INTERNATIONAL TELECOMMUNICATION UNION

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THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

BLUE BOOK

VOLUME VI – FASCICLE VI.8

SPECIFICATIONS OF SIGNALLING SYSTEM No. 7

RECOMMENDATIONS Q.721-Q.766

IXTH PLENARY ASSEMBLY
MELBOURNE, 14-25 NOVEMBER 1988

Geneva 1989

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Specifications of Signalling System No. 7

PRELIMINARY NOTES

1 The Questions entrusted to each Study Group for the Study Period 1989-1992 can be found in Contribution No. 1 to that Study Group.

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

3 The strict observance of the specifications for standardized international signalling and switching equipment is of the utmost importance in the manufacture and operation of the equipment. Hence these specifications are obligatory except where it is explicitly stipulated to the contrary.

The values given in Fascicles VI.1 to VI.13 are imperative and must be met under normal service conditions.

FASCICLE VI.8

Recommendations Q.721 to Q.766

SPECIFICATIONS OF SIGNALLING SYSTEM No. 7

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SECTION 1

TELEPHONE USER PART (TUP)

Recommendation Q.721

FUNCTIONAL DESCRIPTION OF THE SIGNALLING SYSTEM No. 7 TELEPHONE USER PART (TUP)

1 General

Use of Signalling System No. 7 for telephone call control signalling requires:

- application of *Telephone User Part* (TUP) functions, in combination with
- application of an appropriate set of *Message Transfer Part* (MTP) functions.

A general description of the signalling system and the division of functions between the Message Transfer Part and the Telephone User Part are presented in Recommendation Q.700 and the requirements of interaction between those two parts are contained in Recommendation Q.701.

2 Telephone User Part

The Telephone User Part specified in these specifications defines the necessary telephone signalling functions for use of Signalling System No. 7 for international telephone call control signalling. It is specified with the aim of providing the same features for telephone signalling as other CCITT telephone signalling systems.

Signalling System No. 7 can be used to control the switching of all types of international circuits to be used in a worldwide connection, including circuits with speech interpolation and satellite circuits.

The system meets all requirements defined by the CCITT concerning the service features for worldwide international semiautomatic and automatic telephone traffic. It is designed for the bothway operation of speech circuits.

When used with homogeneous digital telephone circuits the continuity of these circuits is ensured by the means for transmission quality supervision and failure detection that are inherent in the digital systems providing these circuits. However, the system includes means for link-by-link assurance of continuity check of the speech path when used with analogue telephone circuits and/or digital circuits including certain types of equipment, where fault indications are lost, e.g., circuit multiplication equipment.

The signalling system is suitable for national telephone applications. Most telephone signalling message types and signals specified for international use are also required in typical national applications. In addition to these, national applications typically require additional signalling message types and signals; the system provides ample spare capacity for such additions.

The standard label structure specified for telephone signalling messages requires that all exchanges using the signalling system are allocated codes from code plans established for the purpose of unambiguous identification of signalling points. The principles to apply to the international signalling network are specified in Recommendation Q.708.

3 Message Transfer Part

The Message Transfer Part of Signalling System No. 7 is specified in Recommendations Q.701 to Q.709. An overview description of the Message Transfer Part is contained in Recommendation Q.701.

The Message Transfer Part defines a range of functions by which different signalling modes and different signalling network configurations may be realized. Any application of Signalling System No. 7 requires that an appropriate selection of these functions is applied depending on the intended use of the system and the characteristics of the telecommunications network concerned.

Recommendation Q.722

GENERAL FUNCTION OF TELEPHONE MESSAGES AND SIGNALS

This Recommendation describes the general function of telephone signalling messages and the telephone signals and other information components contained in those messages. The requirements relating to the use of the signalling messages and their signal content are specified in Recommendations Q.723 and Q.724.

1 Telephone signalling messages

The definition of formats and codes for telephone messages is based on a functional grouping as indicated in the following. It is expected that national application of the signalling system typically will require further message types in addition to the internationally defined message types indicated in the following. As a result of the criteria on which the grouping of message types are based some groups as yet only contain one message type.

1.1 *Forward address message group*

This message group includes messages sent in the forward direction containing address information. Signals from § 3.3 may be included. Messages so far specified are as follows.

1.1.1 *Initial address message*

A type of message sent first in the forward direction at call set-up. It contains address information and other information relating to the routing and handling of the call.

1.1.2 *Initial address message with additional information*

A type of message sent first in the forward direction at call set-up. It contains address, routing and handling information such as charging and supplementary services information to be used in the call set-up procedures.

1.1.3 *Subsequent address message*

A type of message sent in the forward direction subsequent to the initial address message and containing further address information.

1.1.4 *Subsequent address message with one signal*

A type of message sent in the forward direction subsequent to the initial address message or to the subsequent address message and containing only one address signal.

1.2 *Forward set-up message group*

This message group includes messages sent in the forward direction, subsequent to address messages containing further information for call set-up. Signals from § 3.3 may be included. Messages so far specified are as follows.

1.2.1 *General forward set-up information message*

A type of message containing information relating to the calling line or possibly other information required for call set-up. This message is sent in response to a general request message.

1.2.2 *Continuity check message*

A type of message containing a continuity signal or a continuity-failure signal.

1.3 *Backward set-up request message group*

This message group includes messages sent in the backward direction requesting further information for call set-up. Signals from § 3.4 may be included. Messages so far specified are as follows.

1.3.1 *General request message*

A type of message containing a signal requesting transfer of information relating to a call, e.g., the identity or the category of the calling party.

1.4 *Successful backward set-up information message group*

This message group includes messages sent in the backward direction containing information relating to a successful call set-up. Signals from § 3.4 may be included. Messages so far specified are as follows.

1.4.1 *Address-complete message*

A type of message containing a signal indicating that all address signals required for routing the call to the called party have been received and giving additional information relating to this.

1.4.2 *Charging message*

A type of message containing charging information.

1.5 *Unsuccessful backward set-up information message group*

This message group includes messages sent in the backward direction containing information relating to an unsuccessful call set-up. Signals from § 3.4 may be included. Messages so far specified are as follows.

1.5.1 *Simple unsuccessful backward set-up information message*

A message containing a signal from § 3.4, relating to an unsuccessful call set up.

1.5.2 *Extended unsuccessful backward set-up information message*

A message containing a signal from § 3.4, relating to an unsuccessful call set up, and additional information.

1.6 *Call supervision message group*

This message group includes messages sent in the forward or backward direction, relating to the supervision of the call. Signals from § 3.5 are included.

1.7 *Circuit supervision message group*

This message group includes messages sent in the forward and backward direction, relating to the supervision of the circuit. Signals from § 3.6 are included.

1.8 *Circuit group supervision message group*

This message group contains messages from § 3.7, relating to the supervision of circuit groups.

1.9 *Circuit network management message group*

This message group includes network management messages sent in the backward direction, which are used to control traffic flow to reduce exchange switching congestion. Messages so far specified are as follows.

1.9.1 *Automatic congestion control information message*

A type of message containing information relating to the congestion status of the exchange. Signals from § 3.8 are included.

2 Service information

The service information provides the highest level of discrimination between different sets of signalling messages. It contains the following components. (See also Note.)

2.1 *Service indicator*

Information used to identify the User Part to which the signalling message belongs.

2.2 *Network indicator*

Information used for discrimination between international and national messages. In case of national messages, it may for example also be used for discrimination between different label alternatives for national use.

Note – The service information octet and the label are not included in messages transferred between the telephone user part and the signalling connection control part (e.g., node to node messages).

3 Signalling information

3.1 *Label components*

In the case of the telephone signalling messages, the label is used for message routing and, in general, identification of the concerned telephone circuit. The standard label structure consists of the following components.

3.1.1 *Destination point code*

Information identifying the signalling point to which the message is to be routed.

3.1.2 *Originating point code*

Information identifying the signalling point from which the message has been originated.

3.1.3 *Circuit identification code*

Information identifying the telephone circuit among those interconnecting the destination point and originating point.

3.2 *Message format identifiers*

3.2.1 *Heading*

Information discriminating, as applicable, between different groups or individual types of messages within the set of messages identified by the service information. The heading is split into two levels. The first level discriminates between different groups. The second level either discriminates between different message types or contains a signal.

3.2.2 *Field length indicator*

Information associated with and indicating the length of a variable length field.

3.2.3 *Field indicator*

Information associated with and indicating the presence or absence of an optional field.

3.3 *Forward set-up telephone signals*

3.3.1 *Address signal*

A call set-up signal sent in the forward direction containing one element of information (digit 0, 1, 2, . . ., 9, Code 11 or Code 12) about the called party's number or the end-of-pulsing (ST) signal.

For each call, a succession of address signals is sent.

3.3.2 *End-of-pulsing (ST) signal*

An address signal sent in the forward direction indicating that there are no more address signals to follow.

3.3.3 *Nature-of-address indicator*

Information sent in the forward direction indicating whether the associated address or line identity is an international, national significant or subscriber number.

3.3.4 *Nature-of-circuit indicator*

Information sent in the forward direction about the nature of the circuit or any preceding circuit(s) already engaged in the connection:

- a satellite circuit, or
- no satellite circuit.

An international exchange receiving this information will use it (in combination with the appropriate part of the address information) to determine the nature of the outgoing circuit to be chosen.

3.3.5 *Outgoing echo suppressor indicator*

Information sent in the forward direction indicating whether or not an outgoing half-echo suppressor is included in the connection.

3.3.6 *Incoming international call indicator*

Information sent in the forward direction indicating that the call is an incoming international call.

3.3.7 *Calling-party's-category*

Information sent in the forward direction about the category of the calling party and, in case of semiautomatic calls, about the service language to be spoken by the incoming, delay and assistance operators.

The following categories are provided:

- operator,
- ordinary calling subscriber,
- calling subscriber with priority,
- data call,
- test call,
- payphone.

3.3.8 *Incomplete calling line identity indicator*

An indicator sent in the forward direction indicating that the calling line identity is incomplete.

3.3.9 *Continuity-check indicator*

Information sent in the forward direction indicating whether or not a continuity check will be performed on the circuit concerned or is being (has been) performed on a previous circuit in the connection.

3.3.10 *Calling line identity*

Information sent in the forward direction indicating the national significant number of the calling party.

3.3.11 *Calling line identity presentation indicator*

Information indicating whether or not the calling line identity presentation is restricted.

3.3.12 *Calling-line-identity-unavailable indicator*

Information sent in the forward direction indicating that the identity of the calling line is not available.

3.3.13 *Calling party's category unavailable indicator*

Information sent in the forward direction to indicate that the calling party's category is not available.

3.3.14 *Original called address not available indicator*

Information sent in the forward direction indicating that the original called address is not available.

3.3.15 *Continuity signal*

A signal sent in the forward direction indicating continuity of the preceding System No. 7 speech circuit(s) as well as of the selected speech circuit to the following international exchange, including verification of the speech path across the exchange with the specified degree of reliability.

3.3.16 *Continuity-failure signal*

A signal sent in the forward direction indicating failure of continuity of the System No. 7 speech circuit.

3.3.17 *Redirected call indicator*

Information sent in the forward direction indicating that the call is a forwarded call.

3.3.18 *Original called address*

Information sent in the forward direction indicating the address towards which the call was previously routed (before the redirection occurred).

3.3.19 *All digital path required indicator*

Information sent in the forward direction indicating the type path required (64 kbit/s circuit switched connection-transparent).

3.3.20 *Signalling path indicator*

Information sent in the forward direction indicating that the signalling system used since the originating exchange is System No. 7.

3.3.21 *Additional signals relating to the closed user group facilities*

3.3.21.1 *Closed user group call indicator*

Information sent in the forward direction indicating whether or not the call involves a closed user group and whether or not outgoing access is allowed for the calling user.

3.3.21.2 *Interlock code*

Information sent in the forward direction identifying a closed user group to which the calling user belongs.

3.3.22 *Malicious call identification indicator*

Information sent in the forward direction indicating that the malicious call identification has been provided or not.

3.3.23 *Hold indicator*

Information sent in the forward direction indicating whether the requested holding of the connection is possible or not.

3.3.24 *Transit exchange identity type indicator*

Information sent in the forward direction indicating the type of information included as transit exchange identity.

3.3.25 *Transit exchange identity*

Information sent in the forward direction indicating the identity of the transit exchange by which the call is established such as signalling point code or a part of the calling line identity.

3.3.26 *Incoming trunk identity*

Information sent in the forward direction indicating the identity of the incoming trunk on which the call is established.

3.3.27 *Signals related to charging facilities*

For further study.

3.3.28 *Charging information*

Information sent in the forward direction for charging and/or accounting purposes.

3.4 *Backward set-up telephone signals*

3.4.1 *Calling-line-identity-request indicator*

Information sent in the backward direction requesting transfer of the calling line identity from the originating exchange.

3.4.2 *Calling party's category request indicator*

Information sent in the backward direction requesting transfer of the calling party's category from the originating exchange.

3.4.3 *Original called address information request indicators*

Information sent in the backward direction requesting transfer of the original called address from the originating exchange.

3.4.4 *Address-complete signal*

A signal sent in the backward direction indicating that all the address signals required for routing the call to the called party have been received and that no called-party's-line-condition signals (electrical) will be sent.

3.4.5 *Address-complete signal, charge*

A signal sent in the backward direction indicating that all the address signals required for routing the call to the called party have been received, that no called-party's-line-condition signals (electrical) will be sent and that the call should be charged on answer.

3.4.6 *Address-complete signal, no-charge*

A signal sent in the backward direction indicating that all the address signals required for routing the call to the called party have been received, that no called-party's-line-condition (electrical) will be sent and that the call should not be charged on answer.

3.4.7 *Address-complete signal, payphone*

A signal sent in the backward direction indicating that all the address signals required for routing the call to the called party have been received, that no called-party's-line-condition (electrical) will be sent, that the call should be charged on answer and that the called number is a payphone station.

3.4.8 *Subscriber-free indicator*

Information sent in the backward direction indicating that the called party's line is free.

3.4.9 *Incoming echo suppressor indicator*

Information sent in the backward direction indicating that an incoming half-echo suppressor has been inserted or not.

3.4.10 *Call forwarding indicator*

Information sent in the backward direction indicating that the call has been forwarded to a different address.

3.4.11 *Signalling path indicator*

Information sent in the backward direction indicating that the signalling system used since the terminating exchange is Signalling System No. 7.

3.4.12 *Charging information signals*

Information sent in the backward direction for charging and/or accounting purposes.

3.4.13 *Outgoing echo suppressor request indicator*

Information sent in the backward direction requesting for the insertion of an outgoing suppressor.

3.4.14 *Hold request indicator*

Information sent in the backward direction indicating that the hold of the connection is requested. The release of the call will be controlled by the terminating exchange.

3.4.15 *Malicious call identification indicator*

Information sent in the backward direction indicating that a malicious call identification facility has been encountered.

3.4.16 *Switching-equipment-congestion signal*

A signal sent in the backward direction indicating the failure of the call set-up attempt due to congestion encountered at international switching equipment.

3.4.17 *Circuit-group-congestion signal*

A signal sent in the backward direction indicating the failure of the call set-up attempt due to congestion encountered on an international circuit group.

3.4.18 *National-network-congestion signal*

A signal sent in the backward direction indicating the failure of the call set-up attempt due to congestion encountered in the national destination network [excluding the busy condition of the called party's line(s)].

3.4.19 *Digital path not provided signal*

Information sent in the backward direction indicating that a routing which allows the complete digital path requested does not exist.

3.4.20 *Address-incomplete signal*

A signal sent in the backward direction indicating that the number of address signals received is not sufficient for setting up the call. This condition may be determined in the incoming international exchange (or in the national destination network):

- immediately after the reception of an ST signal, or
- on timeout after the latest digit received.

3.4.21 *Call-failure signal*

A signal sent in the backward direction indicating the failure of a call set-up attempt due to the lapse of a timeout or a fault not covered by specific signals.

3.4.22 *Called party's line condition signals*

3.4.22.1 *Unallocated-number signal*

A signal sent in the backward direction indicating that the received number is not in use (e.g., spare level, spare code, vacant subscriber's number).

3.4.22.2 *Subscriber-busy signal (electrical)*

A signal sent in the backward direction indicating that the line(s) connecting the called party with the exchange is (are) engaged. The subscriber-busy signal will also be sent in case of complete uncertainty about the place where the, busy or congestions are encountered and in the case where a discrimination between subscriber-busy and national-network congestion is not possible.

3.4.22.3 *Line-out-of-service signal*

A signal sent in the backward direction indicating that the called party's line is out-of-service or faulty.

3.4.22.4 *Send-special-information-tone signal*

A signal sent in the backward direction indicating that the special information tone should be returned to the calling party. This tone indicates that the called number cannot be reached for reasons not covered by other specific signals and that the unavailability is of a long-term nature (see also Recommendation Q.35 [1]).

3.4.23 *Access barred signal*

Information sent in the backward direction indicating that the call is rejected because a compatibility check failed.

3.4.24 *Misdialled trunk prefix*

A signal sent in the backward direction indicating the erroneous inclusion of a trunk prefix (for national use).

3.5 *Call supervision signals*

3.5.1 *Forward-transfer signal*

A signal sent in the forward direction on semiautomatic calls when the outgoing international exchange operator wants the help of an operator at the incoming international exchange. The signal will normally serve to bring an assistance operator (see Recommendation Q.101 [2]) into the circuit if the call is automatically set up at the exchange. When a call is completed via an operator (incoming or delay operator) at the incoming international exchange, the signal should preferably cause this operator to be recalled.

3.5.2 *Answer signal, charge*

A signal sent in the backward direction indicating that the call is answered and subject to charge.

In semiautomatic working, this signal has a supervisory function. In automatic working, the signal is used:

- to start metering the charge to the calling subscriber (Recommendation Q.28 [3]), and
- to start the measurement of call duration for international accounting purposes (Recommendation E.260 [4]).

3.5.3 *Answer signal, no charge*

A signal sent in the backward direction indicating that the call is answered but is not subject to charge. It is used for calls to particular destinations only.

In semiautomatic working, this signal has a supervisory function. In automatic working, the reception of this signal shall not start the metering to the calling subscriber.

3.5.4 *Answer signal, unqualified* (basic national use)

A signal sent in the backward direction to indicate that the call is answered.

3.5.5 *Clear-back signal*

A signal sent in the backward direction indicating that the called party has cleared.

In semiautomatic working, this signal has a supervisory function. In automatic working, the arrangements specified in Recommendation Q.118 [5] apply.

3.5.6 *Re-answer signal*

A signal sent in the backward direction indicating that the called party, after having cleared, again lifts his receiver or in some other way reproduces the answer condition, e.g., switch-hook flashing.

3.5.7 *Clear-forward signal*

A signal sent in the forward direction to terminate the call or call attempt and release the circuit concerned. This signal is normally sent when the calling party clears but also may be a proper response in other situations as, for example, when reset circuit is received.

3.5.8 *Calling party clear signal* (national option)

A signal sent in the forward direction, when the holding of the connection is provided, to indicate that the calling party has cleared.

3.6 *Circuit supervision signals*

3.6.1 *Release-guard signal*

A signal sent in the backward direction in response to a clear-forward signal, or if appropriate to the reset-circuit signal, when the circuit concerned has been brought into the idle condition.

3.6.2 *Reset-circuit signal*

A signal that is sent to release a circuit when, due to memory mutilation or other causes, it is unknown whether, for example, a clear-forward or clear-back signal is appropriate. If at the receiving end the circuit is blocked, this signal should remove that condition.

3.6.3 *Blocking signal*

A signal sent only for maintenance purposes to the exchange at the other end of a circuit to cause engaged conditions of that circuit for subsequent calls outgoing from that exchange. When a circuit is used in the bothway mode of operation, an exchange receiving the blocking signal must be capable of accepting incoming calls on that circuit unless it also has sent a blocking signal. Under conditions covered later, a blocking signal is also a proper response to a reset circuit signal.

3.6.4 *Unblocking signal*

A signal sent to the exchange at the other end of a circuit to cancel in that exchange the engaged conditions of that circuit caused by an earlier blocking signal or maintenance-oriented group blocking message.

3.6.5 *Blocking-acknowledgement signal*

A signal sent in response to a blocking signal indicating that the speech circuit has been blocked.

3.6.6 *Unblocking-acknowledgement signal*

A signal sent in response to an unblocking signal indicating that the speech circuit has been unblocked.

3.6.7 *Continuity-check-request signal*

A signal sent requesting an independent circuit continuity test.

3.7 *Circuit group supervision messages*

3.7.1 *Maintenance oriented group blocking message*

A message sent for maintenance purposes to the exchange at the other end of a circuit group to cause an engaged condition on that circuit group or parts thereof for subsequent calls outgoing from that exchange. An exchange receiving the maintenance oriented group blocking message must be capable of accepting incoming calls on the blocked circuits of that circuit group unless it also has sent a blocking message.

3.7.2 *Maintenance oriented group unblocking message*

A message sent to the exchange at the other end of a circuit group to cancel in that exchange the engaged condition on that circuit group or parts thereof caused by an earlier maintenance-oriented group blocking message or blocking signal.

3.7.3 *Hardware failure oriented group blocking message*

A message sent for reason of a hardware failure to the exchange at the other end of a circuit group to cause an engaged condition on that circuit group or parts thereof. An exchange receiving the hardware failure oriented group blocking message must be capable of accepting incoming calls on the blocked circuits of that circuit group unless it also has sent a blocking message.

3.7.4 *Hardware failure oriented group unblocking message*

A message sent to the exchange at the other end of a circuit group to cancel in that exchange the engaged condition on that circuit group or parts thereof caused by an earlier hardware failure oriented group blocking message.

3.7.5 *Software generated group blocking message (national option)*

A message sent for reason of a software generated alarm to the exchange at the other end of a circuit group to cause an engaged condition on that circuit group or parts thereof. An exchange receiving the software generated group blocking message must be capable of accepting incoming calls on the blocked circuits of that circuit group unless it also has sent a blocking message.

3.7.6 *Software generated group unblocking message (national option)*

A message sent to the exchange at the other end of a circuit group to cancel in that exchange the engaged condition on that circuit group or parts thereof caused by an earlier software generated group blocking message.

3.7.7 *Circuit group reset message*

A message that is sent to release a circuit group or parts thereof when, due to memory mutilation or other causes, it is unknown which of the clearing signals is appropriate for the particular circuits within that circuit group. If at the receiving end circuits are blocked, this message should remove that condition.

3.7.8 *Maintenance oriented group blocking-acknowledgement message*

A message sent in response to a maintenance oriented group blocking message indicating that the circuit group or parts thereof has/have been blocked.

3.7.9 *Maintenance oriented group unblocking-acknowledgement message*

A message sent in response to a maintenance oriented group unblocking message indicating that the circuit group or parts thereof has/have been unblocked.

3.7.10 *Hardware failure oriented group blocking-acknowledgement message*

A message sent in response to a hardware failure oriented group blocking message indicating that the circuit group or parts thereof has/have been blocked.

3.7.11 *Hardware failure oriented group unblocking-acknowledgement message*

A message sent in response to a hardware failure oriented group unblocking message indicating that the circuit group or parts thereof has/have been unblocked.

3.7.12 *Software generated group blocking-acknowledgement message (national option)*

A message sent in response to a software generated group blocking message indicating that the circuit group or parts thereof has/have been blocked.

3.7.13 *Software generated group unblocking-acknowledgement message (national option)*

A message sent in response to a software generated group unblocking message indicating that the circuit group or parts thereof has/have been unblocked.

3.7.14 *Circuit group reset-acknowledgement message*

A message sent in response to a circuit group reset message indicating that:

i) if the range field is not coded all zero, the circuits are reset; or

ii) if the range field is coded all zero, the reset of the circuit group has been started and the reset state of each circuit concerned will be reported by the appropriate call, circuit or circuit group supervision signal/message.

3.8 *Automatic congestion control signals*

Signals generated by the exchange to indicate that a congestion threshold has been exceeded (see Recommendation Q.542, § 5.4.5).

3.8.1 *Congestion level 1*

A signal indicating that the first (less severe) congestion threshold in an exchange has been exceeded.

3.8.2 *Congestion level 2*

A signal indicating that the second (more severe) congestion threshold in an exchange has been exceeded.

References

[1] CCITT Recommendation *Characteristics of the dial tone, ringing tone, busy tone, congestion tone, special information tone and warning tone,* Rec. Q.35.

[2] CCITT Recommendation *Facilities provided in international semiautomatic working,* Rec. Q.101.

[3] CCITT Recommendation *Determination of the moment of the called subscriber's answer in the automatic service,* Rec. Q.28.

[4] CCITT Recommendation *Basic technical problems concerning the measurement and recording of call durations,* Rec. E.260.

[5] CCITT Recommendation *Special release arrangements and indication of congestion conditions at transit exchanges,* Rec. Q.118.

Recommendation Q.723

FORMATS AND CODES

1 Basic format characteristics

1.1 *General*

The telephone user messages are carried on the signalling data link by means of signal units, the format of which is described in Recommendation Q.703, § 2.2.

The signalling information of each message constitutes the signalling information field of the corresponding signal unit and consists of an integral number of octets. It basically contains the *label,* the *heading code* and one or more *signals* and/or *indications.* Structure and function of the label are described in § 2; the heading codes and detailed message formats are described in § 3.

1.2 *The service information octet*

The *service information octet* comprises the *service indicator* and the *subservice field.*

The service indicator is used to associate signalling information with a particular User Part and is only used with message signal units (see Recommendation Q.704, § 12.2).

The information in the subservice field permits a distinction to be made between national and international signalling messages. In national applications when this discrimination is not required possibly for certain national User Parts only, the subservice field can be used independently for different User Parts.

The format of the service information octet is shown in Figure 1/Q.723.

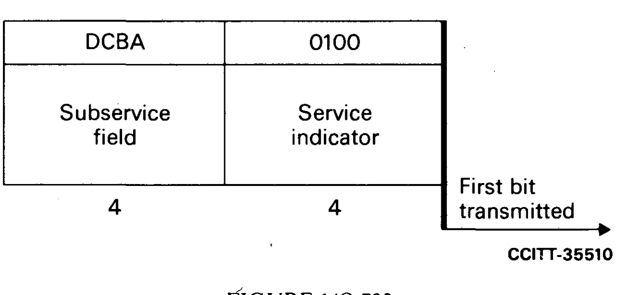


FIGURE 1/Q.723

Service information octet

The following codes are used in the fields of the service information octet:

a) The service indicator is coded 0100.

b) Subservice field.

bits	B A	Spare (see Note)
bits	D C	Network indicator
	0 0	International network
	0 1	Spare (for international use only)
	1 0	National network
	1 1	Reserved for national use

Note – The two unused bits in the service information octet are spare for possible future needs that may require a common solution for all international User Parts and Message Transfer Part level 3. The bits are coded 00.

1.3 *Format principles*

The user generated information in the signalling information field is, in general, divided into a number of subfields which may be either of fixed or variable length. For a given message type identified by a unique message heading, the presence of a given subfield may be either mandatory or optional. The various types of subfields are further defined below.

1.3.1 *Mandatory subfields*

Subfields which have been declared mandatory for a given message type appear in all messages of that type.

1.3.2 *Optional subfields*

Subfields which have been declared optional for a given message type only appear when required in messages of that type. The presence or absence of each optional field is indicated by the state of a field indicator located in an indicator field, which in this case is a mandatory subfield.

1.3.3 *Fixed length subfields*

Subfields which have been declared fixed length for a given message type, contain the same number of bits in all messages of that type.

1.3.4 *Variable length subfields*

For subfields which have been declared variable length for a given message type, the number of bits may vary between messages of that type. The size of a variable length subfield is indicated in an immediately preceding fixed length subfield in terms of a predefined unit such as bits, octets or half-octets.

1.3.5 *Order of subfield transmission*

For a given type of message the various types of subfields are transmitted in the following order:

a) mandatory subfields,

b) optional subfields.

Within each of these two classes, the order of subfield transmission is, in general, as follows:

1) fixed length subfields (with the exception of the indicator field and subfields indicating the size of a variable length subfield),

2) variable length subfields.

1.3.6 *Order of bit transmission*

Within each defined subfield the information is transmitted least significant bit first.

1.3.7 *Coding of spare bits*

Spare bits are coded 0 unless indicated otherwise.

2 Label

2.1 *General*

The *label* is an item of information which forms part of every signalling message and is used by the message routing function at Message Transfer Part level 3 to select the appropriate signalling route and by the User Part function to identify the particular transaction (e.g. the call) to which the message pertains.

In general, label information encompasses an explicit or implicit indication of the message source and destination and, depending on the application, various forms of transaction identification.

For messages which are related to circuits or calls, the transaction is conveniently identified by including the corresponding circuit identity in the label. This technique applies to messages which pass between adjacent nodes, and to messages which pass between nodes which are not adjacent; in this case the technique is known as the pass-along method. In future, the introduction of new subscriber services may require the transfer of call related messages between exchanges at a time when no circuit is associated with the call. Such messages could be carried using the services of the Signalling Connection Control Part SCCP [6]. In this case the standard access to the Signalling Connection Control Part is used.

Note – The service information octet, the routing label and the circuit identification code are not included in the information transferred between the Telephone User Part and the Signalling Connection Control Part.

One standard label format is specified (§ 2.2) for international use. The same standard label is applicable for national use; admitted deviations from the format of the standard label are described in § 2.3.

2.2 *Standard telephone label*

2.2.1 *Label format*

The *standard label* has a length of 40 bits and is placed at the beginning of the signalling information field. The label structure is as shown in Figure 2/Q.723.

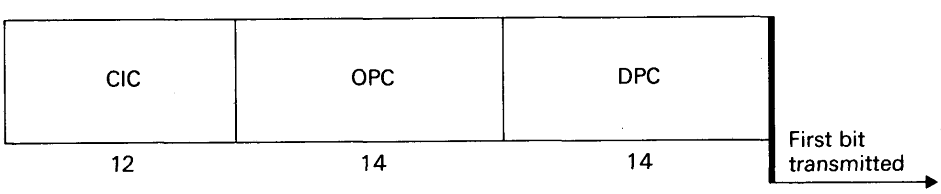


FIGURE 2/Q.723
Standard telephone label structure

The *destination point code* (DPC) indicates the signalling point for which the message is intended, while the *originating point code* (OPC) indicates the signalling point which is the source of the message. The *circuit identification code* (CIC) indicates one speech circuit among those directly interconnecting the destination and the originating points.

The portion of the label that consists of the destination point code and originating point code fields and of the four least significant bits of the circuit identification code field corresponds to the standard routing label specified in Recommendation Q.704, § 13.2.

2.2.2 *Destination and originating point codes*

The standard label structure requires that each telephone exchange in its role as signalling point is allocated a code from code plans established for the purpose of unambiguous identification of signalling points.

Separate code plans will be used for the international signalling network and for different national signalling networks.

The principles of code allocation which apply to the international signalling network should be in accordance with Recommendation Q.708.

The destination point code will be the code applicable to the telephone exchange to which the message is sent. The originating point code will be the code applicable to the telephone exchange from which the message is sent.

2.2.3 *Circuit identification code*

The allocation of circuit identification codes to individual telephone circuits is determined by bilateral agreement and/or in accordance with applicable predetermined rules.

Allocation rules for certain applications are defined below:

a) 2048 kbit/s digital path

For circuits which are derived from a 2048-kbit/s digital path (Recommendations G.732 [1] and G.734 [2]) the circuit identification code contains in the 5 least significant bits a binary representation of the actual number of the time slot which is assigned to the speech circuit. The remaining bits in the circuit identification code are used where necessary, to identify one among several systems interconnecting an originating and destination point.

b) 8448 kbit/s digital path

For circuits which are derived from a 8448-kbit/s digital path (Recommendation G.744 [3] and G.746 [4]) the circuit identification code contains in the 7 least significant bits an identification of the channel which is assigned to the speech circuit. The codes in Table 1/Q.723 are used.

The remaining bits are used, where necessary, to identify one among several systems interconnecting an originating and destination point.

c) Frequency division multiplex (FDM) systems in networks using the 2048-kbit/s pulse code modulation standard

For FDM systems existing in networks that also use the 2048-kbit/s pulse code modulation standard, the circuit identification code contains in the 6 least significant bits the identification of a channel within a group of 60 channels carried by 5 basic FDM groups which may or may not be part of the same supergroup.

The codes in Table 2/Q.723 are used.

TABLE 1/Q.723

0000000	channel 1
0000001	channel 2
|	|
0011111	channel 32
0100000	channel 33
|	|
1111110	channel 127
1111111	channel 128

TABLE 2/Q.723

000000	unallocated	
000001 | 001100	channel 1 | channel 12	1st basic (FDM) group
001101 001110 001111 010000 010001 | 011001	channel 1 channel 2 channel 3 unallocated channel 4 | channel 12	2nd basic (FDM) group
011010 | 011111 100000 100001 | 100110	channel 1 | channel 6 unallocated channel 7 | channel 12	3rd basic (FDM) group
100111 | 101111 110000 110001 110010 110011	channel 1 | channel 9 unallocated channel 10 channel 11 channel 12	4th basic (FDM) group
110100 | 111111	channel 1 | channel 12	5th basic (FDM) group

2.3 *Optional national labels*

For the purpose of satisfying the requirements imposed by specific characteristics of some national signalling networks, field sizes different from those specified for the standard label are admitted for the destination point code, originating point code and circuit identification code fields in national labels.

3 Telephone signal message formats and codes

3.1 *General*

All telephone signal messages contain a *heading* consisting of two parts, heading code H0 and heading code H1. Code H0 identifies a specific message group (see Recommendation Q.722, § 3.2.1) while H1 either contains a signal code or in case of more complex messages, identifies the format of these messages. The allocation of the H0 and H1 code is summarized in Table 3/Q.723.

TABLE 3/Q.723

Heading code allocation

Message group	H0 \ H1	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
	0000	Spare, reserved for national use															
FAM	0001		IAM	IAI	SAM	SAO											
FSM	0010		GSM		COT	CCF											
BSM	0011		GRQ														
SBM	0100		ACM	CHG													
UBM	0101		SEC	CGC	NNC	ADI	CFL	SSB	UNN	LOS	SST	ACB	DPN	MPR			EUM
CSM	0110	ANU	ANC	ANN	CBK	CLF	RAN	FOT	CCL								
CCM	0111		RLG	BLO	BLA	UBL	UBA	CCR	RSC								
GRM	1000		MGB	MBA	MGU	MUA	HGB	HBA	HGU	HUA	GRS	GRA	SGB[a]	SBA[a]	SGU[a]	SUA[a]	
	1001					RESERVED											
CNM	1010		ACC			Spare reserved for international and basic national use											
	1011																
	1100					Spare, reserved for national use											
	1101																
	1110																
	1111																

[a] National option.

Abbreviations used in Table 3/Q.723

ACB	Access barred signal
ACC	Automatic congestion control information message
ACM	Address complete message (note)
ADI	Address incomplete signal
ANC	Answer signal, charge
ANN	Answer signal, no charge
ANU	Answer signal, unqualified
BLA	Blocking-acknowledgement signal
BLO	Blocking signal
BSM	Backward set-up message
CBK	Clear-back signal
CCF	Continuity-failure signal
CCL	Calling party clear signal
CCM	Circuit supervision message
CCR	Continuity-check-request signal
CFL	Call-failure signal
CGC	Circuit-group-congestion signal
CHG	Charging message
CLF	Clear-forward signal
CNM	Circuit network management message group
COT	Continuity signal
CSM	Call supervision message
DPN	Digital path not provided signal
EUM	Extended unsuccessful backward set-up information message
FAM	Forward address message
FOT	Forward-transfer signal
FSM	Forward set-up message
GRA	Circuit group reset-acknowledgement message
GRM	Circuit group supervision messages
GRQ	General request message
GRS	Circuit group reset message
GSM	General forward set-up information message
HBA	Hardware failure oriented group blocking-acknowledgement message
HGB	Hardware failure oriented group blocking message
HGU	Hardware failure oriented group unblocking message
HUA	Hardware failure oriented group unblocking-acknowledgement message
IAI	Initial address message with additional information
IAM	Initial address message
LOS	Line-out-of-service signal
MBA	Maintenance oriented group blocking-acknowledgement message
MGB	Maintenance oriented group blocking message
MGU	Maintenance oriented group unblocking message
MPR	Misdialled trunk prefix
MUA	Maintenance oriented group unblocking-acknowledgement message
NNC	National-network-congestion signal
RAN	Reanswer signal
RLG	Release-guard signal
RSC	Reset-circuit signal
SAM	Subsequent address message
SAO	Subsequent address message with one signal
SBA	Software generated group blocking-acknowledgement message
SBM	Successful backward set-up information message
SEC	Switching-equipment-congestion signal
SGB	Software generated group blocking message
SGU	Software generated group unblocking message
SSB	Subscriber-busy signal (electrical)
SST	Send-special-information tone signal
SUA	Software generated group unblocking-acknowledgement
UBA	Unblocking-acknowledgement signal
UBL	Unblocking signal
UBM	Unsuccessful backward set-up information message
UNN	Unallocated-number signal

Note – Each address complete message contains one of the following signals:
- ADC Address-complete, charge
- ADN Address-complete, no charge
- ADX Address-complete, coin box
- AFC Address-complete, charge subscriber free
- AFN Address-complete, no charge, subscriber free
- AFX Address-complete, coin box, subscriber free

3.2 *Heading code H0*

The *heading code* H0 occupies the 4-bit field following the label and is coded as follows:

0000	spare, reserved for national use
0001	forward address messages
0010	forward set-up messages
0011	backward set-up request messages
0100	successful backward set-up information messages
0101	unsuccessful backward set-up information messages
0110	call supervision messages
0111	circuit supervision messages
1000	circuit group supervision messages
1001	reserved
1010	circuit network management messages
1011	reserved for international and basic national use
1100 to 1111	reserved for national use

3.3 *Forward address messages*

The following types of *forward address messages* are specified and are each identified by a different heading code H1:

- Initial address message.
- Initial address message with additional information.
- Subsequent address message (with one or more address signals).
- Subsequent address message with one (address) signal.

3.3.1 *Initial address message*

The basic format of the *initial address message* is shown on Figure 3/Q.723.

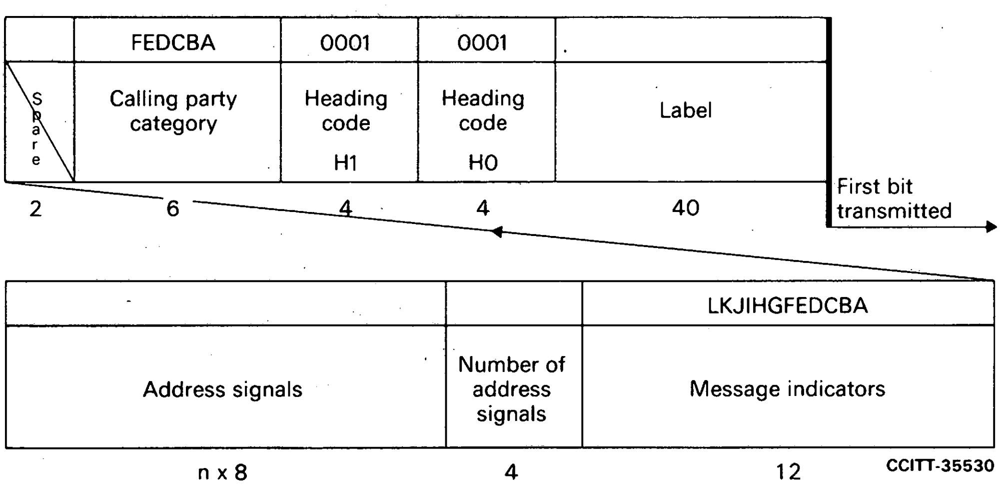


FIGURE 3/Q.723

Initial address message

The following codes are used in the fields of the initial address message.

a) Label: see § 2

b) Heading code H0 is coded 0001

c) Heading code H1 is coded 0001

d) Calling party category

bits F E D C B A	
0 0 0 0 0 0	unknown source (Note 1)
0 0 0 0 0 1	operator, language French
0 0 0 0 1 0	operator, language English
0 0 0 0 1 1	operator, language German
0 0 0 1 0 0	operator, language Russian
0 0 0 1 0 1	operator, language Spanish
0 0 0 1 1 0 0 0 0 1 1 1 0 0 1 0 0 0	available to Administrations for selecting a particular language provided by mutual agreement
0 0 1 0 0 1	reserved (see Recommendation Q.104 [5]) (Note 2)
0 0 1 0 1 0	ordinary calling subscriber
0 0 1 0 1 1	calling subscriber with priority
0 0 1 1 0 0	data call
0 0 1 1 0 1	test call
0 0 1 1 1 0	spare
0 0 1 1 1 1	payphone
0 1 0 0 0 0 to 1 1 1 1 1 1	spare

Note 1 – The calling party category "unknown source" is classified, for the time being, for basic national use. The use of this category in the international network is for further study.

Note 2 – In national networks, code 001001 may be used to indicate that the calling party is a national operator.

e) Spare

The bits in this field are spare for international allocation.

f) Message indicators

bits B A: nature of address indicator
0 0 subscriber number
0 1 spare, reserved for national use
1 0 national (significant) number
1 1 international number

bits D C: nature-of-circuit indicator
0 0 no satellite circuit in the connection
0 1 one satellite circuit in the connection
1 0 spare
1 1 spare

bits F E: continuity-check indicator
0 0 continuity-check not required
0 1 continuity-check required on this circuit
1 0 continuity-check performed on a previous circuit
1 1 spare

bit G: echo-suppressor indicator
0 outgoing half echo suppressor not included
1 outgoing half echo suppressor included

bit H: incoming international call indicator
0 call other than international incoming
1 incoming international call

bit I: redirected call indicator
0 not a redirected call
1 redirected call

bit J: all-digital-path-required indicator
0 ordinary call
1 digital path required

bit K: signalling path indicator
0 any path
1 all signalling system No. 7 path

bit L: spare

Note – The spare indicator may be used, e.g., to provide the μ/A law conversion control, pending further study.

g) Number of address signals

A code expressing in pure binary representation the number of address signals contained in the initial address message, except for the code 0000 to which the meaning 16 digits including ST signal is assigned.

h) Address signals

0000 digit 0
0001 digit 1
0010 digit 2
0011 digit 3
0100 digit 4
0101 digit 5
0110 digit 6
0111 digit 7
1000 digit 8
1001 digit 9
1010 spare
1011 code 11
1100 code 12
1101 spare
1110 spare
1111 ST

The most significant address signal is sent first. Subsequent address signals are sent in successive 4-bit fields.

i) Filler

In case of an odd number of address signals, the filler code 0000 is inserted after the last address signal. This ensures that the variable length field which contains the address signals consists of an integral number of octets.

3.3.2 *Initial address message with additional information*

The basic format of the *initial address message with additional information* is shown in Figure 4/Q.723.

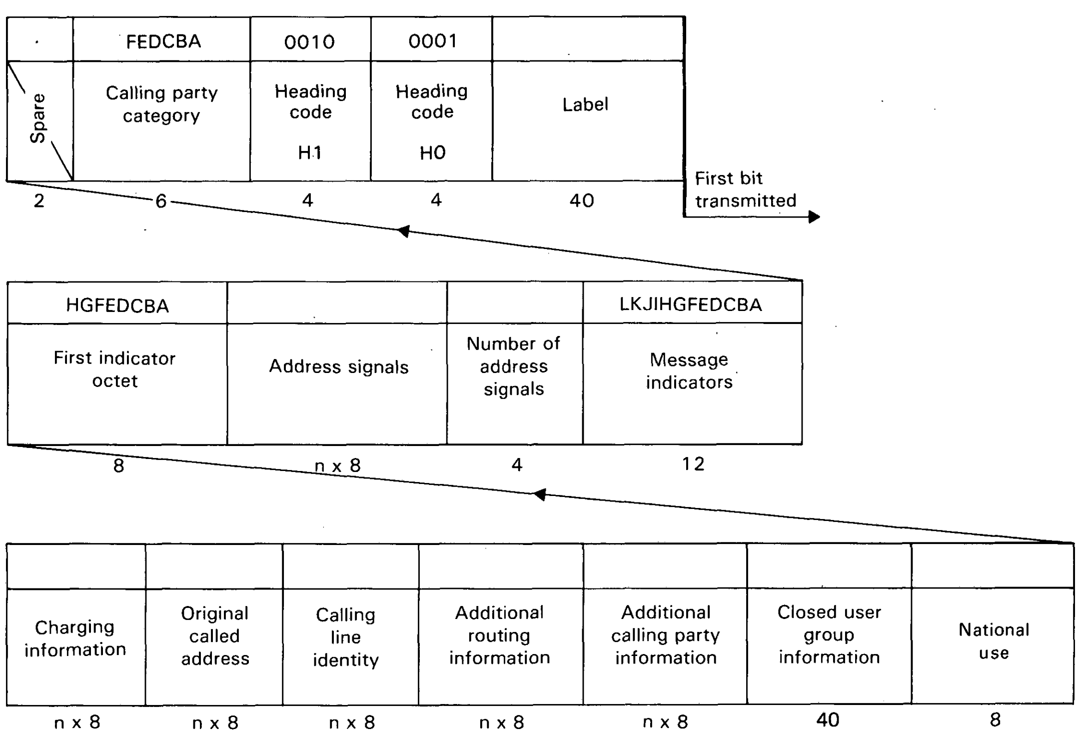


FIGURE 4/Q.723

Initial address message with additional information

The following codes are used in the initial address message with additional information:

a) Label: see § 2

b) Heading code H0 is coded 0001

c) Heading code H1 is coded 0010

d) Calling party category: [see § 3.3.1 d)]

e) Message indicators: [see § 3.3.1 f)]

f) Number of address signals: [see § 3.3.1 g)]

g) Address signals: [see § 3.3.1 h)]

h) First indicator octet

bit A: network capability or user facility information indicator
0 network capability or user facility information not included
1 network capability or user facility information included

bit B: closed user group information indicator
0 closed user group information not included
1 closed user group information included

bit C: additional calling party information indicator
0 additional calling party information not included
1 additional calling party information included

bit D: additional routing information indicator
0 additional routing information not included
1 additional routing information included

bit E: calling line identity indicator
0 calling line identity not included
1 calling line identity included

bit F: original called address indicator
0 original called address not included
1 original called address included

bit G: charging information indicator
0 charging information not included
1 charging information included

bit H: spare, reserved for indicating the presence or absence of a second indicator octet

i) Network capability or user facility information: spare, reserved for national use. (This optional field may be used in national applications to indicate specific network capabilities and/or user facility information.)

j) Closed user group (CUG) information

The basic format of the closed user group information field is shown in Figure 4a/Q.723.

		DCBA
Interlock code	Spare	CUG indicator
32	4	4

FIGURE 4a/Q.723

Closed user group information field

The following codes are used in the subfields of the closed user group information field.

– bits B A: CUG call indicator
  - 0 0 ordinary call
  - 0 1 successful check
  - 1 0 outgoing access allowed
  - 1 1 outgoing access not allowed
– bits C D: spare
– Interlock code

  A code identifying the closed user group involved in the call. The nature of this code is for further study.

k) Additional calling party information: for further study. (This optional field is of fixed length and will indicate additional information concerning the calling party, which is not carried by the calling party's category indicator.)

l) Additional routing information: for further study. (This optional field is of fixed length and will indicate that the call has to be routed in some particular way, due for example to additional customer services.)

m) Calling line identity

The basic format of the calling line identity field is shown in Figure 4b/Q.723.

	DCBA	DCBA
Calling line identity	Number of address signals	Address indicator
n × 8	4	4

FIGURE 4b/Q.723

Calling line identity field

The following codes are used in the subfields of the calling line identity field.

– Address indicators:

  bits B A: nature of address indicator
  - 0 0 subscriber number
  - 0 1 spare, reserved for national use
  - 1 0 national significant number
  - 1 1 international number

  bit C: calling line identity presentation indicator
  - 0 calling line identity presentation not restricted
  - 1 calling line identity presentation restricted

  bit D: incomplete calling line identity indicator
  - 0 no indication
  - 1 incomplete calling line identity

– Number of address signals

  bits D C B A
  - 0 0 0 0 calling line identity not available indicator
  - 0 0 0 1 to 1 1 1 1 a code expressing in pure binary representation the number of address signals.

– Calling line address signals

  Each signal is coded as indicated in § 3.3.1 h) as applicable.

n) Original called address

The basic format of the original called address field is shown in Figure 4c/Q.723.

	DCBA	DCBA
Original called address	Number of address signals	Address indicators
n × 8	4	4

FIGURE 4c/Q.723

Original called address field

The following codes are used in the subfields of the original address field:

– Address indicator

bits B A: nature of address indicator
- 0 0 subscriber number
- 0 1 spare, reserved for national use
- 1 0 national (significant) number
- 1 1 international number

bits DC: spare

– Number of address signals

bits DCB A
- 0 0 0 0 original called address not available
- 0 0 0 1 to 1 1 1 1 a code expressing in pure binary representation the number of address signals.

– Original called address signals

Each signal is coded as indicated in § 3.3.1 h) as applicable.

o) Charging information: for further study. (This optional field will contain information to be sent to a successive exchange for charging and/or accounting purposes.)

3.3.3 *Subsequent address message*

The basic format of the *subsequent address* message (SAM) is shown in Figure 5/Q.723.

		0000	0011	0001	
Address signals	No. of address signals	Filler	Heading code H1	Heading code H0	Label
n x 8	4	4	4	4	40

First bit transmitted →

CCITT-35550

FIGURE 5/Q.723

Subsequent address message

The following codes are used in the fields of the subsequent address message:

a) Label: see § 2

b) Heading code H0 is coded 0001

c) Heading code H1 is coded 0011

d) Address signal is coded as indicated in § 3.3.1 h) as applicable

e) Number of address signals: a code expressing in pure binary representation the number of address signals contained in the subsequent address message.

3.3.4 *Subsequent address message with one signal*

The basic format of the *subsequent address message with one signal* is shown in Figure 6/Q.723.

0000		0100	0001	
Filler	Address signal	Heading code H1	Heading code H0	Label
4	4	4	4	40

First bit transmitted

CCITT-35560

FIGURE 6/Q.723

Subsequent address message with one signal

The following codes are used in the fields of the subsequent address message with one signal:

a) Label: see § 2

b) Heading code H0 is coded 0001

c) Heading code H1 is coded 0100

d) Address signal is coded as indicated in § 3.3.1 h) as applicable.

3.4 *Forward set-up messages*

The following types of forward set-up messages are specified and are each identified by a different heading code H1:

- general forward set-up information message,
- continuity-check message.

Unallocated H1 codes in this message group are spare.

3.4.1 *General forward set-up information message*

The basic format of the general forward set-up information message is shown in Figure 7/Q.723.

				FEDCBA	HGFEDCBA	0001	0010	
Original called address	Incoming trunk and transit exchange identity	Calling line identity	Spare	Calling party category	Response type indicators	Heading code H1	Heading code H0	Label
n x 8	n x 8	n x 8	2	6	8	4	4	40

First bit transmitted

CCITT-85 940

FIGURE 7/Q.723

General forward set-up information message

The following codes are used in the fields of the general forward set-up information message:

a) Label: see § 2

b) Heading code H0 is coded 0010

c) Heading code H1 is coded 0001

d) Response type indicator

bit A: calling party category indicator
0 calling party category not included
1 calling party category included

bit B: calling line identity indicator
0 calling line identity not included
1 calling line identity included

bit C: incoming trunk and transit exchange: identity indicator
0 incoming trunk and transit exchange identity not included
1 incoming trunk and transit exchange identity included

bit D: original called address indicator
0 original called address not included
1 original called address included

bit E: outgoing echo suppressor indicator
0: outgoing half echo suppressor not included
1: outgoing half echo suppressor included

bit F: malicious call identification indicator
0 malicious call identification not provided
1 malicious call identification provided

bit G: hold indicator
0 hold not provided
1 hold provided

bit H: spare

e) Calling party category:

bits F E D C B A
0 0 0 0 0 0 unknown source/calling party category unavailable indicator

0 0 0 0 0 1
to
1 1 1 1 1 1 } (see § 3.3.1 d))

f) Calling line identity:

Format and codes are the same as used in the calling line identity contained in the initial address message with additional information (see § 3.3.2).

g) Incoming trunk and transit exchange identity:

The basic format of the incoming trunk and transit exchange identity field is shown in Figure 8/Q.723.

	DCBA			DCBA	DCBA
Incoming trunk identity	Field length indicator	Spare	Transit exchange identity	Exchange identity length indicator	Identity type indicator
n × 8	4	4	n × 8	4	4

FIGURE 8/Q.723

Incoming trunk and transit exchange identity field

The following codes are used in the subfields of the incoming trunk and transit exchange identity field:

– Identity type indicator

bits B A:
0 0 spare
0 1 signalling point code
1 0 available part of calling line identity
1 1 spare

bits D C: spare

– Exchange identity length indicator

A code expressing in pure binary representation the number of address signals included in the transit exchange identity subfield for the case when part of the calling line identity is used for this purpose.

When the transit exchange is identified by the signalling point code, this subfield is coded 0000.

– Transit exchange identity

A code consisting of either:

i) the signalling point code of the exchange, or

ii) a part of the calling line identity, in which case each address digit contained in this identity is coded as indicated in § 3.3.1 h) where applicable.

– Field length indicator

A code indicating in pure binary representation the number of octets in the incoming trunk identity field.

Code 0000 indicates that the incoming trunk identity is not provided.

– Incoming trunk identity

A code contained in a maximum of 15 octets, identifying the incoming trunk. The encoding of the incoming trunk identity is for further study.

h) Original called address

See § 3.3.2 n).

3.4.2 *Continuity-check message*

The basic format of the *continuity-check* message is shown in Figure 9/Q.723.

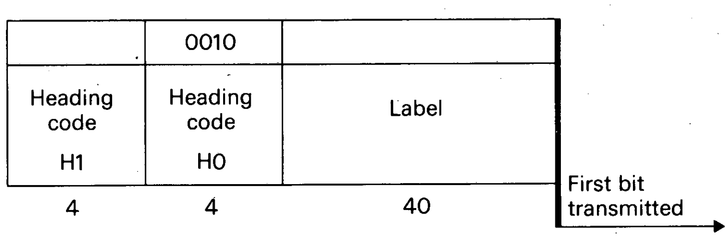


FIGURE 9/Q.723
Continuity-check message

The following codes are used in the fields of the continuity-check message:

a) Label: see § 2

b) Heading code H0 is coded 0010

c) Heading code H1 contains signal codes as follows:

0011 continuity signal
0100 continuity-failure signal

3.5 *Backward set-up request message*

The following type of backward set-up request message is specified and is identified by one of the heading codes H1. The other H1 codes in this message group are spare.

3.5.1 General request message

The basic format of the general *request* message is shown in Figure 10/Q.723.

HGFEDCBA	0001	0011	
Request type indicators	Heading code H1	Heading code H0	Label
8	4	4	40

First bit transmitted

CCITT-35570

FIGURE 10/Q.723

General request message

The following codes are used in the fields of the general request message:

a) Label: see § 2

b) Heading code H0 is coded 0011

c) Heading code H1 is coded 0001

d) Request type indicators

bit A: calling party category request indicator
- 0 no calling party category request
- 1 calling party category request

bit B: calling line identity request indicator
- 0 no calling line identity request
- 1 calling line identity request

bit C: original called address request
- 0 no original called address request
- 1 original called address request

bit D: malicious call identification indicator (national option)
- 0 no malicious call identification encountered
- 1 malicious call identification encountered

bit E: hold request indicator
- 0 hold not requested
- 1 hold requested

bit F: echo suppressor request indicator
- 0 no outgoing half echo suppressor requested
- 1 outgoing half echo suppressor requested

bit GH: spare

3.6 *Successful backward set-up information messages*

The following types of successful backward set-up information messages are specified and are each identified by a different heading code H1:

- address-complete message
- charging message.

3.6.1 *Address-complete message*

The basic format of the *address-complete* message is shown in Figure 11/Q.723.

HGFEDCBA	0001	0100	
Message indicators	Heading code H1	Heading code H0	Label
8	4	4	40

First bit transmitted →

CCITT-35580

FIGURE 11/Q.723

Address-complete message

The following codes are used in the fields of the address-complete message:

a) Label: see § 2

b) Heading code H0 is coded 0100

c) Heading code H1 is coded 0001

d) Message indicators

bits B A: type of address-complete signal indicators
0 0 address-complete signal
0 1 address-complete signal, charge
1 0 address-complete signal, no charge
1 1 address-complete signal, payphone

bit C: subscriber-free indicator
0 no indication
1 subscriber-free

bit D: incoming echo suppressor indicator
0 no incoming half echo suppressor included
1 incoming half echo suppressor included

bit E: call forwarding indicator
0 call not forwarded
1 call forwarded

bit F: signalling path indicator
0 any path
1 all signalling system No. 7 path

bits G H: spare, for national use (may be used to indicate call redirection, holding of the connection or the end-to-end signalling method to be used).

Note – The address-complete signal without qualification is classified for the time being in the basic national category of signals. The use of this signal in the international network is for further study.

3.6.2 *Charging message* (see Note)

The basic format of the *charging* message is shown in Figure 12/Q.723.

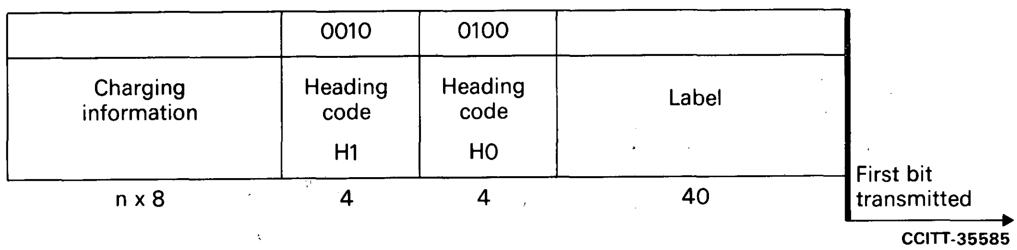


FIGURE 12/Q.723

Charging message

The following codes are used in the fields of the charging message:

a) Label: see § 2

b) Heading code H0 is coded 0100

c) Heading code H1 is coded 0010

d) Charging information

(Possible formats and codes of the charging information field are shown in Annex A.)

Note – The charging message is classified, for the time being, in the basic national category of messages. The use of this message in the international network is for further study.

3.7 *Unsuccessful backward set-up information messages*

3.7.1 *Simple unsuccessful backward set-up information message*

The basic format of the simple unsuccessful backward set-up information message is shown in Figure 13/Q.723.

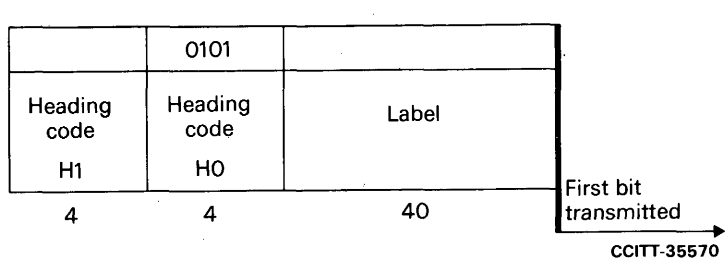


FIGURE 13/Q.723

Simple unsuccessful backward set-up information message

The following codes are used in the fields of the simple unsuccessful backward set-up information message.

a) Label: see § 2

b) Heading code H0 is coded 0101

c) Heading code H1 contains signal codes as follows:

0000	spare
0001	switching-equipment-congestion signal
0010	circuit-group-congestion signal
0011	national-network-congestion signal
0100	address-incomplete signal
0101	call-failure signal
0110	subscriber-busy signal (electrical)
0111	unallocated-number signal
1000	line-out-of-service signal
1001	send-special-information-tone signal
1010	access barred signal
1011	digital path not provided signal
1100	misdialled trunk prefix signal (for national use)
1101 to 1110	spare

3.7.2 *Extended unsuccessful backward set-up information message*

The basic format of the extended unsuccessful backward set-up information message is shown in Figure 13a/Q.723.

		HGFEDCBA	1111	0101	
	Signalling point code	Octet indicator	Heading code H1	Heading code H0	Label
2	14	8	4	4	40

First bit transmitted

CCITT-85960

FIGURE 13a/Q.723

Extended unsuccessful backward set-up information message

The following codes are used in the fields of the extended unsuccessful backward set-up information message:

a) Label: see § 2

b) Heading code H0 is coded 0101

c) Heading code H1 contains signal code 1111

d) Octet indicator

bits D C B A:	unsuccessful indicator
0 0 0 0	spare
0 0 0 1	subscriber busy
0 0 1 0 to 1 1 1 1	spare
bits H G F E:	spare.

e) Signalling point code

The point code of the signalling point in which the message is originated.

3.8 *Call supervision message*

The basic format of the *call supervision* message is shown in Figure 14/Q.723.

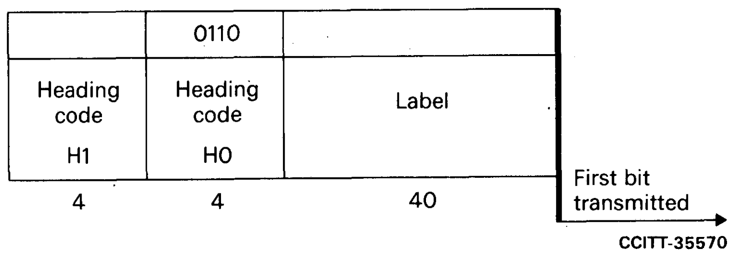


FIGURE 14/Q.723
Call supervision message

The following codes are used in the fields of the call supervision message:

a) Label: see § 2

b) Heading code H0 is coded 0110

c) Heading code H1 contains signal codes as follows:

0000	answer signal, unqualified
0001	answer signal, charge
0010	answer signal, no charge
0011	clear-back signal
0100	clear-forward signal
0101	re-answer signal
0110	forward-transfer signal
0111	calling party clear signal (national option)
1000 to 1111	spare.

3.9 *Circuit supervision message*

The basic format of the *circuit supervision* message is shown in Figure 15/Q.723.

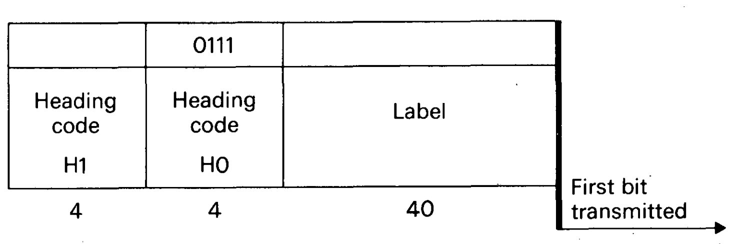


FIGURE 15/Q.723
Circuit supervision message

The following codes are used in the fields of the circuit supervision message:

a) Label: see § 2

b) Heading code H0 is coded 0111

c) Heading code H1 contains signal codes as follows:

0000	spare
0001	release-guard signal
0010	blocking signal
0011	blocking-acknowledgement signal
0100	unblocking signal
0101	unblocking-acknowledgement signal
0110	continuity-check-request signal
0111	reset-circuit signal
1000 to 1111	spare

3.10 *Circuit group supervision message*

The basic format of the circuit group supervision message is shown in Figure 16/Q.723:

			1000	
Status	Range	Heading code H1	Heading code H0	Label
n x 8 0 ≦ n ≦ 32	8	4	4	40

First bit transmitted

CCITT-85970

FIGURE 16/Q.723

Circuit group supervision message

The following codes are used in the fields of the circuit group supervision message:

a) Label: see § 2

The following interpretations apply to the CIC given in the label:

i) If the range field is not coded all zero the CIC given in the label is the first CIC within the circuit group or the first CIC within that part of the circuit group.

ii) If the range field is coded all zero (national option) the CIC given in the label is a representative CIC within the circuit group.

b) Heading code H0 is coded 1000

c) Heading code H1 contains message codes as follows:

0000	spare
0001	Maintenance oriented group blocking message
0010	Maintenance oriented group blocking-acknowledging message
0011	Maintenance oriented group unblocking message
0100	Maintenance oriented group unblocking-acknowledgement message
0101	Hardware failure oriented group blocking message
0110	Hardware failure oriented group blocking-acknowledge message
0111	Hardware failure oriented group unblocking message
1000	Hardware failure oriented group unblocking-acknowledgement message
1001	Circuit group reset message
1010	Circuit group reset-acknowledgement message
1011	Software generated group blocking message (national option)
1100	Software generated group blocking-acknowledgement message (national option)
1101	Software generated group unblocking message (national option)
1110	Software generated group unblocking-acknowledgement message (national option)
1111	spare

d) Range: in principle, two different codings are possible:

i) not all zero: The message is related to a whole circuit group or a part thereof, and includes a status field unless the message is the circuit group reset message. The number of consecutive circuits to be handled is indicated by the value contained in the range field increased by 1. The CIC of the first circuit to be handled is given in the label. The number of circuits to be indicated is 2 (range value 1) to 256 (range value 255).

ii) all zero[1] (national option): The message is related to a pre-determined circuit group. No status field is included. In this case the circuit group is addressed by means of a representative CIC within the circuit group.

Note – In national networks, the range field may not be used if only the concept of pre-determined circuit group applies.

e) Status field

All circuit group supervision messages except the circuit group reset message include a status field containing status indicator bits when the range field is not coded all zero. The number of status indicator bits is indicated by the value given in the range field increased by one.

The status field contains up to 256 one bit status indicators. The first status indicator bit is related to the circuit indicated by the CIC contained within the label, the second one is related to the circuit address by the CIC contained in the label increased by 1.

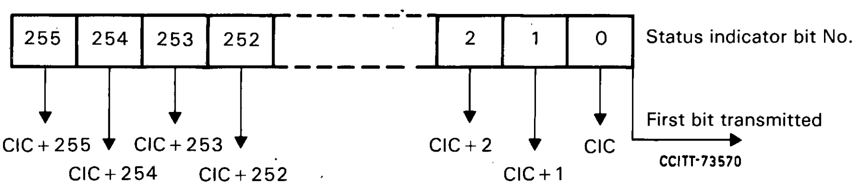


FIGURE 17/Q.723

Status indicator field

The CIC of the last circuit concerned is obtained by adding the value given in the range field to the CIC in the label. The status field consists of an integral number of octets. Bits within the last octet that are not used as status indicators are filled with zeros.

The status indicator bits are coded as follows:

– in all group blocking messages (MGB, HGB, SGB)

1 blocking
0 no blocking

– in all group blocking-acknowledgement messages (MGB, HBA, SBA)

1 blocking acknowledgement
0 no blocking acknowledgement

– in all unblocking messages (MGU, HGU, SGU)

1 unblocking
0 no unblocking

– in all group unblocking-acknowledgement messages (MUA, HUA, SUA)

1 unblocking acknowledgement
0 no unblocking acknowledgement

– in the circuit group reset-acknowledgement message (GRA)

1 blocking for maintenance reasons
0 no blocking for maintenance reasons

[1] Range value zero is only for national use.

3.11 *Circuit network management messages*

The following type of circuit network management message is specified and identified by one of the heading codes H1. Unallocated H1 codes in this message group are spare.

3.11.1 *Automatic congestion control information message*

The basic format of the automatic congestion control (ACC) information message is shown in Figure 18/Q.723:

HGFEDCBA	0001	1001	
Message indicators	Heading code H1	Heading code H0	Label
8	4	4	40

First bit transmitted

T1109900-88

FIGURE 18/Q.723

Automatic congestion control information message

The following codes are used in the fields of the automatic congestion control information message.

a) Label: see § 2

b) Heading code H0 is coded 1001

c) Heading code H1 is coded 0001

d) Message indicators

bits B A	ACC information
0 0	spare
0 1	congestion level 1
1 0	congestion level 2
1 1	spare
bits HGFEDC	spare

ANNEX A

(to Recommendation Q.723)

Charging messages

A.1 *Introduction*

The application of Signalling System No. 7 in national networks was recognized from the beginning of the discussions about the signalling system. The result of this can be found throughout the specifications especially in those Recommendations dealing with the TUP. One of the points which is particularly of interest for an Administration is the possibility of transfer of charging information. Signalling System No. 7 allows for such a feature for charging a calling subscriber by defining a specific charging message as indicated in § 3.6.2. However, the detailed format, coding and related procedures are not given, mostly because this matter is very dependent on the circumstances within a specific national network. The following examples illustrate a particular implementation in a national network for telephony without exclusion of other possible solutions.

A.2 *Starting points*

Before describing in detail the messages involved, a number of starting points have to be adopted.

a) The first No. 7 exchange performs metering according to all possible tariffs.

b) The determination of a particular tariff is performed in a point somewhere in the network.

c) The receipt of messages containing charging information should be acknowledged within the call control procedures.

d) At dedicated moments the actual charging should be adapted.

e) A variety of charging possibilities should be available.

The effect of these starting points is:

a) the actual generation of charging units according to a particular tariff is always performed at the lowest level of the national public telephone network (local exchange);

b) the determination of tariffs for local and trunk calls is carried out in the local exchange and for international calls in the international exchange; however, also the use of a centre for determination of all kinds of tariffs is possible;

c) the transmission of charging information is assured at the highest level of the call control procedures and possibly inhibits call completion without receipt of charging information;

d) calls of long duration can be subject to different charging rates;

e) the application of charge free calls, specific charge on answer, time dependent charging during a call, additional (specific) charge during a call and a combination of these.

A.3 *Messages and procedures*

To meet all the above mentioned requirements a number of messages are defined.

A.3.1 *Charging message*

This message has to be sent for any call, charge free or not. In the procedure this is covered by the fact that the charging message has to be received during call set up before receipt of the address complete message.

If not, then the call should be cleared immediately.

The content of the message will vary depending on the actual tariff and this is indicated by a number of indicators indicating the presence of certain fields in the message.

Possible contents:

a) charge band

The indication of a certain charge band should allow the receiving exchange to charge a call according to a certain tariff including possible switchover times to higher or lower rates. This method results in a simple message but requires the receiving exchange to have all the information available related to all possible charge bands, national and international.

b) explicit charging indication

In this case the message contains explicit indications of details of the tariff viz.
- number of charging units on answer (packet)
- time dependent tariff(s)
- possible switchover time.

This method results in a more complex message but does not require the permanent storage of any charging information.

A.3.2 *Change message*

A consequence of the adoption of the method with explicit charging indication (§ A.3.1 b)) is the necessity to allow for tariff switchover for calls of very long duration or for calls which are answered just after the switchover time given in the message described in § A.3.1 b). The content of such at message is rather simple because it only contains the new applicable tariff and the actual switch-over time.

The procedure to acknowledge the receipt of the message cannot be found in the normal call control procedure, therefore an acknowledgement message (see § A.3.5) in the forward direction is used. If this acknowledgement message is not received within a certain time, the change message has to be repeated.

A.3.3 *Collection charging*

For a variety of reasons it might be necessary to charge a subscriber during the call a certain amount. For this purpose a message is used indicating the number of charging units related to the amount for which the subscriber has to be charged.

The procedure to assure the receipt of this message is the same as described in § A.3.2 above. A possible further collection charging message should not be sent before receipt of the acknowledgement message and the charging confirmation message (see § A.3.4 charging confirmation).

A.3.4 *Charging confirmation*

In relation with the message described in § A.3.3 a message in the forward direction is required indicating how many charging units actually are charged to the subscriber. This number should match to the number given in the collection charging message, otherwise it must be concluded that for some reason the order is not executed, e.g., a certain service should now be withheld to be furnished to the subscriber.

Again the procedure is the one as described in § A.3.2 above but in the opposite direction.

A.3.5 *Acknowledgement*

To acknowledge the receipt of the messages described in §§ A.3.2, A.3.3 and A.3.4, an acknowledgement message is used in both directions only indicating the receipt of the related message.

A.4 *Formats and codes*

A.4.1 *Charging messages*

A.4.1.1 *Charge band*

		0010	0100	
Spare	Charge band	H1	H0	Label

CCITT-86010

- Charge band

  A charge indicates the combination of tariffs including switch-over times which is applicable for a certain period (e.g., day or week).

A.4.1.2 *Explicit charging indication*

								HGFEDCBA	0010	0100	
Tariff factor B	Tariff indicators B	Packet charging B	Time indicator	Spare	Tariff factor A	Tariff indicators A	Packet charging A	Message indicators	H1	H0	Label
8	4	4	6	2	8	4	4	8	4	4	40

CCITT-86020

- Message indicators

  bit A: tariff indicator current tariff (A)
  - 0 packet charging field and tariff indicators current tariff (A) not present
  - 1 packet charging field and tariff indicators current tariff (A) present

  bit B: tariff factor current tariff (A)
  - 0 tariff factor field current tariff (A) not present
  - 1 tariff factor field current tariff (A) present

bit C: tariff indicator next tariff (B)
0 packet charging field and tariff indicators next tariff (B) not present
1 packet charging field and tariff indicators next tariff (B) present

bit D: tariff factor next tariff (B)
0 tariff factor field next tariff (B) not present
1 tariff factor field next tariff (B) present

bit H-E spare

– Packet charging field

0000
| number of charging units on answer
1111

– Tariff indicators

0000	tariff scale 0	(no time dependent tariff)
0001	tariff scale I	
|	|	every scale indicates a certain step in seconds or parts thereof
1111	tariff scale XV	

– Tariff factors

If a call is charge free (A = B = C = D = 0) only the message indicator octet is present.

If a call is charge free from the start but may become chargeable (A = 1, B = 0, C = 1, D = 0/1), the packet charging field for the current tariff is 0000 and the tariff indicator for the current tariff indicates scale 0.

If a call is chargeable from the start but may become charge free (A = 1, B = 0/1, C = 1, D = 0) the packet charging field for the next tariff is 0000 and the tariff indicator for the next tariff indicates scale 0. If a call is chargeable according to only one tariff (A = 1, B = 0/1, C = 0, D = 0), also the time indicator is not present in the message. The actual tariff is determined by multiplication of the step indicated by the tariff indicator with the tariff factor which gives then a specific charging unit interval in seconds.

– Time indicator

000000	spare
000001	00.30 h
000010	01.00 h
|	|
110000	24.00 h

A.4.2 *Tariff change message*

				DCBA	0011	0000	
Time indicator	Spare	Tariff factor	Tariff indicators	Message indicator	H1	H0	Label
6	2	8	4	4	4	4	40

CCITT-86030

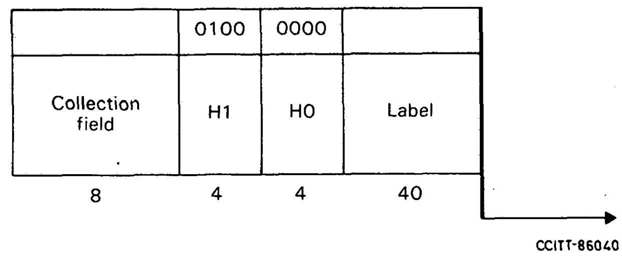
– Message indicator

Bit A: tariff factor next tariff
0 tariff factor field next tariff not present
1 tariff factor field next tariff present

Bits D-B: spare

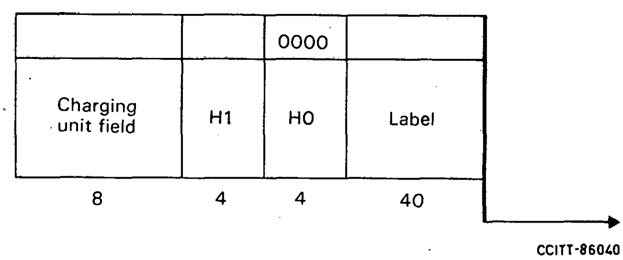
– Tariff indicator, tariff factor and time indicator: see § A.4.1.2

A.4.3 *Collection charging message*



The collection field contains the number of charging units which are to be charged to the calling subscriber. The field has a length of 8 bits so a maximum of 256 units is possible.

A.4.4 *Charging confirmation message*



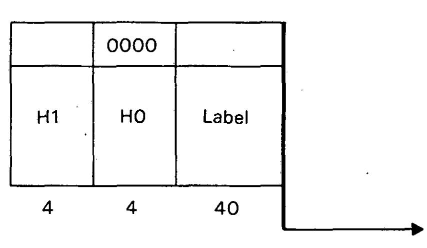
– Heading code H1

  H1 = 0101 confirmation of packet charging
  H1 = 0110 confirmation of collection charging

– Charging unit field

  Number of charging units which actually are charged to the calling party

A.4.5 *Acknowledgement message*



– Heading code H1

  H1 = 1000 acknowledgement receipt of tariff review, collection charging or charging confirmation message

References

[1] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s*, Rec. G.732.

[2] CCITT Recommendation *Characteristics of 2048-kbit/s frame structure for use with digital exchanges*, Vol. III, Rec. G.734.

[3] CCITT Recommendation *Second order PCM multiplex equipment operating at 8448 kbit/s*, Rec. G.744.

[4] CCITT Recommendation *Characteristics of 8448-kbit/s frame structure for use with digital exchanges*, Rec. G.746.

[5] CCITT Recommendation *Language digit or discriminating digits*, Rec. Q.104.

[6] CCITT Recommendation *Signalling Connection Control Part*, Recs. Q.711-Q.714.

Recommendation Q.724

SIGNALLING PROCEDURES

1 Normal call set-up

In this Recommendation the signalling procedures are described for the normal call set-up of an international call. The messages and signals are defined in Recommendation Q.722 and the format and content are given in Recommendation Q.723.

1.1 *Initial address message*

An *initial address message* which is sent as the first message of a call set-up generally includes all of the information required by the next international exchange to route the call. The seizing function is implicit in the reception of this initial address message.

The sending sequence of address information will be the country code (not sent to an incoming international exchange) followed by the national (significant) number. For calls to operator positions (code 11 and code 12), refer to Recommendation Q.107 [1].

All digits required for routing the call through the international network will be sent in the initial address message. On calls with a country code in the address (except in the case of calls to special operators), the initial address message will contain a minimum of 4 digits and should contain as many digits as are available. All digits of the address may be included; however, the initial address message can contain one digit in specific circumstances, e.g. national applications.

Selection of the outgoing national circuit normally can start at the incoming international exchange on receipt of the initial address message and signalling can proceed on the first national link.

When no echo suppressor or nature-of-circuit indication is received from a preceding circuit using a signalling system with fewer facilities, the indicators will be considered as received *no*, unless exchange data indicates otherwise.

Note – When additional signalling information (e.g. related to supplementary services) is to be sent, an initial address message with additional information may be used.

1.2 *Subsequent address message*

The remaining digits, if any, of the address may be sent individually in one-digit messages or in groups in multidigit messages. Efficiency can be gained by grouping together as many digits as possible.

However, to prevent an increase in post-dialling delay in those cases where overlap operation with subscribers' dialling is used, it may be desirable to send the last few digits individually. With reference to the withholding of digits, sufficient digits should be withheld to avoid the operation at subsequent exchanges of the short 4-6 second timeout which may be used in certain cases to determine the address complete condition. (See Recommendation Q.608, § 8.2.1).

Subsequent address messages can be sent on the national network as they are received. If a continuity-check has to be performed on one or more of the international circuits involved in the connection, appropriate measures [e.g. by withholding the last digit(s) of the national number] must be taken at the last common channel exchange to prevent ringing the called subscriber or alerting the operator until the continuity of such speech circuits has been verified.

Note – If in the international network the code 0000 in the number of address signals field is received the message is considered as faulty.

1.3 *End-of-pulsing (ST) signal*

The end-of-pulsing (ST) signal is always sent in the following situations:

a) semiautomatic calls,

b) test calls, and

c) when the end-of-pulsing signal is received from a preceding circuit.

In automatic working, the end-of-pulsing signal will be sent whenever the outgoing international exchange is in a position to know, by digit analysis, that the final digit has been sent. Digit analysis may consist of an examination of the country code and counting the maximum (or fixed) number of digits of the national number. In other cases, the end-of-pulsing signal is not sent and the end-of-address information is determined by the receipt of one of the address-complete signals from the incoming international exchange.

1.4 *Continuity-check of the telephone circuits*

Because the signalling in Signalling System No. 7 does not pass over the speech path, facilities should be provided for making a *continuity-check* of the speech path in the circumstances described below.

The application of the continuity-check depends on the type of the transmission system used for the telephone circuit.

For transmission systems having some inherent fault indication features giving an indication to the switching system in case of fault, a continuity check is not required. This situation commonly occurs when fully digital circuits are used. However, a per-call continuity check may be needed on fully digital circuits when circuits or bundles of circuits in primary multiplex groups are dropped and inserted en route between switches and alarm indications carried on bits of the primary multiplex frame structure are lost in passing through an intermediate transmission facility that does not relay them transparently. Typically, per-call continuity checks may be needed when the transmission link between switches contains a TDMA satellite system, a digital circuit multiplication system or a digital access and crossconnection system, where fault indications are lost.

When an initial address message is received with a request for a continuity-check relating to a digital circuit having inherent fault indication, one of the following actions is taken:

a) the continuity-check request is disregarded; or

b) a continuity-check loop is connected and the maintenance system is alerted. In this case the call may fail since no continuity signal may be received from the distant end.

Note – The reception of such a request could only be caused by an abnormal condition such as administrative errors or the occurrence of signalling errors.

When the circuit type is unknown to a Signalling System No. 7 exchange, or in an application where both analogue and digital circuits may be served, or when no inherent fault indication is available, a continuity-check loop should always be connected in the following cases:

i) when the exchange has the capability to process initial address messages with continuity-check request and such messages are received;

ii) when continuity-check requests are received.

For analogue circuits with pilot supervision it is sufficient to perform the continuity-check on a statistical basis or by test calls (see § 7.5) [1]. For analogue circuits not using pilot supervision and for mixed circuits, i.e. analogue and digital circuits, the continuity-check should be performed on a per call basis. Within mixed connections, i.e. connections composed of circuits with and without continuity-check on a per call basis, it shall be ensured that the continuity signal be forwarded to the destination point although no continuity-check may have been performed on one or more parts of the end-to-end connection.

The continuity-check is not intended to eliminate the need for routine testing of the transmission path.

The continuity-check of the speech circuit will be done, link-by-link, on a per call basis or by a statistical method prior to the commencement of conversation. Procedures and requirements are specified in § 7.

The actions to be taken when pilot supervision is used are described in § 9.

1.5 *Cross-office check*

For digital exchanges the requirements mentioned in Recommendation Q.504 [2] shall be met. For other exchanges Administrations shall ensure the reliability of a connection through a switching machine (cross-office check) either on a per call basis or by a statistical method. With either method, the probability of the connection being established with an unacceptable speech path transmission quality should not exceed 10^{-5} as the long-term average.

1.6 *Address-complete signals*

An *address-complete* signal will not be sent until the continuity signal has been received and the cross-office check made, if they are applicable.

If the succeeding network does not provide electrical called-party's-line-condition signals, the last Signalling System No.7 exchange shall originate and send an address-complete signal when the end of address signalling has been determined and a possible GRQ/GSM cycle has been completed:

a) by receipt of an end-of-pulsing signal;

b) by receipt of the maximum number of digits used in the national numbering plan;

c) by analysis of the national (significant) number to indicate that a sufficient number of digits has been received to route the call to the called party;

d) by receipt of an end-of-selection signal from the succeeding network (e.g. number received signal in Signalling System No. 4); or

e) exceptionally, if the succeeding network uses overlap signalling and number analysis is not possible, by observing that 4 to 6 seconds have elapsed since the last digit was received, and that no fresh information has been received; in such circumstances, transmission to the national network of the last digit received must be prevented until the end of the waiting period which causes an address-complete signal to be sent over the international circuit. In this way, it is ensured that no national answer signal can arrive before an address-complete signal has been sent.

Specifically, in cases d) and e) above, the address-complete charge signal should be sent.

Note – If the succeeding network provides electrical called-party's-line-condition signals, the last Signalling System No. 7 exchange shall originate and send address-complet signal when that condition has been received from the succeeding network and a possible GRQ/GSM cycle has been completed.

If in normal operation, delay in the receipt of an address-complete or equivalent signal from the succeeding network is expected, the last common channel signalling exchange will originate and send an address-complete signal 15 to 20 seconds after receiving the latest address message. This time-out condition is an upper limit considering the clauses of § 6.4.1 (20 to 30 seconds for outgoing international exchanges in abnormal release conditions).

On receipt of an address-complete signal, the first Signalling System No. 7 exchange will through-connect the speech path of the interconnected circuit [2].

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[1] The application to the international circuits and the quantitative aspects (in particular, the frequency of performing the continuity-check) are for further study.

[2] It is envisaged that in the future evolution of the Telephone User Part (e.g. in the context of an integrated services digital network) the through-connection immediately after sending of the initial address message may become a mandatory requirement.

After an address-complete signal, only the following signals relating to the call set-up may be sent in the backward direction:

a) in normal operation, one of the answer or release-guard signals;

b) call-failure signal; or

c) the national network congestion signal; or

d) the circuit group congestion signal.

Note – Cases b), c) and d) can only occur after an address complete signal without subscriber free.

Any further information about the called-party's-line-condition will be transmitted to the calling subscriber or operator as audible tones or announcements.

The address-complete signal with the subscriber-free indication is sent when it is known that the called subscriber's line is free (not busy). It must be originated in the called subscriber's exchange, and therefore cannot be followed by one of the unsuccessful backward set-up information signals.

If an incoming international exchange has sent a general request message, then an address complete message must not be sent until a general forward set-up information message has been received in response to that general forward set-up information message.

1.7 *Address-incomplete signal*

The determination that the proper number of digits has not been received can be made at once if the end-of-pulsing signal is received or by receipt of an *address-incomplete* signal (or equivalent) from the national network. When overlap working is used and the end-of-pulsing signal has not been received, the address-incomplete signal will be sent by the last common channel Signalling exchange 15 to 20 seconds after receipt of the latest digit.

Each Signalling System No. 7 exchange on receipt of the address-incomplete signal will send the signal to the preceding Signalling System No. 7 exchange, if any, and clear forward the connection. The first Signalling System No. 7 exchange will send a suitable signal on the preceding circuit if the related signalling system permits to do so; otherwise the appropriate tone or announcement for the national network concerned will be sent to the calling party.

1.8 *Congestion signals*

As soon as the congestion condition is detected one of the *congestion* signals (see Recommendation Q.722, § 3.4) is sent without waiting for the completion of a possible continuity-check sequence.

Reception of a congestion signal at any Signalling System No. 7 exchange will cause the clear-forward signal to be sent and cause an appropriate signal to be sent to the preceding exchange if the signalling system allows this or an appropriate tone or announcement to be sent to the originating subscriber or operator.

1.9 *Called-party's-line-condition signals*

The *called-party's-line-condition* signals (see Recommendation Q.722, § 3.4) will be sent when the appropriate electrical signals are received at the incoming international exchange from the national network.

The *called-party's-line-condition* signals will be sent without waiting for the completion of a possible continuity check. On receipt of one of these signals, the first Signalling System No. 7 exchange (or the outgoing international exchange) will clear forward the connection and cause an appropriate signal to be sent to the preceding exchange if the signalling system allows this or an appropriate tone or announcement to be sent to the originating subscriber or operator.

Each Signalling System No. 7 exchange on receipt of one of these signals has to clear forward the connection.

1.10 *Answer signals*

The signals *answer, charge and answer, no charge* are sent as received from the national network or from the succeeding international link.

The signals answer, charge and answer, no charge are used only as a result of the first off-hook signal from the called party.

1.11 *Clear-back signal*

A *clear-back* signal must not disconnect the speech path at a Signalling System No. 7 exchange. The requirements for the release of a connection in the event that a clear-forward signal is not received are given in Recommendation Q.118 [3].

1.12 *Reanswer and clear-back signal sequences*

Subsequent off-hook, on-hook signals from the called party, such as will result from switch-hook flashing, will cause the following sequence of signals to be sent:

- clear-back,
- reanswer,
- clear-back,
- reanswer,
- etc.

It is necessary that a flashing sequence be retransmitted to the operator (or the preceding link) and that the final condition of the circuit represents the final position of the called party's switch hook.

1.13 *Forward-transfer signal*

The *forward-transfer* signal may be sent in semiautomatic working in either of the following two cases:

a) following a call switched automatically to a subscriber, or following a call established via a special operator, the controlling operator wishes to call in an assistance operator. On receipt of the forward-transfer signal at the incoming international exchange, an assistance operator is called in;

b) following a call via code 11 and 12, the controlling operator wishes to recall the incoming operator at the incoming international exchange. Receipt of the forward-transfer signal at the incoming international exchange recalls the incoming operator on calls completed via the operator positions at the exchange.

1.14 *Clear-forward and release-guard sequences*

The *clear-forward* signal is overriding and all exchanges must be in a position to respond by releasing the circuit and sending a *release-guard* signal at any time during the progress of a call and even if the circuit is in the idle condition. If sent while a circuit is blocked it will not result in unblocking the circuit concerned (see § 5). The fact that the circuit is blocked will not delay the transmission of the release-guard signal.

1.15 *Reset of circuits and circuit groups*

In systems which maintain circuit status in memory there may be occasions when the memory becomes mutilated. In such a case the circuits must be reset to the idle condition in both exchanges to make them available for new traffic. Since the exchange with the mutilated memory does not know whether the circuits are idle, busy outgoing, busy incoming, blocked, etc., reset-circuit signals or a circuit group reset message should be sent as appropriate for the affected circuits. The reset-circuit signal may also be sent, in certain cases, when a signalling fault occurs (see §§ 6.2 and 6.5).

1.15.1 *Reset-circuit signal*

If only a few circuits are concerned a reset-circuit signal should be sent for each affected circuit.

On receipt of a reset-circuit signal the unaffected exchange will:

a) accept the signal as a clear-forward signal and respond by sending a release-guard signal, after the circuit has been made idle, if it is the incoming exchange on a connection in any state of call set-up or during a call;

b) accept the signal as a clear-back or call-failure signal, whichever is appropriate, and respond by sending a clear-forward signal immediately if it is the outgoing exchange on a connection;

c) accept the signal as a clear-forward signal and respond by sending a release-guard signal if the circuit is in the idle condition;

d) if it has previously sent a blocking signal, or if it is unable to release the circuit as described above, respond by the blocking signal. If an incoming or outgoing call is in progress, this call should be disconnected and the circuit returned to the idle (blocked) state. A clear-forward or release-guard signal may be sent. The blocking signal should be acknowledged by the affected exchange. If the acknowledgement is not received, the repetition procedure specified in § 6.4.4 should be followed;

e) if it had previously received the blocking signal, respond by disconnecting any connected call, remove the blocked condition and restore the circuit to the idle state. If an outgoing call had been in progress, respond with a clear-forward or, in all other cases, a release-guard signal;

f) if a reset-circuit signal is received after the sending of an initial address message but before receipt of a backward signal relating to that call, clear the circuit and make an automatic repeat attempt on another circuit if appropriate.

g) if a reset-circuit signal is received after having sent a reset-circuit signal, respond by a release-guard signal. The circuit should be restored to traffic;

h) send an appropriate clearing signal on an interconnected circuit (e.g., clear-forward, or a suitable backward signal).

The affected exchange will then reconstruct its memory according to the received acknowledgement to the reset-circuit signal, and respond to the signals received in the normal way, i.e. release-guard in response to a clear-forward, blocking-acknowledgement in response to a blocking signal.

In addition, an interconnected circuit may be cleared by the use of an appropriate signal. If no acknowledgement to the reset-circuit signal is received before 4-15 seconds, the reset-circuit signal should be repeated. If an acknowledgement for the signal is not received within 1 minute after the sending of the initial reset-circuit signal, maintenance personnel should be notified to permit manual restoration procedures. However, the sending of the reset-circuit signal should continue at 1-minute intervals until maintenance intervention occurs.

1.15.2 *Circuit group reset message*

If a considerable number of circuits or all circuits are affected by the memory mutilation, circuit group reset messages should be used to make these circuits available for new traffic.

Since the effect of erroneous circuit group reset messages generated by undetected errors may seriously affect the quality of service, each circuit group reset message has to be sent twice.

On receipt of two circuit group reset messages with 5 seconds for the same group or parts thereof the unaffected exchange will:

i) If the range field is not coded all zero:

  a) restore the circuits involved to the idle state;

  b) send the appropriate group blocking message(s) if it had previously sent a hardware failure oriented and/or software generated group blocking message;

  c) respond by a circuit group reset-acknowledgement message in which the status indicator bits of the circuits available for service or blocked for reasons of hardware failure or a software generated alarm are coded 0 and the status indicator bit of all circuits blocked for maintenance reasons are set to 1.

ii) If the range field is coded all zero (national option)

  a) send the appropriate group blocking message(s) if it had previously sent a hardware oriented and/or a software generated group blocking message;

  b) start the restoration of the circuits on a per circuit basis in the same way as after receipt of a reset circuit for each circuit within the group (see § 1.15.1);

  c) respond by a circuit group reset-acknowledgement message indicating that the restoration of the circuits concerned was started.

iii) Independent from the coding of the range field the following actions should take place in the unaffected exchange after receipt of two circuit group reset signals within 5 seconds:

   a) if it had previously received (a) blocking signal(s) or (a) blocking message(s) for one or more of the circuit(s) involved the blocked condition will be removed and the circuits will be made available for service;

   b) if a circuit group reset message is received after having sent a circuit group reset message or (a) reset circuit signal(s) the circuits involved in both the sent and the received message/signal(s) are made available for service;

   c) appropriate signals should be sent on interconnected circuits to release them.

The affected exchange will then reconstruct its memory according to the possibly received blocking messages and the received circuit group reset-acknowledgement message. It will respond to the possibly received group blocking messages in the normal way.

If no acknowledgement to a circuit group reset message is received before 4-15 seconds the circuit group reset message should be repeated (twice). If acknowledgement for the message is not received within 1 minute after sending the initial circuit group reset message maintenance personnel should be notified to permit manual restoration procedures. However, the sending of the circuit group reset message should continue at 1 minute intervals until maintenance intervention occurs.

1.16 *Analysis of digit information for routing*

(See Recommendation Q.107 *bis*.)

1.17 *Diagrams showing signal sequence*

Some examples of call set-up sequences are shown diagrammatically (Tables 1/Q.724 and 2/Q.724).

1.18 *Use of the General Request Message and the General Forward Set-up Information Message (GRQ/GSM)*

The following procedures shall be applicable to exchanges generating or receiving GRQ or GSM messages:

a) The GRQ/GSM protocol can only be initiated during call set-up.

b) A unique GSM must be sent in response to a GRQ and must only contain answers to all requests contained in the GRQ.

c) At a transit exchange, once a GRQ has been sent, there is no requirement to wait for the resultant GSM before setting up a connection to a succeeding exchange, unless the information requested is necessary for routing/analysis functions for that call.

d) An exchange having sent a GRQ should wait until the GSM is received before sending an Address Complete Message (ACM). However, in a whole Signalling System No. 7 international network there is no requirement in the international transit exchange to delay sending the ACM, even if the GRQ/GSM cycle is not completed (i.e. ignore GSM).

e) A subsequent GRQ must not be sent from the same exchange before a reply (GSM) has been received in response to the previous GRQ. Consequently any GRQ's received by an exchange subsequent to the first GRQ and prior to replying with a GSM shall be ignored.

f) The GRQ-GSM interchange shall always take place on a link-by-link basis. This means that an exchange receiving a GRQ for which it does not hold the information, must initiate a separate GRQ/GSM cycle on the preceding link.

g) Information received in the GSM, other than that specifically requested in the associated GRQ, will be ignored.

h) An exchange shall store any information gained on a call by using the GRQ/GSM interchange or receipt of an IAM/IAI, until the call is completed successfully or failed.

i) If a call attempt fails (e.g., receipt of CGC, NCC, CFL, etc.) during the period when an exchange is waiting for a GSM, then the appropriate backward call failure shall be sent without waiting for the GSM.

j) Failure to receive a GSM in response to a GRQ will result in the preceding exchange failing the call due to non-receipt of the ACM (T2 timer expires in 20-30 seconds).

TABLE 1/Q.724

Semiautomatic (SA) and automatic (A) terminal traffic
(error-free operation assumed)

Outgoing international exchange		Incoming international exchange
	Normal call to a free subscriber (using continuity-check)	
Address signals from the national network are analysed.		
The outgoing circuit is seized.		
The initial address message is sent: – all address signals including ST in "en bloc" operation, or – all available address signals in overlap operation (a minimum of 4 digits).	Initial address message [a] →	The address message is analysed to determine: – the circuit to be seized – country code not included – nature-of-circuit (satellite or terrestrial) – echo suppressor control – calling-party's-category – continuity-check control.
The echo suppressor, if present, is disabled so that the speech path continuity-check may be performed.		The echo-suppressor, if present, is disabled so that the speech path continuity-check may be performed. The loop for the speech path continuity-check is attached to the incoming circuit.
The transceiver for the speech path continuity-check is attached, and the check-tone is transmitted on the outgoing circuit.	Check-tone [a] →	Set-up the call in the national network begins when enough address signals are received for routing (overlap operation).
When the speech path continuity-check and cross-office check have been completed, and if the incoming circuit is used with common channel signalling, when the continuity signal has been received from the national network, the continuity signal is sent, and the transceiver is removed. (When the continuity-check fails, the continuity-failure signal is sent forward. An automatic repeat attempt is made.) The echo suppressor, if present, is enabled as appropriate. The remaining address signals are sent forward in overlap operation.	← Check-tone Continuity → Subsequent address messages →	The check-loop is removed and the echo suppressor, if present, is enabled. Address signals are passed into the national network. The speech path is switched through. The address messages are analysed to determine that all the required address signals have been received (where applicable) [b]. Set-up of the speech path is completed. Subsequent supervisory signals are handled by the processor as appropriate.
On receipt of the address-complete signal, registers (if any) are released and the speech path through-connected, the address signals are erased. Subsequent supervisory signals are handled by the processor as appropriate.	← Address-complete	
The operator (SA), or the calling subscriber (A) hears ringing tone.	← Audible ringing tone	Ringing tone of the country of destination is sent back.
On receipt of the answer signal, charging [c] measurement of call duration and conversation begin.	← Answer	Signals from the national network are passed to the outgoing international exchange as follows. The called subscriber answers (charge or no charge).
"Clear-back" is recognized. SA: A clearing supervisory signal to given to the controlling operator. A: After 1-2 min., if there is no clear-forward signal, the international connection is released and charging and measurement of the call duration are ceased.	← Clear-back	The called subscriber hangs up. SA and A: After 2-3 min., if there is no clear-forward signal, the national part of the connection is released.
The outgoing operator (SA) or the calling subscriber (A) clears. When the outgoing equipment is released, the clear-forward signal is sent.	Clear-forward →	"Clear-forward" is recognized. The connection is released, and "clear-forward" is sent to the national network of destination.
"Release-guard" is recognized, and the outgoing circuit is made available for new traffic.	← Release-guard	When the incoming equipment has released, a release-guard signal is sent back. The circuit is made available for new traffic.

[a] Solid arrows denote common channel signals; dotted arrows are tones sent via the speech path (check-tone and audible tones).
[b] Address-complete signal may come from the national network.
[c] Unless a no-charge answer or address-complete signal has been received.

TABLE 2/Q.724 (Sheet 1 of 4)

Semiautomatic (SA) and automatic (A) transit traffic
(error-free operation assumed)

Outgoing international exchange		International transit exchange		Incoming international exchange
		Call to a free subscriber (using continuity-check)		
Address signals from the national network are analysed. The outgoing circuit is seized. The initial address message is sent: – all address signals including ST in "en bloc" operation or – all available address signals in overlap operation.	Initial address message [a)] →	The address message is analysed to determine: – the circuit to be seized – country code included – nature-of-circuit (satellite or terrestrial) – echo suppressor control – calling-party's-category – continuity-check control.		
The echo suppressor, if present, is disabled so that the speech path continuity-check may be performed.			Initial address message →	The address message is analysed to determine: – the circuit to be seized – country code not included – nature-of-circuit (satellite or terrestrial) – echo suppressor control – calling-party's-category – continuity-check control.
The transceiver is attached and the check-tone is transmitted on the outgoing circuit.	Check-tone [a)] - - →	The incoming half-echo suppressor, if present, is disabled; the loop for the speech path continuity-check is attached. When enough address signals have been received to select a route, the outgoing circuit is seized. The address message is sent. The outgoing half-echo suppressor, if present, is disabled.		
	← - - Check-tone			
When the speech path continuity-check and the cross-office check have been completed, the continuity signal is sent and the transceiver is removed. (When the continuity-check fails, the continuity-failure signal is sent forward. An automatic repeat attempt is made.)	Continuity →	The transceiver is attached and the check-tone is transmitted. On receipt of continuity signal, the loop is removed.	Check-tone - - →	The echo suppressor, if present, is disabled and the loop is attached so that the speech path continuity-check may be performed. When enough address signals are received to select the national route, a circuit is seized and the available address signals are passed into the national network (overlap operation).
The echo suppressor, if present, is enabled as appropriate.	Subsequent address messages →	Address signals are passed to the incoming international exchange.	Subsequent address messages →	Address signals are passed into the national network.
		Cross-office check. The transceiver is removed.	← - - Check-tone	

a) Solid arrows denote common channel signals; dotted arrows are tones sent via the speech path (check-tone and audible tones).

TABLE 2/Q.724 (Sheet 2 of 4)

Outgoing international exchange		International transit exchange		Incoming international exchange
		(When the continuity-check fails, the continuity-failure signal is sent forward. An automatic repeat attempt is made.) The speech path is switched-through.	Continuity →	On receipt of continuity signal, the loop is removed. The echo suppressor, if present, is enabled as appropriate. The last address signal, if withheld, is passed into the national network.
On the receipt of the address-complete signal, registers (if any) are released and the speech path is through-connected. The address signals are erased. Subsequent supervisory signals are handled by the processor as appropriate.	← Address complete	"Address-complete" is passed on to the outgoing international exchange. The address signals are erased. Subsequent supervisory signals are handled by the processor, as appropriate.	← Address complete	The address messages are analysed to determine that all required address signals have been received (where applicable)[b]. On receipt of continuity signal, set-up of the speech path is completed. Subsequent supervisory signals are handled by the processor as appropriate.
The operator (SA) or the calling subscriber (A) hears the audible ringing tone.	← - - -	Audible ringing tone[a] - - -	- - -	Audible ringing tone of the incoming national network is sent back. Signals from the national network are passed to the outgoing international exchange as follows:
On receipt of the answer signal, charging[c], measurement of call duration and conversation begin.	← Answer	"Answer" is passed on to the outgoing international exchange.	← Answer	The called subscriber answers (charge or no charge).
"Clear-back" is recognized. SA: A clearing supervisory signal is given to the controlling operator. A: After 1-2 min., if there is no clear-forward signal, the international connection is released and charging and measurement of the call duration are ceased.	← Clear-back	"Clear-back" is passed on to the outgoing international exchange.	← Clear-back	The called subscriber hangs up. SA and A: After 2-3 min., if there is no clear-forward signal, the national part of the connection is released.
The outgoing operator (SA) or the calling subscriber (A) clears. When the outgoing equipment is released, the clear-forward signal is sent.	Clear-forward →	"Clear-forward" is passed on to the incoming international exchange after release of the connection and outgoing equipment.	Clear-forward →	"Clear-forward" is recognized, the connection is released, and "clear-forward" is sent to the national network of destination.
"Release-guard" is recognized and the outgoing circuit is made available for new traffic.	← Release-guard	When the incoming equipment has released, "release-guard" is sent back to the outgoing international exchange. The incoming circuit is made available for new traffic.		
		"Release-guard" is recognized, and the outgoing circuit is made available for new traffic.	← Release-guard	When the incoming equipment has released, the release-guard signal is sent back. The circuit is made available for new traffic.

[b] The address-complete signal may come from the national network.

[c] Unless a no-charge answer or address-complete signal has been received.

TABLE 2/Q.724 (Sheet 3 of 4)

Outgoing international exchange		International transit exchange		Incoming international exchange
		Call to a busy subscriber		
The signal sequence is the same as for a call to a free subscriber up to the point where all of the address signals have been passed into the incoming national network.				
SA: A busy indication is given ot the operator. A: The calling subscriber hears the local national busy tone sent by the outgoing (national or international exchange).	Subscriber-busy signal (electrical) ←	"Subscriber-busy" (electrical) is passed back to the outgoing international exchange.	Subscriber-busy signal (electrical) ←	First case: The incoming national network returns the subscriber-busy signal (electrical).
		The circuit is cleared automatically.	Clear-forward →	"Clear-forward" is recognized, the connection is released, and "clear-forward" is sent to the national network of destination.
		"Release-guard" is recognized, and the outgoing circuit is made available for new traffic.	Release-guard ←	When the incoming equipment has released, "release-guard" is sent back. The circuit is made available for new traffic.
The circuit is cleared automatically.	Clear-forward →			
"Release-guard" is recognized and the outgoing circuit is made available for new traffic.	Release-guard ←	When the incoming equipment has released, "release-guard" is sent back to the outgoing international exchange. The incoming circuit is made available for new traffic.		
The operator (SA) or the calling subscriber (A) hears the busy tone of the distant country and clears.	← - - -	Busy tone	- - -	Second case: The busy tone of the incoming national network is sent back.
The clear-forward sequence follows as above.				
		Congestion (For simplicity, the continuity-check is not shown.)		
Address signal from the national network are analysed. The outgoing circuit is seized. The initial address message is sent.	Initial address message →	When enough address signals have been received to select a route, an attempt is made to seize an outgoing circuit. When blockage occurs in the switching equipment, the switching-equipment-congestion signal is sent backward.		

TABLE 2/Q.724 (Sheet 4 of 4)

Outgoing international exchange		International transit exchange		Incoming international exchange
Appropriate action is taken. (For example, an indication is given to the calling subscriber or an automatic repeat attempt is made, etc.)	Switching-equipment-congestion ← Circuit-group congestion ←	When the circuit group is fully occupied, the circuit-group-congestion signal is sent backward (if overflow is inappropriate)		
SA: An indication is given to the operator. A: An indication is given to the calling subscriber.	National-network-congestion ←	The national-network-congestion signal is passed backward. For the other congestion signals, appropriate action is taken. (For example, the congestion signal is sent backward or an automatic repeat attempt is made, etc.)	National-network-congestion ← Switching equipment-congestion ←	If congestion occurs in the national network, the national-network-congestion signal is sent backward. If blockage occurs in the switching equipment at the intenational exchange, the switching-equipment-congestion signal is sent backward.
The outgoing operator (SA) or the calling subscriber (A) clears. Appropriate action is taken. (For example, an indication is given to the calling subscriber, or an automatic repeat attept is made, etc.)	Switching-equipment-congestion ←			

2 Dual seizure with both-way operation

2.1 *Dual seizure*

Since Signalling System No. 7 circuits have the capability of *both-way* operation, it is possible that the two exchanges will attempt to seize the same circuit at approximately the same time.

2.2 *Unguarded interval*

Considering that with Signalling System No. 7:

a) signalling data link propagation time may be relatively long,

b) there may be significant delay due to retransmissions,

c) quasi-associated operation may add extra message transfer time(s) at signalling transfer points,

the unguarded interval during which *dual seizure* can occur may be relatively long in some instances. The exchange must therefore detect dual seizure and take action as defined in § 2.5.

2.3 *Detection of dual seizure*

A dual seizure is detected by an exchange from the fact that it receives an initial address message for a circuit for which it has sent an initial address message (see also § 7.5.1).

2.4 *Preventive action*

Different methods for circuit selection can be envisaged to minimize the occurrence of dual seizure. In the following, two methods are described. Further study is required to determine the field of application of each method and to ensure that the two methods do interwork satisfactorily.

Other methods for circuit selection may also be used provided that they give the same degree of protection against dual seizure also when one of the methods specified is used at the other end.

Method 1

An opposite order of selection is used at each terminal exchange of a both-way circuit group.

Method 2

Each terminal exchange of a both-way circuit group has priority access to the group of circuits which it is controlling (see § 2.5). Of this group the circuit which has been released the longest is selected *(first-in - first-out).* In addition each terminal exchange of a both-way circuit group has nonpriority access to the group of circuits which it is noncontrolling. Of this group the latest released circuit is selected *(last-in - first-out).*

For call control purposes a both-way circuit group can be subdivided into subgroups in an exchange.

It is necessary to take preventive action in cases where Signalling System No. 7 uses a signalling data link with long propagation time.

2.5 *Action to be taken on detection of dual seizure*

Each exchange will control one half of the circuits in a both-way circuit group. On detection of a dual seizure, the call being processed by the control exchange for that circuit will be completed and the received initial address message will be disregarded.

Under these conditions, the call being processed by the control exchange will be allowed to complete although, when continuity-check has to be performed, the continuity of the circuit may have been checked in the direction from noncontrol to control only. The call being processed by the noncontrol exchange will be backed off, switches released, the continuity-check transceiver removed, and the check-loop connected unless or until a continuity signal has been received from the control exchange. A clear-forward signal will not be sent. The noncontrol exchange will make an automatic repeat attempt on the same or on an alternative route.

For the purpose of resolution of dual seizure on both-way circuits, the exchange with the higher signalling point code will control all even-numbered circuits (circuit identification code) and the other exchange the odd-numbered circuits. The designation of control may also be used for maintenance control purposes.

3 Automatic repeat attempt

Automatic repeat attempt, as defined in Recommendation Q.12 [4], is provided in Signalling System No. 7.

An automatic repeat attempt will be made:

- upon failure of the continuity-check (see § 7.3);
- on detection of dual seizure (at the noncontrol exchange) (see § 2.5);
- on receipt of the blocking signal after sending an initial address message and before any backward signal has been received (see § 6);
- on receipt of a reset-circuit signal after sending an initial address message and before a backward signal has been received;
- on receipt of unreasonable signalling information after sending an initial address message and before one of the backward signals required for call set-up has been received.

4 Speed of switching and signal transfer in international exchanges

4.1 *Outgoing international exchange*

At the outgoing international exchange:

- if overlap operation is used, the sending of the initial address message shall take place as soon as sufficient digits are received and analyzed to permit the selection of an outgoing circuit;
- if "en bloc" operation is used, the initial address message should be sent as soon as all the digits of the address including the end-of-pulsing signal are available and the outgoing circuit has been chosen.

4.2 *International transit exchange*

At the international transit exchange, the selection of an outgoing circuit should begin as soon as the digits necessary to determine the routing have been received and analyzed.

4.3 *Incoming international exchange*

At the incoming international exchange:

- if overlap operation is used in the national network, the setting-up of the national part of the connection should start as soon as a sufficient number of digits has been received for routing;
- if "en bloc" operation is used in the national network, the setting-up of the national part of the connection should start as soon as all the digits of the address including the end-of-pulsing signal have been received.

5 Blocking and unblocking of circuits and circuit groups

The circuit blocking (unblocking) signal and the group blocking (unblocking) message are provided to permit the switching equipment or maintenance personnel to remove from (and return to) traffic, the distant terminal(s) at a circuit or circuit group because of fault or to permit testing. Specific conditions for automatic sending of blocking and unblocking signals and messages by the switching equipment in case of use of the interruption control on interexchange circuits appear in § 9.

Since circuits served by Signalling System No. 7 have both-way capability, the blocking signal or a group blocking message can be originated by either exchange. The receipt of the blocking signal or a group blocking message will have the effect of prohibiting calls on the relevant circuit(s) outgoing from that exchange until an unblocking signal or the appropriate group unblocking message is received, but will not in itself prohibit calls incoming to that exchange. Acknowledgement sequences are always required for the blocking and unblocking signals as well as for the group blocking and group unblocking messages, using the blocking-acknowledgement signal, the unblocking-acknowledgement signal, the appropriate group blocking-acknowledgement message and the appropriate group unblocking-acknowledgement message, respectively. The acknowledgement is not sent until the appropriate action, either blocking or unblocking, has been taken. The clear forward signal should not override a

blocking condition and return circuits to service which might be faulty. (A) blocked circuit(s) will be returned to service on transmission of the unblocking-acknowledgement signal or the appropriate group unblocking-acknowledgement message at one exchange and on receipt of the unblocking-acknowledgement signal or the appropriate group unblocking-acknowledgement message at the other exchange.

A circuit that has been maintenance blocked by a blocking signal can be unblocked by either an unblocking signal or a maintenance oriented group unblocking message. A circuit that has been maintenance blocked by a maintenance oriented group blocking message can be unblocked by either an unblocking signal or a maintenance oriented group unblocking message.

5.1 *Other actions on receipt of a blocking signal*

In the event of the receipt of a blocking signal:

- after an initial address message has been sent, and
- before a backward signal relating to that call has been received,

an automatic repeat attempt will be made on another circuit. The exchange receiving the blocking signal should clear forward the original attempt in the normal manner after sending the blocking-acknowledgement signal.

If the blocking signal for a circuit is received:

- in the outgoing exchange after at least one backward signal relating to a call has been received, or
- in the incoming exchange after at least one backward signal relating to a call has been sent,

the exchange will not seize that circuit for subsequent calls.

The fact that the circuit is engaged on a call will not delay transmission of the blocking (unblocking)-acknowledgement signal.

If a blocking signal is sent and subsequently an initial address message is received in the opposite direction, the following action is taken:

- for test calls, the call should be accepted, if possible. In the case where the test call cannot be accepted, the blocking signal must be returned;
- for calls other than test calls, the blocking signal must be returned.

Blocking of a circuit that has not been withdrawn from service by use of the blocking signal should not exceed five minutes, after which an alarm should be given at each terminal of the circuit. Should a call be in progress on the circuit involved, the five minutes time will commence when that call is cleared. If the work on the circuit must exceed five minutes, the circuit should be withdrawn from service.

5.2 *Group blocking and unblocking messages*

The following group blocking (unblocking) messages and the appropriate acknowledgement messages are provided:

- maintenance oriented group blocking (unblocking) message;
- hardware failure oriented group blocking (unblocking) message;
- software generated group blocking (unblocking) message (national option).

The range of circuits to be blocked (unblocked) is dependent on the coding of the range field:

- if the range field is not coded all zero, the circuits indicated in the status field have to be blocked (unblocked);
- if the range field is coded all zero all circuits of the predetermined circuit group have to be blocked (unblocked).

The same rule applies to the acknowledgements.

Since the effect of erroneous group blocking (unblocking) messages generated by undetected errors may seriously affect the quality of service, each group blocking (unblocking) message has to be sent twice. Therefore, at the receiving exchange actions only take place after a blocking (unblocking) message was received twice within 5 seconds.

For the circuits blocked for maintenance reasons the same conditions apply and the same actions have to be taken as described in § 5.1.

For the circuits blocked for reasons of hardware failure or software generated alarm, the following actions will be taken:

- the maintenance personnel will be alerted;
- all interconnected circuits will be released by the appropriate signals;
- the affected circuits will be set to the condition idle/hardware or software blocked without any exchange of clearing signals.

6 Release of international connections and associated equipment

6.1 *Normal release conditions*

Connections are normally released in the forward direction as a result of the receipt of a clear-forward signal from the preceding exchange.

In addition, the normal release of connections (or circuits) occurs as follows:

- on continuity-check failure (see § 7.3);
- on receipt of an address-incomplete signal (see § 1.7);
- on receipt of one of the congestion signals (see § 1.8);
- on receipt of one of the called-party's-line-condition signals (see § 1.9);
- on receipt of the blocking signal or the maintenance oriented group blocking message after sending an initial address message and before a backward signal relating to that call has been received (see § 5);
- on receipt of unreasonable signalling information after sending an initial address message and before one of the backward signals required for call set-up has been received (see § 6.5).

If the conditions for the normal release of connections as described above are not fulfilled, release is provided as follows:

- in the release under abnormal conditions (see § 6.4);
- on receipt of a call-failure signal (see § 6.3);
- on failure to receive a clear-forward signal after sending a clear-back signal (see § 6.4);
- on failure to receive an answer signal (see § 6.4);
- on receipt of a reset-circuit signal or circuit group reset message (see § 1.15).

Address and routing information are released from memory in each of the exchanges of a connection as described in the following subsections.

6.1.1 *Outgoing international exchange*

Address and routing information stored at the outgoing international exchanges can be erased on receipt of one of the following backward signals:

a) one of the address-complete signals,

b) the address-incomplete signal,

c) one of the congestion signals,

d) one of the called-party's-line-condition signals,

e) the call-failure signal,

or when the connection is cleared earlier and no automatic repeat attempt has to be made.

6.1.2 *Incoming international exchange*

Address and routing information stored at the incoming international exchange can be erased on receipt of one of the backward signals indicated in § 6.1.1 (or equivalent) from a national signalling system, or when one of the following signals has been originated and sent to the outgoing international exchange:

a) one of the address-complete signals,

b) the address-incomplete signal,

c) one of the congestion signals,

d) the call-failure signal,

e) the reset-circuit signal, or circuit group reset message,

or on receipt of a clear-forward signal.

6.1.3 *International transit exchange*

Address and routing information stored at an international transit exchange can be erased on receipt of one of the backward signals indicated in § 6.1.1, on receipt of a clear-forward signal, or when one of the congestion signals is originated in that exchange.

6.2 *Abnormal release conditions – Clear-forward, release-guard sequences*

6.2.1 *Inability to release in response to a clear-forward signal*

If an exchange is unable to return the circuit to the idle condition in response to a clear-forward signal, it should remove the circuit from service and send the blocking signal. Upon receipt of the blocking-acknowledgement signal, the release-guard signal is sent in acknowledgement of the original clear-forward signal.

6.2.2 *Inability to release in response to a backward signal*

If an exchange is unable to release a circuit in response to an address-incomplete, congestion, called-party's-line-condition or call-failure signal, it should remove the circuit from service by sending the blocking signal. Upon receipt of the blocking-acknowledgement signal, the clear-forward signal should be sent in reply to the original backward signal.

6.2.3 *Failure to receive a release-guard signal in response to a clear-forward signal*

If a release-guard signal is not received in response to a clear-forward signal before 4-15 seconds, the clear-forward signal will be repeated.

If, after sending a clear-forward signal, a release-guard signal is not received within a period of one minute after the first clear-forward signal, the maintenance personnel shall be alerted. The repetition of the clear-forward signal is ceased, and circuit reset is initiated.

6.3 *Call-failure signal*

The *call-failure* signal is sent as the result of time-out situations, described in § 6.4 and whenever a call attempt fails and other specific signals do not apply, viz:

- the address-incomplete signal,
- the congestion signals, or
- the called-party's-line-condition signals.

Reception of the call-failure signal at any Signalling System No. 7 exchange will cause the clear-forward signal to be sent and, if the signalling system permits to do so, the appropriate signal to be sent to the preceding exchange or the appropriate tone or announcement to be sent to the national network.

Failure to receive a clear-forward signal within 4-15 seconds of sending a call-failure signal causes the latter to be repeated. If no clear-forward signal is received within 1 minute of sending the call-failure signal, repetition of the call-failure signal is ceased, maintenance personnel is alerted and circuit reset initiated.

6.4 *Abnormal release condition – other sequences*

If the conditions for normal release as covered in § 6.1 are not fulfilled, release will take place under the following conditions:

6.4.1 *Outgoing international exchange*

An outgoing international exchange shall:

a) release all equipment and clear forward the connection on failure to meet the conditions for normal release of address and routing information as covered in § 6.1.1 before 20-30 seconds after sending the latest address message;

b) release all equipment and clear forward the connection on failure to receive an answer signal within the interval specified in Recommendation Q.118 [3];

c) release all equipment and clear forward the connection on failure to receive a clear-forward signal from the national network after having received a clear-back signal within the interval specified in Recommendation Q.118 [3].

6.4.2 *Incoming international exchange*

An incoming international exchange shall:

a) release all equipment, clear forward the connection into the national network and send back a call-failure signal in the following cases:

   – on failure to receive a continuity or continuity-failure signal if applicable (see Recommendation Q.723, § 3.3.1) before 10-15 seconds after receipt of the initial address message; or

   – on failure to receive one of the backward signals indicated in § 6.1.1 (or equivalent) from a national network (where expected) before 20-30 seconds after receipt of the latest address message, unless the timing for sending the address-incomplete signal (see § 1.7) is provided; or

   – on receipt of an address-incomplete signal after an address-complete signal has been generated;

b) send the call-failure signal on failure to receive a clear-forward signal for the incoming circuit before 4-15 seconds after sending an address-incomplete, congestion, call-failure or a called-party's-line-condition signal indicating inability to complete the call.

   If a clear-forward signal is not received within a period of one minute after sending the call-failure signal, the repetition of the call-failure signal should be ceased, maintenance personnel should be alerted, and a reset-circuit signal should be sent for the concerned circuit.

c) release all equipment and clear forward the connection into the national network on failure to receive a clear-forward signal after sending a clear-back signal within the interval specified in Recommendation Q.118 [3].

6.4.3 *International transit exchange*

An international transit exchange shall:

a) release all equipment, clear forward the connection and send back the call-failure signal in the following cases:

   – on failure to receive a continuity or continuity-failure signal if applicable (see Recommendation Q.723, § 3.3.1) before 10-15 seconds after receipt of the initial address message; or

   – on failure to meet the conditions for normal release as covered in § 6.1.3 before 20-30 seconds after sending the latest address message; or

b) send the call-failure signal on failure to receive a clear-forward signal for the incoming circuit before 4-15 seconds after sending an address-incomplete, congestion, call-failure or a called-party's-line-condition signal indicating inability to complete the call.

   If a clear-forward signal is not received within a period of one minute after sending the call-failure signal, the repetition of the call-failure signal should be ceased, maintenance personnel should be alerted, and a reset-circuit signal should be sent for the concerned circuit.

6.4.4 *Failure in the blocking/unblocking sequence*

An exchange will repeat the blocking (unblocking) signal or the group blocking (unblocking) messages on failure to receive the appropriate acknowledgement in response to one of these signals/messages before 4-15 seconds (see § 5).

If an acknowledgement is not received within a period of one minute after sending the initial blocking (unblocking) signal or group blocking (unblocking) messages, maintenance personnel should be alerted, the repetition of the blocking (unblocking) signal or group blocking (unblocking) messages should be continued at one minute intervals.

6.5 *Receipt of unreasonable signalling information*

The Message Transfer Part of the signalling system will avoid mis-sequencing, or double delivery, of messages with a high reliability (Recommendation Q. 706, § 2). However, undetected errors at the signalling link level and exchange malfunctions may produce signalling information in messages that is either ambiguous or inappropriate.

In order to resolve some possible ambiguities in the state of a circuit when unreasonable signals are received the following will apply:

a) if a clear-forward signal is received relating to an idle circuit it will be acknowledged with a release-guard signal;

b) if a release-guard signal is received relating to a circuit for which a clear-forward signal has not been sent, the following actions will be undertaken:

   – if the circuit is idle, the release-guard signal is discarded;

   – if the circuit is seized by a call, the release-guard signal is considered as an ordinary unreasonable information (see item g));

c) if a blocking signal is received for a blocked circuit, a blocking-acknowledgement signal will be sent;

d) if an unblocking signal is received for an unblocked circuit, an unblocking-acknowledgement signal will be sent;

e) if a blocking-acknowledgement signal for which no blocking signal has been sent is received:

   – relating to a circuit blocked by sending a blocking signal, the blocking-acknowledgement signal will be discarded,

   – relating to a circuit which is not blocked by sending a blocking signal, an unblocking signal will be sent;

f) if an unblocking-acknowledgement signal for which no unblocking signal has been sent, is received:

   – relating to a circuit blocked by sending a blocking signal, the blocking signal will be sent,

   – relating to a circuit which is not blocked by sending a blocking signal, the unblocking-acknowledgement signal will be discarded;

g) if other unreasonable signalling information is received, the following actions will be undertaken:

   – if the circuit is idle, the reset-circuit signal is sent;

   – if the circuit is seized by a call, after receipt of a backward signal required for the call set-up, the unreasonable signalling information is discarded;

   – if the circuit is seized by a call, before receipt of a backward signal required for the call set-up, the reset-circuit signal is sent. If the circuit is seized by an incoming call, the call will be released. If the circuit is seized by an outgoing call, an automatic repeat attempt is provided on another circuit.

7 Continuity-check for 4-wire speech circuits

7.1 *General*

This specification relates only to that part of a 4-wire connection served by Signalling System No. 7. The part of the speech path to be checked may include a circuit with speech interpolation. As the presence of active echo suppressors in the circuit would interfere with the continuity-check, it is necessary to disable the suppressors during the check and to re-enable them, if required, after the check has been completed.

The *transceiver* (check-tone transmitter and receiver) is connected to the *go* and *return* paths of the outgoing circuit at the first and each succeeding exchange, excluding the last exchange, in that part of the connection served by Signalling System No. 7. The *check-loop* should be connected to the *go* and *return* paths of the incoming circuit at each exchange except the first in that part of the connection served by Signalling System No. 7. A continuity-check is considered successful when a tone is sent on the *go* path and is received on the *return* path within acceptable transmission and timing limits.

7.2 *Transmission requirements*

7.2.1 *Transmitting equipment*

The *check-tone* frequency will be 2000 ± 20 Hz. For international application the sending level of the check-tone will be −12 ± 1 dBm0.

7.2.2 *Check-loop*

The check-loop will have a loss of 0 dB, taking into account any difference between the relative levels of the two paths at the point of attachment.

7.2.3 *Receiving equipment*

The check-tone receiver will have the following characteristics:

a) *Operating requirements*

Check-tone frequency: 2000 ± 30 Hz

Check-tone level range for international application:

The absolute power level N of the check-tone shall be within the limits $(-18 + n) \leqslant N \leqslant (-6 + n)$ dBm where n is the relative power level at the receiver input.

Recognition time: 30-60 ms

The frequency and level range tolerances allow for variations at the sending end and for variations in line transmission that are considered acceptable.

b) *Non-operating requirements*

Signal frequency: outside the frequency band 2000 ± 200 Hz

Signal level for international application: below or equal to $-22 + n$ dBm.

The limit is 10 dB below the nominal absolute level of the check-tone at the input of the receiver. If the level falls below this point, transmission is considered unacceptable.

Signal duration: shorter than 30 ms

The level range of $(-18 + n) \leqslant N \leqslant (-6 + n)$ dBm will serve as a Go/No-go check on the links in that part of the international connection served by Signalling System No. 7.

c) *Release requirements*

If the receiver is used to test for the removal of check-tone (see § 7.3):

- after recognition of tone, interruptions of up to 15 ms shall be ignored; this will prevent switching through the speech path prematurely;
- the indication of tone removal should not be delayed more than 40 ms; and
- the release level of the receiver should be lower than $-27 + n$ dBm for international application.

7.3 *Continuity-check procedure*

Decision on whether continuity-check should be performed or not on a given circuit should be made by an outgoing exchange according to the criteria described in § 1.4. The outgoing exchange will indicate whether continuity-check is required or not by the continuity-check indicator in the initial address message (Recommendation Q.723, § 3.3.1) or by a continuity check request in a continuity-check-test call (see Rec. Q.723 § 9 and Rec. Q.724, § 7.5). If it is required, the outgoing exchange will connect a transceiver to the speech circuit when it sends an initial address message. If continuity-check is not required either on the incoming circuit or on the outgoing circuit, the outgoing exchange can switch-through the speech path immediately after having sent the initial address message.

A description of the procedure using the specification and description language is given in the state transition diagrams in Figures 4/Q.724 and 5/Q.724. The Signalling System No. 7 exchange will send forward the continuity signal after completion of all the following actions:

- the continuity-check performed on the outgoing circuit is completed;
- the speech path across the exchange has been checked and found correct (see § 1.4); and
- if the continuity-check indicator in the received initial address message indicates that continuity-check is being (has been) performed on previous circuit(s), receipt of a continuity signal from the preceding exchange.

The speech path may be switched through at an international transit or incoming exchange and the transceiver disconnected after the continuity-check of the circuit has been successfully completed. However, the switching through of the speech path should be delayed until the residual check-tone has propagated through the return path of the speech circuit.

This determination may be made by timing, or by using the check-tone receiver to test for the removal of the check-tone, or other appropriate means.

As a national option the following single report procedure may be used to assure that on terrestrial circuits a complete check has been made of both directions of transmission in the face of high noise and in the double seizing situations. With this procedure, the continuity check is not considered successful until the check tone is recognized and its subsequent removal recognized within the continuity check timing interval. On tone recognition it must be ensured that at least 60 ms of continuity check tone has been sent. In the double seizing case, this procedure will ensure that both ends will recognize the check tone if both directions of transmission are within acceptable transmission limits. The end originating the continuity check and, in the case of double seizing, the control end send the continuity signal on successful completion of the check. The exchange at the other end of circuit removes the loop (or transceiver in the case of double seizing) on receipt of the continuity signal. If this exchange is the last common channel signalling exchange, the address-complete signal is not returned until either the loop (or transceiver or in the double seizing case) is disconnected.

With the single report continuity check procedure, the first exchange that has initiated the continuity check must delay through-connect until receipt of an address complete signal to avoid the potential hazards associated with delayed loop removal.

On receipt of the continuity signal in the following international exchange, the continuity-check loop will be removed if inserted. Also, any digits of the national number which were withheld may be released (see § 1.2).

If in an interworking situation a continuity check has to be performed on one or more of the circuits involved in the connection preceding the interworking point, appropriate measures must be taken to prevent alerting of the called party until the continuity of such circuits has been verified. Interworking situations which could be discriminated are:

a) Signalling System No. 7 → any non No. 7 Signalling System.

b) International Signalling System No. 7 → national Signalling System No. 7 not performing continuity check.

For a) the last digit(s) of the national number have to be withheld in any (interworking) transit exchange or terminating exchange in case of DDI (direct dialling in) or the alerting of the called party is postponed in the terminating exchange in case of non-DDI.

For b) either the last digit(s) of the national number are withheld in the incoming international transit exchange, a transit exchange in the national network or the terminating exchange in case of DDI or the alerting of the called party is postponed in the terminating exchange in case of non-DDI.

At the Signalling System No. 7 exchange, on failure of the outgoing circuit to satisfy the continuity-check:

– the continuity-check transceiver will be removed and an automatic repeat attempt will be made on another circuit,

– a continuity-failure signal will be sent to the following exchange.

A repeat of the continuity-check of the speech path will be made on the failed outgoing circuit within 1-10 seconds of detection of the continuity-check failure, in case of the initiation of the procedure has been made by an initial address message.

The second continuity-check will be initiated by the Signalling System No. 7 exchange detecting the failure using the continuity-check-request signal.

If the repeated check passes on this call, the speech circuit will be returned to idle with a clear-forward/release-guard sequence. If the second check fails, the maintenance staff will be alerted that a failure has occurred and the check will be repeated at intervals of 1-3 minutes. The repeated continuity-check will only be finished when continuity is detected.

According to transmission maintenance requirements, Signalling System No. 7 may provide for:

a) a print-out each time a second continuity-check is started. In such cases, the circuit involved should be identified;

b) a print-out each time a continuity-check results in a warning being given to maintenance personnel.

Since a continuity-check failure can be caused by a faulty transceiver, precautions should be taken to ensure a low probability of selecting a faulty one for both the initial continuity-check and the second check, e.g. by ensuring the selection of a different transceiver for each of the checks.

7.4 *Continuity-check timing*

7.4.1 *Time-out period*

The continuity-check is considered to have failed if the receiver has not responded within a period determined by the Administration concerned. This period should not exceed two seconds.

The time-out period of the continuity-check should always exceed the continuity recognition time, T_{CR}, given by:

$$T_{CR} = 2T_P + T_{IAM} + T_{TC} + T_L + T_R - T_T$$

where

- T_P One-way propagation time of the speech circuit and the signalling link (where these times are the same),
- T_{TC} Speech interpolation clip time for two speech interpolation systems in series (for connections not using speech interpolation $T_{TC} = 0$),
- T_R Receiver response time,
- T_L Loop connecting time (maximum),
- T_T Transceiver connecting time (minimum),
- T_{IAM} Emission time of the longest initial address message.

If retransmission of an initial address message is to be included in T_{CR}, the following formula may be used:

$$T_{CR} = 4T_P + 2T_{IAM} + T_{FISU} + 2T_X + T_L + T_R - T_T$$

where

- T_{FISU} Emission time of a fill-in signal unit (length of a fill-in signal unit),
- T_X Time between receiving an initial address message and emitting a signal unit containing an acknowledgement for that initial address message, or

  time between receiving a signal unit asking for retransmission and emitting the initial address message to be retransmitted.

7.4.2 *Switching of continuity-check equipment*

The connection and disconnection of the equipment used for the continuity-check and also the disabling and subsequent enabling of echo suppressors should be related to the following stages of progress in the establishment of the connection:

a) *Preparation at Signalling System No. 7 exchange applying the transceiver* – Action should be initiated when the initial address message is available for transmission in the Message Transfer Part.

b) *Preparation at Signalling System No. 7 exchange connecting the check-loop* – Action should be initiated at the moment of recognition of the initial address message received.

c) *Disconnection at Signalling System No. 7 exchange connecting the check-loop* – Action follows the receipt of the continuity signal, the continuity-failure signal or the clear-forward signal, or the emission of signals indicating that the call cannot be established, e.g. circuit-group-congestion signal.

d) *Disconnection at Signalling System No. 7 exchange applying the transceiver* – Action should be initiated on the successful completion or the failure of the continuity-check.

Exceptionally, if disconnection has not previously occurred, action should be initiated at the moment of recognition of the address-complete signals, the answer signals, signals indicating that the call cannot be established, or on the emission of a clear-forward signal.

It is recommended that the mean time, both for the connection and for the disconnection, is less than 100 ms. A mean time of 200 ms should not be exceeded.

7.5 *Continuity-check test calls*

7.5.1 The following procedure may be used in the cases when continuity-check is performed by test calls. This procedure is used to test a single interexchange circuit, which must be idle when the procedure is initiated.

7.5.2 When the outgoing Signalling System No. 7 exchange intends to initiate the procedure, it sends to the following exchange a continuity-check-request message and it connects the transceiver to the outgoing speech circuit. On receipt of the continuity-check-request message, the following exchange connects the loop to the involved circuit. On detection of the backward tone within the time-out specified in § 7.4.1, the outgoing exchange will disconnect the transceiver and the circuit will be returned to idle with a clear-forward/release-guard sequence.

7.5.3 In the case that no backward tone is detected within the specified time-out, the same actions apply as in the case of continuity-check failure during normal call set-up, see § 7.3 (the clause referring to the repeat attempt is not relevant in this case).

7.5.4 If an exchange receives an initial address message relating to a circuit for which it has sent a continuity-check-request message (i.e. in case of collision on a both-way operated circuit), it will abort the continuity-check test call, disconnect the transceiver and complete the incoming call.

An exchange receiving a continuity-check-request message after having sent an initial address message, will ignore it and continue the call set-up procedure.

8 Continuity-check for 2-wire speech circuits

In general the same procedure as described in § 7 is used for the continuity-check of 2-wire speech circuits except the check-loop which has to be replaced by a transponder and the fact that in the backward direction the frequency 1780 ± 20 Hz is used.

9 Interruption control for multiplex systems

9.1 *Digital circuits*

When fully digital circuits are applied between two exchanges, which have some inherent fault indication features giving an indication to the switching system in case of fault (cf. § 1.4), the switching system should inhibit new local seizures of the concerned circuits when the fault indication arises and for as long as it persists.

9.2 *FDM circuits*

9.2.1 *General*

Interruption of the pilot in frequency-division multiplex systems corresponds to loss of continuity of speech circuits or a considerable reduction of level. Therefore a switching equipment monitoring this indication (see § 1.4) should inhibit local seizure of the concerned speech circuits in case of interruption. Moreover, seizure by the remote exchange should be prevented, as long as the interruption persists, by sending blocking and unblocking signals as specified in § 9.2.2.

When interruption control is implemented, possible use of the specifications contained in Recommendation Q. 416 [5] could be applied.

9.2.2 *Blocking and unblocking of speech circuits*

Blocking signals are sent to the other end, with regard to the relevant speech circuits, whenever an interruption is detected which lasts more than 4-15 seconds.

When an interruption indicated terminates, unblocking signals are sent to the other end after 4-15 seconds, provided that blocking signals were previously sent on occurrence of the interruption.

10 Supplementary services

10.1 *General*

The supplementary services general descriptions in an ISDN environment are covered by other Recommendations, e.g.: Recommendations Q.80 to Q.83 and Q.85 to Q.87.

In principle, many of these descriptions might be applied also in telephone dedicated digital/analogue networks.

This Recommendation includes variants of supplementary services procedures and/or descriptions. It contains its own supplementary services descriptions for the services presented in this chapter.

In this part the signalling procedures related to a number of supplementary services are also described. The messages and signals are defined in Recommendation Q.722 and the format and the content are given in Recommendation Q.723.

10.2 *Closed User Group*

10.2.1 *General*

The closed user group (CUG) facilities enable users to form groups with different combinations of restrictions for access from or to the users having one or more of these facilities. The following CUG facilities are standardized:

a) closed user group – this is the basic facility that enables a user to belong to one or more CUGs;

b) closed user group with outgoing access – this is an extension to a) which also enables the user to make outgoing calls to the open part of the network, and to users having the incoming access capability see c) below;

c) closed user group with incoming access – this is a variant of a) which also enables the user to receive incoming calls from the open part of the networks, and from users having the outgoing access capability see b) above;

d) incoming calls barred within the closed user group – this is a supplementary facility to a), b) or c) which, when used, applies per user per CUG;

e) outgoing calls barred within the closed user group – this is a supplementary facility to a), b) or c) which, when used, applies per user per CUG.

A user may belong to one or more CUGs. In the case where a user belongs to more than one CUG, one of these is nominated as the preferential CUG of that user. Each user belonging to at least one CUG has either the closed user group facility or one or both of the closed user group with outgoing access and the closed user group with incoming access facilities. For each CUG to which a user belongs, either or none of the incoming calls barred within the closed user group or outgoing calls barred within the closed user group facilities may apply for that user. Different combinations of CUG facilities may apply for different users belonging to the same CUG.

The realization of the CUG facilities is done by the provision of interlock codes and is based on various validation checks at call set-up, determining whether or not a requested call to or from a user having a CUG facility is allowed. In particular, a validation check is performed by verification that both the calling and called parties belong to the same CUG as indicated by interlock codes.

The data for each CUG that a user belongs to can either be stored, associated to the user at the local exchange to which the user is connected (decentralized administration of CUG data) or in dedicated point(s) in the network. (Centralized administration of CUG data.)

The validation checks at call set-up when using decentralized administration of the CUG data are performed in the originating and destination exchange. When using centralized administration of CUG data most of the validation checks are made in the dedicated point(s), and a minimum of the CUG data is stored in the local exchanges.

In § 10.2.2 the call set-up procedures based on decentralized administration of CUG data is specified.

The centralized administration of CUG data is not specified in this Recommendation as it requires non-circuit related protocols.

10.2.2 *Call set-up procedure with decentralized administration of CUG data*

10.2.2.1 *Originating exchange*

The actions at the originating exchange at call set-up from a user belonging to a CUG depends on whether the user belongs to one or more CUGs and on the combination of CUG facilities that applies.

a) CUG selection

For each CUG that a user belongs to, the interlock code assigned to the CUG is stored, associated to the user at the local exchange. In the case where a user belongs to more than one CUG, a selection of the CUG concerned, and thus of the corresponding interlock code, is required at call set-up. This selection is based on the following criteria:

In the case where the calling party makes a facility request including an index identifying a particular CUG, this CUG is selected by the originating exchange.

In the case where the calling party makes no facility request identifying a particular CUG, the originating exchange selects the preferential (or only) CUG.

Thus in the case where the calling party belongs to a CUG, no facility request concerning CUG facilities is made if:

i) the user belongs to one CUG only;

ii) a user who belongs to more than one CUG (with or without outgoing access) makes a call within the preferential CUG;

iii) a user having the closed user group with outgoing access facility makes an outgoing access call.

A facility request is always required for a call within any CUG other than the preferential CUG.

b) Call set-up from a user having the closed user group or the closed user group with incoming access facility

In this case the CUG selection is performed in accordance with a) above.

The case where a user has both the closed user group with incoming access and closed user group with outgoing access facilities is handled in accordance with c) below.

In the case where the outgoing calls barred within the closed user group facility does not apply for the selected CUG, the call is set-up at the originating exchange. The initial address message forwarded to the next exchange then includes the interlock code of the selected CUG together with an indication that the call is a CUG call.

In the case where the outgoing calls barred within the closed user group facility applies for the selected CUG, the call is rejected and the access barred signal is returned to the calling party.

c) Call set-up from a user having the closed user group with outgoing access facility

In this case the call is regarded as either an outgoing access call or a call within the preferential (or only) CUG, unless the calling party makes a facility request identifying a particular CUG for the call.

In the case where the outgoing calls barred within the closed user group facility does not apply for the selected CUG, the call is set up at the originating exchange. The initial address message forwarded to the next exchange then includes the interlock code of the selected CUG together with an indication that the call is a CUG for which outgoing access is allowed.

In the case where the outgoing calls barred within the closed user group facility applies for the preferential (or only) CUG, the call is regarded as an outgoing access call. In this case the call is set up at the originating exchange and no interlock code or CUG call indication is included in the initial address message forwarded to the next exchange.

In the case where the calling party makes a facility request identifying a particular CUG and the outgoing calls barred within the closed user group applies for this CUG, the call is rejected and an access barred signal is sent to the calling party.

10.2.2.2 *Transit exchange*

With the possible exception of some gateway exchanges, each transit exchange sets up a CUG call as an ordinary call. The information related to the CUG facilities received from the preceding exchange, i.e. an interlock code, a CUG call indication and possibly an indication that outgoing access is allowed, is forwarded to the succeeding exchange.

In the case of an international CUG call, no special functions are required at the gateway exchange provided that the international interlock code assigned to the international CUG concerned is used in the national network. However, in the case where a national interlock code other than the applicable international interlock code is used within a national network, interlock code conversion is required at the gateway (or corresponding) exchange.

10.2.2.3 *Destination exchange*

At the destination exchange a validation check of the acceptability of a call is made where either the calling party (as indicated by a CUG call indication in the initial address message received) or the called party belongs to CUG. The call is connected only in cases where the information received checks with the information stored at the destination exchange, as specified in the following. In cases where a call is rejected because of incompatible CUG information an unsuccessful backward set-up information message including the access barred signal is sent towards the originating exchange.

a) Calls to a user having the closed user group or the closed user group with outgoing access facility

   In this case an incoming call is accepted only when:

   i) it is a CUG call, including the case where outgoing access is allowed, and

   ii) correspondence is found between the interlock code received and an interlock code associated with the called party, and

   iii) the incoming calls barred within the closed user group facility does not apply for the CUG identified by the interlock code received.

   If all the above conditions are not met, the call is rejected.

b) Calls to a user having the closed user group with incoming access facility

   In this case an incoming call is accepted when it is:

   i) an ordinary call;

   ii) a CUG call for which outgoing access is not allowed, if both conditions specified in ii) and iii) of a) above are met;

   iii) a CUG call for which outgoing access is allowed.

c) CUG calls to a user not belonging to any CUG

   In the case where the incoming call is:

   i) a CUG call for which outgoing access is allowed, it is accepted;

   ii) a CUG call for which outgoing access is not allowed, it is rejected.

10.2.3 *International interlock code*

Each international CUG is assigned a unique International CUG number (ICN) according to the administrative rules defined in Recommendation X.180.

10.3 *Users access to the calling line identification*

10.3.1 *General*

Users access to the calling line identification is a user facility that enables a user to be informed at incoming calls of the identity of the calling line. When provided, the facility applies to all incoming calls except when the calling party has the calling line identity presentation restricted facility or when the complete identity of the calling line is not available at the destination exchange.

The calling line identity is the telephone number of the calling party.

The calling line identity presentation restricted facility enables a user to prohibit the forwarding of the calling line identity to the called party.

In the case where a national network does not always provide the calling line identity facility, the calling line identity is the known part of the telephone number at the interworking point (e.g. Trunk Code).

In the case where the calling is a PABX the network will send the telephone number of the PABX or, in alternative the full DDI number. The latter case is possible if the PABX provides the calling line identification facility to the network.

The information indicating that a user has the calling identity or the calling line identity presentation restricted facility is available in the exchange to which the user is connected.

10.3.2 *Call set-up procedure*

The call control procedure and the information included in call control messages vary depending on whether the calling party has indicated to use the calling line identity presentation restricted facility for this call and whether the calling line identity is included in the initial address message.

Two different call control procedures can be used to provide the calling line identity facility. Both procedures are specified for international use:

10.3.2.1 *The calling line identity is included in the initial address message*

In the case where the calling party has indicated the calling line identity restricted facility, the initial address message includes the calling line identity restricted request indicator.

In the case where the complete identity of the calling party is not available or not allowed to be forwarded outside the network:

a) in international network no information regarding the calling line identity is included;

b) in national networks, the known part of the calling line identity could be included. In this case an incomplete calling line identity indicator is included in the message.

The calling party address is sent to the called party.

In the case where the destination exchange receives the calling party address restricted request indicator or a calling party incomplete address indicator, the calling line identity is not forwarded to the called party.

10.3.2.2 *The calling line identity is not included in the initial address message*

In the case where the called party has the user access to the calling line identification facility, a request is sent towards the originating exchange. The request is included in a general request message.

When receiving the request for calling line identity the originating/interworking exchange sends a response including the calling line identity. In the case where the calling party has the calling line identity presentation restricted facility the response sent from the originating exchange includes the calling line identity presentation restricted request indicator. The response is included in a general forward set-up information message. The information included in the response in addition to the calling line identity presentation restricted indicator (where applicable) is as follows:

a) in the case where the complete identity of calling line is known, the originating exchange includes the complete telephone number of the calling party;

b) in the case where the complete identity of the calling party address is not available or is not allowed to be forwarded outside the network, the response includes:

   i) in international networks the calling line identity unavailable signal;

   ii) in national networks, in addition to the calling line identity unavailable signal, the response can include the known part of the calling line identity. In this case the response includes the incomplete calling line identity indicator.

The calling party address is sent to the called party.

In the case where the destination exchange receives the calling party address restricted request indicator or a calling party incomplete address indicator, the calling line identity is not forwarded to the called party.

The destination exchange must not connect through until the complete calling line identity has been sent to the called party or the called party has been notified that the calling line address identity will not be forwarded.

10.4 *Redirection of calls*

10.4.1 *General*

The redirection of calls facility enables a user to have calls to a telephone number, for which the facility is subscribed, redirected to another predetermined number during periods when the facility is activated.

The redirection of calls rejected facilities enables a user to have redirected calls to his telephone number automatically rejected during periods when the facility is activated.

The redirection of calls information prohibited facility enables the user, who has activated the redirection of calls facility, to prevent the calling party from being informed that the call is redirected.

Depending on the possibilities offered by the Administration facility, activation and deactivation may be made:

a) by the user by means of user controlled activation and deactivation procedures;

b) by the network at predetermined times;

c) by the Administration on request of the user.

User controlled procedures for inquiry of the status of the facility (i.e. whether the facility is activated or deactivated) may also be provided.

A call may only be redirected once. Redirected calls are subject to the same restrictions as other calls where a closed user group is involved.

10.4.2 *Call set-up procedure not involving other facilities affecting the procedure*

Information that a user has the redirection of calls rejected facility is stored at the exchange to which the user is connected. When a redirected call arrives at such a user, the call is rejected in the same manner as if this user had activated the redirection of calls facility.

Information that a user has the redirection of calls information prohibited facility is stored at the exchange, where the user is connected, together with the redirection address.

Information that a subscriber has the redirection of calls facility activated is stored together with the redirection address, at the exchange to which the user is connected. When such a user is called, the call is set up to the redirection address in accordance with the following:

10.4.2.1 *The redirection address is at the same exchange*

In this case the destination exchange connects the call to the redirection address and returns an address complete message including the call forwarding indicator. In the case where the called party has the redirection of calls information prohibited facility activated the address complete message includes the redirection of calls information prohibited indicator. When receiving the call forwarding indicator the originating exchange sends a signal to inform the calling party that the call has been redirected, except for the case when the address complete message includes the redirection of calls information prohibited indicator. In this case no information related to the redirection of calls facility is sent to the calling party.

In the case where the user at the redirection address has the redirection of calls or the redirection of calls rejected facility activated, the destination exchange rejects the call and returns an indication in an unsuccessful backward set-up message.

10.4.2.2 *The redirection address is at another exchange*

In this case the call is set-up to the redirection address in accordance with the following procedure.

The call forwarding procedure is based on the principle that the connection is extended forward from the destination exchange to the new destination exchange.

i) The first destination exchange sets up the forward connection to the redirection address. The initial address message forwarded includes a redirected call indicator and the redirection address and redirection of calls information prohibited indicator (if applicable). In national networks the first called party address and the called line identity (if applicable) and the calling line identity presentation prohibited indicator (if applicable) could also be included in the initial address message.

ii) Upon receipt of the redirected call the new destination exchange connects or rejects the call in accordance with § 10.4.2.1. The redirected call indicator received is used to prevent a further redirection. The first called party address could be used for special acceptance tests, or be sent to the calling party.

iii) In the case where the call is connected to the redirection address the destination exchange will send an address complete message including the call forwarding indicator and the redirection of calls information prohibited indicator (if applicable). The call forwarding indicator is used to inform the originating/controlling exchange, that the first destination exchange performs the charging for the redirected call. It could also be used to indicate to the calling party that the call is redirected. Except for the case, when the address complete message includes the redirection of calls information prohibited indicator. In this case no information relating to the redirection of calls facility is sent to the new called party.

iv) When the first destination exchange receives a message, e.g. request for calling line identity from the new destination exchange, it sends it further backwards to the originating exchange.

10.4.3 *Calls involving other facilities affecting the procedure*

10.4.3.1 *Calls involving a closed user group facility*

Redirected calls are subject to the restrictions applying for the closed user group (CUG) facilities.

- In the case where the call is a CUG call, or the originally called party has a CUG facility, the call is rejected before redirection unless the validation check requirements applying for the CUG facility(ies) concerned are satisfied.
- In the case where the call is a CUG call, or the user at the redirection address has a CUG facility, the call is rejected unless the validation check requirements applying for the CUG facility(ies) concerned are satisfied.
- In the case where:
  i) the call is a CUG call and,
  ii) the redirection address is at an exchange other than the first destination exchange, and
  iii) the procedure for setting up the call to the redirection address is in accordance with § 10.4.2.2 (i.e. call forwarding procedure),

  the first destination has to send the CUG information received (e.g. the CUG call indication and the interlock code) forward to the new destination exchange in the initial address message.

10.4.3.2 *The redirection address has the user's access to the calling party identification*

In the case where a redirected call arrives at a user, who has the users access to the calling party address identification facility, the succeeding actions at the redirection exchange depend on if the calling party address is available at the original called exchange.

In the case where the calling party address is not available, a request for the calling party address is sent to the preceding exchange(s) in accordance with § 10.3.2.2. When the new destination exchange has the calling party address available, it sends it to the new called party unless the calling party address presentation restricted indicator is received at the new destination exchange.

10.4.3.3 *The redirection address has the malicious call identification capability*

In the case where a call arrives at a user marked as an MCI user, the call set-up procedure depends on whether the calling party address and/or the original called party address is included in the initial address message and if the hold option should apply for the call.

a) The hold option does not apply for the call. In this case the call control procedure depends on whether the calling party address and/or the original called party address is included in the initial address message.

   In the case where one or both of the addresses are not available, a request is sent to the preceding exchange(s). The request will indicate which address(es) are requested.

   As a response the preceding (e.g. the originating or the original called) exchange will include the concerned address(es), which has been requested.

b) The hold options applies for the call. In this case the call set-up procedure depends on whether the calling party address and/or the original called party address is included in the initial address message. In this case a request is sent to the preceding exchange(s) indicating that the holding of the circuit is required.

   In the case where one or both of the address(es) are not available, a request is sent to the preceding exchange(s).

   In their response the preceding (e.g. original called or originating) include the addresses concerned, which have been requested and apply the holding of circuit.

   In the case of interworking, the interworking exchange will send in addition to the information specified in § 10.5.3, the original called party address.

   When the original called exchange receives the request when both addresses are not available in this exchange, it repeats the request to the originating exchange. When the original called exchange receives the response it repeats the response towards the destination exchange. When the original called exchange receives the delayed release message, it sends it forward to the destination exchange.

10.5 *Network access to the calling line identification*

10.5.1 *General*

The network access to the calling line identification is a network capability which enables a network to obtain the calling party address inside or outside their own network. The capability is used for example for malicious call identification, charging, etc.

10.5.2 *Malicious call identification* (MCI)

The malicious call identification gives the possibility to obtain by an appropriate request the identification of the calling line and the original called party (in the case of a redirected call). The identification request provokes in the destination exchange, the print-out of the following items:

- called line identity;
- calling line identity and possibly the original called line identity;
- time and date of the call.

The same print-out may be, optionally, obtained in the originating exchange.

The identification request can either be activated before, during or after the conversation phase.

Two different options of the utility are defined namely:

a) MCI with hold (national use);

b) MCI without hold.

One or both options should be provided in a national network.

In case a), the holding of the connection is requested in addition to the identification of the calling party. In case b), only the identification of the calling line is requested.

In case a), the clearing of the connection is subject to called party clearing.

10.5.3 *Call set-up procedure*

In case of an incoming call to a user having the MCI facility the call set-up procedure depends on whether the calling line identity is included in the initial address message and which options, without hold or with hold, the called party has been assigned:

a) if the calling line identity is included in the initial address message:
   - in the case where the called party has the MCI without hold indication, the calling party address and possibly the original called address is stored in the destination exchange;
   - in the case where the called party has the MCI with hold indication, the calling party address and possibly the original called party address is stored at the destination exchange, and a request for holding of the circuit is sent to the originating exchange.

b) if the calling line identity is not included in the initial address message:
   - in the case where the called party has the MCI without hold indication, a request is sent to the originating exchange containing the calling line identity request;
   - in the case where the called party has the hold indication, the request will include requests for the holding of the circuit and for calling line identity.

In addition to the information mentioned above the request will also include the MCI facility encountered indicator. The request will be sent in a general request message.

