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Foreword

This second edition European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS further develops the Signalling System No.7 protocols for the Integrated Services Digital Network (ISDN), Public Switched Telephone Network (PSTN) and Public Land Mobile Networks (PLMNs). It is based on ITU-T Recommendations Q.711 to Q.714 and Q.716 (1993).

This ETS is based on the assumption concerning the interconnection of national Signalling Connection Control Parts (SCCPs) that the Message Transfer Part (MTP) specified in ETS 300 008 (1991) supports the SCCP for international interconnection.

This second edition of ETS 300 009 introduces:

- the use of connectionless functions in international relay points and gateways;

- the use of the connection-oriented (Class 2, with embedded connection setup only) service, which is required to support the ISDN User-To-User Signalling Service 3 (UUS3) (see ETS 300 356-2);

- the procedures for connectionless segmentation and reassembly, needed to support the Intelligent Network Application Protocol (INAP) and the Mobile Application Part (MAP), Version 2;

- the rules for the application of Signalling Connection Control Part (SCCP) addressing in the international network.

In (a) later edition(s), the following features are foreseen to be added:

- the possibility of having subsystems within the international network, for example the Operations, Maintenance and Administration Part (OMAP);

- the SCCP restart procedure;

- Open System Interconnection (OSI) adaptations to allow the use of Signalling System No.7 as transport network for Telecommunications Management Network (TMN) information.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	30 April 1995
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 October 1995
Date of withdrawal of any conflicting National Standard (dow):	31 October 1995

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1 Scope

This European Telecommunication Standard (ETS) defines the use of connectionless functions in international relay points and gateways[1)], the use of the connection-oriented (Class 2, with embedded connection setup only) service, the procedures for connectionless segmentation and reassembly, and the rules for the application of Signalling Connection Control Part (SCCP) addressing in the international network.

This ETS is applicable to the international network and does not intend to restrict national networks.

2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited as the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ITU-T Recommendation Q.711 (1993): "Specifications of Signalling System No.7; Functional description of the signalling connection control part".

[2] ITU-T Recommendation Q.712 (1993): "Specifications of Signalling System No.7; Definition and function of SCCP messages".

[3] ITU-T Recommendation Q.713 (1993): "Specifications of Signalling System No.7; SCCP formats and codes".

[4] ITU-T Recommendation Q.714 (1993): "Specifications of Signalling System No.7; Signalling connection control part procedures".

[5] ITU-T Recommendation Q.716 (1993): "Specifications of Signalling System No.7; Signalling Connection Control Part (SCCP) performances".

[6] ETS 300 008 (1991): "Integrated Services Digital Network (ISDN); CCITT Signalling System No.7; Message Transfer Part (MTP) to support international interconnection".

3 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CC	Connection Confirm message
CCBS	Completion of Calls to Busy Subscriber
CR	Connection Request message
DA	Data Acknowledgement message
DPC	Destination Point Code
DT2	Data Form 2 message
EA	Expedited Data Acknowledgement message
ED	Expedited Data message
INAP	Intelligent Network Application Protocol
ISDN	Integrated Services Digital Network
ISS	ISDN Supplementary Services
ISUP	ISDN User Part
IT	Inactivity Test message
LBCS	Local Broadcast Control
MAP	Mobile Application Part
MTP	Message Transfer Part
OMAP	Operations, Maintenance and Administration Part
OPC	Originating Point Code

---

1) The SCCP gateway functions are relay functions that bridge two Message Transfer Part (MTP) networks.

OSI	Open System Interconnection
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
RI	Routeing Indicator
RSC	Reset Confirm message
RSR	Reset Request message
SCCP	Signalling Connection Control Part
SCLC	SCCP ConnectionLess Control
SCOC	SCCP Connection-Oriented Control
SDL	Specification and Description Language
SLS	Signalling Link Selection
SOG	Subsystem-Out-of-service-Grant message
SOR	Subsystem-Out-of-service-Request message
SPAC	Signalling Point Allowed Control
SPC	Signalling Point Code
SPCC	Signalling Point Congested Control
SPPC	Signalling Point Prohibited Control
SSA	SubSystem-Allowed message
SSN	SubSystem Number message
SSP	SubSystem-Prohibited message
SST	SubSystem-status-Test message
TCAP	Transaction Capabilities Application Part
TMN	Telecommunications Management Network
UDT	UnitDaTa message
UDTS	UnitDaTa Service message
UUS	User-to-User Signalling
UUS3	UUS Service 3
XUDT	eXtended UnitDaTa message
XUDTS	eXtended UnitDaTa Service message

4 Requirements

This ETS is based on ITU-T Recommendations Q.711 to Q.714 ([1] to [4]) and Q.716 [5]. The requirements of these recommendations shall apply with the modifications identified in clause 5 and the specific requirements given in clause 6 of this ETS.

NOTE: Some of the clauses in this ETS on SCCP management procedures are indicated as "not required". In these cases, ITU-T White Book (1993) procedures may be applied if desirable. This should not cause incompatibilities with this ETS.

5 Modifications to ITU-T Recommendations Q.711 to Q.714

The following exceptions to ITU-T Recommendations Q.711 to Q.714 ([1] to [4]) shall apply.

5.1 Modifications to ITU-T Recommendation Q.711 "Functional description of the signalling connection control part"

§ 2 Services provided by the SCCP

Class 3 is not required.

§ 2.1 Connection-oriented services

Permanent signalling connections are not required.

§ 2.1.1.1.2 Data transfer phase

Sequence control and Flow control are not required.

§ 2.1.1.2.1 Overview

N-CONNECT REQUEST is not required. N-EXPEDITED DATA, N-DATA ACKNOWLEDGE, and N-RESET are not required.

§ 2.1.1.2.2 Connection establishment phase

The N-CONNECT REQUEST primitive shall not be used. Instead, the ISDN User Part (ISUP) requests connection setup with the REQUEST TYPE 1 or REQUEST TYPE 2 interface elements.

Negotiation of expedited data is not required.

§ 2.1.1.2.3 Data transfer phase

N-EXPEDITED DATA, N-DATA ACKNOWLEDGE, and N-RESET are not required.

§ 2.1.1.3.2 Connection establishment interface elements

These interface elements are used by ISUP for the embedded setup of connections. The "receipt confirmation selection" shall be set to false. The "quality of service parameter set" shall indicate protocol class 2.

NOTE: In the international network, the REQUEST TYPE 1 interface element would normally not be used. This interface element only applies at the originating node in the national network. However, it should be possible that ISUP performs an association of connection sections itself on user level (see ITU-T Recommendation Q.730, figure 12/Q.730). This may be necessary if different versions of SCCP are used in the national and international networks, or if User-to-User data are transported in the national network in another way.

§ 2.1.2 Permanent signalling connections

Not required.

§ 2.2.1 Description

If the in-sequence delivery is not required (protocol class 0), the SCCP shall insert Signalling Link Selection (SLS) codes with respect to the appropriate load sharing within the signalling network. If the in-sequence delivery is required (protocol class 1), the SCCP, at the originating node, while adhering to the sequence control instruction from the user, shall allocate SLS codes between sequence streams with respect to appropriate load sharing within the signalling network.

As in relay nodes, user sequence control is not available, there shall be a fixed mapping between incoming and outgoing SLS code values for class 1. This mapping may be different for different signalling relations.

§ 2.3.2.1 Overview

N-STATE and N-COORD are not required.

NOTE: N-STATE and N-COORD are not required as long as there are no (duplicated) subsystems (other than ISUP) in the international network.

§ 2.3.2.2 Parameters

"Affected subsystem", "Subsystem multiplicity indicator", "User status" and "Remote SCCP status" are not required.

§ 2.3.2.3.1 COORD

N-COORD is not required.

NOTE: N-COORD is not required as long as there are no (duplicated) subsystems (other than ISUP) in the international network.

§ 2.3.2.3.2 STATE

Subsystem management is not required.

NOTE: Subsystem management is not required as long as there are no (duplicated) subsystems (other than ISUP) in the international network.

§ 3.2 Primitives and parameters

The "cause" parameter in the MTP-STATUS primitive may take the values:

- "Signalling point congested";
- "User part unavailable".

For the cause "Signalling point congested", no congestion priorities are used.

NOTE: The values:

- "User part unavailability: unknown";
- "User part unavailability: unequipped remote user";
- "User part unavailability: inaccessible remote user",

occur in ITU-T Recommendation Q.701, § 8. The first one corresponds to "User part unavailable" in ETS 300 008 [6], the latter two are not part of ETS 300 008 [6].

§ 3.2.4 STATUS

The "cause" parameter in the MTP-STATUS primitive may take the values:

- "Signalling point congested";
- "User part unavailable".

For the cause "Signalling point congested", no congestion priorities are used.

NOTE: The values:

- "User part unavailability: unknown";
- "User part unavailability: unequipped remote user";
- "User part unavailability: inaccessible remote user",

occur in ITU-T Recommendation Q.701, § 8. The first one corresponds to "User part unavailable" in ETS 300 008 [6], the latter two are not part of ETS 300 008 [6].

§ 4.1 Connection-oriented functions

Class 3 functions are not required.

§ 4.1.1.2 Data transfer function

Flow control is not required.
Expedited data support is not required.
Missequence detection is not required.
Reset is not required.
Receipt confirmation is not required.

§ 4.1.2 Functions for permanent signalling connections

Not required.

§ 4.3 Management functions

Co-ordinated state change is not required.

NOTE: Co-ordinated state change is not required as long as there are no (duplicated) subsystems (other than ISUP) in the international network.

§ 4.4 Routeing and translation functions

The routeing and translation function of SCCP does not apply for the embedded method.

