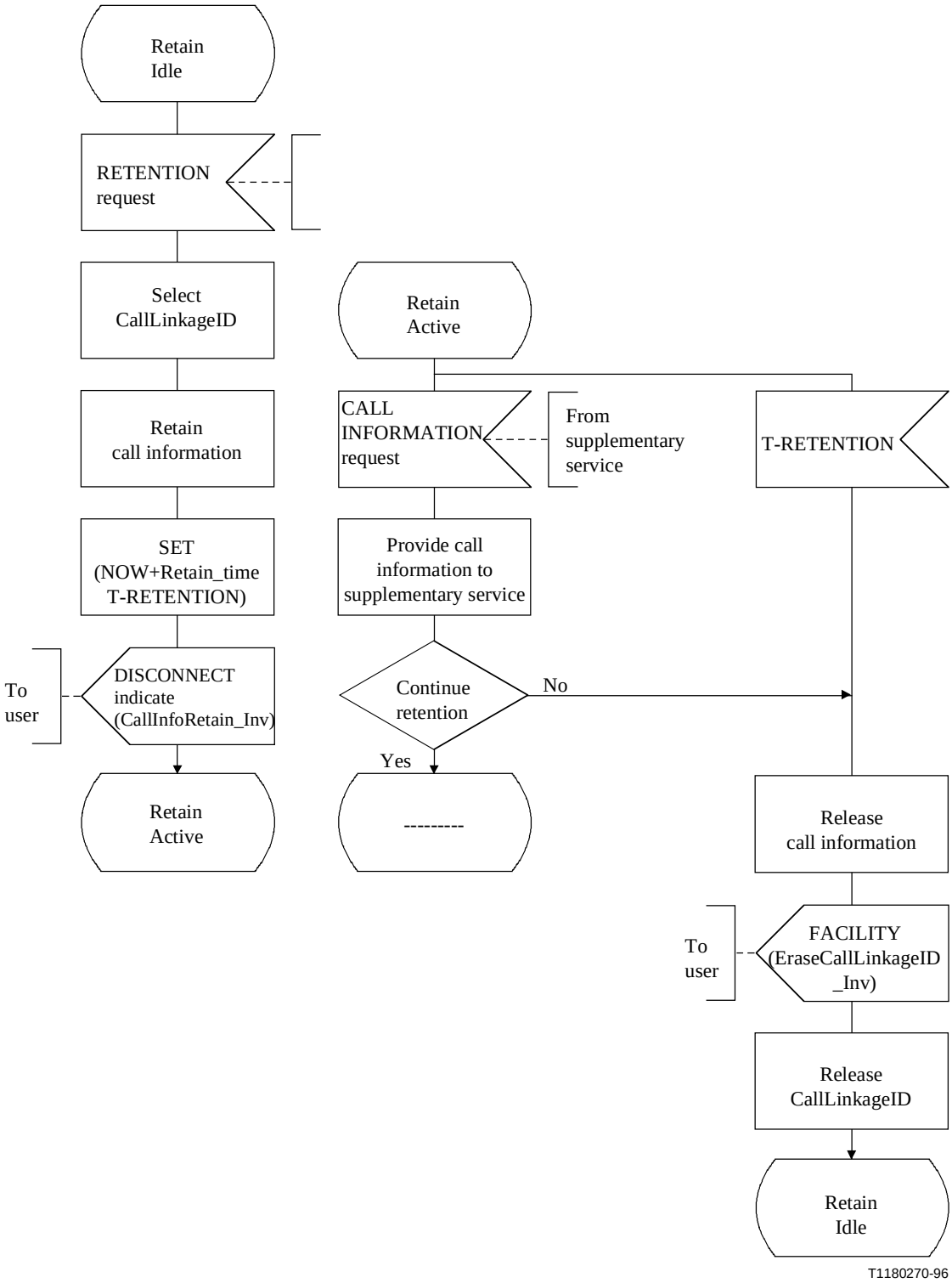


Figure 3.14-1/Q.953.3 (sheet 21 of 38) – Dynamic descriptions

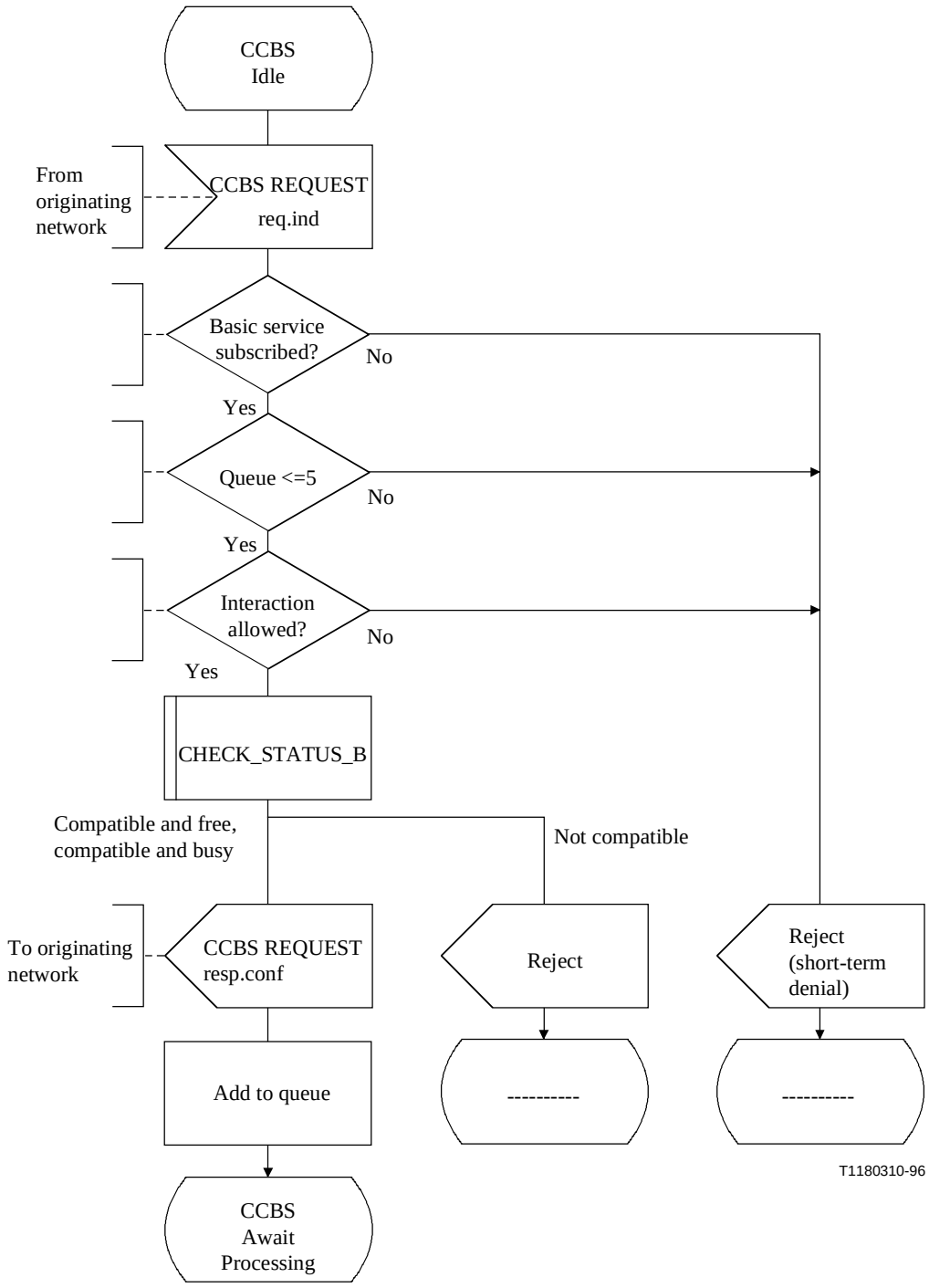


Figure 3.14-1/Q.953.3 (sheet 22 of 38) – Dynamic descriptions

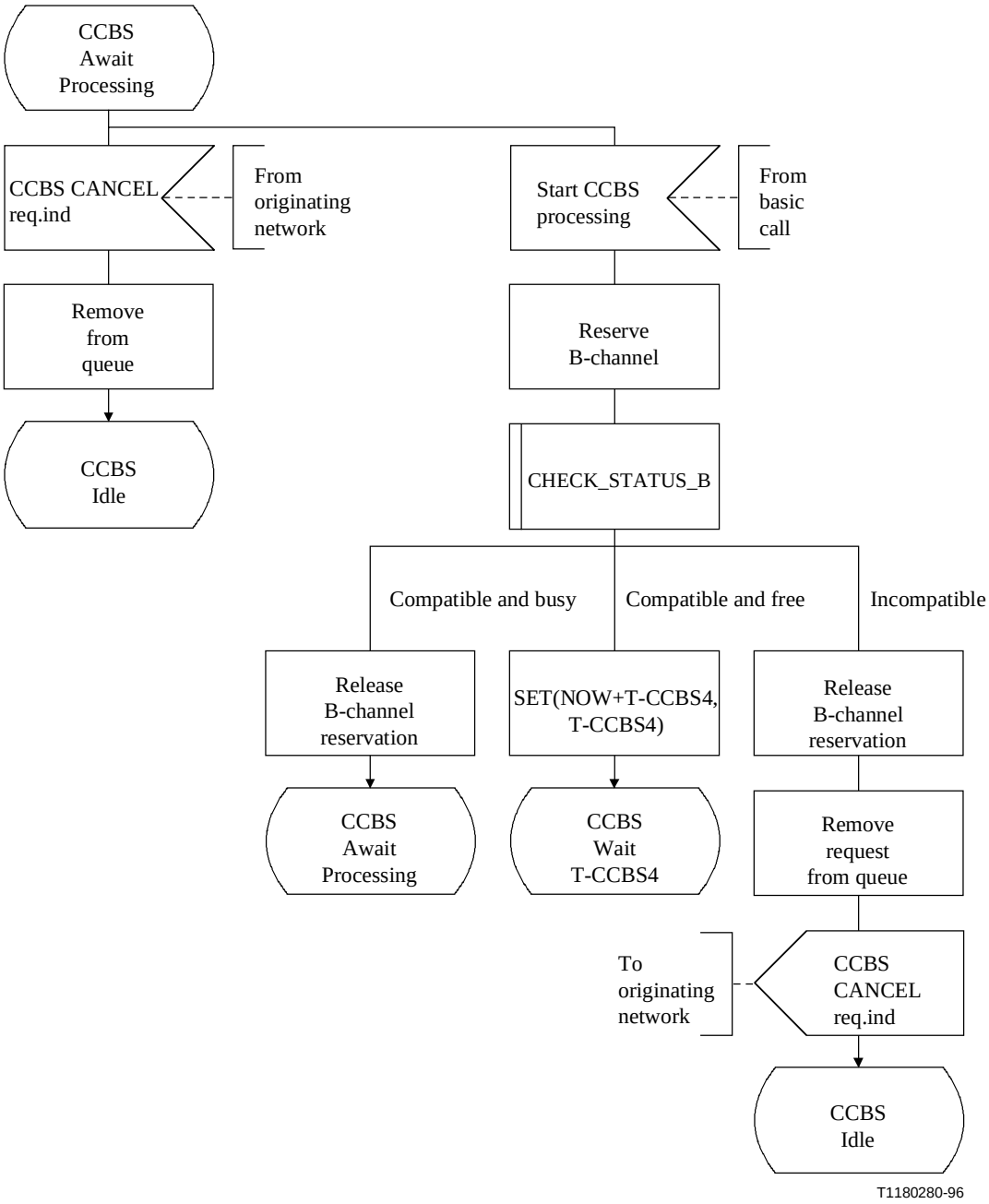


Figure 3.14-1/Q.953.3 (sheet 23 of 38) – Dynamic descriptions

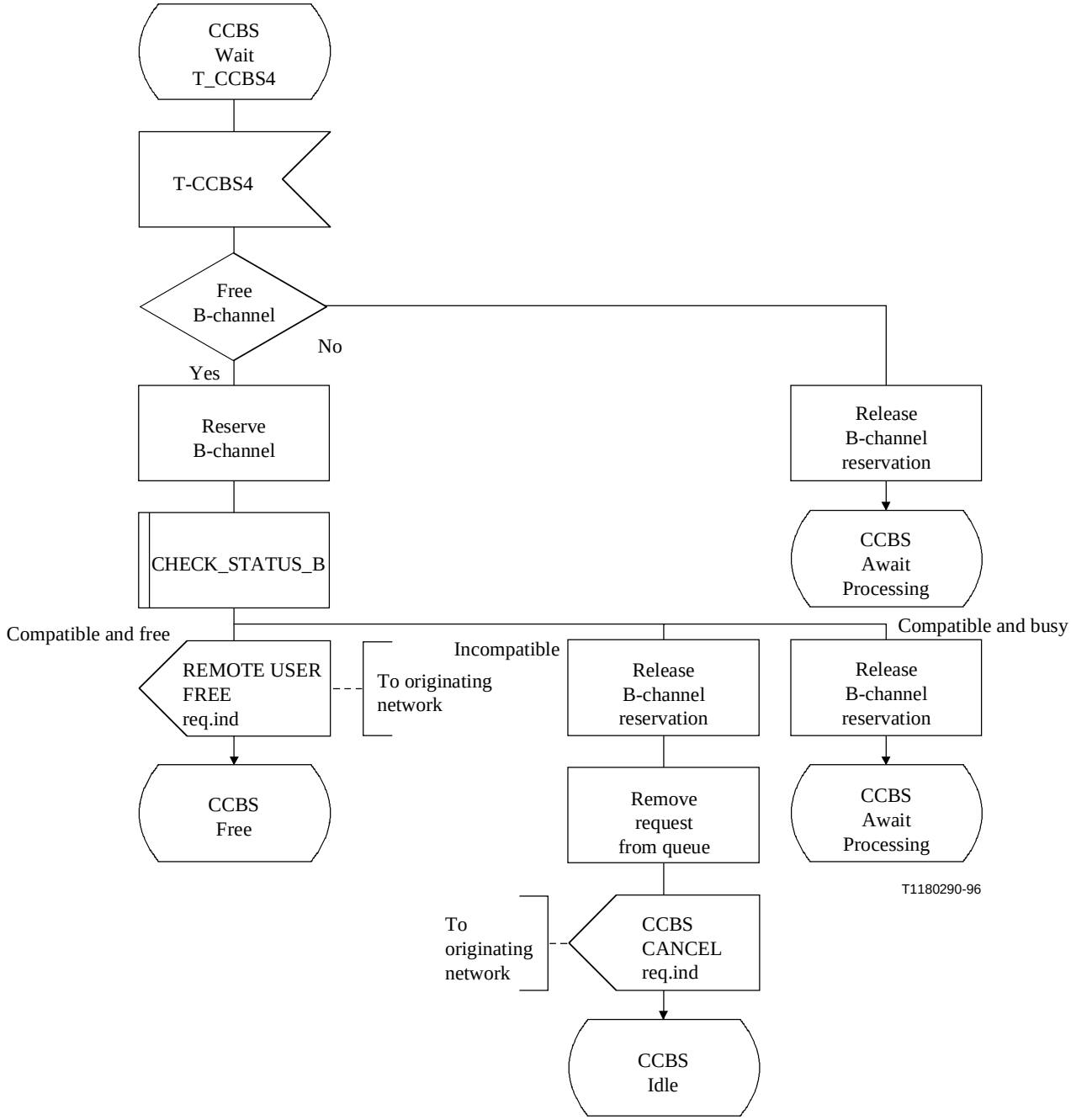


Figure 3.14-1/Q.953.3 (sheet 24 of 38) – Dynamic descriptions

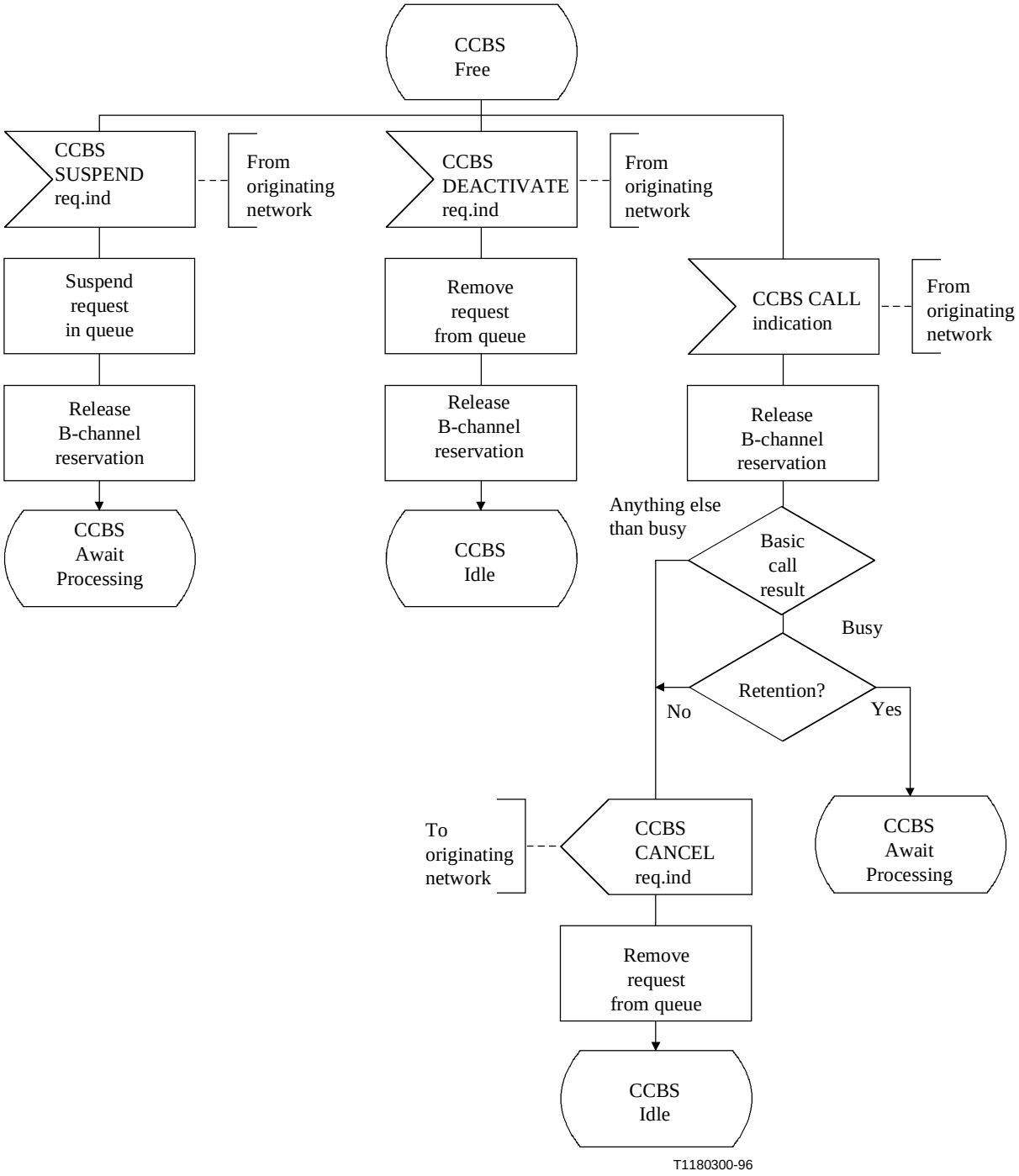


Figure 3.14-1/Q.953.3 (sheet 25 of 38) – Dynamic descriptions

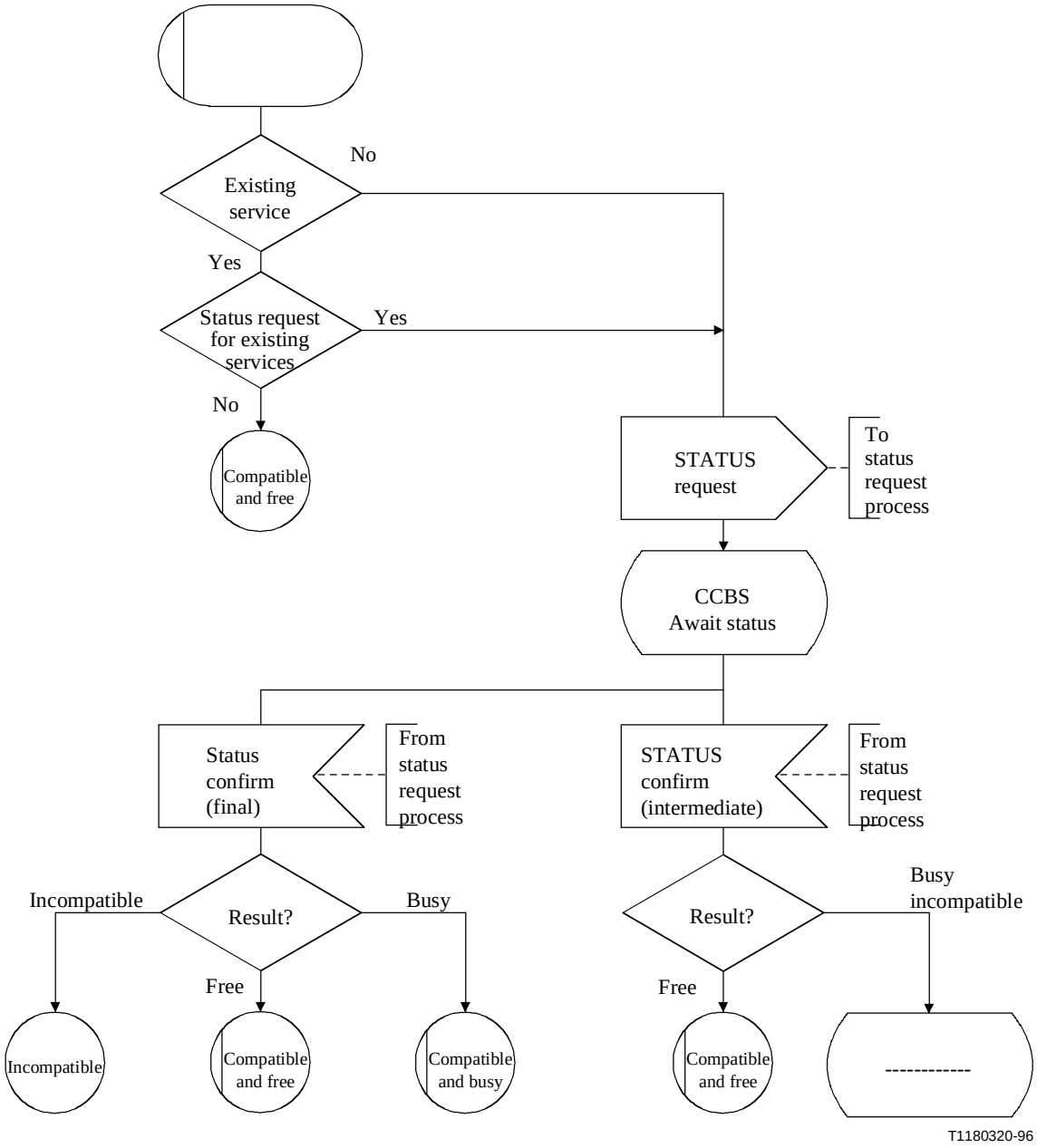


Figure 3.14-1/Q.953.3 (sheet 26 of 38) – Dynamic descriptions