When receiving the MCI request the transit exchange normally repeats the request. However, in two cases the transit exchange acts in another way:

- In the case of interworking with networks that do not provide the calling line identification facility, the relevant transit exchange will send a response including the identity of the transit exchange. The identity of the transit exchange could either be the known part of the calling party address in that exchange or, in national networks, the signalling point code of the transit exchange. In addition to the identity of the transit exchange the response can also include the identity of the incoming trunk. The interworking exchange may also arrange the holding of the incoming trunk even if not explicitly requested (i.e. also in the option "MCI without hold"). In the case where the MCI request also includes the hold request the transit exchange will make the clearing of circuit subject to the called party clearing.
- In the case where the MCI cannot operate (due to administrative or technical reasons), the relevant exchange includes in the MCI response message the MCI not provided indicator.

At the receipt of the MCI request, the originating exchange sends a general forward set-up information message containing the calling line identity and the hold indicator. If holding of the connection is provided the clearing of the circuit will be subject to the called party clearing (i.e. subject to the receipt of the clear-back signal). When the identification request is made the destination exchange produces the print-out of the related MCI information and sends backwards, optionally, the *MCI print-out request* (for further study) message to obtain the print-out of the same information in the originating exchange.

10.5.4 *Clearing procedures*

In the case where no holding of the circuit is requested, the normal release procedure will apply.

In the case where the holding of the circuit is requested, the following procedures apply at the originating exchange and the destination exchange:

a) In the case where the calling party hangs up first, the originating exchange will apply the hold of the connection and stop the charging (if applicable). Moreover, the originating exchange may send forward the optional "calling party clear signal".

   When receiving the calling party clear signal an intermediate charging point stops the charging (if applicable) and forwards the calling party clear signal to the succeeding exchange.

   When receiving the calling party clear signal the destination exchange starts a timer T1, if the identification request is not received.

   The value of T is a national option.

b) In the case where the identification request is made before the called party disconnects, no clear-back signal will be sent until appropriate action has been taken (e.g. maintenance action). If applicable T1 is stopped when the identification request is received.

c) When the called party disconnects the destination exchange may start a timer T2 to allow for making the identification request after the conversation is terminated.

The succeeding actions at the destination exchange will depend on whether an identification request has been made or not.

In the case where the request was not made identification request, the expiration of the timer T2 will result in sending of the clear-back message. The timer T1 is stopped (if applicable).

In the case where the called party makes the request for identification is made before the timer T2 expires, no clear-back signal will be sent until appropriate actions have been taken. The timers T2 and T1 (if applicable) are stopped when receiving the identification request is made.

11 Digital connectivity

11.1 *General*

The digital connectivity is a user facility that enables a user to establish a fully digital path at 64 kbit/s user-to-user. It is an optional facility assigned to the user and provided on a call request basis or specific category.

11.2 *Call set-up procedure*

In the case of a call for which the digital connectivity is required, the IAM/IAI message includes *the all digital path required* indicator.

On recognition of this request each exchange (originating/transit) makes a check on the possibility to route the call on a digital path:

- if the check is positive the call is routed and the request of this facility is forwarded to the succeeding exchange;
- if negative, the call is rejected and one of the following unsuccessful signals is sent backwards:
  - *congestion* or *call-failure signal* in case where a digital path exists but it is not possible to complete the call due to congestion or failure (see Recommendation Q.722, § 3.4).
  - *digital path not provided* in case where a routing that allows a complete digital path doesn't exist.

In the destination exchange, at the reception of an incoming call with the digital connectivity request, the appropriate validation check is made and, if positive, the call is completed using the standard procedures. In the negative case the call is rejected and the *access barred* signal is sent backwards.

12 Echo suppressor control

12.1 *General*

The echo suppressor control signalling procedure is used on per call basis to convey information between exchanges about the demand and ability to insert echo suppressors.

The procedure is mainly intended to be used in the case where the echo suppressors are provided in pools.

The procedure is initiated by the exchange which upon analysis of an initial address message of a call realizes that the call is to be routed on a connection for which echo suppressor is necessary, and no indication is received that an outgoing half-echo suppressor is already included (see Note).

The exchange shall always be able to insert outgoing half-echo suppressors.

One of the exchanges succeeding the above-mentioned exchange shall always be able to insert incoming half-echo suppressors.

The procedure is for application in national networks and could be applied in the international network upon bilateral agreement.

Note – In the case where this exchange knows that there is no echo suppressor situated in the preceding network the procedure is not initiated.

12.2 *Actions at the exchange initiating the echo suppressor control procedure*

Upon receipt of an initial address message the following actions are taken if no indication is received that an outgoing half-echo suppressor is already included:

- a request for outgoing half-echo suppressor is sent in the backward direction;
- a timer T is started (see Note);
- an outgoing half-echo suppressor is reserved;
- the initial address message is sent on with the indication outgoing half-echo suppressor included.

Upon receipt of a response on the outgoing half-echo suppressor request the following actions are taken:

a) if the response is negative:
   - the reserved outgoing half-echo suppressor is included;
   - the timer T is stopped;

b) if the response is positive:
   - the reserved outgoing half-echo suppressor is released;
   - the timer T is stopped.

Note – If response on the request for outgoing half-echo suppressor has not been received before timer T has expired, then the reserved half-echo suppressor is included.

12.3 *Actions at the originating exchange*

Upon receipt of a request for outgoing half-echo suppressor the following actions are taken:

a) if the originating exchange is not able to insert outgoing half-echo suppressor:
   - a negative response is sent in the forward direction;

b) if the originating exchange is able to insert outgoing half-echo suppressor:
   - a half-echo suppressor is included;
   - a positive response is sent in the forward direction.

12.4 *Actions at an intermediate exchange*

12.4.1 *The exchange being able to insert a half-echo suppressor*

Upon receipt of a request for outgoing half-echo suppressor the following actions are taken (see Note 1):

- an outgoing half-echo suppressor is reserved;
- the request message is sent on;
- a timer T is started (see Note 2).

Note 1 – If the intermediate exchange knows that there is no echo suppressor in the preceding network the intermediate exchange performs actions in accordance with § 12.3.

Note 2 – If response on the request for outgoing half-echo suppressor has not been received before timer T has expired, then the reserved half-echo suppressor is included and a positive response is sent in the forward direction.

Upon receipt of a response on the outgoing half-echo suppressor request the following actions are taken:

a) the response is negative:
   - the reserved outgoing half-echo suppressor is included;
   - the timer T is stopped;
   - a positive response is sent in forward direction;

b) the response is positive:
   - the reserved outgoing half-echo suppressor is released;
   - the timer T is stopped;
   - the response is sent on.

Upon receipt of an initial address message with the indication "outgoing half-echo suppressor included" the following actions are taken:

- an incoming half-echo suppressor is reserved;
- the initial address message is sent on.

Upon receipt of an address complete message with an indication on incoming half-echo suppressor the following actions are taken:

a) the indication is negative:
   - the reserved incoming half-echo suppressor is included;
   - the address complete message is sent on with a positive indication;

b) the indication is positive:
   - the reserved incoming half-echo suppressor is released;
   - the address complete message is sent on.

12.4.2 *The exchange not being able to insert half-echo suppressor*

No special actions are required.

12.5 *Actions at the destination exchange*

Upon receipt of an initial address message with the indication "outgoing half-echo suppressor included" the following actions are taken:

a) if the destination exchange is not able to insert an incoming half-echo suppressor:
   - a negative indication on the inclusion of incoming half-echo suppressor is given in the address complete message;

b) if the destination exchange is able to insert incoming half-echo suppressor:

   – a half-echo suppressor is included;

   – a positive indication on the inclusion of incoming half-echo suppressor is given in the address complete message.

13 Congestion control

13.1 *Exchange congestion control*

13.1.1 *Automatic congestion control*

Automatic Congestion Control (ACC) is used when an exchange is in an overload condition (see also Recommendation Q.542, § 5.4.5). Two levels of congestion are distinguished, a less severe congestion threshold (congestion level 1) and a more severe congestion threshold (congestion level 2). If either of the two congestion levels is reached, an automatic congestion control information message may be sent to the adjacent exchanges indicating the level of congestion (congestion level 1 or 2). The adjacent exchanges, when receiving an automatic congestion control information message, should reduce their traffic to the overload affected exchange.

The automatic congestion control information message is sent by the overloaded exchange after receiving the clear-forward signal and before sending the release-guard signal for a circuit. If the overloaded exchange returns to normal traffic load, no more automatic congestion control information messages are sent. The adjacent exchanges then, after a predetermined time, automatically return to their normal status.

13.2 *Telephone User Part signalling congestion control*

13.2.1 *General*

On receipt of congestion indication primitives, CIP (see also Recommendation Q.704, § 10.2.3), the TUP should reduce traffic load (call attempts) into the affected direction in several steps.

13.2.2 *Procedure*

When the first CIP is received by the TUP, the traffic load into the affected direction is reduced by one step. At the same time, two timers Tue1 and Tue2 are started. During Tue1, all the following received CIPs for the same direction are ignored in order not to reduce traffic too rapidly. Reception of a CIP after the expiry of Tue1, but still during Tue2, will decrease the traffic load by one more step and restart Tue1 and Tue2.

If Tue2 expires (i.e. no CIPs have been received during the corresponding period), traffic will be increased by one step and Tue2 will be restarted unless full traffic load has been resumed.

$$\left.\begin{aligned} \text{Tue1} &= \text{300-600 ms} \\ \text{Tue2} &= \text{5-10 s} \end{aligned}\right\}\quad \text{provisional values}$$

The number of steps of traffic reduction and the type and/or amount of increase/decrease of traffic load at the various steps are considered to be an implementation dependent function.

14 Telephone User Part outage

When a Telephone user part outage occurs, actions should be taken as follows:

– The user parts at the nodes connected to the failing node should receive an indication from the user's flow control functions and react by stopping the seizure of circuits to that failing node and by routing the traffic on alternative routes.

– In the user part which has previously failed, after the initialization procedures, the resumption of the signalling relation is obtained by sending circuit group messages in all the circuits affected by the outage, as specified in § 1.15 (Reset of circuits and circuit groups).

15 State transition diagrams

15.1 *General*

This section 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 Telephone User Part signalling procedure function is divided into functional blocks, as shown in Figure 1/Q.724; state transition diagrams are provided for each functional block, as shown below:

- Signalling procedure control (SPRC): Figure 2/Q.724
- Call processing control (CPC): Figure 3/Q.724
- Continuity-check outgoing (CCO): Figure 4/Q.724
- Continuity-check incoming (CCI): Figure 5/Q.724
- Continuity-recheck outgoing (CRO): Figure 6/Q.724
- Continuity-recheck incoming (CRI): Figure 7/Q.724
- Blocking and unblocking signal sending (BLS): Figure 8/Q.724
- Blocking and unblocking signal reception (BLR): Figure 9/Q.724
- Circuit reset (CRS): Figure 10/Q.724
- Circuit group control (CGC): Figure 11/Q.724
- Circuit group reset sending (CGRS): Figure 12/Q.724
- Circuit group reset receipt (CGRR): Figure 13/Q.724
- Maintenance oriented circuit group blocking and unblocking sending (MBUS): Figure 14/Q.724
- Maintenance oriented circuit group blocking and unblocking receipt (MBUR): Figure 15/Q.724
- Hardware failure oriented circuit group blocking and unblocking sending (HBUS): Figure 16/Q.724
- Hardware failure oriented circuit group blocking and unblocking receipt (HBUR): Figure 17/Q.724
- Software generated circuit group blocking and unblocking sending (SBUS): Figure 18/Q.724
- Software generated circuit group blocking and unblocking receipt (SBUR): Figure 19/Q.724

The detailed functional breakdown shown in the diagrams is intended to illustrate a reference model and to assist interpretation of the text in the earlier sections. The state transition diagrams are intended to show precisely the behaviour of the signalling system as viewed from a remote location. It must be emphasized that the functional partitioning shown in the diagrams is used only to facilitate understanding of the system behaviour and is not intended to specify the functional partitioning to be adopted in a practical implementation of the signalling system.

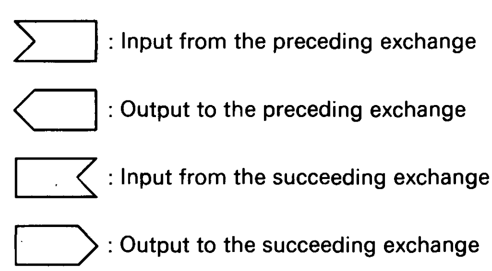
15.2 *Drafting conventions*

a) Abbreviations used in Figures 1/Q.724 to 19/Q.724 are listed in § 15.3.

b) External inputs and outputs are used for interactions with different functional blocks. Internal inputs and outputs are used for interactions within each functional block, e.g. to indicate control of time-outs.

c) External inputs and outputs contain as part of their name, the abbreviations of their source and destination functional block names, with an arrow in between, e.g. Start CPC→ CCO.

d) For interexchange signals or signal messages, external input and output symbols are used as shown below to indicate the direction of each signal on message.



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Note – The functions covered by Figures 1/Q.724 to 19/Q.724 are limited in the following points:

– they refer only to call processing functions in international transit exchanges;

– they do not necessarily cover all the abnormal situations.

However, they include some operations on receipt of unreasonable signalling information as specified in § 6.5.

15.3 *Abbreviations and timers used in Figures 1/Q.724 to 19/Q.724*

General

BBR	Circuit blocked by reception of the blocking signal
BBS	Circuit blocked by sending the blocking signal
CC	Continuity-check
CCT	Telephone circuit
ICC	Incoming trunk circuit
NOK	Not OK
OGC	Outgoing trunk circuit

Functional block names (See Figure 1/Q.724)

BLR	Blocking and unblocking signal reception
BLS	Blocking and unblocking signal sending
CCI	Continuity-check incoming
CCO	Continuity-check outgoing
CGC	Circuit group control
CGRR	Circuit group reset receipt
CGRS	Circuit group reset sending
CPC	Call processing control
CRI	Continuity-recheck incoming
CRO	Continuity-recheck outgoing
CRS	Circuit-reset
HBUR	Hardware failure oriented circuit group blocking and unblocking receipt
HBUS	Hardware failure oriented circuit group blocking and unblocking sending
L3	Level 3 (Signalling network functions)
L4	Level 4 (Telephone user part)
MBUR	Maintenance oriented circuit group blocking and unblocking receipt
MBUS	Maintenance oriented circuit group blocking and unblocking sending
SBUR	Software generated circuit group blocking and unblocking receipt
SBUS	Software generated circuit group blocking and unblocking sending
SPRC	Signalling procedure control

Messages and signals

ACM	Address complete message
ADC	Address complete signal, charge
ADI	Address incomplete signal
ADN	Address complete signal, no charge
ADX	Address complete signal, coin box
AFC	Address complete signal, charge, subscriber free
AFN	Address complete signal, no charge, subscriber free
AFX	Address complete signal, coin box, subscriber free
ANC	Answer signal, charge
ANN	Answer signal, no charge
BLA	Blocking-acknowledgement signal
BLO	Blocking signal

CBK	Clear-back signal
CCF	Continuity-failure signal
CCH	Continuity-check indicator: – 0: CC not required – 1: CC required on this circuit – 2: CC is being (has been) performed on a previous circuit
CCR	Continuity-check-request signal
CFL	Call-failure signal
CGC	Circuit-group-congestion signal
CLF	Clear-forward signal
COT	Continuity signal
FOT	Forward-transfer signal
GRA	Circuit group reset-acknowledgement message
GRS	Circuit group reset message
HBA	Hardware failure oriented group blocking-acknowledgement message
HGB	Hardware failure oriented group blocking message
HGU	Hardware failure oriented group unblocking message
HUA	Hardware failure oriented group unblocking-acknowledgement message
IAM	Initial address message
LOS	Line-out-of-service signal
MBA	Maintenance oriented group blocking-acknowledgement message
MGB	Maintenance oriented group blocking message
MGU	Maintenance oriented group unblocking message
MUA	Maintenance oriented group unblocking-acknowledgement message
NNC	National-network-congestion signal
RAN	Reanswer signal
RLG	Release-guard signal
RSC	Reset-circuit signal
SAO	Subsequent address message with one signal
SAM	Subsequent address message
SBA	Software generated group blocking-acknowledgement message
SEC	Switching-equipment-congestion signal
SGB	Software generated group blocking message
SSB	Subscriber-busy signal (electrical)
SST	Send-special-information-tone signal
SUA	Software generated group unblocking-acknowledgement message
UBA	Unblocking-acknowledgement signal
UBL	Unblocking signal
UNN	Unallocated-number signal

Timers

T1	Timer “waiting for continuity or continuity-failure signal” [10-15 seconds, see § 6.4.3 a)]
T2	Timer “waiting for address-complete signal” [20-30 seconds, see § 6.4.3 a)]
T3	Timer “waiting for clear-forward signal after sending unsuccessful message” [4-15 seconds, see § 6.4.3 b)]
T4	Timer “waiting for clear-forward signal after sending call-failure signal” [4-15 seconds, see § 6.4.3 b)]
T5	Timer “stop sending call-failure messages on time out” [1 minute, see § 6.4.3 b)]

T6 Timer "waiting for release-guard signal" (4-15 seconds, see § 6.2.3)

T7 Timer "stop sending clear-forward signal on time out" (1 minute, see § 6.2.3)

T8 Timer "waiting for backward check-tone" (should not exceed 2 seconds, see § 7.4.1)

T9 Timer "delay to start first-time continuity-recheck" (1-10 seconds, see § 7.3)

T10 Timer "delay for multiple retests of continuity" (1-3 minutes, see § 7.3)

T11 Timer "waiting to alert maintenance personnel following initiation of blocking" (5 minutes, see § 5)

T12 Timer "waiting for blocking-acknowledgement signal" (4-15 seconds, see § 6.4.4)

T13 Timer "waiting to alert maintenance personnel on failure to receive BLA" (1 minute, see § 6.4.4)

T14 Timer "delay to repeat sending of blocking signals" (1 minute, see § 5.1)

T15 Timer "waiting for unblocking acknowledgement" (4-15 seconds, see § 6.4.4)

T16 Timer "waiting to alert maintenance personnel on failure to receive unblocking acknowledgement" (1 minute, see § 6.4.4)

T17 Timer "delay to repeat sending of unblocking acknowledgement" (1 minute, see § 5.1)

T18 Timer "waiting for a response to the reset-circuit signal" (4-15 seconds, see § 1.15)

T19 Timer "delay to send the reset-circuit signal" (1 minute, see § 1.15)

T20 Timer "waiting for second group reset message" (5 seconds, see § 1.15.2)

T21 Timer "waiting for circuit group reset acknowledgement message" (4-15 seconds, see § 1.15)

T22 Timer "delay to send the circuit group reset message" (1 minute, see § 1.15)

T23 Timer "waiting for second maintenance oriented group blocking message" (5 seconds, see § 5.2)

T24 Timer "waiting for second maintenance oriented group unblocking message" (5 seconds, see § 5.2)

T25 Timer "waiting to alert maintenance personnel following initiation of maintenance oriented group blocking" (5 minutes, see § 5)

T26 Timer "waiting for maintenance oriented group blocking acknowledgement message" (4-15 seconds, see § 6.4.4)

T27 Timer "delay to send the maintenance oriented group blocking message" (1 minute, § 6.4.4)

T28 Timer "waiting for maintenance oriented group unblocking acknowledgement message" (4-15 seconds, see § 6.4.4)

T29 Timer "delay to send the maintenance oriented group unblocking message" (1 minute, see § 6.4.4)

T30 Timer "waiting for second hardware failure oriented group blocking message" (5 seconds, see § 5.2)

T31 Timer "waiting for second hardware failure oriented group unblocking message" (5 seconds, see § 5.2)

T32 Timer "waiting for hardware failure oriented group blocking acknowledgement message" (4-15 seconds, see § 6.4.4)

T33 Timer "delay to send hardware failure oriented group blocking message" (1 minute, see § 6.4.4)

T34 Timer "waiting for hardware failure oriented group unblocking acknowledgement message" (4-15 seconds, see § 6.4.4)

T35 Timer "delay to send hardware failure oriented group unblocking message" (1 minute, see § 6.4.4)

T36 Timer “waiting for second software generated group blocking message” (5 seconds, see § 5.2)

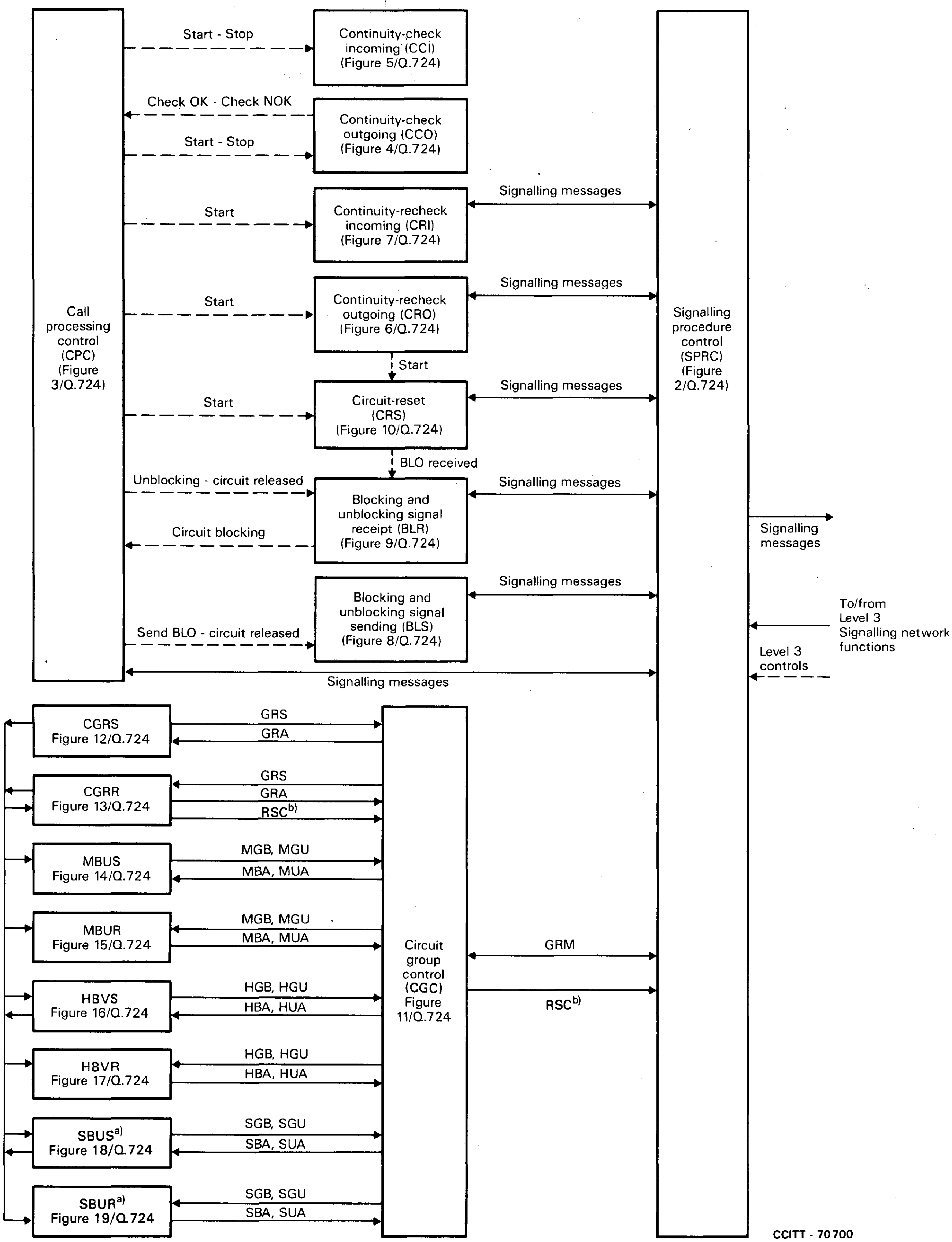
T37 Timer “waiting for second software generated group unblocking message” (5 seconds, see § 5.2)

T38 Timer “waiting for software generated group blocking acknowledgement message” (4-15 seconds, see § 6.4.4)

T39 Timer “delay to send software generated group blocking message” (1 minute, see § 6.4.4)

T40 Timer “waiting for software generated group unblocking acknowledgement message” (4-15 seconds, see § 6.4.4)

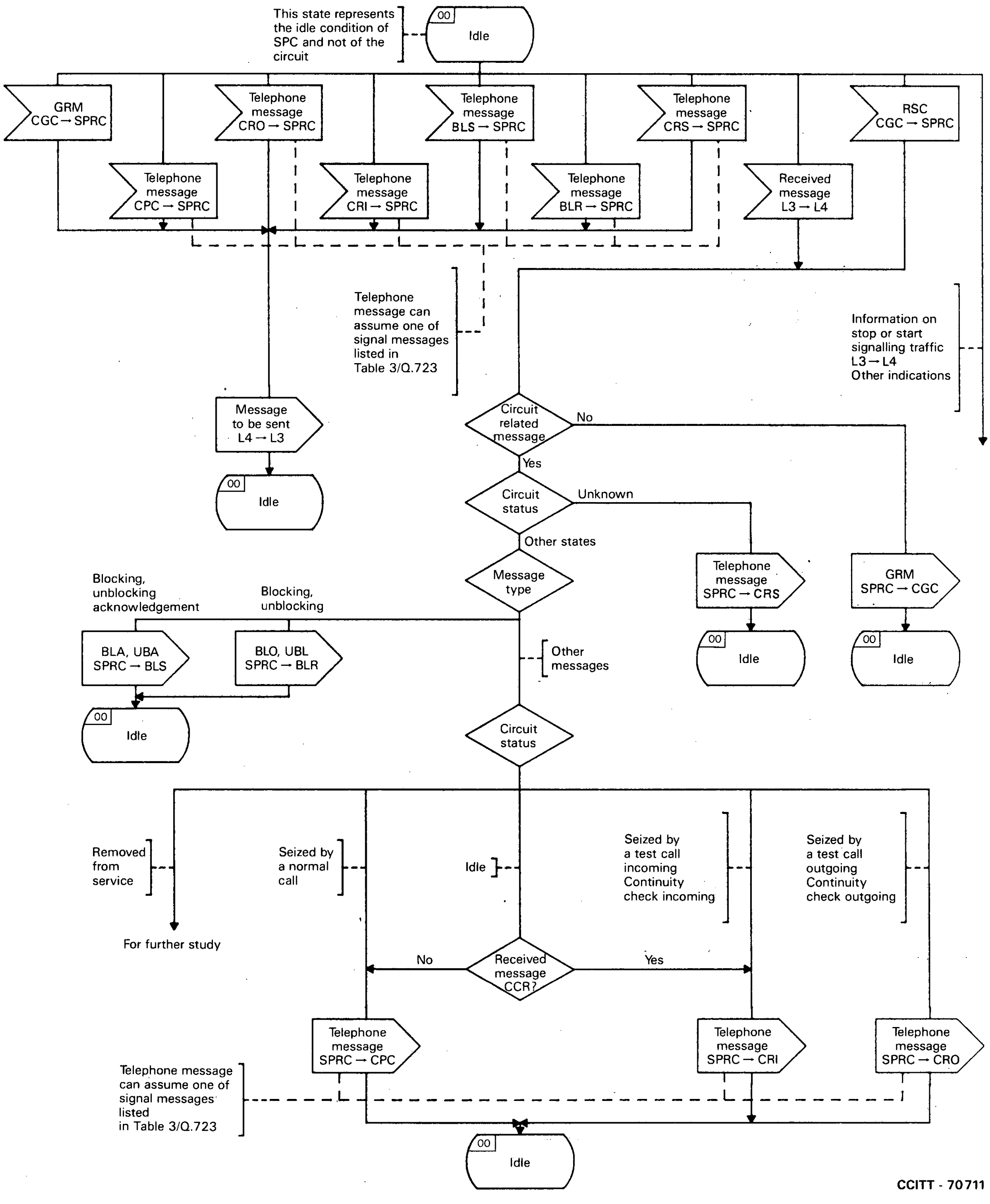
T41 Timer “delay to send software generated group unblocking message” (1 minute, see § 6.4.4)



a) National option
b) Optional

FIGURE 1/Q.724

Level 4 – Telephone User Part functions



Note – In this particular figure, the direction of input and output symbols does not necessarily represent the forward or backward direction of messages contained in them.

FIGURE 2/Q.724

Signalling procedure control (SPRC)

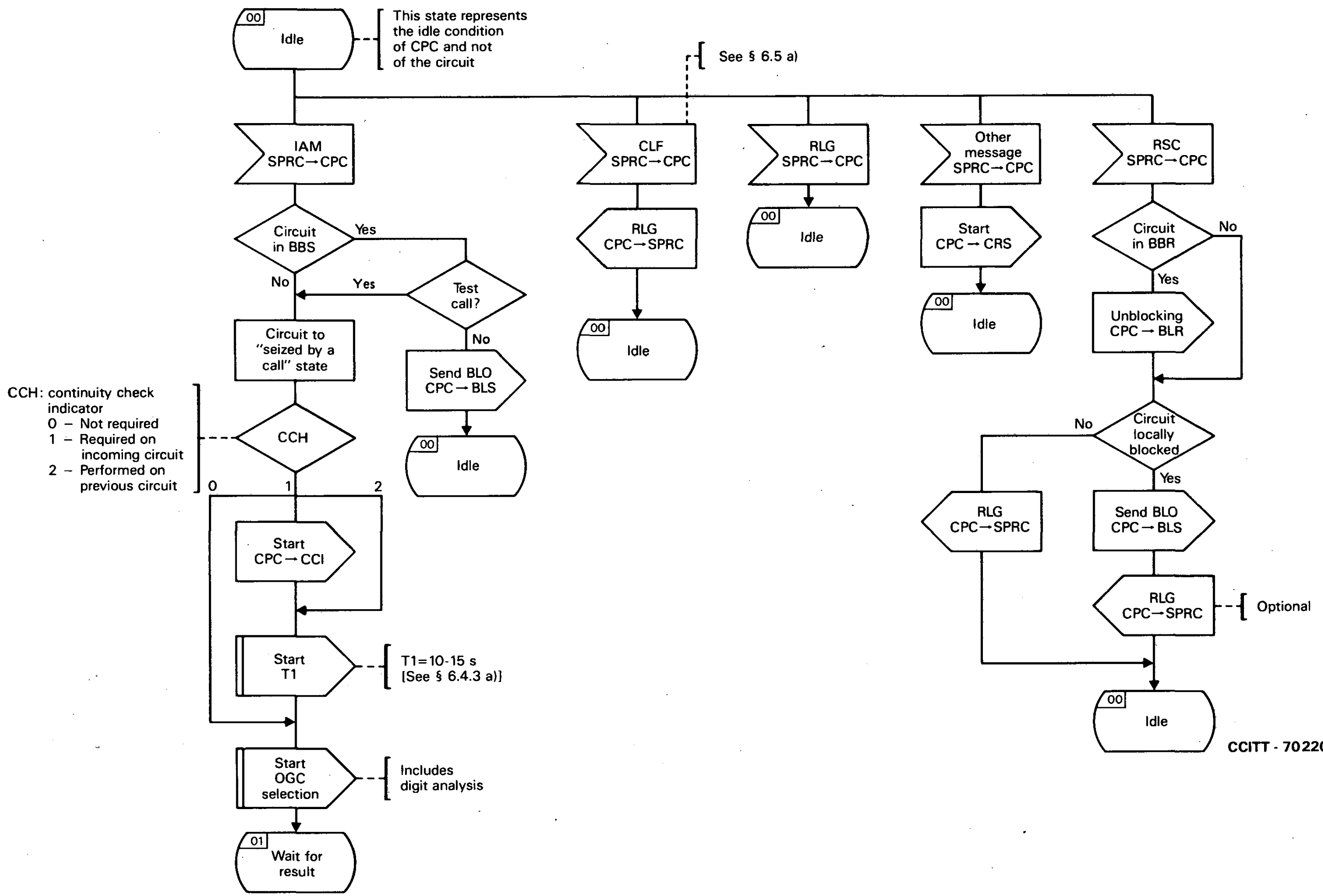
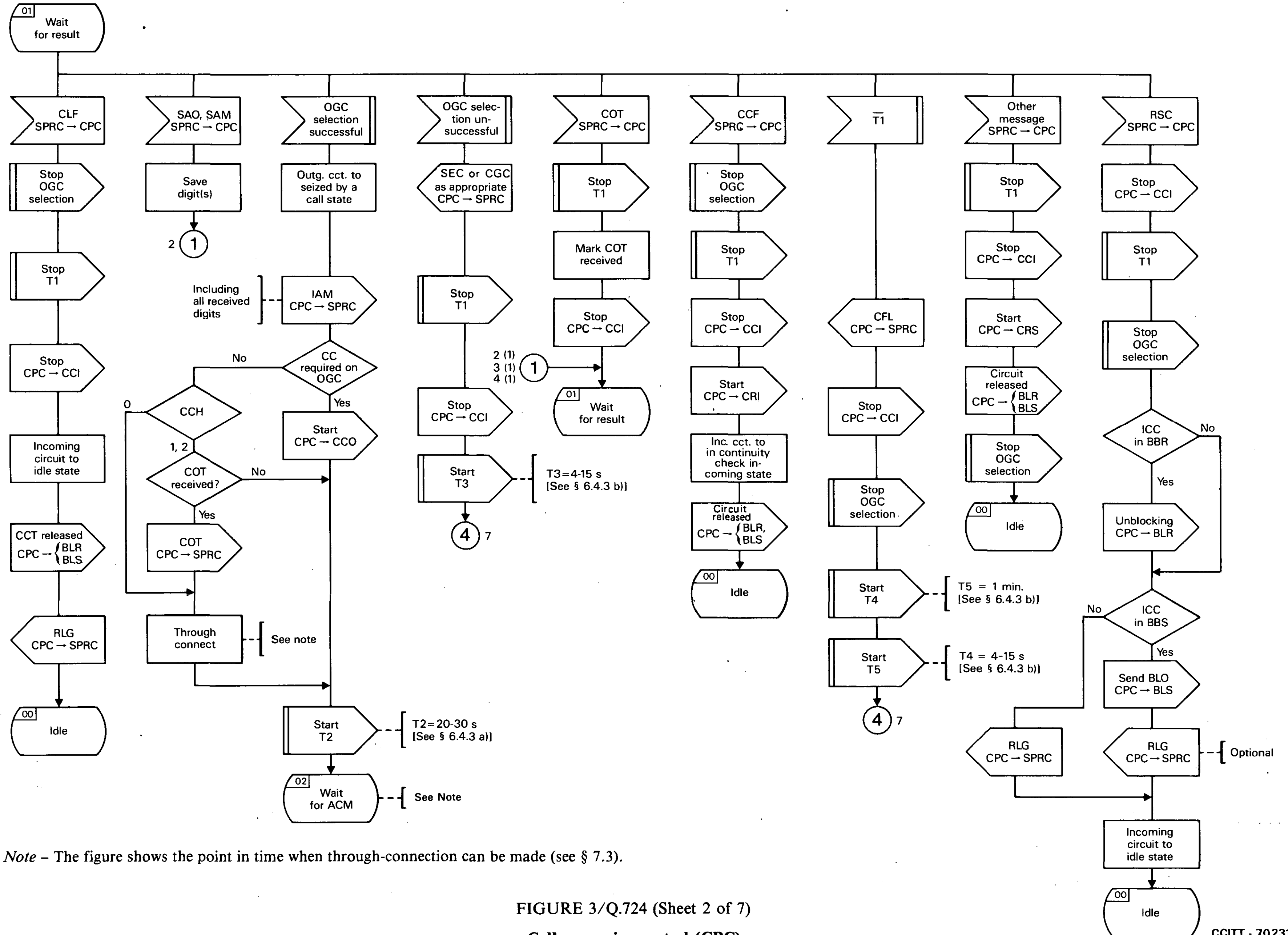


FIGURE 3/Q.724 (Sheet 1 of 7)

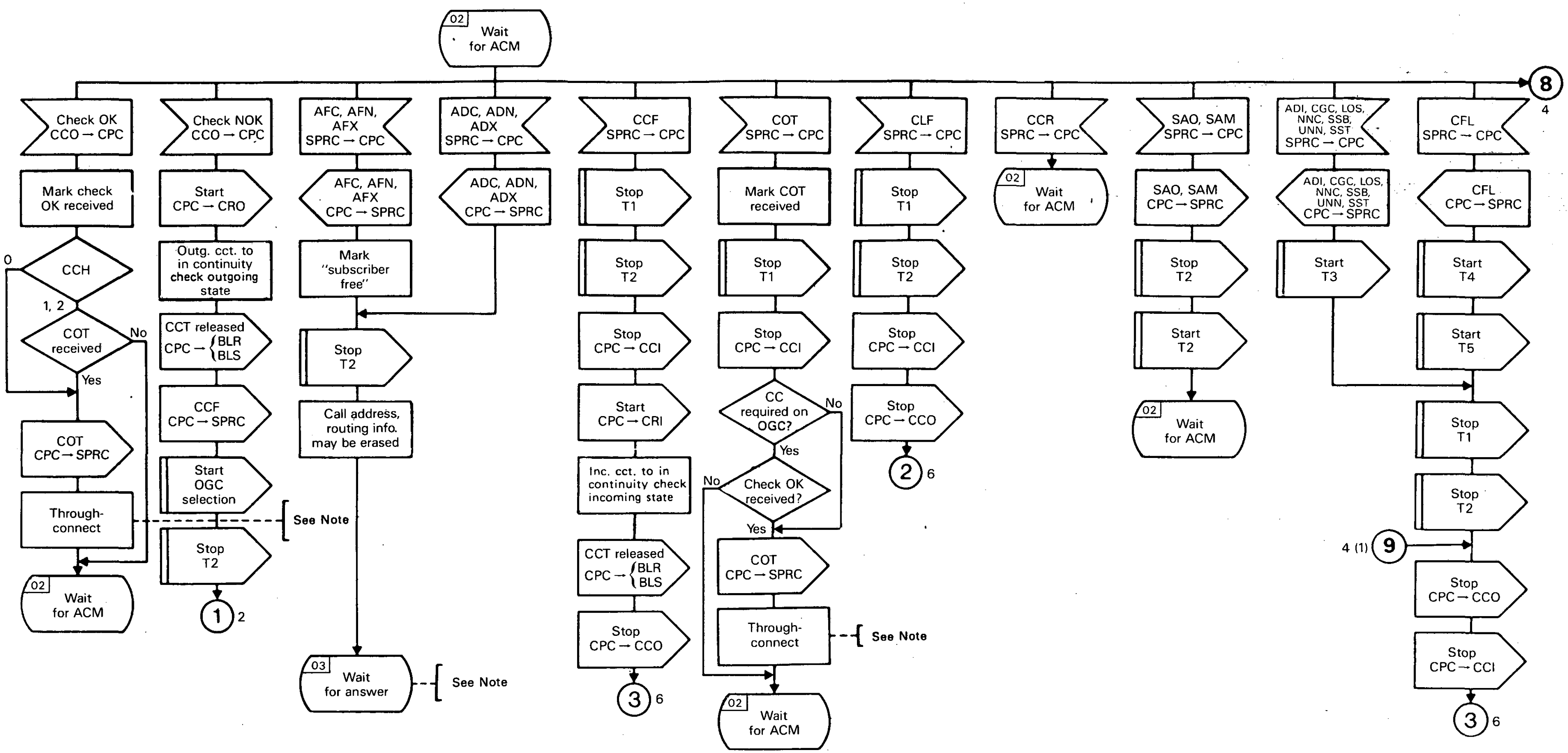
Call processing control (CPC)



Note – The figure shows the point in time when through-connection can be made (see § 7.3).

FIGURE 3/Q.724 (Sheet 2 of 7)

Call processing control (CPC)



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Note – The figure shows the point in time when through-connection can be made (see § 7.3).

FIGURE 3/Q.724 (Sheet 3 of 7)

Call processing control (CPC)

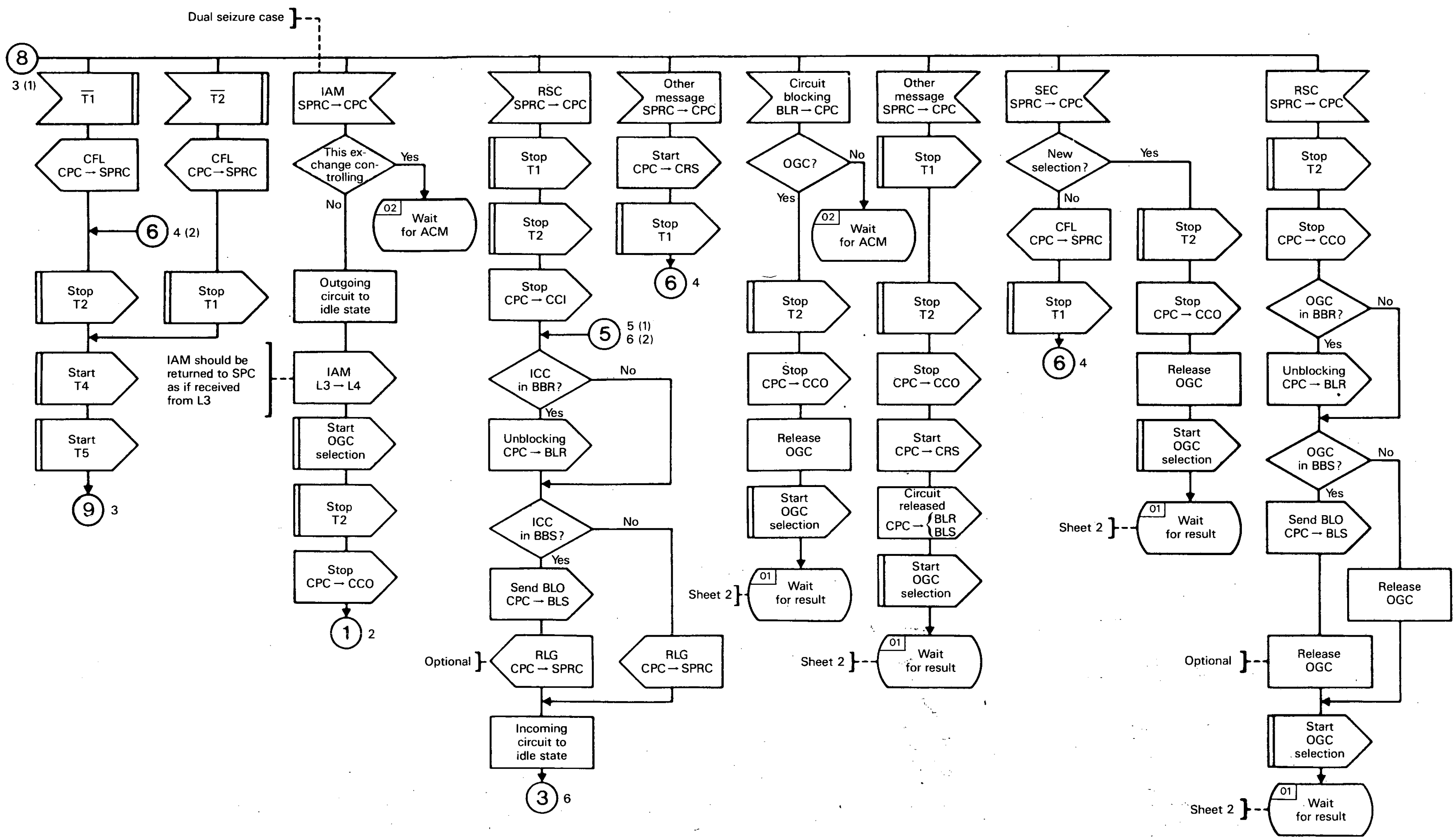

FIGURE 3/Q.724 (Sheet 4 of 7)

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Call processing control (CPC)

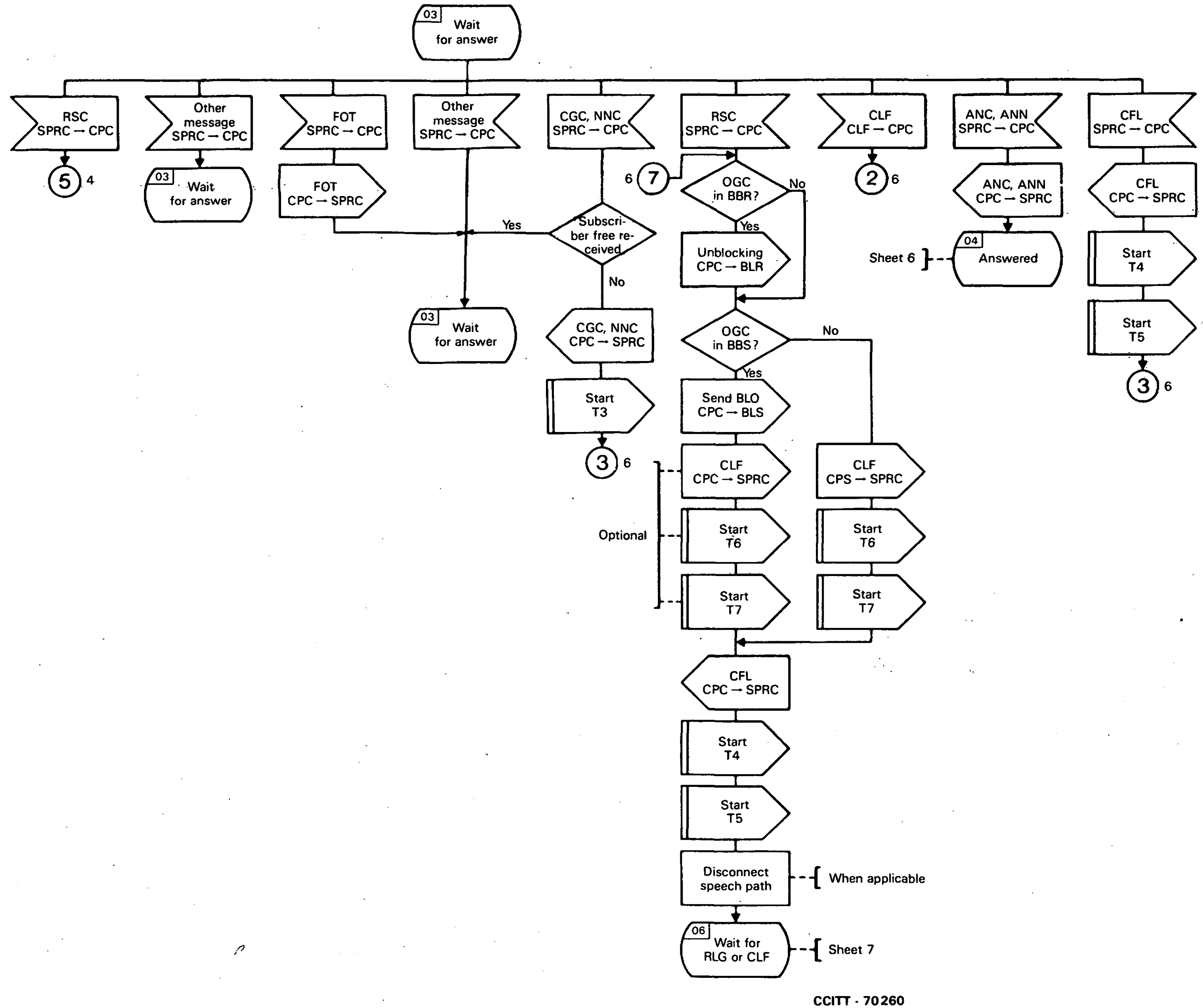

FIGURE 3/Q.724 (Sheet 5 of 7)

Call processing control (CPC)

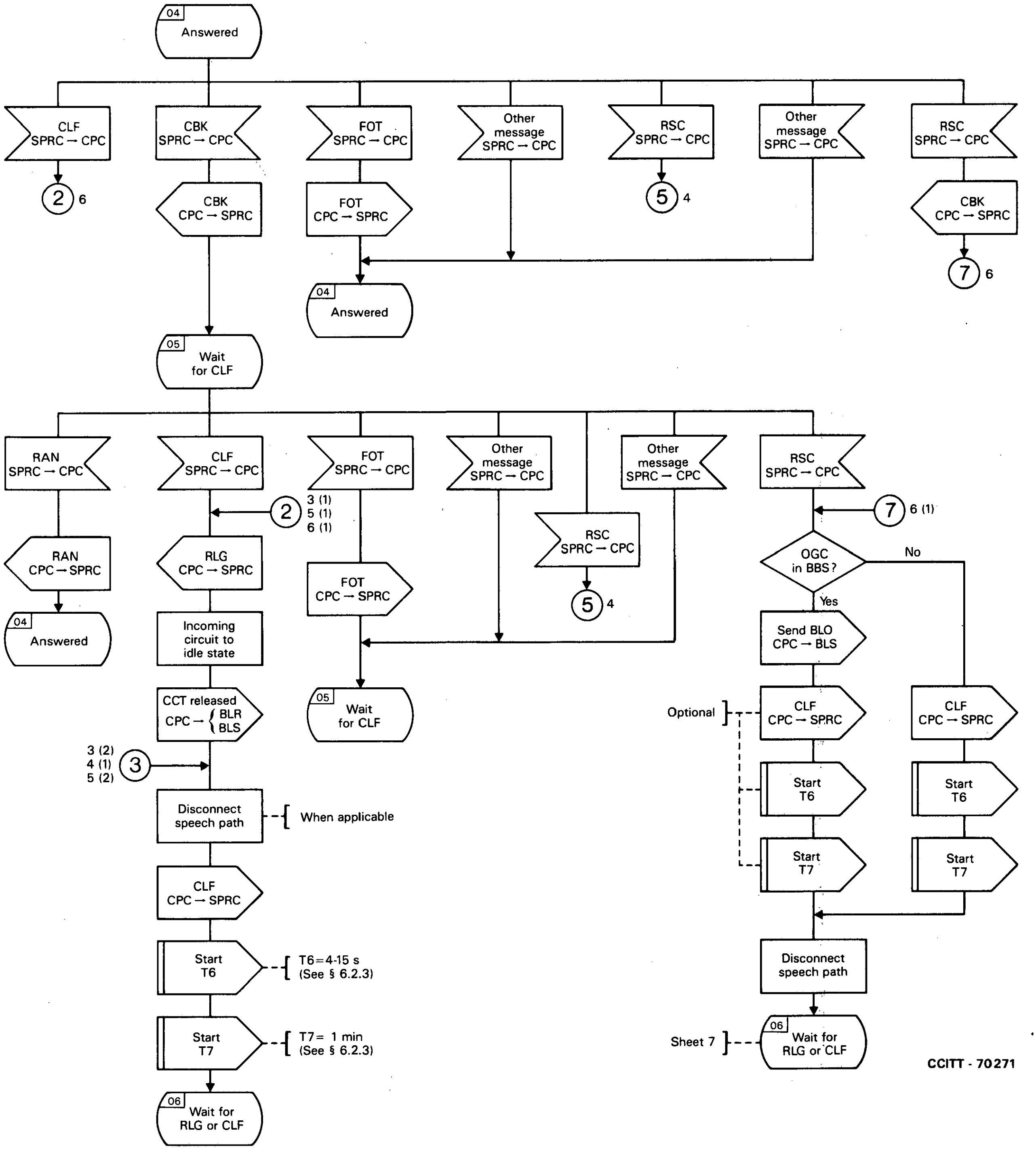

FIGURE 3/Q.724 (Sheet 6 of 7)

Call processing control (CPC)

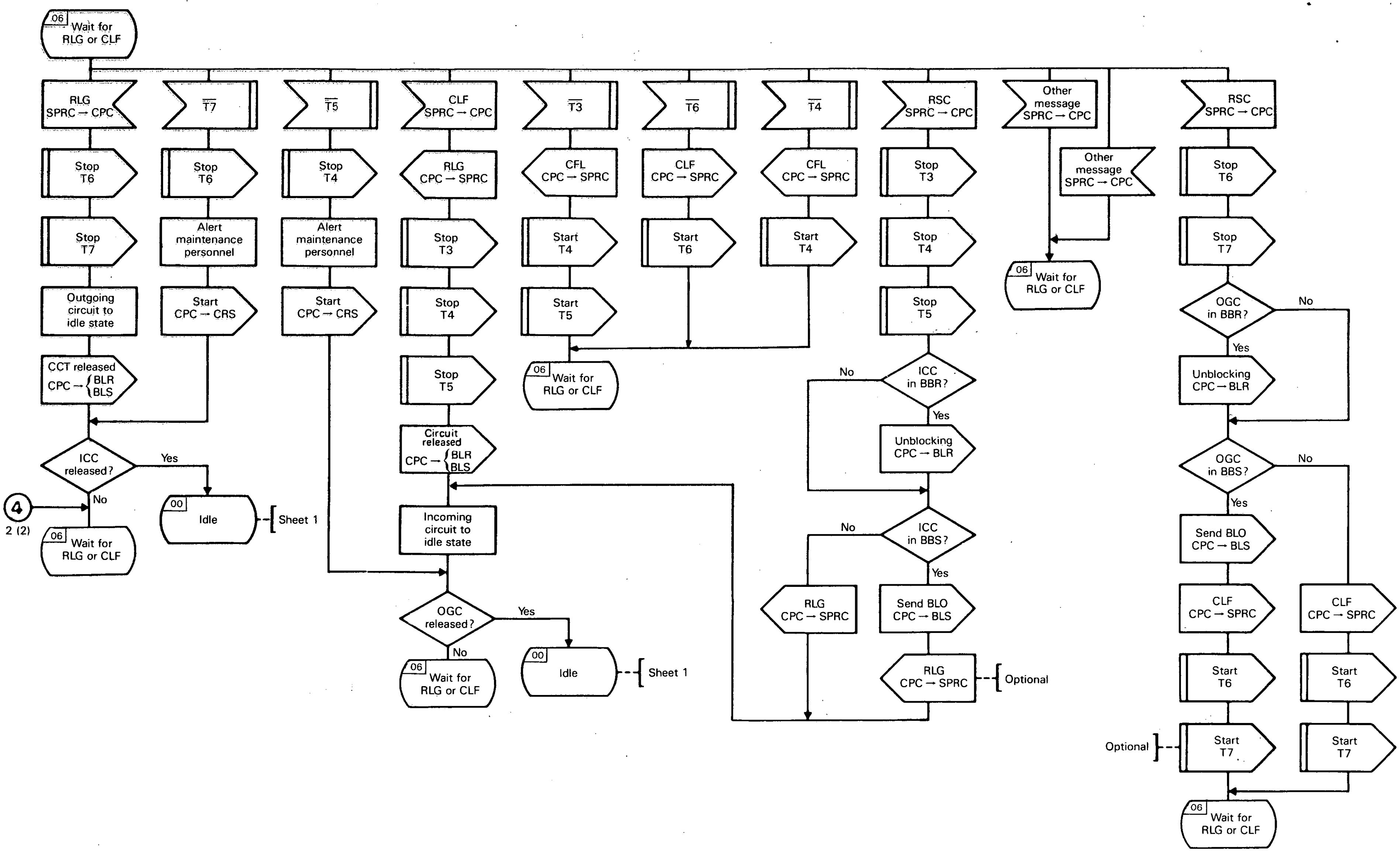

FIGURE 3/Q.724 (Sheet 7 of 7)

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Call processing control (CPC)

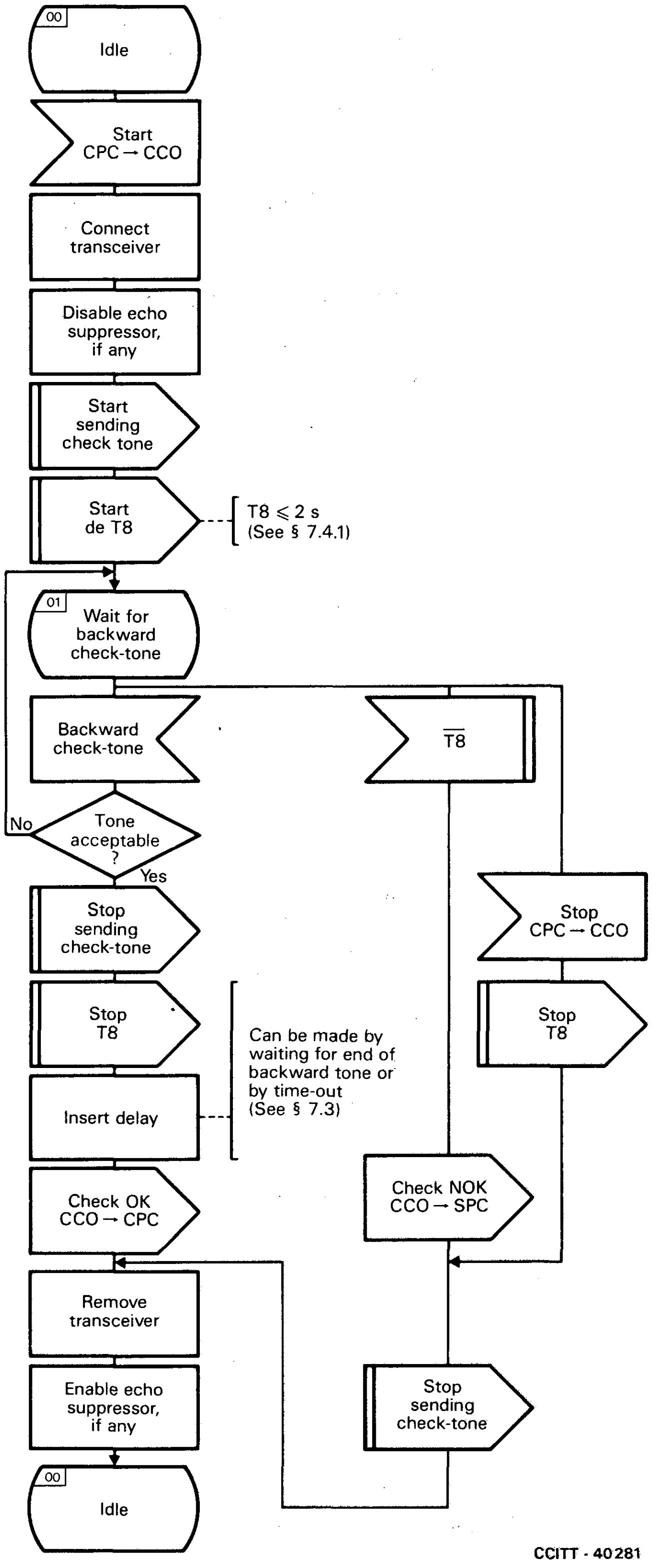


FIGURE 4/Q.724

Continuity-check outgoing (CCO)

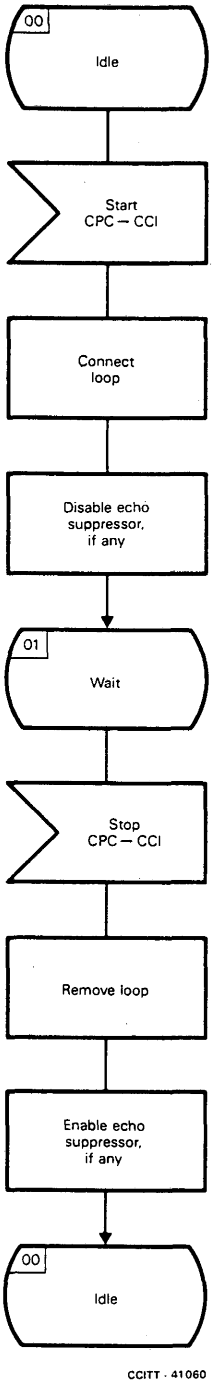


FIGURE 5/Q.724

Continuity-check incoming (CCI)

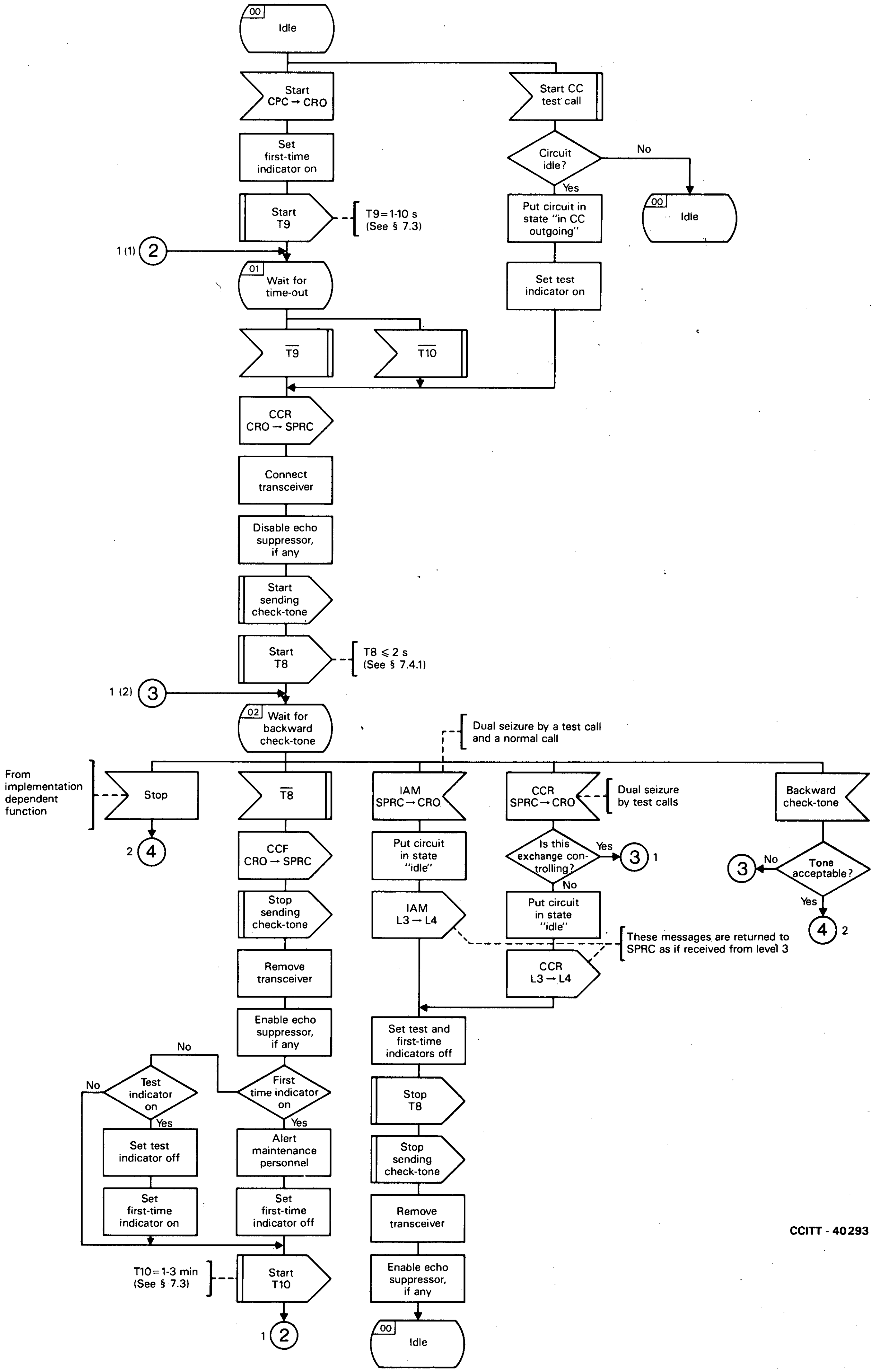


FIGURE 6/Q.724 (Sheet 1 of 2)

Continuity-recheck outgoing (CRO)

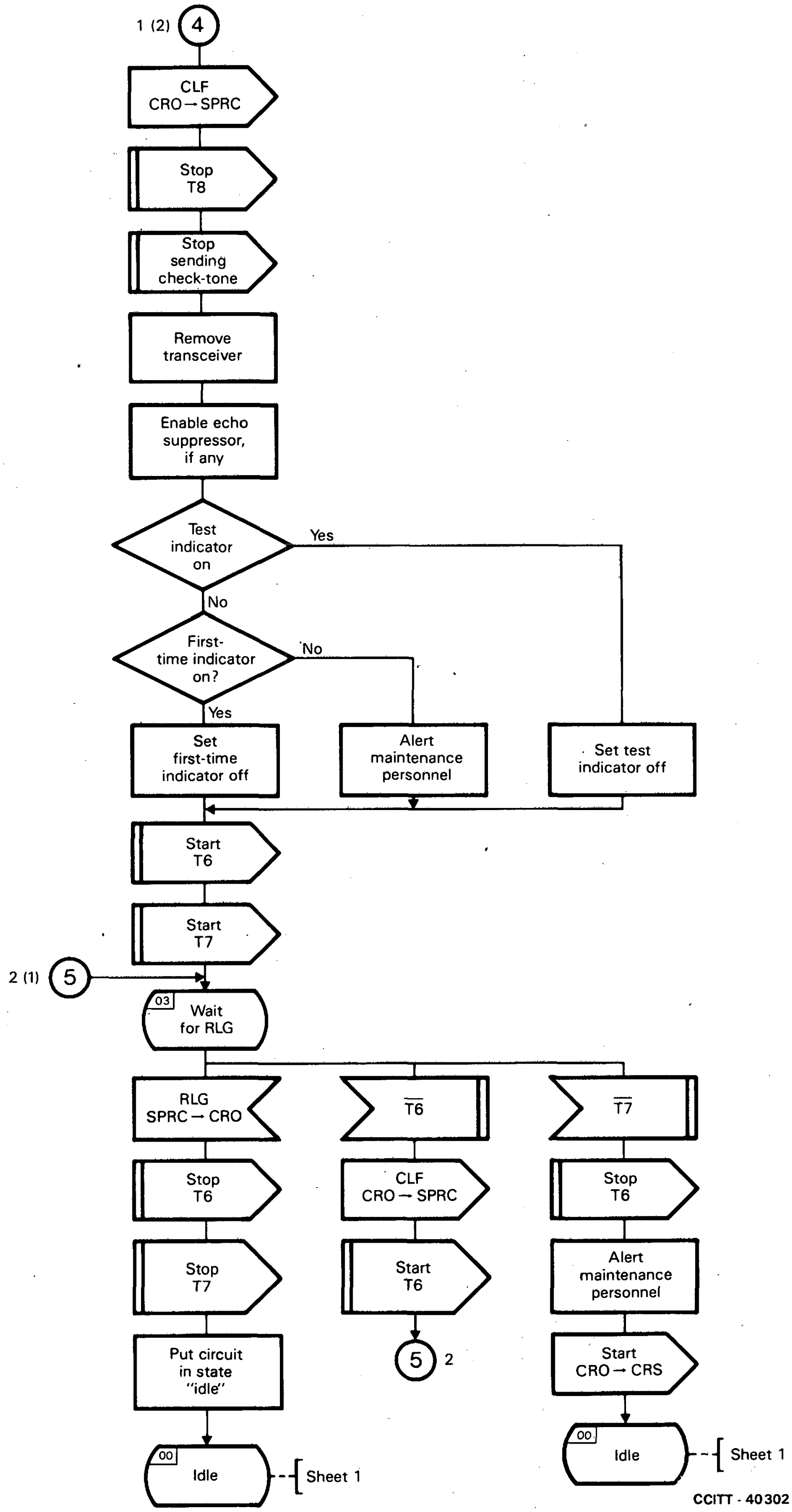


FIGURE 6/Q.724 (Sheet 2 of 2)

Continuity-recheck outgoing (CRO)

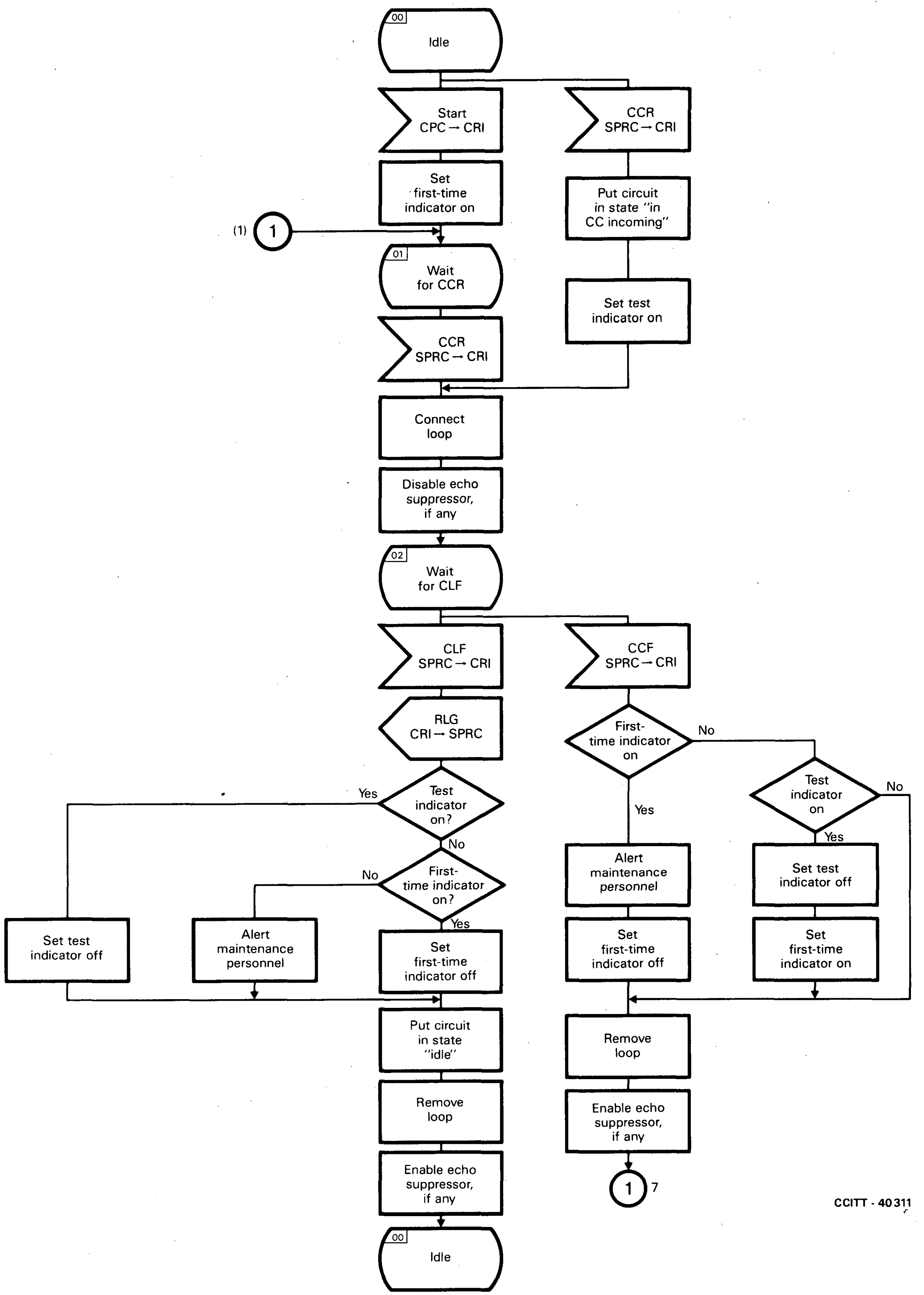


FIGURE 7/Q.724

Continuity-recheck incoming (CRI)

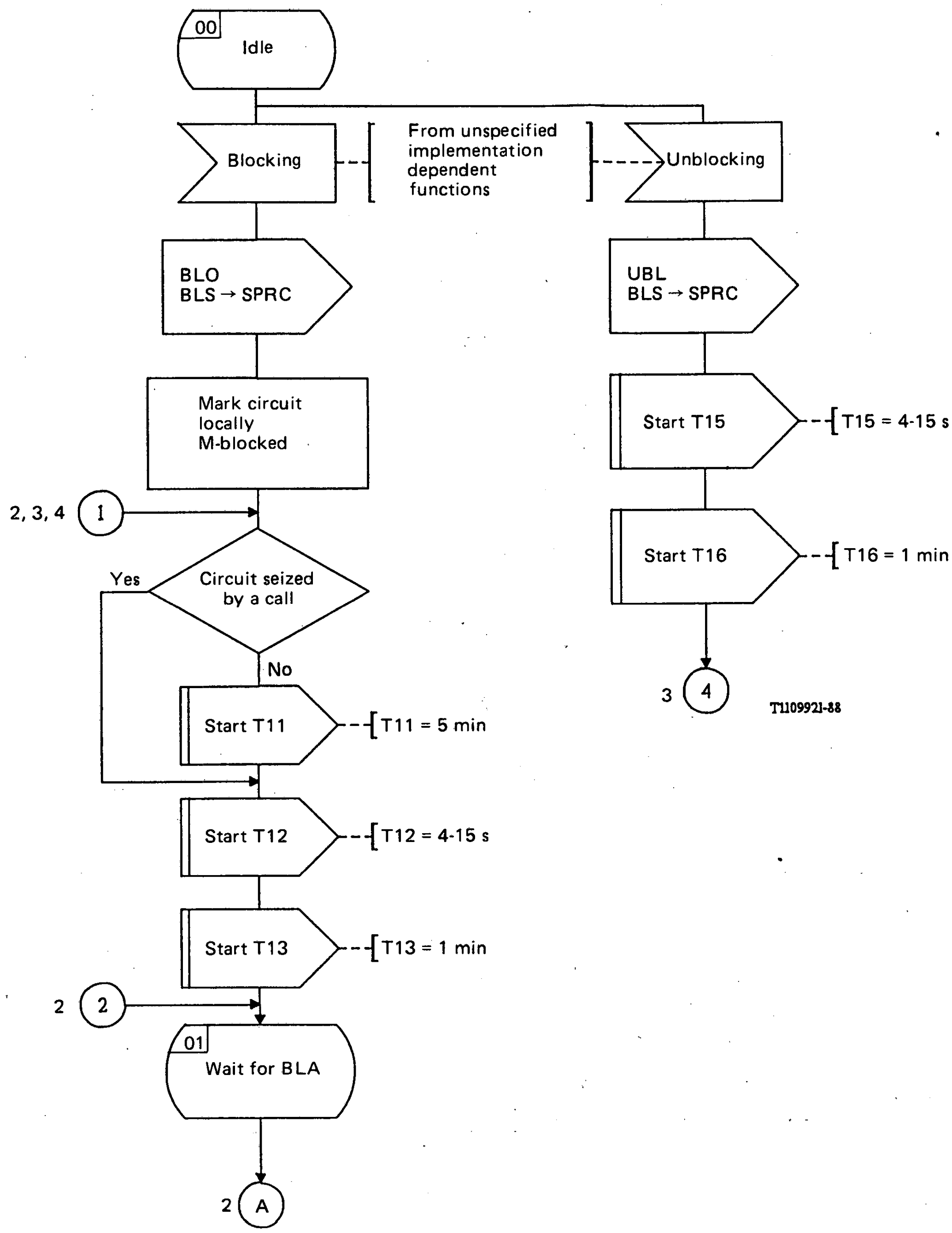


FIGURE 8/Q.724 (Sheet 1 of 4)

Blocking and unblocking signal sending (BLS)

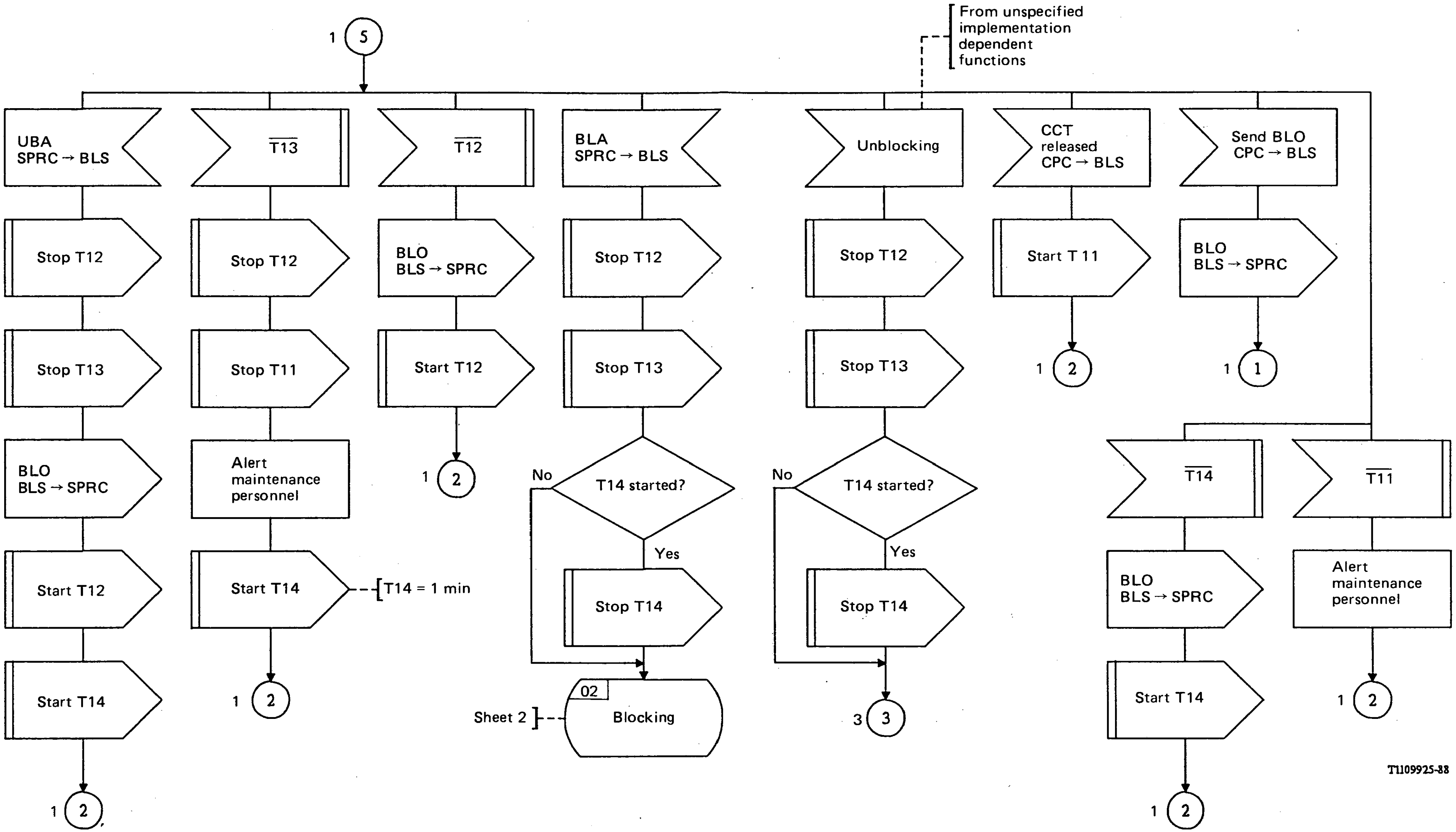


FIGURE 8/Q.724 (Sheet 2 of 4)

Blocking and unblocking signal sending (BLS)

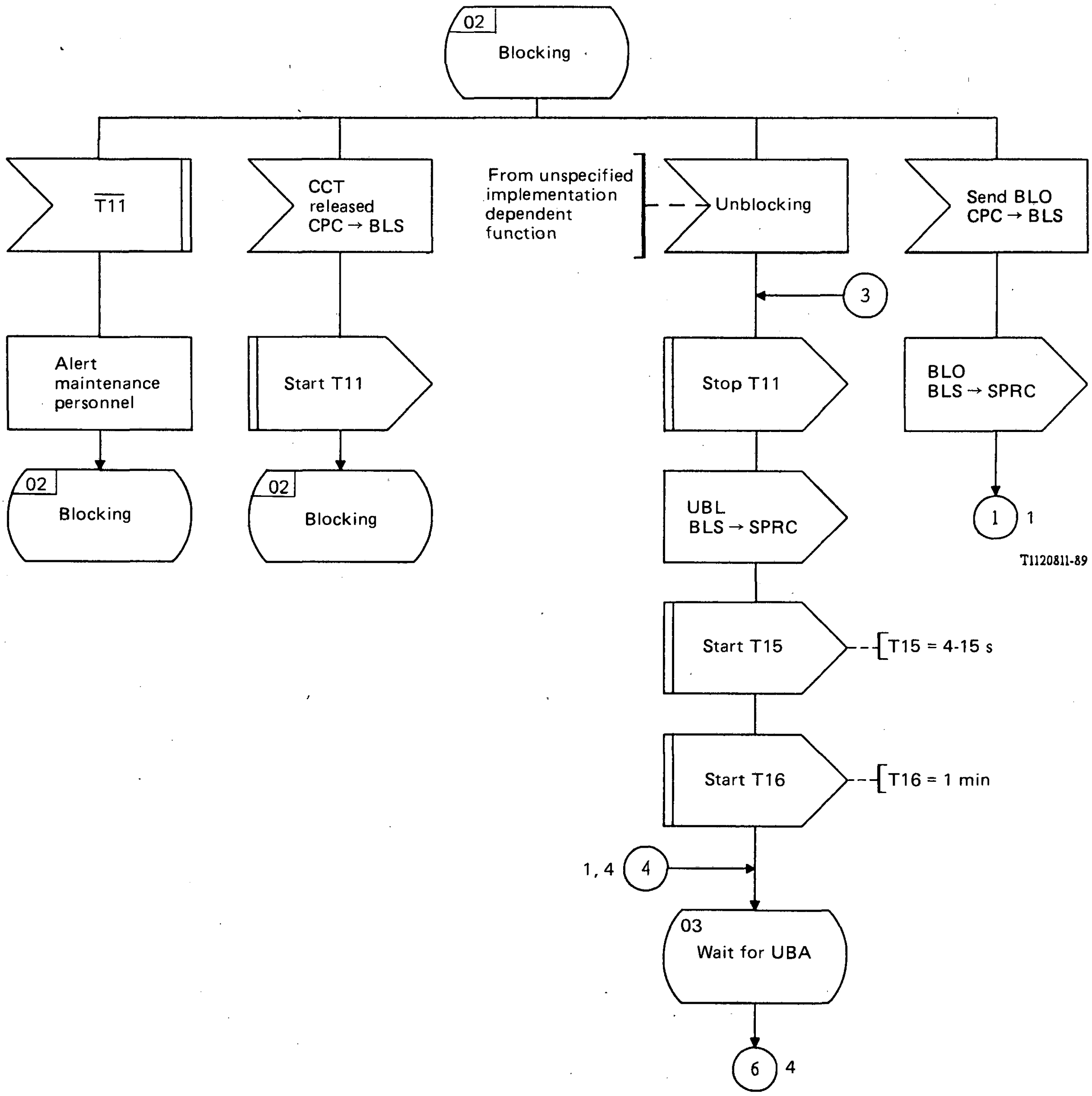


FIGURE 8/Q.724 (Sheet 3 of 4)

Blocking and unblocking signal sending (BLS)

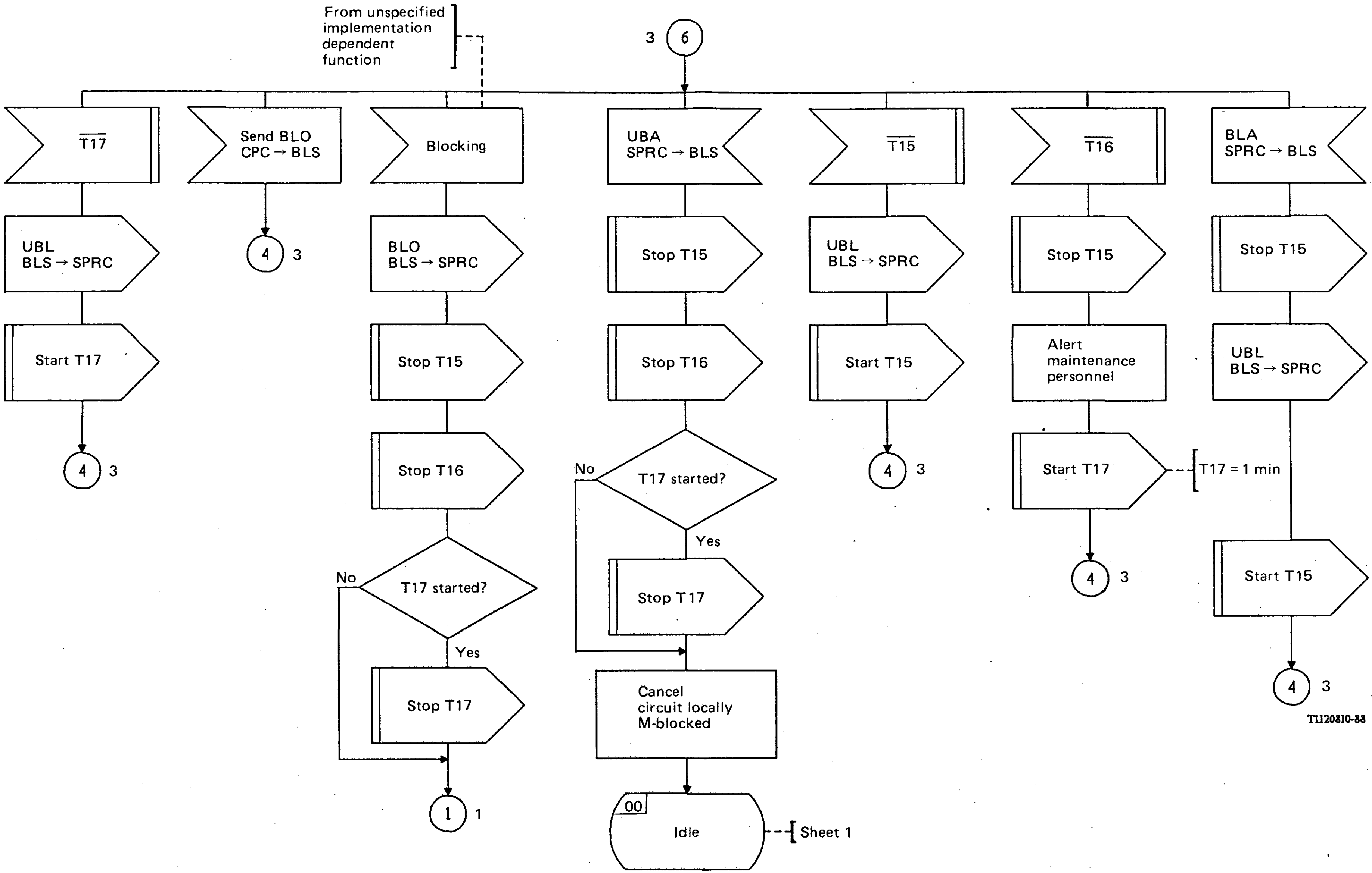


FIGURE 8/Q.724 (Sheet 4 of 4)

Blocking and unblocking signal sending (BLS)

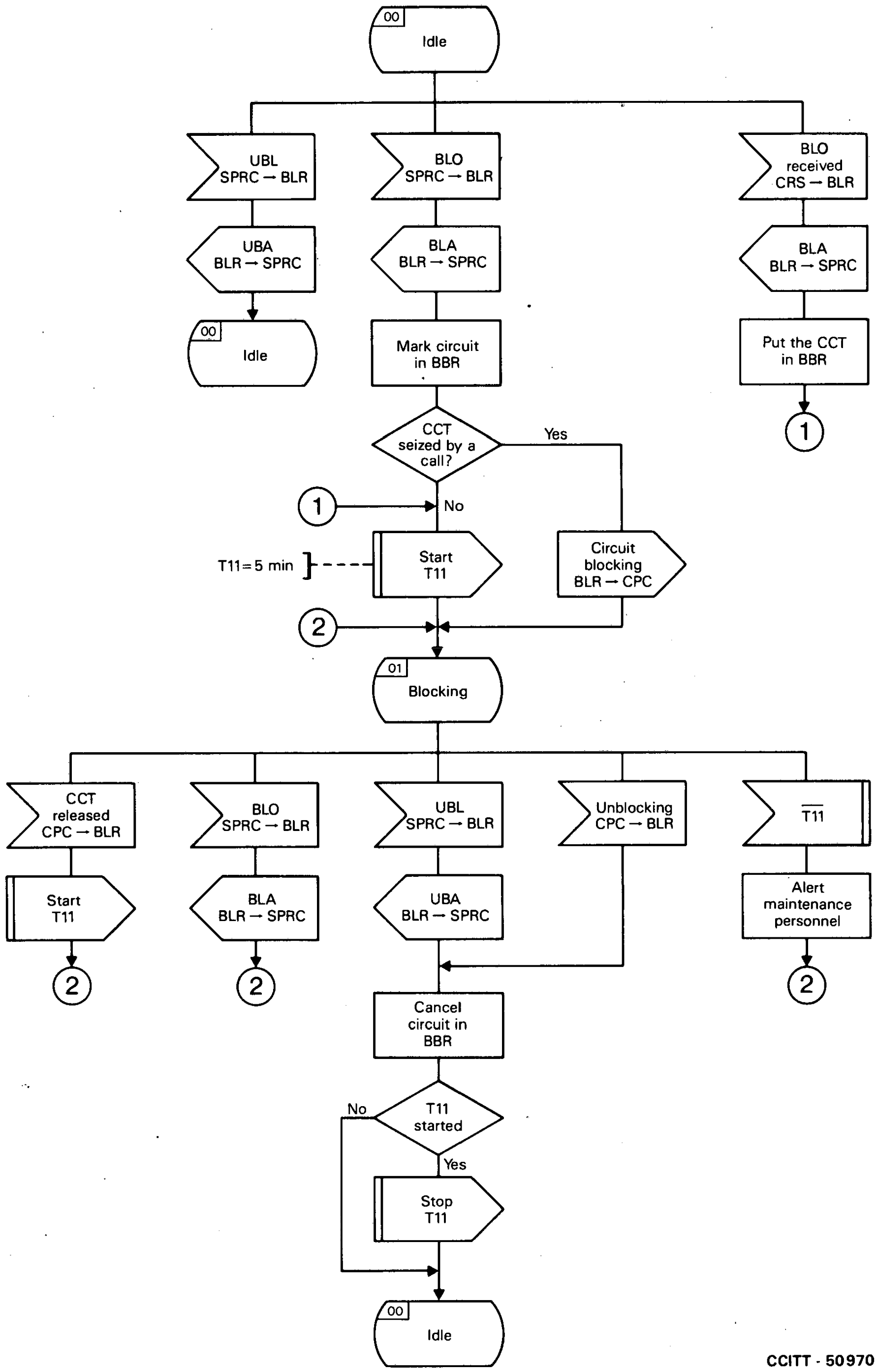


FIGURE 9/Q.724

Blocking and unblocking signal reception (BLR)

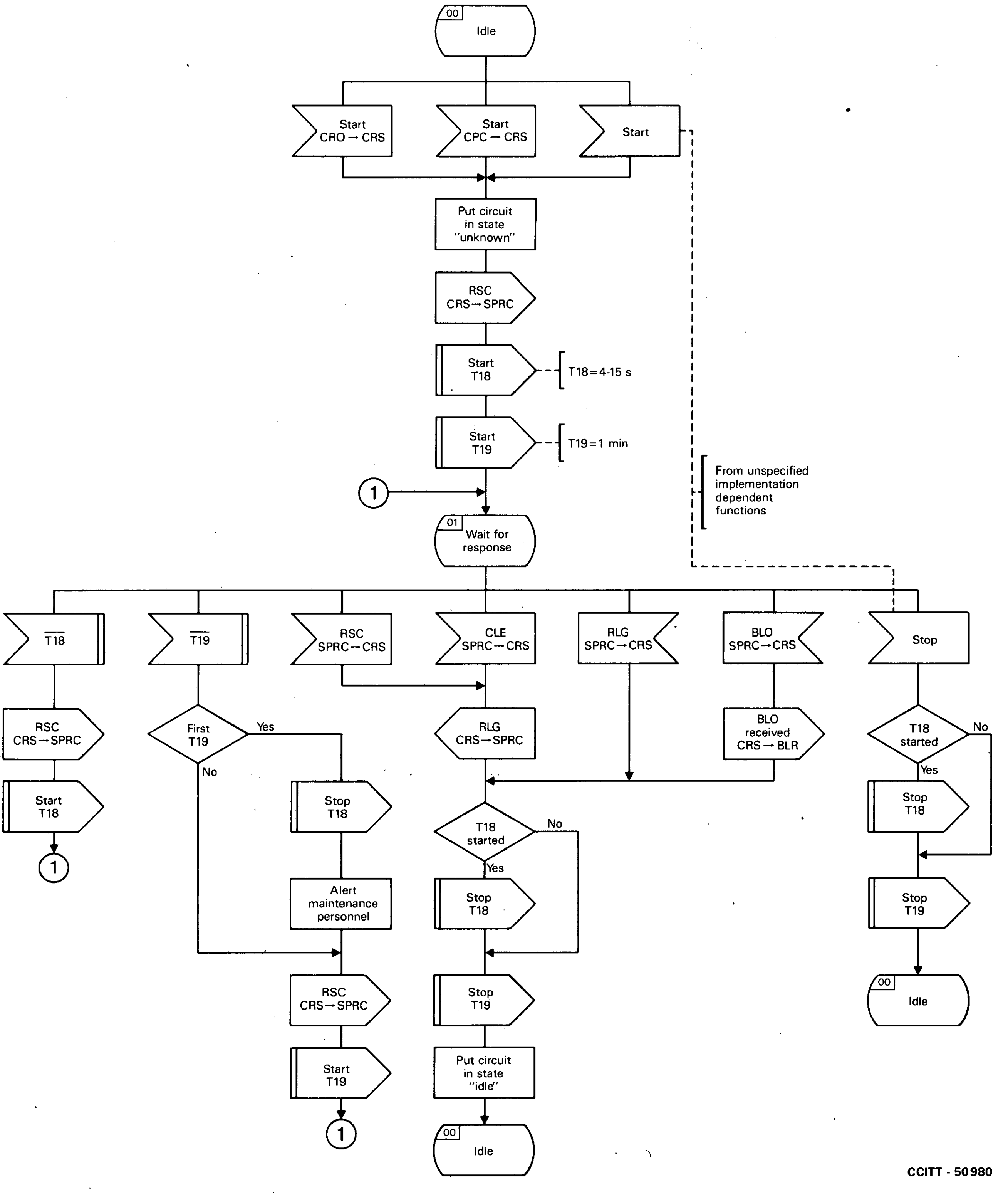


FIGURE 10/Q.724

Circuit-reset (CRS)

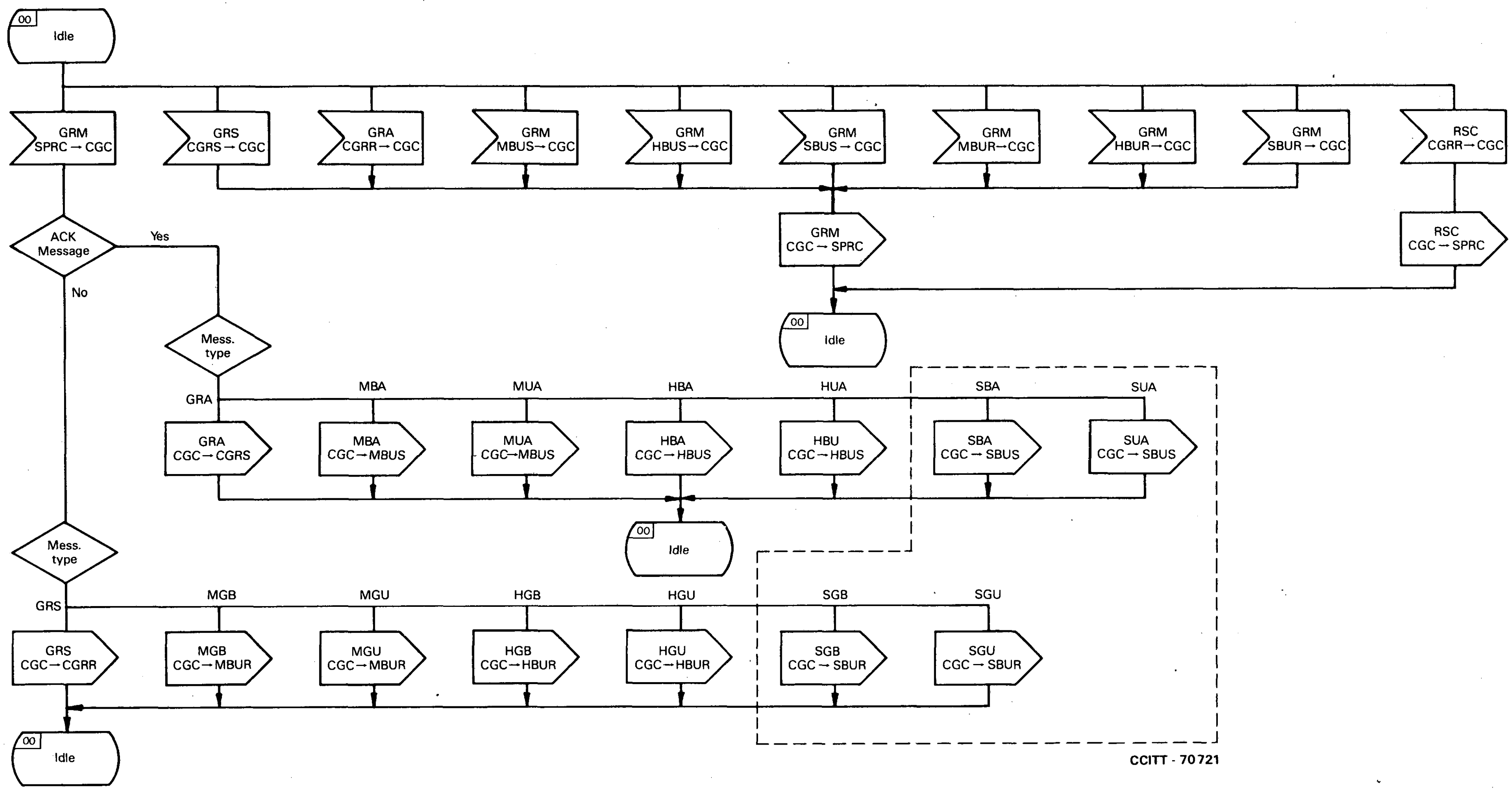


FIGURE 11/Q.724

Circuit group control (CGC)

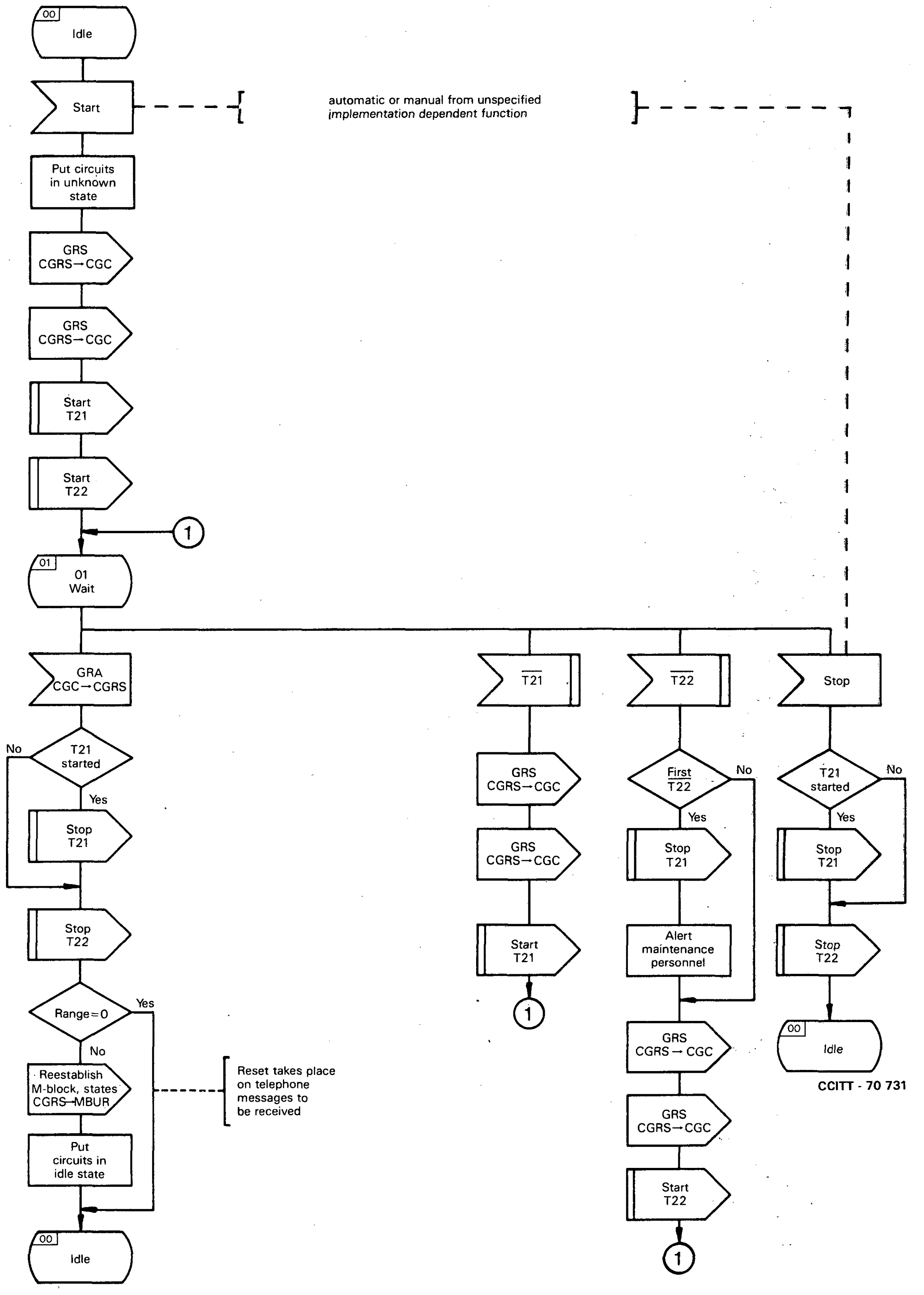
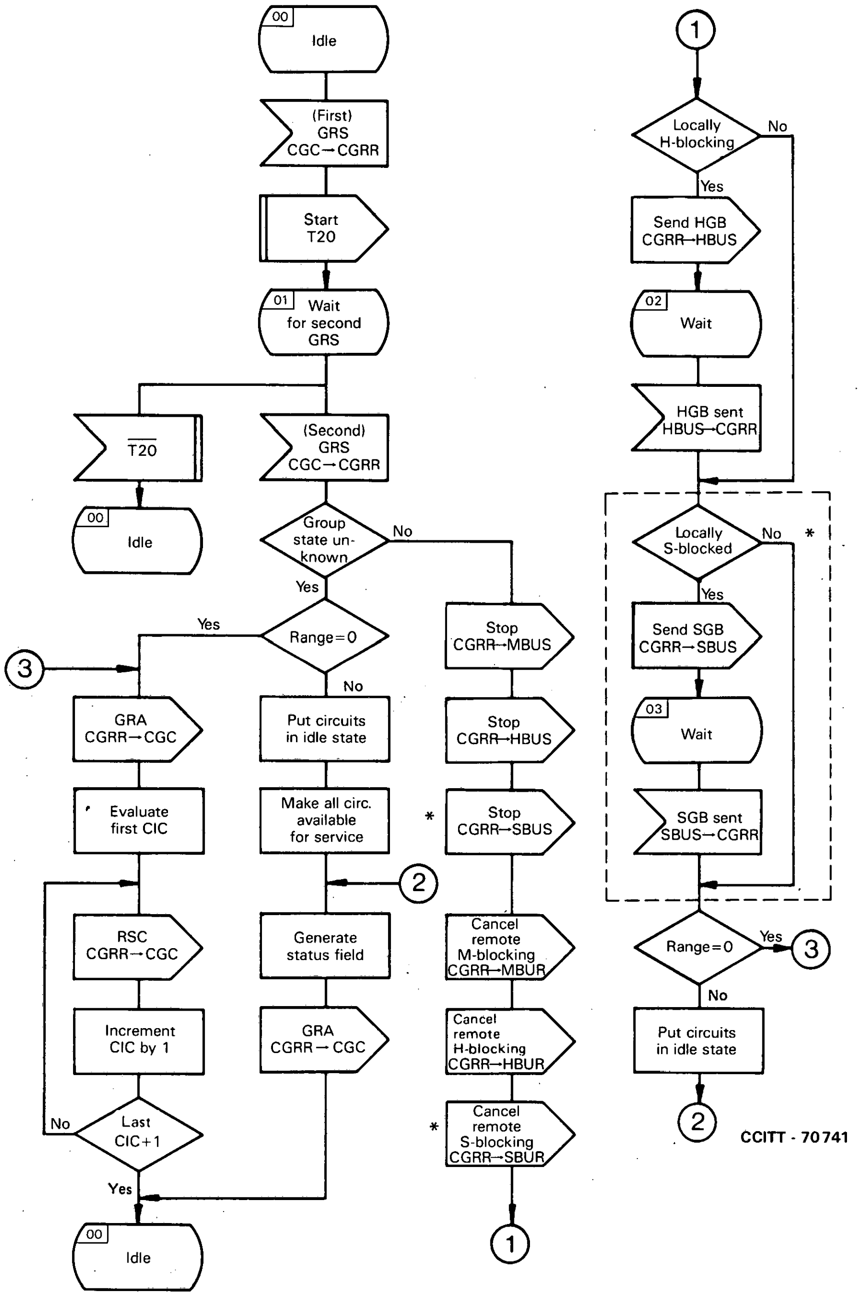


FIGURE 12/Q.724

Circuit group reset sending (CGRS)



* Not included if the national option (SBUS and SBUR) is not implemented.

FIGURE 13/Q.724

Circuit group reset receipt (CGRR)

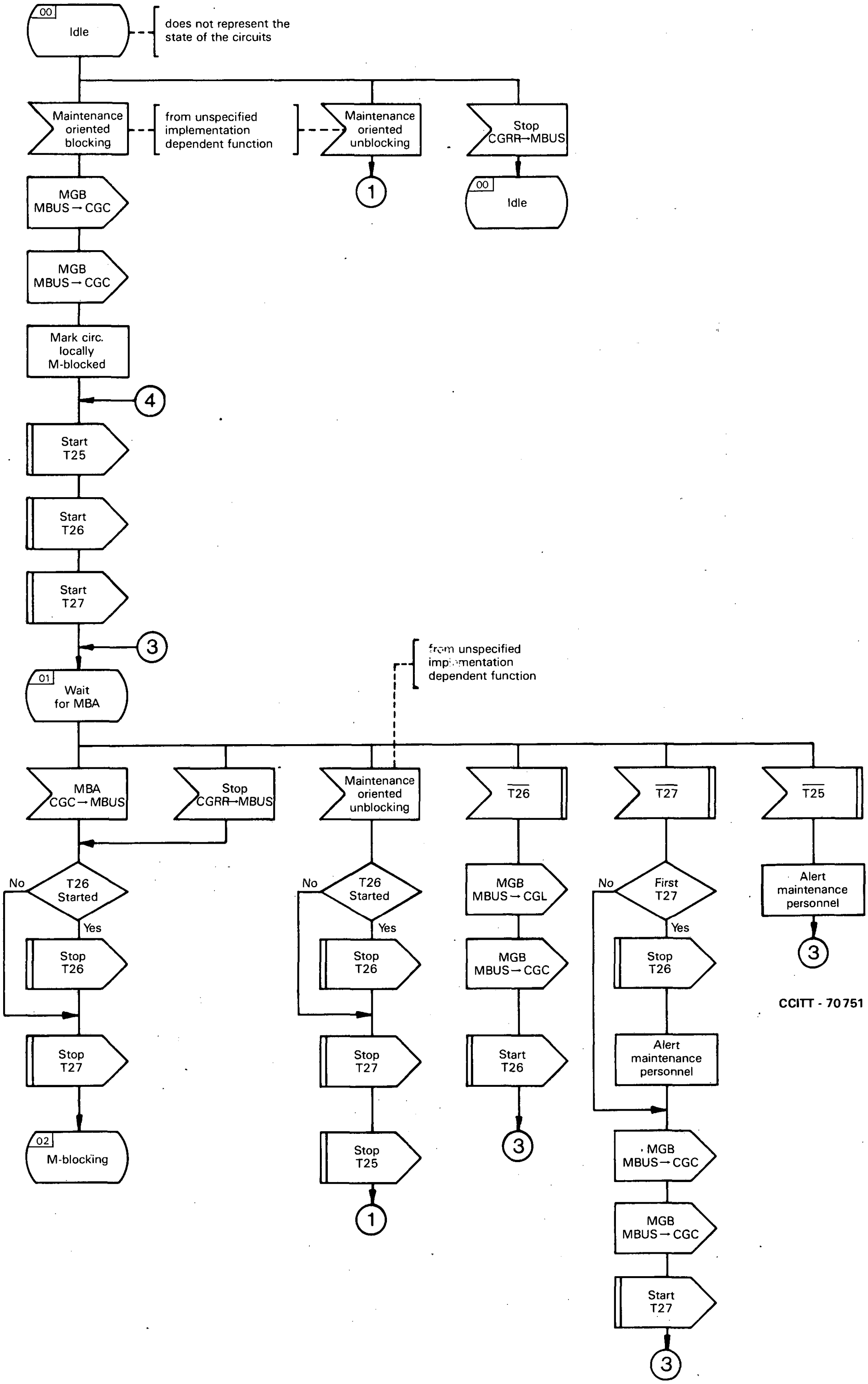


FIGURE 14/Q.724 (Sheet 1 of 2)

Maintenance oriented circuit group blocking and unblocking sending (MBUS)

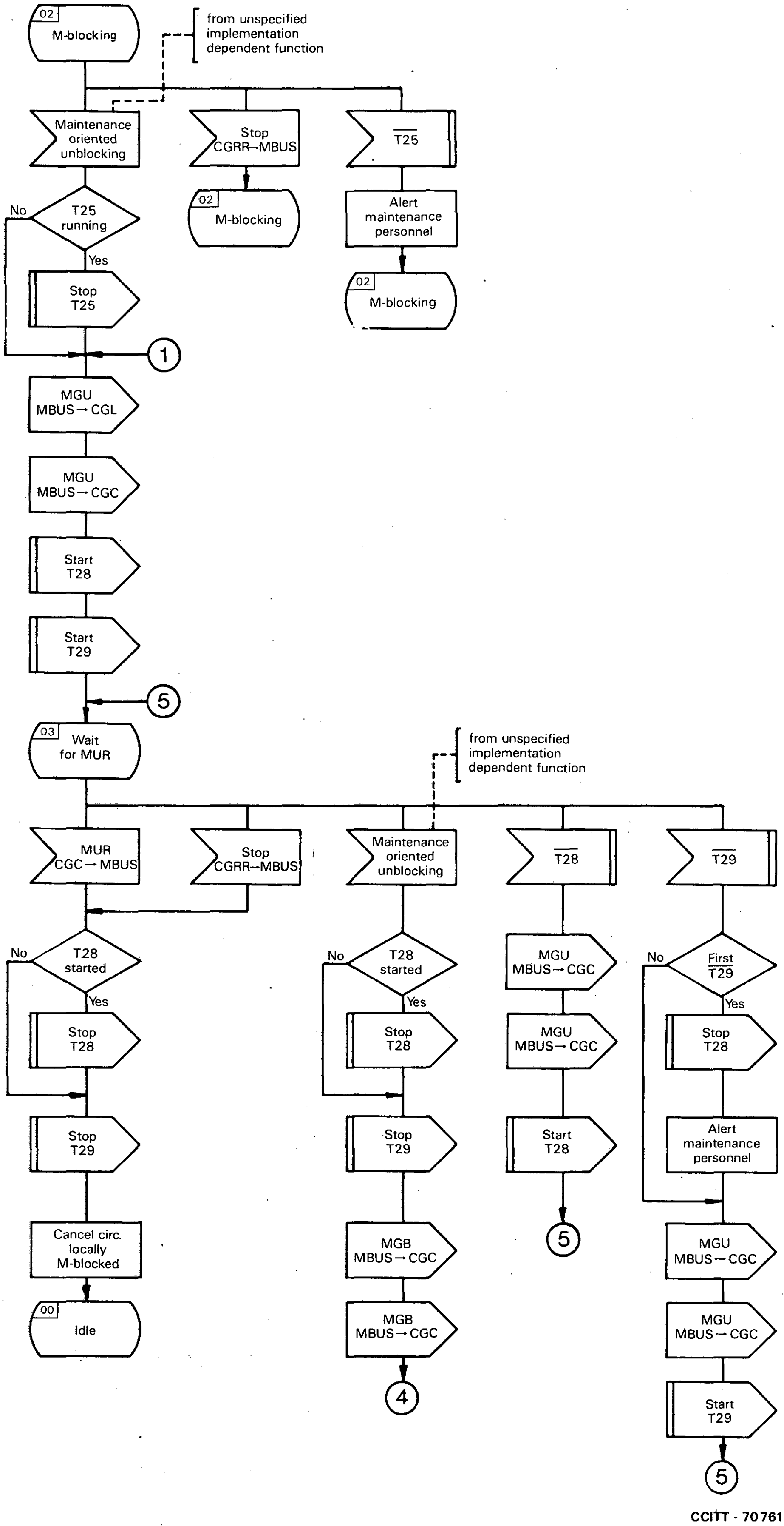


FIGURE 14/Q.724 (Sheet 2 of 2)

Maintenance oriented circuit group blocking and unblocking sending (MBUS)

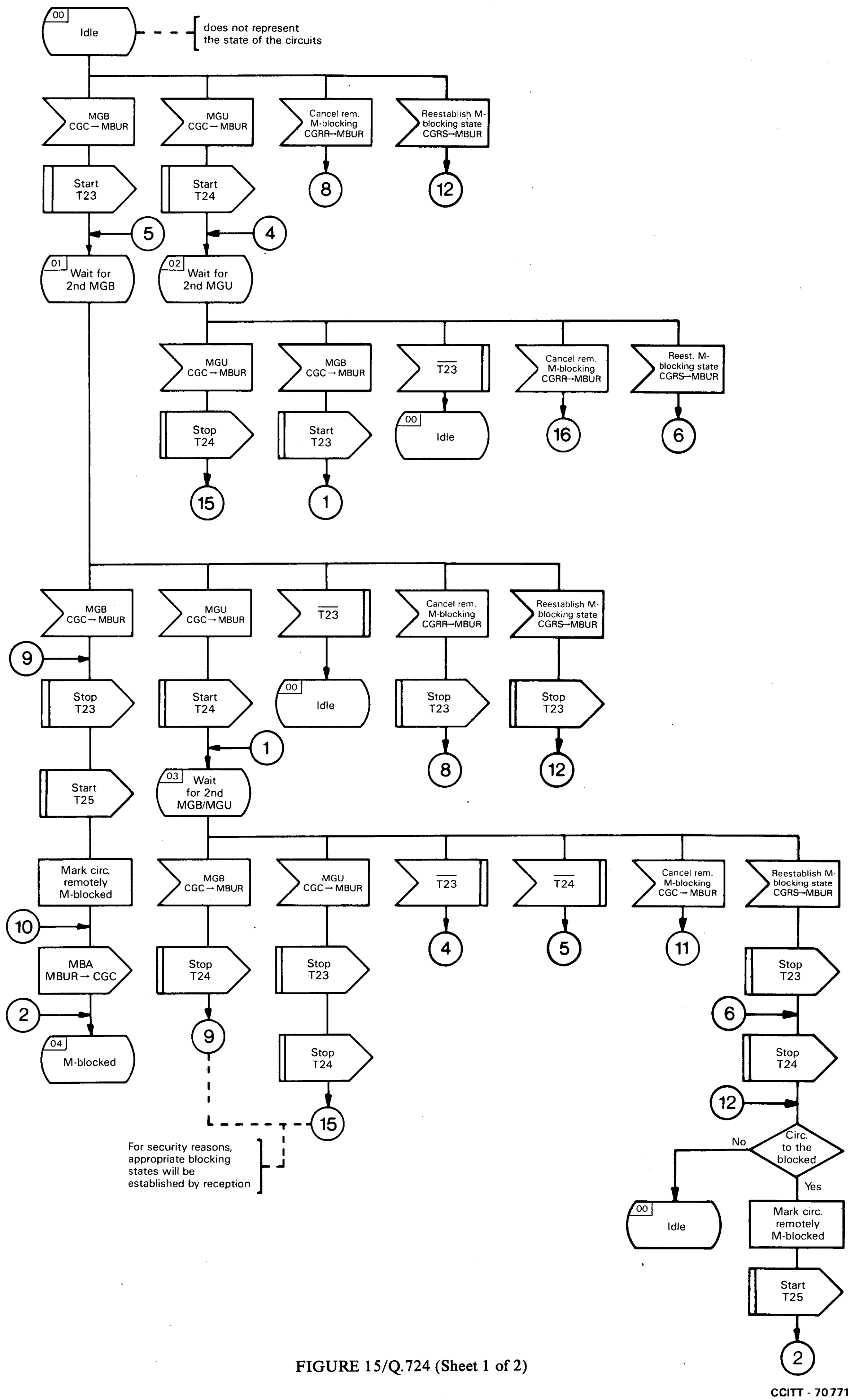


FIGURE 15/Q.724 (Sheet 1 of 2)

Maintenance oriented circuit group blocking and unblocking receipt (MBUR)

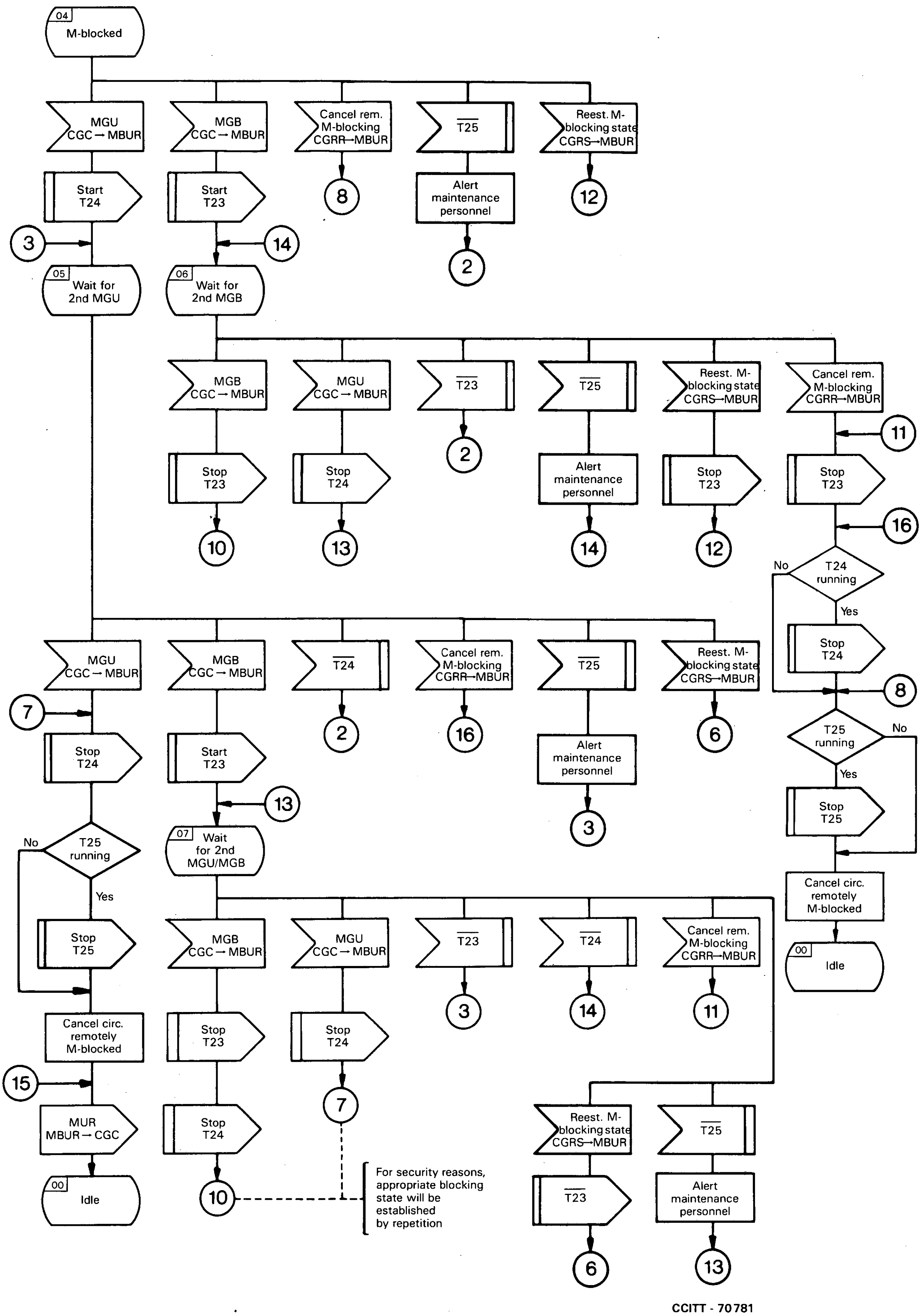


FIGURE 15/Q.724 (Sheet 2 of 2)

Maintenance oriented circuit group blocking and unblocking receipt (MBUR)

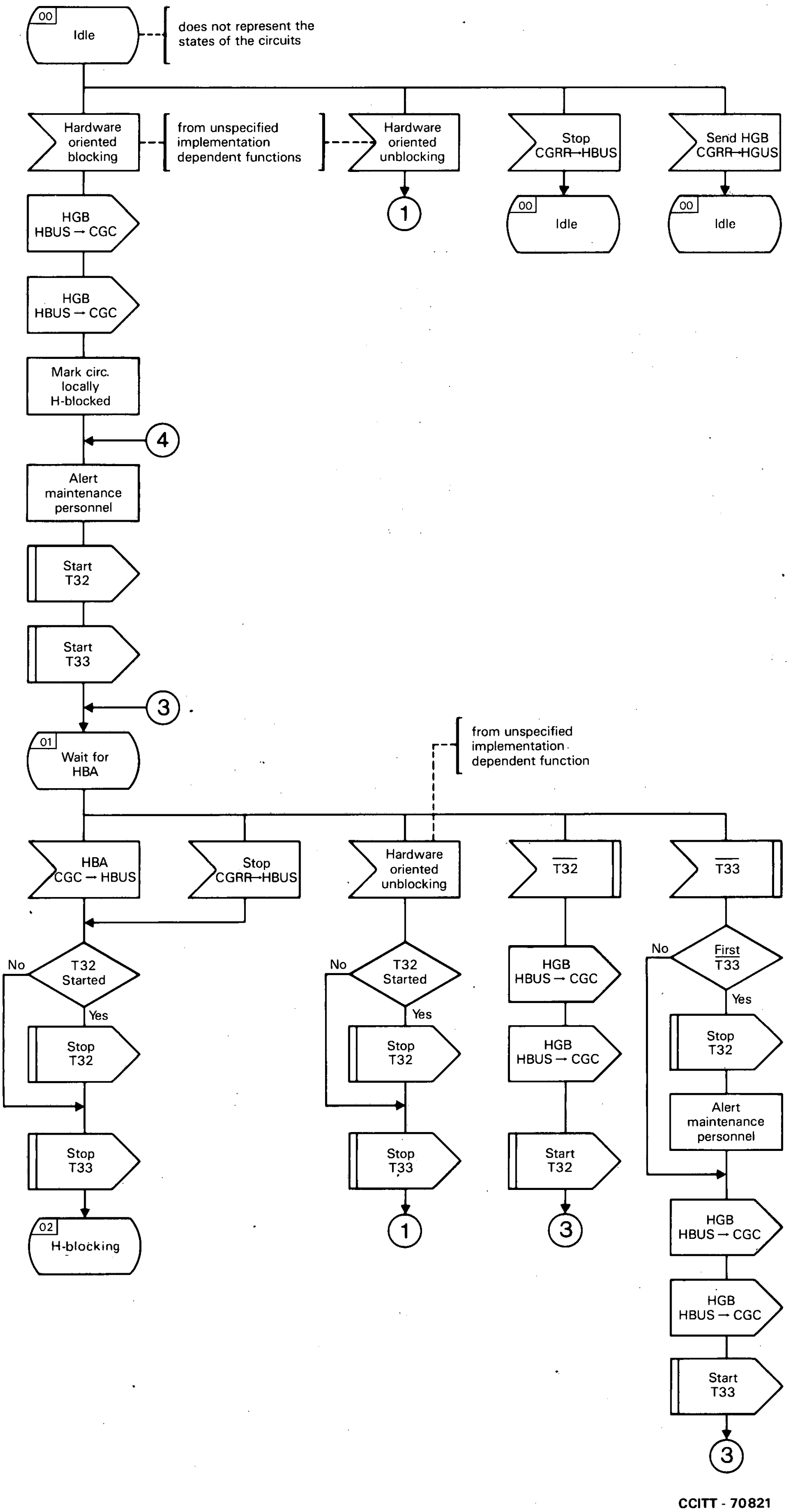


FIGURE 16/Q.724 (Sheet 1 of 2)

Hardware failure oriented circuit group blocking and unblocking sending (HBUS)

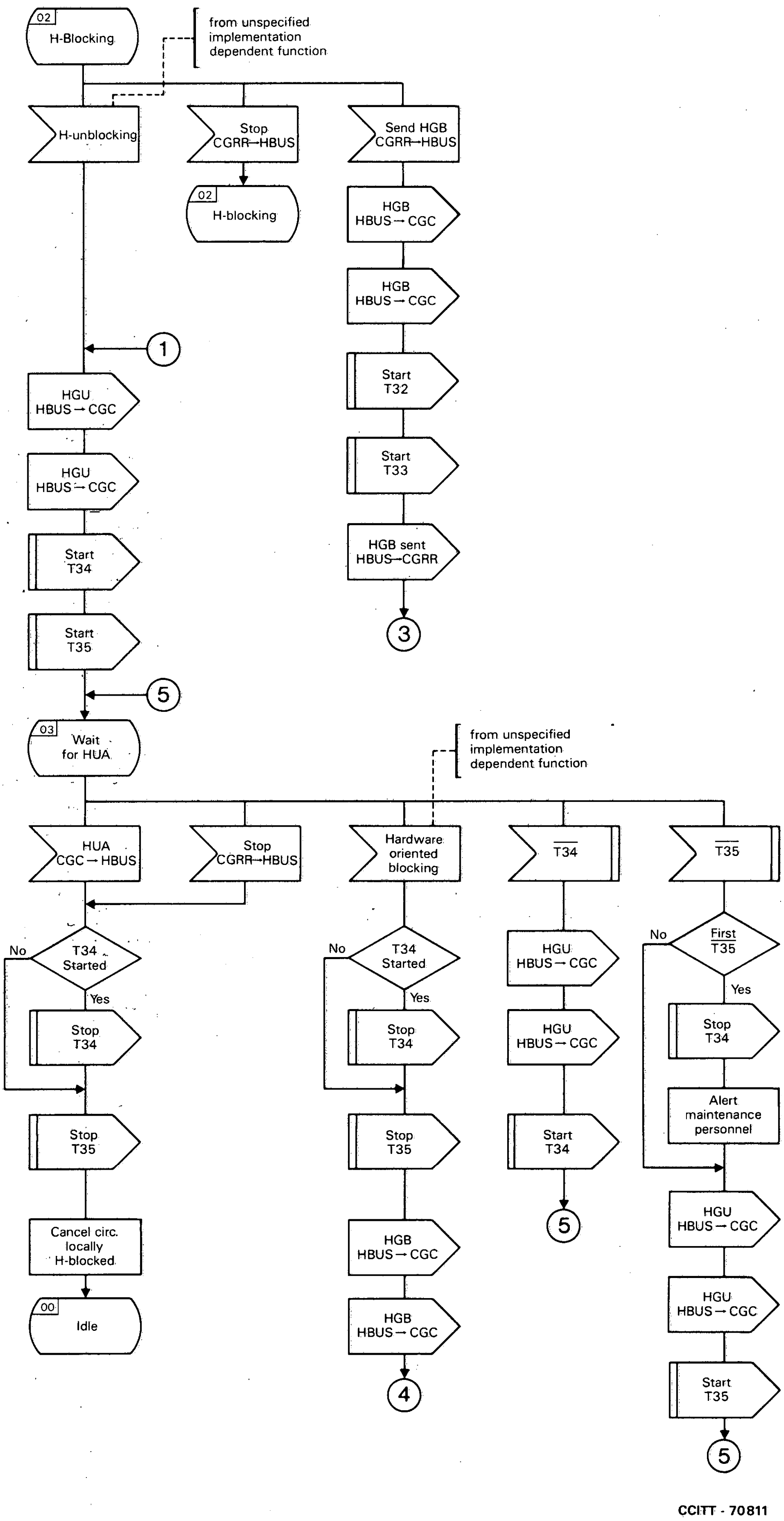


FIGURE 16/Q.724 (Sheet 2 of 2)

Hardware failure oriented circuit group blocking and unblocking sending (HBUS)

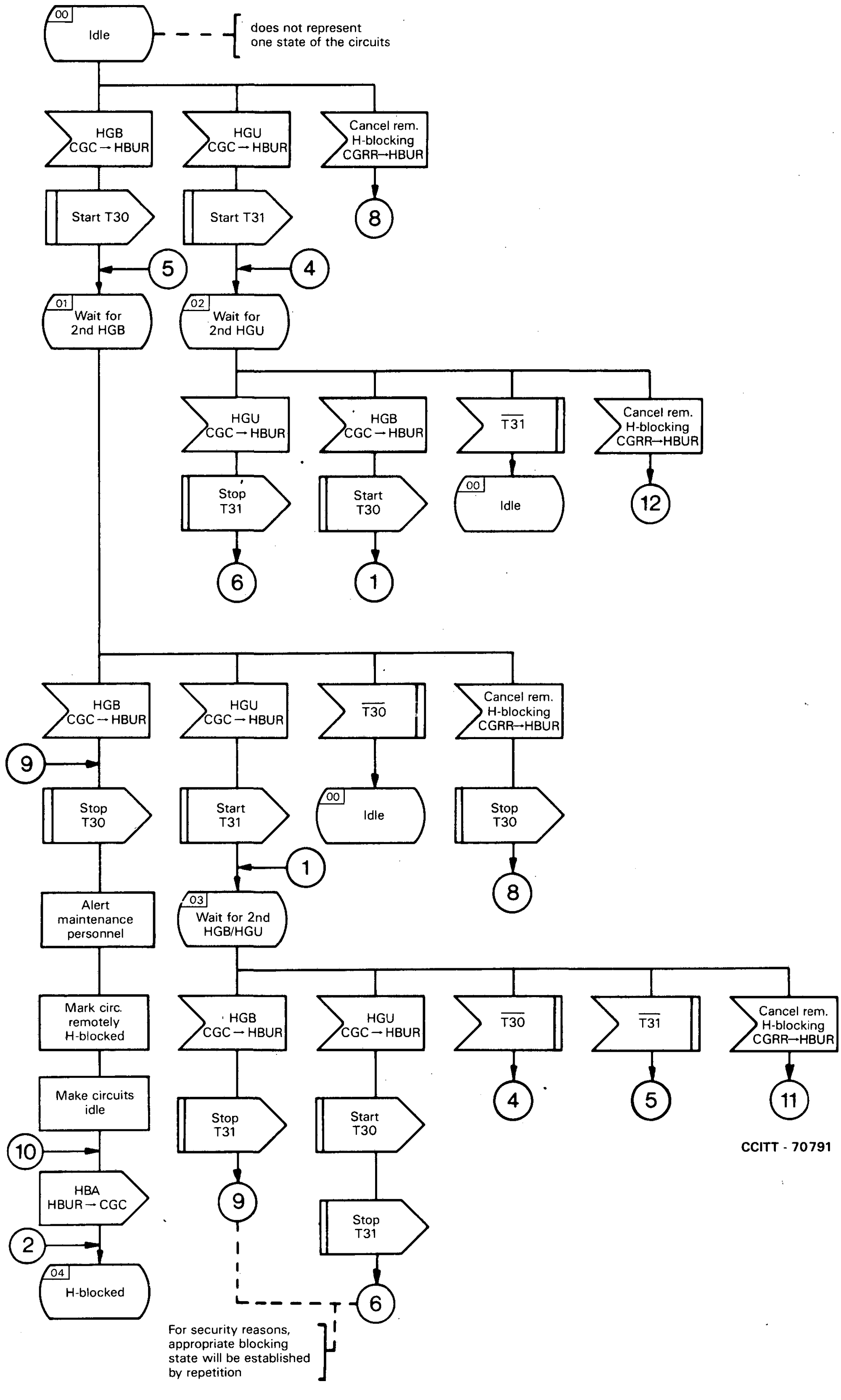


FIGURE 17/Q.724 (Sheet 1 of 2)

Hardware failure oriented circuit group blocking and unblocking receipt (HBUR)

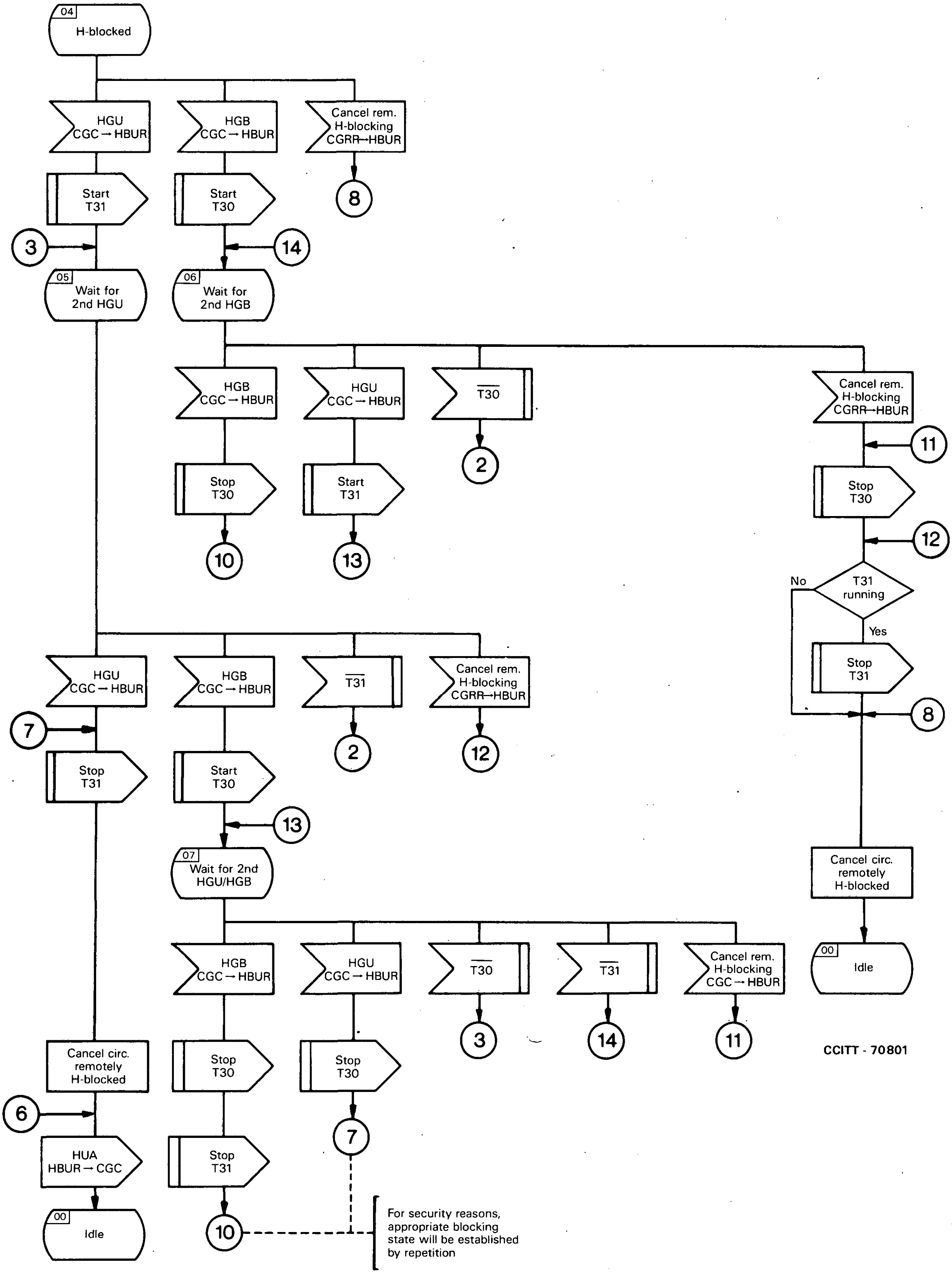


FIGURE 17/Q.724 (Sheet 2 of 2)

Hardware failure oriented circuit group blocking and unblocking receipt (HBUR)

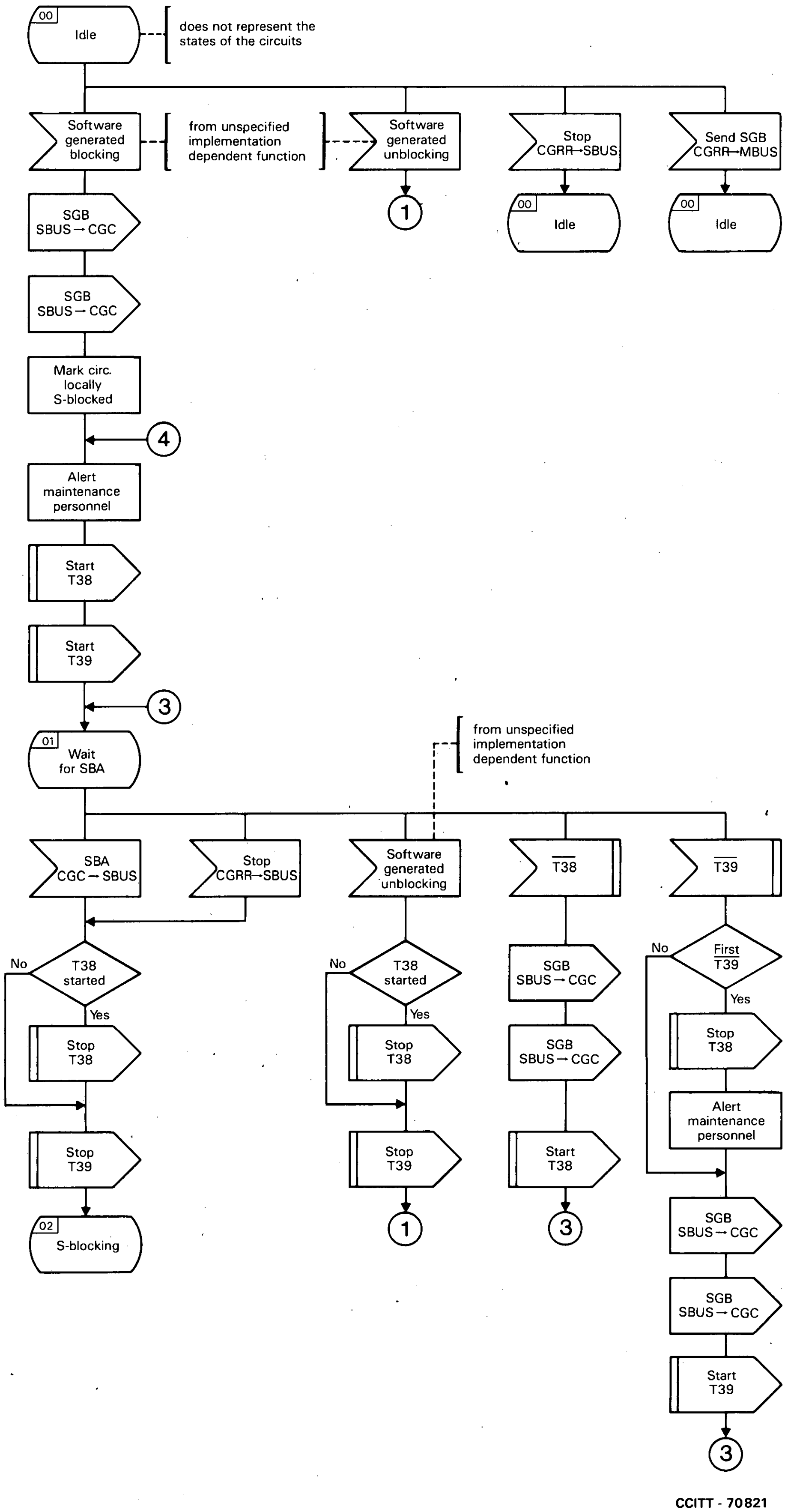


FIGURE 18/Q.724 (Sheet 1 of 2)

Software generated circuit group blocking and unblocking sending (SBUS) (national option)

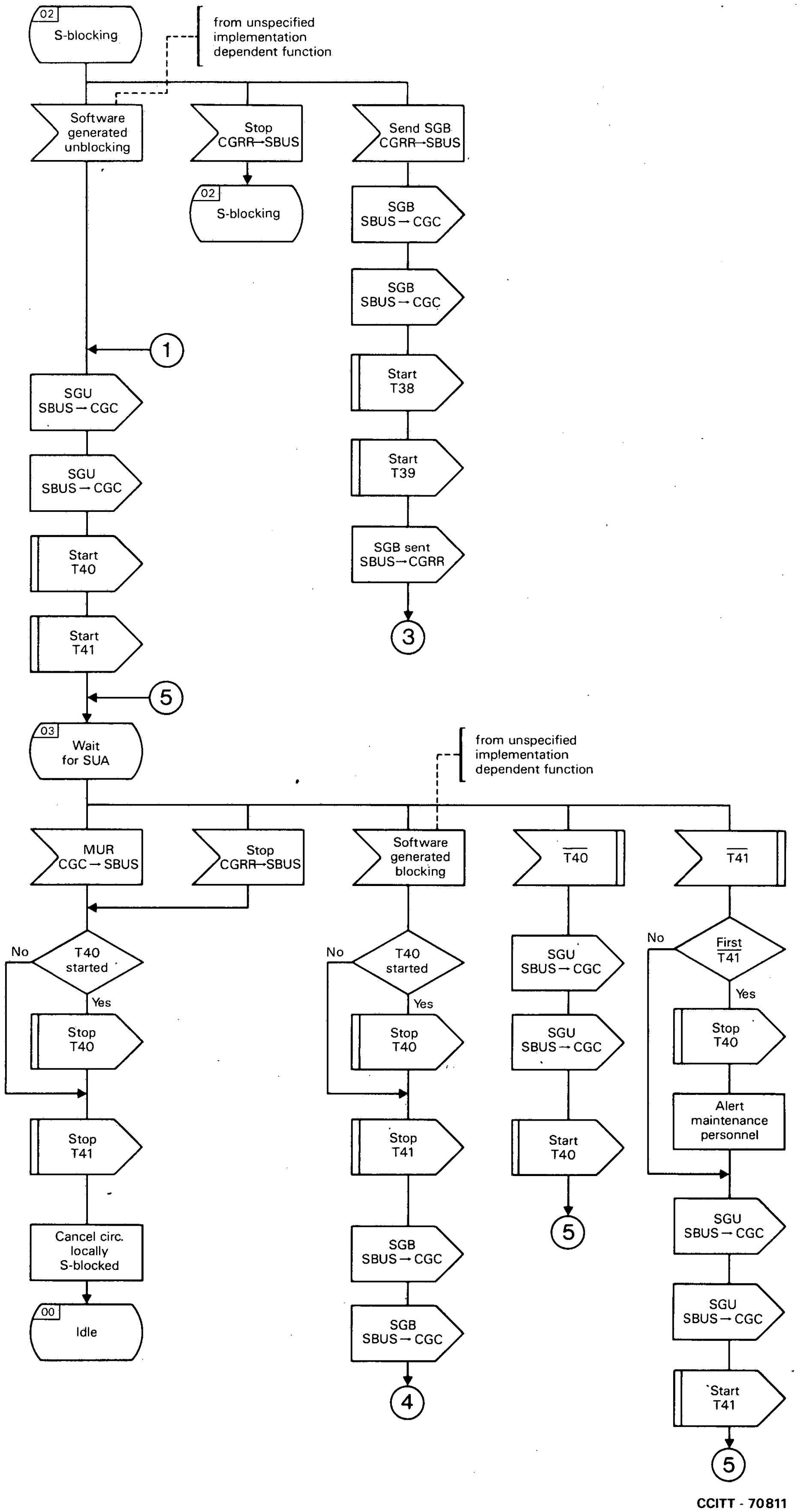


FIGURE 18/Q.724 (Sheet 2 of 2)

Software generated circuit group blocking and unblocking sending (SBUS) (national option)

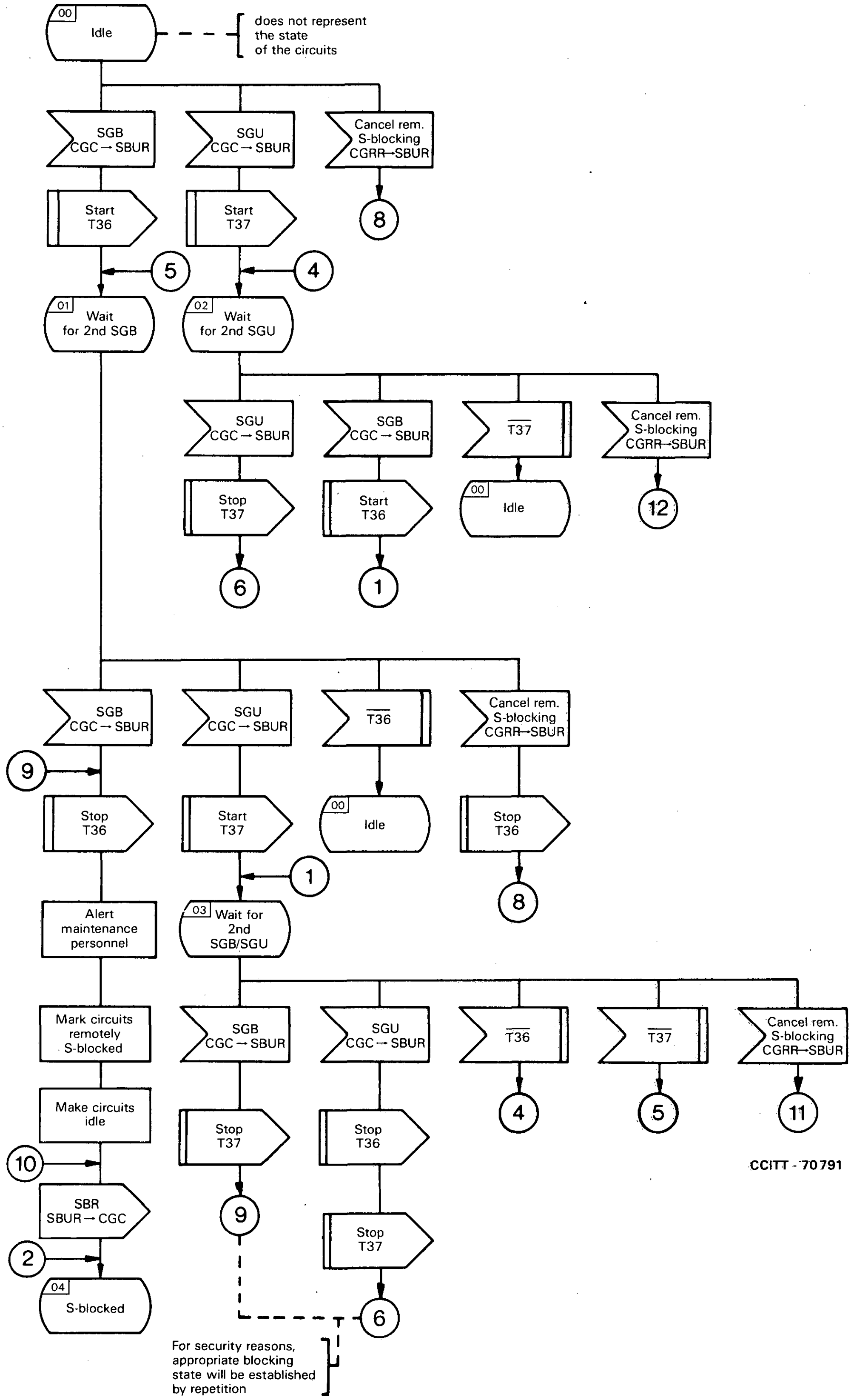


FIGURE 19/Q.724 (Sheet 1 of 2)

Software generated circuit group blocking and unblocking receipt (SBUR) (national option)

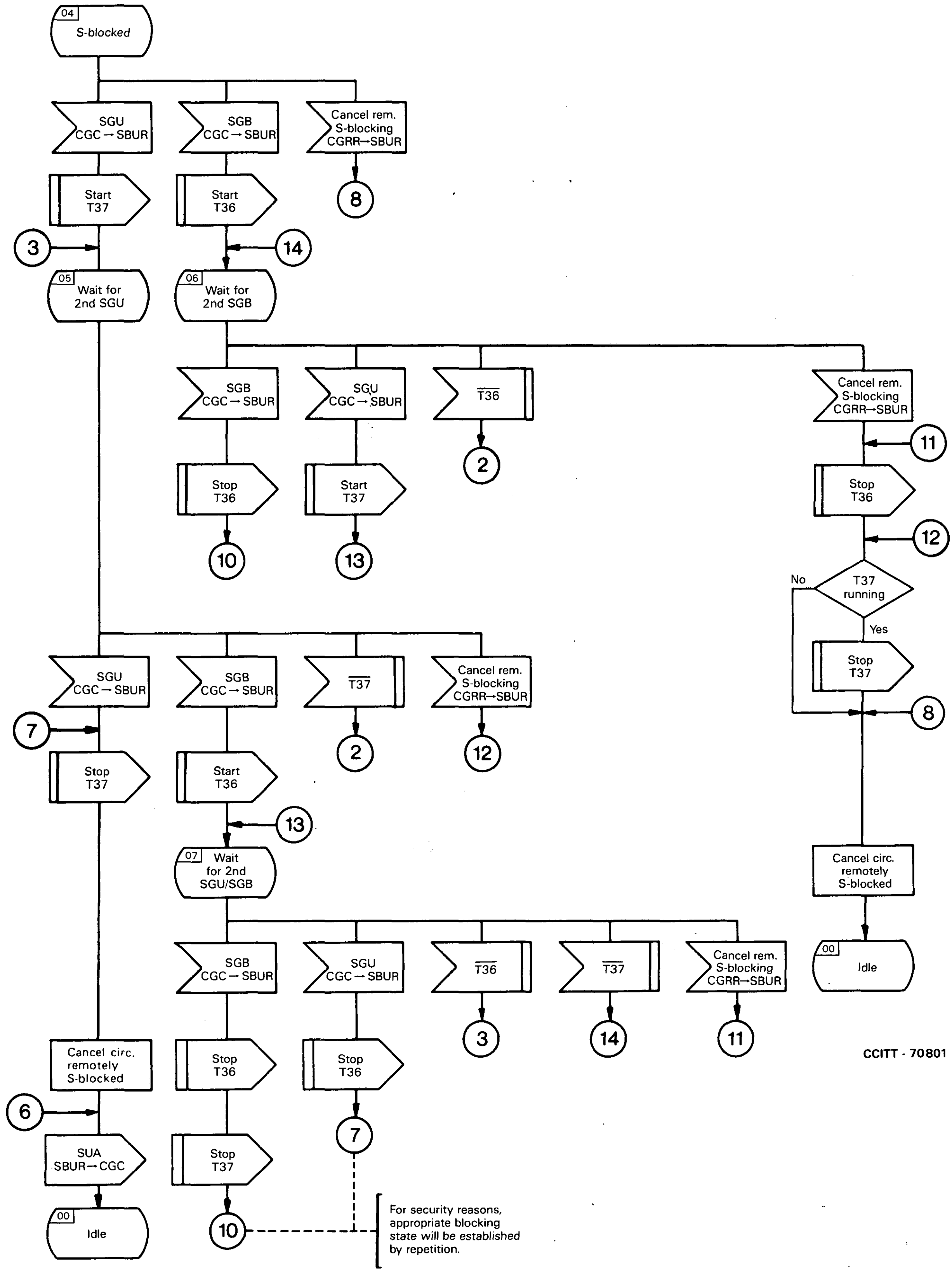


FIGURE 19/Q.724 (Sheet 2 of 2)

Software generated circuit group blocking and unblocking receipt (SBUR) (national option)

References

[1] CCITT Recommendation *Sending sequence of numerical (or address) signals,* Rec. Q.107.

[2] CCITT Recommendation *Performance requirements,* Rec. Q.504.

[3] CCITT Recommendation *Special release arrangements,* Rec. Q.118.

[4] CCITT Recommendation *Overflow-alternative, routing-rerouting automatic repeat attempt,* Rec. Q.12.

[5] CCITT Recommendation *Interruption control,* Rec. Q.416.

Recommendation Q.725

SIGNALLING PERFORMANCE IN THE TELEPHONE APPLICATION

1 Introduction

This Recommendation gives the requirements of the telephone application of Signalling System No. 7.

In Recommendation Q.706, the Message Transfer Part performance is described. The Message Transfer Part is the basis of the telephone application of Signalling System No. 7 and provision of a signalling network to serve the telephone service must take account of the performance of the Message Transfer Part and the requirements of the telephone application. For example, taking account of the message transfer times detailed in Recommendation Q.706 and the requirements for message transfer times between two telephone exchanges, a figure may be derived for the total permissible number of signalling links in signalling relations in tandem for a particular call.

2 Unsuccessful calls due to signalling malfunction

The proportion of calls that are unsuccessful due to signalling malfunction should be less than 1 in 10^5.

By means of error detection (see Recommendation Q.703) as well as transmission fault indication (see Recommendations G.732 [1] and G.733 [2]), it is ensured that, overall, not more than one error in 10^8 of all signal units transmitted is accepted and will cause false operation.

Unsuccessful calls may be caused by undetected errors, loss of messages or messages delivered out of sequence (during emergency situations within the signalling network) and may result in:

– incomplete call set-up,
– misrouted calls (e.g. connection of wrong numbers),
– calls routed correctly but mishandled (e.g. false clearing).

3 Unavailability of a signalling route set

The overall unavailability of a signalling route set causing the unavailability of a signalling relation should not exceed a total of 10 minutes per year.