NOTE: ISUP executes its own routeing function. It provides the minimally necessary information for SCCP in the MTP-routeing label and the Originating Point Code (OPC) field of the embedded request (see ITU-T Recommendation Q.763, § 3.15).

5.2 Modifications to ITU-T Recommendation Q.712 "Definition and function of SCCP messages"

§ 1.2 Connection Request (CR)

Not required (only embedded connection requests are issued).

§ 1.4 Data Acknowledgement (DA)

Not required.

§ 1.6 Data Form 2 (DT2)

Not required.

§ 1.7 Expedited Data (ED)

Not required.

§ 1.8 Expedited Data Acknowledgement (EA)

Not required.

§ 1.13 Reset Confirm (RSC)

Not required.

§ 1.14 Reset Request (RSR)

Not required.

§ 1.15 SubSystem-Allowed (SSA)

Not required.

§ 1.16 Subsystem-Out-of-service-Grant (SOG)

Not required.

§ 1.17 Subsystem-Out-of-service-Request (SOR)

Not required.

§ 1.18 SubSystem-Prohibited (SSP)

Not required.

§ 1.19 SubSystem-Status-Test (SST)

Not required.

§ 2.4 credit

Not required.

§ 2.6 diagnostic

Not required.

§ 2.11 receive sequence number

Not required.

§ 2.14 reset cause

Not required.

§ 2.17 sequencing/segmenting

Not required.

§ 2.18 subsystem multiplicity indicator

For further study.

§ 3 Inclusion of fields in messages

Table 1/Q.712: Inclusion of fields in messages and
Table 2/Q.712: SCCP management messages

Management messages are not required.

5.3 Modifications to ITU-T Recommendation Q.713 "SCCP formats and codes"

§ 3.4.1 Address indicator

On transmission of the called party address, the SubSystem Number (SSN) indicator field shall always be included and set to 0 if unknown.

Bit 8 (reserved for national use) shall always be coded 0 and is not evaluated.

§ 3.4.2.2 Subsystem number

Except for ISUP, there are currently no SCCP-users in the international network. Nevertheless, SSNs have to be allocated for all those SCCP subsystems whose messages may cross network borders, so that international agreement is needed for the SSNs used. If not yet specified by ITU-T, such SSNs will be taken up in this ETS. In addition to the SSNs allocated already in ITU-T Recommendation Q.713 [3], one additional SSN is necessary for ISDN Supplementary Services (ISS) to identify the services (completion of calls to busy subscribers, reverse charging, etc.) that are based on the Transaction Capabilities Application Part (TCAP). The value 0000 1011 is allocated for ISS.

Bits	**8 7 6 5 4 3 2 1**		
	.		
	.		
	0 0 0 0 1 0 1 1		ISDN Supplementary Services (ISS)
	0 0 0 0 1 1 0 0	}	
	to	}	spare
	1 1 1 1 1 1 1 0	}	
	1 1 1 1 1 1 1 1		reserved for expansion

§ 3.4.2.3.1 Global title indicator = 0001

Not required for transmission.

§ 3.4.2.3.2 Global title indicator = 0010

Not required for transmission.

For use by the Completion of Calls to Busy Subscriber (CCBS) supplementary service, one value is allocated for the translation type.

Bits	**8 7 6 5 4 3 2 1**	
	0 0 0 0 0 0 0 0	not used
	.	
	.	
	0 0 0 1 0 0 0 1	ISDN end-to-end supplementary services (e.g. CCBS)
	.	
	.	
	1 1 1 1 1 1 1 1	reserved for expansion

NOTE: The CCBS supplementary service uses Global title indicator = 0100 (see ETS 300 356-18). However, the translation type is defined in § 3.4.2.3.2 of ITU-T Recommendation Q.713 [3] and referred to in the subsequent paragraphs covering Global title indicator values 0011 and 0100.

§ 3.4.2.3.3 Global title indicator = 0011

Not required for transmission.

§ 3.5 Calling party address

For the international network, if segmenting/reassembly of connectionless messages or the return option is used, it is necessary to supply in the calling party address a unique identification of the originator. Inclusion of a global title, uniquely identifying the caller would be sufficient for this purpose. The "address indicator" field shall then never be coded as the "all zeroes" value.

§ 3.8 Receive sequence number

Not required.

§ 3.9 Sequencing/segmenting

Not required.

§ 3.10 Credit

Not required.

§ 3.13 Reset cause

Not required.

§ 4.2 Connection request

Not required (only embedded connection requests are issued).

§ 4.8 Data form 2

Not required.

§ 4.9 Data acknowledgement

Not required.

§ 4.12 Expedited data

Not required.

§ 4.13 Expedited data acknowledgement

Not required.

§ 4.14 Reset request

Not required.

§ 4.15 Reset confirm

Not required.

§ 5 SCCP management messages and codes

Subsystem management messages are not required.

NOTE: Subsystem management messages are not required as long as no subsystems (other than ISUP) are introduced in the international network.

5.4 Modifications to ITU-T Recommendation Q.714 "Signalling connection control part procedures"

§ 1.1.2 Protocol classes

Class 3 procedures are not required.

§ 1.1.2.2 Protocol class 1

The in-sequence delivery not only relies on the properties of the MTP-network, but also SCCP shall guarantee the sequential processing of SCCP-messages. This excludes e.g. arbitrary parallel processing of global title translations in relay nodes.

§ 1.1.2.3 Protocol class 2

Only the embedded method of connection setup is required.

§ 1.1.2.4 Protocol class 3

Not required.

§ 1.1.3 Signalling connections

NOTE: The ITU-T White Book (1993) leaves the possibility of having relay points without coupling for connection-oriented services for further study. This because it is not clear how a connection can be completed (with a Connection Confirm (CC) message) to the originator without changing or including the calling address parameter of the Connection Request (CR) message in relay nodes.

For the embedded method, there is in fact the possibility of having no association in an ISUP relay point (ISUP would in this case simply pass the embedded request further on, without issuing a REQUEST TYPE 2). This is in this case no problem, since the OPC of the originating node or of the last relay node with coupling is included in the embedded connect request of the IAM message. It is therefore always possible to route back the CC message to the correct originator.

§ 1.2.1 Connection establishment

The CR message is not used. The connection request is carried embedded in an ISUP message instead.

NOTE: See also the note relating to § 1.1.3.

The ISUP has the control whether the association of connection sections shall be performed or not. If the SCCP receives a REQUEST TYPE 2 from ISUP with the "reply bit" set, an association of connection sections shall be performed.

§ 1.2.2 Data transfer

Flow control is not required.
Expedited data support is not required.
Missequence detection is not required.
Reset is not required.
Receipt confirmation is not required.

§ 2.2.2 Messages from connection-oriented or connectionless control to SCCP routeing control

In order to route an SCCP message from one country to another, a global title shall always be available. Therefore, the possibility of routeing on Destination Point Code (DPC) and SSN shall not apply for the transit traffic in the international network.

NOTE 1: Routeing on DPC and SSN does not apply as long as no subsystems (other than ISUP) are introduced in the international network.

For routeing from one network to another, passing through the international network, the Routeing Indicator (RI) shall always be set to route on global title.

NOTE 2: The routeing of the embedded connect requests for ISUP, is not done by SCCP, but by ISUP itself. The other connection-oriented messages are routed on DPC only.

§ 3 Connection-oriented procedures

Class 3 procedures are not required.

§ 3.1.1 General

N-CONNECT REQUEST is not required.

§ 3.1.3.1 Protocol class negotiation

If a connection request for protocol class 3 is received, it shall be lowered to class 2 in response.

§ 3.1.3.2 Flow control window negotiation

Not required.

§ 3.1.4.1 Initial actions

The N-CONNECT REQUEST is not required. Only the REQUEST TYPE 1 interface element is used. The proposed protocol class shall be 2, no credit is initiated.

§ 3.1.4.2 Subsequent actions

If the protocol class received in the CC message is not equal to 2, the connection shall be released. A N-DISCONNECT INDICATION primitive is sent to ISUP, and the release procedure is initiated on the signalling connection, indicating "inconsistent connection data".

§ 3.1.5.1 Initial actions

The CR message is not required. Only the REQUEST TYPE 2 interface element is used. If a connection request for protocol class 3 is received, it shall be lowered to class 2 in response.

§ 3.1.5.2 Subsequent actions

If the received protocol class received in the CC message is not equal to 2, the connection refusal procedure shall be initiated, indicating "inconsistent connection data".

§ 3.1.6.1 Initial actions

The CR message is not required. If a connection request for protocol class 3 is received, it shall be lowered to class 2 in response.

§ 3.1.6.2 Subsequent actions

There is no need to update the protocol class and credit anymore, since only class 2 is proposed to the user.

§ 3.2.1 Actions at node initiating connection refusal

1a) is not required.

§ 3.4 Inactivity control

Support of supervision of connection by the SCCP user function is not required. The SCCP itself performs this supervision. The inactivity test procedure shall apply on all connection sections within the international network.

§ 3.5.1 General

Only the DT1 message is required.

§ 3.5.2 Flow control

Not required.

§ 3.6 Expedited data transfer

Expedited data support is not required.

§ 3.7 Reset

Reset is not required.

§ 3.8.2.1 Initial actions

3) Permanent signalling connections are not required.

§ 3.9 Permanent signalling connections

Not required.

§ 4.1.1 Segmentation/reassembly

The international network shall be able to accept and route (including hop-counter check) the new XUDT and XUDTS messages.

NOTE: The principle of Segmenting/reassembly of connectionless messages is such that no actions are necessary in relay nodes, except for routeing the XUDT and XUDTS messages in the same way as UnitDaTa (UDT) and UnitDaTa Service (UDTS) messages, as long as no subsystems (other than ISUP) are introduced in the international network.

