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**Terrestrial Trunked Radio (TETRA);  
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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Terrestrial Trunked Radio (TETRA) Project of the European Telecommunications Standards Institute (ETSI).

This ETS is a multi-part standard and will consist of the following parts:

- Part 1: "General network design";
- Part 2: "Air Interface (AI)";
- Part 3: "Interworking at the Inter-System Interface (ISI)";
- Part 4: "Gateways basic operation";
- Part 5: "Peripheral Equipment Interface (PEI)";
- Part 6: "Line connected Station (LS)";
- Part 7: "Security";
- Part 9: "General requirements for supplementary services";
- Part 10: "Supplementary services stage 1";
- Part 11: "Supplementary services stage 2";**
- Part 12: "Supplementary services stage 3";
- Part 13: "SDL model of the Air Interface (AI)";
- Part 14: "Protocol Implementation Conformance Statement (PICS) proforma specification".

<b>Transposition dates</b>	
Date of adoption of this ETS:	18 February 2000
Date of latest announcement of this ETS (doa):	31 May 2000
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	30 November 2000
Date of withdrawal of any conflicting National Standard (dow):	30 November 2000

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## 1 Scope

This (ETS) specifies the stage 2 description of the Supplementary Service Call Completion to Busy Subscriber (SS-CCBS) for the Terrestrial Trunked Radio (TETRA).

SS-CCBS is a supplementary service which allows completion of a call to a busy subscriber.

Man-Machine Interface and charging principles are outside the scope of this ETS.

Supplementary service specifications are produced in three stages according to the method defined in CCITT Recommendation I.130 [1]. The stage 2 description identifies the functional capabilities and the information flows needed to support the supplementary service as specified in its stage 1 description (see ETS 300 392-10-13 [5]). The stage 2 description is followed by the stage 3 description, which specifies the protocols at the air interface and at the various Inter-System Interfaces (ISI) to support the service.

This ETS is applicable to MS/LS and SwMIs involved in the operation of those supplementary services. Specifications of inter-working gateways to non-TETRA networks (mainly PSTN and ISDN) while affected by that ETS are outside the scope of this ETS.

The stage 2 description for the SS-CCBS are derived from ECMA-185 [2] taken as normative reference for the corresponding supplementary services for Private Integrated Services Networks (PISNs).

NOTE: The stage 2 description is followed by the stage 3 description, which specifies the encoding rules for the information flows and process behavior for the different entities in SwMI, MS and LS.

## 2 References

This ETS incorporates by dated and undated reference, provisions from other publications. These references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this 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 I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [2] ECMA-185 (1997): "Private Integrated Services Network (PISN) - Specification, Functional Model and Information Flows - Call Completion Supplementary Services (CCSD)".
- [3] ITU-T Recommendation I.221 (1993): "Common specific characteristics of services".
- [4] ETSI ETS 300 392-2 (1995): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [5] ETSI ETS 300 392-10-13 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 13: Call completion to busy subscriber".
- [6] ETSI ETS 300 392-12-13 (1998): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 13: Call Completion to Busy Subscriber (CCBS)".

### 3 Definitions and abbreviations

#### 3.1 Definitions

For the purposes of this ETS the following definitions apply:

**Additional Network feature:** capability, over and above that of a basic service, provided by a SWMI, but not directly to a user

**bearer service:** type of telecommunication service that provides the capability for the transmission of signals between user-network interfaces

**busy:** property of a user for whom either a "network determined user busy" or "user determined user busy" condition (see subclause 3.1 of ITU-T Recommendation I.221 [3]) exists

**call, basic call:** instance of the use of a basic service

**call completion:** successful presentation of a previously unsuccessful Call to a destination user (user B) which occurs when the call has entered an alerting phase or has been answered

**compatible MS/LS:** MS/LS presenting the same basic TETRA class of service as the TETRA class of service requested by the calling user MS/LS. By analogy to ISDN "compatible terminal"

**free:** property of a user who can accept any attempt by the SWMI to present a call to that user (i.e. allow the call to reach the alerting or answered state)

**Network Determined User Busy:** if all of the appropriate user-network interface information channels are busy (channels busy) and either the network does not support the offering of additional calls beyond the number of appropriate channels, or the maximum number of such additional calls has been reached, the network will clear the call and indicate network determined user busy. (ITU-T Recommendations I.221 [3] subclause 3.1.4)

**path reservation:** reservation of resources prior to SS-CCBS Recall in order that a connection path through the SWMI is available when user A accepts the SS-CCBS Recall

NOTE 1: Path Reservation would not guarantee that user B will be free when user A accepts the SS-CCBS Recall.

NOTE 2: Path Reservation is not used in the TETRA network environment.

**recall timer:** this timer specifies the length of time the network shall wait for a response from user A to a CCBS Recall

**retention timer:** this timer specifies the period of time the network retains the originating call information after a valid call attempt is released

**SS-CCBS recall:** indication informing user A that user B is no longer busy (in the case of SS-CCBS). or Acceptance of this indication by user A will cause the call to be completed by the SWMI

**SS-CCBS service duration timer:** this timer specifies the length of time that the service shall be active within the network

**supplementary service:** supplementary service modifies or supplements a bearer service or a teleservice. A supplementary service cannot be offered to a customer as a stand alone service. It should be offered in combination with a bearer service or a teleservice

**Switching And Management Infrastructure (SwMI):** all of the TETRA equipment for a Voice plus Data (V+D) network except for subscriber terminals. The SwMI enables subscriber terminals to communicate with each other via the SwMI



**teleservice:** type of telecommunications service that provides the complete capability, including terminal equipment functions, for communication between users according to agreed protocols

**user A:** specific user that originated the call and requested the supplementary service

**user B:** user that was initially addressed in the original call set up

**User Determined User Busy:** by analogy to ISDN, busy shall be user determined user busy when subscriber resources (either the terminal itself or the user) do not respond positively to an incoming call request.

NOTE 3: In the case where the MS/LS has a single resource and is involved in an individual call, UDUB and NDUB will be confounded. In other words, NDUB could result of a single call occurrence.

### 3.2 Abbreviations

For the purposes of this ETS the following abbreviations apply:

#### 3.2.1 General abbreviations

CC	Call Control (functional entity)
CCBS	Completion of Calls to Busy Subscribers
CCBSI	Completion of Calls to Busy Subscribers Identifier
CR	Cancellation Reason
FC	Failure Cause
FE	Functional Entity
GTSI	Group TETRA Subscriber Identity
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ITSI	Individual TETRA Subscriber Identity
LS	Line Station
MS	Mobile Station
NDUB	Network Determined User Busy
PISN	Private Integrated Services Network
PTN	Private Telecommunication Network
RC	Retain Capability
SDL	Specification and Description Language
SS	Supplementary Service

NOTE: The abbreviation SS is only used when referring to a specific supplementary service.

SS-CCBS	Supplementary Service Completion of Calls (or call completion) to Busy Subscribers
SS-CCNR	Supplementary Service Completion of Calls (or call completion) on No Reply
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunked RAdio
UDUB	User Determined User Busy
V+D	Voice Plus Data

**3.2.2 Supplementary service abbreviations**

AL	Ambience Listening
AoC	Advice of Charge
AP	Access Priority
AS	Area Selection
BIC	Barring of Incoming Calls
BOC	Barring of Outgoing Calls
CAD	Call Authorized by Dispatcher
CCBS	Call Completion to Busy Subscriber
CFB	Call Forwarding on Busy
CFNRy	Call Forwarding on No Reply
CFNRc	Call Forwarding on Not Reachable
CFU	Call Forwarding Unconditional
CLIP	Calling Line Identification Presentation
CLIR	Calling/Connected Line Identification Restriction
COLP	COnnected Line Identification Presentation
COLR	COnnected Line Identification Restriction
CR	Call Report
CRT	Call Retention
CW	Call Waiting
DGNA	Dynamic Group Number Assignment
DL	Discreet Listening
HOLD	Call Hold
IC	Include Call
LE	Late Entry
LSC	List Search Call
PC	Priority Call
PPC	Pre-emptive Priority Call
SNA	Short Number Addressing
TC	Transfer of Control
TPI	Talking Party Identification

**4 SS-CCBS stage 2 specifications****4.1 Functional model****4.1.1 Functional model description****4.1.1.1 Individual call**

The functional model shall comprise the following functional entities (FEs) for Individual Calls:

- FE1 Originating SS-CCBS Served user FE;
- FE21 Originating SS-CCBS Controlling FE;
- FE25 Terminating SS-CCBS Controlling FE;
- FE5 Terminating SS-CCBS Affected user FE.

The following functional relationships shall exist between these FEs for Individual Calls:

- ra between FE1 and FE21;
- rb between FE21 and FE25;
- rc between FE25 and FE5.

Figure 1 shows these FEs and relationships.

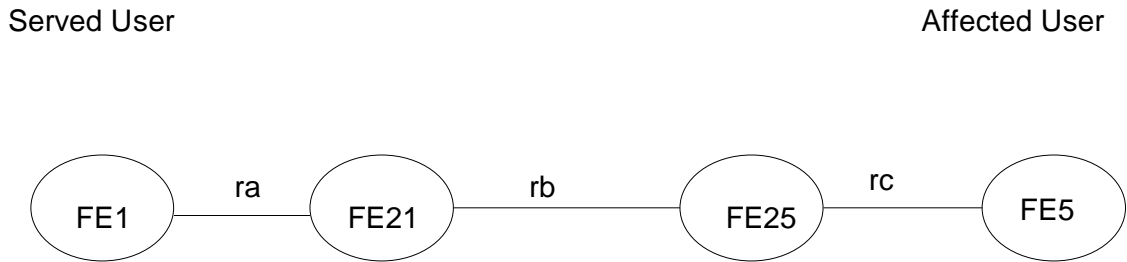


Figure 1: Functional model for SS-CCBS individual call

#### 4.1.1.2 Group call

The functional model shall comprise the following functional entities (FEs) for Group Calls:

- FE1 Originating SS-CCBS Served user FE;
- FE21 Originating SS-CCBS Controlling FE;
- FE22 Group Controlling FE.

The following functional relationships shall exist between these FEs for Individual Calls:

- ra between FE1 and FE21;
- rd between FE1 and FE22.

Figure 2 shows these FEs and relationships.

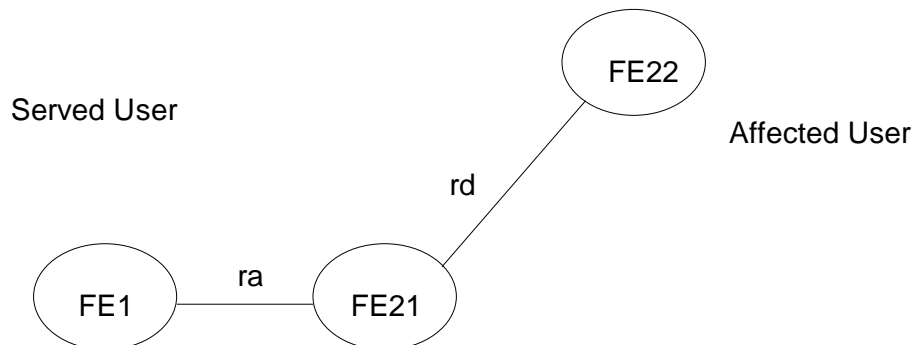


Figure 2: Functional model for SS-CCBS for group call

#### 4.1.2 Description of the functional entities

##### 4.1.2.1 Originating SS-CCBS served user FE, FE1

The FE that serves the served user that invokes the call completion to busy subscriber supplementary service (SS-CCBS).