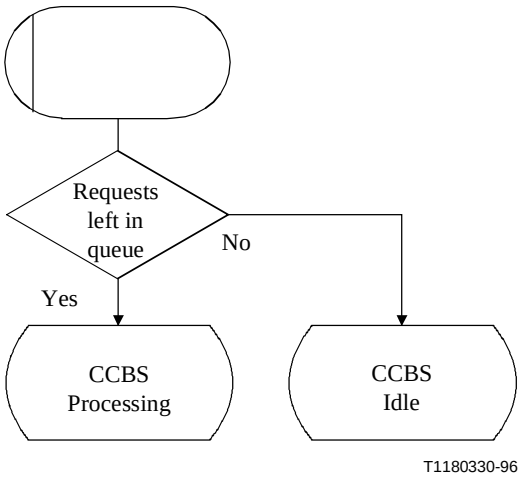


Figure 3.14-1/Q.953.3 (sheet 27 of 38) – Dynamic descriptions

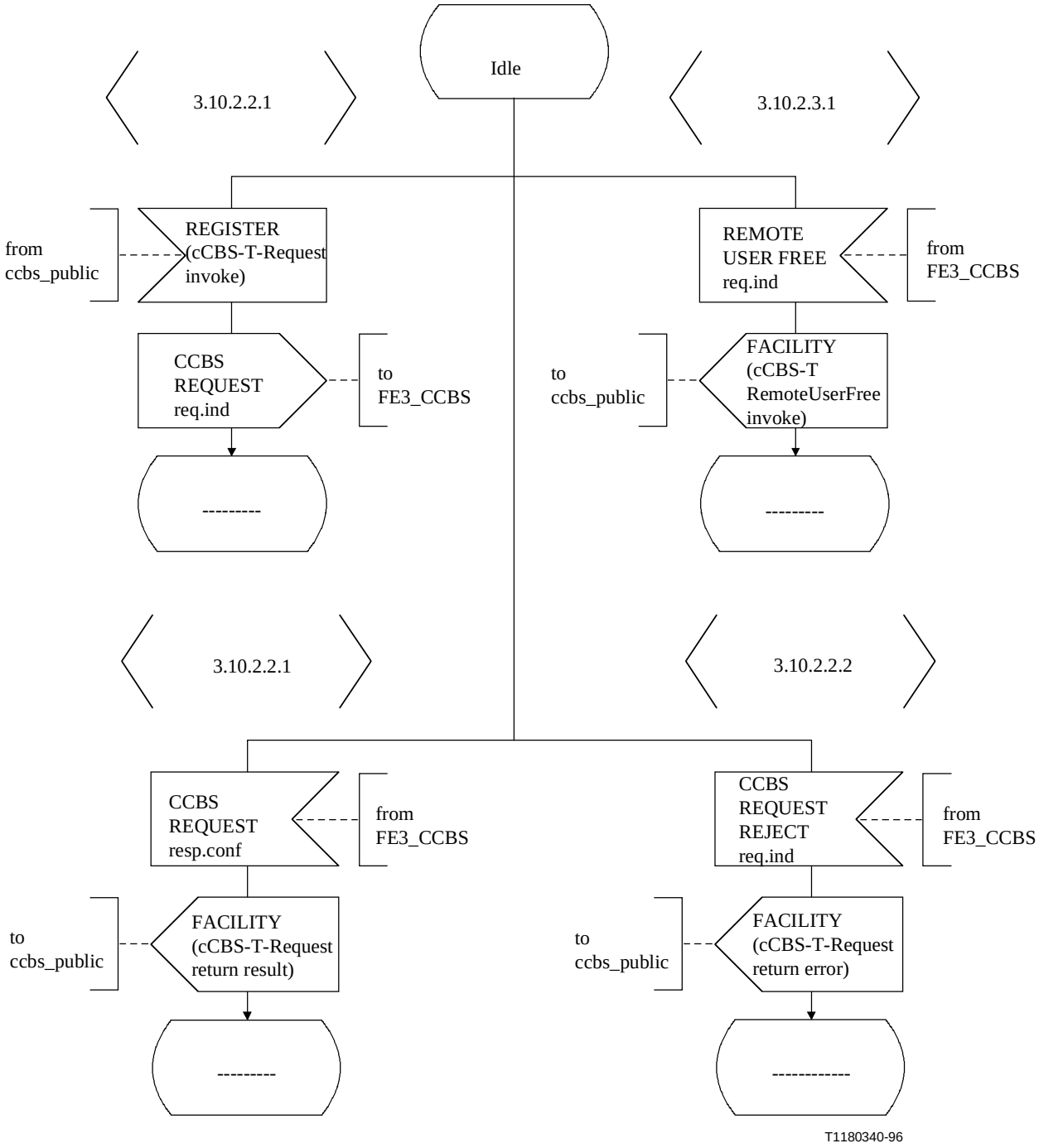


Figure 3.14-1/Q.953.3 (sheet 28 of 38) – Dynamic descriptions

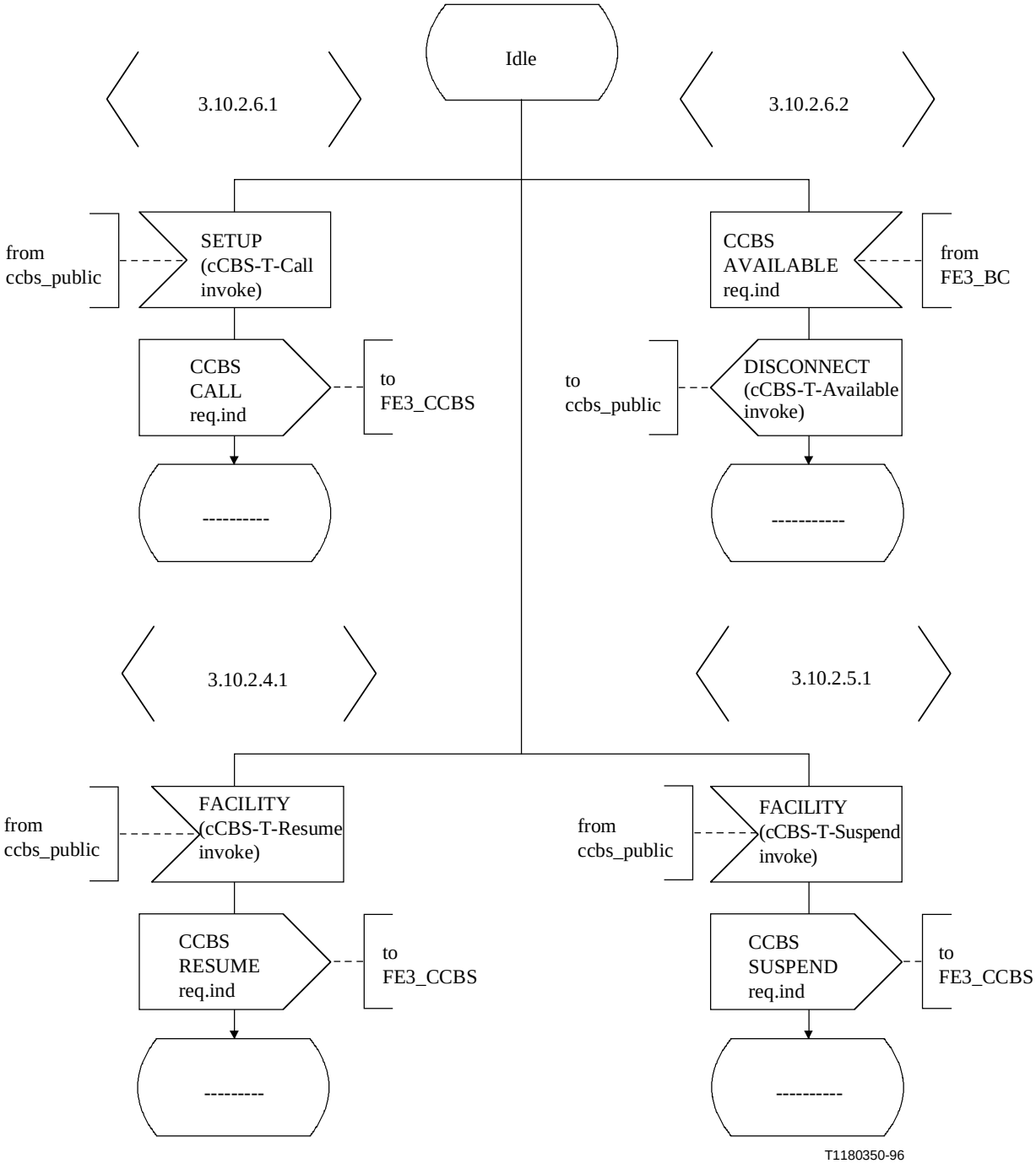


Figure 3.14-1/Q.953.3 (sheet 29 of 38) – Dynamic descriptions

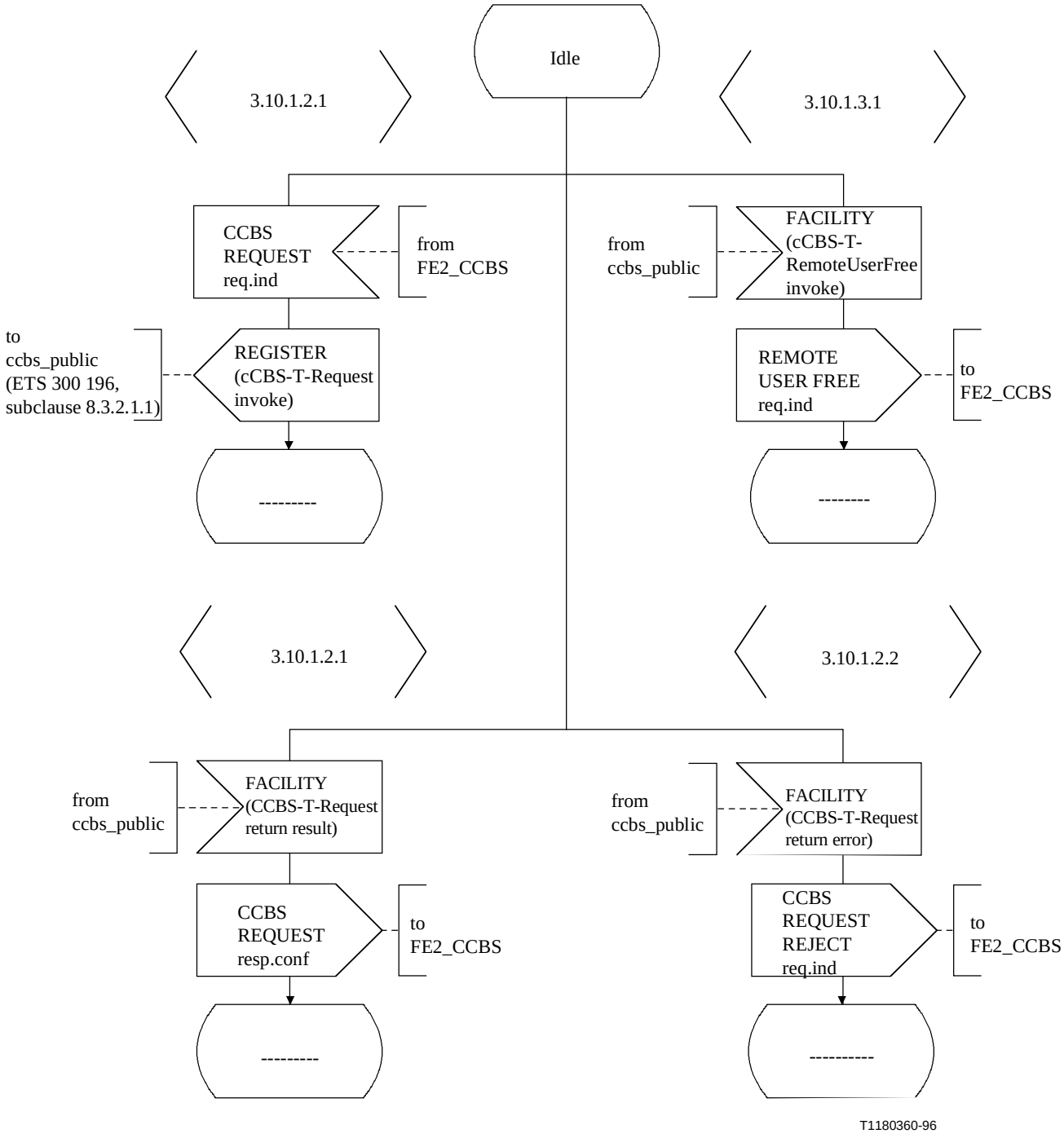


Figure 3.14-1/Q.953.3 (sheet 30 of 38) – Dynamic descriptions

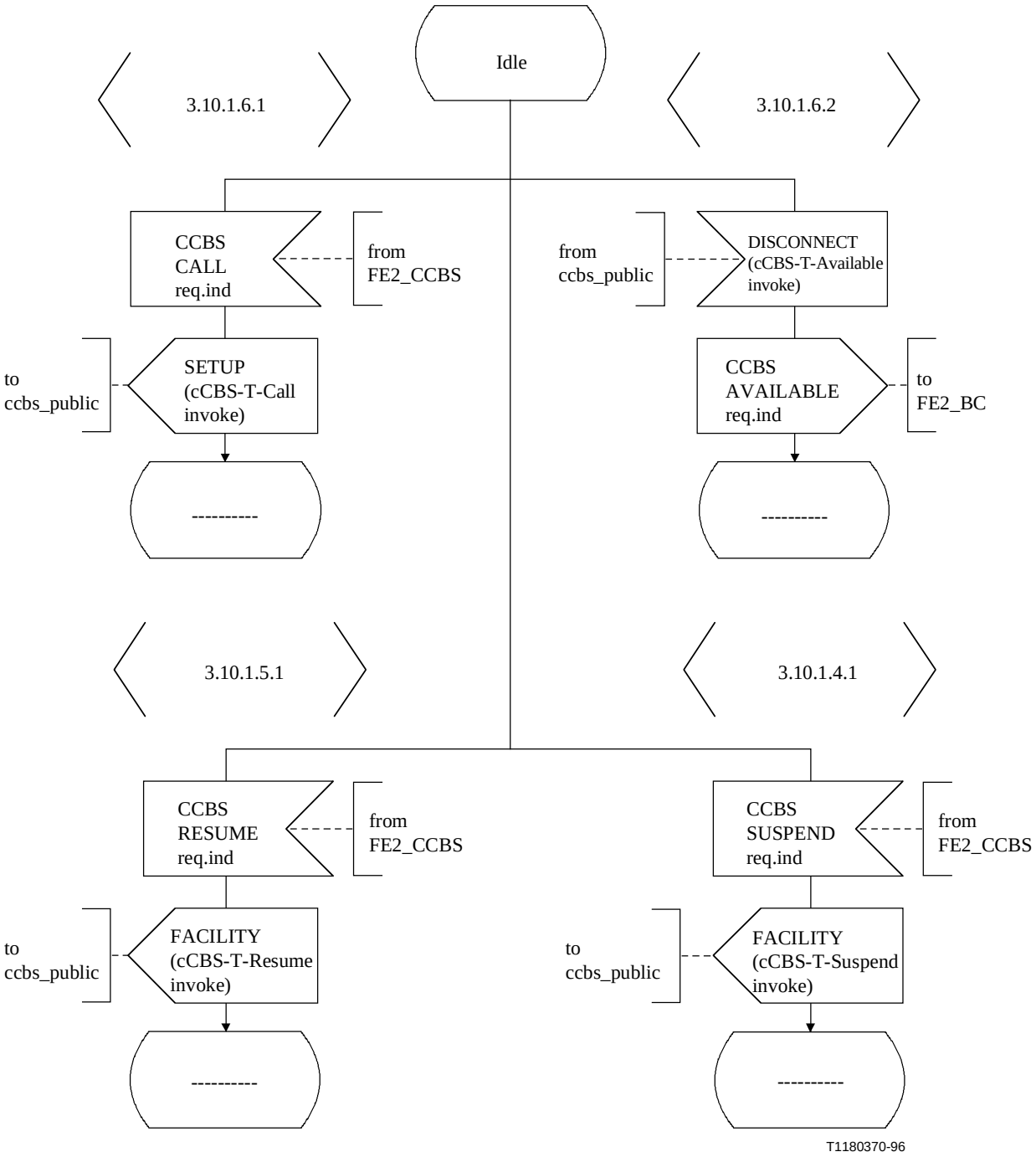


Figure 3.14-1/Q.953.3 (sheet 31 of 38) – Dynamic descriptions

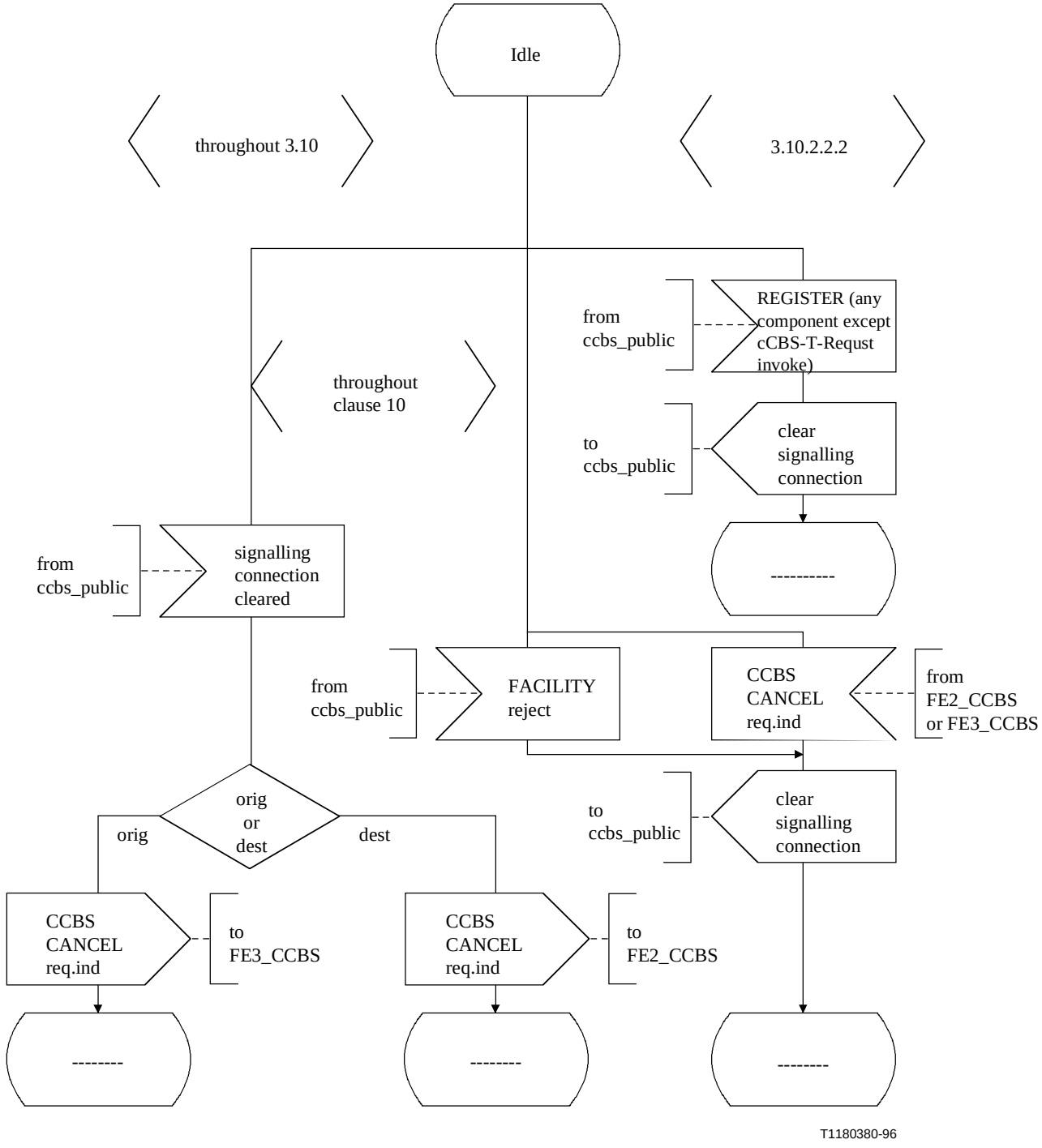
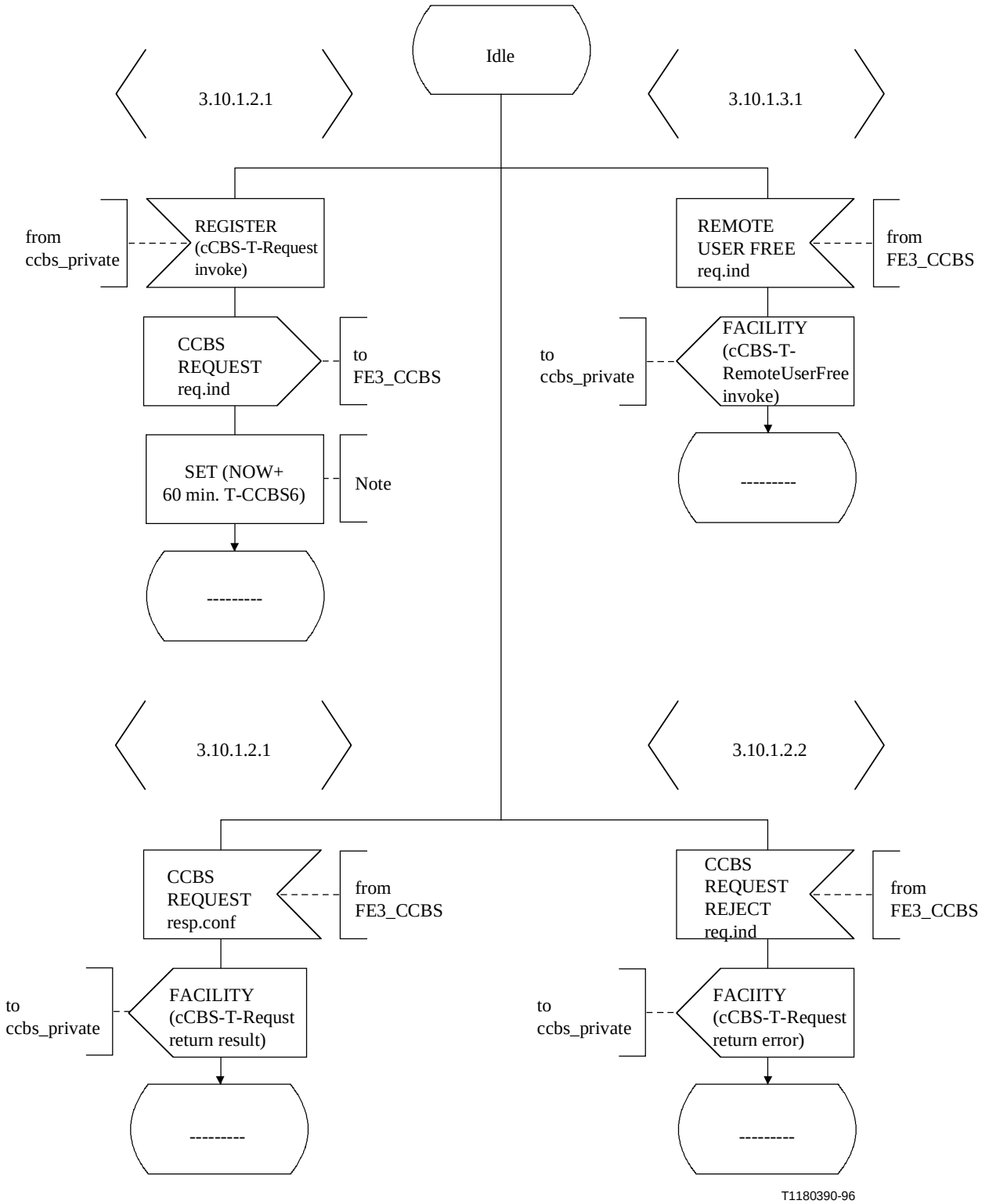


