

Recommendation Q.764 - Signalling procedures

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Recommendation Q.762 [1] and their format and content are given in Recommendation Q.763 [2]. Recommendation Q.730 [3] contains the procedures for supplementary services. (These were previously § 4 of Recommendation Q.764.)

d) Transfer of information not included in the Initial Address Message

As an alternative to the inclusion of call set-up user facility information in the Initial Address Message, any call set-up user facility information that need not be examined at intermediate exchanges and which can be requested from by the destination exchange (see Recommendation Q.763, § 3.22), may be transported between the originating and destination exchange. The method of transportation for this information can be by the link-link method (see section 2.1.6) or via the end-to-end methods (see section 3).

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when digit analysis or timer

(T₁₀), or receipt of the Address Complete Message indicates that all digits have been received.

a) If an indication that the address is complete or no status indication has been received from the ISDN access prior to the destination exchange determining that the complete called party number has been received, the indicators in the Address Complete Message will be set as follows:

significant digits in the called party number may be amended or omitted (see section 2.1.1.1 b)). A change of the

2.1.4.9 Return of sub-address information in Address Complete Message, Connect Message or Call Progress Message

If sub-address information is received from the called access this information is passed unchanged to the originating exchange in the access transport parameter of the Address Complete Message, Connect Message or Call Progress Message.

- if all the information is not available locally or remotely, then an Information Message containing only the available information is sent and the requested but not delivered information is indicated as "not available", using either the indication in the Information Indicator or an appropriate coding in the requested parameter.

2.1.6.3 Sending unsolicited information

Information that is available at an exchange and that does not correspond to information which can be or has been requested by an Information Request Message, can be sent in the Information Message with the solicited information indicator set to signify that the message has been sent unsolicited.

The unsolicited Information Message can be used only if the ISDN user part has been used all the way. It can be sent in any direction in any call state (except in the awaiting release complete state).

Solicited and unsolicited information must not be sent in the same Information Message; if unsolicited information is to be sent at the same time together with solicited information, this has to be done in a separate message with the Solicited Information Indicator set to "Unsolicited".

2.1.6.4 Receiving an Information Message

Upon receipt of an Information Message which does neither contain the requested information or an indication that the requested information is not available, the actions taken will depend on whether the call can be progressed.

Address Message is the same as described in section 2.1.1.1 c).

The only purpose of the Subsequent Address Message is to carry further digits.

The initiating exchange immediately starts the release of the switched path (if established). The exchange sends a Release Message to the preceding exchange and a timer (T_1) is started to ensure that a Release Complete Message is received from the preceding exchange within time T_1 . (Expiration of Timer (T_1) is covered in 2.10.6) (i.e. the exchange controlling the call)

(see section 2.2.4); or

(as described in section 2.2.4).

(ed note word PROCEDURES removed)

The Suspend Message indicates a temporary cessation of communication without releasing the call. It can only be accepted during the conversation/data phase. A Suspend Message can be either generated in response to a suspend request from the calling/called party or generated by the network in response to a clearback indication from an interworking node or an on-hook condition from an analogue called (telephone) party.

(ed note 'called party' removed)

A suspend Message can be generated by the network in response to a clearback indication from an interworking node or an on hook condition from an analogue called party.

a) Action at the terminating exchange (destination) or an interworking exchange

On receipt of the on hook condition or clearback indication or Suspend Message, the controlling exchange starts a timer (T_6) to ensure that an off hook condition, a re-answer indication, a Resume (network) Message or a Release Message is received. The value of this timer (T_6) is covered in Q.118 [11]. If the timer (T_6) expires, the procedures in Section 2.5.3. [1] apply.

Having initiated a suspend condition, a calling party may request a reconnection within timer T_2 . The procedures in Section 2.5.1.1 items a), b) and c) apply except that the Resume Message replaces the Suspend Message. On receipt of the Resume Message, the controlling exchange cancels the timer. (T_2)

A Resume Message is initiated by the network, if a Suspend Message had previously been sent, in response to a reanswer indication from an interworking node or an off hook condition from an analogue called party.

a) Action at the terminating exchange or interworking exchange

On receipt of a reanswer indication at the interworking exchange or an off hook condition in the terminating exchange, the exchange may send a Resume (network) Message to the preceding exchange if a Suspend (network) Message had previously been sent.

c) Action of the controlling exchange (i.e. that exchange controlling the call)

Recommendation Q 118) [11] then the controlling exchange will initiate the release procedure outlined in section 2.3.3.

