INTERNATIONAL TELECOMMUNICATION UNION

# CCITT

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

# Q.83.1

(11/1988)

SERIES Q: SWITCHING AND SIGNALLING

Functions and information flows for services in the ISDN – Supplementary services

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# CALL COMPLETION SUPPLEMENTARY SERVICES – CALL WAITING

Reedition of CCITT Recommendation Q.83.1 published in the Blue Book, Fascicle VI.1 (1988)

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**NOTES**

1 CCITT Recommendation Q.83.1 was published in Fascicle VI.1 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

**Recommendation Q.83.1**

## CALL COMPLETION SUPPLEMENTARY SERVICES

## 1 Call waiting

### 1.1 *General*

This Recommendation provides information on the functions in ISDN entities and the information flows between the entities which are required to provide the call waiting supplementary service.

The **call waiting supplementary service** will permit a subscriber to be notified of an incoming call (as per basic call procedures) with an indication that no interface information channel is available.

The user then has the choice of accepting, rejecting or ignoring the waiting call (as per basic call procedures).

### 1.2 *Description*

#### 1.2.1 *General description*

The ISDN call waiting service allows notification to subscriber B of the incoming call to be out-of-band and this is the assumed case for this definition. In addition, as a service provider option audible in-band indications may be provided.

Where this option is provided, the application of in-band indications, in relation to particular call types and channels, is for further study. Where applied, tones should be in accordance with Recommendation E.180.

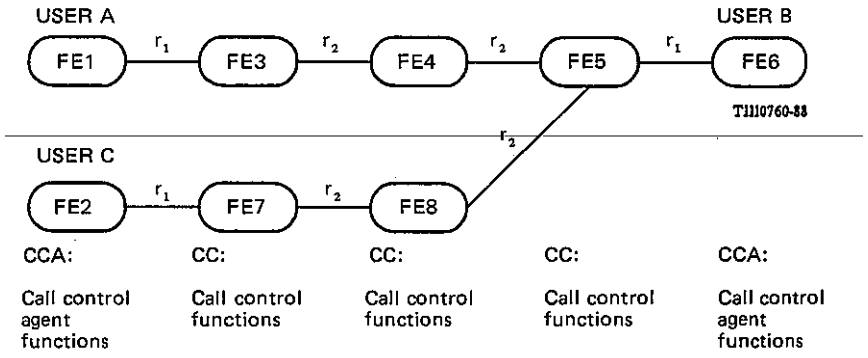
The maximum number of calls that can be handled (e.g. active, held, alerting, waiting) for each ISDN number on a given interface is specified at subscription time.

#### 1.2.2 *Qualifications on the applicability to telecommunication services*

This supplementary service is considered meaningful when applied to the telephony teleservice, speech and 3.1 kHz audio bearer services. Furthermore, it may also be meaningful when applied to other services.

### 1.3 *Derivation of the functional model for call waiting service*

The model used for illustrating the call waiting supplementary service procedures is given below:




CCA is the functional entity that serves the user and is responsible for initiating functional requests and interacting with the network. CC is the functional entity within the network that cooperates with its peers to provide the services requested by CCA.

$r_1$ and $r_2$ are relationships between functional entities wherein information flows occur in order to process call attempts on service requests.

### 1.4 *Information flow diagrams*

This paragraph contains the information flow diagram for the successful sequences of call waiting.

The following flow diagrams are identified:

– Figure 1-1/Q.83: call waiting notification: case 1;
– Figure 1-2/Q.83: call waiting notification: case 2;
– Figure 1-3/Q.83: call waiting notification: case 3;
– Figure 1-4/Q.83: call waiting acceptance by clearing the A call: case 1;
– Figure 1-5/Q.83: call waiting acceptance by clearing the A call: case 2;
– Figure 1-6/Q.83: call waiting acceptance by holding the A call: case 1;
– Figure 1-7/Q.83: call waiting acceptance by holding the A call: case 2;
– Figure 1-8/Q.83: call waiting rejection;
– Figure 1-9/Q.83: call waiting cancellation.

1.4.1 *Call waiting terminology*

Throughout the stage 2 description the following terminology will be used:

i) Subscriber B: This is the subscriber who is provided by the network with call waiting service on a particular interface.

ii) User at B: This is the one user who reacts to the call waiting at B.

iii) User C: This is the user who has originated a call to B which causes the call waiting service to be invoked.

iv) One user at A: This represents a user who is engaged in a call with a user at B (this call can be in any state).

v) Information channel control: A terminal that has information channel control is active on a call, is alerting for an incoming call, has an outgoing call in a state following or including the outgoing call proceeding state, or has a call on hold with reservation.

1.4.2 *Call waiting procedures with successful outcome*

The call waiting procedures with successful outcome are hereafter described by means of generic information flow diagrams.

1.4.2.1 *Call waiting notification*

The call waiting notification procedures are given in Figures 1-1/Q.83 to 1-3/Q.83.

Two categories are identified:

i) Figures 1-1/Q.83 and 1-2/Q.83 describe the case where the served user is notified of an incoming call and the network requires an interface channel to his user access and it has detected that all information channels are in use (no information channel available).

ii) Figure 1-3/Q.83 describes the case where the served user is notified of an incoming call and the network requires an interface channel to his user access and it has detected that an existing free information channel, which is the only compatible terminal, is in the busy condition (information channel available).

The following procedures are valid for call waiting with no information channel available.

When an incoming call from a user C arrives at the functional entity controlling the access at B and encounters the channel's busy condition and the network determined user busy conditions do not result, then the call shall be offered to B by means of the Setup procedure with the “no information channel” indicated.

The following actions will be taken by the terminals connected to the user B access:

i) Incompatible terminals will not react.

ii) Terminals not presently controlling the information channel that are compatible with the incoming call will respond by initiating the release procedure indicating a no information circuit/channel available condition.

iii) Terminals presently controlling the information channel that do not support the call waiting service and are compatible with the incoming call will respond either by initiating the release procedure indicating a user busy condition or by acting as incompatible terminals (e.g. no reaction).

iv) Terminals presently controlling the information channel that support the call waiting service and that are compatible with the incoming call will respond by initiating the call progress (reporting) procedure and will give a local alert to the human user by giving an audible and/or visual (in-band) indication.

When a positive response is received from the terminals at B within the normal basic call period, that (those) user(s) is (are) being informed about the incoming call, then the calling user at C will be given an indication that the called user(s) is (are) being informed. This will be performed by the network at the B side by sending of the ringing tone; some networks may instead generate a special call waiting tone, provided the bearer capability is either speech or audio 3.1 kHz. In addition, optionally, a call waiting out of band indication may be sent to the C user.

*Case 1*: Both B Channels busy, one terminal controlling a B Channel supports call waiting.

Figure 1-1/Q.83 shows the generic information flow diagram for call waiting notification when the incoming call from user C is delivered at the user B access by broadcast data link without available information channels.

The following user B access terminals are assumed:

– TE1: Being a compatible terminal not supporting call waiting occupying channel $B_1$ and having a call reference CR1. This terminal is assumed to be located in FE6.

– TE2: Being a compatible terminal not presently controlling the information channel. This terminal is assumed to be located in FE6`.

– TE3: Being a compatible terminal supporting call waiting, occupying channel $B_2$ and having a call reference CR2. This terminal is assumed to be located in FE6".

The new incoming call from C is assumed to have a call reference CR3.

*Case 2*: Both B Channels busy, both terminals controlling the B Channels support call waiting.

Figure 1-2/Q.83 shows the generic information flow diagram for call waiting notification when the incoming call from user C is delivered at the user B access by broadcast data link without available information channels.

The following user B access terminals are assumed.

– TE1: Being a compatible terminal supporting call waiting occupying channel $B_1$ and having a call reference CR1. This terminal is assumed to be located in FE6.

– TE2: Being a compatible terminal not presently controlling the information channel. This terminal is assumed to be located in FE6`.

– TE3: Being a compatible terminal supporting call waiting, occupying channel $B_2$ and having a call reference CR2. This terminal is assumed to be located in FE6".

The new incoming call from C is assumed to have a call reference CR3.

*Case 3*: One B Channel busy, the terminal controlling the busy B Channel supporting call waiting.

Figure 1-3/Q.83 shows the generic information flow diagram for call waiting notification when the incoming call from user C is delivered at the user B access by broadcast data link with an available information channel, but the only compatible terminal is presently controlling an information channel.

If the thus compatible terminal has call waiting facilities available, it alerts its user (audible or visible indication) and notifies the network (REPORT). The user then can decide whether to accept the waiting call or not.

