



**E**UROPEAN  
**T**ELECOMMUNICATION  
**S**TANDARD

**ETS 300 392-10-11**

April 1996

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Source: ETSI TC-RES

Reference: DE/RES-06001-10-11

ICS: 33.020, 33.060.50

**Key words:** TETRA, V+D

**Radio Equipment and Systems (RES);  
Trans-European Trunked Radio (TETRA);  
Voice plus Data (V+D);  
Part 10: Supplementary services stage 1;  
Part 10-11: Call waiting**

**ETSI**

European Telecommunications Standards Institute

**ETSI Secretariat**

**Postal address:** F-06921 Sophia Antipolis CEDEX - FRANCE

**Office address:** 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

**X.400:** c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee 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: "Inter-working", (DE/RES-06001-3).
- Part 4: "Gateways", (DE/RES-06001-4).
- Part 5: "Terminal equipment interface", (DE/RES-06001-5).
- Part 6: "Line connected stations", (DE/RES-06001-6).
- Part 7: "Security".
- Part 8: "Management services", (DE/RES-06001-8).
- Part 9: "Performance objectives", (DE/RES-06001-9).
- Part 10: "Supplementary services stage 1".**
- Part 11: "Supplementary services stage 2", (DE/RES-06001-11).
- Part 12: "Supplementary services stage 3", (DE/RES-06001-12).
- Part 13: "SDL Model of the Air Interface", (DE/RES-06001-13).
- Part 14: "PICS Proforma", (DE/RES-06001-14).
- Part 15: "Inter-working - Extended Operations", (DE/RES-06001-15).
- Part 16: "Gateways for Supplementary Services", (DE/RES-06001-16).

<b>Transposition dates</b>	
Date of adoption of this ETS:	1 March 1996
Date of latest announcement of this ETS (doa):	31 July 1996
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 January 1997
Date of withdrawal of any conflicting National Standard (dow):	31 January 1997

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## 1 Scope

This European Telecommunication Standard (ETS) defines the stage 1 specifications of the Call Waiting (CW) supplementary service for the Trans-European Trunked Radio (TETRA) as provided by European operators. Stage 1 is an overall service description from the users point of view but does not deal with the details of the human interface itself.

This ETS specifies the service description of the supplementary service and the procedures to be expected with successful and unsuccessful outcomes. In addition this ETS specifies the interactions with other TETRA supplementary services and inter-working considerations.

Charging principles are outside the scope of this ETS.

The CW supplementary service is defined as the possibility for a mobile subscriber to be notified of an incoming call whilst his termination is in the busy state. Subsequently the subscriber can either answer, reject or ignore the incoming call.

## 2 Normative references

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

- [1] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [2] ITU-T Recommendation Z.100 (1993): "Specification and Description Language (SDL)".

## 3 Definitions and abbreviations

### 3.1 Definitions

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

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

**served user B:** The subscriber ITSI/GTSI who is provided by the network with the call waiting service. The served user B may be the owner of the call (or owner of the group if the new incoming call is a multipoint call from user C).

**Supplementary Service (SS):** A 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.

**T1; user terminal response time-out:** The duration of this time-out is the time the network is able to wait for a positive hardware response from a terminal at B, to the offered call. It is be part of the basic call and has a value of less than one second when both parties of the call are located within the same SwMI.

**T2; no answer time-out (Service provider option):** The duration of this time-out is the time the network is able to wait for an acceptance (answer) of the offered call from user C, by served user B. The value of this timer is between 30 seconds and two minutes. If T2 is not provided, the normal time out used when ringing on an idle subscriber in a basic call is used.

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

**user A:** Represents a user (individual or group) who is engaged in a call with user B (this call can be in any state).

**user C:** The user who has originated an individual or multipoint call to served user B which causes the call waiting service to be invoked (a multipoint call shall only invoke CW if the calling user C is not a part of the called group).

### 3.2 General abbreviations

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

GTSI	Group TETRA Subscriber Identity
ISDN	Integrated Services Digital Network
ITSI	Individual TETRA Subscriber Identity
SDL	(Functional) Specification and Description Language
SS	Supplementary Service

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

SwMI	Switching and Management Infrastructure
TETRA	Trans European Trunked Radio

### 3.3 Supplementary service abbreviations

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

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
CCNR	Call Completion on No Reply
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
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-CW stage 1 specification

### 4.1 Description

#### 4.1.1 General description

The call waiting supplementary service shall be defined as the possibility for a mobile or line station user to be notified of an incoming call whilst his termination is in the busy state. The user shall have the choice of accepting, rejecting or ignoring the waiting call. When a user C attempts to connect to that termination the served user B shall be given an appropriate indication of the waiting call. The information sent to the served user B shall be the type and the priority of the incoming call. The information presented to the served user B shall depend on type and functionality of the terminal.

