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DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1

SIGNALLING INTERFACE BETWEEN AN INTERNATIONAL SWITCHING CENTRE (ISC) AND AN ISDN SATELLITE SUBNETWORK

ITU-T Recommendation Q.768

(Previously “CCITT Recommendation”)

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation Q.768 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 17th of October 1995.

NOTE

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

CONTENTS

SUMMARY

This Recommendation describes the essential functions, procedures, and messages required for signalling between an International Switching Centre (ISC) and a digital interface to an ISDN satellite subnetwork. This signalling allows and appropriately equipped ISDN satellite subnetwork to perform on-demand bandwidth allocation for 64 kbit/s unrestricted and multirate ISDN calls, and protocol conversion for those calls which contain protocols that would otherwise experience throughput degradation due to the transmission delay of a satellite link. The framework of this signalling interface allows for growth for the potential inclusion of future ISDN network capabilities at the international interface.

INTRODUCTION

This Recommendation describes the essential functions, procedures, and messages required for signalling between an International Switching Centre (ISC) and a digital interface (herein referred to as a Satellite Connection Manager (SCM)) contained in an ISDN satellite subnetwork. This signalling can be used to facilitate the efficient support of existing and future ISDN services at the international interface, especially for 64 kbit/s unrestricted and multirate ISDN calls. Two representative functions supported by this signalling are on-demand connection management and protocol conversion. This new signalling does not change the fixed mapping provided between outbound trunks at the ingress of the satellite subnetwork (at the outgoing international exchange) and inbound trunks at the egress of the subnetwork (at the incoming international exchange), i.e. the satellite subnetwork does not perform switching.

SIGNALLING INTERFACE BETWEEN AN INTERNATIONAL SWITCHING CENTRE (ISC) AND AN ISDN SATELLITE SUBNETWORK

(Geneva, 1995)

1 Scope

The procedures described in this Recommendation are for a signalling relation between an International Switching Centre (ISC) and a digital interface to a satellite subnetwork, referred to as a Satellite Connection Manager (SCM). This Recommendation is specifically concerned with the transfer of signalling information between the ISC and the SCM, and with the procedures followed at the ISC for establishing and clearing calls routed through the satellite subnetwork. The signalling information transferred by the ISC is derived from Signalling System No. 7 signalling. The signalling information transferred by the SCM to the ISC is derived from control elements in the satellite subnetwork.

This signalling supports the ISDN connection types of 64 kbit/s unrestricted, 2 × 64 kbit/s unrestricted, 384 kbit/s unrestricted, 1536 kbit/s unrestricted, and 1920 kbit/s unrestricted. This signalling is also defined to support the connection types of speech, 3.1 kHz audio, and 64 kbit/s unrestricted preferred on a secondary basis: speech and 3.1 kHz connection types are only supported (uncompressed) in the case of fallback; the support of circuit multiplication functions within the SCM is for further study. Should speech and 3.1 kHz audio calls be carried across the satellite subnetwork, it is not the responsibility of the satellite subnetwork to provide echo control (i.e. follow normal ISUP procedures for placement of echo control.

This Recommendation is not concerned with specifying the SCM, but on the signalling needed between an ISC and a SCM.

This Recommendation is concerned with the international ISDN interface. The relationship of this Recommendation to national networks is for further study.

2 References

The following Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision: all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendation and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

– CCITT Recommendation Q.33 (1988), *Protection against the effects of faulty transmission on groups of Circuits*.

– ITU-T Recommendation Q.50 (1993), *Signalling between Circuit Multiplication Equipments (CME) and International Switching Centres (ISC)*.

– ITU-T Recommendation Q.704 (1993), *Signalling System No. 7 – Signalling network functions and messages*.

– CCITT Recommendation Q.710 (1988), *Simplified MTP version for small systems*.

– CCITT Recommendation Q.724 (1988), *Specifications of Signalling System No. 7 – Signalling procedures*.

– ITU-T Recommendation Q.753 (1993), *Signalling System No. 7 management functions MRVT, SRVT and CVT and definition of the OMASE-user*.

– ITU-T Recommendation Q.763 (1993), *Formats and Codes of the ISDN User Part of Signalling System No. 7*.

- ITU-T Recommendation Q.764 (1993), *Signalling System No. 7 – ISDN User Part signalling procedures*.
- ITU-T Recommendation Q.931 (1993), *Digital subscriber Signalling System No. 1 (DSS 1) – ISDN user-network interface layer 3 specification for basic call control*.

3 Definitions

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

3.1 interworking: Interworking refers to the portion of the ISC call control that includes the transferring of certain information elements from the ISDN-UP messages to the satellite subnetwork. The interworking enables a satellite subnetwork to efficiently manage its transmission resources or improve the transmission performance of certain services.

3.2 satellite connection manager (SCM): A type of equipment which exists between the satellite access equipment at an earth station and an ISC, and which provides certain functions related to ISDN calls.

3.3 circuit multiplication equipment (CME): A type of equipment which permits concentration of a number of trunks on a reduced number of transmission channels.

3.4 protocol conversion function (PCF): A specific interworking function performed on a communications protocol for the purpose of replacing the protocol with a more appropriate protocol for a particular transmission channel. In a satellite context, PCF consists of terminating a user protocol at the source SCM and replacing it with a satellite-optimized protocol over the satellite link, and subsequently reintroducing the original user protocol at the destination SCM in a manner transparent to the end user.

3.5 channel: Used herein to refer to a 64 kbit/s digital circuit.

3.6 trunk; access circuit: A bidirectional connection consisting of a forward channel and a backward channel between the ISC and the SCM. Trunks are otherwise known as access circuits.

3.7 transmission channel; bearer circuit: One channel of the connection between the transmit unit and receive unit of corresponding earth stations.

3.8 Q.768: The signalling interface that exists between the ISC and the SCM.

3.9 satellite subnetwork: A satellite network which exists transparent to the end (access) users on either side of the connection. The satellite subnetwork is bounded by two ISDNs in this case. In an ISDN context, a subnetwork may be transparent to or integrated with the SS No.7 signalling.

3.10 trunk subgroup; trunk group: A set of trunks, between two ISCs, that serves the same connection type(s).

4 Abbreviations

For the purposes of this Recommendation the following abbreviations apply.

NOTE – Signalling System No. 7 message abbreviations are described in Recommendations Q.763 and Q.704:

CCH	Continuity Check
CIC	Circuit Identification Code
CME	Circuit Multiplication Equipment
HLC	High Layer Compatibility
ISC	International Switching Centre
ISC-DPC	ISC Destination Point Code
ISC-OPC	ISC Originating Point Code
ISUP	ISDN User Part

LLC	Low Layer Compatibility
MTP	Message Transfer Part
PCF	Protocol Conversion Function
SCM	Satellite Connection Manager
SIUP	Satellite ISDN User Part
SS No. 7	Signalling System No. 7

5 Architectural model for interworking

Figure 1 illustrates the interworking model for Q.768 signalling. Only signalling links are illustrated. The SCM exists within the satellite subnetwork, and is supported by the signalling across the Q.768 interface. Trunk groups (not shown) exist between the ISC and the SCM, and the SCM maps trunks to satellite transmission channels. Some Q.768 signalling elements are derived from the SS No. 7 messages.

The reference configuration shown in Figure 1 corresponds closely to the reference configuration for ISDN-ISDN interworking via a transit network. The ISDN satellite subnetwork functions as a transit network and performs no switching (i.e. the correspondence between inter-ISC trunks is preserved). The SCMs function as access points to this transit network. Each SCM may have Q.768 signalling links to one or more ISCs; similarly, each ISC may have Q.768 signalling links to one or more SCMs.

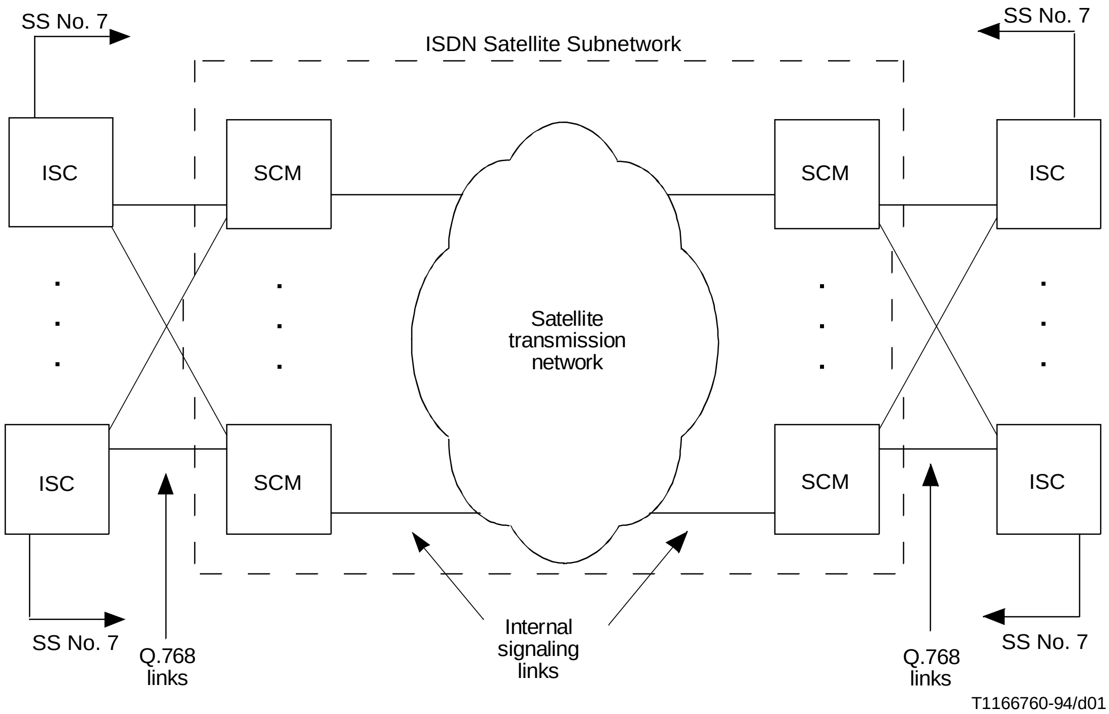


FIGURE 1/Q.768

Architectural model for interworking

If a CME is deployed between the ISC and the satellite subnetwork, the Q.768 signalling system and the associated functions cannot be used for the trunks served by the CME. A different trunk group than that served by the CME is served by the SCM. At call set-up time, the ISC makes the appropriate selection based on the bearer service required.

The functions of the SCM are distinct from the CME. The CME and the SCM can coexist in the same network, but they are served by separate channels. An implication of this is that speech and 3.1 kHz audio calls, if they are routed through the SCM (due to either a lack of CME capacity or the support of fallback), will be uncompressed through the satellite subnetwork. At some point, CME functions may be included in SCM. It is for further study what protocol elements must be added to this Recommendation to support CME functions. In this case, the need for a separate Q.50 signalling interface and trunk separation between the two equipments would be removed.

6 Functions of the signalling system

The signalling system comprises the ISC, the SCM, and a digital channel between the two. The basic signalling function is to support the on-demand establishment of physical connections within the satellite subnetwork. Another signalling function is the provision of information to the satellite subnetwork for the purpose of performing protocol conversion on selected ISDN calls routed through the satellite subnetwork.

6.1 Call set-up

The signalling system provides for the following functions:

a) on-demand call set-up;

b) fixed-assignment channel configuration (e.g. insertion of protocol conversion function);

c) transfer of information elements from ISC to SCM;

d) update of call parameters during call set-up.

This includes fallback initiated by either the terminal or the network (including HLC selection), and out-of-band LLC (see Annex J/Q.931) negotiation.

6.2 Call release

The signalling system provides for call release of the satellite resources when the SS No. 7 network releases the call.

6.3 Maintenance

The signalling system includes means to notify the ISC of call failures of active calls, and of any satellite subnetwork related or signalling related failures that prohibit the use of the satellite subnetwork.

The use of MRVT to verify MTP routing between an ISC and an SCM may be useful. However, since there will be limited routing, the addition of MRVT for MTP supporting SIUP is left as an implementation option.

7 Signalling interface definition

This clause describes the protocol architecture at the Q.768 interface.

The protocol architecture to support the signalling functions is illustrated in Figure 2. Signalling System No. 7 is used in the national and international network at the ISC. The protocols operating over the Q.768 interface are Q.710 MTP and the Satellite ISDN User Part (SIUP). This protocol stack supports communication between the call control functions at the ISC and the SCM.

The SIUP, defined in clause 8, consists of signaling procedures for the set-up and release of international ISDN connections over an on-demand ISDN satellite subnetwork. The SIUP functions are similar to those of SS No. 7 ISUP (see Recommendation Q.764). A simplified Message Transfer Part (MTP), defined in Recommendation Q.710, is used to reliably transfer the SIUP messages. Call control processes at both the ISC and the SCM use the SIUP to set-up and release calls.

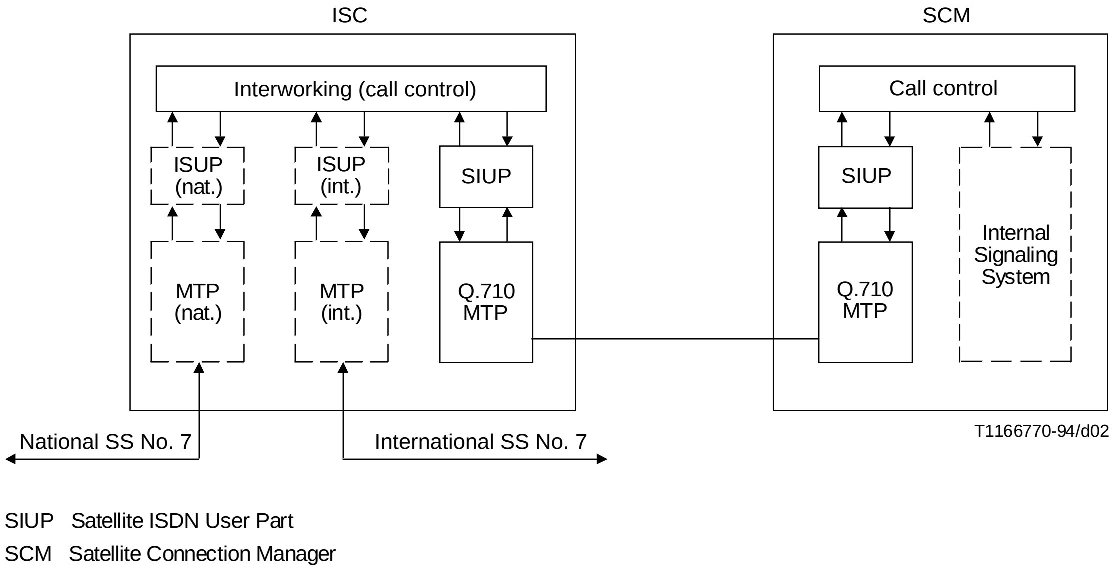


FIGURE 2/Q.768

Protocol architecture

7.1 Simplified Message Transfer Part

The SIUP supports the call control functions in the ISC and in the SCM. It uses the functional interface supported by Recommendation Q.710, simplified Message Transfer Part (levels 1, 2, and 3). In accordance with the description techniques defined by the Open System Interconnection (OSI) model, information is transferred to and from the Q.710 interface function in the form of parameters carried by primitives.

The following primitives are defined at the Q.710 boundary, and are shown in Table 1:

– DL-DATA request (Signalling information);

– DL-DATA indication (Signalling information);

– DL-PAUSE indication;

– DL-RESUME indication.

The selection of a signalling data link between the ISC and the SCM will be determined by each Administration. It is suggested that a 64 kbit/s timeslot be used, corresponding to a digital signalling link described in Recommendation Q.702.

TABLE 1/Q.768

Q.710 Message Transfer Part Primitives

Primitives		Parameters
Generic Name	Specific Name	
DL-DATA	Request Indication	Signalling Information
DL-PAUSE	Indication	
DL-RESUME	Indication	

7.1.1 Label

The coding of the MTP label is as follows:

The label is 4 octets in length, and consists of the standard 32-bit routing label described in clause 2/Q.704. The following convention is used for coding the OPC and the DPC in the routing label (both the ISC and the SCM must belong to the same signalling network):

- for messages sent from the ISC to the SCM, the OPC is coded with the signalling point code of the ISC, and the DPC is coded with the signalling point code of the SCM;
- for messages sent from the SCM to the ISC, the OPC is coded with the signalling point code of the SCM, and the DPC is coded with the signalling point code of the ISC.

The assignment of signalling point codes for the SCM will be determined by administrative arrangement. It is recommended that the ISC point codes used be identical to the international (SS No. 7) point codes.

Signalling links based on this Recommendation can only carry traffic between the SCM and the ISC.

7.1.2 Service Information Octet

The Service Information Octet (SIO) is coded as follows:

The service indicator subfield shall be coded as 1010.

The network indicator must be identical at the SCM and the ISC. Its value will be determined by administrative arrangement.

7.2 Satellite ISDN User Part

The Satellite ISDN User Part (SIUP) supports the call control function at both the ISC and the SCM. It is a user of the MTP. The SIUP is defined in clause 8.

8 Satellite ISDN User Part (SIUP) definition

The Satellite ISDN User Part (SIUP) provides the signalling functions required to support the establishment and release of satellite ISDN calls. The SIUP makes use of the services provided by the Message Transfer Part as specified in Recommendation Q.710.

8.1 Elements for layer to layer communication

Communications between protocol layers are accomplished by means of primitives. Primitives represent, in an abstract way, the logical exchange of information and control between the SIUP and adjacent layers. They do not constrain implementation.

This subclause defines the primitives between SIUP and Q.710 level 3, and between SIUP and call control.

8.1.1 SIUP – Call control interactions

Table 2 defines the following primitives between SIUP and call control.

TABLE 2/Q.768

Primitives between SIUP and call control

Primitives		Parameters (Note)
Generic Name	Specific Name	
SIUP-SETUP	Request Indication Response Confirm	TMR (mandatory) TMR' (optional) LLC (optional, up to 4 included) HLC (optional, up to 2 included) USI (optional) USI' (optional) Continuity check (optional)
SIUP_RELEASE	Request Indication	Cause (optional)
SIUP_UPDATE	Request Indication	TMU (optional) LLC (optional) HLC (optional) Continuity check completed (optional)
SIUP_OUT_OF_SERVICE	Request Indication	Cause (mandatory) Range and status (optional)
SIUP_BACK_IN_SERVICE	Request Indication	Cause (mandatory) Range and status (optional)
SIUP_ERROR	Indication	
NOTE – CIC, ISC-OPC and ISC-DPC are all mandatory parameters for each primitive.		