##### 4.1.2.2 Originating SS-CCBS controlling FE, FE21

The FE within the network which co-operates with its peer (either FE25 for Individual Call or FE22 for Group Call) to provide the SwMI call completion supplementary service as requested by FE1. It also interacts with FE25 to provide the monitoring information that is required for the successful operation of the call completion service in the case of an individual call.

**4.1.2.3 Group call controlling FE, FE22**

The FE within the network which controls group call and call completion to busy subscriber supplementary service based on requests it receives from the served user FE1. It also interacts with FE21 to provide the monitoring information that is required for the successful operation of the call completion service.

In the case of group call, the affected user is actually the affected group.

NOTE: FE22 can be considered as the affected user.

**4.1.2.4 Terminating SS-CCBS controlling FE, FE25**

The FE within the network which co-operates with its peer (FE21) to provide the SwMI call completion supplementary service as requested by FE1. It also interacts with FE5 to provide the monitoring information that is required for the successful operation of the call completion service.

**4.1.2.5 Terminating SS-CCBS FE, FE5**

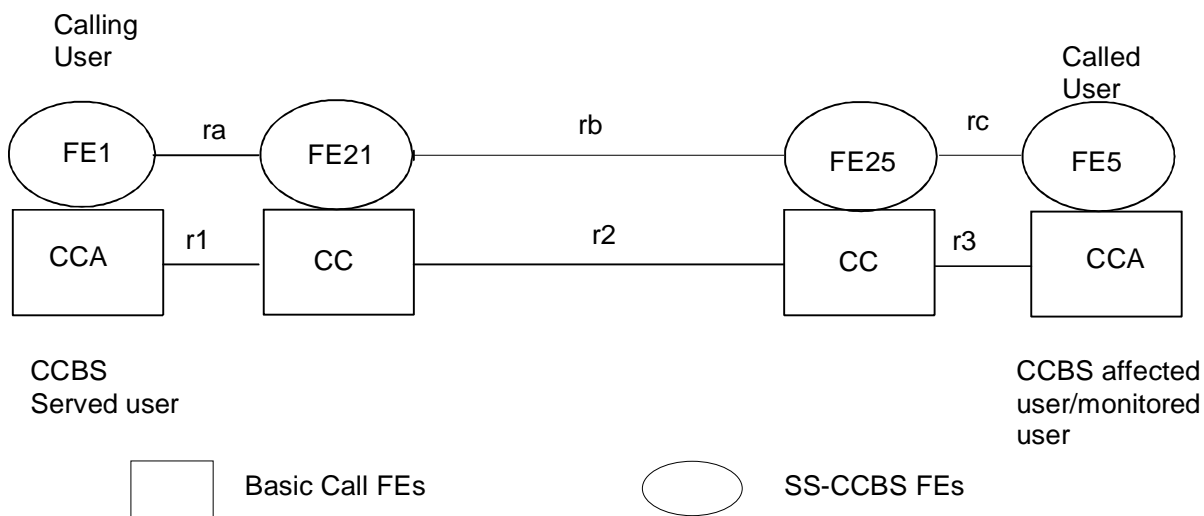
The FE that serves the monitored/affected user (B).

**4.1.3 Relationship of functional model to basic call functional model**

**4.1.3.1 Relationship to basic individual call functional model**

In this subclause, basic call is TETRA basic call and not PSS1 basic call.

An example of a relationship between the FEs for SS-CCBS and FEs for the basic individual call is shown in figure 3.



**Figure 3: Example Relationship between model for SS-CCBS and Basic Individual Call**

#### 4.1.3.2 Relationship to basic group call functional model

In this subclause, basic call is TETRA basic call and not PSS1 basic call.

An example of a relationship between the FEs for SS-CCBS and FEs for the group call is shown in figure 4.

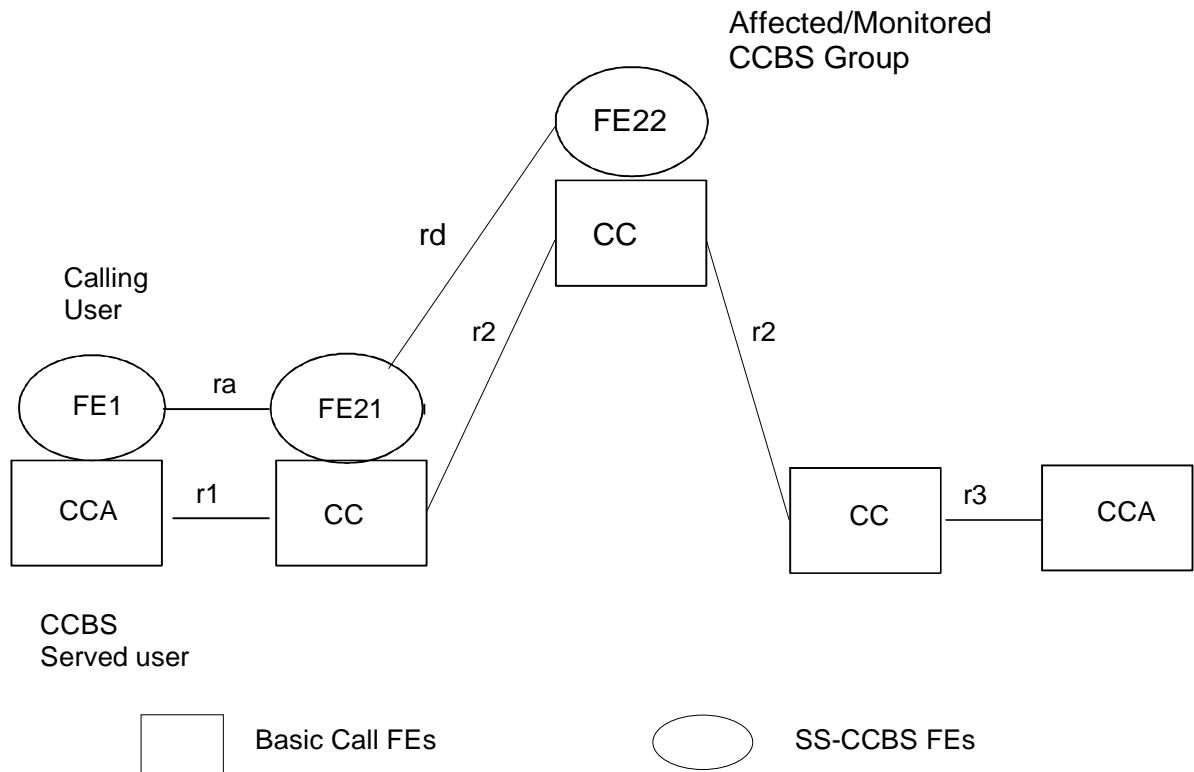


Figure 4: Example Relationship between model for SS-CCBS and Basic Group Call

#### 4.2 Service Primitives

This subclause lists SS-CCBS service primitives used to invoke or being a result of information flow sequences. The SS-CCBS service primitives are defined in ETS 300 392-12-13 [6], subclause 4.2 and the basic call service primitives are defined in ETS 300 392-2 [4], clause 11.

The SS-CCBS service primitives for the served user at the MS/LS TNSS-SAP shall be:

- CALL-INFORMATION-RELEASE indication;
- CALL-INFORMATION-RETENTION indication;
- CANCEL request/confirmation;
- CANCELLED indication;
- FAILED indication;
- LIST-CCBS request/confirmation;
- RECALL request;
- RECALL-ACCEPTED request;
- REQUEST request/confirmation;
- USER-B-FREE indication.

NOTE: Cancellation by the network does not correspond to a primitive seen by the user application.

**4.3 Information flows**

**4.3.1 Definition of information flows**

In the tables listing the service elements in information flows, the column headed "Type" for indicates which of these service elements are mandatory (M) and which are optional (O) in an information flow.

NOTE: Information flows are shown for users A and B having not migrated.

**4.3.1.1 CCBS-CALL-INFORMATION-RELEASE**

CCBS-CALL-INFORMATION-RELEASE is an unconfirmed information flow across ra from FE21 to FE1 which indicates user A that the basic call parameters which were retained may now be released due to expiration of call information retention timer.

Table 1 lists the service elements within the CCBS-CALL-INFORMATION-RELEASE information flow.

**Table 1: Information content of CCBS-CALL-INFORMATION-RELEASE**

Service Element	Type
TETRA Call Identifier	M

**4.3.1.2 CCBS-CALL-INFORMATION-RETENTION**

CCBS-CALL-INFORMATION-RETENTION is an unconfirmed information flow across ra from FE21 to FE1 which gives to user A the basic call parameters (call on which SS-CCBS may be invoked) that user A will need if user A:

- invokes SS-CCBS and/or;
- accepts SS-CCBS recall.

Table 2 lists the service elements within the CCBS-CALL-INFORMATION-RETENTION information flow.

**Table 2: Information content of CCBS-CALL-INFORMATION-RETENTION**

Service Element	Type
TETRA Call Identifier	M
Basic Service	M
Called User Identity	M (notes 1,2)
Area Selection	M
Priority	M
SS-CLIR/COLR invoked	M
NOTE 1: The list of supplementary services invoked for the initial call is kept by the user A SwMI.	
NOTE 2: Includes user B MNI in case of mobility.	

**4.3.1.3 CCBS-CANCEL**

CCBS-CANCEL is an unconfirmed information flow across ra from FE1 to FE21 which cancels the SS-CCBS service.

Table 3 lists the service elements within the CCBS-CANCEL information flow.

**Table 3: Information content of CCBS-CANCEL**

Service Element	Type
CCBS Identifier (CCBSI)	M

#### 4.3.1.4 CCBS-CANCEL-ACK

CCBS-CANCEL-ACK is an unconfirmed information flow across ra from FE21 to FE1 giving the result of the information flow which cancels the SS-CCBS service.

Table 4 lists the service elements within the CCBS-CANCEL-ACK information flow.

**Table 4: Information content of CCBS-CANCEL-ACK**

Service Element	Type
CCBS Identifier (CCBSI)	M
Reject Cause (RC)	O (note)
NOTE: This service element shall be included when the cancellation of SS-CCBS cannot be performed and shall indicate the reason for failure. Examples of the reasons that cancellation may not be possible are:	
<ul style="list-style-type: none"> <li>- SS-CCBS request does not exist; or</li> <li>- no invoked SS-CCBS requests exist.</li> </ul>	

#### 4.3.1.5 CCBS-CANCELLATION (STOP-MONITOR)

In the case of individual call, CCBS-CANCELLATION (STOP-MONITOR) is an unconfirmed information flow across rb either from FE21 to FE25 or from FE25 to FE21 which cancels the SS-CCBS service. In the case of group call, CCBS-CANCELLATION (STOP-MONITOR) is an unconfirmed information flow across rd either from FE21 to FE22 or from FE22 to FE21 which cancels the SS-CCBS service.

Table 5 lists the service elements within the CCBS-CANCELLATION information flow.