The maximum number of waiting calls at any one time per busy subscriber shall be a network option. It is recommended that the maximum number should be one.

#### 4.1.2 Qualifications on applicability to telecommunication services

This supplementary service shall be applicable to the following TETRA incoming services:

- a) all circuit mode individual teleservices and bearer services;
- b) all circuit mode multipoint calls from a user not belonging to the called group.

NOTE: The served user B can be in busy state occupied in either an individual call or in a multipoint call.

### 4.2 Procedures

#### 4.2.1 Provision/withdrawal

The CW supplementary service shall either be provided on a subscription basis Individual TETRA Subscriber Identity (ITSI)/ Group TETRA Subscriber Identity (GTSI) or, as a network option shall be generally available to all users without subscription. The CW supplementary service can be withdrawn at the request of the customer or for administrative reasons.

If CW is provided, it shall be valid for all actual teleservices and bearer services without a selection possibility.

As a network option, call waiting may be offered with the following subscription option (see table 1). The option shall apply separately to each TETRA identity number (ITSI/GTSI).

**Table 1: Subscription options**

Subscription parameter	Value
Calling user receives notification that the call is set in waiting state	- Yes - No

The use of T2 shall be a service provider option. When used, the value T2 shall be set by the service provider as a default value subject to change only by the service provider.

At withdrawal no specific information shall be given from the network to the subscribers about the status changes of this service.

#### **4.2.2 Normal procedures**

##### **4.2.2.1 Activation, deactivation, definition, registration, interrogation and cancellation**

###### **4.2.2.1.1 Activation/Deactivation**

The CW supplementary service shall be activated by the service provider at provision.

The CW supplementary service shall be deactivated by the service provider at withdrawal.

The served user shall also be able to activate/deactivate the service after provision.

One request for activation/deactivation shall reference all TETRA teleservices services/bearer services as defined previously.

###### **4.2.2.1.2 Definition**

Shall not be applicable.

###### **4.2.2.1.3 Registration**

Shall not be applicable for call waiting.

###### **4.2.2.1.4 Interrogation**

The Switching and Management Infrastructure (SwMI) may support interrogation on a per number basis (ITSI/GTSI) for all basic services and/or for a served user specified basic service. The TETRA response to an interrogation request may provide the following information to the user:

- activated or deactivated;
- applicable basic services;
- subscription parameters.

###### **4.2.2.1.5 Cancellation**

Shall not be applicable.

#### **4.2.2.2 Invocation**

The service shall be invoked by the infrastructure on arrival of an incoming individual call from a user C if the served user B's termination is in the busy state. SS-CW may also be invoked on arrival of an incoming multipoint call from a calling user C if the user C is not a part of the called group.

#### **4.2.2.3 Operation**

##### **4.2.2.3.1 General**

When an incoming call from a user C is received by a served user B and user B's terminal is in a busy condition, SS-CW shall be invoked and the incoming call shall be offered to user B.

If a positive hardware response is received from served user B terminal within T1, indicating that the terminal has received the incoming call and that the user has been informed, then the user C shall be given the normal indication that the call is being offered to the called user. As an operator option this indication can also indicate that call waiting is in operation, depending on the value of the subscription option of user B.

#### **4.2.2.3.2 Individual call from user C; served user B is busy in an individual call**

If either user A or user B requests that the active call should be terminated within T2, then this call shall be terminated as for a basic call and the infrastructure shall consider the waiting call from user C to served user B as a new call and shall offer it in a normal manner to user B. User B shall then be able to accept the waiting call from user C before the expiry of T2. If user B accepts the call, any waiting indication to served user B shall be removed, if previously provided.

User B can also free resources by using the call hold individual supplementary service. Served user B shall then be able to accept the waiting call from user C before the expiry of T2. If B accepts the call from C, the waiting indication to served user B shall be removed if provided, and the user A shall receive a suitable indication.

In both these cases the user B shall actively connect to the waiting call.

#### **4.2.2.3.3 Individual call from user C; served user B is busy in a multipoint call**

If served user B is busy in a multipoint call and not the owner of that call he shall be able to immediately leave the multipoint call and answer the waiting call without affecting the ongoing multipoint call.