The definition of these signals is as follows:

a) The SIUP_SETUP primitives are used by the ISC call control to request that an ISDN connection be set-up, and are used by the SCM call control to acknowledge the successful set-up of the requested ISDN connection. SIUP_SETUP.request and SIUP_SETUP.confirm are valid at the ISC, and SIUP_SETUP.indication and SIUP_SETUP.response are valid at the SCM.

In addition to the CIC, ISC-OPC, and ISC-DPC parameters, the SIUP_SETUP primitives have one mandatory parameter, TMR, and six optional parameters: HLC, LLC, TMR′, USI, USI′ and Continuity check. The values of the HLC, LLC, TMR, TMR′, USI and USI′ parameters are the same as those of the corresponding ISUP or SIUP message from which they were extracted. The Continuity check parameter, if present, indicates that the ISC will perform a continuity check on the circuit.

b) The SIUP_RELEASE primitive is used by the ISC call control to request the release of an ISDN connection, and are used by the SCM call control to notify the remote ISC of either an unsuccessful set-up attempt or a premature release of the connection.

The SIUP_RELEASE.indication primitive is also used by SIUP to notify the ISC of a set-up failure due to timer expiry.

In addition to the CIC, ISC-OPC, and ISC-DPC parameters, the SIUP_RELEASE primitives have one optional parameter, Cause. The Cause parameter takes on one of the following values: Set-up failure – lack of capacity, Set-up failure – subnetwork failure, Set-up timeout, or Premature release.

c) The SIUP_UPDATE primitives are used to update the SCM call control with revised call information (e.g. fallback, low layer compatibility negotiation).

   In addition to the CIC, ISC-OPC and ISC-DPC parameters, the SIUP_UPDATE primitives have four optional parameters, HLC, LLC, TMU, and Continuity check completed. The values of the LLC, HLC and TMU parameters are the same as those of the corresponding ISUP or SIUP message from which they were extracted. The Continuity check completed parameter, if present, indicates that the ISC has successfully completed continuity check on the circuit.

d) The SIUP_OUT_OF_SERVICE primitives are used to indicate that a particular CIC or group of CICs are not available for routing, due to failure or maintenance conditions in the satellite subnetwork.

   In addition to the CIC, ISC-OPC, and ISC-DPC parameters, the SIUP_OUT_OF_SERVICE primitives have one mandatory parameter, Cause, and one optional parameter, Range and status. The Cause parameter takes on one of the values defined in the Type indicator field of 8.2.3.1.2.8. The Range and status parameter indicates the additional CICs, in addition to the main CIC parameter, that are covered (see 8.2.3.1.2.9).

e) The SIUP_BACK_IN_SERVICE primitives are used to indicate that a particular CIC or group of CICs, previously taken out of service, should be made available for routing.

   In addition to the CIC, ISC-OPC and ISC-DPC parameters, the SIUP_BACK_IN_SERVICE primitives have one mandatory parameter, Cause, and one optional parameter, Range and status. The Cause parameter takes on one of the values defined in the Type indicator field of 8.2.3.1.2.8. The Range and status parameter indicates the additional CICs, in addition to the CIC parameter, that are covered (see 8.2.3.1.2.9).

f) The SIUP_ERROR.indication primitive is used to indicate to call control that an error has been detected by the SIUP protocol.

8.1.2 SIUP – Q.710 interactions

The primitives that are used between SIUP and Q.710 are described in 7.1. SIUP messages submitted for transmission to the peer are placed in the Signalling information parameter of the DL-DATA.request primitive. Messages extracted from the Signalling information parameter of the DL-DATA.indication primitive are received SIUP messages from the peer.

8.2 Elements for peer-to-peer communications

In the following message descriptions, the term “circuit” can mean one or more circuits needed for the call.

8.2.1 Message description

8.2.1.1 Set-up

A message sent from the ISC to the SCM to initiate seizure of an outgoing circuit, requesting that a satellite circuit be inserted between the corresponding outgoing and incoming circuits on the terrestrial side, and providing information for the purpose of protocol conversion.

8.2.1.2 Set-up Acknowledge

A message sent from the SCM to the ISC indicating that the satellite circuit insertion has been completed successfully.

8.2.1.3 Release

This message, when sent from the ISC to the SCM, indicates the release of the satellite circuit and/or protocol conversion for a particular outgoing circuit or circuits. When sent from the SCM to the ISC, this message indicates the premature release of the satellite circuit, or indicates that the SIUP set-up cannot be satisfied by the satellite subnetwork (i.e. blocking).

8.2.1.4 Update

A message sent from the ISC to the SCM including further call set-up information (e.g. regarding a change in TMR, USI, HLC, or LLC), based on the reception of fallback or LLC negotiation (Annex J/Q.931) information at the ISC, or completion of continuity check.

8.2.1.5 Out of Service

A message sent from the SCM to the ISC that is considered by the ISC to be equivalent to the alarm signal defined in Recommendation Q.33. This message also indicates the cause (e.g. failure, maintenance). The ISC will take release actions (if appropriate) as specified in Recommendation Q.33.

8.2.1.6 Back in Service

A message sent from the SCM to the ISC indicating that one or more circuits are back in service.

8.2.2 Message parameters

8.2.2.1 Circuit Identification Code (CIC)

This parameter contains a code identifying the circuit between a pair of ISCs. If the call is a multirate call, the coding of the CIC follows the coding specified in Recommendation Q.764.

8.2.2.2 High Layer Compatibility (HLC)

This parameter indicates the high layer compatibility information requested by the calling party, as mapped from the ISUP ATP.

8.2.2.3 ISC Destination Point Code (ISC-DPC)

This parameter indicates the international SS No. 7 signalling point code of the incoming ISC.

8.2.2.4 ISC Originating Point Code (ISC-OPC)

This parameter indicates the international SS No. 7 signalling point code of the outgoing ISC.

8.2.2.5 Low Layer Compatibility (LLC)

This parameter indicates the low layer compatibility information requested by the calling party, as mapped from the ISUP ATP.

8.2.2.6 Routing label

This parameter provides addressing information to the message Transfer Part.

8.2.2.7 Transmission Medium Requirement (TMR)

This parameter indicates the type of transmission medium required for the connection.

8.2.2.8 Transmission Medium Requirement prime (TMR prime)

This parameter indicates the fallback connection type in case of fallback.

8.2.2.9 Transmission Medium Used (TMU)

This parameter indicates the resulting fallback connection type being used.

8.2.2.10 User Service Information (USI)

This parameter indicates the bearer capability requested by the calling party.

8.2.2.11 User Service Information prime (USI prime)

This parameter indicates the additional bearer capability requested by the calling party.

8.2.2.12 Continuity check

This parameter indicates the status of the continuity check.

8.2.3 Formats and codes

SIUP messages are carried on the signalling link by means of signal units, the format of which is described in Recommendation 2.2/Q.703 and in clause 7 of this Recommendation.

The signalling information field of each message signal unit consists of an integral number of octets and contains the following parts:

a) routing label;

b) circuit identification code;

c) ISC-Outgoing point code;

d) ISC-Destination point code;

e) message type code;

f) message specific parameters, which may contain fixed length and variable length parameter fields.

The general message format is illustrated in Figure 3. 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. Within each octet and subfield the bits are transmitted with the least significant bit first. Between parameters there should be no unused (i.e. dummy) octets.

All reserved bits are coded as zero by the transmitter and ignored by the receiver.

The first 11 bytes of each message consist of the first 5 message parameters, which are mandatory. In addition, there may be optional or mandatory message specific parameters.

8.2.3.1 Parameter format and codes

8.2.3.1.1 Message label

The message label is included in every SIUP message, and consists of five fixed length parameters. The position, length, and order of the parameters is uniquely defined, thus the names of the parameters and the length indicators are not included in the message.

8.2.3.1.1.1 Routing label

The format and codes used for the routing label are described in 7.1. For each individual circuit connection, the same routing label must be used for each message that is transmitted for that connection.

8.2.3.1.1.2 Circuit identification code

The format and allocation of the Circuit Identification Code (CIC) is described in 1.2/Q.763. The length of the CIC field is 2 octets.

8.2.3.1.1.3 ISC Originating Point Code

The format of the Origination Point Code (ISC-OPC) is the same as that of the signalling point code parameter described in 3.31/Q.763. The length of the ISC-OPC is 2 octets.

8.2.3.1.1.4 ISC Destination Point Code

The format of the Destination Point Code (ISC-DPC) is the same as that of the signalling point code parameter described in 3.31/Q.763. The length of the ISC-DPC is 2 octets.

8.2.3.1.1.5 Message type code

The encoding of the message type is shown in Table 3. All other message type codes are reserved. The length of the message type code is 1 octet.

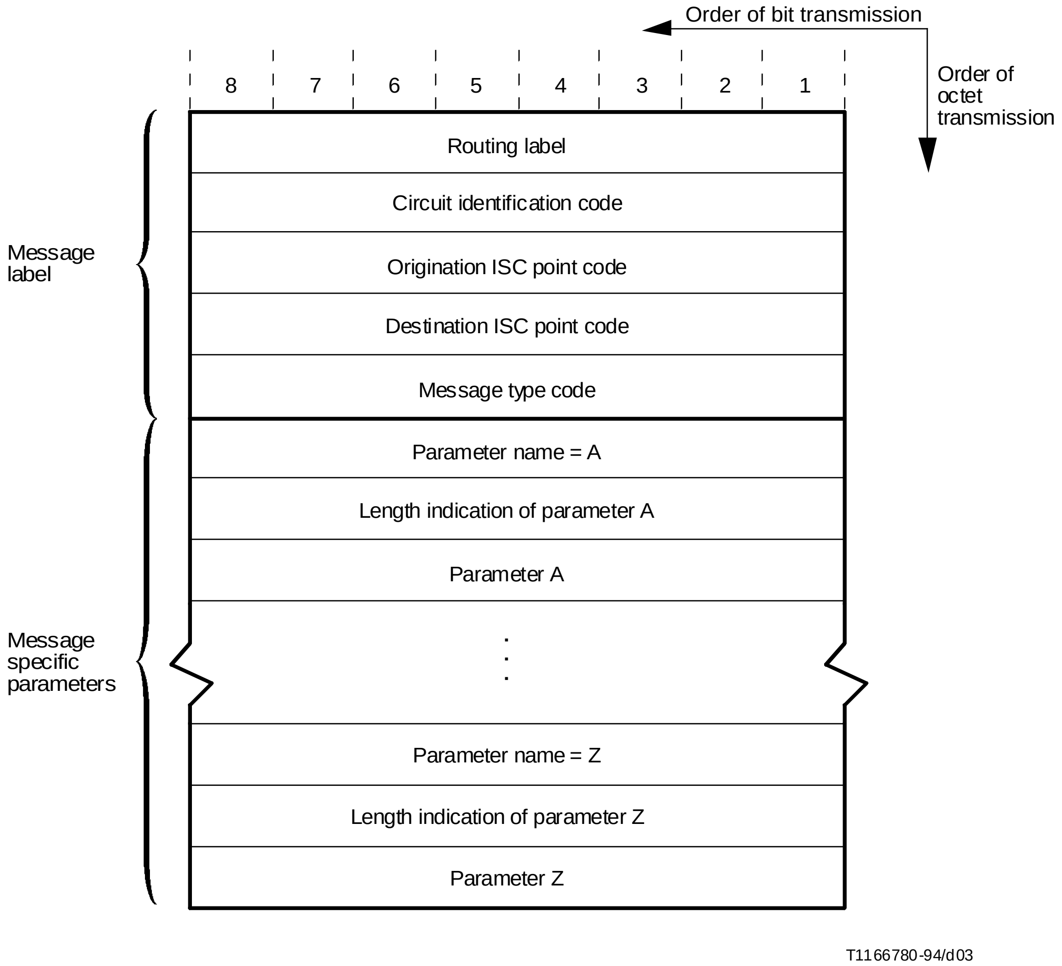


FIGURE 3/Q.768

General message format

TABLE 3/Q.768

Message type codes

Message type	Code
Back in Service	00001001
Out of Service	00001000
Release	00000011
Set-up	00000001
Set-up Acknowledge	00000010
Update	00000100

8.2.3.1.2 Message specific parameters

Figure 3 illustrates the structure and location of message specific parameters. Each message specific parameter is identified by a parameter name, is delimited by a parameter length indication field, and contains the parameter fields described below. Table 4 illustrates the codes for the parameter names. All other parameter names are reserved.

The length indication of a parameter is a 1 octet field which is binary coded to indicate the total number of octets in the relevant parameter. The length indicated does not include the parameter name octet or the length indication of parameter octet. For example, to include the TMR parameter in a message, the TMR parameter name would be followed by a one octet length indicator field indicating a parameter length of 1 octet, followed by the TMR parameter itself.

TABLE 4/Q.768

Parameter name codes

Parameter	Parameter name
Transmission Medium Requirement	00000010
Transmission Medium Requirement Prime	00111110
Transmission Medium Used	00110101
User Service Information	00011101
User Service Information Prime	00110000
High Layer Compatibility	01011101
Low Layer Compatibility	01011111
Cause	00010010
Range and Status	00010110
Continuity Check	00010000

8.2.3.1.2.1 Transmission medium requirement

The format of the Transmission Medium Requirement (TMR) is described in 3.35/Q.763. The length of the TMR is 1 octet.

8.2.3.1.2.2 Transmission medium requirement prime

The format of the Transmission Medium Requirement prime (TMR prime) is described in 3.35A/Q.763. The length of the TMR prime is 1 octet.

8.2.3.1.2.3 Transmission medium used

The format of the Transmission Medium Used (TMU) is described in 3.35B/Q.763. The length of the TMU is 1 octet.

8.2.3.1.2.4 User service information

The format of the User Service Information (USI) is described in 3.36/Q.763. The maximum length of the USI is 11 octets.

8.2.3.1.2.5 User service information prime

The format of the User Service Information prime (USI prime) is described in 3.36A/Q.763. The maximum length of the USI prime is 11 octets.

8.2.3.1.2.6 Low layer compatibility

The format of the Low Layer Compatibility (LLC) is described in Recommendation 4.5.19/Q.931. The first two octets of the LLC described in 4.5.19/Q.931, are the same as the parameter name and length indication fields preceding the parameter; therefore, they are not duplicated. The maximum length of the LLC is 16 octets.

8.2.3.1.2.7 High layer compatibility

The format of the High Layer Compatibility (HLC) is described in Recommendation 4.5.17/Q.931. The first two octets of the LLC described in 4.5.17/Q.931, are the same as the parameter name and length indication fields preceding the parameter; therefore, they are not duplicated. The maximum length of the HLC is 3 octets.

8.2.3.1.2.8 Cause

The cause parameter is 1 octet in length. Figure 4 illustrates the format of the cause parameter.

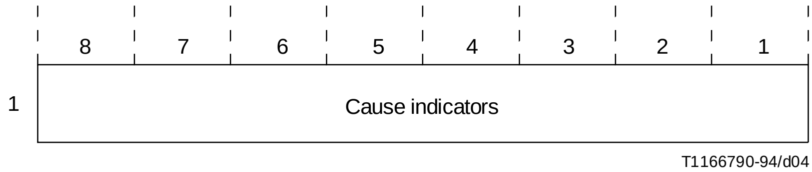


FIGURE 4/Q.768

Cause parameter format

The following codes are used in the cause indicators field:

a) in SIUP Release messages:

bits 2	1	Type indicator
0	0	Reserved
0	1	Set-up failure: Lack of capacity
1	0	Set-up failure: Subnetwork failure
1	1	Premature release

Bits 3-8 are reserved.

b) in SIUP Out of Service and Back in Service messages:

bit 1	Type indicator
0	Maintenance oriented
1	Subnetwork failure

Bits 2-8 are reserved.

8.2.3.1.2.9 Range and status

The range and status parameter is up to 5 octets length. Figure 5 illustrates the format of the range and status parameter:

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 1 to 32. The number represented by the range code indicates the range of circuits affected by the message. Range codes 0 and 33-255 are reserved.

b) *Status*

The status subfield contains from 1 to 32 status bits numbered from 0 to 31. 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 the range. The number of status octets is the minimum number sufficient to carry the status bits needed.

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 SIUP Out of Service messages

0 No indication

1 Out of service

– in SIUP Back in Service messages

0 No indication

1 Back in service

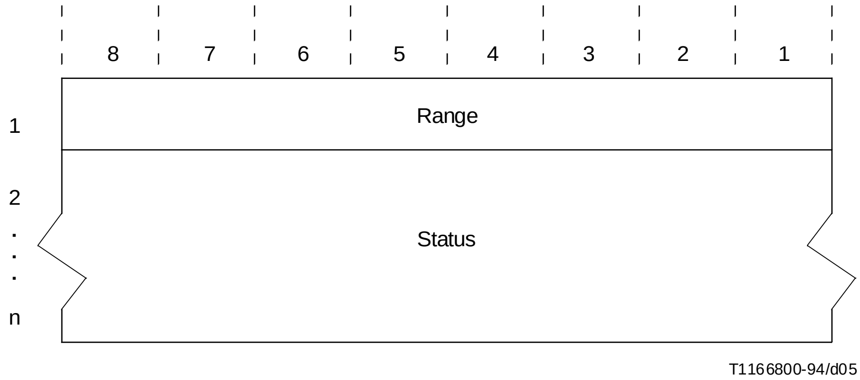


FIGURE 5/Q.768

Range and status parameter format

8.2.3.1.2.10 Continuity check

The Continuity Check (CCH) parameter is 1 octet in length. Figure 6 illustrates the format of the Continuity check parameter.