Figure 3.14-1/Q.953.3 (sheet 32 of 38) – Dynamic descriptions



NOTE – The functionality of timer T-CCBS6 need not be provided in the DSS 1 protocol if equivalent functionality is provided at the same network node by SS No. 7.

Figure 3.14-1/Q.953.3 (sheet 33 of 38) – Dynamic descriptions

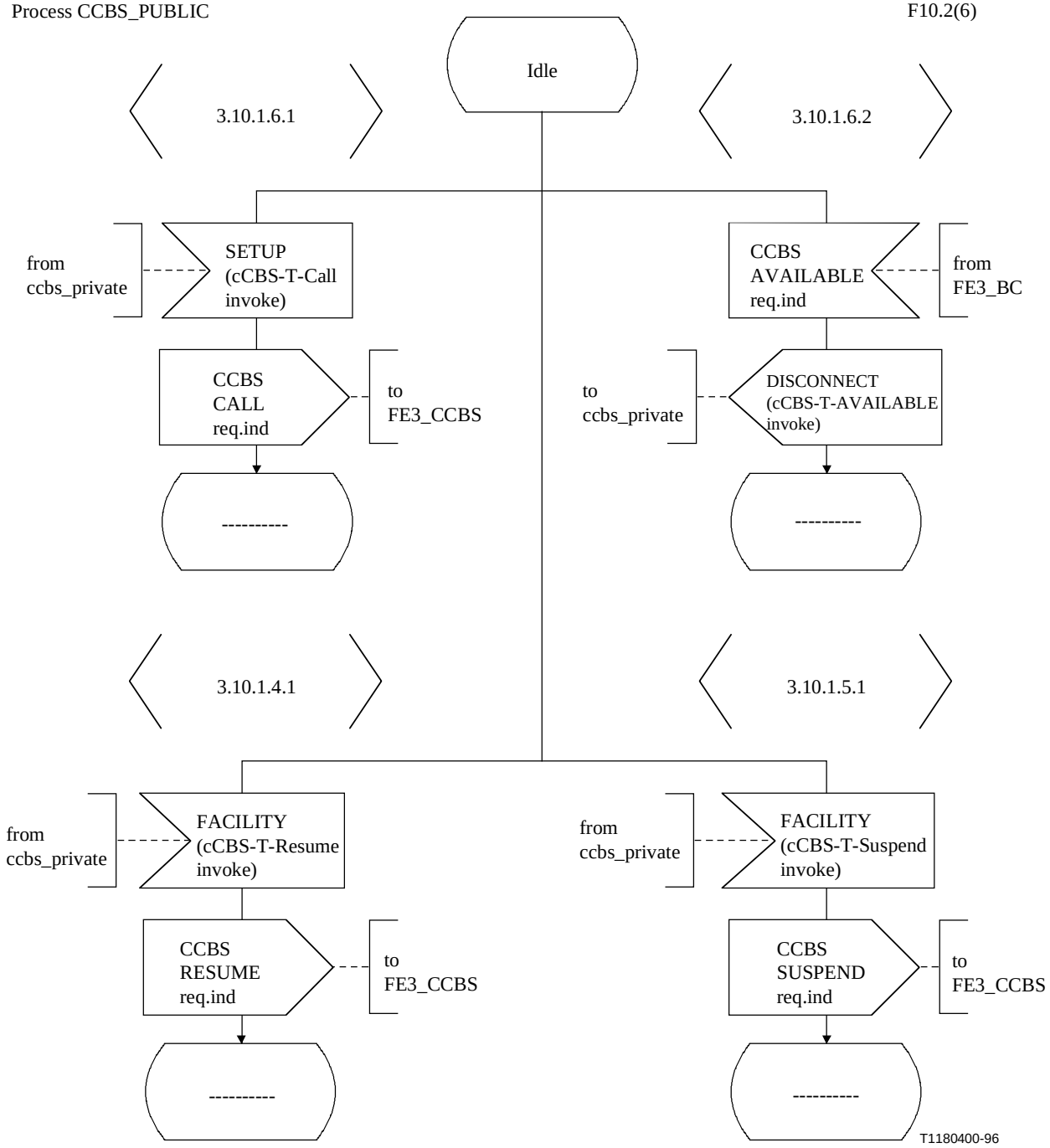
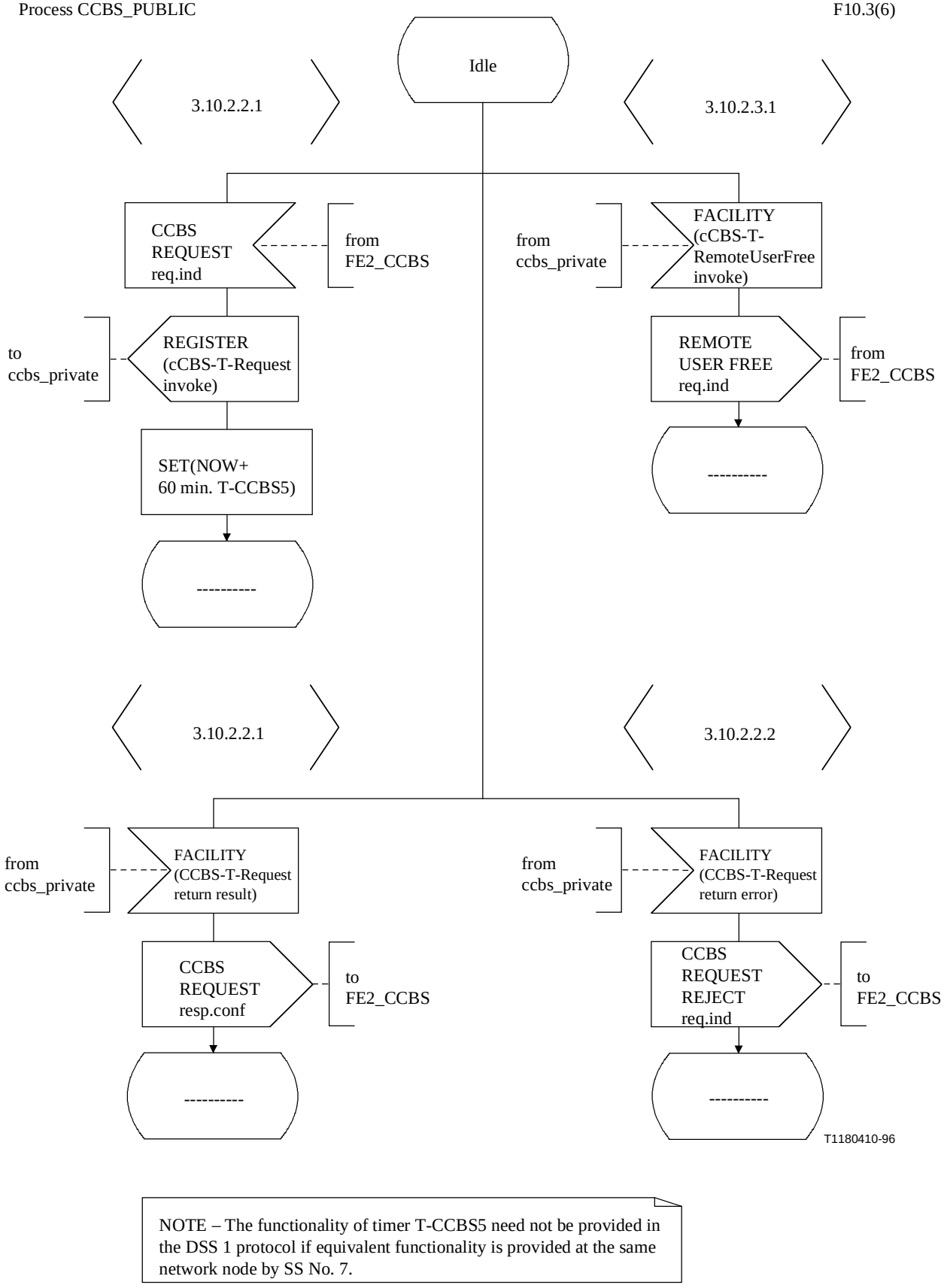


Figure 3.14-1/Q.953.3 (sheet 34 of 38) – Dynamic descriptions



NOTE – The functionality of timer T-CCBS5 need not be provided in the DSS 1 protocol if equivalent functionality is provided at the same network node by SS No. 7.