If served user B is the owner of the ongoing multipoint call, this multipoint call shall be either disconnected or the control for that call needs to be transferred to another group member using the supplementary service transfer of control before the waiting call can be answered.

NOTE: Also the supplementary service Call Hold SS-(HOLD) can be used for the ongoing multipoint call.

#### **4.2.2.3.4 Multipoint call from user C to group B; user C belongs to group B**

The actions taken depend upon whether the network has information about the group B disposition. If the network knows that user C belongs to group B, CW shall not be invoked but SS-Late Entry (LE) can be invoked. If the network does not know that user C belongs to group B the SS-CW shall be invoked in accordance with subclause 4.2.2.3.5

#### **4.2.2.3.5 Multipoint call from user C to group B; user C is not belonging to group B**

If calling user C makes a multipoint call to a group B which he/she does not belong to, and that group is busy in a multipoint call, CW shall be invoked and a call waiting indication shall be sent to the owner of the served call. The calling user C may be given an indication that his/her call has been placed in waiting state.

The call owner of the served group B shall be able, within T2, to disconnect the ongoing multipoint call and answer the waiting subscriber C. This answer shall result in a new multipoint call initiated originating from user C. It is however recommended that SS-HOLD should be used in order to answer user C, followed by the invocation of SS-IC in order to maintain the continuity of the call.

#### **4.2.2.3.6 Incoming call from user C ignored by the served user B**

If the no answer timer T2 expires without any acceptance from served user B of the incoming call, then the network shall remove the CW indication from served user B. Normal release procedures shall apply to the waiting call with an appropriate indication given to user C (the call shall be cleared indicating that it was not accepted by the user B).

#### **4.2.2.3.7 Incoming call from user C rejected by the served user B**

A served user B can reject an incoming call from a user C before expire of the optional no answer timer T2.

#### **4.2.2.3.8 Release by user C within the specified period**

If calling user C informs the network, before the expiry of the optional no answer timer T2, that he/she wishes to release this call attempt to served user B, then the network shall inform served user B of this situation and shall initiate release of the call attempt from user C as for a basic call.

#### **4.2.2.3.9 No resources available**

If user B accepts a call and the SwMI resources are not available to complete the call, (i.e. no traffic channel available), the network shall indicate an error to user B with cause "resources not available". The network shall not clear the call but shall wait for another user B indication for acceptance, until user C clears the call or the timer T2 expires.

### **4.2.3 Exceptional procedures**

#### **4.2.3.1 Activation, deactivation, definition, registration, interrogation and cancellation**

##### **4.2.3.1.1 Activation/Deactivation**

If the SwMI cannot accept an activation/deactivation request from the served user, the served user shall receive a notification that CW activation/deactivation was unsuccessful. Possible causes for rejection can be:

- insufficient information.

##### **4.2.3.1.2 Definition**

Shall not be applicable.

##### **4.2.3.1.3 Registration**

Shall not be applicable.

##### **4.2.3.1.4 Interrogation**

If the SwMI cannot accept an interrogation request, the interrogating user shall receive a notification that CW interrogation was unsuccessful. Possible causes for rejection can be:

- service or option not subscribed to;
- insufficient information;
- invalid ITSi;
- unauthorized user.

##### **4.2.3.1.5 Cancellation**

Shall not be applicable.

#### **4.2.3.2 Invocation and operation**

##### **4.2.3.2.1 Maximum number of waiting calls reached**

Served user B shall be considered as busy when the limit on the maximum number of calls which can be waiting has been reached. Any incoming call during this period shall be handled accordingly. Call waiting shall not be invoked, and busy information shall be sent to the calling user C.

##### **4.2.3.2.2 No positive response from served user B's terminal**

If no positive response is received from the served user B's terminal within the time T1, calling user C shall then receive a further indication to inform him that his/her call cannot be connected.

### **4.3 Interactions with other supplementary services**

#### **4.3.1 Calling Line Identification Presentation (CLIP)**

Call waiting shall not have any interaction with SS-CLIP.

#### **4.3.2 Calling/Connected Line Identification Restriction (CLIR)**

Call waiting shall not have any interaction with SS-CLIR.

#### **4.3.3 Connected Line Identification Presentation (COLP)**

Call waiting shall not have any interaction with SS-COLP.

#### **4.3.4 Call Report (CR)**

Call waiting shall not have any interaction with SS-CR.

#### **4.3.5 Talking Party Identification (TPI)**

Call waiting shall not have any interaction with SS-TPI.