At the start of the call, it is required to know whether the call is an alternate speech/64 kbit or alternate 64 Kbit/speech unrestricted call request. If this is the case then the following procedures apply:

On receipt of a Call Modification Completed Message, the intermediate exchange modifies the resource and, when complete, sends a Call Modification Completed Message to the next exchange.

Actions required at the local exchange receiving the request call for in-call modification

2.7.2.3 Action required at the remote local exchange receiving the call modification request from the network.

If at the remote local exchange the in call modification cannot be

performed, the characteristics of the transmission path are kept in the current mode and the Call Modification Reject Message is returned to the network. If resources have been reserved upon reception of the Call modification Request Message, they are released.

2.8 Echo Control Procedure

2.7.2.1 Actions required at the local exchange initiating the call modification

- a) When the nature of connection indicators parameter field in the IAM indicates that an echo control device is already included:
 - no change to the nature of connection indicators parameter field in the IAM is made;
 - an incoming half echo control device is reserved; and
 - any outgoing half echo control device is disabled.
- b) When the nature of connection indicators parameters in the IAM does not indicate that an echo control device is already included:
 - an outgoing half echo control device is enabled; and
 - the echo control device indicator in the Nature of connection indicators parameter field is set.
- a) When the nature of connection indicators parameter field the IAM indicates that echo control device is already included:
 - no change to the nature of connection indicators parameter field in the IAM is made; and
 - an incoming half echo control device is reserved.
- b) When the nature of connection indicator parameters field in the IAM does not indicate that an echo control device is already included:
 - no additional action is required.

Upon the receipt of an IAM with the indication "outgoing half echo control device included" in the nature of connection indicators parameter field, the following action is taken:

- the echo control device indicator of the backward call indicators parameter field in the first backward message (i.e. ACM or Connect or Call Progress) is set.

If the destination exchange is unable to include an incoming half echo

control device, the information is conveyed to the preceding exchange by echo a control device indicator in the nature of connection indicators field not being set in the first backward message.

Upon receipt of the first backward message (i.e. ACM or Connect or Call Progress) in response to an IAM with echo control indication, then one of the following action can occur:

- a) When the backward call indicators parameter field indicates that incoming half echo control device is already included:
- b) When the backward call indicators parameter field indicates that an incoming half echo control device is already included:
is made.

Automatic repeat attempt, as defined in Recommendation Q.12 [12], is provided in signalling system No 7. An automatic repeat attempt will be made (up to the point when the Initial Address Message information is released. See section 2.3.4.

In the event of a Blocking Message being received:- after an Initial Address Message has been sent in the opposite direction on that circuit, and before a backward message relating to that call has been received, an automatic repeat attempt will be made on another circuit. The exchange receiving the Blocking Message releases the original call attempt in the normal manner after sending the Blocking Acknowledgement message and will not seize that circuit for subsequent calls.

If the Blocking Message is received:

A circuit is controlled by the ISDN User Part if it can be used by the ISDN User Part as a circuit switched bearer. Hence, time slots in a digital path that are used for synchronisation (e.g. time slot 0 in a 2048 kbit/s digital path) or as signalling channels are not circuits whose control is allocated to the ISDN User Part.

be received from the called party. If a destination exchange [9], section 7. [9], section 9.

all parameters in the Initial Address Message. The contents of the Initial Address Message information shall be updated, if the value of parameters change during the call set-up.

have chosen a suitable route (e.g. 64 kbit/s and ISDN user part signalling used all the way) according to information included in the Initial Address Message. Message, the controlling exchange starts a timer (T_2) to ensure that a resume request or Resume Message is received within timer T_2). If the timer (T_2) expires, the procedures in section 2.5.3 apply.

- a) Action at the terminating exchange or interworking exchange

On receipt of a re-answer indication at the interworking exchange or an off-hook condition in the terminating exchange, the exchange may send a Resume (network) Message to the preceding exchange if a Suspend (network) Message had previously been sent.

b) Actions of the intermediate exchange

On receipt of a Resume Message the exchange will send a Resume Message to the preceding exchange.

c) Action of the controlling exchange (i.e. that exchange controlling call)

On receipt of the off-hook condition, re-answer signal, Release message or Resume Message the controlling exchange stops the timer (T_6) (started in paragraph 2.5.1.3. b).

