INTERNATIONAL TELECOMMUNICATION UNION

CCITT

Q.953

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

STAGE 3 DESCRIPTION FOR SUPPLEMENTARY SERVICES USING DSS 1

STAGE 3 DESCRIPTION FOR CALL COMPLETION SUPPLEMENTARY SERVICES USING DSS 1

SECTION 1 – CALL WAITING

Recommendation Q.953

Geneva, 1992

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation Q.953, § 1 was prepared by Study Group XI and was approved under the Resolution No. 2 procedure on the 4th of February 1992.

CCITT NOTE

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

© ITU 1992

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

Recommendation Q.953

STAGE 3 DESCRIPTION FOR CALL COMPLETION SUPPLEMENTARY SERVICES USING DSS 1

1 Call Waiting (CW)

1.1 *Definition*

The Call Waiting (CW) supplementary service permits a subscriber to be notified of an incoming call (as per basic call procedures) with an indication that no information channel is available. The user then has the choice of accepting, rejecting, or ignoring the waiting call.

1.2 *Description*

1.2.1 *General description*

The CW supplementary service allows a subscriber to be notified of an incoming call when a B-channel is not available. The notification is done out-of-band following basic call procedures.

The CW supplementary service may be invoked when both the B-channels are in use or when only one B-channel is in use.

An audible inband indication may be generated locally by the called customer premises equipment, but no inband tone is provided by the network.

1.2.2 *Specific terminology*

The following terms are used in this Recommendation:

– **called user**

The user who reacts to a call that is offered at the terminating interface.

– **calling user**

The user who originates a call.

– **waiting call**

A call that is offered to an ISDN number using the CW supplementary service procedures. A call ceases to be a waiting call when the call is cleared or when the call is answered.

1.2.3 *Qualifications on the applicability of telecommunication services*

Same as § 2.3 of Recommendation I.253.1.

1.2.4 *State definitions*

No states beyond those defined in Recommendation Q.931 are needed for the CW supplementary service operation.

1.3 *Operational requirements*

1.3.1 *Provision/withdrawal*

The CW supplemntary service may be provided by prior arrangement with the Administration or be available on a general basis. Withdrawal will be at the request of the customer or for administrative reasons.

1.3.2 *Requirements on the originating network side*

For the operation of the CW supplementary service, the originating network may deliver the notification indicator information element in the ALERTING message to the calling user if received from the terminating network.

1.3.3 *Requirements in the network*

This section is not applicable to DSS 1 (digital subscriber Signalling System No. 1).

1.3.4 *Requirements on the terminating network side*

For the operation of the CW supplementary service, the terminating network may maintain the following counters:

- *Number of calls*

  The counter maintained by the network to keep track of the current number of calls established via a SETUP message (in either direction) for a given ISDN number. When a call for a given ISDN number is cleared, the number of calls counter is decremented.

- *Number of waiting calls*

  The counter maintained by the network to keep track of the current number of waiting calls for a given ISDN number or group of ISDN numbers. When a call ceases to be waiting, the number of waiting calls counter is decremented.

In addition, the network may maintain the following parameters:

- *Number of B-channels per interface*

  The parameter maintained by the network that indicates the maximum number of B-channels allowed in use (either busy or reserved) per interface.

- *Number of B-channels per ISDN number*

  The parameter maintained by the network that indicates the maximum number of B-channels allowed in use per ISDN number or group of ISDN numbers.

- *Call Waiting subscription*

  The parameter maintained by the network that indicates whether an ISDN number has subscribed to the CW supplementary service.

- *Calling user notification of waiting call*

  The parameter maintained by the network that indicates whether the calling party shall receive a notification that their call is being offered using the Call Waiting service operation. This parameter shall be set for each ISDN number that is subscribed to the CW supplementary service.

1.3.5 *Assumptions made about the terminal*

The terminal used with the CW supplementary service must support call offering from the network (as defined in Recommendation Q.931) using the channel negotiation procedures defined in § 1.5.2.1.3.3. Terminals using this service shall recognize the channel identification information element in the CONNECT ACKNOWLEDGE message.

The calling terminal shall support the procedure contained in § 1.5.2.1.3.2 if the optional indication that their call is waiting is to be understood.