When served user B has activated both SS-TPI and SS-CW he shall still be able to receive a call waiting indication.

#### **4.3.6 Call Forwarding Unconditional (CFU)**

Call waiting shall not have any interaction with SS-CFU.

**Called user:** if CFU has been activated, then the execution of that forwarding condition shall take precedence over call waiting. CFU can be activated while a call is waiting but the waiting call shall then not be forwarded.

**Forwarded to subscriber:** a forwarded call can invoke CW if CW is activated at the forwarded-to address.

#### **4.3.7 Call Forwarding On Busy (CFB)**

Call waiting shall not have any interaction with SS-CFB.

Call waiting shall take precedence over CFB. Rejection of the incoming call shall automatically invoke CFB.

#### **4.3.8 Call Forwarding on No Reply (CFNRy)**

Call waiting shall not have any interaction with SS-CFNRy.

**Forwarded to subscriber:** a forwarded call shall be able to invoke CW if CW is activated at the forwarded-to address.

#### **4.3.9 Call Forwarding on Not Reachable (CFNRc)**

Call waiting shall not have any interaction with SS-CFNRc.

**Called subscriber:** when the B subscriber is not reachable, CW shall not be invoked because the called user is not busy, therefore, forwarding shall take place.

**Forwarded to subscriber:** a forwarded call shall be able to invoke CW if CW is activated at the forwarded-to address.

#### **4.3.10 List Search Call (LSC)**

Call waiting shall not have any interaction with SS-LSC.

#### **4.3.11 Call Authorized by Dispatcher (CAD)**

Call waiting shall not have any interaction with SS-CAD.

The B subscriber should be able to receive an indication of a waiting call whilst engaged in a CAD call. The B subscriber may release the CAD call and subsequently answer the waiting call.

#### **4.3.12 Short Number Addressing (SNA)**

Call waiting shall not have any interaction with SS-SNA.

#### **4.3.13 Area Selection (AS)**

Call waiting shall not have any interaction with SS-AS.

#### **4.3.14 Access Priority (AP)**

Call waiting shall not have any interaction with SS-AP.

#### **4.3.15 Priority Call (PC)**

Call waiting shall not have any interaction with SS-PC.

When CW is activated, the user B shall receive a call waiting indication even if the new incoming call has lower priority than the call in progress. If possible, the priority of the waiting call should be presented to the user B.

#### **4.3.16 Call Waiting (CW)**

Not applicable.

#### **4.3.17 Call Hold (HOLD)**

When a user B receives a call waiting indication he/she shall be able to use the call hold SS to hold the active call and answer the waiting call. Use of the SS-HOLD shall not place a call into a waiting state.

If served user B has been placed in HOLD state and a user C tries to call him, user B shall receive a call waiting indication. In this state user B can either disconnect from the HOLD call and then connect to the waiting call or reject the waiting call.

#### **4.3.18 Call Completion to Busy Subscriber (CCBS)**

If SS-CCBS is available to user C and he/she places a call to served user B who has CW activated, and user B is given a CW indication, the invocation of SS-CCBS shall only be possible after user C has received the busy condition (after that the CW queue has been filled up at user B).

If the mobile served user B is unable to be given a CW indication i.e. the call waiting queue is at maximum, then the user C shall receive a busy indication and shall be able to invoke SS-CCBS.

**4.3.19 Late Entry (LE)**

Call waiting shall not have any interaction with SS-LE.

**4.3.20 Transfer of Control (TC)**

Call waiting shall not have any interaction with SS-TC.

**4.3.21 Pre-emptive Priority Call (PPC)**

If served user B is engaged in a normal call with call waiting activated and a SS-PPC is received to the user B, the ongoing call shall be disconnected and the new call shall be set up. SS-CW shall not be invoked.

If served user B is engaged in a SS-PPC and at the same time has CW activated, a CW indication shall be presented to the user B to indicate that an incoming call from user C has arrived.

**4.3.22 Include Call (IC)**

Call waiting shall not have any interaction with SS-IC.

**4.3.23 Advice of Charge (AC)**

Call waiting shall not have any interaction with SS-AC.

**4.3.24 Barring of Outgoing Calls (BOC)**

Call waiting shall not have any interaction with SS-BOC.

**4.3.25 Barring of Incoming Calls (BIC)**

Call waiting shall not have any interaction with SS-BIC.

Call barring shall have a higher priority than call waiting.

**4.3.26 Discreet Listening (DL)**

Call waiting shall not have any interaction with SS-DL.

