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Foreword

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

This ETS is part 18 of a multi-part standard covering the ISDN User Part (ISUP) version 2 for the international interface, as described below:

Part 1: "Basic services";
Part 2: "ISDN supplementary services";
Part 3: "Calling Line Identification Presentation (CLIP) supplementary service";
Part 4: "Calling Line Identification Restriction (CLIR) supplementary service";
Part 5: "Connected Line Identification Presentation (COLP) supplementary service";
Part 6: "Connected Line Identification Restriction (COLR) supplementary service";
Part 7: "Terminal Portability (TP) supplementary service";
Part 8: "User-to-User Signalling (UUS) supplementary service";
Part 9: "Closed User Group (CUG) supplementary service";
Part 10: "Subaddressing (SUB) supplementary service";
Part 11: "Malicious Call Identification (MCID) supplementary service";
Part 12: "Conference call, add-on (CONF) supplementary service";
Part 14: "Explicit Call Transfer (ECT) supplementary service";
Part 15: "Diversion supplementary services";
Part 16: "Call Hold (HOLD) supplementary service";
Part 17: "Call Waiting (CW) supplementary service";
Part 18: "Completion of Calls to Busy Subscriber (CCBS) supplementary service";
Part 19: "Three party (3PTY) supplementary service".

NOTE: Part 13 has been withdrawn.

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

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

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

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

This ETS details the stage three aspects (signalling system protocols and switching functions) needed to support the Completion of Calls to Busy Subscriber (CCBS) supplementary service. The stage 1 and stage 2 aspects are detailed in ETS 300 357 and ETS 300 358, respectively.

Transposition dates	
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1 Scope

This eighteenth part of ETS 300 356 specifies the stage three of the Completion of Calls to Busy Subscriber (CCBS) supplementary service for the pan-European Integrated Services Digital Network (ISDN) as provided by the European public telecommunications operators by means of the Signalling System No.7 protocol for the ISDN User Part (ISUP). Stage three identifies the protocol procedures and switching functions needed to support a telecommunication service (see CCITT Recommendation I.130 [3]).

This ETS specifies the additional requirements where the service is provided to the user via an intermediate ISDN.

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

Although this ETS applies only to the international section, the specification of functions, formats and codes of messages and signals, and actions performed at originating and destination local exchanges are retained. All formats, codes and procedures, if any, marked for national use are included for informative purposes only.

NOTE: In the case where a national signalling system behaves differently, the international gateway exchange is to support both the concerned national and the international network and the services and equipment supported by both the concerned national and the international network.

Charging aspects are outside the scope of this ETS.

The CCBS supplementary service enables user A, encountering a busy destination B, to have the call completed without having to make a new call attempt when the destination B becomes not busy.

The CCBS supplementary service is applicable to all circuit-switched basic services.

2 Normative references

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

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

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

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

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

[5] ITU-T Recommendation I.221 (1988): "Common specific characteristics of services".

[6] ITU-T Recommendation Q.733.3: "Stage 3 description for call completion supplementary services using SS No.7; Clause 3 - Completion of Calls to Busy Subscriber (CCBS)".

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

[8] CCITT Recommendation Z.100 (1988): "Specification and description language (SDL)".

[9] ETS 300 009 (1991): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Signalling Connection Control Part (SCCP) [connectionless service] to support international interconnection".

[10] ETS 300 121 (1992): "Integrated Services Digital Network (ISDN); Application of the ISDN User Part (ISUP) of CCITT Signalling System No.7 for international ISDN interconnections (ISUP version 1)".

[11] ETS 300 134 (1992): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Transaction Capabilities Application Part (TCAP)".

[12] ETS 300 356-1 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1993), modified]".

[13] ETS 300 356-2 (1995): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 2: ISDN supplementary services [ITU-T Recommendation Q.730 (1993), modified]".

[14] ETS 300 357: "Integrated Service Digital Network (ISDN); Completion of Calls to Busy Subscribers (CCBS) supplementary service; Service description".

[15] ETS 300 358: "Integrated Service Digital Network (ISDN); Completion of Calls to Busy Subscribers (CCBS) supplementary service; Functional capabilities and information flows".

[16] ETS 300 359-1: "Integrated Service Digital Network (ISDN); Completion of Calls to Busy Subscribers (CCBS) supplementary service; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

3 Definitions

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

busy: See ITU-T Recommendation I.221 [5].

CCBS busy: Any one of the following conditions will cause user A to be considered as CCBS busy:

- maximum number of calls reached at user A;
- no B-channels available at user A;
- CCBS recall pending on user A.

CCBS call: A call generated by the network from user A to destination B resulting from user A's acceptance of a CCBS recall.

CCBS call indicator: Indicator used in a CCBS call setup to distinguish this call from an ordinary call at the Destination Local Exchange (DLE).

CCBS indicator: Indicator used in the diagnostic field, sent in the cause parameter in the backward release message, at the initial call failure, to indicate the possibility to invoke a possible succeeding CCBS service request.

CCBS recall: An indication informing user A that the network is ready to initiate a CCBS call to destination B and that the network is awaiting a response to this indication.

CCBS request: An instance of an activation of the CCBS supplementary service which is held in a queue pending the correct conditions for the CCBS supplementary service to be completed.

compatible terminal: A terminal which can support the bearer service or teleservice requested for the original call to destination B and which can accept calls to the ISDN number and subaddress identifying the called user in the original call to destination B.

destination B: The entity addressed in the original call.

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

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

long term denial: The network cannot accept user A's request to activate the CCBS supplementary service and a later attempt to activate the CCBS supplementary service for the same destination B will also be rejected.

retain option: The retain option, if supported in both the originating and destination network, will maintain the CCBS request in the destination B queue, if a CCBS call has failed due to destination busy condition.

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

short term denial: The network temporarily cannot accept user A's request to activate the CCBS supplementary service. A later attempt to activate the CCBS supplementary service for the same destination B may succeed.

subaddress: See CCITT Recommendation E.164 [1].

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

suspended CCBS request: A request which cannot be served even if destination B is not busy, because user A is busy, or CCBS busy.

user A: The user who originated the call and to whom the CCBS supplementary service is provided.

4 Abbreviations

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

ACM	Address Complete message
ANM	Answer message
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
ATP	Access Transport
CCBS	Completion of Calls to Busy Subscriber
CFB	Call Forwarding Busy
CFNR	Call Forwarding No Reply
CFU	Call Forwarding Unconditional
CLI	Calling Line Identification
DLE	Destination Local Exchange
DSS1	Digital Subscriber Signalling System No. one
GT	Global Title
IAM	Initial Address message
IPI	ISUP Preference Indicator

ISDN	Integrated Services Digital Network
ISPBX	Integrated Services Private Branch Exchange
ISUP	ISDN User Part
OLE	Originating Local Exchange
OU	Originating User
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
REL	Release message
RLC	Release Complete message
SCCP	Signalling Connection Control Part
SDL	Specification and Description Language
SPC	Signalling Point Code
SSN	Subsystem Number
SUB	Subaddress
TC	Transaction Capabilities
TCAP	Transaction Capabilities Application Part
TU	Terminating User

5 Description

When user A encounters a busy destination B, user A may request the CCBS supplementary service. The network shall then monitor the wanted destination B for becoming not busy. When the wanted destination B becomes not busy, the network shall wait a short time in order to allow the resources to be re-used for making an outgoing call. If the resources are not re-used within this time, then the network shall automatically recall user A.

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

The service description is given in ETS 300 357 [14] and the functional capabilities and information flows are given in ETS 300 358 [15]. The stage three Digital Subscriber Signalling System No. one (DSS1) description is given in ETS 300 359-1 [16].

This stage three description of the CCBS supplementary service is based on the ISUP protocol as defined in ETS 300 356-1 [12] and ETS 300 356-2 [13].

6 Operational requirements

6.1 Provision and withdrawal

The CCBS supplementary service shall be provided to user A after prior arrangement with the service provider, or shall be generally available. The CCBS supplementary service shall be withdrawn at the customer's request or for administrative reasons, by the network provider.

6.2 Requirements on the originating network side

In order to operate the CCBS supplementary service, the originating network side shall have Transaction Capabilities (TC) resources as specified in ETS 300 134 [11].

6.3 Requirements on the destination network side

In order to operate the CCBS supplementary service, the destination network side shall have TC resources as specified in ETS 300 134 [11].

7 Coding requirements

7.1 ISUP protocol

The coding described in clause 7 and the procedures described in clause 9 assume that the ISDN network uses ISUP version 2 according to ETS 300 356-1 [12] all the way. Subclause 10.1 also describes interworking within one and the same network if parts of the network do not have ISUP version 2 capability.

7.1.1 ISUP Preference Indicator (IPI) in the Initial Address message (IAM)

For the CCBS call, the IPI in the Forward Call Indicators parameter in the IAM shall be set to "ISDN User Part required all the way".

7.1.2 Diagnostic field in Release message (REL)

An indication about the possibility of invocation of the CCBS supplementary service in the DLE is given in the diagnostic field of the cause indicators parameter in the Release message along with cause #17 or #34.

7.1.3 CCBS call indicator

The CCBS call indicator is carried in the CCBS parameter.

The format and coding of the CCBS parameter are described in table 8/Q.763 and subclause 3.12A of ETS 300 356-1 [12].

7.2 Application Service Element (ASE) for CCBS

7.2.1 Protocol elements list

From OLE to DLE:

- CCBS REQUEST (invoke) class 1;
- CCBS SUSPEND class 4;
- CCBS RESUME class 4;
- CCBS CANCEL class 4.

From DLE to OLE:

- CCBS REQUEST (result) class 1;
- REMOTE USER FREE class 4;
- CCBS CANCEL class 4.

7.2.2 List of parameter types

Addressing and identification parameters:

- calling party number (note 1);
- called party number.

NOTE 1: If presentation of the calling party number is allowed, the country code shall be included in the calling party number in the OLE, in case of an international outgoing call.

Service management parameters:

- retainSupported;
- causeCode.

Subscriber management parameters:

- user service information;
- user service information prime (note 2);
- access transport.

NOTE 2: The user service information prime parameter is used in the case of signalling procedures for connection type with fallback capability.

7.2.3 Error types

a) Cause: short term denial;

b) Cause: long term denial.

7.2.4 Abstract syntax, general

Subclause 7.3 specifies the operations and errors which form the CCBS ASE using the Abstract Syntax Notation One (ASN.1) as defined in CCITT Recommendation X.208 [7] and the OPERATION and ERROR MACROs defined in ETS 300 134 [11].

The set of values each of which is a value of the ASN.1 type TCAPMessages.MessageType as defined in ETS 300 134 [11] with the ANY DEFINED BY clauses resolved by the operations and errors definitions included in subclause 7.3 form the abstract syntax for the CCBS ASE protocol.

The encoding rules which are applicable to this abstract syntax are defined in ETS 300 134 [11].

The mapping of the OPERATION and ERROR MACROs to TC components is described in ETS 300 134 [11].

The ASN.1 data type which follows the keywords "PARAMETER" or "RESULT" (for OPERATION and ERROR) is always optional from a syntactic point of view. However, except when stated otherwise, it has to be considered as mandatory from a semantic point of view.

7.3 ASN.1 module

Table 3-1/Q.733 in ITU Recommendation Q.733, clause 3 [6] shows the definition of the operations, errors and types required for the CCBS supplementary service.

NOTE: This definition is reproduced in annex C for informative purposes.

8 State definitions

No specific state definitions are required.

9 Signalling procedures

If a call to destination B encounters a busy condition and the DLE supports the CCBS supplementary service, then the DLE shall set a diagnostic field of the Cause indicators parameter in the REL message to indicate whether or not CCBS is possible.

E.g., if the destination local exchange DLE knows that the CCBS is forbidden on destination B then the diagnostic field shall be set to "CCBS not possible". Otherwise the diagnostic field shall be set to "CCBS possible".

9.1 Activation, deactivation and registration

9.1.1 Activation

9.1.1.1 Actions at the originating local exchange

9.1.1.1.1 Normal procedure

When user A encounters a busy destination B, user A can activate the CCBS supplementary service.

NOTE 1: User A can have a limited number of CCBS requests outstanding. This limit is a network provider option (with a maximum value of 5).

If the OLE is supporting the CCBS supplementary service and this supplementary service is available to user A and the OLE has received from the DLE a Release message with cause parameter containing cause value #17 or #34 and a diagnostic field with a "CCBS possible" indication, the OLE shall retain the call information and start the retention timer CCBS-T1. In case of a diagnostic field with "CCBS not possible" no particular actions are made in the network.

In case "CCBS possible" has been received, if the OLE receives a CCBS request before the expiry of CCBS-T1 and accepts this request (see conditions in ETS 300 357 [14]), the OLE shall:

- stop the retention timer CCBS-T1;

- register the retained call information from the original basic call;

- send a CcbsRequest invoke component to the DLE:

  - the calledPartyNumber parameter shall contain the number of B;

  - the userServiceInf parameter shall contain the bearer capability of the original call , if available;

  - the retainSupported parameter shall indicate whether the OLE supports the retain option;

  - the callingPartyNumber parameter shall contain the number of A;

  NOTE 2: The inclusion is a network provider option.

  - the parameters userServiceInfPrime and accessTransport, if available, contain compatibility information of the original call;

  - the TC-INVOKE primitive shall include the value of the CCBS request timer CCBS-T2.

Call information retained by the network in support of CCBS shall be the following basic call information from the original call, if available:

- user service information;
- user service information prime;
- access transport;
- calling party number;
- called party number.

NOTE 3: Interactions between CCBS and other supplementary services may require other information to be stored; see clause 11.

If the OLE receives a CcbsRequest return result component, the OLE shall:

- store the information whether the retainSupported parameter has been received or not;

- return a CCBS request acceptance to user A to indicate that the service request has been accepted;

- start the service duration timer CCBS-T3.

NOTE 4: The CCBS request timer CCBS-T2 is stopped by TCAP, when the response to the request is received.

Having activated the CCBS supplementary service, user A can originate and receive calls as normal.

9.1.1.1.2 Exceptional procedure

On receipt of the CcbsRequest return error component, the OLE shall indicate either short term denial or long term denial to the user.

9.1.1.2 Actions at the destination local exchange

9.1.1.2.1 Normal procedures

On receipt of a CcbsRequest invoke component, the DLE shall:

a) check for a compatible terminal and if a compatible terminal is found, store the information received in the CcbsRequest invoke component in the destination B queue and send a CcbsRequest return result component to the OLE:

   - if the retainSupported parameter received in the CcbsRequest invoke component indicates that the retain option is supported at the OLE (coded TRUE), then the retainSupported parameter conveyed in the CcbsRequest return result component shall indicate whether the DLE supports the retain option;

   - if the retainSupported parameter received in the CcbsRequest invoke component is coded FALSE, then the retainSupported parameter conveyed in the CcbsRequest return result component is set to the default value (FALSE),

b) start the service duration timer CCBS-T7;

c) monitor destination B for becoming not busy.

9.1.1.2.2 Exceptional procedures

When the activation of the CCBS supplementary service is rejected by the DLE, it shall send a CcbsRequest return error component, either indicating long term denial, or indicating short term denial in the following cases:

- if there are already the maximum number of requests queued against destination B;

- if there is an interaction with a supplementary service which prevents the activation of the CCBS supplementary service;

- if no compatible terminal was found at destination B.

If destination B is no longer busy when the CcbsRequest invoke component arrives, the DLE shall apply the normal procedures as described in subclause 9.1.1.2.1.

9.1.2 Deactivation

9.1.2.1 Actions at the originating local exchange

9.1.2.1.1 Normal procedures

If the OLE receives a deactivation request from the user and accepts this request (see conditions in ETS 300 357 [14]), the OLE shall:

a) delete registered call information;

b) send a CcbsCancel invoke component to the DLE without a cancelCause parameter.

c) inform user A that the deactivation is successful.

9.1.2.1.2 Exceptional procedures

A particular request for this service shall be automatically deactivated and user A is informed if:

a) the CCBS service duration timer (CCBS-T3) expires

   If the timer CCBS-T3 expires, the OLE shall send a CcbsCancel invoke component to the DLE, with cancelCause "CCBS-T3 Timeout".

b) non-acceptance of CCBS recall

   If user A does not accept the CCBS recall before the CCBS recall timer (CCBS-T4) expires, then the CCBS request shall be deactivated. The OLE shall send a CcbsCancel invoke component, with the cancelCause set to "CCBS-T4-Timeout", to the DLE.

9.1.2.2 Actions at the destination local exchange

9.1.2.2.1 Normal procedures

If the DLE receives a CcbsCancel invoke component, it shall delete the CCBS request from the destination B queue.

9.1.2.2.2 Exceptional procedures

A particular request for the service shall be automatically deactivated if the CCBS service supervision timer (CCBS-T7) expires. If timer CCBS-T7 expires, the DLE shall send a CcbsCancel invoke component to the originating exchange, with cancelCause "CCBS-T7 Timeout".

9.1.3 Registration

None identified.

9.2 Actions at the originating local exchange

9.2.1 Normal operation

On receipt of a RemoteUserFree invoke component, the OLE shall initiate recall to user A, with an indication that the recall concerns his CCBS request and the CCBS recall timer CCBS-T4 shall be started.

If user A accepts the recall before the CCBS recall timer expires, then the OLE shall stop timer CCBS-T4 and initiate the CCBS call to destination B by sending an IAM, including the CCBS call indicator and the retained call information (see subclause 9.1.1.1.1). The IPI in the Forward Call Indicators parameter shall be set to "ISDN User Part required all the way".

9.2.2 Exceptional procedures

a) Non-acceptance of CCBS recall

See subclause 9.1.2.1.2 b).

b) User A is found busy or CCBS busy

If user A is found to be busy or CCBS busy, when a RemoteUserFree invoke component has been received, then user A shall be notified and the CCBS request shall be suspended until user A becomes not busy or not CCBS busy again. The network shall expect no response from user A to this notification. The OLE shall send a CcbsSuspend invoke component to the DLE.

When user A is no longer busy, the OLE shall send a CcbsResume invoke component to the destination exchange. On receipt of a RemoteUserFree invoke component from the DLE, the OLE shall offer a CCBS recall to user A.