1.4.2.2 *Call waiting acceptance*

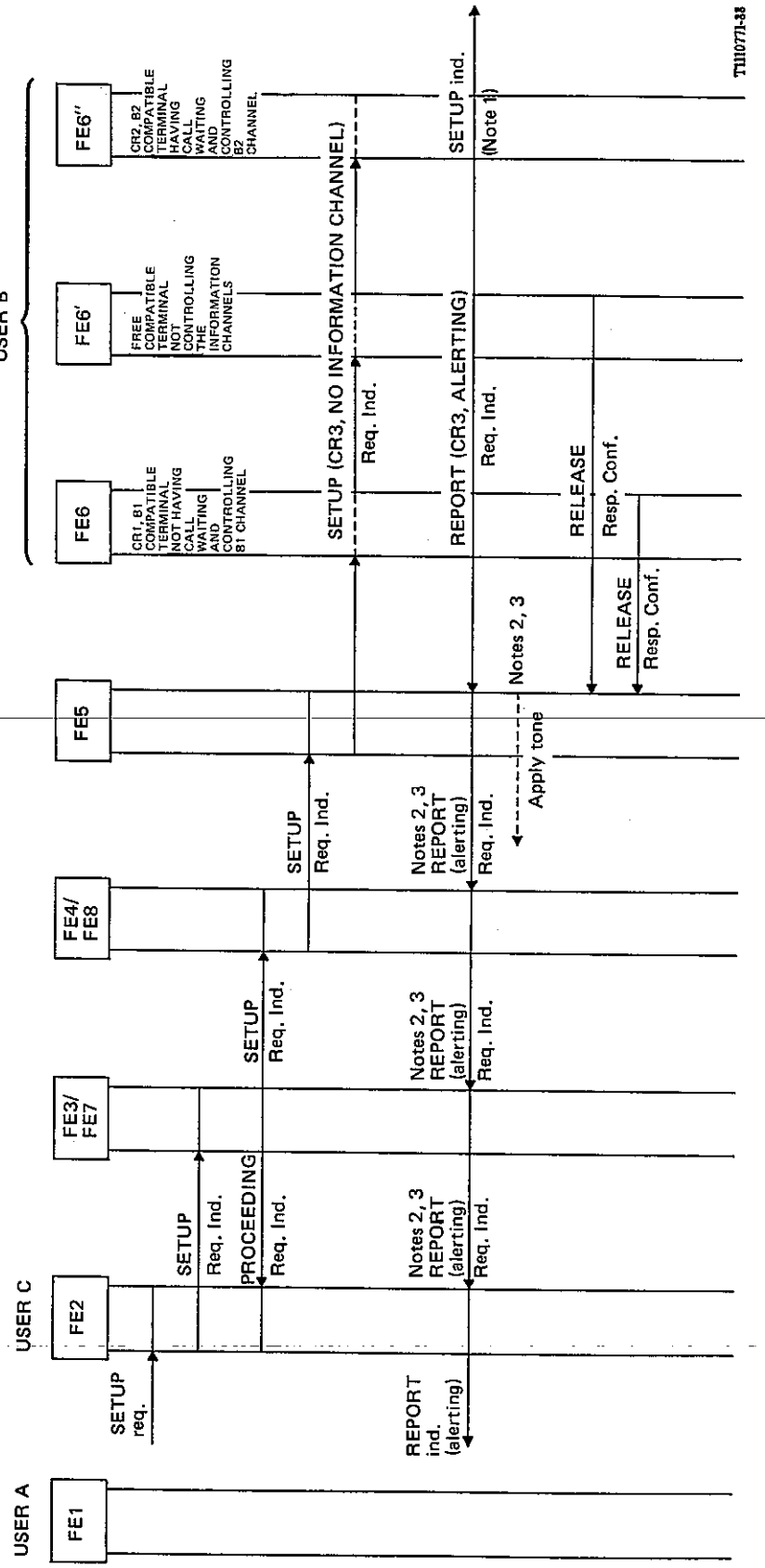
If a user at B requests, within a specified period, to connect to the waiting call, two procedures may be required by user B with regard to the active call with a user at A.

i) Procedure one will terminate the specified active call with a user at A, while the call between a user at C and the user at B is completed in the normal manner (see Figures 1-4/Q.83 and 1-5/Q.83).

ii) Procedure two will place the specified active call with a user at A into a held state, while the call between a user at C and the user at B will be completed in the normal manner. The previously active call between a user at A and the user at B is put into the held state. From this state other supplementary services, for example, three party service may be used (see Figures 1-6/Q.83 and 1-7/Q.83).

This acceptance provokes the initiation of a Hold sequence by the terminal to the network. The network will hold the previous call between a user at A and the user at B, while the waiting call from a user at C will be connected by a Setup response/confirm sequence.

Since more than one terminal controlling the information channels can respond positively to a call waiting offering, the network will subsequently apply a clear procedure to the remaining terminals having responded positively after having received the Setup response/confirmation order.

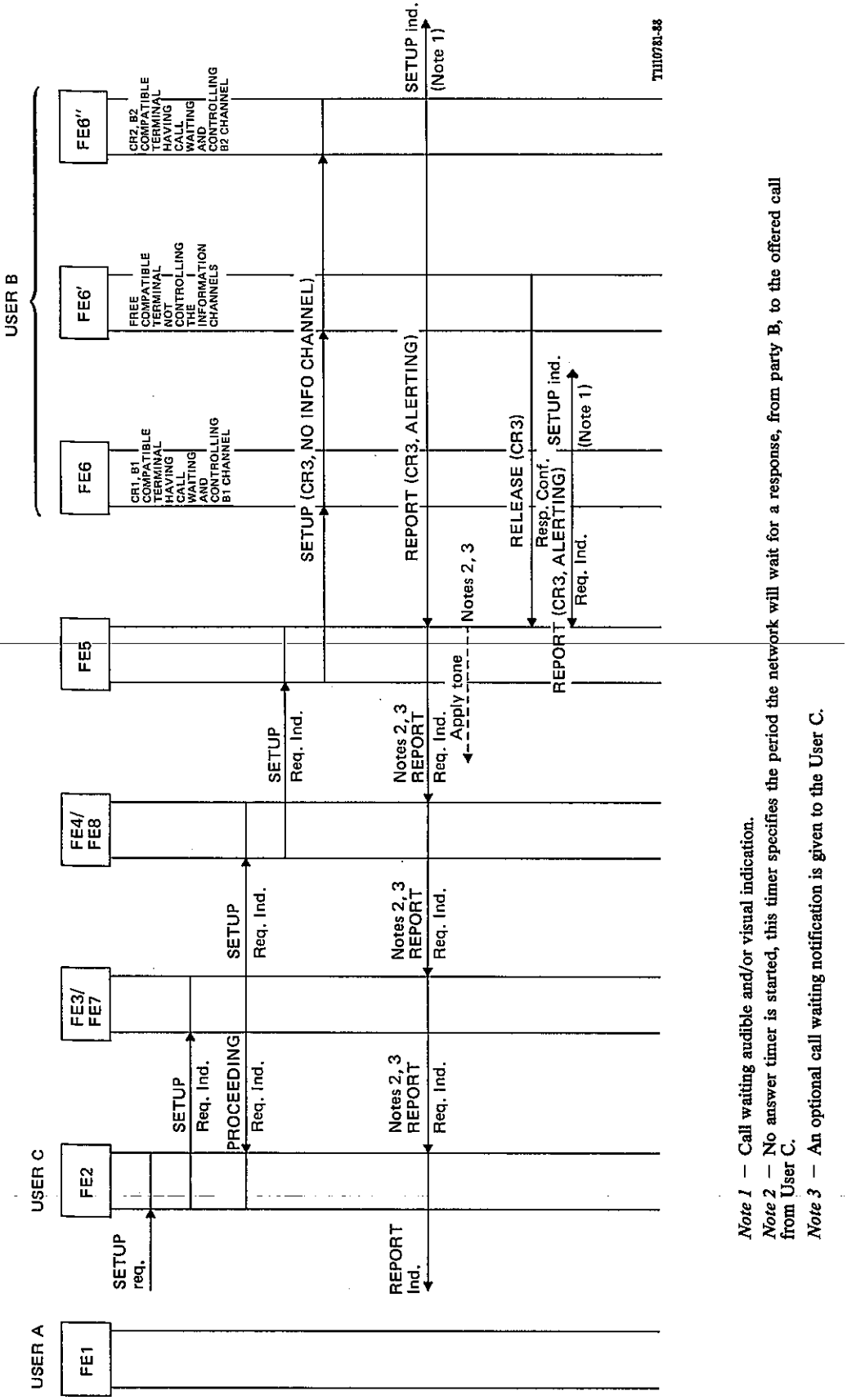



*Note 1* – Call waiting audible and/or visual indication.

*Note 2* – No answer timer is started, this timer specifies the period the network will wait for a response, from party B, to the offered call from User C.

*Note 3* – An optional call waiting notification is given to the User C.