**Table 5: Information content of CCBS-CANCELLATION (STOP-MONITOR)**

Service Element	Type
CCBS Identifier (CCBSI)	M
User A ITSI/GTSI	
User B ITSI/GTSI	M
User B MNI	O (note)
Cancellation Reason (CR)	M
NOTE: If available and if user B is not in the same SwMI as user A.	

#### 4.3.1.6 CCBS-CANCELLED

CCBS-CANCELLED is an unconfirmed information flow across ra from FE21 to FE1 which indicates that the SS-CCBS service has been CANCELLED.

Table 6 lists the service elements within the CCBS-CANCELLED information flow.

**Table 6: Information content of CCBS-CANCELLED**

Service Element	Type
CCBS Identifier (CCBSI)	M
Cancellation Reason (CR)	M

#### 4.3.1.7 CCBS-CCBSI

CCBS-CCBSI is an unconfirmed information flow across either rb from FE21 to FE25 or across rd from FE21 to FE22 which associates a TETRA call set-up and one invocation of SS-CCBS.

Table 7 lists the service elements within the CCBS-CCBSI information flow.

**Table 7: Information content of CCBS-CCBSI**

Service Element	Type
CCBS Identifier (CCBSI)	M

**4.3.1.8 CCBS-FAILED**

CCBS-FAILED is an unconfirmed information flow across ra from FE21 to FE1 informing user A that the SS-CCBS service has failed, subsequent to successful recall of user A.

Table 8 lists the service elements within the CCBS-FAILED information flow.

**Table 8: Information content of CCBS-FAILED**

Service Element	Type
CCBSI	M
Failure Cause (FC)	M (note 1)
Request Maintained	O (note 2)
NOTE 1: This service element indicates the reason for failure of SS-CCBS. Examples of reasons for failure are: - user B busy again; or - Network Congestion.	
NOTE 2: Request maintained is mandatory for TETRA, optional for inter-working.	

**4.3.1.9 CCBS-FREE-NOTIFICATION**

CCBS-FREE-NOTIFICATION is an unconfirmed information flow across either rb from FE25 to FE21 in the case of individual call or rd from FE22 to FE21 in the case of a group call informing FE21 that user B/group B is now free.

The service elements shall be the same as the service elements of the CCBS-RECALL Request/Indication.

**4.3.1.10 CCBS-LIST**

CCBS-LIST is an unconfirmed information flow across ra from FE1 to FE21 which requests a 'list' of all outstanding SS-CCBS requests that user A has invoked. The expected response is CCBS-LIST ACK which contains a list of those SS-CCBS requests invoked by user A.

Table 9 lists the service elements within the CCBS-LIST information flow.

**Table 9: Information content of CCBS-LIST**

Service Element	Type
CCBS Identifier (CCBSI)	O(note)
NOTE: This service element shall be included either if the details of a particular CCBS invocation needs to be provided to the user or the non-detailed list of invocations needs to be provided.	

**4.3.1.11 CCBS-LIST-ACK**

CCBS-LIST-ACK is a confirmed information flow across ra from FE1 to FE21 which contains a list of those requests invoked by user A.



Table 10 lists the service elements within the CCBS-LIST-ACK information flow.

**Table 10: Information content of CCBS-LIST-ACK**

Service Element	Type
CCBS Identifier (CCBSI)	C(note 3)
Reject Cause (RC)	O (note 1)
List Request(RL)	C (note 2)
NOTE 1:	This service element shall be included if the CCBS-LIST confirm/response indicates rejection and indicate the reason for rejection, otherwise it shall be omitted.
NOTE 2:	This service element shall be included if the CCBS-LIST confirm/response indicates success and shall include a list of SwMI ITSI/GTSI on which user A has invoked SS-CCBS, otherwise it shall not be included.
NOTE 3:	This service element shall be included either if the details of a particular CCBS invocation needs to be provided to the user or the non-detailed list of invocations needs to be provided.

#### 4.3.1.12 CCBS-MONITOR

CCBS-MONITOR is a unconfirmed information flow, across either rb in the case of individual call from FE21 to FE25 or rd in the case of a group call from FE21 to FE22, which either initiates monitoring at either FE25 or FE22 or re-initiates monitoring in the case where a SS-CCBS call has failed (e.g. user B busy) and the SwMI provides automatic re-registration of the SS-CCBS service. The expected response is MONITOR-ACK which indicates whether or not either FE25 or FE22 has successfully initiated monitoring of user B.

Table 11 lists the service elements within the CCBS-MONITOR information flow.

**Table 11: Information content of CCBS-MONITOR**

Service Element	Type (note)
CCBSI	M
Call Priority	M
Area Selection	M
Full Calling User Identity	M
Basic Service Information	M
Full Called User Identity	M
NOTE:	This service element shall indicate Monitor for free user B.

#### 4.3.1.13 CCBS-MONITOR ACK

CCBS-MONITOR-ACK is an unconfirmed information flow, across either rb in the case of individual call from FE21 to FE25 or rd in the case of a group call from FE21 to FE22, which confirms that monitoring at either FE25 or FE22 of user B has started; it may also indicate rejection in the case where a SS-CCBS call has failed (e.g. user B busy) and the SwMI provides automatic re-registration of the SS-CCBS service. CCBS-MONITOR-ACK is the expected response to CCBS-MONITOR.

Table 12 lists the service elements within the CCBS-MONITOR-ACK information flow.

**Table 12: Information content of CCBS-MONITOR-ACK**

Service Element	Type
CCBSI	M
Full Calling User Identity	M
Basic Service Information	M
Full Called User Identity	M
Call Priority	M
Area Selection	M
Accept/Reject	M
Reject Cause (RC)	C (note 1)
Retain Capability	O (note 2)
NOTE 1: This service element shall be included if the CCBS-MONITOR request cannot be accepted. Examples of reasons for rejection are: - limit of requests reached; - SS-CCBS not provided.	
NOTE 2: This service element may be included if the CCBS-MONITOR received by either FE25 or FE22 contained the RC Retain Capability service element, otherwise the element shall be omitted. TETRA SwMIs are assumed to support retain capability. This element may be needed in case of inter-working.	

**4.3.1.14 CCBS-RECALL**

CCBS-RECALL is an unconfirmed information flow across ra from FE21 to FE1 indicating that user B is not busy and instructing FE1 to recall user A.

Table 13 lists the service elements within the CCBS-RECALL information flow.

**Table 13: Information content of CCBS-RECALL**

Service Element	Type
CCBS Identifier (CCBSI)	M

**4.3.1.15 CCBS-RECALL-ACCEPTED**

CCBS-RECALL-ACCEPTED is an unconfirmed information flow across ra from FE1 to FE21 in order to indicate that user A has accepted the SS-CCBS Recall and wishes to complete the original call to user B.

Table 14 lists the service elements within the CCBS-RECALL-ACCEPTED information flow.

**Table 14: Information content of CCBS-RECALL-ACCEPTED**

Service Element	Type
CCBS Identifier (CCBSI)	M

**4.3.1.16 CCBS-REQUEST**

CCBS-REQUEST is an unconfirmed information flow across ra from FE1 to FE21 which invokes the SS-CCBS service. The expected response is REQUEST\_ACK which indicates whether the REQUEST to invoke SS-CCBS has been accepted or rejected.

Table 15 lists the service elements within the CCBS-REQUEST information flow.

**Table 15: Information content of CCBS-REQUEST**

Service Element	Type
TETRA Call identifier	M
User B identity	M

**4.3.1.17 CCBS-REQUEST-ACK**

CCBS-REQUEST-ACK is an unconfirmed information flow across ra from FE1 to FE21 which indicates the result of the SS-CCBS service invocation. The expected response indicates whether the REQUEST to invoke SS-CCBS has been accepted or rejected. It also indicates the reason if the response indicates rejection.

Table 16 lists the service elements within the CCBS-REQUEST-ACK information flow.

**Table 16: Information content of CCBS-REQUEST-ACK**

Service Element	Type
TETRA Call identifier	M
CCBS Identifier (CCBSI)	M
User B identity	M
Basic Service Information	M
Call Priority	M
Area Selection	M
Accept/Reject	M
Reject Cause (RC)	C (note 1)
NOTE 1: This service element shall be included if the CCBS-REQUEST cannot be accepted. Examples of possible error conditions are as follows:	
<ul style="list-style-type: none"> <li>- limit of requests reached locally (user A) (short term denial);</li> <li>- limit of requests reached remotely (user B) (short term denial);</li> <li>- SS-CCBS not provided (long term denial);</li> <li>- inter-working with a network that does not support SS-CCBS (long term denial).</li> </ul>	
NOTE 2: This service element shall be provided when the reject cause RC is not present.	

**4.3.1.18 CCBS-RESUME-COMPLETION**

CCBS-RESUME-COMPLETION is an unconfirmed information flow across either rb from FE21 to FE25 in the case of an individual call or rd from FE21 to FE22 in the case of a group call which informs FE25/FE22 that user A is no longer busy and that FE25/FE22 should re-instate monitoring of user B/group B.

Table 17 lists the service elements within the CCBS-RESUME-COMPLETION information flow.

**Table 17: Information content of CCBS-RESUME-COMPLETION**

Service Element	Type
User A Identity	M
CCBS Identifier (CCBSI)	M
User B Identity	M
MNI user A	C (note 1)
MNI User B	C (note 2)
NOTE 1: Present if changed.	
NOTE 2: Present if known.	

#### 4.3.1.19 CCBS-SUSPEND-COMPLETION

CCBS-SUSPEND-COMPLETION is an unconfirmed information flow across either rb from FE21 to FE25 in the case of an individual call or rd from FE21 to FE22 in the case of a group call which informs either FE25 or FE22 that user A is temporarily busy.

Table 18 lists the service elements within the CCBS-SUSPEND-COMPLETION information flow.

**Table 18: Information content of CCBS-SUSPEND-COMPLETION**

Service Element	Type
User A Identity	M
CCBS Identifier (CCBSI)	M
User B Identity	M
MNI user A	C (note 1)
MNI User B	C (note 2)
NOTE 1:	Present if changed.
NOTE 2:	Present if known.

#### 4.3.1.20 CCBS-USER-B-FREE

CCBS-USER-B-FREE is an unconfirmed information flow across ra from FE21 to FE1 in order to inform user A, when user A is known to be busy, that user B (group B) is now FREE.

The service elements within the CCBS-USER-B-FREE information flow shall be the same as the service elements within the CCBS-RECALL.

#### 4.3.2 Relationship of information flows to basic individual call information flows

The CCBS-RECALL-ACCEPTED request information flow shall be sent across ra in conjunction with the basic call U-SETUP request sent to initiate call establishment by user A in response to recall.

The CCBS-CALL-INFORMATION-RETENTION Request/Indication information flow shall be sent across ra in conjunction with the basic call D-DISCONNECT request sent to release call establishment by the network as a result of user B busy.

The CCBS-CANCELLATION (STOP-MONITOR) Request/Indication information flow shall be sent across rb in conjunction with DISCONNECT/RELEASE request/indication when user A rejects SS-CCBS recall.

The CCBS-CALL request/response information flow shall be sent across rb in conjunction with the basic call information flow U-SETUP/D-CONNECT request/response in the case of successful recall of user A.