The served user B which has initiated a SS-DL call shall be able to receive an indication of a waiting call whilst they are engaged in the listening. The served user B may put their listening connection on hold or release his connection and subsequently answer the waiting call.

**4.3.27 Ambience Listening (AL)**

Call waiting shall not have any interaction with SS-AL.

There shall be no interaction at the terminal which activated the SS-AL.

In the event of an incoming call to the ambience listened-to user, SS-CW shall not be invoked.

**4.3.28 Dynamic Group Number Assignment (DGNA)**

Call waiting shall not have any interaction with SS-DGNA.

**4.3.29 Call Completion on No Reply (CCNR)**

Call waiting shall not have any interaction with SS-CCNR.

#### **4.3.30 Call Retention (CRT)**

Call waiting shall not have any interaction with SS-CRT.

#### **4.4 Inter-working considerations**

##### **4.4.1 Inter-working with other SwMIs**

Call waiting supplementary service shall be supported between SwMIs on condition that both TETRA systems are supporting this service.

When a user C is calling in from another TETRA system and the served user B is busy, the call waiting service shall be invoked if activated, and operate as described.

##### **4.4.2 Inter-working with other external networks**

Calls originating from external networks can invoke call waiting at the access of the served user B with no impact on served user B's CW supplementary service.

If user C is calling from a non-ISDN network a special in-band indication may be provided to the gateway indicating that the call has been placed in waiting state.

If user C is calling in from an ISDN network, the indications to user C, if applicable, shall be sent to the gateway to which user C is attached for forwarding to user C.



4.5 Overall SDL

Figure 1 contains the dynamic description of SS-CW using the Specification Description Language (SDL) defined in ITU-T Recommendation Z.100 [2]. The SDL process represents the behaviour of the network in providing SS-CW.