FIGURE 1-1/Q.83
**Call waiting notification (case 1)**

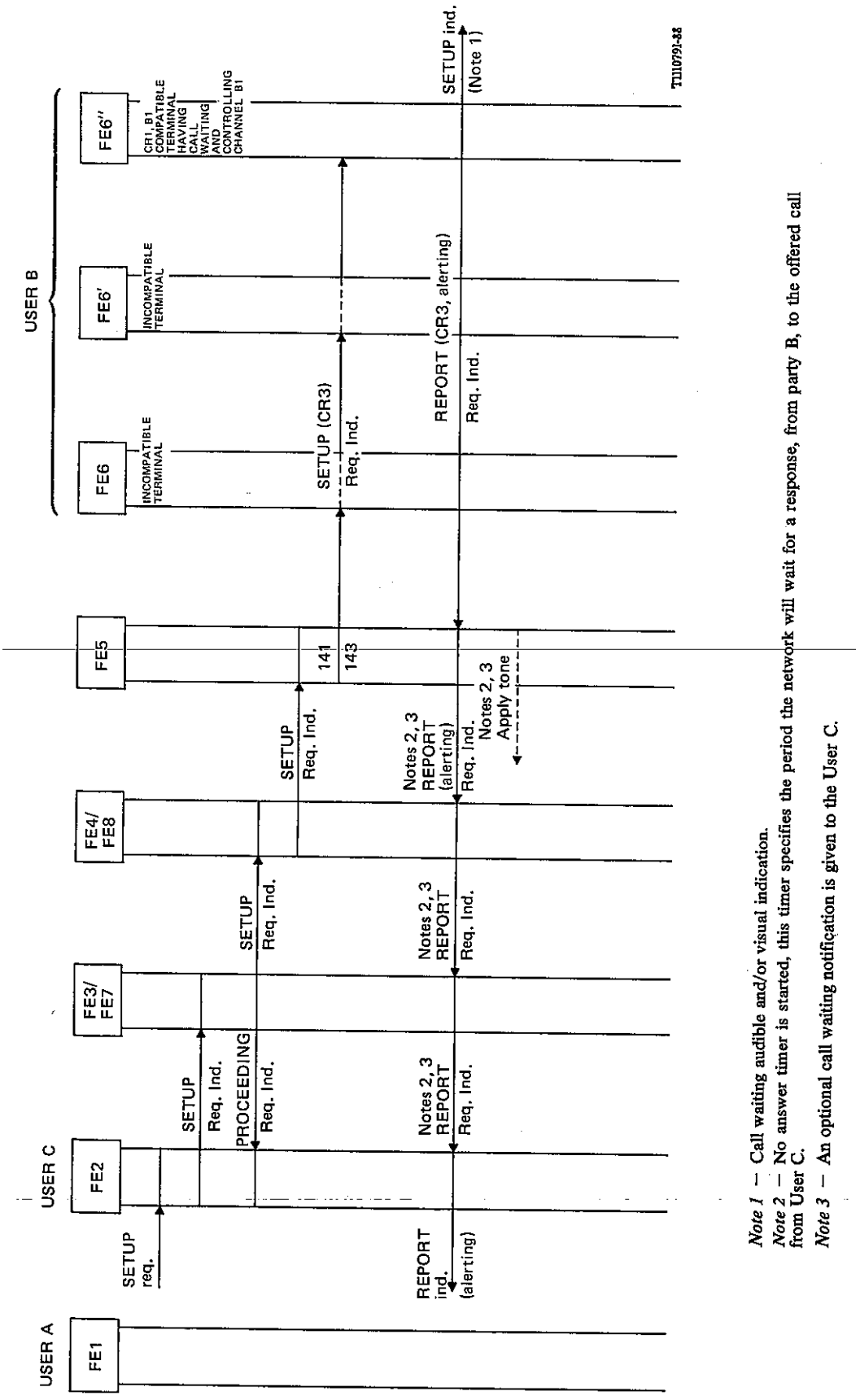



*Note 1* – Call waiting audible and/or visual indication.

*Note 2* – No answer timer is started, this timer specifies the period the network will wait for a response, from party B, to the offered call from User C.

*Note 3* – An optional call waiting notification is given to the User C.

FIGURE 1-2/Q.83
**Call waiting notification (case 2)**




*Note 1* – Call waiting audible and/or visual indication.

*Note 2* – No answer timer is started, this timer specifies the period the network will wait for a response, from party B, to the offered call from User C.

*Note 3* – An optional call waiting notification is given to the User C.