Table 19 summarizes the relationship of the SS-CCBS information flows to those of basic call.

**Table 19: Relationship of SS-CCBS information flows to Basic Call**

Information flow		Independent of basic call?	With basic call flow?	Basic call flows:
CCBS-CALL-INFORMATION-RETENTION		no	yes	D-DISCONNECT
CCBS-CALL-INFORMATION-RELEASE		yes	-	
CCBS-CANCEL		yes	-	
		yes	-	
CCBS-CANCELLED		yes	yes	D-ALERT D-CONNECT (note)
CCBS-CANCELLATION (STOP-MONITOR)		yes	yes	DISCONNECT
CCBS-FAILED		-	yes	U-DISCONNECT req.
CCBS-FREE-NOTIFICATION		yes	-	
CCBS-LIST		yes	-	
		yes	-	
		yes	-	
CCBS-MONITOR		yes	-	
		yes	-	
CCBS-RECALL		yes	-	
CCBS-RECALL-ACCEPTED		-	yes	U-SETUP
CCBS-REQUEST		yes	-	
		yes	-	
CCBS-RESUME-COMPLETION		yes	-	
CCBS-SUSPEND-COMPLETION		yes	-	
CCBS-USER-B-FREE		yes	-	
NOTE: CANCELLED may be associated either to successful completion of CCBS or unsuccessful cancellation by the network.				

#### 4.3.3 Relationship of information flows to group call information flows

The CCBS-RECALL-ACCEPTED request information flow shall be sent across ra in conjunction with the basic call U-SETUP/D-CONNECT request/response sent to initiate call establishment by user A in response to recall.

The CCBS-CANCELLATION (STOP-MONITOR) Request/Indication information flow shall be sent across rd in conjunction with U-DISCONNECT/D-RELEASE request/response when user A rejects SS-CCBS recall.

The CCBS-CALL request/response information flow shall be sent across rd in conjunction with the basic call information flow U-SETUP/D-CONNECT request/response in the case of successful recall of user A.

The CCBS-CALL response information flow shall be sent across rd in conjunction with the basic call information flow DISCONNECT/RELEASE request/response if the call offer to group B is unsuccessful.

Table 20 summarizes the relationship of the SS-CCBS information flows to those of basic call.

**Table 20: Relationship of SS-CCBS information flows to Basic Group Call**

Information flow	Independent of basic call?	With basic call flow?	Basic call flows:
CCBS-CALL-INFORMATION-RETENTION	no	yes	D-DISCONNECT
CCBS-CALL-INFORMATION-RELEASE	YES	-	
CCBS-CANCEL	yes	-	
	yes	-	
CCBS-CANCELLED	yes	yes	D-ALERT D-CONNECT (note)
CCBS-CANCELLATION (STOP-MONITOR)	yes	yes	DISCONNECT
CCBS-FAILED	-	yes	U-DISCONNECT
CCBS-FREE-NOTIFICATION	yes	-	
CCBS-LIST	yes	-	
	yes	-	
CCBS-MONITOR	yes	-	
	yes	-	
CCBS- RECALL	yes	-	
CCBS-RECALL-ACCEPTED	-	yes	U-SETUP
CCBS-REQUEST	yes	-	
	yes	-	
CCBS-RESUME-COMPLETION	yes	-	
CCBS-SUSPEND-COMPLETION	yes	-	
CCBS-USER-B-FREE (GROUP B)	yes	-	
NOTE: CANCELLED may be associated either to successful completion of CCBS or unsuccessful cancellation by the network.			

**4.3.4 Examples of information flow sequences**

A stage 3 ETS for SS-CCBS shall provide signalling procedures in support of the information flow sequences specified below. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services, different topologies, etc...

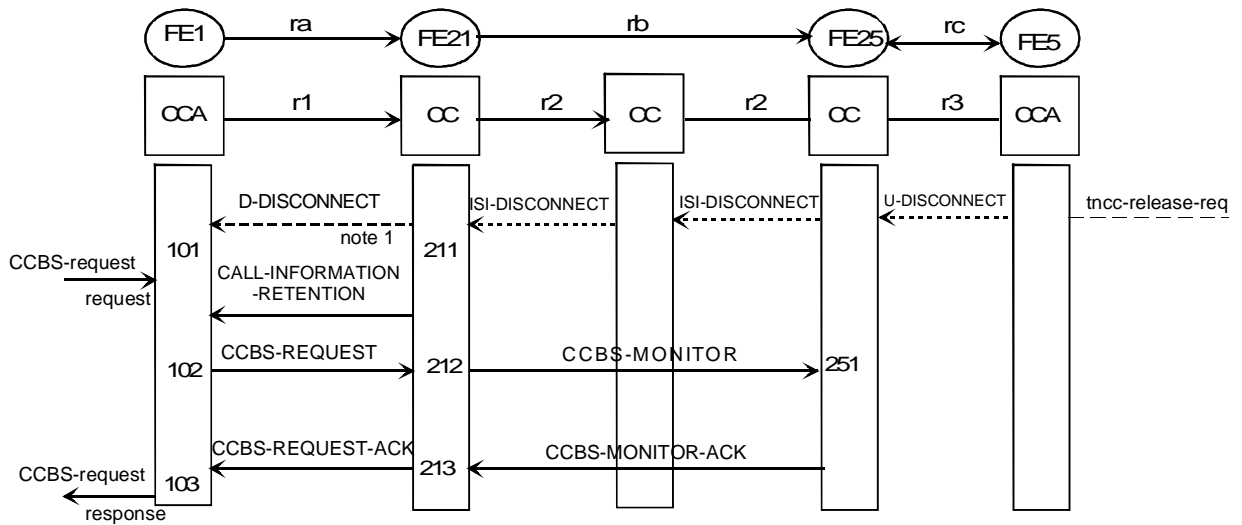
In the figures, SS-CCBS information flows are represented by solid arrows and basic call information flows are represented by broken arrows. An ellipse embracing two information flows indicates that the two information flows occur simultaneously. Within a column representing an SS-CCBS functional entity, the numbers refer to functional entity actions listed below. The following abbreviations are used:

The following information flow sequences assume the signalling connection to be established and to be retained during the whole duration of the SS-CCBS invocation.

4.3.4.1 Examples of information flow sequences in the case of individual call

4.3.4.1.1 Successful invocation of SS-CCBS

Figure 5 shows the information flow sequence for successful invocation of SS-CCBS.



NOTE: The D-DISCONNECT carries the information that SS-CCBS may be invoked and gives the call information parameters which shall be retained/stored in the MS/LS. This information is kept within the originating SwMI during the duration of timer T5; if this timer expires, this information is released by the originating SwMI.

Figure 5: Successful invocation of SS-CCBS

4.3.4.1.2 Cancellation of previously invoked SS-CCBS request by User A

Figure 6 shows the information flow sequence where user A requests cancellation of a previously invoked SS-CCBS request.

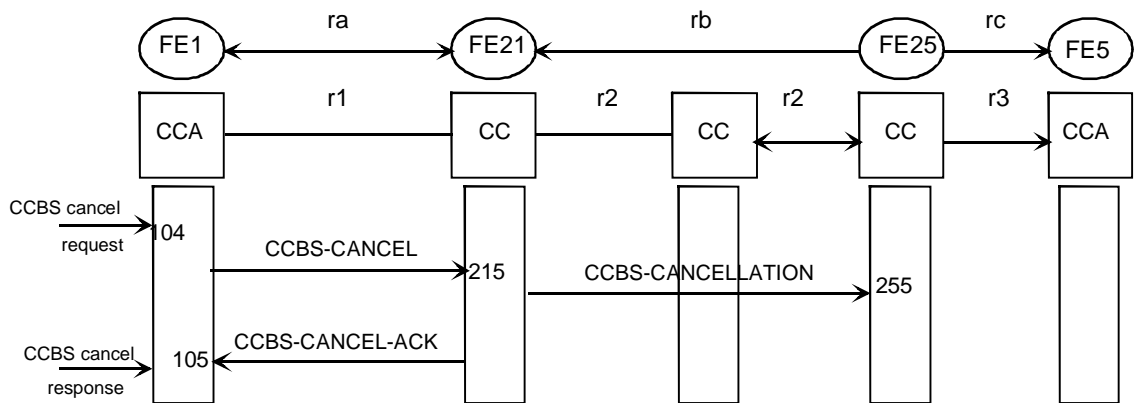


Figure 6: Cancellation of previously invoked SS-CCBS request

4.3.4.1.3 List of SS-CCBS request

Figure 7 shows the information flow sequence where User A requests the status of one or more previously invoked SS-CCBS requests.

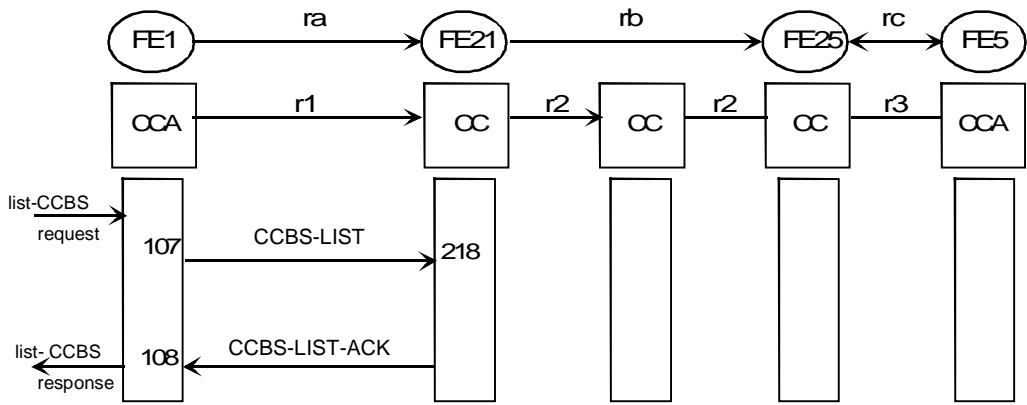
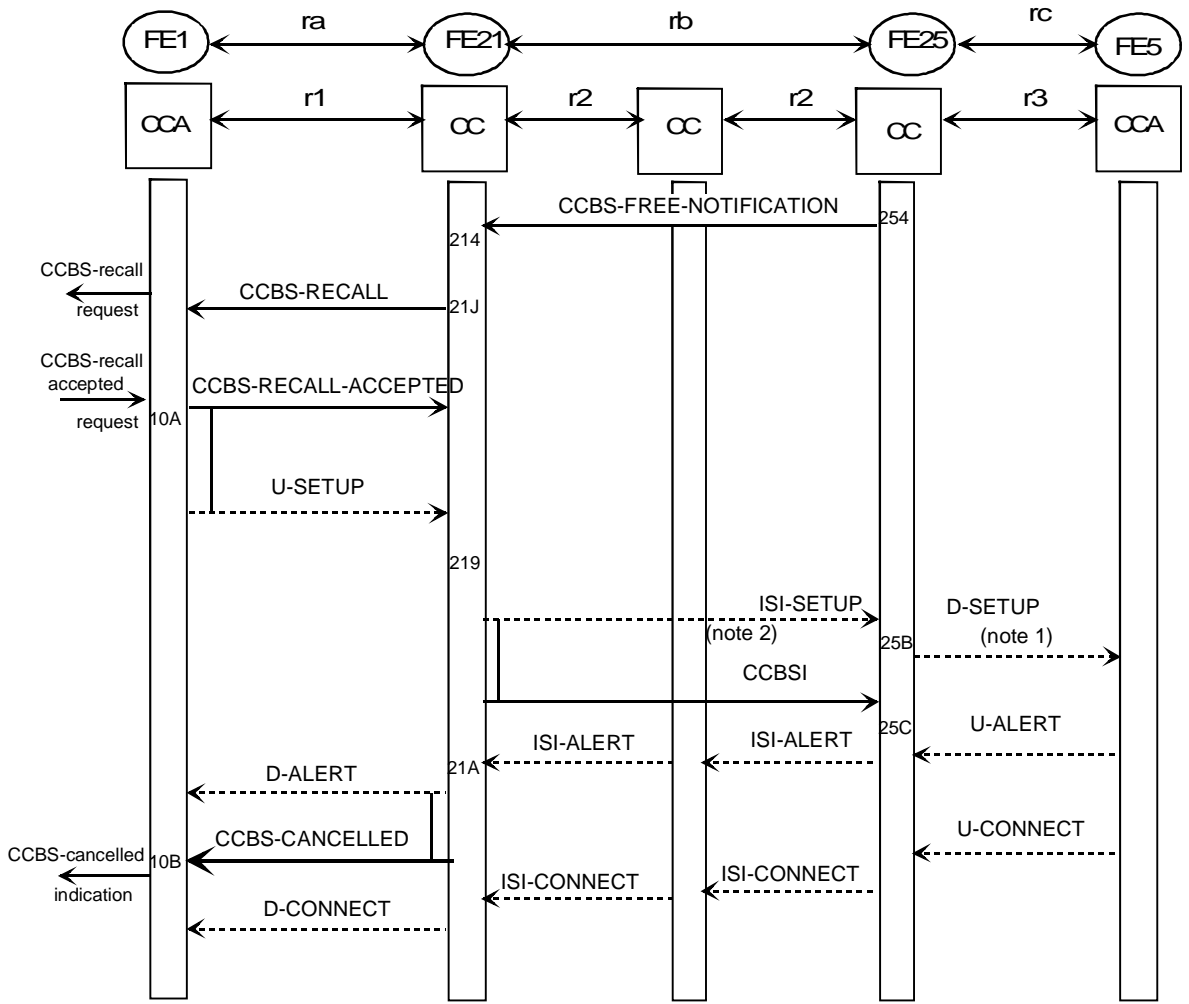