§ 4.1.1.2.3 Return on error procedures

The timeout of the reassembly timer shall be considered to be one of the errors for which this procedure applies.

§ 5.1 General

No management procedures are required except those for updating SCCP translation tables in order to transfer messages to the backup node under primary node failure conditions, i.e. only ITU-T Recommendation Q.714 [4], § 5.2 applies, modified as indicated below.

NOTE: The introduction of User-To-User Signalling Service 3 (UUS3) causes at least one subsystem to exist in the international network (ISUP). However, the routeing for this subsystem is performed by ISUP. ISUP will check Signalling Point Code (SPC) status and take actions on SPC failures. Therefore, no subsystem management is needed until other subsystems like the Operations, Maintenance and Administration Part (OMAP) are introduced in the international network.

§ 5.2.1 General

Signalling point status management shall update translation and status based on the information of network failure or recovery provided by the MTP-PAUSE INDICATION and MTP-RESUME INDICATION primitives. This allows alternative routeing to backup signalling points.

§ 5.2.2 Signalling point prohibited

When the SCCP management receives an MTP-PAUSE INDICATION relating to a destination that becomes inaccessible, SCCP management shall inform the SCCP translation function to update its translation tables.

§ 5.2.3 Signalling point allowed

When the SCCP management receives an MTP-RESUME INDICATION relating to a destination that has become accessible, SCCP management shall inform the SCCP translation function to update its translation tables.

SCCP management messages are not required.

If a MTP based on ETS 300 008 [6] is used, the MTP-STATUS INDICATION primitive and the indication about the end of MTP restart shall be processed.

If a MTP-STATUS INDICATION with cause "user part unavailable" is received, the sending of traffic to the unavailable remote SCCP shall be temporarily stopped. The method used to stop the traffic is implementation dependent.

After reception of the indication of the end of MTP restart, the actions specified in § 5.2.5 apply.

§ 5.2.5 Local MTP availability

If a MTP based on ETS 300 008 [6] is used, the indication of the end of MTP restart shall be processed.

SCCP shall assure as smooth and gradual a restart of the traffic as feasible. The means to do this are implementation dependent.

§ 5.3 Subsystem status management

Subsystem management is not required.

§ 5.3.1 General

Congestion handling is not required.

§ 5.3.2.1 Receipt of a message for a prohibited subsystem

Subsystem management is not required.

§ 5.3.2.2 Receipt of Subsystem-Prohibited message or N-STATE REQUEST primitive or local user failed

Subsystem management is not required.

§ 5.3.3 Subsystem allowed

Subsystem management is not required.

§ 5.3.4 Subsystem status test

Subsystem management is not required.

§ 5.3.5 Co-ordinated status change

Co-ordinated status change is not required.

§ 5.3.6.2 User-out-of-service

Not required.

§ 5.3.6.3 User-in-service

Not required.

§ 5.3.6.4 Signalling point/remote SCCP inaccessible

Remote SCCP inaccessibility not required.

§ 5.3.6.5 Signalling point/remote SCCP accessible

Remote SCCP accessibility not required.

§ 5.3.6.6 Signalling point congested

No congestion levels are used.

§ 5.3.7.2 Subsystem prohibited

Not required.

§ 5.3.7.3 Subsystem allowed

Not required.

§ 5.4 MTP/SCCP restart

SCCP restart is not required.

ANNEX C, § C.4 Timers

The following constraint shall be obeyed for the timers:

$$T(guard) \geq T(interval) + T(iar) + \Delta \text{ (see note)}$$

It may be advantageous to make sure that the inactivity receive timer T(iar) is at least twice the inactivity send timer T(ias), as used in the nodes at the other side of the connection section. This avoids that the loss of one single Inactivity Test (IT) message (e.g. due to short-term MTP congestion) causes the inadvertent release of an otherwise inactive SCCP connection. Loss of more messages (e.g. due to SPC failures) will, however, still cause the connection to get released.

$$T(iar) \geq 2 \times T(ias) + \Delta \text{ (see note)}$$

NOTE: Δ is a margin for the inaccuracy of timers at both ends of the connection and for the transit delay of the IT message. A value of about one minute may be appropriate

ANNEX D State transition diagrams (STD) for SCCP management control

Only the procedures in the "functional blocks" Signalling Point Allowed Control (SPAC), Signalling Point Congested Control (SPCC), Signalling Point Prohibited Control (SPPC), and Local Broadcast Control (LBCS) are required.

ANNEX E Guidelines for the use of the address information elements in the international network

For the international interworking of the CCBS supplementary service, value "0001 0001" will be used for the translation type.

6 Modifications not included in the ITU-T Recommendations

6.1 Compatibility issues

6.1.1 Interface to MTP according to ETS 300 008

ETS 300 008 [6] introduces the MTP restart and user part unavailable procedures. As a consequence, the SCCP shall then be able to react to the indication about the end of MTP restart and to the MTP-STATUS (cause: "User part unavailability") indication primitive.

Since the ITU-T White Book (1993) SCCP-Restart procedure is not the scope of this edition of the ETS, the reactions to these indications may be implementation dependent. Nevertheless, the following restrictions shall be obeyed:

- the implementation shall not rely on the fact that its partners behave in the same way;
- restart of traffic after local MTP restart shall be as smooth and gradual as feasible;
- reception of a MTP-STATUS (cause: "User part unavailability") shall lead to the temporary suspension of traffic.

NOTE: The MTP according to ITU-T White Book (1993) defines separate values for the causes: "user-part-unavailable: reason unknown", "unequipped user" and "inaccessible user". If interworking with a MTP according to ITU-T White Book is necessary, these values should also be accepted and reacted to. Although the new SCCP management procedures of ITU-T White Book are out of the scope of this ETS, ITU-T Recommendation Q.714 [4] may give guidance on handling these situations.

6.1.2 Segmenting/reassembly of connectionless messages

The mechanism for the connectionless segmenting reassembly are not compatible with the CCITT Blue Book (1988). Two messages had to be introduced in the ITU-T White Book (1993) because the current UDT and UDTS message did not foresee the possibility of adding optional parameters. There is no compatibility mechanism foreseen to fallback on use of UDT/UDTS if communication is not successful using the XUDT/XUDTS procedures. The introduction of this feature in the network should therefore be executed in carefully planned stages:

1) before the introduction of any implementations using segmenting/reassembly, all relay nodes that will be passed shall be equipped with the CL-segmenting and reassembly feature;

2) new implementations using segmenting/reassembly are introduced. In this phase, all messages from applications have to be sent as UDT/UDTS messages, as long as they fit within one UDT/UDTS message. For applications according to CCITT Blue Book (1988), there shall not be any change in behaviour of SCCP. This maximizes the chances for successful interworking;

3) as soon as the network is completely retrofitted according to this ETS, it is allowed to segment messages that would otherwise fit into an UDT/UDTS message. This may be done e.g. to restrict the mean length of the messages sent over the network. In this case all messages larger than a certain limit (the value "X" from the ITU-T White Book (1993)) are subjected to segmenting;

4) the final goal is the complete replacement of UDT/UDTS messages by XUDT/XUDTS messages. For a certain period of time, it is nevertheless required to be able to receive and relay UDT messages.

It is out of the scope of this ETS to define whether and when each of these stages is to be achieved.

6.1.3 Embedded method

Failure situations resulting from compatibility problems are covered in subclause 6.2.3 below.

6.2 Additional information for the SCCP embedded method

6.2.1 Service request for UUS3

UUS3 may be requested from ISUP both in call setup phase and in the active phase of the call. As seen from the SCCP there is no difference between these phases, and the request shall be treated the same way for both cases.

6.2.2 Treatment in transit exchanges

The decision whether a transit exchange is a SCCP relay point with coupling is under the control of ISUP. The ISUP has the total control of the setup of the signalling connection. In any transit exchange, i.e. where circuits are terminated, ISUP may decide whether or not association of connection sections shall be performed.

If so, this information is given to the SCCP by invoking the REQUEST TYPE 2 interface element with "reply request" set. The decision is based on local knowledge of the connectivity in the MTP-network routeing.

If no knowledge is available, or when crossing network borders, association shall always be performed.

NOTE: When association is performed, ISUP puts the OPC of the gateway in the embedded connect request. If no association is performed, ISUP passes on the complete embedded connection request transparently without invoking SCCP. Otherwise, the complete embedded connection request is passed on transparently without invoking SCCP.

ISUP may also decide to perform chaining of SCCP connections on its own (see ITU-T Recommendation Q.730, figure 12/Q.730). This may ease exercising congestion control in transit nodes.

6.2.3 Failure situations

Due to the implementation strategy for SCCP in the different administrations, or implemented versions of the SCCP, several failure situations may occur during the setup of a signalling connection using SCCP embedded method over the international interface.

The following subclauses list possible failure situations, and the reactions on these.

6.2.3.1 SCCP not existing in another network

If a setup of UUS3 using the SCCP embedded method enters a network where SCCP is not existing, this will be detected by the ISUP in the gateway node. The embedded connection request shall be discarded, and the ISDN setup shall continue indicating that the link-by-link method is available.

The already partly established SCCP connection sections will be released by the connection establishment timers in the actual nodes.

ISUP in the originating node will be informed by the N-DISCONNECT INDICATION primitive with reason "Abnormal condition".

6.2.3.2 Embedded method not supported by SCCP

If the SCCP in another network does not support the embedded method, this will be detected by the ISUP due to lack of the interface elements REQUEST TYPE 1/2 and the actions performed will be similar to those described in the previous paragraph.