In case of the OLE had sent several CcbsSuspend invoke components to different DLEs and user A becomes neither busy nor CCBS busy, the OLE shall send a CcbsResume invoke component to each DLE for which there is a suspended CCBS request for which a compatible terminal at user A is neither busy nor CCBS busy.

c) User A makes another call to the same destination B

If user A makes another call to the same (busy) destination B and activates the CCBS supplementary service again, then:

- if the two calls are identical, then the following network provider option exists:

  1) the original request shall be retained with the current request being discarded and user A shall be informed that the request has not been accepted because a CCBS request had already been stored against the requested destination B;

  2) the network shall treat this as a new CCBS request;

- if the two calls are not identical, then the network shall treat this as a new CCBS request.

In order to decide that the two calls are identical, the OLE shall only compare the basic call information, i.e. the bearer service and teleservice requirements, the destination selection information, and calling user identity (if any).

d) CCBS call failure

If the CCBS call fails, user A shall be informed as for the basic call procedures.

If the received Release message contains a diagnostic field with "CCBS possible" and either cause #17 or #34 two possibilities exist:

- if the retain option is supported across the networks, the OLE shall keep the transaction resources and shall not restart timer CCBS-T3. If user A attempts to activate CCBS again this shall be treated as described in subclause 9.2.2 case c).

- if the retain option is not supported across the networks, the OLE shall release the transaction resources. The CCBS request shall be deactivated and user A shall be informed accordingly.

If the received Release message does not contain a diagnostic field with "CCBS possible" but contains cause #17 or #34 interworking may be present and procedures of subclause 10.1 shall be followed.

If the received Release message does contain a cause value other than cause #17 or #34 the OLE shall send a CcbsCancel invoke component to the DLE. The CCBS request shall be deactivated and user A shall be informed accordingly.

e) The OLE receives a TC-NOTICE indication primitive upon sending the CcbsSuspend invoke component.

If the OLE receives a TC-NOTICE indication primitive upon sending the CcbsSuspend invoke component to the DLE, then the timer CCBS-T3 is stopped, the request is deleted and the TC resources are released.

f) The OLE receives a TC-NOTICE indication primitive upon sending the CcbsResume invoke component.

If the OLE receives a TC-NOTICE indication primitive upon sending the CcbsResume invoke component to the DLE, then the timer CCBS-T3 is stopped, the request is deleted and the TC resources are released.

9.3 Actions at a transit exchange

9.3.1 Normal operation

The transit exchange shall pass the CCBS call indicator transparently to the succeeding exchange. It shall also pass the diagnostic field including the CCBS indicator transparently to the preceding exchange. Basic call procedures as described in ETS 300 356-1 [12] are applicable.

9.3.2 Exceptional procedures

None identified.

9.4 Actions at the outgoing international gateway exchange

9.4.1 Normal operation

The outgoing international gateway exchange shall pass the CCBS call indicator transparently to the succeeding exchange. It shall also pass the diagnostic field including the CCBS indicator transparently to the preceding exchange. Basic call procedures as described in ETS 300 356-1 [12] are applicable.

9.4.2 Exceptional procedures

None identified.

9.5 Actions at the incoming international gateway exchange

9.5.1 Normal operation

The incoming international gateway exchange shall pass the CCBS call indicator transparently to the succeeding exchange. It shall also pass the diagnostic field including the CCBS indicator transparently to the preceding exchange. Basic call procedures as described in ETS 300 356-1 [12] are applicable.

9.5.2 Exceptional procedures

None identified.

9.6 Actions at the destination local exchange

9.6.1 Normal operation

When destination B becomes not busy, then the DLE shall check the state of the queue for destination B:

- if there is an entry in the CCBS queue currently being processed, then no further action shall be taken;

- otherwise, the entries in the CCBS queue are examined in order;

- if an entry is suspended, it is stepped over;

- if an entry is not suspended, the DLE shall reserve on destination B's interface the resources (e.g. a B-channel) which are necessary to complete the CCBS call. Destination B can use the reserved access resources or other free resources in order to make an outgoing call;

- check whether a compatible terminal at destination B is not busy. If there is no compatible terminal free, the entry is stepped over;

- if a compatible terminal is free, then the procedures as described below are followed;

- if all the entries in the queue have been checked without finding an entry which is not suspended and for which a compatible terminal is free, then the DLE shall release the reserved resources.

The network shall start the destination B idle guard timer CCBS-T8 in the DLE. When timer CCBS-T8 expires, the selected CCBS request shall be processed.

When processing a CCBS request, provided that a compatible terminal is free and the reserved resources are still available at destination B, the DLE shall start the CCBS recall procedure.

The CCBS recall procedure is defined as follows:

- send a RemoteUserFree invoke component to the OLE; and

- start the CCBS recall timer CCBS-T9.

If the DLE receives an IAM while the network has reserved resources on destination B's interface, the DLE shall check whether this new incoming call includes a CCBS call indicator.

If the call includes a CCBS call indicator, the DLE shall offer the CCBS call to destination B.

If the call does not include a CCBS call indicator, the DLE shall compare the service requirements and destination selection information with the information stored in the destination B queue for the CCBS request which is currently being processed.

If the two sets of information are not identical and there are free resources which are not reserved, the DLE shall offer the incoming call to destination B; otherwise the incoming call shall be released.

NOTE: If there is interaction with private networks, different procedures apply; see subclause 10.1.7.

When the DLE has sent an Address Complete message (with subscriber free), a CPG (Alerting) message or a Connect message, it shall:

- release its TC resources;

- stop the timers CCBS-T7 and CCBS-T9;

- check whether there are free resources on the destination B interface:

  - if there are no free resources on the destination B interface then no further action shall be taken;

  - if there are free resources on the destination B interface then the DLE shall service the queue for destination B as described above.

When a CCBS request becomes not suspended because user A has become free (i.e. not busy and not CCBS busy), then if there are free resources on the destination B interface and there is no entry in the CCBS queue which is currently being processed the DLE shall service the destination B queue as described above.

Several CCBS requests can be queued against one destination B in the destination B CCBS queue. The exact size of the destination B CCBS queue (from 1 to 5 entries) is a destination network operator option.

As a network option the destination network operator can reduce the sizes of the CCBS queues associated with individual users. The reduced size can be zero.

If the processing of a CCBS request results in suspending that CCBS request, the DLE shall stop timer CCBS-T9 and attempt to process the next CCBS request in the same queue.

If the processing of a CCBS request results in deactivating that CCBS request, the DLE shall stop timers CCBS-T7 and CCBS-T9 and attempt to process the next CCBS request in the same queue.

9.6.2 Exceptional procedure

a) Resources or compatible terminal at destination B are no longer available when destination B idle guard timer expires

   If, upon expiry of the destination B idle guard timer (CCBS-T8), no access resources are available at destination B (e.g. no compatible terminal is present or destination B makes an outgoing call), then servicing of the destination B CCBS queue shall be deferred until the destination B becomes not busy again.

   If, upon expiry of the destination B idle guard timer (CCBS-T8), all compatible terminals at destination B are busy, then the next request in the destination B CCBS queue shall be selected for processing.

b) Destination B receives a "remote user free" indication while processing the destination B CCBS queue

   See subclause 11.7.

c) Destination B is busy upon arrival of the CCBS call

   If destination B is again busy when the network attempts to make the CCBS call, then the procedures depend on whether the retention option is supported across the networks:

   - if the retention option is not supported across the networks, the corresponding CCBS request shall be cancelled. The DLE shall send a normal Release message (cause #17 or #34 with diagnostic "CCBS possible") to the OLE and shall release its resources. If a new CcbsRequest invoke component is received from the OLE, normal procedures apply according to subclause 9.1.1.2.1;

   - if the retention option is supported across the networks, the original CCBS request shall retain its position in the queue. In this case the DLE shall keep the transaction resources, shall continue to monitor destination B, shall not restart the timer CCBS-T7, shall stop timer CCBS-T9 and shall send a Release message (cause #17 or #34 with diagnostic "CCBS possible") to the OLE.

d) No CCBS call as result

If no CCBS call results from the CCBS recall mechanism, the recall timer CCBS-T9 expires. In this case the DLE shall send a CcbsCancel invoke component to the OLE. The cancelCause shall indicate "CCBS-T9-Timeout". The network shall make any reserved access resources on destination B's interface available for use, if no other CCBS call exists in the queue.

e) The DLE receives a TC-NOTICE indication upon sending the RemoteUserFree invoke component

If the DLE receives a TC-NOTICE indication upon sending the RemoteUserFree invoke component to the OLE, then the timers CCBS-T7 and CCBS-T9 are stopped, the request is deleted and the TC-resources are released. The next active request in the queue (if any) shall be served.

9.7 Use of TCAP and SCCP

The service monitoring and management signals are defined as TC-based application messages (i.e. operations and corresponding results, respectively error messages) as defined in ETS 300 134 [11]. The coding of these messages is given in subclause 7.3.

9.7.1 Routeing in the SCCP network

For routeing on the international interface and for routeing based on the Global Title (GT) translation mechanism within national networks, the coding of the called party address and the calling party address in Signalling Connection Control Part (SCCP) as specified in ETS 300 009 [9] shall comply with the following restrictions:

-	SSN indicator	1	(SSN for ISDN supplementary services is always included)
-	GT indicator	0100	(includes translation type, numbering plan, encoding scheme and nature of address)
-	translation type	0001 0001	(translation table)
-	numbering plan	0001	(ISDN/telephony numbering plan E.164)
-	routeing indicator	0	(routeing on global title)

Alternatively, for routeing within a national network, the SCCP addressing method based on the Signalling Point Codes (SPCs) may apply. However, within large national networks, it would be advisable to use a hybrid addressing method based on SPCs for regional traffic and GT translation mechanism for long distance traffic, to keep the Signalling System No.7 routeing data manageable.

9.7.2 Number information used for routeing

The exchange which initiates a dialogue using the GT translation mechanism, shall give its E.164 service centre address as GT in the SCCP calling party address field. This precludes that number information sensible to privacy regulations (e.g. Calling Line Identification (CLI)) is used for routeing on the international interface.

9.7.3 SCCP message return procedure

The SCCP message return procedure is always requested, by means of the TC-primitives between the CCBS-ASE and the TC protocols.

9.8 ASE for CCBS

The subsystem number value 0000 1011 is dedicated to the ISDN supplementary services ASEs.

9.9 Dialogue

9.9.1 General

The dialogue defined for the CCBS between the peer-to-peer entities (TC-Users) is a structured dialogue. The dialogue ID parameter is used in both operation handling and transmission (dialogue) handling primitives to determine which component(s) pertain(s) to which dialogue.

Each TC-User has its own reference for a given dialogue. These references are local references and mapping of these local references into protocol references transaction ID, included in the messages, is done by TC.

All the operations are belonging to the same dialogue.

Only class 1 and 4 operations are used.

Each TC message conveys only a single CCBS operation.

9.9.2 Dialogue beginning

The OLE establishes the dialogue by using a TC-BEGIN request primitive with TC-INVOKE request primitive to transmit a CCBS request invoke component to the DLE.

The DLE responds by:

- using the TC-CONTINUE request primitive with TC-INVOKE request primitive to transmit a CcbsRequest return result component, confirm the dialogue, and indicate that the CCBS request operation succeeds;

- using the TC-END request primitive with TC-U-ERROR request primitive to transmit a CcbsRequest return error component, end the dialogue, and indicate that the CCBS request operation fails.

9.9.3 Dialogue continuation

The continuation of the dialogue is assumed by class 4 operations using TC-CONTINUE primitives. The TC-CONTINUE primitives, issued by the CCBS-ASEs at both the OLE and DLE, shall include a request for the return option of the SCCP. No result is provided for a class 4 operation. These operations are:

- RemoteUserFree;
- CcbsSuspend;
- CcbsResume.

9.9.4 Dialogue end

a) Basic end

A dialogue end is requested by the CCBS application by a TC-END request primitive with TC-INVOKE request primitive to transmit a CcbsCancel invoke component in the following cases:

with cancelCause:

- at time-out of timers CCBS-T3, CCBS-T4, CCBS-T7 and CCBS-T9;

without cancelCause:

- receipt of a failure indication of the CCBS call from call control;

- upon sending of the Release message with B busy (cause #17 or #34) if the retain option is not supported;

- when user A deactivates the service;

- in case the call forwarding activation exists:
  - CFU; or
  - CFB,
  see subclause 11.10.2.2 case c).

A dialogue end is requested by the CCBS application (DLE) by a TC-END request primitive without component primitive upon the following cases:

- upon sending of the Address Complete message (with subscriber free), Call Progress message (with alerting), or Connect message from the DLE.

  - in case of CFNR, see subclause 11.10.2.2 case c).

A dialogue end is requested by the CCBS application (DLE) by a TC-END request primitive with TC-U-ERROR request primitive to transmit a CcbsRequest return error component in the following cases:

- if the maximum number of entries in the destination B queue has been reached, see subclause 9.1.1.2.2;

- if the user has not subscribed to the given basic service;

- if there is no compatible terminal at destination B when using the status request procedure, see subclause 9.1.1.2.2;

- in case the call forwarding activation exists:
  - CFU; or
  - CFNR; or
  - CFNR and CFB,
  see subclause 11.10.2.2 case a).

A dialogue end is requested by the CCBS application by a TC-END request primitive with TC-U-REJECT request primitive in the following cases:

- if the component check fails.

b) Abort by the TC-User

In case of abnormal situation, the user may abandon the service. In this case a peer to peer information is delivered at the time the abort is issued to the remote TC-User. TC-U-ABORT request primitive without abort reason is used in this case.

c) TC cancellation

If the CCBS request timer CCBS-T2 expires, the CCBS-ASE receives a TC-L-CANCEL indication primitive as response to the CcbsRequest invoke component. In this case the service request shall also be rejected.

10 Interaction with other networks

When user A and destination B belong to different networks, then the CCBS supplementary service can be activated, if all networks involved support the CCBS supplementary service, along the communication path between the two users.

10.1 Interworking with an ISUP network without ISUP version 2 capability

As the first call and the CCBS call are normal calls and as other ISUP versions than version 2 as defined in ETS 300 356-1 [12] may be used, the support of the CCBS supplementary service is not always guaranteed, as the diagnostic field or CCBS indicator is not always conveyed.

Although in ISUP the diagnostic field with the "CCBS is possible" indication is received in the Release message, the CCBS call may not succeed in some cases, e.g.:

- in case of interworking with an ISUP according to the CCITT Blue Book (1988) in a national network not supporting the transfer of a CCBS call indicator in the IAM;

- if the first call (transferring the diagnostic field in the Release message) was routed via ISUP version 2 all along the way, whereas the CCBS call is routed through an intermediate exchange only supporting ISUP version 1 as defined in ETS 300 121 [10]. This may be the case both at interworking or at peer-to-peer interworking.

As a network option, the CCBS supplementary service may be supported within networks without ISUP version 2 capability. Even if no diagnostic field is received in the Release message, the OLE will initiate the sending of a CcbsRequest invoke component if user A activates the CCBS service. The decision in the OLE, whether a CCBS request from user A shall result in the sending of a CcbsRequest invoke component , depends on the received information in the Release message. The outcome of that request depends on the result of the CcbsRequest return component or the TC-NOTICE indication primitive, as described in subclauses 10.2 and 10.3. In table 1, the complete result from the Release message information, the CcbsRequest return result component and the TC-NOTICE indication primitive is shown.

As part of this network option, the signalling system shall support for the CCBS call the transfer of a CCBS call indicator in the IAM. The coding of the CCBS call indicator and the interworking with ISUP version 2 is a national matter, which is outside the scope of this ETS.

If the CCBS call fails due to received release message with cause #17 or #34 and if the retention option is supported across the networks, the OLE shall keep the transaction resources and shall not restart the timer CCBS-T3. If user A attempts to activate CCBS again, this shall be treated as described in subclause 9.2.2 case c).

Table 1: Outcome of the service, related to the diagnostic field in combination with the CcbsRequest return result component and TC-NOTICE indication primitive

	Diagnostic field received (note 3)		**No diagnostic field received**
	CCBS possible	**CCBS not possible**	
CcbsRequest return result received (SCCP/TCAP end-to-end)	service supported (note 1)	not applicable	service supported (note 1)
TC-NOTICE indication received (SCCP/TCAP not end-to-end)	service not supported (note 2)	not applicable	service not supported (note 2)
NOTE 1: CCBS accepted or short term denial. NOTE 2: Long term denial. NOTE 3: The diagnostic field is associated with cause #17 or #34.			

10.2 Interworking with a network without CCBS-ASE capability

If SCCP/TCAP capability is available from the OLE towards a network not supporting the CCBS supplementary service, the following shall apply:

- at the destination node, if the indicated sub-system is not provisioned or is unavailable, SCCP will invoke the message return procedure. Alternatively, if the sub-system is available, but the CCBS ASE does not exist, the dialogue begin request will be rejected. (It is an implementation issue whether the rejection is by TCAP or the TC-user).

If the OLE is informed through the SCCP message return procedure with a TC-NOTICE indication primitive about the inability of SCCP/TCAP capability end-to-end, this implies that the CCBS supplementary service is not supported, as described in table 1.

10.3 Interworking with a network without SCCP/TCAP/ISUP capability

If a specific implementation of the CCBS supplementary service is supported within a network without SCCP/TCAP/ISUP signalling capability, interworking with ISUP version 2 is a national matter. This case is outside the scope of this ETS.

If SCCP/TCAP capability is not available from the OLE towards a network not supporting the CCBS supplementary service, the originating international SCCP relay node shall inform the OLE through the message return procedure as no global title translation can be performed.

10.4 Interworking with Public Switched Telephone Network (PSTN) user

It should be possible to activate CCBS on a call meeting busy between an ISDN and a PSTN user and vice versa, if CCBS is supported for the PSTN user.

10.5 Interworking with a Public Land Mobile Network (PLMN)

The CCBS supplementary service may be supported in case of interworking with a PLMN. The signalling systems used to interwork with a PLMN supporting CCBS shall be compatible, on a functional and a protocol level, with the signalling systems specified in this ETS. If CCBS is not supported by the PLMN, the CCBS request shall be rejected.

10.6 Procedures for interworking with private ISDNs

The CCBS supplementary service, shall not apply in the case of congestion at the interface between a public ISDN and a private ISDN. Therefore the CCBS supplementary service cannot be activated in this situation.

NOTE: Some private ISDNs may use a path reservation method, i.e. a communication path through the private network is reserved before user A is recalled.

If the private network indicates to the DLE that CCBS is possible and the DLE can set the diagnostic field of the Cause indicators parameter in the REL message, then the diagnostic field should be set to "CCBS possible".