1.4 *Coding requirements*

1.4.1 *Messages*

1.4.1.1 *ALERTING message*

TABLE 1-1/Q.953

ALERTING message content

Message type: ALERTING
Significance: global
Direction: both

Information element	Reference	Type	Length
Protocol discriminator	§ 4.2/Q.931	M	1
Call reference	§ 4.3/Q.931	M	≥ 2
Message type	§ 4.4/Q.931	M	1
Notification indicator	§ 1.4.2.2	O (Note)	3
Other information elements as described in Table 3-2/Q.931			

M Mandatory
O Optional

Note – The notification indicator information element shall not be sent by the called party at the access where Call Waiting is invoked. A network termination of type 2 (NT2) may send the notification indicator information element to the public network.

1.4.1.2 *CALL PROCEEDING message*

See Table 3-3/Q.931.

1.4.1.3 *CONNECT message*

See Table 3-5/Q.931.

1.4.1.4 *CONNECT ACKNOWLEDGE message*

TABLE 1-2/Q.953

CONNECT ACKNOWLEDGE message content

Message type: CONNECT ACKNOWLEDGE
Significance: local
Direction: n → u

Information element	Reference	Type	Length
Protocol discriminator	§ 4.2/Q.931	M	1
Call reference	§ 4.3/Q.931	M	≥ 2
Message type	§ 4.4/Q.931	M	1
Notification indicator	§ 4.5/Q.931	O (Note)	≥ 2
Other information elements as described in Table 3-2/Q.931			

M Mandatory
O Optional

Note — The channel identification information element is normally required. As a network option, the channel identification information element is not included if the user had responded with an exclusive channel indication. In this case, the terminal must connect to the last B-channel indicated to the network.

1.4.1.5 *SETUP message*

See Table 3-16/Q.931.

1.4.2 *Information elements*

1.4.2.1 *Channel identification information element*

See § 4.5.13 of Recommendation Q.931 for the coding of the channel identification information element.

For the CW supplementary service, the information channel selection (octet 3) of the channel identification information element shall be coded as “No Channel” in the SETUP message sent to the called ISDN number.

1.4.2.2 *Notification indicator*

The following notification descriptions are used in the call waiting operation:

- *Call is a waiting call*

  This value is used to inform the calling party that the call at the terminating interface is being offered using the CW supplementary service.

The notification description (octet 3) of the notification indicator information element shall be coded as shown in Figure 1-1/Q.953.

Bits 7 6 5 4 3 2 1	Meaning
1 1 0 0 0 0 0	Call is a waiting call

FIGURE 1-1/Q.953

Notification description

1.5 *Signalling requirements*

1.5.1 *Activation/deactivation/registration*

Not applicable.

1.5.2 *Invocation and operation*

1.5.2.1 *Normal operation*

1.5.2.1.1 *Actions at the originating exchange*

When available, the notification description, "call is a waiting call", shall be sent in the notification indicator information element in the ALERTING message to the calling user.

1.5.2.1.2 *Actions at the transit exchange*

This section is not applicable to DSS 1.

1.5.2.1.3 *Actions at the destination exchange*

1.5.2.1.3.1 *Invocation of Call Waiting*

The CW supplementary service is applied by the network when a call is to be terminated to an ISDN number that has subscribed to the CW supplementary service and all three of the following conditions are true:

- resources are busy:

  resources are considered busy if one (or more) of the following is true:

  - the maximum number of B-channels per interface are in use (either busy or reserved); or
  - the maximum number of B-channels per ISDN number are in use;
- the number of calls per ISDN number counter has not reached its maximum value;
- the number of waiting calls per ISDN number counter has not reached its maximum value.

When the network invokes Call Waiting and the counters defined in § 1.3.4 are supported, the network shall increment the number of calls per ISDN number counter and the number of waiting calls per ISDN number counter.

If all three conditions are not met, then the call shall be offered using normal call offering procedures contained in § 5.2 of Recommendation Q.931.

1.5.2.1.3.2 *Notification of Call Waiting*

As a network option, an indication may be sent to the calling party that their call is a waiting call.

Notification description, "call is a waiting call", shall be sent in the notification indicator information element in the ALERTING message.