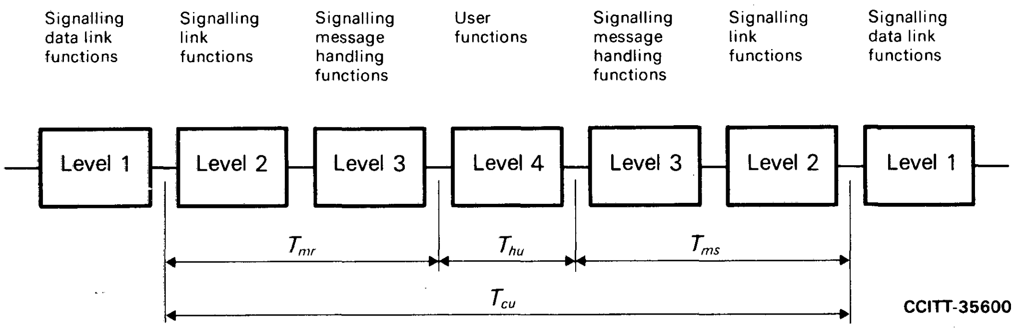
Note – The availability of a signalling route set within a signalling network may be enhanced by replication of signalling links, signalling paths and signalling routes.

4 Labelling potential

The label of the Telephone User Part of Signalling System No. 7 provides the potential to identify 16 384 signalling points and up to 4096 speech circuits for each signalling relation.

5 Cross-office transfer time

5.1 *Functional reference points and transfer time components*



T_{cu} Cross-office transfer time

T_{hu} Telephone User Part handling time

T_{mr} Message Transfer Part receiving time [a)]

T_{ms} Message Transfert Part sending time [a)]

a) The definitions of these times are given in Recommendation Q.706.

FIGURE 1/Q.725

Functional diagram of the cross-office transfer time

5.2 *Definitions*

a) **cross-office transfer time, T_{cu}**

T_{cu} is the period which starts when the last bit of the signal unit leaves the incoming signalling data link and ends when the last bit of the signal unit enters the outgoing signalling data link for the first time. It also includes the queueing delay in the absence of disturbances but not the additional queueing delay caused by retransmission.

b) **user handling time, T_{hu}**

T_{hu} is the period which starts when the last bit of the message has entered the Telephone User Part and ends when the last bit of the derived message has left the Telephone User Part.

5.3 *Queueing delay*

The formulae for the queueing delays are described in Recommendation Q.706, § 4.2.

The telephone traffic model assumed is given in Table 1/Q.725, from which the proportion of signal messages may be obtained as shown in Table 2/Q.725. Using Table 2/Q.725, examples of queueing delays are calculated as shown in Figures 2/Q.725 to 5/Q.725, where one call attempt per second per 64 kbit/s signalling data link may yield 0.00577 Erlang of the traffic loading of each channel.

5.4 *Estimates for message transfer time*

The figures in Table 3/Q.725 are related to a signalling bit rate of 64 kbit/s.

5.5 *Effect of retransmission*

As a consequence of correction by retransmission, not more than one in 10^4 signals should be delayed more than 300 ms as a long-term average. This requirement refers to each signalling link.

This requirement is laid down in order to ensure satisfactory answer delays.

TABLE 1/Q.725

Traffic model

Sending procedure			"En bloc"				Overlap			
Type of call			AW	SB	CC	AB	AW	SB	CC	AB
Percent calls			30	10	5	5	30	10	5	5
Messages per call		Length (bits)								
	12-digit IAM	176	1	1	1	0				
	6-digit IAM	152					1	1	1	1
	3-digit SAM	128					1	1	0	1
	1-digit SAM	112					3	3	0	0
	Address complete	112	1	1	0	0	1	1	0	0
	Others	112	3,5	2	3	0	3,5	2	3	2

AW Answered
SB Subscriber busy and not answered
CC Circuit congestion
AB Abortive

Note – The assumptions used in this model are chosen for illustrative purposes, and should not be considered to be typical.

TABLE 2/Q.725

Proportion of messages

Length (bits)	176	152	128	112	104	Total
Messages per call in both directions	0.45	0.5	0.45	2.0	2.9	6.3
Percent	7.1	7.9	7.1	31.7	46.0	100
Mean message length (T_m)	117.2 bits					
k_1	1.032					
k_2	1.107					
k_3	1.239					

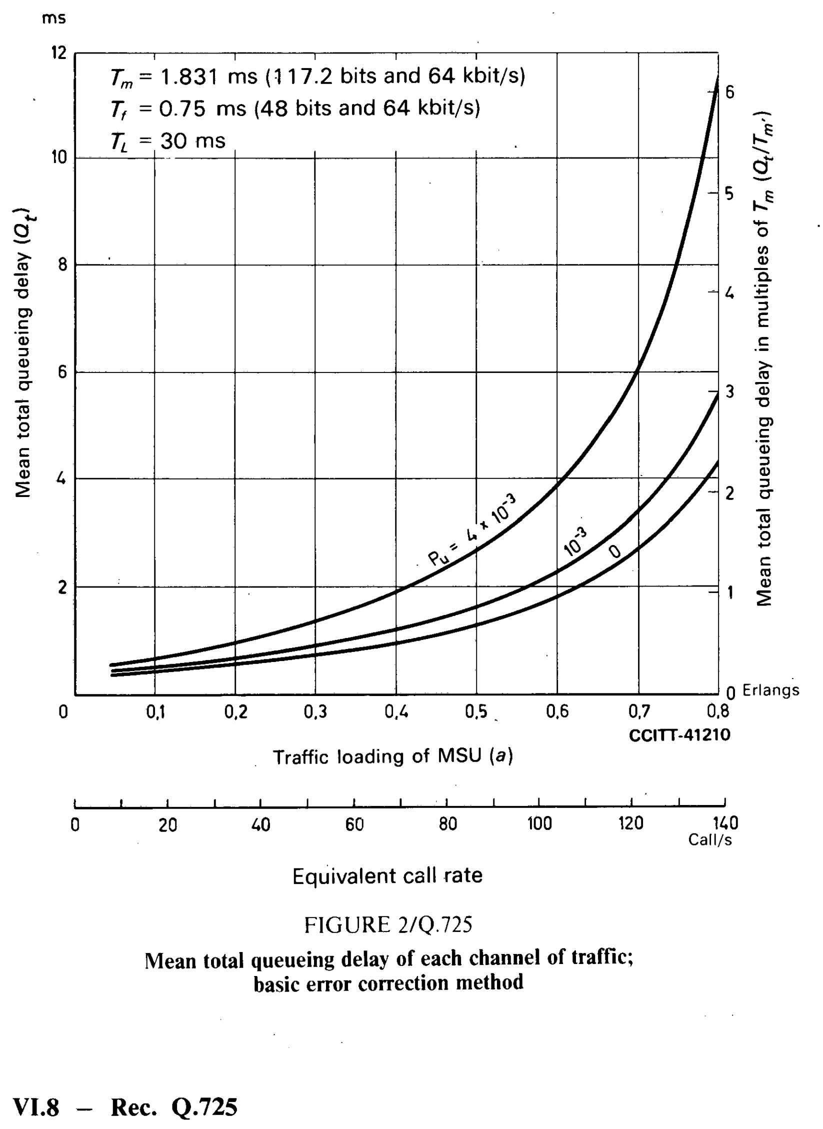


FIGURE 2/Q.725

Mean total queueing delay of each channel of traffic; basic error correction method

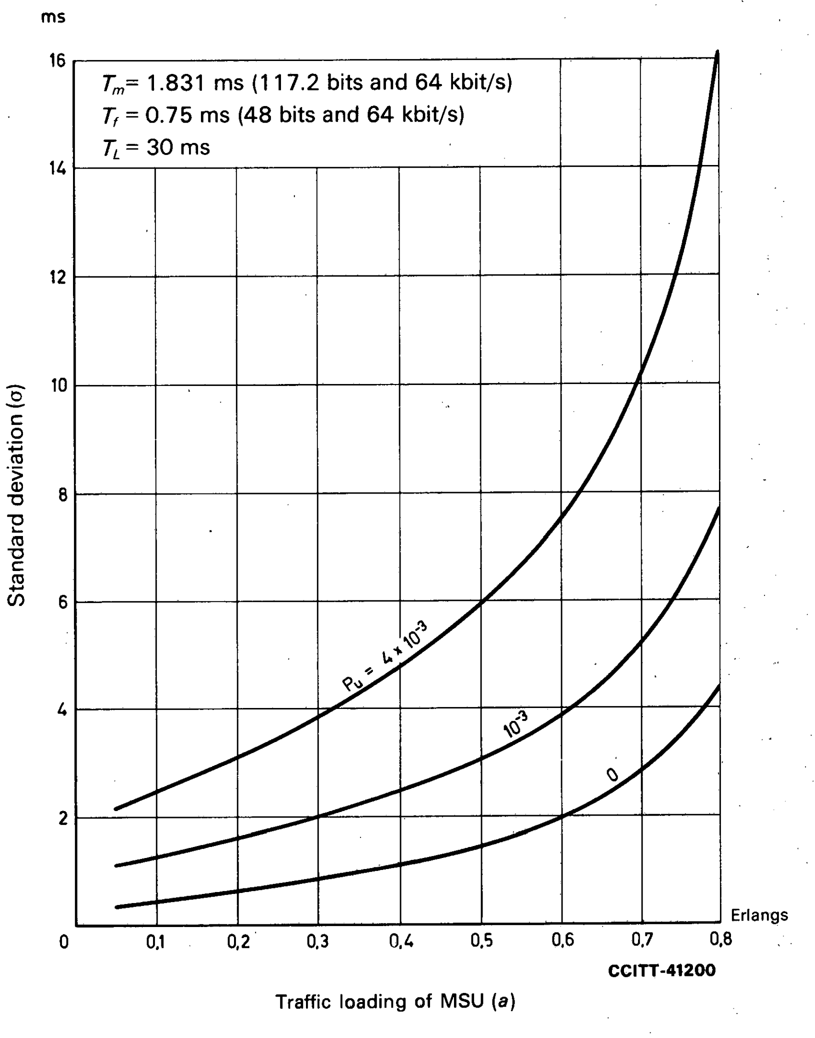


FIGURE 3/Q.725

Standard deviation of queueing delay of each channel of traffic; basic error correction method

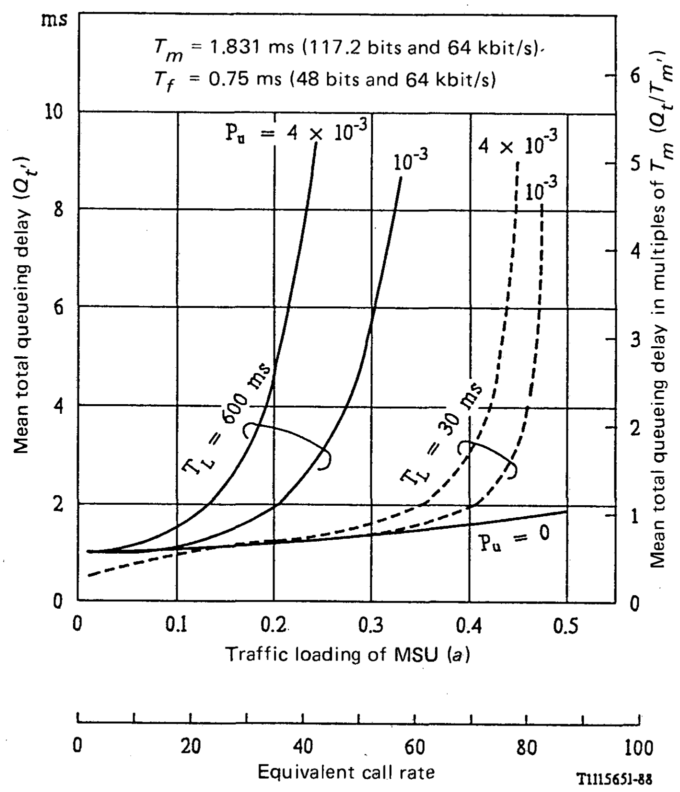


FIGURE 4/Q.725

Mean total queueing delay of each channel of traffic; preventive cyclic retransmission error correction method

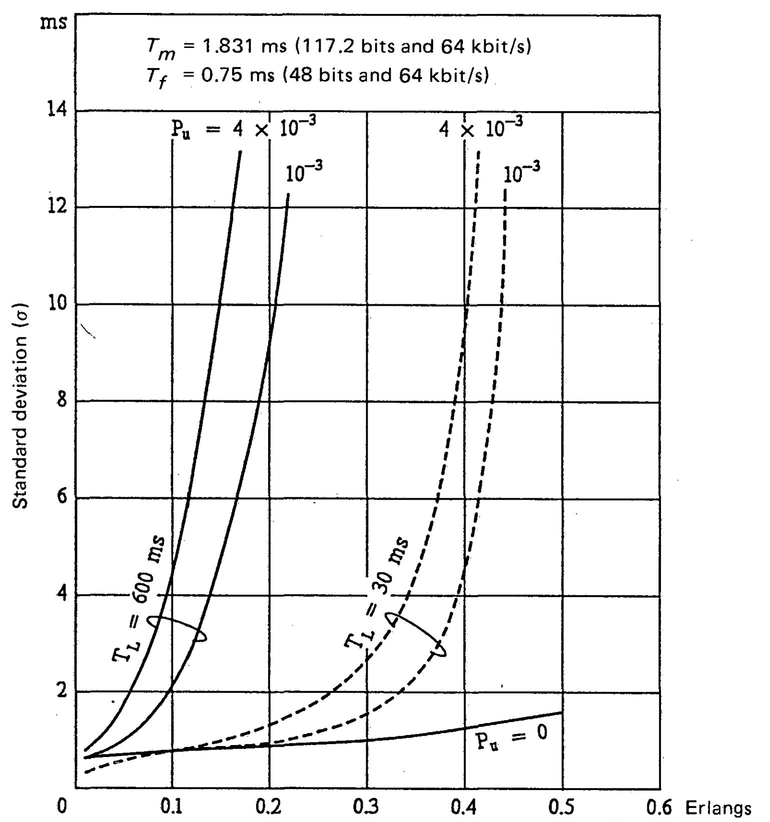


FIGURE 5/Q.725

Standard deviation of queueing delay of each channel of traffic; preventive cyclic retransmission error correction method

TABLE 3/Q.725

Message type	Exchange call attempt loading	Cross-office transfer time T_{cu} (ms) [a)]	
		Mean	95%
Simple (e.g. answer)	Normal +15% +30%	110 165 275	220 330 550
Processing intensive (e.g. IAM)	Normal +15% +30%	180 270 450	360 540 900

a) Provisional values.

References

[1] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s*, Rec. G.732.

[2] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s*, Rec. G.733.

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SECTION 2

ISDN SUPPLEMENTARY SERVICES

Recommendation Q.730

ISDN SUPPLEMENTARY SERVICES

1 General

1.1 This Recommendation describes the signalling procedures for Supplementary Services to be used in conjunction with the ISDN User Part defined in Recommendations Q.761-764, Q.766 and the Transaction Capabilities Applications Part (TCAP) defined in Recommendations Q.771-774.

Each Supplementary Service has been defined in separate sections each containing the complete procedures encompassing both the ISDN User Part and the procedures to be used on the top of TCAP where appropriate.

Each section contains a general paragraph giving details of the specific service with references to the Stage I and II descriptions defined in the relevant Recommendations of the I.200 and Q.80 Series. The call set-up procedures and the actions taken at originating exchanges, etc. are defined. Arrow diagrams showing the message flows for both successful and unsuccessful establishment of the service are generally included. The formats and codings aspects are not defined in this Recommendation but references are made to the appropriate ISDN User Part, TC or SCCP Recommendations.

1.2 *Information request/response*

The "information request/response" message interchange described in the calling line identity supplementary services uses a general request/response mechanism (e.g. INR/INF messages) which can be used in the future for supplementary services not currently defined (see Recommendation Q.764).

1.3 *Exceeding the maximum message length (e.g. ISDN User Part 272 octets)*

If for any reason the combination of basic plus supplementary service information causes the overall maximum length of the message (e.g. Initial Address Message) to be exceeded then the user-to-user supplementary service 1, if included, should be rejected (see § 2 covering interactions).

The combination of other services which may cause the message length to be exceeded will depend on the call state and the requested service.

1.4 *Layout of Recommendation Q.730*

§ 1 General

§ 2 User-to-user signalling (Note)

§ 3 Close user group

§ 4 Calling line identification (presentation and restriction)

§ 5 Direct dialling in

§ 6 Call forwarding (Note)

§ 7 Time-out table for supplementary services (requires further study)

Note – The text for the explicit invocation of the user-to-user signalling has been included as Annex A.

2 *User-to-user signalling service*

2.1 *General description of user-to-user service*

The user-to-user signalling supplementary service(s) provide(s) a means of communication between two users by using the ISDN User Part or SCCP protocols defined in Recommendations Q.711-714 and Q.761-764, 766. In order for the services to be usable, they also have to be provided in the access protocol.

User-to-user signalling is used to exchange I.257 information between two users to provide the user-to-user services described in Recommendation I.257. This section is specific to Signalling System No. 7. The general description for services 1-3 may be found in the last mentioned Recommendation and the functional description in Recommendation Q.87.

2.1.1 *User-to-user services*

Three user-to-user signalling services associated with circuit-switched calls that may be provided by the network users are:

Service 1: user-to-user signalling exchanged during the set-up and clearing phases of a call, within ISDN User Part call set-up and release messages as defined in Recommendation Q.763;

Service 2: user-to-user signalling exchanged during call set-up between the address complete or call progress messages and the answer or connect messages, within user-to-user information messages; and

Service 3: user-to-user signalling exchanged while a call is in the active state, within user-to-user information messages.

All three services may be used separately or in any combination within a single call. As an option at call set-up, users may be able to specify whether the requested user-to-user signalling service(s) is(are) essential or non-essential for the call (i.e. whether the call should be completed or not if user-to-user information cannot be passed). Up to 128 octets of user information may be transferred in a message in each of the three services[1]. The 128 octets does not include the user-to-user information parameter name, the protocol control indicator or the length octets.

2.1.2 *Service request*

Service 1 may be requested implicitly by the presence of the user-to-user information parameter in the Initial Address Message. An implicit request is "non-essential" by default.

Explicit requests of Service 1 and 2 must be in the Initial Address Message. Service 3 may be explicitly requested in the Initial Address Message during call set-up. When there is an explicit request a single user-to-user indicators parameter will be used with one of the following indications for each of the three services:

- no information;
- requested, non-essential;
- requested, essential.

2.1.3 *Response (Confirmation)*

If explicit requests are used there should, in general, be explicit responses in a user-to-user indicators parameter with one of the following indications for each of the three services:

- no information;
- provided;
- not provided.

[1] During an interim period of time, networks may support a lesser number (e.g. 32 octets) due to protocol restrictions; 32 octets will always be supported. Restrictions may apply to calls requesting user-to-user information more than 32 octets.

Implicit "not provided" responses occur when:

- Service 1 has been implicitly requested and no user-to-user information is received in call set-up or release messages; or
- Service 1, 2 or 3 has been explicitly requested and there is no indication of acceptance or rejection from call control.

2.1.4 *Flow control*

The exchange of user-to-user signalling is limited by flow control procedures provided on the access by either the user or network. The need for interexchange flow control procedures by the ISDN User Part for user-to-user signalling should be evaluated.

2.2 *Procedures for user-to-user signalling associated with circuit-switched call*

The following sections only specify the signalling procedure used to implicitly invoke the Service 1. Signalling procedures defined to support the other services are specified in Annex A.

2.2.1 *User-to-user signalling, Service 1*

2.2.1.1 *General characteristics*

Service 1 allows users to communicate with user-to-user signalling by transferring user-to-user information within ISDN User Part messages during the call set-up and clearing phases. The user-to-user signalling service provided is not a guaranteed service. If for any reason the combination of the basic plus supplementary service information causes the overall maximum length of the message to be exceeded then if the User-to-user Signalling Service 1 is included, then the service should be rejected.

2.2.1.2 *User-to-user signalling in the call set-up phase – implicit service request*

Procedures for call set-up are as described in Recommendation Q.764, § 2, with the following changes:

Service 1 may be invoked by sending the user-to-user information parameter of variable length that is specified in Recommendation Q.763, § 3.34 in an Initial Address Message that is requested in a call set-up request from call control. This information parameter is transported across the network and delivered unchanged to the terminating call control for the called user. The user-to-user indicators parameter will not be sent.

The reception of a user-to-user information parameter in a call set-up or release request from the terminating call control is an implicit indication of the acceptance of Service 1.

The user or network may not be able to interpret incoming user-to-user information. In such situations, the user should discard this information without disrupting normal call handling. No specific signalling is provided by the network to accommodate this situation.

2.2.1.3 *Interworking*

In the case of interworking with a non-ISDN network, the "interworking" protocol control information will be returned to the originating exchange in the first appropriate message, e.g. an Address Complete Message. Two ISDN networks that interwork may have to retain knowledge of the service request until it is clear whether both can support the service.

2.2.1.4 *Rejection of implicit service requests*

Networks that cannot provide the service requested may not return a rejection indication.

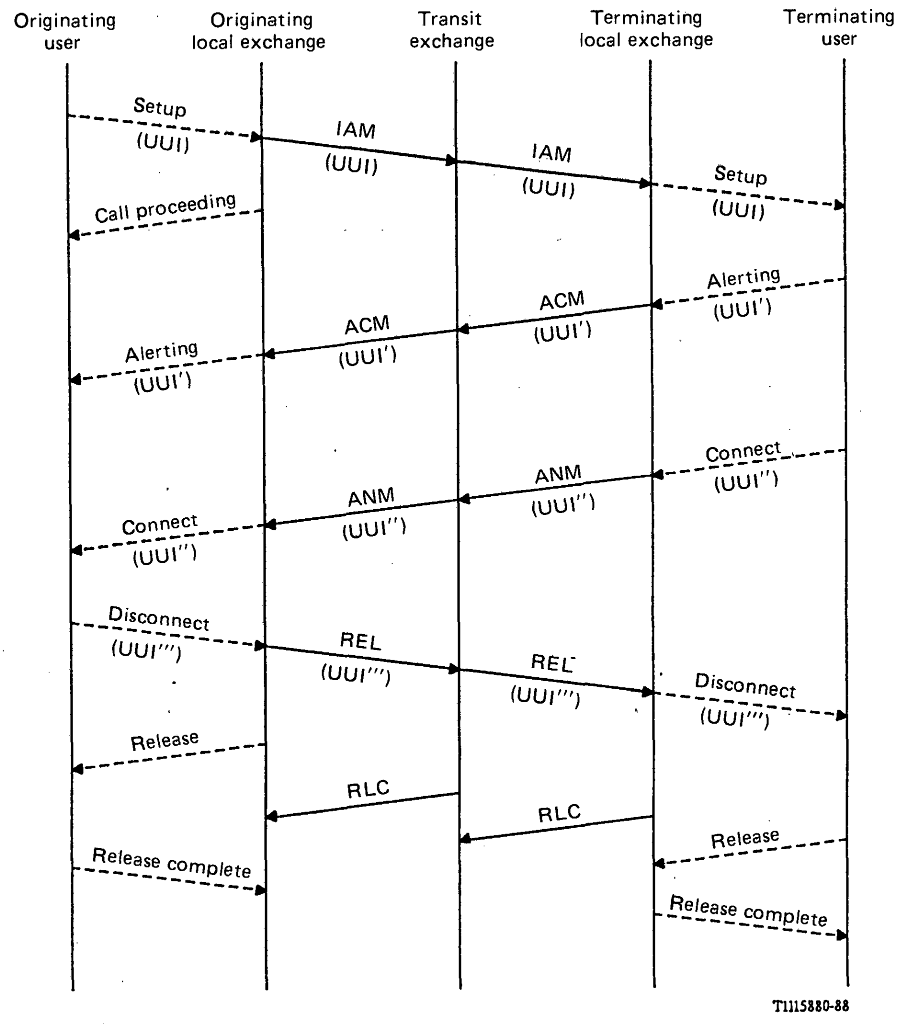
2.2.1.5 *User-to-user signalling in the call clearing phase*

A user-to-user information parameter may be included in the Release Message. The user-to-user information parameter received at the distant exchange in the Release Message is passed to the call control for the remote user. In the case of simultaneous clearing of the call, the Release Message may not reach the distant local exchange and the user-to-user information will be lost.

2.2.1.6 *Message flow diagrams*

The message flow diagrams are shown in Figure 1/Q.730 as well as the use of user-to-user signalling service 1 when implicitly requested in a point-to-point configuration.

The messages shown with dashed lines are not part of the ISDN User Part protocol and are for information only. For detailed information on the access protocol user-to-user procedures the ISDN access protocol Recommendation should be examined.



UUI User-to-user signalling
ACM Address complete message
ANM Answer message
IAM Initial address message
REL Release
RLC Release complete

Note 1 – In the case where an ALERTING indication is carried by a Call Progress Message, the user-to-user information parameter may also be transported in the Call Progress Message.

Note 2 – In the case where the called user is an automatic answering terminal, user-to-user information parameter may be transported in a Connect Message.

FIGURE 1/Q.730

UUS Service 1 (implicit request, called user is point-to-point)

2.2.2 *Interaction with other supplementary services*

2.2.2.1 *Call forwarding services*

Interactions with the call forwarding services are shown in the call forwarding protocol sections.

2.2.2.2 *Call waiting service*

Interactions with the call waiting service are shown in the call waiting protocol sections. (Call waiting is for further study.)

2.2.2.3 *Other services*

There are no known interactions with services other than those listed.

2.2.2.4 *State transition diagrams*

The state transition diagrams may be found in Stage 2 descriptions of the user-to-user service.

3 Closed user group (CUG)

3.1 *General*

The closed user group (CUG) supplementary service enables a group of users to intercommunicate only among themselves or, as required, one or more users may be provided with incoming/outgoing access to users outside the group.

The stage I definition of the CUG service is given in Recommendation I.255, and its stage II service definition including network functions are given in Recommendation Q.85.

The realization of the CUG facilities is done by the provision of interlock codes and is based on various validation checks as defined in Q.85 at call set-up, determining whether or not a requested call to or from a user having a CUG facility is allowed. In particular, a validation check is performed by verifying that both the calling and called parties belong to the CUG indicated by the interlock code.

The data for each CUG that a user belongs to can either be stored at the local exchange to which the user is connected (decentralized administration of CUG data), or at dedicated point(s) in the network (centralized administration of CUG data).

In § 3.2 the call set-up procedure based on decentralized administration of CUG data is specified making use of the ISDN User Part as defined in Recommendations Q.761-764 and Q.766.

In § 3.3 the call set-up procedure based on centralized administration of CUG data is specified making use of the ISDN User Part as defined in Recommendations Q.761-764 and Q.766 and the Transaction Capabilities Application Part (TCAP) as defined in Recommendations Q.771-775.

Section 3.4 specifies the application service element (ASE), situated above the Transaction Capabilities Application Part (TCAP), and used for CUG validation check with centralized administration of CUG data.

3.2 *Call set-up procedure with decentralized administration of CUG data*

3.2.1 *Originating exchange*

The actions at the originating exchange at call set-up from a user belonging to a CUG depend on the result of the validation checks performed there based on whether the user belongs to one or more CUGs and on the combination of CUG facilities that applies.

a) *CUG call without outgoing access*

If the result of the validation check indicates that the call should be dealt with as a CUG call, the interlock code of the selected CUG is obtained. The initial address message forwarded to the next exchange then includes the interlock code together with an indication that the call is a CUG call without outgoing access. The ISUP preference indicator of the forward call indicators parameter in the IAM is set to "ISUP required all the way".

b) *CUG call with outgoing access*

If the result of the validation check indicates that the call should be dealt with as a CUG call with outgoing access, the interlock code of the selected CUG together with an outgoing access indication is obtained. The initial address message forwarded to the next exchange then includes the interlock code together with an indication that the call is a CUG call for which outgoing access is allowed. The ISUP preference indicator of the forward call indicators parameter in the IAM is set to "ISUP preferred all the way", unless another service requires a more stringent setting.

c) *Non-CUG call*

If the result of the validation check indicates that the call should be dealt with as a non-CUG call, the initial address message forwarded to the next exchange then does not include an interlock code nor a CUG call indication.

d) *Call rejected*

If the result of the validation check indicates that the call is to be rejected, the call set-up is not initiated.

3.2.2 *Transit exchange*

With the possible exception of some gateway exchanges, each transit exchange sets up a CUG call as an ordinary call. The information related to the CUG facilities received from the preceding exchange, i.e. an interlock code, a CUG call indication – possibly with an indication that outgoing access is allowed – is forwarded to the succeeding exchange.

In the case of an international CUG call, no special functions are required at the gateway exchange provided that the international interlock code assigned to the international CUG concerned is used in the national network. However, in the case where a national interlock code other than the applicable international interlock code is used within a national network, interlock code conversion is required at the gateway (or corresponding) exchange.

In case of interworking with a network which does not support the CUG facility, the gateway exchange may release the call, depending on the contents of the CUG call indicator in the received IAM. The action at the gateway exchange, in this case, is indicated in Table 1/Q.730. In cases where a call is rejected as the result of the interworking, a release message including the cause parameter indicating # 88 is sent towards the originating exchange.

3.2.3 *Destination exchange*

At the destination exchange a validation check of the acceptability of a call is made according to the rule specified in the Recommendation Q.85 where either the calling party (as indicated by a CUG call indication in the initial address message received) or the called party belongs to a CUG. The call set-up is continued only in cases where the information received checks with the information stored at the destination exchange. Table 2/Q.730 indicates the action to be taken by the destination exchange as the result of the validation check.

In cases where a call is rejected as the result of the validation check because of incompatible CUG information, a release message including the cause parameter indicating one of the following values is sent towards the originating exchange:

#55: Incoming calls barred within CUG

#87: Called user not member of CUG

#88: Incompatible destination

Figure 2/Q.730 illustrates example message flows for CUG calls with decentralized administration of CUG data.

3.3 *Call set-up procedure with centralized administration of CUG data*

In the local exchange an indication is stored, showing only whether the user has one or none of the closed user group facilities.

3.3.1 *Originating exchange*

The originating exchange requests the CUG validation check to the dedicated point by invocation of the "CUG check 1" operation through TCAP. This operation and associated parameters are described in § 3.4 of this Recommendation. The following actions at the originating exchange depend on the result of this validation check:

a) *CUG call indication*

   If the result of the validation check for the calling user at the originating exchange indicates that the check for the calling user has been successful, the interlock code of the selected CUG possibly together with an outgoing access indication is obtained. The initial address message forwarded to the next exchange then includes the interlock code together with an indication that the call is a CUG call without outgoing access or a CUG call with outgoing access.

b) *Non-CUG call indication*

   If the result of the validation check indicates that the call should be dealt with as a non-CUG call, the initial address message forwarded to the next exchange then does not include an interlock code nor a CUG call indication.

c) *Call rejected*

   If the result of the validation check indicates that the call is to be rejected, the call set-up is not initiated.

3.3.2 *Transit exchange*

Refer to § 3.2.2.

3.3.3 *Destination exchange*

In the case of an incoming CUG call for which the validation check for the calling user has successfully been performed, the received initial address message includes the interlock code and CUG call indication possibly with an indication that outgoing access is allowed. The destination exchange then forwards the information received in the initial address message to the dedicated point for CUG validation check. In this case, the destination exchange invokes the "CUG check 2" operation through TCAP. This operation and associated parameters are defined in § 3.4 of this Recommendation.

a) *Check successful indication*

   If the result of the validation check indicates that the check has been successful, the index of the CUG selected for the called user and possibly an outgoing access indication are obtained. The CUG call set-up request is forwarded to the called user with these indications.

b) *Non-CUG call indication*

   If the result of the validation check indicates that the call should be dealt with as a non-CUG call, the set-up request of a non-CUG call is forwarded to the called user.

c) *Call rejected*

   If the result of the validation check indicates that the call is rejected, the reason why the call has been rejected is obtained. A release message including the cause parameter indicating one of the values as listed in § 3.2.3 is sent towards the originating exchange.

3.3.4 *Dedicated point*

At the dedicated point, the CUG validation check is performed according to the rules defined in Recommendation Q.85. The procedures between the dedicated point and the exchange follow those as defined in the ASE part of this Recommendation.

Figure 3/Q.730 illustrates an example message flow for a CUG call with centralized administration of CUG data.

TABLE 1/Q.730

Action at the gateway with a network without CUG capability

CUG call indicator in IAM	Action at the gateway exchange
CUG without outgoing access	Release the call with cause #88
CUG with outgoing access	Treat the call as an ordinary call [a]
Non-CUG	Treat the call as an ordinary call

[a] Discard the interlock code parameter and change the CUG call indicator of the optional forward call indicator to indicate non-CUG call or discard the whole parameter if appropriate.

TABLE 2/Q.730

Handling of a CUG call at the destination exchange

<table>
<tr><th rowspan="3">CUG call indicator in IAM</th><th rowspan="3">CUG match check</th><th colspan="5">Class of called user</th></tr>
<tr><th colspan="2">CUG</th><th colspan="2">CUG + IA</th><th rowspan="2">No CUG</th></tr>
<tr><th>No ICB</th><th>ICB</th><th>No ICB</th><th>ICB</th></tr>
<tr><td rowspan="2">CUG with OA not allowed</td><td>Match</td><td>CUG call</td><td>Release cause #55</td><td>CUG call</td><td>Release cause #55</td><td rowspan="2">Release the call with cause #88</td></tr>
<tr><td>No match</td><td colspan="2">Release the call with cause #87</td><td colspan="2">Release the call with cause #87</td></tr>
<tr><td rowspan="2">CUG with OA allowed</td><td>Match</td><td>CUG call</td><td>Release cause #55</td><td>CUG+OA call</td><td>Non-CUG call</td><td rowspan="2">Non-CUG call</td></tr>
<tr><td>No match</td><td colspan="2">Release the call with cause #87</td><td colspan="2">Non-CUG call</td></tr>
<tr><td>Non-CUG</td><td>–</td><td colspan="2">Release the call with cause #88</td><td colspan="2">Non-CUG call</td><td>Non-CUG call</td></tr>
</table>

IA Incoming access

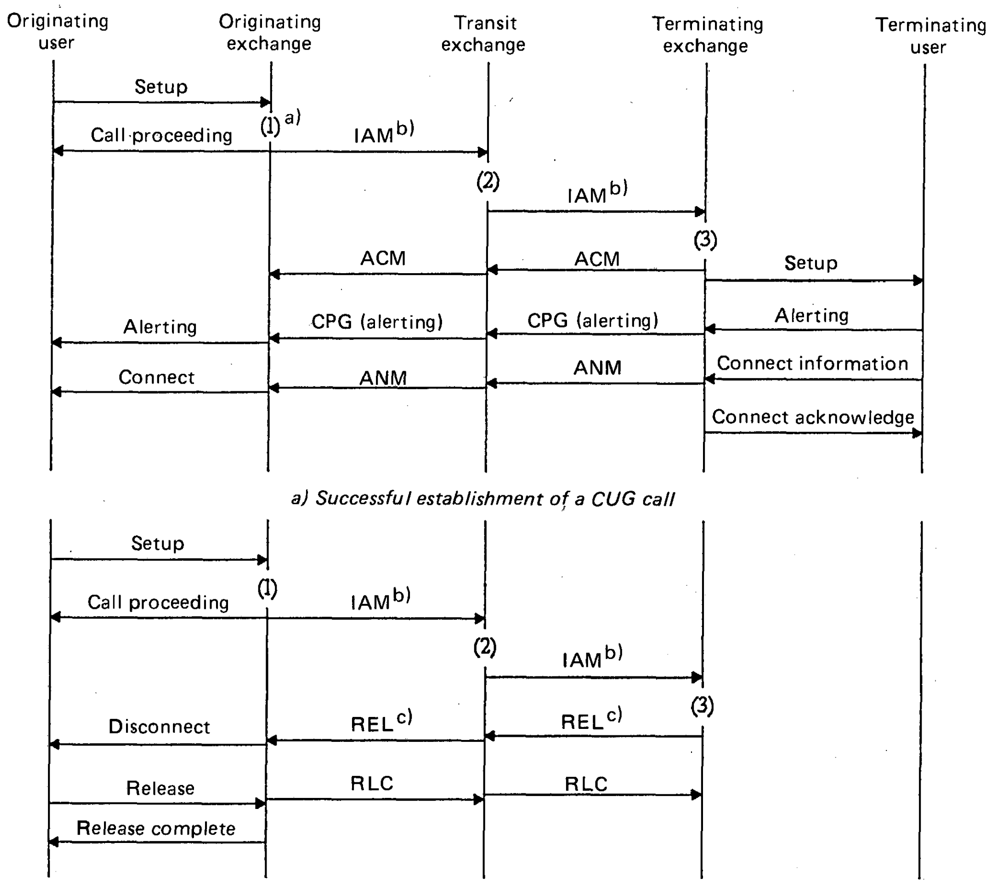
OA Outgoing access

ICB Incoming calls barred

Match The interlock code in the received IAM matches one of the CUGs to which the called user belongs.

No match The interlock code does not match any of the CUGs to which the called user belongs.

Note – As OA attribute of the called user is of no concern at the destination exchange, CUG+OA class is equivalent to CUG, and CUG/IA class is equivalent to CUG+IA in this table. Subscription of preferential CUG by the called user is also of no concern in this table.



b) Unsuccessful establishment of a CUG call

T1119340-88

OE	Originating exchange	IAM	Initial address message
TE	Transit exchange	CPG	Call progress
DE	Destination exchange	ANM	Answer message
		ACM	Address complete message

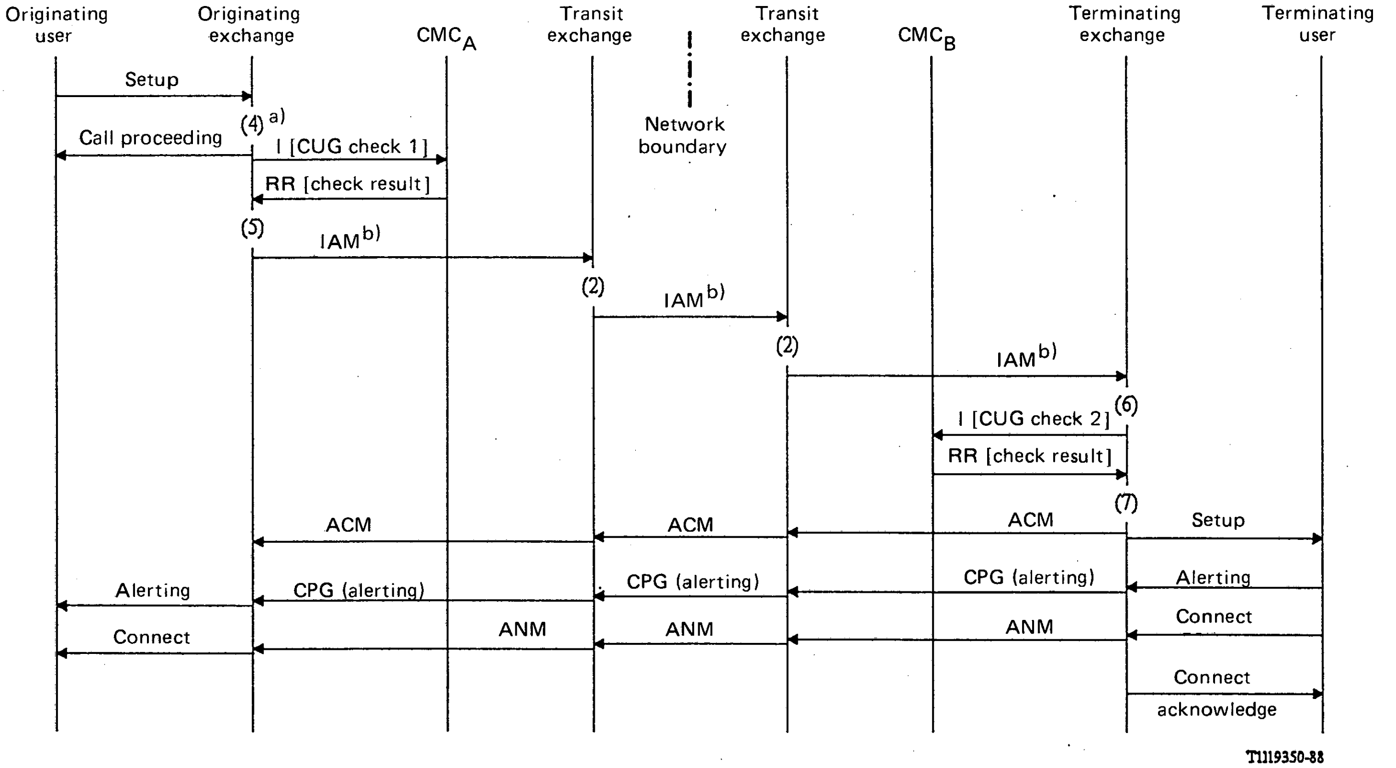
[a] ( ) indicates exchange functions. These are described below Fig. 3/Q.730.

[b] IAM contains the interlock code and CUG call indication, possibly with outgoing access.

[c] REL contains the cause parameter to indicate why the call is being released.

FIGURE 2/Q.730

Example message flow for a CUG call with decentralized administration



CMC CUG management center
I Invoke
RR Return result

a) ( ) indicates exchange functions. These are described below.

b) IAM contains the interlock code, CUG call indication possibly with outgoing access.

Description of exchange functions in Figures 2/Q.730 and 3/Q.730

(1) Validation check on whether the requested call is allowed to the calling user, based on the data stored at the originating exchange.

(2) In the case of an international gateway exchange, interlock code conversion if the national network is not using international interlock codes.

(3) Validation check on whether the requested call is allowed to the called user, based on the data stored at the destination exchange.

(4) Check if the calling user subscribes to the CUG service.

(5) Check of the result of the validation check performed in a CMC.

(6) Check if the called user subscribes to the CUG service.

(7) Check of the result of the validation check performed in a CMC.

FIGURE 3/Q.730

Example message flow for a CUG call with centralized administration of CUG data

3.4 *ASE for CUG service with centralized administration of CUG data*

3.4.1 *General*

The application service element (ASE) for CUG service with centralized administration of CUG data provides the procedures between the exchanges and the CUG management centers (CMC) for CUG validation check.

Two similar but different procedures are defined for CUG validation check. One is the procedure between the originating exchange of a CUG call and a CMC to check the qualification of the calling user to establish the present CUG call. The other is the procedure between the terminating exchange of a CUG call and a CMC to check the qualification of the called user to accept the present CUG call. One TCAP (Transaction Capabilities Application Part) operation is defined for each of these procedures.

3.4.2 *Procedures*

To check the qualification of the calling user the originating exchange initiates the transaction to the CMC by invocation of the CUG Check 1 operation with appropriate parameters. The CMC, in response to this invocation, terminates the transaction with the check result. The check result contains the interlock code and other parameters in case of successful check or an error cause in case of unsuccessful check. Figure 4/Q.730 shows the primitive flows between the ASE and the TCAP at the exchange and between the ASE and the TCAP at the CMC for this case. Table 3/Q.730 shows the result of the validation check which is performed by the CMC, according to various parameters, concerning the calling user.

To check the qualification of the called user, the terminating exchange initiates the transaction to the CMC by invocation of the CUG Check 2 operation with appropriate parameters. The CMC, in response to this invocation, terminates the transaction with the check result. The check result contains the index number for the called user and other parameters in case of successful check or an error cause in case of unsuccessful check. Figure 5/Q.730 shows the primitive flows between the ASE and the TCAP at the exchange and between the ASE and the TCAP at the CMC for this case. Table 4/Q.730 shows the result of the validation check which is performed by the CMC, according to various parameters, concerning the called user.

3.4.3 *Operations*

3.4.3.1 *Description of operations*

3.4.3.1.1 *CUG Check 1*

This operation is used between the originating exchange of a call and a dedicated point for CUG validation check of the calling user.

3.4.3.1.2 *CUG Check 2*

This operation is used between the terminating exchange of a call and a dedicated point for CUG validation check of the called user.

TABLE 3/Q.730

Validation check of CUG call concerning the calling user

Calling user class	Indication from calling user			
	CUG call with index	CUG + OA call with index	CUG + OA call without index	Non-CUG call
CUG with pref.	CUG call [a] [c] IC: specified CUG	CUG call [a] [c] IC: specified CUG	CUG call [a] IC: preferential CUG	CUG call IC: preferential CUG
CUG without pref.	CUG call [a] [c] IC: specified CUG	CUG call [a] [c] IC: specified CUG	Return Error cause #62	Return Error cause #62
CUG + OAI with pref.	CUG + OA [a] [c] IC: specified CUG	CUG + OA [a] [c] IC: specified CUG	CUG + OA [a] IC: preferential CUG	CUG + OA [b] IC: preferential CUG
CUG + OAI without pref.	CUG + OA [a] [c] IC: specified CUG	CUG + OA [b] [c] IC: specified CUG	Non-CUG call	Non-CUG call
CUG + OAE with pref.	CUG call [a] [c] IC: specified CUG	CUG + OA [b] [c] IC: specified CUG	CUG + OA [b] IC: preferential CUG	CUG call [b] IC: preferential CUG
CUG + OAE without pref.	CUG call [a] [c] IC: specified CUG	CUG + OA [b] [c] IC: specified CUG	Non-CUG call	Return Error cause #62
No CUG	Return Error cause #50	Return Error cause #50	Return Error cause #50	Non-CUG call

OAE Outgoing access, explicit request required

OAI Outgoing access, implicit outgoing access for all calls

IC Interlock code of the CUG selected

Note – As IA (incoming access) attribute of the calling user is of no concern for this validation check, CUG + IA class is equivalent to CUG, and CUG + OA/IA class is equivalent to CUG + OA in this table.

[a] In case of OCB (outgoing calls barred) within the CUG, Return Error with cause #53.

[b] In case of OCB within the CUG, the call is interpreted as a non-CUG call.

[c] In the case where the specified index does not match any of the registered indices, Return Error with cause #90.

TABLE 4/Q.730

Validation check of CUG call concerning the called user

CUG call indication in IAM	CUG match check	Class of called user				
		CUG		CUG + IA		No CUG
		No ICB	ICB	No ICB	ICB	
CUG with OA not allowed	Match	CUG call	Return Error cause #55	CUG call	Return Error cause #55	Return Error cause #88
	No match	Return Error cause #87		Return Error cause #87		
CUG with OA allowed	Match	CUG call	Return Error cause #55	CUG + OA call	Non-CUG call	Non-CUG call
	No match	Return Error cause #87		Non-CUG call		
Non-CUG	–	Return Error cause #87		Non-CUG call		Non-CUG call

IA Incoming access

OA Outgoing access

ICB Incoming calls barred

Match The interlock code in the received IAM matches one of the CUGs to which the called user belongs.

No match The interlock code does not match any of the CUGs to which called user belongs.

Note – OA attribute of the called user is of no concern at the destination exchange, the CUG + OA class is equivalent to CUG, and CUG + OA/IA class is equivalent to CUG + IA in this table. Subscription of preferential CUG by the called user is also of no concern in this table.

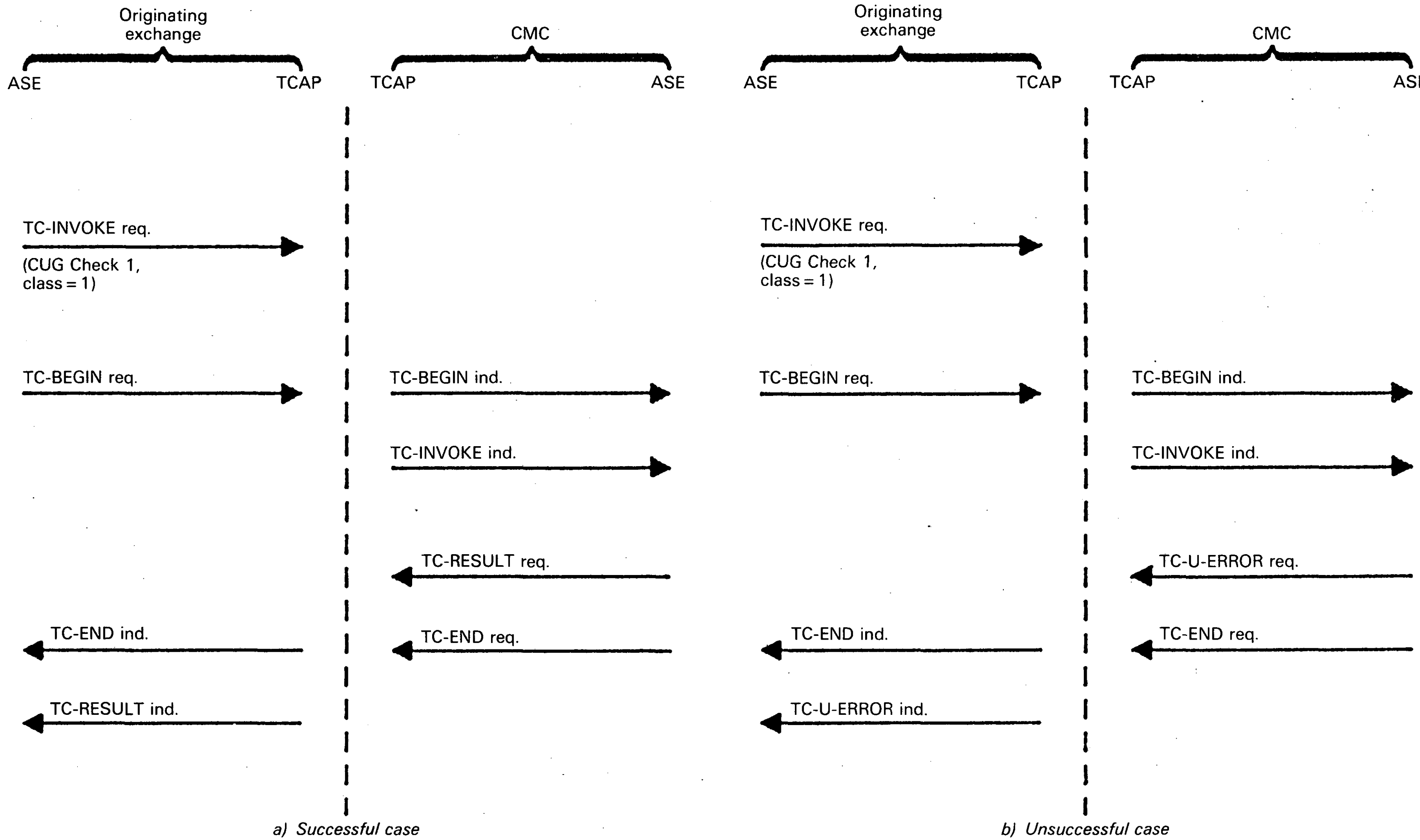


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FIGURE 4/Q.730

Primitive flows between ASE and TCAP for CUG Check 1

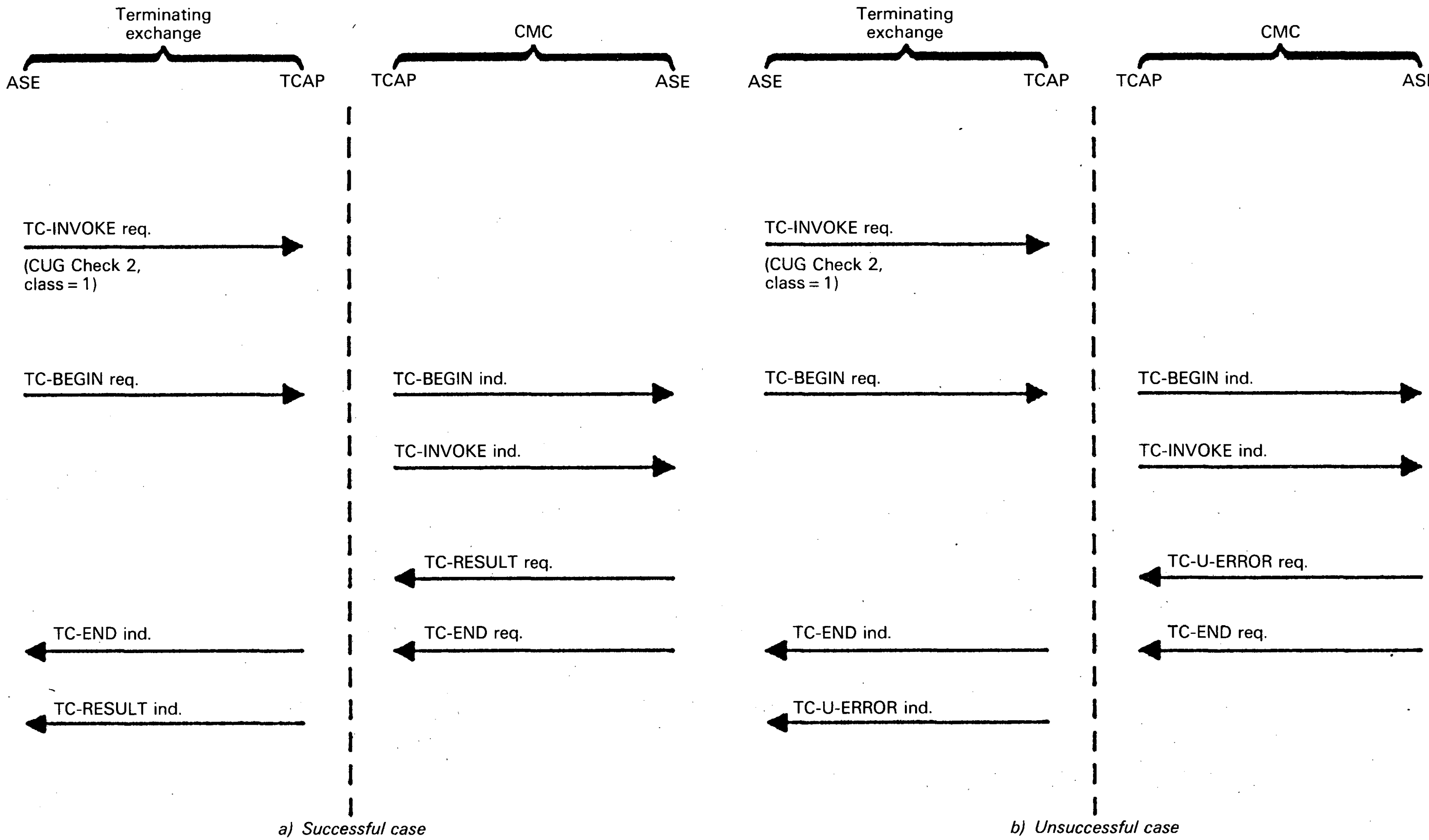


FIGURE 5/Q.730

Primitive flows between ASE and TCAP for CUG Check 2

3.4.3.2 *Parameters of operations and outcomes*

3.4.3.2.1 *CUG Check 1*

CUG Check 1	Timer = x seconds	Class = 1	Code = 00000001
Parameters with Invoke		Optional/ Mandatory	Reference (§)
CallingUserIndex CUGCallIndicator CallingPartyNumber		O M M	3.4.3.3.1 3.4.3.3.2 3.4.3.3.3
Parameters with Return Result			
CUGInterlockCode CUGCallIndicator		M M	3.4.3.3.5 3.4.3.3.2
Linked Operations			
Not applicable			
Errors			
UnsuccessfulCheck			3.4.3.3.7

```
CUGCheck1          OPERATION
     PARAMETER     SEQUENCE    { CallingUserIndex OPTIONAL, CUGCallIndicator,
                                 CallingPartyNumber }
     RESULT        SEQUENCE    { CUGInterlockCode CUGCallIndicator }
     ERRORS                    { UnsuccessfulCheck }
     ::= 1
```

3.4.3.2.2 *CUG Check 2*

CUG Check 2	Timer = x seconds	Class = 1	Code = 00000010
Parameters with Invoke		Optional/ Mandatory	Reference (§)
CUGInterlockCode CUGCallIndicator CalledPartyNumber		M M M	3.4.3.3.5 3.4.3.3.2 3.4.3.3.4
Parameters with Return Result			
CalledUserIndex CUGCallIndicator		O M	3.4.3.3.6 3.4.3.3.2
Linked Operations			
Not applicable			
Errors			
UnsuccessfulCheck			3.4.3.3.7

```
CUGCheck2          OPERATION
    PARAMETER      SEQUENCE     { CUGInterlockCode, CUGCallIndicator,
                                  CalledPartyNumber }
    RESULT         SEQUENCE     { CalledUserIndex OPTIONAL, CUGCallIndicator }
    ERRORS                      { UnsuccessfulCheck }
    ::= 2
```

3.4.3.3 *Parameter coding*

3.4.3.3.1 The CallingUserIndex is the local index at the calling user to identify a particular CUG he belongs to.

CallingUserIndex		Code = 10000001
Contents	Meaning	
IA5 Character String	One IA5 character represents one digit of the CUG index value	

```
CallingUserIndex ::=   [1] IMPLICIT LocalIndex
LocalIndex ::=         IA5 STRING
-- The maximum number of digits is four.
```

3.4.3.3.2 The CUGCallIndicator indicates whether the call is requested or designated as a CUG call and whether outgoing access is requested or allowed.

CUGCallIndicator		Code = 10000010
Contents	Meaning	
00000000	Non-CUG call	
00000001	Non-CUG call	
00000010	CUG call with outgoing access	
00000011	CUG call without outgoing access	

```
CUGCallIndicator ::=  [2] IMPLICIT CallIndicator
CallIndicator ::=     INTEGER {
                          NonCUGCall (0),
                          NonCUGCall(1),
                          outgoingAccessAllowedCUGCall (2),
                          outgoingAccessNotAllowedCUGCall (3) },
```

3.4.3.3.3 The CallingPartyNumber is the network (e.g. E.164) number of the calling party. It is expressed in the same manner as the ISUP Calling party number in § 3.8 of Recommendation Q.763. The code of this parameter is "10000011".

3.4.3.3.4 The CalledPartyNumber is the network (e.g. E.164) number of the called party. It is expressed in the same manner as the ISUP Called party number in § 3.7 of Recommendation Q.763. The code of this parameter is "10000100".

3.4.3.3.5 The CUGInterlockCode is the code to uniquely identify a CUG inside the network. It is expresed in the same manner as the ISUP CUG interlock code in § 3.13 of Recommendation Q.763. The code of this parameter is "10000101".

3.4.3.3.6 The CalledUserIndex is the local index at the called user to identify a particular CUG he belongs to. Refer to § 3.4.3.3.1. The code of this parameter is "10000110".

3.4.3.3.7 *Errors*

UnsuccessfulCheck	Code = 00000001
Parameters	
Cause	3.4.3.3.8

```
UnsuccessfulCheck     Error
      PARAMETERS{ Cause }
      ::= 1
```

3.4.3.3.8 The Cause indicates the reason why the CUG check is unsuccessful.

Cause		Code = 10000111
Contents binary (decimal)	Meaning	
00110010 (50)	Requested facility not subscribed	
00110101 (53)	Outgoing calls barred within CUG	
00110111 (55)	Incoming calls barred within CUG	
00111110 (62)	InconsistencyInDesignatedOutgoingAccessInformationAndSubscriberClass	
01011010 (90)	Non-existent CUG	
01010111 (87)	Called user not member of CUG	
01011000 (88)	Incompatible destination	
01101110 (110)	Inconsistency in data	

```
Cause ::=        [7] IMPLICIT CauseCode
CauseCode ::=    INTEGER {
                     requestedFacilityNotSubscribed(50),
                     outgoingCallsBarredWithinCUG(53),
                     incomingCallsBarredWithinCUG(55),
                     inconsistencyInDesignatedOutgoingAccessInformationAnd
                     SubscriberClass(62),
                     nonExistentCUG(90),
                     calledUserNotMemberofCUG(87),
                     incompatibleDestination(88),
                     inconsistencyInData(110) }
```

4 General description of the Calling Line Identity Presentation and Restriction service

Calling Line Identification Presentation (CLIP) is a supplementary service offered to the called party which provides the calling party's ISDN number, possibly with additional address information (i.e. sub-address), to the called party.

Calling Line Identification Restriction (CLIR) is a supplementary service offered to the calling party to restrict presentation of the calling party's ISDN number, possibly with additional address information (i.e. sub-address), to the called party.

The stage 1 definitions for the CLIP and CLIR services are given in the Recommendation I.254 and the stage 2 service definitions including network functions, are given in Recommendation Q.84. This stage 3 description of CLIP and CLIR use the ISDN User Part protocol as defined in Recommendations Q.761-764 and Q.766.

4.1 *Description of the Calling Line Identity Presentation (CLIP) service*

Calling Line Identity Presentation (CLIP) is a user facility that enables a user to be informed on incoming calls, of the address of the calling party. When provided the facility applies to all incoming calls except for when the calling party has the Calling Line Identity Restriction (CLIR) facility active [see § 4.2 below] or the complete number of the calling party is not available at the destination exchange.

The Calling Line Identity (CLI) is generally the ISDN number of the calling party (with possible additional address information, i.e. sub-address) which may be provided by the network or partly by the calling party.

In the case where a national network does not always provide the CLIP facility, the included CLI may be the known part of the ISDN number at the interworking point (e.g. Trunk Code).

In the case where a calling party is an ISPBX, the network may send the ISDN number of the PABX attendant operator or, if provided by the calling party, the DDI number of the extension as the CLI.

When the CLI is provided by the user or ISPBX it is verified or screened for validity by the network, i.e. the CLI provided by the user is within the known number range for that user.

i) If the user provided CLI is valid the Calling Number Parameter field contains the CLI in the Address Signal with the Screening indicator set to "user provided verified and passed".

ii) If the user provided CLI is not valid or screened the originating exchange defaults to the network provided CLI for the Address Signals of the Calling Party Number parameter field with the Screening indicator set to "network provided".

When the CLI is provided by the network the originating exchange includes the stored CLI set against the calling party and sets the screening indicator to "network provided".

The CLI sent to the called user should contain all the necessary digits to enable a call to be established in the reverse direction.

Note – This may not always be possible if, for example, the DDI extension of an ISPBX is not provided by the calling party.

Information indicating that a subscriber has the user access to the CLIP facility is available in the exchange to which the subscriber is connected.

4.1.1 *Call set-up procedure*

The call control procedure and the information included in Call Control Messages vary depending on whether the CLI is included in the Initial Address Message and also whether the calling party has indicated a request to use the CLIR facility for this call.

Two different call control procedures can be used to provide the CLIP facility. Both procedures are specified for international use, however, the first method is to be preferred.

4.1.1.1 *The Calling Line Identity is included in the Initial Address Message*

When the CLI is available for insertion in the IAM the systematic inclusion of this parameter, in the IAM, is recommended. However, it is realized that under certain interworking conditions the CLI may only be available subsequent to the transmission of the IAM.

In this situation, to avoid unnecessary unsuccessful requests for the CLI, the following procedures are recommended:

a) If the CLI cannot be included in the IAM (for any reason) but is available and may be requested with a good chance of receiving it, then the optional field "calling party number parameter" *should not* be included in the IAM.

b) If the CLI cannot be transferred (because it is not allowed to be passed or because the national network cannot provide the number), then the optional field "calling party number parameter" *should* be included in the IAM with the indication "presentation restricted" or "address not available" set as appropriate in the Address Presentation Restricted indicator.

The CLI is sent to the called party in accordance with the user-network interface protocol.

For calls between networks (e.g. an outgoing ISC as referred to in b) above) the outgoing gateway exchange may remove any CLI digits from the IAM and indicate in the calling party number parameter that presentation is restricted.

Interworking exchanges may generate only part of the CLI for inclusion in the IAM (e.g. trunk code). This will be indicated in the number incomplete indicator in the Calling Party Number Parameter field.

In the case where the destination exchange receives only part of the CLI, (it is assumed to be the most significant part), the CLI is forwarded to the called party with the appropriate indications set.

4.1.1.2 *The Calling Line Identity is not included in the Initial Address Message*

In the case where the CLIP facility is applied, and the IAM has indicated that the CLI may be available, an Information Request Message is sent towards the originating exchange with the Information Request Indicator Parameter field bit set to the calling party address requested.

When receiving the request for Calling Party Address and the CLI is available, the originating/interworking exchange sends an information message containing the Calling Party Number Parameter field with the appropriate indications and CLI included.

In the case where the identity of the calling party is not available or is not allowed to be forwarded outside the network, the response will be an Information message including the Information Indicators Parameter Field indicating the CLI is not available.

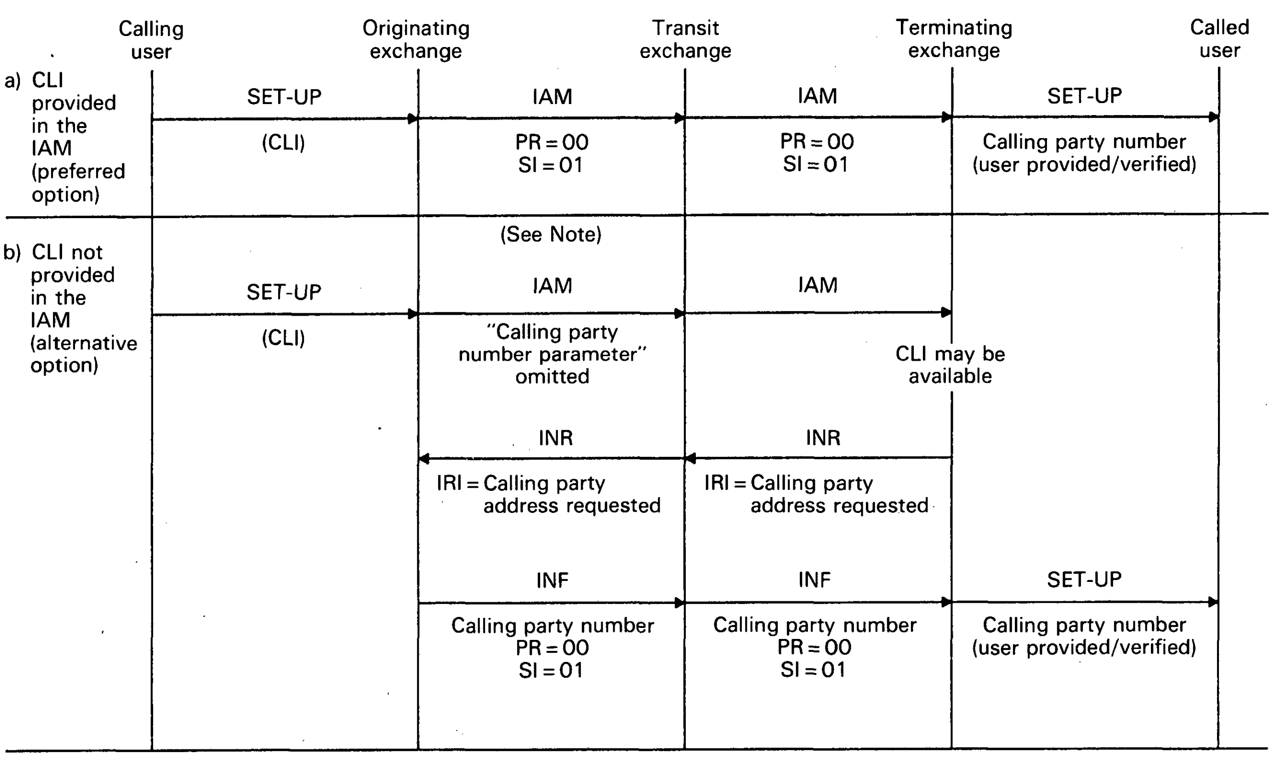
In the case where the destination exchange receives only part of the CLI, (it is assumed to be the most significant part), the CLI is forwarded to the called party with the appropriate indications set.

The CLI is sent to the called party in accordance with the user-network interface protocol.

In the case where the destination exchange receives the "presentation restricted" or an "address not available", in the Presentation Restriction indicator of the Information message, the calling party address is not forwarded to the called party.

4.1.1.3 *Message Sequence diagrams for CLIP*

Figures 6/Q.730 and 7/Q.730 describe the message flows for CLIP.

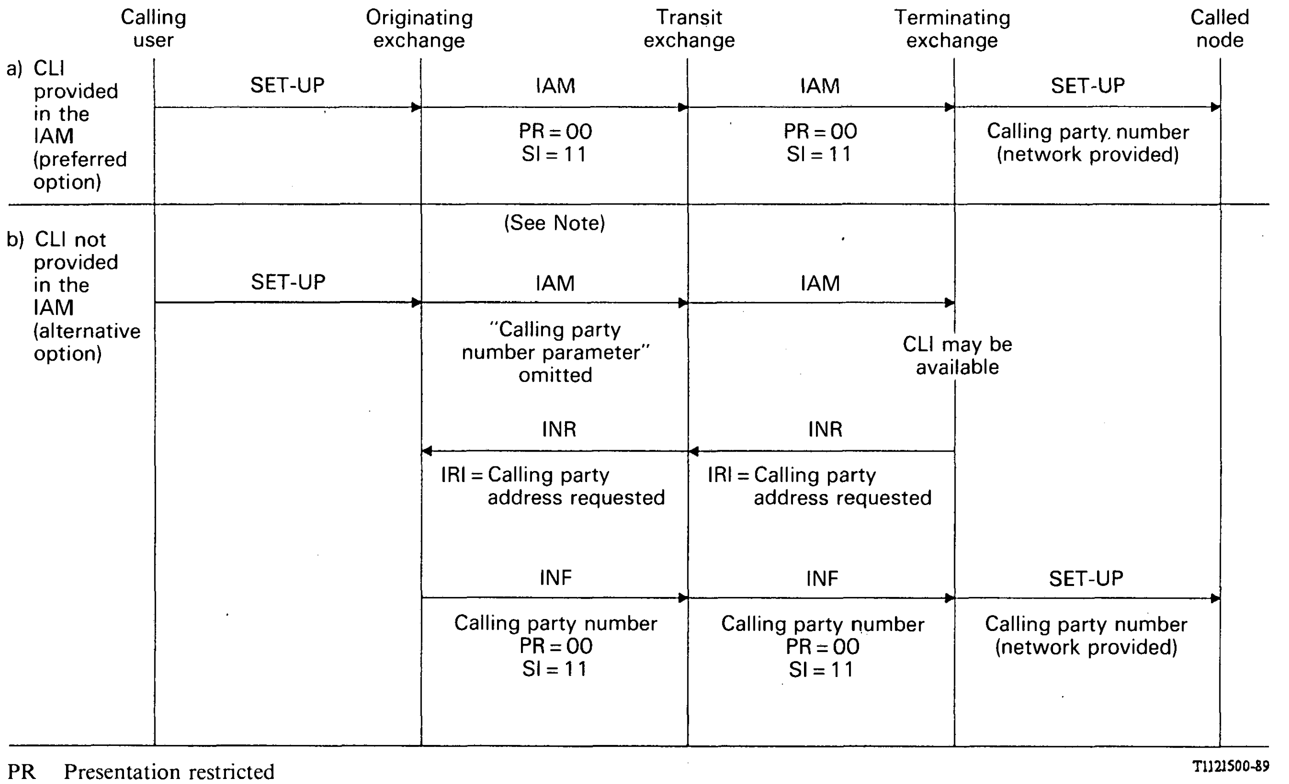


PR Presentation restricted
SI Screening indicator
IRI Information required indicator

Note – If the CLI is definitely not available the calling party number parameter will be included in the IAM with the PR = 10, "not available".

FIGURE 6/Q.730

Calling Line Identification Presentation
Presentation allowed – CLI provided by the calling user



PR Presentation restricted
SI Screening indicator
IRI Information required indicator

Note – If the CLI is definitely not available the calling party number parameter will be included in the IAM with the PR = 10, "not available".

FIGURE 7/Q.730

Calling Line Identification Presentation
Presentation allowed – CLI provided by the originating node

4.2 *Description of the Calling Line Identity Restriction (CLIR) service*

Calling Line Identification Restriction (CLIR) is a user facility offered to restrict the presentation of the Calling Line Identity to the Called Party.

The Calling Line Identity (CLI) is the ISDN number of the calling party possibly with additional address information.

Information that a subscriber has the Calling Line Identity Restriction facility is available at the exchange to which the subscriber is connected.

4.2.1 *Normal Case*

When CLIR is applicable the originating exchange will provide the destination node with a notification that the Calling Line Identity is not allowed to be presented at the called party. In this case the Calling Line Identity will be marked as presentation restricted, in the Address Presentation Restricted Indicator, when it is passed across the network, in either an Initial Address Message or Information Message. In the case of CLIR the Calling Line Identity will not be included in the call offering to the called party's installation.

4.2.2 *Abnormal Case*

4.2.2.1 *Override Category within an ISDN*

As a national option the terminating exchange can override the presentation restriction indication and the CLI presented at the called subscriber for specific called party's categories (e.g. Police).

4.2.2.2 *Override Category between ISDN's*

When a call originates in one ISDN network and terminates in another ISDN network and CLIR is applicable, the rules and regulations of the destination (host) network should apply.

For example, if an override category is not available in the originating network but is available in the destination network. The destination network can still override the presentation restriction whenever CLI is available at this network.

As a national option the originating network can restrict the CLI to the destination network if the CLIR is applicable.

4.2.2.3 *Interworking with non-ISDN or via non-ISDN*

On calls to or via non-ISDN networks, it cannot be guaranteed that the CLIR indication will be carried to the destination network.

As a national option the originating network can restrict the CLI to the destination network if CLIR is applicable.

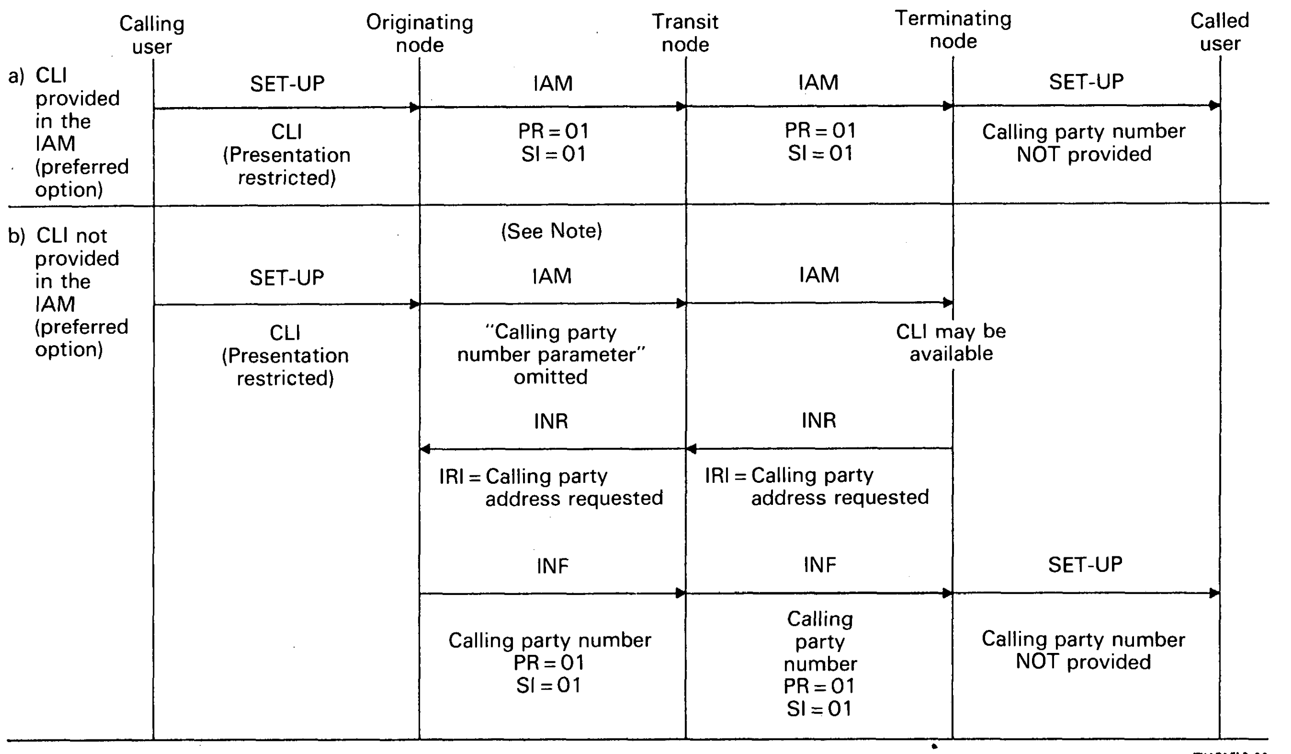
If the destination network receives a Calling Line Identity without any indication of presentation allowed or restricted, the destination network will act according to its rules and regulations.

4.2.2.4 *Restriction of Additional Address Information*

Any additional address information provided by the calling party, i.e. sub-address, will also be subject to the CLIR supplementary service as indicated in the Presentation Restriction Indicator in the Calling Party Number Parameter field.

4.2.2.5 *Message Sequence diagrams for CLIR*

Figure 8/Q.730 describes the message flow for CLIR.



PR Presentation restricted SI Screening indicator IRI Information required indicator

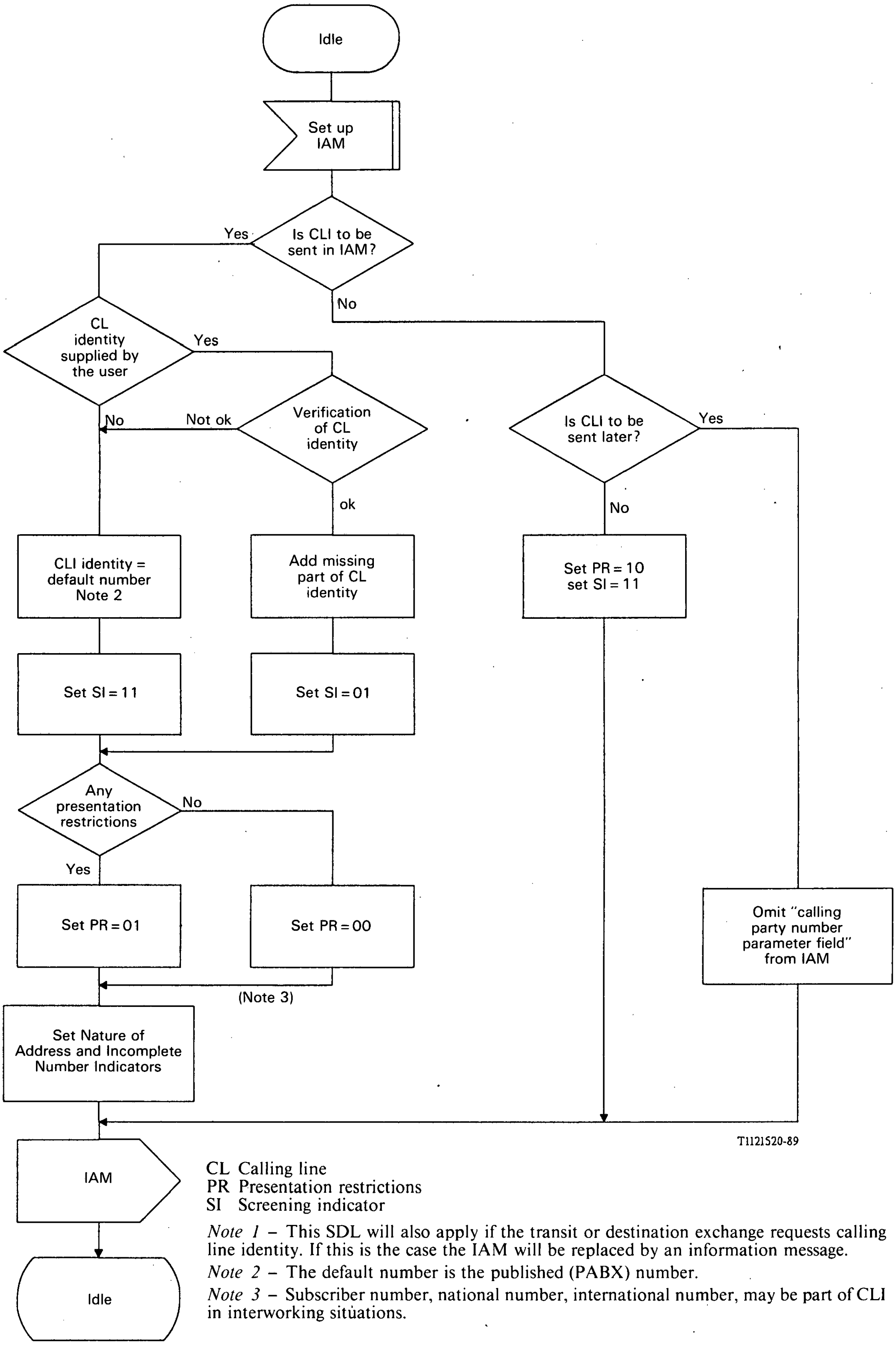
Note – If the CLI is definitely not available the calling party number parameter will be included in the IAM with the PR = 10, "not available".

FIGURE 8/Q.730

Calling Line Identification Restriction
Presentation not allowed – CLI provided by the calling user

4.3 *Nodal signalling function SDLs for CLIP and CLIR*

Nodal signalling function procedures for CLIP and CLIR are described in Figures 9/Q.730 to 13/Q.730.



CL Calling line
PR Presentation restrictions
SI Screening indicator

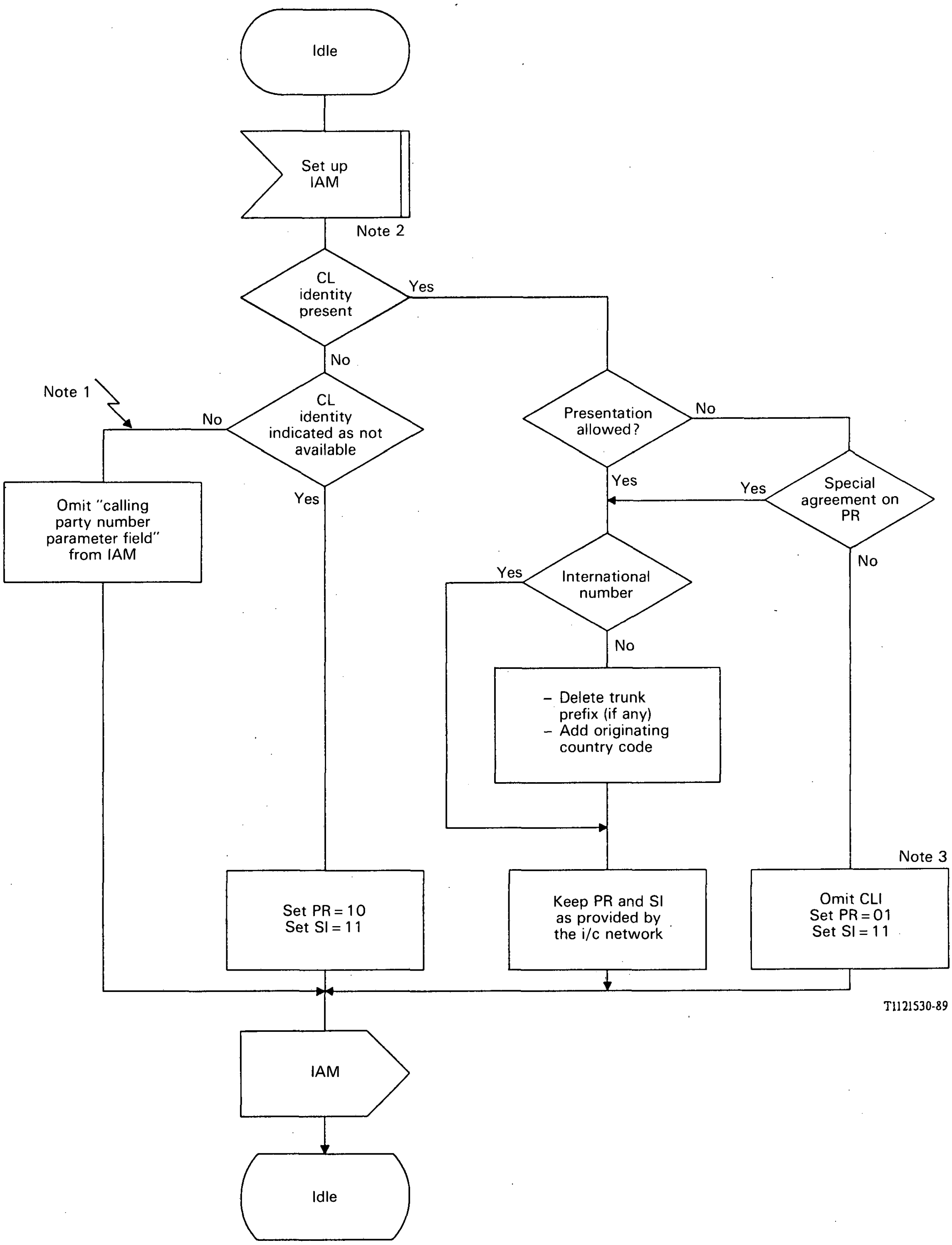
Note 1 – This SDL will also apply if the transit or destination exchange requests calling line identity. If this is the case the IAM will be replaced by an information message.

Note 2 – The default number is the published (PABX) number.

Note 3 – Subscriber number, national number, international number, may be part of CLI in interworking situations.

FIGURE 9/Q.730

Nodal signalling functions for CLIP and CLIR
Originating local exchange



CL Calling line
PR Presentation restrictions
SI Screening indicator

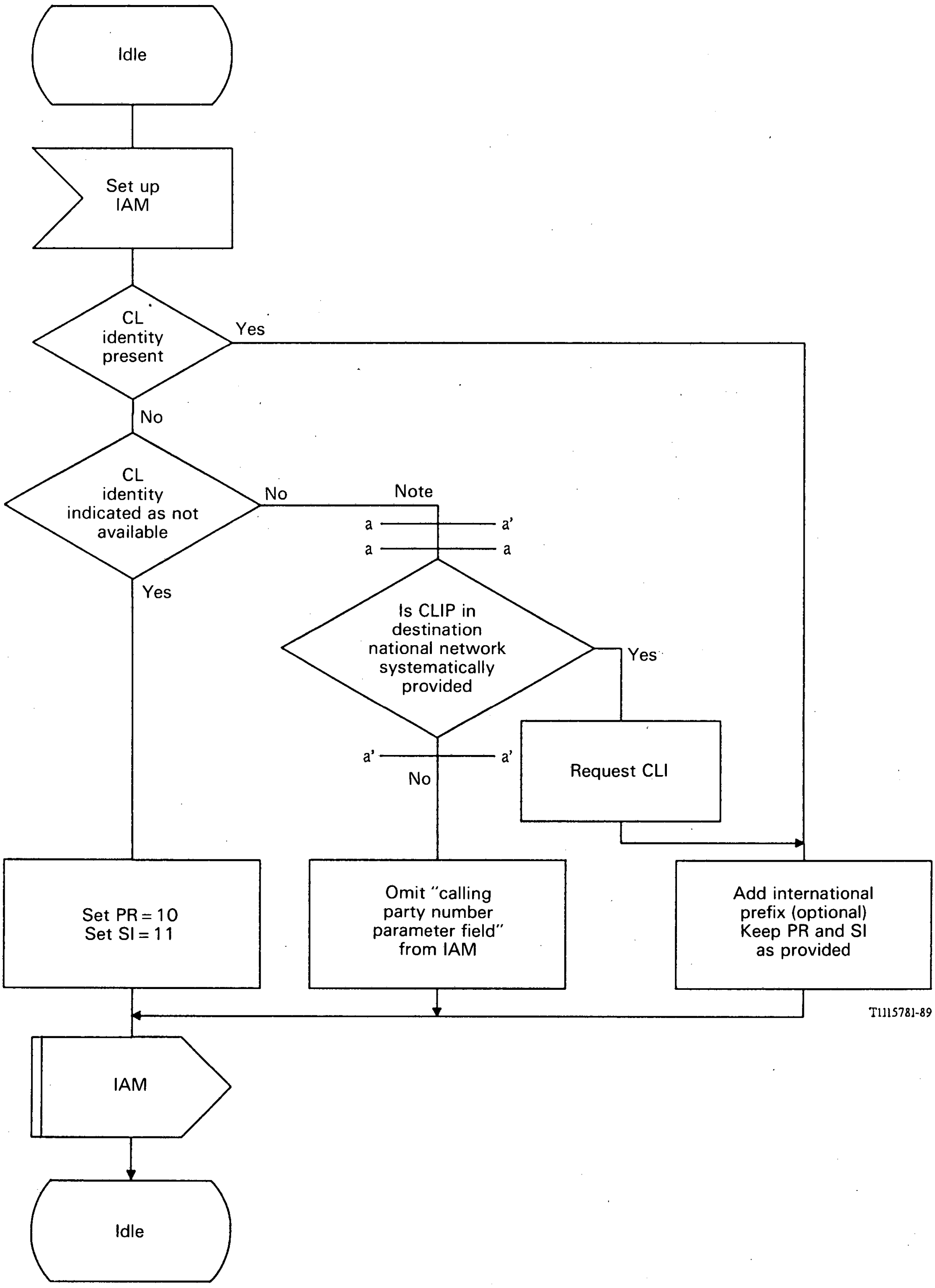
Note 1 – The calling party number parameter is not included in the incoming IAM.

Note 2 – This flow assumes that there is no restriction on passing non-restricted CLI's across the international boundary. If no such agreement exists then any CLI in the incoming IAM will be removed and the PR indicator set to 10, "CLI not available".

Note 3 – If the CLI is restricted and the digits are omitted from the outgoing IAM any subsequent backward requests for CLI shall be rejected by an information message indicating CLI is not available.

FIGURE 10/Q.730

Nodal signalling function for CLIP and CLIR
Outgoing international gateway

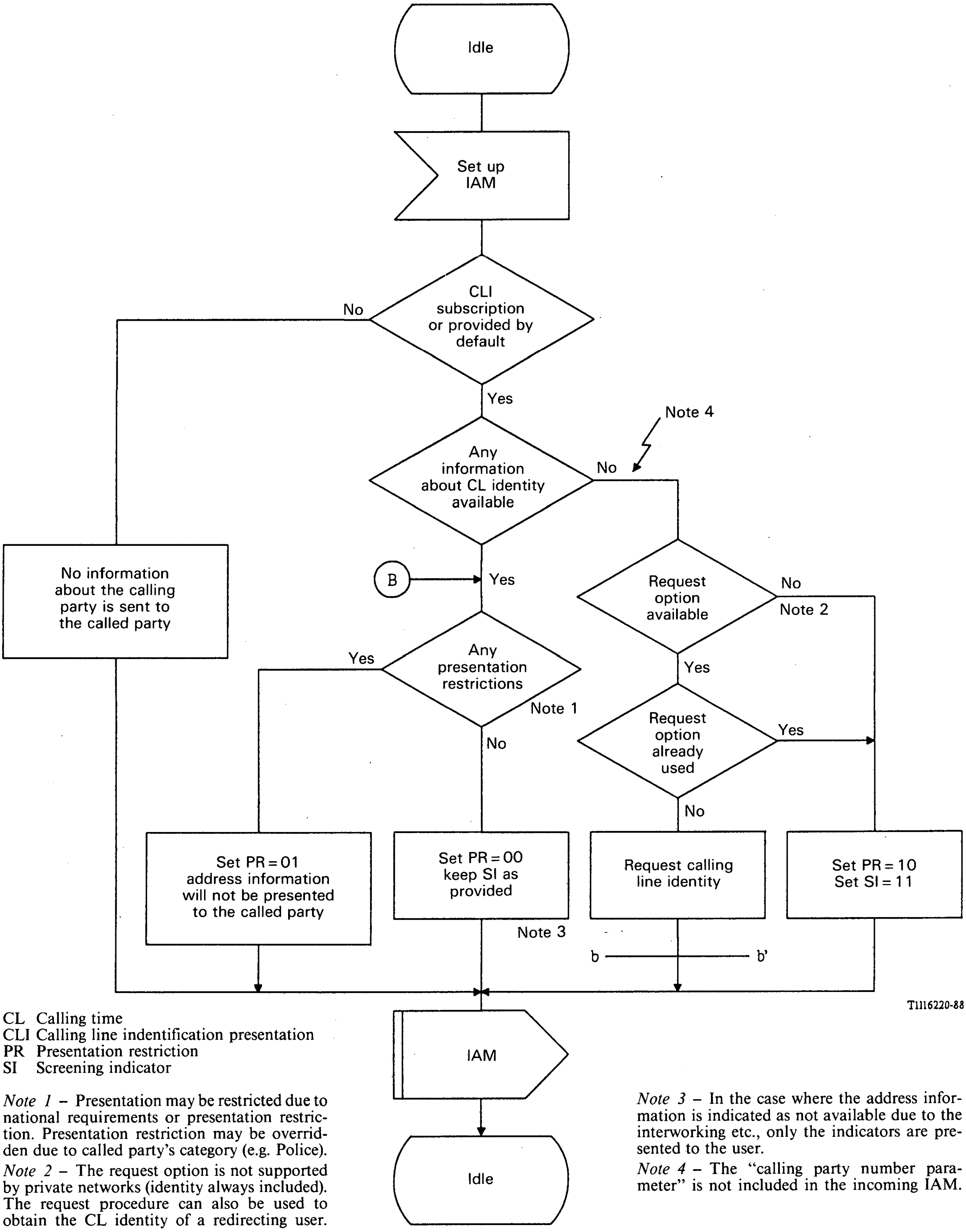


CL Calling line
PR Presentation restriction
SI Screening indicator

Note – The "calling party number parameter" is not included in the incoming IAM.

FIGURE 11/Q.730

Nodal signalling function for CLIP and CLIR
Destination international gateway exchange



CL Calling time
CLI Calling line indentification presentation
PR Presentation restriction
SI Screening indicator

Note 1 – Presentation may be restricted due to national requirements or presentation restriction. Presentation restriction may be overridden due to called party's category (e.g. Police).

Note 2 – The request option is not supported by private networks (identity always included). The request procedure can also be used to obtain the CL identity of a redirecting user.

Note 3 – In the case where the address information is indicated as not available due to the interworking etc., only the indicators are presented to the user.

Note 4 – The "calling party number parameter" is not included in the incoming IAM.

FIGURE 12/Q.730

Nodal signalling function for CLIP and CLIR destination local exchange

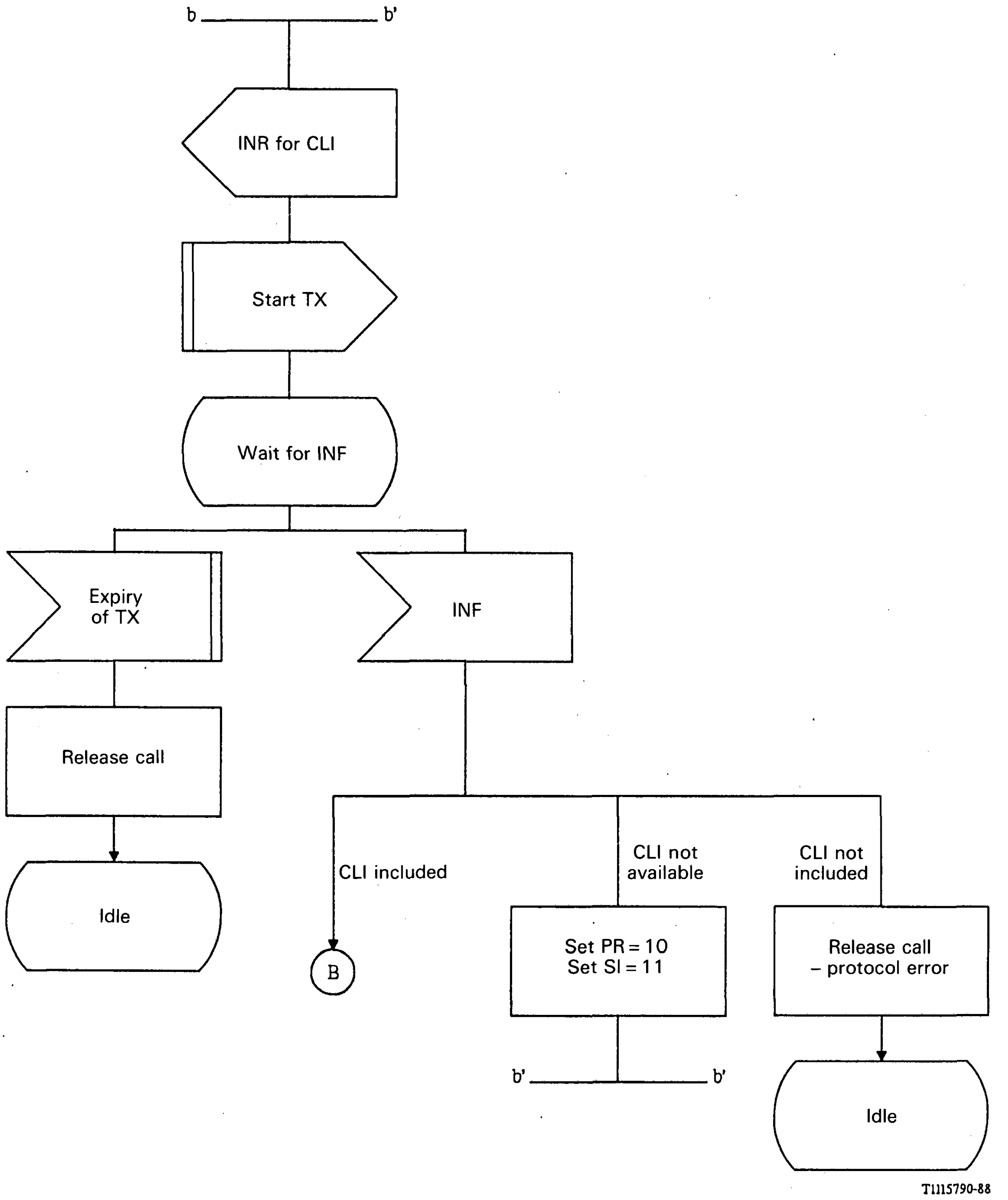


FIGURE 13/Q.730

Extension to nodal signalling function for CLIP and CLIR
Destination local exchange

4.4 *Interaction of CLIP with other supplementary services*

4.4.1 *Calling Line Identification Restriction*

The calling line identification will not be present if the calling user has an arrangement to inhibit the presentation of his number to the called party.

4.4.2 *Call Forwarding*

If the call has been redirected the CLI presented to the user will be the originating CLI.

4.4.3 *Call Waiting*

No interaction.

4.4.4 *Closed User Group*

No interaction.

4.4.5 *Direct Dialling In*

No interaction.

4.4.6 *User to User Information*

No interaction.

4.5 *Interaction of CLIR with other supplementary services*

4.5.1 *Calling Line Identification Presentation*

Calling Line Identification Restriction will take precedence over Calling Line Identification Presentation.

The only occasion when a user subscribing to Calling Line Identification Presentation can take precedence over Calling Line Identification Restriction is when the user has override category. This is a national option.

4.5.2 *Call Forwarding*

If the call has been re-directed the CLI presented to the user will be the originating CLI. When Calling Line Identification Restriction is applicable and activated, the calling party's ISDN number will not be presented to the "forwarded to" user unless this user has an override category. The latter is a national option.

4.5.3 *Call Waiting*

When Calling Line Identification Restriction is applicable and activated, no number will be presented to a called user subscribing to Call Waiting.

4.5.4 *Closed User Group*

It is an option to allow invocation of Calling Line Identification Restriction in connection with a CUG call.

4.5.5 *Direct Dailling In*

No interaction.

4.5.6 *User to User Information*

No interaction.

5 Direct Dialling In (DDI)

5.1 *Definitions*

Direct Dialling In (DDI) enables a user to call directly another user on a PABX or other private system without attendant intervention, the DDI digit(s) being the least significant digit(s) of the called ISDN number.

The stage 1 definition of DDI is to be found in Recommendation I.251, § A. The stage 2 description is included in Recommendation Q.81, § 1. This stage 3 description of DDI compliments the ISDN User Part protocol as defined in Recommendations Q.761-Q.764 and Q.766.

5.2 *Procedures*

The procedures to set up a call are in general the same as the basic procedures. A distinction is made whether DDI is applied to an analogue or an ISDN PABX and whether the destination local exchange is aware of the number of DDI digits required by the called PABX.

Besides sending the Address Complete Message and possibly Call Progress Message(s) the subsequent messages will be the same as for a normal call without DDI.

5.2.1 *Analogue PABX*

An Address Complete Message is sent as soon as the destination local exchange has received the complete called party number and has selected a free circuit to the PABX. The Called Line Status is set to "no indication".

If the destination local exchange has no knowledge about the number of DDI digits required to set up the call it selects a free circuit, sends the received DDI digits to the PABX and returns an Address Complete Message as soon as it has received a signal to that effect from the PABX. The Called Line Status is set to either "no indication" or "subscriber free" according to the signal received from the PABX.

5.2.2 *ISDN PABX*

An Address Complete Message is sent as soon as the destination local exchange has received the complete called party number with the Called Line Status set to "no indication".

If the destination local exchange has no knowledge about the number of DDI digits required to set up the call it sends an Address Complete Message as soon as it has received the relevant information (Call Proceeding) from the PABX. The Called Line Status is set to "no indication".

On receipt of an "alerting" indication from the PABX the destination local exchange sends a Call Progress Message with the Called Line Status set to "subscriber free".

If tones and/or announcements are provided from the destination local exchange the transmission path is through connected on receipt of the relevant information (Connect) from the PABX before sending the Answer Message to the preceding exchange. If tones and/or announcements are provided from the PABX the destination local exchange connects the backward path on receipt of an indication to that effect from the PABX and sends a Call Progress Message to the preceding exchange. The transmission path is fully through connected on receipt of the relevant information (Connect) from the PABX.

5.3 *Interactions with sub-addressing*

The use of DDI has no impact on the use of sub-addressing and vice versa.

6 **Call Forwarding services**

6.1 *General description of Call Forwarding services*

The Call Forwarding services involve the redirection of a call originally intended for one destination, towards another destination. The stage 1 definitions for the Call Forwarding services are given in Recommendation I.252 and the stage 2 descriptions are contained in Recommendation Q.82, § 2.

This section gives the ISDN User Part procedures to support the Call Forwarding Unconditional, Call Forwarding Busy, and Call Forwarding No Reply services. The functional description, formats and codes and general procedures for the ISDN User Part are contained in Recommendations Q.761-764 and Q.766. This section does not cover the optional validation procedure of Recommendation I.252. One possible method of performing this validation is to use a courtesy call at call forwarding activation time.

6.2 *Definition of Call Forwarding services*

The **Call Forwarding Unconditional service** permits a served user to have the network send all incoming calls, or just those associated with a specified basic service, addressed to the served user's ISDN number to another Number. This forwarding occurs regardless of the condition of the termination (busy or idle) and without the subscriber being given the opportunity to answer the call.

The **Call Forwarding Busy service** permits a served user to have the network send all incoming calls, or just those associated with a specified basic service, addressed to the served user's ISDN number, to another Number if the served user is in the busy state (user busy, either Network Determined User Busy (NDUB) or User Determined User Busy (UDUB). Recommendation I.252 contains the definitions for busy in an ISDN environment (NDUB occurs when both B-channels are busy for example).

The **Call Forwarding No Reply service** permits a served user to have the network send all incoming calls, or just those associated with a specified bearer service, addressed to the served user's ISDN number to another Number if the served user does not respond to the alerting within a specified time period.

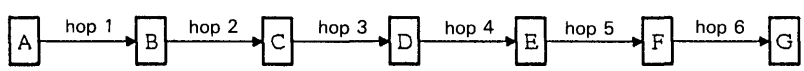
A terminating exchange that determines that Call Forwarding may occur will not discard the setup information until the exchange determines that Call Forwarding will not occur in this particular instance.

6.3 *Procedures for Call Forwarding*

The following three sections detail the ISDN-User Part procedures associated with the Call Forwarding services. The first section gives a high level view of ISDN User Part Call Forwarding procedures. The section consists of a figure that demonstrates the parameters and parameter values that occur in an Initial Address Message as a call undergoes a series of call forwardings. The second section gives the procedures for an exchange that determines that a call it has received should be forwarded. The third section gives the procedures for notification of the calling user.

6.3.1 *Call Forwarding related parameters in the Initial Address Message during Multiple Forwardings*

A originally calls B



Information carried in the Initial Address Message

	hop 1	hop 2	hop 3	hop 4	hop 5	hop 6
NUMBER INFORMATION						
Called party number	B	C	D	E	F	G
Redirecting number			C	D	E	F
Original called number		B	B	B	B	B
REDIRECTION INFORMATION						
Redirection counter		1	2	3	4	5
Redirecting indicator		V	V	V	V	V
Redirecting reason		W	W	W	W	W
Original redirection reason		W	W	W	W	W

T1121540-89

V : Value (Call forwarded) or (call forwarded, all redirection information presentation restricted) or (call forwarded, redirection number presentation restricted.)

W : Value (Unknown/not available) or (user busy) or (no reply) or (unconditional.)

FIGURE 14/Q.730

Parameter information for multiple redirection

6.3.2 *Procedures for an exchange that determines that a call it has received should be forwarded*

6.3.2.1 *General overview*

When an exchange determines that it must forward a call, it first checks to see if forwarding the call would result in the call exceeding the number of forwardings allowed within the network. The second action that needs to be undertaken, given that the limit was not exceeded, is the setting of the parameters that would be used in an Initial Address Message for the forwarded call. Even if the forwarding is intra-exchange this parameter information is set and retained. The reason for the retention is that, if subsequent forwarding occurs, the information is required to guarantee that the forwarding completes correctly. Finally the exchange attempts to set up the forwarded call. Any parameters received in the Initial Address Message not associated with forwarding (e.g., Calling Number, Higher Layer Compatibility etc.) are included unchanged in the Initial Address Message used to set up the forwarded call.

6.3.2.2 *Checking the forwarding limit*

If the call has already undergone forwarding, the redirection counter is examined to see if another forwarding would take the counter above the network specified limit. If it would, but the reason for the forwarding is Call Forwarding No Reply, the call should be left in its current state with the calling party continuing to receive ringing (the call is not cleared as the calling user would get a confusing sequence of tones and announcements e.g. ringing to network busy). In all other cases the call is cleared. The cause value used in the Release message depends upon which of the Call Forwarding services it is that would take the call over the limit. The mapping is as follows:

a) Call Forwarding Busy, the cause value "user busy" is used;

b) Call Forwarding No Reply, the cause value "no answer from user" is used;

c) Call Forwarding Unconditional, the cause value "no user responding" is used.

6.3.2.3 *Setting the parameters associated with call forwarding*

The parameters to be set depend upon the number of forwardings that the call has undergone. The following three sections give the procedures for the case where this is the first forwarding, the second forwarding and the third or greater forwarding that the call has undergone.

6.3.2.3.1 *This is the first forwarding that the call has undergone*

There are three parameters to set: the redirection information, the called party number and the original called number. Their values are set as follows:

1) Redirection information. The redirection counter is one. The redirecting reason. and redirecting indicator are set according to the forwarding conditions.

2) Original called number. This is equal to the first number that was called.

3) Called party number. This is equal to the number that the call is to be forwarded to.

6.3.2.3.2 *This is the second forwarding that the call has undergone*

There are three parameters to set: the redirection information, the called party number, and the redirecting number. Their values are set as follows:

1) Redirection information. The redirection counter is two. The redirecting reason and redirecting indicators are set according to the forwarding conditions.

2) Redirecting number. This is equal to the number that is doing the redirecting.

3) Called number. This is equal to the number that the call is to be forwarded to.

6.3.2.3.3 *This is the third or greater forwarding that the call has undergone*

There are three parameters that must be set: the redirection information, the called party number and the redirecting number. Their values are set as follows:

1) Redirection information. The redirection counter is incremented. The redirecting reason and redirecting indicators are set according to the forwarding conditions.

2) Redirecting number. This is equal to the number that is doing the redirecting.

3) Called number. This is equal to the number that the call is to be forwarded to.

6.3.2.4 *Forwarding procedures at the forwarding exchange*

The exchange continues based on the service that is causing the forwarding. The procedures to be followed if the cause of the forwarding was either Busy (Network Determined) or Unconditional are given below. These are followed by the procedures for No Reply. Lastly the procedures for Busy (User Determined) are given.

6.3.2.4.1 *Call Forwarding Unconditional or Busy (Network Determined)*

The exchange continues in the following fashion:

1) If the number that the call is to be forwarded to resides at another exchange, an Initial Address Message is sent to continue the call on to that exchange. The incoming trunk or line should be connected to the chosen outgoing trunk immediately. The Initial Address Message includes the parameter information as shown in § 6.3.1.
2) If the number resides in the same exchange, the exchange tries to set up a call to that number. If the attempt is successful and neither Call Forwarding Busy or Call Forwarding Unconditional occurs, the incoming line or trunk should be connected to the destination line. If Call Forwarding Busy or Call Forwarding Unconditional occurs when the attempt is made, the Call Forwarding procedures should be re-entered.

6.3.2.4.2 *Call Forwarding No Reply*

The exchange continues in the following fashion:

1) If the number that the call is to be forwarded to resides at another exchange, an Initial Address Message is sent to continue the call on to that exchange. The incoming trunk or line is not connected to the chosen outgoing trunk yet as it could result in confusing sequences of in band tones or announcements (e.g., ringing going to busy). The Initial Address Message includes the parameter information as shown in § 6.3.1. If the exchange receives an alerting indication it should connect the incoming trunk or line to the outgoing trunk, in at least the backward direction. If the exchange receives an answer indication it should connect in both directions. If the exchange receives a release indication – called party busy for instance, the current connections should simply be left intact, until timer expiry or calling user disconnect.
2) If the original called user answers prior to receipt of alerting indication from the forwarded-to exchange, this user is awarded the call and the connection toward the forwarded-to exchange is released.
3) If the number resides in the same exchange, the exchange tries to set up a call to that number. If the attempt is successful and neither Call Fowarding Busy or Call Forwarding Unconditional occurs, the incoming line or trunk is connected to the destination line. If Call Forwarding Busy or Call Forwarding Unconditional occurs when the attempt is made, the Call Forwarding procedures should be re-entered. If the exchange cannot complete the call (e.g., destination is busy and No Call Forwarding on Busy active), the current connections are left intact.

6.3.2.4.3 *Call Forwarding Busy (User Determined)*

The exchange continues in the following fashion:

1) An Address Complete Message with no indication of the called party's status in the backward call indicators parameter should be returned to the calling party's exchange.
2) If the number that the call is to be forwarded to resides at another exchange, an Initial Address Message is sent to continue the call on to that exchange. The Initial Address Message includes the parameter information as shown in § 6.3.1. If the exchange receives an alerting indication it should connect the incoming trunk or line to the outgoing trunk. If the exchange receives a release indication – called party busy for instance, the call should be released with the cause value "user busy".
3) If the number resides in the same exchange, the exchange tries to set up a call to that number. If the attempt is successful and neither Call Forwarding Busy or Call Forwarding Unconditional occcurs, the incoming line or trunk is connected to the destination line. If call Forwarding Busy or Call Forwarding Unconditional occurs when the attempt is made, the Call Forwarding procedures should be re-entered. If the exchange cannot complete the call (e.g., destination is busy and no Call Forwarding on Busy active) the call should be released with the cause value "user busy".

6.3.3 *Notification procedures for the forwarding exchange*

An exchange forwarding a call sends a call progress message in the backward direction if the forwarding (served) user does not subscribe to notification (to the calling party) of the forwarded-to number. Procedures for users subscribing to the notification of forwarded-to number are for further study.

6.3.3.1 *Forwarding user subscribes to redirection information presentation restricted*

The call progress message contains an event indicator of the "Event Information Presentation Restricted Type". The value is set according to the redirecting reason.

6.3.3.2 *Forwarding user does not subscribe to redirection information presentation restricted*

The call progress message contains an event indicator that is not of the "Event Information Presentation Restricted" type. The value is set according to the redirecting reason.

6.3.3.3 *Nofitification for Call Forwarding No Reply*

If Call Forwarding No Reply is in effect, and the exchange alerts the called party, the Address Complete message sent including the Backward and Optional Backward Call indicators set to the appropriate values. In this case, the Call Progress message is delayed until receipt of an alerting indication from the forwarded-to exchange.

6.4 *Interactions with other Supplementary Services where interaction has ISDN User Part impact*

6.4.1 *User-to-User Signalling*

6.4.1.1 *Description of interaction*

6.4.1.1.1 *Call Forwarding Busy (Network Determined) or Call Forwarding Unconditional*

If the forwarding party does not subscribe to a Service requested as "essential" the call is cleared. If the forwarding party inhibits User to User on Forwarded calls and one or more User to User service was requested as "essential", the call is cleared. The cause is "no user responding" in the case of Call Forwarding Unconditional and "user busy" in the case of Call Forwarding Busy.

If call clearing does not occur above and the forwarding party inhibits User to User on Forwarded calls, the forwarding exchange will not include a User to User indicators parameter in the Initial Address Message used to set up the forwarded leg of the call. If the forwarding party does not subscribe to any of the User to User services requested by the calling user, the forwarding exchange will again not include a User to User indicators parameter in the Initial Address Message used to set up the forwarded leg of the call. In both of these cases the normal User to User procedures will ensure that the calling user is informed of the lack of User to User signalling capability.

If the forwarding user subscribes to a requested user to user service and does not inhibit it on forwarded calls, the forwarding exchange will try to supply the user to user service requested. This will be accomplished by requesting the user to user service in the outgoing Initial Address Message using the same request information that was contained in the original Initial Address Message. If the attempt is successful, user to user transfer will be available between the calling user and forwarded to user.

6.4.1.1.2 *Call Forwarding No Reply*

Call Forwarding No Reply subscribers with Call Forwarding No Reply activated can also be User to User Subscribers. They cannot however use the Alerting (Address Complete) indication to indicate acceptance or rejection of User to User Service requests. The Alerting (Address Complete) indication must show a "no indication" response to any User to User service requests. Any other response is a protocol error. Acceptance or rejection of User to User service requests occurs in the Connect (Answer) indication.

If a Call is Forwarded No Reply and one or more of any requested User to User services are essential and the forwarding user inhibits user to user on the forwarding leg, then the call is cleared. If the forwarding party does not subscribe to a Service requested as "essential" the call is cleared. The cause used in both cases is "no answer from user".

Services 1 and 2 are not extended to the forwarded to party in the case of Call Forwarding No Reply. Service 3 may be extended to the forwarded to party if the forwarding user subscribes to User to User Service 3 and does not inhibit User to User on the forwarded leg. The User to User indicators parameter for service 3 in the Forwarding Initial Address Message should be set identically to the values received in the Original Initial Address Message. If the Address Complete Message received on the forwarded leg of the call indicates that service 3 was not provided, the call Forwarding No Reply exchange should retain this indicator and insert it in the Answer Message when it is received. If the Address Complete Message received on the forwarded leg of the call indicates that servive 3 is provided, the Call Forwarding No Reply exchange should retain this indicator and insert it in the Answer Message when it is received.

6.4.1.1.3 *Call Forwarding Busy (User Determined)*

Call Forwarding Busy (User Determined) subscribers can also be User to User Subscribers. The Address Complete Message sent back upon receipt of the release from the originally called party should give "no information" in response to any received User to User requests.

If a Call is Forwarded Busy (User Determined) and one or more of any requested User to User services are essential and the forwarding user inhibits user to user on the forwarding leg, then the call is cleared. If the fowarding party does not subscribe to a Service requested as "essential" the call is cleared. The cause used in both cases is "user busy".

Services 1 and 2 are not extended to the forwarded to party in the case of Call Forwarding Busy (User Determined). Service 3 may be extended to the forwarded to party if the forwarding user subscribes to User to User Service 3 and does not inhibit User to User on the forwarded leg. The User to User indicators parameter for service 3 in the Forwarding Initial Address Message should be set identically to the values received in the Original Initial Address Message. If the Address Complete Message received on the forwarded leg of the call indicates that service 3 was not provided, the Call Forwarding Busy (User Determined) exchange should retain this indicator and insert it in the Answer Message when it is received. If the Address Complete Message received on the forwarded leg of the call indicates that service 3 is provided, the Call Forwarding Busy (User Determined) exchange should retain this indicator and insert it in the Answer Message when it is received.

6.4.1.1.4 *Message length*

There is a further implication in that multiple forwarding adds to the length of the Initial Address Message. If the Initial Address Message that is to be used on a call setup is within 32 octets of the 272 octet message length limit, the user to user information should be dropped. This will result in a guarantee that the Initial Address Message will not subsequently exceed the length limit.

6.4.2 *Closed User Group*

6.4.2.1 *Description of interaction*

Closed User Group restrictions must be met on each leg of the call. In addition, CUG restrictions must be met end-to-end. If the call is forwarded multiple times, CUG restrictions have to be met between the calling user and every intermediate forwarding user.

Calling User/Forwarded-to User: When a call is forwarded a new check of the CUG restrictions is made at the forwarded-to destination. The CUG information sent to the forwarded-to destination is the same CUG information that was sent from the originating exchange.

6.4.2.2 *Actions at a forwarding exchange*

For a subscriber who has both CUG interlock and Call Forwarding services, checks will have to be made prior to entering the Call Forwarding procedures. The forwarding users CUG interlock code(s) will have to be checked against the calling user CUG interlock code. The check would be done at the exchange for the decentralized case and at a database after a TCAP query response sequence for the centralized case. If the check is passed, the Call Forwarding procedures may be entered. If the call proceeds onwards from the forwarding exchange the CUG interlock code and outgoing access indication, which was included in the Initial Address Message received, is included in the Initial Address Message transmitted.

6.4.2.3 *Actions at a destination exchange*

If an exchange receives a call for a CUG member it will have to check against the calling user CUG code. The check would be done at the exchange for the decentralized case and at a database after a TCAP query response sequence for the centralized case. The check would have to be passed for the call to complete.

6.4.3 *Calling Line Identification Presentation*

When an exchange receives a call for a Call Forwarding No Reply Subscriber, Address Complete is not returned until alerting is received from the called party. Address Complete messages returned for Call Forwarding No Reply or Call Forwarding (user determined) Busy. Subscribers contain an optional backwards call indicators parameter. The value of this parameter should indicate "Call Forwarding may occur". This indication alerts the transit and originating exchanges that the call is not yet in a stable state as Call Forwarding No Reply may occur. This is used to allow the request/response cycle to be used to obtain the calling number for the forwarded to party if Call Forwarding No Reply occurs.

6.5 *Message flow diagrams*

The messages over the access are included as examples only and are not exhaustive.

Call release procedures are as per normal call.

Abbreviations used in Figures 15/Q.730 to 22/Q.730 are the following:

IAM Initial Address Message

CPG Call Progress Message

ACM Address Complete Message

ANM Answer Message

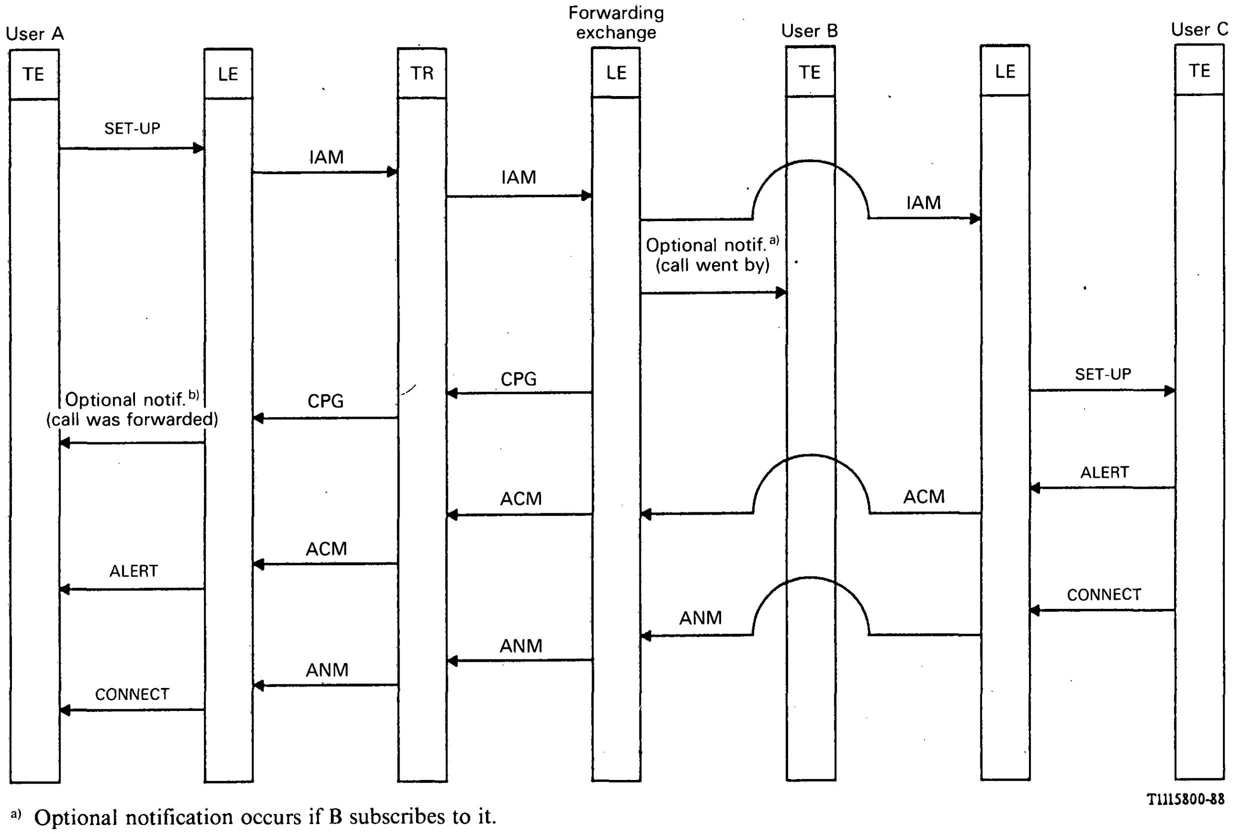
REL Release

RLC Release Complete

LE Local Exchange

TE Terminal Entity

TR Transit Exchange

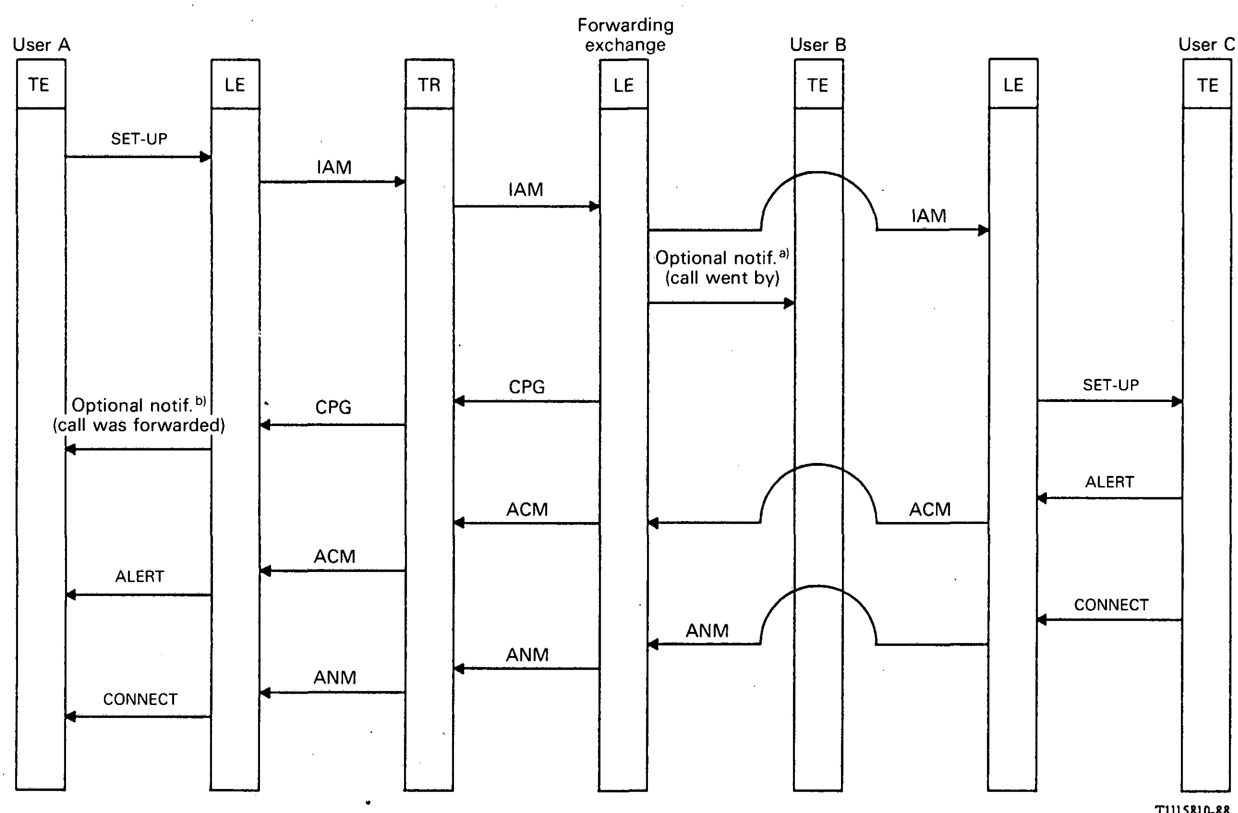


a) Optional notification occurs if B subscribes to it.

b) Optional notification only sent if B subscribes to forwarding notification.

FIGURE 15/Q.730

Call forwarding unconditional – Normal case

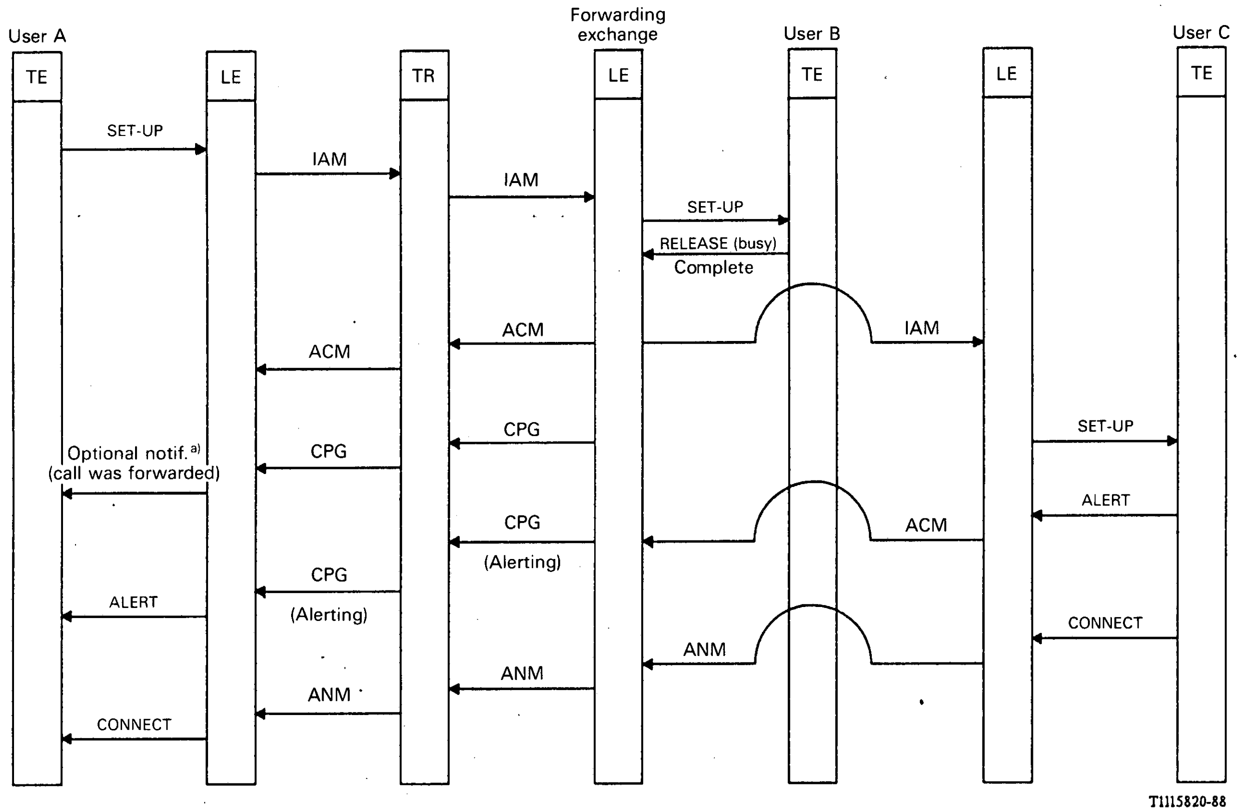


a) Optional notification occurs if B subscribes to it.

b) Optional notification only sent if B subscribes to forwarding notification.

FIGURE 16/Q.730

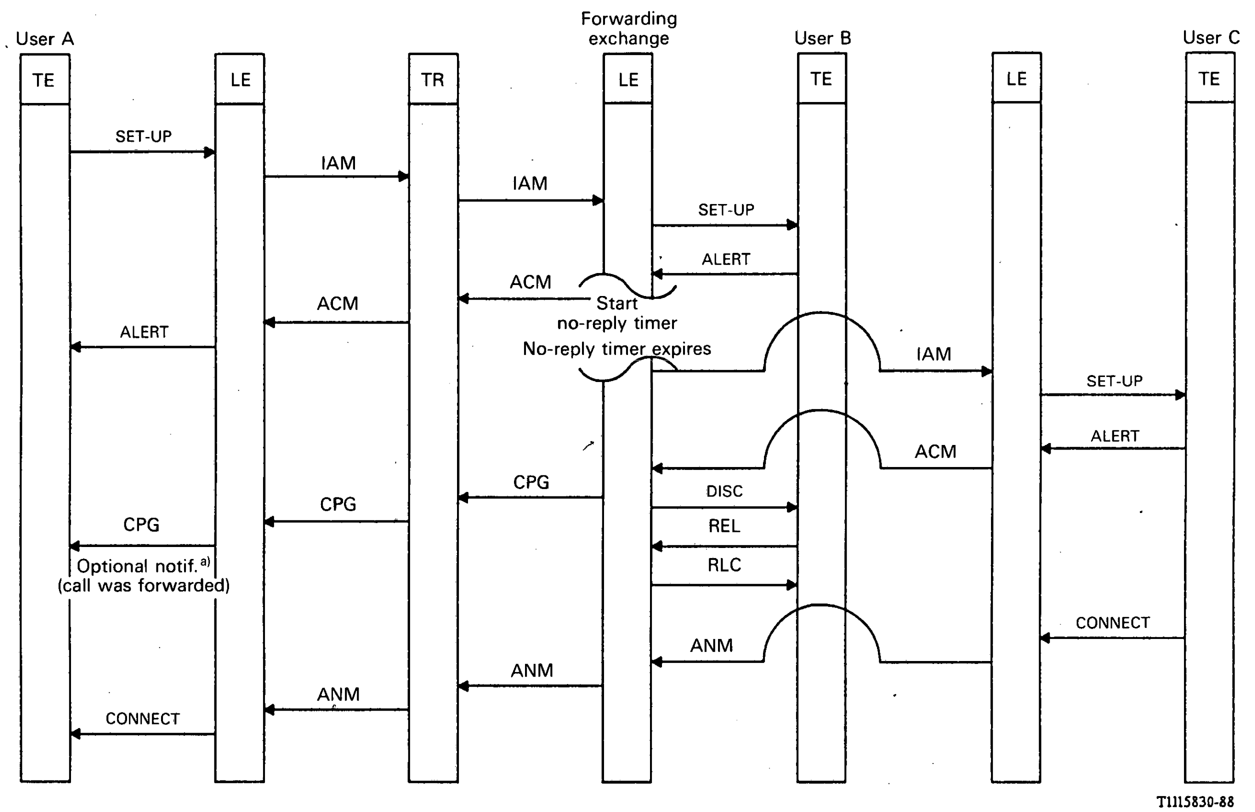
Call forwarding busy (network determined) – Normal case



a) Optional notification only sent if B subscribes to forwarding notification.

FIGURE 17/Q.730

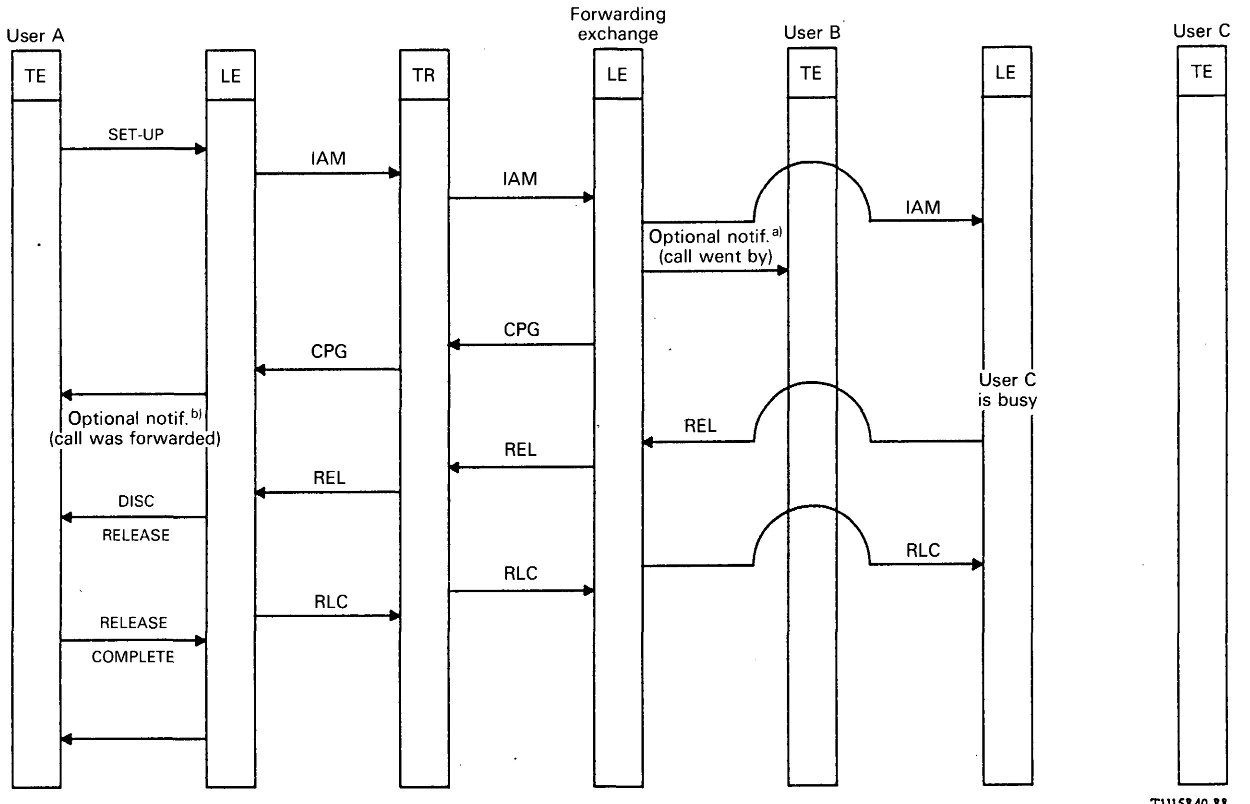
Call forwarding busy (user determined) – Normal case



a) Optional notification only sent if B subscribes to forwarding notification.

FIGURE 18/Q.730

Call forwarding no reply – Normal case

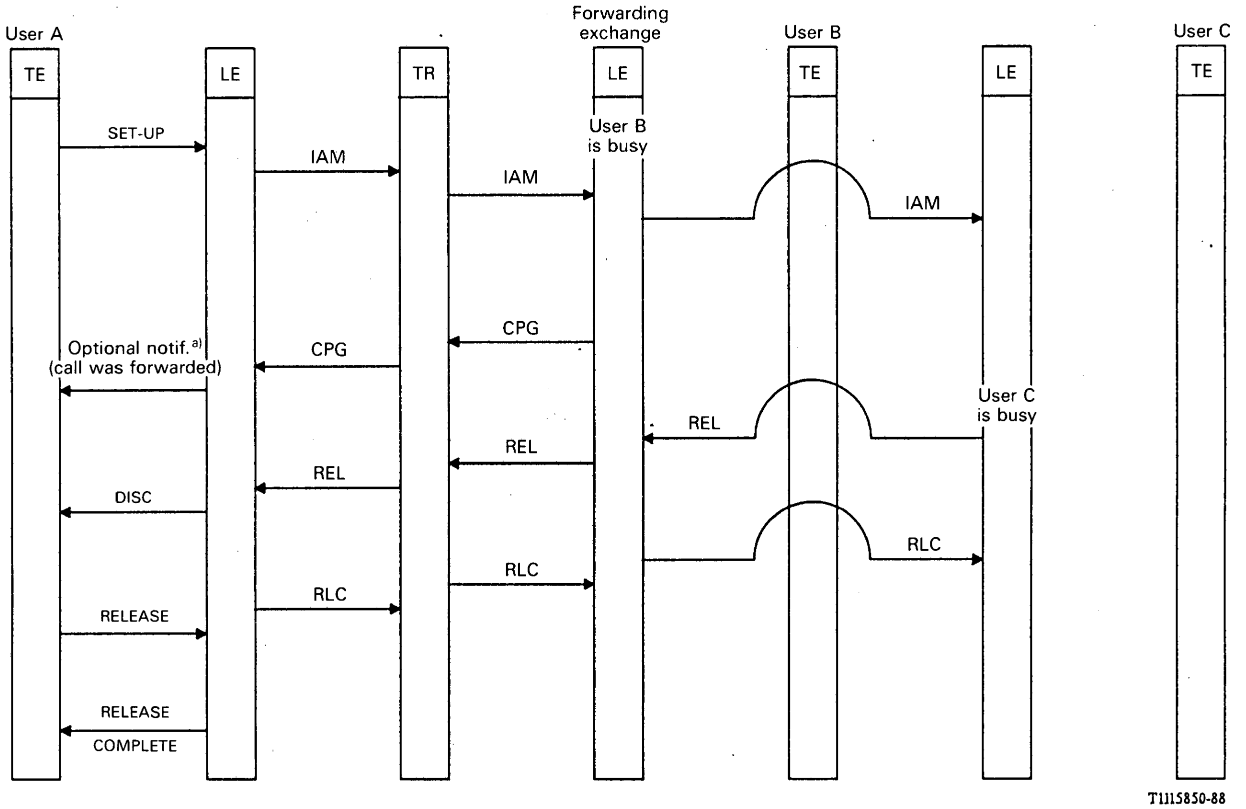


a) Optional notification occurs if B subscribes to it.

b) Optional notification only sent if B subscribes to forwarding notification.

FIGURE 19/Q.730

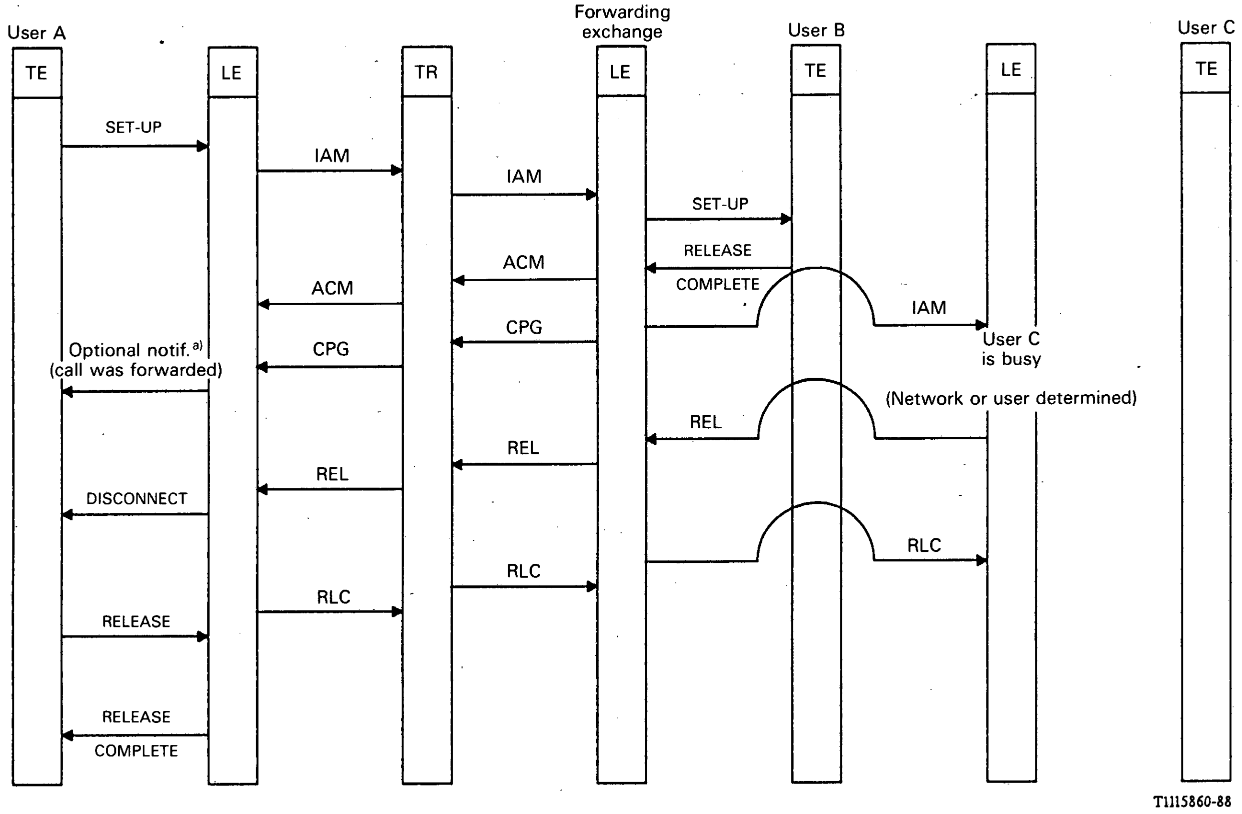
Call forwarding unconditional – Unsuccessful



a) Optional notification only sent if B subscribes to forwarding notification.

FIGURE 20/Q.730

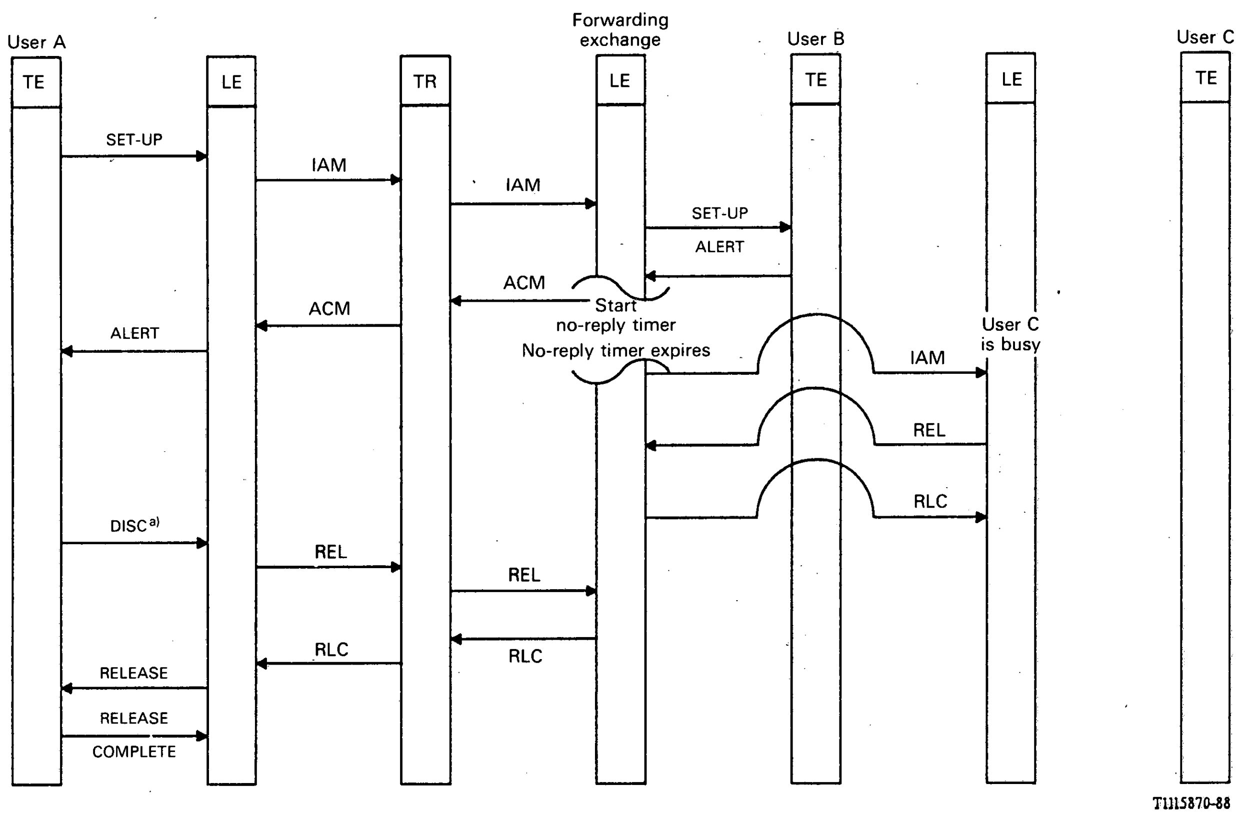
Call forwarding busy (network determined) – Unsuccessful



a) Optional notification only sent if B subscribes to forwarding notific ion.

FIGURE 21/Q.730

Call forwarding busy (user determined) – Unsuccessful



a) Calling user disconnect, or timeout at controlling exchange.

FIGURE 22/Q.730

Call forwarding no reply – Unsuccessful

7 Time-out table

Table 5/Q.730 specifies the timers to be used in conjunction with the supplementary services defined in this Recommendation. (This requires further study.)

TABLE 5/Q.730

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry	Section
T_3			U-U facility request	Receipt of facility Acceptance or reject message	"Protocol error" passed to call control		

ANNEX A

(to Recommendation Q.730)

Signalling procedure for the explicit invocation of user-to-user signalling services 1, 2 and 3

A.1 *User-to-user signalling service*

A.1.1 *General description of user-to-user service*

See §§ 2.1 and 2.2.

A.2 *Procedures for user-to-user signalling associated with circuit switched calls*

A.2.1 *User-to-user signalling, Service 1*

A.2.1.1 *General characteristics*

Service 1 allows users to communicate with user-to-user signalling by transferring user-to-user information within ISDN user part messages during the call set-up and clearing phases. The user-to-user signalling service provided is not a guaranteed service. If for any reason the combination of the basic plus supplementary service information causes the overall maximum length of the message to be exceeded then if the User-to-user Signalling Service 1 is included the service should be rejected.

A.2.1.2 *User-to-user signalling, Service 1 — Explicit service request*

Procedures for call set-up are as described in Recommendation Q.764, § 2 with the following changes:

On call set-up, the Initial Address Message will contain the user-to-user indicators parameter with Service 1 indicated as "requested essential/not essential" and Service 2 and 3 indicated as "no information". The service request will be received from call control at the originating exchange and will be passed to the call control at the terminating exchange.

If the called user or network can support the transfer of user-to-user, a Service 1 acceptance will be returned to the originating exchange in an Address Complete or Call Progress Message for the point-to-point case or the Answer or Connect Message in the point-to-multipoint case with the indication "Service 1 provided" in the user-to-user indicators parameter. Services 2 and 3 will be indicated as "no information" in the user-to-user indicators parameter. These explicit indications shall be forwarded to the call control at the originating exchange.

User-to-user information may be contained in any of the messages that may be transferred in the call set-up phase.

A.2.1.3 *Interworking*

In the case of interworking with a non-ISDN network, the "interworking" protocol control information will be returned to the originating exchange in the first appropriate message, e.g., and Address Complete Message. Two ISDN networks that interwork may have to retain knowledge of the service request until it is clear whether both can support the service.

A.2.1.4 *Rejection of explicit service requests*

If the called user or network does not understand the Service 1 request then the Address Complete or Call Progress Message returned to the originating exchange shall not include either a Service 1 acceptance or rejection. This type of response will be taken as an implicit rejection of Service 1. (*Note* — The Study Group XVIII service description does not allow this implicit rejection.)

If the network or called user cannot support Service 1, and it was requested with a non-essential indication, a Service 1 rejection indication is returned in the Address Complete or Call Progress Message with the indication "Service 1 not provided" in the user-to-user indicators parameter.

If the Service 1 request is indicated as essential and the called user or network cannot support it a Release Message is sent with cause code 50, "requested facility not subscribed", cause code 29, "facility rejected by the network" or cause code 69, "requested facility not implemented" and the diagnostic containing the user-to-user indicators parameter.

A.2.1.5 *User-to-user signalling in the call clearing phase*

A user-to-user information parameter may be included in the Release Message. The user-to-user information parameter received at the distant exchange in the Release Message is passed to the call control for the remote user. In the case of simultaneous clearing of the call the Release Message may not reach the distant local exchange and the user-to-user information will be lost.

A.2.2 *User-to-user signalling, Service 2*

A.2.2.1 *General characteristics*

Service 2 allows the users to communicate with user-to-user signalling by transferring up to two user-to-user information messages in each direction during the call setup phase. As a network option, user-to-user information may de delivered to the called party after the call is answered to accommodate situations where the information was sent at approximately the same time as the call was answered. This service allows either an implicit or explicit rejection.

Service 2 is only applicable when a point-to-point configuration exists at the user-network interface at the terminating exchange.

A.2.2.2 *Call set-up*

Procedures for call set-up are as described in Recommendation Q.764, § 2 with the following changes:

On call set-up the Initial Address Message will contain the user-to-user indicators parameter with Service 2 indicated as "requested essential/not essential" and Services 1 and 2 indicated as "no information"[1]. The service request will be received from call control. The service request will be passed to call control at the terminating exchange.

If the called user or network can support the transfer of user-to-user information, a Service 2 acceptance will be returned to the originating exchange in an Address Complete or Call Progress Message with the indication "Service 2 provided" in the user-to-user indicators parameter[2]. Services 1 and 3 will be indicated as "no information" in the user-to-user indicators parameter. These explicit indications shall be forwarded to the call control at the originating exchange.

A.2.2.3 *Service rejection*

A.2.2.3.1 *Point-to-point calls*

If the called user or network does not understand the Service 2 request then the Address Complete or Call Progress Message returned to the originating exchange shall not include either a Service 2 acceptance or rejection. This type of response will be taken as an implicit rejection of Service 2.

If the network or called user cannot support Service 2, and it was requested with a non-essential indication, a Service 2 rejection indication is returned in the Address Complete or Call Progress Message with the indication "Service 2 not provided" in the user-to-user indicators parameter[3]. (*Note* – The Study Group XVIII service description does not allow this implicit rejection.)

[1] The Connection Request parameter will be included if CO-SCCP method is selected, or the call reference parameter if CL-SCCP method is selected.

[2] The SCCP connection confirm message will be returned if CO-SCCP method is selected.

[3] The SCCP connection refused message will be returned if CO-SCCP method is selected.

If the Service 2 request is indicated as essential and the called user or network cannot support it a Release Message is sent with cause code 50, "requested facility not subscribed" cause code 29, "facility rejected by the network" or cause code 69, "requested facility not implemented" and the diagnostic containing the user-to-user indicators parameter.

A.2.2.3.2 *Point-to-multipoint calls*

If the call is point-to-multipoint then Service 2 cannot be provided at the called party because the user is not identified until the user is connected. Consequently, Service 2 must be rejected using the point-to-point procedures. The cause value in this case is code 88, "incompatible destination".

A.2.2.4 *Interworking*

In the case of interworking with a non-ISDN network, the "interworking" protocol control information will be returned to the originating exchange in the appropriate message, e.g., an Address Completed Message. Two ISDN networks that interwork may have to retain knowledge of the service request until it is clear whether both can support the service.

A.2.2.5 *Transfer of messages containing user-to-user information*

Once acceptance of Service 2 has been transmitted across the network, both of the involved users can transfer user-to-user information between themselves. Within the network the user-to-user information parameter will be carried in a User-to-user Information Message. The network provides for the transfer of these messages from the calling to the called side and vice versa.

The User-to-user Information Message format can be found in Table 20/Q.763.

If the Service 2 is provided, no more than two User-to-user Information Messages carrying user-to-user information parameters may be transmitted in each direction during the call set-up phase. If more than two messages are received during call set-up, the additional messages are discarded. If only Service 2 has been requested, one of the messages may also be received and passed after the answer state has been reached.

No transfer of user-to-user information can occur until the service is acknowledged.

A.2.3 *User-to-user signalling, Service 3*

A.2.3.1 *General characteristics*

Service 3 allows the users to communicate with user-to-user signalling by transferring User-to-user Information Messages in each direction during the active phase of the call. This service allows either an implicit or explicit rejection.

Service 3 allows the service to be requested either during call set-up or after call set-up. However, Service 3 should not be requested after call set-up if it has been rejected during the call set-up phase.

A.2.3.2 *Service 3 requested during call set-up*

Procedures for call set-up are as described in Recommendation Q.764, § 2 with the following changes:

On call set-up the Initial Address Message will contain the user-to-user indicators parameter with Service 3 indicated as "requested essential/not essential" and Services 1 and 2 indicated as "no information"[4]. The service request will be received from call control at the originating exchange. The service request will be passed to the call control at the terminating exchange.

If the called user or network can support the transfer of user-to-user information, a Service 3 Acceptance will be returned to the originating exchange in an Answer or Connect Message with the indication "Service 3 provided" in the user-to-user indicators parameter[5]. Services 1 and 2 will be indicated as "no information" in the user-to-user indicators parameter. These explicit indications shall be forwarded to the call control at the originating exchange.

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[4] The Connection Request parameter will be included if CO-SCCP method is selected, or the call reference parameter if CL-SCCP method is selected.

[5] The SCCP connection confirm message will be returned if CO-SCCP method is selected.

A.2.3.3 *Rejection of Service 3 when requested during call set-up*

If the called user or network does not understand the Service 3 request then the Address Complete Call Progress Message, Answer or Connect Message, returned to the originating exchange shall not include either a Service 3 acceptance or rejection. This type of response will be taken as an implicit rejection of Service 3.

If the network or called user cannot support Service 3, and it was requested with a non-essential indication, a Service 3 rejection indication is returned in the Address Complete, Call Progress Message, Answer or Connect with the indication "Service 3 not provided" in the user-to-user indicators parameter[6]. (*Note* – The Study Group XVIII service description does not allow this implicit rejection.)

If the Service 3 request is indicated as essential and the called user or network cannot support it a Release Message is sent with cause code 50, "requested facility not subscribed", cause code 29, "facility rejected by the network" or cause code 69, "requested facility not implemented" and the diagnostic containing the user-to-user indicators parameter.