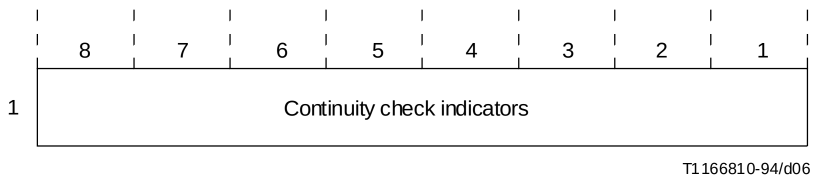


FIGURE 6/Q.768

Continuity check parameter format

The following codes are used in the Continuity check indicators field:

a) in SIUP Set-up messages:

bit 1 Indicator

0 No continuity check

1 Continuity check

Bits 2-8 are reserved.

b) in SIUP Update messages:

bit 1 Indicator

0 Continuity check not completed

1 Continuity check completed successfully

Bits 2-8 are reserved.

8.2.3.2 Message formats and codes

The following message codings are based on the general format described in Figure 3. In Figures 7 through 11, the message label (first 11 octets) of each message is shown as a single block, for simplicity of illustration. Some SIUP messages have "message specific" parameters in addition to the message label.

8.2.3.2.1 Set-up

The SIUP Set-up message includes the following message specific parameters, if present:

a) Transmission Medium Requirement (TMR);

b) Transmission Medium Requirement prime (TMR prime), if present;

c) User Service Information (USI), if present;

d) User Service Information prime (USI prime), if present;

e) Low Layer Compatibility (LLC), if present;

f) High Layer Compatibility (HLC), if present;

g) Continuity Check (CCH), if present.

The LLC and HLC parameters are extracted from the ATP at the international exchange. If multiple LLC or HLC parameters are encoded in the ATP, they are placed in the SIUP Set-up message in decreasing order of priority.

The format of the set-up message is shown in Figure 7.

8.2.3.2.2 Set-up Acknowledge

The SIUP Set-up Acknowledge message does not include any parameters in addition to the message label. The format of the Set-up Acknowledge message is shown in Figure 8.

8.2.3.2.3 Release

The SIUP Release message may contain the optional parameter "Cause". The format of the Release message is shown in Figure 9.

8.2.3.2.4 Update

The SIUP Update message includes the following message specific parameters, if present:

a) Transmission Medium Used (TMU), if present;

b) Low Layer Compatibility (LLC), if present;

c) High Layer Compatibility (HLC), if present;

d) Continuity Check (CCH), if present.

The LLC and HLC parameters are extracted from the ATP at the international exchange.

The format of the Update message is shown in Figure 10.

8 7 6 5 4 3 2 1
Message label (11 octets)
Transmission medium requirement
Transmission medium requirement prime (if present)
User service information (if present)
User service information prime (if present)
High layer compatibility (if present)
High layer compatibility (if present)
Low layer compatibility (if present)
Low layer compatibility (if present)
Low layer compatibility (if present)
Low layer compatibility (if present)
Continuity check (if present)

T1178170-95/d07

FIGURE 7/Q.768

Set-up message format

8 7 6 5 4 3 2 1
Message label (11 octets)

T1166830-94/d08

FIGURE 8/Q.768

Set-up Acknowledge message format

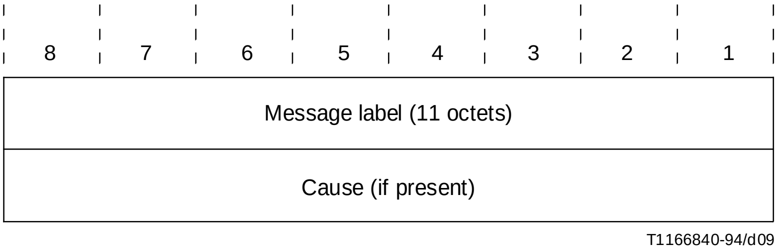


FIGURE 9/Q.768

Release message format

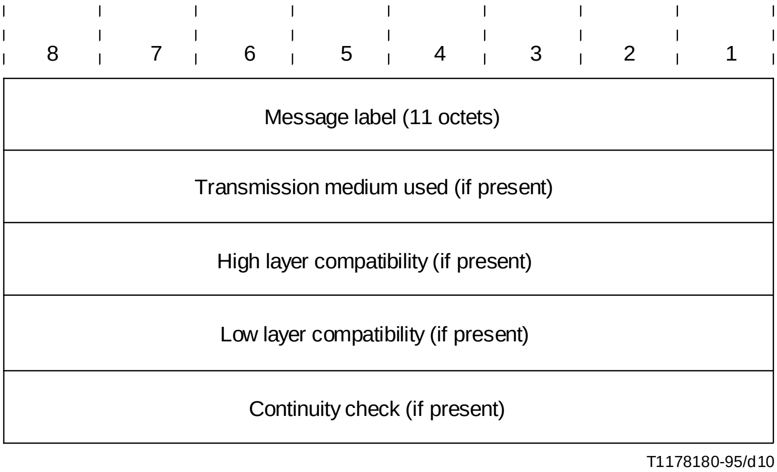


FIGURE 10/Q.768

Update message format

8.2.3.2.5 Out of Service, Back in Service

The SIUP Out of Service and Back in Service messages have the same format. The messages contain the mandatory parameter "Cause" and may contain the optional parameter "Range and Status". The format of these messages is shown in Figure 11.

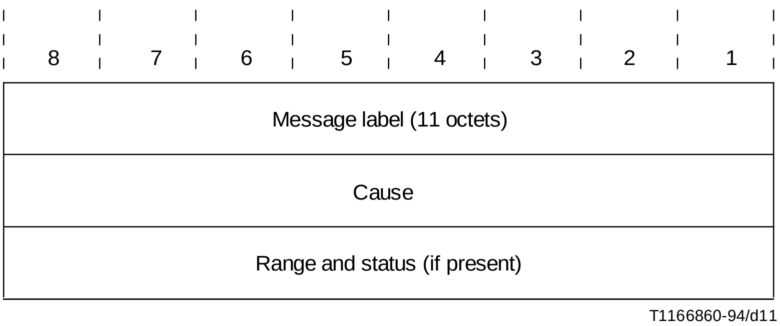


FIGURE 11/Q.768

Out of Service and Back in Service messages format

8.2.4 SIUP signalling procedures and information flows

The basic call control procedure is divided into three phases: call set-up, the data/conversation phase, and call clear-down. Messages on the signaling link are used to establish and terminate the different phases of the call. Annex A illustrates message flows for these procedures.

8.2.4.1 Call set-up

The following describes a message flow scenario for the procedure of connection establishment between an outgoing and an incoming ISC using the SIUP signalling. This procedure applies to both provisioned (fixed-assignment) circuits and on-demand circuits. The procedures are equally applicable to *en bloc* or overlap operation.

NOTE – Use of SIUP procedures for provisioned circuits permits the enabling and disabling of protocol converters on the fixed assignment circuit.

8.2.4.1.1 Procedures at the outgoing ISC

a) *Actions performed during circuit selection*

As specified in Recommendation Q.764, upon receipt of an initial address message (IAM), the outgoing ISC will determine if it can route the call using the connection type specified, seize a free inter-exchange circuit, and send an IAM to the succeeding exchange. If the inter-exchange circuit seized by the ISC is supported by SIUP signalling, then the call control follows the procedures described below before instructing the outgoing ISUP to send the IAM to the succeeding exchange; otherwise, the Q.764 procedures are followed.

The SIUP receives from the call control a SIUP_SETUP.request primitive that contains the CIC, ISC-OPC, ISC-DPC, and the following parameters, if present:

a) Transmission Medium Requirement (TMR/TMR prime);

b) Lower Layer Compatibility (LLC, as mapped from ATP);

c) Higher Layer Compatibility (HLC, as mapped from ATP);

d) User Service Information (USI/USI prime);

e) Continuity Check (CCH).

NOTE – The IAM could be segmented, in which case the LLC and HLC are in the second segment.

The SIUP sends a Set-up message to the SCM, and starts timer SIUP_T1. If the SIUP receives a Set-up Acknowledge message from the SCM before timer SIUP_T1 expires, it sends a SIUP_SETUP.confirm primitive to call control and stops timer SIUP_T1. If the SIUP receives a Release message or an expiry of SIUP_T1 before receipt of a Set-up Acknowledge message, it sends a SIUP_RELEASE.indication primitive to call control.

If the call control process receives a SIUP_SETUP.confirm primitive in response to the SIUP_SETUP.request primitive, it will proceed by sending the IAM to the succeeding exchange, and continues with normal call set-up procedures. If it receives a SIUP_RELEASE.indication primitive in response to the SIUP_SETUP.request primitive, it will attempt to reroute the call.

b) *Actions performed during call set-up pending*

If the ISC receives an ISUP Address Complete Message (ACM), Connect Message (CON), Call Progress Message (CPG), or an Answer Message (ANM) containing a TMU or an ATP, it forwards these parameters to call control, which then instructs SIUP, through the use of the SIUP_UPDATE.request primitive, to send an Update message containing the new TMU, HLC and/or LLC to the outbound SCM.

8.2.4.1.2 Procedures at the incoming ISC

If the incoming international exchange receives an IAM for an incoming inter-exchange circuit supported by SIUP signalling, it follows normal call set-up procedures as described in Recommendation Q.764.

If the ISC receives an ACM, CON, CPG, or an ANM ISUP message containing a TMU or an ATP, it forwards these parameters to call control, which then instructs SIUP, through the use of the SIUP_UPDATE.request primitive, to send an Update message containing the new TMU, HLC and/or LLC to the inbound SCM.

8.2.4.1.3 Procedures at the outgoing SCM

Upon receipt of a SIUP Set-up message, the call control at the SCM forwards the request to the satellite subnetwork control. If the satellite subnetwork determines that it can complete the requested call, the SCM instructs SIUP to return a Set-up Acknowledge message to the ISC. If the satellite subnetwork cannot successfully complete the requested call set-up, the SCM instructs SIUP to return a Release message to the ISC.

Upon receipt of a SIUP Update message, the call control at the SCM processes the new information and makes any necessary changes to the satellite circuit (e.g. removal of unused circuits, insertion of protocol conversion).

8.2.4.1.4 Procedures at the incoming SCM

Upon receipt of a SIUP Update message, the call control at the SCM processes the new information and makes any necessary changes to the satellite circuit (e.g. removal of unused circuits, insertion of protocol conversion).

8.2.4.1.5 Fallback

The basic signalling procedures for SIUP are based on the scenario that the IAM contains the final agreed-upon parameters of a call. However, Recommendation Q.764 allows for fallback procedures. Fallback procedures in ISUP are intended to be general in coverage, based on the two types of bearer capabilities presented by the access signalling. This possibility requires the SIUP Update message, since the outgoing SCM cannot make assumptions about the final agreed-upon parameters of a call based on the IAM.

Upon receipt of an IAM, the ISC forwards the LLC, USI, HLC, and TMR parameters to the SCM via a SIUP Set-up Request message. If fallback is a possibility (if TMR′ and USI′ are present, and the intermediate exchange has determined that the requested satellite circuit and the succeeding network are capable of fallback) these elements should also be included in the Set-up message. The SCM should have the capability to handle both the preferred and fallback TMR. The SCM responds with a Set-up Acknowledge message, and then proceeds to set-up the satellite path based on the requirements for the preferred TMR.

If, at any succeeding point in the call, fallback occurs, that exchange will notify the exchanges in the backward direction through the use of a TMU parameter in the ISUP CPG or ACM (in the case of fallback indicated before answer) or in the ANM or CON (fallback indicated at answer).

If a TMU is received by the outgoing or incoming ISC which indicates that fallback has occurred, the ISC may take actions to modify network resources. Also, a SIUP Update message is sent to the SCM upon receipt of the TMU or ATP in either the ACM, CON, CPG, or ANM messages.

8.2.4.1.6 LLC negotiation and HLC selection

The signalling procedures for SIUP are based on the scenario that the IAM contains the final agreed-upon parameters of a call. However, the revised Recommendation Q.931 allows for LLC negotiation and HLC selection. This procedure requires the SIUP Update message, since the calling end SCM cannot make assumptions about the final agreed-upon parameters of a call based on the IAM.

LLC negotiation is described in Annex J/Q.931. It allows for the possibility of a repeat indicator and the inclusion of up to four prioritized LLC information elements. There are two types of LLC negotiation- in-band and out-of-band. If out-of-band negotiation is supported, the LLC negotiation, if supported by the network signalling (i.e. if the network carries the ATP), will be conveyed to the calling user through the ATP of the ANM or CON.

Out-of-band LLC negotiation can be handled through a SIUP Update message. At both the incoming and outgoing ISC, if a received ANM or CON contains an ATP with an LLC parameter, a SIUP Update message containing the LLC should be sent to the SCMs on either side of the satellite subnetwork. Since the value of the LLC is transparent to SS No. 7, it is required for the ISC to always provide this update to the SCM.

The procedures for this Recommendation to support in-band negotiation are for further study. However, an effective protocol converter would be able to detect and react to in-band negotiation.

Recommendation Q.931 also defines procedures for high layer compatibility selection. If fallback occurs to the alternative high layer compatibility during call set-up, an ATP with a HLC parameter will be included in either the ANM or the CON. A SIUP Update message containing the alternative HLC shall be sent from both the incoming and outgoing ISC when an ANM or CON message contains an ATP with a HLC parameter.

8.2.4.1.7 Continuity checking

The SCM is transparent to continuity checks performed by the ISC. PCF, if present, will be inserted after the continuity check. Therefore, the SCM must be notified of the completion of the continuity check through the use of the SIUP Update message. The SCM must not insert PCF until receipt of an Update message, if continuity check is to be performed.

Upon receipt of a successful report of continuity on the outgoing (satellite) circuit, and upon sending of the COT message to the incoming ISC, the outgoing ISC should send a SIUP Update message, with the CCH parameter, to the SCM. According to Recommendation Q.764, if the ISC encounters continuity failure, an automatic repeat attempt will be made on another circuit and a continuity failure 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 IAM. If the repeated check passes on the call, the circuit will be returned to idle with a Release/Release Complete sequence. In order that continuity recheck may be applied if necessary, the ISC should not release the SCM circuit upon failure of the continuity check. It shall release the circuit by sending a SIUP Release upon successful completion of the continuity recheck.

The inbound ISC should send a SIUP Update message, with the CCH parameter, when it receives a COT from the outbound ISC.

NOTE – More than one SIUP Update message is possible during the call set-up process.

8.2.4.2 Call release

The basic procedures for call release are similar for release initiated by the called end and by the calling end. If an ISC receives an ISUP REL message for a circuit for which it has a satellite connection to the next ISC, it sends a SIUP Release message for that circuit and continues with the normal SS No. 7 ISUP release procedures. Call release should normally only be invoked by the ISC call control.

8.2.4.3 Call suspend/resume

The satellite subnetwork is transparent to call suspend and resume. Receipt of a call suspend or resume message does not result in any SIUP messages to change the satellite connection.

8.2.4.4 Blocking and unblocking of circuits and circuit groups

Blocking and unblocking of circuits served by the satellite subnetwork can occur transparently to the satellite subnetwork. If a circuit served by the on-demand satellite subnetwork is blocked by the ISC, the ISC will need to set-up the satellite circuit (via SIUP messages) before it sends a test IAM to provide through-connect to the next exchange.

8.2.4.5 Exceptional procedures

8.2.4.5.1 Dual seizure

As described in 2.9/Q.764, dual seizure may occur on international circuits. Upon detection of dual seizure, when the non-control exchange backs off the call and releases the switch path, it also sends to the SCM a SIUP Release for the relevant circuit.

8.2.4.5.2 Reset

The general principle for the ISC to follow is that the receipt of a reset circuit or a circuit group reset message should result in a SIUP Release message for each of the circuits affected.

The receipt of a reset message for a circuit served by SIUP signalling shall result in a SIUP Release message from the ISC for the circuit.

The receipt of a circuit group reset message for a circuit group served by SIUP signalling shall result in a SIUP Release message from the ISC for each circuit in the circuit group.

8.2.4.5.3 Receipt of unexpected/unrecognized/errored signalling messages

Future versions of the SIUP protocol may include new messages or parameters at either an ISC or an SCM. If a message is not recognized as a valid message type, it should be discarded without other action. If a message contains a parameter with an unrecognized name, the parameter should be discarded and the rest of the message processed normally. If a parameter contains a codepoint that is not recognized, the codepoint shall be ignored.

When a message format error is detected, the message should be discarded. The definition of message format errors are given in 2.9.5/Q.764.

When an unexpected message is received by the SIUP, the following actions are taken:

- if no call is active or being setup on the circuit, ignore the message;
- if a call is active on the circuit or in the process of being setup, clear the call by issuing a SIUP Release message.

8.2.4.5.4 Out of Service

If needed, the SCM may take circuits out of service (e.g. failure, maintenance). The Out of Service and Back in Service messages are sent from the SCM to the ISC. The Out of Service message is considered by the ISC to be equivalent to the alarm signal defined in Recommendation Q.33. The ISC will take release actions (if appropriate) as specified in Recommendation Q.33. The Back in Service message lifts the out of service condition for a circuit or circuits.

8.2.5 Timers

There is one SIUP timer, located at the outgoing ISC:

- SIUP_T1: Waiting for SIUP Set-up Acknowledge.

SIUP_T1 is set whenever a SIUP Set-up message is sent from the ISC to the SCM. SIUP-T1 is reset whenever a SIUP Set-up Acknowledge message is received from the SCM. If SIUP-T1 expires, a SIUP_RELEASE.indication primitive is generated to call control with the Cause value = “Set-up timeout”, and a Release message is sent to the peer SCM.

The default value of SIUP_T1 is 1 second.