FIGURE 1-3/Q.83
**Call waiting notification (case 3)**

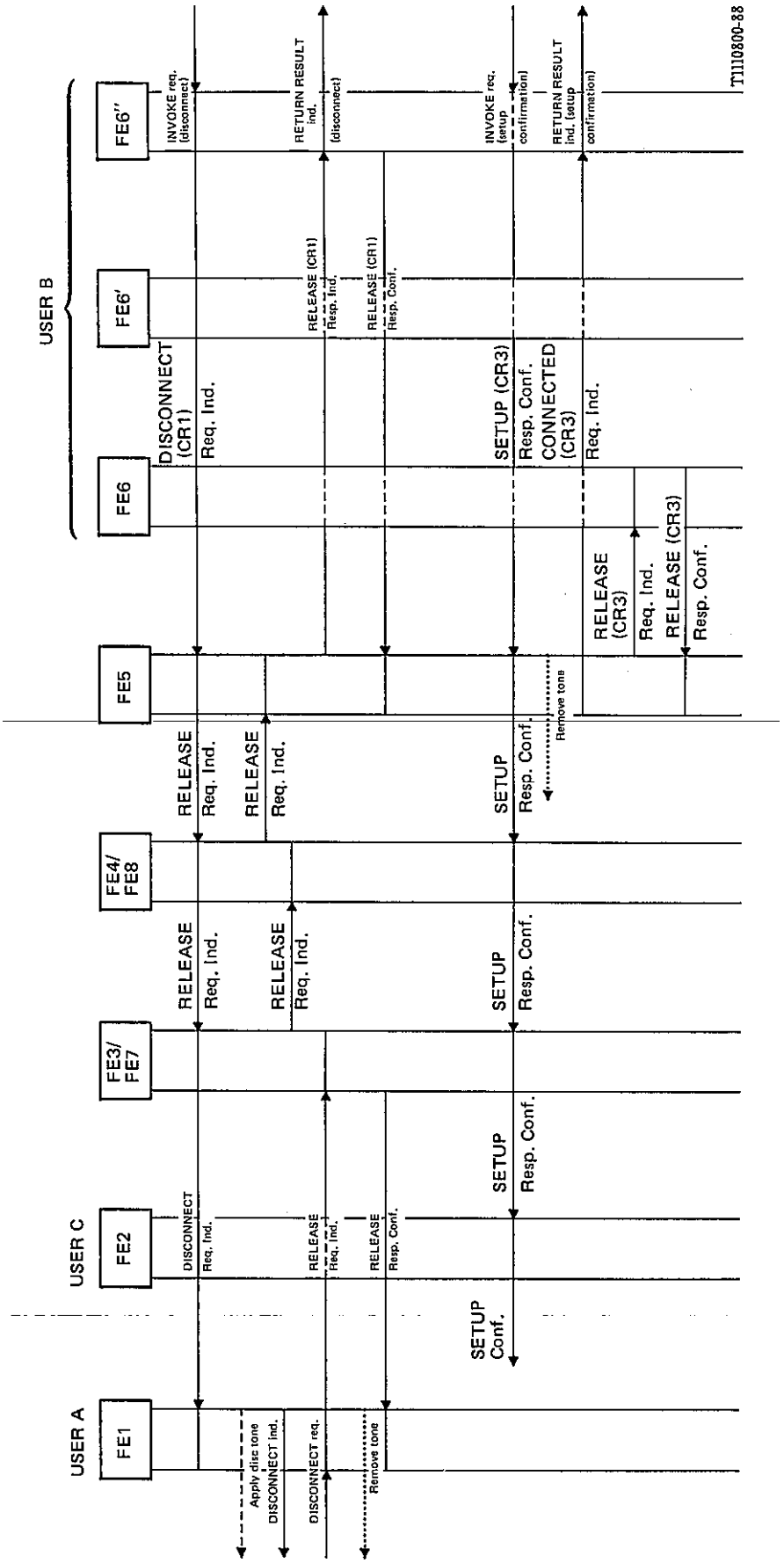



FIGURE 1-4/Q.83

**Call waiting acceptance (clearing A-call): case 1**

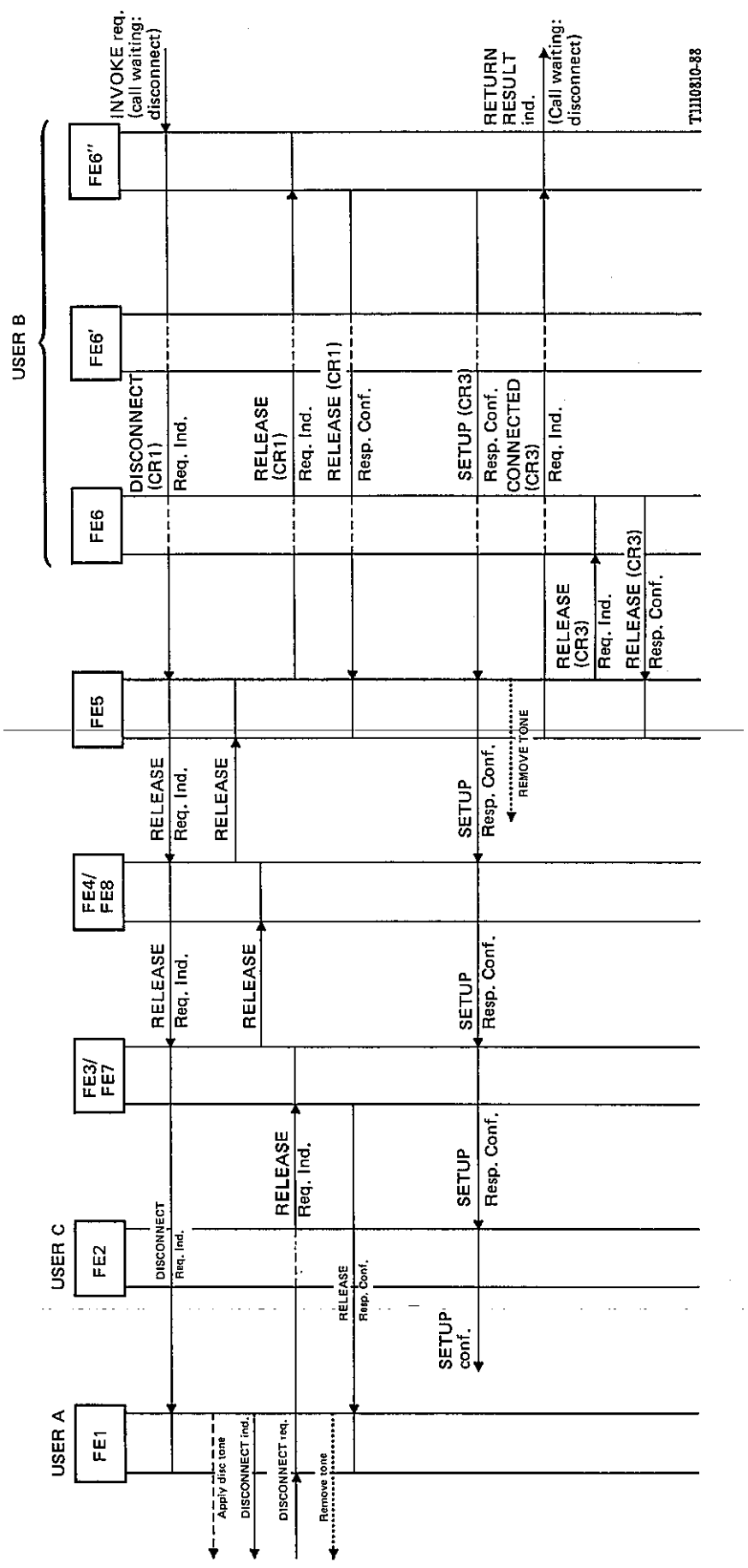



FIGURE 1-5/Q.83

**Call waiting acceptance (clearing A-call): case 2**

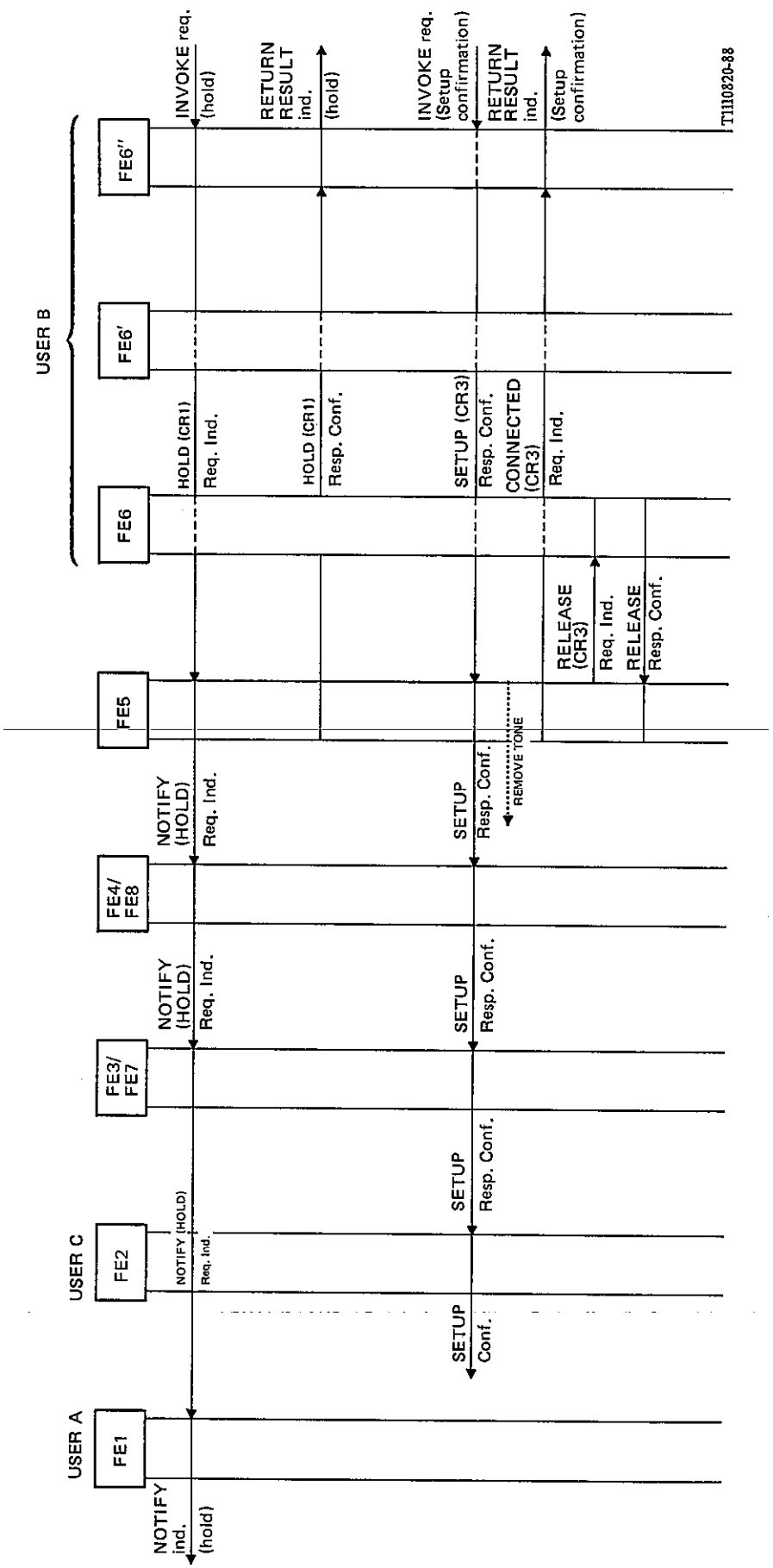



FIGURE 1-6/Q.83

**Call waiting acceptance (holding A-call): case 1**

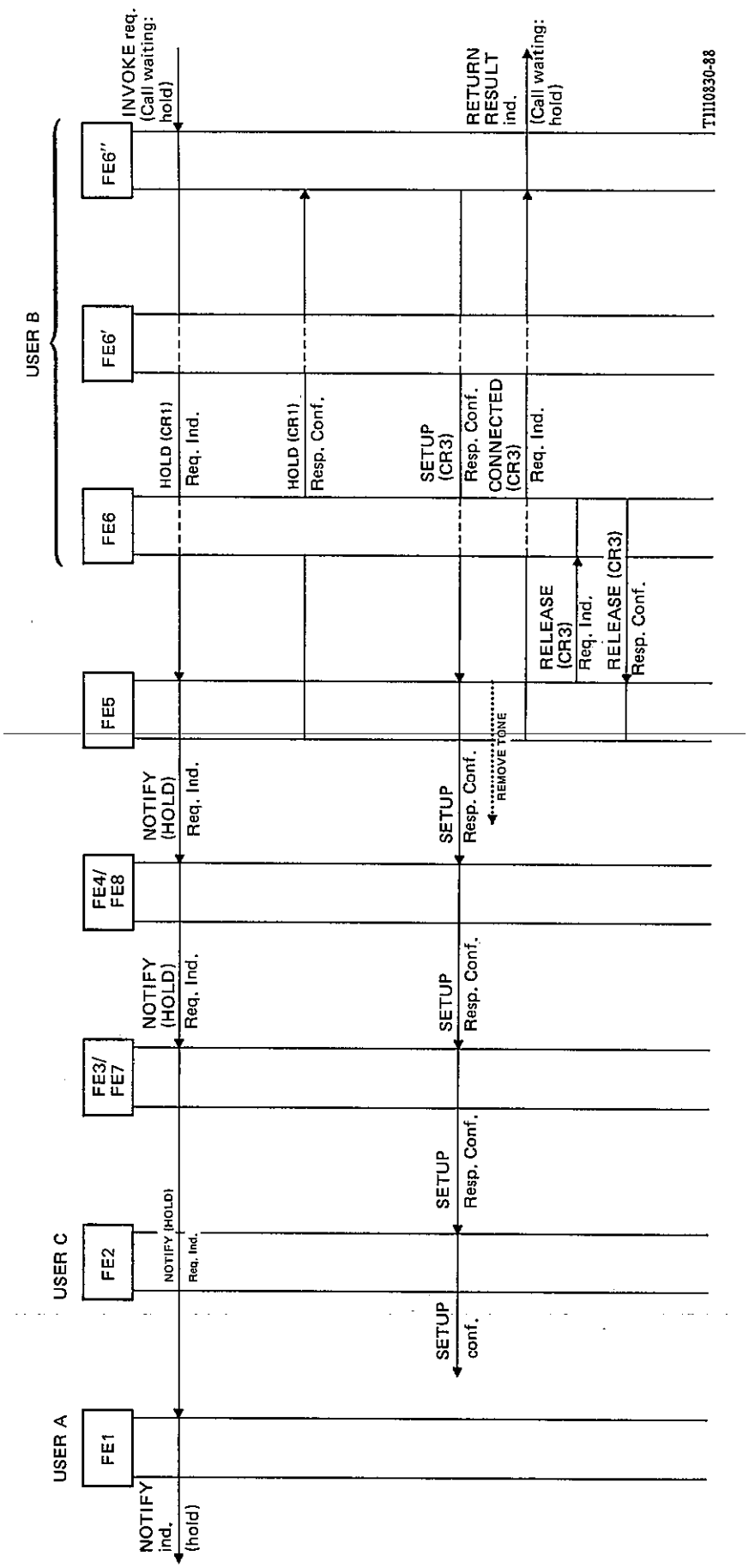



FIGURE 1-7/Q.83

**Call waiting acceptance (holding A-call): case 2**

1.4.2.3 *Call waiting rejection*

The user at B can also, within the specified period, reject the new incoming call from user C. In this case, call clearing procedures (see Figure 1-8/Q.83) will apply at the basic access interface.

If the terminals controlling the information channels have initiated the Report (alerting) procedures, the network will wait after the reception of the first release sequence from a terminal for the possible reaction of the other terminal. If all the users reject the waiting call, the network shall initiate the clearing of the call indicating the user determined busy condition of the called users to the calling user C.

1.4.2.4 *Call waiting notification ignored*

If the specified period expires without any acceptance from B of the incoming call, then the network shall inform B of this situation and also inform C that this call cannot be connected.

Normal release applies to the call attempt from C by sending an appropriate clearing indication to the calling user (see Figure 1-9/Q.83).

A rejection of the waiting call by one terminal will not stop the call waiting timer, as another terminal may accept the waiting call within the specified period.

## 1.5 *SDL diagrams for functional entities*

This section contains the SDL diagrams for the network function entity FE5. The entire SDL is a variation of the basic call $r_2$-$r_1$ CALL SENT state.

The relationships "$r_1$" and "$r_2$" have been deleted in functional entity FE5 between functional entities FE4 ($r_2$) and FE6 ($r_1$). (See § 1.3.)

## 1.6 *Functional entity actions*

The functional entity actions are identical to the actions required for the circuit mode switched bearer services speech, 3.1 kHz audio unrestricted and alternate speech/unrestricted information transfer.