A.2.3.4 *Service 3 requested after call set-up*

After call set-up has been completed either the calling or called party may request to transfer Service 3 information. On reception of the request from call control the ISDN User Part sends a Facility Request Message containing the facility indicator parameter indicating user-to-user service and a user-to-user indicators parameter requesting Service 3 to the distant local exchange using the appropriate transport method. The facility request will contain the user-to-user indicators parameter with Service 3 indicated as "requested essential/not essential" and Services 1 and 2 indicated as "no information"[7]. On receipt of the Facility message at the distant exchange call control will be notified which will then notify the remote user. If the user wishes to support Service 3 during the active phase, a Service 3 acceptance will be returned to call control. On notification of the acceptance by call control the ISDN User Part will generate a Facility Accepted Message with the indication "Service 3 provided" in the user-to-user indicators parameter[8]. Services 1 and 2 will be indicated as "no information" in the user-to-user indicators parameter. On the receipt of the message this explicit acceptance indication shall be forwarded to call control which will then notify the requesting user.

A.2.3.5 *Rejection of Service 3 when requested after call set-up*

If the requested user or network does not understand the Service 3 request then no message is returned. This response shall be taken as an implicit rejection of the service request.

If the network or requested user cannot support Service 3, and it was requested with a non-essential indication, a Service 3 rejection indication is returned in the Facility Reject Message with the indication "Service 3 not provided" in the user-to-user indicators parameter[6].

If the call control does not indicate acceptance or rejection the network shall not return any explicit rejection to the exchange.

Note 1 – The Stage 1 service description does not allow this implicit rejection.

Note 2 – The handling of essential/non essential Service 3 request is not yet consistent with the State 1 service description.

---

[6] The SCCP connection refused message will be returned if CO-SCCP method is selected.

[7] The Connection Request parameter will be included if CO-SCCP method is selected, or the call reference parameter if CL-SCCP method is selected.

[8] The SCCP connection confirm message will be returned if CO-SCCP method is selected.

A.2.3.6 *Interworking*

In the case of interworking with a non-ISDN network an "interworking" protocol control indicator will be returned to the originating exchange in the first appropriate message[9]. If Service 3 was requested after call set-up, a Facility Reject Message is returned[9]. Two ISDN networks that interwork may have to retain knowledge of the service request until it is clear whether both can support the service.

A.2.3.7 *Transfer of messages containing user-to-user information*

Once acceptance of Service 3 has been transmitted across the network, both of the involved users can transfer user-to-user information between themselves. Within the network the user-to-user information parameter will be carried in a User-to-user Information Message. The network provides for the transfer of these messages from the calling to the called side and vice versa.

The User-to-user Information Message format can be found in Table 20/Q.763.

A.2.4 *Requesting user-to-user signalling Services 1, 2 and 3*

This section describes procedures for requesting Services 1, 2 and 3.

Note – User-to-user Service 1 implicit request/response procedures are also found in § 2.2.1. Only explicit Service 1 requests may follow the procedure in this section.

A.2.4.1 *Call establishment*

Procedures for call establishment are described in §§ A.2.1.2, A.2.2 and A.2.3.2 with the following modifications:

On service request one user-to-user indicators parameter will be sent with each service being indicated as "requested, essential/non essential".

If the called user can support the indicated services, then all three services will be indicated as "provided" in the user-to-user indicators parameter in the Address Complete or Call Progress Message. Alternatively, the Address Complete or Call Progress Message may indicate "Service 3, no information" and "Service 3 provided" in the Answer or Connect Message as provided in § A.2.3.2. In the case that the call is to multi-point users, the acknowledgement of Services 1 and 3 shall be delayed until the Answer or Connect Message is sent.

A.2.4.2 *Service rejection*

If the called user or network does not understand the service requested, then the Address Complete, Call Progress, Answer or Connect Messages returned will not include either service(s) acceptance or rejection. This type of response will be taken as an implicit rejection of all services.

If the called user or network does not understand a specific service request, that specific service is implicitly rejected following the procedures of §§ A.2.1.4, A.2.2.3 and A.2.3.3. Alternatively, if the network or called user cannot support one or more service requests and the service requests were indicated as non-essential, then the rejection may be provided in the Address Complete or Call Progress Messages. (In the case of a call to multi-point users only Service 2 may be rejected in this way, Service 1 and 3 must be rejected in the Answer or Connect Message if the called user is furnishing the rejection.) The services may also be rejected following the procedures of §§ A.2.1.4, A.2.2.3 and A.2.3.3.

If any or all of the services requested is indicated as essential and the called user or network cannot support one or more of the services, a Release Message is sent with cause code 29, "facility rejected by the network", cause code 50, "requested facility not subscribed", or cause code 69, "requested facility not implemented" and the diagnostic containing the user-to-user indicators parameter.

[9] The SCCP connection refused message will be returned if CO-SCCP method is selected.

If the call control does not indicate Service 1, 2 or 3 acceptance or rejection prior to the sending of the Address Complete, Call Progress, Answer or Connect Message, then no indication of service acceptance or rejection shall be returned for the specific service(s).

A.2.4.3 *Interworking*

In the case of interworking with a non-ISDN network, the "interworking" protocol information will be returned to the originating exchange in the first appropriate message, e.g., an Address Complete Message. Two ISDN networks that interwork may have to retain knowledge of the service request until it is clear whether both can support the services.

A.2.4.4 *Transfer of User-to-user Information Messages*

The procedures for the transfer of User-to-user Information Messages is covered in §§ A.2.2.5 and A.2.3.7.

A.2.5 *User-to-user information transport methods for Services 2 and 3*

The Transport methods for Services 2 and 3 may be found in § 3 of Recommendation Q.764.

A.2.6 *Message flow diagrams*

The message flow diagrams are shown in Figures A-1/Q.730 to A-7/Q.730.

For User-to-user Signalling Service 2 and 3 the figures only show ISDN user part messages required for basic call control and user-to-user signalling and are not meant to imply any particular transfer method. The parameters and indicators shown are for the User-to-user Signalling Service only, i.e. any parameters or message associated with the various transport methods are not shown.

The following notes apply to Figures A-1/Q.730 to A-7/Q.730:

Note 1 – In cases where an ALERTING indication is carried by a Call Progress Message the user-to-user indicators parameter and/or the user-to-user information parameter may also be transported in the Call Progress Message.

Note 2 – In cases where the called user is an automatic answering terminal, user-to-user indicators parameter and/or the user-to-user information parameter may be transported in a Connect Message.

Figure A-1/Q.730 shows a successful use of user-to-user Signalling Service 1 when explicitly requested in a point-to-point configuration.

Figure A-2/Q.730 shows both the successful and unsuccessful use of user-to-user Signalling Service 2 in a point-to-point configuration.

Figure A-3/Q.730 shows an unsuccessful use of user-to-user Signalling Service 2 in a point-to-multipoint configuration. This unsuccessful case is shown because the network reactions will be the same in all similar cases.

Figure A-4/Q.730 shows both successful and unsuccessful cases for user-to-user Signalling Service 3 when the service is non-essential in a point-to-point configuration.

Figure A-5/Q.730 shows a successful use of user-to-user Signalling Service 3 after the call is active in a point-to-point configuration.

Figure A-6/Q.730 shows a successful use of user-to-user signalling Services 1, 2 and 3 and where all services are non-essential in a point-to-point configuration.

Figure A-7/Q.730 shows successful use of user-to-user signalling Services 1 and 3 and unsuccessful use of Service 2 in a point-to-multipoint configuration. It should be noted again that Service 2 will not work in a point-to-multipoint configuration.

The following abbreviations are used in the figures:

Abbreviations	User-to-user Indicator Values
ni	no information
rne	requested, non essential
re	requested, essential
p	provided
np	not provided
Abbreviations	**Parameter name**
UUI	user-to-user information
UUI ind.	user-to-user indicators
Abbreviations	**Message name**
ACM	Address Complete
ANM	Answer
FAR	Facility Request
FAA	Facility Accepted
IAM	Initial Address
REL	Release
RLC	Release Complete
USR	User-to-user Information

The messages shown with dashed lines are not part of the ISDN User Part protocol and are for information only. For detailed information on the access protocol user-to-user procedures the ISDN access protocol Recommendation Q.931 should be examined.

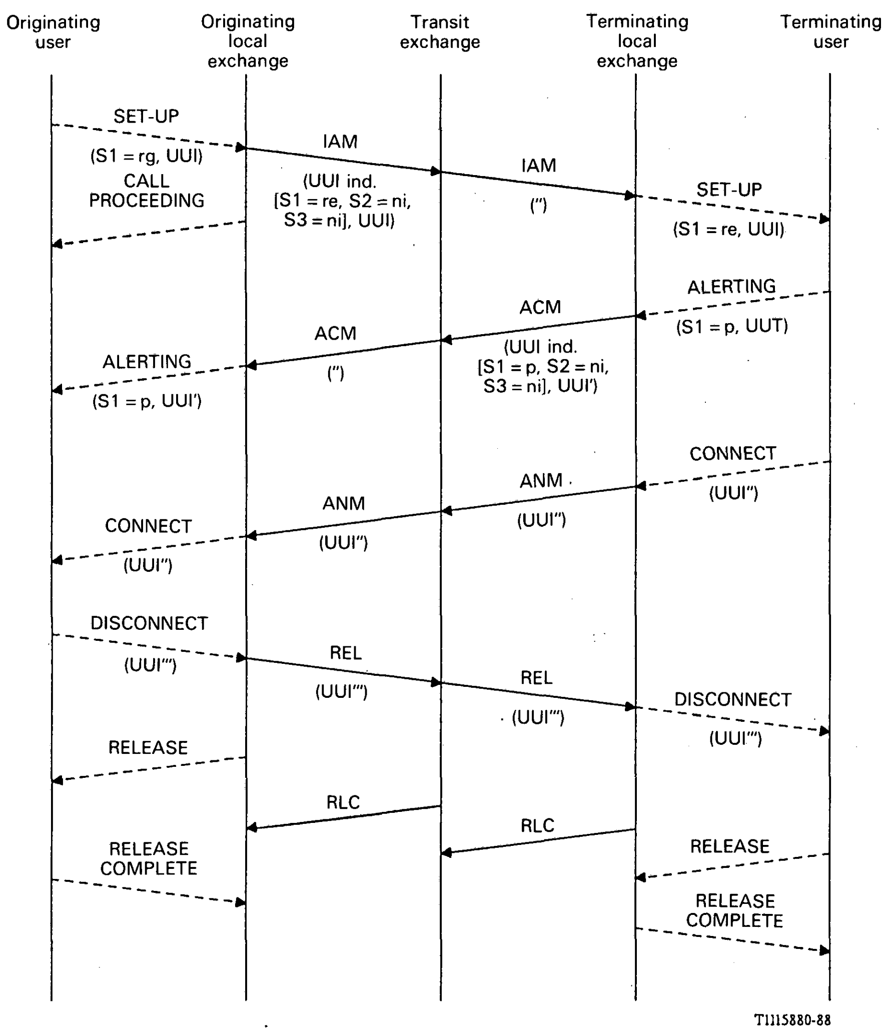
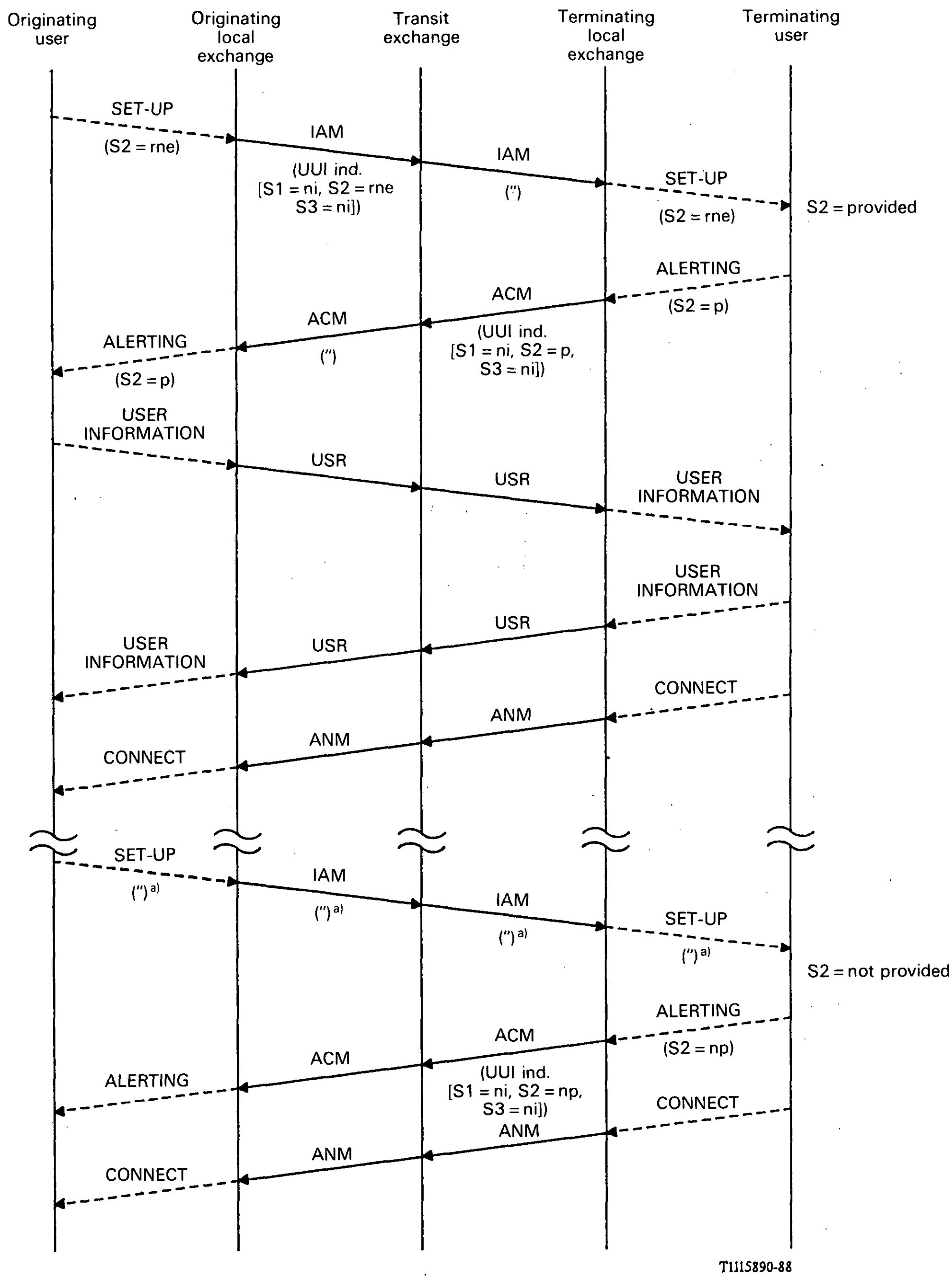


FIGURE A-1/Q.730

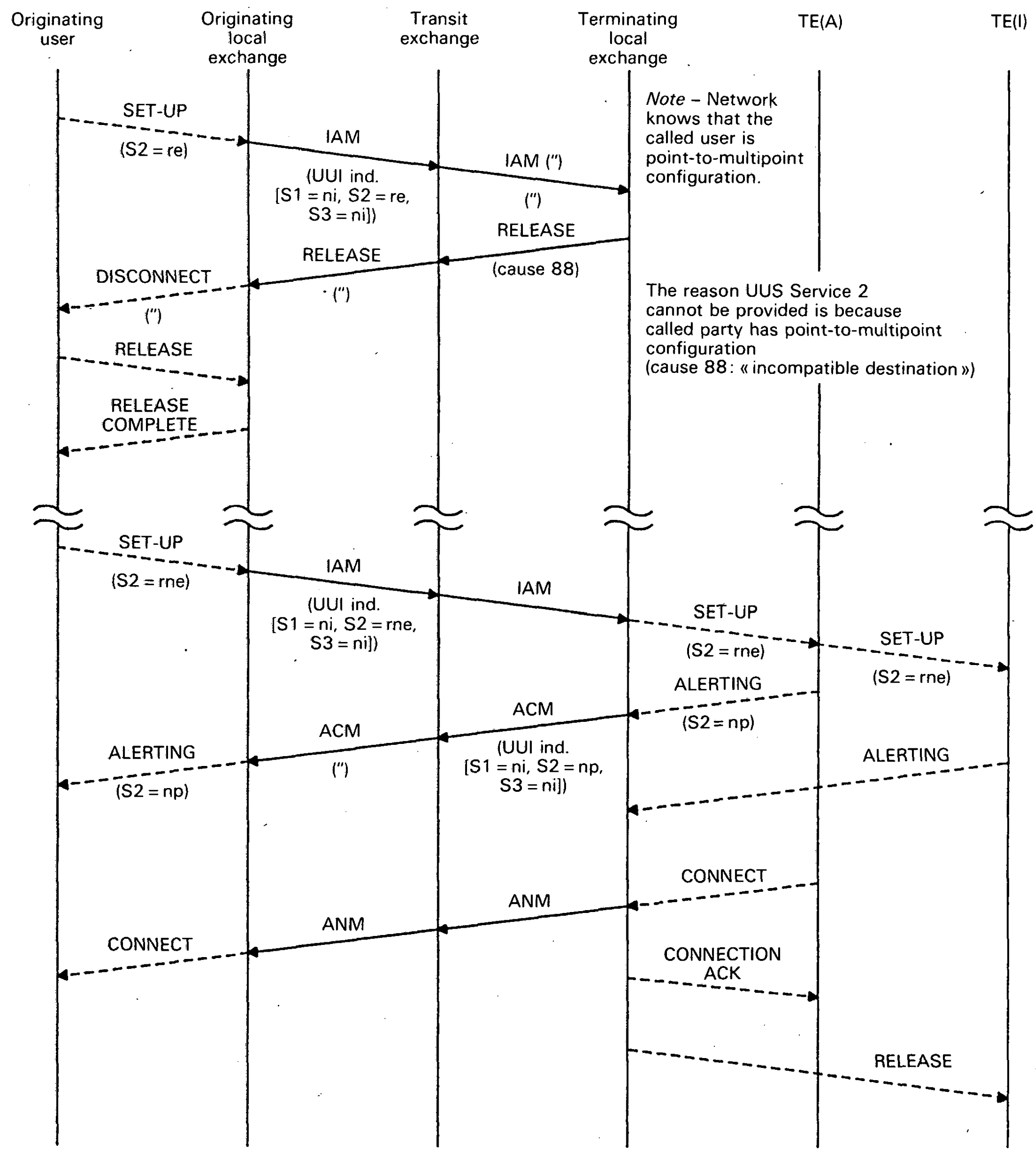
UUS Service 1 – successful case
(explicit request, called user is point-to-point)



a) Same as in "provided" case.

FIGURE A-2/Q.730

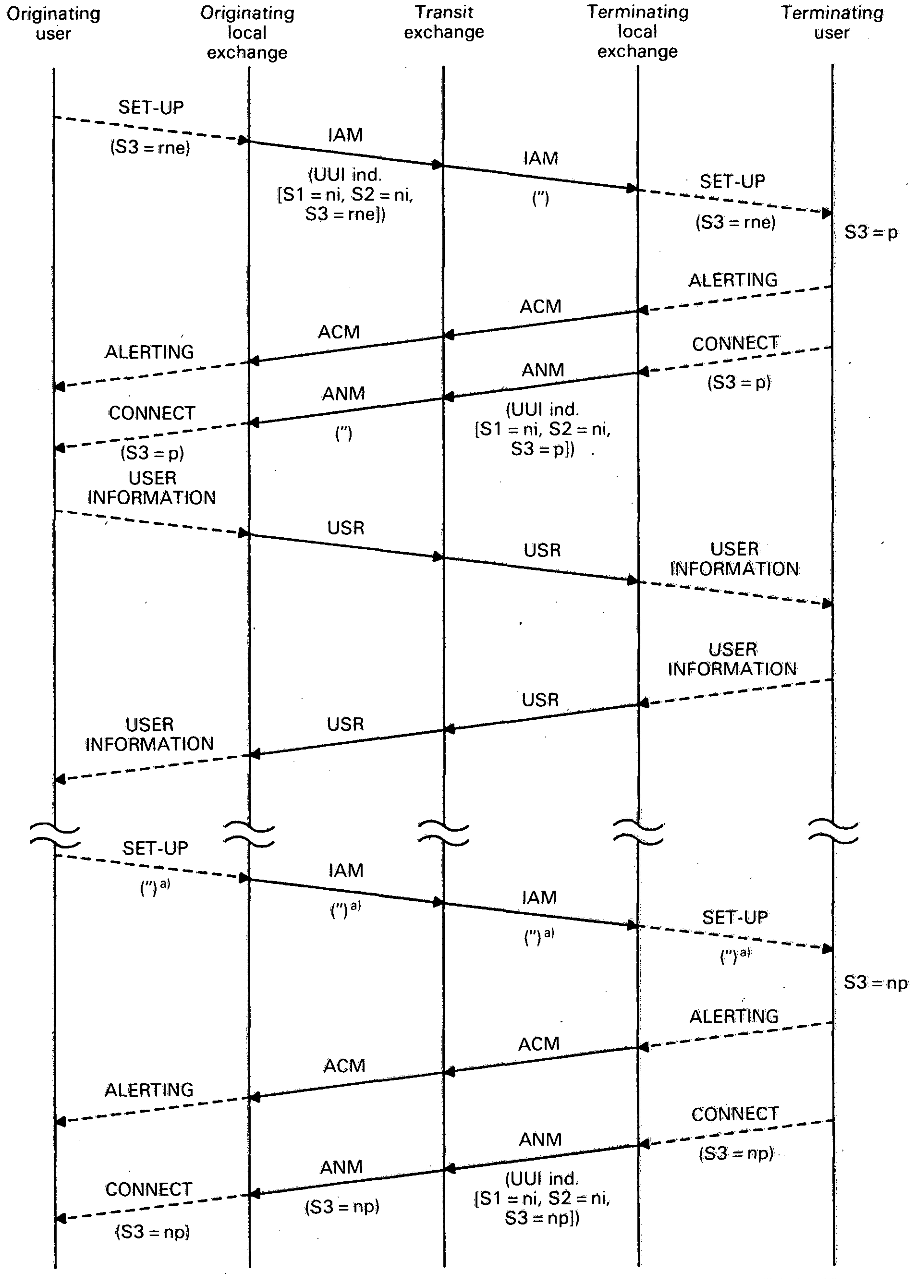
UUS Service 2 (called user is point-to-point)



[Included only because network reactions are always the same.]

FIGURE A-3/Q.730

UUS Service 2 (called user is point-to-multipoint)



a) Same as in "provided" case.

FIGURE A-4/Q.730

User-to-user Service 3 (Service 3 non-essential)

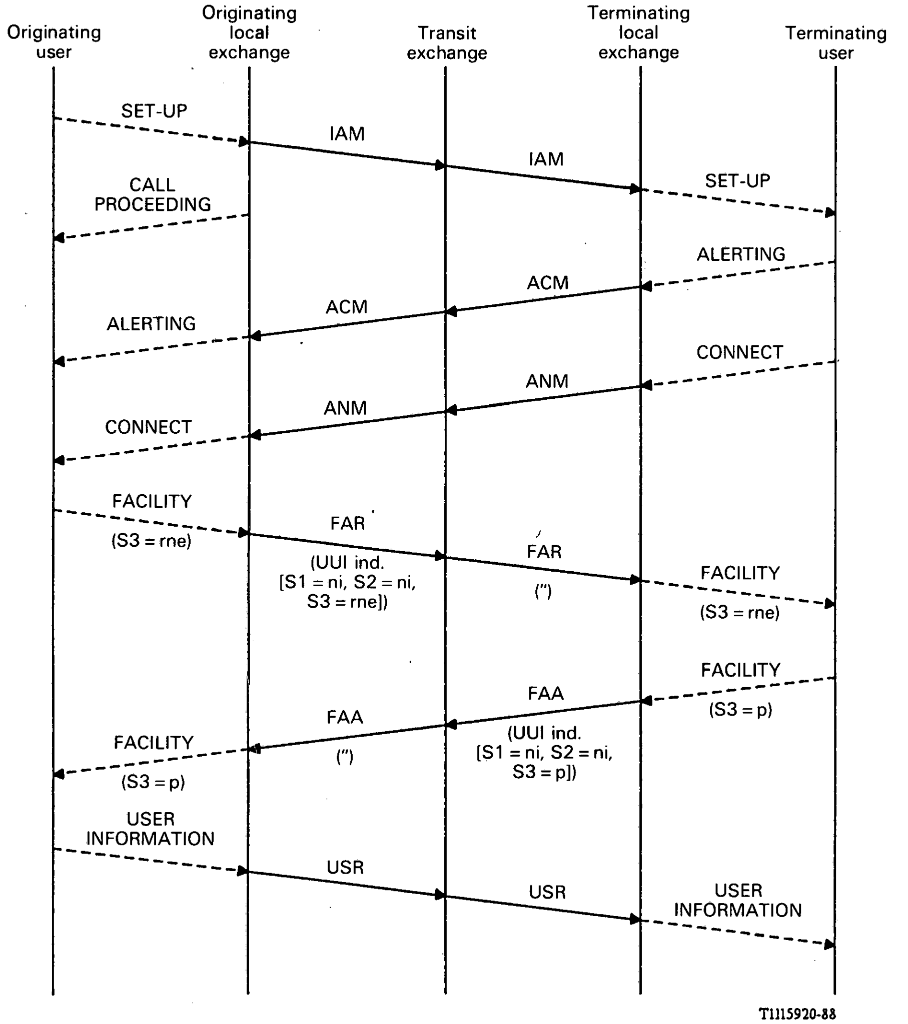


FIGURE A-5/Q.730

Service 3 requested after call is active

(Service 3 is required to be non-essential)

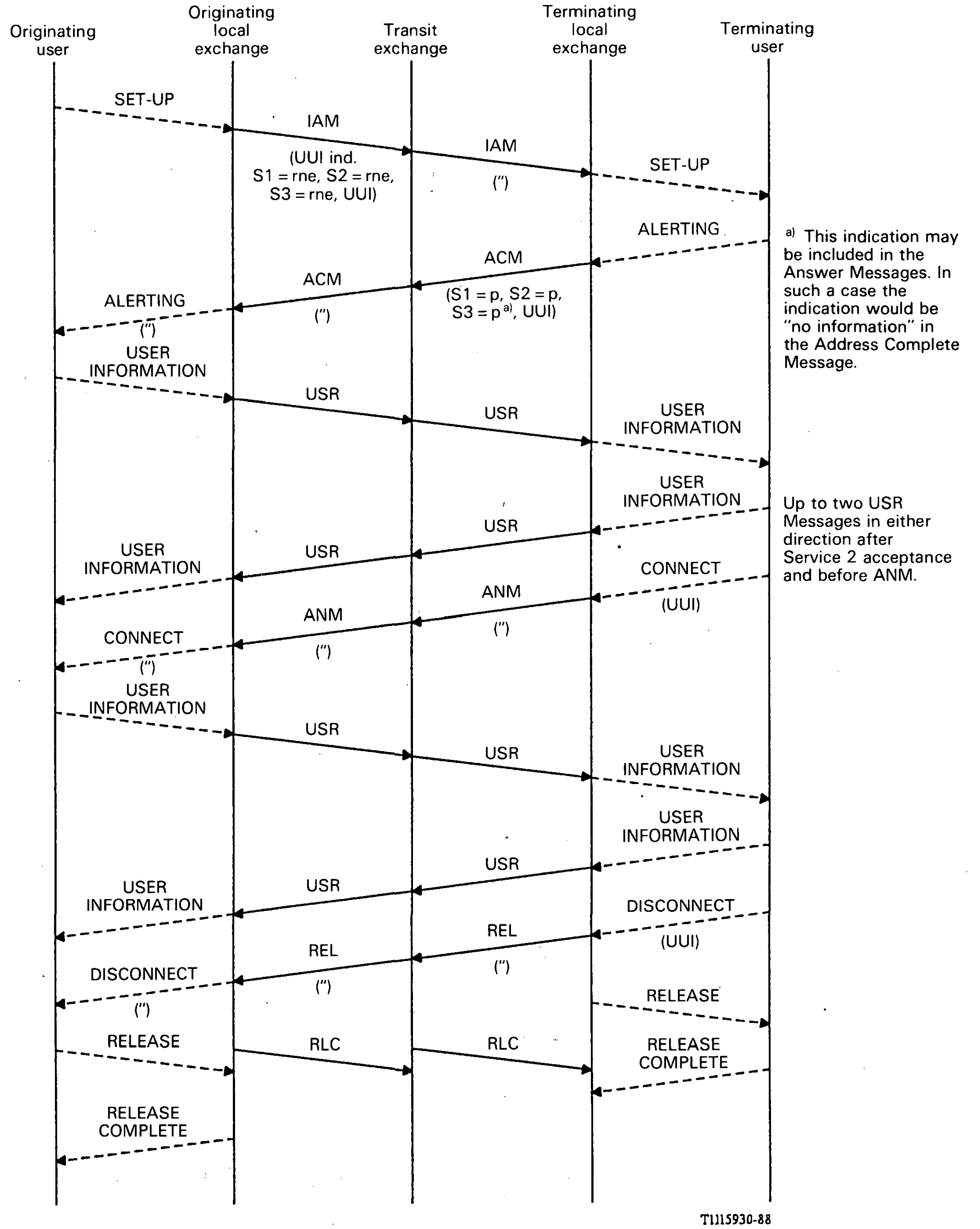
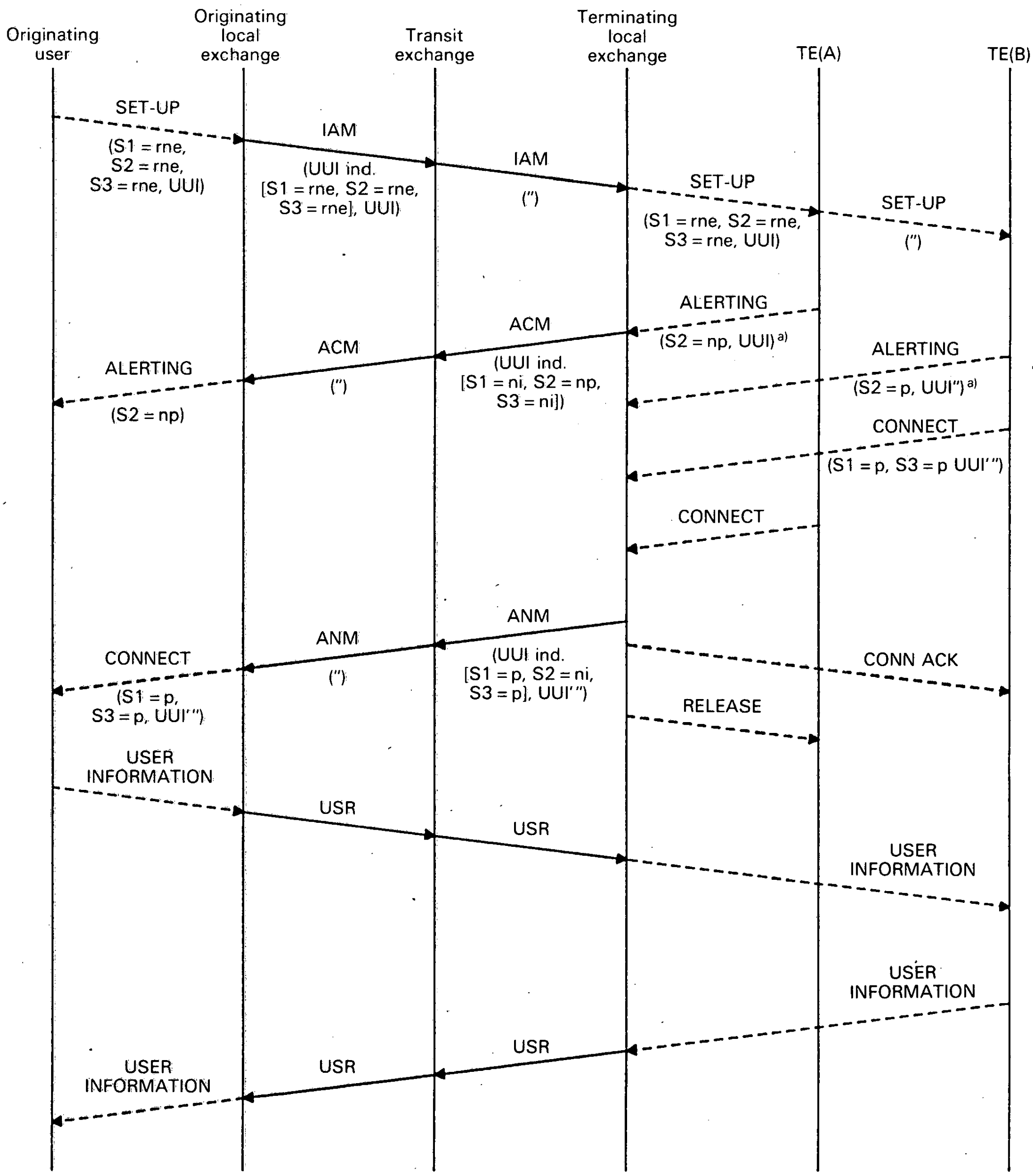


FIGURE A-6/Q.730

UUS Services 1, 2 and 3 are requested
(all services are non essential, called user is point-to-point)



a) In case of point-to-multipoint configuration, UUI (′, ″) in the ALERTING [TE(A) & TE(B) and CONNECT from the non-selected TE(TE(A)] are discarded at the terminating local exchange.

FIGURE A-7/Q.730

All the UUS Service 1, 2, 3 are requested
(called user is point-to-multipoint)

A.2.7 *Interaction with other supplementary services*

A.2.7.1 *Call forwarding services*

Interactions with the call forwarding services are shown in the call forwarding protocol sections.

A.2.7.2 *Call waiting service*

Interactions with the call waiting service are shown in the call waiting protocol sections. (Call waiting is for further study.)

A.2.7.3 *Other services*

There are no known interactions with services other than those listed.

A.2.8 *State transition diagrams*

The state transition diagrams may be found in the Stage 2 description of the User-to-user Service.

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SECTION 3

DATA USER PART (DUP)

Recommendation Q.741

SIGNALLING SYSTEM No. 7 – DATA USER PART

(This Recommendation appears in Fascicle VIII.3 of the Blue Book, as Recommendation X.61.)

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SECTION 5

INTEGRATED SERVICES DIGITAL NETWORK USER PART (ISUP)

Recommendation Q.761

FUNCTIONAL DESCRIPTION OF THE ISDN USER PART OF SIGNALLING SYSTEM No. 7

1 General

The ISDN User Part is the Signalling System No. 7 protocol which provides the signalling functions required to support basic bearer services and supplementary services for voice and non-voice applications in an integrated services digital network.

The ISDN User Part is also suited for application in dedicated telephone and circuit switched data networks and in analogue and mixed analogue/digital networks. In particular the ISDN User Part meets the requirements defined by CCITT for worldwide international semi-automatic and automatic telephone and circuit switched data traffic.

The ISDN User Part is furthermore suitable for national applications. Most signalling procedures, information elements and message types specified for international use are also required in typical national applications. Moreover, coding space has been reserved in order to allow national administrations and recognized private operating agencies to introduce network specific signalling messages and elements of information within the internationally standardized protocol structure.

The ISDN User Part makes use of the services provided by the Message Transfer Part (MTP) and in some cases by the Signalling Connection Control Part (SCCP) for the transfer of information between ISDN User Parts.

The ISDN User Part protocol which supports the basic bearer service is described in Recommendations Q.761 to Q.764 and Q.766. A general description of ISDN User Part signals and messages is provided in Recommendation Q.762. Message formats and message field codings are defined in Recommendation Q.763, while the signalling procedures are described in Recommendation Q.764. Recommendation Q.766 deals with ISDN User Part performance objectives.

ISDN User Part protocol elements which support supplementary services are described in Recommendation Q.730.

Note – The message set, message formats and procedures specified in this version of the ISDN User Part protocol are not in complete alignment with those of the 1984 version (Red Book). The two versions of the protocol are therefore not compatible in all aspects.

2 Services supported by the ISDN User Part

The ISDN User Part protocol supports the basic bearer service, i.e. the establishment, supervision and release of 64 kbit/s circuit switched network connections between subscriber line exchange terminations.

In addition to the basic bearer service the ISDN User Part also supports the following supplementary services:

- calling line identification,
- call forwarding,
- closed user groups,
- directing dialling in, and
- user-to-user signalling.

3 Services assumed from the Message Transfer Part (MTP)

3.1 *General*

This section describes the functional interface presented by the Message Transfer Part to the ISDN User Part. In accordance with the description techniques defined by the Open System Interconnection (OSI) model, information is transferred to and from the MTP in the form of Parameters carried by Primitives.

The general syntax of a primitive is as follows:

X	Generic name	Specific name	Parameter

where

X designates the function providing the service (the MTP, in this case),

the Generic name describes an action by X,

the Specific name indicates the purpose of the primitive, i.e. whether it conveys a request for service, an indication that service related information has been received, a response to a service request or a confirmation that the requested service has been performed, and

the Parameters contain the elements of supporting information transferred by the primitive.

3.2 *Description of primitives*

The following paragraphs describe the primitives used across the ISDN User Part-Message Transfer Part functional interface. The primitives together with the parameters carried by each primitive are also shown in Table 1/Q.761.

3.2.1 *Transfer*

The MTP-TRANSFER primitive is used either by the ISDN User Part to access the Signalling Message Handling function of the Message Transfer Part or by the latter to deliver signalling message information to the ISDN User Part.

3.2.2 *Pause*

The MTP-PAUSE primitive is sent by the Message Transfer Part to indicate its inability to transfer messages to the destination specified as a parameter.

3.2.3 *Resume*

The MTP-RESUME primitive is sent by the Message Transfer Part to indicate its ability to resume unrestricted transfer of messages to the destination specified as a parameter.

3.2.4 *Status*

The MTP-STATUS primitive is sent by the Message Transfer Part to indicate that the signalling route to a specific destination is congested or the ISDN User Part at the destination is unavailable. The affected destination and the congestion indication are carried as parameters (see Table 1/Q.761) in the primitive.

TABLE 1/Q.761

Message transfer part service primitives

Primitives		Parameters
Generic name	Specific name	
MTP-TRANSFER	Request indication	OPC DPC SLS SIO Signalling info.
MTP-PAUSE	Indication	Affected DPC
MTP-RESUME	Indication	Affected DPC
MTP-STATUT	Indication	Affected DPC Cause (see Note)

OPC Originating point code
DPC Destination point code
SLS Signaling link selection code
SIO Service information octet

Note – The cause parameter can assume two values:
- signalling network congested (level), where level is included only if natioal options with congestion priorities and multiple signalling states without congestion priorities (see Recommendation Q.704).
- remote user unavailable.

4 End-to-end signalling

4.1 *General*

End-to-end signalling is defined as the capability to transfer signalling information of end points significance directly between signalling end points in order to provide a requesting user with a basic or supplementary service.

End-to-end signalling is used typically between call originating and terminating local exchanges, to request or to respond to requests for additional call related information, to invoke a supplementary service or to transfer user-to-user information transparently through the network.

End-to-end signalling procedures are described in Recommendation Q.764, § 3.

The following two methods of end-to-end signalling are supported:

4.2 *SCCP method of end-to-end signalling*

Connection-oriented or connectionless transfer of end-to-end signalling information can be accomplished by using the service provided the Signalling Connection Control Part (SCCP) of Signalling System No. 7. The relevant procedures are described in Recommendation Q.764, § 3.4.

4.3 *Pass-along method of end-to-end signalling*

The pass-along method of end-to-end signalling provides transfer of signalling information without requiring the services of the SCCP.

This method may be used between two exchanges when the information to be transferred relates to an existing call for which a physical connection between the same two exchanges has been established. The information transfer in this case occurs over the same signalling path as that used to set up the call and establish the physical connection.

The relevant procedures are described in Recommendation Q.764, § 3.3.

5 **Future enhancements**

Requirements for additional protocol capabilities, such as the ability to support new supplementary services, will result from time to time in the need to add to or modify existing protocol elements and thus to create a new protocol version.

In order to ensure adequate service continuity, the insertion of a new protocol version into one part of a network should be transparent to the remainder of the network. Compatible interworking between protocol versions is optimized by adhering to the following guidelines when specifying a new version:

1) Existing protocol elements, i.e. procedures, messages, parameters and codes, should not be changed unless a protocol error needs to be corrected or it becomes necessary to change the operation of the service that is being supported by the protocol.
2) The semantics of a message, a parameter or of a field within a parameter should not be changed.
3) Established rules for the formatting and encoding messages should not be modified.
4) The addition of parameters to the mandatory part of an existing message should not be allowed. If needed, a new message should be defined containing the desired set of existing and new mandatory parameters.
5) A parameter may be added to an existing message as long as it is allocated to the optional part of the message.
6) The addition of new octets to an existing mandatory fixed length parameter should be avoided. If needed, a new optional parameter should be defined containing the desired set of existing and new information fields.
7) The sequence of fields in an existing variable length parameter should remain unchanged. New fields may be added at the end of the existing sequence of parameter fields. If a change in the sequence of parameter fields is required, a new parameter should be defined.
8) The all zeros code point should be used exclusively to indicate an unallocated (spare) or insignificant value of a parameter field. This avoids an all zeros code, sent by one protocol version as a spare value, to be interpreted as a significant value in another version.

Recommendation Q.762

GENERAL FUNCTION OF MESSAGES AND SIGNALS

This Recommendation describes the elements of signalling information used by the ISDN User Part protocol and their function. The encoding of these elements, the format of the messages in which they are conveyed and their application in the ISDN User Part signalling procedures are described in Recommendations Q.763 and Q.764. Table 1/Q.762 gives the mandatory or optional parameters in the ISDN user part messages and Table 2/Q.762 the list of abbreviations of these messages.

1 Signalling messages

1.1 Address complete message (ACM)

A message sent in the backward direction indicating that all the address signals required for routing the call to the called party have been received.

1.2 Answer message (ANM)

A message sent in the backward direction indicating that the call has been answered. In semi-automatic working this message has a supervisory function. In automatic working this message is used in conjunction with charging information in order to:

- start metering the charge to the calling subscriber (see Recommendation Q.28), and
- start measurement of call duration for international accounting purposes (Recommendation E.260).

1.3 Blocking message (BLO)

A message sent only for maintenance purposes to the exchange at the other end of a circuit, to cause an engaged condition of that circuit for subsequent calls outgoing from that exchange. When a circuit is used in the bothway mode of operation an exchange receiving the blocking message must be capable of accepting incoming calls on the concerned circuit unless it has also sent a blocking message. Under certain conditions, a blocking message is also a proper response to a reset circuit message.

1.4 Blocking acknowledgement message (BLA)

A message sent in response to a blocking message indicating that the circuit has been blocked.

1.5 Call modification completed message (CMC)

A message sent in response to a call modification request message indicating that the requested call modification (e.g. from voice to data) has been completed.

1.6 Call modification reject message (CMRJ)

A message sent in response to a call modification request message indicating that the request has been rejected.

1.7 Call modification request message (CMR)

A message sent in either direction indicating a calling or called party request to modify the characteristics of an established call (e.g. from data to voice).

1.8 Call progress message (CPG)

A message sent in the backward direction indicating that an event has occurred during call set-up which should be relayed to the calling party.

1.9 Charge information message (CRG) *(national use)*

Information sent in either direction for accounting and/or call charging purposes.

1.10 **Circuit group blocking message (CGB)**

A message sent to the exchange at the other end of an identified group of circuits to cause an engaged condition of this group of circuits for subsequent calls outgoing from that exchange. An exchange receiving a circuit group blocking message must be able to accept incoming calls on the group of blocked circuits unless it has also sent a blocking message. Under certain conditions, a circuit group blocking message is also a proper response to a reset circuit message.

1.11 **Circuit group blocking acknowledgement message (CGBA)**

A message sent in response to a circuit group blocking message to indicate that the requested group of circuits has been blocked.

1.12 **Circuit group reset message (GRS)**

A message sent to release an identified group of circuits when, due to memory mutilation or other causes, it is unknown whether for example, a release or release complete message is appropriate for each of the circuits in the group. If at the receiving end a circuit is remotely blocked, reception of this message should cause that condition to be removed.

1.13 **Circuit group reset acknowledgement message (GRA)**

A message sent in response to a circuit group reset message and indicating that the requested group of circuits has been reset. The message also indicates the maintenance blocking state of each circuit.

1.14 **Circuit group unblocking message (CGU)**

A message sent to the exchange at the other end of an identified group of circuits to cause cancellation in that group of circuits of an engaged condition invoked earlier by a blocking or circuit group blocking message.

1.15 **Circuit group unblocking acknowledgement message (CGUA)**

A message sent in response to a circuit group unblocking message to indicate that the requested group of circuits has been unblocked.

1.16 **Circuit group query message (CQM)**

A message sent on a routine or demand basis to request the far-end exchange to give the state of all circuits in a particular range.

1.17 **Circuit group query response message (CQR)**

A message sent in response to a circuit group query message to indicate the state of all circuits in a particular range.

1.18 **Confusion message (CFN)**

A message sent in response to any message (other than a confusion message) if the exchange does not recognize the message or detects a part of the message as being unrecognized.

1.19 **Connect message (CON)**

A message sent in the backward direction indicating that all the address signals required for routing the call to the called party have been received and that the call has been answered.

1.20 **Continuity message (COT)**

A message sent in the forward direction indicating whether or not there is continuity on the preceding circuit(s) as well as of the selected circuit to the following exchange, including verification of the communication path across the exchange with the specified degree of reliability.

1.21 **Continuity check request message (CCR)**

A message sent by an exchange for a circuit on which a continuity check is to be performed, to the exchange at the other end of the circuit, requesting continuity checking equipment to be attached.

1.22 **Delayed release message (DRS)** *(national use)*

A message sent in either direction indicating that the called or calling party has disconnected but that the network is holding the connection.

1.23 **Facility accepted message (FAA)**

A message sent in response to a facility request message indicating that the requested facility has been invoked.

1.24 **Facility reject message (FRJ)**

A message sent in response to a facility request message to indicate that the facility request has been rejected.

1.25 **Facility request message (FAR)**

A message sent from an exchange to another exchange to request activation of a facility.

1.26 **Forward transfer message (FOT)**

A message sent in the forward direction on semi-automatic calls when the outgoing international exchange operator wants the help of an operator at the incoming international exchange. The message will normally serve to bring an assistance operator (see Recommendation Q.101) into the circuit if the call is automatically set up at the exchange. When the call is completed via an operator (incoming or delay operator) at the incoming international exchange, the message should preferably cause this operator to be recalled.

1.27 **Information message (INF)**

A message sent to convey information in association with a call, which may have been requested in an information request message.

1.28 **Information request message (INR)**

A message sent by an exchange to request information in association with a call.

1.29 **Initial address message (IAM)**

A message sent in the forward direction to initiate seizure of an outgoing circuit and to transmit number and other information relating to the routing and handling of a call.

1.30 **Loop back acknowledgement message (LPA)** *(national use)*

A message sent in the backward direction in response to a continuity check request message indicating that a loop (or transceiver in the case of a 2-wire circuit) has been connected.

1.31 **Overload message (OLM)** *(national use)*

A message sent in the backward direction, on non-priority calls in response to an IAM, to invoke temporary trunk blocking of the circuit concerned when the exchange generating the message is subject to load control.

1.32 **Pass-along message (PAM)**

A message that may be sent in either direction to transfer information between two signalling points along the same signalling path as that used to establish a physical connection between those two points.

1.33 Release message (REL)

A message sent in either direction to indicate that the circuit is being released due to the reason (cause) supplied and is ready to be put into the idle state on receipt of the release complete message. In case the call was forwarded or is to be rerouted, the appropriate indicator is carried in the message together with the redirection address and the redirecting address.

1.34 Release complete message (RLC)

A message sent in either direction in response to the receipt of a released message, or if appropriate to a reset circuit message, when the circuit concerned has been brought into the idle condition.

1.35 Reset circuit message (RSC)

A message sent to release a circuit when, due to memory mutilation or other causes, it is unknown whether for example, a release or a release complete message is appropriate. If, at the receiving end, the circuit is remotely blocked, reception of this message should cause that condition to be removed.

1.36 Resume message (RES)

A message sent in either direction indicating that the calling or called party, after having been suspended, is reconnected.

1.37 Subsequent address message (SAM)

A message that may be sent in the forward direction following an initial address message, to convey additional called party number information.

1.38 Suspend message (SUS)

A message sent in either direction indicating that the calling or called party has been temporarily disconnected.

1.39 Unblocking message (UBL)

A message sent to the exchange at the other end of a circuit to cancel, in that exchange, the engaged condition of the circuit caused by a previously sent blocking or circuit group blocking message.

1.40 Unblocking acknowledgement message (UBA)

A message sent in response to an unblocking message indicating that the circuit has been unblocked.

1.41 Unequipped circuit identification code message (UCIC) *(national use)*

A message sent from one exchange to another when it receives an unequipped circuit identification code.

1.42 User-to-user information message (USR)

A message to be used for the transport of user-to-user signalling independent of call control messages.

2 Signalling information

2.1 Access transport

Information generated on the access side of a call and transferred transparently in either direction between originating and teminating local exchanges. The information is significant to both users and local exchanges.

2.2 Address presentation restricted indicator

Information sent in either direction to indicate that the address information is not to be presented to a public network user, but can be passed to another public network. It may also be used to indicate that the address cannot be ascertained.

2.3 **Address signal**

An element of information in a network number. The address signal may indicate digit values 0 to 9, code 11 or code 12. One address signal value (ST) is reserved to indicate the end of the called party number.

2.4 **Automatic congestion level**

Information sent to the exchange at the other end of a circuit to indicate that a particular level of congestion exists at the sending exchange.

2.5 **Call forwarding may occur indicator**

Information sent in the backward direction indicating that call forwarding may occur, depending on the response received (or lack thereof) from the called party.

2.6 **Call identity**

Information sent in the call reference parameter indicating the identity of a call in a signalling point.

2.7 **Call reference**

Circuit independent information identifying a particular call.

2.8 **Called party number**

Information to identify the called party.

2.9 **Called party's category indicator**

Information sent in the backward direction indicating the category of the called party, e.g. ordinary subscriber or payphone.

2.10 **Called party's status indicator**

Information sent in the backward direction indicating the status of the called party, e.g. subscriber free.

2.11 **Calling party number**

Information sent in the forward direction to identify the calling party.

2.12 **Calling party address request indicator**

Information sent in the backward direction indicating a request for the calling party address to be returned.

2.13 **Calling party address response indicator**

Information sent in response to a request for the calling party address, indicating whether the requested address is included, not included, not available or incomplete.

2.14 **Calling party number incomplete indicator**

Information sent in the forward direction indicating that the complete calling party number is not included.

2.15 **Calling party's category**

Information sent in the forward direction indicating the category of the calling party and, in case of semi-automatic calls, the service language to be spoken by the incoming, delay and assistance operators.

2.16 **Calling party's category request indicator**

Information sent in the backward direction indicating a request for the calling party's category to be returned.

2.17 **Calling party's category response indicator**

Information sent in response to a request for the calling party's category, indicating whether or not the requested information is included in the response.

2.18 **Cause value**

Information sent in either direction indicating the reason for sending the message (e.g. release message). Definitions for each cause value are listed below.

a) *Normal class*

Cause 1 – Unallocated (unassigned) number

This cause indicates that the called party cannot be reached because, although the called party number is in a valid format, it is not currently allocated (assigned).

Cause 2 – No route to specified transit network

This cause indicates that the equipment sending this cause has received a request to route the call through a particular transit network which it does not recognize. The equipment sending this cause does not recognize the transit network either because the transit network does not exist or because that particular transit network, while it does exist, does not serve the equipment which is sending this cause. This cause is supported on a network-dependent basis.

Cause 3 – No route to destination

This cause indicates that the called party cannot be reached because the network through which the call has been routed does not serve the destination desired. This cause is supported on a network-dependent basis.

Cause 4 – Send special information tone

This cause indicates that the called party cannot be reached for reasons that are of long-term nature and that the special information tone should be returned to the calling party.

Cause 5 – Misdialled trunk prefix

This cause indicates the erroneous inclusion of a trunk prefix in the called party number (for national use only).

Cause 16 – Normal call clearing

This cause indicates that the call is being cleared because one of the users involved in the call has requested that the call be cleared. Under normal situation, the source of this cause is not the network.

Cause 17 – User busy

This cause is used when the called party has indicated the inability to accept another call. It is noted that the user equipment is compatible with the call.

Cause 18 – No user responding

This cause is used when a called party does not respond to a call establishment message with either an alerting or connect indication within the prescribed period of time.

Cause 19 – No answer from user (user alerted)

This cause is used when the called party has been alerted but does not respond with a connect indication within the prescribed period of time.

Cause 21 – Call rejected

This cause indicates that the equipment sending this cause does not wish to accept this call, although it could have accepted the call because the equipment sending this cause is neither busy or incompatible.

Cause 22 – Number changed

This cause is returned to a calling party when the called number indicated by the calling party is no longer assigned. The new called number may optionally be included in the diagnostic field. If a network does not support this capability, cause number 1 shall be used.

Cause 27 – Destination out of order

This cause indicates that the destination requested by the user cannot be reached because the interface to the destination is not functioning correctly. The term "not functioning correctly" indicates that a signalling message was unable to be delivered to the remote party; e.g. a physical layer or data link layer failure at the remote party, user equipment off-line, etc.

Cause 28 – Address incomplete

This cause indicates that the called party cannot be reached because the called party number is not in a valid format or is not complete. This condition may be determined in the incoming international exchange (or in the national destination network):

- immediately after reception of an ST signal, or
- on time-out after the last received digit.

Cause 29 – Facility rejected

This cause is returned when a supplementary service requested by the user cannot be provided by the network.

Cause 31 – Normal, unspecified

This cause is used to report a normal event only when no other cause in the normal class applies.

b) *Resource Unavailable class*

Cause 34 – No circuit available

This cause indicates that there is no appropriate circuit presently available to handle the call.

Cause 38 – Network out of order

This cause indicates that the network is not functioning correctly and that the condition is likely to last a relatively long period of time, e.g. immediately re-attempting the call is not likely to be successful.

Cause 41 – Temporary failure

This cause indicates that the network is not functioning correctly and that the condition is not likely to last a long period of time, e.g. the use may wish to try another call attempt almost immediately.

Cause 42 – Switching equipment congestion

This cause indicates that the switching equipment generating this cause is experiencing a period of high traffic.

Cause 47 – Resource unavailable, unspecified

This cause is used to report a resource unavailable event only when no other cause in the resource unavailable class applies.

c) *Service or Option Not Available class*

Cause 50 – Requested facility not subscribed

This cause indicates that the user has requested a supplementary service which is implemented by the equipment which generated this cause, but the user is not authorized to use.

Cause 55 – Incoming calls barred within CUG

This cause indicates that although the called party is a member of the CUG for the incoming CUG call, incoming calls are not allowed within this CUG.

Cause 57 – Bearer capability not authorized

This cause indicates that the user has requested a bearer capability which is implemented by the equipment which generated this cause but the user is not authorized to use.

Cause 58 – Bearer capability not presently available

This cause indicates that the user has requested a bearer capability which is implemented by the equipment which generated this cause but which is not available at this time.

Cause 63 – Service or option not available, unspecified

This cause is used to report a service or option not available event only when no other cause in the service or option not available class applies.

d) *Service or Option Not Implemented class*

Cause 65 – Bearer capability not implemented

This cause indicates that the equipment sending this cause does not support the bearer capability requested.

Cause 69 – Requested facility not implemented

This cause indicates that the equipment sending this cause does not support the requested supplementary service.

Cause 70 – Only restricted digital information bearer capability is available

This cause indicates that the calling party has requested an unrestricted bearer service but that the equipment sending this cause only supports the restricted version of the requested bearer capability.

Cause 79 – Service or option not implemented, unspecified

This cause is used to report a service or option not implemented event only when no other cause in the service or option not implemented class applies.

e) *Invalid Message (e.g. Parameter out of Range) class*

Cause 87 – Called user not member of CUG

This cause indicates that the called user for the incoming CUG call is not a member of the specified CUG.

Cause 88 – Incompatible destination

This cause indicates that the equipment sending this cause has received a request to establish a call which has low layer compatibility or high layer compatibility or other compatibility attributes (e.g. data rate) which cannot be accommodated.

Cause 91 – Invalid transit network selection

This cause indicates that a transit network identification was received which is of an incorrect format as defined in Annex C of Recommendation Q.931.

Cause 95 – Invalid message, unspecified

This cause is used to report an invalid message event only when no other cause in the invalid message class applies.

f) *Protocol error (e.g. Unknown Message) class*

Cause 97 – Message type non-existent or not implemented

This cause indicates that the equipment sending this cause has received a message which it does not recognize either because this is a message type not defined or defined but not implemented by the equipment sending this cause.

Cause 99 – Parameter non-existent or not implemented – discarded

This cause indicates that the equipment sending this cause has received a message which includes parameters not recognized because the parameters are not defined or are defined but not implemented by the equipment sending the cause. The cause indicates that the parameter(s) were discarded.

Cause 103 – Parameter non-existent or not implemented – passed on

This cause indicates that the equipment sending this cause has received a message which includes parameters not recognized because the parameters are not defined or are defined but not implemented by the equipment sending the cause. The cause indicates that the parameter(s) were ignored. In addition, if the equipment sending this cause is an intermediate point, then this cause indicates that the parameter(s) were passed on unchanged.

Cause 111 – Protocol error, unspecified

This cause is used to report a protocol error event only when no other cause in the protocol error class applies.

g) *Interworking class*

Cause 127 – Interworking, unspecified

This cause indicates that there has been interworking with a network which does not provide causes for actions it takes; thus, the precise cause for a message which is being sent cannot be ascertained.

2.19 **Charge indicator**

Information sent in the backward direction indicating whether or not the call is chargeable.

2.20 **Charge information request indicator** *(national use)*

Information sent in either direction requesting charge information to be returned.

2.21 **Charge information response indicator** *(national use)*

Information sent in response to a request for charge information indicating whether or not the requested information is included.

2.22 **Circuit group supervision message type indicator**

Information sent in a circuit group blocking or unblocking message, indicating whether blocking (unblocking) is maintenance oriented or hardware oriented.

2.23 **Circuit identification code**

Information identifying the physical path between a pair of exchanges.

2.24 **Circuit state indicator**

Information indicating the state of a circuit according to the sending exchange.

2.25 **Closed user group call indicator**

Information indicating whether or not the concerned call can be set up as a closed user group call and, if a closed user group call, whether or not outgoing access is allowed.

2.26 **Closed user group interlock code**

Information uniquely identifying a closed user group within a network.

2.27 **Coding standard**

Information sent in association with a parameter (e.g. cause indicators) identifying the standard in which the parameter format is described.

2.28 **Connected number**

Information sent in the backward direction to identify the connected party.

2.29 **Connection request**

Information sent in the forward direction on behalf of the signalling connection control part requesting the establishment of an end-to-end connection.

2.30 **Continuity check indicator**

Information sent in the forward direction indicating whether or not a continuity check will be performed on the circuit(s) concerned or is being (has been) performed on a previous circuit in the connection.

2.31 **Continuity indicator**

Information sent in the forward direction indicating whether or not the continuity check on the outgoing circuit was successful. A continuity check successful indication also implies continuity of the preceding circuits and successful verification of the path across the exchange with the specified degree of reliability.

2.32 **Credit**

Information sent in a connection request, indicating the window size requested by the signalling connection control part for an end-to-end connection.

3.33 **Diagnostic**

Information sent in association which a cause value and which provides supplementary information about the reason for sending the message.

2.34 **Echo control device indicator**

Information indicating whether or not a half echo control device is included in the connection.

2.35 **End-to-end information indicator**

Information sent in either direction indicating whether or not the sending exchange has further call information available for end-to-end transmission. In the forward direction, an indication that end-to-end information is available will imply that the destination exchange may obtain the information before alerting the called party.

2.36 **End-to-end method indicator**

Information sent in either direction indicating the available methods, if any, for end-to-end transfer of information.

2.37 **Event indicator**

Information sent in the backward direction indicating the type of event which caused a call progress message to be sent to the originating local exchange.

2.38 **Event presentation restricted indicator**

Information sent in the backward direction indicating that the event should not be presented to the calling party.

2.39 **Extension indicator**

Information indicating whether or not the associated octet has been extended.

2.40 **Facility indicator**

Information sent in facility related messages identifying the facility or facilities with which the message is concerned.

2.41 **Holding indicator** *(national use)*

Information sent in either direction indicating that holding of the connection is requested.

2.42 **Hold provided indicator** *(national use)*

Information sent in either direction indicating that the connection will be held after the calling or called party has attempted to release.

2.43 **In-band information indicator**

Information sent in the backward direction indicating that in-band information or an appropriate pattern is now available.

2.44 **Internal network number indicator**

Information sent to the destination exchange indicating whether or not the call is allowed should the called party number prove to be an internal network number (e.g. mobile access point).

2.45 **Interworking indicator**

Information sent in either direction indicating whether or not Signalling System No. 7 is used in all parts of the network connection.

2.46 **ISDN access indicator**

Information sent in either direction indicating whether or not the access signalling protocol is ISDN.

2.47 **ISDN user part indicator**

Information sent in either direction to indicate that the ISDN user part is used in all preceding parts of the network connection. When sent in the backward direction, the preceding parts are those towards the called party.

2.48 **ISDN user preference indicator**

Information sent in the forward direction indicating whether or not the ISDN user part is required or preferred in all parts of the network connection.

2.49 **Local reference**

Information sent in the connection request, indicating the local reference allocated by the signalling connection control part to an end-to-end connection.

2.50 **Location**

Information sent in either direction indicating where an event (e.g. release) was generated.

2.51 **Malicious call identification request indicator** *(national use)*

Information sent in the backward direction to request the identity of the calling party for the purpose of malicious call idenification.

2.52 **Modification indicator**

Information sent in the call modification indicators parameter indicating whether the call modification is to service 1 or service 2.

2.53 **National/international call indicator**

Information sent in the forward direction indicating in the destination national network whether the call has to be treated as an international call or as a national call.

2.54 **Nature of address indicator**

Information sent in association with an address indicating the nature of that address, e.g. ISDN international number, ISDN national significant number, or ISDN subscriber number.

2.55 **Numbering plan indicator**

Information sent in association with a number indicating the numbering plan used for that number (e.g. ISDN number, Telex number).

2.56 **Odd/even indicator**

Information sent in association with an address, indicating whether the number of address signals contained in the address is even or odd.

2.57 **Original called number**

Information sent in the forward direction when a call is redirected and identifies the original called party.

2.58 **Original redirection reason**

Information sent in either direction indicating the reason why the call was originally redirected.

2.59 **Point code**

Information sent in the call reference parameter indicating the code of the signalling point in which the call identity allocated to the call reference is relevant.

2.60 **Protocol class**

Information sent in the connection request parameter indicating the protocol class requested by the signalling connection control part for the end-to-end connection.

2.61 **Protocol control indicator**

Information consisting of the end-to-end method indicator, the interworking indicator, the end-to-end information indicator, the SCCP method indicator and the ISDN user part indicator. The protocol control indicator is contained in both the forward and backward call indicators parameter field and describes the signalling capabilities within the network connection.

2.62 **Range**

Information sent in a circuit group supervision message (e.g. circuit group blocking) to indicate the range of circuits affected by the action in the message.

2.63 **Recommendation indicator**

Information sent in association with a cause value identifying the Recommendation to which the cause value applies.

2.64 **Redirecting indicator**

Information sent in either direction indicating whether the call has been forwarded or rerouted and whether or not presentation of redirection information to the calling party is restricted.

2.65 **Redirecting number**

Information sent in the forward direction when a call is redirected more than once, indicating the number from which the call was last redirected.

2.66 **Redirecting reason**

Information sent in either direction indicating, in the case of calls undergoing multiple redirections, the reason why the call has been redirected.

2.67 **Redirection counter**

Information sent in either direction indicating the number of redirections which have occurred on a call.

2.68 **Redirection number**

Information sent in the backward direction indicating the number towards which the call must be rerouted or has been forwarded.

2.69 **Routing label**

Information provided to the message transfer part for the purpose of message routing (see Recommendation Q.704, § 2.2).

2.70 **Satellite indicator**

Information sent in the forward direction indicating the number of satellite circuits in the connection.

2.71 **SCCP method indicator**

Information sent in either direction indicating the available SCCP methods, if any, for end-to-end transfer of information.

2.72 **Screening indicator**

Information sent in either direction to indicate whether the address was provided by the user or network.

2.73 **Signalling point code** *(national use)*

Information sent in a release message to identify the signalling point in which the call failed.

2.74 **Solicited information indicator**

Information sent in an information message to indicate whether or not the message is a response to an information request message.

2.75 **Status**

Information sent in a circuit group supervision message (e.g. circuit group blocking) to indicate the specific circuits, within the range of circuits stated in the message, that are affected by the action specified in the message.

2.76 **Suspend/Resume indicator**

Information sent in the suspend and resume messages to indicate whether suspend/resume was initiated by an ISDN subscriber or by the network.

2.77 **Temporary trunk blocking after release** *(national use)*

Information sent to the exchange at the other end of a circuit (trunk) to indicate low level of congestion at the sending exchange and that the circuit (trunk) should not be re-occupied by the receiving exchange for a short period of time after release.

2.78 **Transit network selection** *(national use)*

Information sent in the initial address message indicating the transit network(s) requested to be used in the call.

2.79 **Transmission medium requirement**

Information sent in the forward direction indicating the type of transmission medium required for the connection (e.g. 64 kbit/s unrestricted, speech).

2.80 **User service information**

Information sent in the forward direction indicating the bearer capability requested by the calling party.

2.81 **User-to-user indicators**

Information sent in association with a request (or response to a request) for user-to-user signalling supplementary service(s).

2.82 **User-to-user information**

Information generated by a user and transferred transparently through the interexchange network between the originating and terminating local exchanges.

TABLE 1/Q.762 (Sheet 1 of 3)

Mandatory or optional parameters in the ISDN user part messages

Parameter field	Sub-field	Message: Group	Forward set-up		General set-up			Backward set-up			Call supervision			Circuit supervision							Circuit group supervision				In-call modification			End-to-end	
		Type Q.763 ref. (§)	IAM	SAM	INR	INF	COT	ACM	CON	CPG	ANM	FOT	REL	DRS	RLC	CCR RSC LPA	BLO UBL UCIC	BLA UBA OLM	SUS RES	CFN	CGB CGU	CGBA CGU-A	GRS GRA COM	COR	CMR CMC CMPJ	FAA FAR	FRJ	PAM	USR
Message type		2.1	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Access transport		3.2	O			O		O		O	O		O																O
Automatic congestion level		3.3											O																
Backward call indicators	Charge indicator Called party's status ind. Called party's category ind. End-to-end method ind. Interworking ind. End-to-end information ind. ISDN user part indicator Holding indicator ISDN access indicator Echo control device indicator SCCP Method indicator	3.4						M	M	O	O																		
Call modification ind.	Modification indicator	3.5																							M				
Call reference	Call identity Point code	3.6	O		O	O		O	O	O	O	O		O					O						O	O	O		O
Called party number	Odd/even indicator Nature of address Internal network number ind. Numbering plan indicator Address signals	3.7	M																										
Redirection number		3.30								O			O																
Calling party number	Odd/even indicator Nature of address Number incomplete indicator Numbering plan indicator Address pres. restricted ind. Screening indicator Address signals	3.8	O			O																							
Calling party's category		3.9	M			O																							
Cause indicators	Coding standard Location Recommendation Cause value Diagnostic	3.10						O		O			M		O					M							M		
Circuit group supervision message type ind.	Type indicator	3.11																			M	M							
Circuit state indicator		3.12																						M					
CUG interlock code	Network identity Binary code	3.13	O																										

TABLE 1/Q.762 (Sheet 2 of 3)

Mandatory or optional parameters in the ISDN user part messages

Message:		Group	Forward set-up		General set-up			Backward set-up			Call supervision			Circuit supervision							Circuit group supervision				In-call modification			End-to-end	
Parameter field	Sub-field	Type Q.763 ref. (§)	IAM	SAM	INR	INF	COT	ACM	CON	CPG	ANM	FOT	REL	DRS	RLC	CCR RSC LPA	BLO UBL UCIC	BLA UBA OLM	SUS RES	CFN	CGB CGU	CGBA CGU-A	GRS GRA COM	COR	CMR CMC CMPJ	FAA FAR	FRJ	PAM	USR
Connected number	Odd/even indicator Nature of address Numbering plan indicator Address pres. restricted ind. Screening indicator Address signals	3.14						O	O		O																		
Connection request	Local reference Point code Protocol class Credit	3.15	O			O																							
Continuity indicators	Continuity indicators	3.16					M																						
Event information	Event indicator Event pres. restrocted ind.	3.18								M																			
Facility indicator		3.19																								M	M		
Forward call indicator	National/international call ind. End-to-end method indicator Interworking indicator End-to-end information ind. ISDN user part indicator ISDN user part preference ind. ISDN access indicator SCCP method indicator	3.20	M																										
Information indicators	Calling party address resp. ind. Hold provided indicator Calling party's cat. resp. ind. Charge info. response ind. Solicited information ind.	3.21				M																							
Information request indicators	Calling party address request ind. Holding indicator Calling party's category req. ind. Charge information request ind. Malicious call ID request ind.	3.22			M																								
Nature of connection indicators	Satellite indicator Continuity check indicator Echo control device indicator	3.23	M																										
Optional backward call indicators	In-band information indicator Call forwarding may occur ind.	3.24						O	O	O	O																		

TABLE 1/Q.762 (Sheet 3 of 3)

Mandatory or optional parameters in the ISDN user part messages

Parameter field	Sub-field	Group	Forward set-up		General set-up			Backward set-up			Call supervision			Circuit supervision							Circuit group supervision				In-call modification			End-to-end	
	Message :	Type Q.763 ref. (§)	IAM	SAM	INR	INF	COT	ACM	CON	CPG	ANM	FOT	REL	DRS	RLC	CCR RSC LPA	BLO UBL UCIC	BLA UBA OLM	SUS RES	CFN	CGB CGU	CGBA CGU-A	GRS GRA COM	COR	CMR CMC CMPJ	FAA FAR	FRJ	PAM	USR
Optional forward call indicators	CUG call indicator	3.25	O																										
Original called number	Odd/even indicator Nature of address ind. Numbering plan Address pres. restricted ind. Address signals	3.26	O																										
Redirecting number		3.28	O																										
Range & status	Range Status	3.27																			M	M	M	M					
Redirection information	Redirecting indicator Redirecting reason Redirection counter Original redirection reason	3.29	O										O																
Signalling point code		3.31											O																
Subsequent number	Odd/even indicator Address signals	3.32		M																									
Suspend/resume indicators		3.33																	M										
Transit network selection	Odd/even indicator Type of network identification Network identification plan Network identification	3.34	O																										
Transmission medium requirement		3.35	M																										
User service information	Coding standard Information transfer capability Transfer mode Information transfer rate Structure Configuration Establishment Symmetry User information protocols	3.36	O																										
User-to-user indicators	Type Service 1 Service 2 Service 3	3.37	O					O	O	O	O															O	O		
User-to-user information		3.38	O					O	O	O	O		O												O				M

TABLE A-2/Q.762

ISDN user part message acronyms

English	*French*	*Spanish*	
ACM	ACO	MDC	Address complete
ANM	REP	RST	Answer
BLA	BLA	ARB	Blocking acknowledgement
BLO	BLO	BLO	Blocking
CCR	CCD	PPC	Continuity check request
CFN	ICO	CFN	Confusion
CGB	BLG	BGC	Circuit group blocking
CGBA	BGA	ARBG	Circuit group blocking acknowledgement
CGU	DBG	DGC	Circuit group unblocking
CGUA	DGA	ARDG	Circuit group unblocking acknowledgement
CMC	MAE	MLC	Call modification completed
CMR	MAD	PML	Call modification request
CMRJ	MAR	RFA	Call modification reject
CON	CON	CNX	Connect
COT	CCP	CON	Continuity
CPG	PRG	PRL	Call progress
CRG	TAX	TAS	Charge information
CQM	IGD	IGC	Circuit group query
CQR	IGR	RIG	Circuit group query response
DRS	LID	LID	Delayed release
FAA	SUAC	FAA	Facility accepted
FAR	SUDM	PFA	Facility request
FOT	IOP	INT	Forward transfer
FRJ	SURF	RFA	Facility reject
GRA	RZA	ARRG	Circuit group reset acknowledgement
GRS	RZG	RGC	Circuit group reset
IAM	MIA	MID	Initial address
INF	INF	INF	Information
INR	IND	PIN	Information request
LPA	BOA	AEB	Loop back acknowledgment
OLM	SUR	SBC	Overload
PAM	FAP	MDP	Pass along
REL	LIB	LIB	Release
RES	RPR	REA	Resume
RLC	LIT	LIC	Release complete
RSC	RZC	RCI	Reset circuit
SAM	MSA	MSD	Subsequent address
SUS	SUS	SUS	Suspend
UBL	DBO	DBL	Unblocking
UBA	DBA	ARD	Unblocking acknowledgement
UCIC	CINE	CICN	Unequipped circuit identification code
USR	UAU	IUU	User-to-user information

FORMATS AND CODES

1 General

ISDN user part messages are carried on the signalling link by means of signal units the format of which is described in Recommendation Q.703, § 2.2.

The format of and the codes used in the service information octet are described in Recommendation Q.704, § 14.2. The service indicator for the ISDN user part is coded 0101.

The signalling information field of each message signal unit containing an ISDN user part message consists of an integral number of octets and encompasses the following parts (see Figure 1/Q.763):

a) routing label;

b) circuit identification code;

c) message type code;

d) the mandatory fixed part;

e) the mandatory variable part;

f) the optional part, which may contain fixed length and variable length parameter fields.

Note – The service information octet, the routing label and circuit identification code are not included in the SCCP user data parameter transferred between the ISDN user part and signalling connection control part.

A description of the various message parts is given in the following sections.

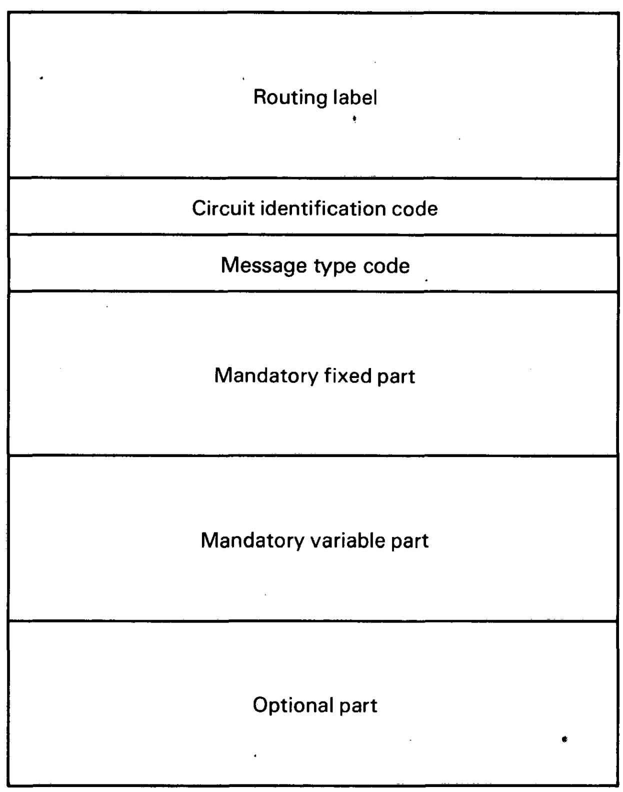

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FIGURE 1/Q.763

ISDN user part message parts

1.1 *Routing label*

The format and codes used for the routing label are described in Recommendation Q.704, § 2.2. For each individual circuit connection, the same routing label must be used for each message that is transmitted for that connection.

1.2 *Circuit identification code*

The format of the circuit identification code (CIC) is shown in Figure 2/Q.763.

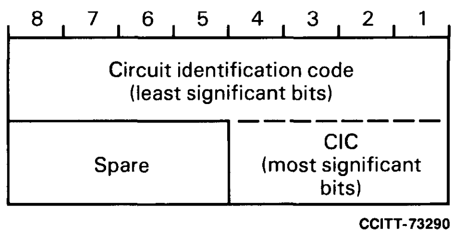

FIGURE 2/Q.763

Circuit identification field

The allocation of circuit identification codes to individual circuits is determined by bilateral agreement and/or in accordance with applicable predetermined rules.

For international applications, the four spare bits of the circuit identification field are reserved for CIC extension, provided that bilateral agreement is obtained before any increase in size is performed. For national applications, the four spare bits can be used as required.

Allocations for certain applications are defined below:

a) *2048 kbit/s digital path*

For circuits which are derived from a 2048 kbit/s digital path (Recommendations G.732 and G.734) the circuit identification code contains in the 5 least significant bits a binary representation of the actual number of the time slot which is assigned to the communication path.

The remaining bits in the circuit identification code are used, where necessary, to identify these circuits uniquely among all other circuits of other systems interconnecting an originating and destination point.

b) *8448 kbit/s digital path*

For circuits which are derived from a 8448 kbit/s digital path (Recommendations G.744 and G.747) the circuit identification code contains in the 7 least significant bits an identfication of the circuit which is assigned to the communication path. The codes in Table 1/Q.763 are used.

The remaining bits in the circuit identification code are used, where necessary, to identify these circuits uniquely among all other circuits of other systems interconnecting an originating and destination point.

c) *Frequency division multiplex (FDM) systems in networks using the 2048 kbit/s pulse code modulation standard*

For frequency division multiplex systems existing in networks that also use the 2048 kbit/s pulse code modulation standard, the circuit identification code contains in the 6 least significant bits the identification of a circuit within a group of 60 circuits carried by 5 basic frequency division multiplex groups which may or may not be part of the same supergroup. The codes in Table 2/Q.763 are used.

The remaining bits in the circuit identification code are used, where necessary, to identify these circuits uniquely among all other circuits of other systems interconnecting an originating and destination point.

TABLE 1/Q.763

0 0 0 0 0 0 0	Circuit 1
0 0 0 0 0 0 1 | 0 0 1 1 1 1 1	Circuit 2 | Circuit 32
0 1 0 0 0 0 0 | 1 1 1 1 1 1 0	Circuit 33 | Circuit 127
1 1 1 1 1 1 1	Circuit 128

TABLE 2/Q.763

0 0 0 0 0 0	Unallocated	
0 0 0 0 0 1 | 0 0 1 1 0 0	Circuit 1 | Circuit 12	1st basic (FDM) group
0 0 1 1 0 1 0 0 1 1 1 0 0 0 1 1 1 1 0 1 0 0 0 0 0 1 0 0 0 1 | 0 1 1 0 0 1	Circuit 1 Circuit 2 Circuit 3 Unallocated Circuit 4 | Circuit 12	2nd basic (FDM) group
0 1 1 0 1 0 | 0 1 1 1 1 1 1 0 0 0 0 0 1 0 0 0 0 1 | 1 0 0 1 1 0	Circuit 1 | Circuit 6 Unallocated Circuit 7 | Circuit 12	3rd basic (FDM) group
1 0 0 1 1 1 | 1 0 1 1 1 1 1 1 0 0 0 0 1 1 0 0 0 1 1 1 0 0 1 0 1 1 0 0 1 1	Circuit 1 | Circuit 9 Unallocated Circuit 10 Circuit 11 Circuit 12	4th basic (FDM) group
1 1 0 1 0 0 | 1 1 1 1 1 1	Circuit 1 | Circuit 12	5th basic (FDM) group

1.3 *Message type code*

The message type code consists of a one octet field and is mandatory for all messages. The message type code uniquely defines the function and format of each ISDN user part message.

The allocation with reference to the appropriate descriptive section of this Recommendation is summarized in Table 3/Q.763.

1.4 *Formatting principles*

Each message consists of a number of PARAMETERS listed and described in § 2. Each parameter has a NAME which is coded as a single octet (see Table 4/Q.763). The length of a parameter may be fixed or variable, and a LENGTH INDICATOR of one octet for each parameter may be included as described below.

The detailed format is uniquely defined for each message type as described in § 3.

A general format diagram is shown in Figure 3/Q.763.

1.5 *Mandatory fixed part*

Those parameters that are mandatory and of fixed length for a particular message type will be contained in the *mandatory fixed part.* The position, length and order of the parameters is uniquely defined by the message type, thus the names of the parameters and the length indicators are not included in the message.

1.6 *Mandatory variable part*

Mandatory parameters of variable length will be included in the *mandatory variable part.* Pointers are used to indicate the beginning of each parameter. Each pointer is encoded as a single octet. The name of each parameter and the order in which the pointers are sent is implicit in the message type. Parameter names are, therefore, not included in the message. The details of how pointers are encoded is found in § 2.3. The number of parameters, and thus the number of pointers is uniquely defined by the message type.

A pointer is also included to indicate the beginning of the optional part. If the message type indicates that no optional part is allowed, then this pointer will not be present. If the message type indicates that an optional part is possible, but there is no optional part included in this particular message than a pointer field containing all zeros will be used. It is recommended that all future message types with a mandatory variable part indicate that an optional part is allowed.

All the pointers are sent consecutively at the beginning of the mandatory variable part. Each parameter contains the parameter length indicator followed by the contents of the parameters.

1.7 *Optional part*

The optional part consists of parameters that may or may not occur in any particular message type. Both fixed length and variable length parameters may be included. Optional parameters may be transmitted in any order. Each optional parameter will include the parameter name (one octet) and the length indicator (one octet) followed by the parameter contents.

1.8 *End of optional parameters octet*

If optional parameters are present and after all optional parameters have been sent, an "end of optional parameters" octet containing all zeros will be transmitted.

1.9 *Order of transmission*

Since all the fields consist of an integral number of octets, the formats are presented as a stack of octets. The first octet transmitted is the one shown at the top of the stack and the last is the one at the bottom (see Figure 3/Q.763).

Unless otherwise indicated, within each octet and subfield the bits are transmitted with the least significant bit first.

1.10 *Coding of spare bits*

Spare bits are coded 0 unless indicated otherwise.

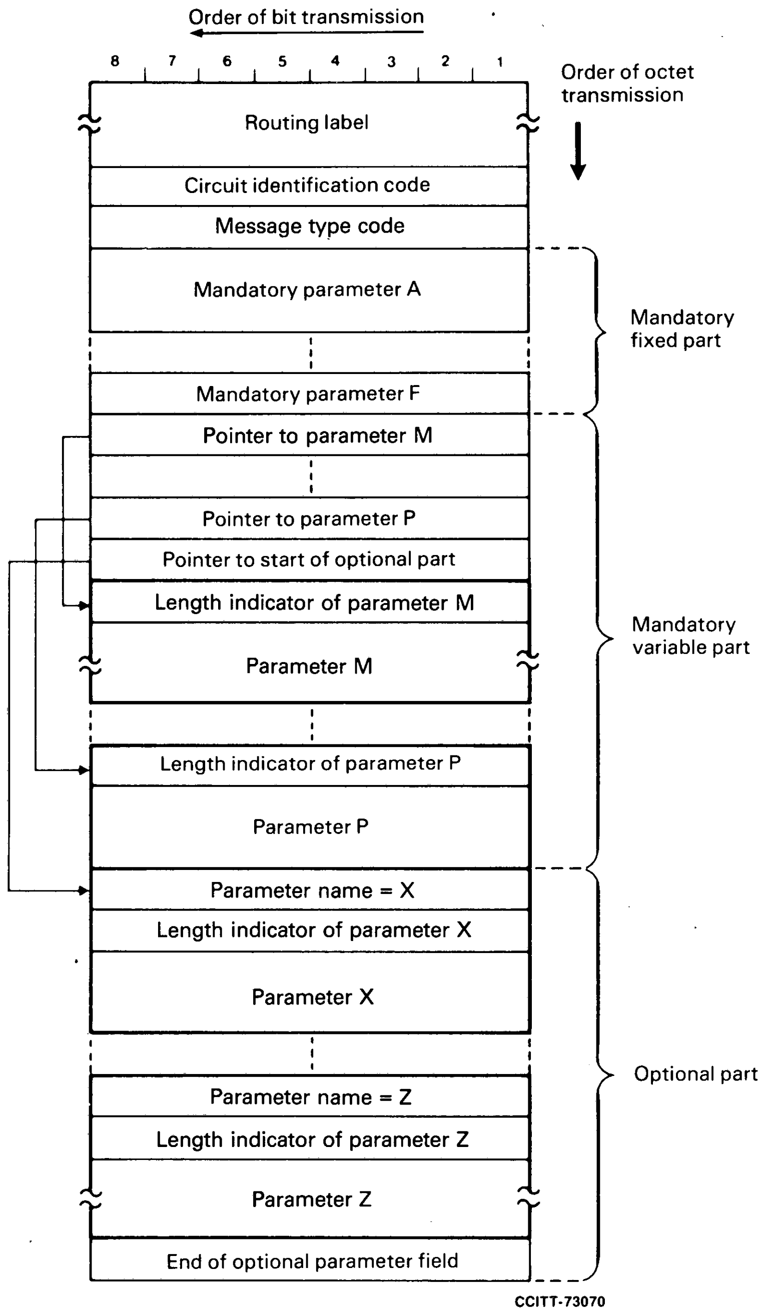

FIGURE 3/Q.763

1.11 *National message types and parameters*

If message type codes and parameter name codes are required for national uses not included in this Recommendation, the codes chosen should be from the highest code downwards, that is, starting at code 11111111. Codes in the range 11111111 to 11100000 are reserved exclusively for this purpose.

2 Parameter formats and codes

2.1 *Message type codes*

The encoding of the message type is shown in Table 3/Q.763.

TABLE 3/Q.763

Message type	Reference (Table)	Code
Address complete	5/Q.763	00000110
Answer	6/Q.763	00001001
Blocking	23/Q.763	00010011
Blocking acknowledgement	23/Q.763	00010101
Call modification completed	24/Q.763	00011101
Call modification request	24/Q.763	00011100
Call modification reject	24/Q.763	00011110
Call progress	7/Q.763	00101100
Circuit group blocking	25/Q.763	00011000
Circuit group blocking acknowledgement	25/Q.763	00011010
Circuit group query	26/Q.763	00101010
Circuit group query response	8/Q.763	00101011
Circuit group reset	26/Q.763	00010111
Circuit group reset acknowledgement	9/Q.763	00101001
Circuit group unblocking	25/Q.763	00011001
Circuit group unblocking acknowledgement	25/Q.763	00011011
Charge information [a]	(see Note)	00110001
Confusion	10/Q.763	00101111
Connect	11/Q.763	00000111
Continuity	12/Q.763	00000101
Continuity check request	23/Q.763	00010001
Delayed release [a]	21/Q.763	00100111
Facility accepted	27/Q.763	00100000
Facility reject	13/Q.763	00100001
Facility request	27/Q.763	00011111
Forward transfer	21/Q.763	00001000
Information	14/Q.763	00000100
Information request	15/Q.763	00000011
Initial address	16/Q.763	00000001
Loop back acknowledgement [a]	23/Q.763	00100100
Overload [a]	23/Q.763	00110000
Pass-along	28/Q.763	00101000
Release	17/Q.763	00001100
Release complete	18/Q.763	00010000
Reset circuit	23/Q.763	00010010
Resume	22/Q.763	00001110
Subsequent address	19/Q.763	00000010
Suspend	22/Q.763	00001101
Unblocking	23/Q.763	00010100
Unblocking acknowledgement	23/Q.763	00010110
Unequipped CIC [a]	23/Q.763	00101110
User-to-user information	20/Q.763	00101101
Reserved (used in 1984 version)		00001010 00001011 00001111 00100010 00100011 00100101 00100110

[a] For national use only

Note – The format of this message is a national matter.

2.2 *Coding of the length indicator*

The length indicator field is binary coded to indicate the number of octets in the parameter content field. The length indicated does not include the parameter name octet or the length indicator octet.

2.3 *Coding of the pointers*

The pointer value (in binary) gives the number of octets between the pointer itself (included) and the first octet (not included) of the parameter associated with that pointer.

The pointer value all zeros is used to indicate that, in the case of optional parameters, no optional parameter is present.

3 **ISDN user part parameters**

3.1 *Parameter names*

The parameter name codes are given in Table 4/Q.763 together with references to the subsections in which they are described.

3.2 *Access transport*

The format of the access transport parameter field is shown in Figure 4/Q.763.

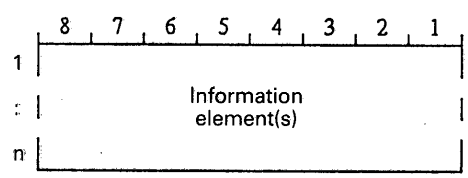

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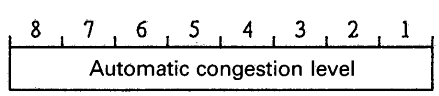
FIGURE 4/Q.763

Access transport parameter field

The information element is coded as described in Recommendation Q.931, § 4.5. Multiple Q.931 information elements can be included within the access transport parameter. The information elements applicable to a particular usage of the access transport parameter are dependent on, and will be determined by, the relevant procedures.

3.3 *Automatic congestion level*

The format of the automatic congestion level parameter field is shown in Figure 5/Q.763.



T1110040-88

FIGURE 5/Q.763

Automatic congestion level parameter field

TABLE 4/Q.763

Parameter name	Reference (§)	Code
Access transport	3.2	00000011
Automatic congestion level	3.3	00100111
Backward call indicators	3.4	00010001
Call modification indicators	3.5	00010111
Call reference	3.6	00000001
Called party number	3.7	00000100
Calling party number	3.8	00001010
Calling party's category	3.9	00001001
Cause indicators	3.10	00010010
Circuit group supervision message type indicator	3.11	00010101
Circuit state indicator	3.12	00100110
Closed user group interlock code	3.13	00011010
Connected number	3.14	00100001
Connection request	3.15	00001101
Continuity indicators	3.16	00010000
End of optional parameters	3.17	00000000
Event information	3.18	00100100
Facility indicator	3.19	00011000
Forward call indicators	3.20	00000111
Information indicators	3.21	00001111
Information request indicators	3.22	00001110
Nature of connection indicators	3.23	00000110
Optional backward call indicators	3.24	00101001
Optional forward call indicators	3.25	00001000
Original called number	3.26	00101000
Range and status	3.27	00010110
Redirecting number	3.28	00001011
Redirection information	3.29	00010011
Redirection number	3.30	00001100
Signalling point code [a]	3.31	00011110
Subsequent number	3.32	00000101
Suspend/Resume indicators	3.33	00100010
Transit network selection [a]	3.34	00100011
Transmission medium requirement	3.35	00000010
User service information	3.36	00011101
User-to-user indicators	3.37	00101010
User-to-user information	3.38	00100000
Reserved (used in 1984 version, Red Book)		00010100 00011001 00011011 00011100 00011111
Reserved for multi-slot identifier		00100101

[a] For national use only

The following codes are used in the automatic congestion level parameter field:

00000000	spare
00000001	congestion level 1 exceeded
00000010	congestion level 2 exceeded
00000011 to 11111111	spare

3.4 *Backward call indicators*

The format of the backward call indicators parameter field is shown in Figure 6/Q.763.

	8	7	6	5	4	3	2	1
1	H	G	F	E	D	C	B	A
2	P	O	N	M	L	K	J	I

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FIGURE 6/Q.763

Backward call indicators parameter field

The following codes are used in the backward call indicators parameter field:

bits B A:	Charge indicator
0 0	no indication
0 1	no charge
1 0	charge
1 1	spare
bits D C:	Called party's status indicator
0 0	no indication
0 1	subscriber free
1 0	connect when free
1 1	spare
bits F E:	Called party's category indicator
0 0	no indication
0 1	ordinary subscriber
1 0	payphone
1 1	spare
bits H G:	End-to-end method indicator (Note)
0 0	no end-to-end method available (only link-by-link method available)
0 1	pass along method available
1 0	SCCP method available
1 1	pass along and SCCP methods available
bit I:	Interworking indicator (Note)
0	no interworking encountered
1	interworking encountered
bit J:	End-to-end information indicator (Note)
0	no end-to-end information available
1	end-to-end information available
bit K:	ISDN User Part indicator (Note)
0	ISDN User Part not used all the way
1	ISDN User Part used all the way
bit L:	Holding indicator (national use)
0	holding not requested
1	holding requested

bit M: ISDN access indicator
- 0 terminating access non-ISDN
- 1 terminating access ISDN

bit N: Echo control device indicator
- 0 incoming half echo control device not included
- 1 incoming half echo control device included

bits P O: SCCP method indicator
- 0 0 no indication
- 0 1 connectionless method available
- 1 0 connection oriented method available
- 1 1 connectionless and connection oriented methods available

Note – Bits G-K and O-P constitute the protocol control indicator.

3.5 *Call modification indicators*

The format of the call modification indicators parameter field is shown in Figure 7/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 7/Q.763

Call modification indicators parameter field

The following codes are used in the call modification indicators parameter field:

bits B A: Modification indicator
- 0 0 spare
- 0 1 modify to service 1
- 1 0 modify to service 2
- 1 1 spare

bits H C: Spare

Note – Service 1 and 2 are described by the transmission medium requirement.

3.6 *Call reference*

The format of the call reference parameter is shown in Figure 8/Q.763.

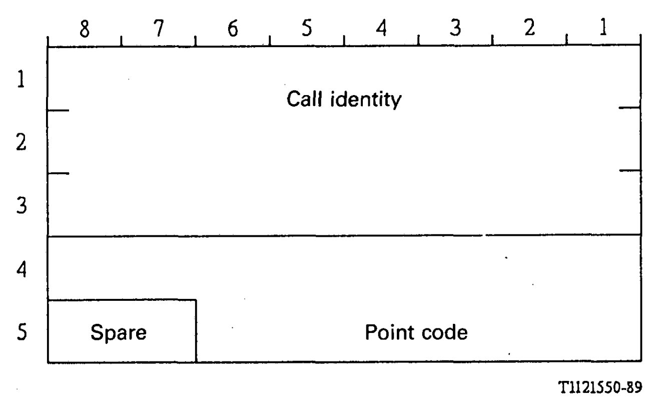

FIGURE 8/Q.763

Call reference parameter field

The following codes are used in the subfields of the call reference parameter field:

a) *Call identity*

A code expressing in pure binary representation the identification number allocated to the call.

b) *Point code*

The code of the signalling point in which the call identity is relevant.

3.7 *Called party number*

The format of the called party number parameter field is shown in Figure 9/Q.763.

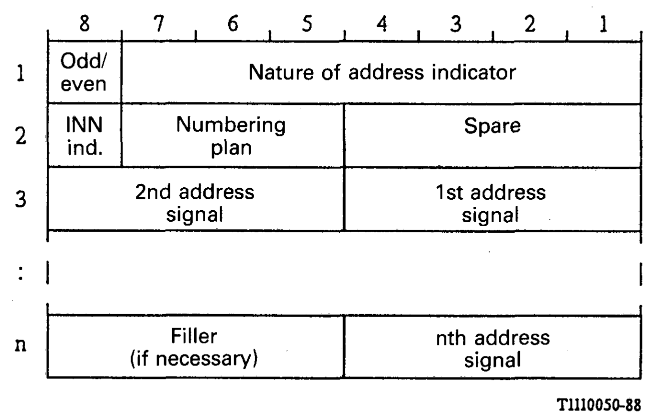

FIGURE 9/Q.763

Called party number parameter field

The following codes are used in the subfields of the called party number parameter field:

a) *Odd/even indicator*

0 even number of address signals
1 odd number of address signals

b) *Nature of address indicator*

0000000	spare
0000001	subscriber number
0000010	spare, reserved for national use
0000011	national (significant) number
0000100	international number
0000101 to 1101111	spare
1110000 to 1111110	reserved for national use
1111111	spare

c) *Internal network number indicator (INN ind.)*

0 routing to internal network number allowed
1 routing to internal network number not allowed

d) *Numbering plan indicator*

000 spare
001 ISDN (Telephony) numbering plan (Recommandation E.164, E.163)
010 spare
011 Data numbering plan (Recommandation X.121)
100 Telex numbering plan (Recommendation F.69)
101 reserved for national use
110 reserved for national use
111 spare

e) *Address singal*

0000 digit 0
0001 digit 1
0010 digit 2
0011 digit 3
0100 digit 4
0101 digit 5
0110 digit 6
0111 digit 7
1000 digit 8
1001 digit 9
1010 spare
1011 code 11
1100 code 12
1101 spare
1110 spare
1111 ST

The most significant address signal is sent first. Subsequent address signals are sent in successive 4-bit fields.

f) *Filler*

In case of an odd number of address signals, the filler code 0000 is inserted after the last address signal.

3.8 *Calling party number*

The format of the calling party number parameter field is shown in Figure 10/Q.763.

	8	7	6	5	4	3	2	1
1	Odd/even	Nature of address indicator						
2	NI ind.	Numbering plan			Presentation restriction		Screening indicator	
3	2nd address signal				1st address signal			
:								
n	Filler (if necessary)				nth address signal			

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Note – When the address presentation restricted indicator indicates address not available, octets 3 to n are omitted.

FIGURE 10/Q.763

Calling party number parameter field

The following codes are used in the calling party number parameter field.

a) *Odd/even indicator*:

See § 3.7 a).

b) *Nature of address indicator*

0000000	spare
0000001	subscriber number
0000010	spare, reserved for national use
0000011	national (significant) number
0000100	international number
0000101 to 1101111	spare
1110000 to 1111110	reserved for national use
1111111	spare

Note – Other types of nature of address indications (e.g. transit exchange identity) are for further study.

c) *Calling party number incomplete indicator (NI)*

0 complete
1 incomplete

d) *Numbering plan indicator*

See § 3.7 d).

e) *Address presentation restricted (Pres. Restric.) indicator*

00 presentation allowed
01 presentation restricted
10 address not available (Note)
11 spare

Note – When the address is unavailable, the subfields in items a), b), c) and d) are coded with 0's.

f) *Sceening indicator*

00 reserved (Note)
01 user provided, verified and passed
10 reserved (Note)
11 network provided

Note – Code 00 and 10 are reserved for "user provided, not verified" and "user provided, verified and failed" respectively.

g) *Address signal*

0000	digit 0
0001	digit 1
0010	digit 2
0011	digit 3
0100	digit 4
0101	digit 5
0110	digit 6
0111	digit 7
1000	digit 8
1001	digit 9

1010 spare
1111 code 11
1100 code 12

1101 to 1111 spare

h) *Filler*

See § 3.7 f).

3.9 *Calling party's category*

The format of the calling party's category parameter field is shown in Figure 11/Q.763.

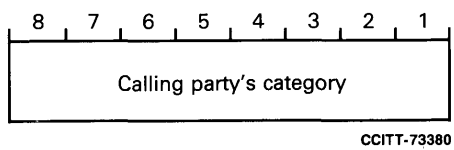

FIGURE 11/Q.763

Calling party's category parameter field

The following codes are used in the calling party's category parameter field.

00000000	calling party's category unknown at this time
00000001	operator, language French
00000010	operator, language English
00000011	operator, language German
00000100	operator, language Russian
00000101	operator, language Spanish
00000110 00000111 00001000	available to Administrations for selecting a particular language by mutual agreement
00001001	reserved (see Recommendation Q.104) (Note)
00001010	ordinary calling subscriber
00001011	calling subscriber with priority
00001100	data call (voice band data)
00001101	test call
00001110	spare
00001111	payphone
00010000 to 11011111	spare
11100000 to 11111110	reserved for national use
11111111	spare

Note – In national networks code 00001001 may be used to indicate that the calling party is a national operator.

3.10 *Cause indicators*

The format of the cause indicators parameter field is shown in Figure 12/Q.763.

Octet	8	7	6	5	4	3	2	1
1	ext	Coding standard		Spare	Location			
1a	ext	Recommendation						
2	ext	Cause value						
3 : 3n	Diagnostic(s) (if any)							

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Note 1 – Octet 1a may be omitted
Note 2 – Octet 3 to 3n may be omitted or repeated. e.g. 3' to 3'n.

FIGURE 12/Q.763

Cause indicators parameter field

The following codes are used in the subfields of the cause indicators parameter field:

a) *Extension indicator (ext)*

0 octet continues through the next octet (e.g. octet 1 to 1a)
1 last octet

b) *Coding standard*

00 CCITT standard, as described below
01 reserved for other international standards (Note)
10 national standard (Note)
11 standard specific to identified location (Note)

Note – These other coding standards should be used only when the desired cause cannot be represented with the CCITT standard.

c) *Location*

0000	user
0001	private network serving the local user
0010	public network serving the local user
0011	transit network
0100	public network serving the remote user
0101	private network serving the remote user
0111	international network
1010	beyond an interworking point, all other values are reserved.

Note – Depending on the location of the users, the public network serving the local user may be the same network serving the remote user. Rules for coding the location field are defined in Recommendation Q.931 Annex J.

d) *Recommendation*

0000000	Rec. Q.763
0000011	Rec. X.21
0000100	Rec. X.25
0000101	Public land mobile networks, Q.1000 Series.
	All other values are reserved.

Note – If octet 1a is omitted, Recommendation Q.763 is assumed.

e) *Cause value*

The cause value is divided into two fields, a class (bits 5 through 7) and a value within a class (bits 1 through 4). The decimal equivalent of the cause value is shown in brackets beside the cause value.

Class 000 and 001 – normal event:

0000001	(1)	unallocated (unassigned) number
0000010	(2)	no route to specified transit network (national use)
0000011	(3)	no route to destination
0000100	(4)	send special information tone
0000101	(5)	misdialled trunk prefix
0010000	(16)	normal call clearing
0010001	(17)	user busy
0010010	(18)	no user responding
0010011	(19)	no answer from user (user alerted)
0010101	(21)	call rejected
0010110	(22)	number changed
0011011	(27)	destination out of order
0011100	(28)	address incomplete
0011101	(29)	facility rejected
0011111	(31)	normal – unspecified

Class 010 – resource unavailable:

0100010	(34)	no circuit available
0100110	(38)	network out of order
0101001	(41)	temporary failure
0101010	(42)	switching equipment congestion
0101100	(44)	requested channel not available
0101111	(47)	resource unavailable – unspecified

Class 011 – service or option not available:

0110010	(50)	requested facility not subscribed
0110111	(55)	incoming calls barred within CUG
0111001	(57)	bearer capability not authorized
0111010	(58)	bearer capability not presently available
0111111	(63)	service/option not available – unspecified

Class 100 – service or option not implemented:

1000001	(65)	bearer capability not implemented
1000101	(69)	requested facility not implemented
1000110	(70)	only restricted digital information bearer capability is available
1001111	(79)	service or option not implemented – unspecified

Class 101 – invalid mesage (e.g. parameter out of range):

1010111	(87)	called user not member of CUG
1011000	(88)	incompatible destination
1011011	(91)	invalid transit network selection (national use)
1011111	(95)	invalid message – unspecified

Class 110 – protocol error (e.g. unknown message):

1100001	(97)	message type non-existant or not implemented
1100011	(99)	parameter non-existant or not implemented – discarded
1100101	(103)	parameter non-existent or not implemented – passed on
1101111	(111)	protocol error – unspecified

Class 111 – interworking:

1111111	(127)	interworking unspecified

f) *Diagnostic*

The format and existence of the diagnostic field is dependant on the cause value and the location of generation. For causes generated by a public network, the following diagnostics may be included:

Cause	*Diagnostic*	*Format*
1	Condition	See below
2	Transit Network identity	See § 3.34 (Note)
3	Condition	See below
16	Condition	See below
21	Condition	See below
22	Called party number (new)	See § 3.7 (Note)
29	Rejected parameter (Note)	
50	Rejected parameter (Note)	
57	Attribute identity	See below
58	Attribute identity	See below
65	Attribute identity	See below
69	Rejected parameter (Note)	
97	Message type	See Table 3/Q.763
99	Parameter name(s)	See Table 4/Q.763
103	Parameter name(s)	See Table 4/Q.763

Note – These diagnostics shall also include the parameter name and length octets.

1) *Diagnostic with attribute identity*

The format of the diagnostic field when coded with an attribute identity is shown in Figure 13/Q.763.

	8	7 6 5 4 3 2 1
3	ext	Attribute number
3a	ext	Rejected attribute
3b	ext	Available attribute

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FIGURE 13/Q.763

Diagnostic field for attribute identity

The attribute number subfield identifies the rejected attribute as follows:

0110001	Information transfer capability
0110010	Information transfer mode
0110011	Information transfer rate
0110100	Structure
0110101	Configuration
0110110	Etablishment
0110111	Symmetry
0111000	Information transfer rate (dest to orig)
0111001	Layer identification and corresponding user information

The rejected attribute and available attribute subfields are coded the same as in the equivalent octet of the user service information parameter field (see § 3.36) which contains the relevant attribute. Bits not related to the rejected attribute are coded 0. If more than one bearer capability attribute was rejected, the diagnostic field can be repeated.

The extension bit (ext), when coded 0, indicates that this diagnostic continues to the next octet (e.g. octet 3a to 3b). The inclusion of the available attribute subfield is optional.

2) *Condition diagnostic*

A condition diagnostic is a 1 octet field containing an extension bit (bit 8) and one of the following codes in bits 2-1:

00 unknown
01 permanent
10 transient
11 spare

Bits 3 to 7 of a condition diagnostic are spare.

3.11 *Circuit group supervision message type indicator*

The format of the circuit group supervision message type indicator parameter field is shown in Figure 14/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 14/Q.763

Circuit group supervision message type indicator parameter field

The following codes are used in the circuit group supervision message type indicator parameter field:

bits B A: Type indicator
0 0 maintenance oriented
0 1 hardward failure oriented
1 0 reserved for national use (used in 1984 version)
1 1 spare

bits C H: Spare

3.12 *Circuit state indicator*

The format of the circuit state indicator parameter field is shown in Figure 15/Q.763.

	8	7	6	5	4	3	2	1
1	H	G	F	E	D	C	B	A
:								
n	H	G	F	E	D	C	B	A

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FIGURE 15/Q.763

Circuit state indicator parameter field

The number of octets in the circuit state indicator parameter field is equal to the specified range + 1. Each circuit state indicator octet is associated with a circuit identification code such that octet n is associated with circuit identification code $m+n-1$, where m is the circuit identification code contained in the message.

The following codes are used in each circuit state indicator octet.

a) *for bits D C = 0 0*

bits B A: Maintenance blocking state
- 0 0 transient
- 0 1 spare
- 1 0 spare
- 1 1 unequipped

bits E-H: Spare

b) *for bits D C not equal to 0 0*

bits B A: Maintenance blocking state
- 0 0 no blocking (active)
- 0 1 locally blocked
- 1 0 remotely blocked
- 1 1 locally and remotely blocked

bits D C: Call processing state
- 0 1 circuit incoming busy
- 1 0 circuit outgoing busy
- 1 1 idle

bits F E: Hardware blocking state (Note)
- 0 0 no blocking (active)
- 0 1 locally blocked
- 1 0 remotely blocked
- 1 1 locally and remotely blocked

bits G-H: Spare

Note – If bits F E are not coded 0 0, bits D C must be coded 1 1.

3.13 *Closed user group interlock code*

The format of the closed user group interlock code parameter field is shown in Figure 16/Q.763.

	8 7 6 5	4 3 2 1
1	1st NI digit	2nd NI digit
2	3rd NI digit	4th NI digit
3	Binary code	
4		

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FIGURE 16/Q.763

Closed user group interlock code

The following codes are used in the subfields of the closed user group interlock code parameter field:

a) *Network identity (NI) (octets 1 and 2)*

Each digit is coded in the binary coded decimal representation from 0 to 9.

If the first digit of this field is coded 0 or 9, the TCC (Telephony Country Code) follows in the second to fourth NI digits (the most significant TCC digit is in the 2nd NI digit). If the TCC is one or two digits long, the excess digit(s) is inserted with the code for RPOA or network identification, if necessary. If octet 2 is not required, it is coded all 0.

Coding of the first digit as 1 or 8 is excluded.

If the first digit is not 0, 9, 1 or 8 this field contains a DNIC (Data Network Identification Code) as defined in Recommendation X.121.

b) *Binary code (octets 3 and 4)*

A code allocated to a closed user group administered by a particular ISDN or data network. Bit 8 of octet 3 is the most significant and bit 1 of octet 4 is the least significant.

3.14 *Connected number*

The format of the connected number parameter field corresponds to the format shown in Figure 17/Q.763.

<table>
<tr><th></th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td>1</td><td>Odd/ even</td><td colspan="7">Nature of address indicator</td></tr>
<tr><td>2</td><td>Spare</td><td colspan="3">Numbering plan</td><td colspan="2">Pres. restric.</td><td colspan="2">Screening indicator</td></tr>
<tr><td>3</td><td colspan="4">2nd address signal</td><td colspan="4">1st address signal</td></tr>
<tr><td>:</td><td colspan="8"></td></tr>
<tr><td>n</td><td colspan="4">Filler (if necessary)</td><td colspan="4">nth address signal</td></tr>
</table>

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Note – When the address presentation restricted indicator indicates address not available, octets 3 to n are omitted.

FIGURE 17/Q.763

Connected number parameter field

The following codes are used in the subfields of the connected number parameter field:

a) Odd/even indicator: see § 3.7 a)

b) Nature of address indicator: see § 3.7 b)

c) Numbering plan indicator: see § 3.7 d)

d) Address presentation restricted indicator: see § 3.8 e)

e) Screening indicator: see § 3.8 f)

f) Address signal: see § 3.8 g)

g) Filler: see § 3.7 h).

3.15 *Connection request*

The format of the connection request parameter field is shown in Figure 18/Q.763.

The following codes are used in the subfields of the connection request parameter field:

a) *Local reference*

A code indicating the local reference allocated by the signalling connection control part to the end-to-end connection.

b) *Point code*

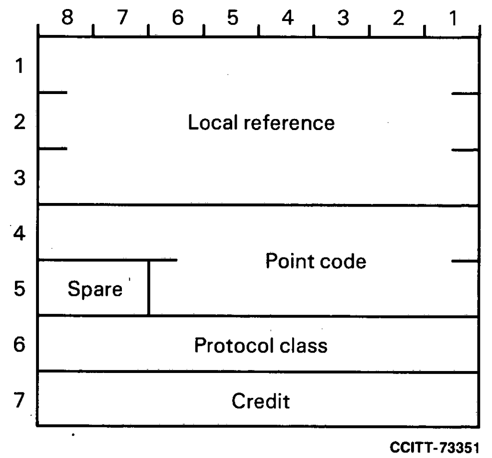
A code identifying the signalling point at which the connection request originated.

c) *Protocol class*

A code identifying in pure binary representation, the protocol class requested for the end-to-end connection.

d) *Credit*

A code identifying in pure binary representation the window size requested for the end-to-end connection.



Note – Octets 6 and 7 may be omitted if the protocol class requested is 2.

FIGURE 18/Q.763

Connection request parameter field

3.16 *Continuity indicators*

The format of the continuity indicators parameter field is shown in Figure 19/Q.763.

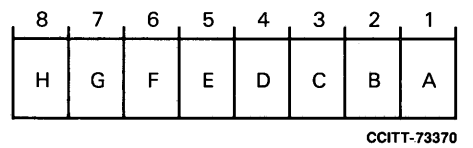


FIGURE 19/Q.763

Continuity indicators parameter field

The following codes are used in the continuity indicators parameter field.

bit A: Continuity indicator
- 0 continuity check failed
- 1 continuity check successful

bits B-H: Spare

3.17 *End of optional parameters indicator*

The last optional parameter field of a message is followed by the end of optional parameters indicator, which occupies a one octet field containing all zeros.

3.18 *Event information*

The format of the event information parameter field is shown in Figure 20/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 20/Q.763

Event information parameter field

The following codes are used in the event indicator parameter field:

bits GFEDCBA: Event indicator

0000000	spare
0000001	ALERTING
0000010	PROGRESS
0000011	in-band information of an appropriate pattern is now available
0000100	call forwarded on busy
0000101	call forwarded on no reply
0000110	call forwarded unconditional
0000111 to 1111111	spare

bit H: Event presentation restricted indicator

0	no indication
1	presentation restricted

3.19 *Facility indicator*

The format of the facility indicator parameter field is shown in Figure 21/Q.763.

8	7	6	5	4	3	2	1
Facility indicator							

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FIGURE 21/Q.763

Facility indicator parameter field

The following codes are used in the facility indicator parameter field.

00000000	spare
00000001	spare
00000010	user-to-user service
00000011 to 11111111	spare

3.20 *Forward call indicators*

The format of the forward call indicators parameter field is shown in Figure 22/Q.763.

	8	7	6	5	4	3	2	1
1	H	G	F	E	D	C	B	A
2	P	O	N	M	L	K	J	I

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FIGURE 22/Q.763

Forward call indicators parameter field

The following codes are used in the forward call indicators parameter field:

bit A: National/international call indicator
0 call to be treated as a national call
1 call to be treated as an international call

This bit can be set to any value in the country of origin. In the international network this bit is not checked. In the destination country, calls from the international network will have this bit set to 1.

bits C B: End-to-end method indicator (Note)
0 0 no end-to-end method available (only link-by-link method available)
0 1 pass along method available
1 0 SCCP method available
1 1 pass along and SCCP methods available

bit D: Interworking indicator (Note)
0 no interworking encountered (No. 7 signalling all the way)
1 interworking encountered

bit E: End-to-end information indicator (Note)
0 no end-to-end information available
1 end-to-end information available

bit F: ISDN user part indicator (Note)
0 ISDN user part not used all the way
1 ISDN user part used all the way

bits H G: ISDN user part preference indicator
0 0 ISDN user part preferred all the way
0 1 ISDN user part not required all the way
1 0 ISDN user part required all the way
1 1 spare

bit I: ISDN access indicator
0 originating access non-ISDN
1 originating access ISDN

bits K J: SCCP method indicator
0 0 no indication
0 1 connectionless method available
1 0 connection oriented method available
1 1 connectionless and connection oriented methods available

bit L: Spare

bits M-P: Reserved for national use

Note – Bits B-F and J-K constitute the protocol control indicator.

3.21 *Information indicators*

The format of the information indicators parameter field is shown in Figure 23/Q.763.

	8	7	6	5	4	3	2	1
1	H	G	F	E	D	C	B	A
2	P	O	N	M	L	K	J	I

CCITT-73375

FIGURE 23/Q.763

Information indicators parameter field

The following codes are used in the information indicators parameter field:

bits B A: Calling party address response indicator
0 0 calling party address not included
0 1 calling party address not available
1 0 spare
1 1 calling party address included

bit C: Hold provided indicator (national use)
0 hold not provided
1 hold provided

bits E D: Spare

bit F: Calling party's category response indicator
0 calling party's category not included
1 calling party's category included

bit G: Charge information response indicator (national use)
0 charge information not included
1 charge information included

bit H: Solicited information indicator
0 solicited
1 unsolicited

bits I-P: Spare

3.22 *Information request indicators*

The format of the information request indicators parameter field is shown in Figure 24/Q.763.

	8	7	6	5	4	3	2	1
1	H	G	F	E	D	C	B	A
2	P	O	N	M	L	K	J	I

CCITT-73375

FIGURE 24/Q.763

Information request indicators parameter field

The following codes are used in the information request indicators parameter field.

bit A: Calling party address request indicator
- 0 calling party address not requested
- 1 calling party address requested

bit B: Holding indicator (national use)
- 0 holding not requested
- 1 holding requested

bit C: Spare

bit D: Calling party's category request indicator
- 0 calling party's category not requested
- 1 calling party's category requested

bit E: Charge information request indicator (national use)
- 0 charge information not requested
- 1 charge information requested

bits G F: Spare

bit H: Malicious call identification request indicator (national use)
- 0 malicious call identification not requested
- 1 malicious call identification requested

bits I-P: Spare

3.23 *Nature of connection indicators*

The format of the nature of connection indicators parameter field is shown in Figure 25/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 25/Q.763

Nature of connection indicators parameter field

The following codes are used in the nature of connection indicators parameter field:

bits B A: Satellite indicator
- 0 0 no satellite circuit in the connection
- 0 1 one satellite circuit in the connection
- 1 0 two satellite circuits in the connection
- 1 1 spare

bits D C: Continuity check indicator
- 0 0 continuity check not required
- 0 1 continuity check required on this circuit
- 1 0 continuity check performed on a previous circuit
- 1 1 spare

bit E: Echo control device indicator
- 0 outgoing half echo control device not included
- 1 outgoing half echo control device included

bits F-H: Spare

3.24 *Optional backward call indicators*

The format of the optional backward call indicators parameter field is shown in Figure 26/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 26/Q.763

Optional backward call indicators parameter field

The following codes are used in the optional backward call indicators parameter field:

bit A: In-band information indicator
- 0 no indication
- 1 in-band information or an appropriate pattern is now available

bit B: Call forwarding may occur indicator
- 0 no indication
- 1 call forwarding may occur

bits C-D: Spare

bits E-H: Reserved for national use

3.25 *Optional forward call indicators*

The format of the optional forward call indicators parameter field is shown in Figure 27/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

CCITT-73380

FIGURE 27/Q.763

Optional forward call indicators parameter field

The following codes are used in the optional forward call indicators parameter field:

bits B A: Closed user group call indicator
- 0 0 non-CUG call
- 0 1 spare
- 1 0 closed user group call, outgoing access allowed
- 1 1 closed user group call, outgoing access not allowed

bit C-H: Spare

3.26 *Original called number*

The format of the original called number parameter field corresponds to the format shown in Figure 28/Q.763.

The following codes are used in the subfields of the original called number parameter field:

a) Odd/even indicator: see § 3.7 a)

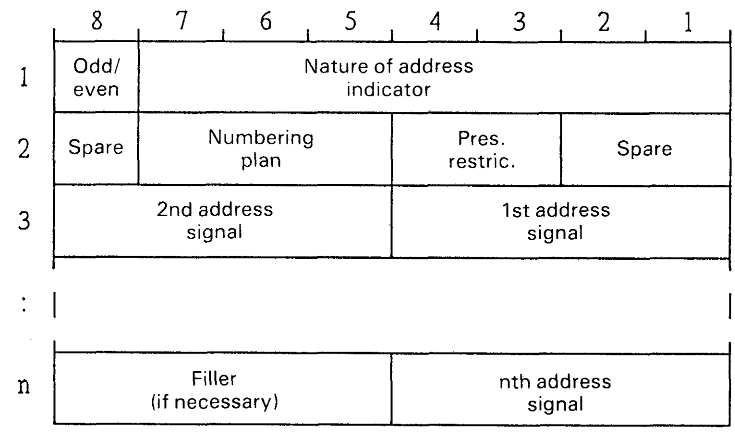
b) Nature of address indicator: see § 3.7 b)

c) Numbering plan indicator: see § 3.7 d)

d) Address presentation restricted indicator: see § 3.8 e)

e) Address signal: see § 3.8 g)

f) Filler: see § 3.7 h).



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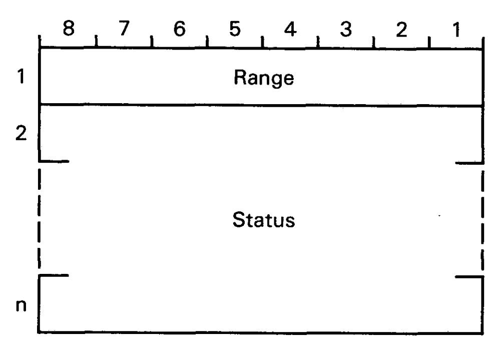
Note – When the address presentation restricted indicator indicates address not available, octets 3 to n are omitted.

FIGURE 28/Q.763

Original called number parameter field

3.27 *Range and status*

The format of the range and status parameter field is shown in Figure 29/Q.763.



CCITT-73360

FIGURE 29/Q.763

Range and status parameter field

The following codes are used in the subfields of the range and status parameter field:

a) *Range*

A number in pure binary representation ranging from 0 to 255. Range code 0 indicates absence of the status field. The number represented by a non-zero range code +1 indicates the range of circuits affected by the message.

b) *Status*

The status subfield contains from 1 to 256 status bits numbered from 0 to 255. Status bit 0 is located in bit position 1 of the first status subfield octet. Other status bits follow in numerical order. The number of relevant status bits in a given status subfield is equal to range +1.

Each status bit is associated with a circuit identification code such that status bit n is associated with circuit identification code m+n, where m is the circuit identification code contained in the message.

The status bits are coded as follows:

– in circuit group blocking messages
  0 no indication
  1 blocking

– in circuit group blocking acknowledgement messages
  0 no indication
  1 blocking acknowledgement

– in circuit group unblocking messages
  0 no indication
  1 unblocking

– in circuit group unblocking acknowledgement messages
  0 no indication
  1 unblocking acknowledgement

– in circuit group reset acknowledgement messages
  0 not blocked for maintenance reasons
  1 blocked for maintenance reasons

The number of circuits affected by a group supervision message is limited to 32 or less. For the group reset and query messages this requires that the range value be 31 or less. For the group blocking and unblocking messages the range value may be up to 255, but the number of status bits set to 1 must be 32 or less.

For the group blocking, unblocking and reset messages, range code 0 is reserved.

3.28 *Redirecting number*

The format of the redirecting number parameter field corresponds to the format shown in Figure 28/Q.763.

The following codes are used in the subfields of the redirecting number parameter field:

a) Odd/even indicator: see § 3.7 a)

b) Nature of address indicator: see § 3.7 b)

c) Numbering plan indicator: see § 3.7 d)

d) Address presentation restricted indicator: see § 3.8 e)

e) Address signal: see § 3.8 g)

f) Filler: see § 3.7 f).

3.29 *Redirection information*

The format of the redirection information parameter field is shown in Figure 30/Q.763.

	8	7	6	5	4	3	2	1
1	H	G	F	E	D	C	B	A
2	P	O	N	M	L	K	J	I

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Note – Octet 2 is omitted if the redirection counter is coded 001.

FIGURE 30/Q.763

Redirection information parameter field

The following codes are used in the redirection information parameter field:

bits C B A:	Redirecting indicator
0 0 0	no redirection
0 0 1	call rerouted
0 1 0	call rerouted, all redirection information presentation restricted
0 1 1	call forwarded
1 0 0	call forwarded, all redirection information presentation restricted
1 0 1	call rerouted, redirection number presentation restricted
1 1 0	call forwarded, redirection number presentation restricted
1 1 1	spare
bit D:	Spare
bits H G F E:	Original redirection reasons
0 0 0 0	unknown/not available
0 0 0 1	user busy
0 0 1 0	no reply
0 0 1 1	unconditional
0 1 0 0 to 1 1 1 1	spare
bits K J I:	Redirection counter. Number of redirections the call has undergone expressed as a binary number between 1 and 5.
bit L:	Spare
bits P O N M:	Redirecting reason
0 0 0 0	unknown/not available
0 0 0 1	user busy
0 0 1 0	no reply
0 0 1 1	unconditional
0 1 0 0 to 1 1 1 1	spare

3.30 *Redirection number*

The format of the redirection number parameter field corresponds to the format shown in Figure 9/Q.763.

The following codes are used in the subfields of the redirection number parameter field:

a) Odd/even indicator: see § 3.7 a)

b) Nature of address indicator: see § 3.7 b)

c) Internal nerwork number indicator: see § 3.7 c)

d) Numbering plan indicator: see § 3.7 d)

e) Address signal: see § 3.8 f)

f) Filler: see § 3.7 f).

3.31 *Signalling point code (national use)*

The format of the signalling point code parameter field is shown in Figure 31/Q.763.

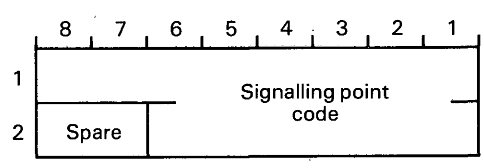

FIGURE 31/Q.763

Signalling point code

The signalling point code is a pure binary representation of the code allocated to a node in the signalling network.

3.32 *Subsequent number*

The format of the subsequent number parameter field is shown in Figure 32/Q.763.

	8	7	6	5	4	3	2	1
1	Odd/even	Spare						
2	2nd address signal				1st address signal			
⋮								
n	Filler (if necessary)				nth address signal			

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FIGURE 32/Q.763

Subsequent number parameter field

The following codes are used in the subfields of the subsequent number parameter field:

a) Odd/even indicator: see § 3.7 a)

b) Address signal: see § 3.7 e)

c) Filler: see § 3.7 f).

3.33 *Suspend/resume indicators*

The format of the suspend/resume indicators parameter field is shown in Figure 33/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 33/Q.763

Suspend/resume indicators parameter field

The following codes are used in the suspend/resume indicators parameter field:

bit A: Suspend/resume indicator
0: ISDN subscriber initiated
1: network initiated

bits B-H: Spare

3.34 *Transit network selection (national use)*

The format of the transit network selection parameter field is shown in Figure 34/Q.763.

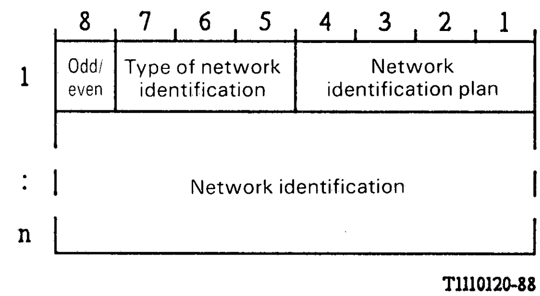

FIGURE 34/Q.763

Transit network selection parameter field

The following codes are used in the subfields of the transit network selection parameter field:

a) *Odd/even indicator*

0 even number of digits
1 odd number of digits

b) *Type of network identification*

000 CCITT-standardized identification
010 national network identification
other reserved

c) *Network identification plan*

i) For CCITT-standardized identification

0000 unknown
0011 public data network identification code (DNIC), Recommendation X.121
0110 public land mobile network identification code (MNIC), Recommendation E.212
other spare

ii) For national network identification

This information is coded according to national specifications.

d) *Network identification*

This information is organized according to the network identification plan and the encoding principles given in § 3.8 f).

3.35 *Transmission medium requirement*

The format of the transmission medium requirement parameter field is shown in Figure 35/Q.763.

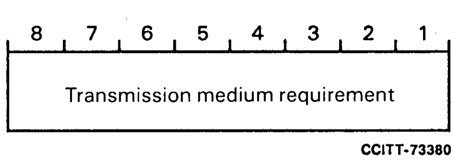

FIGURE 35/Q.763

Transmission medium requirement parameter field

The following codes are used in the transmission medium requirement parameter field.

00000000	speech
00000001	spare
00000010	64 kbit/s unrestricted
00000011	3.1 kHz audio
00000100	alternate speech (service 2)/64 kbit/s unrestricted (service 1) (Note 1)
00000101	alternate 64 kbit/s unrestricted (service 1)/speech (service 2) (Note 2)
00000110	spare
00000111	reserved for 2 × 64 kbit/s unrestricted
00001000	reserved for 384 kbit/s unrestricted
00001001	reserved for 1536 kbit/s unrestricted
00001010	reserved for 1920 kbit/s unrestricted
00001011 to 11111111	spare

Note 1 – The initial mode is speech.

Note 2 – The initial mode is 64 kbit/s unrestricted.

3.36 *User service information*

The format of the user service information parameter field is shown in Figure 36/Q.763. This format is the same as the bearer capability information element from Recommendation Q.931 and not all capabilities coded here are supported at this time.

<table>
<tr><th></th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td>1</td><td>Ext.</td><td colspan="2">Coding standard</td><td colspan="5">Information transfer capability</td></tr>
<tr><td>2</td><td>Ext.</td><td colspan="2">Transfer mode</td><td colspan="5">Information transfer rate</td></tr>
<tr><td>2a</td><td>Ext.</td><td colspan="3">Structure</td><td colspan="2">Configuration</td><td colspan="2">Establishment</td></tr>
<tr><td>2b</td><td>Ext.</td><td colspan="2">Symmetry</td><td colspan="5">Information transfer rate (destination to origination)</td></tr>
<tr><td>3</td><td>Ext.</td><td colspan="2">Layer ident.</td><td colspan="5">User information layer 1 protocol</td></tr>
<tr><td>4</td><td>Ext.</td><td colspan="2">Layer ident.</td><td colspan="5">User information layer 2 protocol</td></tr>
<tr><td>5</td><td>Ext.</td><td colspan="2">Layer ident.</td><td colspan="5">User information layer 3 protocol</td></tr>
</table>

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Note 1 – Octet 2a is omitted if default values apply to all fields of octets 2a and 2b.

Note 2 – Octet 2b is omitted if default values apply to all fields of octet 2b.

Note 3 – Octets 3, 4, 5 or any combination of these octets may be omitted. Octet 3 may be extended as described in § 3.36k).

FIGURE 36/Q.763

User service information parameter field

The following codes are used in the subfields of the user service information parameter field:

a) *Extension indicator (ext)*

0	octet continues through the next octet (e.g. octet 2 to 2a, 2a to 2b, 3 to 3a)
1	last octet

b) *Coding standard*

00	CCITT standardized coding as described below
01	reserved for other international standards (Note)
10	national standard (Note)
11	standard defined for the network (either public or private) present on the network side of the interface (Note)

Note – These other coding standards should only be used when the desired bearer capability cannot be represented with the CCITT standardized coding.

c) *Information transfer capability*

00000	speech
01000	unrestricted digital information
01001	restricted digital information
10000	3.1 kHz audio
10001	7 kHz audio
11000	video

All other values are reserved

d) *Transfer mode*

00	circuit mode
10	packet mode

All other values are reserved

e) *Information transfer rate (octets 2 and 2b)* (Note 1)

00000	This code shall be used for packet-mode calls
10000	64 kbit/s
10001	2 × 64 kbit/s (Note 2)
10011	384 kbit/s
10101	1536 kbit/s
10111	1920 kbit/s

All other values are reserved.

Note 1 – When octet 2b is omitted, the bearer capability is bidirectional symmetric at the information transfer rate specified in octet 2. When octet 2b is included, the information rate in octet 2 refers to the origination to destination direction.

Note 2 – For this case, the coding of octets 1 and 2a refer to both 64 kbit/s circuits.

f) *Structure*

000	default (Note 1)
001	8 kHz integrity (Note 2)
100	service data unit integrity
111	unstructured

All other values are reserved.

Note 1 – If octet 2a is omitted, or the structure field is coded 000, then the value of the structure attribute is according to the following:

Transfer mode	*Transfer capability*	*Structure*
circuit	speech	8 kHz integrity
circuit	unrestricted digital	8 kHz integrity
circuit	restricted digital	8 kHz integrity
circuit	audio	8 kHz integrity
circuit	video	8 kHz integrity
packet	unrestricted digital	service data unit integrity

Note 2 – When the information transfer rate 2 × 64 kbit/s is used, 8 kHz integrity with Restricted Differential Time Delay (RDTD) is offered.

g) *Configuration*

00	point-to-point

All other values are reserved. If omitted, the configuration is assumed to be point-to-point.

h) *Establishment*

00	demand

All other values are reserved. If omitted, the establishment is assumed to be demand.

i) *Symmetry*

00 bidirectional symmetric

All other values are reserved. If omitted, the symmetry is assumed to be bidirectional symmetric.

j) *Layer identification*

00 reserved
01 user information layer 1 protocol
10 user information layer 2 protocol
11 user information layer 3 protocol

Note – Bits 5-1 of the same octet represent the corresponding identification as per points k), l) and m) below. If octet 3, 4 or 5 is omitted, the corresponding user information protocol is assumed to be undefined.

k) *User information layer 1 protocol identification*

00001 CCITT standardized rate adaption V.110/X.30. This implies the presence of octet 3a defined in § 3.36 k) 1), and optionally octets 3b, 3c and 3d defined in § 3.36 k) 2) below.
00010 Recommendation G.711 µ-law
00010 Recommendation G.711 A-law
00100 Recommendation G.721 32 kbit/s ADPCM and Recommendation I.460
00101 Recommendations G.722 and G.724 for 7 kHz audio
00110 Recommendation G.735 for 384 kbit/s video
00111 non-CCITT standardized rate adaption. This implies the presence of octet 3a, and optionally 3b, 3c and 3d. The use of this codepoint indicates that the user rate specified in octet 3a is defined in accordance with the non-CCITT standardized rate adaption scheme. Additionally, octets 3b, 3c and 3d, if present, are defined consistent with the specified rate adaption.
01000 CCITT standardized rate adaption V.120. This implies the presence of octet 3a defined in § 3.36 k) 1), octet 3b defined in § 3.36 k) 3), and optionally octets 3c and 3d defined in § 3.36 k) 2) below.
01001 CCITT standardized rate adaption X.31 HDLC flag stuffing.

All other values are reserved.

Note – Octet 3 shall be omitted if the transfer mode is "circuit-mode", the information transfer capability is "unrestricted digital information" or "restricted digital information" and the user information layer 1 protocol is not to be identified to the network; octet 3 may be omitted if the transfer mode is "packet-mode"; otherwise octet 3 shall be present.

1) *Octet 3a for layer 1 rate adaption* (see Figure 37/Q.763)

	8	7	6	5	4	3	2	1
3a	Ext.	Synch/ asynch	Negot.	User rate				

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FIGURE 37/Q.763

Basic layer 1 rate adaption fields

– The synchronous/asynchronous indicator is coded:

0 synchronous
1 asynchronous

Octets 3b to 3d may be omitted in case of synchronous user rates.

– The negotiation indicator is coded:

0 in-band negotiation not possible
1 in-band negotiation possible

Note – See Recommendations V.110 and X.30

– The user rate is coded:

00000	rate indicated by E-bits	Rec. I.460
00001	0.6 kbit/s	Rec. V.6 and X.1
00010	1.2 kbit/s	Rec. V.6
00011	2.4 kbit/s	Rec. V.6 and X.1
00100	3.6 kbit/s	Rec. V.6
00101	4.8 kbit/s	Rec. V.6 and X.1
00110	7.2 kbit/s	Rec. V.6
00111	8.0 kbit/s	Rec. I.460
01000	9.6 kbit/s	Rec. V.6 and X.1
01001	14.4 kbit/s	Rec. V.6
01010	16.0 kbit/s	Rec. I.460
01011	19.2 kbit/s	Rec. V.6
01100	32.0 kbit/s	Rec. I.460
01110	48.0 kbit/s	Rec. V.6 and X.1
01111	56.0 kbit/s	Rec. V.6
10101	0.1345 kbit/s	Rec. X.1
10110	0.100 kbit/s	Rec. X.1
10111	0.075/1.2 kbit/s	Rec. V.6 and X.1 (Note)
11000	1.2/0.075 kbit/s	Rec. V.6 and X.1 (Note)
11001	0.050 kbit/s	Rec. V.6 and X.1
11010	0.075 kbit/s	Rec. V.6 and X.1
11011	0.110 kbit/s	Rec. V.6 and X.1
11100	0.150 kbit/s	Rec. V.6 and X.1
11101	0.200 kbit/s	Rec. V.6 and X.1
11110	0.300 kbit/s	Rec. V.6 and X.1
11111	12 kbit/s	Rec. V.6 and X.1

All other values are reserved.

Note – The first rate is the transmit rate in the forward direction of the call. The second rate is the transmit rate in the backward direction of the call.

2) *Octets 3b, 3c and 3d for Recommendations V.110/X.30 rate adaption* (see Figure 38/Q.763)

	8	7	6	5	4	3	2	1
3b	Ext.	Intermediate rate		NIC on Tx	NIC on Rx	Flow cont. on Tx	Flow cont. on Rx	Spare
3c	Ext.	Number of stop bits		Number of data bits		Parity		
3d	Ext.	Duplex mode	Modem type					

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Note – Octets 3c and 3d may be omitted.

FIGURE 38/Q.763

Recommendations V.110/X.30 rate adaptation extension fields

– Intermediate rate indicator is coded:

00 not used
01 8 kbit/s
10 16 kbit/s
11 32 kbit/s

– Network independent clock (NIC) on transmission (TX) indicator is coded:

0 not required to send data with NIC
1 required to send data with NIC

Note – Refers to transmission in the forward direction of the call, see Recommendations V.110 and X.30

– Network independent clock (NIC) on reception (Rx) indicator is coded:

0 cannot accept data with NIC (i.e. sender does not support this optional procedure)
1 can accept data with NIC (i.e. sender does support this optional procedure)

Note – Refers to transmission in the backward direction of the call, see Recommendations V.110 and X.30.

– Flow control on transmission (Tx) indicator is coded:

0 not required to send data with flow control mechanism
1 required to send data with flow control mechanism

Note – Refers to transmission in the forward direction of the call, see Recommendations V.110 and X.30.

– Flow control on reception (Rx) indicator is coded:

0 cannot accept data with flow control mechanism (i.e. sender does not support this optional procedure)
1 can accept data with flow control mechanism (i.e. sender does support this optional procedure)

Note – See Recommendations V.110 and X.30.

– Number of stop bits indicator is coded:

00 not used
01 1 bit
10 1.5 bits
11 2 bits

– Number of data bits indicator, including parity bit if present, is coded:

00 not used
01 5 bits
10 7 bits
11 8 bits

– Parity indicator is coded:

000 odd
010 even
011 none
100 forced to 0
101 forced to 1
All other values are reserved

– Duplex mode indicator is coded:

0 half duplex
1 full duplex

– modem type indicator is coded according to network specific rules.

3) *Octet 3b for Recommendation V.120 rate adaption* (see Figure 39/Q.763)

	8	7	6	5	4	3	2	1
3b	Ext.	Hdr/ no hdr	Multi frame supp.	Mode	LLI Neg.	Assigner/ Assignee	Inband/ Outband	Spare

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Note – Octets 3c and 3d in Figure 38/Q.763 may also be present.

FIGURE 39/Q.763

Recommendation V.120 rate adaption extension fields

- Rate adaption header/no header indicator is coded:
  0 rate adaption header not included
  1 rate adaption header included

- Multiple frame establishment support in data link indicator is coded:
  0 multiple frame establishment not supported, only UI frames allowed
  1 multiple frame establishment supported

- Mode of operation indicator is coded:
  0 bit transparent mode of operation
  1 protocol sensitive mode of operation

- Logical link identifier (LLI) negotiation indicator is coded:
  0 default, LLI = 256 only
  1 full protocol negotiation (Note)

  Note – A connection over which protocol negotiation will be executed is indicated in bit 2 of octet 3b.

- Assignor/assignee indicator is coded:
  0 message originator is "default assignee"
  1 message originator is "assignor only"

- In-band/out-of-band negotiation indicator is coded:
  0 negotiation is done with USER INFORMATION messages on a temporary signalling connection
  1 negotiation is done in-band using logical link zero

l) *User information layer 2 protocol identification*

00010 Recommendation Q.921 (I.441)
00110 Recommendation X.25, link level
All other values are reserved. If the transfer mode is "packet mode", this octet shall be present. In other cases, the octet is present only if the protocol is to be identified to the network.

m) *User information layer 3 protocol identification*

00010 Recommendation Q.931 (I.451)
00110 Recommendation X.25, link level
All other values are reserved. The octet is present only if the protocol is to be identified to the network.

3.37 *User-to-user indicators*

The format of the user-to-user indicators parameter field is shown in Figure 40/Q.763.

8	7	6	5	4	3	2	1
H	G	F	E	D	C	B	A

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FIGURE 40/Q.763

User-to-user indicators parameter field

The following codes are used in the user-to-user indicators parameter field:

bit A Type
0 request
1 response

If bit A equals 0 (request):

bits C B: Service 1
0 0 no information
0 1 spare
1 0 request, not essential
1 1 request, essential

bits E D: Service 2
0 0 no information
0 1 spare
1 0 request, not essential
1 1 request, essential

bits G F: Service 3
0 0 no information
0 1 spare
1 0 request, not essential
1 1 request, essential

bit H Spare

If bit A equals 1 (response):

bits C B: Service 1
0 0 no information
0 1 not provided
1 0 provided
1 1 spare

bits E D: Service 2
0 0 no information
0 1 not provided
1 0 provided
1 1 spare

bits G F: Service 3
0 0 no information
0 1 not provided
1 0 provided
1 1 spare

bit H Spare

3.38 *User-to-user information*

The format of the user-to-user information parameter is shown in Figure 41/Q.763.

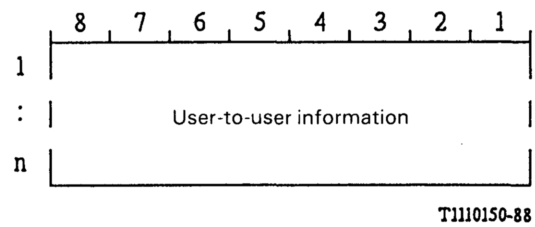


FIGURE 41/Q.763

User-to-user information parameter field

The format of the user-to-user information parameter field is coded identically to the protocol discriminator plus user information field described in Recommendation Q.931, § 4.5.29.

4 ISDN user part messages and codes

In the following tables the format and coding of ISDN user part messages is specified. For each message, a list of the relevant parameters is given and for each parameter:

- a *reference* to the section where the formatting and coding of the parameter content is specified;
- the *type* of the parameter. The following types are used in the tables:

  F = mandatory fixed length parameter;
  V = mandatory variable length parameter;
  O = optional parameter of fixed or variable length;
- the *length* of the parameter. The value in the table includes:
  - *for type F parameters* the length, in octets, of the parameter content;
  - *for type V parameters* the length, in octets, of the length indicator and of the parameter content. The minimum and the maximum length are indicated;
  - *for type O parameters* the length, in octets, of the parameter name, length indicator and parameter content. For variable length parameters the minimum and maximum length is indicated.

For each message type, type F parameters and the pointers for the type V parameters must be sent in the order specified in the tables.

The routing label and circuit identification code fields, which are transmitted ahead of the message type field if required are not shown. Parameter names, pointers to mandatory variable fields and the optional part, and length indicators appear in the message in accordance with Figure 3/Q.763 and are not shown explicitly in Tables 5/Q.763 to 28/Q.763.

TABLE 5/Q.763

Message type: Address complete

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Backward call indicators	3.4	F	2
Optional backward call indicators	3.24	O	3
Cause indicators	3.10	O	4-?
Connected number	3.14	O	4-12
Call reference	3.6	O	7
User-to-user indicators	3.37	O	3
User-to-user information	3.38	O	3-131 [a)]
Access transport	3.2	O	3-?
End of optional parameters	3.17	O	1

[a)] Some networks may only support up to 35 octets.

TABLE 6/Q.763

Message type: Answer

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Backward call indicators	3.4	O	4
Optional backward call indicators	3.24	O	3
Call reference	3.6	O	7
User-to-user indicators	3.37	O	3
User-to-user information	3.38	O	3-131 [a)]
Connected number	3.14	O	4-12
Access transport	3.2	O	3-?
End of optional parameters	3.17	O	1

[a)] Some networks may only support up to 35 octets.

TABLE 7/Q.763

Message type: Call progress

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Event information	3.18	F	1
Cause indicators	3.10	O	4-?
Call reference	3.6	O	7
Backward call indicators	3.4	O	4
Optional backward call indicators	3.24	O	3
Access transport	3.2	O	3-?
User-to-user indicators	3.37	O	3
User-to-user information	3.38	O	3-131 [a)]
Redirection number	3.30	O	5-12
End of optional parameters	3.17	O	1

[a)] Some networks may only support up to 35 octets.

TABLE 8/Q.763

Message type: Circuit group query response

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Range and status [a]	3.27	V	2
Circuit state indicator	3.12	V	3-33

[a] The status subfield is not present.

TABLE 9/Q.763

Message type: Circuit group reset acknowledgement

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Range and status	3.27	V	3-34

TABLE 10/Q.763

Message type: Confusion

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Cause indicators	3.10	V	3-?
End of optional parameters	3.17	O	1

TABLE 11/Q.763

Message type: Connect

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Backward call indicators	3.4	F	2
Optional backward call indicators	3.24	O	3
Connected number	3.14	O	4-12
Call reference	3.6	O	7
User-to-user indicators	3.37	O	3
User-to-user information	3.38	O	3-131 [a)]
Access transport	3.2	O	3-?
End of optional parameters	3.17	O	1

[a)] Some networks may only support up to 35 octets.

TABLE 12/Q.763

Message type: Continuity

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Continuity indicators	3.16	F	1

TABLE 13/Q.763

Message type: Facility reject

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Facility indicator	3.19	F	1
Cause indicators	3.10	V	3-?
User-to-user indicators	3.37	O	3
Call reference	3.6	O	7
End of optional parameters	3.17	O	1

TABLE 14/Q.763

Message type: Information

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Information indicators	3.21	F	2
Calling party's category	3.9	O	3
Calling party number	3.8	O	5-12
Call reference	3.6	O	7
Connection request	3.15	O	7-9
Access transport	3.2	O	4-?
End of optional parameters	3.17	O	1

TABLE 15/Q.763

Message type: Information request

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Information request indicators	3.22	F	2
Call reference	3.6	O	7
End of optional parameters	3.17	O	1

TABLE 16/Q.763

Message type: Initial address

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Nature of connection indicators	3.23	F	1
Forward call indicators	3.20	F	2
Calling party's category	3.9	F	1
Transmission medium requirement	3.35	F	1
Called party number	3.7	V	4-11
Transit network selection [a]	3.34	O	4-?
Call reference	3.6	O	7
Calling party number	3.8	O	4-12
Optional forward call indicators	3.25	O	3
Redirecting number	3.28	O	4-12
Redirection information	3.29	O	3-4
Closed user group interlock code	3.13	O	6
Connection request	3.15	O	7-9
Original called number	3.26	O	4-12
User-to-user information [b]	3.38	O	3-131
Access transport	3.2	O	3-?
User service information [c]	3.36	O	4-13
User-to-user indicators	3.37	O	3
End of optional parameters	3.17	O	1

[a] For national use only.

[b] Some networks may only support up to 35 octets.

[c] This parameter can be repeated in case of an alternate bearer service, in which case the initial parameter represents the initial establishment mode.

TABLE 17/Q.763

Message type: Release

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Cause indicators	3.10	V	3-?
Redirection information	3.29	O	3-4
Redirection number	3.30	O	5-12
Signalling point code [a)]	3.31	O	4
Access transport	3.2	O	3-?
User-to-user information [b)]	3.38	O	3-131
Automatic congestion level	3.3	O	3
End of optional parameters	3.17	O	1

[a)] For national use only.

[b)] Some networks may only support up to 35 octets.

TABLE 18/Q.763

Message type: Release complete

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Cause indicators	3.10	O	5-?
End of optional parameters	3.17	O	1

TABLE 19/Q.763

Message type: Subsequent address

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Subsequent number	3.32	V	3-10
End of optional parameters	3.17	O	1

TABLE 20/Q.763

Message type: User-to-user information

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
User-to-user information	3.38	V	2-130
Access transport	3.2	O	3-?
Call reference	3.6	O	7
End of optional parameters	3.17	O	1

TABLE 21/Q.763

Message type: Delayed release (national use)
Forward transfer

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Call reference	3.6	O	7
End of optional parameters	3.17	O	1

TABLE 22/Q.763

Message type: Suspend
Resume

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Suspend/Resume indicators	3.33	F	1
Call reference	3.6	O	7
End of optional parameters	3.17	O	1

TABLE 23/Q.763

Message type: **Blocking**
Blocking acknowledgement
Continuity check request
Loop back acknowledgement (national use)
Overload (national use)
Reset circuit
Unblocking
Unblocking acknowledgement
Unequipped circuit identification code (national use)

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1

TABLE 24/Q.763

Message type: **Call modification completed**
Call modification request
Call modification reject

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Call modification indicators	3.5	F	1
Call reference	3.6	O	7
User-to-user information	3.38	O	3-131 [a)]
End of optional parameters	3.17	O	1

a) Some networks may only support up to 35 octets.

TABLE 25/Q.763

Message type: **Circuit group blocking**
Circuit group blocking acknowledgement
Circuit group unblocking
Circuit group unblocking acknowledgement

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Circuit group supervision message type indicator	3.11	F	1
Range and status	3.27	V	3-34

TABLE 26/Q.763

Message type: Circuit group reset
Circuit group query

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Range and status [a]	3.27	V	2

[a] The status subfield is not present.

TABLE 27/Q.763

Message type: Facility accepted
Facility request [a]

Parameter	Reference (§)	Type	Length (octets)
Message type	2.1	F	1
Facility indicator	3.19	F	1
User-to-user indicators	3.37	O	3
Call reference	3.6	O	7
End of optional parameters	3.17	O	1

[a] Whether or not the facility request message should contain a connection request parameter requires further study.

TABLE 28/Q.763

Message type: Pass-along

Parameter	Reference (§)	Type	Length (octets)
Message type (00101000)	2.1	F	1
Message type Mandatory fixed part Mandatory variable part Optional part	Any message in Tables 5/Q.764 to 27/Q.764 which is relevant only at the "endpoint" of a connection as defined in § 3 of Recommendation Q.764		

ANNEX A

(to Recommendation Q.763)

Interpretation of spare codes

This Annex describes interpretations which can be applied when a recognized parameter is received containing codes currently indicated as being spare in Recommendation Q.763. This situation can occur when an implementation in accordance to this Recommendation interworks with a future version of this Recommendation. The default interpretations for some of these cases are listed in Table A-1/Q.763.

For the remaining cases, listed in Table A-2/Q.763, there is no default which is considered appropriate. It is recommended that the entire parameter in these cases should be considered uninterpretable except as noted.

Actions taken after applying the default interpretation of unrecognized fields or after determining that an entire parameter should be considered uninterpretable are described in § 2.10.5.3 of Recommendation Q.764. Application of default interpretations is of particular interest when an unrecognized parameter value is passed on at an intermediate exchange or is used at a connection endpoint. However, other applications are not precluded.

TABLE A-1/Q.763

Fields and their default interpretations

Field name with unrecognized code	Default interpretation
Charge indicator	Charge
Called party's status indicator	No indication
Called party's category indicator	No indication
Calling party category	Handle as an ordinary call
Address presentation restricted indicator	Presentation restricted
Cause indicator-location	(see note)
Cause value (unextended)	Unspecified: within class xxx
Cause value (extended)	Unspecified: interworking class
Calling party number response indicator	Calling party number included
Connected number response indicator	Connected number included
Redirecting number response indicator	Redirecting number included
Satellite indicator	Two satellites
Continuity check indicator	Continuity check not required
Redirecting reason indicator	Unknown/unavailable
Redirection counter	Maximum redirections
Original redirection reason indicator	Unknown/unavailable
Redirecting indicator	Call forwarded, all redirection information presentation restricted
Closed user group indicator	Non-CUG call
User-to-user (service 1)	No information
User-to-user (service 2)	No information
User-to-user (service 3)	No information

Note – If a network receives an unrecognized location field from other networks, the default interpretation of this field will be the location of the network which sends the unrecognized location, otherwise the default interpretation is "beyond an interworking point".

TABLE A-2/Q.763

Fields with no default interpretations

Uninterpretable field
Nature of address
Numbering plan
Address signal
Cause indicator-coding standard [a)]
Cause indicator-recommendation [a)]
Diagnostic
User service information (any field)
Transmission medium requirement
Call modification indicator
Event indicator
Facility indicator
Circuit state indicator
Automatic congestion level
Circuit group supervision message type

[a)] Cause value interpreted as if coded "unspecified: interworking class" (1111111) and the location field interpreted as if coded "Beyond Interworking Point" (1010).

Recommendation Q.764

SIGNALLING PROCEDURES

1 General

1.1 *Relationship with other Recommendations*

This Recommendation describes the signalling procedures for the set-up and cleardown of national and international ISDN connections. The messages and signals are defined in Recommendation Q.762 and their format and content are given in Recommendation Q.763. Recommendation Q.730 contains the procedures for supplementary services. (These were previously § 4 of Recommendation Q.764.)

1.2 *Numbering* (see Recommendations E.163, E.164)

The procedures described assume that the ISDN uses the international numbering plan defined for the ISDN and thus provides a basic circuit switched service between ISDN terminals or between ISDN terminals and terminals being connected to the existing international telephony network.

1.3 *Address signalling*

In general, the call set-up procedure described is standard for both speech and non-speech connections using en-bloc address signalling for calls between ISDN terminals. Overlap address signalling is also specified.

1.4 *Basic procedures*

The basic call control procedure is divided into three phases; call set-up, the data/conversation phase and call cleardown. Messages on the signalling link are used to establish and terminate the different phases of a call. Standard inband supervisory tones and/or recorded announcements are returned to the caller onspeech and 3.1 kHz connections to provide information on call progress. Calls originating from ISDN terminals may be supplied with more detailed call progress information by means of additional messages in the access protocol supported by a range of messages in the network.

1.5 *Signalling methods*

Two signalling methods are used in this Recommendation:

- link-by-link;
- end-to-end.

The link-by-link method is primarily used for messages that need to be examined at each exchange (see § 2). The end-to-end methods are used for messages of end point significance (see Recommendation Q.730).

The link-by-link method may be used for messages of end point significance. (However, the messages may be affected by processing delays.)

1.6 *Layout of Recommendation Q.764*

The procedures specified in § 2 of this Recommendation relate to basic calls (i.e. calls not involving supplementary services). Section 3 of this Recommendation specifies the procedures relating to end-to-end signalling connections. The additional requirements to be met in the case of calls involving supplementary services and network utilities are specified in Recommendation Q.730. The timers used in this Recommendation are summarized in Annex A. The SDLs for the ISDN-UP are presented in Annex B.

1.7 *Interworking with other signalling systems or user parts*

Only some examples are included in this Recommendation and these should not be used as a definitive interworking guide.

2 **Basic call control and signalling procedures**

Figures 1/Q.764 to 10/Q.764 at the end of this section show the ISDN call set-up sequences which are described below.

2.1 *Successful call set-up*

2.1.1 *Forward address signalling – en bloc operation*

2.1.1.1 *Actions required at originating exchange*

a) *Circuit selection*

When the originating exchange has received the complete selection information from the calling party, and has determined that the call is to be routed to another exchange, selection of a suitable, free, inter-exchange circuit takes place and an initial address message is sent to the succeeding exchange.

Appropriate routing information is either stored at the originating exchange or at a remote database to which a request may be made.

The selection of the route will depend on the called party number, connection type required and the network signalling capability required. This selection process may be performed at the exchange or with the assistance of the remote database.