Figure 3.14-1/Q.953.3 (sheet 35 of 38) – Dynamic descriptions

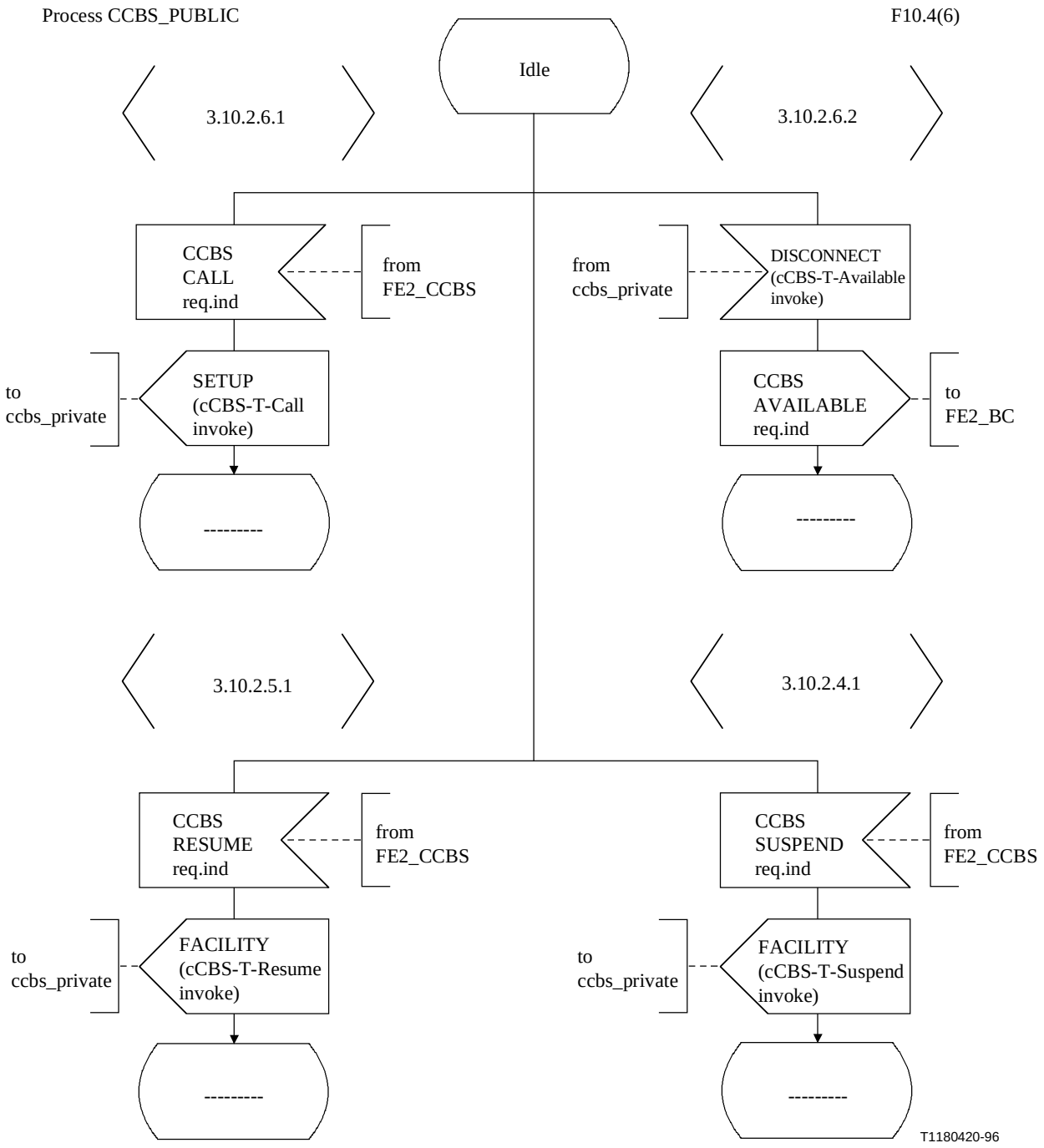


Figure 3.14-1/Q.953.3 (sheet 36 of 38) – Dynamic descriptions

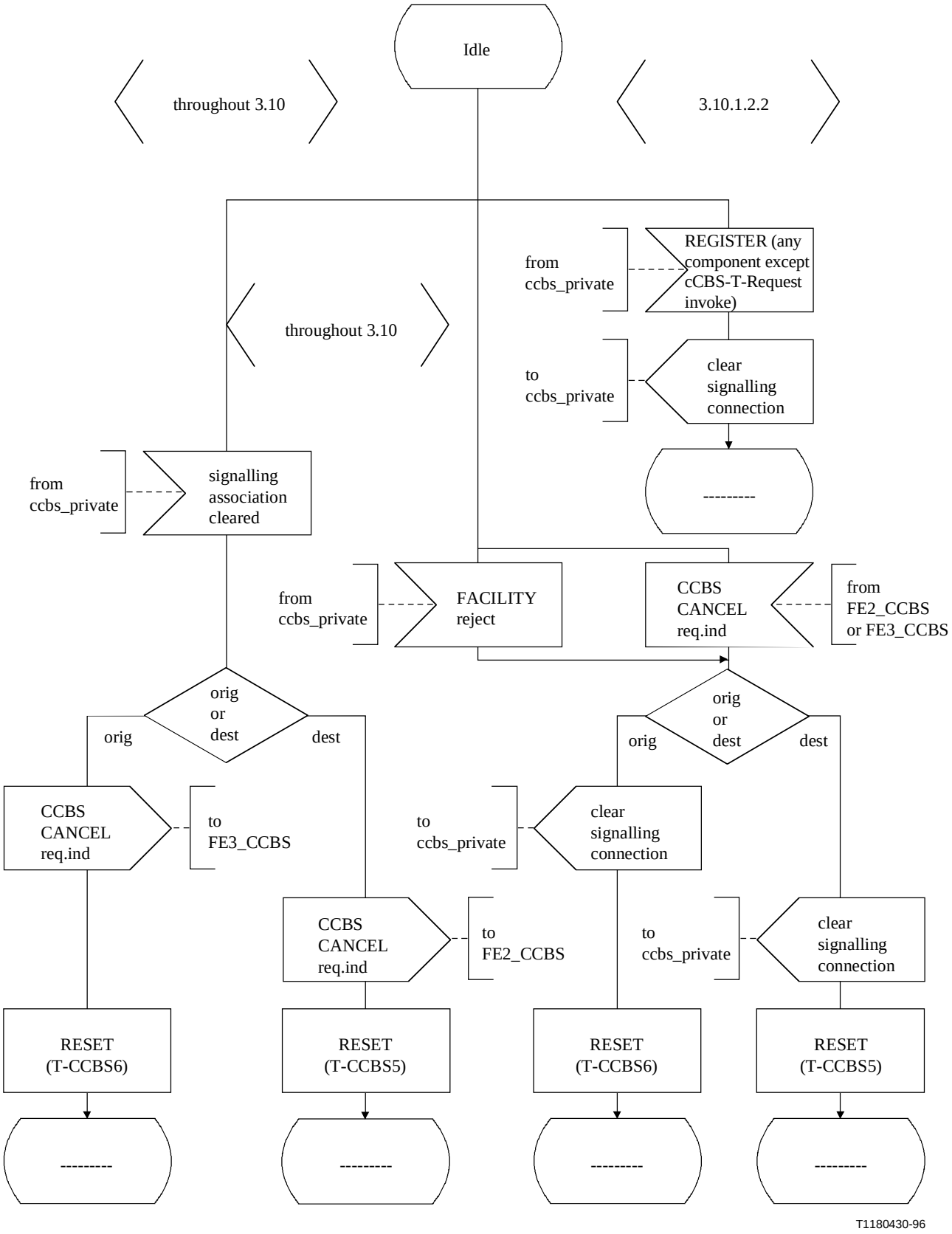


Figure 3.14-1/Q.953.3 (sheet 37 of 38) – Dynamic descriptions

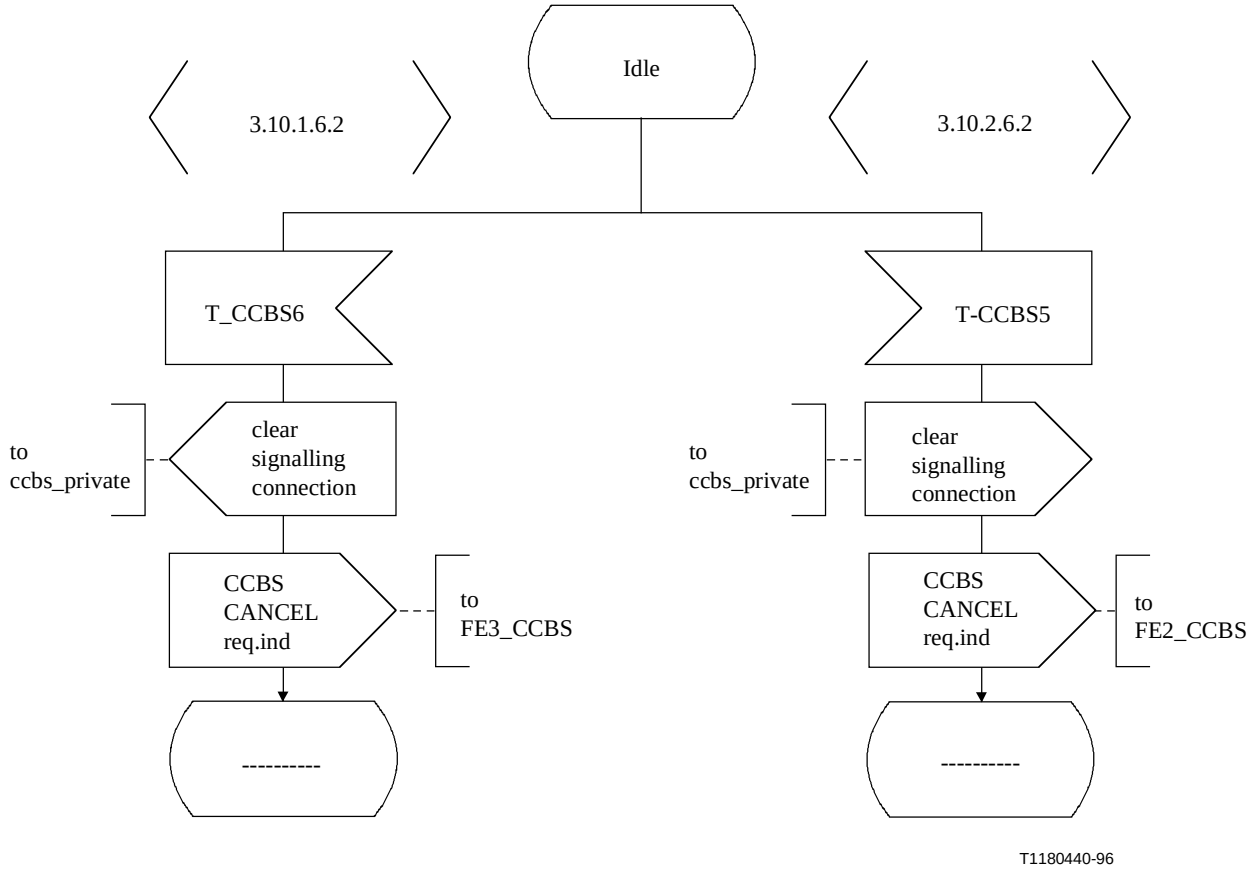


Figure 3.14-1/Q.953.3 (sheet 38 of 38) – Dynamic descriptions

APPENDIX I

Signalling flows

The following figures contain the signalling flows for the different cases of CCBS.

– Figure 3-I.1 – Normal operation; specific recall; user A free.
– Figure 3-I.2 – Normal operation; global recall; at least one user A free.
– Figure 3-I.3 – Specific recall; user A busy.
– Figure 3-I.4 – Global recall; user A busy.
– Figure 3-I.5 – Global recall; No user A responds.
– Figure 3-I.6 – Destination B NDUB again; retention option is not used.
– Figure 3-I.7 – Destination B NDUB again; retention option is used.
– Figure 3-I.8 – T-CCBS2 expiry.

– Figure 3-I.9 – T-CCBS3 expiry.
– Figure 3-I.10 – Rejection of CCBS request; Invalid CallLinkageID.
– Figure 3-I.11 – Rejection of CCBS request; CCBS is already activated.
– Figure 3-I.12 – Rejection of CCBS call request; CCBS request prior to recall indication.
– Figure 3-I.13 – Rejection of CCBS call request; no B-channels can be selected.
– Figure 3-I.14 – Rejection of CCBS call request; more than one user A request CCBS call.
– Figure 3-I.15 – User A clears CCBS call before receipt of ALERTING or CONNECT message.
– Figure 3-I.16 – CCBS deactivation by user A.
– Figure 3-I.17 – CCBS deactivation by the network.
– Figure 3-I.18 – CCBS deactivation by user A; CCBS call establishment is in progress.
– Figure 3-I.19 – Interrogation by user A; general interrogation.
– Figure 3-I.20 – Interrogation by user A; particular interrogation.
– Figure 3-I.21 – Originating from private ISDN (normal operation).
– Figure 3-I.22 – Deactivation by private ISDN.
– Figure 3-I.23 – Deactivation by public ISDN.
– Figure 3-I.24 – Originating from private ISDN; destination B again NDUB; retention option is used.
– Figure 3-I.25 – Originating from private ISDN; destination B again NDUB; retention option is not used.
– Figure 3-I.26 – Originating from private ISDN; T-CCBS6 expiry.
– Figure 3-I.27 – Originating from private ISDN; User A busy.

