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Part 1: Protocol specification**

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Foreword

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

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

- Part 1: "Protocol specification";**
- Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification";
- Part 3: "Test Suite Structure and Test Purposes (TSS&TP) specification for the user";
- Part 4: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for the user";
- Part 5: "TSS&TP specification for the network";
- Part 6: "ATS and partial PIXIT proforma specification for the network".

In accordance with CCITT Recommendation I.130, the following three level structure is used to describe the supplementary telecommunication services as provided by European public telecommunications operators under the pan-European 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 stage 3 aspects (signalling system protocols and switching functions) needed to support the Call Hold (HOLD) supplementary service. The stage 1 and stage 2 aspects are detailed in ETS 300 139 (1992 and ETS 300 140 (1992), respectively.

This reprint includes all previous Corrigenda as shown in the History box at the last page.

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1 Scope

This first part of ETS 300 141 specifies the stage three of the Call Hold supplementary (HOLD) supplementary service for the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications operators at the T reference point or coincident S and T reference point (as defined in CCITT Recommendation I.411 [1]) by means of the Digital Subscriber Signalling System No. one (DSS1) protocol. Stage three identifies the protocol procedures and switching functions needed to support a telecommunications service (see CCITT Recommendation I.130 [2]).

In addition this standard specifies the protocol requirements at the T reference point where the service is provided to the user via a private ISDN.

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

The HOLD supplementary service allows a user to interrupt communications on an existing call and then subsequently, if desired, re-establish communications.

The HOLD supplementary service is applicable to all circuit-switched telecommunication services.

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

This standard is applicable to equipment, supporting the HOLD supplementary service, to be attached at either side of a T reference point or coincident S and T reference point when used as an access to the public ISDN.

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 into it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] CCITT Recommendation I.411 (1988): "ISDN user-network interfaces - Reference configurations".
- [2] CCITT Recommendation I.130 (1988): "Method for the characterisation of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [3] CCITT Recommendation I.112 (1988): "Vocabulary of terms for ISDNs".
- [4] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".
- [5] ETS 300 196-1 (1993): "Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [6] ETS 300 195-1: "Integrated Services Digital Network (ISDN); Supplementary service interactions; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".
- [7] CCITT Recommendation Z.100 1988): "Functional Specification and Description Language (SDL)".
- [8] CCITT Recommendation I.210 1988): "Principles of telecommunication services supported by an ISDN and the means to describe them".

3 Definitions

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

Basic service: a bearer service or teleservice. The terms bearer service and teleservice are defined in CCITT Recommendation I.112 [3], § 2.2, definitions 202 and 203, respectively.

Integrated Services Digital Network (ISDN): see CCITT Recommendation I.112 [3], § 2.3, definition 308.

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

Service; telecommunication service: see CCITT Recommendation I.112 [3], § 2.2, definition 201.

Supplementary service: see CCITT Recommendation I.210 [8], § 2.4.

User A: the user which invokes the HOLD supplementary service for a given call. User A is the served user.

User B: the user engaged in the given call with user A. User B is the non-served user.

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

4 Symbols and abbreviations

DSS1	Digital Subscriber Signalling System No. one
HOLD	Call Hold
ISDN	Integrated Services Digital Network

5 Description

When the HOLD supplementary service is invoked, communication on a B-channel shall be interrupted, the B-channel shall be released, a B-channel shall be reserved by the network for subsequent reuse by user A.

6 Operational requirements

6.1 Provision and withdrawal

The HOLD supplementary service may be available by prior arrangement with the service provider or it may be generally available. Withdrawal shall be at the request of the customer or for administrative reasons.

NOTE: As the HOLD supplementary service can often be used together with other supplementary services (e.g. call transfer and three party supplementary services) a service provider may choose to make the subscription to the HOLD supplementary service implied by the subscription of these supplementary services.

6.2 Requirements on the originating network side

Not applicable.

6.3 Requirements on the destination network side

Not applicable.

7 Coding requirements

The HOLD and RETRIEVE family of messages that shall be used for the invocation and control of the HOLD supplementary service, as defined in subclause 11.1.1 of ETS 300 196-1 [5], are as follows:

- HOLD;
- HOLD ACKNOWLEDGE;
- HOLD REJECT;
- RETRIEVE;
- RETRIEVE ACKNOWLEDGE;
- RETRIEVE REJECT.

Table 1 contains the additional codepoints for the HOLD supplementary service which shall be employed in octet 3 of the Notification indicator information element (to be conveyed in the NOTIFY message) for remote hold and remote retrieval.