In addition, in the case of a subscriber with digital access, the set-up message contains bearer capability information which is analyzed by the originating exchange to determine the correct connection type and network signalling capability. The bearer capability information will be mapped into the user service information parameter of the initial address message. The information received from the access interface is used to set the value of the transmission medium requirement parameter. The first value of bearer information received will be used to set the initial mode of the connection.

The connection types allowed are:

- speech;
- 3.1 kHz audio;
- 64 kbit/s unrestricted;
- alternate speech/64 kbit/s unrestricted;
- alternate 64 kbit/s unrestricted/speech.

The network signalling capabilities allowed are:

- ISDN-UP preferred;
- ISDN-UP required;
- ISDN-UP not required (any signalling system).

The information used to determine the routing of the call by the originating exchange will be included in the initial address message, (as transmission medium requirement and forward call indicators), to enable correct routing at intermediate exchanges. The initial address message conveys implicitly the meaning that the indicated circuit has been seized.

In the case where $N \times 64$ kbit/s ($N \geq 2$) connections are required, the procedures for a single 64 kbit/s connection may be used if the $N \times 64$ kbit/s are contiguous 64 kbit/s channels and are pre-assigned for $N \times 64$ kbit/s use.

If subaddress information is received from the calling access, this information is passed unchanged to the destination exchange in the access transport parameter of the initial address message.

b) *Address information sending sequence*

The sending sequence of address information on international calls will be the country code (not sent to an incoming international exchange) followed by the national (significant) number. On national connections, the address information may be the local number or the national (significant) number as required by the Administration concerned. For calls to international operator positions (Code 11 and Code 12) refer to Recommendation Q.107.

The end of pulsing (ST) signal will be used whenever the originating exchange or the outgoing exchange is in a position to know by digit analysis that the final digit has been sent.

c) *Initial address message*

The initial address message (IAM) in principle contains all the information that is required to route the call to the destination exchange and connect the call to the called party.

All initial address messages will include a protocol control indicator (in the forward call indicator parameter) and a transmission medium requirement parameter.

The originating exchange will set the parameters in the protocol control indicator and in the ISDN-UP preference indicator to indicate:

i) the type of end-to-end method that can be accommodated (§ 3);

ii) the availability of Signalling System No. 7 signalling;

iii) the use of the ISDN-UP;

iv) whether further information is available (to be requested before the called party is alerted);

v) network signalling capability required, e.g. ISDN-UP required all the way.

The ISDN-UP preference indicator is set according to the bearer service, teleservice and supplementary service(s) requested. The exact setting depends on the service demand conditions and may be different depending on individual cases. In principle, if the service demand requires ISDN-UP to be essential then the indicator is set to "required", if the service required is optional but preferred it is set to "preferred", otherwise it is set to "not required". The indicator is set to either "required" or "preferred", or "not required", according to the most stringent condition required by one or more of the parameters in the initial address message. In addition, if end-to-end signalling is essential to provide the requested service the indicator should always be set to "required" (see Recommendation E.172).

The transmission medium requirement parameter contains the connection type required information, e.g. 3.1 kHz audio.

The originating exchange may also include in the initial address message:

i) a call reference (including the point code of the originating exchange) to enable the destination exchange to establish an end-to-end connection (§ 3);

ii) the calling party number if this is to be passed forward without being requested. The calling party number could contain Code 11 or 12 if the call is from an international operator;

iii) an SCCP connection request parameter; and

iv) other information related to supplementary services and network utilities.

The initial address message can contain an access transport parameter.

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-to-link method (see § 2.1.6) or via the end-to-end methods (see § 3).

e) *Completion of transmission path*

Through connection of the transmission path will be completed in the backward direction (the transmission path is completed in the forward direction on receipt of a connect or answer message) at the originating exchange immediately after the sending of the initial address message, except in those cases where conditions on the outgoing circuit prevent it (see § 2.1.9).

It is also acceptable that on speech or 3.1 kHz audio calls, through-connection of the transmission path will be completed in both directions immediately after the initial address message has been sent, except in those cases where conditions on the outgoing circuit prevent it (see § 2.1.9).

f) *Network protection timer*

When the originating exchange or the controlling exchange has sent the initial address message the awaiting address complete timer (T_7) is started. If timer (T_7) expires the connection is released and an indication is returned to the calling subscriber.

2.1.1.2 *Actions required at an intermediate exchange*

a) *Circuit selection*

An intermediate exchange, on receipt of an initial address message will analyze the called party number and the other routing information (§ 2.1.1.1 a)) to determine the routing of the call. If the intermediate exchange can route the call using the connection type specified in the transmission medium requirement parameter, a free inter-exchange circuit is seized and an initial address message is sent to the succeeding exchange. Within a network if the intermediate exchange does not route the call using just the connection type specified in the transmission medium requirement parameter, the exchange may also examine the user service information containing the bearer capability information (if available) to determine if a suitable route can be selected. In this case if a new connection type is provided the transmission medium requirement parameter is modified to the new connection type.

For calls between networks, the gateway exchange (e.g. outgoing ISC) must ensure that the transmission medium requirement parameter is set according to the service requested by the customer (see Recommendation E.172). More specifically this parameter is carried unchanged within the international network.

When no echo suppressor or nature-of-circuit indication is received from a preceding exchange using a signalling system with fewer facilities, the indicators will be considered as received "no" unless positive knowledge is available.

b) *Parameters in the initial address message*

An intermediate exchange may modify signalling information received from the preceding exchange according to the capabilities used on the outgoing route. Signalling information that may be changed are nature of connection indicator, end-to-end method indicator; the most significant digits in the called party number may be amended or omitted (see § 2.1.1.1 b)). A change of the end-to-end method used may also alter parameters (see § 3). Other signalling information is passed on transparently, e.g. the access transport parameter, user service information, etc.

c) *Completion of transmission path*

Through-connection of the transmission path in both directions will be completed at an intermediate exchange immediately after the initial address message has been sent, except in those cases where conditions on the outgoing circuit prevent it (see § 2.1.9).

2.1.1.3 *Actions required at the destination exchange*

a) *Selection of called party*

Upon receipt of an initial address message the destination exchange will analyze the called party number to determine to which party the call should be connected. It will also check the called party's line condition and perform various checks to verify whether or not the connection is allowed. These checks will include correspondence of compatibility checks, e.g. checks associated with supplementary services.

At this point, certain call set-up information may need to be obtained from an originating or controlling exchange (see § 2.1.6). Examination of the protocol control indicator will show whether end-to-end information is necessary to be obtained before further processing of the call, in this case the SCCP, pass along or information request and information messages can be used.

In this case where the connection is allowed, the destination exchange will set up a connection to the called party. If a continuity check has to be performed on one or more of the circuits involved in a connection, setting up of the connection to the called party must be prevented until the continuity of such circuits has been verified.

2.1.2 *Forward address signalling – Overlap operation*

2.1.2.1 *Actions required at originating exchange*

a) *Circuit selection*

When the originating exchange has received sufficient information [see § 2.1.2.1 c)] from the calling party to determine that the call is to be routed to another exchange, selection of a suitable, free, inter-exchange circuit takes place and an initial address message is sent to the succeeding exchange.

Appropriate routing information is either stored at the originating exchange or at a remote database to which a request may be made.

The selection of the route will depend on the called party number, connection type required and the network signalling capability required. This selection process may be performed at the exchange or with the assistance of a remote database.

In addition, in the case of a subscriber with digital access, the set-up message contains bearer capability information which is analyzed by the originating exchange to determine the correct connection type and network signalling capability. The bearer capability information will be mapped into the user service information parameter of the initial address message. The information received from the access interface is used to set the value of the transmission medium requirement parameter. The first value of bearer information received will be used to set the initial mode of the connection.

The connection types allowed are:

- speech;
- 3.1 kHz audio;
- 64 kbit/s unrestricted;
- alternate speech/64 kbit/s unrestricted;
- alternate 64 kbit/s unrestricted/speech.

The network signalling capabilities allowed are:

- ISDN-UP preferred;
- ISDN-UP required;
- ISDN-UP not required (any signalling system).

The information used to determine the routing of the call by the originating exchange will be included in the IAM, (as transmission medium requirement and forward call indicators), to enable correct routing at intermediate exchanges. The IAM conveys implicitly the meaning that the indicated circuit has been seized.

In the case where N × 64 kbit/s (N ≥ 2) connections are required, the procedures for a single 64 kbit/s connection may be used if the N × 64 kbit/s are contiguous 64 kbit/s channels and are pre-assigned for N × 64 kbit/s use.

If subaddress information is received from the calling access, this information is passed unchanged to the destination exchange in the access transport parameter of the initial address message only.

b) *Address information sending sequence*

The sending sequence of address information on international calls will be the country code (not sent to an incoming international exchange) followed by the national (significant) number. On national connections, the address information may be the local number or the national (significant) number as required by the Administration concerned. For calls to international operator positions (Code 11 and Code 12) refer to Recommendation Q.107.

The end of pulsing (ST) signal will be used whenever the originating exchange or the outgoing exchange is in a position to know by digit analysis that the final digit has been sent.

c) *Content of initial and subsequent address messages*

The initial and subsequent address messages in principle contain all of the information that is required to route the call to the destination exchange and connect the call to the called party. The contents of the initial address message is the same as described in § 2.1.1.1 c). The only purpose of the subsequent address message is to carry further digits.

All digits required for routing the call through the international network will be sent in the IAM. On calls with a country code in the number (except in the case of calls to special operators), the IAM will contain a minimum of 4 digits and should contain as many digits as are available. Within national networks the address information contained within the IAM may vary depending on the routing requirement within the network.

The remaining digits of the number may be sent in subsequent address messages containing one or several digits as they are received. Efficiency can be gained by grouping together as many digits as possible. However, to prevent an increase in postsending delay in those cases where overlap operation with subscribers' dialling is used, it may be desirable to send the last few digits individually.

The end-of-pulsing (ST) signal is always sent in the following situations:

i) semi-automatic calls;

ii) test calls; and

iii) when the end-of-pulsing (ST) signal is received.

In automatic working, the end-of-pulsing (ST) signal will be sent whenever the originating or outgoing exchange is in a position to know, by digit analysis, that the final digit has been sent. Digit analysis may consist of an examination of the country code and counting the maximum (or fixed) number of digits of the national number. In other cases, the end-of-pulsing signal is not sent and the end-of-address information is determined by the receipt of the address complete message or connect message from the incoming exchange.

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 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-by-link method (see § 2.1.6) or via the end-to-end methods (see § 3).

e) *Completion of transmission path*

Through connection of the transmission path in the backward direction (the transmission path is completed in the forward direction on receipt of connect or answer message) at the originating exchange will be completed except in the cases where conditions on the outgoing circuit prevent it (see § 2.1.9):

i) immediately after the sending of the initial address message, or

ii) when digit analysis or timer (T_{10}), or receipt of the address complete message indicates that all digits have been received.

It is also acceptable that on speech or 3.1 kHz audio calls, through connection of the transmission path will be completed in both directions immediately after the initial address message has been sent, except in the cases where conditions on the outgoing circuit prevent it (see § 2.1.9).

f) *Network protection timer*

Each time when the originating exchange has sent an address message the awaiting address complete timer (T_7) is started. If timer (T_7) expires the connection is released and an indication is sent to the calling subscriber.

2.1.2.2 *Actions required at an intermediate exchange*

a) *Circuit selection*

An intermediate exchange, on receipt of an IAM, will analyze the digits available and the other routing information [see § 2.1.2.1 a)] to determine the routing of the call. If the intermediate exchange can route the call using the connection type specified in the transmission medium requirement parameter a suitable free inter-exchange circuit is seized and an IAM is sent to the succeeding exchange. If the number of digits in the called party number are not sufficient to route the call the routing will be carried out when the intermediate exchange has received additional digits in subsequent address message(s). Any address digits received in subsequent address messages during the circuit selection process may be included in this IAM. Any subsequent address messages received after the IAM has been sent, are forwarded to the succeeding exchange as subsequent address message(s).

Within the network if the intermediate exchange does not route the call just using the connection type specified in the transmission medium requirement parameter, the exchange may also examine the user service information containing the bearer capability information (if available) to determine if a suitable route can be selected. In this case the transmission medium requirement parameter is modified to the new connection type.

For calls between networks, the gateway exchange (e.g. outgoing ISC) must ensure that the transmission medium requirement parameter is set according to the service requested by the customer (see Recommendation E.172). More specifically this parameter is carried unchanged within the international network.

When no echo suppressor or nature-of-circuit indication is received from a preceding exchange using a signalling system with fewer facilities the indicators will be considered as received "no" unless positive knowledge is available.

Selection of the outgoing national circuit normally can start at an incoming international exchange on receipt of the IAM and signalling can proceed on the first national link.

b) *Parameters in the initial address message*

An intermediate exchange may modify signalling information received from the preceding exchange according to the capabilities used on the outgoing route. Signalling information that may be changed are nature of connection indicator, end-to-end method indicator; the most significant digits in the called party number may be amended or omitted [see § 2.1.1.1 b)]. A change of the end-to-end method used may also alter parameters (see § 3). Other signalling information is passed on transparently, e.g. the access transport parameter, user service information, etc.

c) *Completion of transmission path*

Through-connection of the transmission path in both directions will be completed at an intermediate exchange immediately after the initial address message has been sent, except in those cases where conditions on the outgoing circuit prevent it (see § 2.1.9).

2.1.2.3 *Actions required at the destination exchange*

a) *Selection of called party*

Upon the receipt of the sufficient called party number information the destination exchange will analyze the called party number to determine to which party the call should be connected. It will also check the called party's line condition and perform various checks, to verify whether or not the connection is allowed. These checks will include correspondence of compatibility checks, e.g. checks associated with supplementary services.

At this point, certain call set-up information may need to be obtained from an originating or controlling exchange (see § 2.1.6). Examination of the protocol control indicator will show whether end-to-end information is necessary to be obtained before further processing of the call, in this case the SCCP, pass along or information request and information messages can be used.

In the case where the connection is allowed, the destination exchange will set up a connection to the called party. If a continuity check has to be performed on one or more of the circuits involved in a connection, setting up of the connection to the called party must be prevented until the continuity of such circuits has been verified.

2.1.3 *Calling party number*

The calling party number can either be included in the initial address message [§§ 2.1.1.1 c) and 2.1.2.1 c)] or requested by the destination exchange (see § 2.1.6). If the calling party number is required at the destination exchange but is not included in the initial address message, the destination exchange will analyze the protocol control indicator to determine if the request and response should be conducted by one of the procedures in § 3. The destination exchange will investigate the presence/absence or the calling party number parameter to determine whether a request is useful or not. Further it may be necessary to withhold the sending of the address complete message until the calling party number has been successfully delivered.

2.1.4 *Address complete message, connect message and call progress message*

2.1.4.1 *Return of address complete message from destination exchange*

An address complete message will be sent from the destination exchange as soon as it has been determined that the complete called party number has been received, or an indication received from the called party that an inband tone is being connected (for this case see §§ 2.1.5 and 2.2.4). However there is no direct mapping from alerting, received from the access signalling system, to address complete in the network. In the case that the continuity check is performed the destination exchange will withhold sending the address complete message until a successful continuity indication has been received (see § 2.1.9).

Address complete is sent from the destination exchange in the following conditions:

1) In the case where the terminating access is non ISDN the following action takes place at the destination exchange:

   a) In all cases an address complete message is sent as soon as it has been determined that the complete called party number has been received, and the destination exchange established that the subscriber is free. Indicators in the address complete message will be set to indicate:

      – call line status: "Subscriber free"
      – ISDN access indicator: "Non ISDN"

   b) In the case of a PBX an address complete message is sent as soon as it has been determined that the called party number has been received. Indicators in the address complete message will be set to indicate:

      – called line status: "No indication"
      – ISDN access indicator: "Non ISDN".

2) In the case where the terminating access is ISDN, the following conditions can apply:

   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:

      – called line status: "No indication"
      – ISDN access indicator: "ISDN".

      Note – In case a) the indication that the destination user is being alerted is transferred in a call progress message (see § 2.1.5).

   b) The destination exchange concludes from the receipt of an indication from the ISDN access that the complete called party number has been received. In this case the indicators in the address complete message will be set as follows:

      – called line status: "Subscriber free"
      – ISDN access indicator: "ISDN".

2.1.4.2 *Return of connect message from the destination exchange*

If a connect indication is received from the ISDN access under the following conditions:

– no alerting indication received from the ISDN access and

– an address complete message has not yet been sent by the destination exchange,

a connect message is sent by the destination exchange. This connect message signifies both address complete and answer conditions.

Indicators in the connect message will indicate:

– called line status: "Subscriber free"

– ISDN access indicator: "ISDN".

The destination exchange will through-connect before the connect message is sent.

2.1.4.3 *Receipt of address complete message or connect message at an intermediate exchange*

Upon receipt of an address complete message an intermediate exchange will send the corresponding address complete message to the preceding exchange. If a connect message is received at an intermediate exchange instead of an address complete message, a connect message will be sent to the preceding exchange.

2.1.4.4 *Receipt of address complete message or the connect message at the originating exchange*

a) When the originating exchange receives an address complete message the appropriate exchange functions take place.

b) On receipt of an address complete message with the called line status indicator set to "subscriber free" an alerting indication is passed to the calling party if possible.

c) On receipt of the address complete message the awaiting address complete timer (T_7) is stopped and the awaiting answer timer (T_9) is started. If timer (T_9) expires the connection is released and an indication is sent to the calling subscriber.

d) If the connect message is received then the appropriate exchange functions take place. The awaiting address complete timer (T_7) is stopped (see § 2.1.7.2).

2.1.4.5 *Through-connection and awaiting answer indication at the destination exchange*

The sending of the awaiting answer indication (e.g. ring tone) at the destination exchange depends on the type of call. On speech and 3.1 kHz calls and call to an analogue called party the awaiting answer indication is applied to the transmission path to the calling party from the destination exchange on receipt of an alerting indication from the called party or from information contained within the destination exchange that the called party will not or is prohibited from providing inband tone.

Regardless of whether tones are to be provided or not, the destination exchange will through-connect after the reception of the connection indication from the called party and before sending the answer/connect message to the preceding exchange.

If the destination exchange does not send the awaiting answer indication because the destination user provides for the sending of tones, then the destination exchange will through-connect the transmission path in the backward direction on receipt of the progress indication.

The complete through-connection of the transmission path at answer is covered in § 2.1.7.

2.1.4.6 *Address complete message with charging information*

The address complete message carries a charge indicator.

2.1.4.7 *Address complete message with other information*

Additional information can be included in the address complete messages (e.g. related to supplementary services, see Recommendation Q.730).

2.1.4.8 *Return of address complete message in interworking situations*

An address complete message will not be sent until the cross-office check is made, if applicable (see § 2.1.10).

If the succeeding network does not provide electrical called-party's-line-condition indications the last Signalling System No. 7 exchange shall originate and send an address complete message when the end of address signalling has been determined:

a) by receipt of an end-of-pulsing (ST) signal; or

b) by receipt of the maximum number of digits used in the national numbering plan; or

c) by analysis of the national (significant) number to indicate that a sufficient number of digits has been received to route the call to the called party; or

d) by receipt of an end-of-selection signal from the succeeding network (e.g. number received signal in Signalling System No. 5); or

e) exceptionally, if the succeeding network uses overlap signalling and number analysis is not possible, by observing that timer (T_{10}) has elapsed since the last digit was received, and that no fresh information has been received; in such circumstances, transmission to the national network of the last digit received must be prevented until the end of the waiting period which causes an address complete message to be sent backward. In this way, it is ensured that no national answer signal can arrive before an address complete message has been sent.

If in normal operation, a delay in the receipt of an address complete signal from the succeeding network is expected, the last common channel signalling exchange will originate and send an address complete message 15 to 20 seconds (timer (T_{11})) after receiving the latest address message. The time-out condition is an upper limit considering the clauses of § 2.9.10.3 (20 to 30 seconds waiting for address complete message timer (T_7) for outgoing international exchanges in abnormal release conditions).

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.

2.1.5 *Call progress*

The call progress message is sent (either before or after the address complete message) from an exchange in the backward direction indicating that an event has occurred during call set-up which should be relayed to the calling party.

2.1.5.1 *Return of call progress message from the destination exchange*

The call progress message is sent from the destination exchange if the address complete message has been sent and subsequently:

– an indication is received that the called party is being alerted,

  the call progress message contains an event indicator that is set to "alerting"

– a progress indication is received from the called party,

  the call progress message contains an event indicator that is set to "progress".

If the indication received from the called party contains a "progress indication", this is carried by the call progress message in the access transport parameter (transported unchanged across the public network).

The destination exchange may on receipt of the indication from the called party, that contains an appropriate progress indicator, through-connect the speech path, see § 2.1.4.5.

In the case of call failure and the connection of a tone or announcement being returned before the address complete message has been returned, see § 2.2.4.

2.1.5.2 *Action at an intermediate exchange*

On receipt of a call progress message an intermediate exchange will send the corresponding call progress message to the preceding exchange.

2.1.5.3 *Actions at the originating exchange*

On receipt of a call progress message at the originating exchange, no state change occurs (i.e. the awaiting address complete or the awaiting answer timer are not stopped), and the appropriate indication is sent to the calling user. If the call progress message contained information carried in the access transport parameter it is transferred unaltered into the indication returned to the calling user.

2.1.6 *Information messages*

2.1.6.1 *Requesting information*

An information request message may be sent to any exchange in the forward (backward) call establishment direction after sending (receiving) an IAM during call set-up.

2.1.6.2 *Sending information*

On sending an information request message a timer (T_{33}) is started. No second information request message may be sent in the same direction until a response information message is received. If the timer (T_{33}) expires before the response message is received, see § 2.10.7. The value of this timer (T_{33}) is 12-15 seconds to allow for a cascade of information request messages, as described in item ii). The response information message may be sent as follows:

i) if all the information requested is available locally, then an information message containing all the required information is sent in response;

ii) if all the information is not available locally, but may be available remotely, than an information request message may be sent to a subsequent exchange in the connection in an attempt to extract the information not locally available. (This information request message may be delayed if one has already been sent and the response not yet received.) On receipt of a response, all the information necessary to respond to the original information message is sent in an information message;

iii) 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 nor an indication that the requested information is not available, the actions taken will depend on whether the call can be progressed.

2.1.7 *Answer message*

2.1.7.1 *Return of answer message from destination exchange*

When the called party answers, the destination exchange connects through the transmission path and the ringing tone is removed if applicable. An answer message to the preceding exchange is sent. If the destination exchange is the exchange controlling charging, then charging may begin.

2.1.7.2 *Receipt of answer message at intermediate exchange*

Upon receipt of an answer message, an intermediate exchange sends the corresponding answer message to the preceding exchange and, if this is the exchange controlling charging, charging may begin, and timer (T_9) is stopped.

2.1.7.3 *Receipt of answer message at originating exchange*

When the originating exchange receives an answer message indicating the required connection has been completed, the transmission path is connected-through in the forward direction, if not already connected. The awaiting answer timer (T_9) is stopped. If the originating exchange is the exchange controlling charging, charging may begin if applicable. The calling party is informed.

2.1.7.4 *Return of answer from automatic terminals*

When connections are set-up to terminals having an automatic answer feature, the alerting indication may not be received from the called party. If a destination exchange receives an answer indication an answer message is sent provided that an address complete message has been sent, otherwise the connect message is sent.

2.1.7.5 *Answer with charging information*

The answer message received from the destination exchange or from a succeeding network carries a charge indicator.

2.1.8 *Continuity-check*

Because the signalling in Signalling System No. 7 does not pass over the circuit, facilities should be provided for making a continuity-check of the circuit in the circumstances described below.

The application of the continuity-check depends on the type of the transmission system used for the circuit.

For transmission systems having some inherent fault indication features giving an indication to the switching system in case of fault, a continuity-check is not required. However, a per call continuity-check may be needed on fully digital circuits when circuits or bundles of circuits in primary multiplex groups are dropped and inserted en route between switches, and alarm indications carried on bits of the primary multiplex frame structure are lost in passing through an intermediate transmission facility that does not relay them transparently. Typical, per call continuity-checks may be needed when the transmission link between switches contains a TDMA satellite system, a digital circuit multiplication system or a digital access and cross connection system, where fault indications are lost (see Recommendation Q.33).

When an initial address message is received with a request for a continuity-check relating to a digital circuit having inherent fault indication, one of the following actions is taken:

either a) the continuity-check request is disregarded;

or b) a continuity-check loop is connected and the maintenance system is alerted. In this case the call may fail since no continuity signal may be received from the distant end.

Note – The reception of such a request could only be caused by an abnormal condition such as administrative errors or the occurrence of signalling errors.

When the circuit type is unknown to an SS No. 7 exchange, or in an application where both analogue and digital circuits may be served or when no inherent fault indication is available, a continuity-check loop should always be connected in the following case:

i) when the exchange has the capability to process initial address messages with continuity-check request and such messages are received;

ii) when continuity-check request messages are received.

Means should be provided in SS No. 7 to detect circuit identification code misunderstandings between SS No. 7 exchanges.

For exchanges having both analogue and digital circuits served by SS No. 7, the continuity-check initiated by a continuity-check request message could be used to test for proper alignment of circuit code identities. On those exchanges, reception of a continuity-check request message should always cause a loop to be attached to the circuit.

Alternative methods for detection of circuit identity misunderstandings in exchanges with all digital circuits may be employed.

The continuity-check is not intended to eliminate the need for routine testing of the transmission path.

The continuity check of the circuit will be done, link-by-link, on a per call basis or by a statistical method prior to the commencement of conversation. Procedures and requirements are specified in Recommendation Q.724, § 7.

The actions to be taken when pilot supervision is used are described in Recommendation Q.724, § 9.

2.1.9 *Special procedures at an interworking point*

2.1.9.1 *Completion of transmission path at an interworking exchange*

In general, completion of the transmission path at an interworking point should occur as soon as possible during the call set-up phase. The actual point of switch-through will vary depending on the interworking signalling system, e.g. whether inband or outband signalling is used or whether a continuity-check procedure is applied.

When interworking with other internationally specified signalling systems, the following rules on switch-through should be applied:

SS No. 7 → SS No. 7	When no continuity-check is to be made on the outgoing circuit, through-connection should occur after sending the initial address message. When continuity-check is to be made on the outgoing circuit, through-connection should occur after residual check tone has propagated through the return path of the circuit (see Recommendation Q.724, § 7.3).
SS No. 6 → SS No. 7 SS No. 5 → SS No. 7 R1 → SS No. 7 SS No. 7 → SS No. 6	When no continuity-check is to be made on the outgoing circuit, through-connection can occur after sending the initial address message. When a continuity-check is to be made on the outgoing circuit, through-connection can occur after residual check tone has propagated through the return path of the circuit (see Recommendation Q.724, § 7.3).
R2 → SS No. 7	Through-connection should occur after receipt of address complete.
SS No. 7 → SS No. 5 SS No. 7 → R1	Through-connection can occur after sending ST (end of pulsing) signal and removal of a possible check loop.
SS No. 7 → R2	Through-connection should occur after sending of address complete.

When a continuity-check is made on the outgoing circuit, and early connection is made, there is a possibility that the calling party has its go and return paths temporarily looped (from the instant of through-connection to the instant of loop removal of the incoming end of the circuit). This problem can be prevented by using the optional single report continuity-check procedure given in Recommendation Q.724, § 7.3.

2.1.9.2 *Alerting of called party*

If in an interworking situation a continuity-check has to be performed on one or more of the circuits involved in the connection preceding the interworking point, appropriate measures must be taken to prevent alerting of the called party until the continuity of such circuits has been verified. Interworking situations which could be discriminated are:

a) SS No. 7 → any non No. 7 signalling system.

b) International SS No. 7 → national SS No. 7 not performing continuity-check.

For a) the last digit(s) of the national number have to be withheld in any (interworking) transit exchange or terminating exchange in case of DDI (direct dialling in) or the alerting of the called party is postponed in the terminating exchange in case of non DDI.

For b) either the last digit(s) of the national number are withheld in the incoming international transit exchange, a transit exchange in the national network or the terminating exchange in case of DDI (direct dialling in) or the setting up of the connection to the called party is postponed in the terminating exchange in case of non DDI.

2.1.10 *Cross office check*

For digital exchanges, the requirements mentioned in Recommendation Q.543 shall be met. For other exchanges, Administrations shall ensure the reliability of a connection through a switching machine (cross-office check) either on a per call basis or by a statistical method. With either method, the probability of the connection being established with an unacceptable transmission quality should not exceed 0.00001 as the long-term average.

2.1.11 *Charging procedures*

2.1.11.1 *Basic call charging*

Charging will normally begin when the exchange(s) controlling charging receives the answer or connect message from the network. Optionally an Administration may wish to begin charging prior to the receipt of the answer or connect message for national and/or international calls.

2.1.11.2 *Network charging messages* (national option)

When the charging exchange does not have the capability to determine the charge rate for a particular call, charge information may be received during the call set-up. Also, charge rate information may be returned during call set-up, followed subsequently by further charge information messages during the conversation/data phase, should the original rate require to be changed during the call.

2.1.12 *Forward transfer message*

The forward transfer message may be sent in telephony semi-automatic working in either of the following two cases:

a) following a call switched automatically to a subscriber, or following a call established via a special operator, the controlling operator wishes to call in an assistance operator. On receipt of the forward transfer message at the incoming international exchange, an assistance operator is called in;

b) following a call via codes 11 and 12, the controlling operator wishes to recall the incoming international exchange. Receipt of the forward transfer message at the incoming international exchange recalls the incoming operator on calls completed via the operator positions at the exchange.

2.1.13 *Transit network selection* (national option)

If transit network selection information is included in the set-up information from the calling party or is provided on a subscription basis, this information is carried in the transit network selection parameter, and is used for routing of the call, e.g. to a specific carrier.

A sequence of transit networks may be specified by the calling party, in which case the transit network selection parameter is repeated in the order specified.

2.2 *Unsuccessful call set-up*

If at any time in the call set-up the connection cannot be completed a release message is returned. This message contains the reason.

2.2.1 *Actions at exchange initiating a release message*

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].

2.2.2 *Actions at intermediate exchange*

On receipt of a release message from the succeeding exchange, an intermediate exchange:

i) immediately start the release of the switched path; when the circuit is reselectable, a release complete message is returned to the succeeding exchange;

ii) at the same time as the start of the release of the switched path, a release message is sent to the preceding exchange. 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 this time is covered in § 2.10.6).

2.2.3 *Actions at the controlling exchange* (i.e. the exchange controlling the call)

On receipt of a release message from the succeeding exchange, the controlling exchange starts the release of the switched path.

In addition, the controlling exchange will: (if applicable)

a) return an indication (in band or out band) to the calling party (see § 2.2.4); or

b) attempt to re-route the call set-up; or

c) initiate release procedures to the preceding exchange (as described in § 2.2.4).

In case a) above an indication is carried in the call progress message or address complete message indicating in-band information is available, (see § 2.2.4).

When the controlling exchange is ready for circuit re-selection, a release complete message is sent to the succeeding exchange.

2.2.4 *Tones and announcements*

If a call set-up fails and an in-band tone or announcement has to be returned to the calling party from an exchange or called party, the exchange or user concerned connects the in-band tone to the transmission path.

If an address complete message has been returned to the preceding exchange a call progress message indicating that in-band tone information is available, is returned to the preceding exchange (see § 2.1.5).

If an address complete message has not been returned to the preceding exchange already, an address complete message, with the appropriate cause parameter and the "in-band information" indicator set in the optional backward call indicator, will be returned to the originating exchange.

2.3 *Normal call release*

The release procedures are based on a two message (release, release complete) approach whereby the release message initiates release of the circuit switched connection.

The same procedures are used in the network irrespective of whether they are initiated by the calling party, the called party or the network. The normal release procedure can be prevented by the network if this is required on a particular call (§ 2.6).

To satisfy the need for rapid transfer of release across the network, it is required that the circuit is selectable from the subsequent exchange within the mean cross-office transfer time, T_{cu}, for simple messages as specified in Recommendation Q.766.

2.3.1 *Release initiated by a calling party*

a) *Actions at the originating exchange*

On receipt of a request to release the call from the calling party, the originating exchange immediately starts the release of the switched path. A release message is sent to the succeeding exchange and a timer (T_1) is started to ensure that a release complete message is received from the succeeding exchange within T_1 (expiration of this time is covered in § 2.10.6).

b) *Actions at an intermediate exchange*

On receipt of a release message from the preceding exchange, an intermediate exchange:

i) immediately starts the release of the switched path; when the circuit is reselectable, a release complete message is returned to the preceding exchange;

ii) at the same time as the start of the release of the switched path, sends a release message to the succeeding exchange. A timer (T_1) is started to ensure that a release complete message is received from the succeeding exchange within time T_1 (expiration of this time is covered in § 2.10.6).

c) *Actions at the destination exchange*

On receipt of a release message from the preceding exchange, the destination exchange will start the release of the switched path. When the circuit is ready for reselection a release complete message is returned to the preceding exchange.

d) *Charging*

Charging is stopped upon receipt of the release message at the charging exchange or on receipt of a request to release the call from the calling party when the charging exchange is the originating local exchange.

e) *Collision of release messages*

In the case when two points in the connection both initiate the release of a call, a release message may be received at an exchange from a succeeding or preceding exchange after the release of the switched path is initiated. In this case, the exchange will return a release complete message to the exchange from which the concerned release message was received. The release complete message will be sent when the circuit is ready for re-selection.

2.3.2 *Release initiated by a called party*

The procedures in § 2.3.1 apply, except that the functions at the originating and destination exchanges are transposed.

2.3.3 *Release initiated by the network*

The procedures in § 2.3.1 apply, except that they can be initiated at any exchange (originating, destination or intermediate).

2.3.4 *Storage and release of IAM information*

Each exchange of the connection shall store during the call set-up the information contained in the initial address message sent (the originating exchange) or received (intermediate or destination exchange). The information to be stored includes all parameters in the IAM. The contents of the IAM information shall be updated, if the value of parameters change during the call set-up.

The IAM information can be released from memory:

a) in the originating exchange when the address complete message or connect message has been received and the calling party does not subscribe to a supplementary service which would cause a new call set-up (e.g. call transfer). The release of the information when the calling party does subscribe to a supplementary service is covered in Recommendation Q.730;

b) in the intermediate exchange when the address complete message or the connect message has been received;

c) in the destination exchange when the address complete message or connect message has been sent and the called party does not subscribe to a supplementary service which would cause a new call set-up (e.g. call transfer). The release of the information when the called party does subscribe to a supplementary service is covered in Recommendation Q.730,

and when the call is released earlier and no automatic repeat attempt is to be attempted.

2.4 *Transfer of user-to-user information*

2.4.1 *Requirements for transfer of user-to-user data*

See Recommendation Q.730.

2.5 *Suspend, resume*

2.5.1 *Suspend*

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.

2.5.1.1 *Suspend initiated by a calling party*

A suspend message is generated in response to a suspend request from a calling party.

a) *Actions at originating exchange*

On receipt of a suspend request from the calling party, the originating exchange sends a suspend message to the succeeding exchange.

b) *Actions at an intermediate exchange*

On receipt of the suspend message from the peceding exchange the intermediate exchange sends a suspend message to the succeeding exchange.

c) *Actions at destination exchange*

On receipt of the suspend message from the preceding exchange, the destination exchange informs the called party that a suspend has been requested.

d) *Actions at the suspend request controlling exchange*

On receipt of the suspend request from a user or the suspend 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 § 2.5.3 apply.

2.5.1.2 *Suspend initiated by a called party*

The procedures in § 2.5.1.1 apply, except that the functions at the originating and destination exchanges are transposed.

2.5.1.3 *Suspend initiated by the network*

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 an on-hook condition in the terminating exchange or a clearback signal at the interworking exchange, the exchange may send a suspend (network) message to the preceding exchange.

b) *Action at the intermediate exchange*

On receipt of a suspend message the exchange will send a suspend message to the preceding exchange.

c) *Action at the controlling 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 Recommendation Q.118. If the timer (T_6) expires, the procedures in § 2.5.3 apply.

2.5.2 *Resume*

A resume message indicates a request to recommence communication. A request to release the call received from the calling or called party will override the suspend/resume sequence and the procedures given in § 2.3 will be followed.

2.5.2.1 *Resume initiated by a calling party*

Having initiated a suspend condition, a calling party may request a reconnection within timer T_2. The procedures in § 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).

2.5.2.2 *Resume initiated by a called party*

The procedures in § 2.5.2.1 apply except that the functions at the originating and destination exchange are transposed.

2.5.2.3 *Resume initiated by the network*

A resume message is initiated by the network, if a suspend message had previously been sent, in response to a re-answer 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 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. exchange controlling the 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 § 2.5.1.3 c)].

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 (T_2) or timer (T_6) covered in Recommendation Q.118 then the controlling exchange will initiate the release procedure outlined in § 2.3.3.

2.6 *Delayed release* (national option)

The delayed release message is generated by the network in response to a request from the calling/called party to release the call if the network is applying a hold to the connection. The delayed released message can be sent in either direction.

The local exchange receiving the release request sends a delayed release message. The connection is split, timer (T_3) is started (to prevent network lock-up) and charging is stopped. At the other end of the connection, the delayed release message causes an indication to be sent to the called/calling party.

Receipt of a connect or reconnection request from the called/calling party during the held state (after the delayed release message has been sent) will not cause the network to set up or resume the connection. When the hold condition is removed or the timer (T_3) matures, the network generates the normal release sequence (§ 2.3.3).

2.7 *In-call modification*

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

Following call set-up the calling or called party may choose to modify the characteristics of the call during the conversation/data phase. During call set-up, the network will 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.

2.7.1 *Successful completion*

2.7.1.1 *Actions required at the exchange originating the call modification*

a) On receipt of a call modification request from the called/calling party, the initiating exchange checks that call modification is allowed and that the necessary resources are available. If acceptable, the resources are reserved and the call modification request message is sent. A timer (T_4) is started to ensure that a call modification completed message is received within timer (T_4).

b) On receipt of the call modification complete message, the exchange modifies the resource and, when complete, informs the initiating party that the modification is complete. The timer (T_4) is cancelled.

2.7.1.2 *Actions required at intermediate exchanges*

a) On receipt of the call modification request message an intermediate exchange checks that the necessary resources are available. If acceptable, the resources are reserved and the call modification request message is passed on to the next exchange.

b) 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.

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

a) On receipt of a call modification request message the exchange checks that call modification is allowed and that the necessary resources are available. If acceptable, the resources are reserved and the call modification indication is sent to the called/calling party.

b) After the calling/called party has changed state and the modification in the local exchange has been completed, a call modification complete message is returned to the network.

2.7.2 *Unsuccessful completion*

Basically three cases of unsuccessful completion can be identified:

i) If the in call modification request fails at an intermediate or at the remote exchange, i.e. because no resources are available or in call modification is not allowed, a call modification reject message is returned in the direction of the exchange originating the in call modification request. The connection is maintained in its current mode.

ii) If an intermediate exchange or the exchange initiating the call modification request fails to modify the characteristics of the transmission path, the connection is released.

iii) If at the exchange initiating the call modification request timer (T_4) expires, the connection is released.

2.7.2.1 *Actions required at the local exchange initiating the call modification*

On receipt of the call modification reject message the exchange keeps the characteristics of the transmission path in the current mode, stops the timer (T_4) and informs the initiating party. If resources have been reserved upon reception of the call modification request, they are released.

2.7.2.2 *Actions required at an intermediate exchange*

If the in call modification request fails or if the call modification reject message is received by the intermediate exchange the characteristics of the transmission path are kept in the current mode and the call modification reject message is returned in the initiating direction. If resources have been reserved upon reception of the call modification request message, they are released.

If an intermediate exchange, upon receipt of a call modification complete message, fails to change the characteristics of the transmission path, it initiates the release of the connection in both directions.

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*

2.8.1 *General*

The echo control procedure is used on a per call basis to convey information between exchange nodes about the demand and ability to insert echo control devices.

The procedure is invoked when a call is to be routed on a connection for which echo control is necessary. It could be initiated at the originating exchange or at an intermediate exchange.

2.8.2 *Forward direction*

2.8.2.1 *Actions at the originating exchange*

If an originating exchange has sufficient information to determine that echo control is necessary for the outgoing circuit then:

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

2.8.2.2 *Actions at an intermediate exchange*

If an intermediate exchange has sufficient information to determine that echo control is 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 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 an 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.

2.8.2.3 *Actions at the destination exchange*

See § 2.8.3.1 below.

2.8.3 *Backward direction*

2.8.3.1 *Actions at the destination exchange*

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:

- an incoming half echo control device is enabled; and
- 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 an echo control device indicator in the nature of connection indicators field not being set in the first backward message.

2.8.3.2 *Actions at an intermediate exchange*

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 actions can occur:

a) When the backward call indicators parameter field indicates that an incoming half echo control device is not already included:
   - the reserved incoming half echo control device is included; and
   - the echo control device indicator in the backward call indicators parameter field is set.

b) When the backward call indicators parameter field indicates that an incoming half echo control device is already included:
   - the reserved incoming half echo control is released; and
   - no change to the backward call indicators parameter field in the backward message is made.

2.8.3.3 *Actions at the originating exchange*

No additional action is required.

2.9 *Network features*

2.9.1 *Automatic repeat attempt*

Automatic repeat attempt, as defined in Recommendation Q.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 § 2.3.4):

i) on detection of dual seizure (at the non-control exchange) (see § 2.10.1.4);

ii) on receipt of the blocking message after sending an address message and before any backward message has been received (see § 2.9.2);

iii) on receipt of a reset circuit message after sending an address message and before a backward message has been received [see § 2.10.3.1 e)];

iv) on failure of continuity-check, when a continuity check is performed;

v) on receipt of an unreasonable message during call set up (see § 2.10.5).

2.9.2 *Blocking and unblocking of circuits and circuit groups*

The blocking (unblocking) message and the circuit group blocking (unblocking) message are provided to permit the switching equipment or maintenance system to remove from (and return to) traffic the distant terminal(s) of a circuit or group of circuits because of a fault or to permit testing.

Since the circuits served by the ISDN user part have both-way capability, the blocking message or circuit group blocking message can be originated by either exchange. The receipt of a blocking message or a circuit group blocking message will have the effect of prohibiting non test calls on the relevant circuit(s) outgoing from the exchange until an unblocking message or an appropriate circuit group unblocking message is received, but will not prohibit test calls incoming to that exchange. An acknowledgement sequence is always required for the blocking and unblocking message as well as for the circuit group blocking message and circuit group unblocking messages using the blocking acknowledgement message, the unblocking acknowledgement message, the appropriate circuit group blocking acknowledgement messages and the appropriate circuit group unblocking acknowledgement message respectively. The acknowledgement is not sent until the appropriate action – either blocking or unblocking – has been taken. The release message should not override a blocking message and return circuits to service which might be faulty. The blocked circuit(s) will be returned to service on transmission of the unblocking acknowledgement message or the appropriate circuit group unblocking acknowledgement message at one exchange and on receipt of the unblocking acknowledgement message or the appropriate circuit group unblocking acknowledgement message at the other exchange.

2.9.2.1 *Other actions on receipt of a blocking message*

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:

- after an initial address message has been sent for that circuit in the opposite direction and after at least one backward message relating to that call has been received, or
- after an intial address message has been received for that circuit beforehand,

the exchange will not seize that circuit for subsequent calls.

The fact that the circuit is engaged on a call will not delay transmission of the blocking (unblocking) acknowledgement message.

If a blocking message is sent and subsequently an initial address message is received in the opposite direction, the following action is taken:

- for test calls, the call should be accepted, if possible. In the case where the test call cannot be accepted, the blocking message must be returned;
- for calls other than test calls, the blocking message must be returned and the initial address message discarded.

When a circuit is blocked by use of the blocking message the maintenance system should be informed at both ends of the circuit.

2.9.2.2 *Circuit group blocking and unblocking messages*

The following circuit group blocking (unblocking) messages and their corresponding acknowledgement messages are provided:

- maintenance oriented circuit group blocking (unblocking) message;
- hardware failure oriented circuit group blocking (unblocking) message;

The circuits to be blocked (unblocked) are indicated in the status field.

The maximum number of circuits to be blocked (unblocked) with one circuit group blocking (unblocking) message is limited to 32.

A received circuit group blocking (unblocking) acknowledgement message has to match in the parameter value of the circuit identification code, the circuit group supervision message type indicator, and the range field (see Recommendation Q.763) with the previously sent group blocking (unblocking) message in order to be considered a valid acknowledgement.

A circuit is controlled by the ISND 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.

Some of the circuit identification code values covered by the range field of a circuit group blocking (unblocking acknowledgement) message may not be allocated to any circuit. Then the corresponding status bits in the status field are set to 0. This is not allowed for the circuit identification code values related to status bits being set to 1. Those circuit identification code values must always be allocated to circuits whose control is allocated to the ISDN user part. In particular the circuit identification code value indicated in the label of a message must be allocated to a circuit.

The maintenance oriented circuit group blocking (unblocking) procedures set (remove) the same blocking states as the blocking (unblocking) procedures. This means that a blocking state set by a maintenance oriented circuit group blocking message or indicated as blocked for maintenance purposes in the status field of a circuit group reset acknowledgement message can be removed by an unblocking message. Similarly, a blocking state set by a blocking message can be removed by a maintenance oriented circuit group unblocking message.

The maintenance blocked state set by maintenance oriented circuit group blocking message, by a status indicator in a circuit group reset acknowledgement message or a blocking message cannot be removed by a hardware oriented circuit group unblocking message.

The range of circuits to be blocked (unblocked) is indicated in the range field. Those circuits within the range that have to be blocked (unblocked) are indicated in the status field. The same rule applies to the acknowledgements.

For the circuits blocked for maintenance reasons the same conditions apply and the same actions have to be taken as described in § 2.9.2.1.

For the circuits seized by ongoing calls or call attempts and blocked for reasons of harware failure the following actions will be taken:

- all interconnected circuits have to be released by the appropriate messages;
- the affected circuits are set to the condition "idle hardware blocked" without any exchange of release messages.

The fact that a circuit is engaged on a call will not delay the transmission of the corresponding circuit group blocking (unblocking) acknowledgement message.

The hardware blocked state can only be removed by a hardware failure oriented circuit group unblocking message.

For all instances of circuit group blocking the maintenance system should be notified at both ends of the circuit(s).

2.9.2.3 *Abnormal blocking and circuit group blocking procedures*

The following procedures are designed to cover abnormal cases which may occur in the circuit group blocking/unblocking procedures.

i) If a circuit group blocking message is received relating to remotely blocked circuits then blocking acknowledgement indications for those circuits are given in the status field of the corresponding circuit group blocking acknowledgement message which will be sent in response.

ii) If a circuit group un unblocking message is received relating to circuits which are not in the state remotely blocked, then unblocking acknowledgement indications for those circuits are given in the status field of the corresponding circuit group unblocking acknowledgement message which will be sent in response.

iii) When an exchange upon receipt of a circuit group blocking (unblocking) message is not able to give an appropriate blocking (unblocking) acknowledgement indication for each circuit identification code (e.g. because that/those circuit identification code(s) is(are) not allocated to any circuit at the receiving exchange) for which also a blocking (unblocking) indication is given in the status field of the received group blocking (unblocking) message, then no blocking (unblocking) acknowledgement indication relating to that/those circuit identification code(s) will be given in the status field of the corresponding circuit group blocking (unblocking) acknowledgement message which will be sent in response.

iv) If a circuit group blocking acknowledgement message in response to a circuit group blocking message is received containing in the status field the indications no blocking aknowledgement for the circuits which are to be blocked due to the previously sent circuit group blocking message, then (a) circuit group blocking message(s) will be repeated for the circuits concerned (see § 2.10.4). The same rule applies to the unblocking procedures.

v) If a circuit group blocking acknowledgement message in response to a circuit group blocking message is received containing in the status field blocking acknowledgement indications for the circuits which are not to be blocked due to the previously sent circuit group blocking message and are not marked locally blocked, then a circuit group unblocking message will be sent for the circuits concerned.

iv) If a circuit group unblocking acknowledgement message in response to a group unblocking message is received containing in the status field unblocking acknowledgement indications for circuits which are not to be unblocked due to the previously sent circuit group unblocking message and have to remain marked locally blocked, then a circuit group blocking message will be sent for the circuits concerned.

vii) If a circuit group blocking acknowledgment message which is not expected as an acknowledgent for any circuit group blocking message is received:

- relating to circuits which all are in the status locally blocked the received circuit group blocking acknowledgement will be discarded;
- relating to circuits part or all of which are not in the status locally blocked then a circuit group unblocking message will be sent for the relevant circuits.

viii) If a circuit group unblocking acknowledgement message which is not expected as an acknowledgement for any circuit group unblocking message is received:

– relating to circuits none of which is in the status locally blocked then the circuit group unblocking acknowledgement message will be discarded;
– relating to circuits part or all of which are locally blocked then a circuit group blocking message will be sent for the relevant circuits.

ix) If a circuit group blocking (unblocking) message or a circuit group blocking (unblocking) acknowledgement message refers to status changes for more than 32 circuits the receiving exchange may discard that message.

x) If a blocking message is received for a blocked circuit, a blocking acknowledgement message will be sent.

xi) If an unblocking message is received for an unblocked circuit, an unblocking acknowledgement message will be sent.

xii) If a blocking acknowledgement message, which is not expected as an acknowledgement for a blocking message, is received:

– relating to a circuit which is locally blocked, the blocking acknowledgement message is discarded;
– relating to a circuit which is not locally blocked, then an unblocking message will be sent;

xiii) If an unblocking acknowledgement message, which is not an expected response to an unblocking message, is received:

– relating to a circuit which is not locally blocked, the received unblocking acknowledgement message is discarded;
– relating to a circuit which is locally blocked then a blocking message will be sent.

xiv) If a non test initial address message is received on a remotely blocked circuit, the remotely blocked state of the circuit is removed and the initial address message is processed normally unless the circuit is also locally blocked in which case the initial address message is discarded. This applies to the blocking state whether maintenance, hardware or both. However it should not be the preferred method of unblocking a circuit.

2.9.3 *Circuit group query*

2.9.3.1 *General*

The circuit group query test allows an exchange to audit the state of a circuit on a demand or routine basis.

The value N of the range field of the circuit group query message, including $N=0$ for a single circuit, indicates the range to be tested. The maximum value of N is 31. If that value is exceeded the circuit group query message is discarded.

2.9.3.2 *Interpretation of circuit states*

For the purposes of circuit query procedures, there are states which are classified into four major categories, as follows:

1) unequipped and transient conditions,
2) call processing states,
3) maintenance blocking states,
4) hardware blocking states.

The two states "unequipped" and "transient" do not overlap with other states.

Call processing states include:

1) idle,
2) circuit incoming busy,
3) circuit outgoing busy.

Maintenance blocking states include:

1) unblocked,
2) remotely blocked,
3) locally blocked,
4) locally and remotely blocked.

Hardware blocking states include:

1) unblocked,
2) remotely blocked,
3) locally blocked,
4) locally and remotely blocked.

A circuit is "unequipped" if the circuit is not available for ISDN user part. Call processing or maintenance action cannot be performed on it. This is a unique state and will not overlap with any other state.

The "transient" state refers to any transient call processing or maintenance states.

Call processing is in a transient state

a) after having sent an initial address message and waiting for the first backward message (whether a suspended call is in a transient state in the context of circuit group query is for further consideration), or

b) after having sent a release message and waiting for the release complete message.

Transient maintenance states are those, where the exchange after having sent a (group) (un)blocking message is awaiting the proper (group) (un)blocking acknowledgement message from the remote exchange.

The circuit state is also considered transient as long as a circuit (group) reset message has not been acknowledged.

The "idle" state is a call-processing state of an equipped, non-busy circuit. The "circuit incoming busy" or "circuit outgoing busy" refers to a stable call processing state.

The hardware or maintenance "remotely blocked" state refers to the state marked by the exchange when the far-end exchange initiates blocking. The maintenance blocking state can co-exist with "idle", "circuit incoming busy", or "circuit outgoing busy" state. The hardware blocking state can only co-exist with the "idle" call processing state, as calls are immediately released when hardware blocking is invoked.

The hardware or maintenance "locally blocked" state refers to the state marked by the exchange when it initiated blocking to the far-end exchange and the proper acknowledgement was received. The maintenance blocking state can co-exist with "idle", "circuit incoming busy", or "circuit outgoing busy" state. The hardware blocking state can only co-exist with the "idle" call processing state, as calls are immediately released when hardware blocking is invoked.

To initiate the circuit group query procedure, the sending exchange sends a circuit group query message indicating in the routing label and range field those circuits to be audited. If no response to the circuit group query message is received before timer (T_{34} 12-15 seconds) expires, maintenance systems should be informed.

The receiving exchange will process the circuit group query message, and return a circuit group query response message setting the circuit state indicators to the state of the circuits being audited.

If this circuit group procedure uncovers discrepancies in the state of a circuit as perceived at the two ends. The action to be taken in order to align the two views are for further study.

2.10 *Abnormal conditions*

2.10.1 *Dual seizure*

Because Signalling System No. 7 circuits have the capability of bothway operation, it is possible that the two exchanges will attempt to seize the same circuit at approximately the same time.

2.10.1.1 *Unguarded interval*

The exchange must detect dual seizure and take action as defined in § 2.10.1.4.

2.10.1.2 *Detection of dual seizure*

A dual seizure is detected by an exchange from the fact that it receives an initial address message for a circuit for which it has sent an initial address message, but before it receives a valid backwards message.

2.10.1.3 *Preventive action*

Different methods for circuit selection can be envisaged to minimise the occurrence of dual seizure. In the following, two methods are described. Further study is required to determine the field of application of each method and to ensure that the two methods do inter-work satisfactorily.

Other methods for circuit selection may also be used provided that they give the same degree of protection against dual seizure also when one of the methods specified is used at the other end.

Method 1

An opposite order of selection is used at each exchange of a bothway circuit group.

Method 2

Each exchange of a bothway circuit group has priority access to the group of circuits which it is controlling (see § 2.10.1.4). Of this group the circuit which has been released the longest is selected (first-in, first-out). In addition each exchange of a bothway circuit group has non-priority access to the group of circuits which it is non-controlling. Of this group the latest released circuit is selected (last-in, first-out) if all circuits in the group are busy.

For call control purposes a bothway circuit group can be subdivided into subgroups in an exchange.

It is necessary to take preventive action in cases where Signalling System No. 7 uses a signalling data link with long propagation time.

2.10.1.4 *Action to be taken on detection of dual seizures*

Each exchange will control one half of the circuits in a bothway circuit group. On detection of a dual seizure, the call being processed by the control exchange for that circuit will be completed and the received initial address message will be disregarded.

Under these conditions, the call being processed by the control exchange will be allowed to mature. The call being processed by the non-control exchange will be backed off and the switch-path released. A release message will not be sent. The non-control exchange will make an automatic repeat attempt on the same or on an alternative route.

For the purpose of resolution of dual seizure on bothway circuits, the exchange with the higher signalling point code will control all even-numbered circuits (circuit identification code) and the other exchange the odd-numbered circuits. The designation of control may also be used for maintenance system purposes.

2.10.2 *Transmission alarm handling for digital inter-exchange circuits*

When fully digital circuits are provided between two exchanges, which have some inherent fault indication feature giving an indication to the switching system when faults on tansmission systems are detected, the switching system should inhibit selection of the circuits concerned for the period the fault conditions persist.

2.10.3 *Reset of circuits and circuit groups*

In systems which maintain circuit status in memory there may be occasions when the memory becomes mutilated. In such a case the circuits must be reset to the idle condition at both exchanges to make them available for new traffic. Since the exchange with the mutilated memory does not know whether the circuits are idle, busy outgoing, busy incoming, blocked, etc., reset circuit messages or a circuit group reset message should be sent as appropriate for the affected circuits.

2.10.3.1 *Reset circuit message*

If only a few circuits are concerned a reset circuit message should be sent for each affected circuit.

On receipt of a reset circuit message the receiving (unaffected) exchange will:

a) if it is the incoming or outgoing exchange on a connection in any state of call set-up or during a call, accept the message as a release message and respond by sending a release complete message, after the circuit has been made idle;

b) if the circuit is in the idle condition, accept the message as a release message and respond by sending a release complete message;

c) if it has previously sent a blocking message, or if it is unable to release the circuit as described above, respond by the blocking message. If an incoming or outgoing call is in progress, this call should be released and the circuit returned to the "idle, blocked" state. A release complete message is sent following the blocking message. The blocking message should be acknowledged by the affected exchange. If the acknowledgement is not received, the repetition procedure specified in § 2.10.4 should be followed;

d) if it has previously received a blocking message, respond by releasing a possible outgoing call or call attempt on the circuit, remove the blocked condition, restore the circuit to the idle state, and respond with a release complete message;

e) if the message is received after the sending of an initial address message but before receipt of a backward message relating to that call, clear the circuit and make an automatic repeat attempt on another circuit if appropriate;

f) if the message is received after having sent a reset circuit message, respond by a release complete message. The circuit should be restored to the idle state;

g) clear any interconnected circuits by the appropriate method (e.g. release).

The affected exchange will then reconstruct its memory according to the received response(s) to the reset circuit and respond to the message(s) in the normal way, i.e. blocking acknowledgement message in response to a blocking message.

If no release complete message is received in acknowledgement to the reset circuit message before 4-15 seconds, the reset circuit message should be repeated. If an acknowledgement for the message is not received within 1 minute after the initial reset circuit message, the maintenance system should be notified. However, the sending of the reset circuit message should continue at 1 minute intervals until maintenance intervention occurs.

2.10.3.2 *Circuit group reset message*

If a considerable number of circuits or all circuits are affected by a memory mutilation, (a) circuit group reset message(s) should be used to make them available for new traffic.

The maximum number of circuits to be reset with a circuit group reset message is limited to 32.

On receipt of a circuit group reset message the receiving (unaffected) exchange will:

a) restore the circuits to the idle state;

b) send the appropriate circuit group blocking message(s) if it had previously sent a hardware failure oriented circuit group blocking message;

c) respond by a circuit group reset acknowledgement message in which the status indicator bits of the circuits available for service or blocked for reasons of hardware failure are coded 0 and the status indicator bits of all circuits blocked for maintenance reasons are set to 1;

d) if it had previously received (a) blocking message(s) or (a) circuit group blocking message(s) for one or more of the circuit(s) involved, the blocked condition will be removed and the circuits will be made available for service;

e) if a circuit group reset message is received concerning circuits for which a circuit group reset message or reset circuit message(s) have been sent the circuits concerned are made available for service after receipt of the appropriate acknowledgement message;

f) appropriate messages should be sent on interconnected circuits to release them.

The affected exchange will then reconstruct its memory according to the possibly received circuit group blocking messages and the received circuit group reset acknowledgement message. It will respond to the possibly received circuit group blocking messages in the normal way.

If no acknowledgement to a circuit group reset message is received before 4-15 seconds the circuit group reset message should be repeated. If an acknowledgement for the circuit group reset message is not received within 1 minute after sending the initial circuit group reset message the maintenance system should be notified. However, the sending of the circuit group reset message should continue at 1 minute intervals until maintenance intervention occurs.

A correct acknowledgement should match the original circuit group reset message in range and circuit identification code indicated in the routing label. The circuit identification code in the routing label of both circuit group reset messages and circuit group reset acknowledgement messages should belong to a circuit whose control is allocated to the ISDN-UP.

All circuit identification codes in the range of a circuit group reset and circuit group reset acknowledgement message must belong to circuits whose control is allocated to the ISDN-UP.

2.10.3.3 *Abnormal circuit group reset message procedures*

i) If a circuit group reset message is received indicating reset of more circuits than allowed by the receiving exchange, it is discarded.

ii) If a circuit group reset acknowledgement message is received which is not a correct response to a sent circuit group reset message, it is discarded.

iii) If a circuit group reset message is received requesting reset of circuits that are not controlled by the ISDN user part, or a circuit group reset acknowledgement message that contains circuit identification codes that are not controlled by the ISDN-UP, the message is discarded.

2.10.4 *Failure in the blocking/unblocking sequence*

An exchange will repeat the blocking (unblocking) message or the circuit group blocking (unblocking) message on failure to receive the appropriate acknowledgement in response to one of these messages before 4-15 seconds (T_{12}). (See § 2.9.2).

If the appropriate acknowledgement is not received within a period of one minute (T_{20}) after sending the initial blocking (unblocking) message or group blocking (unblocking) message, the maintenance system should be alerted, the repetition of the blocking (unblocking) message or circuit group blocking (unblocking) message should be continued at one minute intervals until maintenance intervention occurs and the circuit(s) taken out of (returned to) service as appropriate.

2.10.5 *Receipt of unreasonable and unrecognized signalling information messages*

The message transfer part of the signalling system will avoid missequencing, or double delivery, of messages with a high reliability (Recommendation Q.706, § 2). However, undetected errors at the signalling link level and exchange malfunctions may produce signalling information messages that are either ambiguous or inappropriate.

The procedures listed below do not include the procedures for the blocking, circuit group blocking and the circuit group reset; these are covered in §§ 2.9.2.3 and 2.10.3.3 respectively.

2.10.5.1 *Handling of unexpected messages*

An unexpected message is one which is recognized and valid but has been received in the wrong phase of the call.

In order to resolve possible ambiguities in the state of a circuit when unexpected messages are received the following will apply:

a) if a release message is received relating to an idle circuit it will be acknowledged with a release complete message;

b) if a release complete message is received relating to an idle circuit it will be discarded;

c) if a release complete message is received relating to a busy circuit for which a release message has not been sent, the circuit will be released and a release message will be sent (the possibility of maintaining the connection is for further study);

d) if other unreasonable signalling information is received, the following actions will be undertaken:
   - if the circuit is idle, the reset circuit message is sent;
   - if the circuit has been seized by a call, after receipt of a backward message required for the call set-up, the unreasonable signalling information is discarded;
   - if the circuit has been seized by a call, before receipt of a backward message required for the call set-up, the reset circuit message is sent. If the circuit is seized by an incoming call, the call will be released. If the circuit is seized by an outgoing call, an automatic repeat attempt is provided on another circuit;

e) if unreasonable signalling information caused by conflicting code point values in the protocol control indicator as specified in Recommendation Q.763 is received in a backwards call set-up message, and if the conflicting conditions can be reconciled by assuming lower network capability in the affected parameter, the call should be allowed to continue if the service requirements for the call can be satisfied.

Except in certain cases (see § 2.10.1) any other unexpected messages received will be discarded. If the discarding of the signalling information prevents a call from being completed, that call will eventually be released by the expiry of a time out.

2.10.5.2 *General requirements on receipt of unrecognized signalling information messages and parameters*

Normally an exchange knows the signalling system or version of a signalling system to be used to its adjacent exchanges. However, in certain circumstances (e.g. upgrading of a signalling system in the network) it may happen that an exchange receives unrecognized information, i.e. messages or parameters or parameter values. No distinction is being made between unrecognized and unimplemented functions.

The procedure to be used on receipt of unrecognized information, may use one of the following messages:

– confusion,

– release,

– release complete,

– facility reject.

It should be noted that the use of the confusion message is mainly to facilitate interworking with subsequent issues of the ISDN user part protocol. In these cases the message will include one of the following cause values with a diagnostic field containing either the unrecognized message type code or the unrecognized parameter name code (this information will be returned as soon as possible):

– unrecognized message,

– unrecognized parameter passed on (see Note),

– unrecognized parameter discarded (see Note).

Note – In a confusion message these parameters are always followed by the parameter name code in the diagnostic field.

The procedures are based on the following assumptions:

– Signalling for a facility completely provided between the originating and destination local exchanges will utilise one of the end-to-end methods defined in § 3, i.e. such facilities do not have to be supported by transit exchanges.

– As a minimum, all implementations must recognize all messages specified in Table 1/Q.764.

– If an exchange receives a confusion, release, release complete or facility reject message indicating an unrecognized message parameter or parameter value received it assumes interworking with an exchange at a different functional level.

– Unrecognized parameters only refer to optional parameters since mandatory parameters will always be recognized by their location in a message.

Action taken on receipt of these messages, will depend on the call state and the affected service. The default action taken on receipt of a confusion message is to discard the message without disrupting normal call processing. In addition, if the cause received indicates discarded information and that information is important, the call may be released with a release message with the cause "normal, unspecified".

The actions taken at an intermediate node, e.g. transit exchange on receipt of a confusion message will be dependent on the call state.

If an intermediate node, e.g. transit exchange, does not have the capability to take action on receipt of a facility reject message, it should pass the message transparently to the preceding or succeeding exchange.

Action taken on receipt of a release complete message with cause indicating unrecognized information may be as for the normal procedures.

TABLE 1/Q.764

Minimum messages recognized

Address complete
Answer
Blocking
Blocking acknowledgement
Call progress
Circuit group blocking
Circuit group blocking acknowledgement
Circuit group reset
Circuit group reset acknowledgement
Circuit group unblocking
Circuit group unblocking acknowledgement
Connect
Continuity
Confusion
Facility reject
Facility request
Forward transfer
Information
Information request
Initial address
Release
Release complete
Reset circuit
Resume
Subsequent address
Suspend
Unblocking
Unblocking acknowledgement

2.10.5.3 *Procedures for the handling of the unrecognized messages or parameters*

A confusion message must not be sent in response to a received confusion message.

a) *Unrecognized mesages*

If an unrecognized message is received at an exchange, the message is discarded and a confusion message returned. The confusion message will include the cause value "unrecognized message" followed by a diagnostic field containing the message type code.

Note – All messages not included in Table 1/Q.764 may be regarded as unrecognized. As a minimum all implementations must recognize all messages specified in Table 1/Q.764.

b) *Unrecognized parameters*

If an exchange receives and detects an unrecognized parameter the actions taken will be dependent on whether the call can be progressed or not.

If the call cannot be processed a release message is sent containing the cause "unrecognized parameter discarded" followed by the parameter name code in the diagnostic field.

If the call can be progressed, the call is processed and the message is sent to the succeeding/preceding exchange. The unrecognized parameter may be either passed on or discarded.

If the unrecognized parameter is discarded a confusion message is sent to the exchange from which the unrecognized parameter was received. The confusion message contains the cause "unrecognized parameter discarded".

If the unrecognized parameter is passed on, a confusion message may be sent to the exchange from which the unrecognized parameter was received.

If a facility request message is received with unrecognized parameters the message is discarded and a facility reject message is returned including the cause "unrecognized parameter discarded" followed by the parameter name code in the diagnostic field.

If a release message is received with an unrecognized parameter, a release complete message is returned including the cause "unrecognized parameter passed on" followed by the parameter name code in the diagnostic field.

c) *Unrecognized parameter values*

If an exchange receives and detects a recognized parameter but the contents are unrecognized, then the actions taken are as defined below:

i) *Unrecognized mandatory parameter values*

If an exchange receives and detects an unrecognized mandatory parameter value, the actions taken will be dependent on whether the call can be progressed or not.

If the call can be progressed, the unrecognized mandatory parameter value shall be passed on unmodified. A confusion message with the cause "unrecognized parameter passed on" is sent to the exchange from which the unrecognized mandatory parameter value was received.

If the call cannot be progressed or the unrecognized mandatory parameter value cannot be passed unmodified, a release message with the cause "unrecognized parameter discarded" followed by the parameter name in the diagnostic field is returned.

If a facility request message is received with an unrecognized mandatory parameter value(s) the message is discarded and a facility reject message is returned including the cause "unrecognized parameter discarded" followed by the parameter name code in the diagnostic field.

If a release message is received with an unrecognized mandatory parameter value, a release complete message is returned including the cause "unrecognized parameter passed on" followed by the parameter name code in the diagnostic field.

ii) *Unrecognized optional parameter values*

If an exchange receives and detects an unrecognized optional parameter value, the actions taken will be dependent on whether the call can be progressed or not.

If the call can be progressed, the unrecognized optional parameter value may be passed on unmodified or discarded. If the unrecognized optional parameter value has been passed on unmodified, a confusion message with the cause "unrecognized parameter passed on" may be sent to the exchange from which the unrecognized optional parameter value was received. If the unrecognized parameter value has been discarded, a confusion message shall be returned.

If the call cannot be progressed, a release message with the cause "unrecognized parameter discarded" followed by the parameter name in the diagnostic field shall be returned.

If a facility request message is received with an unrecognized optional parameter value(s) the message is discarded and a facility reject message is returned including the clause "unrecognized parameter discarded" followed by the parameter name code in the diagnostic field.

If a release message is received with an unrecognized optional parameter value, a release complete message is returned including the cause "unrecognized parameter passed on" followed by the parameter name code in the diagnostic field.

2.10.6 *Failure to receive a "release complete" message – time T_1 and T_5*

If a release complete message is not received in response to a release message before time (T_1) the exchange will retransmit the release message.

On retransmitting the initial release message, a one minute timer (T_5) is started. If no release complete message is received on the expiry of this timer (T_5), the exchange shall:

i) send a reset circuit message;

ii) alert the maintenance system;

iii) remove the circuit from service;

iv) continue the sending of the reset circuit message at 1 minute intervals until maintenance action occurs.

2.10.7 *Failure to receive a response to an information request message*

If a response is not received in response to an information request message before timer (T_2) expires, the exchange will release the connection and the maintenance system may be informed.

2.10.8 *Other failure conditions*

2.10.8.1 *Inability to release in response to a release message*

If an exchange is unable to return the circuit to the idle condition in response to a release message, it should immediately remove the circuit from service, alert the maintenance system and send the blocking message.

Upon receipt of the blocking acknowledgement message, the release complete message is sent in acknowledgement of the release message.

2.10.8.2 *Call-failure*

The call-failure indication is sent in a release message (§ 2.2) whenever a call attempt fails and other specific signals do not apply. Reception of the release message at any Signlalling System No. 7 exchange will cause the release message to be sent to preceding exchanges. If the signalling does not permit the release message to be sent, the appropriate signal, tone or announcement is sent to preceding exchanges.

2.10.8.3 *Abnormal release conditions*

If the conditions for normal release as covered in § 2.3 are not fulfilled, release will take place under the following conditions:

a) *Outgoing international or national controlling exchange*

The exchange shall:

- release all equipment and the connection on failure to meet the conditions for normal release of address and routing information before 20-30 seconds after sending the latest address message;
- release all equipment and release the connection on failure to receive an answer message within time (T_6) specified in Recommendation Q.118 after the receipt of the address complete message.

b) *Incoming international exchange*

An incoming international exchange shall release all equipment and the connection into the national network and send back a release message in the following cases:

- on failure to receive a continuity message if applicable before 10-15 seconds (T_8) after receipt of the initial address message; or
- on failure to receive a backward signal from a national network (where expected) before 20-30 seconds (T_7) after receipt of the latest address message; or
- on receipt of a release message after an address complete message has been generated.

The procedures for the release message are detailed in § 2.2.2.

c) *Transit exchange*

The exchange shall release all equipment and the connection and send back the release message in the following cases:

- on failure to receive a continuity message if applicable before 10-15 seconds after receipt of the initial address message; or
- on failure to meet the conditions for normal release as covered in § 2.3 before 20-30 seconds after sending the latest address message;

The procedures for the release message are detailed in § 2.2.2.

2.10.8.4 If messages are lost during an end-to-end transfer, appropriate actions will be taken according to the type of end-to-end technique being used.

2.10.8.5 For calls involving the SCCP, expiration of the call supervision timer (concerned with call set-up) will result in the SCCP being notified of an error condition.

2.10.9 *Temporary Trunk Blocking (TTB)* (national use)

TTB is essentially a means of blocking circuits, for a predetermined period, on a route or part of route, to reduce traffic to an exchange which has invoked load control. Circuits are removed from service on a per circuit basis under delay time out conditions applied by the unaffected exchange.

2.10.10 *Temporary trunk blocking before release of call (use of a discrete overload message)*

2.10.10.1 *Characteristics*

When load control is invoked IAMs associated with non-priority calls received on the circuits concerned are "backed-off" by return of the overload message in response to the IAM. Release of the circuit is then delayed by the unaffected node for a period, e.g. 2 minutes, after which the circuit is cleared by normal release procedures.

Calls backed-off by overload messages may be processed on alternative routes, if available, by-passing the affected nodes; if not they are released in the backward direction with reason (network) congestion.

Initial address messages marked as priority are not subject to the overload procedure; they are accepted by the affected node and processed as normal.

During the overload time-out period the circuit concerned is not available for traffic from the affected node to the unaffected node.

Recognition of the overload situation does not involve the examination of existing messages for detection of an optional TTB parameter.

2.10.10.2 *Procedures*

a) *Non priority call set-up to an exchange subject to load control*

   i) *Actions at originating exchange*

   In an originating exchange, calls originating from non-priority class lines will not set the calling party category parameter field to "subscriber with priority" in the outgoing IAM.

   ii) *Actions at an intermediate or terminating exchange*

   When an IAM is received by an exchange which is subject to load control and the calling party category parameter does not indicate a priority call the IAM is not processed and an overload message is returned to the preceding exchange.

   iii) *Actions on receipt of the overload message*

   At an originating, or intermediate exchange receipt of the overload message shall cause the following actions:

   – A timer (T overload) is started, provisional value 2 minutes. On expiry of the timer the release procedure shall be initiated of the circuit concerned.

   – The call attempt will be continued on an alternative route if available. If not the call will be released in the backward direction with cause "congestion".

b) *Priority call set-up to an exchange subject to load control*

   i) *Actions at originating exchange*

   In an originating exchange, calls originating from priority class lines will set the calling party category parameter field to "subscriber with priority" in the outgoing IAM.

   ii) *Actions at intermediate or terminating exchange*

   At an intermediate or terminating exchange where load control has been invoked, the priority call will override the load control and the call will continue in its attempt to be set up.

2.11 *ISDN user part signalling congestion control*

2.11.1 *General*

On receipt of congestion indication primitives (see also Recommendation Q.704 § 11.2.3) the ISDN user part should reduce traffic load (e.g. call attempts) into the affected direction in several steps.

2.11.2 *Procedures*

When the first congestion indication primitive is received by the ISDN user part, the traffic load into the affected direction is reduced by one step. At the same time two timers T_{29} and T_{30} are started. During T_{29} all received congestion indication primitives for the same direction are ignored in order not to reduce traffic too rapidly. Reception of a congestion indication primitive after the expiry of T_{29}, but still during T_{30}, will decrease the traffic load by one more step and restart T_{29} and T_{30}. This stepwise reduction of the ISDN user part signalling traffic is continued until maximum reduction is obtained by arriving at the last step. If T_{30} expires (i.e. no congestion indication primitives having been received during the T_{30} period) traffic will be increased by one step and T_{30} will be restarted unless full traffic load has been resumed.

Timers T_{29} and T_{30} have the following values:

T_{29} = 300-600 ms,

T_{30} = 5-10 s.

The number of steps of traffic reduction and the type and/or amount of increase/decrease of traffic load at the various steps are considered to be an implementation matter.

2.12 *Automatic congestion control*

Automatic Congestion Control (ACC) is used when an exchange is in an overload condition (see also Recommendation Q.542). Two levels of congestion are distinguished, a less severe congestion threshold (congestion level 1) and a more severe congestion threshold (congestion level 2).

If either of the two congestion thresholds are reached, an automatic congestion level parameter is added to all release messages generated by the exchange. This parameter indicates the level of congestion (congestion level 1 or 2) to the adjacent exchanges. The adjacent exchanges, when receiving a release message containing an automatic congestion level parameter should reduce their traffic to the overload affected exchange.

If the overloaded exchange returns to a normal traffic load it will cease including automatic congestion level parameters in release messages.

The adjacent exchanges then, after a predetermined time, automatically return to their normal status.

2.12.1 *Receipt of a release message containing an automatic congestion level parameter*

When an exchange receives a release message containing an automatic congestion level parameter the ISDN user part should pass the appropriate information to the signalling system independent network management/overload control function within the exchange. This information consists of the received congestion level information and the circuit identification to which the release message applies.

ACC actions are applicable only at exchanges adjacent to the congested exchange. Therefore, an exchange that receives a release message containing an automatic congestion level parameter should discard that parameter after notifying the network management/overload control function.

2.12.2 *Actions taken during overload*

Whenever an exchange is in an overload state (congestion level 1 or 2), the signalling system independent network management/overload control function will direct the ISDN user part to include an automatic congestion level parameter in every release message transmitted by the exchange.

The network management/overload control function will indicate which congestion level (1 or 2) to code in the automatic congestion level parameter.

When the overload condition has ended the network management/overload control function will direct the ISDN user part to cease including automatic congestion level parameters in the transmitted release messages.

2.13 *Unequipped circuit identification code message* (national option)

An Unequipped Circuit Identification Code (UCIC) message is sent by an exchange in response to either the reception of an IAM, a CCR, a circuit supervision message, or a circuit group supervision message on which it is unable to act as a consequence of its inability to perform a circuit identification code translation. The sending of the UCIC in response to the reception of other messages with UCIC is for further study.

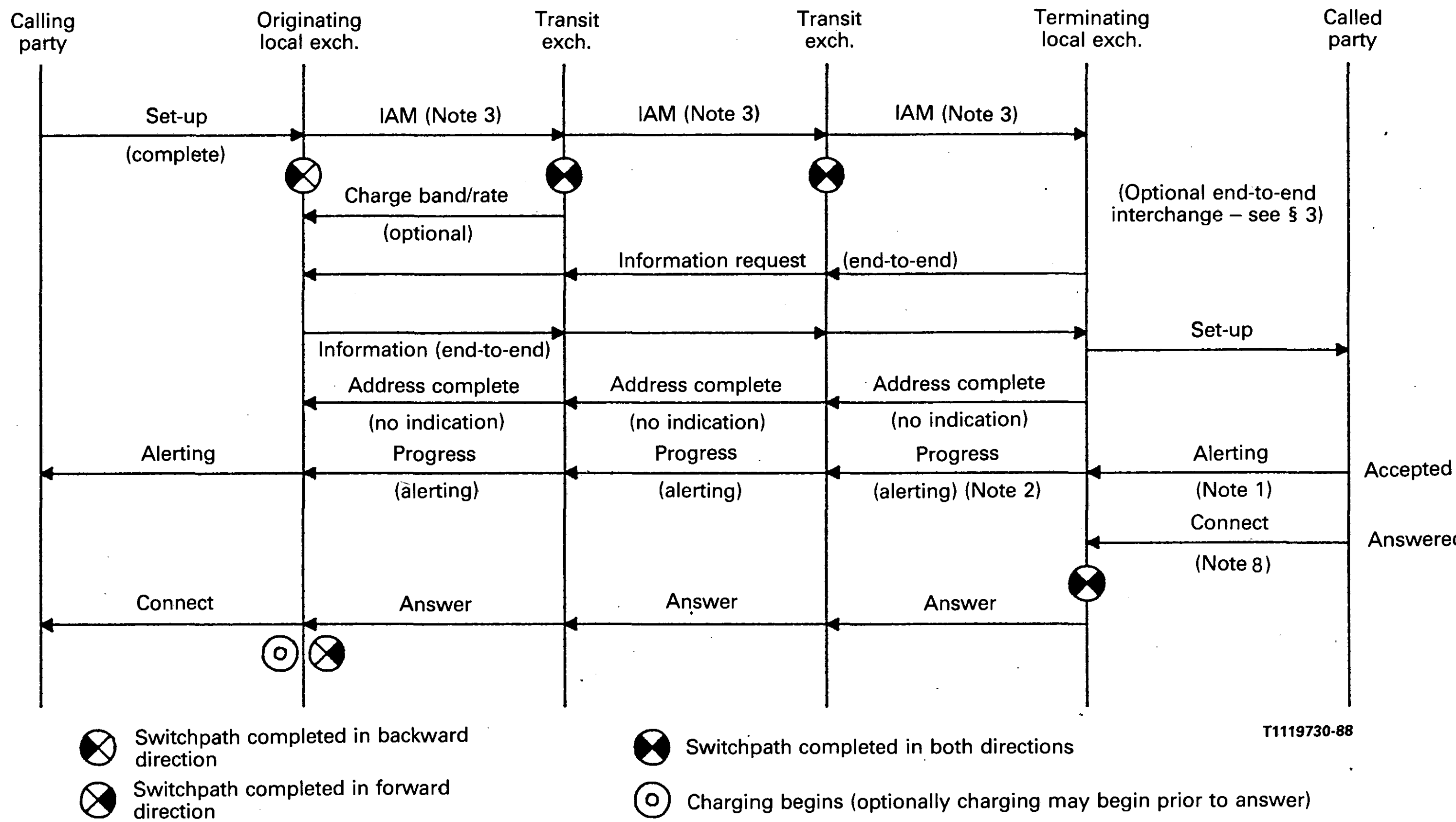
If an unequipped circuit identification code message is received for an SS No. 7 circuit which has been seized and an initial address message transmitted, the receiving exchange shall:

1) remove the indicated circuit from the service and report the circuit to the maintenance system for maintenance action;
2) re-attempt the call on another circuit providing the rejected attempt was a first attempt. If the rejected attempt was a second attempt, either a release message should be returned, (if the incoming circuit is an SS No. 7) or a recorded announcement connected (if the incoming circuit is conventional).

If an unequipped circuit identification code message is received in response to the transmission of a circuit supervision message, or a continuity check request message, the circuit should be removed from the service and the circuit reported to the maintenance system for maintenance action.

An exchange receiving a circuit group supervision message whose CIC in the routing label is unequipped should respond with a UCIC message for the circuit in the label. This in effect is the acknowledgement to the initial message. An exchange receiving a circuit group message where CIC in the routing label is equipped but one or more of the indicated circuits by the range field is unequipped merely responds in the manner that it would have if the circuit were equipped. The unequipped state of the circuit(s) will be recovered when an IAM, a CCR message, or circuit query message is received for the affected circuit(s).

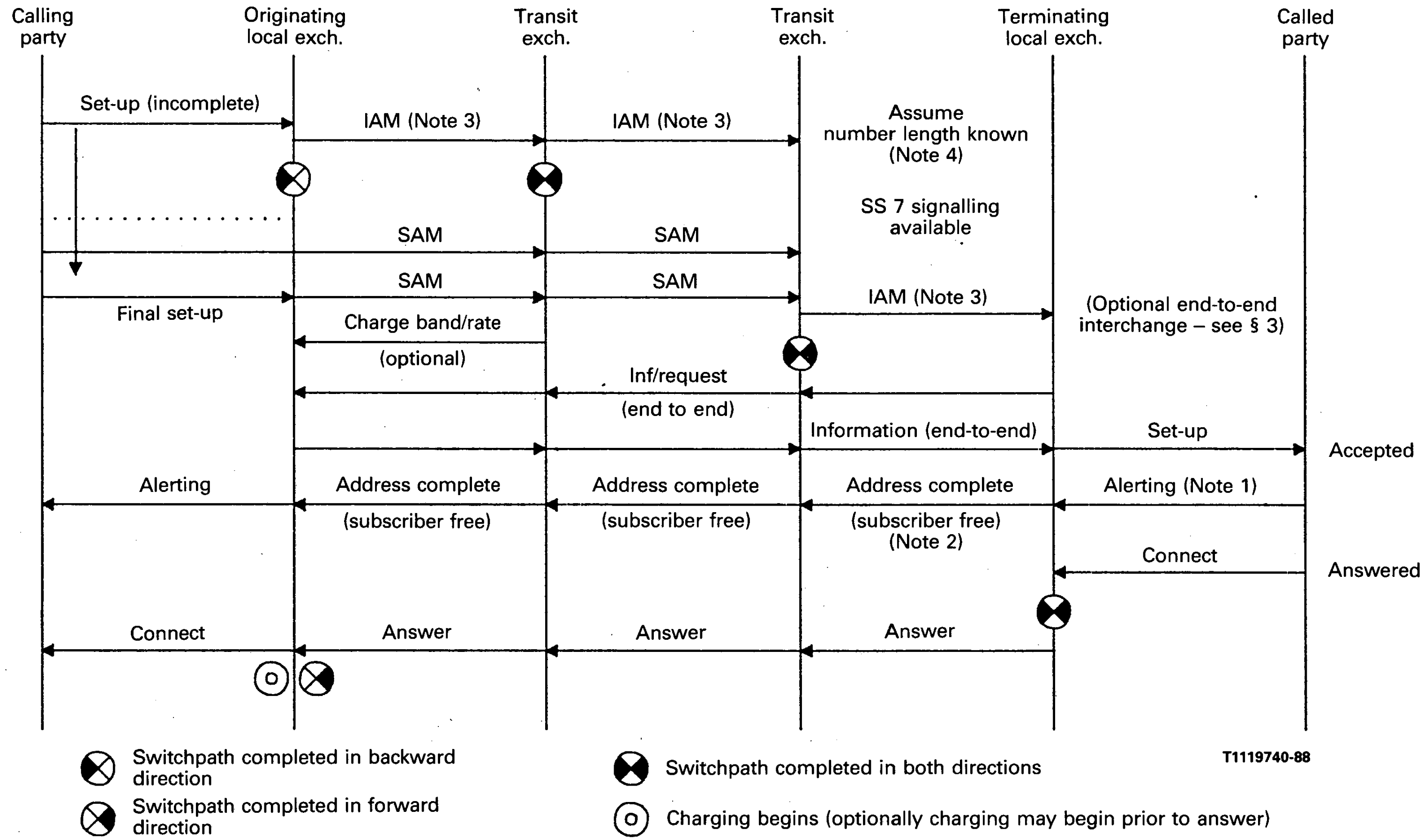
An exchange receiving an unequipped CIC message after having transmitted a circuit group supervision message removes the indicated circuit from service, assumes the regular acknowledgement message will not be received and treats the other circuits as though the responding exchange had not taken the action on the affected circuits indicated in the initial message.



Note – For explanation of notes, see at the end of Figure 3/Q.764.

FIGURE 1/Q.764

Successful ordinary call (en block operation)



Note – For explanation of notes, see at the end of Figure 3/Q.764.

FIGURE 2/Q.764

Successful ordinary call (overlap operation)

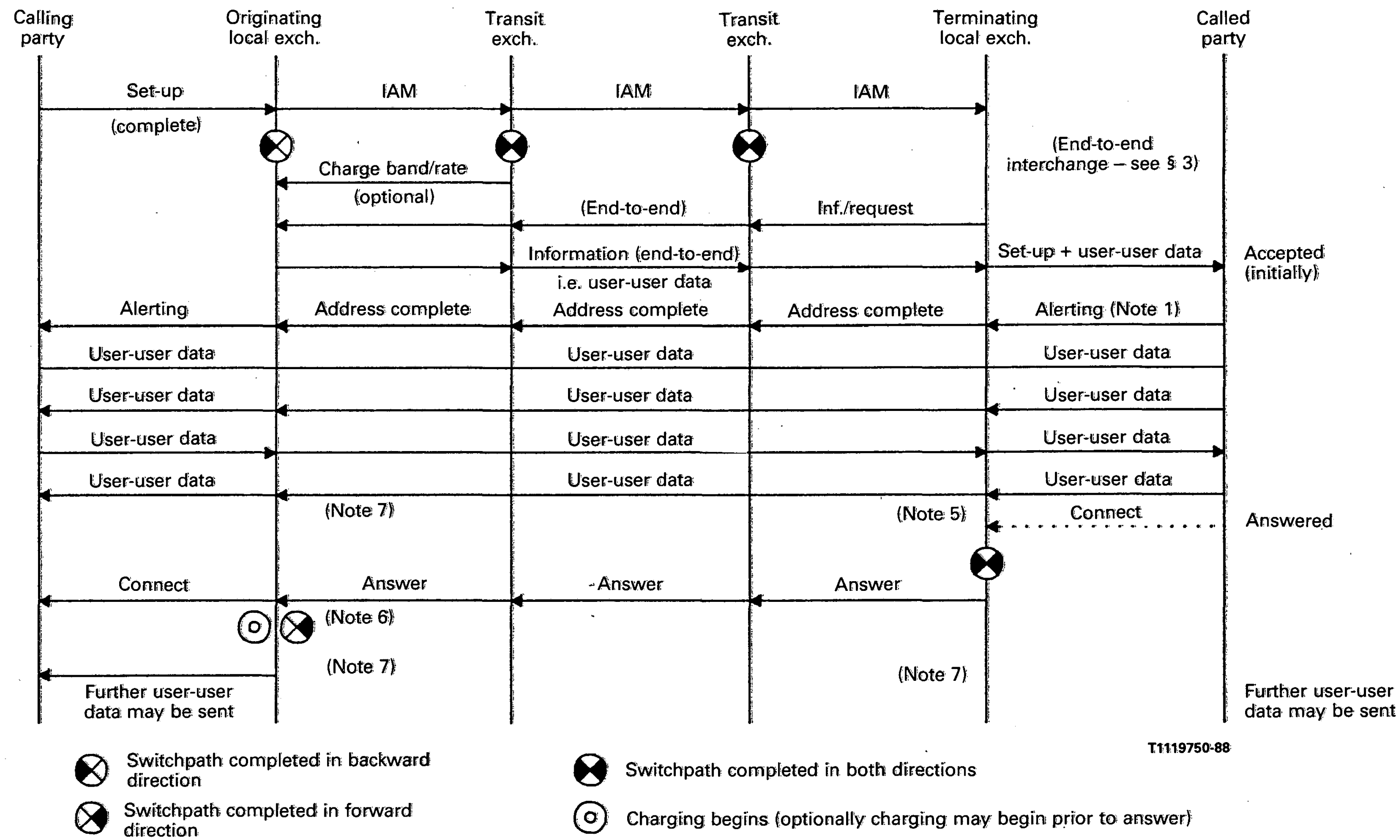


FIGURE 3/Q.764

Transfer of user-user data on call set-up

Notes referring to Figures 1/Q.764 to 3/Q.764

Note 1 – The alerting message may not be given by a called terminal having automatic answer. Under these circumstances the Connect Message will be sent as soon as the Connect Message is received and through-connection of the speech path has been completed.

Note 2 – For telephone calls within the ISDN, ringing tone will be applied by the terminating exchange as soon as it is known that the subscriber is free. In the case of a PABX connected to the access interface there is the option of an early through-connection of the switchpath so that the in-band call arrival indication generated in the PABX is returned to the calling user. For data calls, ringing tone is not applied.

Note 3 – The continuity check may be applicable on an intermediate circuit if analogue circuits are used.

Note 4 – This example assumes that the number length is known at the second transit exchange in order to illustrate the addition of SAMs to the IAM received. This function does not have to be performed in this way.

Note 5 – The call may be rejected by the user at this point following interchanges of user-user data, e.g. as a result of a failed compatibility check.

Note 6 – Charging for the transfer of user-user data requires further study.

Note 7 – Flow control of user-user data is achieved by the originating and destination exchanges by the use of "receive ready" and "receive not ready" messages throughout the conversation/data phase.

Note 8 – Access protocol example is for point-to-point operation only.

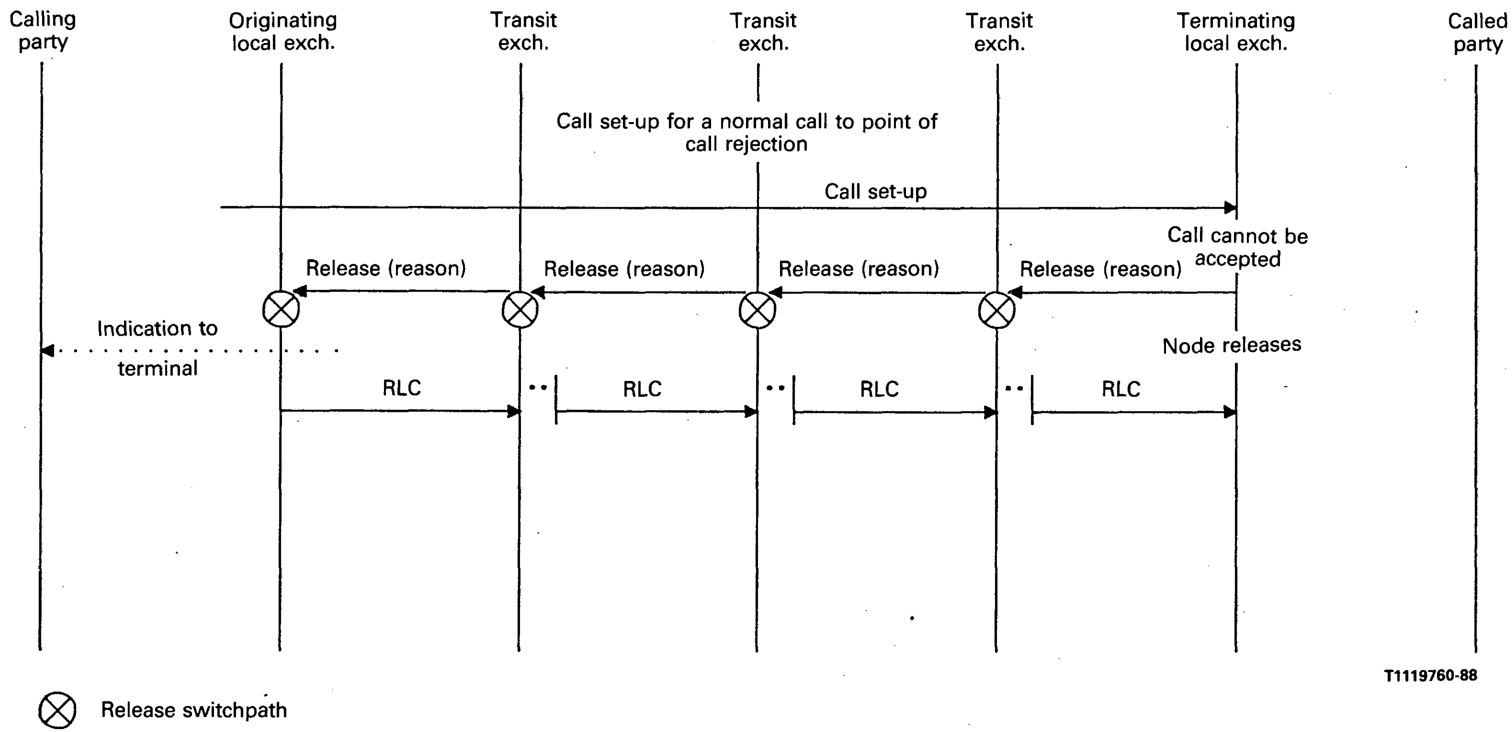


FIGURE 4/Q.764

Unsuccessful call set-up – no rerouting

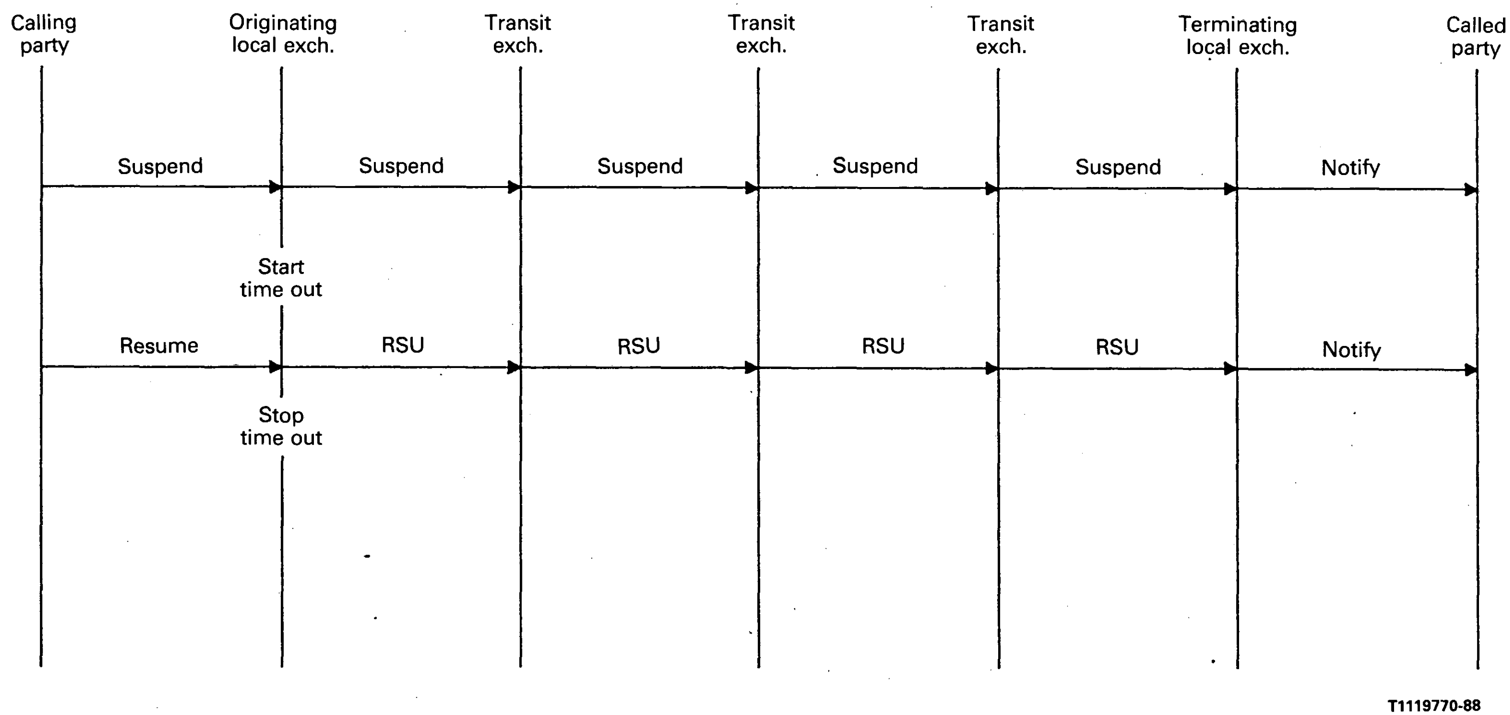


FIGURE 5/Q.764

Suspend request and resume

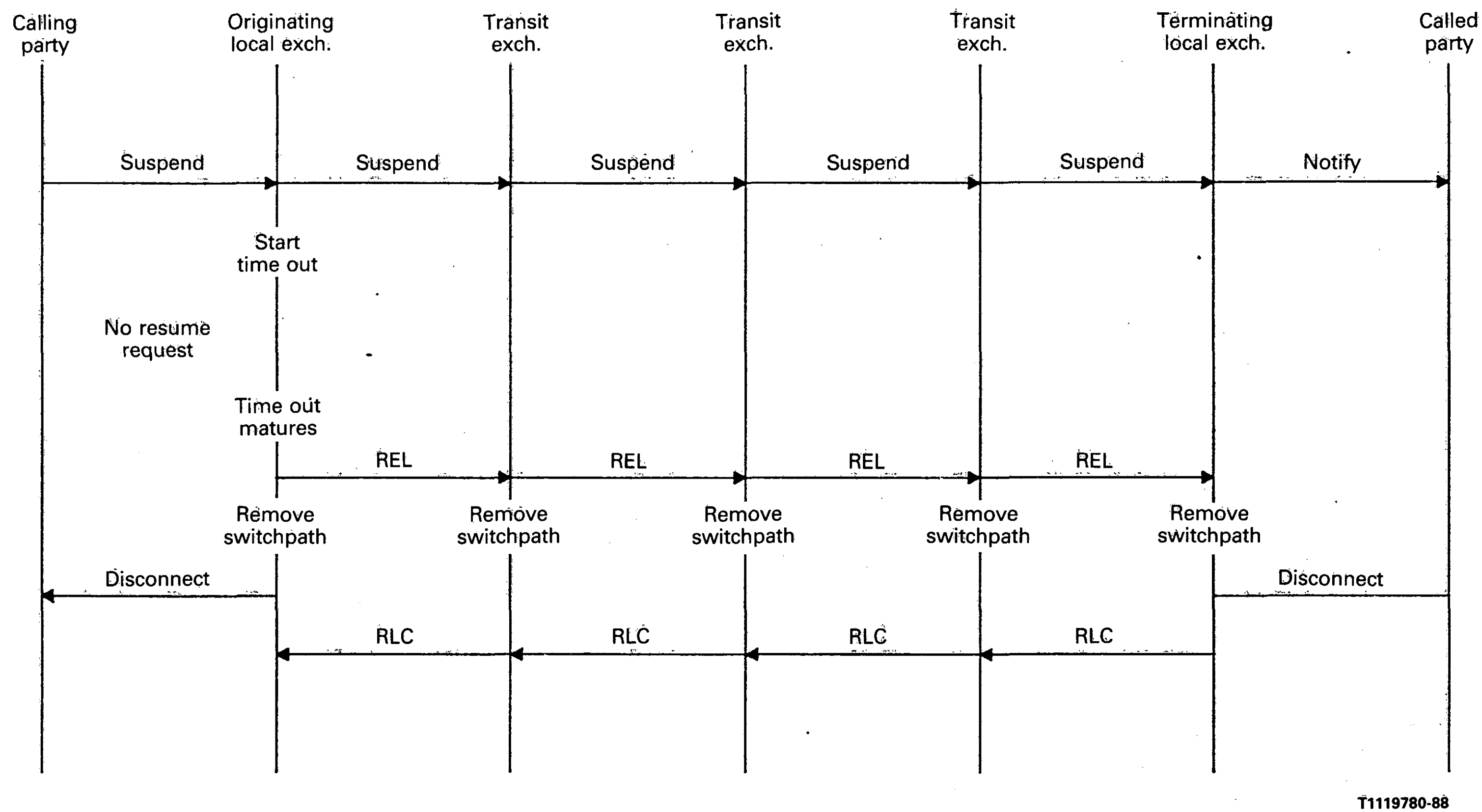


FIGURE 6/Q.764

Suspend request with no connection

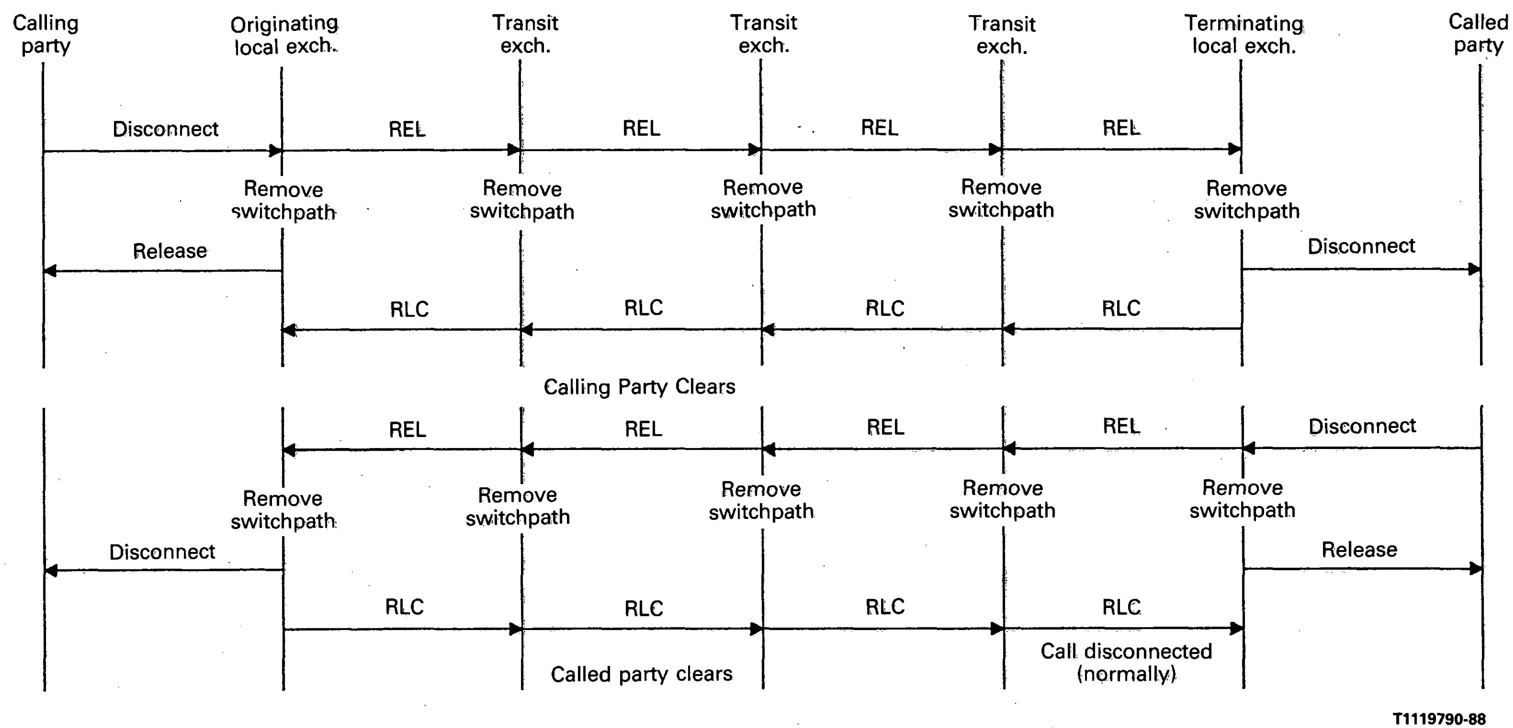


FIGURE 7/Q.764

Normal call release

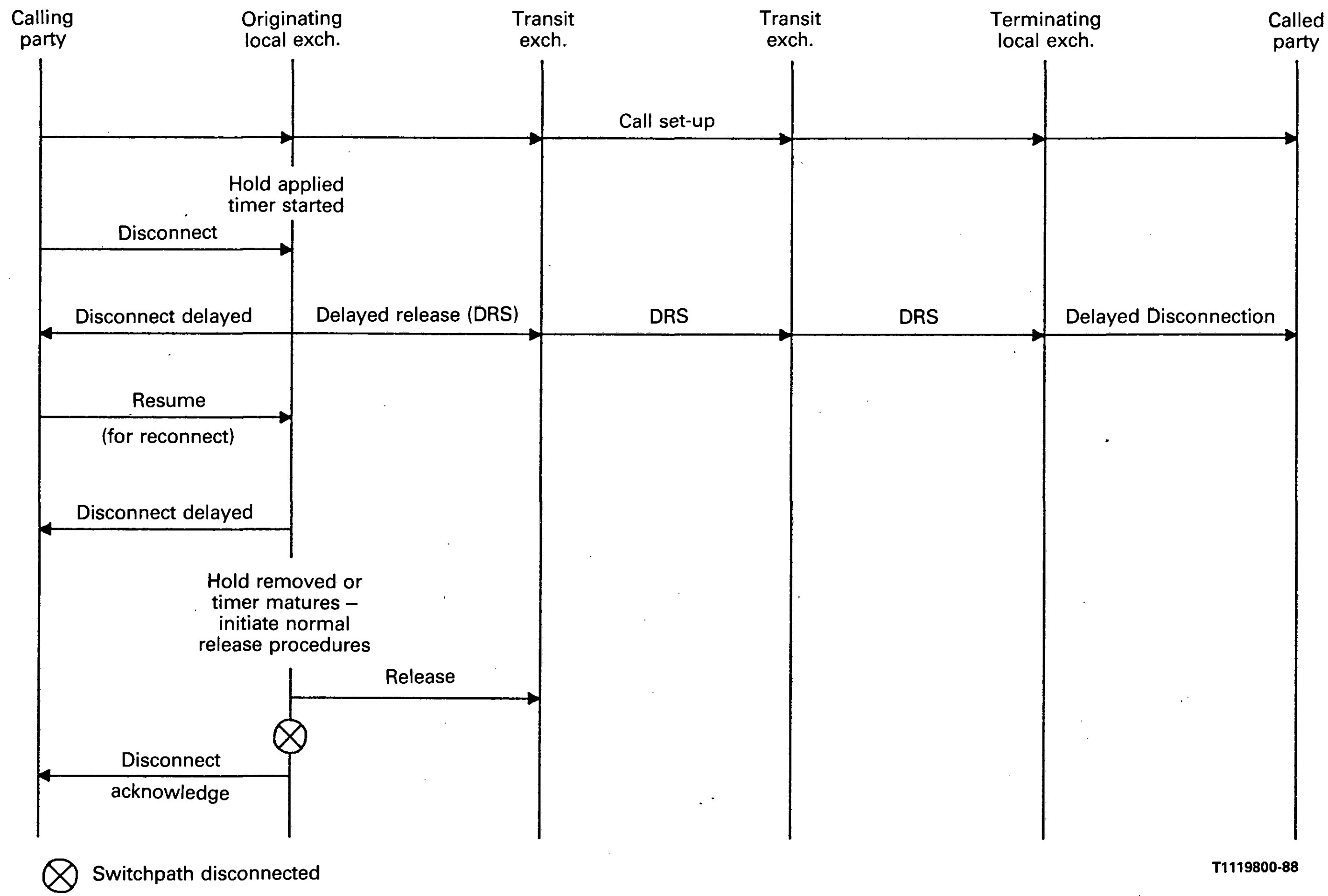


FIGURE 8/Q.764

Delayed release

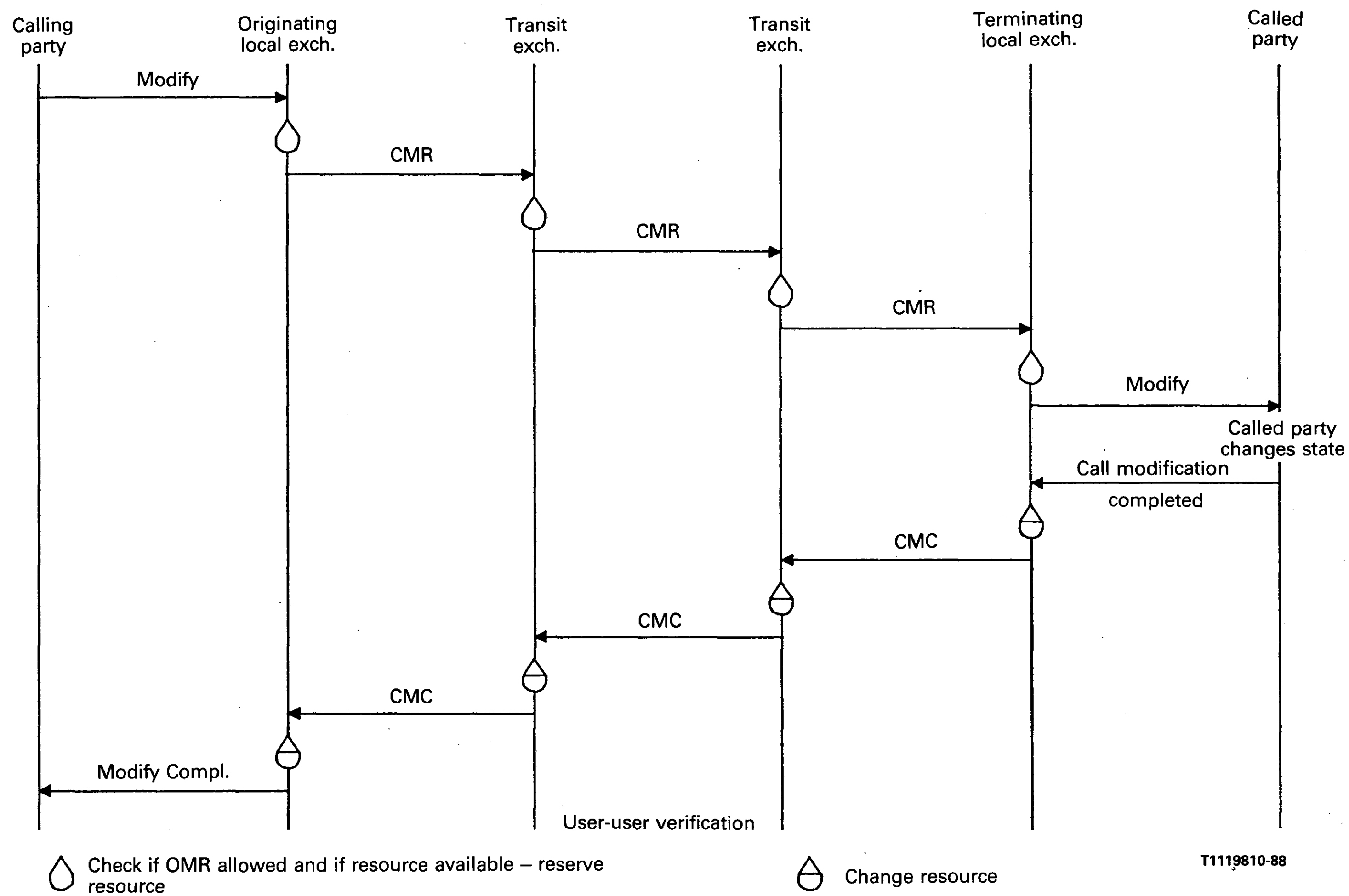


FIGURE 9/Q.764

In-call modification – successful

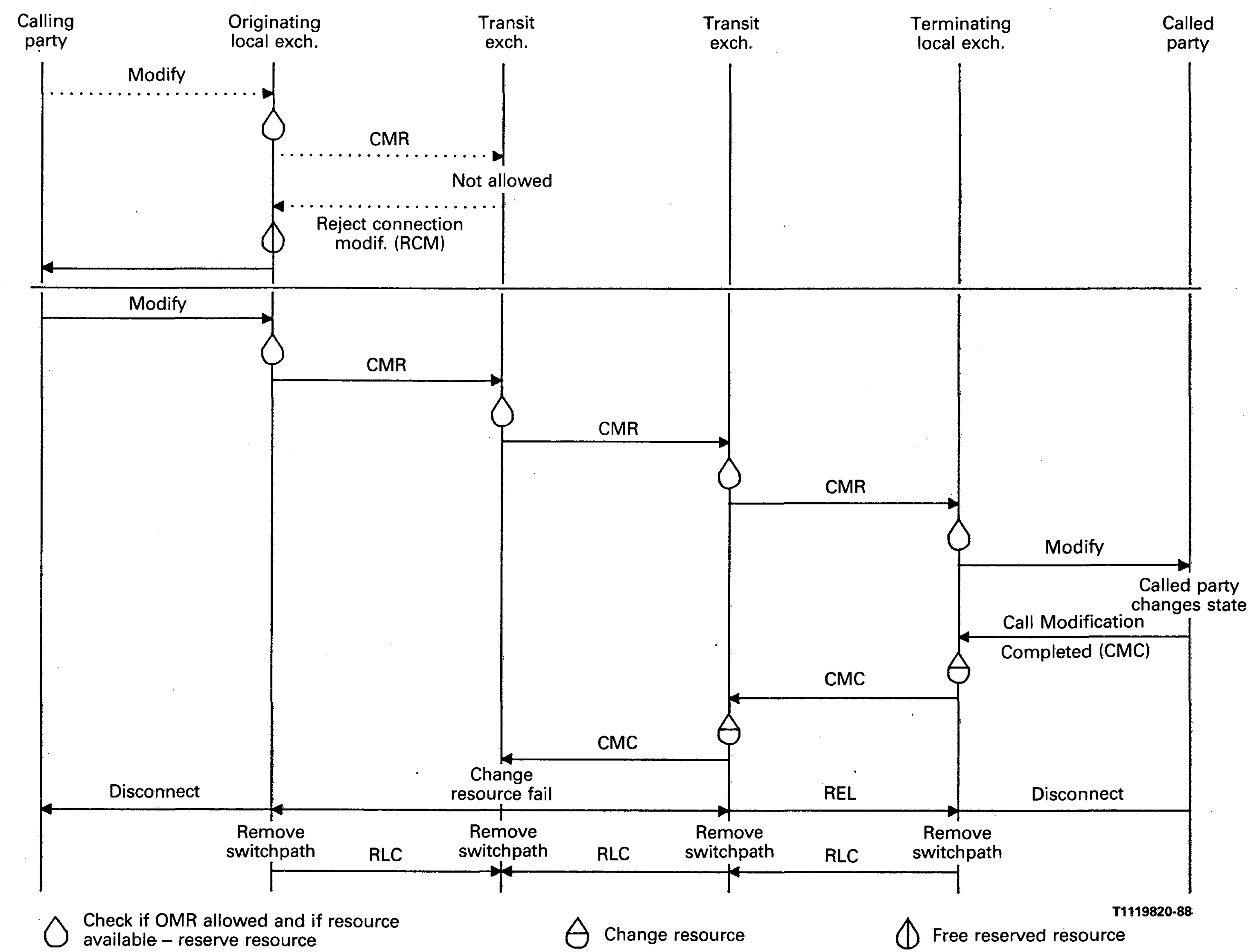


FIGURE 10/Q.764

In-call modification – not allowed and failed

3 End-to-end signalling

3.1 *Introduction*

End-to-end messages contain only information which is relevant for the "endpoints" of a circuit-switched connection. Endpoints are signalling points such as local exchanges and possibly exchanges at network boundaries, e.g. international gateway exchanges within the Signalling System No. 7 network.

Two methods are available for ISDN end-to-end signalling:

- the pass-along method; and
- the signalling connection control part (SCCP) method.

The choice of method is, to some extent, dependent on the size and architecture of the signalling network. Both methods may coexist in a given network.

The pass-along method and the SCCP method are specified for circuit-switched connections.

An end-to-end signalling connection established for end-to-end signalling is called an "ISDN user part end-to-end signalling connection" in this section.

§ 1.5 discusses the use of the end-to-end and link-by-link methods.

3.2 *Pass-along method*

In the pass-along method, use is made of an ISDN user part end-to-end signalling connection which in fact is being set up whenever a physical connection between two endpoints is established.

The ISDN user part end-to-end signalling connection in this case consists of a number of connection sections in tandem which run in parallel with and use the same identification code as the circuits in the physical connection.

The association of incoming and outgoing circuits in a transit exchange also establishes the coupling of the connection sections related to these circuits.

The pass-along method defines, section by section, the appropriate routing label for the message to be passed along via ISDN user part connection; but the content of pass-along messages is only evaluated and possibly changed at the endpoints. The pass-along message group is characterised by a special message type code as specified in Recommendation Q.763. One ISDN user part message to be passed along may be embedded in one pass-along message.

In a signalling connection for which pass-along method is available pass-along messages may be sent in either the forward or backward direction.

A forward pass-along message may not be sent until either a backward pass-along or the first backward set-up message has been received or after the physical connection is released.

Call control path information (see § 3.5) included in the initial address and backward set-up messages is used to indicate to the connection endpoints whether or not the call control path can support pass-along message transfer.

A pass-along message that has been received at a transit exchange and cannot be transferred to the subsequent exchange is discarded without affecting call states and timers in that exchange.

3.3 *SCCP method*

In the SCCP method the ISDN user part employs the services of the signalling connection control part (SCCP) for the transfer of end-to-end signalling information.

3.3.1 *Call reference*

The call reference is a circuit independent information identifying a particular call. It is needed when end-to-end signalling information associated with the call is to be transferred by a connectionless SCCP service. If, in turn, an SCCP connection request for connection-oriented SCCP service is carried embedded in an ISDN-UP message, the call reference is omitted.

References for a given call are allocated independently in the two concerned signalling points and are subsequently exchanged. The allocation of call references may be initiated by either side. The call reference consists of a call identity and the point code where the call identity is established. If, e.g. signalling point A initiates the exchange of call references, it selects a call identity CIA and transfers it together with the point code of A, PCA, to signalling point B. Signalling point B then allocates its own identity CIB to the call and returns it together with the signalling point code of B, PCB, to signalling point A. Subsequent call related end-to-end message transferred from signalling point A to signalling point B contain call identity CIB and are routed directly using destination point code PCB. Conversely, end-to-end messages transferred from signalling point B to signalling point A contain call identity CIA and are routed using destination point code PCA.

A linkage of call references at network boundaries has to be provided.

3.3.2 *Coupling of connection sections*

An ISDN user part end-to-end signalling connection may consist of a number of connection sections in tandem. In order to couple two connection sections at the SCCP relay point, linkage of call references 3 (Ref 3) is performed by ISDN user part for connectionless SCCP service and linkage of local references is performed by SCCP for connection-oriented SCCP service.

An SCCP relay point where linkage of call references is performed by the ISDN user part is called an "intermediate relay node" in this section.

3.3.3 *Connectionless service*

For connectionless service, the ISDN user part transfers the data to be transmitted to the SCCP together with a request for the appropriate protocol class of service. The Ref 3 signalling information, transfer and delivery of this data to the distant ISDN user part is controlled entirely by the SCCP. The association between the transferred information and a call is made by the ISDN user part, which transfers the call reference as part of signalling information for this purpose.

The protocol class of service is assumed to be 0. Individual networks may choose class 1 based on the predetermined arrangement.

3.3.4 *Connection-oriented service*

3.3.4.1 *Connection request embedded in an ISDN user part message*

At the exchange initiating the establishment of an ISDN user part end-to-end signalling connection based on connection-oriented SCCP service, the ISDN user part requests the SCCP to provide the necessary information for a connection request for an SCCP end-to-end connection. This connection request is then carried embedded in an ISDN user part message. At the destination exchange the connection request is passed to the SCCP by the ISDN user part. The SCCP at the destination exchange then behaves as if the connection request had been sent directly by the SCCP from the originating exchange: it indicates the connection request to the ISDN user part and upon response from the ISDN user part it returns a connection confirm message to the SCCP at the originating exchange. The SCCP at the originating exchange confirms the set-up of the end-to-end connection to the ISDN user part. The contents in the embedded connection request is not evaluated by the ISDN user part at any exchange.

3.3.4.2 *Protocol class of service*

The protocol class of service is assumed to be 2. If the connection request is of protocol class 3, the ISDN user part connection request parameter must include explicit protocol class and credit indications in addition to the SCCP source local reference.

3.3.4.3 *Mechanism of coupling*

Although coupling of connection sections may not be appropriate in combination with the embedded method, coupling is necessary at network boundaries. In this case the ISDN user part at the intermediate point has knowledge that a coupling of end-to-end connections sections has to be performed, and therefore connection requests received embedded in an ISDN user part message are passed to the SCCP. The SCCP, in turn, furnishes the ISDN user part with a connection request for the new connection section in order to have it included in the outgoing ISDN user part message.

After the coupling of the connection sections has been successfully initiated by the ISDN user part, end-to-end signalling information passing through an intermediate point is not passed to the ISDN user part.

3.3.4.4 *Release of ISDN user part end-to-end signalling connection*

The SCCP end-to-end connection is released according to the procedures described in the Recommendation Q.714.

The physical connection and the ISDN user part end-to-end signalling connection can be released independently of each other.

Generally, both the ISDN user part end-to-end signalling connection and the physical connection are released simultaneously. However, for certain applications it is possible to maintain the SCCP end-to-end connection although the physical connection has already been released.

3.4 *Chaining of ISDN user part end-to-end signalling connections*

At an exchange where the contents of end-to-end signalling information may need to be evaluated by the ISDN user part, ISDN user part end-to-end signalling connections are chained. Chaining of two ISDN user part end-to-end signalling connections means that one ISUP signalling connection terminates and another ISUP signalling connection associated with it originates with all end-to-end signalling information passing through the ISDN user part. The new ISUP signalling connection may have different characteristics from the previous one. See Figure 22/Q.764.

If chaining is not appropriate for the associated call when the service requirements cannot be satisfied because of it, the call may be released. In addition, if any of the ISDN user part end-to-end signalling connections under chaining cannot be established or is abnormally disconnected the associated call may be released if the required service cannot be completed without it.

3.5 *Use of the Protocol Control Indicator (PCI)*

The protocol control indicator is control information concerning the end-to-end signalling procedures. It is contained in the forward call indicator and the backward call indicator, respectively, and has to be examined to determine which end-to-end signalling method should be used if any (when an embedded connection request is not included in the appropriate message) for the end-to-end transfer of messages.

The following indications are provided:

a) available information that could be transmitted (end-to-end) to the other endpoint;

b) Signalling System No. 7 path between the two endpoints, no interworking along the route;

c) pass-along method available;

d) SCCP connection-oriented class available;

e) SCCP connectionless class available;

f) ISDN user part used all the way.

3.6 *Operation of the pass-along method*

Figure 11/Q.764 illustrates the operation of the pass-along protocol. In this Figure the PCI is the protocol control indicator in the IAM. “Interworking” in the IAM or ACM indicates that the control path is not wholly Signalling System No. 7.

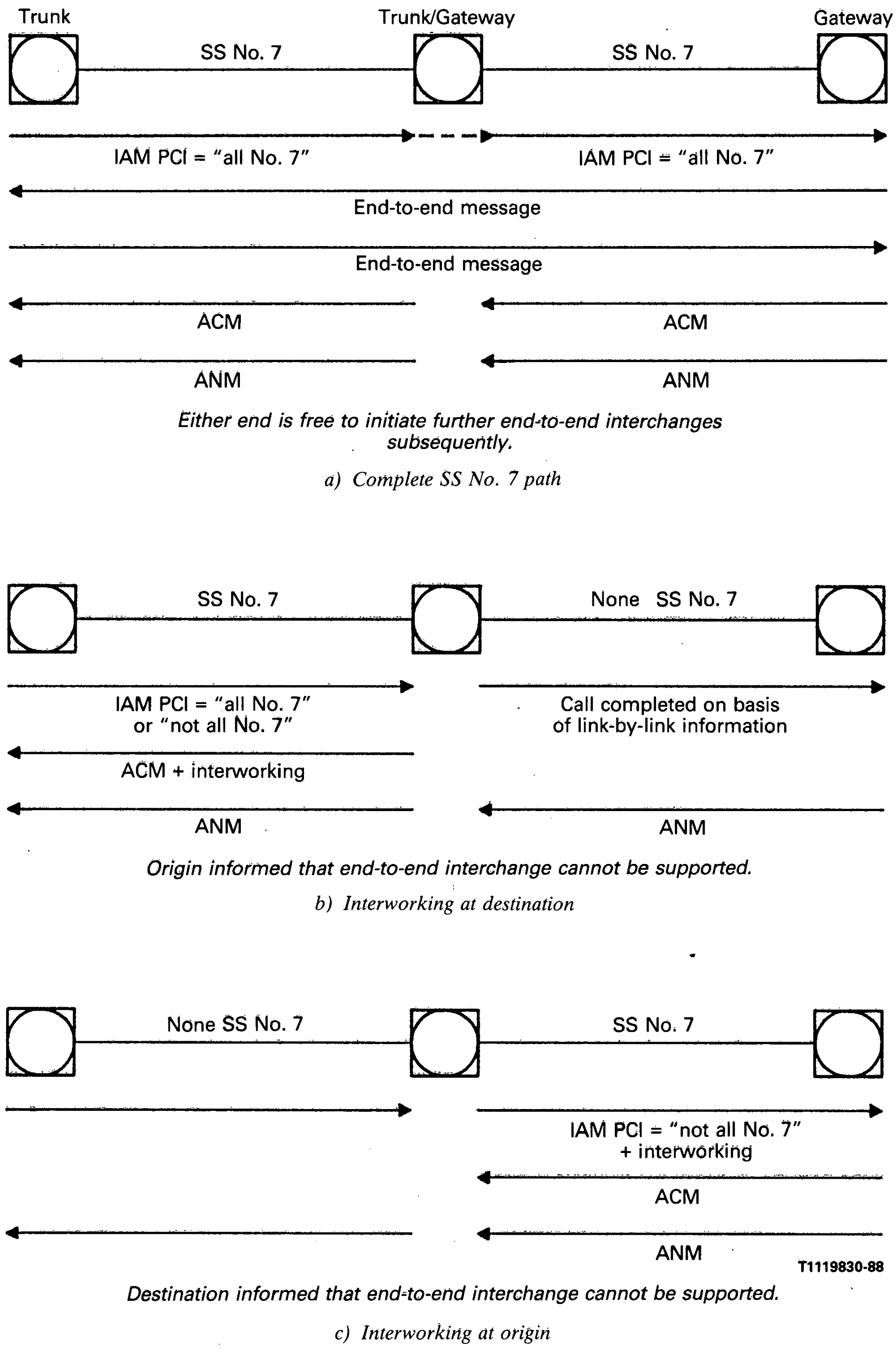


FIGURE 11/Q.764

Operation of end-to-end protocol (pass along method)

3.7 *Operation of the SCCP method - connectionless services*

3.7.1 *Successful set-up of the ISDN user part end-to-end signalling connection*

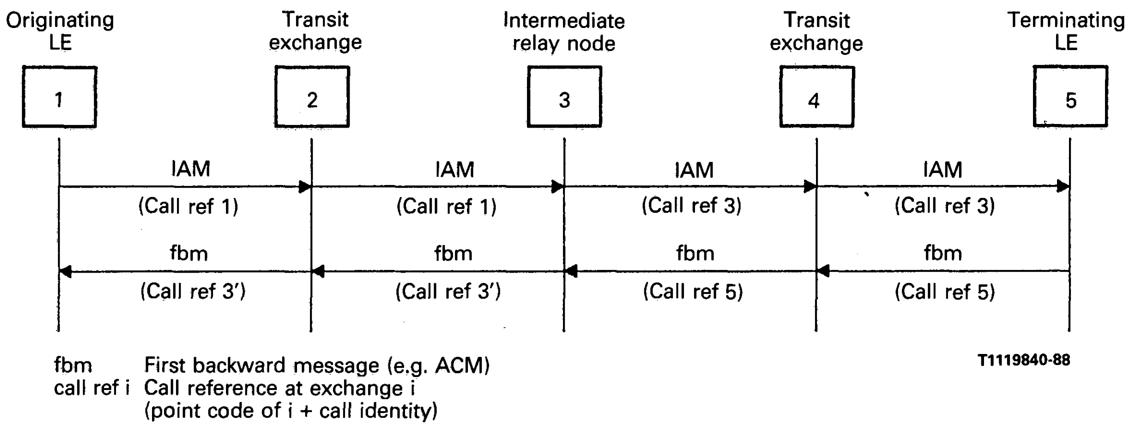
3.7.1.1 *Simultaneous establishment of an ISDN user part end-to-end signalling connection and a physical connection*

In the case of simultaneous establishment of a signalling connection with a physical connection, the initial address message from the originating exchange of a call contains the call reference consisting of the point code of the originating exchange and the call identity. The inclusion of the call reference implicitly indicates that the establishment of a signalling connection is requested. When the terminating exchange receives an IAM with a call reference in it and a signalling connection can be established, it responds to that with its own call reference included in the first backward message (e.g. an address complete message).

At an intermediate relay node where SCCP is terminated, its own call reference is allocated to the signalling connection and the coupling of call references is made. When the first backward message contains a call reference, an intermediate relay node replaces that with its own call reference and relays this message towards the originating exchange.

When the originating exchange receives the destination call reference from the exchange at the other end of the connection section the signalling connection is regarded as in a ready state and end-to-end signalling information can be transferred over this connection.

Figure 12/Q.764 shows the procedure for this case.



Note – Call ref 3 and call ref 3′ may be the same or different.

FIGURE 12/Q.764

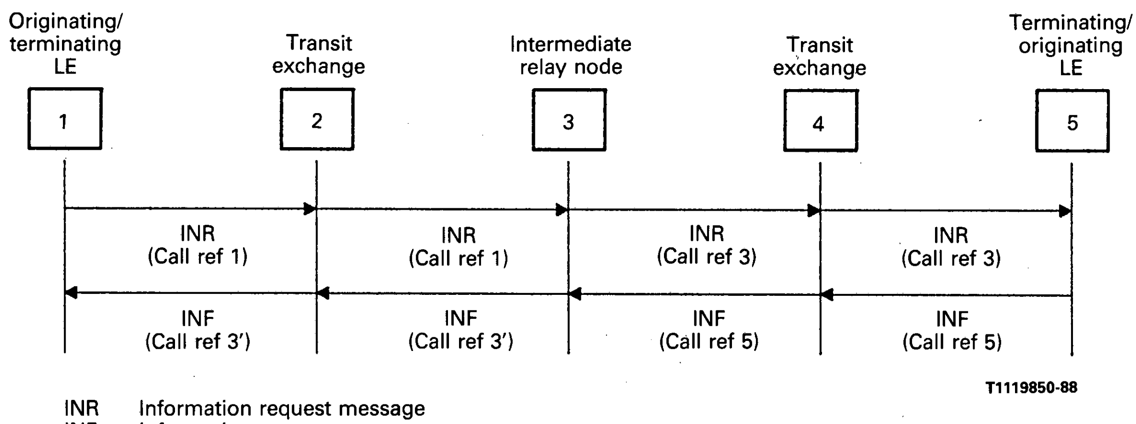
Simultaneous establishment of a bearer connection and an ISDN user part end-to-end signalling connection, based on SCCP connectionless class

3.7.1.2 *Establishment of a signalling connection when the circuit-associated signalling path has been established*

When the circuit-associated signalling path has already been established, the establishment of a signalling connection can be initiated either by the originating or the terminating exchange of a call. In this case, an Information Request message (INR) is transferred from the initiating exchange to the other end. This INR message contains a call reference as in the case of an IAM as described in § 3.6.1.1 above.

An information message (INF) containing a call reference as in the case of the first backward message in § 3.6.1.2 is returned to the initiating exchange and a signalling connection is successfully established.

Figure 13/Q.764 shows the procedure for this case.



INR Information request message
INF Information message

Note – Call ref 3 and call ref 3' may be the same or different.

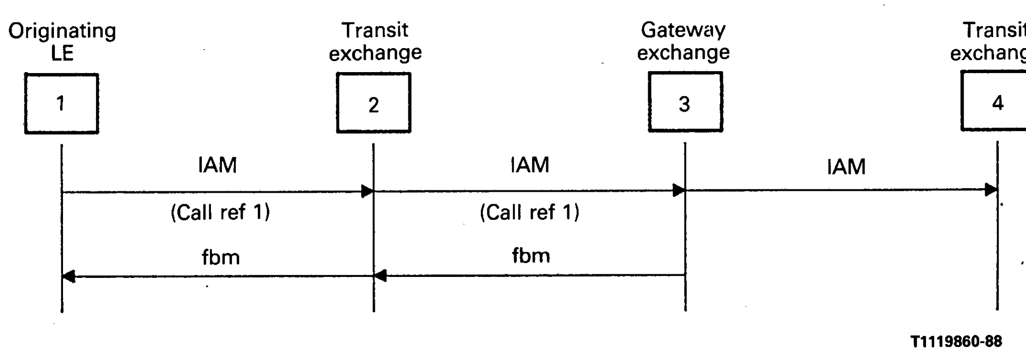
FIGURE 13/Q.764

Establishment of an ISDN signalling connection based on SCCP connectionless class, after the establishment of a circuit-associated signalling path

3.7.2 *Unsuccessful set-up of a signalling connection*

In a case where a signalling connection cannot be established, e.g. due to interworking with a PSTN, the first backward message in response to the initial address message containing the originating call reference includes no call reference.

The procedure for this case is shown in Figure 14/Q.764.



fbm First backward message containing no call reference and possibly including some indicator (e.g. interworking) to imply that end-to-end signalling connection cannot be established.

FIGURE 14/Q.764

Unsuccessful establishment of an ISDN user part end-to-end signalling connection, SCCP connectionless class, e.g. due to interworking with a PSTN

In a case where the establishment for a signalling connection is requested by an INR message as shown in Figure 13/Q.764 the initiating exchange usually knows the end-to-end signalling capability for the call concerned and a signalling connection can successfully be established. However, if a signalling connection cannot be established for some reason, an INF message containing no call reference is returned to the initiating exchange.

In these situations, the call may be released if the ISDN user part end-to-end signalling connection is essential to satisfy the service requirements of the call.

In these cases, the call reference(s) is frozen for the time (T_{31}) as described in § 3.7.4.

3.7.3 *Abnormal situations*

If no response to the INR message containing the originating call reference is received for the time T_{33} at the initiating exchange and if necessary (e.g. in the case of an interworking exchange of different end-to-end signalling schemes) at an intermediate relay node, the call is released (see § 2.9.7).

In this case, the call reference(s) is frozen for the time T_{31} as described in § 3.7.4.

The procedure for this case is shown in Figure 15/Q.764.

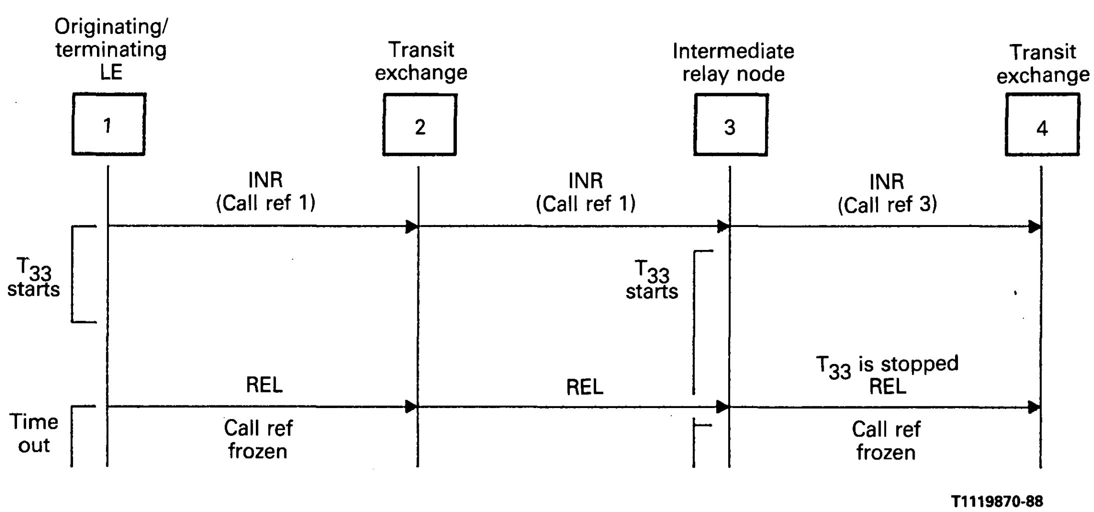


FIGURE 15/Q.764

No response from SCCP after time T_{33} after the transmission of the originating call reference, during the establishment of an ISDN user part end-to-end signalling connection based on SCCP connectionless class

3.7.4 *Release of a signalling connection*

3.7.4.1 *Simultaneous release of a physical connection and a signalling connection*

When the call is released, the ISDN user part end-to-end signalling connection is considered to be released simultaneously. Call references allocated at local exchanges and intermediate relay node(s) are frozen for time T_{31} as described in § 3.7.4.2 below.

The procedure for this case is shown in Figure 16/Q.764.

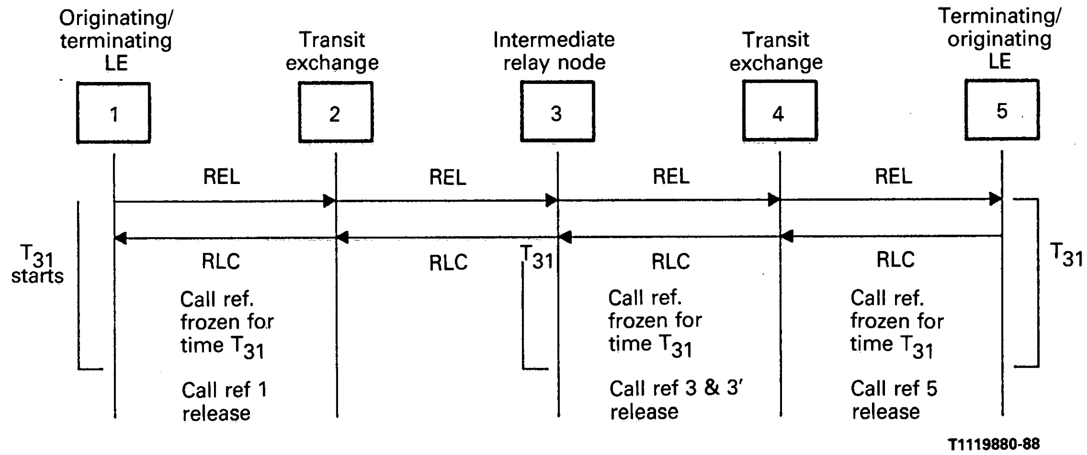


FIGURE 16/Q.764

Simultaneous release of a bearer connection and an ISDN user part end-to-end signalling connection based on SCCP connectionless class

3.7.4.2 *Frozen call reference*

When an ISDN user part end-to-end signalling connection is released, call references allocated for this signalling connection are frozen for time T_{31}. These references will not be used for another signalling connection during the frozen period. T_{31} is chosen to sufficiently reduce the probability of erroneously associating a message with the previously used call reference. Optionally call identities may be allocated to individual signalling connections in a cyclic manner so that a previously used call identity is not to be used again for sufficient amount of time.

If an end-to-end message containing a frozen call reference is received, it is discarded.

3.7.5 *End-to-end message transfer*

An end-to-end message is transferred in an SCCP unitdata (UDT) message according to the procedures defined in Recommendation Q.714. ISDN user part interfaces with SCCP via the primitives are defined in Recommendation Q.711 for this transfer. The unit-data request/indication primitive includes in its user data parameter an ISDN user part message beginning with the message type and ending with the parameters.

At the local exchange which has responded to the request of establishment of an ISDN user part end-to-end signalling connection from the other local exchange, an end-to-end message cannot be transferred for time T_{32} or until the first end-to-end message has been received from the other end. T_{32} is chosen to sufficiently reduce the probability that an end-to-end message from the responding local exchange is received at the initiating local exchange or the intermediate relay node, before the ISDN user part message which contains the response to the signalling connection establishment request.

If a relay exchange receives an end-to-end message in a UDT, in any case the UDT will be forwarded to the succeeding exchange if possible.

The procedure for this case is shown in Figure 17/Q.764.

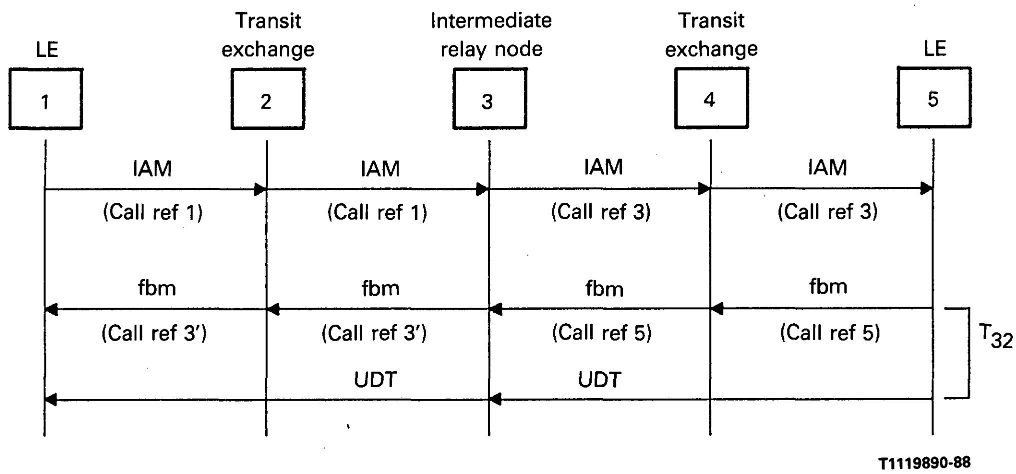


FIGURE 17/Q.764

Transfer of UDT message from the local exchange which has responded to the ISUP signalling connection establishment request

3.8 *Operation of the SCCP method – connection-oriented service*

The initial address message, the facility request message and the information message may be used for the embedded transfer of the connection request. The procedures described and the figures refer to the case where the connection request is sent in the forward direction. In principle, they also apply when the connection request is sent in the backward direction in the facility request or the information message.

For the connection request embedded in an ISDN user part message an additional interface is used. This functional interface is described in Recommendations Q.711 and Q.714 (signalling connection control part of Signalling System No. 7). The interface elements are listed in § 3.9.

Procedures concerning the SCCP are in accordance with those described in Recommendation Q.714 (signalling connection control part of Signalling System No. 7) and are described here only for illustrative purposes.

3.8.1 *Successful set-up of the ISDN user part end-to-end signalling connection*

The following actions are performed at the originating exchange and at the destination exchange for the set up of an SCCP end-to-end connection using embedded transfer of the connection request in an ISDN user part message (the numbers in the text correspond to the numbers in Figure 18/Q.764):

1) The ISDN user part (ISUP) at the originating exchange requests the SCCP to provide the necessary information for a connection request to the called address using the REQUEST type 1 interface element.

2) The SCCP at the originating exchange generates a connection request and transfers it to the ISDN user part using the REPLY interface element.

3) The ISDN user part at the originating exchange transmits the connection request embedded in an ISDN user part message to the ISDN user part at the destination exchange.

7) Upon receiving an embedded connection request in an ISDN user part message, the ISDN user part at the destination exchange transfers the received connection request to the SCCP using the REQUEST type 2 interface element.

8) The SCCP at the destination exchange informs the ISDN user part of a request to establish an end-to-end connection using the N-CONNECT indication primitive.

9) The ISDN user part responds to the request using the N-CONNECT response primitive.

10) Upon receiving the N-CONNECT response primitive from the ISDN user part, the SCCP at the destination exchange sends a connection confirm message into the backward direction.

12) Upon receiving a connection confirm message the SCCP at the originating exchange informs the ISDN user part using the N-CONNECT confirmation primitive.

At those transit exchanges which are not SCCP relay-points, the connection request embedded in an ISDN user part message is left unchanged by the ISDN user part and transferred into the forward direction.

An SCCP relay-point is an exchange where two connection sections belonging to the same end-to-end connection are coupled.

The following actions are performed at an SCCP relay-point for the coupling of two connection sections (the numbers in the text correspond to the numbers in Figure 18/Q.764):

4) Upon receiving an embedded connection request in an ISDN user part (ISUP) message, the ISDN user part at the SCCP relay-point transfers the received connection request to the SCCP using the REQUEST type 2 interface element with the reply request set.

5) The reply request in the REQUEST type 2 interface element causes the SCCP at the SCCP relay-point to provide a connection request for a new connection section. The new connection request is provided to the ISDN user part using the REPLY interface element.

   Note – The SCCP allocates an outgoing local reference and associates the incoming and outgoing local references and their corresponding point codes.

6) The ISDN user part at the SCCP relay-point transmits the connection request embedded in an ISDN user part message.

11) Upon receiving a connection confirm message, the SCCP at the SCCP relay-point sends a connection confirm message into the backward direction.

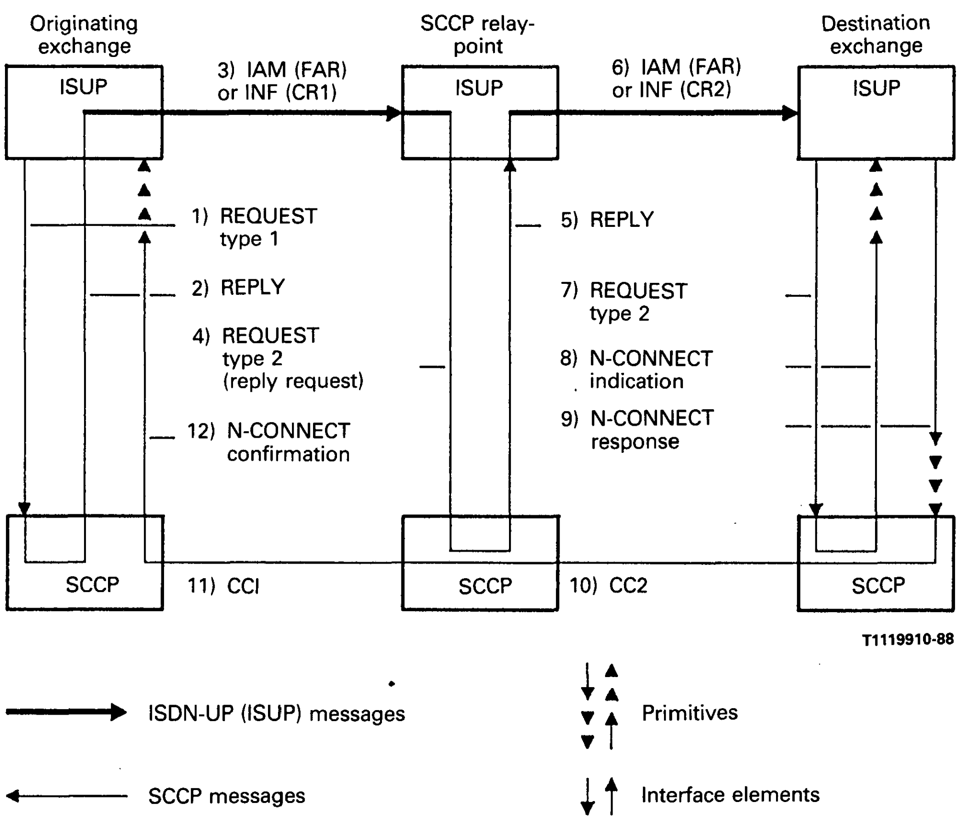


FIGURE 18/Q.764

Embedded transfer of the connection request actions under successful set up of the SCCP end-to-end connection

3.8.2 *Unsuccessful set-up of the SCCP end-to-end connection*

If the ISDN user part end-to-end signalling connection cannot be extended beyond a transit exchange because (for instance) interworking occurs, the ISDN user part at this transit exchange initiates the refusal of the connection request which is then performed by the SCCP. The set-up of the physical connection may be continued.

If the ISDN user part initiates the refusal of a connection request received embedded in the initial address message, in general the following actions are performed. The numbers in the text correspond to the numbers in Figure 19/Q.764:

1) Upon receiving an embedded connection request, the ISDN user part transfers the received connection request to the SCCP using the REQUEST type 2 interface element with the refusal indicator set.
2) Upon receiving the REQUEST type 2 interface element with the refusal indicator set, the SCCP sends a connection refused message (CREF) into the backward direction.
3) Upon receiving a connection refused message, the SCCP at the originating exchange informs the ISDN user part using the N-DISCONNECT indication primitive.

If the SCCP at an SCCP relay-point receives a connection refused message instead of a connection confirm message, the incoming connection section is also released by sending a connection refused message into the backward direction.

If the SCCP at the destination exchange fails to set up the requested end-to-end connection, the following actions are performed to refuse the connection request received in a REQUEST type 2 interface element (the numbers in the text correspond to the numbers in Figure 20/Q.764):

1) The SCCP at the destination exchange sends an N-DISCONNECT indication primitive to the ISDN user part.
2) At the same time the SCCP sends a connection refused message into the backward direction.

In these situations, the call may be released if the ISDN user part end-to-end signalling connection is essential to satisfy the service requirements of the call.

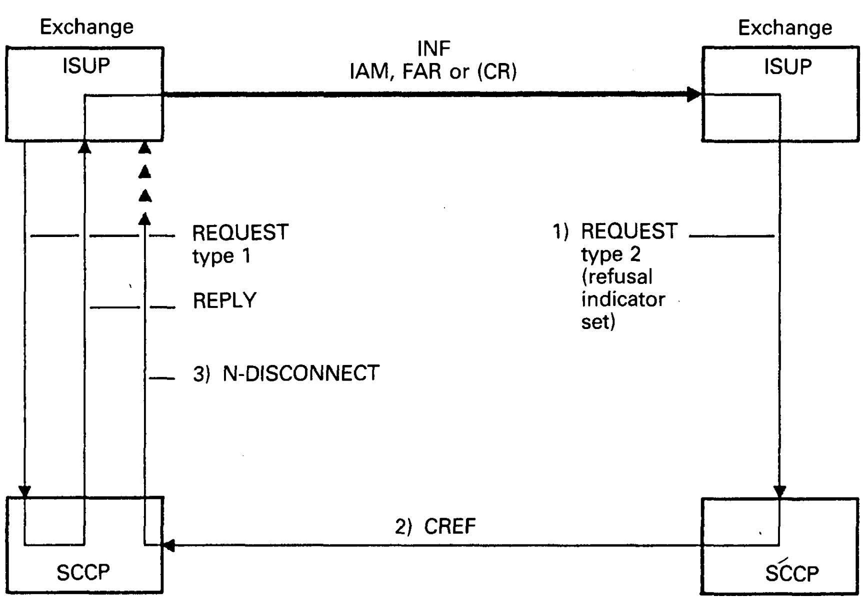


FIGURE 19/Q.764

Embedded transfer of the connection request
Refusal of the connection request initiated by the ISDN user part.

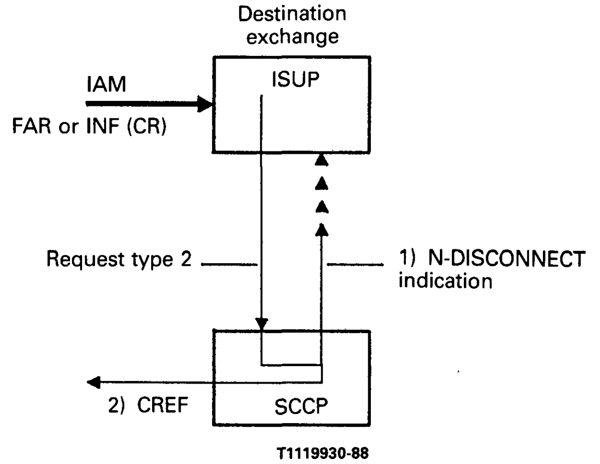


FIGURE 20/Q.764

Embedded transfer of the connection request
Failure of the SCCP at the destination exchange in setting up the requested end-to-end connection.

3.8.3 *Unsuccessful set-up of the physical connection*

If the physical connection cannot be set up at a transit exchange, in addition to releasing the physical connection so far established the ISDN user part initiates the refusal of the connection request. The same actions are performed as at a transit exchange beyond which a logical connection cannot be extended.

If the physical connection cannot be set up at the destination exchange, the ISDN user part can initiate either the refusal or the confirmation of the connection request depending on supplementary services. It may be preferred to always confirm the connection request to allow for the initiation of supplementary services by the calling subscriber.

3.8.4 *Release of the ISDN user part (ISUP) end-to-end signalling connection*

3.8.4.1 *Simultaneous release of the physical and ISUP signalling connections*

The release of the ISDN user part end-to-end signalling connection is initiated from the exchange which initiates the release of the call concerned. At the initiating exchange of call release, when the ISDN user part release message (REL) is transmitted, ISDN user part requests SCCP to transmit a released message (RLSD). This RLSD message contains a cause value of "end user originated" in its cause parameter, if a normal call release initiated by a user is taking place.

Figure 21/Q.764 shows the procedure for this case.

In the case where no application requires the ISDN user part end-to-end signalling connection to be maintained, the ISDN user part at a local exchange, or an exchange performing chaining, requests the SCCP to release the SCCP end-to-end connection if it receives a release message (REL) and the SCCP has not yet received a released (RLSD) message at that time (see Figure 22/Q.764).