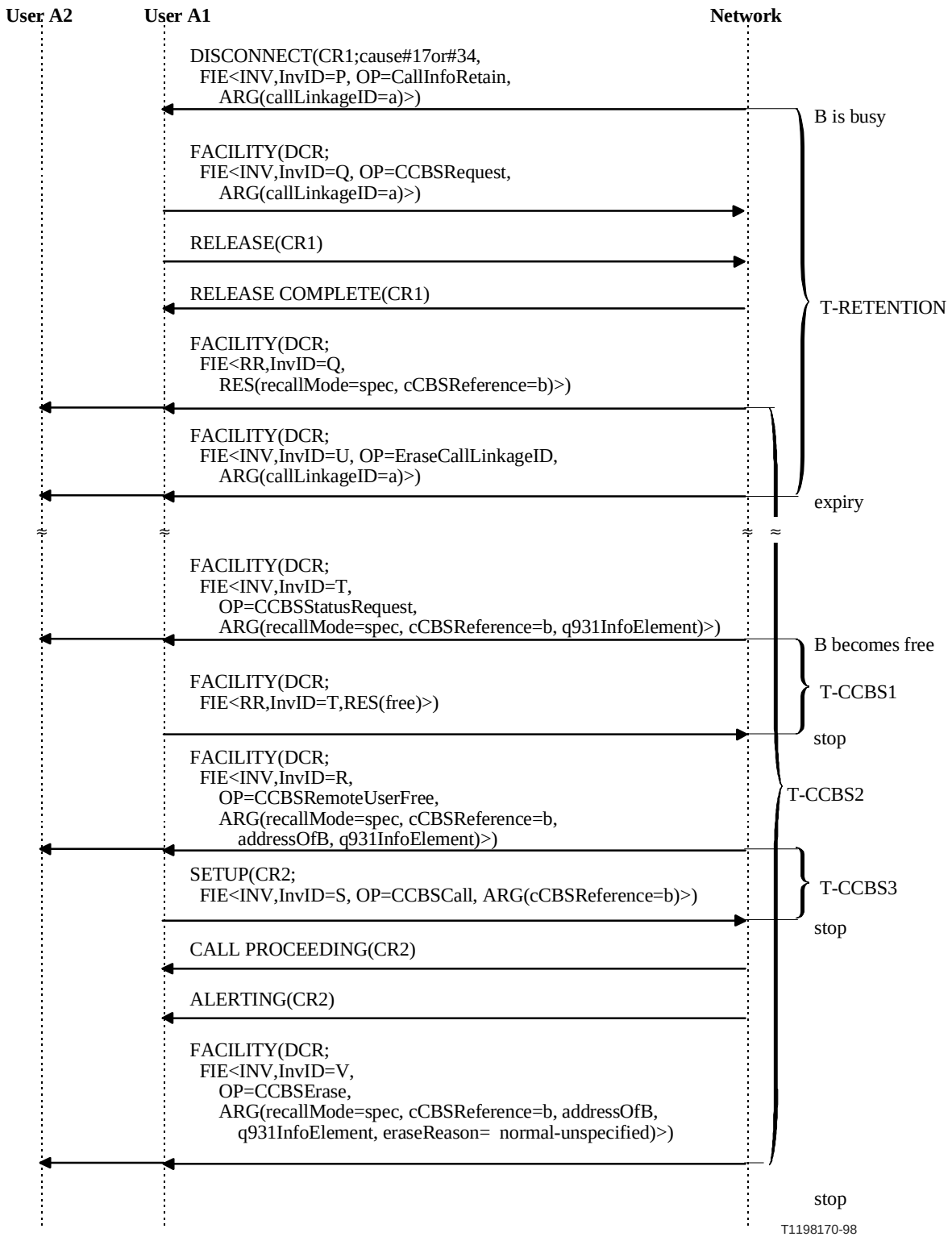


Figure 3-I.1/Q.953.3 – Normal operation; specific recall; user A free

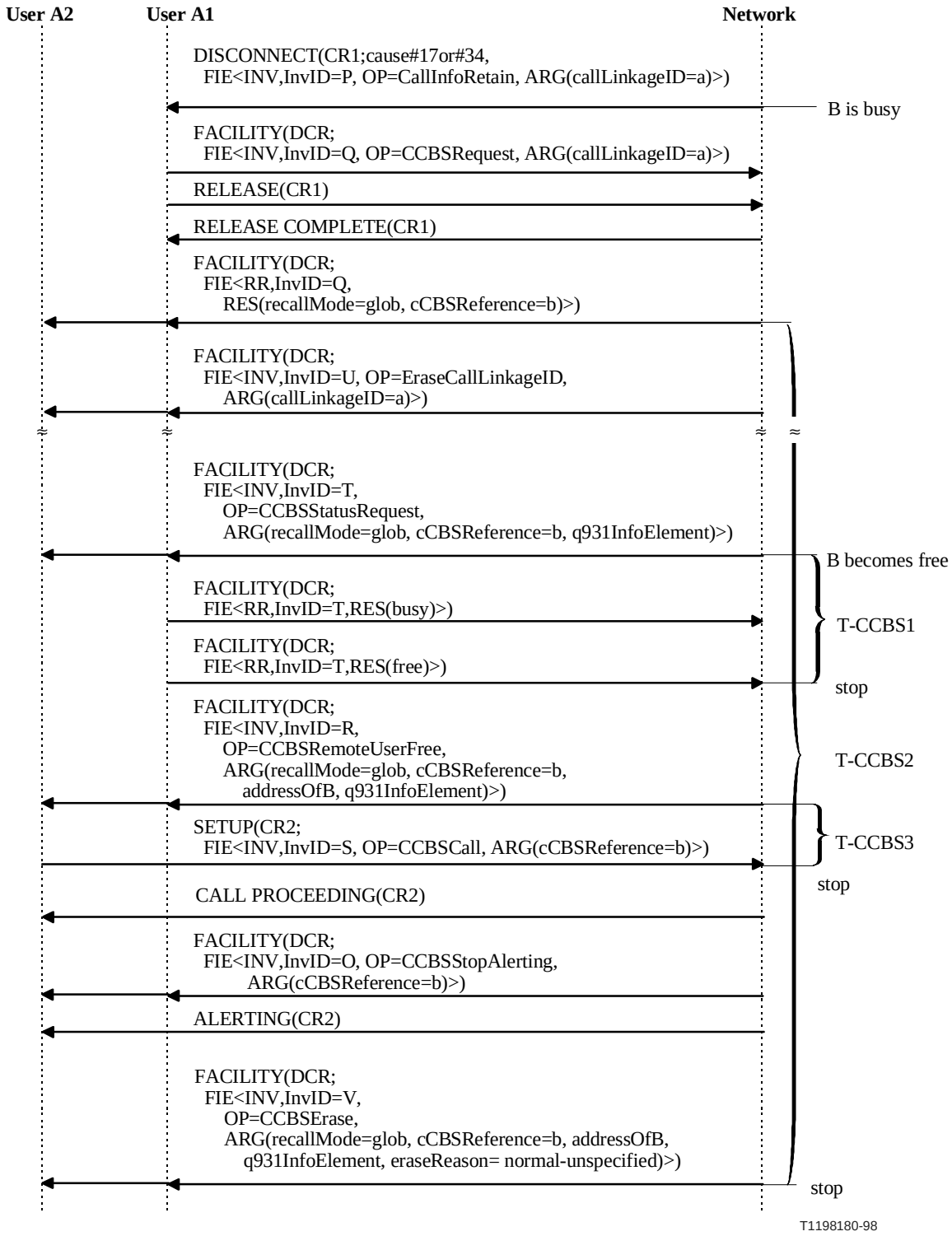


Figure 3-I.2/Q.953.3 – Normal operation; global recall; at least one user A free

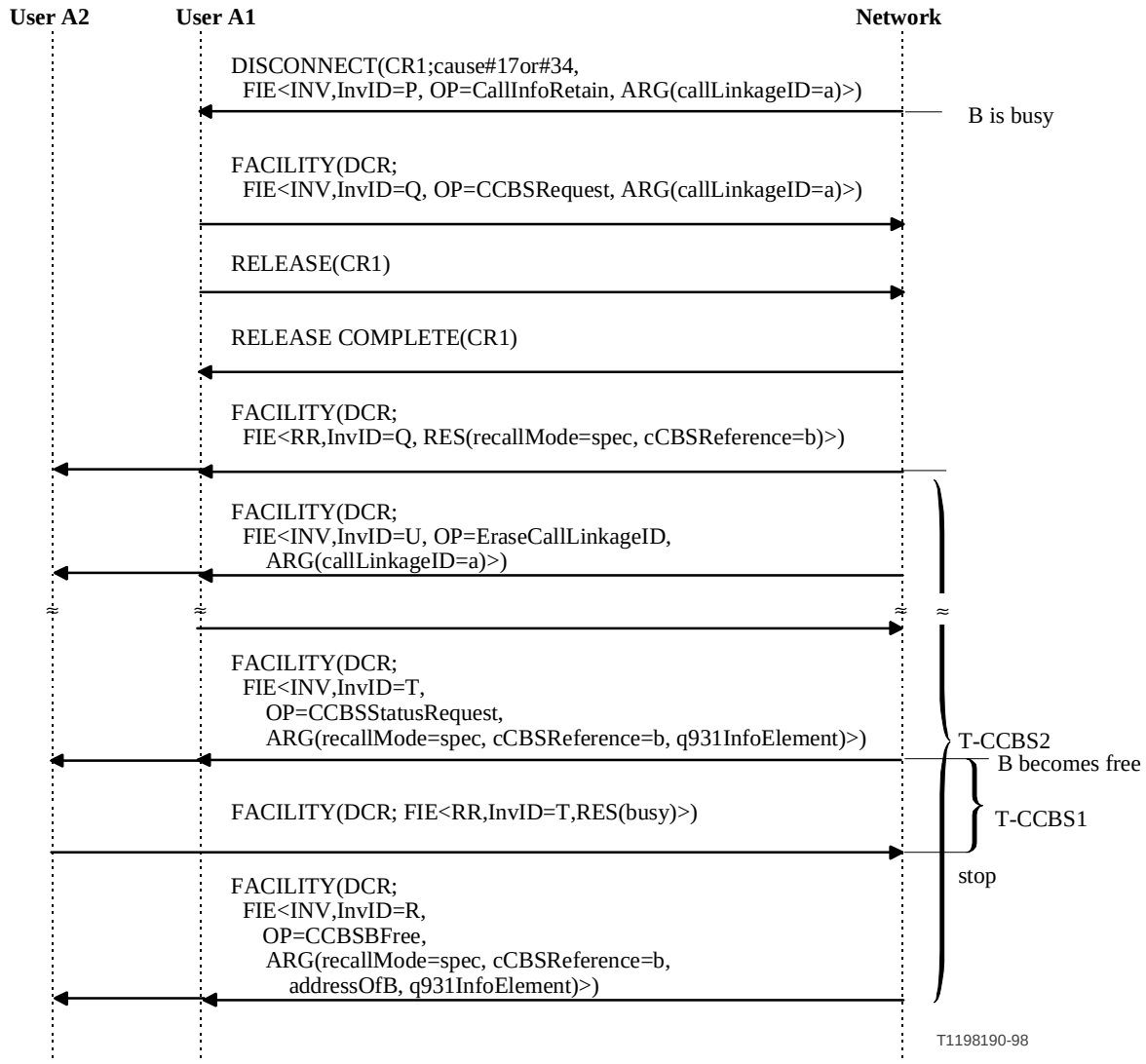


Figure 3-I.3/Q.953.3 – Specific recall; user A busy

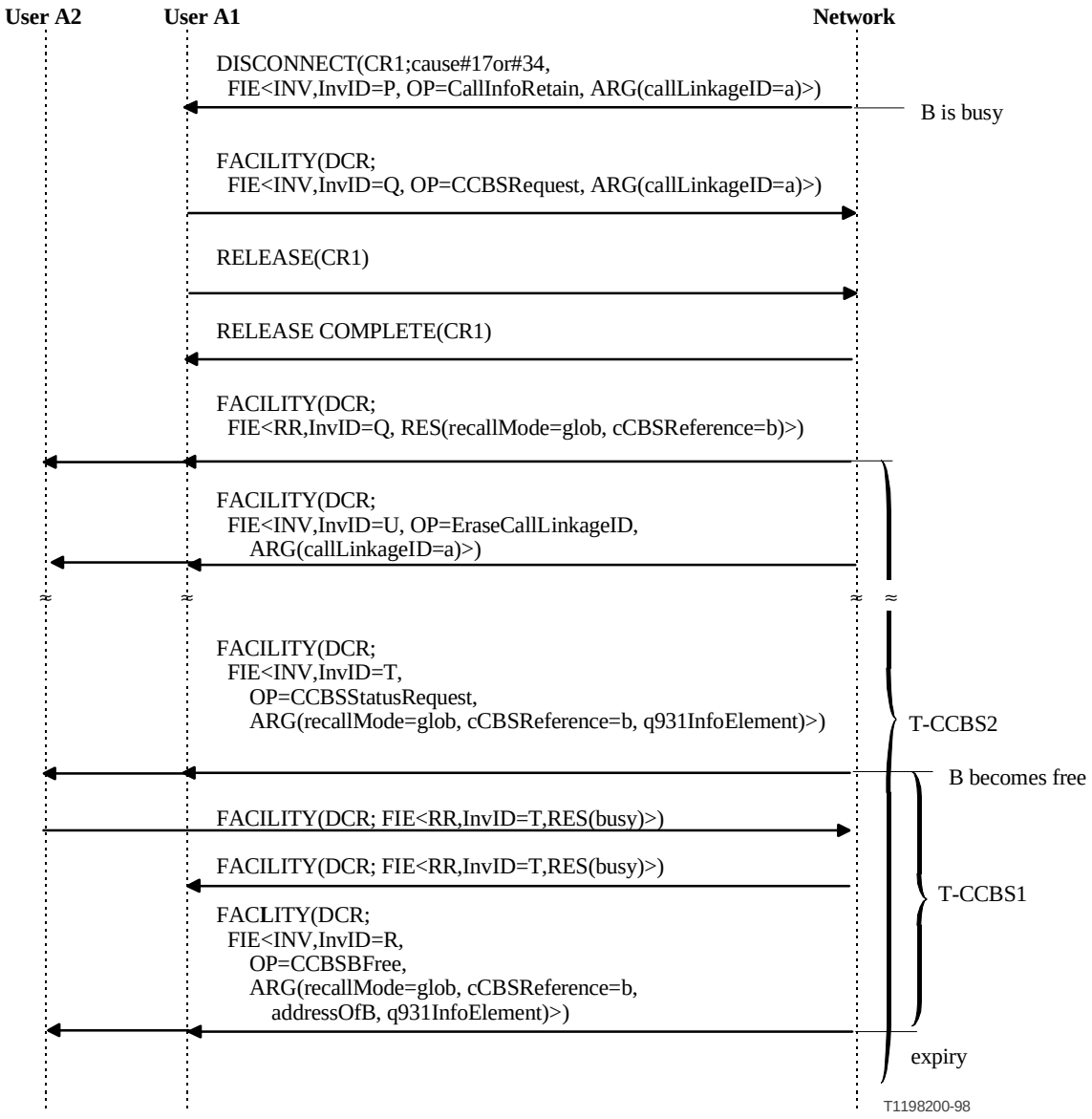


Figure 3-I.4/Q.953.3 – Global recall; user A busy

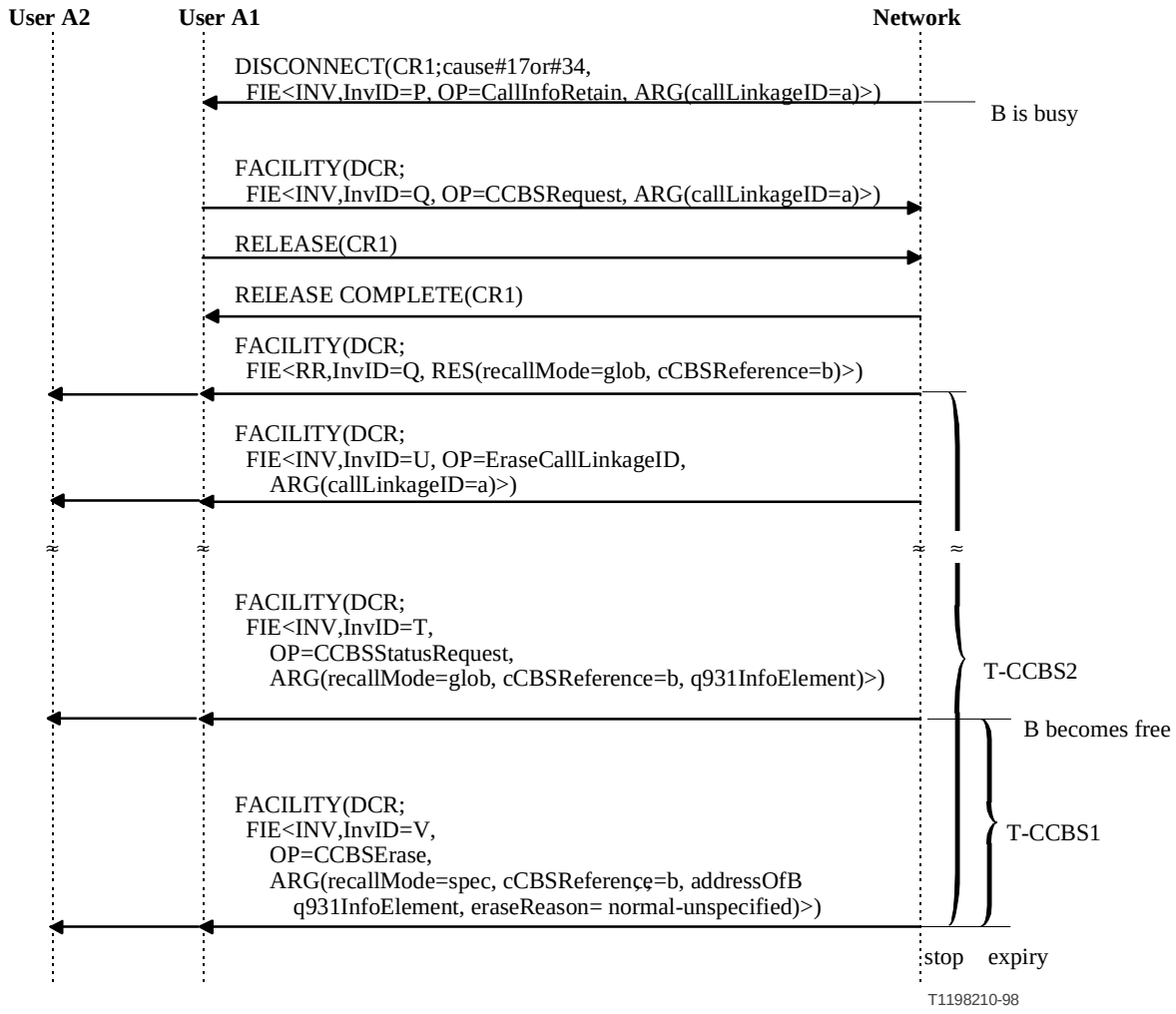


Figure 3-I.5/Q.953.3 – Global recall; no user A responds

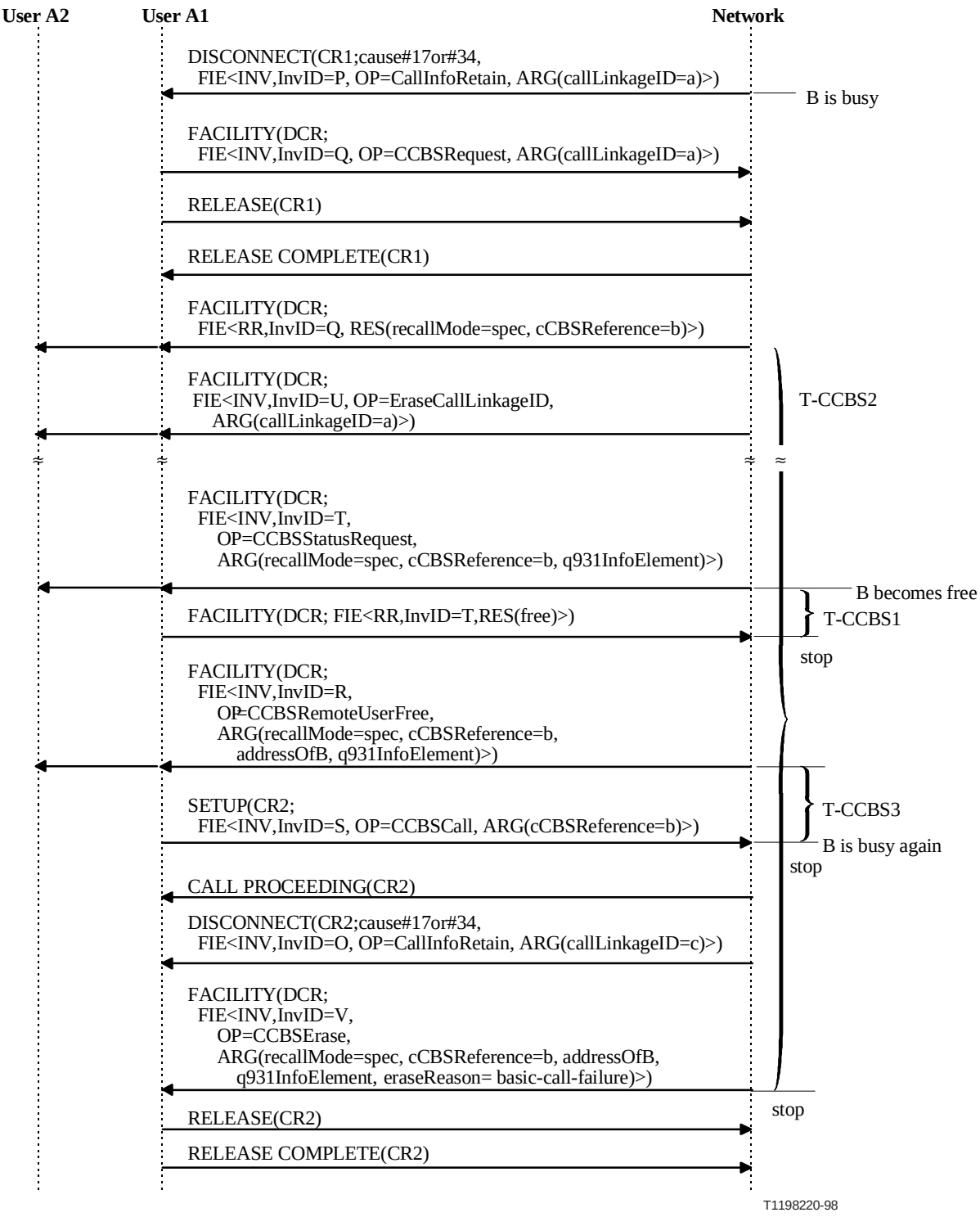


Figure 3-I.6/Q.953.3 – Destination B NDUB again; retention option is not used

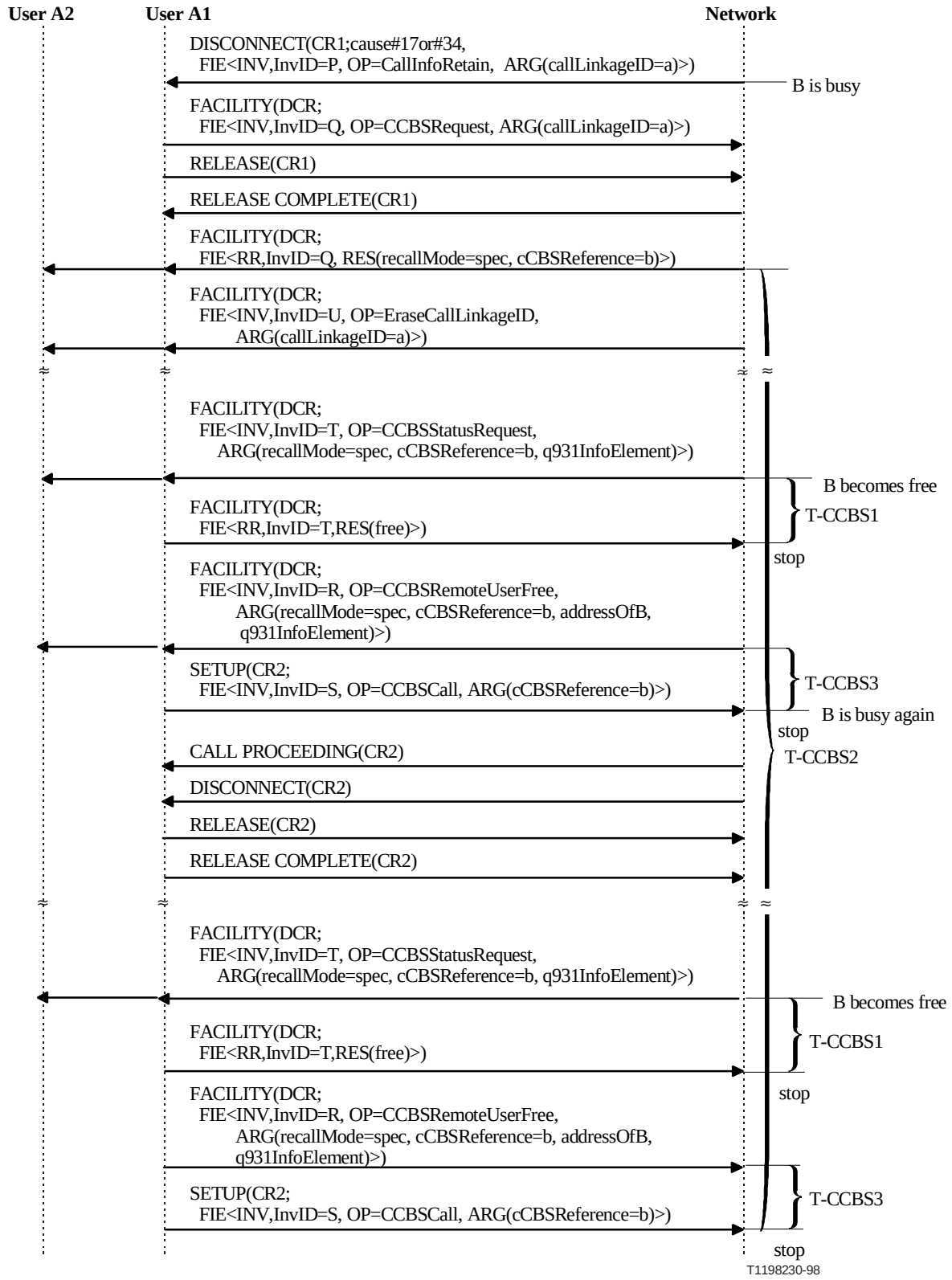