Table 1: Additional codepoints in the Notification indicator information element

Bits	
7654321	
1111001	Remote hold
1111010	Remote retrieval

8 State definitions

The call states, as defined in ETS 300 102-1 [4], subclause 2.1, shall be utilised in the HOLD supplementary service operation, as appropriate.

The auxiliary states to support the Hold function and the Retrieve function, as defined in ETS 300 196-1 [5], subclause 7.1.2, shall be used.

Table 2 shows the states which shall be used on the user side and network side for the HOLD supplementary service. These states are specified for the purpose of the protocol definition; the states need not be provided in an implementation.

Table 2: States for the HOLD supplementary service.

User A states	
HOLD Idle	the HOLD supplementary service has not been activated.
HOLD Hold Requested	the call hold part of the HOLD supplementary service has been requested by the user.
HOLD Call Held	the HOLD supplementary service has been activated.
HOLD Retrieve Requested	the call retrieve part of the HOLD supplementary service has been requested by the user.
Network states	
HOLD Idle	the HOLD supplementary service has not been activated.
HOLD Call Held	the HOLD supplementary service has been activated.

9 Signalling procedures at the coincident S and T reference point

User A at the originating side can hold a call in the Active state (U10) (after receiving the CONNECT message) and additionally, as a network option, in the Call Delivered state (U4) (after receiving the ALERTING message). User A shall check the call states accordingly. User A shall not request to hold a call in any other state.

User A at the destination side can hold a call in the Active state (U10) (after receiving the CONNECT ACKNOWLEDGE message). User A shall check the call states accordingly. User A shall not request to hold a call in any other state.

A call can be retrieved after being held, i.e. communication on a B-channel between user A and user B can be re-established.

9.1 Holding a call - procedures at the interface of user A

9.1.1 Normal operation

User A shall initiate the call hold part of the HOLD supplementary service by requesting the Hold function according to subclauses 7.2.1.1, 7.2.2.1 and 7.3 of ETS 300 196-1 [5], utilising the call reference indicating the call for which the HOLD supplementary service is to apply.

The network, on receipt of the Hold function request shall:

- check whether the basic service is valid;
- check whether there is a valid user subscription for the HOLD supplementary service; and
- check whether the network is in the Active state (N10) or as a network option in the Call Delivered state (N4).

If the checks are successful, the network shall perform the Hold function.

On performing the Hold function, the implicit channel reservation function defined in subclause 10.1.1 of ETS 300 196-1 [5] shall be used.

NOTE: The implicit channel reservation function is regarded as the normal reservation function. Instead of the implicit channel reservation function the explicit channel reservation function can be used as defined in subclause 10.1.2 of ETS 300 196-1 [5]. The explicit channel reservation function is optional for both the user and the network and its application is subject to a bilateral agreement between the subscriber and the network provider.

Subsequent basic call procedures, and use of the Hold function and the Retrieve function, may also require operation of the reservation procedures of the Reservation function.

9.1.2 Exceptional procedures

Failure of the call hold part of the HOLD supplementary service shall be indicated by rejection of the Hold function request. Table 3 shows the cause values which shall be used in the Cause information element in a HOLD REJECT message, in addition to those specified in subclauses 7.2.1.2 and 7.2.2.2 of ETS 300 196-1 [5].

Table 3: Use of cause values

Error	Value
User A has not subscribed to the HOLD supplementary service	Cause value # 50 "requested facility not subscribed" and a location of "public network serving the local user".
The network does not support the HOLD supplementary service	Cause value # 69 "requested facility not implemented" and a location of "public network serving the local user".
The call requested to be held by user A is not in a valid network state	Cause value # 101 "message not compatible with call state" and a location of "public network serving the local user".
The network receives a request for the HOLD function for a particular call and determines that the call identified by the call reference of the HOLD message is not a circuit-mode call	Cause value # 57 "bearer capability not authorised" and a location of "public network serving the local user".

9.2 Holding a call - procedures at the interface of user B

9.2.1 Normal operation

On completion of the Hold function, the network shall send a Notification indicator information element with a notification description of "remote hold" to user B according to the procedures of subclause 9.3.1 of ETS 300 196-1 [5].

If the Hold function was completed in state N4, the notification procedure shall apply to each user that gave a positive response.

NOTE: During an interim period of time, some networks may not support the sending of notifications to the remote user.