6.2.3.3 ISUP fails to invoke a REQUEST TYPE 2 primitive in a transit exchange

If the ISUP fails to invoke the REQUEST TYPE 2 primitive in a transit exchange, it might be impossible to route the CC message back to the originating node. In this case, the CC message is lost (since the OPC is not reachable by MTP routeing), and the connection on the originating side will be released by the connection establishment timers. On the terminating side, the connection will be released by the inactivity receive timer.

ISUP will in both ends be informed by the N-DISCONNECT INDICATION primitive with reason "Abnormal condition".

6.2.3.4 Node restarting during setup

If a node or the SCCP in a node restarts during the setup, all connection data in this node might be lost, and the setup will fail. This will be detected in the other nodes by connection establishment timer expiry, and expiry of the inactivity timers.

ISUP will in both ends be informed by the N-DISCONNECT INDICATION primitive with reason "Abnormal condition".

6.3 Specification and Description Language (SDL) diagrams for connectionless segmenting/reassembly

The SDL diagrams refer to the fields of the XUDT message as follows:

CL	in-sequence delivery option;
F	First bit;
PC	requested Protocol Class (in primitive);
REF	segmenting REFerence;
RS	Remaining Segments;
SEG	SEGmentation parameter;
UDL	User Data Length.

In addition, the following state-variables are used:

#SEG	number of SEGments;
RSE	Remaining Segments Expected.

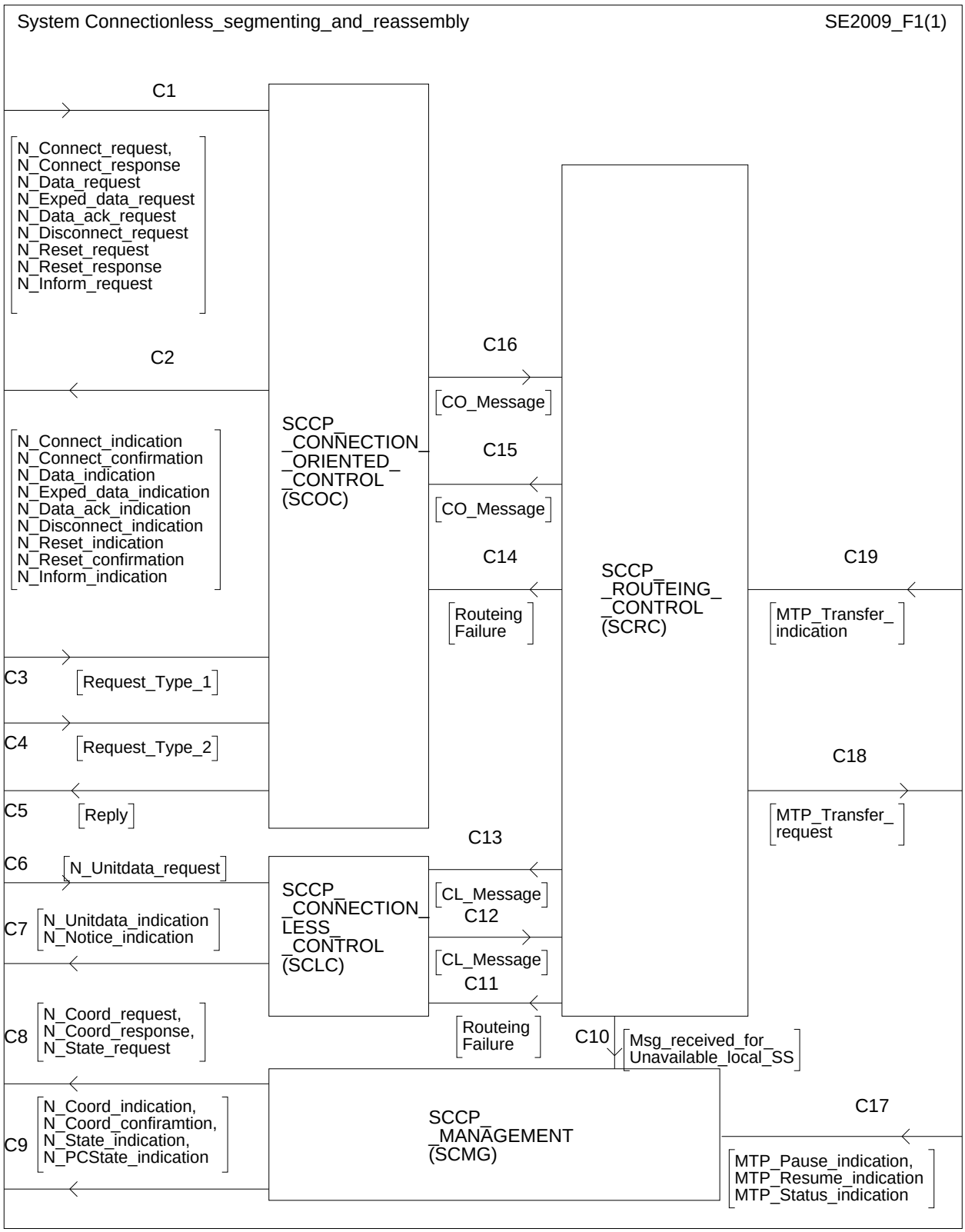

Figure 1: System diagram for SCCP Connectionless Control (SCLC)