If the private network does not indicate to the DLE that CCBS is possible, then the diagnostic field shall not be set.

As user A and/or destination B monitoring functions are assumed by the private network, specific procedures apply in OLE and/or DLE in the case of interworking with one or two private networks.

The specific procedures are only described hereafter.

10.6.1 Provision and withdrawal

As indicated above, a specific category is dedicated to the private network's ISDN number.

10.6.2 Normal procedure

10.6.2.1 Activation, deactivation and registration

10.6.2.1.1 Activation

The "retainSupported" in the CCBS request is coded TRUE by the OLE only if received from user A.

This information shall be sent to the Integrated Services Private Branch Exchange (ISPBX) by the DLE, and the "retainSupported" in the CCBS request return result is coded TRUE only if received from an ISPBX.

If received by the DLE in the CCBS request, the CLI optional parameter is forwarded towards the private network B in order to allow interworking with existing private networks using CLI in a linkage mechanism.

The DLE shall start the supervision timer T_{SUP} on sending the CCBS request to the private network.

The OLE shall start the supervision timer T_{SUP} on receipt of a successful service activation indication.

10.6.2.1.2 Deactivation

If a deactivation request is received from user A, the OLE shall send a CcbsCancel invoke component to the DLE for each concerned transaction. User A shall be informed that the deactivation is successful. The resources are released.

10.6.2.1.3 Registration

Not applicable.

10.6.2.2 Erasure

Not applicable.

10.6.2.3 Invocation and operation

The RemoteUserFree invoke component shall be sent by the DLE to the OLE only when a "Remote User Free" indication is received from the private network.

On successful completion of the CCBS call, the DLE shall be informed by the private network of the successful outcome. The DLE shall end the TC dialogue by means of a TC-END request primitive (basic end) without component primitive.

10.6.3 Exceptional procedures

10.6.3.1 Activation, deactivation and registration

10.6.3.1.1 Activation

None identified.

10.6.3.1.2 Deactivation

None identified.

10.6.3.1.3 Registration

Not applicable.

10.6.3.2 Erasure

Not applicable.

10.6.3.3 Invocation and operation

10.6.3.3.1 Exceptional situation at destination B's side

The CCBS supervision timer T_{SUP} expires.

If timer T_{SUP} expires, the DLE shall send a TC-END request primitive with TC-INVOKE request primitive to transmit the CcbsCancel invoke component to the OLE without cancelCause.

The resources are released in the DLE and in the OLE.

If a CCBS failure condition is encountered within the private network, the DLE shall be informed. The DLE shall end the TC dialogue by means of a TC-END request primitive (basic end) without component primitive.

10.6.3.3.2 Exceptional situation at user A's side

The CCBS supervision timer T_{SUP} expires.

If timer T_{SUP} expires, the OLE shall send a TC-END request primitive with TC-INVOKE component primitive for CcbsCancel to the DLE without cancelCause.

The resources are released in the OLE and in the DLE.

If a CCBS failure condition is encountered within the private network, the OLE shall be informed. The OLE shall end the TC dialogue by means of a TC-END primitive (basic end), with TC-INVOKE component primitive for CcbsCancel without cancelCause.

10.6.3.3.3 Network congestion

None identified.

11 Interaction with other supplementary services

11.1 Advice of charge services

11.1.1 Charging information at call set-up time

No impact on either ISUP or CCBS-ASE.

11.1.2 Charging information during the call

No impact on either ISUP or CCBS-ASE.

11.1.3 Charging information at the end of a call

No impact on either ISUP or CCBS-ASE.

11.2 Call waiting

No impact on either ISUP or CCBS-ASE.

11.3 Call hold

No impact on either ISUP or CCBS-ASE.

11.4 Call transfer

11.4.1 Explicit call transfer

No impact on either ISUP or CCBS-ASE.

11.5 Number identification services

11.5.1 Calling line identification presentation

No impact on either ISUP or CCBS-ASE.

11.5.2 Calling line identification restriction

The CLIR requirements from the original call shall be retained by the OLE and used when the CCBS call is completed.

The CLIR requirements from the original call shall apply to the calling user's identity in the CCBS request operation, i.e. if the CLIR requirements indicate that the transfer of the calling user's identity is restricted, the calling user's identity shall not be included in the CCBSRequest operation.

11.5.3 Connected line identification presentation

No impact on either ISUP or CCBS-ASE.

11.5.4 Connected line identification restriction

No impact on either ISUP or CCBS-ASE.

11.6 Closed user group

When the original call was a CUG call, all CUG information is stored in the OLE and is then used for the set-up of the CCBS call.

No impact on either ISUP or CCBS-ASE.

11.7 Completion of calls to busy subscriber

The following actions are applied if the exchange acts as the destination B's exchange for one instance of the CCBS service, and for another instance of the service acts as the user A's exchange.

If the exchange receives a remote user free indication while processing the destination B CCBS queue, then two cases exist:

a) the destination B idle guard timer (CCBS-T8) is running. If a remote user free indication is received from a remote local exchange, indicating that a recall shall be started towards the user (for this call being a user A for another CCBS request), then the recall to its own user shall take priority over the ongoing B queue processing;

b) the recall timer (CCBS-T9) is running. Depending on the availability of the access resources, the following shall occur:

   1) if no other resources than the reserved one are available, then the access is considered to be busy and the procedure of subclause 9.2.2 case b) shall apply;

   2) if there are other resources available, the procedures of subclause 9.2 shall apply.

11.8 Conference services

11.8.1 Conference call, add-on

No impact on either ISUP or CCBS-ASE.

NOTE: When the conference controller has a conference call active, the CCBS supplementary service can be applied to his/her line. For determination of busy, the conference call appears the same as a two-party call.

11.8.2 Meet-me conference

When the exchange that provides the meet-me conference bridge also supports the CCBS supplementary service, then for all incoming calls towards the conference bridge, meeting busy the DLE shall provide the CCBS indicator with the value "CCBS not possible" towards the OLE.

NOTE: If the CCBS supplementary service is not supported by the exchange providing the meet-me conference bridge, then any CCBS activation attempt against a meet-me conference call meeting busy will be rejected due to the absence of the CCBS capability (i.e. CCBS-ASE) in that exchange. See the procedure described in subclause 10.2.

If user A requests the activation of the CCBS supplementary service against the meet-me conference bridge, the DLE shall send a CcbsRequest return error component with long term denial to the OLE.

11.9 Direct dialling in

No impact on either ISUP or CCBS-ASE.

11.10 Diversion services

11.10.1 Call forwarding activated by user A

CCBS recalls shall not be diverted. They are given to user A at his/her original location.

11.10.2 Call forwarding activated by destination B

11.10.2.1 Originating local exchange

No impact.

11.10.2.2 Destination local exchange (B)

a) Call forwarding is (are) already activated on receipt of a CCBS request

On receipt of a CCBS request:

- if destination B has a CFU activated, the destination B's local exchange rejects the CCBS request with short term denial as the reason. If any other call diversion is activated in addition to CFU, the result should be the same;

- if destination B has only a CFB activated, destination B's local exchange accepts the CCBS request;

- if destination B has CFNR activated (with or without a CFB in addition), destination B's local exchange shall reject the CCBS request with short term denial as the reason.

NOTE: A local exchange is not aware of the activation of any call deflection. Consequently, a CCBS is always accepted by the local exchange of such a user.

b) Call forwarding is (are) activated after CCBS request(s) has (have) been accepted

If destination B activates a CFB or a CFNR after CCBS requests have been accepted, outstanding CCBS requests will remain in the destination B CCBS request queue, no specific action is taken.

If destination B activates a CFU after CCBS requests have been accepted, the following procedure shall apply:

- on activation of a CFU, outstanding CCBS requests shall remain in the destination B CCBS request queue until the CCBS service duration timer expires and destination B's local exchange stops monitoring destination B.

- On deactivation of CFU, if at least one CCBS request is standing in the queue, destination B's local exchange starts monitoring destination B.

c) CCBS call

If destination B has activated a CFU whilst the recall timer (CCBS-T9) is running, upon the arrival of a CCBS call, the CCBS call shall be forwarded as a normal call and the TC-dialogue is terminated by destination B according to subclause 9.9.4 case a). The CCBS parameter in the forwarded IAM message is deleted.

If destination B has activated a CFNR whilst the recall timer (CCBS-T9) is running, upon the arrival of a CCBS call, the CCBS call shall be forwarded as a normal call and the TC-dialogue is terminated by destination B according to subclause 9.9.4 case a).

If destination B has activated a CFB, if destination B is busy upon the arrival of a CCBS call, as a network option, the CCBS call can be either:

- treated as a "destination B busy upon arrival of CCBS request" (see subclause 5.3.5.2 case b));

- forwarded as a normal call. The CCBS parameter in the forwarded IAM message is deleted. The TC-dialogue is terminated by destination B according to subclause 9.9.4 case a).

If destination B tries to activate a CD, upon the arrival of a CCBS call this request shall be rejected. The CCBS call shall continue according to subclause 9.6.1.

11.11 Freephone

No impact on either ISUP or CCBS-ASE.

11.12 Malicious call identification

No impact on either ISUP or CCBS-ASE.

11.13 Multiple subscriber number

No impact on either ISUP or CCBS-ASE.

11.14 Subaddressing

The called user's subaddress (if any), which was supplied in the original call, shall be included in the CcbsRequest invoke component and in the CCBS call, which may follow it.

11.15 Terminal portability

No impact on either ISUP or CCBS-ASE.

11.16 Three party

No impact on either ISUP or CCBS-ASE.

11.17 User-to-user signalling

Requests for the activation of the user-to-user signalling supplementary service (service 1, and/or service 2, and/or service 3), contained in the original call request, shall be stored with the CCBS request.

The OLE shall not store any user-to-user information contained in the original call. However, user A can include user-to-user information in response to the CCBS recall.

NOTE: The original call information, excluding any user-to-user information, is retained by the OLE.

12 Parameter values (timers)

12.1 Timers in the originating local exchange

CCBS-T1 Retention timer. This timer specifies the amount of time that the network retains all of the information supplied by the calling user when the call encounters busy. This timer is part of the basic call procedures. Although this timer is optional for basic call procedures, it is needed for the operation of the CCBS supplementary service. The value shall be greater than 15 seconds.

CCBS-T2 CCBS request operation timer. Supervision of response to CcbsRequest invoke component sent from the OLE to the DLE. CCBS-T2 will expire if signalling is not possible, at signalling failures, or if the DLE cannot respond. Duration = 10 seconds.

CCBS-T3 CCBS service duration timer. The maximum time the CCBS supplementary service will remain activated for user A within the network. The value of this timer shall be a minimum of 15 minutes and a maximum of 45 minutes.

CCBS-T4 CCBS recall timer. The maximum time the network will wait for user A to respond to a CCBS recall. The value of this timer shall be a minimum of 10 seconds and a maximum of 20 seconds.

12.2 Timers in the destination local exchange

CCBS-T7 CCBS service supervision timer. CCBS-T7 expiry will only be meaningful if expiry of CCBS-T3 has not been notified to the destination exchange. CCBS-T7 shall have longer duration than CCBS-T3, i.e. CCBS-T7 shall expire at abnormal situations only. The value of this timer shall be 60 minutes. When CCBS-T7 expires, the CCBS request will be cancelled in the DLE as well as in the OLE.

CCBS-T8 Destination B idle guard timer. The time the network will wait after destination B has become not busy before initiating a RemoteUserFree invoke component towards the originating destination. The value of this timer shall be a maximum of 15 seconds.

CCBS-T9 Recall timer. CCBS-T9 should expire at emergency only, i.e. the recall should be cancelled by CCBS-T4 in the OLE if recall is not responded to. Duration of CCBS-T9 = 30 seconds.

12.3 Interworking timers

T_{SUP} Supervision timer. This timer is used in the OLE or DLE whenever a private network is attached to these exchanges and user A and destination B are in the private network. The duration of this timer shall be 60 minutes.

13 Dynamic description

13.1 SDL diagrams for ISUP

The CCBS supplementary service applies basic call procedures. No ISUP signalling procedures beyond those defined by ETS 300 356-1 [12], clause 8, are required.

13.2 SDL diagrams for ASE

The dynamic description is specified in figures 1 to 8. The dynamic descriptions specified are according to CCITT Recommendation Z.100 [8] with some simplifications in the interest of better readability.

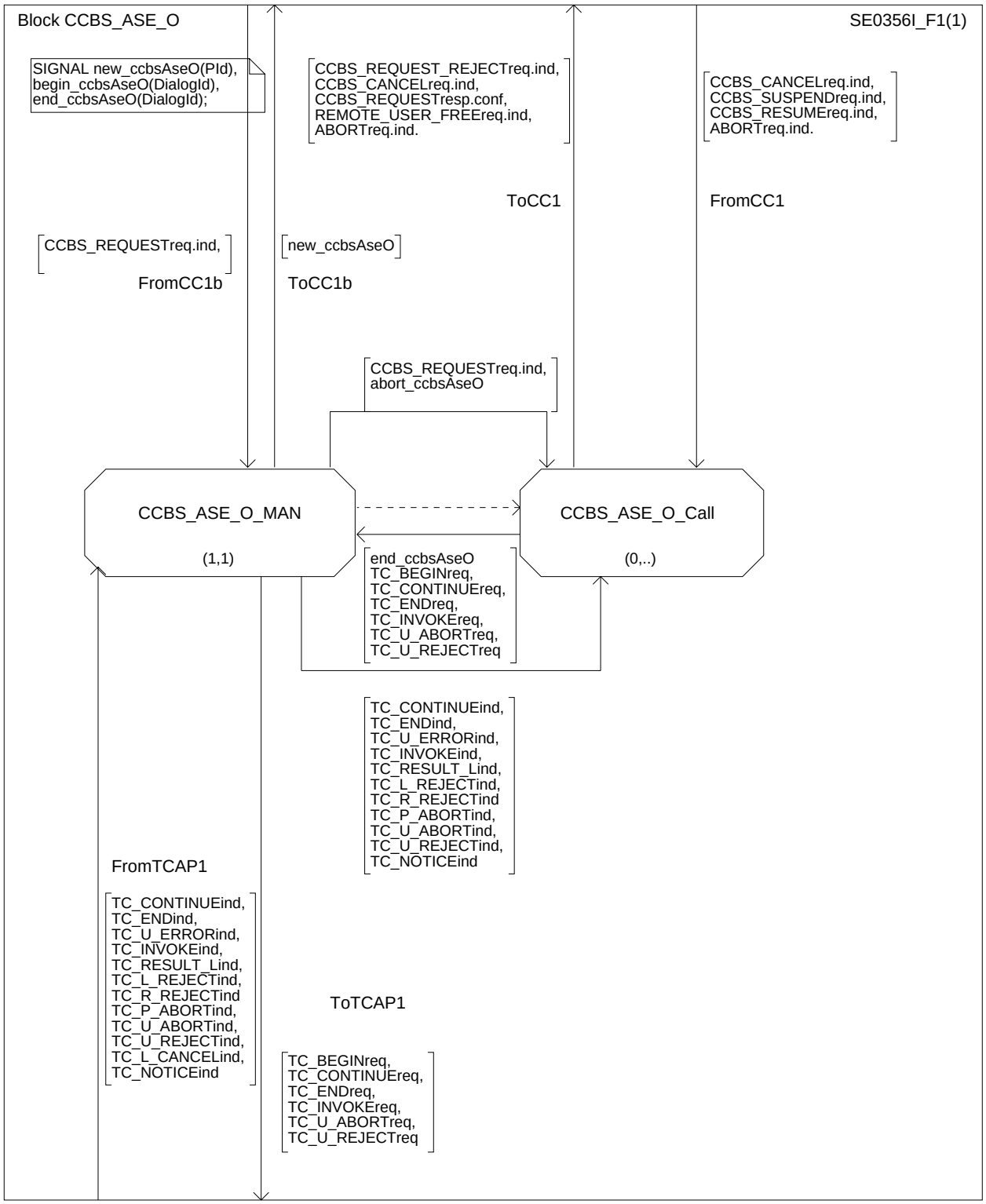


Figure 1: Originating CCBS ASE

Process CCBS_ASE_O_MAN SE0356I_F2.1(3)

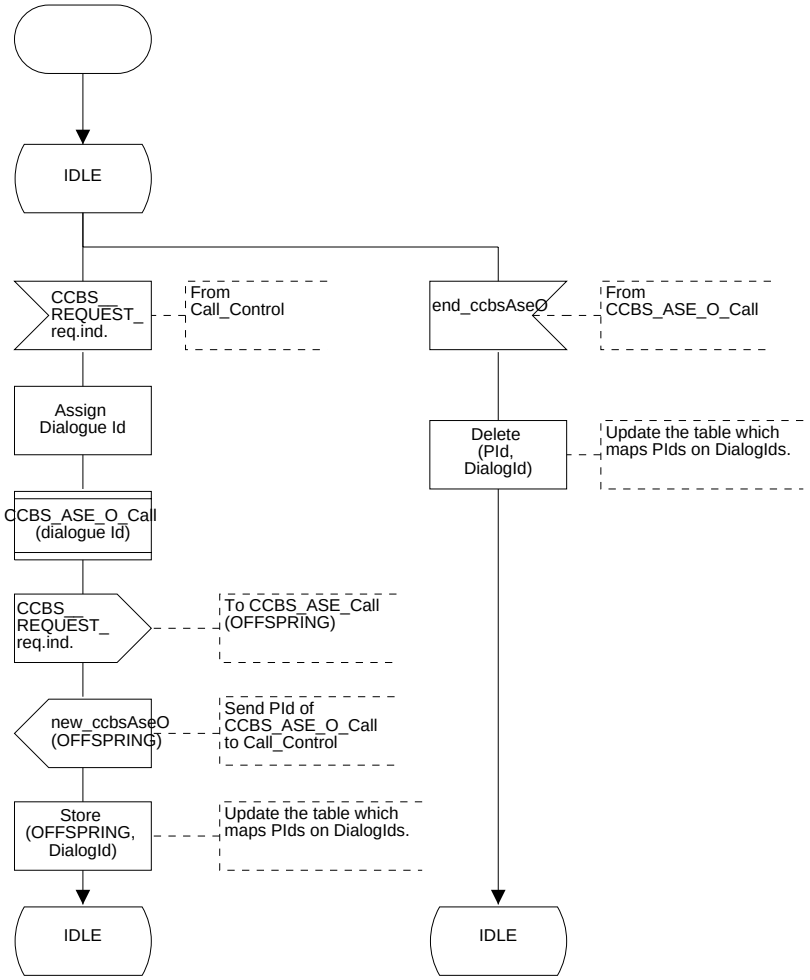


Figure 2 (sheet 1 of 3): Originating CCBS ASE

Process CCBS_ASE_O_MAN SE0356I_F2.2(3)