1.5.2.1.3.3 *Operation of Call Waiting*

When the network has determined that the CW supplementary service shall be applied for a particular waiting call, the network shall send to the called ISDN user a SETUP message with channel identification “no channel”.

The call offering timers shall be the same for call waiting as for the call offering procedure in Recommendation Q.931.

The called user has the choice of accepting, rejecting, or ignoring the waiting call, using the procedures contained in Recommendation Q.931. If the call is to be accepted, the channel negotiation procedures, which are described below, are to be used. The network treatment given due to multiple ISDN users responding to the same waiting call on the same interface shall be the same (except for the channel negotiation procedures) as the procedures in Recommendation Q.931.

1.5.2.1.3.3.1 *Called user accepts the waiting call*

If the called user is to accept the waiting call, the non-rejecting messages that may be sent in response to a SETUP message are CALL PROCEEDING (see § 1.4.1.2), ALERTING (see § 1.4.1.1), or CONNECT (see § 1.4.1.3).

The procedures for the receipt of a CALL PROCEEDING and/or ALERTING message are as described in Recommendation Q.931 with the exception of the procedures associated with the channel identification information element.

The channel negotiation procedures allow the user to designate a channel in the CONNECT message, rather than restricting channel designation to a given ISDN user's first response to the SETUP message. A channel designation in either a CALL PROCEEDING or ALERTING message may be ignored by the network for the CW supplementary service operation. It is a network option to act upon the contents of the channel identification information element.

If the called user responding to the waiting call has a call on a channel, that user shall make a channel available by using the call clearing procedures contained in § 5.3 of Recommendation Q.931, before returning a CONNECT message to attempt to answer the waiting call. It is also possible that another user that is not contending for the incoming call and has a call on a channel, can make a channel available by using the call clearing procedures. The cleared channel is not reserved by the network for the waiting call. It is a network option to reserve the identified channel for the responding user. When a call is cleared and the counters defined in § 1.3.4 are supported, the number of calls per ISDN number counter shall be decremented for the ISDN number that cleared the call.

The called user may also make a channel available by holding an existing call (see § 1.6.15).

The user can return a CONNECT message with any of the following channel designations:

a) channel is indicated, no acceptable alternative;

b) channel is indicated, any alternative is acceptable;

c) any channel is acceptable; or

d) no channel designation present in the CONNECT message.

When the network receives a CONNECT message from the called ISDN user, the channel designation shall be checked:

- If the designated channel is not available and is indicated as in case a), the network shall initiate call clearing to the responding user following the procedures in Recommendation Q.931, using CCITT cause value No. 44, “requested circuit channel not available”.
- If the designated channel is available and is indicated as in case a), the network shall return a CONNECT ACKNOWLEDGE message (Table 1-2/Q.953) with the channel designation, and follow procedures contained in § 5.2.8 (receipt of active indication) and § 5.2.9 (to clear non-selected users) of Recommendation Q.931. In some networks, the channel identification information element may not be included in the CONNECT ACKNOWLEDGE message.

- If the designated channel is available and is indicated as in case b), the network shall return a CONNECT ACKNOWLEDGE message (Table 1-2/Q.953) with the channel designation, and follow procedures contained in § 5.2.8 (Active indication) and § 5.2.9 (non-selected user clearing) of Recommendation Q.931.
- If the designated channel is not available, is indicated as in case b), and another channel is available, the network shall return a CONNECT ACKNOWLEDGE message with the channel designation, and follow procedures contained in §§ 5.2.8 and 5.2.9 of Recommendation Q.931.
- If a channel is available and is indicated as in case c) or d), the network shall return a CONNECT ACKNOWLEDGE message with the channel designation, and follow procedures contained in §§ 5.2.8 and 5.2.9 of Recommendation Q.931.

  In some networks, if the channel is indicated as in case d) and the network had received the channel designation, "channel is indicated, no acceptable alternative", in the first response to the SETUP message (e.g., the ALERTING message), the Channel identification information element may not be included in the CONNECT ACKNOWLEDGE message.
- If no channel is available, the network shall initiate call clearing to the responding user following the procedures in Recommendation Q.931 using CCITT cause value No. 34, "No circuit/channel available".