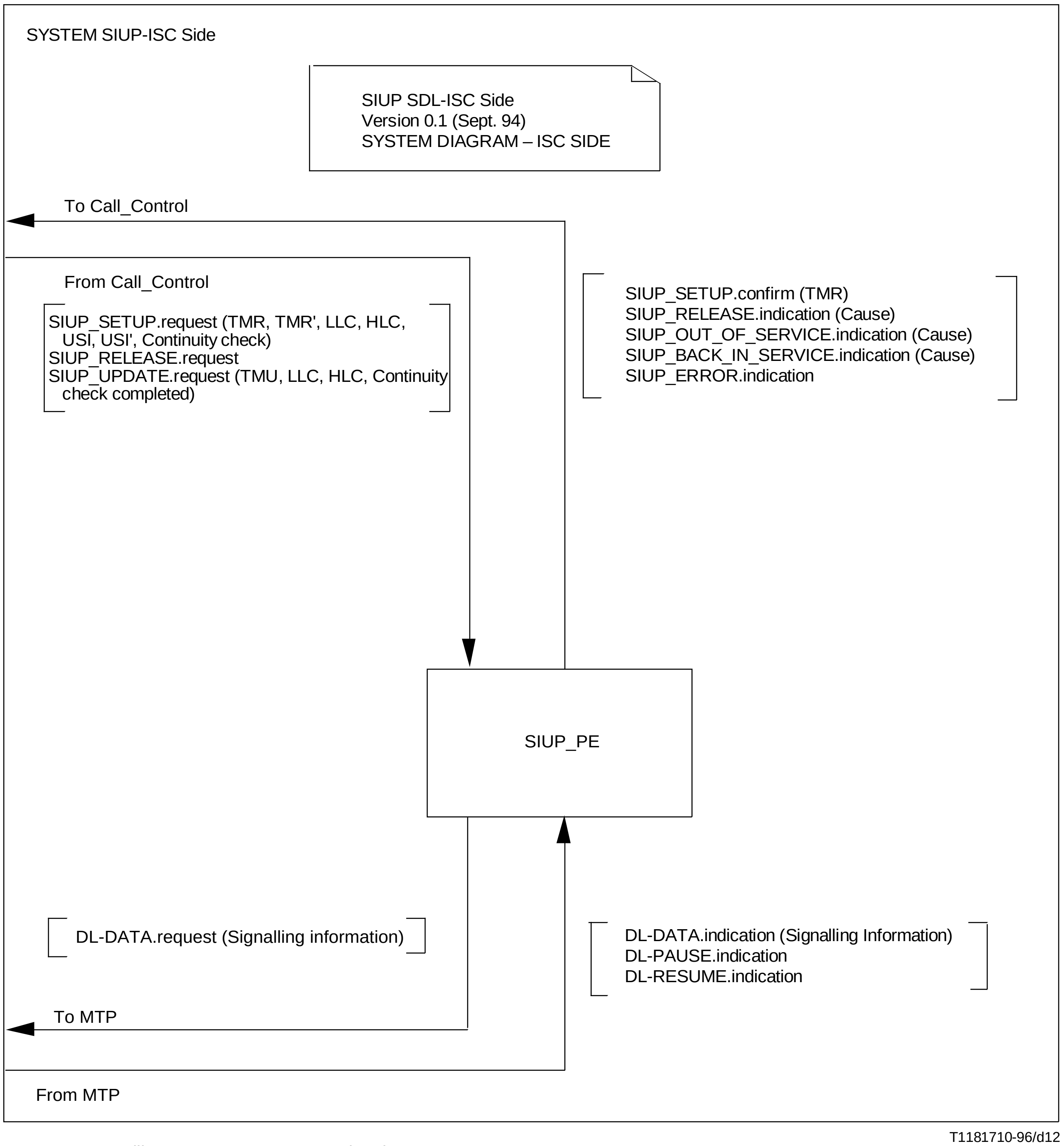
8.3 Specification of SIUP - SDL diagrams

This subclause provides a set of SDL diagrams defining the procedures of SIUP. These SDL diagrams are the definitive description of the procedures and, in case of a conflict with the text of 8.2, the SDL diagrams take precedence.

For clarity of illustration, the SDL diagrams use a conceptual state machine process; this illustration, however, is not intended to constrain implementation.

8.3.1 ISC side SDLs

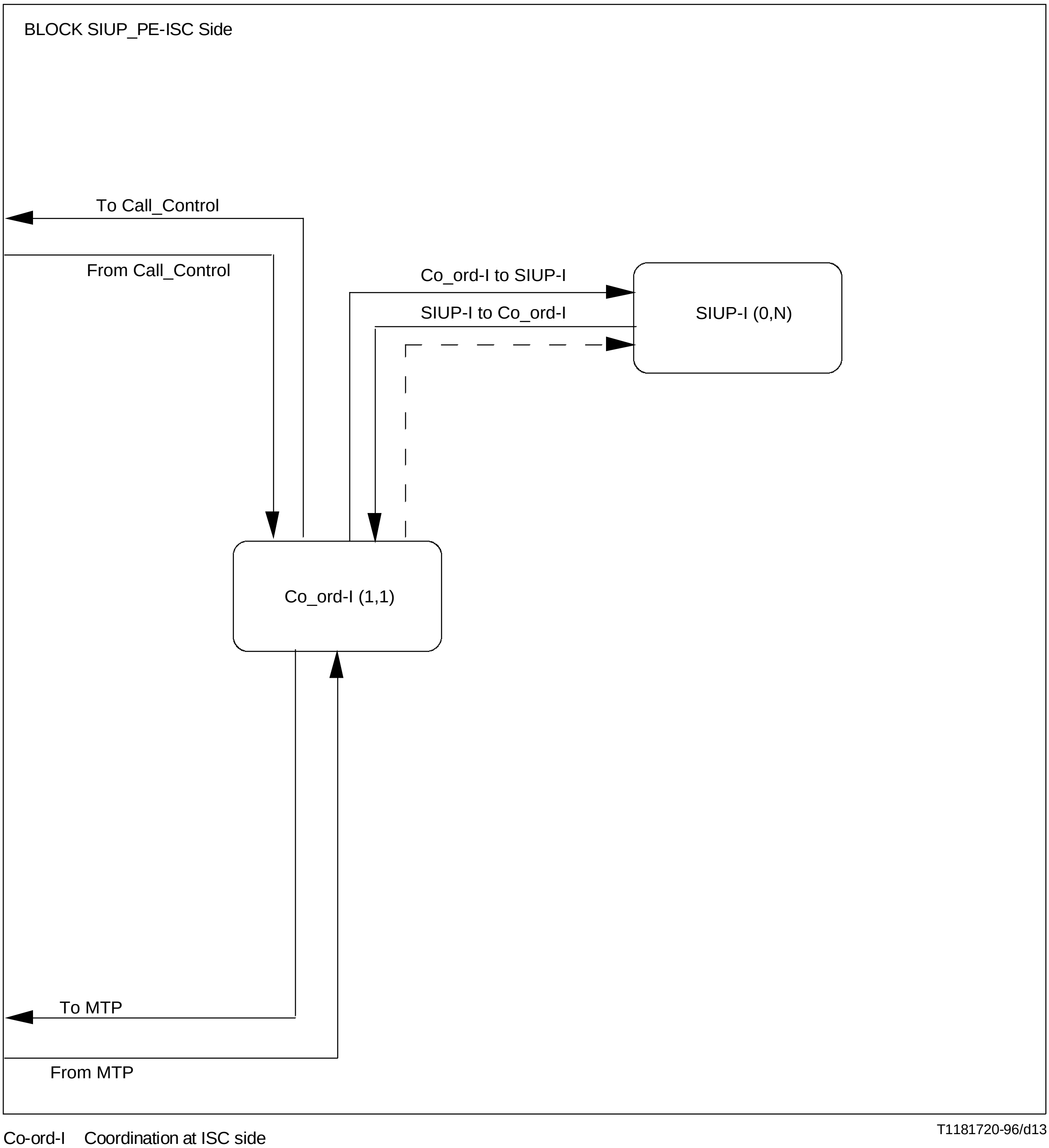
See Figures 12 to 21



SIUP_PE Satellite ISDN User Part_Protocol Entity
MTP Message Transfer Part (Rec. Q.710)

FIGURE 12/Q.768

SIUP System



Co-ord-I Coordination at ISC side
MTP Message Transfer Part (Rec. Q.710)

FIGURE 13/Q.768

SIUP Block

page 1 of (2)

Acronyms and abbreviations
==

CC = Call control

/* */ = Text comment

x.x = Reference to relevant subclause x.x of Q.768

Message (#) = General reference to message (with parameters) from SIUP-I process, to be sent to peer

'Primitive' = General reference to primitive from SIUP-I process, to be sent to call control

Messages to/from peer (parameters in parentheses) (defined in 8.2)
==

NOTE – In addition to the message specific parameters listed, all messages contain the following five parameters: Routing Label, ISC-OPC, ISC-DPC, CIC, and Message Type (defined in 8.2.3)

Messages to SIUP-SCM

RELEASE
SETUP (CCH, HLC, LLC, TMR, TMR', USI, USI')
UPDATE (CCH, HLC, LLC, TMU)

Messages from SIUP-SCM

OUT OF SERVICE (Cause, Range and status)
SETUP ACKNOWLEDGE (TMR)
BACK IN SERVICE (Cause, Range and status)
RELEASE (Cause)

Primitives to/from Call Control (parameters in parentheses)(defined in 8.1)
===

NOTE – In addition to the parameters listed, all primitives carry the following three parameters: ISC-OPC, ISC-DPC, and CIC (defined in 8.1.1)

Primitives from call control

SIUP_SETUP.request (Continuity check, HLC, LLC, TMR, TMR', USI, USI')
SIUP_RELEASE.request
SIUP_UPDATE.request (Continuity check completed, HLC, LLC, TMU)

Primitives to call control

SIUP_SETUP.confirm (TMR)
SIUP_RELEASE.indication (Cause)
SIUP_OUT_OF_SERVICE.indication (Cause)
SIUP_BACK_IN_SERVICE.indication (Cause)
SIUP_ERROR.indication

Primitives to/from MTP (parameters in parentheses) (defined in 7.1)
==

DL-DATA.request (Signalling information)
DL-DATA.indication (Signalling information)
DL-PAUSE.indication
DL-RESUME.indicaiton

T1166890-94/d14

FIGURE 14/Q.768 (sheet 1 of 2)

SDL Conventions

Signal list 'Co_ord-I to SIUP-I' (parameters in parentheses)
==
NOTE – The Co_ord-I process delivers signals (received messages and primitives) to individual SIUP-I state machines, which are defined by the ISC-OPC, ISC-DPC, and CIC. The following signals are passed by Co_ord-I to SIUP-I.

Messages

OUT OF SERVICE (Cause)
SETUP ACKNOWLEDGE (TMR)
BACK IN SERVICE (Cause)
RELEASE (Cause)

Primitives

SETUP.request (Continuity check, HLC, LLC, TMR, TMR', USI, USI')
RELEASE.request
UPDATE.request (Continuity check completed, LLC, TMU)

Signal list 'SIUP-I to Co_ord-I' (parameters in parentheses)
==
NOTE – The SIUP-I process delivers signals to the Co_ord-I process, which subsequently delivers them to MTP as messages or call control as primitives. The following signals are passed by SIUP-I to Co_ord-I.

Messages

RELEASE
SETUP (CCH, HLC, LLC, TMR, TMR', USI, USI')
UPDATE (CCH, LLC, TMU)

Primitives

SETUP.confirm (TMR)
RELEASE.indication (Cause)
OUT_OF_SERVICE.indication (Cause)
BACK_IN_SERVICE.indication (Cause)
ERROR.indication

T1166900-94/d15

FIGURE 14/Q.768 (sheet 2 of 2)

SDL Conventions

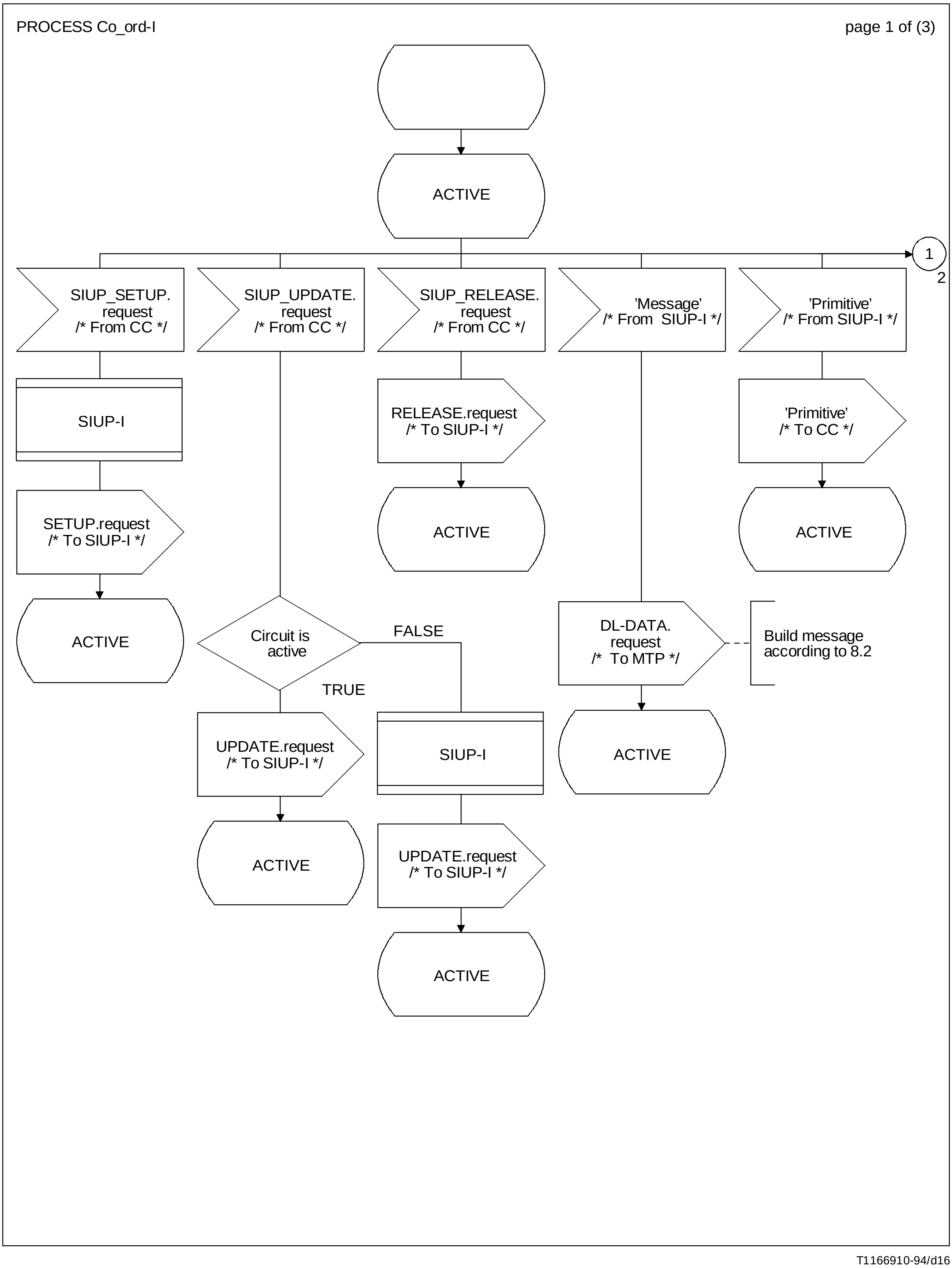


FIGURE 15/Q.768 (sheet 1 of 3)

Coordination Process

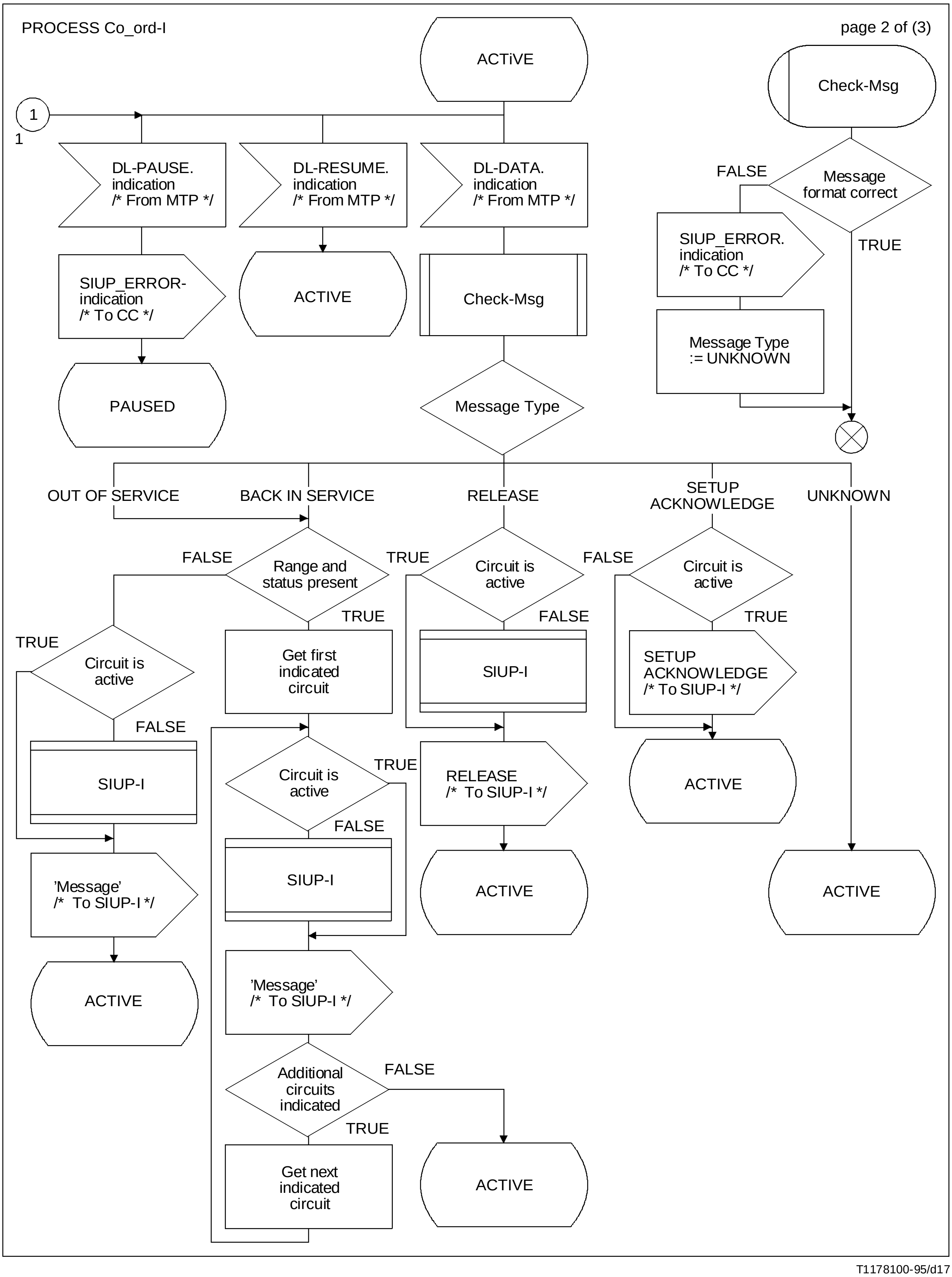


FIGURE 15/Q.768 (sheet 2 of 3)