Figure 7: List of SS-CCBS request

4.3.4.1.4 Successful completion of SS-CCBS

Figure 8 shows the information flow sequence where the SS-CCBS request is successfully completed.



NOTE 1: In the case of a TETRA network, SS-CCBS is completed as soon as D-SETUP is presented to user B since none of the disconnect cause from user B may result in a user B busy. In TETRA network, only NDUB may occur and in that case D-SETUP would not be presented.

NOTE 2: Signals preceded by ISI such as ISI-SETUP indicate that they carry ISI significance (such as mobility). Signals not shown associated to a basic call set-up are carried by the TETRA signalling connection.

Figure 8: Successful completion of individual call SS-CCBS



4.3.4.1.5 Local rejection of SS-CCBS by SwMI

Figure 9 shows the information flow sequence where FE21 rejects the request for SS-CCBS - i.e. local rejection.

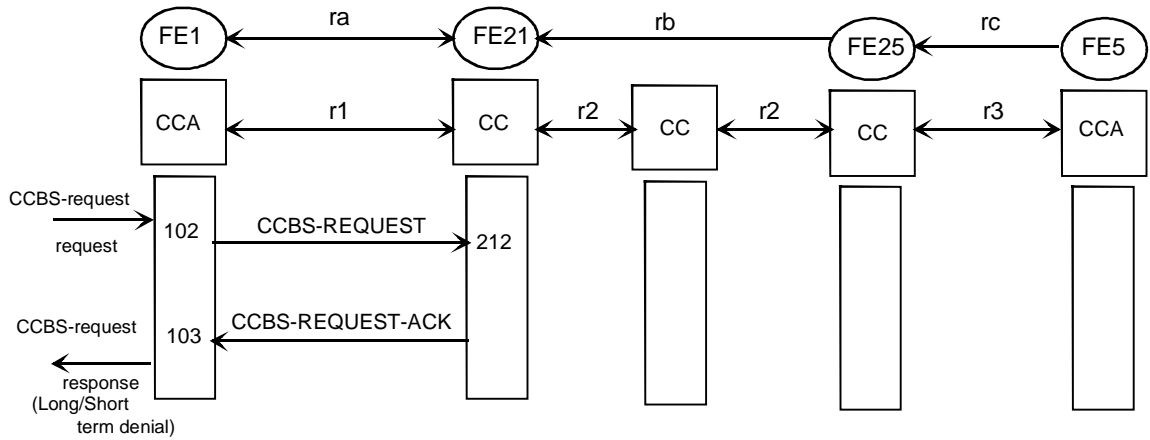


Figure 9: Local rejection of SS-CCBS

4.3.4.1.6 Remote rejection of SS-CCBS by SwMI

Figure 10 shows the information flow sequence where FE25 rejects the request for SS-CCBS - i.e. remote rejection.

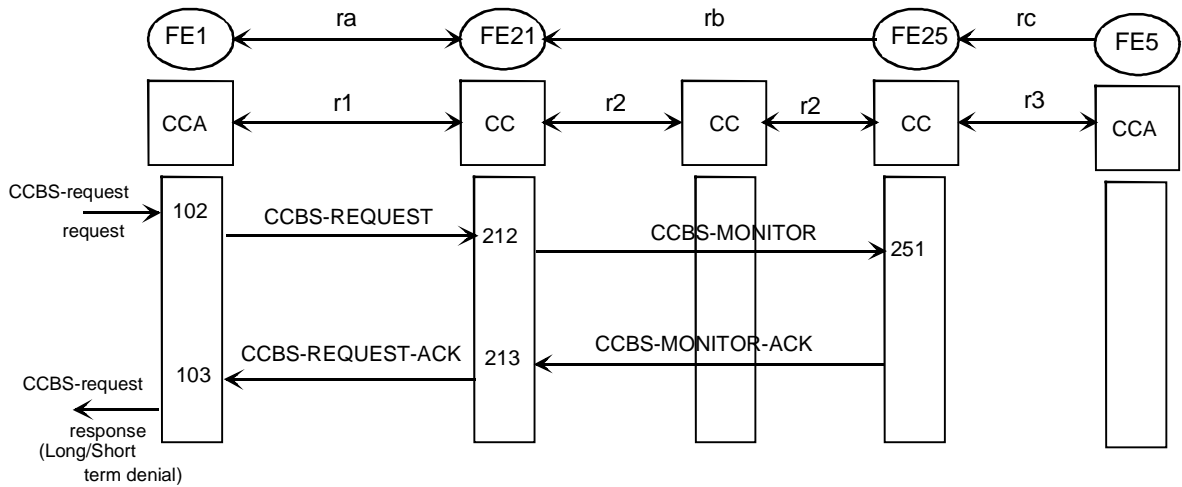
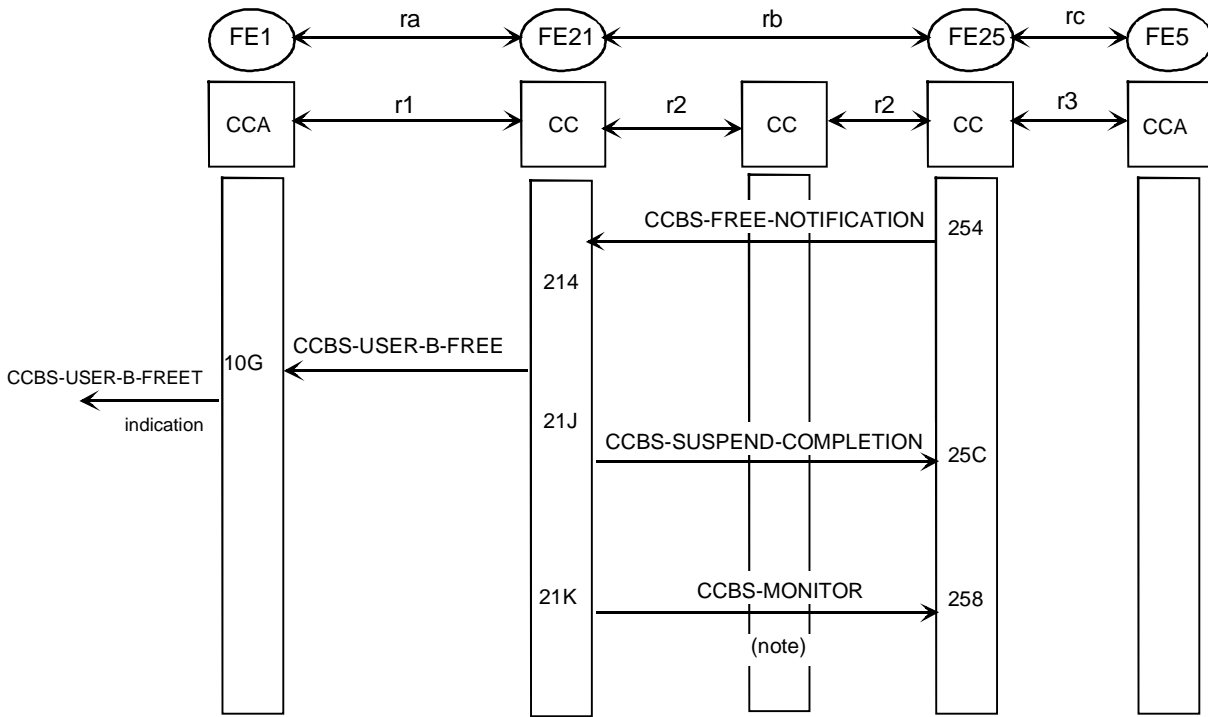


Figure 10: Remote rejection of SS-CCBS

4.3.4.1.7 User A busy when User B becomes not busy (request suspended)

Figure 11 shows the information flow sequence where User A is busy when the SwMI attempts SS-CCBS Recall and FE21 requests FE25 to suspend the SS-CCBS request with a view to re-initiating monitoring of User B.



NOTE: This information flow is actually a RESUME-MONITOR information flow; however, RESUME-MONITOR is the same information flow as MONITOR; resume indicates that monitor has been interrupted when B was found free and is now resumed due to A being busy.

Figure 11: User A busy on recall (request suspended)

4.3.4.1.8 No response by User A to SS-CCBS Recall

Figure 12 shows the information flow sequence where User A ignores (passive rejects) the SS-CCBS Recall.