After the network has sent a CONNECT ACKNOWLEDGE message, the number of waiting calls counter shall be decremented if the counters defined in § 1.3.4 are supported.

The user shall not connect to any B-channel until receiving a CONNECT ACKNOWLEDGE message. The user shall connect to the B-channel specified in the CONNECT ACKNOWLEDGE message.

1.5.2.1.3.3.2 *Called user rejects waiting call*

If the called user rejects the waiting call, the procedures contained in § 5.2.5.3 of Recommendation Q.931 shall be followed.

When the waiting call is cleared and the counters defined in § 1.3.4 are supported, the number of calls counter and number of waiting calls counter shall be decremented.

1.5.2.1.3.3.3 *Called user ignores waiting call*

If the called user ignores the waiting call, the procedures contained in § 5.2.5.4 of Recommendation Q.931 shall be followed.

When the waiting call is cleared and the counters defined in § 1.3.4 are supported, the number of calls counter and number of waiting calls counter shall be decremented.

1.5.2.2 *Exceptional procedures*

If any error conditions exist that are not contained in § 1.5.2.1.3.3, the appropriate procedures in Recommendation Q.931 shall be followed. If the waiting call is cleared and the counters defined in § 1.3.4 are supported, the number of calls counter and number of waiting calls counter shall be decremented.

1.6 *Interactions with other supplementary services*

1.6.1 *Call Waiting*

Not relevant.

1.6.2 *Call Transfer*

No applicable interaction at this time.

1.6.3 *Connected Line Identification Presentation*

No interaction.

1.6.4 *Connected Line Identification Restriction*

No interaction.

1.6.5 *Calling Line Identification Presentation*

If the CLIP procedures allow the calling number to be presented, the calling number shall be sent in the SETUP message containing the call waiting indication.

1.6.6 *Calling Line Identification Restriction*

No interaction.

1.6.7 *Closed User Group*

No interaction.

1.6.8 *Conference Calling*

No applicable interaction at this time.

1.6.9 *Direct-dialling-In*

No interaction.

1.6.10 *Call Diversion Services*

1.6.10.1 *Call Forwarding Busy*

No applicable interaction at this time.

1.6.10.2 *Call Forwarding No Reply*

No applicable interaction at this time.

1.6.10.3 *Call Forwarding Unconditional*

No applicable interaction at this time.

1.6.11 *Line Hunting*

No applicable interaction at this time.

1.6.12 *Three-Party Service*

No applicable interaction at this time.

1.6.13 *User-to-User Signalling*

1.6.13.1 *Service 1*

User-user information is delivered in the SETUP message which contains the call waiting indication according to the procedures contained in User-to-User service 1.

1.6.13.2 *Service 2*

No interaction.

1.6.13.3 *Service 3*

No interaction.

1.6.14 *Multiple Subscriber Number*

No interaction.

1.6.15 *Call Hold*

When a call is offered to an ISDN number using Call Waiting and the user has also subscribed to Call Hold, the called party may use the Call Hold supplementary service in conjunction with the CW supplementary service.

Instead of having to clear a call on a channel, the user could make a channel available for a waiting call by applying the Call Hold service to an established circuit-mode call. A channel may be reserved for the terminal that invoked the Call Hold service.

After a channel has been made available, the called user shall then be able to send a CONNECT message (with or without sending a CALL PROCEEDING message and/or an ALERTING message) to answer the waiting call as described in § 1.5.2.1.3.3.

All procedures of the Call Hold service can be used.

1.6.16 *Advice of Charge*

No applicable interaction at this time.

1.6.17 *Sub-addressing*

No interaction.

1.6.18 *Terminal Portability*

No interaction.

1.6.19 *Call Completion to Busy Subscriber*

No applicable interaction at this time.

1.6.20 *Malicious Call Identification*

No applicable interaction at this time.

1.7 *Interactions with other networks*

1.7.1 *Procedures for interworking with private ISDNs*

1.7.1.1 *Served user is on a private ISDN*

When the CW supplementary service operation occurs within a private network, the notification description, "call is a waiting call", shall be returned in the notification indicator information element in the ALERTING message, when available.