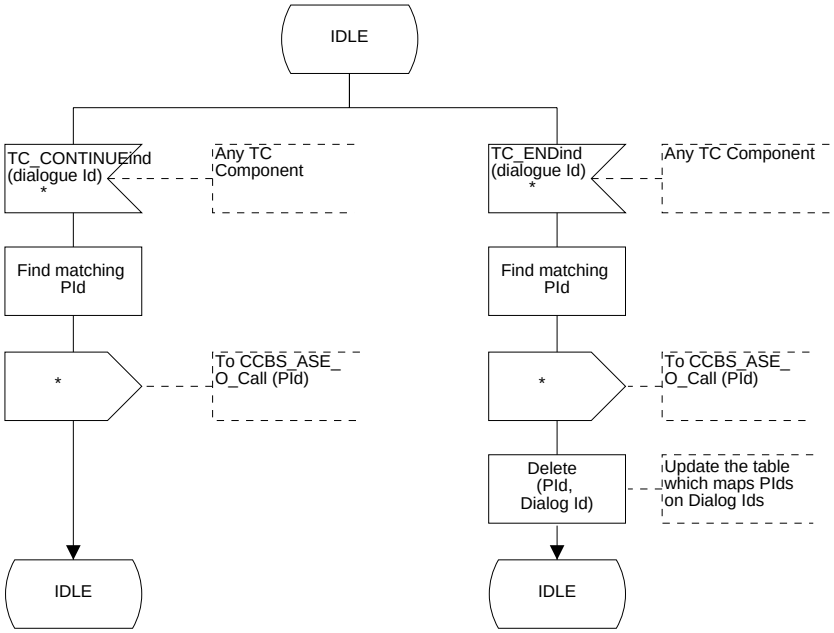


Figure 2 (sheet 2 of 3): Originating CCBS ASE

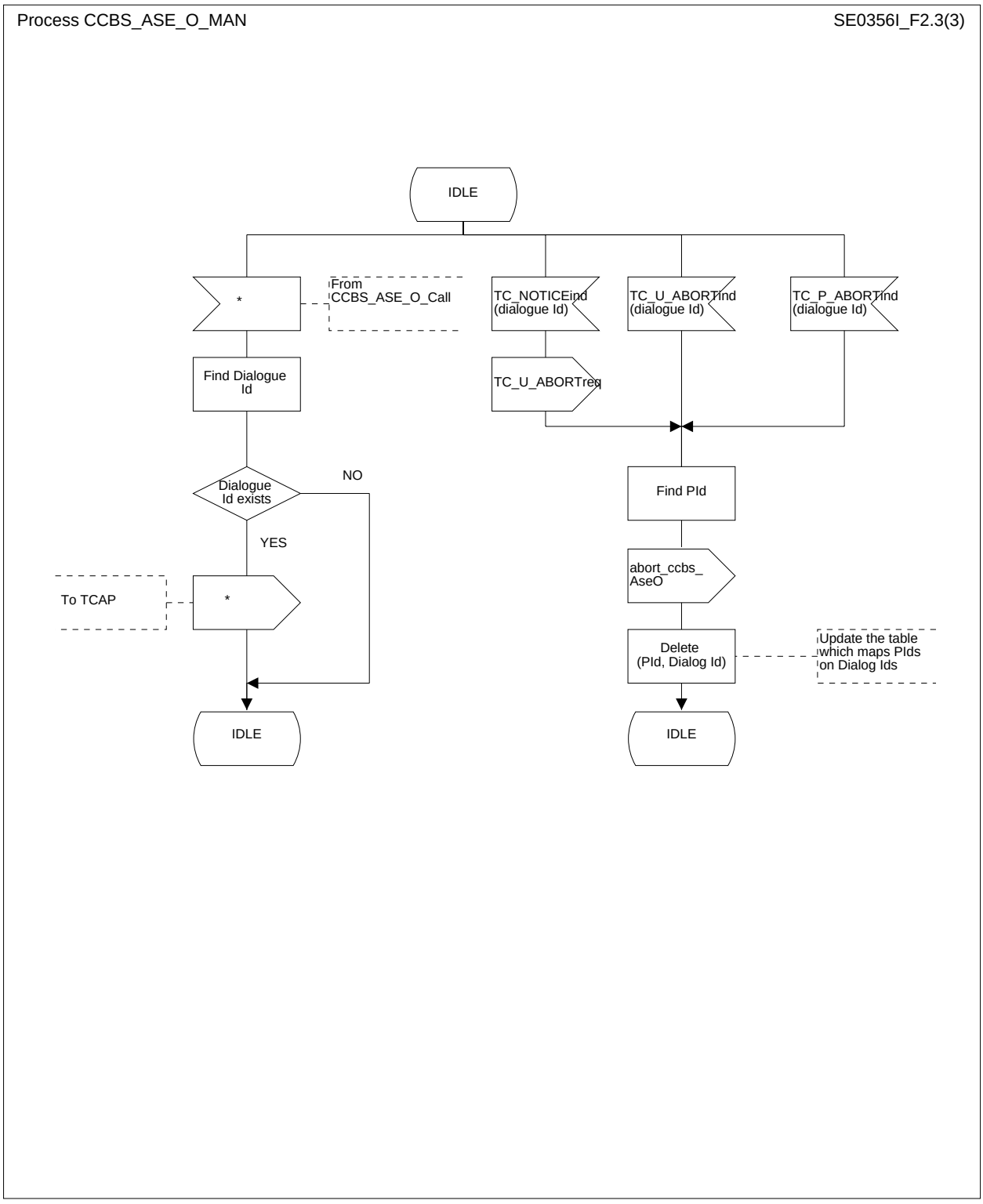


Figure 2 (sheet 3 of 3): Originating CCBS ASE

Process CCBS_ASE_O_Call SE0356I_F3.1(4)