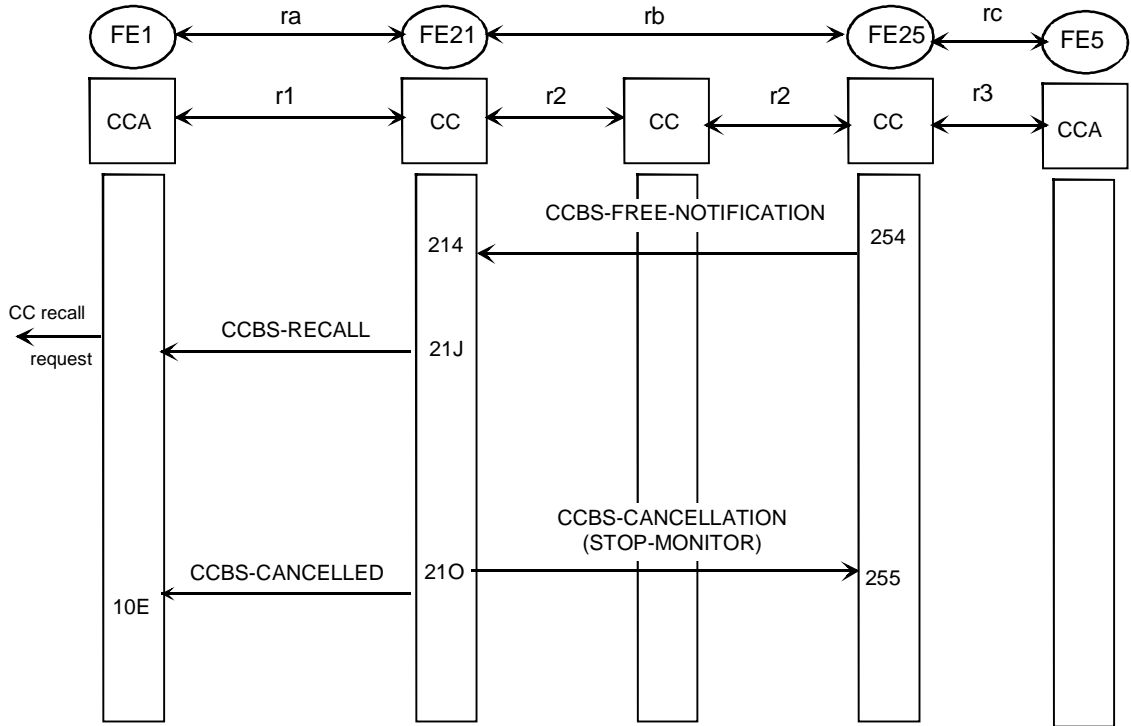
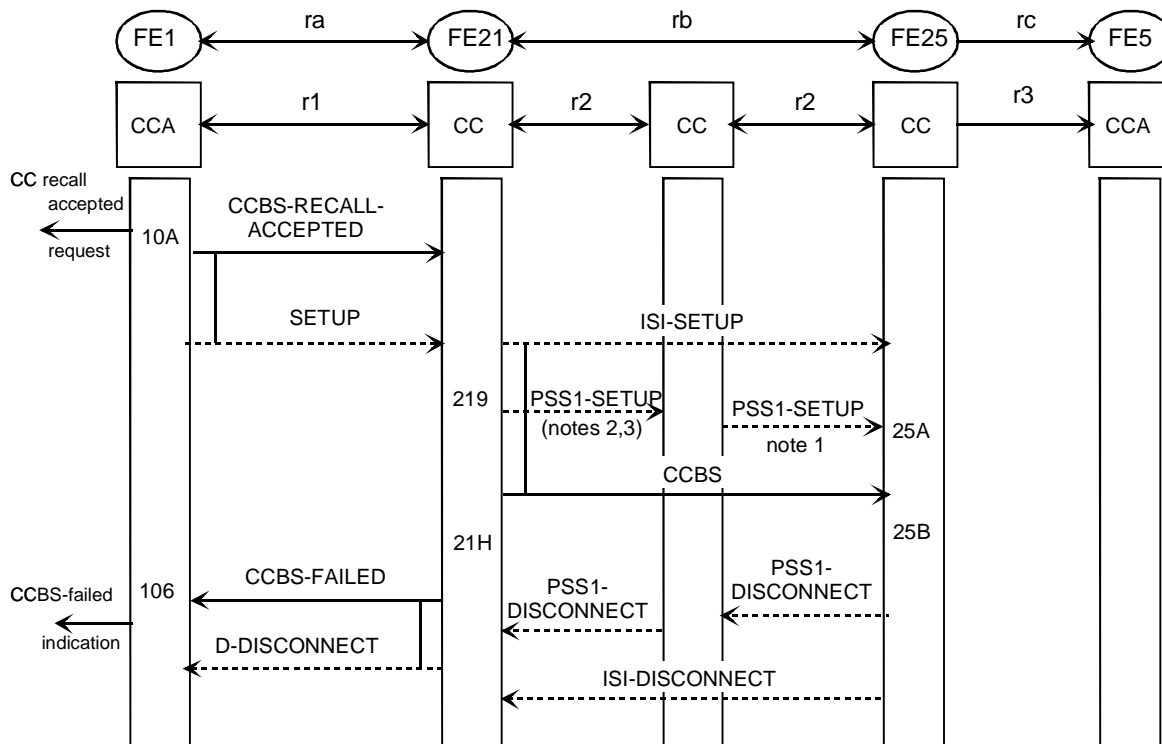


Figure 12: No response to SS-CCBS recall by user A

4.3.4.1.9 Successful SS-CCBS recall, User B busy

Figure 13 shows the information flow sequence where User A accepts SS-CCBS Recall, but User B has become busy by the time the completed call is offered.



- NOTE 1: In the case of a TETRA network, SS-CCBS is completed as soon as D-SETUP is presented to user B since none of the disconnect cause from user B may result in a user B busy. In TETRA network, only NDUB may occur and in that case D-SETUP is not presented.
- NOTE 2: Signals preceded by ISI such as ISI-SETUP indicate that they carry ISI significance (such as mobility). Signals not shown associated to a basic call set-up are carried by the TETRA signalling connection.
- NOTE 3: This is first a PSS1 path set-up then an ISI set-up to indicate that now user B can be alerted and finally an indication that this is in fact a CCBS call with its CCBSI reference. This replaces the CCBS-CALL information flow of ECMA-185 [2].

Figure 13: Successful SS-CCBS recall, user B busy

4.3.4.1.10 Successful SS-CCBS recall, no path to User B

Figure 14 shows the information flow sequence where User A accepts SS-CCBS Recall but there is no path to User B because of congestion.

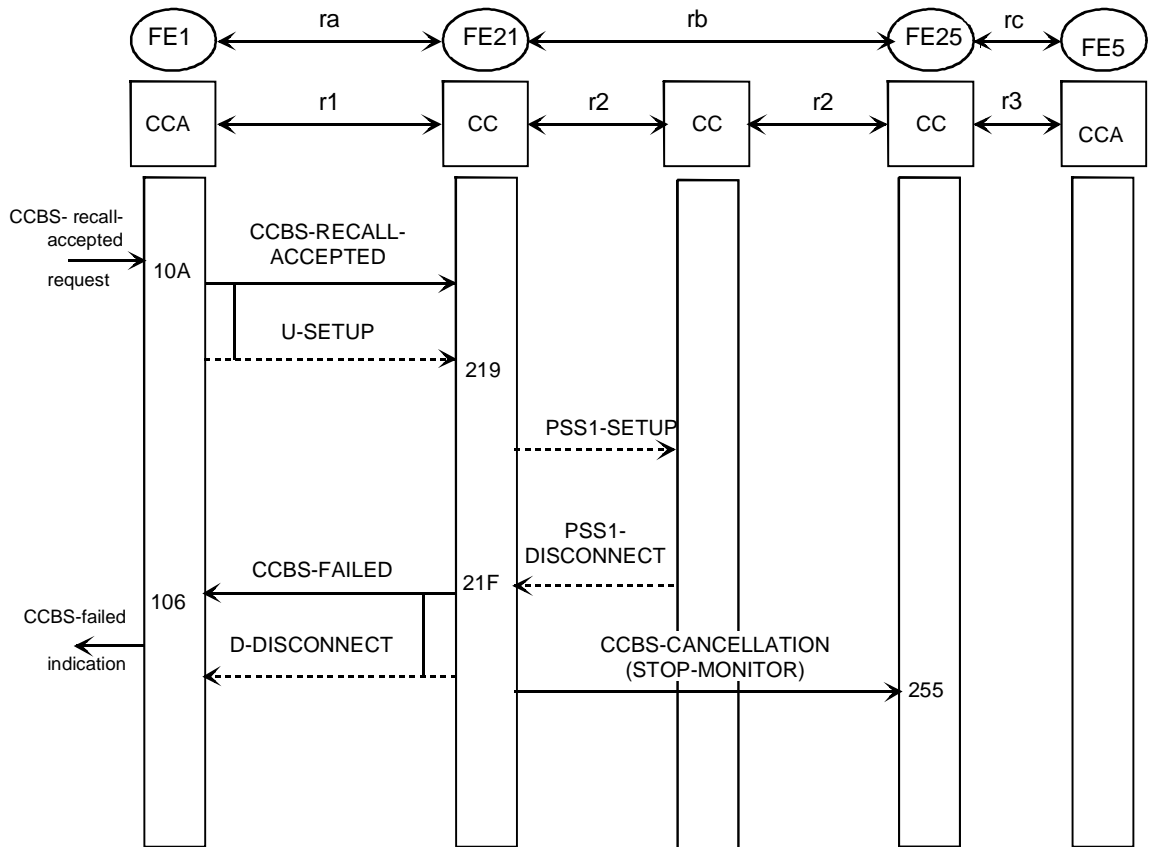
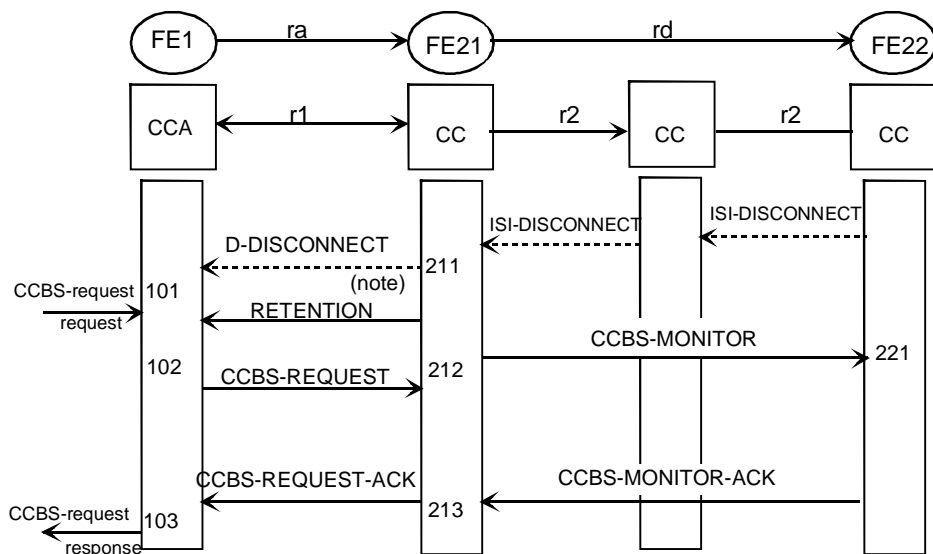


Figure 14: Successful SS-CCBS recall, no path to user B

4.3.4.2 Examples of information flow in the case of group call

4.3.4.2.1 Successful invocation of SS-CCBS

Figure 15 shows the information flow sequence for successful invocation of SS-CCBS.