1.7.1.2 *Calling user is on a private ISDN*

When available, the notification description, "call is a waiting call" shall be sent in the notification indicator information element in the ALERTING message to the calling user.

1.8 *Signalling flows*

Example signalling flows are included to illustrate a subset of the CW supplementary service operation. These figures assume that the terminals are compatible with the incoming call as defined in Recommendation Q.931.

1.9 *Parameter values (timers)*

No states beyond those defined in Recommendation Q.931 are needed for the CW supplementary service operation.

No timers beyond those defined in Recommendation Q.931 are needed for the CW supplementary service operation.

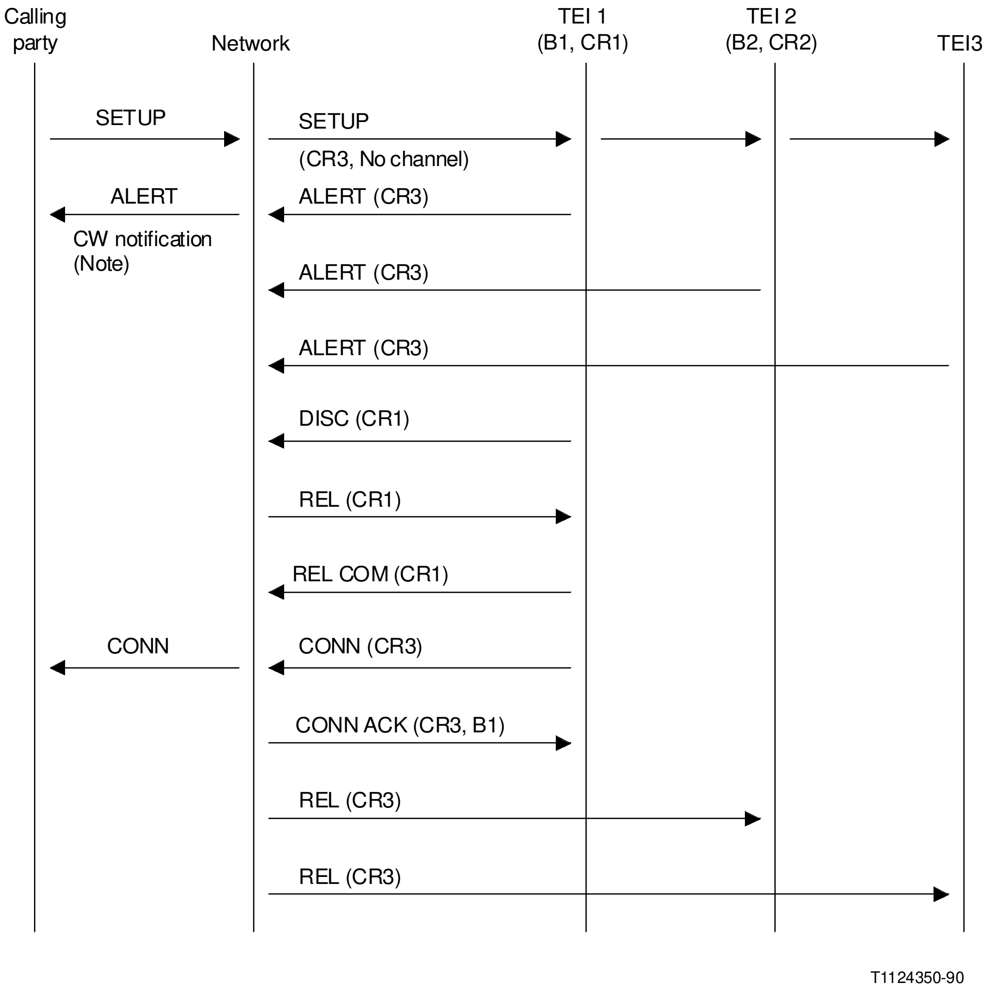
1.10 *Dynamic description (SDLs)*

1.10.1 *User*

Same as in Recommendation Q.931.

1.10.2 *Network*

Same as in Recommendation Q.931.