9.2.2 Exceptional procedures

The exceptional procedures for the transport of notifications are defined in subclause 9.3.2 of ETS 300 196-1 [5].

9.3 Retrieving a call - procedures at the interface of user A

9.3.1 Normal operation

User A shall initiate the call retrieve part of the HOLD supplementary service by requesting the Retrieve function according to subclause 7.4.1.1 of ETS 300 196-1 [5], utilising the call reference indicating the call for which the HOLD supplementary service applies.

On receipt of the Retrieve function request the network shall perform the Retrieve function (see ETS 300 196-1 [5], subclause 7.4.2.1) and perform the reservation function (see ETS 300 196-1 [5], subclause 10.1).

9.3.2 Exceptional procedures

Failure of the call retrieval shall be indicated by rejection of the Retrieve function request as specified in subclauses 7.4.1.2 and 7.4.2.2 of ETS 300 196-1 [5].

9.4 Retrieving a call - procedures at the interface of user B

9.4.1 Normal operation

On completion of the Retrieve function, the network shall send a Notification indicator information element with a notification description of "remote retrieval" to user B according to the procedures of subclause 9.3.1 of ETS 300 196-1 [5].

If the Retrieve function was completed in state N4, the notification procedure shall apply to each user that gave a positive response.

NOTE : During an interim period of time, some networks may not support the sending of notifications to the remote user.

9.4.2 Exceptional procedures

The exceptional procedures for the transport of notifications are defined in subclause 9.3.2 of ETS 300 196-1 [5].

10 Procedures for interworking with private ISDNs

10.1 User A is on a private ISDN

10.1.1 Normal operation

The private ISDN shall inform user B of a call held or retrieved at the S reference point by means of Notification indicator information element with a notification description of "remote hold" or "remote retrieval" according to the procedures of subclause 9.3.1 of ETS 300 196-1 [5], carried in an appropriate call-related transport message (e.g. NOTIFY).

NOTE: HOLD services requests coming from a private ISDN acting as a terminal should be treated as stated in Clause 9.

10.1.2 Exceptional procedures

If the network receives a HOLD or RETRIEVE message from user A, the network shall respond in one of the following ways:

- if the HOLD and RETRIEVE messages are not implemented by the network, the network shall reject these messages according to the error handling procedures specified in subclause 5.8.4 of ETS 300 102-1 [4];

- if the HOLD and RETRIEVE messages are implemented by the network, the network shall reject the messages by sending a HOLD REJECT and RETRIEVE REJECT message respectively, containing a Cause information element indicating cause #29 "Facility rejected".

10.2 User B is on a private ISDN

10.2.1 Normal operation

The procedures of subclauses 9.2.1 and 9.4.1 shall be used.

10.2.2 Exceptional procedures

The procedures of subclause 9.2.2 and 9.4.2 shall be used.

11 Interactions with other networks

Remote users in a non-ISDN may have a decreased notification level.

12 Interactions with other supplementary services

The interactions of the HOLD supplementary service with other supplementary services shall be as specified in ETS 300 195-1 [6].

13 Parameter values (timers)

There are no timers additional to those specified in ETS 300 196-1 [5] subclause 7.5.

14 Dynamic Description (SDLs)

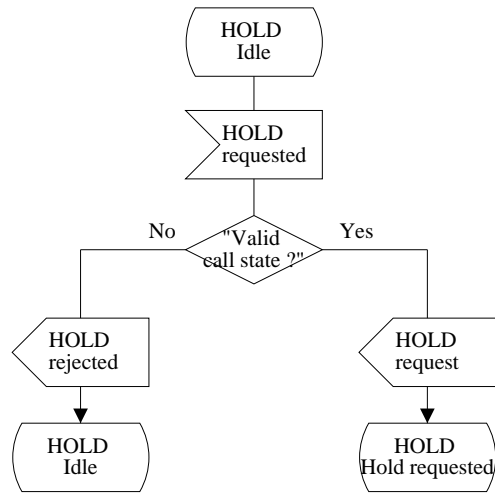
Figure 1 shows the SDL diagram for the hold user process and figure 2 shows the SDL diagram for the hold network process.

The SDL diagrams are specified according to CCITT Recommendation Z.100 [7].

The dynamic description in figure 1 and figure 2 defines the interaction between the human user and the hold and retrieve function, rather than the interaction between the human user and DSS1 messages. The dynamic description of the hold and retrieve function is provided in figures A.1 to A.5 of ETS 300 196-1 [5].

Process HOLD_user

1(4)



NOTE: The call shall be in one of the states specified in Clause 9.