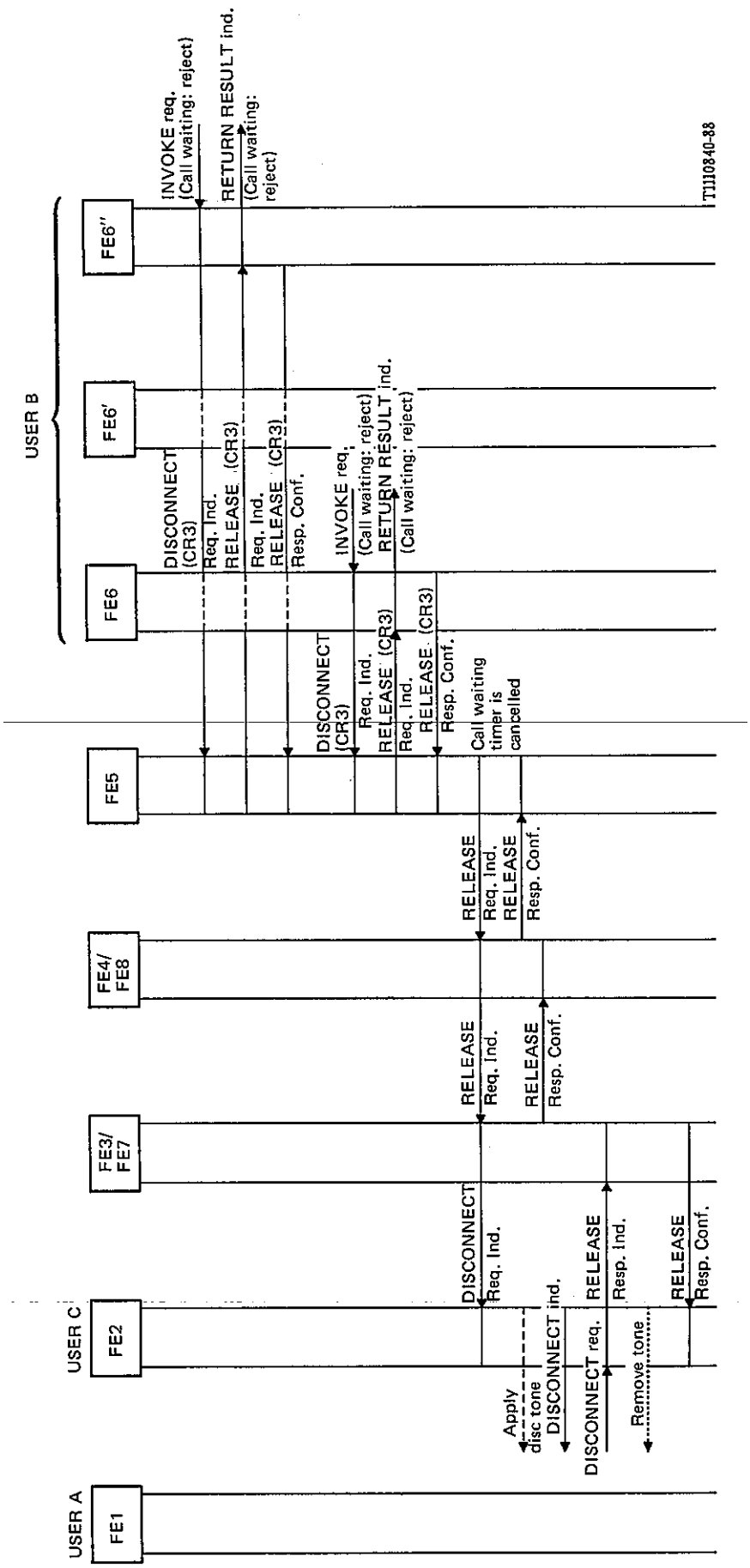



FIGURE 1-8/Q.83
**Call waiting rejection**

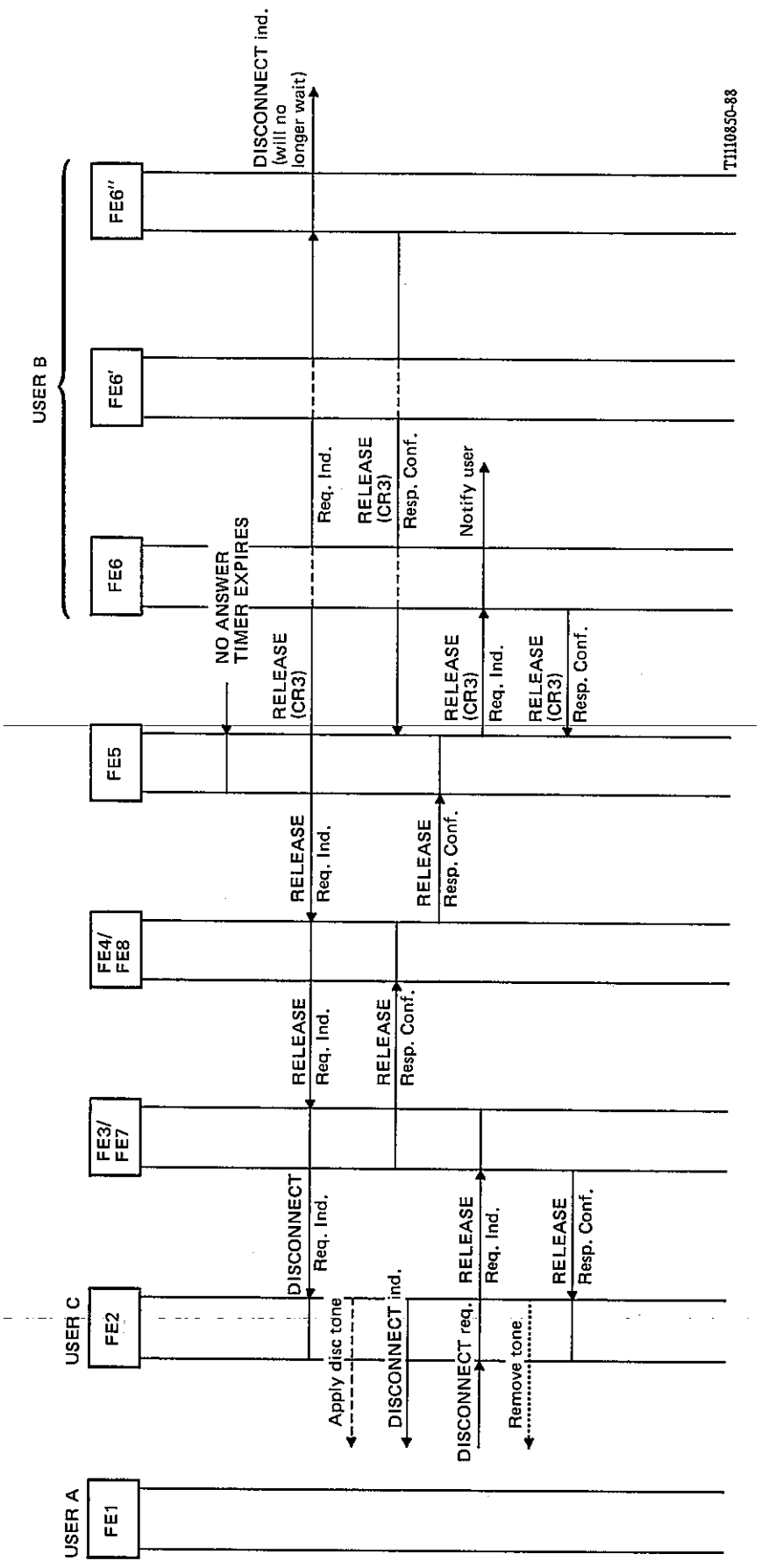
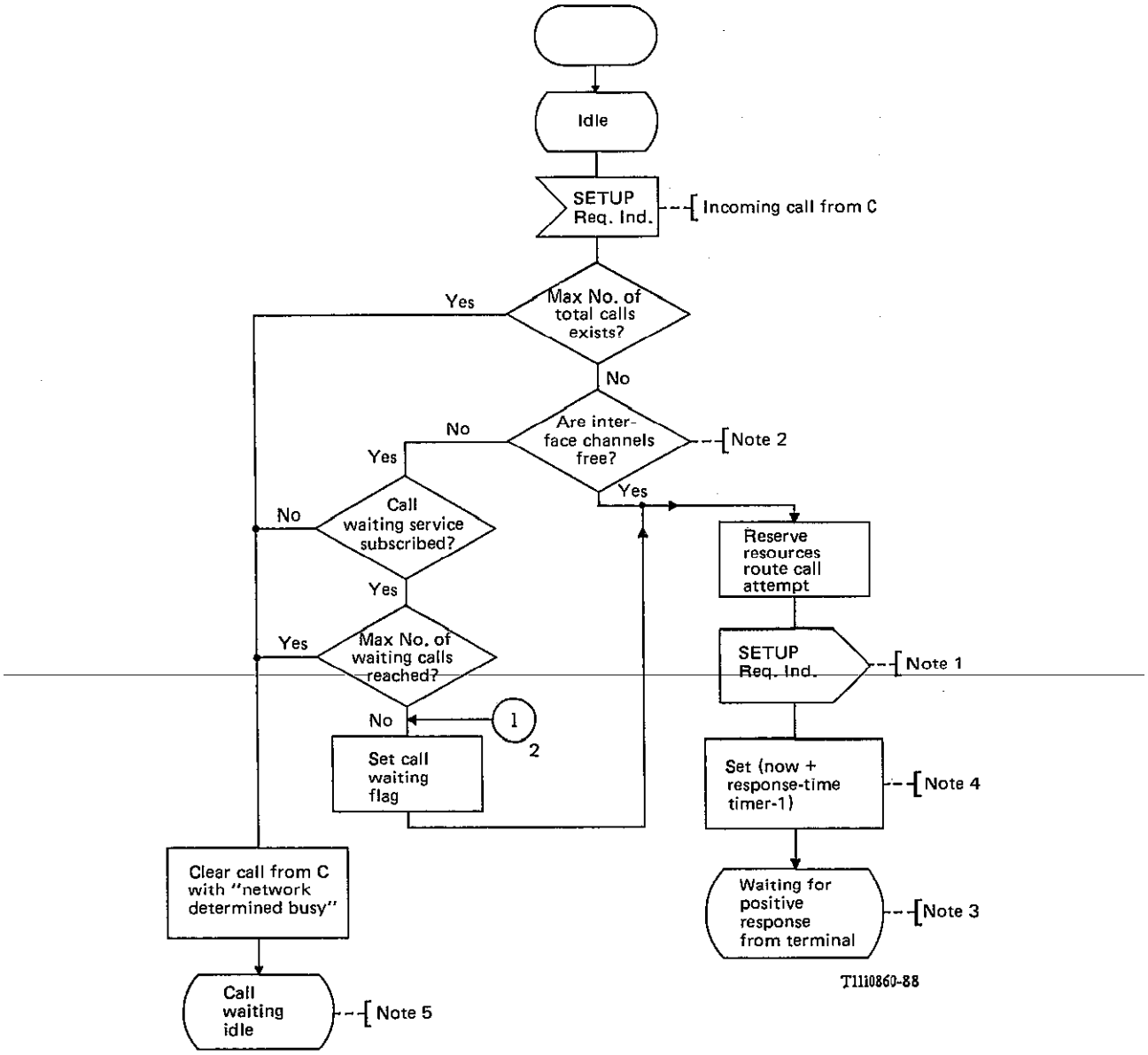



FIGURE 1-9/Q.83
**Call waiting notification ignored**




*Note 1* – If the call waiting flag is set then the "no information channel" indication should be included. When not set, normal call offering procedures apply. Depending on the terminal configuration the set up message will be delivered by point-to-point or by broadcast data link.

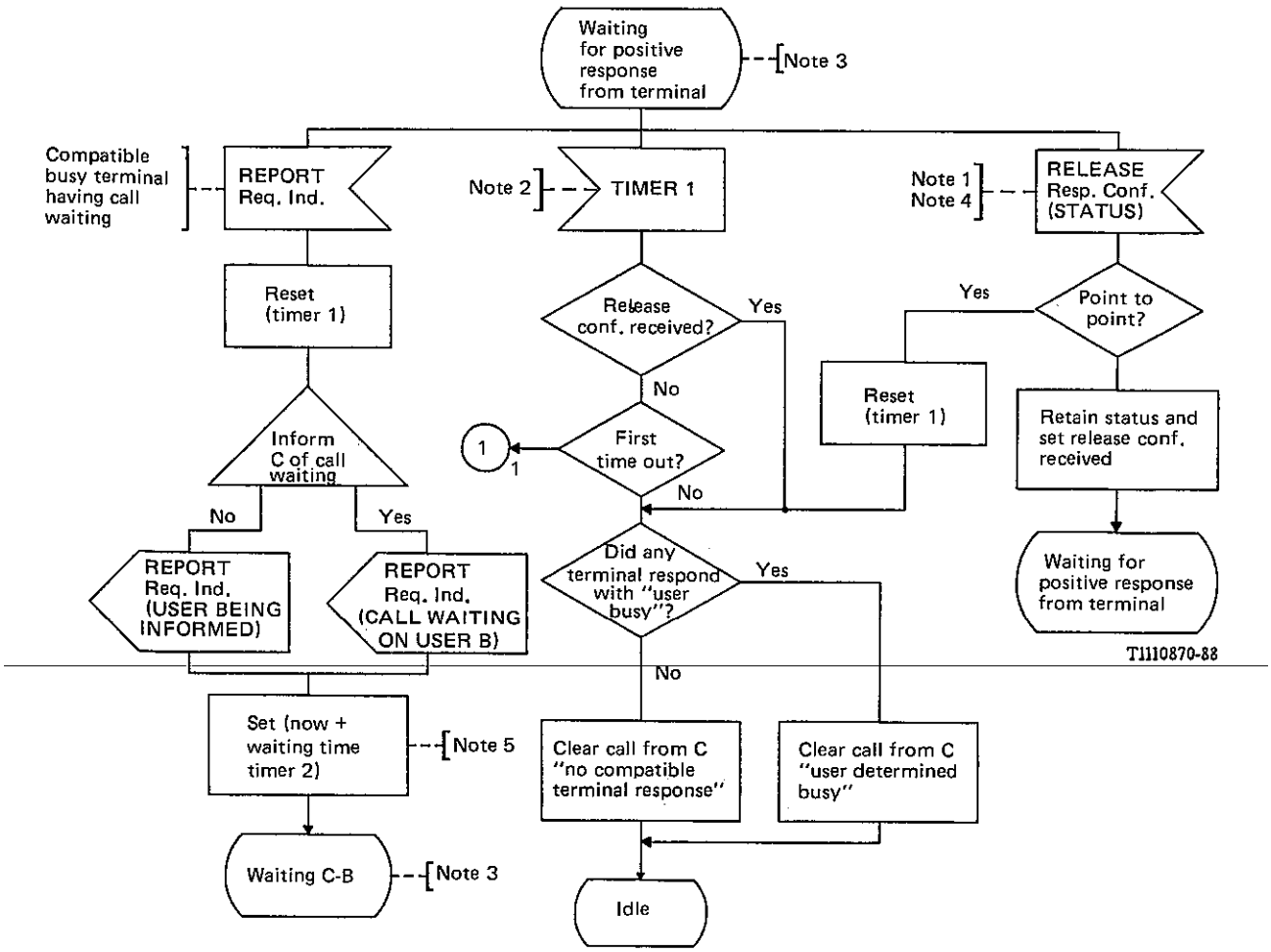
*Note 2* – When user network interface channels are free and the call waiting service is subscribed, some implications may occur with regard to channel negotiation procedure complications, in particular with exclusive channel negotiation.