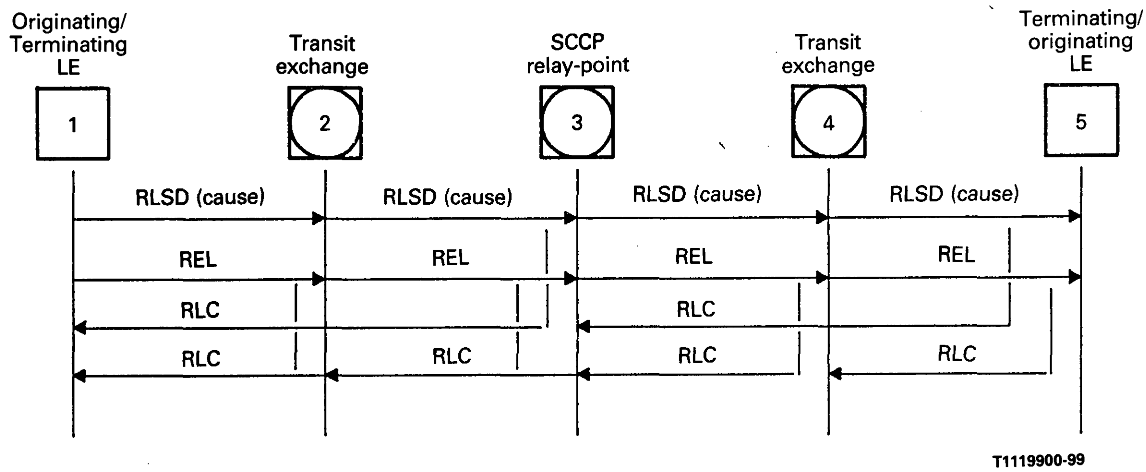


FIGURE 21/Q.764

Simultaneous release of a bearer connection and an ISDN user part end-to-end signalling connection based on SCCP connection-oriented class

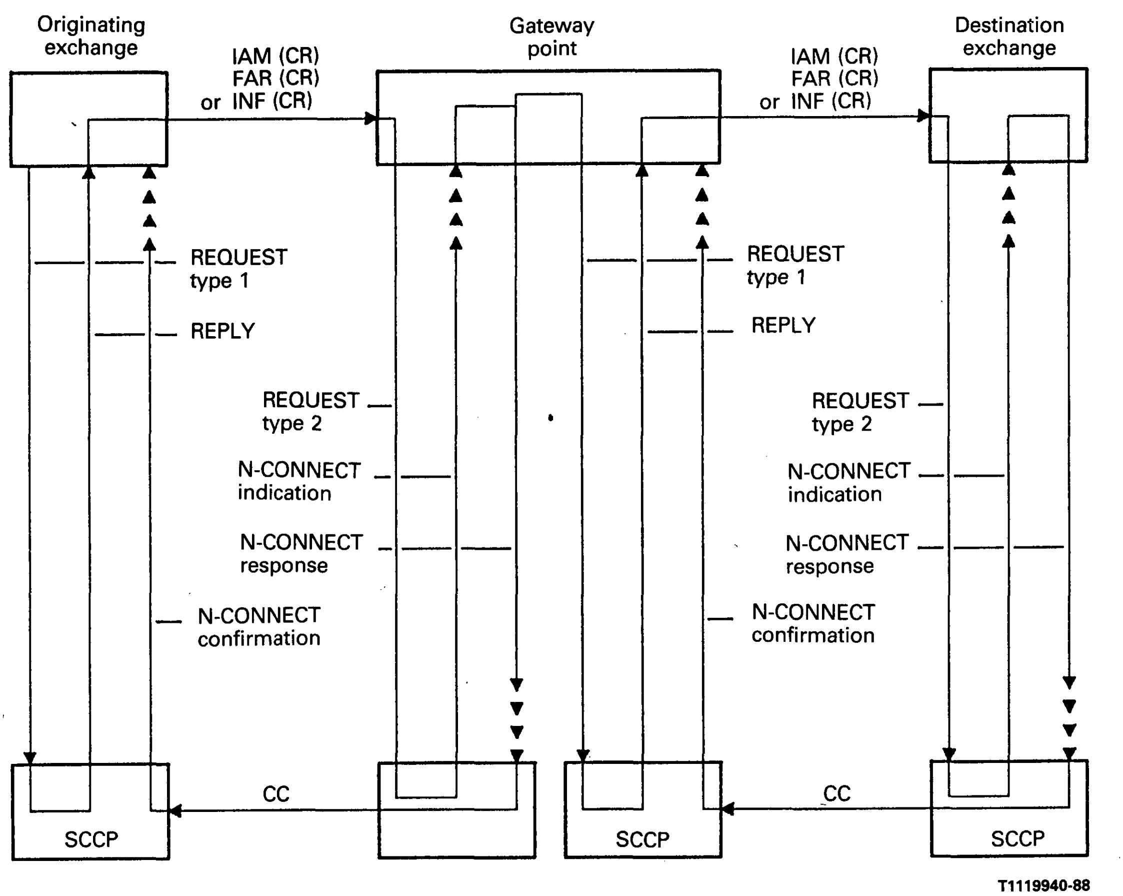


FIGURE 22/Q.764

Chaining of end-to-end connections (The outgoing end-to-end connection is assumed to be of the same type as the incoming end-to-end connection)

3.8.4.2 *Non-simultaneous release of the physical and the ISDN user part end-to-end signalling connections*

Procedures for non-simultaneous release of the physical and the ISDN user part end-to-end signalling connections are to be defined in appropriate supplementary services procedures.

3.8.5 *End-to-end message transfer*

An end-to-end message is transferred in an SCCP data (DT1/DT2) message according to the procedures defined in Recommendation Q.714. ISDN user part interfaces with SCCP via the primitives as defined in Recommendation Q.711 for this transfer. The data request/indication primitive includes in its user data parameter an ISDN user part message beginning with the message type code and ending with the parameters.

3.9 *Interface elements between ISDN user part and SCCP (embedded transfer)*

The ISDN user part may use the functional interface as defined in Recommendation Q.711.

Three interface elements are defined for this functional interface:

a) the REQUEST type 1

b) the REQUEST type 2

c) the REPLY

The contents of these three interface elements are shown in Appendix I.

Figures 18/Q.764, 19/Q.764 and 21/Q.764 indicate the usage of the interface elements during set up of a circuit-switched connection together with an SCCP connection.

ANNEX A

(to Recommendation Q.764)

Timers used in Recommendation Q.764 (Sheet 1 of 6)

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry
T_1	4-15 s	Local	When release message is sent	At the receipt of release complete message	Retransmit release message and reinitialize timer T_1	Same as the first expiry
T_2	3 min	Dual	When controlling exchange receives suspend (user) message	At the receipt of resume (user) message at controlling exchange	Initiate release procedure	–
T_3	3 min	Dual	When local exchange sends delayed release message	When hold condition is removed	Initiate release procedure	–
T_4	4-15 s	Dual	When local exchange sends call modification request message	At the reception call modification complete message		–
T_5	1 min	Local	When initial release message is sent	At receipt of release complete message	Send reset circuit message, alert maintenance personnel, and remove the circuit from service	The sending of the de reset circuit message should continue at 1-min intervals until maintenance intervention occurs
T_6	Covered in Q.118	Dual	When controlling exchange receives suspend (network)	At the receipt of resume (network) message	Initiate release procedure	–

Timers used in Recommendation Q.764 (Sheet 2 of 6)

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry
T_7	20-30 s	Dual	When the latest address message is sent	When the condition for normal release of address and routing informations is met (receipt of ACM, CON, messages)	Release all equipment and connection (Send release message)	–
T_8	10-15 s	Local	When transit of incoming international exchange receives initial adress message	At receipt of continuity message	Release all equipment and connection into national network (Send release message)	–
T_9	Interval specified in Q.118	Dual	When national controlling or outgoing international exchange sends latest address message after the receipt of ACM	At the receipt of answer	Release connection send back release message	–
T_{10}	4-6 s	Dual	When last digit is received in interworking situations	At the receipt of fresh information	Send address complete message	–
T_{11}	15-20 s	Dual	When latest address message is received in interworking situations	Send ACM	Send address complete message	–

Timers used in Recommendation Q.764 (Sheet 3 of 6)

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry
T_{12}	4-15 s	Local	When blocking message is sent	At receipt of blocking acknowledgement	Retransmit blocking message and initiate T_{12}	Same as the left until T_{13} expires
T_{13}	1 min	Local	When initial blocking message is sent	At receipt of blocking acknowledgement	Retransmit blocking message and alert maintenance personnel and start T_{13}. Stop T_{12}	The reception of message should be continued until maintenance intervention occurs and circuit taken out of service as appropriate
T_{14}	4-15 s	Local	When unblocking message is sent	At receipt of unblocking acknowledgement	Retransmit unblocking message and initiate T_{14} timer	Same as the left until T_{15} expires
T_{15}	1 min	Local	When initial unblocking message is sent	At receipt of unblocking acknowledgement	Retransmit unblocking message alert maintenance personnel, start T_{15} timer and stop T_{14}	The repetition of message should be continued until maintenance intervention occurs and circuit taken out of service as appropriate
T_{16}	4-15 s	Local	When reset circuit message is sent	At the receipt of the acknowledgement (RLC message)	Retransmit reset circuit message and restart T_{16}	Same as the left until T_{17} expires
T_{17}	1 min	Local	When initial reset circuit message is sent	At receipt of the acknowledgement	Alert maintenance personnel retransmit reset circuit message, restart T_{17} and stop T_{16}	The repetition of message should be continued until maintenance intervention occurs

Timers used in Recommendation Q.764 (Sheet 4 of 6)

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry
T_{18}	4-15 s	Local	When group blocking message is sent	At receipt of group blocking acknowledgement	Retransmit group blocking message and initiate T_{18}	Same as the left until T_{18} expires
T_{19}	1 min	Local	When initial group blocking message is sent	At receipt of group blocking acknowledgement	Retransmit group blocking message, alert maintenance personnel, initiate T_{19} and stop T_{18}	The repetition of message should be continued until maintenance intervention occurs and circuits taken out of service as appropriate
T_{20}	4-15 s	Local	When group unblocking message is sent	At receipt of group unblocking acknowledgement	Retransmit group unblocking message and initiate T_{20}	Same as the left until T_{20} expires
T_{21}	1 min	Local	When initial group unblocking message is sent	At receipt of group unblocking acknowledgement	Retransmit group unblocking message, alert maintenance personnel, initiate T_{21} and stop T_{20}	The repetition of message should be continued until maintenance intervention occurs and circuits taken out of service as appropriate
T_{22}	4-15 s	Local	When circuit group reset message is sent	At the receipt of the acknowledgement	Retransmit circuit group reset message and restart T_{22}	Same as the first expiry until T_{23} expires

Timers used in Recommendation Q.764 (Sheet 5 of 6)

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry
T_{23}	1 min	Local	When initial circuit group reset message is sent	At the receipt of the acknowledgement	Alert maintenance personnel and restart Timer T_{23}. Retransmit circuit group reset message. Stop timer T_{22}	The reception of message should be continued until maintenance intervention occurs
T_{24}	< 2 s	Local	When check tone is sent	At the receipt of backward check tone	Report failure	–
T_{25}	1-10 s	Local	When continuity check failure is detected (on receipt of continuity recheck request)	–	Send CCR message	–
T_{26}	1-3 min	Local	When second continuity check failure is detected	–	Send CCR message	–
T_{27}	4 min	Local	When continuity recheck request is requested	At receipt of continuity check request message	Return to idle	–
T_{28}	10 s	Local	When send CQM	At receipt of CQR	Alert maintenance	–

Timers used in Recommendation Q.764 (Sheet 6 of 6)

Symbol	Time-out value	Significance	Cause for initiation	Normal termination	At the first expiry	At the following expiry
T_{29}	300-600 ms	Local	First congestion/first congestion indication after T_{30} expires	–	–	–
T_{30}	5-10 s	Local	First congestion indication	–	–	–
T_{31}	> 6 min	Local	Release of ISDN User part signalling connection based on CO SCCP	On expiry	–	Call reference reusable
T_{32}	3-5 s	Local	On receipt of end-to-end message	On expiry	–	End-to-end message to be sent
T_{33}	12-15 s	Local	When send INR	On receipt of INF	Release call	–
T_{34}	12-15 s	Local	When send circuits group query	On receipt of circuits group query response	Maintenance action	–

ANNEX B

(to Recommendation Q.764)

State transition diagrams

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

B.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 B-1/Q.764. These blocks are as follows:

1) *Signalling procedure control (SPRC)*

   SPRC provides procedures for sending ISDN-UP messages to Level 3 (SCCP or MTP) and distributing received messages to the other ISDN-UP 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.

B.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 B-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 B-3/Q.764.

B.3 *Abbreviations, timers and primitives*

B.3.1 *Abbreviations*

1) Table B-1/Q.764:

   Signalling procedure control.

2) Table B-2/Q.764:

   Call processing control.

3) Table B-3/Q.764:

   Circuit supervision control.

B.3.2 *Timers*

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

B.3.3 *Primitives*

Primitives used over the interface between call control and ISDN-UP are shown in Table B-5/Q.764.

B.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)
   - Figure B-4/Q.764
     Functional diagrams
   - Figure B-5/Q.764
     State transition diagrams
2) Call processing control (CPC)
   - Figure B-6/Q.764
     Functional diagrams
   - Figures B-7/Q.764 to B-9/Q.764
     State transition diagrams
3) Circuit supervision control (CSC)
   - Figure B-10/Q.764
     Functional diagrams
   - Figures B-11/Q.764 to B-18/Q.764
     State transition diagrams

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 §§ 1-3. The ISDN-UP diagrams are provided for the above subdivided functional blocks, as shown below:

1) Signalling procedure control (SPRC)
   - Figure B-19/Q.764
     Message sending control
   - Figure B-20/Q.764
     Message distributing control
2) Call processing control (CPC)
   - Figure B-21/Q.764
     Call processing control incoming (CPCI)
   - Figure B-22/Q.764
     Call processing control outgoing (CPCO)
   - Figure B-23/Q.764
     Continuity check incoming (CCI)
   - Figure B-24/Q.764
     Continuity check outgoing (CCO)
3) Circuit supervision control (CSC)
   - Figure B-25/Q.764
     Blocking/unblocking message sending (BLS)
   - Figure B-26/Q.764
     Blocking/unblocking message reception (BLR)
   - Figure B-27/Q.764
     Maintenance oriented circuit group blocking/unblocking sending (MGBS)
   - Figure B-28/Q.764
     Blocking/unblocking reception (MGBR)
   - Figure B-29/Q.764
     Hardware failure oriented locally blocking state (HLB)
   - Figure B-30/Q.764
     Hardware failure oriented remotely blocking state (HRB)
   - Figure B-31/Q.764
     Hardware failure oriented circuit group blocking/unblocking sending (HGBS):

- Figure B-32/Q.764

  Hardware failure oriented circuit group blocking/unblocking reception (HGBR)
- Figure B-33/Q.764

  Circuit reset sending (CRS)
- Figure B-34/Q.764

  Circuit reset reception (CRR)
- Figure B-35/Q.764

  Circuit group reset sending (CGRS)
- Figure B-36/Q.764

  Circuit group reset reception (CGRR)
- Figure B-37/Q.764

  Continuity recheck sending (CRCS)
- Figure B-38/Q.764

  Continuity recheck reception (CRCR)
- Figure B-39/Q.764

  Circuit group query sending (CQS)
- Figure B-40/Q.764

  Circuit group query reception (CQR)

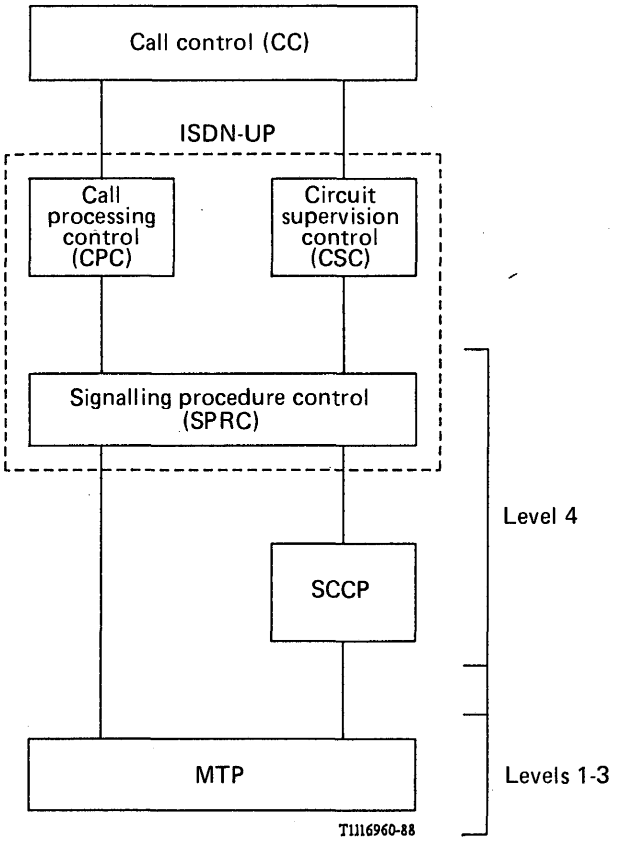
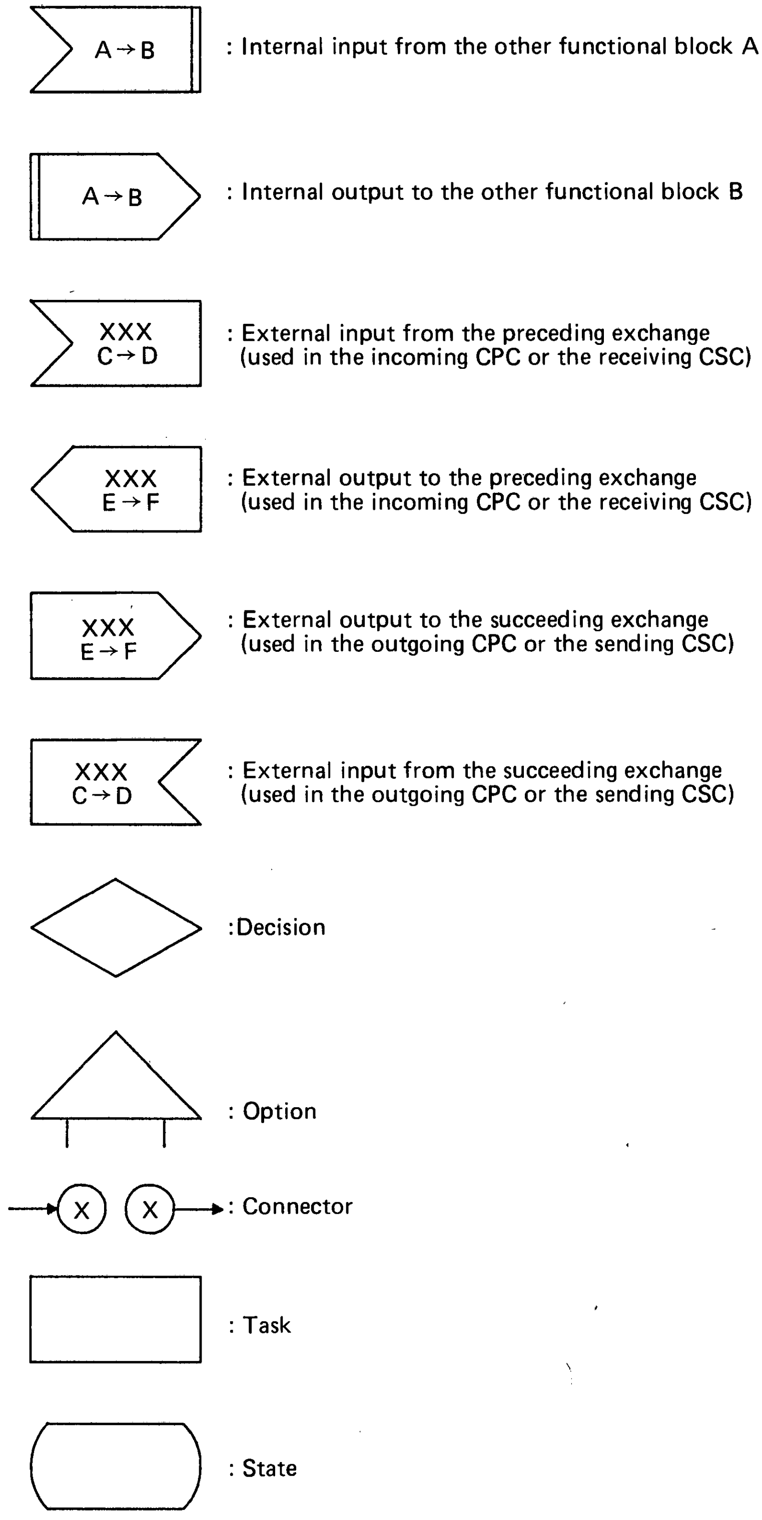


FIGURE B-1/Q.764

Overview functional block diagram for ISDN-UP



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

FIGURE B-2/Q.764

Symbols used in SDL diagrams

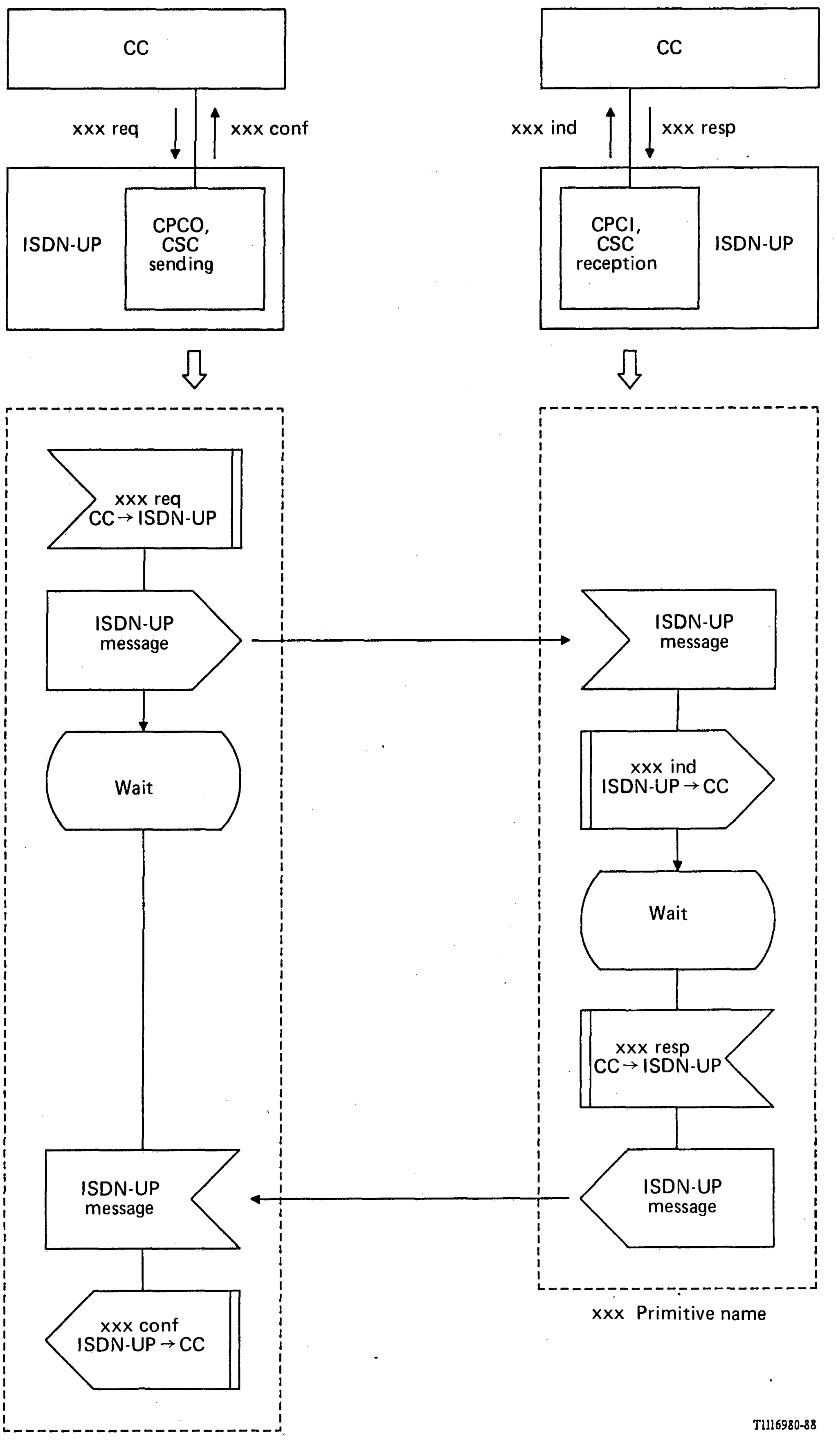


FIGURE B-3/Q.764

SDL convention example

TABLE B-1/Q.764

Signalling procedure control acronym

	Acronym	Description
Functional block name	BLR	Blocking/Unblocking Message Reception
	BLS	Blocking/Unblocking Message Sending
	CCO	Continuity Check Outgoing
	CCI	Continuity Check Incoming
	CGRS	Circuit Group Reset Sending
	CGRR	Circuit Group Reset Reception
	CPC	Call Processing Control
	CRR	Circuit Reset Reception
	CRS	Circuit Reset Sending
	CSC	Circuit Supervision Control
	SPRC	Signalling Procedure Control
	MGBR	Maintenance Oriented Circuit Group Blocking/Unblocking Reception
	HGBR	Hardware Failure Oriented Circuit Group Blocking/Unblocking Reception
	MGBS	Maintenance Oriented Circuit Group Blocking/Unblocking Sending
	HGBS	Hardware Failure Oriented Circuit Group Blocking/Unblocking Sending
	CRCR	Continuity Recheck Control Reception
	CRCS	Continuity Recheck Control Sending
	CQR	Circuit Group Query Reception
	CQS	Circuit Group Query Sending
	MSDC	Message Sending Control
	MDSC	Message Distributing Control
Message type	BLA	Blocking Acknowledgement
	BLO	Blocking
	GRA	Group Reset Acknowledgement
	GRS	Group Reset
	CQR	Circuit Group Query Response
	CQM	Circuit Group Query
	UBA	Unblocking Acknowledgement
	UBL	Unblocking
	CCR	Continuity Check Request
	CGB	Circuit Group Blocking
	CGBA	Circuit Group Blocking Acknowledgement
	CGU	Circuit Group Unblocking
	CGUA	Circuit Group Unblocking Acknowledgement
	RSC	Reset Circuit
	CFN	Confusion

TABLE B-2/Q.764

Call processing control acronym

	Acronym	Description
General	OGC ICC CCH	Outgoing Trunk Circuit Incoming Trunk Circuit Continuity Check Indicator
Functional block name	CC SPRC CPC BLR BLS CCO CCI CGRR CRR CRS CPCI CPCO MGBR HGBR MGBS HGBS CRCR CRCS	Call control Signalling Procedure Control Call Processing Control Blocking/Unblocking Message Reception Blocking/Unblocking Message Sending Continuity Check Outgoing Continuity Check Incoming Circuit Group Reset Reception Circuit Reset Reception Circuit Reset Sending Call Processing Control Incoming Call Processing Control Outgoing Maintenance Oriented Circuit Group Unblocking/Blocking Reception Hardware Failure Oriented Circuit Group Blocking/Unblocking Reception Maintenance Oriented Circuit Group Unblocking/Blocking Sending Hardware Failure Oriented Circit Group Blocking/Unblocking Sending Continuity Recheck Reception Continuity Recheck Sending
Message type	ACM ANM COT CPG IAM SUS RES REL RLC FOT SAM CON	Address Complete Answer Continuity Call Progress Initial Address Suspend (network-or user-initiated) Resume (network-or user-initiated) Release Release Complete Forward Transfer Subsequent Address Connect

TABLE B-3/Q.764

Circuit supervision control acronym

	Acronym	Description
Functional block name	BLR	Blocking/Unblocking Reception
	BLS	Blocking/Unblocking Sending
	CRS	Circuit Reset Sending
	CRR	Circuit Reset Reception
	CGRS	Circuit Group Reset Sending
	CGRR	Circuit Group Reset Reception
	MGBR	Maintenance Oriented Circuit Group Blocking/Unblocking Reception
	HGBR	Hardware Failure Oriented Circuit Group Blocking/Unblocking Reception
	MGBS	Maintenance Oriented Circuit Group Blocking/Unblocking Sending
	HGBS	Hardware Failure Oriented Circuit Group Blocking/Unblocking Sending
	CRCR	Continuity Recheck Reception
	CRCS	Continuity Recheck Sending
	CQR	Circuit Group Query Reception
	CQS	Circuit Group Query Sending
	HRB	Hardware Failure Oriented Remotely Blocking
	HLB	Hardware Failure Oriented Locally Blocking State
Message type	BLA	Blocking Acknowledgement
	BLO	Blocking
	COT	Continuity
	CQR	Circuit Group Query Response
	CQM	Circuit Group Query
	GRA	Group Reset Acknowledgement
	GRS	Group Reset
	RLC	Release Complete
	RSC	Reset Circuit
	UBA	Unblocking Acknowledgement
	UBL	Unblocking
	CGB	Circuit Group Blocking
	CGBA	Circuit Group Blocking Acknowledgement
	CCR	Continuity Check Request
	CGU	Circuit Group Unblocking
	CGUA	Circuit Group Unblocking Acknowledgement
	REL	Release

TABLE B-4/Q.764

Timer

Timer	Symbol	Time-out value
First RLC timer	T1	4-15 s
Second RLC timer	T5	1 min
RES timer (network)	T6	Covered in Q.118
ACM timer	T7	20-30 s
COT timer	T8	10-15 s
ANM timer	T9	Interval specified in Q.118
First BLA timer	T12	4-15 s
Second BLA timer	T13	1 min
First UBA timer	T14	4-15 s
Second UBA timer	T15	1 min
First RSC response timer	T16	4-5 s
Second RSC response timer	T17	1 min
First CGBA timer	T18	4-15 s
Second CGBA timer	T19	1 min
First CGUA timer	T20	4-15 s
Second CGUA timer	T21	1 min
First GRA timer	T22	4-15 s
Second GRA Timer	T23	1 min
Continuity tone timer	T24	$\leqslant$ 2 s
CCR timing timer	T25	1-10 s
CCR response timer	T26	1-3 min
CCR receive timer	T27	4 min
CQR timer	T28	10 s

TABLE B-5/Q.764

Primitives

Primitive		ISDN-UP message	Interface
SETUP	**REQ**UEST **IND**ICATION **RESP**ONSE **CONF**IRMATION	IAM ANM, CON	Interface between CC and CPC
RELEASE		REL, RLC	
RESET	**IND**ICATION **RESP**ONSE	RSC, RLC GRS, GRA	
FORWARD TRANSFER	**REQ**UEST **IND**ICATION	FOT	
PROC		ACM (Other)	
ALERT		CPG, ACM (Subscriber free)	
INFO		SAM	
PROG [a)]		CPG, ACM (Interworking, Q.931 progress indicator)	
IBI [b)]		CPG (In-band information) ACM (In-band information	
SUSPENDED		SUS	
RESUMED		RES	
BLOCKING	**REQ**UEST **IND**ICATION **RESP**ONSE **CONF**IRMATION	BLO, BLA CGB, CGBA	Interface between CC and CSC
UNBLOCKING		UBL, UBA CGU, CGUA	
CCT GROUP QUERY		CQM, CQR	
STOP [c)]	**REQ**UEST **CONF**IRMATION	–	
CONTINUITY RECHECK		CCR	
RESET		GRS, GRA RSC, RLC	

TABLE B-5/Q.764 *(cont.)*

Primitive		ISDN-UP message	Interface
CALL FAILURE [c]	INDICATION	–	Interface between CC and CPC
REATTEMPT [c]			
CONTINUITY REPORT	REQUEST INDICATION	COT	
MAINTENANCE SYSTEM [c]	INDICATION	–	Interface between CC and CSC CC and CPC
START RESET [c]			

[a] Prog (network): Interworking
Prog (access): Q.931 progress indivator

[b] IBI: In-band information available

[c] Locale primitive

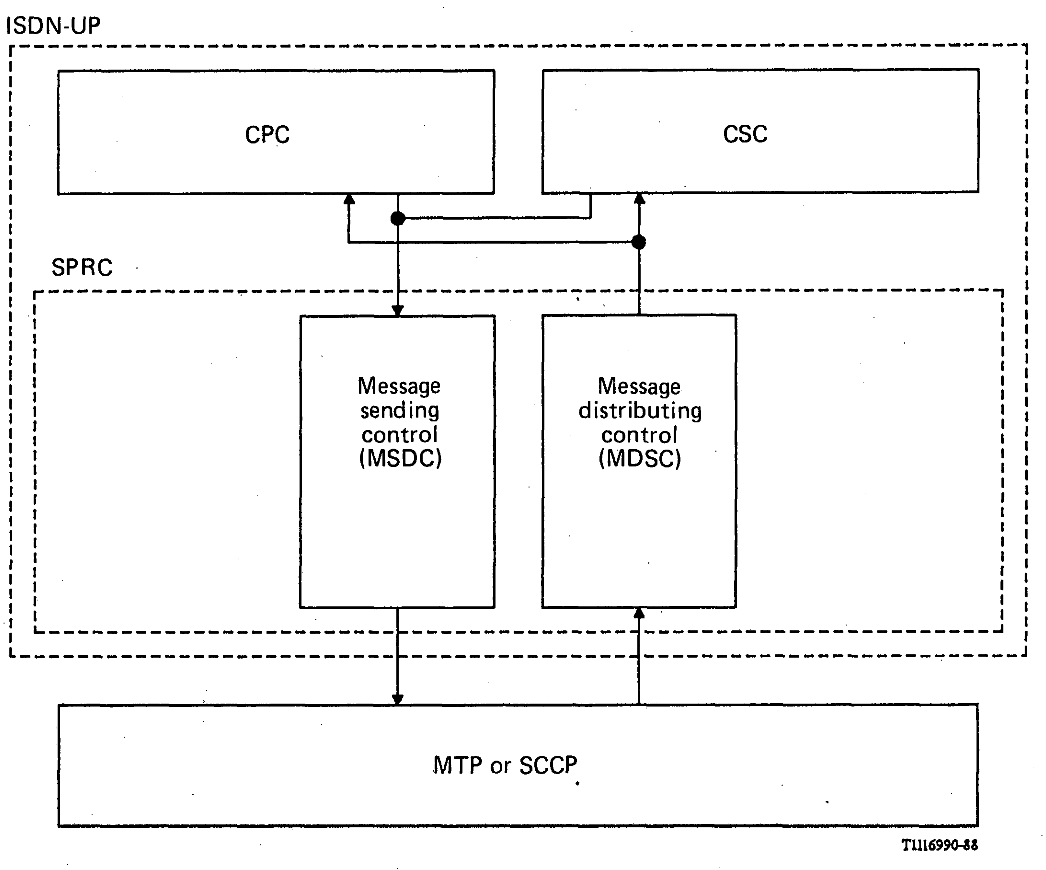
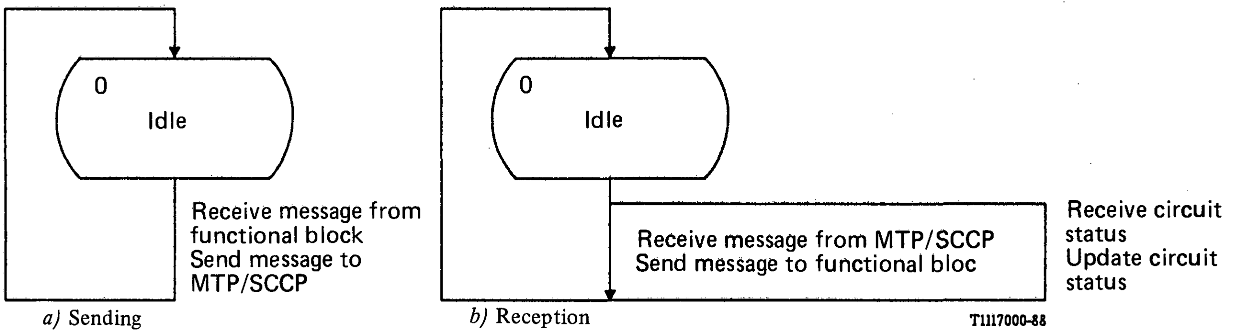


FIGURE B-4/Q.764
Functional block diagram for SPRC



a) Sending

b) Reception

T1117000-88

FIGURE B-5/Q.764

State transition diagrams for SPRC

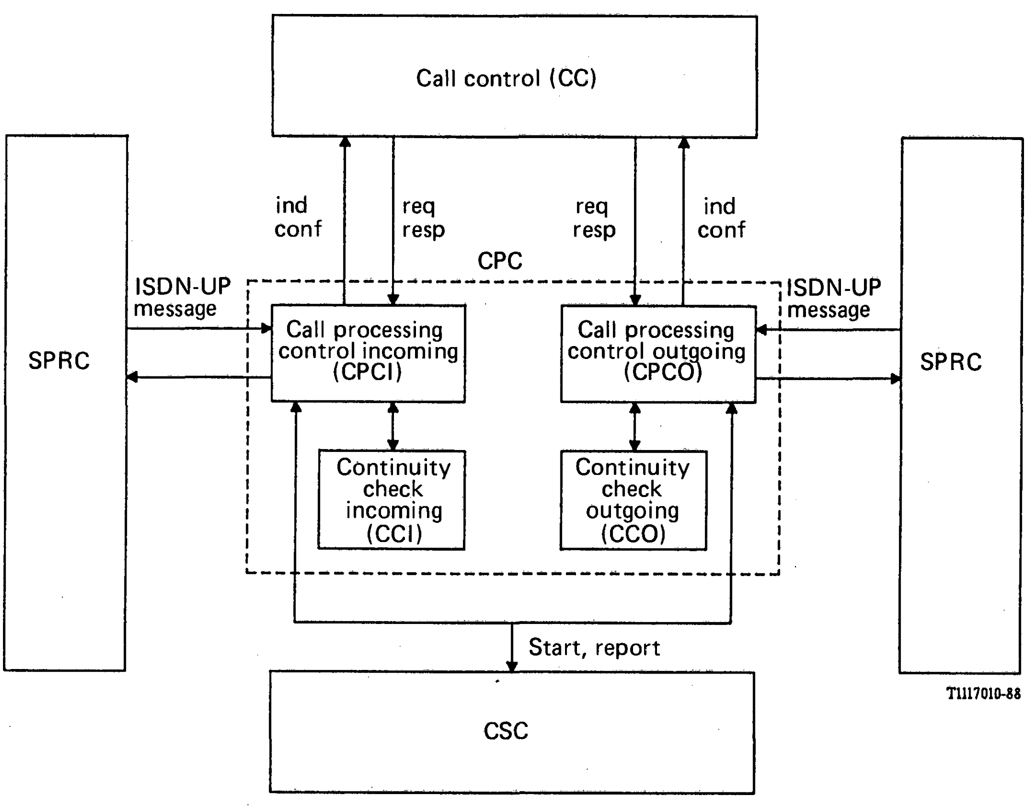


FIGURE B-6/Q.764

Functional block diagram for CPC

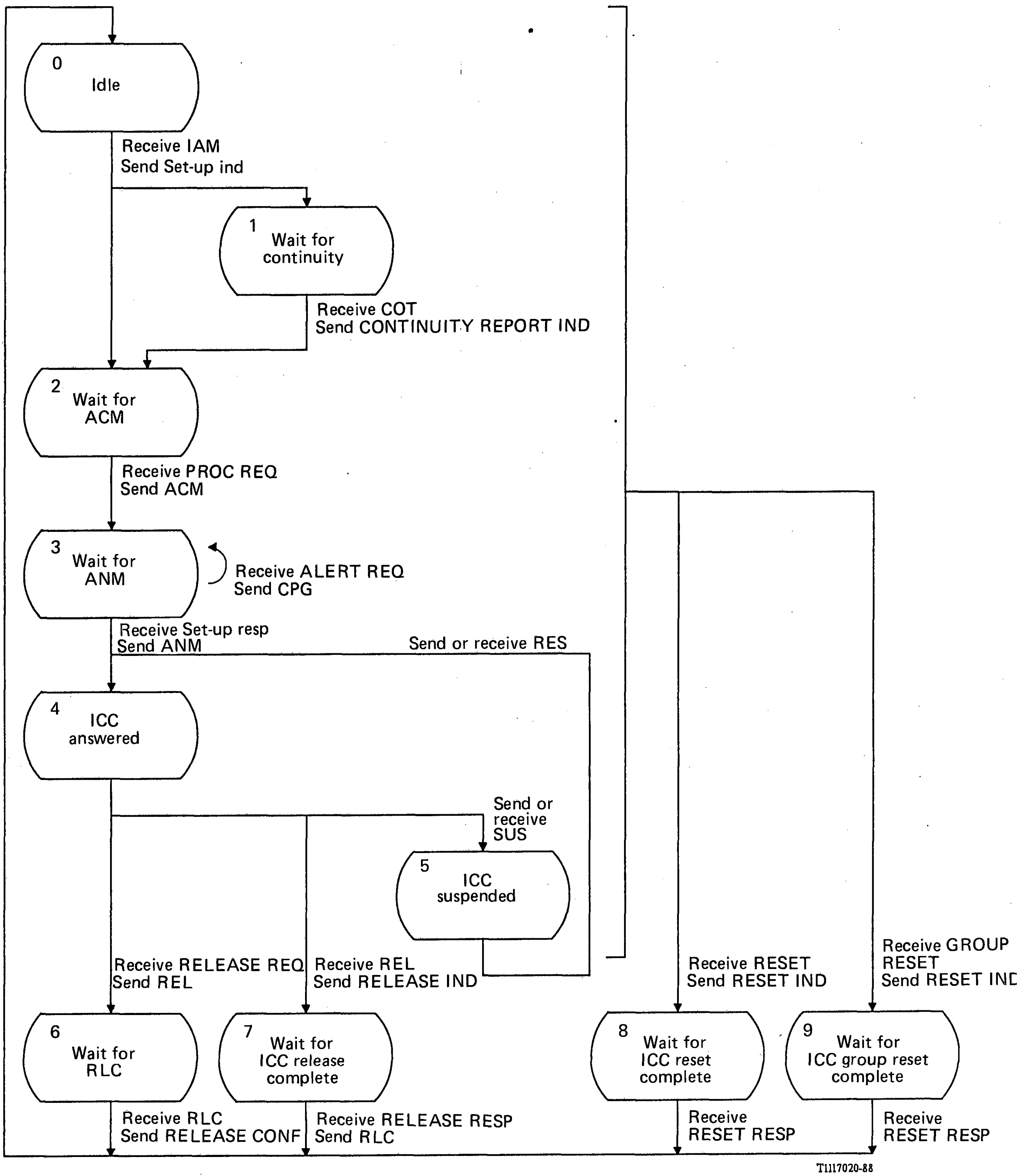


FIGURE B-7/Q.764

State transition diagrams for CPC incoming (CPCI)

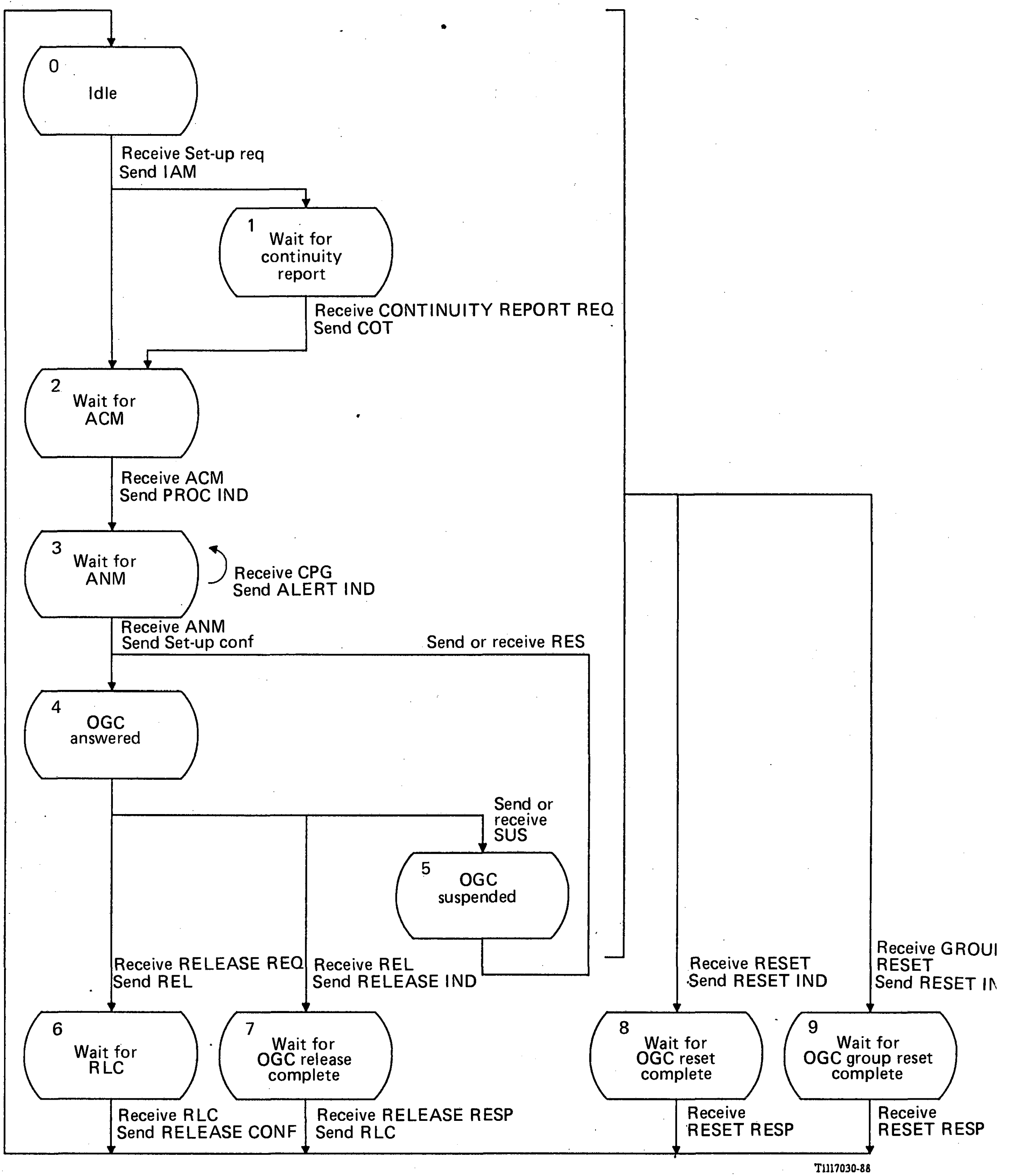
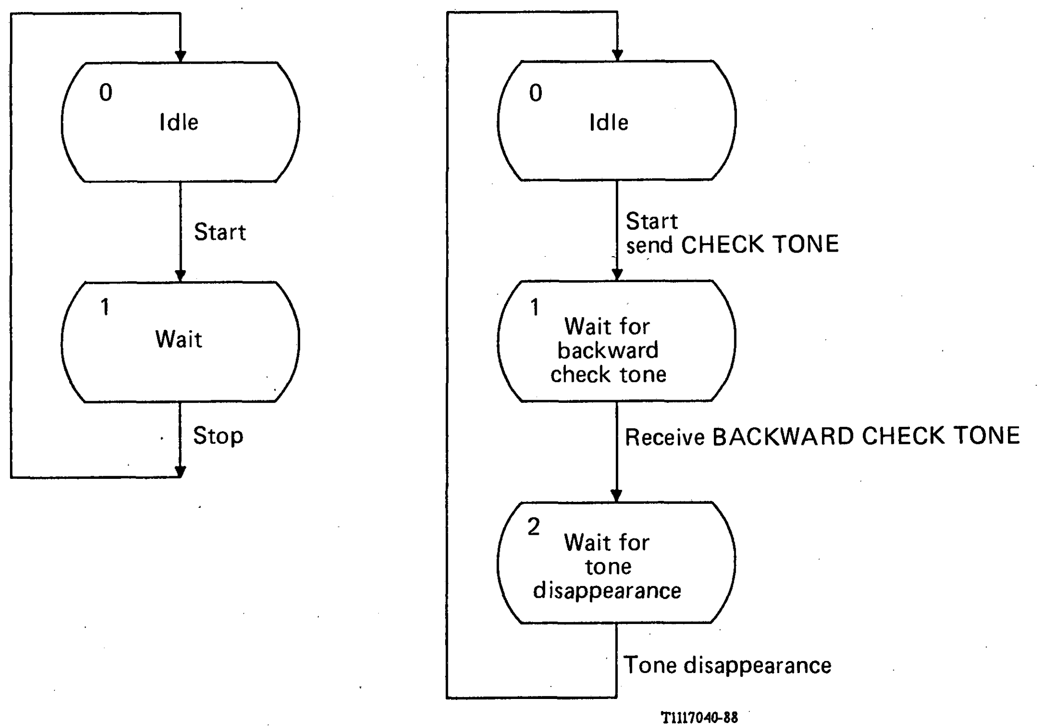


FIGURE B-8/Q.764

State transition diagrams for CPC outgoing (CPCO)



a) Incoming (CCI) *b)* Outgoing (CCO)

FIGURE B-9/Q.764

State transition diagrams for CPC continuity check

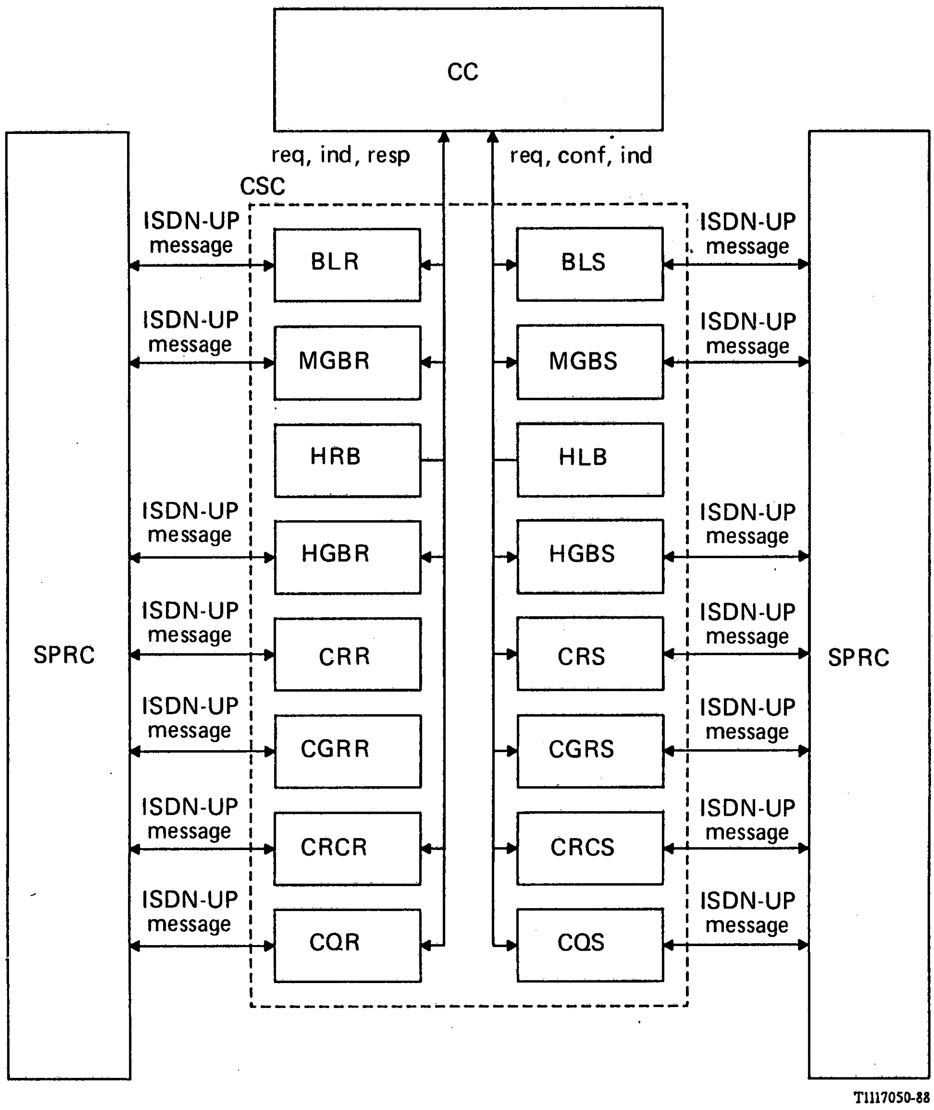
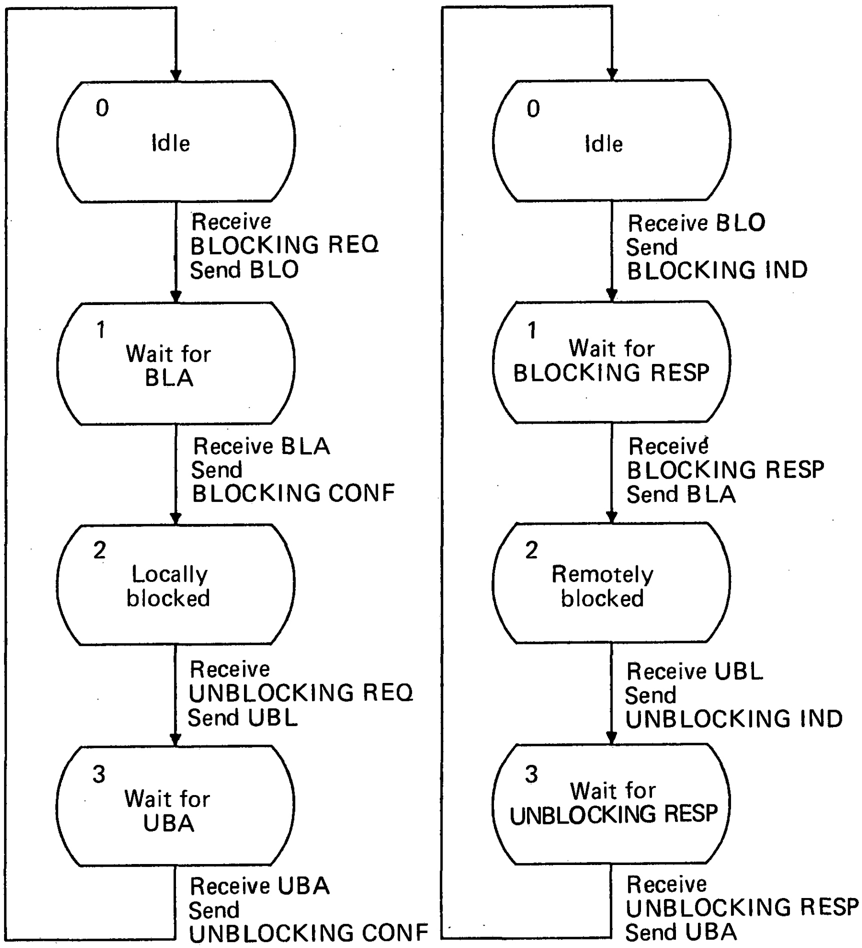


FIGURE B-10/Q.764

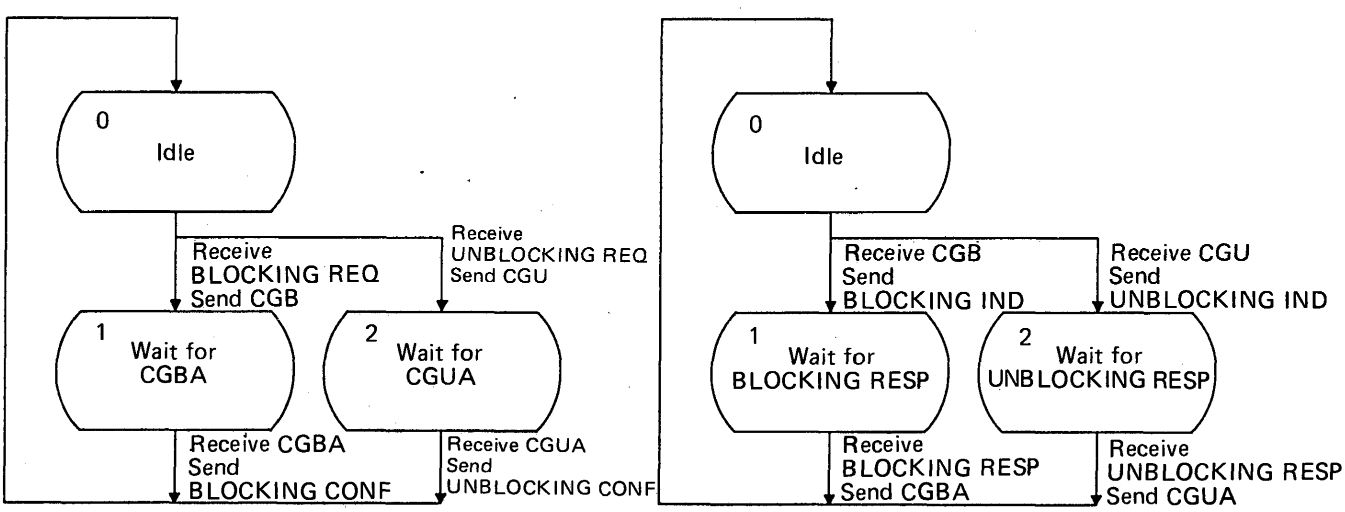
Functional block diagram for CSC



a) Sending (BLS) *b)* Reception (BLR)

FIGURE B-11/Q.764

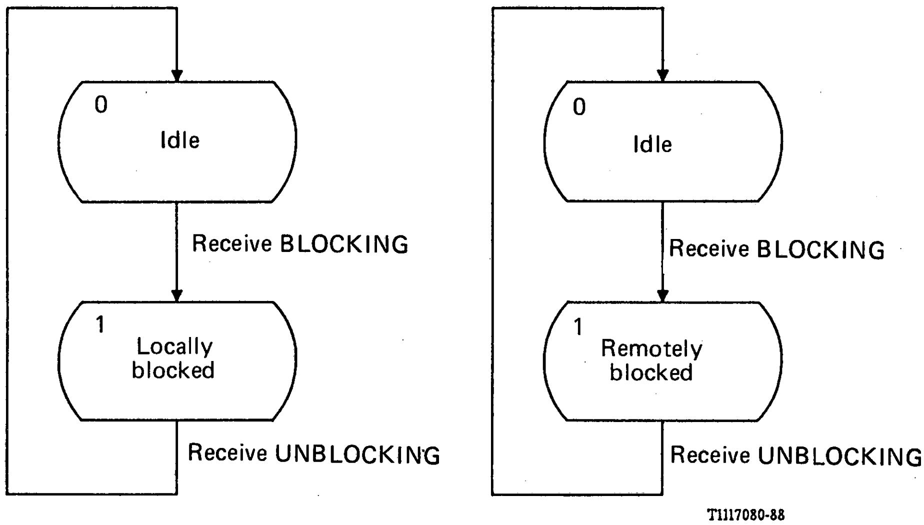
State transition diagrams for Blocking / Unblocking



a) Sending (MGBS) *b)* Reception (MGBR)

FIGURE B-12/Q.764

State transition diagrams for maintenance group blocking/unblocking

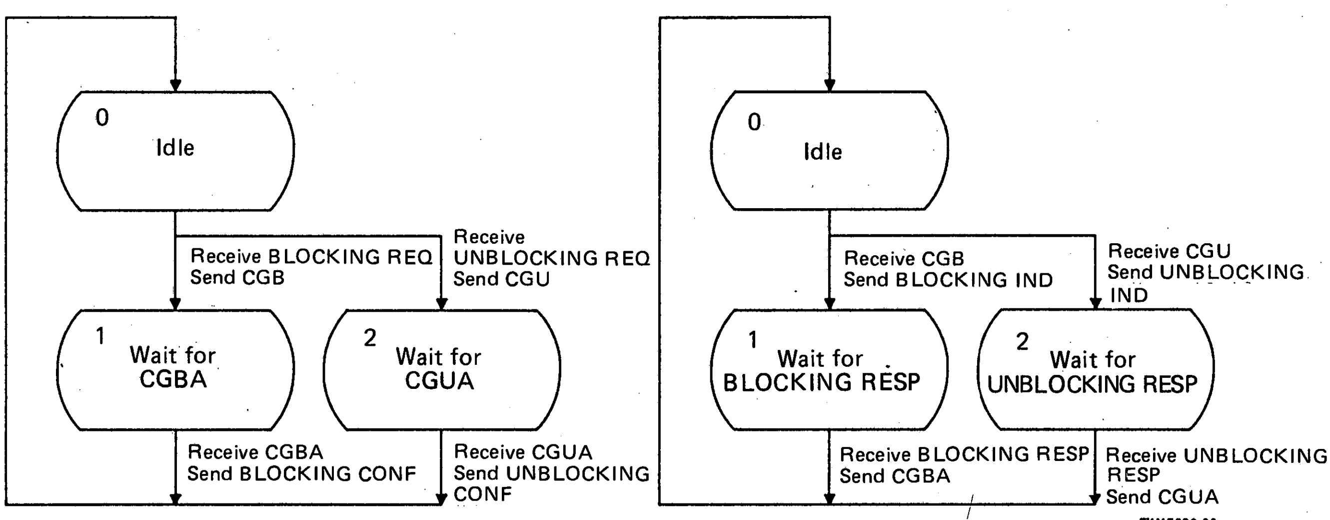


a) Locally blocking state (HLB)

b) Remotely blocking state (HRB)

FIGURE B-13/Q.764

State transition diagrams for hardware failure oriented blocking state

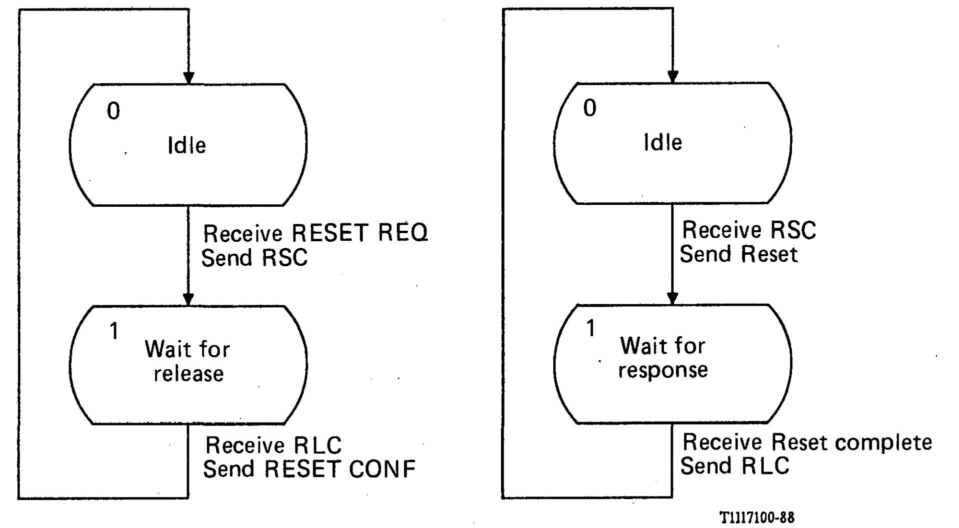


a) Sending (HGBS)

b) Reception (HGBR)

FIGURE B-14/Q.764

State transition diagrams for maintenance group blocking/unblocking

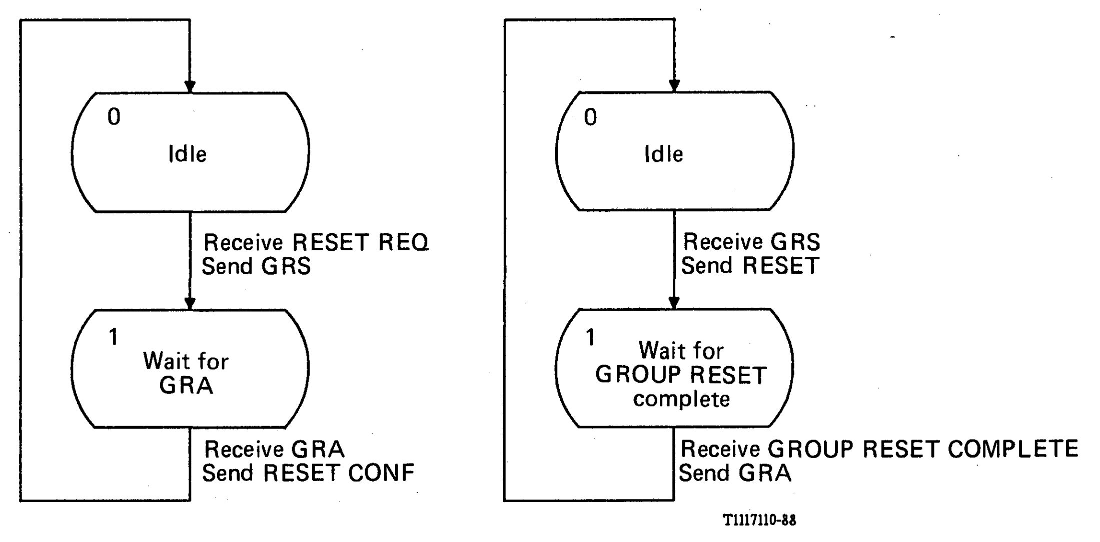


a) Sending (CRS)

b) Reception (CRR)

FIGURE B-15/Q.764

State transition diagrams for circuit reset

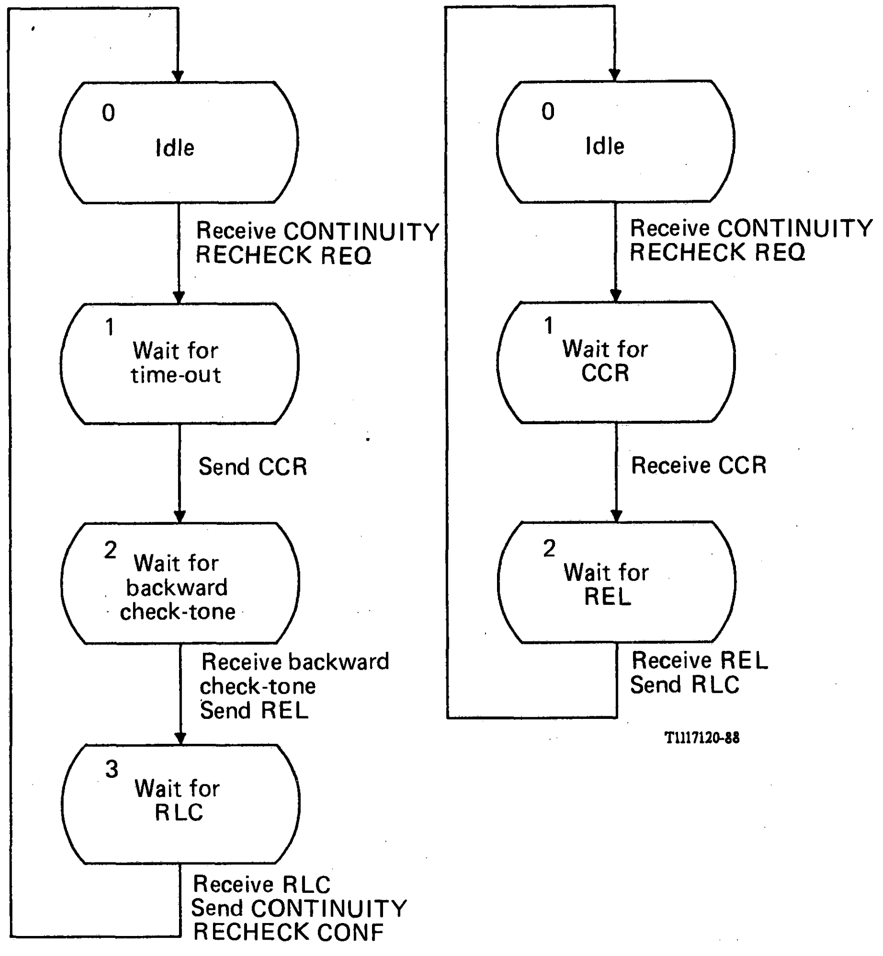


a) Sending (CGRS)

b) Reception (CGRR)

FIGURE B-16/Q.764

State transition diagrams for group reset

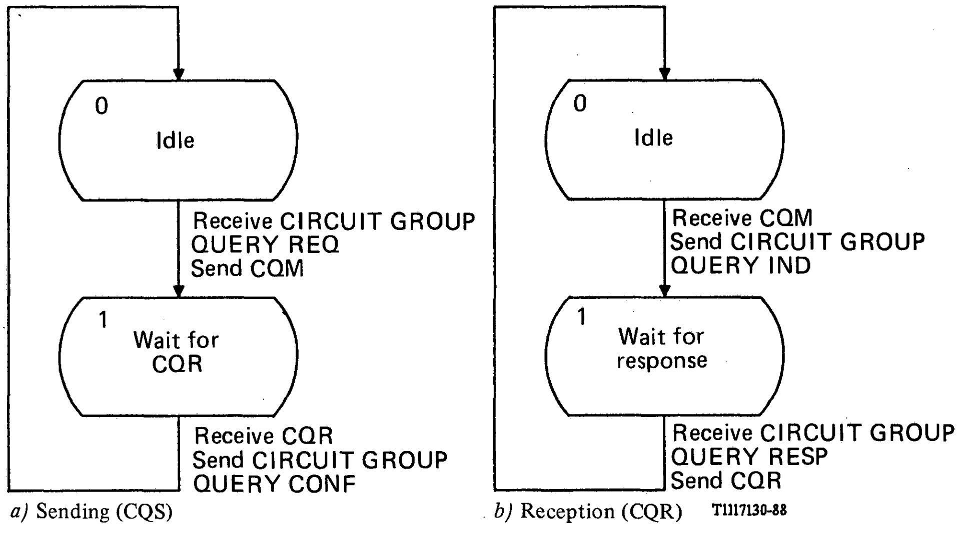


a) Sending (CRCS)

b) Reception (CRCR)

FIGURE B-17/Q.764

State transition diagrams for continuity recheck



a) Sending (CQS)

b) Reception (CQR)

FIGURE B-18/Q.764

State transition diagrams for circuit group query

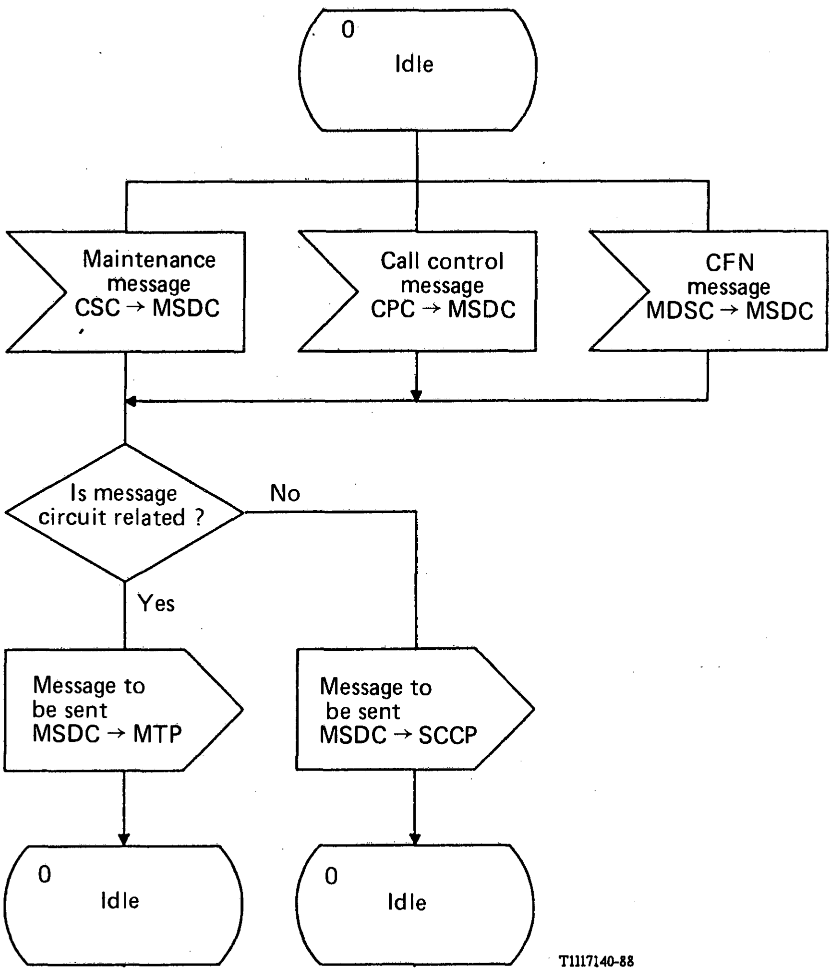
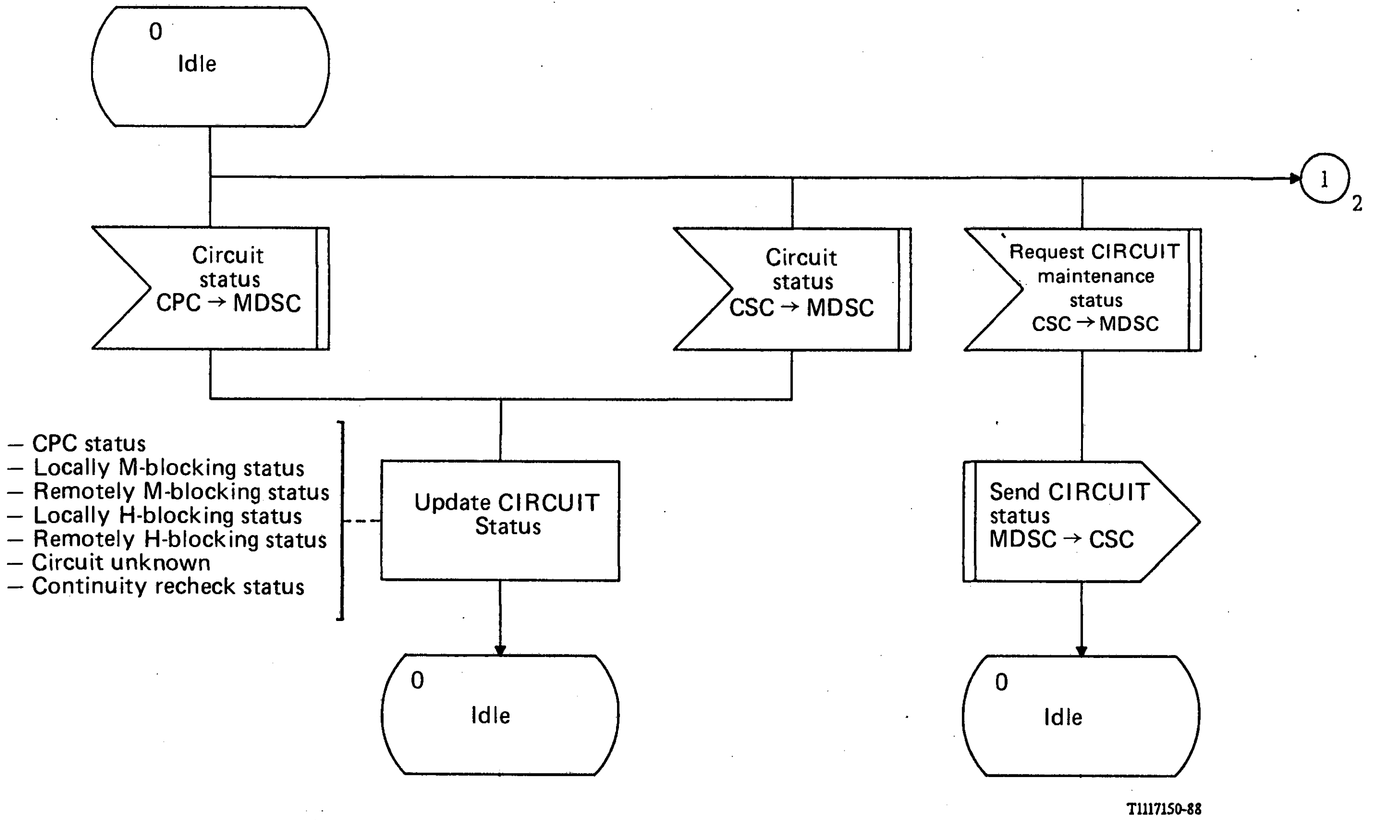


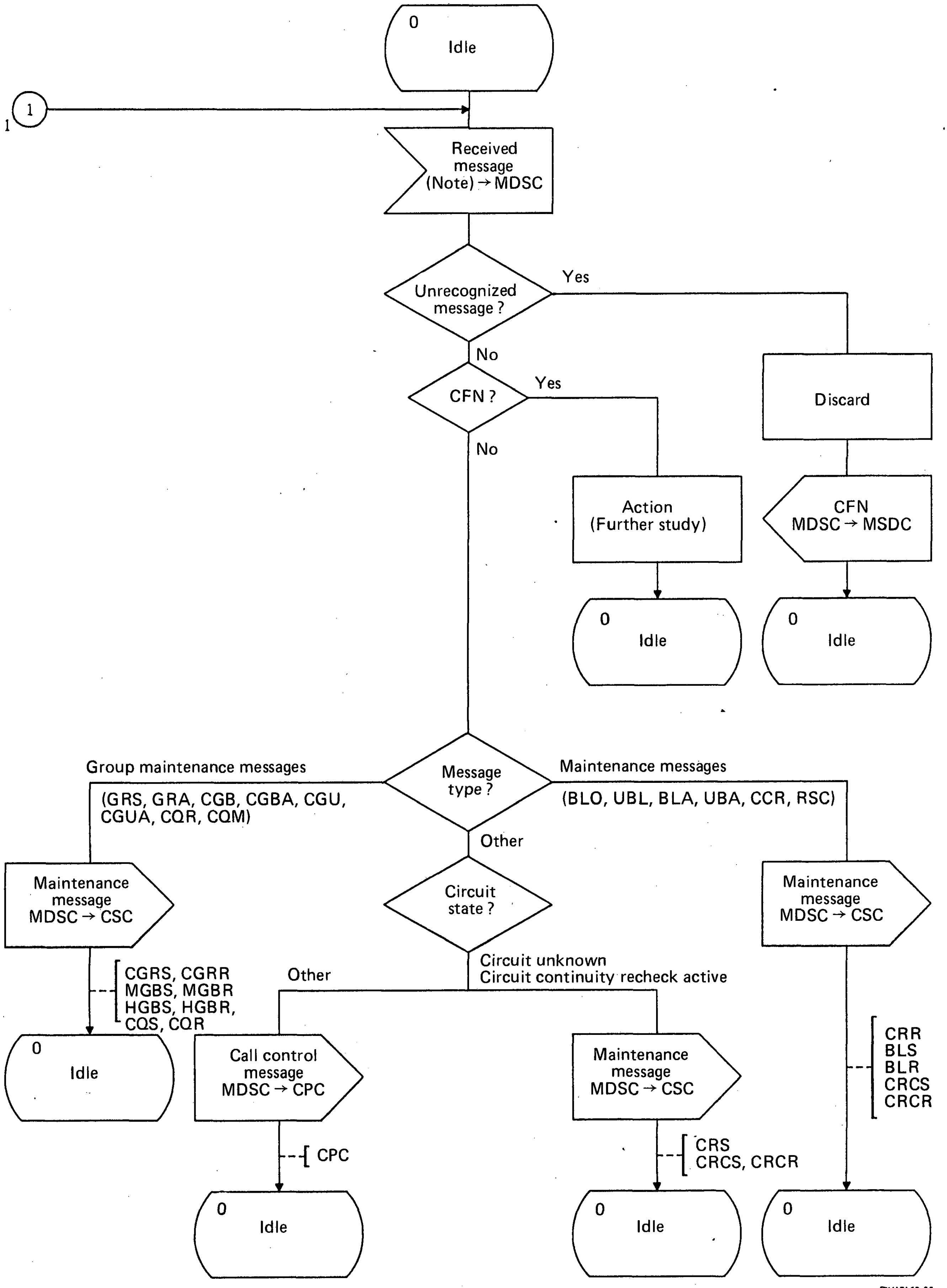
FIGURE B-19/Q.764

Message sending control (MSDC)



M-blocking Maintenance oriented blocking (BLS, BLR, MGBS, MGBR)
H-blocking Hardware failure oriented blocking (HLB, HRB, HGBS, HGBR)

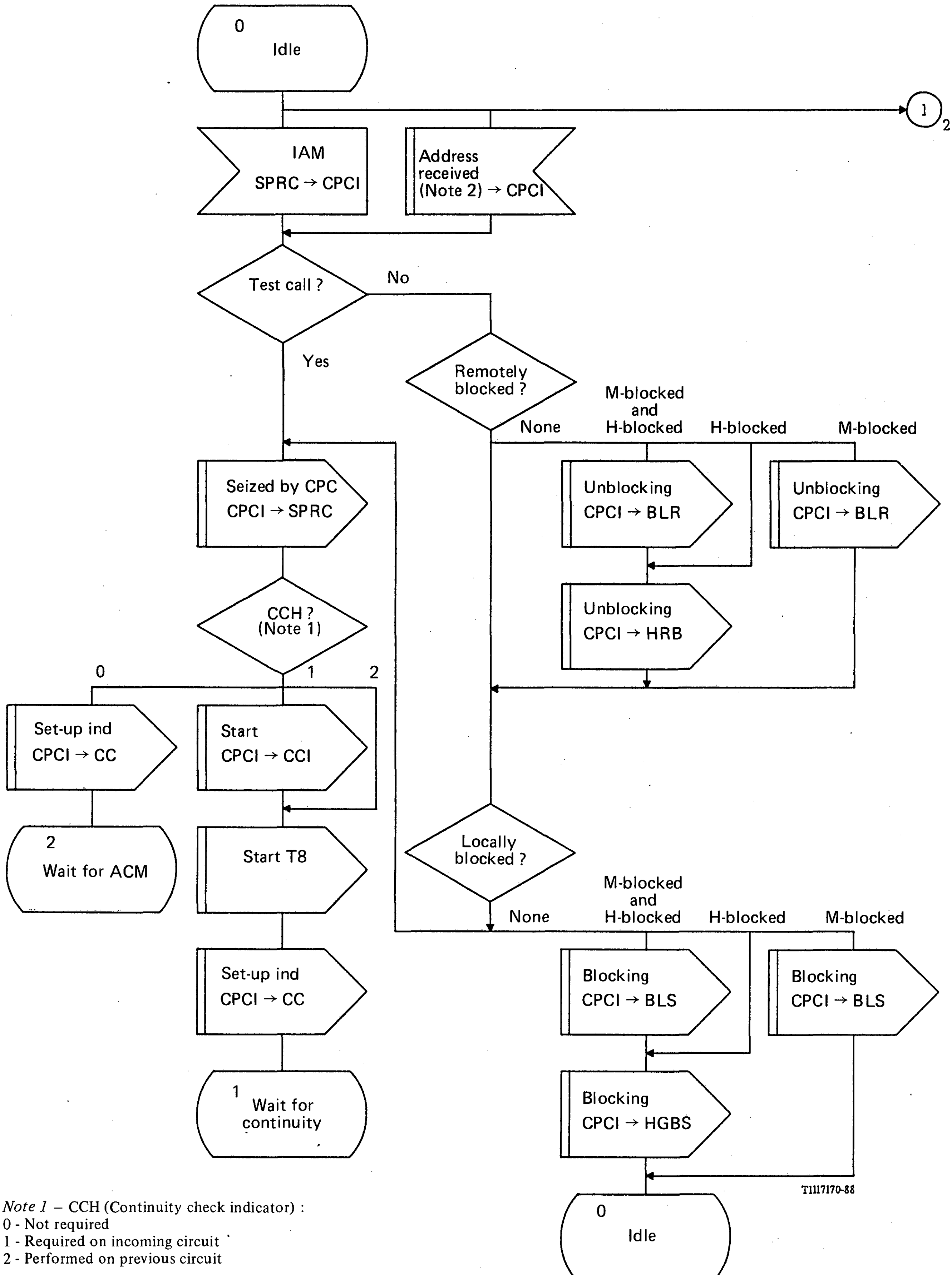
FIGURE B-20/Q.764 (sheet 1 of 2)
Message distributing control (MDSC)



Note – MTP / SCCP

FIGURE B-20/Q.764 (sheet 2 of 2)

Message distributing control (MDSC)



Note 1 – CCH (Continuity check indicator) :
0 - Not required
1 - Required on incoming circuit
2 - Performed on previous circuit

Note 2 – CPCO, CRCS

FIGURE B-21/Q.764 (sheet 1 of 18)

Call processing control incoming (CPCI)

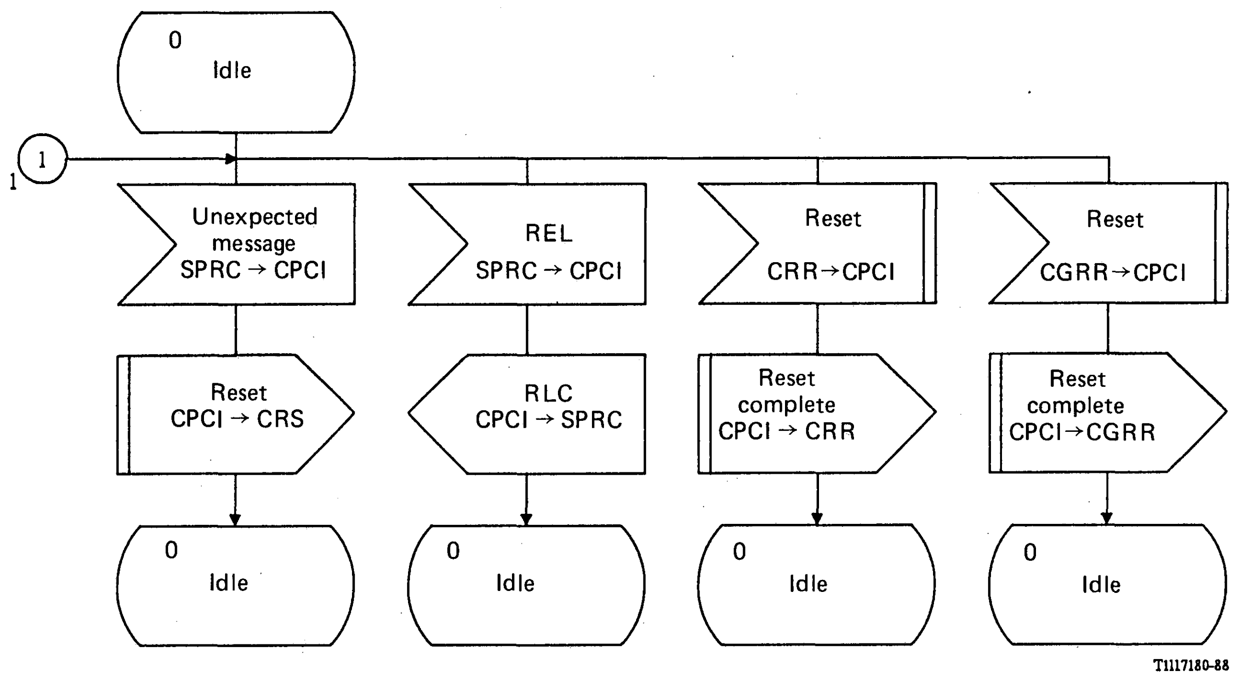


FIGURE B-21/Q.764 (sheet 2 of 18)

Call Processing Control Incoming (CPCI)

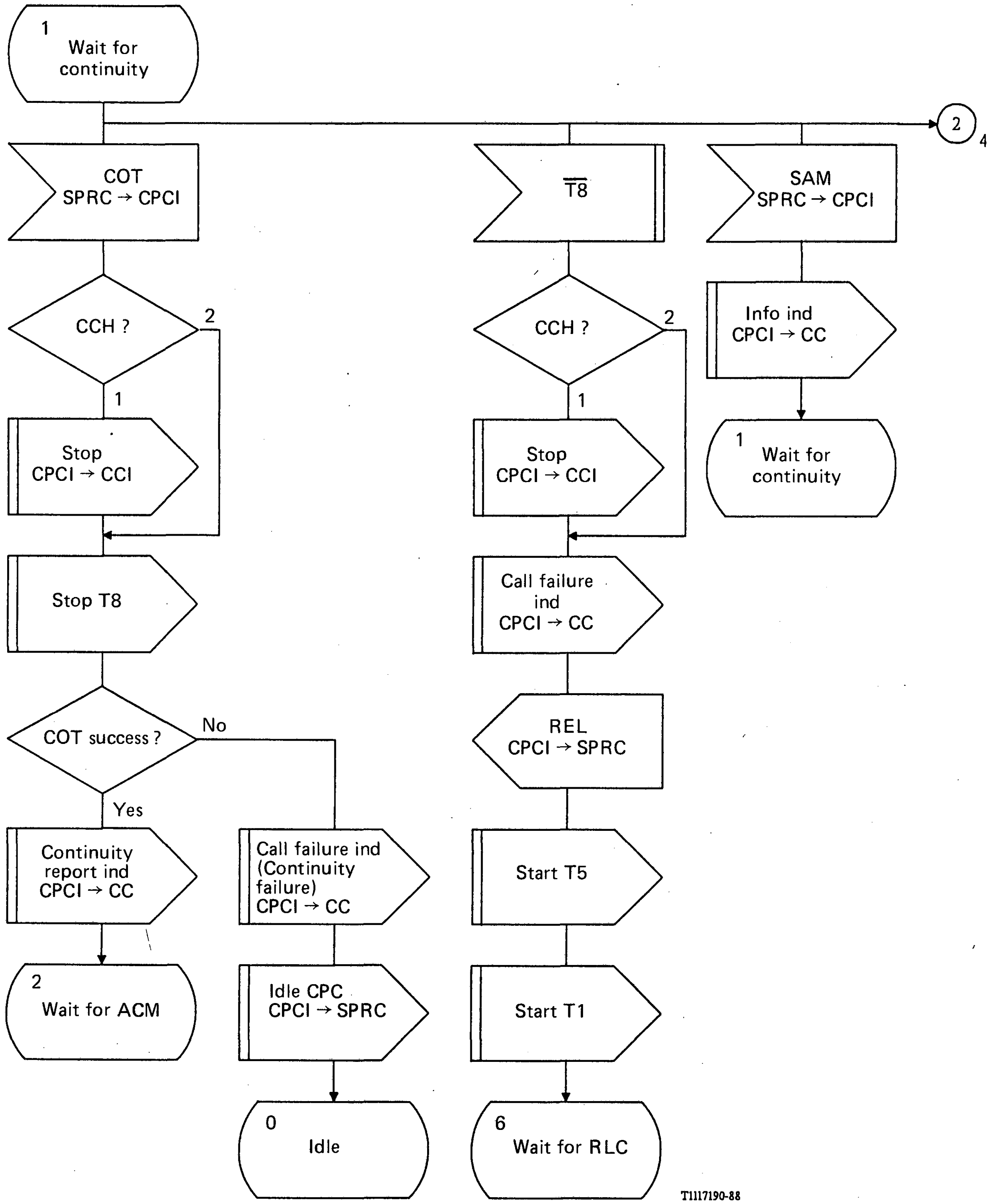


FIGURE B-21/Q.764 (sheet 3 of 18)

Call processing control incoming (CPCI)

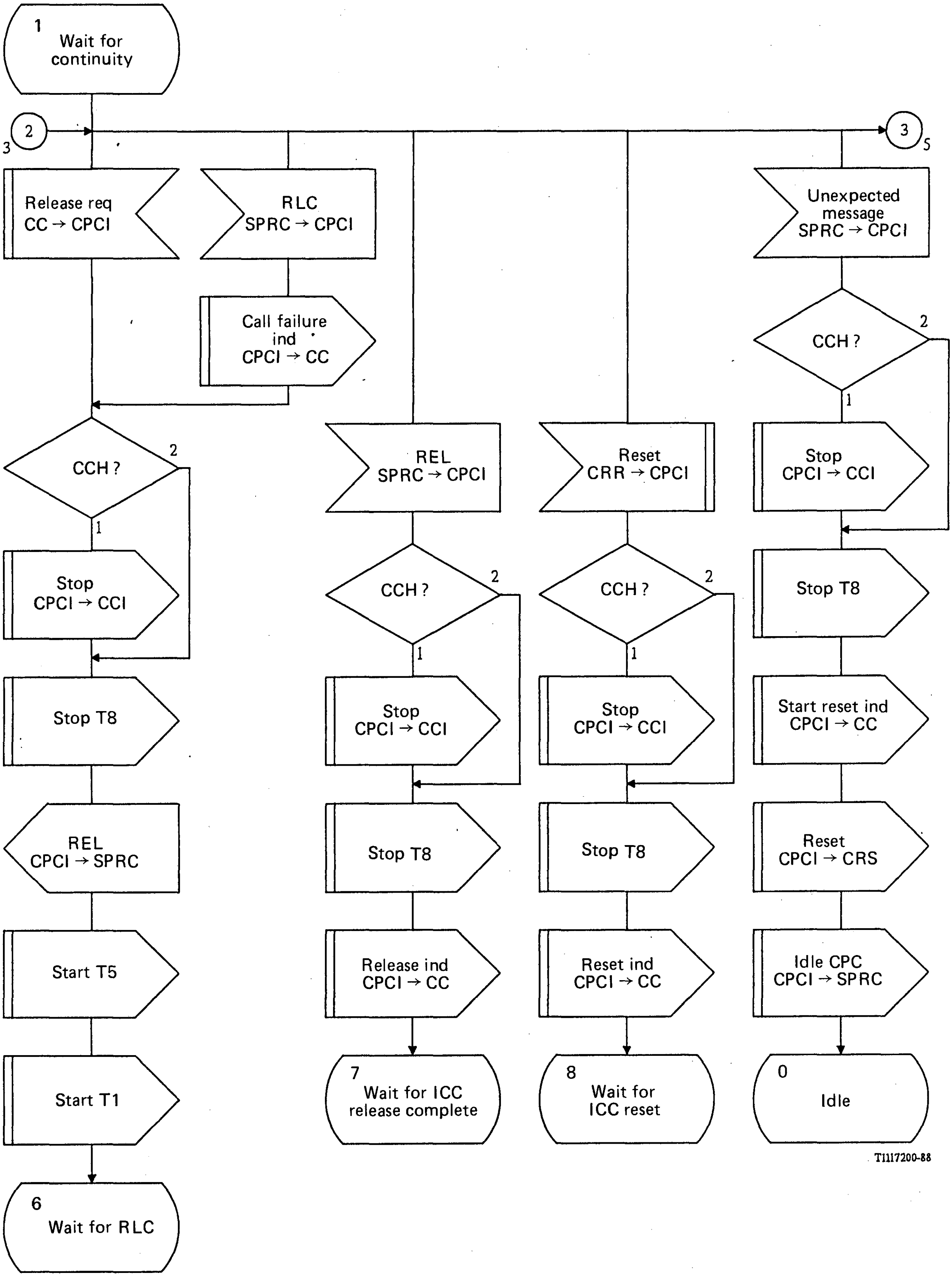
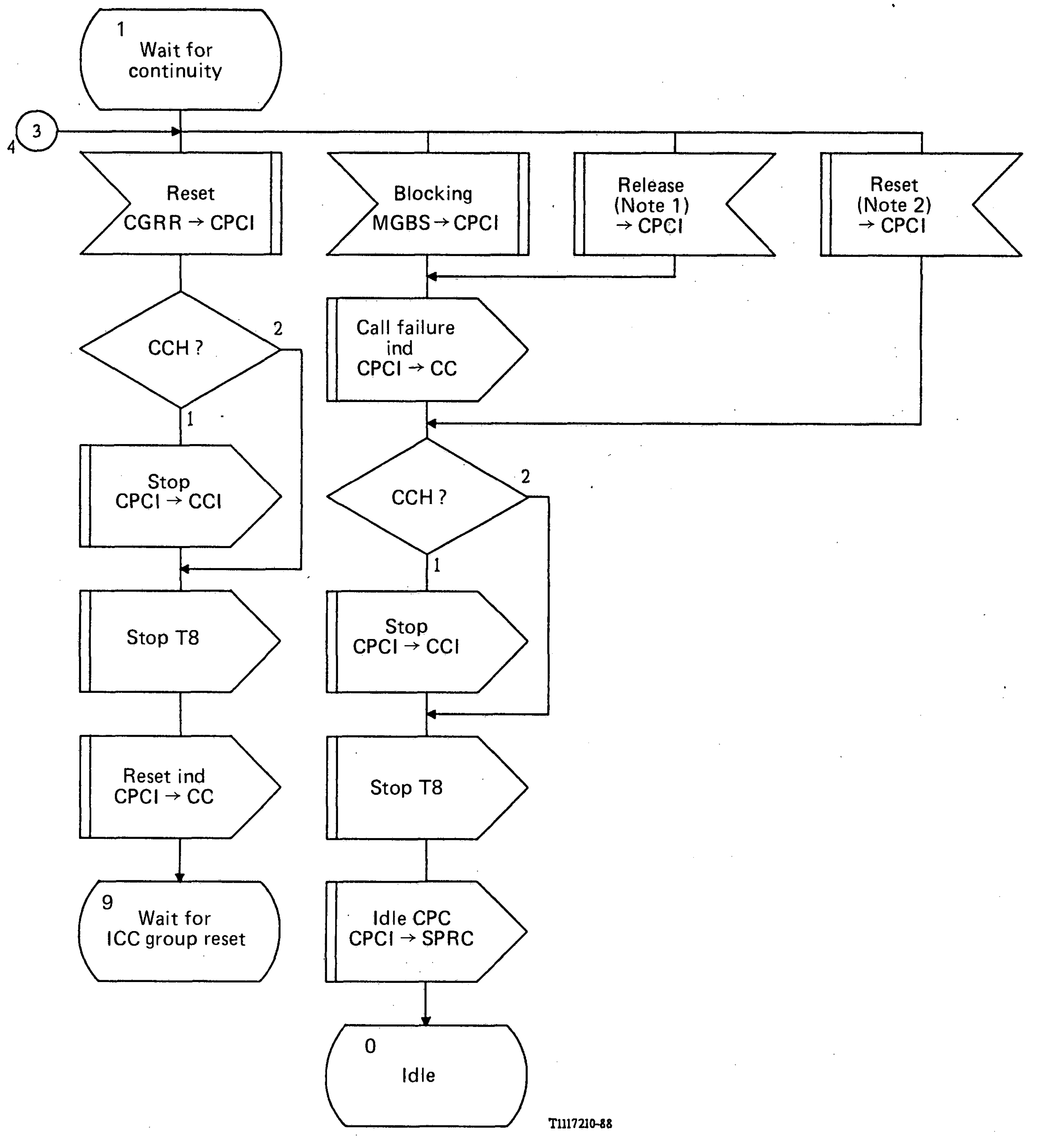


FIGURE B-21/Q.764 (sheet 4 of 18)

Call processing control incoming (CPCI)



Note 1 – HGBS, HGBR.

Note 2 – CRS, CGRS.

FIGURE B-21/Q.764 (sheet 5 of 18)

Call processing control incoming (CPCI)

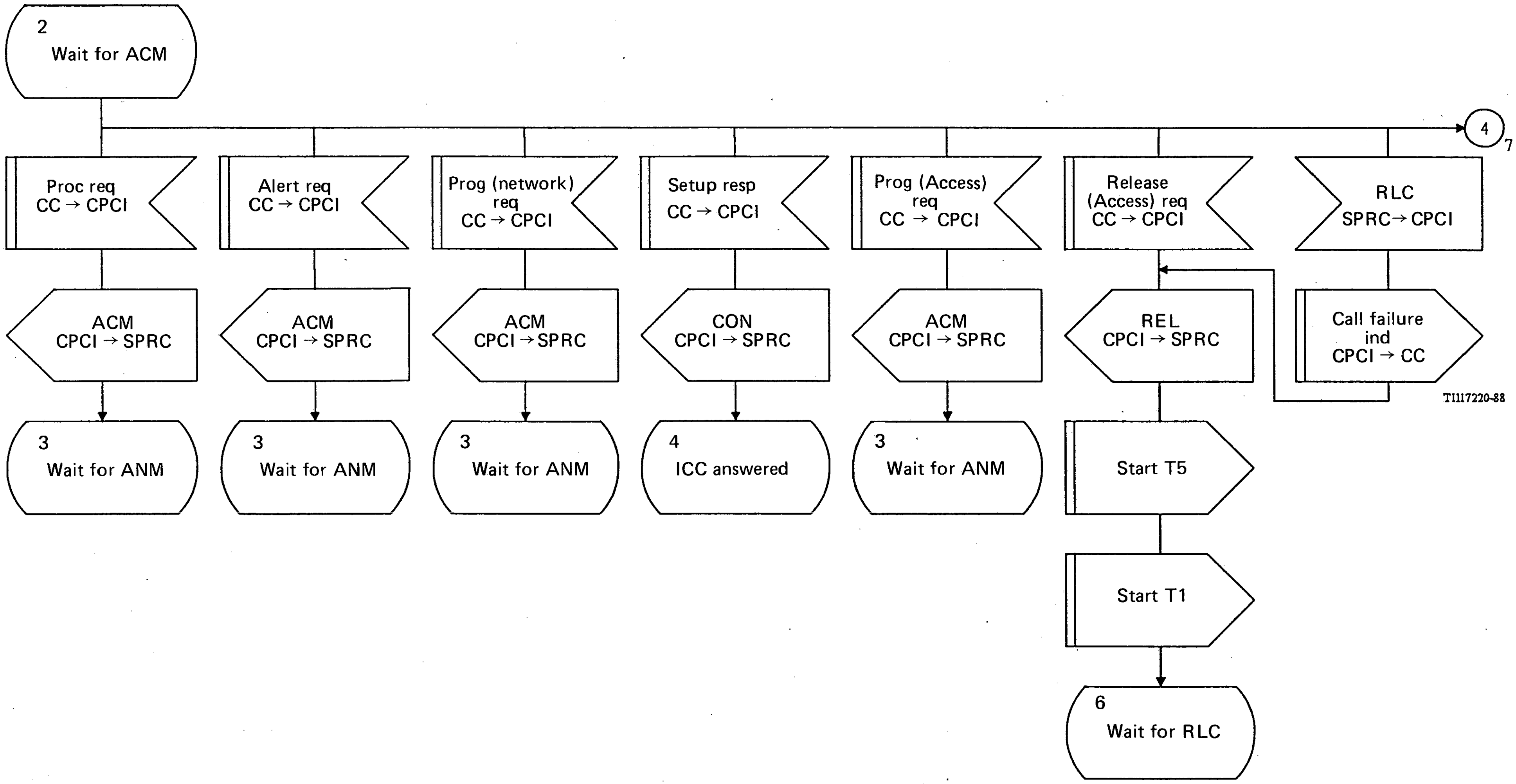
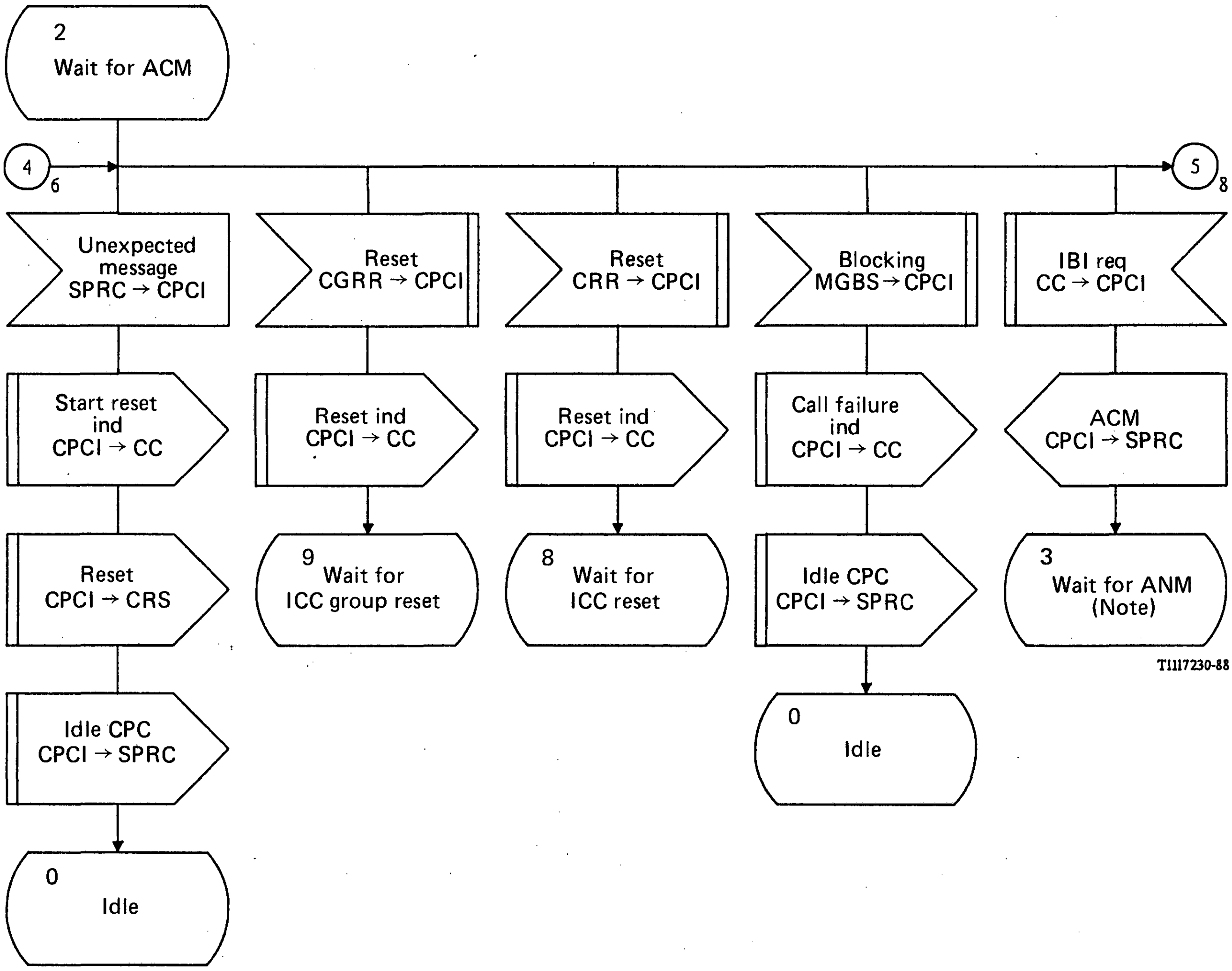


FIGURE B-21/Q.764 (sheet 6 of 18)

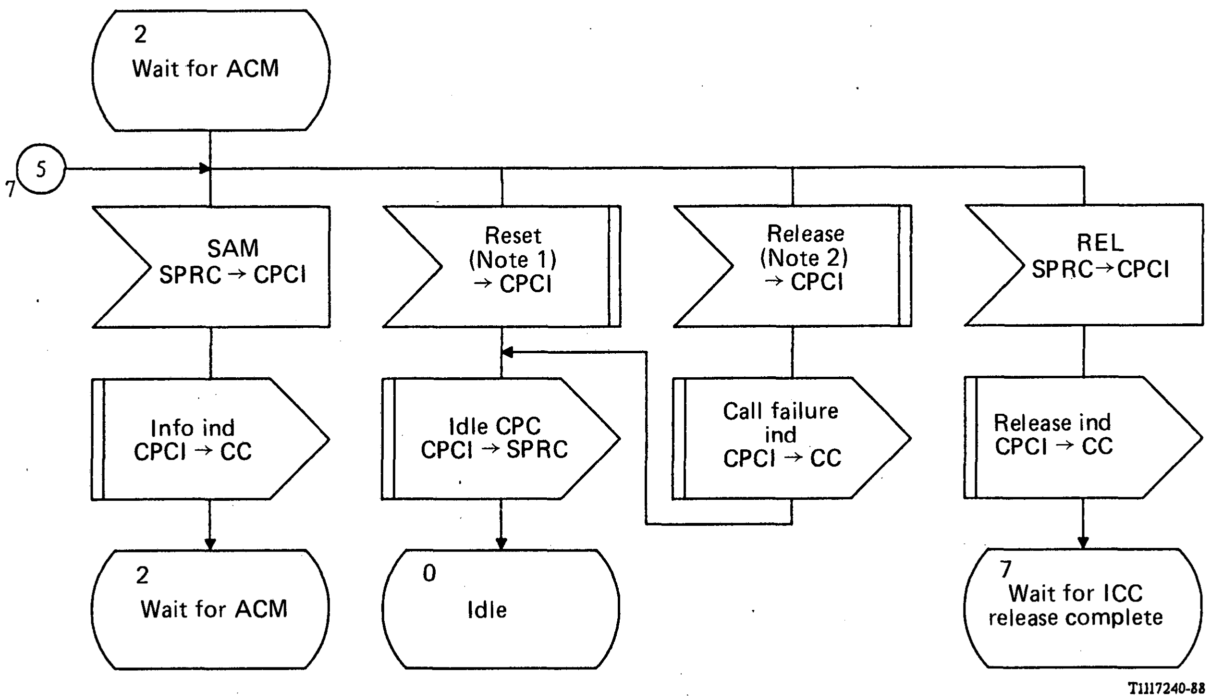
Call processing control incoming (CPCI)



Note – Only REL/RLC message is expected. Other messages are discarded.

FIGURE B-21/Q.764 (sheet 7 of 18)

Call processing control incoming (CPCI)

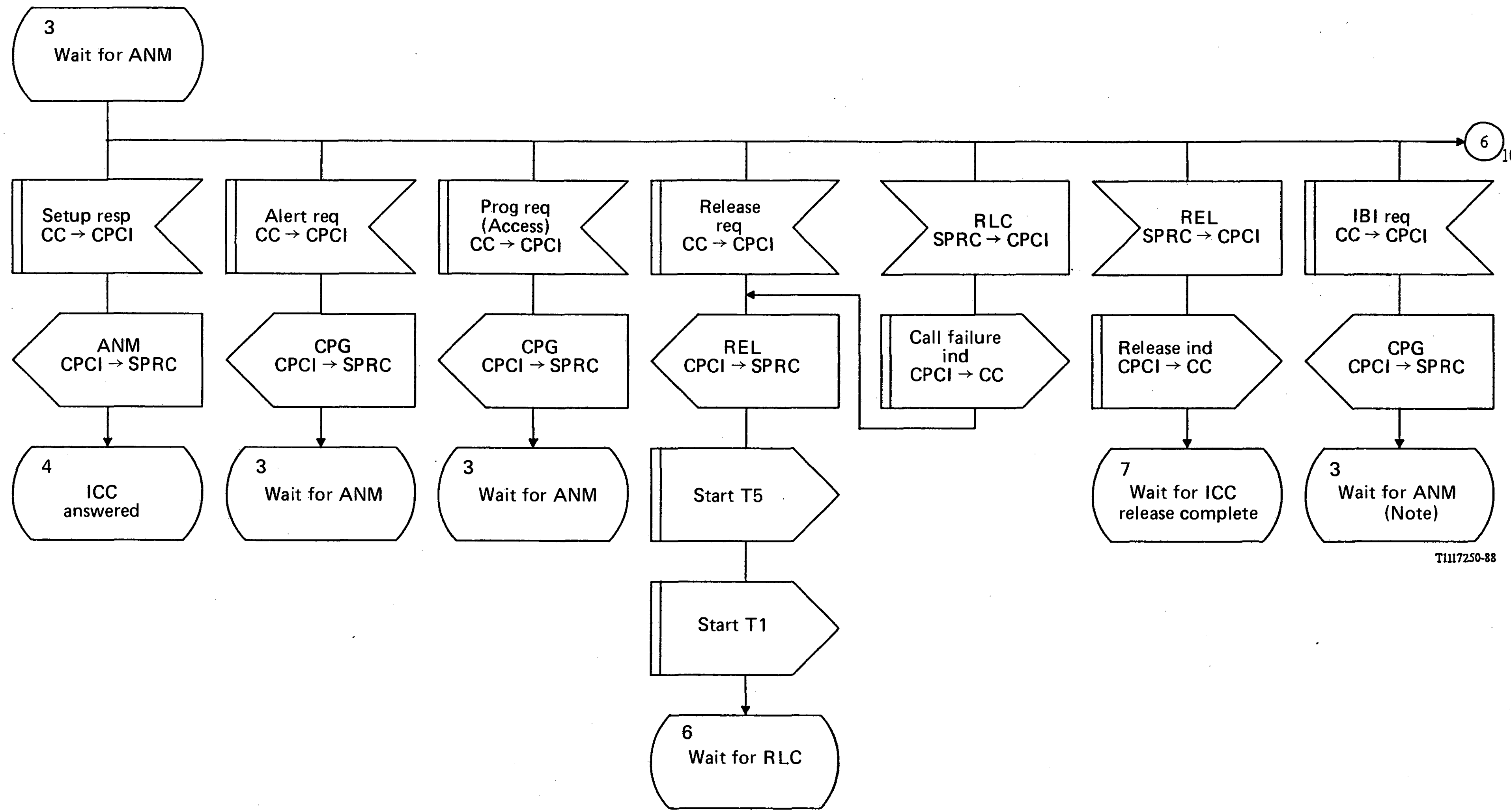


Note 1 – CRS, CGRS.

Note 2 – HGBS, HGBR.

FIGURE B-21/Q.764 (sheet 8 of 18)

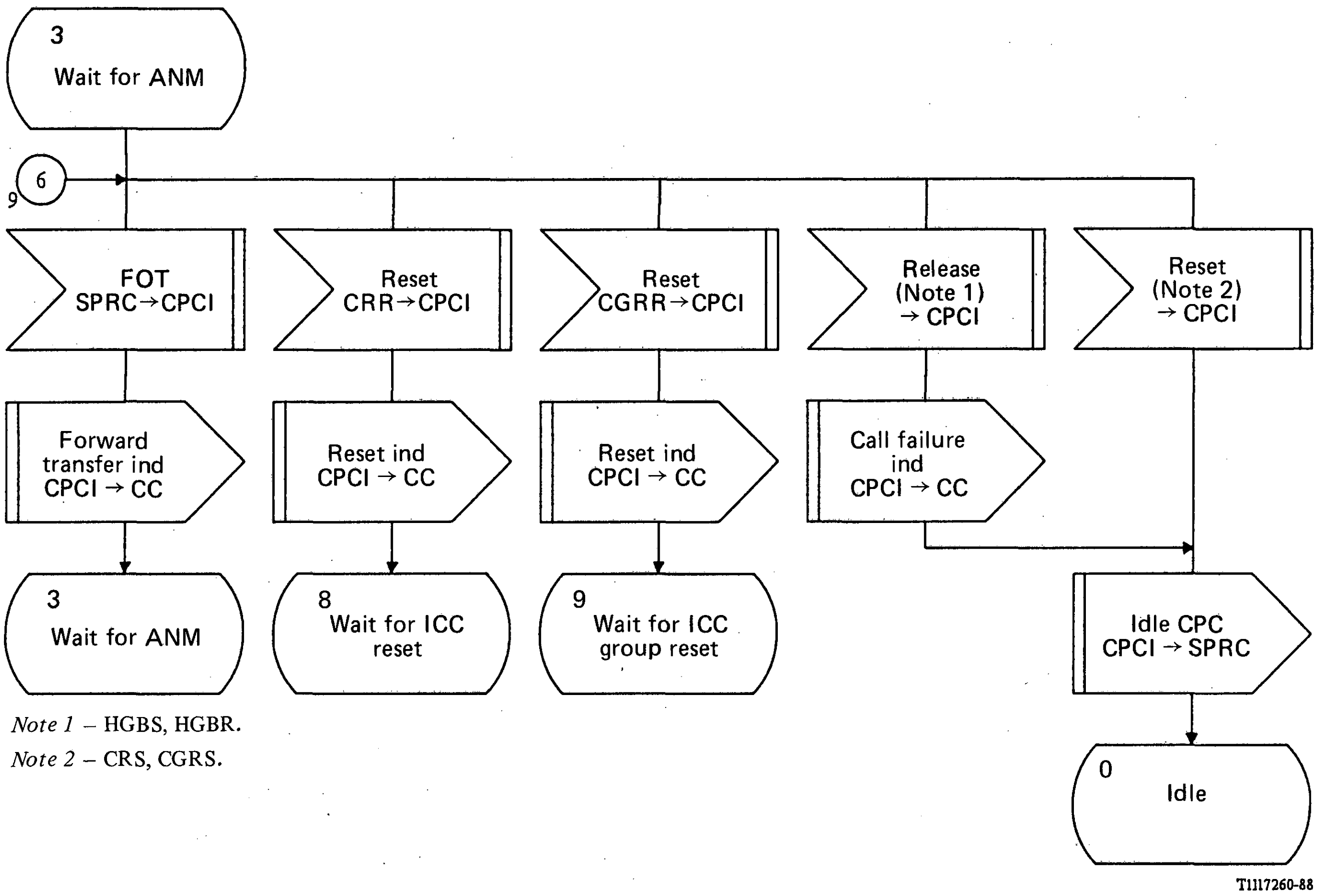
Call processing control incoming (CPCI)



Note – Only REL/RLC message is expected. Other messages are discarded.

FIGURE B-21/Q.764 (sheet 9 of 18)

Call processing control incoming (CPCI)

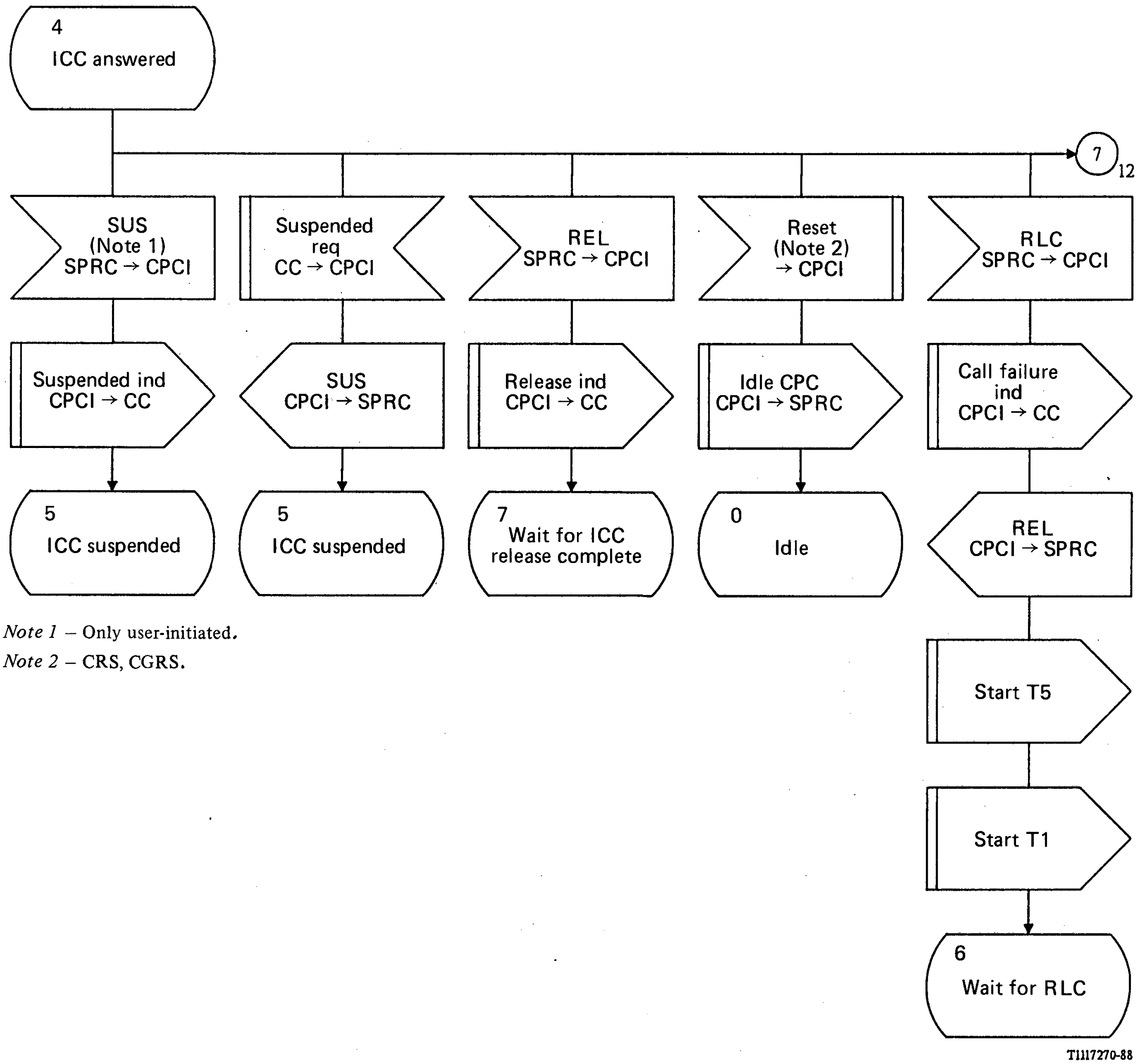


Note 1 – HGBS, HGBR.

Note 2 – CRS, CGRS.

FIGURE B-21/Q.764 (sheet 10 of 18)

Call processing control incoming (CPCI)

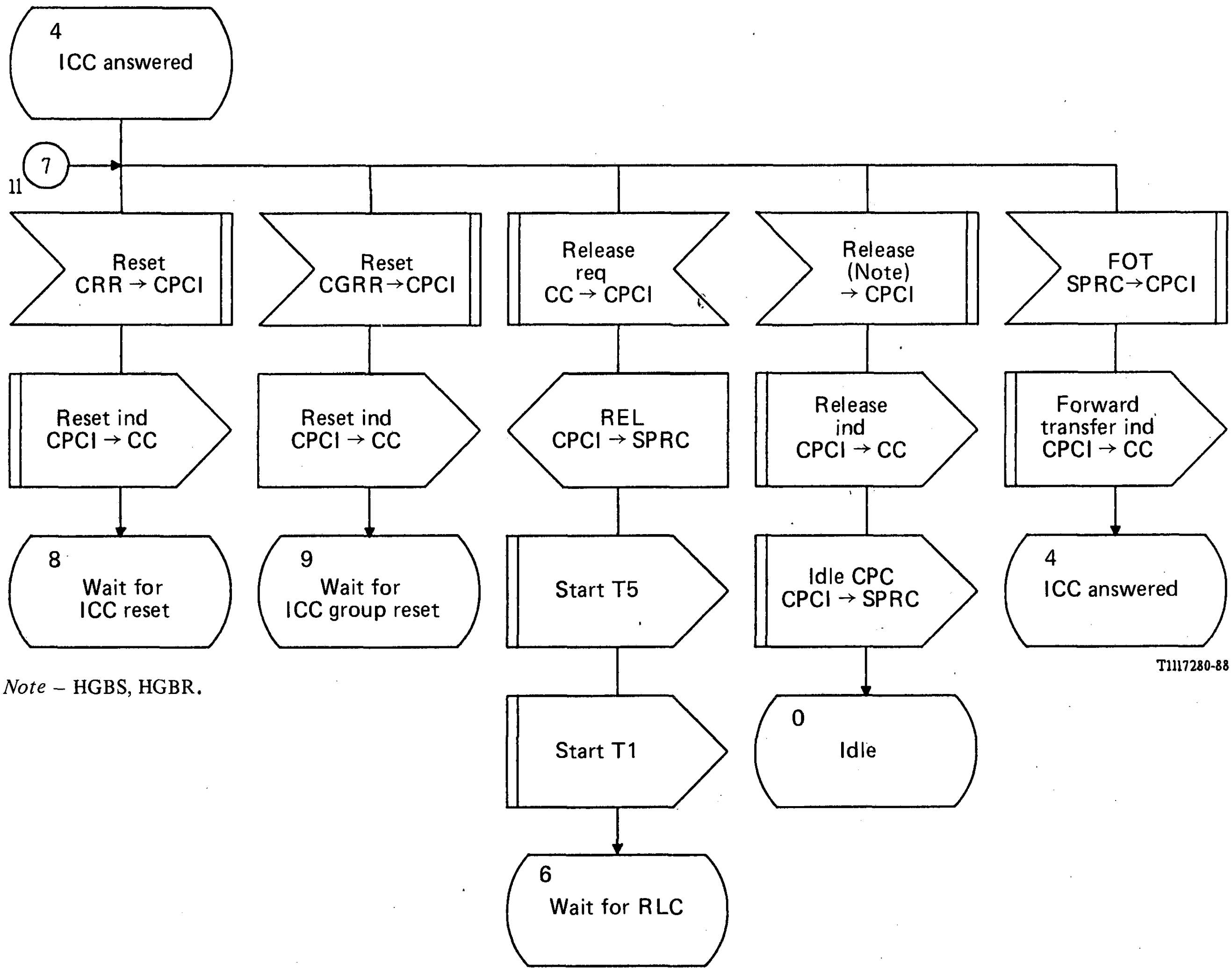


Note 1 – Only user-initiated.

Note 2 – CRS, CGRS.

FIGURE B-21/Q.764 (sheet 11 of 18)

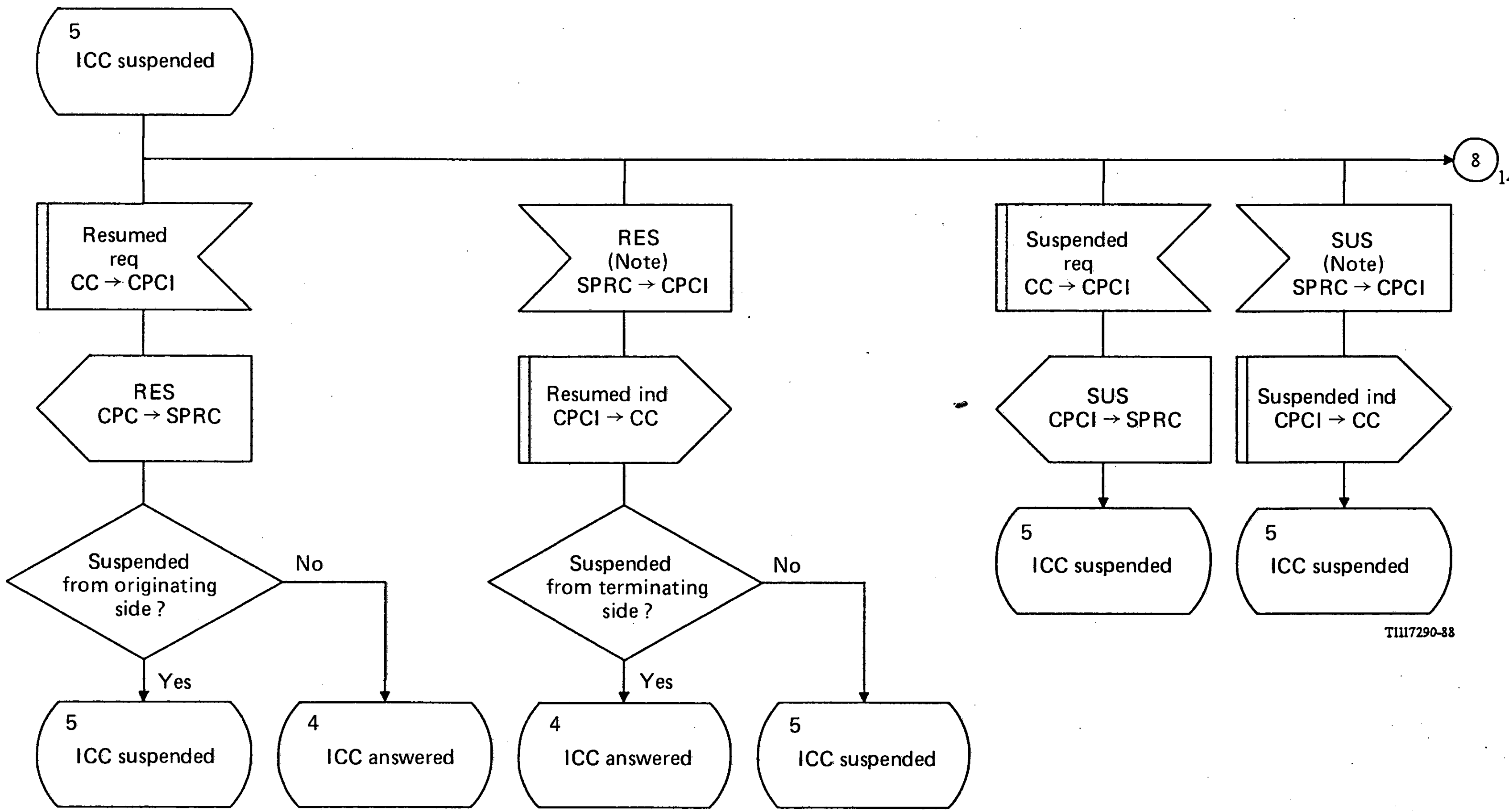
Call processing control incoming (CPCI)



Note – HGBS, HGBR.

FIGURE B-21/Q.764 (sheet 12 of 18)

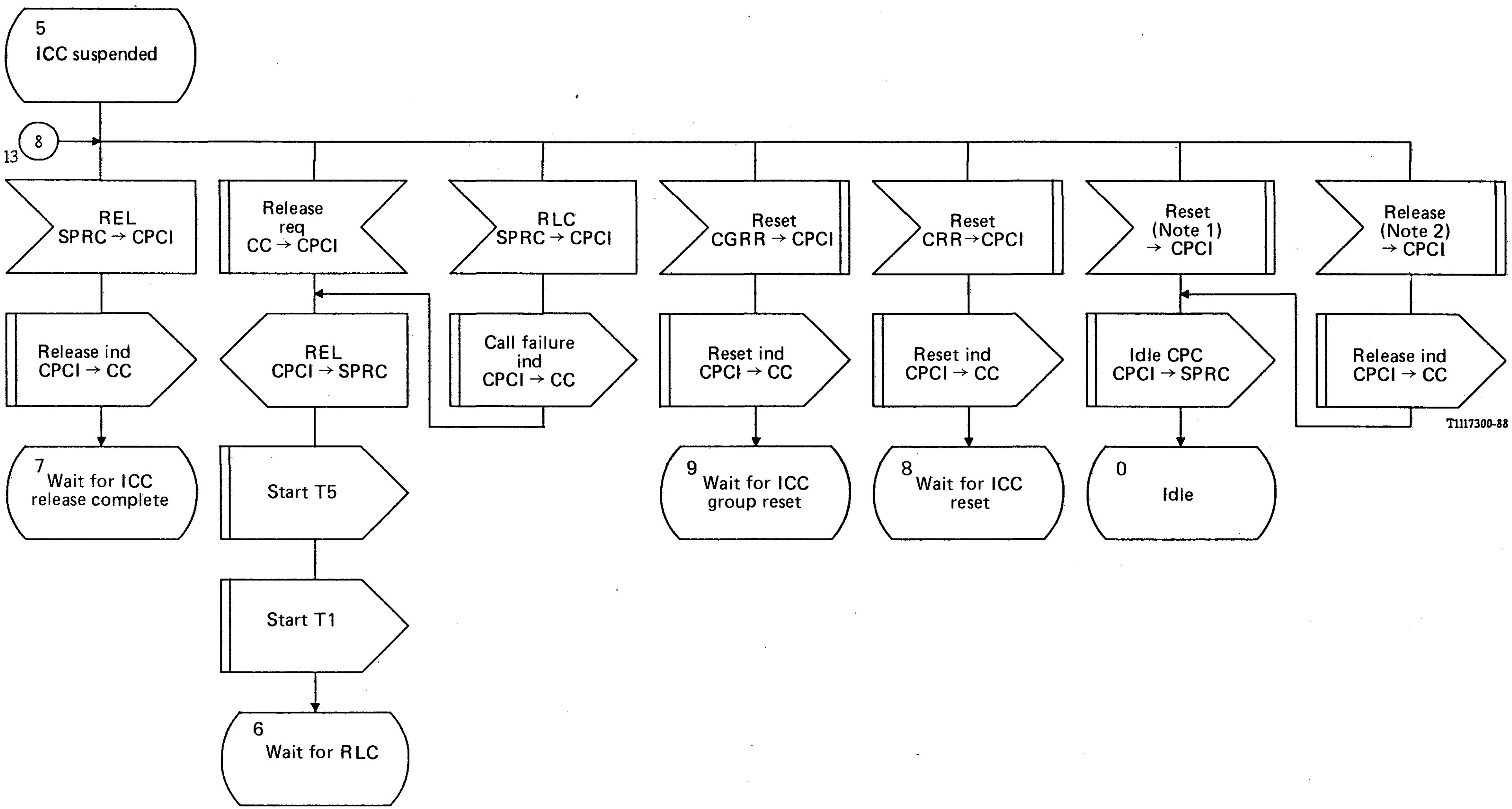
Call processing control incoming (CPCI)



Note – Only user-initiated.

FIGURE B-21/Q.764 (sheet 13 of 18)

Call processing control incoming (CPCI)



Note 1 – CRS, CGRS.

Note 2 – HGBS, HGBR.

FIGURE B-21/Q.764 (sheet 14 of 18)

Call processing control incoming (CPCI)

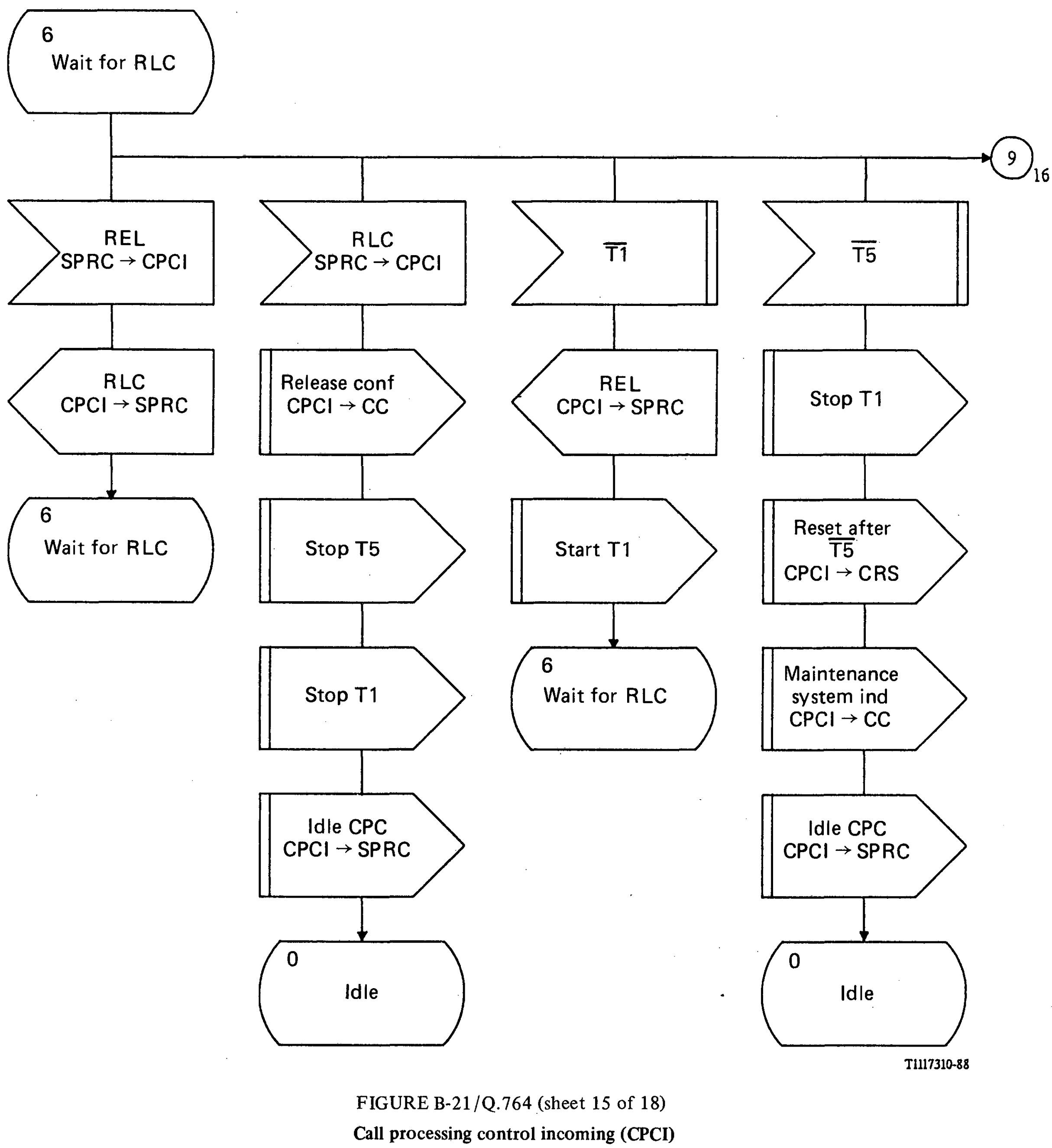
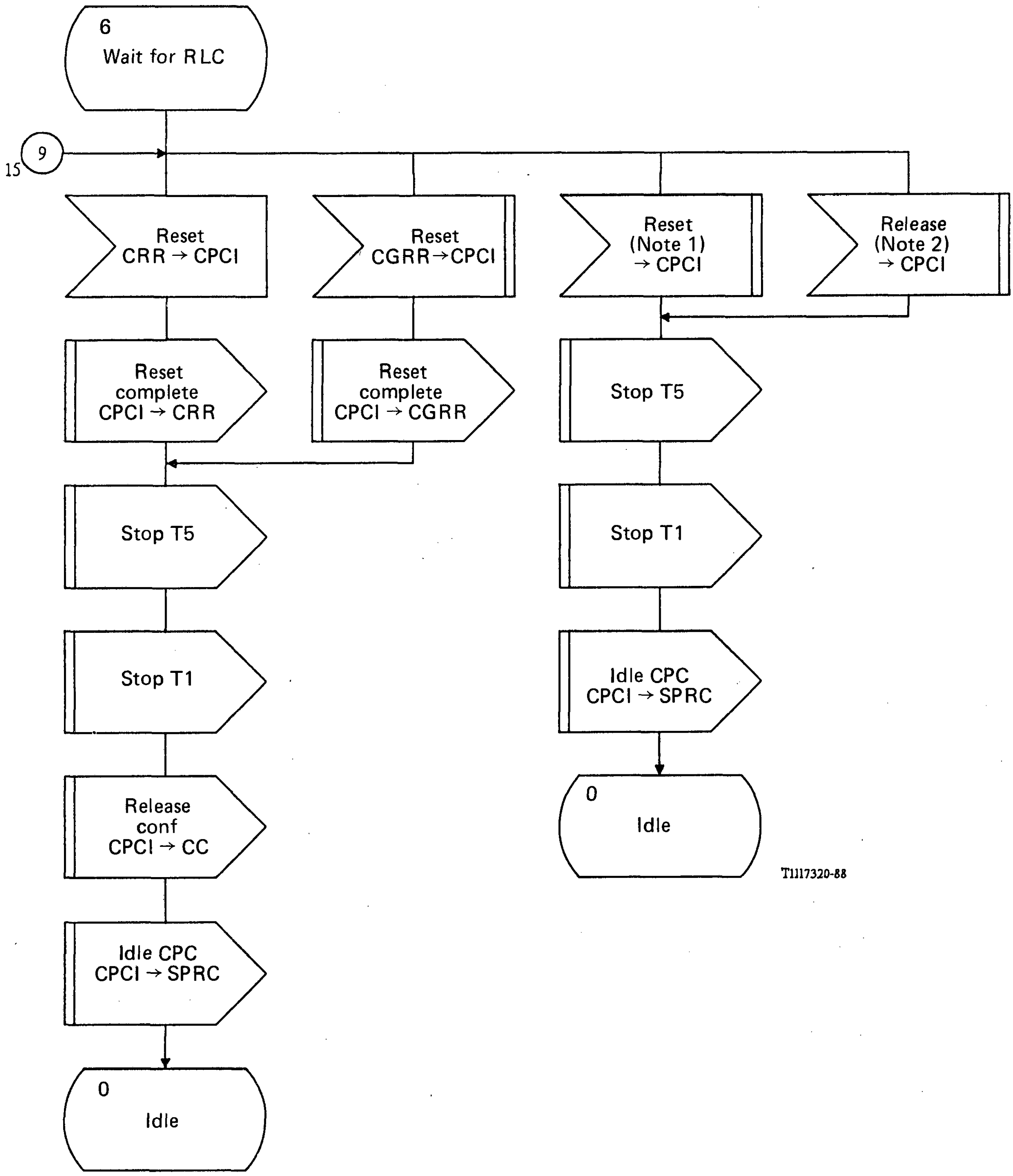


FIGURE B-21/Q.764 (sheet 15 of 18)

Call processing control incoming (CPCI)

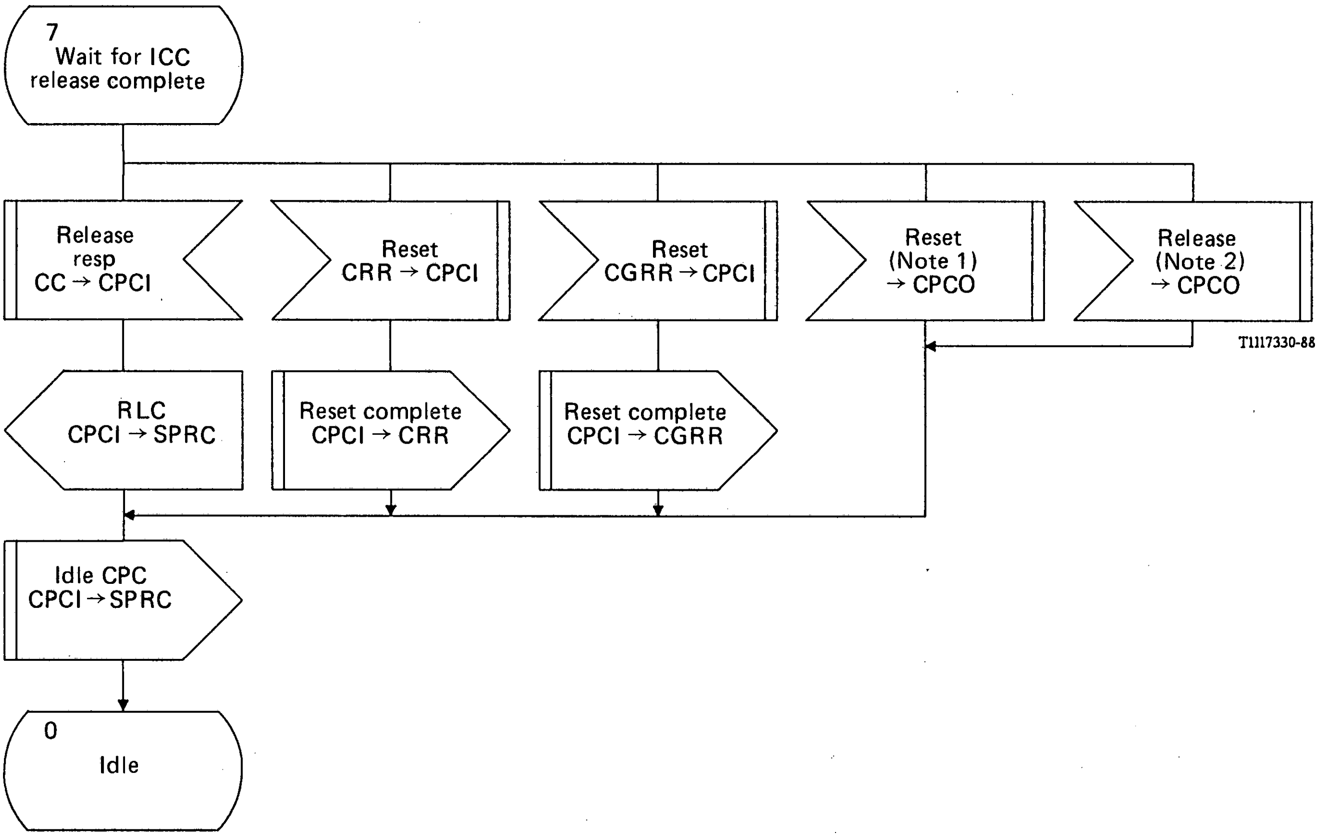


Note 1 – CRS, CGRS.

Note 2 – HGBS, HGBR.

FIGURE B-21/Q.764 (sheet 16 of 18)

Call processing control incoming (CPCI)



Note 1 – CRS, CGRS.

Note 2 – HGBS, HGBR.

FIGURE B-21/Q.764 (sheet 17 of 18)

Call processing control incoming (CPCI)

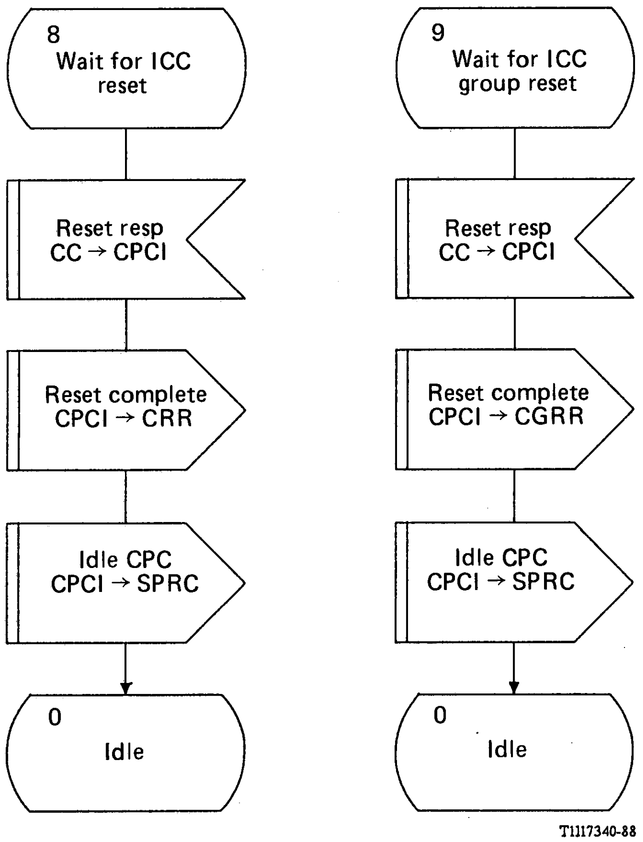


FIGURE B-21/Q.764 (sheet 18 of 18)

Call processing control incoming (CPCI)

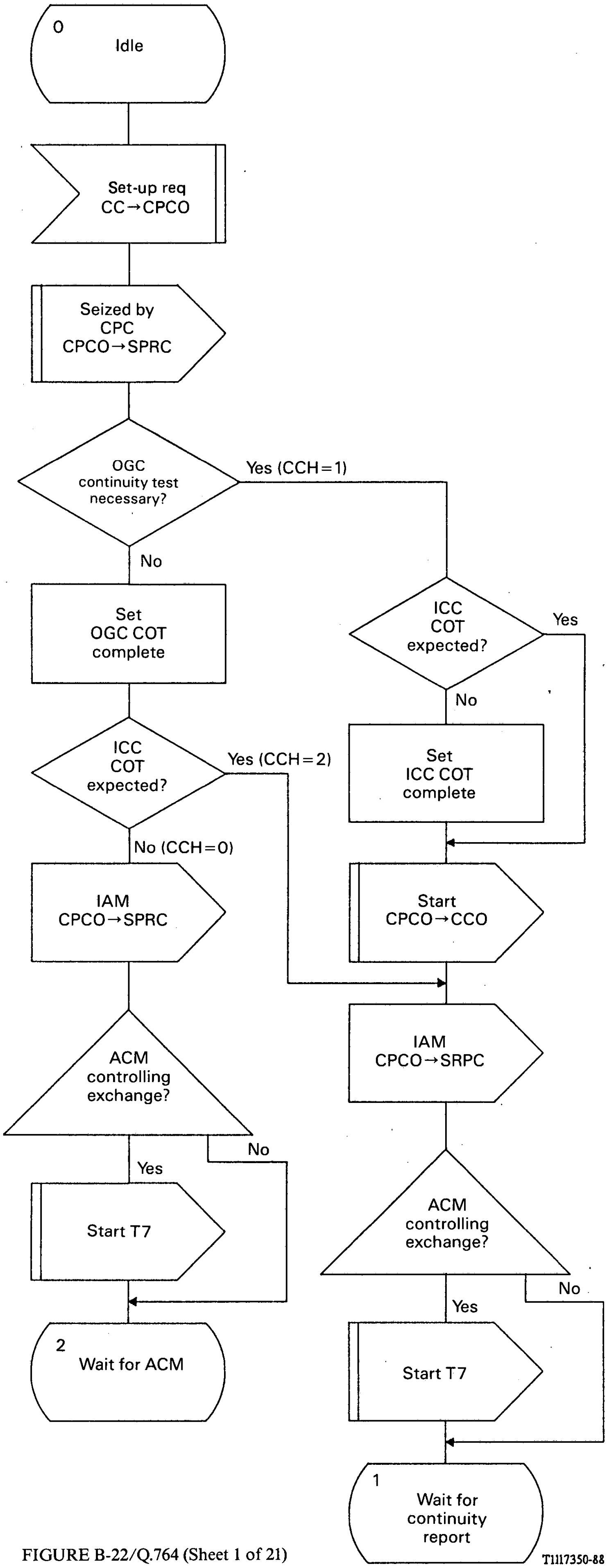


FIGURE B-22/Q.764 (Sheet 1 of 21)

Call Processing Control Outgoing (CPCO)

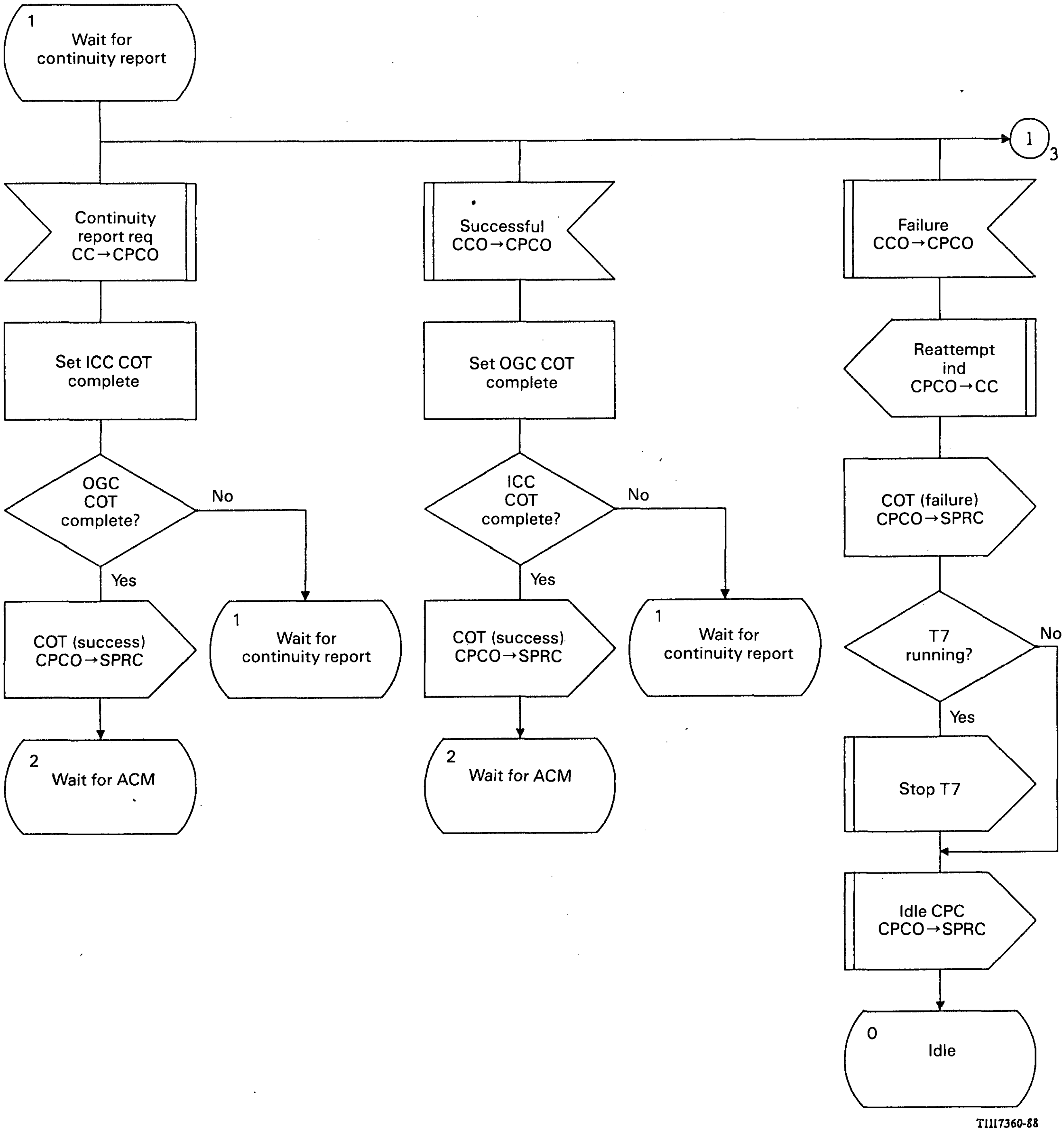
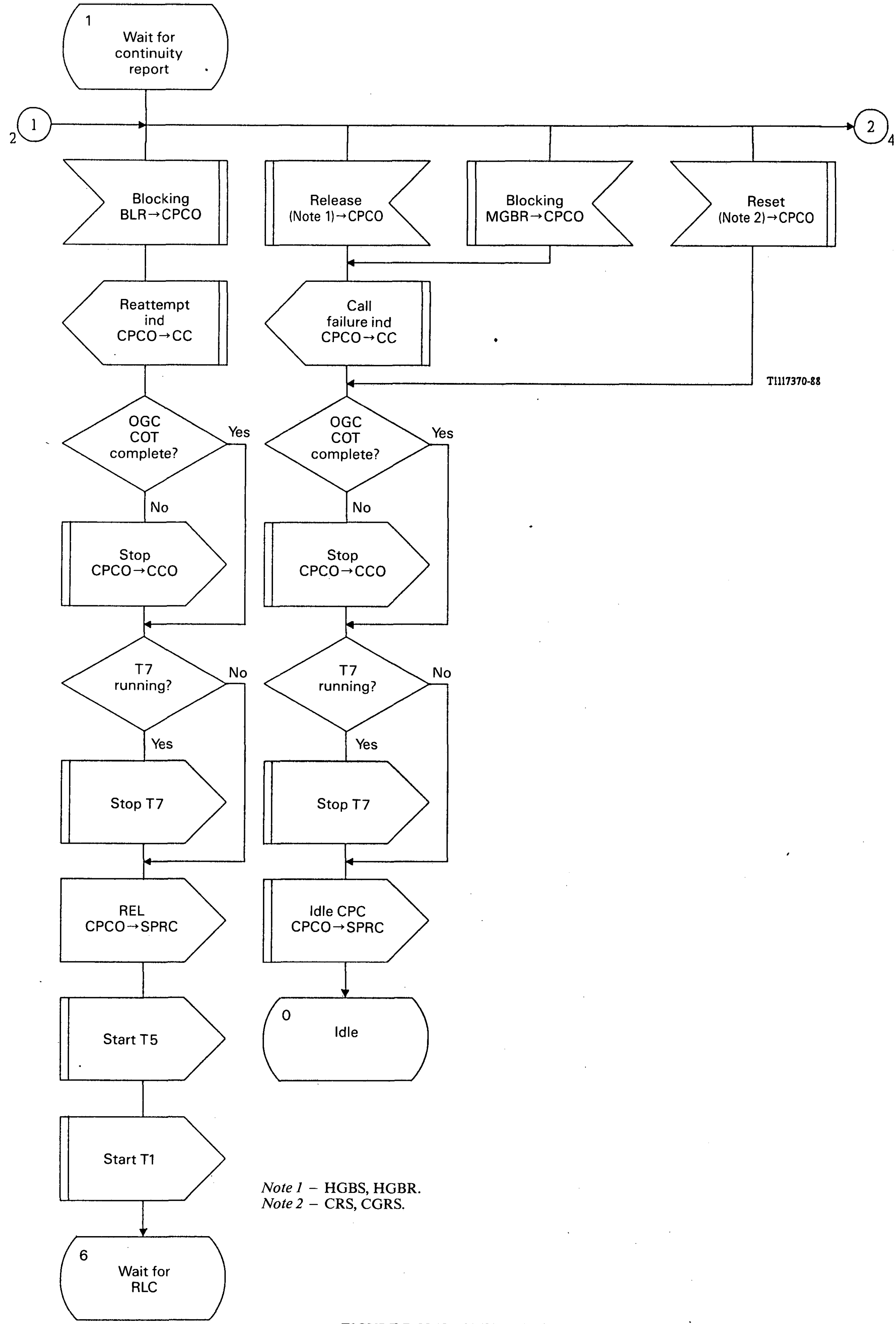


FIGURE B-22/Q.764 (Sheet 2 of 21)

Call Processing Control Outgoing (CPCO)



Note 1 – HGBS, HGBR.
Note 2 – CRS, CGRS.