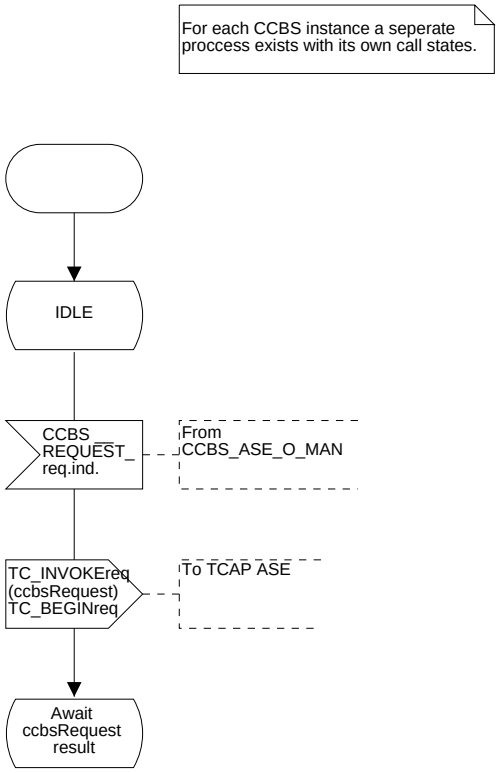


Figure 3 (sheet 1 of 4): Originating CCBS ASE

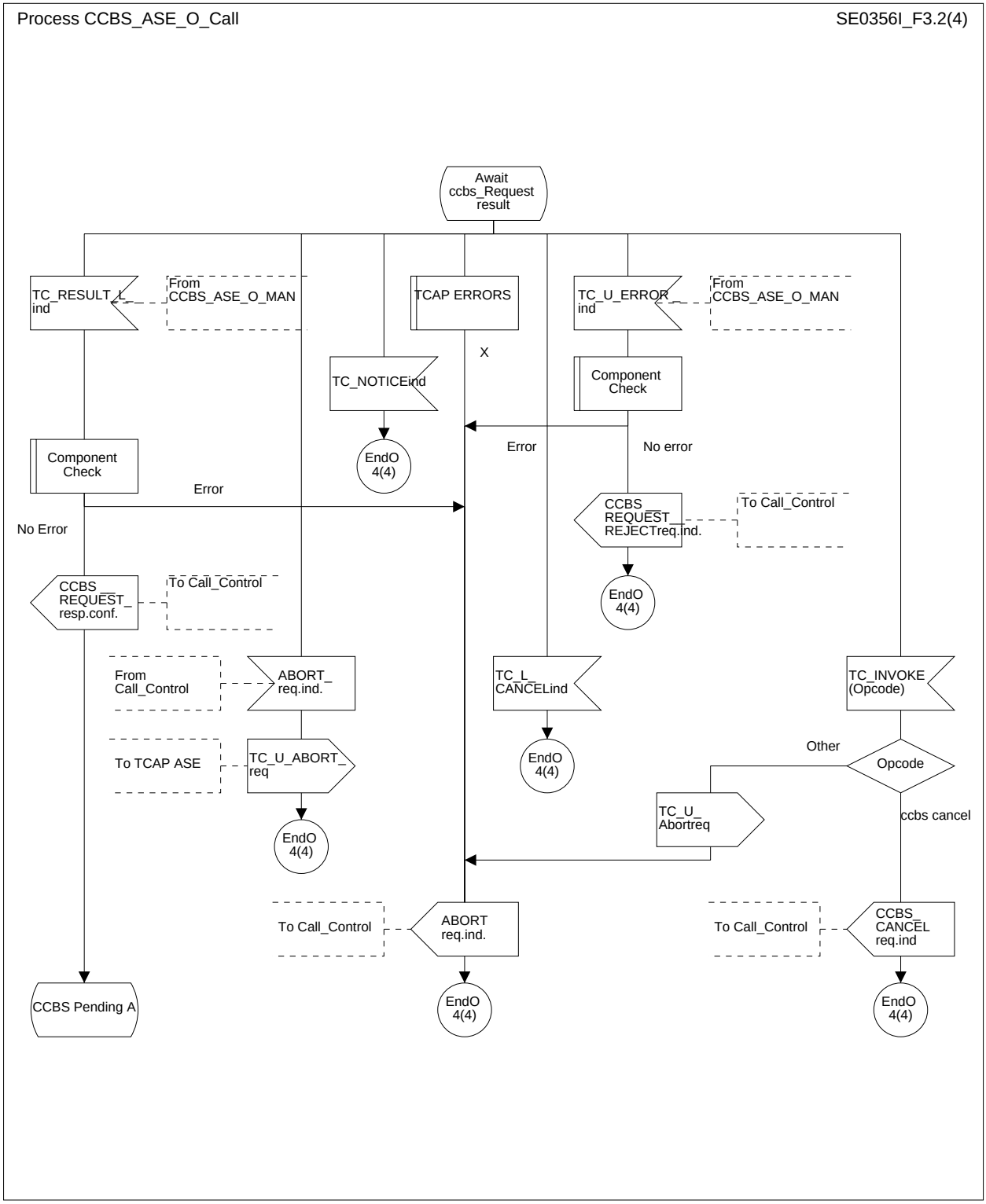


Figure 3 (sheet 2 of 4): Originating CCBS ASE

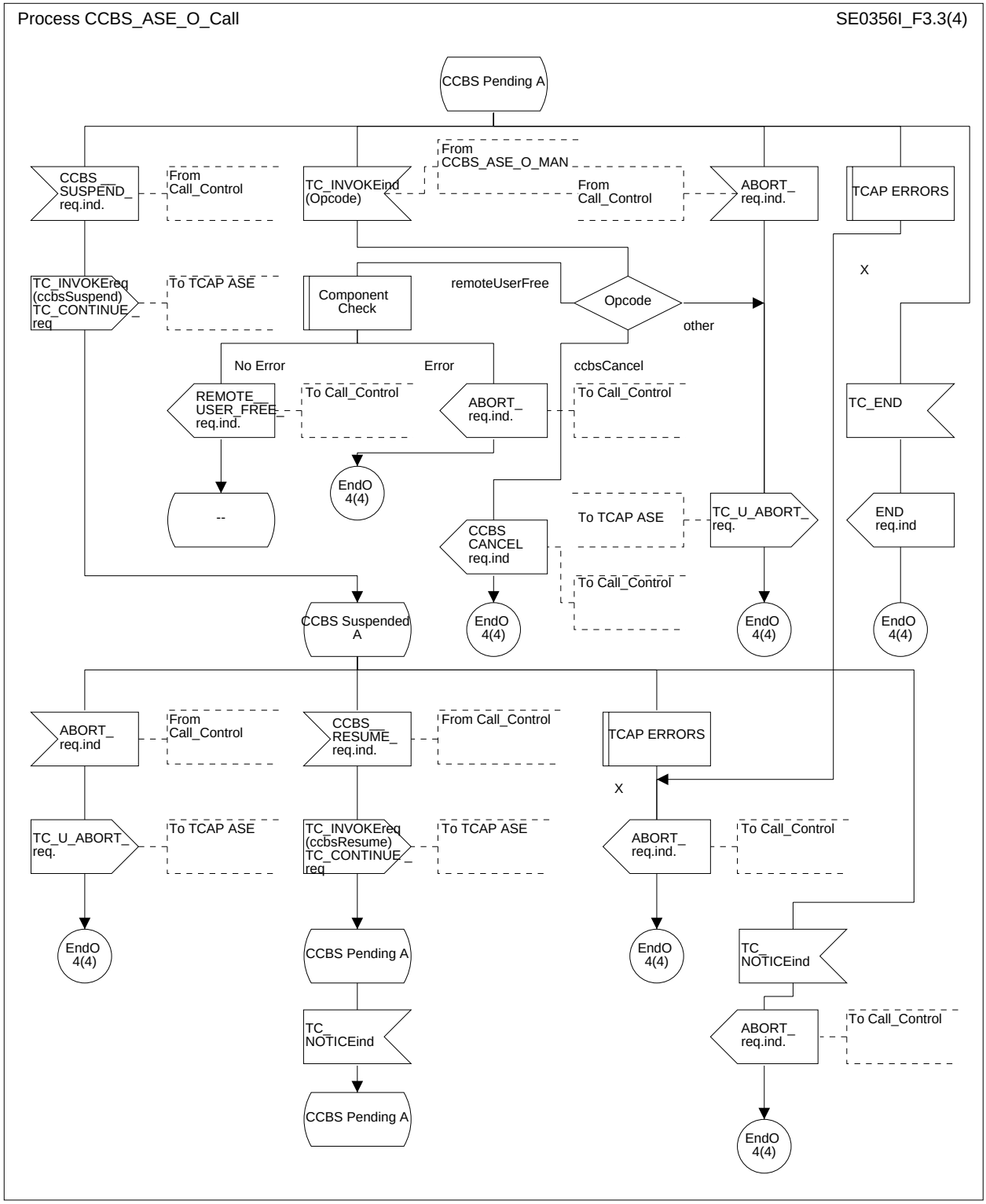


Figure 3 (sheet 3 of 4): Originating CCBS ASE

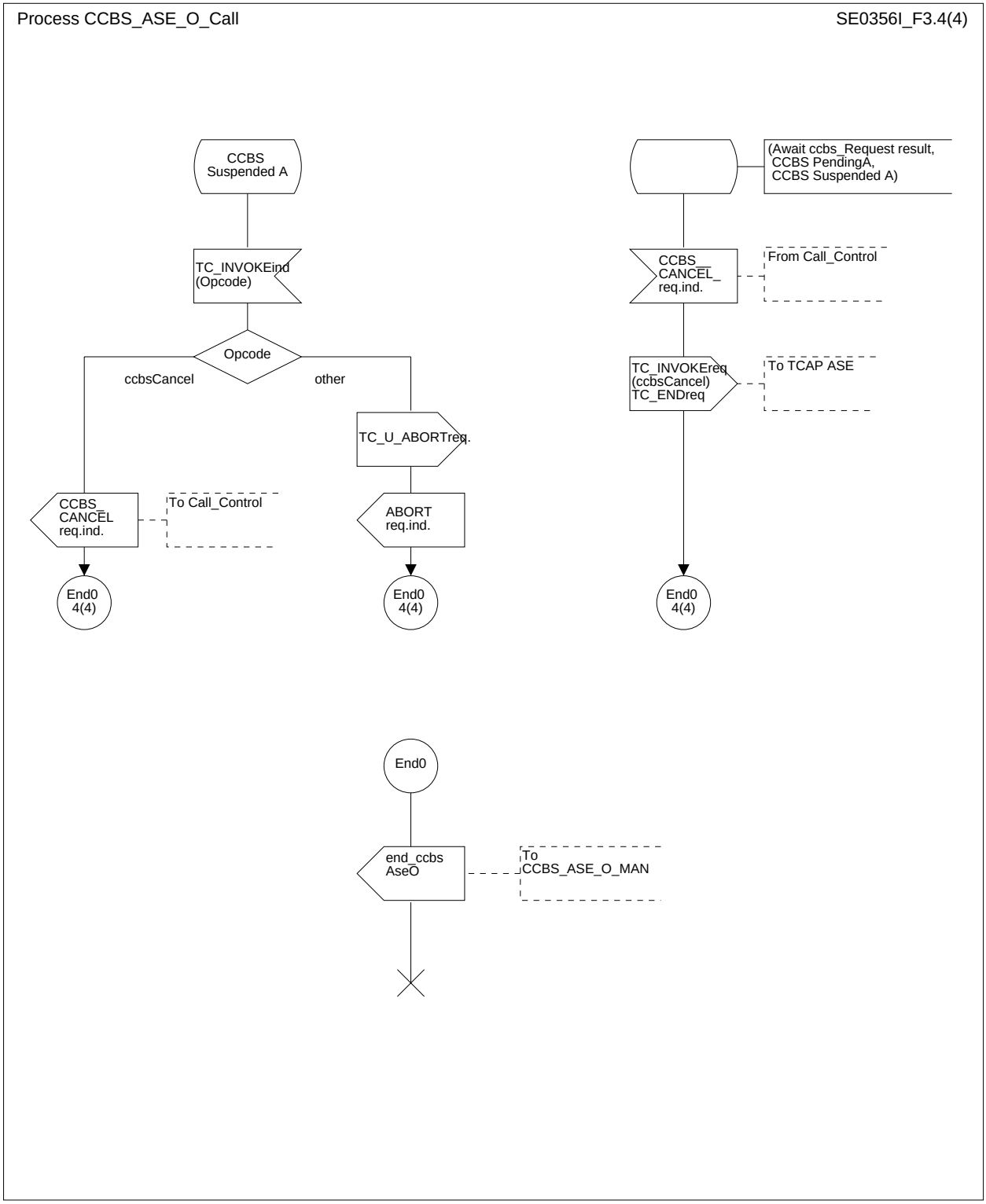


Figure 3 (sheet 4 of 4): Originating CCBS ASE

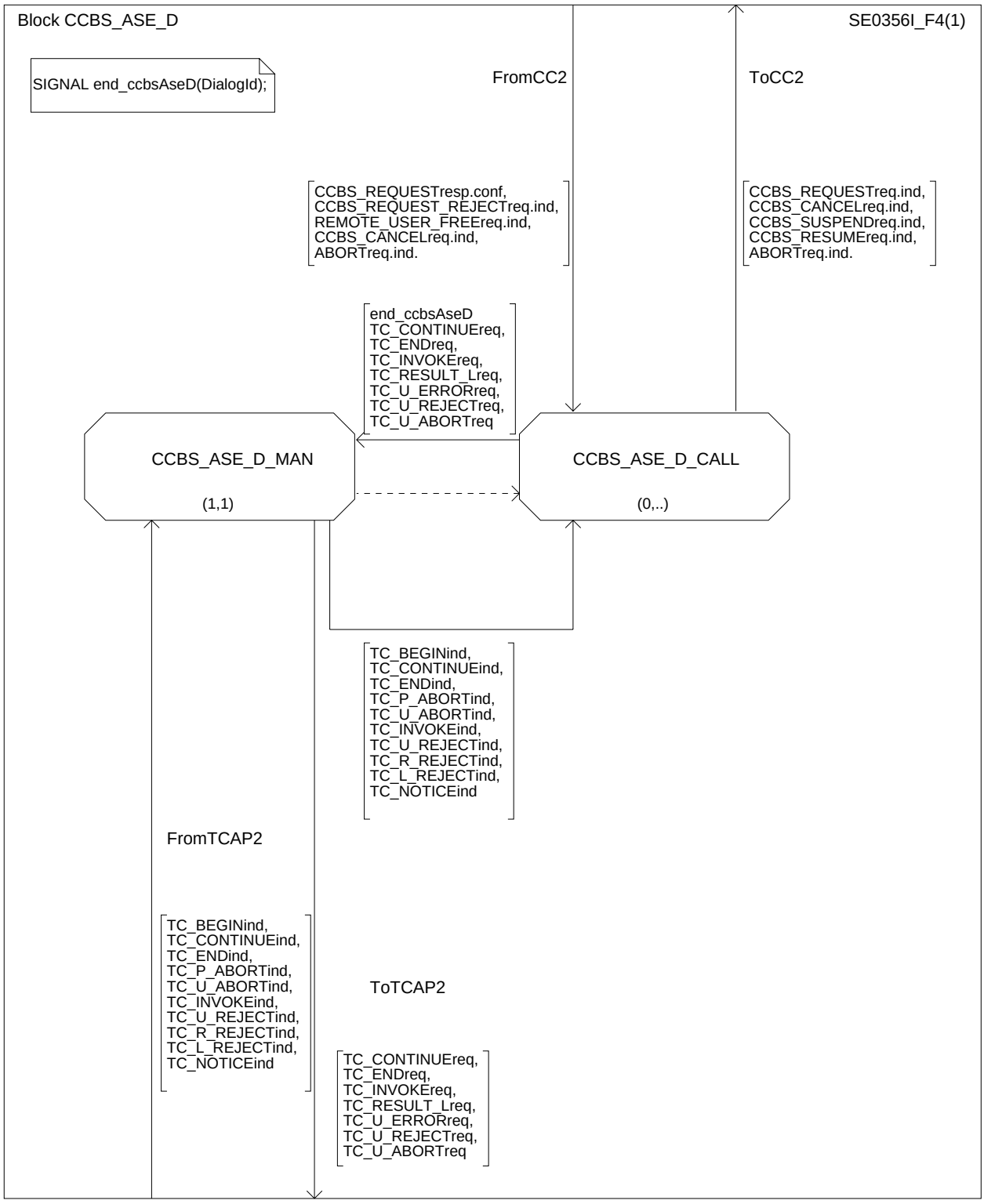


Figure 4: Destination CCBS ASE

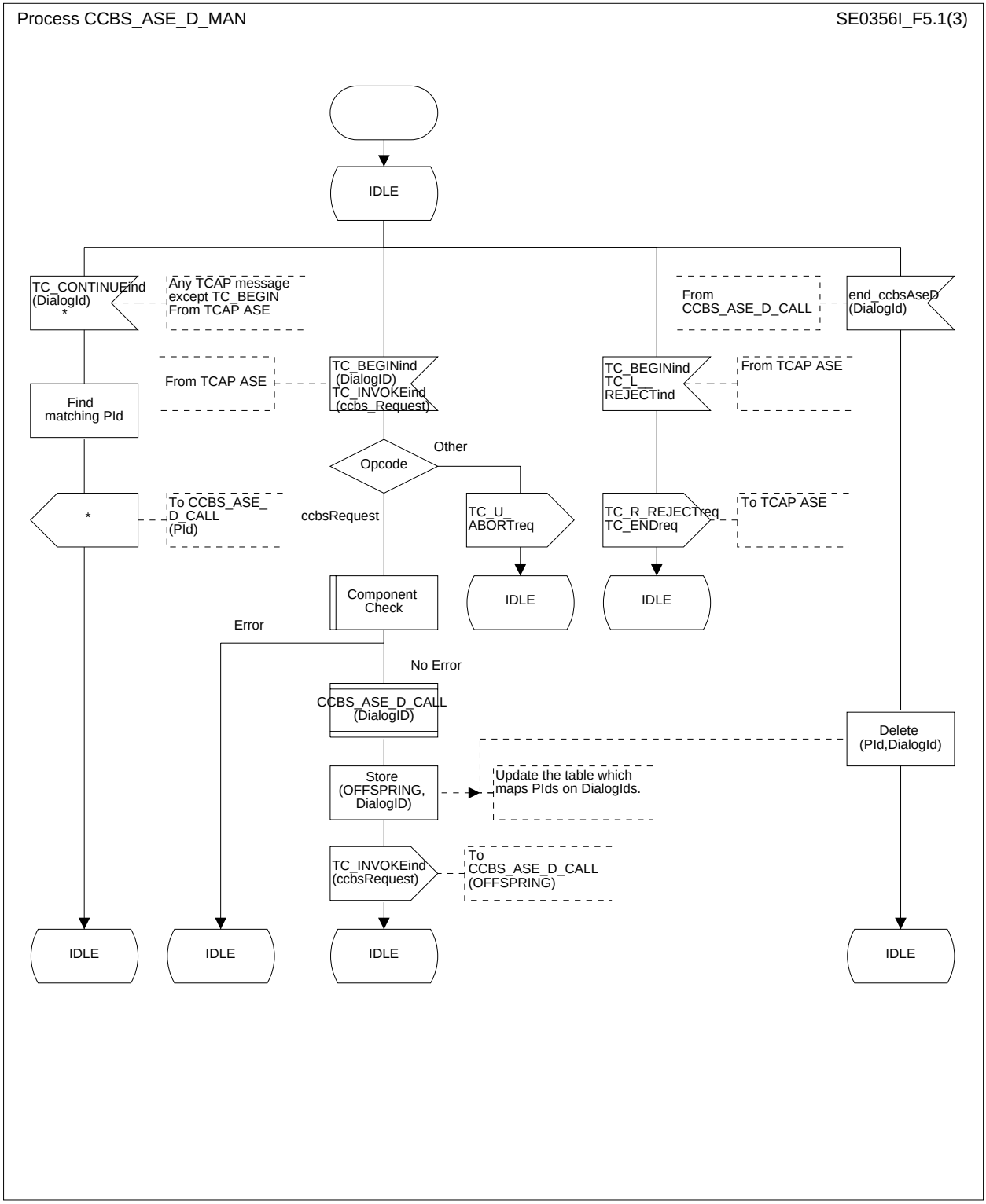


Figure 5 (sheet 1 of 3): Destination CCBS ASE

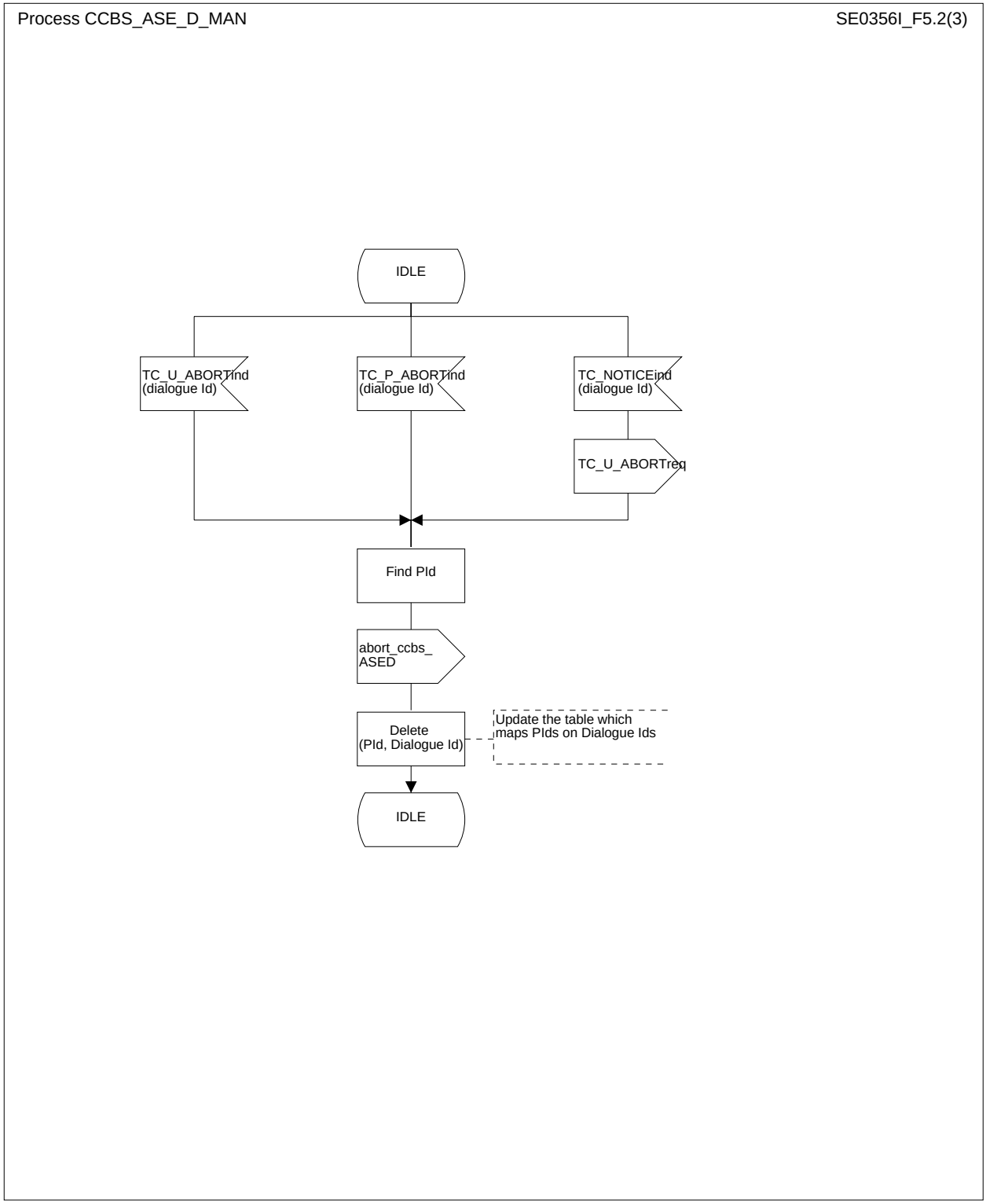


Figure 5 (sheet 2 of 3): Destination CCBS ASE

Process CCBS_ASE_D_MAN SE0356I_F5.3(3)