NOTE: The D-DISCONNECT carries the information that SS-CCBS is possible and gives the retention parameters needed to establish the CCBS REQUEST.

Figure 15: Successful invocation of SS-CCBS

4.3.4.2.2 Cancellation of previously invoked SS-CCBS request by User A

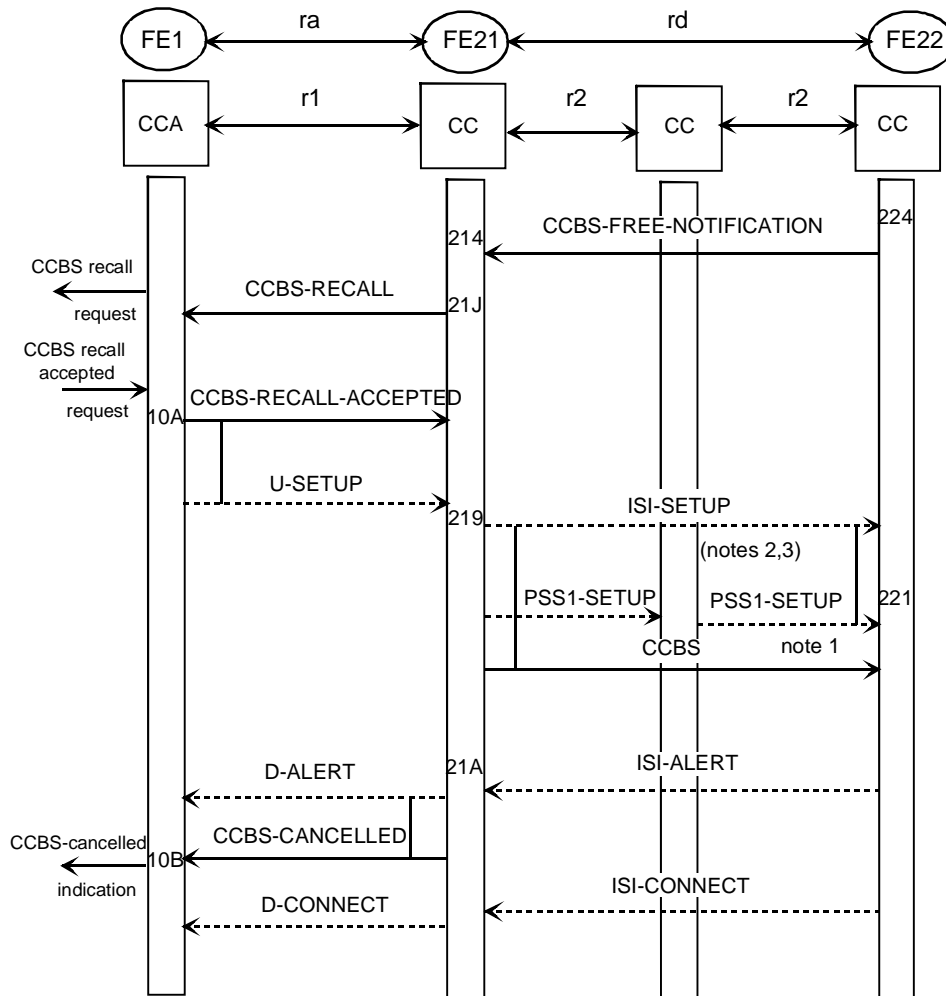
Same figure as in the case of Individual Call replacing FE25 by FE22.

4.3.4.2.3 List of SS-CCBS request status

Same figure as in the case of Individual Call replacing FE25 by FE22.

4.3.4.2.4 Successful completion of SS-CCBS

Figure 16 shows the information flow sequence where the SS-CCBS request is successfully completed.



- NOTE 1: In the case of a TETRA network group call, SS-CCBS is completed as soon as ISI-SETUP is presented to group B SwMI and finds group B non-busy.
- NOTE 2: Signals preceded by ISI such as ISI-SETUP indicate that they carry ISI significance (such as mobility). Signals not shown associated to a basic call set-up are carried by the TETRA signalling connection.
- NOTE 3: This is first a PSS1 path set-up then an ISI set-up to indicate that now user B can be alerted and finally an indication that this is in fact a CCBS call with its CCBSI reference. This replaces the CCBS-CALL information flow of ECMA-185 [2].

Figure 16: Successful completion of group call SS-CCBS

4.3.4.2.5 Local rejection of SS-CCBS by SwMI

Same figure as in the case of Individual Call replacing FE25 by FE22.

4.3.4.2.6 Remote rejection of SS-CCBS by SwMI

Same figure as in the case of Individual Call replacing FE25 by FE22 and deleting FE5.

4.3.4.2.7 User A busy when Group B becomes not busy (request suspended)

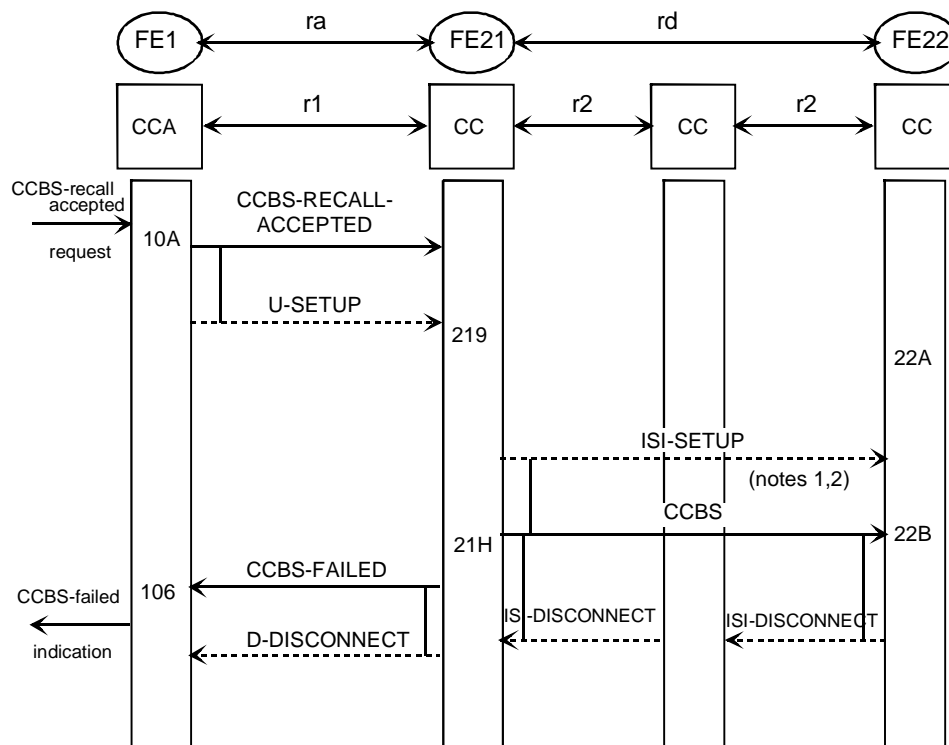
Same figure as in the case of Individual Call replacing FE25 by FE22.

4.3.4.2.8 No response by User A to SS-CCBS Recall

The information flow sequence, where User A does not reply to the SS-CCBS Recall, is shown by the same figure as for individual call, replacing FE25 by FE22 and deleting FE5.

4.3.4.2.9 Successful SS-CCBS recall, Group B busy

Figure 17 shows the information flow sequence where User A accepts SS-CCBS Recall, but User B has become busy by the time the completed call is offered.



NOTE 1: Signals preceded by ISI such as ISI-SETUP indicate that they carry ISI significance (such as mobility). Signals not shown associated to a basic call set-up are carried by the TETRA signalling connection.

NOTE 2: This is not a path set-up since the path has already been reserved but a dummy set-up to indicate that now group B can now be alerted. This replaces the CCBS-CALL information flow of ECMA-185 [2].

Figure 17: Successful SS-CCBS recall, group B busy



4.3.4.2.10 Successful SS-CCBS recall, no path to User B

Figure 18 shows the information flow sequence where User A accepts SS-CCBS Recall but there is no path to User B because of congestion.

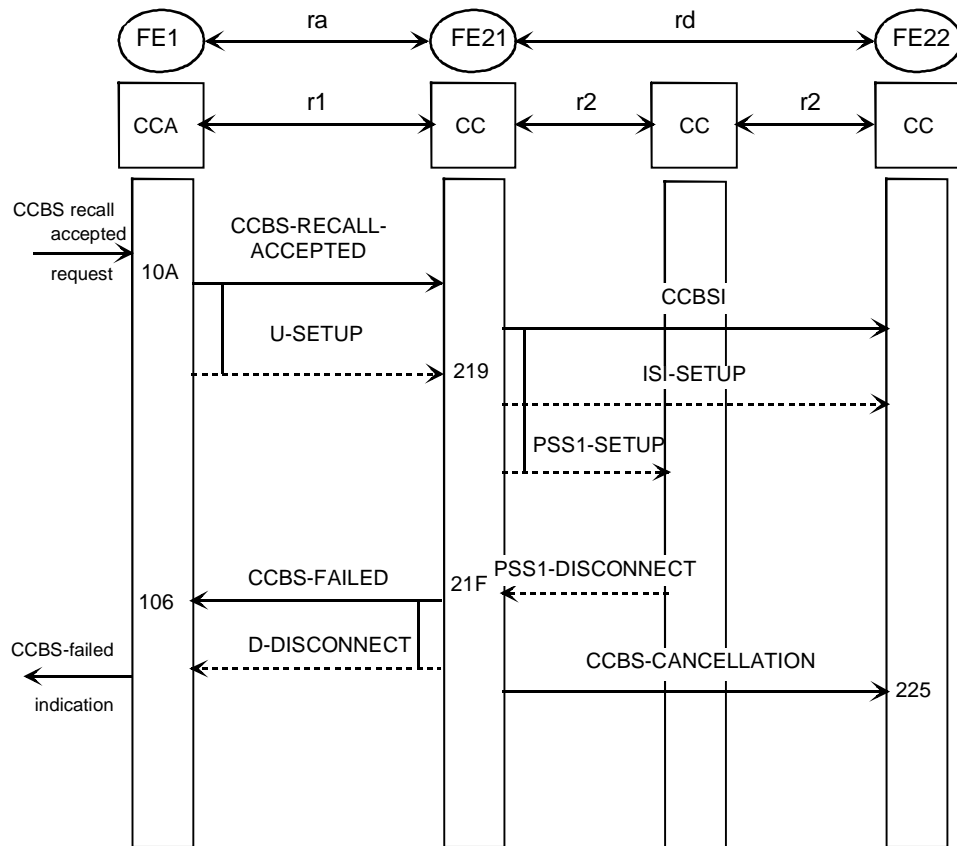


Figure 18: Successful SS-CCBS recall, no path to group B

4.4 Functional entity actions

The following FE actions shall occur at the points indicated in the figures of 4.3.3.

4.4.1 Functional entity actions of FE1

NOTE 1: Action missing numbers correspond either to actions supported by ECMA-185 [2] and not supported by TETRA, actions numbers skipped in ECMA-185 [2] or action numbers described in ECMA-185 [2] text but not found in the figures of ECMA-185 [2].