Coordination Process

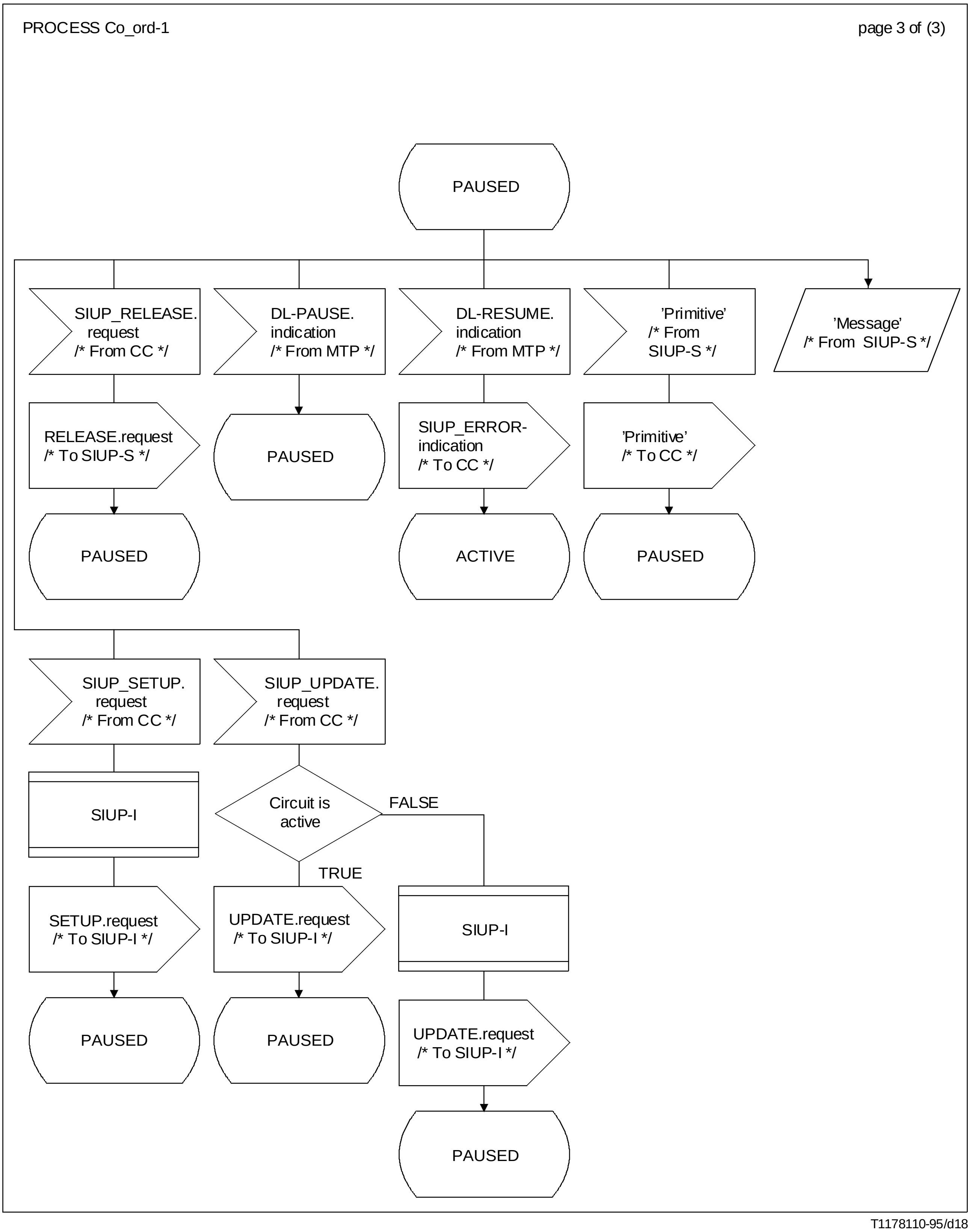


FIGURE 15/Q.768 (sheet 3 of 3)

Coordination Process

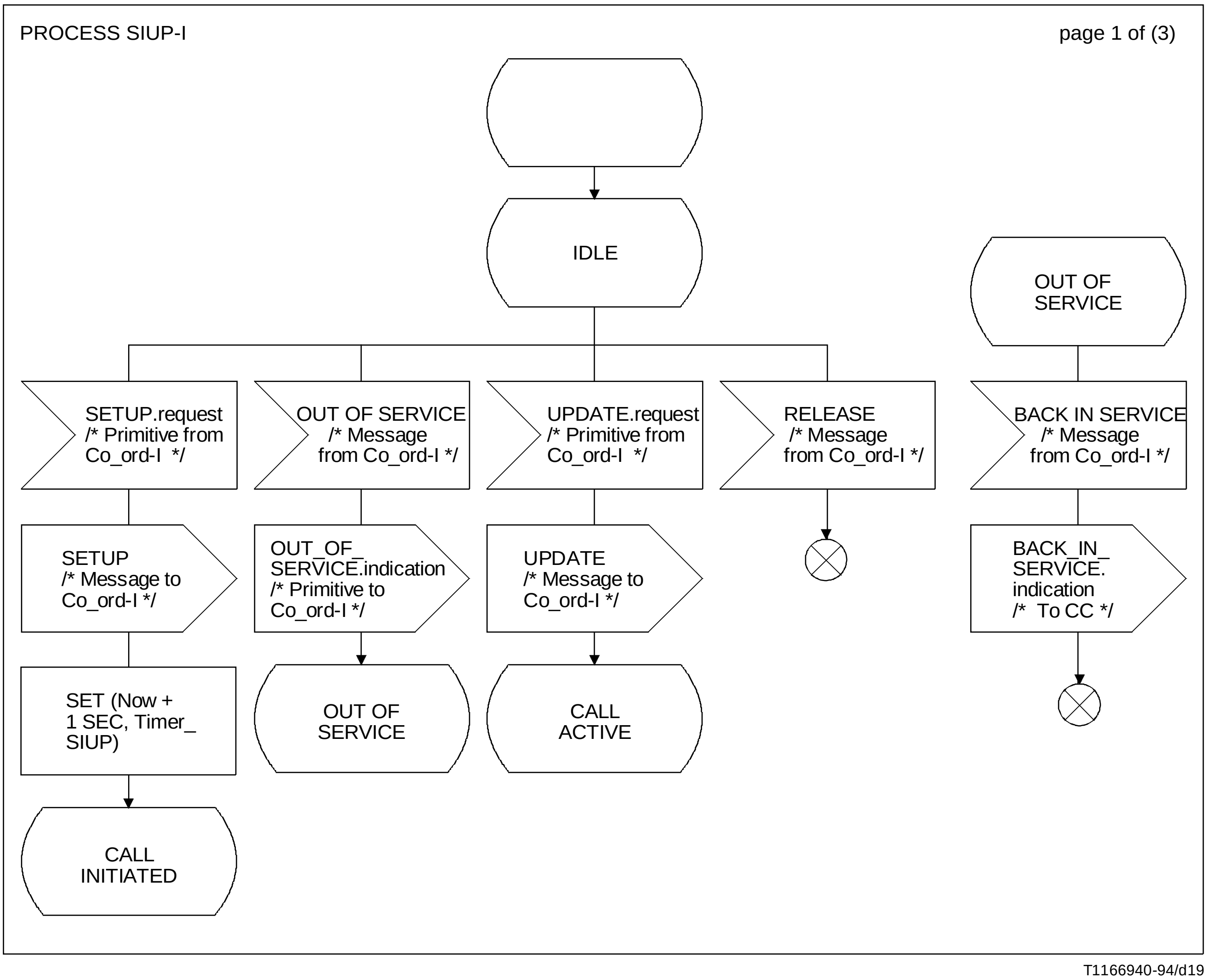


FIGURE 16/Q.768 (sheet 1 of 3)

SIUP-I Process

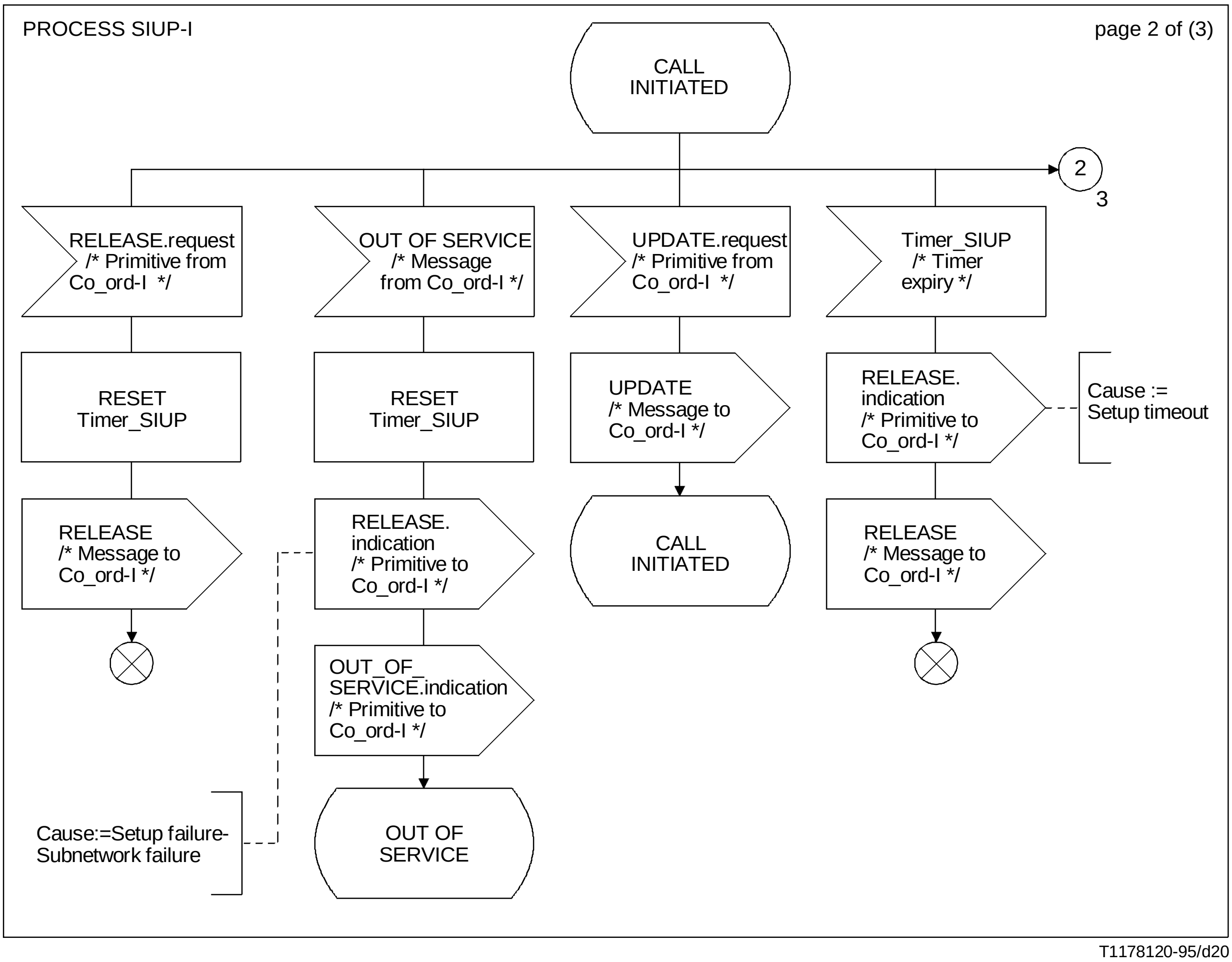
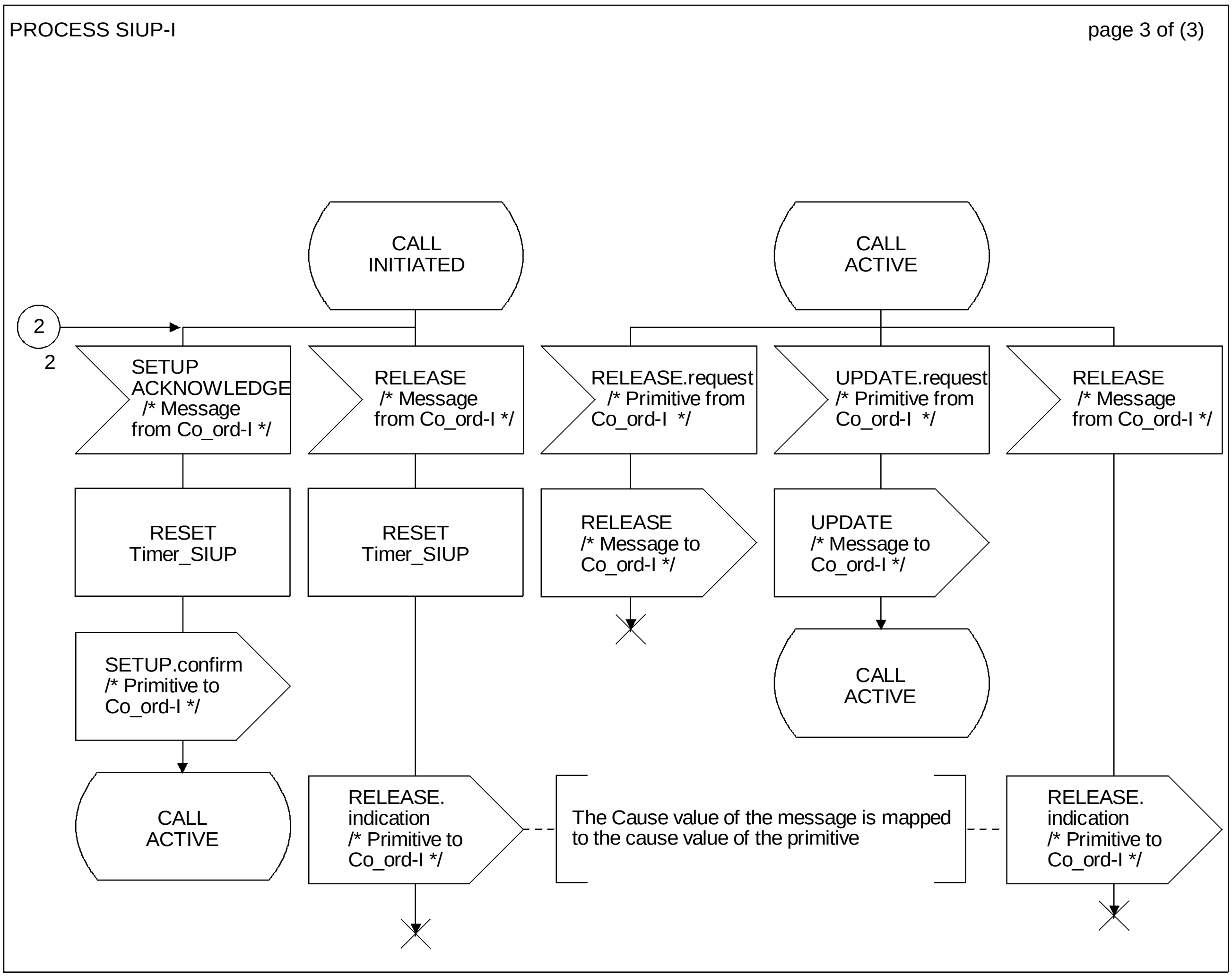


FIGURE 16/Q.768 (sheet 2 of 3)

SIUP-I Process

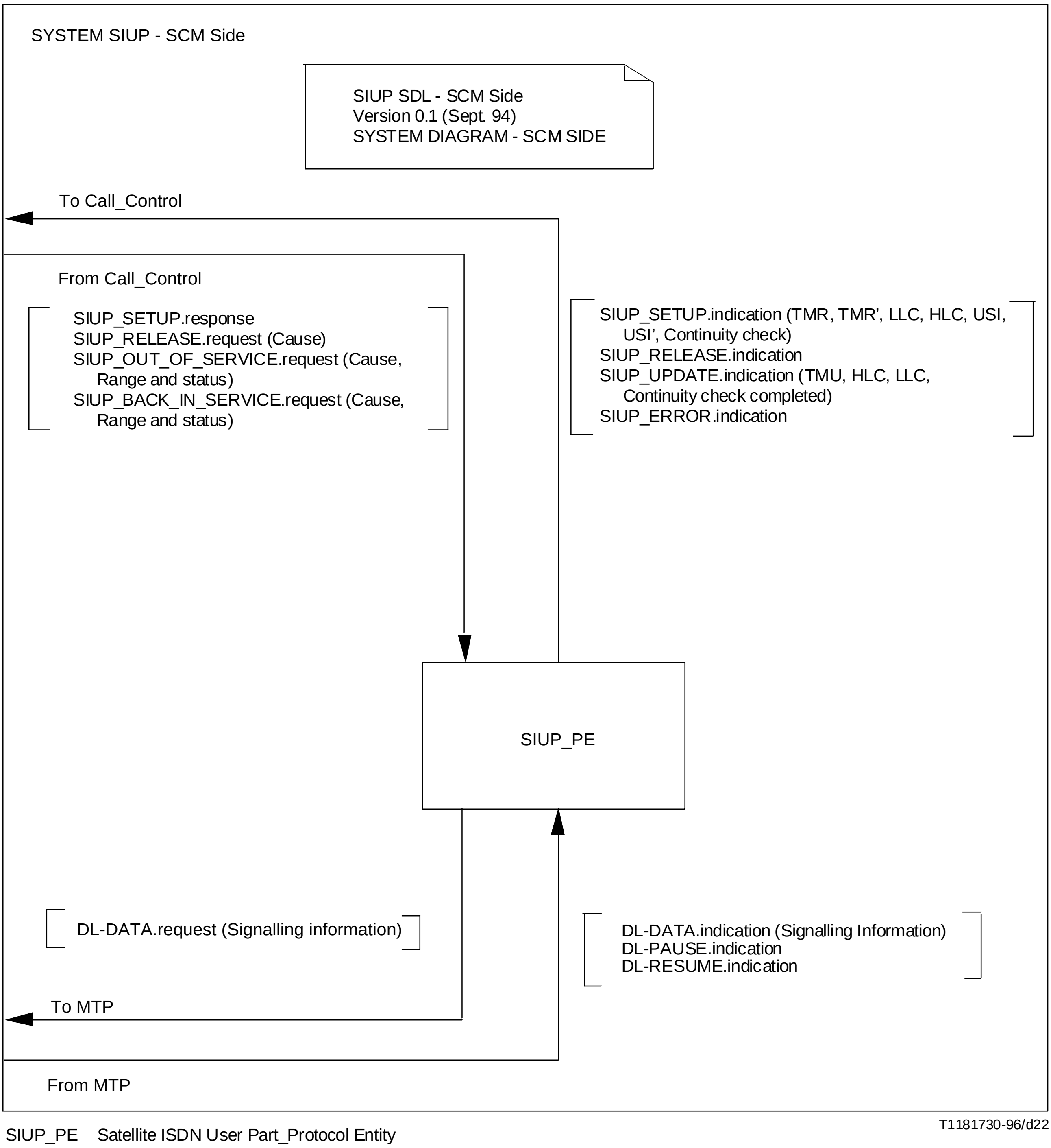


T1166960-94/d21

FIGURE 16/Q.768 (sheet 3 of 3)