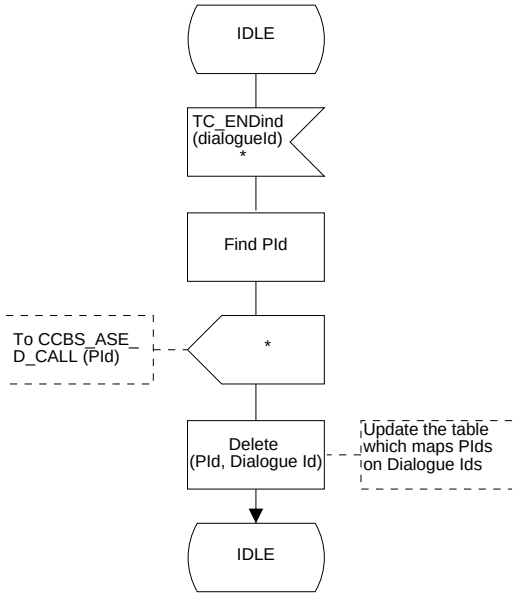


Figure 5 (sheet 3 of 3): Destination CCBS ASE

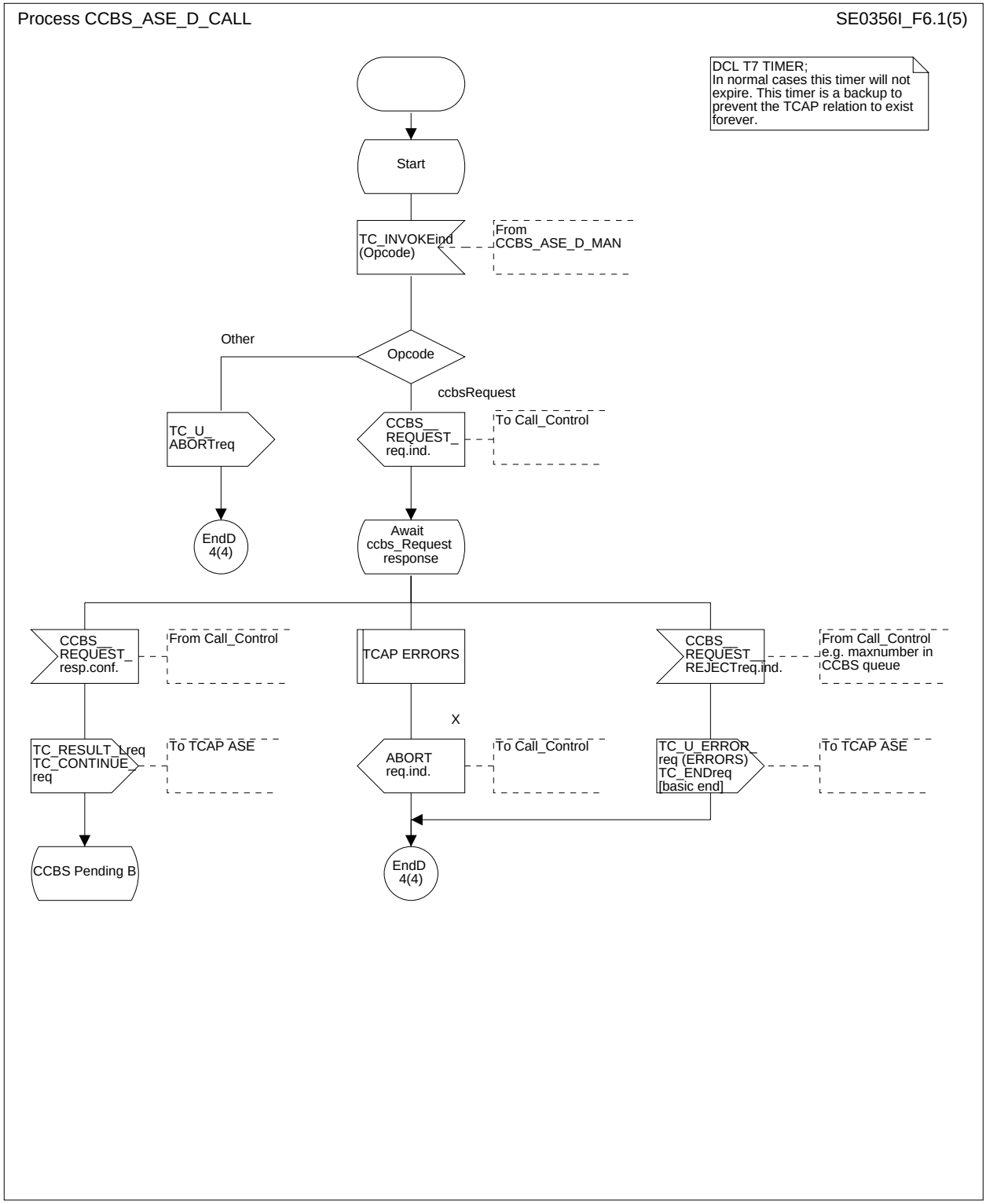


Figure 6 (sheet 1 of 5): Destination CCBS ASE

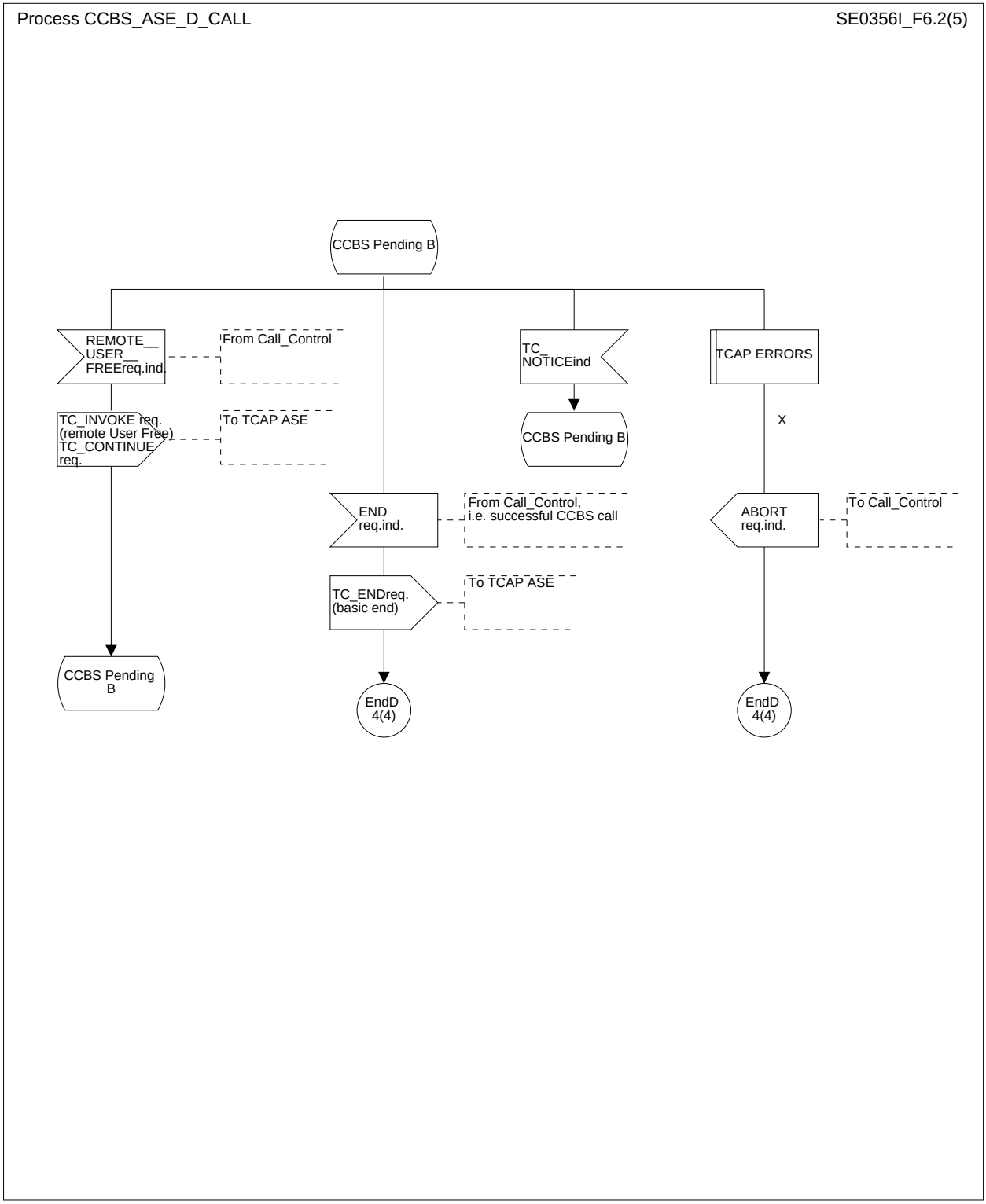


Figure 6 (sheet 2 of 5): Destination CCBS ASE

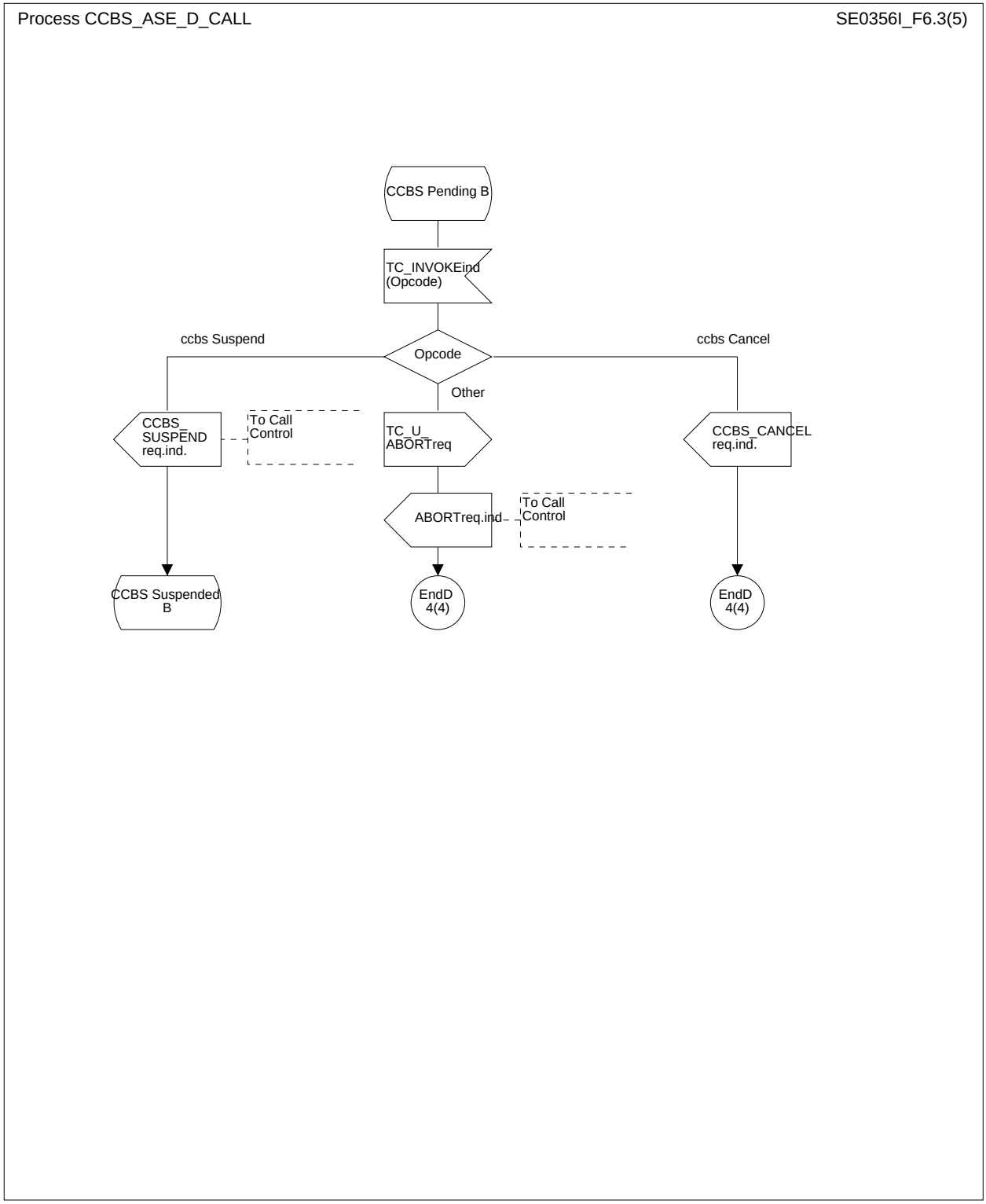


Figure 6 (sheet 3 of 5): Destination CCBS ASE

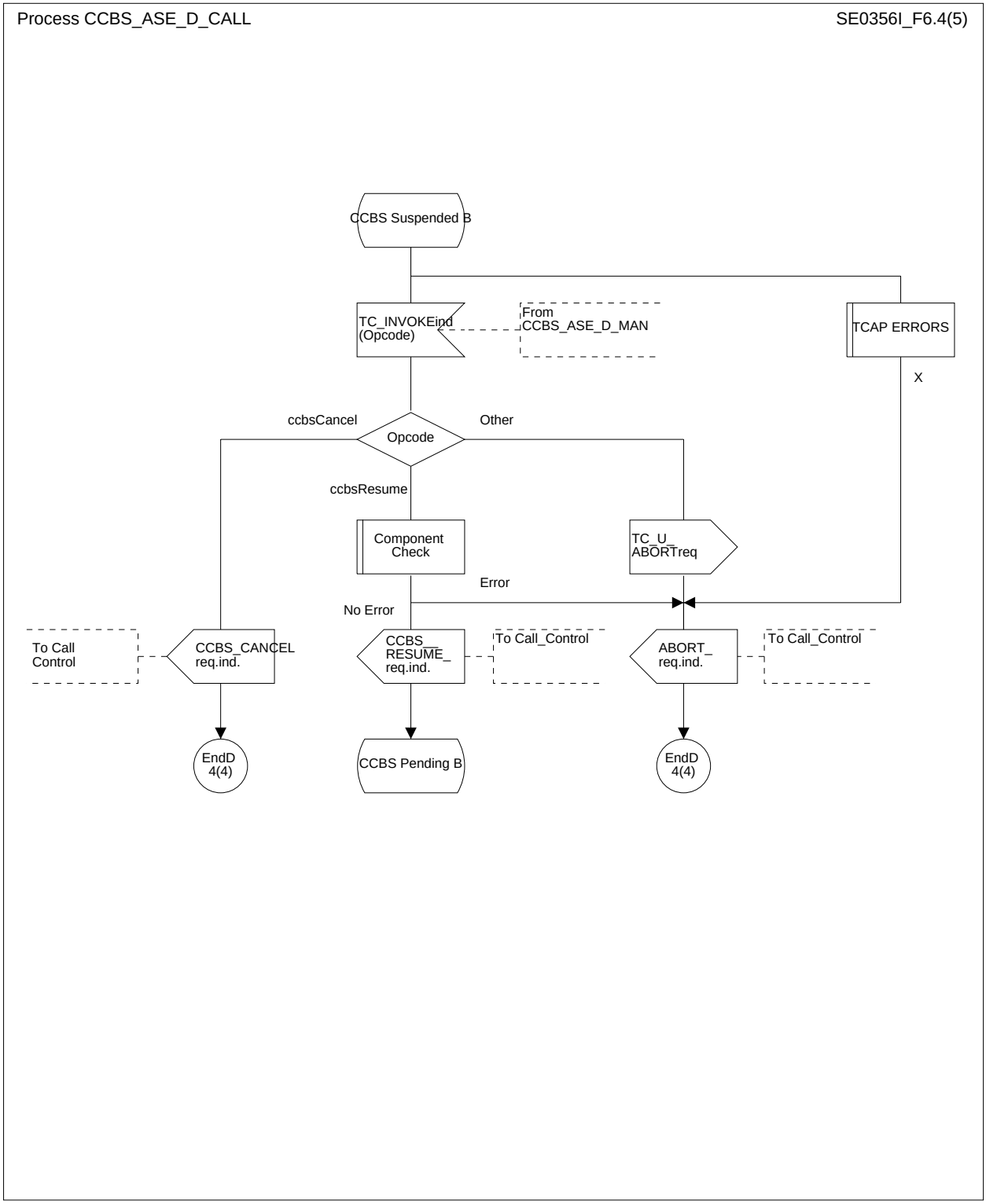


Figure 6 (sheet 4 of 5): Destination CCBS ASE

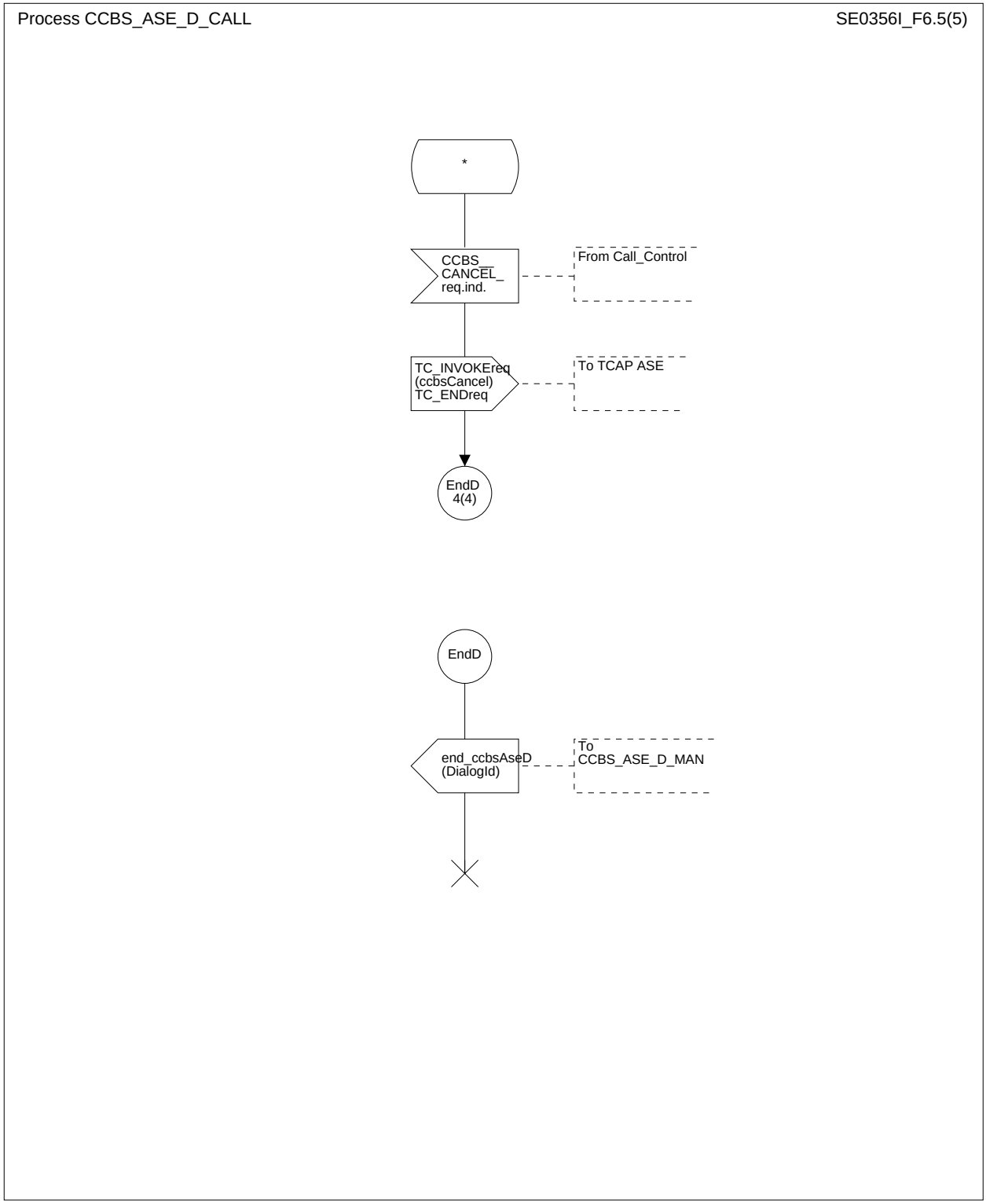


Figure 6 (sheet 5 of 5): Destination CCBS ASE

Macro COMPONENT_CHECK SE0356I_F7(1)

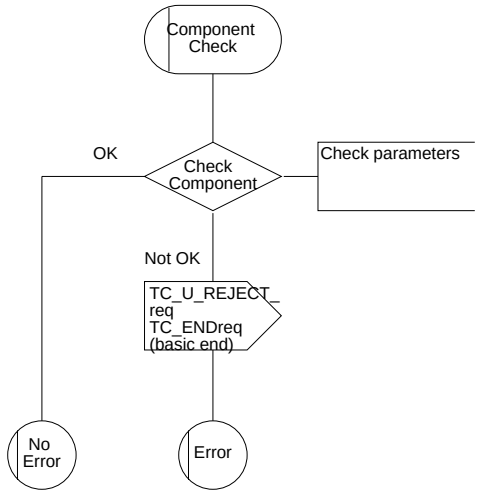


Figure 7: Macro COMPONENT_CHECK

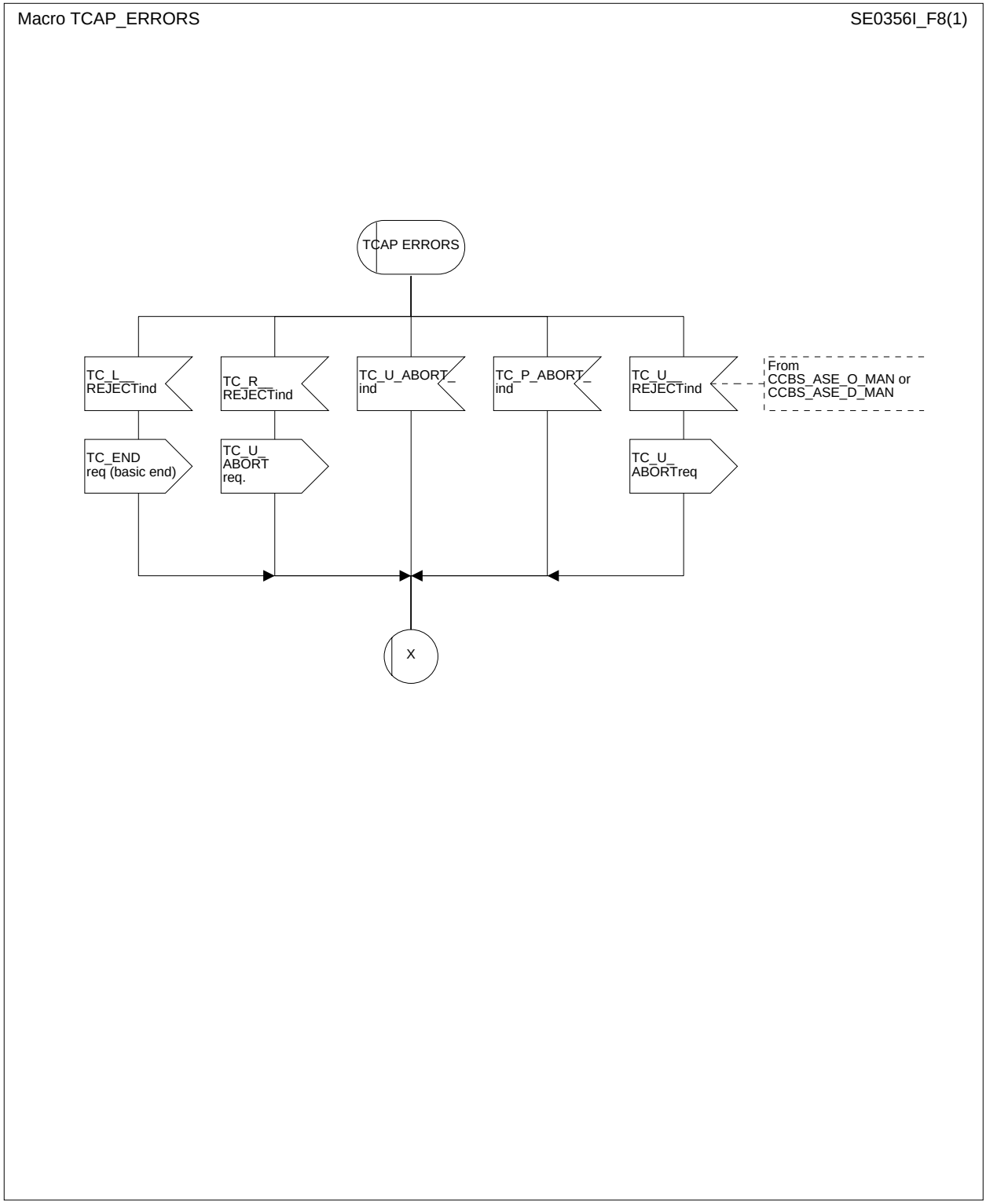
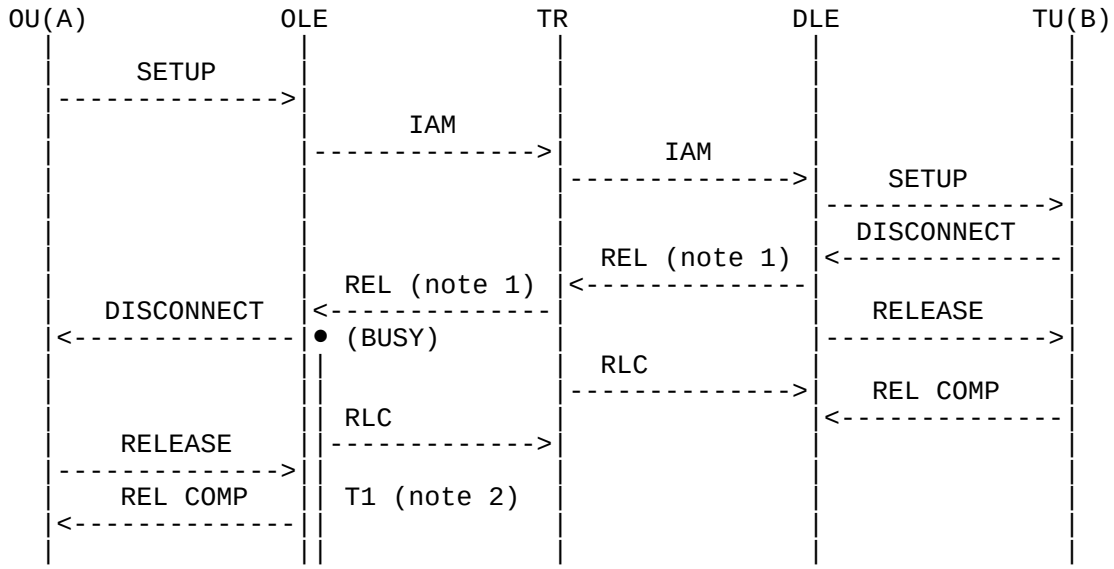


Figure 8: Macro TCAP_ERRORS

Annex A (informative): Signalling flows

This annex contains arrow diagrams showing the ISUP and CCBS-ASE signal flows for different cases of the CCBS supplementary service.