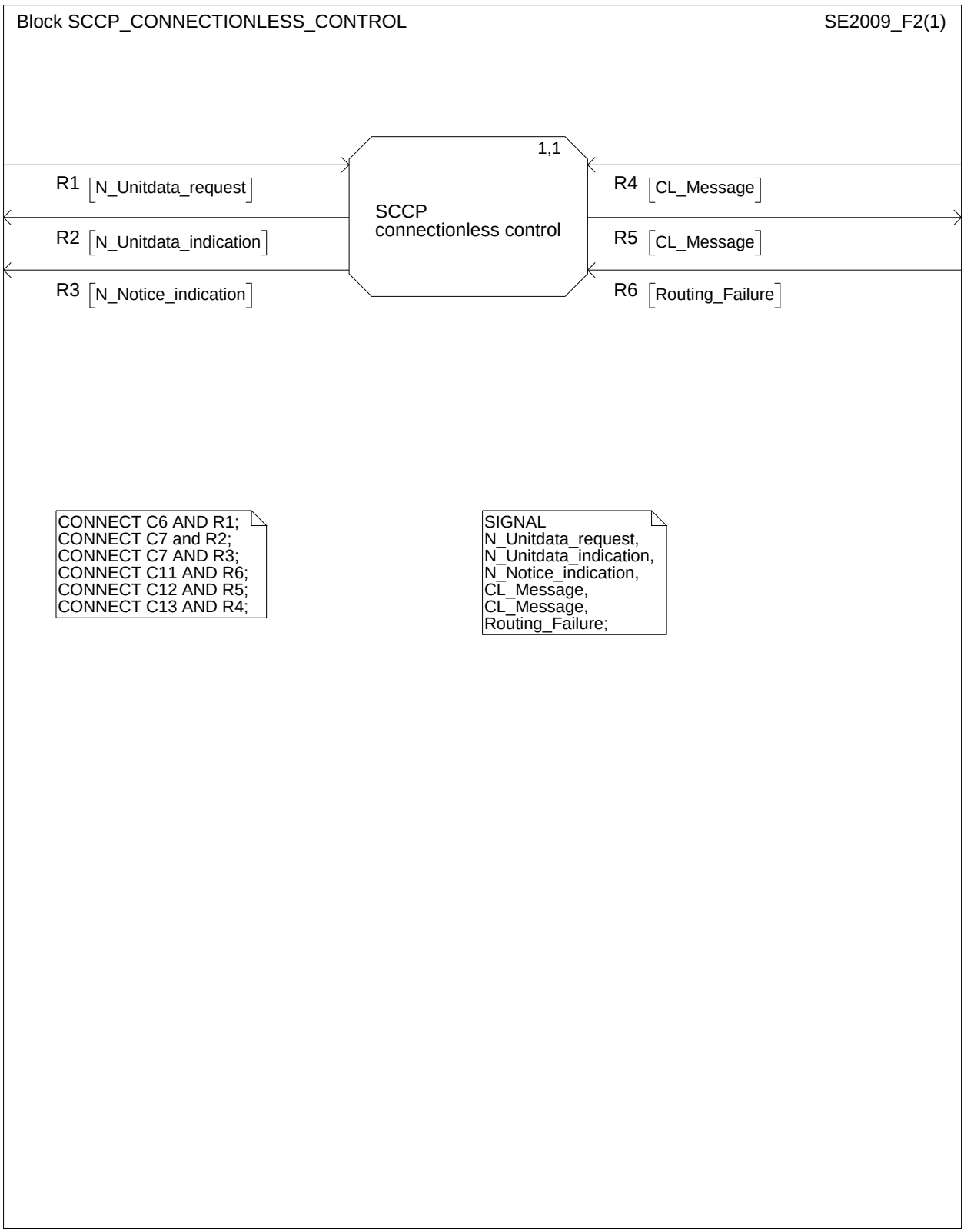

Figure 2: Block diagram for SCLC

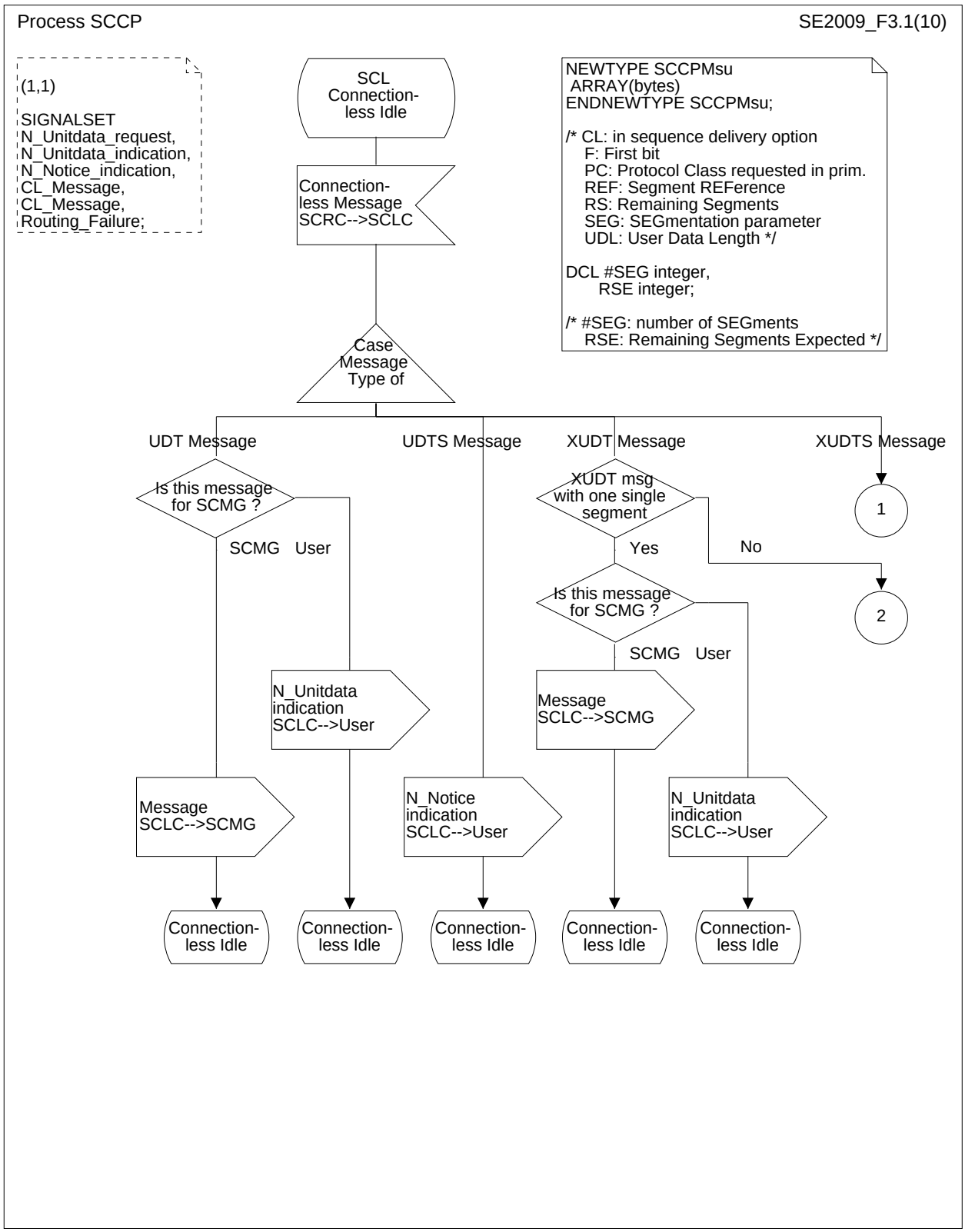

Figure 3 (sheet 1 of 10): Process diagram for SCLC

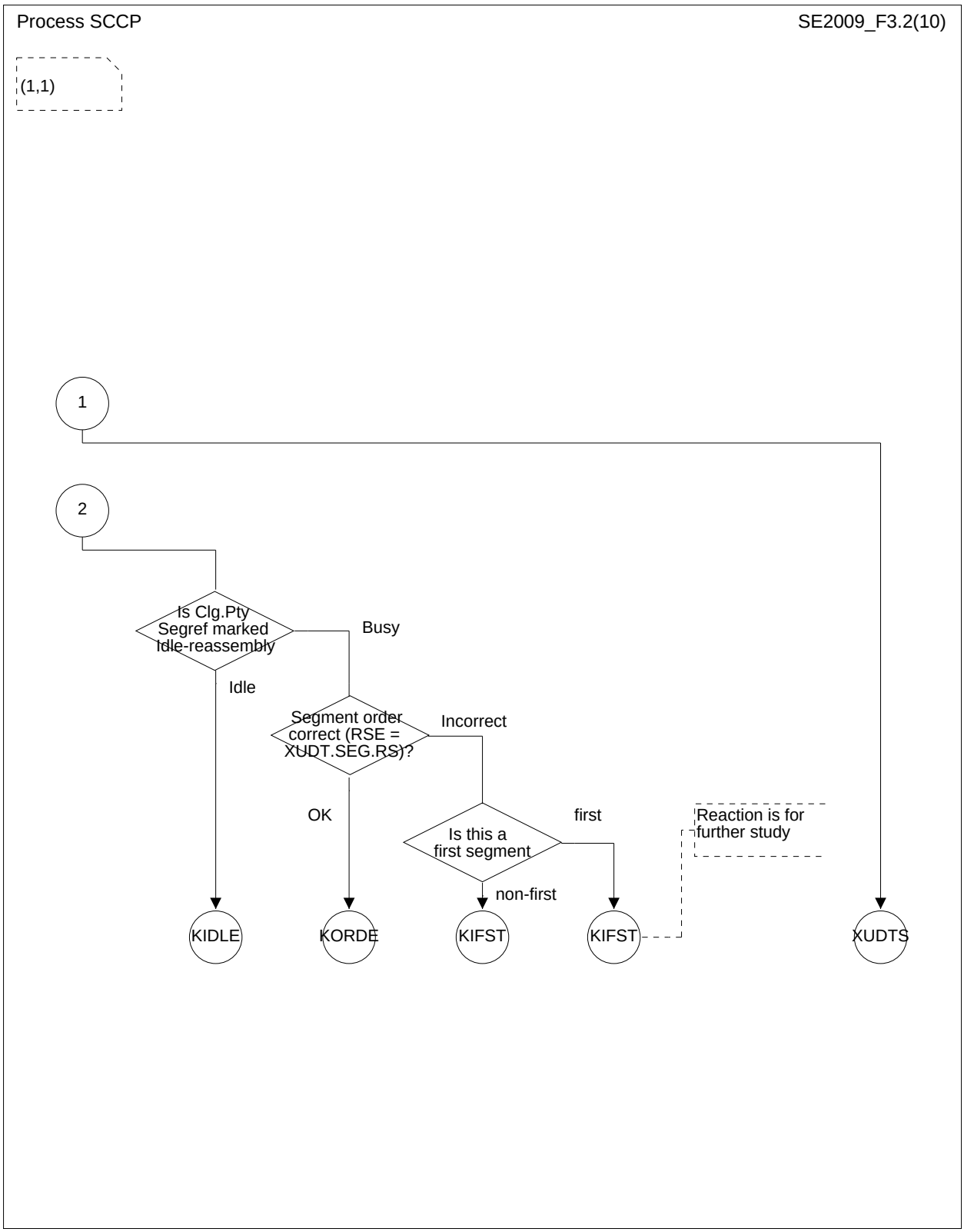

Figure 3 (sheet 2 of 10): Process diagram for SCLC

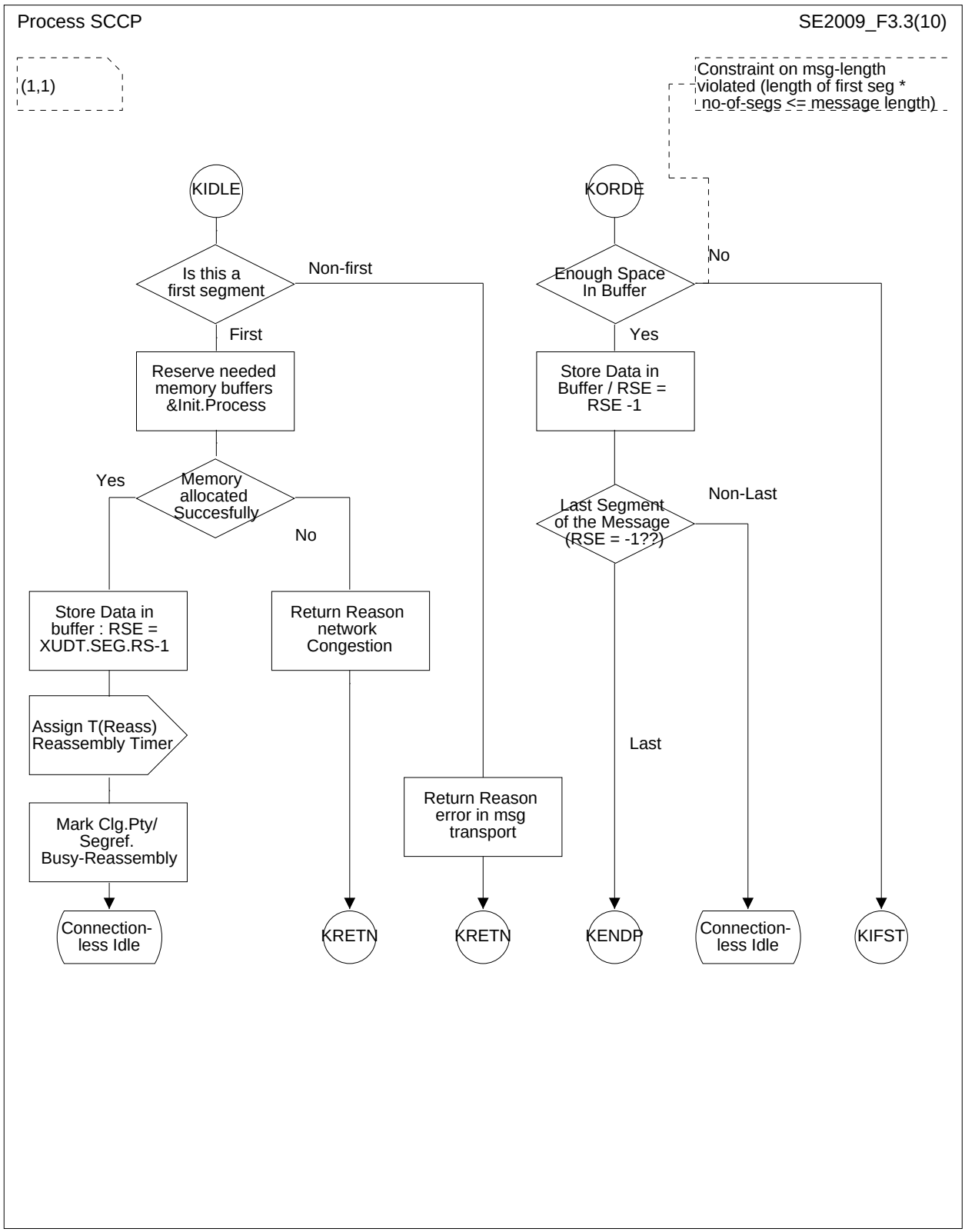

Figure 3 (sheet 3 of 10): Process diagram for SCLC

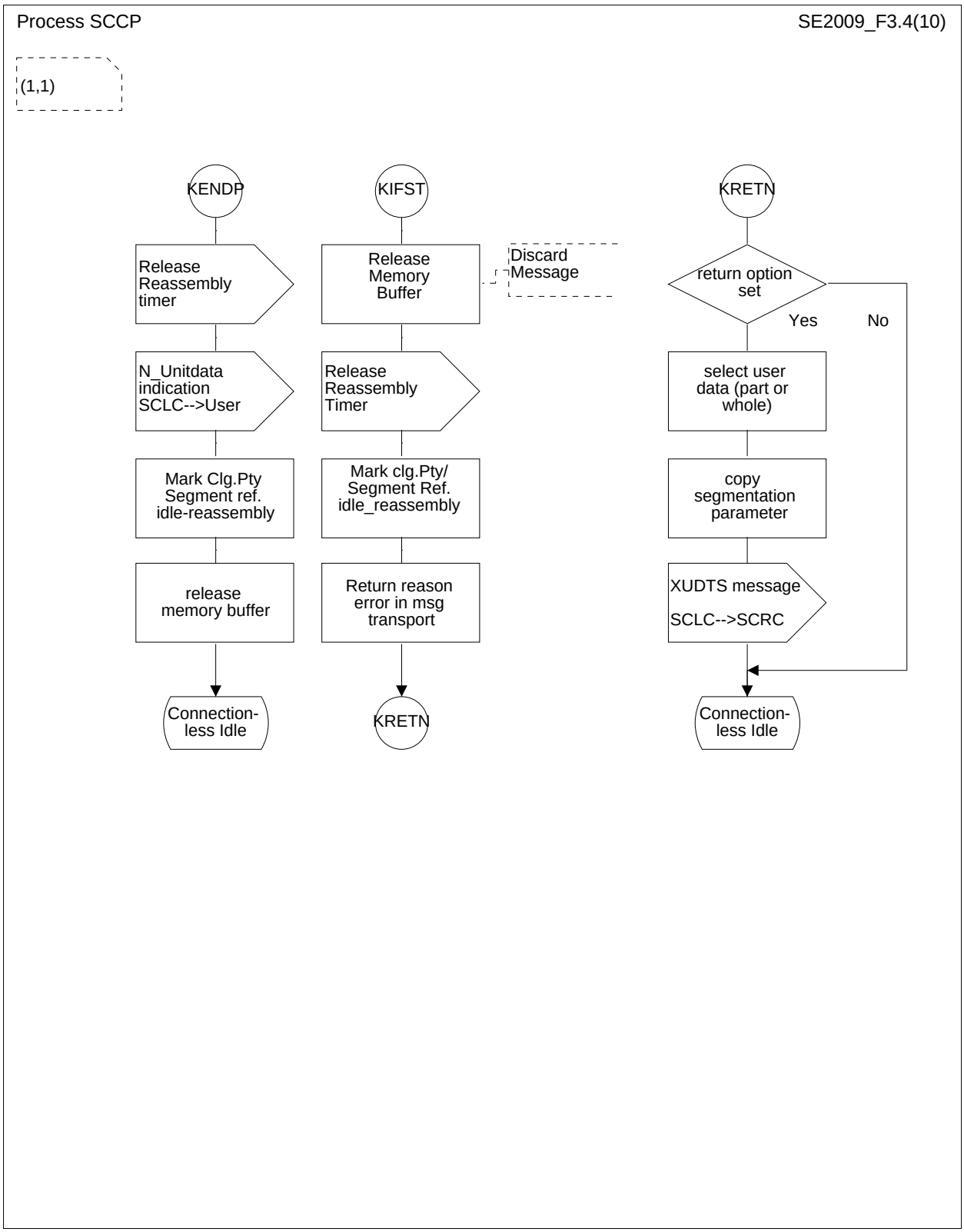

Figure 3 (sheet 4 of 10): Process diagram for SCLC

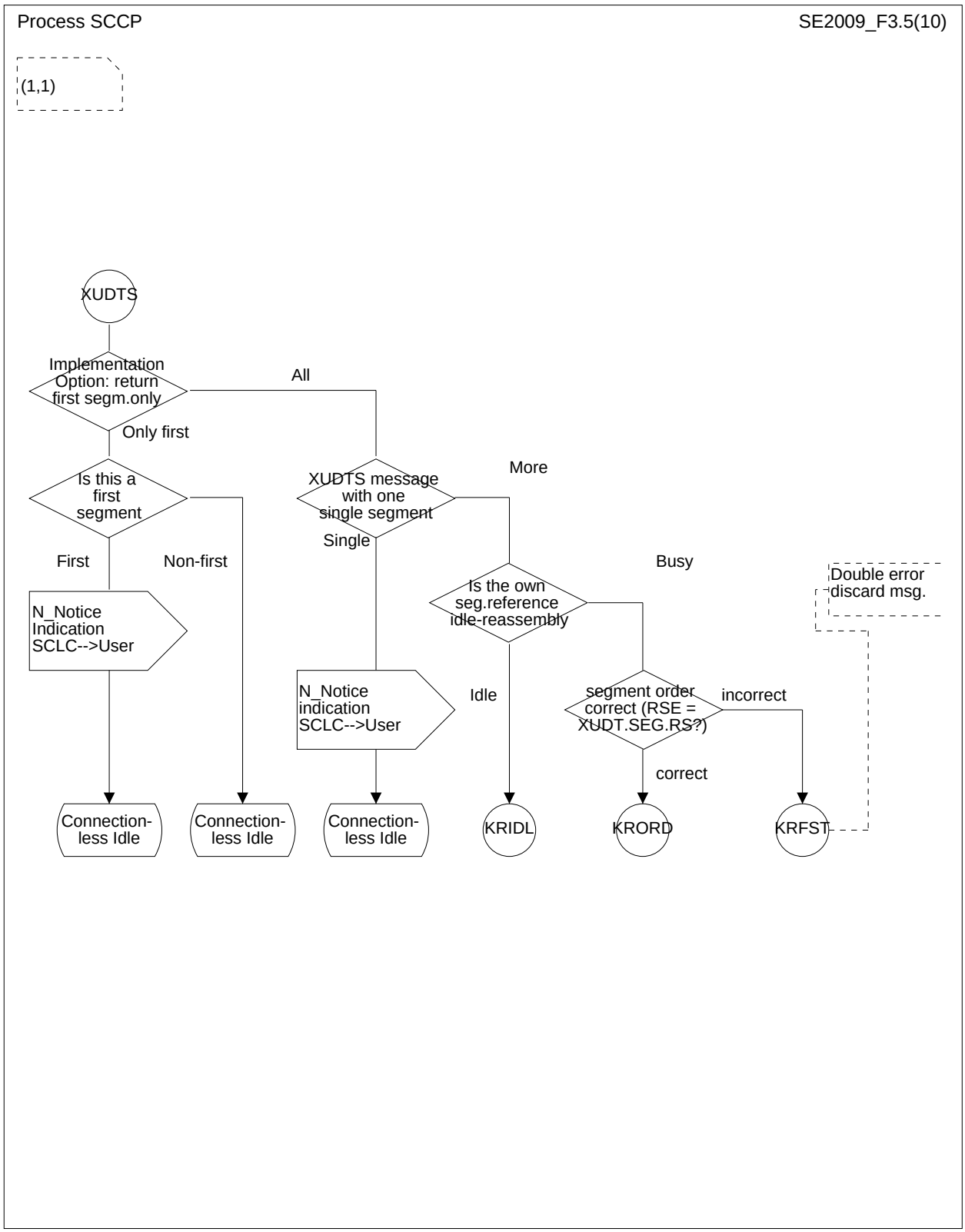