SIUP-I Process

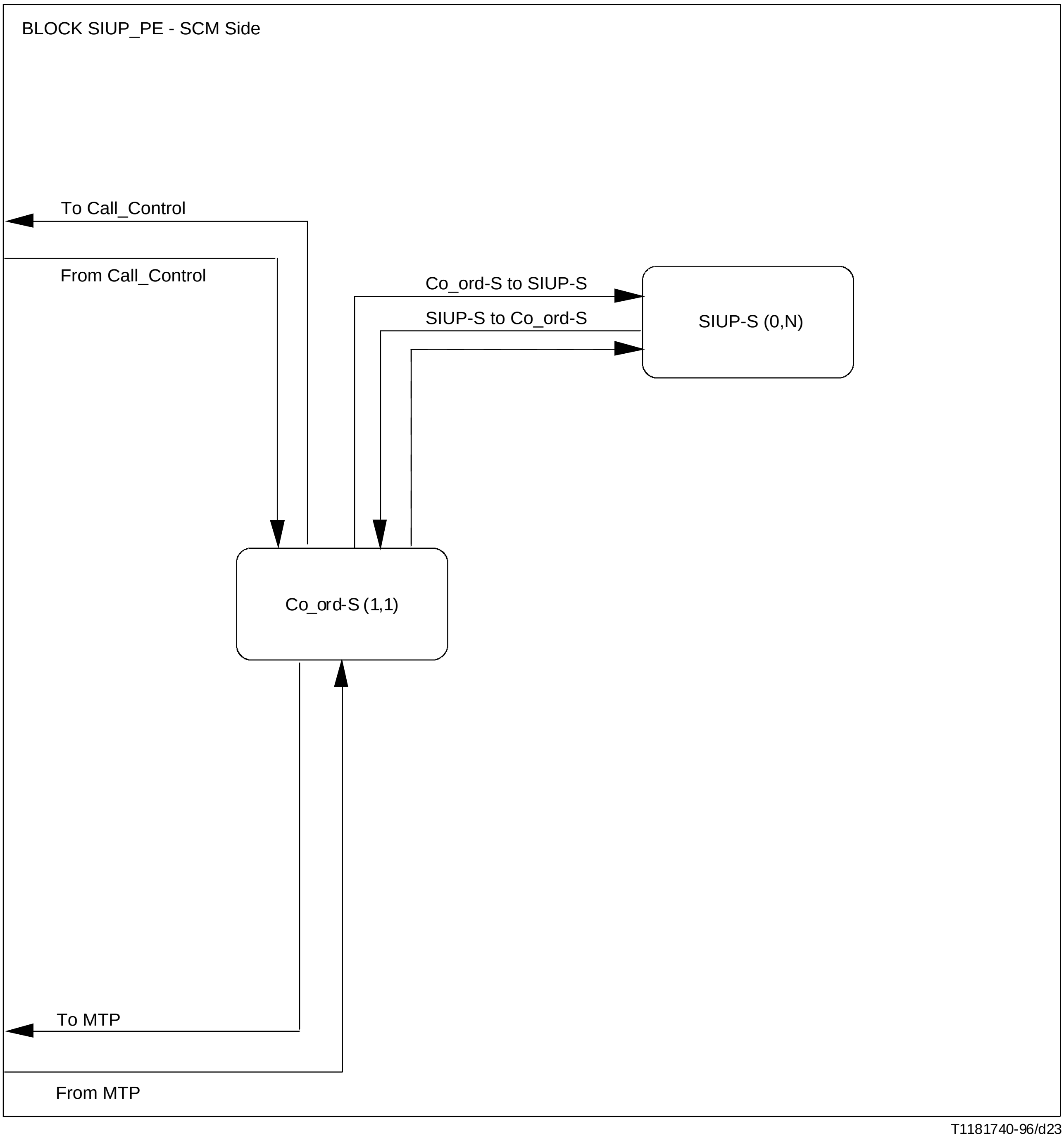
8.3.2 SCM side SDLs



SIUP_PE Satellite ISDN User Part_Protocol Entity
MTP Message Transfer Part (Rec. Q.710)

FIGURE 17/Q.768

SIUP System



Co-ord-S Coordination at SCM side
MTP Message Transfer Part (Rec. Q.710)

FIGURE 18/Q.768

SIUP Block

page 1 of (2)

Acronyms and abbreviations
==

CC = Call control

/* */ = Text comment

x.x   = Reference to relevant subclause x.x of Q.768

Message (#) = General reference to message (with parameters) from ISIP process, to be sent to peer

'Primitive' = General reference to primitive from ISIP process, to be sent to call control

Messages to/from peer (parameters in parentheses) (defined in 8.2)
==

NOTE – In addition to the message specific parameters listed, all messages contain the following five parameters: Routing Label, ISC-OPC, ISC-DPC, CIC, and Message Type (defined in 8.2.3)

Messages from SIUP-ISC

RELEASE
SETUP (CCH, HLC, LLC, TMR, TMR', USI, USI')
UPDATE (CCH, HLC, LLC, TMU)

Messages to SIUP-ISC

OUT OF SERVICE (Cause, Range and status)
SETUP ACKNOWLEDGE (TMR)
BACK IN SERVICE (Cause, Range and status)
RELEASE (Cause)

Primitives to/from Call Control (parameters in parentheses)(defined in 8.1)
==

NOTE: In addition to the parameters listed, all primitives carry the following three parameters:
ISC-OPC, ISC-DPC, CIC (defined in 8.1.1)

Primitives to call control

SIUP_SETUP.indication (Continuity check, HLC, LLC, TMR, TMR', USI, USI')
SIUP_RELEASE.indication
SIUP_UPDATE.indication (Continuity check completed, HLC, LLC, TMU)
SIUP_ERROR.indication

Primitives from call control

SIUP_SETUP.response (TMR)
SIUP_RELEASE.request (Cause)
SIUP_OUT_OF_SERVICE.request (Cause, Range and status)
SIUP_BACK_IN_SERVICE.request (Cause, Range and status)

Signals to/from MTP (parameters in parentheses) (defined in 7.1)
==

DL-DATA.request (Signalling information)
DL-DATA.indication (Signalling information)
DL-PAUSE.indication
DL-RESUME.indicaiton

T1166990-94/d24

FIGURE 19/Q.768 (sheet 1 of 2)

SDL Conventions

Signal list 'Co_ord-S to SIUP-S' (parameters in parentheses)
==

NOTE – The Co_ord-S process delivers signals (received messages and primitives) to individual SIUP-S state machines, which are defined by the ISC-OPC, ISC-DPC, and CIC. The following signals are passed by Co_ord-S to SIUP-S.

Messages

RELEASE
SETUP (CCH, HLC, LLC, TMR, TMR', USI, USI')
UPDATE (CCH, LLC, TMU)

Primitives

SETUP.response (TMR)
RELEASE.request (Cause)
OUT_OF_SERVICE.request (Cause)
BACK_IN_SERVICE.request (Cause)

Signal list 'SIUP-S to Co_ord-S' (parameters in parentheses)
==

NOTE – The SIUP-S process delivers signals to the Co_ord-S process, which subsequently delivers them to MTP as messages or call control as primitives. The following signals are passed by SIUP-S to Co_ord-S.

Messages

SETUP ACKNOWLEDGE (TMR)
RELEASE (Cause)

Primitives

SETUP.indication (Continuity check, HLC, LLC, TMR, TMR', USI, USI')
RELEASE.indication
UPDATE.indication (Continuity check completed, LLC, TMU)
ERROR.indication

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FIGURE 19/Q.768 (sheet 2 of 2)

SDL Conventions

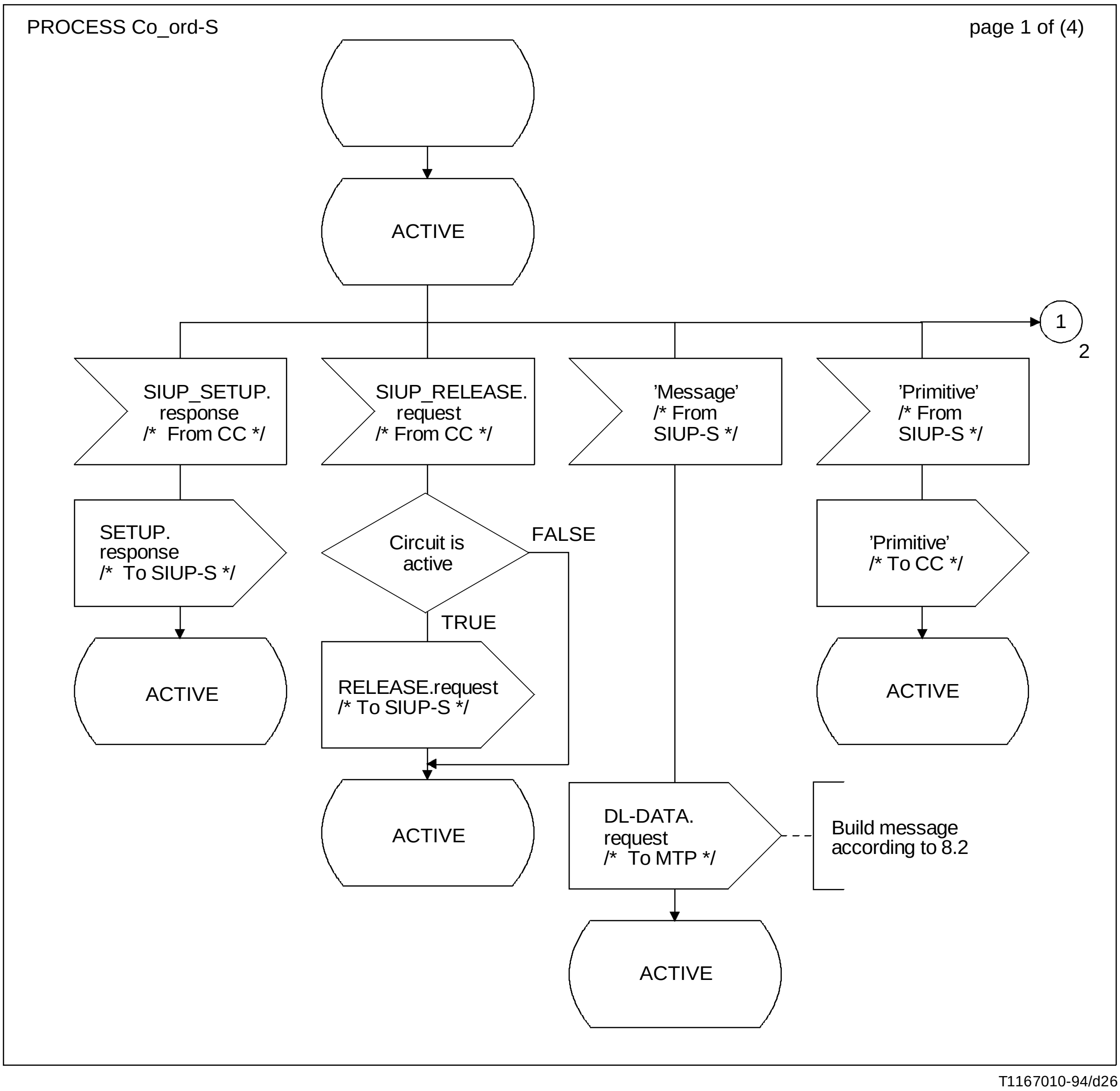

FIGURE 20/Q.768 (sheet 1 of 4)

Coordination Process

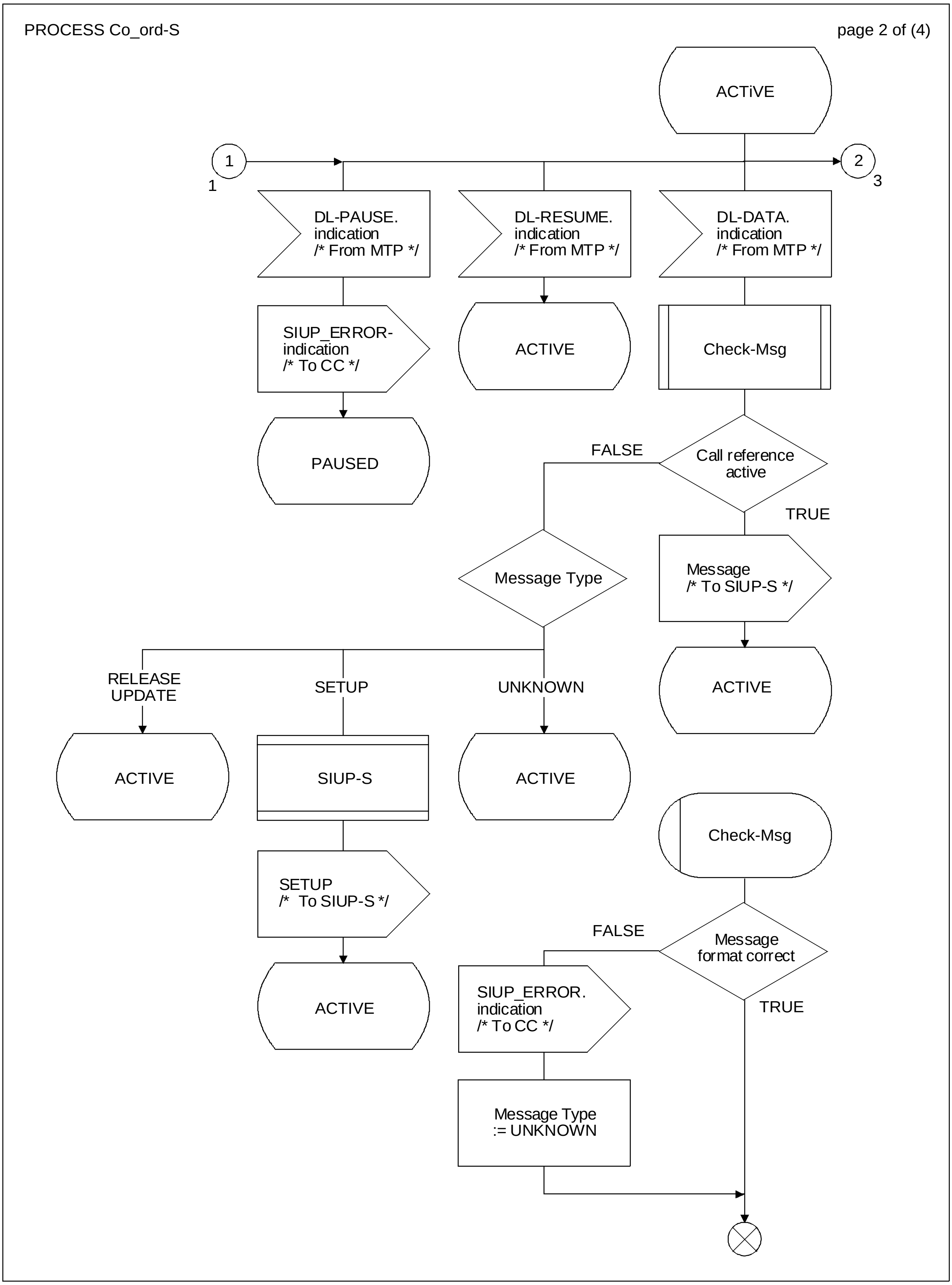

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FIGURE 20/Q.768 (sheet 2 of 4)