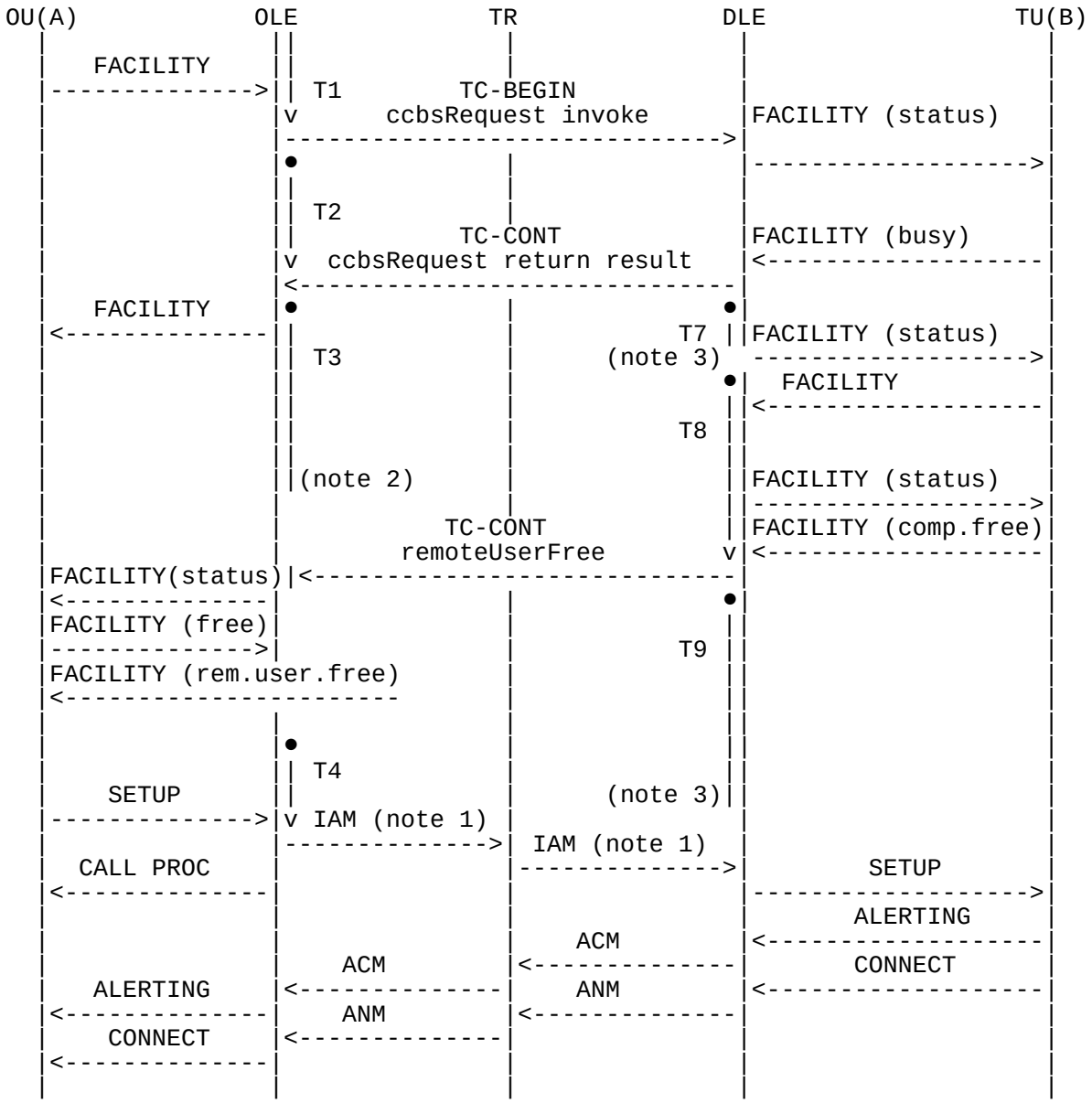
References to signal flows or the access are also included, but for illustrative purposes only; for example the intention of the drawings is not to indicate point-to-point or point-to-multipoint configurations.



NOTE 1: RELEASE message indicating cause #17 or #34. Information about CCBS availability in the DLE is provided in the diagnostic field if ISUP version 2 is used all the way.

NOTE 2: T1 = retention timer; T1 starts if OU(A) has subscribed to CCBS, or if CCBS is generally available.

Figure A.1: Normal call - B busy

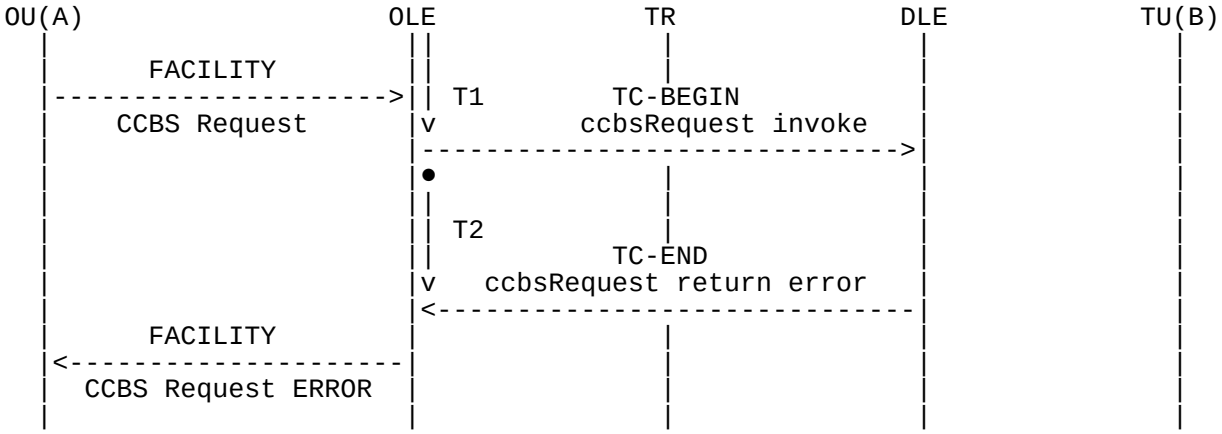


NOTE 1: IAM with:
- ISUP capability required;
- CCBS call indicator.

NOTE 2: On receipt of a TC-END indication primitive in the OLE, timer CCBS-T3 is stopped and the CCBS resources are released.

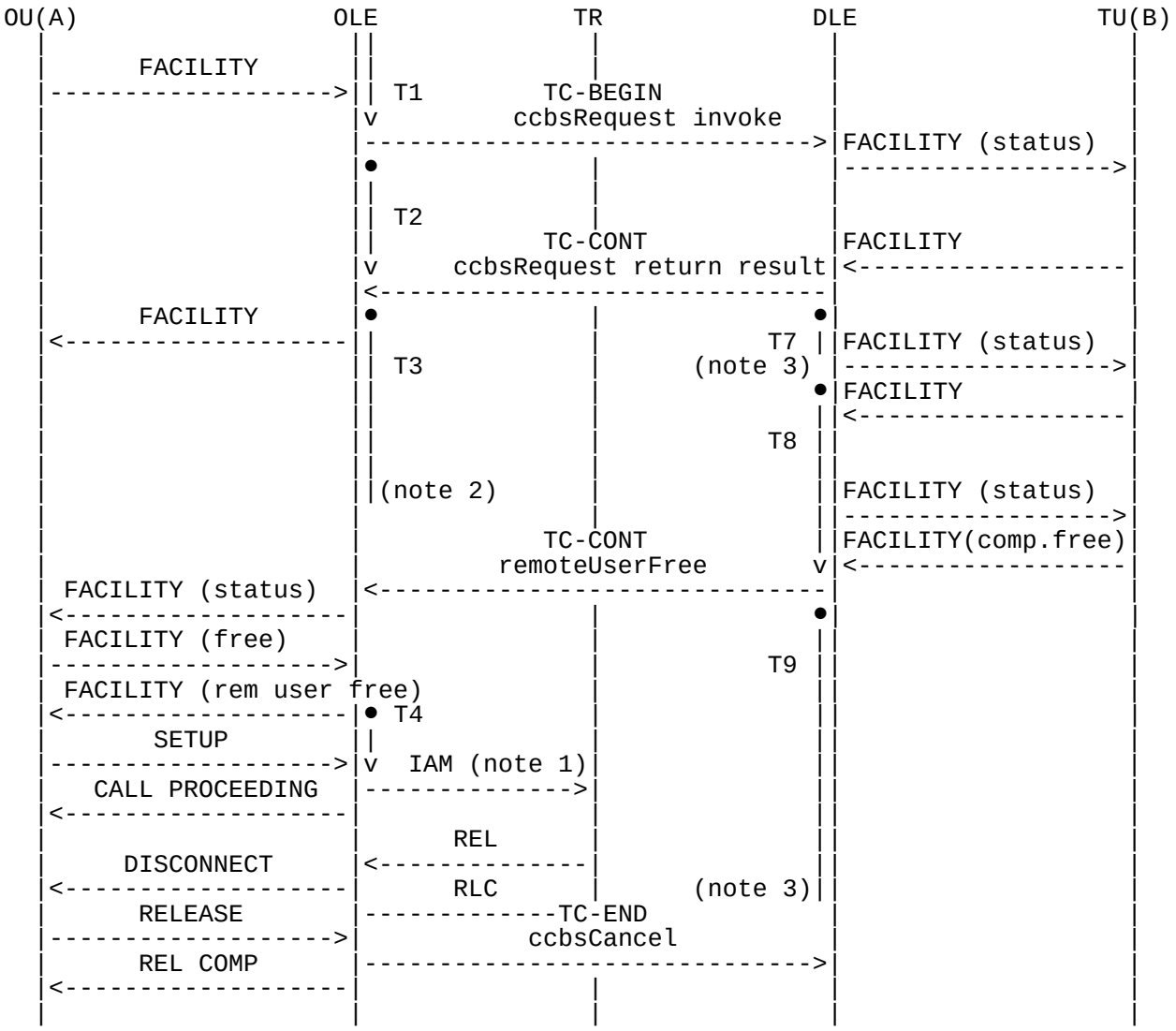
NOTE 3: On receipt of a TC-END indication primitive in the DLE, timers CCBS-T7 and CCBS-T9 are stopped and the CCBS resources are released.

Figure A.2: Normal call - Successful CCBS call setup



NOTE: ShortTermDenial or LongTermDenial.

Figure A.3: Unsuccessful CCBS request

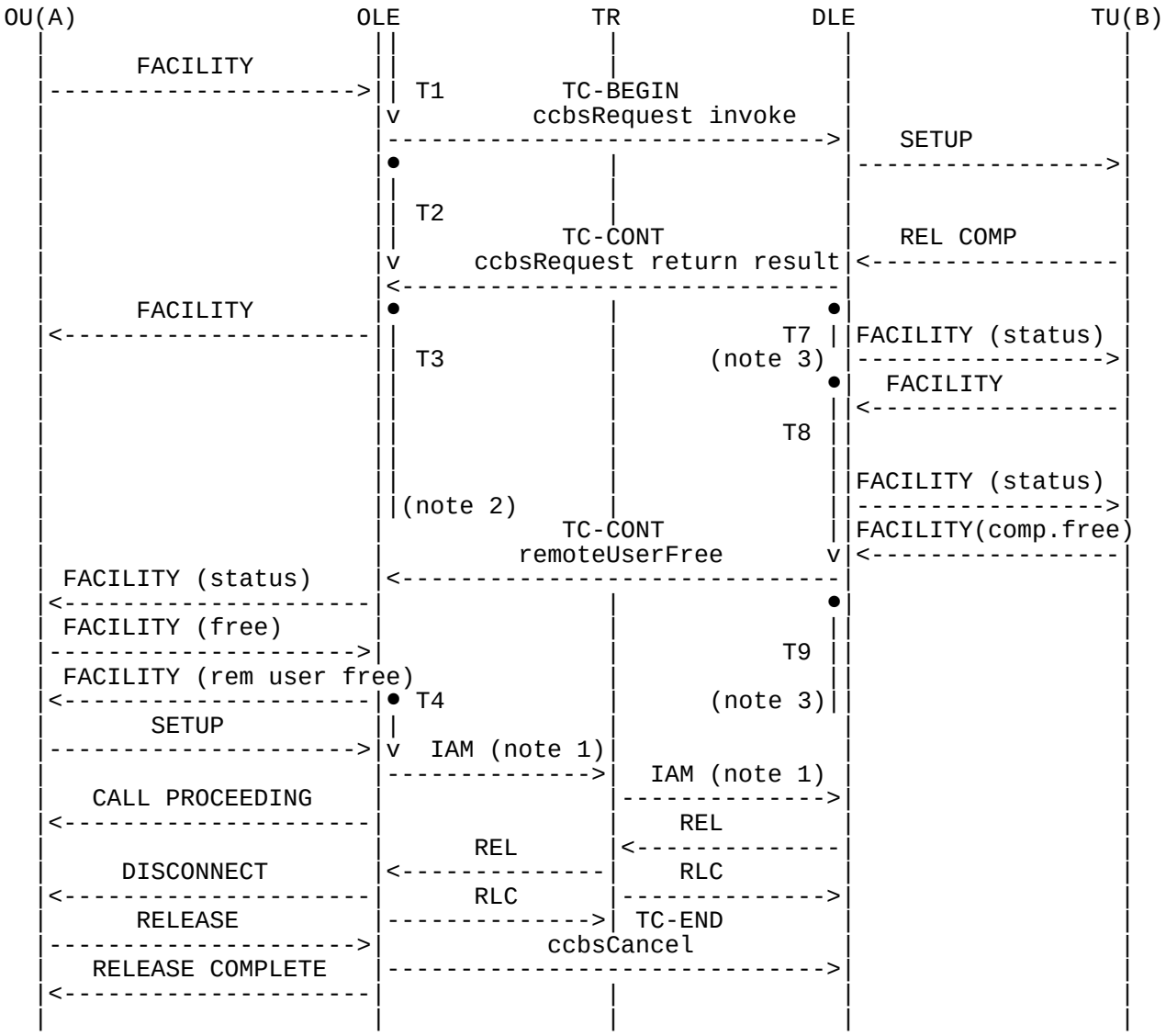


NOTE 1: IAM with:
- ISUP capability required;
- CCBS call indicator.

NOTE 2: On receipt of a TC-END indication primitive in the OLE, timer CCBS-T3 is stopped and the CCBS resources are released.

NOTE 3: On receipt of a TC-END indication primitive in the DLE, timers CCBS-T7 and CCBS-T9 are stopped and the CCBS resources are released.