2.5.3 Expiration of timer (T_2) or timer T_6

If a request for reconnection or a Resume Message is not received within timer (R_2) or timer (T_6) covered in Recommendation Q 118 [11] then the controlling exchange will initiate the release procedure outlined in section 2.3.3.

condition is removed or the timer (T_3 *) matures, the network generates the normal release sequence(section 2.3.3).

a) When the nature of connection indicators parameter field in the IAM indicates that an echo control device is already included

- no change to the nature of connection indicators parameter field in the IAM is made;
- an incoming half echo control device is reserved; and
- any outgoing half echo control device is disabled.

b) When the nature of connection indicators parameters in the IAM does not indicate that an echo control device is already included:

- an outgoing half echo control device is enabled; and
- the echo control device indicator in the Nature of connection indicators parameter field is set.

If the intermediate exchange has sufficient information to determine that echo control is not required for the outgoing circuit then one of the following actions can occur:

a) When the nature of connection indicators parameter field in the IAM indicates that echo control device is already included:

- no change to the nature of connection indicators parameter field in the IAM is made; and
- an incoming half echo control device is reserved.

b) When the nature of connection indicator parameter field in the IAM does not indicate that an echo control device is already included:

- no additional action is required.

REFERENCES

- [1] CCITT Recommendation Q.762 - General functions of messages and signals.
- [2] CCITT Recommendation Q.763 - Formats and codes.
- [3] CCITT Recommendation Q.730 - ISDN supplementary services.
- [4] CCITT Recommendation E.163 - Numbering plan for the international telephone service.
- [5] CCITT Recommendation E.164 - Numbering plan for the ISDN era.
- [6] CCITT Recommendation Q.107 - Standard sending sequence of forward address information.
- [7] CCITT Recommendation E.172 - Call routing in the ISDN era.
- [8] CCITT Recommendation Q.33 - Protection against the effects of faulty transmission on groups of circuits.
- [9] CCITT Recommendation Q.724 - Signalling procedures.

- [10] CCITT Recommendation Q.543 - Digital exchange performance design objectives.
- [11] CCITT Recommendation Q.118 - Special release arrangements.
- [12] CCITT Recommendation Q.12 - Overflow-alternative routing-rerouting- automatic repeat attempt.
- [13] CCITT Recommendation Q.706 - Message Transfer Part signalling performance.
- [14] CCITT Recommendation Q.714 - Signalling Connection Control Part procedures.
- [15] CCITT Recommendation Q.711 - Functional description of the Signalling Connection Control Part.

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Annex A - (to Recommendation Q.764)

STATE TRANSITION DIAGRAMS

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ANNEX A

(to Recommendation Q.764)

State transition diagrams

Should any conflict arise between the text and the SDL definition, the textual description is taken as definitive.

A.1 General

This Annex contains the description of the signalling procedures described in this Recommendation in the form of state transition diagrams according to the CCITT Specification and Description Language (SDL). In order to facilitate functional description, the ISDN User Part (ISDN-UP) signalling procedure is divided into main functional blocks, as shown in Figure A-1/Q.764. These blocks are as follows:

1) Signalling Procedure Control (SPRC)

SPRC provides procedures for sending ISUP messages to Level 3 (SCCP or MTP) and distributing received ISUP messages to the other ISUP functional blocks.

2) Call Processing Control (CPC)

CPC provides call control procedures for realizing basic circuit switched service according to user's request.

3) Circuit Supervision Control (CSC)

CSC provides procedures for circuit supervision control for maintenance purpose and for recovery from abnormal situation.

A.2 Drafting convention

a) External inputs and outputs are used for interactions with a remote exchange and interaction between SPRC and the other functional blocks. Internal inputs and outputs are used for interactions within each functional block, e.g., to indicate control of time-out. For these interactions, input and output symbols are used as shown in Figure A-2/Q.764.

b) Inputs and outputs symbols contain as part of their name acronyms of their source and destination functional block names with an arrow in between, e.g., Blocking BLS -> CPC.

c) A simple example of SDL diagram according to the above conventions is shown in Figure A-3/Q.764.

A.3 Abbreviations, timers and primitives

A.3.1 Abbreviations

1) Signalling Procedure Control: Table A-1/Q.764

2) Call Processing Control: Table A-2/Q.764

3) Circuit Supervision Control: Table A-3/Q.764

A.3.2 Timers

Timers used in the ISDN-UP SDL diagrams are shown in Table A-4/Q.764.