Coordination Process

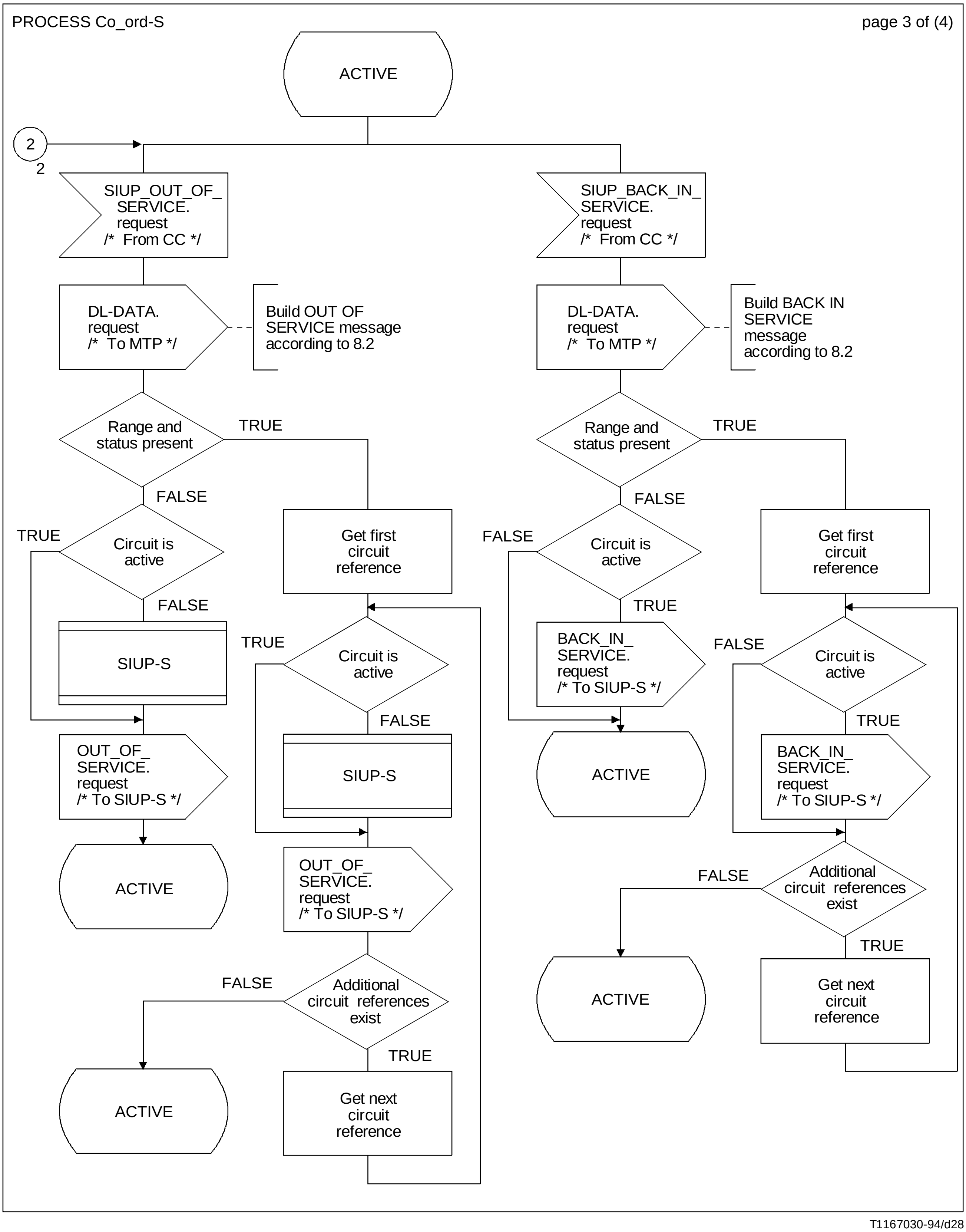

FIGURE 20/Q.768 (sheet 3 of 4)

Coordination Process

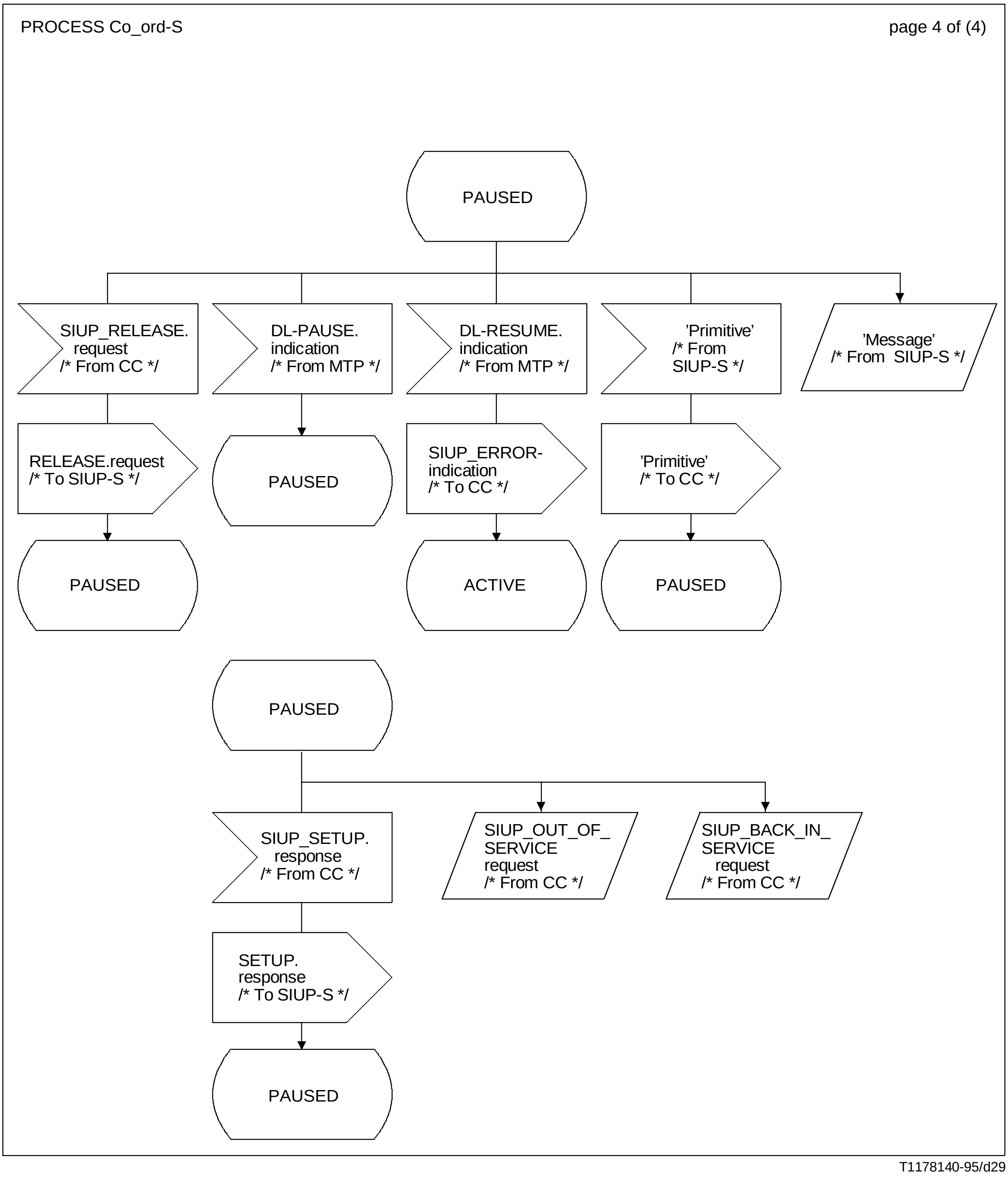

FIGURE 20/Q.768 (sheet 4 of 4)

Coordination Process

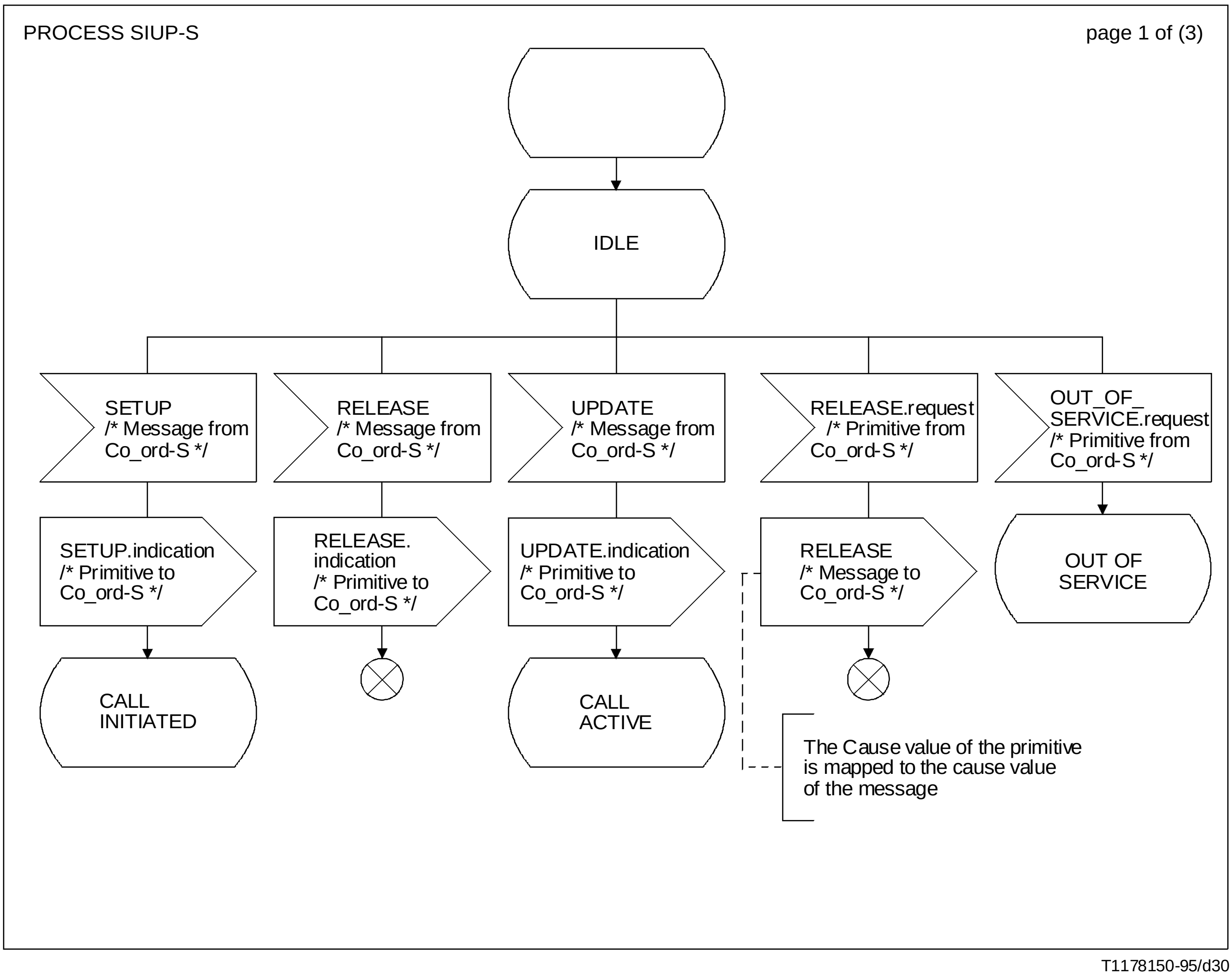

FIGURE 21/Q.768 (sheet 1 of 3)

SIUP-S Process

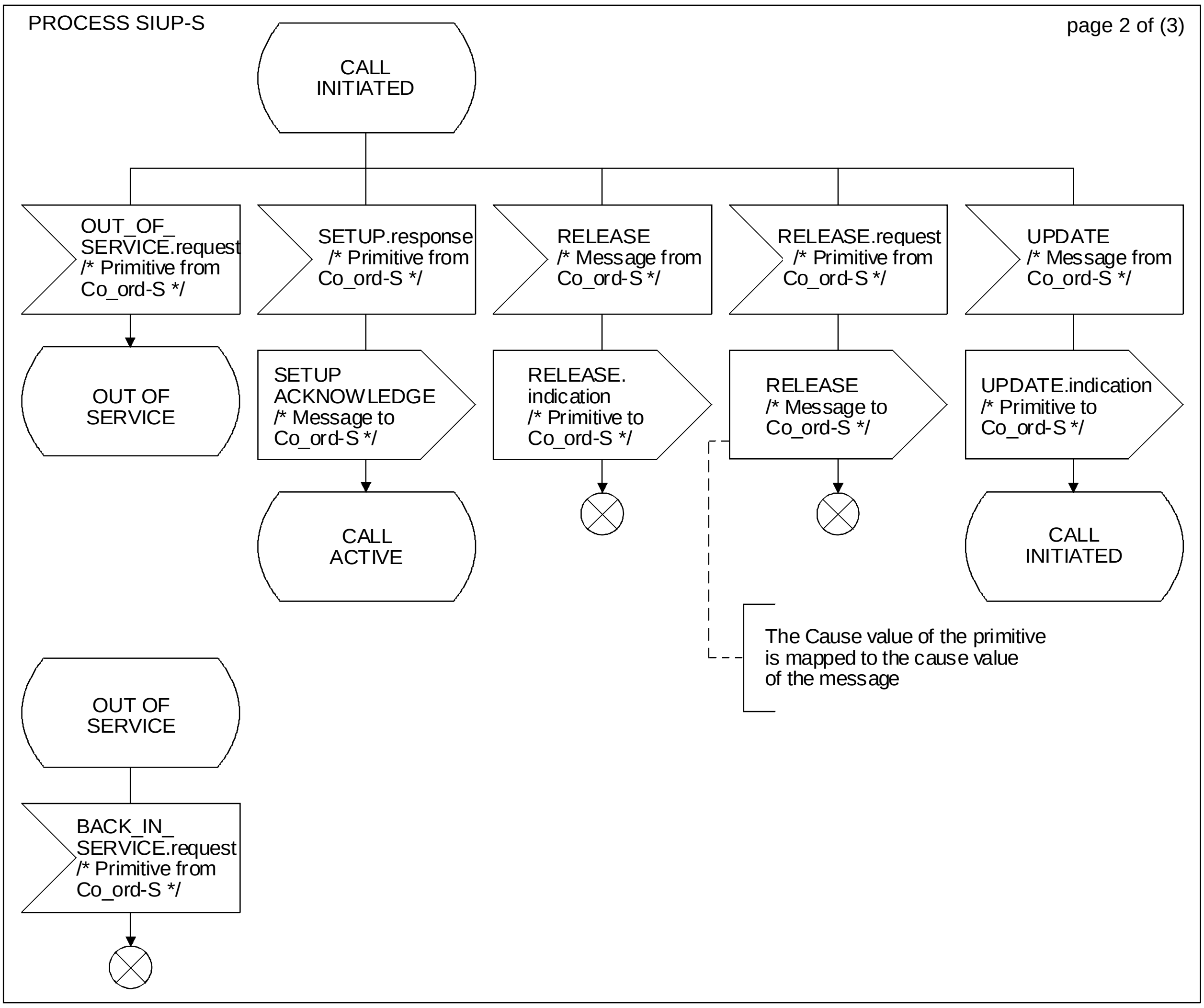

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FIGURE 21/Q.768 (sheet 2 of 3)

SIUP-S Process

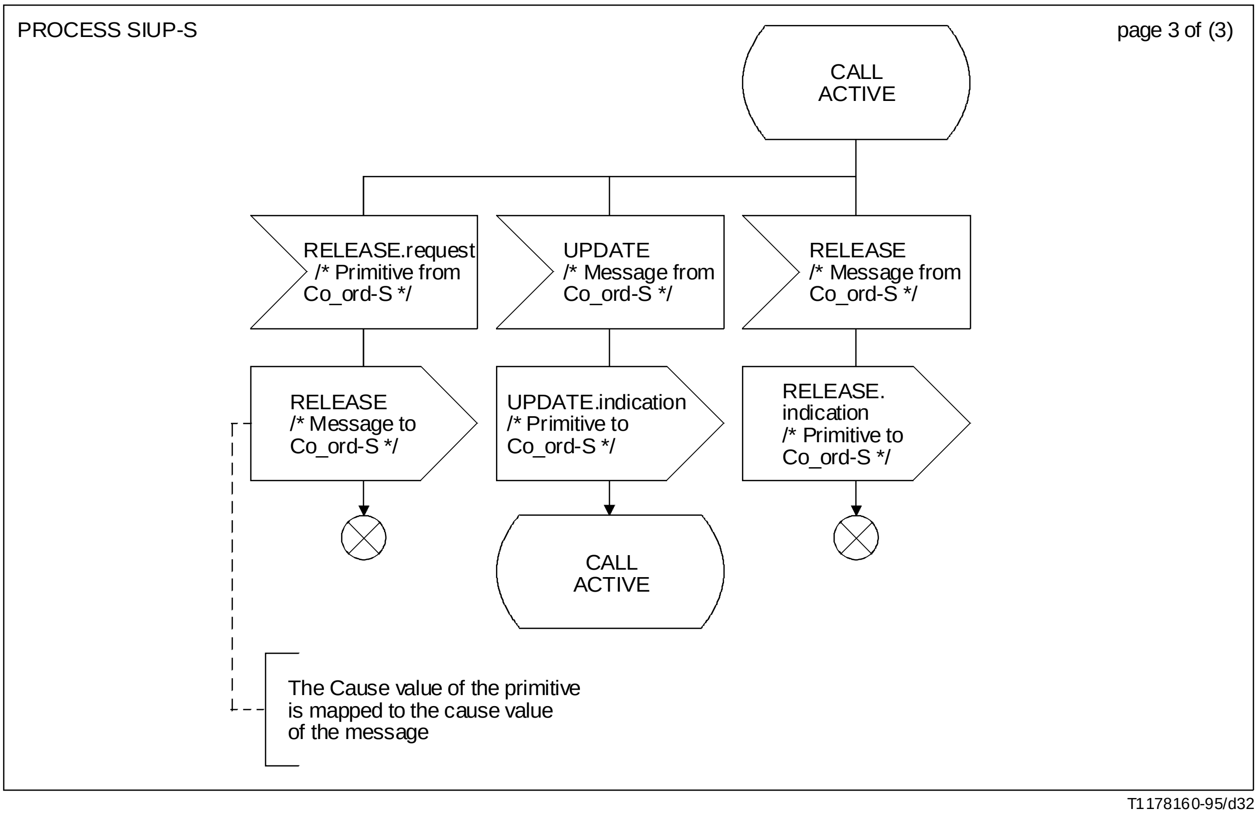


FIGURE 21/Q.768 (sheet 3 of 3)

SIUP-S Process

Annex A

Figures on Basic Call Control Signalling Procedures

(This annex forms an integral part of this Recommendation)

Figures A.1 through A.7 illustrate typical SIUP message flows for call establishment and release. SIUP messages are represented by dashed lines, and ISUP messages are represented by solid lines. In the figures, the ISUP messages represented do not interact with the SCM, nor do the SS No. 7 paths necessarily pass through the satellite subnetwork (i.e. SS No. 7 operates in parallel with SIUP).

Figure A.1 illustrates the normal message flows for call set-up.

Figure A.2 illustrates the message flow for the case of fallback (including HLC selection) or LLC negotiation (TMU and/or ATP present in the ISUP message).