Figure A.4: Unsuccessful CCBS call set up - transit centre reject

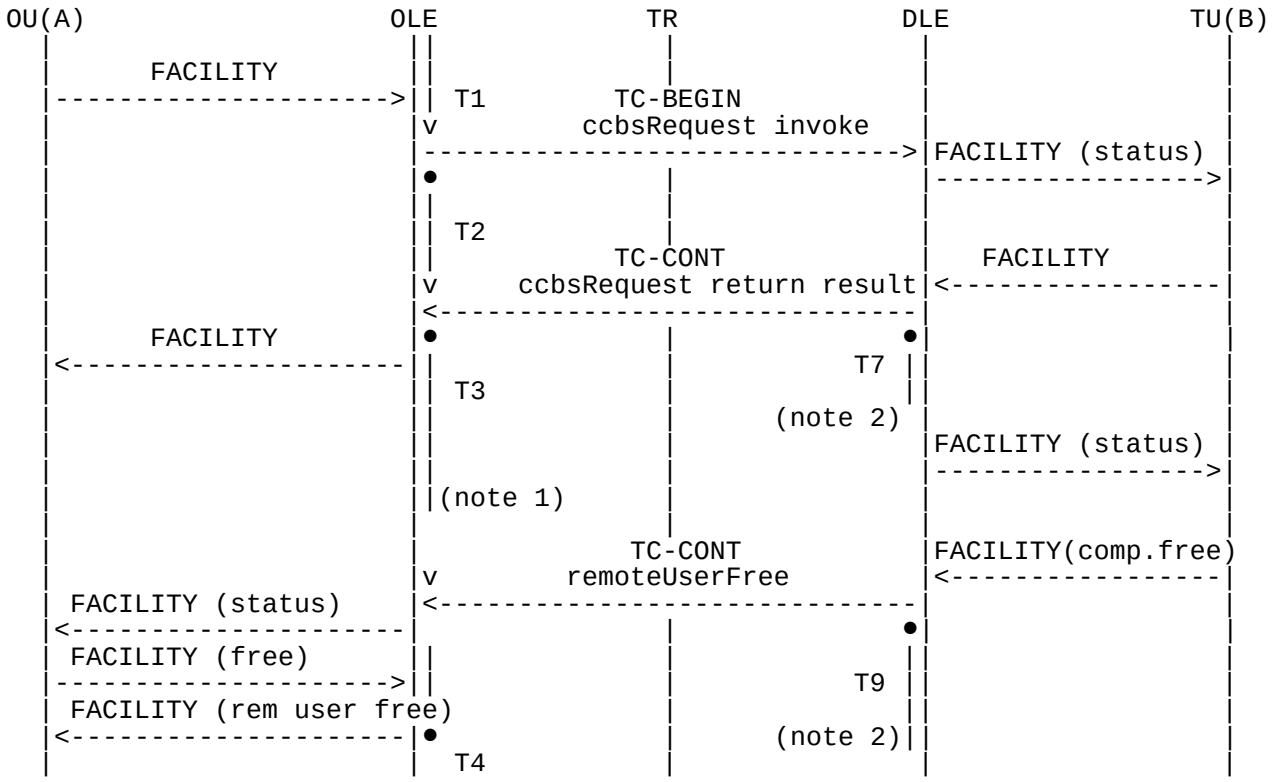


NOTE 1: IAM with:
- ISUP capability required;
- CCBS call indicator.

NOTE 2: On receipt of a TC-END indication primitive in the OLE, timer CCBS-T3 is stopped and the CCBS resources are released.

NOTE 3: On receipt of a TC-END indication primitive in the DLE, timers CCBS-T7 and CCBS-T9 are stopped and the CCBS resources are released.

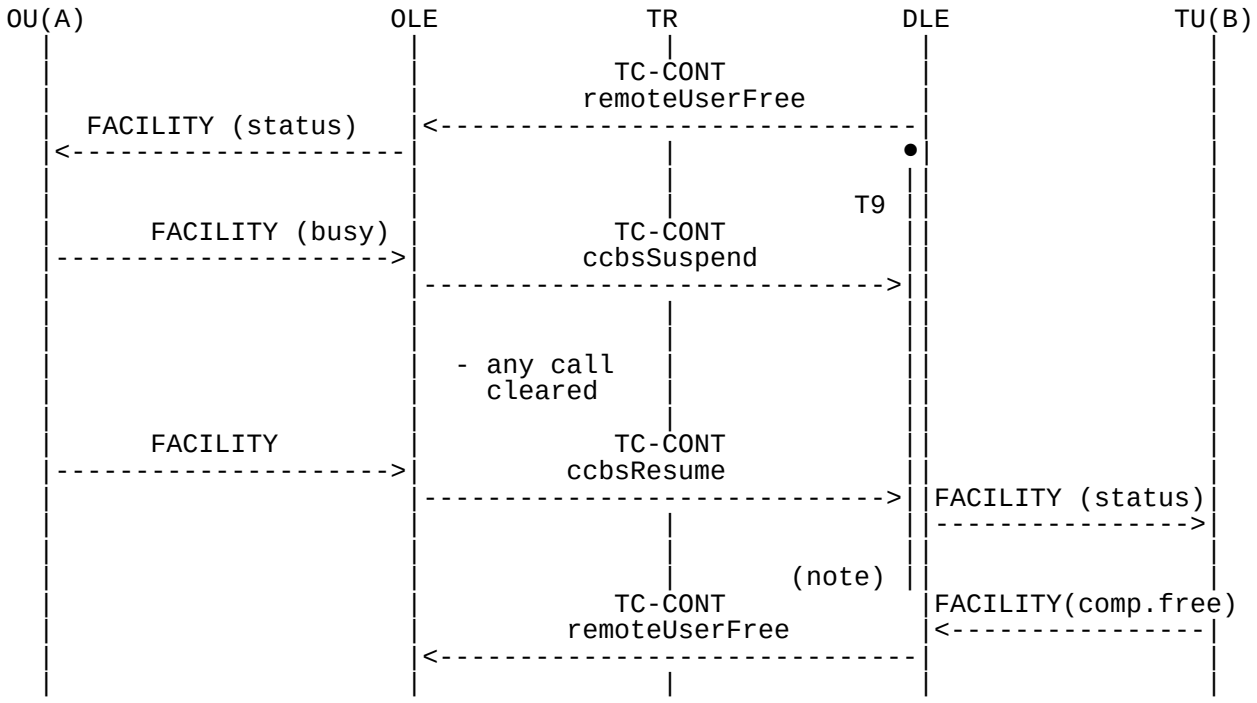
Figure A.5: Unsuccessful CCBS call set up - DLE reject



NOTE 1: On receipt of a TC-END indication primitive in the OLE, timer CCBS-T3 is stopped and the CCBS resources are released.

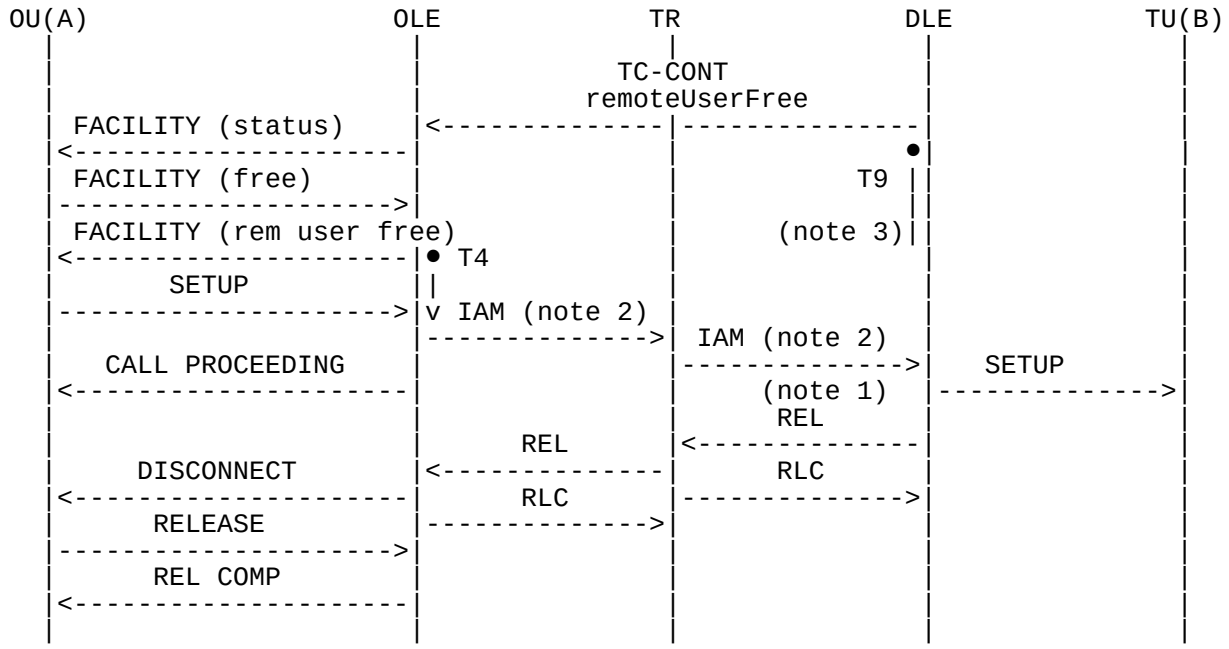
NOTE 2: On receipt of a TC-END indication primitive in the DLE, timers CCBS-T7 and CCBS-T9 are stopped and the CCBS resources are released.

Figure A.6: B idle at CCBS request from A



NOTE: On receipt of a TC-END indication primitive in the DLE, timer CCBS-T9 is stopped and the CCBS resources are released.

Figure A.7: A busy when B becomes free

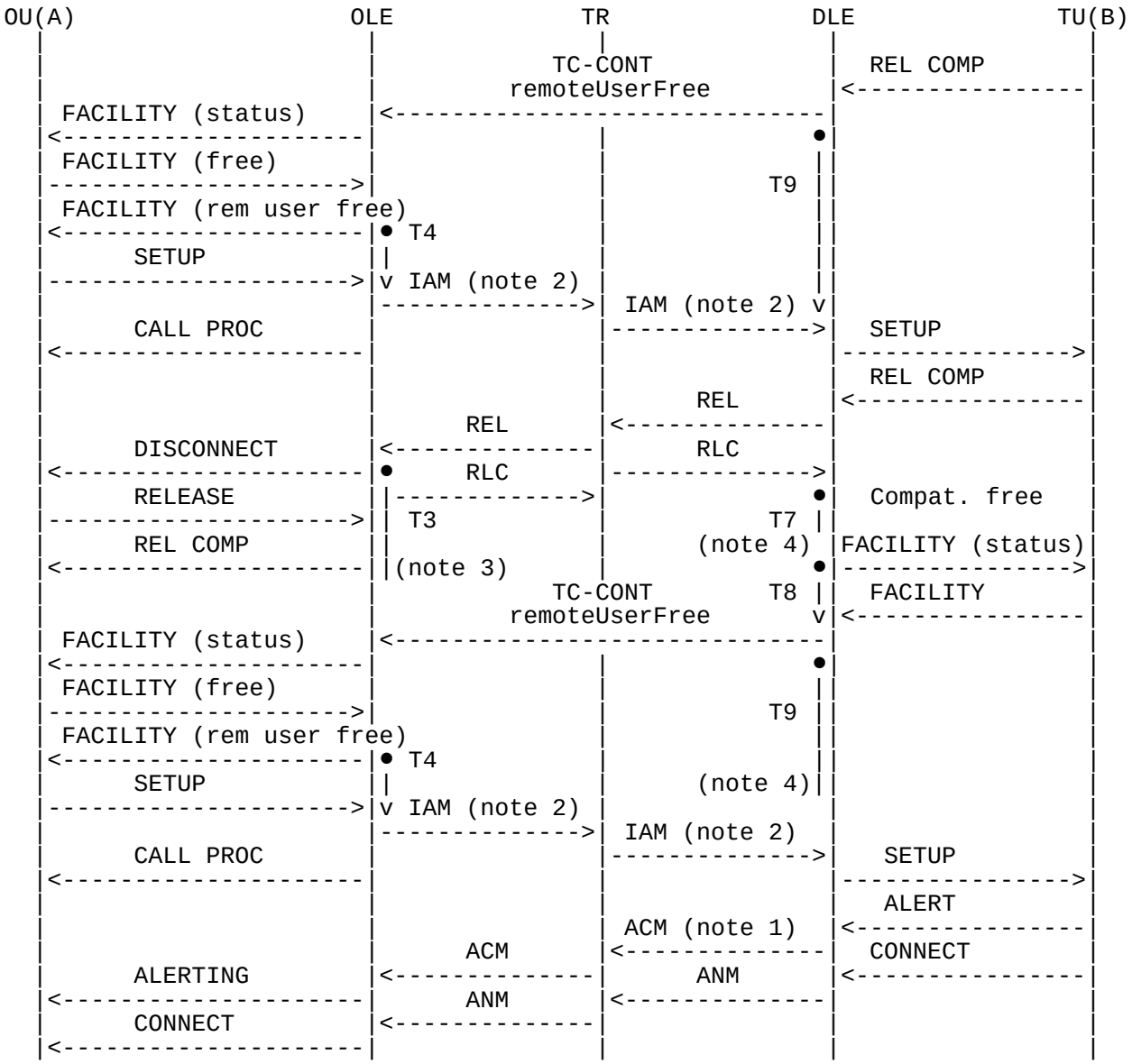


NOTE 1: The CCBS resources are released in the DLE and TC-END indication primitive is sent.

NOTE 2: IAM with:
- ISUP capability required;
- CCBS call indicator.

NOTE 3: On receipt of a TC-END indication primitive in the DLE, timer CCBS-T9 is stopped and the CCBS resources are released.

Figure A.8: B busy upon arrival of the CCBS call - retain option not activated



NOTE 1: The CCBS resources are released in the DLE and TC-END indication primitive is sent.

NOTE 2: IAM with:
- ISUP capability required;
- CCBS call indicator.

NOTE 3: On receipt of a TC-END indication primitive in the OLE, timer CCBS-T3 is stopped and the CCBS resources are released.

NOTE 4: On receipt of a TC-END indication primitive in the DLE, timers CCBS-T7 and CCBS-T9 are stopped and the CCBS resources are released.

Figure A.9: B busy upon arrival of the CCBS call - retain option activated

Annex B (normative): Coding of the compatibility information

The parameter compatibility information parameter for the CCBS parameter shall be coded as follows:

a) N^{th} upgraded parameter
0100 1011 CCBS parameter

b) Instruction indicators

bit A: Transit at intermediate exchange indicator
0 transit interpretation

bit B: Release call indicator
0 do not release call

bit C: Send notification indicator
0 do not send notification

bit D: Discard message indicator
0 do not discard message (pass on)

bit E: Discard parameter indicator
0 do not discard parameter (pass on)

bits GF: Pass on not possible indicator
10 discard parameter

Annex C (informative): Definition of operations for the CCBS supplementary service

Table C.1 shows the definition of the operations, errors and types required for the CCBS supplementary service using ASN.1 as defined in CCITT Recommendation X.208 [7] and using the OPERATION and ERROR macro as defined in ETS 300 134 [11].

The extension mechanism marker will be used for future standardized minor additions to CCBS. The mechanism implements extensions differently by including an "extensions marker" in the type definition. The extensions are expressed by optional fields that are placed after the marker. When an entity receives an unrecognized parameter that occurs after that marker, it is ignored.

NOTE: The extension mechanism marker will be defined in ITU-T Recommendation X.680. As long as this new version of ASN.1 has not been ratified, the marker is placed within a comment, so that it can be easily uncommented once this version of ASN.1 becomes available.

Table C.1: Definition of operations for the CCBS supplementary service (extract of ITU-T Recommendation Q.733.3 [6], table 3-1/Q.733)

```
CCBS-Protocol {itu-t recommendation q 733 3 modules(2) operations-and-errors(1) version1(1)}

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS             OPERATION,
                    ERROR
                    FROM TCAPMessages
                        {ccitt recommendation q 773 moduleA(0)};

-- operation types

CcbsRequest     ::= OPERATION
                        PARAMETER SEQUENCE {
                            calledPartyNumber           Number,
                            retainSupported             BOOLEAN DEFAULT FALSE,
                            userServiceInf              [1] IMPLICIT USICode OPTIONAL,
                            callingPartyNumber          [2] IMPLICIT Number OPTIONAL,
                            userServiceInfPrime         [3] IMPLICIT USICode OPTIONAL,
                            accessTransportParameter    [4] IMPLICIT AccessTransport OPTIONAL
                        --  ,...
                            }
                        RESULT SEQUENCE {
                            retainSupported             BOOLEAN DEFAULT FALSE
                        --  ,...
                            }
                        ERRORS {
                            ShortTermDenial,
                            LongTermDenial}

-- Timer T = CCBS-T2

CcbsCancel      ::= OPERATION
                        PARAMETER
                            cancelCause                 CauseCode
                                                        -- optional; the cause code may not
                                                        -- be sent in certain circumstances
CcbsSuspend     ::= OPERATION

CcbsResume      ::= OPERATION

RemoteUserFree  ::= OPERATION

-- error type definitions

ShortTermDenial ::= ERROR

LongTermDenial  ::= ERROR

-- constants and data type definitions

Number          ::= OCTET STRING (SIZE (1..10))
                -- the number is coded as described in ITU-T Recommendation Q.763
```

Table C.1 (concluded): Definition of operations for the CCBS supplementary service (extract of ITU-T Recommendation Q.733.3 [6], table 3-1/Q.733)

```
CauseCode       ::= ENUMERATED {
                        cCBS-T3-Timeout (1),
                        cCBS-T4-Timeout (2),
                        cCBS-T7-Timeout (3),
                        cCBS-T9-Timeout (4)}

USICode         ::= OCTET STRING (SIZE (1..11))
                    -- the USICode is coded as described in ITU-T Recommendation Q.763

AccessTransport ::= OCTET STRING (SIZE (1..maxAccessTransportLength))
                    -- the AccessTransport is used to carry HLC, LLC, Calling Party SUB and
-                   -- Called Party SUB as described in ITU-T Recommendation Q.931

maxAccessTransportLength    INTEGER ::= 255

-- object identifier path

ccbsOID         OBJECT IDENTIFIER   ::= {itu-t recommendation q 733 3 operations-and-errors(1)}

-- operation values

ccbsRequest     CcbsRequest         ::= globalValue {ccbsOID ccbsrequest    (1)}
ccbsCancel      CcbsCancel          ::= globalValue {ccbsOID ccbscancel     (2)}
ccbsSuspend     CcbsSuspend         ::= globalValue {ccbsOID ccbssuspend    (3)}
ccbsResume      CcbsResume          ::= globalValue {ccbsOID ccbsresume     (4)}
remoteUserFree  RemoteUserFree      ::= globalValue {ccbsOID remoteuserfree (5)}

-- error values

shortTermDenial ShortTermDenial     ::= globalValue {ccbsOID shorttermdenial(6)}
longTermDenial  LongTermDenial      ::= globalValue {ccbsOID longtermdenial (7)}

END -- of CCBS-Protocol
```

Annex D (informative): Bibliography

1) CCITT Recommendation Q.761 (1988): "Functional description of the ISDN user part of Signalling System No.7".

2) CCITT Recommendation Q.762 (1988): "General function of messages and signals".

3) CCITT Recommendation Q.763 (1988): "Formats and codes".

4) CCITT Recommendation Q.764 (1988): "Signalling procedures".

5) CCITT Recommendation Q.767 (1991): "Application of the ISDN user part of CCITT Signalling System No.7 for international ISDN interconnections".

History

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