Figure 1 (sheet 1 of 4): HOLD supplementary service SDL (user side)

Process HOLD_user

2(4)

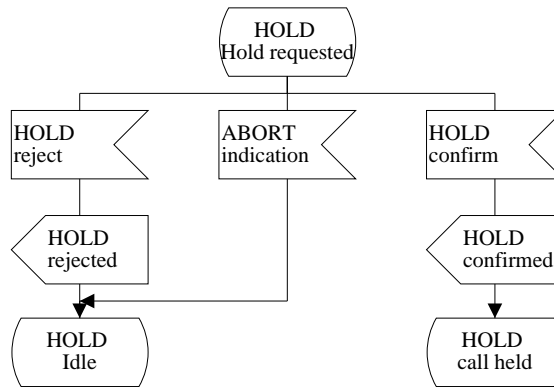


Figure 1 (sheet 2 of 4): HOLD supplementary service SDL (user side)

Process HOLD_user

3(4)

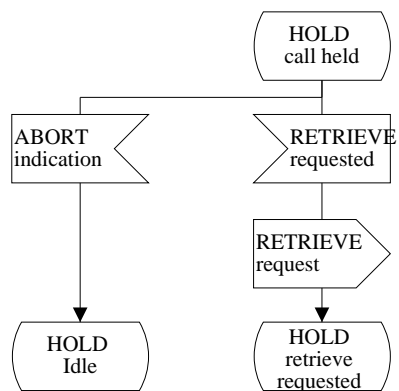


Figure 1 (sheet 3 of 4): HOLD supplementary service SDL (user side)

Process HOLD_user

4(4)

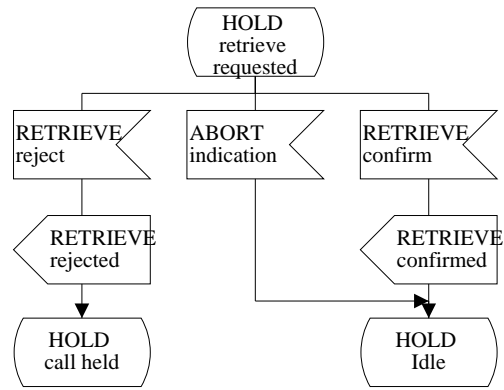
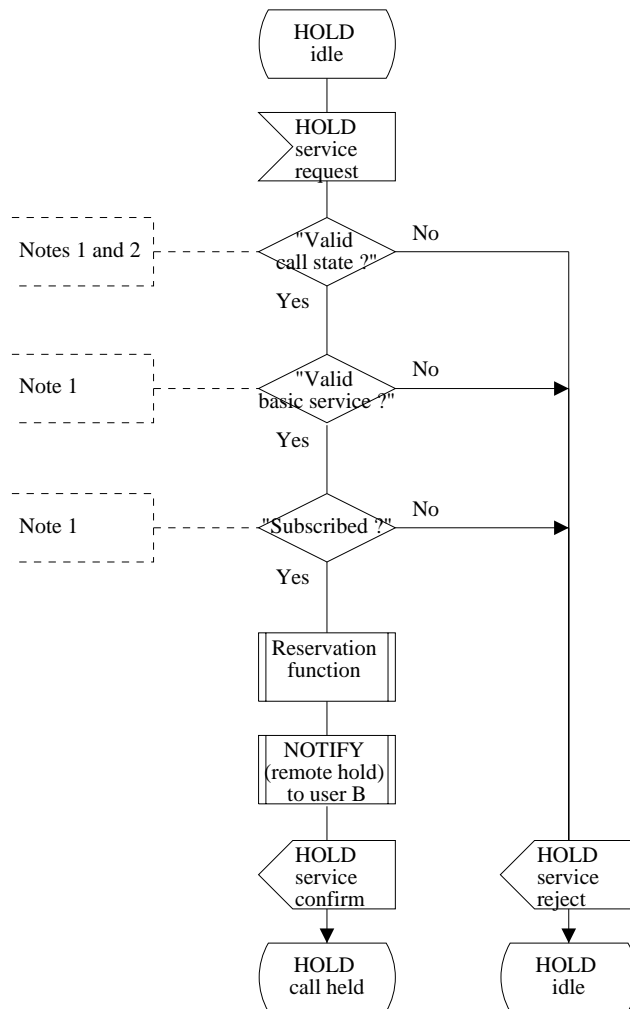