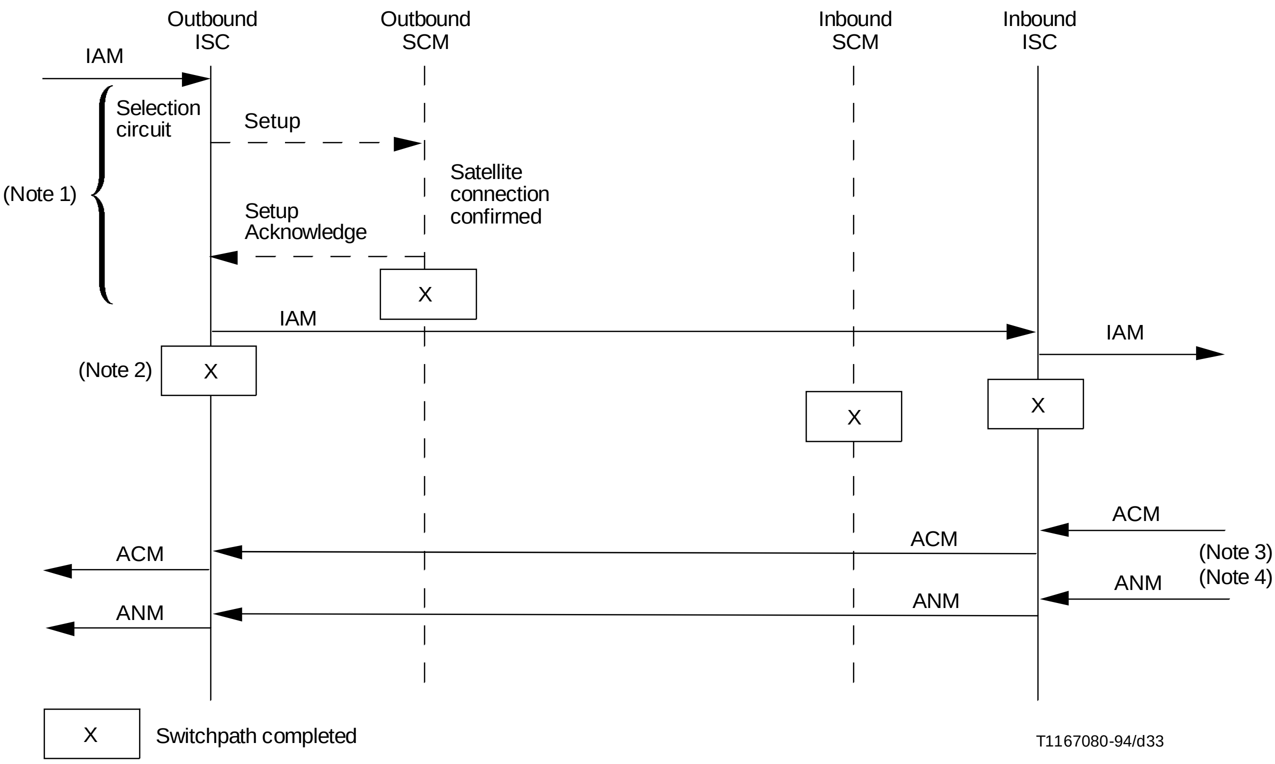
Figure A.3 llustrates the message flow for normal call release initiated by the calling end.

Figure A.4 illustrates the message flow for normal call release initiated by the called end.

Figure A.5 illustrates the message flow for the case in which the satellite subnetwork must reject the call request.

Figure A.6 illustrates the message flow for the case in which dual seizure occurs between the international ISCs. In this procedure, the satellite subnetwork does not interfere with the normal resolution of dual seizure according to Recommendation Q.764.

Figure A.7 illustrates the message flow for the case in which a continuity check is applied on the satellite circuit. The outbound ISC sends a SIUP Update message when it forwards the COT to the inbound ISC. The inbound ISC sends a SIUP Update message when it receives a COT from the outbound ISC.



NOTES

1 This entire process is considered part of circuit selection, from ISUP protocol perspective.

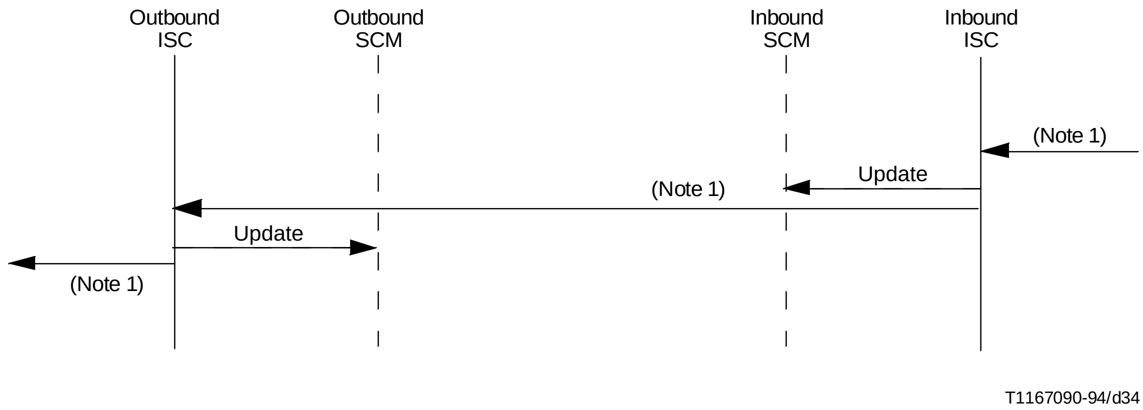
2 Instead of through-connect after ISIP set-up confirm, the exchange may perform continuity check according to clause 7/Q.724 and then through connect (see Figure A.7).

3 ACM/ANM may be replaced by CON message.

4 CPG may occur between ACM and ANM.

FIGURE A.1/Q.768

Call set-up procedures



NOTES

1 These procedures apply to the arrival of either an ACM, CPG, ANM, or CON message containing a TMU and/or ATP parameter

2 If the TMU arrived in the ACM or CPG, an additional Update Request message may be needed (for LLC negotiations or HLC selection) after the ANM message

3 Update messages relevant to continuity check are illustrated in Figure A.7.

FIGURE A.2/Q.768

Update procedures

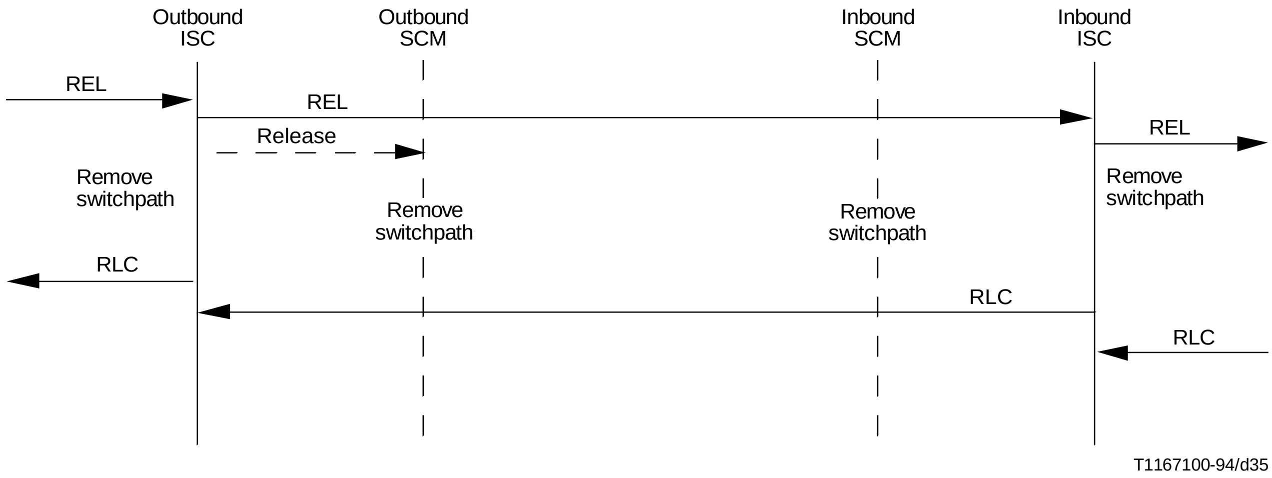


FIGURE A.3/Q.768

Calling end release procedures

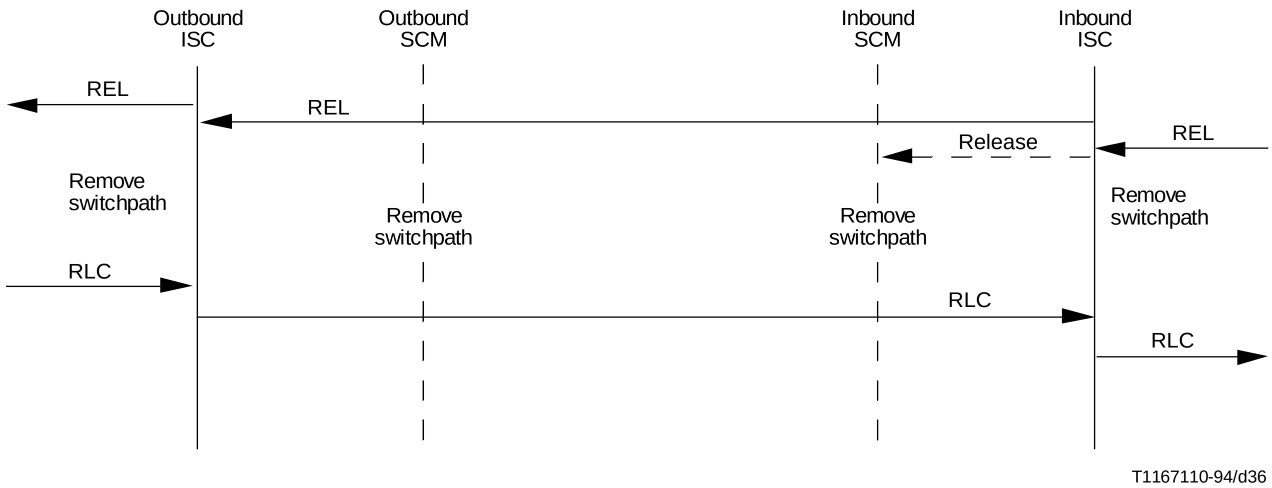
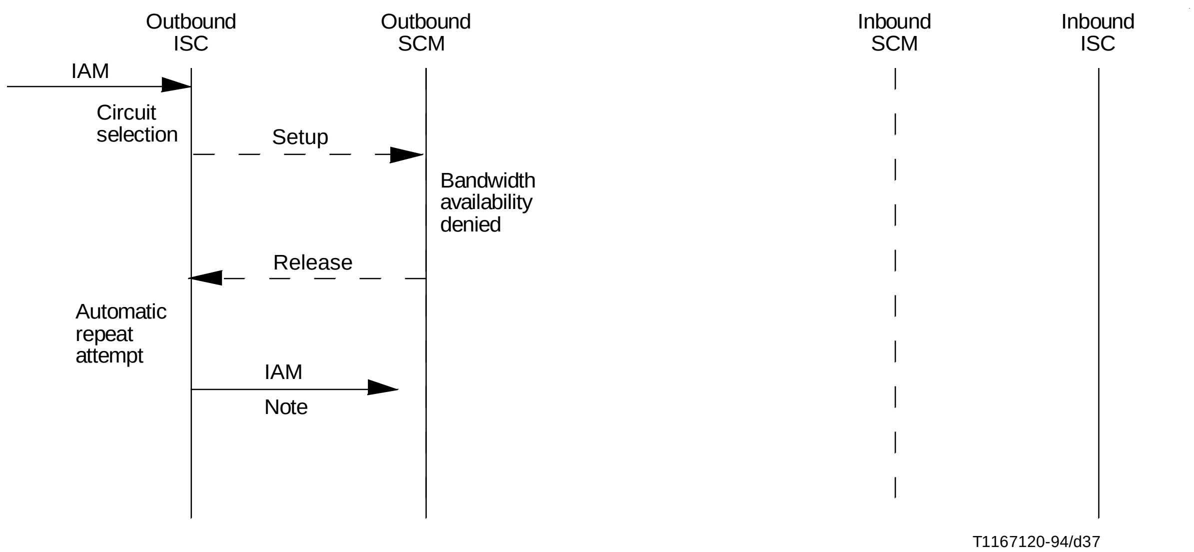


FIGURE A.4/Q.768

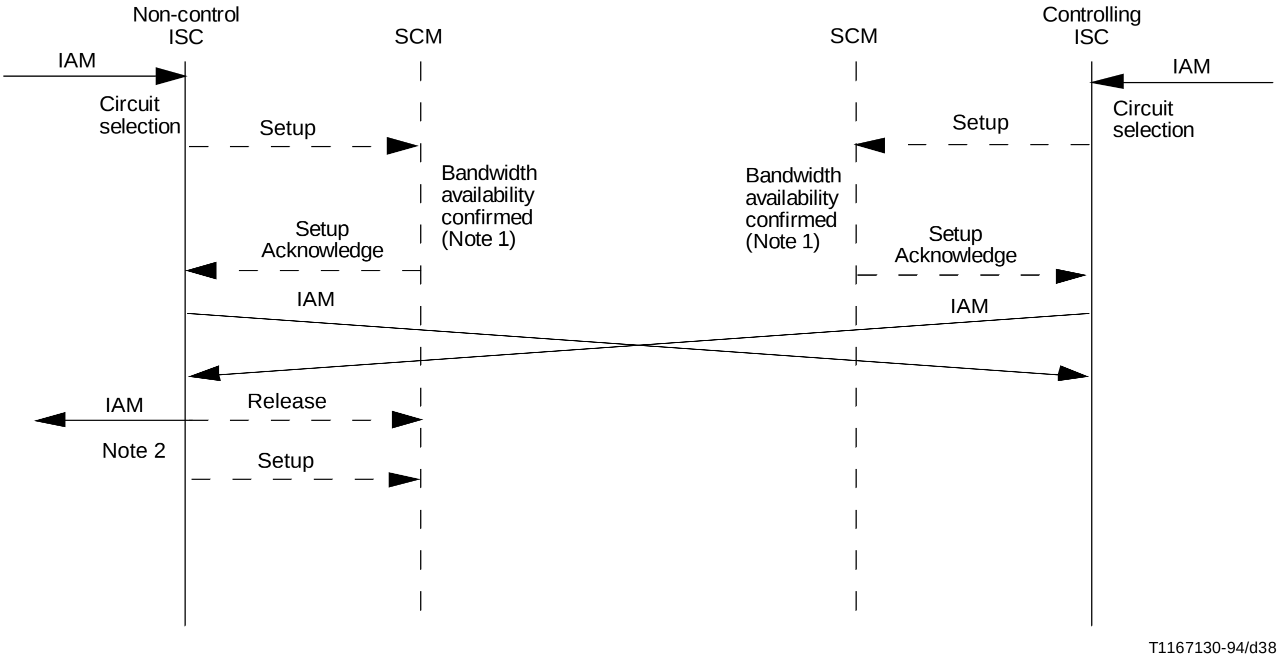
Called end release procedures



NOTE – The ISC will attempt to reroute the call.

FIGURE A.5/Q.768

Unsuccessful cal set-up procedures



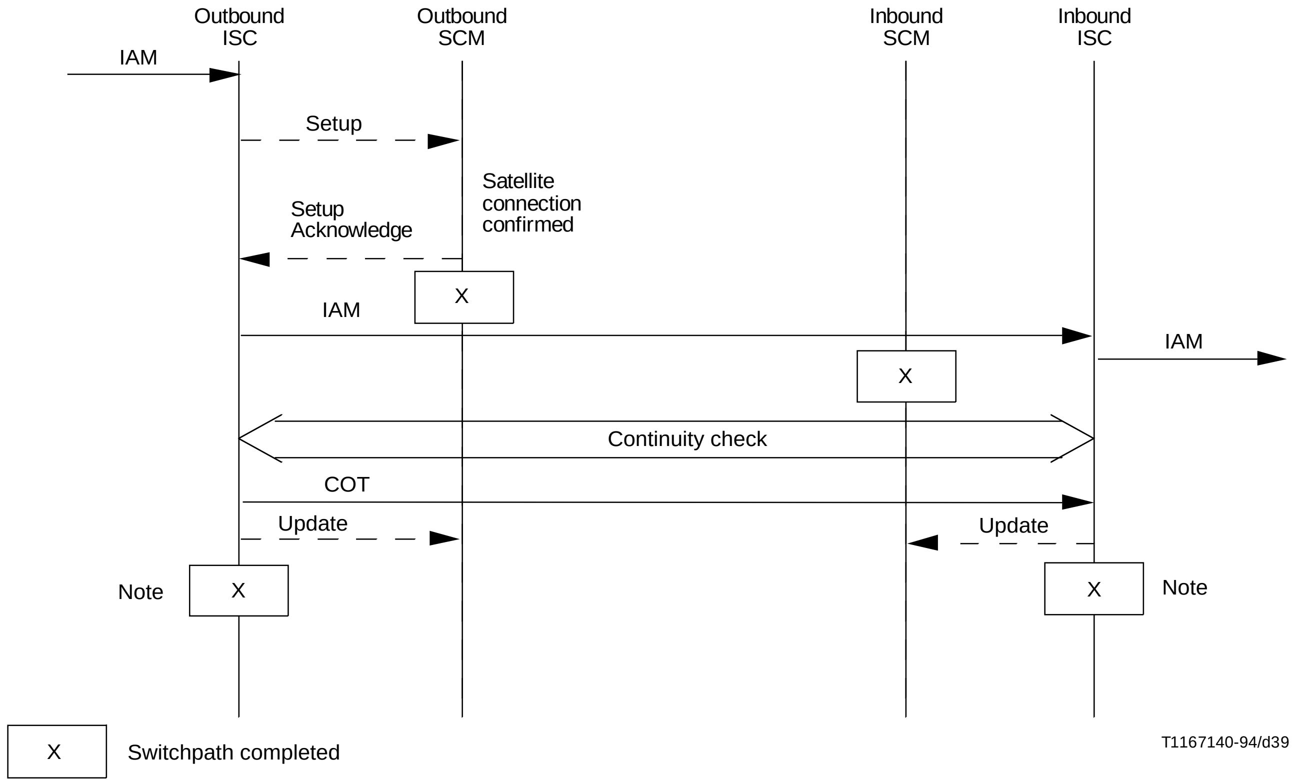
NOTES

1 Although the satellite subnetwork control may be aware of the dual seizure of the CIC, it confirms both requests and waits for one of the ISCs to notify it of backoff.

2 At this point, the ISC selects another interexchange circuit. In the example, another satellite circuit is requested.

FIGURE A.6/Q.768

Dual seizure resolution procedures



NOTE – This figure does not illustrate possible continuity checks on circuits on the national side of the ISCS.

FIGURE A.7/Q.768

Continuity checking procedures