*Note 3* – This is a substate of the "$r_2$-$r_1$ CALL SENT" state of the basic service description.

*Note 4* – This timer is the same as for the basic call service.

*Note 5* – Other possible supplementary services may apply; e.g. CCBS, CFB.

FIGURE 1-10/Q.83 (Sheet 1 of 7)
**Call waiting process FE5**




*Note 1* – Optionally compatible busy terminals not having call waiting may not respond.

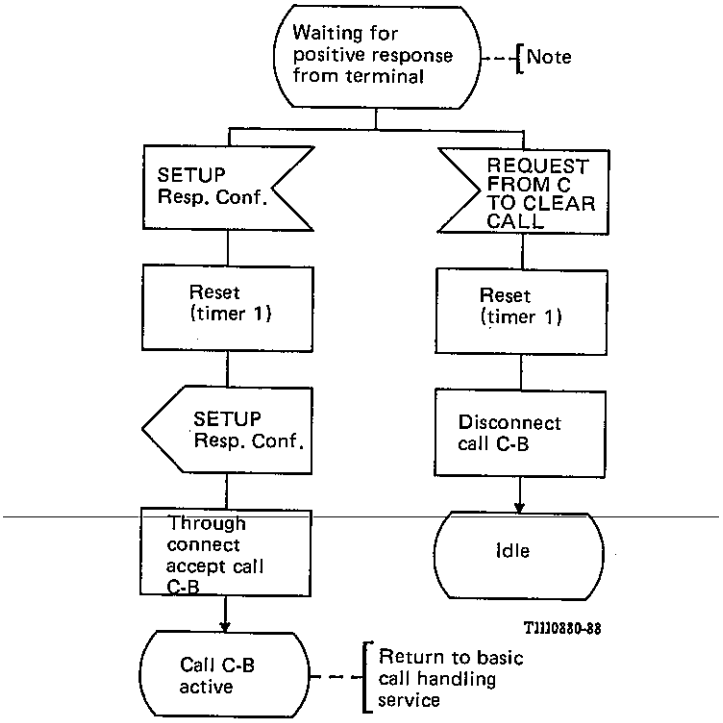
*Note 2* – Timer 1 expiration is dependent on terminal configuration being either point-to-point or broadcast link.

*Note 3* – This is a substate of the "$r_2$-$r_1$ CALL SENT" state of the basic service description.

*Note 4* – The status may either indicate "USER BUSY" (for compatible busy terminals not having call waiting); or "no-circuit-or-channel available" (for free compatible terminal).

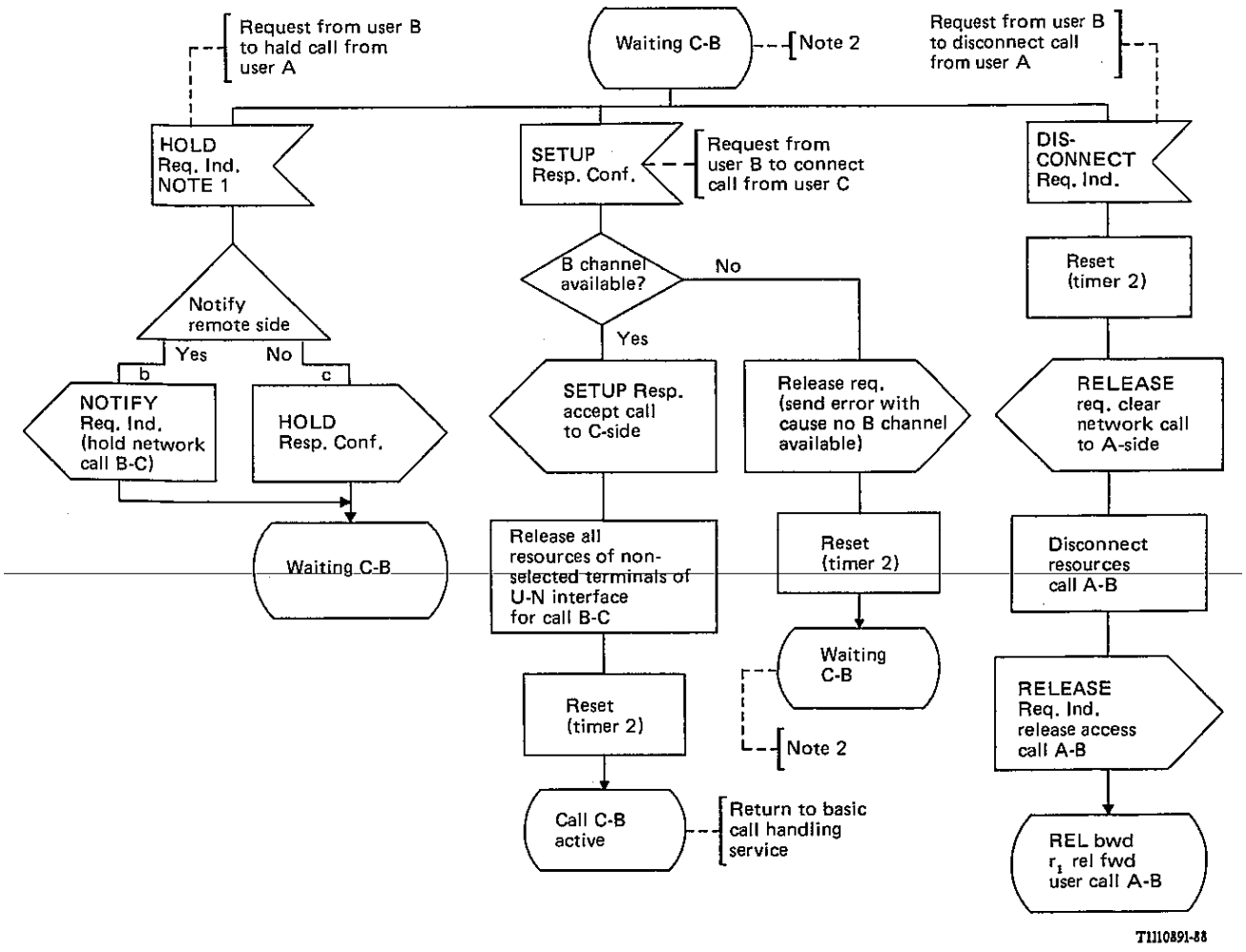
*Note 5* – If the call waiting flag is not set this is the normal call service supervision timer which controls the time-out for Report (Alert) without receipt of the setup confirmation, and specifies the period the network will wait for a response, from party B, to the offered call from user C.

FIGURE 1-10/Q.83 (Sheet 2 of 7)
**Call waiting process FE5**




*Note* – This is a substate of the "$r_2$-$r_1$ CALL SENT" state of the basic service description.

FIGURE 1-10/Q.83 (Sheet 3 of 7)
**Call waiting process FE5**




*Note 1* – Timer 2 is not stopped and supervises the receipt of the consequent setup confirmation.
*Note 2* – This is a substate of the "$r_2$-$r_1$ CALL SENT" state of the basic service description.