Figure 3 (sheet 5 of 10): Process diagram for SCLC

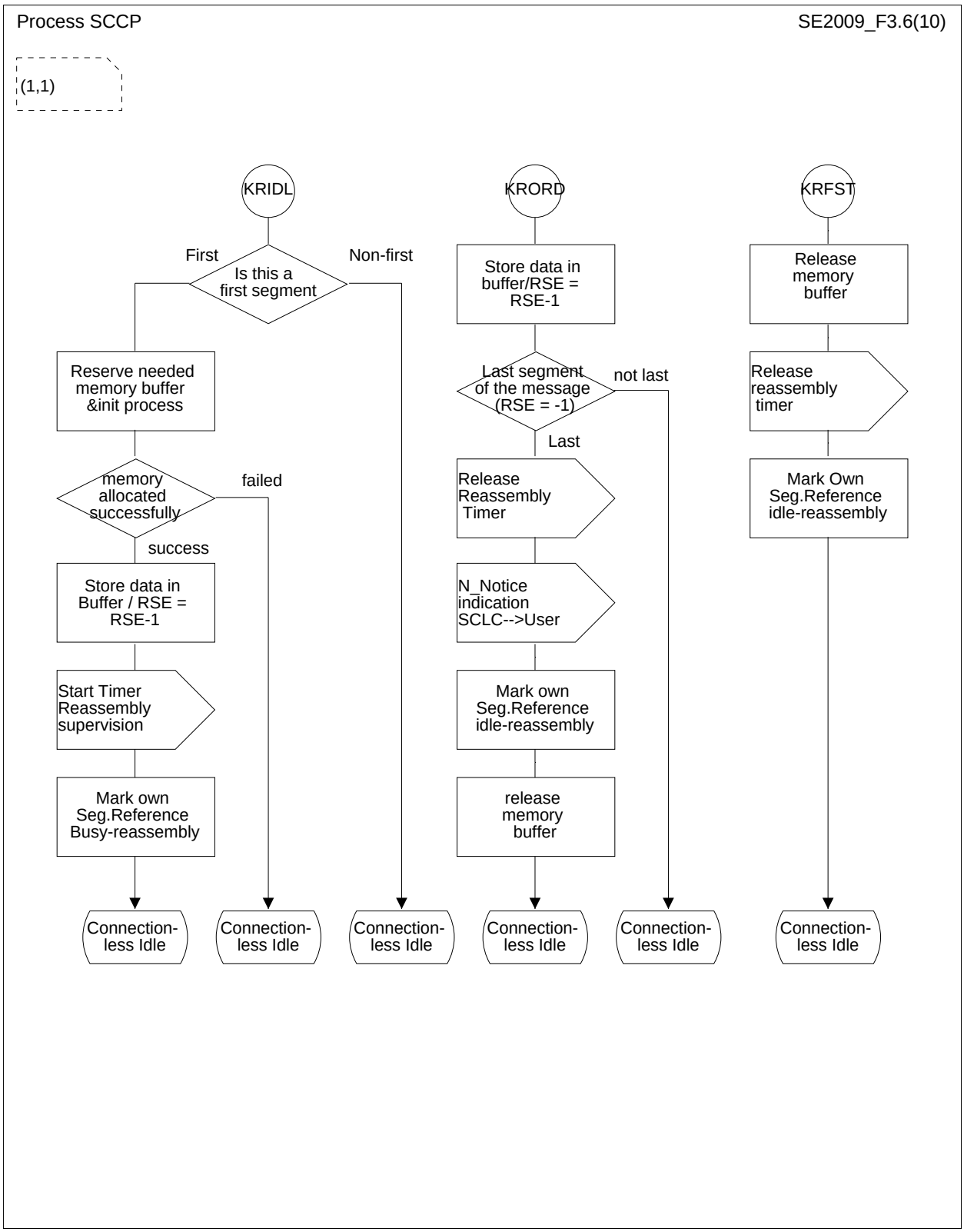

Figure 3 (sheet 6 of 10): Process diagram for SCLC

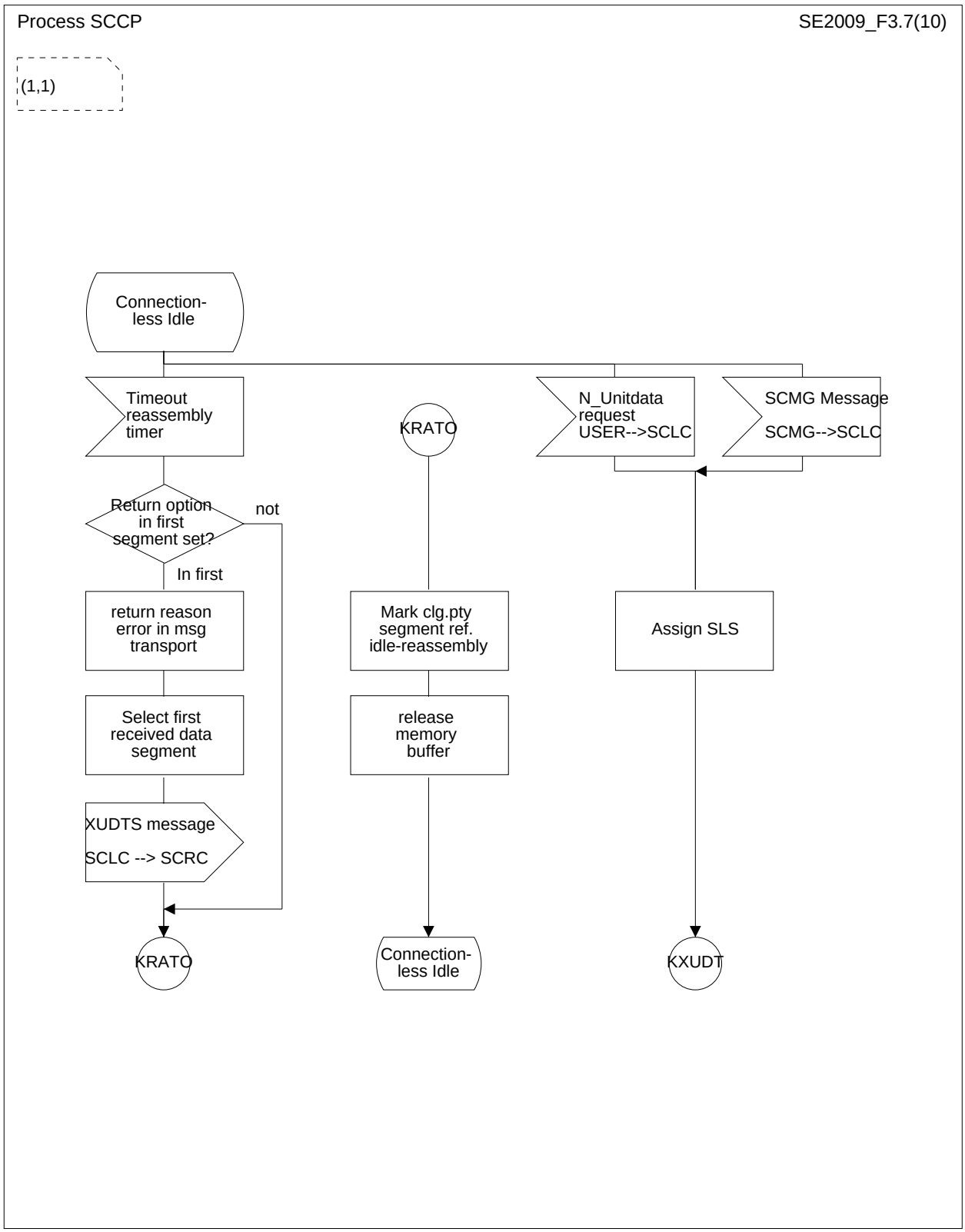

Figure 3 (sheet 7 of 10): Process diagram for SCLC

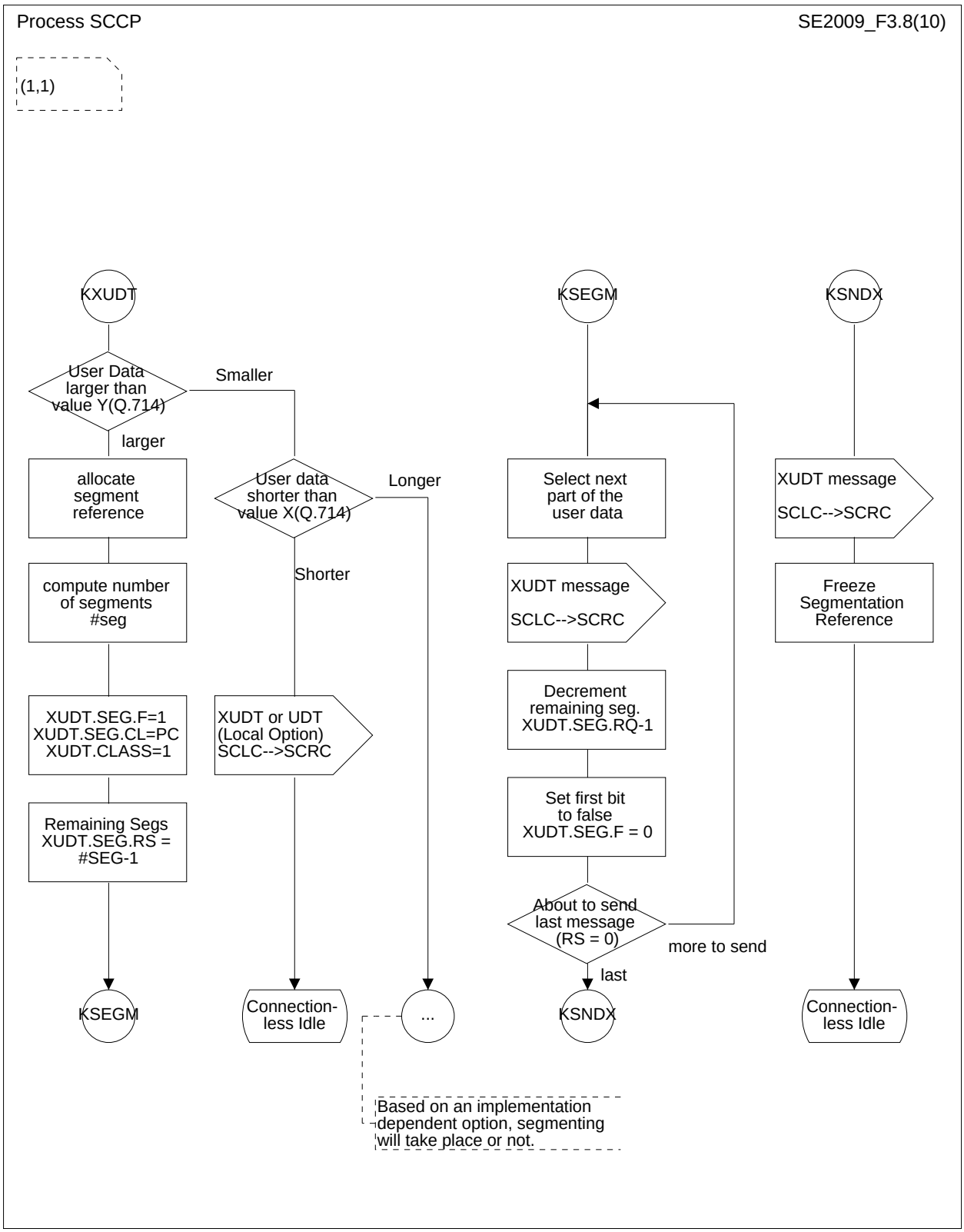

Figure 3 (sheet 8 of 10): Process diagram for SCLC

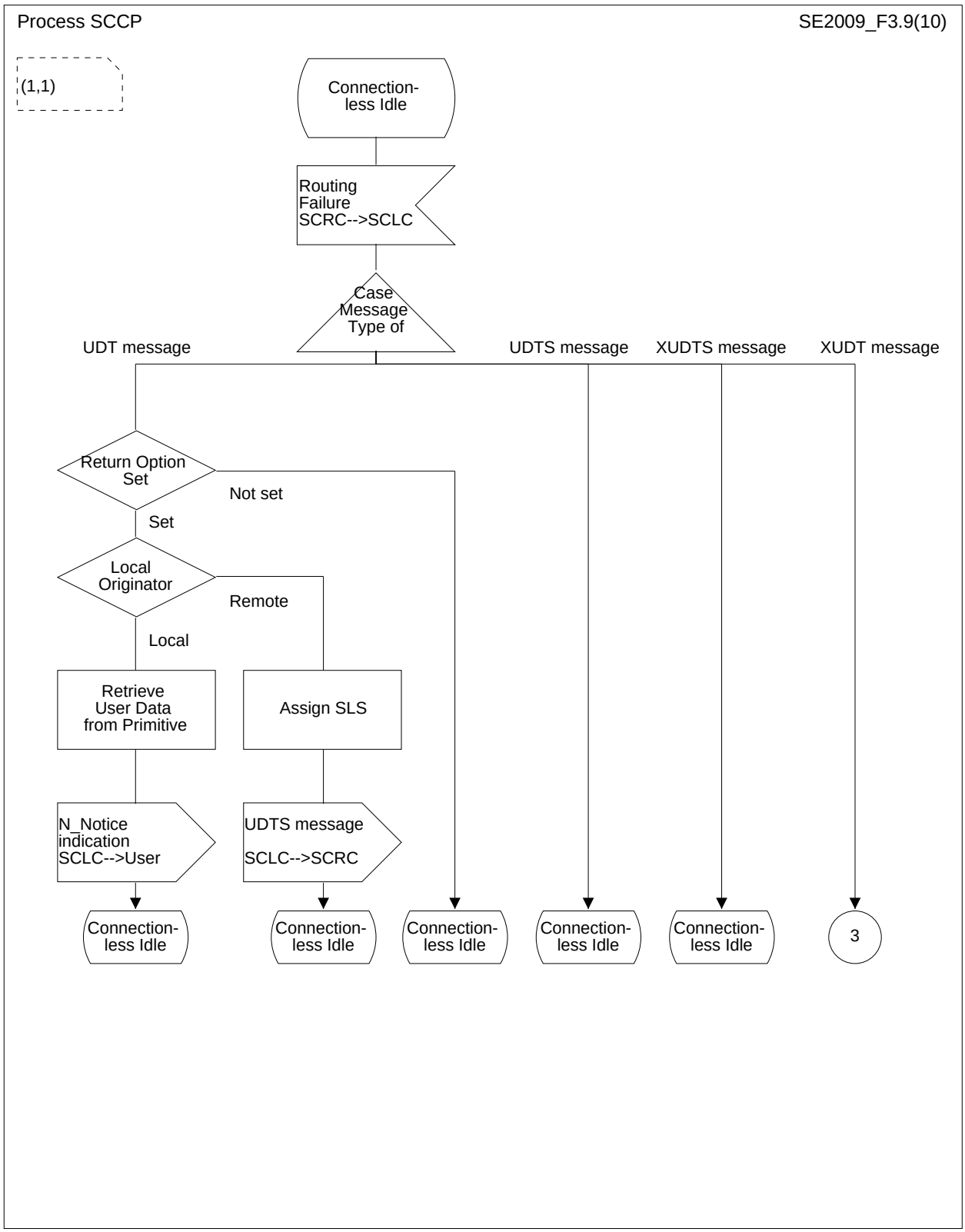

Figure 3 (sheet 9 of 10): Process diagram for SCLC

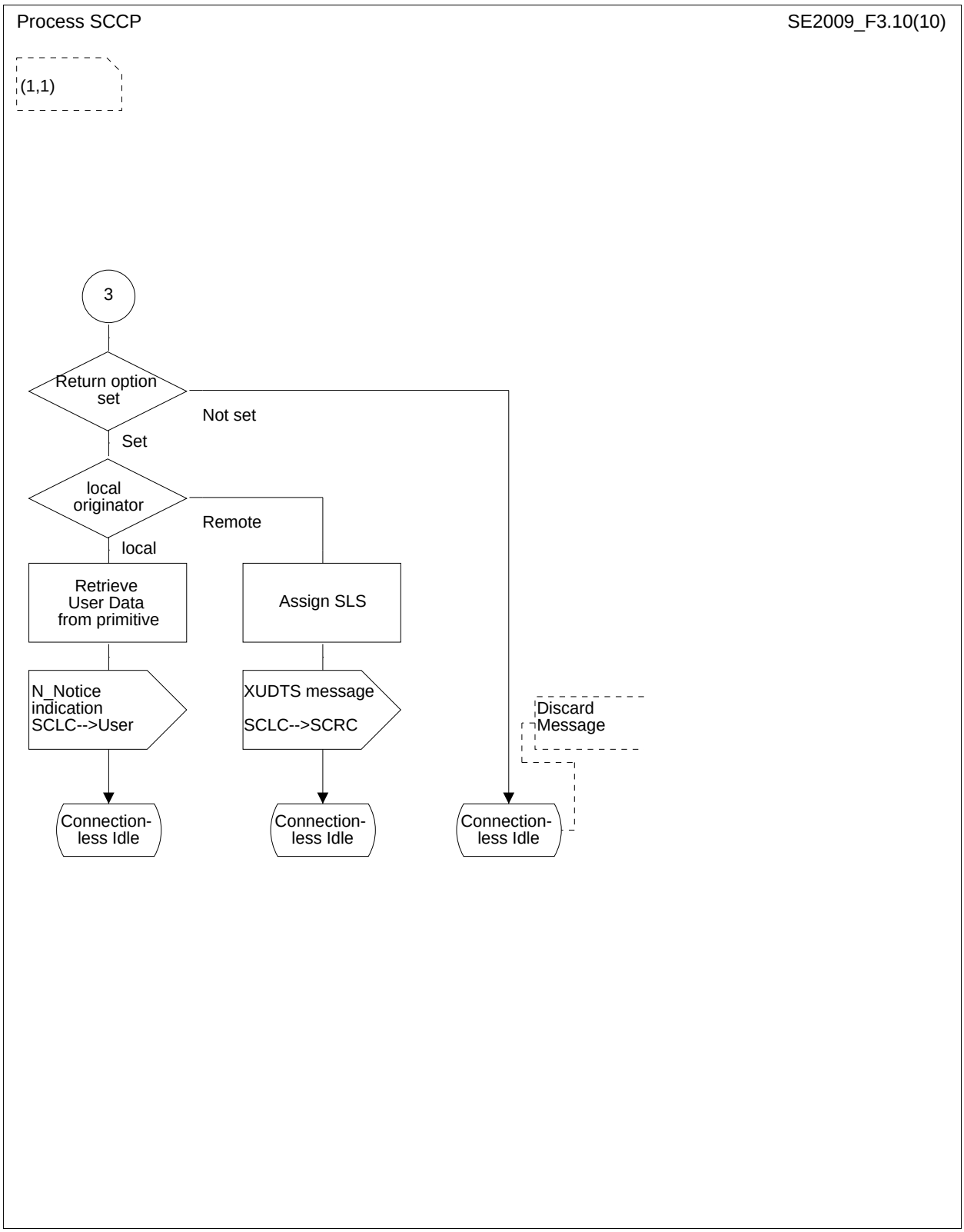

Figure 3 (sheet 10 of 10): Process diagram for SCLC

Annex A (informative): Bibliography

1) ITU-T Recommendation Q.701 (1993): "Specifications of Signalling System No.7; Functional description of the Message Transfer Part (MTP) of Signalling System No.7".

2) ITU-T Recommendation Q.730 (1993): "Specifications of Signalling System No.7; Signalling System No.7 - ISDN supplementary services".

3) ITU-T Recommendation Q.763 (1993): "Specifications of Signalling System No.7; Formats and codes of the ISDN user part of Signalling System No.7".

4) ETS 300 356-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1993), modified]".

5) ETS 300 356-2: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 2: ISDN supplementary services [ITU-T Recommendation Q.730 (1993), modified]".

6) ETS 300 356-18: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 18: Completion of Calls to Busy Subscriber (CCBS) supplementary service".

History

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