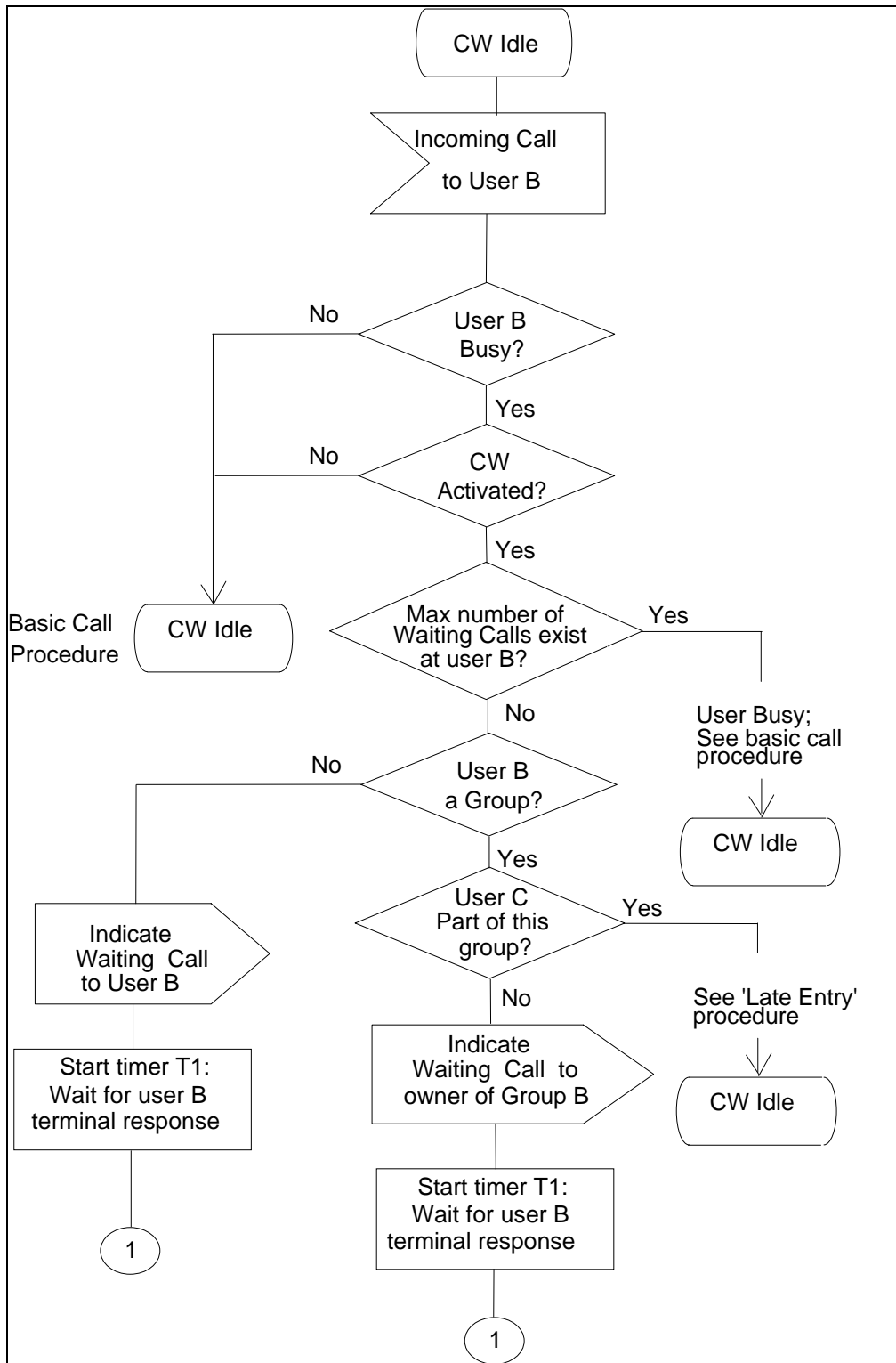


Figure 1: Sheet 1 of 4, SS-CW, overall SDL

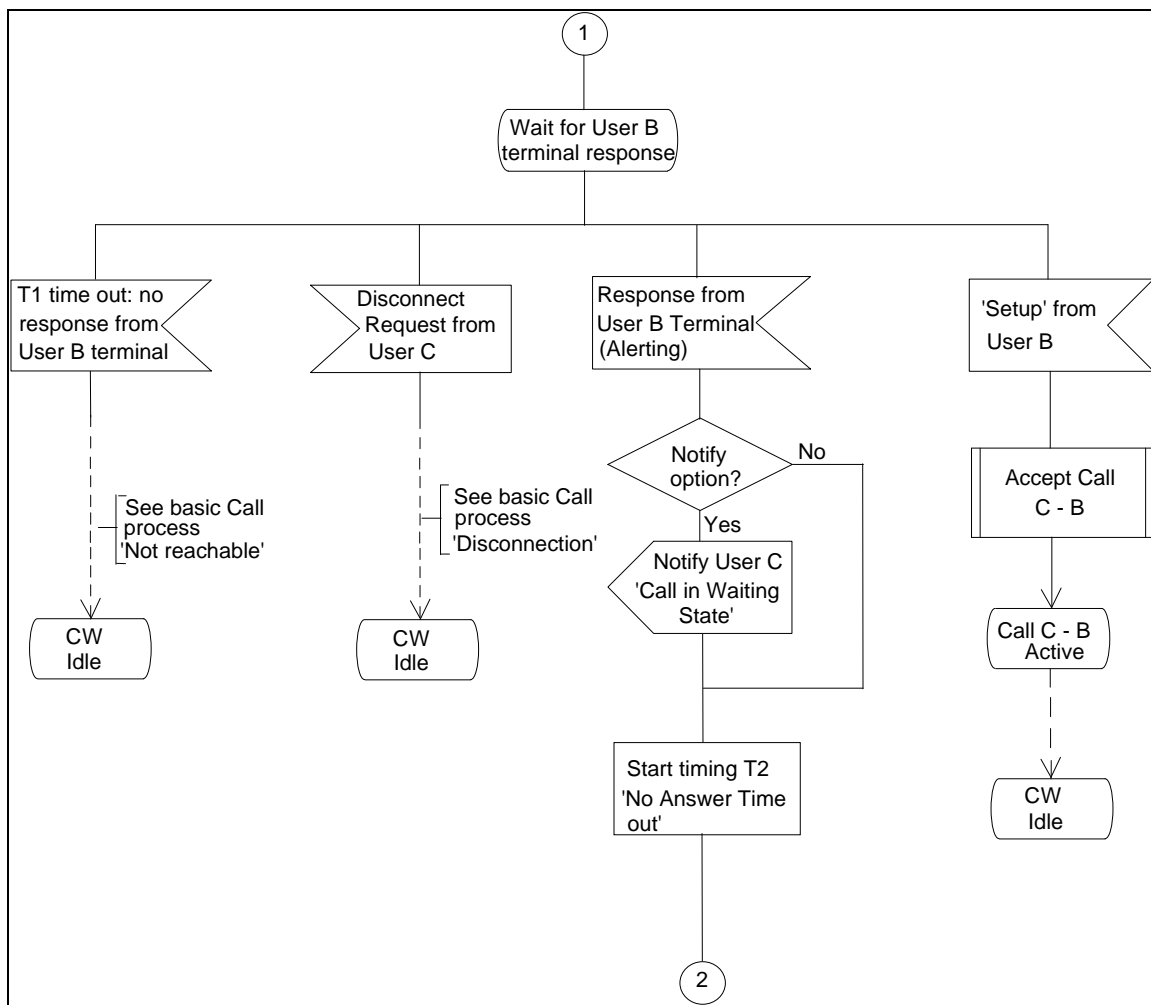


Figure 1: Sheet 2 of 4, SS-CW, overall SDL