Figure 1 (sheet 4 of 4): HOLD supplementary service SDL (user side)

Process HOLD_network

1(2)



NOTE 1: The call shall be in one of the states as specified in subclause 9.1

NOTE 2: The order of these tests is implementation dependent

Figure 2 (sheet 1 of 2): HOLD supplementary service SDL (network side)

Process HOLD_network

2(2)

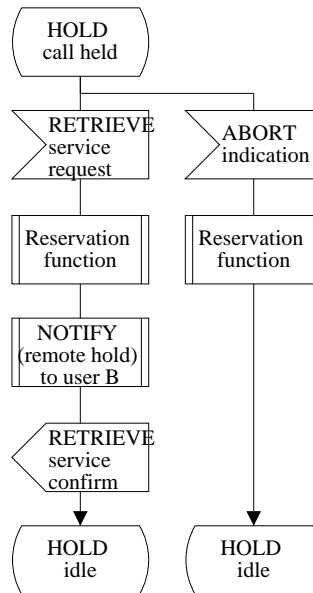


Figure 2 (sheet 2 of 2): HOLD supplementary service SDL (network side)

Annex A (informative): Signalling flows

An example information flow for the HOLD supplementary service is shown in figure A.1.

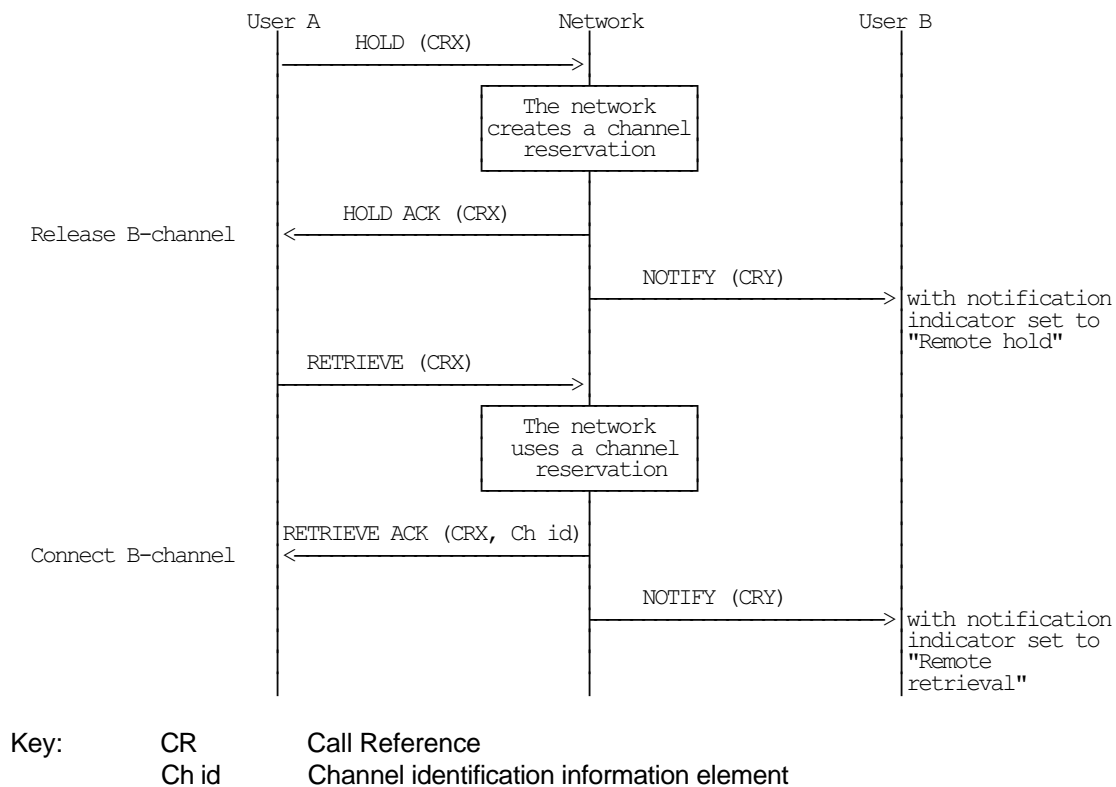


Figure A.1: Hold and retrieve with reservation (successful procedure)

History

Document history	
May 1992	First Edition
August 1993	Corrigendum to First Edition
April 1994	Corrigendum to First Edition: change to part 1 of a multi-part standard
March 1996	Converted into Adobe Acrobat Portable Document Format (PDF) and incorporation of all prior Corrigenda