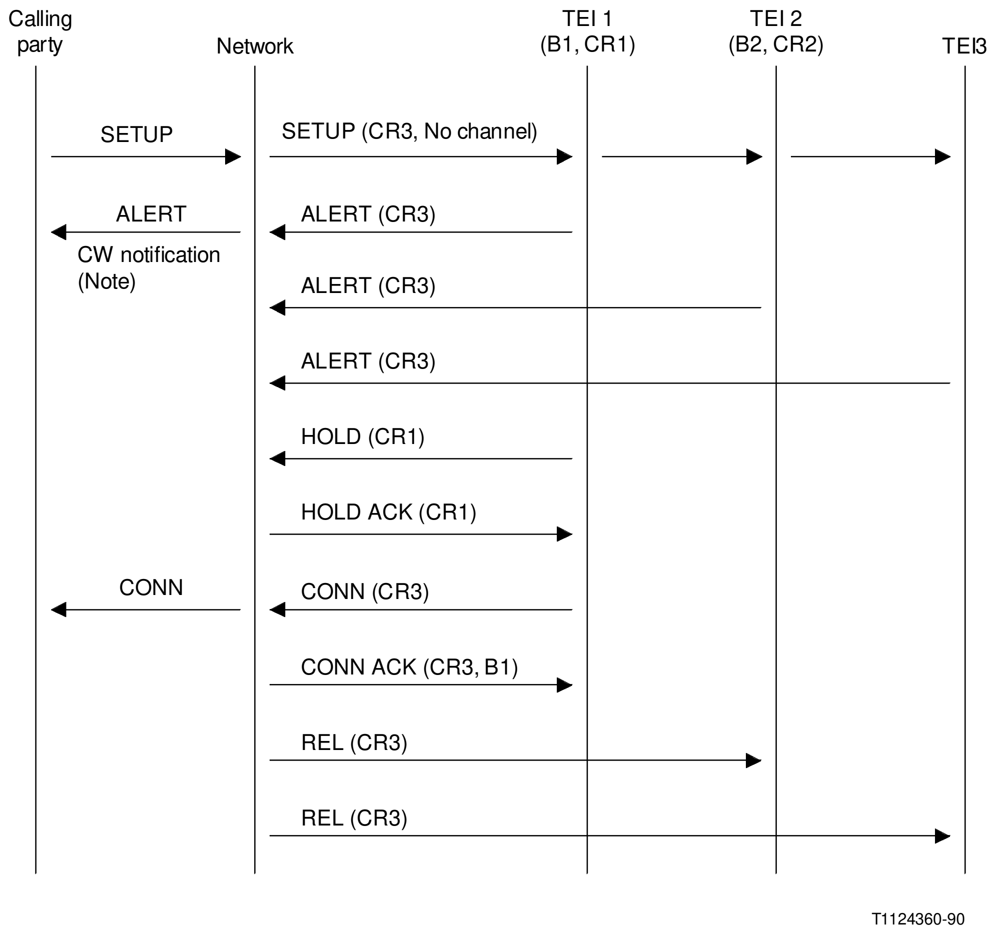

Calling party
Network
TEI 1 (B1, CR1)
TEI 2 (B2, CR2)
TEI3
SETUP
SETUP
(CR3, No channel)
ALERT
ALERT (CR3)
CW notification (Note)
ALERT (CR3)
ALERT (CR3)
DISC (CR1)
REL (CR1)
REL COM (CR1)
CONN
CONN (CR3)
CONN ACK (CR3, B1)
REL (CR3)
REL (CR3)
T1124350-90

CR Call reference
TEI Terminal endpoint identifier

Note – Notification of call waiting is a network option.

FIGURE 1-2/Q.953

Call Waiting – Call acceptance by clearing an existing call


Calling party
Network
TEI 1 (B1, CR1)
TEI 2 (B2, CR2)
TEI3
SETUP
SETUP (CR3, No channel)
ALERT
ALERT (CR3)
CW notification (Note)
ALERT (CR3)
ALERT (CR3)
HOLD (CR1)
HOLD ACK (CR1)
CONN
CONN (CR3)
CONN ACK (CR3, B1)
REL (CR3)
REL (CR3)
T1124360-90

CR	Call reference
TEI	Terminal endpoint identifier

Note – Notification of call waiting is a network option.

FIGURE 1-3/Q.953

Call Waiting – Call acceptance by placing an existing call on hold