A.3.3 Primitives

Primitives used over the interface between Call Control and ISDN-UP are shown in Table A-5/Q.764.

A.4 State transition diagrams and SDL diagrams

Each ISDN-UP main functional block is further subdivided into the functional blocks. Functional diagrams and simple state transition diagrams for each main functional block are shown below:

- 1) Signalling Procedure Control (SPRC)
 - Functional diagrams: Figure A-4/Q.764
 - State transition diagrams: Figure A-5/Q.764
- 2) Call Processing Control (CPC)
 - Functional diagrams: Figure A-6/Q.764
 - State transition diagrams: Figure A-7 - 9/Q.764
- 3) Circuit Supervision Control (CSC)
 - Functional diagrams: Figure A-10/Q.764
 - State transition diagrams: Figure A-11 - 18/Q.764

The ISDN-UP SDL diagrams are described based on the three-blocks approach. In this approach Call control, which provides signalling independent functions such as connect through, circuit selection and digits analysis is outside the ISDN-UP. These functions are described only in sections 1-4. The ISDN-UP diagrams are provided for the above subdivided functional blocks, as shown below:

- 1) Signalling Procedure Control (SPRC)
 - Message Sending Control: Figure A-19/Q.764
 - Message Distributing Control: Figure A-20/Q.764
- 2) Call Processing Control (CPC)
 - Call Processing Control Incoming (CPCI): Figure A-21/Q.764
 - Call Processing Control Outgoing (CPCO): Figure A-22/Q.764
 - Continuity Check Incoming (CCI): Figure A-23/Q.764
 - Continuity Check Outgoing (CCO): Figure A-24/Q.764
- 3) Circuit Supervision Control (CSC)
 - Blocking/Unblocking Message Sending (BLS): Figure A-25/Q.764
 - Blocking/Unblocking Message Reception (BLR): Figure A-26/Q.764
 - Maintenance Oriented Circuit Group Blocking/Unblocking Sending (MGBS): Figure A-27/Q.764

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- Maintenance Oriented Circuit Group
Blocking/Unblocking Reception
(MGBR): Figure A-28/Q.764
- Hardware Failure Oriented Locally
Blocking State (HLB): Figure A-29/Q.764
- Hardware Failure Oriented Remotely
Blocking State (HRB): Figure A-30/Q.764
- Hardware Failure Oriented Circuit
Group Blocking/Unblocking Sending
(HGBS): Figure A-31/Q.764
- Hardware Failure Oriented Circuit
Group Blocking/Unblocking Reception
(HGBR): Figure A-32/Q.764
- Circuit Reset Sending (CRS): Figure A-33/Q.764
- Circuit Reset Reception (CRR): Figure A-34/Q.764
- Circuit Group Reset Sending (CGRS): Figure A-35/Q.764
- Circuit Group Reset Reception
(CGRR): Figure A-36/Q.764
- Continuity Recheck Sending (CRCS): Figure A-37/Q.764
- Continuity Recheck Reception
(CRCR): Figure A-38/Q.764
- Circuit Group Query Sending (CQS): Figure A-39/Q.764
- Circuit Group Query Reception
(CQR): Figure A-40/Q.764

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FIGURE A-1/Q.764

Overview Functional Block Diagram for ISDN-UP

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Note - Input which is not shown in SDL diagrams should be discarded.

FIGURE A-2/Q.764

Symbols Used In SDL Diagrams

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FIGURE A-3/Q.764

SDL Convention Example

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TABLE A-1/Q.764

Signalling Procedure Control Acronym

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TABLE A-2/Q.764

Call Processing Control Acronym

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TABLE A-3/Q.764

Circuit Supervision Control Acronym

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TABLE A-4/Q.764

Timers

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TABLE 1-5/Q.764

Primitives

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FIGURE A-4/Q.764

Functional Block Diagram for SPRC

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FIGURE A-5/Q.764

State Transition Diagrams for SPRC

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FIGURE A-6/Q.764

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Functional Block Diagram for CPC

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FIGURE A-7/Q.764

State Transition Diagrams for CPC Incoming (CPCI)

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FIGURE A-8/Q.764

State Transition Diagrams for CPC Outgoing (CPCO)