Figure 3-I.7/Q.953.3 – Destination B NDUB again; retention option is used

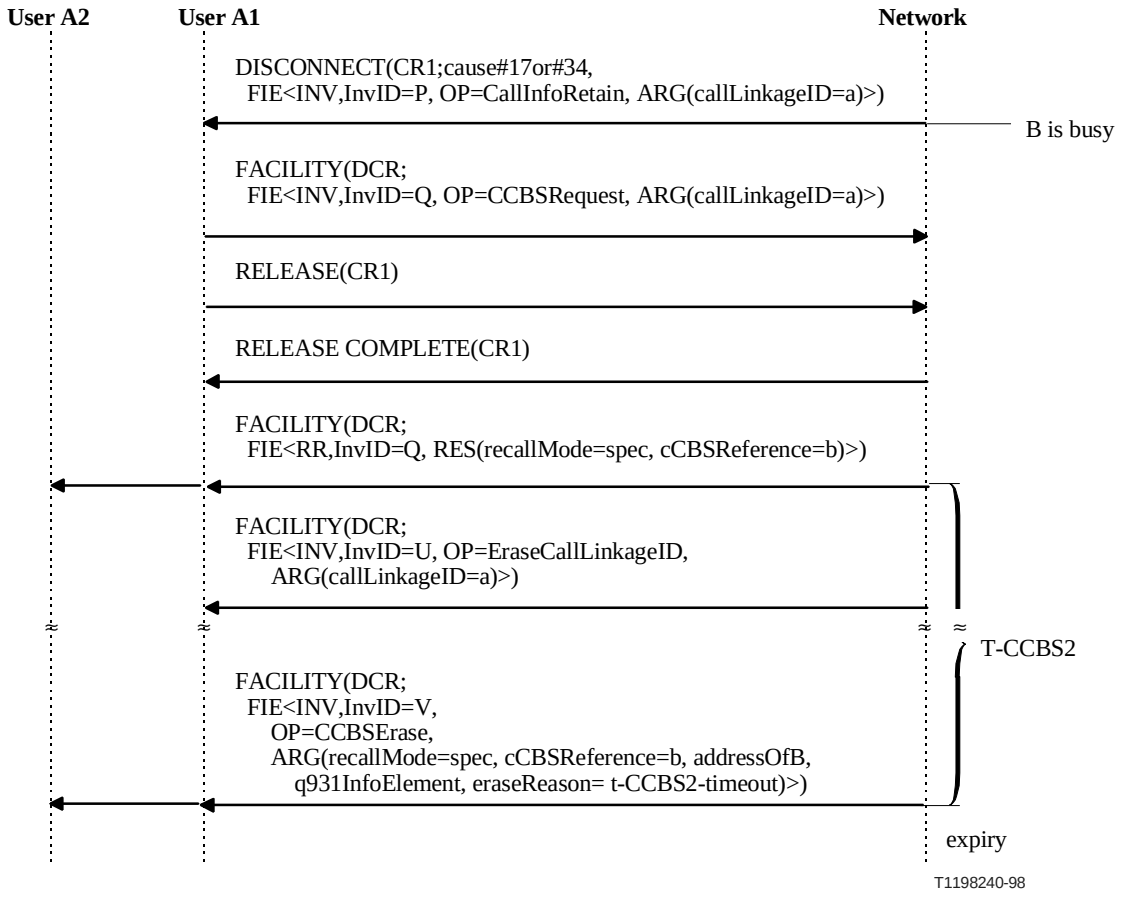


Figure 3-I.8/Q.953.3 – T-CCBS2 expiry

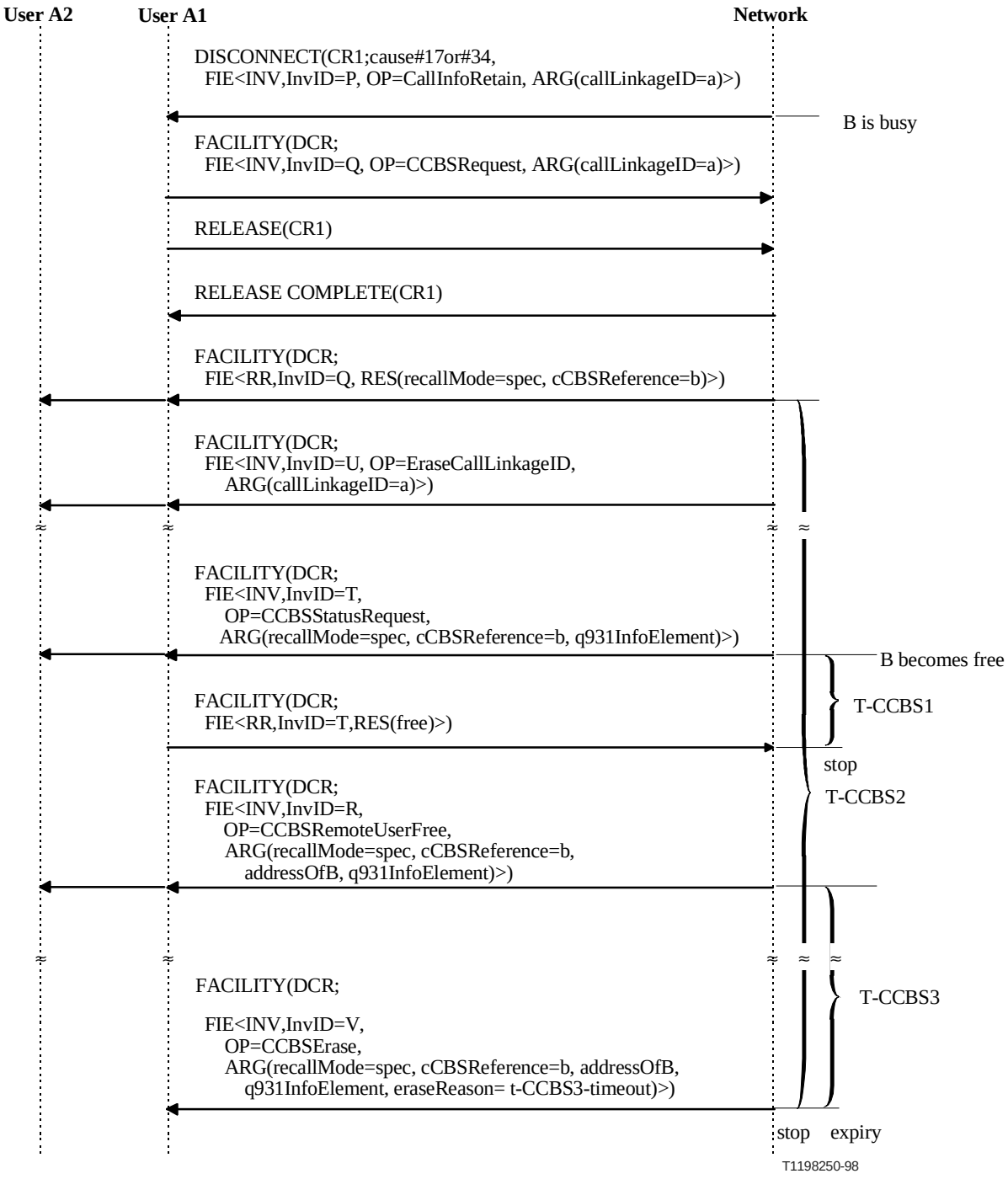


Figure 3-I.9/Q.953.3 – T-CCBS3 expiry

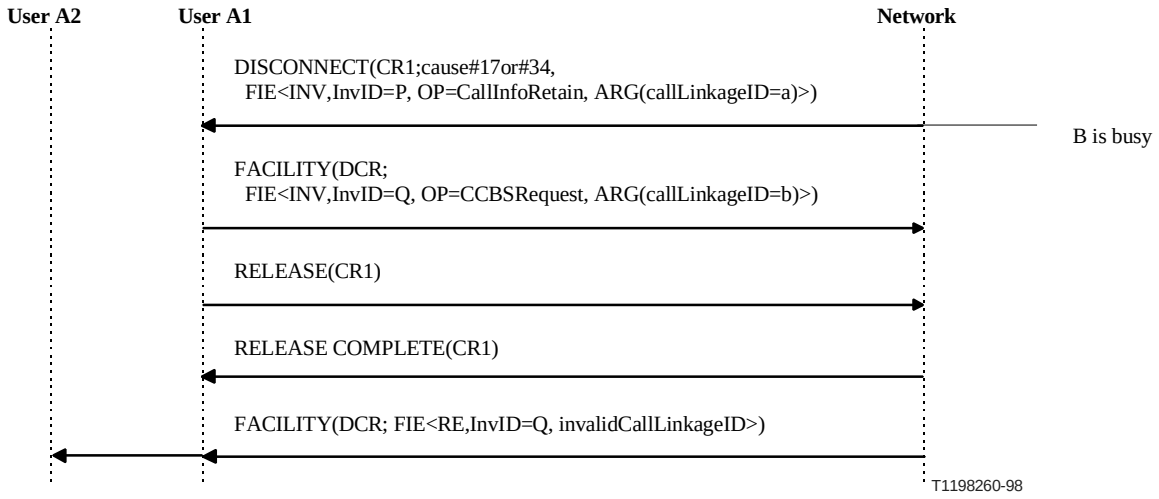


Figure 3-I.10/Q.953.3 – Rejection of CCBS request; Invalid CallLinkageID

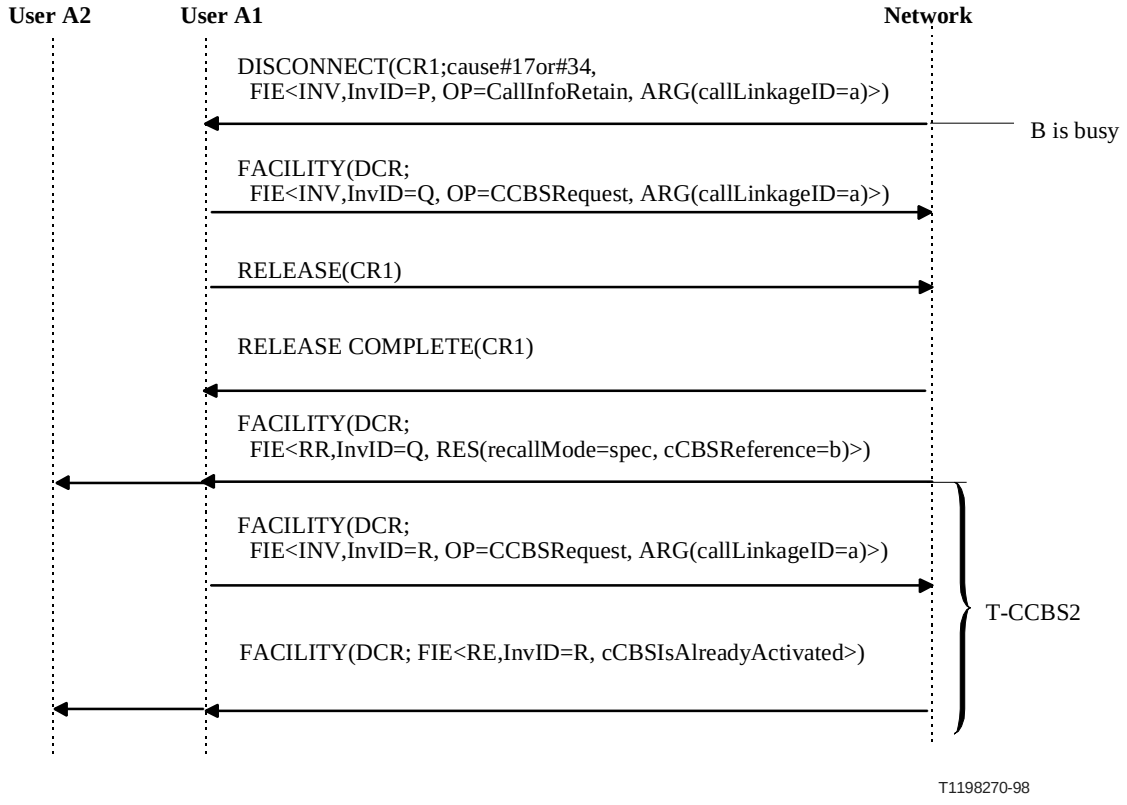


Figure 3-I.11/Q.953.3 – Rejection of CCBS request; CCBS is already activated

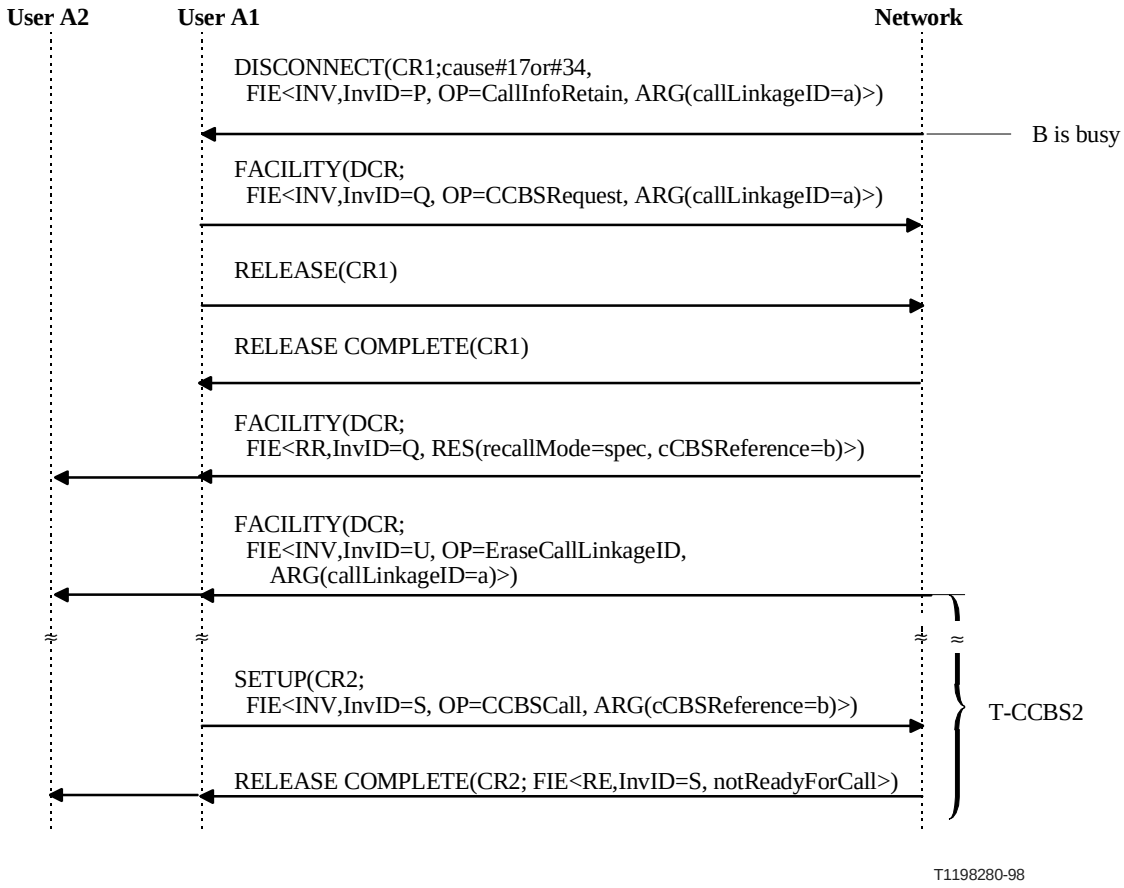


Figure 3-I.12/Q.953.3 – Rejection of CCBS call request; CCBS request prior to recall indication

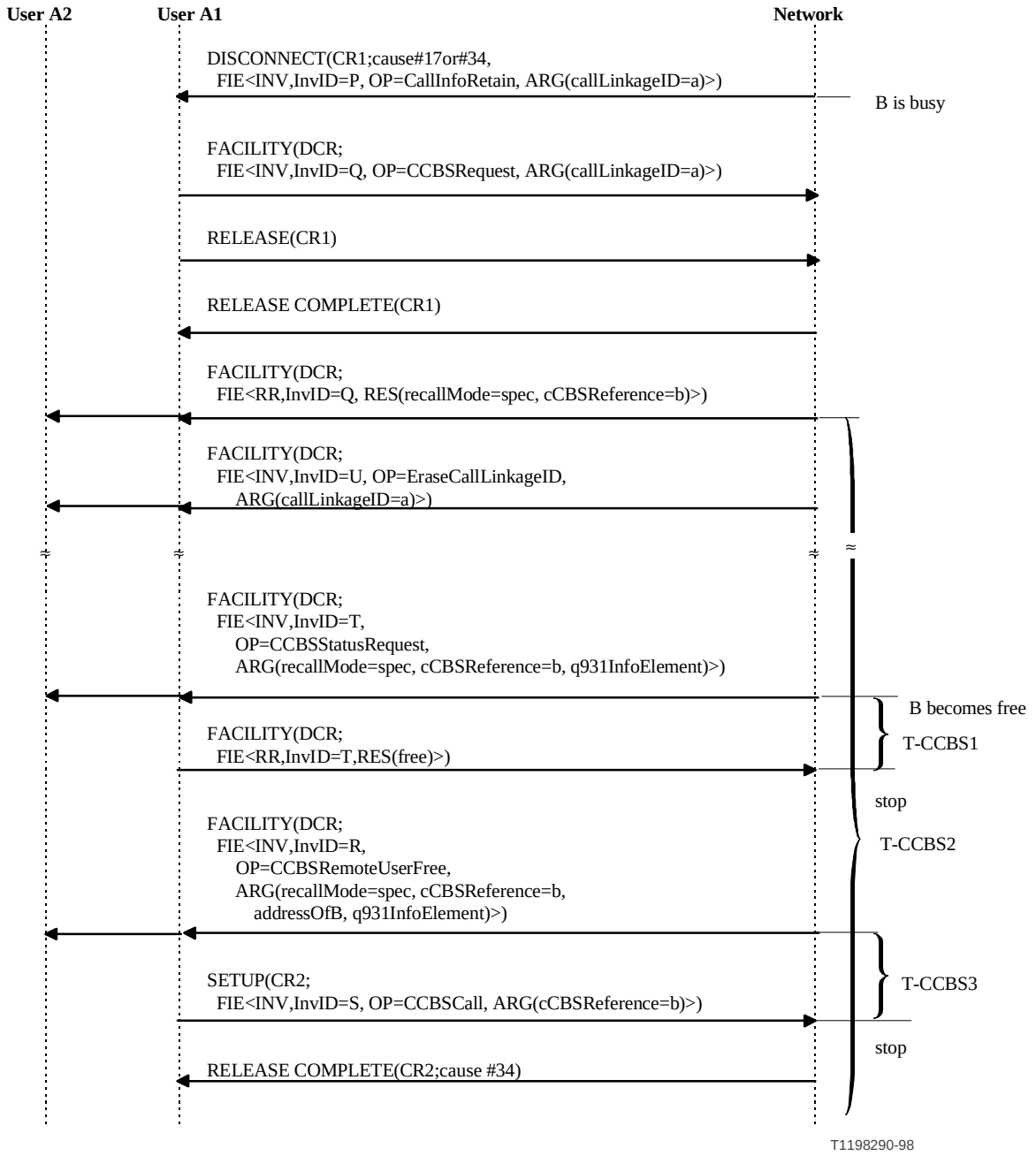


Figure 3-I.13/Q.953.3 – Rejection of CCBS call request; no B-channels can be selected