- 101 Store information related to failed TETRA basic call to enable User A to request SS-CCBS.
- 102 Send CCBS-REQUEST to FE21.
- 103 Present result of request for SS-CCBS to User A. If response indicates rejection, discard details of SS-CCBS.
- 104 Send CCBS-CANCEL to FE21.
- 105 Present a response of the result of the cancellation to User A. If cancellation is successful, discard details of SS-CCBS.
- 106 Present indication of failure to User A. If SS-CCBS has been cancelled, discard details of SS-CCBS.
- 107 Send CCBS-LIST to FE21.

- 108 Present CCBS-LIST-ACK to FE1 then to User A.
- 10A Send CCBS-RECALL-ACCEPTED to FE21. This shall be accompanied by a TETRA basic call U-SETUP toward FE21.
- 10B Discard details of SS-CCBS.
- 10E Forward notification of CCBS failure to User A. Discard details of SS-CCBS.
- NOTE 2: 115 (of ECMA-185 [2]) is not applicable) Stop SS-CCBS recall if not already accepted.
- 10G Inform User A (who is busy) that User B is not busy.

#### 4.4.2 Functional entity actions of FE21

- NOTE 1: Action missing numbers correspond either to actions supported by ECMA-185 [2] and not supported by TETRA, actions numbers skipped in ECMA-185 [2] or action numbers described in ECMA-185 [2] text but not found in the figures of ECMA-185 [2].
- NOTE 2: In this part of the ETS, FE25/FE22 is to be understood as either FE25 in the case of individual call or FE22 in the case of group call.
- 211 Store details of failed TETRA basic call.
- NOTE 3: Action 211 could also be initiated by receipt of a busy indication as part of another Supplementary Service, rather than via the release of the TETRA basic call.
- 212 If SS-CCBS is activated and requested, send CCBS-MONITOR to FE25/FE22 to monitor User/Group B.  
If SS-CCBS is not activated, send a CCBS-REQUEST-ACK indicating SS-CCBS rejection to FE1.
- 213 If the SS-CCBS request has been accepted, send CCBS-REQUEST-ACK to FE1 to indicate SS-CCBS acceptance and start the SS-CCBS service duration timer.  
If the CCBS-MONITOR-ACK does not indicate acceptance, send CCBS-REQUEST-ACK to FE1 to indicate that FE25/FE22 did not accept the monitor request and discard details of the SS-CCBS request.
- 214 Record the fact that User B is not busy and determine status of User A.
- 215 Check that the SS-CCBS request identified in the CCBS-CANCEL is valid.  
If valid, send CCBS-CANCELLATION (STOP-MONITOR) req. to FE25/FE22, and CCBS-CANCEL-ACK to FE1, to acknowledge that cancellation has been successful and discard details of the SS-CCBS request. Stop the SS-CCBS service duration timer.  
If the request is not valid, send CCBS-CANCEL-ACK to FE1 indicating the reason cancellation could not take place.
- 218 If the request is valid, determine the status of the outstanding SS-CCBS requests and return CCBS-LIST-ACK to FE1 indicating this status.  
If the request is not valid, return CCBS-LIST-ACK to FE1 indicating the reason for failure.
- 219 Stop SS-CCBS recall timer. Send towards FE25/FE22 a TETRA basic call SETUP with the CCBSI value for that call.
- 21A Discard details of SS-CCBS request. Stop the SS-CCBS service duration timer. Send CCBS CANCELLED to FE1.
- 21F Send CCBS-FAILED to FE1 to indicate that the SS-CCBS recall has failed and service not retained. Send CCBS-CANCELLATION (STOP-MONITOR) to FE25/FE22. Discard details of SS-CCBS.

- 21H Send CCBS-FAILED to FE1 to indicate that the SS-CCBS recall has failed and whether the service has been cancelled or is continuing.  
Since automatic re-registration of SS-CCBS is supported and SS-CCBS has been cancelled, send CCBS-MONITOR to FE25/FE22 to re-register SS-CCBS (not shown).
- 21J If User A is free:
- start SS-CCBS Recall timer; and
  - send CCBS-RECALL to FE1.
- If User A is busy:
- send CCBS-USER-B-FREE to FE1;
  - send CCBS-SUSPEND-COMPLETION to either FE25 or FE22; and
  - monitor for a call being cleared to User A.
- 21K If User A is free, send CCBS-MONITOR to FE25/FE22.
- NOTE 4: This is actually a MONITOR RESUME information flow.
- If User A is busy, monitor for a call being cleared to User A.
- 21N If User A is busy, send CCBS-USER-B-free to FE1, optionally send CCBS-SUSPEND-COMPLETION to FE25/FE22, and monitor for a call being alerted by User A.
- 21O On expiration of the SS-CCBS recall timer, send CCBS-CANCELLATION (STOP-MONITOR) to FE25/FE22, send CCBS-CANCELLED to FE1 and discard details of SS-CCBS.

#### 4.4.3 Functional Entity Actions of FE25

NOTE: Action missing numbers correspond either to actions supported by ECMA-185 [2] and not supported by TETRA, actions numbers skipped in ECMA-185 [2] or action numbers described in ECMA-185 [2] text but not found in the figures of ECMA-185 [2].

- 251 If SS-CCBS is possible:
- store request against User B, and:
    - if User B is free, return CCBS-MONITOR-ACK to FE21 indicating acceptance of the SS-CCBS request followed by CCBS-FREE-NOTIFICATION to FE21 to indicate that User B is now free; or
    - if User B is busy, return CCBS-MONITOR to FE21 indicating acceptance of the SS-CCBS request and continue to monitor User B's status to determine when User B becomes free.
  - if SS-CCBS is not possible, return CCBS-MONITOR-ACK to FE21 indicating the reason for rejection.
- 254 Send CCBS-FREE-NOTIFICATION to FE21 to indicate that User B is free.
- 255 Cancel SS-CCBS on User B and discard details of SS-CCBS request.
- 258 Resume monitoring of User B's status to determine when User B becomes free.
- 25A Offer completed call to User B by means of the TETRA basic call; if FE25 is informed that User B is non busy, discard details of the SS-CCBS request.  
If the basic call to User B is not accepted by User B, send to FE21 a TETRA basic call reject response indicating the reason for failure of SS-CCBS and whether the SS-CCBS registration has been maintained.
- 25B Offer completed call to User B by means of the basic call.
- 25C Mark the related SS-CCBS attempt on User B as suspended and await notification from FE21 to resume monitoring of user B. At this point, user B can receive all incoming calls and continue to be able to initiate outgoing calls; if no other events occur, this suspension will continue until user B SwMI SS-CCBS duration timer expires.

#### 4.4.4 Functional Entity Actions of FE22

NOTE: Action missing numbers correspond either to actions supported by ECMA-185 [2] and not supported by TETRA, actions numbers skipped in ECMA-185 [2] or action numbers described in ECMA-185 [2] text but not found in the figures of ECMA-185 [2].

- 221 If SS-CCBS is possible:
- store request against Group B, and:
    - if Group B is free, return CCBS-MONITOR-ACK to FE21 indicating acceptance of the SS-CCBS request followed by CCBS-FREE-NOTIFICATION to FE21 to indicate that Group B is now free; or
    - if Group B is busy, return CCBS-MONITOR-ACK to FE21 indicating acceptance of the SS-CCBS request and continue to monitor Group B's status to determine when Group B becomes free;
  - if SS-CCBS is not possible, return CCBS-MONITOR-ACK to FE21 indicating the reason for rejection.
- 224 Send CCBS-FREE-NOTIFICATION to FE21 to indicate that Group B is free.
- 225 Cancel SS-CCBS on Group B and discard details of SS-CCBS request.
- 228 Resume monitoring of Group B's status to determine when Group B becomes free.
- 22A Offer completed call to Group B by means of the TETRA basic call; if FE22 is informed that Group B is non busy, discard details of the SS-CCBS request.  
If the TETRA basic call to Group B is not accepted by Group B, send to FE21 a TETRA basic call reject response indicating the reason for failure of SS-CCBS and whether the SS-CCBS registration has been maintained.
- 22B Offer completed call to User B by means of the basic call.
- 22C Mark the related SS-CCBS attempt on Group B as suspended and await notification from FE21 to resume monitoring of Group B.

#### 4.4.5 Functional entity actions of FE5

None.

**4.5 Allocation of functional entities to physical equipment in case of individual call**

The allocations of FEs to physical equipment shown in table 21 shall apply.

**Table 21: Scenarios for the allocation of FEs to physical equipment in case of individual call**

Scenario	Functional Entities			
	User A		User B	
	FE1	FE21	FE25	FE5
1 Users A and B in same SwMI	MS/LS	SwMI	SwMI	MS/LS
2 User A in SwMI, User B in other network	MS/LS	SwMI	Other network	Other network TE
3 User B in SwMI, and user A in other network	TE in other network	Other network	SwMI	MS/LS
NOTE:	Scenario where users A and B are in other network and where TETRA would act as a transit network is not considered in this ETS.			

**4.6 Allocation of functional entities to physical equipment in case of group call**

The allocations of FEs to physical equipment shown in table 22 shall apply.

**Table 22: Scenarios for the allocation of FEs to physical equipment in case of group call**

Scenario	Functional Entities		
	User A		Group B
	FE1	FE21	FE22
1 Users A and B in same SwMI	MS/LS	SwMI	SwMI
3 Group B in SwMI, and user A in other network	TE in other network	Gateway SwMI	SwMI
NOTE:	Scenario where users A and B are in other network and where TETRA would act as a transit network is not considered in this ETS.		

#### 4.7 Inter-working considerations

When inter-working with a public ISDN, the SS-CCBS service will always use the non-path reservation mode due to the capabilities of the public ISDN service. The gateway SwMI shall ensure that the acknowledgement of the SS-CCBS monitor request generated from a received monitor confirmation from the public ISDN is forwarded to the requester of SS-CCBS indicating "reservation not supported" in the case that monitoring of a Public ISDN user is requested. When the SwMI is monitoring a SwMI user on behalf of a Public ISDN user, the service will always use the non-path reservation mode requested by the Public ISDN.

When inter-working with a non-standard network which supports only path reservation, the gateway SwMI shall ensure that the acknowledgement of the SS-CCBS monitor request generated from a received monitor confirmation from the non-standard network is forwarded to the requester of SS-CCBS indicating "reservation supported" in the case that monitoring of a user in that other network is requested. If the SwMI uses the non-path reservation subsequent to this request, the gateway SwMI will be responsible for performing the reservation in the other network when the CCBS-CALL request/response flow is received from FE21.

Inter-working from an external ISDN towards a TETRA group call is not guaranteed and vice-versa.

## **Annex A (informative): Bibliography**

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- ITU-T Recommendation I.112: "Vocabulary of terms for ISDNs".
- ITU-T Recommendations I.210: "Principles of telecommunication services supported by an ISDN and the means to describe them".
- ITU-T Recommendations Z.100: "CCITT specification and description language (SDL)".
- ETSI ETS 300 171 (1992): "Private Telecommunication Network (PTN); Specification, functional models and information flows; Control aspects of circuit mode basic service; ECMA-BCSD".
- ETSI ETS 300 392-3 (1997): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 3: Inter-working at the Inter-System Interface (ISI); Sub-part 1: General design".
- ETSI ETS 300 392-9 (1997): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 9: General requirements for supplementary services".
- ETSI ETS 300 392-1 (1995): "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

## History

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