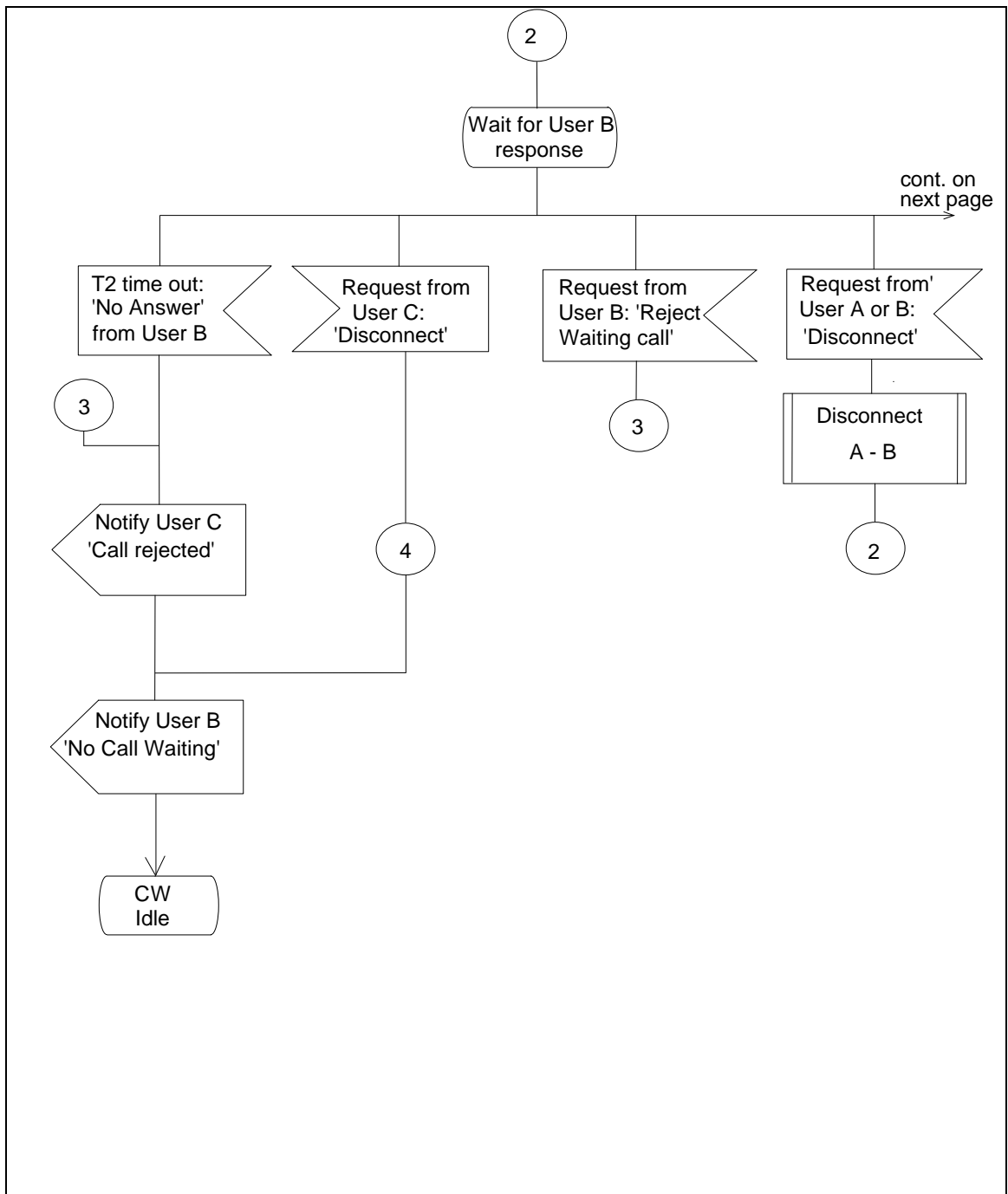


Figure 1: Sheet 3 of 4, SS-CW, overall SDL

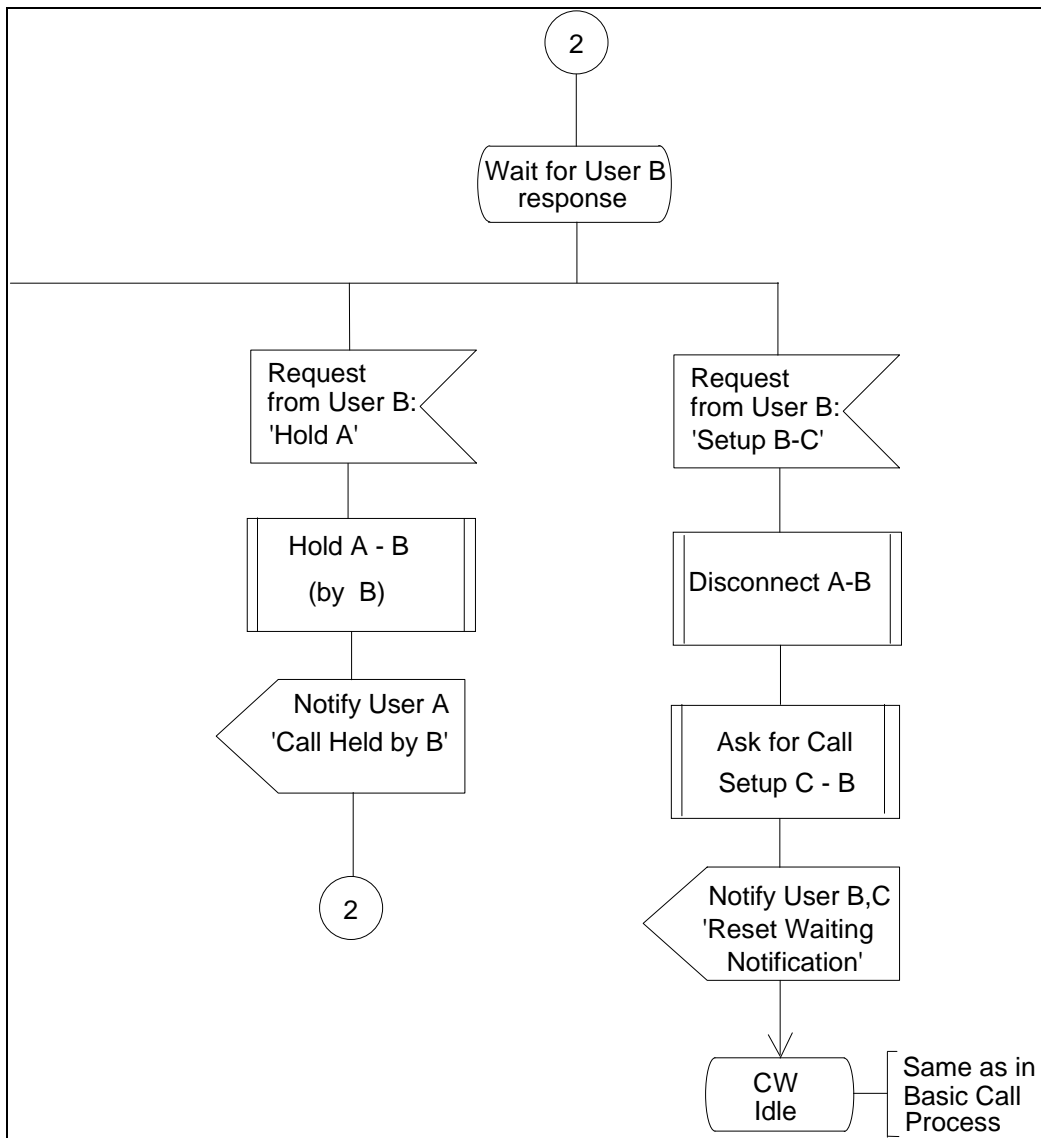


Figure 1: Sheet 4 of 4, SS-CW, overall SDL

## History

Document history			
November 1994	Public Enquiry	PE 73:	1994-11-07 to 1995-03-03
December 1995	Vote	V 94:	1995-12-27 to 1996-02-16
April 1996	First Edition		