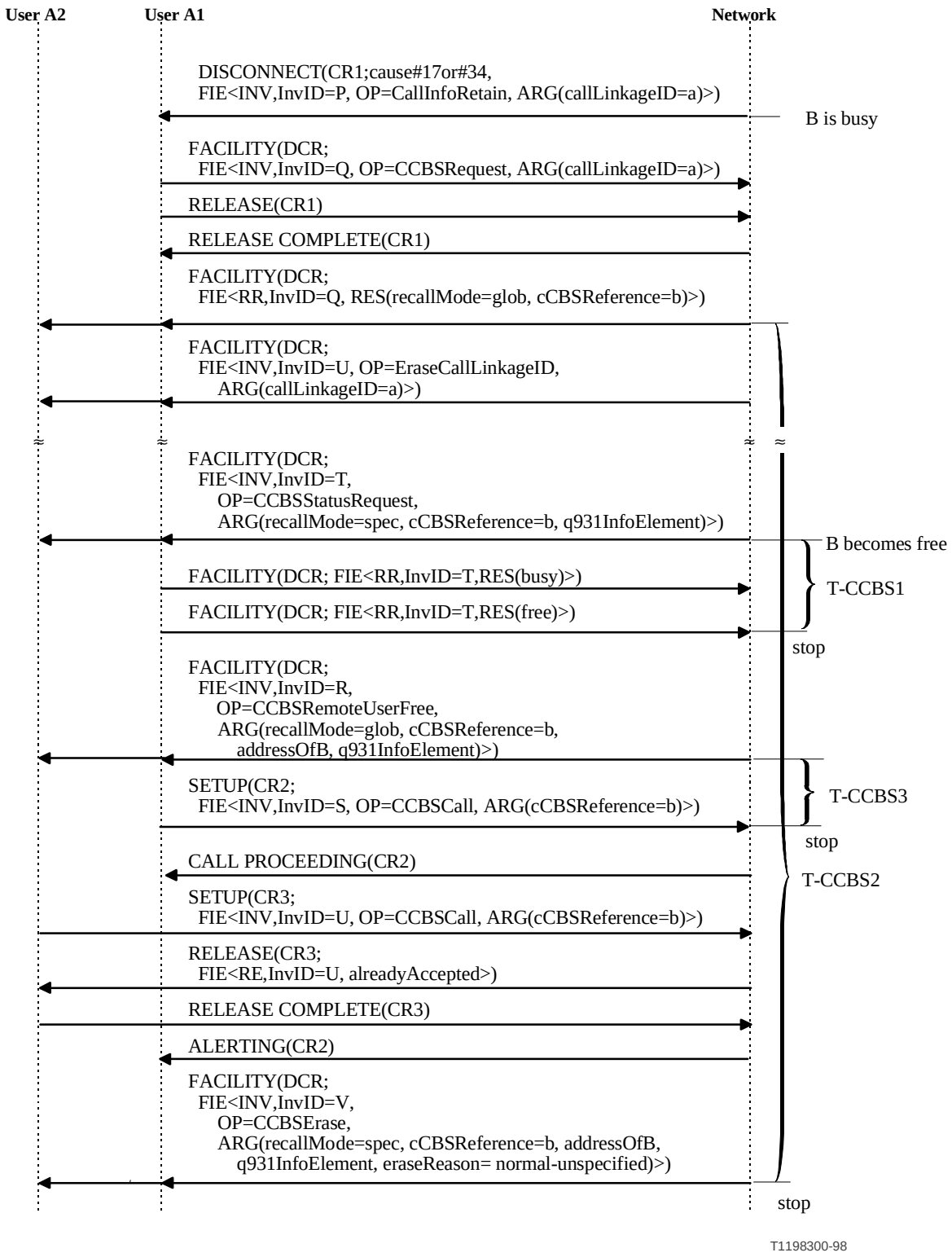


Figure 3-I.14/Q.953.3 – Rejection of CCBS call request; more than one user A request CCBS call

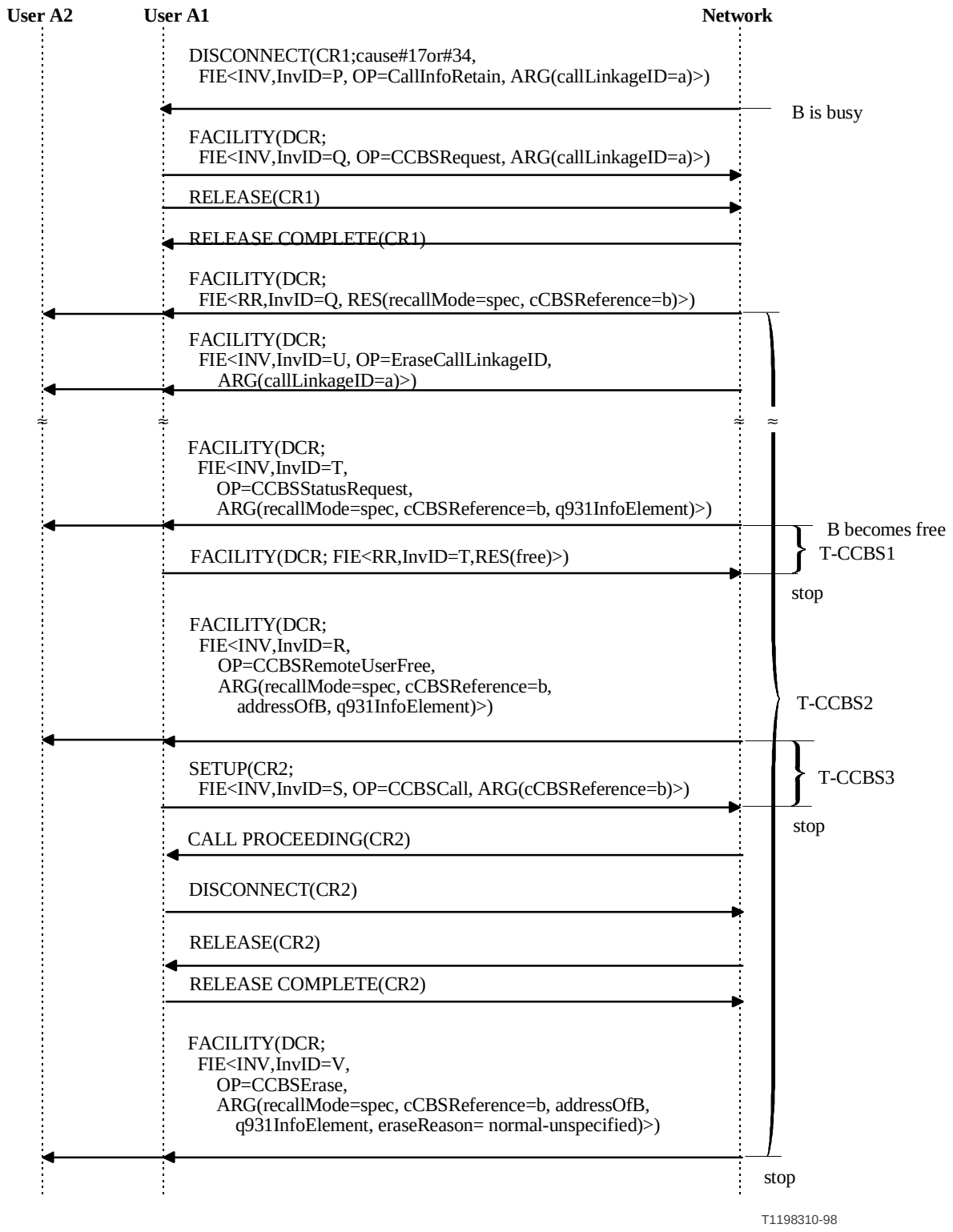


Figure 3-I.15/Q.953.3 – User A clears CCBS call before receipt of ALERTING or CONNECT message

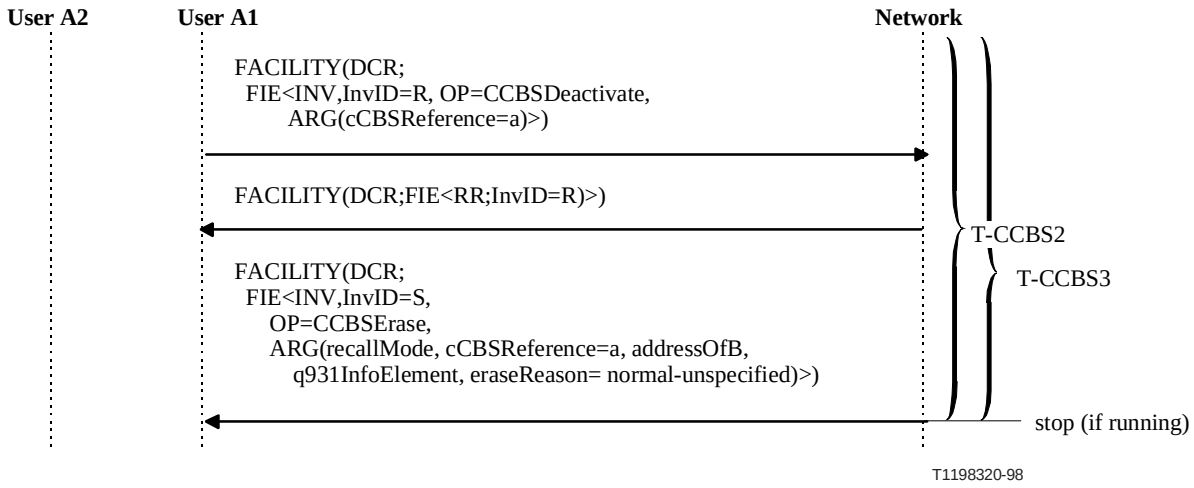


Figure 3-I.16/Q.953.3 – CCBS deactivation by user A

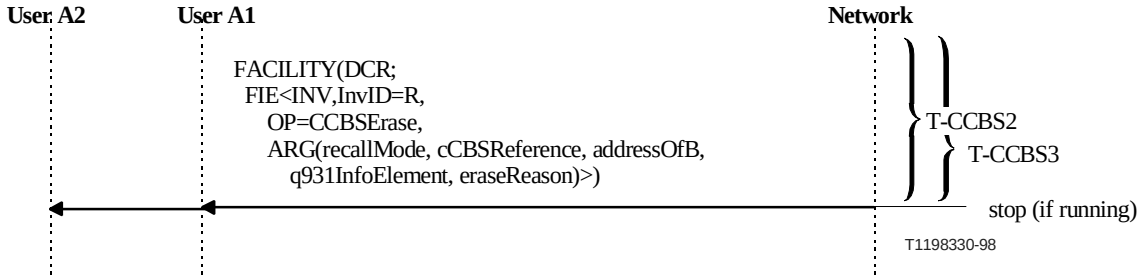


Figure 3-I.17/Q.953.3 – CCBS deactivation by the network

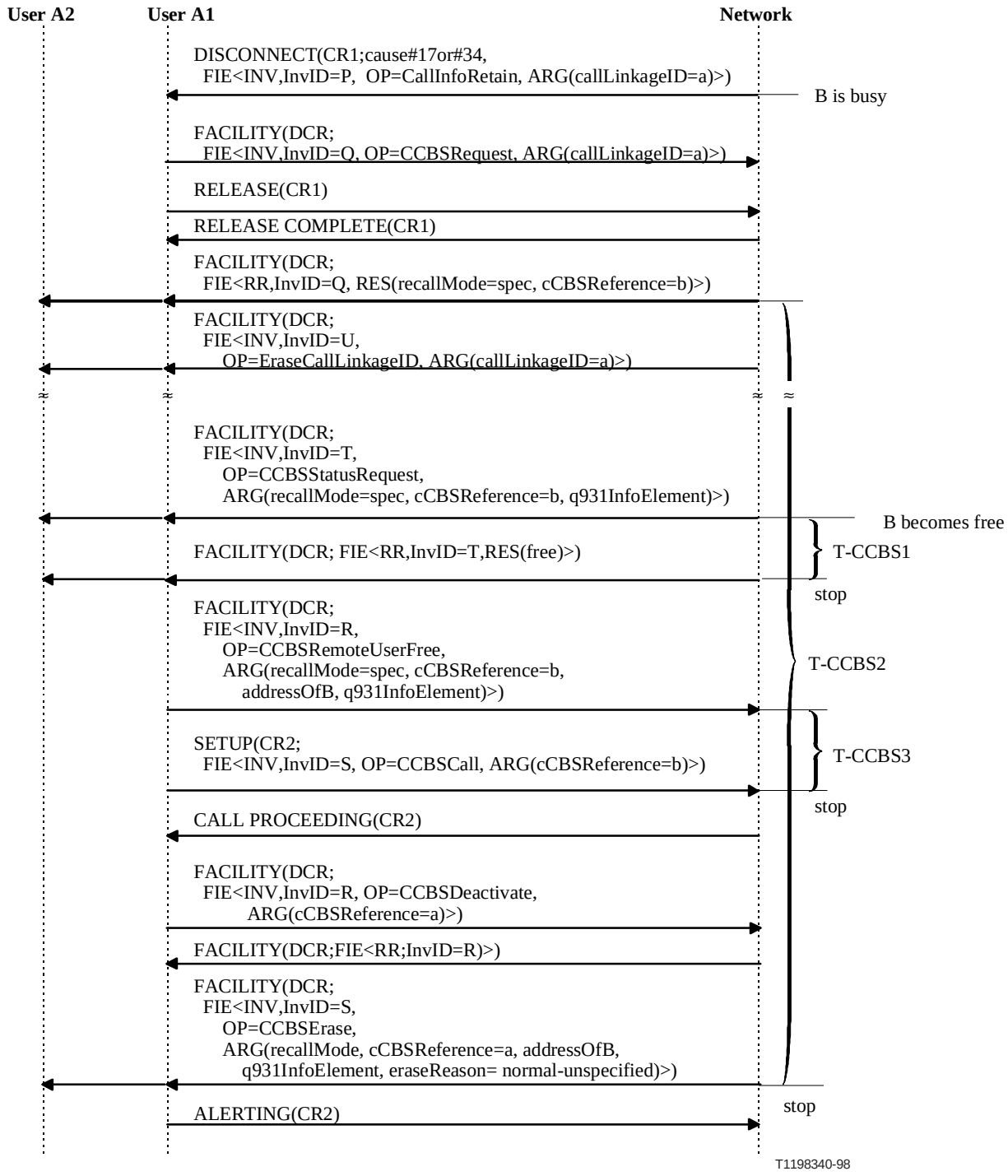


Figure 3-I.18/Q.953.3 – CCBS deactivation by user A; CCBS call establishment is in progress

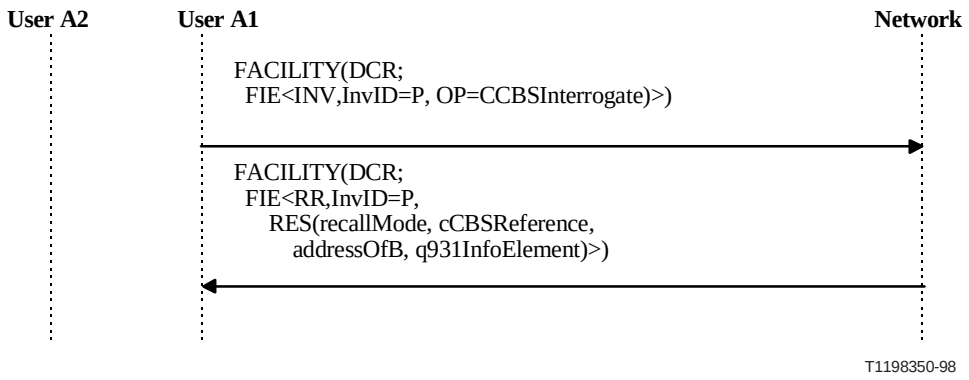


Figure 3-I.19/Q.953.3 – Interrogation by user A; general interrogation

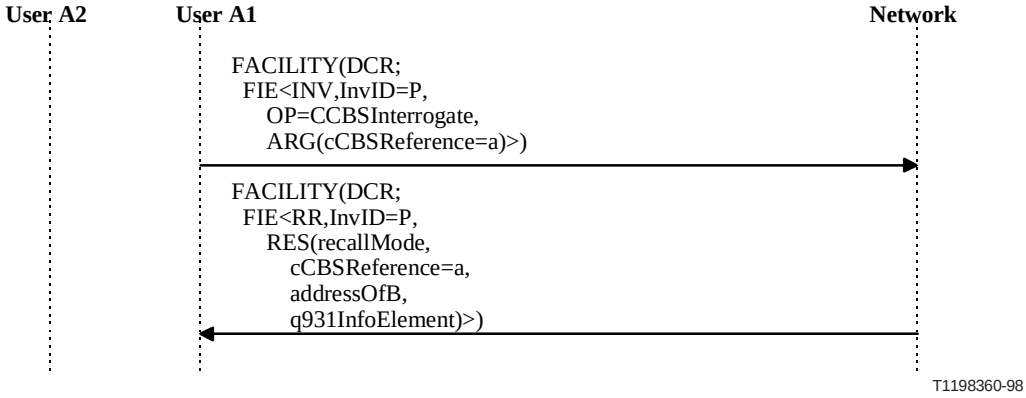


Figure 3-I.20/Q.953.3 – Interrogation by user A; particular interrogation

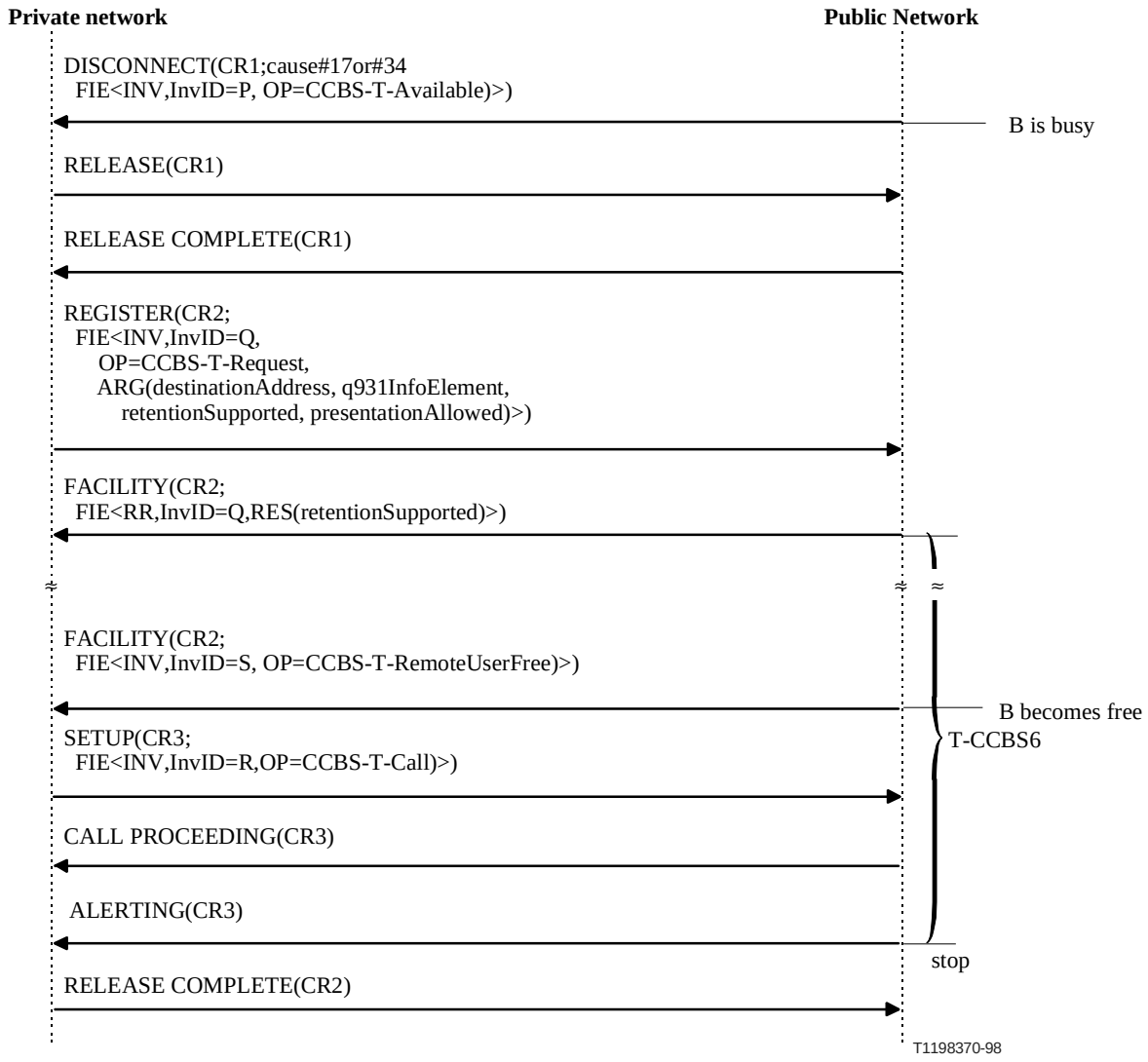


Figure 3-I.21/Q.953.3 – Originating from private ISDN (normal operation)