FIGURE 1-10/Q.83 (Sheet 4 of 7)
**Call waiting process FE5**

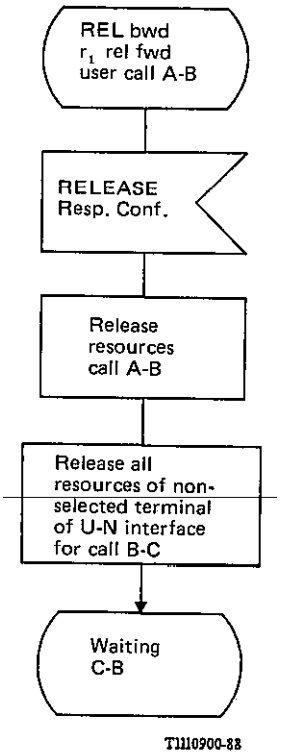
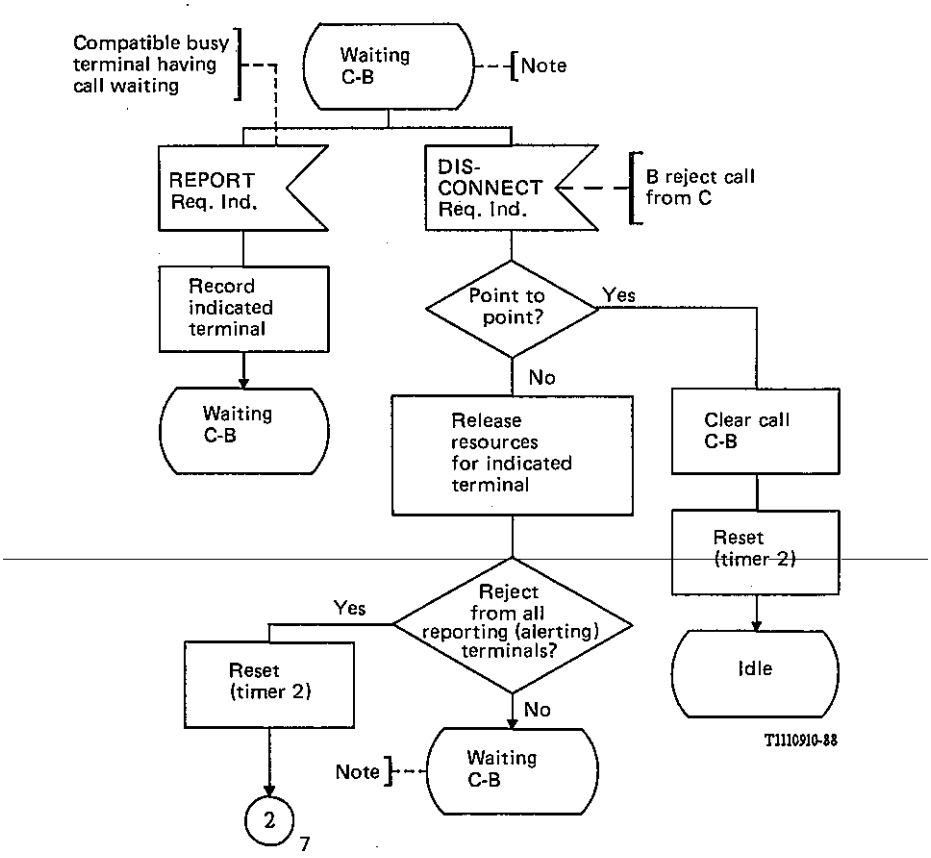
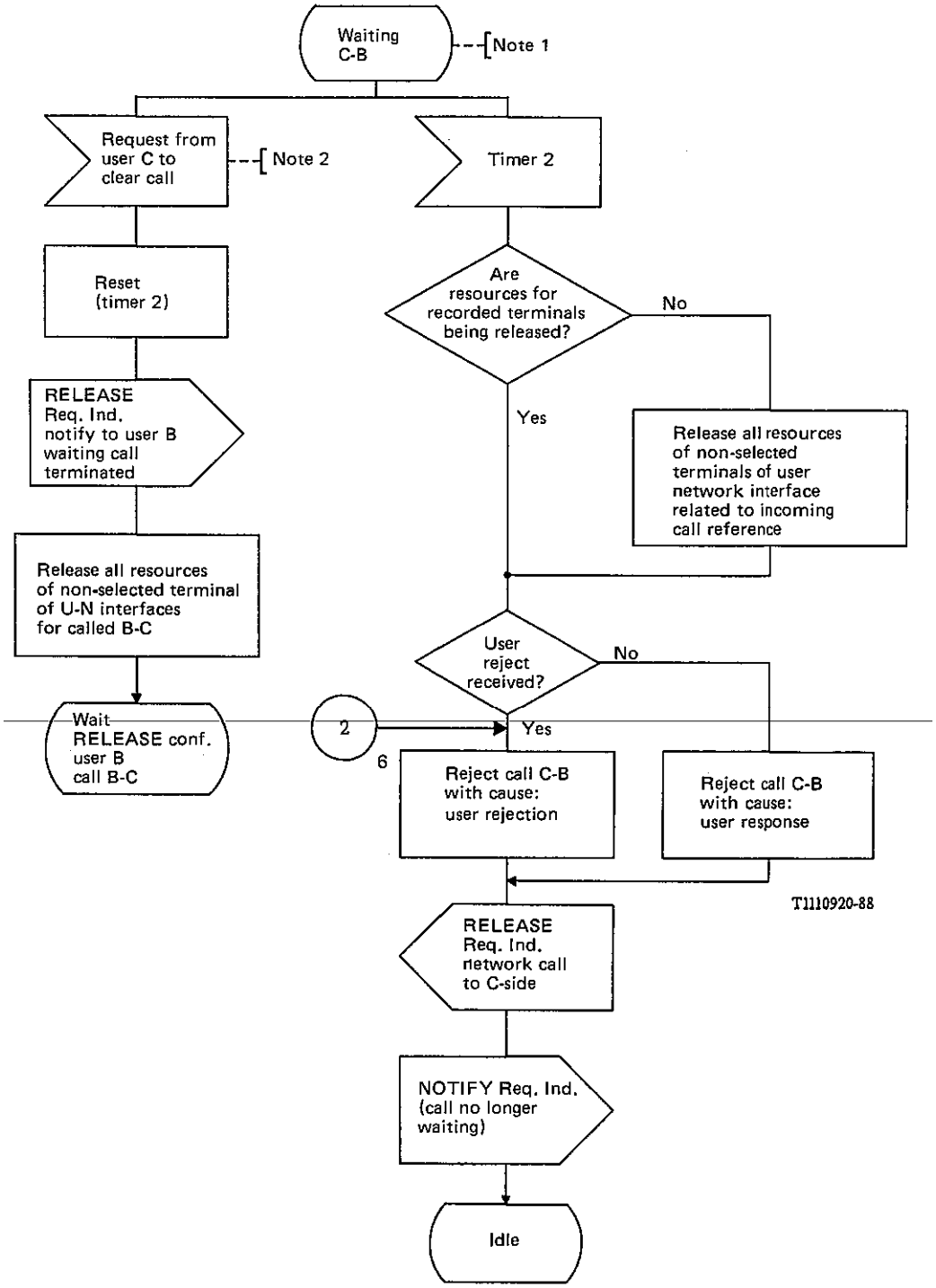



FIGURE 1-10/Q.83 (Sheet 5 of 7)
**Call waiting process FE5**




*Note* – This is a substate of the "$r_2$-$r_1$ CALL SENT" state as described in the basic service description.

FIGURE 1-10/Q.83 (Sheet 6 of 7)
**Call waiting process FE5**




*Note 1* – This is a substate of the "$r_2$-$r_1$ CALL SENT" state as described in the basic service description.
*Note 2* – This is an "R2 DISCONNECT IND" signal.

FIGURE 1-10/Q.83 (Sheet 7 of 7)
**Call waiting process FE5**

1.7 *Allocation of functional entities to physical locations*

The following allocation of functional entities to physical locations of the call waiting supplementary service are applicable:

i) Case 1

FE1 FE3 FE4 FE5 FE6

FE2 <ACCESS> FE7 <NETWORK> FE8 <NETWORK> LE <ACCESS> TE

TE LE TR

FE1, FE2 and FE6 are the functional entities which represent the users of the call waiting supplementary service (e.g. may be physically located in TE or NT2 equipment). FE1 represents user A, FE2 user C and FE6 user B. FE6 is the service requesting terminal and FE1 and FE2 the remote terminals.

FE3, FE4, FE5, FE7 and FE8 are the functional entities which represent the network functions.

FE5 represents the network access providing exchange, FE4 and FE8 the transit exchanges, FE3 and FE7 the remote local exchanges.

ii) Case 2

FE1 FE3 FE4 FE5 FE6

FE2 <ACCESS> FE7 <NETWORK> FE8 <ACCESS> NT2 <ACCESS> TE

TE LE LE (PRA) (BA)

FE1, FE2, FE5 AND FE6 are the functional entities which represent the users of the call waiting supplementary service. FE1 represents user A, FE2 user C.

FE6 is the service requesting terminal while FE5 represents the service providing NT2.

FE3, FE4, FE7 and FE8 are the functional entities which represent the local network functions.

iii) *Case 3*

FE1 FE3 FE4 FE5

FE2 <ACCESS> FE7 <ACCESS> FE8 <NETWORK> LE <ACCESS> FE6

TE NT2 LE

FE1, FE2, FE3, FE6 and FE7 are the functional entities which represent the users of the call waiting supplementary service. FE1 and FE3 represent user A, FE2 and FE7 represent user C while FE6 represents user B.

FE6 is the service requesting terminal, FE1 and FE2 the remote terminals and FE3 and FE7 the remote NT2s.

FE4, FE5 and FE8 are the functional entities which represent the local network functions.

iv) *Case 4*

FE1 FE3 FE4 FE5

FE2 <ACCESS> FE7 <NETWORK> FE8 <ACCESS> NT2 <ACCESS> FE6

NT2 LE LE

FE1, FE2, FE5 and FE6 are the functional entities which represent the users of the call waiting supplementary service. FE1 represents user A, FE2 user C and FE5 and FE6 user B, FE6 being the service requesting terminal.

FE5 being the service providing NT2 and FE1 and FE2 the remote terminals.

FE3, FE4, FE7 and FE8 are the functional entities which represent the local network functions.

v) *Case 5*

FE1 FE3 FE4 FE5

FE2 <ACCESS> FE7 <NETWORK> FE8 <ACCESS> TE

TE/NT2 LE

FE1, FE2 and FE5 are the functional entities which represent the users of the call waiting supplementary service. FE1 represents user A, FE2 user C and FE5 and FE6 user B, FE5 is as well as the service requesting as the service providing terminal while FE1 and FE2 are the remote terminals/NT2s.

FE3, FE4, FE7 and FE8 are the functional entities which represent the local network functions.

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Printed in Switzerland
Geneva, 2008