FIGURE B-22/Q.764 (Sheet 3 of 21)

Call Processing Control Outgoing (CPCO)

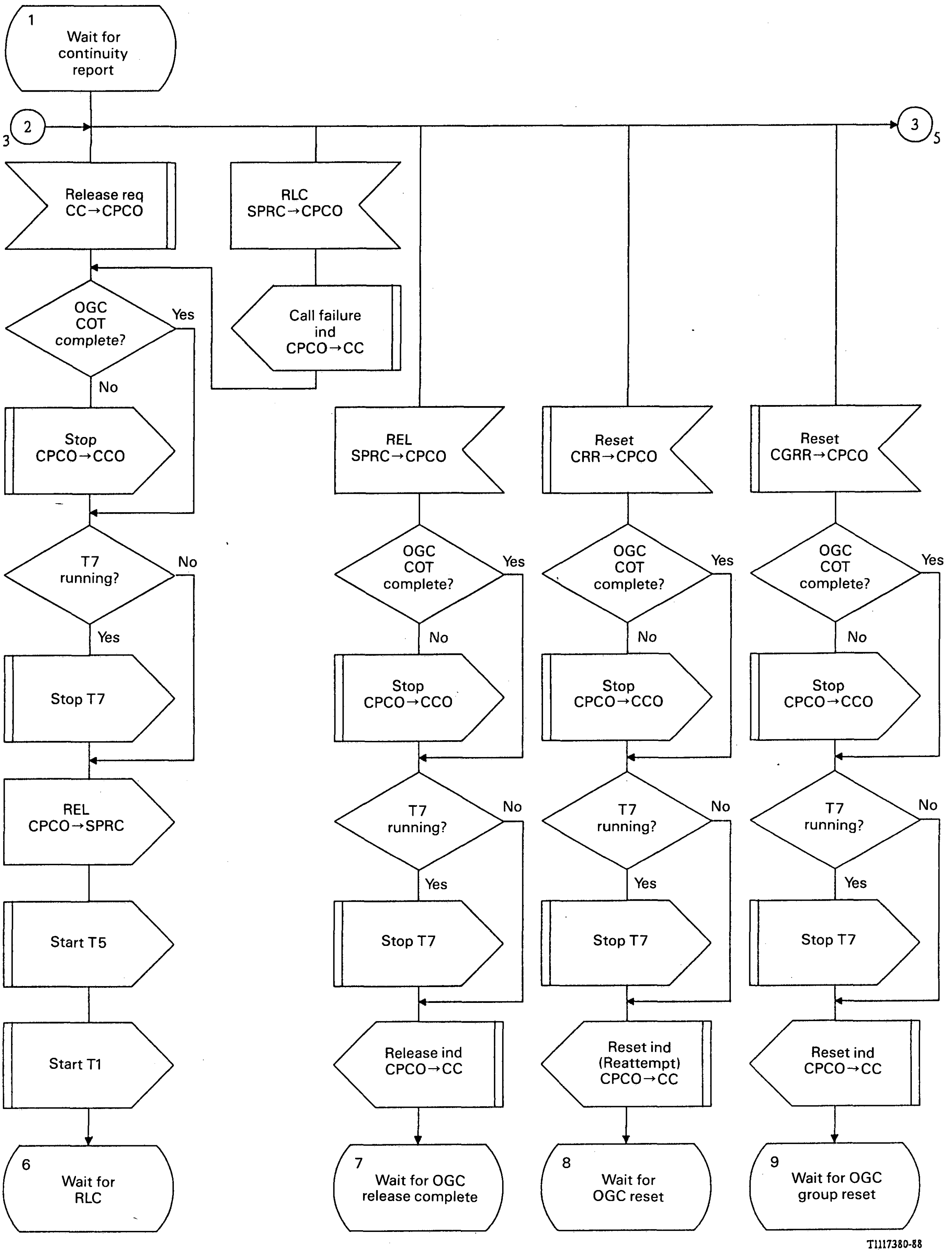


FIGURE B-22/Q.764 (Sheet 4 of 21)

Call Processing Control Outgoing (CPCO)

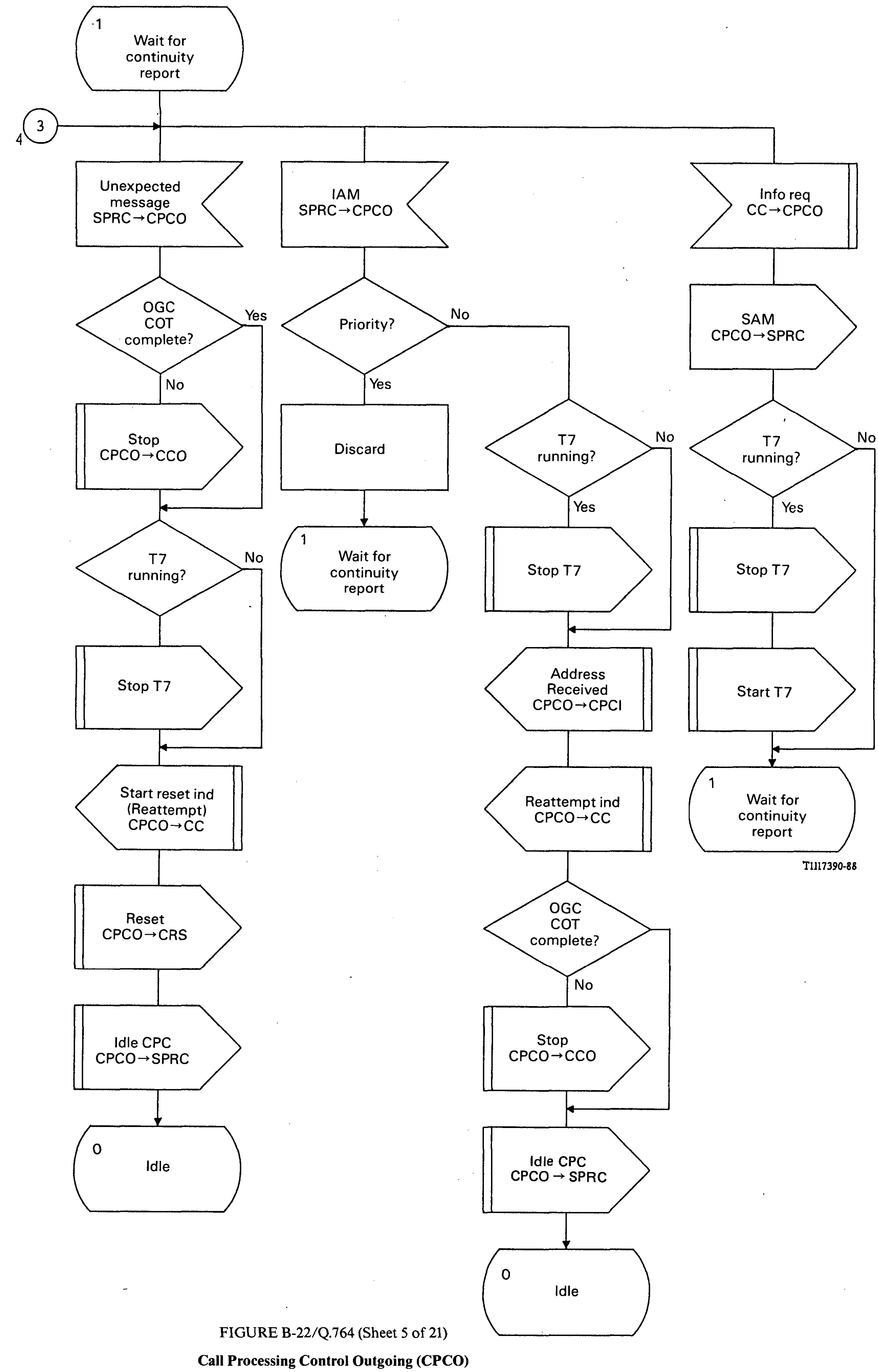


FIGURE B-22/Q.764 (Sheet 5 of 21)

Call Processing Control Outgoing (CPCO)

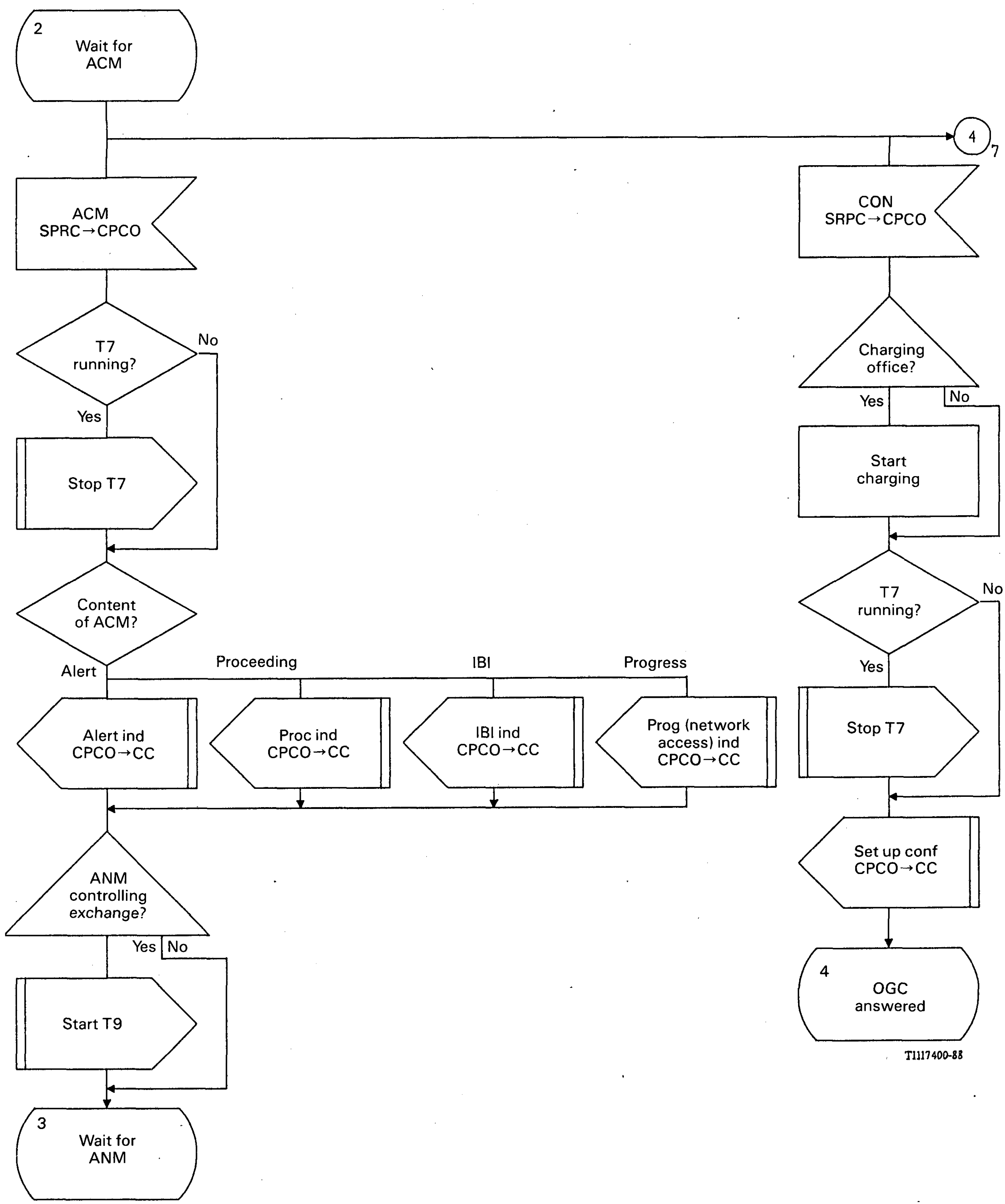


FIGURE B-22/Q.764 (Sheet 6 of 21)

Call Processing Control Outgoing (CPCO)

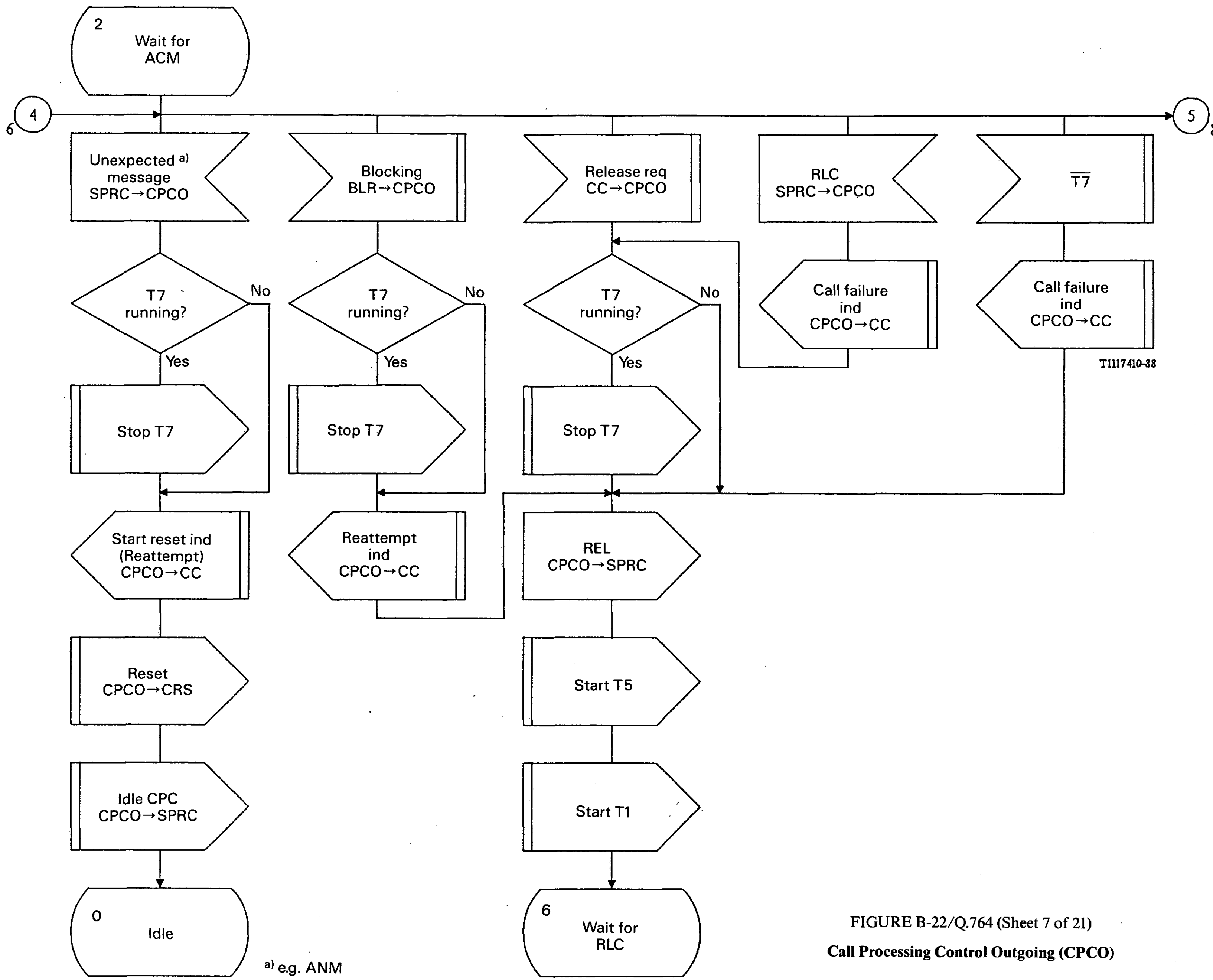
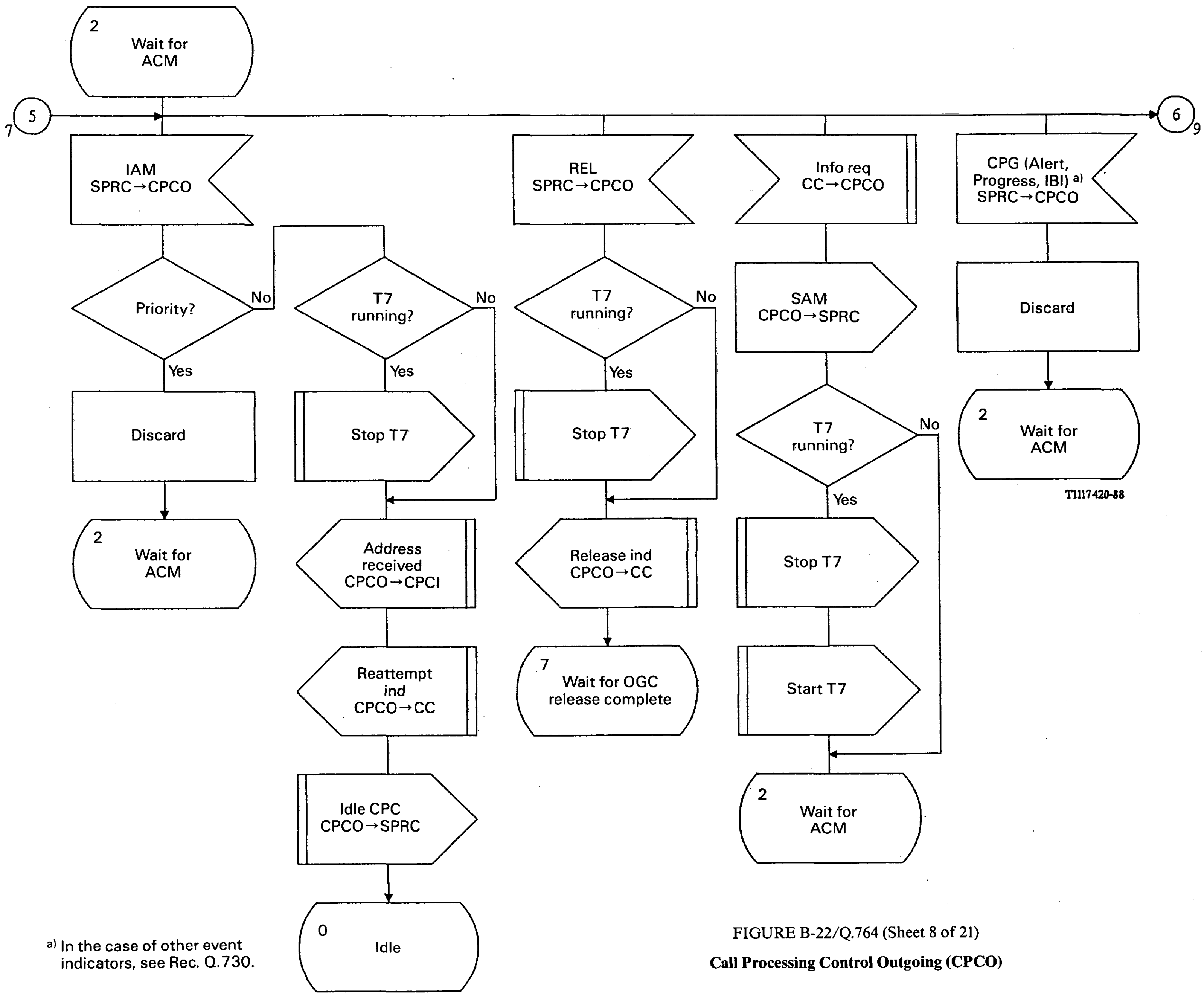


FIGURE B-22/Q.764 (Sheet 7 of 21)

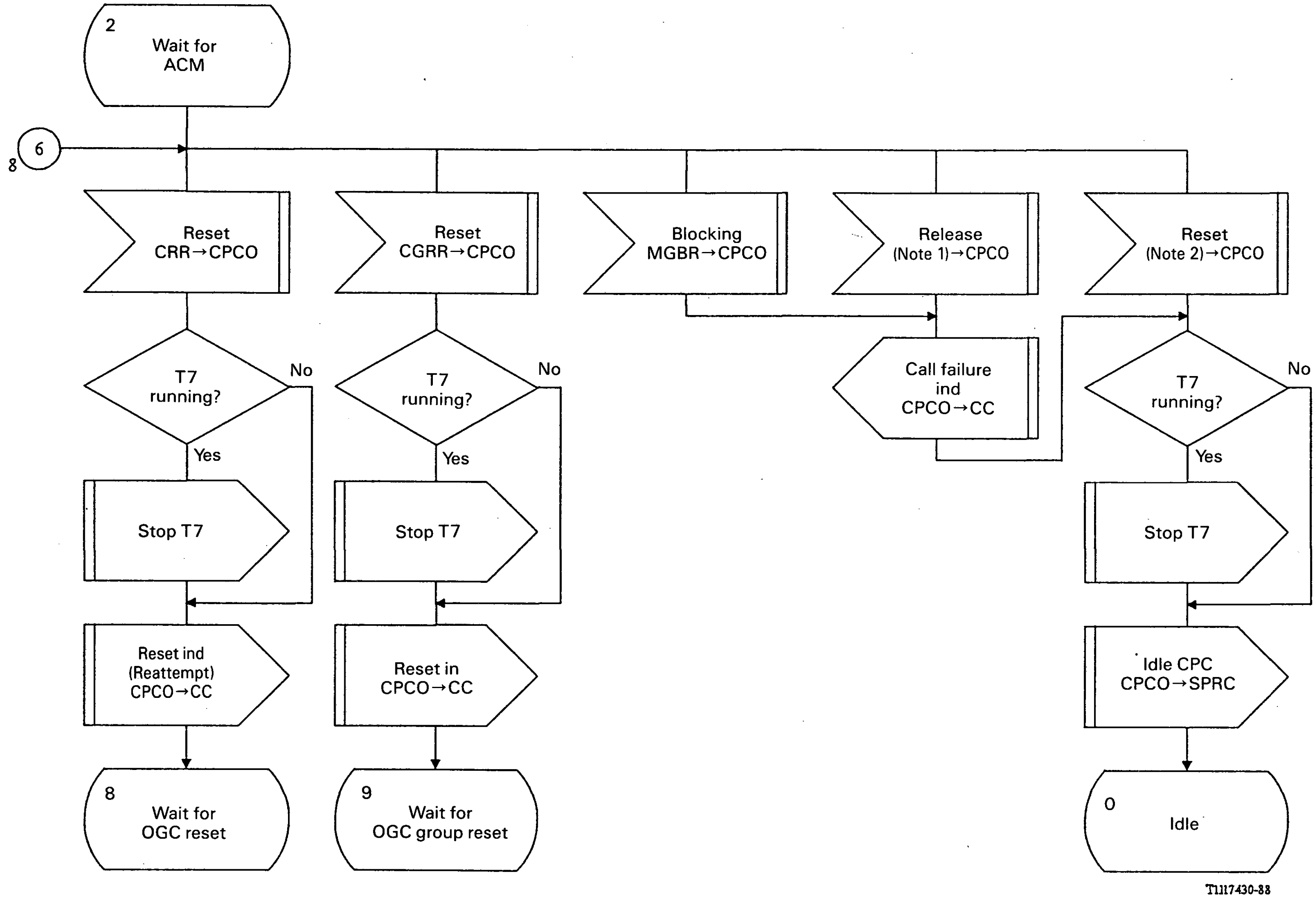
Call Processing Control Outgoing (CPCO)



a) In the case of other event indicators, see Rec. Q.730.

FIGURE B-22/Q.764 (Sheet 8 of 21)

Call Processing Control Outgoing (CPCO)



Note 1 – HGBS, HGBR.
Note 2 – CRS, CGRS.

FIGURE B-22/Q.764 (Sheet 9 of 21)

Call Processing Control Outgoing (CPCO)

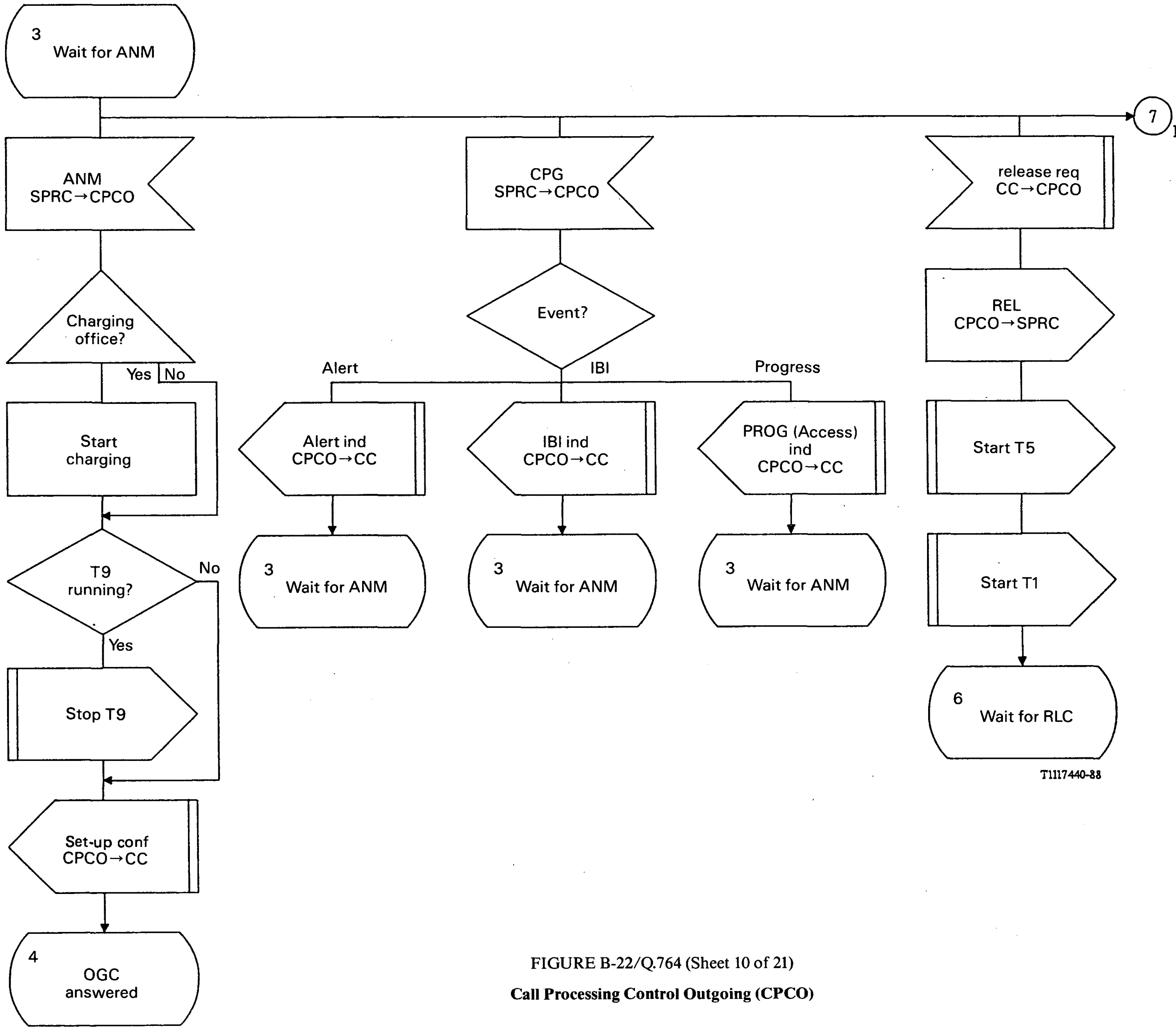
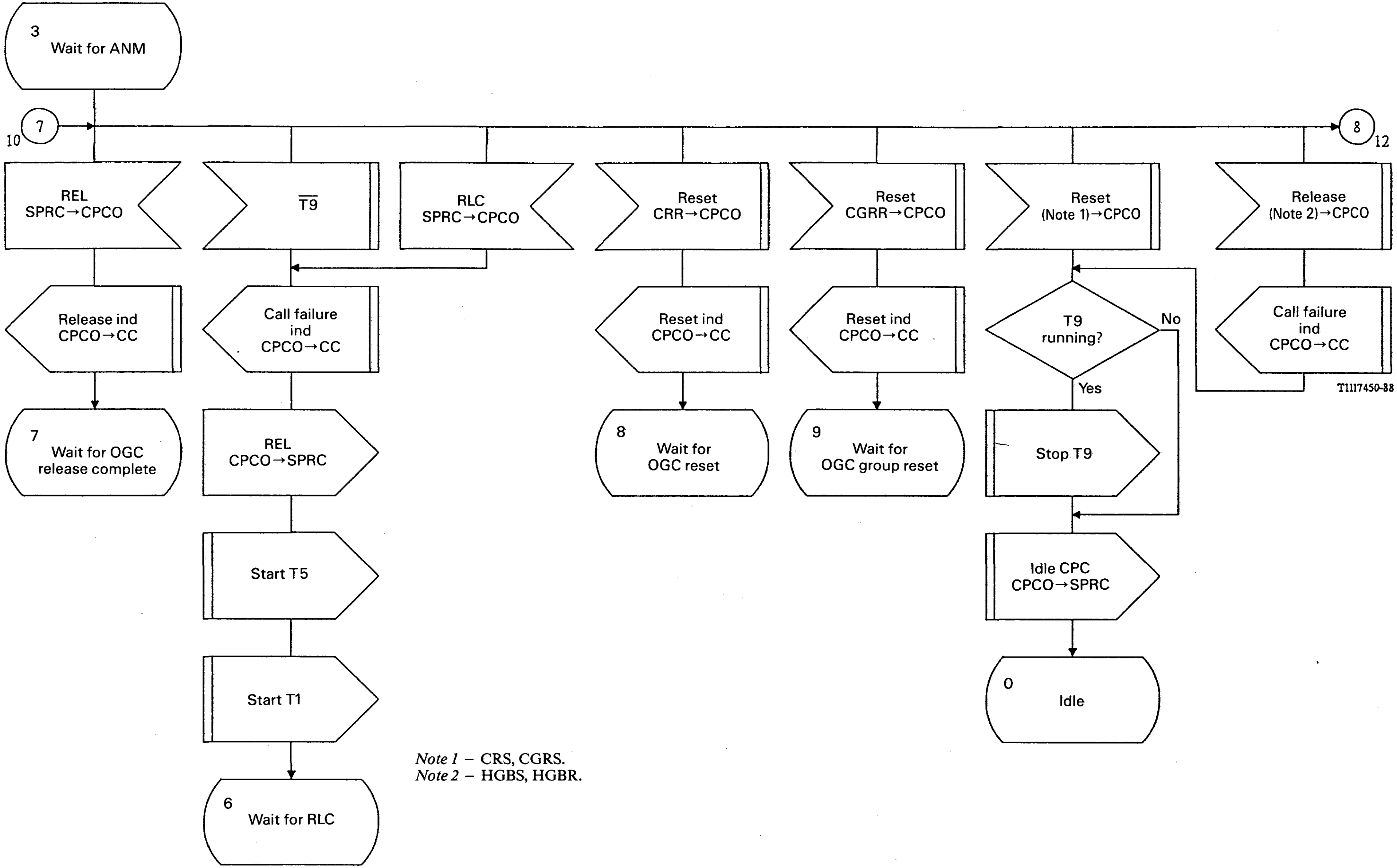


FIGURE B-22/Q.764 (Sheet 10 of 21)

Call Processing Control Outgoing (CPCO)



Note 1 – CRS, CGRS.
Note 2 – HGBS, HGBR.

FIGURE B-22/Q.764 (Sheet 11 of 21)

Call Processing Control Outgoing (CPCO)

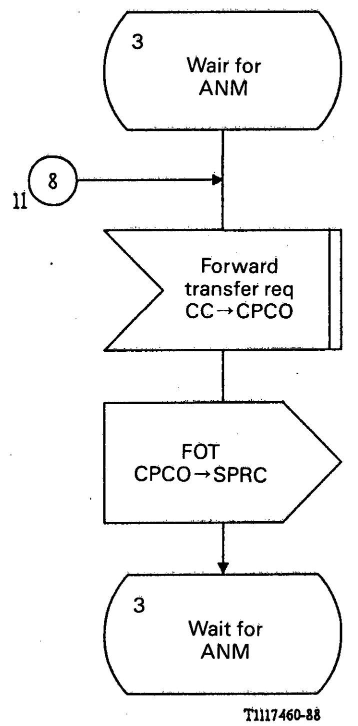


FIGURE B-22/Q.764 (Sheet 12 of 21)

Call Processing Control Outgoing (CPCO)

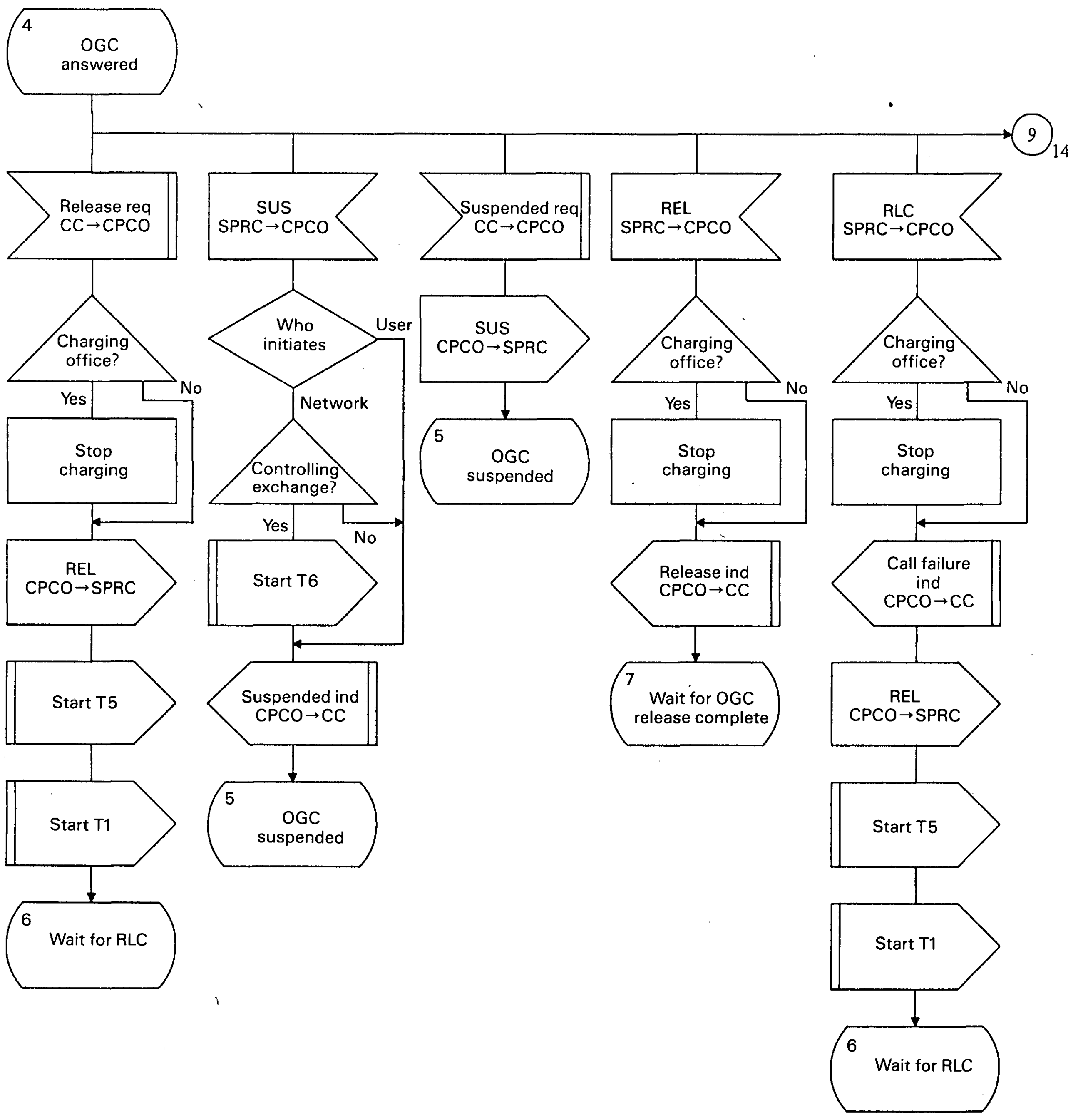
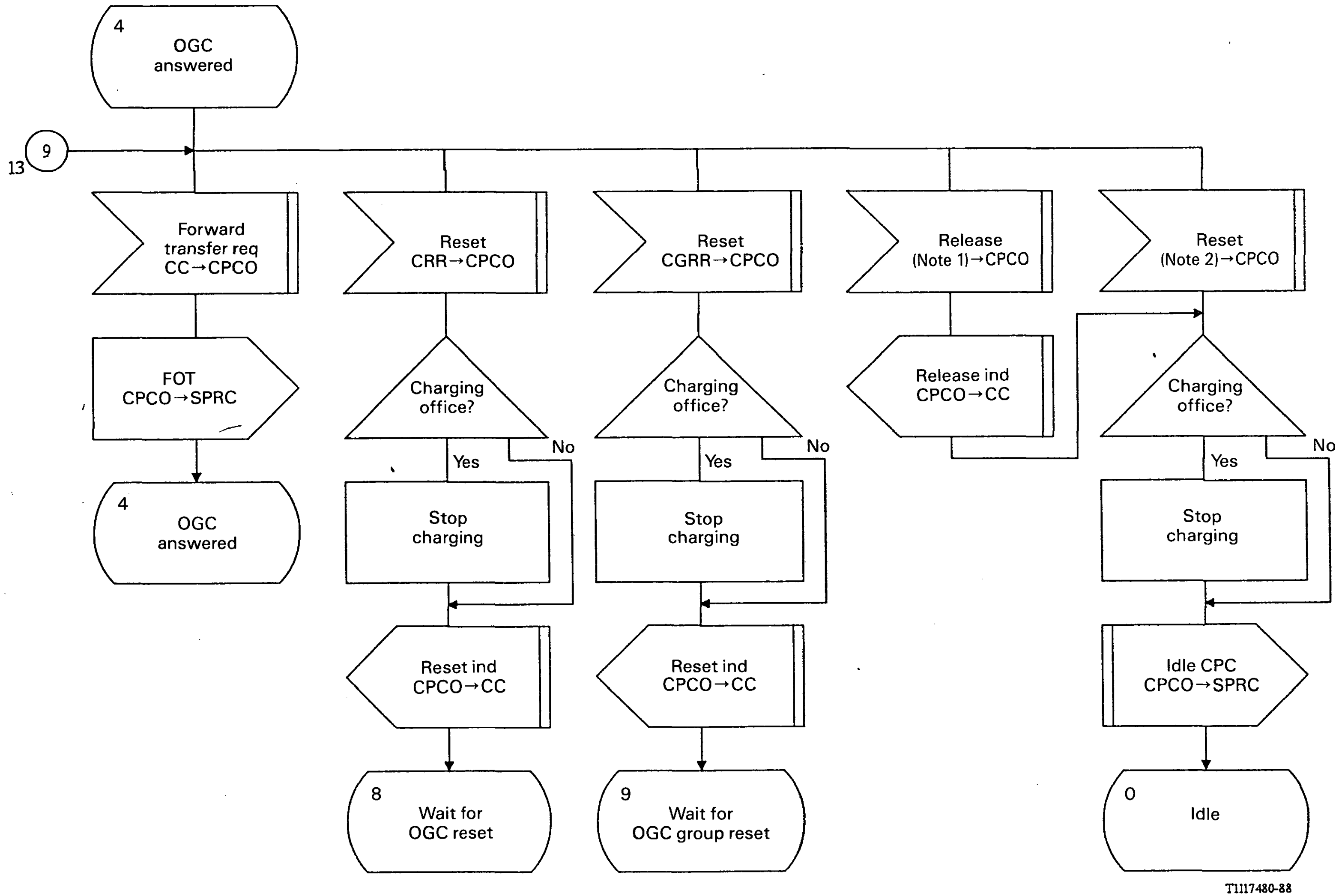


FIGURE B-22/Q.764 (Sheet 13 of 21)

Call Processing Control Outgoing (CPCO)



Note 1 – HGBS, HGBR.
Note 2 – CRS, CGRS.

FIGURE B-22/Q.764 (Sheet 14 of 21)

Call Processing Control Outgoing (CPCO)

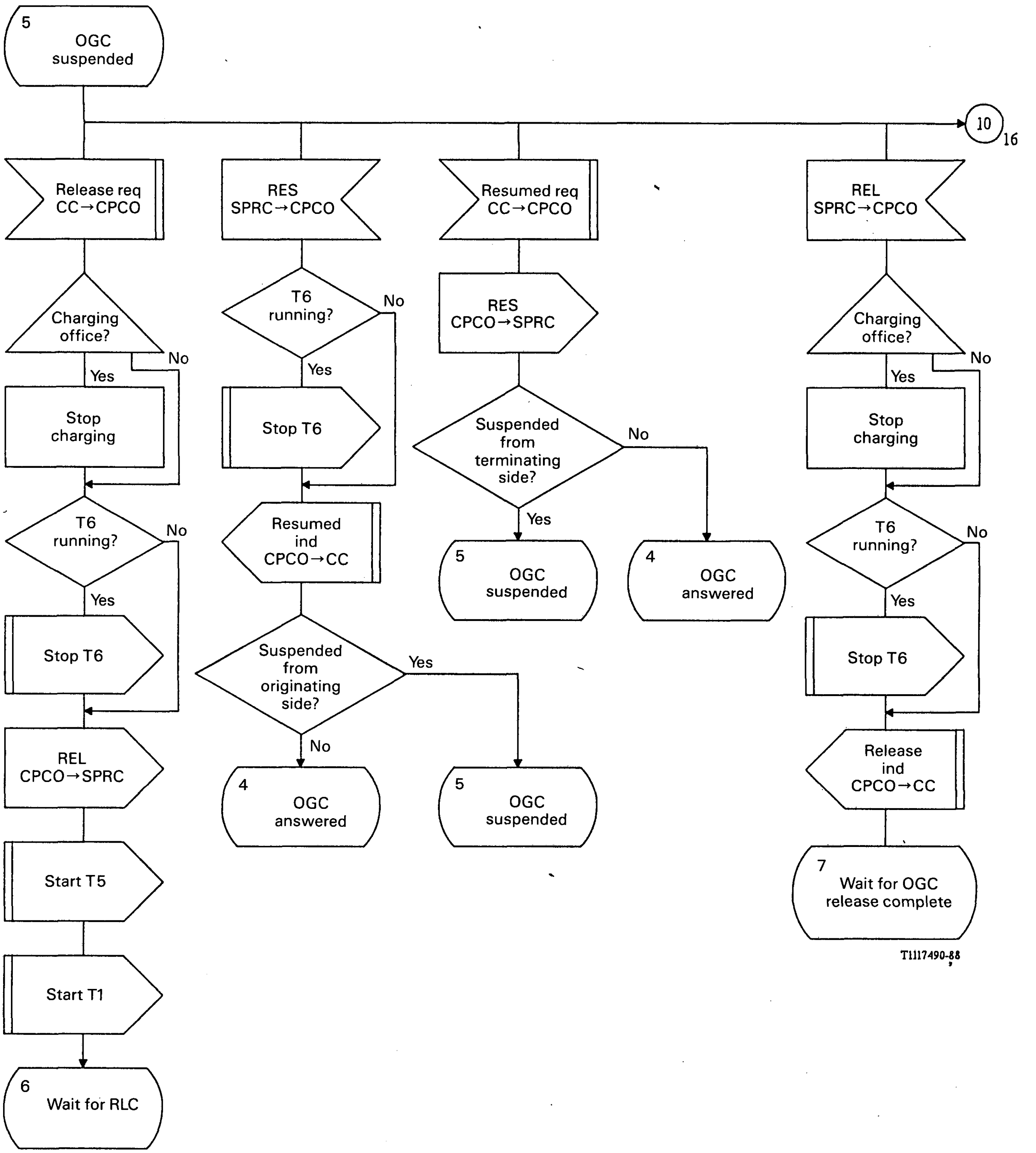


FIGURE B-22/Q.764 (Sheet 15 of 21)

Call Processing Control Outgoing (CPCO)

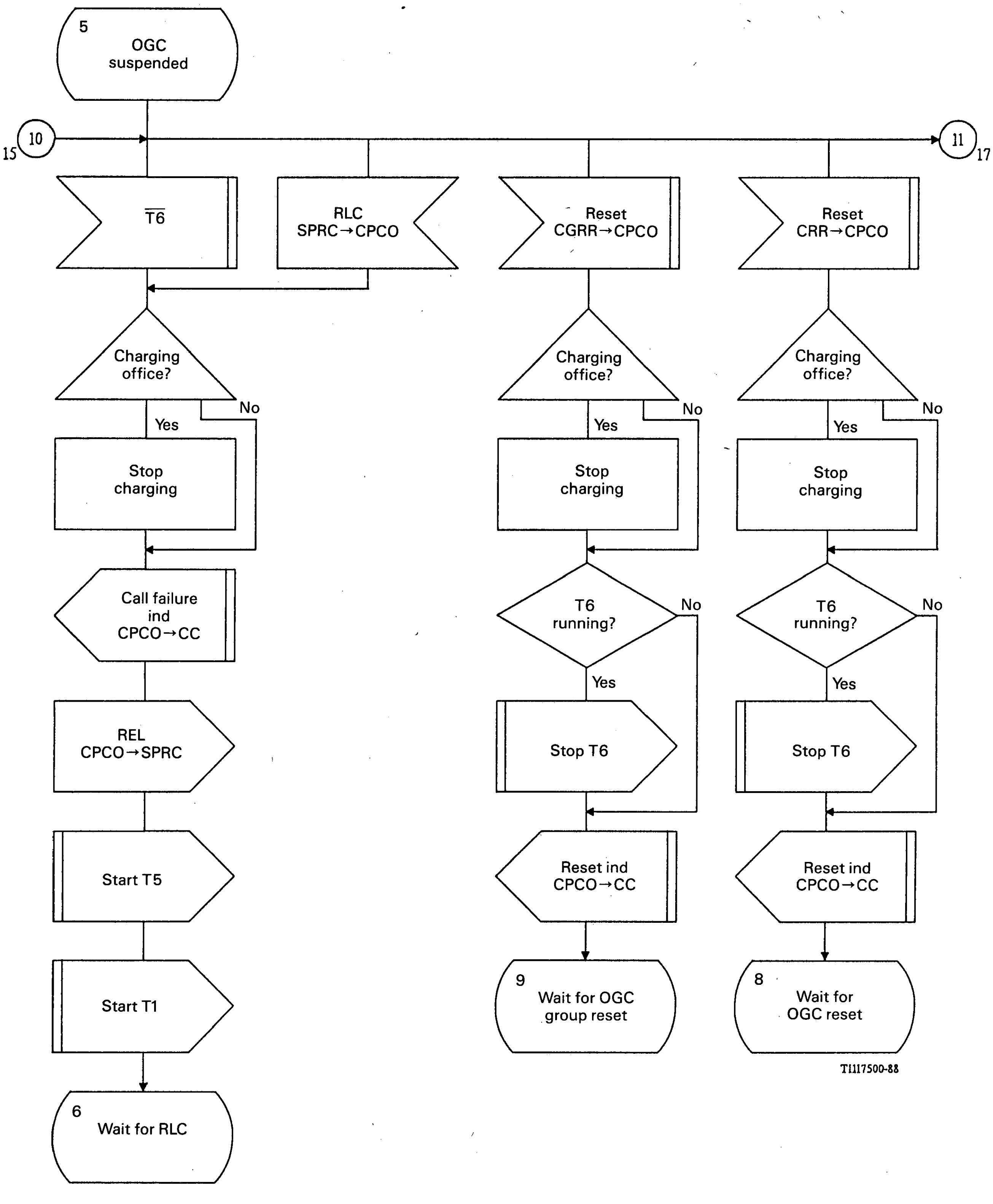
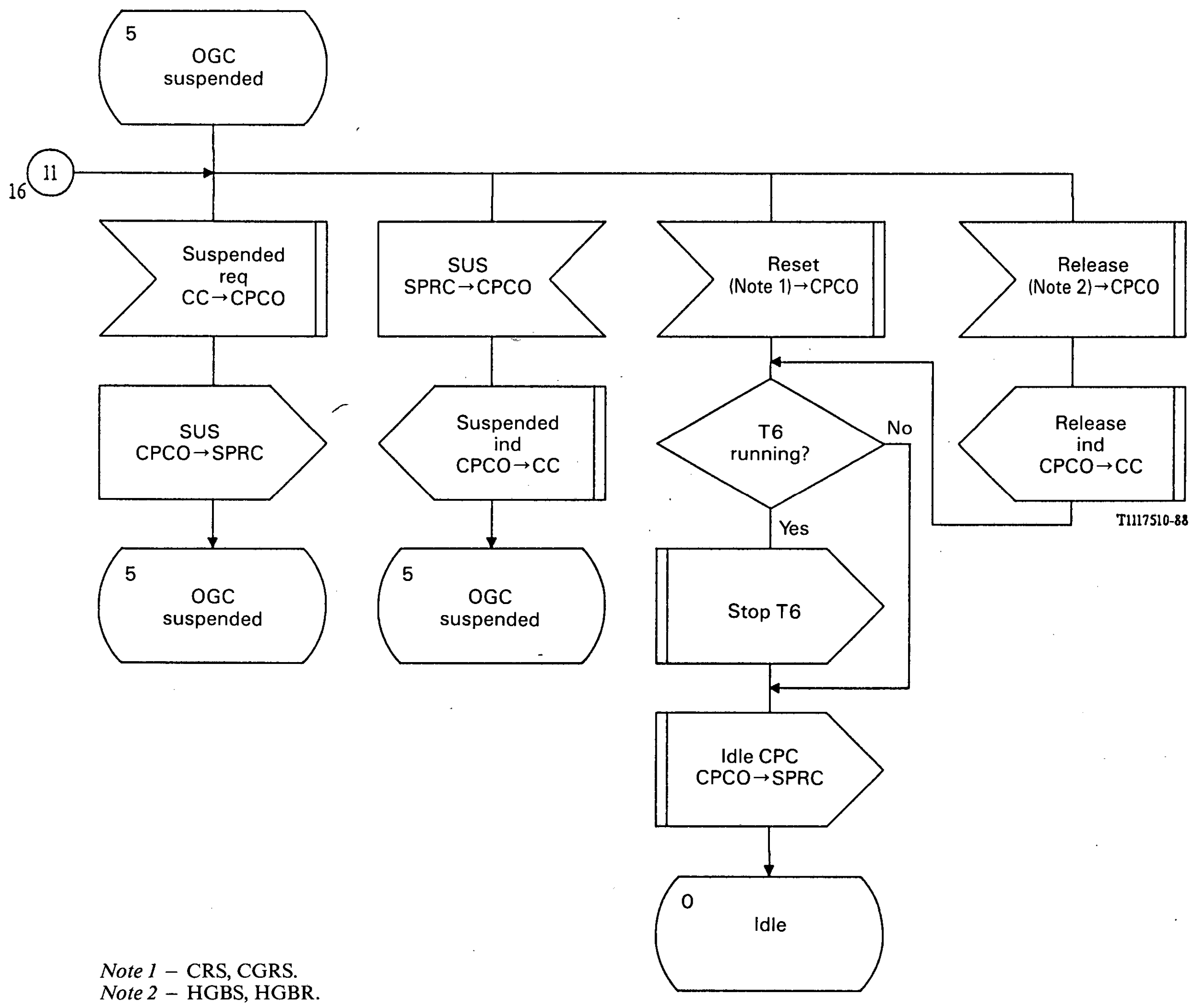


FIGURE B-22/Q.764 (Sheet 16 of 21)

Call Processing Control Outgoing (CPCO)



Note 1 – CRS, CGRS.
Note 2 – HGBS, HGBR.

FIGURE B-22/Q.764 (Sheet 17 of 21)

Call Processing Control Outgoing (CPCO)

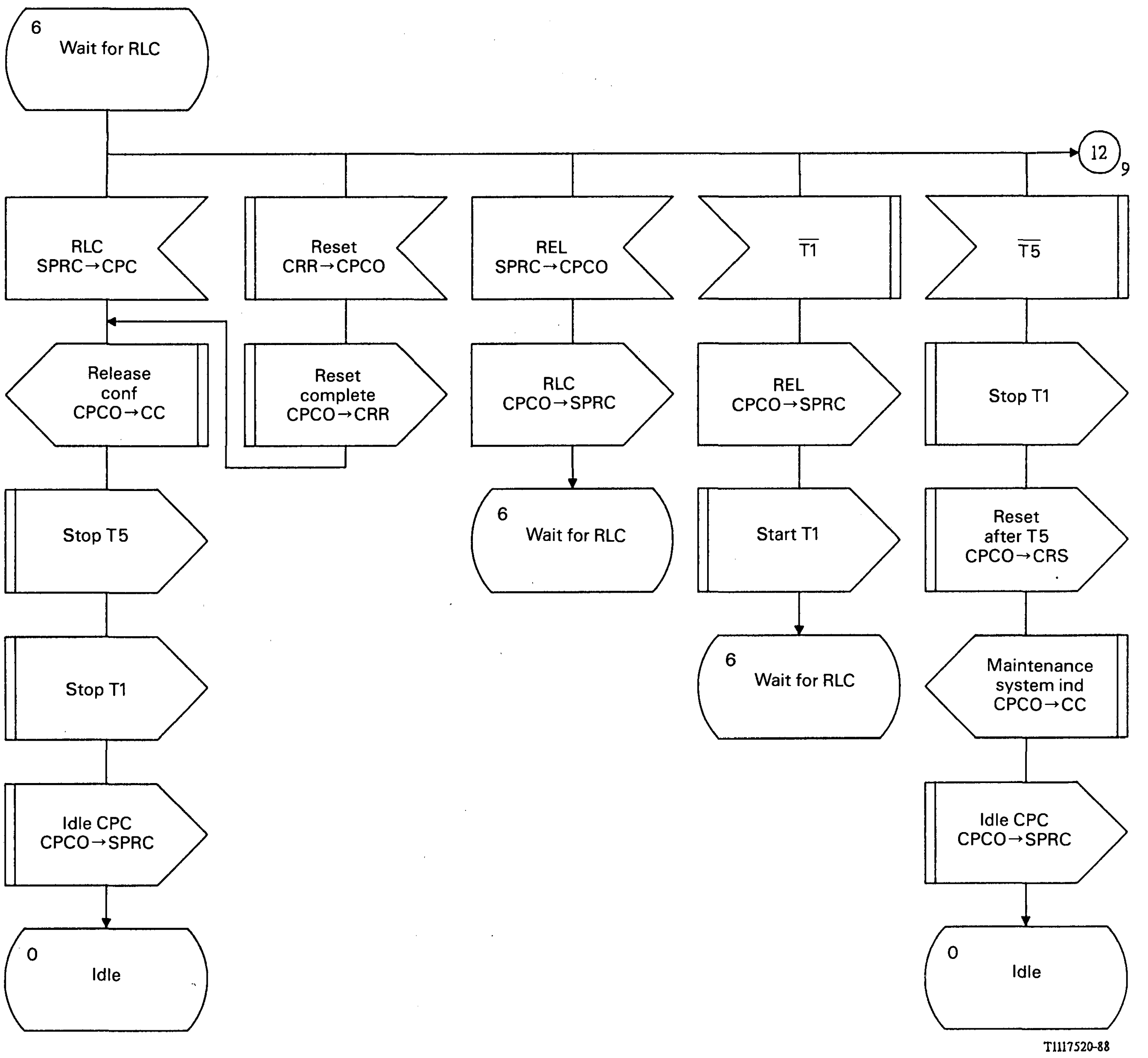
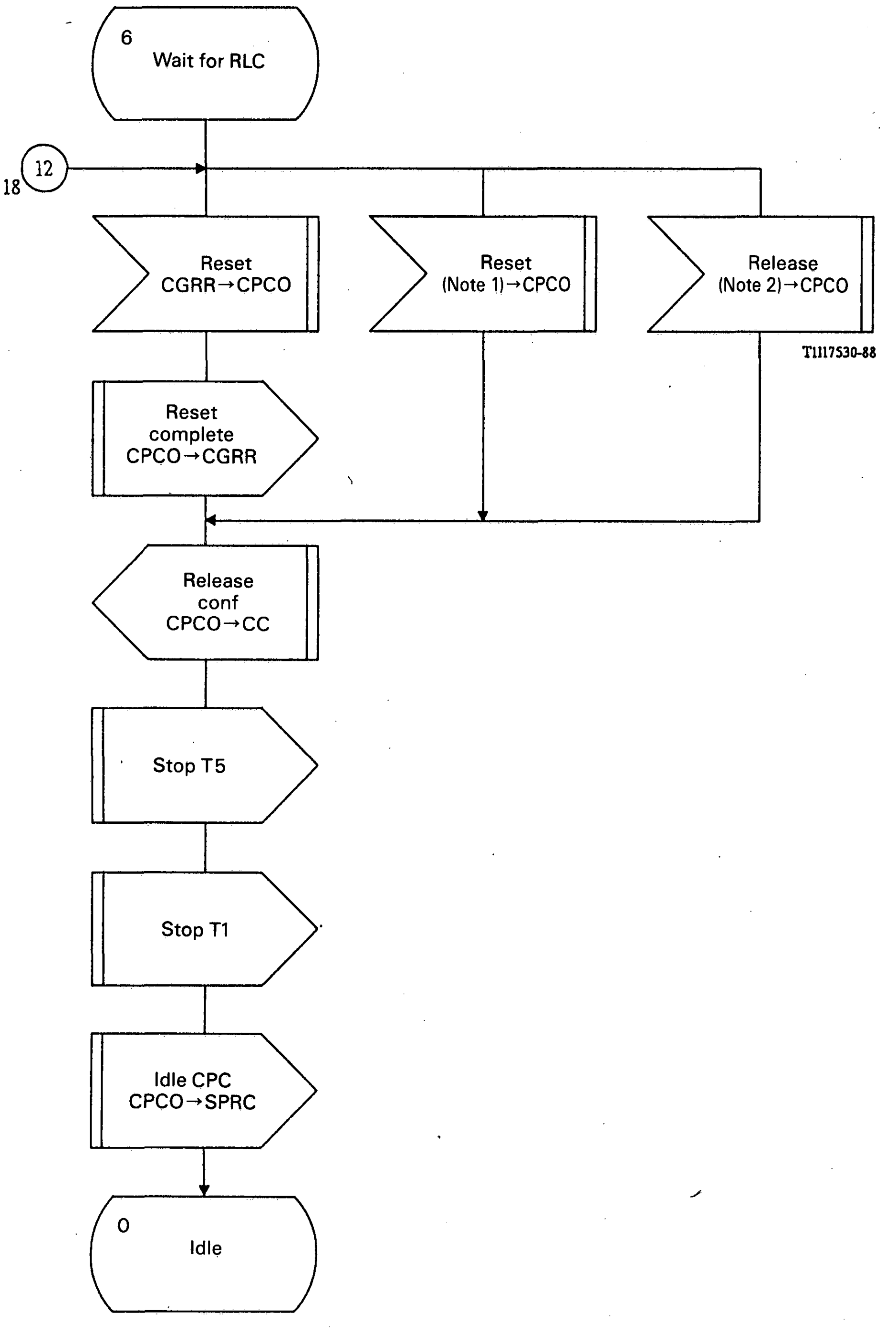


FIGURE B-22/Q.764 (Sheet 18 of 21)

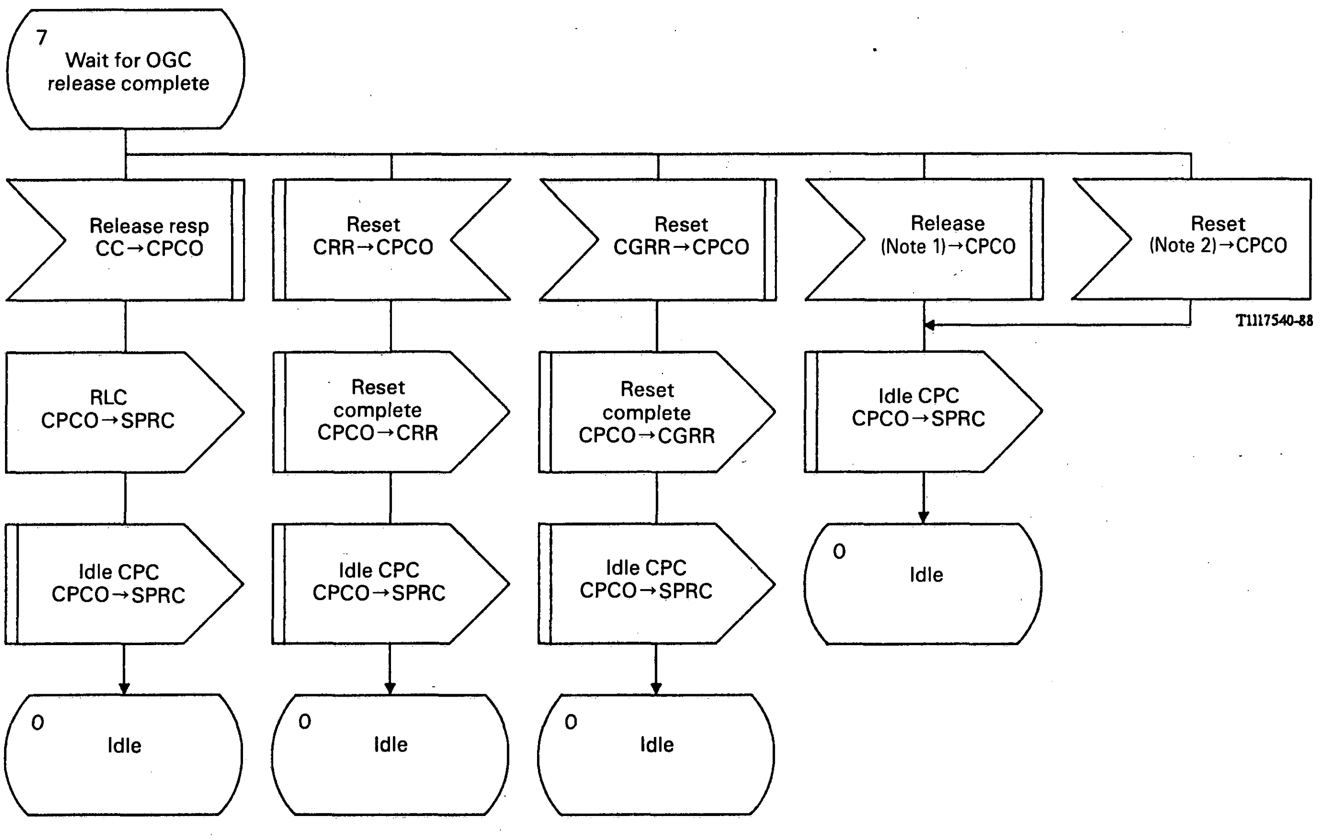
Call Processing Control Outgoing (CPCO)



Note 1 – CRS, CGRS.
Note 2 – HGBS, HGBR.

FIGURE B-22/Q.764 (Sheet 19 of 21)

Call Processing Control Outgoing (CPCO)



Note 1 – HGBS, HGBR.
Note 2 – CRS, CGRS.

FIGURE B-22/Q.764 (Sheet 20 of 21)

Call Processing Control Outgoing (CPCO)

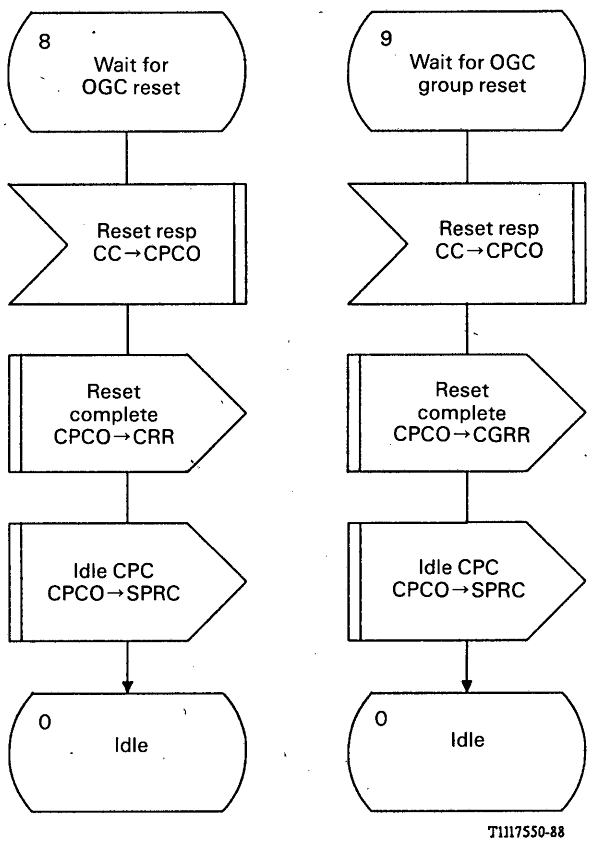


FIGURE B-22/Q.764 (Sheet 21 of 21)

Call Processing Control Outgoing (CPCO)

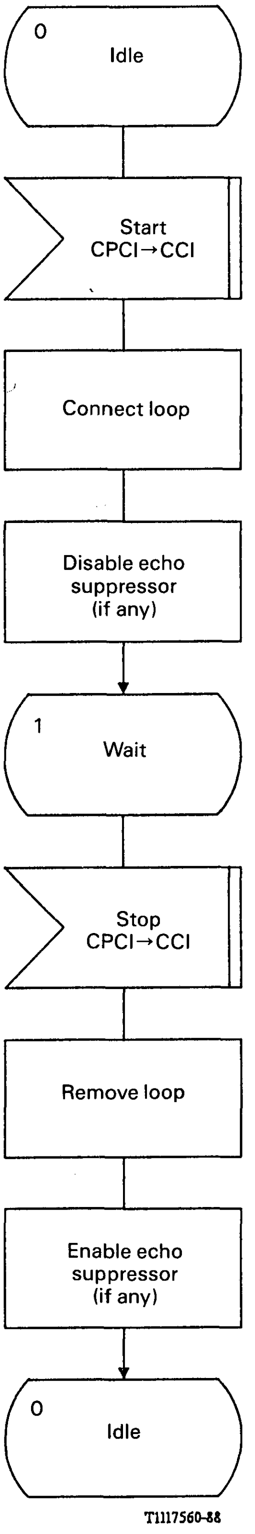


FIGURE B-23/Q.764

Continuity Check Incoming (CCI)

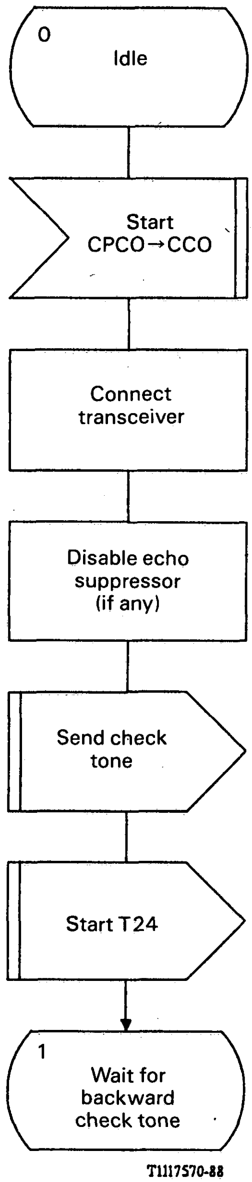


FIGURE B-24/Q.764 (Sheet 1 of 2)

Continuity Check Outgoing (CCO)

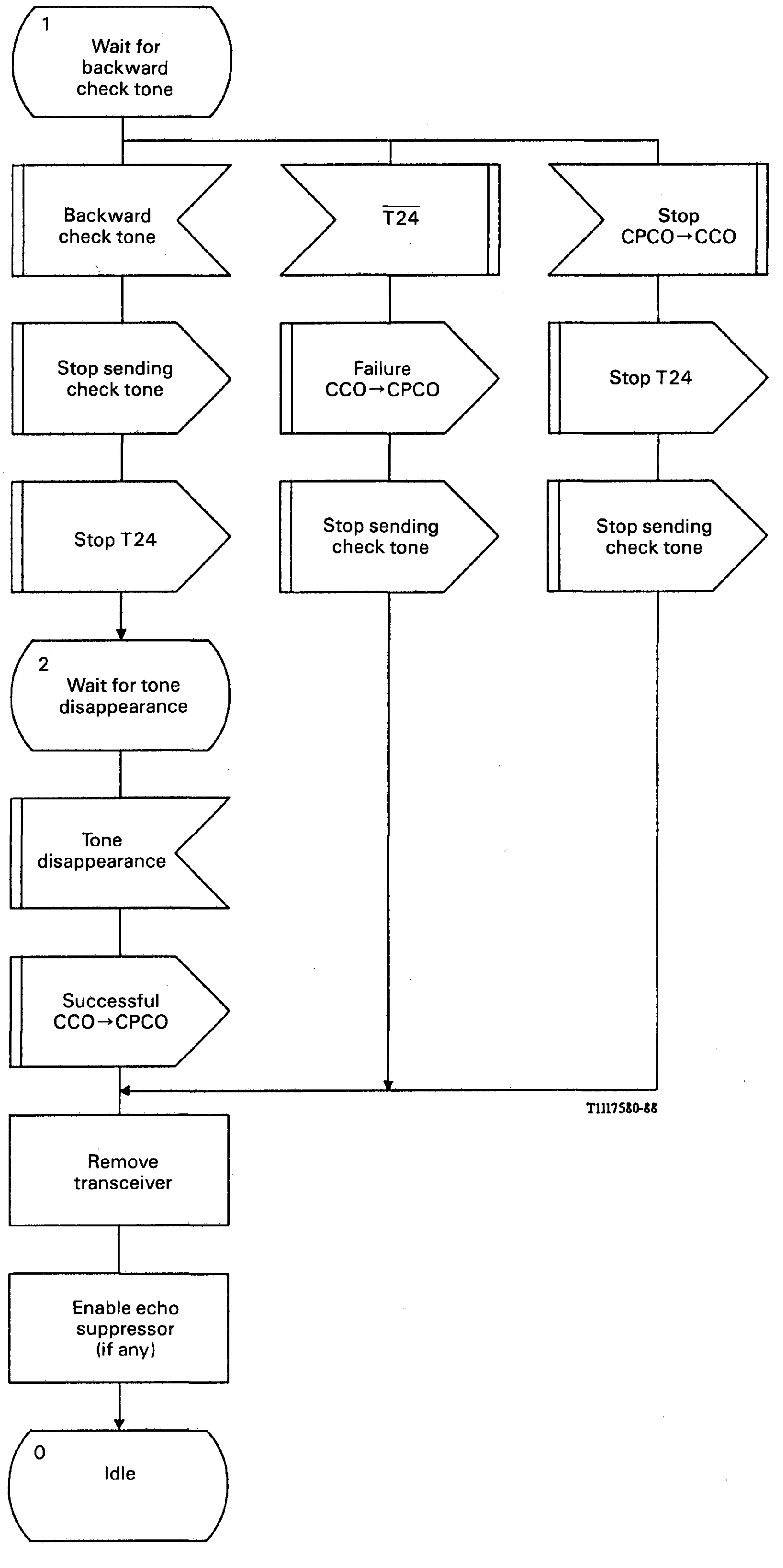


FIGURE B-24/Q.764 (Sheet 2 of 2)

Continuity Check Outgoing (CCO)

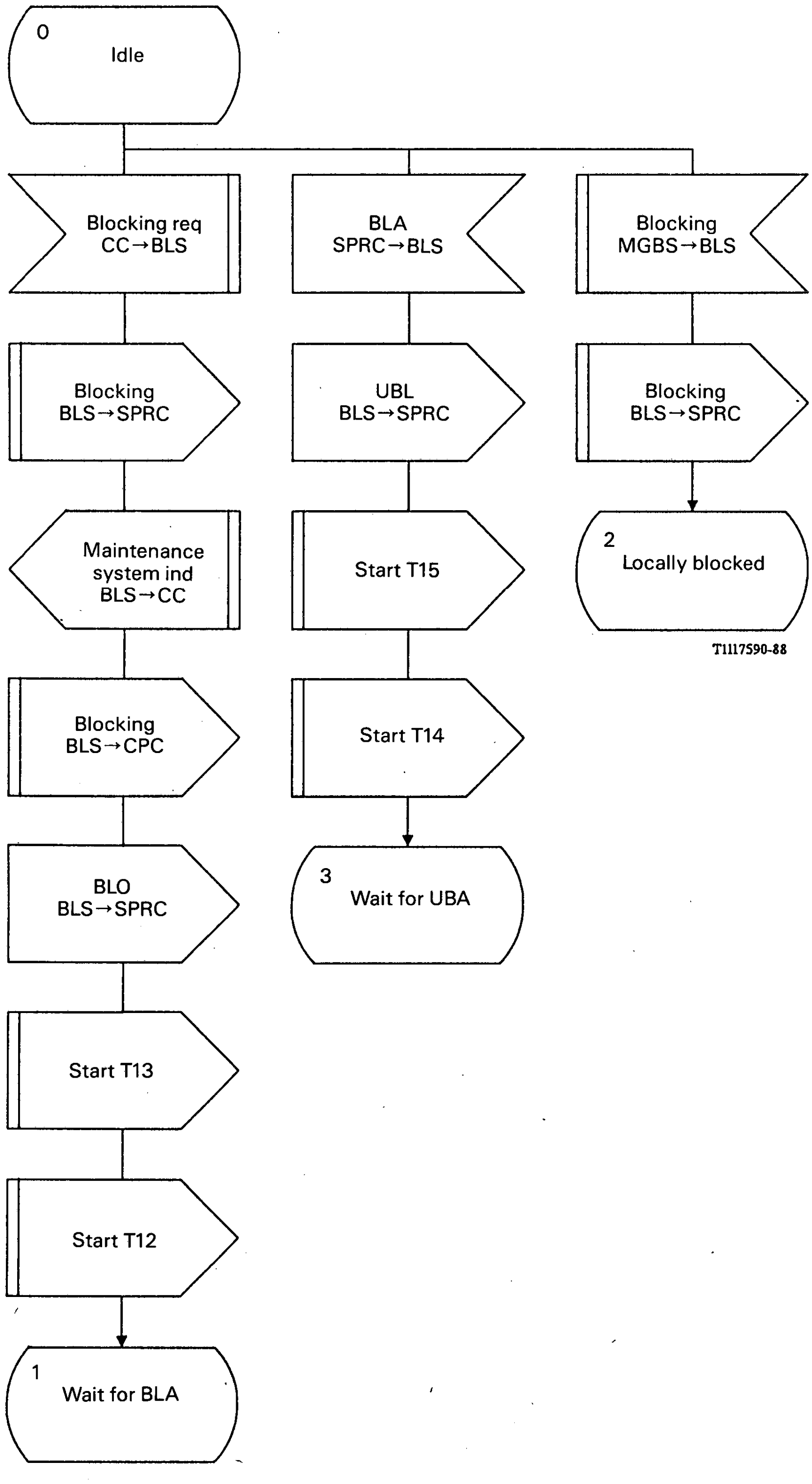


FIGURE B-25/Q.764 (Sheet 1 of 5)

Blocking/Unblocking Message Sending (BLS)

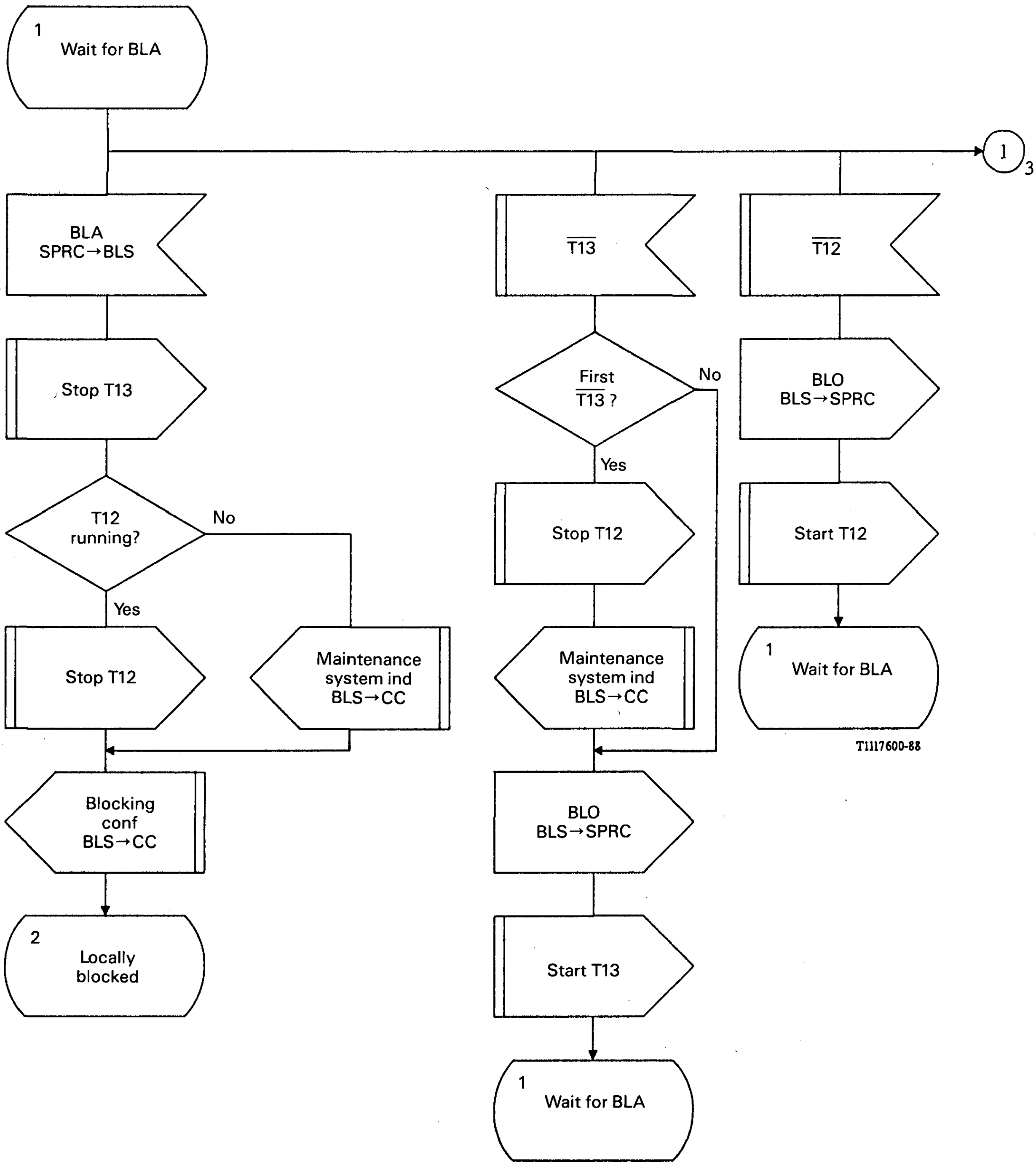
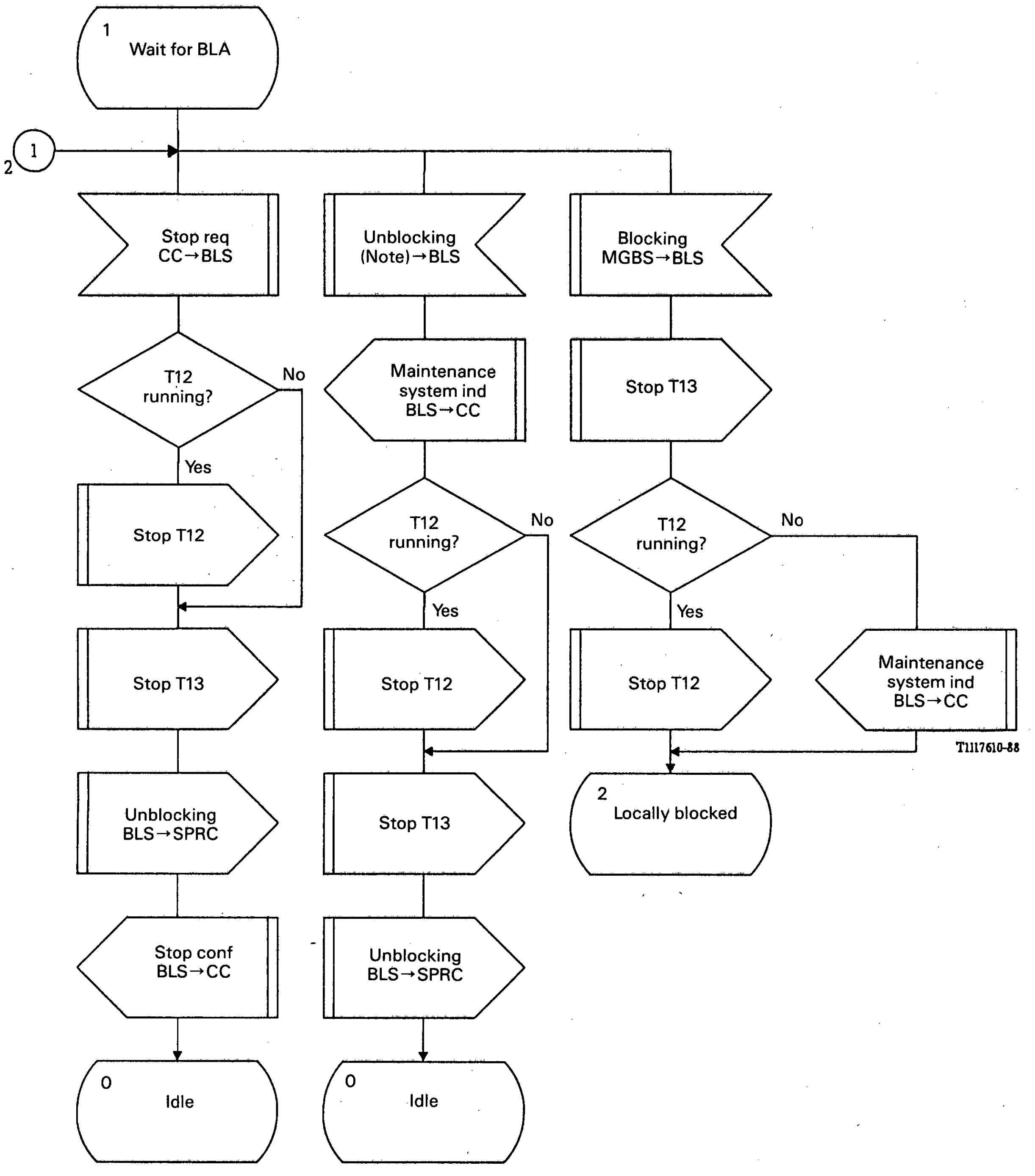


FIGURE B-25/Q.764 (Sheet 2 of 5)

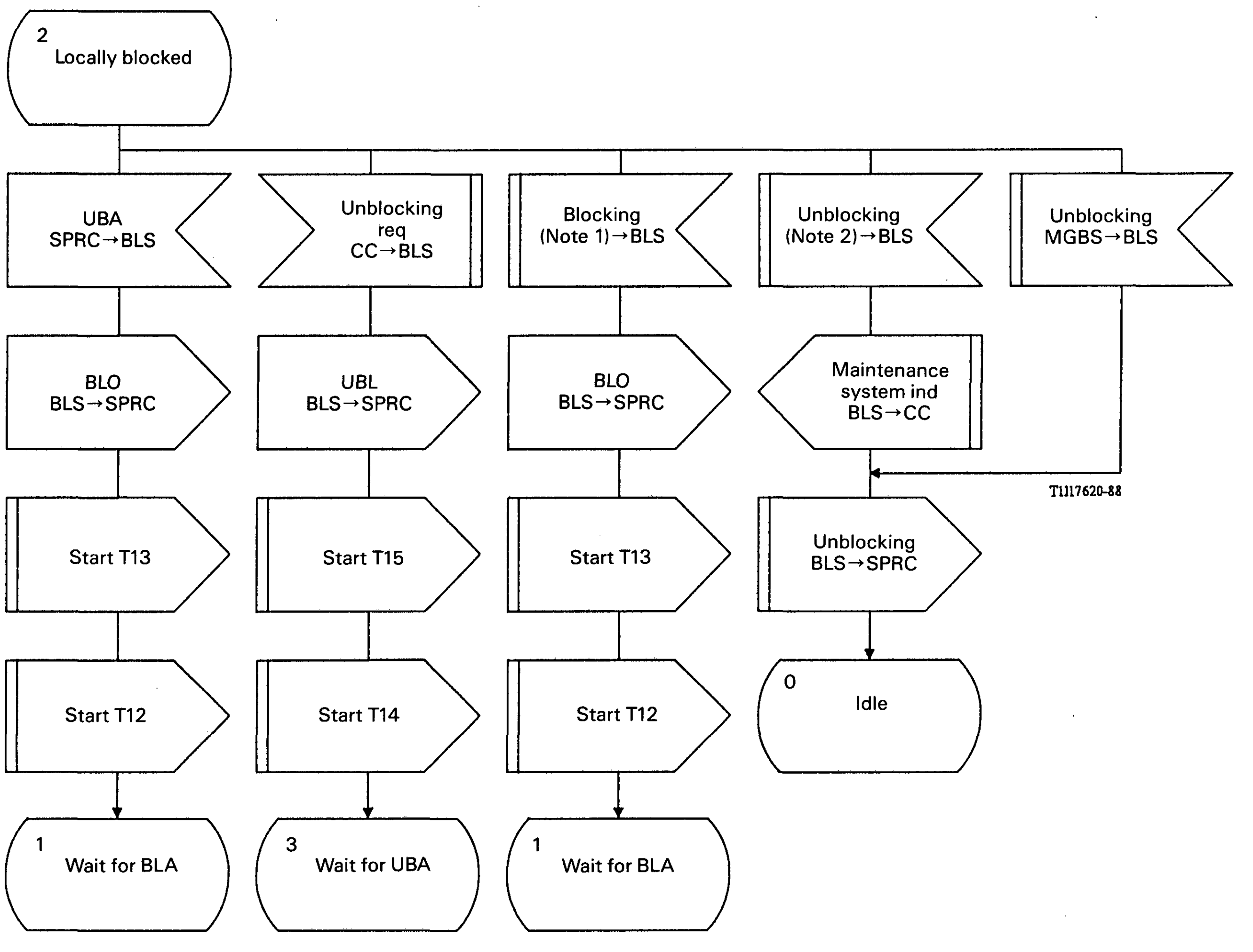
Blocking/Unblocking Message Sending (BLS)



Note – CRS, CGRS.

FIGURE B-25/Q.764 (Sheet 3 of 5)

Blocking/Unblocking Message Sending (BLS)



Note 1 – CRR, CPC.
Note 2 – CRS, CGRS.

FIGURE B-25/Q.764 (Sheet 4 of 5)

Blocking/Unblocking Message Sending (BLS)

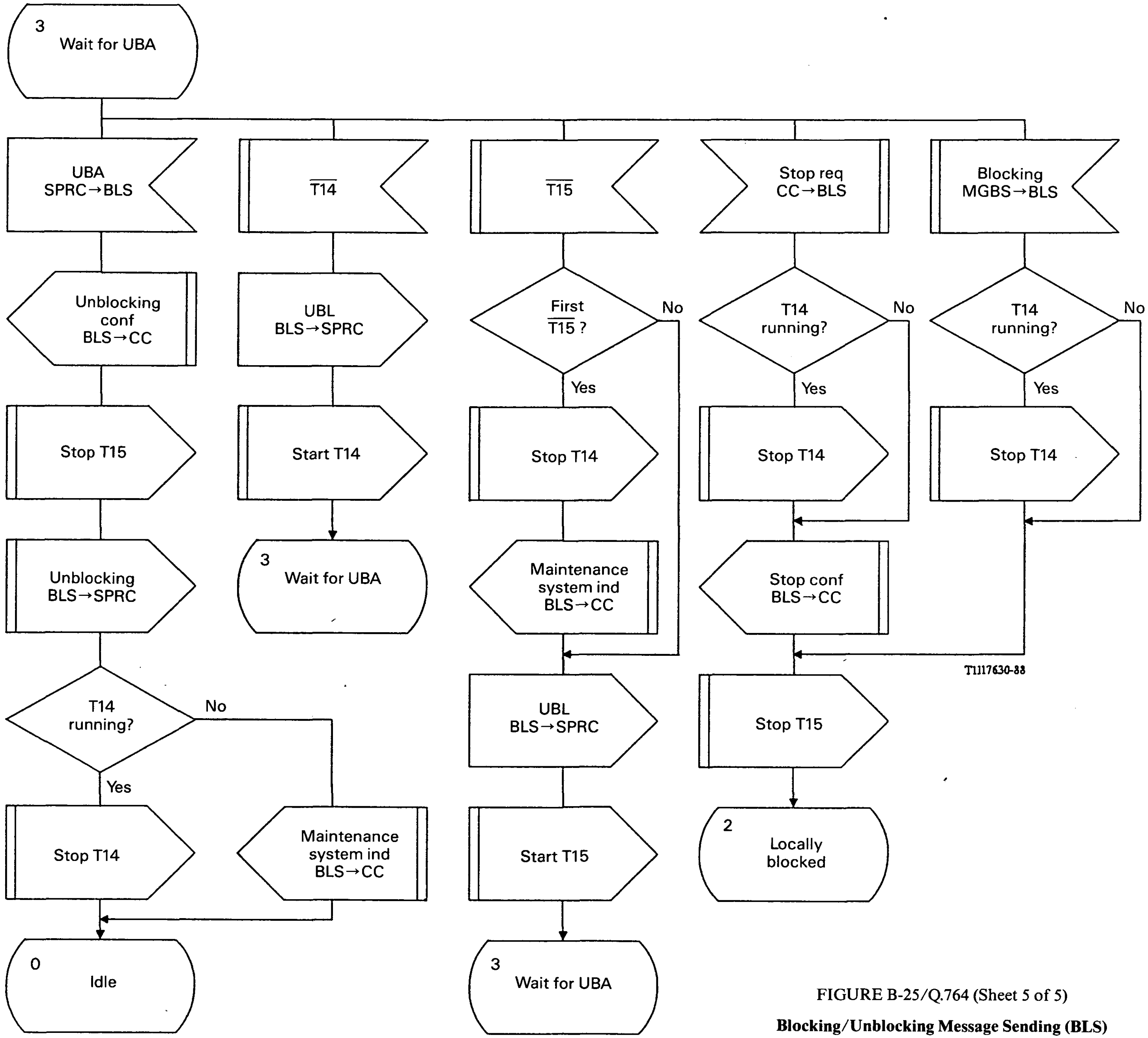


FIGURE B-25/Q.764 (Sheet 5 of 5)

Blocking/Unblocking Message Sending (BLS)

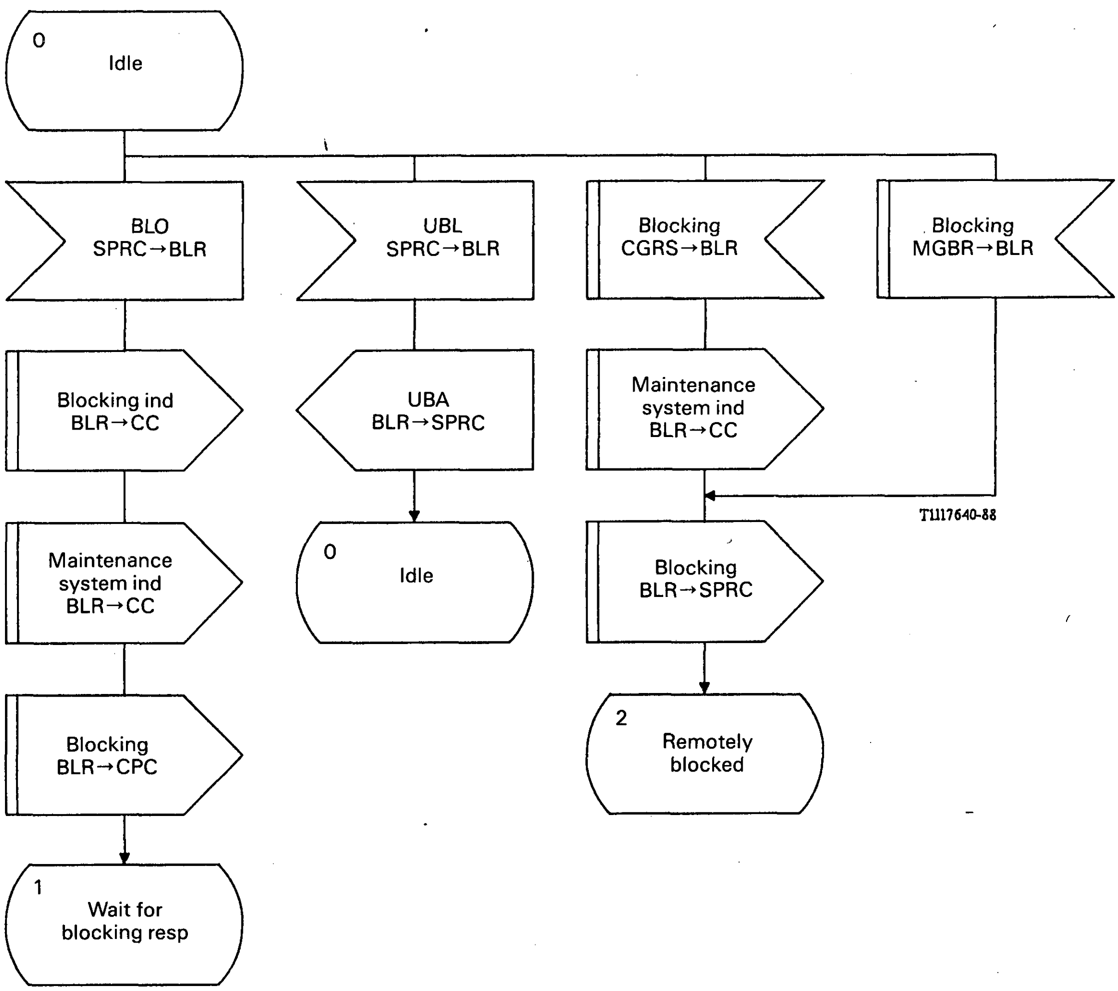
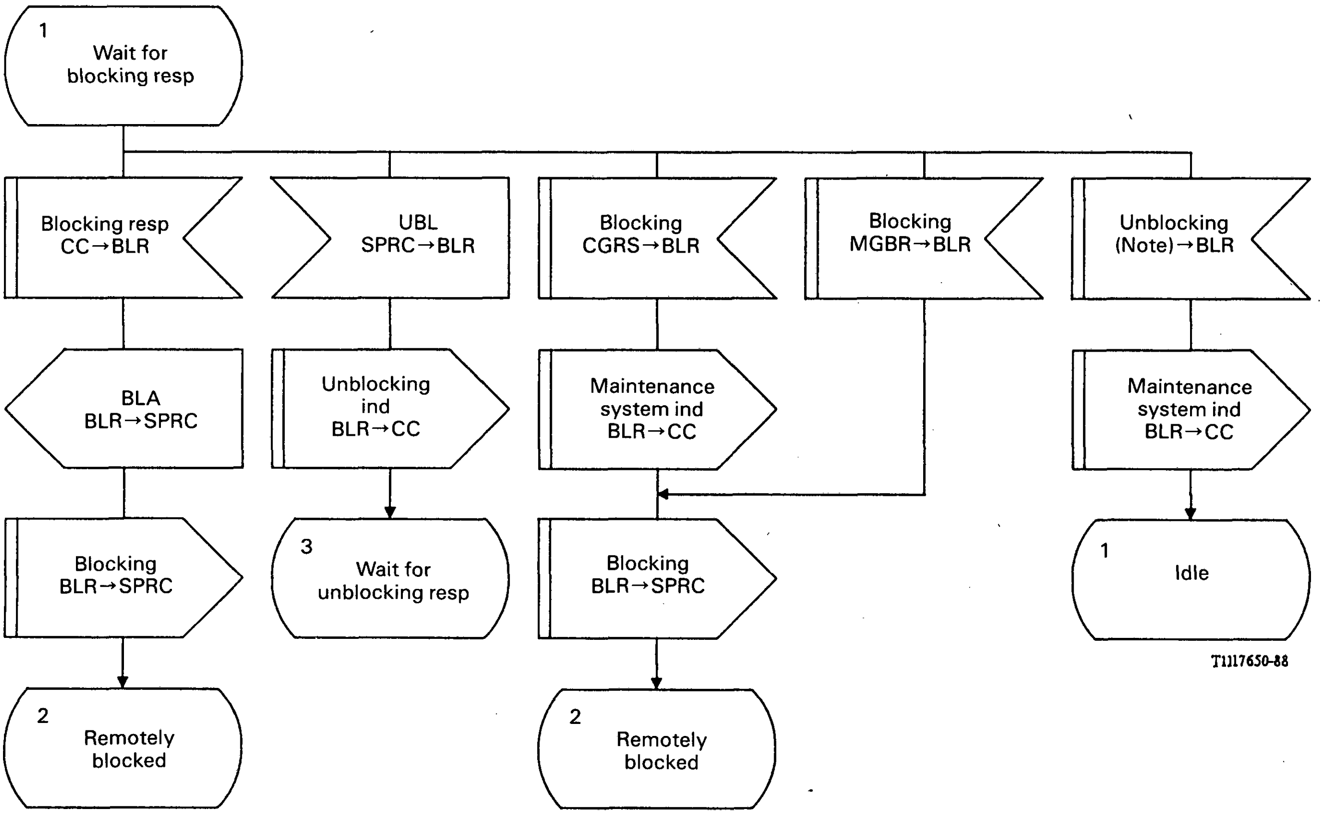


FIGURE B-26/Q.764 (Sheet 1 of 4)

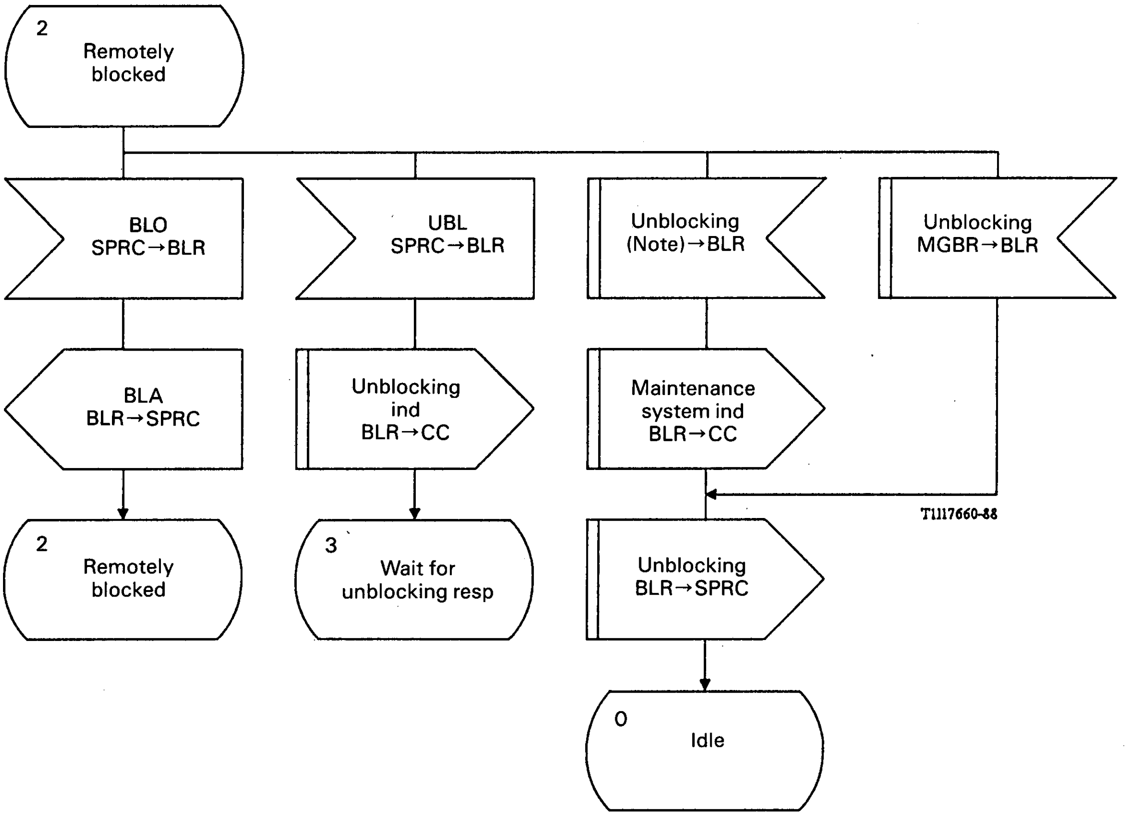
Blocking/Unblocking Message Reception (BLR)



Note – CRR, CRS, CGRR.

FIGURE B-26/Q.764 (Sheet 2 of 4)

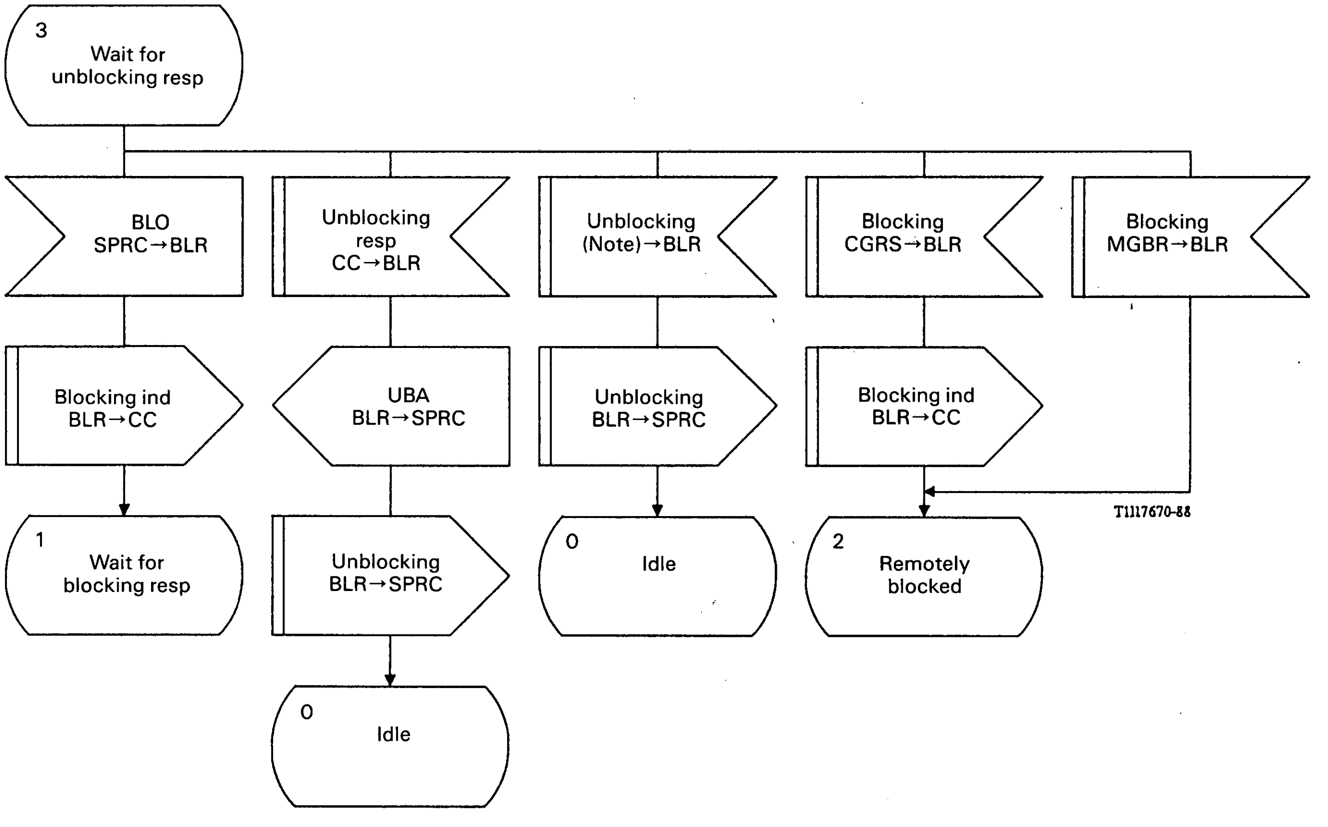
Blocking/Unblocking Message Reception (BLR)



Note – CRR, CGRR, CRS, CPCI.

FIGURE B-26/Q.764 (Sheet 3 of 4)

Blocking/Unblocking Message Reception (BLR)



Note – CRR, CGRR, MGBR, CRS.

FIGURE B-26/Q.764 (Sheet 4 of 4)

Blocking/Unblocking Message Reception (BLR)

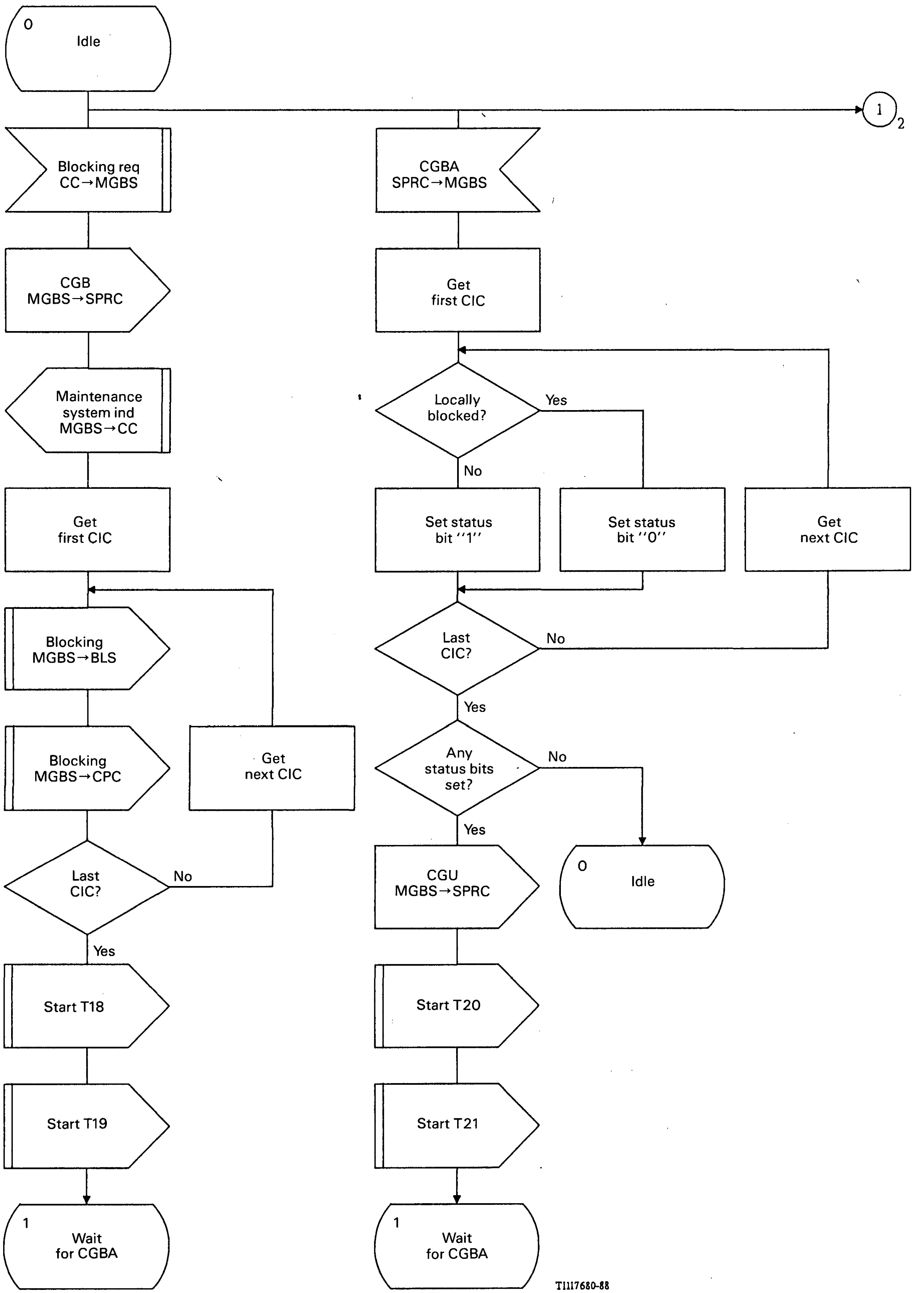


FIGURE B-27/Q.764 (Sheet 1 of 6)

Maintenance Oriented Circuit Group Blocking and Unblocking Sending (MGBS)

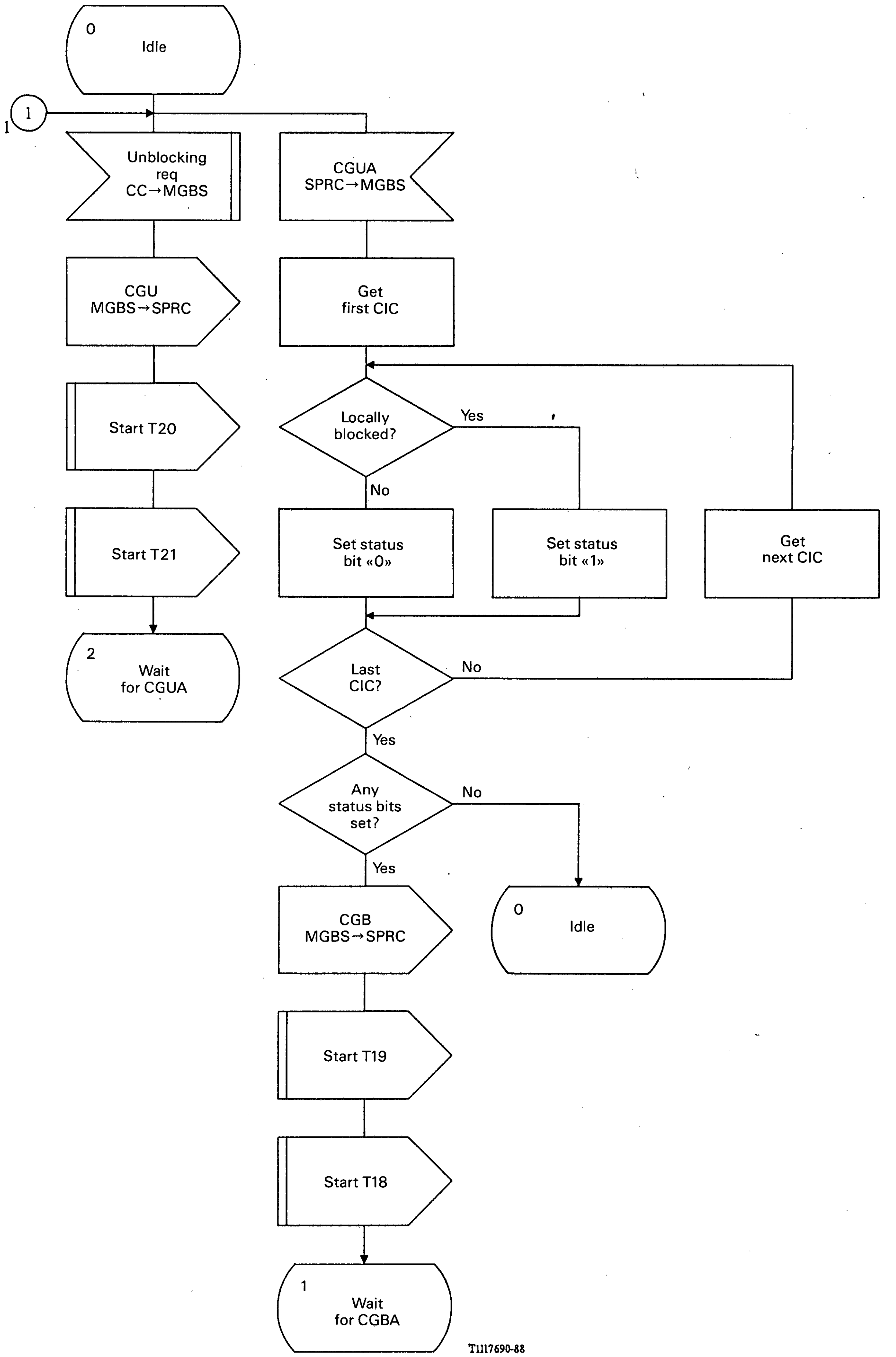


FIGURE B-27/Q.764 (Sheet 2 of 6)

Maintenance Oriented Circuit Group Blocking and Unblocking Sending (MGBS)

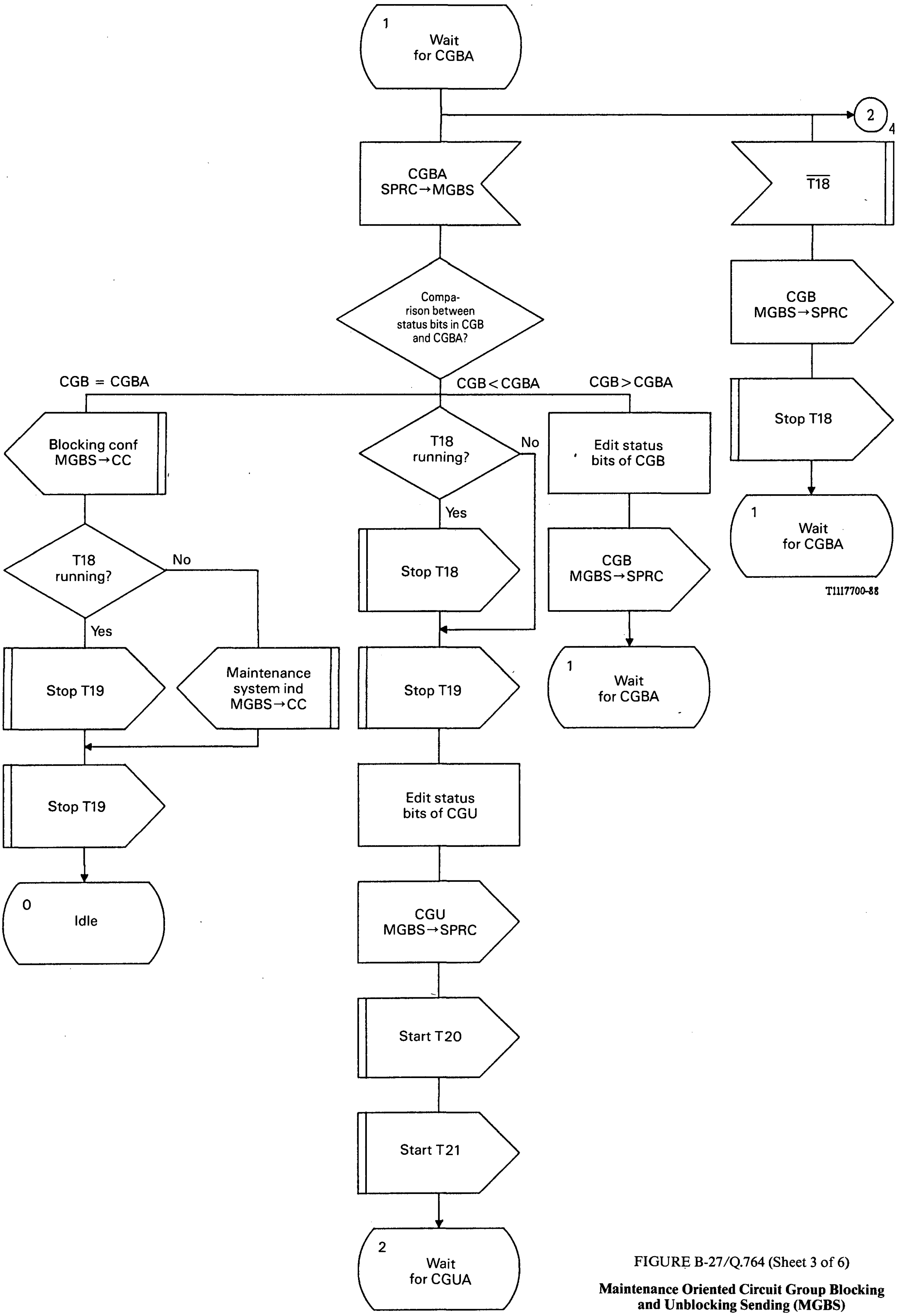


FIGURE B-27/Q.764 (Sheet 3 of 6)

Maintenance Oriented Circuit Group Blocking and Unblocking Sending (MGBS)

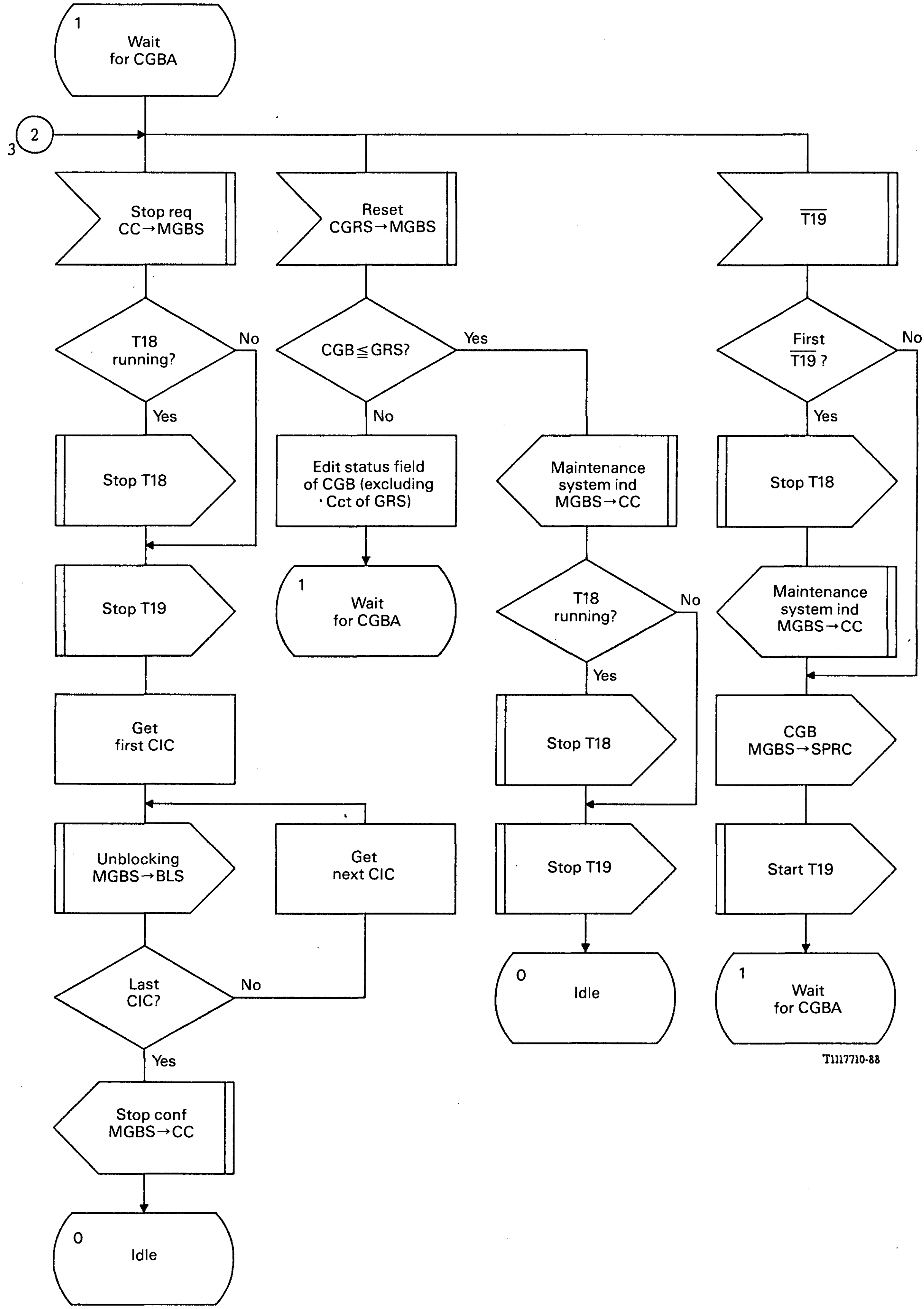


FIGURE B-27/Q.764 (Sheet 4 of 6)

Maintenance Oriented Circuit Group Blocking and Unblocking Sending (MGBS)

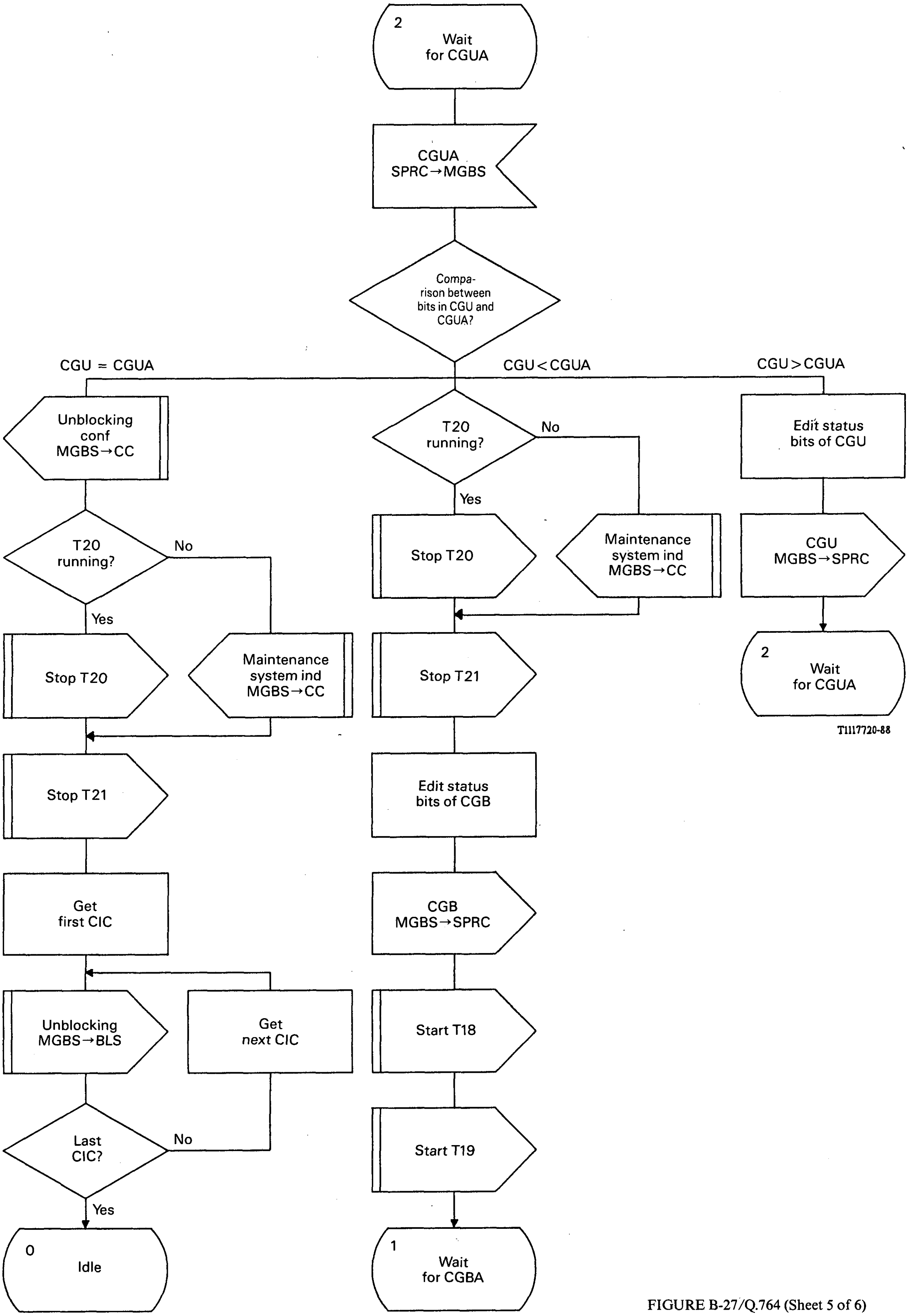


FIGURE B-27/Q.764 (Sheet 5 of 6)

Maintenance Oriented Circuit Group Blocking and Unblocking Sending (MGBS)

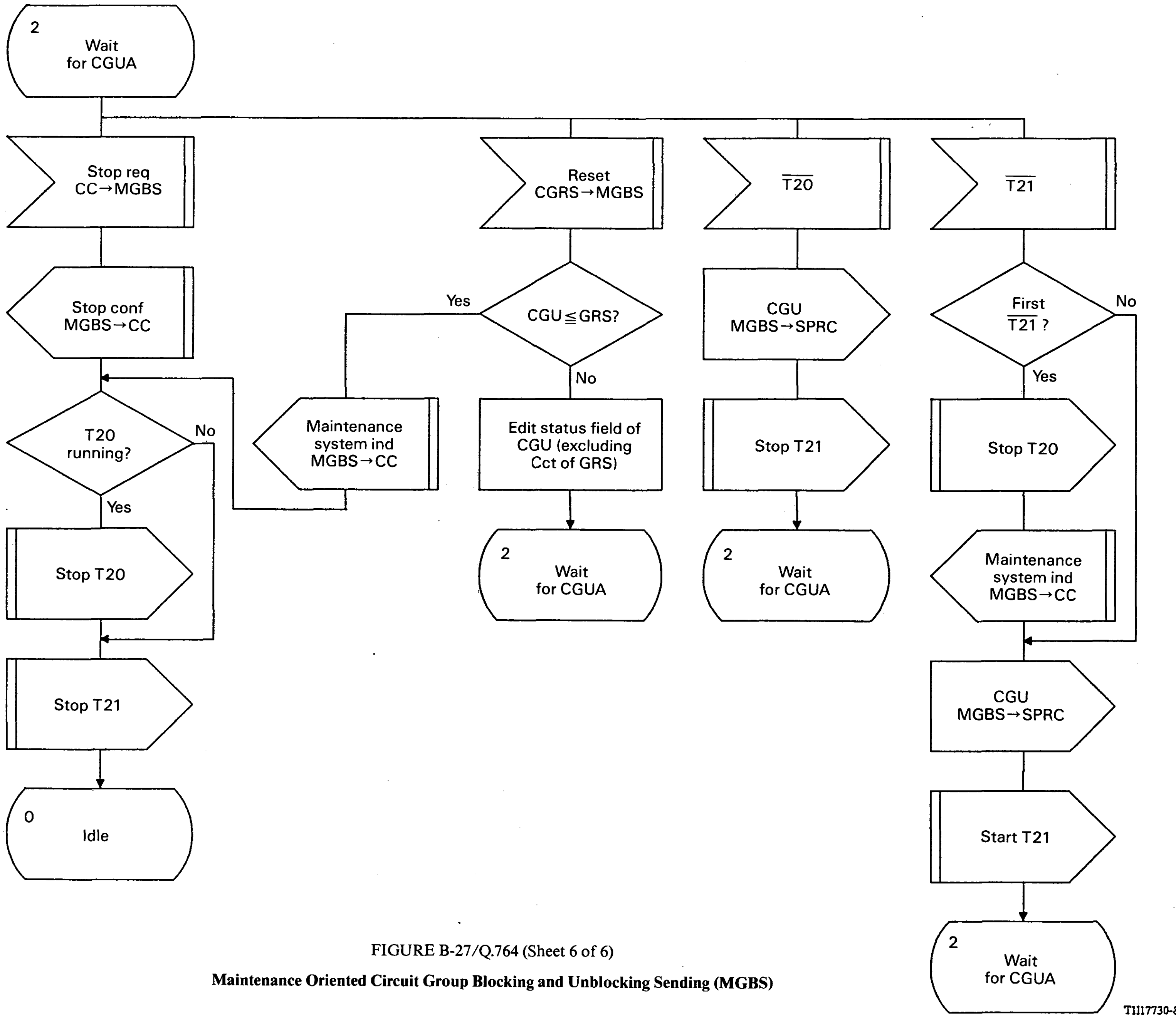


FIGURE B-27/Q.764 (Sheet 6 of 6)

Maintenance Oriented Circuit Group Blocking and Unblocking Sending (MGBS)

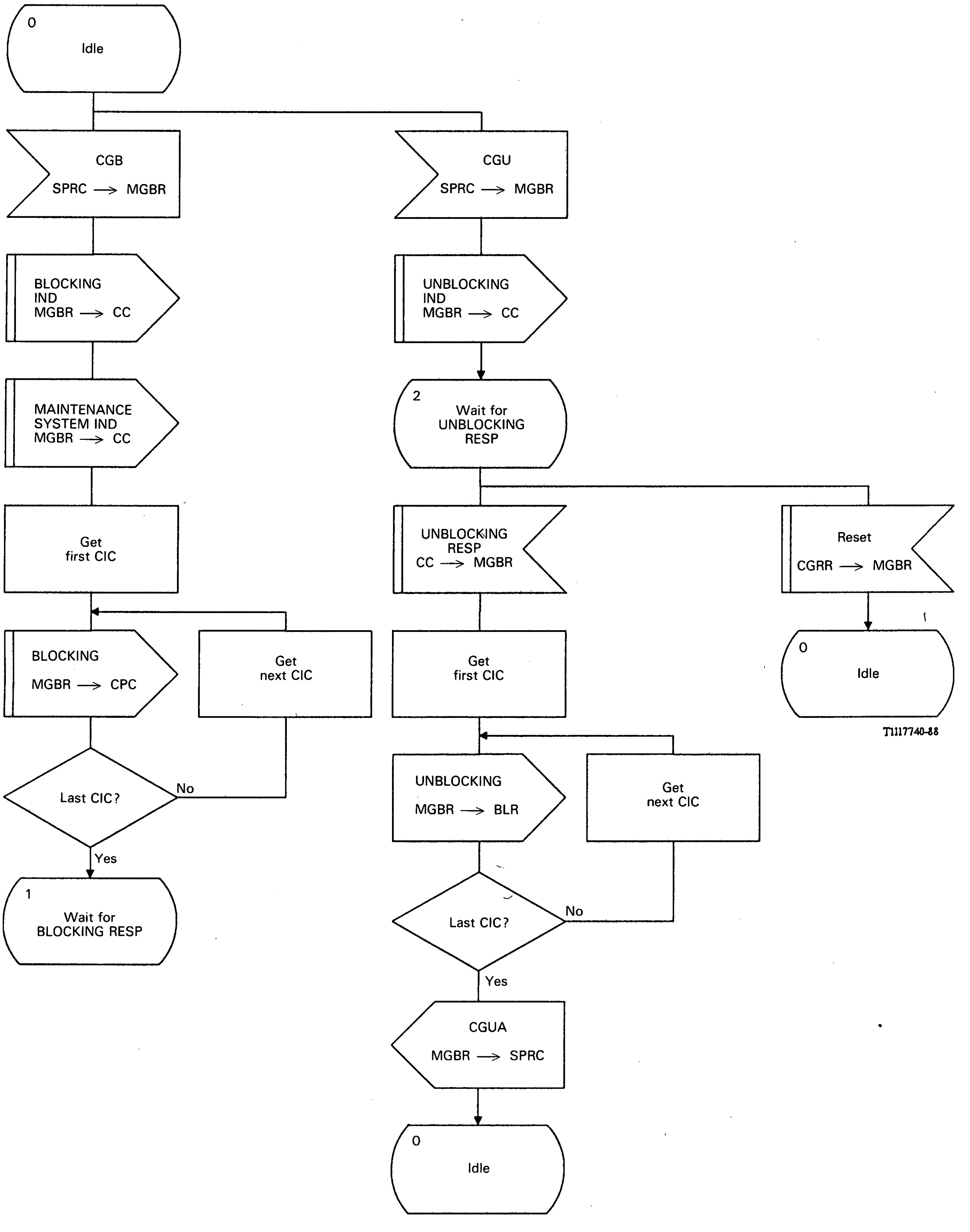
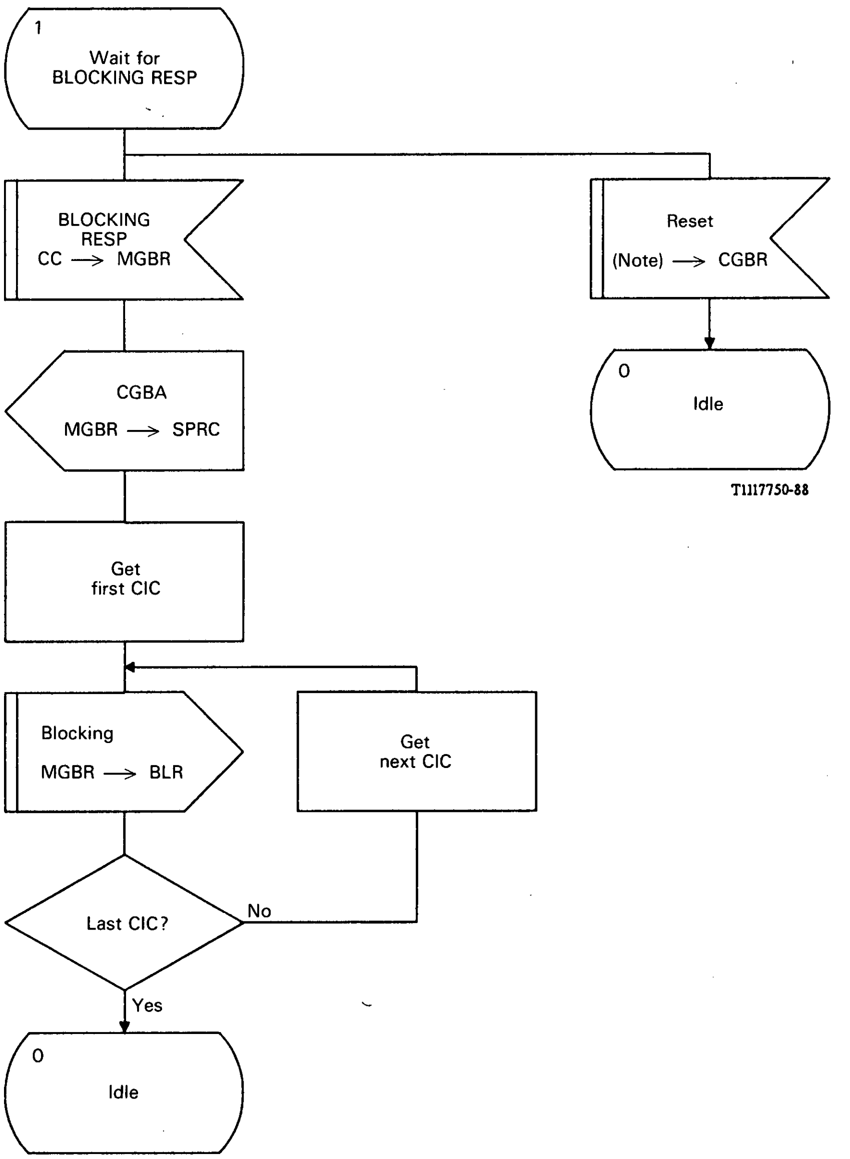


FIGURE B-28/Q.764
(Sheet 1 of 2)

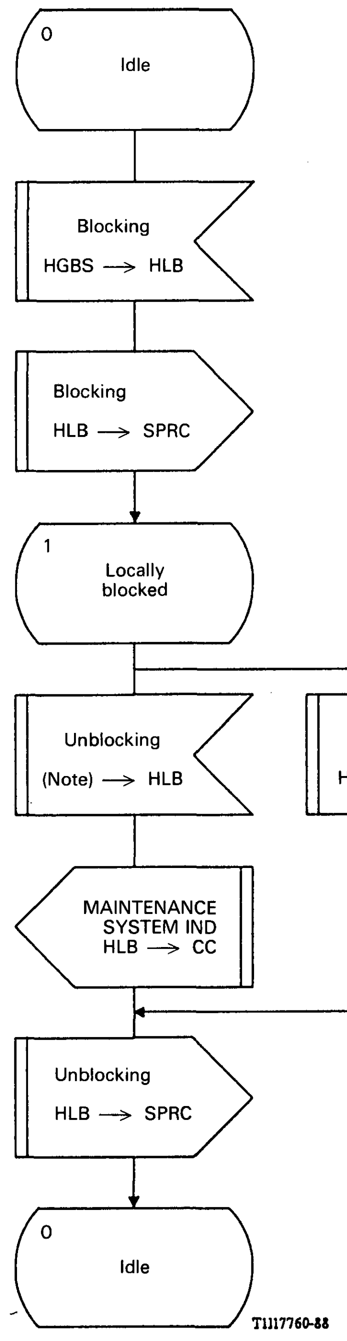
Maintenance Oriented Circuit Group Blocking and Unblocking Reception (MGBR)



Note – CGRS, CGRR.

FIGURE B-28/Q.764
(Sheet 2 of 2)

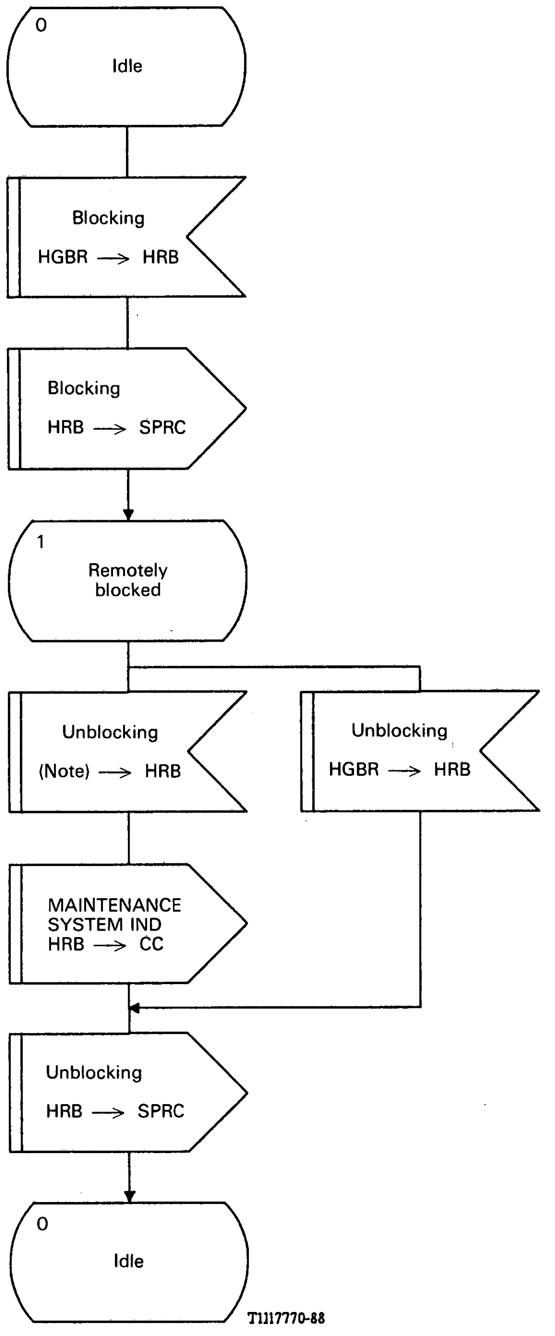
Maintenance Oriented Circuit Group Blocking and Unblocking Reception (MGBR)



Note – CRS, CGRS.

FIGURE B-29/Q.764

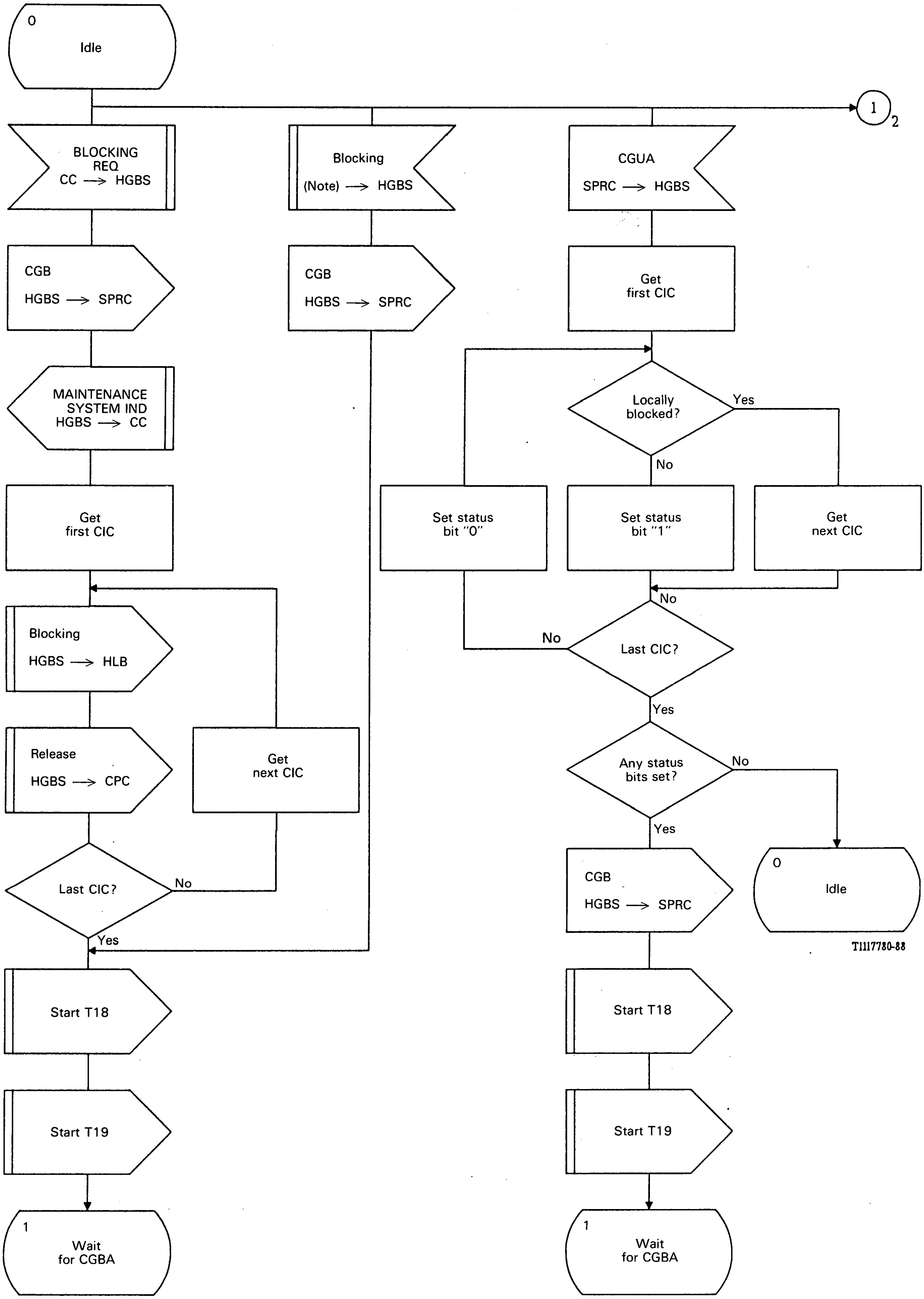
Hardware Failure Oriented Locally Blocking (HLB)



Note – CRS, CRR, CGRS, CGRR.

FIGURE B-30/Q.764

Hardware Failure Oriented Remotely Blocking (HRB)



Note – CRR, CGRR, CPCI.