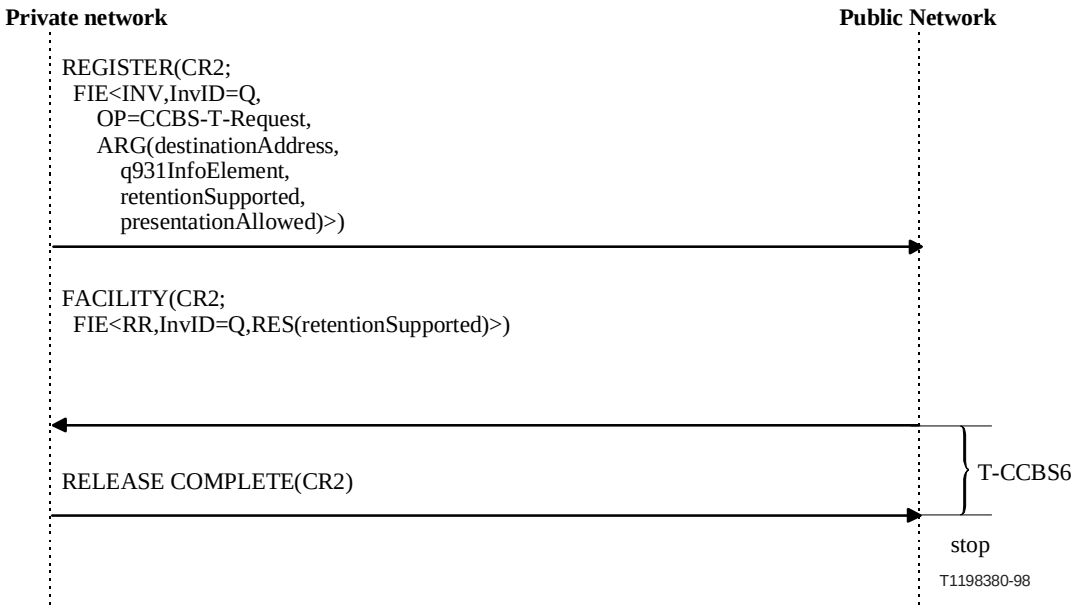


Figure 3-I.22/Q.953.3 – Deactivation by private ISDN

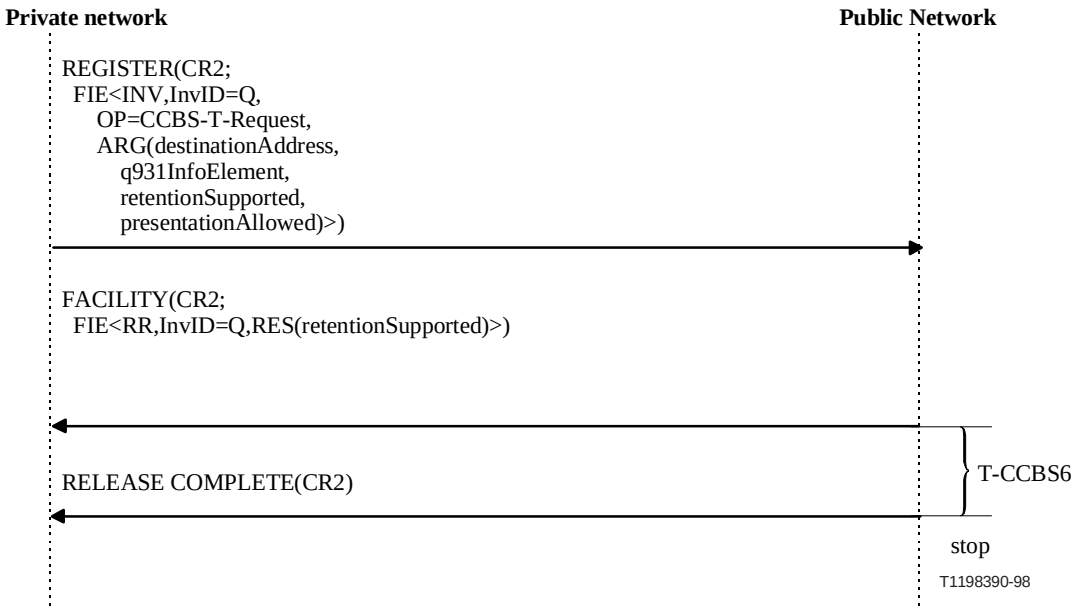


Figure 3-I.23/Q.953.3 – Deactivation by public ISDN

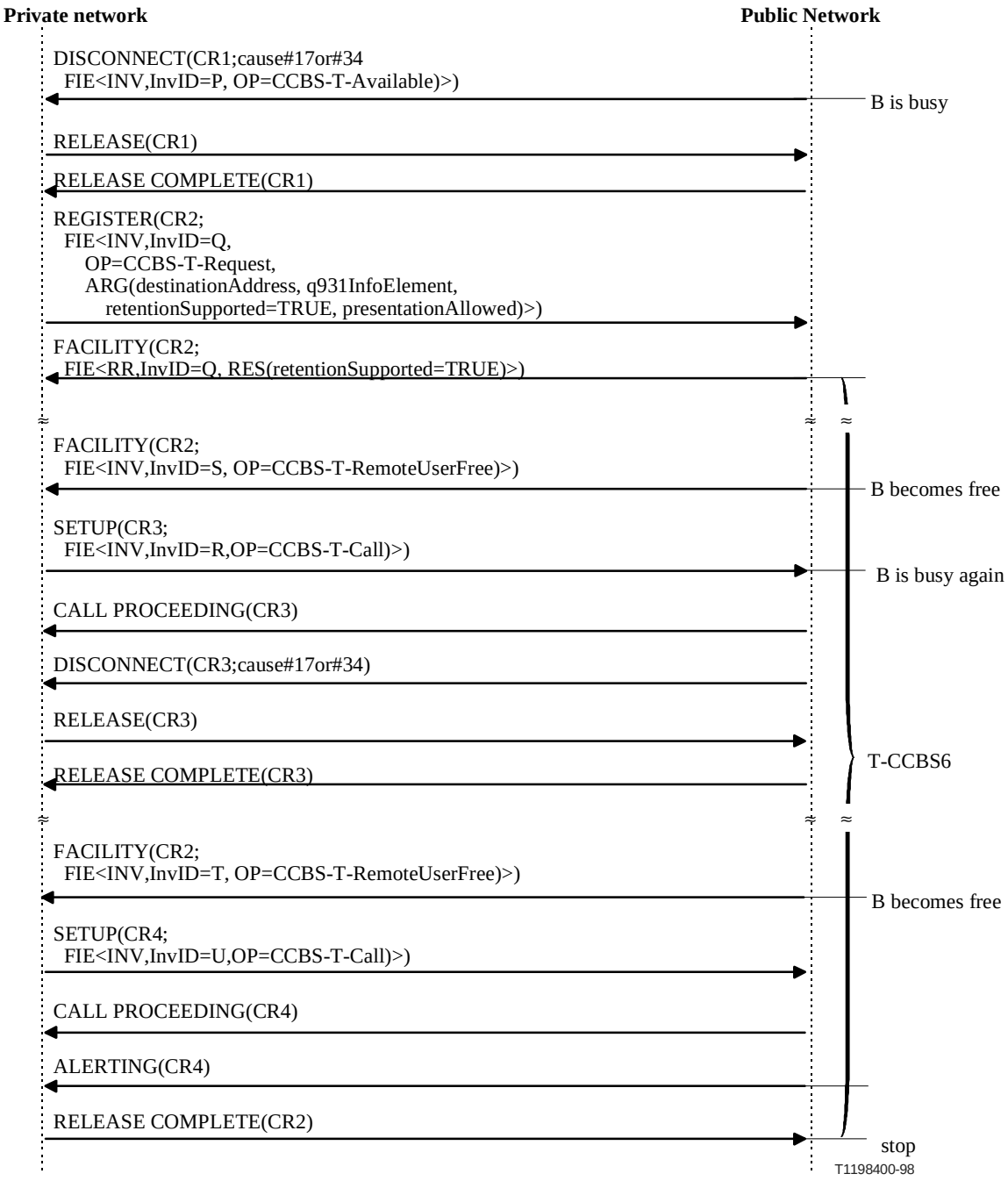


Figure 3-I.24/Q.953.3 – Originating from private ISDN; destination B again NDUB; retention option is used

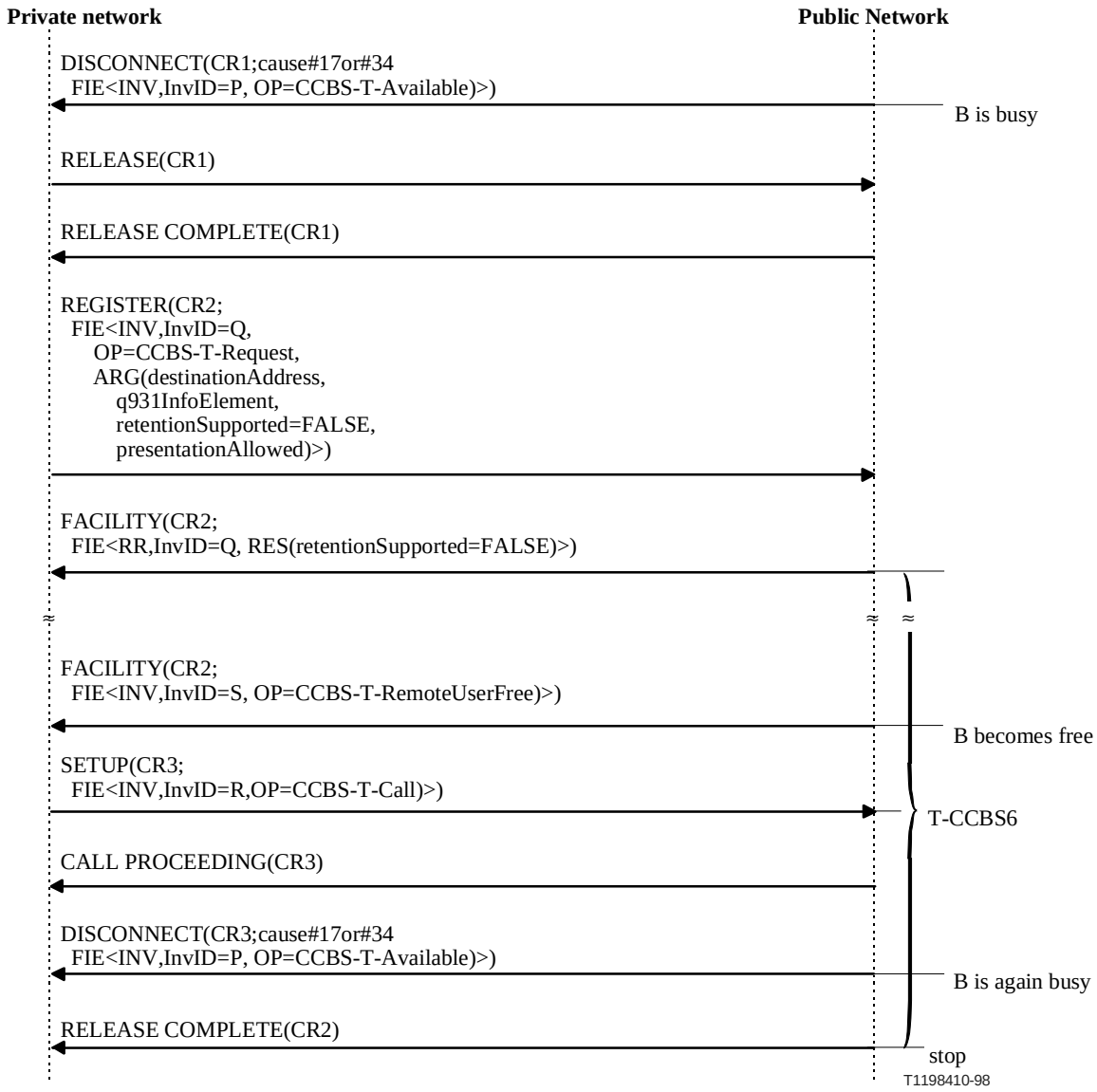


Figure 3-I.25/Q.953.3 – Originating from private ISDN; destination B again NDUB; retention option is not used

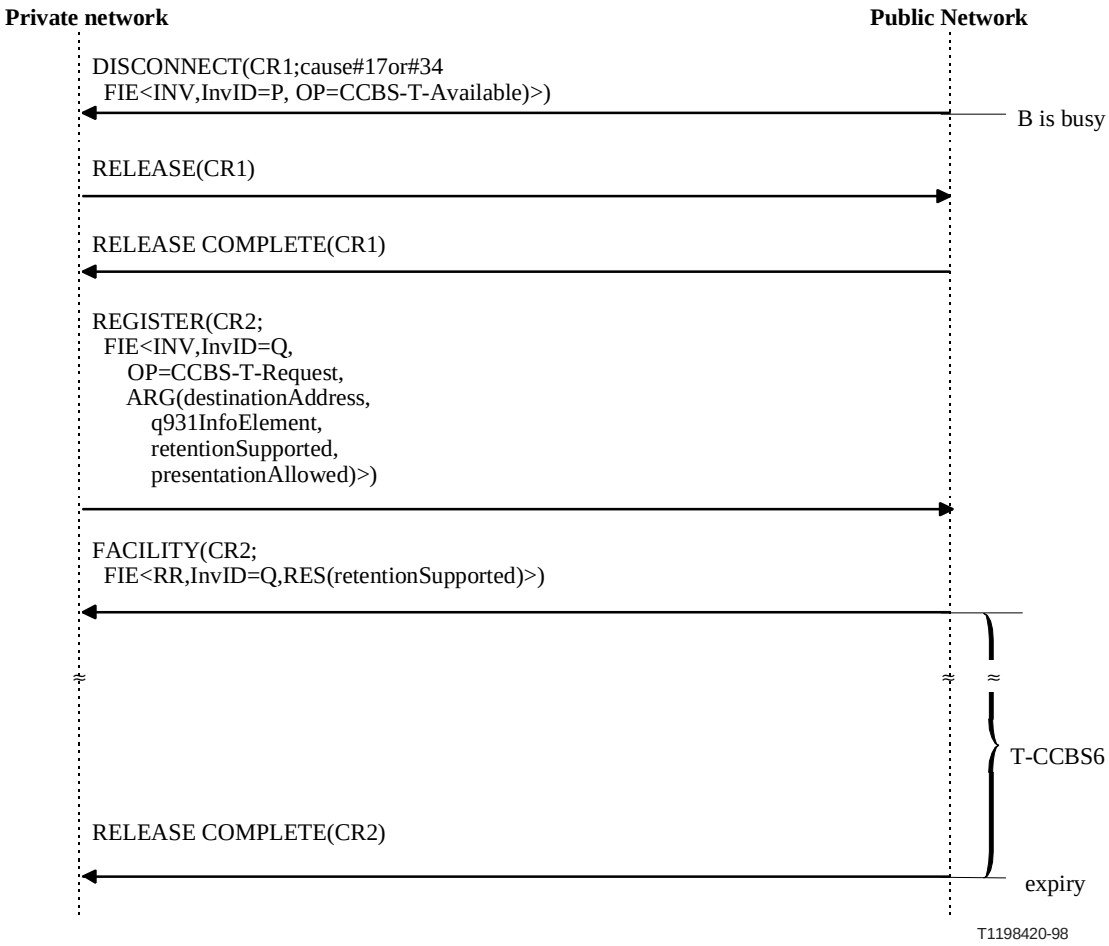


Figure 3-I.26/Q.953.3 – Originating from private ISDN; T-CCBS6 expiry

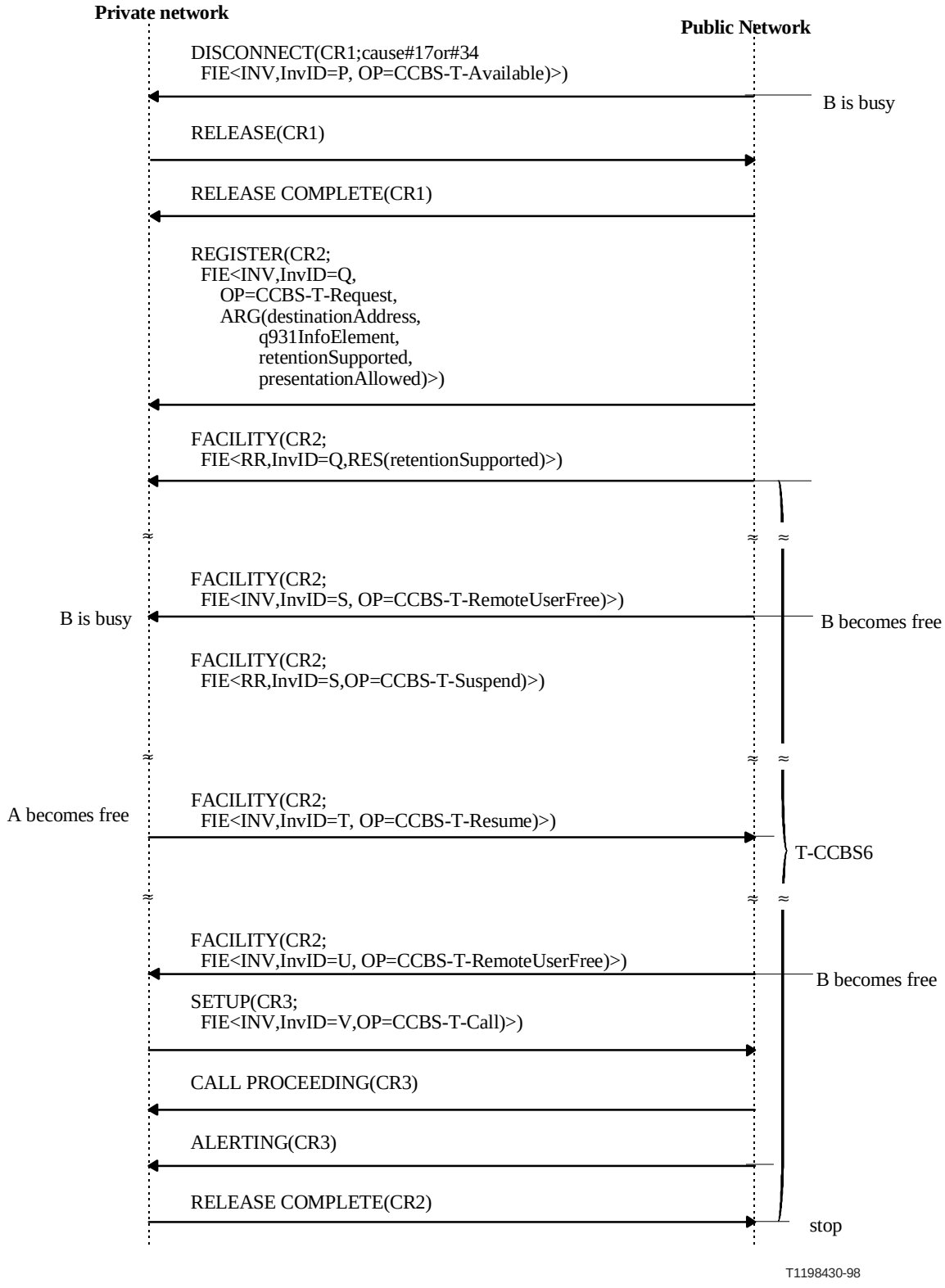


Figure 3-I.27/Q.953.3 – Originating from private ISDN; user A busy

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