FIGURE B-31/Q.764
(Sheet 1 of 6)
Hardware Failure Oriented Circuit Group Blocking and Unblocking Sending (HGBS)

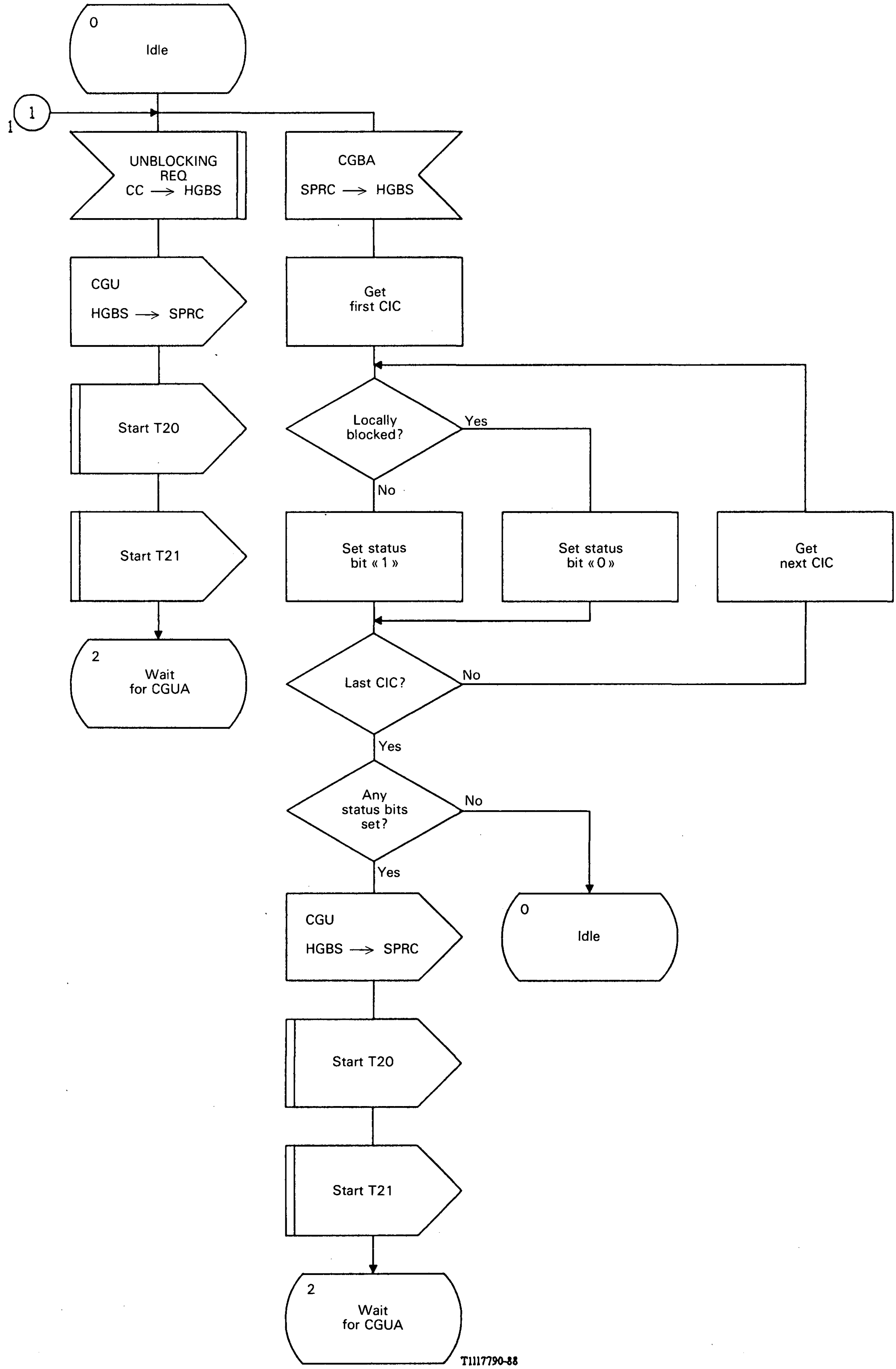


FIGURE B-31/Q.764
(Sheet 2 of 6)

Hardware Failure Oriented Circuit Group Blocking and Unblocking Sending (HGBS)

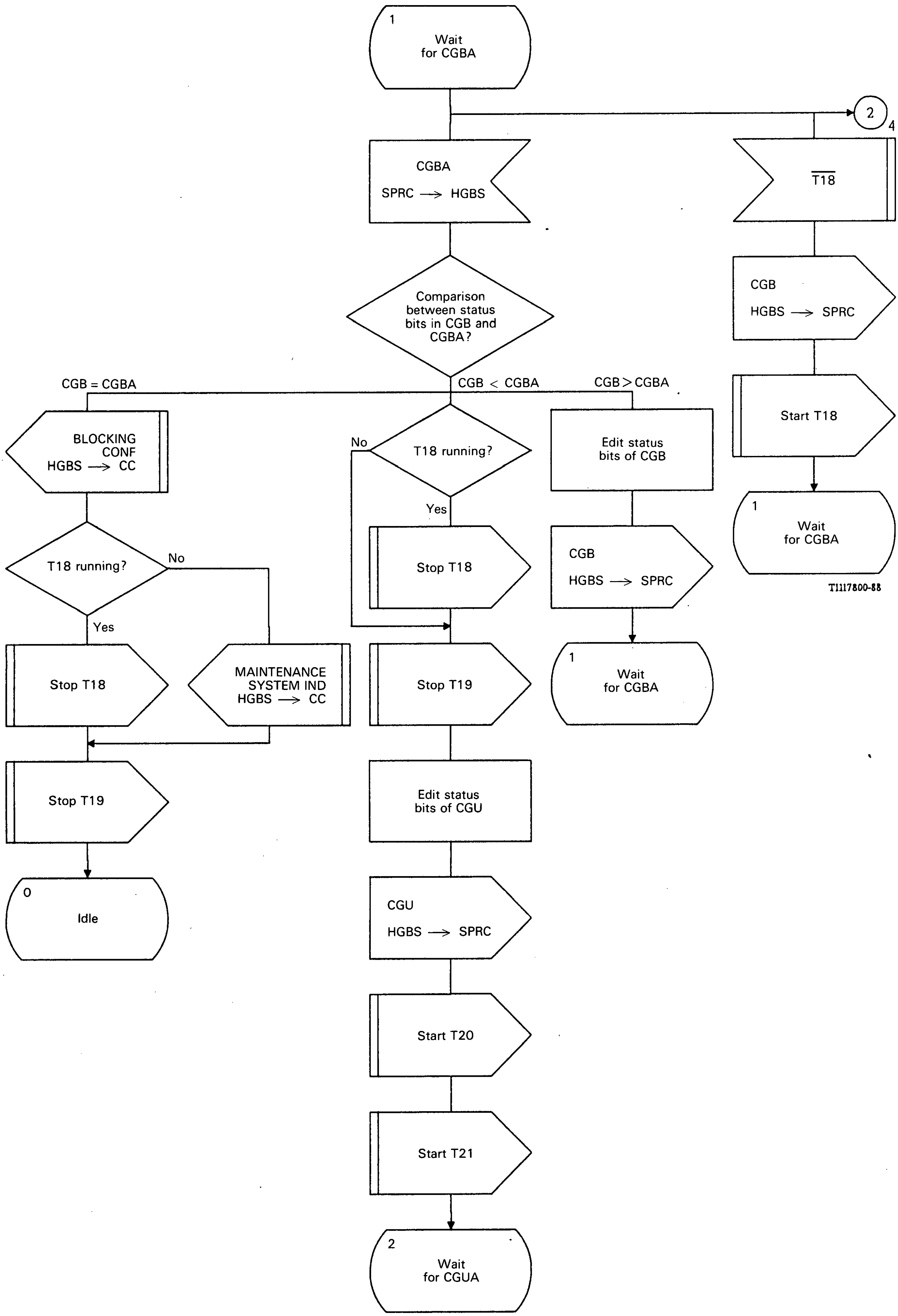


FIGURE B-31/Q.764
(Sheet 3 of 6)
Hardware Failure Oriented Circuit Group Blocking and Unblocking Sending (HGBS)

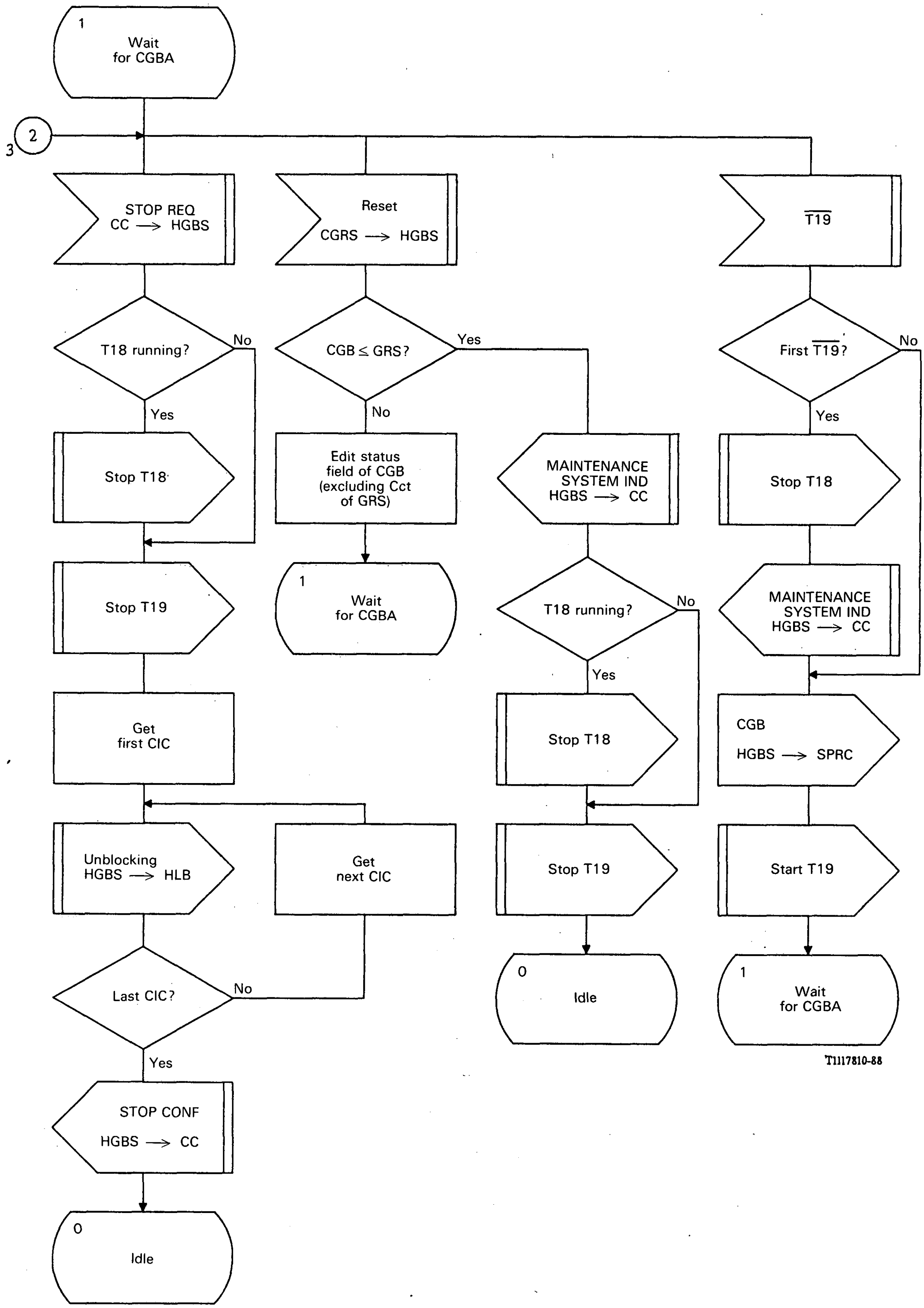


FIGURE B-31/Q.764
(Sheet 4 of 6)

Hardware Failure Oriented Circuit Group Blocking and Unblocking Sending (HGBS)

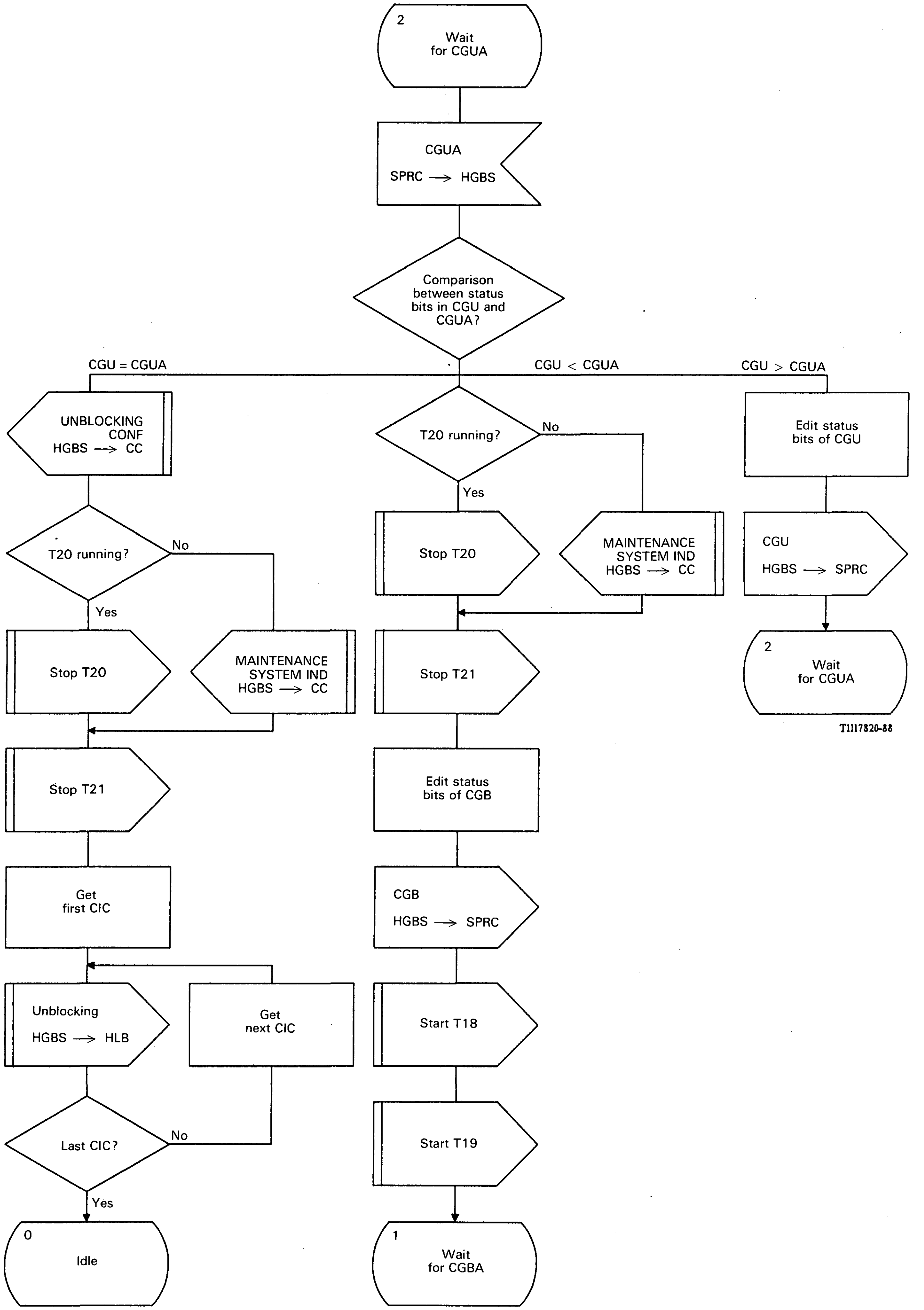


FIGURE B-31/Q.764
(Sheet 5 of 6)
Hardware Failure Oriented Circuit Group Blocking and Unblocking Sending (HGBS)

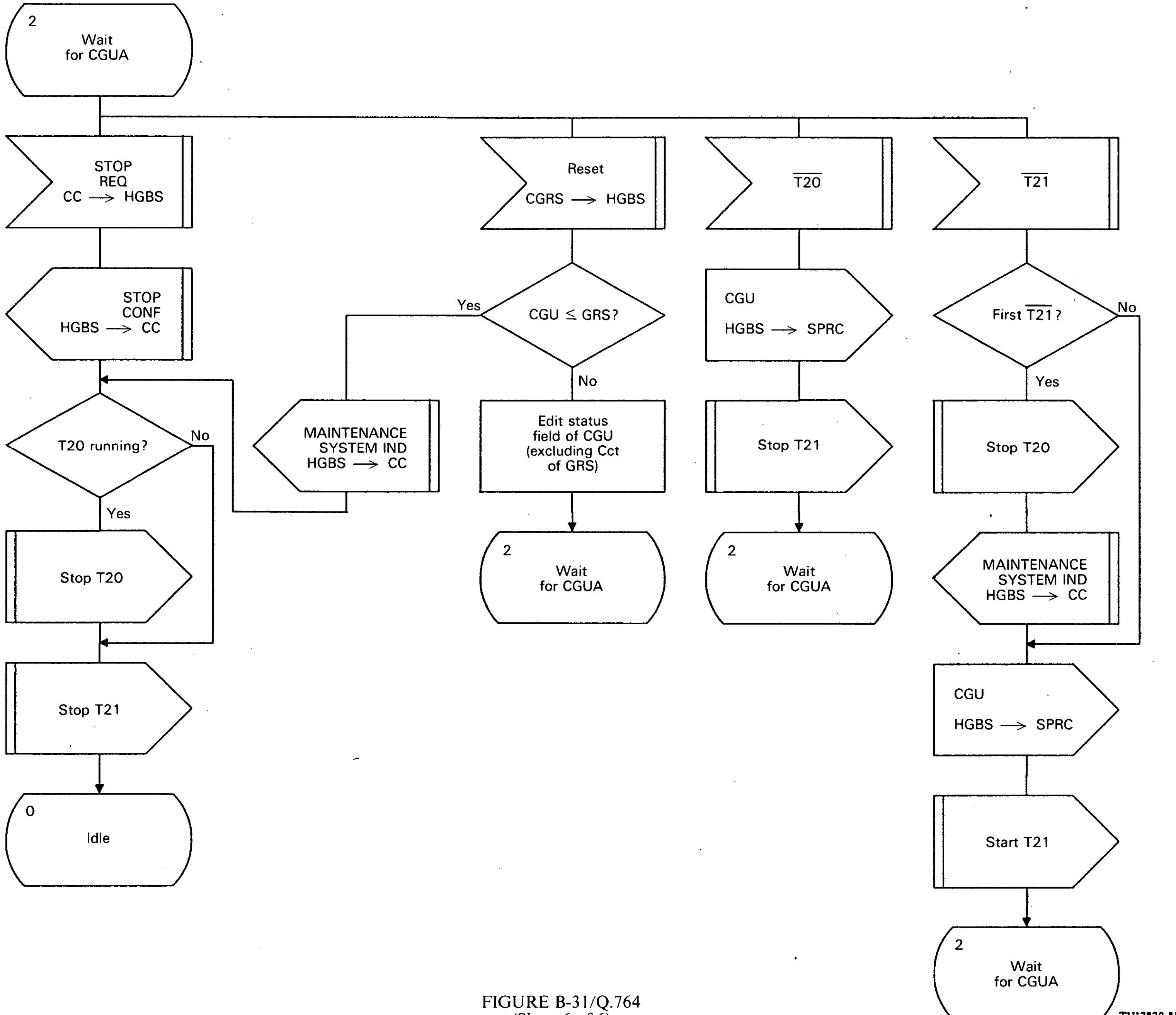


FIGURE B-31/Q.764
(Sheet 6 of 6)

Hardware Failure Oriented Circuit Group Blocking and Unblocking Sending (HGBS)

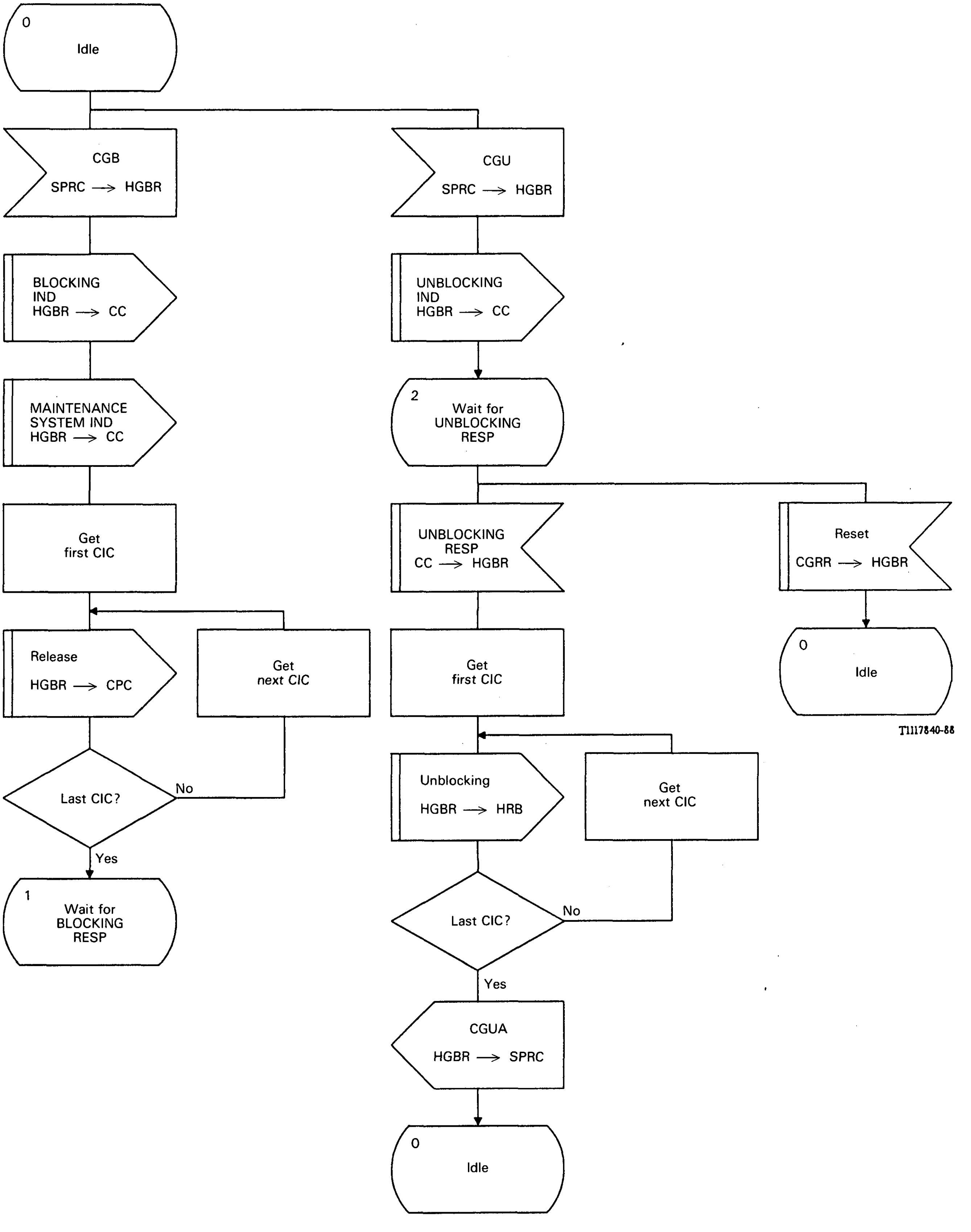
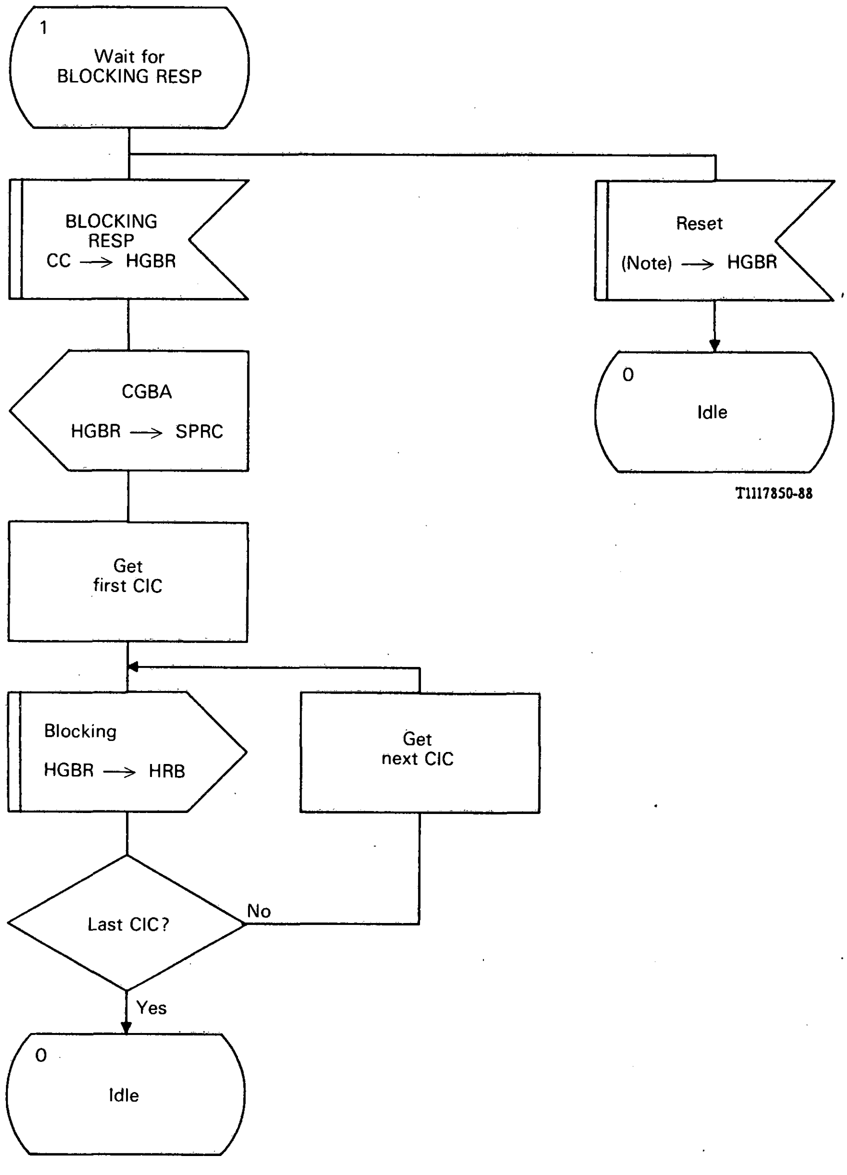


FIGURE B-32/Q.764
(Sheet 1 of 2)

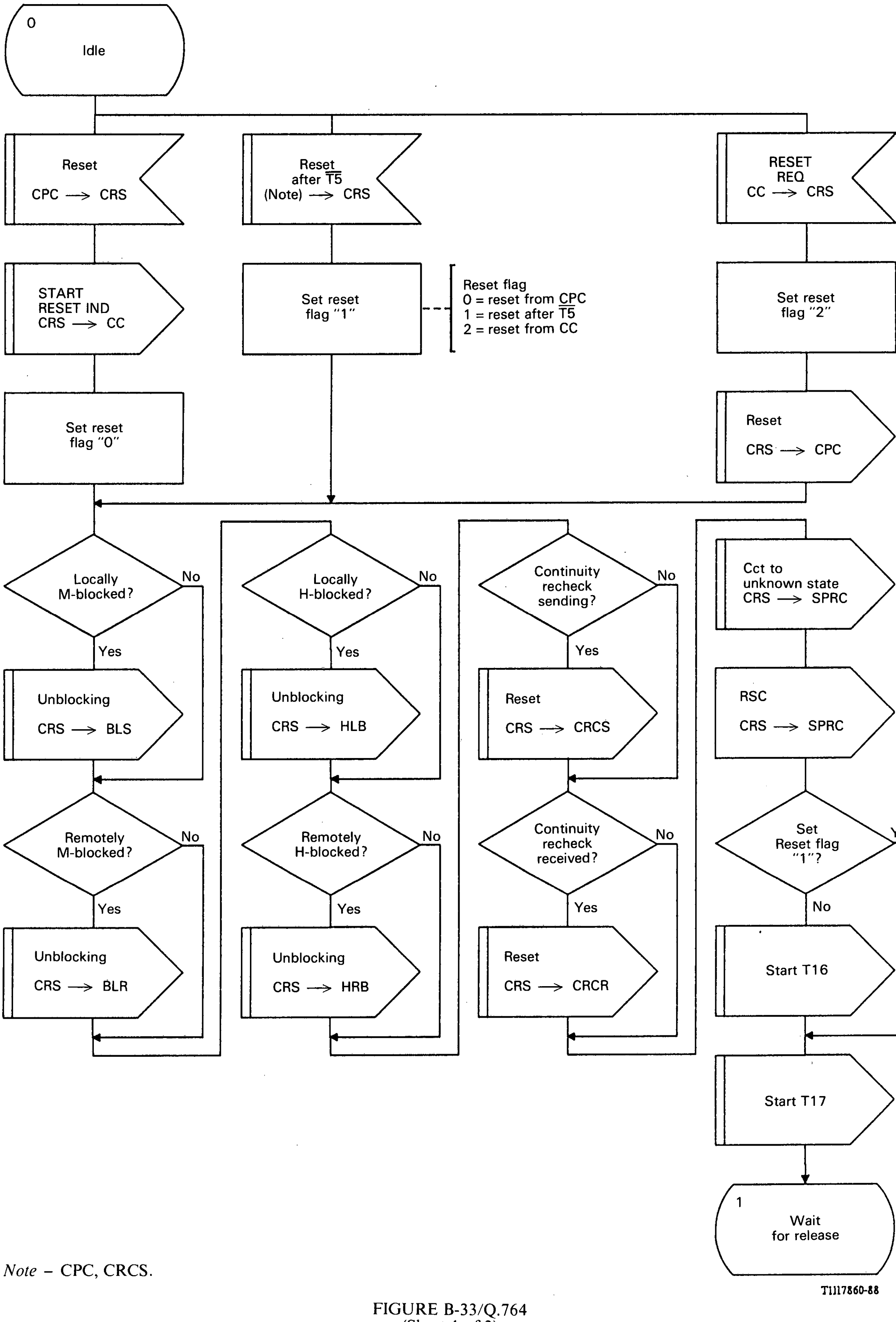
Hardware Failure Oriented Circuit Group Blocking and Unblocking Reception (HGBR)



Note – CGRS, CGRR.

FIGURE B-32/Q.764
(Sheet 2 of 2)

Hardware Failure Oriented Circuit Group Blocking and Unblocking Reception (HGBR)



Note – CPC, CRCS.

FIGURE B-33/Q.764
(Sheet 1 of 3)

Circuit Reset Sending (CRS)

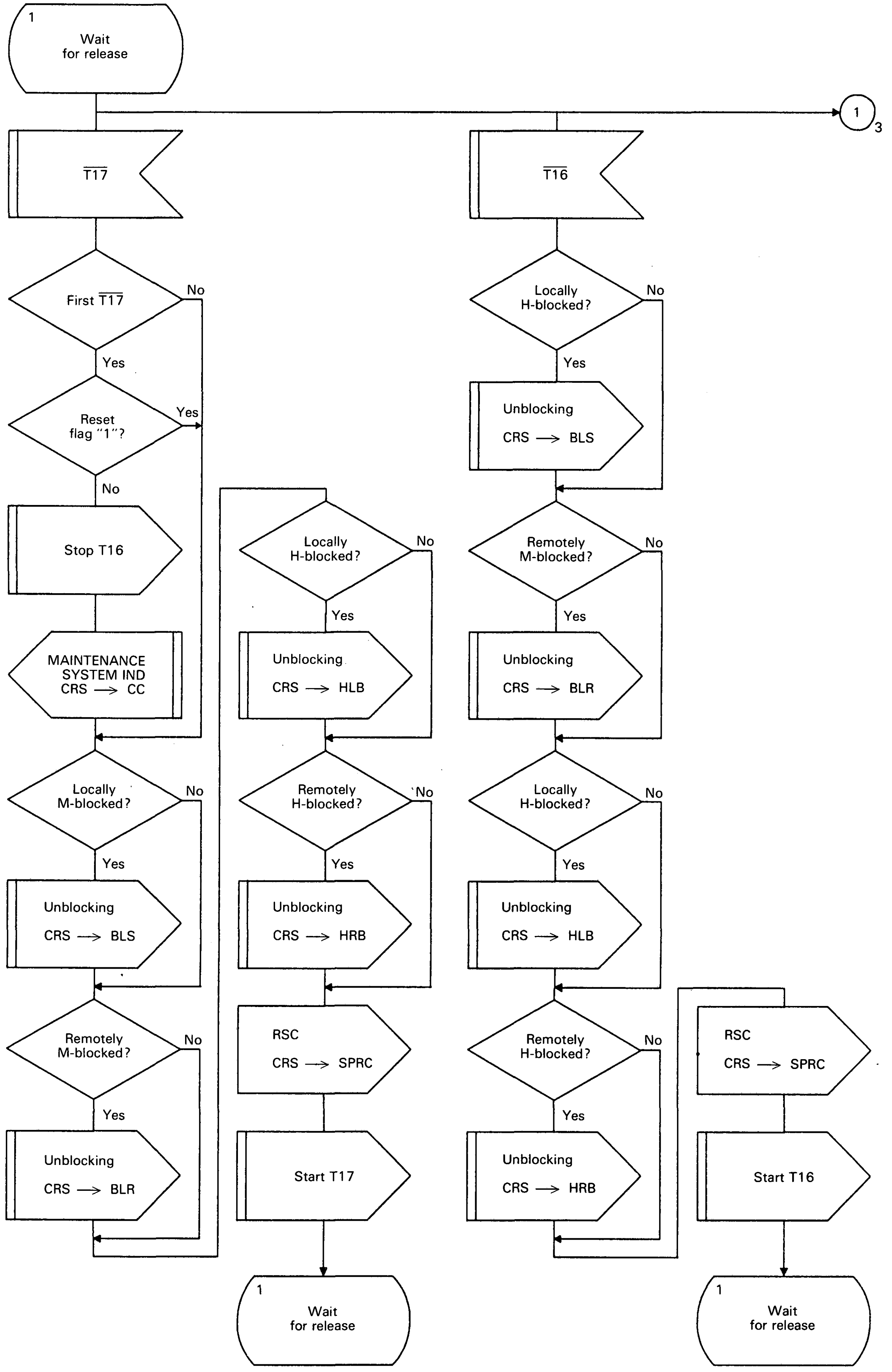


FIGURE B-33/Q.764
(Sheet 2 of 3)

Circuit Reset Sending (CRS)

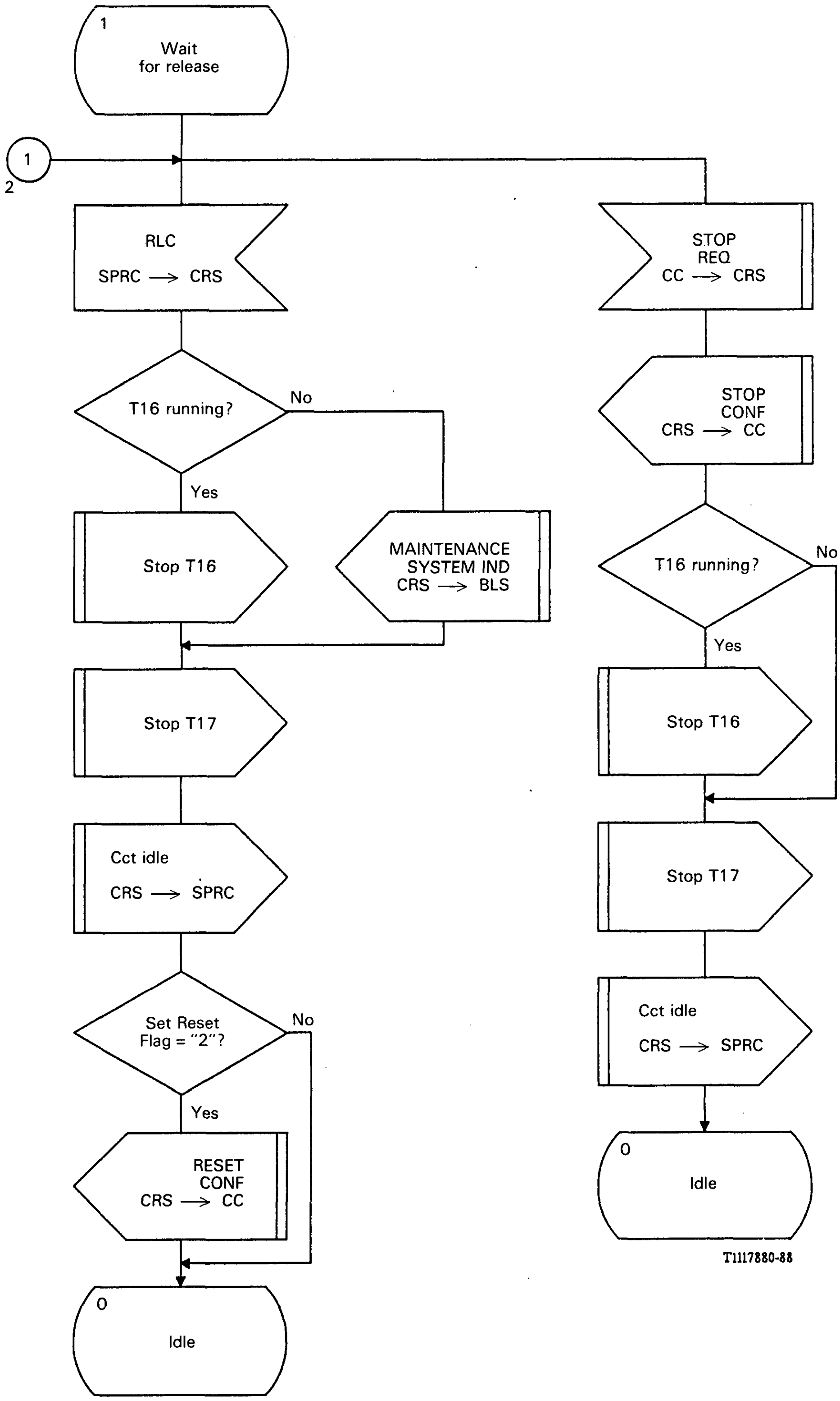


FIGURE B-33/Q.764
(Sheet 3 of 3)
Circuit Reset Sending (CRS)

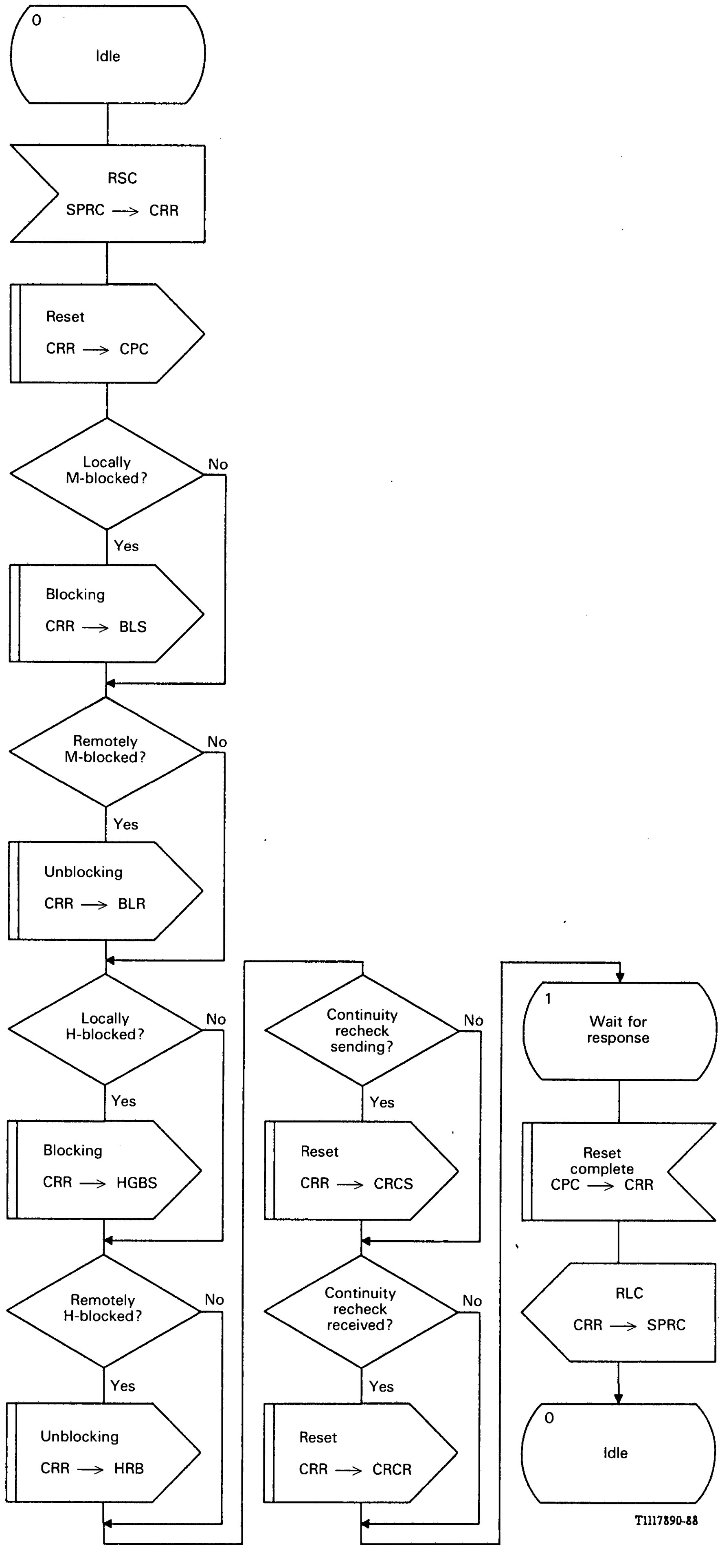
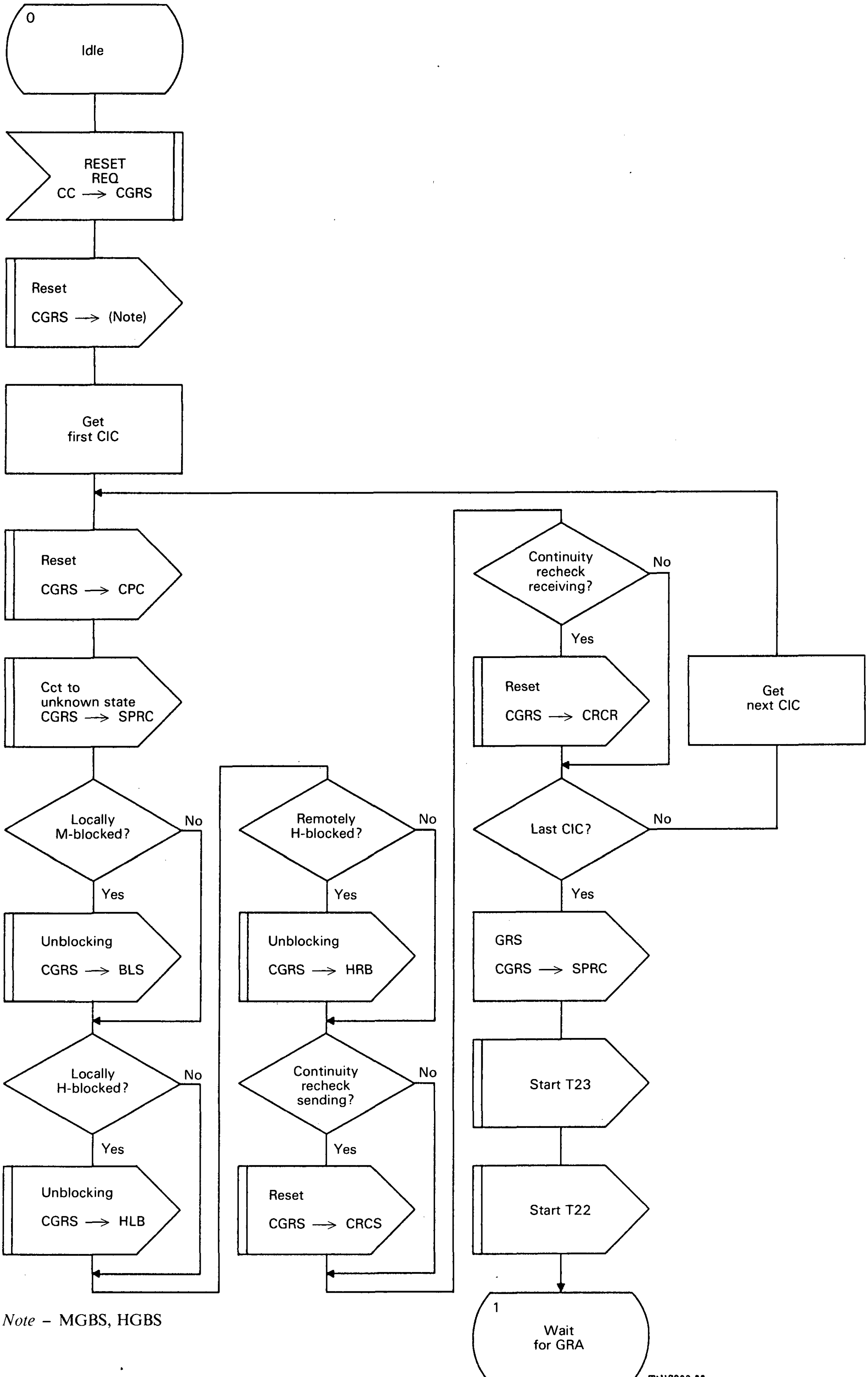


FIGURE B-34/Q.764

Circuit Reset Reception (CRR)



Note – MGBS, HGBS

FIGURE B-35/Q.764
(Sheet 1 of 3)
Circuit Group Reset Sending (CGRS)

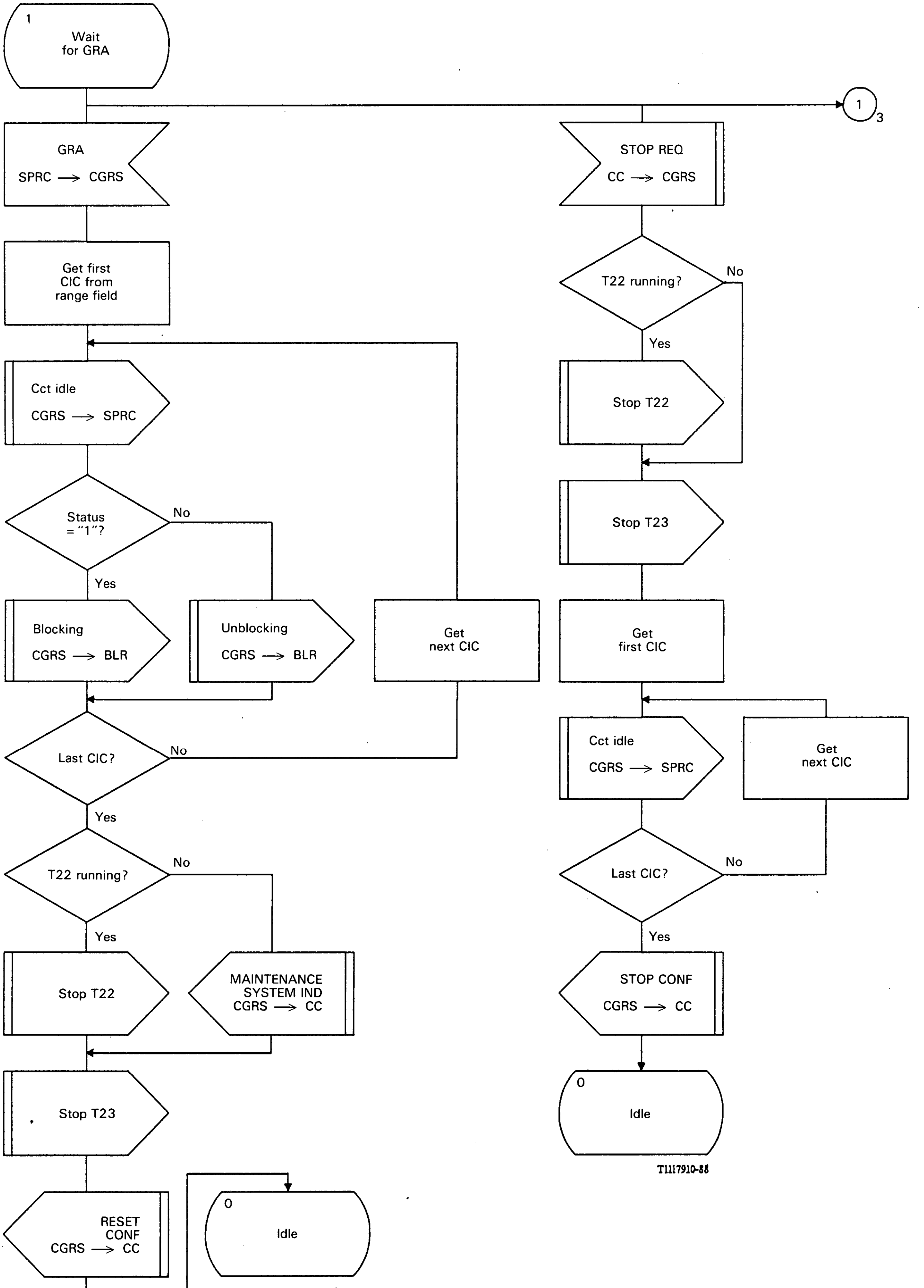


FIGURE B-35/Q.764
(Sheet 2 of 3)
Circuit Group Reset Sending (CGRS)

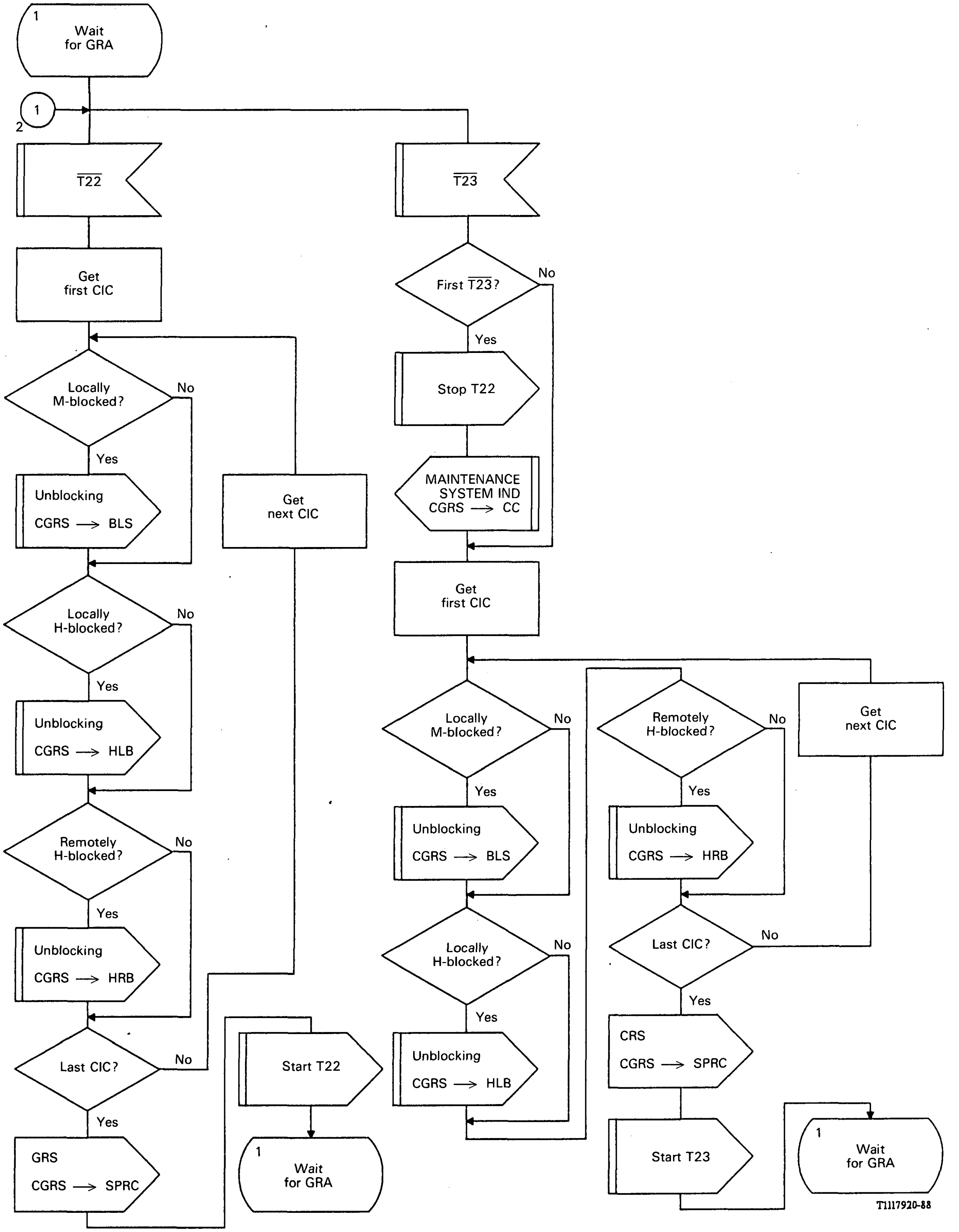
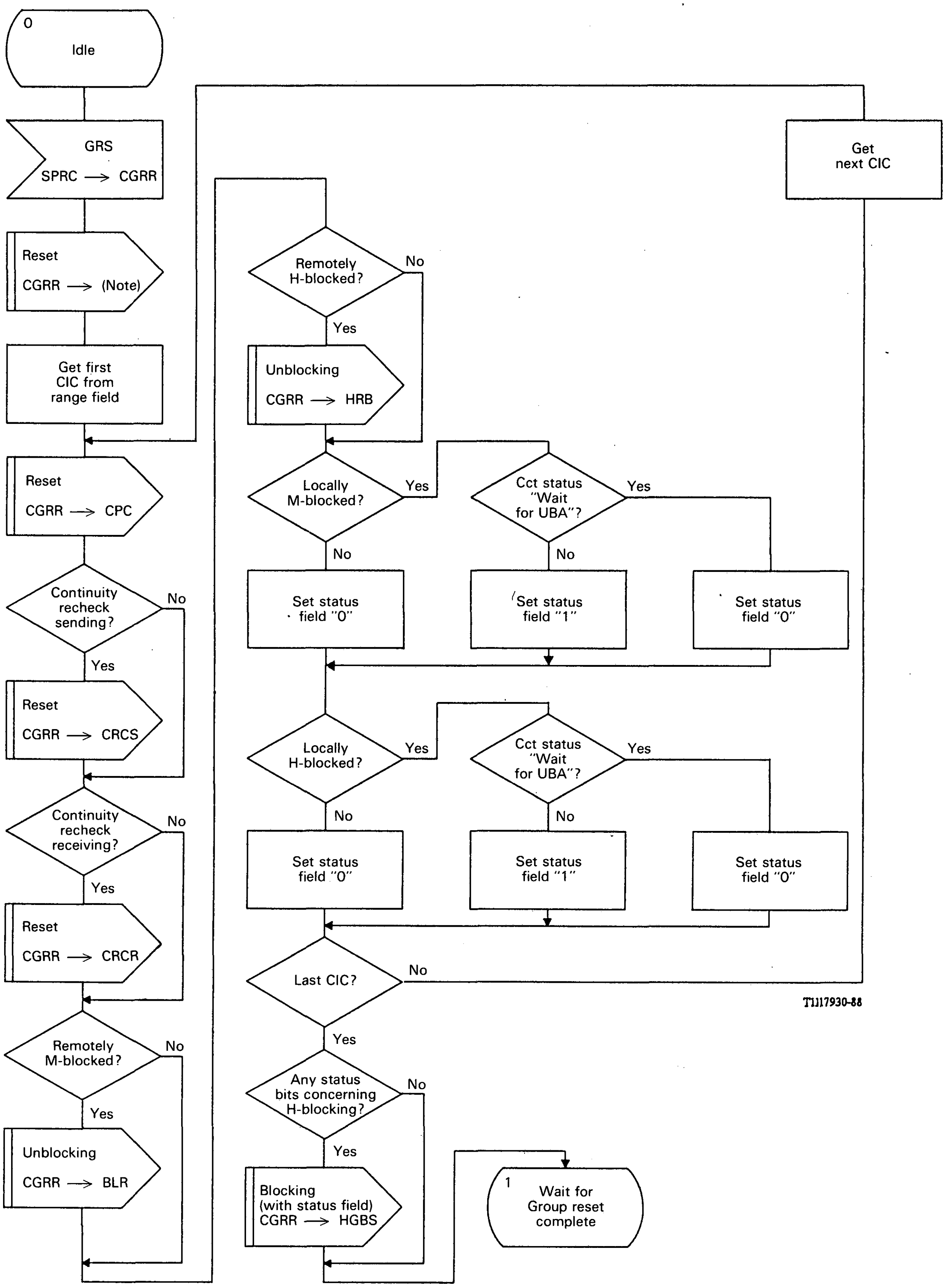


FIGURE B-35/Q.764
(Sheet 3 of 3)

Circuit Group Reset Sending (CGRS)



Note – MGBR, HGBR

FIGURE B-36/Q.764
(Sheet 1 of 2)

Circuit Group Reset Reception (CGRR)

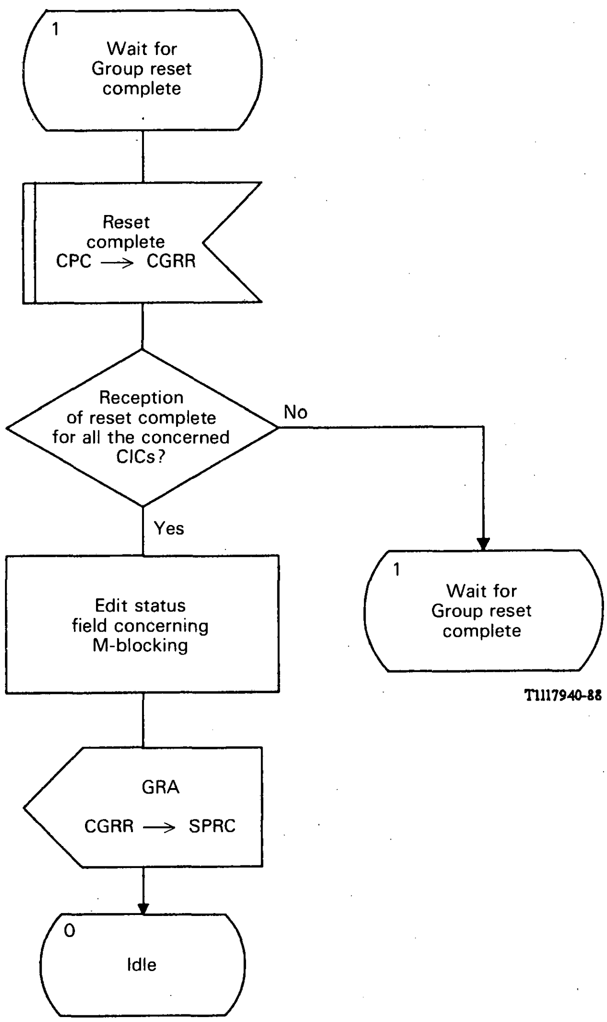


FIGURE B-36/Q.764
(Sheet 2 of 2)

Circuit Group Reset Reception (CGRR)

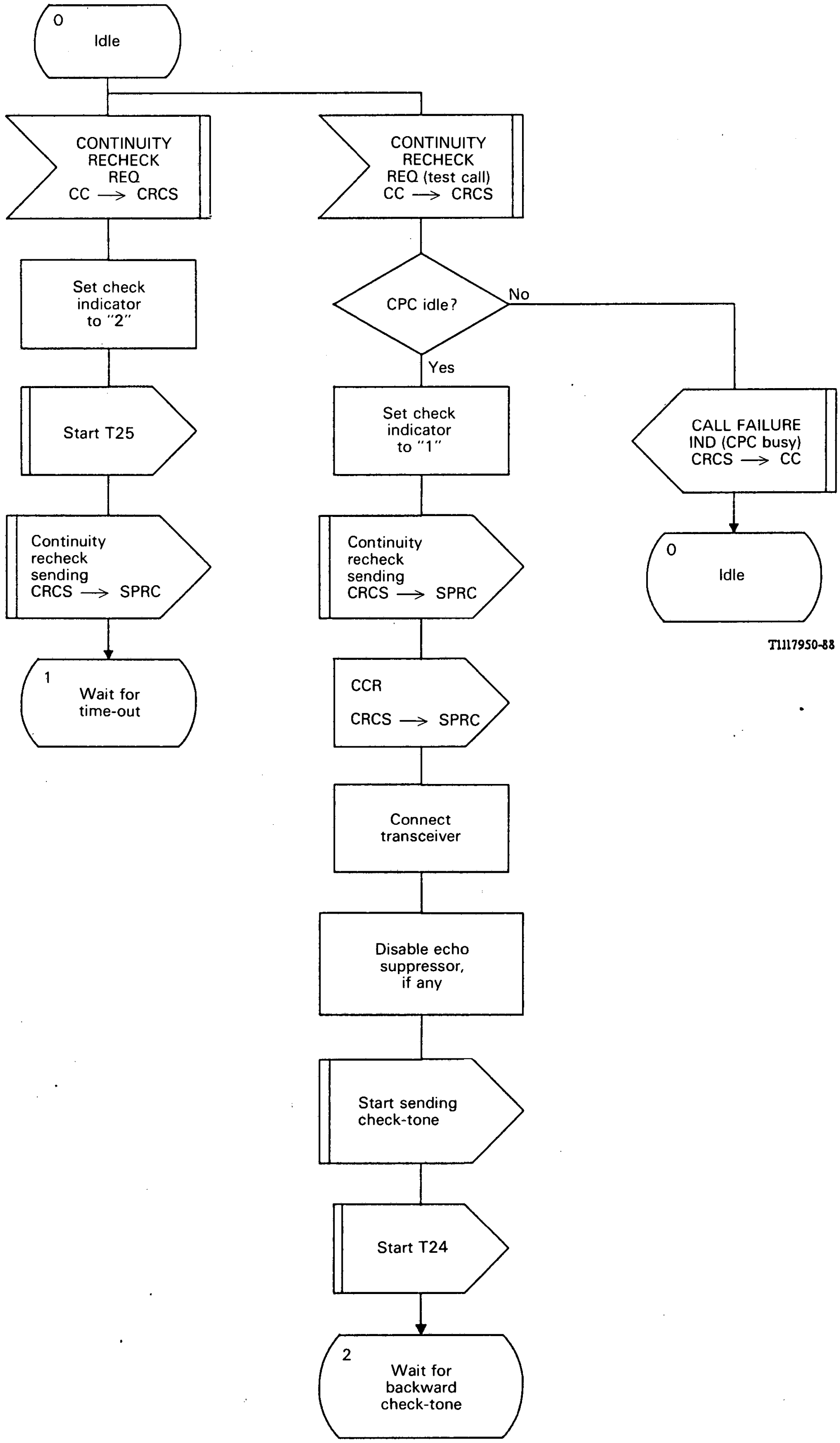
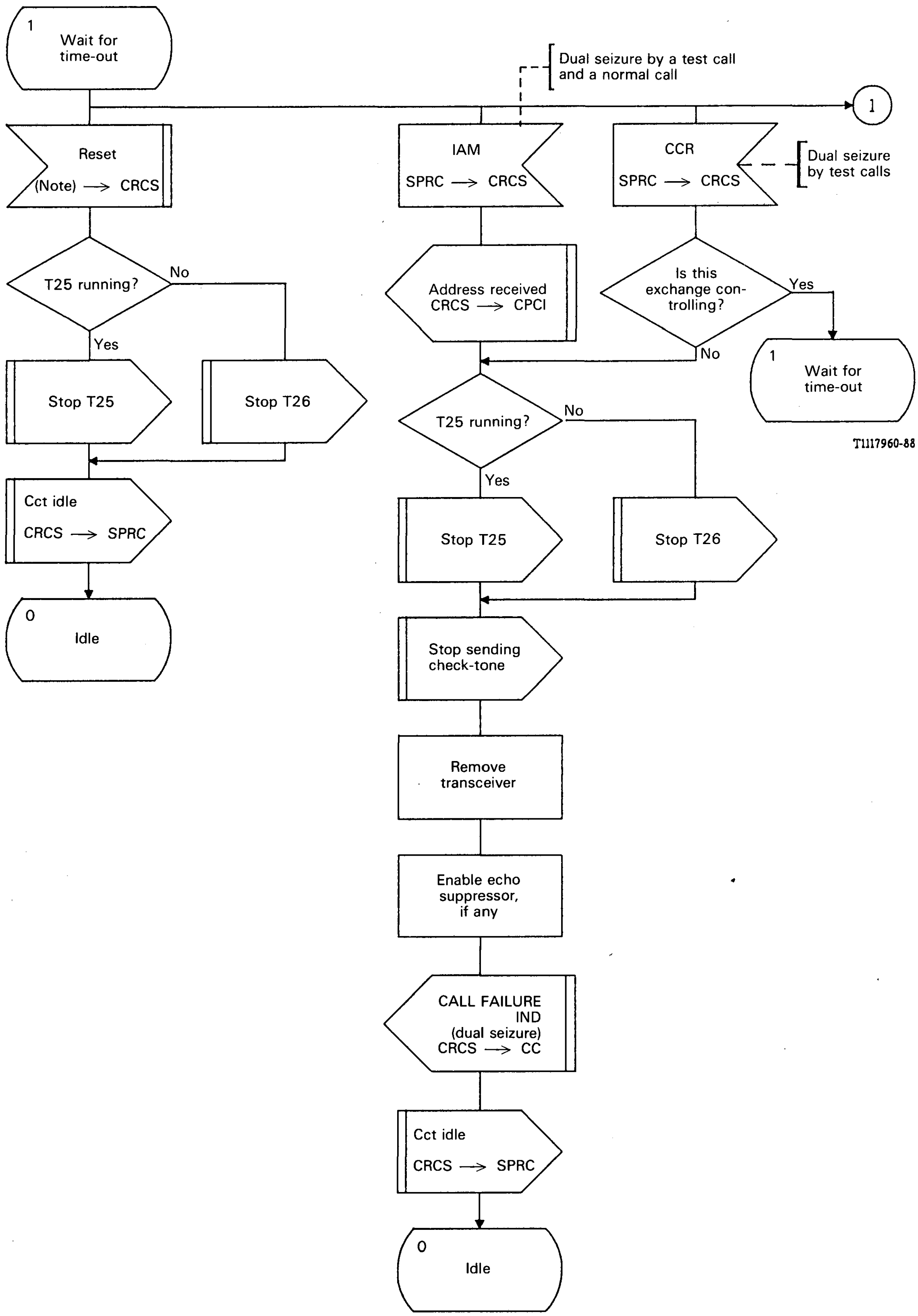


FIGURE B-37/Q.764
(Sheet 1 of 6)

Continuity Recheck Sending (CRCS)



Note – CRS, CRR, CGRS, CGRR.

FIGURE B-37/Q.764
(Sheet 2 of 6)

Continuity Recheck Sending (CRCS)

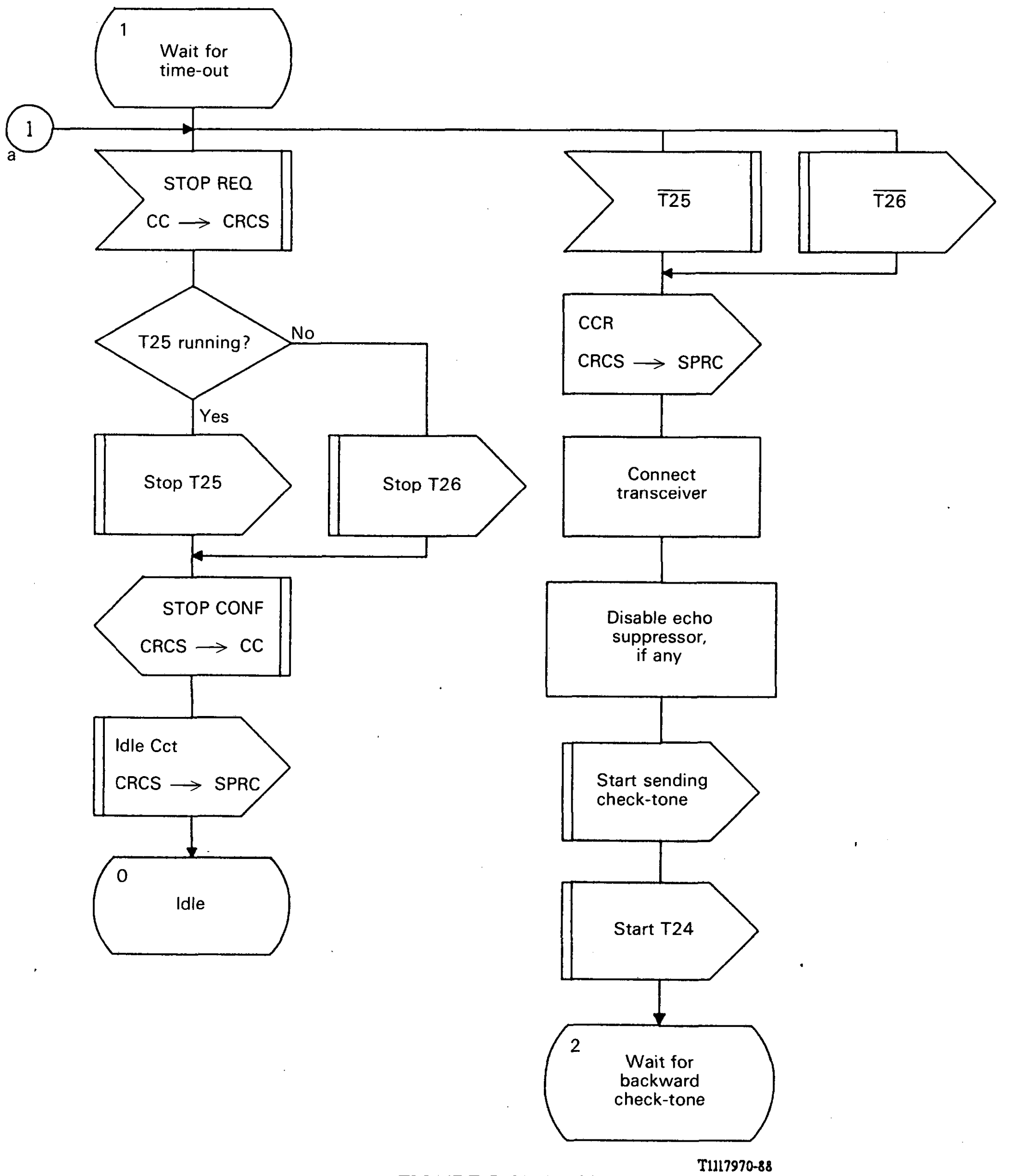


FIGURE B-37/Q.764
(Sheet 3 of 6)

Continuity Recheck Sending (CRCS)

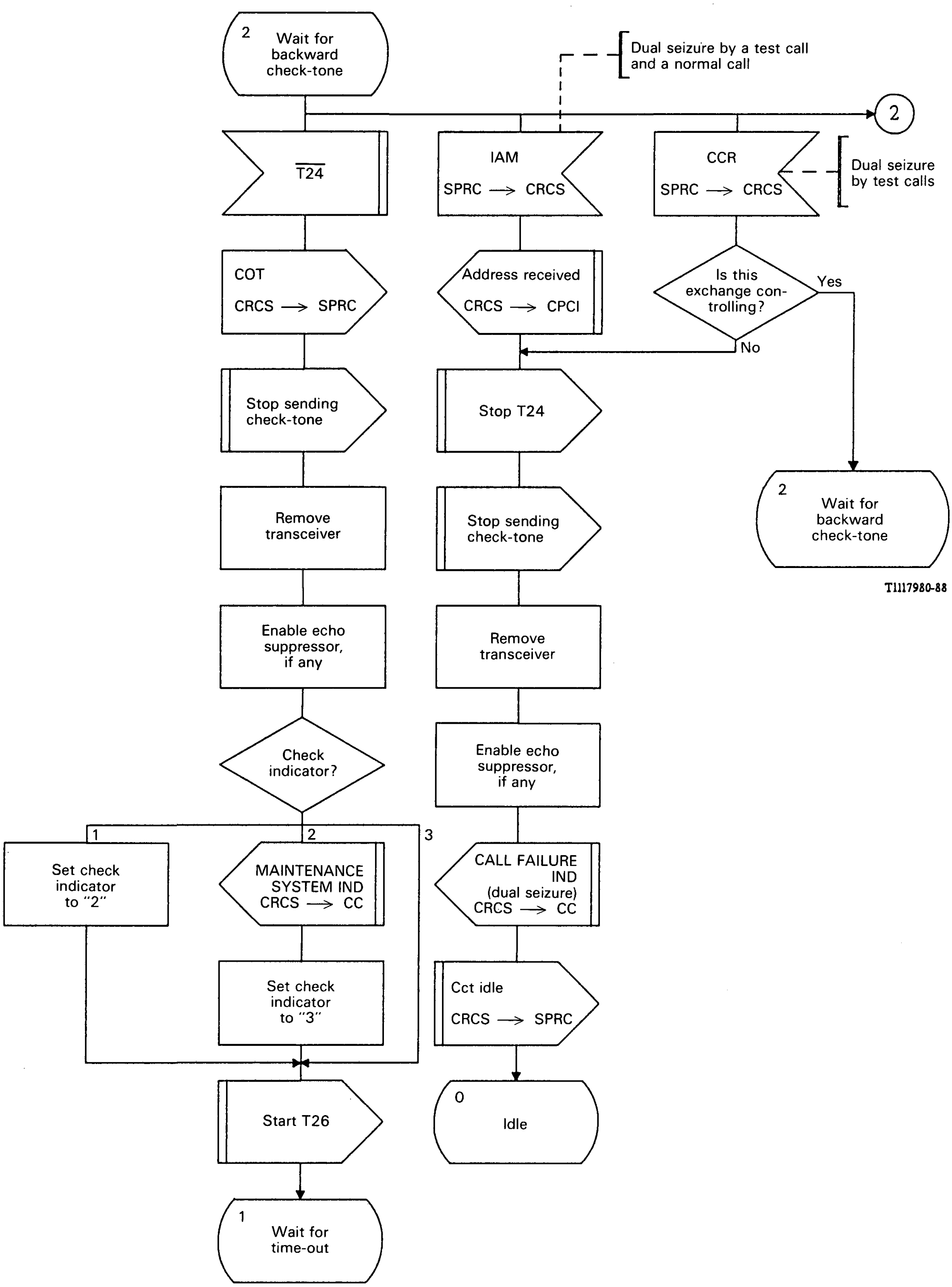
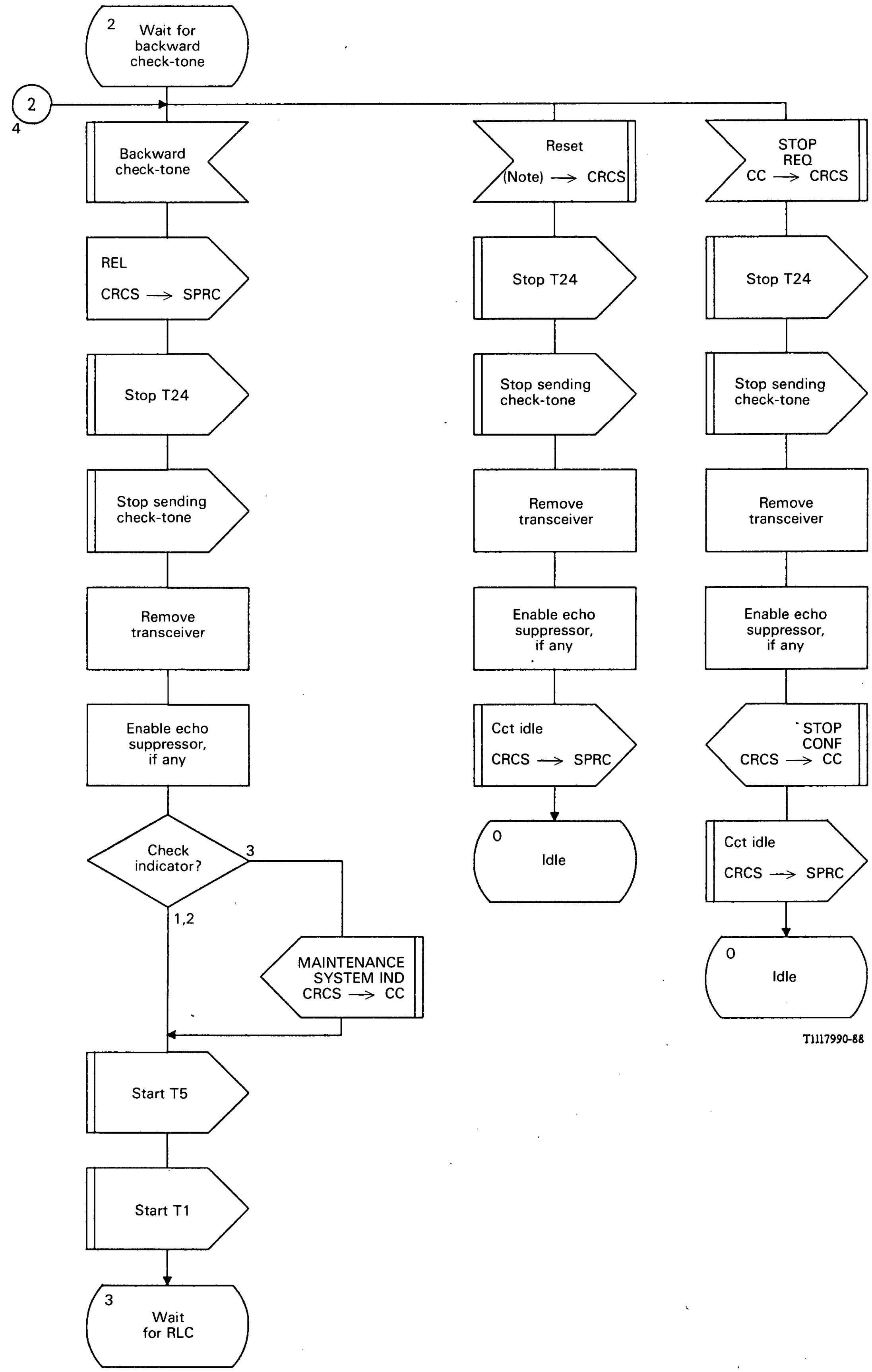


FIGURE B-37/Q.764
(Sheet 4 of 6)

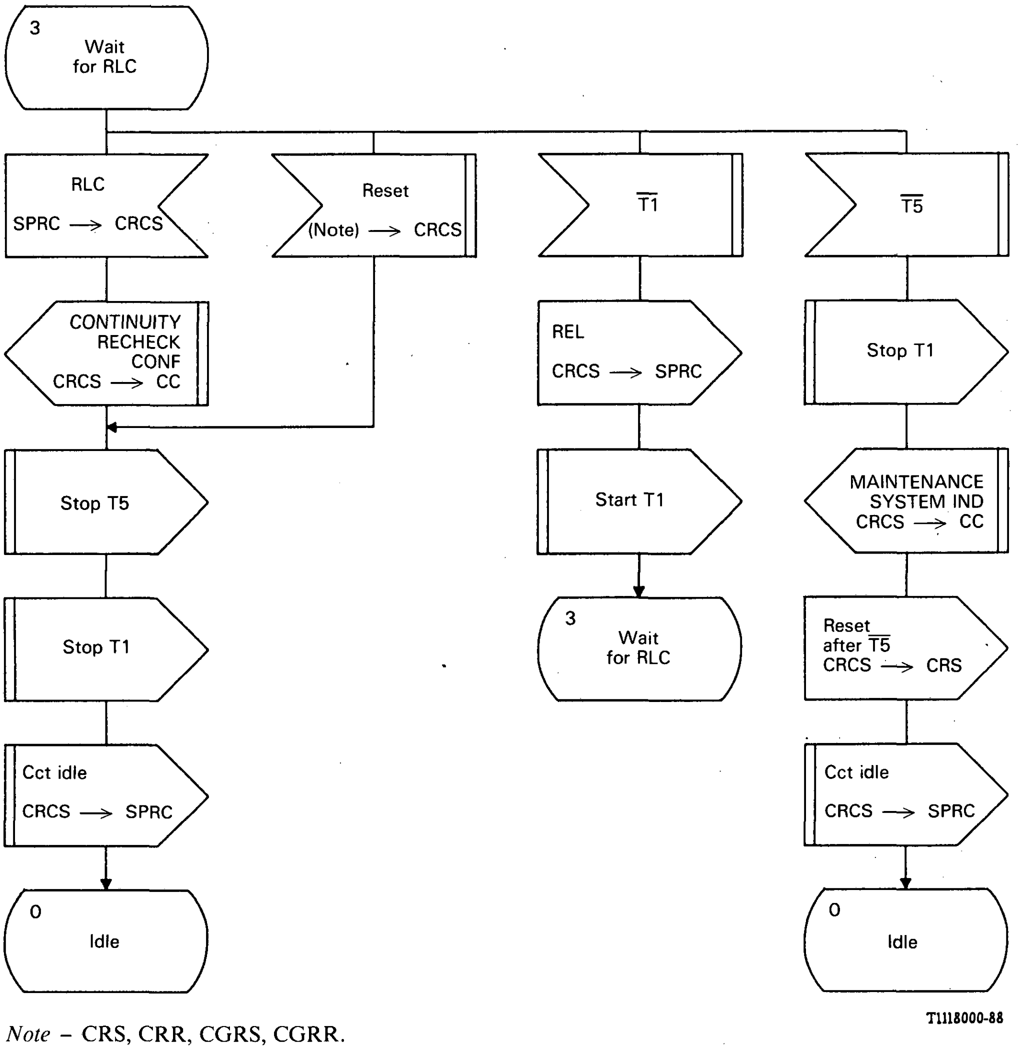
Continuity Recheck Sending (CRCS)



Note – CRS, CRR, CGRS, CGRR.

FIGURE B-37/Q.764
(Sheet 5 of 6)

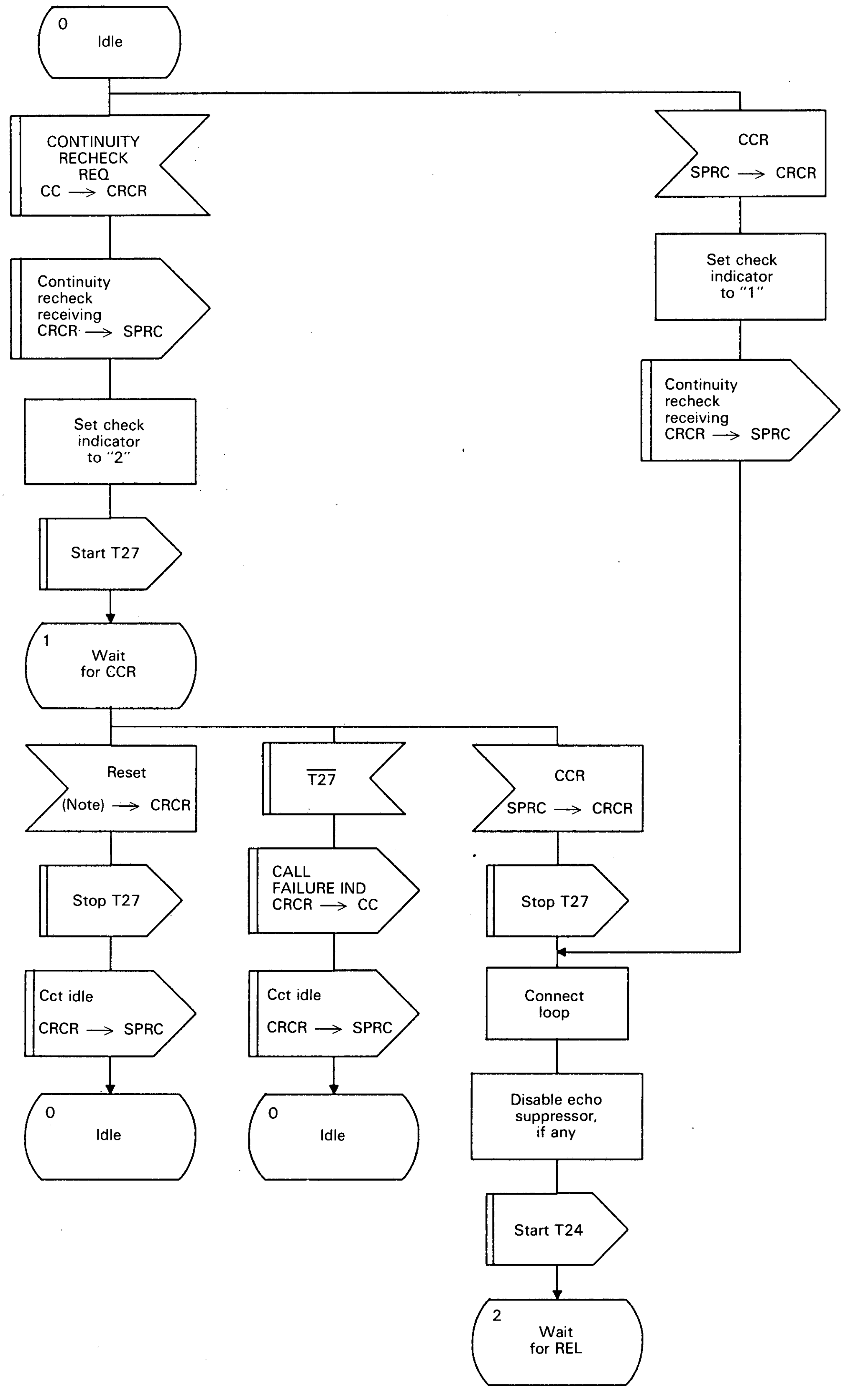
Continuity Recheck Sending (CRCS)



Note – CRS, CRR, CGRS, CGRR.

FIGURE B-37/Q.764
(Sheet 6 of 6)

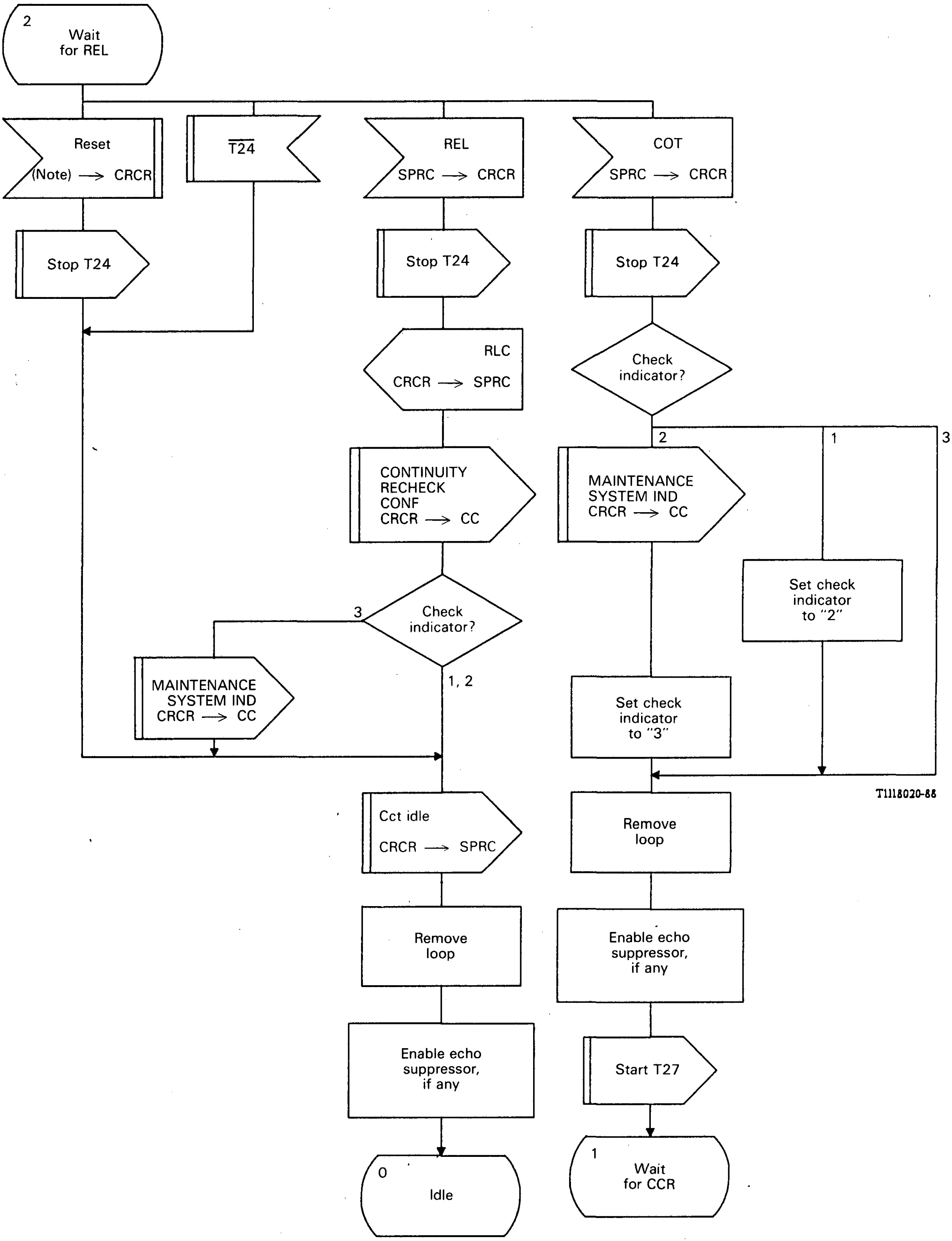
Continuity Recheck Sending (CRCS)



Note – CRS, CRR, CGRS, CCRR.

FIGURE B-38/Q.764
(Sheet 1 of 2)

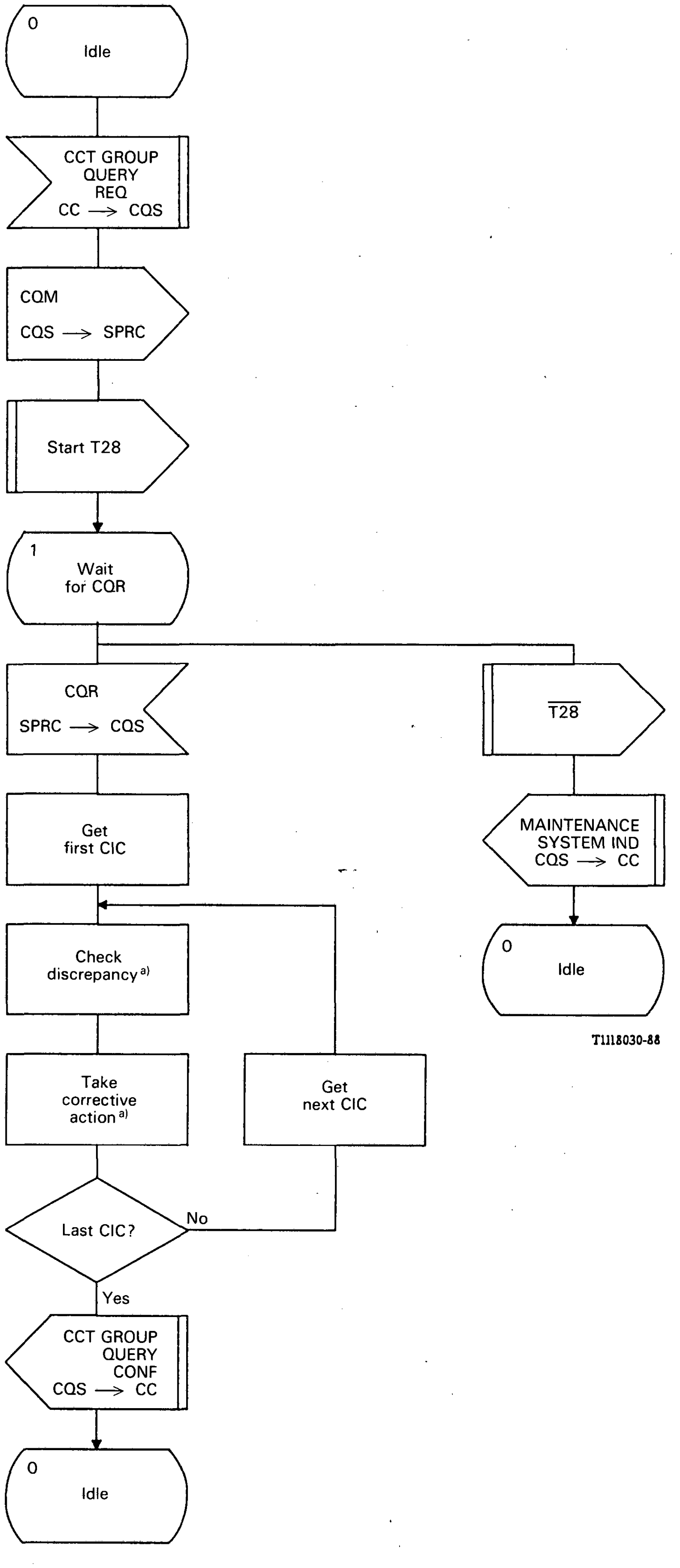
Continuity Recheck Reception (CRCR)



Note – CRS, CRR, CGRS, CGRR.

FIGURE B-38/Q.764
(Sheet 2 of 2)

Continuity Recheck Reception (CRCR)



a) To be specified.

FIGURE B-39/Q.764

Circuit Group Query Sending (CQS)

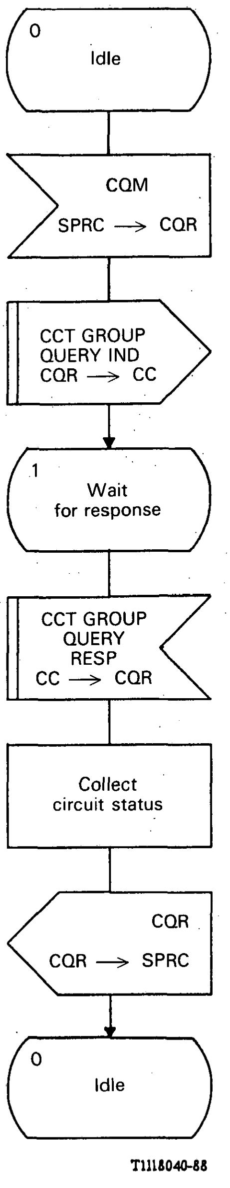


FIGURE B-40/Q.764

Circuit Group Query Reception (CQR)

APPENDIX I

(to Recommendation Q.764)

Contents of the interface elements between the ISDN user part and the SCCP

These interface elements are defined in SCCP Recommendations (Q.711-Q.716) and are included here for information.

I.1 *Contents of the REQUEST type 1*

The REQUEST type 1 interface element may contain the following parameters:

- connection identification (for further study);
- receipt confirmation selection;
- expedited data selection;
- quality of service parameter set.

I.2 *Contents of the REQUEST type 2*

The REQUEST type 2 interface element may contain the following parameters:

- network indicator (for further study);
- protocol class;
- credit;
- connection identification (for further study);
- source local reference;
- originating signalling point code;
- reply request;
- refusal indicator.

I.3 *Contents of the REPLY*

The REPLY interface element may contain the following parameters:

- source local reference;
- protocol class;
- credit;
- connection identification (for further study).

Recommendation Q.766

PERFORMANCE OBJECTIVES IN THE INTEGRATED SERVICES DIGITAL NETWORK APPLICATION

1 Introduction

This Recommendation gives the requirements of the Integrated Services Digital Network (ISDN) application call control service supported by Signalling System No. 7.

In Recommendation Q.706, the Message Transfer Part performance is described. The Message Transfer Part supports the ISDN application of Signalling System No. 7 and provision of a signalling network to support the ISDN application must take account of the performance of the Message Transfer Part and the requirements of the ISDN application. For example, taking account of the message transfer times in Recommendation Q.706 and the requirements for message transfer times between two ISDN exchanges, a figure may be derived for the total permissible number of signalling links in tandem for a particular call.

2 Signalling availability

2.1 *Signalling route set availability*

The availability of a signalling route set is determined by the availability of the individual components of the signalling network (signalling links and the signalling points) and by the structure of a signalling network.

The availability of a signalling route set should not be less than 0.99998, corresponding to a downtime of 10 minutes per year for a user signalling relation.

2.2 *Signalling network availability*

The availability of the signalling network should be sufficiently high as to meet the signalling route set downtime objectives stated in § 2.1. The signalling network architecture selected will strongly influence the availability. In general, the greater the number of link sets in tandem in a signalling route set the more redundant signalling paths that will be needed to meet the availability objective for the signalling route set or user signalling relation.

3 Signalling dependability

3.1 *General*

The ISDN application is different from other applications, such as telephony and data, in that there may be multiple paths involved for any given ISDN call. There may be several circuits (e.g. telephone conferencing) for either telephony or data and non-circuit related connections for access to data bases or for terminal-to-terminal control. This diverse set of uses may require closer control of the signalling network resources than might be required for other more simple applications.

3.1.1 *Probability of false operation*

By means of error detection (see Recommendation Q.703) as well as transmission fault indication (see Recommendations G.732 [1] and G.733 [2], it is ensured that, overall, not more than one in 10^8 of all signal units transmitted is accepted that, due to errors, will cause false operation.

3.2 *Probability of signalling malfunction*

Unsuccessful calls may be caused by undetected errors, loss of messages, or messages delivered out of sequence (during emergency situations within the signalling network) and may result in:

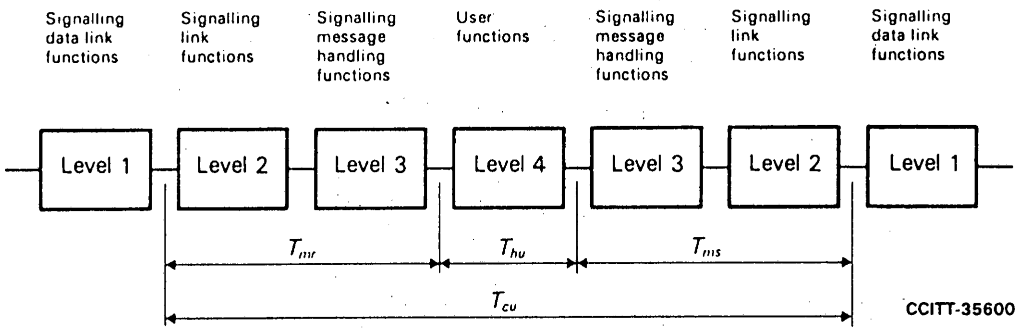
- incomplete call set-up,
- misrouted calls (e.g. connection of wrong numbers),
- calls routed correctly but mishandled (e.g. false clearing),
- inability to access a data base.

Considering the above conditions and the performance for the Message Transfer Part, no more than 2 in 10^5 (provisional value) of all ISDN calls should be unsuccessful due to signalling malfunction.

Note – No more than 1 in 10^5 of all ISDN *circuit connections* should be unsuccessful due to signalling malfunction.

4 Signalling delay

4.1 *Functional reference points and transfer time components*



4.2 *Delays*

4.2.1 **cross-office transfer time, T_{cu}**

T_{cu} is the period which starts when the last bit of the signal unit leaves the incoming signalling data link and ends when the last bit of the signal unit enters the outgoing signalling data link for the first time. It therefore includes the queuing delay in the absence of disturbances but not the additional queuing delay caused by retransmission.

4.2.2 **user handling time, T_{hu}**

T_{hu} is the period which starts when the last bit of the message has entered the upper layer functions and ends when the last bit of the derived message has left the upper layer functions.

4.2.3 *Objectives for cross-office transfer time, T_{cu}*

The figures in Table 1/Q.766 are the objectives for the cross-office transfer time T_{cu} for the ISDN signalling points in the signalling network. These figures are related to a signalling bit rate of 64 kbit/s.

TABLE 1/Q.766 [1)]

Message type	Exchange call attempt loading	Cross-office transfer time T_{cu} (ms)	
		Mean	95%
Simple (e.g., answer)	Normal +15% +30%	110 165 275	220 330 550
Processing intensive (e.g., IAM)	Normal +15% +30%	180 270 450	360 540 900

[1)] Provisional values.

A processing intensive message is one that arrives at an exchange and requires detailed examination (and possibly modification) before it is transmitted to the next exchange.

A simple message is one that requires little or no examination or modification (typically only label translation) before it is transmitted to the next exchange.

4.3 *Effect of retransmission*

As a consequence of correction by retransmission, not more than one in 10^4 signals should be delayed more than 300 ms as a long-term average. This requirement refers to each signalling link.

This requirement is laid down in order to ensure satisfactory answer delays.

5 Signalling system limitations

5.1 *Labelling potential*

5.1.1 *Signalling points*

The label of the Signalling System No. 7 for the ISDN application provides the potential to identify 16 384 signalling points.

5.1.2 *Number of circuits in a user signalling relation*

There may be up to 4096 circuits (4096 channels in each direction) for each user signalling relation.

5.1.3 *Number of SCCP connections in a user signalling relation*

There may be up to 2^{24} SCCP connections available at an ISDN signalling point. All of these may be available for any given user signalling relation, but must be shared over all signalling relations.

5.2 *Number of ISDN call identities at a signalling point*

There may be up to 2^{24} (value for further study) simultaneous ISDN calls at a signalling point with the 2^{24} call identities available. The use of ISDN call identities is for further study.

References

[1] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s*, Rec. G.732.

[2] CCITT Recommendation *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s*, Rec. G.733.

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GLOSSARY OF TERMS USED IN SIGNALLING SYSTEM No. 7

acknowledgement

F: accusé de réception

S: acuse de recibo

A service of the SCCP by which the receiver of the message informs the sender of the correct receipt.

available signalling link

F: canal sémaphore disponible

S: enlace de señalización disponible

A signalling link which has successfully completed the initial alignment procedures and carries (or is ready to carry) signalling traffic.

adjacent signalling points

F: points sémaphores adjacents

S: puntos de señalización adyacentes

Two signalling points that are directly interconnected by (a) signalling link(s).

alignment error rate monitoring

F: surveillance du taux d'erreur pendant la procédure d'alignement

S: monitor de tasa de errores en la alineación

A procedure by which the error rate of signalling link is measured during the initial alignment.

alternative routing (of signalling)

F: acheminement (de signalisation) de secours

S: encaminamiento alternativo (de señalización)

The routing of a given signalling traffic flow in case of failures affecting the signalling links, or routes, involved in the normal routing of that signalling traffic flow.

analogue signalling data link

F: liaison sémaphore de données analogique

S: enlace analógico de datos de señalización

The data link that provides an interface to signalling terminals and is made up of voice-frequency analogue transmission channels and modems.

application

F: application

S: aplicación

The set of user's requirements.

application entity (AE)

F: entité d'application (AE)

S: entidad de aplicación (EA)

A set of Application Service Elements which together perform all or part of the communications aspects of an application process. The Application Entity is addressed through an SCCP subsystem number.

application process

F: processus d'application

S: proceso de aplicación

An element which performs the information processing for a particular application.

application service element (ASE)

F: élément de service d'application (ASE)

S: elemento del servicio aplicación (ESA)

A coherent set of integrated functions within an application entity which provides an OSI environment capability, using underlying services where appropriate.

associated mode (of signalling)

F: mode (de signalisation) associé

S: modo (de señalización) asociado

The mode where messages for a signalling relation involving two adjacent signalling points are conveyed over a directly interconnecting signalling link.

backward indicator bit (BIB)

F: bit indicateur vers l'arrière (BIR)

S: bit indicador inverso (bit indicador hacia atrás) (BII)

A bit in a signal unit requesting, by its status change, retransmission at the remote end when a signal unit is received out of sequence.

backward sequence number (BSN)

F: numéro de séquence vers l'arrière (NSR)

S: número secuencial inverso (hacia atrás) (NSI)

A field in a signal unit sent which contains the forward sequence number of a correctly received signal unit being acknowledged.

basic (error correction) method

F: méthode (de correction d'erreur) de base

S: método básico (de corrección de errores)

A non-compelled, positive/negative acknowledgement, retransmission error control system.

called/calling party address

F: adresse du demandé/du demandeur

S: dirección de la parte llamada/llamante

An address within an SCCP message, consisting of any combination of signalling point code, global title and subsystem number.

changeback

F: retour sur canal sémaphore normal

S: retorno al enlace de servicio

The procedure of transferring signalling traffic from one or more alternative signalling links to a signalling link which has become available.

changeback code

F: code de retour sur canal sémaphore normal

S: código de retorno al enlace de servicio

A field in the signalling network management messages used in the changeback procedure; it is used to discriminate messages relating to different changeback procedures performed at the same time towards the same signalling link.

changeover

F: passage sur canal sémaphore de secours

S: paso a enlace de reserva

The procedure of transferring signalling traffic from one signalling link to one or more different signalling links, when the link in use fails or is required to be cleared of traffic.

check bit (CK)

F: bit de contrôle (CRT)

S: bit de control (BC)

A bit associated with a character or block for the purpose of checking the absence of error within the character or block.

check loop

F: boucle pour contrôle de continuité

S: bucle de pruebas de continuidad

A device which is attached to interconnect the Go and Return paths of a circuit at the incoming end of a circuit to permit the outgoing end to make a continuity check on a loop basis.

circuit identification code (CIC)

F: code d'identification de circuit (CIC)

S: código de identificación de circuito (CIC)

Information identifying a circuit between a pair of exchanges, for which signalling is being performed (14 bits in the international ISDN User Part).

circuit validation test (CVT)

F: essai de validation d'un circuit (EVC)

S: prueba de validación del circuito (PVC)

A procedure used to ensure that two exchanges have sufficient and consistent translation data for placing a call on a specific circuit.

class of operation

F: classe d'opération

S: clase de operación

A number indicating whether an operation reports success or failure, failure only, success only or neither.

class of SCCP service

F: classe de service SSCS

S: clase de servicio PCCS

A number chosen by the user of the SCCP to select 1 out of 4 network services provided by the SCCP.

combined link set

F: faisceau combiné de canaux sémaphores

S: conjunto combinado de enlaces

A load sharing collection of one or more link sets.

common channel signalling

F: signalisation par canal sémaphore

S: señalización por canal común

A signalling technique in which signalling information relating to a multiplicity of circuits, and other information such as that used for network management, is conveyed over a single channel by addressed messages.

component

F: composant

S: componente

A protocol data unit exchanged between TC-users, via the Component sublayer of Transaction Capabilities.

component correlation

F: corrélation de composants

S: correlación de componentes

The association of operation invocations and replies.

component portion

F: partie composante

S: porción componente

The part of a TC message containing the Components.

connection end-point

F: point terminal de connexion

S: punto extremo de conexión

A signalling point which may be either originating or destination.

connection identification

F: identification de connexion

S: identificación de conexión

A number which identifies unambiguously a certain connection at the interface between the SCCP and a user function.

connection-oriented network service

F: service de réseau en mode connexion

S: servicio de red con conexión

A network service that establishes logical connections between end users before transferring information.

connection section

F: section de connexion

S: sección de conexión

A section of an SCCP connection between endpoints or between an endpoint and an intermediate point or between intermediate points.

connectionless network service

F: service de réseau en mode sans connexion

S: servicio de red sin conexión

A network service that transfers information between end users without establishing a logical connection or virtual circuits.

continuity check

F: contrôle de continuité

S: prueba (verificación) de continuidad

A check made to a circuit or circuits in a connection to verify that an acceptable path (for transmission of data, speech, etc.) exists.

continuity check transponder

F: répondeur pour contrôle de continuité

S: transpondedor (transmisor-respondedor) para pruebas de continuidad

A device which is used to interconnect the Go and Return paths of a circuit at the incoming end which on detection of a check tone, returns another check tone to the originating end to permit a continuity checking of a 2-wire circuit.

controlled rerouting

F: retour sous contrôle sur route normale

S: reencaminamiento controlado

A procedure of transferring in a controlled way, signalling traffic from an alternative signalling route to the normal signalling route, when this has become available.

coupling

F: couplage

S: acoplamiento

An SCCP function which provides an association between connection sections at a relay point.

cross-office (transit) delay

F: temps (de transit) dans le commutateur

S: retardo (de tránsito) a través de la central

The time a message will take to pass through an exchange.

cross-office check

F: contrôle de continuité à travers un commutateur

S: prueba (verificación) de continuidad a través de una central

A check made of a circuit across the exchange to verify that a transmission path exists.

data channel propagation time (T_p)

F: temps de propagation sur la voie de données (T_p)

S: tiempo de propagación del canal de datos (T_p)

The period which starts when the last bit of the signal unit has entered the data channel at the sending side and ends when the last bit of the signal unit leaves the data channel at the receiving end, irrespective of whether the signal unit is disturbed or not.

Data User Part (DUP)

F: Sous-Système Utilisateur Données (SSUD)

S: parte de usuario de datos (PUD)

The User Part specified for data services.

destination point (signalling-)

F: point (sémaphore) de destination

S: punto de destino (de la señalización)

The signalling point to which a message is destined.

destination point code (DPC)

F: code du point de destination (CPD)

S: código del punto de destino (CPD)

A part of the label in a signalling message which uniquely identifies, in a signalling network, the (signalling) destination point of the message.

dialogue

F: dialogue

S: diálogo

An association established between two TC users exchanging components.

digital signalling data link

F: liaison sémaphore de données numérique

S: enlace de datos de señalización digital

The data link that provides an interface to signalling terminals and is made up of digital transmission channels and digital switches or their terminating equipment.

dual seizure

F: prise simultanée

S: doble toma (toma simultánea)

The condition which occurs when in bothway operation two exchanges attempt to seize the same circuit at approximately the same time.

emergency changeover

F: passage d'urgence sur canal sémaphore de secours

S: paso de emergencia a enlace de reserva

A modified changeover procedure to be used whenever the normal one cannot be accomplished, i.e. in case of some failures in the signalling terminal equipment or in case of inaccessibility between the two involved signalling points.

end-to-end signalling

F: signalisation de bout en bout

S: señalización de extremo a extremo

The capability to transfer signalling information of end point significance directly between signalling end points in order to provide a requesting user with a basic or supplementary service.

end-user (SCCP)

F: utilisateur terminal (SSCS)

S: usuario de extremo (PCCS)

A functional entity above the SCCP upper layer boundary indirectly using the services of the SCCP.

entity or (N) entity

F: entité ou entité (N)

S: entidad o entidad (N)

A set of functions invoked by a given layer for an instance of intersystems communications in which that system is involved. An entity may be partitioned into several sub-entities. For each instance of intersystems communications, the set of functions invoked will be a part of all the functional capability of the given system within the layer in accordance with the functionality required for that instance of inter-system communication.

expedited data

F: données exprés

S: datos acelerados (datos expeditados)

Data transferred with priority which bypasses the normal data flow control.

failure response time

F: temps de réponse à une défaillance

S: tiempo de respuesta a fallo

The elapsed time from the instant a signalling point recognises that a signalling link is unavailable, until the instant when the signalling point completes sending a changeover (or emergency changeover) order to the remote signalling point.

fill-in signal unit (FISU)

F: trame sémaphore de remplissage (TSR)

S: unidad de señalización de relleno (USR)

A signal unit containing only error control and delimitation information, which is transmitted when there are no message signal units or link status signal units to be transmitted.

flag (F)

F: fanion (F)

S: bandera (BAN)

The unique pattern on the signalling data link used to delimit a signal unit.

flow control

F: contrôle de flux

S: control de flujo

A function in a protocol used to control the flow of signalling messages between adjacent layers of a protocol, and/or between peer entities. The function permits, for example, a receiving entity to control signalling message flow from the sending entity.

forced rerouting

F: passage sous contrainte sur route de secours

S: reencaminamiento forzado

A procedure of transferring signalling traffic from one signalling route to another, when the signalling route in use fails or is required to be cleared of traffic.

forced retransmission (procedure)

F: retransmission forcée (procédure de)

S: retransmisión forzada (procedimiento de)

An error correction procedure used to complement the preventive cyclic retransmission procedure.

forward indicator bit (FIB)

F: bit indicateur vers l'avant (BIA)

S: bit indicador directo (bit indicador hacia adelante) (BID)

A bit in a signal unit which indicates the start of a retransmission cycle.

forward sequence number (FSN)

F: numéro de séquence vers l'avant (NSA)

S: número secuencial directo (hacia adelante) (NSD)

A signal unit used to identify the transmitted message signal units.

function

F: fonction

S: función

A logical object which accepts one or more inputs (arguments) and produces a single output (value) uniquely determined by the combination of the input and the formal specification of the function.

global title (GT)

F: appellation globale (AG)

S: título global (TG)

An address used by the SCCP, such as customer dialled digits which does not explicitly contain information that would allow routing in the signalling network, i.e., the SCCP translation function is required.

hypothetical signalling reference connection (HSRC)

F: communication fictive de réference pour la signalisation

S: conexión ficticia (o hipotética) de referencia para la señalización (CFRS)

A hypothetical reference model of a connection in a signalling network.

identifier (ID)

F: identificateur (ID)

S: identificador (ID)

A character, or group of characters, used to identify or name an item of data and possibly to indicate certain properties of that data.

unavailable signalling link

F: canal sémaphore indisponible

S: enlace de señalización indisponible

A signalling link which has been deactivated and cannot therefore carry signalling traffic.

information element

F: élement d'information

S: elemento de información

The basic unit of a TCAP message.

initial alignment (procedure)

F: alignement initial (procédure d')

S: alineación inicial (procedimiento de)

A procedure by which a signalling link becomes able to carry signalling traffic either for the first time or after a failure has occurred.

integrated digital network (IDN)

F: réseau numérique intégré (RNI)

S: red digital integrada (RDI)

A network in which connections established by digital switching are used for the transmission of digital signals.

integrated services digital network (ISDN)

F: réseau numérique avec intégration des services (RNIS)

S: red digital de servicios integrados (RDSI)

An integrated digital network in which the same digital switches and digital paths are used to establish connections for different services, for example, telephony, data.

Intermediate Service Part

F: Sous-Système Services Intermédiaires (SSSI)

S: parte servicio intermedio

An element of Transaction Capabilities which supports TCAP for connection-oriented messages. It represents OSI layers 4 to 6.

international signalling network

F: réseau sémaphore international

S: red de señalización internacional

A network used for signalling, consisting of international signalling points and common channel signalling links connecting them.

international signalling point

F: point sémaphore international

S: punto de señalización internacional

A signalling point which belongs to the international signalling network.

international signalling point code

F: code de point sémaphore international

S: código de punto de señalización internacional

A part of the label in a signalling message that uniquely identifies each signalling point which belongs to the international signalling network. It consists of a sub-field for the signalling area/network code (11-bit) and a sub-field which identifies a signalling point in a specific area or network (3-bit).

interruption control

F: contrôle d'interruption

S: protección contra las interrupciones

A system which monitors a pilot for interruptions on FDM systems and which transmits an indication to the switching equipment.

ISDN user part (ISDN-UP)

F: Sous-Système Utilisateur pour le RNIS (SSUR)

S: parte usuario de RDSI (PU-RDSI)

A protocol of Signalling System No. 7 which provides the signalling functions necessary to basic bearer services and supplementary services for voice and non-voice applications in the ISDN.

label

F: étiquette

S: etiqueta

Information within a signalling message used to identify typically the particular circuit, call or management transaction to which the message is related.

layer

F: couche

S: capa

A group of one or more entities contained within an upper and lower logical boundary. Layer (N) has boundaries to the layer ($N + 1$) and to the layer ($N - 1$).

layer interface

F: interface entre couches

S: interfaz de capa

The boundary between two adjacent layers of the model.

layer service

F: service de couche

S: servicio de capa

A capability of the (N) layer and the layers beneath it, which is provided to $(N + 1)$ entities, at the boundary between the (N) layer and the $(N + 1)$ layer.

layer service elements

F: elément de service de couche

S: elemento de servicio de capa

An indivisible component of the layer service made visible to the service user via layer primitives.

layer service primitives

F: primitives du service de couche

S: primitivas de servicio de capa

A means for specifying in detail the adjacent layer interactions.

length indicator (LI)

F: indicateur de longueur (INL)

S: indicador de longitud (IL)

A six-bit field which differentiates between message signal units, link status signal units and fill-in signal units and in the case that its binary value is less than 63 indicates the length of a signal unit.

link-by-link signalling

F: signalisation section par section

S: señalización enlace por enlace

A procedure for the exchange of signalling information directly between two signalling points that are either directly connected or via signalling transfer points.

link state control (LSC)

F: supervision de l'état du canal sémaphore (SET)

S: control del estado del enlace (CEE)

Coordinates functions of the signalling link including signal unit delimitation, signal unit alignment, error detection, error correction, initial alignment, signalling link error monitoring and flow control.

link status signal unit (LSSU)

F: trame sémaphore d'état du canal sémaphore (TSE)

S: unidad de señalización del estado del enlace (UEE)

A signal unit which contains status information about the signalling link in which it is transmitted.

linked operation

F: opération liée

S: operación enlazada (vinculada)

An operation invoked from one end of a dialogue that is linked to another operation previously invoked by the other end.

load sharing (general)

F: partage de la charge (en général)

S: compartición de carga (en sentido general)

A process by which signalling traffic is distributed over two or more signalling or message routes, to provide for traffic equalization or security.

local reference

F: référence locale

S: referencia local

A local number, unambiguously identifying an SCCP connection within one SCCP entity.

management inhibiting

F: inhibition par la gestion

S: inhabilitación (o inhibición) (en gestión de tráfico de señalización)

A procedure included in signalling traffic management used to keep a signalling link unavailable to User Part generated signalling traffic, except for test and maintenance traffic.

mandatory fixed part

F: partie obligatoire de longueur fixe

S: parte obligatoria fija

Part of a message that contains those parameters that are mandatory and of fixed length.

mandatory variable part

F: partie obligatoire de longueur variable

S: parte obligatoria variable

Part of a message that contains mandatory parameters of variable length.

message discrimination

F: discrimination des messages (de signalisation)

S: discriminación de mensajes

The process which decides, for each incoming message, whether the signalling point is a destination point or if it should act as a signalling transfer point for that message and accordingly, whether the message should be handed to (signalling) message distribution or to (signalling) message routing functions.

message distribution

F: distribution des messages (de signalisation)

S: distribución de mensajes

The process of determining, upon receipt of a signalling message at its destination point, to which User Part the signalling message is to be delivered.

message route (signalling-)

F: route de message (de signalisation)

S: ruta de mensaje (de señalización)

The signalling link or consecutive links connected in tandem that are used to convey a signalling message from an originating point to its destination point.

message routing (signalling-)

F: acheminement des messages (de signalisation)

S: encaminamiento de mensajes (de señalización)

The process for selecting, for each signalling message to be sent, the signalling link to be used.

message signal unit (MSU)

F: trame sémaphore de message (TSM)

S: unidad de señalización de mensaje (USM)

A signal unit containing a service information octet and a signalling information field which is retransmitted by the signalling link control if it is received in error.

Message Transfer Part (MTP)

F: Sous-Système Transport de Messages (SSTM)

S: parte transferencia de mensajes (PTM)

The functional part of a common channel signalling system which transfers signalling messages as required by all the users, and which performs the necessary subsidiary functions, for example error control and signalling security (levels 1, 2 and 3 of Signalling System No. 7).

message transfer part receiving time (T_{mr})

F: temps de réception du Sous-Système Transport de Messages (T_{mr})

S: tiempo de recepción de la parte de transferencia de mensajes (T_{mr})

The period which starts when the last bit of the signal unit leaves the signalling data link and ends when the last bit of the message has entered the User Part. It includes the handling time at level 2, the transfer time from level 2 to level 3, the handling time at level 3, the transfer time from level 3 to level 4.

message transfer part sending time (T_{ms})

F: temps d'émission du Sous-Système Transport de Messages (T_{ms})

S: tiempo de emisión de la parte de transferencia de mensajes (T_{ms})

The period which starts when the last bit of the message has left the User Part and ends when the last bit of the signal unit enters the data link for the first time. It includes the queueing delay in the absence of disturbances, the transfer time from level 4 to level 3, the handling time at level 3, the transfer time from level 3 to level 2, and handling time in level 2.

message transfer time at signalling transfer points (T_{cs})

F: temps de transfert des messages aux points de transfert sémaphores (T_{cs})

S: tiempo de transferencia de mensajes en los puntos de transferencia de señalización (T_{cs})

The period which starts when the last bit of the signal unit leaves the incoming signalling data link and ends when the last bit of the signal unit enters the outgoing signalling data link for the first time. It includes the queueing delay in the absence of disturbances, but not the additional queueing delay caused by retransmission.

Mobile Application Part (MAP)

F: Sous-Système Application Mobile (SSAM)

S: parte aplicación móvil (PAM)

The Application Entity dedicated to the communication aspects of the mobile application.

MTP routing verification test (MRVT)

F: essai pour la vérification de l'acheminement dans le SSTM (EATP)

S: prueba de verificación de encaminamiento por la PTM (PVEM)

A procedure used to determine if the data of the MTP routing tables in the signalling network are consistent.

national signalling network

F: réseau sémaphore national

S: red de señalización nacional

A network used for signalling, consisting of national signalling points and the connecting common channel signalling links, including the national signalling point of the gateway exchange connected to the internacional signalling network.

national signalling point (NSP)

F: point sémaphore national (PSN)

S: punto de señalización nacional (PSN)

A signalling point which belongs to the national signalling network.

negative acknowledgement (NACK)

F: accusé de réception négatif (ACN)

S: acuse de recibo negativo (RN)

An explicit request for retransmission of signal units, received in a corrupt form.

network indicator

F: indicateur de réseau

S: indicador de red

The part of the subservice field within the service information octet that may be used to discriminate between national and internacional signalling messages.

Network Service Part (NSP)

F: Sous-Système Service Reséau (SSSR)

S: parte servicio de red (PSR)

The combination of the Message Transfer Part and the Signalling Connection Control Part.

nonassociated mode (of signalling)

F: mode (de signalisation) non associé

S: modo (de señalización) no asociado

The mode where messages for a signalling relation involving two (nonadjacent) signalling points are conveyed, between those signalling points, over two or more signalling links in tandem passing through one or more signalling transfer points.

nonadjacent signalling points

F: points sémaphores non adjacents

S: puntos de señalización no adyacentes

Two signalling points that are not directly connected by any signalling links.

normal routing of (signalling)

F: acheminement normal (de signalisation)

S: encaminamiento normal (de señalización)

The routing of a given signalling traffic flow in normal conditions (i.e. in the absence of failures).

NSAP address (OSI-) (NSAP)

F: adresse NSAP (OSI-)

S: dirección PASR (ISA-) (PASR)

A global address as defined for OSI which is understandable over any network and can be used to address between networks.

operation (TC-)

F: opération (GT)

S: operación (CT)

The action being requested of the remote end.

Operation, Maintenance and Administration Part (OMAP)

F: Sous-Système pour l'Exploitation, la Maintenance et la gestion (SSEM)

S: parte, operaciones, mantenimiento y administración (POMA)

The Application Entity dedicated to the communications aspects of the Operation, Administration and Maintenance of the Signalling System No. 7 network and which may have an application for the Telecommunications Management Network (TMN).

optional part

F: partie facultative

S: parte opcional (facultativa)

Part of a message that contains parameters that may or may not occur in any particular message type.

originating point (signalling-)

F: point (sémaphore) d'origine

S: punto de origen (de señalización)

The signalling point in which a message is generated.

originating point code (OPC)

F: code du point d'origine (CPO)

S: código del punto de origen (CPO)

A part of the label in a signalling message which uniquely identifies, in a signalling network, the (signalling) originating point of the message.

peer entities

F: entités homologues

S: entidades pares

Entities in the same layer but in different systems (nodes) which must exchange information to achieve a common objective.

peer protocol

F: protocole homologue

S: protocolo para entidades pares

A formal language used by peer entities to exchange information.

pilot

F: onde pilote

S: piloto

Sinusoidal signal transmitted over analogue FDM links for regulation and supervision purposes.

pointer

F: pointeur

S: puntero

A single octet indicating the beginning of each mandatory variable parameter and optional part.

positive acknowledgement

F: accusé de réception positif

S: acuse de recibo positivo

A way to indicate correct transfer of message signal units.

preventive cyclic retransmission (error control) method

F: méthode (de correction d'erreur) avec retransmission cyclique préventive

S: método (de protección contra errores) por retransmisión cíclica preventiva

A noncompelled, positive acknowledgement, cyclic retransmission forward error correction system.

processor outage

F: processeur hors service

S: interrupción del procesador

A situation in which a signalling link becomes unavailable, due to factors at a functional level higher than level 2. This may be because of, for example, a central processor failure.

Public Land Mobile Network (PLMN)

F: réseau mobile terrestre publique (RMTP)

S: red móvil terrestre pública (RMTP)

A public network dedicated to the operation of mobile radio communications.

quasi-associated mode (of signalling)

F: mode (de signalisation) quasi associé

S: modo (de señalización) cuasiasociado

A nonassociated mode (of signalling) in which the (signalling) message route is determined basically, for each signalling message, by information contained in this message (namely in its routing label) and is fixed in normal operation.

reply

F: réponse

S: respuesta

Any component sent back as the consequence of an operation invocation.

reset (SCCP)

F: reinitialisation (SSCS)

S: reinicialización (PCCS)

A service of the SCCP to return a connection to a predefined state, or to recover from loss of synchronization between two SCCP users.

restart (SCCP)

F: redémarrage (SCCS)

S: rearranque (PCCS)

A recovery mechanism for signalling connection sections in the event of a node failure.

result

F: résultat

S: resultado

The component indicating the outcome (success or failure) of an operation.

retransmission buffer (RTB)

F: tampon de retransmission (TRT)

S: memoria tampón de retransmisión (MTR)

Storage in the signalling link control for signal units transmitted but not yet positively acknowledged.

retrieval

F: récupération

S: recuperación

The process of transferring all those messages in the retransmission buffer of a signalling link (A), which have not yet been positively acknowledged, to the transmission buffers of alternative signalling links.

route set congestion control

F: contrôle d'encombrement de faisceau de routes sémaphores

S: control de la congestión de un conjunto de rutas

A procedure included in the signalling route management which is used to update the congestion status of a signalling route in a given signalling point.

routing label

F: étiquette d'acheminement

S: etiqueta de encaminamiento

The part of the message label that is used for message routing in the signalling network. It includes the destination point code, the originating point code and the signalling link selection field.

SCCP relation

F: relation de SSCS

S: relación PCCS

A relationship between two SCCP users which allows them to exchange data over it. An SCCP relation can consist of one or several routes.

SCCP relay function

F: fonction relais du SSCS

S: función de relevo PCCS

A function which provides an address translation to route an SCCP message to its destination, and may include coupling of connection sections for connection-oriented protocol classes.

SCCP route

F: route du SSCS

S: ruta PCCS

A route composed of an ordered list of nodes where the SCCP is used (origin, relay(s), destination) for the transfer of SCCP messages from an originating SCCP user to the destination SCCP user.

SCCP routing

F: acheminement dans le SSCS

S: encaminamiento (por la) PCCS

A function based on the called party address information, which evaluates and translates the information, checks the addressee availability, and the need for coupling of connection sections.

SCCP routing verification test (SRVT)

F: essai pour la vérification de l'acheminement dans le SSCS (EACP)

S: prueba de verificación del encaminamiento PCCS (PVES)

A procedure used to determine if the data of the SCCP routing tables in the signalling network are consistent.

SCCP user

F: utilisateur du SSCS

S: usuario PCCS

Functional entity which uses directly the services of the SCCP.

segmenting/reassembling

F: segmentation/réassemblage

S: segmentación/reensamblado

If the size of the user data is too big to be transferred within one message, user data are segmented into a number of portions, and reassembled at the receiving end.

sequence numbering

F: numérotation des trames sémaphores

S: numeración secuencial

Each signal unit carries two sequence numbers for error correcting purpose.

sequencing

F: mise en séquence

S: secuenciación

A service of the SCCP that preserves the sequence of Network Service Data Units.

service indicator (SI)

F: indicateur de service (utilisateur) (INS)

S: indicador de servicio (IS)

Information within a signalling message identifying the user to which the message belongs.

service information (octet) (SIO)

F: octet de service (SER)

S: información de servicio (octeto de) (OIS)

Eight bits, contained in a message signal unit, comprising the service indicator and the sub-service field.

signal unit (SU)

F: trame sémaphore (TS)

S: unidad de señalización (US)

A group of bits forming a separately transferable entity used to convey information on a signalling link.

signal unit alignment

F: alignement des trames sémaphores

S: alineación de unidades de señalización

Signal unit alignment exists when flags are received at intervals which correspond to integral numbers of octets and which fall within certain upper and lower limits.

signal unit error rate monitoring

F: surveillance du taux d'erreur sur les trames sémaphores

S: monitor de tasa de errores en las unidades de señalización

A procedure by which the error rate of an active signalling link is measured on the basis of a count of correctly checking and erroneous signal units.

signal unit sequence control

F: contrôle de l'ordre des trames sémaphores

S: control de la secuencia de las unidades de señalización

Procedures used at level 2 to ensure that message signal units are transported in sequence, without loss or duplication, over a particular signalling link.

signalling area/network code (SANC)

F: code de zone/réseau sémaphore (CZRS)

S: código de área/red de señalización

The field in the international signalling point code that identifies the zone and national signalling area or network. It consists of a code for the world geographical zone (3-bit) and a code for the area or network in a specific zone (8-bit).

Signalling Connection Control Part (SCCP)

F: Sous-Système Commande des connexions Sémaphores (SSCS)

S: parte control de la conexión de señalización (PCCS)

Additional functions to the MTP to cater for both connectionless as well as connection-oriented network service and to achieve an OSI compatible network service.

signalling information

F: information de signalisation

S: información de señalización

The information content of a signal or a signalling message.

signalling information (field) (SIF)

F: information de signalisation (domaine d') (INF)

S: información de señalización (campo de) (CIS)

The bits of a message signal unit which cary information particular to a certain user transaction and always contain a label.

signalling link

F: canal sémaphore

S: enlace de señalización

A transmission means which consists of a signalling data link and its transfer control functions, used for reliable transfer of a signalling message.

signalling link activation

F: activation d'un canal sémaphore

S: activación de un enlace de señalización

The process of making a signalling link ready to carry signalling traffic.

signalling link blocking

F: blocage d'un canal sémaphore

S: bloqueo de un enlace de señalización

An event causing the unavailability of a signalling link, typically consisting in a "processor outage" condition at one end of that signalling link.

signalling link code (SLC)

F: code de canal sémaphore (COC)

S: código de enlace de señalización (CES)

A field of the label in the signalling network management messages, which indicates the particular signalling link to which the message refers among those interconnecting the two involved signalling points.

signalling link deactivation

F: désactivation d'un canal sémaphore

S: desactivación de un enlace de señalización

The procedure by which a signalling link is taken out of service.

signalling link error monitoring

F: surveillance des erreurs sur un canal sémaphore

S: monitor de errores en el enlace de señalización

This comprises two functions: initial alignment error rate monitoring and signal unit error rate monitoring.

signalling link failure

F: défaillance d'un canal sémaphore

S: avería (o fallo) del enlace de señalización

An event causing the unavailability of a signalling link, typically consisting in a failure in signalling terminal equipment or in the signalling data link.

signalling link group

F: groupe de canaux sémaphore

S: grupo de enlaces de señalización

A set of signalling links directly connecting two signalling points and having the same physical characteristics (bit rate, propagation delay, etc.).

signalling link management functions

F: fonctions de gestion des canaux sémaphores

S: funciones de gestión de enlaces de señalización

Functions that control and take actions, when required, to preserve integrity of locally connected signalling links, e.g. by reconfiguration of the signalling link sets.

signalling link restoration

F: rétablissement d'un canal sémaphore

S: restauración (o restablecimiento) de enlaces de señalización

An event consisting in the initial alignment procedure on a signalling link following the removal of the previous causes of failure; if no other causes of unavailability exist (i.e. a signalling link blocked condition) then the signalling link becomes available.

signalling link selection field

F: domaine de sélection du canal sémaphore

S: campo de selección de enlace de señalización

A field of the routing label which is typically used by the message routing function to perform load sharing among different signalling links/link sets.

signalling link set

F: faisceau de canaux sémaphores

S: conjunto de enlaces de señalización

A set of one or more signalling links directly connecting two signalling points.

signalling link unblocking

F: déblocage d'un canal sémaphore

S: desbloqueo de un enlace de señalización

An event consisting in the removal of the previous causes of signalling link blocking; if no other causes of unavailability exist (i.e. a signalling link failed condition), then the signalling link becomes available.

Signalling Management Application Process (SMAP)

F: processus d'application de gestion de signalisation (PAGS)

S: proceso de aplicación de gestión de señalización (PAGS)

The application process associated with the operation, administration, and management of the Signalling System No. 7.

signalling message

F: message de signalisation

S: mensaje de señalización

An assembly of signalling information pertaining to a call, management transaction, etc., that is transferred as an entity.

signalling message handling functions

F: fonctions d'orientation des messages de signalisation

S: funciones de tratamiento de mensajes de señalización

Functions that, at the actual transfer of a message, direct the message to the proper signalling link or User Part.

signalling network

F: réseau sémaphore

S: red de señalización

A network used for signalling by one or more users and consisting of signalling points and connecting signalling links.

signalling network components

F: composants du réseau sémaphore

S: componentes de la red de señalización

Components which make up the signalling network, such as signalling points and common channel signalling links.

signalling network functions

F: fonctions du réseau sémaphore

S: funciones de la red de señalización

The functions which are performed by the Message Transfer Part at level 3 and are common to, and independent of, the operation of individual signalling links. They include the signalling message handling functions and the signalling network management functions.

signalling end point

F: point sémaphore terminal

S: punto extremo de señalización

A node in a signalling network associated with a call originating local exchange, terminating local exchange, or gateway exchange.

signalling network management functions

F: fonctions de gestion du réseau sémaphore

S: funciones de gestión de la red de señalización

Functions that, on the basis of predetermined data and information about the status of the signalling network, control the current message routing and configuration of signalling network facilities.

signalling point

F: point sémaphore

S: punto de señalización

A node in a signalling network which either originates and receives signalling messages, or transfers signalling messages from one signalling link to another, or both.

signalling point code

F: code d'un point sémaphore

S: código de punto de señalización

A binary code uniquely identifying a signalling point in a signalling network. This code is used, according to its position in the label, either as destination point code or as originating point code.

signalling point numbering plan

F: plan de numérotage des points sémaphores

S: plan de numeración de los puntos de señalización

A formal description of the method of translating end-user provided address information into an address understandable by the signalling network.

signalling point restart

F: redémarrage d'un point sémaphore

S: rearranque de un punto de señalización

A procedure that allows a graceful increase of traffic to a restarting node.

signalling point with SCCP relay function (SPR)

F: point sémaphore faisant fonction de relais dans le SSCS (PSR)

S: punto de señalización con funciones de relevo PCCS (PSR)

A node in a signalling network with SCCP relay functions.

signalling relation

F: relation sémaphore

S: relación de señalización

A relation between two signalling points involving the possibility of information interchange between corresponding User Part functions.

signalling route

F: route sémaphore

S: ruta de señalización

A predetermined path described by a succession of signalling points that may be traversed by signalling messages directed by a signalling point towards a specific destination point.

signalling route management functions

F: fonctions de gestion des routes sémaphores

S: funciones de gestión de rutas de señalización

Functions that transfer information about changes in the availability of signalling routes in the signalling network.

signalling route-set-test procedure

F: procédure de test de faisceau de routes sémaphores

S: procedimiento de prueba de conjunto de rutas de señalización

A procedure, included in the signalling route management which is used to test the availability of a given signalling route, previously declared unavailable.

signalling traffic management functions

F: fonctions de gestion du trafic sémaphore

S: funciones de gestión del tráfico de señalización

Functions that control and, when required, modify routing information used by the Message routing function and control the transfer of signalling traffic in a manner that avoids irregularities in the message flow.

signalling message transfer delay

F: temps de transfert d'un message sémaphore

S: retardo (tiempo) de transferencia de un mensaje de señalización

The time a message will take to pass through the signalling network.

signalling transfer point (STP)

F: point de transfert sémaphore (PTS)

S: punto de transferencia de señalización (PTS)

A signalling point with the function of transferring signalling messages from one signallig link to another and considered exclusively from the viewpoint of the transfer.

status field (SF)

F: domaine d'état (ETC)

S: campo de estado (CE)

The bits of a link status signal unit which indicate one of the major signalling link states.

subservice field (SSF)

F: domaine de sous-service (DSS)

S: campo de subservicio (CSS)

The level 3 field containing the network indicator and two spare bits.

subsystem

F: Sous-Système (utilisateur du SSCS)

S: subsistema

A direct user of the Signalling Connection Control Part (SCCP) of Signalling System No. 7.

subsystem number (SSN)

F: numéro de Sous-Système (NSS)

S: número de subsistema (NSS)

A number to identify a subsystem using the SCCP either directly, like the ISDN User Part, or indirectly (via the Transaction Capabilities) like the OMAP.

system management application entity (SMAE)

F: entité d'application de gestion du système (SMAE)

S: entidad de aplicación de gestión de sistema (EAGS)

The aspect of system Management Application Process involved with communication.

system management application process

F: processus d'application de gestion de systèmes

S: proceso de aplicación de gestión de sistema

The set of functions which collectively encompass system management.

tag (key) (label)

F: étiquette (SSGT)

S: rótulo (etiqueta)

The tag distinguishes one information element from another, and governs the interpretation of the contets.

Telephone User Part (TUP)

F: Sous-Système Utilisateur Téléphonie (SSUT)

S: parte de usuario de telefonía (PUT)

The User Part specified for telephone services.

traffic flow control (signalling-)

F: contrôle de flux de trafic (sémaphore)

S: control de flujo del tráfico (de señalización)

Actions and procedures intended to limit signalling traffic at its source in the case when the signalling network is not capable of transferring all signalling traffic offered by the User Parts, because of network failures or overload situations.

transaction

F: transaction

S: transacción

An association between two TC providers.

Transaction Capabilities (TC)

F: Gestionnaire de Transactions (GT)

S: capacidades de transacción (CT)

Functions which control information transfer between two or more nodes via a signalling network.

Transaction Capabilities Application Part (TCAP)

F: Sous-Système application pour la Gestion des Transactions (SSGT)

S: parte aplicación de capacidades de transacción (PACT)

The part of the Transaction Capabilities that resides in the application layer of the OSI protocol references model.

transaction portion

F: partie transaction

S: porción de transacción

The portion of the TCAP message that identifies whether the transaction is expected to consist of single or multiple messages and provides a means to associate these messages with a specific transaction and to terminate a transaction. The part of TCAP messages dealing with the control of transactions.

transceiver

F: émetteur-récepteur

S: transceptor (transmisor-receptor)

A tone device inserted in the outgoing end of a circuit which performs the transmitter and receiver check test through a check loop.

transfer-allowed (procedure)

F: transfert autorisé (procédure de)

S: autorización de transferencia (procedimiento de)

A procedure, included in the signalling route management, which is used to inform a signalling point that a signalling route has become available.

transfer controlled (procedure)

F: transfert sous contrôle (procédure de)

S: control de transferencia (procedimiento de)

A procedure, included in signalling route management, which does inform a signalling point of the congestion status of a signalling route.

transfer-prohibited (procedure)

F: transfert interdit (procédure de)

S: prohibición de transferencia (procedimiento de)

A procedure, included in the signalling route management, which is used to inform a signalling point of the unavailability of a signalling route.

transfer restricted (procedure)

F: transfert restreint (procédure de)

S: restricción de transferencia (procedimiento de)

A procedure, included in signalling route management, which does inform a signalling point of the restriction of a signalling route.

transmission buffer (TB)

F: tampon d'émission (TEM)

S: memoria tampón de transmisión (MT)

Storage in the signalling link control for message signal units not yet transmitted.

user (of the signalling system)

F: utilisateur du système de signalisation

S: usuario (del sistema de señalización)

A functional entity, typically a telecommunication service, which uses a signalling network to transfer information.

User Part (UP)

F: Sous-Système Utilisateur (SSU)

S: parte de usuario (o parte de usuario) (PU)

A functional part of the common channel signalling system which transfers signalling messages via the Message Transfer Part. Different types of User Parts exist (e.g. for telephone and data services), each of which is specified to a particular use of the signallig system.

ABBREVIATIONS SPECIFIC TO SIGNALLING SYSTEM No. 7[1)]

English	French	Spanish	Meaning
ACB	ACI	SAP	Access barred signal Table 3/Q.723
ACC	RAE	CAC	Automatic congestion control information message Table 3/Q.723
ACM	ACO	MDC	Address complete message Table 3/Q.723, Figure 3/Q.724
ADI	ADI	SDI	Address incomplete signal Table 3/Q.723, Figure 3/Q.724
AERM	STEA	MA	Alignment error rate monitor Figures 7-9/Q.703 and 11-17/Q.703
ANC	RAT	RCT	Answer signal, charge Table 3/Q.723, Figure 3/Q.724
ANN	RST	RST	Answer signal, no charge Table 3/Q.723
ANU	RSI	RNC	Answer signal, unqualified Table 3/Q.723
BIB	BIR	BII	Backward indicator bit Figures 3/Q.703, 13/Q.703 and 15/Q.703
BLA	BLA	ARB	Blocking-acknowledgement signal Table 3/Q.723
BLO	BLO	BLO	Blocking signal Table 3/Q.723
BSM	DE	MPE	Backward set-up message Table 3/Q.723
BSN	NSR	NSI	Backward sequence number Figures 3/Q.703, 14/Q.703 and 16/Q.703
BSNR	NSR-R	NSIR	Backward sequence number received Figures 7/Q.703, 13/Q.703, 14/Q.703, 16/Q.703
BSNT	NSR-E	NSIT	Backward sequence number of next SU to be transmitted Figures 7-9/Q.703 and 13-16/Q.703, Figures 27 and 30/Q.704.
CBA	RCA	ARS	Changeback acknowledgement signal Table 3/Q.704
CBD	RCO	ORS	Changeback declaration signal Table 3/Q.704
CBK	RAC	COL	Clear-back signal Table 3/Q.723, Figure 3/Q.724
CCF	CCN	FCO	Continuity-failure signal Table 3/Q.723

1) This list of abbreviations is basically the one appearing in Fascicle VI.6 of the *Yellow Book*, 1980. Study Group XI should bring this list up to date in the Study Period 1989-1992.

English	French	Spanish	Meaning
CCI	CCE	PCL	Continuity check incoming Recommendation Q.724, § 7.3, Figures 3/Q.724, 5/Q.724
CCL	RAD	LALN	Calling party clear signal Table 3/Q.723
CCM	SC	MSC	Circuit supervision message Table 3/Q.723
CCO	CCS	PCS	Continuity-check outgoing Recommendation Q.723, § 7.3, Figures 3/Q.724, 4/Q.724
CCR	CCD	PPC	Continuity-check-request signal Table 3/Q.723, Figures 2/Q.724, 3/Q.724, 6/Q.724 and 7/Q.724
CCS	CS	SCC	Common channel signalling Recommendation Q.701, § 1.1
CFL	ECH	SLI	Call-failure signal Table 3/Q.723, Figure 3/Q.724
CGC	EFC	CHC	Circuit-group-congestion Table 3/Q.723, Figure 3/Q.724
CHG	TAX	MTA	Charging message Table 3/Q.723
CHM	PR	MPA	Changeover and changeback messages Table 1/Q.704
CIC	CIC	CIC	Circuit identification code Recommendation Q.704, § 15, Recommendation Q.723, § 2.2.1
CIR	IDD	PIL	Calling-line-identity-request signal Table 3/Q.723
CK	CRT	BCE	Check bits Figure 3/Q.703
CLF	FIN	FIN	Clear-forward signal Table 3/Q.723, Figures 3/Q.724, 6/Q.724, 7/Q.724
CNM	GRC	GRC	Circuit network management message group
CNP	CLI	CIM	Connection-not-possible signal Table 1/Q.704
CNS	CLN	CIN	Connection-not-successful signal Table 1/Q.704
COA	PCA	APR	Changeover acknowledgement signal Table 1/Q.704
COO	PCO	OPR	Changeover order signal Table 1/Q.704
COT	CCP	CON	Continuity signal Table 3/Q.723, Figure 3/Q.724
CPC	STA	CTL	Call processing control Recommendation Q.724, § 10.2, Figures 1-7/Q.724
CRI	CRE	RPL	Continuity recheck incoming Recommendation Q.724, § 15.1, Figures 1/Q.724, 2/Q.724, 3/Q.724, 6/Q.724, 7/Q.724
CRO	CRS	RPS	Continuity-recheck outgoing Recommendation Q.724, § 15.1, Figures 1-3/Q.724, 6/Q.724
CSM	SA	MSL	Call supervision message Table 3/Q.723
CSS	CLR	SCF	Connection-successful signal Table 1/Q.704
DAEDR	DAD-R	DADR	Delimitation, alignment, error detection (reception) Figures 7/Q.703, 9/Q.703, 11/Q.703, 14/Q.703, 16/Q.703, 17/Q.703, 18/Q.703
DAEDT	DAD-E	DADT	Delimitation, alignment, error detection (transmitting) Figures 12/Q.703, 13/Q.703, 15/Q.703

English	French	Spanish	Meaning
DCE	ETCD	ETCD	Data circuit terminating equipment Figure 1/Q.702
DLC	CLO	CED	Signalling-data-link-connection-order signal Table 1/Q.704
DLM	CL	MED	Signalling-data-link-connection-order message Table 1/Q.704
DPC	CPD	CPD	Destination point code Recommendation Q.704, §§ 2.2.3, 13.2, Figure 3/Q.704, 14/Q.704, 26/Q.704, Recommendation Q.706, § 3, Recommendation Q.723, § 2.2.1
DPN	CNN	TDN	Digital path not provided signal Table 3/Q.723
DUP	SSUD	PUD	Data user part Recommendation Q.701, § 2.1, Figure 2/Q.701
ECA	PUA	AER	Emergency changeover acknowledgement signal Table 1/Q.704
ECM	PU	MEP	Emergency changeover message Table 1/Q.704
ECO	PUO	PER	Emergency changeover order signal Table 1/Q.704
EUM	EXT	IAL	Extended-unsuccessful-backward set-up information message indication Table 3/Q.723
F	F	BAN	Flag Figure 3/Q.703
FAM	AD	MDA	Forward-address message Table 3/Q.723
FCM	CF	MCF	Signalling traffic flow control messages Table 1/Q.704
FDM	MRF	MDF	Frequency division multiplex Recommendation Q.723, § 2.2.3, Recommendation Q.724, § 9
FIB	BIA	BID	Forward indicator bit Figures 3/Q.703, 13/Q.703, 15/Q.703
FISU	TSR	USR	Fill-in signal unit Figures 7/Q.703, 8/Q.703, 13-16/Q.703
FOT	IOP	INT	Forward-transfer signal Table 3/Q.723
FSM	EA	MEL	Forward set-up message Table 3/Q.723
FSN	NSA	NSD	Forward sequence number Figures 3/Q.703, 13/Q.703
GRA	RZA	ARG	Circuit group reset-acknowledgement message Table 3/Q.723
GRM	SGC	MSG	Circuit group supervision message Table 3/Q.723
GRQ	DEG	MPG	General request message
GRS	RZG	MRG	Circuit group reset message Table 3/Q.723
GSM	ING	MEG	General forward setup information message

English	French	Spanish	Meaning
HBA	BHA	ABGSF	Hardware failure oriented group blocking-acknowledgement message Table 3/Q.723
HGB	BLH	BGSF	Hardware failure oriented group blocking message Table 3/Q.723
HGU	DBH	DGSF	Hardware failure oriented group unblocking message Table 3/Q.723
HUA	DHA	ADGSF	Hardware failure oriented group unblocking acknowledgement message Table 3/Q.723
HMDC	ODC	HDCM	Message discrimination Recommendation Q.704, § 2, Figures 23-26/Q.704
HMDT	ODT	HDTM	Message distribution Recommendation Q.704, § 2, Figures 23-25/Q.704, 28/Q.704, 30/Q.704, 31/Q.704, 42/Q.704, 44-46/Q.704, 2/Q.707
HMRT	OAC	HENM	Message routing Recommendation Q.704, § 2, Figures 23/Q.704, 24/Q.704, 26/Q.704, 27/Q.704, 30/Q.704, 31/Q.704, 32/Q.704, 33/Q.704, 42/Q.704, 44/Q.704, 45/Q.704, 46/Q.704, 2/Q.707
HO	HO	EO	Heading code Recommendation Q.704, § 15.3, Figure 16/Q.704, Recommendation Q.707, § 5.3, Figure 1/Q.707, Recommendation Q.723, §§ 3.1 and 3.2
H1	H1	E1	Heading code Recommendation Q.704, § 15.3, Figure 16/Q.704, Recommendation Q.723, § 3.1
IAC	CAI	CAI	Initial alignment control Figures 8/Q.703, 9/Q.703, 13-17/Q.703
IAI	MIS	MIA	Initial address message with additional information Table 3/Q.723
IAM	MIA	MID	Initial address message Table 3/Q.723, Figures 3/Q.724, 6/Q.724
ISDN-UP (ISUP)	SSUR	PU-RDSI	ISDN User Part Recommendations Q.700 and Q.761 to Q.764
ISP	PSI	PSI	International signalling point Recommendation Q.705, § 3, Figure 1/Q.705
L1	N1	N1	Level 1 Figures 12/Q.703, 35/Q.704, 38-40/Q.704
L2	N2	N2	Level 2 Figures 8/Q.703, 9/Q.703, 12/Q.703, 13/Q.703, 15/Q.703, 23/Q.704, 24/Q.704, 26/Q.704, 27/Q.704, 30/Q.704, 35/Q.704, 37/Q.704
L3	N3	N3	Level 3 Figures 8/Q.703, 9/Q.704, 13/Q.703, 15/Q.703, 23/Q.704, 24/Q.704, 26/Q.704, 30/Q.704, 31/Q.704, 34/Q.704, 35/Q.704, 37/Q.704, 38/Q.704, 39/Q.704
L4	N4	N4	Level 4 Figures 23/Q.704, 25-27/Q.704, 34/Q.704
LI	INL	IL	Length indicator Recommendation Q.703, § 2.2, Figure 3/Q.703
LLSC	GCSF	CCE	Link set control Figures 29/Q.704, 35-37/Q.704
LOS	LHS	LFS	Line-out-of-service signal Table 3/Q.723, Figure 3/Q.724
LSAC	GCSA	CAE	Signalling link activity control Recommendation Q.704, § 12.6, Figures 28-30/Q.704, 35-41/Q.704
LSC	SET	CEE	Link state control Figures 7-10/Q.703, 13-18/Q.703, Recommendation Q.704, § 14.6, Figure 41/Q.704

English	French	Spanish	Meaning
LSDA	GCAL	AED	Signalling data link allocation Recommendation Q.704, § 12.6, Figures 35/Q.704, 37-40/Q.704, 42/Q.704
LSLA	GCAC	AES	Signalling link activation Recommendation Q.704, § 12.6, Figures 35/Q.704, 37/Q.704, 38/Q.704, 41/Q.704, 42/Q.704
LSLD	GCDA	DES	Signalling link deactivation Recommendation Q.704, § 12.6, Figures 35/Q.704, 37/Q.704, 40/Q.704, 41/Q.704, 42/Q.704
LSLR	GCRE	RES	Signalling link restoration Recommendation Q.704, § 12.6, Figures 35/Q.704, 37/Q.704, 39/Q.704, 41/Q.704, 42/Q.704
LSSU	TSE	UEE	Link status signal units Figures 13-16/Q.703
LSTA	GCAT	ATS	Signalling terminal allocation Recommendation Q.704, § 12.6, Figures 35/Q.704, 38/Q.704, 39/Q.704, 40/Q.704, 41/Q.704
MBA	BMA	ABGM	Maintenance oriented group-blocking-acknowledgement Table 3/Q.723
MGB	BLM	BGM	Maintenance oriented group blocking message Table 3/Q.723
MGMT	GES	SGE	Management system Figures 8/Q.703, 27/Q.704, 28/Q.704, 35-37/Q.704, 2/Q.707
MGU	DBM	DGM	Maintenance oriented group unblocking message Table 3/Q.723
MPR	INU	PIMM	Misdialled trunk prefix Table 3/Q.723
MSU	TSM	USM	Message signal unit Recommendation Q.701, § 2.3, Figures 7/Q.703, 8/Q.703, 14/Q.703, 15/Q.703, 16/Q.703
MTP	SSTM	PTM	Message transfer part Recommendation Q.701, § 2.1, Recommendation Q.721, § 1
MUA	DMA	ADGM	Maintenance oriented group unblocking-acknowledgement message Table 3/Q.723
NACK	ACN	RN	Negative acknowledgement Figures 7/Q.703, 13/Q.703, 14/Q.703
NNC	ERN	CRN	National-network-congestion signal Table 3/Q.723, Figure 3/Q.724
NSP	PSN	PSN	National signalling point Recommendation Q.705, § 3, Figure 1/Q.705
OMAP	SSEM	POMA	Operation, Administration and Maintenance Part Recommendations Q.700 and Q.795
OPC	CPO	CPO	Originating point code Recommendation Q.704, §§ 2.2.3 and 13.2, Figures 3/Q.704 and 14/Q.704, Recommendation Q.706, § 3, Recommendation Q.723, § 2.2.1
PCM	MIC	MIC	Pulse code modulation Recommendation Q.702, § 5.3
PCR	RCP	RCP	Preventive cyclic retransmission Tables 1/Q.706, 2/Q.706

English	French	Spanish	Meaning
POC	SIP	CIP	Processor outage control Figures 8/Q.703, 10/Q.703
RAN	NRP	RRE	Reanswer signal Table 3/Q.723, Figure 3/Q.724
RC	REC	CR	Reception control Figures 8/Q.703, 9/Q.703, 11/Q.703, 13-16/Q.703
RLG	LIG	LGU	Release-guard signal Table 3/Q.723, Figures 2/Q.724, 3/Q.724, 6/Q.724, 7/Q.724
RSC	RZC	RCI	Reseat-circuit signal Table 3/Q.723
RSM	TR	MPR	Signalling-route-set-test message Table 1/Q.704
RSRT	GRTF	CPC	Signalling route set test control Recommendation Q.704, § 13.5, Figures 23/Q.704, 29/Q.704, 43-46/Q.704
RST	TRS	PRS	Signalling-route-set-test signal Table 1/Q.704
RTAC	GRTA	CTA	Transfer allowed control Recommendation Q.704, § 13.3, Figures 29/Q.704, 33/Q.704, 37/Q.704, 43/Q.704, 45/Q.704, 46/Q.704
RTB	TRT	MTR	Retransmission buffer Figures 7/Q.703, 13/Q.703, 15/Q.703
RTPC	GRTI	CTP	Transfer prohibited control Recommendation Q.704, § 13.2, Figures 26/Q.704, 29/Q.704, 32/Q.704, 43/Q.704, 44/Q.704, 46/Q.704
SAM	MSA	MSD	Subsequent-address message Table 3/Q.723, Figure 3/Q.724
SAO	MSS	SDU	Subsequent-address message with one signal Table 3/Q.723
SBA	BSA	ABGSL	Software generated group blocking-acknowledgement message Table 3/Q.723
SBM	SE	MEC	Successful-backward-set-up information message Table 3/Q.723
SCCP	SSCS	PCCS	Signalling Connection Control Part Recommendations Q.700, Q.711-Q.714 and Q.716
SDL	LDS	LED	Functional specification and description language Recommendations Q.703, § 12, Q.704, § 6, Q.707, Recommendations Q.714, Q.724, Q.764, Q.774
SEC	EEC	CEC	Switching-equipment-congestion signal Table 3/Q.723, Figure 3/Q.724
SF	ETC	CE	Status field Figure 3/Q.703
SGB	BLS	BGSL	Software generated group blocking message Recommendation Q.723, Table 3/Q.723
SGU	DBS	DGSL	Software generated group unblocking message Recommendation Q.723, Table 3/Q.723
SI	INS	IS	Service indicator Recommendation Q.704, § 14
SIE	ETAU	IAE	Status indication "emergency terminal status" Recommendation Q.703, §§ 7.2, 7.3 and 10.1.3, Figures 2/Q.703, 4/Q.703, 7-9/Q.703, 13-16/Q.703
SIF	INF	CIS	Signal information field Figure 3/Q.703
SIN	ETAN	IAN	Status indication "normal terminal status" Recommendation Q.703, §§ 7.2, 7.3 and 10.1.3, Figures 2/Q.703, 4/Q.703, 7-9/Q.703, 13-16/Q.703
SIO	SER	OIS	Service information octet Figure 3/Q.703, Recommendation Q.723, § 1.2

English	French	Spanish	Meaning
SIO [2]	ETAP	IFA	Status indication "out of alignment" Recommendation Q.703, §§ 7.2, 7.3 and 10.1.3, Figures 2/Q.703, 4/Q.703, 7-9/Q.703, 13-16/Q.703
SIOS	ETHS	IFS	Status indication "out of service" Recommendation Q.703, §§ 7.2, 7.3 and 10.1.3, Figures 2/Q.703, 4/Q.703, 7-9/Q.703, 13-16/Q.703
SIPO	ETIP	IIP	Status indication "processor outage" Recommendation Q.703, § 10.1.3, Figures 2/Q.703, 7/Q.703, 8/Q.703, 13-16/Q.703
SLC	COC	CES	Signalling link code Recommendation Q.704, § 15, Figure 14/Q.704
SLM	GCS	GES	Signalling link management Recommendation Q.704, §§ 12.1 and 12.6, Figures 23/Q.704, 25/Q.704, 26/Q.704, 27/Q.704, 29/Q.703
SLS	SCS	SES	Signalling link selection code Recommendation Q.704, § 2.2.4, Figures 3/Q.704, 4/Q.704, 26/Q.704, A-3.1/Q.705
SLTA	ESCA	AMPS	Signalling link test message acknowledgement
SLTM	ESCO	MPES	Signalling link test message Figure 2/Q.707
SMH	OMS	TMS	Signalling message handling Recommendation Q.704, § 2, Figures 23/Q.704, 43/Q.704
SP	PS	PS	Signalling point Figures 8/Q.704, 23/Q.704, 24/Q.704, 26/Q.704, 27/Q.704, 30/Q.704, 31/Q.704, 42-44/Q.704
SPRC	CPS	CPS	Signalling procedure control Recommendation Q.724, § 10.1, Figures 1-7/Q.724
SRM	GRS	GRS	Signalling route management Recommendation Q.704, § 13, Figures 23/Q.704, 25-27/Q.704, 43/Q.704
SSB	OCC	ABO	Subscriber-busy signal (electrical) Table 3/Q.723, Figure 3/Q.724
SSF	DSS	CSS	Sub-service field Recommendation Q.704, § 13.1.1, Recommendation Q.723, § 1.2
SST	TSI	TIE	Send-special-information-tone signal Figures 1-7/Q.724
ST	ST	SFN	End-of-pulsing signal Recommendation Q.724, § 1.3
STLC	ESC	CPES	Signalling link test control Figures 25/Q.704, 26/Q.704, 2/Q.707
STM	GTS	GTS	Signalling traffic management Recommendation Q.704, § 4, Figures 23/Q.704, 25-27/Q.704, 30/Q.704, 35/Q.704, 39/Q.704, 43/Q.704
STP	PTS	PTS	Signalling transfer point Figure 4/Q.701, Recommendation Q.705, § 3, Figures A-1/Q.705, A-2/Q.705, Recommendation Q.706, § 4.3.3, Table 3/Q.706
SU	TS	US	Signal unit Figures 2/Q.703, 7/Q.703
SUA	DSA	ADGSL	Software generated group unblocking-acknowledgement messages Table 3/Q.723

[2] In English, another abbreviation will have to be found for *status indication "out of alignment"*, since the abbreviation SIO is already used for *service information octet*.

English	French	Spanish	Meaning
SUERM	STTS	MUS	Signal unit error rate monitor Figures 7/Q.703, 8/Q.703, 11/Q.703, 18/Q.703
SUM	SEE	ESNC	Sample unsuccessful backward setup information message Recommendation Q.723, § 3.7.1
TB	TEM	MT	Transmission buffer Figures 7/Q.703, 13/Q.703, 15/Q.703
TC	GT	CT	Transaction Capabilities Recommendations Q.700 and Q.771-Q.775
TCAP	SSGT	PACT	Transaction Capabilities Application Part Recommendations Q.700 and Q.771-Q.775.
TCBC	GTCN	TCRS	Changeback control Recommendation Q.704, § 6, Figures 27-29/Q.704, 31/Q.704
TCOC	GTCS	TCER	Changeover control Recommendation Q.704, § 5, Figures 27-30/Q.704, 37/Q.704
TCRC	GTRN	TCRC	Controlled rerouting control Recommendation Q.704, § 8, Figures 27/Q.704, 29/Q.704, 33/Q.704, 45/Q.704
TFA	TAO	TRA	Transfer-allowed signal Table 1/Q.704
TFM	TF	MTR	Transfer-prohibited and transfer-allowed messages Table 1/Q.704
TFP	TIO	PTR	Transfer-prohibited signal Table 1/Q.704
TFRC	GTRS	TCRF	Forced rerouting control Recommendation Q.704, § 7, Figures 27/Q.704, 29/Q.704, 32/Q.704
TLAC	GTSD	TCDE	Link availability control Recommendation Q.704, Figures 27-31/Q.704, 37/Q.704
TSFC	GTFX	CFTS	Signalling traffic flow control Figures 27/Q.704, 29/Q.704, 34/Q.704
TSRC	GTAC	CEN	Signalling routing control Recommendation Q.704, Figures 27-34/Q.704, 36/Q.704, 37/Q.704, 44-46/Q.704
TUP	SSUT	PUT	Telephone user part Recommendation Q.701, § 2.1, Figure 2/Q.701, Recommendation Q.721, § 1
TXC	EMI	CT	Transmission control Figures 8/Q.703, 9/Q.703, 12-16/Q.703
UBA	DBA	ARD	Unblocking-acknowledgement signal Table 3/Q.723
UBL	DBO	DBL	Unblocking signal Table 3/Q.723
UBM	EE	MEI	Unsuccessful-backward-set-up-information message Table 3/Q.723
UNN	NNU	NNA	Unallocated-national-number signal Table 3/Q.723, Figure 3/Q.724
UP	SSU	PU	User part Figure 2/Q.704

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